southland filtration

Talk to an expert **1800 656 771**

CSSD RO Water System O&A Manual

Client
HPAC

Project
Newcastle Private Hospital

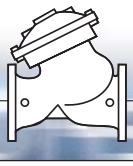
Proposal No.
NPHN-Q5627

Attention
Ekrem Haliloglu

13 August 2019

Southland Filtration Southland Industries Pty Ltd ABN 56 949 035 092
+61 1800 656 771 | filtration@southlandind.com.au | www.southlandfiltration.com.au

Table of Contents



Solenoid Controlled Valve

- Network management optimizing
- Pressure zone isolating
- Burst excess flow shut-off
- Reservoir overflow safety backup
- Switching between "on-duty" valves
- Automatic refreshing of reservoirs

The Model 710 Solenoid Controlled Valve is a hydraulically operated, diaphragm actuated control valve that either opens fully or shuts off in response to electric signals.
For very low pressure applications, refer to the Full Powered Opening and Closing Model 710-B.

Features and Benefits

- **Line pressure driven**
  - Independent operation
  - No motor required
  - Long term drip tight sealing
- **Solenoid controlled**
  - Low power consumption
  - Low cost wiring
  - Wide ranges of pressures and voltages
  - Normally Open, Normally Closed or Last Position
- **In-line serviceable** – Easy maintenance
- **Double chamber**
  - Full powered opening (option “B”) & closing
  - Non-slam closing characteristic
  - Protected diaphragm
- **Semi-straight flow** – Smooth flow characteristics
- **"Y" or angle, wide body** – Minimized pressure loss
- **Flexible design** – Easy addition of features

Major Additional Features

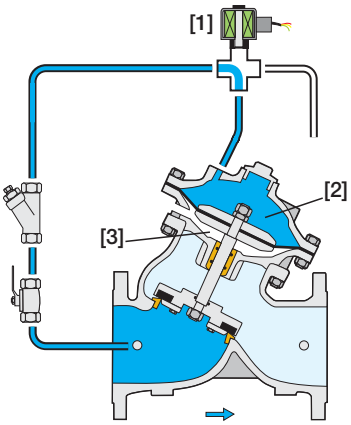
- Full powered opening & closing – **710-B**
- Check feature – **710-20**
- Opening & closing speed control – **710-03**
- Relief override – **710-3Q**
- Flow over the seat (fail-safe close) – **710-O**
- Closing surge prevention – **710-49**

See relevant BERMAD publications.

Operation

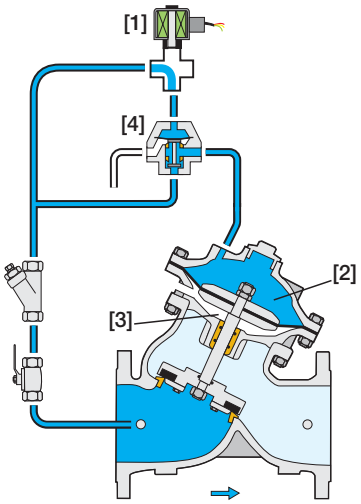
The Model 710 is a solenoid controlled valve equipped with a 3-Way solenoid pilot.
The normally open solenoid **[1]** applies pressure to the upper control chamber **[2]**, harnessing valve differential pressure to power the diaphragm actuator, closing the main valve. Energizing the solenoid vents control chamber pressure, causing the main valve to open fully. The lower control chamber **[3]** is open to the atmosphere.
In cases where pipeline water is contaminated (corrosive, debris laden) external control fluid is often used.
For 10" and larger valves, an accelerator **[4]** quickens valve response.

Size Range 1½-8"



Valve Closing

Size Range 10-20"



Valve Closing

Engineer Specifications

The Solenoid Controlled Valve shall either open fully or shut off in response to electric signals.

Main Valve: The main valve shall be a center guided, diaphragm actuated globe valve of either oblique (Y) or angle pattern design. The body shall have a replaceable, raised, stainless steel seat ring. The valve shall have an unobstructed flow path, with no stem guides, bearings, or supporting ribs. The body and cover shall be ductile iron. All external bolts, nuts, and studs shall be Duplex® coated. All valve components shall be accessible and serviceable without removing the valve from the pipeline.

Actuator: The actuator assembly shall be double chambered with an inherent separating partition between the lower surface of the diaphragm and the main valve. The actuator assembly shall not consist of any closing spring nor spring-like device. The entire actuator assembly (seal disk to top cover) shall be removable from the valve as an integral unit. The stainless steel valve shaft shall be center guided by a bearing in the separating partition. The replaceable radial seal disk shall include a resilient seal and shall be capable of accepting a V-Port Throttling Plug by bolting.

Control System: The control system shall consist of a 3-Way solenoid pilot valve (for 10" and larger valves, an accelerator shall be added to the solenoid), an isolating cock valve, and a filter. The assembled valve shall be hydraulically tested.

Quality Assurance: The valve manufacturer shall be certified according to the ISO 9001 Quality Assurance Standard. The main valve shall be certified as a complete drinking water valve according to NSF, WRAS, and other recognized standards.

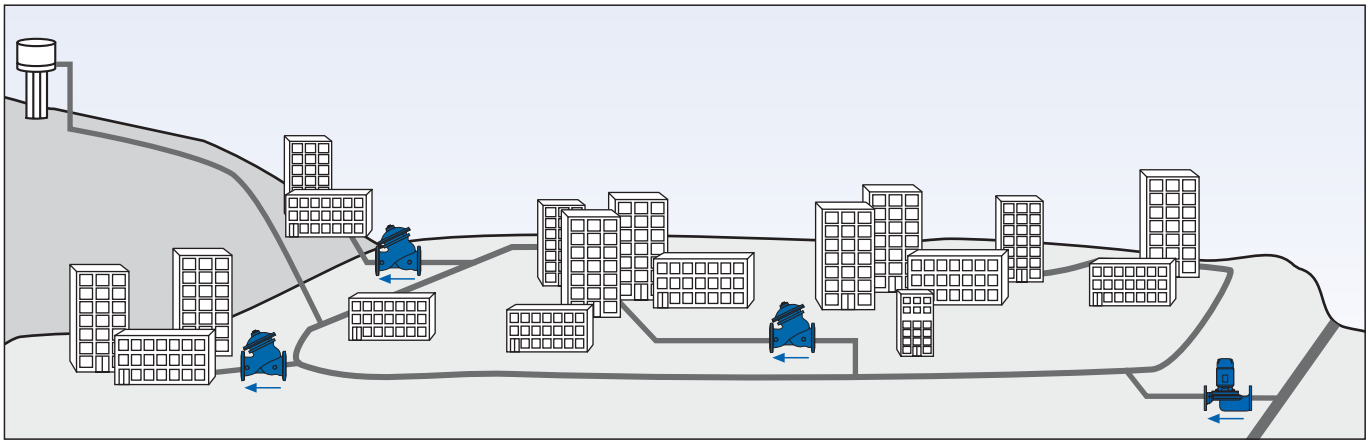
Typical Applications

Complex Distribution Networks

In complex distribution networks, management optimization of sources and consumers is essential:

- Sources are of various qualities and costs
- Source quality varies throughout the year
- Consumers demand various qualities
- Zones require isolation for maintenance
- Burst occurrence requires management
- Reservoirs call for systematic refreshing

The Model 710 is well suited to meet all the above needs and more. It should be included for placement in multiple locations during the design stage or with changing needs.



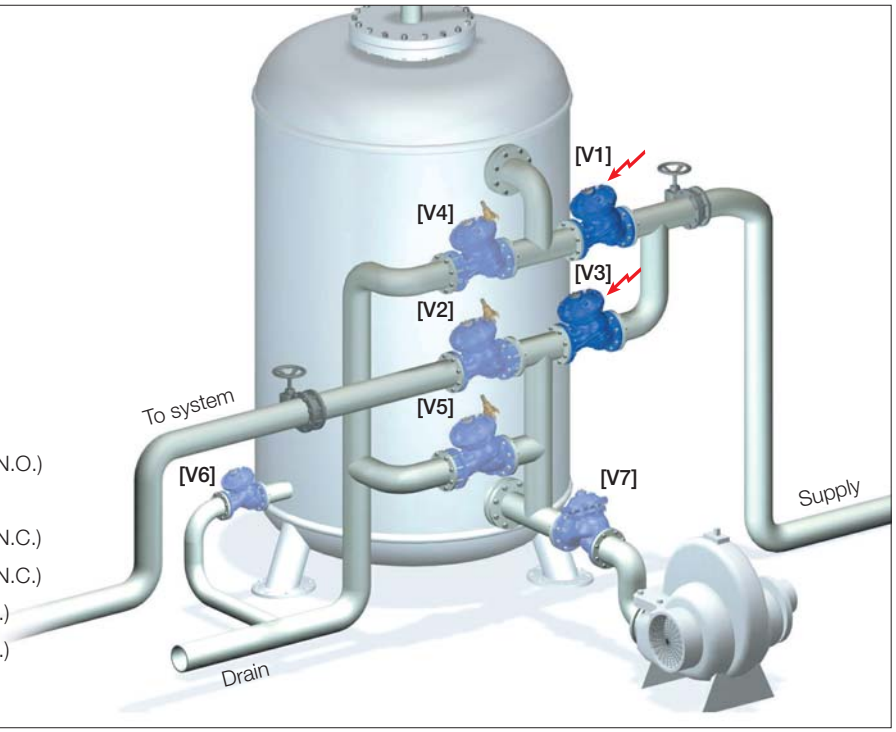
Filtration Systems

In a filter battery installed as part of a water treatment system, each filter requires periodic back flushing. This process entails reversing the direction of flow through each filter. Two Model 710 valves **[V1]** & **[V3]**, installed upstream from each filter, enable this reversal. The "untreated water valve" **[V1]** is Normally Open and the "back flushing inlet valve" **[V3]** is Normally Closed.

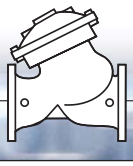
Filtration Process Control Valves:

[V1]	**Untreated water inlet**	**-**	**Model 710 (N.O.)**
[V2]	Treated water outlet	-	Model 770-55-U (N.O.)
[V3]	**Back flushing inlet**	**-**	**Model 710 (N.C.)**
[V4]	Back flushing outlet	-	Model 727-55-U (N.C.)
[V5]	Rinse water outlet	-	Model 727-55-U (N.C.)
[V6]	Scrubbing level drain	-	Model 710-B (N.C.)
[V7]	Air scrubbing inlet	-	Model 710-B (N.C.)

See relevant BERMAD publications.



BERMAD Waterworks



700 Series

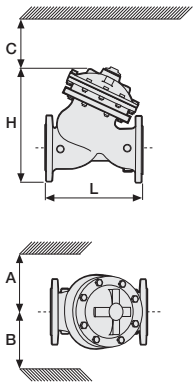
Model 710

Technical Data

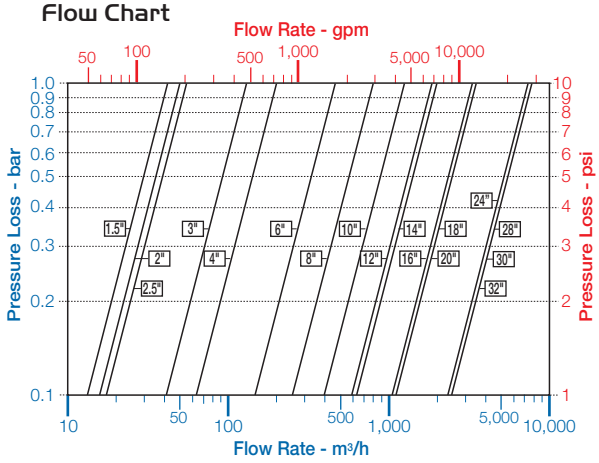
Dimensions and Weights

Size		A, B		C		L		H		Weight	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	kg	lbs
40	1½"	350	14	180	7	205	8.1	239	9.4	9.1	20
50	2	350	14	180	7	210	8.3	244	9.6	10.6	23
65	2½"	350	14	180	7	222	8.7	257	10.1	13	29
80	3"	370	15	230	9	250	9.8	305	12.0	22	49
100	4"	395	16	275	11	320	12.6	366	14.4	37	82
150	6"	430	17	385	15	415	16.3	492	19.4	75	165
200	8"	475	19	460	18	500	19.7	584	23.0	125	276
250	10"	520	21	580	23	605	23.8	724	28.5	217	478
300	12"	545	22	685	27	725	28.5	840	33.1	370	816
350	14"	545	22	685	27	733	28.9	866	34.1	381	840
400	16"	645	26	965	38	990	39.0	1108	43.6	846	1865
450	18"	645	26	965	38	1000	39.4	1127	44.4	945	2083
500	20"	645	26	965	38	1100	43.3	1167	45.9	962	2121

Data is for Y-pattern, flanged, PN16 valves
Weight is for PN16 basic valves
"C" enables removing the actuator in one unit
"L", ISO standard lengths available
For more dimensions and weights tables, refer to Engineering Section



Flow Chart



Data is for Y-pattern, flat disk valves
For more flow charts, refer to Engineering Section

Main Valve

Valve Patterns: "Y" (globe) & angle
Size Range: 1½–32" (40-800 mm)
End Connections (Pressure Ratings):
Flanged: ISO PN16, PN25 (ANSI Class 150, 300)
Threaded: BSP or NPT
Others: Available on request
Working Temperature:
Water up to 80°C (180°F)
Standard Materials:
Body & Actuator: Ductile Iron
Internals:
Stainless Steel, Bronze & coated Steel
Diaphragm:
NBR Nylon fabric-reinforced
Seals: NBR
Coating:
Fusion Bonded Epoxy, RAL 5005 (Blue) NSF & WRAS approved or Electrostatic Polyester Powder, RAL 6017 (Green)

Control System

Standard Materials:
Accessories:
Bronze, Brass, Stainless Steel & NBR
Tubing: Copper or Stainless Steel
Fittings: Forged Brass or Stainless Steel
Solenoid Standard Materials:
Body: Brass or Stainless Steel
Elastomers: NBR or FPM
Enclosure: Molded epoxy
Solenoid Electrical Data:
Voltages:
(ac): 24, 110-120, 220-240, (50-60 Hz)
(dc): 12, 24, 110, 220
Power Consumption:
(ac): 30 VA, inrush; 15 VA (8W), holding or 70 VA, inrush; 40 VA (17.1W), holding
(dc): 8-11.6W

Values might vary according to specific solenoid model

Solenoid Selection

Valve Size	Solenoid Model		Accelerator Model	
	330 (2.0 mm)	311 (1.0 mm)	54	58
1½-8"	■			
1½-6"		■		
10-20"	■		■	
8-20"		■	■	
24 -32"	■			■
24 -32"		■		■
	PN 16		PN 25	

Accelerator Standard Materials:
Body: Brass or Stainless Steel
Internals: Stainless Steel & Brass
Elastomers: NBR or FPM

How to Order

Please specify the requested valve in the following sequence: (for more options, refer to Ordering Guide)

Sector	Size	Primary Feature	Additional Feature	Pattern	Body Material	End Connections	Coating	Voltage & Position	Tubing & Fittings	Additonal Attributes
WW	6"	710	00	Y	C	16	EB	4AC	CB	I

Sector
- WW — Waterworks

Size
- 6" — 1½ - 32"

Primary Feature
- 710 — Solenoid Controlled

Additional Feature (Multiple choices permitted)
- 00 — No Additional Feature
- 03 — Closing and Opening Speed Control
- 20 — Check Valve
- 3Q — Relief Override
- 49 — Closing Surge Prevention

Pattern
- Y — Oblique (up to 20")
- A — Angle (up to 18")
- G — Globe (24-32" only)

Body Material
- C — Ductile Iron Standard
- S — Cast Steel
- N — St. Steel 316
- U — Nickel Alumin. Bronze

End Connections
- 16 — ISO-16
- 25 — ISO-25
- A5 — ANSI-150
- A3 — ANSI-300
- J6 — JIS-16
- J2 — JIS-20

Coating
- EB — Epoxy FB Blue
- PG — Polyester Green
- PB — Polyester Blue
- UC — Uncoated

Voltage & Position
- 4AC — 24VAC/50Hz - N.C.
- 4AO — 24VAC/50Hz - N.O.
- 4DC — 24VDC - N.C.
- 4DO — 24VDC - N.O.
- 4DP — 24VDC - L.P.
- 2AC — 220VAC/50-60Hz N.C.
- 2AO — 220VAC/50-60Hz N.O.

Tubing & Fittings
- CB — Copper Tubing & Brass Fittings
- PB — Plastic Tubing & Brass Fittings
- NN — St. St. 316 Tubing & Fittings

Additonal Attributes (Multiple choices permitted)
- B — Double Chamber
- I — Valve Position Indicator
- F — Large Control Filter
- S — Electric Limit Switch
- O — Flow Over the Seat
- N — St. St. 316 Control Accessories
- T — St. St. 316 Internal Trim (Closure & Seat)
- D — St. St. 316 Actuator Internal Assembly
- R — Delrin Bearing
- E — Viton Elastomers for Seals & Diaphragm
- 6 — Pressure Gauge

info@bermad.com • www.bermad.com

Solenoid Controlled Valve

(Sizes 1½-24"; DN40-600)

Description

The Model 710 solenoid Controlled Valve is a hydraulically operated, diaphragm actuated, that either opens fully or shuts off in response to electric signals.
For very low pressure applications use Full Powered Opening and Closing Model 710-B.

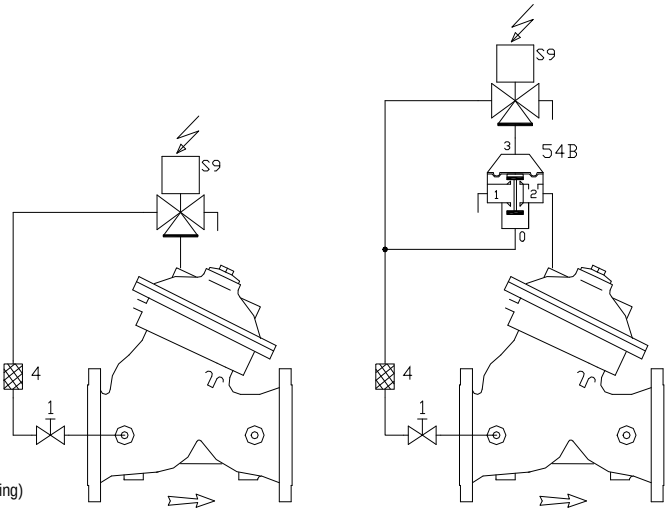
Installation

1. Ensure enough space around the valve assembly for future maintenance and adjustments.
2. Prior to valve installation, flush the pipeline to insure flow of clean fluid through the valve.
3. For future maintenance, install Isolation gate valves upstream and downstream from Solenoid Control valve.
4. Install the valve in the pipeline with the valve flow direction arrow in the actual flow direction. Use the lifting ring provided on the main valve cover for installing the valve.
5. For best performance, it is recommended to install the valve horizontally and upright. For different valve positions – consult Bermad.
6. After installation carefully inspect/correct any damaged accessories, piping, tubing, or fittings.
7. System power connections, control cabinet, controller, sensors & wiring must be carried out by authorized electrical engineer / electrician and comply with Electrical and Instrumentation Codes.
8. Cross-Check solenoid's specifications with design requirements and solenoids/coils label.
9. Pull and connect 3-wired cables, to the solenoid, according to electric diagram. Ensure approved cables protection. Confirm that the wires data meet specifications.
   Note: Energizing the solenoid coil when it is not fixed in its place, is dangerous and might burn the coil.
10. It is highly recommended to install a strainer Bermad model 70F upstream from the Solenoid Control Valve, to prevent debris from damaging valve operation.

Commissioning

1. Confirm that cock valve [1] is open (handle parallel to cock-valve body).
2. Confirm that the supply pressure is typical.
3. Open upstream and downstream isolating valves. Allow the Solenoid Control Valve to open.
4. Vent air from the valve control loop:
   During opening, use solenoid manual override to manually switch position, forcing the valve to close and then to open. At each position, vent air from the valve control loop by loosening tube fitting at the highest point, allowing the air to bleed. For 10" valves & larger, air venting is required also from port [2] of the 3W hydraulic Relay valves [54]. Retighten the fittings eyebolts.
5. The 3W hydraulic relay valves [54] quicken valve response.
6. The Model 710 has three modes of operation:
   6.1. Normally Closed Valve, with a Normally Open Solenoid. Energizing the solenoid will cause the valve to open.
   6.2. Normally Open Valve, with a Normally Closed Solenoid. Energizing the solenoid will cause the valve to Close.
   6.3. Last Position Valve, with a Latch Solenoid. Each electric command will cause the valve to alternate between fully open and closed.

Control Drawing



PARTS LIST

1	2W Cock Valve
4	Control Filter
S9	3W Solenoid
54B	3W Hydraulic Valve (w/o spring)

Sizes 10"; DN250 and Smaller

Sizes 10"; DN250 and Larger

Trouble-Shooting

1. Valve fails to Open: Check for sufficient inlet pressure, confirm solenoid is not jammed, confirm power supply to solenoid & confirm solenoid coil is not burned (N.C. valves), & check cock valve [1] status.
2. Valve fails to Close: Check cock valve [1] status, confirm power supply to solenoid & confirm solenoid coil is not burned (N.O. valves), confirm solenoid is not jammed, clean control filter & detect for clogged ports or fittings, check if any debris trapped in the main valve, confirm diaphragm is not leaking on both the valve and the relay valve.

Preventative Maintenance

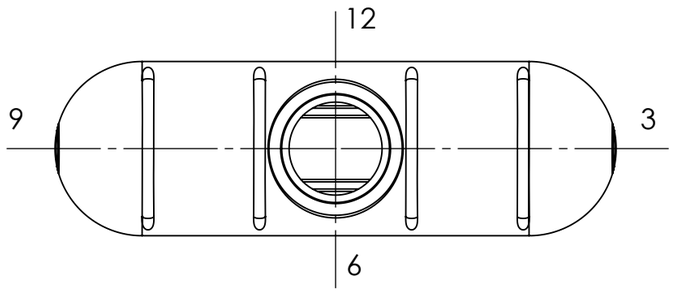
1. System operating conditions that effect on the valve should be checked periodically to determent the required preventative maintenance schedule.
2. Maintenance instructions:
   - 2.1. Tools required:
     - 2.1.1. Metric and imperial wrenches
     - 2.1.2. Anti seize grease
   - 2.2. Visual inspection to locate leaks and external damages
   - 2.3. Functional inspection including: closing, opening and regulation.
   - 2.4. Close upstream and downstream isolating valves (and external operating pressure when used).
   - 2.5. Once the valve is fully isolated vent pressure by loosening a plug or a fitting.
   - 2.6. Open the stud nuts and remove the actuator as one unit from the valve body. Disassemble necessary control tubs.
   - 2.7. It is highly recommended to stock a reserve actuator assembly for each size. This allows minimum system field work and system down time.
   - 2.8. Disassemble the actuator and examine its parts carefully for signs of wear, corrosion, or any other abnormal conditions.
   - 2.9. Replace worn parts and all the Elastomers. Lubricate the bolts and studs threads with Anti seize grease.

Spare parts

Bermad has a convenient and easy to use ordering guide for valve spare-parts and control system components.
For solenoid valves refer to model and S/N on solenoid tags.

Pub # : IOMEW710	By: MB 3/09	Rev: 01MB-3/09	File name: IOMEW710_03_09

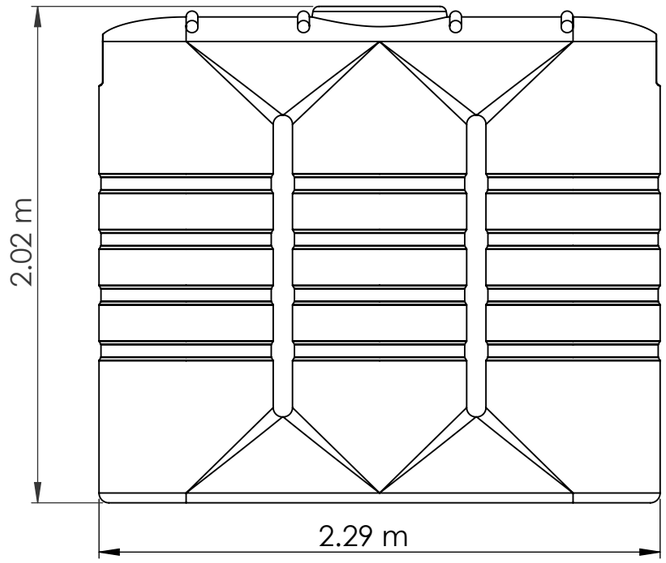
appliceng@bermad.com ● www.bermad.com



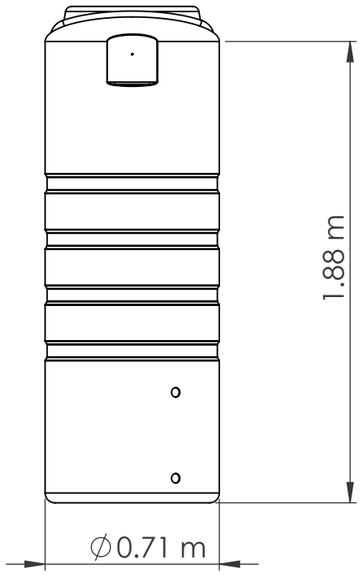
TOP VIEW

ACCESSORIES LIST

ITEM	SIZE	DETAIL	DESCRIPTION	RADIAL DEGREE	HEIGHT FROM BASE



12
REAR VIEW



3
SIDE VIEW

TSL440 V010			
LENGTH (m)	WIDTH (m)	TOTAL HEIGHT (m)	CAPACITY (LTR)
2.29	0.71	2.02	2000

NOTES: 1. Logo and ID plate located at 12 o/c.
2. Capacities & measurements are tested in accordance with AS4766, but may vary due to roto-moulding process.

BUSHMANS INDUSTRIAL
BUSHMANS HEAD OFFICE
GPO 4218, NSW, SYDNEY, 2001 WWW.BUSHMANTANKS.COM.AU

Drawn: TP	Project Title: TSL440 V010	Drawing Title: TSL440 Industrial Grade 2000L Schematic	
Date: 10/08/2018	Material: POLYETHYLENE		
Scale: 1:25	Finish:		

A3 Size Drawing

Company name:
Created by:
Phone:

Date: 12/08/2019

Qty.	Description
1	**CR 32-4-2 A-F-A-E-HQQE**

Note! Product picture may differ from actual product

Product No.: 96122012

Vertical, multistage centrifugal pump with inlet and outlet ports on same the level (inline). The pump head and base are in cast iron – all other wetted parts are in stainless steel. A cartridge shaft seal ensures high reliability, safe handling, and easy access and service. Power transmission is via a rigid split coupling. Pipe connection is via DIN flanges.

The pump is fitted with a 3-phase, fan-cooled asynchronous motor.

Controls:

Frequency converter:	NONE

Liquid:

Pumped liquid:	Water
Liquid temperature range:	-30 .. 120 °C
Selected liquid temperature:	20 °C
Density at selected liquid temperature:	998.2 kg/m³

Technical:

Pump speed on which pump data are based:	2919 rpm
Rated flow:	30 m³/h
Rated head:	53.1 m
Pump orientation:	Vertical
Shaft seal arrangement:	Single
Code for shaft seal:	HQQE
Approvals on nameplate:	CE, EAC,ACS
Curve tolerance:	ISO9906:2012 3B

Materials:

Base:	Cast iron EN 1563 EN-GJS-500-7 ASTM A536 80-55-06
Impeller:	Stainless steel EN 1.4301 AISI 304
Bearing:	SIC
Support bearing:	Graflon

Installation:

Maximum ambient temperature:	60 °C
Maximum operating pressure:	16 bar

Company name:
Created by:
Phone:

Date: 12/08/2019

Qty.	Description	
	Max pressure at stated temp:	16 bar / 120 °C 16 bar / -30 °C
	Type of connection:	DIN
	Size of inlet connection:	DN 65
	Size of outlet connection:	DN 65
	Pressure rating for pipe connection:	PN 40
	Flange size for motor:	FF265
	Electrical data:	
	Motor standard:	IEC
	Motor type:	132SB
	IE Efficiency class:	IE3
	Rated power - P2:	7.5 kW
	Power (P2) required by pump:	7.5 kW
	Mains frequency:	50 Hz
	Rated voltage:	3 x 380-415D/660-690Y V
	Rated current:	14,4-14,0/8,30-8,10 A
	Starting current:	780-910 %
	Cos phi - power factor:	0.88-0.82
	Rated speed:	2910-2920 rpm
	Efficiency:	IE3 90,1%
	Motor efficiency at full load:	90.1-90.4 %
	Motor efficiency at 3/4 load:	90.8 %
	Motor efficiency at 1/2 load:	90.8 %
	Number of poles:	2
	Enclosure class (IEC 34-5):	55 Dust/Jetting
	Insulation class (IEC 85):	F
	Motor No:	85U17522
	Others:	
	Minimum efficiency index, MEI â‰¥:	0.70
	Net weight:	110 kg
	Gross weight:	133 kg
	Shipping volume:	0.309 m³
	Danish VVS No.:	385906042
	Swedish RSK No.:	5824874

PUMP**CONTROL**

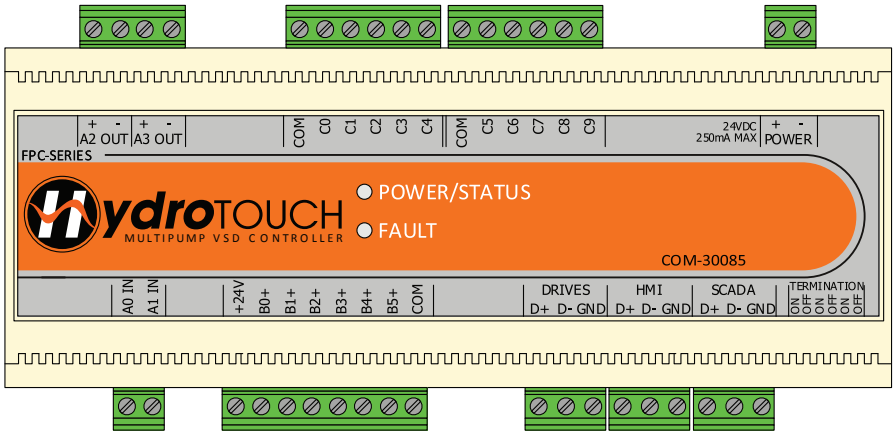
OWNER'S OPERATION & COMMISIONING MANUAL

HydroTOUCH Multipump VSD Controller Specifications

CONTENTS

1. Introduction

Your HydroTOUCH is a second generation variable speed, multi-pump controller designed to operate up to 12 pumps using a PID control algorithm. It features a wide range of advanced control options and a highly flexible array of input and output signals, both digital and analogue. With the use of an easy setup wizard and 'user friendly' touch screen design the operation of your system should be a delight. This manual provides all necessary operating information for the controller and touch screen.



SAFETY

- Prior to Installation, ensure power supply is isolated.
- Power supply must be Circuit Breaker Protected.
  (Qualified Electrician to determine appropriate amp rating.)
- Electrical connection to the panel must be carried out in accordance with 'Connection Instructions', see page 5.
- Additions or modifications to the control panel are not permitted and will void warranty.
- The controller is not intended for use by children or infirm persons without supervision.
- Repairs to the Controller must only be carried out by a suitably qualified Electrician.

This manual makes use of the following symbols to indicate warnings that must be paid specific attention

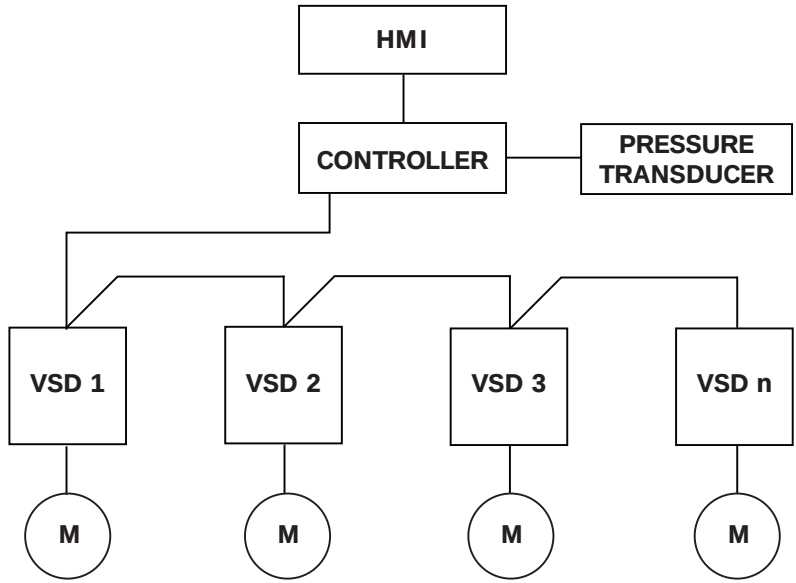
Damage to equipment or personal harm may occur if this instruction is not followed

Electrical risk (electrocution hazard) may occur if this instruction is not followed

WARNING: All electrical connections must be carried out by a suitably qualified and registered electrician

2. Overall Solution

Electrically the system is composed of three main components: the controller, VSDs and Human Machine Interface (HMI). The following diagram depicts the basic layout:



The HydroTOUCH has been designed to be a flexible solution for all aspects of feedback controlled pumps. Whether this is constant pressure, constant flow, constant temperature or proportional level, the HydroTOUCH can be configured to suit.

HARMONIC CONSIDERATION

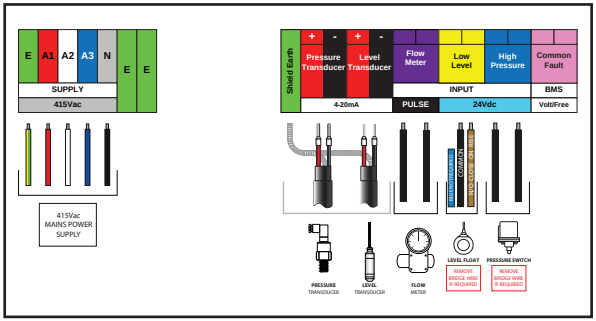
With all variable speed drives there will be some harmonic distortion on the main power supply. The drives we use have internal filters to reduce the amount of distortion, however in some applications additional filtering may be required. If additional harmonic filtering is required to meet site specifications feel free to let us know. See below an excerpt from the Australian Standard AS/NZS 61000.3.6 “Limits - Assessment of emission limits for distorting loads in MV and HV power systems”

‘Power utility companies and Australian Standards stipulate maximum harmonic levels which apply at a customer’s PCC (point of common coupling). Generally, the maximum permissible harmonic levels are given in terms of % THVD however to achieve a reduction in THVD, the customer is required to reduce their THID through the use of harmonic mitigation equipment. Commonly, THVD levels are required to be between 5-8%, however this will vary from state to state. IEEE STD 519 (1992) and AS/NZS 61000.3.6 (2001) are two widely used harmonic limit standards, however other standards may also be relevant including AS/NZS 61000.3.2 2007. Please confirm harmonic requirements with your utility provider. For more information please refer to the relevant standard.’

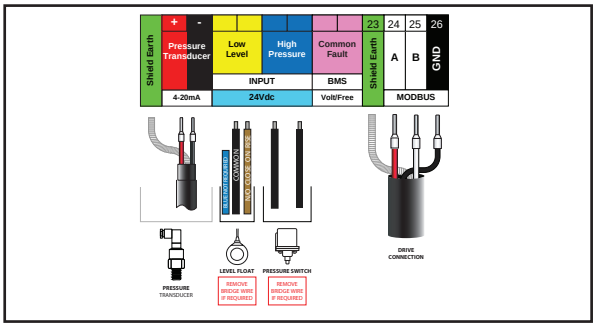
3. Commissioning

3.1 CONNECTIONS

Standard Connections

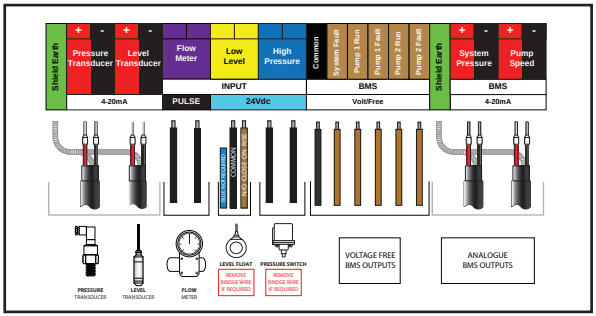


External Connections



Sometimes the HydroTouch is supplied with IP54 drives loose. In this case the drives are connected via Modbus terminals and the power supply into the Panel and out to the drives/pumps is via circuit breakers.

Optional Connections



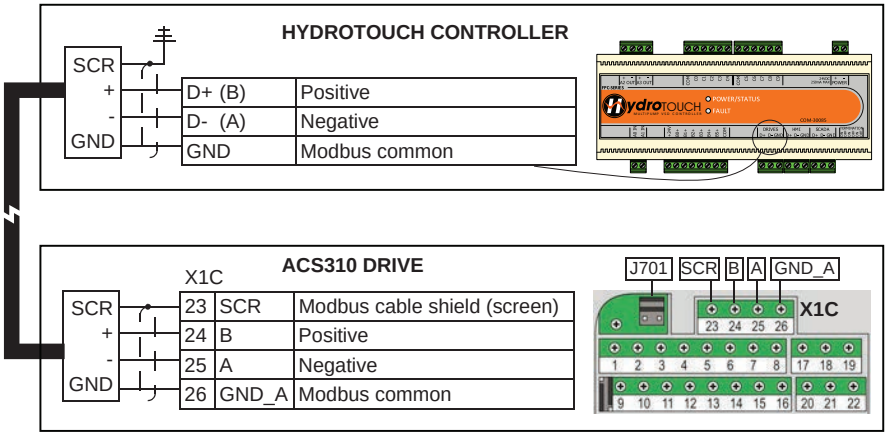
The HydroTouch is flexible and configurable for level transducers, flow meters and custom BMS signals. These options come standard and only need to be enabled in the wizard for use.

3.2 DRIVE COMMUNICATION

The HydroTOUCH controller uses the Modbus RS485 protocol to communicate with the variable speed drives. Due to the heat generated by some larger variable speed drives it may be required that IP54 drives be mounted outside of the main HydroTOUCH enclosure. The connection details are shown below.

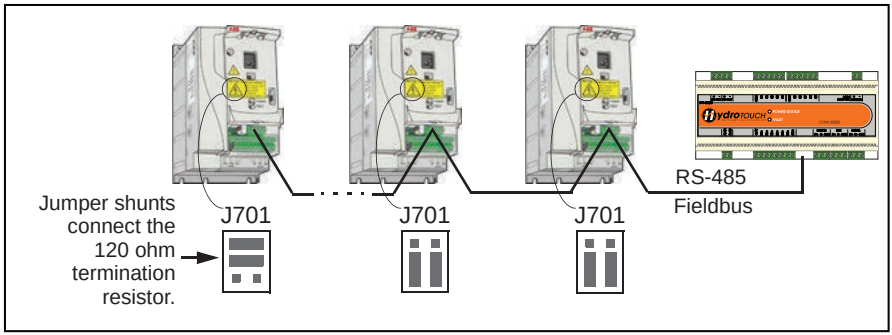
If the drives are wired inside the enclosure then all the drive configuration has already been completed, and you can go to section 3.3

3.2.1 Connecting modbus to the drives (ABB-ACS310)



3.2.2 Termination Resistor (ABB-ACS310)

The final drive in the chain must have a line termination resistor enabled or fitted, and the termination resistor for the “Drives” RS-485 port on the HydroTOUCH controller must be enabled using the corresponding jumper. The controller “Drives” RS-485 port contains inbuilt line polarisation resistors that are always enabled so no other polarisation resistors are to be fitted.



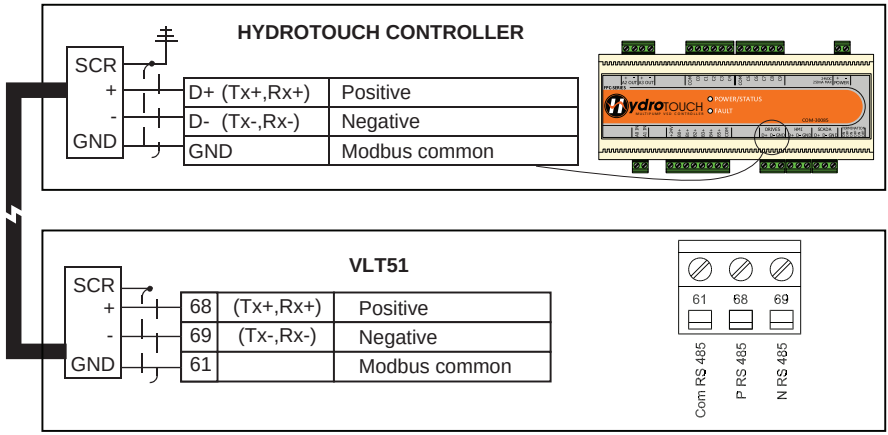
Note: Up to 12 drives can be connected to th e HydroTouch.

Terminate the RS-485 bus with a 120 ohm resistor at the end of the network by setting the jumper J701 shunts as in the figure above.

3.2.3 Set Slave Address (ABB-ACS310)

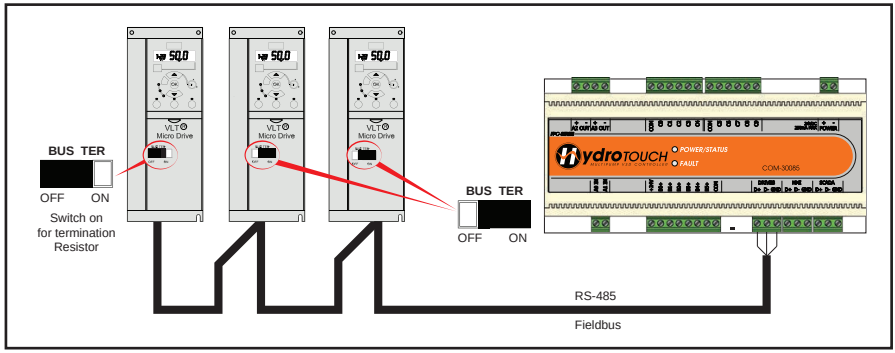
Once power is applied each drive needs to have an individual address set from 1 to 12 that corresponds to the pump number. This is set on the ABB drive under parameter 53-02. For example on drive 1 the parameter 53-02 = 1, for drive 2 parameter 53-02 = 2 and so on for all drives connected. If the parameter is not visible, the extended parameters may need to be enabled by changing 1611 = 3. After these parameters have been set power to the drive needs to be cycled.

3.2.4 Connecting modbus to the drives (DANFOSS - VLT51)



3.2.5 Termination Resistor (DANFOSS - VLT51)

The final drive in the chain must have a line termination resistor enabled or fitted, and the termination resistor for the “Drives” RS-485 port on the HydroTOUCH controller must be enabled using the corresponding jumper. The controller “Drives” RS-485 port contains inbuilt line polarisation resistors that are always enabled so no other polarisation resistors are to be fitted.



Note: Up to 12 drives can be connected to the HydroTouch.

Terminate the RS-485 bus with a termination resistor at the end of the network by setting the switch ‘**BUS TER**’ to on.

3.2.6 Set Slave Address (DANFOSS - VLT51)

Once power is applied each drive needs to have an individual address set from 1 to 12 that corresponds to the pump number. This is set on the Danfoss drive under parameter 8-31. For example on drive 1 the parameter 8-31 = 1, for drive 2 parameter 8-31 = 2 and so on for all drives connected. After these parameters have been set power to the drive needs to be cycled.

3.3 LOGIN

After the power, probes and pumps have been connected the HydroTOUCH is ready for commissioning. On initial power up, the HydroTOUCH will request the setup wizard be run to configure the system to suit site requirements. Once the wizard has been fully completed and saved the configuration will be stored into memory. If at any time site conditions change the setup wizard can be run again from the main menu. This will open up all the previously saved settings which can be further adjusted to suit any changes to site conditions.

There are two levels of access.

For onsite pump control and resetting faults, login using;
User Name: user , Password : 1234

For full access to the wizard, parameter list and resetting log data, login using;
User Name: admin , Password : 5555

Note: User names must be set as **lower case.**

To log in press on the user access box and enter ‘admin’ then press on the password box and enter ‘5555’. Once logged in the user can access all settings without having to renter the password. After 10 minutes of inactivity the user will automatically be logged out requiring them to login again to adjust any more parameters. The login is not required to view the system status.

3.4 EASY SETUP WIZARD

During the easy setup wizard you will be prompted to enter all the relevant information to configure the system. Some of the important features that must be set correctly in the wizard are listed below.

- Motor Data

The full load current (FLC), voltage (V) and Frequency (Hz) are written on the name plate of the pump and are required to set the VSD operation and protection. If these value are not entered correctly then there is potential that the pumps may be damaged. If using a VSD jacking pump, these values are set separately to the main pumps. If set beyond the limit of the drive a drive configuration fault will be activated.

FIGURE 1

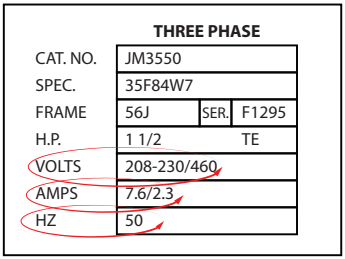


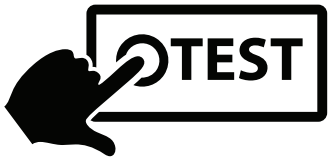
FIGURE 2

- Pump Rotation

The pump rotation simulation is to allow the user to check the rotation of the pumps. Once the start button is pressed the controller will run one pump at a time slowly so that they can be checked for correct rotation. If the rotation is incorrect ensure that power is isolated to the pump before changing the wiring.

- No Demand Speed Test

The no demand speed test checks the pump performance at the set pressure to best determine the speed settings of the HydroTOUCH controller. After the system setpoint has been set the test button will start the test and guide you through a three step process to set the no demand speed. If the system setpoint is changed you may need to rerun this test to optimise the system for the best operation possible.



- System Protections

There are a number of system protections which should be set to best protect the system and the pumps.

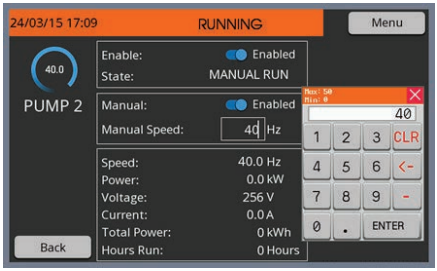
Once the wizard is finished press the save button to save the configuration. The system is configured ready to go. On the main screen the toggle switch is to be used to turn the system into auto position to start running. If site conditions change the wizard can be rerun to further tune the system. Also if fine adjustment is required the extensive parameter list can be accessed via the main menu.

4. Operation

4.1 MAIN SCREEN

The main screen shows how the system is operating and the status of faults, pumps and sensors. All elements can be touched to gain further information from this screen. The menu in the top right corner gives access to further screens for parameter adjustment, to view logged data or past faults or to rerun the wizard if site conditions have changed.

4.2 PUMP SCREEN



By pressing on any pump further pump controls and information can be obtained like pump current, run hours, number of starts and power usage. If a pump needs to be disabled and taken out of operation or even run in a manual mode for testing this is the screen where this is achieved. It is by simply pressing on the toggle switches to choose the operation required. The back button in the bottom left corner will take you back to the main screen.

4.3 OVERVIEW SCREEN

The overview screen is a handy tool to monitor the entire system operation. For ease of use, it will be automatically configured depending on what is set during the easy setup wizard.

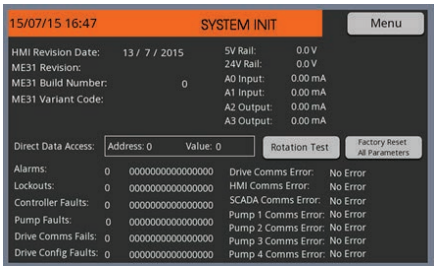
4.4 ALARM SCREEN

Pressing on the current alarms table will bring up the full alarms screen. This screens keeps a log of all past faults with an accurate time and date stamp. This can be a helpful tool in diagnosing what is going on with the system without having to be available 24/7. The back button will take you back to the main screen.

4.5 LOGGED DATA SCREEN

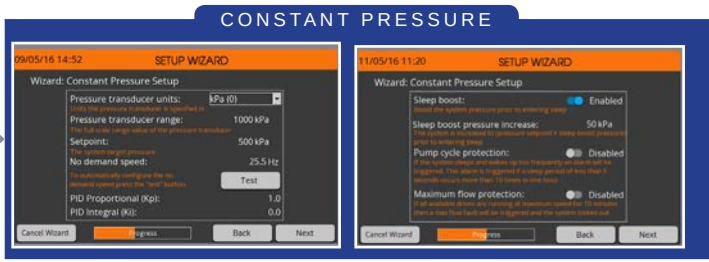
The logged data screen can be accessed through the main menu. On this page you will find access to trend graphs for power, pressure, flow and tank level. Usage graphs for total monthly power and water usage. Run timers for each pump and counters for system event information.

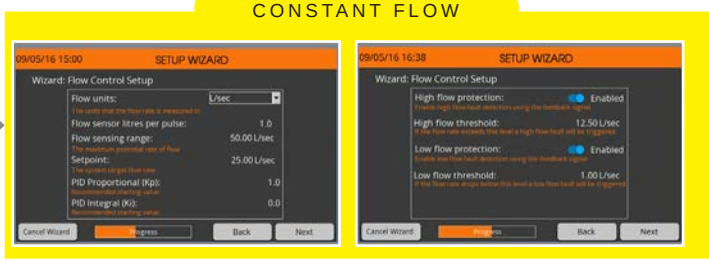
4.6 DIAGNOSTIC SCREEN

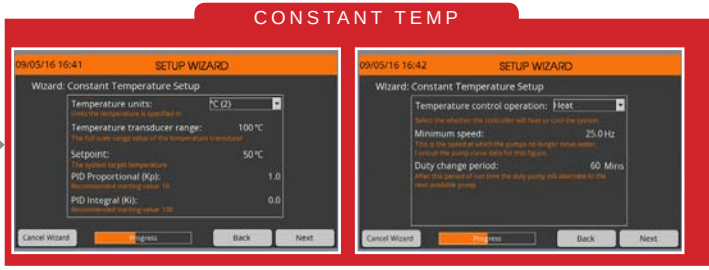


For fault finding and testing the diagnostic screen can be a useful tool. This screen is located at the bottom of the menu list. In this screen a competent user can diagnose communication faults, test pump rotation and even restore all the parameters to factory default if the user so wishes. The menu will give access back to the main screen.

4.7 WIZARD MENU STRUCTURE








11/05/16 11:21
SETUP WIZARD
Wizard: Constant Pressure Setup
High pressure protection:
Enabled
High pressure threshold:
800 kPa
Low pressure protection:
Enabled
Low pressure threshold:
250 kPa
Cancel Wizard
Progress
Back
Next


29/01/16 09:15
SETUP WIZARD
Wizard: Analog Input A1 Setup
Secondary analog input
A1 assign:
Unused
Pressure Backu
Tank Level
A1 level transducer units:
m (9)
A1 level transducer range:
4.00 m
A1 low level protection:
Disabled
Cancel Wizard
Progress
Back
Next


11/05/16 11:22
SETUP WIZARD
Wizard: Rain Mains Setup
Rain mains enable:
Enabled
Cancel Wizard
Progress
Back
Next


29/01/16 09:55
SETUP WIZARD
Wizard: Constant Level Setup
High level protection:
Enabled
High level threshold:
8.75 m
Low level protection:
Enabled
Low level threshold:
0.30 m
Cancel Wizard
Progress
Back
Next


29/01/16 09:55
SETUP WIZARD
Wizard: Constant Level Setup
Pump cycle protection:
Disabled
Maximum flow protection:
Enabled
Cancel Wizard
Progress
Back
Next

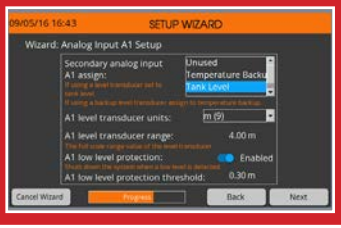

09/05/16 14:58
SETUP WIZARD
Wizard: Flow Meter Setup
Flow meter enable:
Enabled
Flow meter units:
L/sec (10)
Flow sensor litres per pulse:
1.0
Flow sensing range:
50.00 L/sec
Cancel Wizard
Progress
Back
Next


09/05/16 16:39
SETUP WIZARD
Wizard: Auxiliary Analog Input A0 Setup
A0 level transducer enable:
Enabled
A0 level transducer units:
m (9)
A0 level transducer range:
4.00 m
A0 low level protection:
Enabled
A0 low level protection threshold:
0.30 m
Cancel Wizard
Progress
Back
Next


09/05/16 16:40
SETUP WIZARD
Wizard: Auxiliary Analog Input A1 Setup
A1 pressure transducer enable:
Enabled
A1 pressure transducer units:
kPa (0)
A1 pressure transducer range:
1000 kPa
High pressure protection:
Enabled
High pressure protection threshold:
800 kPa
Cancel Wizard
Progress
Back
Next


29/01/16 09:17
SETUP WIZARD
Wizard: Assign Digital BMS
C0 output assign:
General Fault (28)
C1 output assign:
Siren (3)
C2 output assign:
Controller Fault (27)
C3 output assign:
Jacking Run (1)
C4 output assign:
Jacking Run (1)
C5 output assign:
General Fault (28)
C6 output assign:
Pump 1 Fault (4)
C7 output assign:
Pump 2 Fault (5)
C8 output assign:
Pump 3 Fault (6)
C9 output assign:
Pump 4 Fault (7)
Cancel Wizard
Progress
Back
Next


09/05/16 16:42
SETUP WIZARD
Wizard: Constant Temperature Setup
High temperature protection:
Enabled
High temperature threshold:
80 °C
Low temperature alarm:
Enabled
Low temperature threshold:
30 °C
Cancel Wizard
Progress
Back
Next


09/05/16 16:43
SETUP WIZARD
Wizard: Analog Input A1 Setup
Secondary analog input
A1 assign:
Unused
Temperature Backu
Tank Level
A1 level transducer units:
m (9)
A1 level transducer range:
4.00 m
A1 low level protection:
Enabled
A1 low level protection threshold:
0.30 m
Cancel Wizard
Progress
Back
Next


29/01/16 09:17
SETUP WIZARD
Wizard: Assign Analog BMS
A2 output signal:
Mirror Speed (4)
A3 output signal:
Mirror Feedback (3)
Cancel Wizard
Progress
Back
Next

END

5. Features

The HydroTOUCH has a lot of handy features to make the controller flexible and extremely user friendly. A few of these features are listed out below.

5.1 CONFIGURABLE BMS OUTPUTS

One of the great features of the HydroTOUCH is its flexible output assignment. This means the end user can configure the 10 relay outputs (1Amp @ 24Vdc) and 2 analogue outputs as one of the steps in the setup wizard. The relay outputs can be configured to turn on with any system event to indicate a fault, pump run or tank level reached status. The analogue outputs can be assigned to remotely monitor system pressure, system speed, tank/pit level or secondary transducer pressure. These signals are a passive 4-20mA signal used for increased transmission range and accuracy.

5.2 TANK/PIT LEVEL DISPLAY

If required the HydroTOUCH can be configured to draw from a tank or pit using a hydrostatic level transducer. This enables indication of the tank/pit level as well as protection and alarms for high and low levels. To enable this feature the AI1 (analogue input 1) is assigned as 'tank level' during the setup wizard. If this feature is required at a later date the setup wizard can be run again to adjust this setting.

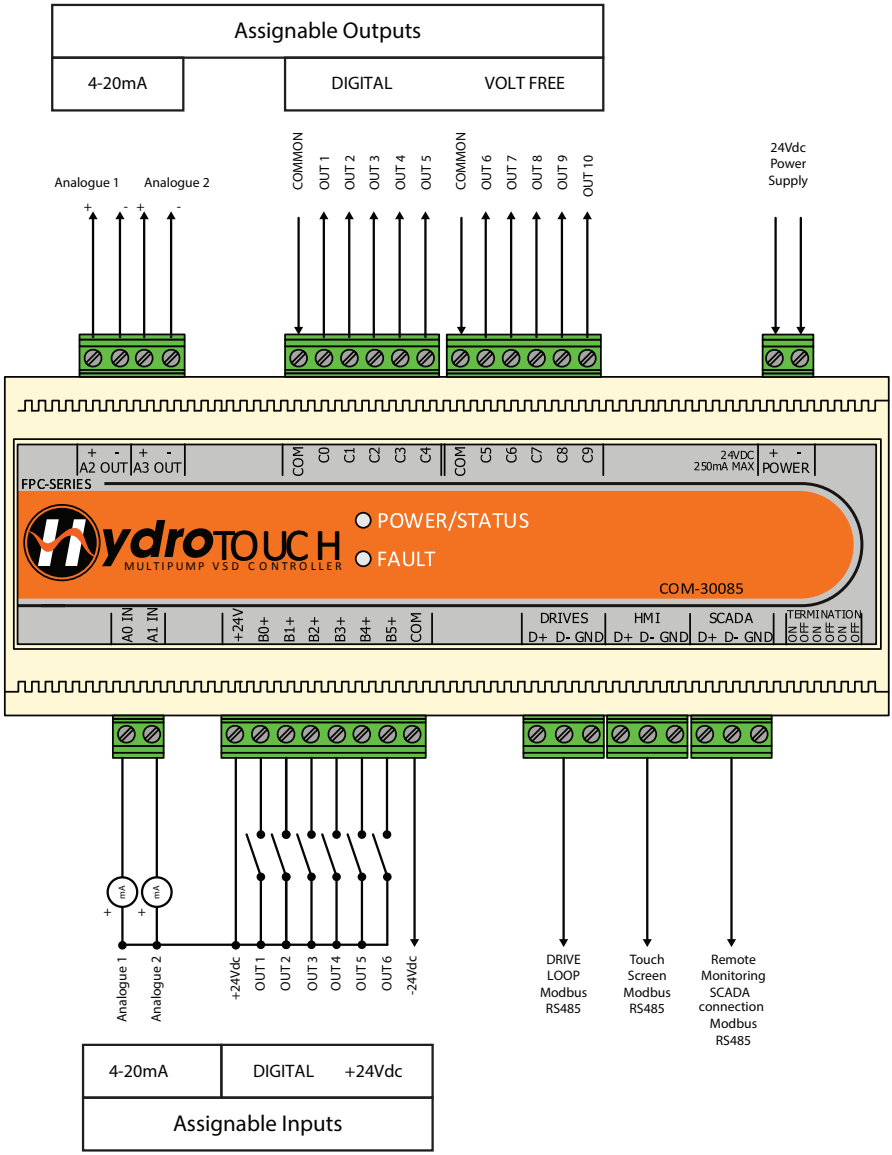
5.3 PRESSURE TRANSDUCER REDUNDANCY

In some installations it is crucial to have minimal or no down time. In this regard the HydroTOUCH can be setup by use of the wizard for a backup (standby) transducer. To enable this feature the AI1 (analogue input 1) is assigned as 'backup transducer' during the setup wizard. In the event of a primary transducer failure the HydroTOUCH will seamlessly transfer the system operation to the backup transducer. Once the primary transducer was put back into operation the HydroTOUCH will see the primary transducer and seamlessly change back. If either transducer was to fail an alarm would be activated so that the end user can inspect the fault and rectify.

5.4 SYSTEM MONITORING

The main screen shows how the system is operating and the status of faults, pumps and sensors.
All elements can be touched to gain further information from this screen. Also the overview page can be viewed to see the big picture.

5.5 HYDROTOUCH CONNECTIONS



6. Fault Diagnosis

6.1 SYSTEM FAULTS

Fault	Cause	Remedy
Drive Comms Fail	No communication between HydroTOUCH and the drive	- Ensure drive has power - Check Comms wires are connected as per section 3.1 - Reload settings from drive screen. Danfoss -0 - 50 = 2 ABB - Copy/DL
Drive Config Fault	- Drive receiving run command but not running - Incorrect pump motor data set in wizard - Pump connected is too big for the drive	-Check drive settings. -Check motor data on pump nameplate corresponds to that entered in setup wizard -Ensure drive kw is greater or equal to the pump kw -Ensure drive is in Auto or Remote.
Pump Fault	Drive has triggered a fault	-Check drive for fault code and refer to drive faults below
No Pumps Available	There are no available pumps to operate in auto	-Ensure pump faults are reset -Ensure available pumps are not disabled
Analogue input fail (A0 or A1)	Analogue reading is outside of the 4-20mA acceptable reading - Transducer not connected - Broken or loose connection	-Check sensors connections -Signal is to be active 4-20mA -Replace sensor if faulty
No feedback Fault	There is no available transducer to operate the system - Transducer not connected - Broken or loose connection	-Check the primary and/or backup transducer connections -Signal is to be active 4-20mA -Replace sensor if faulty
High Pressure Fault	System Pressure has gone above the acceptable level - System overshoot -Incorrect parameter settings	-Check 'High pressure threshold' parameter is set adequately above the setpoint pressure -Ensure a backup high pressure switch is 'open to fault' or input is bridged if not required -Investigate cause of high pressure event
Low Pressure Fault	System Pressure has gone below the acceptable level - Burst pipe - Pump loss of prime -Incorrect parameter settings	-Check 'Low pressure threshold' parameter is set correctly -Investigate cause of low pressure event
High Level Fault	Tank level analogue input has gone above 'high level threshold' or assigned high level input has received a close contact	- Inspect the level in the tank/pit - Check 'high level threshold' parameter is set correctly - Test float switch input - Check input assignment
Low Level Fault	Tank level analogue input has gone below 'low level threshold' or assigned low level input has received a close contact	- Inspect the level in the tank/pit - Check 'low level threshold' parameter is set correctly - Test float switch input - Check input assignment

6.1 SYSTEM FAULTS

Fault	Cause	Remedy
Pipe Fill Fail	The system pressure has not got above the 'pipe fill threshold' within the allocated time - Inadequate speed for head pressure - Open pipe	- Ensure there is no demand for water /all taps shut - Increase the 'pipe fill speed' parameter
Pump Cycle Fault	The system has woken too quickly for the 'pump cycle fault threshold' counter - Inadequate sleep boost set - Small flow or leaks in pipe work	- Increase the sleep boost pressure - Inspect pipe work for leaks - Inspect pressure vessel for correct setting - Ensure check valves are shutting upon entering sleep
Max Flow Fault	The system has run at max speed for the 'max flow fault delay' - Burst pipe - Loss of prime	- Inspect pipe work - Prime the suction line

In addition to the above some digital inputs can be configured for auxiliary equipment faults such as UV's and filters.

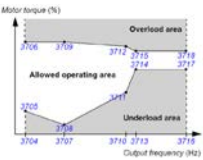
6.2 ABB DRIVE FAULTS

Code	Fault	Cause	Remedy
0001	OVERCURRENT (2310) *0305* bit 0	Output current has exceeded trip level.	Check acceleration time (*2202* and *2205*). Check motor and motor cable (including phasing). Check ambient conditions. Load capacity decreases if installation site ambient temperature exceeds 40 °C. See section *Derating* on page *327*
0002	DC OVERVOLT (3210) *0305* bit 1	Excessive intermediate circuit DC voltage. DC overvoltage trip limit is 420 V for 200 V drives and 840 V for 400 V drives.	Check that overvoltage controller is on (parameter *2005 OVERVOLT CTRL*). Check input power line for static or transient overvoltage. Check deceleration time (*2203, 2206*).
0003	DEV OVERTEMP (4210) *0305* bit 2	Drive IGBT temperature is excessive. Fault trip limit is 135 °C.	Check ambient conditions. See also section *Derating* on page 327. Check air flow and fan operation. Check motor power against drive power.
0004	SHORT CIRC (2340) *0305* bit 3	Short circuit in motor cable(s) or motor	Check motor and motor cable.

6.2 ABB DRIVE FAULTS

Code	Fault	Cause	Remedy
0006	DC UNDERVOLT (3220) *0305* bit 5	Intermediate circuit DC voltage is not sufficient due to missing input power line phase, blown fuse, rectifier bridge internal fault or too low input power.	Check that undervoltage controller is on (parameter *2006 UNDERVOLT CTRL*). Check input power supply and fuses
0009	MOT OVERTEMP (4310) *0305* bit 8 (programmable faultfunction *3005*…*3009* / *3504*)	Motor temperature is too high (or appears to be too high) due to excessive load, insufficient motor power, inadequate cooling or incorrect start-up data.	Check motor ratings, load and cooling. Check start-up data. Check fault function parameters
		Measured motor temperature has exceeded fault limit set by parameter *3504 FAULT LIMIT*.	Check value of fault limit. Check that actual number of sensors corresponds to value set by parameter *3501 SENSOR TYPE*
			Let motor cool down. Ensure proper motor cooling: Check cooling fan,
0012	MOTOR STALL (7121) *0305* bit 11 (programmable faultfunction *3010*…*3012*)	Motor is operating in stall region due to eg excessive load or insufficient motor power.	Check motor load and drive ratings. Check fault function parameters.
0014	EXT FAULT 1 (9000) *0305* bit 13 (programmable fault function *003*)	External fault 1	Check external devices for faults. Check parameter *3003 EXTERNAL FAULT 1* setting.
0015	EXT FAULT 2 (9001) *0305* bit 14 (programmable fault function *3004*)	External fault 2	Check external devices for faults. Check parameter *3004 EXTERNAL FAULT 2* setting.
0016	EARTH FAULT (2330) *0305* bit 15 (programmable fault function *3017*)	Drive has detected earth (ground) fault in motor or motor cable.	Check motor. Check motor cable. Motor cable length must not exceed maximum specifications. See section *Motor connection data* on page *334*. **Note:** Disabling earth fault (ground fault) may void the warranty.

6.2 ABB DRIVE FAULTS

Code	Fault	Cause	Remedy
0018	THERM FAIL (5210) *0306* bit 1	Drive internal fault. Thermistor used for drive internal temperature measurement is open or short circuited.	Contact Netco Pumps
0021	CURR MEAS (2211) *0306* bit 4	Drive internal fault. Current measurement is out of range.	Contact Netco Pumps
0022	SUPPLY PHASE (3130) *0306* bit 5	Intermediate circuit DC voltage is oscillating due to missing input power line phase or blown fuse. Trip occurs when DC voltage ripple exceeds 14% of nominal DC voltage.	Check input power line fuses. Check for input power supply imbalance. Check fault function parameters.
0026	DRIVE ID (5400) *0306* bit 9	Internal drive ID fault	Contact Netco Pumps
0027	CONFIG FILE (630F) *0306* bit 10	Internal configuration file error	Contact Netco Pumps
0028	SERIAL 1 ERR (7510) *0306* bit 11 (programmable fault function *3018, 3019*)	Fieldbus communication break	Check status of fieldbus communication. See chapter *Fieldbus control with the embedded fieldbus* on page *277*. Check fault function parameter settings. Check connections. Check if master can communicate.
0035	OUTP WIRING (FF95) *0306* bit 15 (programmable fault function *3023*)	Incorrect input power and motor cable connection (ie, input power cable is connected to drive motor connection). The fault can be erroneously declared if the drive is faulty or the input power is a delta grounded system and the motor cable capacitance is large	Check input power connections.
0038	USER LOAD CURVE (FF6B) 0307 bit 4	Drive has been running under or over current for the duration of the *3703 USER LOAD C TIME*.	See parameter group *37 USER LOADCURVE.* 
0101-0206	INTERNAL FAULT	Drive internal error	Write down fault code and contact Netco Pumps

NOTE: See ABB ACS310 user manual for further details.

6.3 DANFOSS DRIVE FAULT

The Danfoss drives have 3 levels of alarm protection; warning, fault and trip lock. A warning (yellow indicator) activates an alarm but allows the drive to maintain operation. A fault (flashing red indicator) activates an alarm and also trips the drive to stop operating, requiring a reset. A trip lock is a fault with the added protection, requiring the mains supply be switched off before the alarm can be reset. After being switched back on, the drive is no longer blocked and may be reset once the cause has been rectified. Alarms that are not trip-locked are using the reset on the touchscreen.

Code	Fault	Cause	Remedy
AL2	Live zero error	Signal on terminal 53 or 60 is less than 50% of value set in 6-10 Terminal 53 Low Voltage, 6-12 Terminal 53 Low Current and 6-22 Terminal 60 Low Current.	
AL4	Main phase loss	A phase is missing on the supply side, or the mains voltage imbalance is too high. This message also appears for a fault in the input rectifier on the frequency converter.	Check the supply voltage and supply currents to the frequency converter. The fault may be caused by mains distortions. Installing Danfoss Line Filter may rectify this problem.
AL7	DC over voltage	If the intermediate circuit voltage exceeds the limit, the frequency converter trips after a time.	Connect a brake resistor Extend the ramp time Change the ramp type Activate the functions in *2-10 Brake Function* Increase *14-26 Trip Delay at Inverter Fault* The fault may be caused by mains distortions. Installing Danfoss Line Filter may rectify this problem.
AL8	DC under voltage	If the intermediate circuit voltage (DC link) drops below the under voltage limit, the frequency converter checks if a 24 V DC backup supply is connected. If no 24 V DC backup supply is connected, the frequency converter trips after a fixed time delay. The time delay varies with unit size.	Check that the supply voltage matches the frequency converter voltage. Perform input voltage test. Perform soft charge circuitz-test.

6.3 DANFOSS DRIVE FAULT

Code	Fault	Cause	Remedy
AL9	Inverter overload	The frequency converter is about to cut out because of an overload (too high current for too long). The counter for electronic, thermal inverter protection issues a warning at 98% and trips at 100%, while giving an alarm. The frequency converter cannot be reset until the counter is below 90%. The fault is that the frequency converter has run with more than 100% overload for too long.	Compare the output current shown on the LCP with the frequency converter rated current. Compare the output current shown on the LCP with measured motor current. Display the Thermal Drive Load on the LCP and monitor the value. When running above the frequency converter continuous current rating, the counter increases. When running below the frequency converter continuous current rating, the counter decreases.
AL10	Motor over Load temperature	According to the electronic thermal protection (ETR), the motor is too hot. Select whether the frequency converter gives a warning or an alarm when the counter reaches 100% in *1-90 Motor Thermal Protection.* The fault occurs when the motor is overloaded by more than 100% for too long.	Check for motor overheating. Check if the motor is mechanically overloaded Check that the motor current set in *1-24 Motor Current* is correct. Ensure that Motor data in parameters 1-20 through 1-25 are set correctly. Running AMT in 1-29 Automatic Motor Tuning (AMT). The inverter peak current limit (approx. 200% of the rated current) is exceeded. The warning will last approx. 8-12 s, then the frequency converter trips and issues an alarm. Turn off the frequency converter and check if the motor shaft can be turned and if the motor size matches the frequency converter. If extended mechanical brake control is selected, trip can be reset externally. May tune the frequency converter to the motor more accurately and reduce thermal loading.

NOTE: See Danfoss VLT51 programming guide for further details.

6.3 DANFOSS DRIVE FAULT

Code	Fault	Cause	Remedy
AL11	Motor Thermistor over temp	The thermistor might be disconnected. Select whether the frequency converter gives a warning or an alarm in *1-90 Motor Thermal Protection.*	Check for motor overheating. Check if the motor is mechanically overloaded.
AL13	Over current	The inverter peak current limit (approx. 200% of the rated current) is exceeded. The warning will last approx. 8-12 s, then the frequency converter trips and issues an alarm. Turn off the frequency converter and check if the motor shaft can be turned and if the motor size matches the frequency converter. If extended mechanical brake control is selected, trip can be reset externally.	Remove power and check if the motor shaft can be turned. Check that the motor size matches the frequency converter. Check parameters 1-20 through 1-25 for correct motor data.
AL14	Earth (ground) fault	There is current from the output phases to earth, either in the cable between the frequency converter and the motor or in the motor itself.	Remove power to the frequency converter and repair the earth fault. Check for earth faults in the motor by measuring the resistance to ground of the motor leads and the motor with a megohmmeter.
AL16	Short circuit	There is short-circuiting in the motor or motor wiring.	Remove power to the frequency converter and repair the short circuit.
AL17	Control word timeout	There is no communication to the frequency converter. The warning is only active when *8-04 Control Word Timeout Function* is NOT set to OFF. If *8-04 Control Word Time-out Function* is set to *Stop* and *Trip*, a warning appears and the frequency converter ramps down until it trips, while giving an alarm. *8-03 Control Timeout Time* could possibly be increased.	Check connections on the serial communication cable. Increase *8-03 Control Word Timeout Time* Check the operation of the communication equipment. Verify a proper installation based on EMC requirements.

NOTE: See Danfoss VLT51 programming guide for further details.

6.3 DANFOSS DRIVE FAULT

Code	Fault	Cause	Remedy
AL25	Brake resistor short circuit	The brake resistor is monitored during operation. If a short circuit occurs, the brake function is disabled and the warning appears. The frequency converter is still operational but without the brake function.	Remove power to the frequency converter and replace the brake resistor (see 2-15 Brake Check).
AL27	Brake chopper fault	The brake transistor is monitored during operation and if a short circuit occurs, the brake function is disabled and a warning is issued. The frequency converter is still operational but, since the brake transistor has shortcircuited, substantial power is transmitted to the brake resistor, even if it is inactive.	Remove power to the frequency converter and remove the brake resistor.
AL28	Brake check failed	The brake resistor is not connected or not working.	
AL29	Heatsink temp	The maximum temperature of the heatsink has been exceeded. The temperature fault will not reset until the temperature falls below a defined heatsink temperature. The trip and reset points are different based on the frequency converter power size.	Check for the following conditions. Ambient temperature too high. Motor cable too long. Incorrect airflow clearance above and below the frequency converter. Blocked airflow around the frequency converter. Damaged heatsink fan. Dirty heatsink.
AL30	Motor phase U missing	Motor phase U between the frequency converter and the motor is missing.	Remove power from the frequency converter and check motor phase U.
AL31	Motor phase V missing	Motor phase V between the frequency converter and the motor is missing.	Remove power from the frequency converter and check motor phase V.

NOTE: See Danfoss VLT51 programming guide for further details.

6.3 DANFOSS DRIVE FAULT

Code	Fault	Cause	Remedy
AL32	Motor phase W missing	Motor phase W between the frequency converter and the motor is missing.	Remove power from the frequency converter and check motor phase W.
AL38	Internal fault	Internal fault	Cycle power Check that the option is properly installed Check for loose or missing wiring It may be necessary to contact Netco Pumps. Note the code number for further troubleshooting directions.
AL47	24V supply low	The 24 V DC is measured on the control card.	The external 24 V DC backup power supply may be over-loaded, otherwise contact the Netco Pumps.
AL51	AMT check Unom and Inom	The settings for motor voltage, motor current, and motor power are wrong.	Check the settings in parameters 1-20 to 1-25.
AL55	AMA parameter out of range	The parameter values of the motor are outside of the acceptable range.	
AL63	Mechanical brake low	The actual motor current has not exceeded the “release brake” current within the “Start delay” time window.	
AL80	Drive initialised to default value	Parameter settings are initialised to default settings after a manual reset.	Reset the unit to clear the alarm.
AL84	The connection between drive and LCP is lost	The connection between drive and LCP is lost	Try to reassemble the LCP gently.
AL85	Button disabled	Button disabled	See parameter group 0-4* LCP
AL86	Copy fail	An error occurred while copying from frequency converter to LCP or vice versa.	

NOTE: See Danfoss VLT51 programming guide for further details.

6.3 DANFOSS DRIVE FAULT

Code	Fault	Cause	Remedy
AL87	LCP data invalid	Occurs when copying from LCP if the LCP contains erroneous data - or if no data was uploaded to the LCP.	
AL88	LCP data not compatible	Occurs when copying from LCP if data are moved between frequency converters with major differences in software versions.	
AL89	Parameter read only	Occurs when trying to write to a read-only parameter.	
AL90	Parameter database busy	Parameter database busy	
AL91	Parameter value is not valid in this mode	Occurs when trying to write an illegal value to a parameter.	
AL92	Parameter value exceeds the min/max limits	Occurs when trying to set a value outside the range.	Parameter can only be changed when the motor is stopped. Err. A wrong password was entered, occurs when using a wrong password for changing a password protected parameter.

NOTE: See Danfoss VLT51 programming guide for further details.

COMMERCIAL
CONTROL
VALVES

Magnum® Control Valve

Pentair
Water

COMMERCIAL CONTROL VALVES

Magnum® Control Valve

Controller Options

The Pentair Water® Magnum Control Valve is one of the most versatile valves on the market.

Logix™ Series

- All-electronic control platform
- 24-hour super-capacitor backup – no battery necessary
- Remote mount kit allows programming module to be installed up to 40 feet away
- Universal controller – works on all Autotrol® brand valves
- Automatic capacity calculations – no math or salt tables necessary
- 12-volt operation

The Logix series offers the ultimate in control for the Magnum® valve. Simple 3-step programming and installation makes this electronic controller the industry leader.

742 Time Clock

- Simple, economic electronic time clock (chronometric)
- 7- or 99-day regeneration settings
- Filter or conditioner setting in one control
- Fully programmable cycle times
- Salt setting in 1-pound increments (lbs/cu ft)
- Single controller operates Autotrol 255, 263, 268, 278 models, and Pentair Water Magnum and Magnum IT with one controller

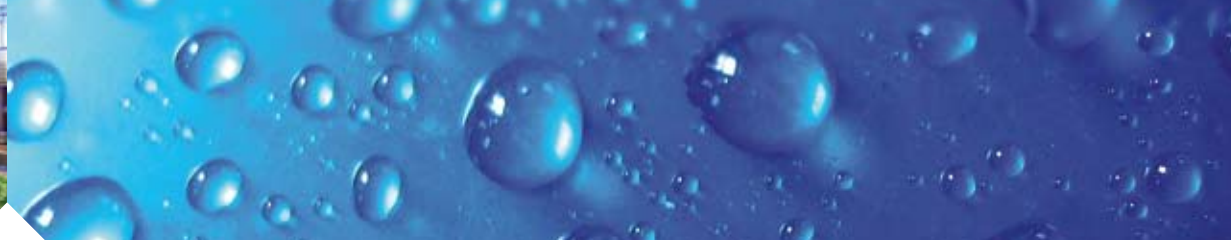
762 Demand

- Simple, economic electronic demand (volumetric)
- Calendar override – 99 day
- 28-day variable reserve
- Filter or conditioner setting in one controller
- Automatic capacity calculations
- Fully programmable cycle times
- Salt setting in 1-pound increments (lbs/cu ft)
- Operates 255, 263, 268, 278, and Magnum IT with one controller

764 Demand

Same features as the 762, plus:

- Multi-tank applications (twin alternating, multi-tank parallel)
- Control lockout
- Remote regeneration



Specifications

Electrical Specifications

Controller Operating Voltage	12 Volt – AC (Requires a transformer supplied by GE)
Input Supply Frequency	50 or 60 Hz (Controller configuration dependent)
Motor Input Voltage	12 Volt – AC
Control System Power Consumption	3 Watts average

Transformer Specifications – All Controllers

All Controllers require the use of a Pentair Water supplied transformer.

Transformer Output Voltage	12 Volt – AC 400mA
Transformer Input Options	115 Volt – AC 50/60 Hz; 230 Volt – AC 50/60 Hz; 100 Volt – AC 50/60 Hz
Transformer Plug Options	Indoor North American Plug Outdoor North American (UL Listed for outdoor use) Japanese Plug Taiwan/Korea Plug Australian Plug United Kingdom Plug Mainland Europe Plug

Additional transformers may be available – call for more information.

Flow Rates (Valve Only)

Service @ 15 psi (1.03 bar) drop	76 gpm (17.3 m^3/hr)
Backwash @ 25 psi (1.72 bar) drop	89 gpm (20.2 m^3/hr)
Service	Cv = 19.5 (Kv = 17)
Backwash	Cv = 17.8 (Kv = 19.9)

Valve Connections/Dimensions

Tank Thread	4-inch 8 UN
Inlet/Outlet	2-inch: connections NPT or BSPT, Female, CPVC
Brine Line	3/4-inch NPT
Drain Line*	1-1/2-inch: connections for NPT or BSPT, Female, CPVC
Riser Tube Diameter	1-1/2-inch
Riser Installation	Above top of tank 5/8-inch (±1/8-inch)
Pilot Drain and Auxiliary Hydraulic Output	1/4-inch tube fitting

*Valve installed drain flow controls available (5 – 40 gpm). If higher backwash flow is needed, an external flow control will be required.

Design Specifications/Ratings

Valve Body	Thermoplastic
O-rings	EPDM
Injector	7 sizes available: 14, 16, 18, 21, 24, 30, 36
Working Pressure	25 psi – 100 psi (1.72 bar – 6.9 bar)
Water Temperature	35° – 100°F (2° – 38°C), 120°F (49°C) Ambient

Options

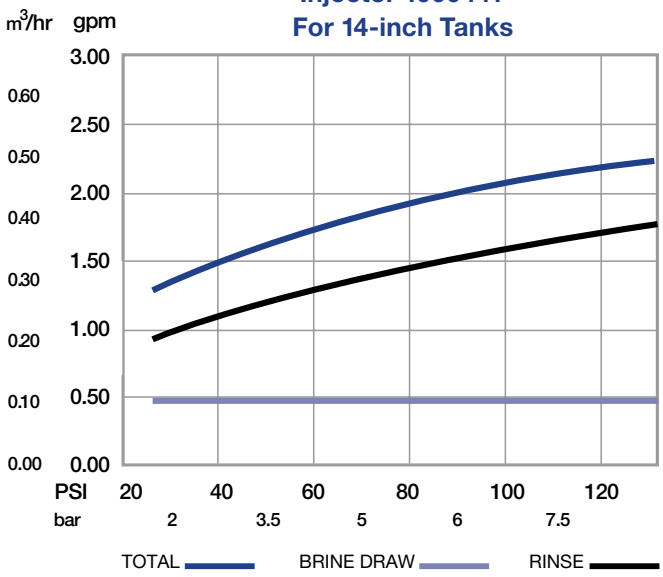
Top Mount or Side Mount Configuration

Pentair Water

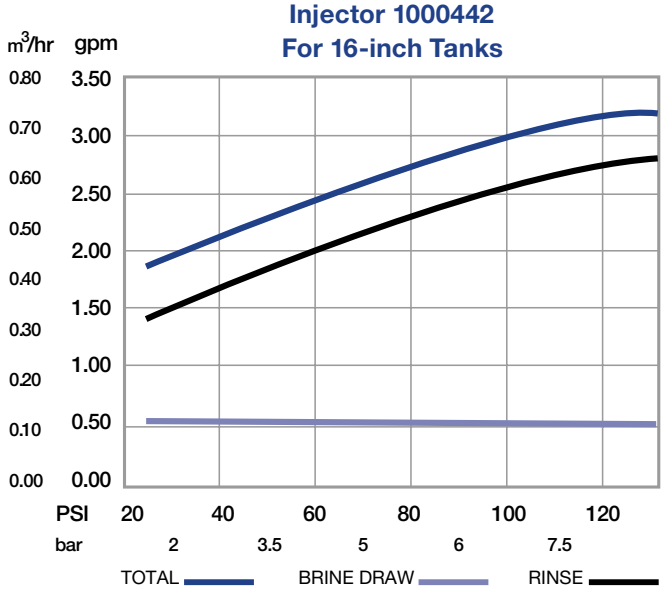
Magnum® Control Valve

Injector Performance – Magnum

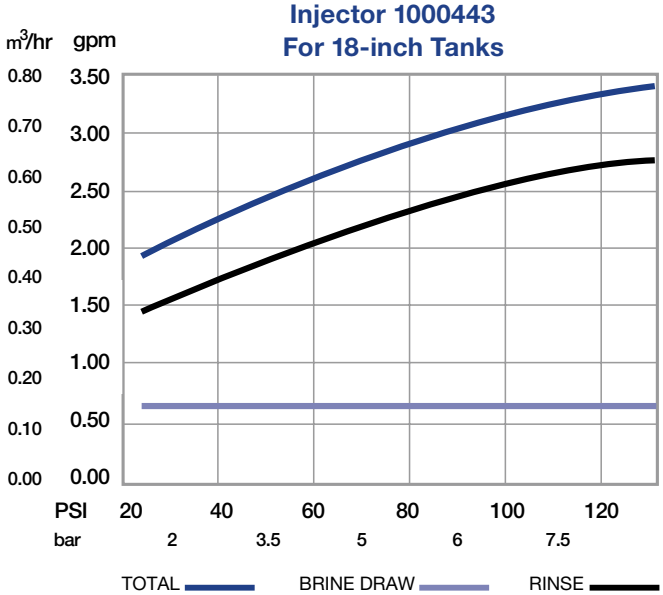
Injector 1000441
For 14-inch Tanks



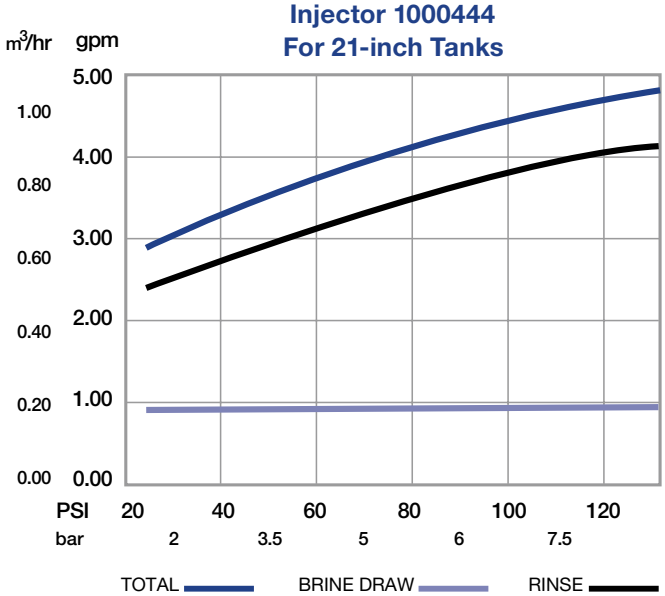
Injector 1000442
For 16-inch Tanks

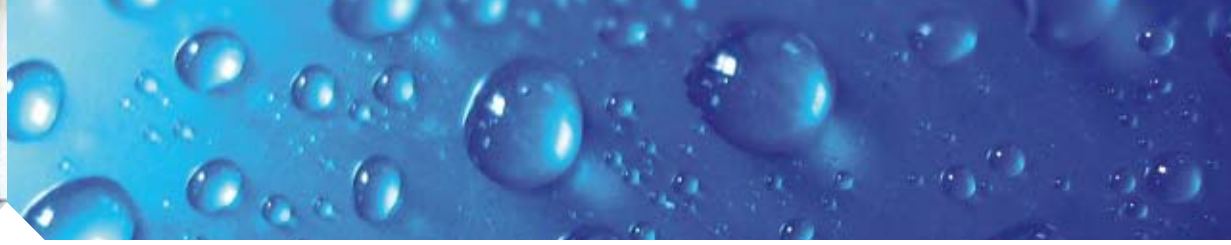


Injector 1000443
For 18-inch Tanks

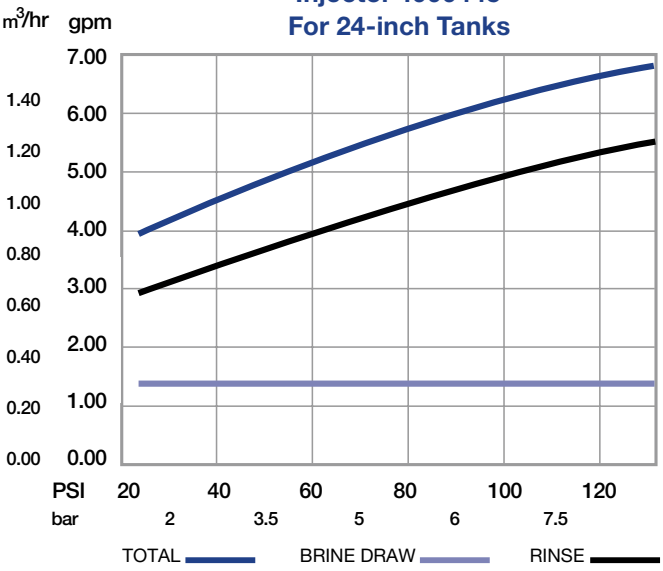


Injector 1000444
For 21-inch Tanks

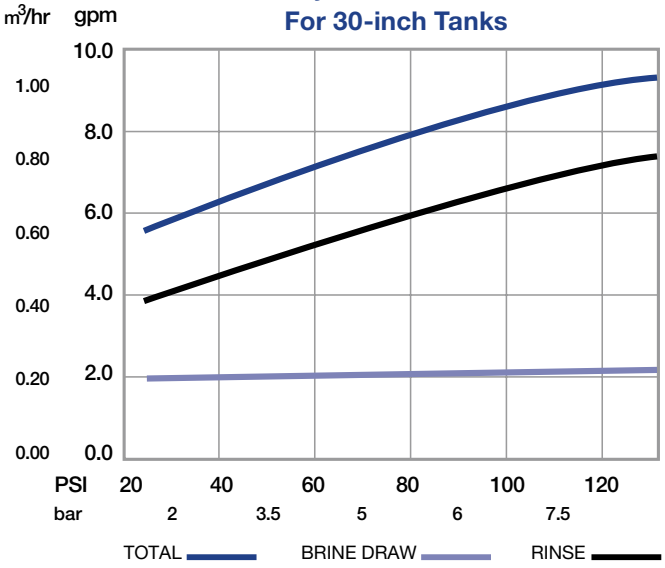




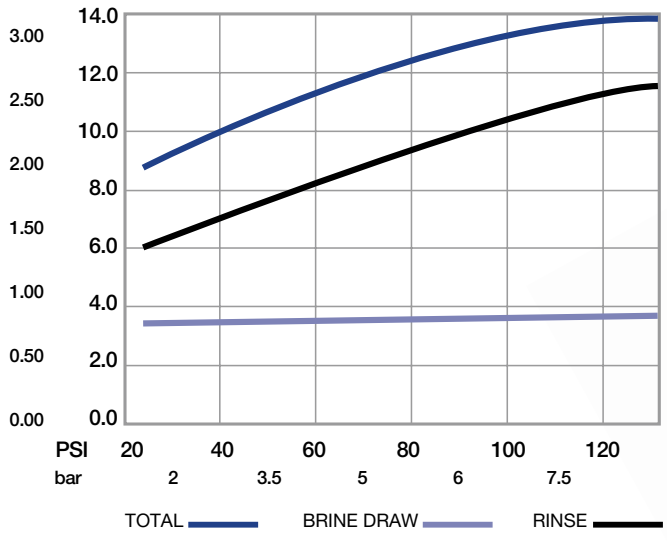
Injector 1000445
For 24-inch Tanks



Injector 1000446
For 30-inch Tanks



Injector 1000447
For 36-inch Tanks



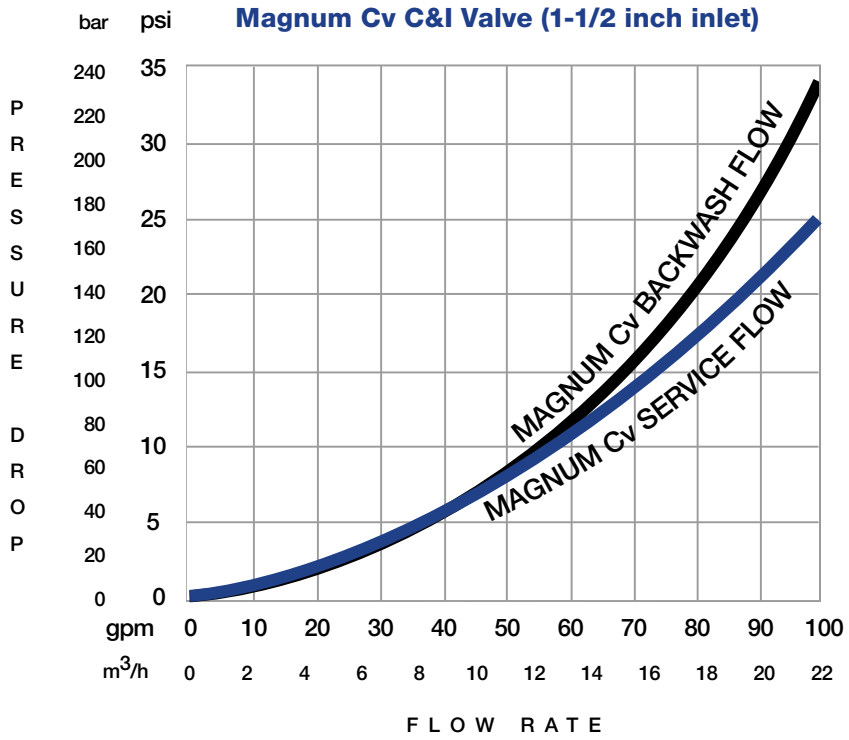
NOTE: Brine draw and rinse rates on empty tank.

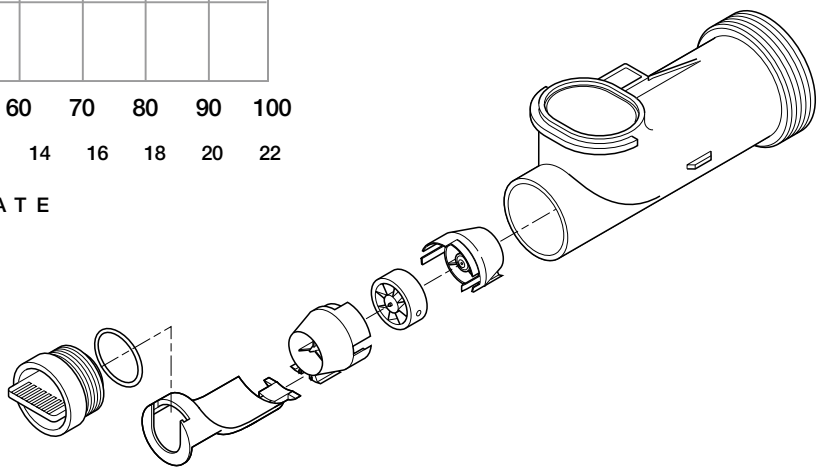
Pentair Water

COMMERCIAL CONTROL VALVES

Magnum® Control Valve

Valve Flow Rate Characteristics





Flow Sensor Options

Internal Turbine Unit

Normal Operating Range	2 - 80 gpm (0.45 - 18.1 m³/hr)
Peak Operating Range	1 - 100 gpm (0.22 - 22.7 m³/hr)
Normal Accuracy Range	±3%

External Flow Meter – 2.0 Inch

Normal Operating Range*	5.0 - 225 gpm (0.50 - 51.0 m³/hr)
Normal Accuracy Range	±3%
Connections	2-inch: connections NPT or BSPT, Female, CPVC

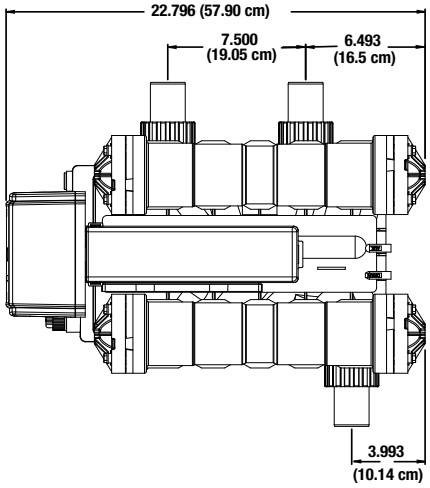
*Recommended maximum continuous duty flow rate of 2-inch turbine is 70% of maximum flow rate.

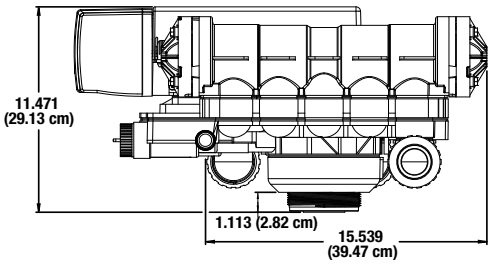
Tank Adapter Options

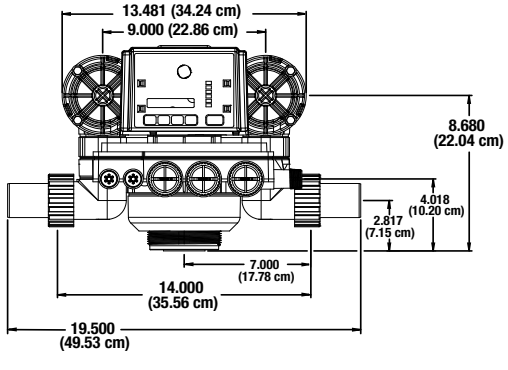
Threaded Stainless Steel	4-inch 8 UN
Flanged Stainless Steel	6-inch

Magnum Valve Outline Dimensions

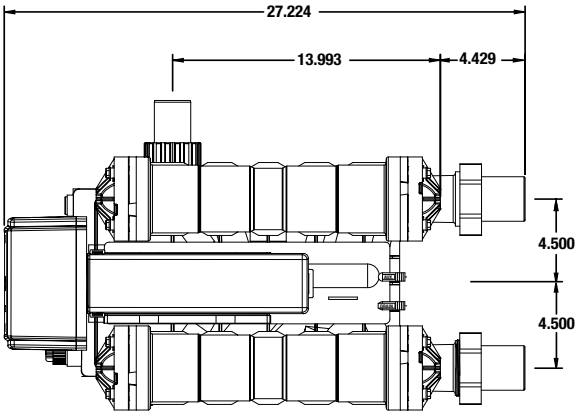
1-1/2-inch Magnum Cv

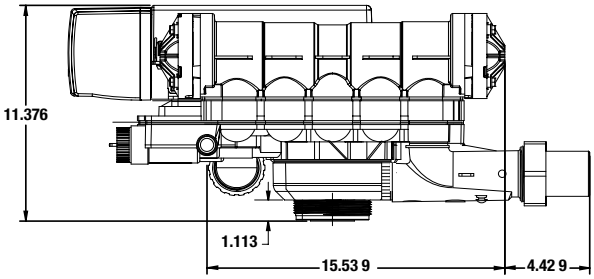


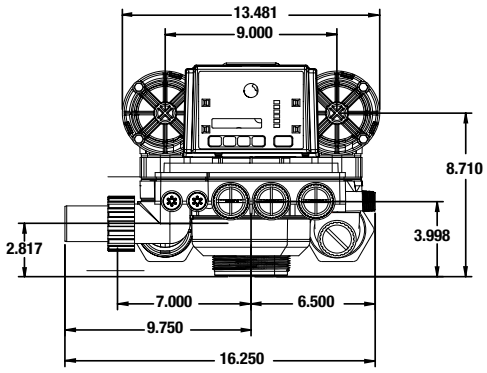




2-inch Magnum IT







Pentair Water

Pentair Water

20580 Enterprise Avenue
Brookfield, WI 53045
Tel: 262.784.4490
Fax: 262.784.7794

5730 North Glen Park Road
Milwaukee, WI 53209
Tel: 262.238.4400
Fax: 262.238.4402

Customer Care: 800.279.9404 www.pentairwatertreatment.com

1017972 Rev F FE10

Logix 764

Operation Manual

Models: 293/298 Magnum IT
Twin Alternating
Twin Parallel
Single with Remote Regeneration Start
Multi-Single Tank with Lockout

Table of Contents

Safety Information

This water conditioner's control valve conforms to UL/CE Standards. Generic valves were tested and certified for compliance as verified by the agency listing.

- Please review the entire Installation and Operation Manual before installing the water conditioning system.
- As with all plumbing projects, it is recommended that a trained professional water treatment dealer install the water conditioning system. Please follow all local plumbing codes for installing this water conditioning system.
- This system will not make microbiologically unsafe water safe. Water that is unsafe must be treated separately from this conditioner.
- This water conditioning system is to be used only for potable water.
- Inspect the water conditioning system for carrier shortage or shipping damage before beginning installation.
- Use only lead-free solder and flux, as required by federal and state plumbing codes, when installing soldered copper plumbing.
- Use caution when installing soldered metal piping near the water conditioning system. Heat can adversely affect the plastic control valve and bypass valve.
- All plastic connections should be hand tightened. Teflon[1] tape may be used on connections that do not use an O-ring seal. Do not use pipe dope type sealants on the valve body. **Do not use pliers or pipe wrenches**.
- Do not use petroleum-based lubricants such as Vaseline, oils or hydrocarbon-based lubricants. Use only 100% silicone lubricants.
- Use only the AC adapter supplied with this water conditioning system.
- All electrical connections must be completed according to local codes.
- The power outlet must be grounded
- Install an appropriate grounding strap across the inlet and outlet piping of the water conditioning system to ensure that a proper ground is maintained.
- To disconnect power, unplug the AC adapter from its power source.
- Observe drain line requirements.
- Do not support the weight of the system on the control valve fittings, plumbing, or the bypass.
- Do not allow this water conditioning system to freeze. Damage from freezing will void this water conditioning system's warranty.
- Operating ambient temperature: 34° to 120°F (1° to 49°C).
- Operating water temperature: 34° to 100°F (1° to 38°C).
- Operating water pressure range : 25 to 100 psi (1.72 to 6.89 bar). In Canada the acceptable operating water pressure range is 25 to 100 psi (1.72 to 6.89 bar).
- Observe all warnings that appear in this manual.
- Keep the media tank in the upright position. Do not turn upside down or drop. Turning the tank upside down or laying the tank on its side can cause media to enter the valve.
- Use only regenerants designed for water conditioning. Do not use ice melting salt, block salt or rock salt.

1. Teflon is a trademark of E. I. duPont de Nemours.

Installation Profile Summary

Installation Date: _____

Installation Location: _____

Installer(s): _____

Phone Number: _____

Valve Number: _____

Application Type: (Softener) (Filter) (Dealkalizer)

Water Source:

(Public Well) (Private Well)

(Surface Supply)

(Other)

Water Test Results:

Hardness:_____ Iron:_____

Other:_____

Misc:

Capacity: _____ Flow Rates: ___min. _____max.

Tank Size: Diameter_____ Height: _____

Resin or Media Volume:_____

Resin or Media Type:_____

Brine Tank Volume: _____

Salt Setting per Regeneration:_____

Control Valve Configuration:

Valve Type:_____

(Hard Water Bypass) (No Hard Water Bypass)

Refill Control: _____ gpm

Injector Control: _____ gpm

Backwash Control:_____ gpm

Electronic Demand Settings

P1 Time of day _____

P2 Day of week _____

P3 Time of regeneration _____

P4 Number of days between regeneration (99 day calendar override) _____

P6 Amount of regenerant used or filter backwash time (salt setting) _____

P7 System capacity _____

P8 Hardness (not used on Filters) _____

P9 Units of measure _____

P10 Clock mode _____

P11 Service interval _____

P12 Remote regeneration switch delay _____

P14 Refill rate (conditioner only) _____

P15 Draw rate (conditioner only) _____

P16 Reserve type (not used for alternating mode) _____

P17 Initial average or fixed reserve (not used for alternating mode) _____

P18 Flow sensor select _____

P19 K-factor or pulse equivalent _____

Pr Refill First Option (not used for alternating mode) _____

Pd Remote Switch Operation _____

How To Use This Manual

This installation manual is designed to guide the installer through the process of installing and starting water conditioning systems featuring the Logix 764 controller.

This manual is a reference and will not include every system installation situation. The person installing this equipment should have:

- Training in the 764 series control and the 298/293 valve.
- Knowledge of water conditioning and how to determine proper control settings.
- Adequate plumbing skills.

Icons That Appear In This Manual

WARNING: Failure to follow this instruction can result in personal injury or damage to the equipment.

Note: Helpful hint to simplify procedure.

The Logix 764 control can be installed on several type valves that can have twin alternating,parallel or single tank configuration. The section on Logix 764 start-up provides a simple explanation of the valve types that are pre-programmed in the 764 control.

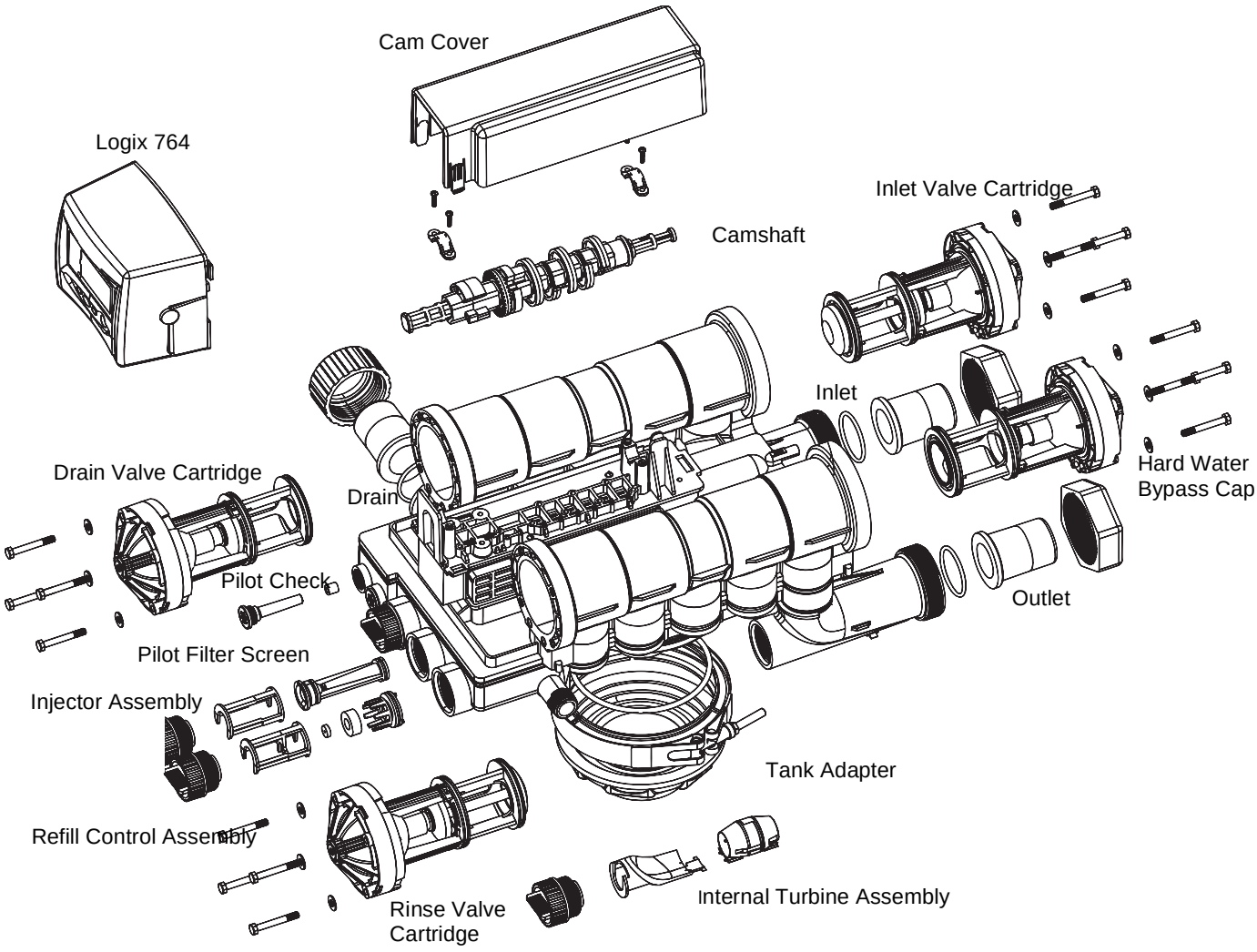


Figure 1 293/298 Valve Layout

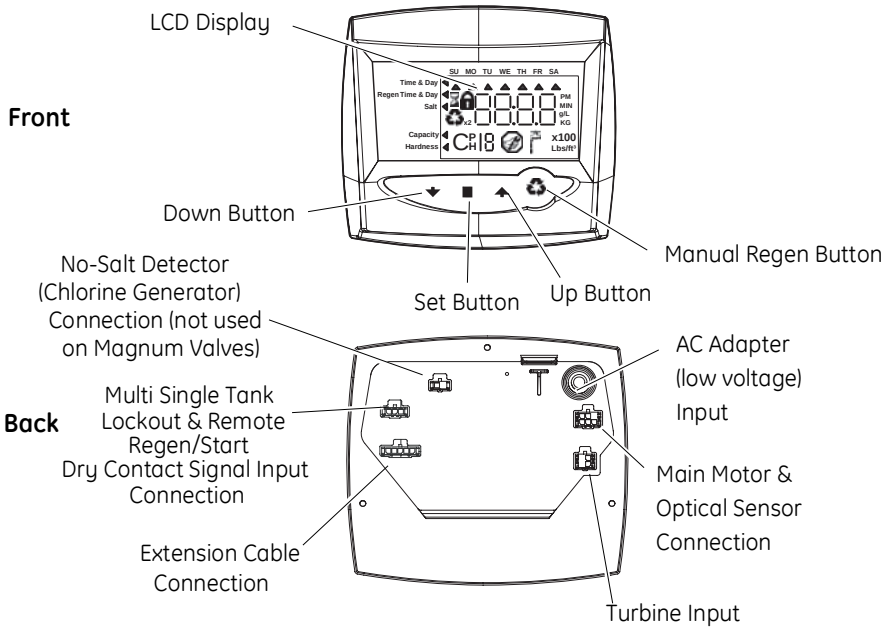


Figure 2 764 Controller Identification

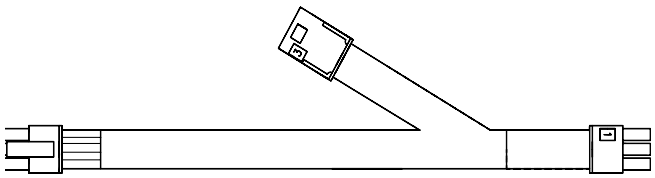


Figure 3 Remote Start/Multi-Tank Lockout Cable

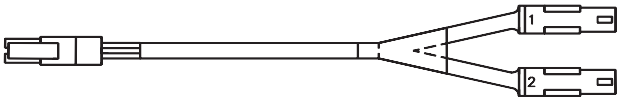


Figure 4 Twin Sensor Cable

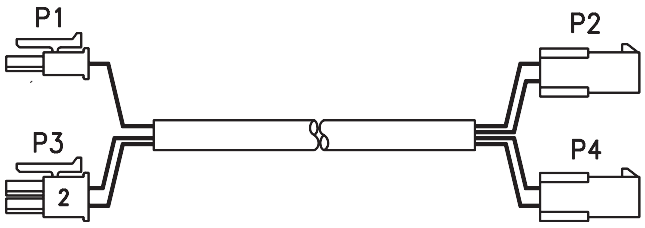


Figure 5 Twin Cable Extension

Location Selection

Location of a water conditioning system is important. The following conditions are required:

- Level platform or floor.
- Room to access equipment for maintenance and adding regenerant (salt) to tank.
- Ambient temperatures over 34^{o}F (1^{o}C) and below 120^{o}F (49^{o}C).
- Water pressure below 100 psi (6.89 bar) and above 25 psi (1.7 bar).
- In Canada the water pressure must be below 100 psi (6.89 bar).
- Constant electrical supply to operate the controller.
- Total minimum pipe run to water heater of ten feet (three meters) to prevent backup of hot water into system.
- Local drain for discharge as close as possible.
- Water line connections with shutoff or bypass valves.
- Must meet any local and state codes for site of installation.
- Valve is designed for minor plumbing misalignments. Do not support weight of system on the plumbing.
- Be sure all soldered pipes are fully cooled before attaching plastic valve to the plumbing.

Outdoor Locations

When the water conditioning system is installed outdoors, several items must be considered.

- Moisture – The valve and control are designed for use in NEMA 3 locations. Falling water should not affect performance. The system is not designed to withstand extreme humidity or water spray from below. Examples are: constant heavy mist, near corrosive environment, or upwards spray from sprinkler.

Caution: This unit is for dry location use only unless used with a listed Class 2 power supply suitable for outdoor use.

- Direct Sunlight – The materials used will fade or discolor over time in direct sunlight. The integrity of the materials will not degrade to cause system failures.
- Temperature – Extreme hot or cold temperatures will cause damage to the valve or control. Freezing temperatures will freeze the water in the valve. This will cause physical damage to the internal parts as well as the plumbing and conditioning resin. High temperatures will affect the control. The display may become unreadable but the control should continue to function. When the temperature returns to normal operating limits the display will re-appear. A protective cover should assist with high temperature applications.
- Insects – The control and valve have been designed to keep all but the smallest insects out of the critical areas. Any holes in the top plate can be covered with duct tape. The top cover should be installed securely in place.

Assembling the Logix 764 Control to the Magnum Valve

The control and the Magnum valve work together as an integral system to ensure synchronization. Follow the steps outlined below to install the control on the Magnum valve.

Remove Cam Cover

Remove the cam cover by pressing in on the cover release tabs (Figure 6). Note the cover locking tab and the slot in the top plate. When you reassemble the cover, the locking tab is placed in the slot first and the cover lowered into position.

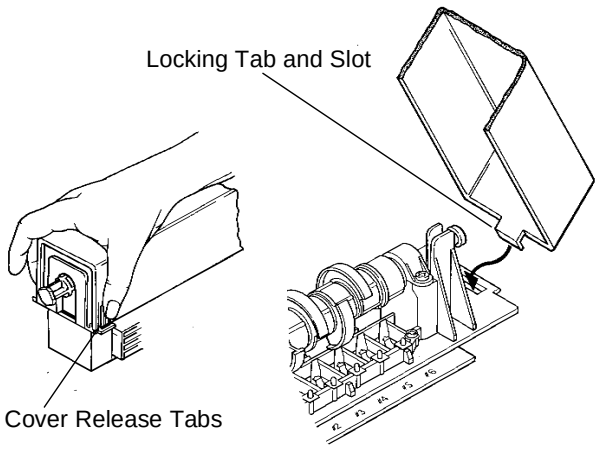


Figure 6

Align Camshaft

The camshaft is keyed and should only be engaged or disengaged when in the position illustrated (Figure 7). If the camshaft is not in the proper position, rotate the cam assembly counterclockwise until the camshaft arrow aligns with pillow block arrow.

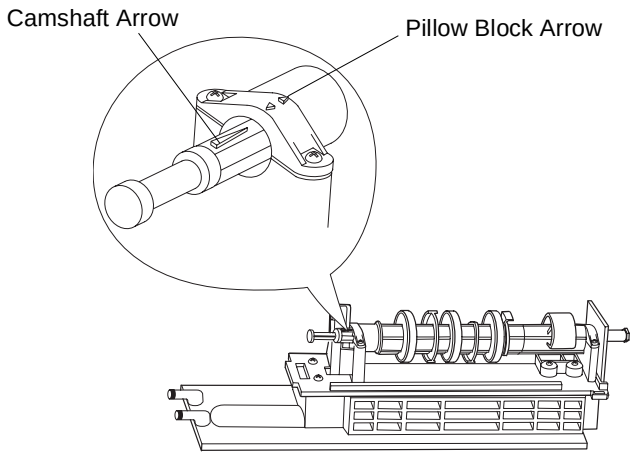


Figure 7

Slide Camshaft

Slide the camshaft toward the back of the valve by pressing on the release tab and pulling on the back end of the camshaft (Figure 8). The front end of the camshaft will be flush with the mounting plate.

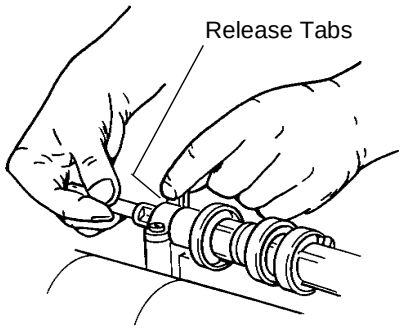


Figure 8

Removing the Control Faceplate

1. Press downward on top tab with fingers (Figure 9) while pushing up on bottom of control's face plate. **DO NOT push on top of control faceplate**.
2. When the lower mount bushings release, swing the lower end of the face plate outward to release.

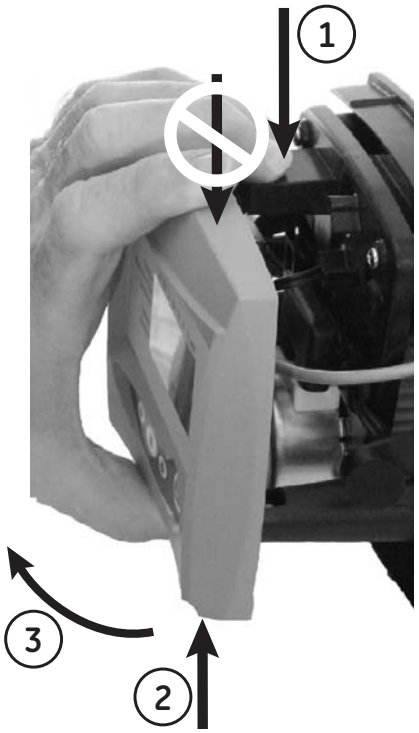
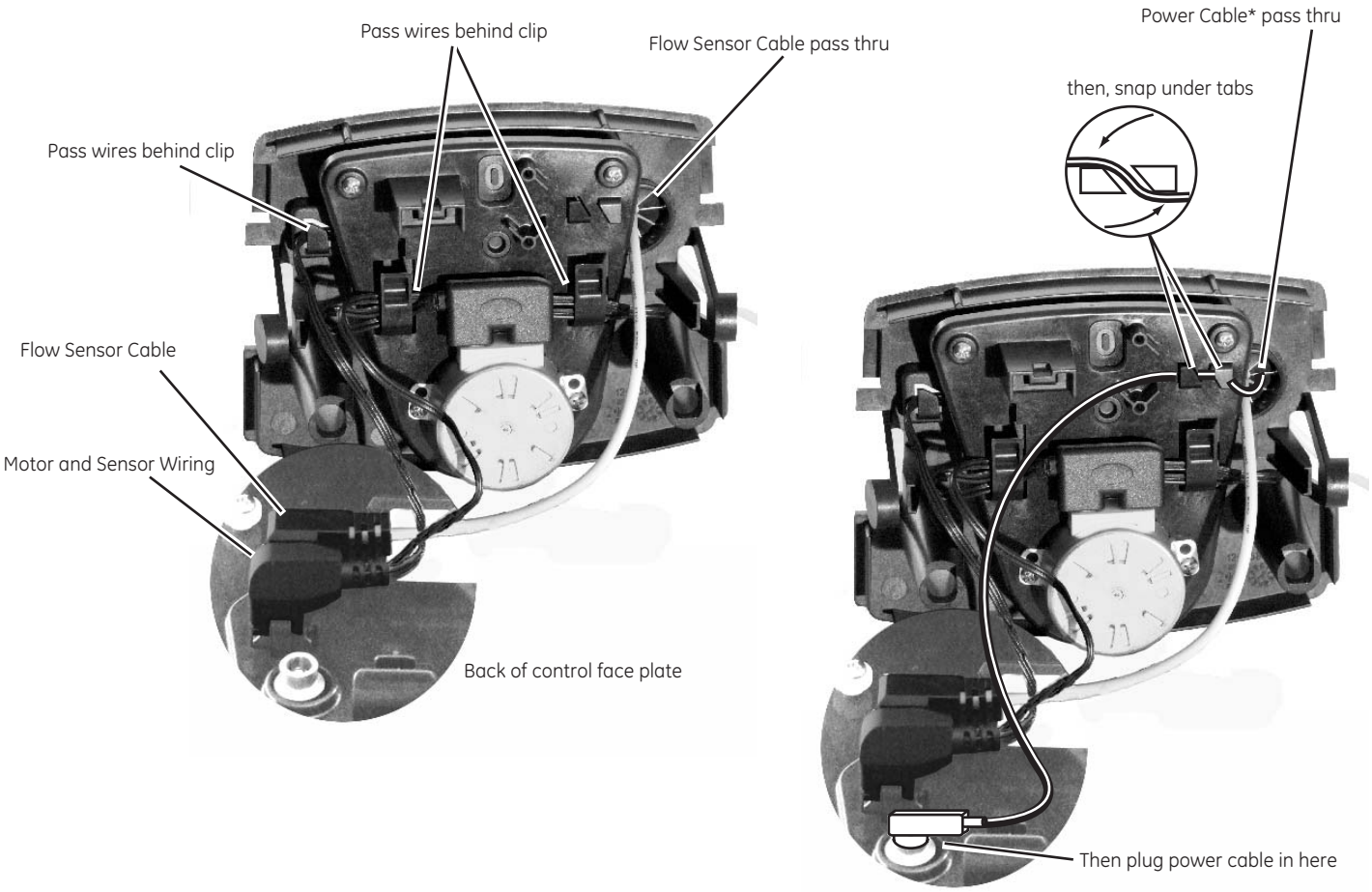


Figure 9

Routing the Cables



*White detail on power cable is for illustration purposes only and does not represent the actual power cable color.

Figure 10

Replacing the Control Face Plate

1. Set the lower mount bushings into the backplate arms.
2. Then, swing top end of control face plate into position until it snaps into place.

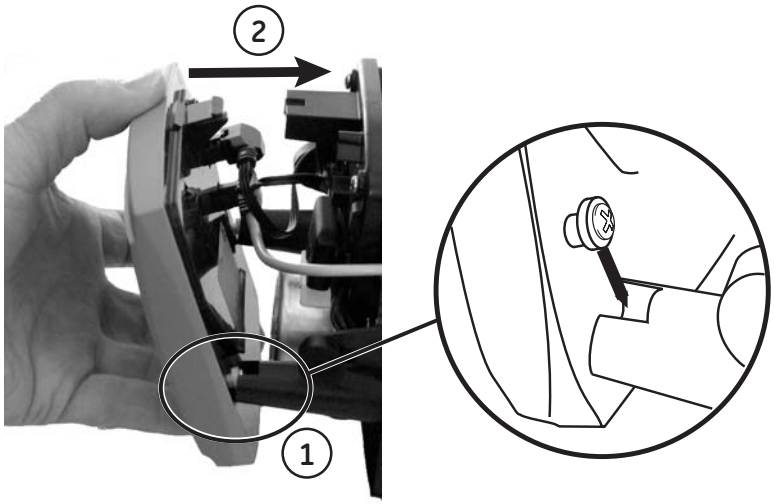


Figure 11

Mount Control

Mount the control onto the valve by sliding the mounting tabs over the mounting plate. Note that all models of Magnum controls mount to the valve in the same manner (Figure 12).

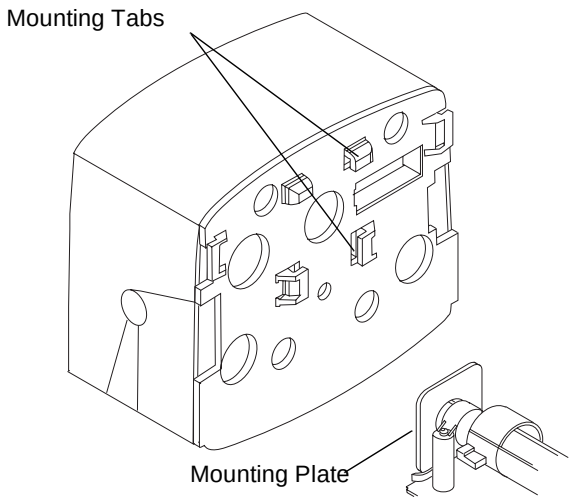


Figure 12

Engage Assembly

The camshaft will not rotate by hand when engaged with the controller. The Logix Magnum controller contains a motor with gears that drive a socket. The camshaft is keyed to only properly engage the socket when the Logix controller is in the treated water (Home) position.

If the camshaft is pulled back and not engaged it can be rotated counterclockwise. Rotate the camshaft to align the arrows (Figure 7). If the Logix Magnum controller is not in the treated water position, cycling the power will cause the socket to rotate to that position.

Engage the control by pressing on the release tab and pushing the camshaft into the control (Figure 13). Do not force the camshaft. If the camshaft does not slide freely into the control, check the alignment of the camshaft to the controller. Ensure it is in the proper position (Figure 7).

The Logix controller moves to the treated water (home) position when first power is applied.

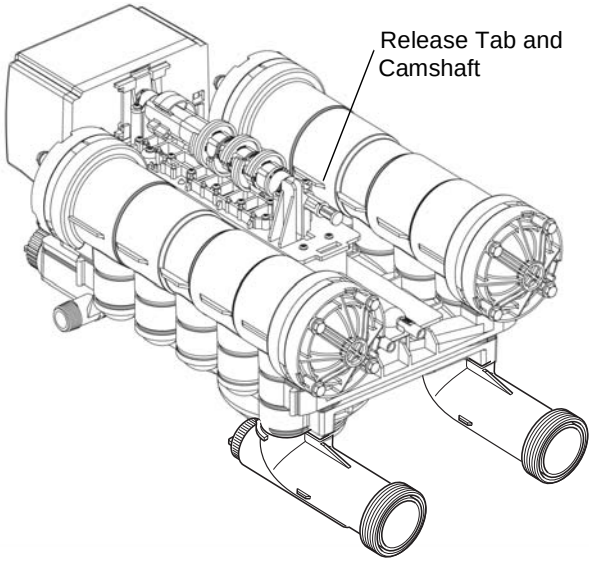


Figure 13

To disassemble the control from the valve, reverse the assembling procedure.

Inlet, Outlet and Drain Connections

The inlet, outlet, and drain connections are designed to accept a Pentair Water supplied CPVC or stainless steel adapter (Figure 14). The adapters provide a convenient union for the three connection ports on the valve. In addition, they incorporate a positive O-ring face seal for ease of installation and leak free operation. DO NOT OVERTIGHTEN THE ADAPTERS. As a general guideline, hand tightening the nut onto the valve is adequate. If additional tightening is required, never exceed a quarter turn beyond the hand tight position.

The outlet of the 2-inch Magnum IT has an integrated turbine. The turbine measures the flow of water through the outlet. This information is used by the controller to determine the best time to regenerate.

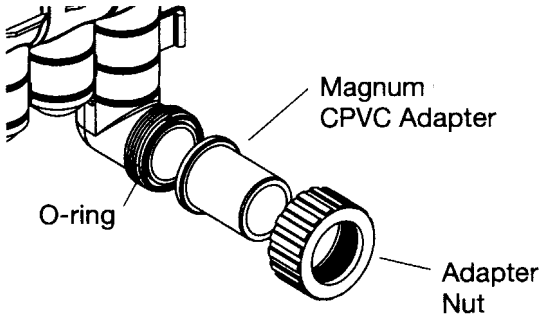


Figure 14

No Hardwater Bypass Feature

The Magnum control valve may be configured for “Hard Water Bypass” or “No Hard Water Bypass”. With Hard Water Bypass, unsoftened or unfiltered water is allowed to bypass the Magnum control valve during regeneration or backwash. With No Hard Water Bypass, a valve cartridge ensures that no unsoftened or unfiltered water bypasses the valve during regeneration or backwash.

It is easy to observe which option is installed in the valve. Note that the Hard Water Bypass End Cap has much longer standoffs than the No Hard Water Bypass cartridge. The No Hard Water Bypass assembly looks identical to the other three valve cartridges on the valve and has a label identifying the cartridge assembly (Figure 15).

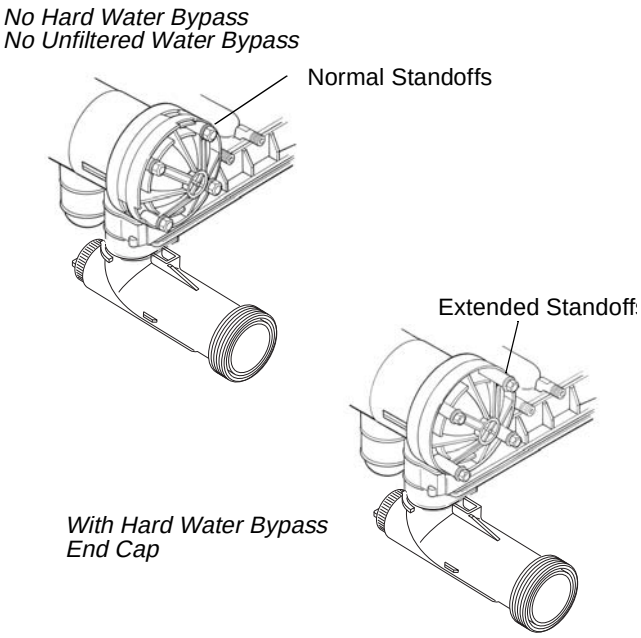


Figure 15

Hydraulic Output Signal

An optional hydraulic output signal is available on the valve. An optional cam lobe on pilot valve #6 is used on the camshaft assembly to initiate the hydraulic output signal during regeneration or backwash (Figure 16). The hydraulic line pressure signal is available through the 1/4-inch connection on the back of the valve marked “AUX”. See Figure 17. Remove the tube cap installed for shipping.

Optional cam lobes available are:

P/N 1000554 Provides a hydraulic signal from the beginning of BACKWASH through the start of REFILL.

P/N 1000553 Provides a hydraulic signal from the beginning of BACKWASH through the end of REFILL.

P/N 1041064 Breakaway cam. Can be programmed to send a hydraulic signal at any time during the REGENERATION or BACKWASH cycle. Note: The camshaft must be turning for the signal to change states, i.e. switch from OFF to ON, or from ON to OFF.

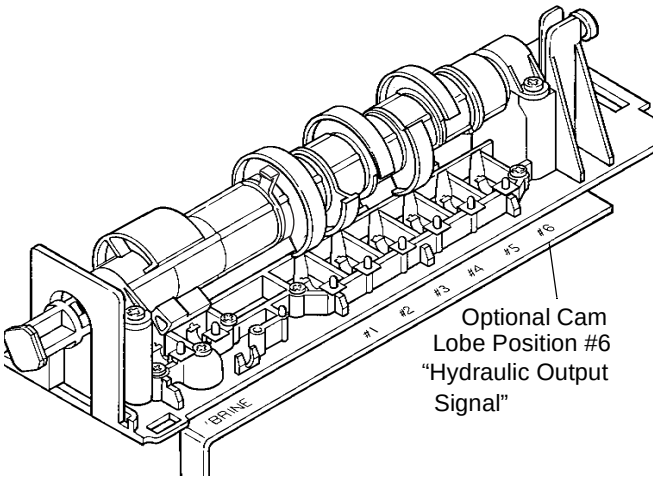


Figure 16

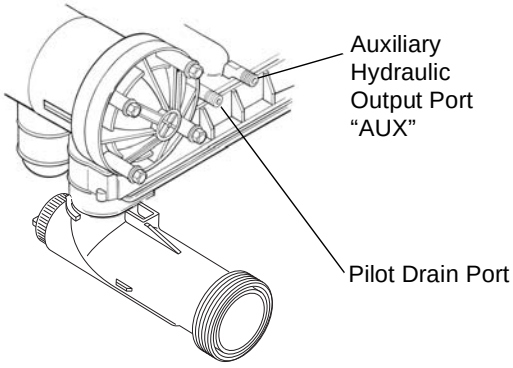


Figure 17

Magnum Tank Adapter and Riser

The Magnum now uses a stainless steel tank adapter that clamps onto the valve body.

The tank adapter on the control valve is designed to be compatible with a 4 inch-8UN (8 threads per inch) tank opening.

The valve is designed to accept a full 1-1/2-inch (3.81-cm) riser pipe with outside diameter of 1.90 to 1.91 inches (48.26 to 48.51 mm) (Figure 18). The riser pipe is sealed by an O-ring on the inside of the valve body (Figure 18). It is recommended that the riser pipe extend beyond the top of the tank by 1/4 inch ± 3/8 inch (6 mm ± 9 mm).

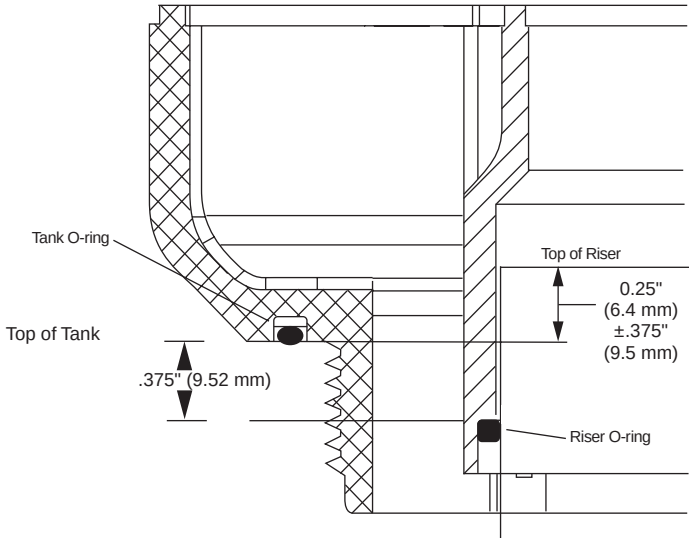


Figure 18

Optional Switch Assembly

A single optional feedback switch kit is available to provide an electrical signal during the entire regeneration or backwash cycle (Figure 19). The switch may be wired in the “Normally Open” or “Normally Closed” position and is rated for 0.1 amp at 125 volts AC. An optional 5.0 amp switch at 1/10 HP 125/ 250 volts AC is available upon request.

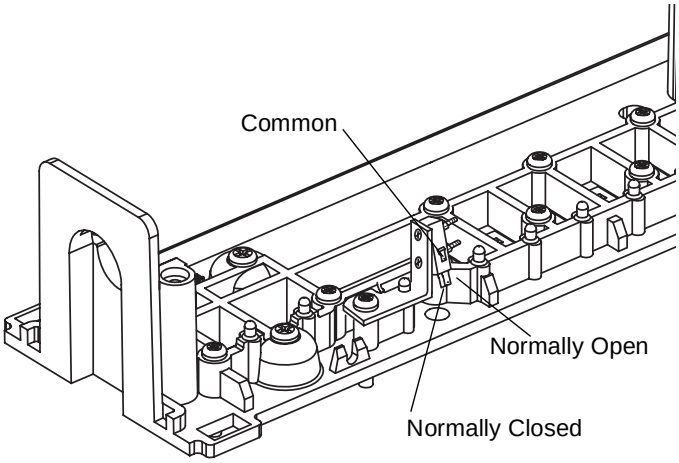


Figure 19

Optional multi-switch kits are available to provide additional electrical or switch closure signals during the regeneration or backwash cycles. Coupled with the optional breakaway cams, signals can be sent to external system equipment at virtually any time while the control/camshaft motor is running. Consult the instruction sheet covering the multi-switch option for additional application and programming information. The instruction sheet is sent with the switch kit.

Magnum General Specifications

Operating and Environmental

Dynamic Pressure ..... 25 to 100 psig (172 to 688 kPa)
100 psig (688kPa) maximum in Canada

Operating Water Temperature Range..... 34 to 100^{o}F (1 to 36^{o}C)

Ambient Temperature Range..... 34 to 120^{o}F (1 to 50^{o}C)

Cap Bolt Torque..... 35 to 40 inch lbs. (3.95 to 4.51 N_m)

Connections

Inlet and Outlet ..... 2-inch Magnum IT

Tank 4-inch 8UN

Brine ..... 3/4-inch NPT

Pilot Drain and Auxiliary Hydraulic Out..... 1/4-inch tube fitting

Riser Pipe Fitting ..... 1-1/2 inch (3.81-cm)

Drain ..... 1-1/2 inch (3.81-cm)

Physical

Dimensions..... 26-11/16" L, 16-1/4" W, 10-11/16" H

Approximate Weight (Valve and Control)..... 27.3 lbs. (10.6 kg.)

Electrical*

Voltage - Logix 764 Series Control ..... 12 VAC wall mount transformer only

Power Consumption ..... 4 watts

*See section on Electronic Controls for alternative electrical configurations.

General Installation Information

Please review the following items thoroughly to ensure an efficient and safe installation of the water treatment system. The typical installation line drawings for the Magnum valves are shown in Figure 22.

WARNING: Filter media may need to be properly conditioned before the filter is placed into full operation. Consult the original equipment manufacturer for proper procedure.

Operating Conditions - ***A minimum dynamic operating water pressure of 25 psig (172 kPa) is required for the Magnum control valve to operate properly.*** Water pressure is not to exceed 100 psig (688 kPa). In Canada, water pressure is not to exceed 100 psig (688 kPa). Water temperature is not to exceed 100°F (36°C). Do not subject the valve to freezing conditions.

Space Requirements - Allow adequate space for the water treatment system and associated piping. A minimum of 4 1/2 inches (11.5 cm) front and rear clearance is required for cartridge assembly and removal.

Plumbing - Always follow good plumbing practices and conform to local codes. Check existing pipes for lime and/or iron buildup. Replace piping if heavy buildup exists and initiate the proper treatment to prevent additional occurrences. Locate the equipment close to a drain that is capable of handling the maximum drain flow rate during backwash.

Flexible Connectors - Some tanks expand and contract over the acceptable range of operating water pressures of the Magnum control valve. The use of flexible connectors is recommended on polywound or fiberglass tank installations of 24-inch (60.96-cm) diameter and larger. Follow the tank manufacturer's instructions for more information.

Inlet and Outlet Piping - Inlet and outlet plumbing should be adequately supported to avoid excessive loads on the valve. Install a manual bypass system to provide for occasions when the water conditioner must be bypassed for servicing.

Drain LIne Piping - To prevent mineral loss during backwash, and to ensure proper operation of the control valve, **A DRAIN LINE FLOW CONTROL** must be plumbed into the drain line prior to placing the valve in the service mode. Flow controls from 5 to 40 gpm (18.92 to 151.4 Lpm) are available that can be easily installed in the drain line. Flow controls greater than 40 gpm (151.4 Lpm) must be plumbed externally. Selection of the proper drain line flow control depends on the tank size and media used for the installation.

The following general drain line piping guidelines should be observed:

- 1-1/2 inch (3.81 cm) or larger piping
- Should not exceed 20 feet (6.1 m)
- Should not be elevated higher than five feet above the control valve
- No shut-off valves should be installed in drain line
- Minimal number of elbows and fittings should be installed in drain line
- Piping must be self-supporting
- Flow control should be installed as close to the Magnum Series control valve as possible if an external flow control is used.

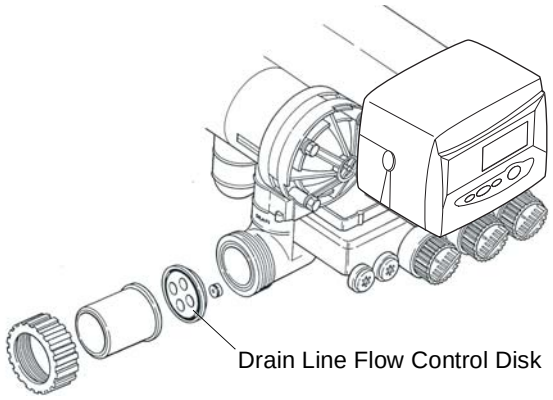


Figure 20

Brining System - The Magnum control valve utilizes timed water refill to add water to the salt tank. A refill tube with check ball is required in the brine tank that does not restrict the refill or brine draw flow rate capabilities of the valve. Although not required, a separate brine valve (safety float) system is recommended for use with Magnum installations. Select a "High-Flow" brine valve that does not restrict the refill or brine draw flow rate capabilities of the valve. The "Performance Injectors and Magnum Flow Controls" section of this manual contains flow rate information for various size injectors and refill controllers.

Pilot Drain - During regeneration, a small amount of water (200 ml or 1 cup) is discharged from the 1/4-inch (6.3-mm) tube fitting on the back of the valve marked DRAIN (Figure 21). To prevent this water from being discharged to the floor, plumb this connection to a non-pressurized drain or to the brine tank. **Do not plug or apply back pressure to the pilot drain at any time.**

Crimping the pilot drain line or installing the line to go up, which causes backpressure, prevents the diaphragm cartridges from shifting properly through the cycles of regeneration or backwash.

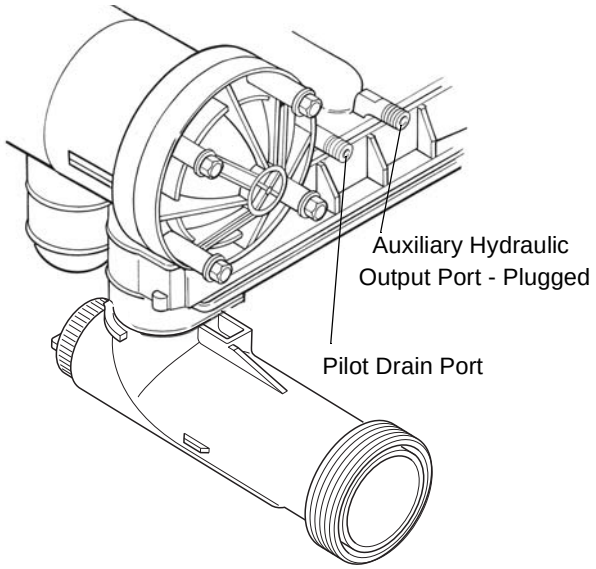


Figure 21

Magnum Valve Installation Guide (Top Mount)

Before the installation of the internal distribution system and loading of the media into the tank, the Magnum valve must be temporarily installed onto the tank. This will ensure that correct alignment of the inlet and outlet piping once the internals are installed and the media is loaded onto the tank.

1. Cut riser 1/4-inch above the top of the tank, plus or minus 3/8 inch. Place riser inside the tank.
2. Install tank O-ring into the tank adapter. **Be sure to lightly lubricate the O-ring with the 100% silicone lubricant provided with the valve.**
3. Screw the stainless steel tank adapter onto the empty tank until O-ring touches the top of the tank.
4. Turn (tighten) the tank adapter an additional 45° to 90° (max).
5. Slide clamp ring over tank adapter.
6. Mount valve on tank adapter until the valve uniformly contacts the tank adapter.
7. Align valve with plumbing connections to minimize unnecessary stress.
8. Remove the Magnum valve in preparation for installation of the internals and media loading.
9. Load media following your supplier's recommendations.
10. Re-mount valve on tank adapter.
11. Slide clamp ring over valve and tank adapter interface.
12. Tighten nut on clamp ring until valve cannot be turned in relation to tank adapter. The nut should be torqued to 20 to 25 ft-lbs.
13. Follow piping recommendations to provide support and flexibility. Layout piping to accommodate for tank and piping dimensional changes and potential water hammering. Flexible connectors may be needed.

Flex connectors are recommended when installing valves on FRP tanks that are 24 inches or larger in diameter.

Electrical

1. Electrical requirements for the installation depends on the configuration of the control.
2. The standard North American Series Logix electronic control is supplied with a 12 volt AC adapter. Optional AC adapters must be ordered separately for all international 12 VAC configurations.

Caution: The Logix Control and supplied AC adapter are for dry location use only, unless used with a Listed Class 2 power supply suitable for outdoor use.

Lubricants

It is very important that 100% silicone lubricant is the only lubricant used for installing the Magnum control valve. Any other lubricant may cause material degradation and potential failure of the valve components.

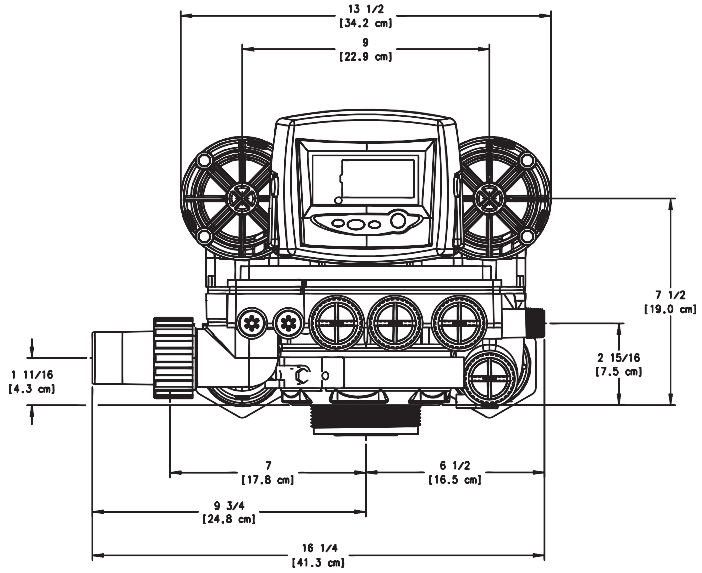
NOTE: Some silicone based lubricants contain petroleum-based ingredients. If there is a question about the lubrication that you are using contact the lubricant manufacturer to be sure the product is 100% silicone.

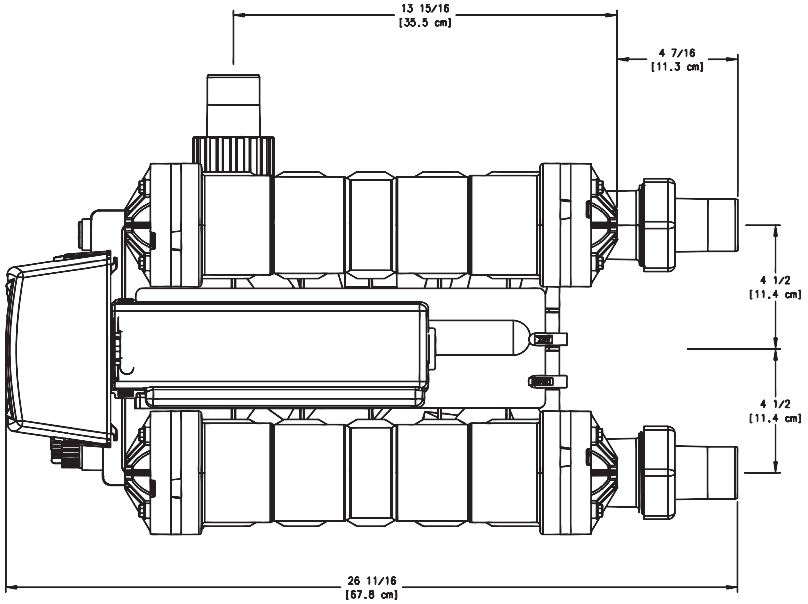
Caution: Plumbing cannot be used for electrical grounding when metal inlet and outlet piping is connected to a non-metal valve.

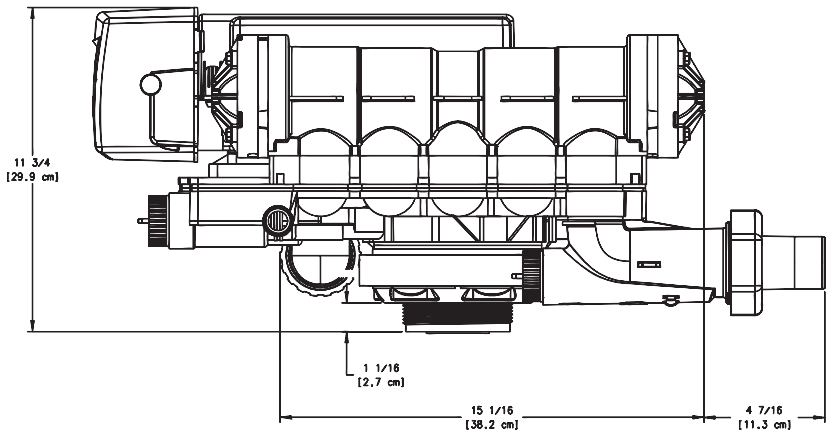
Connect the inlet and outlet piping together using a grounding strap or clamp to establish continuity.

Magnum IT Dimensional Specifications

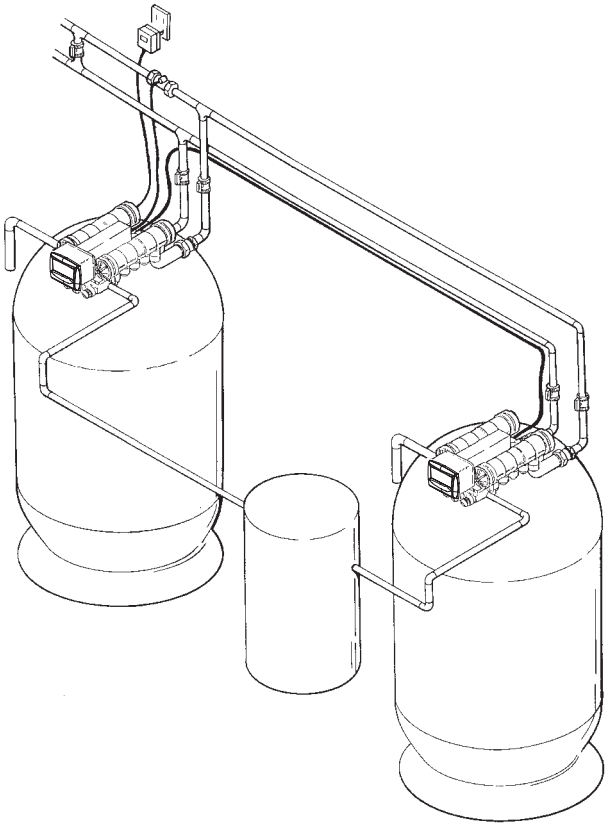
2-Inch Inlet and Outlet, 1 1/2-Inch Drain



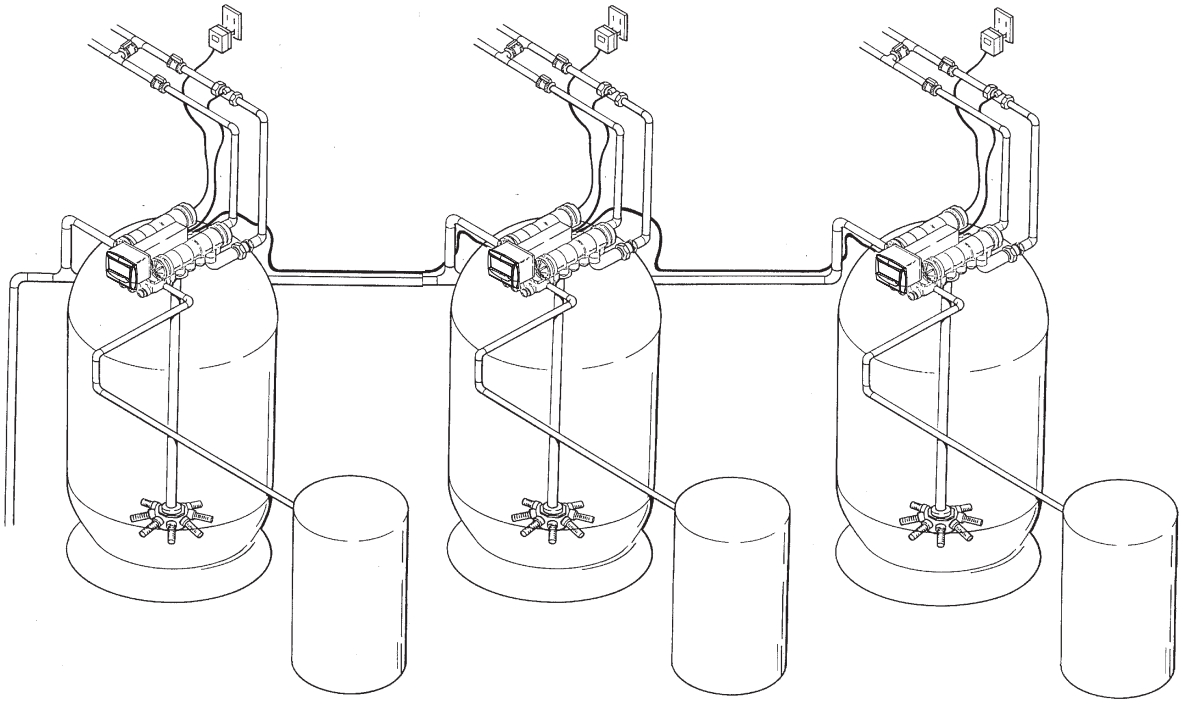




Typical Installation Drawings



Twin Tank



Multiple Tank

Figure 22

Camshaft Cycle Positions

The front end of the camshaft has an indicator cup. The cup has slots in the outer edge and cycle numbers on the inside face.

Remove the cover and look over the top of the 764 control to view the cycle numbers. The number in the opening, (Figure 23) indicates the current cycle position of the control valve. The corresponding slot for the number is positioned at the optical sensor, which is rotated approximately 90 degrees out of phase.

Cycle Indicators:

0 = Treated Water

1 = Backwash Cycle

2 = Regenerant Draw Cycle

3 = Slow Rinse Cycle

5 = Fast Rinse Cycle

8 = Regenerant Refill Cycle

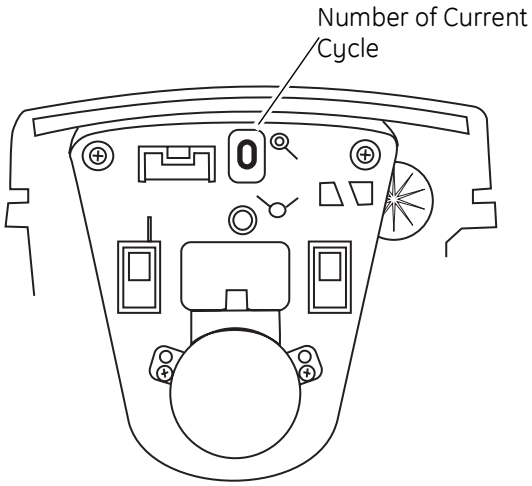


Figure 23 View with Cover and Logix Control Removed

764 Control Operation

Power Loss Memory Retention

The 764 control features battery-free Time of Day and Day of Week retention during loss of power. A super capacitor is designed to keep time for 8 to 24 hours depending on the installation. If the super capacitor is exhausted the Logix control will display four dashes (- - :- -) immediately upon power up. The Time of Day and Day of Week must be reset.

All other programmed parameters are stored in the static memory and are retained.

Flow Diagrams

The Magnum control valve utilizes a series of pilot valves to properly position the diaphragm valve cartridges (Figure 24). The pilot valves are activated by the camshaft (Figure 25). The flow diagrams that follow represent the **Service Cycle** for a 5-cycle conditioner and 3-cycle filter configuration. Both the Hardwater Bypass and No Hardwater Bypass service flow diagrams are presented.

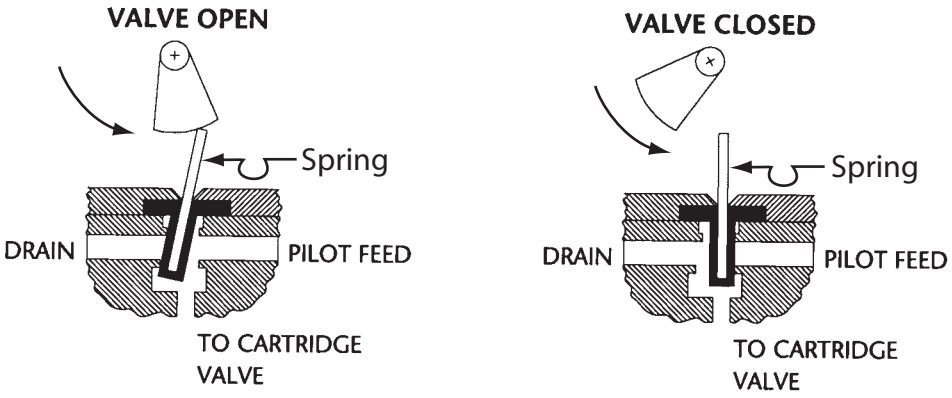


Figure 24 Pilot Valve Principle of Operation, Front View

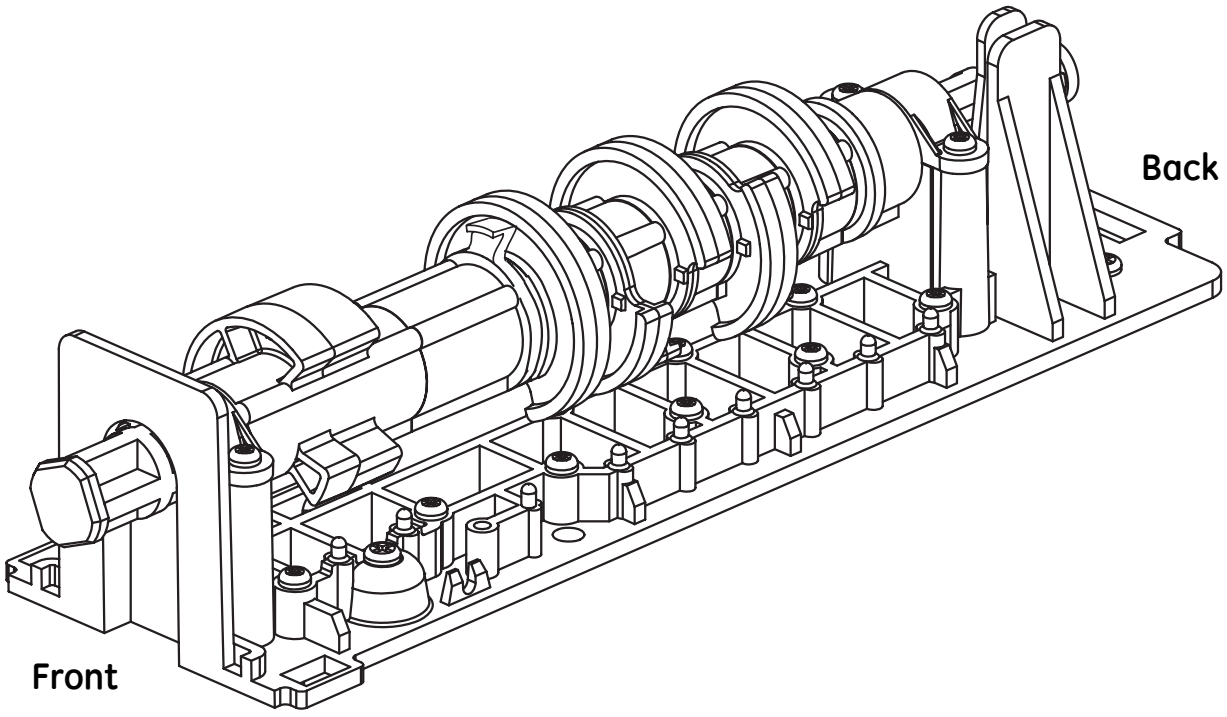
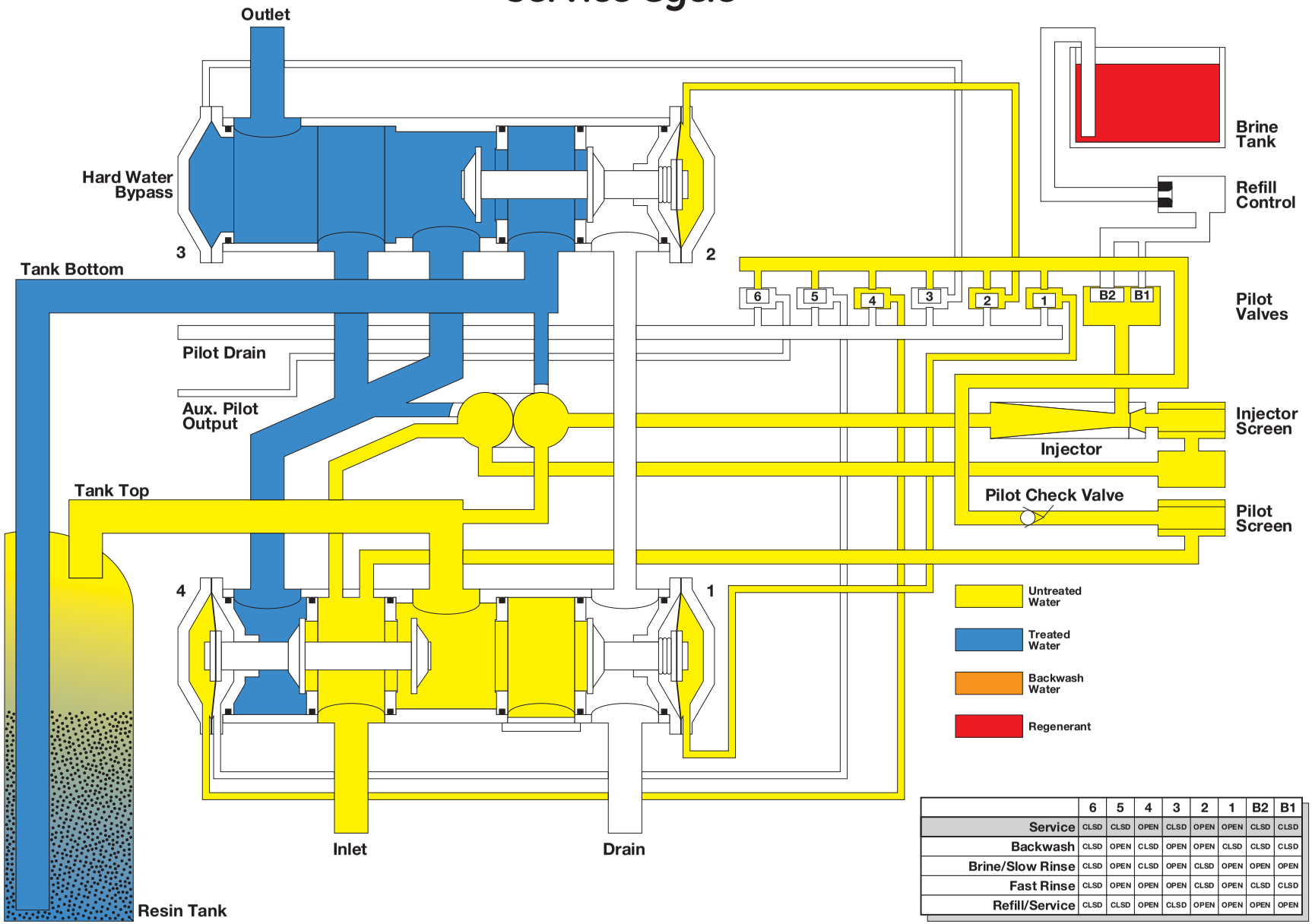


Figure 25 Cam Assembly

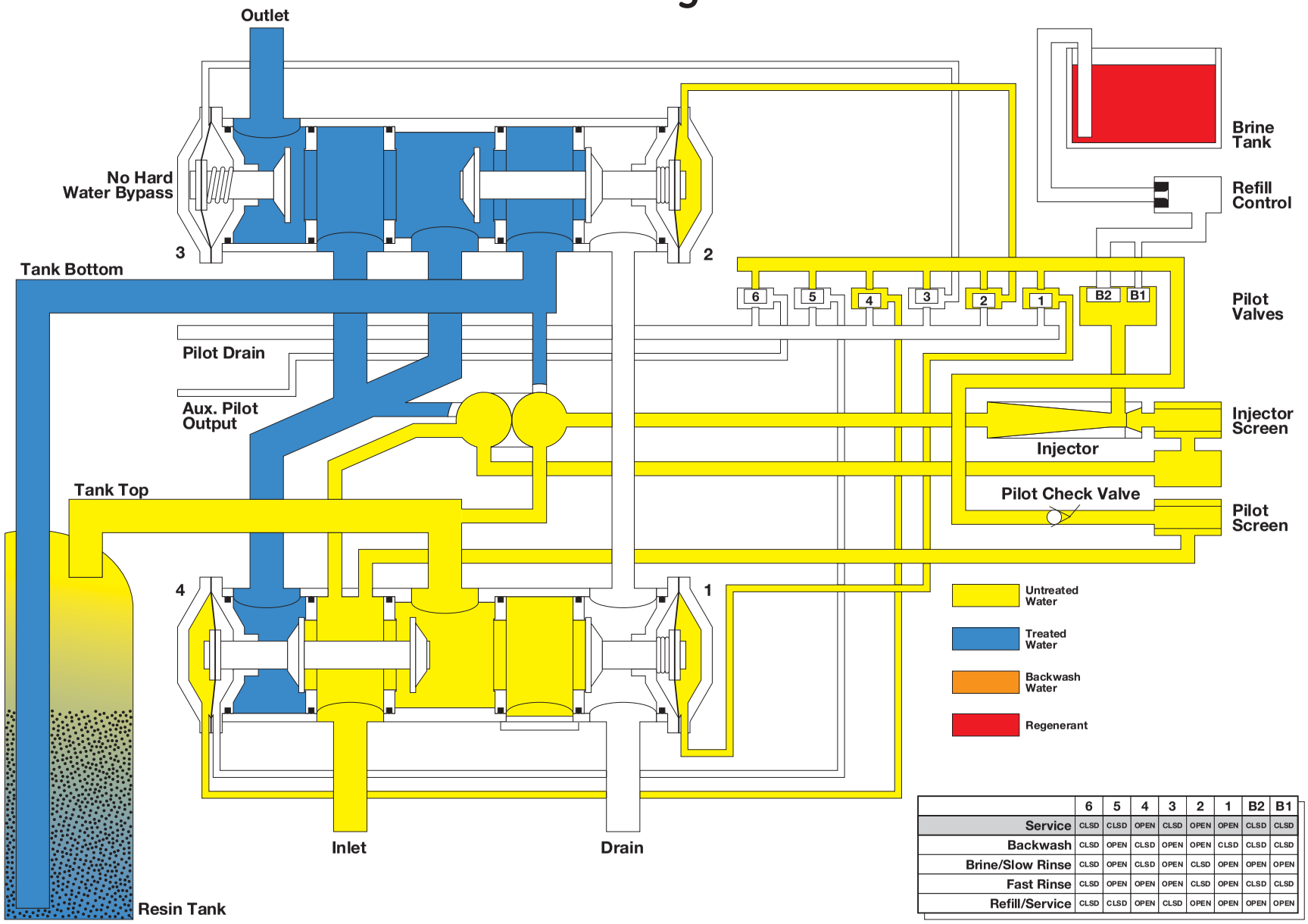
Magnum 5-Cycle Conditioner Hard Water Bypass Service Cycle



	6	5	4	3	2	1	B2	B1
Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD
Backwash	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD	CLSD
Brine/Slow Rinse	CLSD	OPEN	CLSD	OPEN	CLSD	OPEN	OPEN	OPEN
Fast Rinse	CLSD	OPEN	OPEN	OPEN	CLSD	OPEN	CLSD	CLSD
Refill/Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	OPEN	OPEN

Figure 26

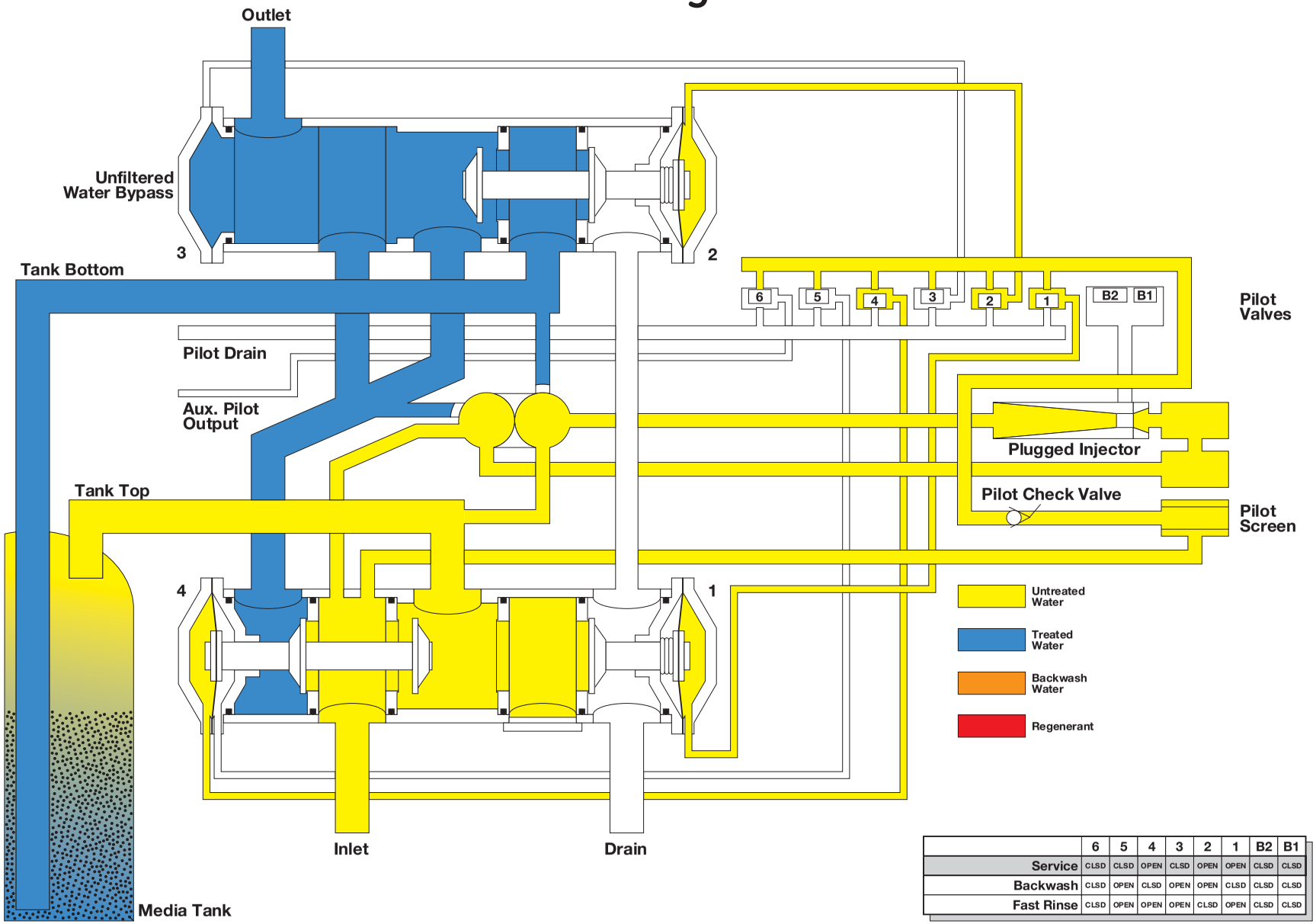
Magnum 5-Cycle Conditioner No Hard Water Bypass Service Cycle



	6	5	4	3	2	1	B2	B1
Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD
Backwash	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD	CLSD
Brine/Slow Rinse	CLSD	OPEN	CLSD	OPEN	CLSD	OPEN	OPEN	OPEN
Fast Rinse	CLSD	OPEN	OPEN	OPEN	CLSD	OPEN	CLSD	CLSD
Refill/Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	OPEN	OPEN

Figure 27

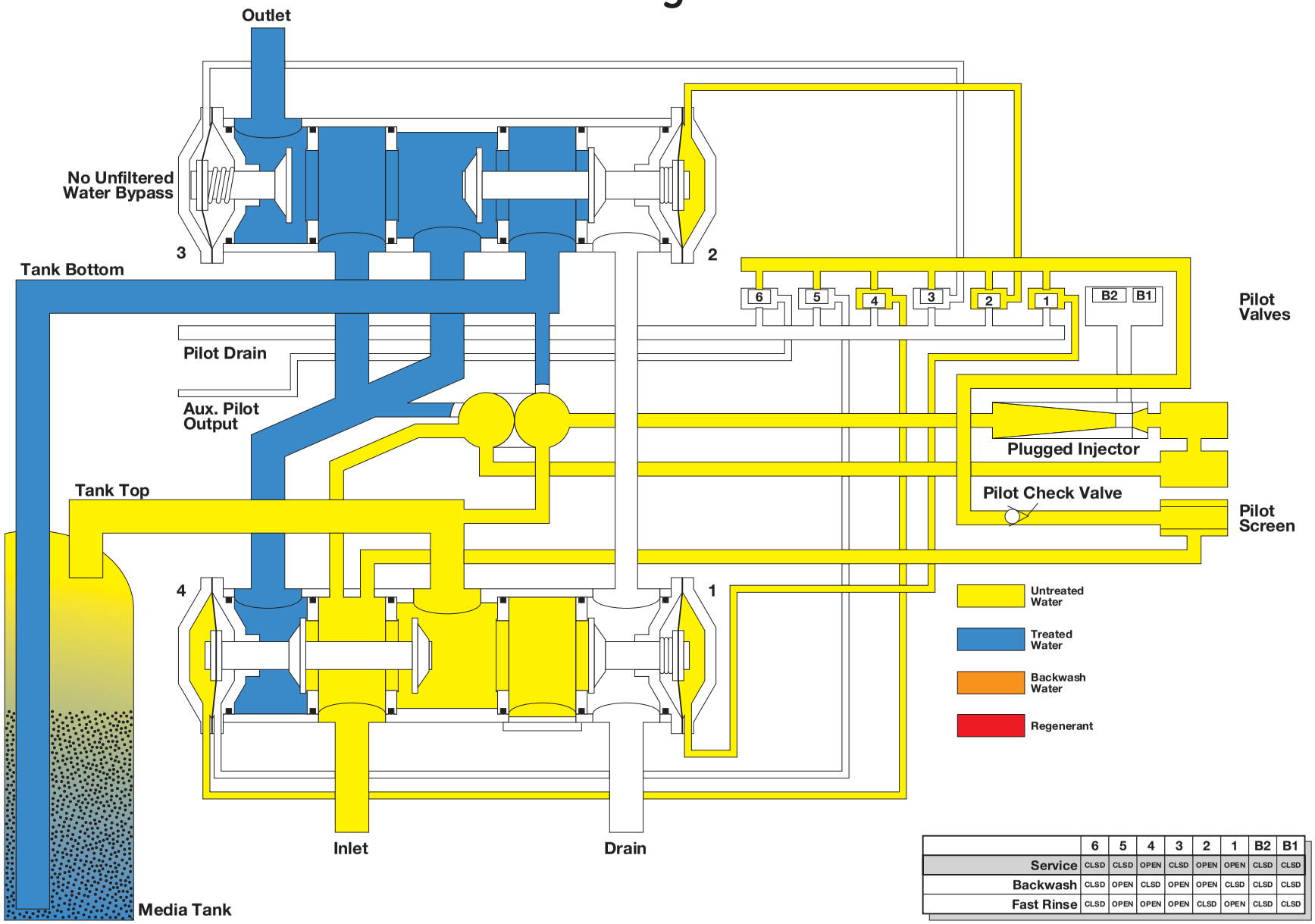
Magnum 3-Cycle Filter: Unfiltered Water Bypass Service Cycle



	6	5	4	3	2	1	B2	B1
Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD
Backwash	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD	CLSD
Fast Rinse	CLSD	OPEN	OPEN	OPEN	CLSD	OPEN	CLSD	CLSD

Figure 28

Magnum 3-Cycle Filter: No Unfiltered Water Bypass Service Cycle



	6	5	4	3	2	1	B2	B1
Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD
Backwash	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD	CLSD
Fast Rinse	CLSD	OPEN	OPEN	OPEN	CLSD	OPEN	CLSD	CLSD

Figure 29

Identifying the Logix Control

If you are unsure of your control model, simply remove the cover and disconnect the controller module from the control valve. On the back of the control valve is a silver label that shows your model number and version revision.

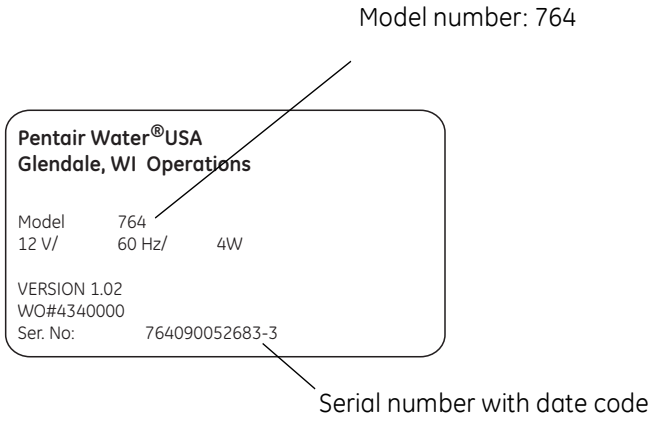


Figure 30

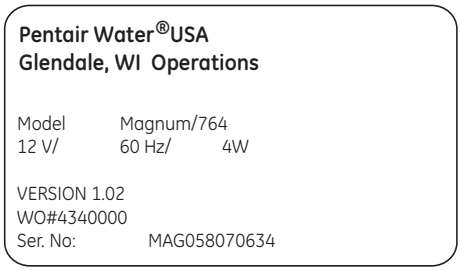


Figure 31

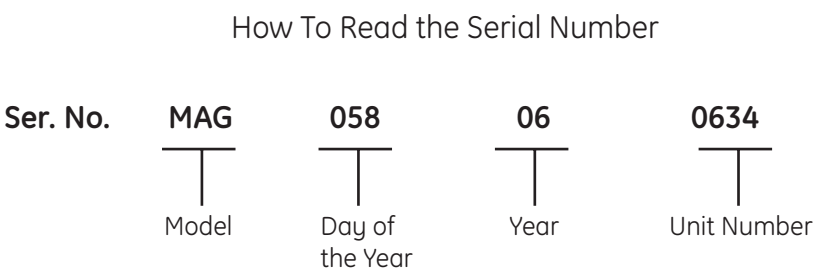
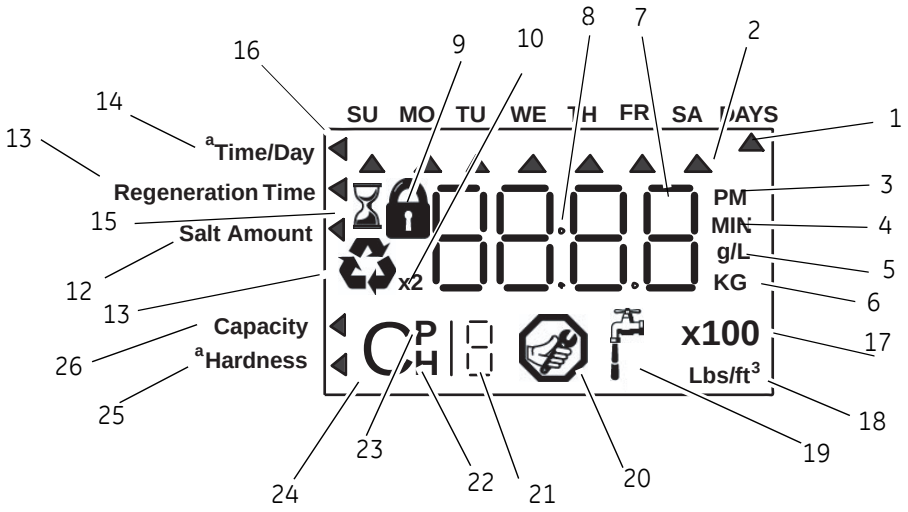


Figure 32

Display Icons & Cursors



[a] If your Logix 764 controller was purchased as a filter control, the overlay will show: Time/Day, Backwash Time, Backwash Length and Capacity.

Note: In normal operation and during programming, only a few of the icons are actually displayed.

1. This cursor is displayed when the days between regeneration are being programmed (used with .5 to 99 day regeneration programming).
2. One of these cursors is displayed to indicate which day will be programmed into the controller.
3. "PM" indicates that the time displayed is between 12:00 noon and 12:00 midnight (there is no AM indicator). PM indicator is not used if clock mode is set to 24-hour.
4. When "MIN" is displayed, the value entered is in minute increments.
5. When g/L is displayed, the value for regenerant amount entered is in grams/Liter.
6. When "Kg" is displayed, the value entered is in kilograms or kilograins.
7. Four digits used to display the time or program value. Also used for error codes.
8. Colon flashes as part of the time display. Indicates normal operation (742 only).
9. Locked/unlocked indicator. In Level I programming this is displayed when the current parameter is locked-out. It is also used in Level II programming to indicate if the displayed parameter is locked (icon flashes) when controller is in Level I.
10. When "x2" is displayed, a second regeneration has been called for.
11. The recycle sign is displayed (flashing) when a regeneration at the next time of regeneration has been called for. Also displayed (continuous) when in regeneration.
12. The display cursor is next to "SALT AMOUNT" when programming the amount of regenerant. If the controller is on a 3-cycle filter then backwash time is programmed.
13. The display cursor is next to "REGENERATION TIME" when programming the time of regeneration and the days of regeneration.
14. The display cursor is next to "TIME/DAY" when programming the current time and day.
15. The hourglass is displayed when the motor is running. The camshaft should be turning.
16. These cursors appear next to the item that is currently displayed.
17. X100 multiplier for large values.
18. When Lbs/ft^3 is displayed the value for regenerant amount entered is in pounds/cubic foot.
19. Faucet is displayed when the current flow rate is displayed. Control may show the faucet and "0", indicating no flow.
20. Maintenance interval display turns on if the months in service exceed the value programmed in P11.

21. Used with #24, #25, and #26. Displays valve in service, a sequence number or a value.
22. History Values (H). The number displayed by #23 identifies which history value is currently displayed.
23. Parameter (P). Displayed only in Level II Programming. The number displayed by #23 identifies which parameter is currently displayed.
24. Cycle (C). The number displayed by #23 is the current cycle in the regeneration sequence.
25. Hardness setting—only used with 298 conditioners.
26. Capacity display—shows estimated system capacity.

Keypad — Buttons

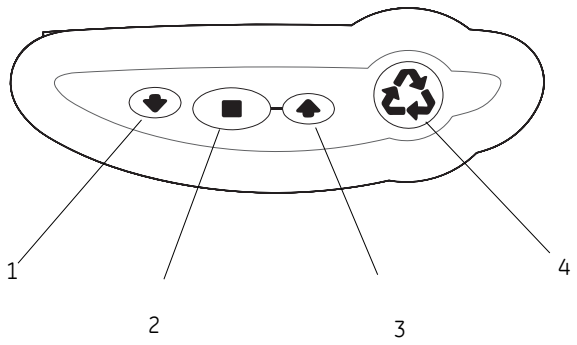


Figure 33

1. DOWN arrow. Generally used to scroll down or increment through a group of choices.
2. SET. Used to accept a setting that normally becomes stored in memory. Also used together with the arrow buttons.
3. UP arrow. Generally used to scroll up or increment through a group of choices.
4. Regenerate. Used to command the controller to regenerate. Also used to change the lock mode.

Note: If a button is not pushed for thirty seconds, the controller returns to normal operation mode. Pushing the Regenerate button immediately returns the controller to normal operation.

Programming Conventions

The 700 series controller is programmed using the buttons on the keypad. The programming instructions are described two ways whenever a section has keypad input.

First, a table shows simplified instructions. Second, text follows that describes the action. In each table:

"Action" lists the event or action desired.

"Keys" are listed as:

- UP for up arrow
- DOWN for down arrow
- SET for set
- REGEN for regeneration

"Duration" describes how long a button is held down:

P/R for press and release

HOLD for press and hold

X sec for a number of seconds to press the button and hold it down

"Display" calls out the display icons that are visible.

Placing Water Conditioning System Into Operation

After you have performed the installation steps, the conditioner will need to be placed into operation.

Follow these steps carefully, (pages 28 to 33) as they differ from previous instructions.

Note: All Logix 764 controls will be shipped in the service (treated water) position. **Check to see that the camshaft is aligned to service position. See Figure 7 on page 9 for proper control/camshaft alignment.**

The incoming supply water should be turned off.

Remove air from tank(s).

1. Position the bypass valve(s) to the in service (not in bypass) position.
2. Open the nearest water faucet completely.
3. Open the incoming water supply valve slowly to the quarter open position.

Note: Do not plug in the power supply until step 5. The tank(s) will fill with water. The air will exit through the faucet. When water flows steady from the faucet, the tank(s) are purged.

4. Turn off the faucet then turn off the incoming water supply.

Power-up the Control

5. Plug the AC adapter into a non-switched outlet. The display will show the valve type that was loaded from memory.

   If this is the first time the control is powered up the display will show 255A.

6. Use the ▲ or ▼ buttons to increment through the available selections, Table 1.

Table 1 Preprogrammed Valves

Type	Valve			Connection - inches
255 A	255	Twin Alternating	8-cycle conditioner	3/4
273 A	273		3-cycle filter	1
278 A	278		5-cycle conditioner	1
293 A	293		3-cycle filter	2
298 A	298		5-cycle conditioner	2
255 P	255	Twin Parallel	8-cycle conditioner	3/4
273 P	273		3-cycle filter	1
278 P	278		5-cycle conditioner	1
293 P	293		3-cycle filter	2
298 P	298		5-cycle conditioner	2
255 L	255	Single Tank Remote Regeneration or Multi-Single Tank Lockout	8-cycle conditioner	3/4
263L	263		8-cycle conditioner	1
268L	268		3-cycle filter	1
273 L	273		3-cycle filter	1
278 L	278		5-cycle conditioner	1
293 L	293		3-cycle filter	2
298 L	298		5-cycle conditioner	2

For the next steps you may want to remove the cover to watch the camshaft movement.

7. Press ■ to enter the valve type and the proper preprogrammed valves for your application:

   293A for Twin Alternating Filter

   298A for Twin Alternating Conditioner

   293P for Twin Parallel Filter

   298P for Twin Parallel Conditioner

   293L for single or multiple tank filters with regeneration lockout or remote regeneration start

   298L for single or multiple tank conditioners with regeneration lockout or remote regeneration start

Note: The control overlay changes depending on whether a filter or conditioner Logix control was purchased. If a filter control is programmed to be a conditioner then the overlay will not be correct. However, the Logix control will function properly. See previous page for overlay text.

8. The display will show - - - . Select media volume or "F" for filter set-up. If a number or an "F" is displayed then the resin volume or filter type has been preprogrammed.

   Finish programming the Logix 764 control using the Level I programming guide.

   For a 293/298A system: the control will automatically syncronize the cam positions.

   Tank 1 will move to standby
   Tank 2 will move to service

   Err3 will be displayed when the Tank 1 cam is moving. Err4 will be displayed when Tank 2 cam is moving.

   For a 293/298P system:

   Tanks 1 and 2 will move to service if not already in service.

   For a 293/298L system:

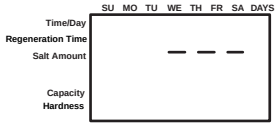
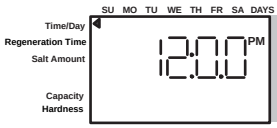
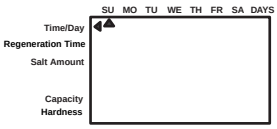
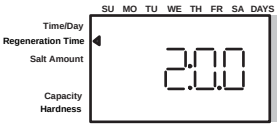
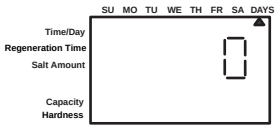
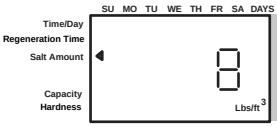
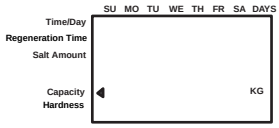
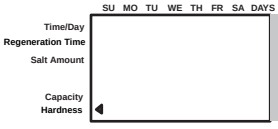
   The tank(s) will move to service if not already in service.

These cam movements may take up to 5 minutes.

Table 2

Resin Volume - 1.0 ft^3 and 25 Liter Steps			
	Resin Volume		
Tank Dia (inches)	**Injector**	**US**	**Metric**
14	14	3.00	75
14	14		100
16	16	4.00	125
18	18	5.00	150
21	21	6.00	175
21	21	7.00	200
21	21	8.00	225
24	24	9.00	250
24	24	10.00	275
24	24		300
24	24	11.00	325
30	30	12.00	350
30	30	13.00	375
30	30	14.00	400
30	30	15.00	425
30	30	16.00	450
30	30	17.00	475
30	30		500
36	36	18.00	525
36	36	19.00	550
36	36	20.00	575
36	36		600
36	36		625
36	36		650
36	36		675
36	36		700

Level I Programming - 764 Control with 298 Valve, 5 Cycle Conditioner

Screen	Buttons to Press	Description	Range
	*then* ▼ or ▲ *press* ■	1. Resin Volume Select correct resin volume	Cubic feet: 3.00 to 20.00
	*press* ■ *then* ▼ or ▲ *press* ■	2. Time of Day (12 hr.) Set to time of day Note: Setting includes PM indicator.	
	*press* ■ *then* ▼ or ▲ *press* ■	3. Day of Week Set to actual day of the week	
	*press* ■ *then* ▼ or ▲ *press* ■	4. Time of Regeneration Set to desired time of regeneration	
	*press* ■ *then* ▼ or ▲ *press* ■	5. Days Override Leave at 0 to disable or Set to desired days between regeneration	Days: 0 to 99
	*press* ■ *then* ▼ or ▲ *press* ■	6. Salt Dosage Set to desired desired dosage lbs per cubic feet of resin	Lbs/ft^3: 3 to 18
	*press* ▼ *to override press* ■ *then* ▼ or ▲ *press* ■	7. Capacity Capacity calculated by Logix Control Use to OVERRIDE calculated capacity	Kilograins: 1 to 900
	*press* ■ *then* ▼ or ▲ *press* ■	8. Hardness Set to actual water hardness in grains per gallon	Grains/gal: 3 to 200

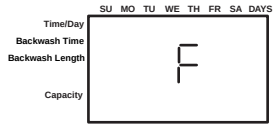
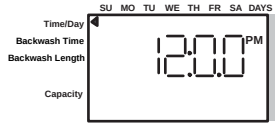
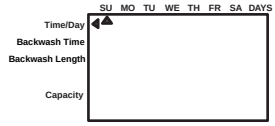
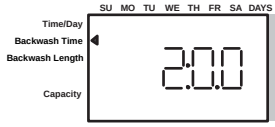
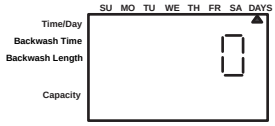
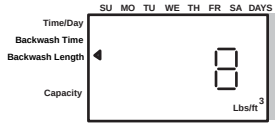
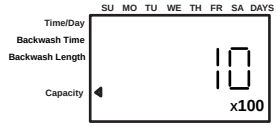
Control programming is complete

Note: If one of the following conditions occur:

- control displays Err3 and goes to home position or
- power outage discharges the supercapacitor and when power is restored the time of day is reset;

the Regen Icon will begin flashing. This indicates that a delayed regeneration will occur at the next programmed time of regeneration. If a delayed regeneration is not desired, press the REGEN Button to disable the delayed regeneration and the system will regenerate by water usage.

Level I Programming - 764 Control with 293 Valve, 3 Cycle Filter

Screen	Buttons to Press	Description	Range
	*then* ▼ or ▲ *press* ■	1. Program Type Select "F"	
	*press* ■ *then* ▼ or ▲ *press* ■	2. Time of Day (12 hr.) Set to time of day Note: Setting includes PM indicator.	
	*press* ■ *then* ▼ or ▲ *press* ■	3. Day of Week Set to actual day of the week	
	*press* ■ *then* ▼ or ▲ *press* ■	4. Time of Backwash Set to desired time of Backwash Note: Time of Backwash is not used for Alternating mode.	
	*press* ■ *then* ▼ or ▲ *press* ■	5. Days Override Leave at 0 to disable or Set to desired days between regeneration	Days:0 to 99
	*press* ■ *then* ▼ or ▲ *press* ■	6. Backwash Length (minutes) Set to desired Backwash length	Minutes: 0 to 200
	*press* ▼ *to override press* ■ *then* ▼ or ▲ *press* ■	7. Capacity (gallons) Set to desired Capacity in multiples of 100 gallons	Gallons: 1 to 900

Control programming is complete

Note: If one of the following conditions occur:

- control displays Err3 and goes to home position or
- power outage discharges the supercapacitor and when power is restored the time of day is reset;

the Regen Icon will begin flashing. This indicates that a delayed regeneration will occur at the next programmed time of regeneration. If a delayed regeneration is not desired, press the REGEN Button to disable the delayed regeneration and the system will regenerate by water usage.

Placing Water Conditioning System Into Operation (cont.)

Note: 293/298 Alternating and parallel tank systems have one Logix 764 control that is mounted on tank 1. Tank 2 has a blank faceplate and the valve is controlled by the Logix 764 control on tank 1.

Quick Cycling the Control 293/298A, 293 298P and 293/298L

It is required that the control be quick cycled to specific regeneration cycles when placing the conditioner into operation. This will ensure that all of the air in the tank and valve is purged. The process also provides a check for leaks and functioning of the brine system. Please perform the following steps for quick cycling the control, before proceeding to start-up.

1. With the control in the treated water position, Press and hold the REGEN button on the controller for 5 seconds. This will initiate a manual regeneration. The control will display a solid hourglass indicating that the motor and camshaft are turning to the backwash cycle (C1). When the control reaches the backwash cycle, the total regeneration time remaining will be displayed. Pressing the SET button will display the specific cycle time remaining**.**
2. Press and release the UP and SET buttons to move the control to the Regenerant Draw cycle (C2).
3. Repeat Step 2 to advance to each cycle.

   Before the final filling of the media tank with water check that:

   – the nearest water faucet is completely closed.
   – the valve drain line is properly routed to a drain
   – the regenerant tank is empty and the regenerant hose is connected to the valve
   – the water supply valve is off.

Note: The control can be sent directly back to the treated water position from any regeneration cycle. Press the UP and SET buttons (about 5 seconds) until the hourglass icon begins flashing. The control will now skip all remaining regeneration cycles.

4. Add water to the regenerant tank.
   A. With a bucket or hose add approx. 4 gallons (15 liters) of water to the regenerant tank.
   B. If the tank has a salt platform in the bottom of the tank, add water until the water level is approximately 1 inch (25 mm) above the platform.

Note: It's recommended that you do not put regenerant into the tank until after the control valve has been put into operation. With no regenerant in the tank, it is much easier to view water flow and motion in the tank.

5. Press and hold the ♻ button on the controller for 5 seconds. This will initiate a manual regeneration.

   The control will display a solid hourglass indicating that the motor and camshaft are turning to the backwash cycle (C1). When the control reaches the backwash cycle, the total regeneration time remaining will be displayed. Pressing SET will display the specific cycle time remaining.
6. While the controller is in cycle C1 (Backwash), open the water supply valve very slowly to approximately the ¼ open position. Water will begin to enter the media tank. Any air remaining will begin to be purged to drain as the media tank fills with water.

⚠ ***WARNING:*** If opened too rapidly or too far, media may be lost out of the tank into the valve or the plumbing. In the ¼ open position, you should hear air slowly escaping from the valve drain line.

   When all of the air has been purged from the media tank (water begins to flow steadily from the drain line), open the main supply valve all of the way. This will purge the final air from the tank.

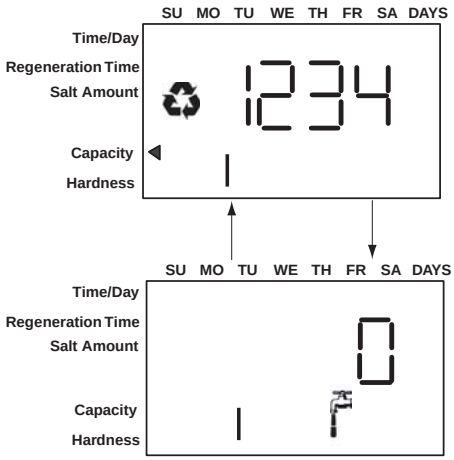
   Allow water to run to drain until the water runs clear from the drain line. This purges any debris from the media bed.
7. Check Regenerant Draw.
   A. Quick cycle the control to the C2 regenerant draw/slow rinse position .
   B. C2 will be displayed. With the control in this position, check to see that the water is being drawn out of the regenerant tank. The water level in the regenerant tank should recede very slowly.
   C. Observe that water is being drawn from the regenerant tank for at least three minutes. If the water level does not recede, check all regenerant line connections for air leaks.

8. If the water level is receding from the regenerant tank you can quick cycle the control to the C8 Regenerant tank refill position.
    A. The control will cycle to the regenerant tank refill cycle, and water will be directed down through the regenerant line to the regenerant tank. Let the water flow through the line until all air bubbles have been purged from the line. Note: Do not let the water flow down the line to the tank for more than one to two minutes, or the tank may overfill.
9. Repeat steps 4 and 8 for each additional tank.
10. Finally, turn on a faucet plumbed after the water conditioner. Run the faucet until the water runs clear.
11. Add the appropriate amount of regenerant to regenerant tank.

The Water Conditioning System is Now Fully Operational

Note: After any control reset (valve type or system change, etc.) it is necessary to initiate a manual regeneration and quick cycle through it. This will ensure the control and cam are synchronized. If not synchronized Err 3 will display and the control will drive cams to the correct position for valve and system type programmed.

In Service Display



Logix 764 Electronic Multi-Tank - "A" Alternating Control:

Service display — The number of the Tank in Service (small digit next to CPH position) and Alternating Capacity Remaining and Flow Rate with Faucet icon of Tank in Service.

Logix 764 Electronic Multi Tank - "P" Parallel Control:

Service Display — alternating three items

Capacity remaining for Tank 1 with digit "1" displayed

Capacity remaining for Tank 2 with digit "2" displayed

System Flow Rate (Tank 1 + Tank 2 added) with Faucet icon

Logix 764 Electronic Multi Tank — "L" Lock Out Control

Service Display — Alternating Capacity Remaining and Flow Rate with Faucet icon "L" displayed indicating lockout signal is active. Blinking "L" and Lock icon if lockout signal is active and control is ready to perform regeneration.

Note: The faucet icon is displayed on all the Logix 764 controls when there is flow. The 764 will show the faucet icon when the flow rate is displayed, even if the flow rate is zero. If the flow rate is zero, the faucet will turn off when the capacity is displayed.

Note: In service flow rate display can be replaced with a clock display. Using Level II (P10) programming if desired.

Programming Overview

The 764 control includes multiple program levels that allow the Water Treatment Professional to customize the system for many water conditions. Additionally, historical data can be viewed allowing quick and easy troubleshooting. In most cases Level I programming is all that is required to set up the water conditioning system for proper operation. A brief description of each program level is listed below.

Level I Used to program control for normal applications.

Level II (P-Values) Allows the installer to customize programming for non-standard applications.

Level Ill (C-Values) Allows the installer to adjust the length of select cycles for non-standard applications.

Level IV History (H-Values) Allows access to historical information for troubleshooting the system.

Note: If a button is not pushed for thirty seconds, the control returns to normal operation mode.

Level I Programming

The 764 control can be quickly programmed by following the sequential procedure in the section “Placing Water Conditioning System Into Operation”. Level I program parameters are those that can be accessed by pressing the UP or DOWN buttons.

- Resin Volume Setting: Set to match the volume (cubic feet) of resin in the mineral tank.
- Time of Day: Includes PM indicator. Can be set to display as a 24-hour clock. See Level ll programming
- Day of Week: Set to actual day of the week.
- Time of Regeneration: Fully adjustable. Default is 2:00 AM.
- Days Override: Range 0.5 to 99 days. Leave at 0 to disable.
- Salt Dosage: Set at pounds of salt per cubic foot of resin in the conditioner tank (298 conditioner only).

  For the 293 filter valve the salt dosage is replaced with backwash length. The display arrow will point to backwash length and the setting is minutes of backwash.

Note: When the control is set up for a twelve-hour clock a PM indicator will illuminate when the displayed time is in the PM hours. There is no AM indicator.

Level II Programming – P Values

Level II program parameters can be adjusted to fine-tune the conditioner's operation. The parameters are accessible by pressing and holding the UP and DOWN buttons until the control displays a "P" value. Note: The control must be in the home position to change settings. See Table below for Level ll parameters. Typically the Level ll parameters will not need to be adjusted as the default settings accommodate most applications. Contact your Water Treatment Professional before attempting any programming.

	Description	Range	Minimum Increments	Default	Units	Notes
P9	Units of Measure	0-1	1	(2)		0 = US 1 = Metric
P10	Clock Mode	0-1	1	(2)		0 = 12 hour clock; flow rate service display 1 = 24 hour clock; flow rate service display 2 = 12 hour clock; Time of Day service display 3 = 24 hour clock; Time of Day service display
P11	Service Interval	0-250	1	0	months	Uses 30 days for each month; 0 = off
P12	Remote regeneration switch delay	3-250	1	60	seconds	Time remote switch must be active to start regeneration.
P13 *	**(not used on Magnum systems)**					
P14	Refill Rate	1-700	1	(1)	gpm x 100	
P15	Draw Rate	1-700	1	(1)	gpm x 100	
P16	Reserve Type (not used for alternating mode)	0-3	1	0		0 = variable reserve delayed regeneration 1 = fixed reserve delayed regeneration 2 = variable reserve immediate regeneration 3 = fixed reserve immediate regeneration
P17	Initial average or fixed reserve (not used for alternating mode)	0-70	1	30	% of Capacity	Depends on value entered in P16
P18	Flow sensor select	0-7	1	(1)		0 = internal magnum NHWB, 1, 6 =1" Autotrol turbine 2, 7 = 2" Autotrol turbine 3 = User defined K-factor 4 = User defined Pulse Equivalent 5 = Internal Magnum HWB Values 6 & 7 are for single turbine configurations on twin alternating systems.
P19	K-factor or Pulse equivalent	1.00-99.99 0-9999	0.01 1	0.01 1		K-factor P18=3; Pulse Equivalent P18 = 4
Pr	Refill First (not used for alternating mode)	0-1	1	0		0 = Refill first off 1 = Refill first on
Pd	Remote switch operation	0-1	1	0		0 = Immediate Regeneration after P12 time 1 = Delayed Regeneration after P12 time
Notes: (1) Default selected with valve type and resin volume. (2) Factory Default is "0" for North America units and "1" for World units.						

*Not used for Magnum valves.

Programming the Lockout Feature

All Level I parameters can be locked out when the control is in Level ll programming. Simply press the REGEN button during Level ll programming and a Lock Icon will appear indicating that the specific setting has been locked out. When locked out, the setting cannot be adjusted. To disable the Lock Out Feature, press the REGEN button when in Level ll. The lock icon will not be displayed.

Salt Setting (298 Conditioner)

The default P6 salt setting is set at 9 lbs/cu ft. Under normal circumstances this setting will provide the correct system capacity. This setting may be adjusted to change the exchange capacity.

Table 3 Standard Efficiency Exchange Capacity

Salt lbs/cu ft	Exchange Capacity grains/cu ft	Salt grams/ liter	Exchange Capacity grams/ liter
3	12714	50	29.9
4	15495	60	34.0
5	17774	70	37.5
6	19661	80	40.6
7	21250	90	43.4
8	22618	100	45.9
9	23828	110	48.2
10	24930	120	50.2
11	25962	130	52.1
12	26950	140	53.8
13	27916	150	55.5
14	28873	170	58.5
15	29829	200	62.7
16	30796	230	66.9
17	31783	260	71.0
18	32806	290	75.3

Level lll Cycle Programming – C Values

Several Level III program parameters can be adjusted to fine-tune valve operation for non-standard applications. Typically these parameters will not need to be adjusted as the default settings accommodate most applications. Contact your Water Treatment Professional before attempting any programming. The parameters are accessible by pressing and holding the UP and SET buttons until the display shows a “C” value.

Note: The control must by in the treated water position to change settings.

C#	Description	Range	Minimum Increments	Default Setting	Notes
C1	Backwash	0 – 200	1 Min	14	Flow rate dictated by size of drain line flow controller
C2	Regenerant Draw	0 – 200[a]	1 Min	See Notes	Automatically calculated from resin volume and salt dosage settings
C3	Slow Rinse	0 – 200	1 Min	See Notes	Automatically calculated from resin volume and salt dosage settings
C5	Fast Rinse	0 – 200	1 Min	6	Rinses residual regenerant from tank
C8	Regenerant Refill	0 – 200[a]	1 Min	See Notes	Automatically calculated from resin volume and salt dosage settings

a. Only adjustable when the 293 filter valve has been selected.

Level IV Viewing History - H Values

Historical information can be viewed by pressing the SET and DOWN buttons simultaneously, with the 764 control in the home position. Release both buttons when the control displays an “H” value. Press the UP or DOWN buttons to navigate to each setting.

Table 4 History Data

H#	Description	Range	Notes
H0[a]	Initial Setting Value	Cubic Feet or Liters	Resin Volume
H1	Days since last regeneration	0 - 255	
H2	Current Flow Rate	Depends on turbine used	
H3	Water used today in gallons or/m^3 since Time of Regeneration	0-131,070 or 0-1,310.70 m^3	
H4	Water used since last regeneration in gallons or/m^3	0-131,070 or 0-1,310.70 m^3	
H5[a]	Total water used since reset in 100s	0-999900 gallons or 0-9999 m^3	
H6[a]	Total water used since reset in 1,000,000	4,294 x 10^6 gal or 4264 x 10^4 m^3	
H7	Average usage for Sunday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H8	Average usage for Monday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H9	Average usage for Tuesday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H10	Average usage for Wednesday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H11	Average usage for Thursday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H12	Average usage for Friday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H13	Average usage for Saturday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H14	Average service cycle	0-255 days	
H15[a]	Peak Flow Rate	0-200 gpm or 1000 Lpm	
H16	Day and Time of Peak Flow Rate	Time and day that peak flow occurred	
H17[a]	Months since service	0-2184 months	
H18	Water used since last regeneration - Tank 1	0-131,070 gallons or 0-1,310.70 m^3	
H19[a]	Water used since last regeneration - Tank 2	0-131,070 gallons or 0-1,310.70 m^3	
Hr	Number of regenerations since last serviced	0-65536	

a. H0, H5, H6, H15, H17, H19 values can be reset by pressing and holding ■ for 3 seconds while the value is being displayed.

Program Reset

The 764 control can be reset to original factory parameters when viewing the H0 parameter. Press and hold the SET button for three seconds while H0 is displayed. Release the button. All settings except for Time of Day and Day of Week will be reset. The 764 Logix control will now display the valve and system type. Refer to Level I Programming.

Note: After any control reset (valve type or system change, etc.) it is necessary to initiate a manual regeneration and quick cycle through it. This will ensure the control and cam are synchronized. If not synchronized Err3 will display and the control will drive cams to the correct position for valve and system type programmed.

Manual Regeneration Options

Refill FIrst Option

Refill First is only available for single tank “L” and twin parallel “P” models.

The 764 control allows users to select when the refill cycle occurs. When Pr = 0 (default) refill occurs immediately after fast rinse. When Pr = 1 refill will not occur until just before a regeneration. This allows for a “dry” brine tank.

If refill first is selected, the valve will move to refill two hours before the start of backwash. After refill is complete, the valve moves back to service for a two-hour brine make-up time. Regeneration then follows as normal, skipping refill.

By default, time of regeneration is set to midnight after refill first is selected.

Note: The tank in service (on-line) cannot be regenerated while the other tanks are isolated. Water for backwash would not be available.

The 764 control features several options that offer additional flexibility for manually regenerating the conditioner. On alternating systems the tank in standby will move through regeneration to service. The tank in service will move through regeneration to standby. On parallel systems, the tank with the lowest remaining capacity will regenerate.

Delayed Manual Regeneration

Press and release the REGEN button to start a delayed manual regeneration. The Regeneration icon on the display will flash indicating a regeneration will start when the time of day reaches the programmed time of regeneration. Pressing the REGEN button again will turn off the regeneration icon and cancel the delayed regeneration.

Immediate Manual Regeneration

Pressing and holding the REGEN button for three seconds starts an immediate manual regeneration. A solid regeneration icon will be displayed. The control will immediately begin a regeneration on the tank in service.

Delayed Second Regeneration

Pressing and releasing the REGEN button while the control is in regeneration will program the control for a delayed second regeneration. A flashing x2 icon next to the regeneration icon will appear indicating a second regeneration will start when the time of day reaches the programmed time of regeneration. The delayed second regeneration will be performed on the new tank in service. For alternating and parallel systems, each tank will regenerate once.

Double Immediate Manual Regeneration

Back-to-Back manual regenerations are initiated by pressing and holding the REGEN button for three seconds while the control is in the regenerating mode. A solid x2 icon next to the regeneration icon will appear indicating a second manual regeneration will start immediately after current regeneration is complete. For alternating and parallel systems each tank will regenerate once. Single tank systems will regenerate twice back-to-back.

Regeneration Modes for Parallel Systems

Parameter P16 is used to determine the method for demand initiated regeneration. Four regeneration modes are possible.

- P16 = 0, Delayed Regeneration with a Smart Reserve Regenerations will start only at the Time of Regeneration entered in P2. A tank is regenerated if the capacity remaining in that tank is below the minimum required capacity needed to meet the next days calculated water usage requirement. The next days water usage number is based on the daily average water usage held in memory plus a 20% reserve. If necessary both tanks will be regenerated sequentially beginning with the most exhausted tank.
  This option allows the control to vary the reserve, and therefore the decision to regenerate, based on the actual daily water usage pattern for the location at which it is installed. See Table 5.
- P16 = 1, Delayed Regeneration with a Fixed Reserve Regenerations will start only at the Time of Regeneration entered in P2. A tank is regenerated if the capacity remaining in that tank is below the percentage entered in P17.
  If either tank's capacity is overrun by 50% a regeneration will take place. The control will also cause both tanks to be regenerated sequentially the next Time of Regeneration regardless of how much water is used during that 24 hour period. This feature is to help recover a severely exhausted bed. See Table 6.
- P16 = 2, Immediate Regeneration - Fixed Reserve/Delayed Regeneration - Smart Reserve
  This option uses the features of both option 0 and option 3. This is the most versatile of regeneration options. Option number 2 provides all the advantages of variable reserve based on the actual amount of water that is used each day plus the capability to react to the excessive water usage days that occur occasionally. See Table 7.
- P16 = 3, Immediate Regeneration - Fixed Reserve
  Regenerations are started immediately when a tank reaches zero or when the system capacity remaining (capacity remaining in both tanks) drops below the reserve capacity programmed in P17. To prevent hard water this reserve should be set large enough to provide conditioned water during the regeneration of the most exhausted tank. See Table 8.

Table 5 P16 = 0

Priority	Flow Rate	Continuous Soft Water	Efficiency
High	●		
Ave		●	●
Low			

Table 6 P16 = 1

Priority	Flow Rate	Continuous Soft Water	Efficiency
High	●		
Ave		●	
Low			●

Table 7 P16 = 2

Priority	Flow Rate	Continuous Soft Water	Efficiency
High		●	
Ave	●		●
Low			

Table 8 P16 = 3

Priority	Flow Rate	Continuous Soft Water	Efficiency
High		●	●
Ave			
Low	●		

Wiring Diagrams

Connecting the Logix 764 Twin Alternating or Parallel Controls

The twin sensor and extension cables are used for twin unit parallel and alternating applications. Four standard connections are required for operation; the power AC adapter, the flow sensor, motor/optical sensor, and the connection between tank 1 and tank 2 controls. Figure 34 outlines these standard features.

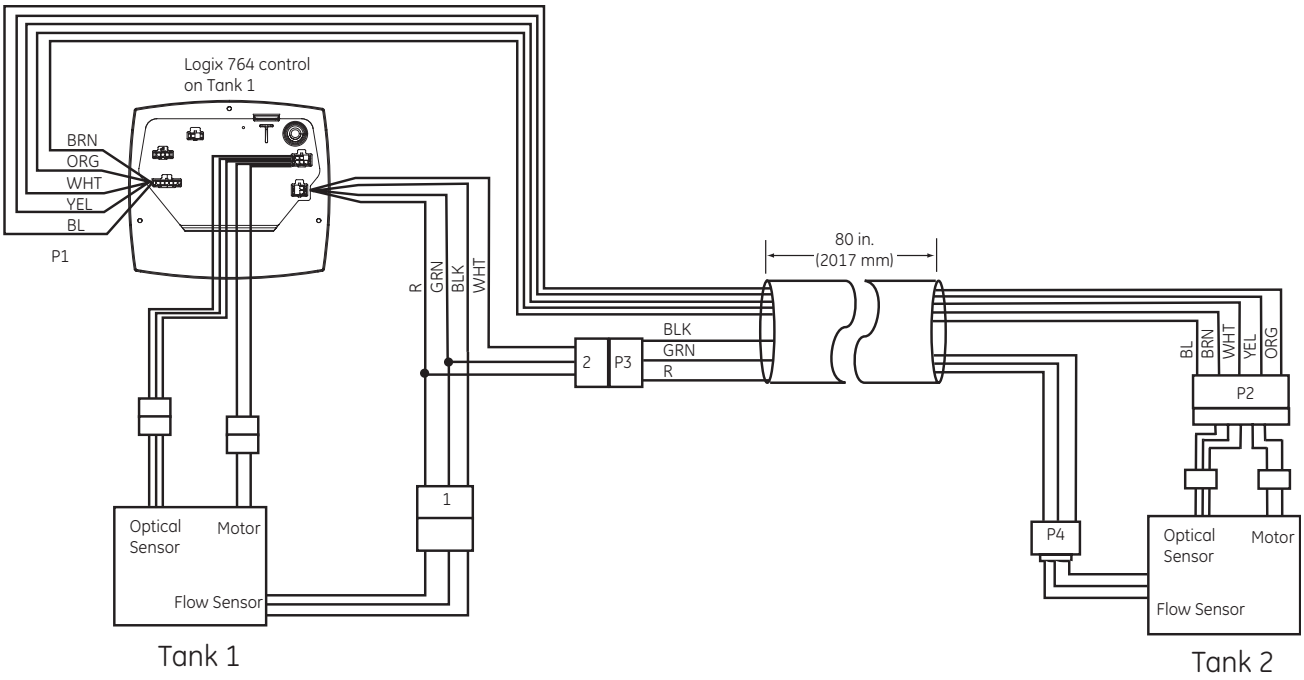
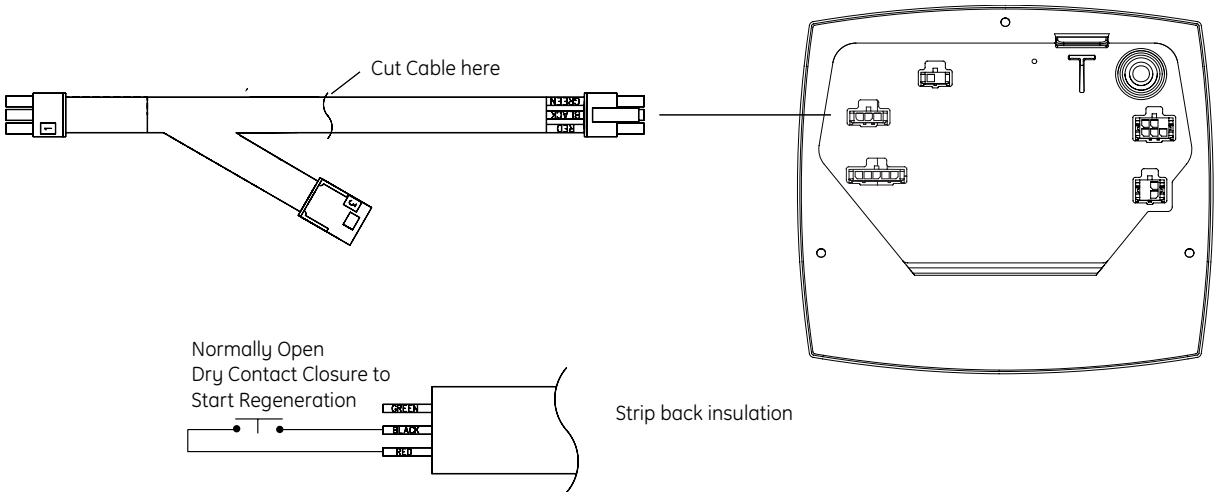


Figure 34

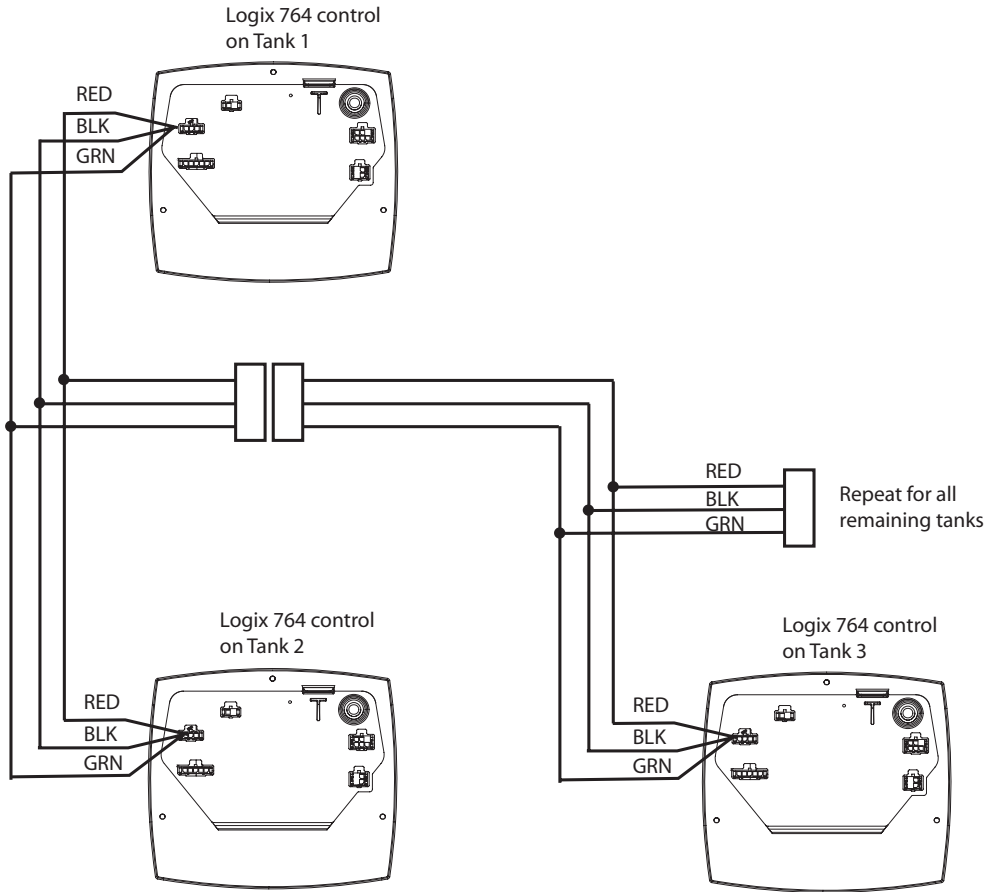
Remote Regeneration Start



Note: Cable PN 3020228 sold separately.

Figure 35

Connecting the Logix 764 Multi Single Tank Control



Note: Cable PN 3020228 sold separately.

Figure 36

Troubleshooting

764 Controller – Error Codes

Problem	Possible Cause	Solution
ERR 1 is displayed.	Program settings have been corrupted.	Press any key and reprogram Level I settings.
ERR 3 is displayed.	Controller on tank 1 does not know the position of the camshaft. Camshaft should be rotating to find Home position.	Wait for two minutes for the controller to return to Home position. The hourglass should be flashing on the display indicating the motor is running.
	Camshaft on tank 1 is not turning during ERR 3 display.	Check that motor is connected. Verify that motor wire harness is connected to motor and controller module. Verify that optical sensor is connected and in place. Verify that motor gear has engaged cam gear. If everything is connected, try replacing in this order: 1. Wire Harness, Motor, Optical Sensor Assy 2. Controller
	Camshaft on tank 1 is turning more than five minutes to find Home position:	Verify that optical sensor is in place and connected to wire. Verify that camshaft is connected appropriately. Verify that no dirt or rubbish is clogging any of the cam slots. If motor continues to rotate indefinitely, replace the following components in this order: 1. Wire Harness, Motor, Optical Sensor Assy 2. Controller
	Regeneration starts but control shows Err3 before completing regeneration.	Verify that the correct valve is selected in the Logix controller.

ERR 4 is displayed.	If single tank system..	Verify system setting is programmed to 293/298“L”.
	Controller on tank 2 does not know the position of the camshaft. Camshaft should be rotating to find Home position.	Wait for two minutes for the controller to return to Home position. The hourglass should be flashing on the display indicating the motor is running.
	Camshaft on tank 2 is not turning during ERR 4 display.	Check that motor is connected. Verify that motor wire harness is connected to motor and controller module. Verify that optical sensor is connected and in place. Verify that motor gear has engaged cam gear. If everything is connected, try replacing in this order: 1. Wire Harness, Motor, Optical Sensor Assy 2. Controller
	Camshaft on tank 2 is turning more than five minutes to find Home position:	Verify that optical sensor is in place and connected to wire. Verify that camshaft is connected appropriately. Verify that no dirt or rubbish is clogging any of the cam slots. If motor continues to rotate indefinitely, replace the following components in this order: 1. Wire Harness, Motor, Optical Sensor Assy 2. Controller

System Troubleshooting

Problem	Possible Cause	Solution
Regenerant tank overflow.	a. Uncontrolled refill flow rate. b. Air Leak in regenerant line to air check. c. Drain control clogged with resin or other debris.	a. Remove refill flow control to clean ball and seat. b. Check all connections in regenerant line for leaks. c. Clean drain control.
Flowing or dripping water at drain or regenerant line after regeneration.	a. Valve stem return spring weak. b. Debris is preventing valve disc from closing.	a. Replace spring. (Contact dealer). b. Remove debris.
Hard water leakage after regeneration.	a. Improper regeneration. b. Leaking of external bypass valve. c. O-Ring around riser pipe damaged. d. System capacity too low due to incorrect resin volume setting	a. Repeat regeneration after making certain correct regenerant dosage was set. b. Replace bypass valve. (Contact dealer). c. Replace O-ring d. Reset control and program resin volume to correct setting
Control will not draw regenerant, or intermittent or irregular draw.	a. Low water pressure. b. Restricted drain line. c. Injector plugged. d. Injector defective. e. Valve disc B1 and/or B2 not fully open.	a. Make correct setting according to instructions, 25 psi dynamic pressure minimum. b. Remove restriction. c. Clean injector and screen. d. Replace injector and cap. (Contact dealer). e. Remove foreign matter from disc and check disc for closing by pushing in on stem. Replace if needed. (Contact dealer).
Control will not regenerate automatically.	a. AC adapter or motor not connected. b. Defective motor. c. Fouled or defective turbine. d. Defective turbine cable.	a. Connect power. b. Replace motor. (Contact dealer). c. Clean or replace turbine assembly. d. Replace turbine cable.
Control regenerates at wrong time of day.	a. Controller set incorrectly.	a. Correct the time setting according to instructions.
No conditioned water after regeneration.	a. No regenerant in regenerant tank. b. Injector plugged.	a. Add regenerant to regenerant tank. b. Clean injector and screen.
Backwashes or purges at excessively low or high rate.	a. Incorrect drain controller used. b. Foreign matter affecting valve operation.	a. Replace with correct size controller (Contact dealer). b. Remove drain controller and clean.
Run out of conditioned water between regenerations.	a. Improper regeneration. b. Incorrect resin volume setting	a. Repeat regeneration, b. Reset control and program resin volume to correct setting
Control displays 1 - x (1 thru 4)	a. Control is in test mode	a. Press control keys in order from left to right.

Magnum Valve Cartridge Troubleshooting

This procedure provides sequential troubleshooting steps to isolate a suspect cartridge. Figure 37 displays the locations of all cartridges.

Note: The Dynamic Pressure applied to the valve must be greater than 25 psi at all times when performing the following tests. If a cartridge needs to be removed, follow the cartridge removal procedure in the next section.

There are four symptoms that may require a cartridge to be removed and inspected or replaced.

1. A constant leak from the pilot drain in any cycle position. A small discharge of water from the pilot drain while transitioning from one cycle to the next is normal. A leak from the pilot drain could be caused by the following:
   a. Diaphragm failure in one of the valve cartridges. See Table 9 for troubleshooting faulty cartridges.
   b. Debris may prevent the flappers from closing.

Inspect discs and seats.

Table 9 Troubleshooting Faulty Cartridges

Quick cycle the Logix Magnum to each cycle indicated below. If the pilot drain leak stops in a particular cycle, remove the cartridge listed in the right column. Inspect for wear or damage.	
No Leak During	**Cartridge**
Service Cycle	#3 Outlet
Backwash	#1 Drain
Brine/Slow Rinse	#2 Rinse
Fast Rinse	#2 Rinse or #4 Inlet

2. A leak to the main 1.5-inch drain valve port.
   a. If the system is newly installed, ensure that the start-up procedure has been properly followed. Refer to the Service Manual or the start up sheet packed in the shipping carton of the Magnum valve.
   b. If the system has been operating correctly for a period of time and is now leaking, see Table 10.

Table 10 Magnum Valve Leak to Main Drain Troubleshooting

Regenerate the unit if the media bed is exhausted, then proceed to the following steps:
1. Test the water leaking from the 1.5-inch drain port of the Magnum valve. It if is treated, remove and inspect the #2 Rinse cartridge.
2. If the water leaking to the 1.5-inch drain port is untreated, remove and inspect the #1 Drain cartridge.

3. Leakage of untreated water to service.
   a. Leak at riser pipe seal or any other cause mentioned in Service Manual.
   b. Bypassing of untreated water by #4 Inlet cartridge, remove and inspect.

4. Leak between the main valve body and the cartridge assembly.
   a. Remove and replace the two small O-rings at the 5:30 and 6:30 positions of the cartridge. The part number for the O-ring set is P/N 1010116.

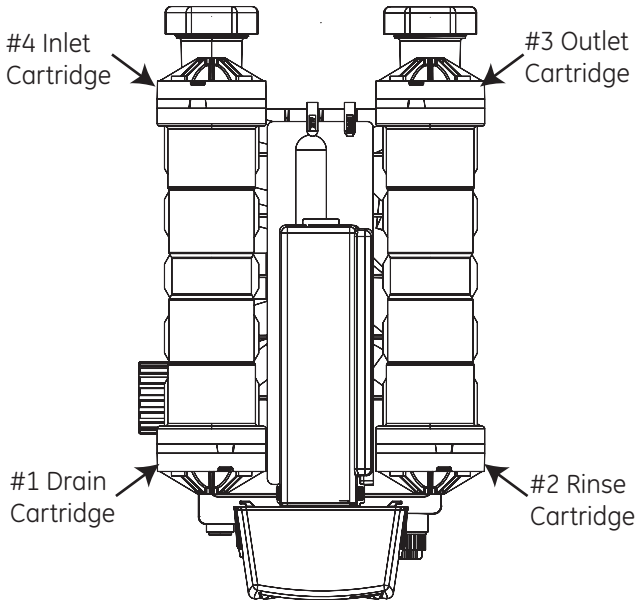


Figure 37 Logix Magnum Control

Note: Replacement cartridges are only available as complete assemblies:

Cartridge #1	Drain	P/N 1000366
Cartridge #2	Fast Rinse	P/N 1000365
Cartridge #3	Service	P/N 1000366 (No bypass)
Cartridge #3	Service	P/N 1000336 (Cap only for bypass)
Cartridge #4	Inlet	P/N 1000317

Magnum Valve Cartridge Removal Procedure

Removal of cartridges should be done only after reviewing all other possible causes of the problem(s) being addressed. There may be some difficulty removing cartridges in valves that have been in service for a period of time. Scale or iron build up around the O-ring seals may cause breakage in the cage assembly of the cartridge. If this occurs the cartridge must be replaced.

To remove the number 1 or number 2 cartridges the control must be removed first.

What follows is a step-by-step procedure for cartridge removal:

1. Remove the four bolts securing the cartridge.
2. There are two parts or sections in the “cap” of the cartridge assembly. The first part is the cover for the diaphragm. The second part is attached to the main cartridge assembly. This part is in contact with the body of the Magnum valve. When referring to inserting screwdrivers for cartridge removal it is the area between the Magnum valve body and the second part of the cartridge that is being referred to. See Figure 38.
3. A small flat blade screwdriver should be inserted as indicated in drawing. Pry a small opening between the Magnum valve body and the second part of the cartridge. This allows the insertion of two larger flat blade screwdrivers that are used to remove the cartridge.
4. Insert the two larger flat blade screwdrivers at the 10 o’clock and 2 o’clock positions on the cartridge. These should be inserted approximately 1/2 inch into the opening created by the small blade screwdriver. Use the two screwdrivers to slowly move the cartridge out of the valve body.
5. The cartridge should be removed for inspection. Look for damaged O-ring or debris on sealing surface ring of poppet.

There are two nipples, one on either side of the bottom center on the inside of the cartridge cap. They transfer water to and from the diaphragm. There are two O-rings associated with the nipples. The O-rings must be in place when the cartridge is re-installed into the valve body.

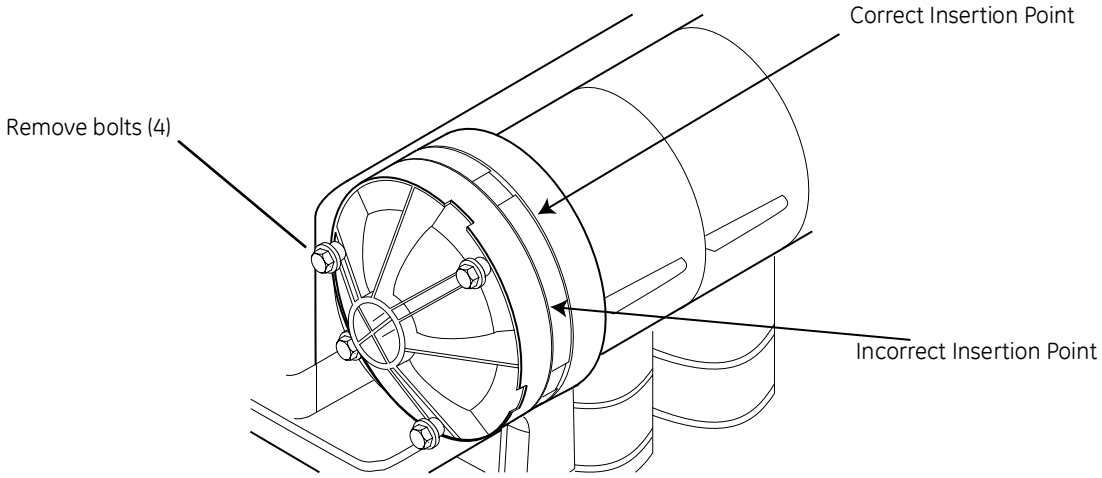
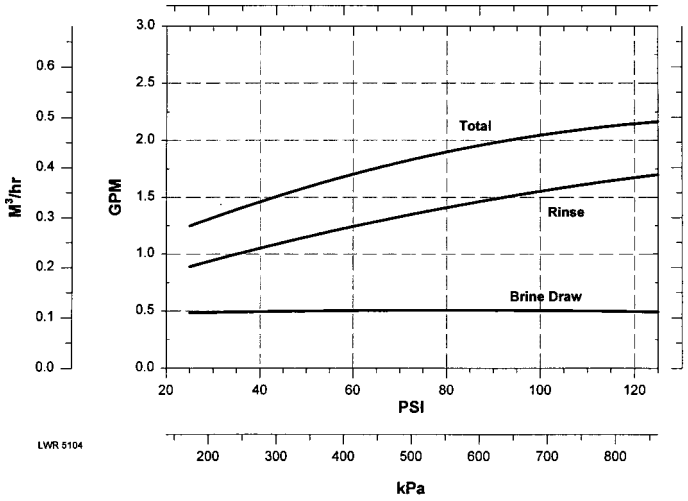


Figure 38

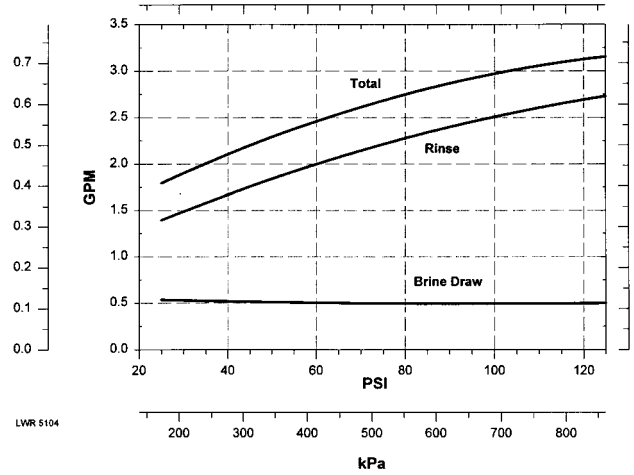
Performance Injectors

Injector Charts

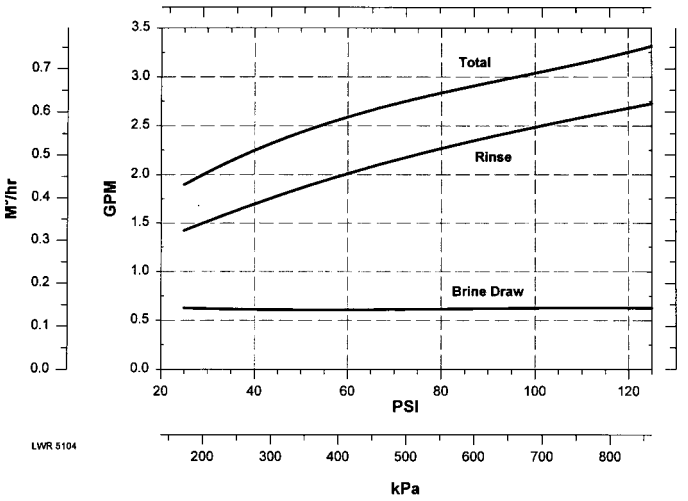
Injector # 1000441
Typical for 14-inch Tank*



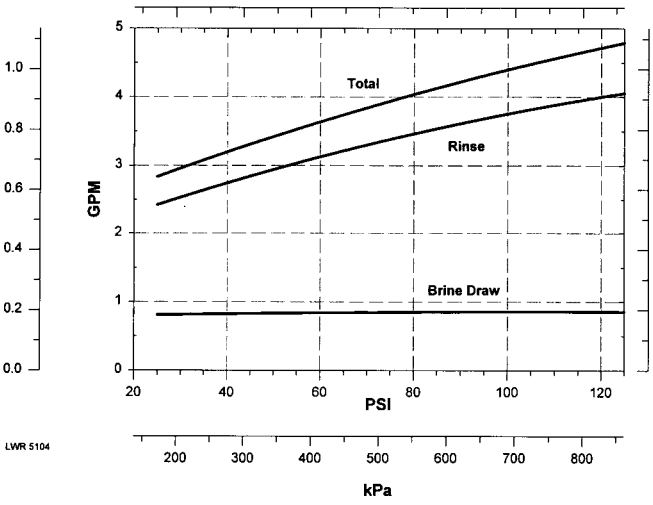
Injector # 1000442
Typical for 16-inch Tank*



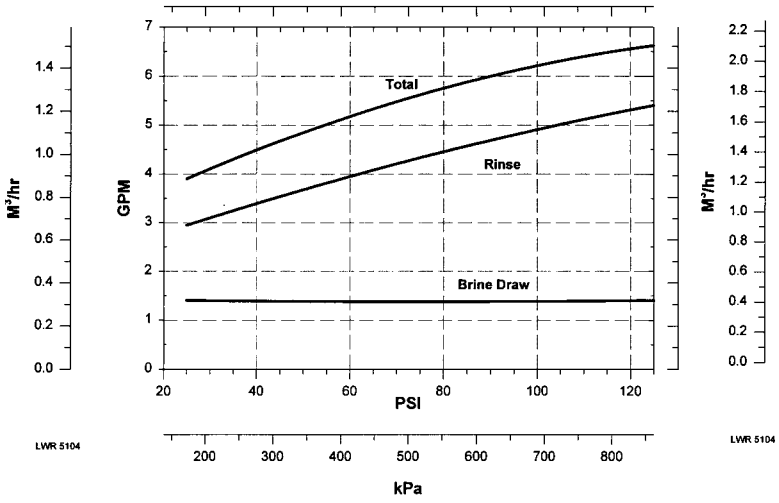
Injector # 1000443
Typical for 18-inch Tank*



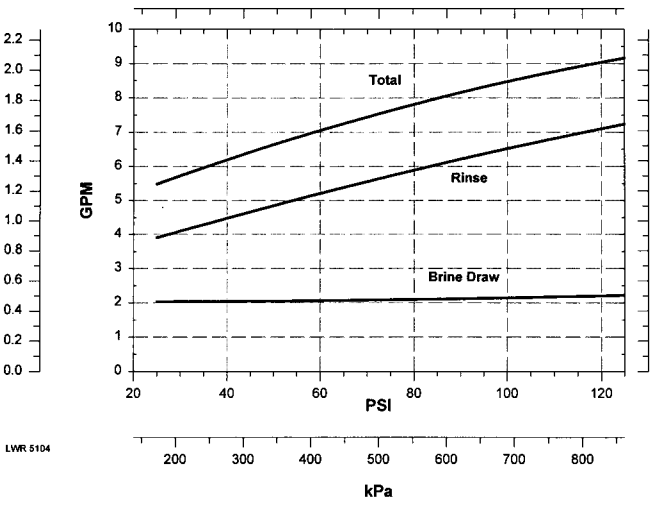
Injector # 1000444
Typical for 21-inch Tank*



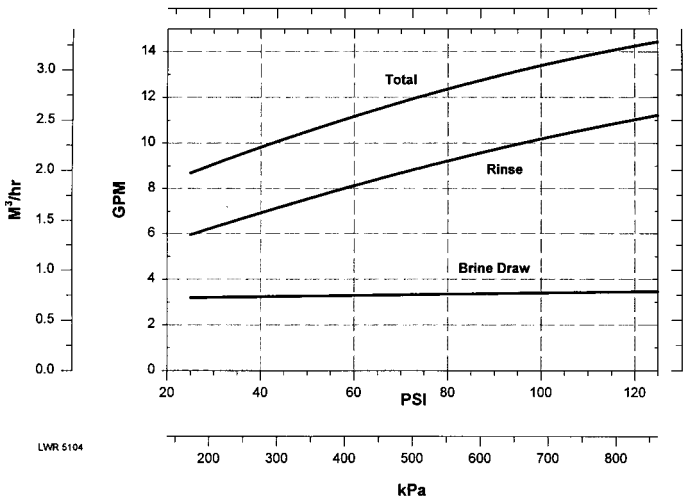
Injector # 1000445
Typical for 24-inch Tank*



Injector # 1000446
Typical for 30-inch Tank*



Injector # 1000447
Typical for 36-inch Tank*



*Brine draw and Rinse rates on empty tank.

Refill Control Identification

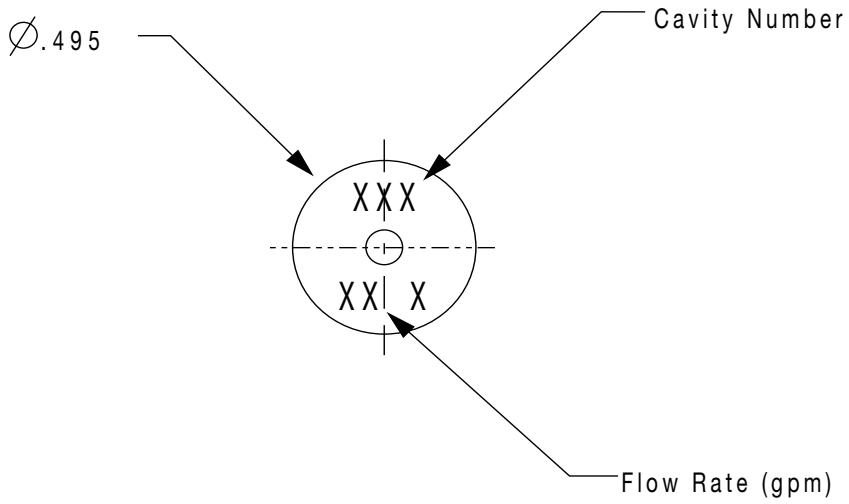


Table 11 Magnum Refill Control Chart (P/N Indicates 3-Pack)

Part Number	Tank Diameter In. (cm)	Flow Rate GPM (LPM)
1040679	14 (35.6)	0.7 (2.65)
1040680	16 (40.6)	0.8 (3.03)
1040681	18 (45.7)	1.0 (3.79)
1040682	21 (53.3)	1.4 (5.30)
1040683	24 (61.0)	2.0 (7.57)
1040684	30 (76.2)	3.0 (11.36)
1040685	36 (91.4)	5.0 (18.93)

NOTE: All flow rates are based on an inlet pressure of 60 psig (413 kPa). Actual rates vary with pressure, temperatures and other system variables.

Drain Line Flow Control

Table 12 Drain Line Flow Controls (5 gpm - 40 gpm)

Part Number	Flow Control Disk		Insert 1	Insert 2	Insert 3	Insert 4
	gpm	m^3/h				
1040720	5	1.135	Blue	Black	Black	Black
1040721	6	1.362	Red	Black	Black	Black
1040722	7	1.589	Brown	Black	Black	Black
1040723	8	1.816	Green	Black	Black	Black
1040724	9	2.043	White	Black	Black	Black
1040725	10	2.27	Blue	Blue	Black	Black
1040726	11	2.497	Red	Blue	Black	Black
1040727	12	2.724	Red	Red	Black	Black
1040728	13	2.951	Brown	Red	Black	Black
1040729	14	3.178	Brown	Brown	Black	Black
1040740	15	3.405	Blue	Blue	Blue	Black
1040741	16	3.632	Green	Green	Black	Black
1040742	17	3.859	White	Green	Black	Black
1040743	18	4.086	White	White	Black	Black
1040744	19	4.313	White	Orange	Black	Black
1040745	20	4.54	Blue	Blue	Blue	Blue
1040746	21	4.767	Brown	Brown	Brown	Black
1040747	22	4.994	Green	Green	Red	Black
1040748	23	5.221	Green	Green	Brown	Black
1040749	24	5.448	Red	Red	Red	Red
1040730	25	5.675	Green	Green	White	Black
1040731	26	5.902	White	White	Green	Black
1040732	27	6.129	White	White	White	Black
1040733	28	6.356	Brown	Brown	Brown	Brown
1040734	29	6.583	Brown	Brown	Brown	Green
1040735	30	6.81	Orange	Orange	Orange	Black
1040736	31	7.037	Green	Green	Green	Brown
1040737	32	7.264	Green	Green	Green	Green
1040738	33	7.491	Green	Green	Green	White
1040739	34	7.718	Green	Green	Green	Orange
1040750	35	7.945	White	Green	Green	Green
1040751	36	8.172	White	White	White	White
1040752	37	8.399	White	White	White	Orange
1040753	38	8.626	Orange	Orange	Orange	Green
1040754	39	8.853	Orange	Orange	Orange	White
1040755	40	9.08	Orange	Orange	Orange	Orange

NOTE: Drain Line Flow Controls above 40 gpm require external control installed in drain line.

Recommended Backwash Flow Rates for Various Media

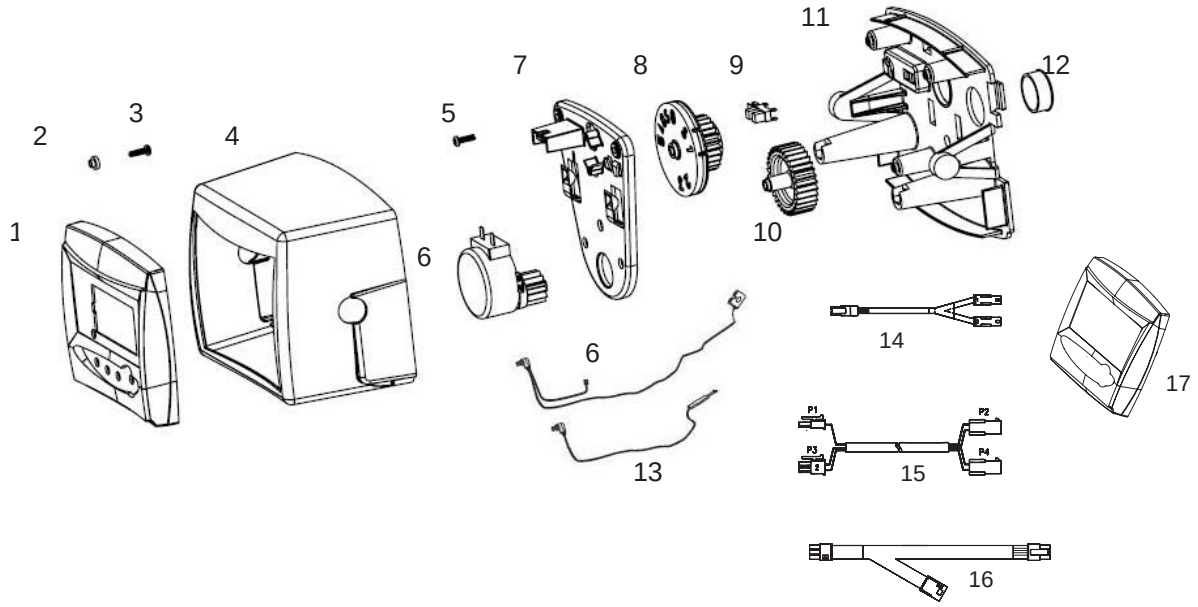
Table 13 Recommended Backwash Flow Rates for Various Media

Media	Tank Diameter						
	14 in (35.6 cm) Tank	**16 in (40.6 cm) Tank**	**18 in (45.7 cm) Tank**	**21 in (53.3 cm) Tank**	**24 in (61.0 cm) Tank**	**30 in (76.2 cm) Tank**	**36 in (91.4 cm) Tank**
	Drain Line Flow Control in GPM						
*Softening Resin (5.0 gpm/ft^2) (12.25 m/h/cm^2)	5	7	9	12	15	25	35
*Fine Mesh Softening Resin (2.8 gpm/ft^2) (6.86 m/h/cm^2)	3	4	5	7	9	14	20
Multi Layer (15 gpm/ft^2) (36.75 m/h/cm^2)	15	20	25	36	50	70	105
Birm, Greensand, Carbon (10 gpm/ft^2) (24.5 m/h/cm^2)	10	15	17	25	30	50	70

*50 ^{o}F (10^{o}C) water temperature, 50% bed expansion

Parts Lists

764 Logix Magnum Exploded View



Item No.	Qty.	Part Number - Kits	Part Number	Description
1	1		3022006	764 Series Logix Control - North American
2	2		1266224	Bushing, Logix Mount
3	2		1005981	Screw
4	1		1262674	Cover, Logix Magnum
5	2	1233809	1005981	Screw
6	1		1238861	Motor, Logix Cable Assembly
7	1		1262673	Gear Plate, Logix
8	1		1262581	Drive Gear, Logix
9	1		1235373	Optic Sensor
10	1		1262672	Idler Gear, Logix
11	1		1262580	Back Plate, Logix Magnum
12	1		1239647	Bushing, Cable
13	1		1266722	Meter Cable, 32 inches
14	1		3016715	Assembly, Sensor Cable Logix Twin
15	1		3016775	Assembly, Cable Extension 3 m (9.8 ft) Logix Twin
16	1		3020228	Kit, Assembly Cable Remote Start/Multi-Tank Lockout 3 m (9.8 ft)
17	1		1254886	Secondary Faceplate with out items 2 & 3
*			1000827	Outdoor Cover

* Not shown.

Replacement Components: Logix Magnum Conditioner/ Filters

Camshaft and Pilot Valve Assembly

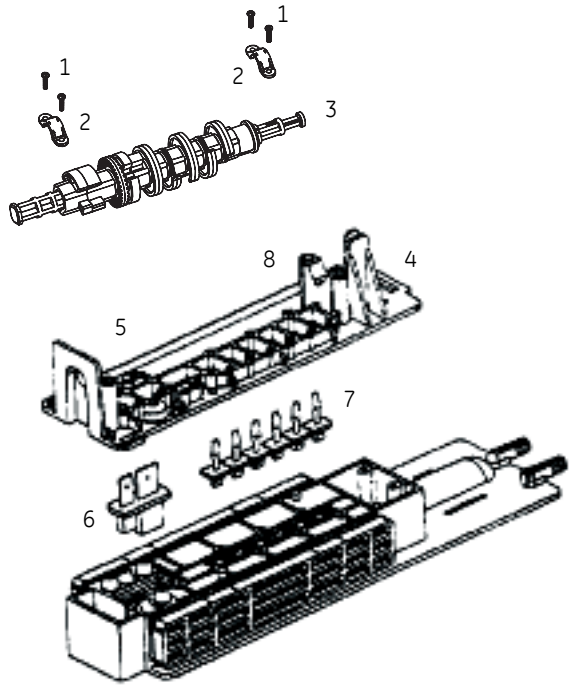
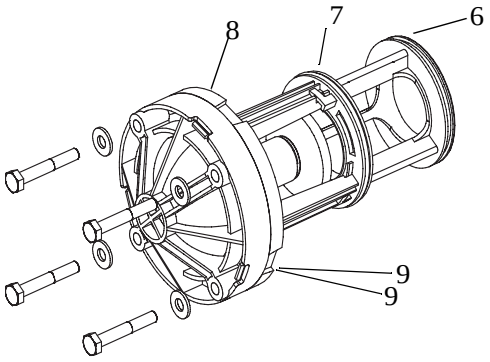


Table 14 Assembly Parts

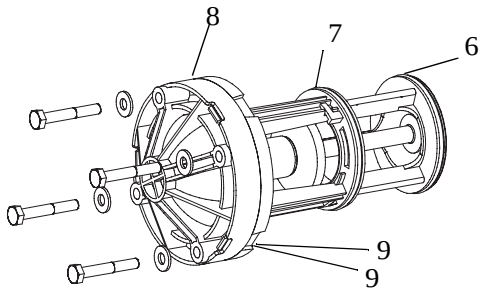
Item Number	Part Number	Description
1	1005953	Screw, Pillow Block
2	1000589	Pillow Block
3*	1001751 1267726	Logix Multi Tank Camshaft, “A”, “P”, or “L” Types Logix Single Tank Magnum Camshaft, “L” Types
4	1000339	Top Plate
5	1234170	Screw Short, Top Plate
6	1000391	Brine Valve Disc
7	1000328	Pilot Valve Disc
8	1005953	Screw Long, Top Plate

* Single tank camshaft allows the unit to go into Service during Refill.

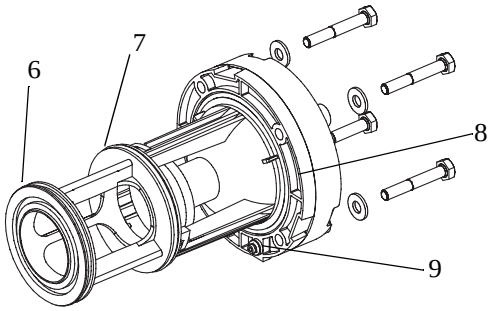
Magnum Valve Cartridges



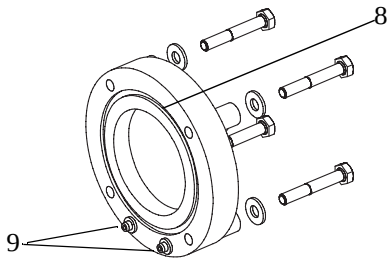
1 - Drain Valve Cartridge



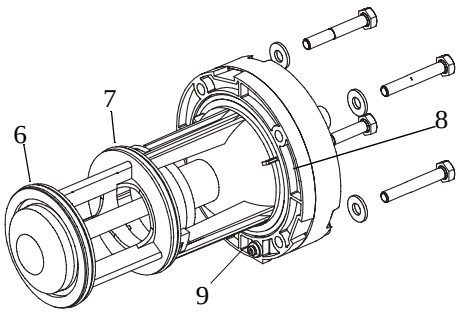
2 - Rinse Valve Cartridge



3 - No Hard Water Bypass Valve Cartridge



4 - Hard Water Bypass Cap

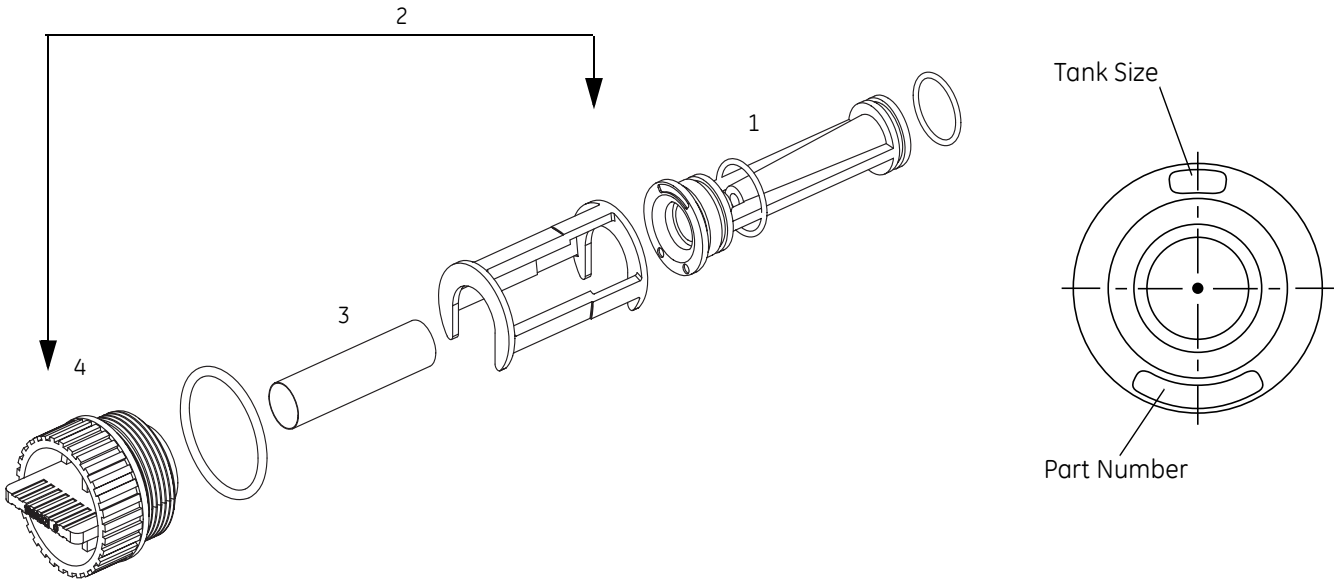


5 - Inlet Valve Cartridge

Item	Part Number	Description
1	1000366	Drain Valve Cartridge, Single Seat - Spring Assisted
2	1000365	Rinse Valve Cartridge, Double Seat - Spring Assisted
3	1000366	No Hardwater Bypass Valve Cartridge, Single Seat - Spring Assisted
4	1000336	Hardwater Bypass Cap
5	1000317	Inlet Valve Cartridge, Double Seat - No Spring Assist
6	1010157	O-Ring
7	1010158	O-Ring
8	1231646	O-Ring
9	1010116	O-Ring (qty. 2 per Cartridge)

NOTE: Items 1 and 3 are identical valve cartridges.

Injector Assembly

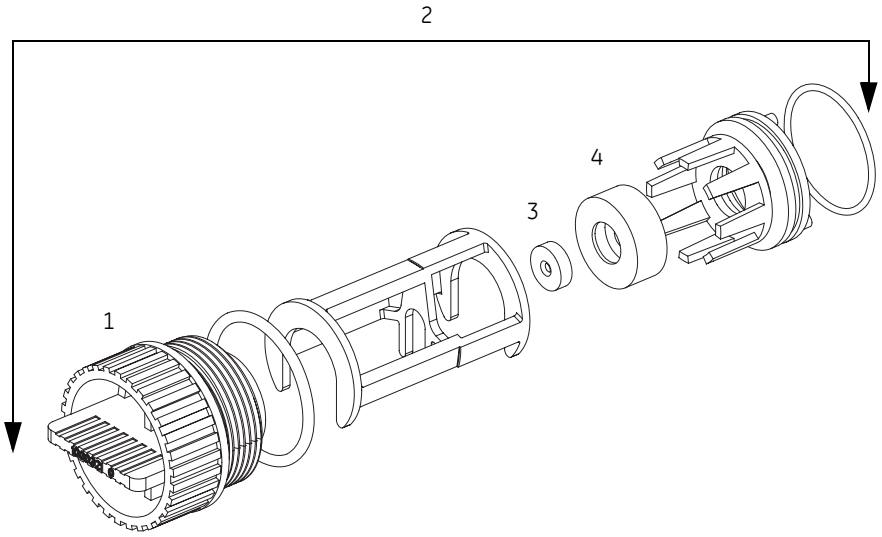


Item	Part Number	Description
1	1040670	Injector for 14-inch (35.6 cm) Tank - 0.5 GPM (1.9 LPM) (includes O-rings)
	1040671	Injector for 16-inch (40.6 cm) Tank - 0.5 GPM (1.9 LPM) (includes O-rings)
	1040672	Injector for 18-inch (45.7 cm) Tank - 0.6 GPM (2.27 LPM) (includes O-rings)
	1040673	Injector for 21-inch (53.3 cm) Tank - 0.9 GPM (3.41 LPM) (includes O-rings)
	1040674	Injector for 24-inch (61.0 cm) Tank - 1.4 GPM (5.3 LPM) (includes O-rings)
	1040675	Injector for 30-inch (76.2 cm) Tank - 2.0 GPM (7.57 LPM) (includes O-rings)
	1040676	Injector for 36-inch (91.4 cm) Tank - 3.3 GPM (12.5 LPM) (includes O-rings)
	1040669*	Injector, Blank (includes O-rings)
2	1040677	Injector Assembly (Less Injector)
3	1040678	Injector Screen (3 pack)
4	1040688	Cap (including O-rings)

NOTE: All flow rates are based on an inlet pressure of 60 psig (413 kPa). Actual rates vary with pressure, temperatures and other system variables.

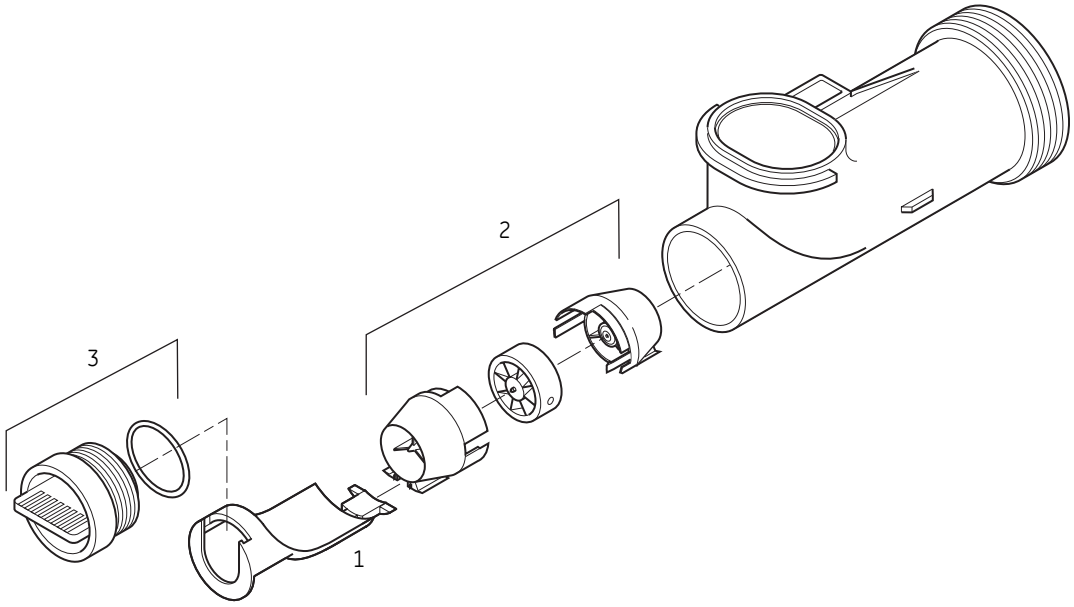
*Filter applications only.

Refill Flow Control Assembly



Item	Part Number	Description
1	1040688	Cap (includes O-ring)
2	1040687	Refill Assembly (Less Refill Flow Control)
3	1040679	Refill Flow Control for 14-inch (35.6 cm) Tank - 0.7 GPM (2.6 LPM) (3 pack)
	1040680	Refill Flow Control for 16-inch (40.6 cm) Tank - 0.8 GPM (3.0 LPM) (3 pack)
	1040681	Refill Flow Control for 18-inch (45.7 cm) Tank - 1.0 GPM (3.8 LPM) (3 pack)
	1040682	Refill Flow Control for 21-inch (53.3 cm) Tank - 1.4 GPM (5.3 LPM) (3 pack)
	1040683	Refill Flow Control for 24-inch (61.0 cm) Tank - 2.0 GPM (7.6 LPM) (3 pack)
	1040684	Refill Flow Control for 30-inch (76.2 cm) Tank - 3.0 GPM (11.4 LPM) (3 pack)
	1040685	Refill Flow Control for 36-inch (91.4 cm) Tank - 5.0 GPM (19.0 LPM) (3 pack)
4	1040686	Refill Flow Control Cage (3 pack)

Magnum IT Flow Sensor Assembly



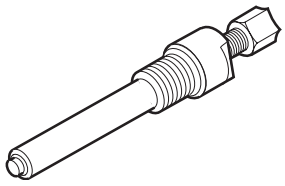
Item	Part Number	Description
1	1000074	Insert, Corner 2-inch
2	1232965	Assembly, Turbine 2-inch Elbow
3	1000318	Assembly, Cap

Installation Adapter Kits

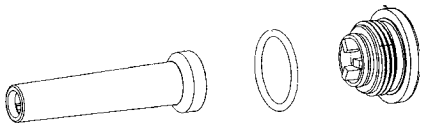
Adapters-Magnum IT

Item	Part Number	Description
Not Shown	3023849	Magnum IT Adapter Kit - Stainless Steel NPT for inlet, outlet, drain
Not Shown	3023674	Magnum IT Adapter Kit - Stainless Steel BSP for inlet, outlet, drain
Not Shown	1040784	Magnum IT Adapter Kit - CPVC for inlet, outlet, drain
Not Shown	3023860	2-inch NPT Stainless Steel Adapter with Zinc Diecast Nut (24 Pack)
Not Shown	3023829	2-inch BSP Stainless Steel Adapter with Zinc Diecast Nut (24 Pack)
Not Shown	1040788	2-inch CPVC Adapter with Zinc Diecast Nut (24 Pack)
Not Shown	1030664	2-inch Cast Zinc Diecast Nut
Not Shown	3014558	2-inch Stainless Steel NPT Adapter
Not Shown	3023879	2-inch Stainless Steel NPT Adapter with Drilled and Tapped 1/4-inch NPT Port
Not Shown	3014559	2-inch Stainless Steel BSP Adapter
Not Shown	3023848	2-inch Stainless Steel BSP Adapter with Drilled and Tapped 1/4-inch BSP Port
Not Shown	1030666	2-inch CPVC Adapter
Not Shown	1030667	63-mm Metric PVC Adapter
Not Shown	1010160	1.5-inch Adapter O-Ring
Not Shown	1010165	2.0-inch Adapter O-Ring
Not Shown	3024790	Stainless Steel Tank Adapter - 4-inch - 8UN Threads
Not Shown	3024788	Stainless Steel Flange
Not Shown	3023732	1-1/2-inch NPT Adapter Kit, includes inlet, outlet, and drain
Not Shown	3023736	1-1/2-inch BSP Adapter Kit, includes inlet, outlet, and drain

Miscellaneous Kits and Assemblies



External Pilot Feed Adapter



Pilot Filter Screen Assembly

Internal Pilot System Check Valve

Part Number	Description
1000226	Pilot Screen Assembly (includes Pilot Screen, Pilot Screen Cap and O-ring)
1040691	Valve O-ring Kit (tank adapter O-ring, (3) O-rings for 1-1/2-inch inlet, outlet, drain and distributor O-ring)
1040692	Pilot Flapper Kit (pilot, brine and springs)
1040668	External Pilot Feed Adapter (separate source pilot water)
3025780	Internal Pilot System Check Valve
1000878	Outdoor Cover
1009115	Top Stacking Distributor
1005953	Top Plate Screws (15 req'd)
1006093	Top Plate Screws (5 req'd)
1010162	Tank Adapter O-ring
1010160	Riser Tube O-ring
3025780	Internal Pilot System Check Valve

P/N 3020015 Rev. B NO08

COMMERCIAL
CONTROL
VALVES

Magnum® Control Valve

Pentair
Water

COMMERCIAL CONTROL VALVES

Magnum® Control Valve

Controller Options

The Pentair Water® Magnum Control Valve is one of the most versatile valves on the market.

Logix™ Series

- All-electronic control platform
- 24-hour super-capacitor backup – no battery necessary
- Remote mount kit allows programming module to be installed up to 40 feet away
- Universal controller – works on all Autotrol® brand valves
- Automatic capacity calculations – no math or salt tables necessary
- 12-volt operation

The Logix series offers the ultimate in control for the Magnum® valve. Simple 3-step programming and installation makes this electronic controller the industry leader.

742 Time Clock

- Simple, economic electronic time clock (chronometric)
- 7- or 99-day regeneration settings
- Filter or conditioner setting in one control
- Fully programmable cycle times
- Salt setting in 1-pound increments (lbs/cu ft)
- Single controller operates Autotrol 255, 263, 268, 278 models, and Pentair Water Magnum and Magnum IT with one controller

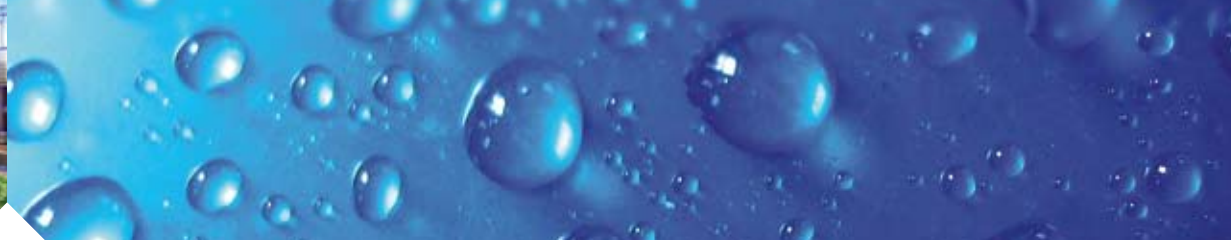
762 Demand

- Simple, economic electronic demand (volumetric)
- Calendar override – 99 day
- 28-day variable reserve
- Filter or conditioner setting in one controller
- Automatic capacity calculations
- Fully programmable cycle times
- Salt setting in 1-pound increments (lbs/cu ft)
- Operates 255, 263, 268, 278, and Magnum IT with one controller

764 Demand

Same features as the 762, plus:

- Multi-tank applications (twin alternating, multi-tank parallel)
- Control lockout
- Remote regeneration



Specifications

Electrical Specifications

Controller Operating Voltage	12 Volt – AC (Requires a transformer supplied by GE)
Input Supply Frequency	50 or 60 Hz (Controller configuration dependent)
Motor Input Voltage	12 Volt – AC
Control System Power Consumption	3 Watts average

Transformer Specifications – All Controllers

All Controllers require the use of a Pentair Water supplied transformer.

Transformer Output Voltage	12 Volt – AC 400mA
Transformer Input Options	115 Volt – AC 50/60 Hz; 230 Volt – AC 50/60 Hz; 100 Volt – AC 50/60 Hz
Transformer Plug Options	Indoor North American Plug Outdoor North American (UL Listed for outdoor use) Japanese Plug Taiwan/Korea Plug Australian Plug United Kingdom Plug Mainland Europe Plug

Additional transformers may be available – call for more information.

Flow Rates (Valve Only)

Service @ 15 psi (1.03 bar) drop	76 gpm (17.3 m^3/hr)
Backwash @ 25 psi (1.72 bar) drop	89 gpm (20.2 m^3/hr)
Service	Cv = 19.5 (Kv = 17)
Backwash	Cv = 17.8 (Kv = 19.9)

Valve Connections/Dimensions

Tank Thread	4-inch 8 UN
Inlet/Outlet	2-inch: connections NPT or BSPT, Female, CPVC
Brine Line	3/4-inch NPT
Drain Line*	1-1/2-inch: connections for NPT or BSPT, Female, CPVC
Riser Tube Diameter	1-1/2-inch
Riser Installation	Above top of tank 5/8-inch (±1/8-inch)
Pilot Drain and Auxiliary Hydraulic Output	1/4-inch tube fitting

*Valve installed drain flow controls available (5 – 40 gpm). If higher backwash flow is needed, an external flow control will be required.

Design Specifications/Ratings

Valve Body	Thermoplastic
O-rings	EPDM
Injector	7 sizes available: 14, 16, 18, 21, 24, 30, 36
Working Pressure	25 psi – 100 psi (1.72 bar – 6.9 bar)
Water Temperature	35° – 100°F (2° – 38°C), 120°F (49°C) Ambient

Options

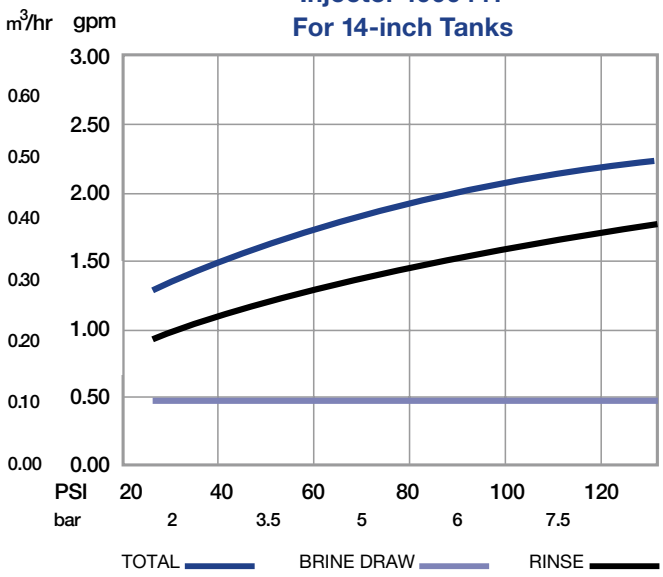
Top Mount or Side Mount Configuration

Pentair Water

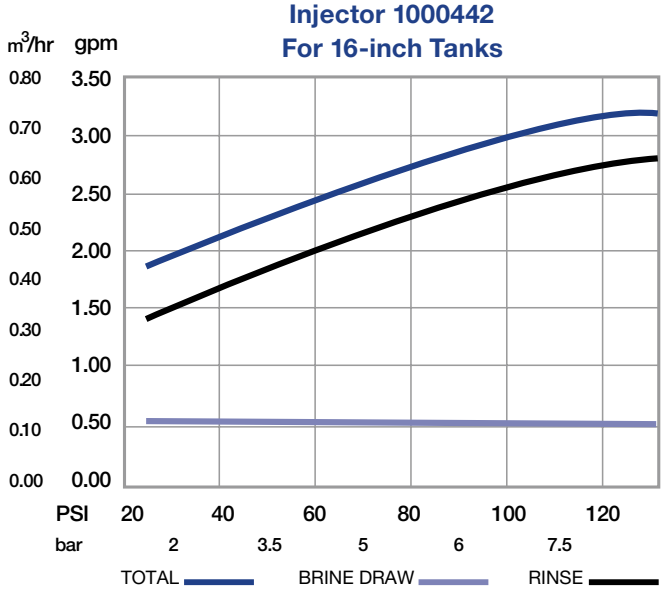
Magnum® Control Valve

Injector Performance – Magnum

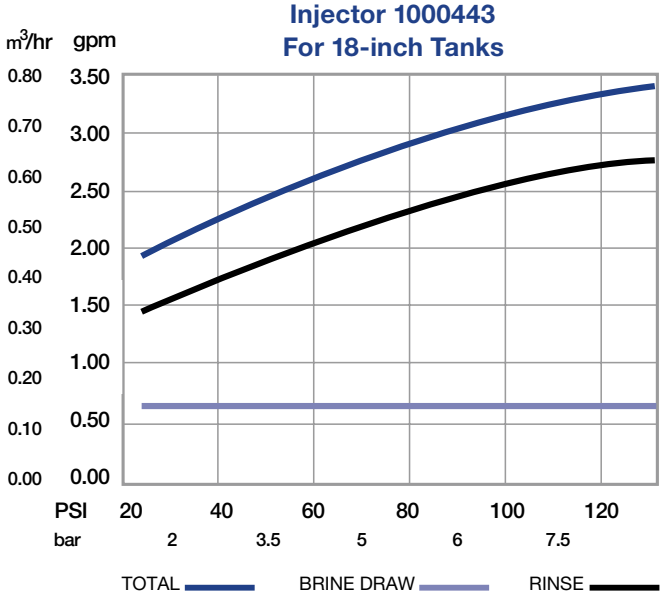
Injector 1000441
For 14-inch Tanks



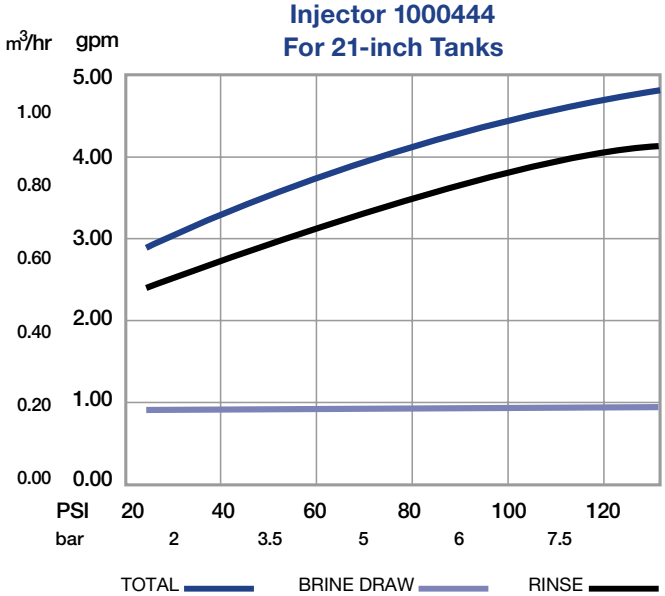
Injector 1000442
For 16-inch Tanks

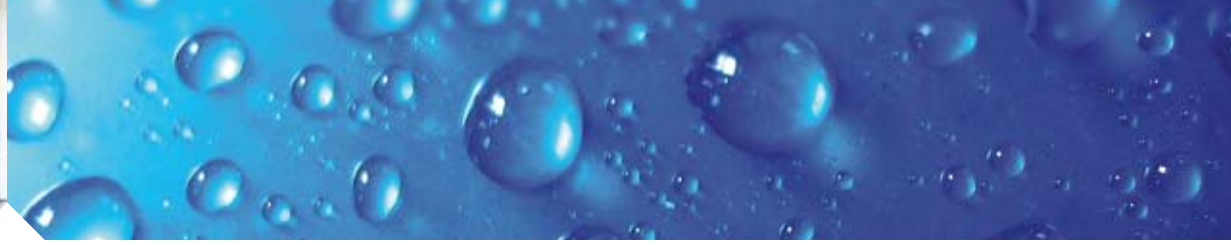


Injector 1000443
For 18-inch Tanks

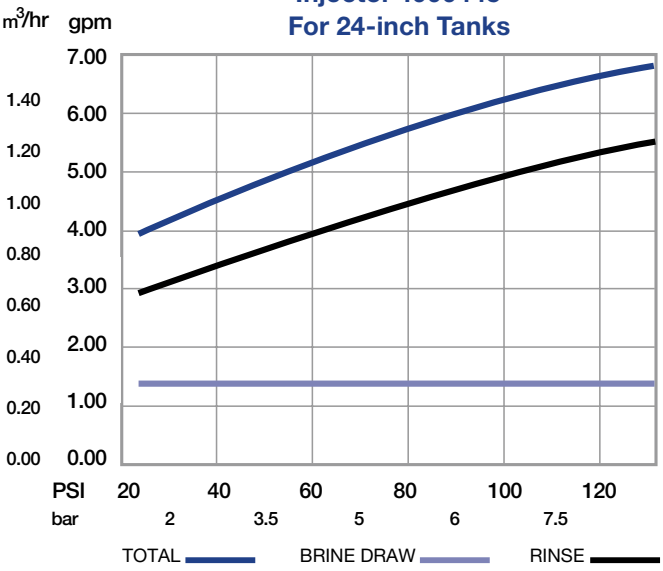


Injector 1000444
For 21-inch Tanks

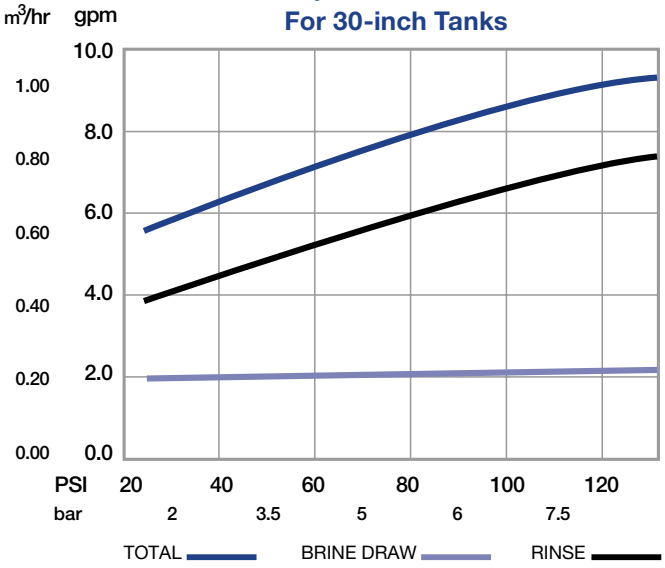




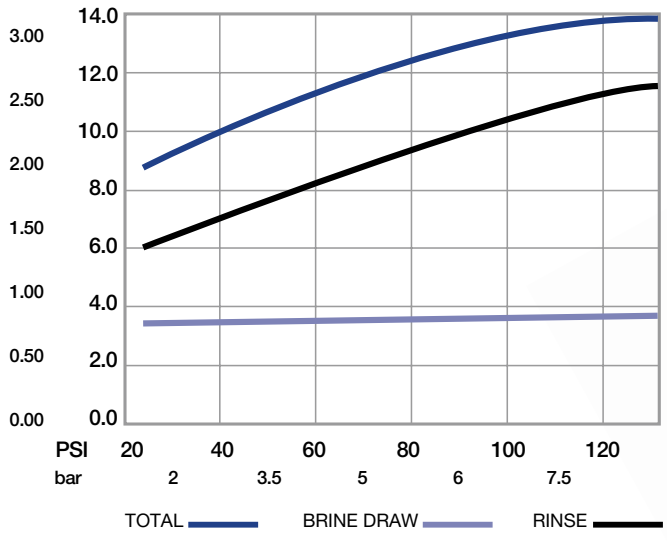
Injector 1000445
For 24-inch Tanks



Injector 1000446
For 30-inch Tanks



Injector 1000447
For 36-inch Tanks



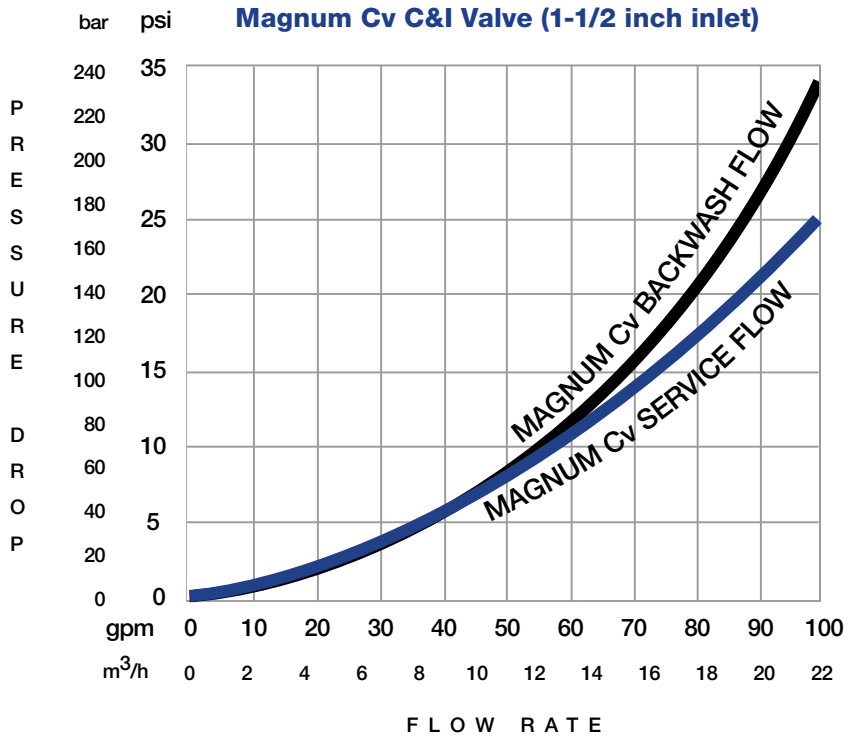
NOTE: Brine draw and rinse rates on empty tank.

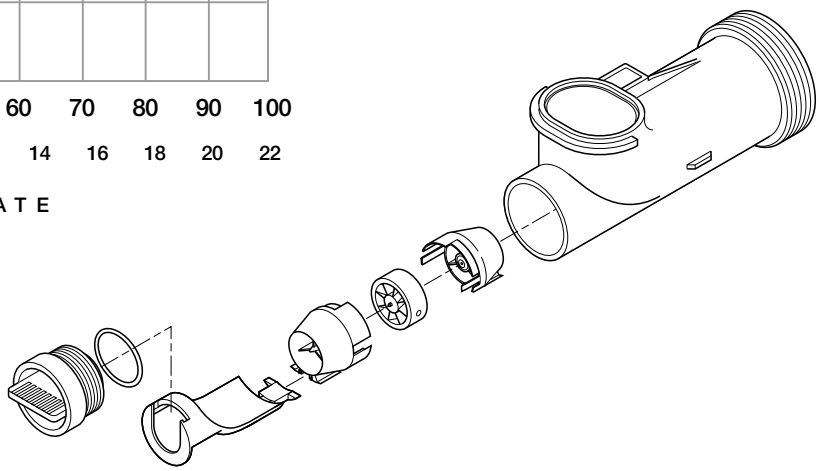
Pentair Water

COMMERCIAL CONTROL VALVES

Magnum® Control Valve

Valve Flow Rate Characteristics





Flow Sensor Options

Internal Turbine Unit

Normal Operating Range	2 - 80 gpm (0.45 - 18.1 m³/hr)
Peak Operating Range	1 - 100 gpm (0.22 - 22.7 m³/hr)
Normal Accuracy Range	±3%

External Flow Meter – 2.0 Inch

Normal Operating Range*	5.0 - 225 gpm (0.50 - 51.0 m³/hr)
Normal Accuracy Range	±3%
Connections	2-inch: connections NPT or BSPT, Female, CPVC

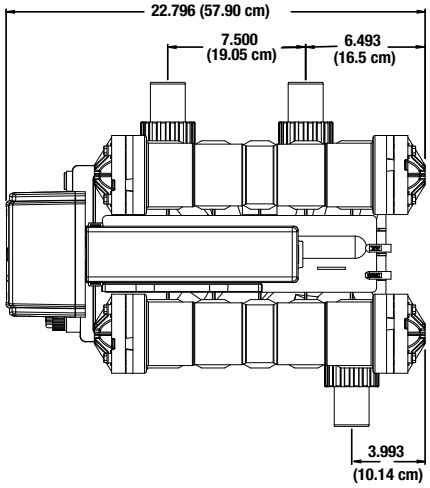
*Recommended maximum continuous duty flow rate of 2-inch turbine is 70% of maximum flow rate.

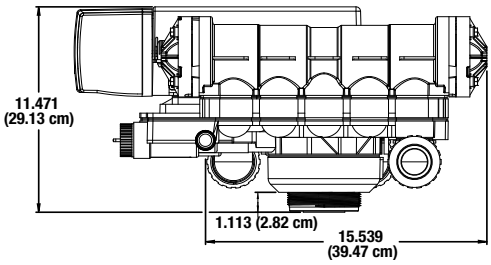
Tank Adapter Options

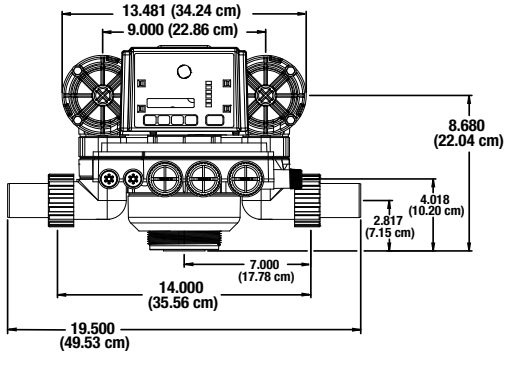
Threaded Stainless Steel	4-inch 8 UN
Flanged Stainless Steel	6-inch

Magnum Valve Outline Dimensions

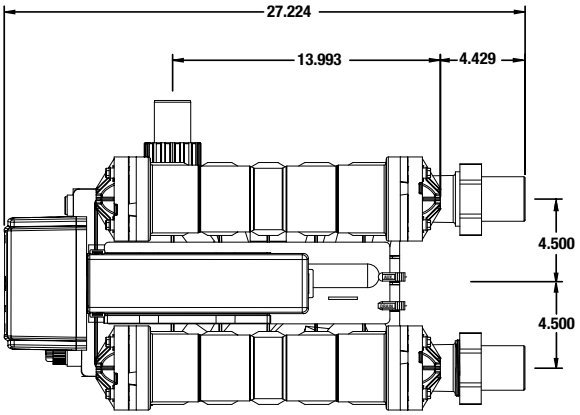
1-1/2-inch Magnum Cv

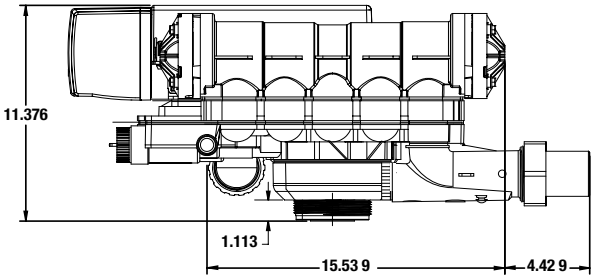


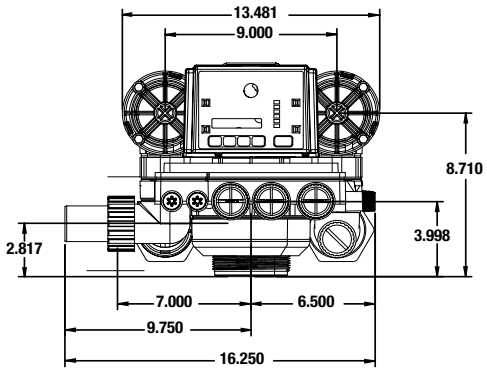




2-inch Magnum IT







Pentair Water

Pentair Water

20580 Enterprise Avenue
Brookfield, WI 53045
Tel: 262.784.4490
Fax: 262.784.7794

5730 North Glen Park Road
Milwaukee, WI 53209
Tel: 262.238.4400
Fax: 262.238.4402

Customer Care: 800.279.9404 www.pentairwatertreatment.com

1017972 Rev F FE10

Logix 764

Operation Manual

Models: 293/298 Magnum IT
Twin Alternating
Twin Parallel
Single with Remote Regeneration Start
Multi-Single Tank with Lockout

Table of Contents

Safety Information

This water conditioner's control valve conforms to UL/CE Standards. Generic valves were tested and certified for compliance as verified by the agency listing.

- Please review the entire Installation and Operation Manual before installing the water conditioning system.
- As with all plumbing projects, it is recommended that a trained professional water treatment dealer install the water conditioning system. Please follow all local plumbing codes for installing this water conditioning system.
- This system will not make microbiologically unsafe water safe. Water that is unsafe must be treated separately from this conditioner.
- This water conditioning system is to be used only for potable water.
- Inspect the water conditioning system for carrier shortage or shipping damage before beginning installation.
- Use only lead-free solder and flux, as required by federal and state plumbing codes, when installing soldered copper plumbing.
- Use caution when installing soldered metal piping near the water conditioning system. Heat can adversely affect the plastic control valve and bypass valve.
- All plastic connections should be hand tightened. Teflon[1] tape may be used on connections that do not use an O-ring seal. Do not use pipe dope type sealants on the valve body. **Do not use pliers or pipe wrenches**.
- Do not use petroleum-based lubricants such as Vaseline, oils or hydrocarbon-based lubricants. Use only 100% silicone lubricants.
- Use only the AC adapter supplied with this water conditioning system.
- All electrical connections must be completed according to local codes.
- The power outlet must be grounded
- Install an appropriate grounding strap across the inlet and outlet piping of the water conditioning system to ensure that a proper ground is maintained.
- To disconnect power, unplug the AC adapter from its power source.
- Observe drain line requirements.
- Do not support the weight of the system on the control valve fittings, plumbing, or the bypass.
- Do not allow this water conditioning system to freeze. Damage from freezing will void this water conditioning system's warranty.
- Operating ambient temperature: 34° to 120°F (1° to 49°C).
- Operating water temperature: 34° to 100°F (1° to 38°C).
- Operating water pressure range : 25 to 100 psi (1.72 to 6.89 bar). In Canada the acceptable operating water pressure range is 25 to 100 psi (1.72 to 6.89 bar).
- Observe all warnings that appear in this manual.
- Keep the media tank in the upright position. Do not turn upside down or drop. Turning the tank upside down or laying the tank on its side can cause media to enter the valve.
- Use only regenerants designed for water conditioning. Do not use ice melting salt, block salt or rock salt.

1. Teflon is a trademark of E. I. duPont de Nemours.

Installation Profile Summary

Installation Date: _____

Installation Location: _____

Installer(s): _____

Phone Number: _____

Valve Number: _____

Application Type: (Softener) (Filter) (Dealkalizer)

Water Source:

(Public Well) (Private Well)

(Surface Supply)

(Other)

Water Test Results:

Hardness:_____ Iron:_____

Other:_____

Misc:

Capacity: _____ Flow Rates: ___min. _____max.

Tank Size: Diameter_____ Height: _____

Resin or Media Volume:_____

Resin or Media Type:_____

Brine Tank Volume: _____

Salt Setting per Regeneration:_____

Control Valve Configuration:

Valve Type:_____

(Hard Water Bypass) (No Hard Water Bypass)

Refill Control: _____ gpm

Injector Control: _____ gpm

Backwash Control:_____ gpm

Electronic Demand Settings

P1 Time of day _____

P2 Day of week _____

P3 Time of regeneration _____

P4 Number of days between regeneration (99 day calendar override) _____

P6 Amount of regenerant used or filter backwash time (salt setting) _____

P7 System capacity _____

P8 Hardness (not used on Filters) _____

P9 Units of measure _____

P10 Clock mode _____

P11 Service interval _____

P12 Remote regeneration switch delay _____

P14 Refill rate (conditioner only) _____

P15 Draw rate (conditioner only) _____

P16 Reserve type (not used for alternating mode) _____

P17 Initial average or fixed reserve (not used for alternating mode) _____

P18 Flow sensor select _____

P19 K-factor or pulse equivalent _____

Pr Refill First Option (not used for alternating mode) _____

Pd Remote Switch Operation _____

How To Use This Manual

This installation manual is designed to guide the installer through the process of installing and starting water conditioning systems featuring the Logix 764 controller.

This manual is a reference and will not include every system installation situation. The person installing this equipment should have:

- Training in the 764 series control and the 298/293 valve.
- Knowledge of water conditioning and how to determine proper control settings.
- Adequate plumbing skills.

Icons That Appear In This Manual

WARNING: Failure to follow this instruction can result in personal injury or damage to the equipment.

Note: Helpful hint to simplify procedure.

The Logix 764 control can be installed on several type valves that can have twin alternating,parallel or single tank configuration. The section on Logix 764 start-up provides a simple explanation of the valve types that are pre-programmed in the 764 control.

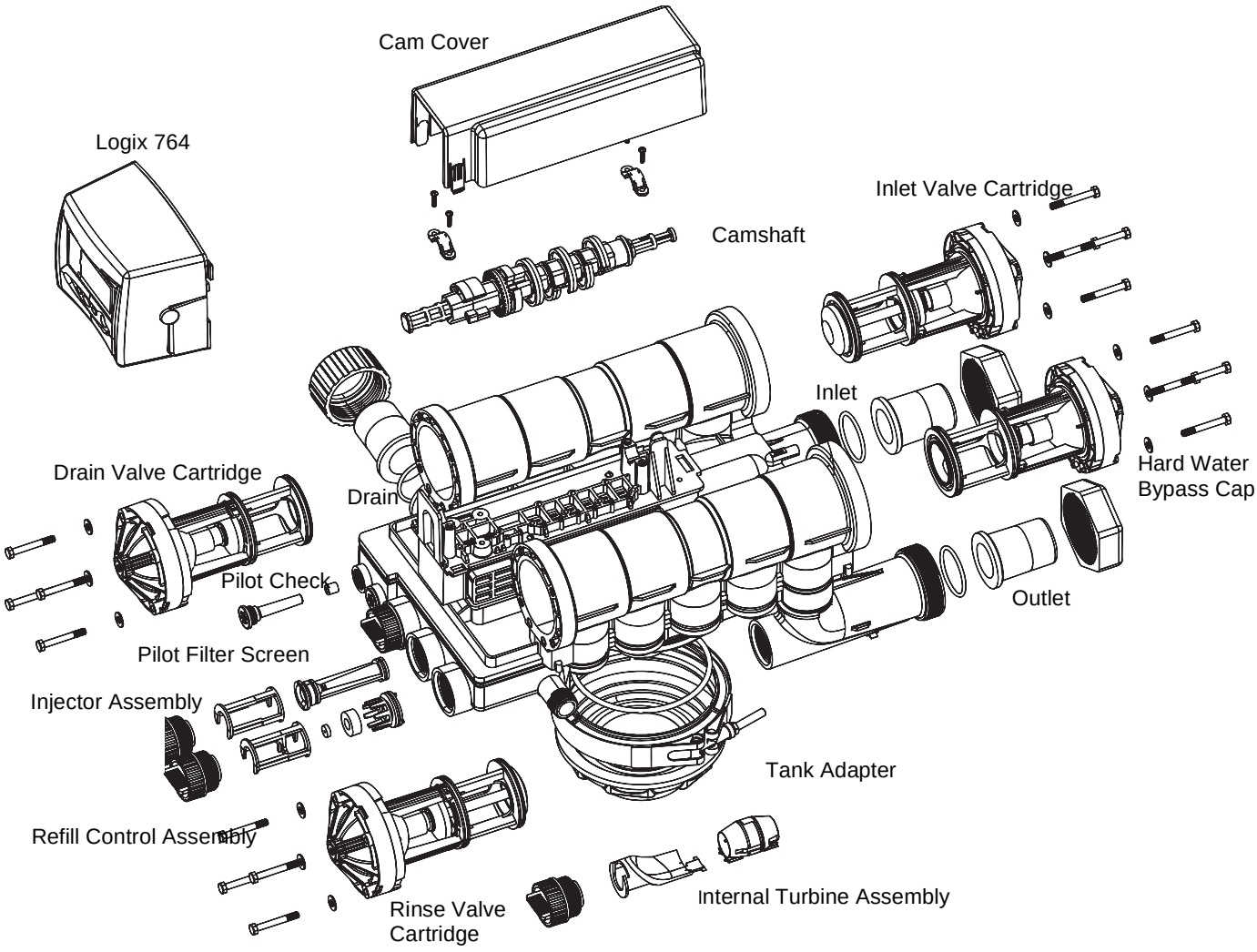


Figure 1 293/298 Valve Layout

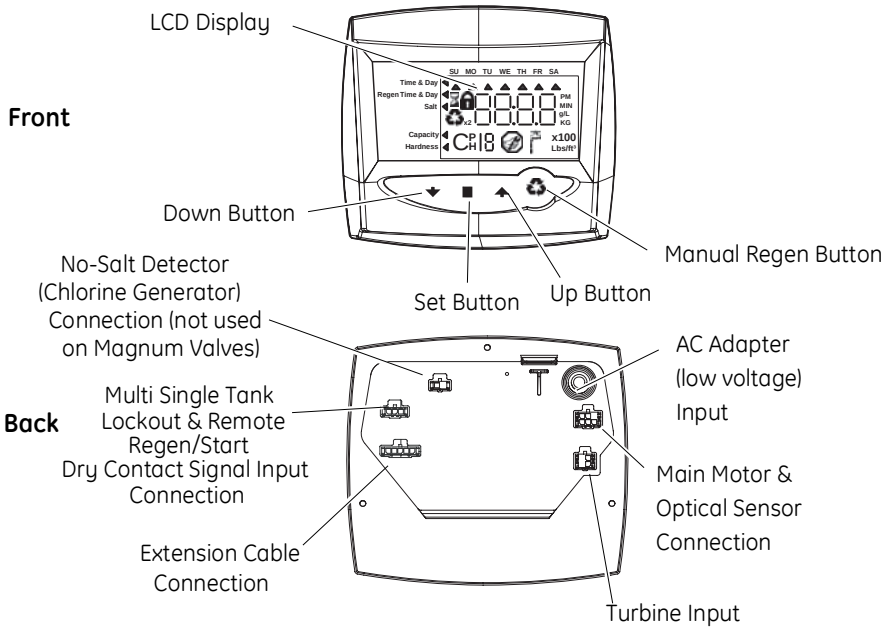


Figure 2 764 Controller Identification

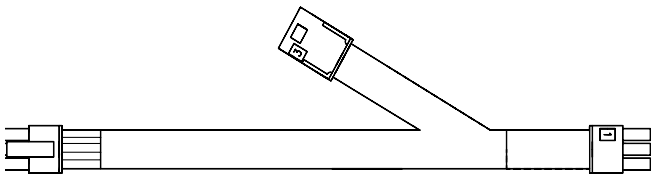


Figure 3 Remote Start/Multi-Tank Lockout Cable

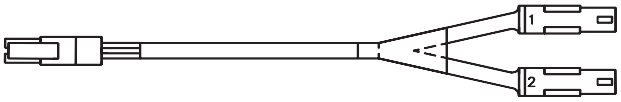


Figure 4 Twin Sensor Cable

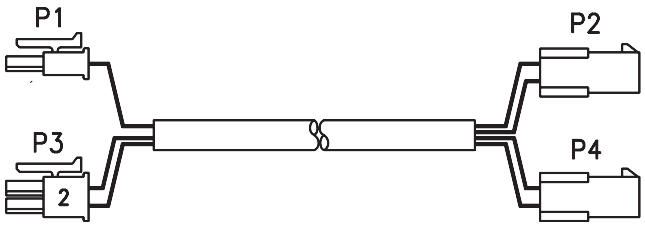


Figure 5 Twin Cable Extension

Location Selection

Location of a water conditioning system is important. The following conditions are required:

- Level platform or floor.
- Room to access equipment for maintenance and adding regenerant (salt) to tank.
- Ambient temperatures over 34^{o}F (1^{o}C) and below 120^{o}F (49^{o}C).
- Water pressure below 100 psi (6.89 bar) and above 25 psi (1.7 bar).
- In Canada the water pressure must be below 100 psi (6.89 bar).
- Constant electrical supply to operate the controller.
- Total minimum pipe run to water heater of ten feet (three meters) to prevent backup of hot water into system.
- Local drain for discharge as close as possible.
- Water line connections with shutoff or bypass valves.
- Must meet any local and state codes for site of installation.
- Valve is designed for minor plumbing misalignments. Do not support weight of system on the plumbing.
- Be sure all soldered pipes are fully cooled before attaching plastic valve to the plumbing.

Outdoor Locations

When the water conditioning system is installed outdoors, several items must be considered.

- Moisture – The valve and control are designed for use in NEMA 3 locations. Falling water should not affect performance. The system is not designed to withstand extreme humidity or water spray from below. Examples are: constant heavy mist, near corrosive environment, or upwards spray from sprinkler.

Caution: This unit is for dry location use only unless used with a listed Class 2 power supply suitable for outdoor use.

- Direct Sunlight – The materials used will fade or discolor over time in direct sunlight. The integrity of the materials will not degrade to cause system failures.
- Temperature – Extreme hot or cold temperatures will cause damage to the valve or control. Freezing temperatures will freeze the water in the valve. This will cause physical damage to the internal parts as well as the plumbing and conditioning resin. High temperatures will affect the control. The display may become unreadable but the control should continue to function. When the temperature returns to normal operating limits the display will re-appear. A protective cover should assist with high temperature applications.
- Insects – The control and valve have been designed to keep all but the smallest insects out of the critical areas. Any holes in the top plate can be covered with duct tape. The top cover should be installed securely in place.

Assembling the Logix 764 Control to the Magnum Valve

The control and the Magnum valve work together as an integral system to ensure synchronization. Follow the steps outlined below to install the control on the Magnum valve.

Remove Cam Cover

Remove the cam cover by pressing in on the cover release tabs (Figure 6). Note the cover locking tab and the slot in the top plate. When you reassemble the cover, the locking tab is placed in the slot first and the cover lowered into position.

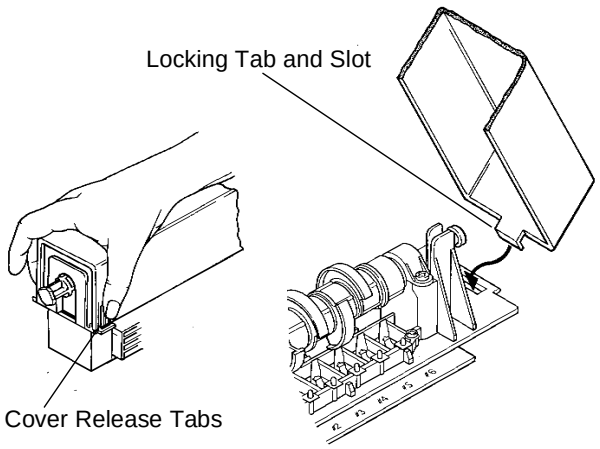


Figure 6

Align Camshaft

The camshaft is keyed and should only be engaged or disengaged when in the position illustrated (Figure 7). If the camshaft is not in the proper position, rotate the cam assembly counterclockwise until the camshaft arrow aligns with pillow block arrow.

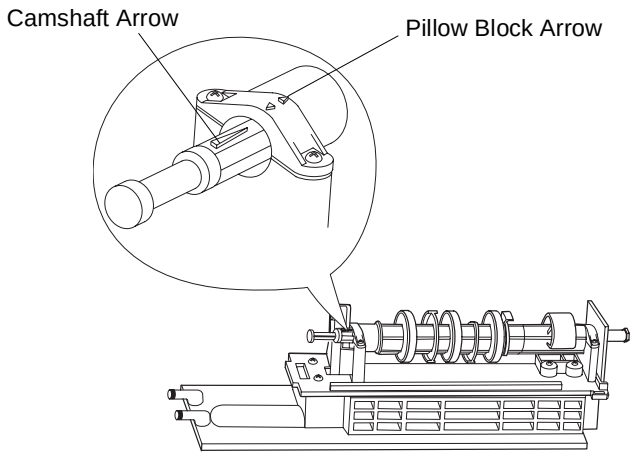


Figure 7

Slide Camshaft

Slide the camshaft toward the back of the valve by pressing on the release tab and pulling on the back end of the camshaft (Figure 8). The front end of the camshaft will be flush with the mounting plate.

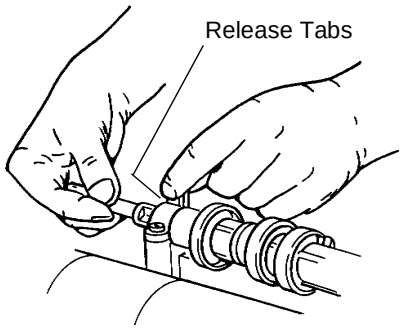


Figure 8

Removing the Control Faceplate

1. Press downward on top tab with fingers (Figure 9) while pushing up on bottom of control's face plate. **DO NOT push on top of control faceplate**.
2. When the lower mount bushings release, swing the lower end of the face plate outward to release.

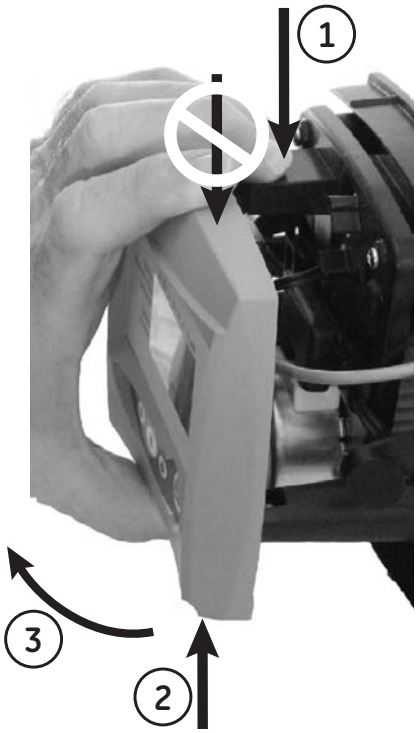
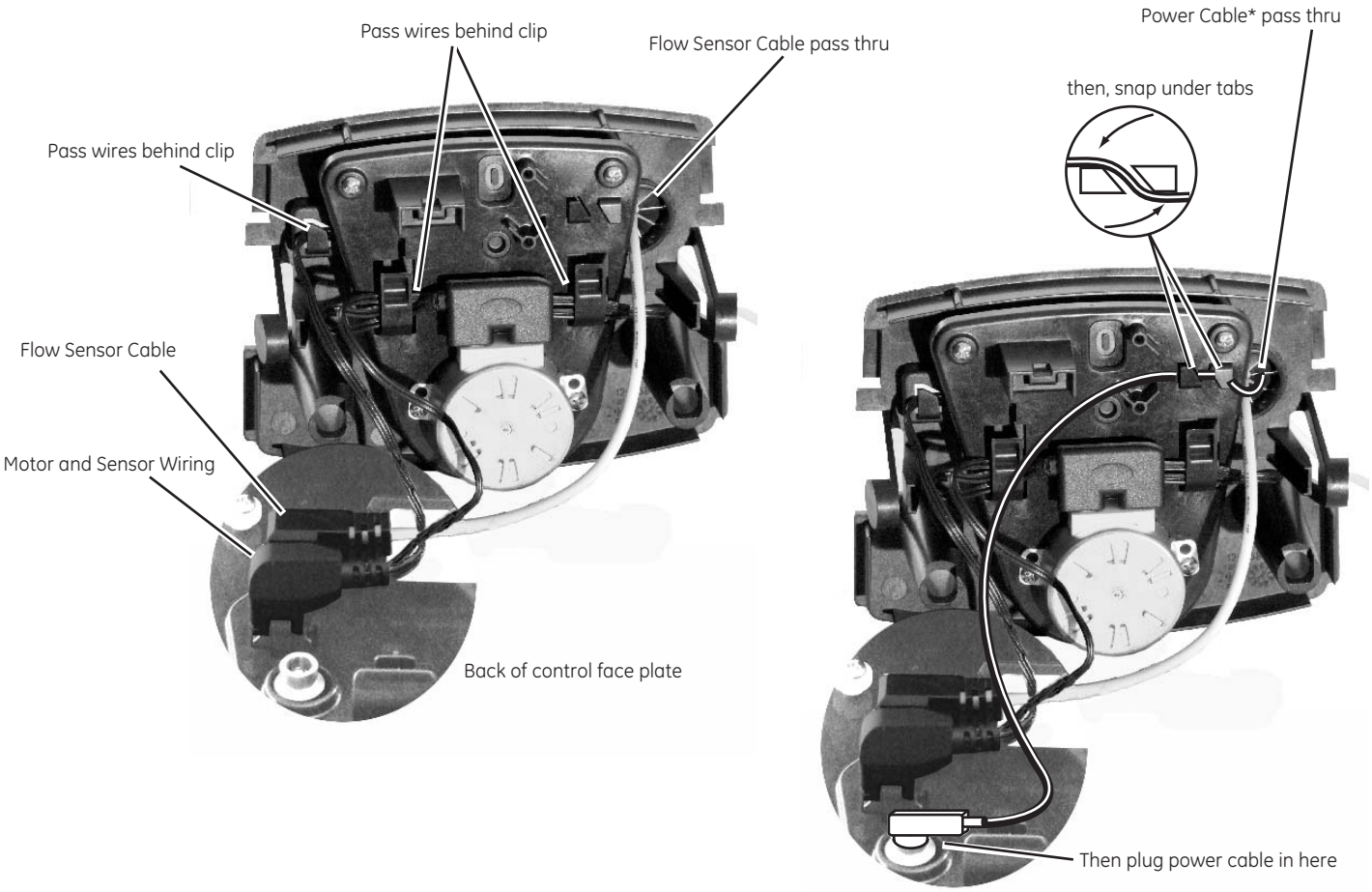


Figure 9

Routing the Cables



*White detail on power cable is for illustration purposes only and does not represent the actual power cable color.

Figure 10

Replacing the Control Face Plate

1. Set the lower mount bushings into the backplate arms.
2. Then, swing top end of control face plate into position until it snaps into place.

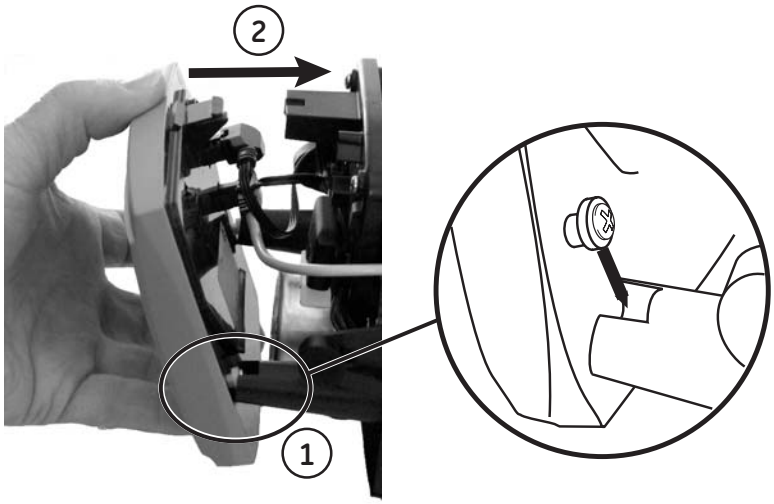


Figure 11

Mount Control

Mount the control onto the valve by sliding the mounting tabs over the mounting plate. Note that all models of Magnum controls mount to the valve in the same manner (Figure 12).

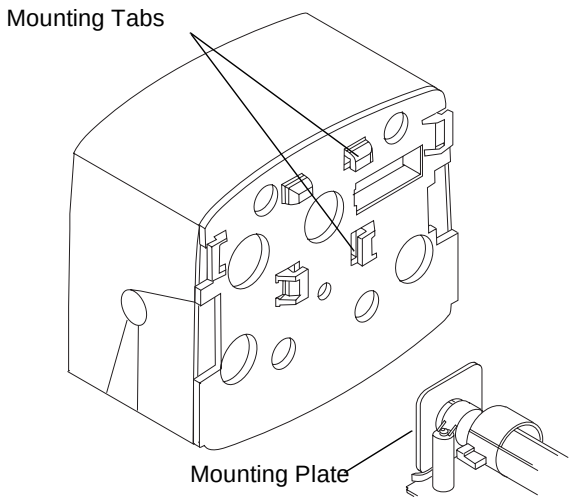


Figure 12

Engage Assembly

The camshaft will not rotate by hand when engaged with the controller. The Logix Magnum controller contains a motor with gears that drive a socket. The camshaft is keyed to only properly engage the socket when the Logix controller is in the treated water (Home) position.

If the camshaft is pulled back and not engaged it can be rotated counterclockwise. Rotate the camshaft to align the arrows (Figure 7). If the Logix Magnum controller is not in the treated water position, cycling the power will cause the socket to rotate to that position.

Engage the control by pressing on the release tab and pushing the camshaft into the control (Figure 13). Do not force the camshaft. If the camshaft does not slide freely into the control, check the alignment of the camshaft to the controller. Ensure it is in the proper position (Figure 7).

The Logix controller moves to the treated water (home) position when first power is applied.

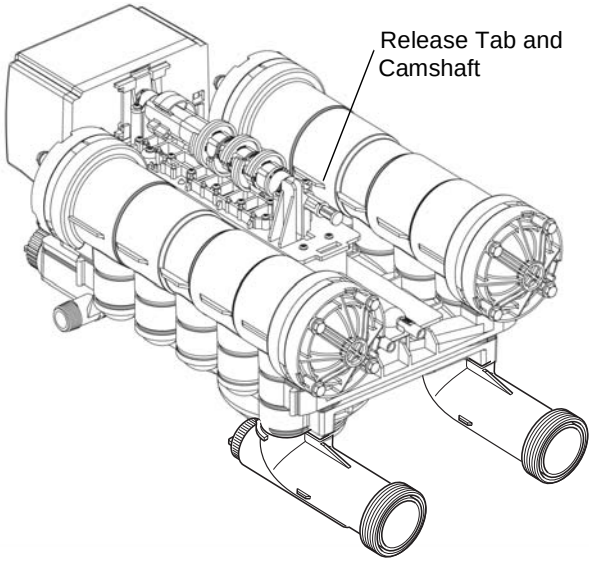


Figure 13

To disassemble the control from the valve, reverse the assembling procedure.

Inlet, Outlet and Drain Connections

The inlet, outlet, and drain connections are designed to accept a Pentair Water supplied CPVC or stainless steel adapter (Figure 14). The adapters provide a convenient union for the three connection ports on the valve. In addition, they incorporate a positive O-ring face seal for ease of installation and leak free operation. DO NOT OVERTIGHTEN THE ADAPTERS. As a general guideline, hand tightening the nut onto the valve is adequate. If additional tightening is required, never exceed a quarter turn beyond the hand tight position.

The outlet of the 2-inch Magnum IT has an integrated turbine. The turbine measures the flow of water through the outlet. This information is used by the controller to determine the best time to regenerate.

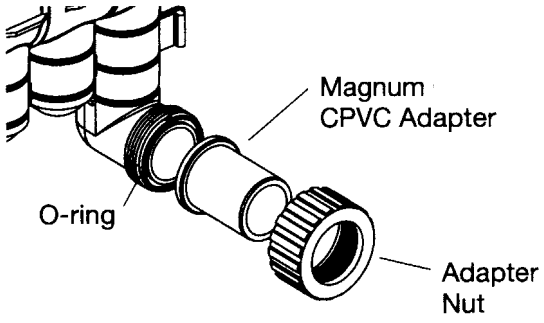


Figure 14

No Hardwater Bypass Feature

The Magnum control valve may be configured for “Hard Water Bypass” or “No Hard Water Bypass”. With Hard Water Bypass, unsoftened or unfiltered water is allowed to bypass the Magnum control valve during regeneration or backwash. With No Hard Water Bypass, a valve cartridge ensures that no unsoftened or unfiltered water bypasses the valve during regeneration or backwash.

It is easy to observe which option is installed in the valve. Note that the Hard Water Bypass End Cap has much longer standoffs than the No Hard Water Bypass cartridge. The No Hard Water Bypass assembly looks identical to the other three valve cartridges on the valve and has a label identifying the cartridge assembly (Figure 15).

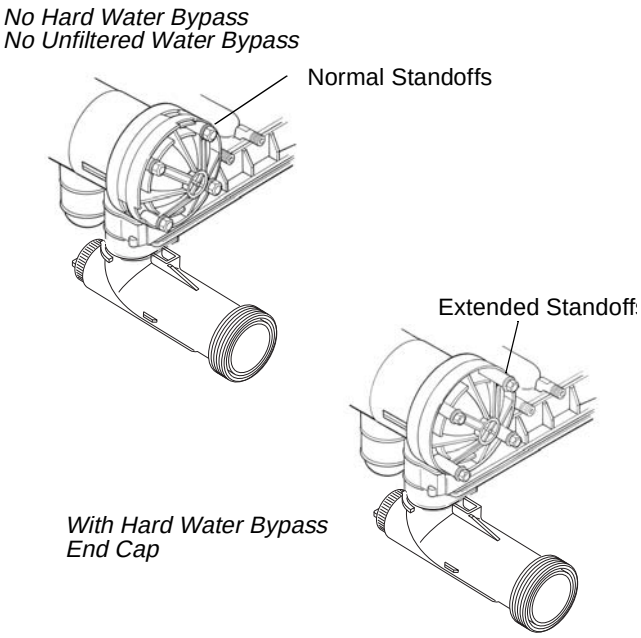


Figure 15

Hydraulic Output Signal

An optional hydraulic output signal is available on the valve. An optional cam lobe on pilot valve #6 is used on the camshaft assembly to initiate the hydraulic output signal during regeneration or backwash (Figure 16). The hydraulic line pressure signal is available through the 1/4-inch connection on the back of the valve marked “AUX”. See Figure 17. Remove the tube cap installed for shipping.

Optional cam lobes available are:

P/N 1000554 Provides a hydraulic signal from the beginning of BACKWASH through the start of REFILL.

P/N 1000553 Provides a hydraulic signal from the beginning of BACKWASH through the end of REFILL.

P/N 1041064 Breakaway cam. Can be programmed to send a hydraulic signal at any time during the REGENERATION or BACKWASH cycle. Note: The camshaft must be turning for the signal to change states, i.e. switch from OFF to ON, or from ON to OFF.

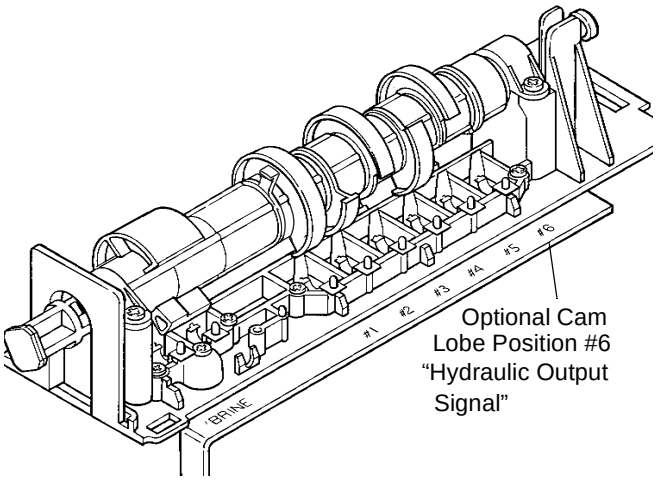


Figure 16

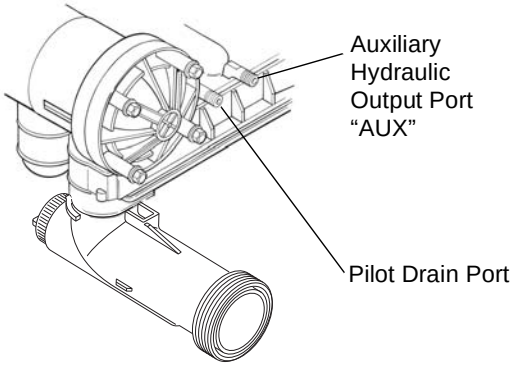


Figure 17

Magnum Tank Adapter and Riser

The Magnum now uses a stainless steel tank adapter that clamps onto the valve body.

The tank adapter on the control valve is designed to be compatible with a 4 inch-8UN (8 threads per inch) tank opening.

The valve is designed to accept a full 1-1/2-inch (3.81-cm) riser pipe with outside diameter of 1.90 to 1.91 inches (48.26 to 48.51 mm) (Figure 18). The riser pipe is sealed by an O-ring on the inside of the valve body (Figure 18). It is recommended that the riser pipe extend beyond the top of the tank by 1/4 inch ± 3/8 inch (6 mm ± 9 mm).

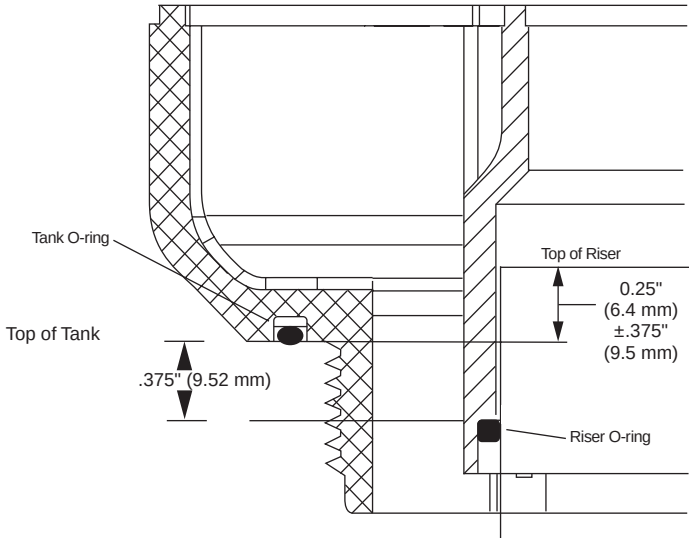


Figure 18

Optional Switch Assembly

A single optional feedback switch kit is available to provide an electrical signal during the entire regeneration or backwash cycle (Figure 19). The switch may be wired in the “Normally Open” or “Normally Closed” position and is rated for 0.1 amp at 125 volts AC. An optional 5.0 amp switch at 1/10 HP 125/ 250 volts AC is available upon request.

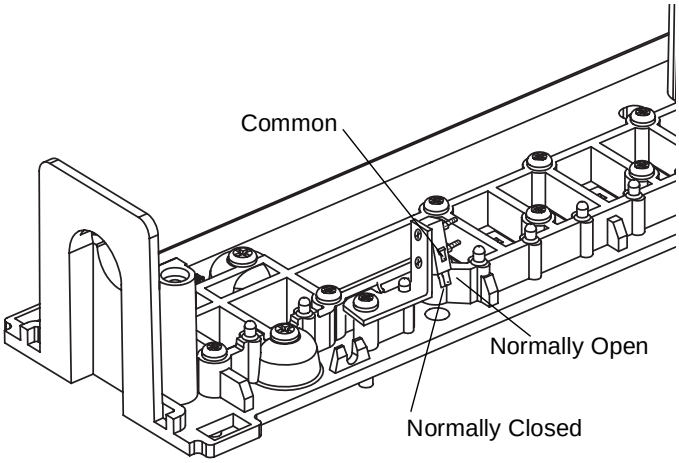


Figure 19

Optional multi-switch kits are available to provide additional electrical or switch closure signals during the regeneration or backwash cycles. Coupled with the optional breakaway cams, signals can be sent to external system equipment at virtually any time while the control/camshaft motor is running. Consult the instruction sheet covering the multi-switch option for additional application and programming information. The instruction sheet is sent with the switch kit.

Magnum General Specifications

Operating and Environmental

Dynamic Pressure ..... 25 to 100 psig (172 to 688 kPa)
100 psig (688kPa) maximum in Canada

Operating Water Temperature Range..... 34 to 100^{o}F (1 to 36^{o}C)

Ambient Temperature Range..... 34 to 120^{o}F (1 to 50^{o}C)

Cap Bolt Torque..... 35 to 40 inch lbs. (3.95 to 4.51 N_m)

Connections

Inlet and Outlet ..... 2-inch Magnum IT

Tank 4-inch 8UN

Brine ..... 3/4-inch NPT

Pilot Drain and Auxiliary Hydraulic Out..... 1/4-inch tube fitting

Riser Pipe Fitting ..... 1-1/2 inch (3.81-cm)

Drain ..... 1-1/2 inch (3.81-cm)

Physical

Dimensions..... 26-11/16" L, 16-1/4" W, 10-11/16" H

Approximate Weight (Valve and Control)..... 27.3 lbs. (10.6 kg.)

Electrical*

Voltage - Logix 764 Series Control ..... 12 VAC wall mount transformer only

Power Consumption ..... 4 watts

*See section on Electronic Controls for alternative electrical configurations.

General Installation Information

Please review the following items thoroughly to ensure an efficient and safe installation of the water treatment system. The typical installation line drawings for the Magnum valves are shown in Figure 22.

WARNING: Filter media may need to be properly conditioned before the filter is placed into full operation. Consult the original equipment manufacturer for proper procedure.

Operating Conditions - ***A minimum dynamic operating water pressure of 25 psig (172 kPa) is required for the Magnum control valve to operate properly.*** Water pressure is not to exceed 100 psig (688 kPa). In Canada, water pressure is not to exceed 100 psig (688 kPa). Water temperature is not to exceed 100°F (36°C). Do not subject the valve to freezing conditions.

Space Requirements - Allow adequate space for the water treatment system and associated piping. A minimum of 4 1/2 inches (11.5 cm) front and rear clearance is required for cartridge assembly and removal.

Plumbing - Always follow good plumbing practices and conform to local codes. Check existing pipes for lime and/or iron buildup. Replace piping if heavy buildup exists and initiate the proper treatment to prevent additional occurrences. Locate the equipment close to a drain that is capable of handling the maximum drain flow rate during backwash.

Flexible Connectors - Some tanks expand and contract over the acceptable range of operating water pressures of the Magnum control valve. The use of flexible connectors is recommended on polywound or fiberglass tank installations of 24-inch (60.96-cm) diameter and larger. Follow the tank manufacturer's instructions for more information.

Inlet and Outlet Piping - Inlet and outlet plumbing should be adequately supported to avoid excessive loads on the valve. Install a manual bypass system to provide for occasions when the water conditioner must be bypassed for servicing.

Drain LIne Piping - To prevent mineral loss during backwash, and to ensure proper operation of the control valve, **A DRAIN LINE FLOW CONTROL** must be plumbed into the drain line prior to placing the valve in the service mode. Flow controls from 5 to 40 gpm (18.92 to 151.4 Lpm) are available that can be easily installed in the drain line. Flow controls greater than 40 gpm (151.4 Lpm) must be plumbed externally. Selection of the proper drain line flow control depends on the tank size and media used for the installation.

The following general drain line piping guidelines should be observed:

- 1-1/2 inch (3.81 cm) or larger piping
- Should not exceed 20 feet (6.1 m)
- Should not be elevated higher than five feet above the control valve
- No shut-off valves should be installed in drain line
- Minimal number of elbows and fittings should be installed in drain line
- Piping must be self-supporting
- Flow control should be installed as close to the Magnum Series control valve as possible if an external flow control is used.

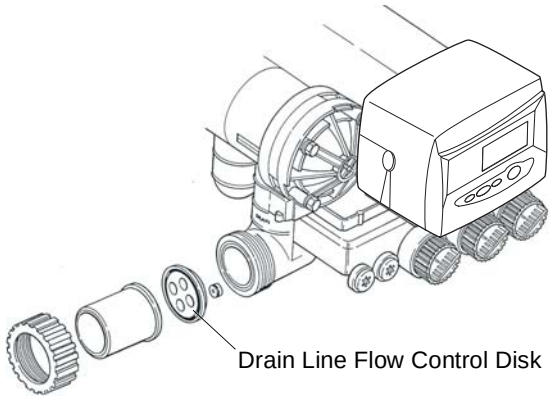


Figure 20

Brining System - The Magnum control valve utilizes timed water refill to add water to the salt tank. A refill tube with check ball is required in the brine tank that does not restrict the refill or brine draw flow rate capabilities of the valve. Although not required, a separate brine valve (safety float) system is recommended for use with Magnum installations. Select a "High-Flow" brine valve that does not restrict the refill or brine draw flow rate capabilities of the valve. The "Performance Injectors and Magnum Flow Controls" section of this manual contains flow rate information for various size injectors and refill controllers.

Pilot Drain - During regeneration, a small amount of water (200 ml or 1 cup) is discharged from the 1/4-inch (6.3-mm) tube fitting on the back of the valve marked DRAIN (Figure 21). To prevent this water from being discharged to the floor, plumb this connection to a non-pressurized drain or to the brine tank. **Do not plug or apply back pressure to the pilot drain at any time.**

Crimping the pilot drain line or installing the line to go up, which causes backpressure, prevents the diaphragm cartridges from shifting properly through the cycles of regeneration or backwash.

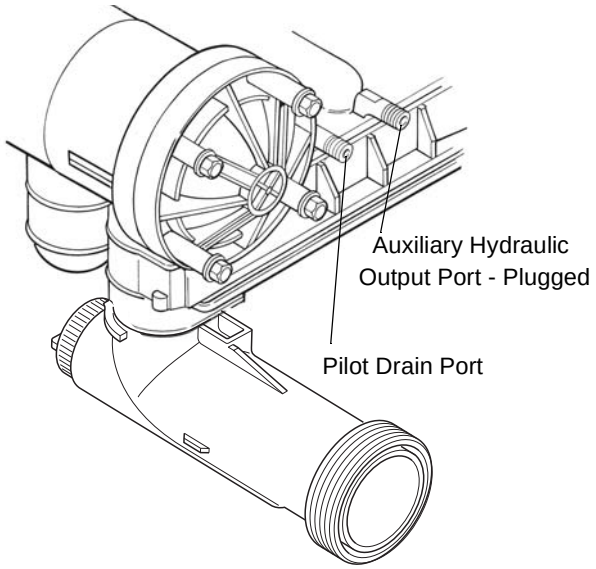


Figure 21

Magnum Valve Installation Guide (Top Mount)

Before the installation of the internal distribution system and loading of the media into the tank, the Magnum valve must be temporarily installed onto the tank. This will ensure that correct alignment of the inlet and outlet piping once the internals are installed and the media is loaded onto the tank.

1. Cut riser 1/4-inch above the top of the tank, plus or minus 3/8 inch. Place riser inside the tank.
2. Install tank O-ring into the tank adapter. **Be sure to lightly lubricate the O-ring with the 100% silicone lubricant provided with the valve.**
3. Screw the stainless steel tank adapter onto the empty tank until O-ring touches the top of the tank.
4. Turn (tighten) the tank adapter an additional 45° to 90° (max).
5. Slide clamp ring over tank adapter.
6. Mount valve on tank adapter until the valve uniformly contacts the tank adapter.
7. Align valve with plumbing connections to minimize unnecessary stress.
8. Remove the Magnum valve in preparation for installation of the internals and media loading.
9. Load media following your supplier's recommendations.
10. Re-mount valve on tank adapter.
11. Slide clamp ring over valve and tank adapter interface.
12. Tighten nut on clamp ring until valve cannot be turned in relation to tank adapter. The nut should be torqued to 20 to 25 ft-lbs.
13. Follow piping recommendations to provide support and flexibility. Layout piping to accommodate for tank and piping dimensional changes and potential water hammering. Flexible connectors may be needed.

Flex connectors are recommended when installing valves on FRP tanks that are 24 inches or larger in diameter.

Electrical

1. Electrical requirements for the installation depends on the configuration of the control.
2. The standard North American Series Logix electronic control is supplied with a 12 volt AC adapter. Optional AC adapters must be ordered separately for all international 12 VAC configurations.

Caution: The Logix Control and supplied AC adapter are for dry location use only, unless used with a Listed Class 2 power supply suitable for outdoor use.

Lubricants

It is very important that 100% silicone lubricant is the only lubricant used for installing the Magnum control valve. Any other lubricant may cause material degradation and potential failure of the valve components.

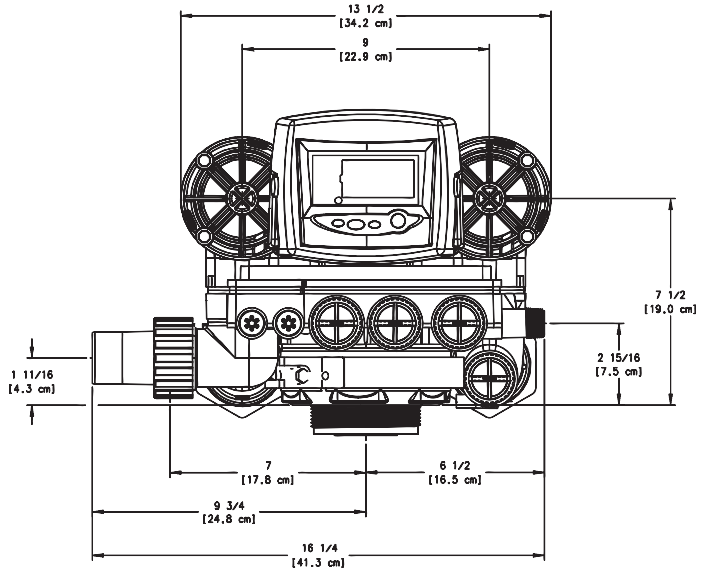
NOTE: Some silicone based lubricants contain petroleum-based ingredients. If there is a question about the lubrication that you are using contact the lubricant manufacturer to be sure the product is 100% silicone.

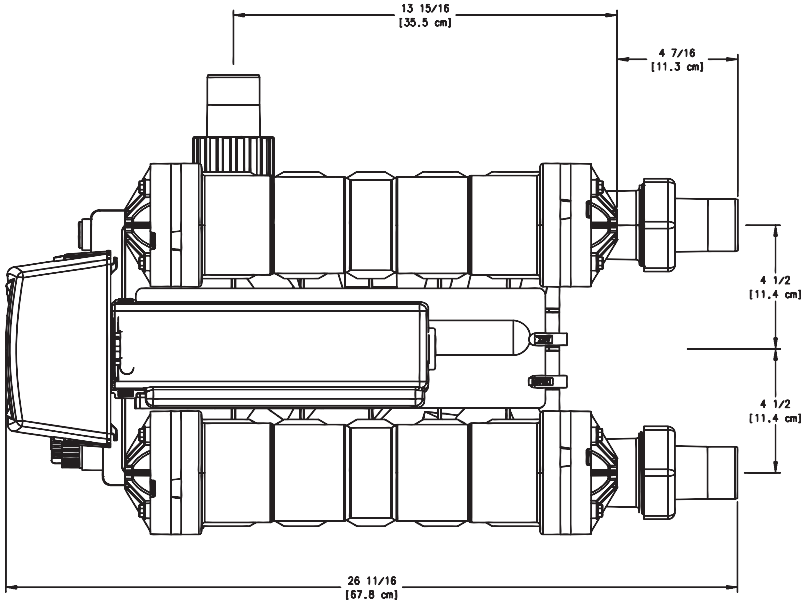
Caution: Plumbing cannot be used for electrical grounding when metal inlet and outlet piping is connected to a non-metal valve.

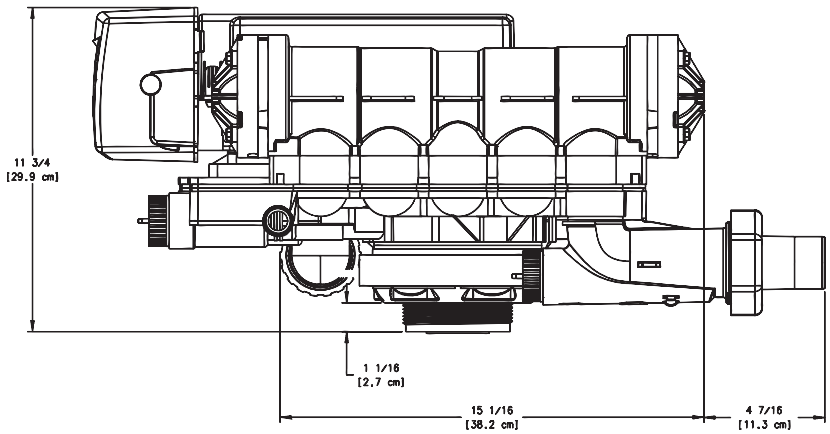
Connect the inlet and outlet piping together using a grounding strap or clamp to establish continuity.

Magnum IT Dimensional Specifications

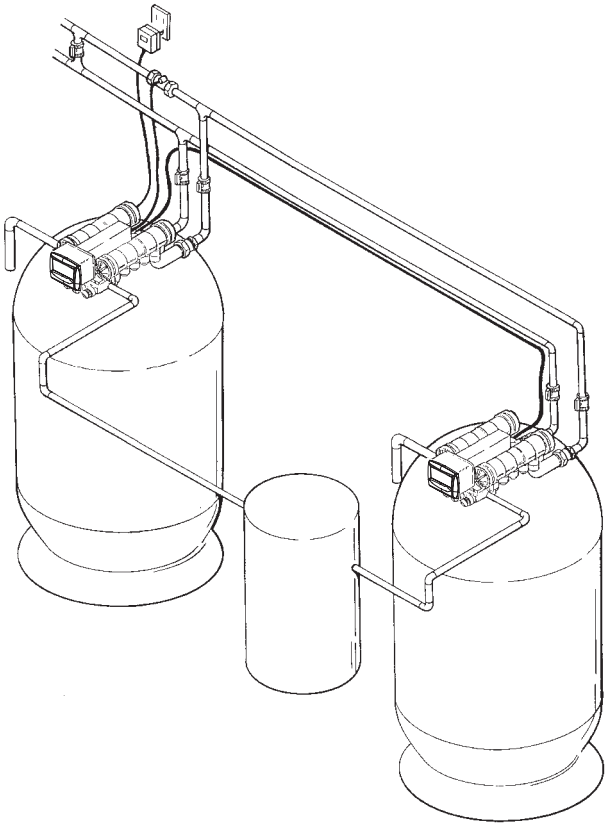
2-Inch Inlet and Outlet, 1 1/2-Inch Drain



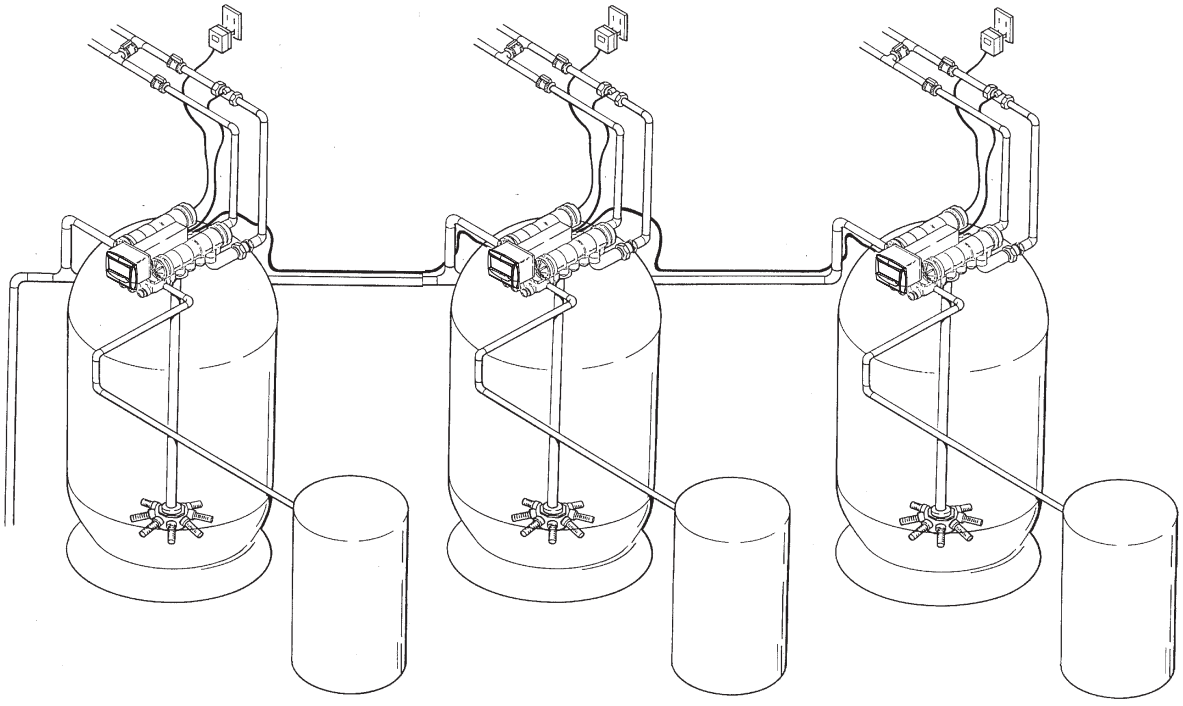




Typical Installation Drawings



Twin Tank



Multiple Tank

Figure 22

Camshaft Cycle Positions

The front end of the camshaft has an indicator cup. The cup has slots in the outer edge and cycle numbers on the inside face.

Remove the cover and look over the top of the 764 control to view the cycle numbers. The number in the opening, (Figure 23) indicates the current cycle position of the control valve. The corresponding slot for the number is positioned at the optical sensor, which is rotated approximately 90 degrees out of phase.

Cycle Indicators:

0 = Treated Water

1 = Backwash Cycle

2 = Regenerant Draw Cycle

3 = Slow Rinse Cycle

5 = Fast Rinse Cycle

8 = Regenerant Refill Cycle

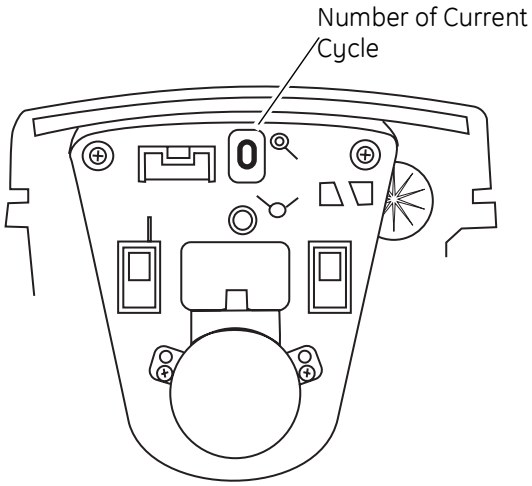


Figure 23 View with Cover and Logix Control Removed

764 Control Operation

Power Loss Memory Retention

The 764 control features battery-free Time of Day and Day of Week retention during loss of power. A super capacitor is designed to keep time for 8 to 24 hours depending on the installation. If the super capacitor is exhausted the Logix control will display four dashes (- - :- -) immediately upon power up. The Time of Day and Day of Week must be reset.

All other programmed parameters are stored in the static memory and are retained.

Flow Diagrams

The Magnum control valve utilizes a series of pilot valves to properly position the diaphragm valve cartridges (Figure 24). The pilot valves are activated by the camshaft (Figure 25). The flow diagrams that follow represent the **Service Cycle** for a 5-cycle conditioner and 3-cycle filter configuration. Both the Hardwater Bypass and No Hardwater Bypass service flow diagrams are presented.

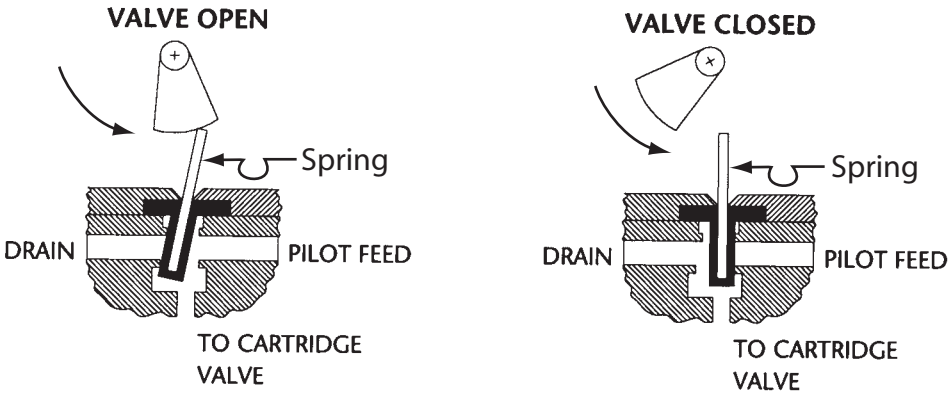


Figure 24 Pilot Valve Principle of Operation, Front View

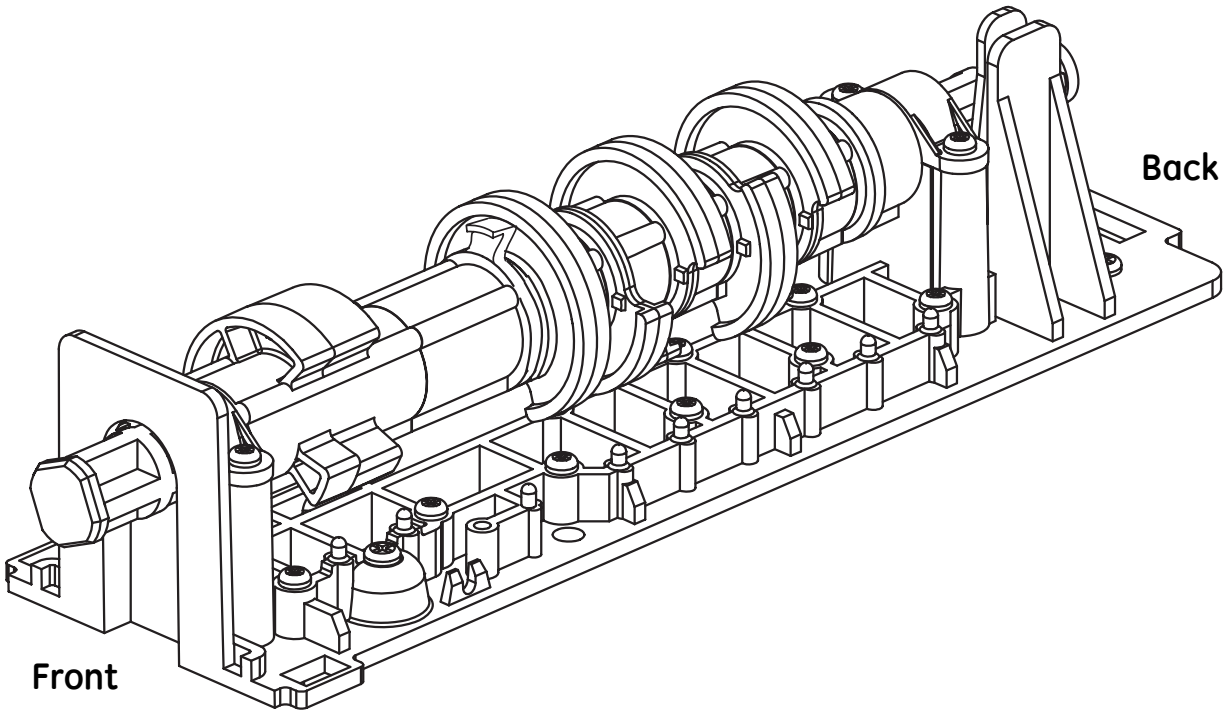
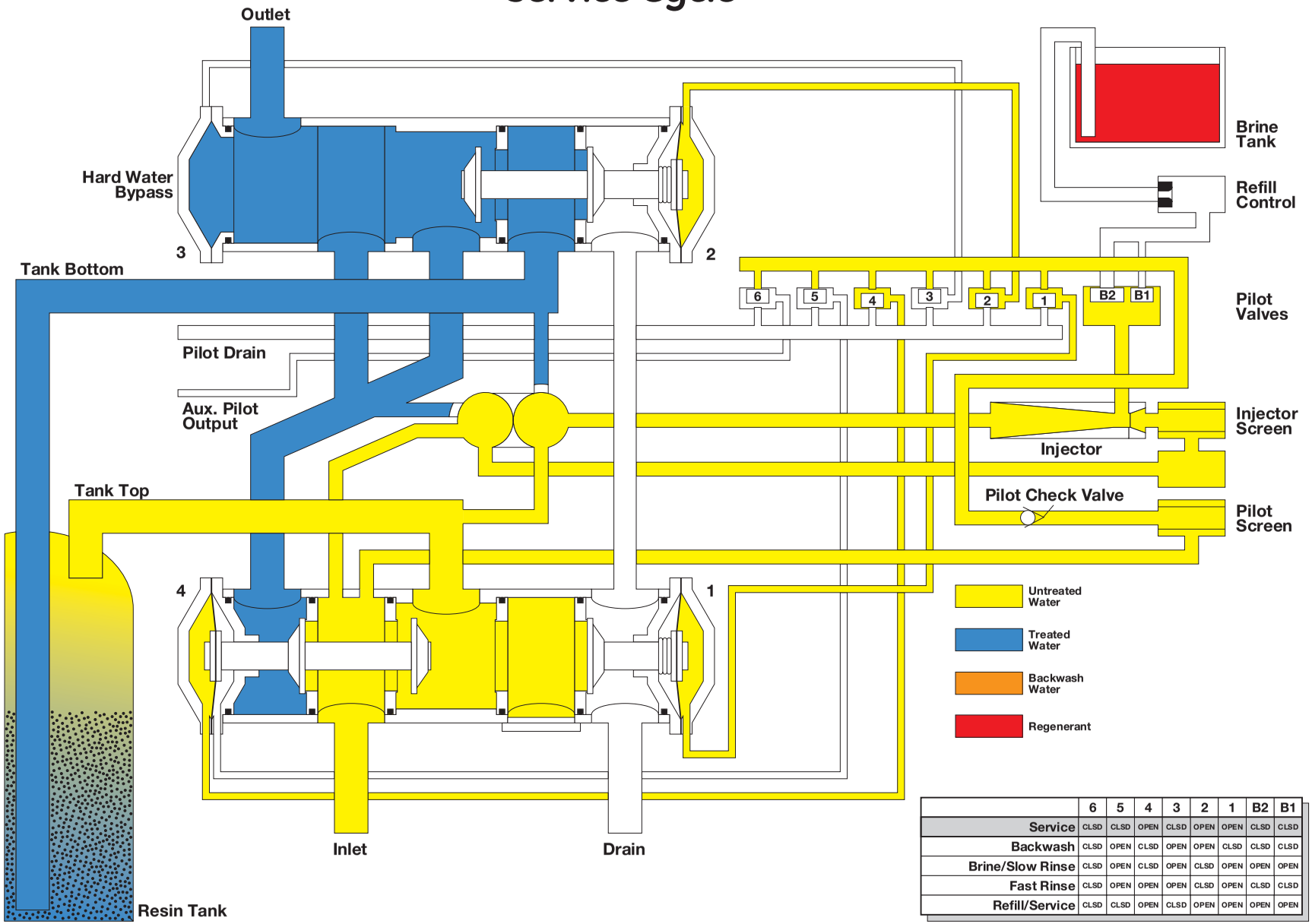


Figure 25 Cam Assembly

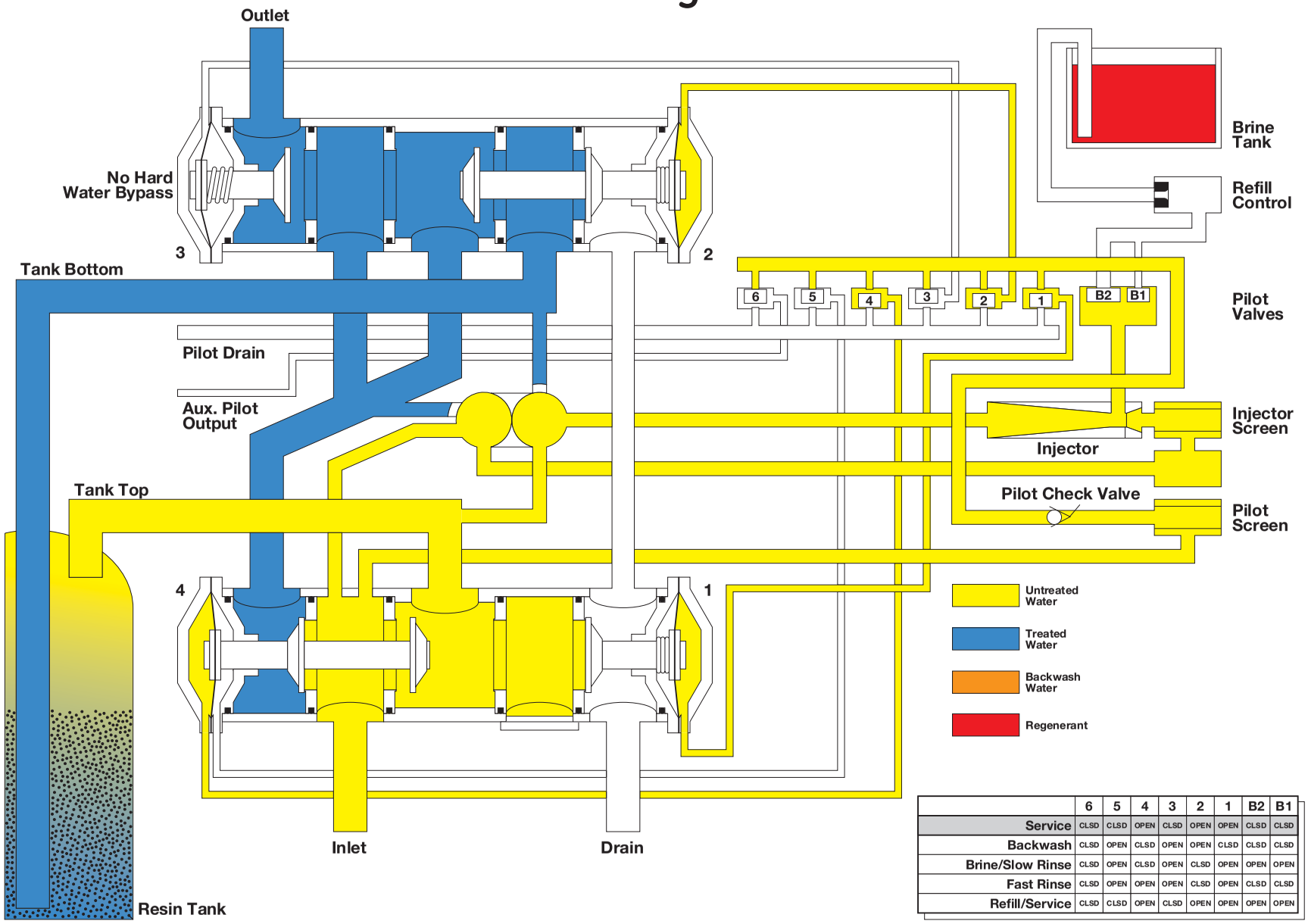
Magnum 5-Cycle Conditioner Hard Water Bypass Service Cycle



	6	5	4	3	2	1	B2	B1
Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD
Backwash	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD	CLSD
Brine/Slow Rinse	CLSD	OPEN	CLSD	OPEN	CLSD	OPEN	OPEN	OPEN
Fast Rinse	CLSD	OPEN	OPEN	OPEN	CLSD	OPEN	CLSD	CLSD
Refill/Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	OPEN	OPEN

Figure 26

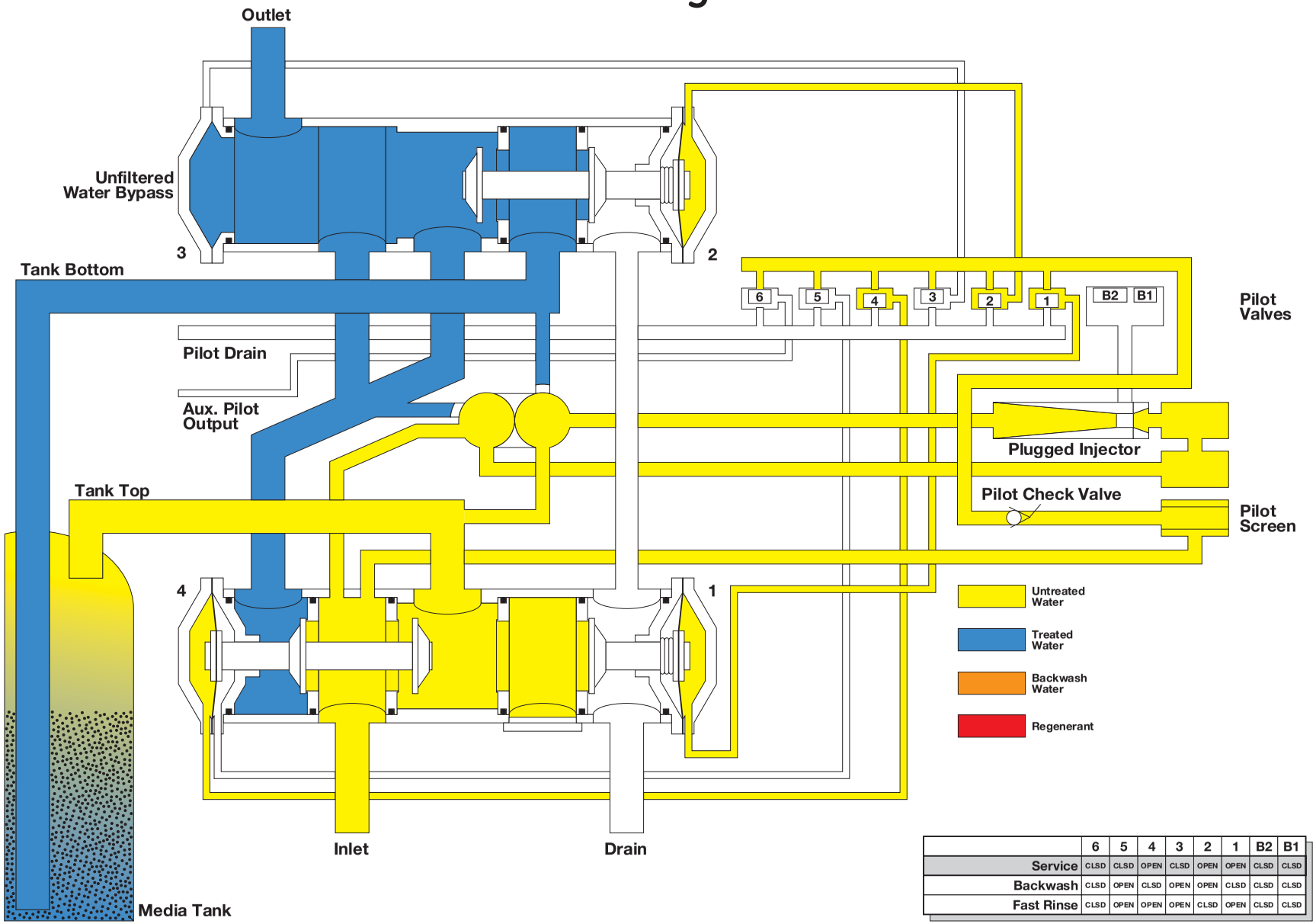
Magnum 5-Cycle Conditioner No Hard Water Bypass Service Cycle



	6	5	4	3	2	1	B2	B1
Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD
Backwash	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD	CLSD
Brine/Slow Rinse	CLSD	OPEN	CLSD	OPEN	CLSD	OPEN	OPEN	OPEN
Fast Rinse	CLSD	OPEN	OPEN	OPEN	CLSD	OPEN	CLSD	CLSD
Refill/Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	OPEN	OPEN

Figure 27

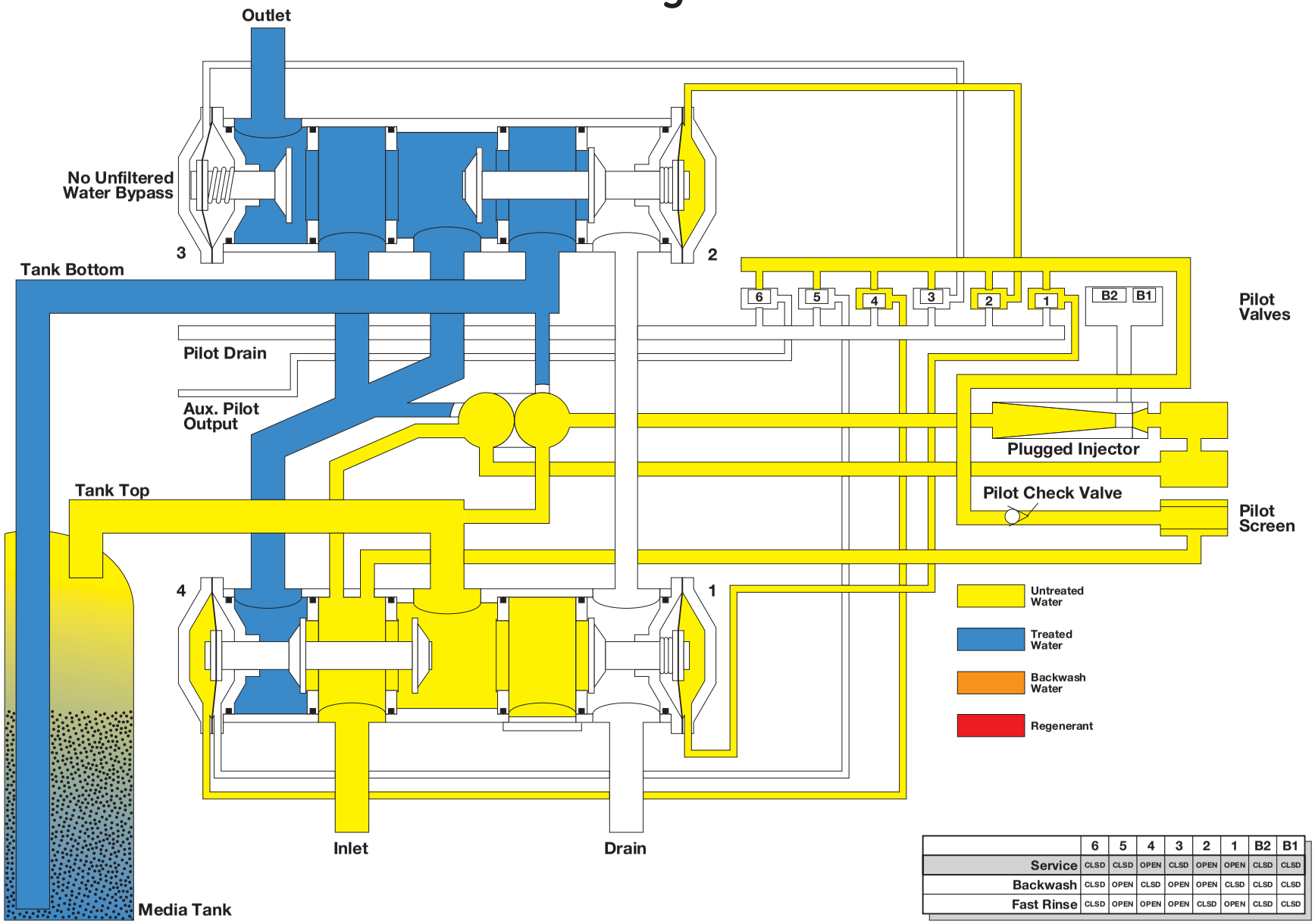
Magnum 3-Cycle Filter: Unfiltered Water Bypass Service Cycle



	6	5	4	3	2	1	B2	B1
Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD
Backwash	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD	CLSD
Fast Rinse	CLSD	OPEN	OPEN	OPEN	CLSD	OPEN	CLSD	CLSD

Figure 28

Magnum 3-Cycle Filter: No Unfiltered Water Bypass Service Cycle



	6	5	4	3	2	1	B2	B1
Service	CLSD	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD
Backwash	CLSD	OPEN	CLSD	OPEN	OPEN	CLSD	CLSD	CLSD
Fast Rinse	CLSD	OPEN	OPEN	OPEN	CLSD	OPEN	CLSD	CLSD

Figure 29

Identifying the Logix Control

If you are unsure of your control model, simply remove the cover and disconnect the controller module from the control valve. On the back of the control valve is a silver label that shows your model number and version revision.

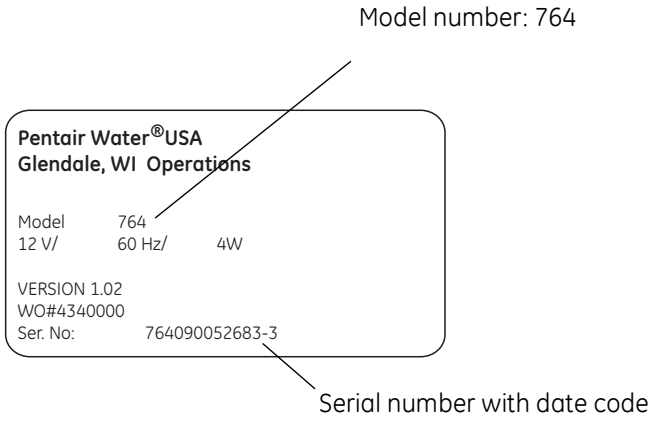


Figure 30

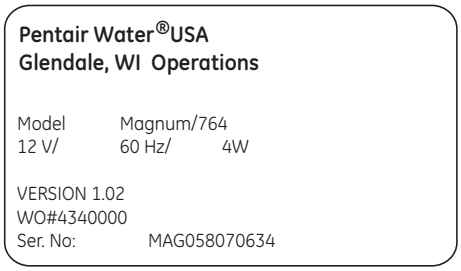


Figure 31

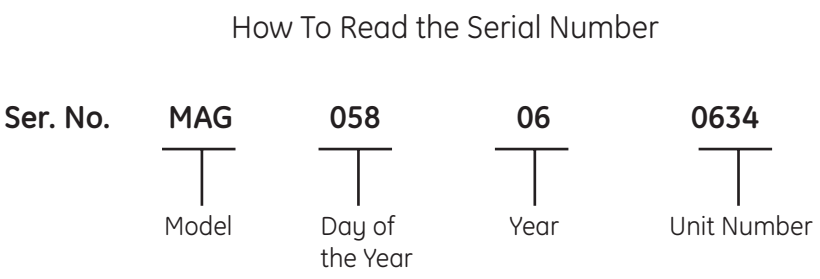
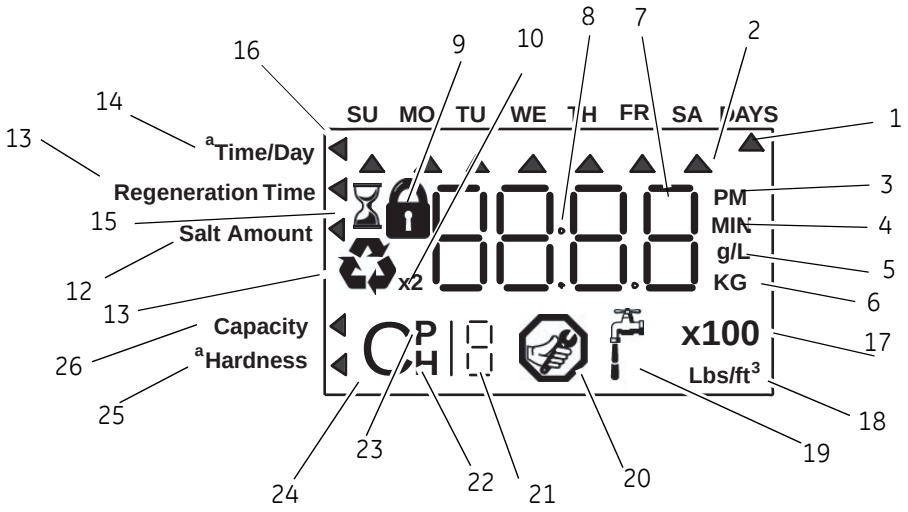


Figure 32

Display Icons & Cursors



[a] If your Logix 764 controller was purchased as a filter control, the overlay will show: Time/Day, Backwash Time, Backwash Length and Capacity.

Note: In normal operation and during programming, only a few of the icons are actually displayed.

1. This cursor is displayed when the days between regeneration are being programmed (used with .5 to 99 day regeneration programming).
2. One of these cursors is displayed to indicate which day will be programmed into the controller.
3. "PM" indicates that the time displayed is between 12:00 noon and 12:00 midnight (there is no AM indicator). PM indicator is not used if clock mode is set to 24-hour.
4. When "MIN" is displayed, the value entered is in minute increments.
5. When g/L is displayed, the value for regenerant amount entered is in grams/Liter.
6. When "Kg" is displayed, the value entered is in kilograms or kilograins.
7. Four digits used to display the time or program value. Also used for error codes.
8. Colon flashes as part of the time display. Indicates normal operation (742 only).
9. Locked/unlocked indicator. In Level I programming this is displayed when the current parameter is locked-out. It is also used in Level II programming to indicate if the displayed parameter is locked (icon flashes) when controller is in Level I.
10. When "x2" is displayed, a second regeneration has been called for.
11. The recycle sign is displayed (flashing) when a regeneration at the next time of regeneration has been called for. Also displayed (continuous) when in regeneration.
12. The display cursor is next to "SALT AMOUNT" when programming the amount of regenerant. If the controller is on a 3-cycle filter then backwash time is programmed.
13. The display cursor is next to "REGENERATION TIME" when programming the time of regeneration and the days of regeneration.
14. The display cursor is next to "TIME/DAY" when programming the current time and day.
15. The hourglass is displayed when the motor is running. The camshaft should be turning.
16. These cursors appear next to the item that is currently displayed.
17. X100 multiplier for large values.
18. When Lbs/ft^3 is displayed the value for regenerant amount entered is in pounds/cubic foot.
19. Faucet is displayed when the current flow rate is displayed. Control may show the faucet and "0", indicating no flow.
20. Maintenance interval display turns on if the months in service exceed the value programmed in P11.

21. Used with #24, #25, and #26. Displays valve in service, a sequence number or a value.
22. History Values (H). The number displayed by #23 identifies which history value is currently displayed.
23. Parameter (P). Displayed only in Level II Programming. The number displayed by #23 identifies which parameter is currently displayed.
24. Cycle (C). The number displayed by #23 is the current cycle in the regeneration sequence.
25. Hardness setting—only used with 298 conditioners.
26. Capacity display—shows estimated system capacity.

Keypad — Buttons

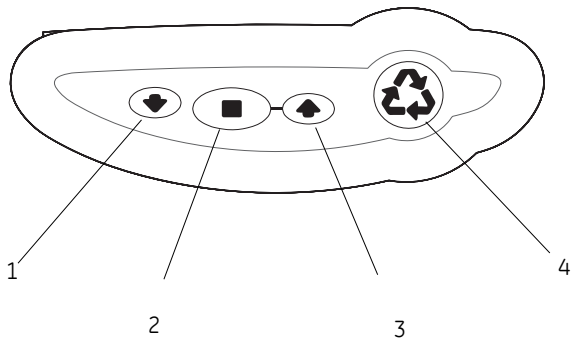


Figure 33

1. DOWN arrow. Generally used to scroll down or increment through a group of choices.
2. SET. Used to accept a setting that normally becomes stored in memory. Also used together with the arrow buttons.
3. UP arrow. Generally used to scroll up or increment through a group of choices.
4. Regenerate. Used to command the controller to regenerate. Also used to change the lock mode.

Note: If a button is not pushed for thirty seconds, the controller returns to normal operation mode. Pushing the Regenerate button immediately returns the controller to normal operation.

Programming Conventions

The 700 series controller is programmed using the buttons on the keypad. The programming instructions are described two ways whenever a section has keypad input.

First, a table shows simplified instructions. Second, text follows that describes the action. In each table:

"Action" lists the event or action desired.

"Keys" are listed as:

- UP for up arrow
- DOWN for down arrow
- SET for set
- REGEN for regeneration

"Duration" describes how long a button is held down:

P/R for press and release

HOLD for press and hold

X sec for a number of seconds to press the button and hold it down

"Display" calls out the display icons that are visible.

Placing Water Conditioning System Into Operation

After you have performed the installation steps, the conditioner will need to be placed into operation.

Follow these steps carefully, (pages 28 to 33) as they differ from previous instructions.

Note: All Logix 764 controls will be shipped in the service (treated water) position. **Check to see that the camshaft is aligned to service position. See Figure 7 on page 9 for proper control/camshaft alignment.**

The incoming supply water should be turned off.

Remove air from tank(s).

1. Position the bypass valve(s) to the in service (not in bypass) position.
2. Open the nearest water faucet completely.
3. Open the incoming water supply valve slowly to the quarter open position.

Note: Do not plug in the power supply until step 5. The tank(s) will fill with water. The air will exit through the faucet. When water flows steady from the faucet, the tank(s) are purged.

4. Turn off the faucet then turn off the incoming water supply.

Power-up the Control

5. Plug the AC adapter into a non-switched outlet. The display will show the valve type that was loaded from memory.

   If this is the first time the control is powered up the display will show 255A.

6. Use the ▲ or ▼ buttons to increment through the available selections, Table 1.

Table 1 Preprogrammed Valves

Type	Valve			Connection - inches
255 A	255	Twin Alternating	8-cycle conditioner	3/4
273 A	273		3-cycle filter	1
278 A	278		5-cycle conditioner	1
293 A	293		3-cycle filter	2
298 A	298		5-cycle conditioner	2
255 P	255	Twin Parallel	8-cycle conditioner	3/4
273 P	273		3-cycle filter	1
278 P	278		5-cycle conditioner	1
293 P	293		3-cycle filter	2
298 P	298		5-cycle conditioner	2
255 L	255	Single Tank Remote Regeneration or Multi-Single Tank Lockout	8-cycle conditioner	3/4
263L	263		8-cycle conditioner	1
268L	268		3-cycle filter	1
273 L	273		3-cycle filter	1
278 L	278		5-cycle conditioner	1
293 L	293		3-cycle filter	2
298 L	298		5-cycle conditioner	2

For the next steps you may want to remove the cover to watch the camshaft movement.

7. Press ■ to enter the valve type and the proper preprogrammed valves for your application:

   293A for Twin Alternating Filter

   298A for Twin Alternating Conditioner

   293P for Twin Parallel Filter

   298P for Twin Parallel Conditioner

   293L for single or multiple tank filters with regeneration lockout or remote regeneration start

   298L for single or multiple tank conditioners with regeneration lockout or remote regeneration start

Note: The control overlay changes depending on whether a filter or conditioner Logix control was purchased. If a filter control is programmed to be a conditioner then the overlay will not be correct. However, the Logix control will function properly. See previous page for overlay text.

8. The display will show - - - . Select media volume or "F" for filter set-up. If a number or an "F" is displayed then the resin volume or filter type has been preprogrammed.

   Finish programming the Logix 764 control using the Level I programming guide.

   For a 293/298A system: the control will automatically syncronize the cam positions.

   Tank 1 will move to standby
   Tank 2 will move to service

   Err3 will be displayed when the Tank 1 cam is moving. Err4 will be displayed when Tank 2 cam is moving.

   For a 293/298P system:

   Tanks 1 and 2 will move to service if not already in service.

   For a 293/298L system:

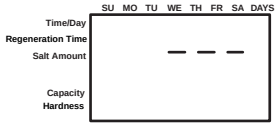
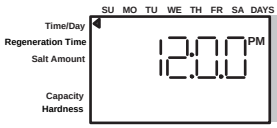
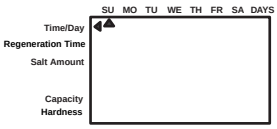
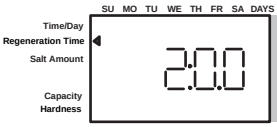
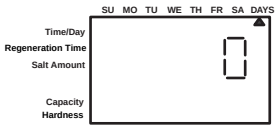
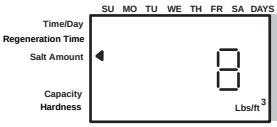
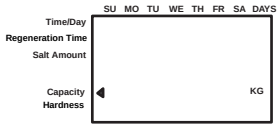
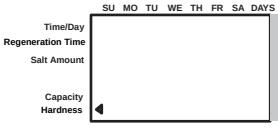
   The tank(s) will move to service if not already in service.

These cam movements may take up to 5 minutes.

Table 2

Resin Volume - 1.0 ft^3 and 25 Liter Steps			
	Resin Volume		
Tank Dia (inches)	**Injector**	**US**	**Metric**
14	14	3.00	75
14	14		100
16	16	4.00	125
18	18	5.00	150
21	21	6.00	175
21	21	7.00	200
21	21	8.00	225
24	24	9.00	250
24	24	10.00	275
24	24		300
24	24	11.00	325
30	30	12.00	350
30	30	13.00	375
30	30	14.00	400
30	30	15.00	425
30	30	16.00	450
30	30	17.00	475
30	30		500
36	36	18.00	525
36	36	19.00	550
36	36	20.00	575
36	36		600
36	36		625
36	36		650
36	36		675
36	36		700

Level I Programming - 764 Control with 298 Valve, 5 Cycle Conditioner

Screen	Buttons to Press	Description	Range
	*then* ▼ or ▲ *press* ■	1. Resin Volume Select correct resin volume	Cubic feet: 3.00 to 20.00
	*press* ■ *then* ▼ or ▲ *press* ■	2. Time of Day (12 hr.) Set to time of day Note: Setting includes PM indicator.	
	*press* ■ *then* ▼ or ▲ *press* ■	3. Day of Week Set to actual day of the week	
	*press* ■ *then* ▼ or ▲ *press* ■	4. Time of Regeneration Set to desired time of regeneration	
	*press* ■ *then* ▼ or ▲ *press* ■	5. Days Override Leave at 0 to disable or Set to desired days between regeneration	Days: 0 to 99
	*press* ■ *then* ▼ or ▲ *press* ■	6. Salt Dosage Set to desired desired dosage lbs per cubic feet of resin	Lbs/ft^3: 3 to 18
	*press* ▼ *to override press* ■ *then* ▼ or ▲ *press* ■	7. Capacity Capacity calculated by Logix Control Use to OVERRIDE calculated capacity	Kilograins: 1 to 900
	*press* ■ *then* ▼ or ▲ *press* ■	8. Hardness Set to actual water hardness in grains per gallon	Grains/gal: 3 to 200

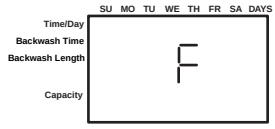
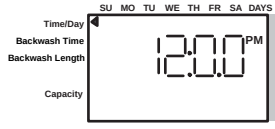
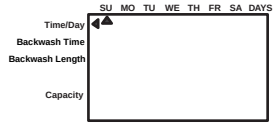
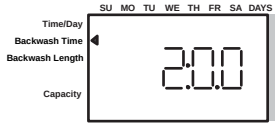
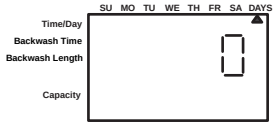
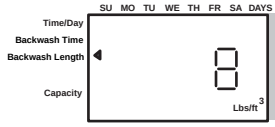
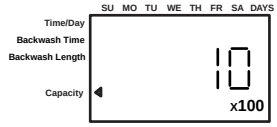
Control programming is complete

Note: If one of the following conditions occur:

- control displays Err3 and goes to home position or
- power outage discharges the supercapacitor and when power is restored the time of day is reset;

the Regen Icon will begin flashing. This indicates that a delayed regeneration will occur at the next programmed time of regeneration. If a delayed regeneration is not desired, press the REGEN Button to disable the delayed regeneration and the system will regenerate by water usage.

Level I Programming - 764 Control with 293 Valve, 3 Cycle Filter

Screen	Buttons to Press	Description	Range
	*then* ▼ or ▲ *press* ■	1. Program Type Select "F"	
	*press* ■ *then* ▼ or ▲ *press* ■	2. Time of Day (12 hr.) Set to time of day Note: Setting includes PM indicator.	
	*press* ■ *then* ▼ or ▲ *press* ■	3. Day of Week Set to actual day of the week	
	*press* ■ *then* ▼ or ▲ *press* ■	4. Time of Backwash Set to desired time of Backwash Note: Time of Backwash is not used for Alternating mode.	
	*press* ■ *then* ▼ or ▲ *press* ■	5. Days Override Leave at 0 to disable or Set to desired days between regeneration	Days:0 to 99
	*press* ■ *then* ▼ or ▲ *press* ■	6. Backwash Length (minutes) Set to desired Backwash length	Minutes: 0 to 200
	*press* ▼ *to override press* ■ *then* ▼ or ▲ *press* ■	7. Capacity (gallons) Set to desired Capacity in multiples of 100 gallons	Gallons: 1 to 900

Control programming is complete

Note: If one of the following conditions occur:

- control displays Err3 and goes to home position or
- power outage discharges the supercapacitor and when power is restored the time of day is reset;

the Regen Icon will begin flashing. This indicates that a delayed regeneration will occur at the next programmed time of regeneration. If a delayed regeneration is not desired, press the REGEN Button to disable the delayed regeneration and the system will regenerate by water usage.

Placing Water Conditioning System Into Operation (cont.)

Note: 293/298 Alternating and parallel tank systems have one Logix 764 control that is mounted on tank 1. Tank 2 has a blank faceplate and the valve is controlled by the Logix 764 control on tank 1.

Quick Cycling the Control 293/298A, 293 298P and 293/298L

It is required that the control be quick cycled to specific regeneration cycles when placing the conditioner into operation. This will ensure that all of the air in the tank and valve is purged. The process also provides a check for leaks and functioning of the brine system. Please perform the following steps for quick cycling the control, before proceeding to start-up.

1. With the control in the treated water position, Press and hold the REGEN button on the controller for 5 seconds. This will initiate a manual regeneration. The control will display a solid hourglass indicating that the motor and camshaft are turning to the backwash cycle (C1). When the control reaches the backwash cycle, the total regeneration time remaining will be displayed. Pressing the SET button will display the specific cycle time remaining**.**
2. Press and release the UP and SET buttons to move the control to the Regenerant Draw cycle (C2).
3. Repeat Step 2 to advance to each cycle.

   Before the final filling of the media tank with water check that:

   – the nearest water faucet is completely closed.
   – the valve drain line is properly routed to a drain
   – the regenerant tank is empty and the regenerant hose is connected to the valve
   – the water supply valve is off.

Note: The control can be sent directly back to the treated water position from any regeneration cycle. Press the UP and SET buttons (about 5 seconds) until the hourglass icon begins flashing. The control will now skip all remaining regeneration cycles.

4. Add water to the regenerant tank.
   A. With a bucket or hose add approx. 4 gallons (15 liters) of water to the regenerant tank.
   B. If the tank has a salt platform in the bottom of the tank, add water until the water level is approximately 1 inch (25 mm) above the platform.

Note: It's recommended that you do not put regenerant into the tank until after the control valve has been put into operation. With no regenerant in the tank, it is much easier to view water flow and motion in the tank.

5. Press and hold the ♻ button on the controller for 5 seconds. This will initiate a manual regeneration.

   The control will display a solid hourglass indicating that the motor and camshaft are turning to the backwash cycle (C1). When the control reaches the backwash cycle, the total regeneration time remaining will be displayed. Pressing SET will display the specific cycle time remaining.
6. While the controller is in cycle C1 (Backwash), open the water supply valve very slowly to approximately the ¼ open position. Water will begin to enter the media tank. Any air remaining will begin to be purged to drain as the media tank fills with water.

⚠ ***WARNING:*** If opened too rapidly or too far, media may be lost out of the tank into the valve or the plumbing. In the ¼ open position, you should hear air slowly escaping from the valve drain line.

   When all of the air has been purged from the media tank (water begins to flow steadily from the drain line), open the main supply valve all of the way. This will purge the final air from the tank.

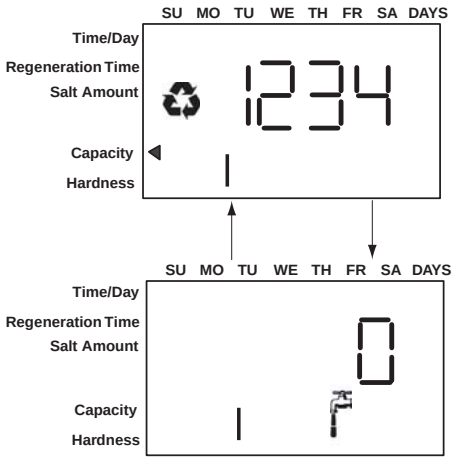
   Allow water to run to drain until the water runs clear from the drain line. This purges any debris from the media bed.
7. Check Regenerant Draw.
   A. Quick cycle the control to the C2 regenerant draw/slow rinse position .
   B. C2 will be displayed. With the control in this position, check to see that the water is being drawn out of the regenerant tank. The water level in the regenerant tank should recede very slowly.
   C. Observe that water is being drawn from the regenerant tank for at least three minutes. If the water level does not recede, check all regenerant line connections for air leaks.

8. If the water level is receding from the regenerant tank you can quick cycle the control to the C8 Regenerant tank refill position.
    A. The control will cycle to the regenerant tank refill cycle, and water will be directed down through the regenerant line to the regenerant tank. Let the water flow through the line until all air bubbles have been purged from the line. Note: Do not let the water flow down the line to the tank for more than one to two minutes, or the tank may overfill.
9. Repeat steps 4 and 8 for each additional tank.
10. Finally, turn on a faucet plumbed after the water conditioner. Run the faucet until the water runs clear.
11. Add the appropriate amount of regenerant to regenerant tank.

The Water Conditioning System is Now Fully Operational

Note: After any control reset (valve type or system change, etc.) it is necessary to initiate a manual regeneration and quick cycle through it. This will ensure the control and cam are synchronized. If not synchronized Err 3 will display and the control will drive cams to the correct position for valve and system type programmed.

In Service Display



Logix 764 Electronic Multi-Tank - "A" Alternating Control:

Service display — The number of the Tank in Service (small digit next to CPH position) and Alternating Capacity Remaining and Flow Rate with Faucet icon of Tank in Service.

Logix 764 Electronic Multi Tank - "P" Parallel Control:

Service Display — alternating three items

Capacity remaining for Tank 1 with digit "1" displayed

Capacity remaining for Tank 2 with digit "2" displayed

System Flow Rate (Tank 1 + Tank 2 added) with Faucet icon

Logix 764 Electronic Multi Tank — "L" Lock Out Control

Service Display — Alternating Capacity Remaining and Flow Rate with Faucet icon "L" displayed indicating lockout signal is active. Blinking "L" and Lock icon if lockout signal is active and control is ready to perform regeneration.

Note: The faucet icon is displayed on all the Logix 764 controls when there is flow. The 764 will show the faucet icon when the flow rate is displayed, even if the flow rate is zero. If the flow rate is zero, the faucet will turn off when the capacity is displayed.

Note: In service flow rate display can be replaced with a clock display. Using Level II (P10) programming if desired.

Programming Overview

The 764 control includes multiple program levels that allow the Water Treatment Professional to customize the system for many water conditions. Additionally, historical data can be viewed allowing quick and easy troubleshooting. In most cases Level I programming is all that is required to set up the water conditioning system for proper operation. A brief description of each program level is listed below.

Level I Used to program control for normal applications.

Level II (P-Values) Allows the installer to customize programming for non-standard applications.

Level Ill (C-Values) Allows the installer to adjust the length of select cycles for non-standard applications.

Level IV History (H-Values) Allows access to historical information for troubleshooting the system.

Note: If a button is not pushed for thirty seconds, the control returns to normal operation mode.

Level I Programming

The 764 control can be quickly programmed by following the sequential procedure in the section “Placing Water Conditioning System Into Operation”. Level I program parameters are those that can be accessed by pressing the UP or DOWN buttons.

- Resin Volume Setting: Set to match the volume (cubic feet) of resin in the mineral tank.
- Time of Day: Includes PM indicator. Can be set to display as a 24-hour clock. See Level ll programming
- Day of Week: Set to actual day of the week.
- Time of Regeneration: Fully adjustable. Default is 2:00 AM.
- Days Override: Range 0.5 to 99 days. Leave at 0 to disable.
- Salt Dosage: Set at pounds of salt per cubic foot of resin in the conditioner tank (298 conditioner only).

  For the 293 filter valve the salt dosage is replaced with backwash length. The display arrow will point to backwash length and the setting is minutes of backwash.

Note: When the control is set up for a twelve-hour clock a PM indicator will illuminate when the displayed time is in the PM hours. There is no AM indicator.

Level II Programming – P Values

Level II program parameters can be adjusted to fine-tune the conditioner's operation. The parameters are accessible by pressing and holding the UP and DOWN buttons until the control displays a "P" value. Note: The control must be in the home position to change settings. See Table below for Level ll parameters. Typically the Level ll parameters will not need to be adjusted as the default settings accommodate most applications. Contact your Water Treatment Professional before attempting any programming.

	Description	Range	Minimum Increments	Default	Units	Notes
P9	Units of Measure	0-1	1	(2)		0 = US 1 = Metric
P10	Clock Mode	0-1	1	(2)		0 = 12 hour clock; flow rate service display 1 = 24 hour clock; flow rate service display 2 = 12 hour clock; Time of Day service display 3 = 24 hour clock; Time of Day service display
P11	Service Interval	0-250	1	0	months	Uses 30 days for each month; 0 = off
P12	Remote regeneration switch delay	3-250	1	60	seconds	Time remote switch must be active to start regeneration.
P13 *	**(not used on Magnum systems)**					
P14	Refill Rate	1-700	1	(1)	gpm x 100	
P15	Draw Rate	1-700	1	(1)	gpm x 100	
P16	Reserve Type (not used for alternating mode)	0-3	1	0		0 = variable reserve delayed regeneration 1 = fixed reserve delayed regeneration 2 = variable reserve immediate regeneration 3 = fixed reserve immediate regeneration
P17	Initial average or fixed reserve (not used for alternating mode)	0-70	1	30	% of Capacity	Depends on value entered in P16
P18	Flow sensor select	0-7	1	(1)		0 = internal magnum NHWB, 1, 6 =1" Autotrol turbine 2, 7 = 2" Autotrol turbine 3 = User defined K-factor 4 = User defined Pulse Equivalent 5 = Internal Magnum HWB Values 6 & 7 are for single turbine configurations on twin alternating systems.
P19	K-factor or Pulse equivalent	1.00-99.99 0-9999	0.01 1	0.01 1		K-factor P18=3; Pulse Equivalent P18 = 4
Pr	Refill First (not used for alternating mode)	0-1	1	0		0 = Refill first off 1 = Refill first on
Pd	Remote switch operation	0-1	1	0		0 = Immediate Regeneration after P12 time 1 = Delayed Regeneration after P12 time
Notes: (1) Default selected with valve type and resin volume. (2) Factory Default is "0" for North America units and "1" for World units.						

*Not used for Magnum valves.

Programming the Lockout Feature

All Level I parameters can be locked out when the control is in Level ll programming. Simply press the REGEN button during Level ll programming and a Lock Icon will appear indicating that the specific setting has been locked out. When locked out, the setting cannot be adjusted. To disable the Lock Out Feature, press the REGEN button when in Level ll. The lock icon will not be displayed.

Salt Setting (298 Conditioner)

The default P6 salt setting is set at 9 lbs/cu ft. Under normal circumstances this setting will provide the correct system capacity. This setting may be adjusted to change the exchange capacity.

Table 3 Standard Efficiency Exchange Capacity

Salt lbs/cu ft	Exchange Capacity grains/cu ft	Salt grams/ liter	Exchange Capacity grams/ liter
3	12714	50	29.9
4	15495	60	34.0
5	17774	70	37.5
6	19661	80	40.6
7	21250	90	43.4
8	22618	100	45.9
9	23828	110	48.2
10	24930	120	50.2
11	25962	130	52.1
12	26950	140	53.8
13	27916	150	55.5
14	28873	170	58.5
15	29829	200	62.7
16	30796	230	66.9
17	31783	260	71.0
18	32806	290	75.3

Level lll Cycle Programming – C Values

Several Level III program parameters can be adjusted to fine-tune valve operation for non-standard applications. Typically these parameters will not need to be adjusted as the default settings accommodate most applications. Contact your Water Treatment Professional before attempting any programming. The parameters are accessible by pressing and holding the UP and SET buttons until the display shows a “C” value.

Note: The control must by in the treated water position to change settings.

C#	Description	Range	Minimum Increments	Default Setting	Notes
C1	Backwash	0 – 200	1 Min	14	Flow rate dictated by size of drain line flow controller
C2	Regenerant Draw	0 – 200[a]	1 Min	See Notes	Automatically calculated from resin volume and salt dosage settings
C3	Slow Rinse	0 – 200	1 Min	See Notes	Automatically calculated from resin volume and salt dosage settings
C5	Fast Rinse	0 – 200	1 Min	6	Rinses residual regenerant from tank
C8	Regenerant Refill	0 – 200[a]	1 Min	See Notes	Automatically calculated from resin volume and salt dosage settings

a. Only adjustable when the 293 filter valve has been selected.

Level IV Viewing History - H Values

Historical information can be viewed by pressing the SET and DOWN buttons simultaneously, with the 764 control in the home position. Release both buttons when the control displays an “H” value. Press the UP or DOWN buttons to navigate to each setting.

Table 4 History Data

H#	Description	Range	Notes
H0[a]	Initial Setting Value	Cubic Feet or Liters	Resin Volume
H1	Days since last regeneration	0 - 255	
H2	Current Flow Rate	Depends on turbine used	
H3	Water used today in gallons or/m^3 since Time of Regeneration	0-131,070 or 0-1,310.70 m^3	
H4	Water used since last regeneration in gallons or/m^3	0-131,070 or 0-1,310.70 m^3	
H5[a]	Total water used since reset in 100s	0-999900 gallons or 0-9999 m^3	
H6[a]	Total water used since reset in 1,000,000	4,294 x 10^6 gal or 4264 x 10^4 m^3	
H7	Average usage for Sunday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H8	Average usage for Monday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H9	Average usage for Tuesday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H10	Average usage for Wednesday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H11	Average usage for Thursday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H12	Average usage for Friday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H13	Average usage for Saturday in gallons or m^3	0-131,070 gallons or 0-1,310.70 m^3	
H14	Average service cycle	0-255 days	
H15[a]	Peak Flow Rate	0-200 gpm or 1000 Lpm	
H16	Day and Time of Peak Flow Rate	Time and day that peak flow occurred	
H17[a]	Months since service	0-2184 months	
H18	Water used since last regeneration - Tank 1	0-131,070 gallons or 0-1,310.70 m^3	
H19[a]	Water used since last regeneration - Tank 2	0-131,070 gallons or 0-1,310.70 m^3	
Hr	Number of regenerations since last serviced	0-65536	

a. H0, H5, H6, H15, H17, H19 values can be reset by pressing and holding ■ for 3 seconds while the value is being displayed.

Program Reset

The 764 control can be reset to original factory parameters when viewing the H0 parameter. Press and hold the SET button for three seconds while H0 is displayed. Release the button. All settings except for Time of Day and Day of Week will be reset. The 764 Logix control will now display the valve and system type. Refer to Level I Programming.

Note: After any control reset (valve type or system change, etc.) it is necessary to initiate a manual regeneration and quick cycle through it. This will ensure the control and cam are synchronized. If not synchronized Err3 will display and the control will drive cams to the correct position for valve and system type programmed.

Manual Regeneration Options

Refill FIrst Option

Refill First is only available for single tank “L” and twin parallel “P” models.

The 764 control allows users to select when the refill cycle occurs. When Pr = 0 (default) refill occurs immediately after fast rinse. When Pr = 1 refill will not occur until just before a regeneration. This allows for a “dry” brine tank.

If refill first is selected, the valve will move to refill two hours before the start of backwash. After refill is complete, the valve moves back to service for a two-hour brine make-up time. Regeneration then follows as normal, skipping refill.

By default, time of regeneration is set to midnight after refill first is selected.

Note: The tank in service (on-line) cannot be regenerated while the other tanks are isolated. Water for backwash would not be available.

The 764 control features several options that offer additional flexibility for manually regenerating the conditioner. On alternating systems the tank in standby will move through regeneration to service. The tank in service will move through regeneration to standby. On parallel systems, the tank with the lowest remaining capacity will regenerate.

Delayed Manual Regeneration

Press and release the REGEN button to start a delayed manual regeneration. The Regeneration icon on the display will flash indicating a regeneration will start when the time of day reaches the programmed time of regeneration. Pressing the REGEN button again will turn off the regeneration icon and cancel the delayed regeneration.

Immediate Manual Regeneration

Pressing and holding the REGEN button for three seconds starts an immediate manual regeneration. A solid regeneration icon will be displayed. The control will immediately begin a regeneration on the tank in service.

Delayed Second Regeneration

Pressing and releasing the REGEN button while the control is in regeneration will program the control for a delayed second regeneration. A flashing x2 icon next to the regeneration icon will appear indicating a second regeneration will start when the time of day reaches the programmed time of regeneration. The delayed second regeneration will be performed on the new tank in service. For alternating and parallel systems, each tank will regenerate once.

Double Immediate Manual Regeneration

Back-to-Back manual regenerations are initiated by pressing and holding the REGEN button for three seconds while the control is in the regenerating mode. A solid x2 icon next to the regeneration icon will appear indicating a second manual regeneration will start immediately after current regeneration is complete. For alternating and parallel systems each tank will regenerate once. Single tank systems will regenerate twice back-to-back.

Regeneration Modes for Parallel Systems

Parameter P16 is used to determine the method for demand initiated regeneration. Four regeneration modes are possible.

- P16 = 0, Delayed Regeneration with a Smart Reserve Regenerations will start only at the Time of Regeneration entered in P2. A tank is regenerated if the capacity remaining in that tank is below the minimum required capacity needed to meet the next days calculated water usage requirement. The next days water usage number is based on the daily average water usage held in memory plus a 20% reserve. If necessary both tanks will be regenerated sequentially beginning with the most exhausted tank.
  This option allows the control to vary the reserve, and therefore the decision to regenerate, based on the actual daily water usage pattern for the location at which it is installed. See Table 5.
- P16 = 1, Delayed Regeneration with a Fixed Reserve Regenerations will start only at the Time of Regeneration entered in P2. A tank is regenerated if the capacity remaining in that tank is below the percentage entered in P17.
  If either tank's capacity is overrun by 50% a regeneration will take place. The control will also cause both tanks to be regenerated sequentially the next Time of Regeneration regardless of how much water is used during that 24 hour period. This feature is to help recover a severely exhausted bed. See Table 6.
- P16 = 2, Immediate Regeneration - Fixed Reserve/Delayed Regeneration - Smart Reserve
  This option uses the features of both option 0 and option 3. This is the most versatile of regeneration options. Option number 2 provides all the advantages of variable reserve based on the actual amount of water that is used each day plus the capability to react to the excessive water usage days that occur occasionally. See Table 7.
- P16 = 3, Immediate Regeneration - Fixed Reserve
  Regenerations are started immediately when a tank reaches zero or when the system capacity remaining (capacity remaining in both tanks) drops below the reserve capacity programmed in P17. To prevent hard water this reserve should be set large enough to provide conditioned water during the regeneration of the most exhausted tank. See Table 8.

Table 5 P16 = 0

Priority	Flow Rate	Continuous Soft Water	Efficiency
High	●		
Ave		●	●
Low			

Table 6 P16 = 1

Priority	Flow Rate	Continuous Soft Water	Efficiency
High	●		
Ave		●	
Low			●

Table 7 P16 = 2

Priority	Flow Rate	Continuous Soft Water	Efficiency
High		●	
Ave	●		●
Low			

Table 8 P16 = 3

Priority	Flow Rate	Continuous Soft Water	Efficiency
High		●	●
Ave			
Low	●		

Wiring Diagrams

Connecting the Logix 764 Twin Alternating or Parallel Controls

The twin sensor and extension cables are used for twin unit parallel and alternating applications. Four standard connections are required for operation; the power AC adapter, the flow sensor, motor/optical sensor, and the connection between tank 1 and tank 2 controls. Figure 34 outlines these standard features.

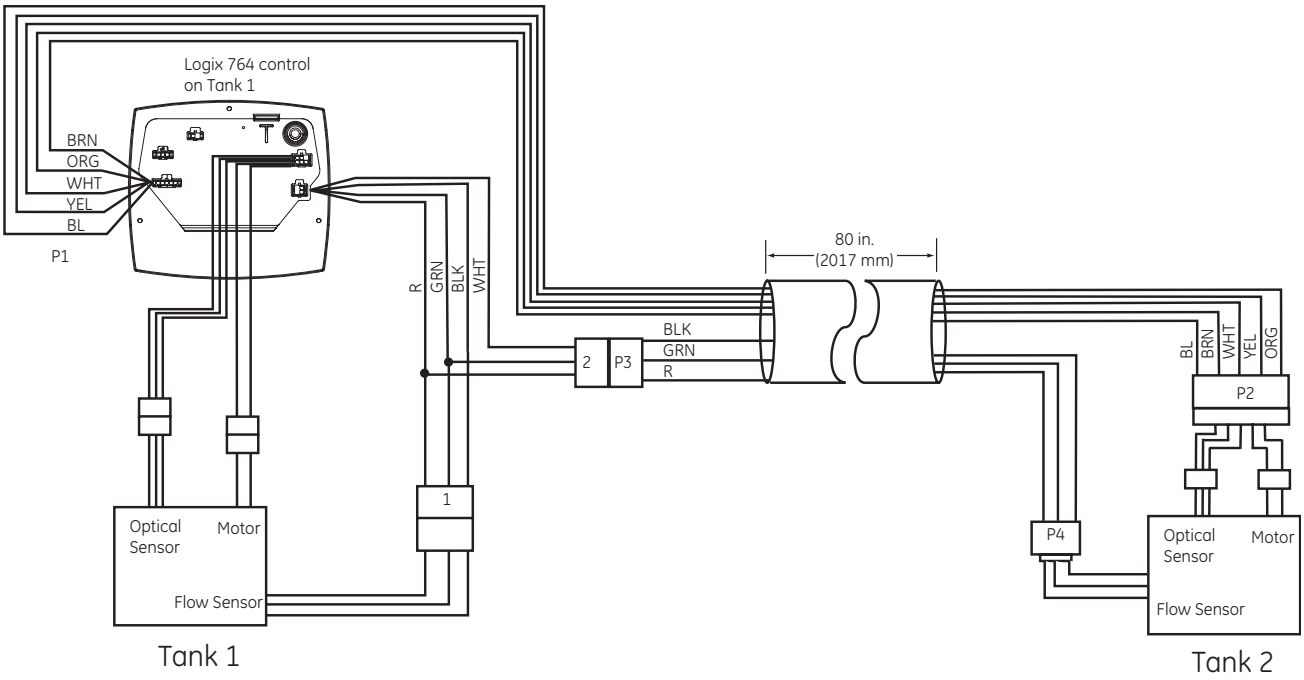
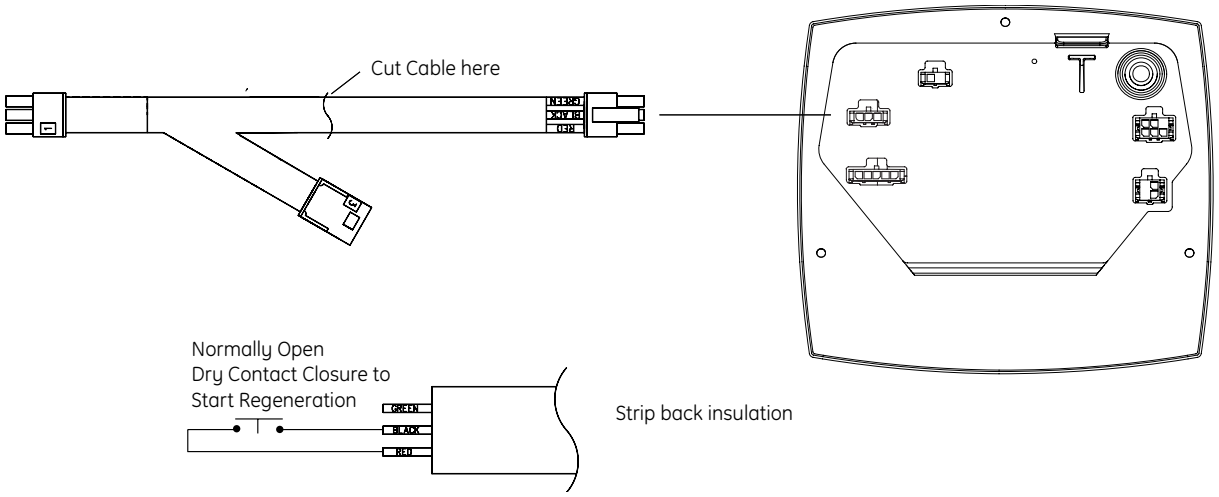


Figure 34

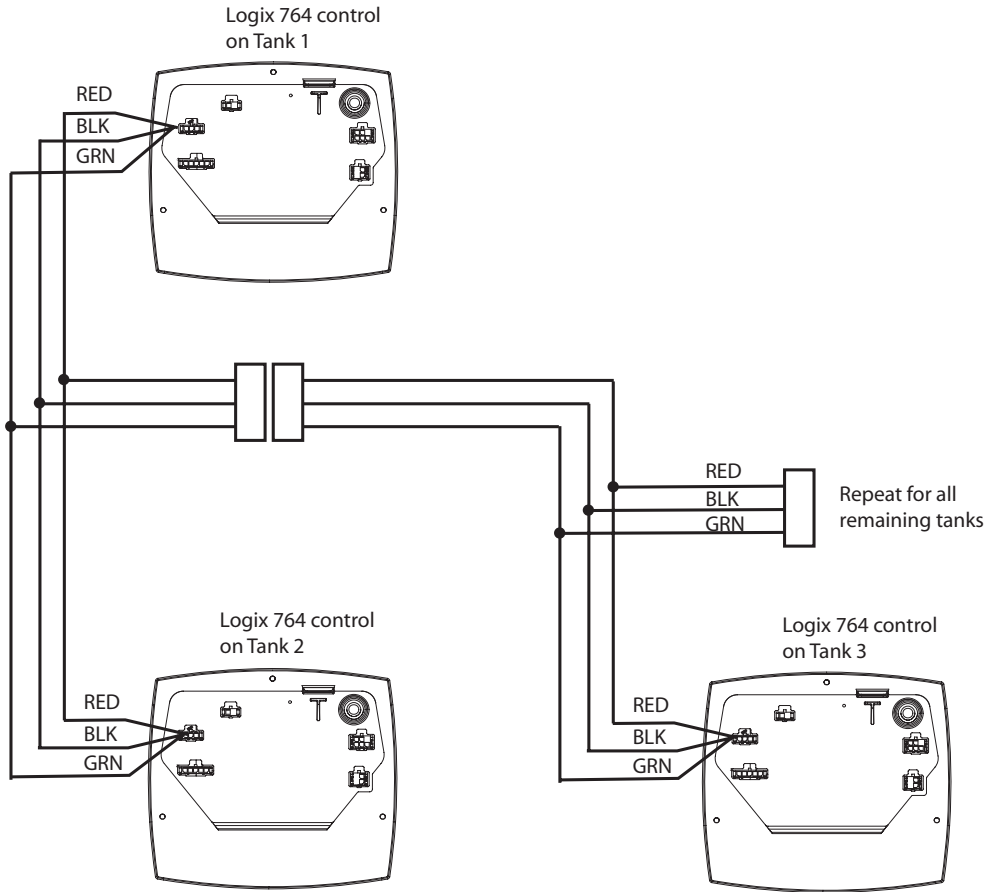
Remote Regeneration Start



Note: Cable PN 3020228 sold separately.

Figure 35

Connecting the Logix 764 Multi Single Tank Control



Note: Cable PN 3020228 sold separately.

Figure 36

Troubleshooting

764 Controller – Error Codes

Problem	Possible Cause	Solution
ERR 1 is displayed.	Program settings have been corrupted.	Press any key and reprogram Level I settings.
ERR 3 is displayed.	Controller on tank 1 does not know the position of the camshaft. Camshaft should be rotating to find Home position.	Wait for two minutes for the controller to return to Home position. The hourglass should be flashing on the display indicating the motor is running.
	Camshaft on tank 1 is not turning during ERR 3 display.	Check that motor is connected. Verify that motor wire harness is connected to motor and controller module. Verify that optical sensor is connected and in place. Verify that motor gear has engaged cam gear. If everything is connected, try replacing in this order: 1. Wire Harness, Motor, Optical Sensor Assy 2. Controller
	Camshaft on tank 1 is turning more than five minutes to find Home position:	Verify that optical sensor is in place and connected to wire. Verify that camshaft is connected appropriately. Verify that no dirt or rubbish is clogging any of the cam slots. If motor continues to rotate indefinitely, replace the following components in this order: 1. Wire Harness, Motor, Optical Sensor Assy 2. Controller
	Regeneration starts but control shows Err3 before completing regeneration.	Verify that the correct valve is selected in the Logix controller.

ERR 4 is displayed.	If single tank system..	Verify system setting is programmed to 293/298“L”.
	Controller on tank 2 does not know the position of the camshaft. Camshaft should be rotating to find Home position.	Wait for two minutes for the controller to return to Home position. The hourglass should be flashing on the display indicating the motor is running.
	Camshaft on tank 2 is not turning during ERR 4 display.	Check that motor is connected. Verify that motor wire harness is connected to motor and controller module. Verify that optical sensor is connected and in place. Verify that motor gear has engaged cam gear. If everything is connected, try replacing in this order: 1. Wire Harness, Motor, Optical Sensor Assy 2. Controller
	Camshaft on tank 2 is turning more than five minutes to find Home position:	Verify that optical sensor is in place and connected to wire. Verify that camshaft is connected appropriately. Verify that no dirt or rubbish is clogging any of the cam slots. If motor continues to rotate indefinitely, replace the following components in this order: 1. Wire Harness, Motor, Optical Sensor Assy 2. Controller

System Troubleshooting

Problem	Possible Cause	Solution
Regenerant tank overflow.	a. Uncontrolled refill flow rate. b. Air Leak in regenerant line to air check. c. Drain control clogged with resin or other debris.	a. Remove refill flow control to clean ball and seat. b. Check all connections in regenerant line for leaks. c. Clean drain control.
Flowing or dripping water at drain or regenerant line after regeneration.	a. Valve stem return spring weak. b. Debris is preventing valve disc from closing.	a. Replace spring. (Contact dealer). b. Remove debris.
Hard water leakage after regeneration.	a. Improper regeneration. b. Leaking of external bypass valve. c. O-Ring around riser pipe damaged. d. System capacity too low due to incorrect resin volume setting	a. Repeat regeneration after making certain correct regenerant dosage was set. b. Replace bypass valve. (Contact dealer). c. Replace O-ring d. Reset control and program resin volume to correct setting
Control will not draw regenerant, or intermittent or irregular draw.	a. Low water pressure. b. Restricted drain line. c. Injector plugged. d. Injector defective. e. Valve disc B1 and/or B2 not fully open.	a. Make correct setting according to instructions, 25 psi dynamic pressure minimum. b. Remove restriction. c. Clean injector and screen. d. Replace injector and cap. (Contact dealer). e. Remove foreign matter from disc and check disc for closing by pushing in on stem. Replace if needed. (Contact dealer).
Control will not regenerate automatically.	a. AC adapter or motor not connected. b. Defective motor. c. Fouled or defective turbine. d. Defective turbine cable.	a. Connect power. b. Replace motor. (Contact dealer). c. Clean or replace turbine assembly. d. Replace turbine cable.
Control regenerates at wrong time of day.	a. Controller set incorrectly.	a. Correct the time setting according to instructions.
No conditioned water after regeneration.	a. No regenerant in regenerant tank. b. Injector plugged.	a. Add regenerant to regenerant tank. b. Clean injector and screen.
Backwashes or purges at excessively low or high rate.	a. Incorrect drain controller used. b. Foreign matter affecting valve operation.	a. Replace with correct size controller (Contact dealer). b. Remove drain controller and clean.
Run out of conditioned water between regenerations.	a. Improper regeneration. b. Incorrect resin volume setting	a. Repeat regeneration, b. Reset control and program resin volume to correct setting
Control displays 1 - x (1 thru 4)	a. Control is in test mode	a. Press control keys in order from left to right.

Magnum Valve Cartridge Troubleshooting

This procedure provides sequential troubleshooting steps to isolate a suspect cartridge. Figure 37 displays the locations of all cartridges.

Note: The Dynamic Pressure applied to the valve must be greater than 25 psi at all times when performing the following tests. If a cartridge needs to be removed, follow the cartridge removal procedure in the next section.

There are four symptoms that may require a cartridge to be removed and inspected or replaced.

1. A constant leak from the pilot drain in any cycle position. A small discharge of water from the pilot drain while transitioning from one cycle to the next is normal. A leak from the pilot drain could be caused by the following:
   a. Diaphragm failure in one of the valve cartridges. See Table 9 for troubleshooting faulty cartridges.
   b. Debris may prevent the flappers from closing.

Inspect discs and seats.

Table 9 Troubleshooting Faulty Cartridges

Quick cycle the Logix Magnum to each cycle indicated below. If the pilot drain leak stops in a particular cycle, remove the cartridge listed in the right column. Inspect for wear or damage.	
No Leak During	**Cartridge**
Service Cycle	#3 Outlet
Backwash	#1 Drain
Brine/Slow Rinse	#2 Rinse
Fast Rinse	#2 Rinse or #4 Inlet

2. A leak to the main 1.5-inch drain valve port.
   a. If the system is newly installed, ensure that the start-up procedure has been properly followed. Refer to the Service Manual or the start up sheet packed in the shipping carton of the Magnum valve.
   b. If the system has been operating correctly for a period of time and is now leaking, see Table 10.

Table 10 Magnum Valve Leak to Main Drain Troubleshooting

Regenerate the unit if the media bed is exhausted, then proceed to the following steps:
1. Test the water leaking from the 1.5-inch drain port of the Magnum valve. It if is treated, remove and inspect the #2 Rinse cartridge.
2. If the water leaking to the 1.5-inch drain port is untreated, remove and inspect the #1 Drain cartridge.

3. Leakage of untreated water to service.
   a. Leak at riser pipe seal or any other cause mentioned in Service Manual.
   b. Bypassing of untreated water by #4 Inlet cartridge, remove and inspect.

4. Leak between the main valve body and the cartridge assembly.
   a. Remove and replace the two small O-rings at the 5:30 and 6:30 positions of the cartridge. The part number for the O-ring set is P/N 1010116.

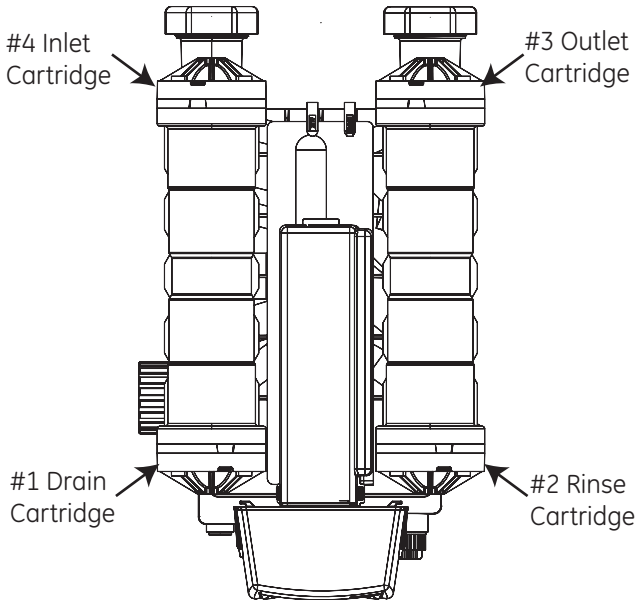


Figure 37 Logix Magnum Control

Note: Replacement cartridges are only available as complete assemblies:

Cartridge #1	Drain	P/N 1000366
Cartridge #2	Fast Rinse	P/N 1000365
Cartridge #3	Service	P/N 1000366 (No bypass)
Cartridge #3	Service	P/N 1000336 (Cap only for bypass)
Cartridge #4	Inlet	P/N 1000317

Magnum Valve Cartridge Removal Procedure

Removal of cartridges should be done only after reviewing all other possible causes of the problem(s) being addressed. There may be some difficulty removing cartridges in valves that have been in service for a period of time. Scale or iron build up around the O-ring seals may cause breakage in the cage assembly of the cartridge. If this occurs the cartridge must be replaced.

To remove the number 1 or number 2 cartridges the control must be removed first.

What follows is a step-by-step procedure for cartridge removal:

1. Remove the four bolts securing the cartridge.
2. There are two parts or sections in the “cap” of the cartridge assembly. The first part is the cover for the diaphragm. The second part is attached to the main cartridge assembly. This part is in contact with the body of the Magnum valve. When referring to inserting screwdrivers for cartridge removal it is the area between the Magnum valve body and the second part of the cartridge that is being referred to. See Figure 38.
3. A small flat blade screwdriver should be inserted as indicated in drawing. Pry a small opening between the Magnum valve body and the second part of the cartridge. This allows the insertion of two larger flat blade screwdrivers that are used to remove the cartridge.
4. Insert the two larger flat blade screwdrivers at the 10 o’clock and 2 o’clock positions on the cartridge. These should be inserted approximately 1/2 inch into the opening created by the small blade screwdriver. Use the two screwdrivers to slowly move the cartridge out of the valve body.
5. The cartridge should be removed for inspection. Look for damaged O-ring or debris on sealing surface ring of poppet.

There are two nipples, one on either side of the bottom center on the inside of the cartridge cap. They transfer water to and from the diaphragm. There are two O-rings associated with the nipples. The O-rings must be in place when the cartridge is re-installed into the valve body.

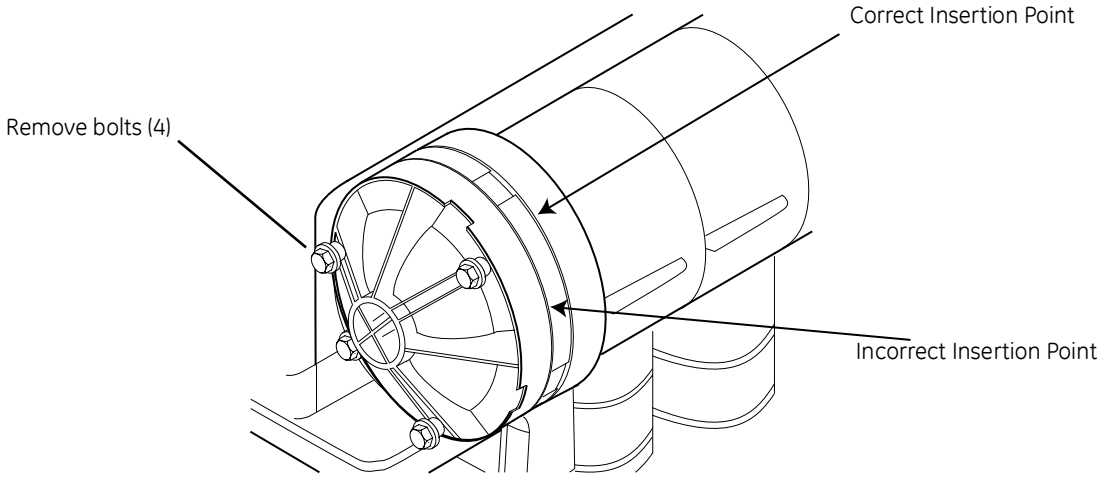
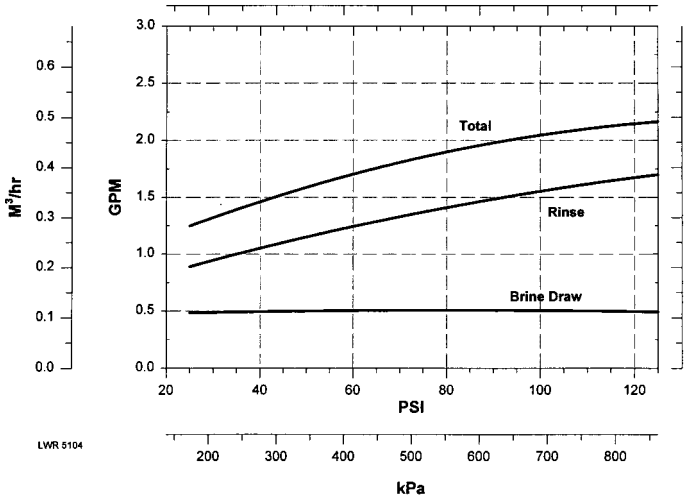


Figure 38

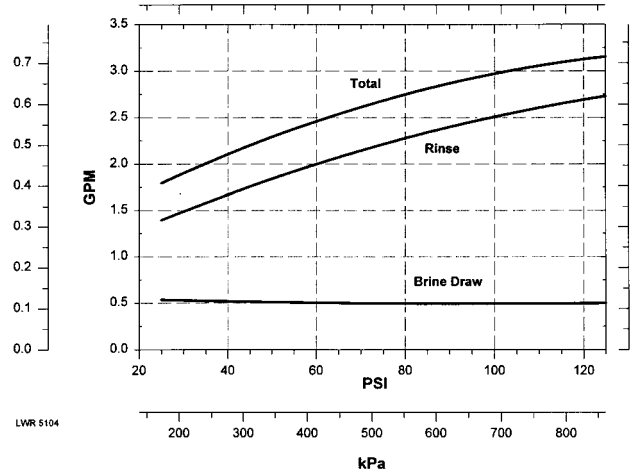
Performance Injectors

Injector Charts

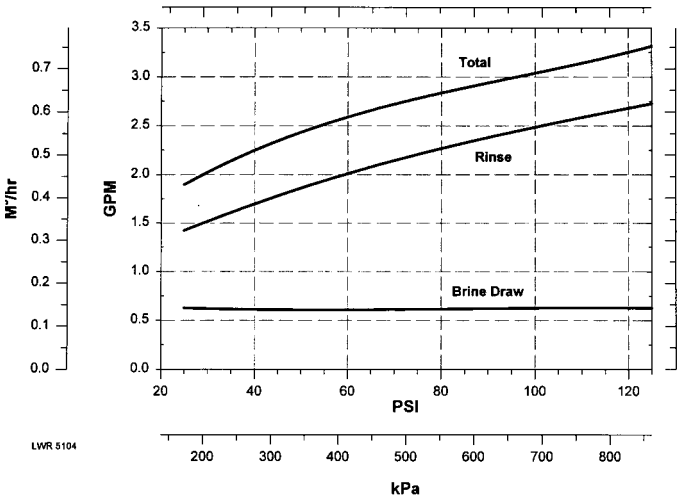
Injector # 1000441
Typical for 14-inch Tank*



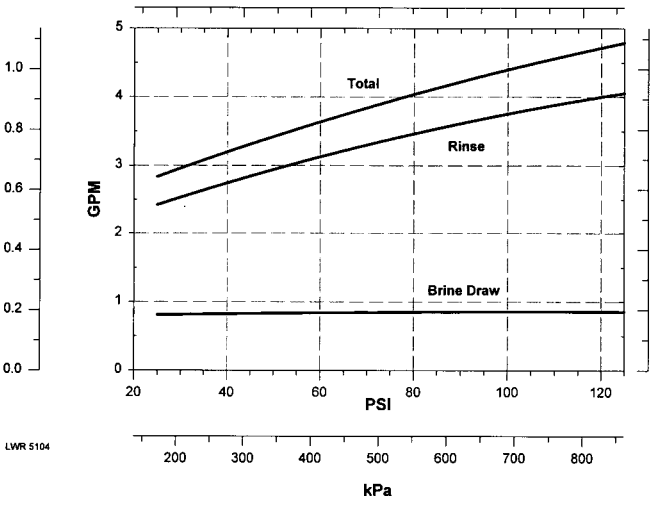
Injector # 1000442
Typical for 16-inch Tank*



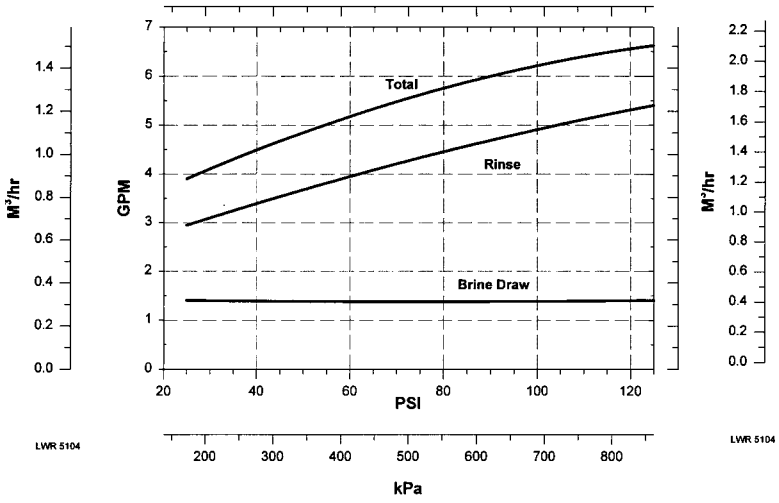
Injector # 1000443
Typical for 18-inch Tank*



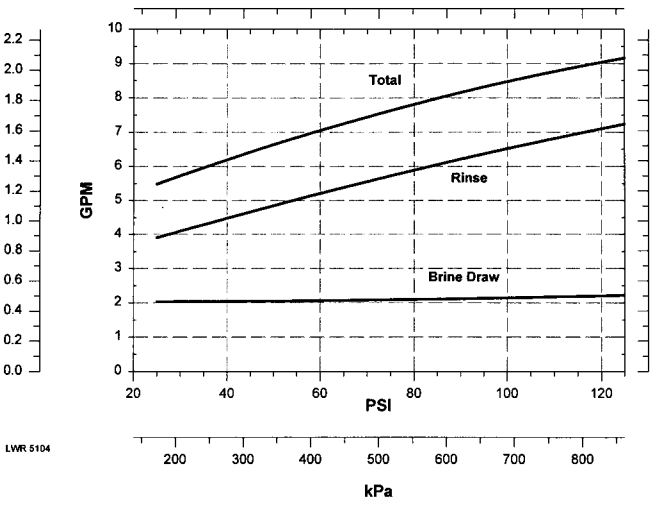
Injector # 1000444
Typical for 21-inch Tank*



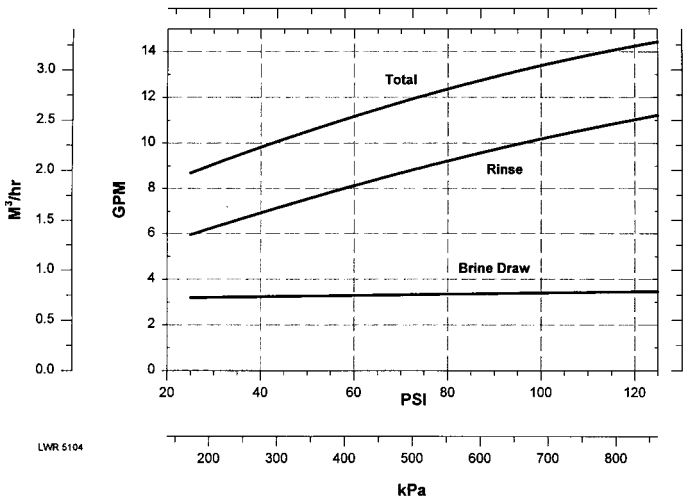
Injector # 1000445
Typical for 24-inch Tank*



Injector # 1000446
Typical for 30-inch Tank*



Injector # 1000447
Typical for 36-inch Tank*



*Brine draw and Rinse rates on empty tank.

Refill Control Identification

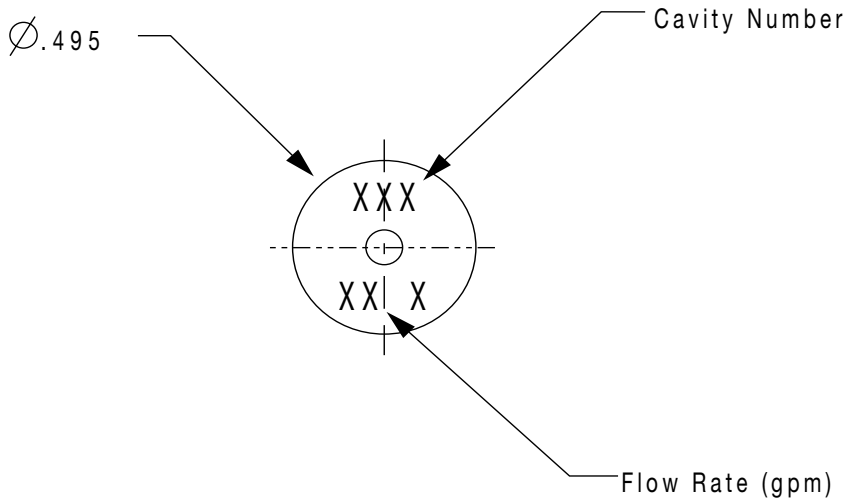


Table 11 Magnum Refill Control Chart (P/N Indicates 3-Pack)

Part Number	Tank Diameter In. (cm)	Flow Rate GPM (LPM)
1040679	14 (35.6)	0.7 (2.65)
1040680	16 (40.6)	0.8 (3.03)
1040681	18 (45.7)	1.0 (3.79)
1040682	21 (53.3)	1.4 (5.30)
1040683	24 (61.0)	2.0 (7.57)
1040684	30 (76.2)	3.0 (11.36)
1040685	36 (91.4)	5.0 (18.93)

NOTE: All flow rates are based on an inlet pressure of 60 psig (413 kPa). Actual rates vary with pressure, temperatures and other system variables.

Drain Line Flow Control

Table 12 Drain Line Flow Controls (5 gpm - 40 gpm)

Part Number	Flow Control Disk		Insert 1	Insert 2	Insert 3	Insert 4
	gpm	m^3/h				
1040720	5	1.135	Blue	Black	Black	Black
1040721	6	1.362	Red	Black	Black	Black
1040722	7	1.589	Brown	Black	Black	Black
1040723	8	1.816	Green	Black	Black	Black
1040724	9	2.043	White	Black	Black	Black
1040725	10	2.27	Blue	Blue	Black	Black
1040726	11	2.497	Red	Blue	Black	Black
1040727	12	2.724	Red	Red	Black	Black
1040728	13	2.951	Brown	Red	Black	Black
1040729	14	3.178	Brown	Brown	Black	Black
1040740	15	3.405	Blue	Blue	Blue	Black
1040741	16	3.632	Green	Green	Black	Black
1040742	17	3.859	White	Green	Black	Black
1040743	18	4.086	White	White	Black	Black
1040744	19	4.313	White	Orange	Black	Black
1040745	20	4.54	Blue	Blue	Blue	Blue
1040746	21	4.767	Brown	Brown	Brown	Black
1040747	22	4.994	Green	Green	Red	Black
1040748	23	5.221	Green	Green	Brown	Black
1040749	24	5.448	Red	Red	Red	Red
1040730	25	5.675	Green	Green	White	Black
1040731	26	5.902	White	White	Green	Black
1040732	27	6.129	White	White	White	Black
1040733	28	6.356	Brown	Brown	Brown	Brown
1040734	29	6.583	Brown	Brown	Brown	Green
1040735	30	6.81	Orange	Orange	Orange	Black
1040736	31	7.037	Green	Green	Green	Brown
1040737	32	7.264	Green	Green	Green	Green
1040738	33	7.491	Green	Green	Green	White
1040739	34	7.718	Green	Green	Green	Orange
1040750	35	7.945	White	Green	Green	Green
1040751	36	8.172	White	White	White	White
1040752	37	8.399	White	White	White	Orange
1040753	38	8.626	Orange	Orange	Orange	Green
1040754	39	8.853	Orange	Orange	Orange	White
1040755	40	9.08	Orange	Orange	Orange	Orange

NOTE: Drain Line Flow Controls above 40 gpm require external control installed in drain line.

Recommended Backwash Flow Rates for Various Media

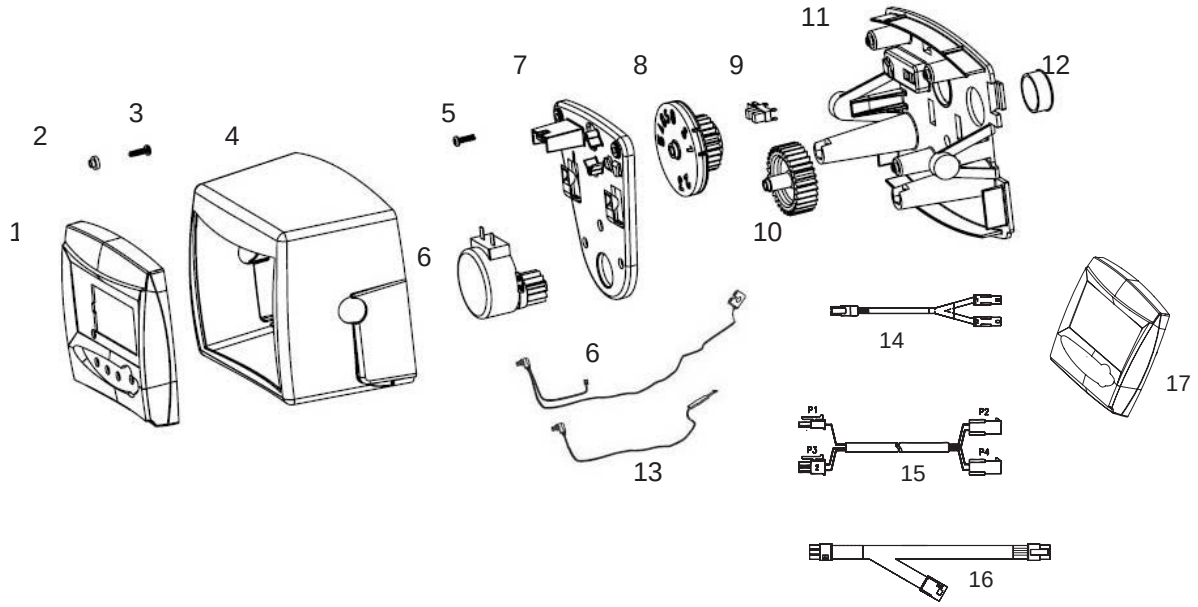
Table 13 Recommended Backwash Flow Rates for Various Media

Media	Tank Diameter						
	14 in (35.6 cm) Tank	**16 in (40.6 cm) Tank**	**18 in (45.7 cm) Tank**	**21 in (53.3 cm) Tank**	**24 in (61.0 cm) Tank**	**30 in (76.2 cm) Tank**	**36 in (91.4 cm) Tank**
	Drain Line Flow Control in GPM						
*Softening Resin (5.0 gpm/ft^2) (12.25 m/h/cm^2)	5	7	9	12	15	25	35
*Fine Mesh Softening Resin (2.8 gpm/ft^2) (6.86 m/h/cm^2)	3	4	5	7	9	14	20
Multi Layer (15 gpm/ft^2) (36.75 m/h/cm^2)	15	20	25	36	50	70	105
Birm, Greensand, Carbon (10 gpm/ft^2) (24.5 m/h/cm^2)	10	15	17	25	30	50	70

*50 ^{o}F (10^{o}C) water temperature, 50% bed expansion

Parts Lists

764 Logix Magnum Exploded View



Item No.	Qty.	Part Number - Kits	Part Number	Description
1	1		3022006	764 Series Logix Control - North American
2	2		1266224	Bushing, Logix Mount
3	2		1005981	Screw
4	1		1262674	Cover, Logix Magnum
5	2	1233809	1005981	Screw
6	1		1238861	Motor, Logix Cable Assembly
7	1		1262673	Gear Plate, Logix
8	1		1262581	Drive Gear, Logix
9	1		1235373	Optic Sensor
10	1		1262672	Idler Gear, Logix
11	1		1262580	Back Plate, Logix Magnum
12	1		1239647	Bushing, Cable
13	1		1266722	Meter Cable, 32 inches
14	1		3016715	Assembly, Sensor Cable Logix Twin
15	1		3016775	Assembly, Cable Extension 3 m (9.8 ft) Logix Twin
16	1		3020228	Kit, Assembly Cable Remote Start/Multi-Tank Lockout 3 m (9.8 ft)
17	1		1254886	Secondary Faceplate with out items 2 & 3
*			1000827	Outdoor Cover

* Not shown.

Replacement Components: Logix Magnum Conditioner/ Filters

Camshaft and Pilot Valve Assembly

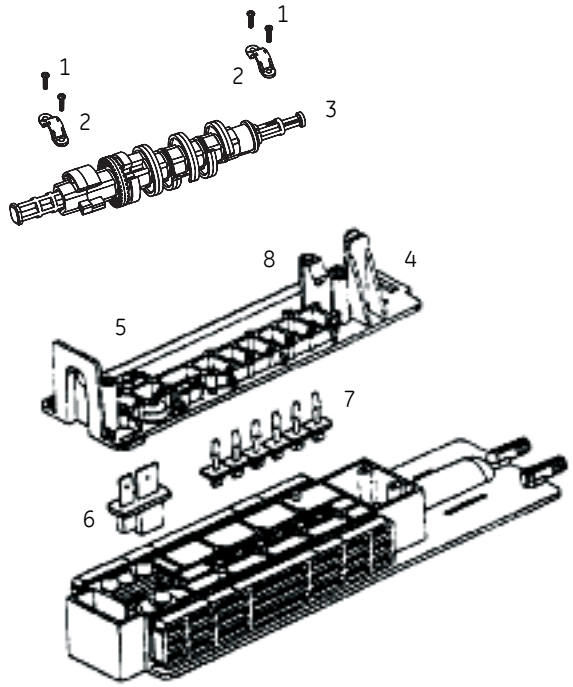
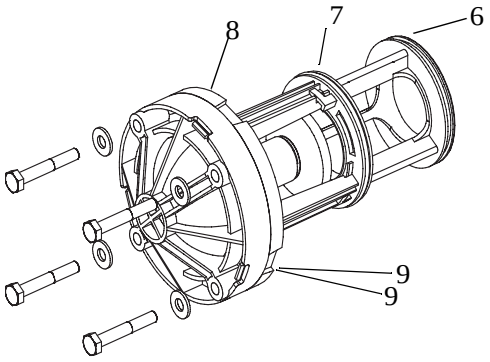


Table 14 Assembly Parts

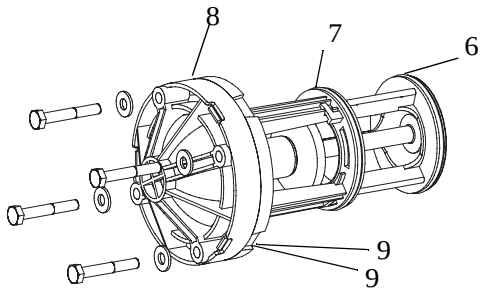
Item Number	Part Number	Description
1	1005953	Screw, Pillow Block
2	1000589	Pillow Block
3*	1001751 1267726	Logix Multi Tank Camshaft, “A”, “P”, or “L” Types Logix Single Tank Magnum Camshaft, “L” Types
4	1000339	Top Plate
5	1234170	Screw Short, Top Plate
6	1000391	Brine Valve Disc
7	1000328	Pilot Valve Disc
8	1005953	Screw Long, Top Plate

* Single tank camshaft allows the unit to go into Service during Refill.

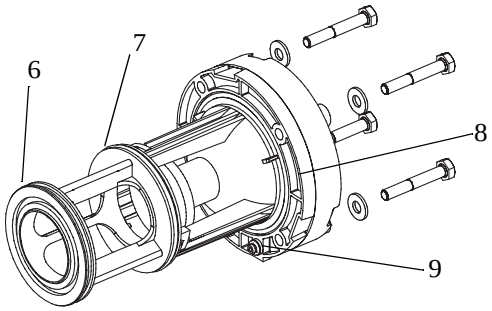
Magnum Valve Cartridges



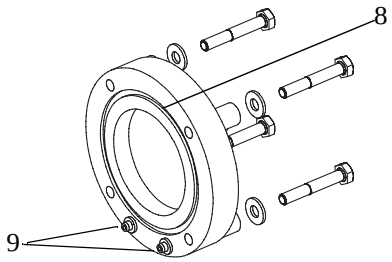
1 - Drain Valve Cartridge



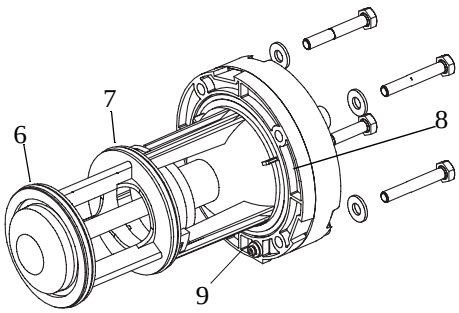
2 - Rinse Valve Cartridge



3 - No Hard Water Bypass Valve Cartridge



4 - Hard Water Bypass Cap

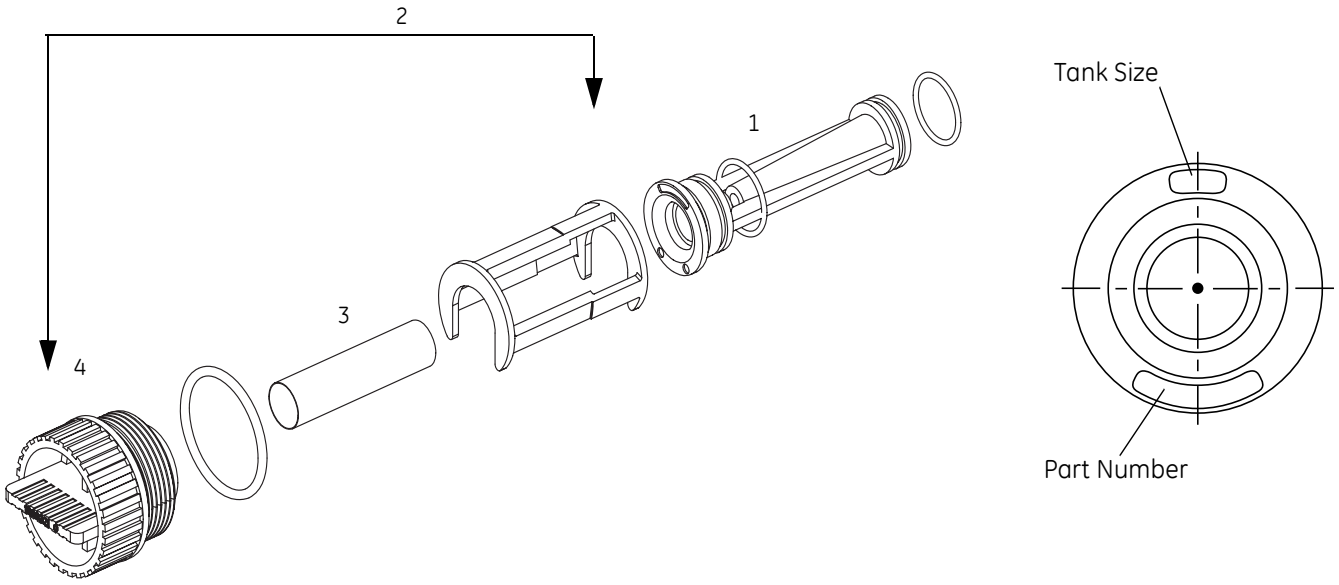


5 - Inlet Valve Cartridge

Item	Part Number	Description
1	1000366	Drain Valve Cartridge, Single Seat - Spring Assisted
2	1000365	Rinse Valve Cartridge, Double Seat - Spring Assisted
3	1000366	No Hardwater Bypass Valve Cartridge, Single Seat - Spring Assisted
4	1000336	Hardwater Bypass Cap
5	1000317	Inlet Valve Cartridge, Double Seat - No Spring Assist
6	1010157	O-Ring
7	1010158	O-Ring
8	1231646	O-Ring
9	1010116	O-Ring (qty. 2 per Cartridge)

NOTE: Items 1 and 3 are identical valve cartridges.

Injector Assembly

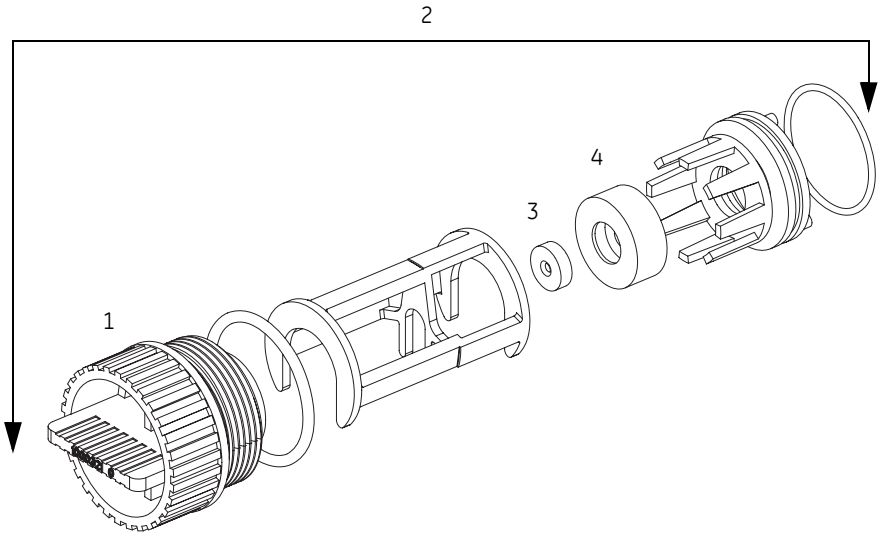


Item	Part Number	Description
1	1040670	Injector for 14-inch (35.6 cm) Tank - 0.5 GPM (1.9 LPM) (includes O-rings)
	1040671	Injector for 16-inch (40.6 cm) Tank - 0.5 GPM (1.9 LPM) (includes O-rings)
	1040672	Injector for 18-inch (45.7 cm) Tank - 0.6 GPM (2.27 LPM) (includes O-rings)
	1040673	Injector for 21-inch (53.3 cm) Tank - 0.9 GPM (3.41 LPM) (includes O-rings)
	1040674	Injector for 24-inch (61.0 cm) Tank - 1.4 GPM (5.3 LPM) (includes O-rings)
	1040675	Injector for 30-inch (76.2 cm) Tank - 2.0 GPM (7.57 LPM) (includes O-rings)
	1040676	Injector for 36-inch (91.4 cm) Tank - 3.3 GPM (12.5 LPM) (includes O-rings)
	1040669*	Injector, Blank (includes O-rings)
2	1040677	Injector Assembly (Less Injector)
3	1040678	Injector Screen (3 pack)
4	1040688	Cap (including O-rings)

NOTE: All flow rates are based on an inlet pressure of 60 psig (413 kPa). Actual rates vary with pressure, temperatures and other system variables.

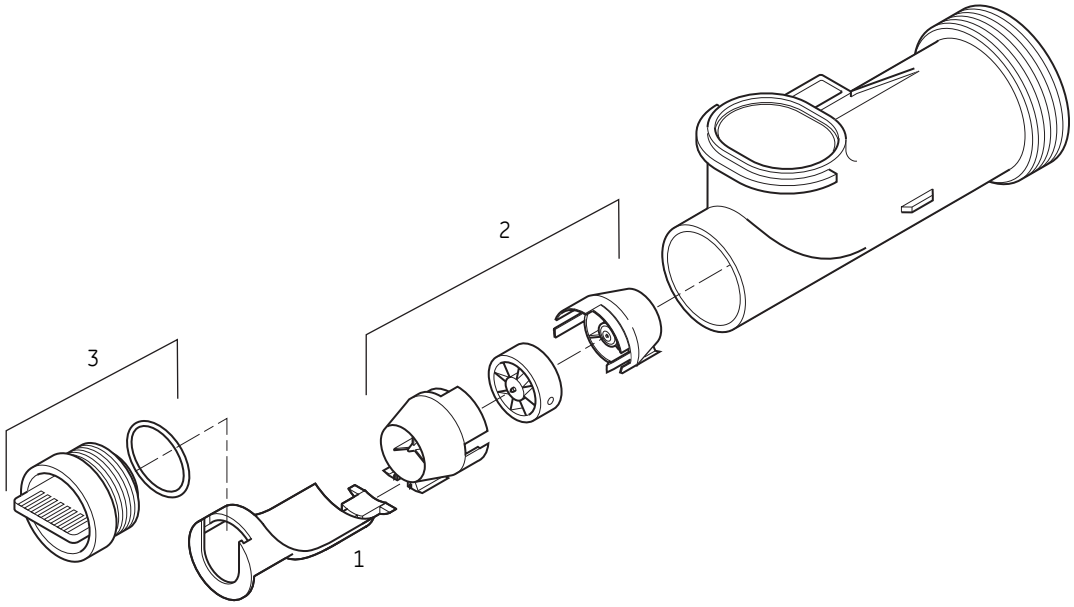
*Filter applications only.

Refill Flow Control Assembly



Item	Part Number	Description
1	1040688	Cap (includes O-ring)
2	1040687	Refill Assembly (Less Refill Flow Control)
3	1040679	Refill Flow Control for 14-inch (35.6 cm) Tank - 0.7 GPM (2.6 LPM) (3 pack)
	1040680	Refill Flow Control for 16-inch (40.6 cm) Tank - 0.8 GPM (3.0 LPM) (3 pack)
	1040681	Refill Flow Control for 18-inch (45.7 cm) Tank - 1.0 GPM (3.8 LPM) (3 pack)
	1040682	Refill Flow Control for 21-inch (53.3 cm) Tank - 1.4 GPM (5.3 LPM) (3 pack)
	1040683	Refill Flow Control for 24-inch (61.0 cm) Tank - 2.0 GPM (7.6 LPM) (3 pack)
	1040684	Refill Flow Control for 30-inch (76.2 cm) Tank - 3.0 GPM (11.4 LPM) (3 pack)
	1040685	Refill Flow Control for 36-inch (91.4 cm) Tank - 5.0 GPM (19.0 LPM) (3 pack)
4	1040686	Refill Flow Control Cage (3 pack)

Magnum IT Flow Sensor Assembly



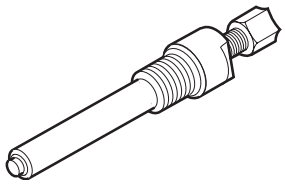
Item	Part Number	Description
1	1000074	Insert, Corner 2-inch
2	1232965	Assembly, Turbine 2-inch Elbow
3	1000318	Assembly, Cap

Installation Adapter Kits

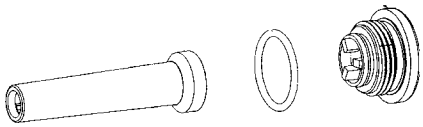
Adapters-Magnum IT

Item	Part Number	Description
Not Shown	3023849	Magnum IT Adapter Kit - Stainless Steel NPT for inlet, outlet, drain
Not Shown	3023674	Magnum IT Adapter Kit - Stainless Steel BSP for inlet, outlet, drain
Not Shown	1040784	Magnum IT Adapter Kit - CPVC for inlet, outlet, drain
Not Shown	3023860	2-inch NPT Stainless Steel Adapter with Zinc Diecast Nut (24 Pack)
Not Shown	3023829	2-inch BSP Stainless Steel Adapter with Zinc Diecast Nut (24 Pack)
Not Shown	1040788	2-inch CPVC Adapter with Zinc Diecast Nut (24 Pack)
Not Shown	1030664	2-inch Cast Zinc Diecast Nut
Not Shown	3014558	2-inch Stainless Steel NPT Adapter
Not Shown	3023879	2-inch Stainless Steel NPT Adapter with Drilled and Tapped 1/4-inch NPT Port
Not Shown	3014559	2-inch Stainless Steel BSP Adapter
Not Shown	3023848	2-inch Stainless Steel BSP Adapter with Drilled and Tapped 1/4-inch BSP Port
Not Shown	1030666	2-inch CPVC Adapter
Not Shown	1030667	63-mm Metric PVC Adapter
Not Shown	1010160	1.5-inch Adapter O-Ring
Not Shown	1010165	2.0-inch Adapter O-Ring
Not Shown	3024790	Stainless Steel Tank Adapter - 4-inch - 8UN Threads
Not Shown	3024788	Stainless Steel Flange
Not Shown	3023732	1-1/2-inch NPT Adapter Kit, includes inlet, outlet, and drain
Not Shown	3023736	1-1/2-inch BSP Adapter Kit, includes inlet, outlet, and drain

Miscellaneous Kits and Assemblies



External Pilot Feed Adapter



Pilot Filter Screen Assembly

Internal Pilot System Check Valve

Part Number	Description
1000226	Pilot Screen Assembly (includes Pilot Screen, Pilot Screen Cap and O-ring)
1040691	Valve O-ring Kit (tank adapter O-ring, (3) O-rings for 1-1/2-inch inlet, outlet, drain and distributor O-ring)
1040692	Pilot Flapper Kit (pilot, brine and springs)
1040668	External Pilot Feed Adapter (separate source pilot water)
3025780	Internal Pilot System Check Valve
1000878	Outdoor Cover
1009115	Top Stacking Distributor
1005953	Top Plate Screws (15 req'd)
1006093	Top Plate Screws (5 req'd)
1010162	Tank Adapter O-ring
1010160	Riser Tube O-ring
3025780	Internal Pilot System Check Valve

P/N 3020015 Rev. B NO08

RESIDENTIAL
CONTROL
VALVES

Performa™ Control Valves

263 and 268 Configurations

Pentair Water® offers a full range of Autotrol® Control Valves to meet all residential water conditioning applications.

Logix™ Series

740 Time Clock

- Simple, economic electronic time clock (chronometric)
- 7- or 99-day regeneration setting
- High efficiency regeneration sequence
- 12-volt operation
- Filter or conditioner setting in one control
- Operates 255, 263, 268 with one controller

742 Time Clock

Same features as the 740 Time Clock, plus:

- Fully programmable cycle times
- Salt setting in 1-pound increments
- Optional no-salt detector
- Operates 255, 263, 268, 278, and Magnum® IT with one controller

760 Demand

- Simple, economic electronic demand (volumetric)
- Calendar override
- 12-volt operation
- 28-day variable reserve
- High efficiency regeneration sequence
- Automatic capacity calculations
- Operates 255, 263, 268 with one controller

762 Demand

Same features as the 760, plus:

- Fully programmable cycle times
- Salt setting in 1-pound increments
- Optional no-salt detector
- Operates 255, 263, 268, 278, and Magnum IT with one controller

764 Demand

Same features as the 762, plus:

- Multi-tank applications (twin alternating, multi-tank parallel)
- Control lockout
- Remote regeneration

Autotrol
Pentair Water

RESIDENTIAL CONTROL VALVES

Performa™ Control Valves

263 and 268 Configurations

Specifications

Electrical

Controller Operating Voltage	12 Volt – AC (Requires use of Pentair Water®-supplied transformer)
Input Supply Frequency	50 or 60 Hz (Controller configuration dependent)
Motor Input Voltage	12 Volt – AC
Controller System Power Consumption	3 Watts average

Transformer – All Controllers

All Controllers require the use of a Pentair Water-supplied transformer.

Transformer Output Voltage	12 Volt – AC 400mA
Transformer Input Options	115 Volt – AC 50/60 Hz; 230 Volt – AC 50/60 Hz; 100 Volt – AC 50/60 Hz
Transformer Plug Options	Indoor North American Plug Outdoor North American (UL Listed for outdoor use) Japanese Plug Taiwan/Korea Plug Australian Plug United Kingdom Plug Mainland Europe Plug

Additional transformers may be available – call for more information.

Design Specifications/Ratings

Valve Body	Glass-filled thermoplastic – NSF Listed material
Rubber Components	Compounded for cold water – NSF Listed material
Valve Materials Certification	WQA Gold Seal Certified to ORD 0902 and NSF/ANSI 44 Rated component for material safety
Weight (Valve with Control)	5.34 lbs (2.42 kg)
Recommended Operating Pressure Canada	20 - 120 psi (1.38 - 8.27 bar) 20 - 100 psi (1.38 - 6.89 bar)
Hydrostatic Test Pressure	300 psi (20.69 bar)
Water Temperature	35° - 100°F (2° - 38°C)
Ambient Temperature*	35° - 120°F (2° - 48.9°C)

*Recommend use of outdoor cover for direct sunlight applications.

Options

Turbine for Demand Systems	Internal Standard Autotrol® 1-inch (25 mm) turbine
Bypass Valve, Model 1265	Thermoplastic, 1-inch flow path
Bypass Fitting Kits:	
Copper, Sweat Tube Adapter	1-1/4-inches, 1-inch or 3/4 inch (32 mm, 25 mm or 19 mm)
CPVC, Solvent Weld Tube Adapter	1-inch or 3/4-inch (25 mm or 19 mm)
Plastic NPT or BSPT Pipe Adapter	1-inch male or 3/4-inch male (25 mm or 19 mm)
Stainless Steel NPT or BSPT Pipe Adapter	1-inch male or 3/4-inch male (25 mm or 19 mm)
Brine Refill Controls	.14 gpm (.53 Lpm) fixed; .33 gpm (1.25 Lpm) fixed; .74 gpm (2.8 Lpm) fixed; 1.3 gpm (4.92 Lpm) fixed
Compatible with Regenerants/Chemicals	Sodium chloride, potassium chloride, potassium permanganate, sodium bisulfite†, sodium hydroxide†, hydrochloric acid†, chlorine†† and chloramines††

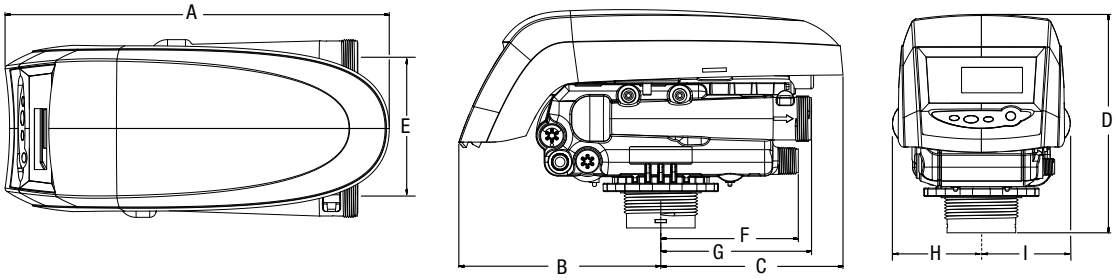
†See owners manual for specific concentrations. ††Valve for use on potable water supply.

Dimensions

Valve Connections

Tank Thread	2-1/2-inches – 8, male
Inlet/Outlet Threads	1-3/4-inches – 12 UNC-2A male
Drain Line	3/4-inch NPT, male
Brine Line	3/8-inch NPT, male
Distributor Tube Diameter	1.050 inches (27 mm)
Distributor Tube Length	1/2 ± 1/2-inches (13 ± 13 mm) above top of tank

Outline Dimensions



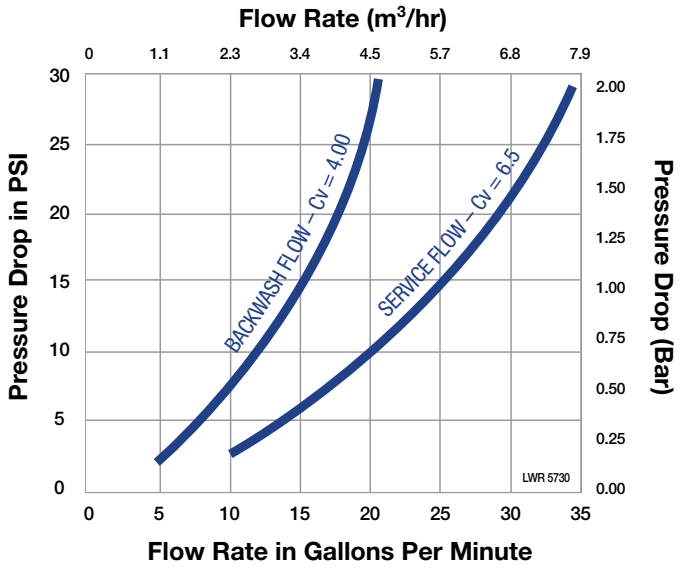
Units	A	B	C	D	E	F	G	H	I
inches	14.9	7.8	7.1	8.5	5.0	5.3	5.8	3.4	3.4
cm	37.8	19.9	17.9	21.5	12.7	13.5	14.8	8.7	8.7

Performance

Flow Rates (Valve Only)

Service @ 15 psi (1.03 bar) drop	25.0 gpm (5.7 m^3/h)
Backwash @ 25 psi (1.72 bar) drop	20.0 gpm (4.5 m^3/h)
Service	Cv = 6.50 (Kv = 5.6)
Backwash	Cv = 4.00 (Kv = 3.5)

Logix™ Series Controller Flow Rate Characteristics



Backwash Flow Control Table

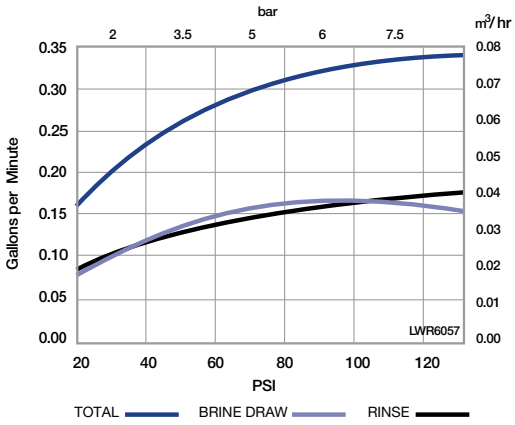
Backwash Number*	Flow Rate (gpm)	Flow Rate (lpm)
7	1.3	4.9
8	1.7	6.4
9	2.2	8.3
10	2.7	10.2
12	3.9	14.76
13	4.5	17.0
14	5.3	20.0

*Backwash flow controls sized for 5.0 gpm/ft^2.

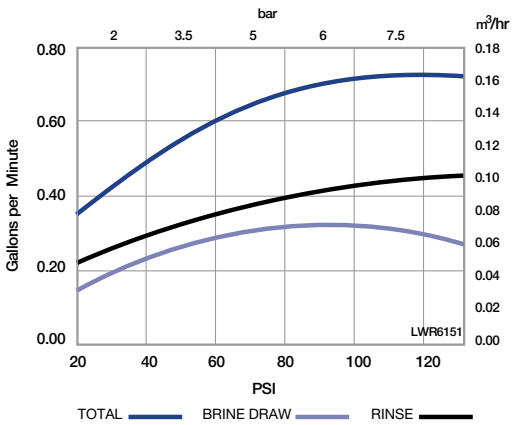
Injector* Performance

Logix™ Series Controllers

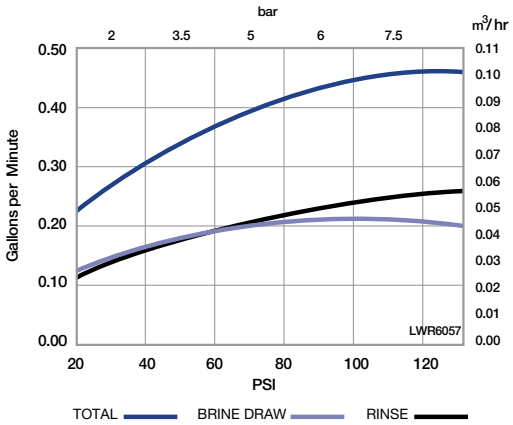
Injector "F" (Peach) For 7-inch Tanks



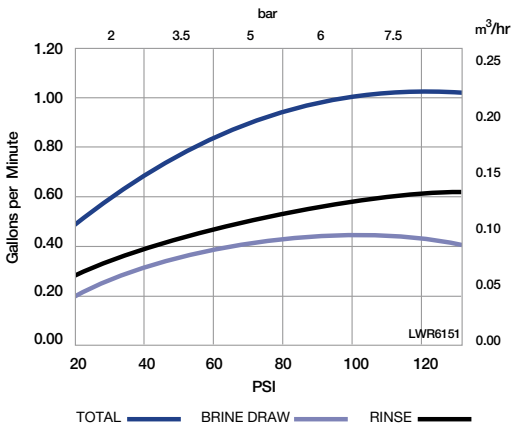
Injector "J" (Light Blue) For 10-inch Tanks



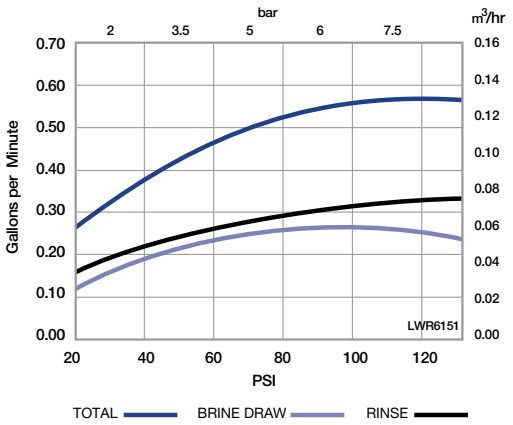
Injector "G" (Tan) For 8-inch Tanks



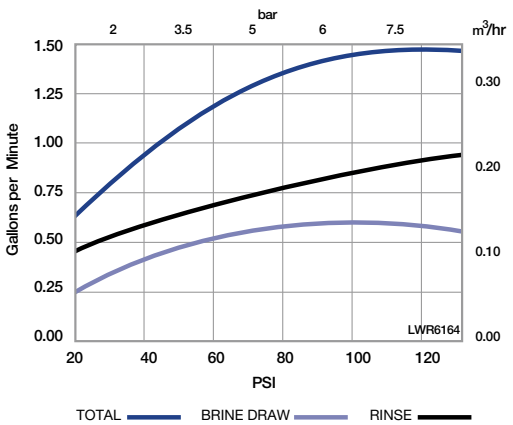
Injector "K" (Pink) For 12-inch Tanks



Injector "H" (Light Purple) For 9-inch Tanks



Injector "L" (Orange) For 13- and 14-inch Tanks



*New injectors for high-efficiency regeneration sequence are standard with Logix Controllers.

NOTE: Actual injector performance is dependent on the resin used, tank geometry, elevated drain, etc. This injector data was taken using an empty tank (no resin).

Pentair Water

20580 Enterprise Avenue
Brookfield, WI 53045
Tel: 262.784.4490
Fax: 262.784.7794

5730 North Glen Park Road
Milwaukee, WI 53209
Tel: 262.238.4400
Fax: 262.238.4402

1223489 Rev D FE10

Customer Care: 800.279.9404 www.pentairwatertreatment.com

740/760 Control
255 and Performa Series
Valves (268, 268FA)

Operation Manual

For Sales & Service questions please contact your dealer:

Your local dealer is:

TABLE OF CONTENTS

LOGIX™ SERIES INSTALLER QUICK-START SHEET

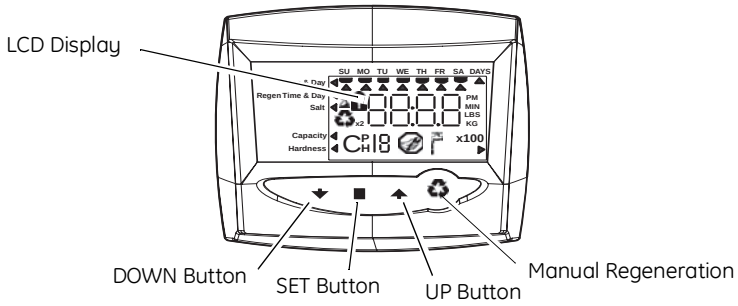
Logix Series Controllers

See *Determining If You Have a 740 or 760 Control* on page 24 to identify your controller.

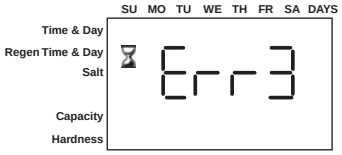
740 Controller - Electronic time clock control capable of doing 7-day (day of week) regeneration, or up to a 99 interval day regeneration. This control will operate both in a conditioner (softener) or 3-cycle filter mode with the same controller.

760 Controller - Electronic metered-demand (volumetric) controller which regenerates based on the water usage of the installation site. A calendar override is a standard feature on this controller.

The Logix Series will operate on both the 255 and Performa valve body series.



Initial Power-up

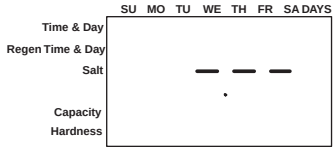


Initial Power Up - (CAMSHAFT proceeds to HOME position)

- At initial power-up, the camshaft will need to rotate to the HOME (in service) position.
- Camshaft may take 1-2 minutes to return to home position.
- Err 3 will be displayed until the camshaft returns to home.
- If more than 2 minutes elapses, verify that the motor is turning the camshaft. If it is not turning, see the troubleshooting section.

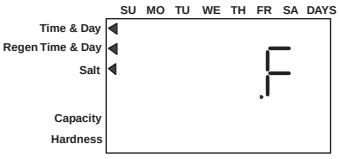
NOTE: The Logix controller features a self-test sequence. At first power-up of the control, you may see a number such as 1.00, 1.02,1.04, or 2.00, displayed. This is an indication that the self-test is not completed. To complete the test, verify that the turbine cable is connected. Blow into the turbine port (valve outlet) to spin the turbine. The controller will verify that the turbine works and the self test will finish. Proceed with the initial start up procedure.

Initial Start-up Step-by-step Instructions



Step 1: Program System Size

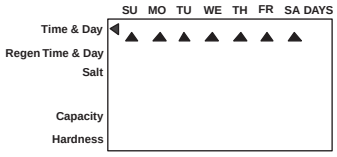
This step may have been performed by your system's OEM manufacturer. In this case, proceed to step 2.



- Input system size - resin volume - in cubic feet or liters.
- Use UP and DOWN buttons to scroll through resin volume choices.
- Choose the nearest volume to your actual system size.
- To choose a 3-cycle filter operation - press DOWN until an "F" is displayed.
- Press SET to accept the system size you've selected.
- If incorrect setting is programmed, see "Resetting the Control" section below.

Step 2: Program Time of Day

- While "12:00" is blinking, set the correct time of day.
- Use the UP and DOWN buttons to scroll to the correct time of day.
- "PM" is indicated, "AM" is not indicated.
- Press SET to accept the correct time of day and advance to the next parameter.

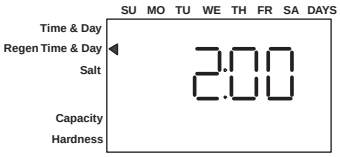


Step 3: Set Day of Week

- Press SET to make the arrow under SU flash.
- Use the UP and DOWN buttons to advance the arrow until it is under the correct day of week.
- Press SET to accept and advance to the next parameter.

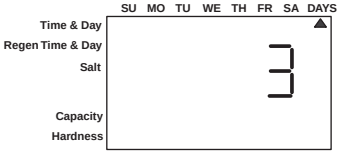
After steps 1-4, the controller will operate most systems. Proceed to step 5 if further adjustments to your system's programming is needed.

To exit the programming state, wait 30 seconds and the controller will automatically put you into the normal operating mode.



Step 4: Set Regen Time

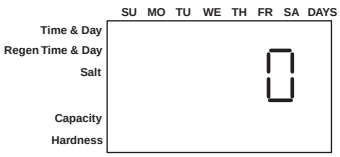
- 2:00 (AM) is the default time of regeneration. To accept this time, press the DOWN button to move to step 5.
- To change the regen time, press SET - causing 2:00 to flash.
- Use the UP and DOWN buttons to advance to the desired regen time.
- Press SET to accept the time and advance to the next parameter.



Step 5: Set Days to Regenerate (740 Time-clock Control Only)

- If using 760 control - proceed to step 5a.
- Set number of days between time-clock regeneration (regen frequency).
- Default time is 3 days.
- Days can be adjusted from 1/2 (.5) to 99 days.
- To change, press SET to make the "3" flash.
- Use the UP and DOWN buttons to change to the number of days desired.
- Press SET to accept the regen frequency, and advance to the next cycle.

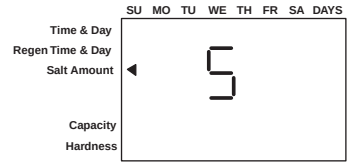
To use the 7-day timer option - see full Dealer Installation Manual.



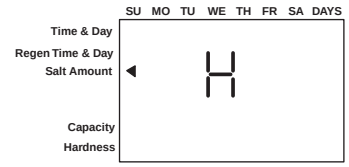
Step 5a: Set Calendar Override (760 Demand Control Only)

- If using 740 control - proceed to step 7.
- Set number of days for calendar override on demand control.
- "0" days is the default for calendar override.
- Days can be adjusted from 1/2 (.5) to 99 days.
- To change, press SET to make the "0" flash.

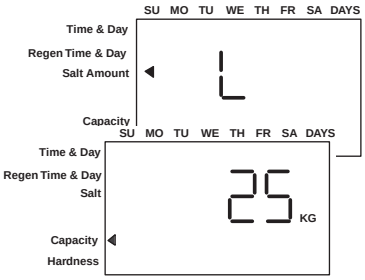
Standard Setting



High Capacity Setting



Low Setting (High Efficiency)



- Use the UP or DOWN buttons to change to the number of days desired.
- Press SET to accept the regen frequency, and advance to the next cycle.

Step 6: Amount of Regenerant used per Regeneration

- Set desired regenerant amount.
- Default setting is "S" standard salting.
- 3 salt settings are available on 740 and 760 controls:

  S – Standard Salt – 9 lbs/cubic foot of resin (120 grams/liter of resin)
  H – High Salt – 15 lbs/cubic foot of resin (200 grams/liter of resin)
  L – Low Salt – 3 lbs/cubic foot of resin (40 grams/liter of resin)

- Low Salt is the "Highly Efficient Mode".
- To change salt setting, press the SET button and use the UP and DOWN buttons to change to the desired setting.
- Press SET to accept the setting and advance to the next parameter.

See *Dealer Installation Manual* for more complete information on salt settings for different system sizes, capacities and expected efficiencies.

Step 7: Estimated Capacity

- System capacity is displayed in total kilograins or kilograms of hardness removed before a regeneration is necessary.
- Value is derived from the system's resin volume input, and salt amount input.
- The capacity displayed is a suggested value - as recommended by resin manufacturers.
- Capacity is only displayed for information purposes on 740 control - it does not (and cannot) need to be changed.
- To change capacity on 760 control, press SET to make the default capacity flash. Use the UP and DOWN buttons to increment to the desired capacity.
- Press SET to accept the setting and advance to the next parameter.

If using 740 control, programming is complete. The control will return you to the normal operation mode.

Step 8: Enter Hardness (760 Demand Control Only)

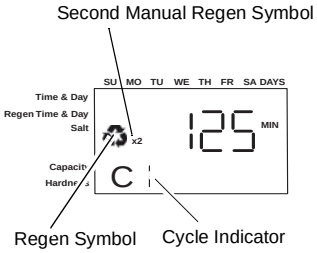
- Enter inlet water hardness at installation site.
- Default hardness setting is 25 grains (25 ppm for metric)
- To change hardness, press SET to make the setting flash. Use the UP and DOWN buttons to scroll to the correct hardness.
- Press SET to accept the entered hardness value.
- The control will return you to the normal operation mode.

Initial system programming is now complete. The control will return to normal operation mode, if a button is not pushed for 30 seconds.

For system start-up procedure, including: purging the mineral tank, refilling the regenerant tank, and drawing regenerant, see the *Initial Startup Step-By-Step Instructions* on page 31.

QUICK START

Manual Regeneration Procedures



To Initiate a Manual Regeneration:

- Press REGEN once for delayed regeneration.
  System will regenerate at next set regen time (2:00 AM).
  A flashing regen (recycle) symbol will be displayed.
- Press and hold REGEN for 5 seconds to initiate immediate manual regeneration. A solid regen symbol will be displayed.
- After immediate regeneration has begun, press REGEN again to initiate a second manual regeneration. An X2 symbol will be displayed, indicating a second regeneration will follow the first regeneration.

During a Regeneration:

- A "C#" is displayed to show current cycle.
- Total regen time remaining is displayed on screen.
- Press and hold SET to show current cycle time remaining.

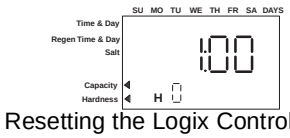
To Advance Regeneration Cycles:

- Press and hold SET - showing current cycle time.
- Simultaneously press SET and UP to advance one cycle.
  An hourglass will display while cam is advancing.
  When cam reaches next cycle, "C2" will be displayed.
- Repeat SET and UP to advance through each cycle.
- Press and hold SET and UP buttons for 5 seconds to cancel regen.
  Hourglass will begin flashing, indicating regen is cancelled.
  Camshaft will advance to home - may take 1-2 minutes.

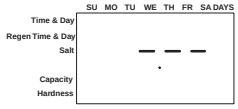
Regeneration Cycles:

- C1 - Backwash
- C2 - Regenerant Draw/Slow Rinse (not used in filter mode)
- C3 - Slow Rinse (not used in filter mode)
- C4 - System Pause (to repressurize tank)
- C5 - Fast rinse cycle 1
- C6 - Backwash cycle 2 (not used in filter mode)
- C7 - Fast Rinse cycle 2 (not used in filter mode)
- C8 - Regenerant refill (not used in filter mode)

Resetting The Control



Resetting the Logix Controller



Unprogrammed control after reset

To reset the control:

1. Press and hold SET and DOWN simultaneously for 5 seconds.
2. H0 and the system's set resin volume (or "F" mode) will be displayed.
3. If a history value other than "H0" is displayed, use the up arrow to scroll through the settings until "H0" is displayed.
4. To reset the control, press and hold SET for 5 seconds.
5. The control will be reset to an unprogrammed state.
6. Go to "Initial Set-up" section of this sheet to reprogram control.

WARNING: Resetting the control will delete all information stored in its memory. This will require you to reprogram the control completely from the initial power up mode.

Further programming or set-up instructions can be found in this manual

MANUAL OVERVIEW

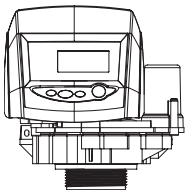
How To Use This Manual

This installation manual is designed to guide the installer through the process of installing and starting conditioners featuring the 700 Logix series controllers.

This manual is a reference and will not include every system installation situation. The person installing this equipment should have:

- Training in the 700 Logix series controllers and water conditioner installation
- Knowledge of water conditioning and how to determine proper control settings
- Basic plumbing skills
- The directional instructions "left" and “right" are determined by looking at the front of the unit.

Left Side Right Side



Icons That Appear In This Manual

WARNING: Failure to follow this instruction can result in personal injury or damage to the equipment.

NOTE: This will make the process easier if followed.

EQUIPMENT INSTALLATION

General Warnings And Safety Information

The 268 and 255 water conditioner's control valve conforms to NSF/ANSI 44 and 61 for materials and structural integrity only. Generic systems were tested and certified by WQA as verified by the performance data sheet.

Electrical

There are no user-serviceable parts in the AC adapter, motor, or controller. In the event of a failure, these should be replaced.

- All electrical connections must be completed according to local codes.
- Use only the power AC adapter that is supplied.
- The power outlet must be grounded.
- To disconnect power, unplug the AC adapter from its power source.

Mechanical

- Do not use petroleum based lubricants such as vaseline, oils, or hydrocarbon based lubricants. Use only 100% silicone lubricants.
- All plastic connections should be hand tightened. Teflon tape may be used on connections that do not use an O-ring seal. **Do not use pliers or pipe wrenches.**
- All plumbing must be completed according to local codes.
- Soldering near the drain line should be done before connecting the drain line to the valve. Excessive heat will cause interior damage to the valve.
- Observe drain line requirements.
- Do not use lead-based solder for sweat solder connections.
- The drain line must be a minimum of 1/2-inch diameter. Use 3/4-inch pipe if the backwash flow rate is greater than 7 GPM (26.5 Lpm) or the pipe length is greater than 20 feet (6 m).
- Do not support the weight of the system on the control valve fittings, plumbing, or the bypass.
- It is not recommended to use sealants on the threads. Use Teflon* tape on the threads of the 1-inch NPT elbow, the drain line connections, and other NPT threads.

**Teflon is a trademark of E.I. duPont de Nemours.*

General

- Observe all warnings that appear in this manual.
- Keep the media tank in the upright position. Do not turn on side, upside down, or drop. Turning the tank upside down will cause media to enter the valve.
- Operating ambient temperature is between 34°F (1°C) and 120°F (49°C).
- Operating water temperature is between 34°F (1°F) and 100°F (38°C).
- Working water pressure range is 20 to 120 psi (1.38 to 8.27 bar). In Canada the acceptable working water pressure range is 20 to 100 psi (1.38 to 6.89 bar).
- Use only regenerant salts designed for water softening. Do not use ice melting, block, or rock salts.
- Follow state and local codes for water testing. Do not use water that is micro biologically unsafe or of unknown quality.
- When filling media tank, do not open water valve completely. Fill tank slowly to prevent media from exiting the tank.
- When installing the water connection (bypass or manifold) connect to the plumbing system first. Allow heated parts to cool and cemented parts to set before installing any plastic parts. Do not get primer or solvent on O-rings, nuts, or the valve.

System Regeneration Cycles (7-Cycle Operation)

1. **Service (Downflow) — Cycle C0:**

   Untreated water is directed down through the resin bed and up through the riser tube. The hardness ions attach themselves to the resin and are removed from the water. The water is conditioned as it passes through the resin bed.

2. **Backwash (Upflow) — Cycles C1, C6:**

   The flow of water is reversed by the control valve and directed down the riser tube and up through the resin bed. During the backwash cycle, the bed is expanded and debris is flushed to the drain.

3. **Brine/Slow Rinse (Downflow) — Cycles C2, C3:**

   The control directs water through the brine injector and brine is drawn from the regenerant tank. The brine is then directed down through the resin bed and up through the riser tube to the drain. The hardness ions are displaced by sodium ions and are sent to the drain. The resin is regenerated during the brine cycle. Brine draw is completed when the air check closes.

4. **Repressurize Cycle — (Hard Water Bypass Flapper Open), Cycle C4:**

   This cycle closes the flappers for a short time to allow the air and water to hydraulically balance in the valve before continuing the regeneration.

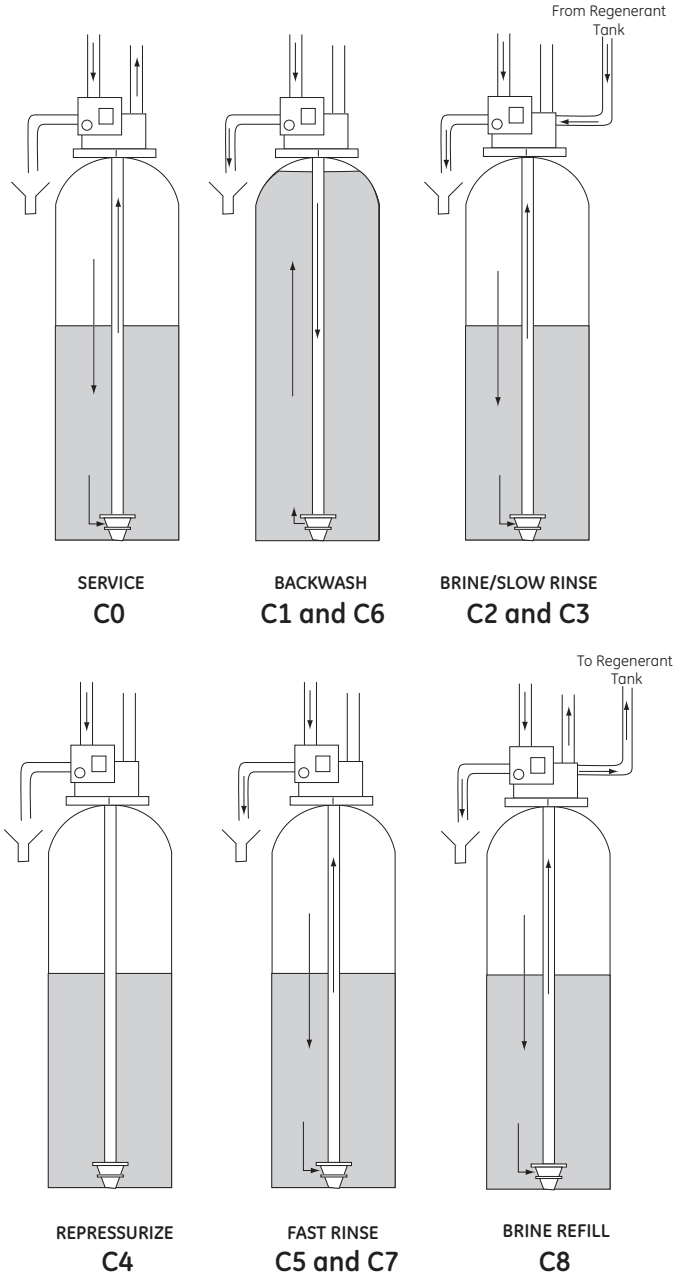
5. **Fast Rinse (Downflow) — Cycles C5, C7:**

   The control directs water down through the resin bed and up through the riser tube to the drain. Any remaining brine residual is rinsed from the resin bed.

6. **Brine Refill — Cycle C8:**

   Brine refill occurs during a portion of the fast rinse cycle. Water is directed to the regenerant tank at a controlled rate, to create brine for the next regeneration.

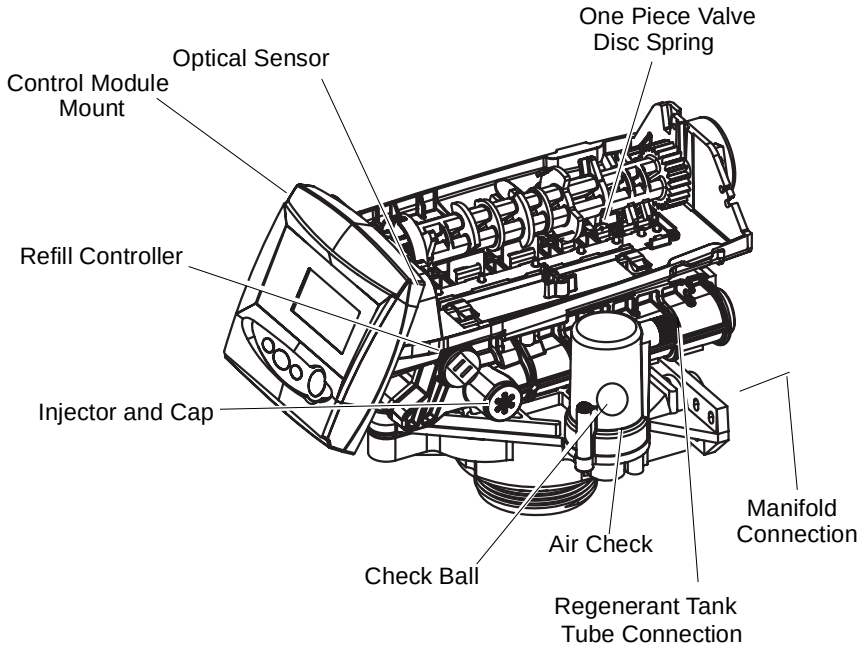
Figure 1



Valve Features

Figure 2
255 Valve Identification

Right Side



Left Side

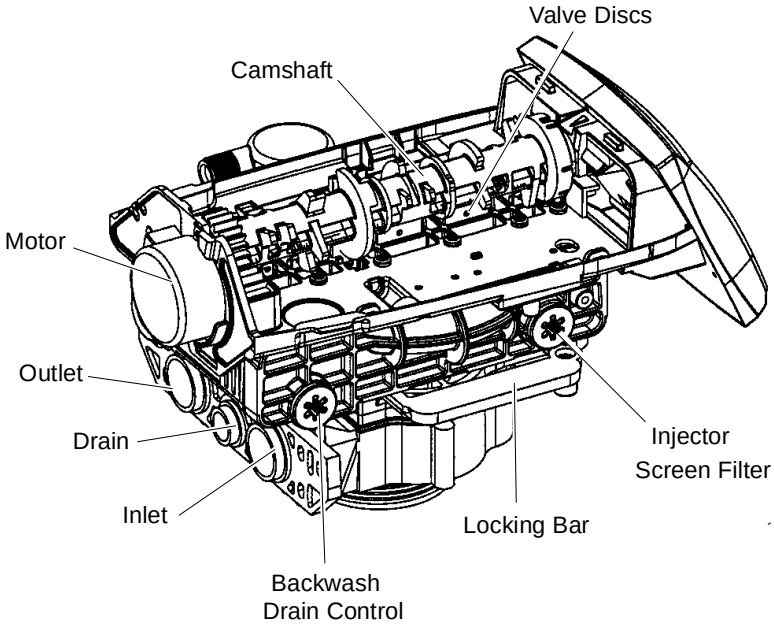
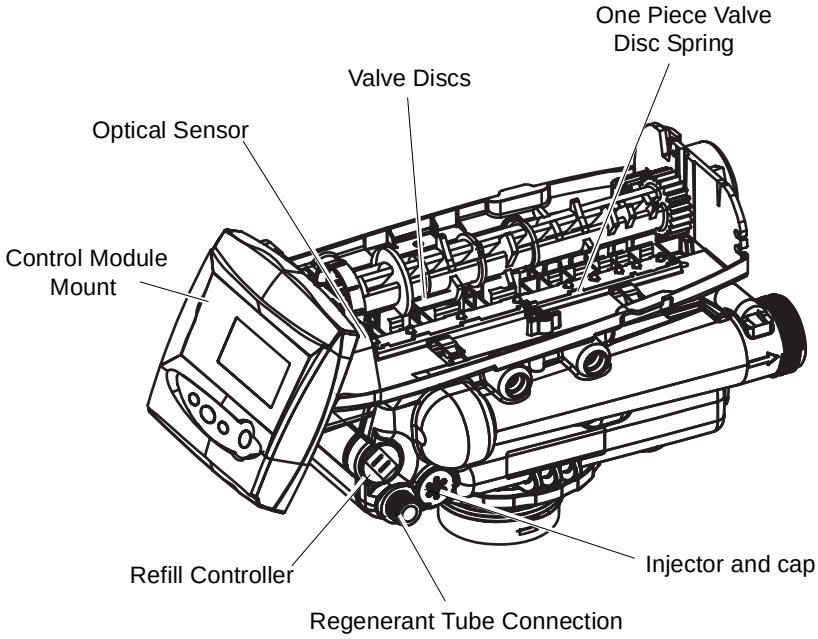


Figure 3
Performa Valve Identification



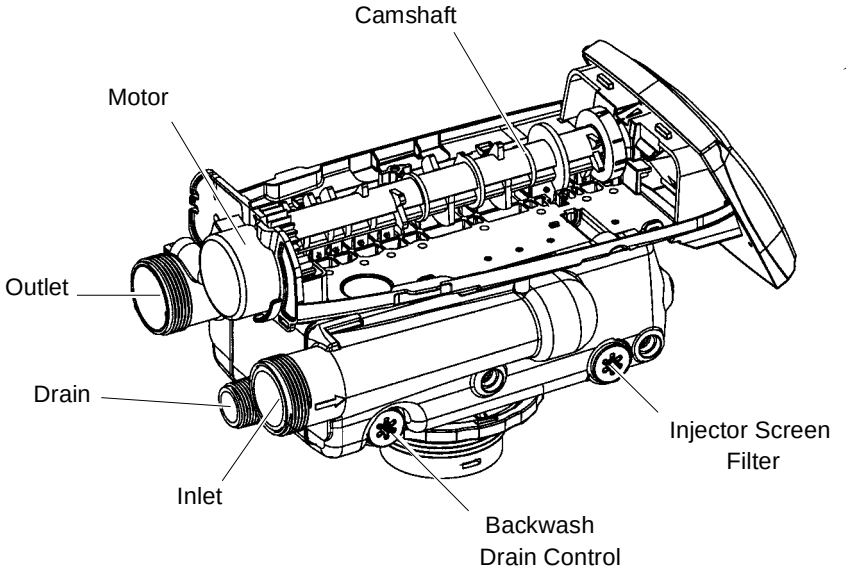
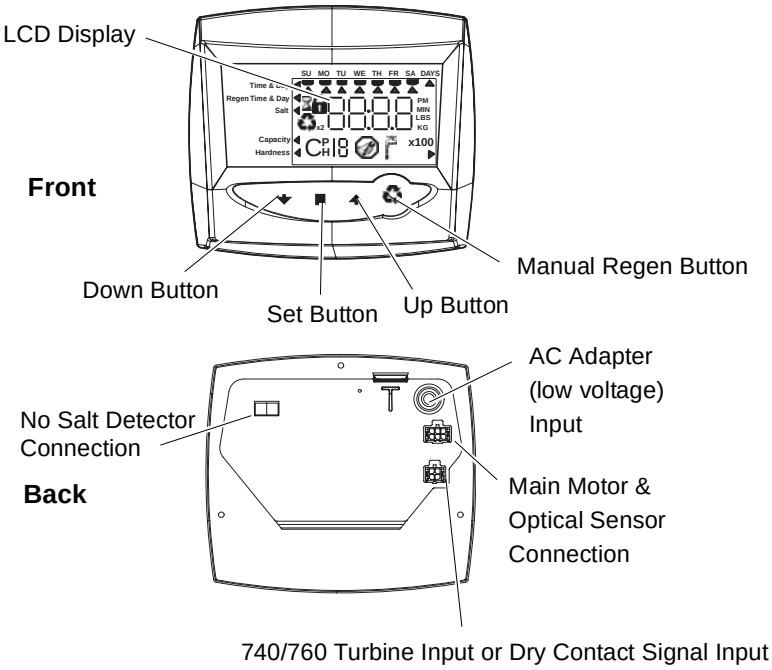


Figure 4
700 Series Controller Identification



Location Selection

Location of a water treatment system is important. The following conditions are required:

Left Side

- Level platform or floor
- Room to access equipment for maintenance and adding regenerant (salt) to tank.
- Ambient temperatures over 34°F (1°C) and below 120°F (49°C).
- Water pressure below 120 psi (8.27 bar) and above 20 psi (1.4 bar).
- In Canada the water pressure must be below 100 psi (6.89 bar).
- Constant electrical supply to operate the controller.
- Total minimum pipe run to water heater of ten feet (three meters) to prevent backup of hot water into system.
- Local drain for discharge as close as possible.
- Water line connections with shutoff or bypass valves.
- Must meet any local and state codes for site of installation.
- Valve is designed for minor plumbing misalignments. Do not support weight of system on the plumbing.
- Be sure all soldered pipes are fully cooled before attaching plastic valve to the plumbing.

Outdoor Locations

When the water conditioning system is installed outdoors, several items must be considered.

- Moisture — The valve and 700 controller are rated for NEMA 3 locations. Falling water should not affect performance.
  The system is not designed to withstand extreme humidity or water spray from below. Examples are: constant heavy mist, near corrosive environment, upwards spray from sprinkler.
- Direct Sunlight — The materials used will fade or discolor over time in direct sunlight. The integrity of the materials will not degrade to cause system failures.
  If it is necessary to locate the conditioner in direct sunlight, a protective outdoor cover (P/N 1267811) over the valve and controller is necessary.
- Temperature — Extreme hot or cold temperatures may cause damage to the valve or controller.
  Freezing temperatures will freeze the water in the valve. This will cause physical damage to the internal parts as well as the plumbing.
  High temperatures will affect the controller. The display may become unreadable but the controller should continue to function. When the temperature drops down into normal operating limits the display will return to normal. A protective cover (P/N 1267811) should assist with high temperature applications.
- Insects — The controller and valve have been designed to keep all but the smallest insects out of the critical areas. Any holes in the top plate can be covered with a metal foil duct work tape. The top cover should be installed securely in place.
- Wind — The Logix cover is designed to withstand a 30 mph (48 Kph) wind when properly installed on the valve.

Water Line Connection

A bypass valve system should be installed on all water conditioning systems. Bypass valves isolate the conditioner from the water system and allow unconditioned water to be used. Service or routine maintenance procedures may also require that the system is bypassed. Figures 5, 6, and 7 show the three common bypass methods.

Figure 5
Series 256 bypass for use with 255 valve body

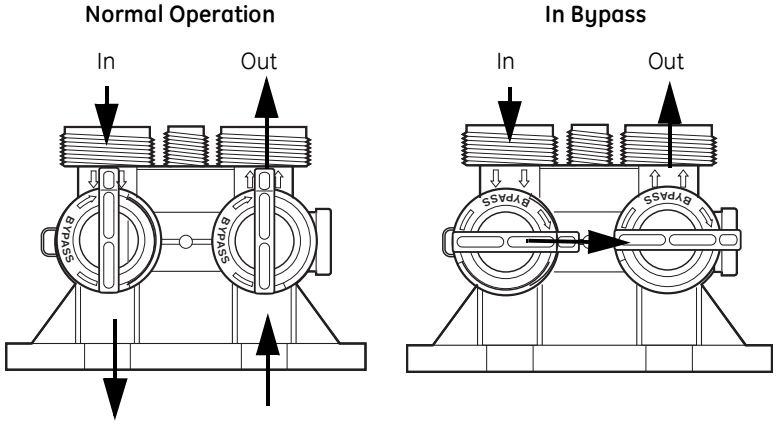


Figure 6
Series 1265 bypass for use with Performa valve bodies

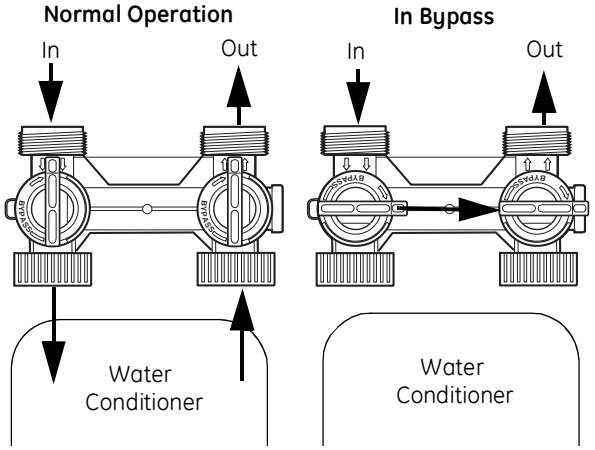
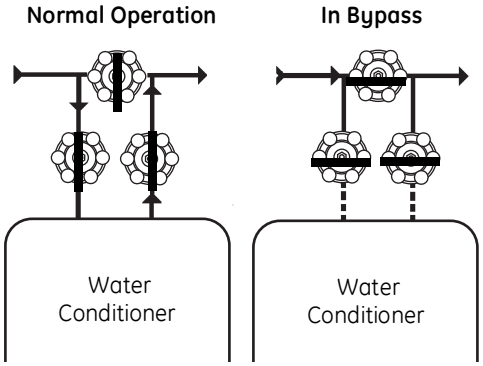


Figure 7
Typical Globe Valve Bypass System



WARNING: The inlet water must be connected to the inlet port of the valve. When replacing non-Pentair Water valves, the inlet and outlet may be reversed. It is also possible for the plumbing to be installed in an opposite order.
Do not solder pipes with lead-based solder.

WARNING: Do not use tools to tighten plastic fittings. Over time, stress may break the connections. When the 1265 or 256 bypass valve is used, only hand tighten the plastic nuts.

WARNING: Do not use petroleum grease on gaskets when connecting bypass plumbing. Use only 100% silicone grease products when installing any plastic valve. Non-silicone grease may cause plastic components to fail over time.

Drain Line Connection

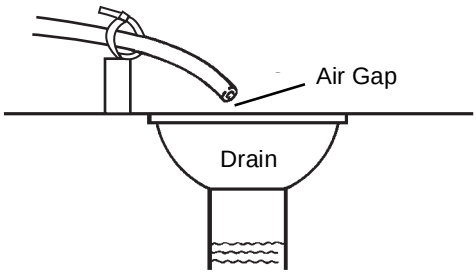
NOTE: Standard commercial practices are expressed here. Local codes may require changes to the following suggestions. Check with local authorities before installing a system.

1. The unit should be above and not more than 20 feet (6.1 m) from the drain. Use an appropriate adapter fitting to connect 1/2-inch (1.3 cm) plastic tubing to the drain line connection of the control valve.
2. If the backwash flow rate exceeds 5 gpm (22.7 Lpm) or if the unit is located 20-40 feet (6.1-12.2 m) from drain, use 3/4-inch (1.9 cm) tubing. Use appropriate fittings to connect the 3/4-inch tubing to the 3/4-inch NPT drain connection on valve.
3. The drain line may be elevated up to 6 feet (1.8 m) providing the run does not exceed 15 feet (4.6 m) and water pressure at the conditioner is not less than 40 psi (2.76 bar). Elevation can increase by 2 feet (61 cm) for each additional 10 psi (.69 bar) of water pressure at the drain connector.
4. Where the drain line is elevated but empties into a drain below the level of the control valve, form a 7-inch (18-cm) loop at the far end of the line so that the bottom of the loop is level with the drain line connection. This will provide an adequate siphon trap.

Where the drain empties into an overhead sewer line, a sink-type trap must be used.

Secure the end of the drain line to prevent it from moving.

Figure 8
Drain Line Connection



NOTE: Waste connections or drain outlet shall be designed and constructed to provide for connection to the sanitary waste system through an air-gap of 2 pipe diameters or 1 inch (22 mm) whichever is larger.

WARNING: Never insert drain line directly into a drain, sewer line, or trap (Figure 8). Always allow an air gap between the drain line and the wastewater to prevent the possibility of sewage being back-siphoned into the conditioner.

Overflow Line Connection

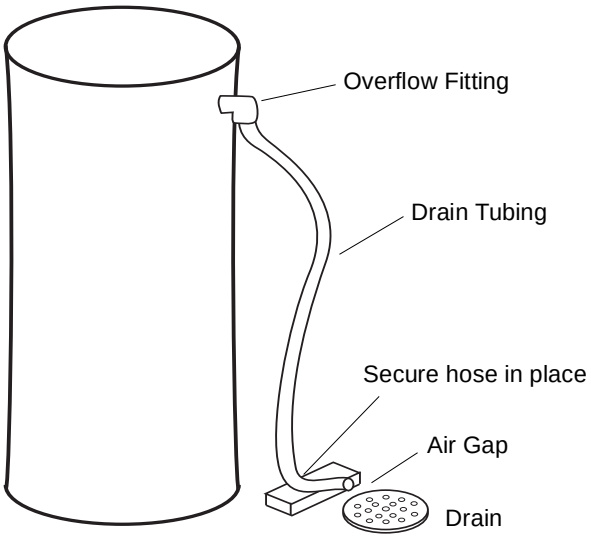
(not used with 3-cycle filter system)

In the event of a malfunction, the regenerant TANK OVERFLOW will direct “overflow” to the drain instead of spilling on the floor. This fitting should be on the side of the cabinet or regenerant tank. Most tank manufacturers include a post for the tank overflow connector.

To connect the overflow line, locate hole on side of tank. Insert overflow fitting into tank and tighten with plastic thumb nut and gasket as shown (Figure 9). Attach length of 1/2-inch (1.3-cm) I.D. tubing (not supplied) to fitting and run to drain. Do not elevate overflow line higher than overflow fitting.

Do not tie into drain line of control unit. Overflow line must be a direct, separate line from overflow fitting to drain, sewer or tub. Allow an air gap as per drain line instructions.

Figure 9
Overflow Line Connection



Regenerant Line Connection

(not used with 3-cycle filter system)

The regenerant line from the tank connects to the valve. Make the connections and hand tighten. Be sure that the regenerant line is secure and free from air leaks. Even a small leak may cause the regenerant line to drain out, and the conditioner will not draw regenerant from the tank. This may also introduce air into the valve causing problems with valve operation.

Most installations utilize a tank check valve. This is not necessary when using the 255 valve with the built-in aircheck. Using a tank check valve with the 255 valve with aircheck will result in premature checking of the aircheck valve, before the tank is empty.

Figure 10
Air Check for 255 valve

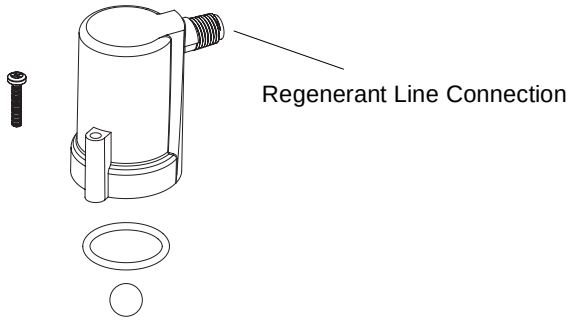
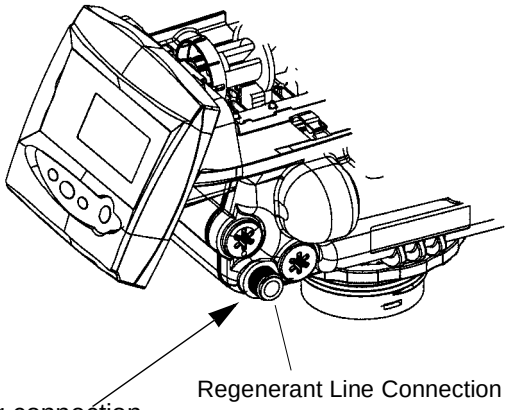


Figure 11
Regenerant Connection for
Performa Valve

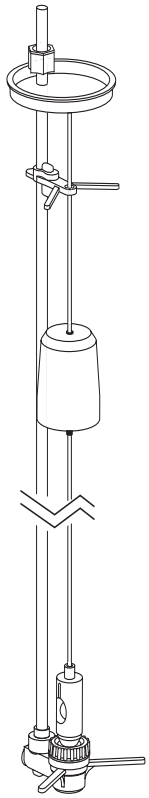


NOTE: Be sure to use plumbing connection tube when attaching regenerant line connections to the Performa valve.

NOTE: When installing a 3-cycle filter (253 or 263 valve) use a cap on the regenerant line connection to prevent water seepage from the port. See *Parts and Accessories* section for part number.

An aircheck must be used in the regenerant line when installing a Performa valve.

Figure 12
Regenerant Tank Check Valve (not provided)*



* Furnished as an option from conditioner system manufacturer.

Electrical Connection

CAUTION: This valve and control are for dry location use only unless used with a Listed Class 2 power supply suitable for outdoor use.

All 700 Series controllers operate on 12-volt alternating current power supply. This requires use of the supplied AC adapter. A variety of AC adapters are available for different applications. These AC adapters are available from your supplier. They include:

AC Adapter	Input Voltage	Application	Part Number
Standard wall-mount AC adapter	120V 60Hz	Standard indoor application	1000811
Outdoor rated AC adapter	120V 60Hz	UL listed for outdoor installations	1235448
International option AC adapters	Varies based on country	Standard indoor application	See Parts Lists Section

100 VAC, 120 VAC and 230 VAC AC Adapters:

Make sure power source matches the rating printed on the AC adapter.

NOTE: The power source should be constant. Be certain the AC adapter is not on a switched outlet. Power interruptions longer than 8 hours may cause the controller to lose the time and day settings. When power is restored, the day and time settings must then be re-entered.

The 700 Series controller is available in two power configurations. The North American controller operates on 60 Hz. If the incoming power is 50 Hz, the "North American" controller will not function. The error code "ERR 2" will show on the display.

The "World" controller will sense the input power as 50 or 60 Hz and operate accordingly.

Controller Location

The 700 Series controllers are designed to be mounted on the valve or attached to a flat surface. Installations that do not provide easy access to the valve can have the controller mounted for remote operation.

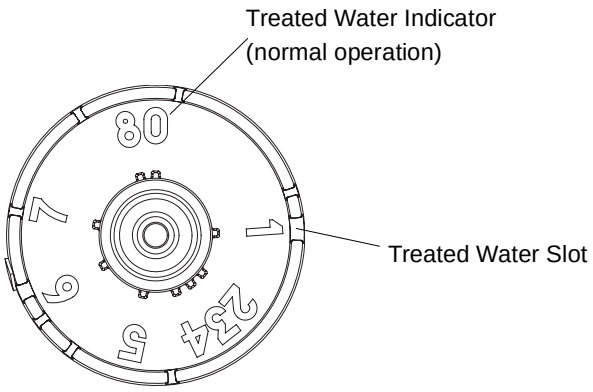
A remote mount connection, P/N 1256257, is available for the 700 Series controller.

Valve Camshaft

The front end of the camshaft has an indicator cup. The cup has slots in the outer periphery and numbers on the inside face (Figure 13).

The numbers can be seen with the cover off, from the front over the top of the controller. The number at the top indicates which regeneration cycle is currently in progress.

Figure 13
Camshaft Front End for 255, 263, and 268 valve bodies



The corresponding slot for the number is positioned at the optical sensor which is approximately 90 degrees out of phase.

Regeneration Cycle Indicators

C0 = Treated Water - normal operation mode
C1 = Backwash Cycle
C2 = Regenerant Draw Cycle (not used in filter mode)
C3 = Slow Rinse Cycle (not used in filter mode)
C4 = System Pause
C5 = Fast Rinse Cycle 1
C6 = Backwash Cycle 2 (not used in filter mode)
C7 = Fast Rinse Cycle 2 (not used in filter mode)
C8 = Regenerant Refill (not used in filter mode)

Valve Disc Operation

Figure 14 - 255 Valve

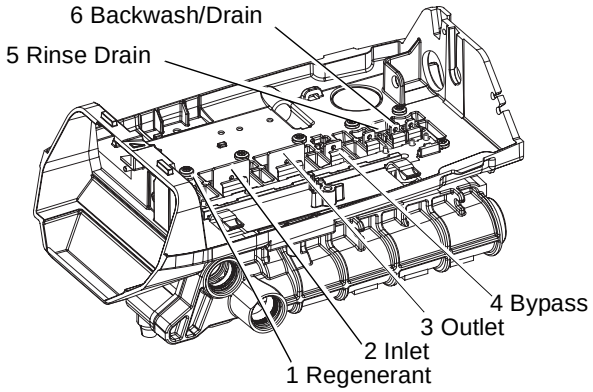
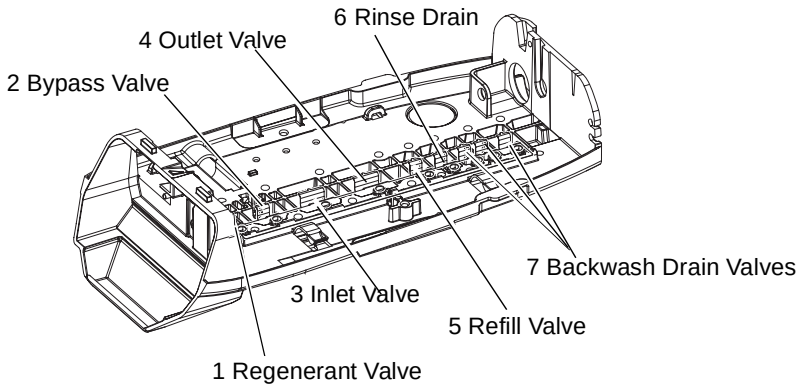


Figure 15 - Performa Valve (263, 268)



SYSTEM DISINFECTION

Disinfection Of Water Conditioners

The materials of construction of the modern water conditioner will not support bacterial growth, nor will these materials contaminate a water supply. During normal use, a conditioner may become fouled with organic matter, or in some cases with bacteria from the water supply. This may result in an off-taste or odor in the water.

Some conditioners may need to be disinfected after installation and some conditioners will require periodic disinfection during their normal life.

Depending upon the conditions of use, the style of conditioner, the type of ion exchanger, and the disinfectant available, a choice can be made among the following methods.

Sodium or Calcium Hypochlorite

Application

These materials are satisfactory for use with polystyrene resins, synthetic gel zeolite, greensand and bentonites.

5.25% Sodium Hypochlorite

These solutions are available under trade names such as Clorox*. If stronger solutions are used, such as those sold for commercial laundries, adjust the dosage accordingly.

1. Dosage
   A. Polystyrene resin; 1.2 fluid ounce (35.5 ml) per cubic foot.
   B. Non-resinous exchangers; 0.8 fluid ounce (23.7 ml) per cubic foot.
2. Brine tank conditioners
   A. Backwash the conditioner and add the required amount of hypochlorite solution to the well of the regenerant tank. The regenerant tank should have water in it to permit the solution to be carried into the conditioner.
   B. Proceed with the normal regeneration.

**Clorox is a trademark of the Clorox Company.*

Calcium Hypochlorite

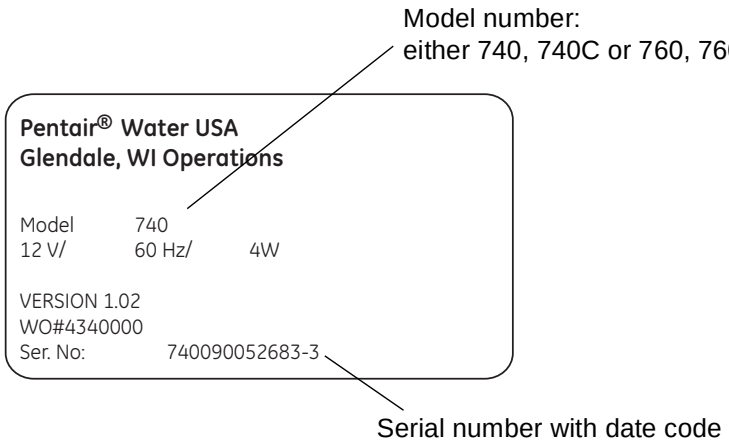
Calcium hypochlorite, 70% available chlorine, is available in several forms including tablets and granules. These solid materials may be used directly without dissolving before use.

1. Dosage
   A. Two grains (approximately 0.1 ounce [3 ml]) per cubic foot.
2. Regenerant tank conditioners
   A. Backwash the conditioner and add the required amount of hypochlorite to the well of the regenerant tank. The regenerant tank should have water in it to permit the chlorine solution to be carried into the conditioner.
   B. Proceed with the normal regeneration.

DETERMINING IF YOU HAVE A 740 OR 760 CONTROL

If you are unsure of your control model, simply remove the cover and disconnect the controller module from the control valve. In the back of the control valve is a silver label that will show your model number and version revision.

Figure 16



GENERAL 700 SERIES INSTRUCTIONS

700 SERIES CONTROLLER

Power Loss Memory Retention

The 700 Series controllers feature battery-free time and date retention during the loss of power. This is designed to last a minimum of 8 hours depending on the installation. The controller will continue to keep time and day in dynamic memory while there is no AC power.

The controller will not track water usage on volumetric demand controls in the event of a power failure.

All programmed parameters are stored in the 700 Series static memory and will not be lost in the event of a power failure. These settings are maintained separately from the time and day settings.

Motor

The 700 series controller uses a standard 12-volt AC motor that works with either 50 Hz or 60 Hz. The same motor is used worldwide and does not need to be changed for different power conditions.

Power

700 Series controllers are available in two power configurations:

1. The North American model requires 60 Hz input. The controller will display USA units when power is first applied.
2. The World model accepts either 60 or 50 Hz input and will automatically adjust measurement units when power is first applied.

Information entered or calculated by the controller is stored in two different ways.

A static memory will store:

Media volume
Regenerant setting
Time of regeneration
Days between regeneration
Filter mode

A dynamic memory with 8 hour retention will store:

Current day of week
Running clock

NOTE: Water flow to the valve can be turned on or bypassed when the controller is powered up for the first time.

Variable Reserve Function

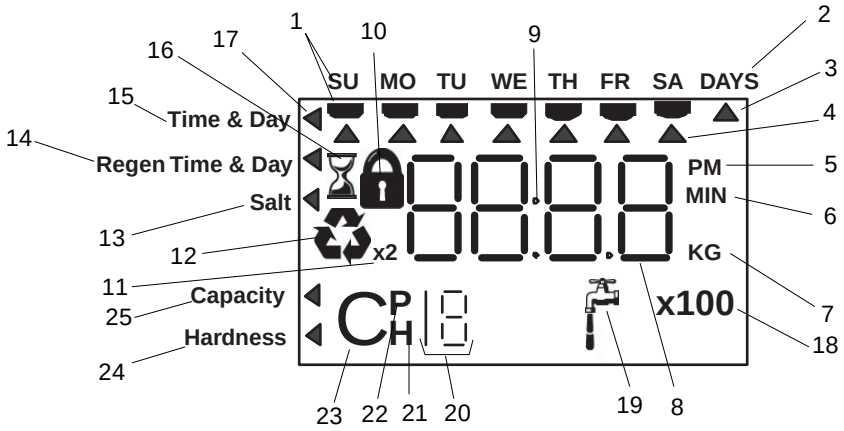
The 700 Series metered-demand volumetric controllers (760 and 760C) are designed to have a variable reserve feature. This feature automatically adjusts the reserve to the end-user's water usage schedule.

A variable reserve saves salt and water by only regenerating when absolutely necessary, and ensures enough soft water for typical high-water usage days.

Each day of regeneration the controller reviews the last four weeks of water usage for the same day of the week to determine if the remaining capacity is adequate for the next day of the week. If the remaining capacity is not adequate, it will initiate an automatic regeneration.

DISPLAY ICONS 700 CONTROLLER

Figure 17

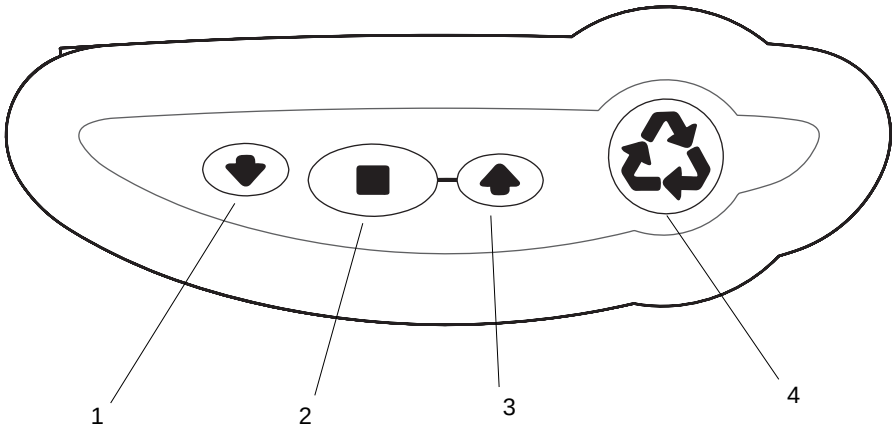


NOTE: In normal operation and during programming, only a few of the icons will actually be displayed.

1. Days of the week. The flag immediately below the day will appear when that day has been programmed as a day the system should regenerate (used with 7-day timer programming).
2. See #3
3. This cursor is displayed when the days between regeneration are being programmed (used with .5 to 99 day regeneration programming).
4. One of these cursors will be displayed to indicate which day will be programmed into the controller.
5. "PM" indicates that the time displayed is between 12:00 noon and 12:00 midnight (there is no AM indicator). PM indicator is not used if clock mode is set to 24-hour.
6. When "MIN" is displayed, the value entered is in minute increments.
7. When "Kg" is displayed, the value entered is in kilograms or kilograins.
8. Four digits used to display the time or program value. Also used for error codes.
9. Colon flashes as part of the time display. Indicates normal operation.
10. Locked/unlocked indicator. In Level I programming this is displayed when the current parameter is locked-out. It is also used in Level II programming to indicate if the displayed parameter will be locked (icon will flash) when controller is in Level I.
11. When "x2" is displayed, a second regeneration has been called for.
12. The recycle sign is displayed (flashing) when a regeneration at the next time of regeneration has been called for. Also displayed (continuous) when in regeneration.
13. The display cursor is next to "SALT" when programming the amount of regenerant. If the controller is on a 3-cycle filter then backwash time is programmed.

14. The display cursor is next to "REGEN TIME & DAY" when programming the time of regeneration and the days of regeneration.
15. The display cursor is next to "TIME & DAY" when programming the current time and day.
16. The hourglass is displayed when the motor is running. The camshaft should be turning.
17. These cursors will appear next to the item that is currently displayed.
18. X100 multiplier for large values.
19. Shows when water is flowing through the valve.
20. Used with #24, #25, and #26. Displays a sequence number or a value.
21. History Values (H). The number displayed by #23 identifies which history value is currently displayed.
22. Parameter (P). Displayed only in Level II Programming. The number displayed by #23 identifies which parameter is currently displayed.
23. Cycle(C). The number displayed by #23 is the current cycle in the regeneration sequence.
24. Hardness setting—only used with 760 and 760C controllers.
25. Capacity display—shows estimated system capacity.

KEYPAD — Buttons



1. DOWN arrow. Generally used to scroll down or increment through a group of choices.
2. SET. Used to accept a setting that normally becomes stored in memory. Also used together with the arrow buttons.
3. UP arrow. Generally used to scroll up or increment through a group of choices.
4. Regenerate. Used to command the controller to regenerate. Also used to change the lock mode.

NOTE: If a button is not pushed for thirty seconds, the controller returns to normal operation mode. Pushing the regenerate button immediately returns the controller to normal operation.

Programming Conventions

The 700 Series controller is programmed using the buttons on the keypad. The programming instructions will be described two ways whenever a section has keypad input.

First, a table shows simplified instructions. Second, text follows that describes the action. In each table:

"Action" lists the event or action desired.

"Keys" are listed as:

UP for up arrow

DOWN for down arrow

SET for set

REGEN for regeneration

"Duration" describes how long a button is held down:

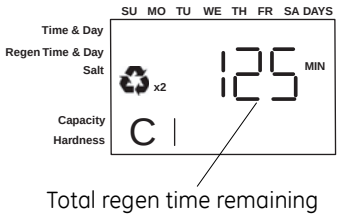
P/R for press and release
HOLD for press and hold
X sec for a number of seconds to press the button and hold it down
"Display" calls out the display icons that are visible.

Regeneration Modes

The 700 Series controllers can be regenerated either automatically or manually. During a regeneration, the total time remaining of the regeneration will be displayed on the controller. The current cycle is shown in the lower left of the display.

To Initiate a Manual Regeneration:

- Press REGEN once for delayed regeneration. System will regenerate at next set regen time (2:00 AM).
  A flashing regen (recycle) symbol will be displayed.
- Press and hold REGEN for 5 seconds to initiate immediate manual regeneration. A solid regen symbol will be displayed.
- After immediate regeneration has begun, press REGEN again to initiate a second manual regeneration. A flashing "x2" symbol indicates the second regeneration will start at the time of regeneration. Press and hold REGEN to turn on the second regeneration immediately following the current regeneration. The double regeneration is indicated by the "x2" symbol being on steady.



During a Regeneration:

- A "C#" is displayed to show current cycle.
- Total regen time remaining is displayed on screen.
- Press and hold SET to show current cycle time remaining.

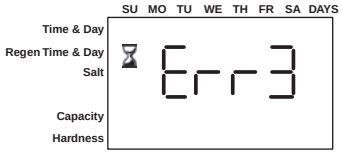
To Advance Regeneration Cycles:

- Press and hold SET - showing current cycle time.
- Simultaneously press SET and UP to advance on cycle. An hourglass will display while cam is advancing.
  When cam reaches next cycle, "C2" will be displayed.
- Repeat SET and UP to advance through each cycle.
- Press and hold SET and UP for 5 seconds to cancel regen.
  Hourglass will flash once cancelled.
  Camshaft will advance to home – may take 1 to 2 minutes.

Regeneration Cycles:

- C1 – Backwash
- C2 – Regeneration Draw/Slow Rinse (not used in filter mode)
- C3 – Slow Rinse (not used in filter mode)
- C4 – System Pause (to repressurize tank)
- C5 – Fast Rinse cycle 1
- C6 – Backwash cycle 2 (not used in filter mode)
- C7 – Fast Rinse cycle 2 (not used in filter mode)
- C8 – Regenerant Refill (not used in filter mode)

740/760 Series Initial Power-Up



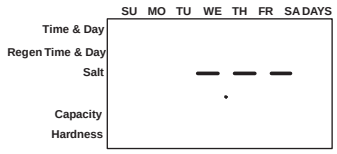
Initial Power Up – (Camshaft proceeds to HOME position)

- At initial power-up, the camshaft may need to rotate to the HOME (in service position).
- Camshaft may take 1 to 2 minutes to return to HOME position.
- Err 3 will be displayed until the camshaft returns to HOME position.
- If more than 2 minutes elapses, verify that the motor is turning the camshaft. If it is not turning, contact Dealer.

NOTE: The 700 Series controller features a self-test sequence. At first power-up of the control, you may see a number such as 1.00, 1.02, 1.04, or 2.00 displayed. This is an indication that the self-test is not completed. To complete the test, verify that the turbine cable is connected. Blow air into the turbine port (valve outlet) to spin the turbine. The controller will verify that the turbine works and the self-test will finish. Proceed with the initial start-up procedure.

Initial Start-up Step-By-Step Instructions

For FA filter applications, please program as normal below. See section *Programming the 700 for 5-Cycle Filter Applications*.

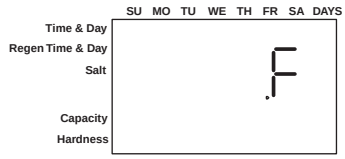


Step 1: Program System Size

This step may have been performed by your system's OEM manufacturer. In this case, proceed to step 2.

NOTE: Capacity is the result of the amount of media in the tank and the salt setting. The default capacity will be changed by selecting a different regenerant setting.

3-cycle filter

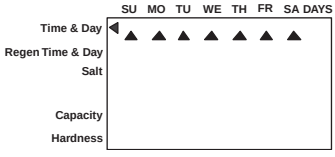


- Input system size – media volume (For FA filters, choose your closest media volume) – in cubic feet or liters.
- Use UP and DOWN buttons to scroll through resin volume choices.
- Choose the nearest volume to your actual system size.
- To choose a 3-cycle filter operation – press DOWN until an "F" is displayed.
- Press SET to accept the system size you've selected.
- If incorrect setting is programmed, see "Resetting the Control" section below.

NOTE: If the controller was incorrectly set to the wrong valve body, press the DOWN button and SET button for five seconds to display resin volume in "HO". Press and hold the SET button for five seconds to reset the controller. Use the UP or DOWN buttons to increment the display to the correct valve body. Press SET.

Step 2: Program Time of Day

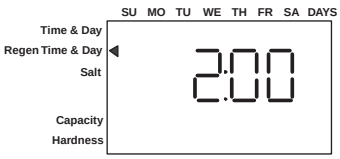
- While "12:00" is blinking, set the correct time of day.
- Use the UP and DOWN buttons to scroll to the correct time of day.
- "PM" is indicated, "AM" is not indicated.
- Press SET to accept the correct time of day and advance to the next parameter.



Step 3: Set Day of Week

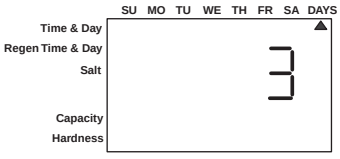
- Press SET to make the arrow under "SU" flash.
- Use the UP and DOWN buttons to advance the arrow until it is under the correct day of week.
- Press SET to accept and advance to the next parameter.

After steps 1-4, the controller will operate most systems. Proceed to step 4 if further adjustments to your system's programming is needed.



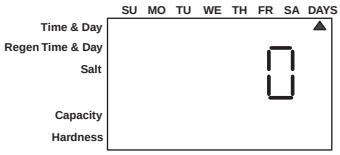
Step 4: Set Regen Time

- 2:00 (AM) is the default time of regeneration. To accept this time, press the DOWN button to move to step 5.
- To change the regen time, press SET – causing “2:00” to flash.
- Use the UP and DOWN buttons to advance to the desired regen time.
- Press SET to accept the time and advance to the next parameter.



Step 5: Set Days to Regenerate (740 Time-Clock Control Only)

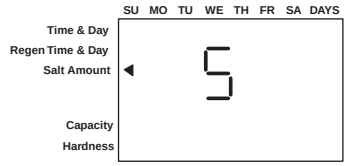
- If using 760 control – proceed to step 5a.
- Set number of days between time-clock regeneration (regen frequency).
- Default time is 3 days.
- Days can be adjusted from ½ (.5) to 99 days.
- To change, press SET to make the “3” flash.
- Use the UP and DOWN buttons to change the number of days desired.
- Press SET to accept the regen frequency, and advance to the next cycle.
- To use the 7-day timer option –see *Dealer Installation Manual*.



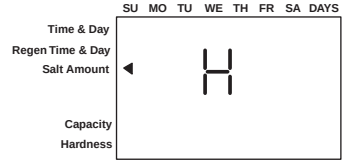
Step 5a: Set Calendar Override (760 Demand Control Only)

- If using 740 control – proceed to step 6.
- Set number of days for calendar override on demand control.
- “0” days is the default for calendar override.
- Days can be adjusted from ½ (.5) to 99 days.
- To change, press SET to make the “0” flash.
- Use the UP and DOWN buttons to change to the number of days desired. Press SET to accept the regen frequency, and advance to the next cycle.

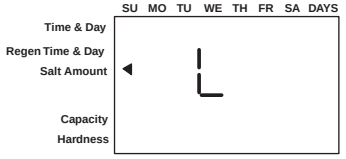
Standard Setting



High Capacity Setting



Low Setting (High Efficiency)



Step 6: Amount of Regenerant used per Regeneration

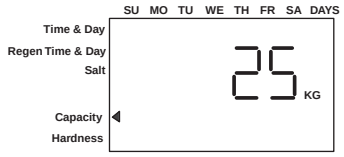
- Set desired regenerant amount.
- Default setting is "S" standard salting.
- 3 salt settings are available on 740 and 760 controls:
- S – Standard Salt – 9 lbs/cubic foot of resin (120 grams/liter of resin)
- H – High Salt – 15 lbs/cubic foot of resin (200 grams/liter of resin)
- L – Low Salt – 3 lbs/cubic foot of resin (40 grams/liter of resin)
- Low Salt is the "Highly Efficient Mode".
- To change salt setting, press the SET button and use the UP and DOWN buttons to change to the desired setting.
- Press SET to accept the setting and advance to the next parameter.
- See *Dealer Installation Manual* for more complete information on salt settings for different system sizes, capacities and expected efficiencies.

Filter Backwash Time (Filter Mode Only)

If the system is set up as a filter, the regenerant amount is unnecessary. The controller deactivates the regenerant amount setting, and changes to an adjustable backwash time in minutes.

- Press SET to change the time.
- The default time of 14 minutes will begin to flash.
- Use UP and DOWN to select the appropriate backwash time for the media type and amount used. The controller can use 0 to 99 minutes for backwash.
- Press SET again to enter that time.

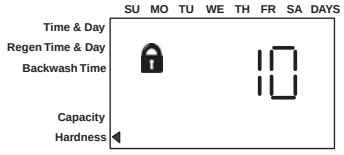
Step 8: Estimated Capacity



- System capacity is displayed in total kilograins or kilograms of hardness removed before a regeneration is necessary.
- Value is derived from the system's resin volume input and salt amount input.
- The capacity is displayed for information purposes on the 740 control. It cannot be changed.
- To change capacity on the 760 control, press SET to make the default capacity flash. Use the UP and DOWN buttons to increment to the desired capacity.
- Press SET to accept the setting and advance to the next parameter.

If using the 740 control, programming is complete. The control will return you to the normal operation mode.

Step 9: Enter Hardness (760 Demand Control Only)



- Enter inlet water hardness at installation site.
- Default hardness setting is 10 grains (ppm for metric).
- To change hardness, press SET to make the setting flash. Use the UP and DOWN buttons to scroll to the desired hardness.
- Press SET to accept the entered hardness value.
- The control will return you to the normal operation mode.

Initial programming is now complete. The control will return to normal operation mode if a button is not pushed for 30 seconds.

For system start-up procedure, including: purging the mineral tank, refilling the regenerant tank, and drawing regenerant, see the system start-up procedure in the *Dealer Installation and Service Manual.*

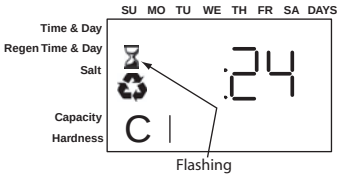
PLACING CONDITIONER INTO OPERATION (turning on the water)

Conditioner and FA Filter Start-Up

After you have performed the previous initial power-up steps, you will need to place the conditioner into operation. Follow these steps carefully, as they differ from previous valve instructions.

WARNING: Do not rotate the camshaft by hand or damage to the unit may occur. Use the controller to step the camshaft electronically through the cycles.

1. Remove the cover from the valve. Removing the cover will allow you to see that the camshaft is turning, and in which cycle the camshaft is currently positioned.
2. With the supply water for the system still turned off, position the bypass valve to the “not in bypass” (normal operation) position.
3. Hold the REGEN button on the controller down for 5 seconds. This will initiate a manual regeneration.



The controller will indicate that the motor is turning the camshaft to the cycle C1 (Backwash) position by flashing an hourglass. The controller will display the total regen time remaining.

If you press and hold the SET button, the controller will indicate the time remaining in the current cycle.

4. Fill the media tank with water.
   A. While the controller is in cycle C1 (Backwash), open the water supply valve very slowly to approximately the 1/4 open position.

WARNING: If opened too rapidly or too far, media may be lost out of the tank into the valve or the plumbing. In the ¼ open position, you should hear air slowly escaping from the valve drain line.

   B. When all of the air has been purged from the media tank (water begins to flow steadily from the drain line), open the main supply valve all of the way. This will purge the final air from the tank.
   C. Allow water to run to drain until the water runs clear from the drain line. This purges any refuse from the media bed.
   D. Turn off the water supply and let the system stand for about five minutes. This will allow any air trapped to escape from the tank.
5. Add water to the regenerant tank (initial fill) (conditioner only).
   A. With a bucket or hose, add approximately 4 gallons (15 liters) of water to the regenerant tank.

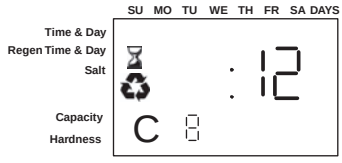
If the tank has a salt platform in the bottom of the tank, add water until the water level is approximately 1 inch (25 mm) above the platform.

NOTE: We recommend that you do not put regenerant into the tank until after the control valve has been put into operation. With no regenerant in the tank, it is much easier to view water flow and motion in the tank.

6. Engage the refill cycle to prime the line between the regenerant tank and the valve (conditioner only).
   A. Slowly open the main water supply valve again, to the fully open position. Be sure not to open too rapidly as that would push the media out of the media tank.
   B. Advance the controller to the Refill (C8) position. From cycle C1 (Backwash), press and hold the SET button. This will display the current cycle.

      While pressing the SET button, press UP to advance to the next cycle. Continue to advance through each cycle until you have reached cycle C8 (Refill).

NOTE: As you advance through each cycle there will be a slight delay before you can advance to the next cycle. The hourglass icon will light while the camshaft is indexing. There may be a pause at cycle C4 (System Pause). This cycle allows the water/air pressure to equalize on each side of the valve discs before moving on. The hourglass will not be visible indicating that the system is paused.



   C. With the water supply completely open, when you arrive at cycle C8 (Refill), the controller will direct water down through the line to the regenerant tank. Let the water flow through the line until all air bubbles have been purged from the line.
   D. Do not let the water flow down the line to the tank for more than one to two minutes, or the tank may overfill.
   E. Once the air is purged from the line, press the SET button and the UP button simultaneously to advance to cycle C0 (Treated Water) position.
7. Draw water from the regenerant tank.
   A. From the treated water position (cycle C0), advance the valve to the draw regenerant position. Hold the REGEN button down for five seconds.

      The controller will begin a manual regen, and advance the control valve to the cycle C1 (Backwash). Press the SET and UP button to advance to cycle C2 (Draw).
   B. With the controller in this position, check to see that the water in the regenerant tank is being drawn out of the tank. The water level in the tank should recede very slowly.
   C. Observe the water being drawn from the regenerant tank for at least three minutes. If the water level does not recede, or goes up, check all

hose connections. C2 should be displayed.

8. If the water level is receding from the regenerant tank you can then advance the controller back to the treated water (C0) position by pressing SET and the UP buttons simultaneously to advance the controller to the C0 position.
9. Finally, turn on a faucet plumbed after the water conditioner. Run the faucet until the water runs clear. Add regenerant to the regenerant tank.

Things You Might Need to Know

- When the controller is first plugged in, it may display a flashing hourglass and the message Err 3, this means that the controller is rotating to the home position. If the Err 2 is displayed, check that the incoming power frequency matches the controller. The North American controller will not run with 50 Hz input.
- The preset default time of regeneration is 2:00 AM.
- English or Metric? The World controller senses the electrical input and decides which is needed. The North American controller only runs on 60 Hz and defaults to English units.
- The 700 Series controller can be programmed to regenerate on specific days of the week.
- If electrical power is not available, the camshaft can be rotated counterclockwise by hand if the motor is removed.
- The 700 Series controllers send commands to the motor for camshaft movement. However, water pressure/flow are required during the regeneration cycle for backwash, purge and refill, and brine draw to actually take place.
- Make sure control power source is plugged in. The transformer should be connected to a non-switched power source.
- You can start programming at the beginning by resetting the amount of media. When viewing H0 (History Value) push and hold SET for five seconds. The display reverts back to **---** and any programmed information is lost. Return to *700 Series Initial Power Up*.

PROGRAMMING THE 700 FOR 5-CYCLE FILTER APPLICATIONS

Manganese Greensand Systems

Sizing FA Filters

Potassium permanganate regenerating iron filters should be sized for the appropriate backwash and injector sizes.

Backwash Controller

Be sure to choose the appropriate backwash flow rate control (see *Parts* section) as recommended by your media manufacturer.

Injector

Use the same injector size as you would for your conditioner control tank diameter.

Refill Controller

A FA filter can use the 0.33 gpm refill control that is featured as standard with a Logix controller. Use a check valve in your potassium permanganate feeder to prevent overflow.

Initial Resin Volume Setting

Programming for a manganese greensand system requires a few minor adjustments to the programming to operate the control correctly. The initial resin volume should be set to the closest volume of the manganese greensand in the system. For example, if the system contains two cubic feet of manganese greensand, program in 2.00 for the resin volume.

"Salt" Setting for $KMNO_3$ Regenerant

Since the same injector is used for the filter application (FA) system and the conditioner system, be sure the regenerant (salt) setting is set to High “H” to allow adequate time to rinse the media.

All other settings will remain the same as mentioned in the previous programming sections.

Days Between Regeneration Setting (740 FA)

To set the days between regenerations, consult the media manufacturer for the actual capacity of the media.

In general, manganese greensand has a capacity of 10,000 ppm of removal capability per cubic foot of media. Calculate the capacity of the system by taking the number of cubic feet of media and multiply by 10,000.

For example, using a 1 cubic foot system provides 10,000 ppm of removal capability.

The next step is to calculate the demand for the system. Multiply the predicted daily water usage by the iron content in ppm.

For example, an average person uses 75 gallons of water per day. Four people living in a home use 300 gallons of water (75 gallons x 4 people) per day. Assume the incoming water has 10 ppm of iron. Now calculate the daily

demand: multiply the gallons of water used per day (300) by the ppm of iron content (10) = 3000 ppm of daily capacity usage.

Now take the system capacity (10,000), divided by the daily demand (3,000) = 3.3 days of capacity. Since you will run out of capacity before the beginning of the fourth day, the proper setting for days between regeneration is 3 days.

For example:

4 people x 75 gals per person = 300 gallons used per day.

10 ppm iron x 300 gal/day = 3000 ppm/day

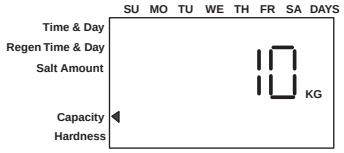
10,000 ppm capacity ÷ 3000 ppm/day = 3.3 days of total capacity

Solution = regenerate every 3 days.

Volume/Demand Regeneration Setting

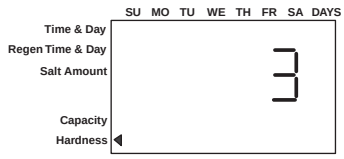
To set a 760 demand system for iron removal you must:

1. Know your media capacity. Generally, one cubic foot of magnesium greensand can remove 10,000 ppm of iron.
2. Know the iron concentration in your water.



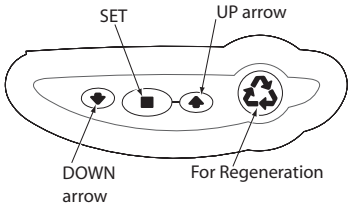
To have your system regenerate on demand, set your system's capacity (P7) to the appropriate factor. On the 760, it will read Kg, but you will actually be working in ppm of iron.

1. If your system is one cubic foot, set the capacity to "10" kg, meaning 10,000. For two cubic feet, set the capacity to "20" kg.
2. Set your hardness to the level of ppm iron in your water. If you have 3 ppm of iron, set the 760 control to "3".



3. The control will calculate the remaining volume capacity in gallons (m^3) and count down to regeneration.

700 Series Advanced Programming



The 700 Series controllers are designed to operate by only setting the time of day and the day of the week. The remaining settings have been set at the factory. These default settings will work for most applications.

To change a setting:

Action	Key	Duration	Display
Enter basic programming	SET	Press and Release	Will show day of week
Move to desired display	UP or DOWN arrows	Press and Release	Will increment through the displays
Enable setting to be changed	SET	Press and Release	Display will flash
Change setting	UP or DOWN arrows	Press and Release	Value changes and continues to flash
Save setting	SET	Press and Release	Display stops flashing
Return to operation	REGEN	Press and Release	Normal operation display
View history values	SET and DOWN	Press and Hold for 5 seconds	HO will be displayed

This level of programming is accessible by pressing the SET button. The UP and DOWN arrows will step through the settings:

Time of day
Day of week
Time of regeneration
Number of days between regeneration (99 day timer)
Day of week regeneration (displays only when number of days between regeneration equals zero) (7 day timer)
Amount of regenerant used per regeneration or filter backwash time
System capacity (view only)

Accessing History Values

The Logix control features a review level that displays the operation history of the system. This is a great troubleshooting tool for the control valve.

To access history values, press and hold SET and DOWN for five seconds to view the "H" levels.

History Values

	Description	Range
H0	Resin volume initial setting value	Cubic feet or liters
H1	Days since last regeneration	0 – 255
H2	Current flow rate	0 – 47 GPM or 0 – 177 LPM
H3	Water used today in gallons/m^3 since Time of Regeneration	0 – 65536 gallons or 0 – 6553.6 m^3
H4	Water used since last regeneration in gallons/m^3	0 – 65536 gallons or 0 – 6553.6 m^3
H5	Total water used since reset in 100s	0 – 65536 gallons or 0 – 6553.6 m^3
H6	Total water used since reset in 1,000,000	0 – 65536 gallons or 0 – 6553.6 m^3
H7	Average usage for Sunday in gallons or m^3	0 – 65536 gallons or 0 – 6553.6 m^3
H8	Average usage for Monday in gallons or m^3	0 – 65536 gallons or 0 – 6553.6 m^3
H9	Average usage for Tuesday in gallons or m^3	0 – 65536 gallons or 0 – 6553.6 m^3
H10	Average usage for Wednesday in gallons or m^3	0 – 65536 gallons or 0 – 6553.6 m^3
H11	Average usage for Thursday in gallons or m^3	0 – 65536 gallons or 0 – 6553.6 m^3
H12	Average usage for Friday in gallons or m^3	0 – 65536 gallons or 0 – 6553.6 m^3
H13	Average usage for Saturday in gallons or m^3	0 – 65536 gallons or 0 – 6553.6 m^3

Resetting the Logix Control

To reset the control:

1. Press and hold SET and DOWN simultaneously for 5 seconds.
2. H0 and the system's set resin volume (or "F" mode) will be displayed.
3. If a history value other the "H0" is displayed, use the UP button to scroll through the settings until "H0" is displayed.
4. To reset the control, press and hold SET for 5 seconds.
5. The control will be reset to an unprogrammed state.
6. Go to "Initial Set-up" section to reprogram control.

WARNING: Resetting the control will delete all information stored in its memory, except time and day. This will require you to reprogram the control completely from the initial power-up mode.

NOTE: If a button is not pushed for thirty seconds the controller returns to normal operation mode. Pushing the UP and DOWN arrows for 5 seconds returns the controller to normal operation.

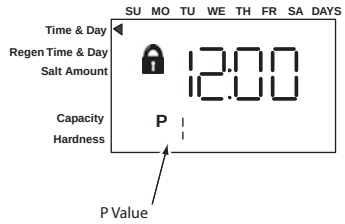
NOTE: Any setting that is a time display will not show "AM" for times between 12:00 midnight and 12:00 noon. "PM" is displayed to the right of the time for times between 12:00 noon and 12:00midnight. When using the 24-hour clock, "PM" is not displayed.

In this level all of the programming features of basic programming are available. In addition, the settings can be locked/unlocked.

A setting that is locked will display a lock icon when viewed in the basic level.

A locked setting is viewable in the basic programming menus but it cannot be changed.

When viewing a setting in this level the display will show a "P" value. This corresponds to the displayed setting.



Level II menus include:

P1 = Time of day

P2 = Day of week

P3 = Time of regeneration

P4 = Number of days between regeneration

P5 = Not used

P6 = Amount of regenerant used per regeneration or filter backwash time

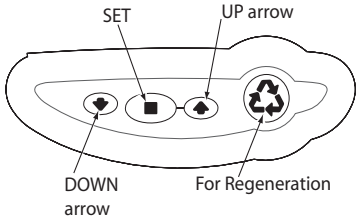
P7 = System capacity

P8 = Hardness

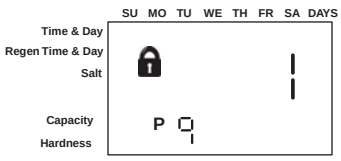
P9 = Units of measure

P10 = Clock mode

To enter Level II (Professional Programming) and change a setting:

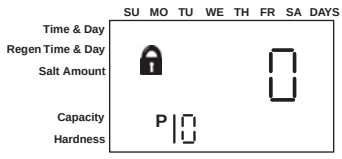


Action	Key	Duration	Display
Enter Level II programming	UP and DOWN	5 sec.	P1 display
Return to operation	UP and DOWN	5 sec.	Time and day of week
Increment through menus	UP and DOWN	P/R	Next parameter display
Enable setting to be changed	SET	P/R	Parameter will flash
Change value	UP and DOWN	P/R	Value changes
Save setting	SET	P/R	Records value and next parameter is displayed



English/Metric - P9 (Only accessed in Professional Level)

This setting is entered automatically at first power-up. The North American controller will default to English units. The World controller senses the electrical input and determines English or metric units. 0 is English units. 1 is metric units. Use the arrow buttons to change this setting. Press SET to accept the setting.



12 hour clock/24 hour clock - P10 (Only accessed in Professional Level)

This setting is entered automatically at first power-up. The North American controller will default to English units. The World controller senses the electrical input and determines a 12- or 24-hour clock. 0 is a 12-hour clock. 1 is 24-hour clock. Use the arrow buttons to change this setting. Press SET to accept the setting.

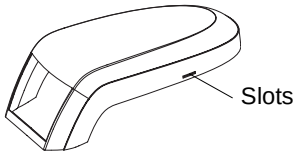
NOTE: Once SET is pressed in P10 the controller will change to treated water (normal operation) mode. The time of day is displayed and the colon is flashing.

VALVE SERVICE

Cover

The cover provides protection for the controller, wiring, and other components. This cover will be removed for most service and maintenance.

When installed, the cover provides NEMA 3 water protection. This protects from falling water up to 30 degrees from vertical.



To remove cover:

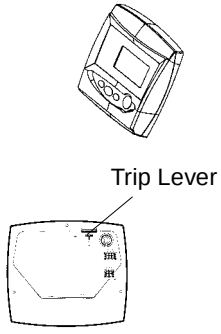
1. Grasp side edges toward rear of the valve.
2. Pull outwards until the slots in the cover clears the projections on the top plate.
3. Lift up on the rear and pull forward to clear the control module.

To install cover:

1. Position cover to be low in front and under the bottom edge of the control module.
2. The cover will hook on the bottom of the controller and drop down over the camshaft.
3. To finish, grasp the side edges and pull outward to clear the projections on the top plate.
4. Drop down until the cover snaps in place.

Electronic Control Module

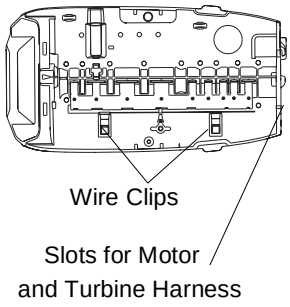
The purpose of the electronic control module is to control the regeneration cycle. The control module has several variations. When replacing the controller, use the same model or some functions may not work. This is an electronic controller that is programmable and uses input/output signals.



To remove control module:

1. Disconnect power to the unit.
2. Remove valve cover.
3. Press trip lever to release module from top plate.
4. Pivot the top forward and up.
5. Remove any wire connections. Wire connectors have a locking tab that must be squeezed before removing.

NOTE: There is no need to label the wires. The keyed connectors will only plug back into one site.



To install control module:

1. Be sure the power is disconnected.
2. Check model.
3. Check routing of wires and plug them into the controller. Connectors will snap in place. Be sure that wires are properly managed through the clips on top plate. This will prevent the wires from being caught in the camshaft.
4. Place bottom of module in position. The bottom will fit into a clip.
5. Pivot the top into position and snap in place. The controller should be secure.

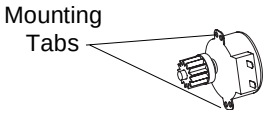
If you are ready to program the controller, then power can be applied by plugging in transformer.

Drive Motor

The drive motor is open loop and receives commands from the control module. The motor has a pinion gear that meshes with the camshaft gear to drive (rotate) the camshaft.

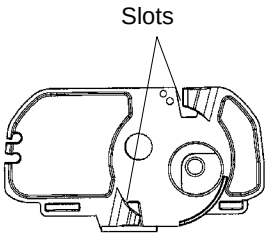
During operation, rotation forces the motor into its mounting position and screws or bolts are not needed.

NOTE: Some units will have a shipping peg in the top motor mount. The peg can be removed and discarded. This peg is not required for motor operation.



To remove motor:

1. Disconnect power to the unit.
2. Remove cover.
3. Pull off wiring connector.
4. Grasp the motor body and rotate counterclockwise.
5. Pull motor out.



To install motor:

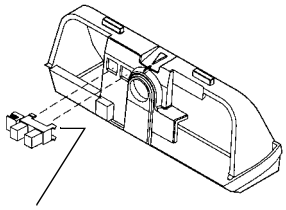
1. Insert gear through hole on top plate and mesh with camshaft. Cam may need to be rotated slightly.
2. With motor ears flat to the rear of the top plate, rotate clockwise until mounting tabs are engaged in slots.
3. Reconnect wires.

NOTE: It is not necessary to pre-position the camshaft or the motor. When the controller is powered up the camshaft will be rotated to the "home" position.

Optical Sensor

The optical sensor is mounted to the top plate. The camshaft cup rotates through the sensor and the slots are detected. A signal is sent to the controller for each slot.

NOTE: Damaged sensors should be replaced. Sensors may be cleaned with compressed air or a soft brush.



Do not bend the legs on the optical sensor

To remove optical sensor:

1. Disconnect power to the unit.
2. Remove cover.
3. Remove controller.
4. From the controller side, pinch the legs of the sensor holder in the top plate.
5. Pull the holder away from the mounting surface.
6. Remove wires.

To install optical sensor:

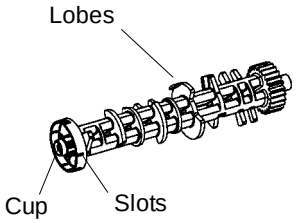
1. Attach wires. Wires should point away from camshaft.
2. Place leading edge of sensor holder into opening.
3. Pivot holder into place. Legs should enter slots and snap in place.

WARNING: The optical sensor legs are fragile and may break. If the optical sensor legs break or crack, we recommend replacement. A damaged sensor may result in improper regeneration.

Camshaft

The camshaft has several lobes that push open the valve discs as the camshaft rotates. Rotation is controlled by a drive motor that drives a gear at the rear of the camshaft. The front end has a cup with markings and slots.

WARNING: The camshaft slots are molded to exact dimensions. Do not attempt to modify the cam cup slots. Improper regen will occur!



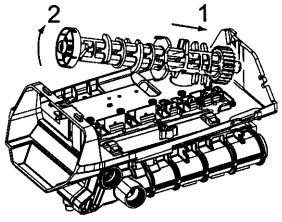
The outside surface of the cup has an arrow mark. When the arrow is at top center, the camshaft is in the loading position. 90 degrees clockwise on the cup an optical sensor is mounted to the top plate. This sensor reads the slots as they pass through. The largest slot is “Home” and the remaining slots are positioned to signal the regeneration cycles.

When looking at the end of the camshaft, numbers are visible in the hollow of the cup. An arrow on the top plate points to the current marking. The numbers represent regeneration cycles as follows:

C0 =Treated water-normal operation mode
C1 = Backwash
C2 = Regenerant draw (not used in filter mode)
C3 = Slow rinse (not used in filter mode)
C4 = System pause
C5 = Fast rinse cycle 1
C6 = Backwash cycle 2 (not used in filter mode)
C7 = Fast rinse cycle 2 (not used in filter mode)
C8 = Regenerant refill (not used in filter mode)

These numbers are offset rotationally 90 degrees from the matching slot. The offset enables the service person to view the number at the top of the cup and determine which slot is at the optical sensor.

NOTE: If any part of the camshaft is broken or damaged the camshaft should be replaced. Do not repair or modify damaged cam lobes, gears or timing cup.



To remove camshaft:

1. Disconnect power to the unit.
2. Remove cover.
3. Remove motor.
4. Camshaft should be in the treated water position. Rotate counterclockwise as needed.
5. Use a screwdriver to hold open the #1 valve disc.

NOTE: When replacing/removing camshaft, make sure not to damage or mis-align the optical sensor. Hold the sensor in position while removing camshaft.

6. Move the camshaft backwards, away from the controller.
7. Lift the loose front end up and out.

To install camshaft:

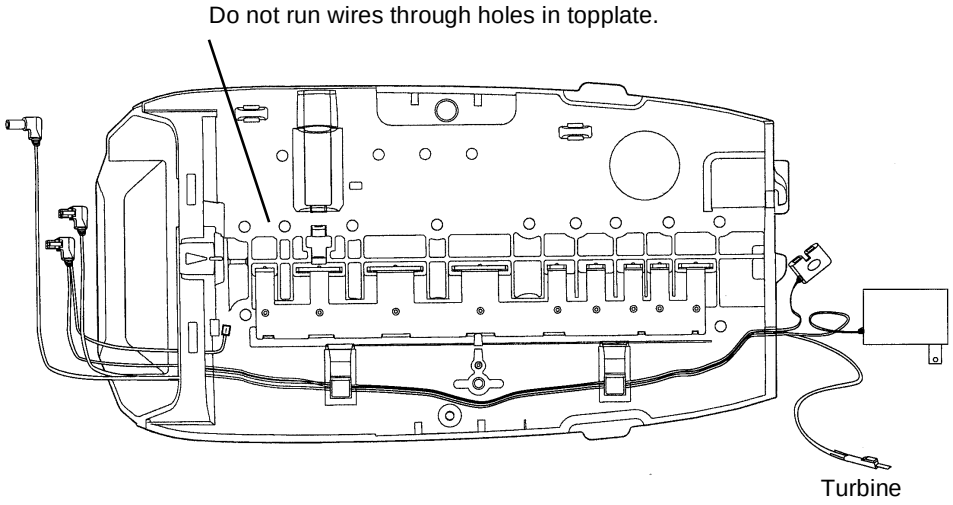
1. Check that the optical sensor is in position.
2. Position camshaft above the valve discs. The arrow on the cup should be up.
3. Slide the rear of the camshaft into place.
4. Pivot the camshaft close to its final position.
5. The camshaft will push on one or more valve discs. You will feel resistance as you complete the installation.
6. Move the camshaft down and into position. Force valve discs to move as needed.
7. Move the camshaft forward. Check that the optical sensor is in position.
8. Install motor.

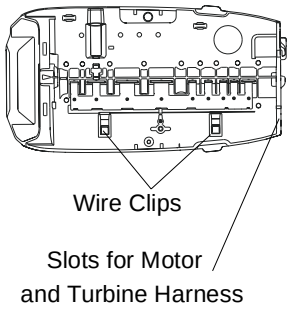
NOTE: The camshaft will position itself to C0 (treated water) when the controller is powered up.

Wiring Harnesses

The wiring harnesses are designed to fit one way. The connectors are unique to the port they plug into. The wires are held in place by clips and the connectors latch in place.

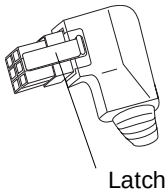
Figure 18 - Wire Harness Routing





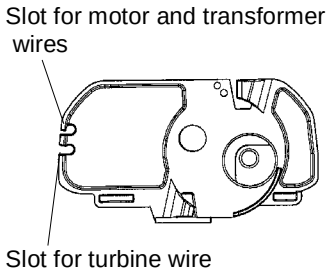
To remove a wiring harnesses:

1. Disconnect power to the unit.
2. Remove cover.
3. Remove controller.
4. Remove connections by squeezing the latch on the connector and pulling out.
5. Pull the harness out of the clips on the top plate.



To install a wiring harness:

NOTE: Start at the back of the valve and work toward the controller. This will place any slack behind the controller. Slack or loose wires can become tangled in the camshaft.



1. Depending on which harness is being installed, plug the connector into the motor or turbine.
2. Route the harness through the opening at the back of the top plate.
3. Place the harness into the clips on the top plate. Do not leave any slack. Put the motor wire in first, then the turbine sensor cable second.
4. Feed the wire through the opening on the front of the top plate.
5. If installing the motor harness the connector to the optical sensor can be clipped in place.
6. Connect the harness to the back of the controller.

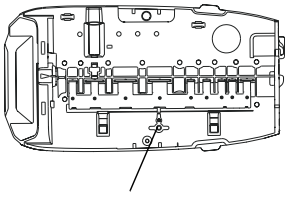
NOTE: If using both a motor and turbine cable harness, install the smaller motor cable first. Install the larger turbine cable second. This will lock the motor cable beneath in the wire management clips.

Microswitch (Optional Under the Cover)

The microswitch is located under the cover and is screwed to the top plate. This switch is turned on/off by a cam lobe on the camshaft. Its function is to signal that the unit is in-service or out-of-service (regenerating).

Microswitches are available as kits from Pentair Water or a standard microswitch can be used as well.

WARNING: This switch will normally control an event on another piece of equipment. Be certain of what effect your actions will have on the other equipment.



To install microswitch:

1. Connect wires.
2. Use self-tapping screws to secure the switch base to the blind boss top plate.
3. Adjust microswitch distance to cam.

NOTE: Proper procedure for replacing a self-tapping screw:

A. Drop screw into hole.

B. With a screwdriver, back the screw up (counterclockwise) until the threads click.

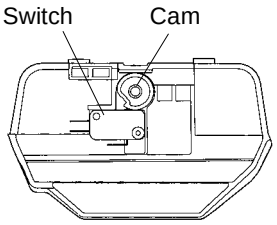
C. Rotate the screw forward (clockwise) until finger tight.

WARNING: The Pentair Water valve is rated for low voltage (less than 48 volts) microswitch components only. Using a high voltage switch may result in damaged valves or fire and may interfere with electronic control function.

To remove microswitch:

1. Disconnect power to the switch.
2. Remove cover.
3. Unscrew switch base from top plate.
4. Disconnect wires.

Microswitch (Optional - Front of Camshaft)



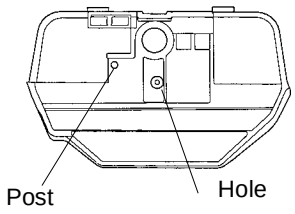
This microswitch is mounted behind the controller at the front end of the camshaft. The switch is mounted to the top plate. The cam for this switch is screwed to the front of the camshaft. This cam can be adjusted to activate the microswitch at any time during the regeneration cycle.

The front end cam switch is available as a kit from Pentair Water.

WARNING: This switch will normally control an event on another piece of equipment. Be certain of what effect your actions will have on the other equipment.

To remove microswitch:

5. Disconnect power to the switch.
6. Remove cover.
7. Remove controller.
8. Unscrew switch from top plate.
9. Disconnect wires.



Optional Microswitch Mount

To install microswitch:

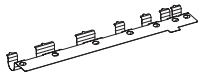
1. Connect wires.
2. Screw switch base to top plate using the switch guide pin over screw boss.
3. Attach the switch cam to front of the camshaft with a self-tapping screw. Adjust to the appropriate cycle and tighten.

NOTE: The cam for this switch is adjustable. To have the microswitch activate at a different point in the cycle, rotate the cam as needed. To rotate the cam loosen the center screw, tighten when the cam is in the new position.

Spring (Valve Discs)

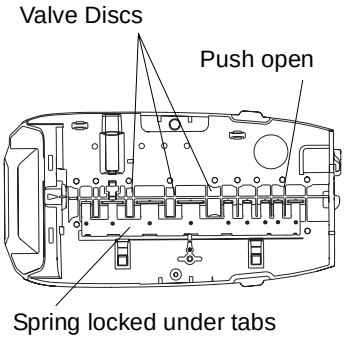
This spring is a one-piece metal spring that applies pressure to the valve discs holding them closed. The rotating camshaft overcomes this pressure to open the valve discs as needed. The shape of the spring is critical for proper operation.

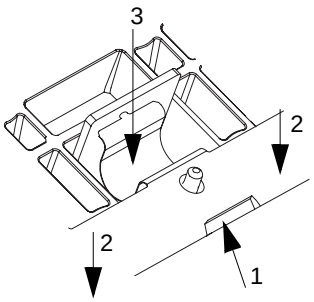
WARNING: Do not attempt to straighten or repair this spring. If this spring is damaged, valve discs may not operate correctly.



To remove spring:

1. Disconnect power to the unit.
2. Remove cover.
3. Remove motor.
4. Remove camshaft.
5. Place unit in bypass.
6. Release water pressure by pushing the last valve discs open with a screw driver.
7. Locate valve discs 2, 3 and 4 for 255 valve or valve discs 3, 4 and 5 for Performa valves.
8. Position yourself on the spring side of the valve discs.
9. Place two (or more) fingers on the flat part of the spring.
10. Move the fingers toward the valve discs and into the spring valley between the previously located valve discs.
11. By pulling back and up on the spring, the spring will pop out of the valley.
12. Pull back further to remove the spring.





To install spring:

1. Inspect the spring for damage. Do not attempt to repair a bent spring.
2. Position yourself on the spring side of the valve discs.
3. Position the spring over the valve body close to final position. The wide spring segments will be located at the wide valve discs. The curve of the spring will be down into the valley.
4. The long flat close edge is inserted first. This edge slides into a channel on the valve body.
5. Rock the spring back and place the flat edge into the channel.
6. Lower the springs until they rest on top of the valve discs.
7. A tool (phillips screwdriver) will be needed to push the springs in place.
8. The spring posts will guide the spring into position.
9. Hold the flat part down with one hand.
10. Spread your fingers apart to cover the length and push down.
11. With the other hand use the tool to push down in the valley of each spring segment.

The spring will slide off the top of the valve disc downward. The small projection on the end of the spring will drop into the hole in the valve disc to provide secure positioning. Repeat for all spring segments.

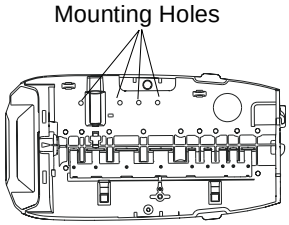
NOTE: If a spring segment goes beyond the locating hole, it can be pulled back using a small flat blade screwdriver.

NOTE: In high pressure (80 psi and higher) applications, the standard single valve disc springs can be installed on top of the one piece spring.

Relay (Optional)

WARNING: The Pentair Water valve is rated for low voltage (less than 48 volts) microswitch components only. Using a high voltage switch may result in damaged valves or fire and may interfere with electronic control function.

Holes are provided to mount a standard relay. It is located under the cover on the top plate. This relay is wired to the controller and changes the digital signal from controller into a signal that can be used to run accessories.



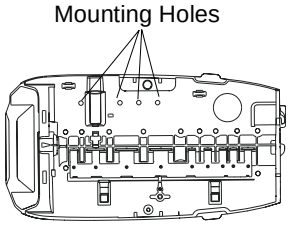
To install relay:

1. Disconnect power to the unit.
2. Remove cover.
3. Remove controller.
4. Use self-tapping screws to secure the relay to the left side of top plate. Screw bosses are available for connecting relay.
5. Connect wires to the controller.
6. Clip wires with plastic tie-wrap to ensure that the wires do not tangle in camshaft.

Terminal Block (Optional)

WARNING: The Pentair Water valve is rated for low voltage microswitch components only. Using a high voltage switch may result in damaged valves or fire and may interfere with electronic control function.

Holes are provided to mount standard terminal blocks. The location is under the cover on the top plate.

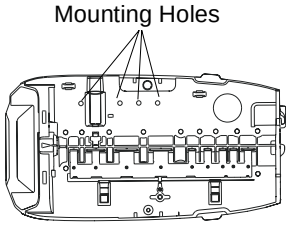


To install terminal blocks:

1. Disconnect power to unit.
2. Remove cover.
3. Use self-tapping screws to secure terminal block to top plate.
4. Clip wires with plastic tie-wrap to ensure that the wires do not tangle in camshaft.

Transformer (Optional)

A transformer is available to be mounted under the cover. Holes are provided on the top plate for a standard 24 VAC to 12 VAC transformer. This type of transformer is used when the plug-in AC adapter is not acceptable.



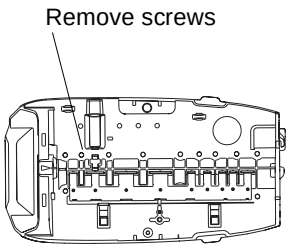
To install transformer:

1. Disconnect power to unit.
2. Remove cover.
3. Use self-tapping screws to secure transformer to top plate.
4. Clip wires with plastic tie-wrap to ensure that the wires do not tangle in camshaft.

Top Plate

The top plate holds the valve discs in place during operation. This plate is removed to allow cleaning and replacing the valve discs.

NOTE: The Pentair Water valve discs are made from a chloramine resistant severe service rubber. The valve discs will usually not need to be changed. Before removing the top plate for valve disc service be certain that one of the discs is not operating correctly.



To remove top plate:

1. Disconnect power to unit.
2. Remove cover.
3. Remove motor.
4. Remove camshaft.
5. Place unit in bypass.
6. Release water pressure by pushing the last valve disc open with a screwdriver.
7. Any optional items may be removed.
8. Wiring harnesses should be removed.
9. Remove valve disc and spring.
10. Use a phillips screwdriver to remove the screws from the top plate.
11. Lift the top plate off. All the valve discs can be pulled straight out.

Inspect valve discs for wear. The sealing surface is the raised ridge on the underside of the top shoulder.

Check each valve disc cavity in the valve for debris. Remove any foreign objects before replacing the valve disc.

To install valve discs:

NOTE: If the valve disc fits properly in the cavity, it will work correctly.

1. Put the valve disc into the correct (based on shoulder size) valve port cavity. The metal end without rubber coating should be visible.
2. Push down on the shoulder to position the valve disc completely into the port cavity.
3. The metal portion will be positioned straight up and the top of the shoulder will be level with the valve.

To install the top plate:

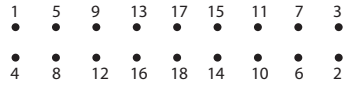
NOTE: All valve discs should be in position. Use the same screws that were removed to reassemble the top plate.

WARNING: Follow the procedure to engage the screws with the existing threads. If the same threads are not used, the holding power of the screw is lost. Under pressure the valve can leak. Screws that have the same diameter but have different threads should not be used.

1. Position the top plate on top of the valve and over the valve discs.
2. Insert a screw at one of the corner positions.

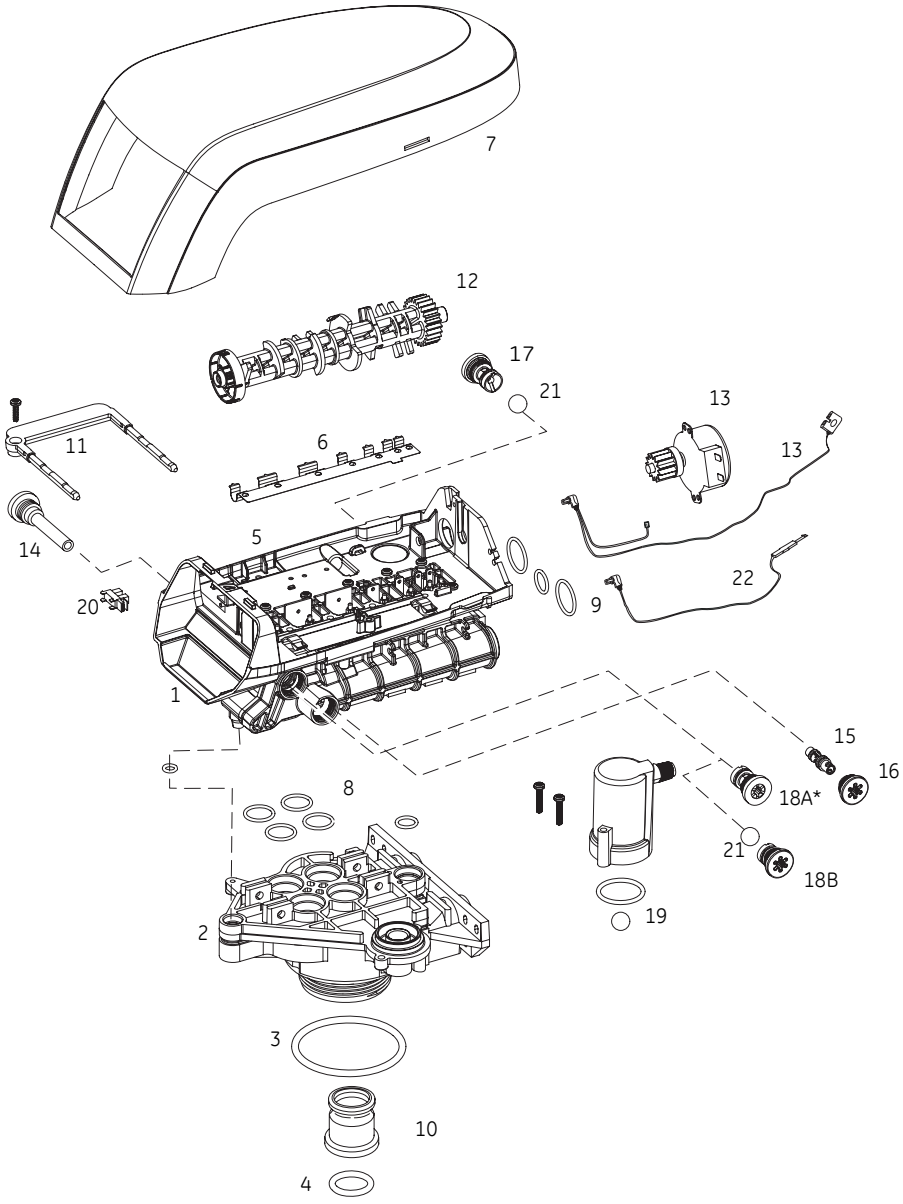
WARNING: This procedure for reinserting screws must be followed to ensure proper holding strength of the screws.

   A. Drop screw of same size and thread into the hole.
   B. Use a phillips screwdriver and lightly rotate the screw backwards (counterclockwise).
   C. When the thread of the screw and the thread of the hole match, the screw will “click” and slightly drop down.
   D. The threads are lined up. Lightly rotate the screw to tighten and engage threads.
   E. Once the threads have engaged the screw can be tightened. Minimal resistance will be present as the screw is turned in. Resistance indicates new threads are being formed. Back the screw out and rematch the threads.



3. Turn the screw in but do not tighten.
4. Place a second screw into the hole diagonally opposite the first screw and turn in but do not tighten.
5. Insert another screw into one of the remaining corners and turn it in.
6. The fourth screw goes into the hole diagonally opposite. Turn it in.
7. Put the remaining screws in following the same criss-cross pattern working from the ends toward the center. When all the screws are in place they can be tightened down.
8. Start at the corner of the screw pattern and tighten that screw. Work the same pattern from the ends toward center and criss-crossing as each screw is tightened. Check that each valve disc moves smoothly before replacing the spring and camshaft.
9. Replace spring.
10. Replace camshaft and motor.
11. Replace controller and wiring harnesses.

255 Valve Exploded View



*Warning: Do not use flow control ball with #18A.

255 Valve Parts List

Code	Part No.	Description	Qty.
1	1244650	255 Valve Assembly, w/o Flow Controls	1
2	1033784	255 Tank Adapter New Style	1
3	1010429	O-Ring BN	1
4	1010428	O-Ring EP	
5	1235340	Top Plate, 255 Valve, Logix Series Controller	1
6	1235341	Spring, One Piece, 255 Valve	1
7	1236246*	Cover, Valve, 255/Performa, Logix Series Controller	1
8	1001404	O-Ring Group: Tank Adapter	1
9	1040459	O-Ring Group: Piping Boss	1
10	1001986	13/16 inch Rubber Insert (Optional)	1
*	1000250	Valve Disk Kit - Standard	1
*	1239760	Blending Valve Kit 900/700 Series	1
11		Locking Bar	1
	1031402	English Language Locking Bar	
	1031403	French Language Locking Bar	
	1031404	German Language Locking Bar	
	1031405	Italian Language Locking/Bar	
	1031406	Japanese Language Locking Bar	
	1031407	Spanish Language Locking Bar	
	1006093	Locking Bar Screw - No. 8-9/16 inch	
12		Camshaft Options	1
	1235353	Cam 255/70 Series Valve, STD, Black	
13	1235361	Motor/Optical Cable Assembly	1
14	1000226	Screen/Cap Assembly w/ O-Ring	1
15		Injector (High Efficiency) Options	1
	1035730	“E” Injector (HIgh Efficiency) - Yellow (6-inch tank)	
	1035731	“F” Injector (High Efficiency) - Peach (7-inch tank)	
	1035732	“G” Injector (High Efficiency) - Tan (8-inch tank)	
	1035733	“H” Injector (High Efficiency) - Lt Purple (9-inch tank)	
	1035734	“J” Injector (High Efficiency) - Lt Blue (10-inch tank)	
	1035735	“K” Injector (High Efficiency) - Pink (12-inch tank)	
	1035736	“L” Injector (High Efficiency) - Orange (13 - 14-inch tank)	
16	1000269	Injector Cap with O-Ring	1
17		Drain Control Assembly with O-Ring	1
	1000209	No. 7 (1.3 gpm; 4.9 Lpm)	
	1000210	No. 8 (1.7 gpm; 6.4 Lpm)	
	1000211	No. 9 (2.2 gpm; 8.3 Lpm)	
	1000212	No. 10 (2.7 gpm; 10.2 Lpm)	
	1002130	No. 12 (3.9 gpm; 14.76 Lpm)	
	1000214	No. 13 (4.5 gpm; 17 Lpm)	
	1000215	No. 14 (5.3 gpm; 20 Lpm)	
18A	1000222	Regenerant Refill Controller, No Ball, 0.33 gal.	1
18B	1243510	Regenerant Refill Controller	
19		Air Check Kit	1
	1032416	Air Check Kit 3/8-inch male	
	1032417	Air Check Kit 1/4-inch male	
20	1235373	Module, Sensor, Photo Interrupter	1
21	1030502	Ball, Flow Control	1
*	1033066	New to Old Style Aircheck Adapter	1
22	1235446	Turbine Cable	1
*	1233187	Motor Locking Pin	
*	1268102	No Salt Detector/Refill Control	
*	1242411	Extension Cord for Cabinet	
*	1239711	Service Kit, Front Mount, 0.1 amp	
*	1239752	Service Kit, Front Mount, 5 amp	
*	1239753	Service Kit, Top Plate Mount, 0.1 amp	
*	1239754	Service Kit, Top Plate Mount, 5 amp	

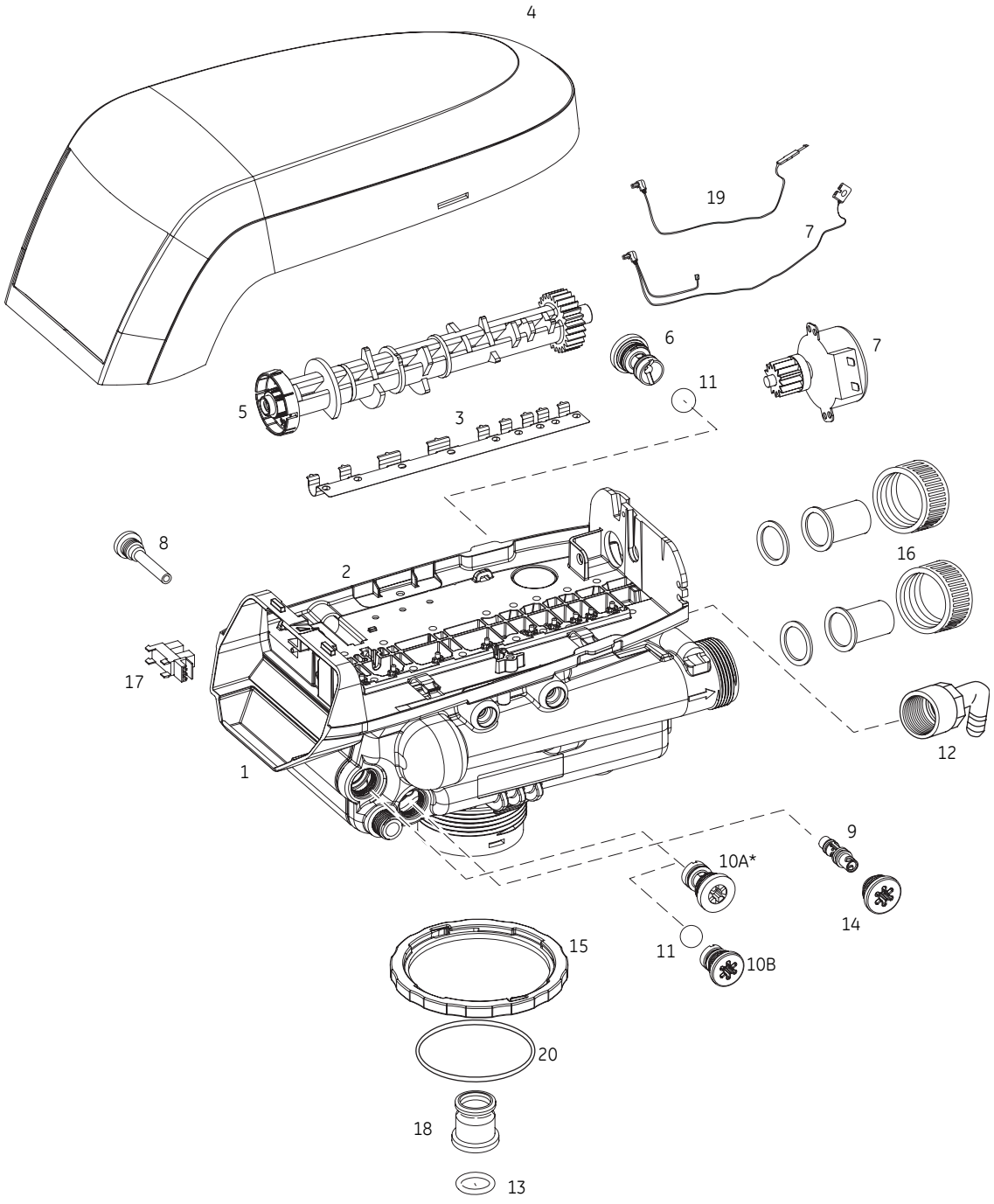
*Not Shown

255 Valve Parts List (Continued)

Code	Part No.	Description	Qty.
*		Piping Boss	
		Piping Boss Kit (includes hardware):	
	1040277	3/4-inch NPT, Brass 3/8-inch NPT Drain	
	1040278	1-inch NPT, Brass 1/2-inch NPT Drain	
	1040281	3/4-inch BSPT, Brass 3/8-inch BSPT Drain	
	1040282	1-inch BSPT, Brass 1/2-inch BSPT Drain	
	1040279	3/4-inch NPT, Noryl 1/2-inch NPT Drain	
	1040280	1-inch NPT, Noryl 1/2-inch NPT Drain	
	1040283	3/4-inch BSPT, Noryl 1/2-inch BSPT Drain	
	1040284	1-inch BSPT, Noryl 1/2-inch BSPT Drain	
*	1040339	Piping Boss Installation Kit	1
*		Meter Adapter	
	1032350	Kit, Meter Adapter	1
	1032351	Meter Install Kit	1
*		Bypass Valve	
	1040769	Bypass Body Assembly with Install Kit	1
	1040524	Bypass Installation Kit	1
		Tube Adapter Kits	
*	1001606	3/4-inch Copper Tube Adapter Kit	1
*	1001670	1-inch Copper Tube Adapter Kit	1
*	1001608	22-mm Copper Tube Adapter Kit	1
*	1001613	3/4-inch CPVC Tube Adapter Kit	1
*	1001614	1-inch CPVC Tube Adapter Kit	1
*	1001615	25-mm CPVC Tube Adapter Kit	1
*	1001769	3/4-inch NPT Plastic Pipe Adapter Kit	1
*	1001603	1-inch NPT Plastic Pipe Adapter Kit	1
*	1001604	3/4-inch BSPT Plastic Pipe Adapter Kit	1
*	1001605	1-inch BSPT Plastic Pipe Adapter Kit	1
*	1001611	3/4-inch BSPT Brass Pipe Adapter Kit	1
*	1001610	1-inch NPT Brass Pipe Adapter Kit	1
*	1001612	1-inch BSPT Brass Pipe Adapter Kit	1

*Not Shown

Performa Exploded View



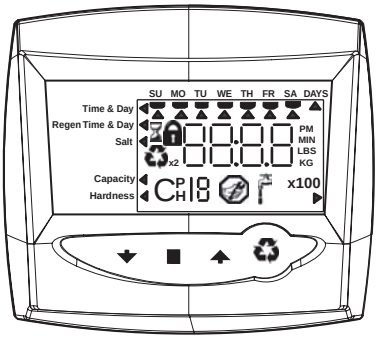
*Warning: Do not use the flow control ball with #10A.

Performa Parts List

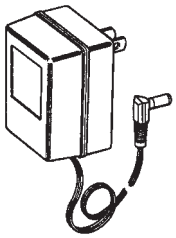
Code	Part No.	Description	Qty.
1	1035807	Valve Assembly w/o Flow Controls	1
2	1235338	Top Plate, 268/700 Series Valves	1
3	1235339	Valve Disc Spring, One Piece, Performa Valve	1
4	1236246	Cover, Valve, 255/Performa Logix Series Controller	1
5		Performa Logix Camshafts	1
	1235352	Cam, 263-268/700 Series Valve, STD, Black	
6		Drain Control Assembly:	1
	1000209	No. 7 (1.3 gpm; 4.9 Lpm)	
	1000210	No. 8 (1.7 gpm; 6.4 Lpm)	
	1000211	No. 9 (2.2 gpm; 8.3 Lpm)	
	1000212	No. 10 (2.7 gpm; 10.2 Lpm)	
	1000213	No. 12 (3.9 gpm; 14.76 Lpm)	
	1000214	No. 13 (4.5 gpm; 17 Lpm)	
	1000215	No. 14 (5.3 gpm; 20 Lpm)	
	1239760	Blending Valve Kit 900/700 Series Top Plate	
*		Drain Line Flow Control (External)	1
	1030355	Drain Line Flow Control, 5 gpm (19 Lpm)	
	1030356	Drain Line Flow Control, 6 gpm (22.5 Lpm)	
	1030357	Drain Line Flow Control, 7 gpm (26.5 Lpm)	
	1030358	Drain Line Flow Control, 8 gpm (30 Lpm)	
	1030359	Drain Line Flow Control, 9 gpm (34 Lpm)	
	1030360	Drain Line Flow Control, 10 gpm (38 Lpm)	
7	1235361	Motor/Optical Cable Assembly	1
8	1000226	Screen/Cap Assembly w/ O-Ring	1
9		Injector (High Efficiency) Options	
	1035730	“E” Injector (HIgh Efficiency) - Yellow (6-inch tank)	
	1035731	“F” Injector (High Efficiency) - Peach (7-inch tank)	
	1035732	“G” Injector (High Efficiency) - Tan (8-inch tank)	
	1035733	“H” Injector (High Efficiency) - Lt Purple (9-inch tank)	
	1035734	“J” Injector (High Efficiency) - Lt Blue (10-inch tank)	
	1035735	“K” Injector (High Efficiency) - Pink (12-inch tank)	
	1035736	“L” Injector (High Efficiency) - Orange (13 & 14-inch tanks)	
	1032978	Plugged Injector for 263 Filter	
	1032985	Plugged Injector Cap	
10A	1000222	Regenerant Refill Controller, No Bal, 0.33 gpm	1
10B	1243510	Regenerant Refill Controller	
11	1030502	Ball, Refill Flow Control	
*	1030334	Plugged Refill Flow Control - for 263 Valve	
12	1002449	Drain Fitting Elbow (3/4-inch hose barbed)	1
13	1010428	O-Ring	1
14	1000269	Injector Cap with O-Ring	1
15	1035622	Tank Ring	1
*	1041174	Valve Disc Kit: Standard	
16	Plumbing Adapter Kits:		1
	1001606	3/4-inch Copper Tube Adapter Kit	
	1001670	1-inch Copper Tube Adapter Kit	
	1001608	22-mm Copper Tube Adapter Kit	
	1001613	3/4-inch CPVC Tube Adapter Kit	
	1001614	1-inch CPVC Tube Adapter Kit	
	1001615	25-mm CPVC Tube Adapter Kit	
	1001769	3/4-inch NPT Plastic Pipe Adapter Kit	
	1001603	1-inch NPT Plastic Pipe Adapter Kit	
	1001604	3/4-inch BSPT Plastic Pipe Adapter Kit	
	1001605	1-inch BSPT Plastic Pipe Adapter Kit	
	1001611	3/4-inch BSPT Brass Pipe Adapter Kit	
	1001610	1-inch NPT Brass Pipe Adapter Kit	
	1001612	1-inch BSPT Brass Pipe Adapter Kit	
17	1235373	Module, Sensor, Photo Interrupter	1
18	1001986	13/16 inch Rubber Insert (Optional)	1
19	1235446	Turbine Cable	1
20	1010154	Tank O-Ring	1
*	1033444	Internal Turbine Meter	
*	1233187	Motor Locking Pin	
*	1268102	No Salt Detector/Refill Control	
*	1033444	Turbine Assembly	
*	1041174	Valve Disc Kit, Standard	
*	1239979	Cable Harness, Remote Regen 740F	
*	1239711	Switch Kit, Front Mount, 0.1 amp	
*	1239752	Switch Kit, Front Mount 5 amp	
*	1239753	Switch Kit, Top Plate Mount, 0.1 amp	
*	1239754	Switch Kit, Top Plate Mount, 5 amp	

*Not shown on drawing.

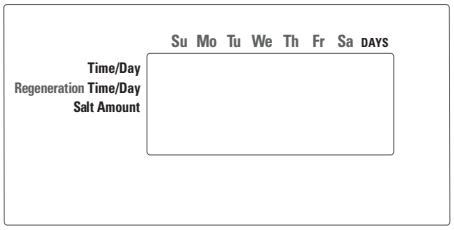
Logix 700 Series Controllers Parts List



700 Series Control



AC Adapter



700 Control Overlays

Code	Part No.	Description	Qty.
		Electronics Modules/Controllers	1
	1242146	Logix 740 Controller	
	1242148	Logix 740F Controller	
	1242163	Logix 760 Controller	
	1242166	Logix 760F Controller	
		Electrical Components	
	1235269	Motor/Optical Cable Assembly, 700 Series Control	
	1235373	Module, Sensor, Photo Interrupter	
	1235361	Motor w/Spacer & Pinion, 700 Series Controller 12V, 50/60 Hz	

Code	Part No.	Description	Qty.
		AC Adapter	
	1000810	Japanese	
	1000811	North American	
	1000812	Australian	
	1000813	British	
	1000814	European	
	1030234	Transformer Extension Cord 15 foot (4.5m)	
	1235448	North American Outdoor AC Adapter	
		Overlays	
	1238476	Overlay, 740/742C Controller, English	

TROUBLESHOOTING

700 Series Controller Troubleshooting

Problem	Possible Cause	Solution
ERR 1 is displayed	Controller power has been connected and the control is not sure of the state of the operation.	Press the UP arrow and the control should reset.
ERR 2 is displayed	Controller power does not match 50 or 60 Hz.	Disconnect and reconnect the power. If problem persists, obtain the appropriate controller or AC adapter for either 50 or 60 Hz power.
ERR 3 is displayed	Controller does not know the position of the camshaft. Camshaft should be rotating to find Home position.	Wait for two minutes for the controller to return to Home position. The hourglass should be flashing on the display indicating the motor is running.
	Camshaft is not turning during ERR 3 display.	Check that motor is connected. Verify that motor wire harness is connected to motor and controller module. Verify that optical sensor is connected and in place. Verify that motor gear has engaged cam gear. If everything is connected, try replacing in this order: —Wire harness —Motor —Optical sensor —Controller
	If camshaft is turning for more than five minutes to find Home position:	Verify that optical sensor is in place and connected to wire. Verify that camshaft is connected appropriately. Verify that no dirt or rubbish is clogging any of the cam slots. If motor continues to rotate indefinitely, replace the following components in this order: —Wire harness —Motor —Optical sensor —Controller
Four dashes displayed: — — : — —	Power failure occurred	Press SET to reset the time display.

System Troubleshooting

Problem	Possible Cause	Solution
1. Brine tank overflow.	a. Uncontrolled brine refill flow rate. b. Air leak in brine line to air check. c. Drain control clogged with resin or other debris.	a. Remove brine control to clean ball and seat. b. Check all connections in brine line for leaks. Refer to instructions. c. Clean drain control.
2. Flowing or dripping water at drain or brine line after regeneration.	a. Valve stem return spring weak. b. Debris is preventing valve disc from closing.	a. Replace spring. (Contact dealer.) b. Remove debris.
3. Hard water leakage after regeneration.	a. Improper regeneration. b. Leaking of external bypass valve. c. O-ring around riser pipe damaged. d. Incorrect capacity.	a. Repeat regeneration after making certain correct regenerant dosage was set. b. Replace bypass valve. (Contact dealer.) c. Replace O-ring. (Contact dealer.) d. Verify appropriate regenerant amount and system capacity. (Contact dealer.)
4. Control will not draw brine.	a. Low water pressure. b. Restricted drain line. c. Injector plugged. d. Injector defective. e. Valve disc 2 and/or 3 not closed. f. Air check valve prematurely closed.	a. Make correct setting according to instructions. b. Remove restriction. c. Clean injector and screen. d. Replace injector and cap. (Contact dealer.) e. Remove foreign matter from disc and check disc for closing by pushing in on stem. Replace if needed. (Contact dealer.) f. Put control momentarily into brine refill, C8. Replace or repair air check if needed. (Contact dealer.)
5. Control will not regenerate automatically.	a. AC adapter or motor not connected. b. Defective motor.	a. Connect power. b. Replace motor. (Contact dealer.)
6. Control regenerates at wrong time of day.	a. Controller set incorrectly.	a. Correct time setting according to instructions.
7. Valve will not draw brine.	a. Low water pressure. b. Restricted drain line. c. Injector plugged. d. Injector defective. e. Air check valve closes prematurely on 255 valve or brine pickup tube.	a. Set pump to maintain 20 psi at softener. b. Change drain to remove restriction. c. Clean injector and screen. d. Replace injector. (Contact dealer.) e. Put control momentarily into brine/slow rinse, C2. Replace or repair air check if needed. (Contact dealer.)
8. System using more or less salt than regenerant setting.	a. Foreign matter in valve causing incorrect flow rates.	a. Remove brine control and flush out foreign matter. Advance control to brine/slow rinse, C2 to clean valve (after so doing position control to "fast rinse, C7" to remove regenerant from tank).
9. Intermittent or irregular regenerant draw.	a. Low water pressure. b. Defective injector.	a. Set pump to maintain 20 psi at conditioner. b. Replace injector. (Contact dealer.)
10. No conditioned water after regeneration.	a. No regenerant in regenerant tank. b. Injector plugged. c. Air check valve closes prematurely.	a. Add regenerant to regenerant tank. b. Clean injector and screen. c. Put control momentarily into brine/slow rinse, C2. Replace or repair air check if needed. (Contact dealer.)

11. Backwashes or purges at excessively low or high rate.	a. Incorrect drain controller used. b. Foreign matter affecting valve operation.	a. Replace with correct size controller. (Contact dealer.) b. Remove drain controller and clean ball and seat.
12. No water flow display when water is flowing on 760 controller.	a. Bypass valve in bypass. b. Meter probe disconnected or not fully connected to meter housing. c. Restricted meter turbine rotation due to foreign material in meter.	a. Shift bypass valve to not-in-bypass position. b. Fully insert probe into meter housing. c. Remove meter housing, free up turbine and flush with clean water. Turbine should spin freely. If not, replace meter. (Contact dealer.)
13. Run out of conditioned water between regenerations.	a. Improper regeneration. b. Incorrect regenerant setting. c. Incorrect hardness or capacity settings. d. Water hardness has increased. e. Restricted meter turbine rotation due to foreign material in meter.	a. Repeat regeneration, making certain that correct regenerant dosage is used. b. Set P6 to proper level. See salt setting chart. c. Set to correct values. See Programming section. d. Set hardness to new value. See Programming section. e. Remove meter housing, free up turbine and flush with clean water. Turbine should spin freely; if not, replace meter. (Contact dealer.)
14. Regenerant tank overflow.	a. Regenerant valve disc 1 being held open by foreign matter. b. Valve disc 2 not closed during regenerant draw causing brine refill. c. Air leak in regenerant line to air check. d. Improper drain control for injector. e. Drain control clogged with resin or other debris.	a. Manually operate valve stem to flush away obstruction. b. Flush out foreign matter holding disc open by manually operating valve stem. c. Check all connections in regenerant line for leaks. Refer to instructions. d. Too small of a drain control with a larger injector will reduce draw rates. e. Clean drain control.

EndoTherm Duo Manual

A guide for Users

southland filtration

Endotherm | southland

Freecall 1800 656 771
service@southlandind.com.au
www.southlandfiltration.com.au

Peace of mind. Delivered.

CE

Contents

For more information on any of the following;

- **Consumables**
- **Technical Assistance**
- **Service Contract**
- **Service Visit**
- **New Systems**
- **Replacement Systems**

Call our Service Department during normal hours (Monday to Friday 8 am to 5 pm) on 1800 656 771or email service@southlandind.com.au

1. System Description

1.1. The EndoTherm Duo Reverse Osmosis system will deliver ambient temperature purified water to HTM2030 and EN ISO 15883 requirements, and can be programmed for thermal sanitisation to take place outside work hours. Reverse osmosis, ultra violet light and 0.05 micron filtration work together in a re-circulating system to achieve and maintain the required water quality. When sanitisation is initiated the tank and ring main can optionally be automatically isolated while a heating element raises the water temperature. The entire thermal sanitisation process can be completed in as little as 3 hours and, should water be required urgently, can be aborted at any point.

1.2. General Guidelines

1.2.1. Pressing 'MENU' from any screen will return you to the main menu screen.

1.2.2. If available, pressing 'Back' will return to the previous screen.

1.2.3. Pressing 'Next' will cycle thru the selected screens

1.2.4. The top bar will show the system status and the colour will indicate if an alarm or warning condition has been detected.

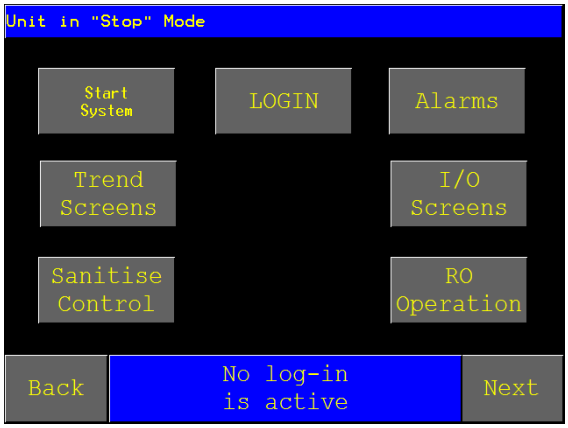
1.2.5. The central bottom bar will show the current login level. Limited functions are available depending on login level.

2. Screen Descriptions

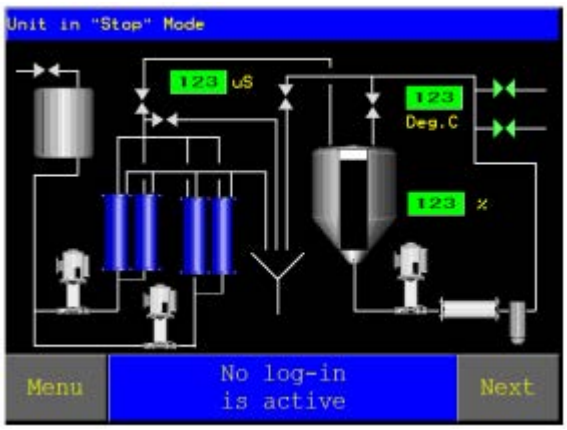
2.1. Main Screen – This is used as a screen saver

2.2. Main Menu Level Screens

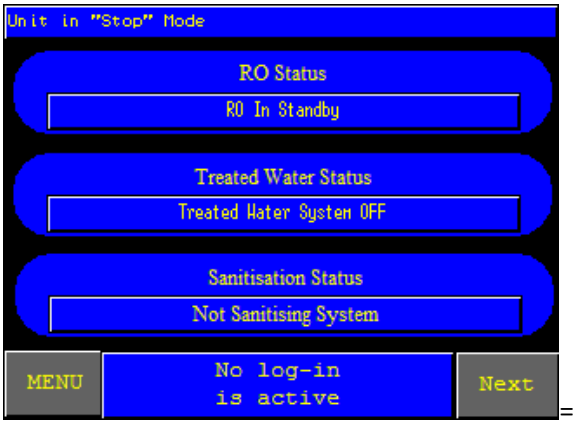
2.2.1. Main Menu – This is reached by pressing 'MENU' from any screen. Not all buttons are available, depending upon the login level.



2.2.2. System Overview (Pictorial) – This screen is reached by pressing 'Next' from the main menu screen. It shows a representation of the system. The top left box (uS – Micro Siemens) shows the quality of the water being produced by the RO system (when running). The temperature box shows the temperature of the water returning from the loop to the treated water tank. The percentage indicator shows the amount of water in the treated water tank.

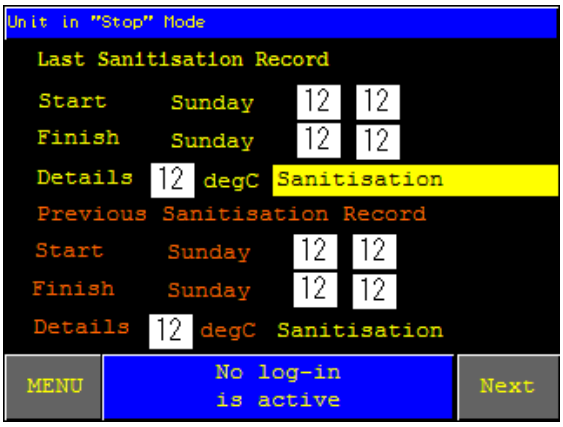


2.2.3. System Overview (Text) – This shows the current status of the three parts of the EndoTherm Duo. The RO Status shows the current condition of the RO system. Note, it will frequently be in standby. The Treated Water Status shows the condition of the main treated water system. The Sanitisation Status shows the condition of the sanitisation system. When sanitising the system is not available for use. During sanitisation it shows the current sanitisation stage.

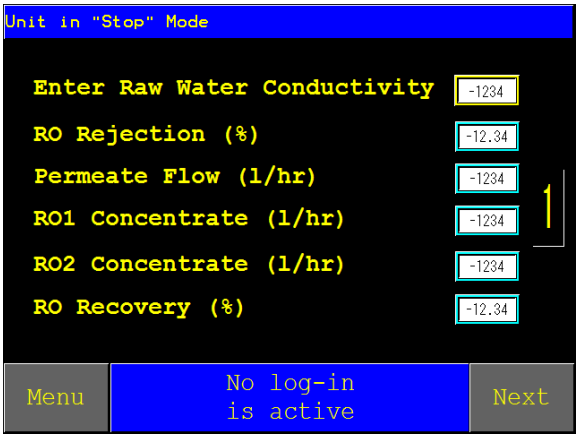


=

2.2.4. Sanitisation Record Screen – This shows the start and finish times of the last two sanitisations and whether they were completed successfully. Note, it does not show the date.

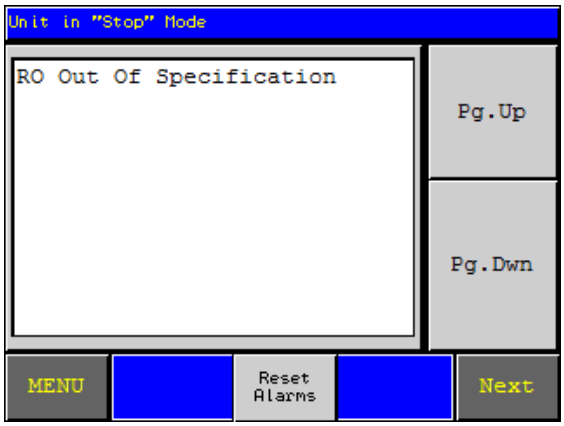


2.2.5. RO Performance Screen - This shows the performance of the Reverse Osmosis system when running. The data will be used to determine membrane performance and indicate when they require changing. This information is primarily for the service engineers. The countdown on the left indicates data reading, when it reaches 0 the values are updated and the system starts logging new data.



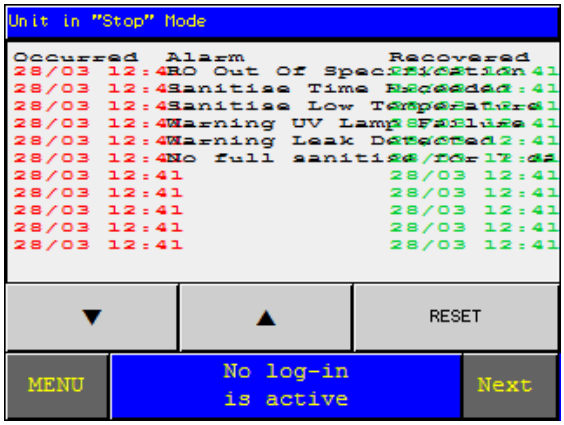
2.3. Alarms

2.3.1. Current Alarms – This screen shows all the current or recent alarms which have occurred in the system. Pressing the reset alarms button will cause the system to reset. All non-active alarms will disappear and only currently active alarms will remain. These should be rectified following the troubleshooting guide.

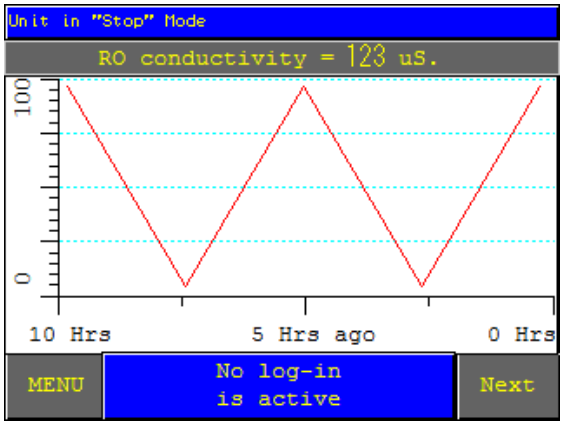


2.3.2. Historical Alarms – This screen shows a historical log of all the alarms on the system, including any current alarms shown on the previous screen. The alarm is shown with

both the date and time the alarm was generated and reset.

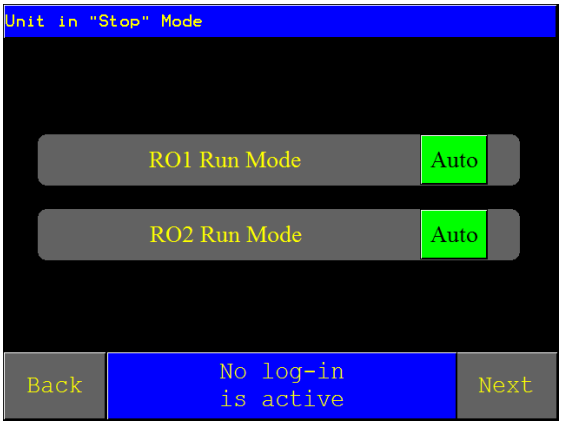


2.4. Trend Screens – These screens graph the various values logged by the system. They are an indication of the system performance over the last ten hours. The graphs log RO conductivity, the treated water tank level and the temperature of the water in the distribution ring. The temperature shows both the ring flow and return temperatures.

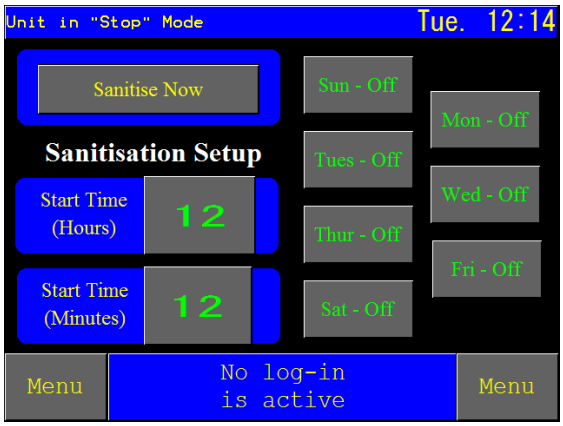


2.5. I/O Screens – This screen shows details of the internal workings of the system. Details may be requested to assist in remote fault finding.

2.6. RO Operation Screen - This screen enables the RO's to be turned 'off' or set to run in 'auto' mode.



2.7. Sanitise Control – This screen controls the sanitisation of the system and is only available to supervisors. Automatic sanitisation is always enabled and will occur on the day and time selected. Selecting no days will stop the system from sanitising automatically. If an immediate sanitisation is required then press the 'Sanitise Now' button. If this is pressed accidentally then the system should be stopped and restarted to abort the sanitisation.



2.8. Start System – This button is used to start and stop the system when it is in local control.

3. Operator Quick Guides

3.1. Login

3.1.1. Press ‘Menu’ to return to main menu screen

3.1.2. Press ‘Login’

3.1.3. Use up and down arrows to select Operator

3.1.4. Enter operator code and press ‘ENT’

3.1.5. If successful then the pop-up screen disappears and the bottom bar shows ‘Operator Access is enabled’.

3.2. Reset Alarms

3.2.1. Press ‘Menu’ to return to main menu screen

3.2.2. Press ‘Alarms’ for the current alarm page

3.2.3. Press ‘Reset Alarms’ to try and reset the alarms.

3.2.4. Any remaining alarms indicate a fault which should be rectified according to the troubleshooting guide.

4. Supervisor Quick Guides

4.1. Login

4.1.1. Press ‘Menu’ to return to main menu screen

4.1.2. Press ‘Login’

4.1.3. Use up and down arrows to select Operator

4.1.4. Enter supervisor code and press ‘ENT’

4.1.5. If successful then the pop-up screen disappears and the bottom bar shows ‘Supervisor Access is enabled’.

4.2. Reset Alarms

4.2.1. Press ‘Menu’ to return to main menu screen

4.2.2. Press ‘Alarms’ for the current alarm page

4.2.3. Press ‘Reset Alarms’ to try and reset the alarms.

4.2.4. Any remaining alarms indicate a fault which should be rectified according to the troubleshooting guide.

4.3. View Alarm History

4.3.1. Press ‘Menu’ to return to main menu screen

4.3.2. Press ‘Alarms’ to view current alarms

4.3.3. Press ‘Next’ to view alarm history. This details when an alarm was generated, what the alarm was and when the alarm was reset.

4.4. Change / Check Sanitisation

4.4.1. Press ‘Menu’ to return to the main menu screen

4.4.2. Press ‘Sanitise Control’ to go to the sanitisation screen

4.4.3. To do an immediate sanitisation press ‘Sanitise Now’. If pressed in error the return to the main menu and stop and start the system (in local control)

4.4.4. Press the ‘Start Time’ buttons to change the time at which to start an automatic sanitisation. Note, the system will not provide water for up to four hours when sanitising.

4.4.5. Press the ‘day’ buttons to select which days of the week the system will sanitise.

5. Settings Page

These settings are a record for reference by the Service Engineer.

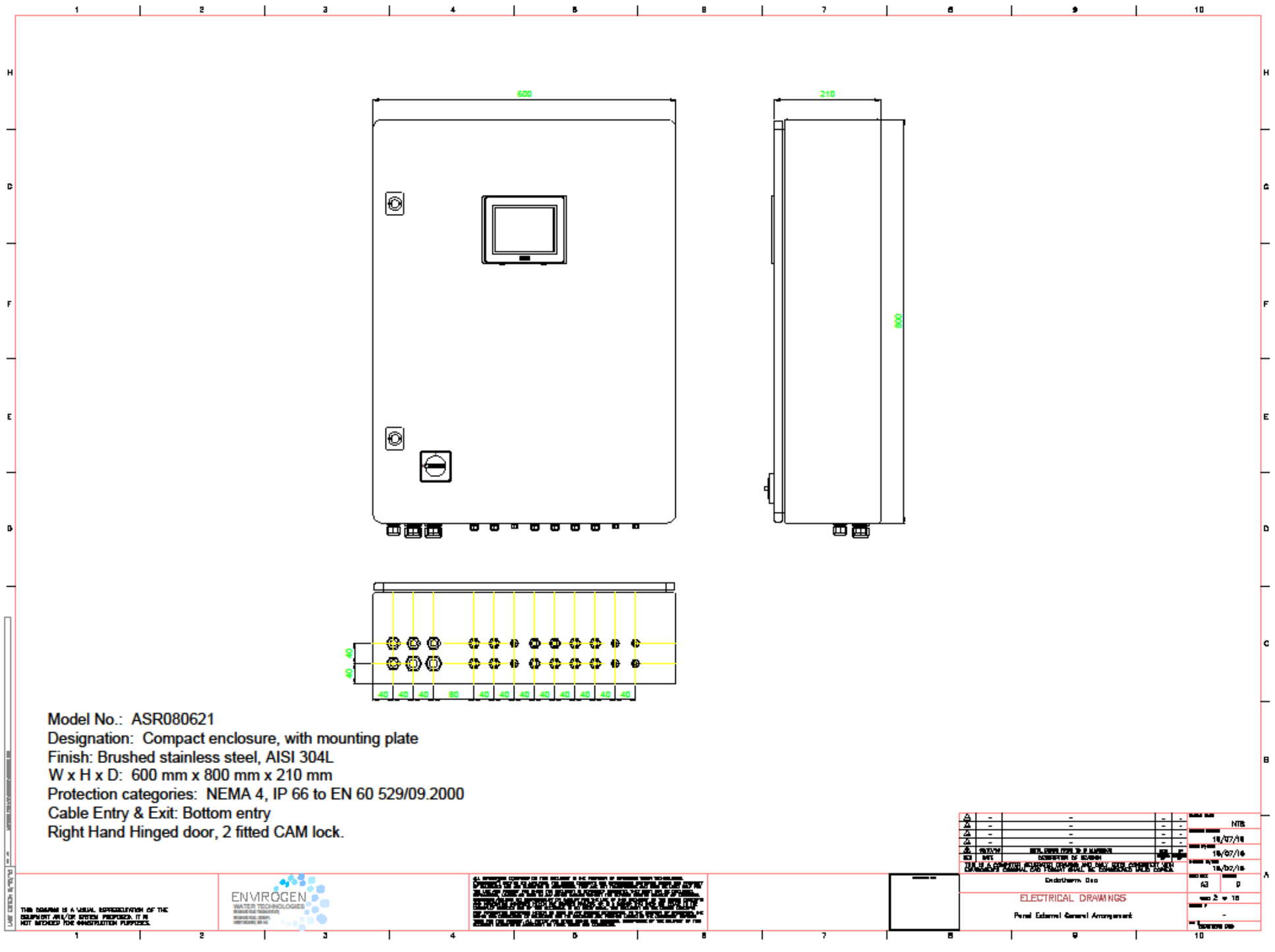
Setting Description	Typical	Unit 1	Unit 2
TWT RO Off	100		
TWT RO On Level	60		
TWT CIP Level	25		
TWT Dump Level	50		
TWT Assist Level	40		
Cond To Tank	30		
Cond Alarm	35		
RW Fill Delay	100		
Max Drain Temp	65		
CIP Heat To	80		
CIP Reqd	75		
CIP Soak (mins)	60		
CIP Cool To	23		
CIP Time (Hrs)	4.0		
Slave Number	1		
Temp to Dump	23		
T Dump Interval	30		
No Run Delay (hrs)	16		
No Run Dump (mins)	3		
Cond Offset	0		
Min Running Temp	4		
TW Zero Point	500		
TW Fill Point	6000		
TW Run Time (Mins)	5		
TW Pause Time (Mins)	20		

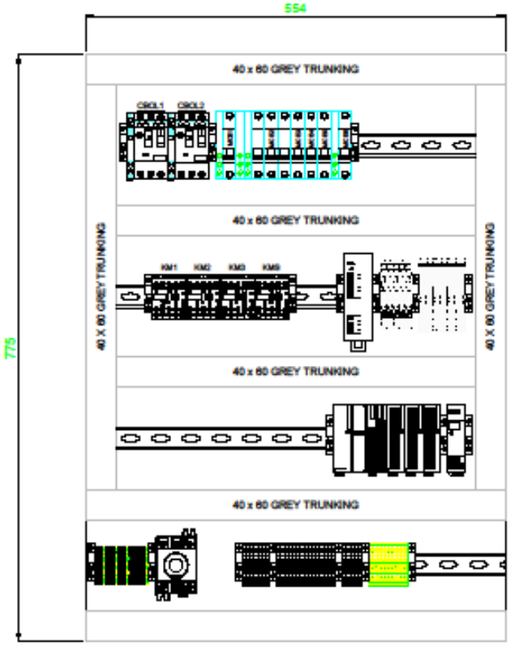
6. Troubleshooting Guide

Error Message	Cause	Solution
RO Out Of Specification	RO system is not producing water to the required quality	Check quality on system overview screen. If greater than 30 then check RO settings and/or replace membranes. If less than 30 then check three way valve PLC output and operation
Sanitise Time Exceeded	Sanitisation has taken longer than allowed	Check graph for issues. If repeated take system offline and monitor sanitisation. Call EWS service engineer.
Sanitise Low Temperature	During sanitisation the temperature has dropped below the required value for a short period.	Check maximum sanitisation temperature to verify sanitisation has occurred. If maximum temperature is low then re-sanitise as soon as convenient.
Warning UV Lamp Failure	UV lamp has failed	Replace lamp
Heater Over Temperature	During sanitisation the heater has thermally cut-out	Check maximum temperature during sanitisation. If repeated alarms occur, or maximum temperature is above 90 degC then call EWS service engineer.
No full sanitise for 7 days.	System has not been sanitised for at least 7 days.	Check automatic sanitisation settings and sanitise as soon as convenient.
Temp Rise Timeout	The temperature of the treated water tank is not rising.	Check operation of the heater. Check operation of the pt100 temperature probe Check water is circulating around system
Sanitise Over Temp Warning	The Sanitisation temperature may have exceeded the mechanical integrity of the 0.05micron filter.	Check filter for signs of fibre adhesive release. Change filter, check sanitisation temperature, re-sanitise and monitor temperature. Do not allow the temperature to exceed 84 deg C.

Raw Water Tank Low Level	Water is not being supplied to the unit. The inlet solenoid feeding the tank has failed.	Check water supply Check PLC output on IO screen and if not on call service engineer Check Solenoid coil and solenoid. Replace as required.
Treated Water Tank Low Level	RO system is not providing water. System has dumped the tank. Leak from distribution system outside unit.	Check RO system operation Check dump valve is not stuck open Check pipe work for leaks
Treated Water Pump Tripped	The treated water pump trip has been activated, or the pump has detected an internal error.	Reset trip and check operation. If pump trips a second time, check the pump electrically and/or replace.
RO Pump Tripped	The RO pump trip has been activated	Reset trip and check operation. If pump trips a second time, check the pump electrically and/or replace.
RO2 Pump Tripped		
Warning Leak Detected	System has a leak within the unit	Check system for leaks and repair. Check leak detection system for correct operation.
Unit Stopped Leak Detected		
Tank Fill Timeout	The RO system is struggling to supply water to the system	Reset and monitor system. Repeated occurrence should be investigated by EWS Service engineer.
Heater Tripped	Heater has thermally tripped.	Isolate system electrically and reset heater. If alarm repeats then change heater or elements.
RO Sensor Fault	RO conductivity sensor failure	Check cable connection and integrity. Replace conductivity sensor and/or transmitter
Ring/Tank Temp. Sensor Fault	Distribution pipe or tank temperature sensor has an error or has failed.	Check cable connection and integrity. Replace temperature sensor
Level sensor Fault	Treated water tank pressure sensor has an error or has failed.	Check cable connection and integrity. Replace pressure sensor

7. Electrical Drawings





THIS DRAWING IS A VISUAL REPRESENTATION OF THE EQUIPMENT AND/OR SYSTEM PROPOSED. IT IS NOT INTENDED FOR CONSTRUCTION PURPOSES.

ENVIROGEN WATER TECHNOLOGIES

-	-	-	-	-	
-	-	-	-	-	
-	-	-	-	-	
-	-	-	-	-	
05/12/18	INITIAL ISSUE FOR TO'S MARKUP				
DCN	DATE	DESCRIPTION OF REVISION			

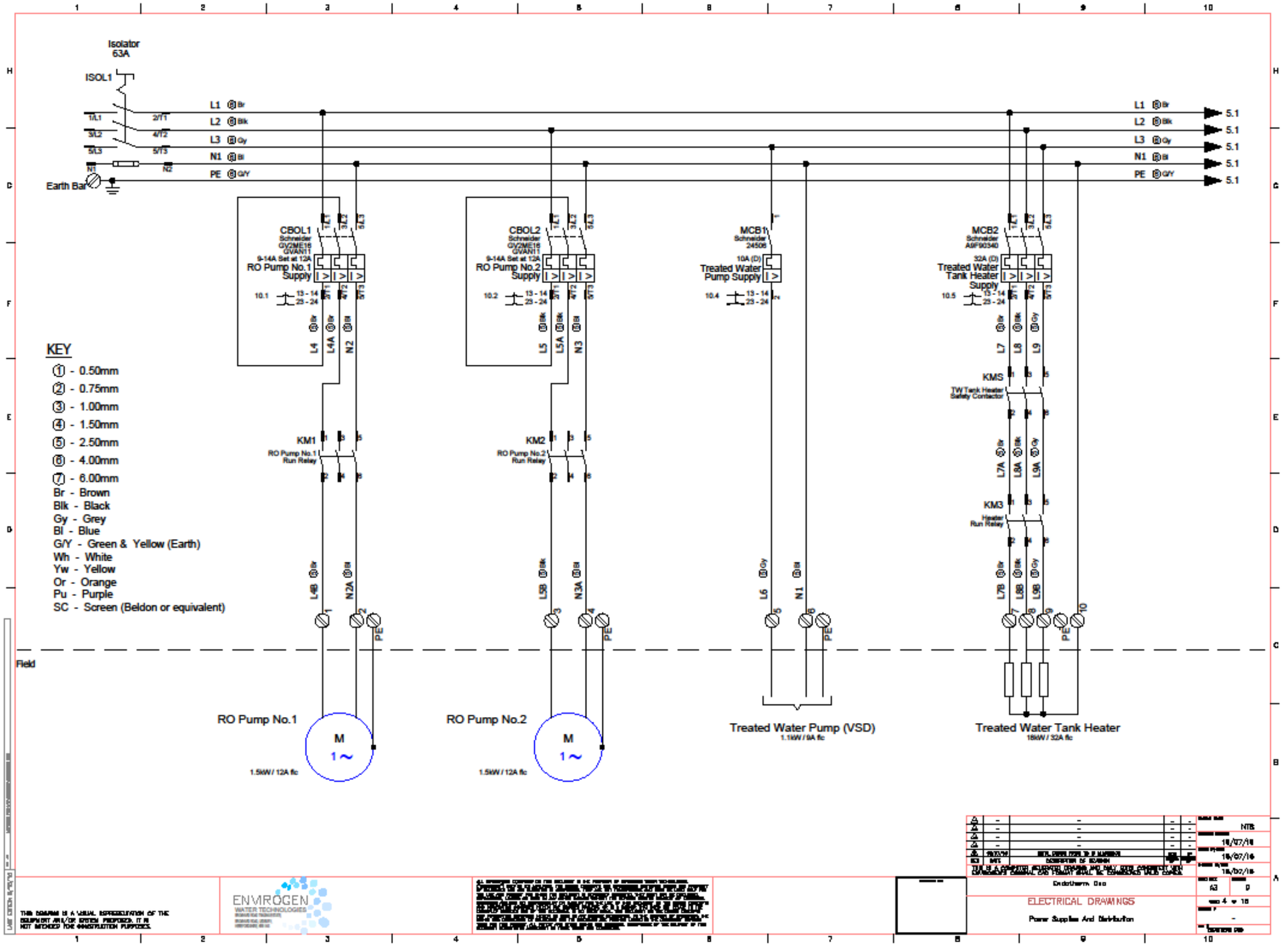
THIS IS A CONCEPTUAL ELECTRICAL DRAWING AND MAY VARY SIGNIFICANTLY WITH DETAILED ENGINEERING AND FINAL EQUIPMENT SELECTIONS. DATA SUBJECT TO CHANGE.

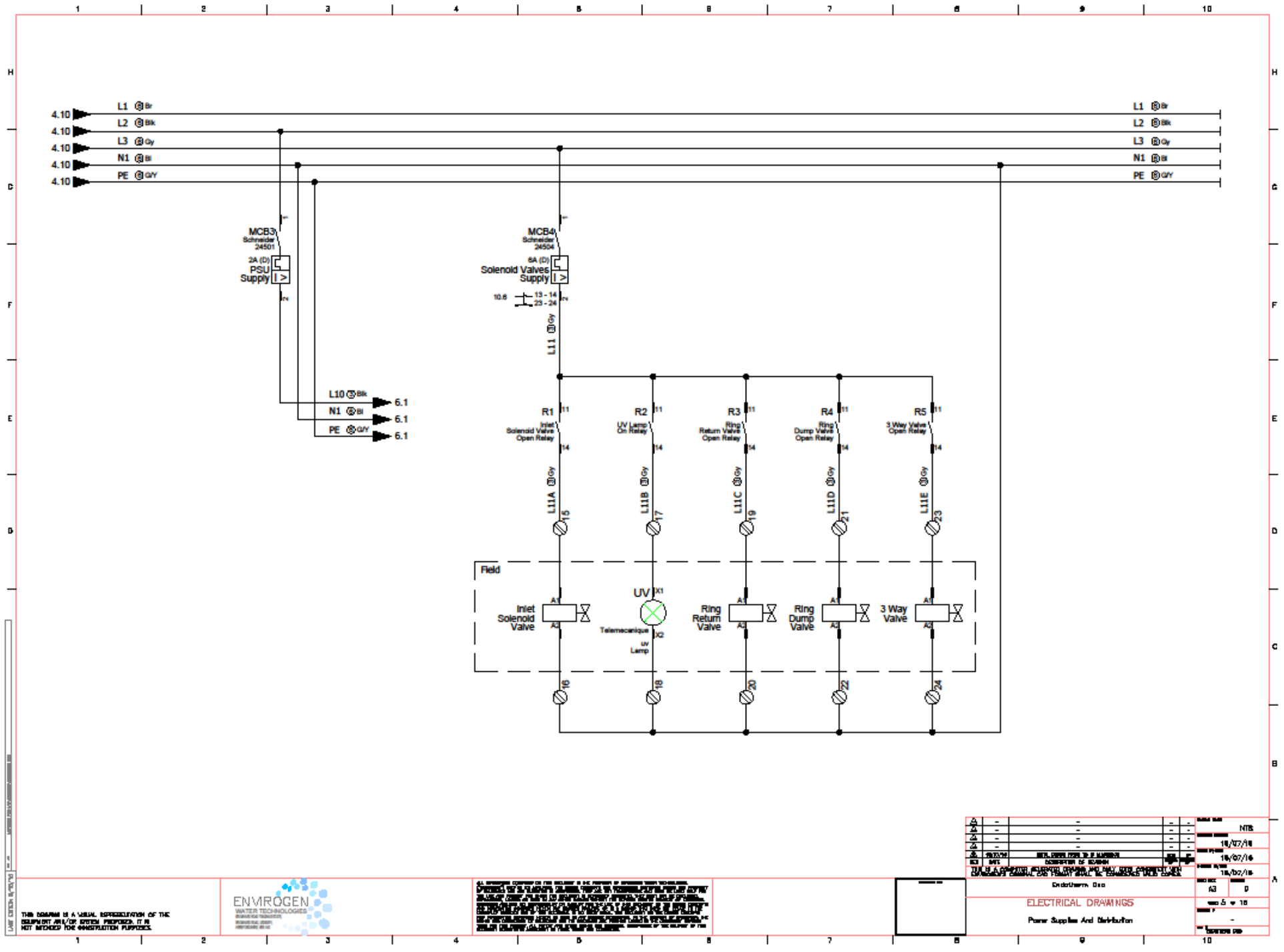
EndoTherm Duo

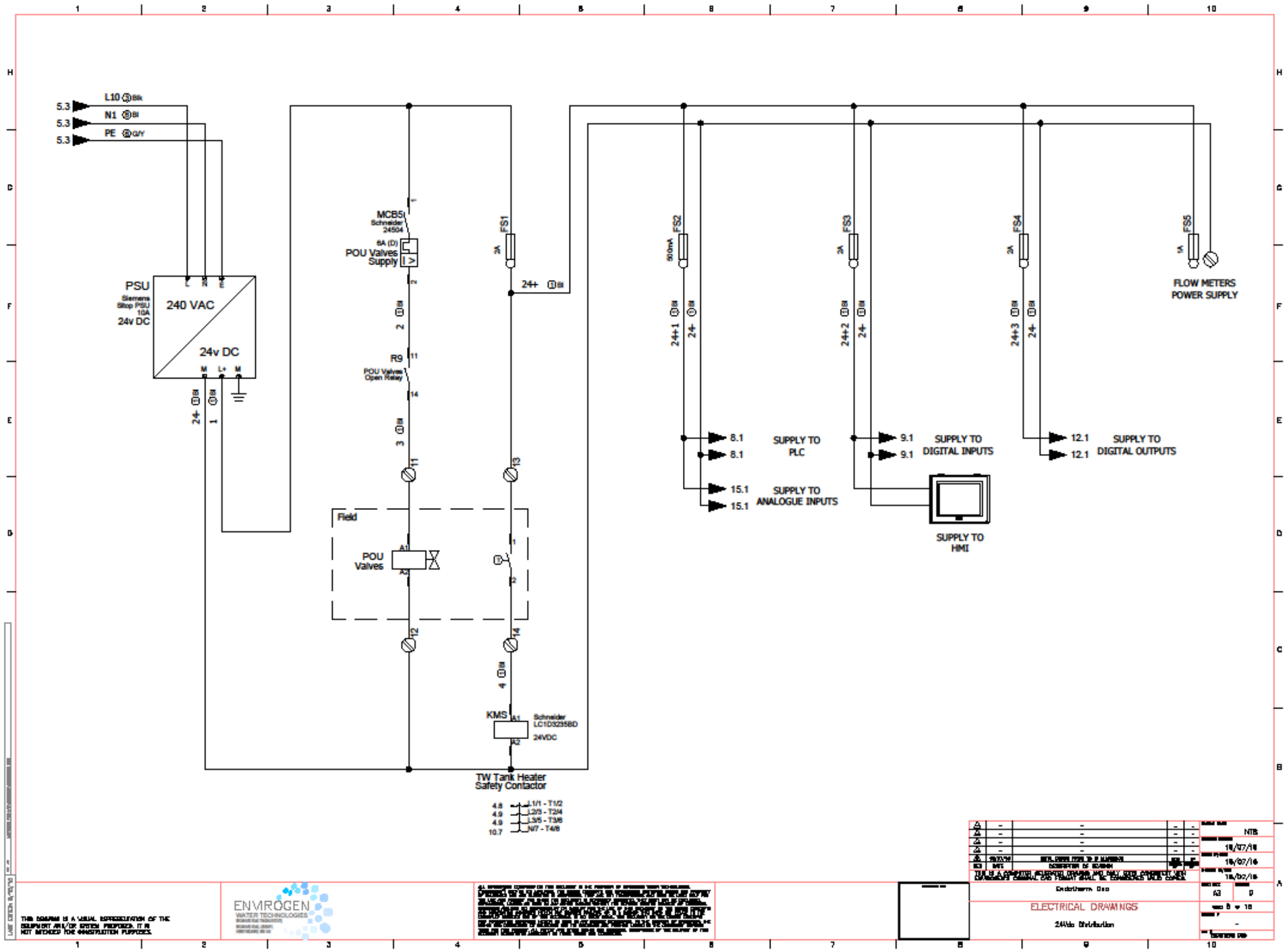
ELECTRICAL DRAWINGS

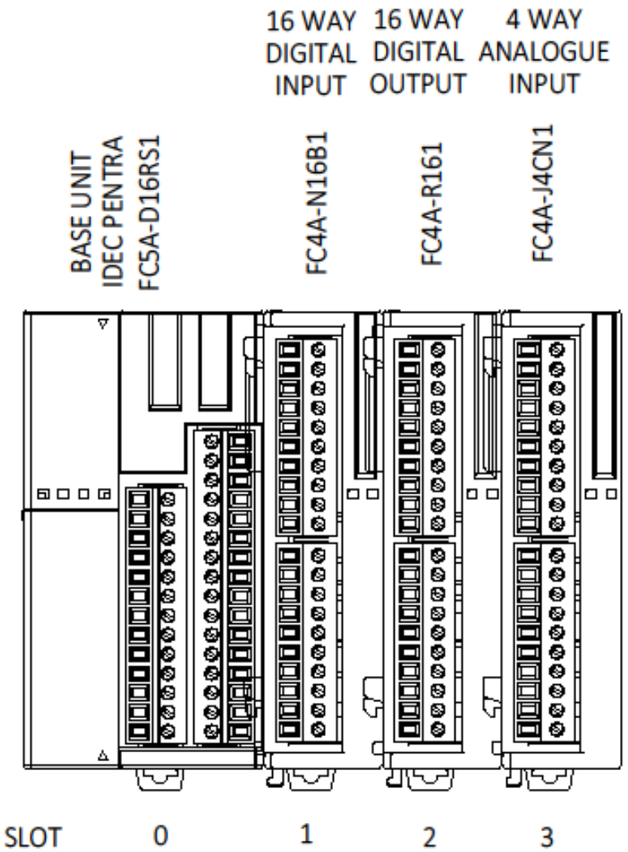
Panel Internal General Arrangement

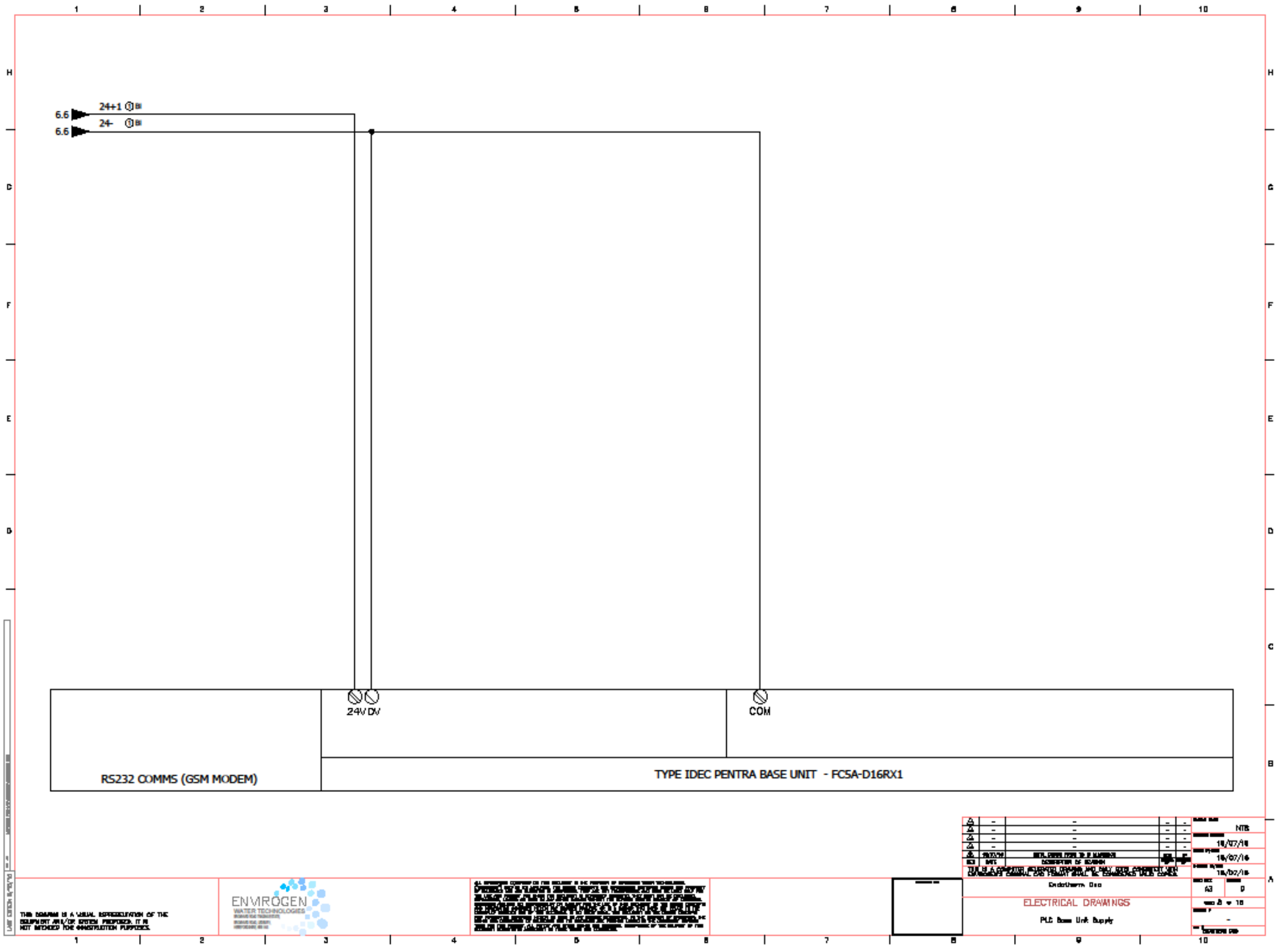
SCALE	NTS
DRAWN	16/07/18
CHECKED	16/07/18
APPROVED	16/07/18
SIZE	A3
REV	D
SHEET	3 of 15
PROJECT	-
DRAWING NO	

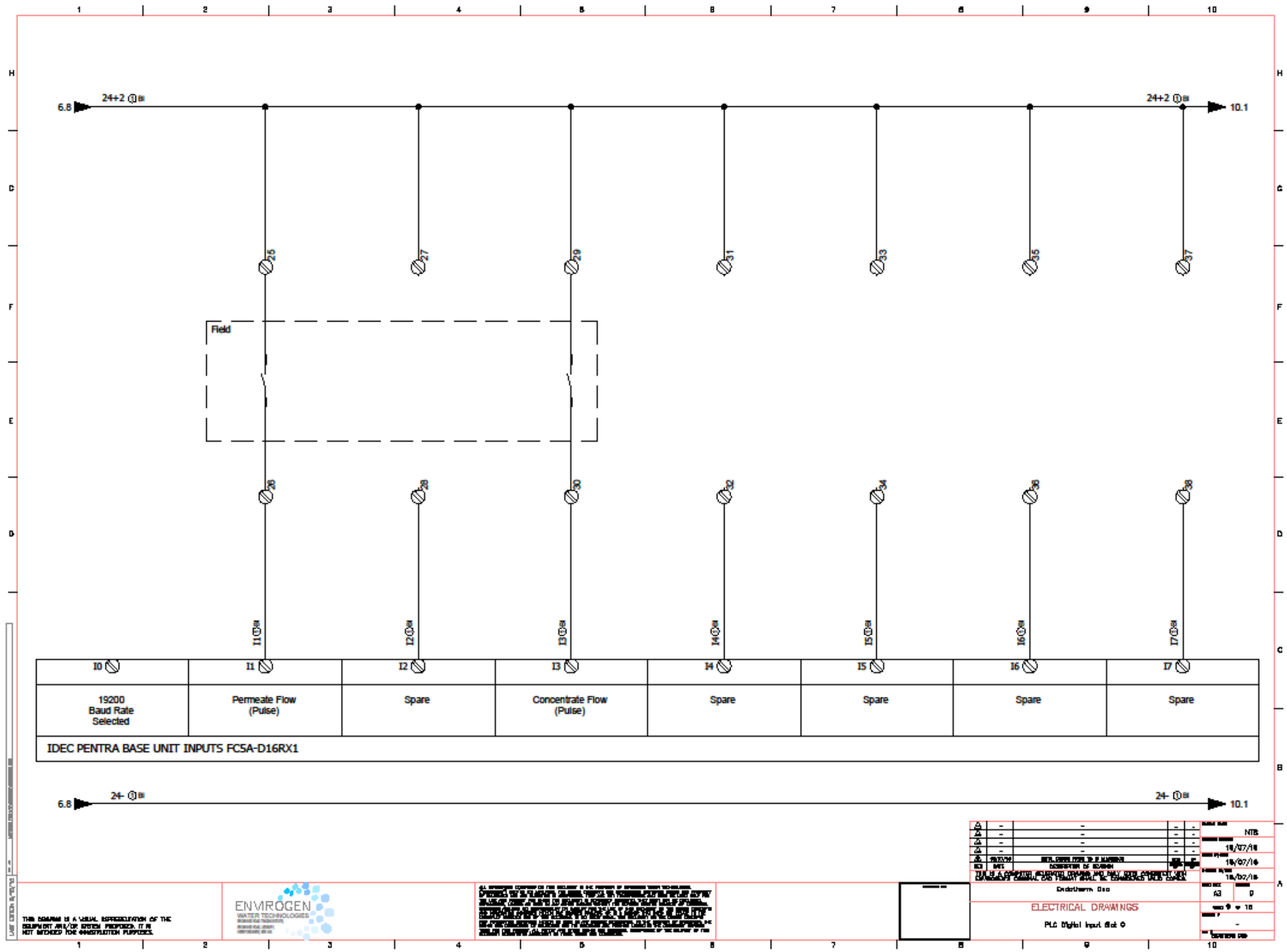

Isolator
63A
ISOL1
L1 Br
L2 Blk
L3 Gy
N1 Bl
PE G/Y
Earth Bar
CBOL1
Schneider
GV2ME16
GVAN11
9-14A Set at 12A
RO Pump No.1
Supply
CBOL2
Schneider
GV2ME16
GVAN11
9-14A Set at 12A
RO Pump No.2
Supply
MCB1
Schneider
24508
10A (D)
Treated Water
Pump Supply
MCB2
Schneider
A9F90340
32A (D)
Treated Water
Tank Heater
Supply
KMS
TW Tank Heater
Safety Contactor
KM1
RO Pump No.1
Run Relay
KM2
RO Pump No.2
Run Relay
KM3
Heater
Run Relay
KEY
① - 0.50mm
② - 0.75mm
③ - 1.00mm
④ - 1.50mm
⑤ - 2.50mm
⑥ - 4.00mm
⑦ - 6.00mm
Br - Brown
Blk - Black
Gy - Grey
Bl - Blue
G/Y - Green & Yellow (Earth)
Wh - White
Yw - Yellow
Or - Orange
Pu - Purple
SC - Screen (Beldon or equivalent)
Field
RO Pump No.1
1.5kW / 12A flc
RO Pump No.2
1.5kW / 12A flc
Treated Water Pump (VSD)
1.1kW / 9A flc
Treated Water Tank Heater
18kW / 32A flc
ELECTRICAL DRAWINGS
Power Supplies And Distribution


4.10 L1 Br
4.10 L2 Blk
4.10 L3 Gy
4.10 N1 Bl
4.10 PE G/Y
L1 Br
L2 Blk
L3 Gy
N1 Bl
PE G/Y
MCB3
Schneider
24501
2A (D)
PSU
Supply
L10 Blk
N1 Bl
PE G/Y
6.1
6.1
6.1
MCB4
Schneider
24504
6A (D)
Solenoid Valves
Supply
10.6
13 - 14
23 - 24
L11 Gy
R1
Inlet
Solenoid Valve
Open Relay
R2
UV Lamp
On Relay
R3
Ring
Return Valve
Open Relay
R4
Ring
Dump Valve
Open Relay
R5
3 Way Valve
Open Relay
L11A Gy
L11B Gy
L11C Gy
L11D Gy
L11E Gy
Field
Inlet
Solenoid
Valve
UV
Telemecanique
uv
Lamp
Ring
Return
Valve
Ring
Dump
Valve
3 Way
Valve
ELECTRICAL DRAWINGS
Power Supplies And Distribution
NTS
18/07/16
18/07/16
18/02/16
A3
D
-

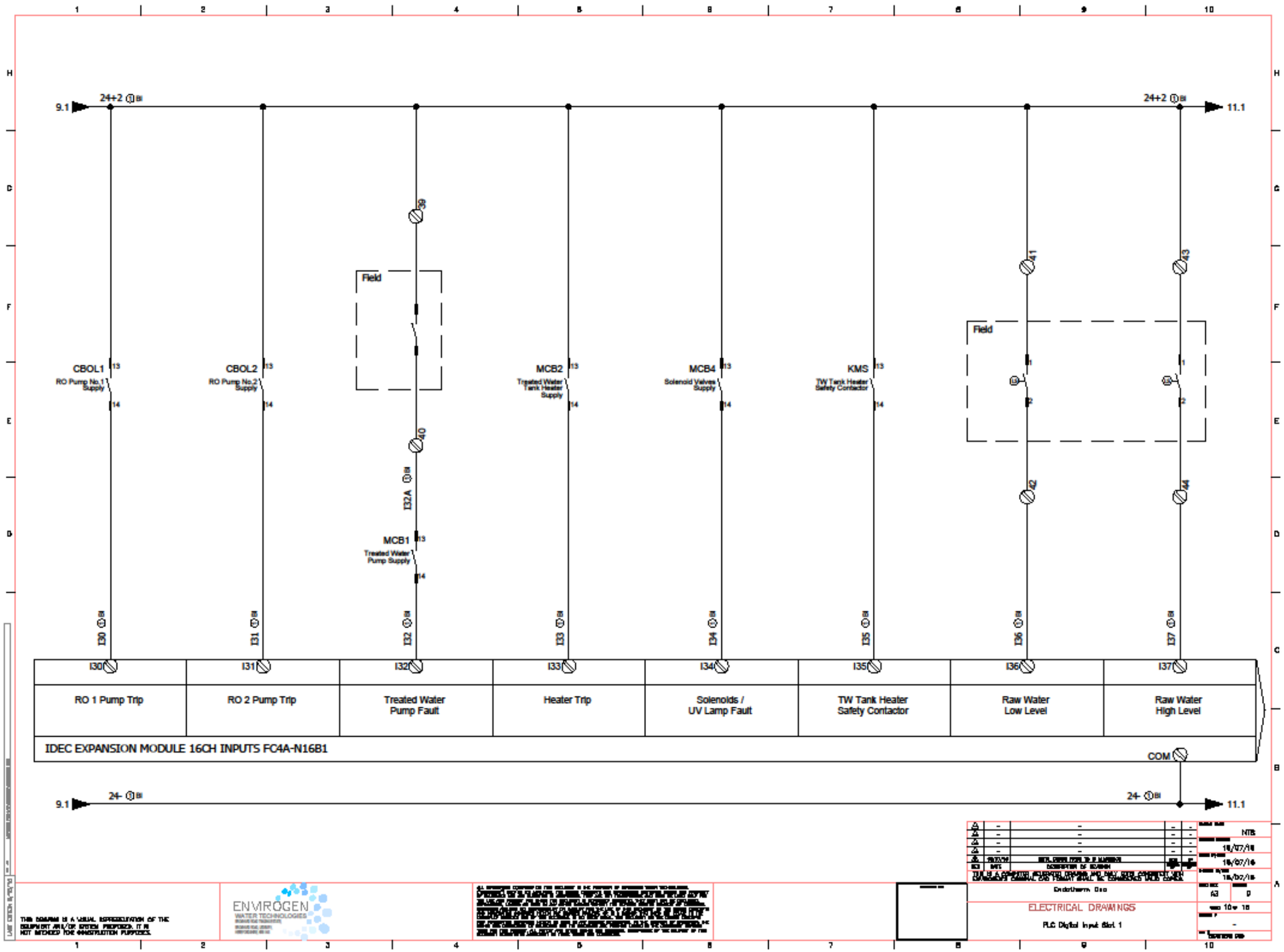

L10 Blk
N1 Bl
PE G/Y
5.3
PSU
Siemens Sitop PSU 10A 24v DC
240 VAC
24v DC
MCB5I
Schneider 24504
6A (D)
POU Valves Supply
R9
POU Valves Open Relay
FS1
2A
24+
FS2
500mA
24+1
24+
8.1
SUPPLY TO PLC
15.1
SUPPLY TO ANALOGUE INPUTS
FS3
2A
24+2
9.1
SUPPLY TO DIGITAL INPUTS
SUPPLY TO HMI
FS4
24+3
12.1
SUPPLY TO DIGITAL OUTPUTS
FS5
1A
FLOW METERS POWER SUPPLY
Field
POU Valves
KMS
Schneider LC1D3235BD
24VDC
TW Tank Heater Safety Contactor
4.8 L1/1 - T1/2
4.9 L3/3 - T3/4
4.9 L3/5 - T3/6
10.7 N/7 - T4/8
THIS DRAWING IS A VISUAL REPRESENTATION OF THE EQUIPMENT AND/OR SYSTEM PROPOSED. IT IS NOT INTENDED FOR CONSTRUCTION PURPOSES.
ENVIROGEN WATER TECHNOLOGIES
ELECTRICAL DRAWINGS
24Vdc Distribution
NTS
18/07/18
A3

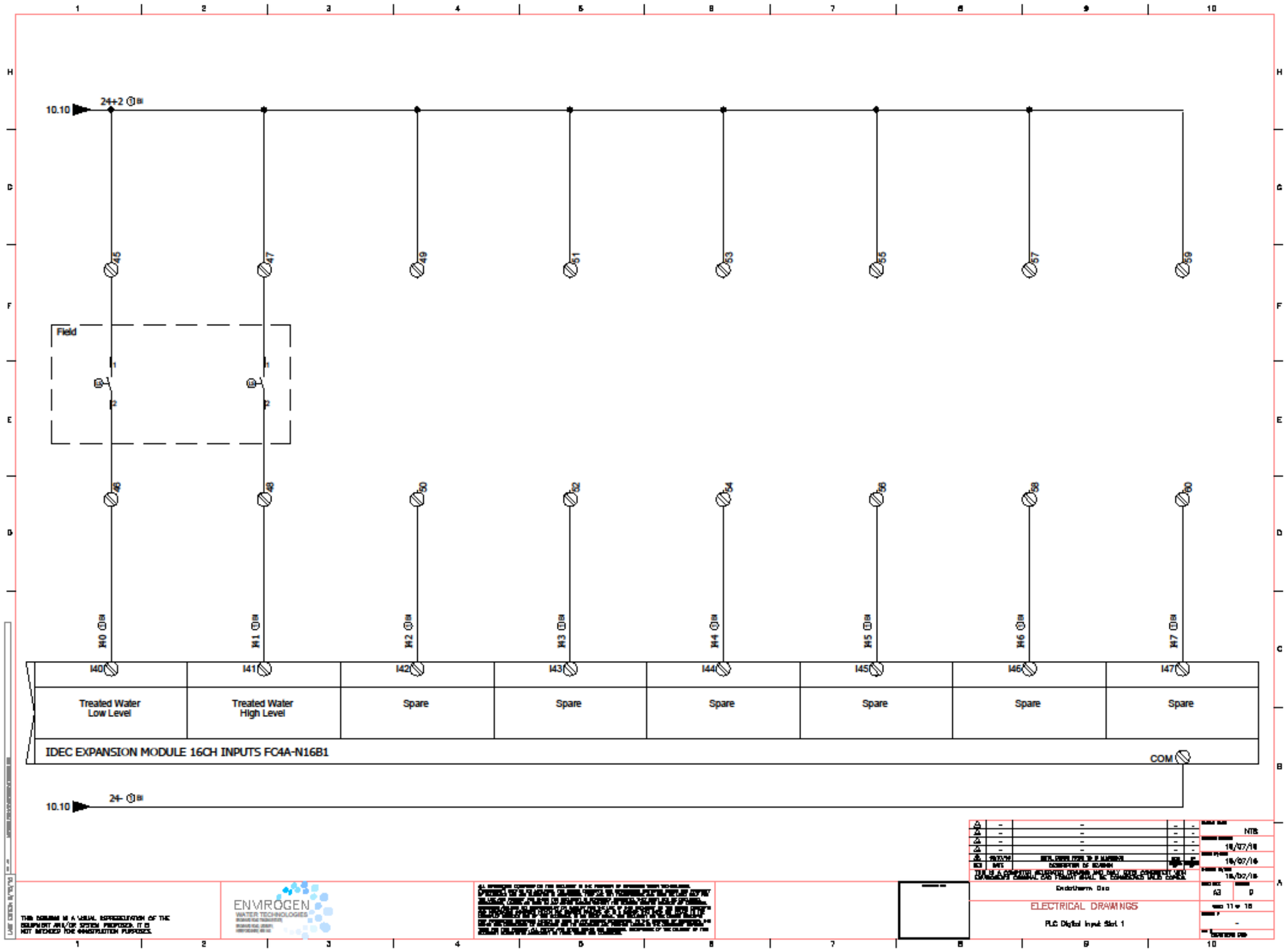

16 WAY DIGITAL INPUT
16 WAY DIGITAL OUTPUT
4 WAY ANALOGUE INPUT
BASE UNIT IDEC PENTRA FC5A-D16RS1
FC4A-N16B1
FC4A-R161
FC4A-J4CN1
SLOT
0
1
2
3

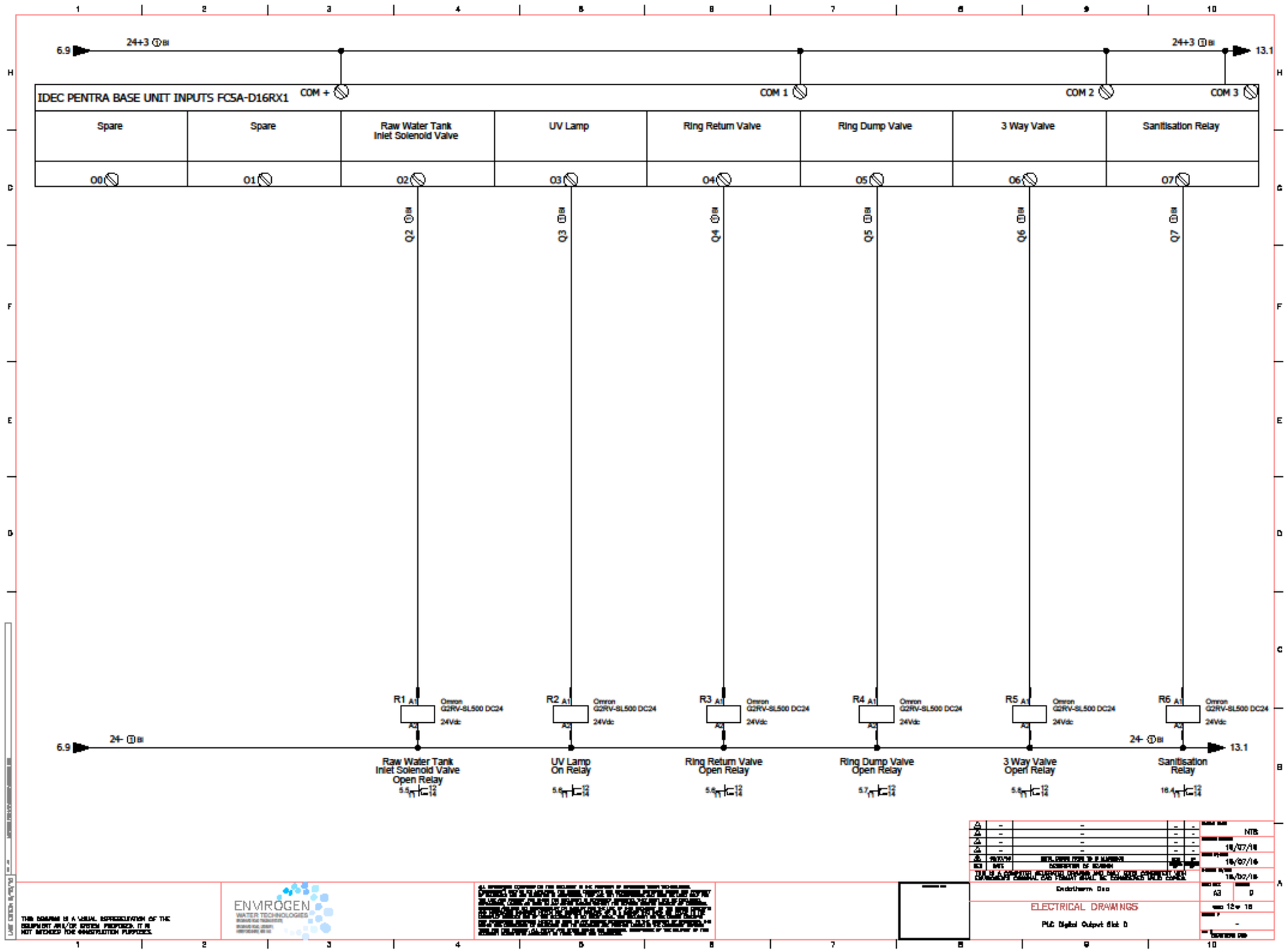

24+1
6.6
24-
6.6
24V DV
COM
RS232 COMMS (GSM MODEM)
TYPE IDEC PENTRA BASE UNIT - FCSA-D16RX1
ENVIROGEN
ELECTRICAL DRAWINGS
PLC Base Unit Supply

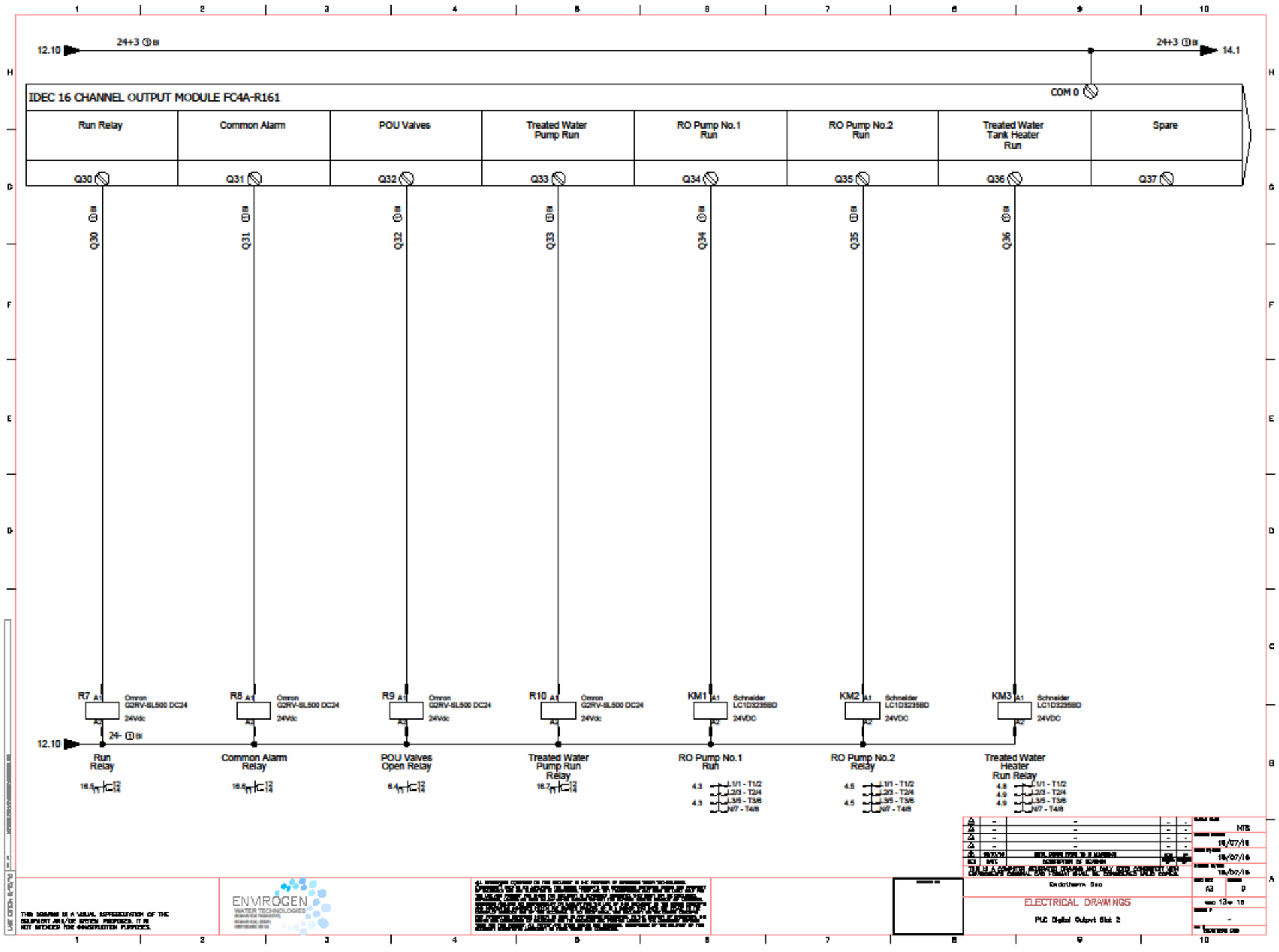


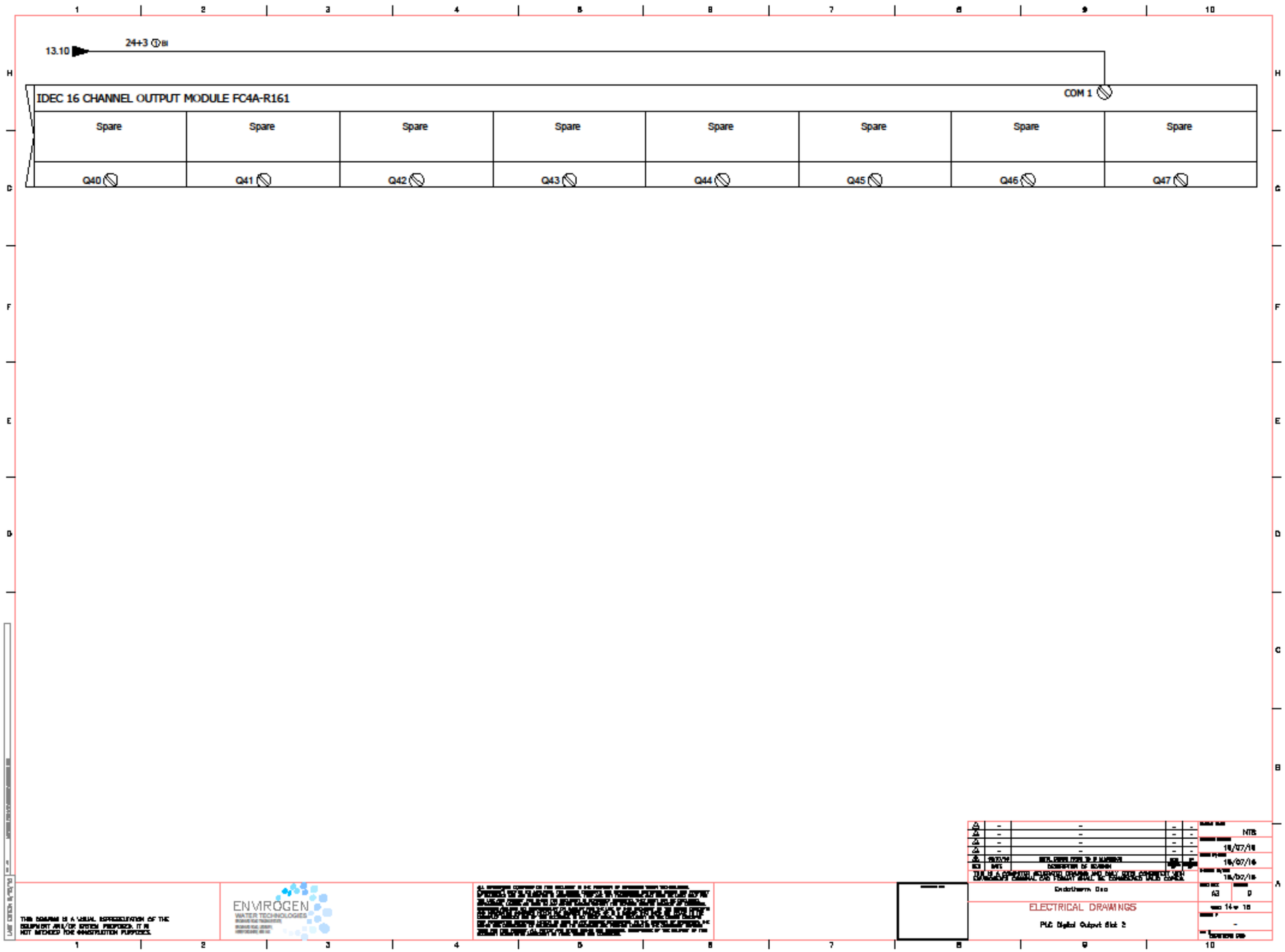
I0	I1	I2	I3	I4	I5	I6	I7
19200 Baud Rate Selected	Permeate Flow (Pulse)	Spare	Concentrate Flow (Pulse)	Spare	Spare	Spare	Spare
IDEC PENTRA BASE UNIT INPUTS FCSA-D16RX1							

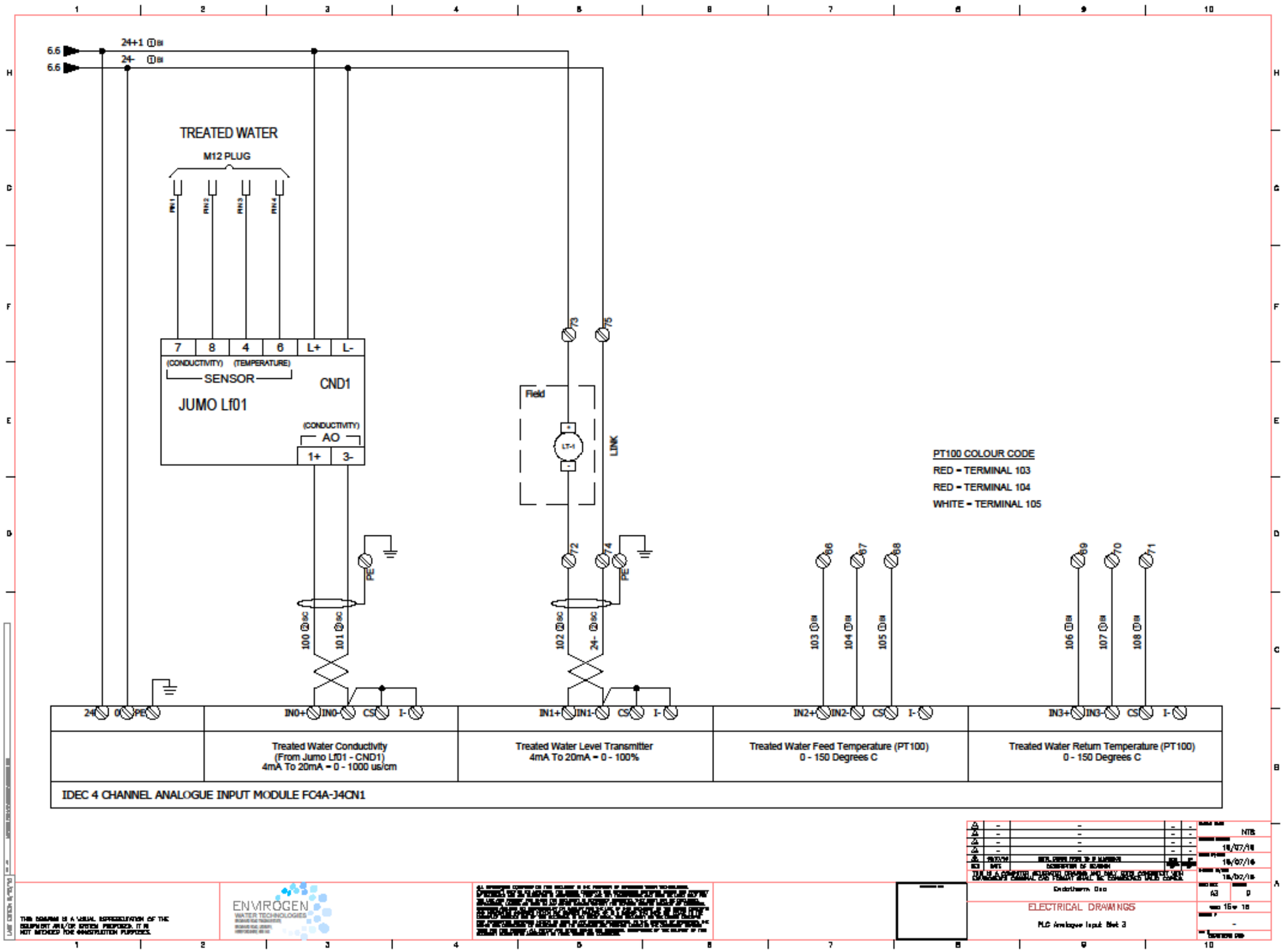

9.1
24+2
11.1
CBOL1
RO Pump No.1 Supply
CBOL2
RO Pump No.2 Supply
Field
MCB1
Treated Water Pump Supply
MCB2
Treated Water Tank Heater Supply
MCB4
Solenoid Valves Supply
KMS
TW Tank Heater Safety Contactor
Field
I30
I31
I32
I33
I34
I35
I36
I37
RO 1 Pump Trip
RO 2 Pump Trip
Treated Water Pump Fault
Heater Trip
Solenoids / UV Lamp Fault
TW Tank Heater Safety Contactor
Raw Water Low Level
Raw Water High Level
IDEC EXPANSION MODULE 16CH INPUTS FC4A-N16B1
COM
24-
ELECTRICAL DRAWINGS
PLC Digital Input Slot 1

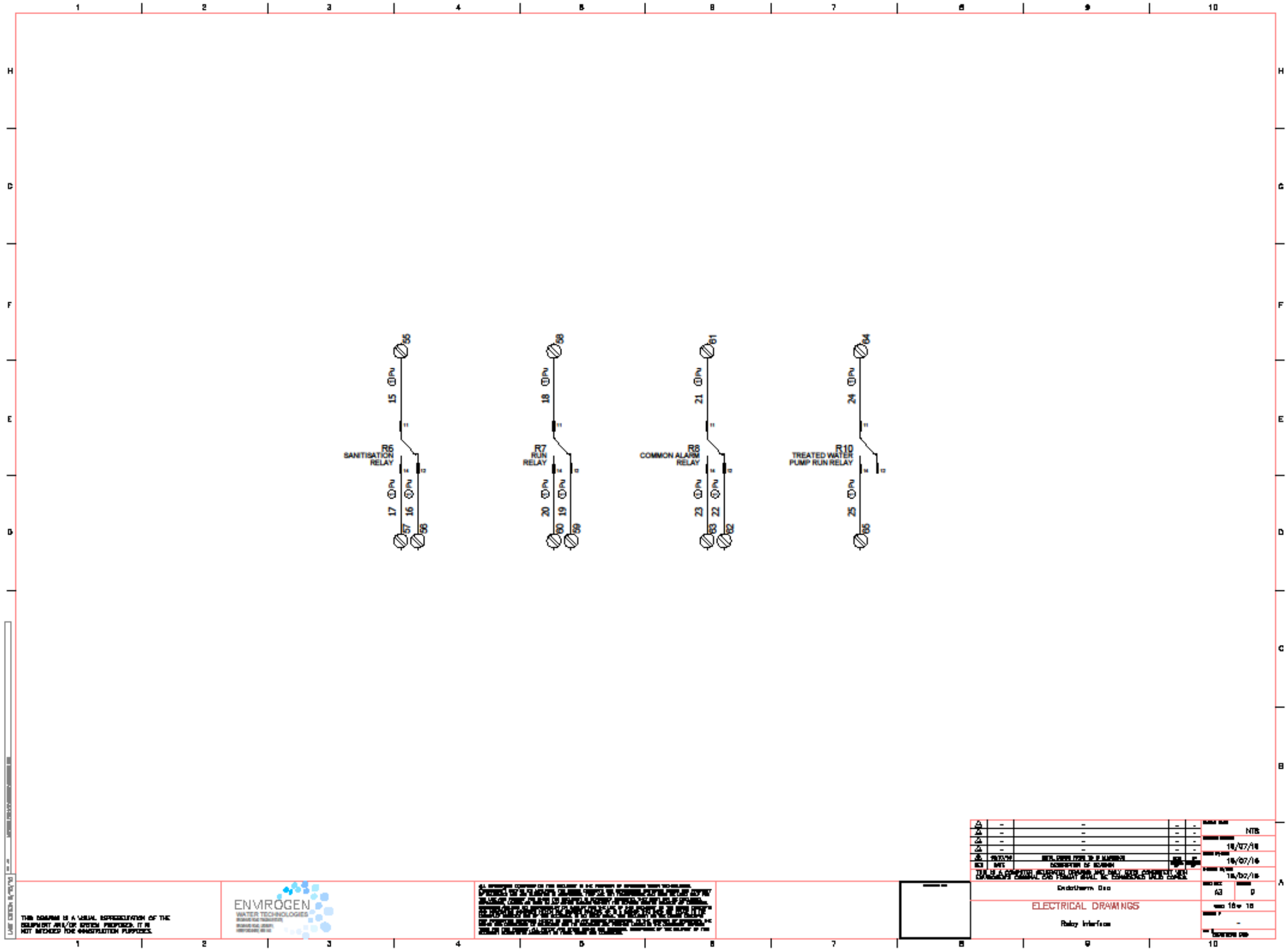

10.10
24+2
45
47
49
51
53
55
57
59
Field
46
48
50
52
54
56
58
60
I40
I41
I42
I43
I44
I45
I46
I47
Treated Water Low Level
Treated Water High Level
Spare
Spare
Spare
Spare
Spare
Spare
IDEC EXPANSION MODULE 16CH INPUTS FC4A-N16B1
COM
10.10
24-
ENVIROGEN
ELECTRICAL DRAWINGS
PLC Digital Input Slot 1


6.9
24+3
13.1
IDEC PENTRA BASE UNIT INPUTS FC5A-D16RX1
COM +
COM 1
COM 2
COM 3
Spare
Spare
Raw Water Tank Inlet Solenoid Valve
UV Lamp
Ring Return Valve
Ring Dump Valve
3 Way Valve
Sanitisation Relay
O0
O1
O2
O3
O4
O5
O6
O7
Q2
Q3
Q4
Q5
Q6
Q7
R1 A1 Omron G2RV-SL500 DC24 24Vdc A2
R2 A1 Omron G2RV-SL500 DC24 24Vdc A2
R3 A1 Omron G2RV-SL500 DC24 24Vdc A2
R4 A1 Omron G2RV-SL500 DC24 24Vdc A2
R5 A1 Omron G2RV-SL500 DC24 24Vdc A2
R6 A1 Omron G2RV-SL500 DC24 24Vdc A2
24-
Raw Water Tank Inlet Solenoid Valve Open Relay
UV Lamp On Relay
Ring Return Valve Open Relay
Ring Dump Valve Open Relay
3 Way Valve Open Relay
Sanitisation Relay
5.5
5.6
5.7
18.4
ENVIROGEN
WATER TECHNOLOGIES
Endotherm Gmbh
ELECTRICAL DRAWINGS
PLC Digital Output Slot 0
NTS
A3
0


12.10
24+3
24+3
14.1
COM 0
IDEC 16 CHANNEL OUTPUT MODULE FC4A-R161
Run Relay
Common Alarm
POU Valves
Treated Water Pump Run
RO Pump No.1 Run
RO Pump No.2 Run
Treated Water Tank Heater Run
Spare
Q30
Q31
Q32
Q33
Q34
Q35
Q36
Q37
R7 Omron G2RV-SL500 DC24 24Vdc
R8 Omron G2RV-SL500 DC24 24Vdc
R9 Omron G2RV-SL500 DC24 24Vdc
R10 Omron G2RV-SL500 DC24 24Vdc
KM1 Schneider LC1D3235BD 24VDC
KM2 Schneider LC1D3235BD 24VDC
KM3 Schneider LC1D3235BD 24VDC
Run Relay
Common Alarm Relay
POU Valves Open Relay
Treated Water Pump Run Relay
RO Pump No.1 Run
RO Pump No.2 Relay
Treated Water Heater Run Relay
ELECTRICAL DRAWINGS
PLC Digital Output Slot 2
ENVIROGEN
WATER TECHNOLOGIES


13.10
24+3
COM 1
IDEC 16 CHANNEL OUTPUT MODULE FC4A-R161
Spare
Spare
Spare
Spare
Spare
Spare
Spare
Spare
Q40
Q41
Q42
Q43
Q44
Q45
Q46
Q47
ENVIROGEN
WATER TECHNOLOGIES
Endotherm Gas
ELECTRICAL DRAWINGS
PLC Digital Output Slot 2
NTS
A3
D


24+1
24-
6.6
6.6
TREATED WATER
M12 PLUG
7
8
4
6
L+
L-
(CONDUCTIVITY)
(TEMPERATURE)
SENSOR
CND1
JUMO Lf01
(CONDUCTIVITY)
AO
1+
3-
Field
LT-1
LINK
73
75
72
74
PE
100
101
102
24-
103
104
105
106
107
108
66
67
68
69
70
71
24
0
PE
IN0+
IN0-
CS
I-
IN1+
IN1-
IN2+
IN2-
IN3+
IN3-
Treated Water Conductivity
(From Jumo Lf01 - CND1)
4mA To 20mA = 0 - 1000 us/cm
Treated Water Level Transmitter
4mA To 20mA = 0 - 100%
Treated Water Feed Temperature (PT100)
0 - 150 Degrees C
Treated Water Return Temperature (PT100)
0 - 150 Degrees C
IDEC 4 CHANNEL ANALOGUE INPUT MODULE FC4A-J4CN1
PT100 COLOUR CODE
RED = TERMINAL 103
RED = TERMINAL 104
WHITE = TERMINAL 105
ELECTRICAL DRAWINGS
PLC Analogue Input Sht 3
NTS
18/07/16
A3
0
16w 16
THIS DRAWING IS A VISUAL REPRESENTATION OF THE SCHEMATIC AND/OR SYSTEM PROPOSED. IT IS NOT INTENDED FOR CONSTRUCTION PURPOSES.
ENVIROGEN
WATER TECHNOLOGIES


55
15
R6
SANITISATION RELAY
17
16
57
56
58
18
R7
RUN RELAY
20
19
60
59
61
21
R8
COMMON ALARM RELAY
23
22
63
62
64
24
R10
TREATED WATER PUMP RUN RELAY
25
65
THIS DRAWING IS A VISUAL REPRESENTATION OF THE EQUIPMENT AND/OR SYSTEM PROPOSED. IT IS NOT INTENDED FOR CONSTRUCTION PURPOSES.
ENVIROGEN
WATER TECHNOLOGIES
ENDOTHERM DAS
ELECTRICAL DRAWINGS
Relay Interface
NTS
18/07/16
18/07/16
18/07/16
A3
D
-

Endotherm | southland

Freecall 1800 656 771
service@southlandind.com.au
www.southlandfiltration.com.au

Peace of mind. Delivered.

CE

CR, CRI, CRN

Vertical multistage centrifugal pumps
60 Hz

be
think
innovate

GRUNDFOS

Table of contents

1. Product introduction

This data booklet deals with Grundfos CR, CRI and CRN pumps.

TM02 7698 3803

Fig. 1 CR, CRI and CRN pumps

Features and benefits

Grundfos CR, CRI, CRN pumps are vertical multistage centrifugal pumps. The in-line design enables the pump to be installed in a horizontal one-pipe system where the suction and discharge ports are in the same horizontal plane and have the same pipe dimensions. This design provides a more compact pump design and pipework.

Grundfos CR pumps come with various pump sizes and various numbers of stages to provide the flow and the pressure required.

CR pumps are suitable for a variety of applications from pumping of potable water to pumping of chemicals. The pumps are therefore used in a wide variety of pumping systems where the performance and material of the pump meet specific demands.

The CR pumps consist of two main components: the motor and the pump unit. The motor on a CR pump is a heavy-duty Grundfos specified motor.

The pump unit consists of optimized hydraulics, various types of connections, an outer sleeve, a top and various other parts.

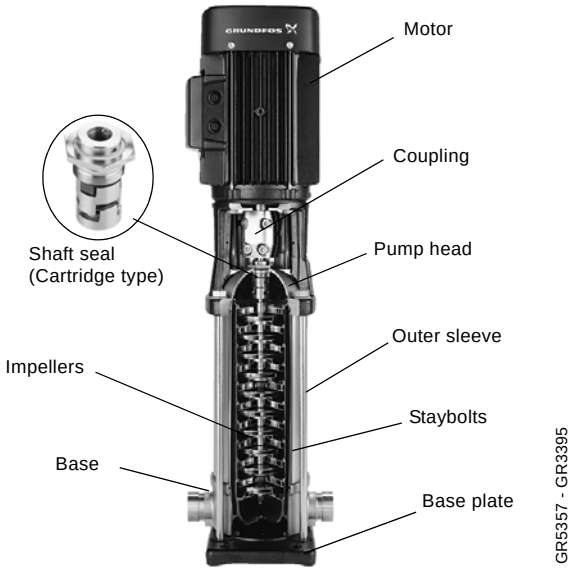
CR pumps are available in various material versions according to the pumped liquid.

Pump

The CR pump is a non-self-priming, vertical multistage centrifugal pump. The pumps are available with a Grundfos standard motor.

The pump consists of a base and a pump head. The chamber stack and the outer sleeve are secured between the pump head and the base by means of staybolts. The base has suction and discharge ports on the same level (in-line).

All pumps are equipped with a maintenance-free mechanical shaft seal of the cartridge type.



GR5357 - GR3395

Fig. 2 CR pump

CR pump with ANSI/NSF 61 listing is available. See UL file MH26400 or contact Grundfos.

Motor

Grundfos standard motors - ML and Baldor® motors

CR, CRI and CRN pumps are fitted with a Grundfos specified motor. The motors are all heavy-duty 2-pole, NEMA C-face motors.

Electrical data

Mounting designation	NEMA
Insulation class	F & B
Efficiency class*	Energy efficient Premium efficiency - on request for 15 Hp and above
Enclosure class	TEFC - Totally Enclosed Fan Cooled (Grundfos standard) ODP - Open Drip Proof - on request
60 Hz standard voltages	1 x 115/208-230 V 3 x 208-230/460 V 3 x 575 V
Approvals	The motors are rated for: Baldor ML

* 1-10 Hp ML motors are premium efficiency as standard.

Optional motors

The Grundfos standard range of motors covers a wide variety of application demands. However, for special applications or operating conditions, custom-built motor solutions can be provided.

For special applications or operating conditions, Grundfos offers custom-built motors such as:

- explosion proof motors
- motors with anti-condensation heating unit
- low-noise motors
- premium efficiency motors
- motors with thermal protection.

Motor protection

Single-phase Grundfos specified motors up to 7.5 Hp have a built-in thermal overload switch.

Three-phase motors **must** be connected to a motor starter in accordance with local regulations.

Terminal box positions

As standard the terminal box is mounted on the suction side of the pump.

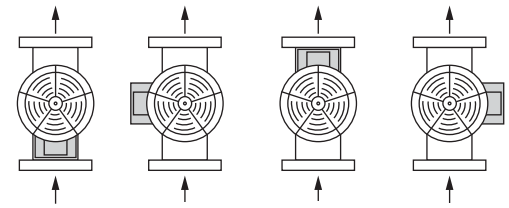


Fig. 3 Terminal box positions

Viscosity

The pumping of liquids with densities or kinematic viscosities higher than those of water will cause a considerable pressure drop, a drop in the hydraulic performance and a rise in the power consumption.

In such situations, the pump should be fitted with a larger motor. If in doubt, contact Grundfos.

Ambient temperature and altitude

If the ambient temperature exceeds the maximum temperature limits of the pump or the pump is installed at an altitude exceeding the altitude values in the chart below, the motor must not be fully loaded due to the risk of overheating.

Overheating may result from excessive ambient temperatures or the low density and consequently low cooling effect of the air at high altitudes. In such cases, it may be necessary to use a motor with a higher rated output (P_2).

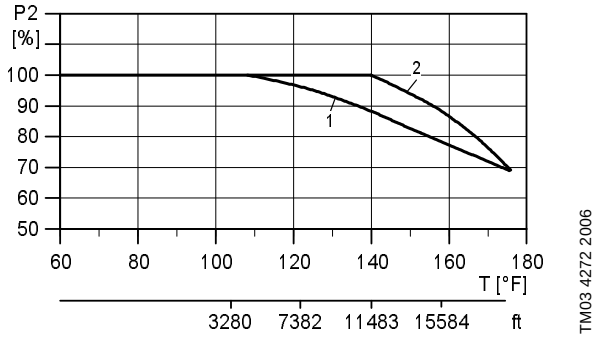


Fig. 4 Relationship between motor output (P_2) and ambient temperature/altitude

Legend

Pos.	Description
1	NEMA energy efficient motors
2	NEMA premium-efficiency motors

Example: From fig. 4 it appears that P_2 must be reduced to 88 % when a pump with a NEMA premium-efficiency ML motor is installed 15,584 ft (4750 m) above sea level. At an ambient temperature of 167 °F (75 °C), P_2 of a standard-efficiency motor must be reduced to 74 % of rated output.

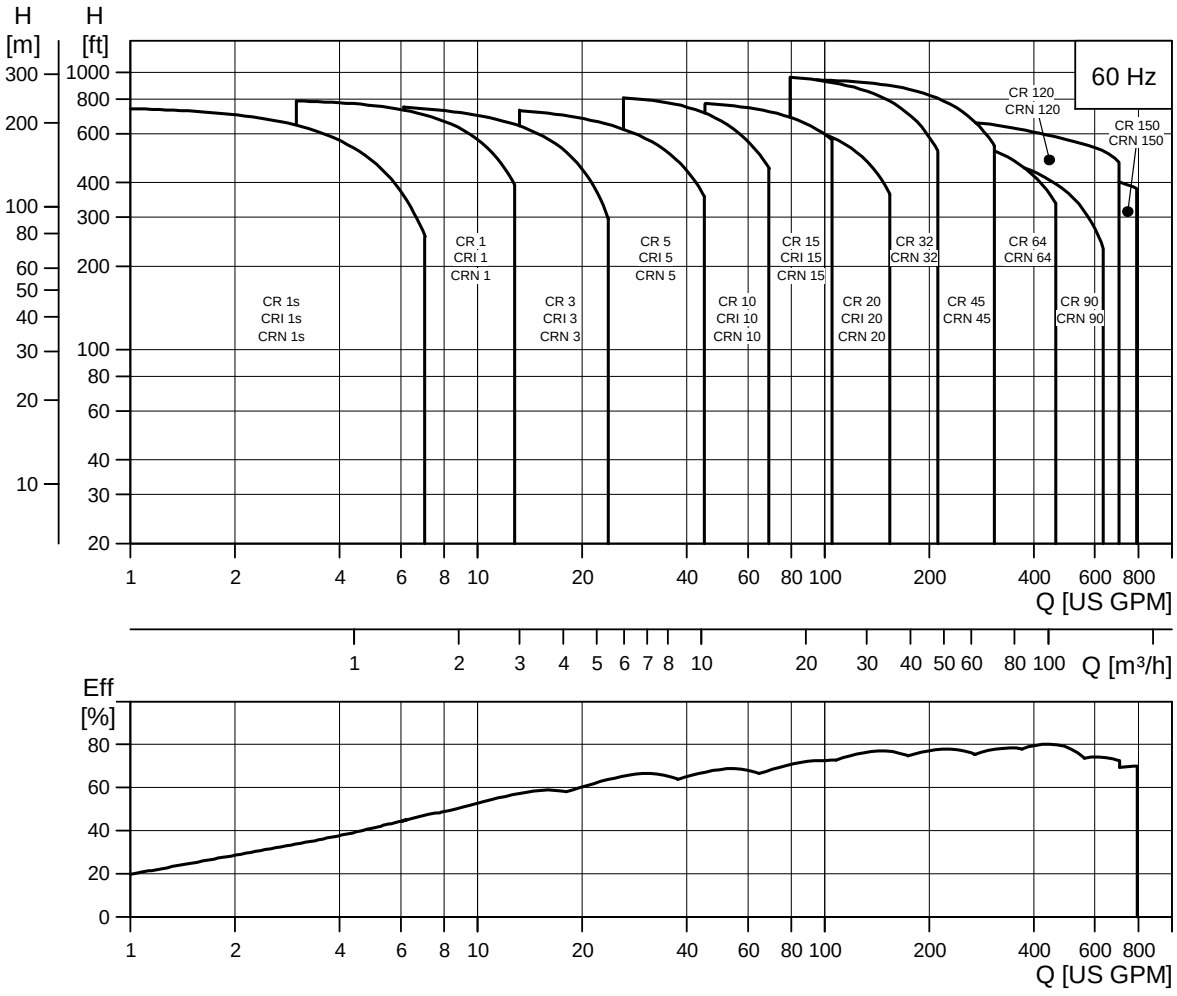
In cases where both the maximum temperature and the maximum altitude are exceeded, the derating factors must be multiplied. Example: 0.89 x 0.89 = 0.79.

2. Applications

Application	CR, CRI	CRN
Water supply		
Filtration and transfer at waterworks	●	❍
Distribution from waterworks	●	❍
Pressure boosting in mains	●	❍
Pressure boosting in high-rise buildings, hotels, etc.	●	❍
Pressure boosting for industrial water supply	●	❍
Industry		
Pressure boosting in...		
process water systems	●	●
washing and cleaning systems	●	●
vehicle washing tunnels	●	❍
fire fighting systems	●	
Liquid transfer in...		
cooling and air-conditioning systems (refrigerants)	●	❍
boiler feed and condensate systems	●	❍
machine tools (cooling lubricants)	●	●
aquafarming★	●	❍
Transfer of...		
oils and alcohols	●	●
acids and alkalis★		●
glycol and coolants	●	
Water treatment		
Ultra-filtration systems		●
Reverse osmosis systems★		●
Softening, ion exchange, demineralizing systems		●
Distillation systems		●
Separators	●	●
Swimming pools★		●
Irrigation		
Field irrigation (flooding)	●	❍
Sprinkler irrigation	●	❍
Drip-feed irrigation	●	❍

● Recommended version.
❍ Alternative version.
★ CRT, CRTE version available. For further information about CRT, CRTE pumps, see *Pumped liquids* on page 13 or related CRT, CRTE product guide.

3. Performance range



TM02 5518 0209

4. Product range

Range	CR 1s	CR 1	CR 3	CR 5	CR 10	CR 15	CR 20
Nominal flow rate [US gpm]	4.5	8.5	15	30	55	95	110
Temperature range [°F]				-4 to +250			
Temperature range [°F] - on request				-40 to +356			
Max. working pressure [psi]★	362	362	362	362	362	362	362
Max. working pressure [psi] - on request	-	725	725	725	725	725	725
Max. pump efficiency [%]	35	49	59	67	70	72	72
CR pumps							
CR: Flow range [US gpm]	0.5 - 5.7	1 - 12.8	1.5 - 23.8	3-45	5.5 - 70	9.5 - 125	11-155
CR: Max. pump pressure (H [ft])	760	790	790	780	820	800	700
CR: Motor power [Hp]	.33 - 2	.33 - 3	.33 - 5	.75 - 7.5	.75 - 15	2-25	3-25
Version							
CR: Cast iron and stainless steel AISI 304	•	•	•	•	•	•	•
CRI: Stainless steel AISI 304	•	•	•	•	•	•	•
CRN: Stainless steel AISI 316	•	•	•	•	•	•	•
CRT, CRTE: Titanium	-	See CRT, CRTE product guide					-
CR pipe connection							
Oval flange (NPT)	1"	1"	1"	1.25"	2"	2"	2"
Oval flange (NPT) - on request	1.25"	1.25"	1.25"	1"	1.5"	-	-
ANSI flange size	1.25"	1.25"	1.25"	1.25"	2"	2"	2"
ANSI flange size - on request	-	-	-	-	-	-	-
ANSI flange class	250 lb.	250 lb.	250 lb.	250 lb.	250 lb.	250 lb.	250 lb.
CRI pipe connection							
Oval flange (NPT)	1"	1"	1"	1.25"	2"	2"	2"
Oval flange (NPT) - on request	1.25"	1.25"	1.25"	1"	1.5"	-	-
ANSI flange size	1.25"	1.25"	1.25"	1.25"	2"	2"	2"
ANSI flange class	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.
Clamp coupling (NPT) - on request	1", 1.25"	1", 1.25"	1", 1.25"	1", 1.25"	1.5", 2"	1.5", 2"	1.5" 2"
Union (NPT ext. Thread) - on request	2"	2"	2"	2"	-	-	-
CRN pipe connection							
PJE (Victaulic)	1.25"	1.25"	1.25"	1.25"	2"	2"	2"
PJE (Victaulic) - on request	-	-	-	-	-	-	-
ANSI flange size	1.25"	1.25"	1.25"	1.25"	2"	2"	2"
ANSI flange size - on request	-	-	-	-	-	-	-
ANSI flange class	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.
Clamp coupling (NPT) - on request	1", 1.25"	1", 1.25"	1", 1.25"	1", 1.25"	1.5", 2"	1.5", 2"	1.5", 2"
Union (NPT ext. Thread) - on request	2"	2"	2"	2"	-	-	-
CRT pipe connection							
PJE coupling (Vitaulic)	-	1.25"	1.25"	1.25"	2"	2"	-
ANSI flange size - on request	-	-	-	-	2"	2"	-

• Available.

★ See section *7. Operating conditions* on page 13 for specific working pressures.

Range	CR 32	CR 45	CR 64	CR 90	CR 120	CR 150
Nominal flow rate [US gpm]	140	220	340	440	610	750
Temperature range [°F]	-22 to +250[1]				-22 to +250[1] & 2)	
Temperature range [°F] - on request	-40 to +356				-	-
Max. working pressure [psi]★	435	435	435	435	435	435
Max. working pressure [psi] - on request	580	580	580	580	-	-
Max. pump efficiency [%]	76	78	79	80	75	73
CR pumps						
CR: Flow range [US gpm]	14-210	22-310	34-450	44-630	61-700	75-790
CR: Max. pump pressure (H [ft])	995	940	565	595	685	570
CR: Motor power [Hp]	5-50	7.5-60	10-60	15-60	20-100	25-100
Version						
CR: Cast iron and stainless steel AISI 304	•	•	•	•	•	•
CRI: Stainless steel AISI 304	-	-	-	-	-	-
CRN: Stainless steel AISI 316	•	•	•	•	•	•
CRT, CRTE: Titanium	-	-	-	-	-	-
CR pipe connection						
Oval flange (NPT)	-	-	-	-	-	-
Oval flange (NPT) - on request	-	-	-	-	-	-
ANSI flange size	2.5"	3"	4"	4"	5" [3]	5" [3]
ANSI flange size - on request	3"	4"	5"[3]	5"[3]	6"	6"
ANSI flange class	125/ 250 lb.	125/ 250 lb.	125/ 250 lb.	125/ 250 lb.	125/ 250 lb.	125/ 250 lb.
CRI pipe connection						
Oval flange (NPT)	-	-	-	-	-	-
Oval flange (NPT) - on request	-	-	-	-	-	-
ANSI flange size	-	-	-	-	-	-
ANSI flange class	-	-	-	-	-	-
Clamp coupling (NPT) - on request	-	-	-	-	-	-
Union (NPT ext. Thread) - on request	-	-	-	-	-	-
CRN pipe connection						
PJE (Victaulic)	-	-	-	-	-	-
PJE (Victaulic) - on request	3"	4"	4"	4"	4"	4"
ANSI flange size	2.5"	3"	4"	4"	5"	5"
ANSI flange size - on request	3"	-	-	5"	6"	6"
ANSI flange class	150/ 300 lb.	150/ 300 lb.	150/ 300 lb.	150/ 300 lb.	150/ 300 lb.	150/ 300 lb.
Clamp coupling (NPT) - on request	-	-	-	-	-	-
Union (NPT ext. Thread) - on request	-	-	-	-	-	-
CRT pipe connection						
PJE coupling (Vitaulic)	-	-	-	-	-	-
ANSI flange size - on request	-	-	-	-	-	-

• Available.

★ See section *7. Operating conditions* on page 13 for specific working pressures.

1) CRN 32 to CRN 90 with HQQE shaft seal: -40 °F to +250 °F.

2) CR, CRN 120 and 150 with 75 or 100 Hp motors with HBQE shaft seal: 0 °F to +250 °F.

3) CR 5" flange is not manufactured to ANSI specification. Gasket contact surface is approximately 0.25". CR 6" ANSI flange adapter is manufactured to ANSI B16.5 specification.

5. Identification

Type key

CR, CRI, CRN

Example	CR	32	(s)	-4	-2	-A	-G	-G	-E	-	HQQE

- Type range: CR, CRI, CRN
- Nominal flow rate [m^3/h]
- All impellers with reduced diameter (applies only to CR, CRI, CRN 1s)
- Number of impellers
- Number of reduced diameter impellers (CR, CRN 32, 45, 64, 90, 120, and 150)
- Code for pump version
- Code for pipe connection
- Code for materials
- Code for rubber parts
- Code for shaft seal

Codes

Example	A	-G	-A	-E	-H	QQ	E

Pump version[1)]

A	Basic version
B	Oversize motor
E	Certificate/approval
F	CR pump for high temperatures (air-cooled top assembly)
H	Horizontal version
HS	High-pressure pump with high speed MLE motor
I	Different pressure rating
J	Pump with different max speed
K	Pump with low NPSH
M	Magnetic drive
N	Fitted with sensor
P	Undersize motor
R	Horizontal version with bearing bracket
SF	High pressure pump
T	Over size motor (two flange sizes bigger)
X	Special version

Pipe connection

A	Oval flange Rp thread
B	Oval flange NPT thread
CA	FlexiClamp (CRI, CRN 1, 3, 5, 10, 15, 20)
CX	Triclamp (CRI, CRN 1, 3, 5, 10, 15, 20)
F	DIN flange
G	ANSI flange
J	JIS flange
N	Changed diameter of ports
P	PJE coupling
X	Special version

Example	A	-G	-A	-E	-H	QQ	E

Materials

A	Basic version
D	Carbon-graphite filled PTFE (bearings)
G	Wetted parts AISI 316
GI	All parts stainless steel, wetted parts AISI 316
I	Wetted parts AISI 304
II	All parts stainless steel, wetted parts AISI 304
K	Bronze (bearings)
S	SiC bearings + PTFE neck rings
X	Special version

Code for rubber parts

E	EPDM
F	FXM
K	FFKM
V	FKM

Shaft seal

A	O-ring seal with fixed driver
B	Rubber bellows seal
E	Cartridge seal with O-ring
H	Balanced cartridge seal with O-ring
K	Metal bellows cartridge seal
O	Double seal, back-to-back
P	Double seal, tandem
X	Special version

B	Carbon, synthetic resin-impregnated
H	Cemented tungsten carbide, embedded (hybrid)
Q	Silicon carbide
U	Cemented tungsten carbide
X	Other ceramics

E	EPDM
F	FXM
K	FFKM
V	FKM

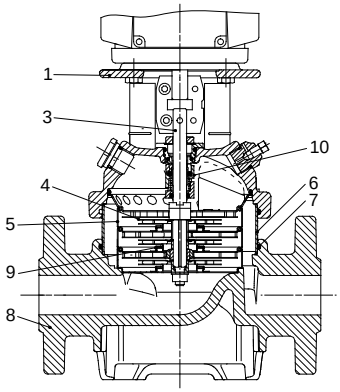
1) If a pump incorporates more than two pump versions, the code for the pump version is X.
X also indicates special pump versions not listed above.

6. Construction

CR 1s, 1, 3, 5, 10, 15 and 20

TM02 1198 0601 - GR7377 - GR7379

Sectional drawing



TM02 1194 1403

Materials: CR

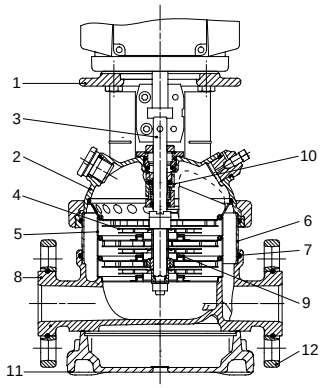
Pos.	Designation	Materials	AISI/ASTM
1	Pump head	Cast iron	A 48-30 B
3	Shaft	Stainless steel	AISI 316[1)] AISI 431[2)]
4	Impeller	Stainless steel	AISI 304
5	Chamber	Stainless steel	AISI 304
6	Outer sleeve	Stainless steel	AISI 304
7	O-ring for outer sleeve	EPDM or FKM	
8	Base	Cast iron	A 48-30 B
9	Neck ring	PTFE	
10	Shaft seal	Cartridge type	
	Bearing rings	Silicon carbide	
	Rubber parts	EPDM or FKM	
12	FGJ flange	Cast iron	A 48-30 B

1) CR 1s, 1, 3, 5
2) CR 10, 15, 20
3) Stainless steel available on request.
4) CF 8M is cast equivalent of AISI 316 stainless steel.
5) CRI/CRN 1s, 1, 3, 5
6) CRN 10, 15, 20
7) CRI 10, 15, 20

CRI, CRN 1s, 1, 3, 5, 10, 15 and 20

TM02 1808 2001 - GR7373 - GR7375

Sectional drawing



TM03 2156 3805

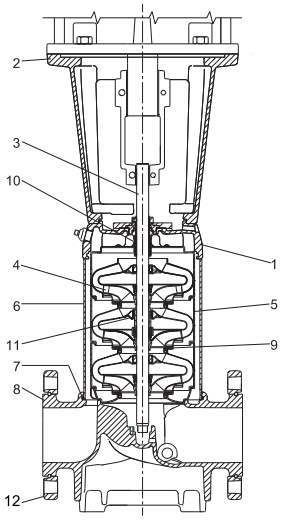
Materials: CRI, CRN

Pos.	Designation	Materials	AISI/ASTM
1	Pump head	Cast iron[3)]	A 48-30 B
2	Pump head cover	Stainless steel	CF 8M[4)]
3	Shaft	Stainless steel	AISI 316[5)] AISI 329[6)] AISI 431[7)]
8	Base	Stainless steel	CF 8M[4)]
9	Neck ring	PTFE	
10	Shaft seal	Cartridge type	
11	Base plate	Cast iron[3)]	A 48-30 B
	Bearing rings	Silicon carbide	
	Rubber parts	EPDM or FKM	
		CRI	
4	Impeller	Stainless steel	AISI 304
5	Chamber	Stainless steel	AISI 304
6	Outer sleeve	Stainless steel	AISI 304
7	O-ring for outer sleeve	EPDM or FKM	
12	FGJ flange ring	Ductile iron[3)]	A 65-45-12
	Oval flange	Stainless steel	AISI 316
		CRN	
4	Impeller	Stainless steel	AISI 316
5	Chamber	Stainless steel	AISI 316
6	Outer sleeve	Stainless steel	AISI 316
7	O-ring for outer sleeve	EPDM or FKM	
12	FGJ flange ring	Ductile iron[3)]	A 65-45-12

CR 32, 45, 64 and 90

TM01 2150 1298

Sectional drawing



TM06 0691 0714

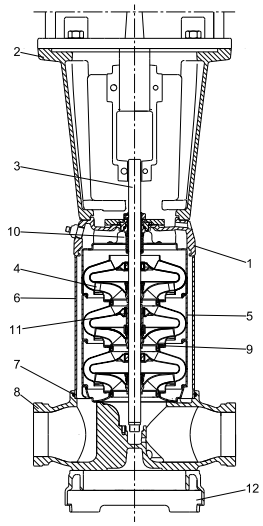
Materials: CR

Pos.	Designation	Materials	AISI/ASTM
1	Pump head	Cast iron EN-GJS-500-7	ASTM 80-55-06
2	Motor stool	Cast iron EN-GJL-200	ASTM 25B
3	Shaft	Stainless steel	AISI 431
4	Impeller	Stainless steel	AISI 304
5	Chamber	Stainless steel	AISI 304
6	Sleeve	Stainless steel	AISI 304
7	O-ring for sleeve	EPDM or FKM	
8	Base	Cast iron EN-GJS-500-7	ASTM 80-55-06
9	Neck ring	Carbon-graphite-filled PTFE	
10	Shaft seal		
11	Bearing ring	SiC/SiC	
12	Flange ring	Ductile iron	A 65-45-12
	Rubber parts	EPDM or FKM	

CRN 32, 45, 64 and 90

TM02 7399 3403

Sectional drawing



TM01 1837 3713

Materials: CRN

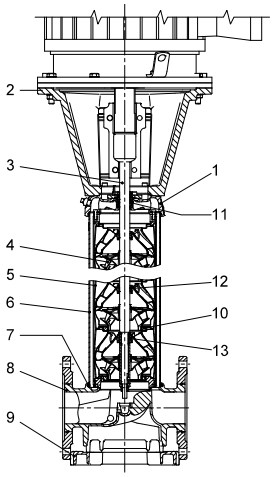
Pos.	Designation	Materials	AISI/ASTM
1	Pump head	Stainless steel	CF 8M equal to AISI 316
2	Motor stool	Cast iron EN-GJL-200[1)]	ASTM 25B
3	Shaft	Stainless steel	
4	Impeller	Stainless steel	AISI 316
5	Chamber	Stainless steel	AISI 316
6	Sleeve	Stainless steel	AISI 316
7	O-ring for sleeve	EPDM or FKM	
8	Base	Stainless steel	CF 8M equal to AISI 316
9	Neck ring	Carbon-graphite-filled PTFE	
10	Shaft seal		
11	Bearing ring	SiC/SiC	
12	Base plate	Cast iron EN-GJS-500-7[1)]	ASTM 88-55-06
	Flange ring	Ductile iron[1)]	A 65-45-12
	Rubber parts	EPDM or FKM	

[1)] Stainless steel available on request.

CR 120 and 150

GrA3731

Sectional drawing



TM03 8835 2607

Materials: CR

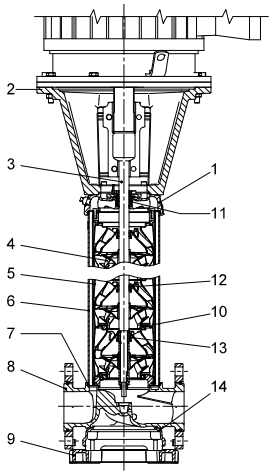
Pos.	Designation	Materials	AISI/ASTM
1	Pump head	Ductile iron	A 536 65-45-12
2	Motor stool (15-60 Hp)	Cast iron	A48-30 B
	Motor stool (75-100 Hp)	Ductile iron	A 536 65-45-12
3	Shaft	Stainless steel	AISI 431
4	Impeller	Stainless steel	AISI 304
5	Chamber	Stainless steel	AISI 304
6	Outer sleeve	Stainless steel	AISI 316
7	O-ring for outer sleeve	EPDM or FKM	
8	Base	Ductile iron	A 536 65-45-12
9	Base plate	Ductile iron	A 536 65-45-12
10	Neck ring	PTFE	
11	Shaft seal[1)]	Cartridge type	
12	Support bearing	PTFE	
13	Bearing rings	Silicone carbide	
	Rubber parts	EPDM or FKM	

1) ∅22 mm shaft, 15-60 Hp. ∅32 mm shaft, 75-100 Hp.

CRN 120 and 150

GrA3732 - GrA3735

Sectional drawing



TM03 8836 2607

Materials: CRN

Pos.	Designation	Materials	AISI/ASTM
1	Pump head	Stainless steel	A 351 CF 8M
2	Motor stool (15-60 Hp)	Cast iron	A48-30 B
	Motor stool (75-100 Hp)	Ductile iron	A 536 65-45-12
3	Shaft	Stainless steel	SAF 2205
4	Impeller	Stainless steel	AISI 316
5	Chamber	Stainless steel	AISI 316
6	Outer sleeve	Stainless steel	AISI 316
7	O-ring for outer sleeve	EPDM or FKM	
8	Base	Stainless steel	A 351 CF 8M
9	Base plate	Ductile iron[1)]	A 536 65-45-12
10	Neck ring	PTFE	
11	Shaft seal[2)]	Cartridge type	
12	Support bearing	PTFE	
13	Bearing rings	Silicone carbide	
14	Base plate	Ductile iron[1)]	A 536 65-45-12
	Rubber parts	EPDM or FKM	

1) Stainless steel available on request.

2) ∅22 mm shaft, 15-60 Hp. ∅32 mm shaft, 75-100 Hp.

7. Operating conditions

Pumped liquids

CR, CRI, CRN pumps are designed to pump thin, non-explosive liquids, not containing solid particles or fibers. The liquid must not chemically attack the pump materials. When pumping liquids with a density and/or viscosity higher than that of water, oversized motors must be used, if required.

Whether a pump is suitable for a particular liquid depends on a number of factors of which the most important are the chloride content, pH value, temperature and content of chemicals, oils, etc.

Please note that aggressive liquids (e.g. sea water and some acids) may attack or dissolve the protective oxide film of the stainless steel and thus cause corrosion. The CR, CRI, CRN pump types are suitable for the following liquids:

CR, CRI

- Non-corrosive liquids.

For liquid transfer, circulation and pressure boosting of cold or hot clean water.

CRN

- Industrial liquids.

In systems where all parts in contact with the liquid must be made of high-grade stainless steel.

CRT

- Saline liquids
- hypochlorites
- acids.

For saline or chloride-containing liquids such as sea water or oxidizing agents such as hypochlorites, CRT pumps of titanium are available. See separate product guide on CRT.

List of pumped liquids

A number of typical liquids are listed on the following pages.

Other pump versions may be applicable, but those stated in the list are considered to be the best choices. The table is intended as a general guide only, and cannot replace actual testing of the pumped liquids and pump materials under specific working conditions.

The list should, however, be applied with some caution as factors such as the following may affect the chemical resistance of a specific pump version:

- concentration of the pumped liquid
- liquid temperature
- pressure.

Safety precautions must be made when pumping dangerous liquids.

Notes

D	Often with additives.
E	Density and/or viscosity differ from that of water. Allow for this when calculating motor output and pump performance.
F	Pump selection depends on many factors. Contact Grundfos.
H	Risk of crystallization/precipitation in shaft seal
1	The pumped liquid highly inflammable.
2	The pumped liquid is combustible.
3	Insoluble in water.
4	Low self-ignition point.

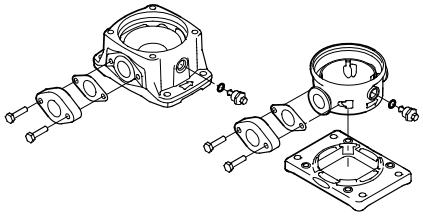
Pumped liquid	Note	Liquid concentration, liquid temperature	CR		CRN	
			1s, 1, 3, 5, 10, 15, 20	32, 45, 64, 90, 120, 150	1s, 1, 3, 5, 10, 15, 20	32, 45, 64, 90, 120, 150
Acetic acid CH_3COOH		5 %, 68 °F			HQQE	HQQE/HBQE
Acetone CH_3COCH_3	1, F	100 %, 68 °F			HBQE	HQQE/HBQE
Alkaline degreasing agent	D, F		HQQE	HQQE/HBQE		
Ammonium bicarbonate NH_4HCO_3	E	20 %, 86 °F			HQQE	HQQE/HBQE
Ammonium hydroxide NH_4OH		20 %, 104 °F	HQQE	HQQE/HBQE		
Aviation fuel	1, 3, 4, F	100 %, 68 °F	HQBV	HQQV/HBQV		
Benzoic acid C_6H_5COOH	H	0,5 %, 68 °F			HQQV	HQQV/HBQV
Boiler water		< 248 °F	HQQE	HQQE/HBQE		
	F	248 °F - 356 °F	-	-		
Calcareous water		< 194 °F	HQQE	HQQE		
Calcium acetate (as coolant with inhibitor) $Ca(CH_3COO)_2$	D, E	30 %, 122 °F	HQQE	HQQE		
Calcium hydroxide $Ca(OH)_2$	E	Saturated solution, 122 °F	HQQE	HQQE		
Chloride-containing water	F	< 86 °F, max. 500 ppm			HQQE	HQQE
Chromic acid H_2CrO_4	H	1 %, 68 °F			HQQV	HQQV/HBQV
Citric acid $HOC(CH_2CO_2H)_2COOH$	H	5 %, 104 °F			HQQE	HQQE/HBQE
Completely desalinated water (demineralized water)		< 248 °F			HQQE	HQQE/HBQE
Condensate		< 194 °F	HQQE	HQQE/HBQE		
Copper sulfate $CuSO_4$	E	10 %, 122 °F			HQQE	HQQE
Corn oil	D, E, 3	100 %, 176 °F	HQQV	HQQV/HBQV		
Diesel oil	2, 3, 4, F	100 %, 68 °F	HQBV	HQQV/HBQV		
Domestic hot water (potable water)		< 248 °F	HQQE	HQQE/HBQE		
Ethanol (ethyl alcohol) C_2H_5OH	1, F	100 %, 68 °F	HQQE	HQQE/HBQE		
Ethylene glycol $HOCH_2CH_2OH$	D, E	50 %, 122 °F	HQQE	HQQE		
Formic acid HCOOH		5 %, 68 °F			HQQE	HQQE/HBQE
Glycerine (glycerol) $OHCH_2CH(OH)CH_2OH$	D, E	50 %, 122 °F	HQQE	HQQE/HBQE		
Hydraulic oil (mineral)	E, 2, 3	100 %, 212 °F	HQQV	HQQV/HBQE		
Hydraulic oil (synthetic)	E, 2, 3	100 %, 212 °F	HQQV	HQQV/HBQE		
Isopropyl alcohol $CH_3CHOHCH_3$	1, F	100 %, 68 °F	HQBV	HQQV/HBQV		
Lactic acid $CH_3CH(OH)COOH$	E, H	10 %, 68 °F			HQQE	HQQE/HBQE
Linoleic acid $C_{17}H_{31}COOH$	E, 3	100 %, 68 °F	HQQV	HQQV/HBQV		
Methanol (methyl alcohol) CH_3OH	1, F	100 %, 68 °F	HQQE	HQQE/HBQE		
Motor oil	E, 2, 3	100 %, 176 °F	HQQV	HQQV/HBQV		
Naphthalene $C_{10}H_8$	E, H	100 %, 176 °F	HQQV	HQQV/HBQV		
Nitric acid HNO_3	F	1 %, 68 °F			HQQE	HQQE/HBQE
Oil-containing water		< 212 °F	HQQV	HQQV/HBQV		
Olive oil	D, E, 3	100 %, 176 °F	HQQV	HQQV/HBQV		
Oxalic acid $(COOH)_2$	H	1 %, 68 °F			HQQE	HQQE/HBQE
Ozone-containing water (O_3)		1 PPM, < 105 °F			HQQE	HQQE/HBQE
Peanut oil	D, E, 3	100 %, 194 °F	HQQV	HQQV/ HBQV		
Petrol/gasoline	1, 3, 4, F	100 %, 68 °F	HQBV	HQQV/HBQV		

Pumped liquid	Note	Liquid concentration, liquid temperature	CR		CRN	
			1s, 1, 3, 5, 10, 15, 20	32, 45, 64, 90, 120, 150	1s, 1, 3, 5, 10, 15, 20	32, 45, 64, 90, 120, 150
Phosphoric acid H_3PO_4	E	20 %, 68 °F			HQQV	HQQV/HBQV
Propanol C_3H_7OH	1, F	100 %, 68 °F	HQQV	HQQV/HBQV		
Propylene glycol $CH_3CH(OH)CH_2OH$	D, E	50 %, 194 °F	HQQE	HQQE		
Potassium carbonate K_2CO_3	E	20 %, 122 °F	HQQE	HQQE		
Potassium formate (as coolant with inhibitor) KOOCH	D, E	30 %, 122 °F	HQQE	HQQE		
Potassium hydroxide KOH	E	20 %, 122 °F			HQQE	HQQE
Potassium permanganate $KmnO_4$		5 %, 68 °F			HQQE	HQQE/HBQE
Rape seed oil	D, E, 3	100 %, 176 °F	HQQV	HQQV/HBQV		
Salicylic acid $C_6H_4(OH)COOH$	H	0,1 %, 68 °F			HQQE	HQQE/HBQE
Silicone oil	E, 3	100 %	HQQV	HQQV/HBQV		
Sodium bicarbonate $NaHCO_3$	E	10 %, 140 °F			HQQE	HQQE/HBQE
Sodium chloride (as coolant) NaCl	D, E	30 %, < 41 °F, pH > 8	HQQE	HQQE		
Sodium hydroxide NaOH	E	20 %, 122 °F			HQQE	HQQE
Sodium hypochlorite NaOCl	F	0,1 %, 68 °F			HQQE	HQQE
Sodium nitrate $NaNO_3$	E	10 %, 140 °F			HQQE	HQQE/HBQE
Sodium phosphate Na_3PO_4	E, H	10 %, 140 °F			HQQE	HQQE
Sodium sulfate Na_2SO_4	E, H	10 %, 140 °F			HQQE	HQQE/HBQE
Softened water		< 248 °F			HQQE	HQQE/HBQE
Soybean oil	D, E, 3	100 %, 176 °F	HQQV	HQQV/HBQV		
Sulfuric acid H_2SO_4	F	1 %, 68 °F			HQQV	HQQV/HQQV
Sulfurous acid H_2SO_3		1 %, 68 °F			HQQE	HQQE/HBQE
Swimming pool water (low chloride)		Max 5 ppm free chlorine (Cl_2)	HQQE	HQQE/HBQE		

Working and inlet pressure

Max. working pressure and temperature range

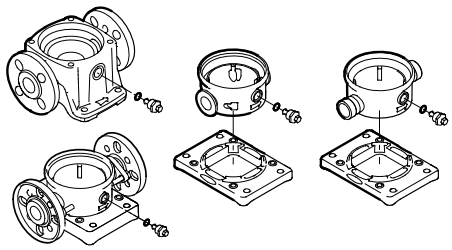
Oval flange



TM02 1379 1101

	Max. working pressure [psi]	Liquid temp. range [°F]
CR, CRI, CRN 1s	232	-4 to +248
CR, CRI, CRN 1	232	-4 to +248
CR, CRI, CRN 3	232	-4 to +248
CR, CRI, CRN 5	232	-4 to +248
CR 10-1 → CR 10-6	145	-4 to +248
CRI, CRN 10-1 → CRI, CRN 10-10	232	-4 to +248
CR 15-1 → CR 15-5	145	-4 to +248
CRI, CRN 15-1 → CRI, CRN 15-8	232	-4 to +248
CR 20-1 → CR 20-5	145	-4 to +248
CRI, CRN 20-1 → CRI, CRN 20-7	232	-4 to +248

ANSI, Clamp, PJE



TM02 8835 0904

	Max. working pressure [psi]	Liquid temp. range [°F]
CR, CRI, CRN 1s	362	-4 to +248
CR, CRI, CRN 1	362	-4 to +248
CR, CRI, CRN 3	362	-4 to +248
CR, CRI, CRN 5	362	-4 to +248
CR, CRI 10-1 → 10-10	232	-4 to +248
CR, CRI 10-12 → 10-17	362	-4 to +248
CRN 10 (all stages)	362	-4 to +248
CR, CRI 15-1 → 15-8	232	-4 to +248
CR, CRI 15-9 → 15-12	362	-4 to +248
CRN 15 (all stages)	362	-4 to +248
CR, CRI 20-1 → 20-7	232	-4 to +248
CR, CRI 20-8 → 20-10	362	-4 to +248
CRN 20 (all stages)	362	-4 to +248
CR, CRN 32-1-1 → 2-5	232	-22 to +248
CR, CRN 32-6-2 → 32-11-2	435	-22 to +248
CR, CRN 45-1-1 → 45-4-2	232	-22 to +248
CR, CRN 45-4-1 → 45-8-1	435	-22 to +248
CR, CRN 64-1-1 → 64-3	232	-22 to +248
CR, CRN 64-4-2 → 64-5-2	435	-22 to +248
CR, CRN 90-1-1 → 90-3	232	-22 to +248
CR, CRN 90-4-2 → 90-4-1	435	-22 to +248
CR, CRN 120-1-1 → 120-5-1	435	-22 to +248
CR, CRN 150-1-1 → 150-4-1	435	-22 to +248

Operating range of the shaft seal

The operating range of the shaft seal depends on operating pressure, pump type, type of shaft seal and liquid temperature. The following curves apply to clean water and water with anti-freeze liquids. For selecting the right shaft seal, see *Pumped liquids* on page 13.

CR 1s - CR 20

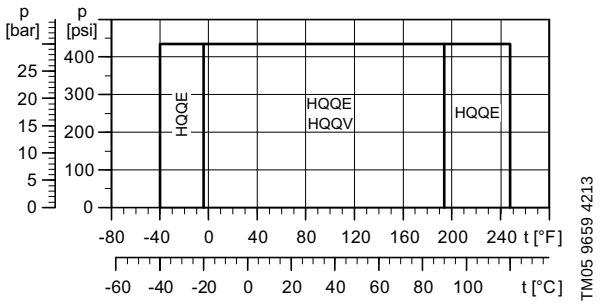


Fig. 5 Operating range of standard shaft seals for CR 1s - CR 20

CR 32 - CR 150 (3.0-60 Hp)

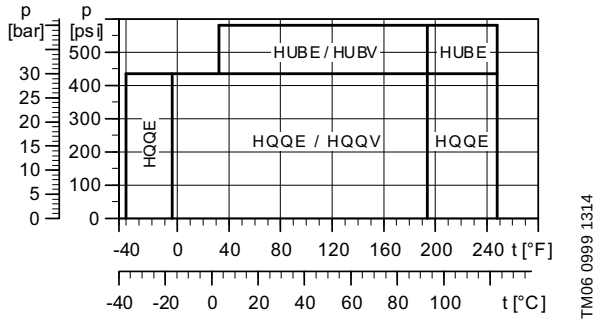


Fig. 6 Operating range of standard shaft seals for CR 32 - CR 150 (3.0-60 Hp)

CR 120 - CR 150 (75-100 Hp)

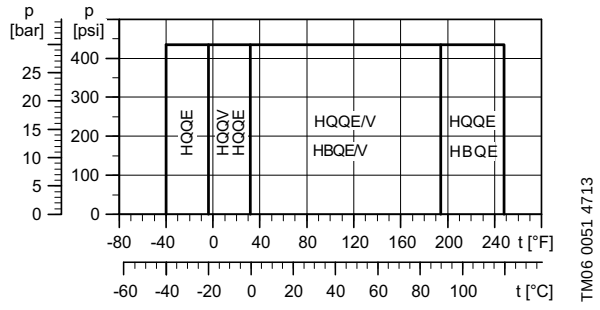


Fig. 7 Operating range of standard shaft seals for CR 120 - CR 150 (75-100 Hp)

Shaft seal	Description	Max. temp. range [°F]
HQQE	O-ring (cartridge) (balanced seal), SiC/SiC, EPDM	-40 °F to +248 °F
HBQE	O-ring (cartridge) (balanced seal), Carbon/SiC, EPDM	+32 °F to +248 °F
HBQV	O-ring (cartridge) (balanced seal), Carbon/SiC, FKM	+32 °F to +194 °F
HQQV	O-ring (cartridge) (balanced seal), SiC/SiC, FKM	-4 °F to +194 °F
HUBE	O-ring (cartridge) (balanced seal), TC/carbon, EPDM	+32 °F to +248 °F
HUBV	O-ring (cartridge) (balanced seal), TC/carbon, FKM	+32 °F to +194 °F

Note: TC= tungsten carbide

See section *Lists of variants - on request* on page 77, in case of extreme temperatures:

- low temperatures down to -40 °F or
- high temperatures up to +356 °F.

Maximum inlet pressure

The following table shows the maximum permissible inlet pressure. However, the current inlet pressure + the pressure against a closed valve **must** always be lower than the maximum permissible operating pressure.

If the maximum permissible operating pressure is exceeded, the bearing in the motor may be damaged and the life of the shaft seal reduced.

Pump type	Stages		Max. [psi (bar)]
	60 Hz	50 Hz	
CR, CRI, CRN 1s	2-27	2-36	145 (10)
CR, CRI, CRN 1	2-25	2-36	145 (10)
	27		217 (15)
CR, CRI, CRN 3	2-17	2-29	145 (10)
	19-25	31-36	217 (15)
CR, CRI, CRN 5	2-9	3-16	145 (10)
	10-24	18-36	217 (15)
CR, CRI, CRN 10	1-5	1-6	116 (8)
	6-17	7-22	145 (10)
CR, CRI, CRN 15	1-2	1-3	116 (8)
	3-12	4-17	145 (10)
CR, CRI, CRN 20	1	1-3	116 (8)
	2-10	4-17	145 (10)
CR, CRN 32	1-1 - 2	1-1 - 4	58 (4)
	3-2 - 6	5-2 - 10	145 (10)
	7-2 - 11-2	11-14	217 (15)
CR, CRN 45	1-1 - 1	1-1 - 2	58 (4)
	2-2 - 3	3-2 - 5	145 (10)
	4-2 - 8-1	6-2 - 13-2	217 (15)
CR, CRN 64	1-1	1-1 - 2-2	58 (4)
	1 - 2-1	2-1 - 4-2	145 (10)
	2 - 5-2	4-1 - 8-1	217 (15)
CR, CRN 90		1-1 - 1	58 (4)
	1-1 - 1	2-2 - 3-2	145 (10)
	2-2 - 4-1	3-6	217 (15)
CR, CRN 120	1-1 - 1	1 - 2-1	145 (10)
	2-2 - 3	2 - 5-1	217 (15)
	4-1 - 5-1	6-1 - 7	290 (20)
CR, CRN 150	1-1	1-1 - 1	145 (10)
	1-2	2-1 - 4-1	217 (15)
	3-2 - 4-1	5-2 - 6	290 (20)

Example of operating and inlet pressures

The values for operating and inlet pressures shown in the tables must not be considered individually but must always be compared, see the following examples:

Example 1:

The following pump type has been selected: CR 3-10 A-A-A

Max. operating pressure: **232 psi**

Max. inlet pressure: **145 psi**

Discharge pressure against a closed valve: **139.2 psi**, see page 43.

This pump is not allowed to start at an inlet pressure of 145 psi, but at an inlet pressure of 232.0 - 139.2 = **92.8 psi**.

Example 2:

The following pump has been selected: CR 10-2 A-GJ-A

Max. operating pressure: **232 psi**

Max. inlet pressure: **116 psi**

Discharge pressure against a closed valve: **42 psi (97 ft)**, see page 49.

This pump is allowed to start at an inlet pressure of 116 psi, as the discharge pressure is only 42 psi, which results in an operating pressure of 116 + 42 = **158 psi**. On the contrary, the max. operating pressure of this pump is limited to 158 psi, as a higher operating pressure will require an inlet pressure of more than 116 psi.

In case the inlet or operating pressure exceeds the pressure permitted, see section *Lists of variants - on request* on page 77.

8. Selection and sizing

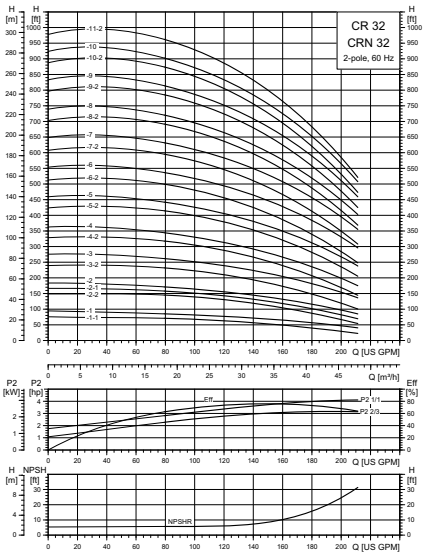
Selection of pumps

Selection of pumps should be based on

- The duty point of the pump (see section 1)
- Sizing data such as pressure loss as a result of height differences, friction loss in the pipework, pump efficiency etc. (see section 2)
- Pump materials (see section 3)
- Pump connections (see section 4)
- Shaft seal (see section 5).

1. Duty point of the pump

From a duty point it is possible to select a pump on the basis of the curve charts in the section *9. Performance curves* starting on page 24.



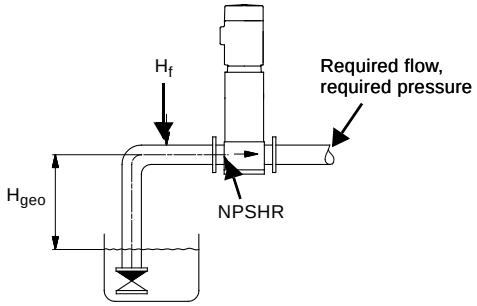
TM02 0039 4713

Fig. 8 Example of a curve chart

2. Sizing data

When sizing a pump the following must be taken into account.

- Required flow and pressure at the point of use.
- Pressure loss as a result of height differences (H_{geo}).
- Friction loss in the pipework (H_f).
  It may be necessary to account for pressure loss in connection with long pipes, bends or valves, etc.
- Best efficiency at the estimated duty point.
- NPSH value.
  For calculation of the NPSH value, see *Minimum inlet pressure - NPSHA* on page 21.

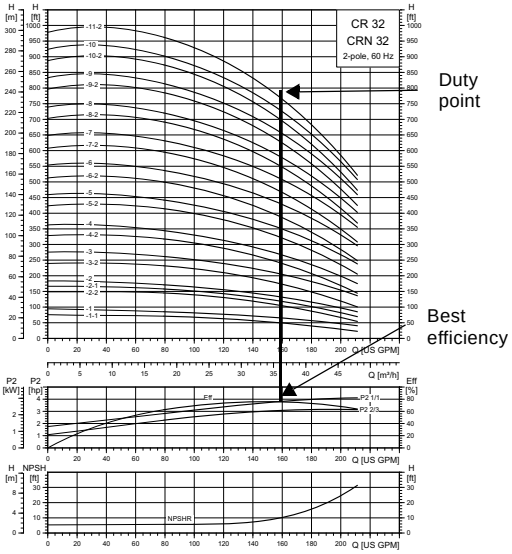


TM02 6711 1403

Fig. 9 Sizing data

Efficiency

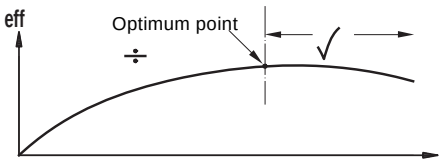
Before determining the point of best efficiency the operation pattern of the pump needs to be identified. Is the pump expected to operate at the same duty point, then select a CR pump which is operating at a duty point corresponding with the best efficiency of the pump.



TM02 0039 1303

Fig. 10 Example of a CR pump's duty point

As the pump is sized on the basis of the highest possible flow, it is important to always have the duty point to the right of the optimum efficiency point (see fig. 11, range with check mark). This must be considered in order to keep efficiency high when the flow drops.



TM02 8579 0504

Fig. 11 Best efficiency

Normally, pumps with an external variable frequency drive (VFD) are used in applications characterized by a variable flow. Consequently, it is not possible to select a pump that is constantly operating at optimum efficiency.

In order to achieve optimum operating economy, the pump should be selected on the basis of the following criteria:

- The max. required duty point should be as close as possible to the QH curve of the pump.
- The required duty point should be positioned so that P2 is close to the max. point of the 100 % curve.

Between the min. and max. performance curves, pumps with a VFD have an infinite number of performance curves each representing a specific speed. Therefore it may not be possible to select a duty point close to the 100 % curve.

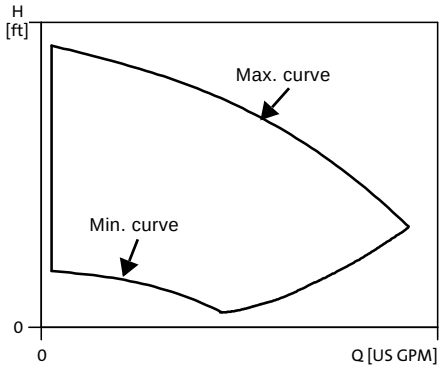


Fig. 12 Min. and max. performance curves

In situations where it is not possible to select a duty point close to the 100 % curve the affinity equations to the right can be used. The head (H), the flow (Q) and the input power (P) are all the appropriate variables for the motor speed (n).

Note:

The approximated formulas apply on condition that the system characteristic remains unchanged for nn and nx and that it is based on the formula H = k x Q2, where k is a constant.

The power equation implies that the pump efficiency is unchanged at the two speeds. In practice this is **not** quite correct.

Finally, it is worth noting that the efficiencies of the frequency converter and the motor **must** be taken into account if a precise calculation of the power saving resulting from a reduction of the pump speed is wanted.

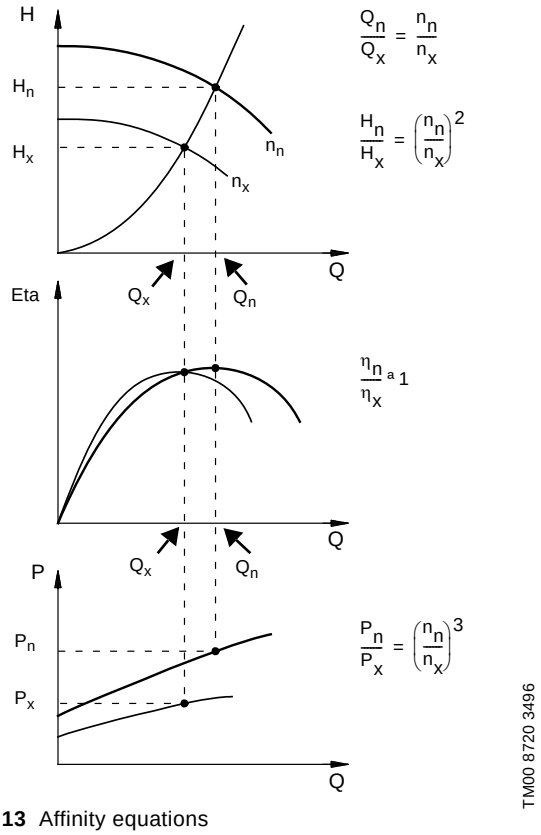


Fig. 13 Affinity equations

Legend

H_n	Rated head in feet
H_x	Current head in feet
Q_n	Rated flow in US gpm
Q_x	Current flow in US gpm
n_n	Rated motor speed in min^{-1} (n_n = 3500 min^{-1})
n_x	Current motor speed in min^{-1}
η_n	Rated efficiency in %
η_x	Current efficiency in %

WinCAPS and WebCAPS

WinCAPS and WebCAPS are both selection programs offered by Grundfos.

The two programs make it possible to calculate a pump's specific duty point and energy consumption.

By entering the sizing data of the pump, WinCAPS and WebCAPS can calculate the exact duty point and energy consumption. For further information see *16. Further product information* on page 83.

3. Material

The material variant (CR, CRI, CRN) should be selected based of the liquid to be pumped. The product range covers three basic types.

- The CR, CRI pump types are suitable for clean, non-aggressive liquids such as potable water, oils, etc.
- The CRN pump type is suitable for industrial liquids and acids, see *Pumped liquids* on page 13 or contact Grundfos.

For saline or chloride-containing liquids such as sea water, CRT pumps of titanium are available.

4. Pump connection

Selection of pump connection depends on the rated pressure and pipework. To meet any requirement the CR, CRI and CRN pumps offer a wide range of flexible connections such as:

- Oval flange (NPT) - fig. 15
- ANSI flange - fig. 15
- PJE coupling - fig. 15
- Clamp coupling
- Union (NPT[M])
- Other connections on request.

5. Shaft seal

As standard, the CR range is fitted with a Grundfos shaft seal (Cartridge type) suitable for the most common applications, see fig. 16.

The following three key parameters **must** be taken into account, when selecting the shaft seal:

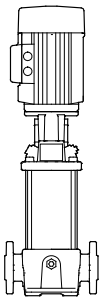
- Type of pumped liquid
- liquid temperature and
- Maximum pressure.

Grundfos offers a wide range of shaft seal variants to meet specific demands see *Pumped liquids* on page 13.

6. Inlet pressure and operating pressure

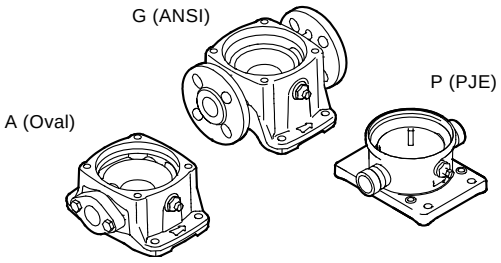
Do **not** exceed the limit values stated on page 16 and page 18 as regards these pressures:

- maximum inlet pressure and
- maximum operating pressure.



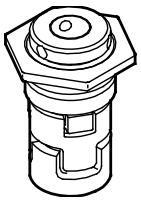
TM03 2155 3805

Fig. 14 CR pump



TM02 1201 0601

Fig. 15 Pump connections



TM02 0538 4800

Fig. 16 Shaft seal (Cartridge type)

Minimum inlet pressure - NPSHA

Calculation of the inlet pressure "H" is recommended in these situations:

- The liquid temperature is high.
- The flow is significantly higher than the rated flow.
- Water is drawn from depths.
- Water is drawn through long pipes.
- Inlet conditions are poor.

To avoid cavitation, make sure that there is a minimum pressure on the suction side of the pump. The maximum suction lift "H" in feet can be calculated as follows:

$H = P_b - NPSHR - H_f - H_v - H_s$

P_b = Barometric pressure in feet absolute. (Barometric pressure can be set to 33.9 feet. At sea level. In closed systems, pb indicates system pressure in feet.)

NPSHR = Net Positive Suction Head Required in feet. (To be read from the NPSHR curve at the highest flow the pump will be delivering).

H_f = Friction loss in suction pipe in feet. (At the highest flow the pump will be delivering.)

H_v = Vapor pressure in feet. (To be read from the vapor pressure scale. "H_v" depends on the liquid temperature "T_m").

H_s = Safety margin = minimum 2.0 feet.

If the "H" calculated is positive, the pump can operate at a suction lift of maximum "H" feet.

If the "H" calculated is negative, an inlet pressure of minimum "H" feet is required.

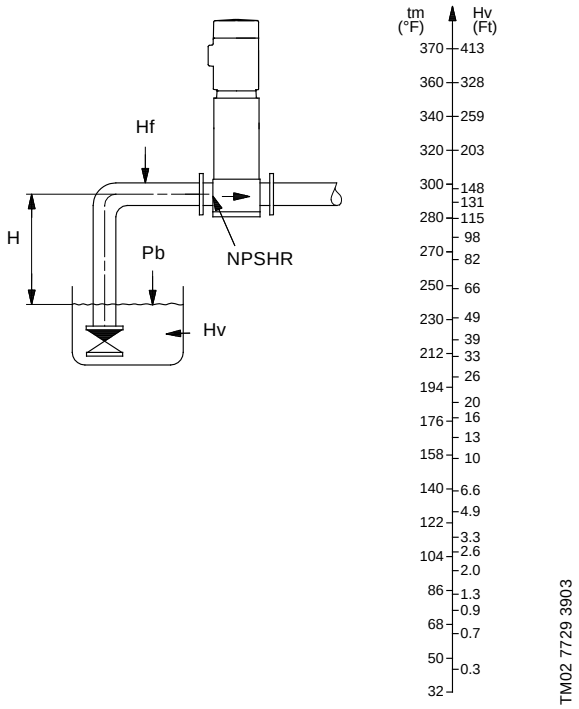


Fig. 17 Minimum inlet pressure - NPSHR

Note: In order to avoid cavitation **never**, select a pump whose duty point lies too far to the right on the NPSHR curve.

Always check the NPSHR value of the pump at the highest possible flow.

In case a lower NPSHR value is required, see *Lists of variants - on request* on page 77.

How to read the curve charts

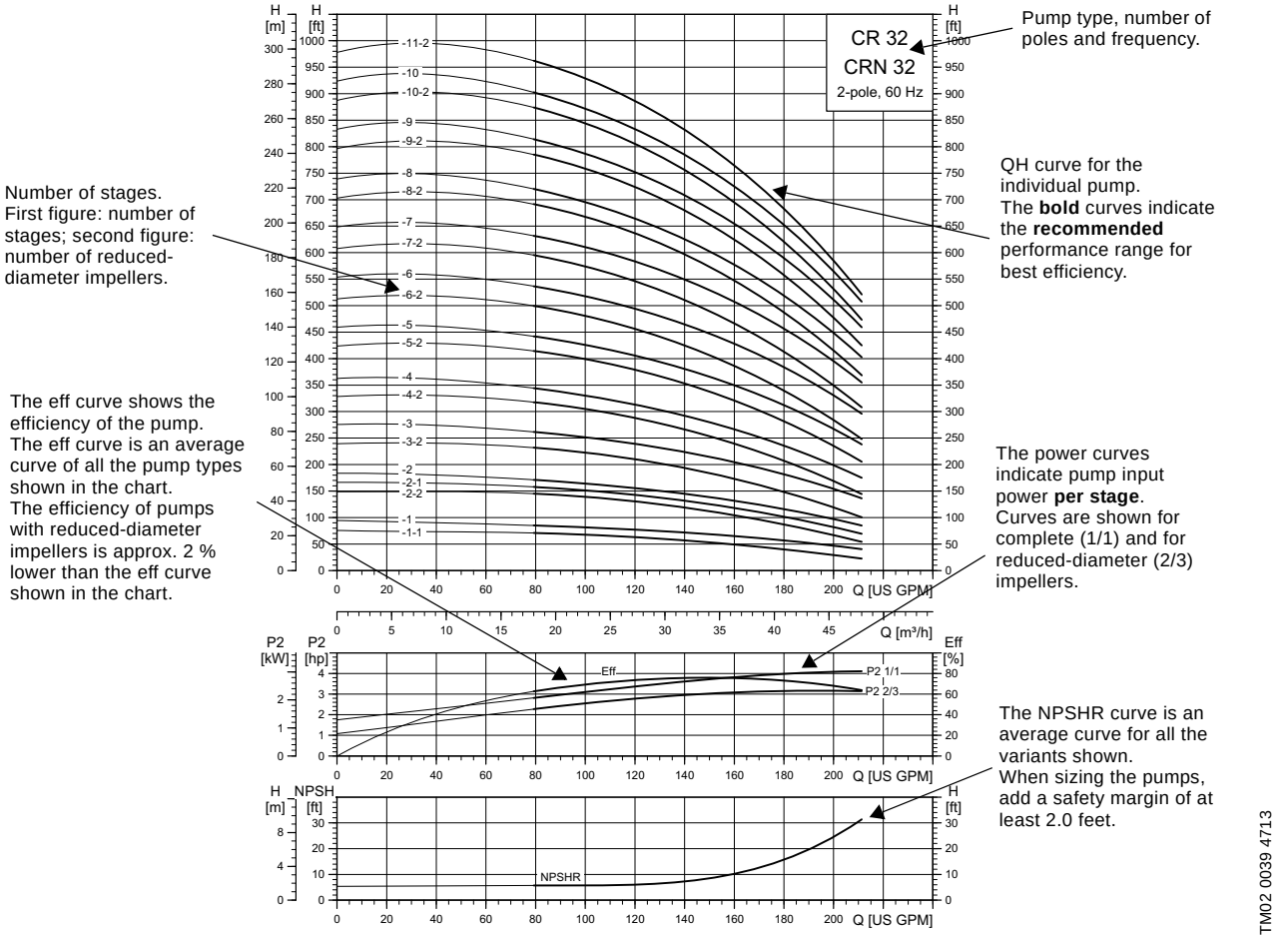


Fig. 18 How to read the curve charts

Guidelines to performance curves

The guidelines below apply to the curves shown on the following pages:

1. The motors used for the measurements are standard motors (ODP, TEFC).
2. Measurements have been made with airless water at a temperature of 68 °F (20 °C).
3. The curves apply to a kinematic viscosity of υ = 1 mm^2/s (1 cSt).
4. Due to the risk of overheating, the pumps should not be used at a flow below the minimum flow rate.
5. The QH curves apply to actual speed with the motor types mentioned at 60 Hz.

The curve below shows the minimum flow rate as a percentage of the nominal flow rate in relation to the liquid temperature. The dotted line shows a CR pump fitted with an air-cooled top assembly.

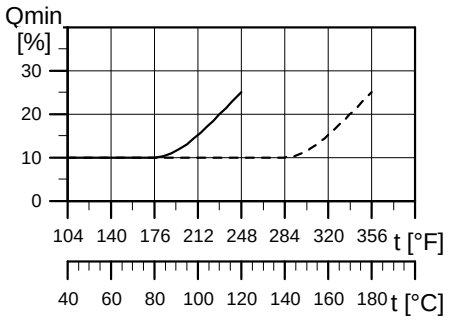
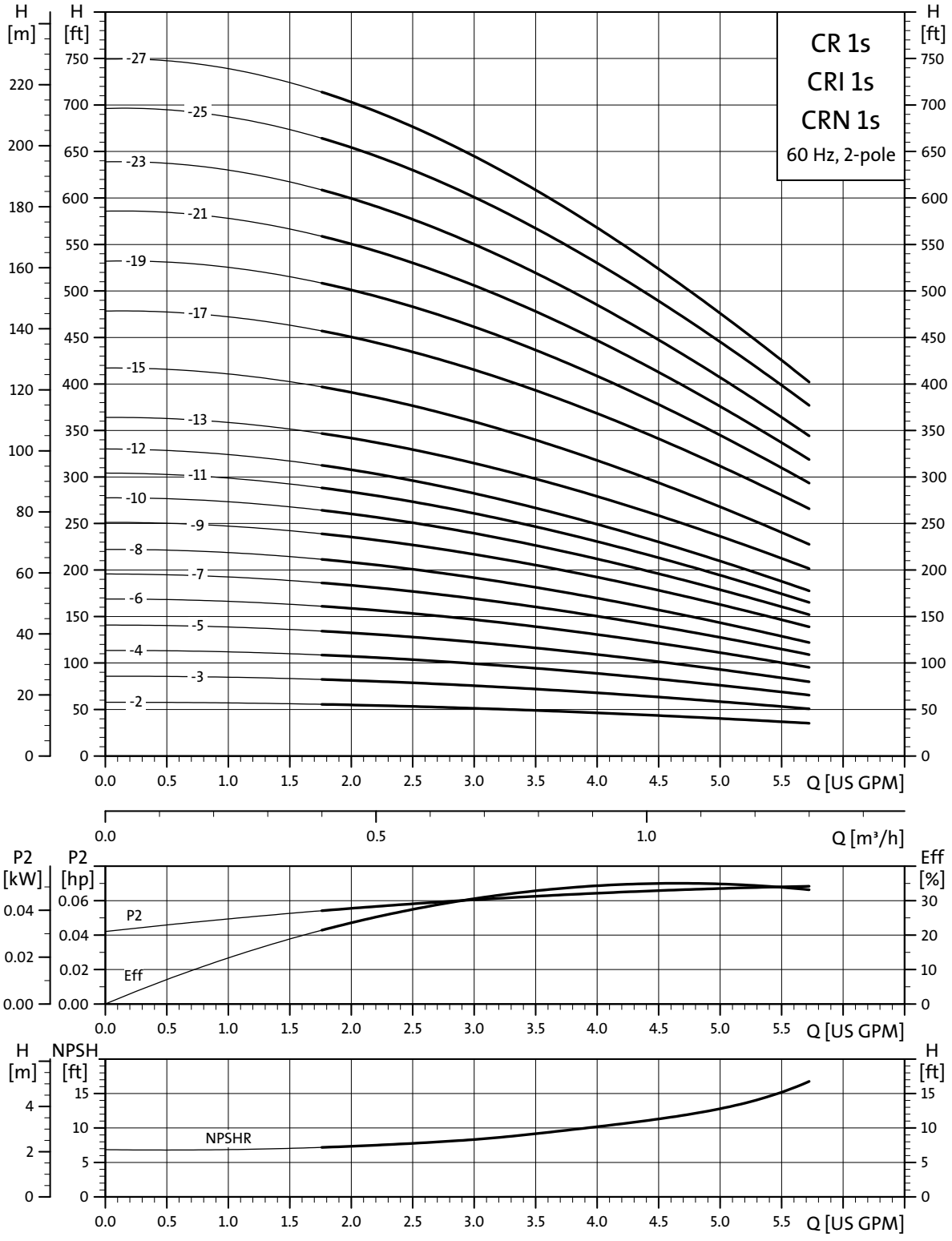


Fig. 19 Minimum flow rate

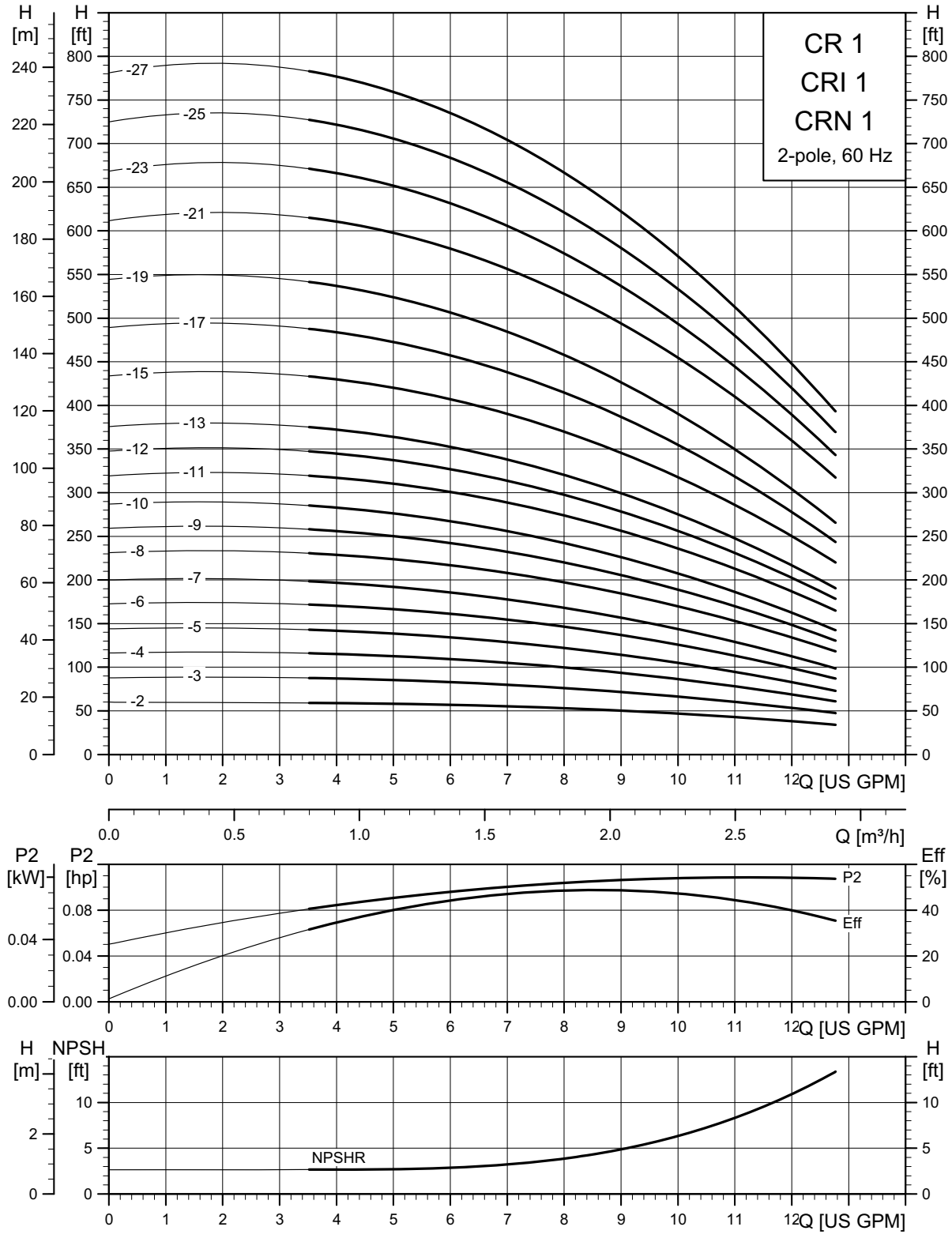
9. Performance curves

CR, CRI, CRN 1s

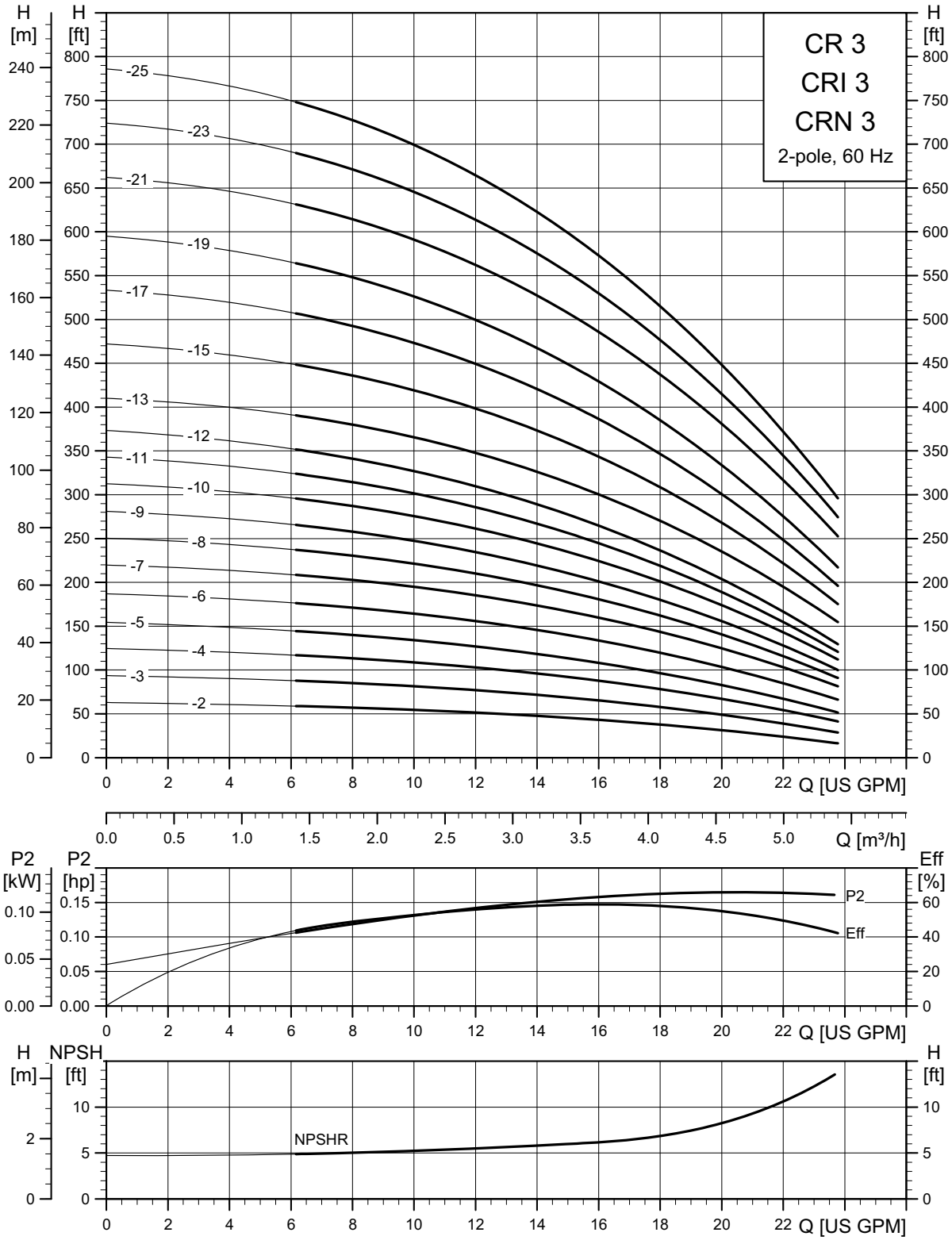


TM02 5741 1303

CR, CRI, CRN 1

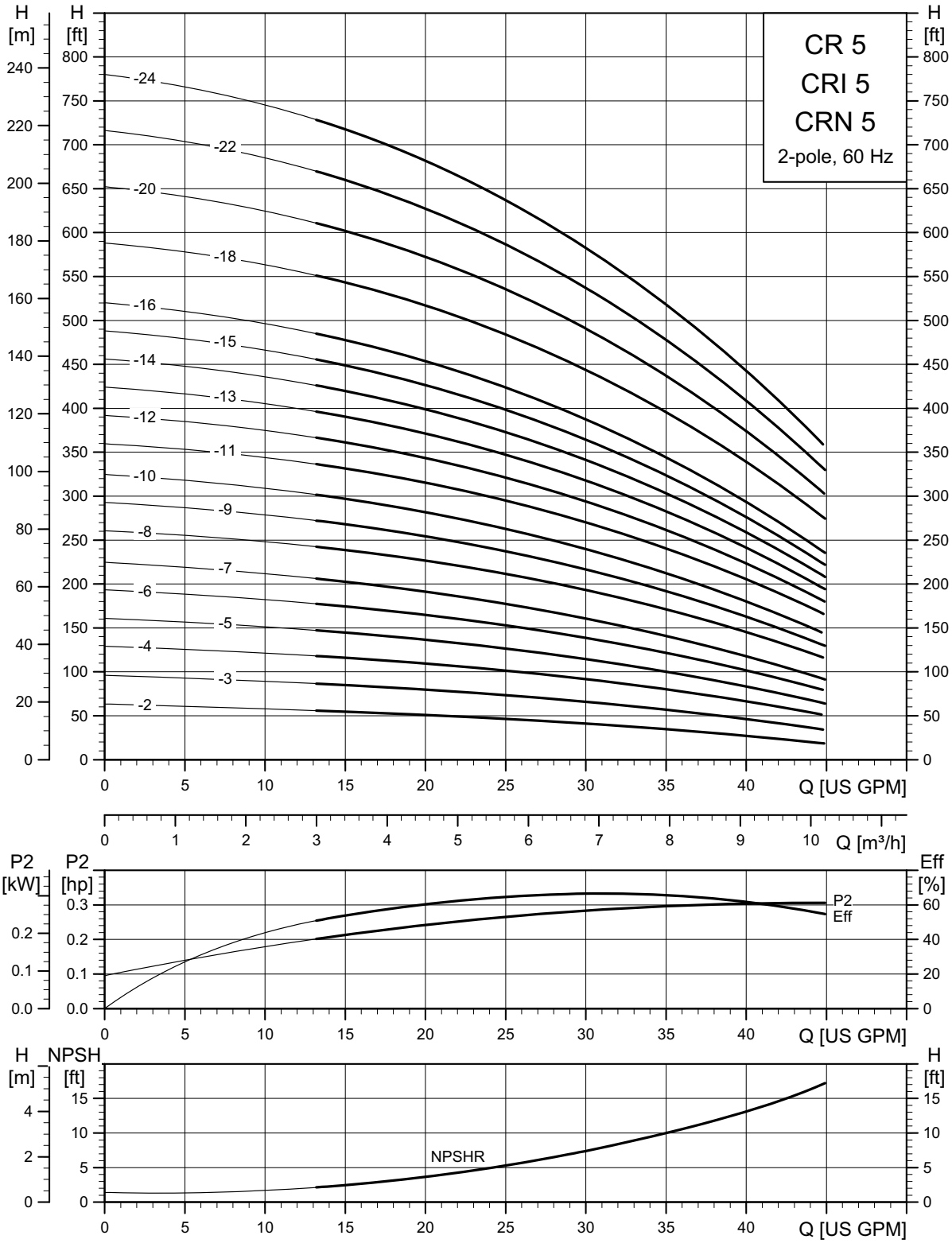

CR 1
CRI 1
CRN 1
2-pole, 60 Hz
H [m]
H [ft]
-27
-25
-23
-21
-19
-17
-15
-13
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
Q [US GPM]
Q [m³/h]
P2 [kW]
P2 [hp]
Eff [%]
P2
Eff
NPSH [ft]
NPSHR
TM02 4083 4713

CR, CRI, CRN 3



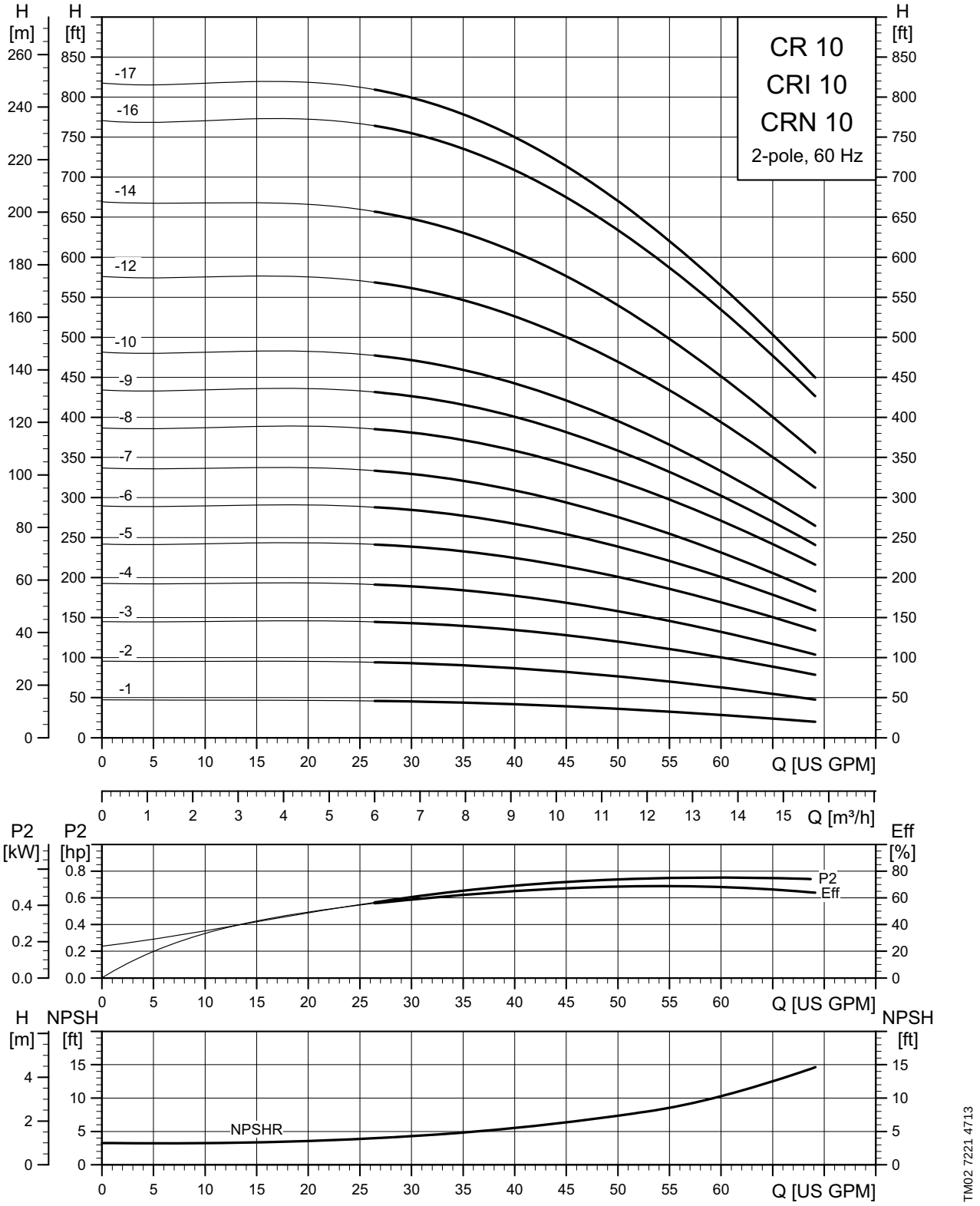
TM02 4084 4713

CR, CRI, CRN 5

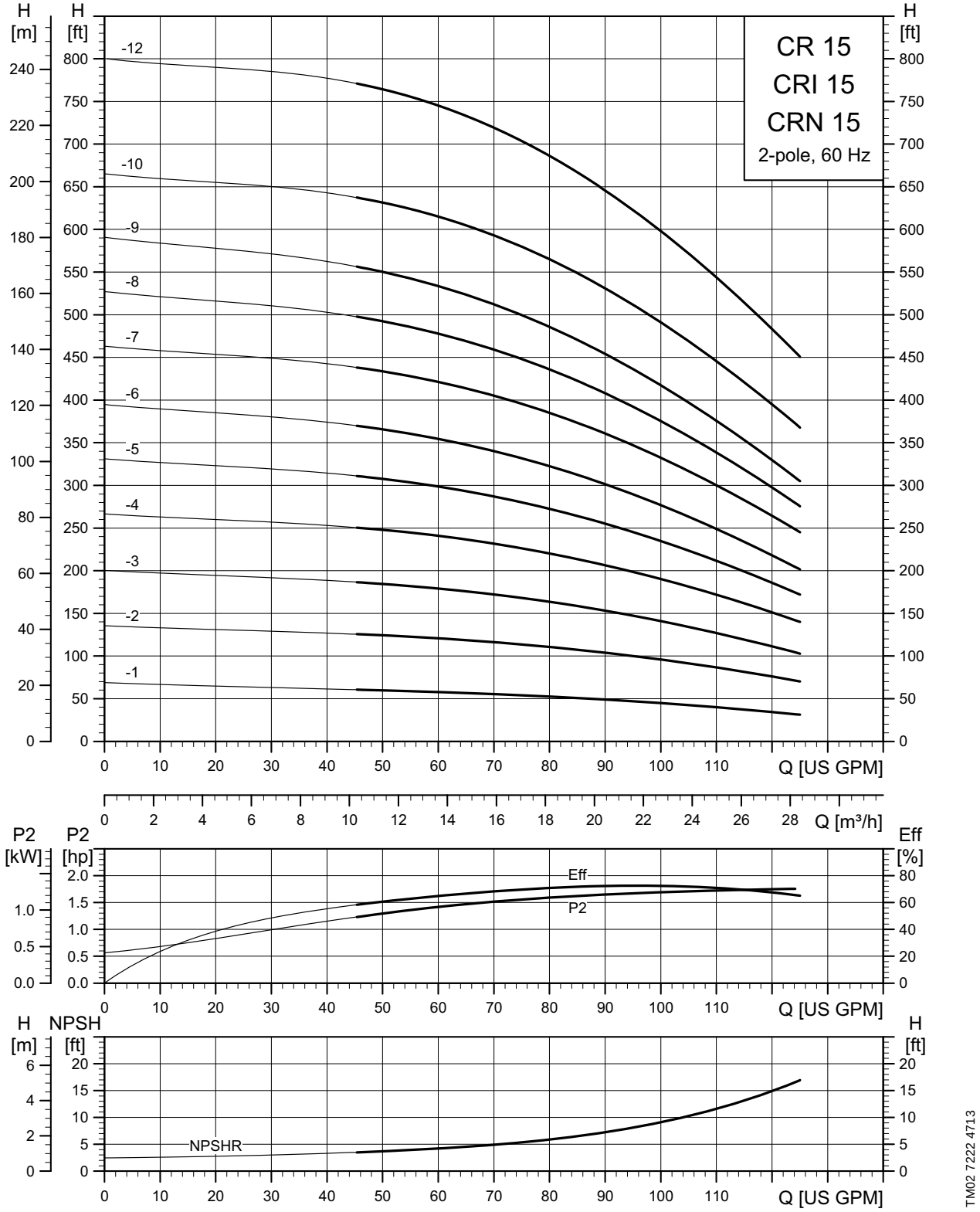


TM02 4085 4713

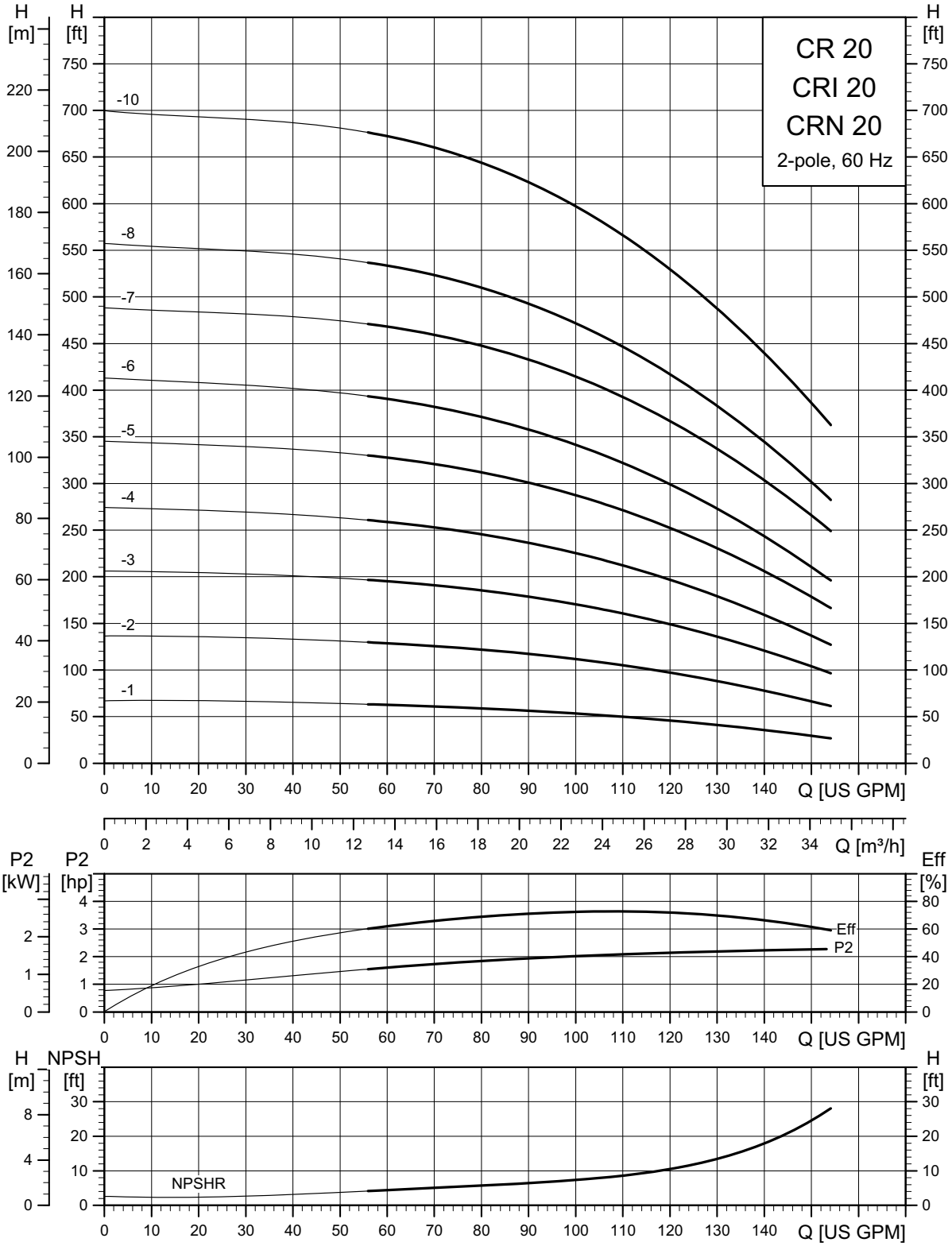
CR, CRI, CRN 10


CR 10
CRI 10
CRN 10
2-pole, 60 Hz
H [m]
H [ft]
-17
-16
-14
-12
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
Q [US GPM]
Q [m³/h]
P2 [kW]
P2 [hp]
Eff [%]
P2
Eff
H [m]
NPSH [ft]
NPSHR
TM02 7221 4713

CR, CRI, CRN 15

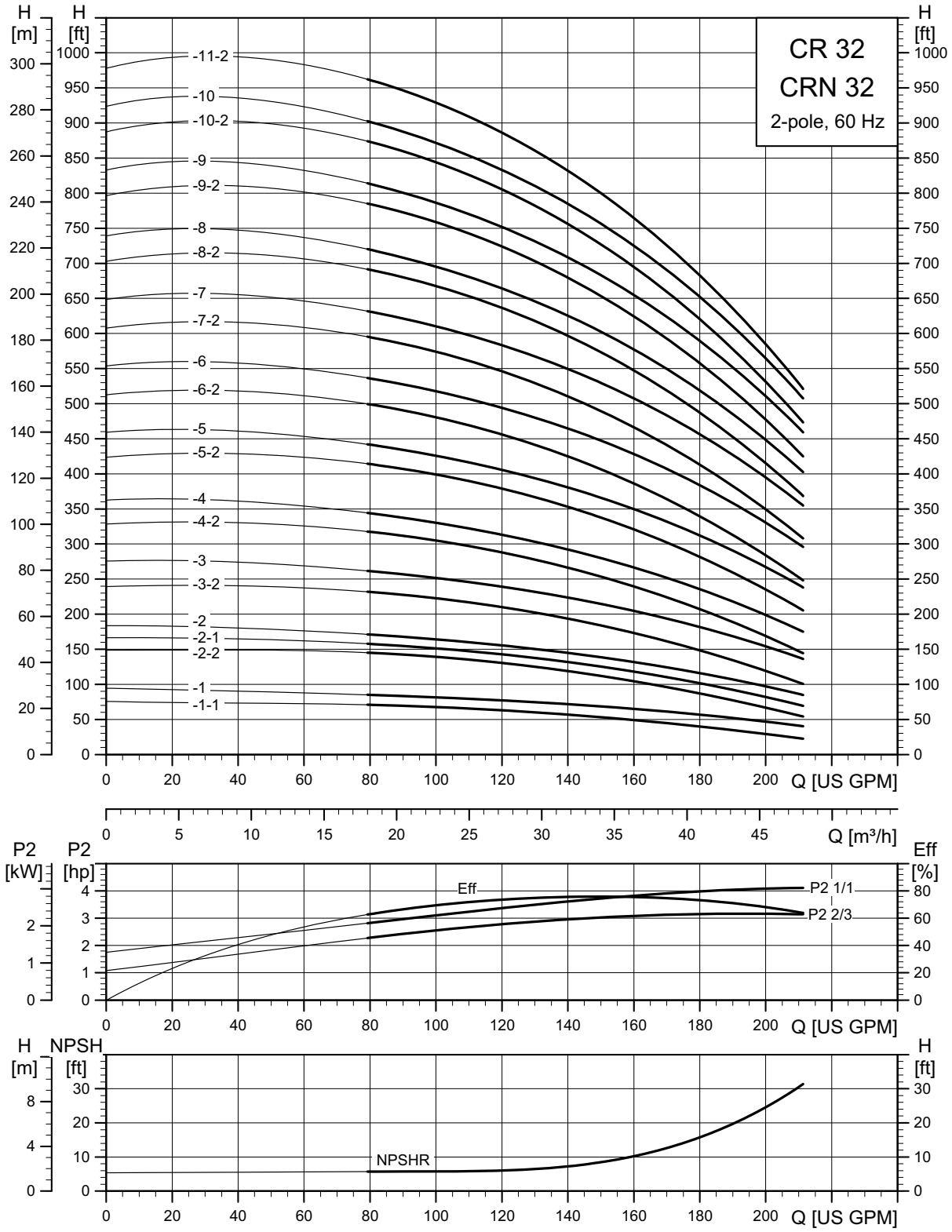

CR 15
CRI 15
CRN 15
2-pole, 60 Hz
H [m]
H [ft]
-12
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
Q [US GPM]
Q [m³/h]
P2 [kW]
P2 [hp]
Eff
Eff [%]
P2
NPSH [m]
NPSH [ft]
NPSHR
TM02 7222 4713

CR, CRI, CRN 20

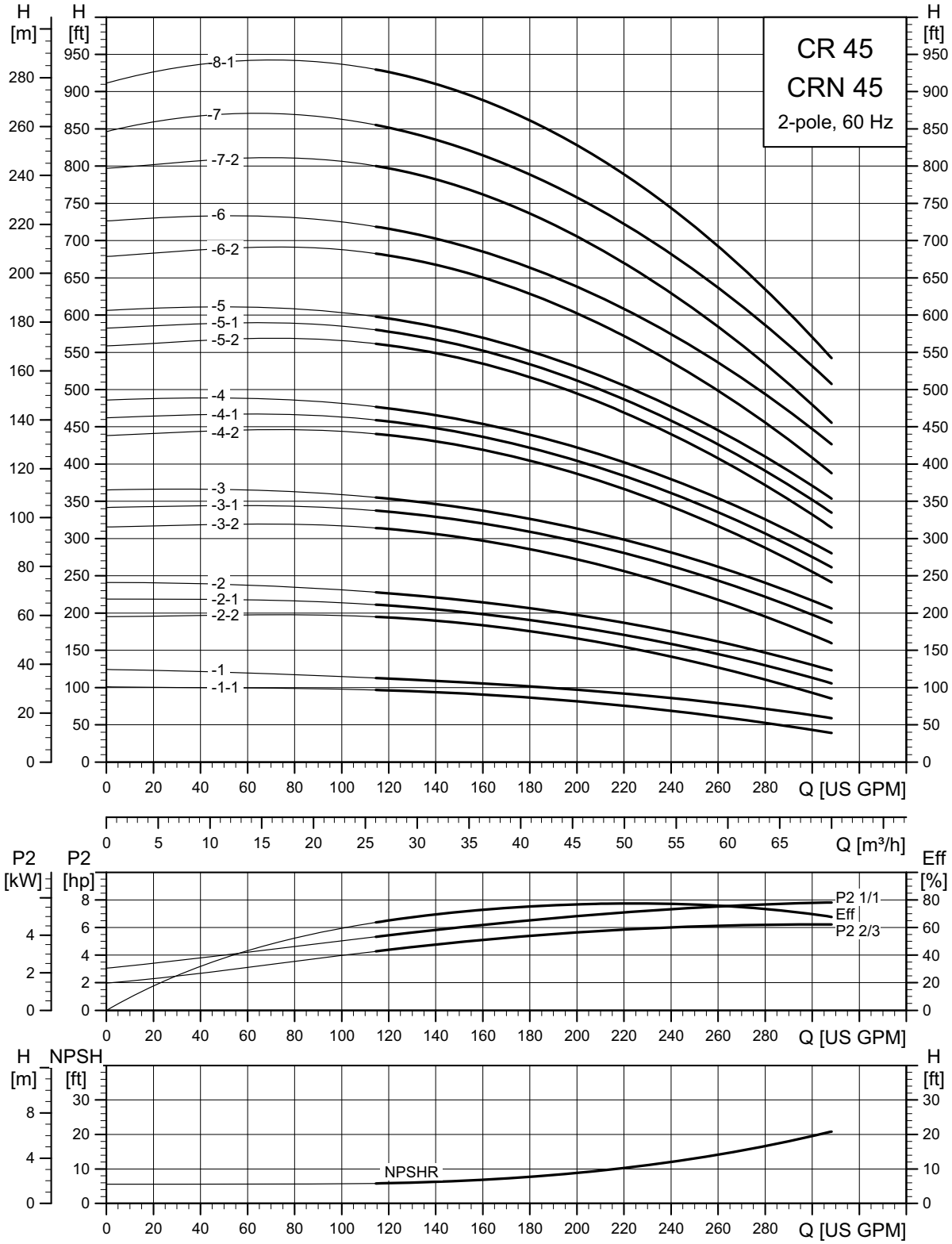


TM02 7223 4713

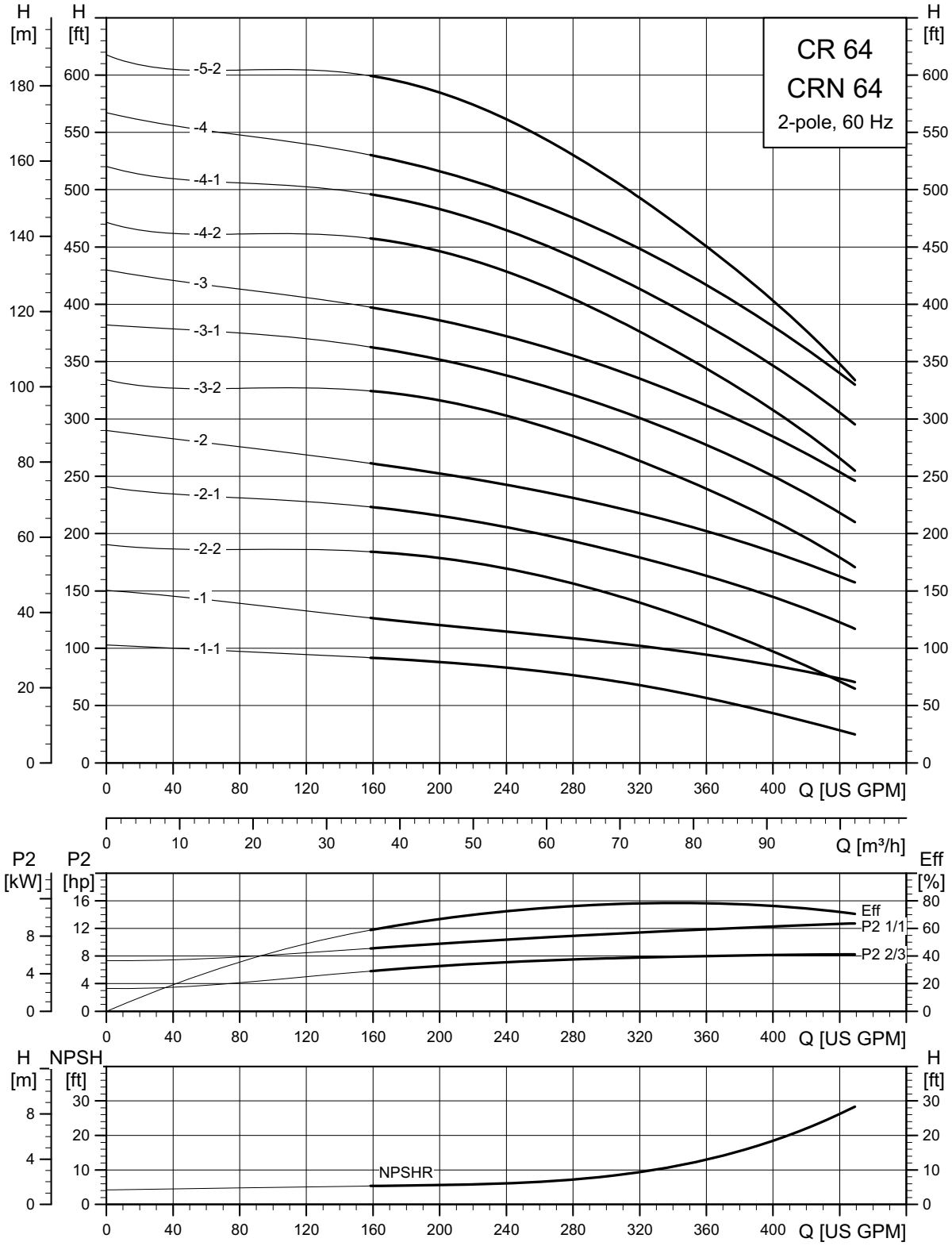
CR, CRN 32


CR 32
CRN 32
2-pole, 60 Hz
H [m]
H [ft]
-11-2
-10
-10-2
-9
-9-2
-8
-8-2
-7
-7-2
-6
-6-2
-5
-5-2
-4
-4-2
-3
-3-2
-2
-2-1
-2-2
-1
-1-1
Q [US GPM]
Q [m³/h]
P2 [kW]
P2 [hp]
Eff [%]
Eff
P2 1/1
P2 2/3
H [m]
NPSH [ft]
NPSHR
TM02 0039 4713

CR, CRN 45

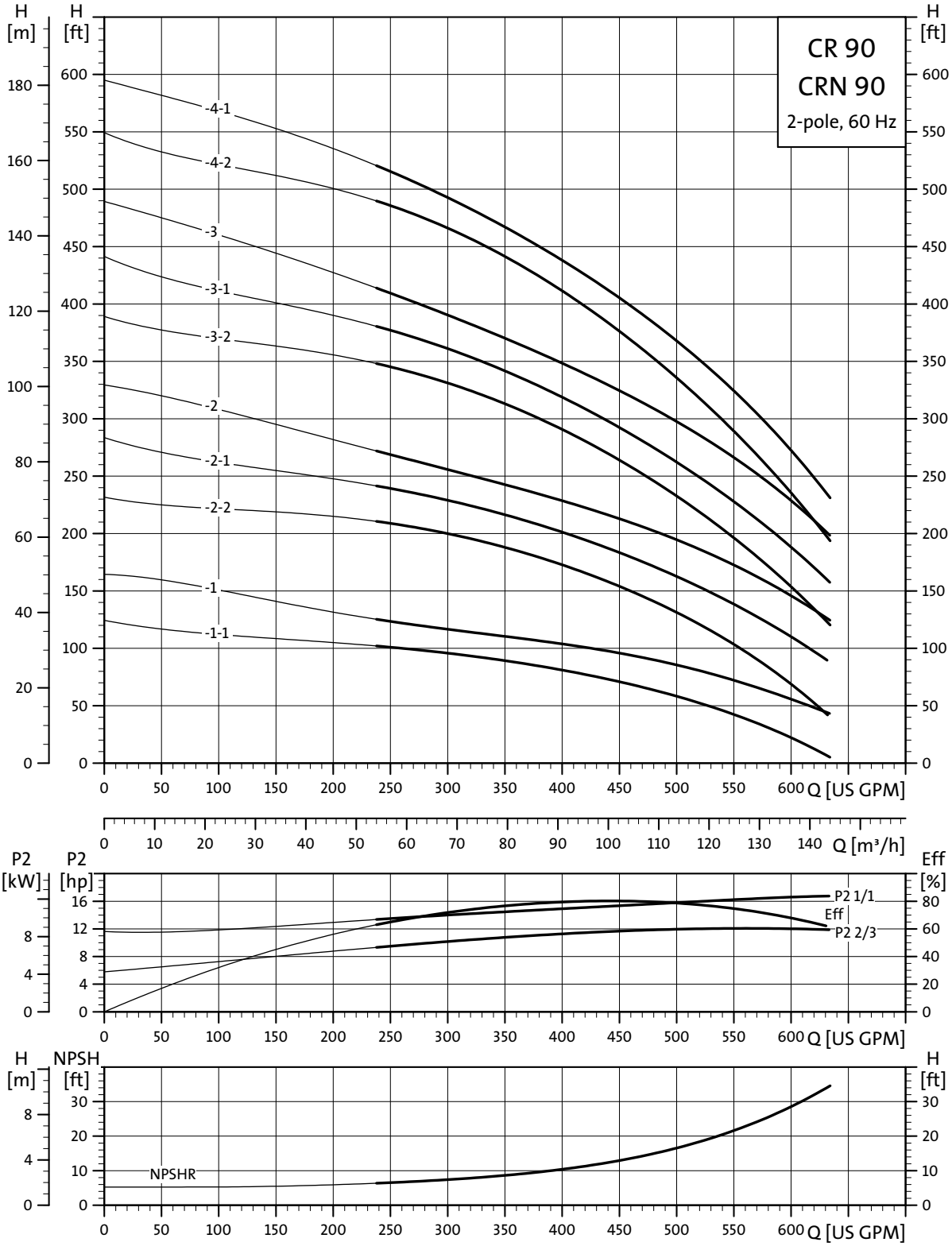

CR 45
CRN 45
2-pole, 60 Hz
H [m]
H [ft]
8-1
-7
-7-2
-6
-6-2
-5
-5-1
-5-2
-4
-4-1
-4-2
-3
-3-1
-3-2
-2
-2-1
-2-2
-1
-1-1
Q [US GPM]
Q [m³/h]
P2 [kW]
P2 [hp]
Eff [%]
P2 1/1
Eff
P2 2/3
H [m]
NPSH [ft]
NPSHR
TM02 0040 4713

CR, CRN 64



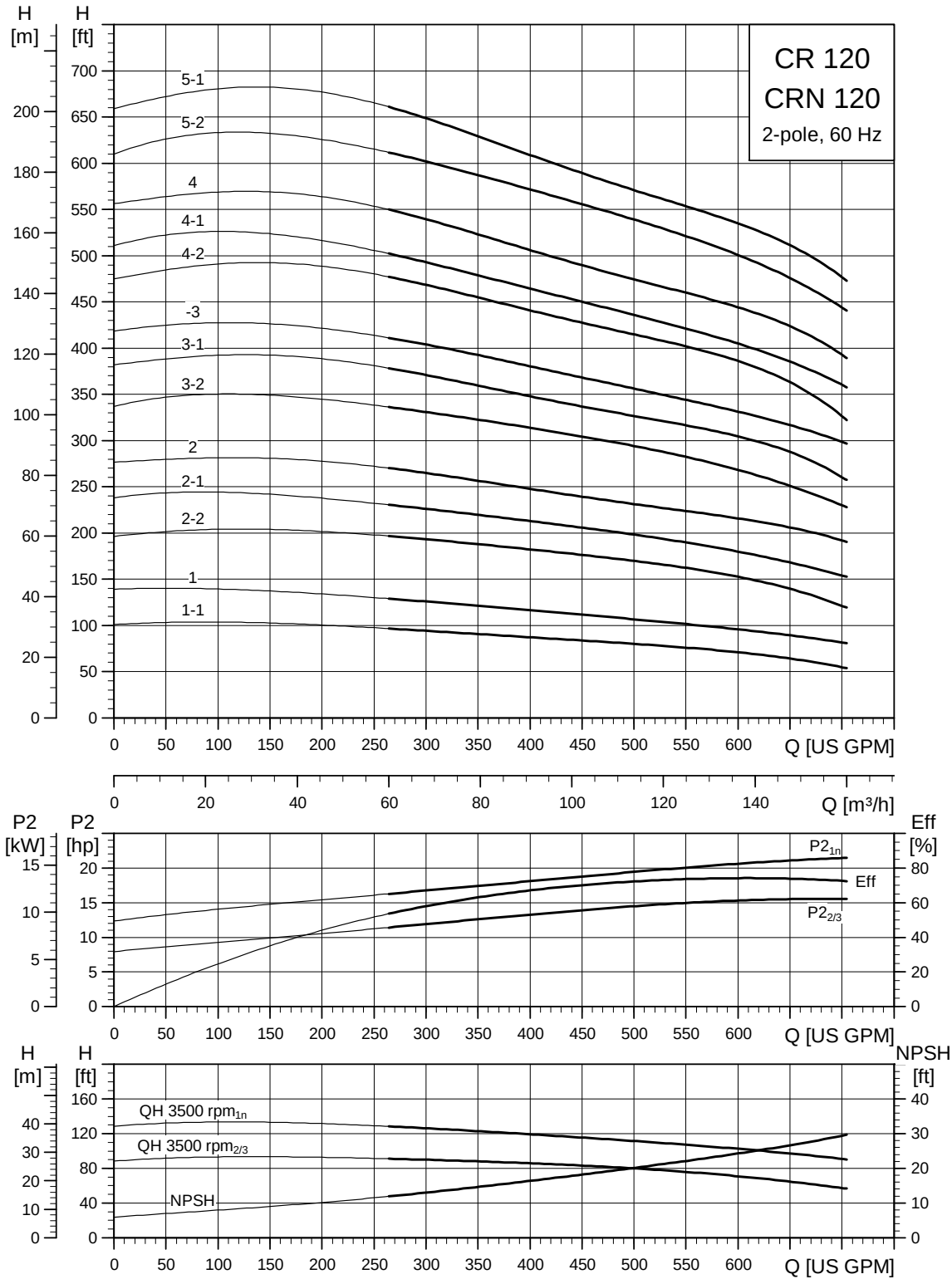
TM02 0041 4713

CR, CRN 90



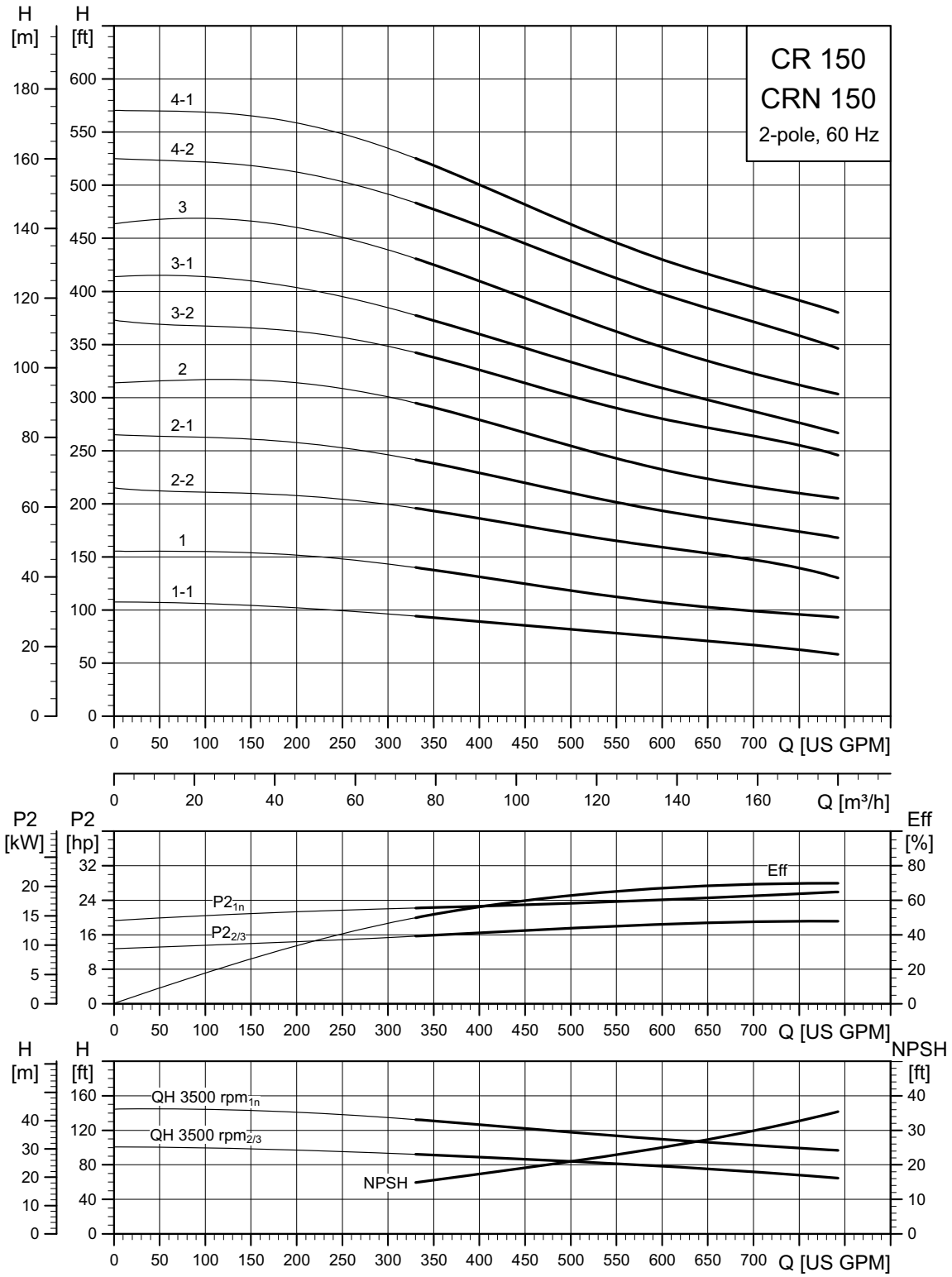
TM02 0042 1303

CR, CRN 120



TM03 9192 0209

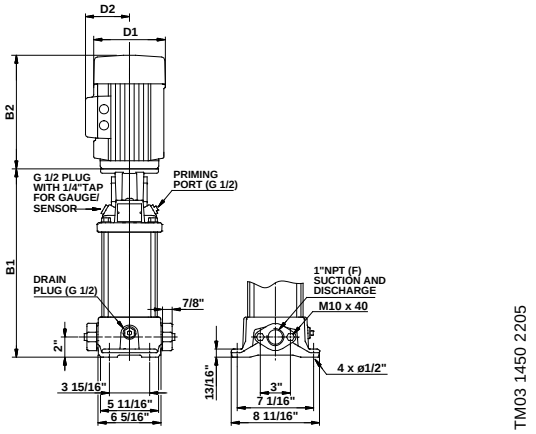
CR, CRN 150



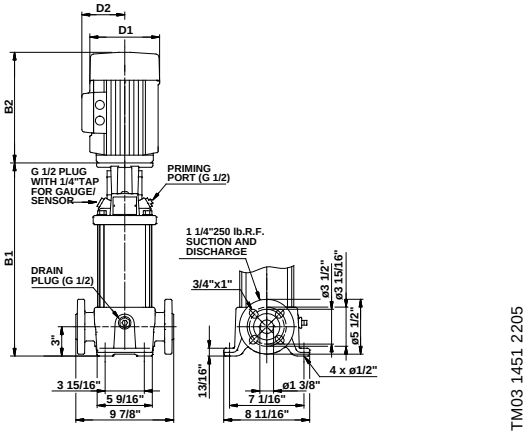
TM03 9193 4213

10. Technical data

CR 1s



TM03 1450 2205



TM03 1451 2205

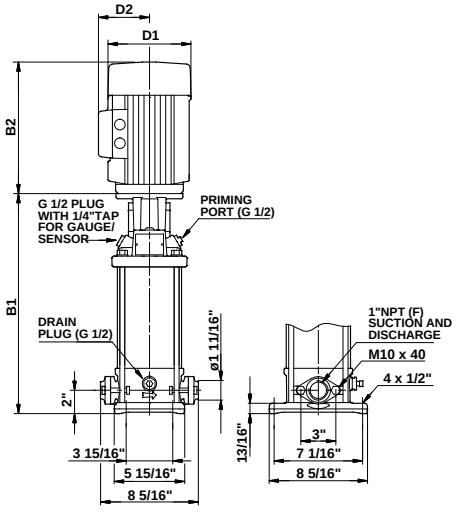
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CR 1s-2	1/3	1	•	11.97 (305)	6.19 (158)	5.18 (132)	21.26 (541)	69 (32)
		3	•	11.97 (305)	5.55 (141)	4.57 (117)	19.41 (494)	67 (31)
CR 1s-3	1/3	1	•	11.97 (305)	6.19 (158)	5.18 (132)	21.26 (541)	69 (32)
		3	•	11.97 (305)	5.55 (141)	4.57 (117)	19.41 (494)	67 (31)
CR 1s-4	1/3	1	•	12.68 (323)	6.19 (158)	5.18 (132)	21.97 (559)	70 (32)
		3	•	12.68 (323)	5.55 (141)	4.57 (117)	20.12 (512)	68 (31)
CR 1s-5	1/3	1	•	13.39 (341)	6.19 (158)	5.18 (132)	22.68 (577)	71 (33)
		3	•	13.39 (341)	5.55 (141)	4.57 (117)	20.83 (530)	69 (32)
CR 1s-6	1/2	1	•	14.09 (358)	6.19 (158)	5.18 (132)	23.38 (594)	75 (35)
		3	•	14.09 (358)	5.55 (141)	4.57 (117)	21.53 (547)	70 (32)
CR 1s-7	1/2	1	•	14.80 (376)	6.19 (158)	5.18 (132)	24.09 (612)	76 (35)
		3	•	14.80 (376)	5.55 (141)	4.57 (117)	22.24 (565)	71 (33)
CR 1s-8	1/2	1	•	15.51 (394)	6.19 (158)	5.18 (132)	24.80 (630)	77 (35)
		3	•	15.51 (394)	5.55 (141)	4.57 (117)	22.95 (583)	72 (33)
CR 1s-9	3/4	1	•	16.22 (412)	6.19 (158)	5.18 (132)	26.13 (664)	82 (38)
		3	•	16.22 (412)	5.55 (141)	4.57 (117)	23.66 (601)	73 (34)
CR 1s-10	3/4	1	•	16.93 (431)	6.19 (158)	5.18 (132)	26.84 (682)	83 (38)
		3	•	16.93 (431)	5.55 (141)	4.57 (117)	24.37 (619)	74 (34)
CR 1s-11	3/4	1	•	17.64 (449)	6.19 (158)	5.18 (132)	27.55 (700)	84 (39)
		3	•	17.64 (449)	5.55 (141)	4.57 (117)	25.08 (638)	75 (35)
CR 1s-12	3/4	1	•	18.35 (467)	6.19 (158)	5.18 (132)	28.26 (718)	85 (39)
		3	•	18.35 (467)	5.55 (141)	4.57 (117)	25.79 (656)	76 (35)
CR 1s-13	1	1	•	19.06 (485)	7.19 (183)	5.73 (146)	30.25 (769)	101 (46)
		3	•	19.06 (485)	5.55 (141)	4.57 (117)	26.50 (674)	77 (35)
CR 1s-15	1	1	•	20.47 (520)	7.19 (183)	5.73 (146)	31.66 (805)	103 (47)
		3	•	20.47 (520)	5.55 (141)	4.57 (117)	27.91 (709)	78 (36)
CR 1s-17	1 1/2	1	•	21.89 (557)	7.19 (183)	5.73 (146)	33.57 (853)	107 (49)
		3	•	21.89 (557)	5.55 (141)	4.57 (117)	30.51 (775)	84 (39)
CR 1s-19	1 1/2	1	-	23.31 (593)	7.19 (183)	5.73 (146)	34.99 (889)	109 (50)
		3	-	23.31 (593)	5.55 (141)	4.57 (117)	31.93 (812)	86 (40)
CR 1s-21	1 1/2	1	-	24.72 (628)	7.19 (183)	5.73 (146)	36.40 (925)	111 (51)
		3	-	24.72 (628)	5.55 (141)	4.57 (117)	33.34 (847)	88 (40)
CR 1s-23	1 1/2	1	-	26.14 (664)	7.19 (183)	5.73 (146)	37.82 (961)	113 (52)
		3	-	26.14 (664)	5.55 (141)	4.57 (117)	34.76 (883)	90 (41)
CR 1s-25	2	1	-	27.56 (701)	7.19 (183)	5.73 (146)	40.12 (1020)	126 (58)
		3	-	27.56 (701)	7.01 (179)	4.33 (110)	38.78 (986)	116 (53)
CR 1s-27	2	1	-	28.98 (737)	7.19 (183)	5.73 (146)	41.54 (1056)	127 (58)
		3	-	28.98 (737)	7.01 (179)	4.33 (110)	40.20 (1022)	118 (54)

All dimensions in inches unless otherwise noted.

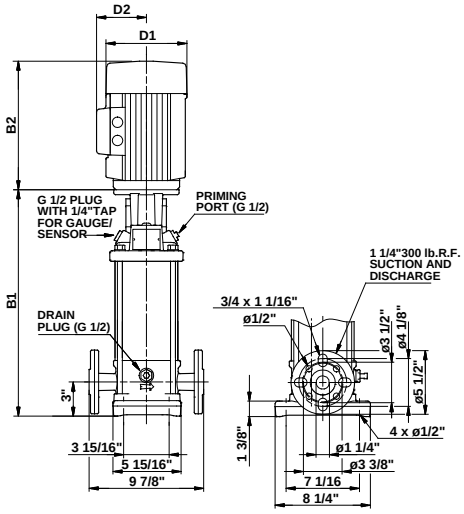
* Oval flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available.

CRI 1s



TM03 1452 2205



TM03 1453 2205

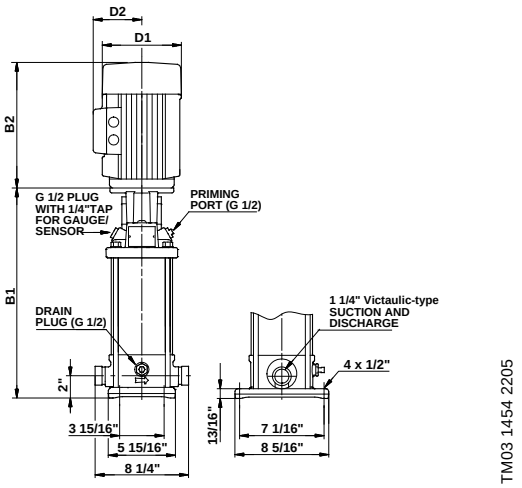
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CRI 1s-2	1/3	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	64 (30)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRI 1s-3	1/3	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	64 (30)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRI 1s-4	1/3	1	•	12.80 (326)	6.19 (158)	5.18 (132)	22.09 (562)	65 (30)
		3	•	12.80 (326)	5.55 (141)	4.57 (117)	20.24 (515)	63 (29)
CRI 1s-5	1/3	1	•	13.50 (343)	6.19 (158)	5.18 (132)	22.79 (579)	66 (30)
		3	•	13.50 (343)	5.55 (141)	4.57 (117)	20.94 (532)	64 (30)
CRI 1s-6	1/2	1	•	14.21 (361)	6.19 (158)	5.18 (132)	23.50 (597)	70 (32)
		3	•	14.21 (361)	5.55 (141)	4.57 (117)	21.65 (550)	65 (30)
CRI 1s-7	1/2	1	•	14.92 (379)	6.19 (158)	5.18 (132)	24.21 (615)	71 (33)
		3	•	14.92 (379)	5.55 (141)	4.57 (117)	22.36 (568)	65 (30)
CRI 1s-8	1/2	1	•	15.63 (398)	6.19 (158)	5.18 (132)	24.92 (633)	72 (33)
		3	•	15.63 (398)	5.55 (141)	4.57 (117)	23.07 (586)	66 (30)
CRI 1s-9	3/4	1	•	16.34 (416)	6.19 (158)	5.18 (132)	26.25 (667)	77 (35)
		3	•	16.34 (416)	5.55 (141)	4.57 (117)	23.78 (605)	68 (31)
CRI 1s-10	3/4	1	•	17.05 (434)	6.19 (158)	5.18 (132)	26.96 (685)	78 (36)
		3	•	17.05 (434)	5.55 (141)	4.57 (117)	24.49 (623)	69 (32)
CRI 1s-11	3/4	1	•	17.76 (452)	6.19 (158)	5.18 (132)	27.67 (703)	79 (36)
		3	•	17.76 (452)	5.55 (141)	4.57 (117)	25.20 (641)	70 (32)
CRI 1s-12	3/4	1	•	18.46 (469)	6.19 (158)	5.18 (132)	28.37 (721)	79 (36)
		3	•	18.46 (469)	5.55 (141)	4.57 (117)	25.90 (658)	70 (32)
CRI 1s-13	1	1	•	19.17 (487)	7.19 (183)	5.73 (146)	30.36 (772)	96 (44)
		3	•	19.17 (487)	5.55 (141)	4.57 (117)	26.61 (676)	71 (33)
CRI 1s-15	1	1	•	20.59 (523)	7.19 (183)	5.73 (146)	31.78 (808)	97 (44)
		3	•	20.59 (523)	5.55 (141)	4.57 (117)	28.03 (712)	73 (34)
CRI 1s-17	1 1/2	1	•	22.01 (560)	7.19 (183)	5.73 (146)	33.69 (856)	102 (47)
		3	•	22.01 (560)	5.55 (141)	4.57 (117)	30.63 (779)	79 (36)
CRI 1s-19	1 1/2	1	-	23.43 (596)	7.19 (183)	5.73 (146)	35.11 (892)	104 (48)
		3	-	23.43 (596)	5.55 (141)	4.57 (117)	32.05 (815)	81 (37)
CRI 1s-21	1 1/2	1	-	24.84 (631)	7.19 (183)	5.73 (146)	36.52 (928)	106 (49)
		3	-	24.84 (631)	5.55 (141)	4.57 (117)	33.46 (850)	82 (38)
CRI 1s-23	1 1/2	1	-	26.26 (668)	7.19 (183)	5.73 (146)	37.94 (964)	107 (49)
		3	-	26.26 (668)	5.55 (141)	4.57 (117)	34.88 (886)	84 (39)
CRI 1s-25	2	1	-	27.68 (704)	7.19 (183)	5.73 (146)	40.24 (1023)	120 (55)
		3	-	27.68 (704)	7.01 (179)	4.33 (110)	38.90 (989)	111 (51)
CRI 1s-27	2	1	-	29.09 (739)	7.19 (183)	5.73 (146)	41.65 (1058)	122 (56)
		3	-	29.09 (739)	7.01 (179)	4.33 (110)	40.31 (1024)	113 (52)

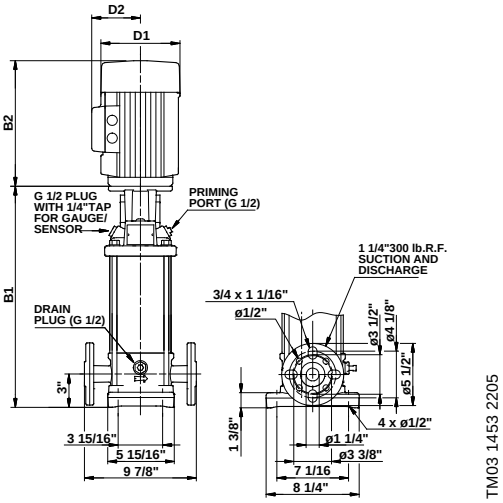
All dimensions in inches unless otherwise noted.

* Oval flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available.

CRN 1s





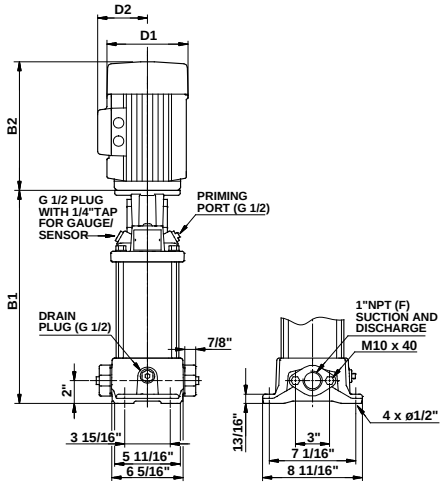
Pump type	P2 [Hp]	Ph.	PJE*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CRN 1s-2	1/3	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	63 (29)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	61 (28)
CRN 1s-3	1/3	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	64 (30)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRN 1s-4	1/3	1	•	12.80 (326)	6.19 (158)	5.18 (132)	22.09 (562)	65 (30)
		3	•	12.80 (326)	5.55 (141)	4.57 (117)	20.24 (515)	63 (29)
CRN 1s-5	1/3	1	•	13.50 (343)	6.19 (158)	5.18 (132)	22.79 (579)	66 (30)
		3	•	13.50 (343)	5.55 (141)	4.57 (117)	20.94 (532)	64 (30)
CRN 1s-6	1/2	1	•	14.21 (361)	6.19 (158)	5.18 (132)	23.50 (597)	70 (32)
		3	•	14.21 (361)	5.55 (141)	4.57 (117)	21.65 (550)	65 (30)
CRN 1s-7	1/2	1	•	14.92 (379)	6.19 (158)	5.18 (132)	24.21 (615)	71 (33)
		3	•	14.92 (379)	5.55 (141)	4.57 (117)	22.36 (568)	65 (30)
CRN 1s-8	1/2	1	•	15.63 (398)	6.19 (158)	5.18 (132)	24.92 (633)	72 (33)
		3	•	15.63 (398)	5.55 (141)	4.57 (117)	23.07 (586)	66 (30)
CRN 1s-9	3/4	1	•	16.34 (416)	6.19 (158)	5.18 (132)	26.25 (667)	77 (35)
		3	•	16.34 (416)	5.55 (141)	4.57 (117)	23.78 (605)	68 (31)
CRN 1s-10	3/4	1	•	17.05 (434)	6.19 (158)	5.18 (132)	26.96 (685)	78 (36)
		3	•	17.05 (434)	5.55 (141)	4.57 (117)	24.49 (623)	69 (32)
CRN 1s-11	3/4	1	•	17.76 (452)	6.19 (158)	5.18 (132)	27.67 (703)	78 (36)
		3	•	17.76 (452)	5.55 (141)	4.57 (117)	25.20 (641)	69 (32)
CRN 1s-12	3/4	1	•	18.46 (469)	6.19 (158)	5.18 (132)	28.37 (721)	79 (36)
		3	•	18.46 (469)	5.55 (141)	4.57 (117)	25.90 (658)	70 (32)
CRN 1s-13	1	1	•	19.17 (487)	7.19 (183)	5.73 (146)	30.36 (772)	96 (44)
		3	•	19.17 (487)	5.55 (141)	4.57 (117)	26.61 (676)	71 (33)
CRN 1s-15	1	1	•	20.59 (523)	7.19 (183)	5.73 (146)	31.78 (808)	97 (44)
		3	•	20.59 (523)	5.55 (141)	4.57 (117)	28.03 (712)	73 (34)
CRN 1s-17	1 1/2	1	•	22.01 (560)	7.19 (183)	5.73 (146)	33.69 (856)	102 (47)
		3	•	22.01 (560)	5.55 (141)	4.57 (117)	30.63 (779)	79 (36)
CRN 1s-19	1 1/2	1	•	23.43 (596)	7.19 (183)	5.73 (146)	35.11 (892)	104 (48)
		3	•	23.43 (596)	5.55 (141)	4.57 (117)	32.05 (815)	81 (37)
CRN 1s-21	1 1/2	1	•	24.84 (631)	7.19 (183)	5.73 (146)	36.52 (928)	105 (48)
		3	•	24.84 (631)	5.55 (141)	4.57 (117)	33.46 (850)	82 (38)
CRN 1s-23	1 1/2	1	•	26.26 (668)	7.19 (183)	5.73 (146)	37.94 (964)	107 (49)
		3	•	26.26 (668)	5.55 (141)	4.57 (117)	34.88 (886)	84 (39)
CRN 1s-25	2	1	•	27.68 (704)	7.19 (183)	5.73 (146)	40.24 (1023)	120 (55)
		3	•	27.68 (704)	7.01 (179)	4.33 (110)	38.90 (989)	111 (51)
CRN 1s-27	2	1	•	29.09 (739)	7.19 (183)	5.73 (146)	41.65 (1058)	122 (56)
		3	•	29.09 (739)	7.01 (179)	4.33 (110)	40.31 (1024)	112 (51)

All dimensions in inches unless otherwise noted.

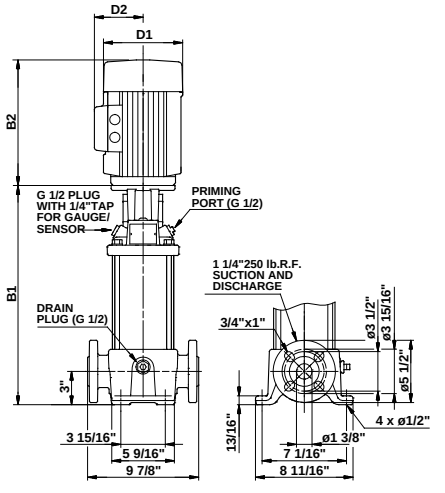
* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available.

CR 1



TM03 1450 2205



TM03 1451 2205

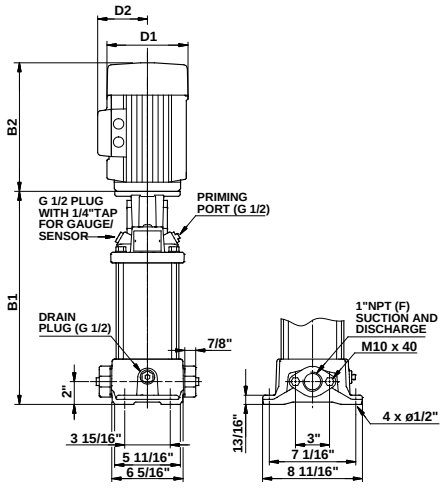
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CR 1-2	1/3	1	•	11.97 (305)	6.19 (158)	5.18 (132)	21.26 (541)	69 (32)
		3	•	11.97 (305)	5.55 (141)	4.57 (117)	19.41 (494)	67 (31)
CR 1-3	1/3	1	•	11.97 (305)	6.19 (158)	5.18 (132)	21.26 (541)	69 (32)
		3	•	11.97 (305)	5.55 (141)	4.57 (117)	19.41 (494)	67 (31)
CR 1-4	1/2	1	•	12.68 (323)	6.19 (158)	5.18 (132)	21.97 (559)	73 (34)
		3	•	12.68 (323)	5.55 (141)	4.57 (117)	20.12 (512)	68 (31)
CR 1-5	1/2	1	•	13.39 (341)	6.19 (158)	5.18 (132)	22.68 (577)	75 (35)
		3	•	13.39 (341)	5.55 (141)	4.57 (117)	20.83 (530)	69 (32)
CR 1-6	3/4	1	•	14.09 (358)	6.19 (158)	5.18 (132)	24.00 (610)	80 (37)
		3	•	14.09 (358)	5.55 (141)	4.57 (117)	21.53 (547)	71 (33)
CR 1-7	3/4	1	•	14.80 (376)	6.19 (158)	5.18 (132)	24.71 (628)	81 (37)
		3	•	14.80 (376)	5.55 (141)	4.57 (117)	22.24 (565)	72 (33)
CR 1-8	1	1	•	15.51 (394)	7.19 (183)	5.73 (146)	26.70 (679)	93 (43)
		3	•	15.51 (394)	5.55 (141)	4.57 (117)	22.95 (583)	72 (33)
CR 1-9	1	1	•	16.22 (412)	7.19 (183)	5.73 (146)	27.41 (697)	94 (43)
		3	•	16.22 (412)	5.55 (141)	4.57 (117)	23.66 (601)	74 (34)
CR 1-10	1 1/2	1	•	16.93 (431)	7.19 (183)	5.73 (146)	28.61 (727)	95 (44)
		3	•	16.93 (431)	5.55 (141)	4.57 (117)	25.55 (649)	74 (34)
CR 1-11	1 1/2	1	•	17.64 (449)	7.19 (183)	5.73 (146)	29.32 (745)	102 (47)
		3	•	17.64 (449)	5.55 (141)	4.57 (117)	26.26 (668)	76 (35)
CR 1-12	1 1/2	1	•	18.35 (467)	7.19 (183)	5.73 (146)	30.03 (763)	103 (47)
		3	•	18.35 (467)	5.55 (141)	4.57 (117)	26.97 (686)	77 (35)
CR 1-13	1 1/2	1	•	19.06 (485)	7.19 (183)	5.73 (146)	30.74 (781)	104 (48)
		3	•	19.06 (485)	5.55 (141)	4.57 (117)	27.68 (704)	78 (36)
CR 1-15	2	1	•	20.47 (520)	7.19 (183)	5.73 (146)	33.03 (839)	114 (52)
		3	•	20.47 (520)	7.01 (179)	4.33 (110)	31.69 (805)	104 (48)
CR 1-17	2	1	•	21.89 (557)	7.19 (183)	5.73 (146)	34.45 (876)	116 (53)
		3	•	21.89 (557)	7.01 (179)	4.33 (110)	33.11 (841)	106 (49)
CR 1-19	3	1	-	24.41 (621)	8.60 (219)	6.87 (175)	39.06 (993)	155 (71)
		3	-	24.41 (621)	7.01 (179)	4.33 (110)	37.64 (957)	123 (56)
CR 1-21	3	1	-	25.83 (657)	8.60 (219)	6.87 (175)	40.48 (1029)	158 (72)
		3	-	25.83 (657)	7.01 (179)	4.33 (110)	39.06 (993)	125 (57)
CR 1-23	3	1	-	27.24 (692)	8.60 (219)	6.87 (175)	41.89 (1065)	159 (73)
		3	-	27.24 (692)	7.01 (179)	4.33 (110)	40.47 (1028)	130 (59)
CR 1-25	3	1	-	28.66 (728)	8.60 (219)	6.87 (175)	43.31 (1101)	161 (74)
		3	-	28.66 (728)	7.01 (179)	4.33 (110)	41.89 (1065)	132 (60)
CR 1-27	3	1	-	30.08 (765)	8.60 (219)	6.87 (175)	44.73 (1137)	163 (74)
		3	-	30.08 (765)	7.01 (179)	4.33 (110)	43.31 (1101)	134 (61)

All dimensions in inches unless otherwise noted.

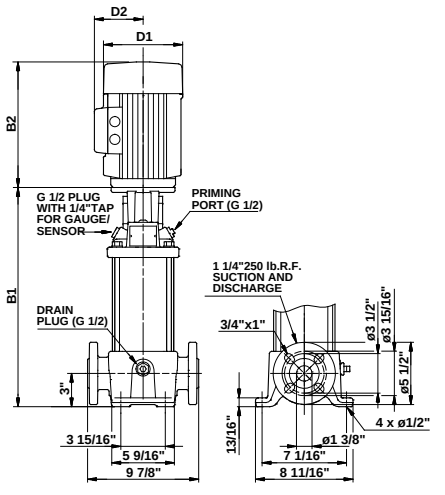
* Oval flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available.

CRI 1



TM03 1450 2205



TM03 1451 2205

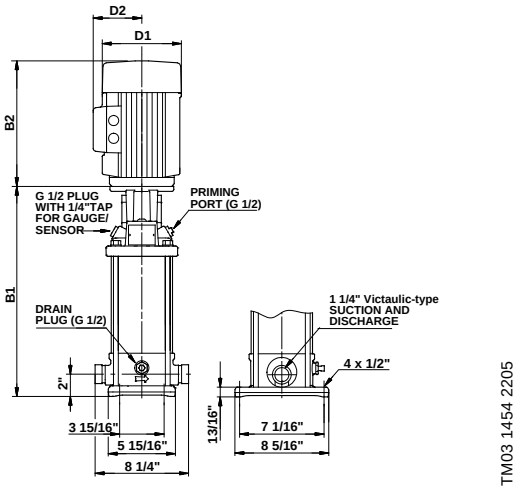
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CRI 1-2	1/3	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	64 (30)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRI 1-3	1/3	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	64 (30)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRI 1-4	1/2	1	•	12.80 (326)	6.19 (158)	5.18 (132)	22.09 (562)	68 (31)
		3	•	12.80 (326)	5.55 (141)	4.57 (117)	20.24 (515)	63 (29)
CRI 1-5	1/2	1	•	13.50 (343)	6.19 (158)	5.18 (132)	22.79 (579)	69 (32)
		3	•	13.50 (343)	5.55 (141)	4.57 (117)	20.94 (532)	64 (30)
CRI 1-6	3/4	1	•	14.21 (361)	6.19 (158)	5.18 (132)	24.12 (613)	74 (34)
		3	•	14.21 (361)	5.55 (141)	4.57 (117)	21.65 (550)	65 (30)
CRI 1-7	3/4	1	•	14.92 (379)	6.19 (158)	5.18 (132)	24.83 (631)	75 (35)
		3	•	14.92 (379)	5.55 (141)	4.57 (117)	22.36 (568)	66 (66)
CRI 1-8	1	1	•	15.63 (398)	7.19 (183)	5.73 (146)	26.82 (682)	88 (40)
		3	•	15.63 (398)	5.55 (141)	4.57 (117)	23.07 (586)	67 (31)
CRI 1-9	1	1	•	16.34 (416)	7.19 (183)	5.73 (146)	27.53 (700)	89 (41)
		3	•	16.34 (416)	5.55 (141)	4.57 (117)	23.78 (605)	68 (31)
CRI 1-10	1 1/2	1	•	17.05 (434)	7.19 (183)	5.73 (146)	28.73 (730)	90 (41)
		3	•	17.05 (434)	5.55 (141)	4.57 (117)	25.67 (653)	69 (32)
CRI 1-11	1 1/2	1	•	17.76 (452)	7.19 (183)	5.73 (146)	29.44 (748)	97 (44)
		3	•	17.76 (452)	5.55 (141)	4.57 (117)	26.38 (671)	70 (32)
CRI 1-12	1 1/2	1	•	18.46 (469)	7.19 (183)	5.73 (146)	30.14 (766)	98 (45)
		3	•	18.46 (469)	5.55 (141)	4.57 (117)	27.08 (688)	71 (33)
CRI 1-13	1 1/2	1	•	19.17 (487)	7.19 (183)	5.73 (146)	30.85 (784)	99 (45)
		3	•	19.17 (487)	5.55 (141)	4.57 (117)	27.79 (706)	72 (33)
CRI 1-15	2	1	•	20.59 (523)	7.19 (183)	5.73 (146)	33.15 (843)	109 (50)
		3	•	20.59 (523)	7.01 (179)	4.33 (110)	31.81 (808)	99 (45)
CRI 1-17	2	1	•	22.01 (560)	7.19 (183)	5.73 (146)	34.57 (879)	110 (50)
		3	•	22.01 (560)	7.01 (179)	4.33 (110)	33.23 (845)	101 (46)
CRI 1-19	3	1	-	24.53 (624)	8.60 (219)	6.87 (175)	39.18 (996)	148 (68)
		3	-	24.53 (624)	7.01 (179)	4.33 (110)	37.76 (960)	116 (53)
CRI 1-21	3	1	-	25.94 (659)	8.60 (219)	6.87 (175)	40.59 (1031)	150 (69)
		3	-	25.94 (659)	7.01 (179)	4.33 (110)	39.17 (995)	118 (54)
CRI 1-23	3	1	-	27.36 (695)	8.60 (219)	6.87 (175)	42.01 (1068)	152 (69)
		3	-	27.36 (695)	7.01 (179)	4.33 (110)	40.59 (1031)	123 (56)
CRI 1-25	3	1	-	28.78 (732)	8.60 (219)	6.87 (175)	43.43 (1104)	154 (70)
		3	-	28.78 (732)	7.01 (179)	4.33 (110)	42.01 (1068)	125 (57)
CRI 1-27	3	1	-	30.20 (768)	8.60 (219)	6.87 (175)	44.85 (1140)	156 (71)
		3	-	30.20 (768)	7.01 (179)	4.33 (110)	43.43 (1104)	127 (58)

All dimensions in inches unless otherwise noted.

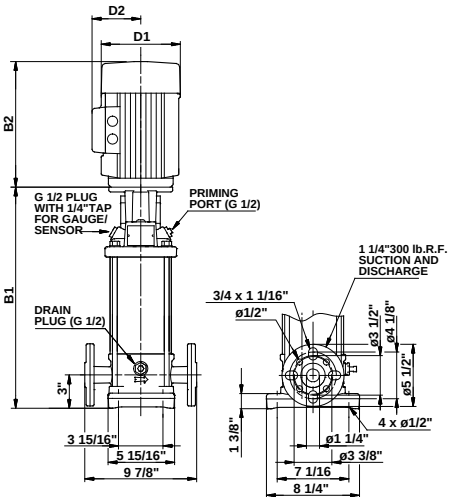
* Oval flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available.

CRN 1



TM03 1454 2205



TM03 1453 2205

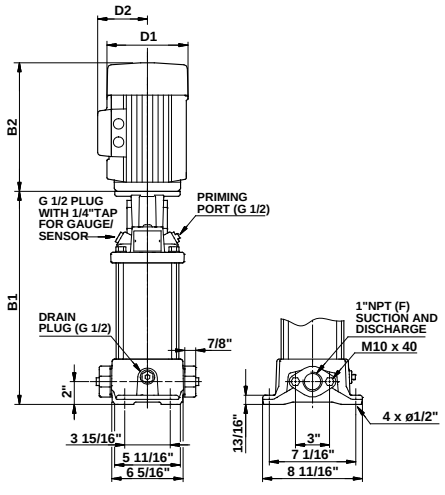
Pump type	P2 [Hp]	Ph.	PJE*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CRN 1-2	1/3	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	64 (30)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRN 1-3	1/3	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	64 (30)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRN 1-4	1/2	1	•	12.80 (326)	6.19 (158)	5.18 (132)	22.09 (562)	68 (31)
		3	•	12.80 (326)	5.55 (141)	4.57 (117)	20.24 (515)	63 (29)
CRN 1-5	1/2	1	•	13.50 (343)	6.19 (158)	5.18 (132)	22.79 (579)	69 (32)
		3	•	13.50 (343)	5.55 (141)	4.57 (117)	20.94 (532)	64 (30)
CRN 1-6	3/4	1	•	14.21 (361)	6.19 (158)	5.18 (132)	24.12 (613)	74 (34)
		3	•	14.21 (361)	5.55 (141)	4.57 (117)	21.65 (550)	65 (30)
CRN 1-7	3/4	1	•	14.92 (379)	6.19 (158)	5.18 (132)	24.83 (631)	75 (35)
		3	•	14.92 (379)	5.55 (141)	4.57 (117)	22.36 (568)	66 (30)
CRN 1-8	1	1	•	15.63 (398)	7.19 (183)	5.73 (146)	26.82 (682)	88 (40)
		3	•	15.63 (398)	5.55 (141)	4.57 (117)	23.07 (586)	67 (31)
CRN 1-9	1	1	•	16.34 (416)	7.19 (183)	5.73 (146)	27.53 (700)	89 (41)
		3	•	16.34 (416)	5.55 (141)	4.57 (117)	23.78 (605)	68 (31)
CRN 1-10	1 1/2	1	•	17.05 (434)	7.19 (183)	5.73 (146)	28.73 (730)	90 (41)
		3	•	17.05 (434)	5.55 (141)	4.57 (117)	25.67 (653)	69 (32)
CRN 1-11	1 1/2	1	•	17.76 (452)	7.19 (183)	5.73 (146)	29.44 (748)	97 (44)
		3	•	17.76 (452)	5.55 (141)	4.57 (117)	26.38 (671)	70 (32)
CRN 1-12	1 1/2	1	•	18.46 (469)	7.19 (183)	5.73 (146)	30.14 (766)	98 (45)
		3	•	18.46 (469)	5.55 (141)	4.57 (117)	27.08 (688)	71 (33)
CRN 1-13	1 1/2	1	•	19.17 (487)	7.19 (183)	5.73 (146)	30.85 (784)	99 (45)
		3	•	19.17 (487)	5.55 (141)	4.57 (117)	27.79 (706)	72 (33)
CRN 1-15	2	1	•	20.59 (523)	7.19 (183)	5.73 (146)	33.15 (843)	108 (49)
		3	•	20.59 (523)	7.01 (179)	4.33 (110)	31.81 (808)	99 (45)
CRN 1-17	2	1	•	22.01 (560)	7.19 (183)	5.73 (146)	34.57 (879)	110 (50)
		3	•	22.01 (560)	7.01 (179)	4.33 (110)	33.23 (845)	101 (46)
CRN 1-19	3	1	•	23.53 (598)	8.60 (219)	6.87 (175)	39.18 (996)	148 (68)
		3	•	23.53 (598)	7.01 (179)	4.33 (110)	37.76 (960)	116 (53)
CRN 1-21	3	1	•	25.94 (659)	8.60 (219)	6.87 (175)	40.59 (1031)	150 (69)
		3	•	25.94 (659)	7.01 (179)	4.33 (110)	39.17 (995)	118 (54)
CRN 1-23	3	1	•	27.36 (695)	8.60 (219)	6.87 (175)	42.01 (1068)	152 (69)
		3	•	27.36 (695)	7.01 (179)	4.33 (110)	40.59 (1031)	123 (56)
CRN 1-25	3	1	•	28.78 (732)	8.60 (219)	6.87 (175)	43.43 (1104)	154 (70)
		3	•	28.78 (732)	7.01 (179)	4.33 (110)	42.01 (1068)	124 (57)
CRN 1-27	3	1	•	30.20 (768)	8.60 (219)	6.87 (175)	44.85 (1140)	155 (71)
		3	•	30.20 (768)	7.01 (179)	4.33 (110)	43.43 (1104)	126 (58)

All dimensions in inches unless otherwise noted.

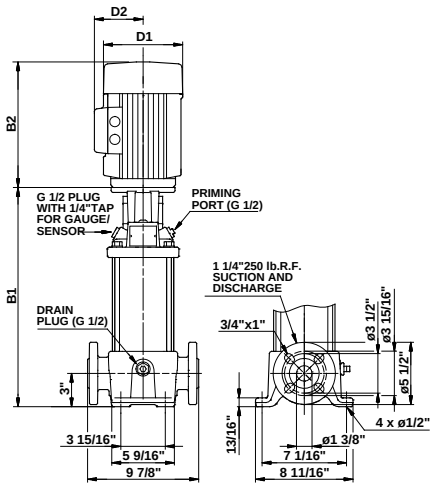
* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available.

CR 3



TM03 1450 2205



TM03 1451 2205

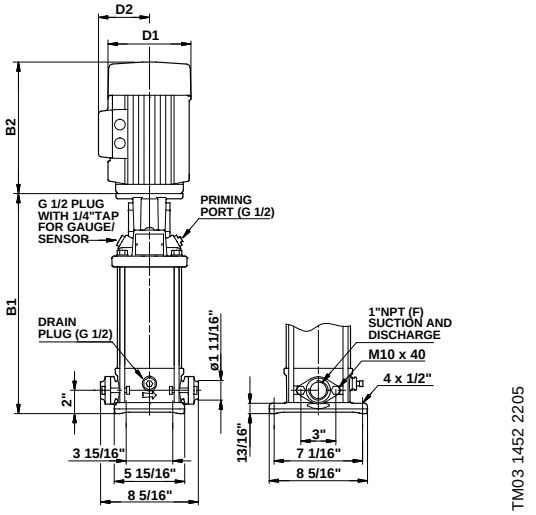
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CR 3-2	1/3	1	•	11.97 (305)	6.19 (158)	5.18 (132)	21.26 (541)	69 (32)
		3	•	11.97 (305)	5.55 (141)	4.57 (117)	19.41 (494)	67 (31)
CR 3-3	1/2	1	•	11.97 (305)	6.19 (158)	5.18 (132)	21.26 (541)	73 (34)
		3	•	11.97 (305)	5.55 (141)	4.57 (117)	19.41 (494)	67 (31)
CR 3-4	3/4	1	•	12.68 (323)	6.19 (158)	5.18 (132)	22.59 (574)	78 (36)
		3	•	12.68 (323)	5.55 (141)	4.57 (117)	20.12 (512)	69 (32)
CR 3-5	3/4	1	•	13.39 (341)	6.19 (158)	5.18 (132)	23.30 (592)	79 (36)
		3	•	13.39 (341)	5.55 (141)	4.57 (117)	20.83 (530)	70 (32)
CR 3-6	1	1	•	14.09 (358)	7.19 (183)	5.73 (146)	25.28 (643)	91 (42)
		3	•	14.09 (358)	5.55 (141)	4.57 (117)	21.53 (547)	71 (33)
CR 3-7	1 1/2	1	•	14.80 (376)	7.19 (183)	5.73 (146)	26.48 (673)	95 (44)
		3	•	14.80 (376)	5.55 (141)	4.57 (117)	23.42 (595)	72 (33)
CR 3-8	1 1/2	1	•	15.51 (394)	7.19 (183)	5.73 (146)	27.19 (691)	96 (44)
		3	•	15.51 (394)	5.55 (141)	4.57 (117)	24.13 (613)	73 (34)
CR 3-9	1 1/2	1	•	16.22 (412)	7.19 (183)	5.73 (146)	27.90 (709)	97 (44)
		3	•	16.22 (412)	5.55 (141)	4.57 (117)	24.84 (631)	74 (34)
CR 3-10	2	1	•	16.93 (431)	7.19 (183)	5.73 (146)	29.49 (750)	109 (50)
		3	•	16.93 (431)	7.01 (179)	4.33 (110)	28.15 (716)	96 (44)
CR 3-11	2	1	•	17.64 (449)	7.19 (183)	5.73 (146)	30.20 (768)	110 (50)
		3	•	17.64 (449)	7.01 (179)	4.33 (110)	28.86 (734)	101 (46)
CR 3-12	2	1	•	18.35 (467)	7.19 (183)	5.73 (146)	30.91 (786)	111 (51)
		3	•	18.35 (467)	7.01 (179)	4.33 (110)	29.57 (752)	102 (47)
CR 3-13	3	1	•	20.16 (513)	8.60 (219)	6.87 (175)	34.81 (885)	147 (67)
		3	•	20.16 (513)	7.01 (179)	4.33 (110)	33.39 (849)	118 (54)
CR 3-15	3	1	•	21.57 (548)	8.60 (219)	6.87 (175)	36.22 (920)	149 (68)
		3	•	21.57 (548)	7.01 (179)	4.33 (110)	34.80 (884)	120 (55)
CR 3-17	3	1	•	22.99 (584)	8.60 (219)	6.87 (175)	37.64 (957)	150 (69)
		3	•	22.99 (584)	7.01 (179)	4.33 (110)	36.22 (920)	121 (55)
CR 3-19	5	1	-	24.41 (621)	10.62 (270)	7.46 (190)	39.93 (1015)	179 (82)
		3	-	24.41 (621)	8.66 (220)	5.28 (135)	39.92 (1014)	175 (80)
CR 3-21	5	1	-	25.83 (657)	10.62 (270)	7.46 (190)	41.35 (1051)	181 (83)
		3	-	25.83 (657)	8.66 (220)	5.28 (135)	41.34 (1051)	177 (81)
CR 3-23	5	1	-	27.24 (692)	10.62 (270)	7.46 (190)	42.76 (1087)	182 (83)
		3	-	27.24 (692)	8.66 (220)	5.28 (135)	42.75 (1086)	179 (82)
CR 3-25	5	1	-	28.66 (728)	10.62 (270)	7.46 (190)	44.18 (1123)	184 (84)
		3	-	28.66 (728)	8.66 (220)	5.28 (135)	44.17 (1122)	181 (83)

All dimensions in inches unless otherwise noted.

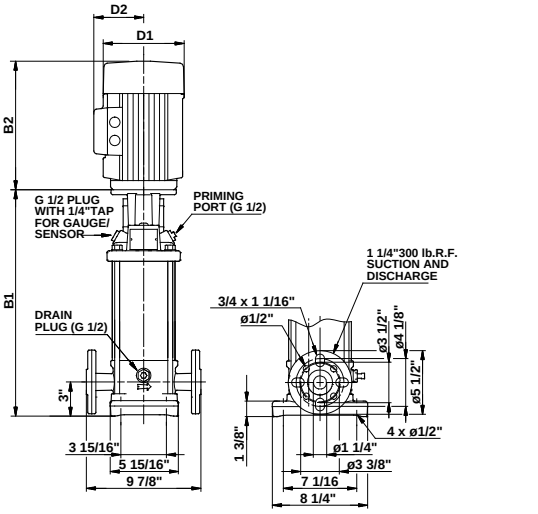
* Oval flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available.

CRI 3



TM03 1452 2205



TM03 1453 2205

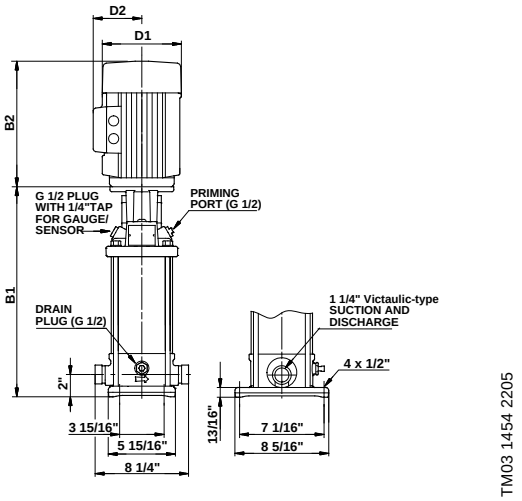
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CRI 3-2	1/3	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	64 (30)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRI 3-3	1/2	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	67 (31)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRI 3-4	3/4	1	•	12.80 (326)	6.19 (158)	5.18 (132)	22.71 (577)	73 (34)
		3	•	12.80 (326)	5.55 (141)	4.57 (117)	20.24 (515)	63 (29)
CRI 3-5	3/4	1	•	13.50 (343)	6.19 (158)	5.18 (132)	23.41 (595)	74 (34)
		3	•	13.50 (343)	5.55 (141)	4.57 (117)	20.94 (532)	65 (30)
CRI 3-6	1	1	•	14.21 (361)	7.19 (183)	5.73 (146)	25.40 (646)	86 (40)
		3	•	14.21 (361)	5.55 (141)	4.57 (117)	21.65 (550)	65 (30)
CRI 3-7	1 1/2	1	•	14.92 (379)	7.19 (183)	5.73 (146)	26.60 (676)	90 (41)
		3	•	14.92 (379)	5.55 (141)	4.57 (117)	23.54 (598)	67 (31)
CRI 3-8	1 1/2	1	•	15.63 (398)	7.19 (183)	5.73 (146)	27.31 (694)	91 (42)
		3	•	15.63 (398)	5.55 (141)	4.57 (117)	24.25 (616)	68 (31)
CRI 3-9	1 1/2	1	•	16.34 (416)	7.19 (183)	5.73 (146)	28.02 (712)	92 (42)
		3	•	16.34 (416)	5.55 (141)	4.57 (117)	24.96 (634)	69 (32)
CRI 3-10	2	1	•	17.05 (434)	7.19 (183)	5.73 (146)	29.61 (753)	104 (48)
		3	•	17.05 (434)	7.01 (179)	4.33 (110)	28.27 (719)	91 (42)
CRI 3-11	2	1	•	17.76 (452)	7.19 (183)	5.73 (146)	30.32 (771)	105 (48)
		3	•	17.76 (452)	7.01 (179)	4.33 (110)	28.98 (737)	95 (44)
CRI 3-12	2	1	•	18.46 (469)	7.19 (183)	5.73 (146)	31.02 (788)	106 (49)
		3	•	18.46 (469)	7.01 (179)	4.33 (110)	29.68 (754)	96 (44)
CRI 3-13	3	1	•	20.28 (516)	8.60 (219)	6.87 (175)	34.93 (888)	140 (64)
		3	•	20.28 (516)	7.01 (179)	4.33 (110)	33.51 (852)	111 (51)
CRI 3-15	3	1	•	21.69 (551)	8.60 (219)	6.87 (175)	36.34 (924)	142 (65)
		3	•	21.69 (551)	7.01 (179)	4.33 (110)	34.92 (887)	113 (52)
CRI 3-17	3	1	•	23.11 (587)	8.60 (219)	6.87 (175)	37.76 (960)	143 (65)
		3	•	23.11 (587)	7.01 (179)	4.33 (110)	36.34 (924)	114 (52)
CRI 3-19	5	1	-	24.53 (624)	10.62 (270)	7.46 (190)	40.05 (1018)	172 (79)
		3	-	24.53 (624)	8.66 (220)	5.28 (135)	40.04 (1018)	168 (77)
CRI 3-21	5	1	-	25.94 (659)	10.62 (270)	7.46 (190)	41.46 (1054)	174 (79)
		3	-	25.94 (659)	8.66 (220)	5.28 (135)	41.45 (1053)	170 (78)
CRI 3-23	5	1	-	27.36 (695)	10.62 (270)	7.46 (190)	42.88 (1090)	175 (80)
		3	-	27.36 (695)	8.66 (220)	5.28 (135)	42.87 (1089)	172 (79)
CRI 3-25	5	1	-	28.78 (732)	10.62 (270)	7.46 (190)	44.30 (1126)	177 (81)
		3	-	28.78 (732)	8.66 (220)	5.28 (135)	44.29 (1125)	174 (79)

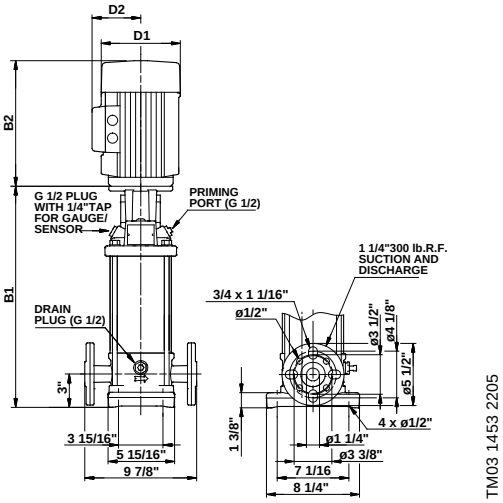
All dimensions in inches unless otherwise noted.

* Oval flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available.

CRN 3





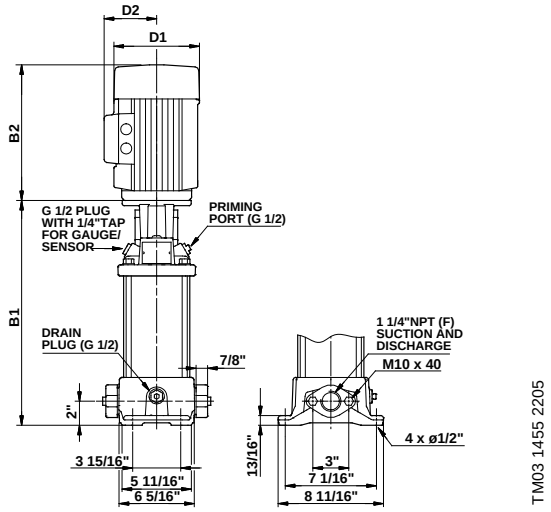
Pump type	P2 [Hp]	Ph.	PJE*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CRN 3-2	1/3	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	64 (30)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRN 3-3	1/2	1	•	12.09 (308)	6.19 (158)	5.18 (132)	21.38 (544)	67 (31)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRN 3-4	3/4	1	•	12.80 (326)	6.19 (158)	5.18 (132)	22.71 (577)	73 (34)
		3	•	12.80 (326)	5.55 (141)	4.57 (117)	20.24 (515)	63 (29)
CRN 3-5	3/4	1	•	13.50 (343)	6.19 (158)	5.18 (132)	23.41 (595)	73 (34)
		3	•	13.50 (343)	5.55 (141)	4.57 (117)	20.94 (532)	64 (30)
CRN 3-6	1	1	•	14.21 (361)	7.19 (183)	5.73 (146)	25.40 (646)	86 (40)
		3	•	14.21 (361)	5.55 (141)	4.57 (117)	21.65 (550)	65 (30)
CRN 3-7	1 1/2	1	•	14.92 (379)	7.19 (183)	5.73 (146)	26.60 (676)	90 (41)
		3	•	14.92 (379)	5.55 (141)	4.57 (117)	23.54 (598)	67 (31)
CRN 3-8	1 1/2	1	•	15.63 (398)	7.19 (183)	5.73 (146)	27.31 (694)	91 (42)
		3	•	15.63 (398)	5.55 (141)	4.57 (117)	24.25 (616)	68 (31)
CRN 3-9	1 1/2	1	•	16.34 (416)	7.19 (183)	5.73 (146)	28.02 (712)	92 (42)
		3	•	16.34 (416)	5.55 (141)	4.57 (117)	24.96 (634)	69 (32)
CRN 3-10	2	1	•	17.05 (434)	7.19 (183)	5.73 (146)	29.61 (753)	104 (48)
		3	•	17.05 (434)	7.01 (179)	4.33 (110)	28.27 (719)	91 (42)
CRN 3-11	2	1	•	17.76 (452)	7.19 (183)	5.73 (146)	30.32 (771)	105 (48)
		3	•	17.76 (452)	7.01 (179)	4.33 (110)	28.98 (737)	95 (44)
CRN 3-12	2	1	•	18.46 (469)	7.19 (183)	5.73 (146)	31.02 (788)	106 (49)
		3	•	18.46 (469)	7.01 (179)	4.33 (110)	29.68 (754)	96 (44)
CRN 3-13	3	1	•	20.28 (516)	8.60 (219)	6.87 (175)	34.93 (888)	139 (64)
		3	•	20.28 (516)	7.01 (179)	4.33 (110)	33.51 (852)	110 (50)
CRN 3-15	3	1	•	21.69 (551)	8.60 (219)	6.87 (175)	36.34 (924)	142 (65)
		3	•	21.69 (551)	7.01 (179)	4.33 (110)	34.92 (887)	112 (51)
CRN 3-17	3	1	•	23.11 (587)	8.60 (219)	6.87 (175)	37.76 (960)	143 (65)
		3	•	23.11 (587)	7.01 (179)	4.33 (110)	36.34 (924)	114 (52)
CRN 3-19	5	1	•	24.53 (624)	10.62 (270)	7.46 (190)	40.05 (1018)	172 (79)
		3	•	24.53 (624)	8.66 (220)	5.28 (135)	40.04 (1018)	168 (77)
CRN 3-21	5	1	•	25.94 (659)	10.62 (270)	7.46 (190)	41.46 (1054)	174 (79)
		3	•	25.94 (659)	8.66 (220)	5.28 (135)	41.45 (1053)	170 (78)
CRN 3-23	5	1	•	27.36 (695)	10.62 (270)	7.46 (190)	42.88 (1090)	175 (80)
		3	•	27.36 (695)	8.66 (220)	5.28 (135)	42.87 (1089)	171 (78)
CRN 3-25	5	1	•	28.78 (732)	10.62 (270)	7.46 (190)	44.30 (1126)	177 (81)
		3	•	28.78 (732)	8.66 (220)	5.28 (135)	44.29 (1125)	173 (79)

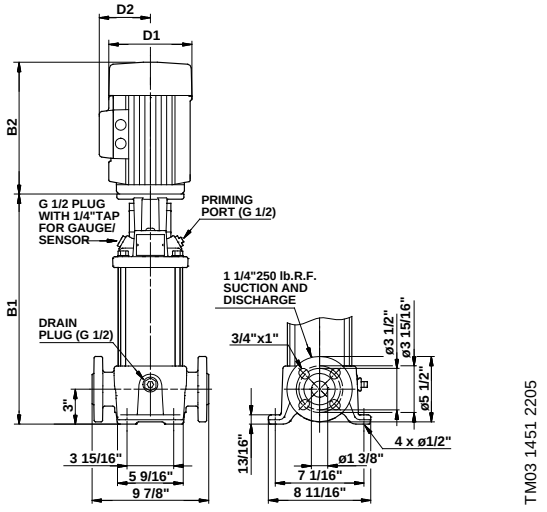
All dimensions in inches unless otherwise noted.

* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available.

CR 5





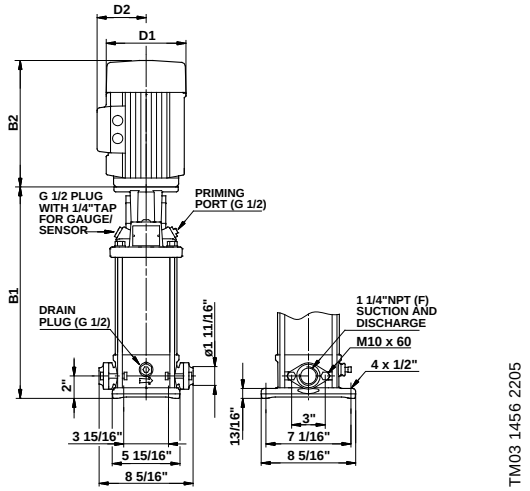
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CR 5-2	3/4	1	•	11.97 (305)	6.19 (158)	5.18 (132)	21.88 (556)	77 (35)
		3	•	11.97 (305)	5.55 (141)	4.57 (117)	19.41 (494)	68 (31)
CR 5-3	1	1	•	13.03 (331)	7.19 (183)	5.73 (146)	24.22 (616)	90 (41)
		3	•	13.03 (331)	5.55 (141)	4.57 (117)	20.47 (520)	69 (32)
CR 5-4	1 1/2	1	•	14.09 (358)	7.19 (183)	5.73 (146)	25.77 (655)	94 (43)
		3	•	14.09 (358)	5.55 (141)	4.57 (117)	22.71 (577)	71 (33)
CR 5-5	2	1	•	15.16 (386)	7.19 (183)	5.73 (146)	27.72 (705)	106 (49)
		3	•	15.16 (386)	7.01 (179)	4.33 (110)	26.38 (671)	93 (43)
CR 5-6	2	1	•	16.22 (412)	7.19 (183)	5.73 (146)	28.78 (732)	108 (49)
		3	•	16.22 (412)	7.01 (179)	4.33 (110)	27.44 (697)	95 (44)
CR 5-7	3	1	•	18.39 (468)	8.60 (219)	6.87 (175)	33.04 (840)	143 (65)
		3	•	18.39 (468)	7.01 (179)	4.33 (110)	31.62 (804)	114 (52)
CR 5-8	3	1	•	19.45 (495)	8.60 (219)	6.87 (175)	34.10 (867)	145 (66)
		3	•	19.45 (495)	7.01 (179)	4.33 (110)	32.68 (831)	116 (53)
CR 5-9	3	1	•	20.51 (521)	8.60 (219)	6.87 (175)	35.16 (894)	147 (67)
		3	•	20.51 (521)	7.01 (179)	4.33 (110)	33.74 (857)	118 (54)
CR 5-10	5	1	•	21.57 (548)	10.62 (270)	7.46 (190)	37.09 (943)	170 (78)
		3	•	21.57 (548)	8.66 (220)	5.28 (135)	37.08 (942)	168 (77)
CR 5-11	5	1	•	22.64 (576)	10.62 (270)	7.46 (190)	38.16 (970)	172 (79)
		3	•	22.64 (576)	8.66 (220)	5.28 (135)	38.15 (970)	169 (77)
CR 5-12	5	1	•	23.7 (602)	10.62 (270)	7.46 (190)	39.22 (997)	177 (81)
		3	•	23.7 (602)	8.66 (220)	5.28 (135)	39.21 (996)	170 (78)
CR 5-13	5	1	•	24.76 (629)	10.62 (270)	7.46 (190)	40.28 (1024)	178 (81)
		3	•	24.76 (629)	8.66 (220)	5.28 (135)	40.27 (1023)	171 (78)
CR 5-14	5	1	•	25.83 (657)	10.62 (270)	7.46 (190)	41.35 (1051)	180 (82)
		3	•	25.83 (657)	8.66 (220)	5.28 (135)	41.34 (1051)	176 (80)
CR 5-15	5	1	•	26.89 (684)	10.62 (270)	7.46 (190)	42.41 (1078)	181 (83)
		3	•	26.89 (684)	8.66 (220)	5.28 (135)	42.40 (1077)	177 (81)
CR 5-16	5	1	•	27.95 (710)	10.62 (270)	7.46 (190)	43.47 (1105)	182 (83)
		3	•	27.95 (710)	8.66 (220)	5.28 (135)	43.46 (1104)	178 (81)
CR 5-18	7 1/2	1	-	30.59 (777)	10.22 (260)	7.62 (194)	46.12 (1172)	200 (91)
		3	-	30.59 (777)	8.66 (220)	5.28 (135)	46.19 (1171)	188 (86)
CR 5-20	7 1/2	1	-	32.72 (832)	10.22 (260)	7.62 (194)	48.25 (1226)	203 (93)
		3	-	32.72 (832)	8.66 (220)	5.28 (135)	48.23 (1226)	190 (87)
CR 5-22	7 1/2	1	-	34.84 (885)	10.22 (260)	7.62 (194)	50.37 (1280)	300 (137)
		3	-	34.84 (885)	8.66 (220)	5.28 (135)	50.35 (1279)	287 (131)
CR 5-24	7 1/2	1	-	36.97 (940)	10.22 (260)	7.62 (194)	52.50 (1334)	302 (137)
		3	-	36.97 (940)	8.66 (220)	5.28 (135)	52.48 (1333)	290 (132)

All dimensions in inches unless otherwise noted.

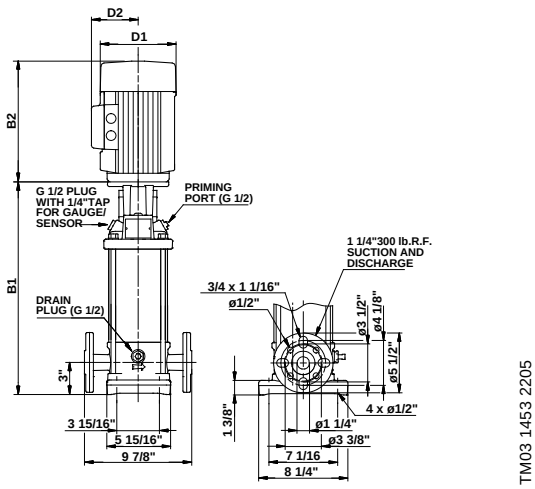
* Oval flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pumps and weight is approximately 9 lbs. less.

• Available.

CRI 5



TM03 1456 2205



TM03 1453 2205

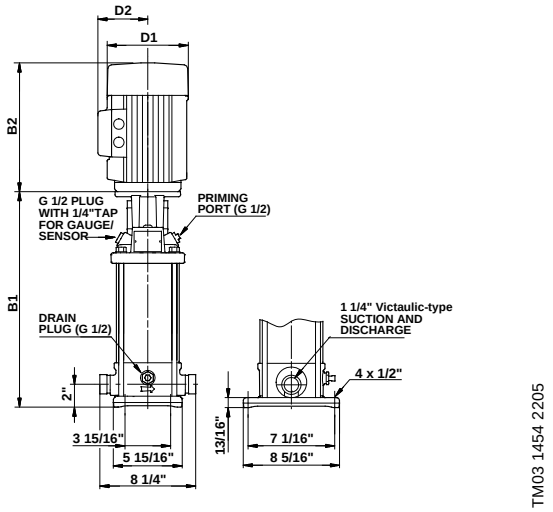
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CRI 5-2	3/4	1	•	12.09 (308)	6.19 (158)	5.18 (132)	22.00 (559)	71 (33)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRI 5-3	1	1	•	13.15 (335)	7.19 (183)	5.73 (146)	24.34 (619)	85 (39)
		3	•	13.15 (335)	5.55 (141)	4.57 (117)	20.59 (523)	64 (30)
CRI 5-4	1 1/2	1	•	14.21 (361)	7.19 (183)	5.73 (146)	25.89 (658)	89 (41)
		3	•	14.21 (361)	5.55 (141)	4.57 (117)	22.83 (580)	66 (30)
CRI 5-5	2	1	•	15.28 (389)	7.19 (183)	5.73 (146)	27.84 (708)	101 (46)
		3	•	15.28 (389)	7.01 (179)	4.33 (110)	26.50 (674)	88 (40)
CRI 5-6	2	1	•	16.34 (416)	7.19 (183)	5.73 (146)	28.90 (735)	103 (47)
		3	•	16.34 (416)	7.01 (179)	4.33 (110)	27.56 (701)	90 (41)
CRI 5-7	3	1	•	18.51 (471)	8.60 (219)	6.87 (175)	33.16 (843)	136 (62)
		3	•	18.51 (471)	7.01 (179)	4.33 (110)	31.74 (807)	107 (49)
CRI 5-8	3	1	•	19.57 (498)	8.60 (219)	6.87 (175)	34.22 (870)	138 (63)
		3	•	19.57 (498)	7.01 (179)	4.33 (110)	32.80 (834)	109 (50)
CRI 5-9	3	1	•	20.63 (525)	8.60 (219)	6.87 (175)	35.28 (897)	140 (64)
		3	•	20.63 (525)	7.01 (179)	4.33 (110)	33.86 (861)	111 (51)
CRI 5-10	5	1	•	21.69 (551)	10.62 (270)	7.46 (190)	37.21 (946)	163 (74)
		3	•	21.69 (551)	8.66 (220)	5.28 (135)	37.20 (945)	160 (73)
CRI 5-11	5	1	•	22.76 (579)	10.62 (270)	7.46 (190)	38.28 (973)	165 (75)
		3	•	22.76 (579)	8.66 (220)	5.28 (135)	38.27 (973)	162 (74)
CRI 5-12	5	1	•	23.82 (606)	10.62 (270)	7.46 (190)	39.34 (1000)	170 (78)
		3	•	23.82 (606)	8.66 (220)	5.28 (135)	39.33 (999)	163 (74)
CRI 5-13	5	1	•	24.88 (632)	10.62 (270)	7.46 (190)	40.40 (1027)	171 (78)
		3	•	24.88 (632)	8.66 (220)	5.28 (135)	40.39 (1026)	164 (75)
CRI 5-14	5	1	•	25.94 (659)	10.62 (270)	7.46 (190)	41.46 (1054)	173 (79)
		3	•	25.94 (659)	8.66 (220)	5.28 (135)	41.45 (1053)	169 (77)
CRI 5-15	5	1	•	27.01 (687)	10.62 (270)	7.46 (190)	42.53 (1081)	174 (79)
		3	•	27.01 (687)	8.66 (220)	5.28 (135)	42.52 (1081)	170 (78)
CRI 5-16	5	1	•	28.07 (713)	10.62 (270)	7.46 (190)	43.59 (1108)	175 (80)
		3	•	28.07 (713)	8.66 (220)	5.28 (135)	43.58 (1107)	171 (78)
CRI 5-18	7 1/2	1	-	30.71 (781)	10.22 (260)	7.62 (194)	46.24 (1175)	193 (88)
		3	-	30.71 (781)	8.66 (220)	5.28 (135)	46.22 (1174)	181 (83)
CRI 5-20	7 1/2	1	-	32.83 (834)	10.22 (260)	7.62 (194)	48.36 (1229)	196 (89)
		3	-	32.83 (834)	8.66 (220)	5.28 (135)	48.34 (1228)	183 (84)
CRI 5-22	7 1/2	1	-	34.96 (888)	10.22 (260)	7.62 (194)	50.49 (1283)	293 (133)
		3	-	34.96 (888)	8.66 (220)	5.28 (135)	50.47 (1282)	280 (128)
CRI 5-24	7 1/2	1	-	37.09 (943)	10.22 (260)	7.62 (194)	52.62 (1337)	295 (134)
		3	-	37.09 (943)	8.66 (220)	5.28 (135)	52.60 (1337)	283 (129)

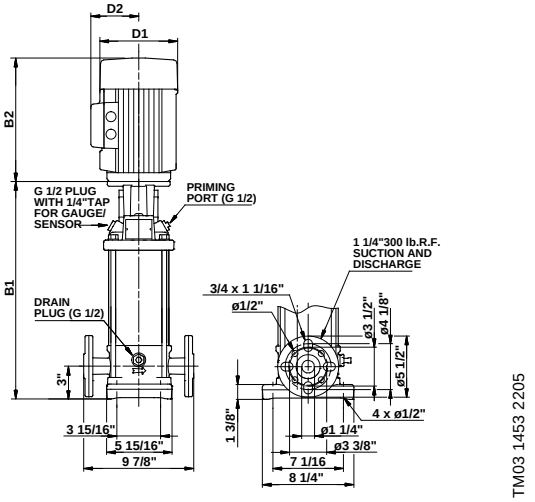
All dimensions in inches unless otherwise noted.

* Oval flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pumps and weight is approximately 9 lbs. less.

• Available.

CRN 5





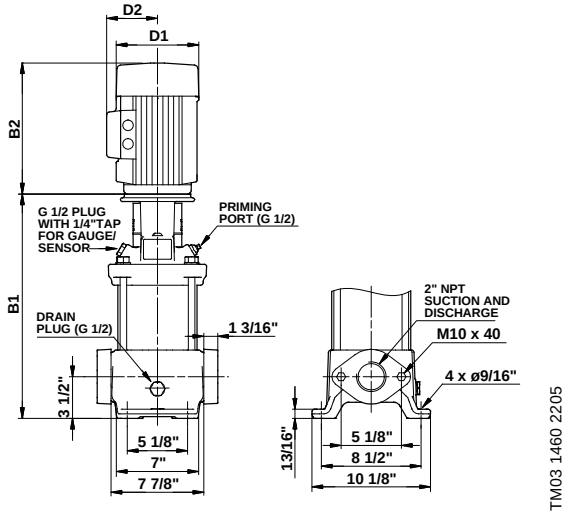
Pump type	P2 [Hp]	Ph.	PJE*	ANSI dimensions [inch (mm)]				Ship. wt. [lbs (kg)]
				B1	TEFC			
					D1	D2	B1+B2	
CRN 5-2	3/4	1	•	12.09 (308)	6.19 (158)	5.18 (132)	22.00 (559)	71 (33)
		3	•	12.09 (308)	5.55 (141)	4.57 (117)	19.53 (497)	62 (29)
CRN 5-3	1	1	•	13.15 (335)	7.19 (183)	5.73 (146)	24.34 (619)	85 (39)
		3	•	13.15 (335)	5.55 (141)	4.57 (117)	20.59 (523)	64 (30)
CRN 5-4	1 1/2	1	•	14.21 (361)	7.19 (183)	5.73 (146)	25.89 (658)	89 (41)
		3	•	14.21 (361)	5.55 (141)	4.57 (117)	22.83 (580)	65 (30)
CRN 5-5	2	1	•	15.28 (389)	7.19 (183)	5.73 (146)	27.84 (708)	101 (46)
		3	•	15.28 (389)	7.01 (179)	4.33 (110)	26.5 (674)	88 (40)
CRN 5-6	2	1	•	16.34 (416)	7.19 (183)	5.73 (146)	28.90 (735)	103 (47)
		3	•	16.34 (416)	7.01 (179)	4.33 (110)	27.56 (701)	90 (41)
CRN 5-7	3	1	•	18.51 (471)	8.60 (219)	6.87 (175)	33.16 (843)	136 (62)
		3	•	18.51 (471)	7.01 (179)	4.33 (110)	31.74 (807)	107 (49)
CRN 5-8	3	1	•	19.57 (498)	8.60 (219)	6.87 (175)	34.22 (870)	138 (63)
		3	•	19.57 (498)	7.01 (179)	4.33 (110)	32.80 (834)	109 (50)
CRN 5-9	3	1	•	20.63 (525)	8.60 (219)	6.87 (175)	35.28 (897)	139 (64)
		3	•	20.63 (525)	7.01 (179)	4.33 (110)	33.86 (861)	110 (50)
CRN 5-10	5	1	•	21.69 (551)	10.62 (270)	7.46 (190)	37.21 (946)	163 (74)
		3	•	21.69 (551)	8.66 (220)	5.28 (135)	37.20 (945)	160 (73)
CRN 5-11	5	1	•	22.76 (579)	10.62 (270)	7.46 (190)	38.28 (973)	165 (75)
		3	•	22.76 (579)	8.66 (220)	5.28 (135)	38.27 (973)	161 (74)
CRN 5-12	5	1	•	23.82 (606)	10.62 (270)	7.46 (190)	39.34 (1000)	170 (78)
		3	•	23.82 (606)	8.66 (220)	5.28 (135)	39.33 (999)	163 (74)
CRN 5-13	5	1	•	24.88 (632)	10.62 (270)	7.46 (190)	40.40 (1027)	171 (78)
		3	•	24.88 (632)	8.66 (220)	5.28 (135)	40.39 (1026)	164 (75)
CRN 5-14	5	1	•	25.94 (659)	10.62 (270)	7.46 (190)	41.46 (1054)	172 (79)
		3	•	25.94 (659)	8.66 (220)	5.28 (135)	41.45 (1053)	169 (77)
CRN 5-15	5	1	•	27.01 (687)	10.62 (270)	7.46 (190)	42.53 (1081)	173 (79)
		3	•	27.01 (687)	8.66 (220)	5.28 (135)	42.52 (1081)	170 (78)
CRN 5-16	5	1	•	28.07 (713)	10.62 (270)	7.46 (190)	43.59 (1108)	175 (80)
		3	•	28.07 (713)	8.66 (220)	5.28 (135)	43.58 (1107)	171 (78)
CRN 5-18	7 1/2	1	•	30.71 (781)	10.22 (260)	7.62 (194)	46.24 (1175)	193 (88)
		3	•	30.71 (781)	8.66 (220)	5.28 (135)	46.22 (1174)	180 (82)
CRN 5-20	7 1/2	1	•	32.83 (834)	10.22 (260)	7.62 (194)	48.36 (1229)	196 (89)
		3	•	32.83 (834)	8.66 (220)	5.28 (135)	48.34 (1228)	183 (84)
CRN 5-22	7 1/2	1	•	34.96 (888)	10.22 (260)	7.62 (194)	50.49 (1283)	292 (133)
		3	•	34.96 (888)	8.66 (220)	5.28 (135)	50.47 (1282)	279 (127)
CRN 5-24	7 1/2	1	•	37.09 (943)	10.22 (260)	7.62 (194)	52.62 (1337)	295 (134)
		3	•	37.09 (943)	8.66 (220)	5.28 (135)	52.60 (1337)	282 (128)

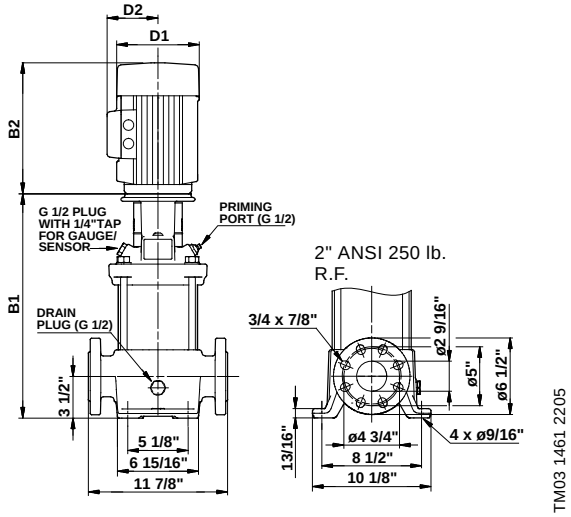
All dimensions in inches unless otherwise noted.

* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pumps and weight is approximately 9 lbs. less.

• Available.

CR 10





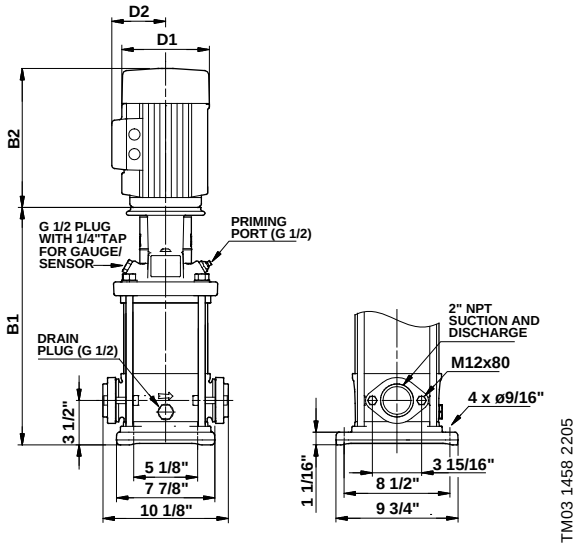
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]							Ship. wt. [lbs (kg)]
				B1	TEFC			ODP			
					D1	D2	B1+B2	D1	D2	B1+B2	
CR 10-1	3/4	1	•	15.28 (389)	6.19 (158)	5.18 (132)	25.19 (640)	-	-	-	115 (53)
		3	•	15.28 (389)	5.55 (141)	4.57 (117)	22.72 (578)	-	-	-	106 (49)
CR 10-2	1 1/2	1	•	15.28 (389)	7.19 (183)	5.73 (146)	26.96 (685)	-	-	-	128 (59)
		3	•	15.28 (389)	5.55 (141)	4.57 (117)	23.90 (608)	-	-	-	106 (49)
CR 10-3	3	1	•	17.20 (437)	8.60 (219)	6.87 (175)	31.85 (809)	-	-	-	183 (84)
		3	•	17.20 (437)	7.01 (179)	4.33 (110)	30.43 (773)	-	-	-	153 (70)
CR 10-4	3	1	•	18.39 (468)	8.60 (219)	6.87 (175)	33.04 (840)	-	-	-	183 (84)
		3	•	18.39 (468)	7.01 (179)	4.33 (110)	31.62 (804)	-	-	-	156 (71)
CR 10-5	5	1	•	19.57 (498)	10.62 (270)	7.46 (190)	35.09 (892)	-	-	-	209 (95)
		3	•	19.57 (498)	8.66 (220)	5.28 (135)	35.08 (892)	-	-	-	206 (94)
CR 10-6	5	1	•	20.75 (528)	10.62 (270)	7.46 (190)	36.27 (922)	-	-	-	212 (97)
		3	•	20.75 (528)	8.66 (220)	5.28 (135)	36.26 (922)	-	-	-	208 (95)
CR 10-7	7 1/2	1	-	22.25 (566)	10.22 (260)	7.62 (194)	37.78 (960)	-	-	-	232 (106)
		3	-	22.25 (566)	8.66 (220)	5.28 (135)	37.76 (960)	-	-	-	221 (101)
CR 10-8	7 1/2	1	-	23.43 (596)	10.22 (260)	7.62 (194)	38.96 (990)	-	-	-	234 (107)
		3	-	23.43 (596)	8.66 (220)	5.28 (135)	38.94 (990)	-	-	-	223 (102)
CR 10-9	7 1/2	1	-	24.61 (626)	10.22 (260)	7.62 (194)	40.14 (1020)	-	-	-	236 (108)
		3	-	24.61 (626)	8.66 (220)	5.28 (135)	40.12 (1020)	-	-	-	225 (103)
CR 10-10	7 1/2	1	-	25.79 (656)	10.22 (260)	7.62 (194)	41.32 (1050)	-	-	-	238 (108)
		3	-	25.79 (656)	8.66 (220)	5.28 (135)	41.30 (1050)	-	-	-	227 (103)
CR 10-12	10	1	-	28.15 (716)	10.23 (260)	10.30 (262)	44.22 (1124)	-	-	-	355 (162)
		3	-	28.15 (716)	10.24 (261)	6.26 (160)	42.88 (1090)	-	-	-	232 (106)
CR 10-14	15	3	-	33.06 (840)	12.36 (314)	8.00 (204)	51.60 (1311)	10.62 (270)	7.33 (187)	49.37 (1254)	414 (188)
CR 10-16	15	3	-	35.43 (900)	12.36 (314)	8.00 (204)	53.97 (1371)	10.62 (270)	7.33 (187)	51.74 (1315)	422 (192)
CR 10-17	15	3	-	37.80 (961)	12.36 (314)	8.00 (204)	56.34 (1432)	10.62 (270)	7.33 (187)	54.11 (1375)	426 (194)

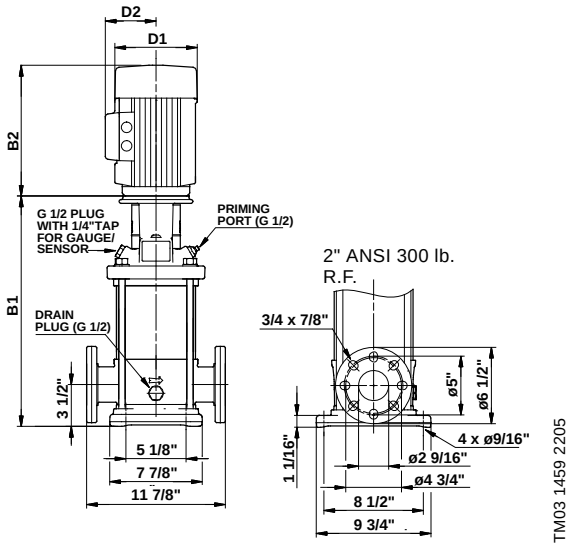
All dimensions in inches unless otherwise noted.

* Oval flanged pump B1 and B1+B2 dimension is equal to ANSI flanged pumps and weight is approximately 3 lbs. less.

• Available.

CRI 10





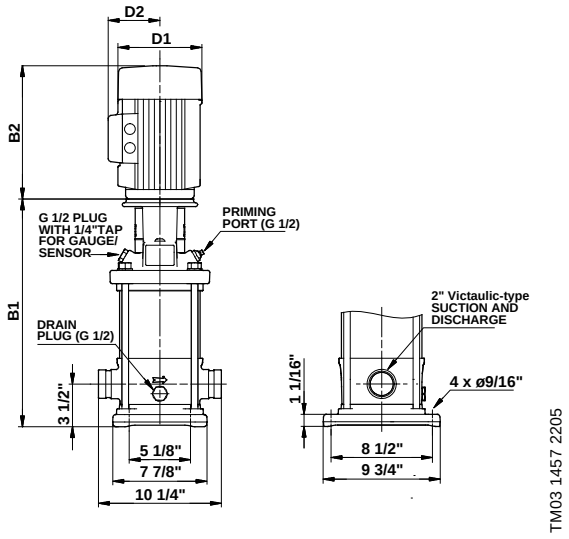
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]							Ship. wt. [lbs (kg)]
				B1	TEFC			ODP			
					D1	D2	B1+B2	D1	D2	B1+B2	
CRI 10-1	1	1	•	15.20 (387)	6.19 (158)	5.18 (132)	25.11 (638)	-	-	-	106 (49)
		3	•	15.20 (387)	5.55 (141)	4.57 (117)	22.64 (576)	-	-	-	98 (45)
CRI 10-2	1 1/2	1	•	15.20 (387)	7.19 (183)	5.73 (146)	26.88 (683)	-	-	-	122 (56)
		3	•	15.20 (387)	5.55 (141)	4.57 (117)	23.82 (606)	-	-	-	100 (46)
CRI 10-3	3	1	•	17.13 (436)	8.60 (219)	6.87 (175)	31.78 (808)	-	-	-	175 (80)
		3	•	17.13 (436)	7.01 (179)	4.33 (110)	30.36 (772)	-	-	-	147 (67)
CRI 10-4	3	1	•	18.31 (466)	8.60 (219)	6.87 (175)	32.96 (838)	-	-	-	177 (81)
		3	•	18.31 (466)	7.01 (179)	4.33 (110)	31.54 (802)	-	-	-	147 (67)
CRI 10-5	5	1	•	19.49 (496)	10.62 (270)	7.46 (190)	35.01 (890)	-	-	-	203 (93)
		3	•	19.49 (496)	8.66 (220)	5.28 (135)	35.00 (889)	-	-	-	199 (91)
CRI 10-6	5	1	•	20.67 (526)	10.62 (270)	7.46 (190)	36.19 (920)	-	-	-	206 (94)
		3	•	20.67 (526)	8.66 (220)	5.28 (135)	36.18 (919)	-	-	-	202 (92)
CRI 10-7	7 1/2	1	•	22.17 (564)	10.22 (260)	7.62 (194)	37.70 (958)	-	-	-	225 (103)
		3	•	22.17 (564)	8.66 (220)	5.28 (135)	37.68 (958)	-	-	-	212 (97)
CRI 10-8	7 1/2	1	•	23.35 (594)	10.22 (260)	7.62 (762)	38.88 (988)	-	-	-	228 (103)
		3	•	23.35 (594)	8.66 (220)	5.28 (135)	38.86 (988)	-	-	-	214 (98)
CRI 10-9	7 1/2	1	•	24.53 (624)	10.22 (260)	7.62 (194)	40.06 (1018)	-	-	-	230 (105)
		3	•	24.53 (624)	8.66 (220)	5.28 (135)	40.04 (1018)	-	-	-	217 (99)
CRI 10-10	7 1/2	1	•	25.71 (654)	10.22 (260)	7.62 (194)	41.24 (1048)	-	-	-	232 (106)
		3	•	25.71 (654)	8.66 (220)	5.28 (135)	41.22 (1047)	-	-	-	219 (100)
CRI 10-12	10	1	-	28.07 (713)	10.23 (260)	10.30 (262)	44.14 (1122)	-	-	-	347 (158)
		3	-	28.07 (713)	10.24 (261)	6.26 (160)	42.80 (1088)	-	-	-	225 (103)
CRI 10-14	15	3	-	32.95 (837)	12.36 (314)	8.00 (204)	51.49 (1308)	10.62 (270)	7.33 (187)	49.26 (1252)	403 (183)
CRI 10-16	15	3	-	35.31 (897)	12.36 (314)	8.00 (204)	53.85 (1368)	10.62 (270)	7.33 (187)	51.62 (1312)	413 (188)
CRI 10-17	15	3	-	37.68 (958)	12.36 (314)	8.00 (204)	56.22 (1428)	10.62 (270)	7.33 (187)	53.99 (1372)	418 (190)

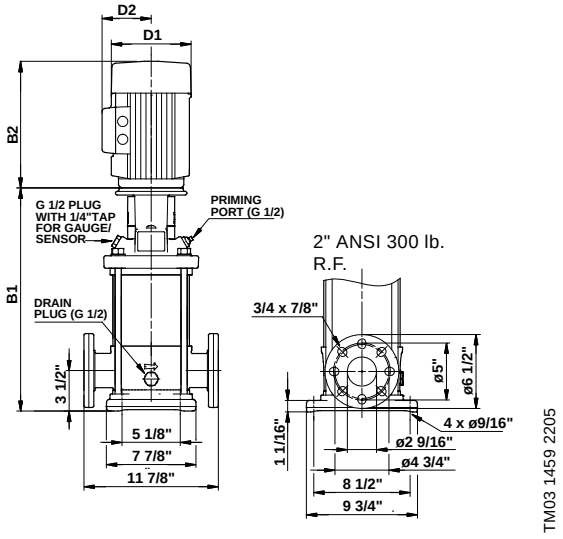
All dimensions in inches unless otherwise noted.

* Oval flanged pump B1 and B1+B2 dimension is equal to ANSI flanged pumps and weight is approximately 7 lbs. less.

• Available.

CRN 10





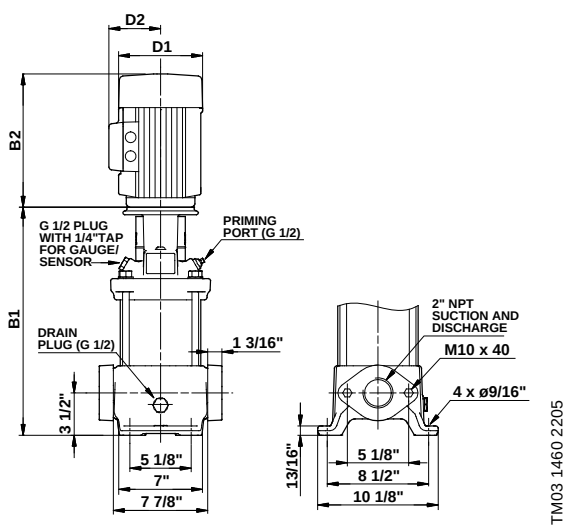
Pump type	P2 [Hp]	Ph.	PJE*	ANSI dimensions [inch (mm)]							Ship. wt. [lbs (kg)]
				B1	TEFC			ODP			
					D1	D2	B1+B2	D1	D2	B1+B2	
CRN 10-1	3/4	1	•	15.20 (387)	6.19 (158)	5.18 (132)	25.11 (638)	-	-	-	106 (49)
		3	•	15.20 (387)	5.55 (141)	4.57 (117)	22.64 (576)	-	-	-	97 (44)
CRN 10-2	1 1/2	1	•	15.20 (387)	7.19 (183)	5.73 (146)	26.88 (683)	-	-	-	121 (55)
		3	•	15.20 (387)	5.55 (141)	4.57 (117)	23.82 (606)	-	-	-	99 (45)
CRN 10-3	3	1	•	17.13 (436)	8.60 (219)	6.87 (175)	31.78 (808)	-	-	-	176 (80)
		3	•	17.13 (436)	7.01 (179)	4.33 (110)	30.36 (772)	-	-	-	147 (67)
CRN 10-4	3	1	•	18.31 (466)	8.60 (219)	6.87 (175)	32.96 (838)	-	-	-	176 (80)
		3	•	18.31 (466)	7.01 (179)	4.33 (110)	31.54 (802)	-	-	-	149 (68)
CRN 10-5	5	1	•	19.49 (496)	10.62 (270)	7.46 (190)	35.01 (890)	-	-	-	203 (93)
		3	•	19.49 (496)	8.66 (220)	5.28 (135)	35.00 (889)	-	-	-	199 (91)
CRN 10-6	5	1	•	20.67 (526)	10.62 (270)	7.46 (190)	36.19 (920)	-	-	-	205 (93)
		3	•	20.67 (526)	8.66 (220)	5.28 (135)	36.18 (919)	-	-	-	201 (92)
CRN 10-7	7 1/2	1	•	22.17 (564)	10.22 (260)	7.62 (194)	37.7 (958)	-	-	-	227 (103)
		3	•	22.17 (564)	8.66 (220)	5.28 (135)	37.68 (958)	-	-	-	214 (98)
CRN 10-8	7 1/2	1	•	23.35 (594)	10.22 (260)	7.62 (194)	38.88 (988)	-	-	-	229 (104)
		3	•	23.35 (594)	8.66 (220)	5.28 (135)	38.86 (988)	-	-	-	216 (98)
CRN 10-9	7 1/2	1	•	24.53 (624)	10.22 (260)	7.62 (194)	40.06 (1018)	-	-	-	232 (106)
		3	•	24.53 (624)	8.66 (220)	5.28 (135)	40.04 (1018)	-	-	-	218 (99)
CRN 10-10	7 1/2	1	•	25.71 (654)	10.22 (260)	7.62 (194)	41.24 (1048)	-	-	-	234 (107)
		3	•	25.71 (654)	8.66 (220)	5.28 (135)	41.22 (1047)	-	-	-	221 (101)
CRN 10-12	10	1	•	28.07 (713)	10.23 (260)	10.30 (262)	44.14 (1122)	-	-	-	346 (157)
		3	•	28.07 (713)	10.24 (261)	6.26 (160)	42.80 (1088)	-	-	-	225 (103)
CRN 10-14	15	3	•	32.95 (837)	12.36 (314)	8.00 (204)	51.49 (1308)	10.62 (270)	7.33 (187)	49.25 (1251)	403 (183)
CRN 10-16	15	3	•	35.31 (897)	12.36 (314)	8.00 (204)	53.85 (1368)	10.62 (270)	7.33 (187)	51.63 (1312)	413 (188)
CRN 10-17	15	3	•	37.68 (958)	12.36 (314)	8.00 (204)	56.22 (1428)	10.62 (270)	7.33 (187)	54.00 (1372)	418 (190)

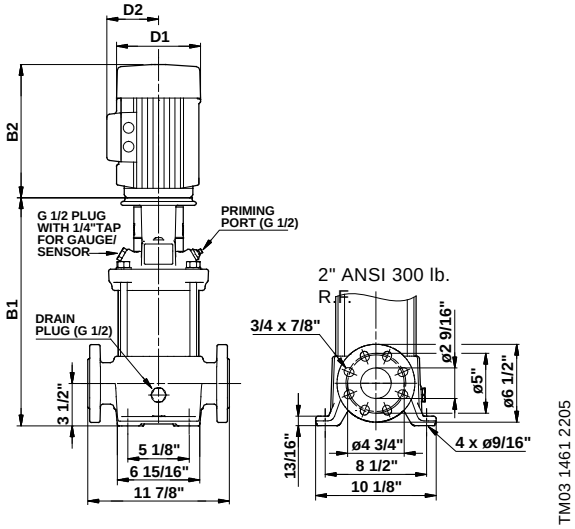
All dimensions in inches unless otherwise noted.

* PJE flanged pump B1 and B1+B2 dimension is equal to ANSI flanged pumps and weight is approximately 9 lbs. less.

• Available.

CR 15





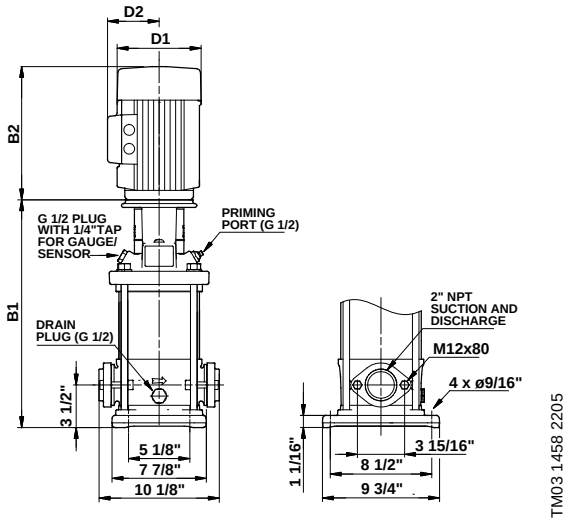
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]							Ship. wt. [lbs (kg)]
				B1	TEFC			ODP			
					D1	D2	B1+B2	D1	D2	B1+B2	
CR 15-1	2	1	•	16.46 (419)	7.19 (183)	5.73 (146)	29.02 (738)	-	-	-	139 (64)
		3	•	16.46 (419)	7.01 (179)	4.33 (110)	27.68 (704)	-	-	-	128 (59)
CR 15-2	5	1	•	17.20 (437)	10.62 (270)	7.46 (190)	32.72 (832)	-	-	-	205 (93)
		3	•	17.20 (437)	8.66 (220)	5.28 (135)	32.71 (831)	-	-	-	201 (92)
CR 15-3	7 1/2	1	•	19.29 (490)	10.22 (260)	7.62 (194)	34.82 (885)	-	-	-	223 (102)
		3	•	19.29 (490)	8.66 (220)	5.28 (135)	34.80 (884)	-	-	-	212 (97)
CR 15-4	7 1/2	1	•	21.06 (535)	10.22 (260)	7.62 (194)	36.59 (930)	-	-	-	225 (103)
		3	•	21.06 (535)	8.66 (220)	5.28 (135)	36.57 (929)	-	-	-	214 (98)
CR 15-5	10	1	•	22.83 (580)	10.23 (260)	10.30 (262)	38.90 (989)	-	-	-	342 (156)
		3	•	22.83 (580)	10.24 (261)	6.26 (160)	37.56 (955)	-	-	-	218 (99)
CR 15-6	15	3	-	27.17 (691)	12.36 (314)	8.00 (204)	45.71 (1162)	10.62 (270)	7.33 (187)	43.48 (1105)	347 (158)
CR 15-7	15	3	-	28.94 (736)	12.36 (314)	8.00 (204)	47.48 (1206)	10.62 (270)	7.33 (187)	45.25 (1150)	378 (172)
CR 15-8	15	3	-	30.71 (781)	12.36 (314)	8.00 (204)	49.25 (1251)	10.62 (270)	7.33 (187)	47.02 (1195)	409 (186)
CR 15-9	20	3	-	32.48 (825)	12.36 (314)	8.00 (204)	51.02 (1296)	11.50 (293)	8.92 (227)	52.17 (1326)	417 (190)
CR 15-10	20	3	-	34.25 (870)	12.36 (314)	8.00 (204)	52.79 (1341)	11.50 (293)	8.92 (227)	53.94 (1371)	421 (191)
CR 15-12	25	3	-	37.17 (945)	12.36 (314)	8.00 (204)	59.56 (1513)	11.50 (293)	8.94 (228)	57.98 (1473)	422 (192)

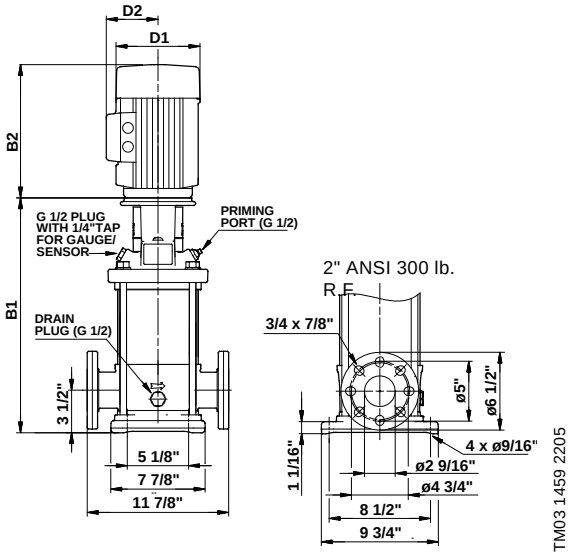
All dimensions in inches unless otherwise noted.

* Oval flanged pump B1 and B1+B2 dimension is equal to ANSI flanged pumps and weight is approximately 3 lbs. less.

• Available.

CRI 15





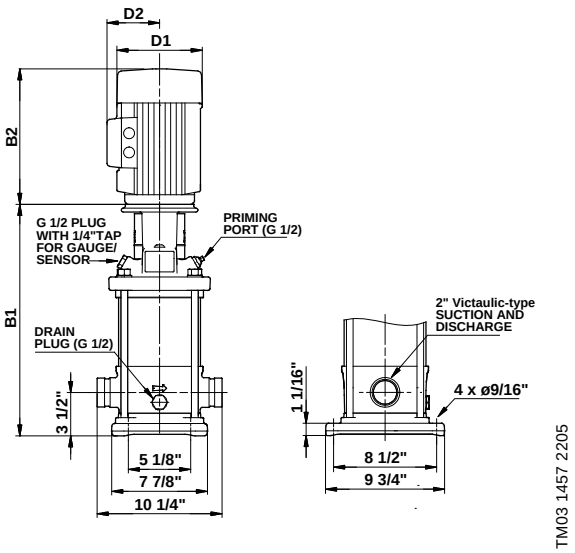
Pump type	P2 [Hp]	Ph.	Oval*	ANSI dimensions [inch (mm)]							Ship. wt. [lbs (kg)]
				B1	TEFC			ODP			
					D1	D2	B1+B2	D1	D2	B1+B2	
CRI 15-1	2	1	•	16.38 (417)	7.19 (183)	5.73 (146)	28.94 (736)	-	-	-	130 (59)
		3	•	16.38 (417)	7.01 (179)	4.33 (110)	27.60 (702)	-	-	-	121 (55)
CRI 15-2	5	1	•	17.13 (436)	10.62 (270)	7.46 (190)	32.65 (830)	-	-	-	198 (90)
		3	•	17.13 (436)	8.66 (220)	5.28 (135)	32.64 (830)	-	-	-	195 (89)
CRI 15-3	7 1/2	1	•	19.21 (488)	10.22 (260)	7.62 (194)	34.74 (883)	-	-	-	216 (98)
		3	•	19.21 (488)	8.66 (220)	5.28 (135)	34.72 (882)	-	-	-	203 (93)
CRI 15-4	7 1/2	1	•	20.98 (533)	10.22 (260)	7.62 (194)	36.51 (928)	-	-	-	218 (99)
		3	•	20.98 (533)	8.66 (220)	5.28 (135)	36.49 (927)	-	-	-	205 (93)
CRI 15-5	10	1	•	22.76 (579)	10.23 (260)	10.30 (262)	38.83 (987)	-	-	-	333 (152)
		3	•	22.76 (579)	10.24 (261)	6.26 (160)	37.49 (953)	-	-	-	212 (97)
CRI 15-6	15	3	•	27.05 (688)	12.36 (314)	8.00 (204)	45.59 (1158)	10.62 (270)	7.33 (187)	43.36 (1102)	336 (153)
CRI 15-7	15	3	•	28.82 (733)	12.36 (314)	8.00 (204)	47.36 (1203)	10.62 (270)	7.33 (187)	45.13 (1147)	369 (168)
CRI 15-8	15	3	•	30.59 (777)	12.36 (314)	8.00 (204)	49.13 (1248)	10.62 (270)	7.33 (187)	46.90 (1192)	402 (183)
CRI 15-9	20	3	-	32.36 (822)	12.36 (314)	8.00 (204)	50.90 (1293)	11.50 (293)	8.92 (227)	52.05 (1323)	410 (186)
CRI 15-10	20	3	-	34.13 (867)	12.36 (314)	8.00 (204)	52.67 (1338)	11.50 (293)	8.92 (227)	53.82 (1368)	413 (188)
CRI 15-12	25	3	-	37.05 (942)	12.36 (314)	8.00 (204)	59.44 (1510)	11.50 (293)	8.94 (228)	57.86 (1470)	413 (188)

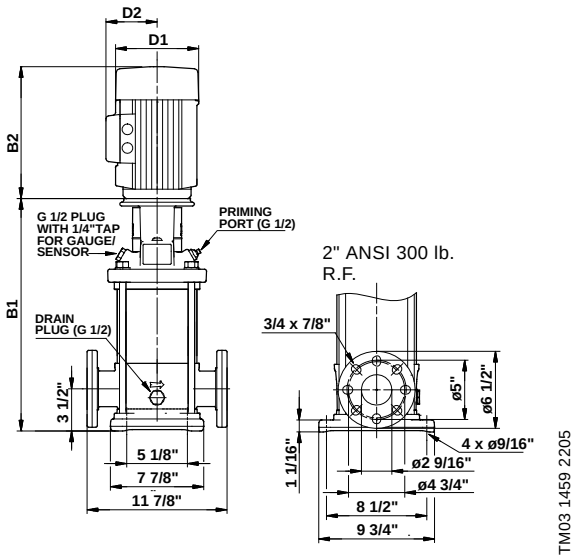
All dimensions in inches unless otherwise noted.

* Oval flanged pump B1 and B1+B2 dimension is equal to ANSI flanged pumps and weight is approximately 7 lbs. less.

• Available.

CRN 15





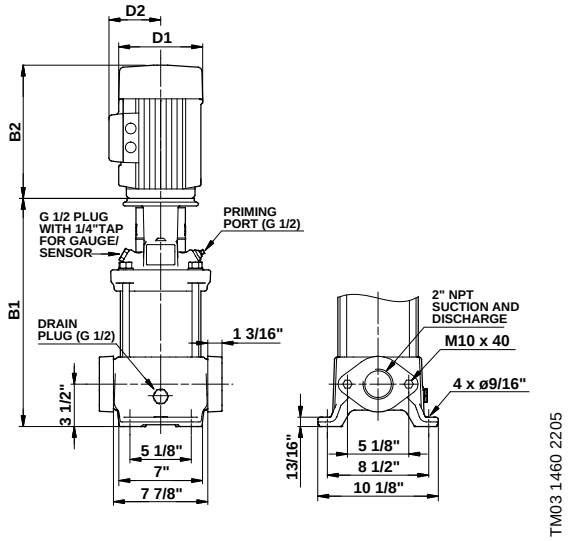
Pump type	P2 [Hp]	Ph.	PJE*	ANSI dimensions [inch (mm)]							Ship. wt. [lbs (kg)]
				B1	TEFC			ODP			
					D1	D2	B1+B2	D1	D2	B1+B2	
CRN 15-1	2	1	•	16.38 (417)	7.19 (183)	5.73 (146)	28.94 (736)	-	-	-	130 (59)
		3	•	16.38 (417)	7.01 (179)	4.33 (110)	27.6 (702)	-	-	-	121 (55)
CRN 15-2	5	1	•	17.44 (443)	10.62 (270)	7.46 (190)	32.96 (838)	-	-	-	203 (93)
		3	•	17.13 (436)	8.66 (220)	5.28 (135)	32.64 (830)	-	-	-	195 (89)
CRN 15-3	7 1/2	1	•	19.21 (488)	10.22 (260)	7.62 (194)	34.74 (883)	-	-	-	216 (98)
		3	•	19.21 (488)	8.66 (220)	5.28 (135)	34.72 (882)	-	-	-	205 (93)
CRN 15-4	7 1/2	1	•	20.98 (533)	10.22 (260)	7.62 (194)	36.51 (928)	-	-	-	218 (99)
		3	•	20.98 (533)	8.66 (220)	5.28 (135)	36.49 (927)	-	-	-	207 (94)
CRN 15-5	10	1	•	22.76 (579)	10.23 (260)	10.30 (262)	38.83 (987)	-	-	-	335 (152)
		3	•	22.76 (579)	10.24 (261)	6.26 (160)	37.49 (953)	-	-	-	214 (98)
CRN 15-6	15	3	•	27.05 (688)	12.36 (314)	8.00 (204)	45.59 (1158)	10.62 (270)	7.33 (187)	43.36 (1102)	336 (153)
CRN 15-7	15	3	•	28.82 (733)	12.36 (314)	8.00 (204)	47.36 (1203)	10.62 (270)	7.33 (187)	45.13 (1147)	369 (168)
CRN 15-8	15	3	•	30.59 (777)	12.36 (314)	8.00 (204)	49.13 (1248)	10.62 (270)	7.33 (187)	46.90 (1192)	402 (183)
CRN 15-9	20	3	•	32.36 (822)	12.36 (314)	8.00 (204)	50.90 (1293)	11.50 (293)	8.92 (227)	52.05 (1323)	410 (186)
CRN 15-10	20	3	•	34.13 (867)	12.36 (314)	8.00 (204)	52.67 (1338)	11.50 (293)	8.92 (227)	53.82 (1368)	413 (188)
CRN 15-12	25	3	•	37.05 (942)	12.36 (314)	8.00 (204)	59.44 (1510)	11.50 (293)	8.94 (228)	57.86 (1470)	413 (188)

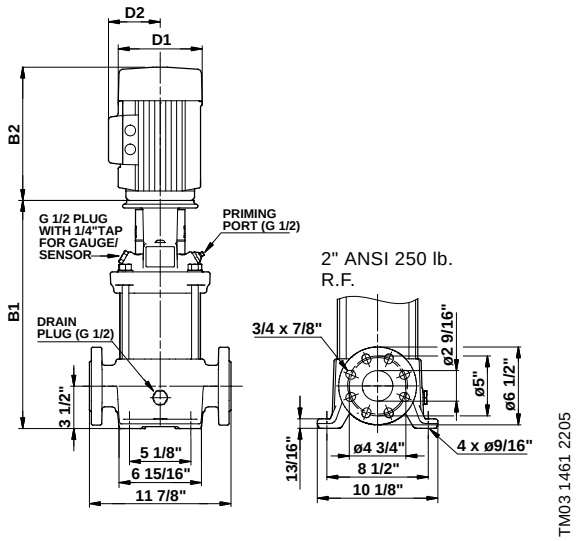
All dimensions in inches unless otherwise noted.

* PJE flanged pump B1 and B1+B2 dimension is equal to ANSI flanged pump and weight is approximately 9 lbs. less.

• Available.

CR 20





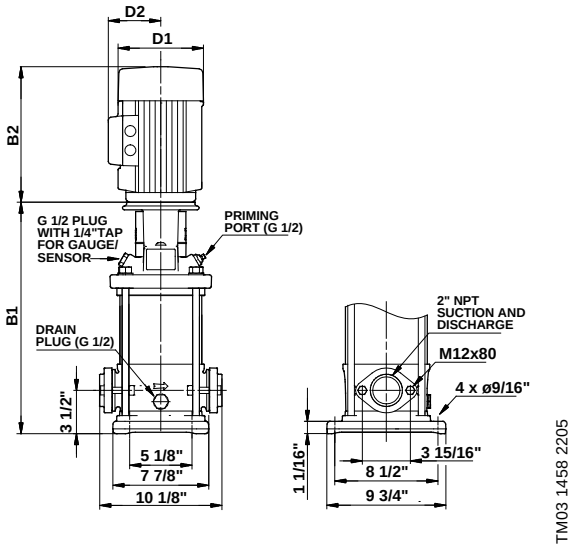
Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]								Ship. wt. [lbs (kg)]
			Oval*	B1	TEFC			ODP			
					D1	D2	B1+B2	D1	D2	B1+B2	
CR 20-1	3	1	•	17.20 (437)	8.60 (219)	6.87 (175)	31.85 (809)	-	-	-	181 (83)
		3	•	17.20 (437)	7.01 (179)	4.33 (110)	30.43 (773)	-	-	-	151 (69)
CR 20-2	5	1	•	17.20 (437)	10.62 (270)	7.46 (190)	32.72 (832)	-	-	-	205 (93)
		3	•	17.20 (437)	8.66 (220)	5.28 (135)	32.71 (831)	-	-	-	201 (92)
CR 20-3	7 1/2	1	•	19.29 (490)	10.22 (260)	7.62 (194)	34.82 (885)	-	-	-	223 (102)
		3	•	19.29 (490)	8.66 (220)	5.28 (135)	34.80 (884)	-	-	-	209 (95)
CR 20-4	10	1	•	21.06 (535)	10.23 (260)	10.30 (262)	37.13 (944)	-	-	-	337 (153)
		3	•	21.06 (535)	10.24 (261)	6.26 (160)	35.79 (910)	-	-	-	214 (98)
CR 20-5	15	3	•	25.39 (645)	12.36 (314)	8.00 (204)	43.93 (1116)	10.62 (270)	7.33 (187)	41.70 (1060)	369 (168)
CR 20-6	15	3	•	27.17 (691)	12.36 (314)	8.00 (204)	45.71 (1162)	10.62 (270)	7.33 (187)	43.48 (1105)	373 (170)
CR 20-7	20	3	•	28.94 (736)	12.36 (314)	8.00 (204)	47.48 (1206)	11.5 (293)	8.92 (227)	48.63 (1236)	409 (186)
CR 20-8	20	3	-	30.71 (781)	12.36 (314)	8.00 (204)	49.25 (1251)	11.5 (293)	8.92 (227)	50.40 (1281)	413 (188)
CR 20-10	25	3	-	33.62 (854)	12.36 (314)	8.00 (204)	56.01 (1423)	11.5 (293)	8.94 (228)	54.43 (1383)	413 (188)

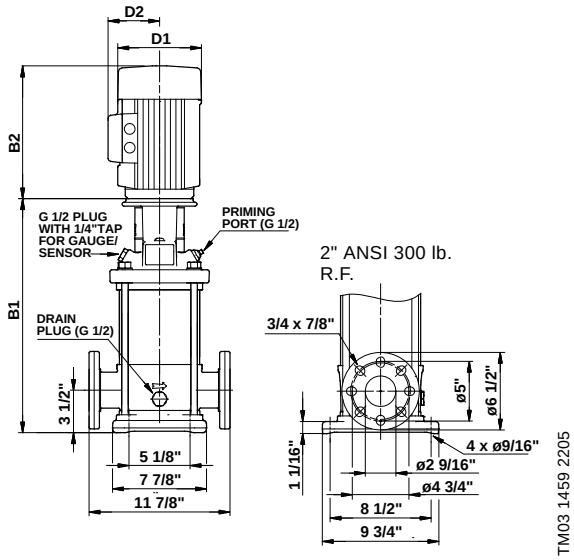
All dimensions in inches unless otherwise noted.

* Oval flanged pump B1 and B1+B2 dimension is equal to ANSI flanged pumps and weight is approximately 3 lbs. less.

• Available.

CRI 20





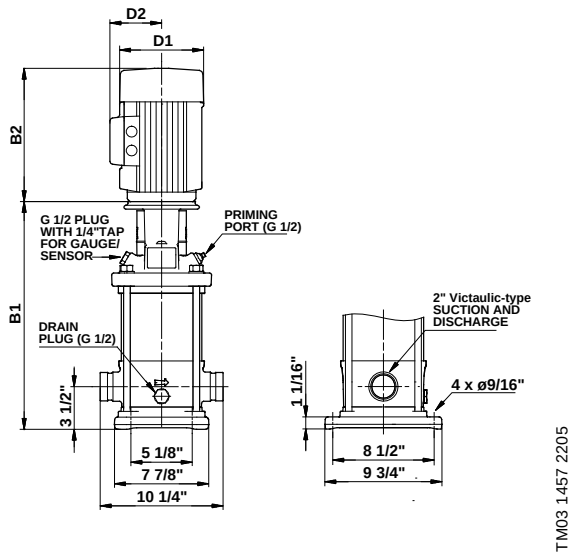
Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]								Ship. wt. [lbs (kg)]
			Oval*	B1	TEFC			ODP			
					D1	D2	B1+B2	D1	D2	B1+B2	
CRI 20-1	3	1	•	17.13 (436)	8.60 (219)	6.87 (175)	31.78 (808)	-	-	-	174 (79)
		3	•	17.13 (436)	7.01 (179)	4.33 (110)	30.36 (772)	-	-	-	145 (66)
CRI 20-2	5	1	•	17.13 (436)	10.62 (270)	7.46 (190)	32.65 (830)	-	-	-	198 (90)
		3	•	17.13 (436)	8.66 (220)	5.28 (135)	32.64 (830)	-	-	-	195 (89)
CRI 20-3	7 1/2	1	•	19.21 (488)	10.22 (260)	7.62 (194)	34.74 (883)	-	-	-	216 (98)
		3	•	19.21 (488)	8.66 (220)	5.28 (135)	34.72 (882)	-	-	-	203 (93)
CRI 20-4	10	1	•	20.98 (533)	10.23 (260)	10.30 (262)	37.05 (942)	-	-	-	331 (151)
		3	•	20.98 (533)	10.24 (261)	6.26 (160)	35.71 (908)	-	-	-	205 (93)
CRI 20-5	15	3	•	25.28 (643)	12.36 (314)	8.00 (204)	43.82 (1114)	10.62 (270)	7.33 (187)	41.59 (1057)	362 (165)
CRI 20-6	15	3	•	27.05 (688)	12.36 (314)	8.00 (204)	45.59 (1158)	10.62 (270)	7.33 (187)	43.36 (1102)	367 (167)
CRI 20-7	20	3	•	28.82 (733)	12.36 (314)	8.00 (204)	47.36 (1203)	11.50 (293)	8.92 (227)	48.51 (1233)	402 (185)
CRI 20-8	20	3	-	30.59 (777)	12.36 (314)	8.00 (204)	49.13 (1248)	11.50 (293)	8.92 (227)	50.28 (1278)	406 (185)
CRI 20-10	25	3	-	33.50 (851)	12.36 (314)	8.00 (204)	55.89 (1420)	11.50 (293)	8.94 (228)	54.31 (1380)	407 (185)

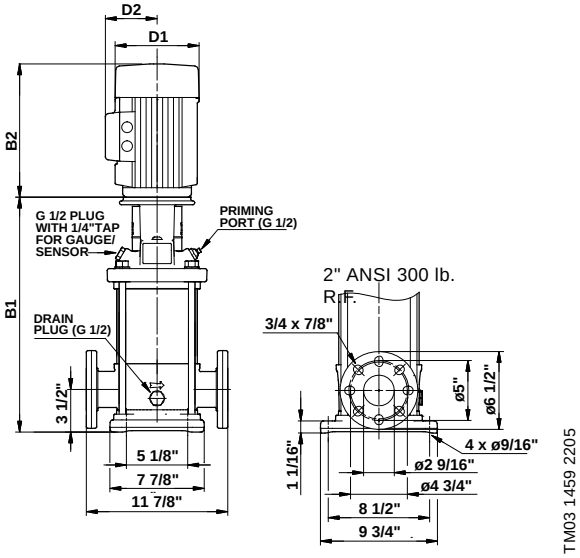
All dimensions in inches unless otherwise noted.

* Oval flanged pump B1 and B1+B2 dimension is equal to ANSI flanged pumps and weight is approximately 7 lbs. less.

• Available.

CRN 20





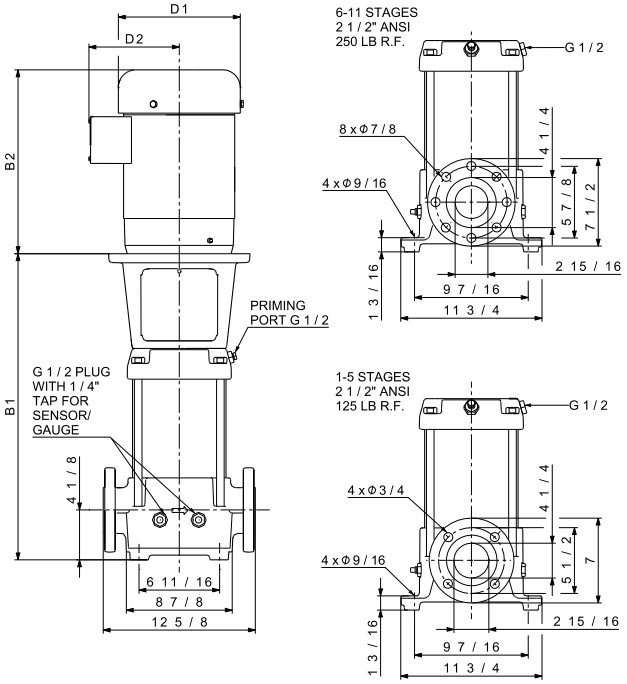
Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]								Ship. wt. [lbs (kg)]
			PJE*	B1	TEFC			ODP			
					D1	D2	B1+B2	D1	D2	B1+B2	
CRN 20-1	3	1	•	17.13 (436)	8.60 (219)	6.87 (175)	31.78 (808)	-	-	-	174 (79)
		3	•	17.13 (436)	7.01 (179)	4.33 (110)	30.36 (772)	-	-	-	145 (66)
CRN 20-2	5	1	•	17.13 (436)	10.62 (270)	7.46 (190)	32.65 (830)	-	-	-	198 (90)
		3	•	17.13 (436)	8.66 (220)	5.28 (135)	32.64 (830)	-	-	-	195 (89)
CRN 20-3	7 1/2	1	•	19.21 (488)	10.22 (260)	7.62 (194)	34.74 (883)	-	-	-	216 (98)
		3	•	19.21 (488)	8.66 (220)	5.28 (135)	34.72 (882)	-	-	-	203 (93)
CRN 20-4	10	1	•	20.98 (533)	10.23 (260)	10.30 (262)	37.05 (942)	-	-	-	331 (151)
		3	•	20.98 (533)	10.24 (261)	6.26 (160)	35.71 (908)	-	-	-	207 (94)
CRN 20-5	15	3	•	25.28 (643)	12.36 (314)	8.00 (204)	43.82 (1114)	10.62 (270)	7.33 (187)	41.59 (1057)	365 (166)
CRN 20-6	15	3	•	27.05 (688)	12.36 (314)	8.00 (204)	45.59 (1158)	10.62 (270)	7.33 (187)	43.36 (1102)	367 (167)
CRN 20-7	20	3	•	28.82 (733)	12.36 (314)	8.00 (204)	47.36 (1203)	11.50 (293)	8.92 (227)	48.51 (1233)	402 (183)
CRN 20-8	20	3	•	30.59 (777)	12.36 (314)	8.00 (204)	49.13 (1248)	11.50 (293)	8.92 (227)	50.28 (1278)	406 (185)
CRN 20-10	25	3	•	33.50 (851)	12.36 (314)	8.00 (204)	55.89 (1420)	11.50 (293)	8.94 (228)	54.31 (1380)	407 (185)

All dimensions in inches unless otherwise noted.

* PJE flanged pump B1 and B1+B2 dimension is equal to ANSI flanged pumps and weight is approximately 9 lbs. less.

• Available.

CR 32

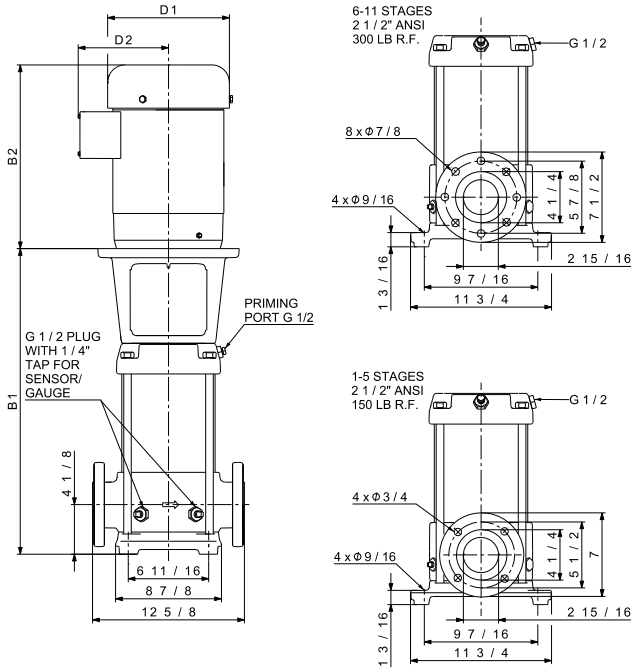


TM02 7699 1009

Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.[1] [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CR 32-1-1	5	1	20.08 (511)	10.62 (270)	7.46 (190)	35.60 (905)	-	-	-	240 (109)
		3	19.88 (505)	8.66 (220)	5.28 (135)	35.39 (899)	-	-	-	218 (99)
CR 32-1	5	1	20.08 (511)	10.62 (270)	7.46 (190)	35.60 (905)	-	-	-	228 (104)
		3	19.88 (505)	8.66 (220)	5.28 (135)	35.39 (899)	-	-	-	218 (99)
CR 32-2-2	7 1/2	1	22.83 (580)	10.22 (260)	7.62 (194)	38.36 (975)	-	-	-	245 (112)
		3	22.64 (576)	8.66 (220)	5.28 (135)	38.15 (970)	-	-	-	229 (104)
CR 32-2-1	7 1/2	1	22.83 (580)	10.22 (260)	7.62 (194)	38.36 (975)	-	-	-	245 (112)
		3	22.64 (576)	8.66 (220)	5.28 (135)	38.15 (970)	-	-	-	229 (104)
CR 32-2	10	1	22.83 (580)	10.23 (260)	10.30 (262)	38.90 (989)	-	-	-	300 (137)
		3	22.64 (576)	10.24 (261)	6.26 (160)	37.87 (962)	-	-	-	229 (104)
CR 32-3-2	10	1	25.59 (650)	10.23 (260)	10.30 (262)	41.66 (1059)	-	-	-	295 (134)
		3	25.39 (645)	10.24 (261)	6.26 (160)	40.12 (1020)	-	-	-	236 (108)
CR 32-3	15	3	29.72 (755)	12.36 (314)	8.00 (204)	48.26 (1226)	10.62 (270)	7.33 (187)	46.03 (1170)	332 (151)
CR 32-4-2	15	3	32.48 (825)	12.36 (314)	8.00 (204)	51.02 (1296)	10.62 (270)	7.33 (187)	48.79 (1240)	339 (154)
CR 32-4	20	3	32.48 (825)	12.36 (314)	8.00 (204)	51.02 (1296)	11.50 (293)	8.92 (227)	52.17 (1326)	344 (157)
CR 32-5-2	20	3	35.24 (896)	12.36 (314)	8.00 (204)	53.78 (1367)	11.50 (293)	8.92 (227)	54.93 (1396)	351 (160)
CR 32-5	20	3	35.24 (896)	12.36 (314)	8.00 (204)	53.78 (1367)	11.50 (293)	8.92 (227)	54.93 (1396)	351 (160)
CR 32-6-2	25	3	37.99 (965)	12.36 (314)	8.00 (204)	60.38 (1534)	11.50 (293)	8.94 (228)	58.80 (1494)	351 (160)
CR 32-6	25	3	37.99 (965)	12.36 (314)	8.00 (204)	60.38 (1534)	11.50 (293)	8.94 (228)	58.80 (1494)	351 (160)
CR 32-7-2	30	3	40.75 (1036)	12.36 (314)	8.00 (204)	63.14 (1604)	11.50 (293)	8.94 (228)	62.56 (1590)	444 (202)
CR 32-7	30	3	40.75 (1036)	12.36 (314)	8.00 (204)	63.14 (1604)	11.50 (293)	8.94 (228)	62.56 (1590)	423 (192)
CR 32-8-2	30	3	43.50 (1105)	12.36 (314)	8.00 (204)	65.89 (1674)	11.50 (293)	8.94 (228)	65.31 (1659)	436 (198)
CR 32-8	40	3	43.50 (1105)	15.32 (390)	13.11 (333)	66.69 (1694)	13.25 (337)	12.21 (311)	66.75 (1696)	631 (287)
CR 32-9-2	40	3	46.26 (1176)	15.32 (390)	13.11 (333)	69.45 (1765)	13.25 (337)	12.21 (311)	69.51 (1766)	637 (289)
CR 32-9	40	3	46.26 (1176)	15.32 (390)	13.11 (333)	69.45 (1765)	13.25 (337)	12.21 (311)	69.51 (1766)	637 (289)
CR 32-10-2	40	3	49.02 (1246)	15.32 (390)	13.11 (333)	72.21 (1835)	13.25 (337)	12.21 (311)	72.27 (1836)	645 (293)
CR 32-10	40	3	49.02 (1246)	15.32 (390)	13.11 (333)	72.21 (1835)	13.25 (337)	12.21 (311)	72.27 (1836)	645 (293)
CR 32-11-2	50	3	51.77 (1315)	16.88 (429)	14.12 (359)	79.58 (2022)	13.25 (337)	12.21 (311)	74.52 (1893)	671 (305)

[1] Weights are based on pump with TEFC motor (see price list for individual weights).
All dimensions in inches unless otherwise noted.

CRN 32

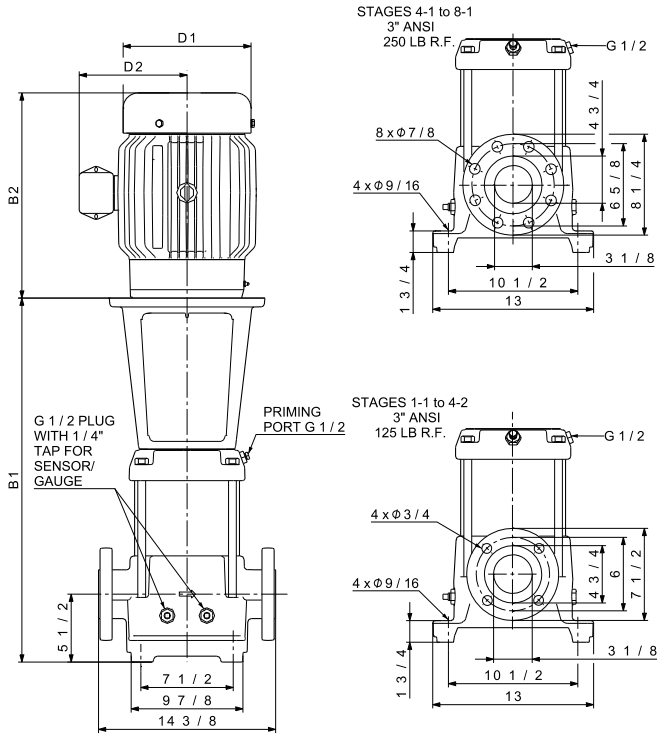


TM02 7703 1009

Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.[1] [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CRN 32-1-1	5	1	20.08 (511)	10.62 (270)	7.46 (190)	35.60 (905)	-	-	-	245 (112)
		3	19.88 (505)	8.66 (220)	5.28 (135)	35.39 (899)	-	-	-	223 (102)
CRN 32-1	5	1	20.08 (511)	10.62 (270)	7.46 (190)	35.60 (905)	-	-	-	233 (106)
		3	19.88 (505)	8.66 (220)	5.28 (135)	35.39 (899)	-	-	-	223 (102)
CRN 32-2-2	7 1/2	1	22.83 (580)	10.22 (260)	7.62 (194)	38.36 (975)	-	-	-	250 (114)
		3	22.64 (576)	8.66 (220)	5.28 (135)	38.15 (970)	-	-	-	234 (107)
CRN 32-2-1	7 1/2	1	22.83 (580)	10.22 (260)	7.62 (194)	38.36 (975)	-	-	-	250 (114)
		3	22.64 (576)	8.66 (220)	5.28 (135)	38.15 (970)	-	-	-	234 (107)
CRN 32-2	10	1	22.83 (580)	10.23 (260)	10.30 (262)	38.90 (989)	-	-	-	305 (139)
		3	22.64 (576)	10.24 (261)	6.26 (160)	37.37 (950)	-	-	-	234 (107)
CRN 32-3-2	10	1	25.59 (650)	10.23 (260)	10.30 (262)	41.66 (1059)	-	-	-	300 (137)
		3	25.39 (645)	10.24 (261)	6.26 (160)	40.12 (1020)	-	-	-	241 (110)
CRN 32-3	15	3	29.72 (755)	12.36 (314)	8.00 (204)	48.26 (1226)	10.62 (270)	7.33 (187)	46.03 (1170)	337 (153)
CRN 32-4-2	15	3	32.48 (825)	12.36 (314)	8.00 (204)	51.02 (1296)	10.62 (270)	7.33 (187)	48.79 (1240)	343 (156)
CRN 32-4	20	3	32.48 (825)	12.36 (314)	8.00 (204)	51.02 (1296)	11.50 (293)	8.92 (227)	52.17 (1326)	348 (158)
CRN 32-5-2	20	3	35.24 (896)	12.36 (314)	8.00 (204)	53.78 (1367)	11.50 (293)	8.92 (227)	54.93 (1396)	355 (162)
CRN 32-5	20	3	35.24 (896)	12.36 (314)	8.00 (204)	53.78 (1367)	11.50 (293)	8.92 (227)	54.93 (1396)	355 (162)
CRN 32-6-2	25	3	37.99 (965)	12.36 (314)	8.00 (204)	60.38 (1534)	11.50 (293)	8.94 (228)	58.80 (1494)	355 (162)
CRN 32-6	25	3	37.99 (965)	12.36 (314)	8.00 (204)	60.38 (1534)	11.50 (293)	8.94 (228)	58.80 (1494)	355 (162)
CRN 32-7-2	30	3	40.75 (1036)	12.36 (314)	8.00 (204)	63.14 (1604)	11.50 (293)	8.94 (228)	62.56 (1590)	448 (204)
CRN 32-7	30	3	40.75 (1036)	12.36 (314)	8.00 (204)	63.14 (1604)	11.50 (293)	8.94 (228)	62.56 (1590)	427 (194)
CRN 32-8-2	30	3	43.50 (1105)	12.36 (314)	8.00 (204)	65.89 (1674)	11.50 (293)	8.94 (228)	65.31 (1659)	440 (200)
CRN 32-8	40	3	43.50 (1105)	15.32 (390)	13.11 (333)	66.69 (1694)	13.25 (337)	12.21 (311)	66.75 (1696)	635 (289)
CRN 32-9-2	40	3	46.26 (1176)	15.32 (390)	13.11 (333)	69.45 (1765)	13.25 (337)	12.21 (311)	69.51 (1766)	641 (291)
CRN 32-9	40	3	46.26 (1176)	15.32 (390)	13.11 (333)	69.45 (1765)	13.25 (337)	12.21 (311)	69.51 (1766)	641 (291)
CRN 32-10-2	40	3	49.02 (1246)	15.32 (390)	13.11 (333)	72.21 (1835)	13.25 (337)	12.21 (311)	72.27 (1836)	648 (294)
CRN 32-10	40	3	49.02 (1246)	15.32 (390)	13.11 (333)	72.21 (1835)	13.25 (337)	12.21 (311)	72.27 (1836)	648 (294)
CRN 32-11-2	50	3	51.77 (1315)	16.88 (429)	14.12 (359)	79.58 (2022)	13.25 (337)	12.21 (311)	74.52 (1893)	674 (306)

[1] Weights are based on pump with TEFC motor (see price list for individual weights).
All dimensions in inches unless otherwise noted.

CR 45

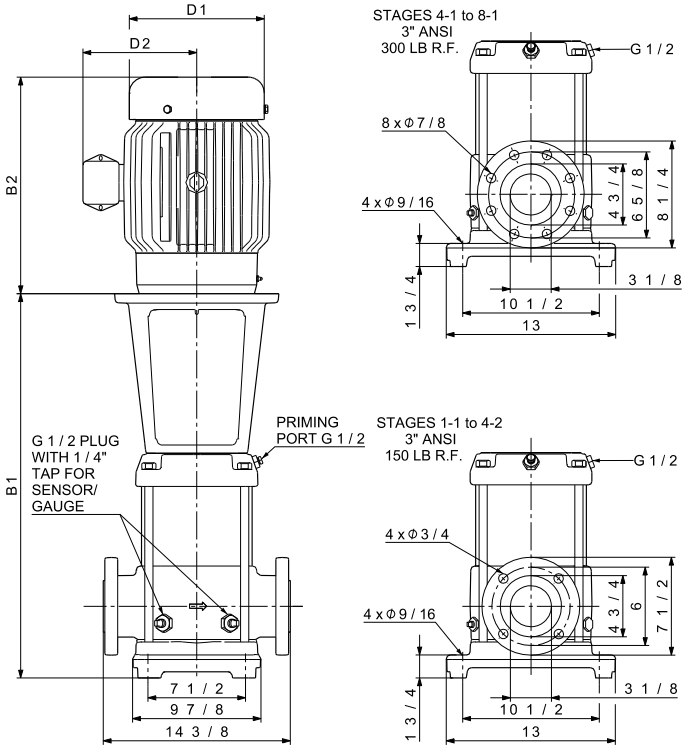


TM02 7700 1009

Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.[1] [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CR 45-1-1	7 1/2	1	22.20 (564)	10.22 (260)	7.62 (194)	37.73 (959)	-	-	-	259 (118)
		3	22.01 (560)	8.66 (220)	5.28 (135)	37.52 (954)	-	-	-	243 (111)
CR 45-1	10	1	22.20 (564)	10.23 (260)	10.30 (262)	38.27 (973)	-	-	-	314 (143)
		3	22.01 (560)	10.24 (261)	6.26 (160)	36.74 (934)	-	-	-	243 (111)
CR 45-2-2	15	3	29.49 (750)	12.36 (314)	8.00 (204)	48.03 (1220)	10.62 (270)	7.33 (187)	45.80 (1164)	347 (158)
CR 45-2-1	15	3	29.49 (750)	12.36 (314)	8.00 (204)	48.03 (1220)	10.62 (270)	7.33 (187)	45.80 (1164)	347 (158)
CR 45-2	15	3	29.49 (750)	12.36 (314)	8.00 (204)	48.03 (1220)	10.62 (270)	7.33 (187)	45.80 (1164)	347 (158)
CR 45-3-2	20	3	32.64 (830)	12.36 (314)	8.00 (204)	51.18 (1300)	11.50 (293)	8.92 (227)	52.33 (1330)	361 (164)
CR 45-3-1	25	3	32.64 (830)	12.36 (314)	8.00 (204)	55.03 (1398)	11.50 (293)	8.94 (228)	53.45 (1358)	353 (161)
CR 45-3	25	3	32.64 (830)	12.36 (314)	8.00 (204)	55.03 (1398)	11.50 (293)	8.94 (228)	53.45 (1358)	353 (161)
CR 45-4-2	30	3	35.79 (910)	12.36 (314)	8.00 (204)	58.18 (1478)	11.50 (293)	8.94 (228)	57.60 (1464)	426 (194)
CR 45-4-1	30	3	35.79 (910)	12.36 (314)	8.00 (204)	58.18 (1478)	11.50 (293)	8.94 (228)	57.60 (1464)	432 (196)
CR 45-4	30	3	35.79 (910)	12.36 (314)	8.00 (204)	58.18 (1478)	11.50 (293)	8.94 (228)	57.60 (1464)	432 (196)
CR 45-5-2	40	3	38.94 (990)	15.32 (390)	13.11 (333)	62.13 (1579)	13.25 (337)	12.21 (311)	62.19 (1580)	634 (288)
CR 45-5-1	40	3	38.94 (990)	15.32 (390)	13.11 (333)	62.13 (1579)	13.25 (337)	12.21 (311)	62.19 (1580)	634 (288)
CR 45-5	40	3	38.94 (990)	15.32 (390)	13.11 (333)	62.13 (1579)	13.25 (337)	12.21 (311)	62.19 (1580)	634 (288)
CR 45-6-2	50	3	42.09 (1070)	16.88 (429)	14.12 (359)	69.90 (1776)	13.25 (337)	12.21 (311)	64.84 (1647)	679 (308)
CR 45-6	50	3	42.09 (1070)	16.88 (429)	14.12 (359)	69.90 (1776)	13.25 (337)	12.21 (311)	64.84 (1647)	679 (308)
CR 45-7-2	50	3	45.24 (1150)	16.88 (429)	14.12 (359)	73.05 (1856)	13.25 (337)	12.21 (311)	67.99 (1727)	689 (313)
CR 45-7	60	3	45.24 (1150)	19.00 (483)	14.90 (379)	76.03 (1932)	15.12 (385)	13.19 (336)	71.37 (1813)	869 (395)
CR 45-8-1	60	3	48.39 (1230)	19.00 (483)	14.90 (379)	79.18 (2012)	15.12 (385)	13.19 (336)	74.52 (1893)	878 (399)

[1] Weights are based on pump with TEFC motor (see price list for individual weights).
All dimensions in inches unless otherwise noted.

CRN 45

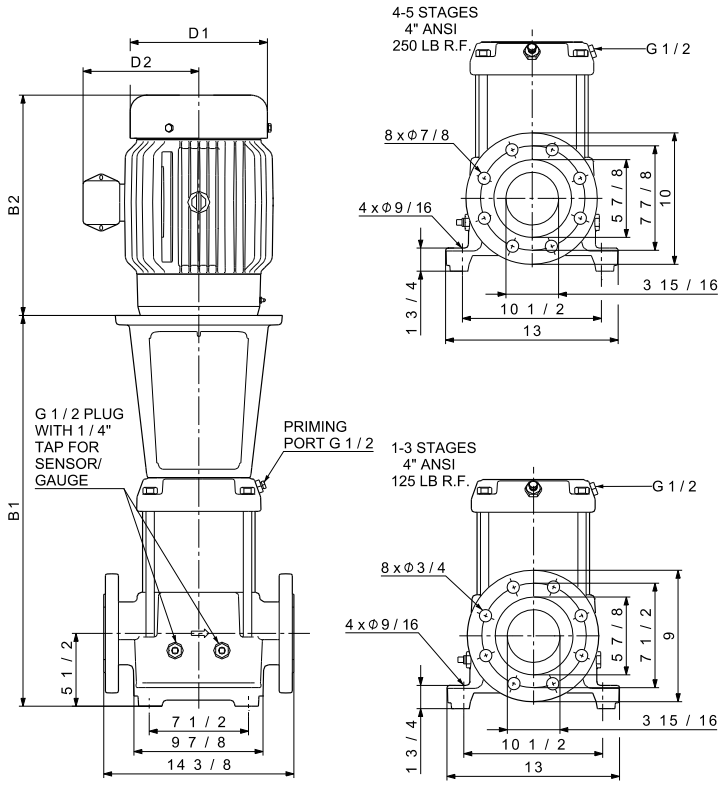


TM02 7704 1009

Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.[1] [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CRN 45-1-1	7 1/2	1	22.20 (564)	10.22 (260)	7.62 (194)	37.73 (959)	-	-	-	259 (118)
		3	22.01 (560)	8.66 (220)	5.28 (135)	37.52 (954)	-	-	-	243 (111)
CRN 45-1	10	1	22.20 (564)	10.23 (260)	10.30 (262)	38.27 (973)	-	-	-	314 (143)
		3	22.01 (560)	10.24 (261)	6.26 (160)	36.74 (934)	-	-	-	243 (111)
CRN 45-2-2	15	3	29.49 (750)	12.36 (314)	8.00 (204)	48.03 (1220)	10.62 (270)	7.33 (187)	45.80 (1164)	347 (158)
CRN 45-2-1	15	3	29.49 (750)	12.36 (314)	8.00 (204)	48.03 (1220)	10.62 (270)	7.33 (187)	45.80 (1164)	347 (158)
CRN 45-2	15	3	29.49 (750)	12.36 (314)	8.00 (204)	48.03 (1220)	10.62 (270)	7.33 (187)	45.80 (1164)	347 (158)
CRN 45-3-2	20	3	32.64 (830)	12.36 (314)	8.00 (204)	51.18 (1300)	11.50 (293)	8.92 (227)	52.33 (1330)	361 (164)
CRN 45-3-1	25	3	32.64 (830)	12.36 (314)	8.00 (204)	55.03 (1398)	11.50 (293)	8.94 (228)	53.45 (1358)	353 (161)
CRN 45-3	25	3	32.64 (830)	12.36 (314)	8.00 (204)	55.03 (1398)	11.50 (293)	8.94 (228)	53.45 (1358)	353 (161)
CRN 45-4-2	30	3	35.79 (910)	12.36 (314)	8.00 (204)	58.18 (1478)	11.50 (293)	8.94 (228)	57.60 (1464)	427 (194)
CRN 45-4-1	30	3	35.79 (910)	12.36 (314)	8.00 (204)	58.18 (1478)	11.50 (293)	8.94 (228)	57.60 (1464)	430 (196)
CRN 45-4	30	3	35.79 (910)	12.36 (314)	8.00 (204)	58.18 (1478)	11.50 (293)	8.94 (228)	57.60 (1464)	430 (196)
CRN 45-5-2	40	3	38.94 (990)	15.32 (390)	13.11 (333)	62.13 (1579)	13.25 (337)	12.21 (311)	62.19 (1580)	632 (287)
CRN 45-5-1	40	3	38.94 (990)	15.32 (390)	13.11 (333)	62.13 (1579)	13.25 (337)	12.21 (311)	62.19 (1580)	632 (287)
CRN 45-5	40	3	38.94 (990)	15.32 (390)	13.11 (333)	62.13 (1579)	13.25 (337)	12.21 (311)	62.19 (1580)	632 (287)
CRN 45-6-2	50	3	42.09 (1070)	16.88 (429)	14.12 (359)	69.90 (1776)	13.25 (337)	12.21 (311)	64.84 (1647)	677 (308)
CRN 45-6	50	3	42.09 (1070)	16.88 (429)	14.12 (359)	69.90 (1776)	13.25 (337)	12.21 (311)	64.84 (1647)	677 (308)
CRN 45-7-2	50	3	45.24 (1150)	16.88 (429)	14.12 (359)	73.05 (1856)	13.25 (337)	12.21 (311)	67.99 (1727)	687 (312)
CRN 45-7	60	3	45.24 (1150)	19.00 (483)	14.90 (379)	76.03 (1932)	15.12 (385)	13.19 (336)	71.37 (1813)	867 (394)
CRN 45-8-1	60	3	48.39 (1230)	19.00 (483)	14.90 (379)	79.18 (2012)	15.12 (385)	13.19 (336)	74.52 (1893)	876 (398)

[1] Weights are based on pump with TEFC motor (see price list for individual weights).
All dimensions in inches unless otherwise noted.

CR 64

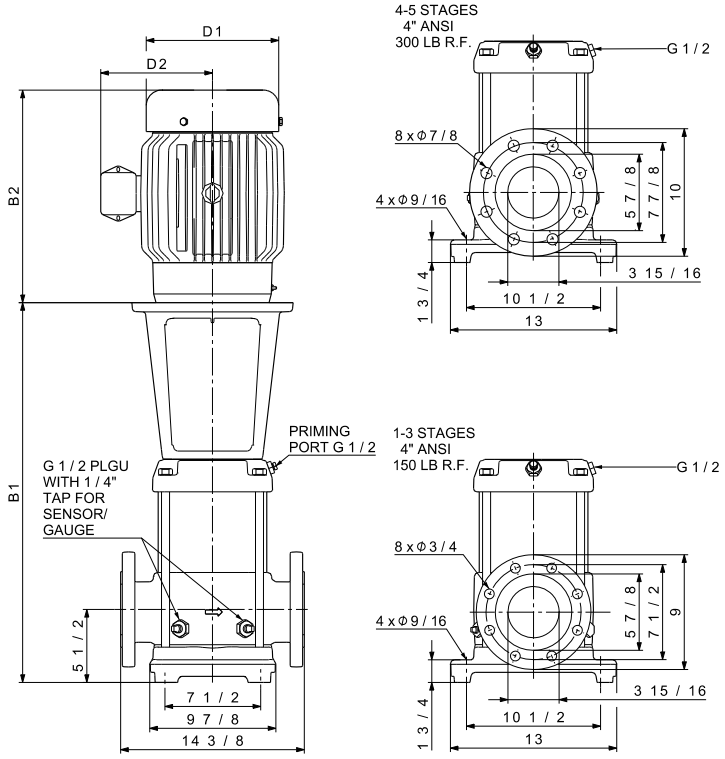


TM02 7701 1009

Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.[1] [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CR 64-1-1	10	1	22.09 (562)	10.23 (260)	10.30 (262)	38.16 (970)	-	-	-	268 (122)
		3	22.09 (562)	10.24 (261)	6.26 (160)	36.82 (936)	-	-	-	252 (115)
CR 64-1	15	3	26.42 (672)	12.36 (314)	8.00 (204)	44.96 (1142)	10.62 (270)	7.33 (187)	42.73 (1086)	348 (158)
CR 64-2-2	20	3	29.69 (755)	12.36 (314)	8.00 (204)	48.23 (1226)	11.50 (293)	8.92 (227)	49.38 (1255)	363 (165)
CR 64-2-1	20	3	29.69 (755)	12.36 (314)	8.00 (204)	48.23 (1226)	11.50 (293)	8.92 (227)	49.38 (1255)	363 (165)
CR 64-2	25	3	29.69 (755)	12.36 (314)	8.00 (204)	52.08 (1323)	11.50 (293)	8.94 (228)	50.50 (1283)	355 (162)
CR 64-3-2	30	3	32.91 (836)	12.36 (314)	8.00 (204)	55.30 (1405)	11.50 (293)	8.94 (228)	54.72 (1390)	430 (196)
CR 64-3-1	40	3	32.91 (836)	15.32 (390)	13.11 (333)	56.10 (1425)	13.25 (337)	12.21 (311)	56.16 (1427)	624 (284)
CR 64-3	40	3	32.91 (836)	15.32 (390)	13.11 (333)	56.10 (1425)	13.25 (337)	12.21 (311)	56.16 (1427)	624 (284)
CR 64-4-2	40	3	36.18 (919)	15.32 (390)	13.11 (333)	59.37 (1508)	13.25 (337)	12.21 (311)	59.43 (1510)	624 (284)
CR 64-4-1	50	3	36.18 (919)	16.88 (429)	14.12 (359)	63.99 (1626)	13.25 (337)	12.21 (311)	58.93 (1497)	676 (307)
CR 64-4	50	3	36.18 (919)	16.88 (429)	14.12 (359)	63.99 (1626)	13.25 (337)	12.21 (311)	58.93 (1497)	676 (307)
CR 64-5-2	60	3	39.41 (1002)	19.00 (483)	14.90 (379)	70.20 (1784)	15.12 (385)	13.19 (336)	65.54 (1665)	866 (393)

[1] Weights are based on pump with TEFC motor (see price list for individual weights).
All dimensions in inches unless otherwise noted.

CRN 64

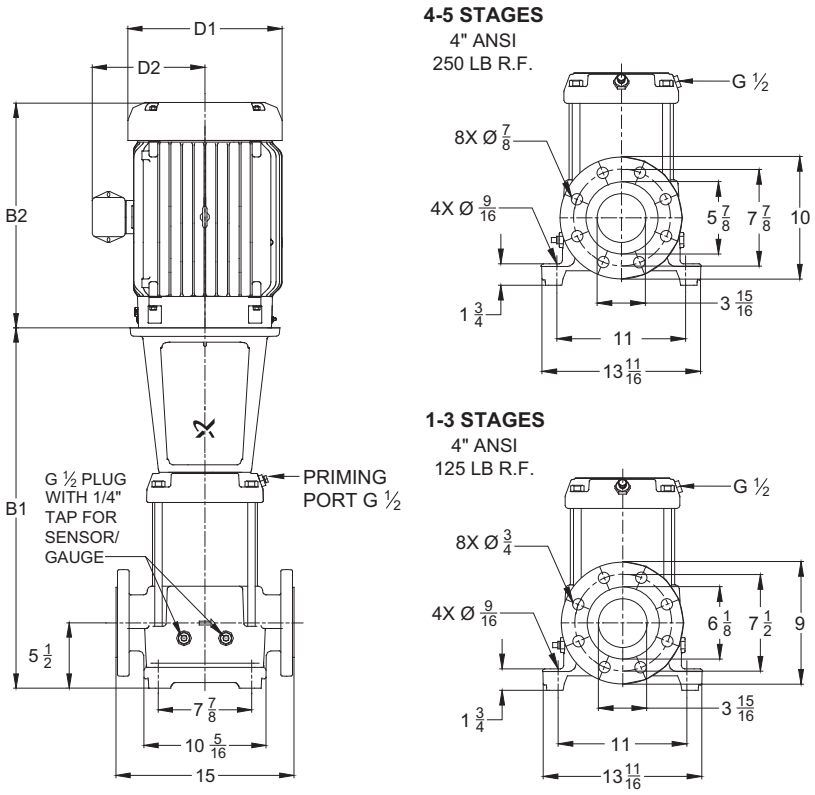


TM02 7705 1009

Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.[1] [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CRN 64-1-1	10	1	22.09 (562)	10.23 (260)	10.30 (262)	38.16 (970)	-	-	-	269 (123)
		3	22.09 (562)	10.24 (261)	6.26 (160)	36.82 (936)	-	-	-	253 (115)
CRN 64-1	15	3	26.42 (672)	12.36 (314)	8.00 (204)	44.96 (1142)	10.62 (270)	7.33 (187)	42.73 (1086)	349 (159)
CRN 64-2-2	20	3	29.69 (755)	12.36 (314)	8.00 (204)	48.23 (1226)	11.50 (293)	8.92 (227)	49.38 (1255)	364 (166)
CRN 64-2-1	20	3	29.69 (755)	12.36 (314)	8.00 (204)	48.23 (1226)	11.50 (293)	8.92 (227)	49.38 (1255)	364 (166)
CRN 64-2	25	3	29.69 (755)	12.36 (314)	8.00 (204)	52.08 (1323)	11.50 (293)	8.94 (228)	50.50 (1283)	357 (162)
CRN 64-3-2	30	3	32.91 (836)	12.36 (314)	8.00 (204)	55.30 (1405)	11.50 (293)	8.94 (228)	54.72 (1390)	432 (196)
CRN 64-3-1	40	3	32.91 (836)	15.32 (390)	13.11 (333)	56.10 (1425)	13.25 (337)	12.21 (311)	56.16 (1427)	625 (284)
CRN 64-3	40	3	32.91 (836)	15.32 (390)	13.11 (333)	56.10 (1425)	13.25 (337)	12.21 (311)	56.16 (1427)	625 (284)
CRN 64-4-2	40	3	36.18 (919)	15.32 (390)	13.11 (333)	59.37 (1508)	13.25 (337)	12.21 (311)	59.43 (1510)	625 (284)
CRN 64-4-1	50	3	36.18 (919)	16.88 (429)	14.12 (359)	63.99 (1626)	13.25 (337)	12.21 (311)	58.93 (1497)	678 (308)
CRN 64-4	50	3	36.18 (919)	16.88 (429)	14.12 (359)	63.99 (1626)	13.25 (337)	12.21 (311)	58.93 (1497)	678 (308)
CRN 64-5-2	60	3	39.41 (1002)	19.00 (483)	14.90 (379)	70.20 (1784)	15.12 (385)	13.19 (336)	65.54 (1665)	868 (394)

[1] Weights are based on pump with TEFC motor (see price list for individual weights).
All dimensions in inches unless otherwise noted.

CR 90

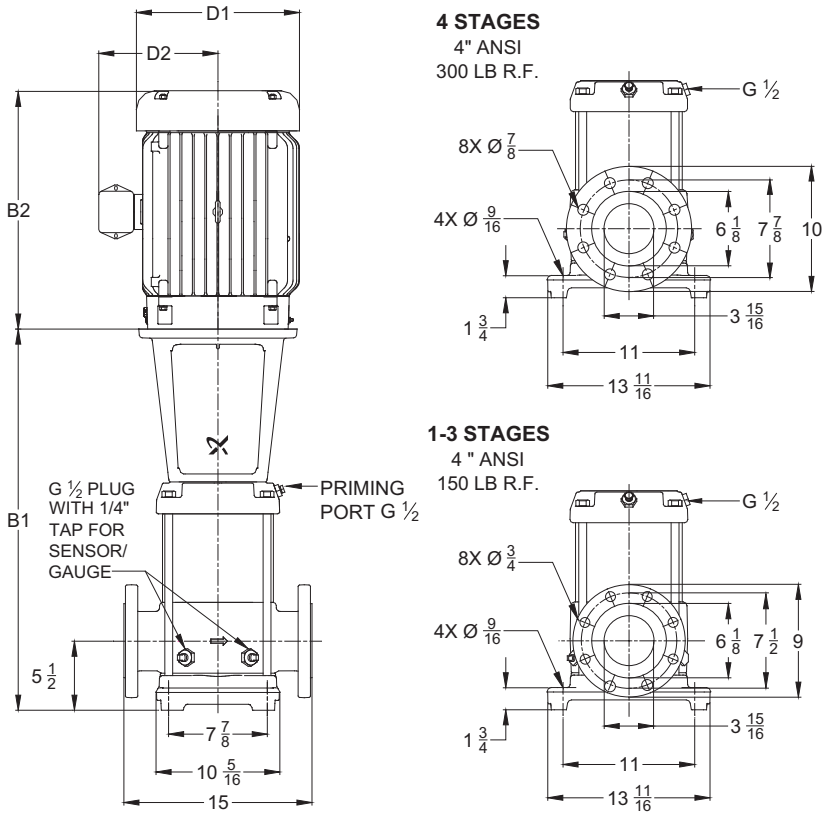


TM02 7702 3804

Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.[1] [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CR 90-1-1	15	3	26.81 (681)	12.36 (314)	8.00 (204)	45.35 (1152)	10.62 (270)	7.33 (187)	43.12 (1096)	358 (163)
CR 90-1	20	3	26.81 (681)	12.36 (314)	8.00 (204)	45.35 (1152)	11.50 (293)	8.92 (227)	46.50 (1182)	363 (165)
CR 90-2-2	25	3	30.43 (773)	12.36 (314)	8.00 (204)	52.82 (1342)	11.50 (293)	8.94 (228)	51.24 (1302)	367 (167)
CR 90-2-1	30	3	30.43 (773)	12.36 (314)	8.00 (204)	52.82 (1342)	11.50 (293)	8.94 (228)	52.24 (1327)	432 (196)
CR 90-2	40	3	30.43 (773)	15.32 (390)	13.11 (333)	53.62 (1362)	13.25 (337)	12.21 (311)	53.68 (1364)	625 (284)
CR 90-3-2	40	3	34.06 (866)	15.32 (390)	13.11 (333)	57.25 (1455)	13.25 (337)	12.21 (311)	57.31 (1456)	636 (289)
CR 90-3-1	50	3	34.06 (866)	16.88 (429)	14.12 (359)	61.87 (1572)	13.25 (337)	12.21 (311)	56.81 (1443)	667 (303)
CR 90-3	50	3	34.06 (866)	16.88 (429)	14.12 (359)	61.87 (1572)	13.25 (337)	12.21 (311)	56.81 (1443)	667 (303)
CR 90-4-2	60	3	37.68 (958)	19.00 (483)	14.90 (379)	68.47 (1740)	15.12 (385)	13.19 (336)	63.81 (1621)	869 (395)
CR 90-4-1	60	3	37.68 (958)	19.00 (483)	14.90 (379)	68.47 (1740)	15.12 (385)	13.19 (336)	63.81 (1621)	869 (395)

[1] Weights are based on pump with TEFC motor (see price list for individual weights).
All dimensions in inches unless otherwise noted.

CRN 90

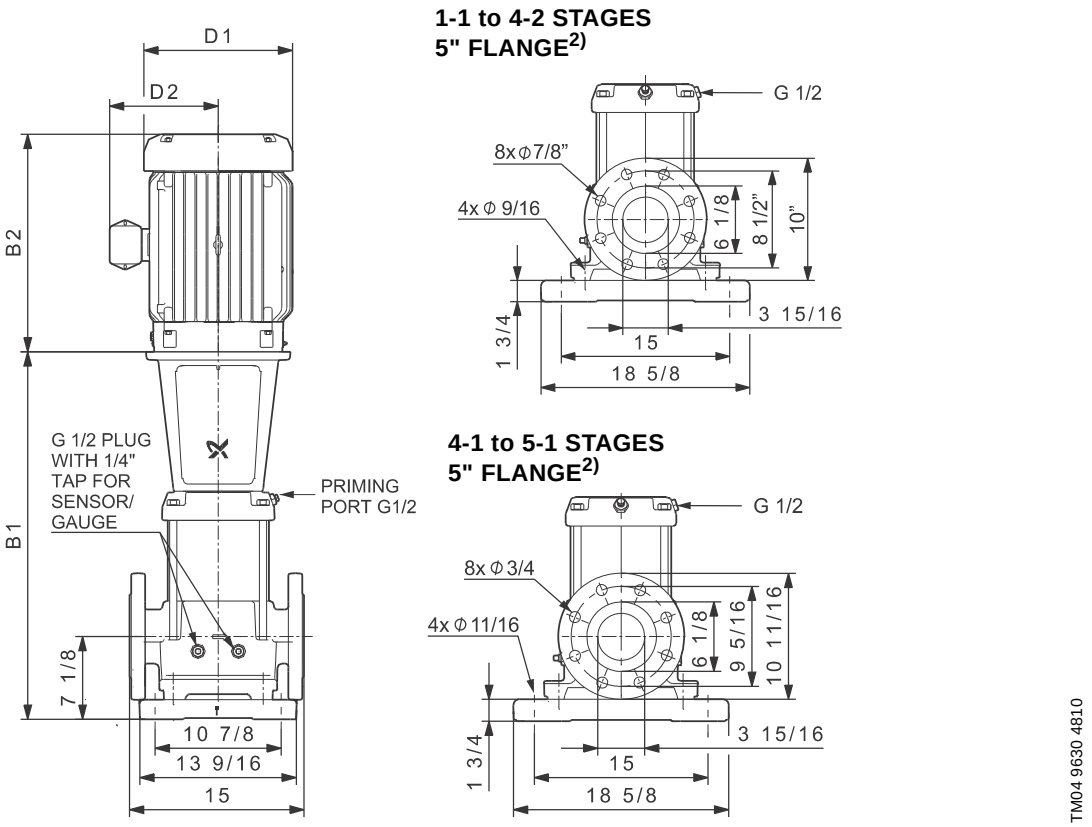


TM02 7706 3804

Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.[1] [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CRN 90-1-1	15	3	26.81 (681)	12.36 (314)	8.00 (204)	45.35 (1152)	10.62 (270)	7.33 (187)	43.12 (1096)	364 (166)
CRN 90-1	20	3	26.81 (681)	12.36 (314)	8.00 (204)	45.35 (1152)	11.50 (293)	8.92 (227)	46.50 (1182)	369 (168)
CRN 90-2-2	25	3	30.43 (773)	12.36 (314)	8.00 (204)	52.82 (1342)	11.50 (293)	8.94 (228)	51.24 (1302)	372 (169)
CRN 90-2-1	30	3	30.43 (773)	12.36 (314)	8.00 (204)	52.82 (1342)	11.50 (293)	8.94 (228)	52.24 (1327)	450 (205)
CRN 90-2	40	3	30.43 (773)	15.32 (390)	13.11 (333)	53.62 (1362)	13.25 (337)	12.21 (311)	53.68 (1364)	631 (287)
CRN 90-3-2	40	3	34.06 (866)	15.32 (390)	13.11 (333)	57.25 (1455)	13.25 (337)	12.21 (311)	57.31 (1456)	642 (292)
CRN 90-3-1	50	3	34.06 (866)	16.88 (429)	14.12 (359)	61.87 (1572)	13.25 (337)	12.21 (311)	56.81 (1443)	668 (304)
CRN 90-3	50	3	34.06 (866)	16.88 (429)	14.12 (359)	61.87 (1572)	13.25 (337)	12.21 (311)	56.81 (1443)	672 (305)
CRN 90-4-2	60	3	37.68 (958)	19.00 (483)	14.90 (379)	68.47 (1740)	15.12 (385)	13.19 (336)	63.81 (1621)	876 (398)
CRN 90-4-1	60	3	37.68 (958)	19.00 (483)	14.90 (379)	68.47 (1740)	15.12 (385)	13.19 (336)	63.81 (1621)	876 (398)

[1] Weights are based on pump with TEFC motor (see price list for individual weights).
All dimensions in inches unless otherwise noted.

CR 120



Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.1) [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CR 120-1-1	20	3	32.83 (834)	12.36 (314)	8.00 (204)	51.37 (1305)	11.50 (293)	8.92 (227)	52.52 (1335)	432 (196)
CR 120-1	25	3	32.83 (834)	12.36 (314)	8.00 (204)	55.22 (1403)	11.50 (293)	8.94 (228)	53.64 (1363)	424 (110)
CR 120-2-2	40	3	38.98 (991)	15.32 (390)	13.11 (333)	62.17 (1580)	13.25 (337)	12.21 (311)	62.23 (1581)	704 (320)
CR 120-2-1	40	3	38.98 (991)	15.32 (390)	13.11 (333)	62.17 (1580)	13.25 (337)	12.21 (311)	62.23 (1581)	704 (320)
CR 120-2	50	3	38.98 (991)	16.88 (429)	14.12 (359)	66.79 (1697)	13.25 (337)	12.21 (311)	61.73 (1568)	735 (334)
CR 120-3-2	60	3	45.08 (1146)	19.00 (483)	14.90 (379)	75.87 (1928)	15.12 (385)	13.19 (336)	71.21 (1809)	936 (425)
CR 120-3-1	60	3	45.08 (1146)	19.00 (483)	14.90 (379)	75.87 (1928)	15.12 (385)	13.19 (336)	71.21 (1809)	936 (425)
CR 120-3	75	3	45.08 (1146)	19.00 (483)	14.90 (379)	75.87 (1928)	15.18 (386)	13.19 (336)	71.21 (1809)	1045 (475)
CR 120-4-2	75	3	51.69 (1313)	19.00 (483)	14.90 (379)	82.48 (2095)	15.18 (386)	13.19 (336)	77.82 (1977)	1199 (544)
CR 120-4-1	100	3	51.69 (1313)	19.00 (483)	17.38 (442)	82.51 (2096)	15.12 (385)	13.19 (336)	79.07 (2009)	1468 (666)
CR 120-4	100	3	51.69 (1313)	19.00 (483)	17.38 (442)	82.51 (2096)	15.12 (385)	13.19 (336)	79.07 (2009)	1468 (666)
CR 120-5-2	100	3	57.80 (1469)	19.00 (483)	17.38 (442)	88.62 (2251)	15.12 (385)	13.19 (336)	85.18 (2164)	1490 (676)
CR 120-5-1[3)]	125	3	57.80 (1469)	-	-	-	16.81 (427)	16.39 (417)	88.77 (2255)	1191 (541)

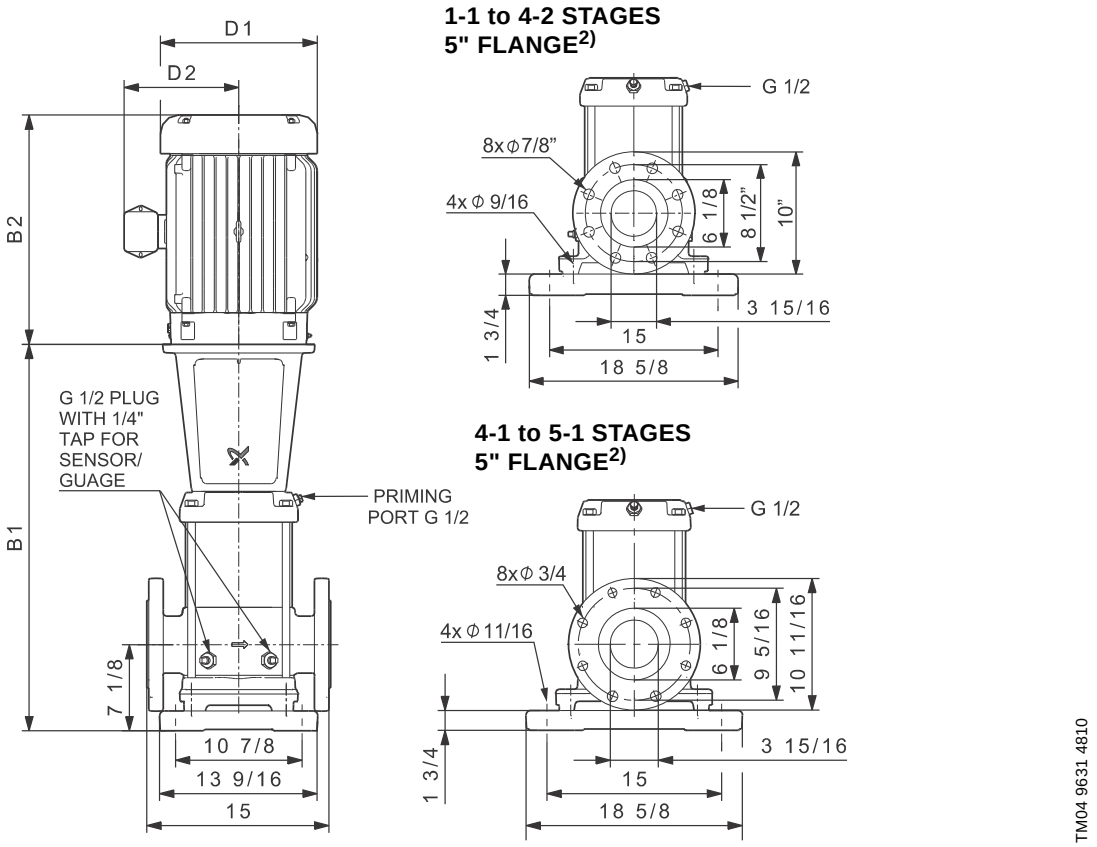
1) Weights are based on pump with TEFC motor (see price list for individual weights).

2) This is a 5" loose flange ring. When using a 5" mating flange, the gasket contact surface is reduced to approximately 0.25". A 4" loose flange ring is available for 4" pipe work. This will provide a standard gasket contact surface. Also available is a 6" ANSI flange adapter manufactured to ANSI B16.5 specifications.

3) CR 120-5-1, 125 Hp, ODP motor only.

All dimensions in inches unless otherwise noted.

CRN 120



Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.1) [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CRN 120-1-1	20	3	32.83 (834)	12.36 (314)	8.00 (204)	51.37 (1305)	11.50 (293)	8.92 (227)	52.52 (1335)	439 (200)
CRN 120-1	25	3	32.83 (834)	12.36 (314)	8.00 (204)	55.22 (1403)	11.50 (293)	8.94 (228)	53.64 (1363)	431 (196)
CRN 120-2-2	40	3	38.98 (991)	15.32 (390)	13.11 (333)	62.17 (1580)	13.25 (337)	12.21 (311)	62.23 (1581)	711 (323)
CRN 120-2-1	40	3	38.98 (991)	15.32 (390)	13.11 (333)	62.17 (1580)	13.25 (337)	12.21 (311)	62.23 (1581)	711 (323)
CRN 120-2	50	3	38.98 (991)	16.88 (429)	14.12 (359)	66.79 (1697)	13.25 (337)	12.21 (311)	61.73 (1568)	742 (337)
CRN 120-3-2	60	3	45.08 (1146)	19.00 (483)	14.90 (379)	75.87 (1928)	15.12 (385)	13.19 (336)	71.21 (1809)	943 (428)
CRN 120-3-1	60	3	45.08 (1146)	19.00 (483)	14.90 (379)	75.87 (1928)	15.12 (385)	13.19 (336)	71.21 (1809)	943 (428)
CRN 120-3	75	3	45.08 (1146)	19.00 (483)	14.90 (379)	75.87 (1928)	15.18 (386)	13.19 (336)	71.21 (1809)	1052 (478)
CRN 120-4-2	75	3	51.69 (1313)	19.00 (483)	14.90 (379)	82.48 (2095)	15.18 (386)	13.19 (336)	77.82 (1977)	1206 (548)
CRN 120-4-1	100	3	51.69 (1313)	19.00 (483)	17.38 (442)	82.51 (2096)	15.12 (385)	13.19 (336)	79.07 (2009)	1475 (670)
CRN 120-4	100	3	51.69 (1313)	19.00 (483)	17.38 (442)	82.51 (2096)	15.12 (385)	13.19 (336)	79.07 (2009)	1475 (670)
CRN 120-5-2	100	3	57.80 (1469)	19.00 (483)	17.38 (442)	88.62 (2251)	15.12 (385)	13.19 (336)	85.18 (2164)	1497 (680)
CRN 120-5-1[3)]	125	3	57.80 (1469)	-	-	-	16.81 (427)	16.39 (417)	88.77 (2255)	1200 (545)

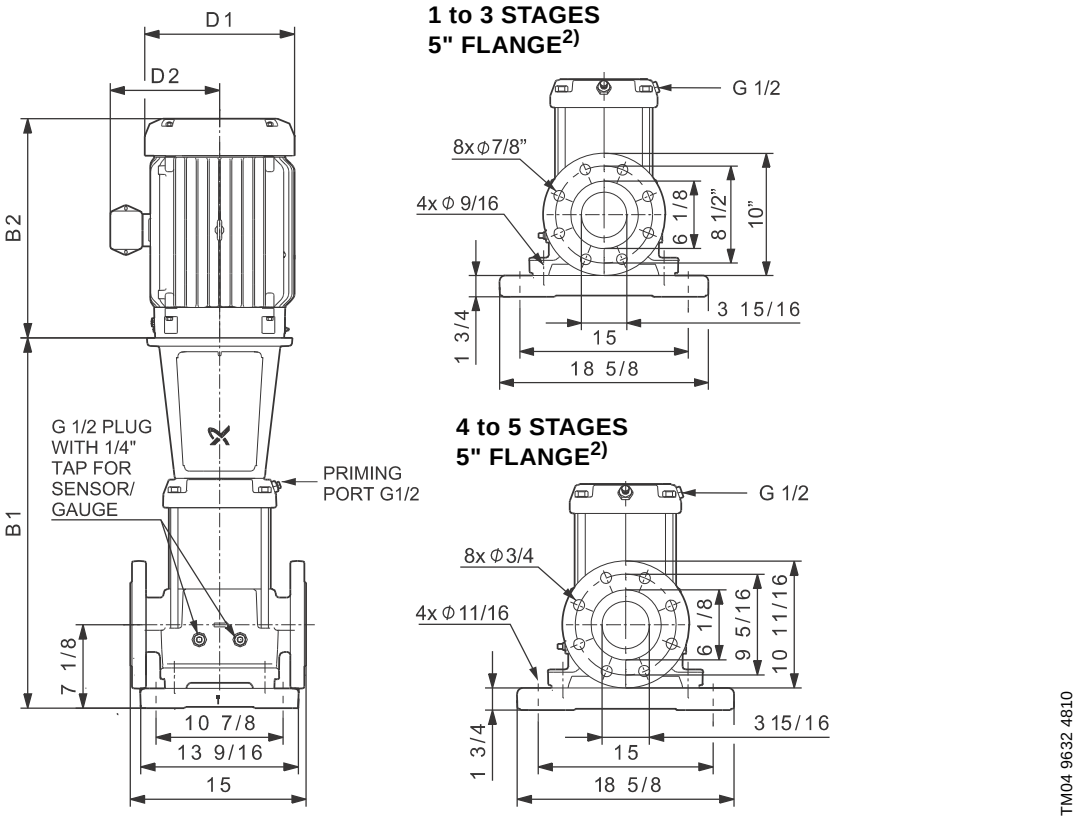
1) Weights are based on pump with TEFC motor (see price list for individual weights).

2) This is a 5" loose flange ring. When using a 5" mating flange, the gasket contact surface is reduced to approximately 0.25". A 4" loose flange ring is available for 4" pipe work. This will provide a standard gasket contact surface. Also available is a 6" ANSI flange adapter manufactured to ANSI B16.5 specifications.

3) CRN 120-5-1, 125 Hp, ODP motor only.

All dimensions in inches unless otherwise noted.

CR 150



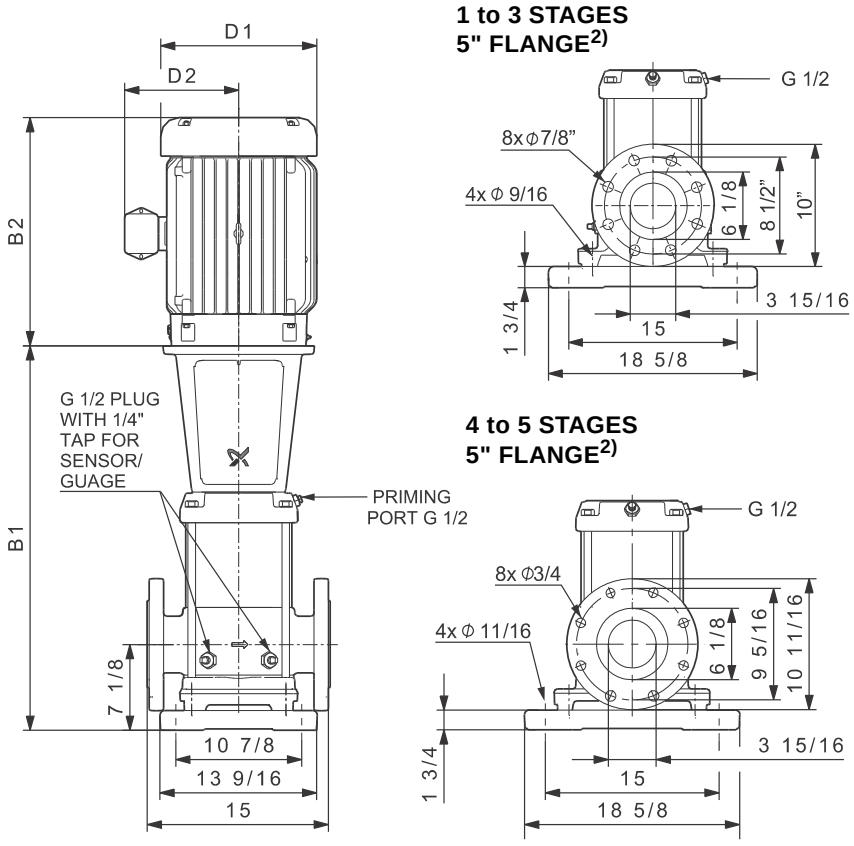
Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.1) [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CR 150-1-1	25	3	32.83 (834)	12.36 (314)	8.00 (204)	55.22 (1403)	11.50 (293)	8.94 (228)	53.64 (1363)	424 (193)
CR 150-1	30	3	32.83 (834)	12.36 (314)	8.00 (204)	55.22 (1403)	11.50 (293)	8.94 (228)	54.64 (1388)	490 (223)
CR 150-2-2	40	3	38.98 (991)	15.32 (390)	13.11 (333)	62.17 (1580)	13.25 (337)	12.21 (311)	62.23 (1581)	705 (320)
CR 150-2-1	50	3	38.98 (991)	16.88 (429)	14.12 (359)	66.79 (1697)	13.25 (337)	12.21 (311)	61.73 (1568)	735 (334)
CR 150-2	60	3	38.98 (991)	19.00 (483)	14.90 (379)	69.77 (1773)	15.12 (385)	13.19 (336)	65.11 (1654)	915 (416)
CR 150-3-2	75	3	45.55 (1157)	19.00 (483)	14.90 (379)	76.34 (1940)	15.18 (386)	13.19 (336)	71.68 (1821)	1178 (535)
CR 150-3-1	75	3	45.55 (1157)	19.00 (483)	14.90 (379)	76.34 (1940)	15.18 (386)	13.19 (336)	71.68 (1821)	1178 (535)
CR 150-3	100	3	45.55 (1157)	19.00 (483)	17.38 (442)	76.37 (1940)	15.12 (385)	13.19 (336)	72.93 (1853)	1215 (552)
CR 150-4-2	100	3	51.69 (1313)	19.00 (483)	17.38 (442)	82.51 (2096)	15.12 (385)	13.19 (336)	79.07 (2009)	1234 (560)
CR 150-4-1	100	3	51.69 (1313)	19.00 (483)	17.38 (442)	82.51 (2096)	15.12 (385)	13.19 (336)	79.07 (2009)	1234 (560)

1) Weights are based on pump with TEFC motor (see price list for individual weights).

2) This is a 5" loose flange ring. When using a 5" mating flange, the gasket contact surface is reduced to approximately 0.25". A 4" loose flange ring is available for 4" pipe work. This will provide a standard gasket contact surface. Also available is a 6" ANSI flange adapter manufactured to ANSI B16.5 specifications.

All dimensions in inches unless otherwise noted.

CRN 150



TM04 9633 4810

Pump type	P2 [Hp]	Ph.	ANSI dimensions [inch (mm)]							Ship. wt.1) [lbs (kg)]
			B1	TEFC			ODP			
				D1	D2	B1+B2	D1	D2	B1+B2	
CRN 150-1-1	25	3	32.83 (834)	12.36 (314)	8.00 (204)	55.22 (1403)	11.50 (293)	8.94 (228)	53.64 (1363)	431 (196)
CRN 150-1	30	3	32.83 (834)	12.36 (314)	8.00 (204)	55.22 (1403)	11.50 (293)	8.94 (228)	54.64 (1388)	496 (225)
CRN 150-2-2	40	3	38.98 (991)	15.32 (390)	13.11 (333)	62.17 (1580)	13.25 (337)	12.21 (311)	62.23 (1581)	711 (323)
CRN 150-2-1	50	3	38.98 (991)	16.88 (429)	14.12 (359)	66.79 (1697)	13.25 (337)	12.21 (311)	61.73 (1568)	741 (337)
CRN 150-2	60	3	38.98 (991)	19.00 (483)	14.90 (379)	69.77 (1773)	15.12 (385)	13.19 (336)	65.11 (1654)	922 (419)
CRN 150-3-2	75	3	45.55 (1157)	19.00 (483)	14.90 (379)	76.34 (1940)	15.18 (386)	13.19 (336)	71.68 (1821)	1184 (538)
CRN 150-3-1	75	3	45.55 (1157)	19.00 (483)	14.90 (379)	76.34 (1940)	15.18 (386)	13.19 (336)	71.68 (1821)	1184 (538)
CRN 150-3	100	3	45.55 (1157)	19.00 (483)	17.38 (442)	76.37 (1940)	15.12 (385)	13.19 (336)	72.93 (1853)	1222 (555)
CRN 150-4-2	100	3	51.69 (1313)	19.00 (483)	17.38 (442)	82.51 (2096)	15.12 (385)	13.19 (336)	79.07 (2009)	1243 (564)
CRN 150-4-1	100	3	51.69 (1313)	19.00 (483)	17.38 (442)	82.51 (2096)	15.12 (385)	13.19 (336)	79.07 (2009)	1243 (564)

1) Weights are based on pump with TEFC motor (see price list for individual weights).

2) This is a 5" loose flange ring. When using a 5" mating flange, the gasket contact surface is reduced to approximately 0.25". A 4" loose flange ring is available for 4" pipe work. This will provide a standard gasket contact surface. Also available is a 6" ANSI flange adapter manufactured to ANSI B16.5 specifications.

All dimensions in inches unless otherwise noted.

11. Motor data

Standard motors in the CR range

Motors used in the CR pump range are:

- Grundfos ML motors
- Grundfos specified **Baldor® motors**.

The information in the tables below applies to following motors type and size:

Type	Phase	Motor range [Hp]	Cooling method
ML	3	1/3 - 30	TEFC
Baldor	1	1/3 - 10	TEFC
	3	40 - 100	TEFC
	3	15 - 125	ODP

Grundfos CR pumps are supplied with heavy-duty 2-pole, NEMA energy efficient C-frame motors built or selected to our rigid specifications. All CR pump motors have heavy-duty bearings for maximum thrust requirements.

It is not recommended that an off-the-shelf standard Baldor motor be used on a Grundfos pump. Ideally, the best motor choice would be the Grundfos specified motor.

Single-phase Grundfos specified motors up to 7.5 Hp have a built-in thermal overload switch.

Other motor types are available (i.e., Explosion proof, Mill and Chem duty, Premium Efficiency, etc.); consult local Grundfos company for more information.

Pumps supplied by Grundfos Canada are normally supplied with motors from other manufactures. 575 volt motors meet NEMA energy efficient standards. Dimensions and data will vary, contact local Grundfos company for more information.

All values are subject to change without notice.

ODP motors

(Open Drip Proof, constant speed)

Hp	Ph	ODP frame	ODP S.F.	ODP voltage [V]	ODP motor eff. %	ODP insul. class	ODP KVA code	ODP full load current	ODP service factor current	ODP starting current
15	3	254TCZ	1.15	208-230/460	89.5	F	H	37-35/17.5	40-39.4/19.7	225-248/124
20	3	254TC	1.15	230/460	90.2	B	G	48/24	55/27.5	306/153
25	3	284TSCZ	1.15	208-230/460	91	B	G	64-59/29.5	74-67/33.5	335-374/187
30	3	284TSC	1.15	230/460	91	F	H	70/35	80/40	480/240
40	3	286TSCZ	1.15	230/460	91.7	F	F	94/47	108/54	542/271
50	3	324TSCZ	1.15	230/460	92.4	F	G	116/58	134/67	706/353
60	3	324TSCZ	1.15	230/460	93	B	G	132/66	152/76	844/422
75	3	364TSCZ	1.15	230/460	93	F	G	168/84	192/96	1110/555
100	3	365TSCZ	1.15	230/460	93	F	G	226/113	260/130	1380/690
125	3	405TSCZ	1.15	460	93.6	B	G	140	171	897

Baldor motor

TM02 7696 3803

TEFC motors

(Totally Enclosed Fan Cooled, constant speed)

Baldor motor

TM02 7696 3803

Grundfos ML motors

Gr7848sh

GR 7845

TM04 2512 2708

Hp	Ph	Frame	S.F.	Voltage [V]	Motor eff. [%]	Insul. class	KVA code	Full load current [A]	Service factor current [A]	Starting current [A]	Motor type
1/3	1	56C	1.35	115/230	55	B	K	6.0/3.0	7.6/3.8	28/14	Baldor
	3	56C	1.35	208-230/460	78.5	F	L	1.12-1.1/0.55	1.5-1.45/0.75	7.1-7.7/3.9	ML
1/2	1	56C	1.6	115/230	62	B	K	7.4/3.7	9.8/4.9	39/19.5	Baldor
	3	56C	1.25	208-230/460	78.5	F	K	1.64-1.55/0.78	2.0-1.9/0.95	9.7-10.1/5.1	ML
3/4	1	56C	1.25	115/230	66	B	K	9.6/4.8	11.4/5.7	56/28	Baldor
	3	56C	1.25	208-230/460	79	F	K	2.4-2.3/1.2	2.9-2.75/1.4	14.2-15/7.8	ML
1	1	56C	1.25	115/230	66	B	K	12/6.0	14.4/7.2	77/38.5	Baldor
	3	56C	1.25	208-230/460	80	F	J	3.25-3.35/1.68	4.0-3.9/1.95	19.2-21.8/10.9	ML
1 1/2	1	56C	1.3	115/208-230	71	B	K	17/9.5-8.6	20.4/11.3-10.2	106/58.6-53	Baldor
	3	56C	1.15	208-230/460	84	F	M	4.7-4.6/2.3	5.2-5.1/2.55	33.8-36.8/18.4	ML
2	1	56C	1.15	115/208-230	74	F	K	23/12.7-11.5	25.4/14.0-12.7	156/86-78	Baldor
	3	56C	1.15	208-230/460	85.5	F	G	5.7-5.4/2.7	6.55-6.1/3.05	46.2-48.6/24.3	ML
3	1	182TC	1.15	115/208-230	75	F	H	29/16-14.5	31.8/18-15.9	170/94-85	Baldor
	3	182TC	1.15	208-230/460	86.5	F	M	8.35-7.50/3.75	9.10-8.15/4.10	86.8-78.0/39.0	ML
5	1	213TCZ	1.15	208-230	80	F	J	24-22	27-25	188-170	Baldor
	3	182TC	1.15	208-230/460	88.5	F	L	14.1-13.1/7.29	16.2-15.0/8.4	207-193/107	ML
7 1/2	1	213TC	1.15	208-230	82	F	F	33.8-31	38.5-35.5	244-220	Baldor
	3	213TC	1.15	208-230/460	89.5	F	N	19.5-18.1/9.09	22.4-20.8/10.4	289-267/135	ML
10	1	213TC	1.15	230	85.5	F	F	40	46	284	Baldor
	3	215TC	1.15	208-230/460	90.2	F	K	26.5-24.6/12.4	29.0-27.0/13.6	261-243/123	ML
15	3	254TC	1.15	208-230/460	91	F	J	37.5-34/17	41.0-37.5/18.6	369-338/168	ML
20	3	254TC	1.15	208-230/460	91	F	K	50.5-46/23	55.5-50.5/25.5	450-410/207	ML
25	3	284TSC	1.15	230/460	91.7	F	J	62.0-56/28	68.0-61.5/31.0	510-462/233	ML
30	3	286TSC	1.15	230/460	91.7	F	H	74.0-67.0/33.5	81.5-73.5/37.0	595-537/271	ML
40	3	286TSC	1.15	230/460	91.7	F	G	88/44	102/51	614/307	Baldor
50	3	326TSC	1.15	230/460	93	F	G	110/55	128/64	746/393	Baldor
60	3	364TSC	1.15	230/460	93	F	G	134/67	154/77	918/459	Baldor
75	3	365TSC	1.15	230/460	93	F	G	166/83	188/94	1162/581	Baldor
100	3	405TSC	1.15	230/460	93.6	F	G	216/108	246/123	1422/711	Baldor

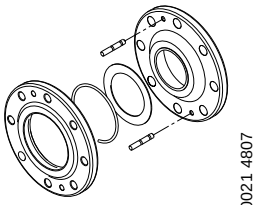
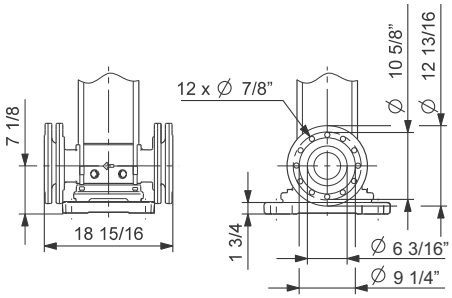
12. Accessories

Pipework connections

For pipework connection, various sets of counter flanges and couplings are available.

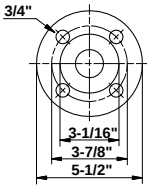
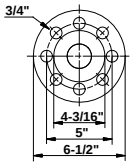
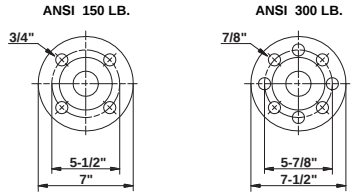
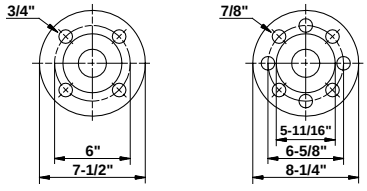
Adapter kit

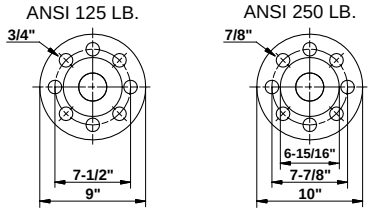
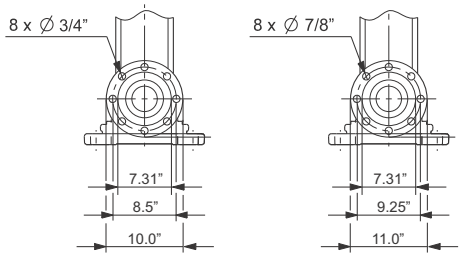
6" flanges are available for CR, CRN 120 and 150 pumps. To use 6" flanges, two adapter kits must be ordered per pump.

Adapter kit	Pump type	Pipe connection	Number of flange kits needed	Product number
 	**CR 120** **CR 150**	6" RF 250 lb. Ductile iron	2	96638184
	CRN 120 **CRN 150**	6" RF 300 lb. ANSI 316 SS	2	96638186

Counter flanges for CR

A set consists of two counter flanges, two gaskets, bolts and nuts.

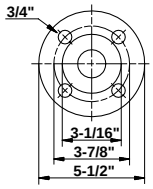
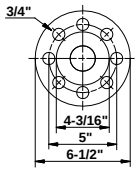
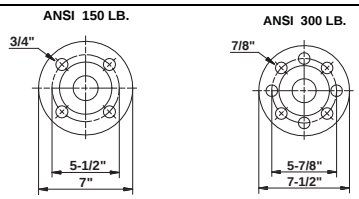
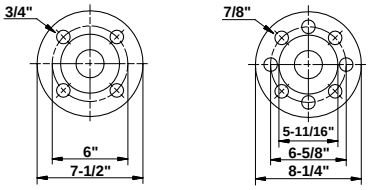
Counter flange		Pump type	Description	Pressure class	Pipework connection	Product number
	TM02 5691 3802	**CR 1s** **CR 1** **CR 3** **CR 5**	Threaded	ANSI 250 lb.	1 1/4" NPT	91122260
	TM02 5692 3802	**CR 10** **CR 15** **CR 20**	Threaded	ANSI 250 lb.	2" NPT	335021
	TM02 5693 + 5694 3802	**CR 32**	Threaded	ANSI 125 lb.	2 1/2" NPT	559601
			Threaded	ANSI 250 lb.	2 1/2" NPT	345050
	TM02 5695 + 5696 3802	**CR 45**	Threaded	ANSI 125 lb.	3" NPT	569601
			Threaded	ANSI 250 lb.	3" NPT	91121952

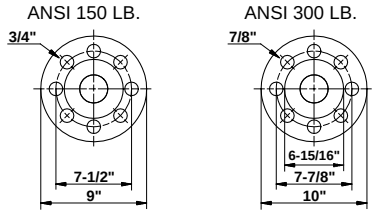
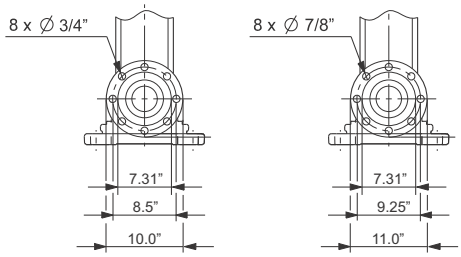
Counter flange		Pump type	Description	Pressure class	Pipework connection	Product number
 TM02 5697 + 5698 3802		**CR 64 CR 90**	Threaded	ANSI 125 lb.	4" NPT	579801
			Threaded	ANSI 250 lb.	4" NPT	3600028
 TM06 0509 1109		**CR 120 CR 150**	Threaded	ANSI 125 lb.	5" NPT	91121956
			Threaded	ANSI 250 lb.	5" NPT	91121957

Counter flanges for CRN

Counterflanges for CRN pumps are made of stainless steel according to AISI 316.

A set consists of two counter flanges, two gaskets, bolts and nuts.

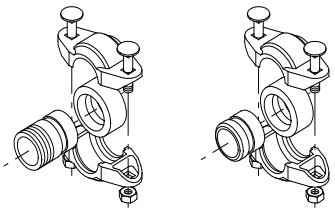
Counter flange		Pump type	Description	Pressure class	Pipework connection	Product number
 TM02 5691 3802		**CRI, CRN 1s, 1, 3 and 5**	Threaded	ANSI 300 lb.	1 1/4" NPT	91129013
 TM02 5692 3802		**CRI, CRN 10, 15, 20**	Threaded	ANSI 300 lb.	2" NPT	339919
 TM02 5693 + 5694 3802		**CRN 32**	Threaded	ANSI 150 lb.	2 1/2" NPT	91121951
			Threaded	ANSI 300 lb.	2 1/2" NPT	0ID00138
 TM02 5695 + 5696 3802		**CRN 45**	Threaded	ANSI 150 lb.	3" NPT	91121953
			Threaded	ANSI 300 lb.	3" NPT	91121954

Counter flange		Pump type	Description	Pressure class	Pipework connection	Product number
ANSI 150 LB. / ANSI 300 LB.  TM02 5697 + 5698 3802		**CRN 64 CRN 90**	Threaded	ANSI 150 lb.	4" NPT	0ID00148
			Threaded	ANSI 300 lb.	4" NPT	91121955
 TM06 0509 1109		**CRN 120 CRN 150**	Threaded	ANSI 150 lb.	5" NPT	91121958
			Threaded	ANSI 300 lb.	5" NPT	91121959

PJE couplings for CRN

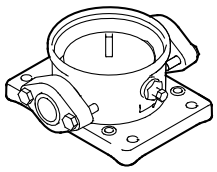
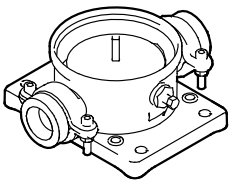
Couplings for CRN pumps are made of stainless steel according to AISI 316.

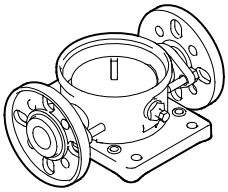
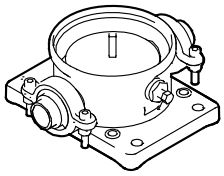
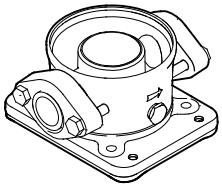
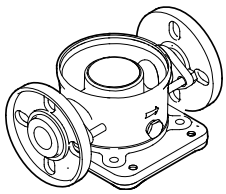
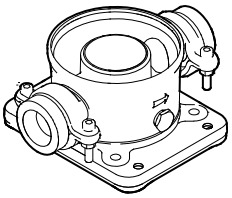
A set consists of two couplings, two gaskets, two pipe stub and bolts and nuts.

Couplings		Pump type	Pipe stub	Rated pressure	Pipework connection	Rubber parts	Number of coupling sets needed	Product number
 TM00 3808 1094		**CRI, CRN 1s, 1, 3 and 5**	Threaded	1160 psi	1 1/4" NPT	EPDM	1	4013010
						FKM	1	0ID00118
		CRI CRN 10, 15 and 20	Threaded	1015 psi	2" NPT	EPDM	1	331301
						FKM	1	0ID00128

FlexiClamp base connections

All sets comprise the necessary number of bolts and nuts as well as a gasket/O-ring.

Base connections		Pump type	Connection	Pipework connection	Rubber parts	Product number
 TM02 1144 0601		**CRI, CRN 1s, 1, 3 and 5**	Oval (cast iron)	1" NPT	Klingersil	96468491
				1 1/4" NPT	Klingersil	96470781
			Oval (stainless steel)	1" NPT	Klingersil	96480850
				1 1/4" NPT	Klingersil	96480851
 TM02 1145 0601		**CRI, CRN 1s, 1, 3 and 5**	Union ext. threaded	2" NPT	EPDM	96480852
					FKM	96480853

Base connections		Pump type	Connection	Pipework connection	Rubber parts	Product number
	TM02 1146 0601	**CRI, CRN 1s, 1, 3 and 5**	ANSI (FGJ) (stainless steel)	1 1/4" NPT	EPDM	96480858
					FKM	96480859
	TM02 1147 0601	**CRI, CRN 1s, 1, 3 and 5**	Clamp, threaded pipe stub	1" NPT	EPDM	96480854
					FKM	96480855
				1 1/4" NPT	EPDM	96480856
					FKM	96480857
	TM02 7237 2803	**CRI, CRN 10, 15 and 20**	Oval (cast iron)	2" NPT	Klingersil	96498838
			Oval (stainless steel)	2" NPT	Klingersil	96498839
	TM02 7238 2803	**CRI, CRN 10, 15 and 20**	ANSI (FGJ) (stainless steel)	2" NPT	EPDM	96511402
					FKM	96511403
	TM02 7239 2803	**CRI, CRN 10, 15 and 20**	Clamp, threaded pipe stub	1 1/2" NPT	EPDM	96500271
					FKM	96500272
				2" NPT	EPDM	96500273
					FKM	96500274
				2" NPT	EPDM	96508602
					FKM	96508603

CR flange guide

Commonly asked questions

What is the "pressure class"?

- The pressure class is a pressure rating expressed as a dimensionless number.
- Pressure class does not affect the pump working pressure.
- The class rating charts in ANSI B16.5 give actual pounds per square inch maximum allowable pressure at a given temperature.
- 150 lb, 150# or Class 150 are different ways to write the same pressure class.

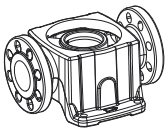
What factors determine the required pressure class?

Pressure ratings are affected by:

- Material
- sealing methods
- operating temperatures.

Are pump flanges compatible with mating flanges of a different pressure class?

- The multiflange used on a CR 1s through 20 can be used on both 125 lb and 250 lb installations.
- The multiflange on a CRI/CRN 1s through 20 can be used on both 150 lb and 300 lb installations.
- All other mating flange classes must match the pump flange class.

Pump	Flange	Size	Material	Pressure class	Mate with:
CR 1s to 5		1.25 in	Cast Iron	250 lb	125 or 250 lb
CRI, CRN 1s to 5		1.25 in	Ductile Iron	300 lb	150 or 300 lb
CR 10 to 20		2 in	Cast Iron	250 lb	125 or 250 lb
CRI, CRN 10 to 20		2 in	Ductile Iron	300 lb	150 or 300 lb

13. Variants

Lists of variants - on request

Although the Grundfos CR, CRI, CRN product range offers a number of pumps for different applications, customers require specific pump solutions to satisfy their needs.

Below please find the range of options available for customizing the CR pumps to meet the customers' demands. Contact Grundfos for further information or for requests other than the ones mentioned below.

Motors

Variant	Description
Explosion proof motors	For operation in hazardous atmospheres, explosion-proof or dust-ignition-proof motors may be required.
Motors with anti-condensation heating unit	For operation in humid environments motors with built-in anti-condensation heating may be required.
Premium efficient motors	Grundfos offers motors from 1 to 100 Hp with a Premium efficiency class.
Different motor brand	If technically possible, Grundfos can fit the pump with a motor of a brand other than the standard. This will normally increase the time of delivery. Alternatively, the pump can be supplied without a motor (motor thrust rating must be checked).
Oversized motor	Ambient temperatures above 104 °F or installation at altitudes of more than 3280 ft above sea level require the use of an oversized motor (i.e. derating).
4-pole motors	Grundfos offers standard motors fitted with 4-poles.

Connections and other variants

Variant	Description
Pipe connections	In addition to the wide range of standard flange connections, a 232 psi DIN standard clamping flange is available. Customized flanges are available according to specifications.
TriClamp connections	TriClamp connections are of a hygienic design with a sanitary coupling for use in the pharmaceutical and food industry.
Electropolished pumps	To substantially reduce the risk of corrosion of the materials. For use in the pharmaceutical/food industry.

Shaft seals

Variant	Description
Shaft seal with FFKM O-ring material	Shaft seals with FFKM or FXM o-ring material are recommended for applications where the pumped liquid may damage the standard O-ring material.
Seal with flush, quench seal	Recommended for applications involving crystallizing, hardening or sticky liquids.
Cool-Top® shaft seal system	Recommended for applications involving extremely high temperatures. No conventional mechanical shaft seal can withstand liquid temperatures of up to 356 °F for any length of time. For that type of application, Grundfos' unique air-cooled shaft seal system is recommended. In order to ensure a low liquid temperature around the standard shaft seal, the pump is fitted with a special air-cooled shaft seal chamber. No separate cooling is required.
Double shaft seal with pressure chamber	Recommended for applications involving poisonous or explosive liquids. Protects the surrounding environment and the people working in the vicinity of the pump. Consists of two seals mounted in a "back-to-back" arrangement inside a separate pressure seal chamber. As the pressure in the chamber is higher than the pump pressure, leakage is prevented. A dosing pump or a special pressure-intensifier generates the seal chamber pressure.
CRN MAGdrive	Magnetically driven pumps for industrial applications. Key applications are industrial processes involving the handling of aggressive, environmental, dangerous or volatile liquids, e.g. organic compounds, solvents, etc.

Pumps

Variant	Description
Horizontally mounted pump	For safety or height reasons, certain applications, for instance on ships, require the pump to be mounted in the horizontal position. For easy installation the pump is equipped with brackets that support motor and pump.
Low-temperature pump to -40 °F	Exposed to temperatures down to -40 °F, coolant pumps may require neck-rings with a different diameter in order to prevent impeller drag.
High-speed pump up to 681 psi	For high-pressure applications, a unique pump capable of generating up to 681 psi pressure is available. The pump is equipped with a high-speed motor, type MLE. The direction of rotation is the opposite of that of standard pumps, and the chamber stack is turned upside-down, as a result of which the pumped liquid flows in the opposite direction.
High-pressure pump up to 696 psi	For high-pressure applications, a unique double pump system capable of generating up to 696 psi pressure is available.
Low-NPSH pump (improved suction)	Recommended for boiler-feed applications where cavitation may occur due to poor inlet conditions.
Belt-driven pumps	Belt-driven pumps designed to operate in places with limited space or where no electrical power is available.
Pumps for pharmaceutical and biotechnological applications	CRN pumps designed for applications requiring the sterilization and CIP capability of pipes, valves and pumps. (CIP = Cleaning-In-Place).

This page intentionally left blank.

14. Submittal data

CR, CRI, CRN

Vertical Multistage Centrifugal Pumps

Company name:

Prepared by:

Phone number: ( )

Fax number: ( )

Date: Page 1 of:

Quote number:

Client Information

Project title:	Client name:
Reference number:	Client number:
Client contact:	Client phone number: ( )

Location Information

For:	Unit:		
Site:	Service:		
Address:	City:	State:	Zip Code:

Application Information

Operating Conditions

	Max.	Norm.	Min.
Capacity (gpm)			
Suction Pressure (psig)			
Discharge Pressure (psig)			
Differential Head (ft)			
Hydraulic Power (Hp) at designated capacity			
NPSH Available (ft)			

Pumped Fluid

Fluid type:

	Rated	Max.	Norm.
Fluid Temperature (°F) at designated temperature			
Specific Gravity			
Vapor Pressure (psia)			
Viscosity (cp)			

Fluid ph: Chlorides (ppm):

Hazardous: Corrosion/Erosion caused by:

Flammable:

Other:

Service

Continuous

Intermittent (starts/day):

Pump Information

Model Information from Type Key and Codes: ----> (Example: CR 5-10 A-FGJ-A-E-HQQE)

Quantity Required:

Minimum required flow: NPSH required at duty point:

Product Guide additional information pages

Materials page number: Performance curve page number:

Technical data page number: Motor data page number:

Motor Information

Hp: Phase: Voltage: Enclosure:

Custom-built pump information (optional):

Additional Information

This page intentionally left blank.

15. Quotation text

CR, CRI, CRN

Vertical, non-self-priming, multistage, in-line, centrifugal pump for installation in pipe systems and mounting on a foundation.

The pump has the following characteristics:

- Impellers and intermediate chambers are made of AISI _____ Stainless steel
- Pump head and base are made of _____
- Power transmission is via cast iron split coupling.
- Pipework connections is via _____
- The motor is a _____ -phase AC motor

Technical

Rated flow: _____ gpm
Rated head: _____ Feet
Minimum liquid temperature: _____ °F
Maximum liquid temperature: _____ °F
Type of shaft seal: _____

Materials

Material, pump housing: _____
Material, shaft: AISI_____ Stainless Steel
Material, impeller: AISI_____ Stainless Steel
Material, sleeve: AISI_____ Stainless Steel
Material, seal metal: AISI_____ Stainless Steel

- seal face: _____
- seal face _____
- seal elastomer: _____

Installation

Maximum ambient temperature: _____ °F
Max. pressure at stated temp.: _____ PSI / °F
Standard, pipe connection: _____
Size, pipe connection: _____
Rated pressure, pipe connection: _____ PSI
Frame size for motor: _____ NEMA

Electrical data

Motor type: _____
Rated power (P2): _____ Hp
Frequency: _____ Hz
Rated voltage: _____ V
Rated current: _____ A
Service factor: _____
Starting current: _____ A
Rated speed: _____ RPM
Full load motor efficiency: _____ %
Insulation class: _____

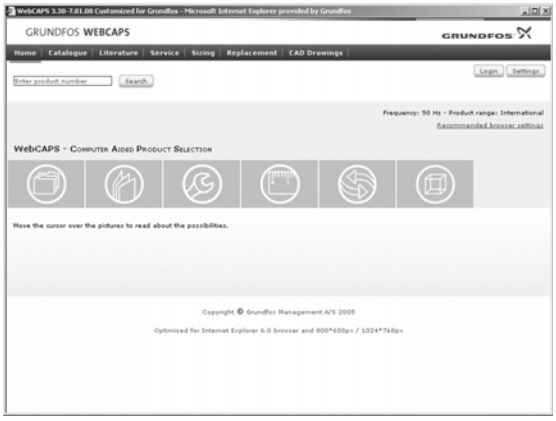
Additional

Gross weight: _____ Lbs.
Shipping volume: _____
Model: _____

This page intentionally left blank.

16. Further product information

WebCAPS

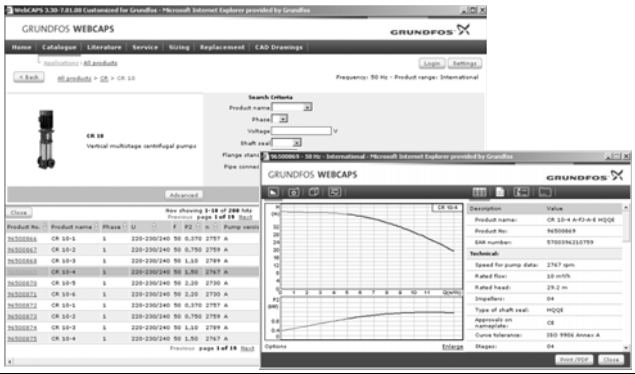


WebCAPS is a **Web**-based **C**omputer **A**ided **P**roduct **S**election program available on www.grundfos.us.

WebCAPS contains detailed information on more than 220,000 Grundfos products in more than 30 languages.

Information in WebCAPS is divided into six sections:

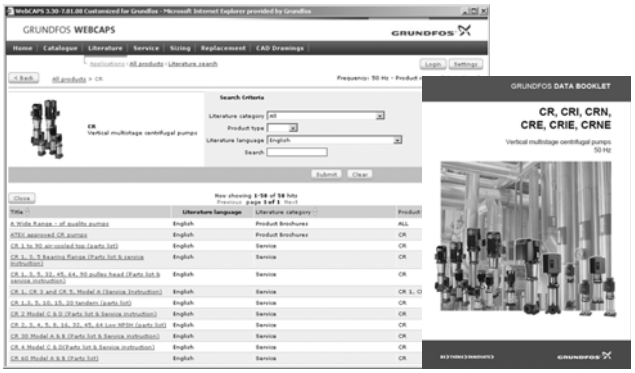
- catalog
- literature
- service
- sizing
- replacement
- cad drawings.



Catalog

Based on fields of application and pump types, this section contains the following:

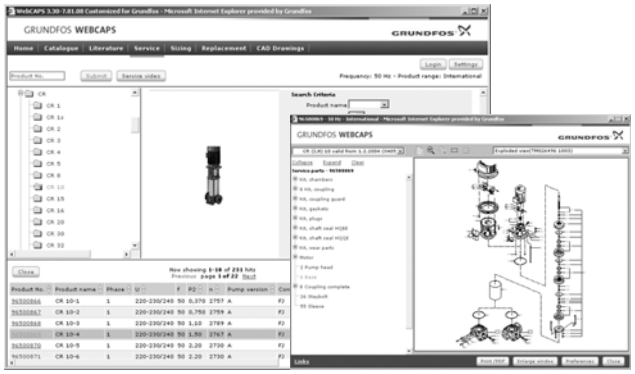
- technical data
- curves (QH, Eff, P1, P2, etc.) which can be adapted to the density and viscosity of the pumped liquid and show the number of pumps in operation
- product photos
- dimensional drawings
- wiring diagrams
- quotation texts, etc.



Literature

This section contains all the latest documents of a given pump, such as

- data booklets
- installation and operating instructions
- service documentation, such as service kit catalog and service kit instructions
- quick guides
- product brochures.



Service

This section contains an easy-to-use interactive service catalog. Here you can find and identify service parts of both existing and discontinued Grundfos pumps.
Furthermore, the section contains service videos showing you how to replace service parts.

Sizing

This section is based on different fields of application and installation examples and gives easy step-by-step instructions in how to size a product:

- Select the most suitable and efficient pump for your installation.
- Carry out advanced calculations based on energy, consumption, payback periods, load profiles, life cycle costs, etc.
- Analyze your selected pump via the built-in life cycle cost tool.
- Determine the flow velocity in wastewater applications, etc.

Replacement

In this section you find a guide to selecting and comparing replacement data of an installed pump in order to replace the pump with a more efficient Grundfos pump.
The section contains replacement data of a wide range of pumps produced by other manufacturers than Grundfos.

Based on an easy step-by-step guide, you can compare Grundfos pumps with the one you have installed on your site. When you have specified the installed pump, the guide will suggest a number of Grundfos pumps which can improve both comfort and efficiency.

CAD drawings

In this section, it is possible to download 2-dimensional (2D) and 3-dimensional (3D) CAD drawings of most Grundfos pumps.

These formats are available in WebCAPS:

2-dimensional drawings:

- .dxf, wireframe drawings
- .dwg, wireframe drawings.

3-dimensional drawings:

- .dwg, wireframe drawings (without surfaces)
- .stp, solid drawings (with surfaces)
- .eprt, E-drawings.

WinCAPS

Fig. 20 WinCAPS DVD

WinCAPS is a **Win**dows-based **C**omputer **A**ided **P**roduct **S**election program containing detailed information on more than 220,000 Grundfos products in more than 30 languages.

The program contains the same features and functions as WebCAPS, but is an ideal solution if no internet connection is available.

WinCAPS is available on DVD and updated once a year.

Grundfos GO

Mobile solution for professionals on the GO!

Grundfos GO is the mobile tool box for professional users on the go. It is the most comprehensive platform for mobile pump control and pump selection including sizing, replacement and documentation. It offers intuitive, handheld assistance and access to Grundfos online tools, and it saves valuable time for reporting and data collection.

GET IT ON Google play

Available on the App Store

Subject to alterations.

be think innovate

L-CR-PG-001

98446676 0414

ECM: 1134614

Grundfos Kansas City
17100 West 118th Terrace
Olathe, Kansas 66061
Phone: 913-227-3400
Fax: 913-227-3500
www.grundfos.us

Grundfos Canada
2941 Brighton Road
Oakville, Ontario L6H 6C9 Canada
Phone: +1-905-829-9533
Fax: +1-905-829-9512
www.grundfos.ca

Grundfos México
Boulevard TLC No. 15
Parque Industrial Stiva Aeropuerto
C.P. 66600 Apodaca, N.L. Mexico
Phone: 011-52-81-8144 4000
Fax: 011-52-81-8144 4010
www.grundfos.mx

GRUNDFOS

CM, CME

Horizontal, multistage centrifugal pumps

50/60 Hz

be
think
innovate

GRUNDFOS

Table of contents

1. Product introduction

The Grundfos CM and CME pumps are horizontal, multistage, end-suction centrifugal pumps. The pumps are of the close-coupled type and available as either self-priming or non-self-priming pumps. CM pumps are fitted with mains-operated motors whereas the motor for CME pumps has an integrated frequency converter. Both CM and CME pumps have mechanical shaft seals.

The CM and CME pumps are available in these three material versions:

- cast iron (EN-GJL-200)*
- stainless steel (EN 1.4301/AISI 304)
- stainless steel (EN 1.4401/AISI 316).

* The pump shaft, impeller, chamber and filling plugs are made of stainless steel (EN 1.4301/AISI 304).

CM

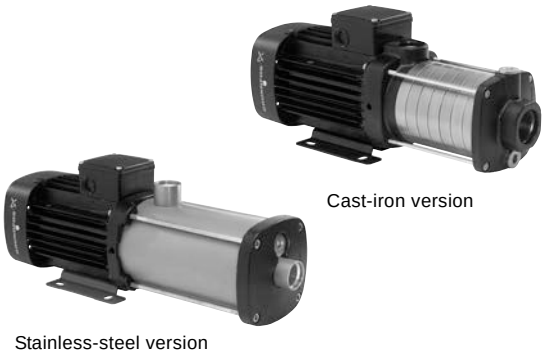


Fig. 1 Grundfos CM pumps

The CM pumps are unique products that have been developed in order to fulfil a wide variety of customer demands. The development of the pumps has resulted in no less than five patent applications.

The CM pumps are available in various sizes and numbers of stages to provide the flow and pressure required.

The CM pumps consist of two main components: the motor and the pump unit. The motor is a Grundfos motor designed to EN standards. The pump unit incorporates optimised hydraulics and offers various types of connections.

The pumps offer many advantages, some of which are listed below and described in detail in *Features and benefits* on page 10:

- compact design
- worldwide usage
- high reliability
- service friendly
- wide performance range
- low noise
- customised solutions.

CME

TM06 6197 0816

Fig. 2 Grundfos CME pump

The CME pumps are built on the basis of CM pumps.

CME pumps belong to the so-called E-pump family.

The difference between the CM and the CME pump ranges is the motor.

The CME pump motor is a Grundfos MGE motor designed to EN standards. The motor incorporates a frequency converter.

Frequency control enables continuously variable control of the motor speed, which makes it possible to set the pump to operation at any duty point. The aim of continuously variable control of the motor speed is to adjust the performance to a given requirement.

You can connect a pressure sensor to the built-in frequency converter on CME pumps. For further information, see section *Sensors for CME* on page 137.

The pump materials are identical to those of the CM pump range.

Highest energy efficiency rating worldwide

CME pumps are fitted with the new-generation MGE motors which are permanent-magnet motors incorporating a high-efficiency frequency converter. This ensures an even higher efficiency of the pump.

The motor is energy efficiency class IE5 according to IEC60034-30-2. In combination with the integrated frequency converter, the combined power drive system is efficiency class IES2 according to IEC50598-2.

Selecting a CME pump

Select a CME pump if the following features are required:

- controlled operation, i.e. consumption fluctuates
- constant pressure
- communication with the pump.

Adaptation of performance through frequency-controlled speed offers obvious benefits such as:

- energy savings
- increased comfort
- control and monitoring of the application and pump performance.

For further information about CME pumps, see *CME pumps* on page 29.

2. Overview

Applications

Pages 8 and 9

Identification

Page 12

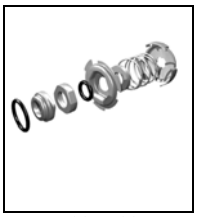
Product range

Pages 13 and 14

Operating conditions

Pages 19 to 22

Construction



Pages 23 to 28

Certificates and approvals


Certificate of compliance w

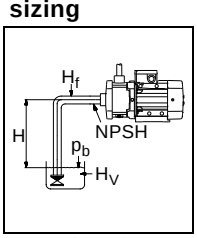
EN 10204 2.1

Customer name	
Customer order no.	
Customer Tag no.	
GRUNDFOS order no.	
Product type	

We the undersigned hereby guarantee and certify that the mat
above mentioned product were manufactured, tested, inspecte
quirements of the appropriate catalogues, drawings and/or spe

Pages 33 and 34

Selection and sizing

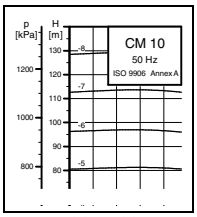


Pages 36 to 37

Pipe connections

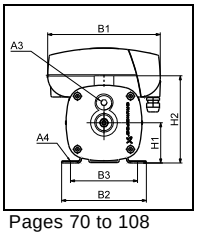
Pages 37 and 130

Performance curves



Pages 39 to 69

Dimensions



Pages 70 to 108

Motor data

Pages 116 to 121

Accessories

Pages 131 to 138

Customisation

Page 124

Further product information

Page 139

3. Applications

The CM and CME pumps are designed to cover a wide variety of applications, ranging from small domestic installations to large industrial systems. The pumps are therefore suitable for a wide diversity of pumping systems where the performance and material of the pump must meet specific demands.

Some of the most typical applications are mentioned below:

- washing and cleaning
- water treatment
- temperature control
- pressure boosting.

Washing and cleaning

Gr3572

Fig. 3 Washing and cleaning

CM and CME pumps can be used in washing and cleaning applications, which usually involve pumping of water containing soap or other cleaning agents.

Reference applications

Typical washing and cleaning applications:

- degreasing and washing of production equipment in industrial environments such as the food and beverage industry
- washing machines
- vehicle-washing tunnels
- mobile-washing units
- units for CIP (Cleaning In Place).

Water treatment

Gr7052

Fig. 4 Water treatment

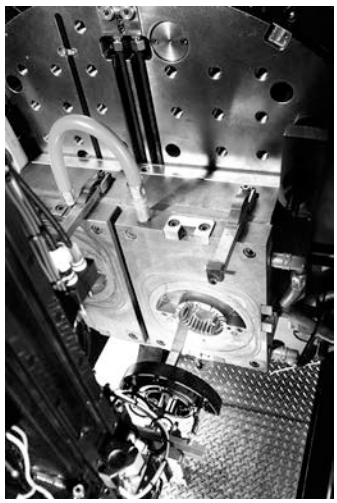
In water treatment plants, the water undergoes a process which makes it more suited for its end use. In this process, the CM and CME pumps can be utilised either as feed pumps or as booster pumps.

Reference applications

Typical water treatment applications:

- nano-, micro- and ultra-filtration systems
- softening, ionising, demineralising systems
- desalination systems
- distillation systems
- separators
- swimming baths.

Temperature control



GrA6288

Fig. 5 Temperature control

Temperature control involves applications where the CM and CME pumps circulate a liquid in a closed loop consisting of a heating or cooling element for optimising a process by means of temperature. Temperature control is also chilling of equipment or food and beverage in the food production industry.

Reference applications

The CM and CME pumps can for example be used in temperature control systems such as:

- electronic data processing
- laser equipment
- medical equipment
- industrial refrigeration
- heating and cooling in industrial processes
- moisturising and humidifying.

To ensure safe and reliable operation in applications involving temperature control, we offer CM and CME pumps designed to meet your needs!

We provide solutions for applications involving pumping of these liquids:

- liquids at temperatures down to -20 °C
- high-temperature liquids
- high-viscous liquids, etc.

Pumping of liquids at temperatures down to -20 °C

When pumping liquids at temperatures down to -20 °C, it is crucial that the pump parts are made of the right materials and have the right dimensions. At such low temperatures, the selection of wrong materials and dimensions may cause deformation because of thermal expansion, and eventually stoppage of operation.

Note: CM and CME pumps for pumping liquids at temperatures below -20 °C are available on request. Please contact Grundfos.

Pumping of high-temperature liquids

The pumping of hot liquids such as water-based liquids up to 120 °C demands much of the pump parts, such as shaft seals and rubber parts.

Pumping of high-viscous liquids

In applications where high-viscous liquids are pumped, the motor of the pump can be overloaded, and the pump performance will be reduced.

The viscosity of a pumped liquid depends strongly on the pumped liquid and its temperature.

To meet the above-mentioned requirements, we offer CM and CME pumps with oversize motors.

Pressure boosting

Gr0526

Fig. 6 Pressure boosting

In pressure-boosting applications, the pumped liquid must be delivered at a desired pressure on demand. The main priorities in pressure-boosting applications are to ensure maximum reliability and user comfort. Therefore, the CM and CME pumps are also ideal for such applications.

Reference applications

Typical pressure-boosting applications:

- pressure boosting and transfer of drinking water
- process-water systems.

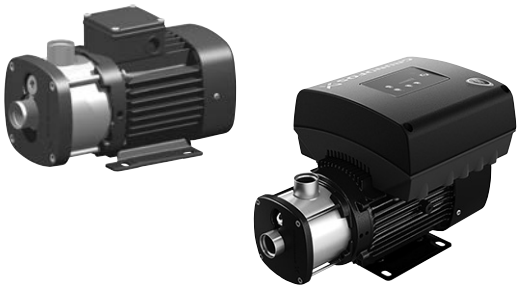
Other applications

Besides the applications mentioned above, the CM and CME pumps can be used in many other applications.

Examples:

- distilling systems
- dosing/mixing
- evaporation
- comprised machinery
- chemical industry
- pharmaceutical industry.

4. Features and benefits



TM04 3509 4508 - TM06 6197 0816

Fig. 7 CM and CME pumps

CM and CME pumps present the following features and benefits:

Compact design

Pump and motor are integrated in a compact and user-friendly design. The pump is fitted to a low-profile base plate, making it ideal for installation in systems where compactness is important.

Modular construction/customised solutions

The modular construction of the CM and CME pumps makes it easy to create many different variants based on standard factory parts. This means that it is possible to create pump variants that are customised for the application in question.

Energy-optimised pumps

CM and CME pumps are energy-optimised and comply with the EuP Directive (Commission Regulation (EC) No 547/2012) in which most pumps are classified/graduated in a new energy efficiency index (MEI). See also page 18.

Worldwide usage

- With different voltage and frequency combinations, the CM and CME product ranges cover markets worldwide.
- The CM and CME product ranges have been approved and are marked for worldwide usage. See *Approvals and markings* on page 32.

High reliability

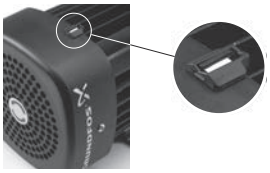
New state-of-the-art shaft seal design and materials offering these benefits:

- high wear resistance and long operating life
- improved sticking and dry-running capabilities.

The pumps are less sensitive to impurities in the pumped liquid than similar pumps of the canned-rotor type.

Easy installation and commissioning

- A Quick Guide supplied with the CM pump enables easy installation and commissioning. Detailed multilingual installation and operating instructions are available for each pump.
- An installation indicator fitted to three-phase CM pumps makes it easy to see if the electrical connection of the motor is correct. Based on the motor cooling air, it indicates the direction of rotation of the motor.



TM05 0870 1811

Fig. 8 Installation indicator

Service-friendly

- Service was in mind during the development.
- No special service tools required.
- Spare parts in stock for quick delivery.
- Service parts available as kits, single parts or bulks.
- Service instructions and video make it simple to disassemble and assemble the pump.
- Service kit instructions available where estimated necessary.

Additional features and benefits for self-priming pumps

The CM self-priming pump can create a suction lift of up to 8 metres in less than 5 minutes when installed and commissioned correctly.

- The pump is available in stainless steel 1.4301 with EPDM or Viton O-rings.
- The pump is available for single-phase operation as standard and for three-phase operation on request.

Wide performance range

Can be used in a wide range of applications:

- washing and cleaning
- water treatment
- temperature control
- pressure boosting
- chemical industry
- pharmaceutical industry
- etc.

Product range in the Grundfos Product Center (http://product-selection.grundfos.com/).

Low noise level

The CM and CME pumps offer very silent operation.

High-performance hydraulics

Pump efficiency is maximised by the optimised hydraulics and carefully crafted production technology.

Electrocoated cast-iron parts

- optimised corrosion resistance
- better efficiency because of smooth surfaces.

Customised solutions

It is possible to create many different variants of the CM and CME pumps. For further information, see *Customisation* on page 124.

- motor adaptation
- pump body modifications.

Grundfos motor

Grundfos motors are remarkably silent and highly efficient.

Grundfos motors are available with integrated frequency converter designed for speed-controlled operation.

Data and literature about the CM and CME pumps

All literature and technical data related to CM and CME pumps are available on line in the Grundfos Product Center (http://product-selection.grundfos.com/).

5. Identification

Example CM 10 - 3 A - R - I - E - A V B E F - A - A - N

Type range

CM: Centrifugal Modular

CME: Centrifugal Modular with integrated frequency converter

Rated flow rate

Rated flow rate at 50 Hz [m^3/h]

Number of impellers

Pump version

A: Basic version

B: Oversize motor (one kW size larger)

D: Special nameplate

E: Pumps with certificates/approvals

N: CME pump with pressure sensor

P: Undersize motor (one kW size smaller)

T: Oversize motor (two kW sizes larger)

O: Self-priming version (maximum suction lift 8 metres)

S: Self-priming version (maximum suction lift 4 metres)

X: Special pump

Note: Two letters symbolise that two parameters have been combined.

Pipe connection

C: Tri-Clamp®

F: DIN/ANSI/JIS flange

P: Victaulic® coupling

R: Whitworth thread Rp (ISO 7/1)

S: Internal NPT thread

Materials in contact with pump media

A:	Inlet and outlet parts	EN-GJL-200
	Pump shaft	EN 1.4301/AISI 304
	Impellers/chambers	EN 1.4301/AISI 304
G:	Sleeve	EN 1.4401/AISI 316
	Pump shaft	EN 1.4401/AISI 316
	Impellers/chambers	EN 1.4401/AISI 316
I:	Sleeve	EN 1.4301/AISI 304
	Pump shaft	EN 1.4301/AISI 304
	Impellers/chambers	EN 1.4301/AISI 304
X:	Special version	

Rubber parts in pump (excluding neck ring and shaft seal)

E: EPDM (ethylene propylene)

K: FFKM (perflour)

V: FKM (flour)

Note: Gaskets between chambers of cast-iron versions are always made of Tesnit® BA-U

Shaft seal

A: O-ring seal with fixed driver

R: O-ring seal with fixed driver and reduced seal face

Material of rotating seal face

Q: Silicon carbide (SIC)

V: Aluminium oxide (AI203)

U: Tungsten carbide

Material of stationary seal face

B: Carbon, resin-impregnated

Q: Silicon carbide (SIC)

U: Tungsten carbide

Material of secondary seal

E: EPDM (ethylene propylene)

K: FFKM (perflour)

V: FKM (flour)

Supply voltage

A: 1 x 220 V, 60 Hz

B: 1 x 115/230 V, 60 Hz

B1: 1 x 115/230 V, 60 Hz, with terminal board

C: 1 x 220-240 V, 50 Hz

D: 1 x 127 V, 60 Hz

E: 3 x 208-230/440-480 V, 60 Hz

E1: 3 x 208-230/440-480 V, 60 Hz, with terminal board

F: 3 x 220-240/380-415 V, 50 Hz

G: 3 x 200/346 V, 50 Hz; 200-220/346-380 V, 60 Hz

H: 3 x 575 V, 60 Hz[1)]

I: 3 x 400 V, 50/60 Hz[1)]

J: 3 x 380-415 V, 50 Hz; 440-480 V, 60 Hz

O: 3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz

Q: 3 x 208-230 V, 50/60 Hz (E-motor)

R: 3 x 200-230 V, 50/60 Hz (E-motor)

S: 3 x 380-500 V, 50/60 Hz (E-motor)

T: 3 x 440-480 V, 50/60 Hz (E-motor)

U: 1 x 200-240 V, 50/60 Hz (E-motor)

X: Special voltage

Motor information

A: Standard motor (IP55)

B: Phase-insulated motor for use with frequency converter

C: Condensing environments

D: Pt100 in stator

E: Angular contact bearing

F: Motor heater

G: Three-phase motor with overload protection

H: Single-phase motor with no protection

I: Radio communication not available

J: IPX5

Mains plug

A: Prepared for cable glands

B: Harting plug

C: With cable

D: Cable gland included

Sensor

N: No sensor

1) Only available with IE2 efficiency motors.

Note: The type key cannot be used for ordering as not all combinations are possible.

6. Product range

CM, CME

Pump type	50 Hz			60 Hz			Shaft seal			Mains-operated motor										Electronically speed-controlled motor				
										50 Hz		60 Hz				50/60 Hz								
	Material			Material						Voltage [V]		Voltage [V]				Voltage [V]				Voltage [V]				
	Cast iron EN-GJL-200 (CM-A)	Stainless steel EN 1.4301/AISI 304 (CM-I)	Stainless steel EN 1.4401/AISI 316 (CM-G)	Cast iron EN-GJL-200 (CM-A)	Stainless steel EN 1.4301/AISI 304 (CM-I)	Stainless steel EN 1.4401/AISI 316 (CM-G)	AVBE, AVBV	AQQE, AQQV, AQBE, AQBV, AQQK	RUUE, RUUV	1 x 220-240 V (supply voltage C)	3 x 220-240/380-415 V (supply voltage F)	1 x 220 V (supply voltage A)	1 x 115/230 V (supply voltage B/B1)[4]	1 x 127 V (supply voltage D)[1]	3 x 208-230/440-480 V (supply voltage E/E1)[4]	3 x 575 V (supply voltage H)[5]	3 x 220-240/380-415 V, (50 Hz)/ 3 x 220-255/380-440 V, (60 Hz) (supply voltage O)	3 x 380-415 V, (50 Hz)/ 3 x 440-480 V, (60 Hz) (supply voltage J)	3 x 200 V/346 V, (50 Hz) 3 x 200-220/346-380 V, (60 Hz) (supply voltage G)	3 x 400 V, (50/60 Hz) (supply voltage I)[5]	3 x 200-230 V, 50/60 Hz (supply voltage R)	3 x 208-230 V, 50/60 Hz (supply voltage Q)	3 x 380-500 V, (50/60 Hz) (supply voltage S)	3 x 440-480 V, (50/60 Hz) (supply voltage T)	1 x 200-240 V, (50/60 Hz) (supply voltage U)
CM 1-2	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 1-3	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 1-4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 1-5	•	•	•	•	•	•	•	•	•[2]	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 1-6	•	•	•		•	•	•	•	•[2]	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 1-7	•	•	•		•	•	•	•		•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 1-8	•	•	•		•	•	•[2]	•		•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 1-9		•	•		•	•	•[2]	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CM 1-10		•	•				•[2]	•		•	•														
CM 1-11		•	•					•[3]		•	•														
CM 1-12		•	•					•[3]		•	•														
CM 1-13		•	•					•[3]		•	•														
CM 1-14		•	•					•[3]		•	•														
CM 3-2	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 3-3	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 3-4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 3-5	•	•	•	•	•	•	•	•	•[2]	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 3-6	•	•	•		•	•	•	•	•[2]	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CM 3-7	•	•	•		•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CM 3-8	•	•	•		•	•	•[2]	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
CM 3-9		•	•		•	•	•[2]	•		•	•				•	•	•	•	•	•	•	•	•	•	
CM 3-10		•	•				•[2]	•		•	•														
CM 3-11		•	•					•[3]		•	•														
CM 3-12		•	•					•[3]		•	•														
CM 3-13		•	•					•[3]		•	•														
CM 3-14		•	•					•[3]		•	•														

1) On request.

2) Neither suitable for 60 Hz mains-operated pumps, nor for CME pumps running at 100 % speed.

3) Not suitable for pumping liquids at temperatures above 90 °C.

4) Pumps with supply voltages B and E are supplied for wire connection without terminal board inside the terminal box (flying wires). Pumps with supply voltages B1 and E1 are supplied with terminal board inside the terminal box.

5) Only available with IE2-compliant motors and cannot be exported to the USA.

Pump type	50 Hz			60 Hz			Shaft seal			Mains-operated motor												Electronically speed-controlled motor				
										50 Hz		60 Hz					50/60 Hz									
	Material			Material						Voltage [V]		Voltage [V]					Voltage [V]					Voltage [V]				
	Cast iron EN-GJL-200 (CM-A)	Stainless steel EN 1.4301/AISI 304 (CM-I)	Stainless steel EN 1.4401/AISI 316 (CM-G)	Cast iron EN-GJL-200 (CM-A)	Stainless steel EN 1.4301/AISI 304 (CM-I)	Stainless steel EN 1.4401/AISI 316 (CM-G)	AVBE, AVBV	AQQE, AQQV, AQBE, AQBV, AQQK	RUUE, RUUV	1 x 220-240 V (supply voltage C)	3 x 220-240/380-415 V (supply voltage F)	1 x 220 V (supply voltage A)	1 x 115/230 V (supply voltage B/B1)[4]	1 x 127 V (supply voltage D)[1]	3 x 208-230/440-480 V (supply voltage E/E1)[4]	3 x 575 V (supply voltage H)[5]	3 x 220-240/380-415 V, (50 Hz)/ 3 x 220-255/380-440 V, (60 Hz) (supply voltage O)	3 x 380-415 V, (50 Hz)/ 3 x 440-480 V, (60 Hz) (supply voltage J)	3 x 200 V/346 V, (50 Hz) 3 x 200-220/346-380 V, (60 Hz) (supply voltage G)	3 x 400 V, (50/60 Hz) (supply voltage I)[5]	3 x 200-230 V, 50/60 Hz (supply voltage R)	3 x 208-230 V, 50/60 Hz (supply voltage Q)	3 x 380-500 V, (50/60 Hz) (supply voltage S)	3 x 440-480 V, (50/60 Hz) (supply voltage T)	1 x 200-240 V, (50/60 Hz) (supply voltage U)
CM 5-2	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 5-3	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 5-4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CM 5-5	•	•	•	•	•	•	•	•	•[2]	•	•		•		•	•	•	•	•	•	•	•	•	•	
CM 5-6	•	•	•		•	•	•	•	•[2]	•	•				•	•	•	•	•	•	•	•	•	•	
CM 5-7	•	•	•		•	•	•	•		•	•				•	•	•	•	•	•	•	•	•	•	
CM 5-8	•	•	•		•	•	•[2]	•		•	•				•	•	•	•	•	•	•	•	•	•	
CM 5-9		•	•				•[2]	•		•	•														
CM 5-10		•	•				•[2]	•		•	•														
CM 5-11		•	•					•[3]		•	•														
CM 5-12		•	•					•[3]			•														
CM 5-13		•	•					•[3]			•														
CM 10-1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•
CM 10-2	•	•	•	•	•	•	•	•	•	•	•				•	•	•	•	•	•	•	•	•	•	
CM 10-3	•	•	•	•	•	•	•	•	•[2]	•	•				•	•	•	•	•	•	•	•	•	•	
CM 10-4	•	•	•		•	•	•	•			•				•	•	•	•	•	•	•	•	•	•	
CM 10-5	•	•	•		•	•	•[2]	•			•				•	•	•	•	•	•	•	•	•	•	
CM 10-6		•	•				•[2]	•			•														
CM 10-7		•	•					•[3]			•														
CM 10-8		•	•					•[3]			•														
CM 15-1	•	•	•	•	•	•	•	•	•	•	•				•	•	•	•	•	•	•	•	•	•	
CM 15-2	•	•	•	•	•	•	•	•	•	•	•				•	•	•	•	•	•	•		•	•	
CM 15-3	•	•	•	•	•	•	•	•	•[2]		•				•	•	•	•	•	•	•		•	•	
CM 15-4	•	•	•				•[2]	•			•														
CM 25-1	•	•	•	•	•	•	•	•	•	•	•				•	•	•	•	•	•	•		•	•	
CM 25-2	•	•	•	•	•	•	•	•	•		•				•	•	•	•	•	•			•	•	
CM 25-3	•	•	•				•[2]	•	•[2]		•														
CM 25-4	•	•	•				•[2]	•			•														

1) On request.

2) Neither suitable for 60 Hz mains-operated pumps, nor for CME pumps running at 100 % speed.

3) Not suitable for pumping liquids at temperatures above 90 °C.

4) Pumps with supply voltages B and E are supplied for wire connection without terminal board inside the terminal box (flying wires). Pumps with supply voltages B1 and E1 are supplied with terminal board inside the terminal box.

5) Only available with IE2-compliant motors and cannot be exported to the USA.

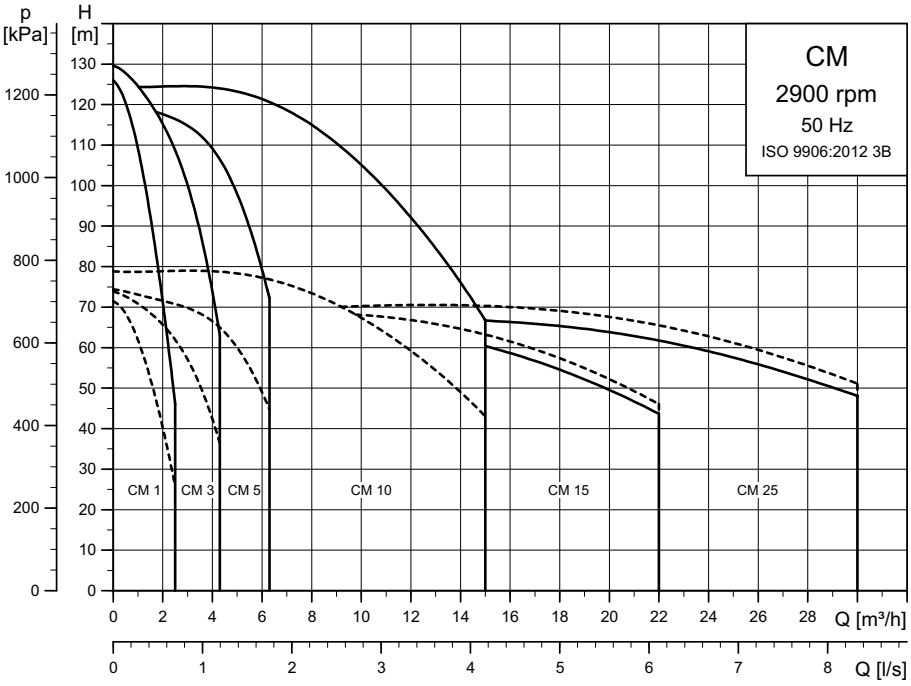
CM self-priming

Pump type	Max. suction lift		Material	Shaft seal		Supply voltage										
						Mains-operated motor										
						50 Hz		60 Hz					50/60 Hz			
	4 metres	8 metres	Stainless steel EN 1.4301/AISI 304 (CM-I)	AVBE/AQQE	AVBV/AQQV	1 x 220-240 V (supply voltage C)	3 x 220-240/380-415 V (supply voltage F)	1 x 220 V (supply voltage A)	1 x 115/230 V (supply voltage B/B1)	1 x 127 V (supply voltage D)	3 x 208-230/440-480 V (supply voltage E/E1)	3 x 575 V (supply voltage H)	3 x 220-240/380-415 V (50 Hz) / 3 x 220-255/380-440 V (60 Hz) (supply voltage O)	3 x 380-415 V (50 Hz)/ 3 x 440-480 V (60 Hz) (supply voltage J)	3 x 200 V/346 V (50 Hz); 3 x 200-220/346-380 V (60 Hz) (supply voltage G)	3 x 400 V (50/60 Hz) (supply voltage I)
CM 1-3	●	-	●	●	❍	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍
CM 1-4	●	-	●	●	❍	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍
CM 1-5	●	-	●	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
CM 1-6	●	-	●	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
CM 3-3	●	●	●	●	❍	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍
CM 3-4	●	●	●	●	❍	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍
CM 3-5	●	●	●	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
CM 3-6	●	●	●	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
CM 5-3	●	●	●	●	❍	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍
CM 5-4	●	●	●	●	❍	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍
CM 5-5	●	●	●	●	❍	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
CM 5-6	●	●	●	●	❍	●	❍	-	-	-	❍	❍	❍	❍	❍	❍
CM 5-7	●	●	●	●	❍	●	❍	-	-	-	❍	❍	❍	❍	❍	❍

● Available as standard
❍ Available on request
- Not available

7. Performance range

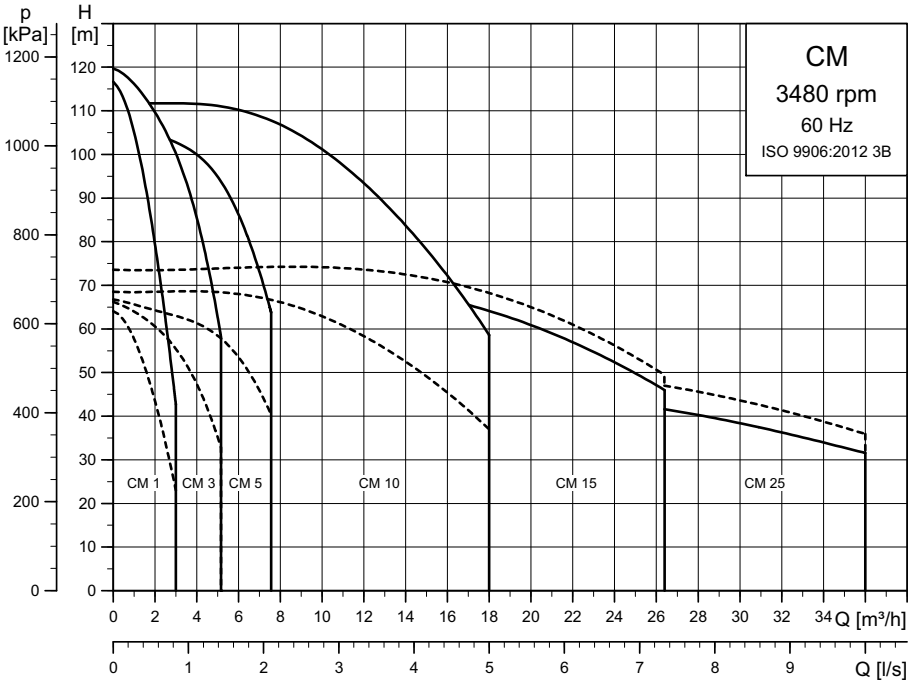
CM, 50 Hz



TM04 3340 4616

CM-A
CM-I/G

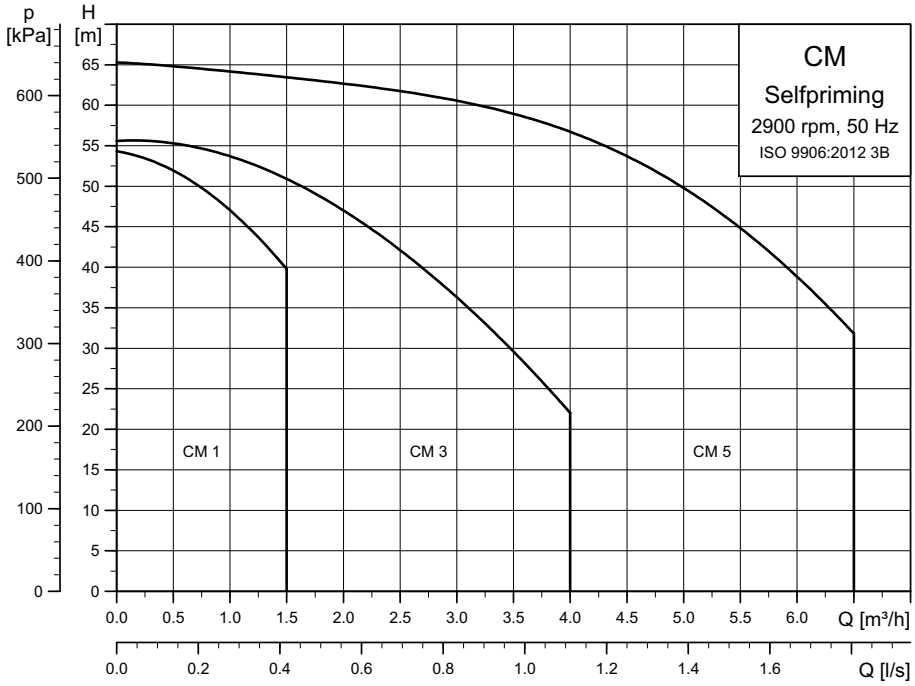
CM, 60 Hz



TM04 3369 4616

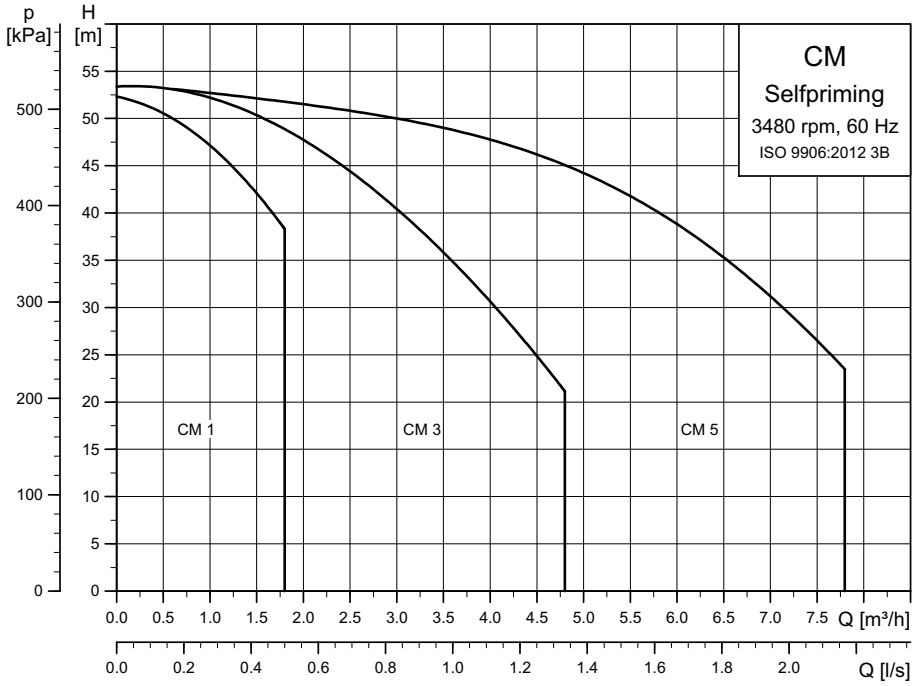
CM-A
CM-I/G

CM self-priming, 50 Hz



TM05 8834 4616

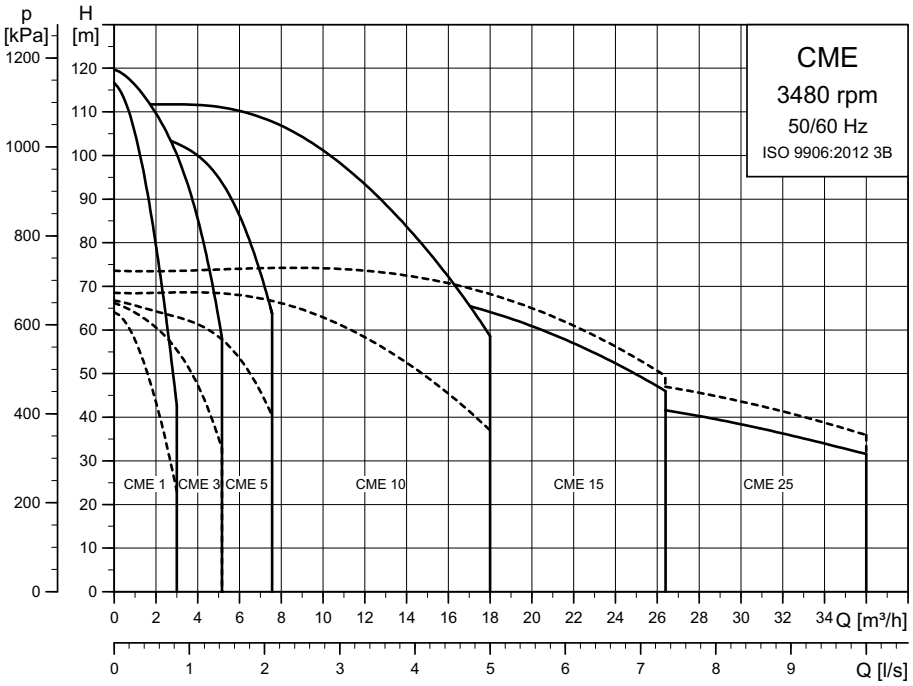
CM self-priming, 60 Hz



TM05 8835 4616

CME, 50/60 Hz

Supply voltages S, T, U



TM04 3568 5112

EuP ready

The CM, CME pumps are energy-optimised and comply with the EuP Directive (Commission Regulation (EC) No 547/2012) which has been effective since 1 January 2013. As from this date, all pumps will be classified/graduated in a new energy efficiency index (MEI).

Minimum efficiency index

Minimum efficiency index (MEI) means the dimensionless scale unit for hydraulic pump efficiency at best efficiency point (BEP), part load (PL) and overload (OL). The Commission Regulation (EU) sets efficiency requirements to MEI ≥ 0.40 as from 1 January 2015. An indicative benchmark for best-performing water pump available on the market as from 1 January 2013 is determined in the Regulation.

- The benchmark for most efficient water pumps is MEI ≥ 0.70.
- The efficiency of a pump with a trimmed impeller is usually lower than that of a pump with the full impeller diameter. The trimming of the impeller will adapt the pump to a fixed duty point, leading to reduced energy consumption. The minimum efficiency index (MEI) is based on the full impeller diameter.
- The operation of this water pump with variable duty points may be more efficient and economic when controlled, for example, by the use of a variable-speed drive that matches the pump duty to the system.
- Information on benchmark efficiency is available at http://europump.eu/efficiencycharts.

Pump type	MEI	Efficiency at best efficiency point [%]
CM, CME 1 A	0.70	37.1
CM, CME 1 I/G	0.68	36.4
CM, CME 3 A	0.70	50.6
CM, CME 3 I/G	0.70	49.3
CM, CME 5 A	0.70	53.3
CM, CME 5 I/G	0.70	52.1
CM, CME 10 A	0.70	62.2
CM, CME 10 I/G	0.52	57.9
CM, CME 15 A	0.70	67.5
CM, CME 15 I/G	0.59	63.1
CM, CME 25 A	0.70	68.3
CM, CME 25 I/G	0.41	63.8

8. Operating conditions

Ambient temperature

The maximum ambient temperature depends on the liquid temperature. The table below shows the temperature limits of CM and CME pumps.

Note: The maximum permissible liquid temperature for CM-A and CME-A is 90 °C.

Maximum ambient temperature [°C]	Minimum ambient temperature [°C]	Liquid temperature [°C]	Pump type		
			CM	CM self-priming	CME[1)]
55 °C		60 °C	•	•	-
55 °C		90 °C	•	-	-
50 °C	-20 °C	100 °C[1)]	•	-	•
45 °C		110 °C[1)]	•	-	•
40 °C		120 °C[1)]	•	-	•

1) CME (supply voltages S, T, U)

CM mains-operated motors

If the ambient temperature for CM pumps exceeds 55 °C, the motor must not be fully loaded due to the risk of overheating.

In such cases, it may be necessary to derate the motor output or use an oversize motor with higher rated output. The CM pumps can be derated in relation to ambient temperature without consequence. Contact Grundfos for further information.

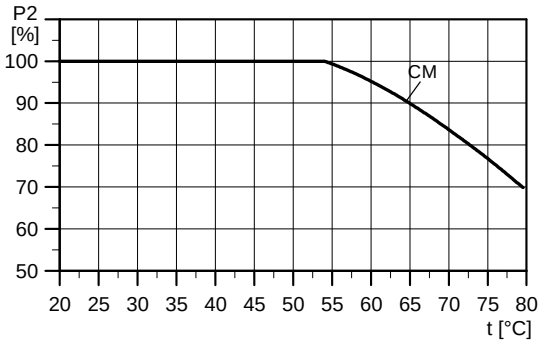


Fig. 9 Derating of CM pump, in relation to ambient temperature

CME speed-controlled motors

The electronics incorporated in the CME pumps is limiting the maximum ambient temperature. This means that the maximum ambient temperature must not be exceeded. If the pump is operated at temperatures exceeding the maximum ambient temperature, the motor life will be reduced.

Maximum ambient temperature

CME, supply voltages S, T, U:

50 °C.

CME 0.37 to 7.5 kW, supply voltages Q, R:

40 °C.

Note: You can operate the new-generation CME pumps at 60 °C as well. In such case, contact Grundfos for further information.

Storage and transport temperature

-30 to +60 °C.

Installation altitude

Installation altitude is the height above sea level of the installation site. Motors installed at maximum altitude can be loaded 100 %. Motors installed above maximum altitude must not be fully loaded due to the low density and consequently low cooling effect of the air.

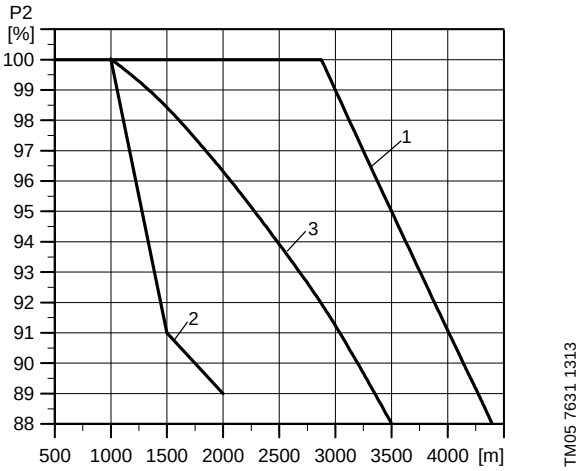


Fig. 10 Relationship between motor output (P_2) and altitude

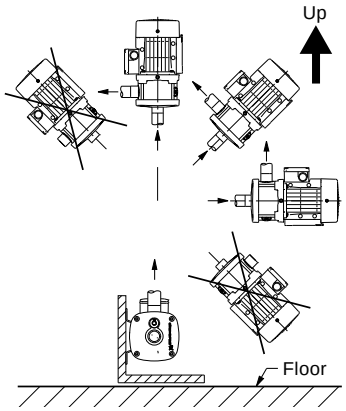
Pos.	Pump type	Voltage type
1	CM	All
2	CME	S, T, U
3	CME	Q, R

Installation of pump

The pump must be installed on a plane surface and fixed so that it cannot be displaced during startup and operation.

Installation of CM and CME pumps

The pump must be installed so that air locks are avoided in the pump housing and pipework. Figure 11 shows the permissible pump positions.

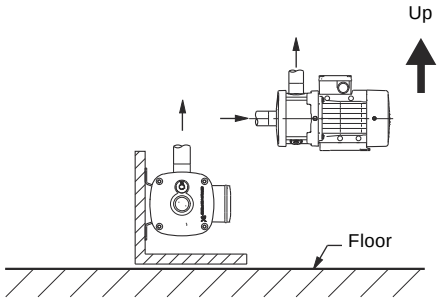


TM03 8773 2810

Fig. 11 Positions of CM and CME pumps

Installation of CM self-priming pumps

Install the pump so that the inlet is horizontal. Figure 12 shows the permissible pump positions.



TM05 8905 2514

Fig. 12 Positions of CM self-priming pumps

Install the pump with easy access for inspection, maintenance and service.

Install the pump in a well-ventilated location.

Maximum operating pressure and permissible liquid temperature

The maximum operating pressure and the permissible liquid temperature depend on the pump material, the type of shaft seal and the pumped liquid.

CM, CME pumps

Material variant	Shaft seal	Permissible liquid temperature[1] [°C]	Maximum operating pressure [bar]
Cast iron (EN-GJL-200)	AVBx	-20 - 40 41-90	10 6
	AQQx/ AQBx	-20 - 90	10
	RUUx	-20 - 60	6
Stainless steel (EN 1.4301/AISI 304)	AVBx	-20 - 40 41-90	10 6
	AQQx/ AQBx	-20[2] - 90 91-120	16 10
	RUUx	-20 - 60	6
Stainless steel (EN 1.4401/AISI 316)	AVBx	-20 - 40 41-90	10 6
	AQQx/ AQBx	-20[2] - 90 91-120	16 10
	RUUx	-20 - +60	6

CM self-priming pumps

Material variant	Shaft seal	Permissible liquid temperature[1] [°C]	Max. operating pressure [bar]
Stainless steel (EN 1.4301/AISI 304)	AVBx	0-40 41-60	10 6
	AQQx	0-60	16

1) At liquid temperatures below 0 °C (32 °F), higher motor outputs may be needed due to increased viscosity, for instance if glycol has been added to the water.

2) CM-I, -G and CME-I, -G pumps for liquid temperatures below -20 °C are available on request. Please contact Grundfos.

Maximum liquid temperature change gradient

Cast-iron pumps (CM-A, CME-A) should not be used in applications where rapid temperature changes of more than 45 °C may occur. If exposed to such rapid temperature changes, a cast-iron pump may leak.

Under such operating conditions, we recommend to use stainless-steel pumps (CM-I, -G and CME-I, -G).

Liquid temperature range

O-ring material/liquid	Permissible liquid temperature [°C]
EPDM	-20 - 120
FFKM	0-120
FKM/liquids containing water	-20 - 90
FKM/oil without water	-20 - 120

Frequency of starts and stops

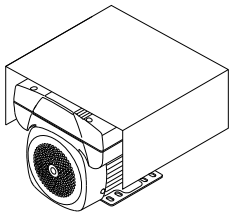
Maximum 100 per hour.

Operation in condensing environments

If the liquid temperature becomes lower than the ambient temperature, condensation may form in the motor during inactivity. In such cases, a motor suited for condensing environments must be used, e.g. an IPX5 motor (available from Grundfos).

Alternatively, you can open the bottom drain hole in the motor flange by removing the plug. The enclosure class of the motor is then reduced to IPX5. Removing the plug helps prevent condensation in the motor as it will make the motor self-venting and allow water and humid air to escape.

When installing CM and CME pumps outdoors, provide them with a suitable cover to protect them from build-up of condensed water. See fig. 13.



TM04 5799 4009

Fig. 13 CME pump with protective cover

Motors in outdoor installations radiate heat to and absorb heat from their surroundings. By day, a stopped motor will absorb more heat than it radiates; by night, especially clear nights, radiation from a stopped motor may be so high that the surface temperature drops a few degrees below the air temperature. This may cause the formation of condensation. Condensation on the inner surfaces may result in moisture on the electronic components, including the printed-circuit boards, which means a risk of failure or even destruction of the motor and electronics.

Furthermore, the cover protects the motor against direct sunlight.

Environmental rating

Three-phase CME motors hold a UL NEMA 3R environmental rating.

Single-phase CME motors have not been tested against the UL NEMA environmental rating.

All motors are IP55.

Operating range of the shaft seal

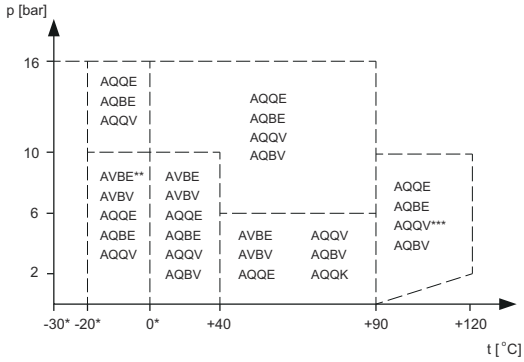
The operating range of the shaft seal depends on operating pressure, type of shaft seal and liquid temperature.

The curve in fig. 14 shows which shaft seals are suitable at a given temperature and a given pressure.

The curve applies to clean water.

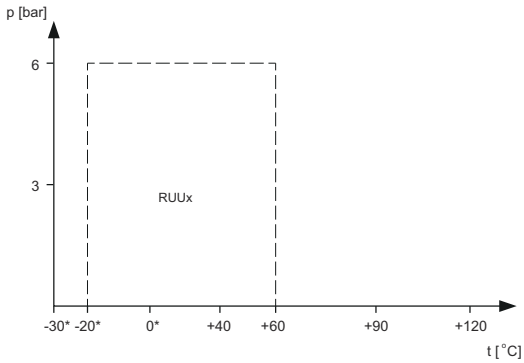
For other pumped liquids, concentrations and temperatures, please visit the Grundfos Product Center liquids section >

http://product-selection.grundfos.com/liquids.html



TM05 7521 1113

Fig. 14 Curve for the selection of AQQx, AQBx and AVBx shaft seals



TM06 2049 3614

Fig. 15 Curve for RUUx shaft seal

* Antifreeze should be added at liquid temperatures below 0 °C.
** CM and CME pumps for liquid temperatures below -20 °C are available on request. Please contact Grundfos.
*** AQQV/AQBV above 90 °C only in media not containing water.

Shaft seal run-in

The seal faces are lubricated by the pumped liquid, meaning that there may be a certain amount of leakage from the shaft seal.

When the pump is started up for the first time, or when a new shaft seal is installed, a certain run-in period is required before the leakage is reduced to an acceptable level. The time required for this depends on the operating conditions, i.e. every time the operating conditions change, a new run-in period will be started.

Under normal conditions, the leaking liquid will evaporate. As a result, no leakage will be detected.

However, liquids such as kerosene will not evaporate. The leakage may therefore be seen as a shaft seal failure.

Viscosity

The pumping of liquids with densities or kinematic viscosities higher than those of water will cause a considerable pressure drop, a drop in the hydraulic performance and a rise in the power consumption.

For instance at liquid temperatures below 0 °C (32 °F), higher motor outputs may be needed due to increased viscosity if glycol has been added to the water.

In such situations, the pump should be fitted with a larger motor. If in doubt, contact Grundfos or visit the Grundfos Product Center >

http://product-selection.grundfos.com/.

Sound pressure level

The sound pressure values in the table below apply for CM pumps. If the motor output (P2) for a given pump is not found in the table, use the nearest rounded-up value. The values for sound pressure include a tolerance of 3 dB(A) according to EN ISO 4871.

P_2 [kW]	50 Hz	60 Hz
	L_{pA} [dB(A)]	L_{pA} [dB(A)]
0.37	50	54
0.55	49	53
0.75	49	54
1.1	54	49
1.5	54	59
2.2	56	60
3.0	55	60
4.0	59	64
5.5	59	64
7.5	60	65

The audible noise from CM pumps is primarily noise from the motor fan. The selection of CME pumps will reduce the noise at partial load, as the motor, and consequently, the motor fan runs at a lower speed. Possible flow noise from control valves is also reduced at partial load in the case of the CME pump.

Minimum inlet pressure, NPSH

Grundfos recommends that you calculate the inlet pressure "H" in these situations:

- The liquid temperature is high.
- The flow is significantly higher than the rated flow.
- Water is drawn from depths.
- Water is drawn through long pipes.
- Inlet conditions are poor.

To avoid cavitation, make sure that there is a minimum pressure on the suction side of the pump. The maximum suction lift "H" in metres head can be calculated as follows:

$$H = p_b \times 10.2 - NPSH - H_f - H_v - H_s$$

p_b	=	Barometric pressure in bar. (Barometric pressure can be set to 1 bar). In closed systems, p_b indicates the system pressure in bar.
NPSH	=	Net Positive Suction Head in metres head. (To be read from the NPSH curve at the highest flow the pump will be delivering).
H_f	=	Friction loss in suction pipe in metres head. (At the highest flow the pump will be delivering).
H_v	=	Vapour pressure in metres head. (To be read from the vapour pressure scale, "H_v" depends on the liquid temperature "T_m").
H_s	=	Safety margin = minimum 0.5 metres head.

If the "H" calculated is positive, the pump can operate at a suction lift of maximum "H" metres head.

If the "H" calculated is negative, an inlet pressure of minimum "H" metres head is required.

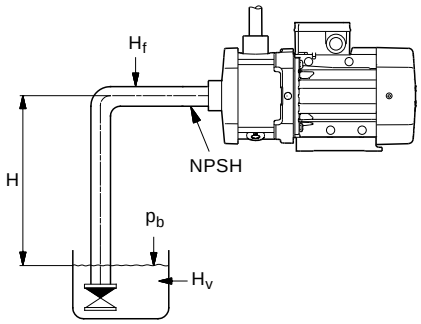


Fig. 16 Minimum inlet pressure (NPSH)

Note: To avoid cavitation, never select a pump with a duty point too far to the right on the NPSH curve.

Always check the NPSH value of the pump at the highest possible flow.

Note: NPSH must also be observed and calculated for CM self-priming pumps.

9. Construction

Pump

The Grundfos CM and CME pumps are horizontal, multistage, end-suction centrifugal pumps. The pumps are of the close-coupled type and are available as either self-priming or non-self-priming pumps. The pumps have an axial inlet port and a radial discharge port and are mounted on a base plate.

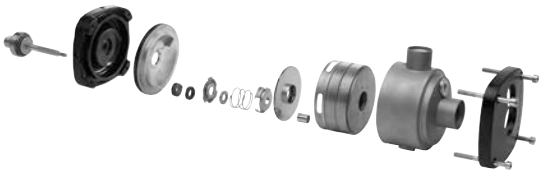
All movable parts are made of stainless steel.

Self priming pumps are fitted with an internal water trap and an internal valve, both of which are mainly made of a composite material.

You find the sectional drawings on pages 25 to 27.

The pumps are available with mains-operated motors (CM pumps) and electronically speed-controlled motors (CME pumps).

All pumps incorporate a maintenance-free mechanical O-ring shaft seal with fixed driver.



TM05 1130 2211

Fig. 17 CM and CME pump hydraulics

Motor

CM and CME pumps are fitted with totally enclosed, fan-cooled, 2-pole motors with principal dimensions to EN 50347. The motors have been developed especially for CM and CME pumps.

Electrical tolerances comply with EN 60034.

Single-phase CME pumps are available from 0.37 to 1.5 kW.

Three-phase CME pumps are available from 0.37 to 7.5 kW.

Soft starter

Soft starters are only to be used for three-phase motors.

Efficiency

Motors for CM and CME pumps comply with different energy-efficiency requirements throughout the world, for example the European Ecodesign.

For China, motors with CCC and CEL marking are available.

Generally, this means that all three-phase motors of 0.75 kW and up are IE3-compliant as standard.

MGE motors

The motor is energy efficiency class IE5 according to IEC60034-30-2. In combination with the integrated frequency converter, the combined power drive system is efficiency class IES2 according to IEC50598-2.

Electrical data

Insulation class	F
Enclosure class	IP55*
Supply voltages (tolerance ± 10 %)	**CM** 1 x 220 V, 60 Hz 1 x 115/230 V, 60 Hz 1 x 220-240 V, 50 Hz 1 x 127 V, 60 Hz 3 x 208-230/440-480 V, 60 Hz 3 x 220-240/380-415 V, 50 Hz 3 x 200/346 V, 50 Hz; 200-220/346-380 V, 60 Hz 3 x 575 V, 60 Hz 3 x 400 V, 50/60 Hz 3 x 380-415 V, 50 Hz; 440-480 V, 60 Hz 3 x 220-240/380-415 V, 50 Hz 3 x 220-255/380-440 V, 60 Hz **CME** 1 x 200-240 V, 50/60 Hz 1 x 208-230 V, 50/60 Hz 3 x 208-230 V, 50/60 Hz 3 x 200-230 V, 50/60 Hz 3 x 380-500 V, 50/60 Hz 3 x 440-480 V, 50/60 Hz

* IP55 is not recommended for operation in condensing environments.
For operation in such environments, see *Operation in condensing environments* on page 21.

Motor protection

Mains-operated motors (CM)

Single-phase motors, 1 x 115/230 V, 60 Hz, do not incorporate motor protection and must be connected to a motor-protective circuit breaker which can be manually reset. Set the motor-protective circuit breaker according to the rated current of the motor ($I_{1/1}$). See the nameplate.

Other single-phase motors have built-in current- and temperature-dependent motor protection in accordance with IEC 60034-11 and require no further motor protection. The motor protection reacts to both slow- and quick-rising temperatures. The motor protection is automatically reset.

Three-phase motors up to 3 kW must be connected to a motor-protective circuit breaker which can be manually reset. Set the motor-protective circuit breaker according to the rated current of the motor ($I_{1/1}$). See the nameplate. Motors with power ratings of 3 kW and up have built-in thermistors (PTC)*. The thermistors are designed according to DIN 44082. The motor protection reacts to both slow- and quick-rising temperatures.

* Applies only to supply voltages F, G and O. Motors for other supply voltages must be connected to a motor-protective circuit breaker as described for three-phase motors up to 3 kW.

Electronically speed-controlled motors (CME)

CME pumps require no external motor protection. The MGE motor incorporates thermal protection against steady overload and stalled condition (IEC 34-11).

Frequency converter operation

All three-phase motors can be connected to a frequency converter. Depending on the frequency converter type, this may cause increased acoustic noise from the motor. Furthermore, it may cause the motor to be exposed to detrimental voltage peaks.

Single-phase motors must not be connected to a frequency converter.

As standard MG 71- and MG 80-based motors have no phase insulation and must therefore be protected against voltage peaks higher than 650 V (peak value) between the supply terminals.

Note: MG 71- and MG 80-based motors with phase insulation are available on request.

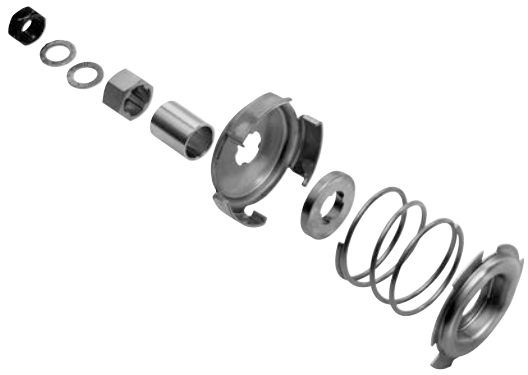
The above disturbances, i.e. both increased acoustic noise and detrimental voltage peaks, can be eliminated by fitting an LC filter between the frequency converter and the motor.

For further information, please contact the frequency converter supplier or Grundfos.

Shaft seal

The shaft seal for the CM and CME pumps is of the O-ring type, which makes it very flexible when different types of O-rings and seal-face materials are needed. The shaft seal has a fixed seal driver which ensures a reliable rotation of all parts - even under the most extreme operating conditions.

Due to the special design of the shaft seal and the interfaces to the rest of the pump construction, the dry-running capabilities are improved significantly compared to most other similar shaft seals and pump types. Furthermore, improvements have been made to reduce the risk and effect of sticking. The shaft seal types available can be found in *Selection of CME pumps* on page 37 where the key parameters of selecting a shaft seal are also described.



TM05 1131 2211

Fig. 18 Exploded view of shaft seal

Note: The available shaft seals for CM and CME pumps are very robust and durable, but dry running must always be avoided.

Details regarding operating conditions for the shaft seal can be found in *Operating range of the shaft seal* on page 21.

Further information about the shaft seal can be found in the separate book covering shaft seals which can be ordered from Grundfos.

Title	Publication number
Mechanical shaft seals for pumps	97506935

CM(E) 1-A

(A = cast iron EN-GJL-200)

Sectional drawing

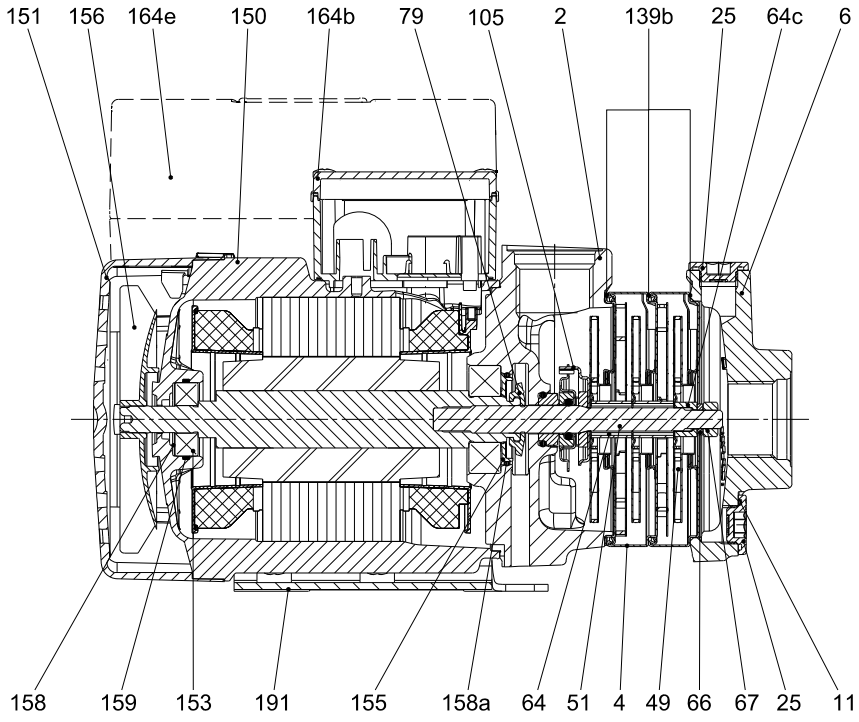


Fig. 19 CM(E) 1-3 with MG(E) 71 motor

Components

Pos.	Component	Pos.	Component	Pos.	Component
2	Discharge part	64c	Clamp	153	Ball bearing
4	Chamber	66	Washer (NORD-LOCK)	155	Bearing cover plate
6	Inlet part	67	Nut	156	Fan
11	O-ring	79	Diverting disc	158	Corrugated spring
25	Plug	105	Shaft seal	158a	O-ring
49	Impeller	139b	Gasket	159	O-ring
51	Pump shaft	150	Stator housing	164b, 164e	Terminal box
64	Spacing pipe	151	Fan cover	191	Base plate

CM(E) 1-I and CM(E) 1-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)

Sectional drawing

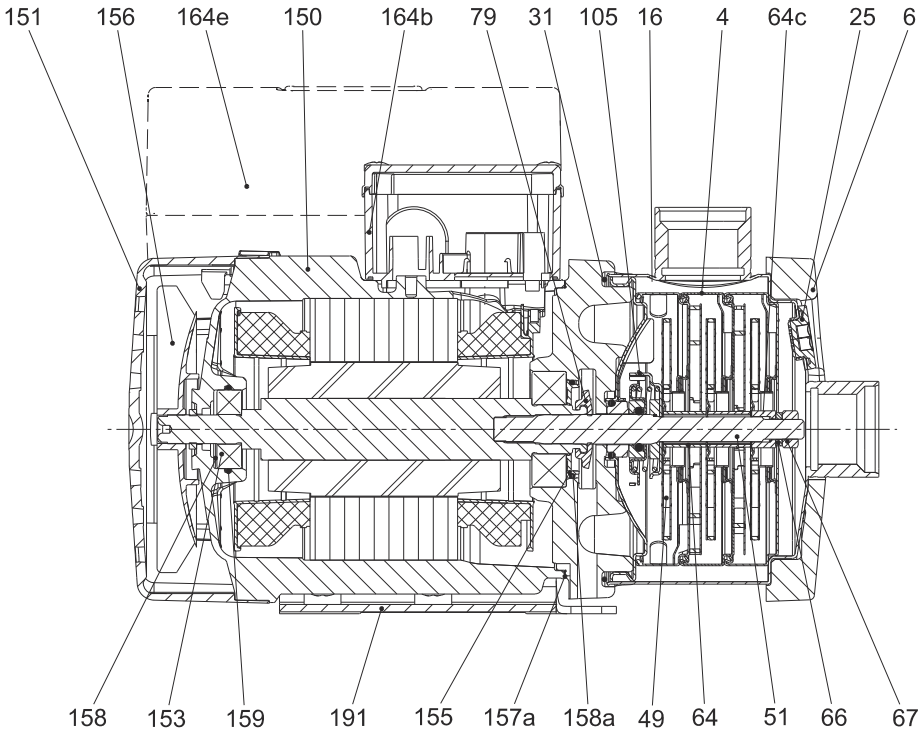


Fig. 20 CM(E) 1-3 with MG(E) 71 motor

Components

Pos.	Component	Pos.	Component	Pos.	Component
4	Chamber	64c	Clamp	155	Bearing cover plate
6	Flange	66	Washer (NORD-LOCK)	156	Fan
16	Sleeve	67	Nut	157a	Gasket
25	Plug	79	Diverting disc	158	Corrugated spring
31	O-ring	105	Shaft seal	158a	O-ring
49	Impeller	150	Stator housing	159	O-ring
51	Pump shaft	151	Fan cover	164b, 164e	Terminal box
64	Spacing pipe	153	Ball bearing	191	Base plate

CM self-priming

(Stainless steel: I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)

Sectional drawing

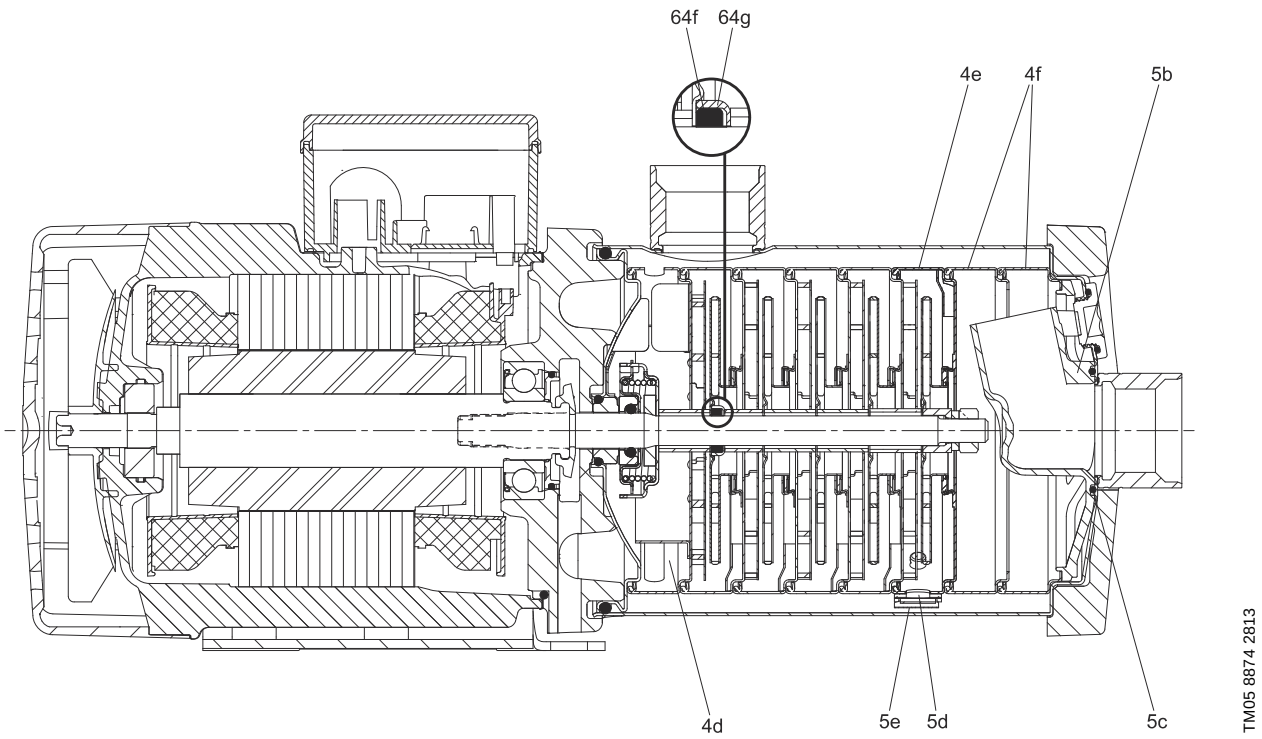


Fig. 21 CM 1-3 (self-priming version)

Components

Pos.	Description	Material
4d	Chamber complete with ribs and vanes	Stainless steel (EN 1.4301/AISI 304)
4e	Chamber with recirculation hole	Stainless steel (EN 1.4301/AISI 304)
4f	Empty chambers	Stainless steel (EN 1.4301/AISI 304)
5b	Syphon	Composite (Noryl 731s-701-1977)
5c	O-ring	EPDM
5d	Base for valve	Composite (Noryl 731s-701-1977)
5e	Spring plate	Stainless steel (EN 1.4310/AISI 301)
64f	Rubber seal	EPDM
64g	Container for rubber seal	Stainless steel (EN 1.4301/AISI 304)

Material specification

Pos.	Description	Material	Pump material version					
			Cast iron (EN-GJL-200)		Stainless steel (EN 1.4301/AISI 304)		Stainless steel (EN 1.4401/AISI 316)	
			EN	ISO/AISI/ASTM	EN	ISO/AISI/ASTM	EN	ISO/AISI/ASTM
Motor parts								
156b	Motor flange	Cast iron						
150	Stator housing	Silumin (Alu)						
151	Fan cover	Composite PBT/PC						
153	Ball bearing							
156	Fan	Composite PA 66 30 % GF						
158	Corrugated spring	Steel						
164b	Terminal box, MG	Composite PC/ASA or silumin (Alu)						
164e	Terminal box, MGE							
191	Base plate	Steel, electrocoated	1.0330.3		1.0330.3			
		Steel, powder-coated, 60 to 120 µ, NCS 7005					1.0330.3	
79	Diverting disc	Silicone fluid (LSR)						
155	Bearing cover plate	PPS						
Pump parts								
105	Shaft seal, steel parts	Stainless steel	1.4301/ 1.4401[1)]	AISI 304/ AISI 316[1)]	1.4301/ 1.4401[1)]	AISI 304/ AISI 316[1)]	1.4401	AISI 316
	Shaft seal, seal faces	Al_2O_3/carbon or SiC						
51	Pump shaft	Stainless steel	1.4301	AISI 304	1.4301/ 1.4401[1)]	AISI 304/ AISI 316[1)]	1.4401	AISI 316
11 31[3)] 158a 159	O-rings	EPDM, FKM or FFKM						
157a[3)]	Gasket	Paper						
139b[4)]	Gasket	Aramide fibres (nbr)						
2[4)]	Discharge part	Cast iron						
6[4)]	Inlet part	Cast iron						
4	Chamber	Stainless steel	1.4301/ 1.4401[1)]	AISI 304/ AISI 316[1)]	1.4301/ 1.4401[1)]	AISI 304/ AISI 316[1)]	1.4401	AISI 316
25	Plug	Stainless steel	1.4404	AISI 316L	1.4404	AISI 316L	1.4404	AISI 316L
49	Impeller	Stainless steel	1.4301/ 1.4401[1)]	AISI 304/ AISI 316[1)]	1.4301/ 1.4401[1)]	AISI 304/ AISI 316[1)]	1.4401	AISI 316
64	Spacing pipe	Stainless steel	1.4401	AISI 316	1.4401	AISI 316	1.4401	AISI 316
64c	Clamp	Stainless steel	STX2000[5)]		STX2000[5)]		STX2000[3)]	
6[3)]	Flange	Cast iron						
16	Sleeve	Stainless steel			1.4301/ 1.4401[1) + 2)]	AISI 304/ AISI 316[1)]	1.4401	AISI 316
67	Nut	Stainless steel A4						
66	Washer (NORD-LOCK)	Steel	1.4547		1.4547		1.4547	

1) On request.

2) As standard, the pumps listed below are fitted with sleeves made of stainless steel 1.4401:
CM(E) 1-9 up to and including CM(E) 1-14
CM(E) 3-9 up to and including CM(E) 3-14
CM(E) 5-9 up to and including CM(E) 5-13
CM(E) 10-6 up to and including CM(E) 10-8.

3) Only in CM(E)-I/G pumps.

4) Only in CM(E)-A pumps.

5) STX2000 ~ CrNiMO 22 19 4.

10. CME pumps

Communication with CME pumps

Communication with CME pumps is possible via

- a central building management system
- Grundfos GO Remote
- a control panel.

Central building management system

The operator can communicate with a CME pump at a distance. Communication can take place via a central building management system allowing the operator to monitor and change control modes and setpoint settings.

Communication interface

CME pumps can be fitted with a communication interface module (CIM). This means that no external communication interface is required.

The modules are available as accessories, see page 136.

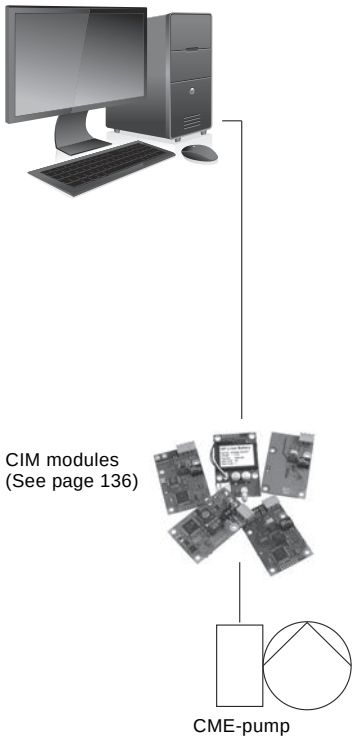


Fig. 22 Structure of a central management system

Grundfos GO

The pump is designed for wireless radio or infrared communication with Grundfos GO.

Grundfos GO enables setting of functions and gives access to status overviews, technical product information and actual operating parameters.

Grundfos GO offers the following mobile interfaces (MI).

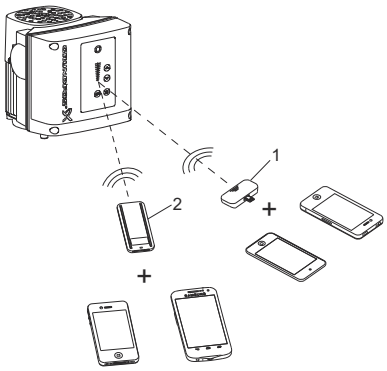


Fig. 23 Grundfos GO communicating with the pump via radio or infrared connection (IR)

Pos.	Description
1	Grundfos MI 204: Add-on module enabling radio or infrared communication. You can use MI 204 in conjunction with an Apple iPhone or iPod with Lightning connector, e.g. fifth generation or later iPhone or iPod. MI 204 is also available together with an Apple iPod touch and a cover.
2	Grundfos MI 301: Separate module enabling radio or infrared communication. You can use the module in conjunction with an Android or iOS-based smart device with Bluetooth connection.

Grundfos GO is available as an accessory. See page 136.

Control panel

The operator can change the setpoint settings manually on the control panel of the CME pump terminal box.

The design and functionality of the control panels vary, depending on the MGE motor fitted to the CME pump.

The control panel of the new-generation CME pumps enables radio communication. The Grundfos Eye at the top of the control panel is a pump status indicator light providing information about the pump operating status. Less or more advanced control panels are available on request.

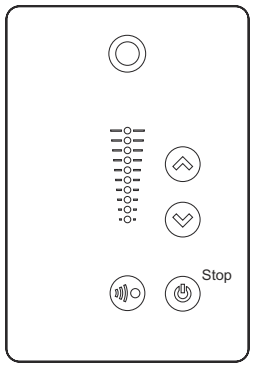


Fig. 24 Standard control panels of CME pumps

Speed control of CME pumps

Affinity equations

Normally, CME pumps are used in applications characterised by a variable flow. Consequently, you cannot select a pump that is constantly operating at its optimum efficiency.

In order to achieve optimum operating economy, the duty point should be close to the optimum efficiency (eta) for most operating hours.

Between the minimum and maximum performance curves, CME pumps have an infinite number of performance curves, each representing a specific speed. You may therefore not be able to select a duty point close to the maximum curve.

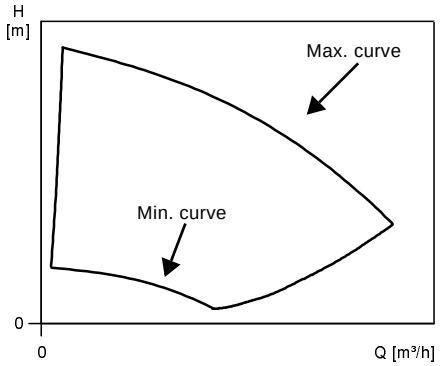


Fig. 25 Minimum and maximum performance curves

In situations where you cannot select a duty point close to the maximum curve, use the affinity equations below. The head (H), the flow rate (Q) and the input power (P) are the appropriate variables for calculating the motor speed (n).

Note: The approximated formulas apply on condition that the system characteristic remains unchanged for n_n and n_x and that it is based on the formula $H = k \times Q^2$ where k is a constant.

The power equation implies that the pump efficiency is unchanged at the two speeds. In practice, this is not quite correct.

Finally, it is worth noting that the efficiency of the frequency converter and the motor must be taken into account if a precise calculation of the power saving resulting from a reduction of the pump speed is wanted.

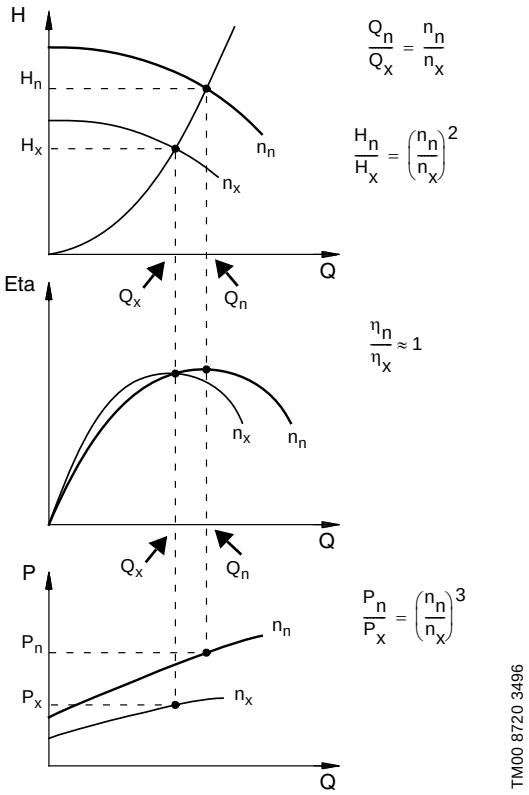


Fig. 26 Affinity equations

Legend

H_n: Rated head [m]
H_x: Current head [m]
Q_n: Rated flow rate [m^3/h]
Q_x: Current flow rate [m^3/h]
n_n: Rated motor speed [min^{-1}]
n_x: Current motor speed [min^{-1}]
η_n: Rated efficiency [%]
η_x: Current efficiency [%].

11. Grundfos CUE

CM pumps connected to Grundfos CUE, external frequency converters

GrA4404

Fig. 27 Grundfos CUE product range

Grundfos CUE is a complete range of frequency converters for pump control in a wide range of applications. Grundfos CUE is designed for wall mounting.

Grundfos CUE provides a variety of benefits to the end-user.

The benefits include

- Grundfos CME pump functionality and user interface
- application- and pump family-related functions
- increased comfort compared to mains-operated pump solutions
- simple installation and commissioning compared to standard frequency converters.

Functions

Intuitive startup guide

The startup guide enables easy installation and commissioning as well as plug-and-pump convenience. Few settings need to be made by the installer as the rest is done automatically or preset from the factory.

Smart user interface

TM04 3283 4108

Fig. 28 Grundfos CUE control panel

Grundfos CUE features a unique user-friendly control panel with graphic display and easy-to-use buttons. Panel layout resembles the well-known Grundfos R100 remote control, which is used with Grundfos CME pumps.

Controlling the value you choose

Grundfos CUE has a built-in PI controller offering closed-loop control of a desired value.

The values include

- constant differential pressure
- proportional pressure
- constant temperature
- constant flow.

Wide product range

The CUE product range is quite comprehensive, covering five different voltage ranges, enclosure classes IP20/21 (NEMA 1) and IP54/55 (NEMA 12), and a wide range of output powers.

The table below provides a general overview.

Input voltage [V]	Output voltage [V]	Motor [kW]
1 x 200-240	3 x 200-240	1.1 - 7.5
3 x 200-240	3 x 200-240	0.75 - 45
3 x 380-500	3 x 380-500	0.55 - 250
3 x 525-600	3 x 525-600	0.75 - 7.5

12. Approvals and markings

CM, CME pumps

Approvals

- RCM mark, New Zealand and Australian EMC.
- EAC certificate.

cULus

The cULus approval covers the standard product range within the following supply voltages:

- 1 x 115/230 V, 60 Hz (supply voltage B)
- 3 x 575 V, 60 Hz (supply voltage H, IE2)
- 1 x 115/230 V, 60 Hz (supply voltage B1)
- 3 x 400 V, 50/60 Hz (supply voltage I, IE2)

Contact Grundfos for further information.

Pumps

UL778 and C22.2 No 108-01

NEMA 250 (IP code).

Overheating protection

UL2111 and C22.2 No 77-95.

Note: cULus/cURus-approved motors have no internal protection. Motors fitted with PTC/PTO have no cULus/cURus approval.

cURus IE3 motors

The cURus approval covers the IE3 motors mentioned in the following:

IE3 motors for the below listed supply voltages comply with UL1004-1 and CSA22.2 No. 100-04.

- 3 x 208-230/440-480 V, 60 Hz (supply voltage E/E1)
- 3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)
- 3 x 380-415 V, 50 Hz; 440-480 V, 60 Hz (supply voltage J).

cURus E-motors

The cURus approval covers the CME motors mentioned in the following:

CME motors for the below listed supply voltages comply with UL 60730-1 and CSA E 60730-1.

- 3 x 380-500 V, 50/60 Hz (supply voltage S)
- 3 x 440-480 V, 50/60 Hz (supply voltage T)
- 1 x 200-230 V, 50/60 Hz (supply voltage U).

Other approvals and compliance with directives

- EAC (Russia, Belarus, Kazakhstan)
- Compliance with RoHS, directive 2002/96/EC
- CCC
- CEL
- EuP
- KEA
- PSE.

Drinking water approvals

- WRAS
- ACS
- NSF61.

Energy approvals

The following energy approvals are available on request:

- Energy Independence and Security Act (EISA) for the USA (CC marking).
- Minimum energy performance standard (MEPS) for Korea, Taiwan, China and Brazil (pending).

Markings

CM self-priming pumps

The following approvals and markings are available as standard. Further approvals and markings are available on request. Contact Grundfos for further information.

Approvals

- TR certificate.

Other approvals and compliance with directives

- EAC
- Compliance with RoHS, directive 2002/96/EC
- CCC
- CEL
- EuP.

Drinking water approvals

- WRAS
- ACS.

Markings

13. Certificates

Certificate	Description
Certificate of compliance with the order	According to EN 10204, 2.1. Grundfos document certifying that the pump supplied is in compliance with the order specifications.
Test certificate. Non-specific inspection and testing	According to EN 10204, 2.2. Certificate with inspection and test results of a non-specific pump.
Inspection certificate 3.1	Grundfos document certifying that the pump supplied is in compliance with the order specifications. Inspection and test results are mentioned in the certificate.
Inspection certificate	Grundfos document certifying that the pump supplied is in compliance with the order specifications. Inspection and test results are mentioned in the certificate. Certificate from the surveyor is included. We offer the following inspection certificates: • Lloyds Register of Shipping (LRS) • Det Norske Veritas (DNV) • Germanischer Lloyd (GL) • Bureau Veritas (BV) • American Bureau of Shipping (ABS) • Registro Italiano Navale Agenture (RINA) • China Classification Society (CCS) • Russian maritime register of Shipping (RS) • Biro Klassifikasio Indonesia (BKI) • United States Coast Guard (USCG) • Nippon Kaiji Koykai (NKK).
Standard test report	Certifies that the main components of the specific pump are manufactured by Grundfos, and that the pump has been QH-tested, inspected and conforms to the full requirements of the appropriate catalogues, drawings and specifications.
Material specification report	Certifies the material used for the main components of the specific pump.
Material specification report with certificate from raw material supplier	Certifies the material used for the main components of the specific pump. A material certificate, EN 10204, 3.1, will be supplied for each main component.
Duty-point verification report	Certifies a test point specified by the customer. Issued according to ISO 9906:2012 concerning "Duty point verification".
Surface-roughness	Shows the measured roughness of the cast pump base of the specific pump. The report indicates the values measured at the base inlet and outlet according to ISO 1302.
Vibration report	Vibration report indicating the values measured during the performance test of the specific pump according to ISO 10816.
Motor test report	Shows the performance test of the specific motor, including power output, current, temperature, stator windings resistance and insulation test.
Cleaned and dried pump	Confirms that the specific pump has been cleaned and dried, and how it was done.
Electro-polished pump	Confirms that the specific pump has been electro-polished. The maximum surface roughness is specified in the report.

Examples of the certificates are shown on pages 34 and 35.
Note: Other certificates are available on request.

Examples of certificates

Certificate of compliance with the order

BE › THINK › INNOVATE › GRUNDFOS

Certificate of compliance with the order

EN 10204 2.1

Customer name	
Customer order no.	
Customer Tag no.	
GRUNDFOS order no.	
Product type	

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and/or specifications relative thereto.

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no. 96 50 78 95/1001002

TM03 4165 1706

Test certificate

BE › THINK › INNOVATE › GRUNDFOS

Test certificate
Non-specific inspection and testing

EN 10204 2.2

Customer name	
Customer order no.	
Customer TAG no.	
GRUNDFOS order no.	

Pump		
Pump type		Part number
Motor make		Part number
Flow	m^3/h	
Head	m	
Power P2	kW	
Voltage	V	
Frequency	Hz	
Full load current	A	
Motor speed	min^{-1}	

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and / or specifications relative thereto.

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no 96 50 78 96/1001002

TM03 4163 1706

Inspection certificate 3.1

BE › THINK › INNOVATE › GRUNDFOS

Inspection certificate.
EN 10204 3.1

Manufactured by	
GRUNDFOS order no.	
GRUNDFOS DUT id.	
Customer order no.	
Customer name and address	
Shipyard / factory	
Ship / new building	
Customer TAG no.	
Classifying society	**GRUNDFOS authorized department**

Pump		Motor	
Pump type		Make	
Part number		Part number	
Serial no.		Serial No.	
Flow rate (m^3/h)		P2 (kW)	
Head (m)		Voltage (V)	
Max. ope. P/t (bar / °C)		Current (A)	
	Din / W. - No.	$n(min^{-1})$	
Base/Pump head cover		Frequency (Hz)	
Impeller/guidevanes		Insulation class	
Shaft/sleeve		Power factor	

Customer's requirements			
Flow rate (m^3/h)		Head (m)	

Test result ref. requirements											
Q(m^3/h)		H(m)		n(min^{-1})		I(A)		P1(kW)			

Hydrostatic test		Bar – no leaks or deformation observed

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no. 96 50 78 97/1014142

TM03 4162 3607

Inspection certificate

BE › THINK › INNOVATE › GRUNDFOS

Inspection certificate.
Russian Maritime Register of Shipping

Manufactured by	
GRUNDFOS order no.	
GRUNDFOS DUT id.	
Customer order no.	
Customer name and address	
Shipyard / factory	
Ship / new building	
Customer TAG no.	
Classifying society	**Russian Maritime Register of Shipping (RS)**

Pump		Motor	
Pump type		Make	
Part number		Part number	
Serial no.		Serial No.	
Flow rate (m^3/h)		P2 (kW)	
Head (m)		Voltage (V)	
Max. ope. P/t (bar / °C)		Current (A)	
Service		$n(min^{-1})$	
Medium		Frequency (Hz)	
	Din / W. - No.	Insulation class	
Base/Pump head cover		Power factor	
Impeller/guidevanes			
Shaft/sleeve			

Customer's requirements			
Flow rate (m^3/h)		Head (m)	

Test result ref. requirements											
Q(m^3/h)		H(m)		n(min^{-1})		I(A)		P1(kW)			

Hydrostatic test		Bar – no leaks or deformation observed
The pump has been marked		

Surveyor signature:
Tested date:

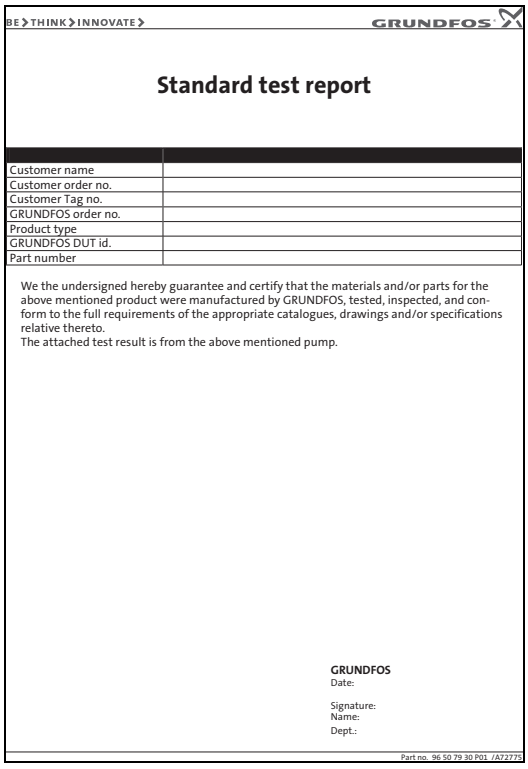
GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no. 96 50 79 25/1014142

TM03 4156 3607

Standard test report



BE › THINK › INNOVATE ›

GRUNDFOS

Standard test report

Customer name	
Customer order no.	
Customer Tag no.	
GRUNDFOS order no.	
Product type	
GRUNDFOS DUT id.	
Part number	

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured by GRUNDFOS, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and/or specifications relative thereto.
The attached test result is from the above mentioned pump.

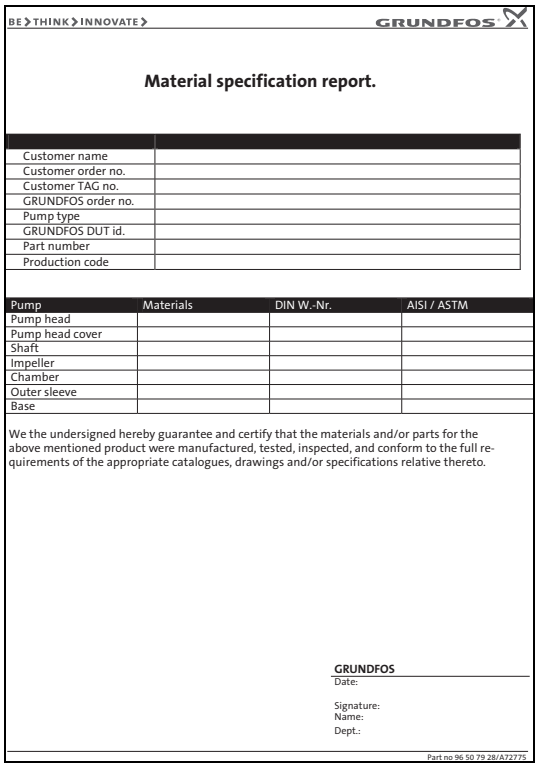
GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no. 96 50 79 30 P01 /A72775

TM03 4143 1706

Material specification report



BE › THINK › INNOVATE ›

GRUNDFOS

Material specification report.

Customer name	
Customer order no.	
Customer TAG no.	
GRUNDFOS order no.	
Pump type	
GRUNDFOS DUT id.	
Part number	
Production code	

Pump	Materials	DIN W.-Nr.	AISI / ASTM
Pump head			
Pump head cover			
Shaft			
Impeller			
Chamber			
Outer sleeve			
Base			

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and/or specifications relative thereto.

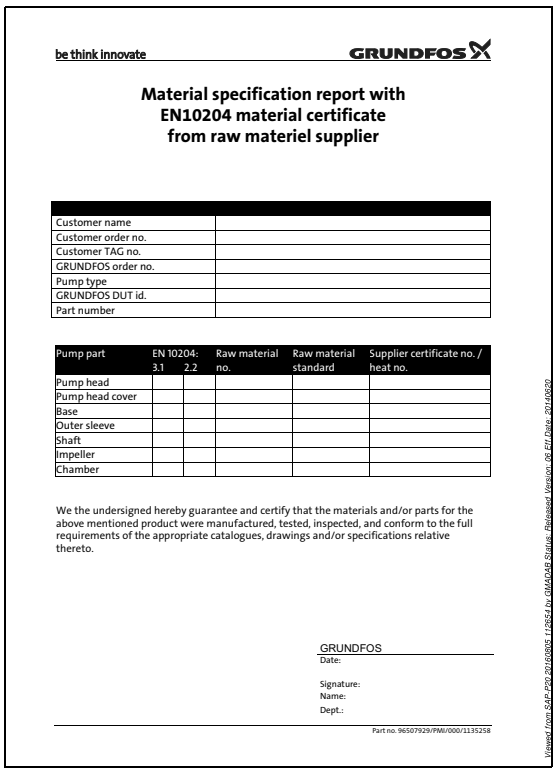
GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no 96 50 79 28/A72775

TM03 4150 1706

Material specification report with certificate from raw material supplier



be think innovate

GRUNDFOS

Material specification report with EN10204 material certificate from raw materiel supplier

Customer name	
Customer order no.	
Customer TAG no.	
GRUNDFOS order no.	
Pump type	
GRUNDFOS DUT id.	
Part number	

Pump part	EN 10204: 3.1	2.2	Raw material no.	Raw material standard	Supplier certificate no. / heat no.
Pump head					
Pump head cover					
Base					
Outer sleeve					
Shaft					
Impeller					
Chamber					

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and/or specifications relative thereto.

GRUNDFOS
Date:

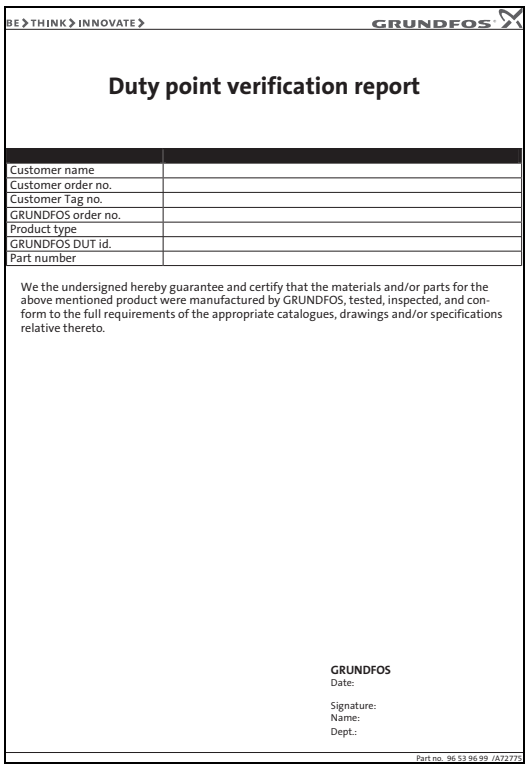
Signature:
Name:
Dept.:

Part no. 96507929/PMI/000/1135258

Viewed from SAP: P30 20160805 112654 by GM40485 Status: Released Version: 06 EH Date: 20140620

TM03 4149 3607

Duty-point verification report



BE › THINK › INNOVATE ›

GRUNDFOS

Duty point verification report

Customer name	
Customer order no.	
Customer Tag no.	
GRUNDFOS order no.	
Product type	
GRUNDFOS DUT id.	
Part number	

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured by GRUNDFOS, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and/or specifications relative thereto.

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no. 96 53 96 99 /A72775

TM03 4148 1706

14. Selection and sizing

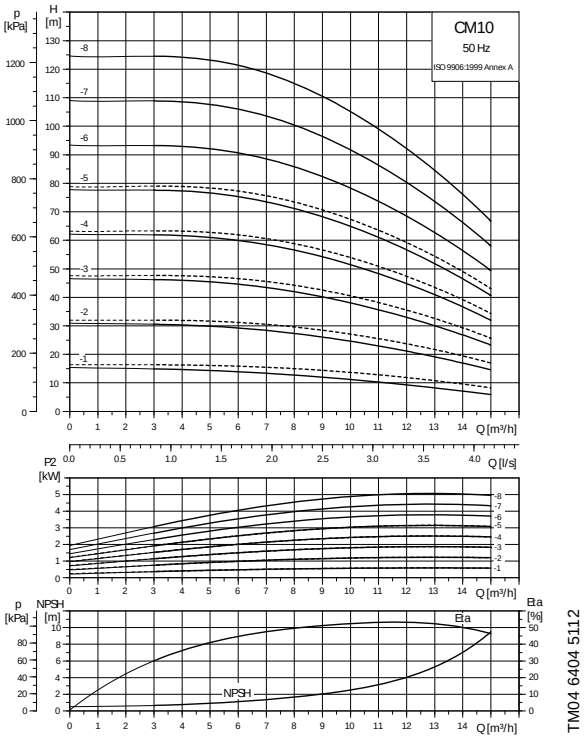
Selection of pumps

Selection of pumps should be based on these elements:

- the duty point of the pump (see below)
- dimensional data such as pressure loss as a result of height differences, friction loss in the pipework, pump efficiency, etc. (see below)
- pump materials (see page 37)
- pump connections (see page 37)
- shaft seal (see page 21).

Duty point of the pump

From a duty point you can select a pump on the basis of the curve charts starting on page 39.



TM04 6404 5112

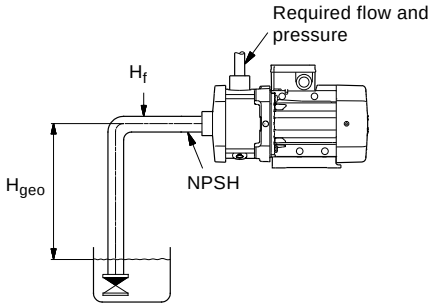
Fig. 29 Example of a curve chart

Dimensional data

When sizing a pump, take the following factors into account:

- Required flow and pressure at the draw-off point.
- Pressure loss as a result of height differences (H_{geo}).
- Friction loss in the pipework (H_f).
  It may be necessary to account for pressure loss in connection with long pipes, bends or valves, etc.
- Best efficiency at the estimated duty point.*
- NPSH value.
  For calculation of the NPSH value, see *Minimum inlet pressure, NPSH* on page 22.

* See *Selection of CME pumps* on page 37 for further information about sizing CME pumps.

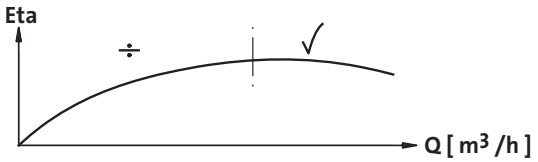


TM04 3486 4508

Fig. 30 Dimensional data

Pump efficiency

When sizing the pump, the efficiency (eta) should be considered so that the pump will operate at or near its maximum efficiency, for instance on the right-hand side in the curve example in fig. 31.



TM00 9190 1303

Fig. 31 Best efficiency

Before determining the best efficiency point, the operation pattern of the pump needs to be identified. If the pump is expected to operate at the same duty point, then select a CM pump which is operating at a duty point corresponding with the best efficiency of the pump. The example in fig. 32 shows how to check the pump efficiency when selecting a CM pump.

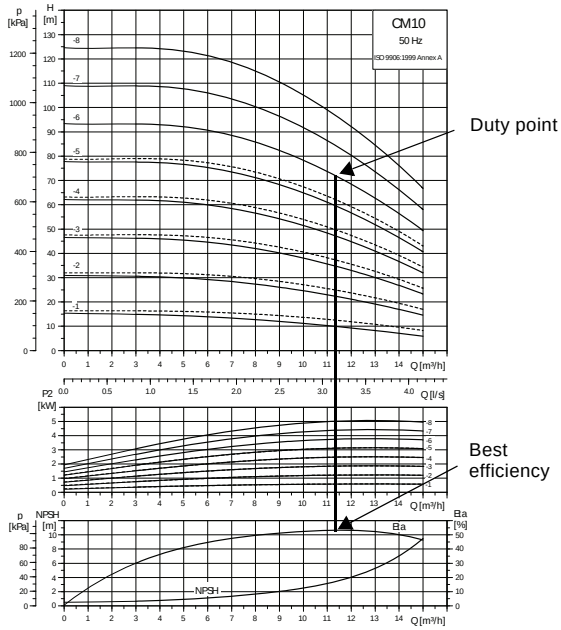


Fig. 32 Example of a CM pump's duty point

Pump materials

Select the material variant on the basis of the liquid to be pumped. The table below gives a general recommendation regarding selection of pump material.

Liquid to be pumped	Material in contact with pump media	Pump type
Clean, non-aggressive liquids such as potable water and oils	Cast iron* (EN-GJL-200)	CM(E)-A
Industrial liquids and acids	Stainless steel (EN 1.4301/AISI 304)	CM(E)-I
	Stainless steel (EN 1.4401/AISI 316)	CM(E)-G

* The impeller, chamber and filling plugs are made of stainless steel (EN 1.4301/AISI 304).
The pump shaft is made of stainless steel (EN 1.4301/AISI 316).

Contact Grundfos for more specific selection based on the pumped liquid.

Pump connections

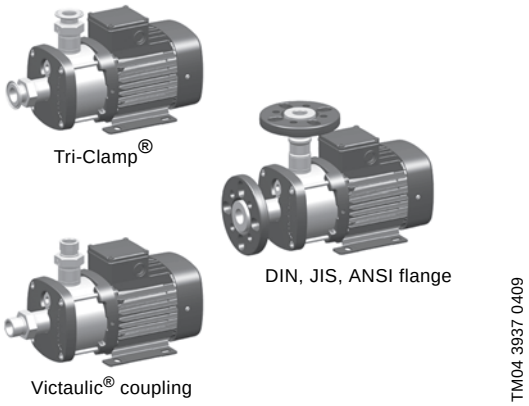


Fig. 33 Examples of pump connections

Selection of pump connection depends on the rated pressure and pipework. To meet any requirement, the CM and CME pumps offer a wide range of flexible connections such as:

- Tri-Clamp®
- DIN flange
- ANSI flange
- JIS flange
- Victaulic® coupling
- Whitworth thread Rp
- internal NPT thread.

Selection of CME pumps

CME pumps are normally used in applications characterised by a variable flow. Consequently, you cannot select a pump that is constantly operating at its optimum efficiency. In order to achieve optimum operating economy, the duty point should therefore be close to the optimum efficiency (eta) for most operating hours. For further information, see *CME pumps* on page 29.

Note: Irrespective of the input frequency, the 100 % speed of CME pumps is approximately 3400 min^{-1}.

See CME performance curves on pages 64 to 69.

15. How to read the curve charts

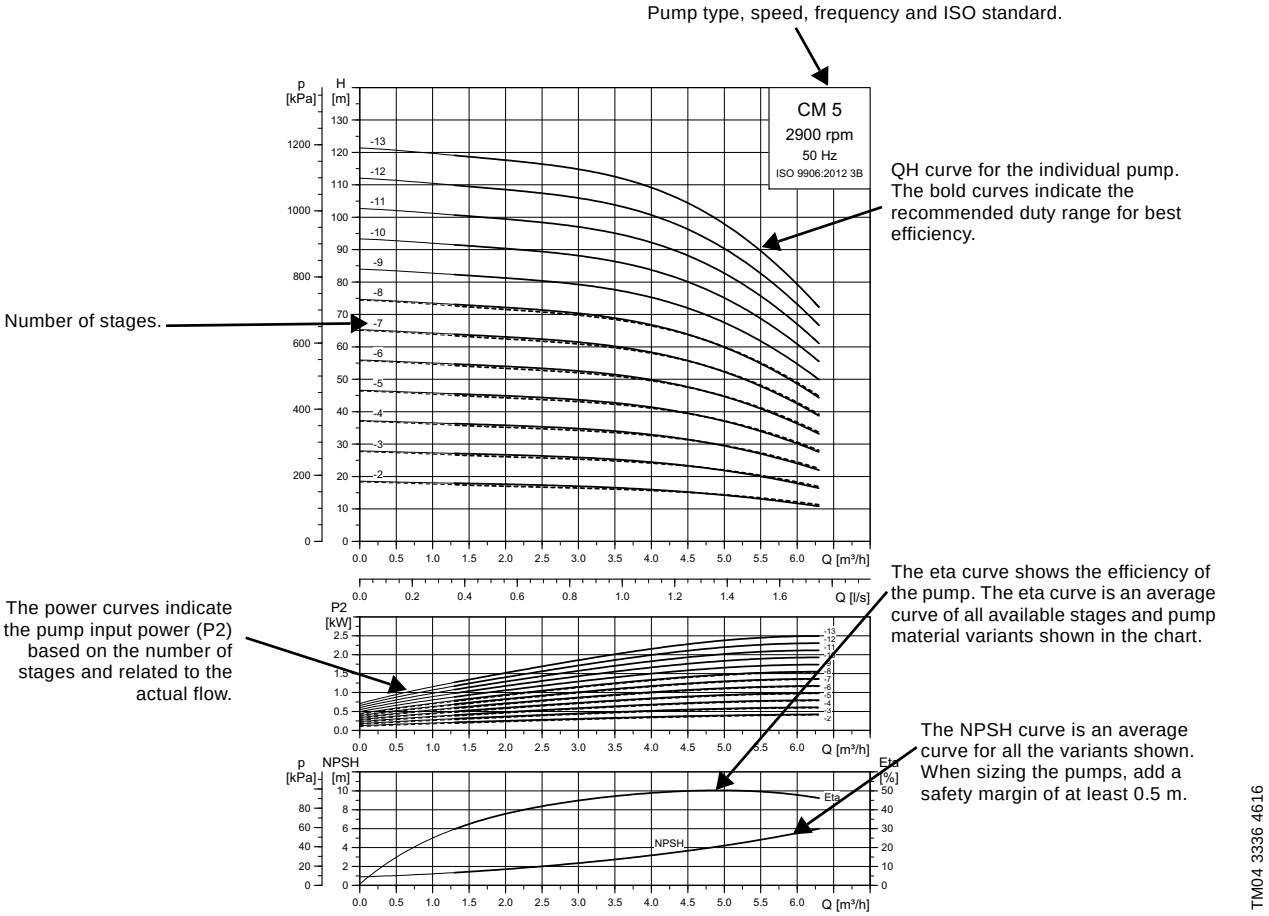


Fig. 34 How to read the curve charts

Guidelines for performance curves

The guidelines below apply to the curves shown on the following pages:

- Tolerances to ISO 9906:2012 3B.
- Measurements have been made with airless water at a temperature of 20 °C.
- The curves apply to the following kinematic viscosity: υ = 1 mm^2/s (1 cSt).
- The QH curves apply to fixed speeds of 2900 min^{-1} (50 Hz) and 3480 min^{-1} (60 Hz).
  Note: The actual speed will in most cases deviate from the above-mentioned speeds. So for realistic curves, please refer to the Grundfos Product Center (http://product-selection.grundfos.com/) where the pump curves include the characteristics of the selected motor and therefore show curves at actual speeds. In the Grundfos Product Center, you can also adjust the curves depending on the density and viscosity.
- The conversion between head H (m) and pressure p (kPa) applies to a water density of ρ = 1000 kg/m^3.
- Due to the risk of overheating, the pumps are not to be used at a flow below the minimum flow rate. The curve in fig. 35 shows the minimum flow rate as a percentage of the rated flow rate in relation to the liquid temperature.

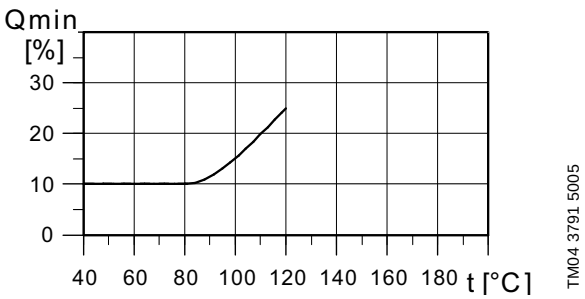
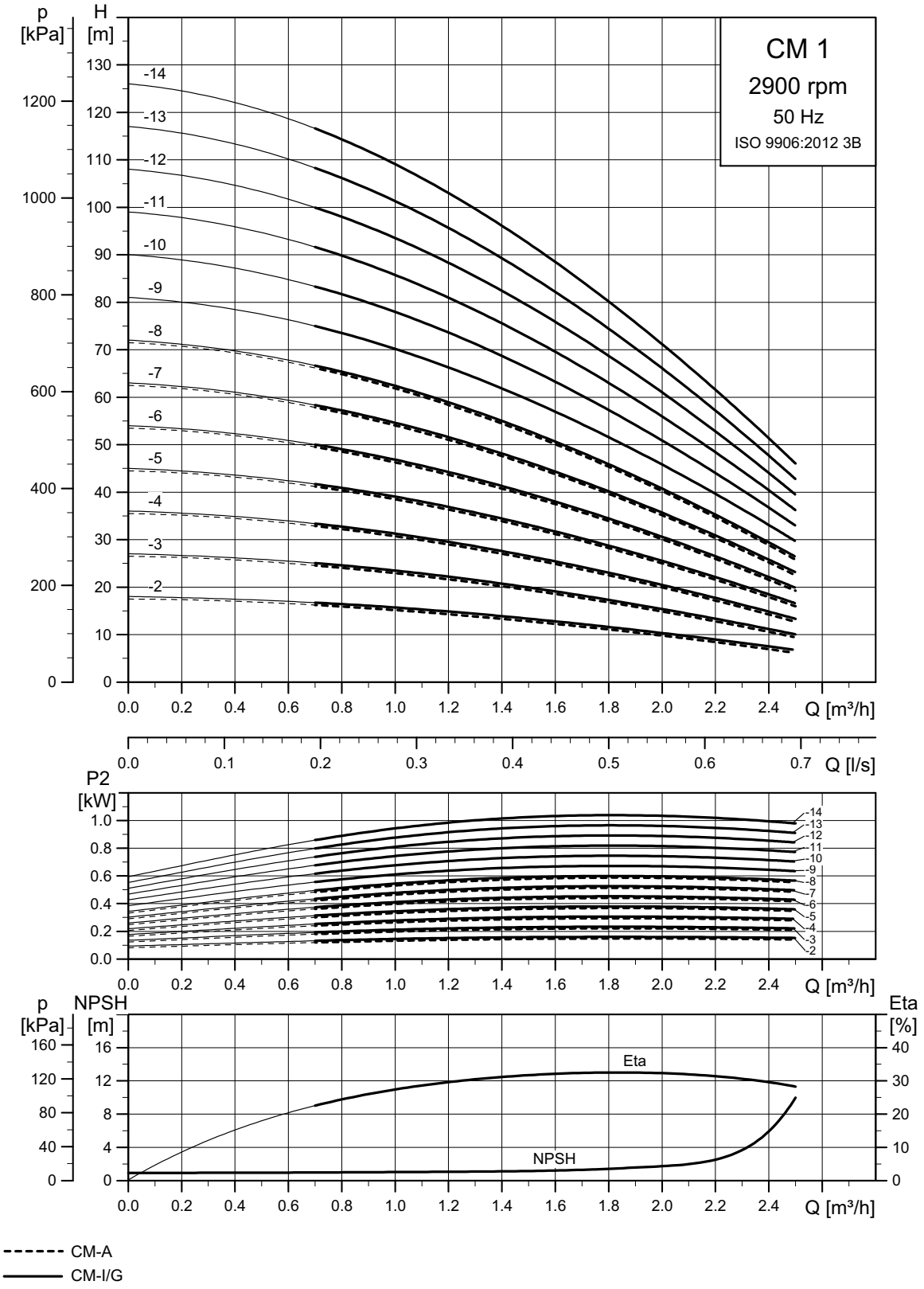


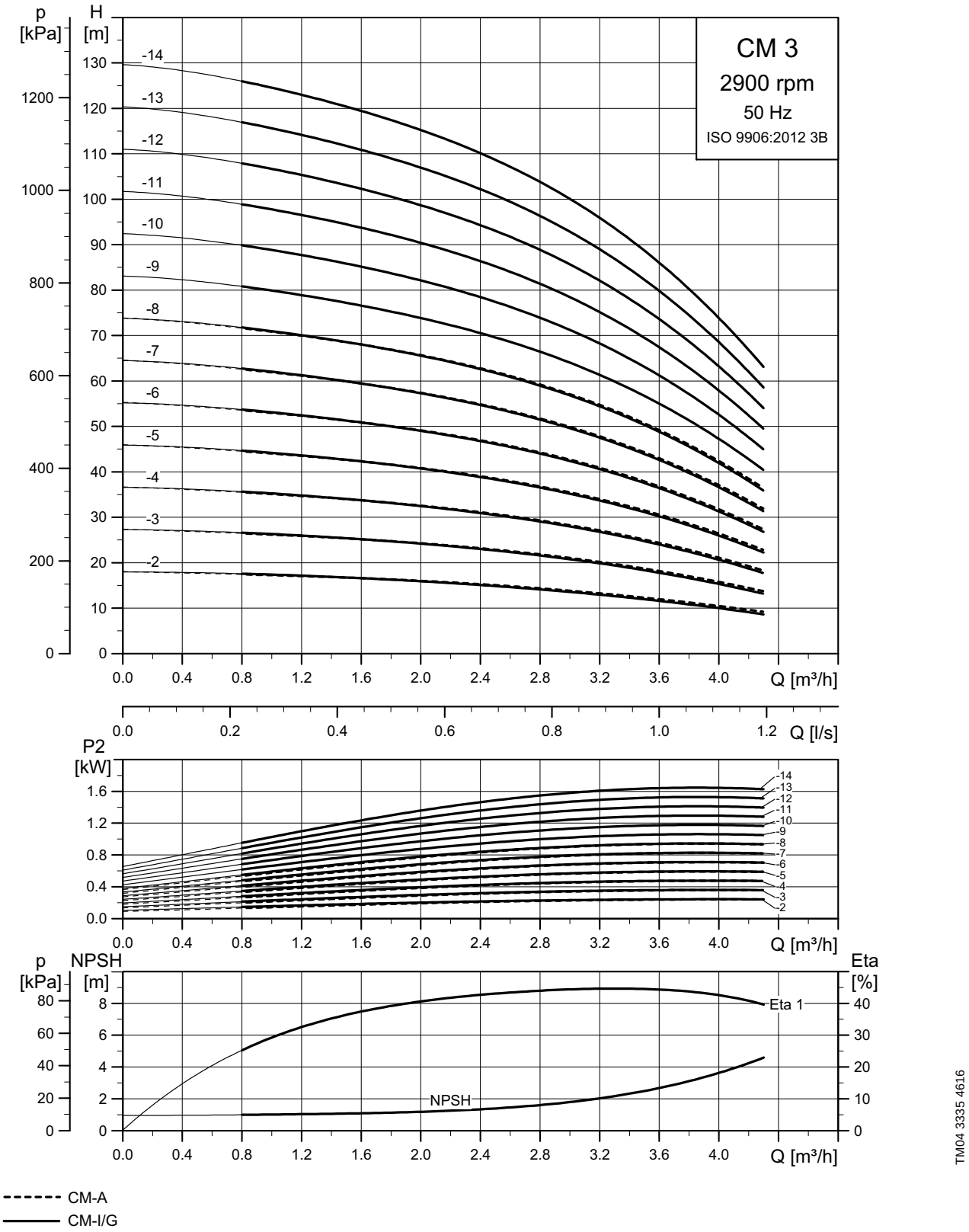
Fig. 35 Minimum flow rate

16. Performance curves, CM 50 Hz

CM 1

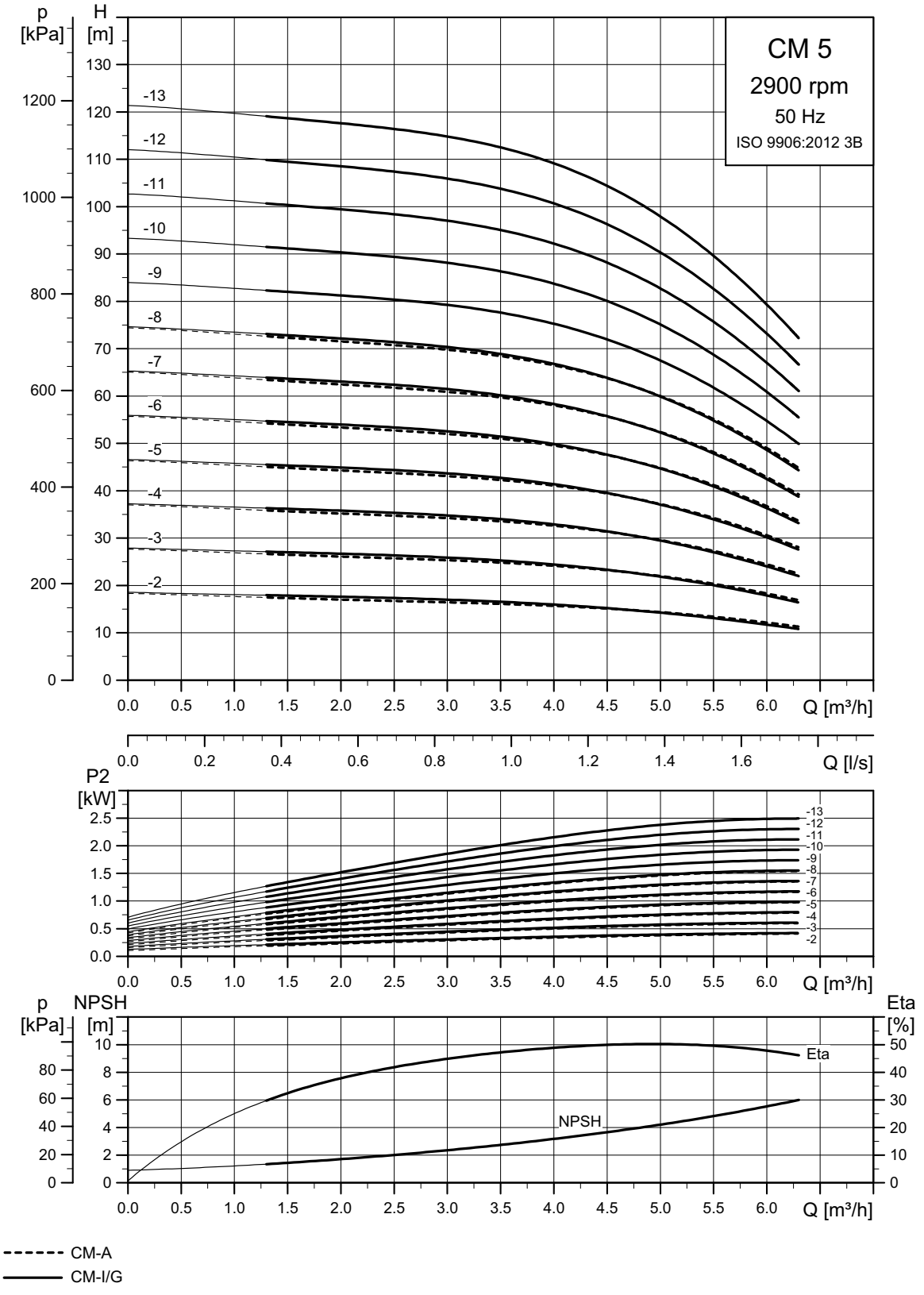


CM 3



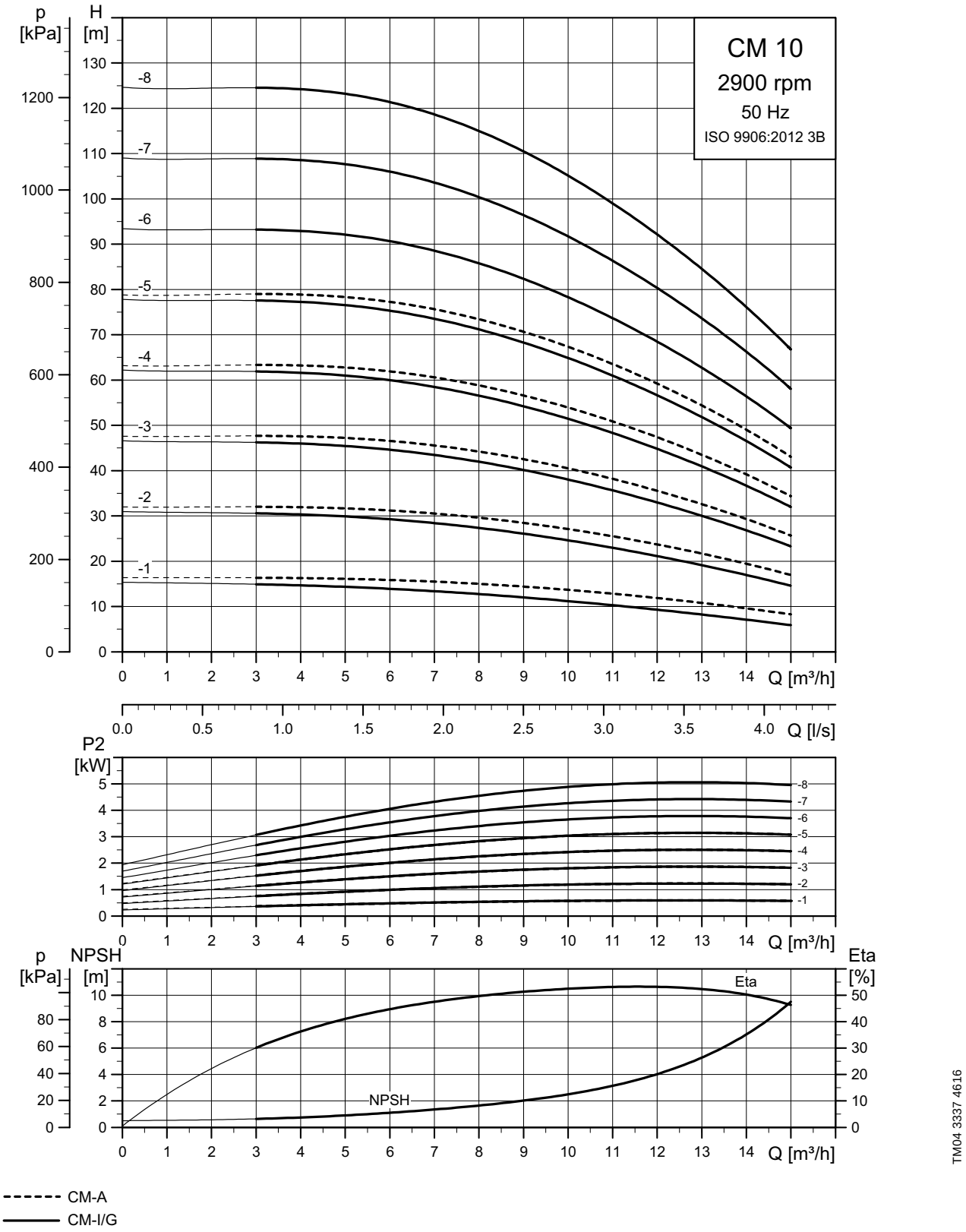
TM04 3335 4616

CM 5



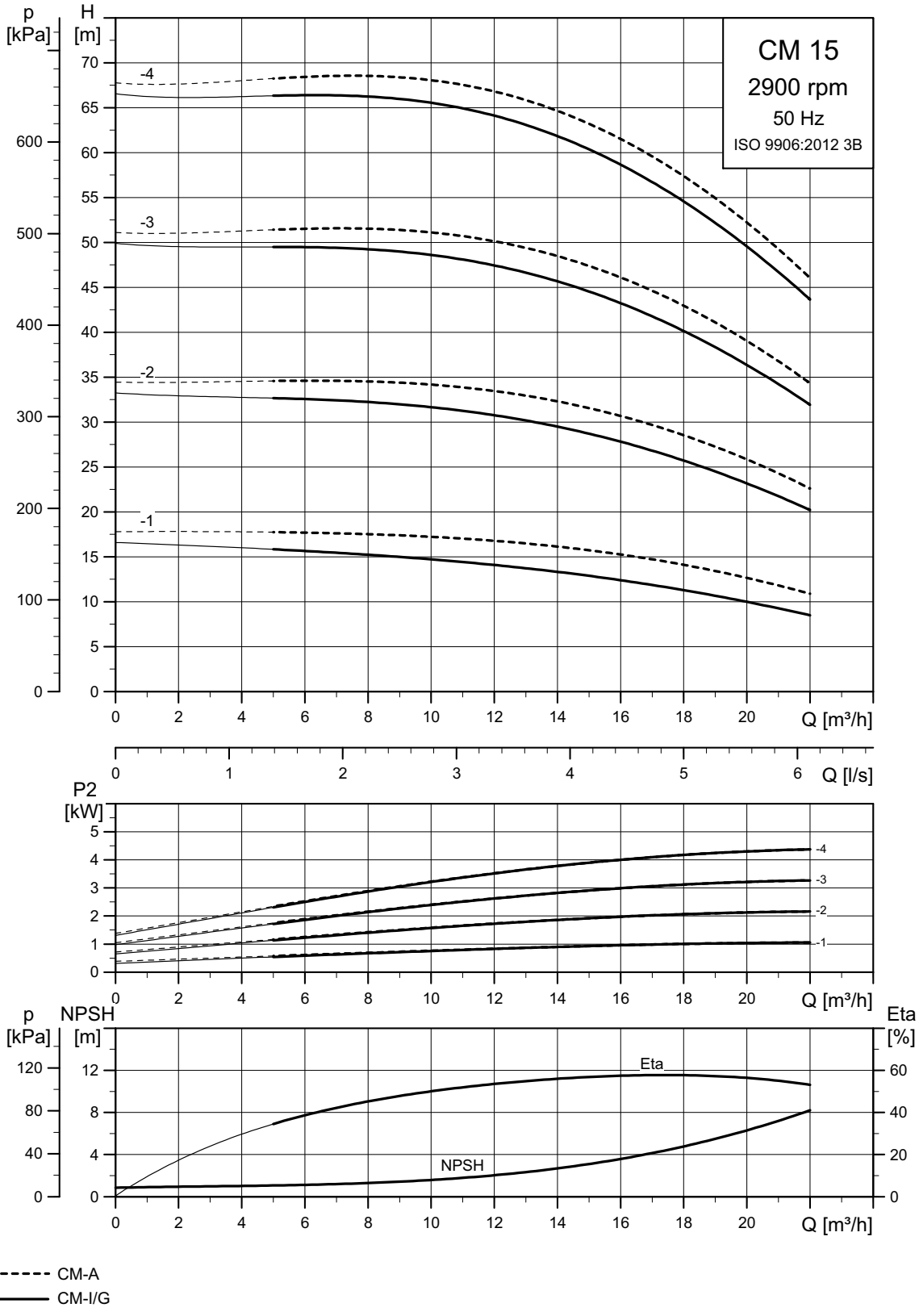
TM04 3336 4616

CM 10

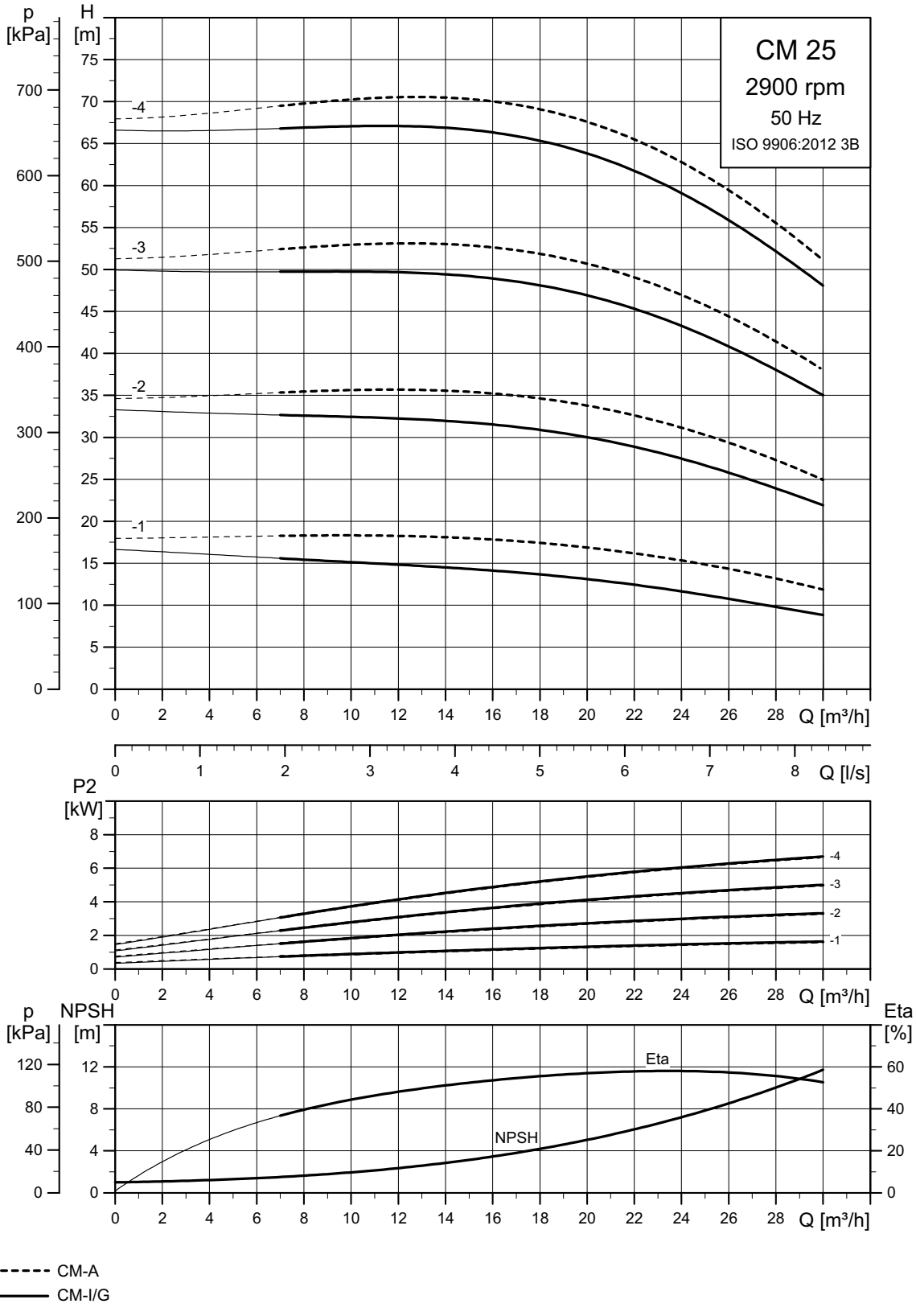


TM04 3337 4616

CM 15


CM 15
2900 rpm
50 Hz
ISO 9906:2012 3B
p [kPa]
H [m]
-4
-3
-2
-1
Q [m³/h]
Q [l/s]
P2 [kW]
p [kPa]
NPSH [m]
Eta [%]
Eta
NPSH
TM04 3338 4616
CM-A
CM-I/G

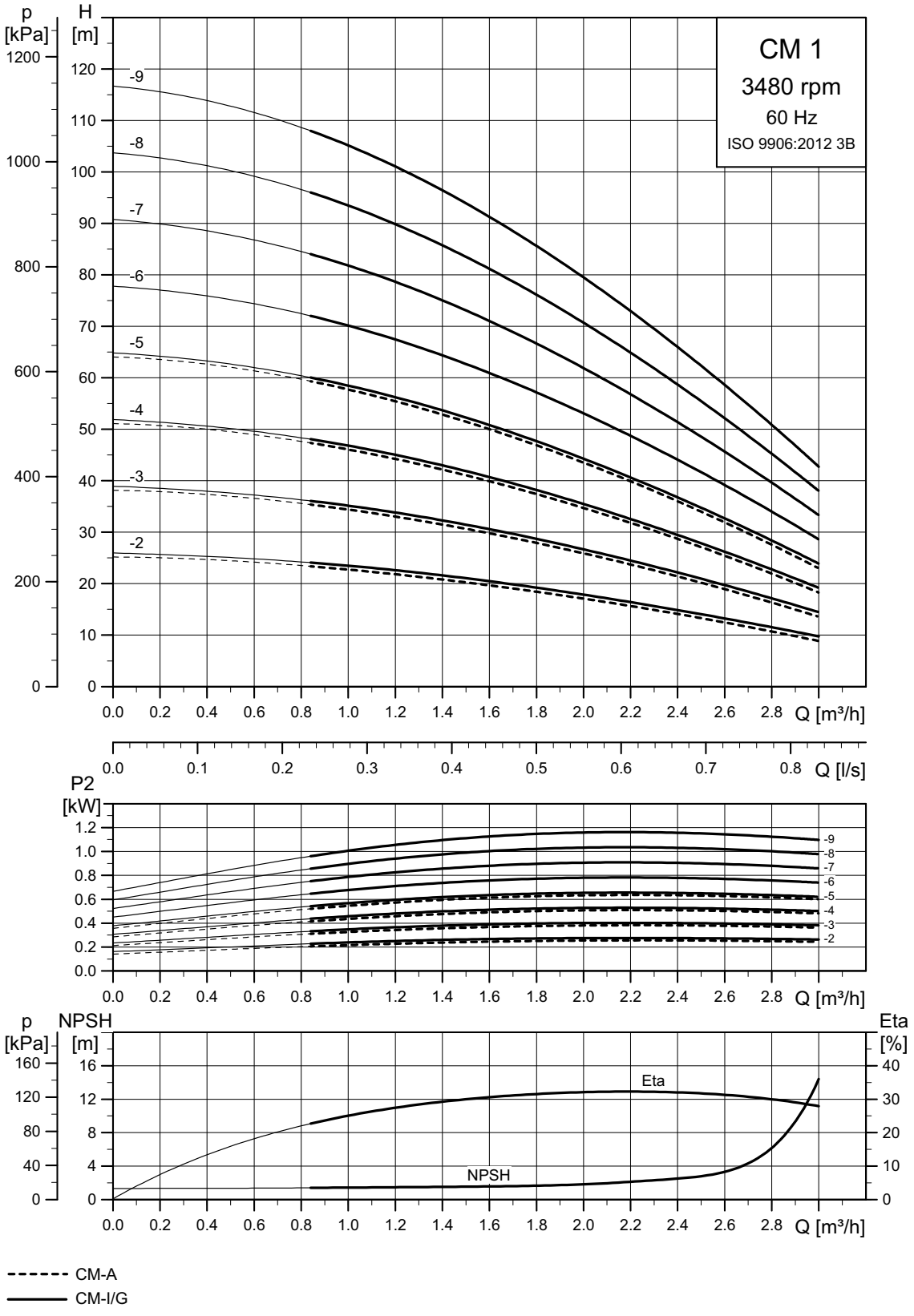
CM 25



TM04 3339 4616

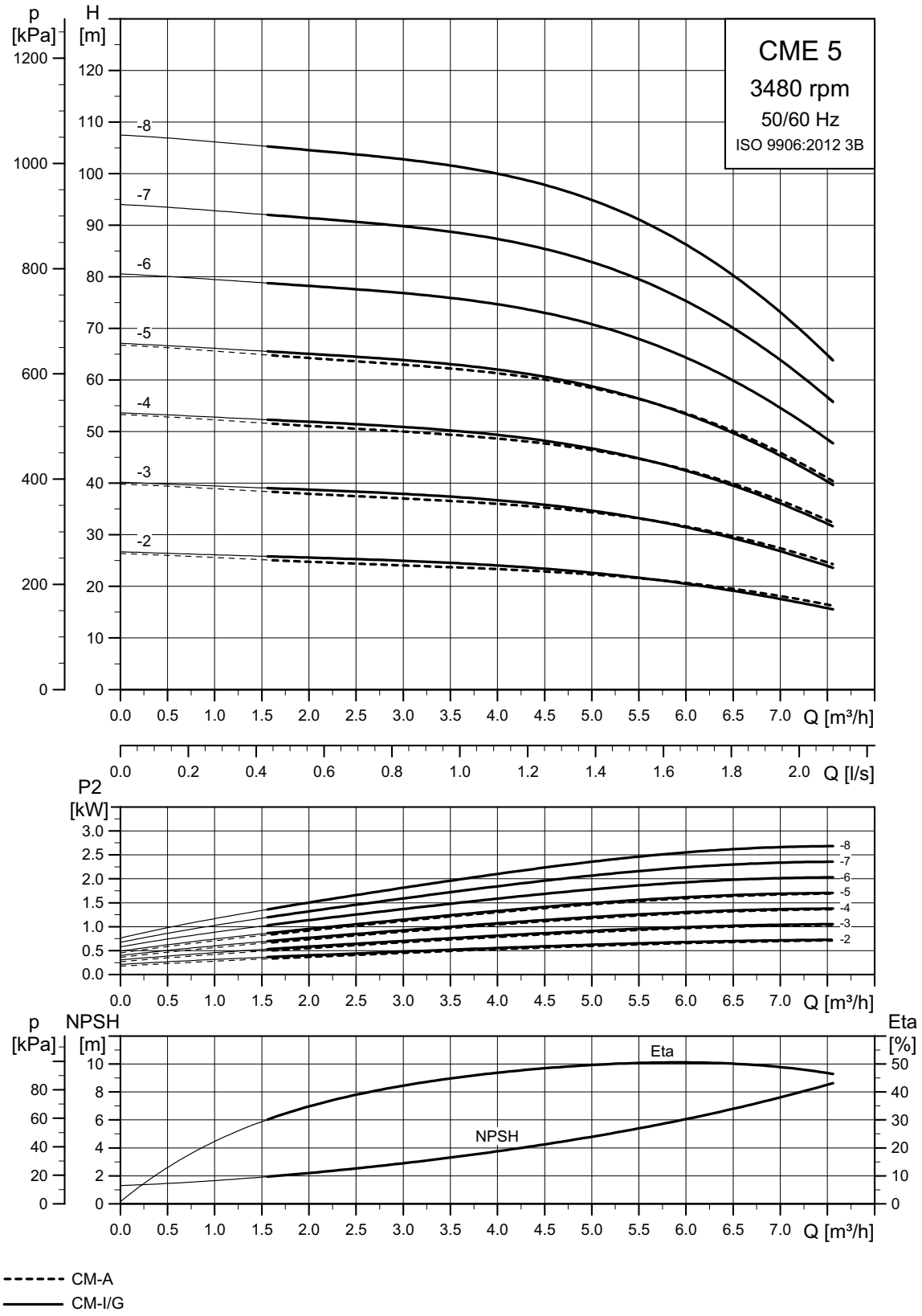
17. Performance curves, CM 60 Hz

CM 1



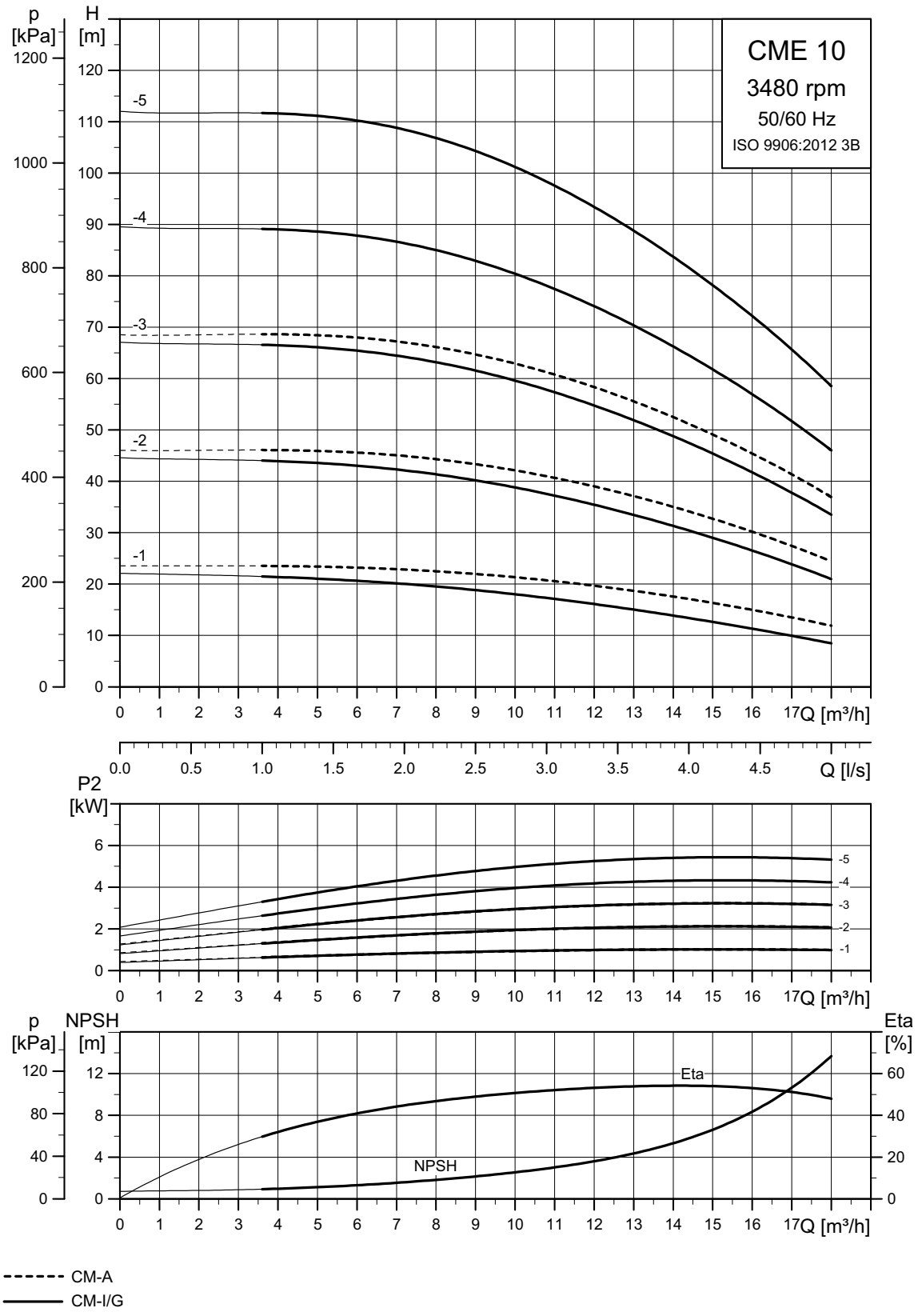
TM04 3370 4616

CM 3

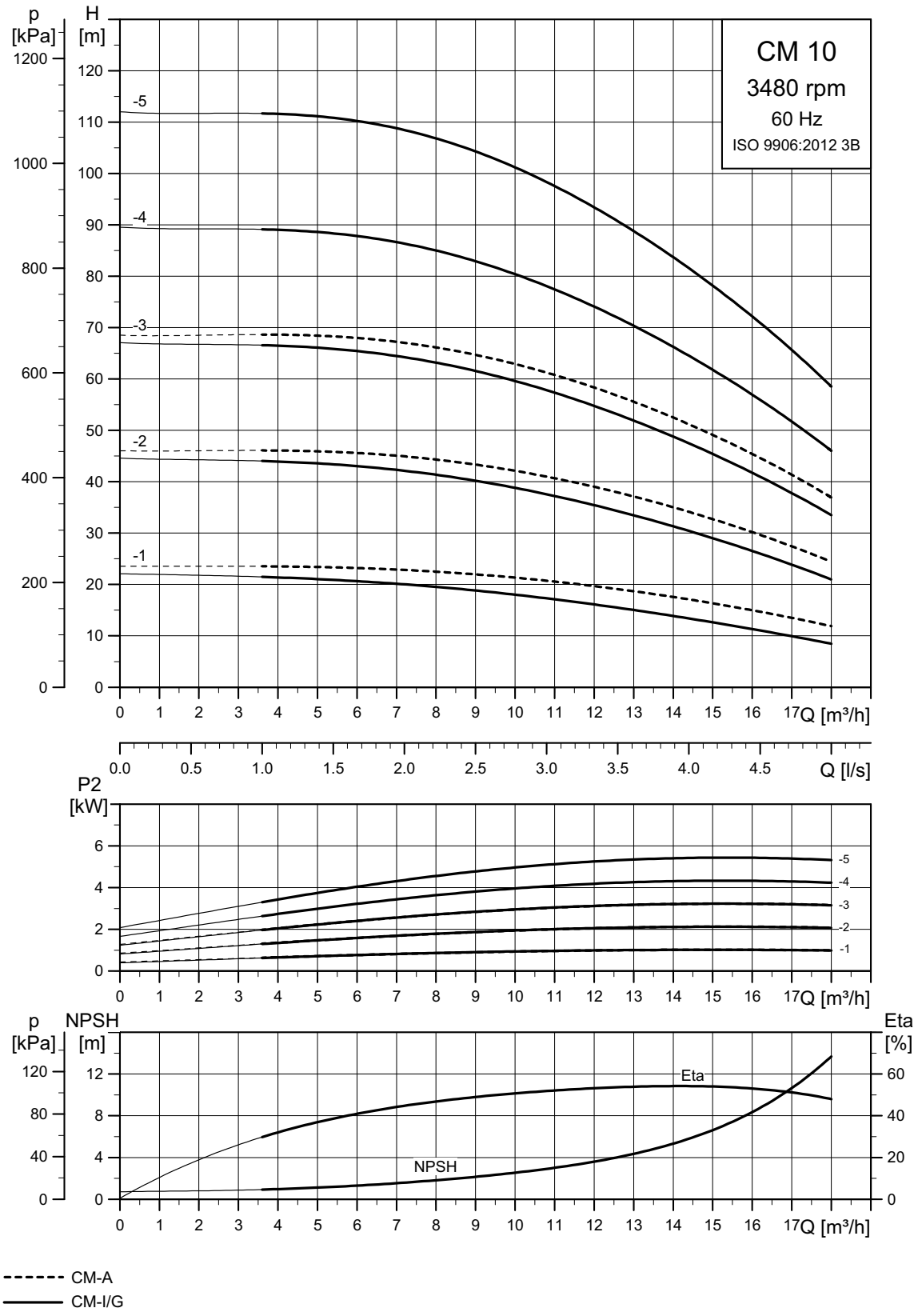


TM04 3371 4616

CM 5

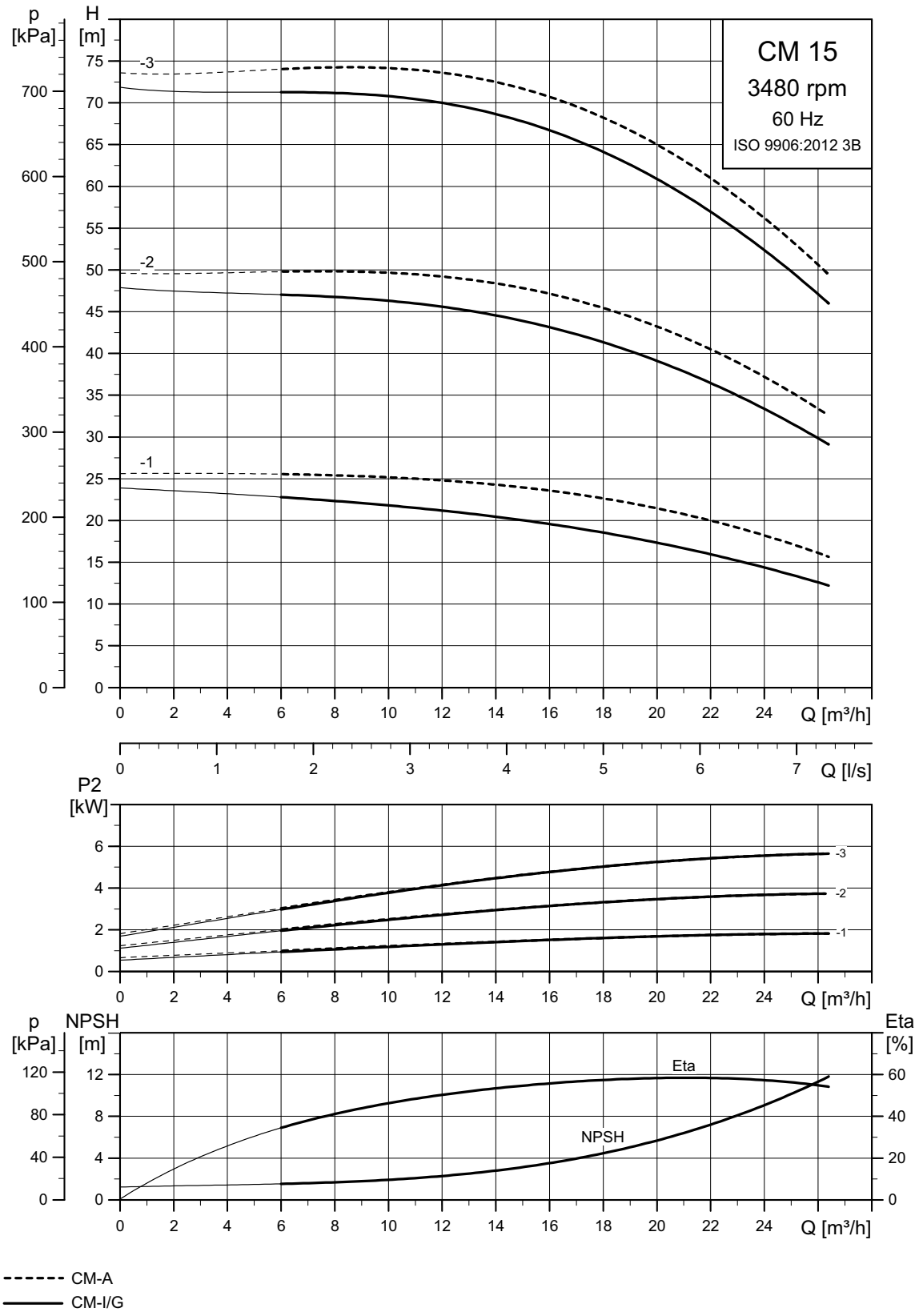

CME 10
3480 rpm
50/60 Hz
ISO 9906:2012 3B
p [kPa]
H [m]
-5
-4
-3
-2
-1
Q [m³/h]
Q [l/s]
P2 [kW]
p [kPa]
NPSH [m]
Eta [%]
Eta
NPSH
TM04 3372 4616
CM-A
CM-I/G

CM 10

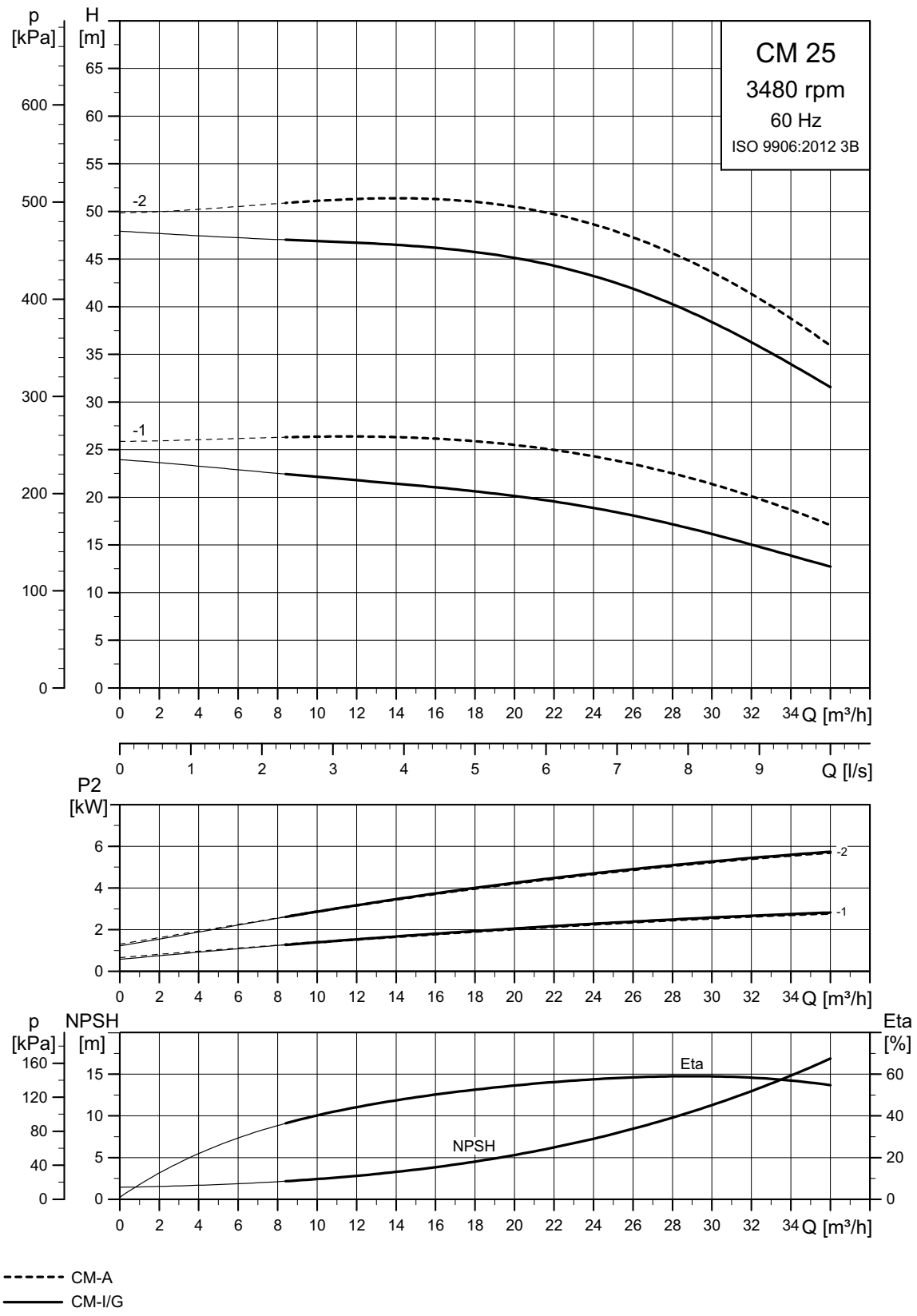


TM04 3373 4616

CM 15


CM 15
3480 rpm
60 Hz
ISO 9906:2012 3B
p [kPa]
H [m]
-3
-2
-1
Q [m³/h]
Q [l/s]
P2 [kW]
p [kPa]
NPSH [m]
Eta [%]
Eta
NPSH
TM04 3374 4616
CM-A
CM-I/G

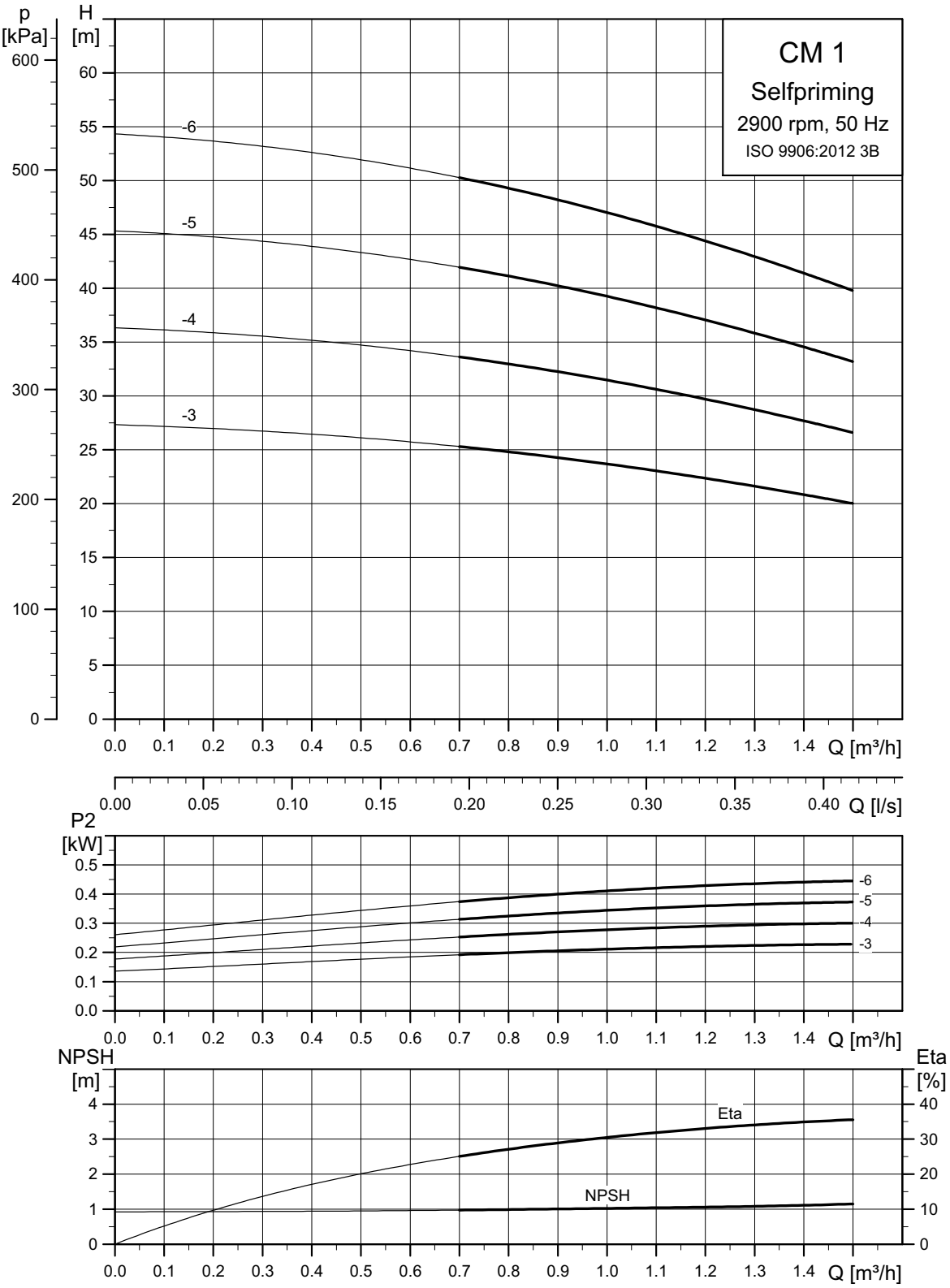
CM 25



TM04 3375 4616

18. Performance curves, CM self-priming, 50 Hz

CM 1



TM05 8756 4616

Note: Pump performance is influenced by the suction lift. See page 52.

Pump performance in relation to suction lift

CM 1-3

Pump head [m]		Flow [m^3/h]						
		0	0.25	0.5	0.75	1	1.25	1.5
Suction lift [m]	0	27.3	26.9	26.1	25.1	23.7	22.0	20.0
	1	26.3	25.9	25.1	24.1	22.7	21.0	19.0
	2	25.3	24.9	24.1	23.1	21.7	20.0	18.0
	3	24.3	23.9	23.1	22.1	20.7	19.0	17.0
	4	23.3	22.9	22.1	21.1	19.7	18.0	16.0

CM 1-4

Pump head [m]		Flow [m^3/h]						
		0	0.25	0.5	0.75	1	1.25	1.5
Suction lift [m]	0	36.3	35.7	34.7	33.3	31.5	29.2	26.6
	1	35.3	34.7	33.7	32.3	30.5	28.2	25.6
	2	34.3	33.7	32.7	31.3	29.5	27.2	24.6
	3	33.3	32.7	31.7	30.3	28.5	26.2	23.6
	4	32.3	31.7	30.7	29.3	27.5	25.2	22.6

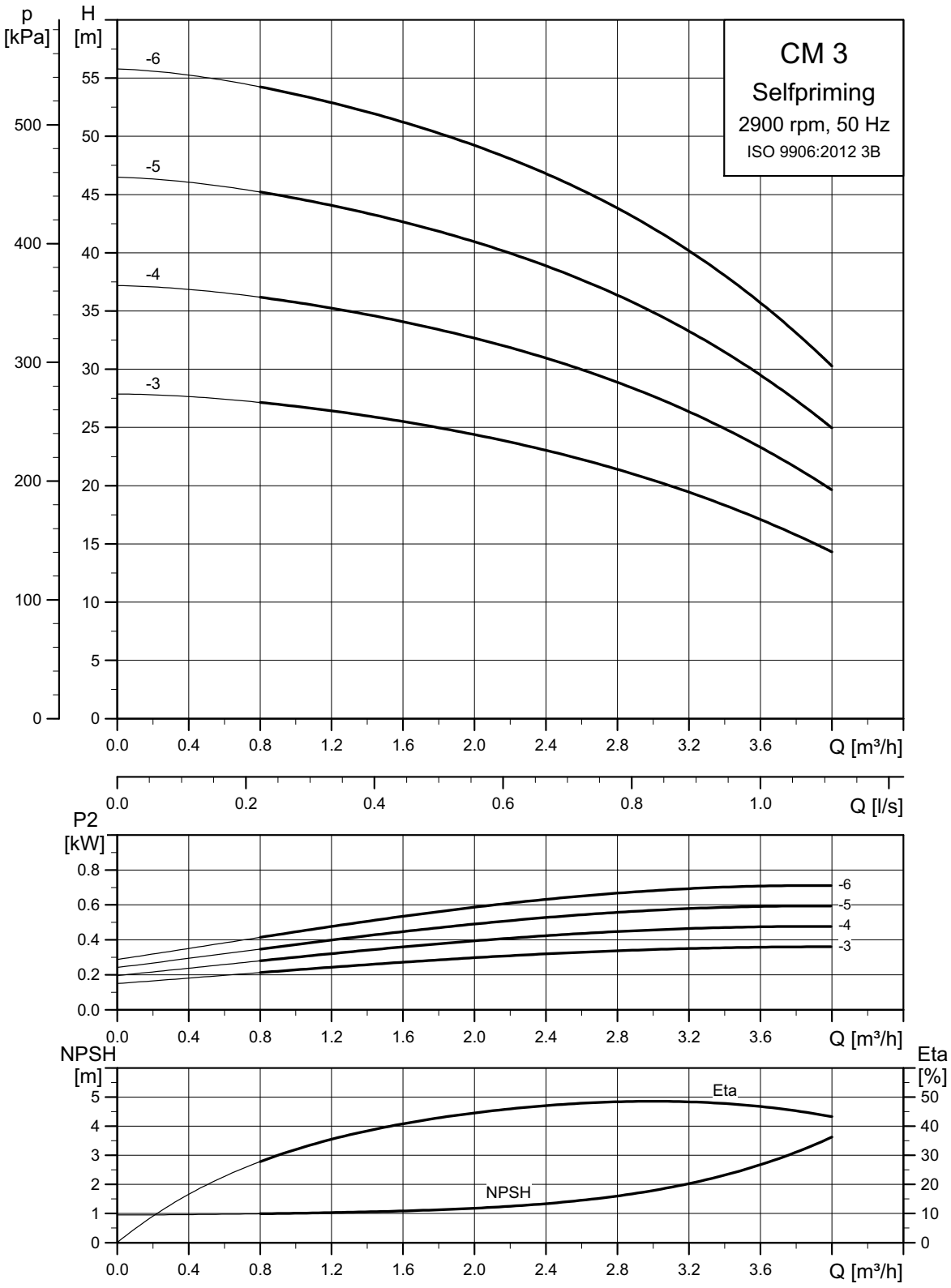
CM 1-5

Pump head [m]		Flow [m^3/h]						
		0	0.25	0.5	0.75	1	1.25	1.5
Suction lift [m]	0	45.3	44.6	43.3	41.6	39.3	36.5	33.2
	1	44.3	43.6	42.3	40.6	38.3	35.5	32.2
	2	43.3	42.6	41.3	39.6	37.3	34.5	31.2
	3	42.3	41.6	40.3	38.6	36.3	33.5	30.2
	4	41.3	40.6	39.3	37.6	35.3	32.5	29.2

CM 1-6

Pump head [m]		Flow [m^3/h]						
		0	0.25	0.5	0.75	1	1.25	1.5
Suction lift [m]	0	54.3	53.4	51.9	49.8	47.0	43.7	39.8
	1	53.3	52.4	50.9	48.8	46.0	42.7	38.8
	2	52.3	51.4	49.9	47.8	45.0	41.7	37.8
	3	51.3	50.4	48.9	46.8	44.0	40.7	36.8
	4	50.3	49.4	47.9	45.8	43.0	39.7	35.8

CM 3



Note: Pump performance is influenced by the suction lift. See page 54.

Pump performance in relation to suction lift

CM 3-3

Pump head [m]		Flow [m^3/h]								
		0	0.5	1	1.5	2	2.5	3	3.5**	4**
Suction lift [m]	0	27.9	27.5	26.8	25.8	24.4	22.7	20.5	17.7	14.3
	1	26.9	26.5	25.8	24.8	23.4	21.7	19.5	16.7	13.3
	2	25.9	25.5	24.8	23.8	22.4	20.7	18.5	15.7	12.3
	3	24.9	24.5	23.8	22.8	21.4	19.7	17.5	14.7	11.3
	4	23.9	23.5	22.8	21.8	20.4	18.7	16.5	13.7	10.3
	5*	22.9	22.5	21.8	20.8	19.4	17.7	15.5	-	-
	6*	21.9	21.5	20.8	19.8	18.4	16.7	14.5	-	-
	7*	20.9	20.5	19.8	18.8	17.4	15.7	-	-	-
	8*	19.9	19.5	18.8	17.8	-	-	-	-	-

CM 3-4

Pump head [m]		Flow [m^3/h]								
		0	0.5	1	1.5	2	2.5	3	3.5**	4**
Suction lift [m]	0	37.2	36.7	35.7	34.4	32.7	30.5	27.7	24.1	19.6
	1	36.2	35.7	34.7	33.4	31.7	29.5	26.7	23.1	18.6
	2	35.2	34.7	33.7	32.4	30.7	28.5	25.7	22.1	17.6
	3	34.2	33.7	32.7	31.4	29.7	27.5	24.7	21.1	16.6
	4	33.2	32.7	31.7	30.4	28.7	26.5	23.7	20.1	15.6
	5*	32.2	31.7	30.7	29.4	27.7	25.5	22.7	-	-
	6*	31.2	30.7	29.7	28.4	26.7	24.5	21.7	-	-
	7*	30.2	29.7	28.7	27.4	25.7	23.5	-	-	-
	8*	29.2	28.7	27.7	26.4	-	-	-	-	-

CM 3-5

Pump head [m]		Flow [m^3/h]								
		0	0.5	1	1.5	2	2.5	3	3.5**	4**
Suction lift [m]	0	46.5	45.9	44.7	43.0	40.9	38.3	34.9	30.5	25.0
	1	45.5	44.9	43.7	42.0	39.9	37.3	33.9	29.5	24.0
	2	44.5	43.9	42.7	41.0	38.9	36.3	32.9	28.5	23.0
	3	43.5	42.9	41.7	40.0	37.9	35.3	31.9	27.5	22.0
	4	42.5	41.9	40.7	39.0	36.9	34.3	30.9	26.5	21.0
	5*	41.5	40.9	39.7	38.0	35.9	33.3	29.9	-	-
	6*	40.5	39.9	38.7	37.0	34.9	32.3	28.9	-	-
	7*	39.5	38.9	37.7	36.0	33.9	31.3	-	-	-
	8*	38.5	37.9	36.7	35.0	-	-	-	-	-

CM 3-6

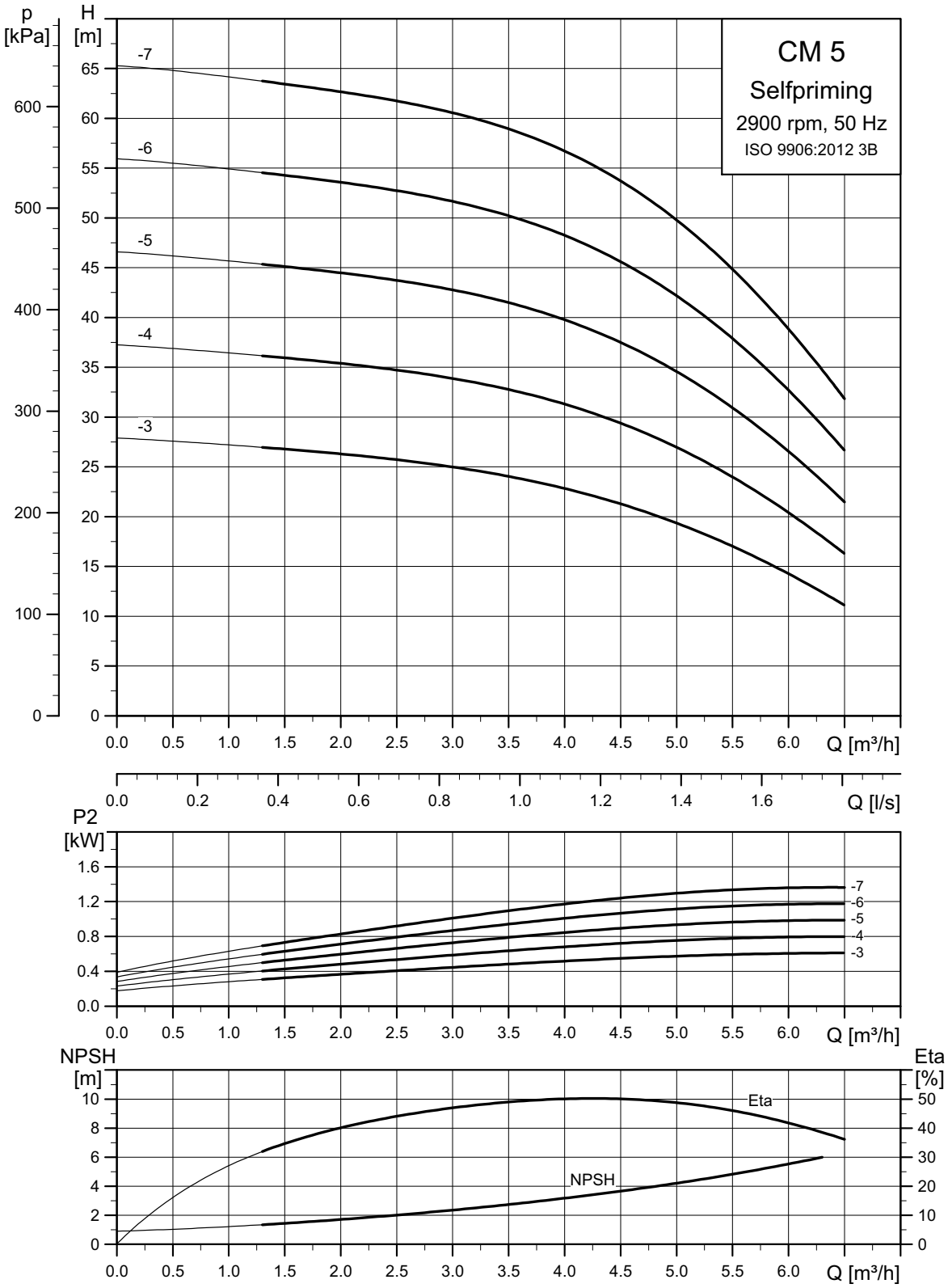
Pump head [m]		Flow [m^3/h]								
		0	0.5	1	1.5	2	2.5	3	3.5**	4**
Suction lift [m]	0	55.8	55.0	53.6	51.7	49.2	46.1	42.1	36.9	30.3
	1	54.8	54.0	52.6	50.7	48.2	45.1	41.1	35.9	29.3
	2	53.8	53.0	51.6	49.7	47.2	44.1	40.1	34.9	28.3
	3	52.8	52.0	50.6	48.7	46.2	43.1	39.1	33.9	27.3
	4	51.8	51.0	49.6	47.7	45.2	42.1	38.1	32.9	26.3
	5*	50.8	50.0	48.6	46.7	44.2	41.1	37.1	-	-
	6*	49.8	49.0	47.6	45.7	43.2	40.1	36.1	-	-
	7*	48.8	48.0	46.6	44.7	42.2	39.1	-	-	-
	8*	47.8	47.0	45.6	43.7	-	-	-	-	-

Note: Depending on the pump model, the maximum suction depth varies between 7.5 and 8.5 m.

* Only available in O-version

** Only available in S-version

CM 5



Note: Pump performance is influenced by the suction lift. See page 56.

Pump performance in relation to suction lift

CM 5-3

Pump head [m]		Flow [m^3/h]													
		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5**	6**	6.5**
Suction lift [m]	0	27.9	27.6	27.2	26.8	26.3	25.7	25.0	24.0	22.8	21.3	19.4	17.0	14.3	11.1
	1	26.9	26.6	26.2	25.8	25.3	24.7	24.0	23.0	21.8	20.3	18.4	16.0	13.3	10.1
	2	25.9	25.6	25.2	24.8	24.3	23.7	23.0	22.0	20.8	19.3	17.4	15.0	12.3	-
	3	24.9	24.6	24.2	23.8	23.3	22.7	22.0	21.0	19.8	18.3	16.4	-	-	-
	4	23.9	23.6	23.2	22.8	22.3	21.7	21.0	20.0	18.8	17.3	-	-	-	-
	5*	22.9	22.6	22.2	21.8	21.3	20.7	20.0	19.0	17.8	-	-	-	-	-
	6*	21.9	21.6	21.2	20.8	20.3	19.7	19.0	-	-	-	-	-	-	-
	7*	20.9	20.6	20.2	19.8	19.3	-	-	-	-	-	-	-	-	-
	8*	19.9	19.6	19.2	18.8	-	-	-	-	-	-	-	-	-	-

CM 5-4

Pump head [m]		Flow [m^3/h]													
		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5**	6**	6.5**
Suction lift [m]	0	37.3	36.9	36.4	35.9	35.4	34.7	33.9	32.8	31.3	29.4	27.0	24.0	20.4	16.3
	1	36.3	35.9	35.4	34.9	34.4	33.7	32.9	31.8	30.3	28.4	26.0	23.0	19.4	15.3
	2	35.3	34.9	34.4	33.9	33.4	32.7	31.9	30.8	29.3	27.4	25.0	22.0	18.4	-
	3	34.3	33.9	33.4	32.9	32.4	31.7	30.9	29.8	28.3	26.4	24.0	-	-	-
	4	33.3	32.9	32.4	31.9	31.4	30.7	29.9	28.8	27.3	25.4	-	-	-	-
	5*	32.3	31.9	31.4	30.9	30.4	29.7	28.9	27.8	26.3	-	-	-	-	-
	6*	31.3	30.9	30.4	29.9	29.4	28.7	27.9	-	-	-	-	-	-	-
	7*	30.3	29.9	29.4	28.9	28.4	-	-	-	-	-	-	-	-	-
	8*	29.3	28.9	28.4	27.9	-	-	-	-	-	-	-	-	-	-

CM 5-5

Pump head [m]		Flow [m^3/h]													
		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5**	6**	6.5**
Suction lift [m]	0	46.6	46.2	45.7	45.1	44.5	43.7	42.8	41.5	39.8	37.5	34.6	30.9	26.5	21.5
	1	45.6	45.2	44.7	44.1	43.5	42.7	41.8	40.5	38.8	36.5	33.6	29.9	25.5	20.5
	2	44.6	44.2	43.7	43.1	42.5	41.7	40.8	39.5	37.8	35.5	32.6	28.9	24.5	-
	3	43.6	43.2	42.7	42.1	41.5	40.7	39.8	38.5	36.8	34.5	31.6	-	-	-
	4	42.6	42.2	41.7	41.1	40.5	39.7	38.8	37.5	35.8	33.5	-	-	-	-
	5*	41.6	41.2	40.7	40.1	39.5	38.7	37.8	36.5	34.8	-	-	-	-	-
	6*	40.6	40.2	39.7	39.1	38.5	37.7	36.8	-	-	-	-	-	-	-
	7*	39.6	39.2	38.7	38.1	37.5	-	-	-	-	-	-	-	-	-
	8*	38.6	38.2	37.7	37.1	-	-	-	-	-	-	-	-	-	-

Note: Depending on the pump model, the maximum suction depth varies between 7.5 and 8.5 m.

* Only available in O-version

** Only available in S-version

CM 5-6

Pump head [m]		Flow [m^3/h]													
		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5**	6**	6.5**
Suction lift [m]	0	55.9	55.5	54.9	54.3	53.6	52.7	51.7	50.2	48.2	45.6	42.2	37.9	32.7	26.6
	1	54.9	54.5	53.9	53.3	52.6	51.7	50.7	49.2	47.2	44.6	41.2	36.9	31.7	25.6
	2	53.9	53.5	52.9	52.3	51.6	50.7	49.7	48.2	46.2	43.6	40.2	35.9	30.7	-
	3	52.9	52.5	51.9	51.3	50.6	49.7	48.7	47.2	45.2	42.6	39.2	-	-	-
	4	51.9	51.5	50.9	50.3	49.6	48.7	47.7	46.2	44.2	41.6	-	-	-	-
	5*	50.9	50.5	49.9	49.3	48.6	47.7	46.7	45.2	43.2	-	-	-	-	-
	6*	49.9	49.5	48.9	48.3	47.6	46.7	45.7	-	-	-	-	-	-	-
	7*	48.9	48.5	47.9	47.3	46.6	-	-	-	-	-	-	-	-	-
	8*	47.9	47.5	46.9	46.3	-	-	-	-	-	-	-	-	-	-

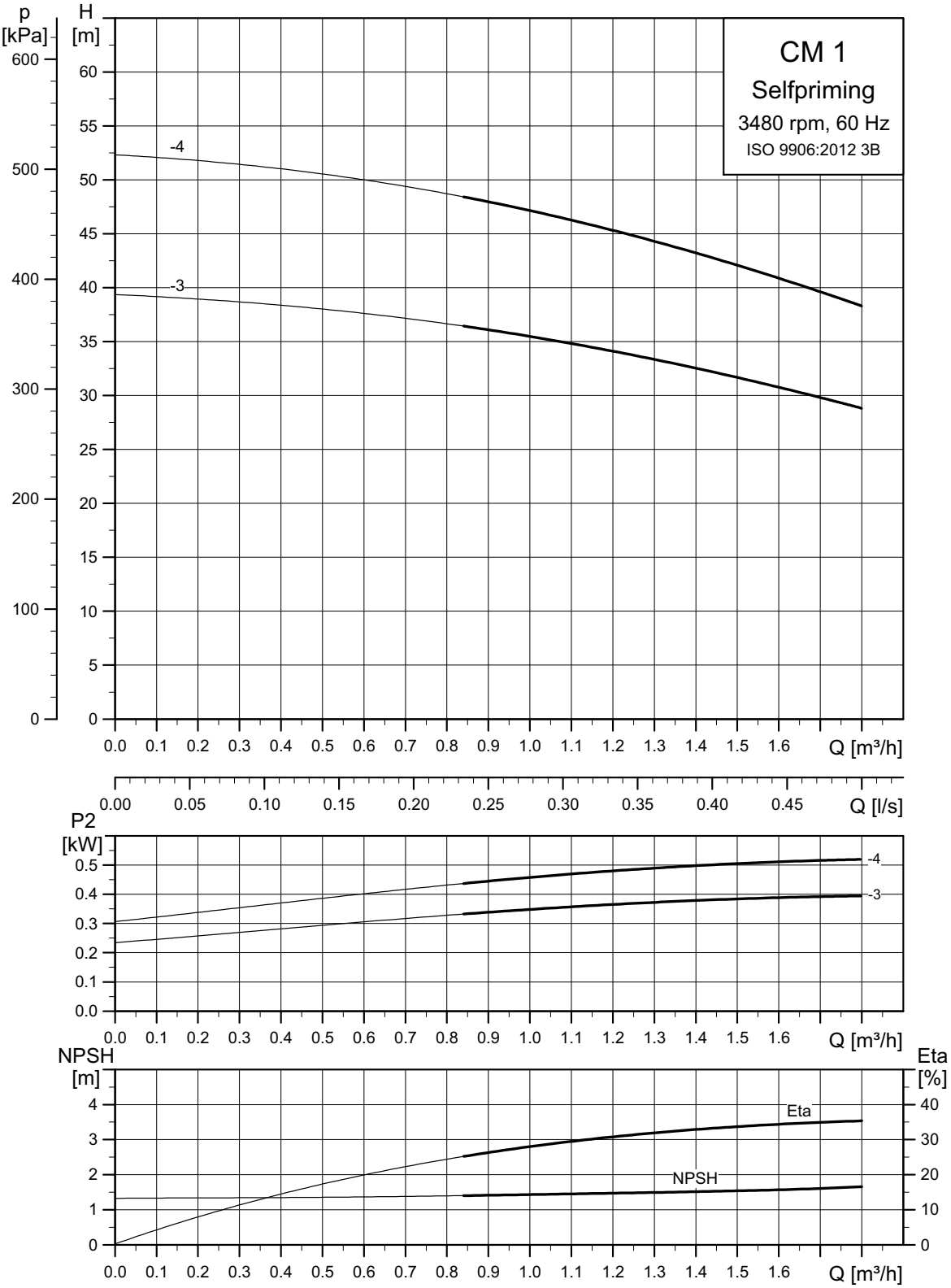
CM 5-7

Pump head [m]		Flow [m^3/h]													
		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5**	6**	6.5**
Suction lift [m]	0	65.3	64.8	64.2	63.4	62.7	61.7	60.6	58.9	56.7	53.7	49.8	44.8	38.8	31.1
	1	64.3	63.8	63.2	62.4	61.7	60.7	59.6	57.9	55.7	52.7	48.8	43.8	37.8	30.1
	2	63.3	62.8	62.2	61.4	60.7	59.7	58.6	56.9	54.7	51.7	47.8	42.8	36.8	-
	3	62.3	61.8	61.2	60.4	59.7	58.7	57.6	55.9	53.7	50.7	46.8	-	-	-
	4	61.3	60.8	60.2	59.4	58.7	57.7	56.6	54.9	52.7	49.7	-	-	-	-
	5*	60.3	59.8	59.2	58.4	57.7	56.7	55.6	53.9	51.7	-	-	-	-	-
	6*	59.3	58.8	58.2	57.4	56.7	55.7	54.6	-	-	-	-	-	-	-
	7*	58.3	57.8	57.2	56.4	55.7	-	-	-	-	-	-	-	-	-
	8*	57.3	56.8	56.2	55.4	-	-	-	-	-	-	-	-	-	-

Note: Depending on the pump model, the maximum suction depth varies between 7.5 and 8.5 m.
* Only available in O-version
** Only available in S-version

19. Performance curves, CM self-priming, 60 Hz

CM 1



TM05 8793 4616

Note: Pump performance is influenced by the suction lift. See page 59.

Pump performance in relation to suction lift

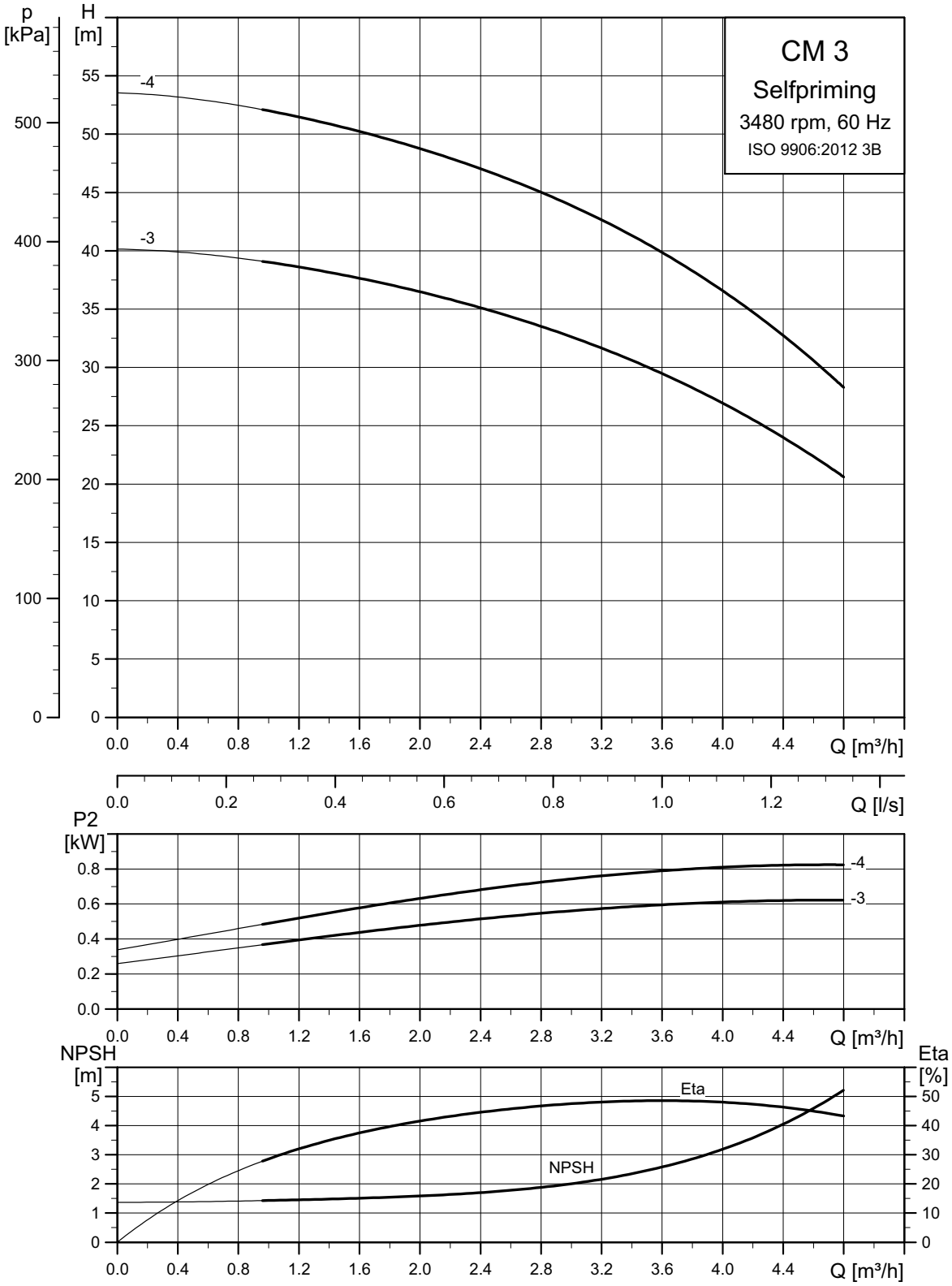
CM 1-3

Pump head [m]		Flow [m^3/h]										
		0	0.25	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5
Suction lift [m]	0	39.4	38.8	38.0	36.9	35.5	33.7	31.7	29.3	26.7	23.8	20.8
	1	38.4	37.8	37.0	35.9	34.5	32.7	30.7	28.3	25.7	22.8	19.8
	2	37.4	36.8	36.0	34.9	33.5	31.7	29.7	27.3	24.7	21.8	18.8
	3	36.4	35.8	35.0	33.9	32.5	30.7	28.7	26.3	23.7	20.8	17.8
	4	35.4	34.8	34.0	32.9	31.5	29.7	27.7	25.3	22.7	19.8	16.8

CM 1-4

Pump head [m]		Flow [m^3/h]										
		0	0.25	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5
Suction lift [m]	0	52.3	51.6	50.5	49.1	47.2	44.8	42.1	39.0	35.5	31.7	27.7
	1	51.3	50.6	49.5	48.1	46.2	43.8	41.1	38.0	34.5	30.7	26.7
	2	50.3	49.6	48.5	47.1	45.2	42.8	40.1	37.0	33.5	29.7	25.7
	3	49.3	48.6	47.5	46.1	44.2	41.8	39.1	36.0	32.5	28.7	24.7
	4	48.3	47.6	46.5	45.1	43.2	40.8	38.1	35.0	31.5	27.7	23.7

CM 3



TM05 8794 4616

Note: Pump performance is influenced by the suction lift. See page 61.

Pump performance in relation to suction lift

CM 3-3

Pump head [m]		Flow [m^3/h]										
		0	0.5	1	1.5	2	2.5	3	3.5	4**	4.5**	5**
Suction lift [m]	0	40.1	39.8	39.0	37.9	36.5	34.7	32.6	30.1	26.9	23.2	18.7
	1	39.1	38.8	38.0	36.9	35.5	33.7	31.6	29.1	25.9	22.2	17.7
	2	38.1	37.8	37.0	35.9	34.5	32.7	30.6	28.1	24.9	21.2	16.7
	3	37.1	36.8	36.0	34.9	33.5	31.7	29.6	27.1	23.9	20.2	-
	4	36.1	35.8	35.0	33.9	32.5	30.7	28.6	26.1	22.9	-	-
	5*	35.1	34.8	34.0	32.9	31.5	29.7	27.6	-	-	-	-
	6*	34.1	33.8	33.0	31.9	30.5	28.7	26.6	-	-	-	-
	7*	33.1	32.8	32.0	30.9	29.5	27.7	-	-	-	-	-
	8*	32.1	31.8	31.0	29.9	-	-	-	-	-	-	-

CM 3-4

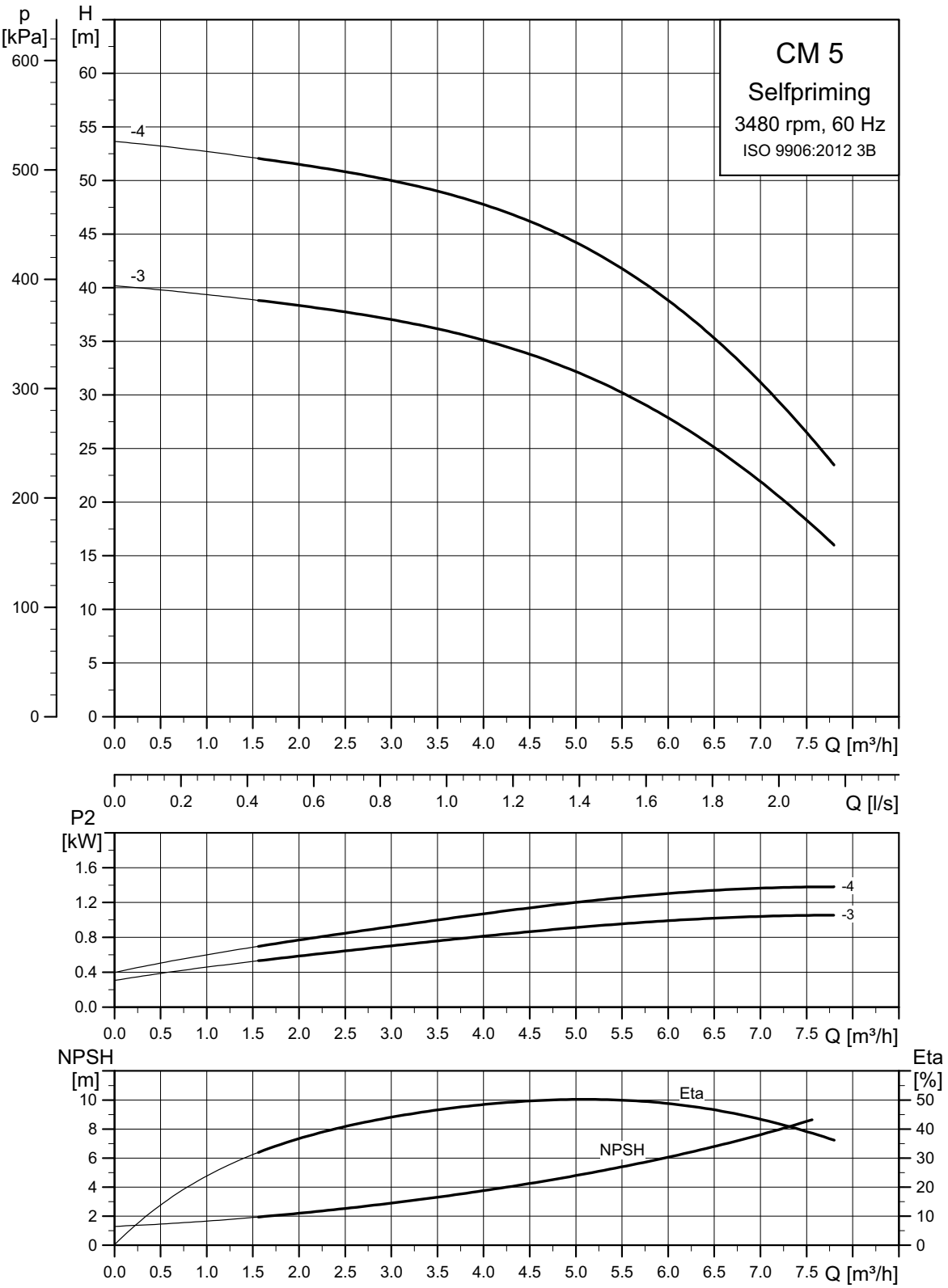
Pump head [m]		Flow [m^3/h]										
		0	0.5	1	1.5	2	2.5	3	3.5	4**	4.5**	5**
Suction lift [m]	0	53.5	53.0	52.0	50.6	48.8	46.6	43.9	40.6	36.6	31.7	25.8
	1	52.5	52.0	51.0	49.6	47.8	45.6	42.9	39.6	35.6	30.7	24.8
	2	51.5	51.0	50.0	48.6	46.8	44.6	41.9	38.6	34.6	29.7	23.8
	3	50.5	50.0	49.0	47.6	45.8	43.6	40.9	37.6	33.6	28.7	-
	4	49.5	49.0	48.0	46.6	44.8	42.6	39.9	36.6	32.6	-	-
	5*	48.5	48.0	47.0	45.6	43.8	41.6	38.9	-	-	-	-
	6*	47.5	47.0	46.0	44.6	42.8	40.6	37.9	-	-	-	-
	7*	46.5	46.0	45.0	43.6	41.8	39.6	-	-	-	-	-
	8*	45.5	45.0	44.0	42.6	-	-	-	-	-	-	-

Note: Depending on the pump model, the maximum suction depth varies between 7.5 and 8.5 m.

* Only available in O-version

** Only available in S-version

CM 5



TM05 8795 4616

Note: Pump performance is influenced by the suction lift. See page 63.

Pump performance in relation to suction lift

CM 5-3

Pump head [m]		Flow [m^3/h]															
		0	**0.5**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6**	**6.5****	**7****	**7.5****
Suction lift [m]	**0**	40.2	39.8	39.4	38.9	38.3	37.7	37.0	36.2	35.1	33.8	32.2	30.2	27.9	25.1	21.9	18.3
	1	39.2	38.8	38.4	37.9	37.3	36.7	36.0	35.2	34.1	32.8	31.2	29.2	26.9	24.1	-	-
	2	38.2	37.8	37.4	36.9	36.3	35.7	35.0	34.2	33.1	31.8	30.2	28.2	25.9	-	-	-
	3	37.2	36.8	36.4	35.9	35.3	34.7	34.0	33.2	32.1	30.8	29.2	-	-	-	-	-
	4	36.2	35.8	35.4	34.9	34.3	33.7	33.0	32.2	31.1	29.8		-	-	-	-	-
	5*	35.2	34.8	34.4	33.9	33.3	32.7	32.0	31.2	30.1	-	-	-	-	-	-	-
	6*	34.2	33.8	33.4	32.9	32.3	31.7	31.0	-	-	-	-	-	-	-	-	-
	7*	33.2	32.8	32.4	31.9	31.3	-	-	-	-	-	-	-	-	-	-	-
	8*	32.2	31.8	31.4	30.9	-	-	-	-	-	-	-	-	-	-	-	-

CM 5-4

Pump head [m]		Flow [m^3/h]															
		0	**0.5**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6**	**6.5****	**7****	**7.5****
Suction lift [m]	**0**	53.6	53.2	52.7	52.1	51.5	50.8	50.0	49.0	47.8	46.2	44.2	41.8	38.8	35.3	31.2	26.5
	1	52.6	52.2	51.7	51.1	50.5	49.8	49.0	48.0	46.8	45.2	43.2	40.8	37.8	34.3	-	-
	2	51.6	51.2	50.7	50.1	49.5	48.8	48.0	47.0	45.8	44.2	42.2	39.8	36.8	-	-	-
	3	50.6	50.2	49.7	49.1	48.5	47.8	47.0	46.0	44.8	43.2	41.2	-	-	-	-	-
	4	49.6	49.2	48.7	48.1	47.5	46.8	46.0	45.0	43.8	42.2	-	-	-	-	-	-
	5*	48.6	48.2	47.7	47.1	46.5	45.8	45.0	44.0	42.8	-	-	-	-	-	-	-
	6*	47.6	47.2	46.7	46.1	45.5	44.8	44.0	-	-	-	-	-	-	-	-	-
	7*	46.6	46.2	45.7	45.1	44.5	-	-	-	-	-	-	-	-	-	-	-
	8*	45.6	45.2	44.7	44.1	-	-	-	-	-	-	-	-	-	-	-	-

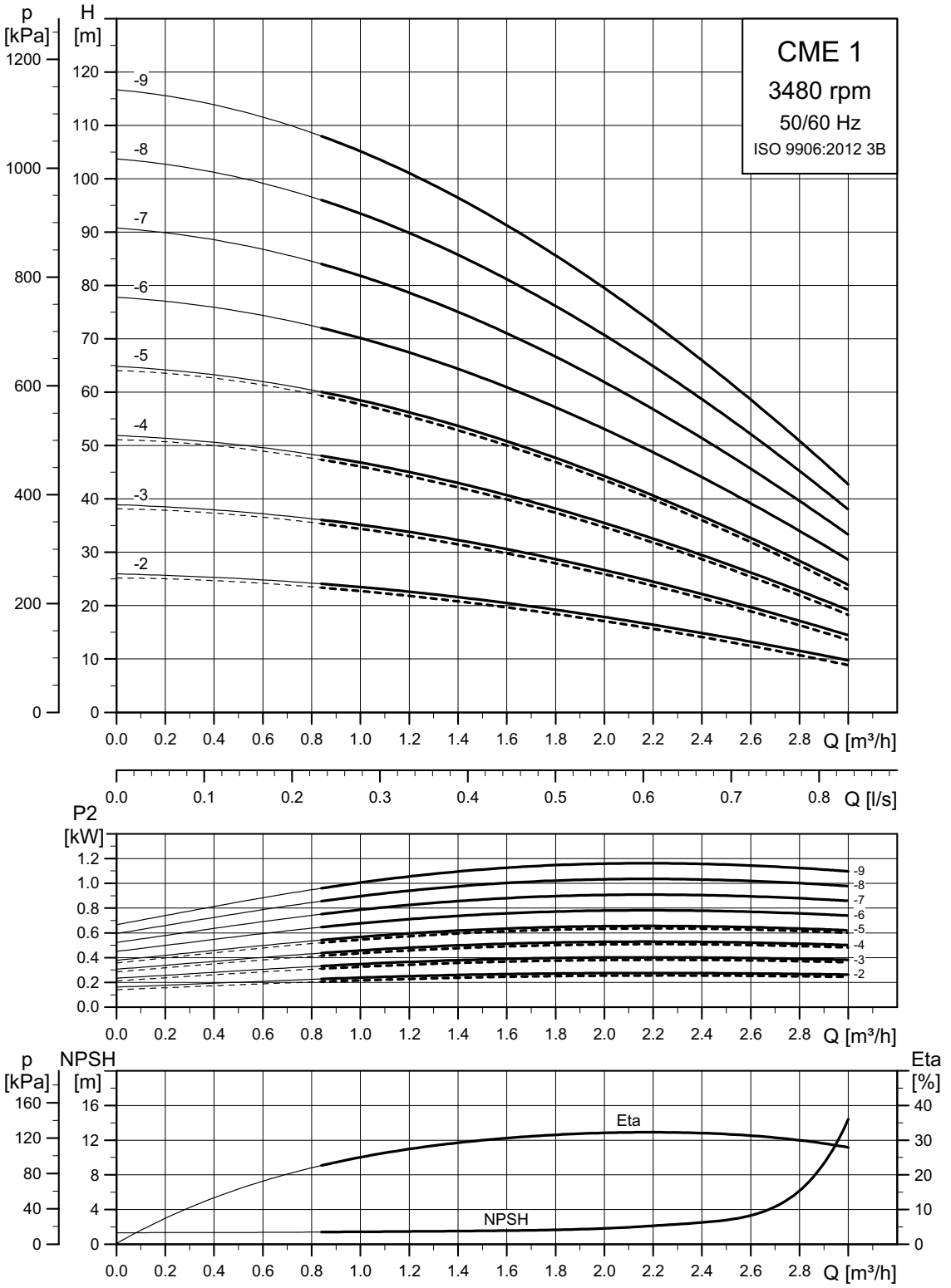
Note: Depending on the pump model, the maximum suction depth varies between 7.5 and 8.5 m.

* Only available in O-version

** Only available in S-version

20. Performance curves, CME 50/60 Hz

CME 1

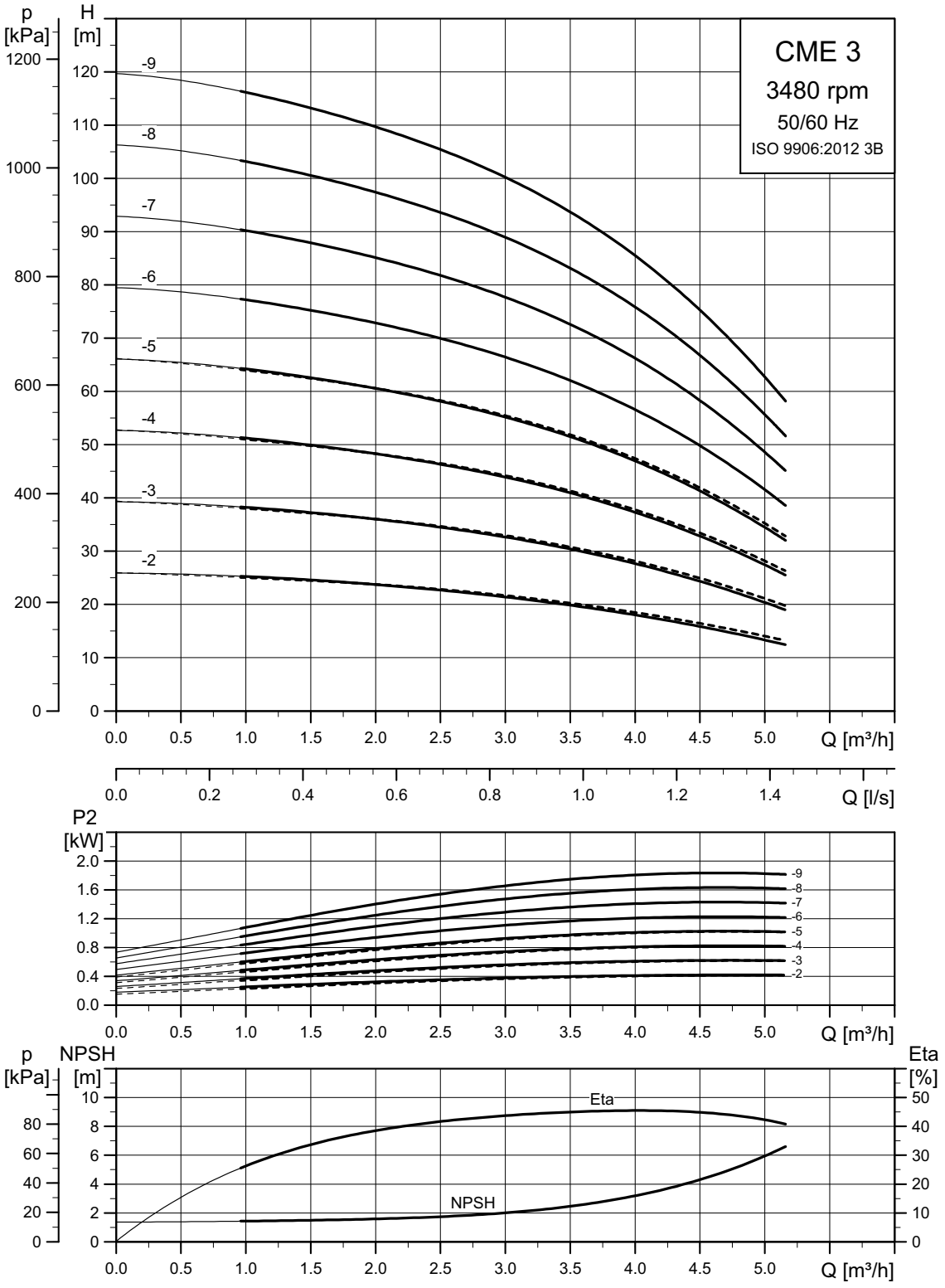


CME-A

CME-I/G

Note: Irrespective of the input frequency, the 100 % speed of CME pumps is approximately 3400 min^{-1}.

CME 3

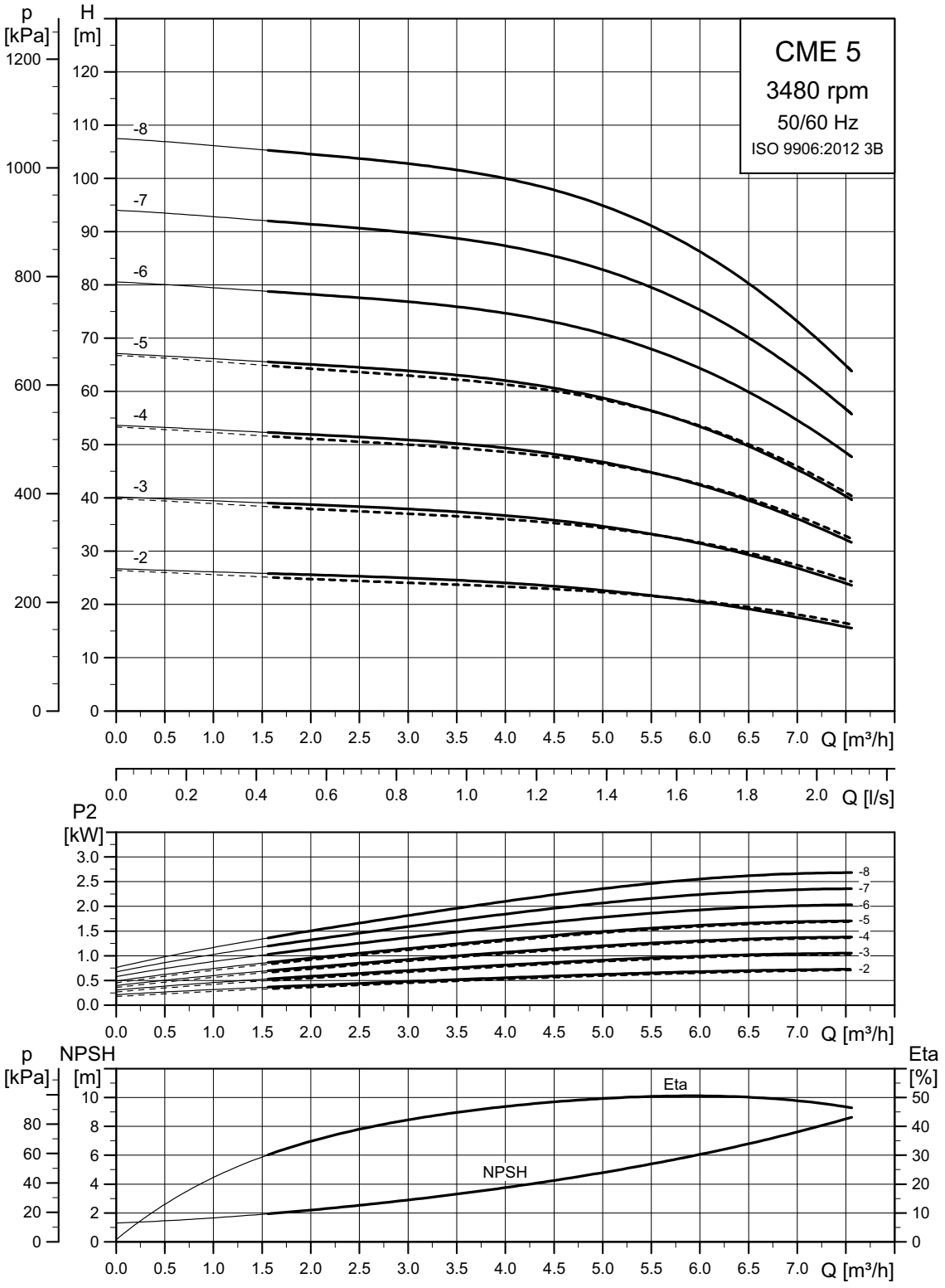


------ CME-A

——— CME-I/G

Note: Irrespective of the input frequency, the 100 % speed of CME pumps is approximately 3400 min^{-1}.

CME 5



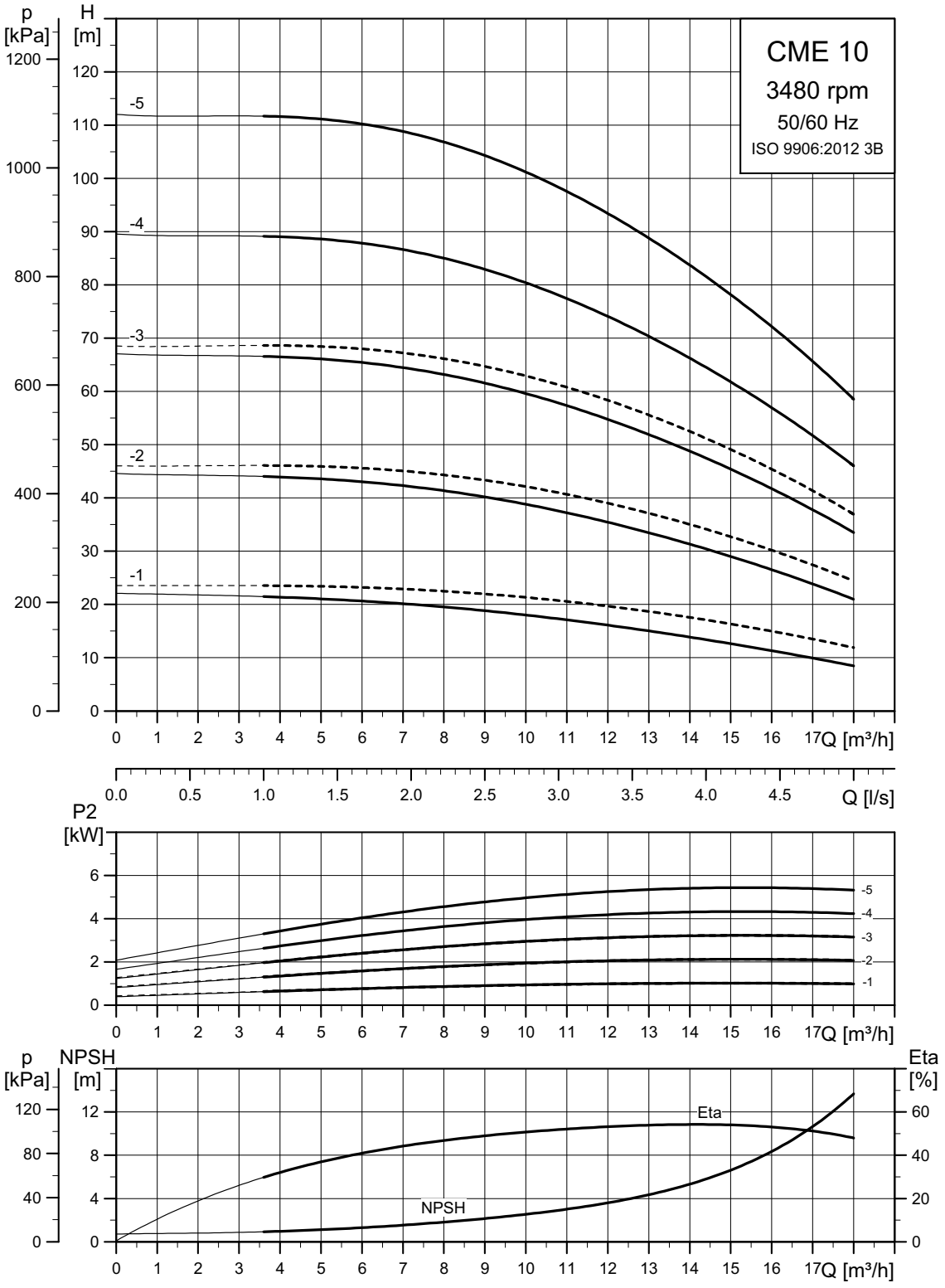
TM04 3571 4616

------ CME-A

——— CME-I/G

Note: Irrespective of the input frequency, the 100 % speed of CME pumps is approximately 3400 min^{-1}.

CME 10



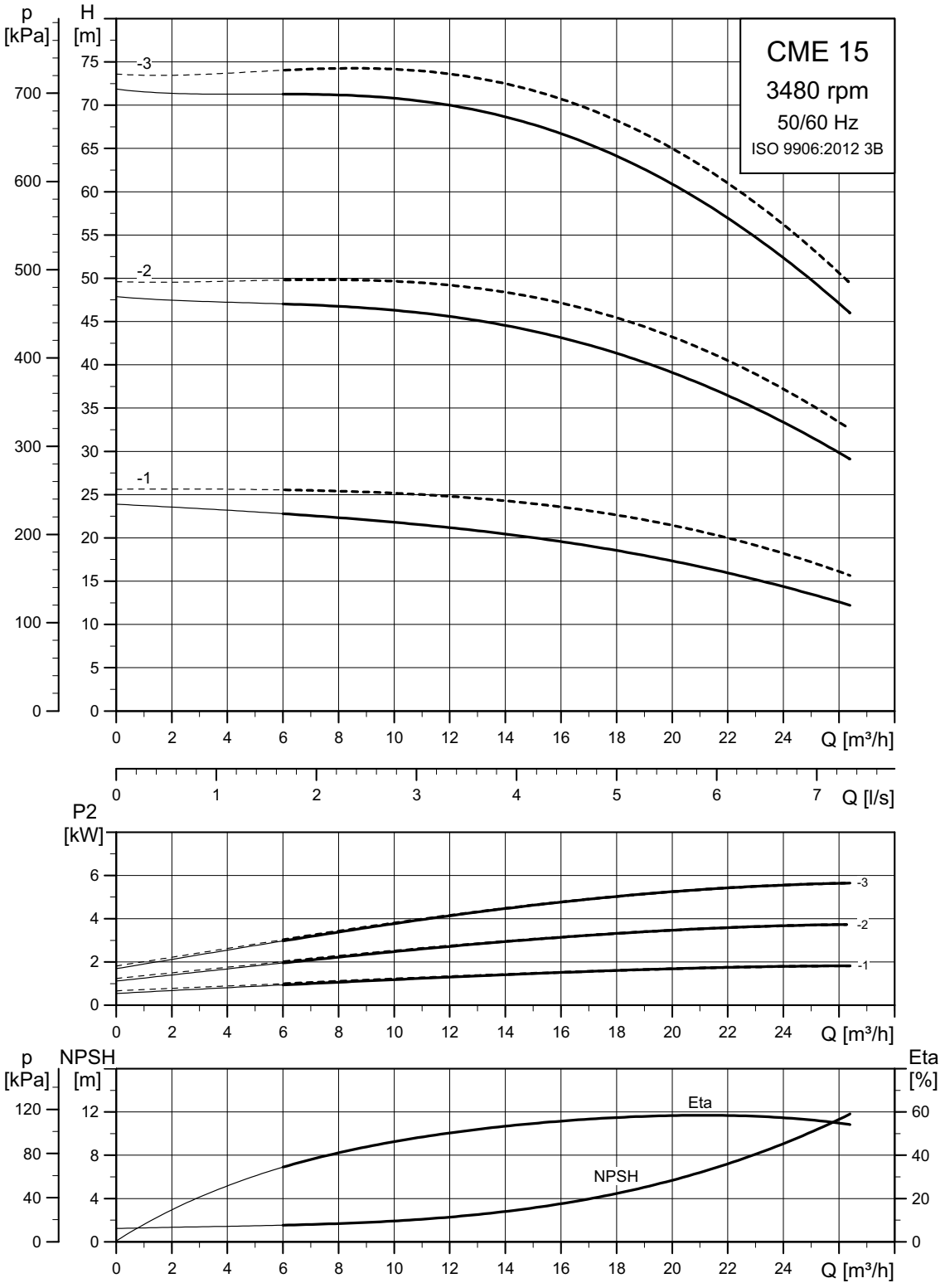
TM04 3572 4616

CME-A

CME-I/G

Note: Irrespective of the input frequency, the 100 % speed of CME pumps is approximately 3400 min^{-1}.

CME 15



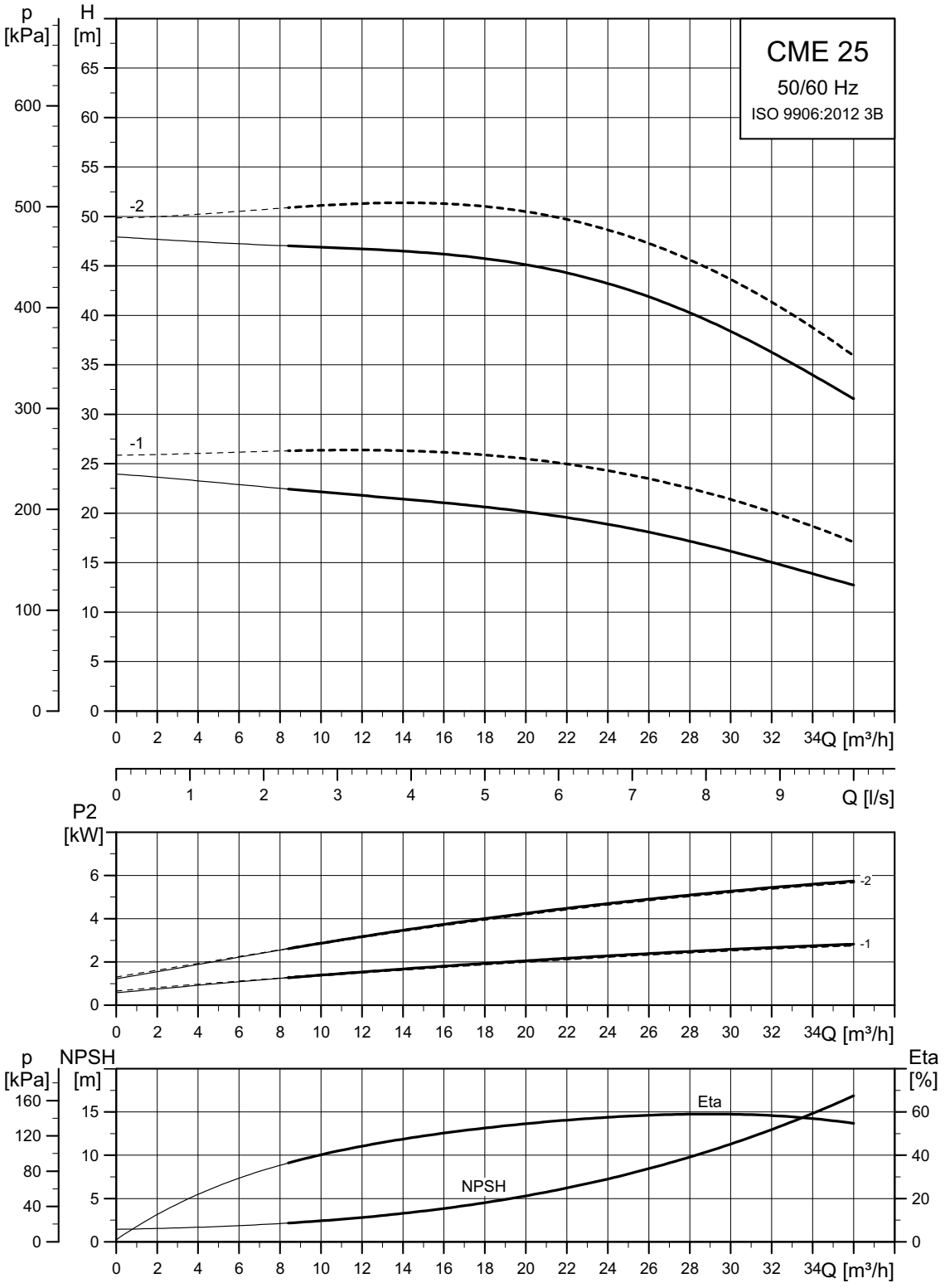
TM04 3573 4616

CME-A

CME-I/G

Note: Irrespective of the input frequency, the 100 % speed of CME pumps is approximately 3400 min^{-1}.

CME 25



CME-A

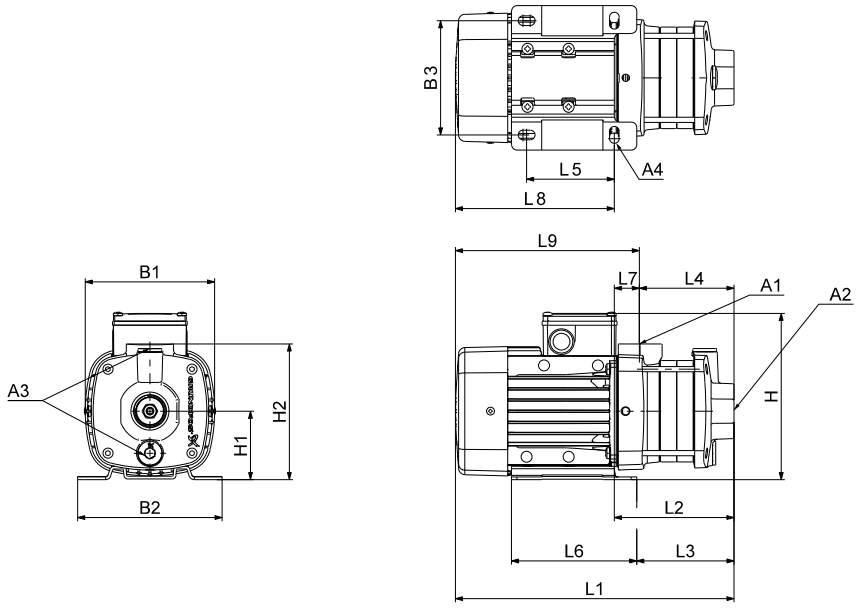
CME-I/G

Note: Irrespective of the input frequency, the 100 % speed of CME pumps is approximately 3400 min^{-1}.

21. Dimensions, CM 50 Hz

CM 1-A

(A = cast iron EN-GJL-200)



TM06 7509 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																	
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-2	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	149	286	112	88	85	96	137	27	174	201
CM 1-3	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	149	304	130	106	103	96	137	27	174	201
CM 1-4	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	149	322	148	124	121	96	137	27	174	201
CM 1-5	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	149	340	166	142	139	96	137	27	174	201
CM 1-6	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	149	358	184	160	157	96	137	27	174	201
CM 1-7	71	0.65	1"	1"	3/8"	10.5	141	158	125	184	75	149	376	202	178	175	96	137	27	174	201
CM 1-8	71	0.65	1"	1"	3/8"	10.5	141	158	125	184	75	149	394	220	196	193	96	137	27	174	201

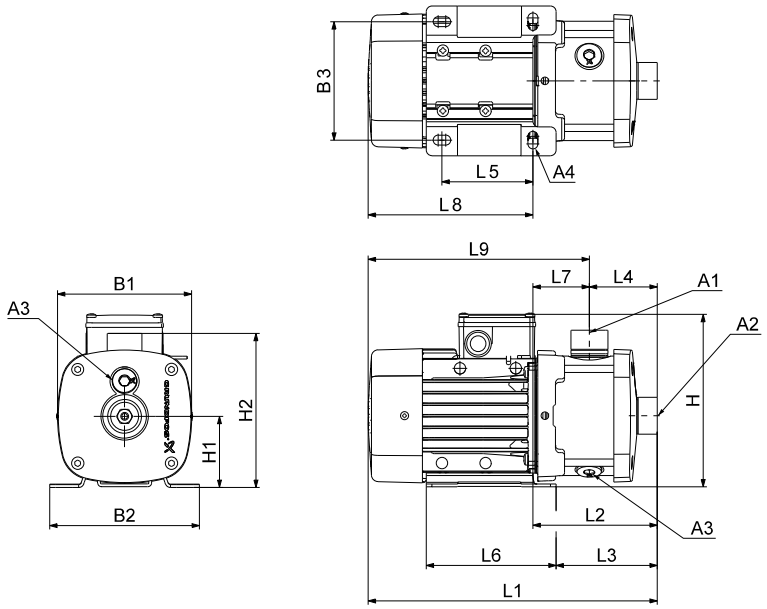
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																	
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-2	71	0.30	1"	1"	3/8"	10.5	141	158	125	208	75	149	286	112	88	85	96	137	27	174	201
CM 1-3	71	0.30	1"	1"	3/8"	10.5	141	158	125	208	75	149	304	130	106	103	96	137	27	174	201
CM 1-4	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	149	322	148	124	121	96	137	27	174	201
CM 1-5	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	149	340	166	142	139	96	137	27	174	201
CM 1-6	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	149	358	184	160	157	96	137	27	174	201
CM 1-7	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	149	376	202	178	175	96	137	27	174	201
CM 1-8	80	0.67	1"	1"	3/8"	10.5	141	158	125	208	75	151	434	220	196	193	96	137	27	214	241

All dimensions are in mm unless otherwise stated.

CM 1-I and CM 1-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-2	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 1-3	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 1-4	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	165	324	150	126	90	96	137	60	174	234
CM 1-5	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	165	342	168	144	108	96	137	60	174	234
CM 1-6	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	165	378	204	180	144	96	137	60	174	234
CM 1-7	71	0.65	1"	1"	3/8"	10.5	141	158	125	184	75	165	378	204	180	144	96	137	60	174	234
CM 1-8	71	0.65	1"	1"	3/8"	10.5	141	158	125	184	75	165	414	240	216	180	96	137	60	174	234
CM 1-9	71	0.65	1"	1"	3/8"	10.5	141	158	125	184	75	165	414	240	216	180	96	137	60	174	234
CM 1-10	80	1.10	1"	1"	3/8"	10.5	141	158	125	184	75	165	510	276	252	216	96	137	60	234	294
CM 1-11	80	1.10	1"	1"	3/8"	10.5	141	158	125	184	75	165	510	276	252	216	96	137	60	234	294
CM 1-12	80	1.10	1"	1"	3/8"	10.5	141	158	125	184	75	165	564	330	306	270	96	137	60	234	294
CM 1-13	80	1.10	1"	1"	3/8"	10.5	141	158	125	184	75	165	564	330	306	270	96	137	60	234	294
CM 1-14	80	1.10	1"	1"	3/8"	10.5	141	158	125	184	75	165	564	330	306	270	96	137	60	234	294

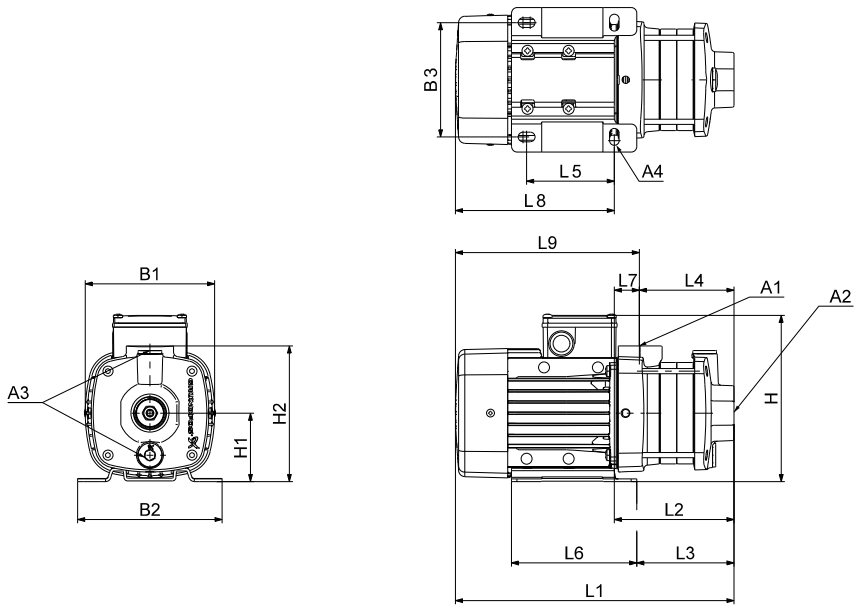
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-2	71	0.30	1"	1"	3/8"	10.5	141	158	125	208	75	165	306	132	108	72	96	137	60	174	234
CM 1-3	71	0.30	1"	1"	3/8"	10.5	141	158	125	208	75	165	306	132	108	72	96	137	60	174	234
CM 1-4	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	324	150	126	90	96	137	60	174	234
CM 1-5	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	342	168	144	108	96	137	60	174	234
CM 1-6	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	378	204	180	144	96	137	60	174	234
CM 1-7	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	378	204	180	144	96	137	60	174	234
CM 1-8	80	0.67	1"	1"	3/8"	10.5	141	158	125	208	75	165	454	240	216	180	96	137	60	214	274
CM 1-9	80	0.67	1"	1"	3/8"	10.5	141	158	125	208	75	165	454	240	216	180	96	137	60	214	274
CM 1-10	80	0.67	1"	1"	3/8"	10.5	141	158	125	208	75	165	490	276	252	216	96	137	60	214	274
CM 1-11	80	0.90	1"	1"	3/8"	10.5	141	158	125	208	75	165	490	276	252	216	96	137	60	214	274
CM 1-12	80	0.90	1"	1"	3/8"	10.5	141	158	125	208	75	165	544	330	306	270	96	137	60	214	274
CM 1-13	80	0.90	1"	1"	3/8"	10.5	141	158	125	208	75	165	544	330	306	270	96	137	60	214	274
CM 1-14	90	1.30	1"	1"	3/8"	10.0	178	178	140	229	90	180	595	371	356	270	125	155	101	224	325

All dimensions are in mm unless otherwise stated.

CM 3-A

(A = cast iron EN-GJL-200)



TM06 7509 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 3-2	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	149	286	112	88	85	96	137	27	174	201
CM 3-3	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	149	304	130	106	103	96	137	27	174	201
CM 3-4	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	149	322	148	124	121	96	137	27	174	201
CM 3-5	71	0.65	1"	1"	3/8"	10.5	141	158	125	184	75	149	340	166	142	139	96	137	27	174	201
CM 3-6	71	0.65	1"	1"	3/8"	10.5	141	158	125	184	75	149	358	184	160	157	96	137	27	174	201
CM 3-7	80	1.10	1"	1"	3/8"	10.5	141	158	125	184	75	149	436	202	178	175	96	137	27	234	261
CM 3-8	80	1.10	1"	1"	3/8"	10.5	141	158	125	184	75	149	454	220	196	193	96	137	27	234	261

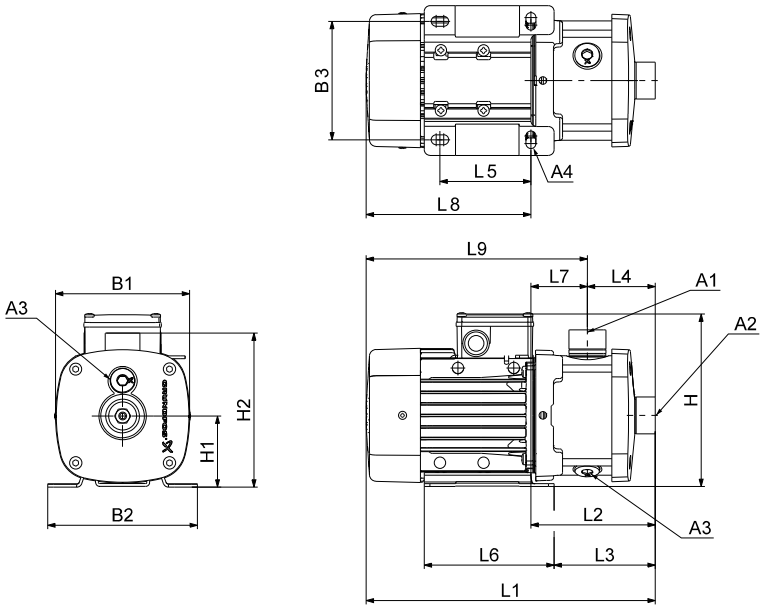
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 3-2	71	0.30	1"	1"	3/8"	10.5	141	158	125	208	75	149	286	112	88	85	96	137	27	174	201
CM 3-3	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	149	304	130	106	103	96	137	27	174	201
CM 3-4	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	149	322	148	124	121	96	137	27	174	201
CM 3-5	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	149	340	166	142	139	96	137	27	174	201
CM 3-6	80	0.67	1"	1"	3/8"	10.5	141	158	125	208	75	151	398	184	160	157	96	137	27	214	241
CM 3-7	80	0.90	1"	1"	3/8"	10.5	141	158	125	208	75	151	416	202	178	175	96	137	27	214	241
CM 3-8	80	0.90	1"	1"	3/8"	10.5	141	158	125	208	75	151	434	220	196	193	96	137	27	214	241

All dimensions are in mm unless otherwise stated.

CM 3-I and CM 3-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 3-2	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 3-3	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 3-4	71	0.46	1"	1"	3/8"	10.5	141	158	125	184	75	165	324	150	126	90	96	137	60	174	234
CM 3-5	71	0.65	1"	1"	3/8"	10.5	141	158	125	184	75	165	342	168	144	108	96	137	60	174	234
CM 3-6	71	0.65	1"	1"	3/8"	10.5	141	158	125	184	75	165	378	204	180	144	96	137	60	174	234
CM 3-7	80	1.10	1"	1"	3/8"	10.5	141	158	125	184	75	165	438	204	180	144	96	137	60	234	294
CM 3-8	80	1.10	1"	1"	3/8"	10.5	141	158	125	184	75	165	474	240	216	180	96	137	60	234	294
CM 3-9	80	1.10	1"	1"	3/8"	10.5	141	158	125	184	75	165	474	240	216	180	96	137	60	234	294
CM 3-10	90	1.50	1"	1"	3/8"	10.0	178	178	140	200	90	180	541	317	302	216	125	155	101	224	325
CM 3-11	90	1.50	1"	1"	3/8"	10.0	178	178	140	200	90	180	541	317	302	216	125	155	101	224	325
CM 3-12	90	1.50	1"	1"	3/8"	10.0	178	178	140	200	90	180	595	371	356	270	125	155	101	224	325
CM 3-13	90	2.20	1"	1"	3/8"	10.0	178	178	140	200	90	180	636	372	357	270	125	155	102	264	366
CM 3-14	90	2.20	1"	1"	3/8"	10.0	178	178	140	200	90	180	636	372	357	270	125	155	102	264	366

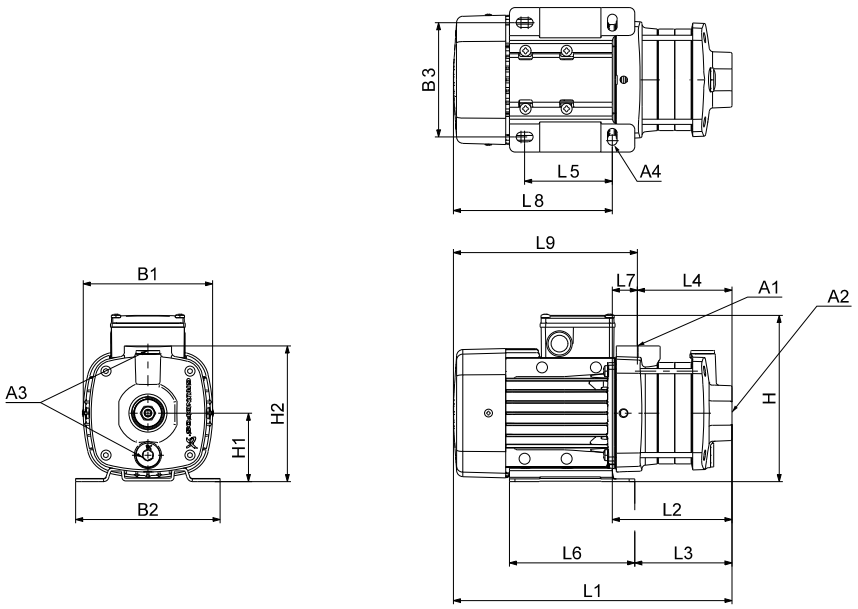
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 3-2	71	0.30	1"	1"	3/8"	10.5	141	158	125	208	75	165	306	132	108	72	96	137	60	174	234
CM 3-3	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	306	132	108	72	96	137	60	174	234
CM 3-4	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	324	150	126	90	96	137	60	174	234
CM 3-5	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	342	168	144	108	96	137	60	174	234
CM 3-6	80	0.67	1"	1"	3/8"	10.5	141	158	125	208	75	165	418	204	180	144	96	137	60	214	274
CM 3-7	80	0.90	1"	1"	3/8"	10.5	141	158	125	208	75	165	418	204	180	144	96	137	60	214	274
CM 3-8	80	0.90	1"	1"	3/8"	10.5	141	158	125	208	75	165	454	240	216	180	96	137	60	214	274
CM 3-9	90	1.30	1"	1"	3/8"	10.0	178	178	140	229	90	180	505	281	266	180	125	155	101	224	325
CM 3-10	90	1.30	1"	1"	3/8"	10.0	178	178	140	229	90	180	541	317	302	216	125	155	101	224	325
CM 3-11	90	1.30	1"	1"	3/8"	10.0	178	178	140	229	90	180	541	317	302	216	125	155	101	224	325
CM 3-12	90	1.30	1"	1"	3/8"	10.0	178	178	140	229	90	180	595	371	356	270	125	155	101	224	325
CM 3-13	90	1.30	1"	1"	3/8"	10.0	178	178	140	229	90	180	595	371	356	270	125	155	101	224	325
CM 3-14	90	1.90	1"	1"	3/8"	10.0	178	178	140	229	90	180	595	371	356	270	125	155	101	224	325

All dimensions are in mm unless otherwise stated.

CM 5-A

(A = cast iron EN-GJL-200)



TM06 7509 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 5-2	71	0.46	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	149	286	112	88	85	96	137	27	174	201
CM 5-3	71	0.65	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	149	304	130	106	103	96	137	27	174	201
CM 5-4	80	1.10	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	149	382	148	124	121	96	137	27	234	261
CM 5-5	80	1.10	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	149	400	166	142	139	96	137	27	234	261
CM 5-6	90	1.50	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	201	456	231	216	144	125	155	88	224	312
CM 5-7	90	1.50	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	201	474	249	234	162	125	155	88	224	312
CM 5-8	90	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	201	533	268	253	180	125	155	89	264	353

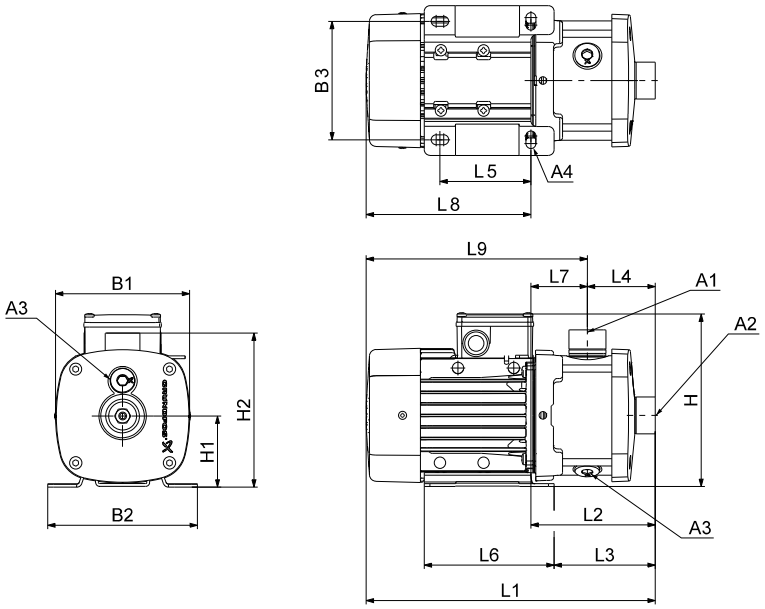
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 5-2	71	0.50	1"	1 1/4"	3/8"	10.5	141	158	125	208	75	149	286	112	88	85	96	137	27	174	201
CM 5-3	71	0.50	1"	1 1/4"	3/8"	10.5	141	158	125	208	75	149	304	130	106	103	96	137	27	174	201
CM 5-4	80	0.67	1"	1 1/4"	3/8"	10.5	141	158	125	208	75	151	362	148	124	121	96	137	27	214	241
CM 5-5	80	0.90	1"	1 1/4"	3/8"	10.5	141	158	125	208	75	151	380	166	142	139	96	137	27	214	241
CM 5-6	90	1.30	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	201	456	231	216	144	125	155	88	224	312
CM 5-7	90	1.30	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	201	474	249	234	162	125	155	88	224	312
CM 5-8	90	1.30	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	201	492	267	252	180	125	155	88	224	312

All dimensions are in mm unless otherwise stated.

CM 5-I and CM 5-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 5-2	71	0.46	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 5-3	71	0.65	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 5-4	80	1.10	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	165	384	150	126	90	96	137	60	234	294
CM 5-5	80	1.10	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	165	402	168	144	108	96	137	60	234	294
CM 5-6	90	1.50	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	469	245	230	144	125	155	101	224	325
CM 5-7	90	1.50	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	469	245	230	144	125	155	101	224	325
CM 5-8	90	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	546	282	267	180	125	155	102	264	366
CM 5-9	90	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	546	282	267	180	125	155	102	264	366
CM 5-10	90	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	582	318	303	216	125	155	102	264	366
CM 5-11	90	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	582	318	303	216	125	155	102	264	366
CM 5-12	100	3.00	1"	1 1/4"	3/8"	12.0	198	199	160	220	100	190	651	378	363	270	140	170	108	273	381
CM 5-13	100	3.00	1"	1 1/4"	3/8"	12.0	198	199	160	220	100	190	651	378	363	270	140	170	108	273	381

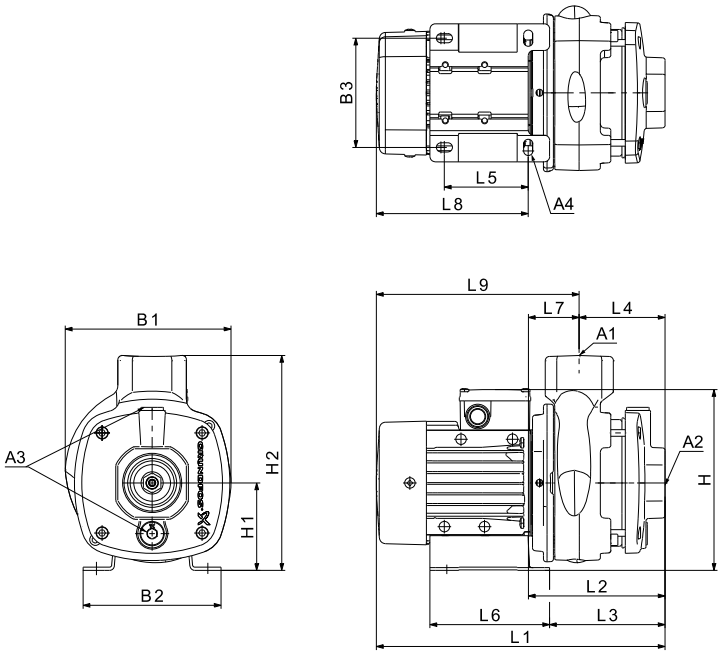
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 5-2	71	0.50	1"	1 1/4"	3/8"	10.5	141	158	125	208	75	165	306	132	108	72	96	137	60	174	234
CM 5-3	71	0.50	1"	1 1/4"	3/8"	10.5	141	158	125	208	75	165	306	132	108	72	96	137	60	174	234
CM 5-4	80	0.67	1"	1 1/4"	3/8"	10.5	141	158	125	208	75	165	364	150	126	90	96	137	60	214	274
CM 5-5	80	0.90	1"	1 1/4"	3/8"	10.5	141	158	125	208	75	165	382	168	144	108	96	137	60	214	274
CM 5-6	90	1.30	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	180	469	245	230	144	125	155	101	224	325
CM 5-7	90	1.30	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	180	469	245	230	144	125	155	101	224	325
CM 5-8	90	1.30	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	180	505	281	266	180	125	155	101	224	325
CM 5-9	90	1.90	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	180	505	281	266	180	125	155	101	224	325
CM 5-10	90	1.90	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	180	541	317	302	216	125	155	101	224	325
CM 5-11	90	1.90	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	180	541	317	302	216	125	155	101	224	325

All dimensions are in mm unless otherwise stated.

CM 10-A

(A = cast iron EN-GJL-200)



TM06 7512 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 10-1	71	0.65	1 1/2"	1 1/2"	3/8"	10.5	190	158	125	209	100	242	330	156	131	97	95	137	59	174	232
CM 10-2	90	1.50	1 1/2"	1 1/2"	3/8"	12.0	190	199	160	210	100	242	420	188	173	97	140	170	91	232	322
CM 10-3	90	2.20	1 1/2"	1 1/2"	3/8"	12.0	190	199	160	210	100	242	490	218	203	127	140	170	91	272	362
CM 10-4	100	3.0	1 1/2"	1 1/2"	3/8"	12.0	198	199	160	220	100	242	537	264	249	157	140	170	107	273	380
CM 10-5	100	3.0	1 1/2"	1 1/2"	3/8"	12.0	198	199	160	220	100	242	567	294	279	187	140	170	107	273	380

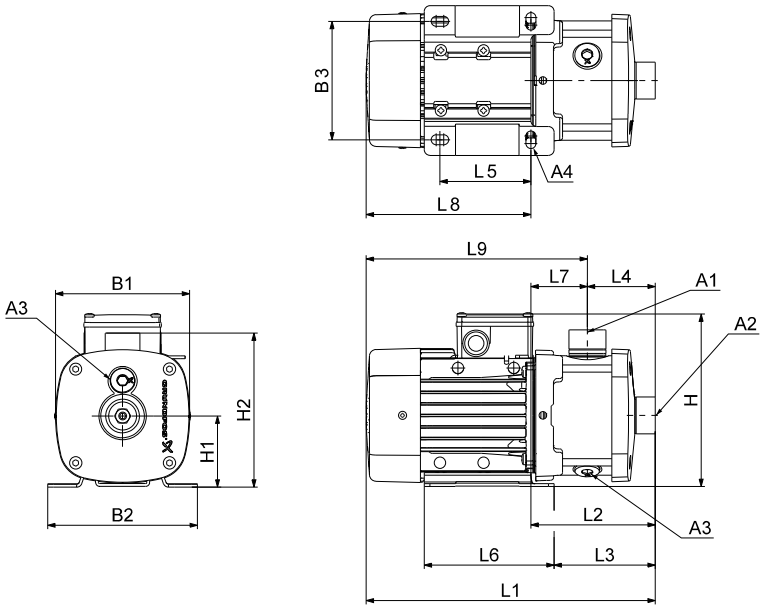
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 10-1	80	0.67	1 1/2"	1 1/2"	3/8"	10.5	190	158	125	233	100	242	370	156	131	97	95	137	59	214	272
CM 10-2	90	1.30	1 1/2"	1 1/2"	3/8"	12.0	190	199	160	239	100	242	420	188	173	97	140	170	91	232	322
CM 10-3	90	1.90	1 1/2"	1 1/2"	3/8"	12.0	190	199	160	239	100	242	451	219	204	127	140	170	92	232	324

All dimensions are in mm unless otherwise stated.

CM 10-I and CM 10-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 10-1	71	0.65	1 1/2"	1 1/2"	3/8"	10.5	141	158	125	209	100	219	360	186	161	105	95	137	81	174	255
CM 10-2	90	1.50	1 1/2"	1 1/2"	3/8"	12.0	178	199	160	210	100	219	450	218	203	105	140	170	113	232	345
CM 10-3	90	2.20	1 1/2"	1 1/2"	3/8"	12.0	178	199	160	210	100	219	490	218	203	105	140	170	113	272	385
CM 10-4	100	3.00	1 1/2"	1 1/2"	3/8"	12.0	198	199	160	220	100	219	537	264	249	135	140	170	129	273	402
CM 10-5	100	3.00	1 1/2"	1 1/2"	3/8"	12.0	198	199	160	220	100	219	597	324	309	195	140	170	129	273	402
CM 10-6	112	4.00	1 1/2"	1 1/2"	3/8"	12.0	220	228	190	246	112	231	650	348	332	195	140	172	153	302	455
CM 10-7	132	5.50	1 1/2"	1 1/2"	3/8"	12.0	220	228	190	246	112	231	710	408	392	255	140	172	153	302	455
CM 10-8	132	5.50	1 1/2"	1 1/2"	3/8"	12.0	220	228	190	246	112	231	710	408	392	255	140	172	153	302	455

Please note that the dimension H is smaller than H2 for CM 10-1, CM 10-2 and CM 10-3.

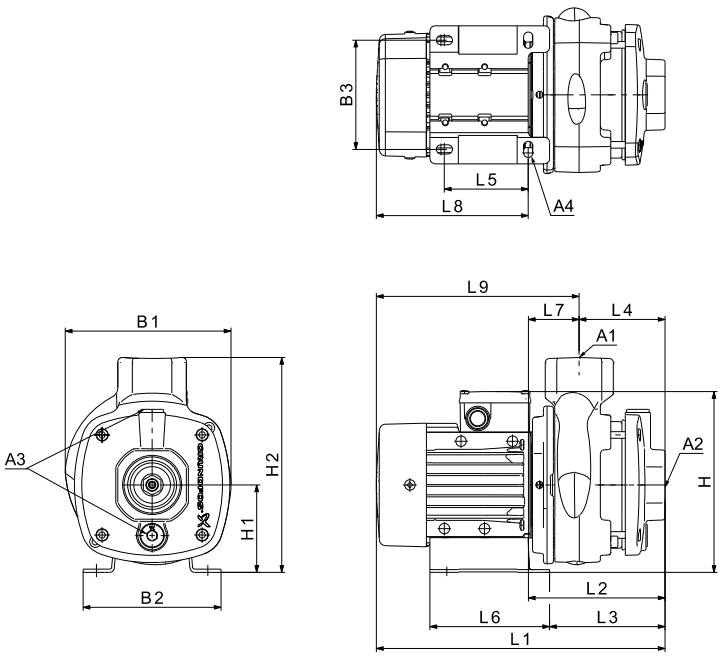
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 10-1	80	0.67	1 1/2"	1 1/2"	3/8"	10.5	141	158	125	233	100	219	400	186	161	105	95	137	81	214	295
CM 10-2	90	1.30	1 1/2"	1 1/2"	3/8"	12.0	178	199	160	239	100	219	450	218	203	105	140	170	113	232	345
CM 10-3	90	1.90	1 1/2"	1 1/2"	3/8"	12.0	178	199	160	239	100	219	451	219	204	105	140	170	114	232	346

All dimensions are in mm unless otherwise stated.

CM 15-A

(A = cast iron EN-GJL-200)



TM06 7512 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 15-1	80	1.1	2"	2"	3/8"	10.5	190	158	125	210	100	242	390	156	131	97	95	137	59	234	292
CM 15-2	90	2.20	2"	2"	3/8"	12.0	190	199	160	210	100	242	460	188	173	97	140	170	91	272	362
CM 15-3	112	4.0	2"	2"	3/8"	12.0	220	228	190	246	112	254	560	258	242	127	140	172	130	302	433
CM 15-4	132	5.5	2"	2"	3/8"	12.0	220	228	190	246	112	254	590	288	272	157	140	172	130	302	433

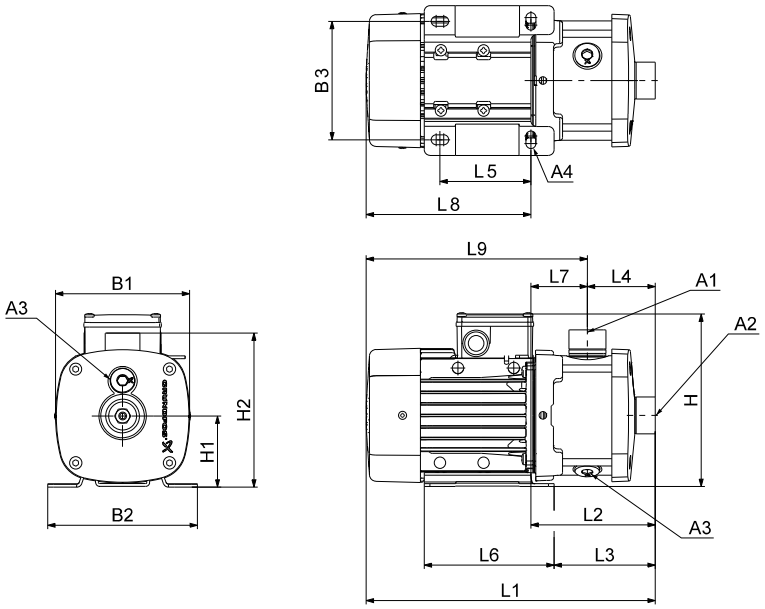
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 15-1	90	1.30	2"	2"	3/8"	12.0	190	199	160	239	100	242	420	188	173	97	140	170	91	232	322
CM 15-2	90	1.90	2"	2"	3/8"	12.0	190	199	160	239	100	242	421	189	174	97	140	170	92	232	324

All dimensions are in mm unless otherwise stated.

CM 15-I and CM 15-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 15-1	80	1.10	2"	2"	3/8"	10.5	141	158	125	210	100	217	420	186	161	105	95	137	81	234	315
CM 15-2	90	2.20	2"	2"	3/8"	12.0	178	199	160	210	100	217	490	218	203	105	140	170	113	272	385
CM 15-3	112	4.00	2"	2"	3/8"	12.0	220	228	190	246	112	229	560	258	242	105	140	172	153	302	455
CM 15-4	132	5.50	2"	2"	3/8"	12.0	220	228	190	246	112	229	590	288	272	135	140	172	153	302	455

Please note that the dimension H is smaller than H2 for CM 15-1 and CM 15-2.

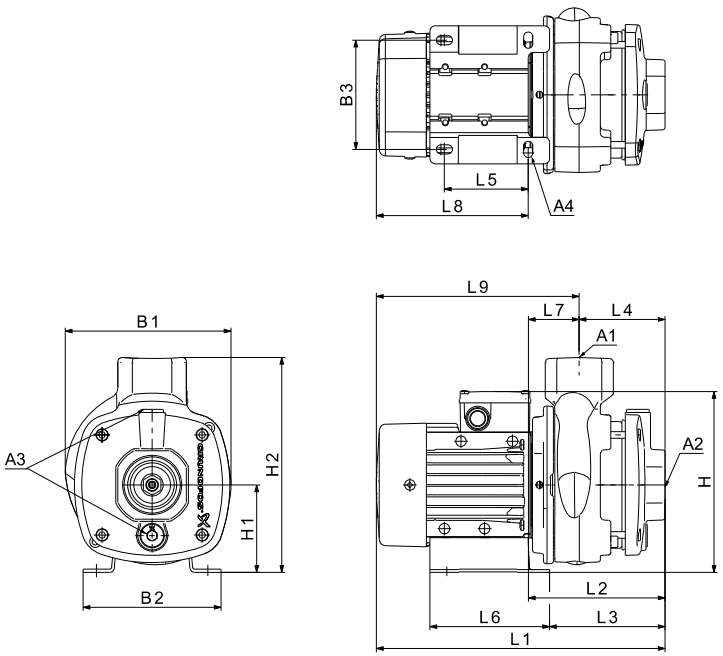
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 15-1	90	1.30	2"	2"	3/8"	12.0	178	199	160	239	100	217	450	218	203	105	140	170	113	232	345
CM 15-2	90	1.90	2"	2"	3/8"	12.0	178	199	160	239	100	217	451	219	204	105	140	170	114	232	346

All dimensions are in mm unless otherwise stated.

CM 25-A

(A = cast iron EN-GJL-200)



TM06 7512 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 25-1	90	2.20	2"	2"	3/8"	12.0	190	199	160	210	100	242	460	188	173	97	140	170	91	272	362
CM 25-2	112	4.0	2"	2"	3/8"	12.0	220	228	190	246	112	254	530	228	212	97	140	172	130	302	433
CM 25-3	132	5.5	2"	2"	3/8"	12.0	220	228	190	246	112	254	560	258	242	127	140	172	130	302	433
CM 25-4*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Available on request.

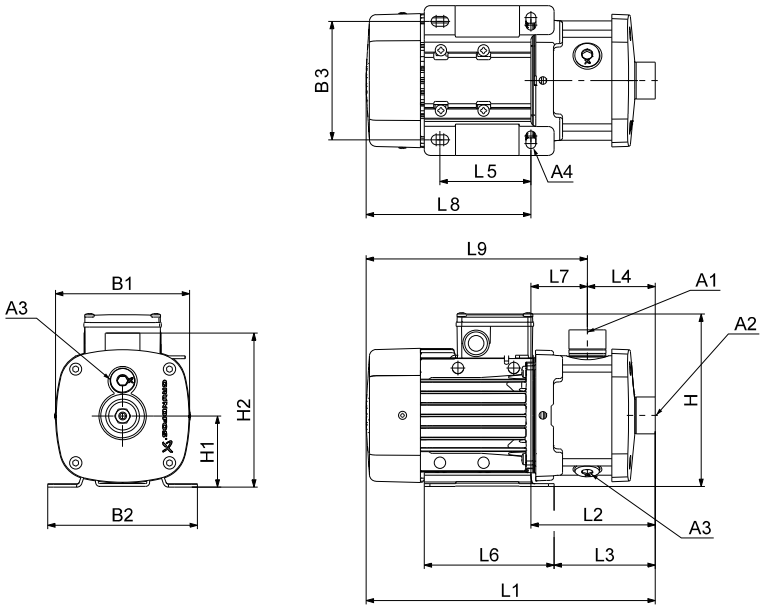
1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 25-1	90	1.90	2"	2"	3/8"	12.0	190	199	160	239	100	242	421	189	174	97	140	170	92	232	324

All dimensions are in mm unless otherwise stated.

CM 25-I and CM 25-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 25-1	90	2.20	2"	2"	3/8"	12.0	178	199	160	210	100	217	490	218	203	105	140	170	113	272	385
CM 25-2	112	4.00	2"	2"	3/8"	12.0	220	228	190	246	112	229	560	258	242	105	140	172	153	302	455
CM 25-3	132	5.50	2"	2"	3/8"	12.0	220	228	190	246	112	229	560	258	242	105	140	172	153	302	455
CM 25-4*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Available on request.
Please note that the dimension H is smaller than H2 for CM 25-1.

1 x 220-240 V, 50 Hz (supply voltage C)

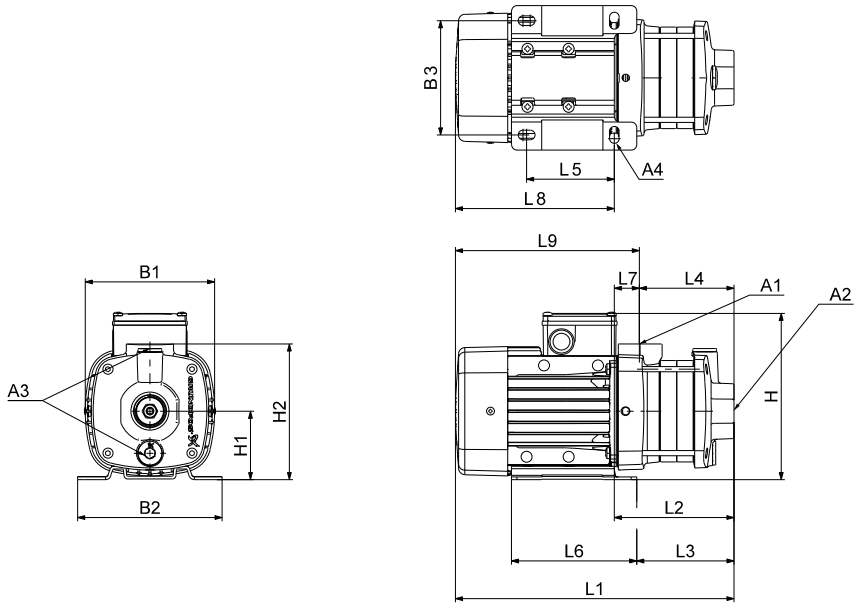
Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 25-1	90	1.90	2"	2"	3/8"	12.0	178	199	160	239	100	217	451	219	204	105	140	170	114	232	346

All dimensions are in mm unless otherwise stated.

22. Dimensions, CM 60 Hz and 50/60 Hz

CM 1-A

(A = cast iron EN-GJL-200)



TM06 7509 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-2	71	0.25 / 0.43*	0.43 / 0.74*	1"	1"	3/8"	10.5	141	158	125	192	75	151	286	112	88	85	96	137	27	174	201
CM 1-3	71	0.25 / 0.43*	0.43 / 0.74*	1"	1"	3/8"	10.5	141	158	125	192	75	151	304	130	106	103	96	137	27	174	201
CM 1-4	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	192	75	151	322	148	124	121	96	137	27	174	201
CM 1-5	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	192	75	151	340	166	142	139	96	137	27	174	201

* Applies to supply voltage O.

1 x 115/230 V, 60 Hz (supply voltage B)
1 x 220 V, 60 Hz (supply voltage A)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-2	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	149	286	112	88	85	96	137	27	174	201
CM 1-3	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	149	304	130	106	103	96	137	27	174	201
CM 1-4	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	149	322	148	124	121	96	137	27	174	201
CM 1-5	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	149	340	166	142	139	96	137	27	174	201

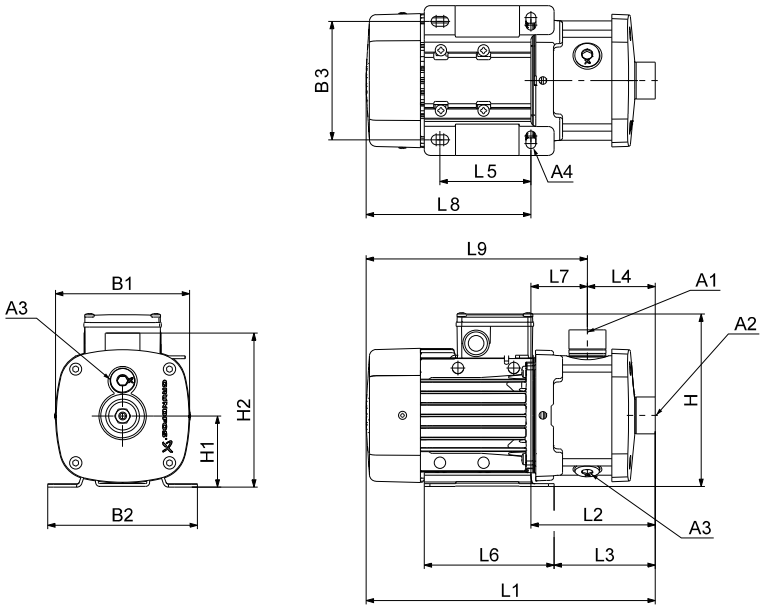
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-2	71	0.25	0.43	1"	1"	3/8"	10.5	141	158	125	184	75	149	286	112	88	85	96	137	27	174	201
CM 1-3	71	0.25	0.43	1"	1"	3/8"	10.5	141	158	125	184	75	149	304	130	106	103	96	137	27	174	201
CM 1-4	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	184	75	149	322	148	124	121	96	137	27	174	201
CM 1-5	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	184	75	149	340	166	142	139	96	137	27	174	201

All dimensions are in mm unless otherwise stated.

CM 1-I and CM 1-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-2	71	0.25 / 0.43*	0.43 / 0.74*	1"	1"	3/8"	10.5	141	158	125	192	75	165	306	132	108	72	96	137	60	174	234
CM 1-3	71	0.25 / 0.43*	0.43 / 0.74*	1"	1"	3/8"	10.5	141	158	125	192	75	165	306	132	108	72	96	137	60	174	234
CM 1-4	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	192	75	165	324	150	126	90	96	137	60	174	234
CM 1-5	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	192	75	165	342	168	144	108	96	137	60	174	234
CM 1-6	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	192	75	165	378	204	180	144	96	137	60	174	234
CM 1-7	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	192	75	165	378	204	180	144	96	137	60	174	234
CM 1-8	80	0.64	1.10	1"	1"	3/8"	10.5	141	158	125	192	75	165	454	240	216	180	96	137	60	214	274
CM 1-9	80	0.64	1.10	1"	1"	3/8"	10.5	141	158	125	192	75	165	474	240	216	180	96	137	60	234	294

* Applies to supply voltage O.

1 x 115/230 V, 60 Hz (supply voltage B); 1 x 220 V, 60 Hz (supply voltage A)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-2	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	165	306	132	108	72	96	137	60	174	234
CM 1-3	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	165	306	132	108	72	96	137	60	174	234
CM 1-4	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	165	324	150	126	90	96	137	60	174	234
CM 1-5	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	165	342	168	144	108	96	137	60	174	234
CM 1-6	80	0.84* / 0.78	1"	1"	3/8"	10.5	141	158	125	208	75	165	418	204	180	144	96	137	60	214	274
CM 1-7	80	1.14* / 1.10	1"	1"	3/8"	10.5	206	158	125	208	75	165	418	204	180	144	96	137	60	214	274
CM 1-8	80	1.14* / 1.10	1"	1"	3/8"	10.5	206	158	125	208	75	165	454	240	216	180	96	137	60	214	274
CM 1-9	80	1.14* / 1.10	1"	1"	3/8"	10.5	206	158	125	208	75	165	454	240	216	180	96	137	60	214	274

* Applies to supply voltage A.

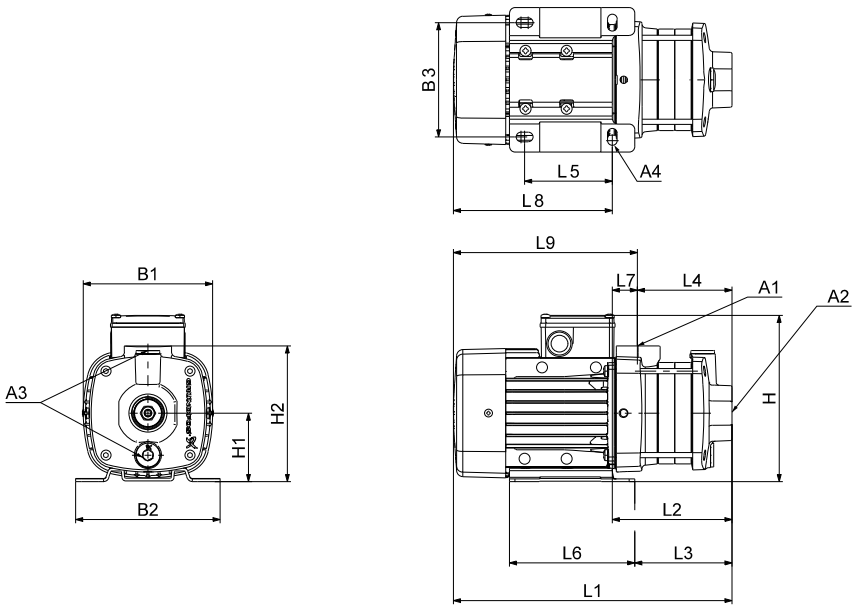
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-2	71	0.25	0.43	1"	1"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 1-3	71	0.25	0.43	1"	1"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 1-4	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	184	75	165	324	150	126	90	96	137	60	174	234
CM 1-5	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	184	75	165	342	168	144	108	96	137	60	174	234
CM 1-6	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	184	75	165	378	204	180	144	96	137	60	174	234
CM 1-7	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	184	75	165	378	204	180	144	96	137	60	174	234
CM 1-8	80	0.74	1.28	1"	1"	3/8"	10.5	141	158	125	184	75	165	474	240	216	180	96	137	60	234	294
CM 1-9	80	0.74	1.28	1"	1"	3/8"	10.5	141	158	125	184	75	165	474	240	216	180	96	137	60	234	294

All dimensions are in mm unless otherwise stated.

CM 3-A

(A = cast iron EN-GJL-200)



TM06 7509 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																			
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 3-2	71	0.25 / 0.43*	0.43 / 0.74*	1"	1"	3/8"	10.5	141	158	125	192	75	151	286	112	88	85	96	137	27	174	201
CM 3-3	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	192	75	151	304	130	106	103	96	137	27	174	201
CM 3-4	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	192	75	151	322	148	124	121	96	137	27	174	201
CM 3-5	80	0.64	1.10	1"	1"	3/8"	10.5	141	158	125	192	75	149	380	166	142	139	96	137	27	214	241

* Applies to supply voltage O.

1 x 115/230 V, 60 Hz (supply voltage B)
1 x 220 V, 60 Hz (supply voltage A)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 3-2	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	149	286	112	88	85	96	137	27	174	201
CM 3-3	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	149	304	130	106	103	96	137	27	174	201
CM 3-4	80	0.84* / 0.78	1"	1"	3/8"	10.5	141	158	125	208	75	149	362	148	124	121	96	137	27	214	241
CM 3-5	80	1.14* / 1.10	1"	1"	3/8"	10.5	206	158	125	208	75	149	380	166	142	139	96	137	27	214	241

* Applies to supply voltage A.

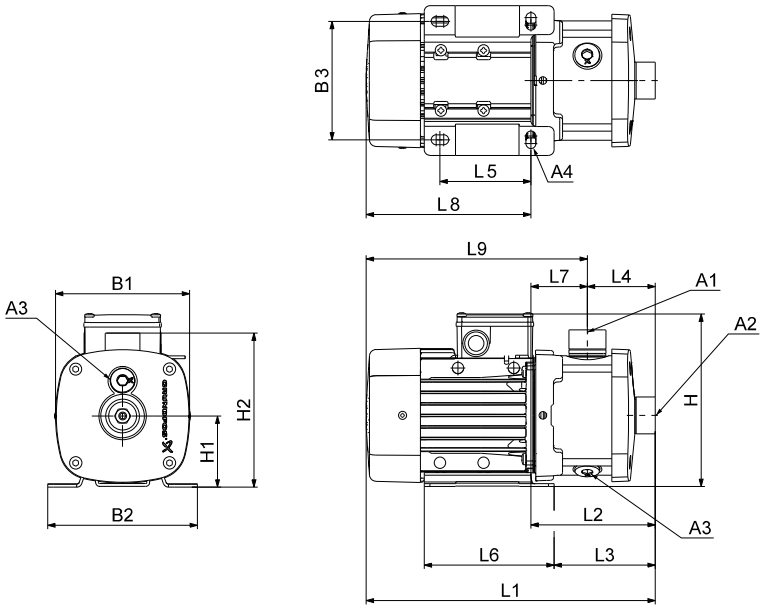
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																			
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 3-2	71	0.25	0.43	1"	1"	3/8"	10.5	141	158	125	184	75	149	286	112	88	85	96	137	27	174	201
CM 3-3	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	184	75	149	304	130	106	103	96	137	27	174	201
CM 3-4	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	184	75	149	322	148	124	121	96	137	27	174	201
CM 3-5	80	0.74	1.28	1"	1"	3/8"	10.5	141	158	125	184	75	149	400	166	142	139	96	137	27	234	261

All dimensions are in mm unless otherwise stated.

CM 3-I and CM 3-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 3-2	71	0.25 / 0.43 *	0.43 / 0.74*	1"	1"	3/8"	10.5	141	158	125	192	75	165	306	132	108	72	96	137	60	174	234
CM 3-3	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	192	75	165	306	132	108	72	96	137	60	174	234
CM 3-4	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	192	75	165	324	150	126	90	96	137	60	174	234
CM 3-5	80	0.64	1.10	1"	1"	3/8"	10.5	141	158	125	192	75	165	382	168	144	108	96	137	60	214	274
CM 3-6	80	1.27	2.20	1"	1"	3/8"	10.5	141	158	125	192	75	165	438	204	180	144	96	137	60	234	294
CM 3-7	90	1.27	2.20	1"	1"	3/8"	10.0	178	178	140	200	90	180	469	245	230	144	125	155	101	224	325
CM 3-8	90	1.27	2.20	1"	1"	3/8"	10.0	178	178	140	200	90	180	546	282	267	180	125	155	102	264	366
CM 3-9	90	1.27	2.20	1"	1"	3/8"	10.0	178	178	140	200	90	180	546	282	267	180	125	155	102	264	366

* Applies to supply voltage O.

1 x 115/230 V, 60 Hz (supply voltage B); 1 x 220 V, 60 Hz (supply voltage A)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 3-2	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	165	306	132	108	72	96	137	60	174	234
CM 3-3	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	165	306	132	108	72	96	137	60	174	234
CM 3-4	80	0.84* / 0.78	1"	1"	3/8"	10.5	141	158	125	208	75	165	364	150	126	90	96	137	60	214	274
CM 3-5	80	1.14* / 1.10	1"	1"	3/8"	10.5	206	158	125	208	75	165	382	168	144	108	96	137	60	214	274
CM 3-6	90	1.54* / 1.50	1"	1"	3/8"	10.0	178	178	140	229	90	180	469	245	230	144	125	155	101	224	325
CM 3-7	90	1.54* / 1.50	1"	1"	3/8"	10.0	178	178	140	229	90	180	469	245	230	144	125	155	101	224	325
CM 3-8	90	1.54* / 1.50	1"	1"	3/8"	10.0	178	178	140	229	90	180	505	281	266	180	125	155	101	224	325

* Applies to supply voltage A.

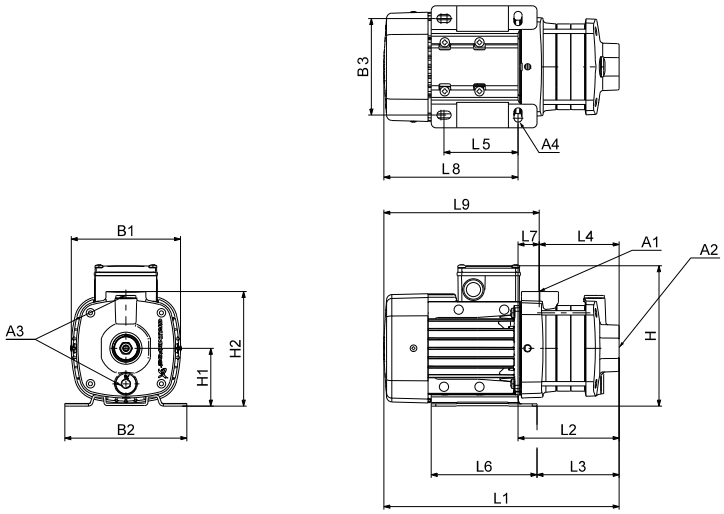
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 3-2	71	0.25	0.43	1"	1"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 3-3	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 3-4	71	0.43	0.74	1"	1"	3/8"	10.5	141	158	125	184	75	165	324	150	126	90	96	137	60	174	234
CM 3-5	80	0.74	1.28	1"	1"	3/8"	10.5	141	158	125	184	75	165	402	168	144	108	96	137	60	234	294
CM 3-6	80	0.74	1.28	1"	1"	3/8"	10.5	141	158	125	184	75	165	438	204	180	144	96	137	60	234	294
CM 3-7	90	1.27	2.20	1"	1"	3/8"	10.0	178	178	140	200	90	180	510	246	231	144	125	155	102	264	366
CM 3-8	90	1.27	2.20	1"	1"	3/8"	10.0	178	178	140	200	90	180	546	282	267	180	125	155	102	264	366
CM 3-9	90	1.27	2.20	1"	1"	3/8"	10.0	178	178	140	200	90	180	546	282	267	180	125	155	102	264	366

All dimensions are in mm unless otherwise stated.

CM 5-A

(A = cast iron EN-GJL-200)



TM06 7509 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 5-2	71	0.43	0.74	1"	1 1/4"	3/8"	10.5	141	158	125	192	75	151	286	112	88	85	96	137	27	174	201
CM 5-3	71	0.64	1.10	1"	1 1/4"	3/8"	10.5	141	158	125	192	75	149	344	130	106	103	96	137	27	214	241
CM 5-4	71	1.27	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	201	420	195	180	108	125	155	88	224	312
CM 5-5	80	1.27	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	201	479	214	199	126	125	155	89	264	353

1 x 115/230 V, 60 Hz (supply voltage B); 1 x 220 V, 60 Hz (supply voltage A)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 5-2	80	0.84* / 0.78	1"	1 1/4"	3/8"	10.5	141	158	125	208	75	149	326	112	88	85	96	137	27	214	241
CM 5-3	80	1.14* / 1.10	1"	1 1/4"	3/8"	10.5	206	158	125	208	75	149	344	130	106	103	96	137	27	214	241
CM 5-4	90	1.54* / 1.50	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	201	420	195	180	108	125	155	88	224	312
CM 5-5	90	1.50	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	201	438	213	198	126	125	155	88	224	312

* Applies to supply voltage A.
Note: CM 5-5 is not available with supply voltage A.

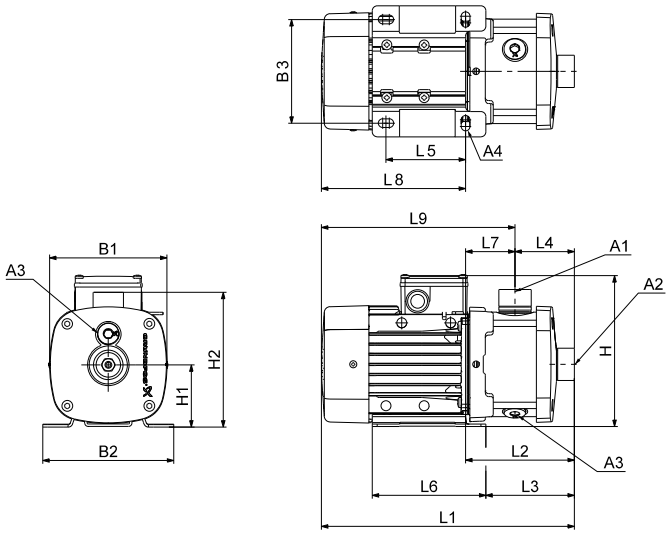
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 5-2	71	0.43	0.74	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	149	286	112	88	85	96	137	27	174	201
CM 5-3	80	0.74	1.28	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	149	364	130	106	103	96	137	27	234	261
CM 5-4	90	1.27	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	201	461	196	181	108	125	155	89	264	353
CM 5-5	90	1.27	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	201	479	214	199	126	125	155	89	264	353

All dimensions are in mm unless otherwise stated.

CM 5-I and CM 5-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 5-2	71	0.43	0.74	1"	1 1/4"	3/8"	10.5	141	158	125	192	75	165	306	132	108	72	96	137	60	174	234
CM 5-3	80	0.64	1.10	1"	1 1/4"	3/8"	10.5	141	158	125	192	75	165	346	132	108	72	96	137	60	214	274
CM 5-4	90	1.27	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	415	191	176	90	125	155	101	224	325
CM 5-5	90	1.27	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	474	210	195	108	125	155	102	264	366
CM 5-6	90	1.27	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	510	246	231	144	125	155	102	264	366
CM 5-7	90	1.68	2.90	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	510	246	231	144	125	155	102	264	366
CM 5-8	100	1.68	2.90	1"	1 1/4"	3/8"	12.0	198	199	160	220	100	190	561	288	273	180	140	170	108	273	381

1 x 115/230 V, 60 Hz (supply voltage B)
1 x 220 V, 60 Hz (supply voltage A)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 5-2	80	0.84* / 0.78	1"	1 1/4"	3/8"	10.5	141	158	125	208	75	165	346	132	108	72	96	137	60	214	274
CM 5-3	80	1.14* / 1.10	1"	1 1/4"	3/8"	10.5	206	158	125	208	75	165	346	132	108	72	96	137	60	214	274
CM 5-4	90	1.54* / 1.50	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	180	415	191	176	90	125	155	101	224	325
CM 5-5	90	1.50	1"	1 1/4"	3/8"	10.0	178	178	140	229	90	180	433	209	194	108	125	155	101	224	325

* Applies to supply voltage A.
Note: CM 5-5 is not available with supply voltage A.

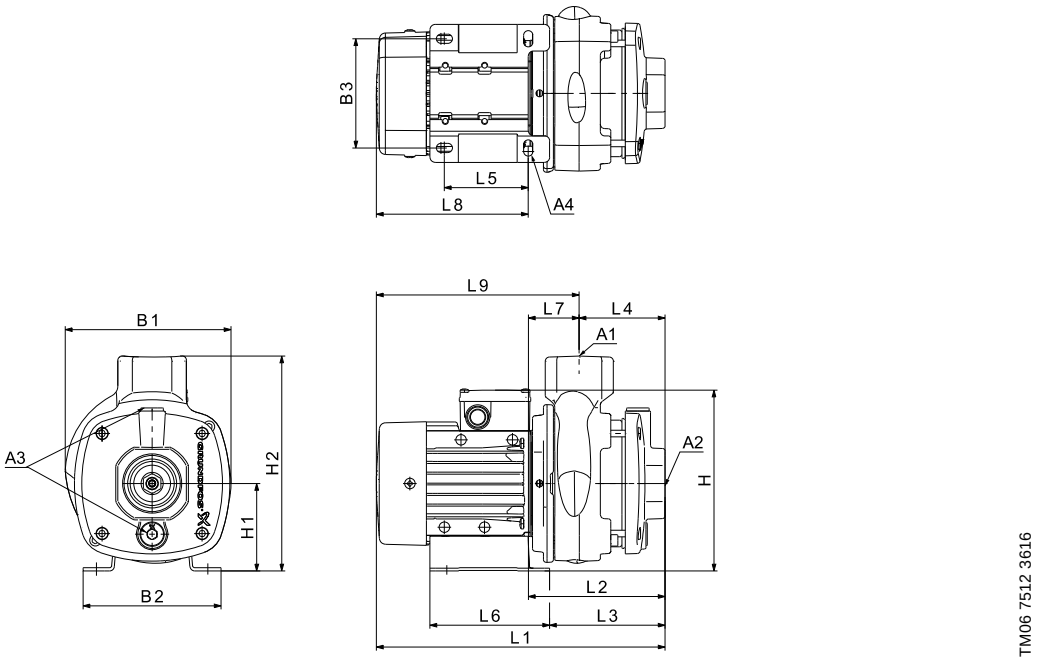
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 5-2	71	0.43	0.74	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	165	306	132	108	72	96	137	60	174	234
CM 5-3	80	0.74	1.28	1"	1 1/4"	3/8"	10.5	141	158	125	184	75	165	366	132	108	72	96	137	60	234	294
CM 5-4	90	1.27	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	456	192	177	90	125	155	102	264	366
CM 5-5	90	1.27	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	474	210	195	108	125	155	102	264	366
CM 5-6	90	1.27	2.20	1"	1 1/4"	3/8"	10.0	178	178	140	200	90	180	510	246	231	144	125	155	102	264	366
CM 5-7	100	1.68	2.90	1"	1 1/4"	3/8"	12.0	198	199	160	220	100	190	525	252	237	144	140	170	108	273	381
CM 5-8	100	1.68	2.90	1"	1 1/4"	3/8"	12.0	198	199	160	220	100	190	561	288	273	180	140	170	108	273	381

All dimensions are in mm unless otherwise stated.

CM 10-A

(A = cast iron EN-GJL-200)



TM06 7512 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 10-1	80	0.64	1.10	1 1/2"	1 1/2"	3/8"	10.5	190	158	125	217	100	242	390	156	131	97	95	137	59	234	292
CM 10-2	90	1.27	2.20	1 1/2"	1 1/2"	3/8"	12.0	190	199	160	210	100	242	460	188	173	97	140	170	91	272	362
CM 10-3	100	2.30	4.00	1 1/2"	1 1/2"	3/8"	12.0	198	199	160	220	100	242	507	234	219	127	140	170	107	273	380

1 x 115/230 V, 60 Hz (supply voltage B)
1 x 220 V, 60 Hz (supply voltage A)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 10-1	80	1.14* / 1.10	1 1/2"	1 1/2"	3/8"	10.5	255	158	125	233	100	242	370	156	131	97	95	137	59	214	272

* Applies to supply voltage A.

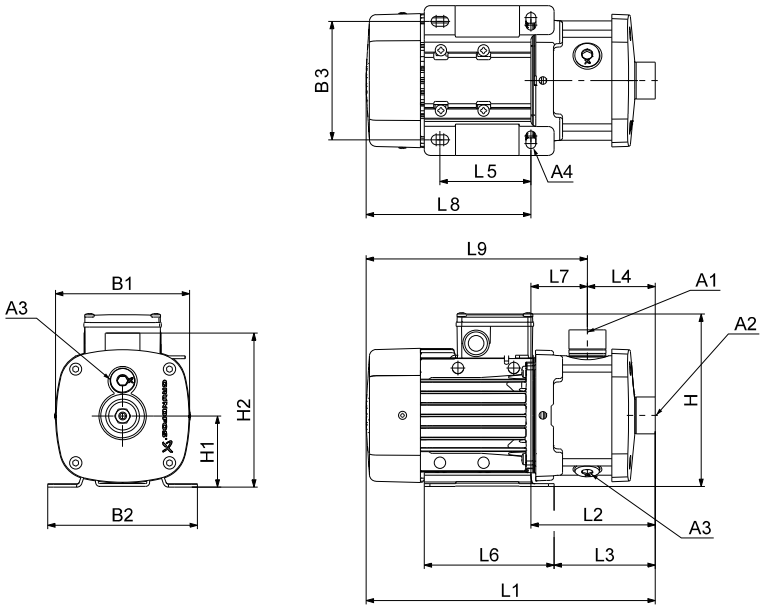
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 10-1	80	0.74	1.28	1 1/2"	1 1/2"	3/8"	10.5	190	158	125	209	100	242	390	156	131	97	95	137	59	234	292
CM 10-2	90	1.27	2.20	1 1/2"	1 1/2"	3/8"	12.0	190	199	160	210	100	242	460	188	173	97	140	170	91	272	362
CM 10-3	112	2.30	4.00	1 1/2"	1 1/2"	3/8"	12.0	220	228	190	246	112	254	560	258	242	127	140	172	130	302	433

All dimensions are in mm unless otherwise stated.

CM 10-I and CM 10-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 10-1	80	0.64	1.10	1 1/2"	1 1/2"	3/8"	10.5	180	158	125	217	100	219	420	186	161	105	95	137	81	234	315
CM 10-2	90	1.27	2.20	1 1/2"	1 1/2"	3/8"	12.0	178	199	160	210	100	219	490	218	203	105	140	170	113	272	385
CM 10-3	100	2.30	4.00	1 1/2"	1 1/2"	3/8"	12.0	198	199	160	220	100	219	507	234	219	105	140	170	129	273	402
CM 10-4	132	3.18	5.50	1 1/2"	1 1/2"	3/8"	12.0	220	228	190	246	112	231	590	288	272	135	140	172	153	302	455
CM 10-5	132	3.18	5.50	1 1/2"	1 1/2"	3/8"	12.0	220	228	190	246	112	231	650	348	332	195	140	172	153	302	455

Note: The dimension H is smaller than H2 for CM 10-1 and CM 10-2.

1 x 115/230 V, 60 Hz (supply voltage B)
1 x 220 V, 60 Hz (supply voltage A)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 10-1	80	1.14* / 1.10	1 1/2"	1 1/2"	3/8"	10.5	206	158	125	233	100	219	400	186	161	105	95	137	81	214	295

* Applies to supply voltage A.

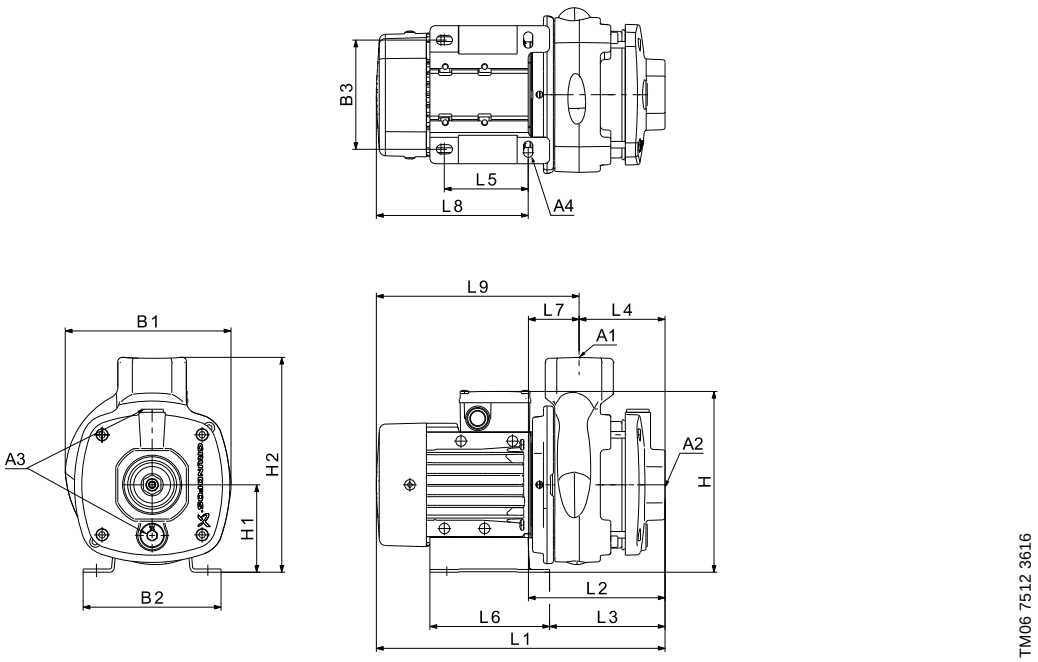
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 10-1	80	0.74	1.28	1 1/2"	1 1/2"	3/8"	10.5	180	158	125	209	100	219	420	186	161	105	95	137	81	234	315
CM 10-2	90	1.27	2.20	1 1/2"	1 1/2"	3/8"	12.0	178	199	160	210	100	219	490	218	203	105	140	170	113	272	385
CM 10-3	112	2.30	4.00	1 1/2"	1 1/2"	3/8"	12.0	220	228	190	246	112	231	560	258	242	105	140	172	153	302	455
CM 10-4	132	3.18	5.50	1 1/2"	1 1/2"	3/8"	12.0	220	228	190	246	112	231	590	288	272	135	140	172	153	302	455
CM 10-5	132	3.18	5.50	1 1/2"	1 1/2"	3/8"	12.0	220	228	190	246	112	231	650	348	332	195	140	172	153	302	455

All dimensions are in mm unless otherwise stated.
Note: The dimension H is smaller than H2 for CM 10-1 and CM 10-2.

CM 15-A

(A = cast iron EN-GJL-200)



TM06 7512 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 15-1	90	1.27	2.20	2"	2"	3/8"	12.0	190	199	160	210	100	242	460	188	173	97	140	170	91	272	362
CM 15-2	100	2.30	4.00	2"	2"	3/8"	12.0	198	199	160	220	100	242	477	204	189	97	140	170	107	273	380
CM 15-3	132	3.70	6.40	2"	2"	3/8"	12.0	220	228	190	246	112	254	560	258	242	127	140	172	130	302	433

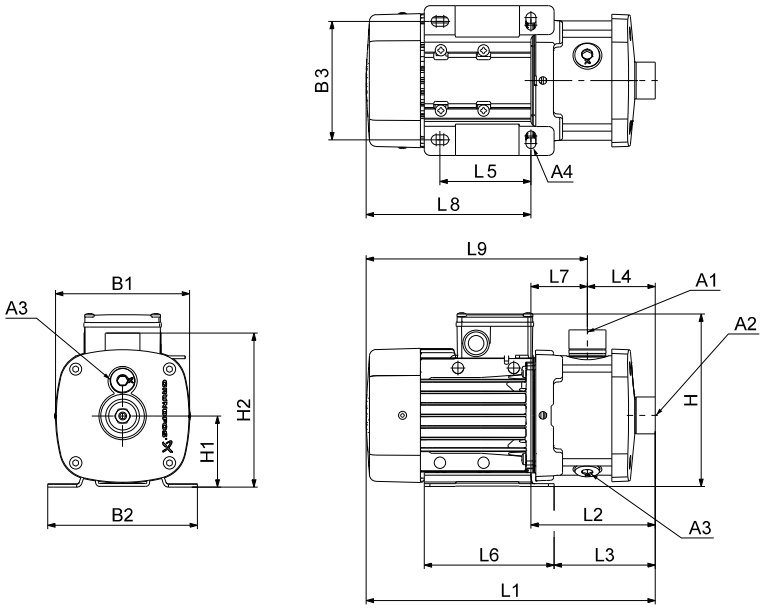
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 15-1	90	1.27	2.20	2"	2"	3/8"	12.0	190	199	160	210	100	242	460	188	173	97	140	170	91	272	362
CM 15-2	112	2.30	4.00	2"	2"	3/8"	12.0	220	228	190	246	112	254	530	228	212	97	140	172	130	302	433
CM 15-3	132	3.70	6.40	2"	2"	3/8"	12.0	220	228	190	246	112	254	560	258	242	127	140	172	130	302	433

All dimensions are in mm unless otherwise stated.

CM 15-I and CM 15-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 15-1	90	1.27	2.20	2"	2"	3/8"	12.0	178	199	160	210	100	217	490	218	203	105	140	170	113	272	385
CM 15-2	100	2.30	4.00	2"	2"	3/8"	12.0	198	199	160	220	100	217	507	234	219	105	140	170	129	273	402
CM 15-3	132	3.70	6.40	2"	2"	3/8"	12.0	220	228	190	246	112	229	560	258	242	105	140	172	153	302	455

Note: The dimension H is smaller than H2 for CM 15-1.

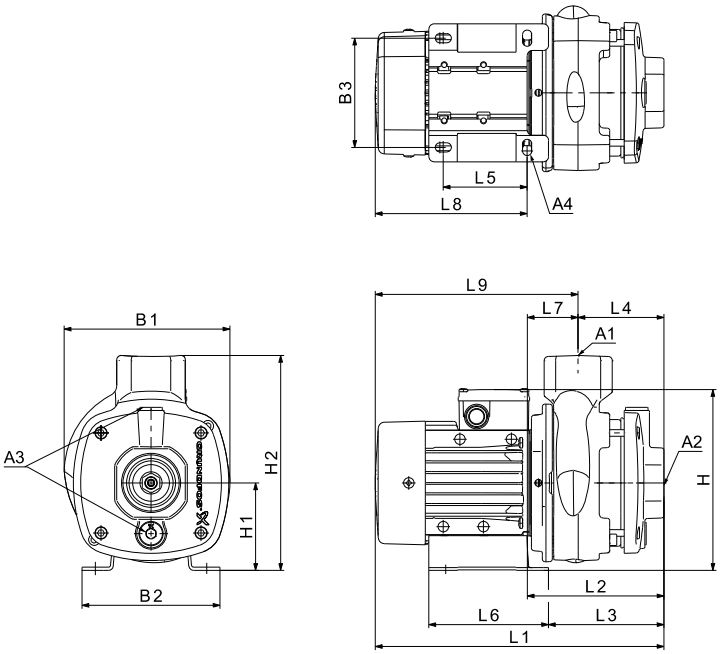
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 15-1	90	1.27	2.20	2"	2"	3/8"	12.0	178	199	160	210	100	217	490	218	203	105	140	170	113	272	385
CM 15-2	112	2.30	4.00	2"	2"	3/8"	12.0	220	228	190	246	112	229	560	258	242	105	140	172	153	302	455
CM 15-3	132	3.70	6.40	2"	2"	3/8"	12.0	220	228	190	246	112	229	560	258	242	105	140	172	153	302	455

Note: The dimension H is smaller than H2 for CM 15-1.
All dimensions are in mm unless otherwise stated.

CM 25-A

(A = cast iron EN-GJL-200)



TM06 7512 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 25-1	100	2.30	4.00	2"	2"	3/8"	12.0	198	199	160	220	100	242	477	204	189	97	140	170	107	273	380
CM 25-2	132	3.70	6.40	2"	2"	3/8"	12.0	220	228	190	246	112	254	530	228	212	97	140	172	130	302	433

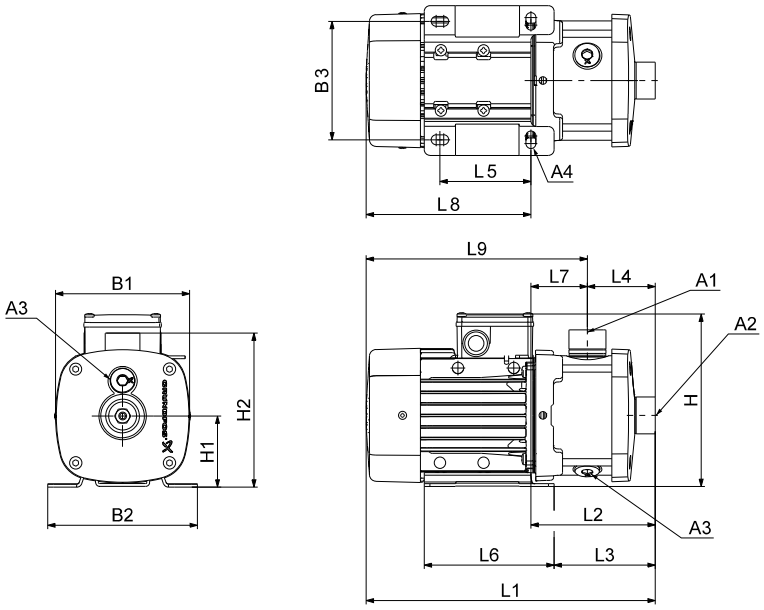
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 25-1	112	2.30	4.00	2"	2"	3/8"	12.0	220	228	190	246	112	254	530	228	212	97	140	172	130	302	433
CM 25-2	132	3.70	6.40	2"	2"	3/8"	12.0	220	228	190	246	112	254	530	228	212	97	140	172	130	302	433

All dimensions are in mm unless otherwise stated.

CM 25-I and CM 25-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7507 3616

Dimensions

3 x 208-230/440-480 V, 60 Hz (supply voltage E)
3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)
3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

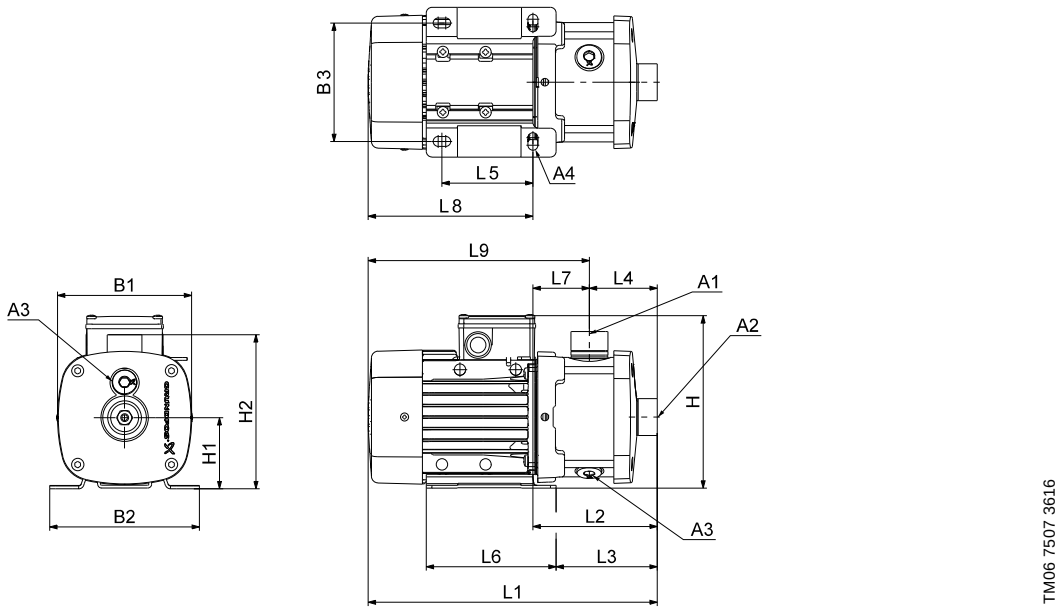
Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 25-1	100	2.30	4	2"	2"	3/8"	12.0	198	199	160	220	100	217	507	234	219	105	140	170	129	273	402
CM 25-2	132	3.70	6.4	2"	2"	3/8"	12.0	220	228	190	246	112	229	560	258	242	105	140	172	153	302	455

3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Pump type	Frame size	P_2 [kW]		Dimensions [mm]																		
		50 Hz	60 Hz	A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 25-1	112	2.30	4.00	2"	2"	3/8"	12.0	220	228	190	246	112	229	560	258	242	105	140	172	153	302	455
CM 25-2	132	3.70	6.40	2"	2"	3/8"	12.0	220	228	190	246	112	229	560	258	242	105	140	172	153	302	455

All dimensions are in mm unless otherwise stated.

23. Dimensions, CM self-priming 50 Hz and 60 Hz



Dimensions

1 x 220-240 V, 50 Hz (supply voltage C)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-3	71	0.30	1"	1"	3/8"	10.5	141	158	125	208	75	165	378	204	180	144	96	137	60	174	234
CM 1-4	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	378	204	180	144	96	137	60	174	234
CM 1-5	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	414	240	216	180	96	137	60	174	234
CM 1-6	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	414	240	216	180	96	137	60	174	234
CM 3-3	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	378	204	180	144	96	137	60	174	234
CM 3-4	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	378	204	180	144	96	137	60	174	234
CM 3-5	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	414	240	216	180	96	137	60	174	234
CM 3-6	80	0.67	1"	1"	3/8"	10.5	141	158	125	208	75	165	454	240	216	180	96	137	60	214	274
CM 5-3	71	0.50	1"	1"	3/8"	10.5	141	158	125	208	75	165	378	204	180	144	96	137	60	174	234
CM 5-4	80	0.67	1"	1"	3/8"	10.5	141	158	125	208	75	165	418	204	180	144	96	137	60	214	274
CM 5-5	80	0.90	1"	1"	3/8"	10.5	141	158	125	208	75	165	454	240	216	180	96	137	60	214	274
CM 5-6	90	1.30	1"	1"	3/8"	10.0	178	178	140	229	90	180	505	281	266	180	125	155	101	224	325
CM 5-7	90	1.30	1"	1"	3/8"	10.0	178	178	140	229	90	180	541	317	302	216	125	155	101	224	325

1 x 220 V, 60 Hz (supply voltage A)

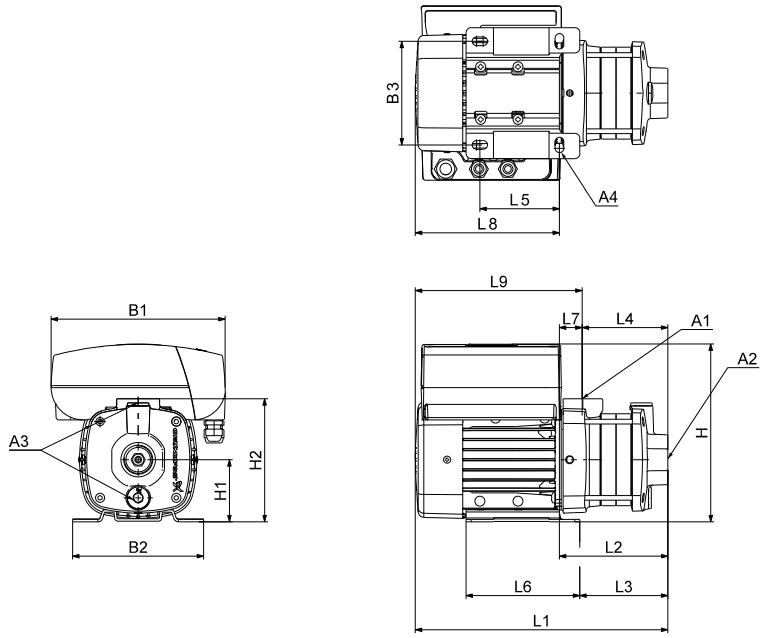
Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CM 1-3	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	165	378	204	180	144	96	137	60	174	234
CM 1-4	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	165	378	204	180	144	96	137	60	174	234
CM 3-3	71	0.60	1"	1"	3/8"	10.5	141	158	125	208	75	165	378	204	180	144	96	137	60	174	234
CM 3-4	80	0.84	1"	1"	3/8"	10.5	141	158	125	208	75	165	418	204	180	144	96	137	60	214	274
CM 5-3	80	1.14	1"	1"	3/8"	10.5	141	158	125	208	75	165	418	204	180	144	96	137	60	214	274
CM 5-4	90	1.54	1"	1"	3/8"	10.0	178	178	140	229	90	180	469	245	230	144	125	155	101	224	325

All dimensions are in mm unless otherwise stated.

24. Dimensions, CME 60 Hz and 50/60 Hz

CME 1-A

(A = cast iron EN-GJL-200)



TM06 7510 3616

Dimensions

3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 1-2	71	0.55	1"	1"	3/8"	10.5	267	158	125	233	75	149	348	112	87	85	96	137	27	236	263
CME 1-3	71	0.55	1"	1"	3/8"	10.5	267	158	125	233	75	149	366	130	105	103	96	137	27	236	263
CME 1-4	71	0.55	1"	1"	3/8"	10.5	267	158	125	233	75	149	384	148	123	121	96	137	27	236	263
CME 1-5	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	149	402	166	141	139	96	137	27	236	263

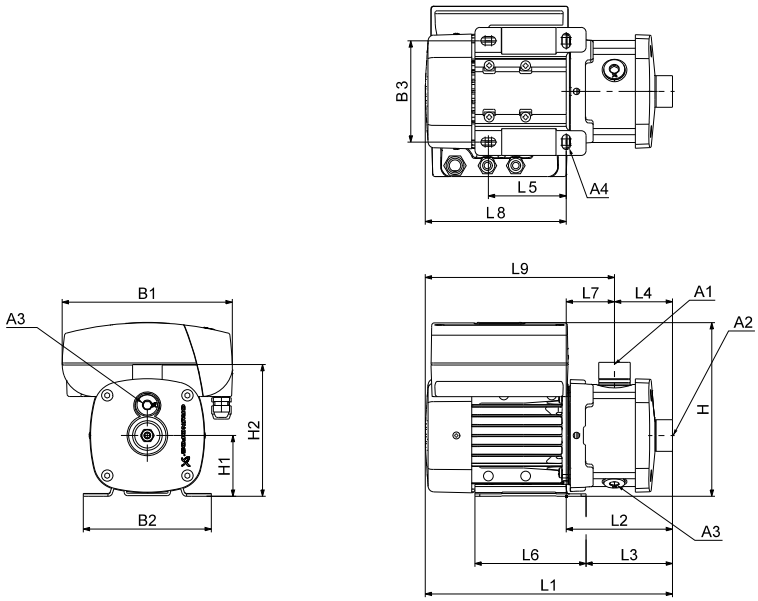
1 x 200-240 V, 50/60 Hz (supply voltage U)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 1-2	71	0.55	1"	1"	3/8"	10.5	212	158	125	233	75	149	308	112	87	85	96	137	27	196	223
CME 1-3	71	0.55	1"	1"	3/8"	10.5	212	158	125	233	75	149	326	130	105	103	96	137	27	196	223
CME 1-4	71	0.55	1"	1"	3/8"	10.5	212	158	125	233	75	149	344	148	123	121	96	137	27	196	223
CME 1-5	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	149	362	166	141	139	96	137	27	196	223

All dimensions are in mm unless otherwise stated.

CME 1-I and CME 1-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7508 3616

Dimensions

3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 1-2	71	0.55	1"	1"	3/8"	10.5	267	158	125	233	75	165	368	132	107	72	96	137	60	236	296
CME 1-3	71	0.55	1"	1"	3/8"	10.5	267	158	125	233	75	165	368	132	107	72	96	137	60	236	296
CME 1-4	71	0.55	1"	1"	3/8"	10.5	267	158	125	233	75	165	386	150	125	90	96	137	60	236	296
CME 1-5	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	165	404	168	143	108	96	137	60	236	296
CME 1-6	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	165	440	204	179	144	96	137	60	236	296
CME 1-7	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	165	440	204	179	144	96	137	60	236	296
CME 1-8	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	165	476	240	215	180	96	137	60	236	296
CME 1-9	90	1.50	1"	1"	3/8"	10.5	267	178	140	248	90	181	482	285	270	180	125	155	105	198	303

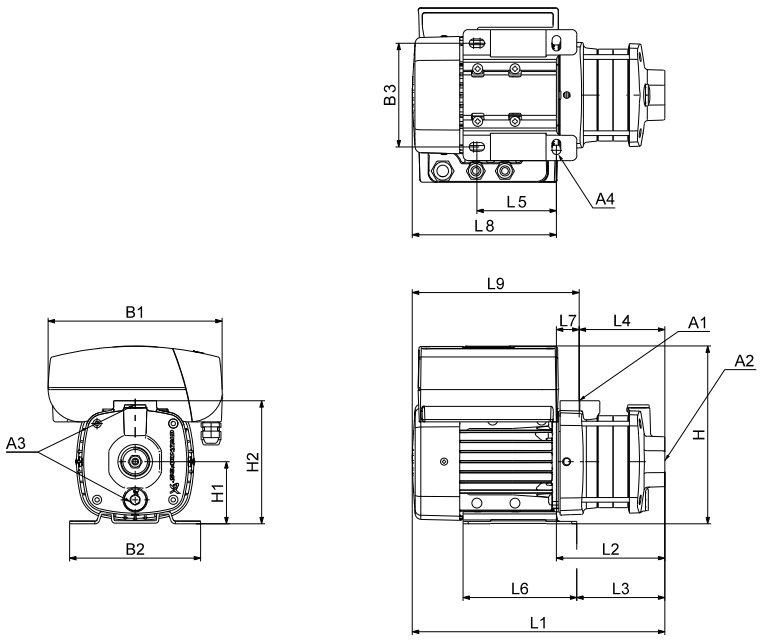
1 x 200-240 V, 50/60 Hz (supply voltage U)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 1-2	71	0.55	1"	1"	3/8"	10.5	212	158	125	233	75	165	328	132	107	72	96	137	60	196	256
CME 1-3	71	0.55	1"	1"	3/8"	10.5	212	158	125	233	75	165	328	132	107	72	96	137	60	196	256
CME 1-4	71	0.55	1"	1"	3/8"	10.5	212	158	125	233	75	165	346	150	125	90	96	137	60	196	256
CME 1-5	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	165	364	168	143	108	96	137	60	196	256
CME 1-6	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	165	400	204	179	144	96	137	60	196	256
CME 1-7	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	165	400	204	179	144	96	137	60	196	256
CME 1-8	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	165	436	240	215	180	96	137	60	196	256
CME 1-9	90	1.50	1"	1"	3/8"	10.5	212	178	140	248	90	181	443	285	270	180	125	155	105	158	263

All dimensions are in mm unless otherwise stated.

CME 3-A

(A = cast iron EN-GJL-200)



TM06 7510 3616

Dimensions

3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 3-2	71	0.55	1"	1"	3/8"	10.5	267	158	125	233	75	149	348	112	87	85	96	137	27	236	263
CME 3-3	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	149	366	130	105	103	96	137	27	236	263
CME 3-4	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	149	384	148	123	121	96	137	27	236	263
CME 3-5	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	149	402	166	141	139	96	137	27	236	263

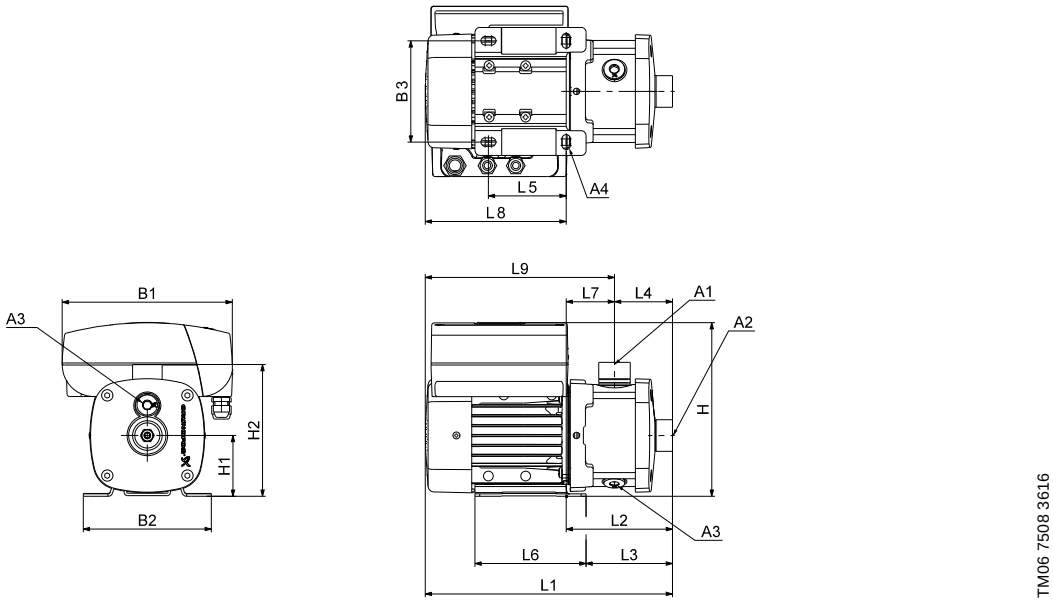
1 x 200-240 V, 50/60 Hz (supply voltage U)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 3-2	71	0.55	1"	1"	3/8"	10.5	212	158	125	233	75	149	308	112	87	85	96	137	27	196	223
CME 3-3	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	149	326	130	105	103	96	137	27	196	223
CME 3-4	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	149	344	148	123	121	96	137	27	196	223
CME 3-5	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	149	362	166	141	139	96	137	27	196	223

All dimensions are in mm unless otherwise stated.

CME 3-I and CME 3-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7508 3616

Dimensions

3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 3-2	71	0.55	1"	1"	3/8"	10.5	267	158	125	233	75	165	368	132	107	72	96	137	60	236	296
CME 3-3	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	165	368	132	107	72	96	137	60	236	296
CME 3-4	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	165	386	150	125	90	96	137	60	236	296
CME 3-5	80	1.10	1"	1"	3/8"	10.5	267	158	125	233	75	165	404	168	143	108	96	137	60	236	296
CME 3-6	90	1.50	1"	1"	3/8"	10.5	267	178	140	248	90	181	446	249	234	144	125	155	105	198	303
CME 3-7	90	1.50	1"	1"	3/8"	10.5	267	178	140	248	90	181	446	249	234	144	125	155	105	198	303
CME 3-8	90	2.20	1"	1"	3/8"	10.5	267	178	140	248	90	181	482	285	270	180	125	155	105	198	303
CME 3-9	90	2.20	1"	1"	3/8"	10.5	267	178	140	248	90	181	482	285	270	180	125	155	105	198	303

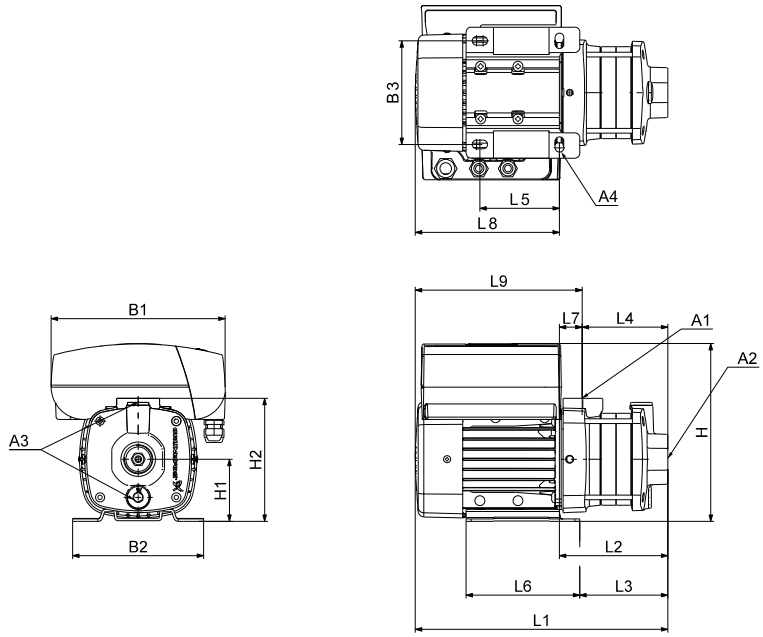
1 x 200-240 V, 50/60 Hz (supply voltage U)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 3-2	71	0.55	1"	1"	3/8"	10.5	212	158	125	233	75	165	328	132	107	72	96	137	60	196	256
CME 3-3	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	165	328	132	107	72	96	137	60	196	256
CME 3-4	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	165	346	150	125	90	96	137	60	196	256
CME 3-5	80	1.10	1"	1"	3/8"	10.5	212	158	125	233	75	165	364	168	143	108	96	137	60	196	256
CME 3-6	90	1.50	1"	1"	3/8"	10.5	212	178	140	248	90	181	407	249	234	144	125	155	105	158	263
CME 3-7	90	1.50	1"	1"	3/8"	10.5	212	178	140	248	90	181	407	249	234	144	125	155	105	158	263

All dimensions are in mm unless otherwise stated.

CME 5-A

(A = cast iron EN-GJL-200)



TM06 7510 3616

Dimensions

3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 5-2	80	1.10	1"	1 1/4"	3/8"	10.5	267	158	125	233	75	149	348	112	87	85	96	137	27	236	263
CME 5-3	80	1.10	1"	1 1/4"	3/8"	10.5	267	158	125	233	75	149	366	130	105	103	96	137	27	236	263
CME 5-4	90	1.50	1"	1 1/4"	3/8"	10.5	267	178	140	248	90	202	397	199	184	108	125	155	92	198	290
CME 5-5	90	2.20	1"	1 1/4"	3/8"	10.5	267	178	140	248	90	202	415	217	202	126	125	155	92	198	290

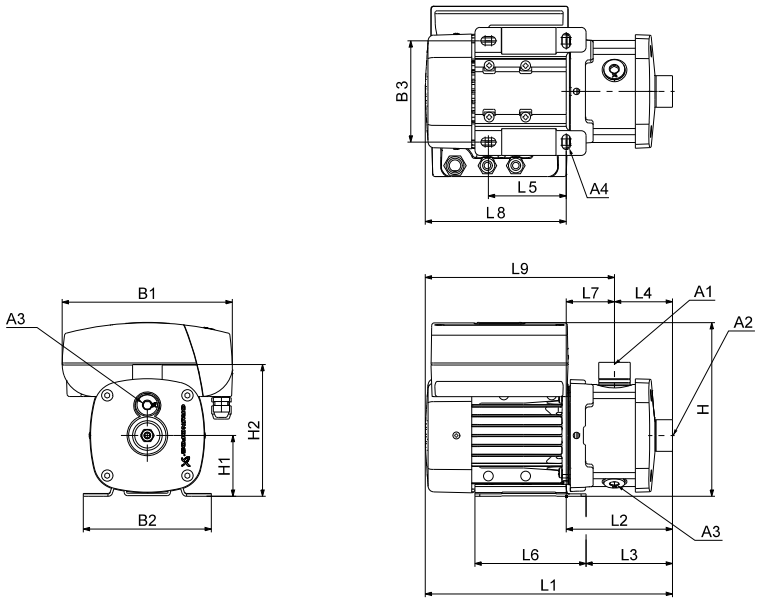
1 x 200-240 V, 50/60 Hz (supply voltage U)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 5-2	80	1.10	1"	1 1/4"	3/8"	10.5	212	158	125	233	75	149	308	112	87	85	96	137	27	196	223
CME 5-3	80	1.10	1"	1 1/4"	3/8"	10.5	212	158	125	233	75	149	326	130	105	103	96	137	27	196	223
CME 5-4	90	1.50	1"	1 1/4"	3/8"	10.5	212	178	140	248	90	202	357	200	185	108	125	155	92	158	250

All dimensions are in mm unless otherwise stated.

CME 5-I and CME 5-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7508 3616

Dimensions

3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 5-2	80	1.10	1"	1 1/4"	3/8"	10.5	267	158	125	233	75	165	368	132	107	72	96	137	60	236	296
CME 5-3	80	1.10	1"	1 1/4"	3/8"	10.5	267	158	125	233	75	165	368	132	107	72	96	137	60	236	296
CME 5-4	90	1.50	1"	1 1/4"	3/8"	10.5	267	178	140	248	90	181	392	195	180	90	125	155	105	198	303
CME 5-5	90	2.20	1"	1 1/4"	3/8"	10.5	267	178	140	248	90	181	410	213	198	108	125	155	105	198	303
CME 5-6	90	2.20	1"	1 1/4"	3/8"	10.5	267	178	140	248	90	181	446	249	234	144	125	155	105	198	303
CME 5-7	100	3.00	1"	1 1/4"	3/8"	12.0	291	200	160	300	100	190	520	250	233	144	140	173	106	270	376
CME 5-8	100	3.00	1"	1 1/4"	3/8"	12.0	291	200	160	300	100	190	556	286	269	180	140	173	106	270	376

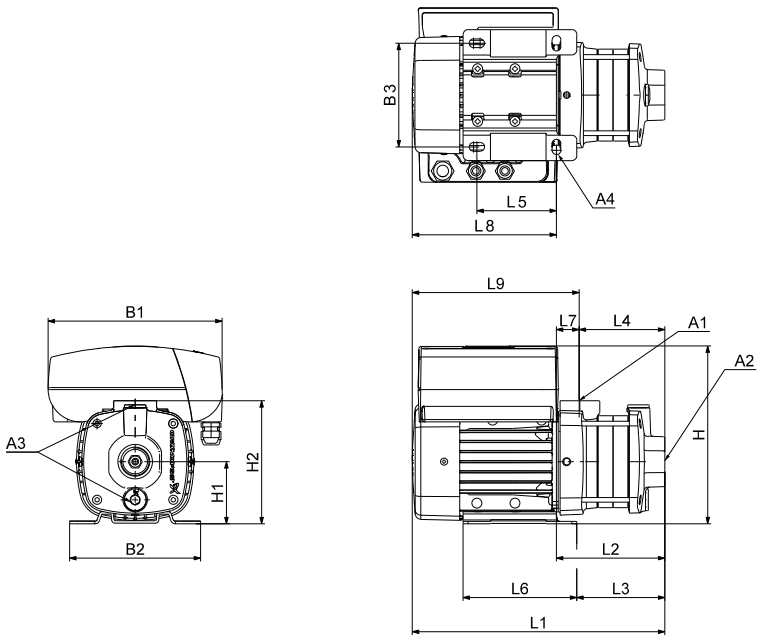
1 x 200-240 V, 50/60 Hz (supply voltage U)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 5-2	80	1.10	1"	1 1/4"	3/8"	10.5	212	158	125	233	75	165	328	132	107	72	96	137	60	196	256
CME 5-3	80	1.10	1"	1 1/4"	3/8"	10.5	212	158	125	233	75	165	328	132	107	72	96	137	60	196	256
CME 5-4	90	1.50	1"	1 1/4"	3/8"	10.5	212	178	140	248	90	181	353	195	180	90	125	155	105	158	263

All dimensions are in mm unless otherwise stated.

CME 10-A

(A = cast iron EN-GJL-200)



TM06 7510 3616

Dimensions

3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 10-1	80	1.10	1 1/2"	1 1/2"	3/8"	10.5	267	158	125	258	100	242	398	162	138	97	95	137	65	236	301
CME 10-2	90	2.20	1 1/2"	1 1/2"	3/8"	12.0	267	199	160	258	100	242	398	190	175	97	140	170	93	209	301
CME 10-3	112	4.00	1 1/2"	1 1/2"	3/8"	12.0	291	230	190	312	112	254	506	242	222	127	140	189	115	264	379

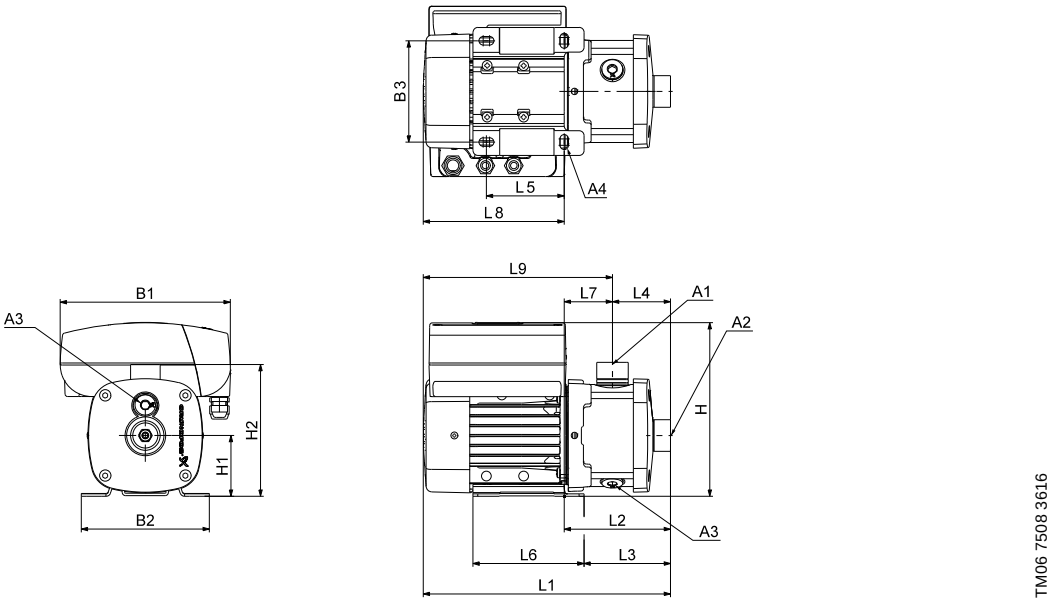
1 x 200-240 V, 50/60 Hz (supply voltage U)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 10-1	80	1.10	1 1/2"	1 1/2"	3/8"	10.5	212	158	125	258	100	242	352	155	131	97	95	137	58	196	255

All dimensions are in mm unless otherwise stated.

CME 10-I and CME 10-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



Dimensions

3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 10-1	80	1.10	1 1/2"	1 1/2"	3/8"	10.5	267	158	125	258	100	219	428	192	168	105	95	137	87	236	323
CME 10-2	90	2.20	1 1/2"	1 1/2"	3/8"	12.0	267	199	160	258	100	219	428	220	205	105	140	170	115	209	323
CME 10-3	112	4.00	1 1/2"	1 1/2"	3/8"	12.0	291	230	190	312	112	230	506	242	222	105	140	189	137	264	401
CME 10-4	112	5.50	1 1/2"	1 1/2"	3/8"	12.0	291	230	190	312	112	230	553	289	269	135	140	189	154	264	418
CME 10-5	112	5.50	1 1/2"	1 1/2"	3/8"	12.0	291	230	190	312	112	230	613	349	329	195	140	189	154	264	418

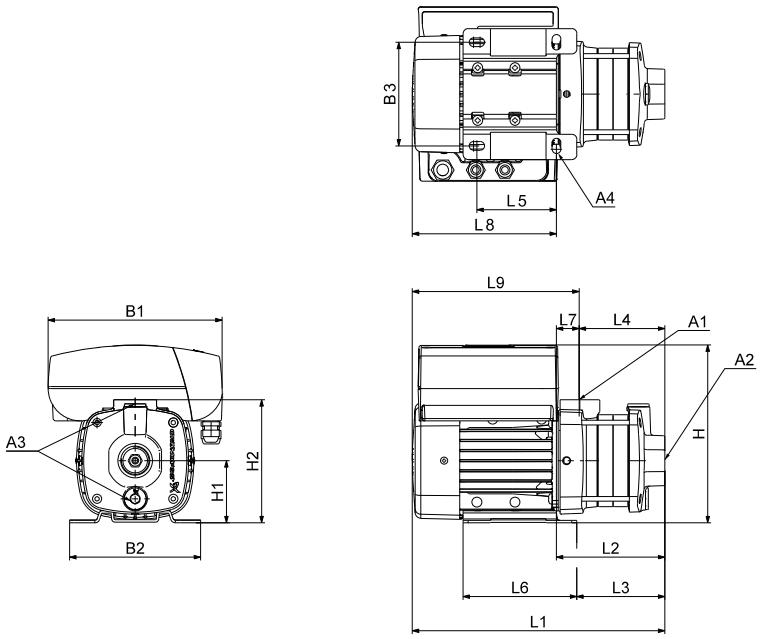
1 x 200-240 V, 50/60 Hz (supply voltage U)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 10-1	80	1.10	1 1/2"	1 1/2"	3/8"	10.5	212	158	125	258	100	219	382	185	161	105	95	137	80	196	277

All dimensions are in mm unless otherwise stated.

CME 15-A

(A = cast iron EN-GJL-200)



TM06 7510 3616

Dimensions

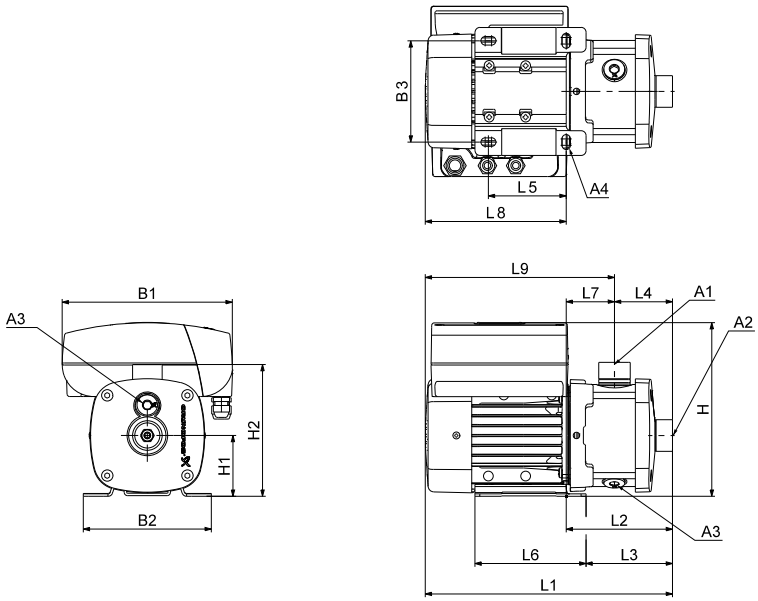
3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 15-1	90	2.20	2"	2"	3/8"	12.0	267	199	160	258	100	242	398	190	175	97	140	170	93	209	301
CME 15-2	112	4.00	2"	2"	3/8"	12.0	291	230	190	312	112	254	476	212	192	97	140	189	115	264	379
CME 15-3	132	7.50	2"	2"	3/8"	12.0	346	256	216	368	132	274	559	259	239	127	140	192	132	300	432

All dimensions are in mm unless otherwise stated.

CME 15-I and CME 15-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7508 3616

Dimensions

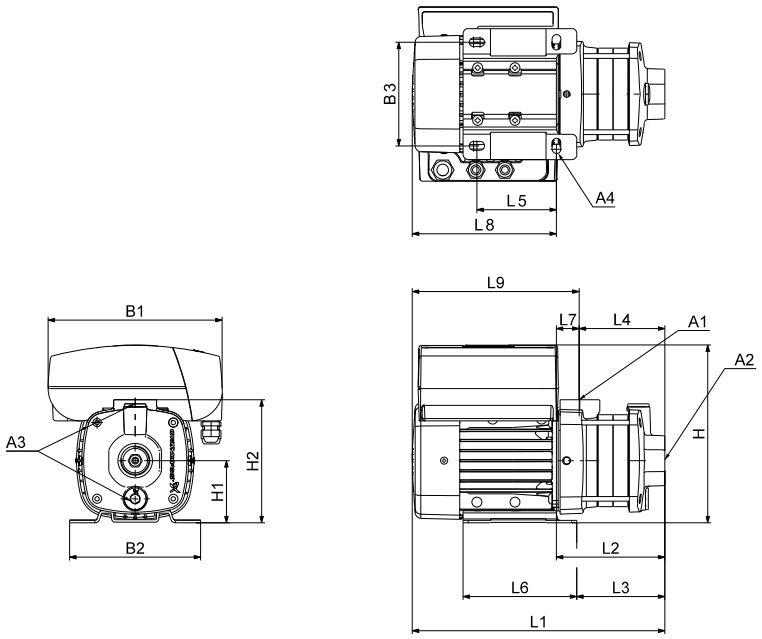
3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 15-1	90	2.20	2"	2"	3/8"	12.0	267	199	160	258	100	217	428	220	205	105	140	170	115	209	323
CME 15-2	112	4.00	2"	2"	3/8"	12.0	291	230	190	312	112	229	506	242	222	105	140	189	137	264	401
CME 15-3	132	7.50	2"	2"	3/8"	12.0	346	256	216	368	132	249	559	259	239	105	140	192	154	300	454

All dimensions are in mm unless otherwise stated.

CME 25-A

(A = cast iron EN-GJL-200)



TM06 7510 3616

Dimensions

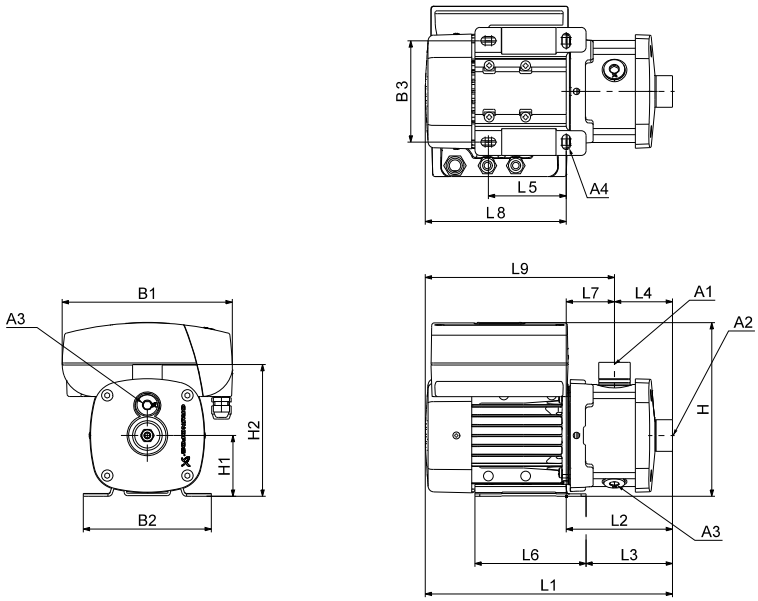
3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 25-1	100	3.00	2"	2"	3/8"	12.0	291	200	160	300	100	242	476	205	189	97	140	173	108	270	379
CME 25-2	132	7.50	2"	2"	3/8"	12.0	346	256	216	368	132	274	529	229	209	97	140	192	132	300	432

All dimensions are in mm unless otherwise stated.

CME 25-I and CME 25-G

(I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)



TM06 7508 3616

Dimensions

3 x 380-500 V, 50/60 Hz (supply voltage S)
3 x 440-480 V, 50/60 Hz (supply voltage T)

Pump type	Frame size	P_2 [kW]	Dimensions [mm]																		
			A1	A2	A3	A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8	L9
CME 25-1	100	3.00	2"	2"	3/8"	12.0	291	200	160	300	100	217	506	235	219	105	140	173	130	270	401
CME 25-2	132	7.50	2"	2"	3/8"	12.0	346	256	216	368	132	249	559	259	239	105	140	192	154	300	454

All dimensions are in mm unless otherwise stated.

25. Weights and shipping volume

All weights and volumes refer to pumps with standard pipe connections.

Overview

CM non-self-priming pumps

Cast iron (A = cast iron EN-GJL-200)

CM non-self-priming pumps Cast iron (A = cast iron EN-GJL-200)	Pump type	Net weight [kg]	Gross weight [kg]	Shipping volume [m^3]
1 x 220 V, 60 Hz (supply voltage A)	CM 1-2	11.68	14.18	0.02
	CM 1-3	11.96	14.46	0.02
	CM 1-4	12.22	14.72	0.02
	CM 1-5	12.50	15.00	0.02
	CM 3-2	11.68	14.18	0.02
	CM 3-3	11.96	14.46	0.02
	CM 3-4	13.62	16.12	0.03
	CM 3-5	15.00	17.50	0.04
	CM 5-2	12.98	15.48	0.02
	CM 5-3	14.36	16.86	0.04
	CM 5-4	24.25	26.75	0.04
	CM 10-1	24.53	27.03	0.04
1 x 115/230 V, 60 Hz (supply voltage B)	CM 1-2	23.36	25.86	0.04
	CM 1-3	11.96	14.46	0.02
	CM 1-4	12.22	14.72	0.02
	CM 1-5	12.50	15.00	0.02
	CM 3-2	11.68	14.18	0.02
	CM 3-3	11.96	14.46	0.02
	CM 3-4	13.62	16.12	0.03
	CM 3-5	15.00	17.50	0.04
	CM 5-2	12.98	15.48	0.02
	CM 5-3	14.36	16.86	0.04
	CM 5-4	24.25	26.75	0.04
	CM 5-5	24.53	27.03	0.04
	CM 10-1	23.36	25.86	0.04
1 x 220-240 V, 50 Hz (supply voltage C)	CM 1-2	10.98	13.48	0.02
	CM 1-3	11.26	13.76	0.02
	CM 1-4	12.22	14.72	0.02
	CM 1-5	12.50	15.00	0.02
	CM 1-6	12.77	15.27	0.03
	CM 1-7	13.04	15.54	0.03
	CM 1-8	14.71	17.21	0.03
	CM 3-2	10.98	13.48	0.02
	CM 3-3	11.96	14.46	0.02
	CM 3-4	12.22	14.72	0.02
	CM 3-5	12.50	15.00	0.02
	CM 3-6	14.17	16.67	0.03
	CM 3-7	15.54	18.04	0.03
	CM 3-8	15.81	18.31	0.03
	CM 5-2	11.58	14.08	0.02
	CM 5-3	11.86	14.36	0.02
	CM 5-4	13.53	16.02	0.03
	CM 5-5	14.90	17.40	0.03
	CM 5-6	22.70	25.20	0.04
	CM 5-7	22.97	25.47	0.04
	CM 5-8	23.24	25.74	0.04
	CM 10-1	22.16	24.66	0.04
	CM 10-2	29.83	32.33	0.04
	CM 10-3	32.64	35.14	0.04

CM non-self-priming pumps Cast iron (A = cast iron EN-GJL-200)	Pump type	Net weight [kg]	Gross weight [kg]	Shipping volume [m^3]
1 x 220-240 V, 50 Hz (supply voltage C)	CM 15-1	28.53	31.03	0.04
	CM 15-2	31.27	33.77	0.04
	CM 25-1	30.63	33.13	0.04
3 x 220-240/380-415 V, 50 Hz (supply voltage F)	CM 1-2	10.98	13.48	0.02
	CM 1-3	11.26	13.76	0.02
	CM 1-4	11.52	14.02	0.02
	CM 1-5	11.80	14.30	0.02
	CM 1-6	12.07	14.57	0.03
	CM 1-7	13.04	15.54	0.03
	CM 1-8	13.31	15.81	0.03
	CM 3-2	10.98	13.48	0.02
	CM 3-3	11.26	13.76	0.02
	CM 3-4	11.52	14.02	0.02
	CM 3-5	12.50	15.00	0.02
	CM 3-6	12.77	15.27	0.03
	CM 3-7	16.54	19.04	0.03
	CM 3-8	16.81	19.31	0.04
	CM 5-2	10.88	13.38	0.02
	CM 5-3	11.86	14.36	0.02
	CM 5-4	15.63	18.13	0.03
	CM 5-5	15.90	18.40	0.03
	CM 5-6	25.50	28.00	0.04
	CM 5-7	25.77	28.27	0.04
	CM 5-8	28.94	31.44	0.05
	CM 10-1	20.86	23.36	0.04
	CM 10-2	32.63	35.13	0.04
	CM 10-3	35.84	38.34	0.04
	CM 10-4	41.51	44.01	0.05
	CM 10-5	42.20	44.70	0.05
	CM 15-1	22.54	25.04	0.04
	CM 15-2	35.18	37.68	0.04
	CM 15-3	52.02	54.52	0.08
	CM 15-4	56.40	58.90	0.08
	CM 25-1	33.83	36.33	0.04
	CM 25-2	51.31	53.81	0.08
	CM 25-3	55.72	58.22	0.08
	CM 25-4	56.40	58.90	0.08
3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)	CM 1-2	10.98	13.48	0.02
	CM 1-3	11.26	13.76	0.02
	CM 1-4	12.22	14.72	0.02
	CM 1-5	12.50	15.00	0.02
	CM 3-2	10.98	13.48	0.02
	CM 3-3	11.96	14.46	0.02
	CM 3-4	12.22	14.72	0.02
	CM 3-5	16.00	18.50	0.03
	CM 5-2	11.58	14.08	0.02
	CM 5-3	15.36	17.86	0.03
	CM 5-4	29.45	31.95	0.04
	CM 5-5	29.73	32.23	0.04
	CM 10-1	24.36	26.86	0.04
	CM 10-2	35.84	38.34	0.04
	CM 10-3	52.68	55.18	0.08
	CM 15-1	35.83	38.33	0.04
	CM 15-2	51.31	53.81	0.08
	CM 15-3	55.32	57.82	0.08
	CM 25-1	50.67	53.17	0.08
	CM 25-2	54.61	57.11	0.08
3 x 208-230/440-480 V, 60 Hz (supply voltage E) 3 x 575 V, 60 Hz (supply voltage H) 3 x 400 V, 50/60 Hz (supply voltage I) 3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J) 3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)	CM 1-2	11.68	14.18	0.02
	CM 1-3	11.96	14.46	0.02
	CM 1-4	12.22	14.72	0.02
	CM 1-5	12.50	15.00	0.02
	CM 3-2	11.68	14.18	0.02
	CM 3-3	11.96	14.46	0.02
	CM 3-4	12.22	14.72	0.02
	CM 3-5	15.63	18.13	0.03
	CM 5-2	11.58	14.08	0.02
	CM 5-3	15.36	17.86	0.03
	CM 5-4	27.85	30.35	0.04
	CM 5-5	28.13	30.63	0.04

CM non-self-priming pumps Cast iron (A = cast iron EN-GJL-200)	Pump type	Net weight [kg]	Gross weight [kg]	Shipping volume [m^3]
3 x 208-230/440-480 V, 60 Hz (supply voltage E) 3 x 575 V, 60 Hz (supply voltage H) 3 x 400 V, 50/60 Hz (supply voltage I) 3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J) 3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)	CM 10-1	23.20	25.70	0.04
	CM 10-2	35.84	38.34	0.04
	CM 10-3	52.68	55.18	0.08
	CM 15-1	33.83	36.33	0.04
	CM 15-2	51.31	53.81	0.08
	CM 15-3	55.32	57.82	0.08
	CM 25-1	50.67	53.17	0.08
	CM 25-2	54.61	57.11	0.08

CM non-self-priming pumps

Stainless steel (I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)

CM non-self-priming pumps Stainless steel (I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)	Pump type	Net weight [kg]	Gross weight [kg]	Shipping volume [m^3]
1 x 220 V, 60 Hz (supply voltage A)	CM 1-2	12.31	14.81	0.02
	CM 1-3	12.39	14.89	0.02
	CM 1-4	12.72	15.22	0.02
	CM 1-5	13.07	15.57	0.02
	CM 1-6	15.07	17.57	0.03
	CM 1-7	16.25	18.75	0.04
	CM 1-8	16.84	19.34	0.04
	CM 1-9	16.93	19.43	0.04
	CM 3-2	12.31	14.81	0.02
	CM 3-3	12.39	14.89	0.02
	CM 3-4	14.12	16.62	0.03
	CM 3-5	15.57	18.07	0.04
	CM 3-6	23.95	26.45	0.04
	CM 3-7	24.04	26.54	0.04
	CM 3-8	24.63	27.13	0.04
	CM 5-2	13.68	16.18	0.02
	CM 5-3	14.86	17.36	0.04
	CM 5-4	22.98	25.48	0.04
	CM 10-1	18.75	21.25	0.04
1 x 115/230 V, 60 Hz (supply voltage B)	CM 1-2	12.31	14.81	0.02
	CM 1-3	12.39	14.89	0.02
	CM 1-4	12.72	15.22	0.02
	CM 1-5	13.07	15.57	0.02
	CM 1-6	15.07	17.57	0.03
	CM 1-7	16.25	18.75	0.04
	CM 1-8	16.84	19.34	0.04
	CM 1-9	16.93	19.43	0.04
	CM 3-2	12.31	14.81	0.02
	CM 3-3	12.39	14.89	0.02
	CM 3-4	14.12	16.62	0.03
	CM 3-5	15.57	18.07	0.04
	CM 3-6	23.95	26.45	0.04
	CM 3-7	24.04	26.54	0.04
	CM 3-8	24.63	27.13	0.04
	CM 5-2	13.68	16.18	0.02
	CM 5-3	14.86	17.36	0.04
	CM 5-4	22.98	25.48	0.04
	CM 5-5	23.33	25.83	0.04
	CM 10-1	18.75	21.25	0.04
1 x 220-240 V, 50 Hz (supply voltage C)	CM 1-2	11.61	14.11	0.02
	CM 1-3	11.69	14.19	0.02
	CM 1-4	12.72	15.22	0.02
	CM 1-5	13.07	15.57	0.02
	CM 1-6	13.67	16.17	0.03
	CM 1-7	13.75	16.25	0.03
	CM 1-8	15.74	18.25	0.04
	CM 1-9	15.82	18.32	0.04
	CM 1-10	16.44	18.94	0.04
	CM 1-11	17.61	20.11	0.04
	CM 1-12	18.48	20.98	0.05
	CM 1-13	18.55	21.05	0.05
	CM 1-14	24.32	26.82	0.08

CM non-self-priming pumps Stainless steel (I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)	Pump type	Net weight [kg]	Gross weight [kg]	Shipping volume [m^3]
1 x 220-240 V, 50 Hz (supply voltage C)	CM 3-2	11.61	14.11	0.02
	CM 3-3	12.39	14.89	0.02
	CM 3-4	12.72	15.22	0.02
	CM 3-5	13.07	15.57	0.02
	CM 3-6	15.07	17.57	0.03
	CM 3-7	16.25	18.75	0.03
	CM 3-8	16.84	19.34	0.04
	CM 3-9	22.61	25.11	0.04
	CM 3-10	23.23	25.73	0.05
	CM 3-11	23.30	25.80	0.05
	CM 3-12	24.17	26.67	0.08
	CM 3-13	24.24	26.74	0.08
	CM 3-14	26.42	28.92	0.08
	CM 5-2	12.28	14.78	0.02
	CM 5-3	12.36	14.86	0.02
	CM 5-4	14.09	16.59	0.03
	CM 5-5	15.54	18.04	0.03
	CM 5-6	21.83	24.33	0.04
	CM 5-7	21.91	24.41	0.04
	CM 5-8	22.51	25.01	0.04
	CM 5-9	24.69	27.19	0.04
	CM 5-10	25.30	27.80	0.05
	CM 5-11	25.37	27.87	0.05
	CM 10-1	17.56	20.06	0.04
	CM 10-2	24.79	27.29	0.04
	CM 10-3	27.09	29.59	0.04
	CM 15-1	24.48	26.98	0.04
	CM 15-2	26.78	29.28	0.04
	CM 25-1	26.58	29.08	0.04
3 x 220-240/380-415 V, 50 Hz (supply voltage F)	CM 1-2	11.61	14.11	0.02
	CM 1-3	11.69	14.19	0.02
	CM 1-4	12.02	14.52	0.02
	CM 1-5	12.37	14.87	0.02
	CM 1-6	12.97	15.47	0.03
	CM 1-7	13.75	16.25	0.03
	CM 1-8	14.35	16.84	0.03
	CM 1-9	14.43	16.93	0.03
	CM 1-10	18.54	21.04	0.04
	CM 1-11	18.61	21.11	0.04
	CM 1-12	19.48	21.98	0.05
	CM 1-13	19.55	22.05	0.05
	CM 1-14	19.63	22.13	0.05
	CM 3-2	11.61	14.11	0.02
	CM 3-3	11.69	14.19	0.02
	CM 3-4	12.02	14.52	0.02
	CM 3-5	13.07	15.57	0.02
	CM 3-6	13.67	16.17	0.03
	CM 3-7	17.25	19.75	0.03
	CM 3-8	17.84	20.34	0.04
	CM 3-9	17.95	20.45	0.04
	CM 3-10	26.03	28.53	0.05
	CM 3-11	26.10	28.60	0.05
	CM 3-12	26.94	29.44	0.08
	CM 3-13	29.94	32.44	0.08
	CM 3-14	30.02	32.52	0.08
	CM 5-2	11.58	14.08	0.02
	CM 5-3	12.36	14.86	0.02
	CM 5-4	16.19	18.69	0.04
	CM 5-5	16.54	19.04	0.03
	CM 5-6	24.63	27.13	0.04
	CM 5-7	24.71	27.21	0.04
	CM 5-8	28.21	30.71	0.05
	CM 5-9	28.29	30.79	0.05
	CM 5-10	28.90	31.40	0.05
	CM 5-11	30.54	33.04	0.05
	CM 5-12	31.49	33.99	0.08
	CM 5-13	31.56	34.06	0.08
	CM 10-1	16.25	18.75	0.04

CM non-self-priming pumps Stainless steel (I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)	Pump type	Net weight [kg]	Gross weight [kg]	Shipping volume [m^3]
3 x 220-240/380-415 V, 50 Hz (supply voltage F)	CM 10-2	27.59	30.09	0.04
	CM 10-3	30.30	32.80	0.05
	CM 10-4	36.12	38.62	0.05
	CM 10-5	37.51	40.01	0.08
	CM 10-6	49.52	52.02	0.08
	CM 10-7	54.71	57.21	0.08
	CM 10-8	54.91	57.41	0.08
	CM 15-1	18.48	20.98	0.04
	CM 15-2	30.68	33.18	0.04
	CM 15-3	47.02	49.52	0.05
	CM 15-4	51.57	54.07	0.05
	CM 25-1	29.78	32.28	0.04
	CM 25-2	46.81	49.31	0.05
	CM 25-3	50.73	53.23	0.05
	CM 25-4	51.57	54.07	0.05
3 x 208-230/440-480 V, 60 Hz (supply voltage E) 3 x 575 V, 60 Hz (supply voltage H) 3 x 400 V, 50/60 Hz (supply voltage I) 3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J) 3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)	CM 1-2	12.31	14.81	0.02
	CM 1-3	12.39	14.89	0.02
	CM 1-4	12.72	15.22	0.02
	CM 1-5	13.07	15.57	0.02
	CM 1-6	13.67	16.17	0.03
	CM 1-7	13.75	16.25	0.03
	CM 1-8	17.87	20.37	0.04
	CM 1-9	17.95	20.45	0.04
	CM 3-2	12.31	14.81	0.02
	CM 3-3	12.39	14.89	0.02
	CM 3-4	12.72	15.22	0.02
	CM 3-5	16.60	19.10	0.03
	CM 3-6	27.56	30.06	0.04
	CM 3-7	27.64	30.14	0.04
	CM 3-8	28.23	30.73	0.05
	CM 3-9	28.31	30.81	0.05
	CM 5-2	12.28	14.78	0.02
	CM 5-3	15.86	18.36	0.03
	CM 5-4	26.58	29.08	0.04
	CM 5-5	26.93	29.43	0.04
	CM 5-6	27.53	30.03	0.04
	CM 5-7	29.26	31.76	0.05
	CM 5-8	30.06	32.56	0.05
	CM 10-1	18.59	21.09	0.04
	CM 10-2	30.79	33.29	0.04
	CM 10-3	47.13	49.63	0.05
	CM 10-4	44.28	46.78	0.05
	CM 10-5	45.67	48.17	0.08
	CM 15-1	29.78	32.28	0.04
	CM 15-2	46.81	49.31	0.05
	CM 15-3	50.33	52.83	0.05
	CM 25-1	46.62	49.12	0.05
	CM 25-2	50.12	52.62	0.05

CM self-priming pumps

Stainless steel (I = EN 1.4301/AISI 304)

CM self-priming pumps Stainless steel (I = EN 1.4301/AISI 304)	Pump type	Net weight [kg]	Gross weight [kg]	Shipping volume [m^3]
1 x 220 V, 60 Hz (supply voltage A)	CM 1-3	11.7	14.2	0.02
	CM 1-4	12.0	14.5	0.02
	CM 3-3	11.7	14.2	0.02
	CM 3-4	12.0	14.5	0.02
	CM 5-3	12.4	14.9	0.02
	CM 5-4	15.5	18.0	0.03
1 x 220-240 V, 50 Hz (supply voltage C)	CM 1-3	11.7	14.2	0.02
	CM 1-4	12.7	15.2	0.02
	CM 1-5	13.1	15.6	0.02
	CM 1-6	13.7	16.2	0.03
	CM 3-3	12.4	14.9	0.02
	CM 3-4	12.7	15.2	0.02
	CM 3-5	13.1	15.6	0.02
	CM 3-6	15.1	17.6	0.03
	CM 5-3	12.4	14.9	0.02
	CM 5-4	14.1	16.6	0.03
	CM 5-5	15.5	18.0	0.03
	CM 5-6	21.8	24.3	0.04
	CM 5-7	21.9	24.4	0.04

CME non-self-priming pumps

Cast iron (A = cast iron EN-GJL-200)

CME non-self-priming pumps Cast iron (A = cast iron EN-GJL-200)	Pump type	Net weight [kg]	Gross weight [kg]	Shipping volume [m^3]
3 x 380-500 V, 50/60 Hz (supply voltage S) 3 x 440-480 V, 50/60 Hz (supply voltage T)	CME 1-2	13.68	17.18	0.08
	CME 1-3	13.96	17.46	0.08
	CME 1-4	14.22	17.72	0.08
	CME 1-5	15.30	18.80	0.08
	CME 3-2	13.68	17.18	0.08
	CME 3-3	14.76	18.26	0.08
	CME 3-4	15.02	18.52	0.08
	CME 3-5	15.30	18.80	0.08
	CME 5-2	14.38	17.88	0.08
	CME 5-3	14.66	18.16	0.08
	CME 5-4	18.15	21.65	0.08
	CME 5-5	17.59	21.09	0.08
	CME 10-1	23.56	27.06	0.08
	CME 10-2	27.13	30.63	0.08
	CME 10-3	41.28	44.78	0.09
	CME 15-1	25.83	29.33	0.08
	CME 15-2	39.91	43.41	0.09
	CME 15-3	52.88	56.38	0.09
	CME 25-1	36.05	39.55	0.09
	CME 25-2	52.20	55.70	0.09
1 x 200-240 V, 50/60 Hz (supply voltage U)	CME 1-2	12.78	16.28	0.03
	CME 1-3	13.06	16.56	0.04
	CME 1-4	13.32	16.82	0.04
	CME 1-5	14.40	17.90	0.04
	CME 3-2	12.78	16.28	0.03
	CME 3-3	13.86	17.36	0.04
	CME 3-4	14.12	17.62	0.04
	CME 3-5	14.40	17.90	0.04
	CME 5-2	13.48	16.98	0.03
	CME 5-3	13.76	17.26	0.04
	CME 5-4	17.35	20.85	0.04
	CME 10-1	22.66	26.16	0.04

CME non-self-priming pumps

Stainless steel (I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)

CME non-self-priming pumps Stainless steel (I = EN 1.4301/AISI 304 and G = EN 1.4401/AISI 316)	Pump type	Net weight [kg]	Gross weight [kg]	Shipping volume [m^3]
3 x 380-500 V, 50/60 Hz (supply voltage S) 3 x 440-480 V, 50/60 Hz (supply voltage T)	CME 1-2	14.31	17.81	0.08
	CME 1-3	14.39	17.89	0.08
	CME 1-4	14.72	18.22	0.08
	CME 1-5	15.77	19.27	0.08
	CME 1-6	16.37	19.87	0.08
	CME 1-7	16.45	19.95	0.08
	CME 1-8	17.05	20.55	0.08
	CME 1-9	18.61	22.11	0.08
	CME 3-2	14.31	17.81	0.08
	CME 3-3	15.09	18.59	0.08
	CME 3-4	15.42	18.92	0.08
	CME 3-5	15.77	19.27	0.08
	CME 3-6	17.86	21.36	0.08
	CME 3-7	17.93	21.43	0.08
	CME 3-8	19.93	23.43	0.08
	CME 3-9	20.01	23.51	0.08
	CME 5-2	14.98	18.48	0.08
	CME 5-3	15.06	18.56	0.08
	CME 5-4	16.88	20.38	0.08
	CME 5-5	18.63	22.13	0.08
	CME 5-6	19.23	22.73	0.08
	CME 5-7	29.29	32.79	0.09
	CME 5-8	29.88	33.38	0.09
	CME 10-1	18.95	22.45	0.08
	CME 10-2	22.09	25.59	0.08
	CME 10-3	35.73	39.23	0.09
	CME 10-4	45.87	49.37	0.09
	CME 10-5	47.27	50.77	0.09
	CME 15-1	21.78	25.28	0.08
	CME 15-2	35.41	38.91	0.09
	CME 15-3	52.88	56.38	0.09
	CME 25-1	31.99	35.49	0.09
	CME 25-2	52.20	55.70	0.09
1 x 200-240 V, 50/60 Hz (supply voltage U)	CME 1-2	13.51	17.01	0.04
	CME 1-3	13.59	17.09	0.04
	CME 1-4	13.92	17.42	0.04
	CME 1-5	14.97	18.47	0.04
	CME 1-6	15.57	19.07	0.04
	CME 1-7	15.65	19.15	0.04
	CME 1-8	16.25	19.75	0.04
	CME 1-9	17.81	21.31	0.04
	CME 3-2	13.51	17.01	0.04
	CME 3-3	14.29	17.79	0.04
	CME 3-4	14.62	18.12	0.04
	CME 3-5	14.97	18.47	0.04
	CME 3-6	17.06	20.56	0.04
	CME 3-7	17.14	20.64	0.04
	CME 5-2	14.18	17.68	0.04
	CME 5-3	14.26	17.76	0.04
	CME 5-4	16.08	19.58	0.04
	CME 10-1	18.06	21.56	0.04

26. Motor data

Mains-operated motors, 50 Hz

1 x 220-240 V, 50 Hz (supply voltage C)

Frame size	P_2 [kW]	$I_{1/1}$ [A]	Cos $\varphi_{1/1}$	η [%]	I_{start} [A]	Speed [min^{-1}]
71A	0.3	1.8 - 2.4	0.95 - 0.86	67.4 - 61.4	6.1 - 8.2	2.800 - 2.830
71B	0.5	3.1 - 2.8	0.97 - 0.99	74-70	16.4 - 14.8	2.730 - 2.740
80A	0.67	4.4 - 4.0	0.99 - 0.99	71.8 - 73	17.2 - 15.6	2.720 - 2.800
80B	0.9	5.4 - 5.0	0.98 - 0.98	76-74	23.2 - 21.5	2.750 - 2.790
90SA	1.3	8.4 - 8.0	0.98 - 0.98	71-71	28.6 - 27.2	2.710 - 2.710
90SB	1.9	11.0 - 10.0	0.99 - 0.98	75-76	40.7 - 37.0	2.755 - 2.770

3 x 220-240/380-415 V, 50 Hz (supply voltage F)

Frame size	P_2 [kW]	$I_{1/1}$ [A]	Cos $\varphi_{1/1}$	η [%]	I_{start} [A]	Speed [min^{-1}]
71A	0.46	2.0 - 2.2 / 1.0 - 1.2	0.83 - 0.75	73.4 - 73.6	9.8 - 11.7 / 4.9 - 6.4	2.770 - 2.820
71B	0.65	2.8 - 3.1 / 1.6 - 1.8	0.82 - 0.72	73.9 - 72.9	16.2 - 19.2 / 9.3 - 11.2	2.770 - 2.820
80C	1.10	4.4 - 4.5 / 2.55 - 2.6	0.82 - 0.74	83.1 - 83.4	31.7 - 35.1 / 18.4 - 20.3	2.830 - 2.860
90SB	1.50	5.45 - 5.45 / 3.15 - 3.15	0.87 - 0.82	84.2 - 84.9	46.3 - 50.7 / 26.8 - 29.3	2.890 - 2.910
90LC	2.20	7.70 - 7.70 / 4.45 - 4.45	0.89 - 0.87	85.9 - 85.9	65.5 - 73.2 / 37.8 - 42.3	2.890 - 2.910
100LC	3.00	11.0 - 11.0 / 6.30 - 6.30	0.87 - 0.82	87.2 - 87.1	92.4 - 101.2 / 52.9 - 58.0	2.900 - 2.920
112MC	4.00	13.8 - 13.2 / 8.00 - 7.65	0.89 - 0.86	89.2 - 89.2	154.6 - 162.4 / 89.6 - 94.1	2.920 - 2.940
132SC	5.50	19.0 - 19.0 / 11.0 - 11.0	0.87 - 0.82	89.9 - 90.2	212.8 - 243.2 / 123.2 - 140.8	2.920 - 2.940
132SD	6.40	22.8 - 22.6 / 13.2 - 13.0	0.86 - 0.80	89.9 - 90.0	273.6 - NA / 158.4 - NA	2.920 - 2.930

Mains-operated motors, 60 Hz

1 x 220 V, 60 Hz (supply voltage A)

Frame size	P_2		Service factor	$I_{1/1}$ [A]	Service factor current	Cos $\varphi_{1/1}$	η [%]	I_{start} [A]	Speed [min^{-1}]
	[kW]	[hp]							
71B	0.60	0.80	1	4.1	4.1	0.98	71	16.8	3.300
80A	0.84	1.1	1	5.8	5.8	0.98	69.8	18.6	3.150
80B	1.14	1.5	1	7.35	7.35	0.99	73.5	19.8	3.270
90SB	1.54	2.0	1	9.8	9.8	0.98	74.8	37.2	3.330

1 x 115/230 V, 60 Hz (supply voltage B)

Frame size	P_2		Service factor	$I_{1/1}$ [A]	Service factor current	Cos $\varphi_{1/1}$	η [%]	I_{start} [A]	Speed [min^{-1}]
	[kW]	[hp]							
71BA	0.60	0.8	1	7.6 / 3.9	7.6 / 3.9	0.76	69-66	19.8 / 10.1	3.240
80AA	0.78	1.06	1	10.6 / 5.4	10.6 / 5.4	0.65	69-68	31.8 / 16.2	3.240
80BA	1.10	1.50	1	14.0 / 7.0	14.0 / 7.0	0.94	71-69	44.8 / 22.4	3.320
90CC	1.50	2.03	1	19.5 / 9.8	19.5 / 9.8	0.97	72.9 - 69	78.0 / 39.2	3.360

3 x 208-230/440-480 V, 60 Hz (supply voltage E)

Frame size	P_2 [kW]	P_2 [hp]	Service factor	$I_{1/1}$ [A]	Service factor current	Cos $\varphi_{1/1}$	η [%]	I_{start} [A]	Speed [min^{-1}]
71AA	0.43	0.58	1	1.9 - 1.7 / 1.0 - 0.8	1.9 - 1.7 / 1.0 - 0.8	0.85 - 0.81 / 0.85 - 0.81	76.0 - 78.6	11.2 - 11.1 / 5.9 - 5.2	3.360 - 3.420
71BA	0.74	1.0	1	3.4 - 3.6 / 1.7 - 1.8	3.4 - 3.6 / 1.7 - 1.8	0.89 - 0.83 / 0.89 - 0.83	76.0 - 78.4	20.1 - 23.4 / 10.0 - 11.7	3.220 - 3.370
80CB	1.1	1.47	1	5.2 - 5.1 / 2.55 - 2.65	5.2 - 5.1 / 2.55 - 2.65	0.81 - 0.73 / 0.81 - 0.73	84.8 - 84.7	35.4 - 39.3 / 17.3 - 20.4	3.430 - 3.470
90FA	2.2	2.95	1	8.20 - 7.7 / 4.0 - 3.7	8.20 - 7.7 / 4.0 - 3.7	0.9 - 0.86 / 0.9 - 0.86	86.5 - 87.0	74.6 - 80.9 / 36.4 - 38.9	3.510 - 3.530
100DA	2.9	3.9	1	10.8 - 10.5 / 5.25 - 5.3	10.8 - 10.5 / 5.25 - 5.3	0.85 - 0.78 / 0.85 - 0.78	88.0 - 88.2	129.6 - 91.4 / 63.0 - 46.1	3.520 - 3.530
112CA	4.0	5.36	1	14.6 - 13.6 / 6.95 - 6.65	14.6 - 13.6 / 6.95 - 6.65	0.9 - 0.86 / 0.9 - 0.86	88.6 - 88.5	131.4 - 156.4 / 62.6 - 76.5	3.530 - 3.540
132DA	5.5	7.37	1	20.4 - 19.8 / 9.95 - 9.85	20.4 - 19.8 / 9.95 - 9.85	0.84 - 0.78 / 0.84 - 0.78	90.1 - 90.0	259.1 - 277.2 / 126.4 - 137.9	3.540 - 3.550
132EB	6.4	8.57	1	23.6 - 22.8 / 11.6 - 11.6	23.6 - 22.8 / 11.6 - 11.6	0.84 - 0.78 / 0.84 - 0.78	90.1 - 89.9	144.0 - 143.6 / 70.8 - 73.1	3.530 - 3.550

3 x 575 V, 60 Hz (supply voltage H)*

Frame size	P_2 [kW]	P_2 [hp]	Service factor	$I_{1/1}$ [A]	Service factor current	Cos $\varphi_{1/1}$	η [%]	I_{start} [A]	Speed [min^{-1}]
71AA	0.43	0.58	1	0.7	0.7	0.84	76.0	4.6	3.340
71BA	0.74	1.0	1	1.3	1.3	0.84	76	8.5	3.340
80BA	1.04	1.4	1	1.55	1.55	0.8	85.2	11.8	3.450
80CB	1.28	1.7	1	1.84	1.84	0.82	85.7	15.3	3.440
90CC	1.7	2.3	1	2.89	2.89	0.83	85.9	27.7	3.440
90FA	2.5	3.4	1	3.5	3.5	0.9	85.9	20.7	3.490
100BB	4.0	5.4	1	5.7	5.7	0.88	88.5	49.6	3.500
132CA	6	8	1	8.2	8.2	0.86	89.2	106.6	3.520

* Only available with IE2 efficiency motors.

Mains-operated motors, 50/60 Hz

3 x 220-240/380-415 V, 50 Hz; 3 x 220-255/380-440 V, 60 Hz (supply voltage O)

Frame size	P_2 [kW]	Frequency [Hz]	$I_{1/1}$ [A]	Cos $\varphi_{1/1}$	η [%]	I_{start} [A]	Speed [min^{-1}]
71B	0.43	50	2.3 - 2.6 / 1.3 - 1.5	0.72 - 0.60	78-76	11.5 - 15.6 / 6.5 - 9.0	2.870 - 2.890
	0.74	60	3.1 - 2.75 / 1.78 - 1.58	0.87 - 0.84	75-77	15.5 - 16.5 / 8.9 - 9.5	3.280 - 3.350
80C	0.64	50	3.75 - 4.75 / 2.16 - 2.75	0.56 - 0.43	83.1 - 78.6	36.0 - 42.8 / 20.7 - 24.8	2.920 - 2.930
	1.1	60	4.30 - 4.25 / 2.48 - 2.44	0.83 - 0.72	84.6 - 85.4	28.4 - 33.2 / 16.4 - 19.0	3.420 - 3.470
90LC	1.27	50	5.9 - 6.95 / 3.40 - 4.0	0.70 - 0.55	85.4 - 83.4	85.6 - 95.9 / 49.3 - 55.2	2.960 - 2.970
	2.2	60	7.95 - 7.55 / 4.60 - 4.35	0.88 - 0.84	86.8 - 87.0	71.6 - 90.6 / 41.4 - 52.2	3.520 - 3.530
100LC	1.68	50	7.0 - 7.90 / 4.05 - 4.55	0.73 - 0.62	88.1 - 86.2	98.0 - 110.6 / 56.7 - 63.7	2.950 - 2.960
	2.90	60	10.2 - 9.10 / 5.85 - 5.25	0.90 - 0.85	86.9 - 88.5	88.7 - 88.3 / 50.9 - 50.9	3.490 - 3.520
112MC	2.3	50	9.95 - 10.6 / 5.75 - 6.1	0.73 - 0.63	88.4 - 86.7	159.2 - 173.8 / 92.0 - 100.0	2.970 - 2.970
	4	60	14.0 - 12.8 / 8.05 - 7.35	0.89 - 0.84	89.1 - 89.7	147.0 - 169.0 / 84.5 - 97.0	3.520 - 3.540
132SC	3.18	50	12.4 - 13.0 / 7.20 - 7.45	0.78 - 0.69	90.0 - 89.2	213.3 - 236.6 / 123.8 - 135.6	2.960 - 2.960
	5.5	60	19.0 - 16.8 / 11.0 - 9.75	0.91 - 0.86	89.5 - 90.4	201.4 - 231.0 / 116.6 - 134.1	3.510 - 3.530
132SD	3.7	50	16.4 - 18.4 / 9.45 - 10.6	0.69 - 0.57	89.6 - 87.8	272.2 - 311.0 / 156.9 - 179.1	2.960 - 2.970
	6.4	60	22.2 - 20.4 / 12.8 - 11.8	0.89 - 0.82	90.0 - 90.2	217.6 - 265.2 / 125.4 - 153.4	3.510 - 3.540

3 x 380-415 V, 50 Hz; 3 x 440-480 V, 60 Hz (supply voltage J)

Frame size	P_2 [kW]	Frequency [Hz]	$I_{1/1}$ [A]	Cos $\varphi_{1/1}$	η [%]	I_{start} [A]	Speed [min^{-1}]
71AA	0.25	50	0.55 - 0.65	0.77 - 0.71	77-76	4.0 - 5.1	2.870 - 2.890
	0.43	60	0.95 - 0.80	0.85 - 0.82	76.0 - 78.6	5.6 - 5.2	3.360 - 3.420
71BA	0.43	50	1.4 - 1.5	0.76 - 0.66	77-76	7.7 - 9.0	2.860 - 2.890
	0.74	60	1.7 - 1.8	0.89 - 0.83	76.0 - 78.4	10.0 - 11.7	3.220 - 3.380
80CB	0.64	50	1.82 - 1.98	0.67 - 0.56	84.2 - 83.1	16.9 - 19.2	2.910 - 2.920
	1.10	60	2.22 - 2.22	0.8 - 0.72	84.9 - 85.4	16.7 - 19.3	3.440 - 3.470
90FA	1.27	50	2.85 - 2.9	0.81 - 0.74	86.7 - 86	34.2 - 37.7	2.950 - 2.960
	2.2	60	4.0 - 3.7	0.88 - 0.84	86.8 - 87.0	36.0 - 40.7	3.520 - 3.530
100DA	1.68	50	4.05 - 4.60	0.73 - 0.62	88.1 - 86.2	48.6 - 62.1	2.950 - 2.960
	2.9	60	5.25 - 5.3	0.85 - 0.79	88.5 - 88.2	63.0 - 46.1	3.520 - 3.540
112CA	2.3	50	5.2 - 5.1	0.8 - 0.74	86.4 - 88.8	80.6 - 78.3	2.960 - 2.970
	4.0	60	6.95 - 6.65	0.88 - 0.84	88.7 - 88.5	84.1 - 89.1	3.540 - 3.550
132DA	3.18	50	7.2 - 7.45	0.78 - 0.69	90.0 - 89.2	123.8 - 135.6	2.960 - 2.960
	5.5	60	9.7 - 9.45	0.86 - 0.82	90.4 - 90.4	133.4 - 145.5	3.530 - 3.550
132EB	3.7	50	9.45 - 10.6	0.69 - 0.57	89.6 - 87.8	156.9 - 179.1	2.960 - 2.970
	6.4	60	11.8 - 12.0	0.82 - 0.74	90.6 - 90.2	153.4 - 174.0	3.540 - 3.550

3 x 200/346 V, 50 Hz; 3 x 200-220/346-380 V, 60 Hz (supply voltage G)

Frame size	P_2 [kW]	Frequency [Hz]	$I_{1/1}$ [A]	Cos $\varphi_{1/1}$	η [%]	I_{start} [A]	Speed [min^{-1}]
71AA	0.25	50	1.6 / 1.0	0.65	77	11.7 / 7.3	2.900
	0.43	60	2.0 - 1.8 / 1.15 - 1.05	0.85 - 0.8	76.0 - 78.6	11.8 - 11.7 / 6.8 - 6.8	3.370 - 3.424
71B	0.43	50	3.6 / 2.0	0.53	77	19.8 / 11.0	2.904
	0.74	60	3.3 - 3.5 / 2.0 - 2.2	0.83 - 0.76	76 - 78.4	19.5 - 22.8 / 11.8 - 14.3	3.380 - 3.429
80C	0.74	50	5.95 / 3.45	0.46	78.1	37.5 / 21.7	2.920
	1.28	60	5.5 - 5.65 / 3.15 - 3.25	0.80 - 0.71	84.4 - 84.3	34.4 - 37.9 / 19.7 - 21.8	3.410 - 3.450
90LC	1.27	50	6.75 / 3.9	0.69	86.0	99.9 / 57.7	2.960
	2.2	60	8.85 - 8.35 / 5.1 - 4.8	0.88 - 0.85	86.8 - 87.0	92.9 - 100.2 / 53.6 - 57.6	3.510 - 3.520
100LC	1.68	50	7.45 / 4.30	0.73	88.1	59.6 / 34.4	2.950
	2.90	60	10.8 - 10.4 / 6.25 - 6.0	0.91 - 0.87	86.9 - 88.1	81.0 - 96.7 / 46.9 - 55.8	3.490 - 3.510
112MC	2.3	50	10.2 / 5.9	0.77	87.3	157.1 / 90.9	2.960
	4	60	14.6 - 13.6 / 8.45 - 7.85	0.90 - 0.87	88.6 - 89.1	135.8 - 148.9 / 78.6 - 86.0	3.520 - 3.540
132SC	3.18	50	13.6 / 7.85	0.78	90.0	152.3 / 87.9	2.960
	5.5	60	21.0 - 20.0 / 12.1 - 11.6	0.91 - 0.88	89.5 - 90.1	214.2 - 296.0 / 123.4 - 171.7	3.510 - 3.520
132SD	3.7	50	20.0 / 11.6	0.63	88.8	240.0 / 139.2	2.970
	6.4	60	24.6 - 23.6 / 14.2 - 13.8	0.87 - 0.82	90.1 - 90.6	270.6 - 290.3 / 156.2 - 169.7	3.520 - 3.520

3 x 400 V, 50/60 Hz (supply voltage I)*

Frame size	P_2 [kW]	Frequency [Hz]	$I_{1/1}$ [A]	Cos $\varphi_{1/1}$	η [%]	I_{start} [A]	Speed [min^{-1}]
71AA	0.25	50	0.73	0.68	72.6	4.7	2.890
	0.43	60	1.0	0.86	73.5	6.5	3.320
71BA	0.43	50	1.68	0.53	71.1	10.9	2.890
	0.74	60	1.70	0.84	76.0	11.1	3.320
80BA	0.6	50	1.9	0.59	81.6	13.5	2.910
	1.04	60	2.18	0.83	83	13.5	3.400
80CB	0.74	50	2.28	0.57	82.4	13.9	2.920
	1.28	60	2.65	0.84	83.9	13.8	3.400
90CC	1	50	3	0.59	81.3	26.7	2.960
	1.7	60	3.2	0.87	81.3	23.7	3.510
90FA	1.45	50	3.0	0.83	86.8	36.0	2.920
	2.5	60	4.65	0.91	85.4	41.9	3.500
100BB	2.32	50	5.5	0.7	87	63.3	2.960
	4	60	7.35	0.89	87.6	63.2	3.500
132CA	3.5	50	8.8	0.65	88.2	145.2	2.960
	6	60	11.2	0.87	90	172.9	3.520

* Only available with IE2 efficiency motors.

Speed-controlled motors

3 x 380-500 V, 50/60 Hz (supply voltage S)

Frame size	P_2 [kW]	$I_{1/1}$ [A]	Cos $\varphi_{1/1}$
71	0.55	1.30 - 1.10	0.83 - 0.72
80	1.10	2.15 - 1.80	0.91 - 0.82
90	1.50	2.90 - 2.40	0.92 - 0.84
90	2.20	4.15 - 3.40	0.93 - 0.87
100	3.00	5.80 - 4.80	0.91 - 0.86
112	4.00	7.60 - 6.20	0.92 - 0.87
112	5.50	10.30 - 8.20	0.92 - 0.88
132	7.50	14.10 - 11.20	0.93 - 0.89

3 x 440-480 V, 50/60 Hz (supply voltage T)

Frame size	P_2		Service factor	$I_{1/1}$ [A]	Service factor current [A]	Cos $\varphi_{1/1}$
	[kW]	[hp]				
71	0.55	0.75	1.25	1.20	1.50	0.76
80	1.10	1.50	1.15	1.90	2.10	0.85
90	1.50	2.00	1.15	2.60	2.90	0.87
90	2.20	3.00	1.15	3.70	4.25	0.89
112	3.70	5.00	1.15	6.20 - 5.80	7.00 - 6.60	0.90 - 0.88
112	5.50	7.50	1.15	9.10 - 8.50	10.4 - 9.70	0.91 - 0.89
132	7.50	10.00	1.15	12.4 - 11.5	14.2 - 13.0	0.91 - 0.90

1 x 200-240 V, 50/60 Hz (supply voltage U)

Frame size	P_2		Service factor	$I_{1/1}$ [A]	Service factor current [A]	Cos $\varphi_{1/1}$
	[kW]	[hp]				
71A	0.55	0.75	1	3.40 - 2.90	3.40 - 2.90	0.98
80B	1.1	1.5	1	6.55 - 5.45	6.55 - 5.45	0.99
90C	1.5	2	1	8.90 - 7.45	8.90 - 7.45	0.99

3 x 208-230 V, 50/60 Hz (supply voltage Q)

Frame size	P_2 [kW]	$I_{1/1}$ [A]	Cos $\varphi_{1/1}$
90CC	1.50	5.60 - 5.10	0.95 - 0.95
90SB	1.50	5.60 - 5.10	0.95 - 0.95
90LC	2.20	8.3 - 7.6	0.95 - 0.90
90FA	2.20	8.3 - 7.6	0.95 - 0.90
112MC	4.0	13.4 - 12.8	0.94 - 0.9
132SC	5.5	19.7 - 18.1	0.94 - 0.92

3 x 200-230 V, 50/60 Hz (supply voltage R)

Frame size	P_2 [kW]	$I_{1/1}$ [A]	Cos $\varphi_{1/1}$
90SB	1.50	5.60 - 5.10	0.95 - 0.95
90LC	2.20	8.3 - 7.6	0.95 - 0.90
112MC	4.0	13.4 - 12.8	0.94 - 0.9
132SC	5.5	19.7 - 18.1	0.94 - 0.92

Additional data for speed-controlled motors

Single-phase supply voltage

1 x 200-240 V, 50/60 Hz (supply voltage U)

Recommended fuse size

Motor size [kW]	Min. [A]	Max. [A]
0.12 - 0.75	6	10
1.1 - 1.5	10	16

You can use standard as well as quick-blow or slow-blow fuses.

Leakage current

Earth leakage current less than 3.5 mA, AC.

Earth leakage current less than 10 mA, DC.

The leakage currents are measured in accordance with EN 61800-5-1:2007.

Three-phase supply voltage

3 x 380-500 V, 50/60 Hz (supply voltage S)

3 x 440-480 V, 50/60 Hz (supply voltage T)

Recommended fuse size

Motor size [kW]	Min. [A]	Max. [A]
0.12 - 1.1	6	6
1.5	6	10
2.2	6	16
3	10	16
4	13	16
5.5	16	32
7.5	20	32
11	32	32

You can use standard as well as quick-blow or slow-blow fuses.

Leakage current, AC

Speed [min^{-1}]	Power [kW]	Mains voltage [V]	Leakage current [mA]
2900-4000	0.25 - 2.2	≤ 400	< 3.5
		> 400	< 5
	3 - 5.5	≤ 400	< 3.5
		> 400	< 3.5
	7.5 - 11	≤ 400	< 3.5
		> 400	< 5
4000-5900	0.25 - 2.2	≤ 400	< 3.5
		> 400	< 5
	3 - 5.5	≤ 400	< 3.5
		> 400	< 3.5
	7.5 - 11	≤ 400	< 3.5
		> 400	< 5

The leakage currents are measured in accordance with EN 61800-5-1:2007.

Inputs and outputs

Earth reference, GND

All voltages refer to GND.

All currents return to GND.

Absolute maximum voltage and current limits

Exceeding the following electrical limits may result in severely reduced operating reliability and motor life:

Relay 1:

Maximum contact load: 250 VAC, 2 A or 30 VDC, 2 A.

Relay 2:

Maximum contact load: 30 VDC, 2 A.

GENI terminals: -5.5 to 9.0 VDC or less than 25 mADC.

Other input or output terminals: -0.5 to 26 VDC or less than 15 mADC.

Digital inputs, DI

Internal pull-up current greater than 10 mA at V_i equal to 0 VDC.

Internal pull-up to 5 VDC (currentless for V_i greater than 5 VDC).

Low logic level: V_i less than 1.5 VDC.

High logic level: V_i greater than 3.0 VDC.

Hysteresis: No.

Screened cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Maximum cable length: 500 m.

Open-collector digital outputs, OC

Current sinking capability: 75 mADC, no current sourcing.

Load types: Resistive or/and inductive.

Low-state output voltage at 75 mADC: Maximum 1.2 VDC.

Low-state output voltage at 10 mADC: Maximum 0.6 VDC.

Overcurrent protection: Yes.

Screened cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Maximum cable length: 500 m.

Analog inputs, AI

Voltage signal ranges:

- 0.5 - 3.5 VDC, AL AU.
- 0-5 VDC, AU.
- 0-10 VDC, AU.

Voltage signal: R_i greater than 100 kΩ at 25 °C.

Leak currents may occur at high operating temperatures. Keep the source impedance low.

Current signal ranges:

- 0-20 mADC, AU.
- 4-20 mADC, AL AU.

Current signal: R_i equal to 292 Ω.

Current overload protection: Yes. Change to voltage signal.

Measurement tolerance: - 0/+ 3 % of full scale (maximum-point coverage).

Screened cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Maximum cable length: 500 m (excl. potentiometer).

Potentiometer connected to +5 V, GND, any AI:

Use maximum 10 kΩ.

Maximum cable length: 100 m.

Analog output, AO

Current sourcing capability only.

Voltage signal:

- Range: 0-10 VDC.
- Minimum load between AO and GND: 1 kΩ.
- Short-circuit protection: Yes.

Current signal:

- Ranges: 0-20 and 4-20 mADC.
- Maximum load between AO and GND: 500 Ω.
- Open-circuit protection: Yes.

Tolerance: - 0/+ 4 % of full scale (maximum-point coverage).

Screened cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Maximum cable length: 500 m.

Pt100/1000 inputs, PT

Temperature range:

- Minimum -30 °C. 88 Ω / 882 Ω.
- Maximum 180 °C. 168 Ω / 1685 Ω.

Measurement tolerance: ± 1.5 °C.

Measurement resolution: < 0.3 °C.

Automatic range detection, Pt100 or Pt1000: Yes.

Sensor fault alarm: Yes.

Screened cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Use Pt100 for short wires.

Use Pt1000 for long wires.

LiqTec sensor inputs*

Use Grundfos LiqTec sensor only.

Screened cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Grundfos Digital Sensor input and output, GDS*

Use Grundfos Digital Sensor only.

* Only applicable for TPE, TPED Series 2000 and TPE3, TPE3 D pumps.

Power supplies

+5 V:

- Output voltage: 5 VDC - 5 %/+ 5 %.
- Maximum current: 50 mADC, sourcing only.
- Overload protection: Yes.

+24 V:

- Output voltage: 24 VDC - 5 %/+ 5 %.
- Maximum current: 60 mADC, sourcing only.
- Overload protection: Yes.

Digital outputs, relays

Potential-free changeover contacts.

Minimum contact load when in use: 5 VDC, 10 mA.

Screened cable: 0.5 - 2.5 mm^2, 28-12 AWG.

Maximum cable length: 500 m.

Bus input

Grundfos GENIbus protocol, RS-485.

Screened 3-core cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Maximum cable length: 500 m.

EMC (electromagnetic compatibility)

Standard used: EN 61800-3.

The table below indicates the emission category of the motor.

C1: Fulfils the requirements for residential areas.

C3: Fulfils the requirements for industrial areas.

Motor [kW]	Emission category	
	1450-2000 min^{-1}	2900-4000 min^{-1} 4000-5900 min^{-1}
0.25	C1	C1
0.37	C1	C1
0.55	C1	C1
0.75	C1	C1
1.1	C1	C1
1.5	C1	C1
2.2	C1	C1
3	C1	C1
4	C1	C1
5.5	C3/C1*	C1
7.5	C3/C1*	C3/C1*
11	-	C3/C1*

* C1, if equipped with an external Grundfos EMC filter.

Immunity: Fulfils the requirements for industrial areas.

Contact Grundfos for further information.

Enclosure class

Standard: IP55 (IEC 34-5).
Optional: IP66 (IEC 34-5).

Insulation class

F (IEC 85).

Standby power consumption

5-10 W.

Cable entries

Motor [kW]	Number and size of cable entries	
	2900-4000 min^{-1}	4000-5900 min^{-1}
0.25 - 1.5	4 x M20	4 x M20
2.2	4 x M20	4 x M20
3-4	1 x M25 + 4 x M20	1 x M25 + 4 x M20
5.5	1 x M25 + 4 x M20	1 x M25 + 4 x M20
7.5 - 11	1 x M32 + 5 x M20	1 x M32 + 5 x M20

Cable glands delivered with the pump

Motor [kW]	Quantity	Thread size	Cable diameter [mm]
0.25 - 2.2	2	M20 x 1.5	5
	1		7-14
3 - 5.5	4	M20 x 1.5	5
	1	M25 x 1.5	9-18
7.5 - 11	4	M20 x 1.5	5
	1	M32 x 1.5	14-25

Torques

Terminal	Thread size	Maximum torque [Nm]
L1, L2, L3, L, N	M4	1.8
NC, C1, C2, NO	M2.5	0.5
1-26 and A, Y, B	M2	0.5

Sound pressure level

Motor [kW]	Maximum speed stated on nameplate [min^{-1}]	Speed [min^{-1}]	Sound pressure level ISO 3743 [dB(A)]	
			1-phase motors	3-phase motors
0.25 - 0.75	2000	1500	38	38
		2000	42	42
	4000	3000	53	53
		4000	58	58
	5900	4000	58	58
		5900	68	68
1.1	2000	1500		38
		2000		42
	4000	3000	53	53
		4000	58	58
	5900	4000	58	58
		5900	68	68
1.5	2000	1500		39
		2000		46
	4000	3000	57	57
		4000	64	64
	5900	4000	58	58
		5900	68	68
2.2	2000	1500		47
		2000		
	4000	3000		57
		4000		64
	5900	4000		58
		5900		68
3	2000	1500		48
		2000		54
	4000	3000		59
		4000		67
	5900	4000		63
		5900		73
4	2000	1500		48
		2000		55
	4000	3000		60
		4000		67
	5900	4000		63
		5900		73
5.5	2000	1500		54
		2000		60
	4000	3000		60
		4000		68
	5900	4000		63
		5900		73
7.5	2000	1500		55
		2000		61
	4000	3000		64
		4000		72
	5900	4000		68
		5900		79
11	4000	3000		65
		4000		73
	5900	4000		69
		5900		79

The grey fields indicate that the motor is not available in this MGE motor range.

27. Customisation

Although the Grundfos CM and CME product range offers a number of pumps for different applications, customers require specific pump solutions to satisfy their needs. Below are the options available for customising the CM and CME pumps.

Contact Grundfos for further information or for requests other than the ones mentioned below.

Motors

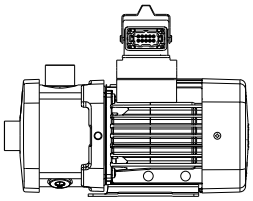
Motor with multiplug connection

Mains-operated motors fitted with a Harting® 10-pin multiplug connection, HAN 10 ES, enable easy connection to the mains.

Note: For CME pumps we offer the solutions shown on page 125.

The purpose of a multiplug connection is to facilitate the electrical installation and service of the pump. The multiplug functions as a plug-and-pump device.

Figure 36 shows the position of the multiplug on the mains-operated motor.



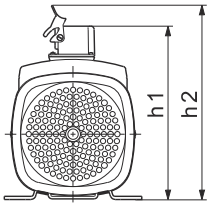
TM04 5846 4109

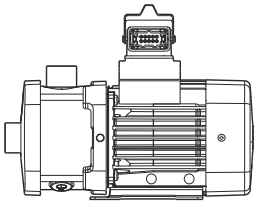
Fig. 36 Motor with multiplug connection

TM02 0470 0700

Fig. 37 Multiplug logo

Dimensions

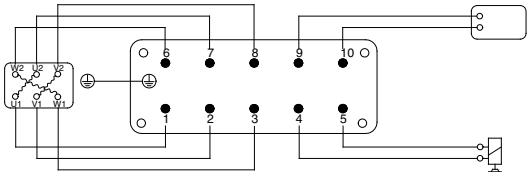




TM04 5847 4609

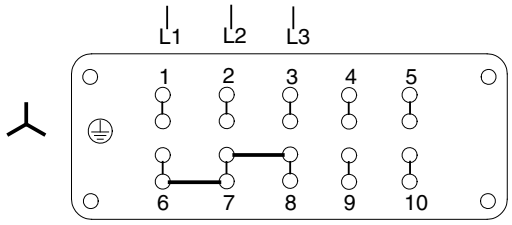
Pump type	Frame size	h1	h2
CM 1 CM 3 CM 5	71	206	237
	80	206	237
	90	263	294
	100	283	314
CM 10 CM 15 CM 25	71	231	262
	80	231	262
	90	273	304
	100	283	314
	112	309	340
	132	309	340

Plug connections



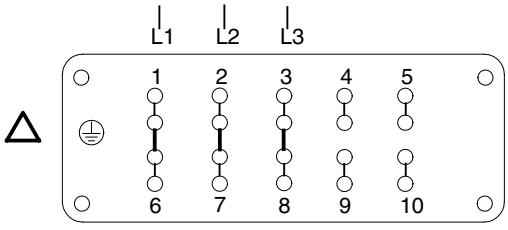
TM01 8702 0700

Fig. 38 Plug connection from motor



TM01 8703 0700

Fig. 39 Plug connection for star connection



TM01 8704 0700

Fig. 40 Plug connection for delta connection

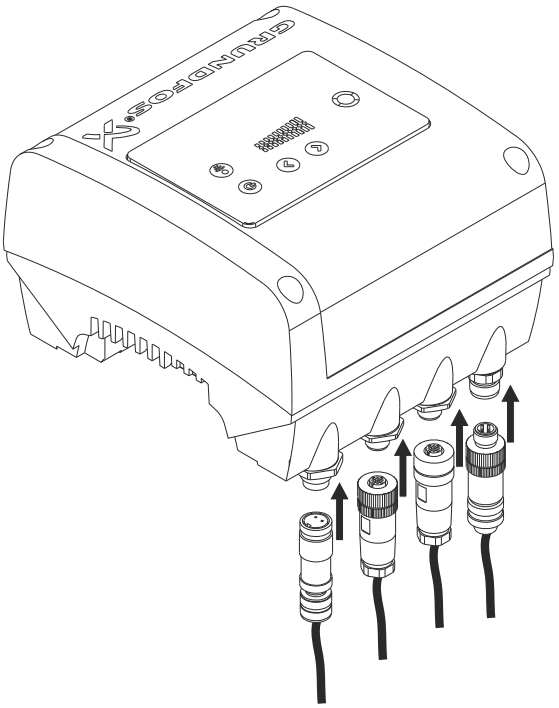
Note: Wire bridges for connections are located in the plug.

Plug-and-pump solution for CME pumps

To facilitate electrical installation and service, we offer plug-and-pump solutions for CME pumps. These customised solutions are only available on request. Please contact Grundfos.

CME pumps can be fitted with receptacles in the cable entries of the motor for fast cable connection. Simply plug and pump.

Figure 41 shows how the CME pumps are connected.



TM05 7677 1413

Fig. 41 Fast connection of CME pumps

Motor with anti-condensation heater

CM

TM03 2440 4305

Fig. 42 Mains-operated motor with anti-condensation heater

In applications where condensation in the motor may occur, we recommend that you install a motor with an anti-condensation heater on the stator coil ends. The heater keeps the motor temperature higher than the ambient temperature and prevents condensation.

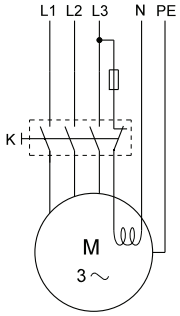
In areas with ambient temperatures below 0 °C, we recommend that you always use motors with anti-condensation heater.

High humidity may cause condensation in the motor. Slow condensation occurs as a result of a decreasing ambient temperature; rapid condensation occurs as a result of shock cooling caused by direct sunlight followed by rain.

Note: Rapid condensation is not to be confused with the phenomenon which occurs when the pressure inside the motor is lower than the atmospheric pressure. In such cases, moisture is sucked from the atmosphere into the motor through bearings, housings, etc.

In applications with constant humidity levels above 85 %, the drain holes in the drive-end flange must be open. This changes the enclosure class to IPX5. If IP55 protection is required due to operation in dusty environments, we recommend that you install a motor with anti-condensation heater.

Figure 43 shows a typical circuit of a three-phase motor with anti-condensation heater.



TM03 4058 1406

Fig. 43 Three-phase motor with anti-condensation heater

Legend

Symbol	Designation
K	Contactor
M	Motor

Note: Connect the anti-condensation heater to the power supply so that it is on when the motor is switched off.

The following motor sizes are available with anti-condensation heater:

Motors, 50/60 Hz	Power of heating unit [W]	
Frame size	1 x 24 V	1 x 190-250 V
71/80	38	23
90		31
100		38
112/132	2 x 38	2 x 38

CME

The MGE motors fitted to CME pumps incorporate a standstill heating function. No external heater on the stator coil is necessary.

The working principle is that AC voltage is applied to the motor windings. The applied AC voltage will not make the motor run, but will ensure that sufficient heat is generated to prevent condensation in the motor. The terminal box is kept warm and dry by the heat generated via the mains voltage connected. However, it is a condition that the terminal box is not exposed to open air. It must be provided with a suitable cover to protect it from rain and the drain plugs have to be removed to obtain ventilation in motor and terminal box. See *Operation in condensing environments*, on page 21.

Motors with PTC sensors

TM02 7038 2403

Fig. 44 PTC sensor incorporated in windings

Built-in PTC sensors (thermistors) protect the motor against overheating. Single-phase motors are protected against slow and rapid overheating. Three-phase motors are protected against slow overheating.

We offer built-in PTC sensors to protect the motor.

Three-phase mains-operated motors with supply voltages F, G and O of 3 kW and up have PTC sensors as standard (UL-approved motors have no internal protection).

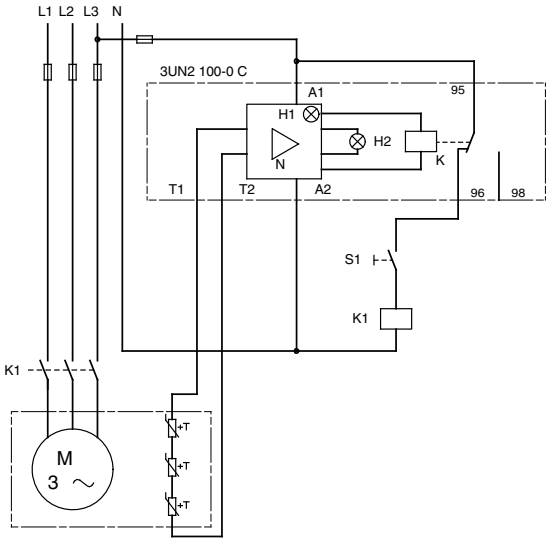
Note: PTC sensors must be connected to an external tripping unit connected to the control circuit.

Protection according to IEC 60034-11:

- slow and rapid overheating.

PTC sensors comply with DIN 44082. Maximum voltage at the terminals, U_{max} = 2.5 VDC. All tripping units available for DIN 44082 PTC sensors meet this requirement.

Figure 45 shows a typical circuit of a three-phase motor with PTC sensors.



TM00 3965 1494

Fig. 45 Three-phase motor with PTC sensors

Legend

Symbol	Designation
S1	On/off switch
K1	Contactor
+T	PTC sensor (thermistor) in motor
M	Motor
3UN2 100-0 C	Tripping unit with automatic resetting
N	Amplifier
K	Output relay
H1	LED "Ready"
H2	LED "Tripped"
A1, A2	Connection for control voltage
T1, T2	Connection for PTC sensor loop

Motors with thermal switches (PTO)

TM02 7042 2403

Fig. 46 Thermal switch incorporated in windings

Built-in thermal switches protect the motor against overheating. Single-phase motors are protected against slow and rapid overheating. Three-phase motors are protected against slow overheating.

We offer mains-operated motors with bimetallic thermal switches in the motor windings.

Three-phase mains-operated motors with supply voltages F, G and O are available with built-in thermal switches.

Note: Thermal switches must be connected to an external control circuit to protect the motor against slow overheating. The thermal switches require no tripping unit.

Protection according to IEC 60034-11:

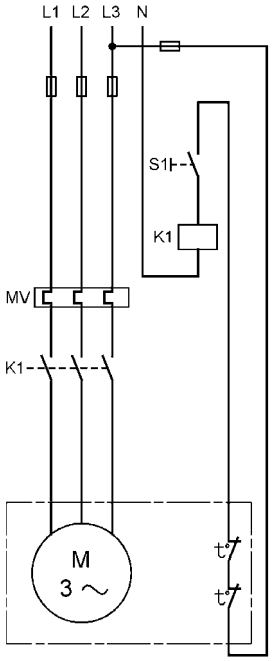
- slow and rapid overheating.

As protection against seizure, the motor must be connected to a motor-protective circuit breaker.

Thermal switches tolerate the following maximum loads:

U_{max}	250 VAC
I_N	1.5 A
I_{max}	5.0 A (locked-rotor and breaking current)

Figure 47 shows a typical circuit of a three-phase motor with built-in bimetallic thermal switches.



TM00 3964 1494

Fig. 47 Three-phase motor with thermal switches

Legend

Symbol	Designation
S1	On/off switch
K1	Contactor
t°	Thermal switch in motor
M	Motor
MV	Motor-protective circuit breaker

Undersize and oversize motors

The available motor sizes are shown in section *Motor data* on pages 116 to 120.

Undersize and oversize motors are defined as the next kW size below or above the fitted standard motor.

Note: The CM 1, 3 and 5 cannot be combined with frame sizes 112 and 132.

We recommend that you use an oversize motor if the operating conditions fall outside the standard conditions.

We especially recommend oversize motors in these cases:

- The pump is installed at an altitude of more than 1000 metres above sea level.
- The viscosity or density of the pumped liquid is higher than that of water.
- The ambient temperature exceeds 55 °C (CM).

We recommend that you use an undersize motor if the operating conditions do not at all reach the standard conditions.

We especially recommend undersize motors in these cases:

- The viscosity or density of the pumped liquid is lower than that of water.
- The duty point of the pump is constant, and the flow rate is significantly lower than the recommended maximum flow rate.

Terminal box positions

As standard the terminal box is mounted in 12 o'clock position as shown in fig. 48. CM pumps with motor frame sizes of 71 and 80 are available with other terminal box positions on special request.

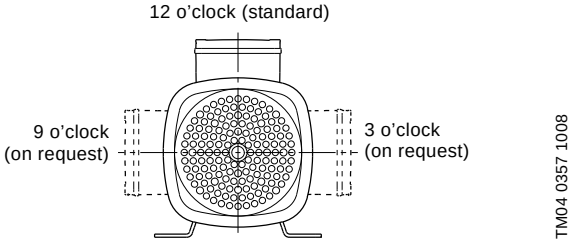


Fig. 48 Terminal box positions of frame sizes 71 and 80, as seen from fan cover side

Functional modules for CME pumps

CME pumps offer a number of advantages, depending on hardware combinations and software configuration of the motor. For example, various functional modules are available.

As standard, the CME pumps are fitted with the standard functional module. The basic or advanced module is available as a customised solution.

Basic functional module (FM 100)

The basic module has only the most necessary inputs for closed- and open-loop operation. The module also enables communication via a GENIbus connection.

The basic module has these connections:

- analog voltage input
- two digital inputs or one digital input and one open-collector output
- GENIbus connection.

Standard functional module (FM 200)

The standard module has more inputs and outputs than the basic module and is suitable for even more demanding applications.

The standard module has these connections:

- two analog inputs
- two digital inputs or one digital input and one open-collector output
- Grundfos Digital Sensor input and output
- two signal relay outputs
- GENIbus connection.

Advanced functional module (FM 300)

The advanced module has a number of inputs and outputs enabling the motor to be used in advanced applications where many inputs and outputs are required.

The advanced module has these connections:

- three analog inputs
- one analog output
- two dedicated digital inputs
- two configurable digital inputs or open-collector outputs
- Grundfos Digital Sensor input and output
- two Pt100/1000 inputs
- LiqTec sensor inputs
- two signal relay outputs
- GENIbus connection.

Pumps

Pumping of liquids down to -30 °C

We offer custom-built pumps for the pumping of liquids down to -30 °C. The pumps have an oversize neck ring ensuring that impellers do not seize up as a result of thermal expansion.

We offer the above solution for CM and CME in I and G versions (stainless steel).

Surface treatment

Cleaned and dried pumps

We recommend cleaned and dried pumps for use in applications involving strict demands on cleanliness and surface quality, such as low content of silicone. Prior to assembly, all pump parts are cleaned in 60 to 70 °C water with a cleaning agent. All pump parts are then thoroughly rinsed in de-ionised water and dried. The pump is assembled without any use of silicone lubricants.

Cleaned and dried pumps are not performance-tested.

Electropolished stainless-steel pumps

Electropolished pumps are often used in the pharmaceutical industry and in the food and beverage industry where materials and surface quality must meet strict requirements to hygiene or corrosion resistance.

Electropolishing removes burrs as well as metallic and non-metallic inclusions, providing a smooth, clean and corrosion-resistant stainless-steel surface.

First, all components are pickled in a mixture of nitric and hydrofluoric acid. Subsequently, the components are electropolished in a mixture of sulphuric and phosphoric acid. Finally, the components are passivated in nitric acid.

To meet the strict hygienic requirements to material and surface quality, we offer electropolished stainless-steel pumps with the following surface quality:

Surface quality: Ra ≤ 0.8 µm.

Alternative colouring

We offer custom-built pumps in any NCS- or RAL-specified colour to suit your requirements!

The used paint is water-based. Painted parts correspond to corrosion class III.

All pump types and sizes are available with alternative colouring.

Customised nameplate

We offer additional customised nameplates attached to the pump:

- A nameplate supplied by you.
- A Grundfos nameplate customised in terms of a specific duty point.
- A Grundfos nameplate with a tag number.

Note: The Grundfos standard nameplate is always fitted to the pump.

Shaft seal arrangements

The shaft seal is developed with customisation in mind. Depending on media, you may combine the seal faces in any way.

Available stationary seal faces: Q, B, U.

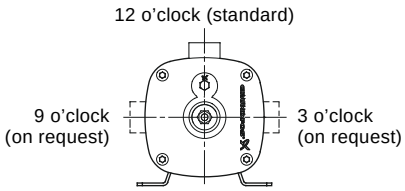
Available rotating seal faces: Q, V, U.

Rubber: E, V and K.

Note: For further details about seal face material codes, see *Identification* on page *Identification*.

Alternative connection positions

The pump is available with various connection positions on special request. See fig. 49.



TM03 8709 1008

Fig. 49 Alternative connection positions as seen from pump inlet side

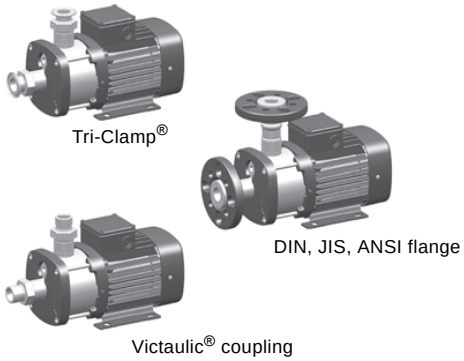
Note: On CM 1, 3 and 5 pumps fitted with motor frame sizes 71 and 80, the outlet can be positioned upon customer request without any issues. All other pump types cannot be factory tested if they are ordered with outlet positions that are not standard.

Alternative pipe connections

A wide range of pipe connections are available for the CM and CME pumps:

- Tri-Clamp®
- DIN, JIS, ANSI flange (combi flange)
- Victaulic® coupling
- Whitworth thread Rp
- internal NPT thread.

The available pipe connections are shown in fig. 50.



TM04 3937 0409

Fig. 50 Examples of pipe connections

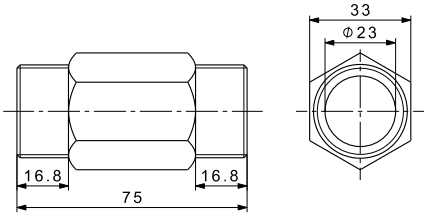
28. Accessories

Pipework connections

Various sets of flanges and couplings are available for pipework connection.

Distance piece

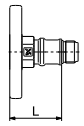
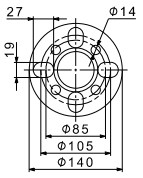
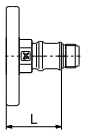
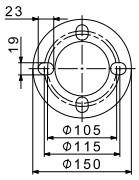
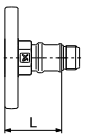
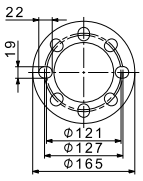
The distance piece is intended for mounting on the outlet port in order to improve the accessibility when connecting the pump to the piping system. The distance piece is made of brass.

Distance piece		Pump type	Pipework connection	Pump thread	Product number
 TM04 5800 4009		CM 1 CM 3 CM 5	1"	R	96587201

Flange sets for CM(E) (DIN/ANSI/JIS)

All materials in contact with the pumped liquids are made of stainless steel EN 1.4408/AISI 316.

The pipe stub is made of stainless steel EN 1.4408/AISI 316 and the flange part is made of cast iron EN-GJL-200.

Flange		Pump type	Pipework connection	Pump thread	L* [mm]		Product number
					Flange mounted on pump inlet	Flange mounted on pump outlet	
		CM 1 CM 3	DN 32	Rp	49.0	78.0	96904693
				NPT			96904705
		CM 5		Rp			96904696
				NPT			96904708
		CM 10	DN 40	Rp	44.0	68.0	96904699
				NPT			96904711
		CM 15 CM 25	DN 50	Rp	48.0	68.0	96904702
				NPT			96904714

TM04 3867 0309

TM04 3869 0309

TM04 3868 0309

* Length from outer edge of flange to pump inlet or outlet port.

Note: Please pay attention to the compatibility between pump and flange before ordering. See tables below.

CM pumps compatible with DIN/ANSI/JIS flanges

Pump type	Material version	MG 71/80 1-ph	MG 71/80 3-ph	MG 90 1-ph	MG 90 3-ph	MG 100	MG 112
CM 1, 3, 5	Cast iron		•	•	•		
	Stainless steel	•	•		•	•	
CM 10, 15, 25	Cast iron	•	•	•	•	•	•
	Stainless steel	•	•	•	•	•	•

CME pumps compatible with DIN/ANSI/JIS flanges

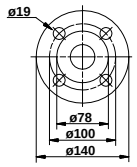
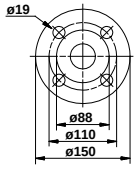
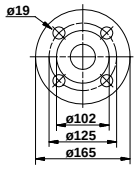
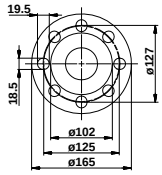
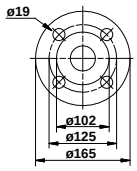
Pump type	Material version	Supply voltages Q, R			Supply voltages S, T, U	
		MGE 90S	MGE 90L	MGE 112/132	MGE 71/80	MGE 90
CME 1, 3, 5	Cast iron	• *)	•			
	Stainless steel		•			
CME 10, 15, 25	Cast iron		•	•	•	•
	Stainless steel		•	•	•	•

*) Only 9 mm clearance between flange and terminal box.

Counter-flanges for CM(E)-A

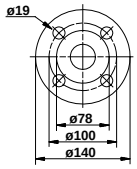
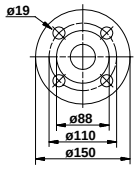
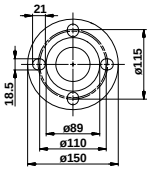
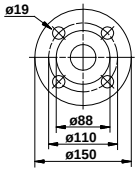
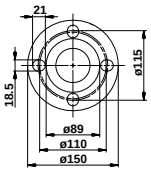
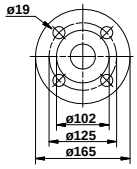
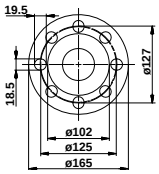
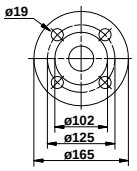
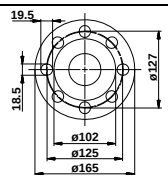
Counter-flanges for CM(E)-A pumps are made of cast iron EN-GJL-200.

A counter-flange set consists of one counter-flange, one gasket, bolts and nuts.

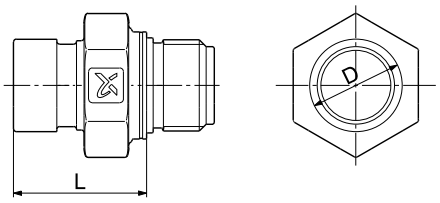
Counter-flange	Pump type	Description	Rated pressure	Pipework connection	Product number
 TM03 0400 3705	CM(E) 1-A CM(E) 3-A CM(E) 5-A	Threaded	16 bar, EN 1092-2	Rp 1 1/4	00419901
		For welding	25 bar, EN 1092-2	32 mm, nominal	00419902
 TM03 0401 3705	CM(E) 10-A	Threaded	16 bar, EN 1092-2	Rp 1 1/2	00429902
		Threaded	16 bar, EN 1092-2	Rp 2	00429904
		For welding	25 bar, EN 1092-2	40 mm, nominal	00429901
		For welding	40 bar, special flange	50 mm, nominal	00429903
 TM03 0402 3705	CM(E) 15-A CM(E) 25-A	Threaded	16 bar, EN 1092-2	Rp 2	00339903
		Threaded	16 bar, special flange	Rp 2 1/2	00339904
 TM02 7203 2803		Threaded	16 bar, special flange	Rp 2 1/2	96509578
 TM03 0402 3705		For welding	25 bar, EN 1092-2	50 mm, nominal	00339901
		For welding	40 bar, special flange	65 mm, nominal	00339902

Counter-flanges for CM(E)-I/G

Counter-flanges for CM(E)-I/G pumps are made of stainless steel EN 1.4401/AISI 316.
A counter-flange set consists of one counter-flange, one gasket, bolts and nuts.

Counter-flange	Pump type	Description	Rated pressure	Pipework connection	Product number
 TM03 0400 3705	CM(E) 1-I/G CM(E) 3-I/G CM(E) 5-I/G	Threaded	16 bar, EN 1092-2	Rp 1 1/4	00415304
		For welding	25 bar, EN 1092-2	32 mm, nominal	00415305
 TM03 0401 3705		Threaded	16 bar, EN 1092-2	Rp 1 1/2	00425245
 TM02 7202 2803	CM(E) 10-I/G	Threaded	16 bar, EN 1092-2	Rp 2	96509570
 TM03 0401 3705		For welding	25 bar, EN 1092-2	40 mm, nominal	00425246
 TM02 7202 2803		For welding	25 bar, special flange	50 mm, nominal	96509571
 TM00 0402 3705	CM(E) 15-I/G CM(E) 25-I/G	Threaded	16 bar, EN 1092-2	Rp 2	00335254
 TM02 7203 2803		Threaded	16 bar, special flange	Rp 2 1/2	96509575
		Threaded	16 bar, special flange	Rp 2 1/2	96509579
 TM03 0402 3705		For welding	25 bar, EN 1092-2	50 mm, nominal	00335255
 TM00 7203 2803		For welding	25 bar, special flange	65 mm, nominal	96509573

Victaulic® connections for CM(E)

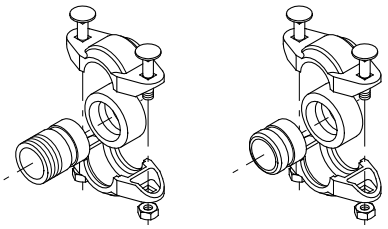
Victaulic® connection	Pump type	Pump thread	D [mm]	L* [mm]	Product number
 TM04 3865 0309	CM 1	Rp	33.7	48.5	96904694
	CM 3	NPT			96904706
	CM 5	Rp	33.7 / 42.4	48.5	96904697
		NPT			96904709
	CM 10	Rp	48.3	48.5	96904700
		NPT			96904712
	CM 15	Rp	60.3	50.1	96904703
	CM 25	NPT			96904715

* Length from outer edge of connection to pump inlet or outlet port.

Coupling, pipe stub and gasket for Victaulic® connections

Parts in contact with the pumped liquid are made of stainless steel EN 1.4401/AISI 316, and rubber.

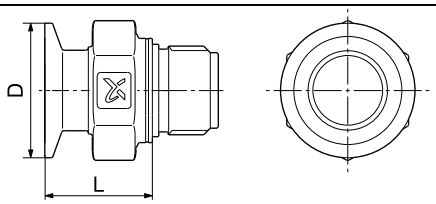
A Victaulic® coupling set consists of two coupling halves (Victaulic, type 77), one gasket, one pipe stub (for welding or threaded), bolts and nuts.

Coupling and pipe stub	Pump type	Pipe stub	Pipework connection	Rubber parts	Number of coupling sets required	Product number
 TM00 3808 1094	CM(E) 1 CM(E) 3 CM(E) 5*	Threaded	R 1	EPDM	2	97575245
				FKM	2	97575246
		For welding	DN 25	EPDM	2	97575247
				FKM	2	97575248
	CM(E) 5**	Threaded	R 1 1/4	EPDM	1	00419911
				FKM	1	00419905
		For welding	DN 32	EPDM	1	00419912
				FKM	1	00419904
	CM(E) 10	Threaded	R 1 1/2	EPDM	2	97575249
				FKM	2	97575250
		For welding	DN 40	EPDM	2	97575251
				FKM	2	97575252
	CM(E) 15 CM(E) 25	Threaded	R 2	EPDM	2	00339911
				FKM	2	00339918
		For welding	DN 50	EPDM	2	00339910
				FKM	2	00339917

* For outlet port. **Note:** Only one coupling set is required for the outlet port.

** For inlet port.

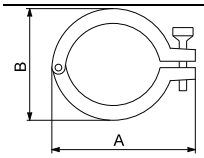
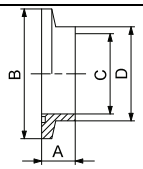
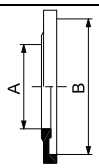
Tri-Clamp® connections for CM(E)

Tri-Clamp®	Pump type	Pump thread	D [mm]	L* [mm]	Product number
	CM 1	Rp	50.4	40.3	96904695
	CM 3	NPT			96904707
	CM 5	Rp	50.4	35.3	96904698
		NPT			96904710
	CM 10	Rp	50.4	37.4	96904701
		NPT			96904713
	CM 15	Rp	63.9	37.4	96904704
	CM 25	NPT			96904716

TM04 3866 0309

* Length from outer edge of Tri-Clamp® connection to pump inlet or outlet port.

Clamping ring, pipe stub and gasket for Tri-Clamp® connections

Clamping ring			Pipe stub				Gasket	
								
TM03 4645 2406			TM03 4646 2406				TM03 4647 2406	
Pump type	**Nominal diameter [mm]**	**A [mm]**	**B [mm]**	**A [mm]**	**B [mm]**	**C [mm]**	**D [mm]**	**A [mm]**	**B [mm]**
CM(E) 1, 3, 5, 10	38.0	92.0	59.5	21.5	50.5	35.6	38.6	35.3	50.5
CM(E) 15, 25	51.0	104.4	74.0	21.5	64.0	48.6	51.6	48.0	64.0

The clamping ring is made of stainless steel EN 1.4301/AISI 304.

The pipe stub is made of stainless steel EN 1.4401/AISI 316.

The gasket is made of PTFE or EPDM.

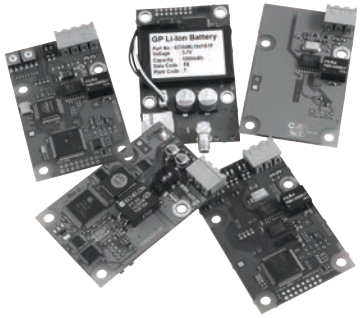
Pump type	Pipework connection	Connection material	Gasket	Pressure [bar]	Number of coupling sets required	Product number
CM(E) 1, 3, 5, 10	DN 32	Stainless steel	EPDM	16	2	96515374
			PTFE		2	96515375
CM(E) 15, 25	DN 50		EPDM		2	96515376
			PTFE		2	96515377

Potentiometer for CME

The potentiometer is for setpoint setting and start/stop of the CME pump.

Product	Product number
External potentiometer with cabinet for wall mounting	625468

Communication interface modules (CIM) for CME



TM05 7508 1113

Fig. 51 Grundfos CIM modules

A CIM module is an add-on communication interface module for MGE motors. The CIM module enables data transmission between the pump and an external system, for example a BMS (building management system) or SCADA system.

We offer the following CIM modules:

Description	Fieldbus protocol	Product number
CIM 050	GENIbus	96824631
CIM 100	LonWorks	96824797
CIM 150	PROFIBUS DP	96824793
CIM 200	Modbus RTU	96824796
CIM 250*	GSM/GPRS	96824795
CIM 270*	GRM	96898815
CIM 300	BACnet MS/TP	96893770
CIM 500	BACnet IP	98301408
CIM 500	Modbus TCP	
CIM 500	PROFINET	

* Antenna not included. See below.

Antennas for CIM 250 and 270

Description	Product number
Antenna for roof	97631956
Antenna for desk	97631957

Grundfos GO

Grundfos GO is used for wireless infrared or radio communication with the pumps.

Various Grundfos GO variants are available. The variants are described in the following.

MI 204

The MI 204 is an add-on moduleswith built-in infrared and radio communication. The MI 204 can be used in conjunction with an Apple iPhone or iPod with Lightning connector, e.g. fifth generation iPhone or iPod.

(The MI 204 is also available together with an Apple iPod touch and a cover.)

MI 204

TM05 7704 1513

Fig. 52 MI 204

Supplied with the product:

- Grundfos 204
- sleeve
- quick guide
- charger cable.

MI 301

The MI 301 is a module with built-in infrared and radio communication. The MI 301 must be used in conjunction with an Android or iOS-based smart devices with a Bluetooth connection. The MI 301 has rechargeable Li-ion battery and must be charged separately.

TM05 3890 1712

Fig. 53 MI 301

Supplied with the product:

- Grundfos MI 301
- battery charger
- quick guide.

Product numbers

Grundfos GO Remote variant	Product number
Grundfos MI 204	98424092
Grundfos MI 204 including iPod touch	98612711
Grundfos MI 301	98046408

Sensors for CME

The sensors must be fitted to the pipework with suitable fittings.

Accessory	Type	Supplier	Measuring range	Product number
Flowmeter	SITRANS FM MAGFLO MAG 5100 W	Siemens	1-5 m^3 (DN 25)	ID8285
Flowmeter	SITRANS FM MAGFLO MAG 5100 W	Siemens	3-10 m^3 (DN 40)	ID8286
Flowmeter	SITRANS FM MAGFLO MAG 5100 W	Siemens	6-30 m^3 (DN 65)	ID8287
Flowmeter	SITRANS FM MAGFLO MAG 5100 W	Siemens	20-75 m^3 (DN 100)	ID8288
Temperature sensor	TTA (0) 25	Carlo Gavazzi	0-25 °C	96432591
Temperature sensor	TTA (-25) 25	Carlo Gavazzi	-25-25 °C	96430194
Temperature sensor	TTA (50) 100	Carlo Gavazzi	50-100 °C	96432592
Temperature sensor	TTA (0) 150	Carlo Gavazzi	0-150 °C	96430195
Accessory for temperature sensor. All with 1/2 RG connection.	Protecting tube ∅9 x 50 mm	Carlo Gavazzi		96430201
	Protecting tube ∅9 x 100 mm	Carlo Gavazzi		96430202
	Cutting ring bush	Carlo Gavazzi		96430203
Temperature sensor, ambient temperature	WR 52	tmg (Plesner)	-50-50 °C	ID8295
Differential-temperature sensor	ETSD	Honsberg	0-20 °C	96409362
Differential-temperature sensor	ETSD	Honsberg	0-50 °C	96409363

Note: All sensors have 4-20 mA signal output.

Danfoss pressure sensor kits for CME pumps and CM pumps connected to Grundfos CUE

The kit comprises:	Pressure range [bar]	Temperature range	Product number
• Danfoss pressure transmitter, type MBS 3000, with 2 m screened cable Connection: G 1/2 A (DIN 16288 - B6kt) • 5 cable clips (black) • Installation and operating instructions PT (400212)	0-4	-40-85 °C	96428014
	0-6		96428015
	0-10		96428016
	0-16		96428017
	0-25		96428018

DPI differential-pressure sensor kit

The kit comprises:	Pressure range [bar]	Product number
• 1 sensor incl. 0.9 m screened cable (7/16" connections) • 1 original DPI bracket (for wall mounting) • 1 Grundfos bracket (for mounting on motor) • 2 M4 screws for mounting of sensor on bracket • 1 M6 screw (self-cutting) for mounting on MGE 90/100 • 1 M8 screw (self-cutting) for mounting on MGE 112/132 • 3 capillary tubes (short/long) • 2 fittings (1/4" - 7/16") • 5 cable clips (black) • Installation and operating instructions (480675) • Service kit instructions	0 - 0.6	96611522
	0 - 1.0	96611523
	0 - 1.6	96611524
	0 - 2.5	96611525
	0 - 4.0	96611526
	0 - 6.0	96611527
	0-10	96611550

MP 204 motor protector

TM03 1471 2205

Fig. 54 MP 204

The MP 204 is an electronic motor protector and data collecting unit. Apart from protecting the motor, it can also send information to a control unit via GENIbus, like for instance:

- trip
- warning
- energy consumption
- input power
- motor temperature.

The MP 204 protects the motor primarily by measuring the motor current by means of a true RMS measurement.

The pump is protected secondarily by measuring the temperature with a Tempcon sensor, a Pt100/Pt1000 sensor and a PTC sensor/thermal switch.

The MP 204 is designed for single- and three-phase motors.

Note: The MP 204 must not be used together with frequency converters.

Features

- Phase-sequence monitoring
- indication of current or temperature
- input for PTC sensor/thermal switch
- indication of temperature in °C or °F
- 4-digit, 7-segment display
- setting and status reading with the Grundfos GO Remote
- setting and status reading via the Grundfos GENIbus fieldbus.

Tripping conditions

- Overload
- underload (dry running)
- temperature
- missing phase
- phase sequence
- overvoltage
- undervoltage
- power factor (cos φ)
- current unbalance.

Warnings

- Overload
- underload
- temperature
- overvoltage
- undervoltage
- power factor (cos φ)
- run capacitor (single-phase operation)
- starting capacitor (single-phase operation)
- loss of communication in network
- harmonic distortion.

Learning function

- Phase sequence (three-phase operation)
- run capacitor (single-phase operation)
- starting capacitor (single-phase operation)
- identification and measurement of Pt100/Pt1000 sensor circuit.

Product number

Description	Product number
MP 204 motor protector	96079927

Cover for CM motor

The cover protects the motor from ingress of liquid, especially if the pump is installed in a vertically tilted position with the motor end pointing upwards.

Product number

Description	Product number
Cover for CM motors, frame sizes 71 and 80	97528743

Angled cable gland

TM05 0729 1411

Fig. 55 Angled cable gland with O-ring and lock nut

Description	Product number
Angled cable gland with O-ring and lock nut	97842998

29. Grundfos Product Center

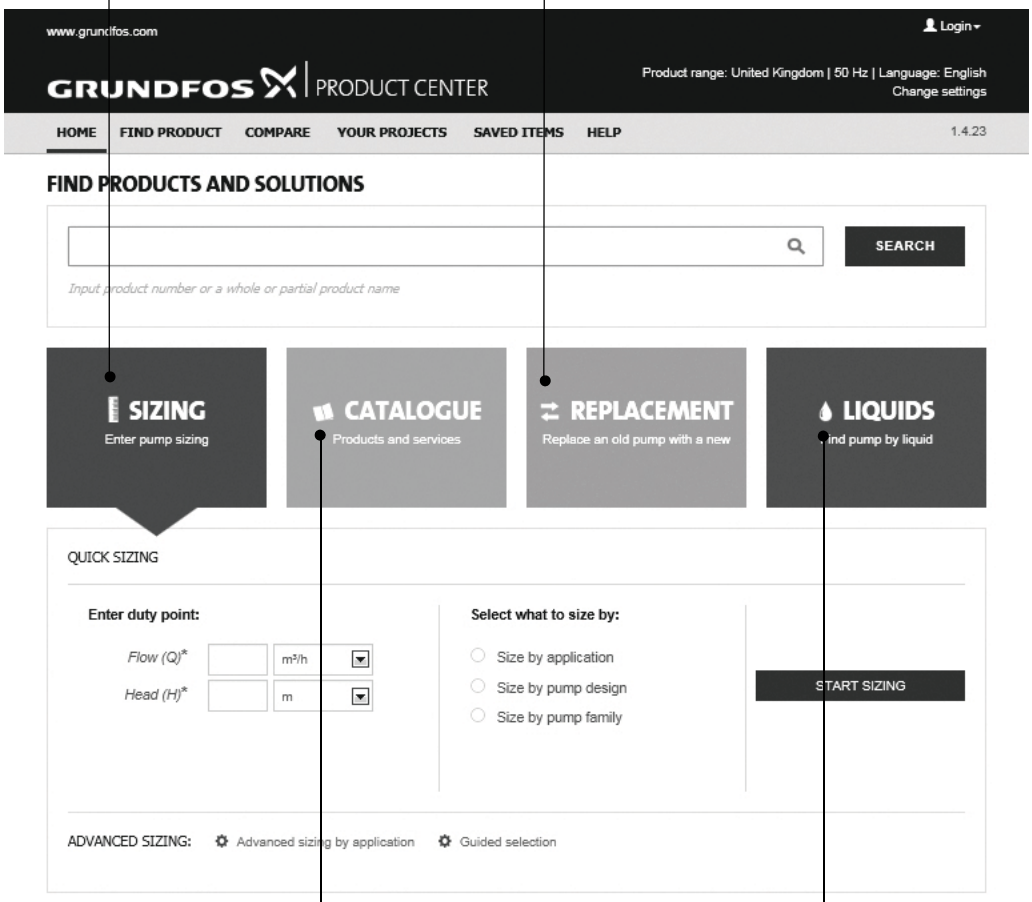
Online search and sizing tool to help you make the right choice.

http://product-selection.grundfos.com

"SIZING" enables you to size a pump based on entered data and selection choices.

"REPLACEMENT" enables you to find a replacement product.
Search results will include information on

- the lowest purchase price
- the lowest energy consumption
- the lowest total life cycle cost.



"CATALOGUE" gives you access to the Grundfos product catalogue.

"LIQUIDS" enables you to find pumps designed for aggressive, flammable or other special liquids.

All the information you need in one place

Performance curves, technical specifications, pictures, dimensional drawings, motor curves, wiring diagrams, spare parts, service kits, 3D drawings, documents, system parts. The Product Center displays any recent and saved items - including complete projects - right on the main page.

Downloads

On the product pages, you can download installation and operating instructions, data booklets, service instructions, etc. in PDF format.

96903467 1216
ECM: 1197690

GRUNDFOS A/S
DK-8850 Bjerringbro . Denmark
Telephone: +45 87 50 14 00
www.grundfos.com

GRUNDFOS

southland filtration

SKAN

The SKAN GM filter cartridge is a microbially rated pleated filter element based on a naturally hydrophilic, mirrored asymmetric Polyethersulphone membrane.

The SKAN GM filter cartridge has a multi-layer construction, with an integral microfibre pre-filter layer and polypropylene support and drainage layers. The high surface area, 0.6m² EFA, and integral pre -filter ensures high flow rates with low pressure drops and long service life.

The SKAN GM membranes are naturally hydrophilic so contain no wetting agents, this with the thermal bonding assembly process results in very low levels of extractables, and when supplied, pre-rinsed SKAN GM filter cartridges have fast rinse up times of up to 18 MΩ.cm. Another feature of the Bevflo GM membrane is low protein binding, meaning that most of the proteins present in the feed remain in the filtrate.

SKAN GM filter cartridges are available in a wide range of length and end cap configurations to retrofit most industry standard applications.

Features and Benefits

- Integrity testable, bubble point and diffusional flow data supplied.
- Individually lot numbered with unique serial numbers for traceability.
- Can be steam sterilised and repeatedly hot water sanitised.
- Excellent chemical compatibility and resistant to hydrolysis.
- Low protein binding, does not strip out proteins or remove colours when used for beverage filtration.
- Naturally hydrophilic, no wetting agents needed and very low levels of extractables.
- Meets current USP Class VI plastics test and CFR Title 21 for food contact.

Dimensions

Outside Diameter: 69mm
Inside Diameter: up to 32mm
Lengths: 5” to 70”

Sanitisation

Steam or Autoclave: 125°C for 30 minutes (with steam ring, 30 cycles)
Hot Water Sanitisation: 90°C for 30 minutes repeatedly

Operating Conditions

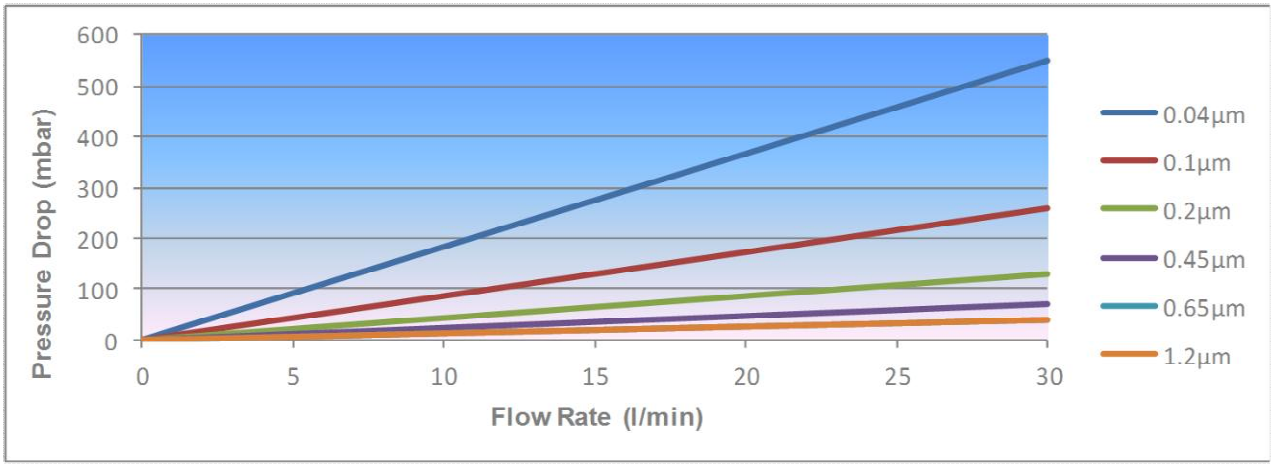
Recommended Maximum ΔP:

Forward Flow 4 bar @ 20°C
2.8 bar @ 65°C
1 bar @ 80°C
Reverse Flow 3 bar @ 20°

Integrity Test

Pore Size Micron	Bubble Point psi	Diffusion Rate	
		cc/min	psi
0.04	45	<36	37
0.1	35	<56	28
0.2	27	<35	22
0.45	21	<24	17
0.65	12	<20	10

Water Flow Rate 10” Element, Water @ 20°C

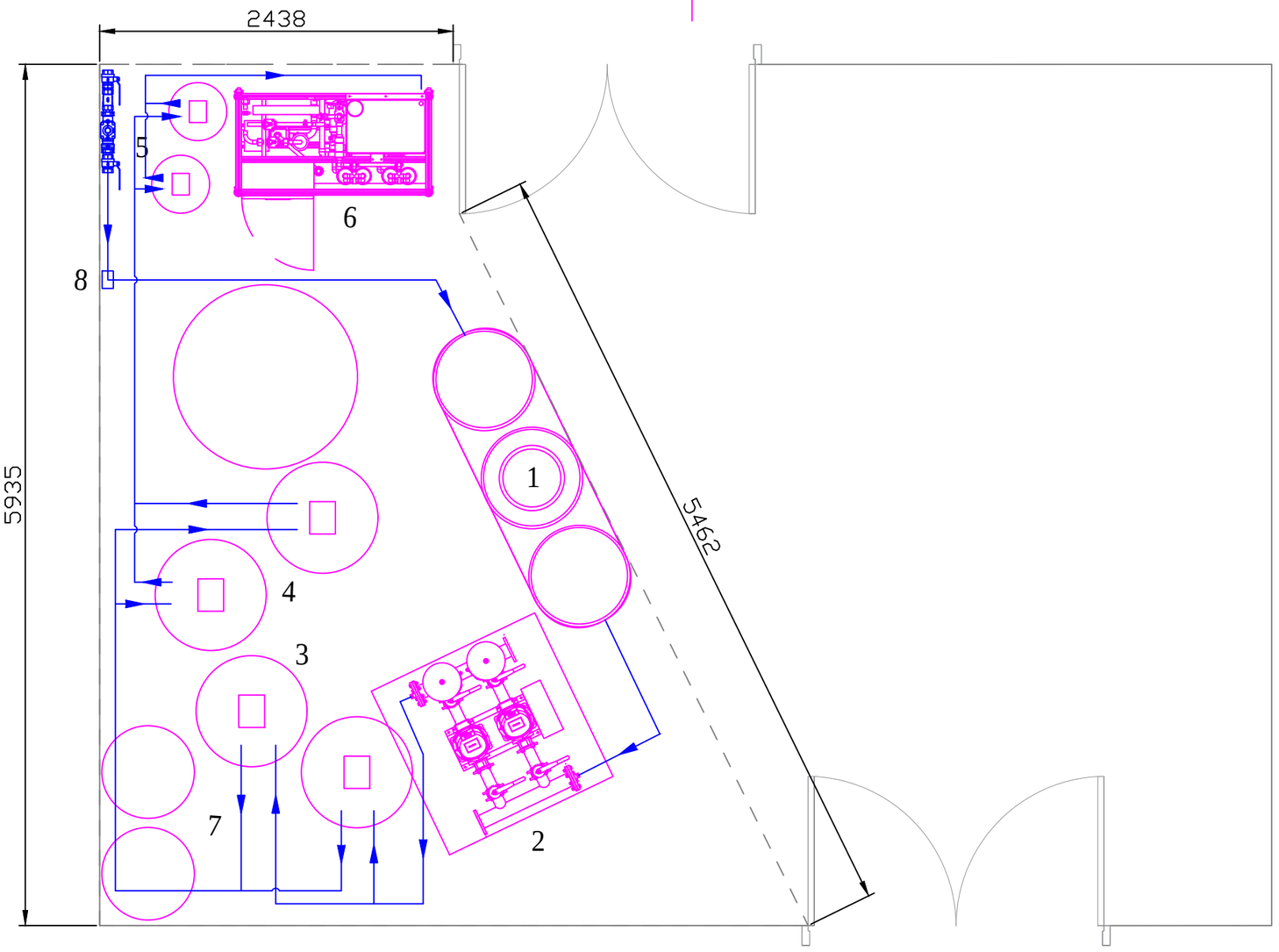


Ordering Guide

V1-08/14

Name	Micron Rating	Nominal Length	End Cap Type	Seal Type	Special
SKAN GM	0.04µm	5”	03	E - EPDM	
	0.1µm	9 7/8”	04 - DOE	N - Nitrile	
	0.2µm	10”	07	S - Silicone	
	0.45µm	20”	08	V - Vitron	
	0.65µm	30”	Amazon End Cap Style		
		40”			

southland filtration
FREECALL 1800 656 771
E filtration@southlandind.com.au
www.southlandfiltration.com.au



NO.	DESCRIPTION
1	2,000 L FEED WATER BREAK TANK (2,210MM L X 700MM W X 2,150MM H)
2	DUAL PRESSSURE BOOSTER PUMPS, EACH OPERATING AT 487 L/MIN AT 5 BAR
3	DUAL AUTO BACKWASBLE SEDIMENT FILTER (ø750MM X 2,000MM H)
4	DUAL WATER SOFTENER WITH SINGLE BRINE TANK (ø750MM X 2,000MM H WITH ø1,270MM X 1,524MM H BRINE TANK)
5	DUAL AUTO BACKWASHABLE CARBON FILTER (ø400MM X 2,000MM H)
6	ENDOTHERM-1200-DUO-HF RO UNIT (1,400MM L X 750MM W X 1,950MM H)
7	HOTWATER CYLINDERS
8	TANK FILL VALVE

Rev	Details	Date	Drawn/Check	Eng./Check	Authorised
0	FOR INFORMATION ONLY	29/07/2019	RM	JC	JC
0	FOR INFORMATION ONLY	11.02.2019	SM	MC	MC

SOUTHLAND FILTRATION PTY LTD.
1800 656 771
www.southland.com.au

WATER TREATMENT AS BUILT DRAWINGS

PURIFIED WATER PLANT FOR CSSD CLEANING & FINAL RINSE PROCESSES
PROPOSED EQUIPMENT LAYOUT

CAD File: NPHN-5627-002 | Scale: NTS | A3 | NPHN-5627-002-PL-002

southland filtration

Talk to an expert **1800 656 771**

Southland Filtration Southland Industries Pty Ltd ABN 56 949 035 092
+61 1800 656 771 | filtration@southlandind.com.au | www.southlandfiltration.com.au