CR, CRI, CRN, CRE, CRIE, CRNE custom-built pumps

60 Hz NEMA

GRUNDFOS

Table of contents

1. Introduction 4
Customized CR pumps 4
Pumps for specific requirements 4
Features and benefits 5
Motors 5
Pump Energy Index (PEI) 5
Further documentation 6

2. Performance range 7
CR, CRI, CRN - 60 Hz 7
CRE, CRIE, CRNE - 60 Hz 8
CR, CRN High Pressure - 60 Hz 9

3. Identification 10
Type key 10

4. Applications 12
High-pressure applications 12
Hot-water applications 13
Temperature control applications 14
Aggressive or hazardous liquids 15
Hygienic applications 16
Special installation requirements 17
Special applications 18

5. Accessories 19
ATEX-approved dry-running protection for EEC countries 19
Venting valve with connecting pipe 19
Dosing pump system for barrier fluid 19

6. Motors 20
Customized motor solutions 20
Standard WEG motors 20
Tropicalized motors 20
Energy 20
Other motor approvals 20
Explosion-proof motors 21
Special voltage 22
Motor with multiplug connection 22
Motor with space heater 23
Motors with PTC sensors 24
Motors with thermal switches 25
Oversize motors 26
Alternative enclosure class (IP) 26
Alternative terminal box positions 26
4-pole motors 27
Motor efficiency classes 27
Alternate NEMA motors 27

7. Shaft seals 28
Shaft seal arrangements 28
Shaft seal variants 28
Overview of shaft seals 29
Single shaft seals 30
Double seal arrangements 30
Back-to-back seal arrangement 31
Tandem seal arrangement 35
CR with air-cooled top 37
Magnetic-drive pump (MAGdrive) 40

8. Pump 42
Measurement of inlet pressure 42
Pumping of liquids down to -40 °F 42
Carbon-free pumps 43
CRN all-stainless steel pumps 43
Surface treatment 43
CR low NPSH 46
Horizontal in-line pumps 47
Horizontal end-suction pumps 52
Belt-driven pumps 54
Pump rubber parts 56
Bearing flange 57
Support bearings 58
Bearing material 58
Pump head positions 58
Customized nameplate 58
Dry-running protection 59
Pipe connections 60
Base plate for CR 95 with CR 90 footprint 65

9. Certificates 66
CR pumps with certificates 66
Examples of certificates 68

10. CRE pump solutions 72
Customized CRE pump solutions 72
Control of E-pumps 72
Environmental enclosure ratings 74
Terminal box positions 75
Ambient temperature and installation altitude 75
Maximum ambient temperature and altitude for Grundfos MLE motors 75
Motor load for Grundfos MLE motors 75
Central management system 75
Communication Interface Unit (CIU) 77
Communication Interface Module (CIM) 77
Bluetooth 78
Grundfos GO Link 78
Safe Torque Off (STO) function 78
Functional module, FM300 79
Functional module, FM310 and FM311 81
Industrial custom-built E-solutions 83

11. How to read the curve charts 89
Guidelines to performance curves 90

12. Performance curves. 91
Low-NPSH pumps with 2-pole motor 91
CR pumps with 4-pole motor 99

13. Technical data 114
Dimensional drawings for CR low-NPSH pumps . . 114
CR low-NPSH pumps dimensions 118
CRE low-NPSH pumps dimensional data 123
CR pumps with 4-pole motor 133
Boiler feed pumps 136
Bypass orifices dimensions 142
CRN pumps with magnetic drive 143

14. Motor data 155
Standard motors in the CR range 155
2-pole TEFC motors (WEG) 156
4-pole TEFC motors (WEG) 158
2-pole ODP motors (WEG). 159
2-pole E-motors (Grundfos MLE) 160
2-pole TEFC motors (Grundfos ML). 161

15. Pumped liquids 163
List of pumped liquids 163

16. Grundfos Product Center 166
Grundfos GO 167

17. Document quality feedback. 168

1. Introduction

This catalogue gives an overview of some of the customized CR pump solutions offered by Grundfos. If the catalogue does not provide a solution to your specific pumping needs, contact us with a detailed description of your application.

Related information

Further documentation

Customized CR pumps

We offer a wide range of customized variants of the CR type range for a variety of demanding industrial applications.

With these multistage in-line pumps, based on the well-known CR-type range, we satisfy the customers' need for pumps that meet special installation requirements and handle the following mediums:

- high-temperature liquids
- crystallizing liquids
- high-viscosity liquids, such as paints and varnishes
- aggressive liquids
- volatile liquids
- flammable liquids.

Most of the pumps are available with either mains-operated motors (CR, CRI and CRN) or electronically speed-controlled motors (CRE, CRIE and CRNE).

The pump types below are available as customized pumps.

Pump type	CR	CRI	CRN
1s, 1, 3, 5	•	•	•
10, 15, 20	•	•	•
32, 45, 64	•		•
95, 125, 155	•		•
185, 215, 255	•		•

Pumps for specific requirements

The CR pumps can be customized to meet customer-specific requirements. This is due to the "mix-and-match" approach to customization, where the various pump features and options are to be regarded as modules that can be combined to create the ideal pump.

Motor options

CR motors are available in many different configurations to meet the requirements presented by the power supply, the pump environment and the pumped liquid itself.

- Power supply systems vary in terms of both frequency and voltage, and required protection methods.
- The environment may be explosive, very hot or very humid. Special conditions also apply at high altitudes.
- The pumped liquid may require a special motor solution. High or low viscosities or densities may require non-standard motor sizes. You may also need an explosion-proof variant.
- The installation site of the pump may require alternative positions of pump and motor parts, such as terminal box positions and vent screw positions.

Shaft seal options

Extreme liquids sometimes necessitate extreme measures.

- High temperatures damage seal faces unless precautions are taken.
- Concern for safety can require special measures for aggressive, toxic or flammable liquids.
- Liquids can be harmful to shaft seals because they crystallize, harden or are extremely abrasive.

Pump options

The CR pump elements can handle the most demanding liquids and pressures, and be adapted to suit many other requirements:

- Horizontal installation is available if height is a limitation.

Poor inlet conditions mean that NPSH values must be adjusted to avoid cavitation.

- Very high pressures demand special solutions.
- Special surface treatments or certificates may be required.

Connection options

Your chosen pump elements can be fitted with the connections you need. All standards are covered, and special connection variants are available for maximum compactness, high liquid pressures, etc.

Features and benefits

Customized CR pumps have the following features and benefits:

Shaft seal solutions

The specially designed cartridge seal increases reliability, ensures safe handling, and enables easy service and access.

The cartridge shaft seal comes in a wide choice of materials. It is available in single and double-seal arrangements, and magnetic-drive configurations.

Connections

The Grundfos CR pump can be connected to any system, and is available in four different material variants.

Material options	
CRN, CRNE:	Stainless steel AISI 316
CRI, CRIE:	Stainless steel AISI 304
CR, CRE:	Stainless steel AISI 304/cast iron

Wide range of pump sizes

The CR pump comes in sixteen flow sizes and hundreds of pressure sizes, ensuring that you can always find exactly the right pump for the job.

High-performance hydraulics

Pump efficiency is maximized by the optimized hydraulics and carefully crafted production technology.

Dry-running protection

The patented Grundfos LiqTec system eliminates the risk of breakdowns caused by dry running. If there is no liquid in the pump, the LiqTec stops the pump immediately.

GR5357

Motors

CR pumps are fitted with a Grundfos-specified motor. The pumps are supplied with WEG motors as standard. Grundfos ML motors are available on request. The CRE pumps are fitted with a high-speed Grundfos MLE motor with integrated frequency converter. Three-phase motors comply with EISA requirements.

WEG motors 1/4 to 20 hp

- rolled steel construction
- service factor 1.15
- suitable for VFD operation per NEMA MG 1 part 31.4.4.2
- certified Class I, Division 2, Groups A, B, C, D
- certified Class II, Division 2, Groups F, G (three-phase only).

WEG motors 25 to 300 hp

- Cast iron frame
- rated for severe duty
- service factor 1.25 (25 to 100 hp)
- service factor 1.15 (125 to 300 hp)
- inverter rated per NEMA MG 1 part 31
- certified Class I, Division 2, Groups A, B, C, D
- certified Class II, Division 2, Groups F, G.

Pump Energy Index (PEI)

Pump Energy Index (PEI) was established by the U.S. Department of Energy (DOE) and adopted by Canada as the standard metric used to evaluate pump efficiency. The value is the ratio of the pump efficiency rating (PER) divided by the calculated minimally compliant PER (PER_{STD}) for the pump type. This provides a representation of the actual performance of a pump compared to the minimal standard performance required by regulation. The lower the PEI value, the more efficient a pump is at the tested operating points.

PER is determined by defined testing parameters required by the DOE. This includes testing a particular pump model at its best efficiency point (BEP).

For PEI values, there are two different versions:

- PEI_{CL} (constant load): applies to a bare-shaft pump and a pump sold with a motor
- PEI_{VL} (variable load): applies to pumps sold with a motor and controller (such as VFD, VSD).

The DOE has set the maximum PEI value to be 1.00. Any pump, pump and motor, or pump, motor and controller that exceeds a PEI value of 1.00 can no longer be manufactured after January 26, 2020.

PEI is a generalized efficiency value. PEI cannot be used to determine the efficiency of a pump in a specific application.

PEI for standard and low-NPSH CR pumps

PEI values for standard CR pumps

Product type	Poles	PEI_{CL} bare-shaft pump	PEI_{CL} pump with motor	PEI_{VL} pump with motor plus controller [1]	Impeller diameter [in (mm)]
CR, CRN, CRI 10	2	0.87	0.87	0.48	3.66 (92.9)
CR, CRN, CRI 15	2	0.91	0.91	0.48	4.13 (104.8)
CR, CRN, CRI 20	2	0.91	0.91	0.47	4.13 (104.8)
CR, CRN 32	2	0.87	0.87	0.45	4.66 (118.4)
	4	0.90	0.91	0.50	
CR, CRN 45	2	0.89	0.89	0.46	5.34 (136)
	4	0.91	0.91	0.47	
CR, CRN 64	2	0.93	0.93	0.46	5.59 (142)
	4	0.94	0.94	0.48	
CR, CRN 95	2	0.92	0.93	0.45	6.07 (154)
	4	0.94	0.94	0.47	
CR, CRN 125	2	0.92	0.93	0.59	6.38 (162)
	4	0.94	0.94	0.47	
CR, CRN 155	2	0.93	0.93	0.59	6.64 (169)
	4	0.95	0.95	0.47	
CR, CRN 185 [2]	4	0.95	0.95	0.46	7.36 (187)
CR, CRN 215 [2]	4	0.96	0.96	0.47	7.80 (198)
CR, CRN 255 [2]	4	0.97	0.97	0.48	7.72 (196)

1) Grundfos CUE continuous controls

2) 2-pole CR, CRN 185, 215, 255: out of scope for DOE PEI

PEI values for CR low-NPSH pumps

Product type	Poles	PEI_{CL} bare-shaft pump	PEI_{CL} pump with motor	PEI_{VL} pump with motor plus controller [3]	Impeller diameter [in (mm)]
CR, CRN, CRI 5	2	0.94	0.94	0.54	2.88 (73.2)
CR, CRN, CRI 10	2	0.93	0.94	0.50	3.66 (92.9)
CR, CRN, CRI 15	2	0.93	0.93	0.48	4.13 (104.8)
CR, CRN, CRI 20	2	0.96	0.96	0.49	4.13 (104.8)
CR, CRN, CRI 32	2	0.87	0.87	0.45	4.66 (118.4)
CR, CRN, CRI 45	2	0.89	0.89	0.46	5.34 (136)
CR, CRN, CRI 64	2	0.93	0.93	0.46	5.59 (142)

3) Grundfos CUE continuous controls

PEI values for CRE low-NPSH pumps

Product type	Poles	PEI_{VL} Impeller diameter
CRE, CRNE, CRIE 5	2	See dimensional data for CRE 5 low-NPSH pumps.
CRE, CRNE, CRIE 10	2	See dimensional data for CRE 10 low-NPSH pumps.
CRE, CRNE, CRIE 15	2	See dimensional data for CRE 15 low-NPSH pumps.
CRE, CRNE, CRIE 20	2	See dimensional data for CRE 20 low-NPSH pumps.
CRE, CRNE, CRIE 32	2	See dimensional data for CRE 32 low-NPSH pumps.
CRE, CRNE, CRIE 45	2	See dimensional data for CRE 45 low-NPSH pumps.
CRE, CRNE, CRIE 64	2	See dimensional data for CRE 64 low-NPSH pumps.

Related information

CRE 5 low-NPSH pumps dimensional data
CRE 10 low-NPSH pumps dimensional data
CRE 15 low-NPSH pumps dimensional data
CRE 20 low-NPSH pumps dimensional data
CRE 32 low-NPSH pumps dimensional data
CRE 45 low-NPSH pumps dimensional data
CRE 64 low-NPSH pumps dimensional data

Further documentation

This product guide is a supplement to the product guides listed below. It gives an overview of some of the customized solutions offered by Grundfos. If the product guide does not provide a solution to your specific pumping needs, please contact us with a detailed description of your application.

The following product guides are available at the Grundfos Product Center.

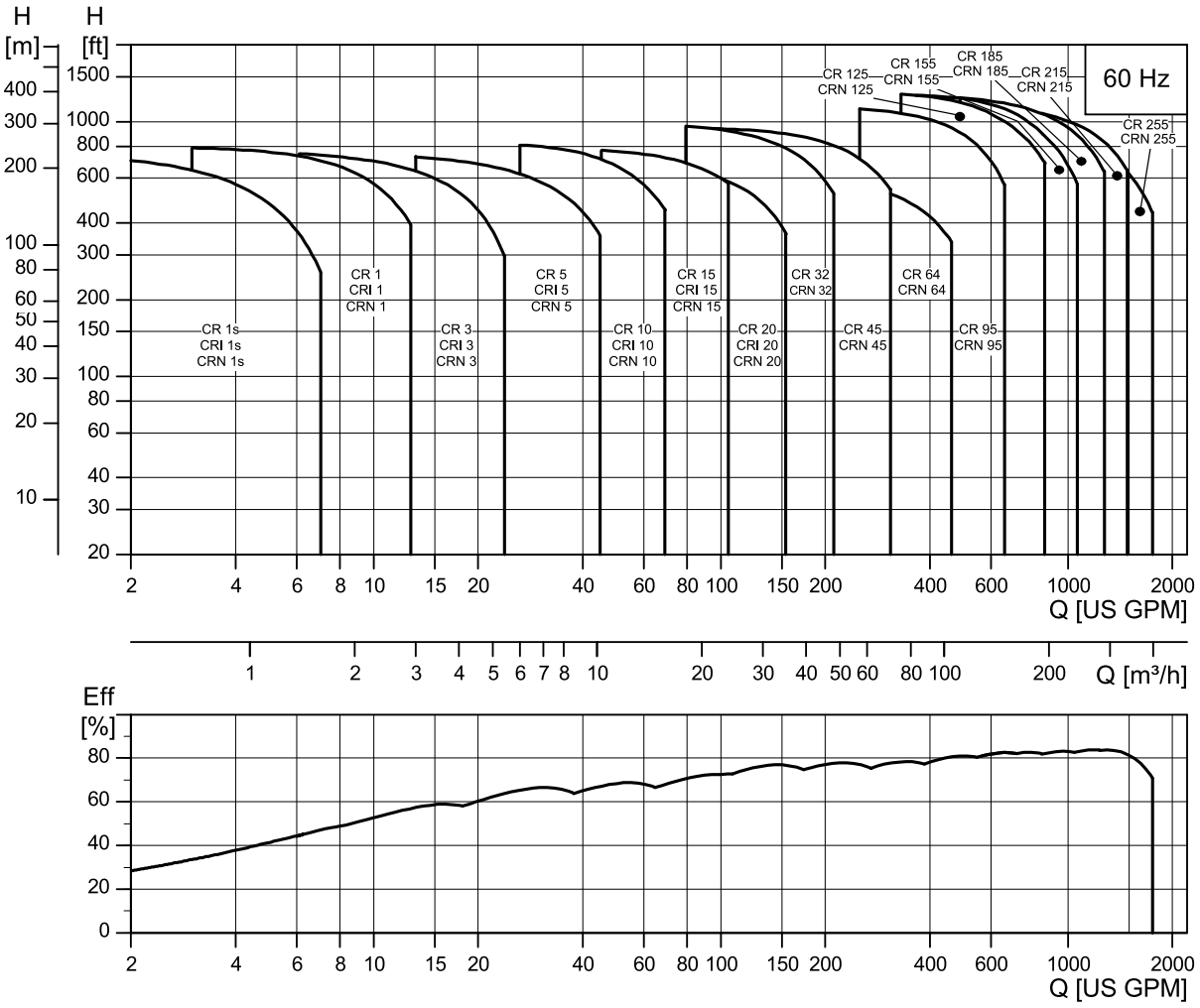
Product guide	Link and publication number
CR, CRI, CRN	http://net.grundfos.com/qr/i/98446676
CR, CRN 95-255	http://net.grundfos.com/qr/i/99407996
CRE, CRIE, CRNE	http://net.grundfos.com/qr/i/98556115
CR, CRN High pressure	http://net.grundfos.com/qr/i/98561453
CRN-H, CRE-H, CRNE-H	http://net.grundfos.com/qr/i/98665987
Mechanical shaft seals for pumps	http://net.grundfos.com/qr/i/97506935

Related information

16. Grundfos Product Center

2. Performance range

CR, CRI, CRN - 60 Hz



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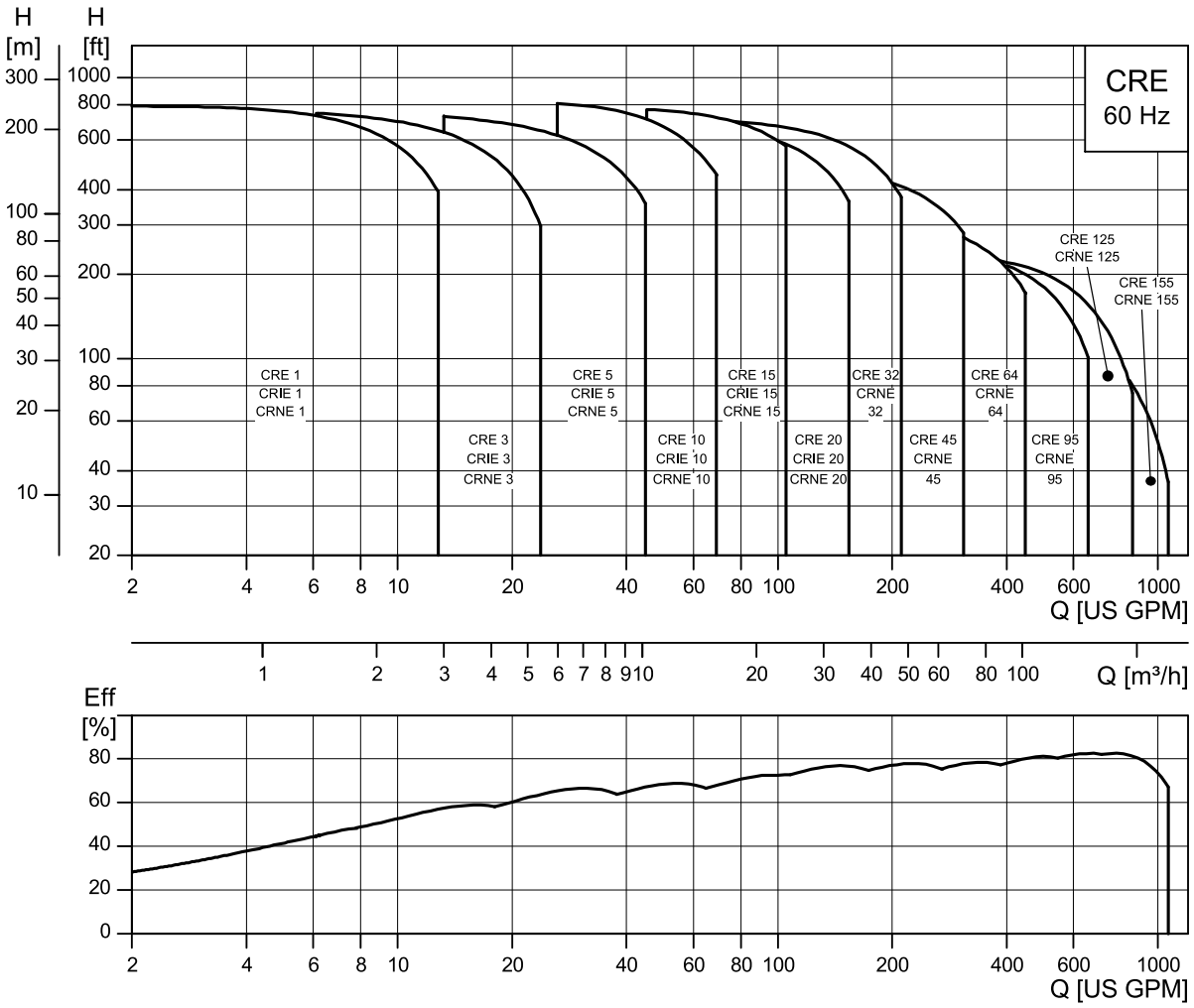
CRE, CRIE, CRNE - 60 Hz



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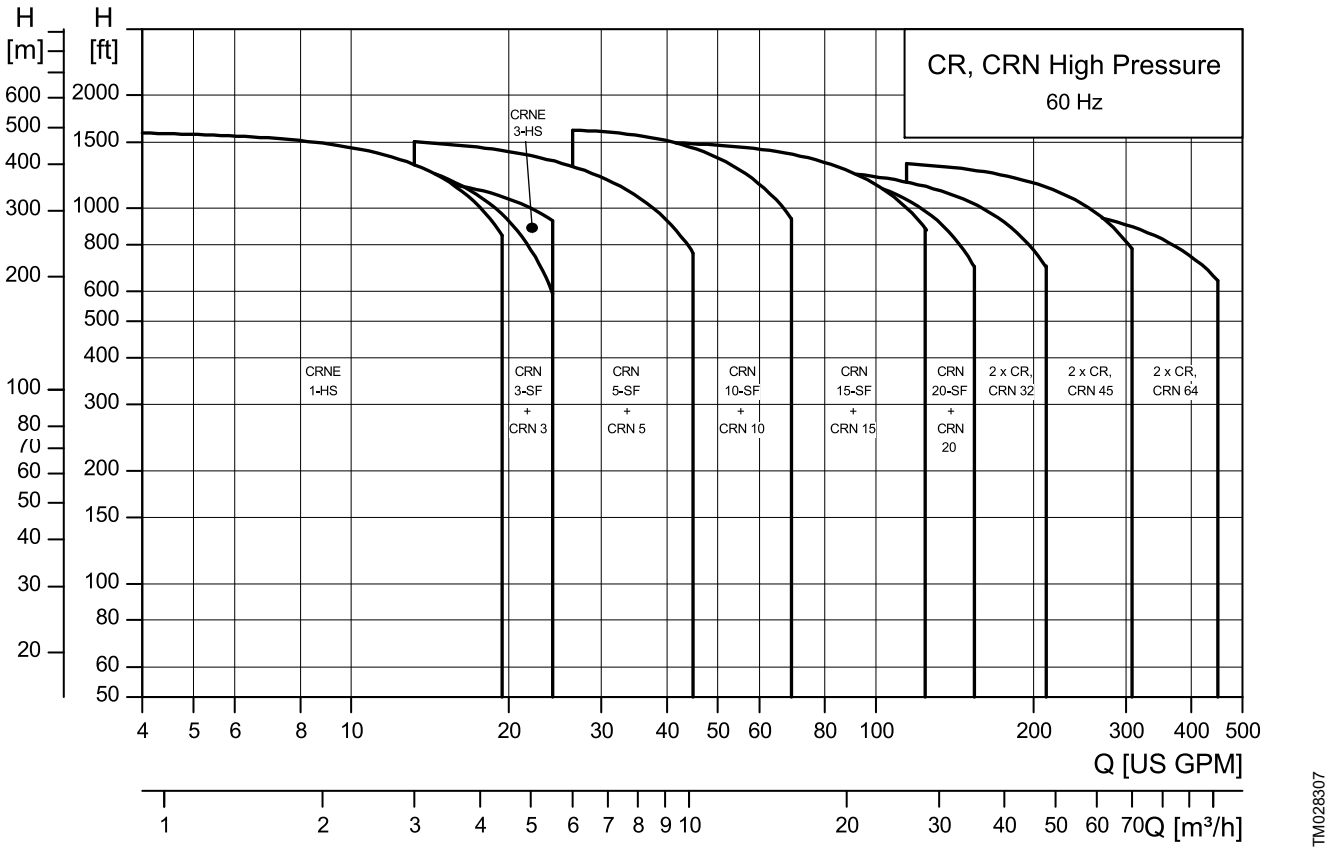
Note that CRE, CRIE, CRNE pumps are available up to 30 hp (22 kW).

CR, CRN High Pressure - 60 Hz



3. Identification

Type key

Example

CRE 32-4-2 A-G-A-E-HQQE-N-C-B

Code	Explanation
CR	Type range: CR, CRI, CRN
E	Pump with integrated frequency converter
32	Flow rate [gpm (m^3/h)]
4	Number of impellers
2	Number of reduced-diameter impellers
A	Code for pump version
G	Code for pipe connection
A	Code for materials
E	Code for rubber parts
	Code for shaft seal:
H	• Shaft seal type designation
Q	• Seal face material (rotating seal face)
Q	• Seal face material (stationary seal face)
E	• Secondary seal material (rubber parts)
N	Code for motor: P2 [hp (kW)]
C	Code for motor: phase and voltage [V]
B	Code for motor: speed variant [rpm]

Key to codes

Code	Description
Pump version	
A	Basic version
B	Oversize motor
C	CR compact
D	Pump with pressure intensifier
E	Pump with certificate
F	Pump for high temperatures (with air-cooled top)
G	E-pump without operating panel
H	Horizontal version
I	Different pressure rating
J	E-pump with a different maximum speed
K	Pump with low NPSH
L	Pump including Grundfos CUE and certificate
M	Magnetic drive
N	With sensor
O	Cleaned and dried
P	Undersize motor
Q	High-pressure pump with high-speed MLE motor
R	Belt-driven pump
S	High-pressure pump
T	Thrust handling device
U	ATEX-approved pump
V	Cascade function
W	Deep-well pump with ejector
X	Special version
6	Special version with NSF 61/372 approval
Y	Electropolished
Z	Pumps with bearing flange
Pipe connection	
A	Oval flange
B	NPT thread
CA	FlexiClamp
CX	TriClamp
F	DIN flange
FC	DIN 11853-2 flange (collar flange)
FE	EN 1092-1, type E
G	ANSI flange
J	JIS flange
N	Changed diameter of ports
P	PJE coupling (Victaulic type)
X	Special version
Materials	
A	Basic version
C	Carbon-free pump
D	Carbon-graphite-filled PTFE (bearings)/tungsten carbide
E	Pickled and passivated (Only Japan)
H	Flanges and base plate EN 1.4408
K	Bronze (bearings)/tungsten carbide
L	Motor stool, base plate and flanges EN 1.4408
M	Motor stool, base plate, coupling and flanges EN 1.4408 and coupling guards in cobber. Bolts, nuts and spacing pipes EN 1.4401 or higher grade
N	Flanges EN 1.4408
P	PEEK neck ring
Q	Silicon carbide/silicon carbide bearing in pump and silicon carbide/silicon carbide seal faces in thrust handling device
R	Silicon carbide/silicon carbide bearing
S	PTFE neck rings
T	Base plate EN 1.4408
U	Silicon carbide/silicon carbide bearing in pump and silicon carbide/tungsten carbide seal faces in thrust handling device
W	Tungsten carbide/tungsten carbide
X	Special version
Rubber parts in pump	
E	EPDM
F	FXM (Fluoraz®)
K	FFKM (Kalrez®)
N	CR (Neoprene)
V	FKM (Viton®)
Shaft seal type designation	
A	O-ring seal with fixed driver
H	Balanced cartridge seal with O-ring

Code	Description
O	Double seal, back-to-back
P	Double seal, tandem
X	Special version
Seal face material (rotating and stationary seal face)	
B	Carbon, synthetic resin-impregnated
U	Cemented tungsten carbide
Q	Silicon carbide
X	Other ceramics
Secondary seal material (rubber parts)	
E	EPDM
F	FXM (Fluoraz®)
K	FFKM (Kalrez®)
V	FKM (Viton®)

Codes for motor

Code	Description
P2 [hp (kW)]	
C	0.33 (0.25)
D	0.5 (0.37)
E	0.75 (0.55)
F	1 (0.75)
G	1.5 (1.1)
H	2 (1.5)
I	3 (2.2)
K	5 (4)
L	7.5 (5.5)
M	10 (7.5)
N	15 (11)
O	20 (15)
P	25 (18.5)
Q	30 (22)
R	40 (30)
S	50 (37)
T	60 (45)
U	75 (55)
V	100 (75)
W	120 (90)
1	150 (110)
2	175 (132)
3	215 (160)
4	270 (200)
5	335 (250)
Phase and voltage (V)	
A	1 × 200-240 V
B	3 × 200-240 V
C	3 × 440-480 V
D	3 × 380-500 V
X	Not defined
Speed variant (rpm)	
A	1450-2000
B	2900-4000
C	4000-5900
2	2-pole
4	4-pole

4. Applications

High-pressure applications

TM078856

CR high-pressure pumps

Reference applications

- Filtration
- reverse osmosis
- cleaning and washing
- boiler feed.

Customized solutions

High-pressure applications often expose pumps to a variety of extreme conditions, such as high inlet pressure, high operating pressure, frequent starts/stops and pressure pulsing.

Overload of the pump may cause increased wear of pump parts, such as motor bearings and shaft seal, and thus reduce the pump life.

To avoid unexpected breakdowns, we offer customized solutions designed to meet your needs.

High pressure handling

We offer high-pressure pumps specially designed to cope with pressures up to 725 psi (50 bar) at maximum 248 °F (120 °C).

CR high-pressure pumps come in two variants: as a single-pump solution or as a 2-pump solution.

The single-pump solution is used for flow rates up to 24 gpm, while the 2-pump solution is used for flow rates above 24 gpm.

Single-pump solutions

Our single-pump solutions include the pump types CRNE 1 HS and CRNE 3 HS.

CRNE HS pumps are fitted with a high-speed motor with integrated frequency converter.

To minimize the pressure on the shaft seal, the direction of rotation is the opposite of that of standard pumps, and the chamber stack is turned up-side down. Consequently, the pumped liquid flows in the opposite direction.

Two-pump solutions

We offer two-pump solutions for the following pumps: CRN 5, 10, 15, 20, 32, 45, 64 SF.

The solution consists of two pumps in series. The first pump is a standard pump for feeding. The second pump is a high-pressure pump (SF) specially designed for high pressure.

To minimize the pressure on the shaft seal, the direction of rotation on CR SF pumps is the opposite of that of standard pumps, and the chamber stack is turned up-side down. Consequently, the pumped liquid flows in the opposite direction.

Supplementary Grundfos pumps

For pressures above 725 psi (50 bar), we recommend Grundfos BM modules or Grundfos BME, BMET pumps.

Further documentation

The following product guide is available at the Grundfos Product Center.

Product guide	Link and publication number
CR, CRN High pressure	http://net.grundfos.com/qr/i/98561453

Related information

Special installation requirements
10. CRE pump solutions
16. Grundfos Product Center

Hot-water applications

TM078857

CR pumps for hot-water applications

Reference applications

- Boiler feeding
- applications involving poor inlet conditions
- cleaning and washing applications
- high-temperature applications.

Customized solutions

Hot-water applications often expose pumps to a variety of extreme conditions, such as high temperatures, long operating hours, frequent starts/stops, pressure pulsing, poor inlet conditions and high inlet pressure. Such conditions may result in cavitation or cause increased wear of pump parts, for instance motor bearings and shaft seal, and thus reduce the pump life.

To avoid breakdowns, we offer customized solutions designed to meet your needs and special requirements:

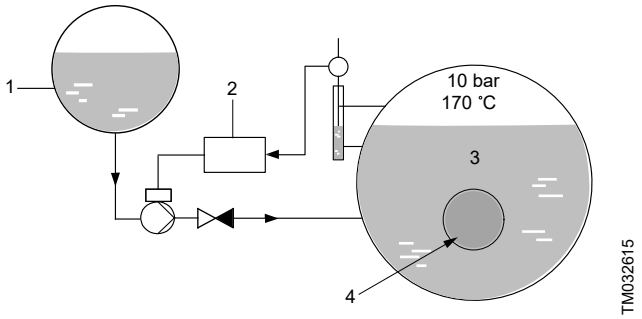
- steady steam production
- poor inlet conditions
- high temperature.

Steady steam production

To ensure a steady steam production and a constant water level in the boiler, we recommend speed-controlled pumps.

The advantages of speed-controlled pumps:

- Steady and continuous flow of water increases the efficiency of the boiler.
- The reaction to changes in the steam consumption is faster compared to the on/off controlled pumps.
- The water level in the boiler feed tank is kept stable, which ensures higher steam quality and less humidity in the steam.
- The installation and maintenance costs are lower compared to systems with on/off controlled pumps and valves, as well as systems with level control and modulating feed valves.
- No bypass pipe is needed.



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Boiler-feed application with speed-controlled pump

Pos.	Description
1	Condensate
2	Controller
3	Boiler
4	Burner

Applications involving poor inlet conditions

Cavitation is often a problem in applications where pumps have to cope with the combination of high liquid temperatures, poor inlet pressure or high flow rate. Low-NPSH pumps eliminate the risk of cavitation and ensure a stable and reliable operation.

The CR low-NPSH pump is a pump with a special first-stage design that reduces the NPSH value, and prevents the erosion or destruction of the pump.

For further information about NPSH and the calculation of NPSH-value, see the product guides available at the Grundfos Product Center.

High-temperature applications

The pumping of hot liquids is demanding for pump parts, such as the shaft seal and rubber parts. To ensure a reliable and stable production, we offer CR pumps with an air-cooled top.

A CR pump with an air-cooled top has a standard mechanical shaft seal that can handle liquid temperatures up to 356 °F (180 °C) at 363 psi (25 bar) without external cooling. At the same time, the pump delivers a high pressure. As the name implies, the pump is fitted with a special air-cooled shaft seal chamber generating the same insulation effects as that of a vacuum flask.

Related information

Special installation requirements
Oversize motors
CR with air-cooled top
CR low NPSH
10. CRE pump solutions
16. Grundfos Product Center

Temperature control applications

TM027397

CRE, CRIE, CRNE pumps with sensor

Reference applications

Cooling systems:

- Electronic data processing
- laser equipment
- medical equipment
- industrial cooling and freezing processes, etc.

Temperature-control systems:

- Casting and moulding tools
- oil processing.

Customized solutions

To ensure a safe and reliable operation in applications involving temperature control, we offer customized solutions designed to meet your needs.

We provide solutions for applications involving pumping of the following liquids:

- liquids at temperatures down to -40 °F (-40 °C)
- high-temperature liquids
- high-viscous liquids and similar.

Pumping of liquids down to -40 °F (-40 °C)

In applications where liquids are pumped at temperatures down to -40 °F (-40 °C), it is crucial for a successful production that pump parts are of the right materials and dimensions.

At such low temperatures, the selection of wrong materials and dimensions may cause deformation due to thermal expansion, and eventually stoppage of operation.

For low-temperature liquids below -4 °F (-20 °C), we recommend CRN pumps.

Pumping of high-temperature liquids

The pumping of hot liquids is demanding for pump parts, such as shaft seals and rubber parts. Examples of such liquids are the following:

- water-based liquids up to 356 °F (180 °C) at 363 psi (25 bar)
- thermal oils up to 464 °F (240 °C) at 232 psi (16 bar).

To ensure a reliable and stable production, we offer CR pumps with an air-cooled top and special rubber parts.

A CR pump with an air-cooled top is a pump that can handle high temperatures and deliver a high pressure. The pump is fitted with a special air-cooled shaft seal chamber generating the same insulation effects as that of a vacuum flask.

Pumping of viscous liquids

In applications where viscous liquids are pumped, precautions must be taken to ensure that the motor of the pump is not overloaded, and that the pump performance is not reduced too much.

The viscosity of a pumped liquid depends strongly on the liquid temperature.

To ensure a stable and reliable operation, we offer CR pumps with oversize motors.

Related information

Special installation requirements
ATEX-approved pumps for EEC countries
Oversize motors
CR with air-cooled top
Pump rubber parts
10. CRE pump solutions
16. Grundfos Product Center

Aggressive or hazardous liquids

CR pumps for aggressive/hazardous liquids

Reference applications

- Chemical industry
- pharmaceutical industry
- refineries
- petrochemical industry
- distilling plants
- paint industry
- mining.

Customized solutions

In industries where pumping of dangerous and aggressive liquids is an integrated part of the daily production, safety is top priority. Leaking pumps pose a danger to the environment.

To prevent breakdowns, we offer customized solutions designed to meet your needs.

We provide solutions for the following liquids:

- Aggressive liquids
- toxic and hazardous liquids
- flammable liquids
- odorous liquids.

To ensure a safe handling of the above liquids, we offer the following pumps:

- Pumps with tandem seal arrangement and flushing
- pumps with back-to-back seal arrangement and pressure intensifier
- pumps with magnetic drive (MAGdrive)
- pumps with ATEX approval.

Pumps with back-to-back seal arrangement

We recommend pumps with back-to-back seal arrangements for toxic, aggressive or flammable liquids.

Pumps with back-to-back seal arrangements are connected to a pressure intensifier preventing leakage from the pump to the atmosphere side.

Pumps with tandem seal arrangement

Pumps with tandem seal arrangements connected to a flushing device are used for crystallizing, hardening or sticky liquids.

If the primary seal leaks, the leaking liquid is flushed away by a flushing liquid.

MAGdrive pumps

We recommend pumps with magnetic drive (MAGdrive) for toxic and hazardous liquids.

The MAGdrive pump is a hermetically sealed pump. In the MAGdrive pump, the power from the motor is transmitted to the pump shaft a magnetic force instead of a traditional coupling.

ATEX-approved pumps

We recommend ATEX-approved pumps for potentially explosive atmospheres. Explosive atmospheres consist of air and combustible material such as gases, vapors, mists or dusts in which the explosion spreads after ignition. Grundfos ATEX-approved pumps comply with the ATEX directive for EEC countries.

Electropolished pumps

We recommend electropolished pumps for applications with strict requirements concerning corrosion and cleanability.

We offer electropolished pumps in all CRN pump sizes.

Related information

Special installation requirements
ATEX-approved pumps for EEC countries
Back-to-back seal arrangement
Tandem seal arrangement
Magnetic-drive pump (MAGdrive)
10. CRE pump solutions
16. Grundfos Product Center

Hygienic applications

TM078859

CR pumps for hygienic applications

CR pumps are not designed for the pumping of hygienic and sterile liquids, but their construction and the choice of materials make them an ideal solution for secondary processes in hygienic applications.

Reference applications

- Pharmaceutical industries
- biotechnological industries
- electronics industries
- food and beverage industries
- process industries.

Customized solutions

We provide solutions for applications involving special requirements to hygienic design, materials, surface quality and cleanability.

Hygienic design

The surface quality of pump parts is of utmost importance, both for corrosion resistance and microbial adhesion and growth.

To meet the strict hygienic requirements to material and surface quality in secondary hygienic processes, we offer electropolished stainless steel CRN pumps with the following surface quality:

Pump type	Cast stainless steel	Stainless steel parts (not cast)	Surface quality
CRN 1s, 1, 3, 5	•	•	Ra ≤ 0.8 µm
CRN 10, 15, 20	•	•	Ra ≤ 0.8 µm
CRN 32, 45, 64	•		Ra ≤ 8.0 µm
		•	Ra ≤ 0.8 µm
CRN 95, 125, 155	•		Ra ≤ 8.0 µm
		•	Ra ≤ 0.8 µm
CRN 185, 215, 255	•		Ra ≤ 8.0 µm
		•	Ra ≤ 0.8 µm

• Available.

Note that CRN pumps are not sanitary pumps regardless of the surface quality.

Furthermore, we offer a wide variety of connections, such as TriClamp connections, specially designed for pharmaceutical, food and beverage industries.

For further information about TriClamp connections, see section about TriClamp connections.

We offer the following pumps:

- cleaned and dried pumps
- mechanically or electropolished pumps.

Electropolished pumps have a higher corrosion resistance than non-polished pumps.

Cleanability

For secondary hygienic applications, for example non-food contact applications, we recommend CRN, CRNE pumps that all have wetted pump parts in stainless steel. As the surface and properties of the metal is not affected by cleaning agents, stainless steel is the ideal solution.

ATEX-approved pumps

We recommend ATEX-approved pumps for potentially explosive atmospheres. Explosive atmospheres consist of air and combustible material such as gases, vapors, mists or dusts in which the explosion spreads after ignition. Grundfos ATEX-approved pumps comply with the ATEX directive for EEC countries.

Related information

Special installation requirements
ATEX-approved pumps for EEC countries
Back-to-back seal arrangement
Tandem seal arrangement
Magnetic-drive pump (MAGdrive)
TriClamp connection
10. CRE pump solutions
16. Grundfos Product Center

Special installation requirements

TM060754

CR pumps for special installations

Reference applications

- Places with limited access and space
- ships
- mobile applications
- fire protection
- earthquake-prone areas
- applications in remote areas.

Customized solutions

Due to safety, location and arrangement requirements, some installations require pumps of another design than traditional vertical pumps.

To meet special installation requirements, we offer customized solutions designed to meet your needs.

We provide solutions for the following pump types:

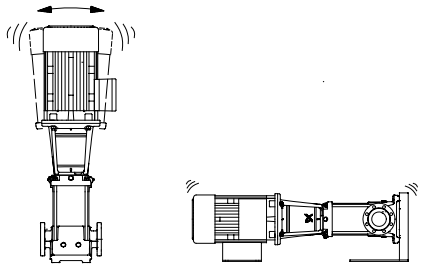
- horizontally mounted pumps
- belt-driven pumps
- pumps with alternative mounting.

Horizontally mounted pumps

We recommend horizontally mounted pumps in the following cases:

- installations with limited access and space, for instance cabinets and compact systems
- installations with limited height
- earthquake-prone areas
- mobile systems, for instance ships and vehicles.

Horizontally mounted pumps have a lower center of gravity and thus minimize swings during an earthquake. See the example in the figure below.



TM032645

Vibrations of pumps in earthquake-prone areas

Horizontal mounting requires special mounting plates, and foot-mounted motors are required on pumps with a motor size of 7 1/2 hp (5.5 kW) or larger.

Belt-driven pumps

Belt-driven pumps are often selected in the following cases:

- non-electrically driven applications, for instance air-, solar-, wind-, diesel- and pneumatically driven applications
- installations requiring an alternative supply, for instance firefighting systems and emergency pumps.

The construction of belt-driven pumps is like that of electrically driven pumps, but belt-driven pumps have a pulley and belt connected to a combustion engine or other device.

Alternative mounting for limited access and space

For installations with limited access and space, we offer pumps with alternative mounting of pump parts, such as terminal box and vent screw.

Certificates, approvals and reports

We offer customized pumps with a wide variety of certificates and approvals. Examples:

- Inspection certificate 3.1C
  - Lloyds Register of Shipping (LRS)
  - Det Norske Veritas (DNV)
- ATEX, VIK and UL approvals
- Duty-point verification report
- Vibration test report.

Related information

CRN all-stainless steel pumps
Belt-driven pumps
CR pumps with certificates
10. CRE pump solutions
16. Grundfos Product Center

Special applications

CRN and CRNE pumps

Reference applications

- Off-shore and maritime applications
- cooling applications
- pumps operating under special conditions.

Customized solutions

To ensure a stable and reliable operation, we offer customized solutions for a number of special applications that can be designed to meet your needs. Examples:

- Off-shore and maritime applications
- pumping of liquids down to -40 °F (-40 °C)
- special conditions
- special requirements as to approvals, voltage and frequency.

Pumping of liquids down to -40 °F (-40 °C)

In applications with liquid temperatures down to -40 °F (-40 °C), the material of shaft seal faces, the dimensions of the neck ring and other factors must meet high requirements. At such low temperatures, the selection of wrong materials and dimensions may cause deformation due to thermal expansion, and eventually stoppage of operation.

For liquids below -4 °F (-20 °C), we recommend CRN pumps.

Pumps operating under special conditions

- Installations at high altitudes above 3280 ft (1000 m)
- applications with low, high or fluctuating ambient temperatures
- the pumping of high-viscous or high-density liquids.

In such cases, the motor may be overloaded, and an oversize motor may be required.

Special requirements

We offer customized pumps meeting special requirements as to approvals, voltage, frequency, etc.

Related information

Special installation requirements
Oversize motors
Pumping of liquids down to -40 °F
CR pumps with certificates
10. CRE pump solutions
16. Grundfos Product Center

5. Accessories

ATEX-approved dry-running protection for EEC countries

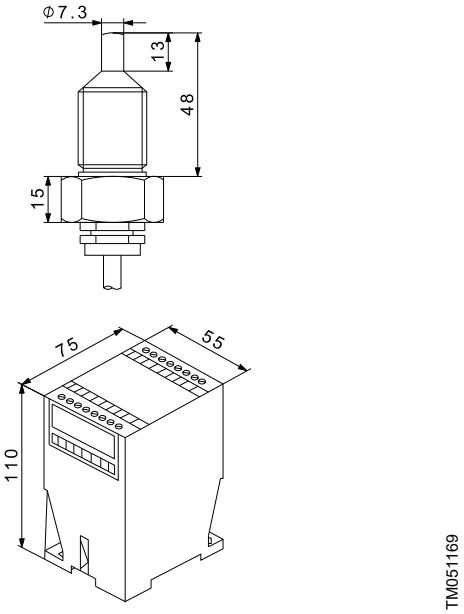
For environments, group II, category 2G, always use the ATEX-approved dry-running protection described below.

The link between ATEX groups, categories and zones is explained in the 1999/92/EC directive. Note that this is a minimum directive. Some EEC countries may therefore have stricter local rules. The user or installer is always responsible for making sure that the group and category of the pump correspond to the zone classification of the installation site.

The dry-running protection with ATEX approval mentioned below is offered by Grundfos.

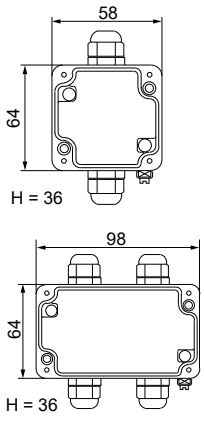
Components

Designation	Ex marking	Connection	[°C]	Product number
Flow sensor	II 2G Ex ib IIC T6	G 1/2 AISI316Ti	85	96607921
		G 1/2 AISI316Ti	120	96607922
Amplifier for flow sensor	-		[V]	-
	II (1) GD [Ex ia] IIC		230	96607923
Extension box	-	Terminals	Type	-
	II 2GEx e IIT6	4	GKEI 100	97754528
	II 2GEx ia IIC T6	4	GKI 60	97754527
	II 2GEx e [ia] IIC T6	4	GKE 60	97752524



TM051169

ATEX-approved flow sensor and amplifier

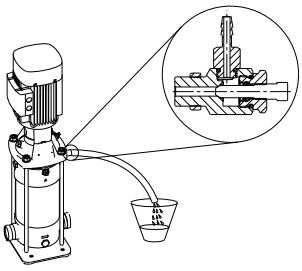


TM079116

ATEX-approved extension box (mm)

The extension box is designed for connection of intrinsically safe or non-intrinsically safe circuits in explosion-hazardous areas of category 2 (zone 1 and 21).

Venting valve with connecting pipe



TM051160

Venting valve with connecting pipe

The connecting pipe of this special venting valve allows the operator to de-aerate the pump into a closed container. This accessory is ideal when pumping aggressive or hazardous liquids.

Designation	Connection	Type	Product number
Venting valve with connecting pipe	G 1/2	EPDM	97773787
		FKM	97775104
		FFKM	97775105
		FXM	97775106

Dosing pump system for barrier fluid

The dosing pump system is used to supply pressurised barrier liquid to a CR pump with a back-to-back seal arrangement.

Related information

Back-to-back seal arrangement

6. Motors

CR pumps are fitted with a Grundfos-specified motor. The pumps are supplied with WEG motors as standard. Grundfos ML motors are available on request. The CRE pumps are fitted with a high-speed Grundfos MLE motor with integrated frequency converter. Three-phase motors comply with EISA requirements.

Customized motor solutions

The Grundfos standard range of motors meets a wide variety of application demands. For special applications or operating conditions, we offer various customized solutions:

- a wide range of motor approvals
- motors with special voltage
- motors with space heater
- motors with built-in PTC sensor
- motors with built-in thermal switch
- oversize motors
- motors with alternative enclosure class
- tropicalized motor windings
- explosion-proof motors
- custom NEMA motor.

Standard WEG motors

WEG motors 1/4 to 20 hp

- rolled steel construction
- service factor 1.15
- suitable for VFD operation per NEMA MG 1 part 31.4.4.2
- certified Class I, Division 2, Groups A, B, C, D
- certified Class II, Division 2, Groups F, G (three-phase only).

WEG motors 25 to 300 hp

- Cast iron frame
- rated for severe duty
- service factor 1.25 (25 to 100 hp)
- service factor 1.15 (125 to 300 hp)
- inverter rated per NEMA MG 1 part 31
- certified Class I, Division 2, Groups A, B, C, D
- certified Class II, Division 2, Groups F, G.

Tropicalized motors

A tropicalized motor does not contain paper, wood or similar materials containing wood pulp.

Grundfos defines a tropicalized motor as a motor that fulfils the climate group "World-Wide" in DIN/IEC 721-2-1 and has the following characteristics:

- enamel-covered windings
- double winding impregnation
- double winding insulation
- FPM V-ring
- terminal board made of polyester
- liquid sealing between frame and flange/end shield
- all outside screws made of stainless steel
- 30 µm paint layer on aluminium stator housings
- 120 µm paint layer on cast-iron stator housings
- heating element.

Energy

We offer mains-operated motors that comply with the following energy standards:

- CEL
- EISA
- KEMCO
- INMETRO
- NOM-016-ENER
- cURus ENERGY.

Other motor approvals

We offer a wide range of motor approvals:

- CCC
- C-tick
- GOST
- BΔ
- TSU
- METI/JQA
- CB.

Explosion-proof motors

ATEX-approved pumps for EEC countries

TM016193

We recommend ATEX-approved pumps for potentially explosive atmospheres. Explosive atmospheres consists of air and combustible material, such as gases, vapors, mists or dusts in which the explosion spreads after ignition.

We offer explosion-proof motors in accordance with the directive 2014/34/EU, the so-called ATEX directive.

The ATEX-approved pumps can be used in areas (zones) classified according to the directive 1999/92/EC. In case of doubt, consult the above-mentioned directives or contact Grundfos.

ATEX-approved pumps are supplied with serial number, special installation and operating instructions, and a nameplate showing the ATEX classification. The nameplate includes an "X" to indicate that the product is subject to special conditions for safe use.

A pump report is available on request.

Scope of ATEX categories

Group I		
	Category M2	
Underground installations in mines liable to be endangered by explosive gases or combustible dust.	Pumps made of materials that do not create sparks and thus do not constitute any danger of explosion.	
CR pumps available	CR, CRI, CRN	
Motors available	None [4]	

4) Air-driven or hydraulically driven motors are not available from Grundfos.

Group II		
	Category 2	
Installation areas liable to be endangered by explosive atmospheres.	Pumps intended for use in areas in which explosive atmospheres are likely to occur.	
	G (gas)	D (dust)
1999/92/EC [5]	Zone 1	Zone 21
CR pumps available	CR, CRI, CRN [6]	CR, CRI, CRN
Motors available	II 2G Ex eb IIC T3 Gb II 2G Ex db IIC T4 Gb	II 2D Ex tb IIIC T125 °C Db (257 °F)
	Category 3	
Installation areas liable to be endangered by explosive atmospheres.	Pumps intended for use in areas in which explosive atmosphere only rarely occur.	
	G (gas)	D (dust) [5]

Group II		
	Category 2	
1999/92/EC [5]	Zone 2	Zone 22
CR pumps available	CR, CRI, CRN	CR, CRI, CRN
Motors available	II 2G Ex eb IIC T3 Gb II 2G Ex db IIC T4 Gb	II 2D Ex tb IIIC T125 °C Db

5) The link between groups, categories and zones is explained in the 1999/92/EC directive. Note that this is a minimum directive. Some EEC countries may therefore have stricter local rules. The user or installer is always responsible for makin sure that the group and category of the pump correspond to the zone classification of the installation site.

6) For group II, category 2 G (zone 1), the pump must be protected against dry running.

To protect the pump against dry running, use one of the following methods:

- an ATEX-approved dry-running protection
  Always use this protection on pumps with MAGdrive or pumps with a single mechanical shaft seal.
- pumps with double seal system
  - Back-to-back: the system for pressurising the system must be ATEX-approved.
  - Tandem: make sure that the flow of flushing liquid is always sufficient, and the elevated tank never runs dry of flushing liquid.

We offer the following ATEX-approved motors:

Motor [hp (kW)]	**Version**			
	II 2G Ex eb IIC T3 Gb	**II 2G Ex db IIC T4 Gb**	**II 2D Ex tb IIIC T125 °C Db (257 °F)**	**II 3D Ex tc IIIC T125 °C Dc (257 °F)**
0.5-38 (0.37-28)	•			
0.5-272 (0.37-200)		•	•	•

All explosion-proof motors have PTC sensors.

Related information

Motors with PTC sensors

Special voltage

We offer pumps with the following voltages:

Frequency	Voltage
Motor	
50 Hz	3 x 220-240 Δ / 380-415 YV
	3 x 200-220 / 346-380 V
	3 x 380-415 ΔV
	3 x 380-415 Δ / 660-690 YV
60 Hz	3 x 200-230 / 346-400 V
	3 x 208 [7]-230 / 460 V
	3 x 220-255 Δ / 380-440 YV
	3 x 220-277 Δ / 380-480 YV
	3 x 380-440 ΔV
	3 x 380-480 ΔV
	3 x 380-480 Δ / 660-690 YV
	3 x 575 YV
Motor with integrated frequency converter	
60 Hz	1 x 200-240 V
	3 x 200-240 V
	3 x 440-480 V

7) WEG motors with a nameplate stating 230/460 V are suitable for operation at 208 V. Grundfos ML motors are rated for 208-230/460 V.

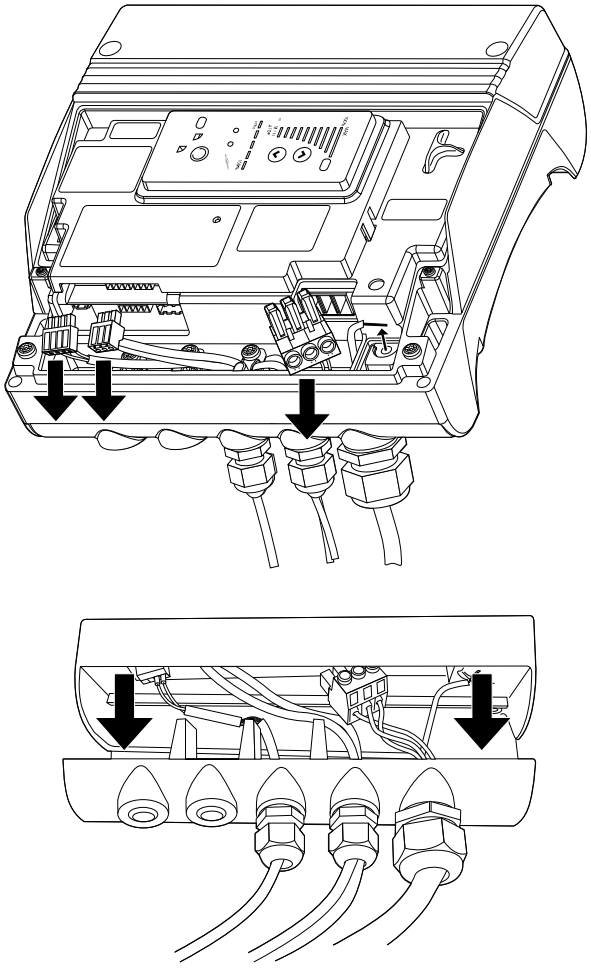
Note that other voltages are available on request.

Motor with multiplug connection

Plug-and-pump solutions for CRE pumps

To facilitate electrical installation and service of our three-phase CRE pumps fitted with integrated frequency converter, all motor terminal boxes are equipped with a detachable cable inlet bar. This plug-and-pump solution is available for CRE pumps up to 30 hp.

When the cable inlet bar is removed, you can disconnect all electrical connections.



Location of the detachable cable inlet bar on the motor terminal box as well as plugs for mains connection, sensor and communication

Motor with space heater

In applications where condensation in the motor may occur, we recommend installing a motor with a space heater on the stator coil ends. The heater keeps the motor temperature higher than the ambient temperature and prevents condensation.

High humidity may cause condensation in the motor. 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. We recommend always using motors with space heater in areas with ambient temperatures below 32 °F (0 °C).

Note that rapid condensation is not to be confused with the phenomenon that 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, for example, bearings and housing.

Motors from 1/2 - 150 hp (0.37 to 110 kW) are available with a space heater, also called anti-condensation heater. The power supply of the space heater is 1/60/110 or 1/60/230.

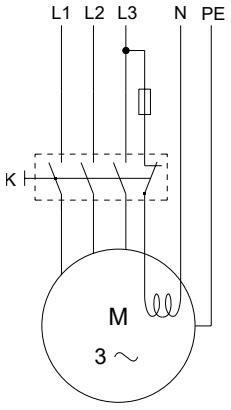
TM032440

Mains-operated ML motor with a space heater

Note that a space heater is standard on all MLE motors and can be activated remotely.

In applications with humidity level constantly above 85 %, the drain holes in the drive-end flange must be open. This changes the enclosure class to IP44. If IP55 protection is required due to operation in dusty environments, we recommend installing a motor with space heater.

The figure below shows a typical circuit of a three-phase motor with space heater.



TM034058

Three-phase motor with space heater

Pos.	Description
K	Contactor
M	Motor

Connect the space heater to the supply voltage so that it is on when the motor is switched off.

Motor size, 50/60 Hz [hp (kW)]		Power of heating unit [W]		
2-pole	4-pole	1 x 24 V	1 x 115 V	1 x 190-250 V
1/2 - 1 1/2 (0.37 - 1.1)	1/3 - 1 (0.25 - 0.75)	38		23
2 - 5 (1.5 - 3.0)	1 1/2 - 5 (1.1 - 3.0)	38		31
5 - 7 1/2 (4.0 - 5.5)	5 (4.0)	38		38
10 - 30 (7.5 - 22)	7 1/2 - 20 [8] (5.5 - 15) [8]	38		2 x 38
40 - 50 (30 - 37)	25 [8] (18.5) [8]		55	55
60 - 75 (45 - 55)			92	92
100 (75)			109	109

[8] 20 and 25 hp (15 and 18.5 kW) 4-pole are oversize motors in the CR pump range.

Motors with PTC sensors

TM027038

PTC sensor incorporated in winding

Built-in PTC sensors (thermistors) protect the motor against rapid as well as steady overload.

We offer motors with temperature-controlled PTC sensors in the motor windings.

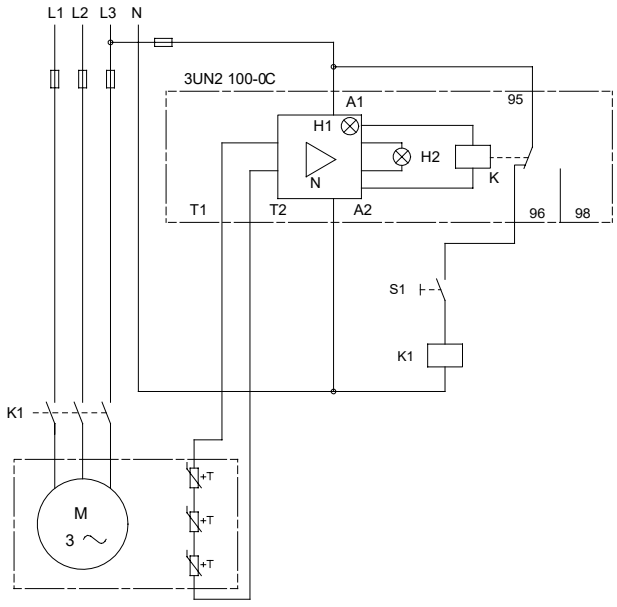
Three-phase mains-operated Grundfos ML motors from 5 hp (3 kW) and up have PTC sensors as standard.

Note that temperature-controlled PTC sensors must be connected to an external tripping or LiqTec unit connected to the control circuit. For further information about LiqTec, see section about LiqTec.

- PTC sensors offer protection against steady and rapid overload. PTO sensors offer protection against steady overload.

PTC sensors comply with DIN 44 082. The maximum voltage at the terminals (U_{max}) is 2.5 VDC. All tripping units available for DIN 44 082 PTC sensors meet this requirement.

The figure below shows a typical circuit of a three-phase motor with PTC sensors.



TM003965

Three-phase motor with PTC sensors

Pos.	Description
S1	On/off switch
K1	Contactor
+T	PTC sensor (thermistor) in motor
M	Motor
3UN2 100-0 C	Tripping unit with automatic reset
N	Amplifier
K	Output relay
H1	LED "Ready"
H2	LED "Tripped"
A1, A2	Connection for control voltage
T1, T2	Connection for PTC sensor loop

Related information

LiqTec

Motors with thermal switches

TM027042

Thermal switch incorporated in winding

Built-in thermal switches protect the motor against rapid as well as steady overload.

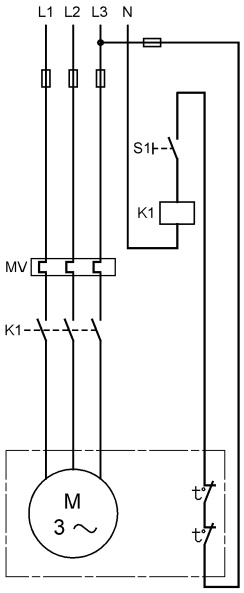
We offer three-phase mains-operated motors from 1/2 to 15 hp (0.37 to 11 kW) with built-in thermal switches.

Note that thermal switches must be connected to an external control circuit to protect the motor against steady overload. The thermal switches require no tripping unit.

The protection is according to IEC 60034-11: TP 211, referring to both rapid and steady overload. To ensure protection against seizure, connect the motor 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)



TM003964

Typical circuit of a three-phase motor with built-in bimetallic thermal switches

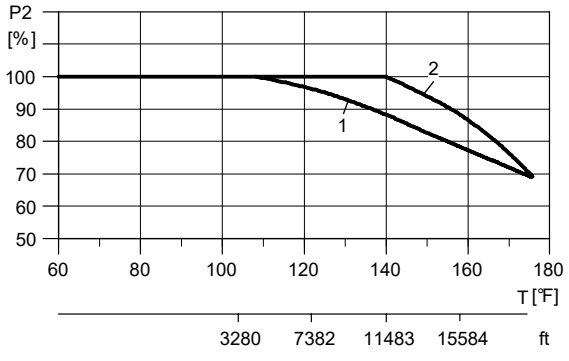
Pos.	Description
S1	On/off switch
K1	Contactor
t °	Thermal switch in motor
M	Motor
MV	Motor-protective circuit breaker

Oversize motors

We recommend using an oversize motor if operating conditions fall outside those described in the relevant product guides available at the Grundfos Product Center.

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 (P2).

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 risk of overheating.



Relationship between motor output (P2) and ambient temperature (T) and altitude (ft)

Legend

Pos.	Description
1	NEMA energy-efficient motors
2	NEMA premium-efficiency motors

The figure above shows that the P2 must be reduced to 88 % when a pump with a NEMA premium-efficiency Grundfos ML motor is installed at 15,584 ft (4750 m) above sea level. At an ambient temperature of 167 °F (75 °C), the P2 of a standard-efficiency motor must be reduced to 74 % of the 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.

Alternative enclosure class (IP)

The motor enclosure class complies with IEC 60034-5.

The enclosure class states the degree of protection of the motor against ingress of solid objects and water.

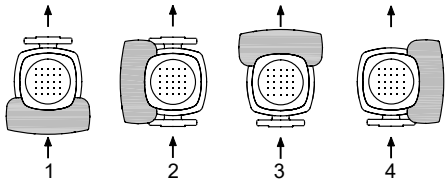
All motors comply with IP55 as standard.

On request, we offer motors that comply with IP54, IP56, IP65 and IP66.

IP class	Description
IP54	• The motor is protected against the ingress of dust, yielding harmful layers of dust. • The motor is protected against water splashing from any direction.
IP55	• The motor is protected against the ingress of dust, yielding harmful layers of dust. • The motor is protected against water projected by a nozzle from any direction.
IP56	• The motor is protected against the ingress of dust. • The motor is protected against heavy seas or high-pressure water jets from any direction.
IP65	• The motor is completely dust-proof. • The motor is protected against water projected by a nozzle from any direction.
IP66	• The motor is completely dust-proof. • The motor is protected against heavy seas or high-pressure water jets from any direction.

Alternative terminal box positions

The terminal box is in 6 o'clock position by default. The possible terminal box positions are shown below.



Possible terminal box positions

Pos.	Description
1	6 o'clock position (default)
2	9 o'clock position
3	12 o'clock position
4	3 o'clock position

4-pole motors

We offer all CR pumps with 4-pole motors.

4-pole motors are often preferred in the following cases:

- A low sound pressure level is required.
- Inlet conditions are poor.
- Beating of the liquid is not allowed.

For performance curves of 4-pole CR pumps, see section about CR pumps with 4-pole motor.

For electrical data of 4-pole CR pumps, see section about standard motors in the CR range.

For pump types and motor ranges of 4-pole CR pumps, see section about CR pumps with 4-pole motor.

Related information

CR pumps with 4-pole motor

Standard motors in the CR range

Motor efficiency classes

North America

Motors fitted to CR pumps for use in North America meet NEMA Premium Efficiency standards and comply with with the US Energy Independence and Security Act (EISA).

Alternate NEMA motors

Explosion-proof: Motors are UL- and CSA-approved for Class I, Div I, Group D and Class II, Div I, Groups F&G as defined by NEC article 500. Explosion-proof motors have all cast iron construction and corrosion resistant epoxy finish. The service factor is 1.0 when operated with sine wave power. Consult factory when explosion-proof motors are operated via variable frequency.

Inverter Duty: These motors meet and exceed requirements for variable torque applications as defined by MG-1 part 31 and premium efficiency per NEMA table 12-12, as well as class H insulation, ISR wire, thermostats and precision balance.

Inverter Ready: TEFC motors, which are premium-efficient, are suitable for operation with VFD. Similarly, ODP motors, which are constructed with class F insulation, are also suitable for VFD operation. The motors meet or exceed requirements for spike resistance as defined by MG-1 part 31 section 4.4.2, as well as including class F insulation and ISR wire.

Severe Duty: The motors have the following: corrosion-resistant hardware, double dip and bake winding varnish, epoxy finish, Marine duty with IEEE 45/USCG 259 label, moisture sealant between frame and end bell, neoprene gaskets, regreasable ball bearings, stainless steel nameplate, and v-ring shaft slinger seal. The construction is all cast iron, requiring 182TC frames or larger.

Chemical Processing/Mill and Chem Duty: See Severe duty.

Dirty Duty: The motors have the following: 416 stainless steel shaft extension, corrosion resistant hardware, double dip and bake winding varnish, epoxy finish, neoprene gaskets, stainless steel nameplate, and v-ring shaft slinger seal. These are typically smaller, rolled steel, 56C frame motors.

IEEE-841 Mill and Chem Duty: The motors have the following: corrosion-resistant hardware, division 2 nameplate markings, double dip and bake winding varnish, epoxy finish, foot pad planarity within 0.005 inches, Inpro seals, IP56 enclosure, conductor lugs, moisture sealant between frame and end bell, neoprene gaskets, precision balance, regreasable ball bearings, stainless steel nameplate, and v-ring shaft slinger seal.

Marine Duty per IEEE-45: See the description for Severe Duty.

Washdown Duty: The motors have the following: 300 series stainless steel hardware, autophoretic primer, double dip and bake winding varnish, double sealed ball bearings, epoxy finish, lip seal on drive end, moisture sealant between frame and end bell, neoprene gaskets, stainless steel shaft extension, and v-ring slinger seal on drive end.

7. Shaft seals

Shaft seal arrangements

CR pumps are available with the following shaft seals to meet a wide variety of applications:

- single seal arrangement
- double seal arrangement
- magnetic drive.

CR, CRE, CRI, CRIE, CRN, CRNE pumps are fitted with a cartridge shaft seal mounted in a single seal arrangement as standard:

- HQQE or HQQV, 0.3 - 300 hp (0.25 - 110 kW)

In applications where the pumped liquid may harm the environment, double seal arrangements or magnetic drive pumps are selected.

To ensure reliability, the following conditions must be taken into consideration when selecting a shaft seal:

- operating pressure
- type of pumped liquid
- liquid temperature.

Shaft seal variants

Liquids or applications exceeding the range of normal operating conditions require special-purpose shaft-seal solutions.

In order to meet any specific requirement, we offer variants of seal face material and secondary seal material (rubber parts).

The following recommendations apply to clean water and water containing glycol.

For ultra-pure water (conductivity lower than 5 µS/cm), do not use an xQQx seal face combination. Instead, use an xQUx seal face combination.

FKM (xxxV) is limited to 194 °F (90 °C) in water.

If abrasive particles are present, use an xQQx seal face combination.

Further information on shaft seals

For explanation of codes, shaft seal types and materials, see the type key section, or see the product guide on mechanical shaft seals available at the Grundfos Product Center.

Product guide	Link and publication number
Mechanical shaft seals for pumps	http://net.grundfos.com/qr/i/97506935

Overview of shaft seals

The table below shows the shaft seals available.
For information about codes for shaft seals, see section about type key.

		x = E		x = V		x = K		x = F	
Shaft seal type	**Shaft diameter [inch (mm)]**	**[psi] [°F]**	**[bar] [°C]**	**[psi] [°F]**	**[bar] [°C]**	**[psi] [°F]**	**[bar] [°C]**	**[psi] [°F]**	**[bar] [°C]**
HQQx	∅0.47, ∅0.63 (∅12, ∅16)	435 -40 to +248	30 -40 to +120	435 -4 to +194	30 -20 to +90	435 41 to 248	30 -5 to +120	435 14 to 248	30 -10 to +120
	∅0.87 (∅22)	435 -40 to +248	30 -40 to +120	435 -4 to +194	30 -20 to +90	435 41 to 248	30 -5 to +120	435 14 to 248	30 -10 to +120
		435-580 -40 to +176	30-40 -40 to +80	435-580 -4 to +176	30-40 -20 to +80	435-580 41 to 176	30-40 -5 to +80	435-580 14 to 176	30-40 -10 to +80
	∅1.1, ∅1.42 (∅28, ∅36)	363 -40 to +248	25 -40 to +120	363 -4 to +194	25 -20 to +90	-	-	363 14 to 248	25 -10 to +120
		363-580 -40 to +176	25-40 -40 to +80	363-580 -4 to +176	25-40 -20 to +80	-	-	-	--
HUUx [9]	∅0.47, ∅0.63 (∅12, ∅16)	435 -40 to +194	30 -40 to +90	435 -4 to +194	30 -20 to +90	435 41 to 194	30 -5 to +90	435 14 to 194	30 -10 to +90
	∅0.87 (∅22)	435 -40 to +194	30 -40 to +90	435 -4 to +194	30 -20 to +90	435 41 to 194	30 -5 to +90	435 14 to 194	30 -10 to +90
		435-580 -40 to +158	30-40 -40 to +70	435-580 -4 to +158	30-40 -20 to +70	435-580 41 to 158	30-40 -5 to +70	435-580 14 to 158	30-40 -10 to +70
	∅1.1, ∅1.42 (∅28, ∅36)	363 -40 to +176	25 -40 to +80	363 -4 to +176	25 -20 to +80	-	--	-	-
		363-580 -40 to +140	25-40 -40 to +60	363-580 -4 to 140	25-40 -20 to +60	-	-	-	-
HQUx [10] *7.3 Overview of shaft seals* HUQx [11]	∅0.47, ∅0.63 (∅12, ∅16)	435 -40 to +230	30 -40 to +110	435 -4 to +194	30 -20 to +90	435 41 to 230	30 -5 to +110	435 14 to 230	30 -10 to +110
	∅0.87 (∅22)	435 -40 to +230	30 -40 to +110	435 -4 to +194	30 -20 to +90	435 41 to 230	30 -5 to +110	435 14 to 230	30 -10 to +110
		435-580 -40 to +158	30-40 -40 to +70	435-580 -4 to +158	30-40 -20 to +70	435-580 41 to 158	30-40 -5 to +70	435-580 14 to 158	30-40 -10 to +70
	∅1.1, ∅1.42 (∅28, ∅36)	363 -40 to +230	25 -40 to +110	363 -4 to +194	25 -20 to +90	-	-	-	-
		363-580 -40 to +158	25-40 -40 to +70	363-580 -4 to +158	25-40 -20 to +70	-	-	-	-
HQBx HUBx	∅0.47, ∅0.63 (∅12, ∅16)	435 32 to 248	30 0 to +120	435 32 to 194	30 0 to +90	435 32 to 248	30 0 to +120	435 32 to 248	30 0 to +120
	∅0.87 (∅22)	435 32 to 248	30 0 to +120	435 32 to 194	30 0 to +90	435 32 to 248	30 0 to +120	435 32 to 248	30 0 to +120
		435-580 32 to 176	30 to 40 0 to +80	435-580 32 to 176	30-40 0 to +80	435-580 32 to 176	30-40 0 to +80	435-580 32 to 176	30-40 0 to +80
	∅1.1, ∅1.42 (∅28, ∅36)	363 32 to 248	25 0 to +120	363 32 to 194	25 0 to +90	-	-	-	-
		363-580 32 to 176	25-40 0 to +80	363-580 32 to 176	25-40 0 to +80	-	-	-	-

[9] HUUF ∅0.87 inches (∅22 mm) shaft diameter is available for CR pump sizes 1s-64.

[10] HQUx shaft seal types are available for shaft diameters ∅0.47, ∅0.63 and ∅0.87 inches (∅12, ∅16 and ∅22 mm).

[11] HUQx shaft seal types are available for shaft diameters ∅0.87, ∅1.1 and ∅1.42 inches (∅22, ∅28 and ∅36 mm).

Related information

Type key

Single shaft seals

Single shaft seals with EPDM O-ring material (HxxE)

We recommend single shaft seals with EPDM O-ring material for water and aqueous solutions.

EPDM rubber is not resistant to mineral oils.

Temperature range for rubber material:

- water and watery medias from -40 to +248 °F (-40 to +120 °C).

Single shaft seals with FKM O-ring material (HxxV)

We recommend single shaft seals with FKM O-ring material for a wide range of temperatures and pumped liquids, such as acids, saline solutions, mineral oil, vegetable oil and most solvents.

Temperature range for rubber material:

- heat-resistant from -4 to +464 °F (-20 to +240 °C) (oil only)
- water-resistant from -4 to +194 °F (-20 to +90 °C).

Single shaft seals with FFKM O-ring material (HxxK)

We recommend single shaft seals with FFKM O-ring material for a wide range of pumped liquids, such as nitric acid, solvents, varnishes, paints and dyes.

Temperature range for rubber material:

- water-resistant from 23 to 527 °F (-5 to +275 °C).

Single shaft seals with FXM O-ring material (HxxF)

We recommend single shaft seals with FXM O-ring material for high temperatures, as well as for acid liquids and gases within oil and gas extraction.

Temperature range for rubber material:

- 14 to 428 °F (-10 to +220 °C).

Plug and sleeve O-rings made of FXM are available for the full range.

Further information on O-ring materials

Further information about O-ring materials is available in our standard product guides at the Grundfos Product Center.

Related information

Further documentation

Type key

Double seal arrangements

We offer two double seal arrangements:

- back-to-back (OQQx)
- tandem (PQQx).

Related information

Further documentation

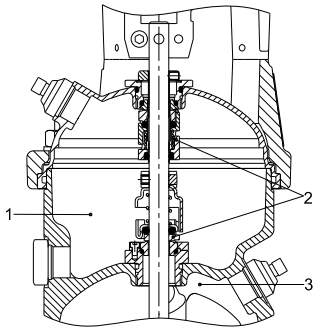
Back-to-back seal arrangement

Back-to-back seal arrangements consist of two Grundfos cartridge shaft seals, type O, fitted back-to-back in a separate seal chamber.

We recommend this type of seal arrangement for handling the following liquids:

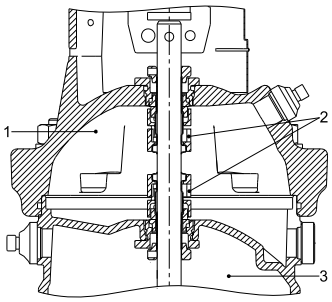
- toxic, aggressive or flammable liquids
- abrasive or sticky liquids that would either wear out, damage or block a mechanical shaft seal.

The back-to-back double seal protects the surrounding environment and the people working in the vicinity of the pump. It is specially designed for operating pressures up to 363 psi (25 bar) and 248 °F (120 °C) with the aim of minimizing the risk of leakage from the pump to the environment.



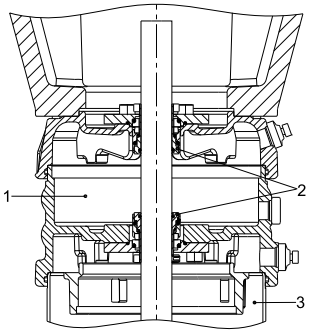
TM044404

CR 1s to 5 with a back-to-back seal arrangement



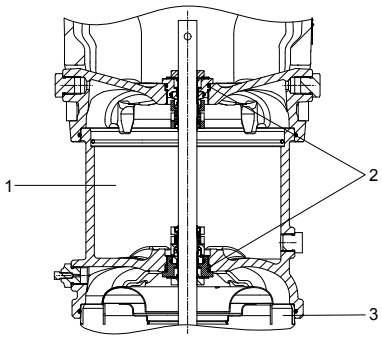
TM044405

CR 10 to 20 with a back-to-back seal arrangement



TM044406

CR 32 to 64 with a back-to-back seal arrangement



TM072100

CR 95, 125 and 155 with a back-to-back seal arrangement

Pos.	Description
1	Seal chamber
2	Shaft seals
3	Pump

The back-to-back seal arrangement is available for the following CR pumps:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	●	●	●
10, 15, 20	●	●	●
32, 45, 64	●		●
95 [12], 125 [12], 155 [12]	●		●
185, 215, 255			

[12] Available for pumps up to and including 75 hp (55 kW)

● Available.

Dimensions

Pump type	Additional height of seal chamber [inches (mm)]
CRI, CRN 1s, 1, 3, 5	4.25 (108)
CRI, CRN 10, 15, 20	3.54 (90)
CR, CRN 32	5.51 (140)
CR, CRN 45	6.30 (160)
CR, CRN 64	6.54 (166)
CR, CRN 95	8.23 (209)
CR, CRN 125	9.61 (244)
CR, CRN 155	9.61 (244)

Pressurizing

In back-to-back seal arrangements, the pressure in the seal chamber must be higher than the pump pressure to prevent the pumped liquid from leaking through the shaft seal to the environment.

Note that the barrier liquid seeps through the lower (primary) shaft seal and is mixed with the pumped liquid. Always use a barrier liquid that is compatible with the pumped liquid.

The pressure in the seal chamber can be generated in three ways:

- by an existing pressure source
- by a dosing pump
- by a pressure intensifier.

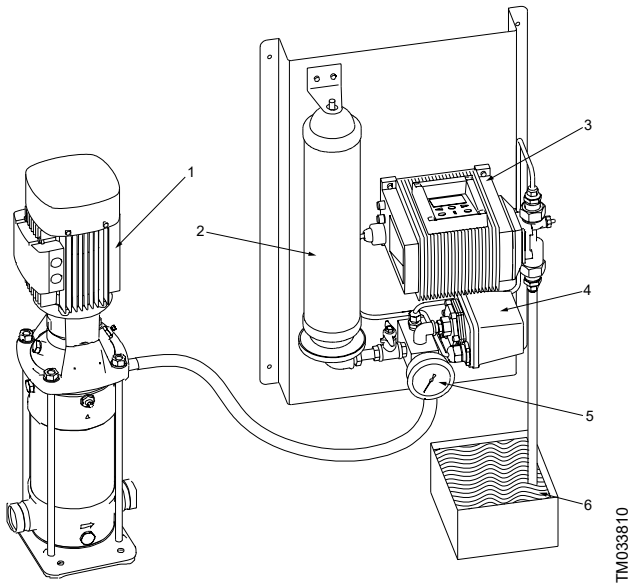
Further information

For further information about back-to-back seal arrangements, see the product guide on mechanical shaft seals available at the Grundfos Product Center.

Product guide	Link and publication number
Mechanical shaft seals for pumps	http://net.grundfos.com/qr/i/97506935

CR pump with a dosing pump in a back-to-back seal arrangement

The example below shows a CR pump with a back-to-back seal arrangement. The barrier liquid is supplied and pressurized by a dosing pump.



CR pump with dosing pump

Pos.	Description
1	Pump
2	Pressure tank
3	Dosing pump
4	Pressure switch
5	Manometer
6	Reservoir with barrier liquid

The setpoint of the barrier-liquid pressure is set by the pressure switch (4). When the pressure drops below the setpoint, the dosing pump starts and thus maintains a higher pressure in the seal chamber (maximum pressure: 232 psi [16 bar]). Barrier liquid is supplied from a reservoir (6).

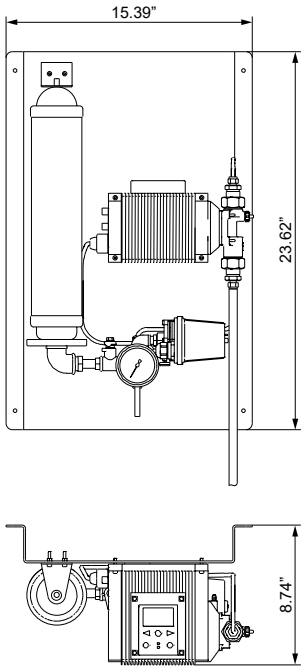
One dosing pump can supply several pumps with back-to-back seal arrangements.

Connections are all RG 1/2".

Note that connecting pipes and hoses are not included.

Dimensions of back plate with components

All dimensions are in inches.

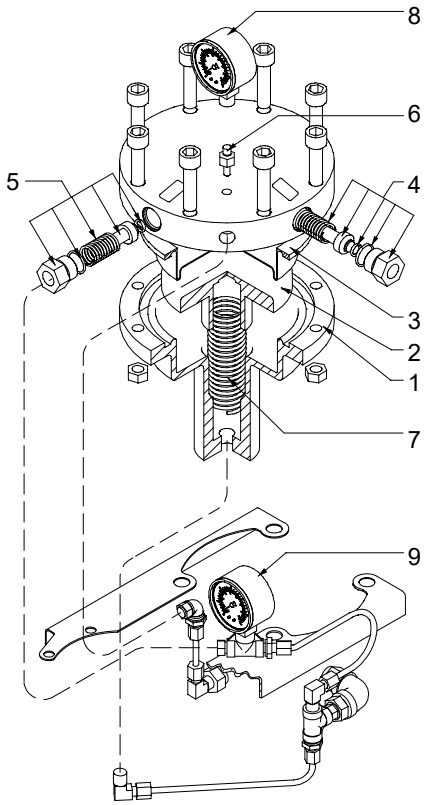


Dimensional sketch of a back plate

CR pump with a pressure intensifier in a back-to-back seal arrangement

GR5954P_W

CR pump with a pressure intensifier



TM038299

Components of a pressure intensifier

Pos.	Description
1	Pressure intensifier
2	Piston
3	Diaphragm
4	Check valve
5	Relief valve
6	Vent screw, Rp 1/8
7	Spring for piston
8	Pressure gauge (barrier liquid)
9	Pressure gauge (pumped liquid)

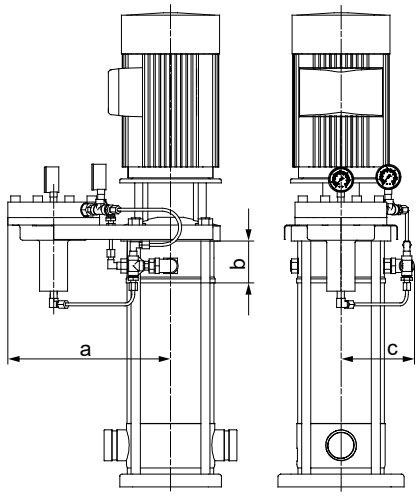
The seal chamber is primed with barrier liquid via a check valve (4) until the pressure gauge (8) reaches 21.7 to 29 psi (1.5 to 2 bar). The spring (7) is now preloaded with the barrier liquid pressure. The pump is primed and vented. When the pump is started, the pump pressure plus the pressure from the preloaded spring yields a pressure of 21.7 to 29 psi (1.5 to 2 bar) higher in the seal chamber.

Note: One pressure intensifier can only supply one pump. The pressure intensifier is fitted on the pump from factory.

The maximum operating pressure is 363 psi (25 bar).

Dimensions

All dimensions are in inches.



TM0144459

Dimensional sketch of a pump with a pressure intensifier

Pump type	a	b	c
CR, CRI, CRN 1, 3, 5	11.69	4.25	5.04
CR, CRI, CRN 10, 15, 20	12.99	3.54	5.51
CR, CRN 32	13.46	8.27	6.10
CR, CRN 45	13.74	9.45	6.46
CR, CRN 64	13.74	6.54	6.46

Note: The dimension "b" is the additional height as compared to the standard pump.

Tandem seal arrangement

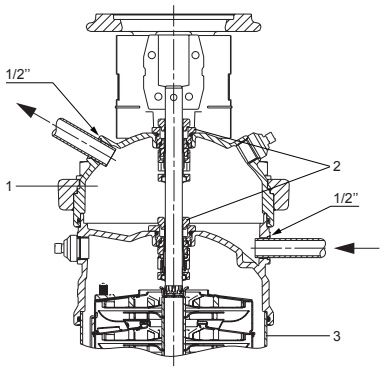
Tandem seal arrangements consist of two Grundfos cartridge shaft seals, type P, mounted tandem in a separate seal chamber.

We recommend tandem seals for crystallizing, hardening or sticky liquids.

The tandem seal arrangement is specially designed for operating pressures up to 363 psi (25 bar) and 248 °F (120 °C).

Note that for CR 1s-64 pumps, an option is available for temperatures from 248 to 302 °F (120 to 150 °C). The O-ring material in the shaft seal must be FXM (Fluoraz).

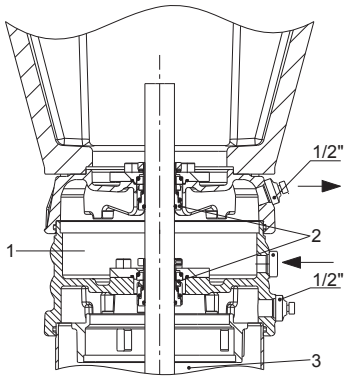
CR 1s, 1, 3, 5, 10, 15 and 20



TM033657

CR 1s to 20 with a tandem seal arrangement

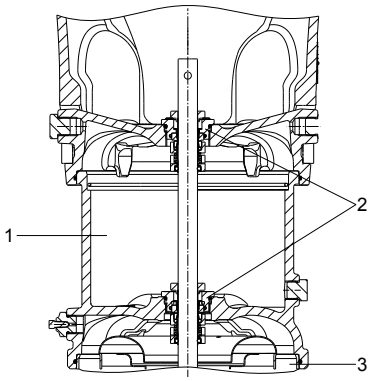
CR 32, 45 and 64



TM044164

CR 32 to 64 with a tandem seal arrangement

CR 95, 125 and 155



TM072101

CR 95, 125 and 155 with a tandem seal arrangement

Pos.	Description
1	Seal chamber
2	Shaft seals
3	Pump

The tandem type of seal is available for the following CR pumps:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	•	•	•
10, 15, 20	•	•	•
32, 45, 64	•		•
95 [13], 125 [13], 155 [13]	•		•
185, 215, 255			

[13] Available for pumps up to and including 75 hp (55 kW)

• Available.

Dimensions

Pump type	Additional height of seal chamber [inches (mm)]
CRI, CRN 1s, 1, 3, 5	4.25 (108)
CRI, CRN 10, 15, 20	3.54 (90)
CR, CRN 32	5.51 (140)
CR, CRN 45	6.30 (160)
CR, CRN 64	6.54 (166)
CR, CRN 95	8.23 (209)
CR, CRN 125	9.61 (244)
CR, CRN 155	9.61 (244)

Flushing-liquid systems

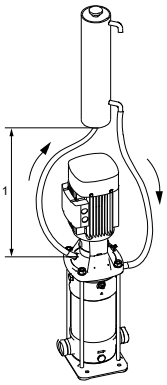
CR pumps with tandem seal arrangement must be equipped with a flushing-liquid system.

Note that the pumped liquid seeps through the lower (primary) shaft seal and is mixed with the flushing liquid.

The flushing-liquid flow rate must also be matched to the application, the recommended flow rate being 0.1 - 0.9 gpm. The pressure of the flushing liquid must always be lower than the pressure of the pumped liquid.

Note that the flushing-liquid supply must never be connected directly to the public water supply system. Local regulations must be observed.

The following figures show examples of flushing systems for tandem seal arrangements.



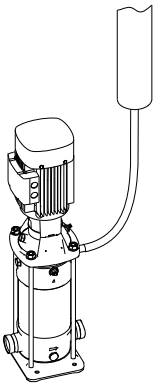
TM078889

Tandem seal arrangement with circulating flushing liquid

Pos.	Description
1	Minimum 3 ft

In tandem seal arrangements with circulating flushing liquid, the flushing liquid circulates between an elevated tank and the pump by natural circulation. Heated flushing liquid rises from the seal chamber to the tank where it cools down. The cooled-down flushing liquid returns to the seal chamber.

At high temperatures, the circulation of flushed liquid through the seal chamber cools the seal faces of the shaft seal and reduces noise.

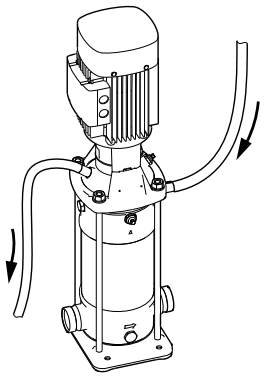


TM078890

Tandem seal arrangement with a flushing-liquid supply

In tandem seal arrangements with a flushing-liquid supply, the flushing liquid enters the seal chamber via a pipe from an elevated tank.

No heat is dissipated from the system.



TM033813

Tandem seal arrangement with flushing liquid connected to a drain

In tandem seal arrangements with flushing liquid connected to a drain, the flushing liquid enters the seal chamber via a pipe from an elevated tank.

In case of leakage, the pumped liquid is washed away to the drain by the flushing liquid.

Further information

For further information about Grundfos tandem seal arrangements, see the product guide on mechanical shaft seals available at the Grundfos Product Center.

Product guide	Link and publication number
Mechanical shaft seals for pumps	http://net.grundfos.com/qr/i/97506935

CR with air-cooled top

CR pumps with an air-cooled top are used where the pumping of hot liquids is crucial for a successful production. A CR pump with an air-cooled top is a pump with a special air-cooled shaft seal chamber. No external cooling is necessary. The ambient temperature is sufficient.

GR5228

CR pump with an air-cooled top

CR pumps with an air-cooled top have a mechanical silicon carbide/silicon carbide/EPDM cartridge shaft seal, type HQQE, as standard.

The pumps can handle liquid temperatures up to 356 °F (180 °C) at a maximum pressure of 363 psi (25 bar) for CR 1s-155 pumps. If the pumped liquid is oil, the pumps can handle liquid temperatures up to 464 °F (240 °C) at maximum 232 psi (16 bar).

The following rubber part variants are available for our air-cooled top solutions:

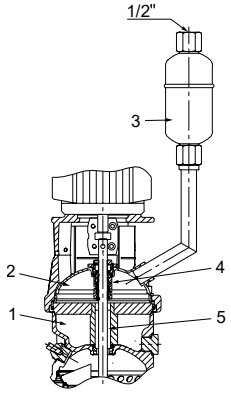
Pump size	Maximum pressure [psi (bar)]	Liquid temperature [°F (°C)]	Rubber part material
Water-based liquids			
CR 1s - 64	580 (40)	248-284 °F (120-140 °C)	EPDM
CR 1s - 155	363 (25)	248-356 °F (120-180 °C)	FXM/EPDM
Thermal oils			
CR 1s - 155	232 (16)	248-464 °F (120-240 °C)	FKM

Temperatures above 248 °F (120 °C) normally result in a substantial reduction of seal life due to poor lubrication of the seal faces. As the temperature in the seal chamber does not exceed 248 °F (120 °C) during operation, a standard Grundfos shaft seal can be used.

An automatic vent is required for venting the pump seal chamber.

Note that for safety reasons, you must fit a pipe in order to lead away steam from the vent to a drain. Local regulations must be observed.

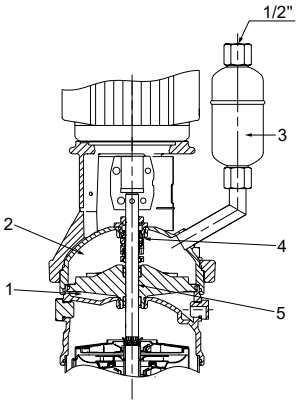
CR 1s, 1, 3 and 5



TM039159

CR 1s, 1, 3 and 5 with an air-cooled top

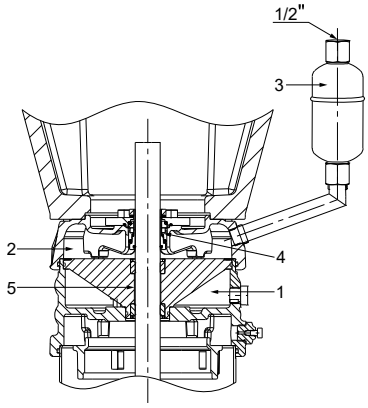
CR 10, 15 and 20



TM039160

CR 10, 15 and 20 with an air-cooled top

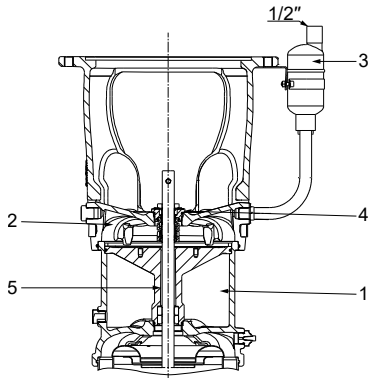
CR 32, 45 and 64



TM044165

CR 32, 45 and 64 with an air-cooled top

CR 95, 125 and 155



TM072099

CR 95, 125 and 155 with an air-cooled top

Pos.	Description
1	Air chamber
2	Liquid
3	Vent
4	Shaft seal
5	Cooling channel

Pump range

The air-cooled top is available for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5		•	•
10, 15, 20		•	•
32, 45, 64	•		•
95 [14], 125 [14], 155 [14]	•		•
185, 215, 255			

[14] Available for pumps up to and including 75 hp (55 kW)

• Available.

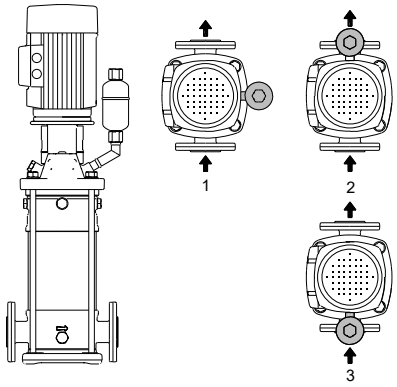
Bearing flanges for CR pumps with an air-cooled top

When pumping hot liquids, the pump requires a net positive inlet pressure according to the vapor pressure of the specific liquid.

If the vapor pressure of the liquid exceeds the maximum inlet pressure of the pump, a bearing flange is required.

Vertical CR pumps with an air-cooled top

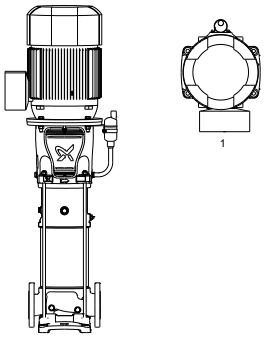
The vent of vertical CR pumps with an air-cooled top is in line with the outlet port (12 o'clock position) as standard. See possible vent positions in the figures below.



TM033659

Vent positions on vertical CR 1s-64 pumps

Pos.	Description
1	3 o'clock
2	12 o'clock
3	6 o'clock



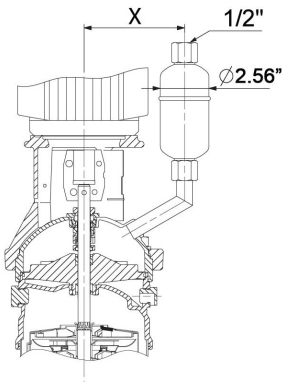
TM073057

Vent positions on vertical CR 95-155 pumps

Pos.	Description
1	12 o'clock

Dimensions

All dimensions are in inches.



TM057333

Dimensions of vertical CR pumps with air-cooled top

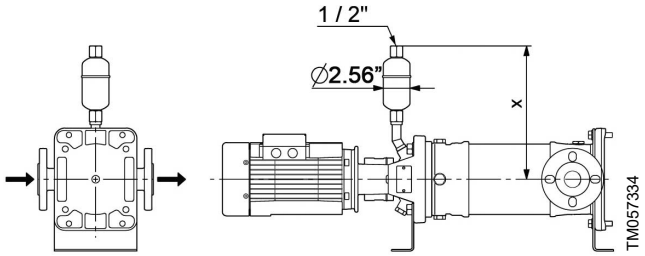
Pump type		X [inches (mm)]
CRI, CRN 1s, 1, 3, 5	(≤3 hp) (< 3 kW)	5.59 (142)
CRI, CRN 1s, 1, 3, 5	(3-10 hp) (3 - 7.5 kW)	6.77 (172)
CRI, CRN 10, 15, 20	(≤5 hp) (< 4 kW)	6.14 (156)
CRI, CRN 10, 15, 20	(7.5 - 10 hp) (4 - 7.5 kW)	7.32 (186)
CRI, CRN 10, 15, 20	(15-25 hp) (11 - 18.5 kW)	8.54 (217)
CR, CRN 32		6.93 (176)
CR, CRN 45, 64		7.32 (186)
CR, CRN 95, 125, 155	(7.5 - 10 hp) (5.5 - 7.5 kW)	8.66 (220)
CR, CRN 95, 125, 155	(15-30 hp) (11-22 kW)	9.65 (245)
CR, CRN 95, 125, 155	(40-50 hp) (30-37 kW)	10.63 (270)
CR, CRN 95, 125, 155	(75 hp) (55 kW)	12.60 (320)

Additional pump height

Pump type	Additional pump height [inches (mm)]
CRI, CRN 1, 3, 5	4.25 (108)
CRI, CRN 10, 15, 20	3.54 (90)
CR, CRN 32	5.51 (140)
CR, CRN 45	6.30 (160)
CR, CRN 64	6.54 (166)
CR, CRN 95	8.23 (209)
CR, CRN 125, 155	9.61 (244)

Horizontal CR pumps with an air-cooled top

On horizontal pumps, the vent is mounted on the top.



TM057334

Vent position and dimensions of horizontal CR pumps with an air-cooled top

Dimensions

Pump type	X [inches (mm)]
CRI, CRN 1s, 1, 3, 5	12.13 (308)
CRI, CRN 10, 15, 20	12.76 (324)
CR, CRN 32	15.39 (391)
CR, CRN 45, 64	15.67 (398)
CR, CRN 95	14.02 (356)
CR, CRN 125, 155	15.04 (382)

Magnetic-drive pump (MAGdrive)

Grundfos CRN MAGdrive pumps operate according to a patented, magnetic-drive system that eliminates the need for shaft seals. The power from the motor is transmitted to the pump by magnetic force and not by a conventional coupling. Combined with a semi-hermetically sealed liquid end, the pump is essentially leak-free.

As all axial forces are absorbed in the MAGdrive system, the pump incorporates a standard NEMA motor with keyway and deep-groove ball bearing.

GRA4445

CRN MAGdrive pumps

The MAGdrive solution is available for the following pumps:

Pump type	CRN
1s, 1, 3, 5	●
10, 15, 20	●
32 [15], 45 [15], 64 [15]	●
95, 125, 155	
185, 215, 255	

[15] Available up to 30 hp (22 kW)

● Available.

As minimum, a soft starter is required for the following motors:

- 2-pole motors: 25 and 30 hp (18.5 and 22 kW)
- 4-pole motors: 1 1/2 hp (1 kW) and up.

Features and benefits

CRN MAGdrive offers the following special features and benefits:

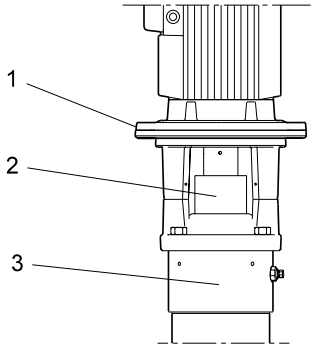
- a semi-hermetically sealed drive system for essentially leak-free pump operation
- a self-regulating heat-tracing cable for eliminating ice formation
- special choice of materials and design for low energy loss
- simple pump design for ease of service
- unique pump design for efficient cooling of magnet by the pumped liquid
- ATEX version available for EEC countries.

Applications

The CRN MAGdrive pump is suitable for a wide selection of industrial applications, such as:

- aggressive or corrosive liquids, for example, concentrated sulphuric acid, nitric acid, phosphoric acid, and similar
- toxic liquids, for example, trichloroethylene, chloroform, phenol, and similar
- flammable liquids, for example, petrol, jet fuels, LPG, alcohols, and similar
- hardening/curing liquids, for example, paint, glue, resins, and similar
- crystallizing liquids, for example, glycol additives, naphthalene, sugar products, salts, and similar
- refrigerants, for example, ammonia and synthetic chemicals (HCFC, HFC).

Design



TM039149

MAGdrive system

Pos.	Description	Material
1	Motor stool	Cast iron. Stainless steel on request
2	MAGdrive	-
3	Pump head	Stainless steel (EN 1.4408)

The configuration of the CRN MAGdrive pump is almost identical to that of the standard CRN pump.

The following rubber parts solutions are available:

- EPDM
- FXM (Fluoraz®)
- FFKM (Kalrez®)
- FKM (Viton®)
- CR (Neoprene), available for CRN 1 - 20.

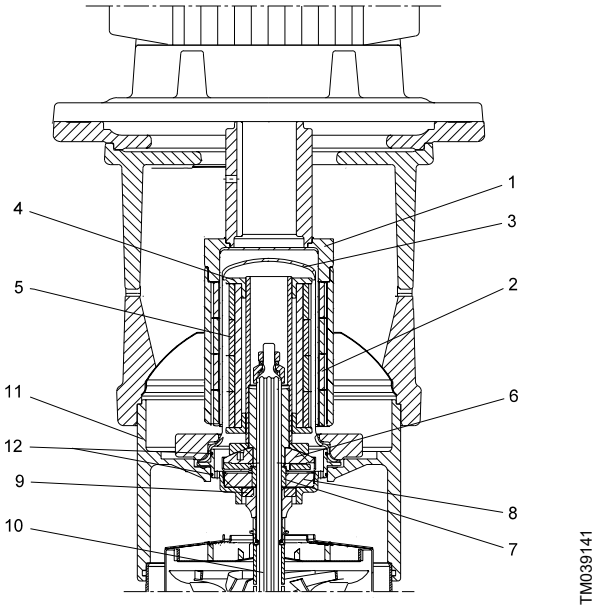
Connections available for CRN MAGdrive pumps:

Connection type	CRN	
	1s, 1, 3, 5, 10, 15, 20	32, 45, 64
DIN, ANSI, JIS flange	•	•
PJE	•	•
FlexiClamp, union, oval flange, TriClamp	•	

• Available.

Construction

The magnetic field is generated by two magnets: the outer magnet is driven by the motor, and the inner magnet is connected to the pump. The two shafts are not connected.



Sectional drawing of a MAGdrive system

Pos.	Description	Material
1	Outer drive	AISI 304 SS
2	Outer magnets	NdFeB (neodymium)
3	Can	AISI 904L SS
4	Inner drive	AISI 316 SS
5	Inner magnets	NdFeB (neodymium)
6	Rotating thrust bearing	SiC Q_1^G (silicon carbide, carbon-filled)
7	Stationary thrust bearing	SiC Q_1^G (silicon carbide, carbon-filled)
8	Radial bearing	SiC (silicon carbide)
9	Upthrust bearing	Graflon (carbon-graphite-filled PTFE)
10	Drive/pump shaft	CRN 1s-5: AISI 316 SS CRN 10-20: AISI 329 SS CRN 32-64: SAF 2205
11	Pump head	CF 8M (cast equiv. of AISI 316 SS)
12	O-ring	EPDM, FKM, FXM, FFKM

Operating conditions

Maximum pressure: 363 psi (25 bar).

Temperature range: -40 to +248 °F (-40 to +120 °C).

Viscosity range: 0.15 - 300 centipoise.

Technical data

Motor range: 1/2 to 30 hp (0.37 to 22 kW).

Dimensions

The height of the MAGdrive system typically makes the pump a little higher than a standard CRN pump. Some pump sizes have a larger motor than the standard range.

For dimensions and weights for CRN MAGdrive pumps, see section about dimensional drawings for CRN pumps with magnetic drive.

Note: When ordering a Grundfos MAGdrive, the following information is required for the selection of the correct MAGdrive/motor combination:

- liquid temperature [°F]
- liquid viscosity [centipoise or mPas]
- liquid density [lb/ft^3]
- frequency [Hz].

Self-regulating heat-tracing cable

In pumped liquid temperatures below 32 °F (0 °C), humidity in the surrounding air may lead to ice formation on the MAGdrive unit. Over time, the ice can block the outer part of the MAGdrive when the pump is stopped. A self-regulating heat-tracing cable, mounted in a holder that fits the outer part of the MAGdrive, solves this problem by preventing ice formation, reducing the need for time-consuming maintenance and contributing to an improved uptime.

The heat-tracing cable automatically adjusts the heat output in response to increasing or decreasing ambient temperatures, keeping the MAGdrive ice-free and the pump running at all times. It is suitable for use in safe, hazardous, and corrosive areas.

The heat-tracing cable is quick and easy to install. Connect the cable to 1 x 220-240 V, 50/60 Hz power supply.

The heat-tracing cable is available for the following CRN MAGdrive pumps:

Pump type	CRN
1s, 1, 3, 5	
10, 15, 20 [16)]	•
32, 45, 64	
95, 125, 155	
185, 215, 255	

[16)] Available up to and including 7 1/2 hp (5.5 kW).

• Available.

Related information

Dimensional drawings - CRN pumps with magnetic drive

8. Pump

We offer customized pump solutions for the following maximum allowed operating pressures:

Pump type	CR	CRI	CRN
	[psi (bar)]	[psi (bar)]	[psi (bar)]
1s, 1, 3, 5,	363 (25)	363 (25)	363 (25)
10, 15, 20	363 (25)	363 (25)	363 (25)
32, 45, 64	580 (40)	-	580 (40)
5, 125, 155	435 (30)	-	580 (40)
185, 215, 255	580 (40)		580 (40)

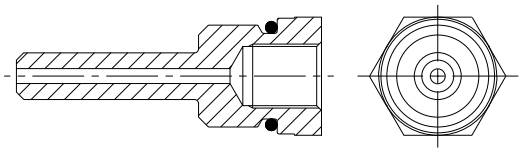
Note: In applications with high inlet pressures, a bearing flange must be fitted or a high pressure pump (CR SF) must be used. For further information, see the high-pressure product guide available at the Grundfos Product Center.

Measurement of inlet pressure

As CR 1s to CR 20 pumps are not equipped with a connection for the measurement of pump inlet pressure, we offer customized pumps with a tapping for a pressure gauge or pressure sensor.

TM034726

CR pump with a pressure gauge



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Insert for measurement of inlet pressure

The material of the insert is stainless steel (AISI 316).

Designation	Rubber material	Connection	Product number
Insert for measurement of inlet pressure	CR 1s, 1, 3, 5		
	EPDM	NPT 1/4"	99566644
	FKM		99566646
	CRI, CRN 1s, 1, 3, 5		
	EPDM	NPT 1/4"	99566645
	FKM		99566647
	CR 10, 15, 20		
	EPDM	NPT 1/4"	99566673
	FKM		99566674
	CRI, CRN 10, 15, 20		
	EPDM	NPT 1/4"	99566661
	FKM		99566662

We offer the following pump types with tappings:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	•	•	•
10, 15, 20	•	•	•
32, 45, 64			
95, 125, 155			
185, 215, 255			

• Available.

CR, CRE, CRN, CRNE 32, 45, 64, 95, 125, 155, 185, 215 and 255 have pressure gauge ports for measurement of pump inlet pressure as standard.

Pumping of liquids down to -40 °F

We offer customized pumps for the pumping of liquids down to -40 °F (-40 °C). The pumps have an oversize neck ring ensuring that impellers do not seize up due to thermal expansion.

We offer the above solution for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5		•	•
10, 15, 20		•	•
32, 45, 64			•
95, 125, 155			•
185, 215, 255			•

• Available.

Carbon-free pumps

Certain processes, such as pumping of pure water in electronics industries, require pumps that do not contain carbon.

To meet such requirements, we offer the following 100 % carbon-free pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	❍	❍	❍
10, 15, 20	❍	❍	❍
32, 45, 64	●		●
95, 125, 155	●		●
185, 215, 255	●		●

● Available

❍ Pumps with an HQQx shaft seal are carbon-free as standard

CRN all-stainless steel pumps

We offer customized stainless steel CRN pumps for maritime applications and very humid environments:

- pump with stainless steel motor stool
- pump with stainless steel base
- pump with stainless steel flanges.

The dimensions of customized stainless steel CRN pumps do not differ from those of standard CRN pumps.

We offer the above solutions for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5			●
10, 15, 20			●
32, 45, 64			●
95 [17], 125 [17], 155 [17]			●
185 [17], 215 [17], 255 [17]			●

[17] For CR, CRN 95 - 255, we do not offer a stainless steel motor stool. Instead, we offer improved corrosion protection in form of painted coating. See corrosion protection standard and categories in the section on surface treatment.

● Available

Surface treatment

See the overview of applications and corresponding surface treatments in the following table:

	Surface treatment					
Applications	Cleaned and dried	Cleaned and dried, PWIS-free	Vacuum-dried	Electropolished	Alternative colouring	Corrosion protection
Offshore						●
Pharmaceutical industry, food and beverage industry	●	●		●		
Automotive industry		●				
Cooling industry			●			

Cleaned and dried pumps

Cleaned and dried pumps are used in applications involving strict demands to cleanliness and surface quality, such as low content of silicone.

To meet such strict demands, we offer the following cleaned and dried pump types:

Pump type	CRI	CRN
1s, 1, 3, 5	●	●
10, 15, 20	●	●
32, 45, 64		●
95, 125, 155		
185, 215, 255		

● Available.

Prior to assembly, all pump parts are cleaned in 140 to 158 °F (60 to 70 °C) water with a cleaning agent. Then all pump parts are thoroughly rinsed in de-ionized water, and air-dried. The pump is assembled without any use of silicone lubricants. Finally, the pump is packed in silicone-free plastic.

De-oiled shaft seals are available as an option for CRI and CRN 1s to 64 pumps.

CRN 95 to 255 pumps ordered as cleaned and dried, PWIS-free, are fitted with a de-oiled shaft seal as standard.

PWIS means Paint-Wetting Impairment Substances.

The term is used to describe substances that inhibit or destroy the ability of paint to adhere to surfaces.

A PWIS-free environment is mainly required in the automotive industry and in paint shops.

PWIS-free pumps are manufactured according to the specifications below:

- All components of the pump including shaft seal, motor, rubber materials for shaft seals, do not contain or release PWIS.

- Before being assembled, pump components are washed in pure, hot soap water, rinsed in de-ionized water and dried.
- Consumables like oil, grease and soap water not containing PWIS, are used during assembly.
- Tools for product assembly do not contain any PWIS.
- The product is not performance tested.
- The finished product is wrapped in a special PWIS-free plastic bag before being packed for shipment.

We offer the following PWIS-free pumps:

Pump type	CRI	CRN
1s, 1, 3, 5		●
10, 15, 20		●
32, 45, 64		●
95, 125, 155		●
185, 215, 255		●

● Available.

Vacuum-dried pumps

In general, all CR products are tested before leaving the assembly line.

After the test, all pumps are drained. Due to the design of the chamber stack, it is not possible to completely drain the product. Primarily within cooling applications, no residual water from the test is accepted in the pump, and all pumps must be completely dry. After the pump performance test, vacuum-dried pumps are therefore handled as described below:

1. Water is blown out of the pump with compressed air.
2. The pump is ventilated with hot air for a predefined period of time.
3. The pump is exposed to vacuum for a predefined period of time.
4. The humidity inside the pump is measured.

If necessary, steps 2 and 3 are repeated until the humidity level reaches a predefined value ensuring that no liquid is present inside the pump.

We offer the following vacuum-dried pumps:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	●	●	●
10, 15, 20, 32	●	●	●
45, 64	-	-	-
95, 125, 155	-	-	-
185, 215, 255	-	-	-

● Available.

Electropolished 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 regarding 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.

All cast parts of CRN 1s-20 pumps are polished mechanically before being electropolished.

Note that the pump incorporates a standard shaft seal that has not been polished.

To meet the strict hygienic requirements to material and surface quality, we offer electropolished stainless steel CRN pumps with the following surface quality:

Pump type	Cast stainless steel parts	Stainless steel parts (not cast)	Surface quality
CRN 1s, 1, 3, 5	●	●	Ra ≤ 0.8 µm
CRN 10, 15, 20	●	●	Ra ≤ 0.8 µm
CRN 32, 45, 64	●		Ra ≤ 8.0 µm
		●	Ra ≤ 0.8 µm
CRN 95, 125 [18], 155 [18]	●		Ra ≤ 8.0 µm
		●	Ra ≤ 0.8 µm

[18] Available for pumps up to and including 75 hp (55 kW)

● Available.

We offer the following electropolished pumps:

Pump type	CR	CRI	CRN
1s, 1, 3, 5			●
10, 15, 20			●
32, 45, 64			●
95, 125, 155			●
185, 215, 255			

● Available.

Alternative coloring

We offer customized pumps in any NCS- or RAL-specified color 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 coloring.

Corrosion protection

We offer corrosion protection in form of painting and in several categories according to the specific requirements of the pump installation.

The categories refer to area or environment, layer thickness and lifetime expectancy.

Corrosion protection is according to DS/EN ISO standard 12944.

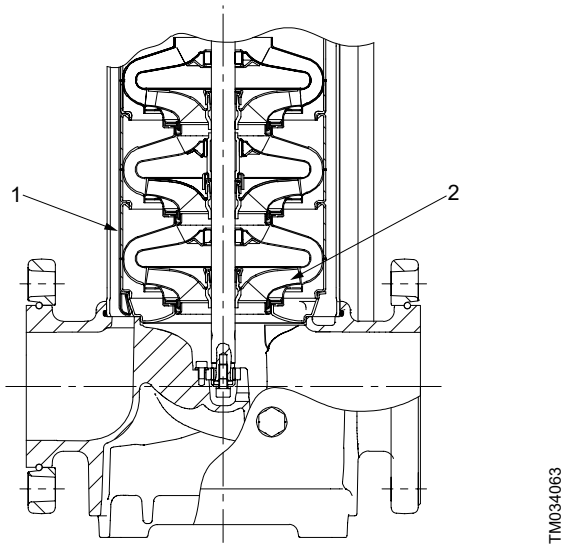
Corrosion category	Validity	Chemical resistance test	Tropical test	Salt mist test
		[hours]	[hours]	[hours]
C2	Low		48	
	Medium		48	
	High		120	
C3	Low		48	120
	Medium		120	240
	High		240	480
C4	Low		120	240
	Medium		240	480
	High		480	720
C5-I	Low	168	240	480
	Medium	168	480	720
	High	168	720	1440
C5-M	Low		240	480
	Medium		480	720
	High		720	1440

CR low NPSH

Cavitation is often a problem in applications where pumps have to deal with the combination of high liquid temperatures, poor inlet pressure or high flow rate. Low-NPSH pumps are designed to reduce the risk of cavitation and ensure stable and reliable operation.

The CR low-NPSH pump is a pump with a special first-stage design that reduces the NPSH value of the pump and prevents erosion or destruction of the pump, pipes and valves. Due to the improved inlet design, low-NPSH pumps can handle more stress than conventional pumps without affecting the stability of operation.

The CR low-NPSH pump reduces the excess pressure itself and does not require an additional tank to provide supplementary pressure. In boiler feed applications where many large tanks are gathered, a compact system is an advantage.



Sectional drawing of a CR low-NPSH pump

Pos.	Description
1	Special inlet part
2	Special inlet impeller

Pump range

The following pump types are available as low-NPSH pumps:

Pump type	CR	CRI	CRN
1s, 1			
3, 5	•	•	•
10, 15, 20	•	•	•
32, 45, 64	•		•
95, 125, 155			
185, 215, 255			

• Available.

Maximum pressure	363 psi (25 bar)
Maximum liquid temperature	248 °F [19] (120 °C)

[19] With air-cooled top, the maximum liquid temperature is 356 °F (180 °C).

Further information about CR low NPSH

- Performance curves are provided in section about low-NPSH pumps with 2-pole motor.
- Dimensions and weights are provided in section about dimensional drawings for CR low-NPSH pumps.
- The continuous feed boiler pumps require a bypass orifice to be placed on the outlet side of the pump to maintain a minimum flow rate. See the bypass orifice chart for continuous feed boilers.
- CR low-NPSH pump sizing charts are available for on-off feed boilers and for continuous feed boilers.

The pump selection must be verified to account for specific boiler application and local, state, and federal codes.

Due to the larger first-stage impeller, some CR low-NPSH pumps require a larger motor than the standard CR pumps.

Some CR low-NPSH pump ends have a taller overall pump height than the standard CR pump ends. The taller overall pump height is due to a larger motor stool on some CR low-NPSH pump models.

Related information

Low-NPSH pumps with 2-pole motor

Dimensional drawings for CR low-NPSH pumps

CRE low-NPSH pumps dimensional data

Bypass orifices for CR, CRI, CRN 1s-20, continuous feed boilers

CR low-NPSH pump sizing chart for on-off feed boilers, 60 Hz

CR low-NPSH pump sizing chart for continuous feed boilers, 60 Hz

Continuous feed boiler chart

The design flow rate is based on 1.5 times the evaporation rate plus the by-pass flow. The pump design pressure is 10 to 15 psi (0.68 to 1.03 bar) higher than the boiler pressure. Some pumps need to be throttled to meet the flow rate for which they are sized.

The NPSH required of the pump is available on the performance curve. The NPSH available must be checked for each system.

A bypass orifice must be placed on the outlet to maintain minimum flow rate.

On-off feed boiler chart

The design flow rate is based on 2.0 times the evaporation rate. The pump design pressure is 10 to 15 psi (0.68 to 1.03 bar) higher than the boiler pressure. Some pumps need to be throttled to meet the flow rate for which they are sized.

The NPSH required of the pump is available on the performance curve. The NPSH available must be checked for each system.

Horizontal in-line pumps

GR5379_HORIZONTAL

Horizontal CR pump

Horizontal pumps are used in applications for safety or space-saving reasons.

In areas prone to earthquakes, horizontal pumps are more reliable than vertical pumps. In case of earthquake, the design and mounting of the pump dampen the oscillations of the pump.

In installations with limited access or space, we recommend horizontal pumps to improve installation and service.

Pump range

The following Grundfos pumps are available for horizontal mounting:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	●	●	●
10, 15, 20	●	●	●
32, 45, 64	●		●
95, 125, 155	●		●
185, 215, 255	●		●

● Available.

Foot-mounted motors are required on CR, CRE, CRI, CRIE, CRN, CRNE 5, 10, 15, 20 pumps with a motor size of 7 1/2 hp or larger.

A foot-mounted motor is required for all CR, CRE, CRI, CRIE, CRN, CRNE 32, 45, 64, 95, 125, 155, 185, 215 and 255 pumps.

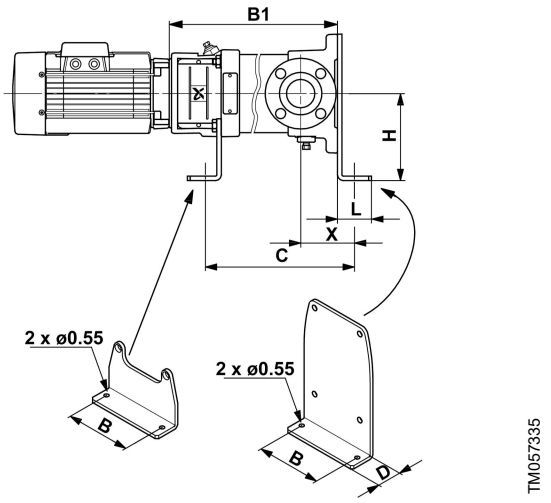
Horizontal mounting kits

Material Number	Description
91134594	Horizontal mount kit CR 1s, 1, 3, 5
91136738	Horizontal mount kit CR(N) 1, 3, 5, 213TC
91136734	Horizontal kit (CR(N) 10, 15, 20, 56C, 182TC
91136733	Horizontal mount kit CR(N) 10, 15, 20, 213TC
91136731	Horizontal mount kit CR(N) 10, 15, 20, 254TC
91136739	Horizontal mount kit CR(N) 10, 15, 20, 284TC
99072958	Horizontal mount kit LACR(N), 182/184TC
99072960	Horizontal mount kit LACR(N), 213/215TC
99046164	Horizontal mount kit LACR(N), 254/256TC
99046165	Horizontal mount kit LACR(N), 284/286TSC
99046166	Horizontal mount kit LACR(N), 324/326TSC
99046167	Horizontal mount kit LACR(N), 364/365TSC

Dimensions of horizontal in-line pumps

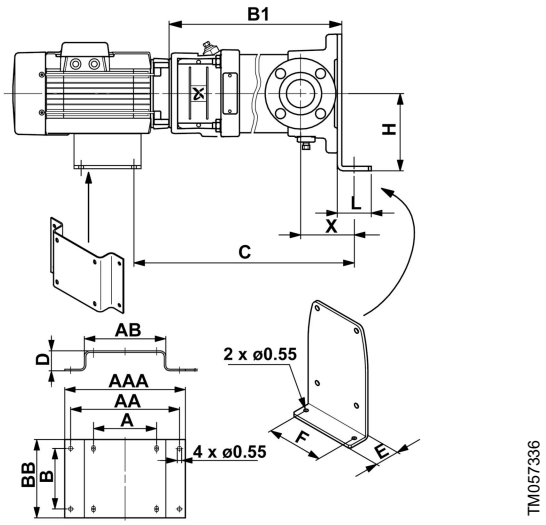
All dimensions are in inches.

CR, CRE, CRI, CRIE, CRN, CRNE 1s, 1, 3, 5 (≤ 5 hp) and 10, 15, 20 (≤ 5 hp)



TM057335

CR, CRE, CRI, CRIE, CRN, CRNE 5 (7 1/2 - 10 hp) and 10, 15, 20 (≥ 7 1/2 hp)



TM057336

CR, CRE, CRI, CRIE, CRN, CRNE 1s, 1, 3, 5 (≤ 5 hp), support for base plate and pump head

Motor [hp]	B	C	D	H	L	X	
						ANSI	Oval, PJE, FlexiClamp
1/2 - 2	5.43	B1 - 3.25	1.77	5.51	1.97	4.18	3.18
3-5	5.43	B1 - 4.15	1.77	5.51	1.97	4.18	3.18

Note: For pump height (B1), and for combined pump and motor height (B1+B2), see the CR, CRI, CRN or the CRE, CRIE, CRNE product guide.

CR, CRE, CRI, CRIE, CRN, CRNE 5 (7 1/2 - 10 hp)

Motor [hp]	A	AA	AAA	AB	B	BB	C	D	E	F	H	L	X	
													ANSI	Oval, PJE, Flexiclamp
7 1/2	8.50	12.83	14.41	10.87	5.51	7.09	B1 + 4.69	2.68	1.77	5.43	7.87	1.97	4.18	3.18
10	8.50	12.83	14.41	10.87	5.51	7.09	B1 + 4.69	2.68	1.77	5.43	7.87	1.97	4.18	3.18

Note: For pump height (B1), and for combined pump and motor height (B1+B2), see the CR, CRI, CRN or the CRE, CRIE, CRNE product guide.

CR, CRE, CRI, CRIE, CRN, CRNE 10, 15, 20 (≤ 5 hp), support for base plate and pump head

Motor [hp]	B	C	D	H	L	X
						ANSI, Oval, PJE, FlexiClamp
1/3 - 2	6.69	B1 - 3.44	1.77	6.85	1.97	4.68
3-5	6.69	B1 - 9.88	1.77	6.85	1.97	4.68

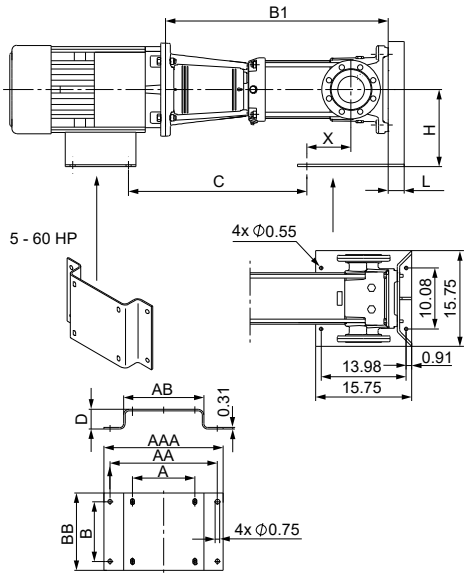
Note: For pump height (B1), and for combined pump and motor height (B1+B2), see the CR, CRI, CRN or the CRE, CRIE, CRNE product guide.

CR, CRE, CRI, CRIE, CRN, CRNE 10, 15, 20 (≥ 7 1/2 hp), support for base plate and motor

Motor [hp]	A	AA	AAA	AB	B	BB	C	D	E	F	H	L	X
													ANSI, Oval, PJE, FlexiClamp
7 1/2	8.50	12.83	14.41	10.87	5.51	7.08	B1 + 4.69	2.68	1.77	6.69	7.87	1.97	4.68
10	8.50	12.83	14.41	10.87	5.51	7.08	B1 + 4.69	2.68	1.77	6.69	7.87	1.97	4.68
15	10.00	15.11	16.69	13.15	8.27	10.24	B1 + 5.44	1.57	1.77	6.69	7.87	1.97	4.68
20	10.00	15.11	16.69	13.15	8.27	10.24	B1 + 5.44	1.57	1.77	6.69	7.87	1.97	4.68
25	10.00	15.11	16.69	13.15	8.27	10.24	B1 + 6.12	1.57	1.77	6.69	7.87	1.97	4.68
30	10.98	16.89	18.46	14.92	9.88	12.24	B1 + 6.12	0.87	1.77	6.69	7.87	1.97	4.68

Note: For pump height (B1), and for combined pump and motor height (B1+B2), see the CR, CRI, CRN or the CRE, CRIE, CRNE product guide.

CR, CRE, CRN, CRNE 32, 45, 64, support for base plate and motor

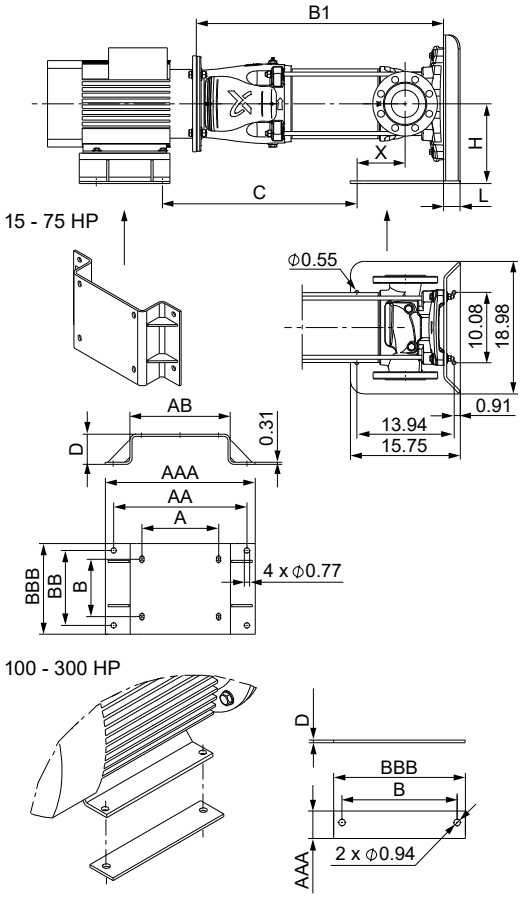


TM057337

Motor [hp]	A	AA	AAA	AB	B	BB	C	D	H	L	X	
											CR 32 ANSI	CR 45, 64 ANSI
5	7.52	14.57	16.93	10.83	5.51	7.09	B1 - 9.22	6.93	11.42	2.36	8.36	6.98
7 1/2	8.50	15.55	17.91	11.81	7.09	8.66	B1 - 8.19	6.18	11.42	2.36	8.36	6.98
10	8.50	15.55	17.91	11.81	7.09	8.66	B1 - 8.19	6.18	11.42	2.36	8.36	6.98
15	10.00	17.91	20.28	13.39	10.04	12.20	B1 - 7.35	5.16	11.42	2.36	8.36	6.98
20	10.00	17.91	20.28	13.39	10.04	12.20	B1 - 7.35	5.16	11.42	2.36	8.36	6.98
25	11.02	19.09	21.46	14.37	11.02	13.39	B1 - 6.97	4.41	11.42	2.36	8.36	6.98
30	11.02	19.09	21.46	14.37	11.02	13.39	B1 - 6.97	4.41	11.42	2.36	8.36	6.98
40	11.02	19.09	21.46	14.37	11.02	13.39	B1 - 6.48	4.41	11.42	2.36	8.36	6.98
50	12.52	21.26	23.62	16.14	12.01	14.37	B1 - 6.48	3.43	11.42	2.36	8.36	6.98
60	14.02	22.83	25.20	17.72	12.28	14.65	B1 - 6.09	2.40	11.42	2.36	8.36	6.98

Note: For pump height (B1), and for combined pump and motor height (B1+B2), see the CR, CRI, CRN or the CRE, CRIE, CRNE product guide.

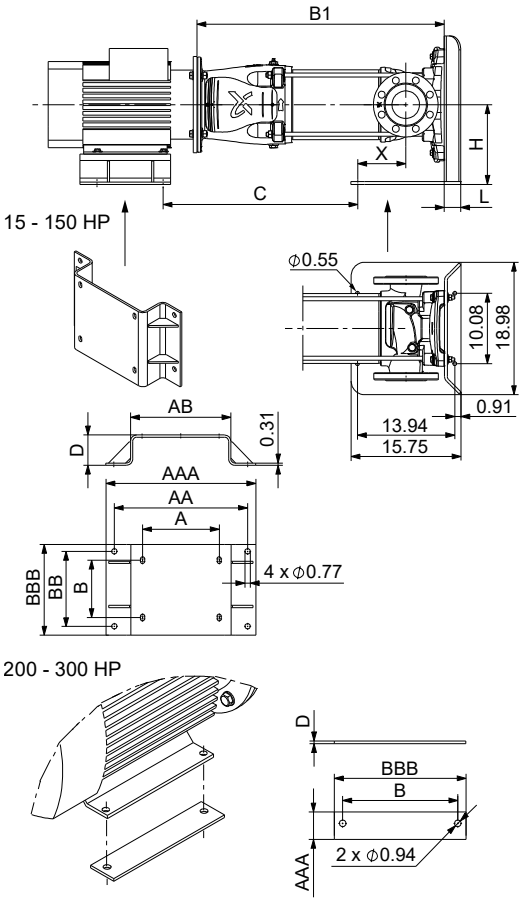
CR, CRE, CRN, CRNE 95, 125, 155, support for base plate and motor



Motor [hp]	A	AA	AAA	AB	B	BB	BBB	C	D	H	L	X	
												CR 95 ANSI	CR 125, 155 ANSI
15	10.00	17.91	20.28	13.39	9.15	9.15	12.20	B1 - 7.34	5.16	11.42	2.36	6.97	5.39
20	10.00	17.91	20.28	13.39	9.15	9.15	12.20	B1 - 7.34	5.16	11.42	2.36	6.97	5.39
25	11.02	19.09	21.46	14.37	10.24	10.24	13.39	B1 - 6.97	4.41	11.42	2.36	6.97	5.39
30	11.02	19.09	21.46	14.37	10.24	10.24	13.39	B1 - 6.97	4.41	11.42	2.36	6.97	5.39
40	12.52	21.26	23.62	16.14	11.22	11.22	14.37	B1 - 6.48	3.43	11.42	2.36	6.97	5.39
50	12.52	21.26	23.62	16.14	11.22	11.22	14.37	B1 - 6.48	3.43	11.42	2.36	6.97	5.39
60	14.02	22.83	25.2	17.72	11.75	11.75	14.65	B1 - 6.09	2.40	11.42	2.36	6.97	5.39
75	14.02	22.83	25.2	17.72	11.75	11.75	14.65	B1 - 6.09	2.40	11.42	2.36	6.97	5.39
100	-	-	3.50	-	13.74	-	16.65	B1 - 5.46	-	11.42	2.36	-	5.39
125	-	-	4.72	-	16.50	-	23.62	B1 - 4.63	-	11.42	2.36	-	5.39
150	-	-	4.72	-	16.50	-	23.62	B1 - 4.63	-	11.42	2.36	-	5.39
200	-	-	4.72	-	25.00	-	32.28	B1 - 4.98	-	11.42	2.36	-	5.39
250	-	-	4.72	-	25.00	-	32.28	B1 - 4.98	-	11.42	2.36	-	5.39
300	-	-	4.72	-	25.00	-	32.28	B1 - 4.98	-	11.42	2.36	-	5.39

Note: For pump height (B1), and for combined pump and motor height (B1+B2), see the CR, CRN 95-255 or the CRE, CRIE, CRNE product guide.

CR, CRN 185, 215, 255 support for base plate and motor



Motor [hp]	A	AA	AAA	AB	B	BB	BBB	C	D	H	L	X
												CR 185, 215, 255 ANSI
40	12.52	21.26	23.62	16.14	11.22	11.22	14.37	B1 - 6.48	5.20	13.19	2.36	4.61
50	12.52	21.26	23.62	16.14	11.22	11.22	14.37	B1 - 6.48	5.20	13.19	2.36	4.61
60	14.02	22.83	25.20	17.72	11.75	11.75	14.65	B1 - 6.09	4.17	13.19	2.36	4.61
75	14.02	22.83	25.20	17.72	11.75	11.75	14.65	B1 - 6.09	4.17	13.19	2.36	4.61
100	15.98	25.59	27.95	20.47	13.74	13.74	18.50	B1 - 5.46	3.19	13.19	2.36	4.61
125	18.00	27.56	29.92	22.44	16.50	16.50	20.47	B1 - 4.63	2.19	13.19	2.36	4.61
150	18.00	27.56	29.92	22.44	16.50	16.50	20.47	B1 - 4.63	2.19	13.19	2.36	4.61
200	-	-	4.72	-	25.00	-	32.28	B1 - 4.98	-	13.19	2.36	4.61
250	-	-	4.72	-	25.00	-	32.28	B1 - 4.98	-	13.19	2.36	4.61
300	-	-	4.72	-	25.00	-	32.28	B1 - 4.98	-	13.19	2.36	4.61

Note: For pump height (B1), and for combined pump and motor height (B1+B2), see the CR, CRN 95-255 or the CRE, CRIE, CRNE product guide.

Horizontal end-suction pumps

TM051717

Horizontal end-suction pumps

CR-H, CRN-H, 60 Hz

CR-H, CRE-H, CRN-H and CRNE-H pumps are horizontal end-suction pumps, typically mounted on base plates. The pumps are available in a 60 Hz range with NEMA motors.

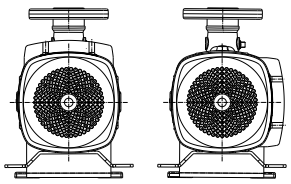
Interchangeable ANSI solution

The patented loose-flange concept provides easy installation in ANSI pipes.

Pump connection configurations comply with the ANSI/ASME B73.1 standard, and ensure interchangeability with traditional end-suction pumps with axial inlet port and radial center-line outlet port. This makes the CR-H a high-efficiency solution designed for ANSI-specified applications and drop-in replacement of ANSI-configured pumps. The back pull-out design enables service of most versions without removing the base from the pipes.

CR-H and CRN-H pumps are suitable for a variety of applications from pumping of drinking 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 have to meet specific demands.

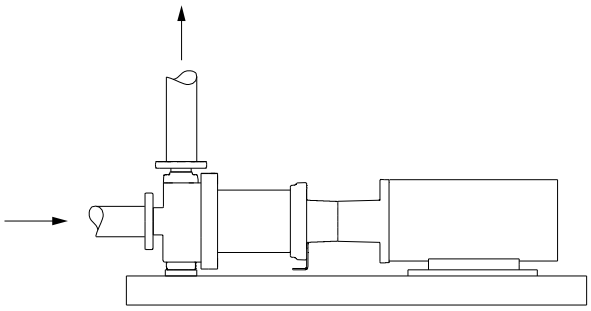
Terminal box positions



TM051988

Energy efficiency

To reduce loss and thus increase the pump efficiency, CR-H and CRN-H pumps are available in an energy-optimized version with inlet and outlet ports in a larger diameter than ANSI specifications.



TM051378

CR-H pump with axial inlet port and radial outlet port

Maximum pressure:	435 psi (30 bar)
Maximum liquid temperature:	248 °F (120 °C) (air-cooled top: 356 °F (180 °C)) (oil: 464 °F (240 °C))
Maximum motor size:	60 hp

NEMA motor

Pump type	CR-H	CRN-H
1s, 1, 3, 5	•	•
10, 15, 20	•	•
32, 45, 64	•	•
95, 125, 155		
185, 215, 255		

Variants

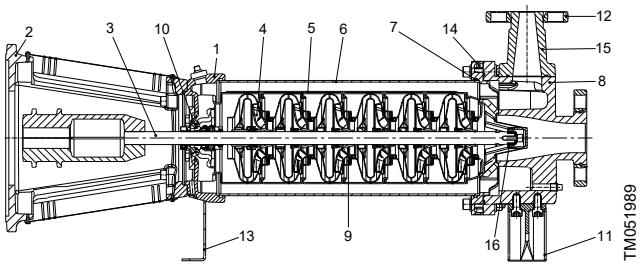
The same variants and accessories are available for the CR-H, CRN-H pump range as for the standard CR pump range.

Further information on CR-H pumps

For dimensions of CR-H pumps with NEMA motors, see the Grundfos Product Center. For further information about CR-H pumps, see the relevant product guide available at the Grundfos Product Center.

Product guide	Link and publication number
CRN-H, CRE-H, CRNE-H	http://net.grundfos.com/qr/i/98665987

Construction



Sectional drawing of horizontal end-suction pump

Pos.	Description	Pos.	Description
1	Pump head	9	Neck ring
2	Motor stool	10	Shaft seal
3	Shaft	11	Foot
4	Impeller	12	Flange ring
5	Chamber	13	Support bracket
6	Sleeve	14	Sleeve flange
7	O-ring for sleeve	15	Outlet port
8	Base	16	Bottom bearing ring

Belt-driven pumps

Belt-driven CR pump

Belt-driven pumps are used in applications for space-saving reasons or where no electrical power is available.

The belt-driven pump has a pulley for connection to an internal combustion engine. Belt-driven CR pumps are of the same construction as electrically driven CR pumps.

Pump range

The following Grundfos pumps are available as belt-driven pumps:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	•	•	•
10, 15, 20	•	•	•
32, 45, 64	•		•
95, 125, 155			
185, 215, 255			

• Available.

An additional bearing has been added on top of an existing bearing flange. The two bearings are fitted back to back. This bearing design makes it possible to withstand the extra radial forces caused by a pulley.

A pulley can be attached to the end of the shaft.

Note that the pulley is not supplied with the pump.

By pulley belts, the pump can be driven by a motor mounted next to it rather than on top of it.

The pump can be mounted horizontally or vertically by the extra support plates.

The pulley head is positioned on the motor stool where the motor would normally be fitted. By the existing holes in the motor stool, the pulley head can be secured to the motor stool with bolts, washers and nuts. The pulley wheel is then attached to the shaft using an appropriate bush and key.

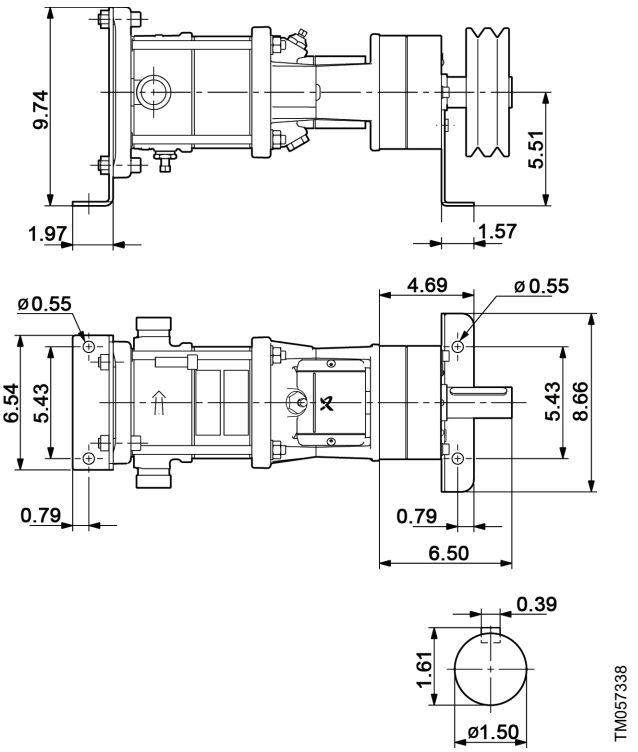
The maximum pump speed is 3000 rpm. Size and select the CR pumps from the CR 50 Hz performance curves.

For extended bearing life, we recommend the following pulley wheel sizes:

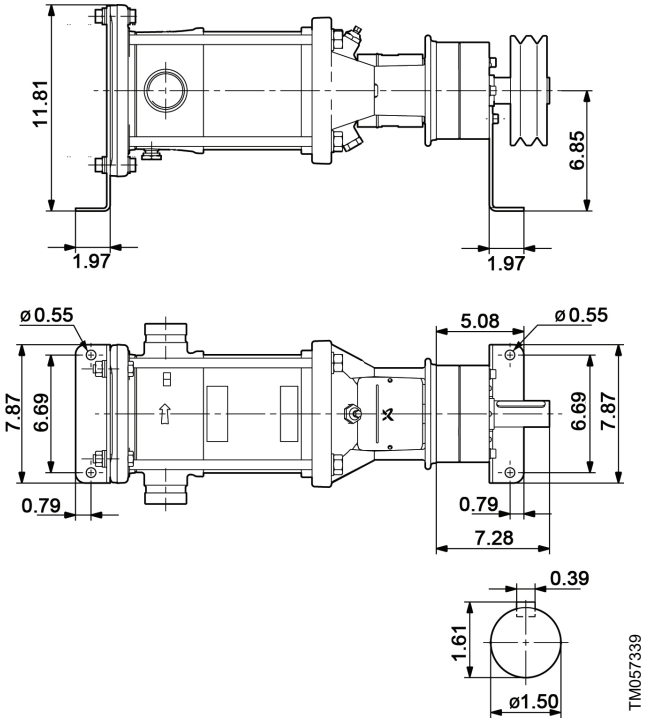
	Type III	Type IV	Type II	Type I
Pulley head	**1/2 - 7 1/2 [hp]**	**10-25 [hp]**	**2-10 [hp]**	**15-60 [hp]**
Pump type	**CR, CRI, CRN**		**CR, CRN**	
	1s, 1, 3, 5, 10, 15, 20	10, 15, 20	32, 45, 64	
Pulley wheel diameter	∅4.41 - 5.31	Min. ∅7.87	Min. ∅6.30	Min. ∅7.87
V-belts	2	Min. 3	Min. 2	Min. 3
Pump speed [rpm]	Max. 3000			

Dimensional drawings

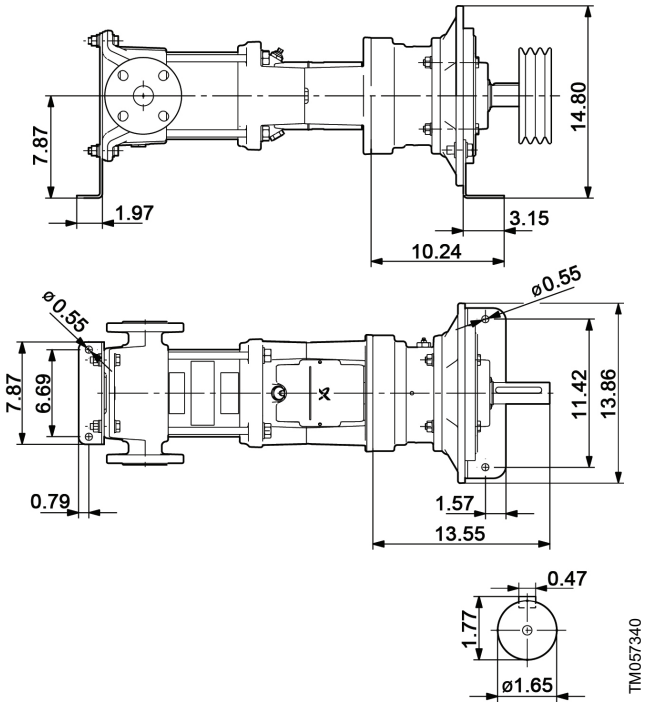
CR, CRI, CRN 1s, 1, 3 and 5 (type III)



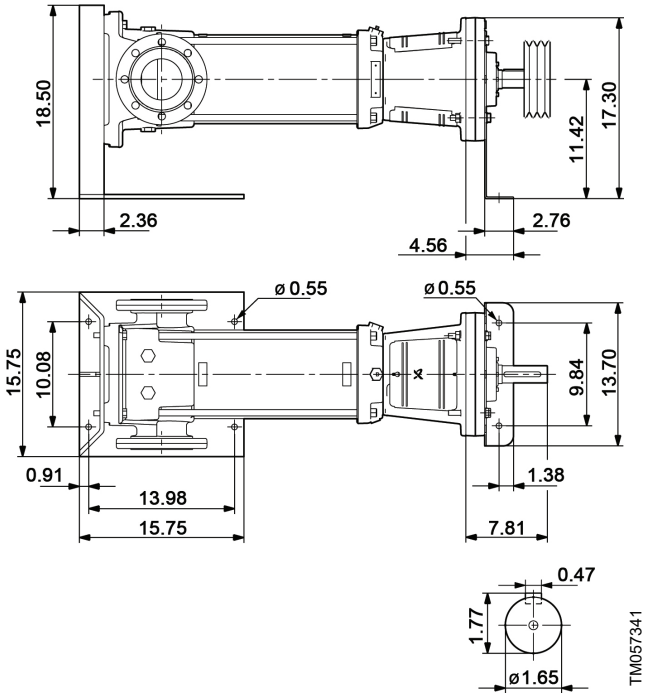
CR, CRI, CRN 10, 15 and 20 (type III)



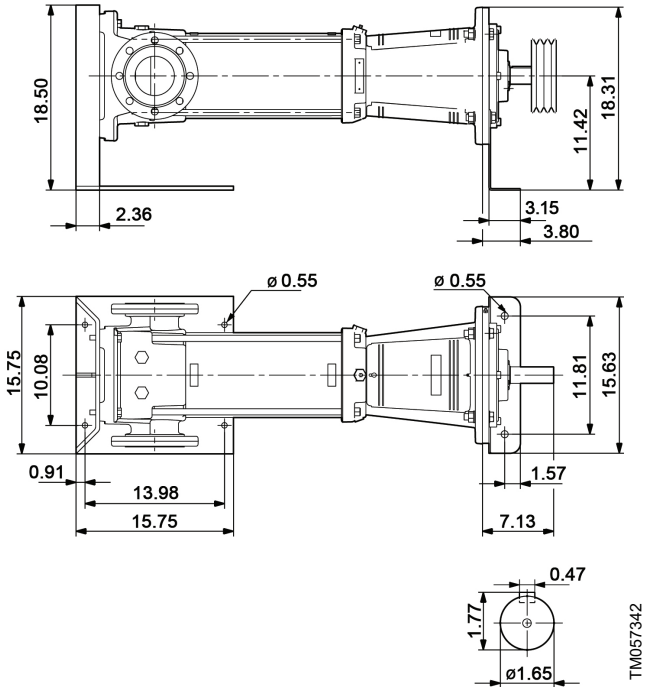
CR, CRI, CRN 10, 15 and 20 (type IV)



CR, CRN 32, 45 and 64 (type II)



CR, CRN 32, 45 and 64 (type I)



Pump rubber parts

We offer pumps with a wide range of customized rubber materials, such as EPDM, FKM, FFKM, FXM and CR, to suit your requirements.

Pump type	Rubber material				
	EPDM	FKM	FFKM	FXM	CR [20]
CR, CRI, CRN 1s, 1, 3, 5	●	●	●	●	●
CR, CRI, CRN 10, 15, 20	●	●	●	●	●
CR, CRN 32, 45, 64	●	●	● [21]	●	
CR, CRN 95, 125, 155	●	●	● [21]	●	
CR, CRN 185, 215, 255	●	●			

[20] The material is only available for CRN MAGDrive pumps.

[21] These pumps are fitted with FXM sleeve gaskets. All other rubber parts are of FFKM.

● Available.

We offer customized rubber materials for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	●	●	●
10, 15, 20	●	●	●
32, 45, 64	●		●
95, 125, 155	●		●
185, 215, 255			

Rubber materials

The table below shows the resistance of pump rubber materials to low and high temperatures and to a selection of pumped liquids.

Factors	EPDM	FKM	FFKM	FXM
Low temperatures (temp. < 32 °F [0 °C])	+	-	-	-
High temperatures (temp. > 194 °F [90 °C])	+	-	+	+
Acids	±	±	+	±
Alkalis	+	-	+	+
Glycols	+		+	+
Oils and fuels	-	+	+	±
Solvents	-	±	+	-

+	Suitable
±	Suitable under certain conditions
-	Not suitable

EPDM

EPDM is a rubber quality especially suitable for water and aqueous solutions, but non-resistant to mineral oils.

Further characteristics are as follows:

- good mechanical properties at low temperatures
- resistant to water up to 248 °F (120 °C)
- resistant to polar solvents (alcohols, ketones and esters)
- resistant to ozone and weather
- resistant to glycol
- partly resistant to vegetable oils at low temperatures
- not resistant to mineral oils.

FKM

FKM rubber covers a very wide range of liquids and temperatures, and has the following characteristics:

- poor mechanical properties at low temperature
- resistant to water up to 194 °F (90 °C)
- resistant to acids and saline solutions
- resistant to mineral oils and vegetable oils
- resistant to most solvents (toluene, petrol, trichloroethylene, etc.)
- resistant to ozone and weather
- not resistant to certain polar solvents (for instance alcohols, ketones and esters)
- not resistant to alkaline liquids at high temperatures.

FFKM

FFKM (perfluoroelastomer) is chemically resistant to a wide range of liquids. FFKM rubber corresponds to PTFE, but offers considerably better mechanical properties:

- resistant to water up to 302 °F (150 °C)
- especially suitable for use in chemical processing plants, in the production of dyes, paints, varnishes, solvents, nitric acid, etc.
- resistant to ozone and weather
- not entirely resistant to amines and strongly alkaline liquids at high temperatures.

FXM

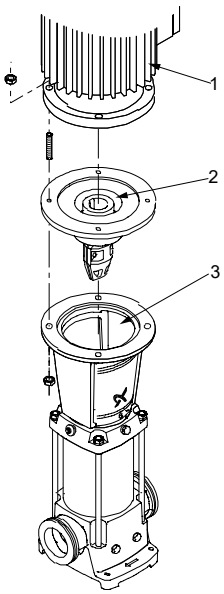
FXM (fluorinated copolymer) is particularly suitable for extremely high temperatures and pressures as well as for use in acid liquids and gases within oil and gas extraction (in boreholes, on land and at sea). Its resistance to chemicals and high temperatures has been considerably improved as compared to flourized rubber, with excellent resistance to hot water and steam.

Further characteristics are as follows:

- elastic seal material
- temperature range: 14 to 356 °F (-10 to 180 °C)
- excellent hot water and steam resistance
- available in material resistant to sudden decompression
- consisting of a modified structure of tetrafluoroethylene (TFE) and propylene copolymers, FXM is widely used within the chemical and petrochemical, and aviation and space industries, as well as mechanical engineering and refineries.

Bearing flange

To ensure long pump life and reliable operation, fit a bearing flange between the motor and the pump head.



TM034062

Bearing flange

Pos.	Description
1	Motor
2	Bearing flange
3	Pump head

A bearing flange is an additional flange with two angular contact bearings to absorb axial forces from both directions. The coupling is part of the bearing flange fitted to obtain optimum alignment.

Note that the bearing flange requires a motor with keyway and deep-groove ball bearings. A bearing flange is used in two situations:

1. A standard motor with standard ball bearing is required. The bearing flange absorbs the hydraulic load from the pump, ensuring an acceptable motor bearing life.
2. The pump is to run at a higher inlet pressure than the maximum pressure recommended.

Lubrication

For motor sizes above 15 hp (11 kW), the bearing flange is equipped with grease nipples and must be lubricated regularly. Follow the instructions on the bearing flange.

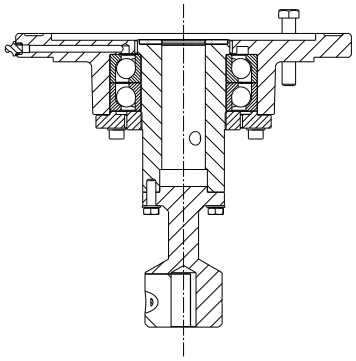
Pump range

The following pump types are available with bearing flange:

Pump type	CR	CRI	CRN
1s, 1, 3, 5			
10, 15, 20			
32, 45, 64	•		•
95, 125, 155	•		•
185, 215, 255	•		•

• Available.

Additional height of bearing flange



TM073754

Bearing flange for CR pumps

The following additional heights must be added to the total height of the pump.

CR, CRN 32, 45, 64

Motor power [hp]	Additional height [in (mm)]
15 - 60	0.75 (19)

CR, CRN 95, 125, 155, 185, 215, 255

Motor power [hp]	Additional height [in (mm)]
15 - 75	0.83 (21)
100 - 300	0.98 (25)

For information about the total height of a given CR pump, see the relevant product guides available at the Grundfos Product Center.

Related information

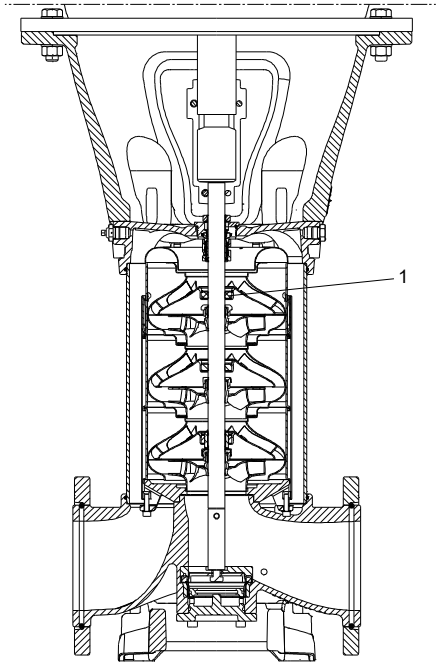
Further documentation

Support bearings

We offer customized pumps with support bearings of bronze for corrosive applications for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5			
10, 15, 20			
32, 45, 64	•		•
95, 125, 155	•		•
185, 215, 255			

• Available.



Placement of the support bearings on a CR pump

Pos	Description
1	Support bearing

Bearing material

We offer pumps with a wide range of customized bearing materials, such as bronze, tungsten carbide and carbon-filled PTFE, to suit your requirements.

Pump size	Bearing material
CR, CRN 1, 3, 5, 10, 15, 20	Bronze/tungsten carbide
	Graflon/tungsten carbide
CR, CRN 32, 45, 64	Tungsten carbide/tungsten carbide
CR, CRN 95, 125, 155	Silicon carbide/silicon carbide

We offer customized bearing materials for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	•	•	•
10, 15, 20	•	•	•
32, 45, 64	•		•
95, 125, 155	•		•
185, 215, 255			

• Available.

Pump head positions

As standard, the pump head is mounted so that the vent screw is in line with the outlet port.

The pump head can be mounted in three other positions in steps of 90°.

Note that the vent of horizontal pumps must always point upwards.

Customized nameplate

We offer additional customized nameplates attached to the pump:

- a nameplate supplied by you
- a Grundfos nameplate customized in terms of a specific duty point
- a Grundfos nameplate with a tag number.

A Grundfos standard nameplate is always fitted on the pump.

Dry-running protection

LiqTec

GR9415

LiqTec dry-running protection device

The Grundfos LiqTec immediately cuts off the pilot current to the motor protection relay in the following cases:

- There is no liquid in the pump.
- The liquid temperature exceeds 266 ± 9 °F (130 ± 5 °C).
- The sensor, sensor cable, electronic unit or power supply fails.

When connected to the PTC sensors in the motor, the LiqTec also protects the motor against overheating.

The sensor is easily inserted through the 1/2" connection in the pump head close to the shaft seal. It can also be used externally.

LiqTec sends a heat impulse through the sensor and measures its temperature. Liquid in the pump cools the sensor as well as the shaft seal and other pump parts.

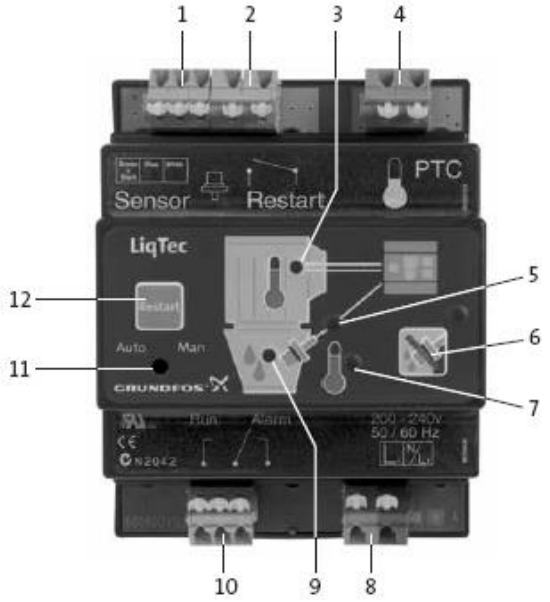
If there is no liquid present, LiqTec detects a high temperature in the sensor and turns off the pump motor immediately to prevent damage. LiqTec also prevents excessive liquid temperatures from damaging the pump.

If LiqTec senses a liquid temperature above 266 °F (130 °C), it turns off the pump motor immediately. LiqTec is a fail-safe device, meaning that the pump stops as soon as the sensor detects an error on the sensor cable or the electronics, or if the power supply of the control unit is switched off.

Restarting the pump can be automatic or manual when the sensor detects liquid in the pump again.

Remote restarting is possible via a digital input.

The electronic control unit can also be connected to the PTC sensor measuring the motor temperature. In case of overheating of the motor, the system turns off the pump motor.



TM058867

LiqTec connected to a standard motor

1. Connection for Grundfos dry-running sensor
2. Connection for external restarting switch
3. Motor PTC indicator light
4. Connection for motor PTC sensor
5. Sensor indicator light
6. Deactivation of the dry-running monitoring function
7. High liquid temperature indicator light
8. Connection for supply voltage
9. Dry-running indicator light
10. Connection for Alarm/Run relay output
11. Auto/Manual restart switch
12. Restart button

Dimensions

4.57" x 3.54".

LiqTec can be mounted on a DIN rail in a control cabinet.

Technical data

Supply voltage	1 x 80-130 V or 1 x 200-240 V
Power consumption	5 W
Maximum pressure	580 psi (40 bar)
Minimum/maximum liquid temperature	-4 °F / 248 °F (-20 °C / 120 °C)
Maximum ambient temperature	122 °F (50 °C)
Humidity	99 %
Enclosure class	IPX0
Pumped liquid	Any water-based liquid handled by Grundfos pumps
Cable length	16.4 ft. (5 m)[22)]

22) 49.2 ft. (15 m) cable is available on request.

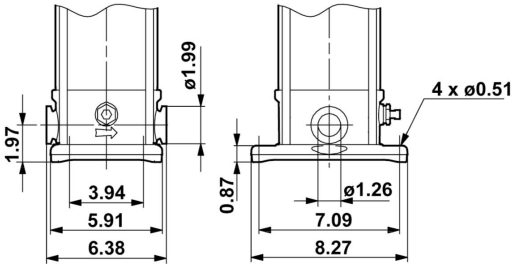
Pipe connections

TriClamp connection

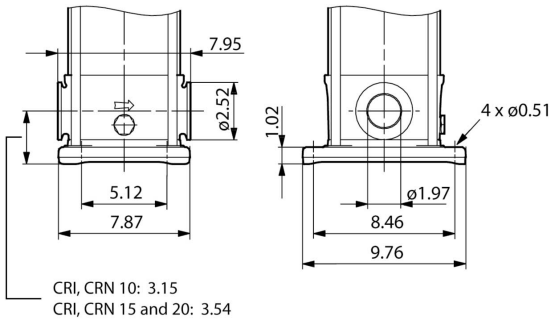
A base with TriClamp connection is a hygienic design with a sanitary coupling for use in the pharmaceutical, food and beverage industry. The connection is in accordance with EN/DIN 32676.

A set consists of one clamping ring, one gasket and one pipe stub. The clamping ring is made of stainless steel EN/DIN 1.4301/AISI 304. The pipe stub is made of stainless steel EN/DIN 1.4401/AISI 316. The gasket is made of PTFE or EPDM.

Dimensions [inches]



TriClamp connection for CRI, CRN 1s, 1, 3 and 5



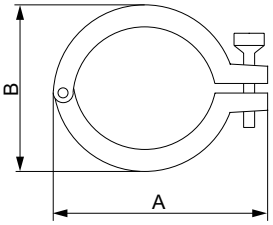
TriClamp connection for CRI, CRN 10, 15 and 20

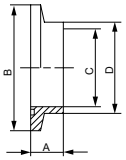
Dimensions [mm]

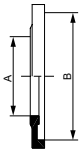
Clamping ring

Pipe stub

Gasket







Pump type	Nominal diameter	A	B	A	B	C	D	A	B
CRI, CRIE, CRN, CRNE 1s, 1, 3, 5	38.0	92.0	59.5	21.5	50.5	35.6	38.6	35.3	50.5
	32.0	102.0	60.0		50.5	32.0	36.0	32.2	50.5
CRI, CRIE, CRN, CRNE 10, 15, 20	51.0	104.4	74.0		64.0	48.6	51.6	48.0	64.0
	50.0	123.0	75.0		65.0	50.0	54.0	50.2	64.0

Pump type	Pipe connection	Connection material	Gaskets	Pressure [psi (bar)]	Coupling sets required	Product number
CRI, CRIE, CRN, CRNE 1, 3, 5	1 1/2"	Stainless steel	PTFE	232 (16 bar)	2	96515375
			EPDM	232 (16 bar)	2	96515374
				725 (50 bar)	2	97549395
CRI, CRIE, CRN, CRNE 10, 15, 20	2"	Stainless steel	PTFE	232 (16 bar)	2	96515377
			EPDM	232 (16 bar)	2	96515376
				725 (50 bar)	2	97549397

We offer TriClamp connections for the following pump types:

● Available.

Pump type	CR	CRI	CRN
1s, 1, 3, 5		●	●
10, 15, 20		●	●
32, 45, 64			
95, 125, 155			
185, 215, 255			

Oval connection (NPT)

A base with oval connections is designed for use in a wide range of industrial applications. Oval NPT connections for CRN pumps are available on request.

Oval connection (CR)

Oval connection (CRI, CRN)

We offer oval connections for the following CRN pump types:

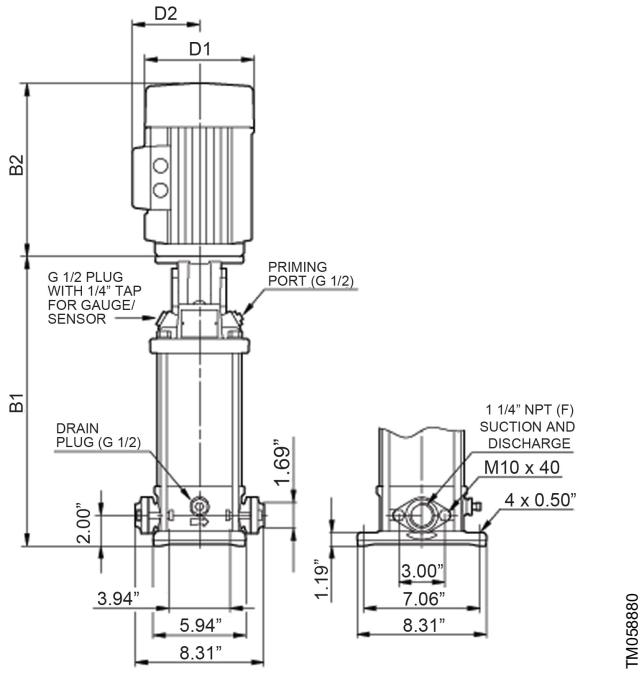
Pump type	CR	CRI	CRN
1s, 1, 3, 5 [23)]			•
10, 15, 20 [23)]			•
32, 45, 64			
95, 125, 155			
185, 215, 255			

23) Oval connections are available as standard for CR, CRI 1s, 1, 3, 5, 10, 15 and 20 pumps.

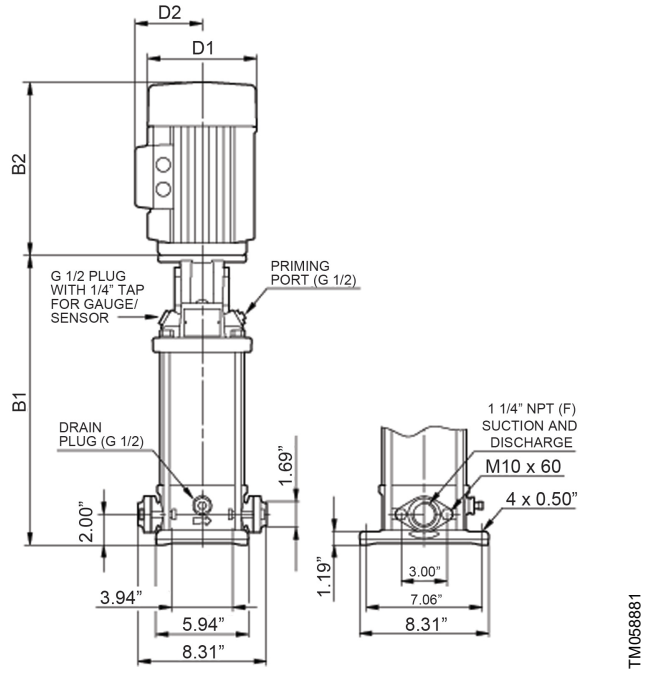
• Available.

Dimensions for CRN

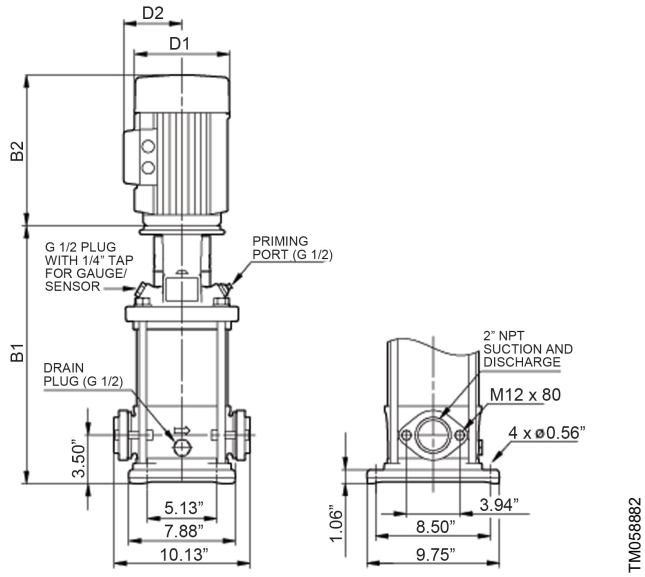
All dimensions are in inches.



CRN 1s - CRN 3

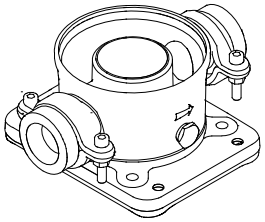


CRN 5



CRN 10 - CRN 20

Union and clamp connection

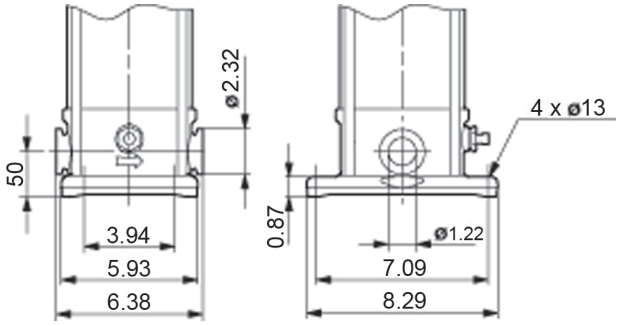


TM027239

Union and Clamp connection (CRI, CRN)

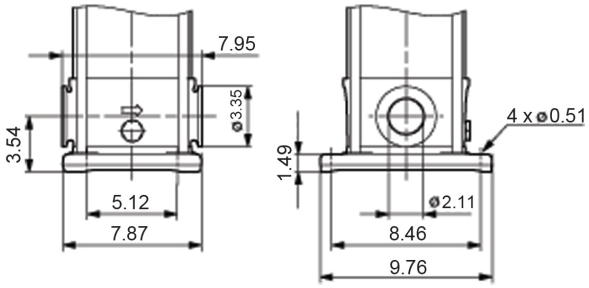
Dimensions

All dimensions are in inches.



TM058883

Union and clamp connection for CRI, CRN 1s, 1, 3 and 5

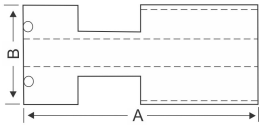


TM058884

Clamp connection for CRI, CRN 10, 15 and 20

Union connection, external NPT thread

Union Adapter



Pump type	Nominal diameter	A	B
CRI(E), CRN(E) 1s, 1, 3, 5	2" NPT	1.30	2.35

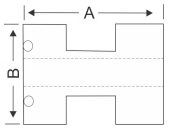
We offer clamp connections for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5		●	●
10, 15, 20			
32, 45, 64			
95, 125, 155			
185, 215, 255			

● Available.

Clamp connection, internal NPT thread

Socket



TM058886

Pump type	Nominal diameter	A	B
CRI(E), CRN(E) 1s, 1, 3, 5	1" NPT	0.90	2.32
	1 1/4" NPT	0.90	2.32
CRI(E), CRN(E) 10, 15, 20	1 1/2" NPT	1.12	3.50
	2" NPT	1.12	3.50

We offer union connections for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5		●	●
10, 15, 20		●	●
32, 45, 64			
95, 125, 155			
185, 215, 255			

● Available.

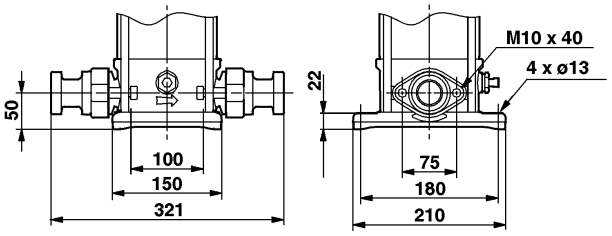
FlexiClamp according to EN/DIN 11851

A base with connections according to EN/DIN 11851 is of hygienic design for use in dairies and in the food and beverage industry.

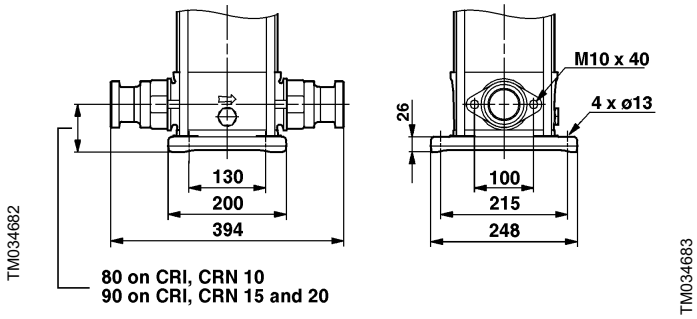
A set consists of one pipe stub with external thread designed for a FlexiClamp base with union connection.

Dimensions

All dimensions are in millimeters.



Connection to EN/DIN 11851 for CRI, CRN 1s, 1, 3 and 5



Connection to EN/DIN 11851 for CRI, CRN 10, 15 and 20

Pump type	Pipe connection	Connection material	Gaskets	Pressure [bar]	Coupling sets required	Product number
CRI(E), CRN(E) 1, 3, 5	DN 32	Stainless steel	EPDM	16	2	96551545
			FKM		2	96551547
CRI(E), CRN(E) 10, 15, 20	DN 50		EPDM		2	96551549
			FKM		2	96551570

We offer the above connections for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5			•
10, 15, 20			•
32, 45, 64			
95, 125, 155			
185, 215, 255			

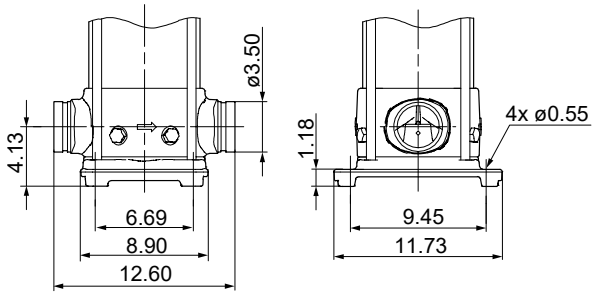
• Available.

PJE couplings with NBR rubber parts

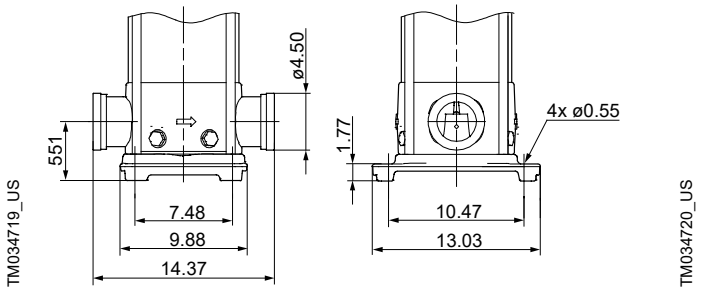
A base with PJE couplings is designed for use in a wide range of industrial applications.
A PJE coupling set consists of two coupling halves, one gasket, one coupling liner for welding and bolts and nuts.

Dimensions

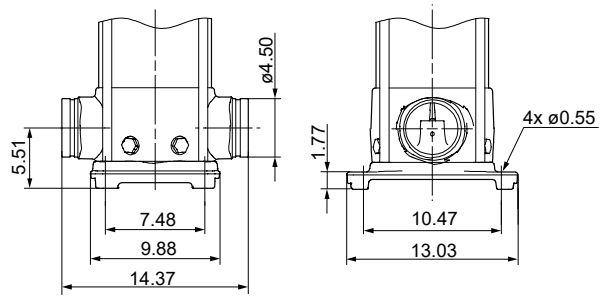
All dimensions are in inches.



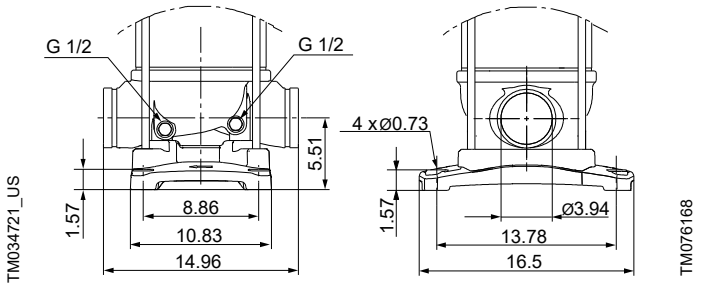
PJE coupling for CRN 32



PJE coupling for CRN 45



PJE coupling for CRN 64



PJE coupling for CRN 95

Part	Description	Designed for pump type	Size	Product number
	Victaulic type 77 coupling 3" 4"	CRN 32	3" (NBR seal)	00ID7664
		CRN 45, 64, 95	4" (NBR seal)	96415463
	Victaulic coupling liner for welding	CRN 32	3" 316 SS	00150574
		CRN 45, 64, 95	4" 316 SS	96416743

PJE couplings with NBR rubber parts are available on request for CRN, CRNE.
We offer PJE couplings with NBR rubber parts for the following pump types:

Pump type	CR, CRE	CRI, CRIE	CRN, CRNE
1s, 1, 3, 5			
10, 15, 20			
32, 45, 64, 95			●
125, 155			
185, 215, 255			

● Available.

Note that PJE connections with EPDM and FKM rubber parts are available on CRN, 1s, 1, 3, 5, 10, 15 and 20 pumps as standard.

DIN or JIS connection

We offer pumps with DIN or JIS connections for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5 [24)]			
10 [24)]			
15, 20 [24)]	•	•	•
32, 45, 64	•		•
95, 125, 155	•		•
185, 215, 255	•		•

24) As standard, CR, CRE, CRI, CRIE, CRN, CRNE 1s, 1, 3, 5 and 10 pumps are available with connections that meet the requirements of ANSI, DIN and JIS.

• Available.

The dimensions of pumps with DIN, ANSI or JIS flanges are the same, apart from the flange bolt holes.

Customized connections

We offer a wide range of customized connections for the following pump types:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	•	•	•
10, 15, 20	•	•	•
32, 45, 64, 95	•		•
125, 155			
185, 215, 255			

• Available.

Examples of customized connections:

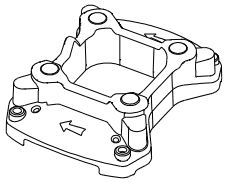
- Oval flanges (Rp or BSP)
- DIN connection (DN)
- PJE couplings (Victaulic®) for CRN, CRNE
- clamp couplings (L-couplings)
- unions (+GF+).

Contact Grundfos for further information about customized connections. Standard connections are described in the relevant product guides available at the Grundfos Product Center.

Base plate for CR 95 with CR 90 footprint

It is possible to use a CR 95 pump as drop-in replacement for a CR 90 pump and still have the same footprint.

A special base plate with the same small footprint as the CR 90 pump is available for CR 95 pumps up to and including 75 hp (55 kW).The material is ductile cast iron EN-GJS-500-7.



TM072495

Base plate for CR 95 with a small CR 90 footprint

9. Certificates

CR pumps with certificates

We offer certificates for a number of applications requiring documentation on the pump quality:

- pharmaceutical industries
- maritime and offshore applications
- potentially explosive environments
- energy and power suppliers.

Note: The certificates must be ordered with the pump.

The following pumps are available with certificates:

Pump type	CR	CRI	CRN
1s, 1, 3, 5	●	●	●
10, 15, 20	●	●	●
32, 45, 64	●		●
95, 125, 155	●		●
185, 215, 255	●		●

● Available.

Certificates

Certificate	Description
Certificate of compliance with the order	It is a Grundfos document according to EN 10204, 2.1, certifying that the pump supplied is in compliance with the order specifications.
Test certificate (non-specific inspection and testing)	It is a certificate according to EN 10204, 2.2, with inspection and test results of a non-specific pump.
Inspection certificate 3.1	It is a 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	It is a 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	This 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	It is a report certifying the material used for the main components of the specific pump.
Duty-point verification report	This report certifies a test point specified by the customer, and is issued according to ISO 9906 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	This report indicates the values measured during the performance test of the specific pump according to ISO 10816.
Motor test report	This report shows the performance test of the specific motor, including power output, current, temperature, stator windings resistance and insulation test.

Certificate	Description
Cleaned and dried pump	It confirms that the specific pump has been cleaned and dried, and includes how it was done.
Electropolished pump	It confirms that the specific pump has been electropolished. The maximum surface roughness is specified in the report.
ATEX-approved pump	It confirms that the specific pump is ATEX-approved according to the EU directive 94/9/EC, the "ATEX directive".

Note: Other certificates are available on request.

Related information

Examples of certificates

Examples of certificates

Certificate of compliance with the order

be think innovate

GRUNDFOS

Certificate of compliance with the order

EN 10204 2.1

General Info	
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. 96507895/PMI/000/1221711

TM034165

Test certificate

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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	
Max.operating pressure	bar	
Max.operating temperature	0C	
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 *1), inspected, and conform to the full requirements of the appropriate catalogues, drawings and/or specifications relative thereto.

*1) Cleaned and dried pumps and PWIS free pumps are not performance tested

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no. 96507896/PMI/000/1221711

TM034163

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 No.		Part No.	
Serial No.		Serial No.	
Model		P2 [kW]	
Flow rate [m^3/h]		Voltage [V]	
Head [m]		Current [A]	
Max.liquid temp [°C]		Motor speed [min^{-1}]	
Max.opr. Press. [bar]		Frequency [Hz]	
	Din / W.-No.	Insulation Class	
Base/Pump head cover		Power factor	
Impeller/guide vanes			
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 are deformation observed

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no. 96507897/10141142

TM034162

Inspection certificate

Inspection Certificate

Russian Maritime Register of Shipping

General Info			
Customer name			
Customer order no.		GRUNDFOS order no.	
Customer TAG no.		Certificate No.	
Ship / new building			
Shipyard / factory			

Pump		Motor	
Pump type		Make	
Part No.		Part No.	
Serial No.		Serial No.	
Model		P2 [kW]	
Flow rate [m^3/h]		Voltage [V]	
Head [m]		Current [A]	
Max.liquid temp [°C]		Motor speed [min^{-1}]	
Max.opr. Press. [bar]		Frequency [Hz]	
Stamping ID		IP code	
		Max.temp.amb. [°C]	

Part according to EN 10204 - 3.1

Part	Raw material Grundfos PN	Raw material grade and standard	Vendor	Heat / Charge No.
Pump head				
Pump head cover*				
Base				
Sleeve				
Pump head*				
Seal chamber**				
THD flange***				
Blind cover (THD)***				

*) Only for CR(I/N) Back to Back, Tandem, Air cooled top
**) Only for CR(I/N) MagDrive ("Pump head cover" removed and "Pump head" included)
***) Only for CR(N) 95, 125, 155, 185, 215, 255 with base prepared for THD

Part according to EN 10204 - 2.2

Part	Material type	Raw material grade acc. to standard
Shaft		
Impeller		
Chamber		

Operational function			
Media		Application	

Required duty point			
Flow rate [m^3/h]		Head [m]	

Test performance
Result of tests are attached. See test point

Declaration of compliance for the Class Society Rules
Rules for technical supervision during construction of ships and manufacture of materials and products for ships, Part IV

GRUNDFOS
Date:

Signature:
Name:
Dept.:

be think innovate

GRUNDFOS

Part no. 96507925/PMI/000/ 1249889

TM034156

Standard test report

Test Report - Performance curve

ISO 9906:2012 Grade 3B

General Info			
Customer name			
Customer order no.			
Customer TAG no.			
GRUNDFOS order no.			
Pump type		Part number	
Serial number		Model	

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.:

be think innovate

Part no. 96507930/PMI/000/1250007

TM034143

Material specification report

Material specification report

Type EN 10204 - 2.2

General Info			
Customer name			
Customer order no.			
Customer TAG no.			
GRUNDFOS order no.			
Pump type		Part number	
Serial number		Model	

Part	Material	Standard

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.:

be think innovate

Part no. 96507928/PMI/000/1253903

TM034150

Vacuum-dried pump

be think innovate

Vaccum Dried Pump

Customer name	
Customer order no.	
Customer TAG no.	
GRUNDFOS order no.	
GRUNDFOS DUT id.	
Part number	

GRUNDFOS hereby confirms that the pump mentioned above is manufactured according to the specifications mentioned in the "CR, CRI, CRN Custom-built pumps" data booklet. This means that after the performance test of the pump, a heat and vacccum drying process will ensure that no liquid water is present insider the pump.

The in-and outlet of the pump is sealed by means of a sticker after the drying process.

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no. 98606312/PMI/000/1221711

TM060335

Duty point verification report

Test Report - Duty point verification

ISO 9906:2012 Grade 3B, Q&H

General Info			
Customer name			
Customer order no.			
Customer TAG no.			
GRUNDFOS order no.			
Pump type		Part number	
Serial number		Model	

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.:

be think innovate

Part no. 96539699/PMI/000/1250007

TM034148

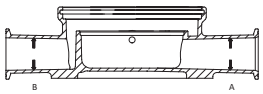
Surface-roughness

Report – Surface roughness

According to ISO 1302

General Info			
Customer name			
Customer order no.			
Customer TAG no.			
GRUNDFOS order no.			
Pump type		Part number	
Serial number		Model	
Base part number			

The surface roughness is measured as the maximum roughness of the inlet and outlet surface of the base.



Surface Treatment	
None	
Electro-polished	

Measured values A		
R_{max}	[µm]	
R_A	[µm]	
R_z	[µm]	

Measured values B		
R_{max}	[µm]	
R_A	[µm]	
R_z	[µm]	

Roughness value RA [µm]	Roughness degree
50	N 12
25	N 11
12.5	N 10
6.3	N 9
3.2	N 8
1.6	N 7
0.8	N 6
0.4	N 5
0.2	N 4
0.1	N 3
0.05	N 2
0.025	N 1

GRUNDFOS
Date:

Signature:
Name:
Dept.:

be think innovate GRUNDFOS

Part no. 96507931/PMI/000/1252874

TM034147

Vibration report

Vibration report

According to ISO 20816-1 / ISO 10816-7

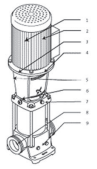
General Info			
Customer name			
Customer order no.			
Customer TAG no.			
GRUNDFOS order no.			
Pump type		Part number	
Serial number		Model	

Test Conditions: The pump is floor mounted on a steel plate supported by Sylomer foam. For vibration measurement positions see Figure.

P2 [kW]		Voltage [V]	
Frequency [Hz]		Number of Poles	
Flow rate [m^3 /h]		Head [m]	
Remarks:			

Result of Measurement:

Position	RMS vibration Velocity (mm/s)
1	
2	
3	
4	
5	
6	
7	
8	
9	



Typical Zone boundary - ISO 20816-1:

Vel. (mm/s)	Range of typical zone boundary values for non-rotating parts.		
0,28			
0,45			
0,71	Zone boundry A/B 0,71 to 4,5		
1,12			
1,80		Zone boundry B/C 1,8 to 9,3	
2,80			
4,50			Zone boundry C/D 4,5 to 14,7
7,10			
9,30			
11,2			
14,7			
18,0			
28,0			
45,0			

GRUNDFOS
Date:

Signature:
Name:
Dept.:

be think innovate GRUNDFOS

Part no. 96507932/PMI/000/ 1249870

TM034167

Motor test report

be think innovate GRUNDFOS

Motor test report

Customer name	
Customer order no.	
Customer TAG no.	
GRUNDFOS order no.	
GRUNDFOS DUT id.	
Part number	
Motor no.	
Motor serie no.	

We the undersigned hereby guarantee and certify that the above motor has been tested. The performance of the motor can be seen in the motor test report on the next page.

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no. 96507933P01/PMI/000/1135258

TM034146

Cleaned and dried pump

Report

Cleaned and dried pump

General Info			
Customer name			
Customer order no.			
Customer TAG no.			
GRUNDFOS order no.			
Pump type		Part number	
Serial number		Model	

We the undersigned hereby confirm that the above-mentioned product is manufactured according to specifications mentioned in data booklet for the relevant product type. This means that prior to assembly, pump components are washed in pure, hot soapy water, rinsed in de-ionized water and dried.

The pump is wrapped in a plastic bag before being packed.

The pump has not been performance-tested.

GRUNDFOS
Date:

Signature:
Name:
Dept.:

be think innovate GRUNDFOS

Part no. 96507934/PMI/000/1252874

TM034145

Electropolished pump

Report

Electro-polished pump

General Info			
Customer name			
Customer order no.			
Customer TAG no.			
GRUNDFOS order no.			
Pump type		Part number	
Serial number		Model	

Grundfos hereby conforms that the pump mentioned above is manufactured according to below specifications prior to assembly.

All components are treated according listed steps:
1) Degreased in a mechanical washing tunnel with soap.
2) Pickled in a mixture of nitric-or hydrofluoric acid (HF)
3) Electropolished in Sulfuric acid (H2SO4) and Phosphoric acid (H3PO4)
4) Passivated in 10-12% Nitric acid (HNO3)
5) Washed in a mechanical washing tunnel without soap

The casted parts for a CRN 1s to a CRN 20, are all mechanically polished before being electropolished.

The pump will then obtain following surface roughness

Pump type	Stainless steel casted parts	Stainless steel plate and other non-casted parts	Surface roughness Ra [µm]
CRN1s,1, 3, 5	X	X	Equal to or below 0,8
CRN10, 15, 20	X	X	Equal to or below 0,8

GRUNDFOS
Date:

Signature:
Name:
Dept.:

be think innovate

Part no. 96507935/PMI/000/1250017

TM034144

ATEX-approved pump

Report

ATEX approved pump

General Info			
Customer name			
Customer order no.			
Customer TAG no.			
GRUNDFOS order no.			
Pump type			
Serial number		Model	
Pump part No.		Serial No.	
Motor part No.		Serial No.	
ATEX Approval of pump		Technical File No.	

GRUNDFOS hereby confirms that the pump mentioned above is manufactured according the ATEX directive.
This means the pump is conformity with the ATEX 2014/34/EU ANNEX VIII directive as mentioned in the "ATEX Supplement to installation and operating instructions" supplied with the pump.

GRUNDFOS
Date:

Signature:
Name:
Dept.:

be think innovate

Part no. 96512240/PMI/000/1281066

TM034166

Inspection certificate 3.1

Inspection Certificate

Type EN 10204 3.1

General Info			
Customer name			
Customer order no.		GRUNDFOS order no.	
Customer TAG no.			
Ship / new building			
Shipyard / factory			

Pump		Motor	
Pump type		Make	
Part No.		Part No.	
Serial No.		Serial No.	
Model		P2 [kW]	
Flow rate [m³/h]		Voltage [V]	
Head [m]		Current [A]	
Max.liquid temp [°C]		Motor speed [min⁻¹]	
Max.opr. Press. [bar]		Frequency [Hz]	
		IP code	
		Max.temp.amb. [°C]	

Required duty point			
Flow rate [m³/h]		Head [m]	

Test performance
Result of tests are attached. See test point

GRUNDFOS
Date:

Signature:
Name:
Dept.:

be think innovate

Part no. 96507897/PMI/000/1252874

TM060200

Material specification report with certificate from raw material supplier

Material specification report

Type EN 10204 – 3.1/2.2

General Info			
Customer name			
Customer order no.			
Customer TAG no.			
GRUNDFOS order no.			
Pump type		Part number	
Serial number		Model	

Part according to EN 10204 - 3.1				
Part	**Raw material Grundfos PN**	**Raw material grade and standard**	**Vendor**	**Heat / Charge No.**
Pump head				
Pump head cover*				
Base				
Sleeve				
Pump head*				
Seal chamber**				
THD flange***				
Blind cover (THD)***				

*) Only for CR(I/N) MagDrive ("Pump head cover" removed and "Pump head" included)
**) Only for CR(I/N) Back to Back, Tandem, Air cooled top
***) Only for CR(N) 95, 125, 155, 185, 215, 255 with base prepared for THD

Part according to EN 10204 - 2.2		
Part	**Material type**	**Raw material grade acc. to standard**
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.:

be think innovate

Part no. 96507929/PMI/000/1249525

TM060753

10. CRE pump solutions

TM056774

Motors for CRE, CRIE, CRNE pumps

Besides continuous variable performance, CRE, CRIE and CRNE pumps offer a number of advantages, depending on the hardware and software combinations of the motor.

CRE pumps are not dependent on the frequency of the supply voltage and are designed for operation at frequencies between 750 rpm and 6000 rpm. This offers a number of advantages:

- compact pump
- higher performance in relation to physical size
- larger dynamic range
- less noise at reduced speed
- more gentle handling of the pumped liquid at reduced speed.

The speed may be chosen freely, taking into consideration the maximum motor load and the hydraulic properties of the pump. Pumps can be delivered with oversize or undersize motors, depending on load profile. The configuration of the ball bearing can also be altered to fit load and demands.

Customized CRE pump solutions

As an alternative to the standard CRE pump solutions, we offer CRE pumps customized for your requirements.

You can configure CRE pumps as follows:

- Select an operating panel on the front of the terminal box of the motor.
- Select a communication module for bus standards such as GENIbus, LONWorks, PROFIBUS.
- Select a customized functionality by special configuration files (gsc-files).

Control of E-pumps

Control options

It is possible to communicate with E-pumps via the following platforms:

- operating panel on the pump
- Grundfos GO
- Grundfos GO Link
- central management system.

The purpose of controlling an E-pump is to monitor and control the pressure, temperature, flow rate and liquid level of the system.

Operating panels

The operating panel on the E-pump terminal box makes it possible to change the setpoint settings manually. All settings are saved if the power supply is switched off.

The operating panel available as standard is HMI 300.

The operating panel available on booster pumps is HMI 200.

Note that these panels include an integrated radio module.

The following operating panels without an integrated radio module are available on request:

- HMI 201
- HMI 301.

For further information, see the sections on variants.

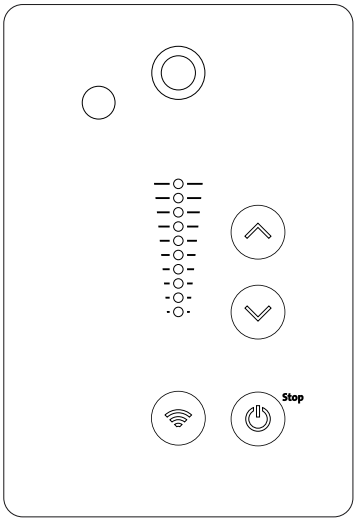
Related information

HMI 200

HMI 300

HMI 200

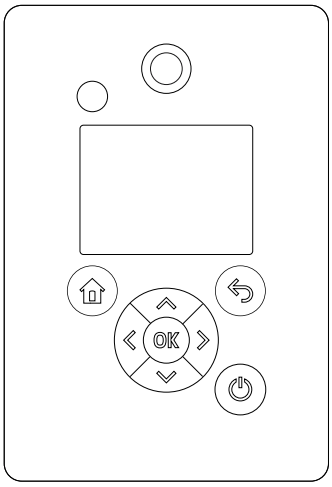
This operating panel is available on booster pumps.



TM084861

HMI 300

This operating panel is available as standard.



TM084862

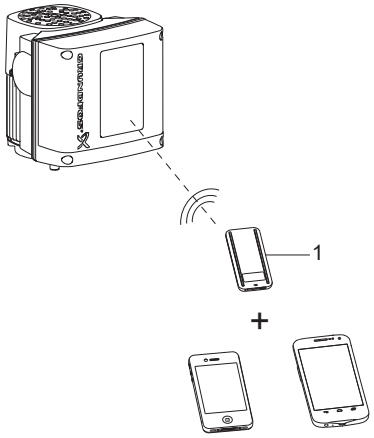
Grundfos GO

Grundfos GO enables you to set functions and gives you access to status overviews, technical product information and current operating parameters.

MLE 1/2 to 15 hp

The product is designed for wireless radio or infrared communication with Grundfos GO.

Use Grundfos GO together with the Grundfos MI 301 mobile interface.



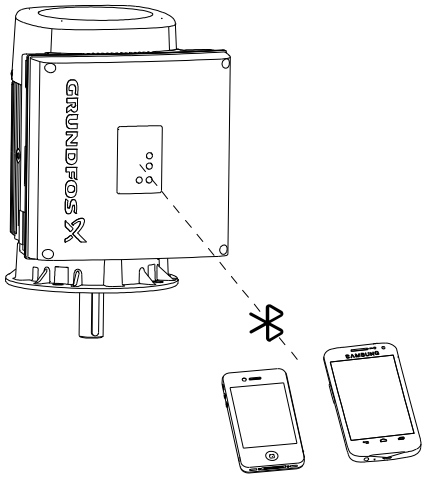
TM066256

Pos.	Description
1	Grundfos MI 301: It is a separate module enabling radio or infrared communication. Use the module together with an Android or iOS-based smart device via a Bluetooth connection.

MLE 20 to 30 hp

The product is designed for wireless communication with Grundfos GO using Bluetooth (BLE).

Via the built-in Bluetooth module, the product can communicate with Grundfos GO.



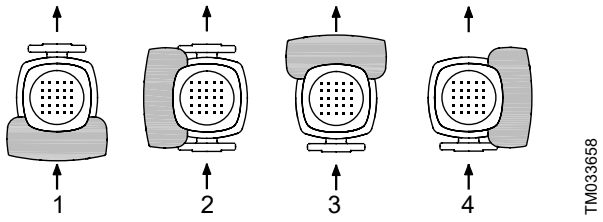
TM082930

Environmental enclosure ratings

According to UL 778 and C22.2 No 108-14, pumps that are intended for outdoor use must be marked enclosure type 3, and the product must be tested at a rated surface temperature down to -31 °F (-35 °C). The enclosure of the MLE Model H, I and J (1/2 to 15 hp) is approved for type 3 and a rated surface temperature down to 32 °F (0 °C), and thus only for indoor use in UL 778 and C22.2 No 108-14 pump applications. The enclosure of the MGE, MLE Model K (20 to 30 hp) is approved for NEMA type 12 and is suitable for indoor use only. For more information about ambient temperature during operation, see the sections on operating conditions and ambient temperature.

Terminal box positions

As standard, the terminal box is fitted on the inlet side of the pump.



Terminal box positions

Pos.	Description
1	6 o'clock position (standard)
2	9 o'clock position
3	12 o'clock position
4	3 o'clock position

Ambient temperature and installation altitude

The ambient temperature and the installation altitude are important factors for the motor life as they affect the bearings and the insulation system. The installation altitude is the height of the installation site above sea level.

Motors installed up to the maximum ambient temperature and altitude can be loaded 100 %.

If the ambient temperature or the installation altitude exceeds the recommended maximum values, the motor must not be fully loaded due to risk of overheating. Overheating may result from excessive ambient temperatures or high altitudes with low density and low cooling effect of the air.

In such cases, it may be necessary to select an oversized motor with a higher rated output. To determine the motor load, it is necessary to calculate the derated motor power.

Maximum ambient temperature and altitude for Grundfos MLE motors

The table shows the maximum permissible ambient temperature at full load and the maximum permissible installation altitude above sea level at full load.

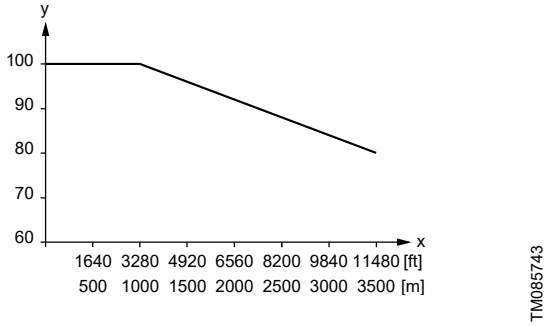
Motor efficiency class: IE5

Motor power [hp]	Motor make	Voltage [V]	Max. ambient temperature [°F (°C)]	Max. altitude above sea level [ft (m)]
1/2 to 2	MLE	1 × 200-240	122 (50)	3280 (1000)
1 1/2 to 7 1/2	MLE	3 × 200-240	104 (40)	
1 to 30	MLE	3 × 440-480	122 (50)	

Motor load for Grundfos MLE motors

MLE motors can be installed up to 11 480 ft (3500 m) above sea level.

Motors installed above the maximum installation altitude of 3280 ft (1000 m) above sea level must not be fully loaded. Use the below curve to calculate the derated motor power. If the required motor output exceeds the derated motor power, select an oversized motor.

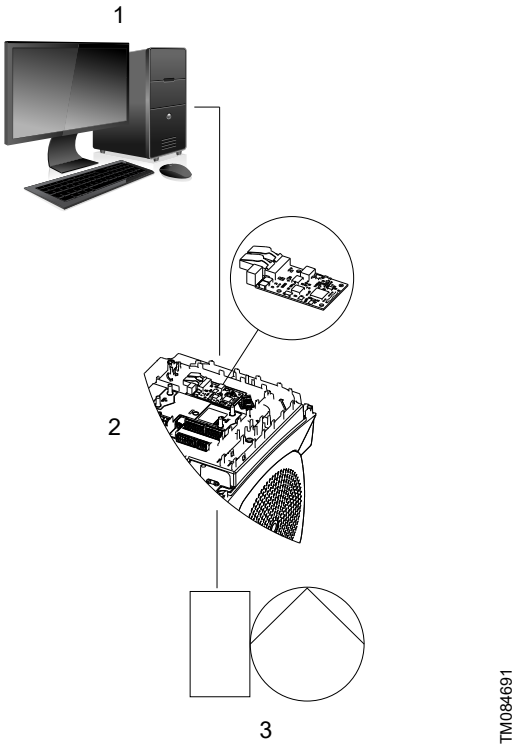


Derating of motor output power P2 % (y-axis) in relation to installation altitude above sea level in feet (x-axis)

Central management system

Communication with the E-pump is possible even if the operator is not present near the E-pump. Communication is enabled by connecting the E-pump to a central building management system. This allows the operator to monitor the pump and change control modes and setpoint settings.

Communication between E-pumps and a central building management system is enabled via a Grundfos Communication Interface Module (CIM).



Structure of a central management system

Pos.	Description
1	Central management system
2	CIM [25)]
3	E-pump

25) See the section on Communication Interface Modules.

Related information

Communication Interface Module (CIM)

Communication Interface Unit (CIU)

GRA6118

Grundfos CIU

The CIU standard interface units with internal power supply are suitable for Grundfos products that do not support the internal mounting of a communication interface module (CIM).

The CIU incorporates a 24-240 VAC/VDC power supply module. The CIU can either be mounted on a DIN rail or on a wall.

We offer the following communication interface units:

CIU 900

It is for mounting an add-on CIM. The CIU 900 includes an internal power supply.

A CIM is required.

CIU 901

It is for mounting an add-on CIM 200, CIM 280 or CIM 500.

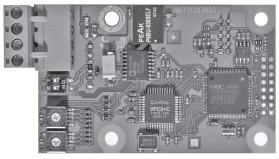
The CIM 500 only supports Modbus TCP/IP and GiC/GRM IP when mounted in the CIU 901.

The CIU 901 includes an internal power supply and an integrated input/output board. The built-in multi-purpose input/output board enables monitoring of standard pumps, sensors, meters and switches.

A CIM is required.

Description	Fieldbus protocol	Product number
CIU 900	CIU unit only	99448387
CIU 901	CIU unit with input/output board	99448389

Communication Interface Module (CIM)



GRA6121

Grundfos CIM

These modules enable communication of operating data, such as measured values and setpoints, between CRE, CRIE or CRNE pumps of 15-30 hp and a building management system. The CIM is an add-on communication module that is fitted in the terminal box of CRE, CRIE, CRNE pumps of 15-30 hp. Note that a CIM must be fitted by authorized persons.

We offer the following types of CIM:

Description	Fieldbus protocol	Product number
CIM 040	TTL Adaptor Module	98415941
CIM 050	GENIbus Interface	96824631
CIM 060 [26)]	Grundfos GO Remote Connection	98778356
CIM 100	LON interface for pumps	96824797
CIM 110	LON interface for boosters	96824798
CIM 200	Modbus RTU	96824796
CIM 280 [27)]	US GiC/GRM 3G/4G	99895386
CIM 300	BACnet Interface	96893770
CIM 500	Ethernet, Modbus TCP/IP, BACnet IP, PROFINET, GiC/GRM IP, EtherNet IP	98301408
CIM 550	Ethernet GIC (DHCP only)	92546689

[26)] Extended range antenna is available as an option for CIM 060. Product number: 98778357.

[27)] Antenna is not included. See Antennas for CIM 280.

Antennas for the CIM 280

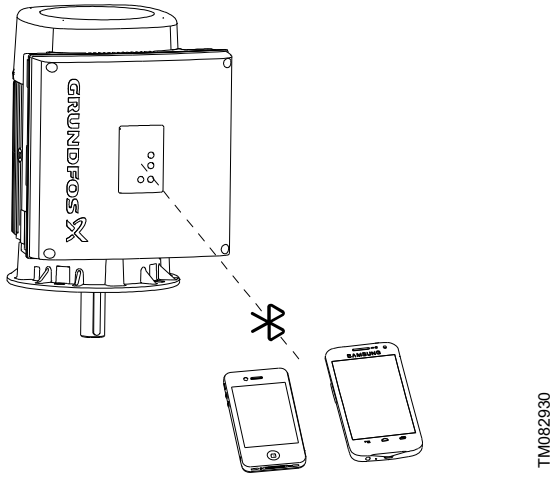
Description	Product number
Antenna for GRM 3G/4G, flush mount	99606613
External mounting bracket for antenna (optional)	99606614
Directional antenna for 3G/4G High gain, mount and 25-foot cable included	98851149
Battery for the CIM 280 3G/4G, for power loss to the CIU (optional)	99499908

For further information about data communication via CIM and fieldbus protocols, see the CIM documentation available at the Grundfos Product Center at www.grundfos.com.

Bluetooth

For MLE motors from 20 to 30 hp, the product incorporates a Bluetooth (BLE) module for remote control.

Via the built-in Bluetooth module, the product can communicate with the Grundfos GO. Bluetooth communication can take place at distances up to 32.8 ft.



Bluetooth information

Frequency of operation	2400 - 2483.5 MHz
Modulation type	GFSK
Data rate	2 Mbps
Transmit power	5 dBm EIRP with internal antenna

GLoWpan information

Frequency of operation	2405-2480 MHz
Modulation type	GP O-QPSK
Data rate	1 Mbps
Transmit power	5 dBm EIRP with internal antenna

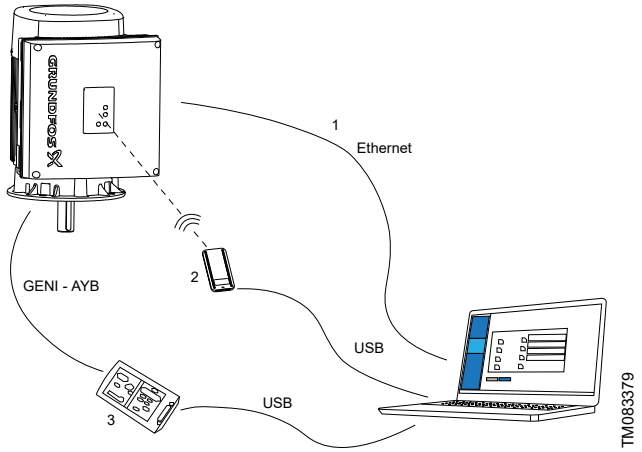
Grundfos GO Link

The product is designed for wired or wireless communication with Grundfos GO Link.

Grundfos GO Link enables you to set functions and gives you access to status overviews, configuration and current operating parameters.

Use Grundfos GO Link together with these interfaces:

- Ethernet cable (Only FM310 and FM311)
- Grundfos MI 301 - USB - Wired/wireless (Only HMI 100, HMI 200 and HMI 300)
- Grundfos MI 301 - USB - Wired/wireless (Only HMI 200 and HMI 300)
- Grundfos PC Tool Link - USB - Wired



Grundfos GO Link setup

Pos.	Description
1	Ethernet cable: Standard Ethernet cable CAT5/CAT6.
2	Grundfos MI 301: Separate radio equipment enabling radio communication. Use the module together with a USB cable to connect to a laptop.
3	Grundfos PC Tool Link: Separate module enabling wired connection to the pump. Use the module together with a USB cable to connect to a laptop.

Safe Torque Off (STO) function

The Safe Torque Off (STO) is a safety function to stop the motor from turning without actively braking it. It follows the definition by EN 61800-5-2.

The main difference between the STO function and a functional stop using a digital input (for example DI1) is that the STO is approved to provide a defined safety integrity.

The principle of operation is the following:

1. The STO function is activated (the input circuits are opened, for example by opening contactors).
2. The STO inputs of the motor de-energize.
3. The motor cuts off the control signal for the output transistors.
4. The motor coasts to a stop if it is running. The drive cannot restart while the STO function is activated. After deactivating the STO, the motor can restart immediately.
5. The control software of the motor generates an STO alert and corresponding indications. The STO alert can be configured. See the section on STO alert handling.

The version of the STO function is marked on the motor nameplate after the product version number.

Functional module, FM300

MLE 1/2 to 15 hp

The FM300 is factory-fitted in all pumps from 1/2 to 15 hp.

The 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 FM300 has the following 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
- two LiqTec sensor inputs
- two signal relay outputs
- GENIbus connection.

Connection terminals

All inputs and outputs are internally separated from the mains-conducting parts by reinforced insulation, and galvanically separated from other circuits. All control terminals are supplied with protective extra-low voltage (PELV), thus ensuring protection against electric shock.

Signal relay outputs:

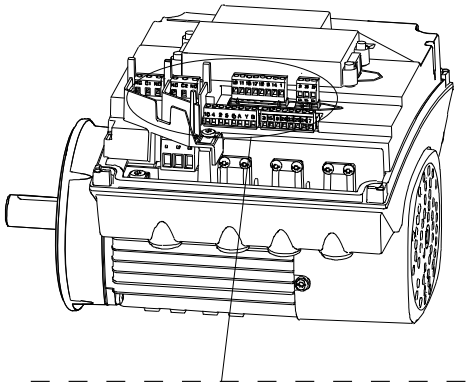
- Signal relay 1:

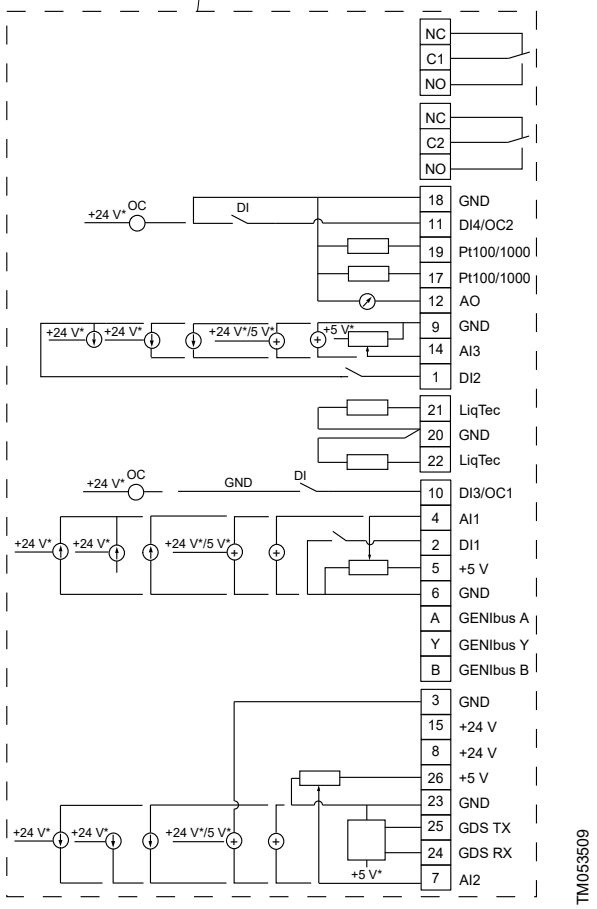
  LIVE: Power supply voltages up to 250 VAC can be connected to this output.

  PELV: The output is galvanically separated from other circuits. Therefore, the supply voltage or protective extra-low voltage can be connected to the output as desired.
- Signal relay 2:

  PELV: The output is galvanically separated from other circuits. Therefore, the supply voltage or protective extra-low voltage can be connected to the output as desired.

Power supply: terminals N, PE, L or L1, L2, L3, PE





* If an external supply source is used, there must be a connection to GND.

Connection terminals, FM300 functional module

Terminal	Type	Function
NC	Normally closed contact	Signal relay 1: LIVE or PELV
C1	Common	
NO	Normally open contact	
NC	Normally closed contact	Signal relay 2: PELV only
C2	Common	
NO	Normally open contact	
18	GND	Signal ground

Terminal	Type	Function
110.5 - 3.5 V or 0-5 V or 0-10 V	DI4/OC2	Digital input/output, configurable Open collector: max. 24 V resistive or inductive
19	Pt100/1000 input 2	Pt100/1000 sensor input 2
17	Pt100/1000 input 1	Pt100/1000 sensor input 1
12	AO	Analog output: • 0-20 mA or 4-20 mA • 0-10 V
9	GND	Signal ground
14	AI3	Analog input: • 0-20 mA or 4-20 mA • 0-10 V
1	DI2	Digital input, configurable
21	LiqTec sensor input 1	LiqTec sensor input 1 White conductor
20	GND	Signal ground Brown and black conductors
22	LiqTec sensor input 2	LiqTec sensor input 2 Blue conductor
10	DI3/OC1	Digital input/output, configurable Open collector: max. 24 V resistive or inductive
4	AI1	Analog input: • 0-20 mA or 4-20 mA • 0.5 - 3.5 V, 0-5 V or 0-10 V
2	DI1	Digital input, configurable
5	+5 V	Supply to potentiometer and sensor
6	GND	Signal ground
A	GENIbus, A	GENIbus, A (+)
Y	GENIbus, Y	GENIbus, GND
B	GENIbus, B	GENIbus, B (-)
3	GND	Signal ground
15	+24 V	Power supply
8	+24 V	Power supply
26	+5 V	Supply to potentiometer and sensor
23	GND	Signal ground
25	GDS TX	Grundfos Digital Sensor output
24	GDS RX	Grundfos Digital Sensor input
7	AI2	Analog input: • 0-20 mA or 4-20 mA • 0.5 - 3.5 V, 0-5 V or 0-10 V

Functional module, FM310 and FM311

MLE 20 to 30 hp

FM310 and FM311 are factory-fitted in all pumps from 20 to 30 hp.

Inputs and outputs

Note that the FM311 functional module does not include Bluetooth connection.

The 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
- two LiqTec sensor inputs
- two signal relay outputs
- GENIbus/Modbus connection
- two Safe Torque Off (STO) inputs
  (Safe Torque Off (STO) is a safety function to stop the motor from turning without actively braking it. It follows the definition by EN 61800-5-2.)
- Ethernet connection
- Bluetooth (BLE) connection. [28)]

28) FM311 is without Bluetooth.

Connection terminals

All control terminals are supplied with safety extra-low voltage (SELV), ensuring protection against electric shock.

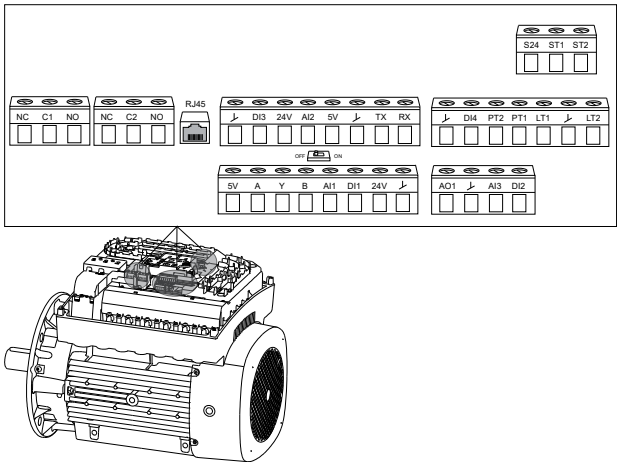
The inputs and outputs are internally separated from the mains-conducting parts by reinforced insulation and galvanically separated from other circuits.

Cables for the relays and the Ethernet cable must be rated at least 250V/2A.

The relays are approved for overvoltage category II, whether power is supplied from a transformer or the power supply.

Signal relay outputs:

- Signal relay 1:
  LIVE: You can connect supply voltages up to 250 VAC to the output.
  SELV: The output is galvanically separated from other circuits. Therefore, you can connect the supply voltage or safety extra-low voltage to the output as desired.
- Signal relay 2:
  SELV: The output is galvanically separated from other circuits. Therefore, you can connect the supply voltage or safety extra-low voltage to the output as desired.



Terminal	Type	Function
NC	Normally closed contact	Signal relay 1: LIVE or SELV
C1	Common	
NO	Normally open contact	
NC	Normally closed contact	Signal relay 2: SELV only
C2	Common	
NO	Normally open contact	
RJ45	Ethernet	Ethernet communication
GND	GND	Signal ground
DI3	DI3/OC1	Digital input/output, configurable Open collector: max. 24 V resistive or inductive
24V	+24 V	Power supply
AI2	AI2	Analog input: • 0-20 mA or 4-20 mA • 0.5 - 3.5 V, 0-5 V or 0-10 V
5V	+5 V	Power supply to a potentiometer or sensor
GND	GND	Signal ground
TX	GDS TX	Grundfos Digital Sensor output
RX	GDS RX	Grundfos Digital Sensor input
GND	GND	Signal ground
DI4	DI4/OC2	Digital input/output, configurable Open collector: max. 24 V resistive or inductive
PT2	Pt100/1000 input 2	Pt100/1000 sensor input 2
PT1	Pt100/1000 input 1	Pt100/1000 sensor input 1
LT1	LiqTec sensor input 1	LiqTec sensor input 1 White conductor
GND	GND	Signal ground Brown and black conductors
LT2	LiqTec sensor input 2	LiqTec sensor input 2 Blue conductor
5V	+5 V	Power supply to a potentiometer or sensor
A	GENIbus, A	GENIbus, A (+) / Modbus, D1 (+)

Terminal	Type	Function
Y	GENIbus, Y	GENIbus, GND / Modbus, GND
B	GENIbus, B	GENIbus, B (-) / Modbus, D0 (-)
AI1	AI1	Analog input: • 0-20 mA or 4-20 mA • 0.5 - 3.5 V, 0-5 V or 0-10 V.
DI1	DI1	Digital input [29], configurable
24V	+24 V	Power supply
GND	GND	Signal ground
AO1	AO	Analog output: • 0-20 mA or 4-20 mA • 0-10 V.
GND	GND	Signal ground
AI3	AI3	Analog input: • 0-20 mA or 4-20 mA • 0.5 - 3.5 V, 0-5 V or 0-10 V.
DI2	DI2	Digital input, configurable
S24	+24 V (STO)	Power supply to the Safe Torque Off inputs
ST1	STO1	Safe Torque Off - Input 1
ST2	STO2	Safe Torque Off - Input 2

29) Digital input 1 is factory-set to be start or stop input where an open circuit results in stop. A jumper has been factory-fitted between terminals DI1 and GND. Remove the jumper if digital input 1 is to be used as external start or stop or any other external function.

Industrial custom-built E-solutions

Pump running at over-synchronous speed

Pumps running at over-synchronous speed run at speed exceeding the standard, maximum speed, for example 50/60 Hz.

By increasing the pump speed, the pump performance increases even more due to the laws of affinity. If you increase the speed of the pump with 20 % from 2,900 rpm to 3,470 rpm, the pump performance increases by more than 70 %.

Affinity equations

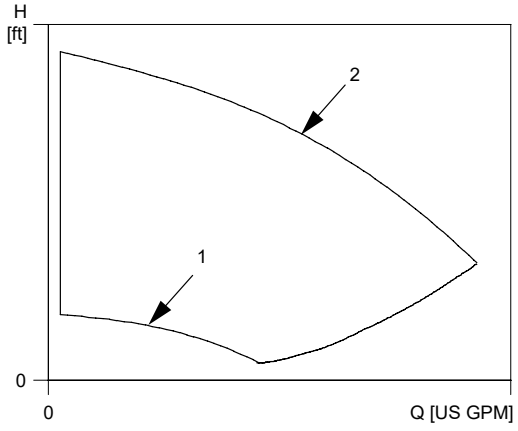
Normally, speed-regulated pumps are used in applications characterized by a variable flow rate. Consequently, you cannot select a pump that is constantly operating at its optimum efficiency.

To achieve optimum operating economy, select the pump based on the following criteria:

- The maximum duty point must be as close to the QH curve of the pump as possible.
- The required duty point must be positioned so that P2 is close to the maximum point of the QH curve.

The flow rate of the required duty point must be close to the optimum efficiency (eta) for most operating hours.

Between the minimum and maximum performance curves, speed-regulated 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.



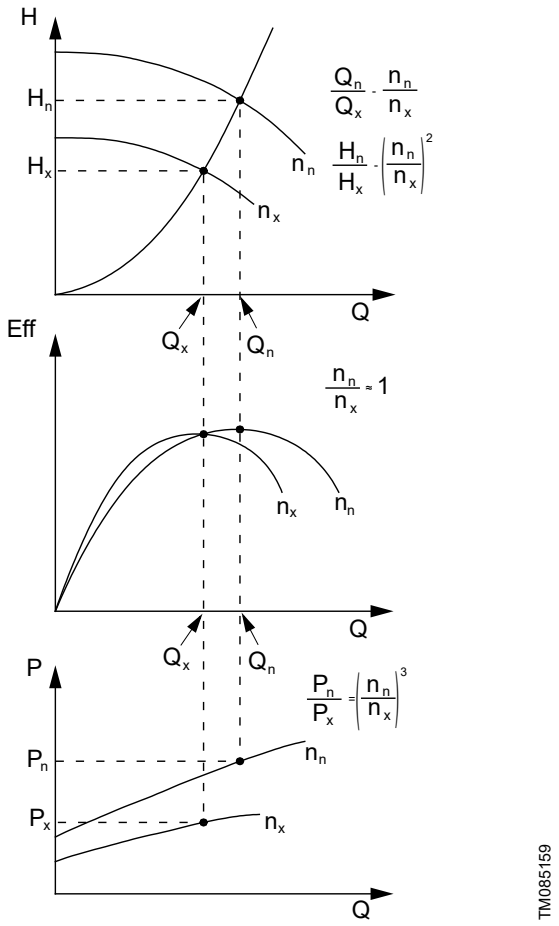
Maximum (1) and minimum (2) performance curves

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 that 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.

To obtain a precise calculation of the power savings resulting from a reduction of pump speed, take into account the efficiencies of the frequency converter and the motor.



Affinity equations

Legend

H_n	Rated head [feet]
H_x	Current head [feet]
Q_n	Rated flow rate [gpm]
Q_x	Current flow rate [gpm]
n_n	Rated motor speed [rpm]
n_x	Current motor speed [rpm]
η_n	Rated efficiency [%]
η_x	Current efficiency [%]
P_n	Rated power [hp]
P_x	Current power [hp]

Pump hydraulic limitations

Running over-synchronous speed increases the differential pressure over the chambers and the entire chamber stack. This might affect the lifetime of the pump depending on the application. Therefore, do not exceed the pressure limits stated in the table below. Special chambers and software setup might be required.

Pump type	Maximum differential pressure over the chamber [psi/bar]					
	Standard chamber		Reinforced chamber		Laser-welded chamber	
CR, CRI, CRN 1s	13.1	0.9				
CR, CRI, CRN 1	13.1	0.9	31.9	2.2	31.9	2.2
CR, CRI, CRN 3	13.1	0.9	31.9	2.2	31.9	2.2
CR, CRI, CRN 5	13.1	0.9	31.9	2.2		
CR, CRI, CRN 10	31.9	2.2				
CR, CRI, CRN 15	31.9	2.2				
CR, CRI, CRN 20	31.9	2.2				
CR, CRI, CRN 32	72.5	5.0				
CR, CRI, CRN 45	72.5	5.0				
CR, CRI, CRN 64	72.5	5.0				
CR, CRN 95	65.3	4.5				
CR, CRN 125	69.6	4.8				
CR, CRN 155	76.9	5.3				

The durability of the different chamber types depends on the number of starts and stops of the pump. The estimated maximum number of pump starts and stops is stated below:

Chamber type	Maximum number of starts and stops
Standard chamber	1,000,000
Reinforced chamber	300,000
Laser-welded chamber	800,000

The table below states the maximum differential pressure over the entire chamber stack.

Pump type	Maximum differential pressure over the entire chamber stack [psi/bar]	
CR, CRI, CRN 1-5	725	50
CR, CRI, CRN 10-20	435	30
CR, CRI, CRN 32-64	478	33
CR, CRN 95	451.12	31.1
CR, CRN 125	568.1	39.2
CR, CRN 155	577.3	39.8

Purpose and benefits

Traditionally, pumps are sized so that the maximum pressure and flow rate required in the application can be handled with a standard pump. For pumps working in conditions with various pressure and flow rate requirements, this can have the effect that the most common duty point is where the pumping efficiency is not optimal. By choosing a pumping solution that can reach over-synchronous speeds, the pump can be sized from most common duty point and speed up when a higher flow rate or pressure is required.

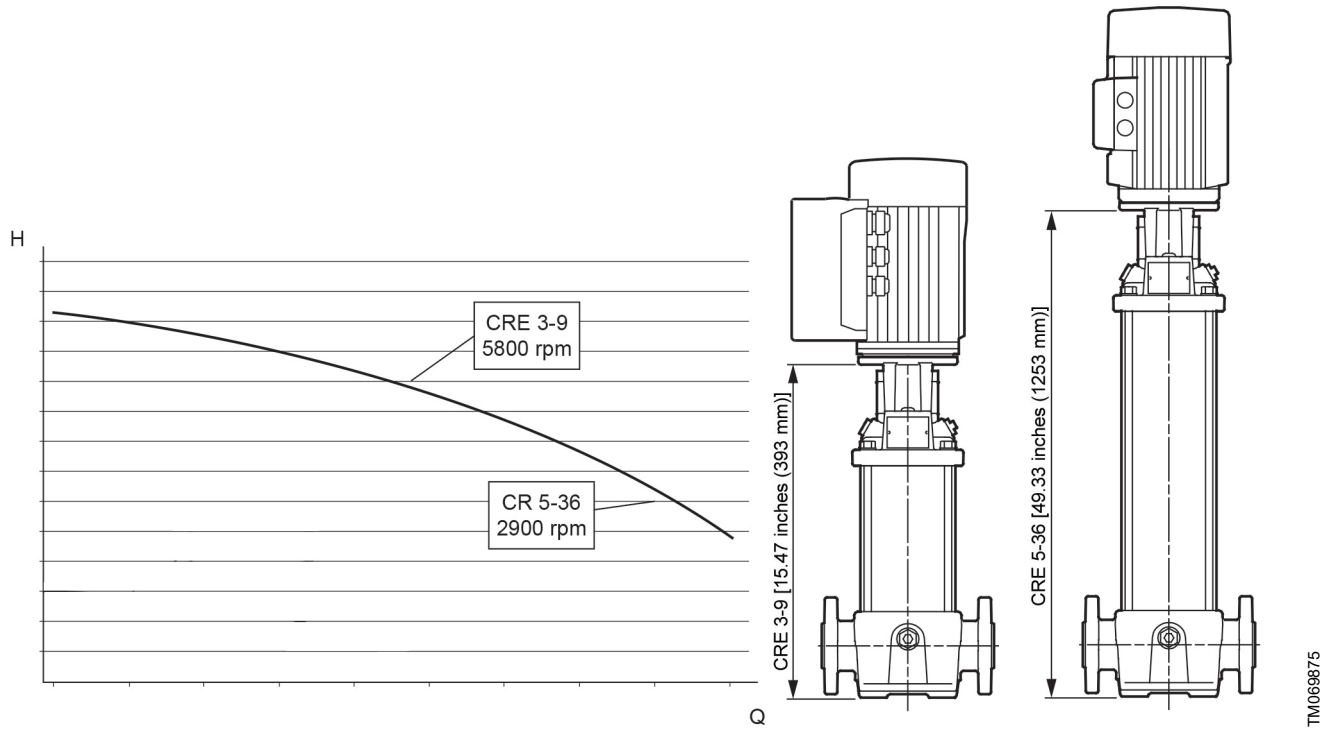
- Compact solution. Increasing rpm enables high pressure with few stages, requiring less space.

In applications where a high flow rate or pressure is needed momentarily, sizing can be done from the most used duty point with the ability to run over-synchronous speed for momentary high flow rate or pressure.

Applications

This solution is ideal in cases where the pump weight and dimension are to be kept at a minimum and the pump performance is to be maintained.

The figure below illustrates how a pump can be down-sized and still deliver the same performance.



Comparison of performance: a CRE 3-9 running at over-synchronous speed equals the performance of a CR 5-36 running at 2900 rpm

Availability

This function is available in the following pump sizes:

	2-pole
Single-phase pumps	1/2 - 2 hp (0.37 - 1.5 kW)
Three-phase pumps	1-30 hp (0.75 - 22 kW)

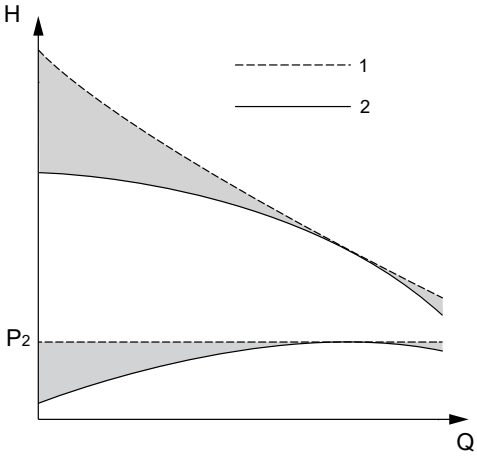
Setup

This function is available in factory-configured products.

Running at over-synchronous speed affects the NPSH value, sufficient inlet pressure is therefore required. Sound pressure level emitted from the pump and motor increases when increasing the speed.

Pump operating at power limit

When a pump operates at the power limit, the MLE motor delivers an output corresponding to the maximum load stated on the nameplate. The maximum load is never exceeded.



Curves of a standard E-pump and a pump operating at power limit

Pos.	Description
1	Power limit
2	Standard

Purpose and benefits

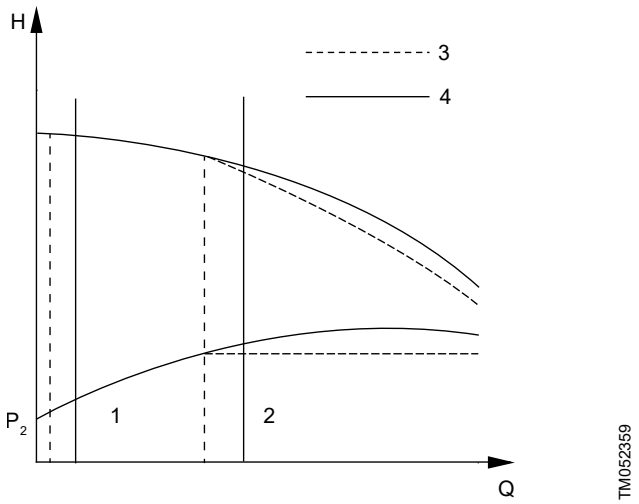
When using a standard pump at a low flow rate, the power consumption drops, and the motor has excess power available.

By setting the CRE pump to operate at a higher speed, the excess power can be used to provide a higher pressure. The power limit function makes sure that the motor load never exceeds its maximum by decreasing the speed until the motor is at its power limit.

In cases where an undersized motor is used with standard speed, the power limit function still reduces the speed and protects the motor against overload at high flow rates. The solution offers the following benefits:

- reduced motor size
- reduced pump size.

The section about affinity equations shows that a pump operating at low flow rates and relatively high pressures (1) can be fitted with an undersize motor with a rated power that matches this operating range. At higher flow rates and relatively lower pressures (2), the motor reduces its speed when the power limit is exceeded and follows a steeper curve corresponding to the power available.

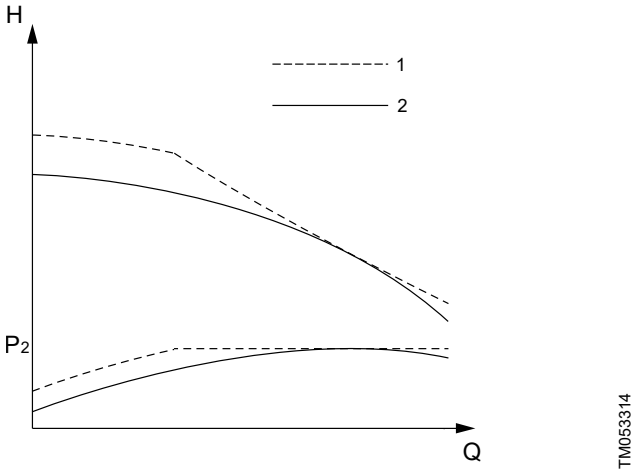


Standard performance curve compared to a curve for a pump fitted with an undersized MLE motor

Pos.	Description
3	Reduced motor
4	Standard motor

The MLE motor can be set to a higher speed than standard, enabling the pump to deliver more pressure. The pump operates at this higher speed until it reaches the flow rate where the motor is loaded to its full rated power. If the flow rate is increased further, the motor reduces its speed so as not to exceed its rated power.

Using this function can in some instances enable use of a smaller pump to reach the desired duty point compared to a pump running with standard maximum speed.



Standard performance curve (60 Hz) compared to a performance curve for a pump running at maximum speed

Pos.	Description
1	Maximum speed
2	Standard

Applications

The power limit function is primarily used in applications where the motor size is dimensioned to be as small as possible to reduce size or cost. Or, it is used in applications demanding a high maximum speed to achieve a high pressure at low flow rates. In both cases, the motor is protected by the power limit function at a higher flow rate where a lower speed is needed to prevent the motor from overloading.

Examples of application:

- Washing and cleaning
- boiler feed.

Availability

This function is available in the following pump sizes:

	2-pole
Single-phase pumps	1/2 - 2 hp (0.37 - 1.5 kW)
Three-phase pumps	1-30 hp (0.75 - 22 kW)

Setup

The power limit is always active in CRE pumps to protect the motor against overload. Pumps with undersized motor and pumps with higher maximum speed are available as factory-configured products.

Note that running at over-synchronous speed affects the NPSH value, and sufficient inlet pressure is therefore required.

Sound pressure level emitted from the pump and motor may increase at higher speeds.

Furthermore, the differential pressure over the chambers must be taken into consideration.

Related information

Pump hydraulic limitations

Affinity equations

Low-flow stop function

The stop function ensures that the pump stops when low or no flow is detected, for example, if the pump is pumping against a closed valve.

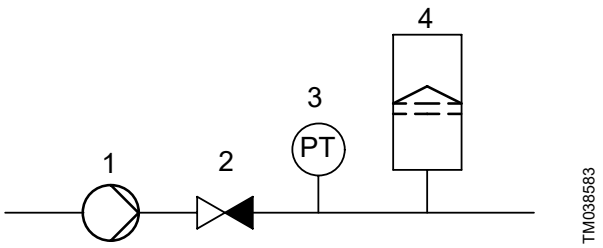
Purpose and benefits

The stop function provides the following benefits:

- Energy consumption is limited and system efficiency is improved.
- Unnecessary heating of the pumped liquid is avoided.
- Wear of the shaft seals is reduced.
- Noise from operation is reduced.

Applications

The stop function is used in systems with a diaphragm tank and where periodically low or no consumption can occur, thus preventing the pump from running against a closed valve.



Pos.	Description
1	Pump
2	Check valve
3	Pressure sensor
4	Diaphragm bank

Availability

This function is available in the following pump sizes:

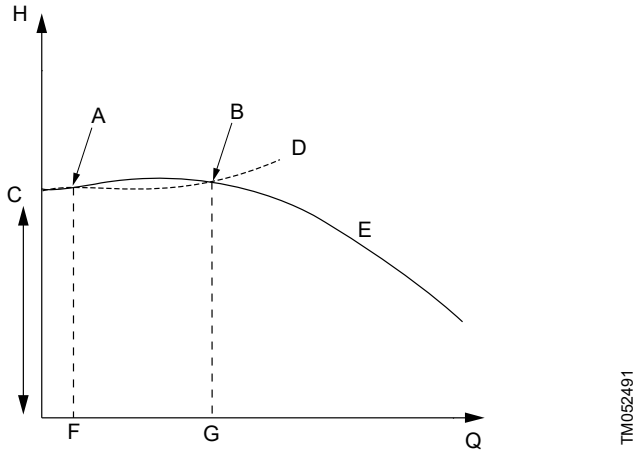
	2-pole
Single-phase pumps	1/2 - 2 hp (0.37 - 1.5 kW)
Three-phase pumps	1 - 30 hp (0.75 - 22 kW)

Setup

This function is available in factory-configured products.

Stabilizing unstable pump curves

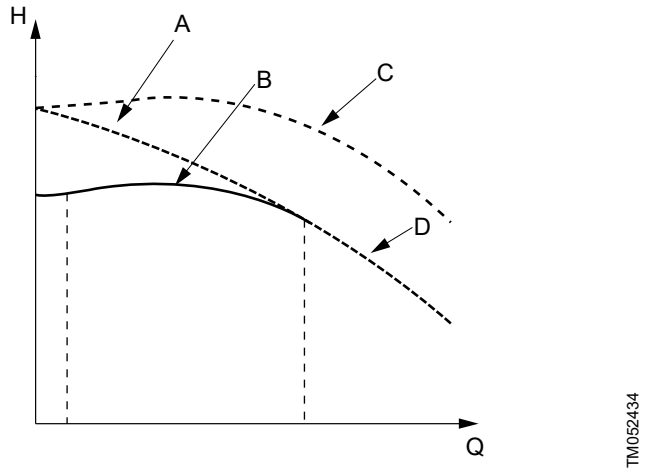
When the pump curve has a shape where it intersects the system curve at two points (A and B) with identical pressure but at different flow rates, the pump curve is defined as unstable. This is especially problematic in systems with a flat system characteristic as it prevents the pump from being controlled to a flow rate which is lower than the flow rate at point B.



Unstable pump curve

Pos.	Description
A	Intersection between pump curve and system curve
B	Intersection between pump curve and system curve
C	Counter pressure
D	Flat system characteristic
E	Unstable curve
F	2 m^3/h
G	7 m^3/h

The E-motor can stabilize an unstable pump curve in the low flow rate area by changing to a higher speed. The figure below illustrates how the pump curve is straightened out in this area. As the flow rate increases, the E-motor gradually reduces the speed to normal speed and the pump performance follows the standard pump curve.



Pump curve with a stabilized operating range

Pos.	Description
A	Stabilized pump curve
B	Unstable standard pump curve
C	65 Hz curve
D	60 Hz

Purpose and benefits

The purpose of stabilizing an unstable pump is to enable normal control throughout the entire operating range. Thus, fully stable operation is achieved, even in the low flow range. This enables the use of modern high-efficiency pumps in applications where this would otherwise not be possible.

Applications

Unstable operation may occur in applications with a high counter pressure and a flat system characteristic.

Examples of application:

- Pumping of water to a water tower
- boiler feed.

Note that the sound pressure level emitted from the pump and motor may increase at higher speeds.

Availability

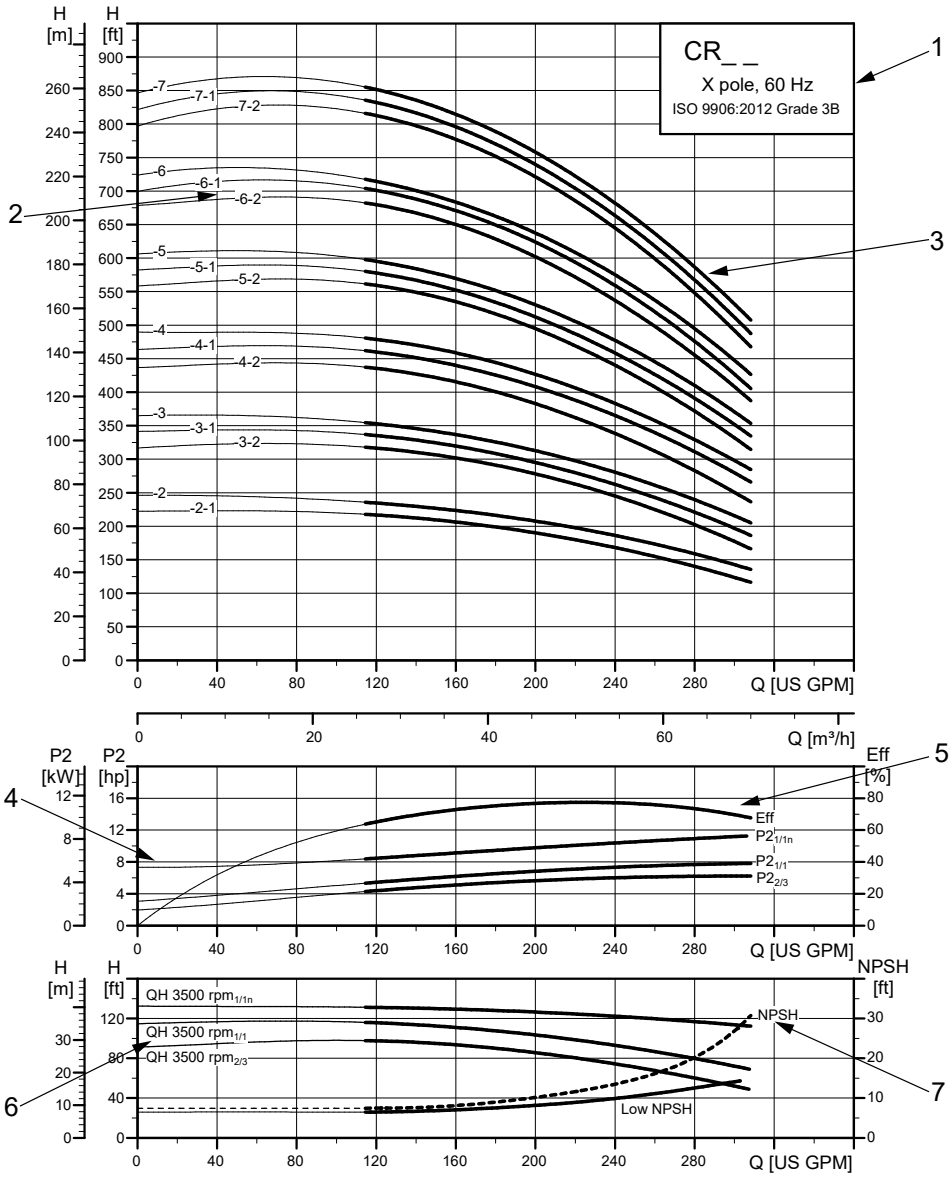
This function is available in the following pump sizes:

	2-pole
Single-phase pumps	1/2 - 2 hp (0.37 - 1.5 kW)
Three-phase pumps	1-30 hp (0.75 - 22 kW)

Setup

This function is available in factory-configured products.

11. How to read the curve charts



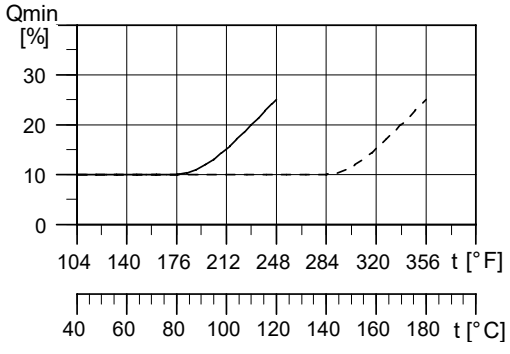
Pos.	Description
1	It shows the pump type, frequency, poles or speed as well as the ISO or ANSI standard.
2	Number of stages. First figure: number of stages. Second figure: number of reduced-diameter impellers.
3	It is the QH curve of the individual pump with the bold curves indicating the recommended duty range for best efficiency.
4	The power curves indicate pump input power **per stage**. Curves are shown for a pump with one stage (1/1), low-NPSH stage (1/1n) and reduced-diameter impellers (2/3).
5	The Eff curve shows the efficiency of a pump with three full-size impellers. The efficiency of pumps with reduced-diameter impellers is approximately 2 % lower than the Eff curve shown in the chart.
6	It is the QH for each individual impeller. Curves are shown for a pump with one stage (1/1), low-NPSH stage (1/1n) and reduced-diameter impellers (2/3).
7	The NPSH curve is a maximum curve for all the variants shown.

Guidelines to performance curves

The guidelines below apply to the performance curves:

- Tolerances to ANSI or ISO standards, such as ISO 9906:2012, Grade 3B, if indicated on the curve chart.
- The motors used for the measurements are standard Grundfos-specified motors.
- Measurements have been made with airless water at a temperature of 68 °F (20 °C).
- The curves apply to the following kinematic viscosity: υ = 1 mm^2/s (1 cSt).
- Due to risk of overheating, the pumps must not be used at a flow rate below the minimum flow rate.
- The QH curves apply to a rated motor speed of a three-phase mains-operated motor. For realistic curves, go to Grundfos Product Center (http://product-selection.grundfos.com) and insert data.

The curve below shows the minimum flow rate as a percentage of the rated flow rate in relation to the liquid temperature. The dotted line shows a CRN pump fitted with an air-cooled top assembly.

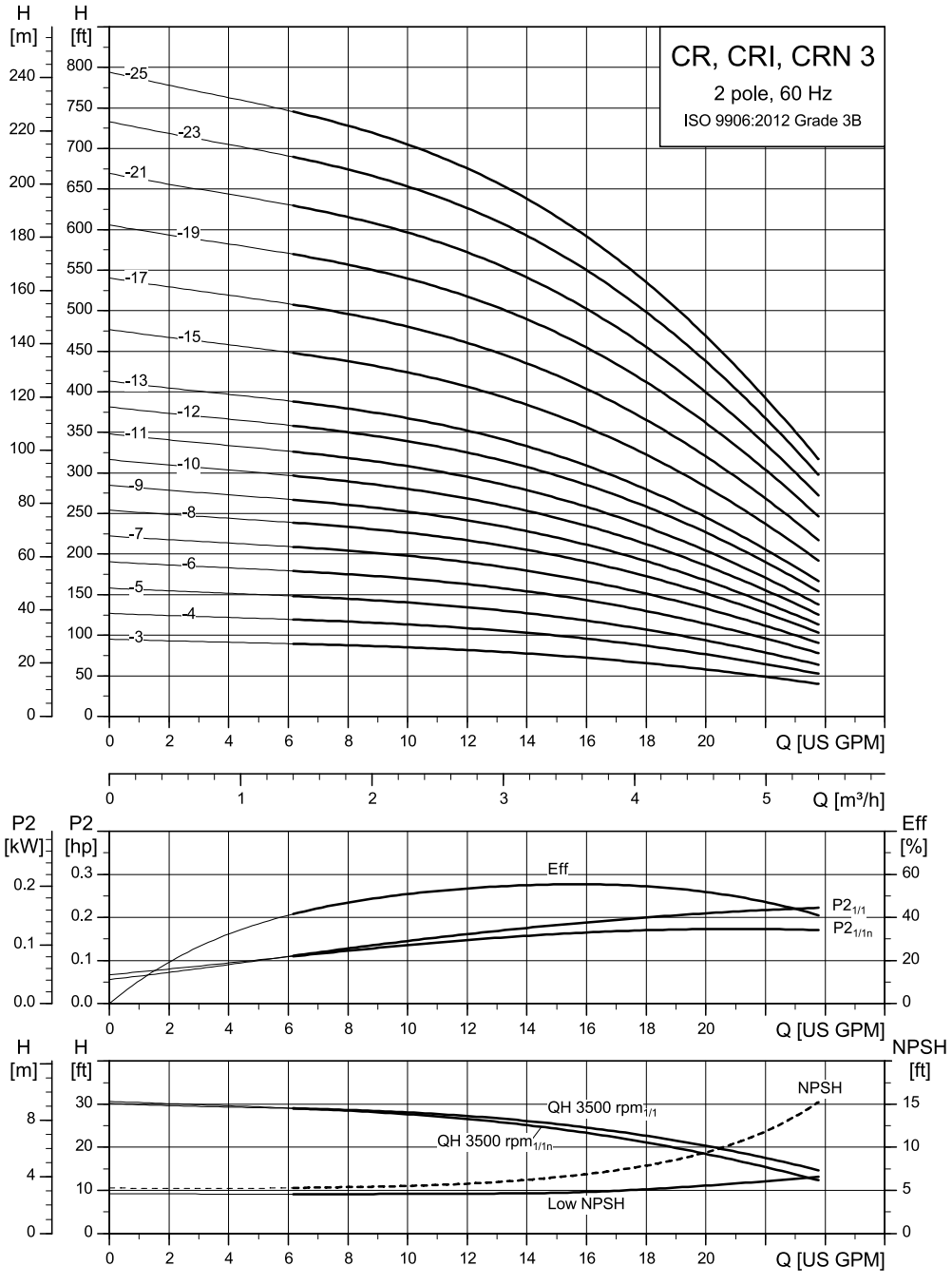


Minimum flow rate

12. Performance curves

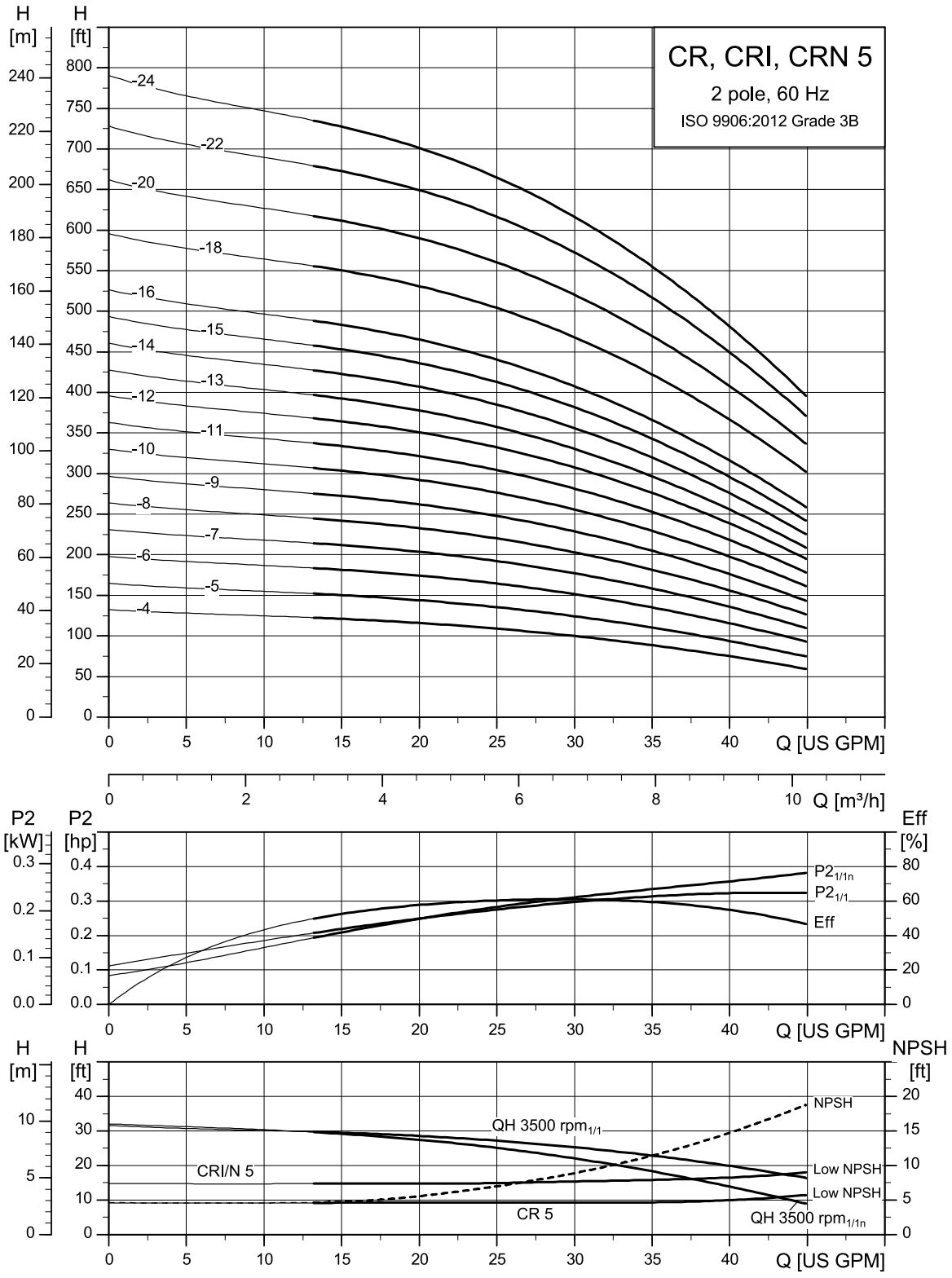
Low-NPSH pumps with 2-pole motor

CR, CRI, CRN 3



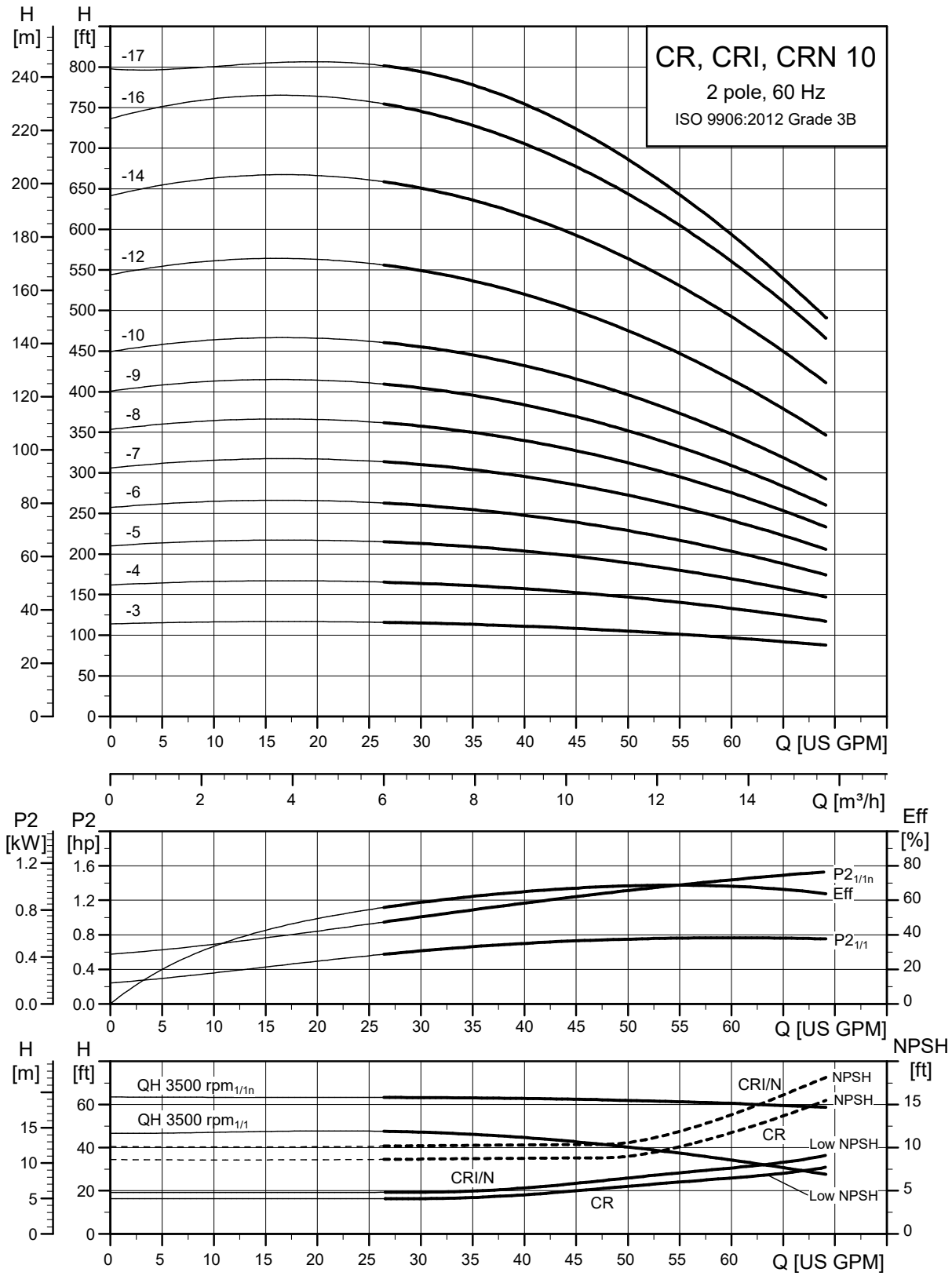
TM057078

Low-NPSH pumps with 2-pole motor: CR, CRI, CRN 5

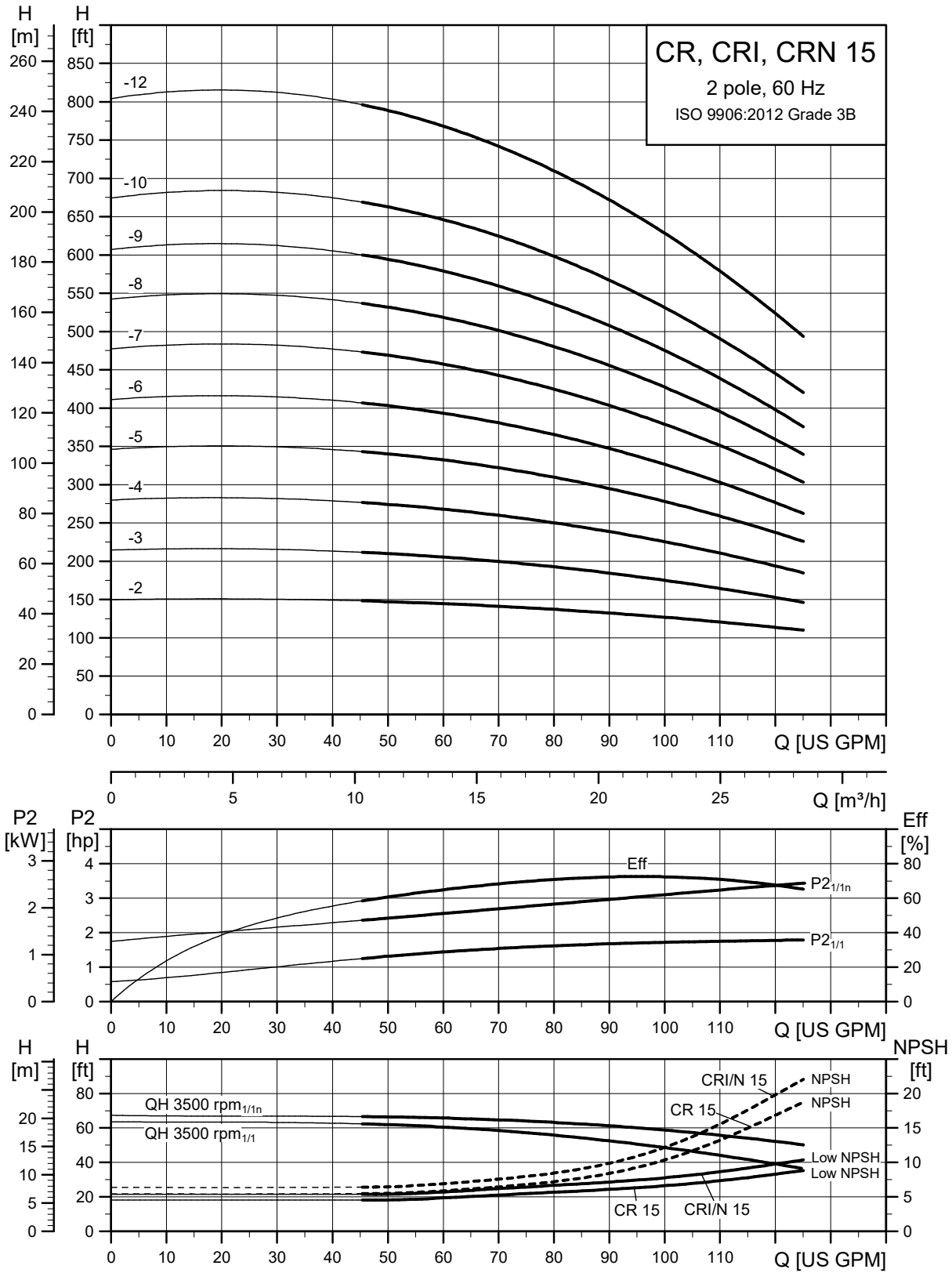


TM057079

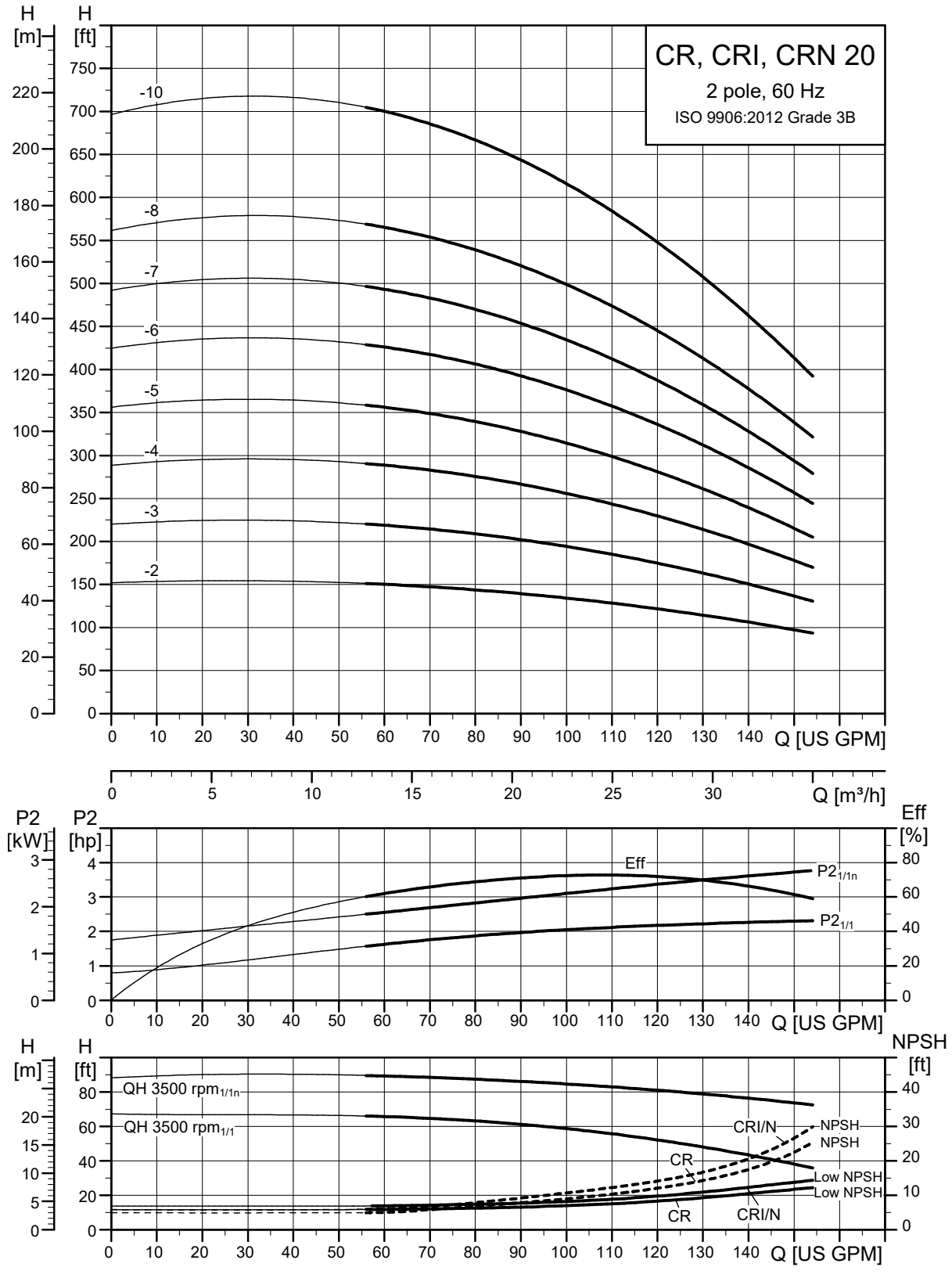
Low-NPSH pumps with 2-pole motor: CR, CRI, CRN 10



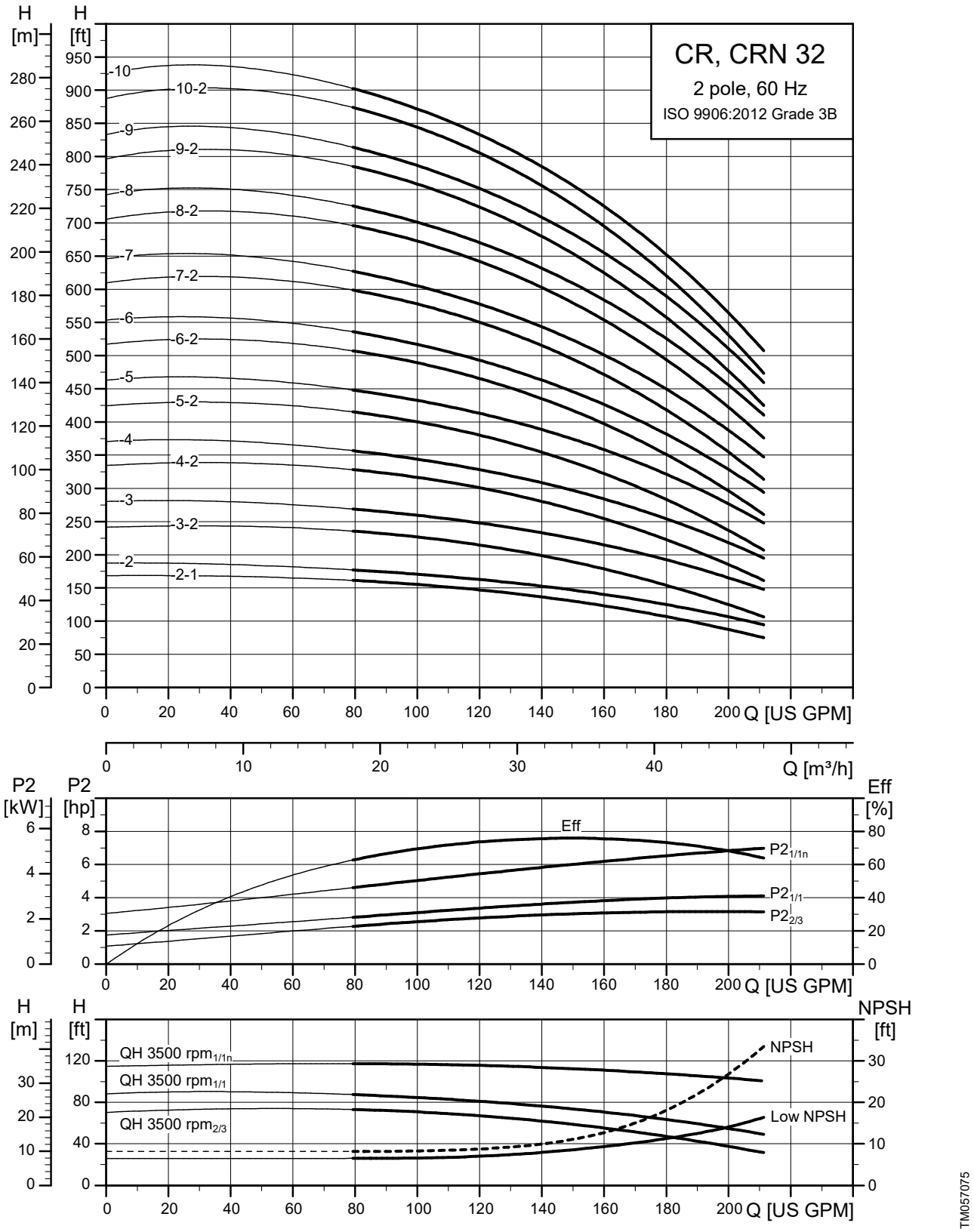
Low-NPSH pumps with 2-pole motor: CR, CRI, CRN 15



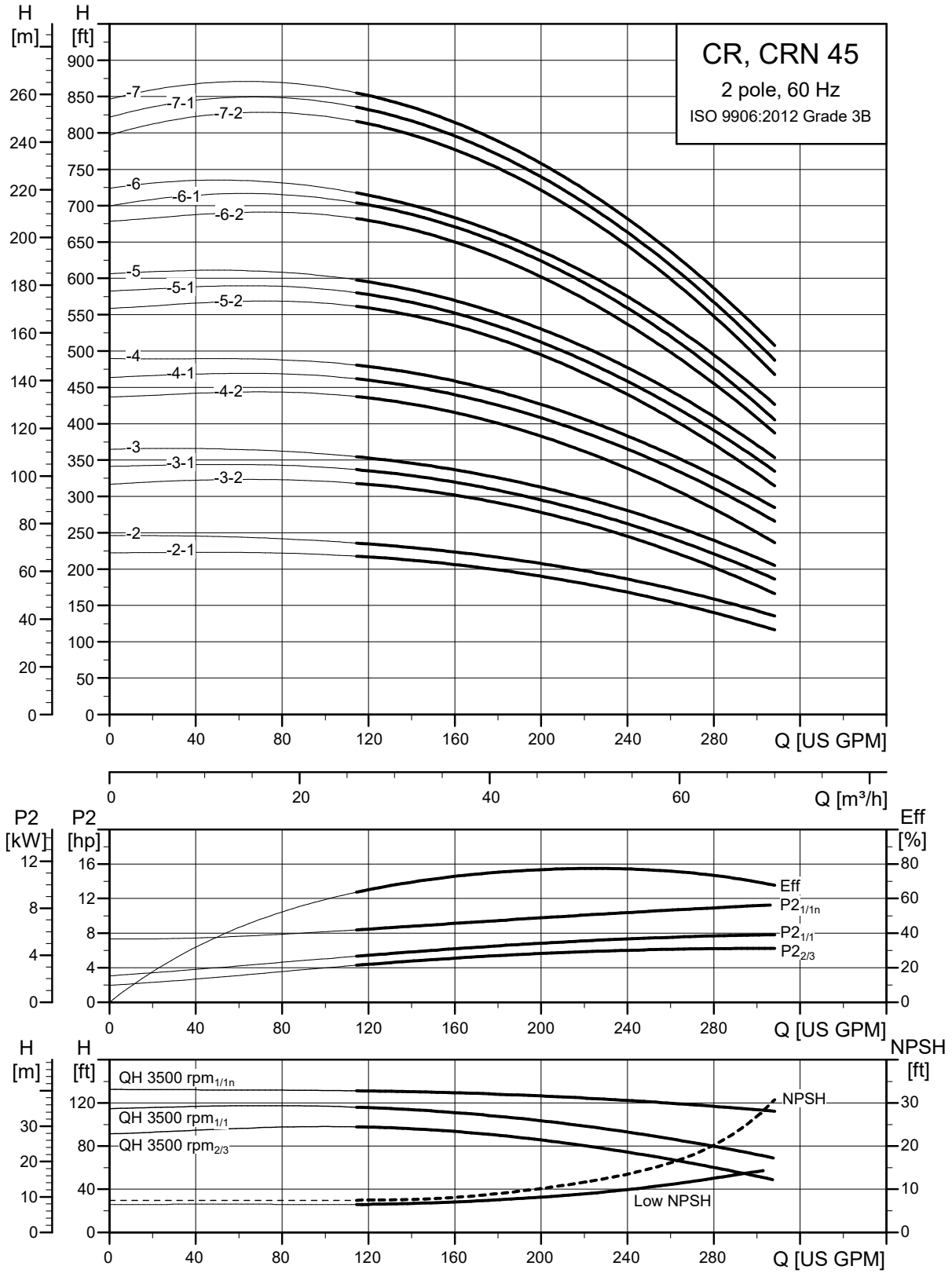
Low-NPSH pumps with 2-pole motor: CR, CRI, CRN 20



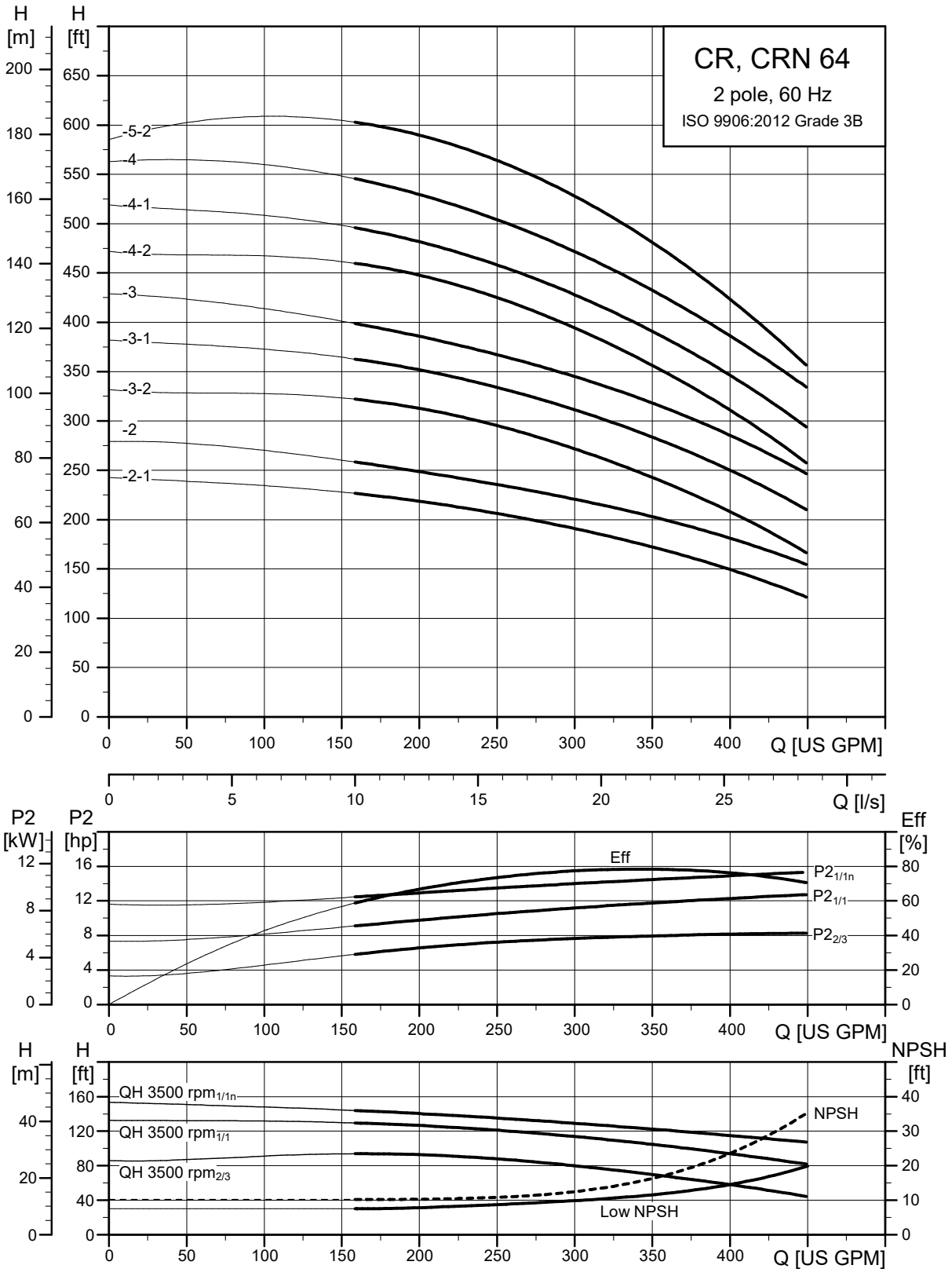
Low-NPSH pumps with 2-pole motor: CR, CRI, CRN 32



Low-NPSH pumps with 2-pole motor: CR, CRI, CRN 45

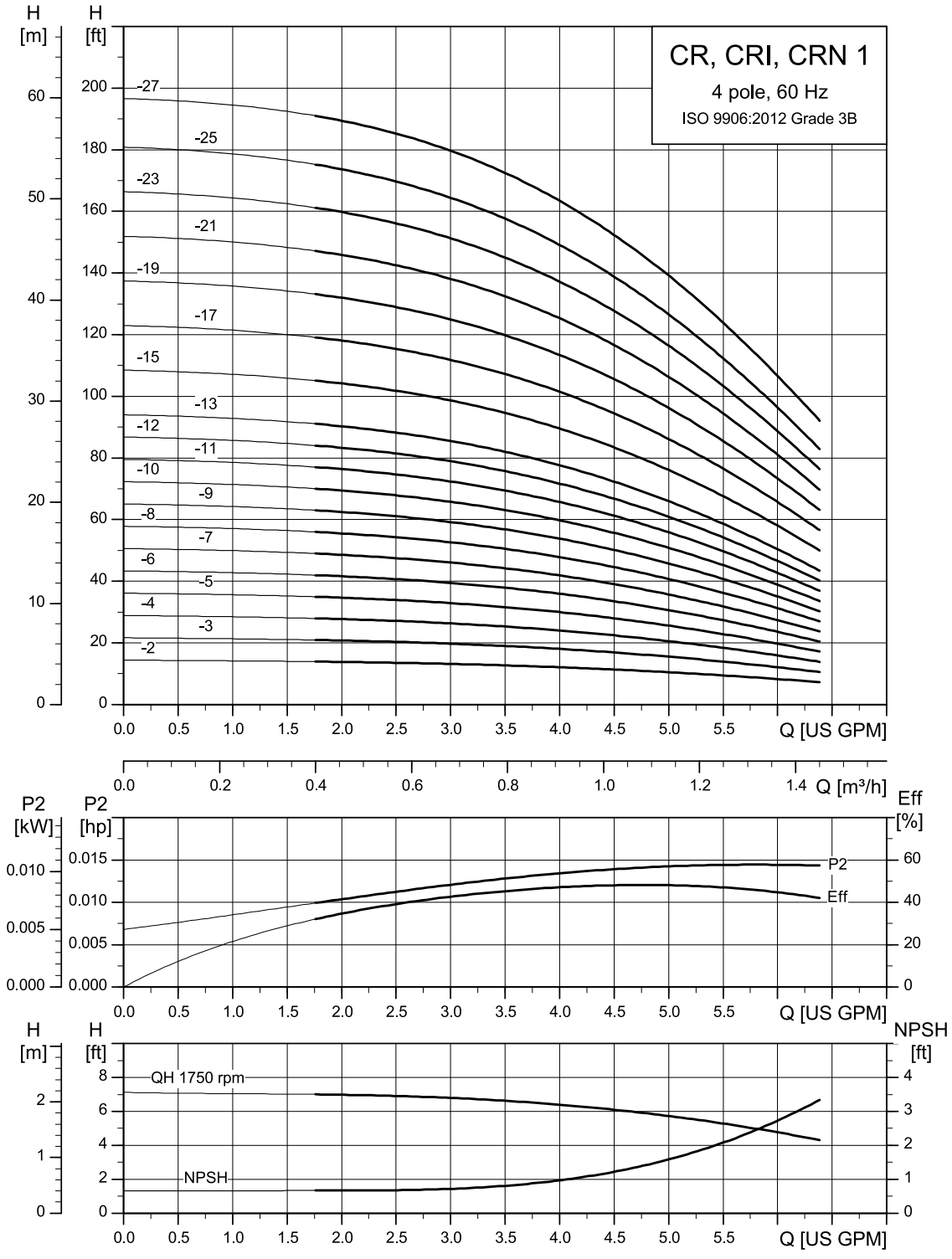


Low-NPSH pumps with 2-pole motor: CR, CRI, CRN 64



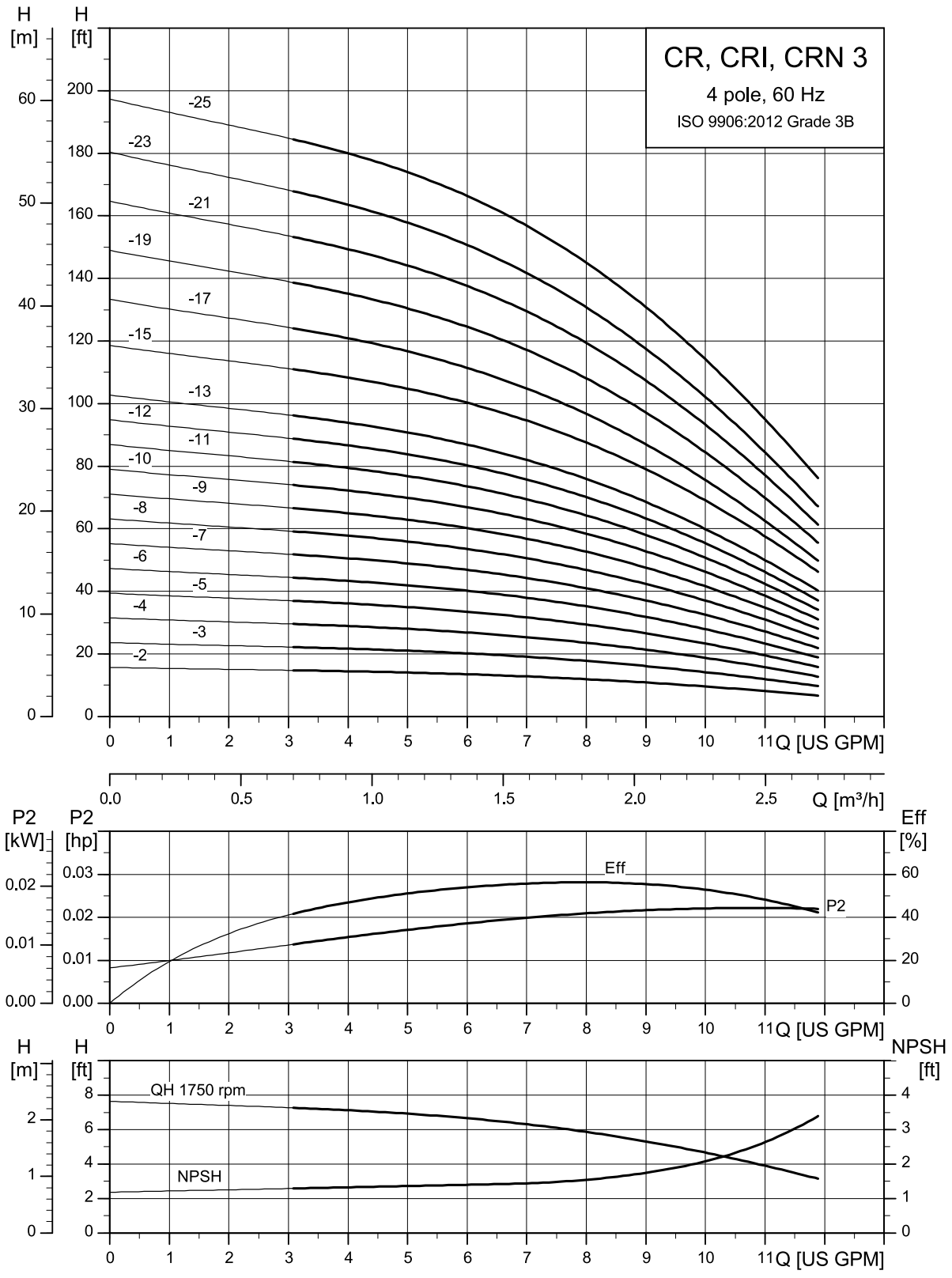
CR pumps with 4-pole motor

CR, CRI, CRN 1



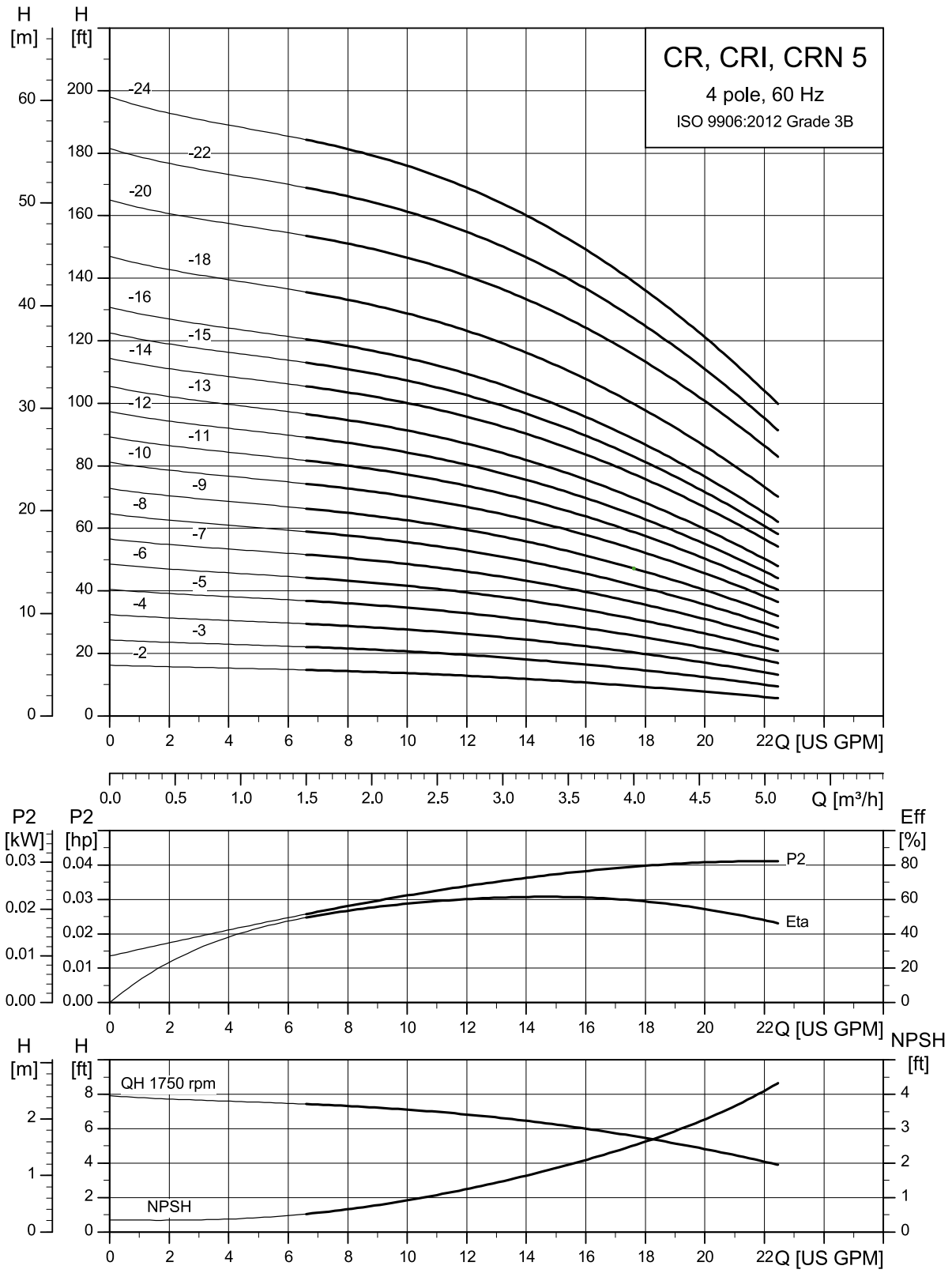
TM057073

CR pumps with 4-pole motor: CR, CRI, CRN 3



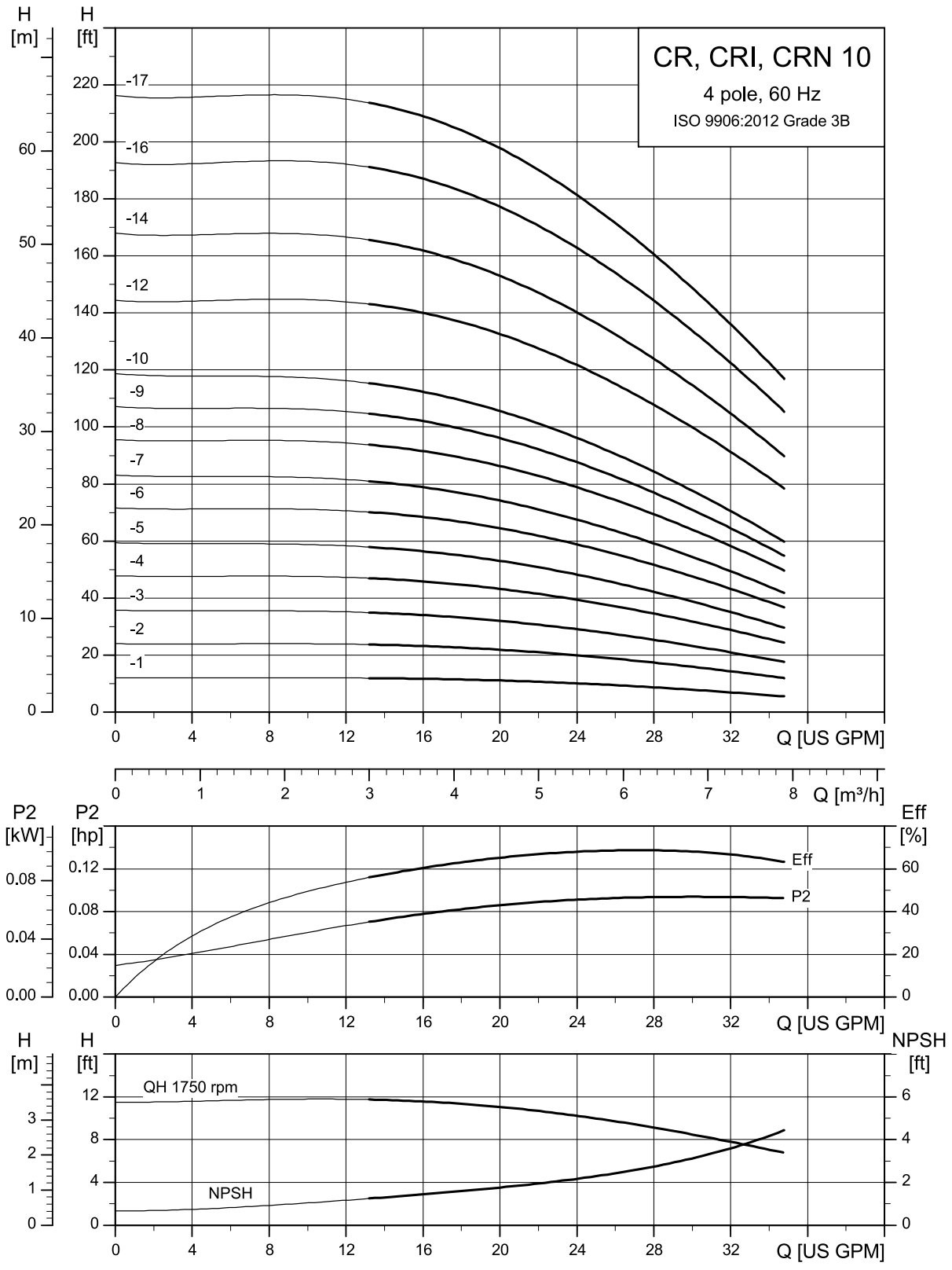
TM057074

CR pumps with 4-pole motor: CR, CRI, CRN 5



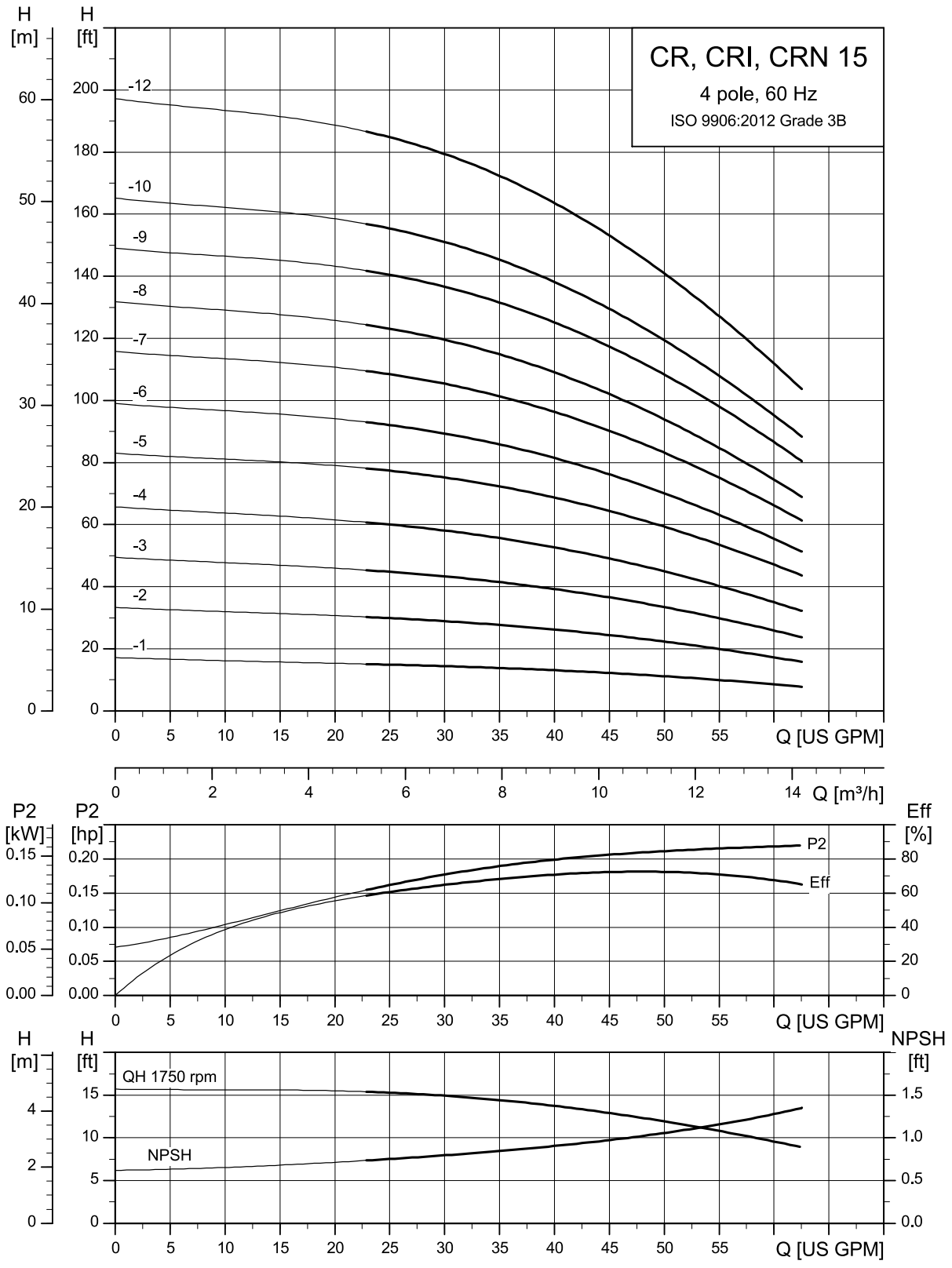
TM057080

CR pumps with 4-pole motor: CR, CRI, CRN 10



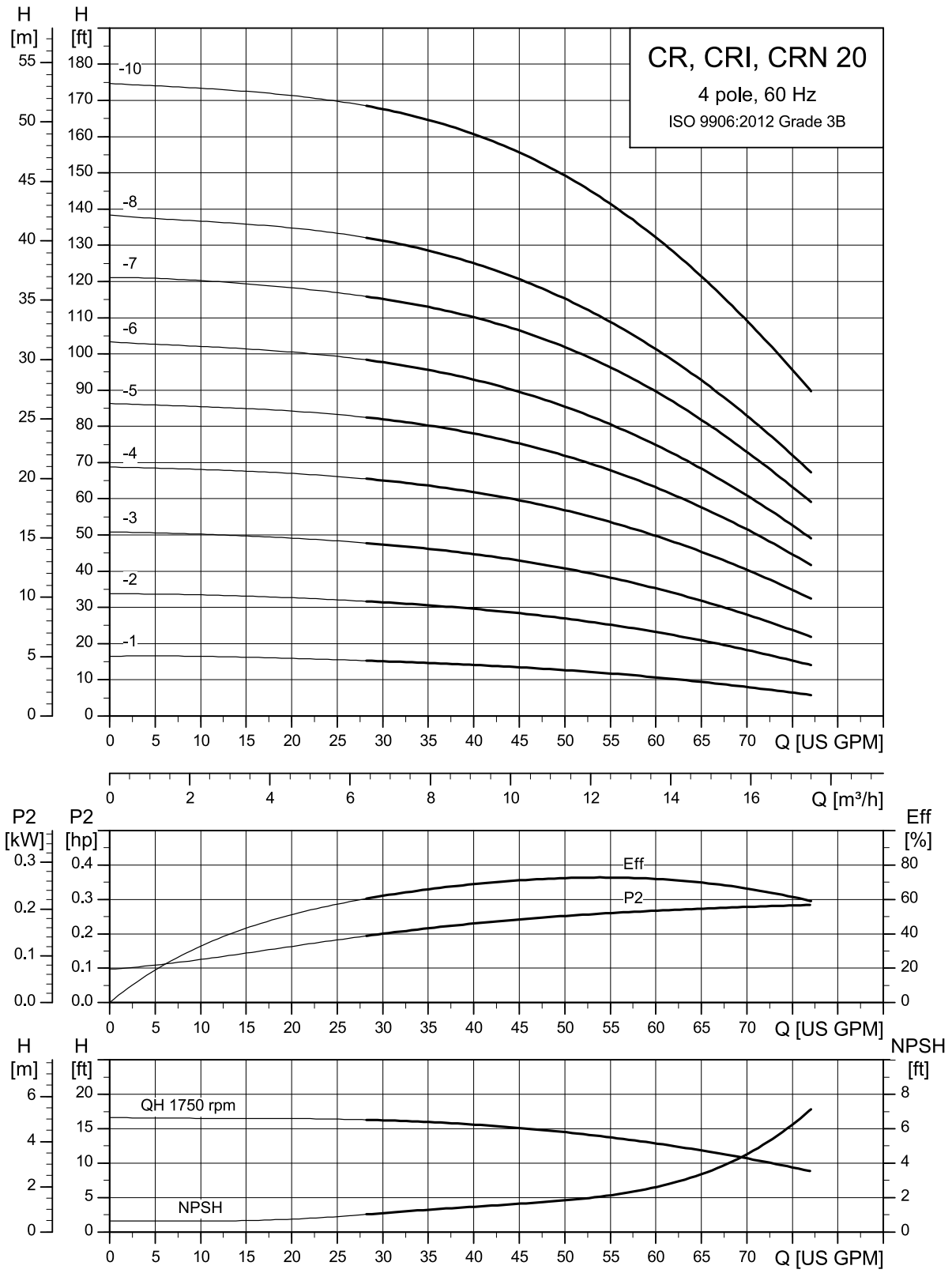
TM057082

CR pumps with 4-pole motor: CR, CRI, CRN 15



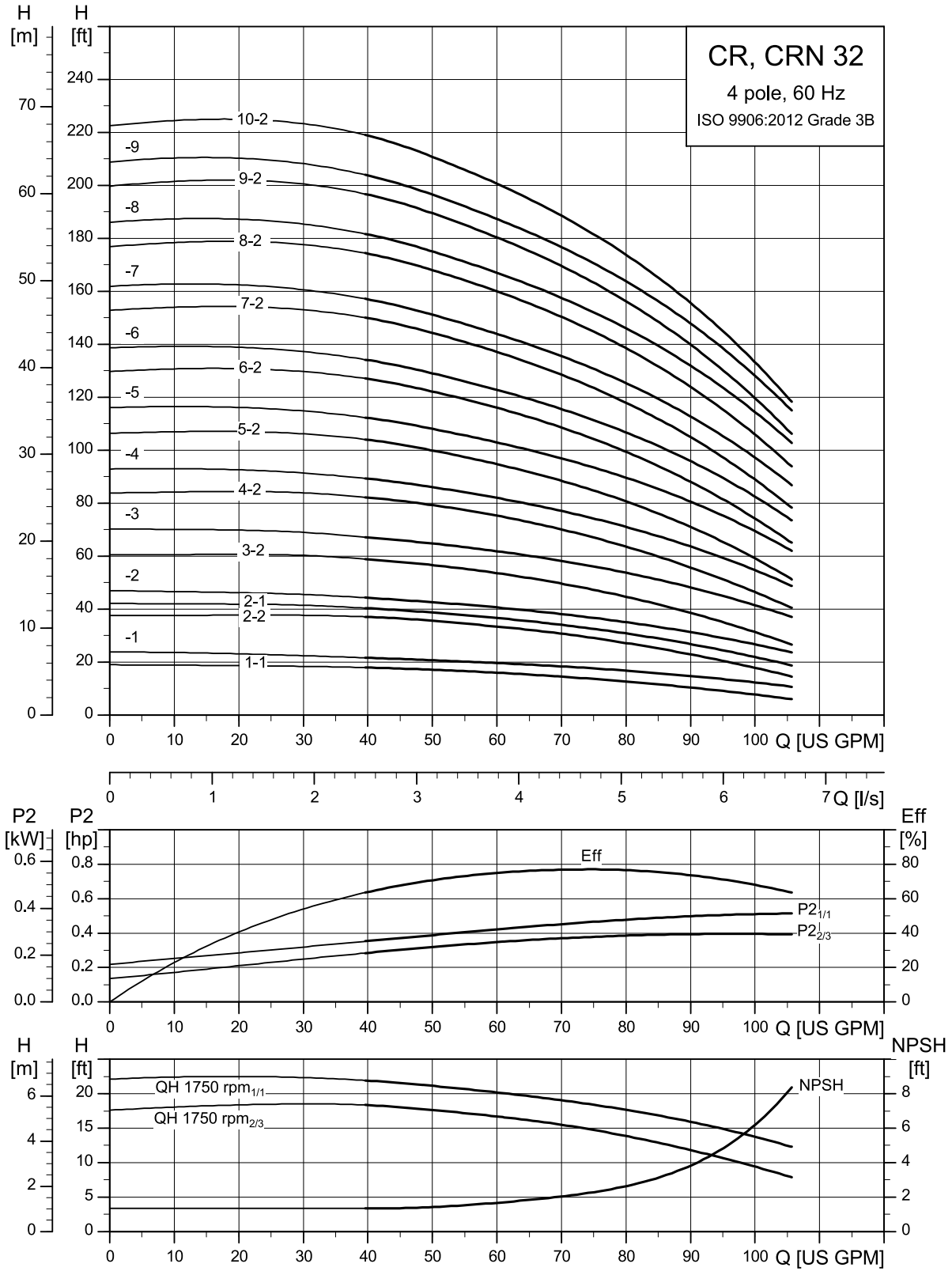
TM057084

CR pumps with 4-pole motor: CR, CRI, CRN 20



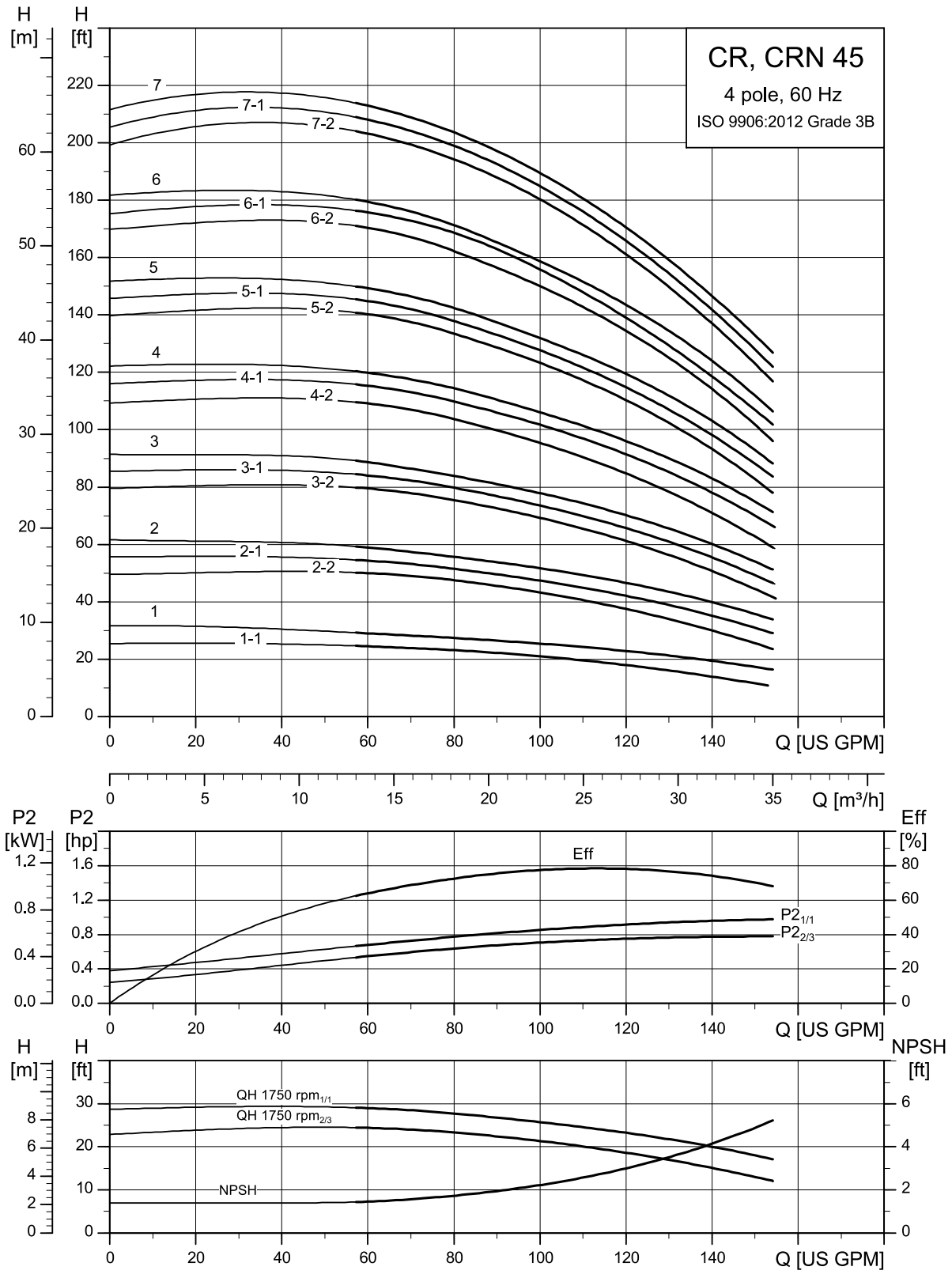
TM057086

CR pumps with 4-pole motor: CR, CRI, CRN 32

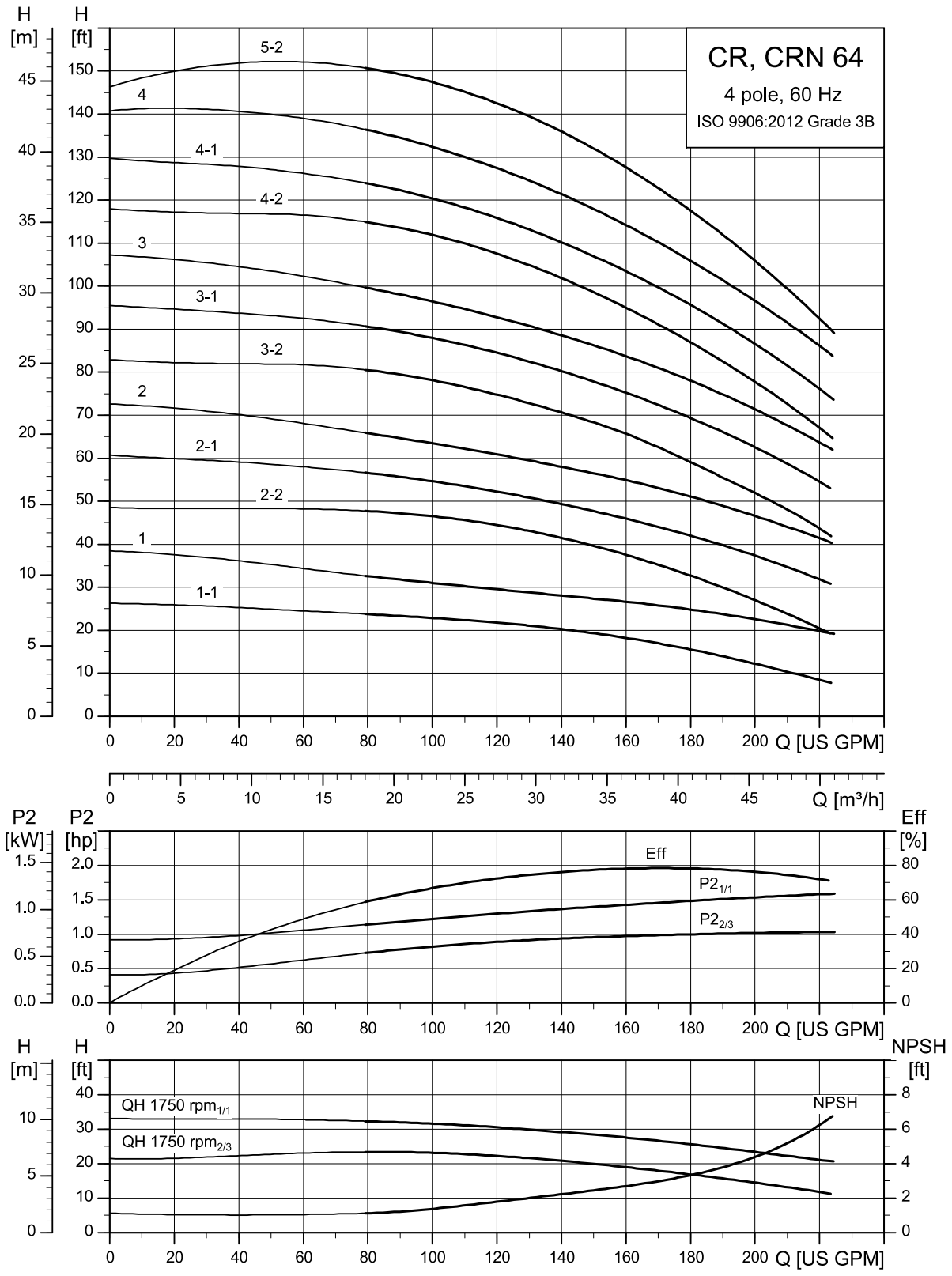


TM057087

CR pumps with 4-pole motor: CR, CRI, CRN 45

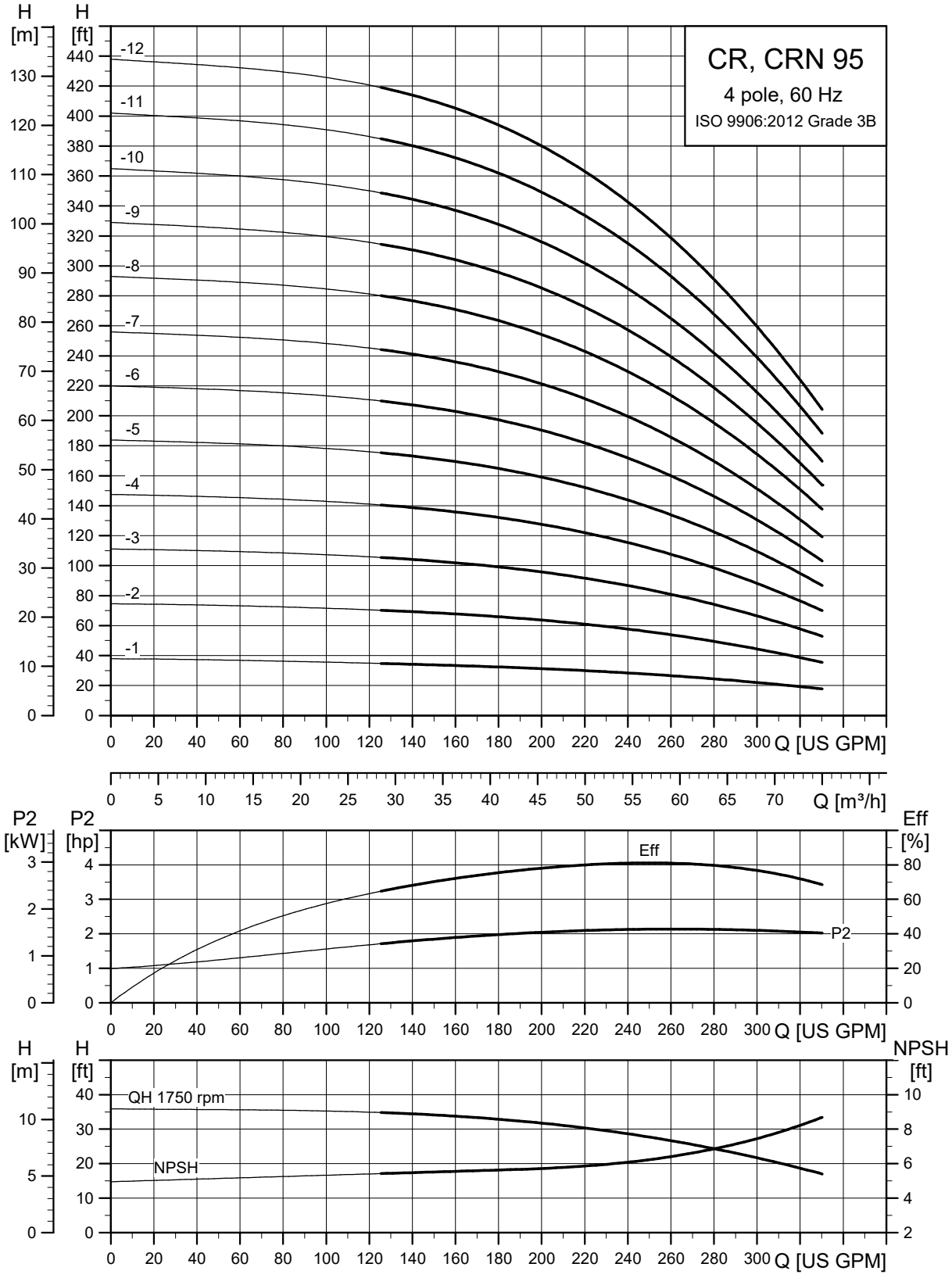


CR pumps with 4-pole motor: CR, CRI, CRN 64

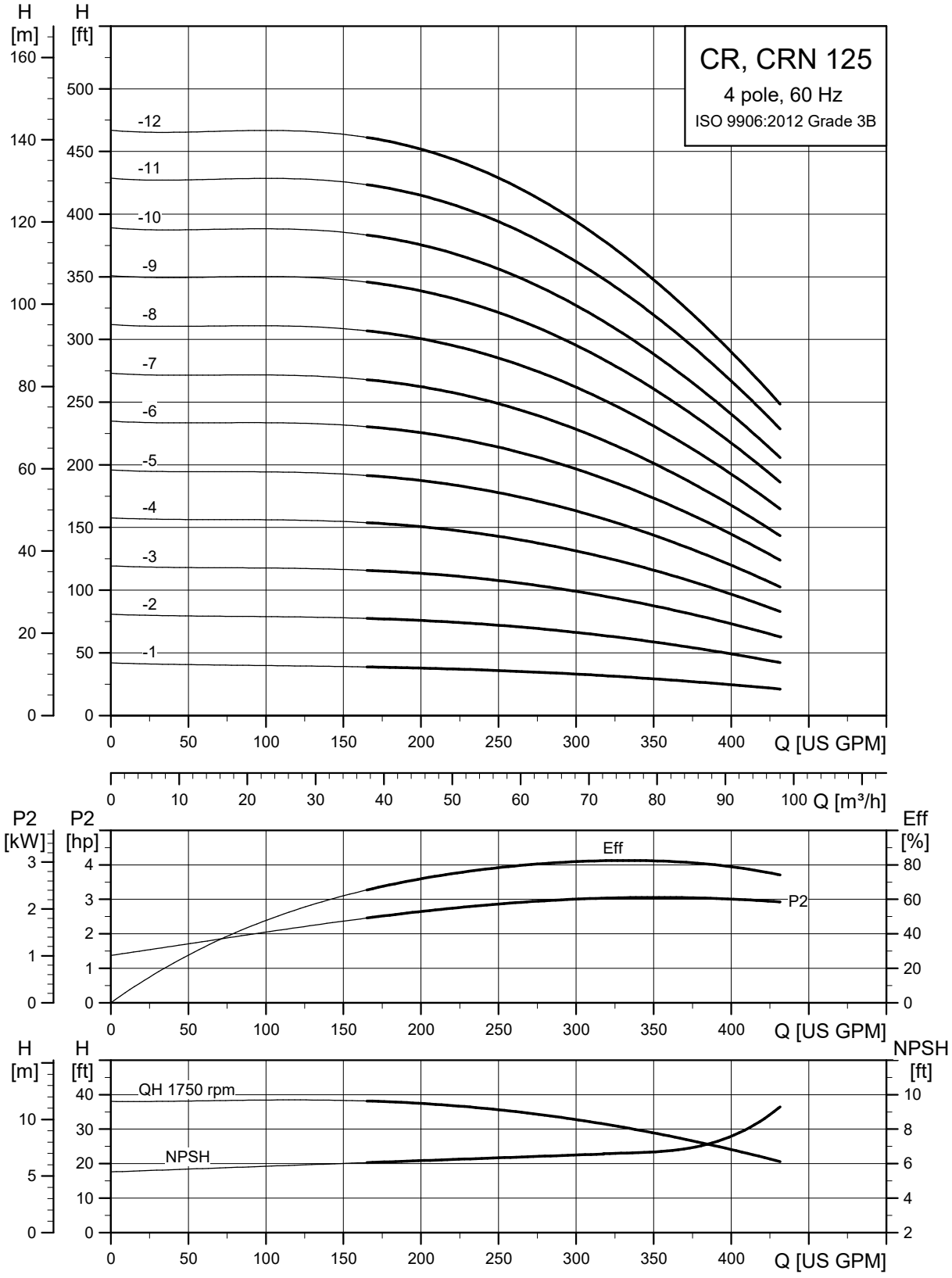


TM057089

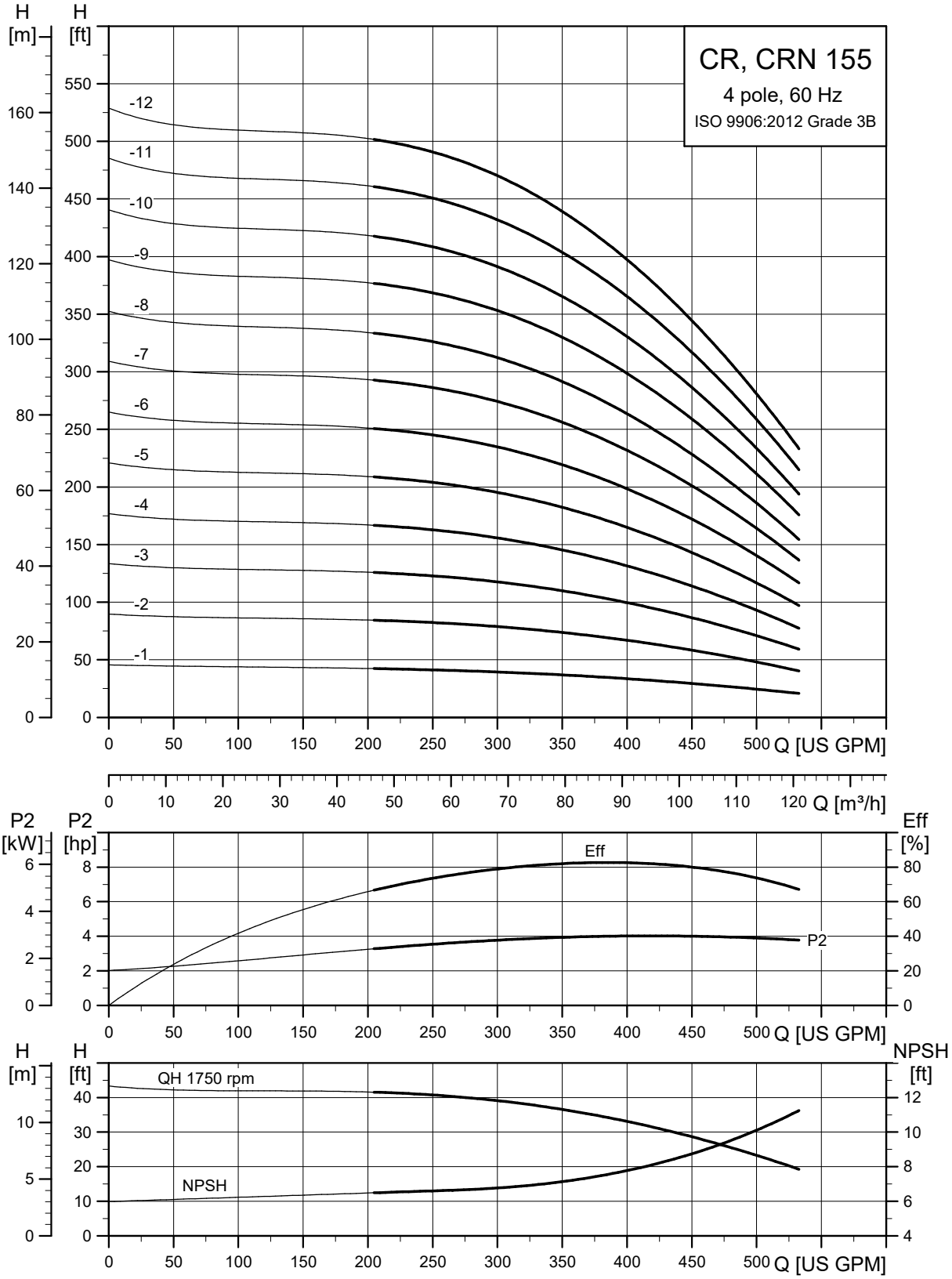
CR pumps with 4-pole motor: CR, CRN 95



CR pumps with 4-pole motor: CR, CRN 125

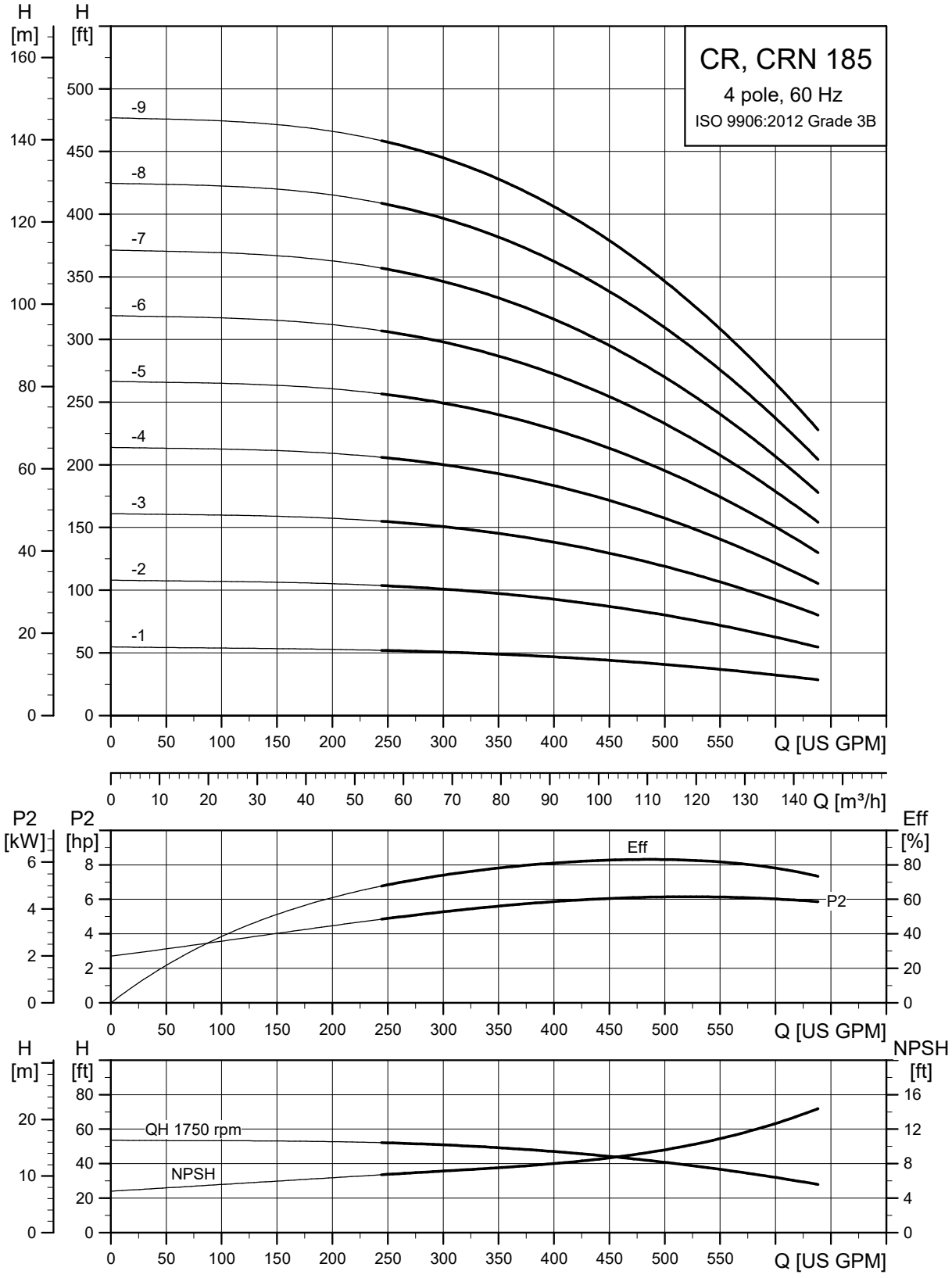


CR pumps with 4-pole motor: CR, CRN 155



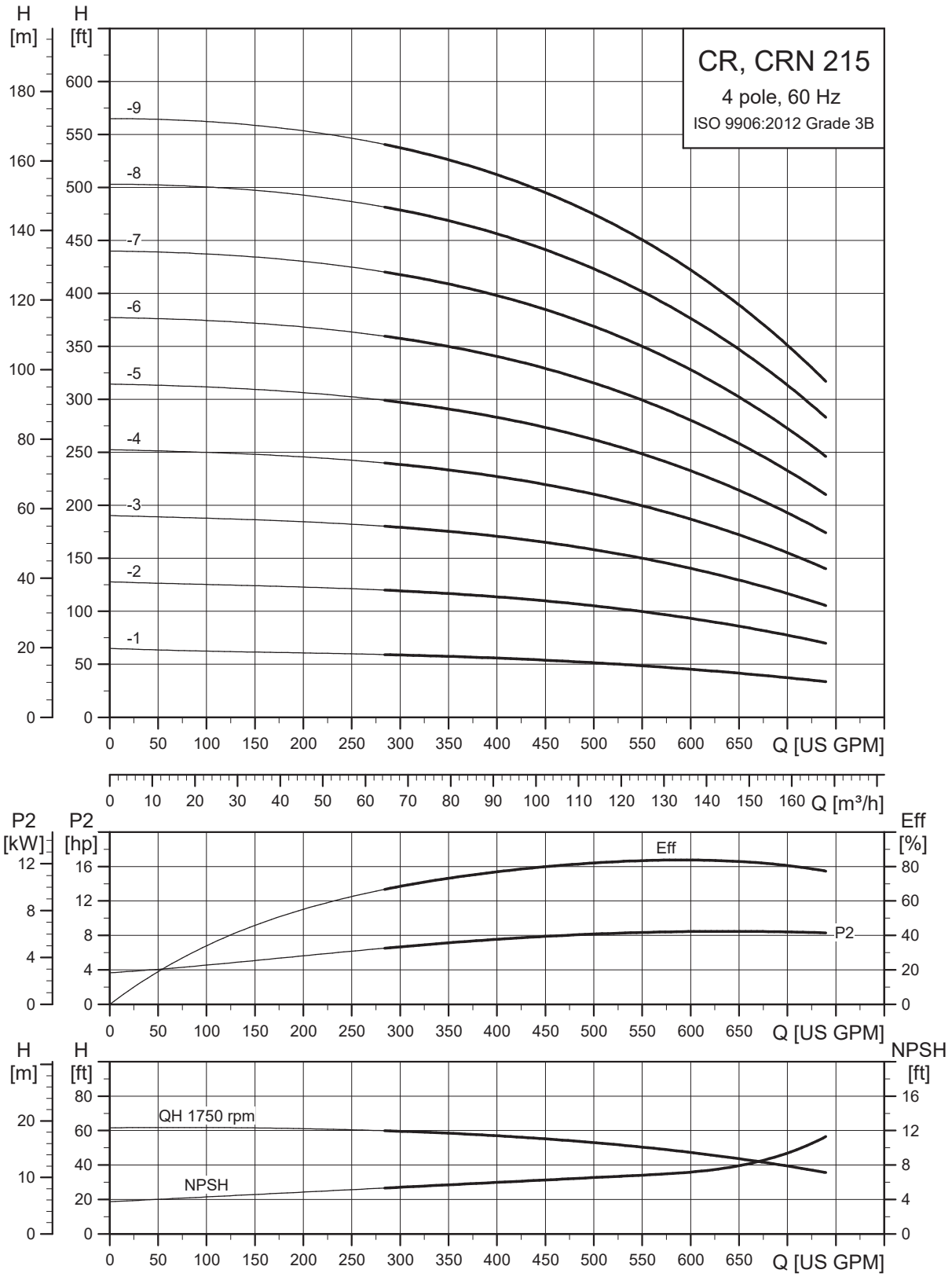
TM077589

CR pumps with 4-pole motor: CR, CRN 185



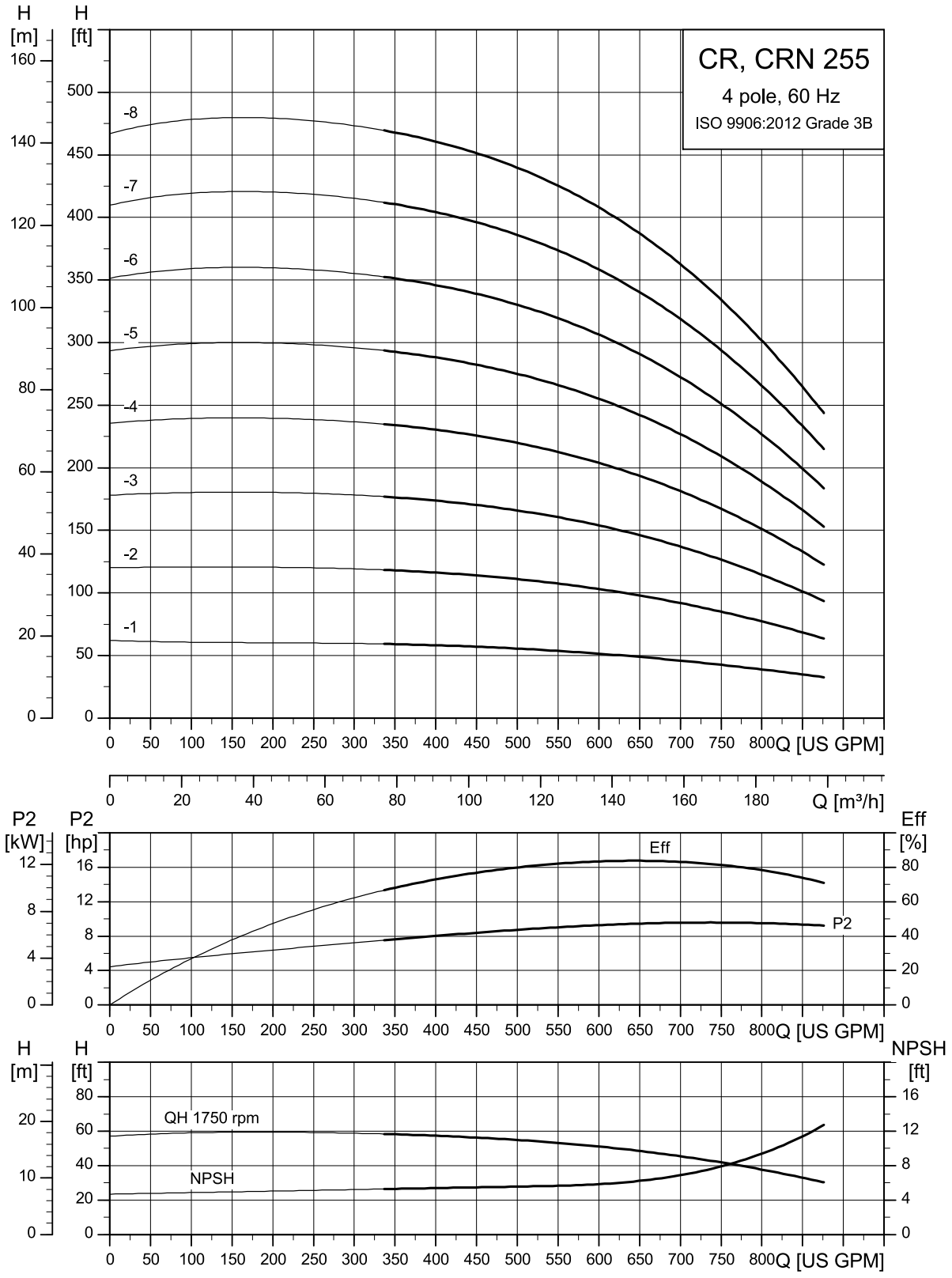
TM077590

CR pumps with 4-pole motor: CR, CRN 215



TM079896

CR pumps with 4-pole motor: CR, CRN 255

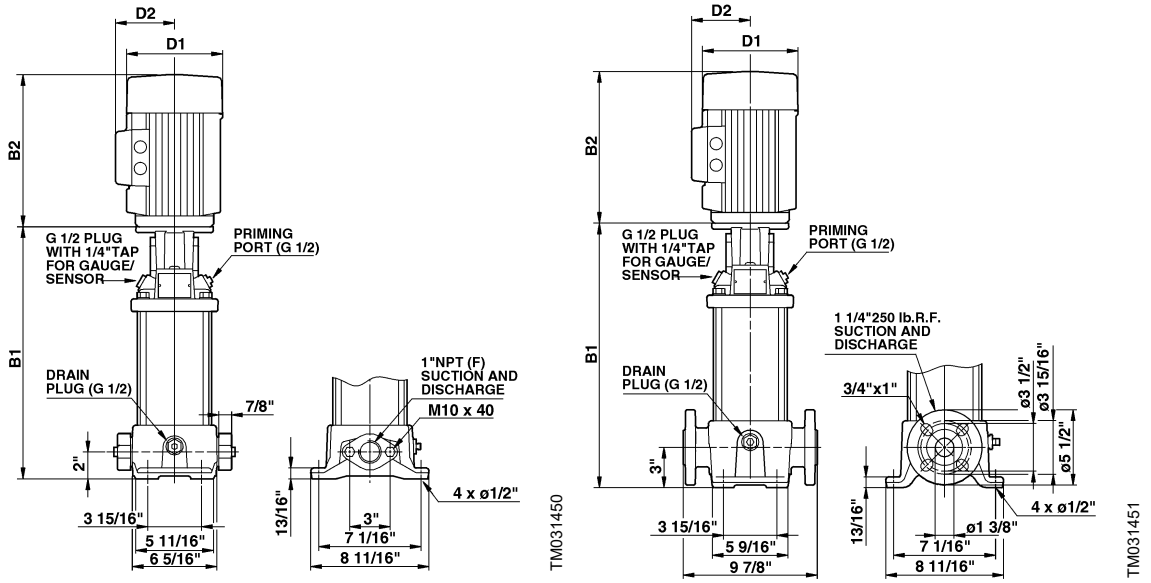


TM081000

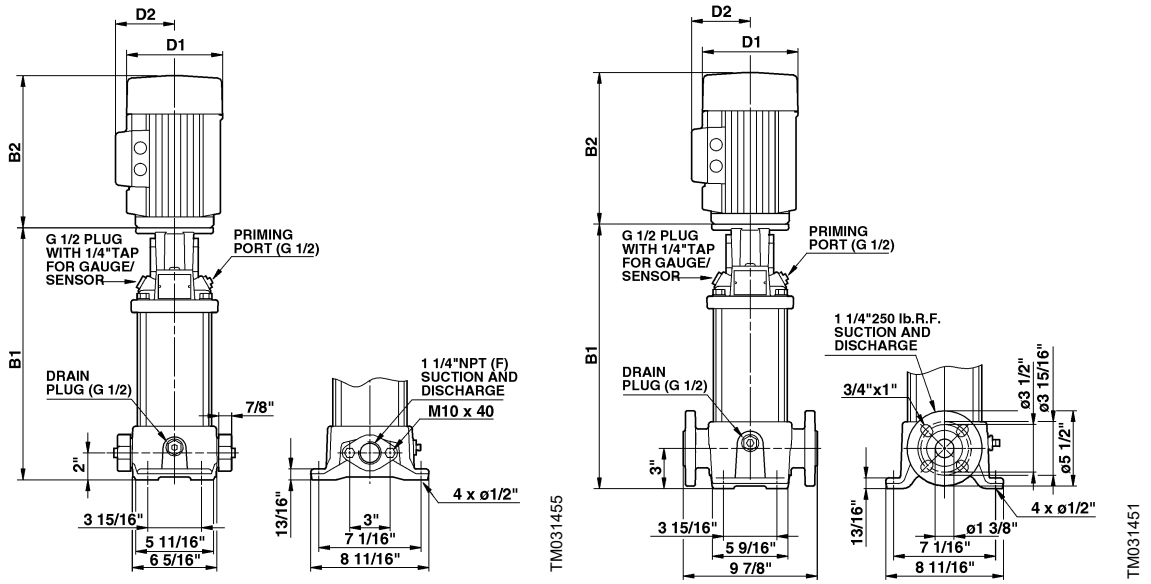
13. Technical data

Dimensional drawings for CR low-NPSH pumps

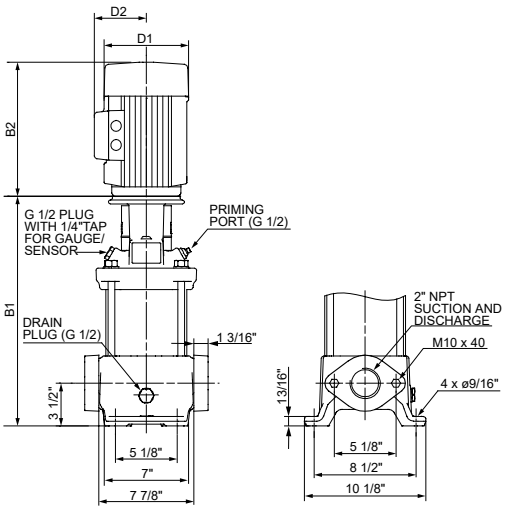
CR 3



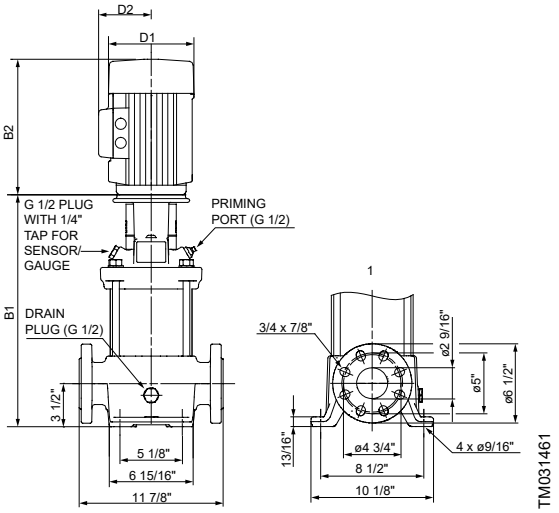
CR 5



CR 10
CR 15
CR 20

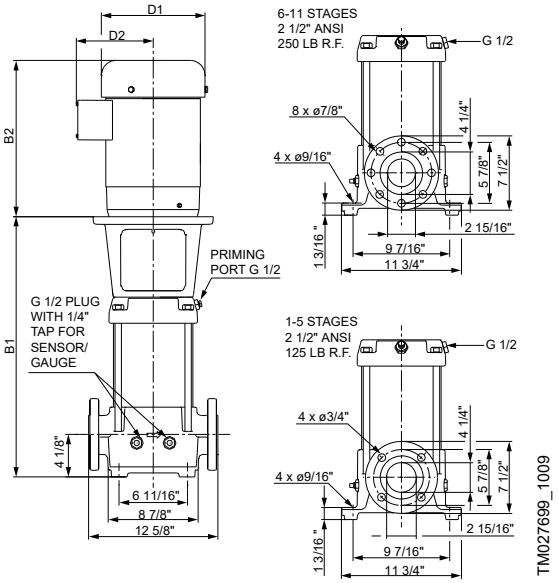


TM031460

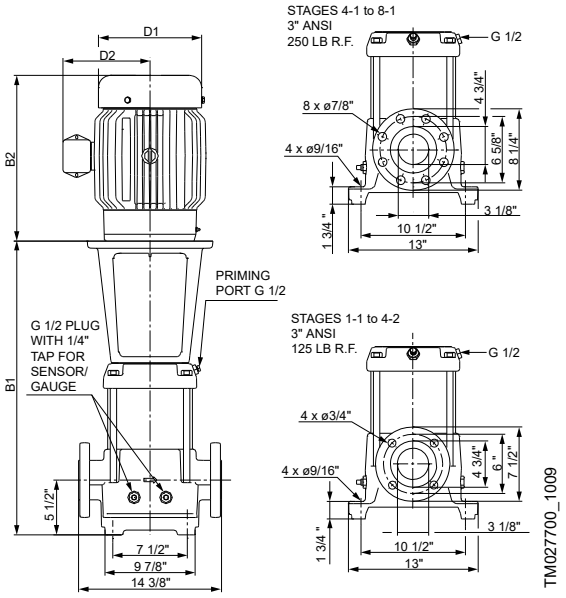


TM031461

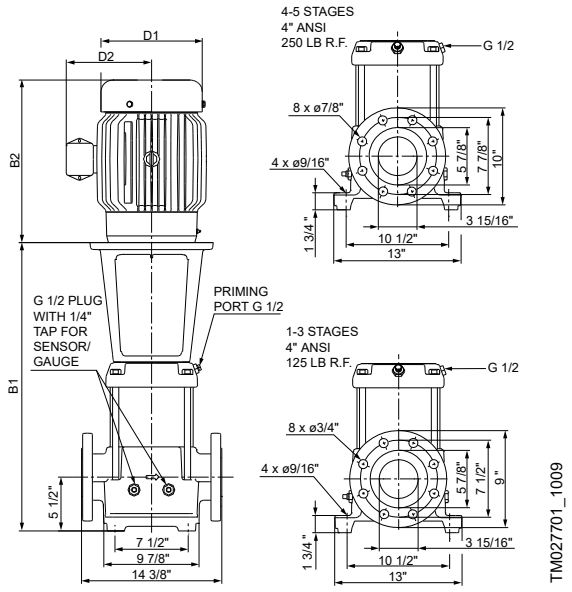
CR 32


D1
D2
B2
B1
PRIMING PORT G 1/2
G 1/2 PLUG WITH 1/4" TAP FOR SENSOR/ GAUGE
4 1/8"
6 11/16"
8 7/8"
12 5/8"
6-11 STAGES
2 1/2" ANSI
250 LB R.F.
G 1/2
8 x ø7/8"
4 x ø9/16"
4 1/4"
5 7/8"
7 1/2"
2 15/16"
1 3/16 "
9 7/16"
11 3/4"
1-5 STAGES
2 1/2" ANSI
125 LB R.F.
G 1/2
4 x ø3/4"
4 x ø9/16"
4 1/4"
5 7/8"
7 1/2"
2 15/16"
1 3/16 "
9 7/16"
11 3/4"
TM027699_1009

CR 45


D1
D2
B2
B1
PRIMING PORT G 1/2
G 1/2 PLUG WITH 1/4" TAP FOR SENSOR/ GAUGE
5 1/2"
7 1/2"
9 7/8"
14 3/8"
STAGES 4-1 to 8-1
3" ANSI
250 LB R.F.
G 1/2
8 x ø7/8"
4 x ø9/16"
4 3/4"
6 5/8"
8 1/4"
3 1/8"
1 3/4 "
10 1/2"
13"
STAGES 1-1 to 4-2
3" ANSI
125 LB R.F.
G 1/2
4 x ø3/4"
4 x ø9/16"
4 3/4"
6 "
7 1/2"
3 1/8"
1 3/4 "
10 1/2"
13"
TM027700_1009

CR 64


D1
D2
B2
B1
G 1/2 PLUG WITH 1/4" TAP FOR SENSOR/ GAUGE
PRIMING PORT G 1/2
5 1/2"
7 1/2"
9 7/8"
14 3/8"
4-5 STAGES
4" ANSI
250 LB R.F.
G 1/2
8 x ø7/8"
4 x ø9/16"
5 7/8"
7 7/8"
10"
1 3/4"
3 15/16"
10 1/2"
13"
1-3 STAGES
4" ANSI
125 LB R.F.
G 1/2
8 x ø3/4"
4 x ø9/16"
5 7/8"
7 1/2"
9"
1 3/4"
3 15/16"
10 1/2"
13"
TM027701_1009

CR low-NPSH pumps dimensions

CR 3 low-NPSH pumps, 60 Hz

Pump type	hp	PH	NEMA Frame size	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2
CR 3-3	3/4	1	56C	11.97	7.64	5.88	23.26
		3	56C	11.97	6.69	5.52	20.63
CR 3-4	1	1	56C	12.68	7.64	5.88	24.38
		3	56C	12.68	6.69	5.52	21.73
CR 3-5	1	1	56C	13.39	7.64	5.88	25.09
		3	56C	13.39	6.69	5.52	22.44
CR 3-6	1 1/2	1	56C	14.09	7.64	5.88	26.56
		3	56C	14.09	7.64	5.88	25.78
CR 3-7	1 1/2	1	56C	14.80	7.64	5.88	27.27
		3	56C	14.80	7.64	5.88	26.49
CR 3-8	1 1/2	1	56C	15.51	7.64	5.88	27.98
		3	56C	15.51	7.64	5.88	27.2 0
CR 3-9	2	1	56C	16.22	7.64	5.88	29.09
		3	56C	16.22	7.64	5.88	28.70
CR 3-10	2	1	56C	16.93	7.64	5.88	29.80
		3	56C	16.93	7.64	5.88	29.41
CR 3-11	2	1	56C	17.64	7.64	5.88	30.51
		3	56C	17.64	7.64	5.88	30.12
CR 3-12	3	1	182TC	19.45	9.45	8.06	35.91
		3	182TC	19.45	9.45	6.69	33.15
CR 3-13	3	1	182TC	20.16	9.45	8.06	36.62
		3	182TC	20.16	9.45	6.69	33.86
CR 3-15	3	1	182TC	21.57	9.45	8.06	38.03
		3	182TC	21.57	9.45	6.69	35.27
CR 3-17	3	1	182TC	22.99	9.45	8.06	39.45
		3	182TC	22.99	9.45	6.69	36.69
CR 3-19	5	1	213TC	24.41	10.96	8.41	43.75
		3	184TC	24.41	9.45	6.69	39.68
CR 3-21	5	1	213TC	25.83	10.96	8.41	45.17
		3	184TC	25.83	9.45	6.69	41.1 0
CR 3-23	5	1	213TC	27.24	10.96	8.41	46.58
		3	184TC	27.24	9.45	6.69	42.51
CR 3-25	5	1	213TC	28.66	10.96	8.41	48
		3	184TC	28.66	9.45	6.69	43.93

All dimensions are in inches unless otherwise noted.

Note: CR 3 low-NPSH pumps are also available as CRI and CRN pumps with PJE and CA connection.

CR 5 low-NPSH pumps, 60 Hz

Pump type	hp	PH	NEMA Frame size	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2
CR 5-4	2	1	56C	14.09	7.64	5.88	26.08
		3	56C	14.09	7.64	5.88	23.97
CR 5-5	3	1	182TC	16.26	9.45	8.06	30.63
		3	182TC	16.26	9.45	6.69	27.95
CR 5-6	3	1	182TC	17.32	9.45	8.06	31.69
		3	182TC	17.32	9.45	6.69	29.01
CR 5-7	3	1	182TC	18.39	9.45	8.06	34.85
		3	182TC	18.39	9.45	6.69	32.09
CR 5-8	5	1	213TC	19.45	10.96	8.41	37.92
		3	184TC	19.45	9.45	6.69	32.44
CR 5-9	5	1	213TC	20.51	10.96	8.41	38.98
		3	184TC	20.51	9.45	6.69	33.50
CR 5-10	5	1	213TC	21.57	10.96	8.41	40.91
		3	184TC	21.57	9.45	6.69	36.84
CR 5-11	5	1	213TC	22.64	10.96	8.41	41.98
		3	184TC	22.64	9.45	6.69	37.91
CR 5-12	5	1	213TC	23.70	10.96	8.41	43.04
		3	184TC	23.70	9.45	6.69	38.97
CR 5-13	5	1	213TC	24.76	10.96	8.41	44.1 0
		3	184TC	24.76	9.45	6.69	40.03
CR 5-14	5	1	213TC	25.83	10.96	8.41	45.17
		3	184TC	25.83	9.45	6.69	41.1 0
CR 5-15	7 1/2	1	213TC	27.41	10.96	8.41	46.75
		3	213TC	27.41	10.96	7.97	44.38
CR 5-16	7 1/2	1	213TC	28.47	10.96	8.41	47.81
		3	213TC	28.47	10.96	7.97	45.44
CR 5-18	7 1/2	1	213TC	30.59	10.96	8.41	49.94
		3	213TC	30.59	10.96	7.97	47.56
CR 5-20	7 1/2	1	213TC	32.72	10.96	8.41	52.07
		3	213TC	32.72	10.96	7.97	49.69
CR 5-22	7 1/2	1	213TC	34.84	10.96	8.41	54.19
		3	213TC	34.84	10.96	7.97	51.81
CR 5-24	10	1	215TC	36.97	10.96	8.41	55.77
		3	215TC	36.97	10.96	7.97	55.79

All dimensions are in inches unless otherwise noted.

Note: CR 5 low-NPSH pumps are also available as CRI and CRN pumps with PJE and CA connection.

CR 10 low-NPSH pumps, 60 Hz

Pump type	hp	PH	NEMA Frame size	PEI_{CL}	Impeller diameter (in)	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR 10-3	3	1	182TC	0.94	3.66	17.20	9.45	8.06	33.66			
		3		0.94	3.66	17.20	9.45	6.69	3.90			
CR 10-4	5	1	213TC	0.94	3.66	18.39	10.96	8.41	36.86			
		3	184TC	0.94	3.66	18.39	9.45	6.69	31.38			
CR 10-5	5	1	213TC	0.94	3.66	19.57	10.96	8.41	38.91			
		3	184TC	0.94	3.66	19.57	9.45	6.69	34.84			
CR 10-6	5	1	213TC	0.94	3.66	20.75	10.96	8.41	40.09			
		3	184TC	0.94	3.66	20.75	9.45	6.69	36.02			
CR 10-7	7 1/2	1	213TC	0.94	3.66	22.25	10.96	8.41	41.60			
		3		0.94	3.66	22.25	10.96	7.97	39.22			
CR 10-8	7 1/2	1	213TC	0.94	3.66	23.43	10.96	8.41	42.78			
		3		0.94	3.66	23.43	10.96	7.97	40.40			
CR 10-9	7 1/2	1	213TC	0.94	3.66	24.61	10.96	8.41	43.96			
		3		0.94	3.66	24.61	10.96	7.97	41.58			
CR 10-10	10	1	215TC	0.94	3.66	25.79	10.96	8.41	44.59			
		3		0.94	3.66	25.79	10.96	7.97	44.61			
CR 10-12	10	1	215TC	0.94	3.66	28.15	10.96	8.41	47.49			
		3		0.94	3.66	28.15	10.96	7.97	46.97			
CR 10-14	15	3	254TC	0.94	3.66	33.06	13.18	9.45	51.89	11.58	9.45	51.73
CR 10-16	15	3	254TC	0.94	3.66	35.43	13.18	9.45	54.25	11.58	9.45	54.1 0
CR 10-17	15	3	254TC	0.94	3.66	37.80	13.18	9.45	56.61	11.58	9.45	56.46

All dimensions are in inches unless otherwise noted.

Note: CR 10 low-NPSH pumps are also available as CRI and CRN pumps with PJE and CA connection.

CR 15 low-NPSH pumps, 60 Hz

Pump type	hp	PH	NEMA Frame size	PEI_{CL}	Impeller diameter (in)	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR 15-2	7 1/2	1	213TC	0.93	4.13	17.52	10.96	8.41	36.87			
		3		0.93	4.13	17.52	10.96	7.97	34.49			
CR 15-3	7 1/2	1	213TC	0.93	4.13	19.29	10.96	8.41	38.64			
		3		0.93	4.13	19.29	10.96	7.97	36.26			
CR 15-4	10	1	215TC	0.93	4.13	21.06	10.96	8.41	40.40			
		3		0.93	4.13	21.06	10.96	7.97	39.88			
CR 15-5	15	3	254TC	0.93	4.13	25.40	13.18	9.45	44.21	11.58	9.45	44.06
CR 15-6	15	3	254TC	0.93	4.13	27.17	13.18	9.45	45.98	11.58	9.45	45.83
CR 15-7	15	3	254TC	0.93	4.13	28.94	13.18	9.45	47.75	11.58	9.45	47.6 0
CR 15-8	20	3	256TC	0.93	4.13	30.71	13.18	9.45	50.32	11.58	9.45	49.37
CR 15-9	20	3	256TC	0.93	4.13	32.48	13.18	9.45	52.09	11.58	9.45	51.14
CR 15-10	20	3	256TC	0.93	4.13	34.25	13.18	9.45	53.86	11.58	9.45	52.91
CR 15-12	25	3	284TSC	0.93	4.13	37.17	14.17	11.08	60.79	16.21	11.93	59.33

All dimensions are in inches unless otherwise noted.

Note: CR 15 low-NPSH pumps are also available as CRI and CRN pumps with PJE and CA connection.

CR 20 low-NPSH pumps, 60 Hz

Pump type	hp	PH	NEMA Frame size	PEI_{CL}	Impeller diameter (in)	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR 20-2	7 1/2	1	213TC	0.96	4.13	17.52	10.96	8.41	36.87			
		3		0.96	4.13	17.52	10.96	7.97	34.49			
CR 20-3	10	1	215TC	0.96	4.13	19.29	10.96	8.41	38.63			
		3		0.96	4.13	19.29	10.96	7.97	38.11			
CR 20-4	15	3	254TC	0.96	4.13	23.62	13.18	9.45	42.44	11.58	9.45	
CR 20-5	15	3	254TC	0.96	4.13	25.39	13.18	9.45	44.21	11.58	9.45	44.06
CR 20-6	15	3	254TC	0.96	4.13	27.17	13.18	9.45	45.98	11.58	9.45	45.83
CR 20-7	20	3	256TC	0.96	4.13	28.94	13.18	9.45	48.54	11.58	9.45	47.6 0
CR 20-8	20	3	256TC	0.96	4.13	30.71	13.18	9.45	50.32	11.58	9.45	49.37
CR 20-10	25	3	284TSC	0.96	4.13	33.62	14.17	11.08	57.21	16.21	11.93	55.82

All dimensions are in inches unless otherwise noted.

Note: CR 20 low-NPSH pumps are also available as CRI and CRN pumps with PJE and CA connection.

CR 32 low-NPSH pumps, 60 Hz

Pump type	hp	PH	NEMA Frame size	PEI_{CL}	Impeller diameter (in)	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR 32-2-1	10	1	215TC	0.87	4.66	22.83	10.96	8.41	42.17			
		3		0.87	4.66	22.83	10.96	7.97	41.65			
CR 32-2	15	3	254TC	0.87	4.66	26.96	13.18	9.45	45.79	11.58	9.45	
CR 32-3-2	15	3	254TC	0.87	4.66	29.72	13.18	9.45	48.54	11.58	9.45	
CR 32-3	15	3	254TC	0.87	4.66	29.72	13.18	9.45	48.54	11.58	9.45	
CR 32-4-2	20	3	256TC	0.87	4.66	32.48	13.18	9.45	52.09	11.58	9.45	
CR 32-4	20	3	256TC	0.87	4.66	32.48	13.18	9.45	52.09	11.58	9.45	
CR 32-5-2	25	3	284TSC	0.87	4.66	35.24	14.17	11.08	58.86	16.21	11.93	
CR 32-5	25	3	284TSC	0.87	4.66	35.24	14.17	11.08	58.86	16.21	11.93	
CR 32-6-2	25	3	284TSC	0.87	4.66	37.99	14.17	11.08	61.58	16.21	11.93	
CR 32-6	30	3	286TSC	0.87	4.66	37.99	14.17	11.08	61.57	16.21	11.93	
CR 32-7-2	30	3	286TSC	0.87	4.66	40.75	14.17	11.08	64.33	16.21	11.93	
CR 32-7	40	3	324TSC	0.87	4.66	40.75	15.83	12.58	66.85	17.67	13.39	64.91
CR 32-8-2	40	3	324TSC	0.87	4.66	43.50	15.83	12.58	69.60	17.67	13.39	67.66
CR 32-8	40	3	324TSC	0.87	4.66	43.50	15.83	12.58	69.60	17.67	13.39	67.66
CR 32-9-2	40	3	324TSC	0.87	4.66	46.26	15.83	12.58	72.36	17.67	13.39	70.42
CR 32-9	40	3	324TSC	0.87	4.66	46.26	15.83	12.58	72.36	17.67	13.39	70.42
CR 32-10-2	50	3	326TSC	0.87	4.66	49.02	15.83	12.58	75.14	17.67	13.39	73.19
CR 32-10	50	3	326TSC	0.87	4.66	49.02	15.83	12.58	75.14	17.67	13.39	73.19

All dimensions are in inches unless otherwise noted.

Note: CR 32 low-NPSH pumps are also available as CRN pumps with PJE connection.

CR 45 low-NPSH pumps, 60 Hz

Pump type	hp	PH	NEMA Frame size	PEI_{CL}	Impeller diameter (in)	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR 45-2-1	20	3	256TC	0.89	5.34	29.49	13.18	9.45	49.10	11.58	9.45	48.15
CR 45-2	20	3	256TC	0.89	5.34	29.49	13.18	9.45	49.10	11.58	9.45	48.15
CR 45-3-2	25	3	284TSC	0.89	5.34	32.64	14.17	11.08	56.22	16.21	11.93	54.84

Pump type	hp	PH	NEMA Frame size	PEI_{CL}	Impeller diameter (in)	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR 45-3-1	25	3	284TSC	0.89	5.34	32.64	14.17	11.08	56.22	16.21	11.93	54.84
CR 45-3	30	3	286TSC	0.89	5.34	32.64	14.17	11.08	56.22	16.21	11.93	54.8
CR 45-4-2	40	3	324TSC	0.89	5.34	35.79	15.83	12.58	61.89	17.67	13.39	59.95
CR 45-4-1	40	3	324TSC	0.89	5.34	35.79	15.83	12.58	61.89	17.67	13.39	59.95
CR 45-4	40	3	324TSC	0.89	5.34	35.79	15.83	12.58	61.89	17.67	13.39	59.95
CR 45-5-2	40	3	324TSC	0.89	5.34	38.94	15.83	12.58	65.04	17.67	13.39	63.1
CR 45-5-1	50	3	326TSC	0.89	5.34	38.94	15.83	12.58	65.06	17.67	13.39	63.11
CR 45-5	50	3	326TSC	0.89	5.34	38.94	15.83	12.58	65.06	17.67	13.39	63.11
CR 45-6-2	50	3	326TSC	0.89	5.34	42.09	15.83	12.58	68.21	17.67	13.39	66.26
CR 45-6	50	3	326TSC	0.89	5.34	42.09	15.83	12.58	68.21	17.67	13.39	66.26
CR 45-7-2	60	3	364TSC	0.89	5.34	45.24	17.91	16.02	74.06	17.67	13.39	69.4 0
CR 45-7	60	3	364TSC	0.89	5.34	45.24	17.91	16.02	74.06	17.67	13.39	69.40

All dimensions are in inches unless otherwise noted.

Note: CR 45 low-NPSH pumps are also available as CRN pumps with PJE connection.

CR 64 low-NPSH pumps, 60 Hz

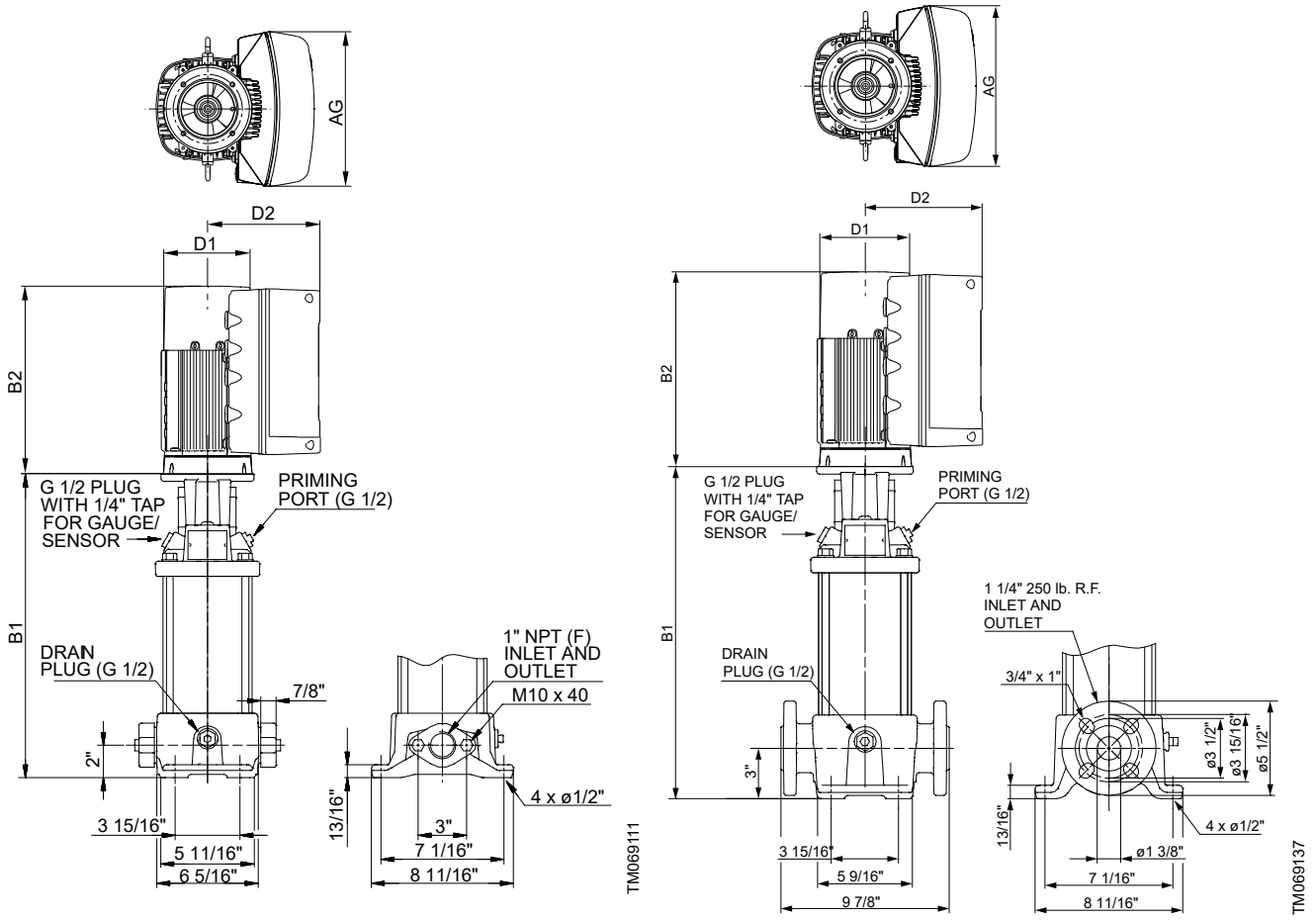
Pump type	hp	PH	NEMA Frame size	PEI_{CL}	Impeller diameter (in)	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR 64-2-1	25	3	284TSC	0.93	5.59	29.69	14.17	11.08	53.31	16.21	11.93	51.85
CR 64-2	30	3	286TSC	0.93	5.59	29.69	14.17	11.08	53.27	16.21	11.93	51.85
CR 64-3-2	40	3	324TSC	0.93	5.59	32.91	15.83	12.58	59.01	17.67	13.39	57.07
CR 64-3-1	40	3	324TSC	0.93	5.59	32.91	15.83	12.58	59.01	17.67	13.39	57.07
CR 64-3	40	3	324TSC	0.93	5.59	32.91	15.83	12.58	59.01	17.67	13.39	57.07
CR 64-4-2	50	3	326TSC	0.93	5.59	36.18	15.83	12.58	62.30	17.67	13.39	60.35
CR 64-4-1	50	3	326TSC	0.93	5.59	36.18	15.83	12.58	62.30	17.67	13.39	60.35
CR 64-4	60	3	364TSC	0.93	5.59	36.18	17.91	16.02	65	17.67	13.39	60.34
CR 64-5-2	60	3	364TSC	0.93	5.59	39.41	17.91	16.02	68.23	17.67	13.39	63.57

All dimensions are in inches unless otherwise noted.

Note: CR 64 low-NPSH pumps are also available as CRN pumps with PJE connection.

CRE low-NPSH pumps dimensional data

CRE 3 low-NPSH pumps dimensional data

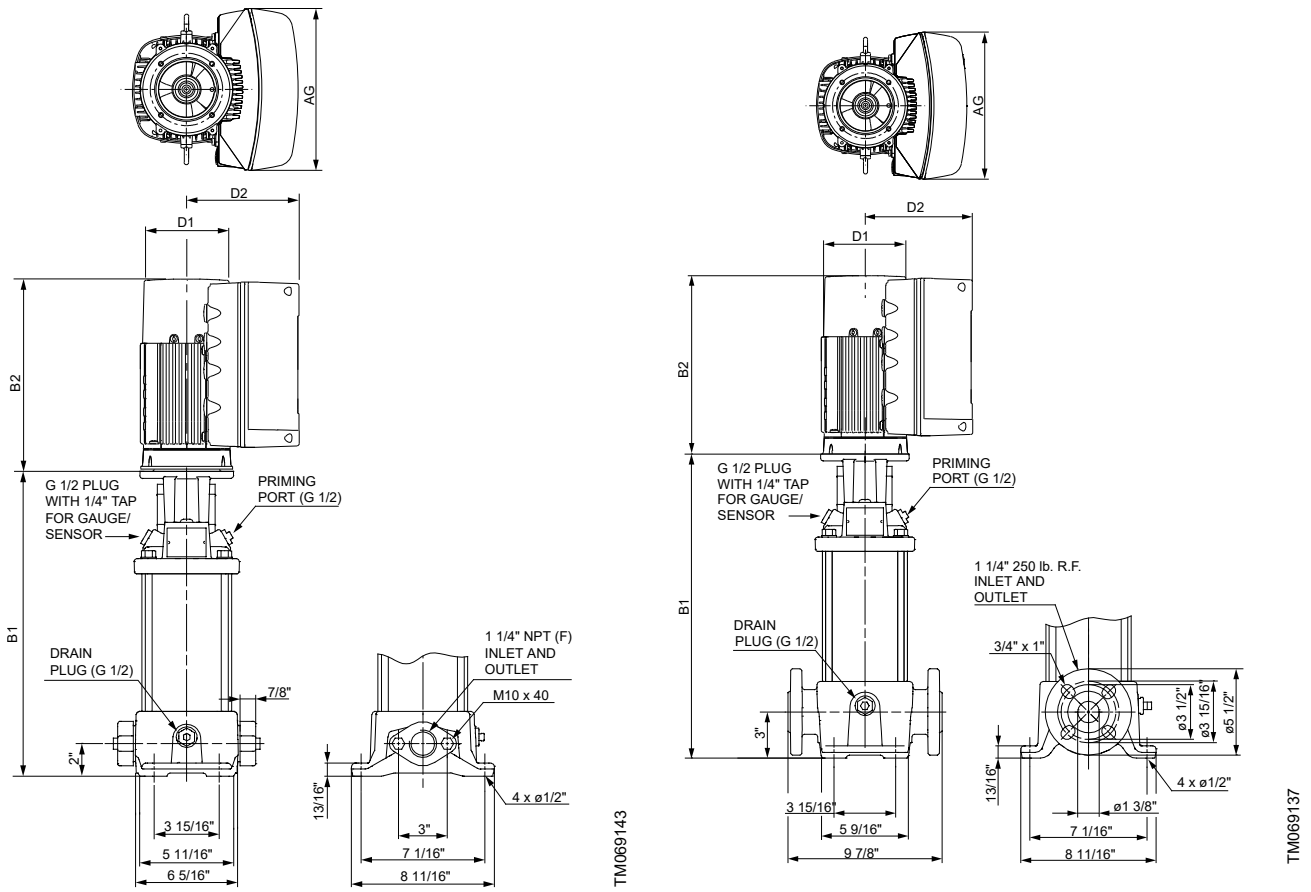


Pump type	hp	PH	Voltage [V]	NEMA frame size	ANSI B1 [in (mm)]	MLE D1 [in (mm)]	MLE D2 [in (mm)]	AG [in (mm)]	ANSI MLE B1+B2 [in (mm)]	ANSI ship wt. [lbs (kg)]
CRE 3-3	1 1/2	3	200-240	56C	11.97 (304)	5.50 (139.7)	3.50 (88.9)	10.04 (255)	22.01 (559)	79 (36)
	1	3	440-480	56C	11.97 (304)	5.50 (139.7)	3.50 (88.9)	10.04 (255)	22.01 (559)	77 (35)
CRE 3-5	1 1/2	3	200-240	56C	13.39 (340)	5.50 (139.7)	3.50 (88.9)	10.04 (255)	23.43 (595)	81 (37)
	1	3	440-480	56C	13.39 (340)	5.50 (139.7)	3.50 (88.9)	10.04 (255)	23.43 (595)	79 (36)
CRE 3-8	1 1/2	3	200-240	56C	15.51 (394)	5.50 (139.7)	3.50 (88.9)	10.04 (255)	25.55 (649)	84 (38)
	1 1/2	3	440-480	56C	15.51 (394)	5.50 (139.7)	3.50 (88.9)	10.04 (255)	25.55 (649)	84 (38)
CRE 3-11	2	3	200-240	56C	17.64 (448)	5.50 (139.7)	3.50 (88.9)	10.83 (275)	28.46 (723)	93 (42)
	2	3	440-480	56C	17.64 (448)	5.50 (139.7)	3.50 (88.9)	10.83 (275)	28.46 (723)	93 (42)

Pump type	hp	PH	Voltage [V]	NEMA frame size	ANSI B1 [in (mm)]	MLE D1 [in (mm)]	MLE D2 [in (mm)]	AG [in (mm)]	ANSI MLE B1+B2 [in (mm)]	ANSI ship wt. [lbs (kg)]
CRE 3-13	3	3	200-240	182TC	20.16 (512)	5.50 (139.7)	3.50 (88.9)	13.27 (337)	33.43 (849)	115 (52)
	3	3	440-480	182TC	20.16 (512)	5.50 (139.7)	3.50 (88.9)	10.83 (275)	30.98 (787)	107 (49)
CRE 3-17	3	3	200-240	182TC	22.99 (584)	5.50 (139.7)	3.50 (88.9)	13.27 (337)	36.26 (921)	119 (54)
	3	3	440-480	182TC	22.99 (584)	5.50 (139.7)	3.50 (88.9)	10.83 (275)	33.82 (859)	111 (50)
CRE 3-21	5	3	200-240	182TC	25.83 (656)	5.50 (139.7)	3.50 (88.9)	13.27 (337)	39.09 (993)	133 (60)
	5	3	440-480	182TC	25.83 (656)	5.50 (139.7)	3.50 (88.9)	13.27 (337)	39.09 (993)	136 (62)
CRE 3-25	5	3	200-240	182TC	28.66 (728)	5.50 (139.7)	3.50 (88.9)	13.27 (337)	41.93 (1065)	136 (62)
	5	3	440-480	182TC	28.66 (728)	5.50 (139.7)	3.50 (88.9)	13.27 (337)	41.93 (1065)	150 (68)

● Available.

CRE 5 low-NPSH pumps dimensional data



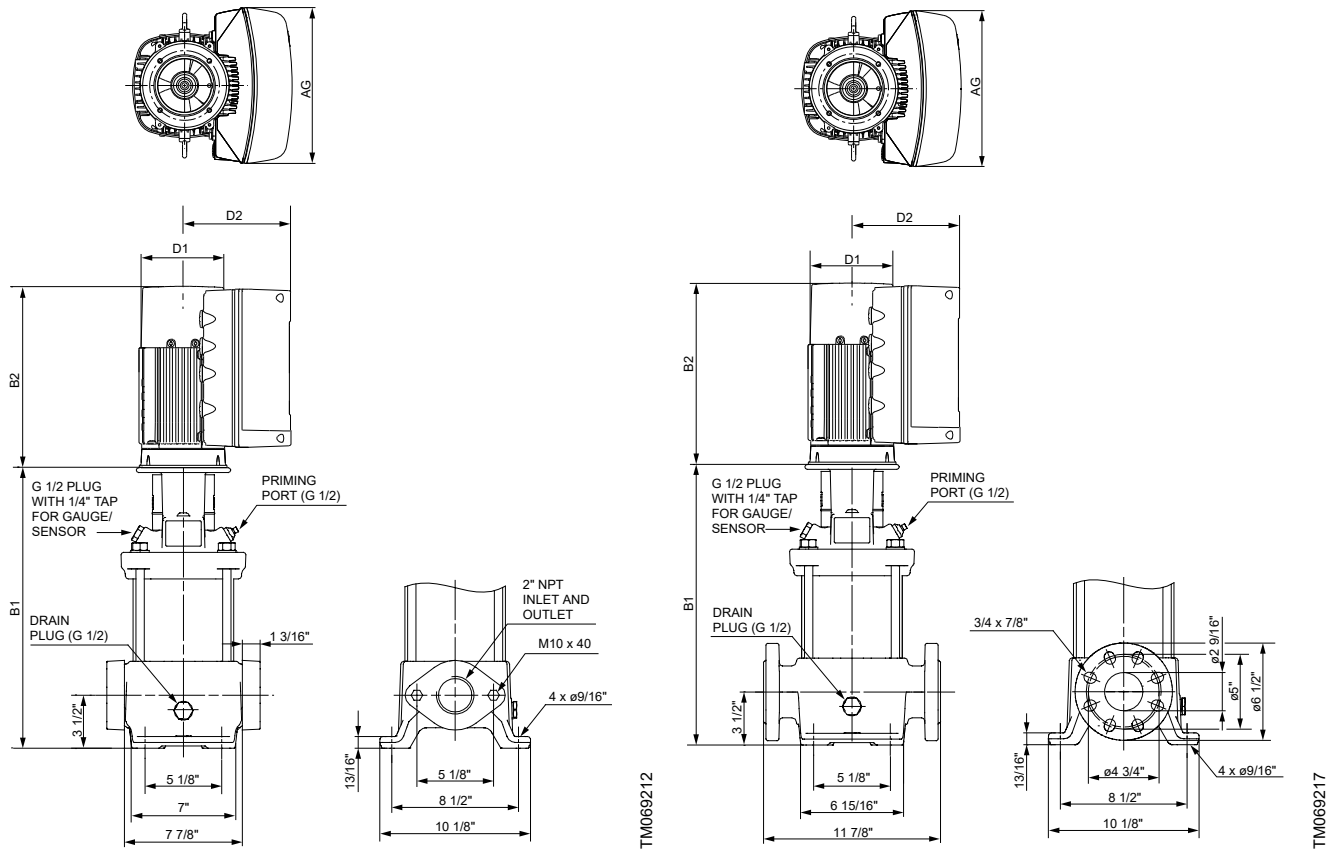
Pump type	hp	PH	Voltage [V]	NEMA frame size	Oval [30]	PEI_{VL}	Impeller diameter [in (mm)]	ANSI B1 [in (mm)]	MLE D1 [in (mm)]	MLE D2 [in (mm)]	AG [in (mm)]	ANSI MLE B1+B2 [in (mm)]	ANSI ship wt. [lbs (kg)]
CRE 5-4	2	3	200-240	56C	•	0.41	2.88 (73.20)	14.09 (358)	5.50 (139.70)	3.50 (88.90)	10.83 (275)	24.92 (633)	85 (39)
		3	440-480	56C	•	0.42	2.88 (73.20)	14.09 (358)	5.50 (139.70)	3.50 (88.90)	10.83 (275)	24.92 (633)	87 (40)
CRE 5-7	3	3	200-240	182TC	•	0.41	2.88 (73.20)	18.39 (467)	5.50 (139.70)	3.50 (88.90)	13.27 (337)	31.65 (804)	112 (51)
		3	440-480	182TC	•	0.42	2.88 (73.20)	18.39 (467)	5.50 (139.70)	3.50 (88.90)	10.83 (275)	29.22 (742)	104 (47)
CRE 5-10	5	3	200-240	182TC	•	0.41	2.88 (73.20)	21.57 (548)	5.50 (139.70)	3.50 (88.90)	13.27 (337)	34.84 (885)	123 (56)
		3	440-480	182TC	•	0.42	2.88 (73.20)	21.57 (548)	5.50 (139.70)	3.50 (88.90)	13.27 (337)	34.84 (885)	126 (57)
CRE 5-14	5	3	200-240	182TC	•	0.41	2.88 (73.20)	25.83 (656)	5.50 (139.70)	3.50 (88.90)	13.27 (337)	39.09 (993)	132 (60)
		3	440-480	182TC	•	0.42	2.88 (73.20)	25.83 (656)	5.50 (139.70)	3.50 (88.90)	13.27 (337)	39.09 (993)	145 (66)
CRE 5-18	7 1/2	3	200-240	213TC	•	0.41	2.88 (73.20)	30.59 (777)	5.50 (139.70)	3.50 (88.90)	15.55 (395)	46.14 (1172)	237 (108)
		3	440-480	213TC	•	0.42	2.88 (73.20)	30.59 (777)	5.50 (139.70)	3.50 (88.90)	14.65 (372)	45.24 (1149)	157 (71)

Pump type	hp	PH	Voltage [V]	NEMA frame size	Oval [30)]	PEI_{VL}	Impeller diameter [in (mm)]	ANSI B1 [in (mm)]	MLE D1 [in (mm)]	MLE D2 [in (mm)]	AG [in (mm)]	ANSI MLE B1+B2 [in (mm)]	ANSI ship wt. [lbs (kg)]
CRE 5-22	7 1/2	3	200-240	213TC		0.41	2.88 (73.20)	34.84 (885)	5.50 (139.70)	3.50 (88.90)	15.55 (395)	50.39 (1280)	270 (123)
		3	440-480	213TC		0.42	2.88 (73.20)	34.82 (885)	5.50 (139.70)	3.50 (88.90)	14.65 (372)	49.49 (1257)	256 (116)
CRE 5-24	10	3	440-480	213TC		0.42	2.88 (73.20)	36.97 (939)	5.50 (139.70)	3.50 (88.90)	15.55 (395)	52.52 (1334)	282 (128)

30) For oval flanged pumps, the B1 and B1+B2 dimensions are one inch less than for ANSI flanged pumps, and the weight is approximately 9 lbs (4 kg) less.

● Available.

CRE 10 low-NPSH pumps dimensional data

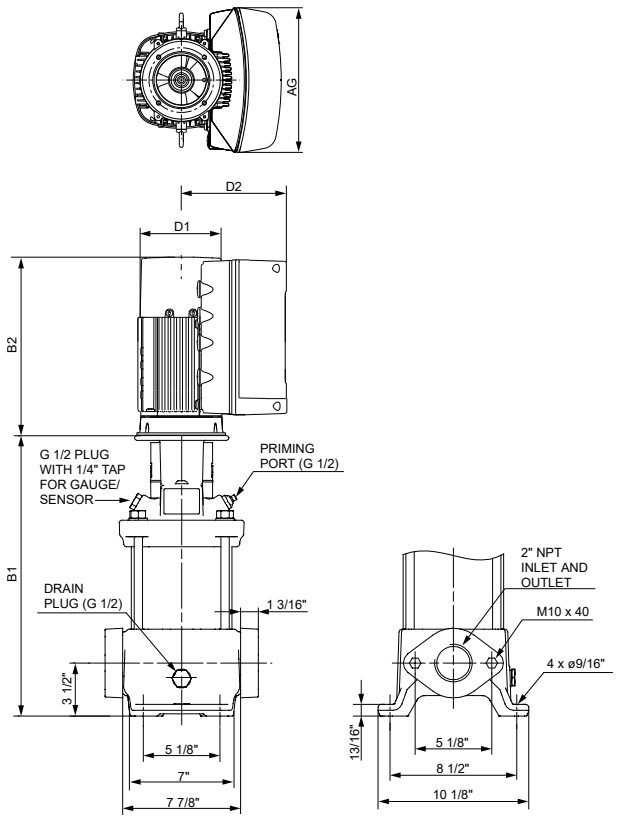


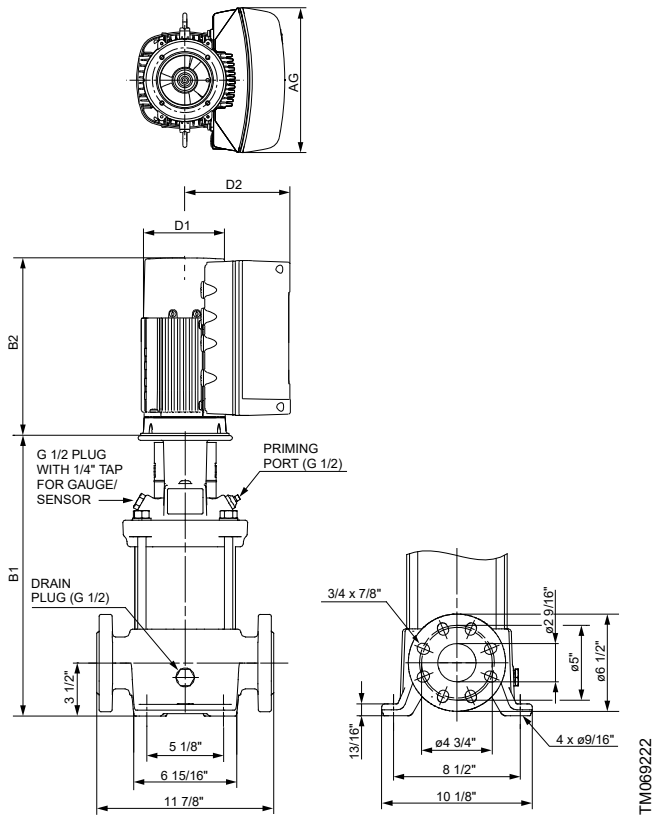
Pump type	hp	PH	Voltage [V]	NEMA frame size	Oval [31]	PEI_{VL}	Impeller diameter [in (mm)]	ANSI B1 [in (mm)]	MLE D1 [in (mm)]	MLE D2 [in (mm)]	AG [in (mm)]	ANSI MLE B1+B2 [in (mm)]	ANSI ship wt. [lbs (kg)]
CRE 10-3	3	3	200-240	182TC	●	0.41	3.66 (92.90)	18.39 (467)	6.50 (165.10)	5.0 (127)	13.27 (337)	31.65 (804)	152 (69)
		3	440-480	182TC	●	0.40	3.66 (92.90)	18.39 (467)	6.50 (165.10)	5.00 (127)	10.83 (275)	29.21 (742)	143 (65)
CRE 10-6	5	3	200-240	182TC	●	0.41	3.66 (92.90)	20.75 (527)	6.50 (165.10)	5.00 (127)	13.27 (337)	34.02 (864)	163 (74)
		3	440-480	182TC	●	0.40	3.66 (92.90)	20.75 (527)	6.50 (165.10)	5.00 (127)	13.27 (337)	34.02 (864)	176 (80)
CRE 10-9	7 1/2	3	200-240	213TC		0.41	3.66 (92.90)	24.61 (625)	6.50 (165.10)	5.00 (127)	15.55 (395)	40.16 (1020	273 (124)
		3	440-480	213TC		0.40	3.66 (92.90)	24.61 (625)	6.50 (165.10)	5.00 (127)	14.65 (372)	39.25 (997)	203 (92)
CRE 10-12	10	3	440-480	213TC		0.40	3.66 (92.90)	28.15 (715)	6.50 (165.10)	5.00 (127)	15.55 (395)	43.70 (1110)	300 (136)
CRE 10-14	15	3	440-480	254TC		0.40	3.66 (92.90)	33.06 (840)	6.50 (165.10)	5.00 (127)	15.59 (396)	48.66 (1236)	353 (160)
CRE 10-17	15	3	440-480	254TC		0.40	3.66 (92.90)	37.80 (960)	6.50 (165.10)	5.00 (127)	15.59 (396)	53.39 (1356)	370 (168)

31) For oval flanged pumps, the B1 and B1+B2 dimensions are one inch less than ANSI flanged pumps, and the weight is approximately 3 lbs (1.3 kg) less.

● Available.

CRE 15 low-NPSH pumps dimensional data



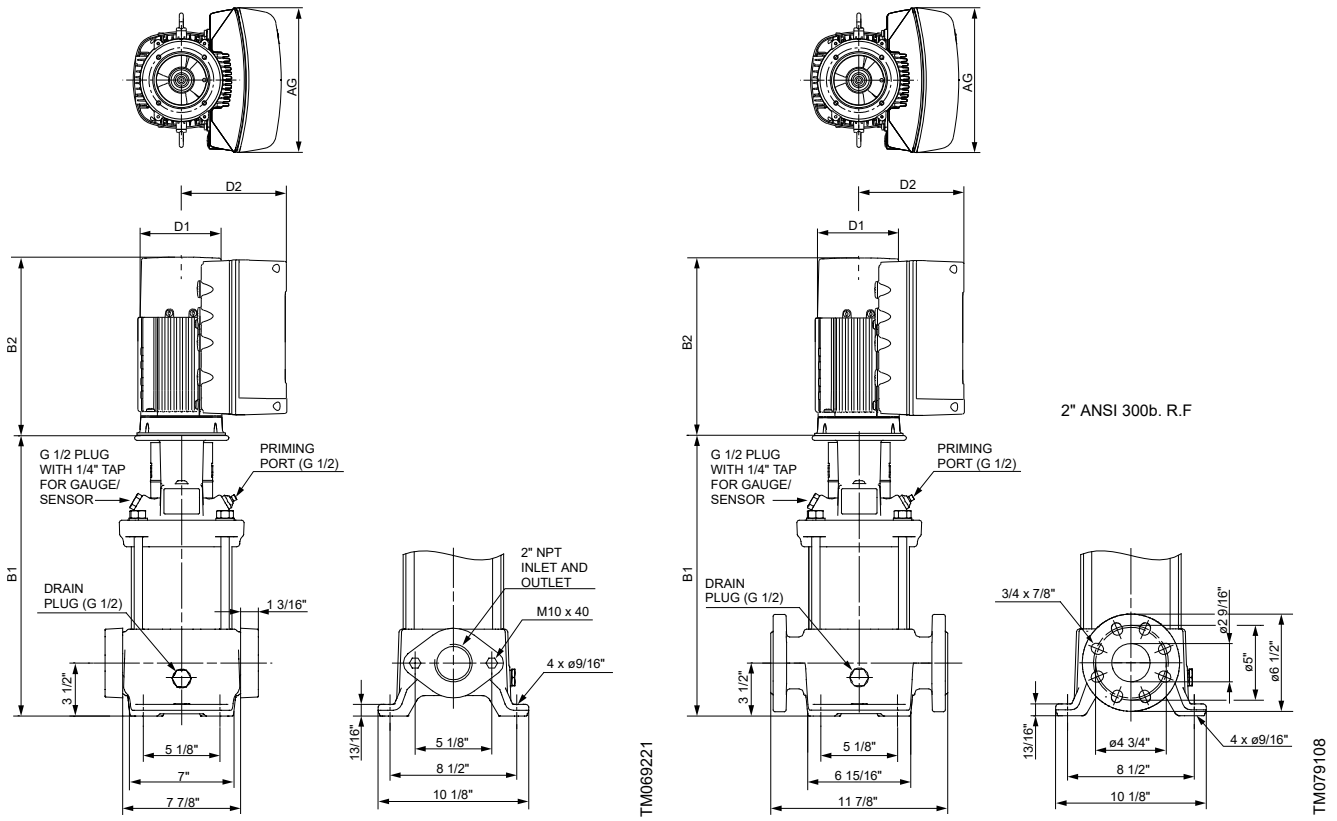


Pump type	hp	PH	Voltage [V]	NEMA frame size	Oval [32]	PEI_{VL}	Impeller diameter [in (mm)]	ANSI B1 [in (mm)]	MLE D1 [in (mm)]	MLE D2 [in (mm)]	AG [in (mm)]	ANSI MLE B1+B2 [in (mm)]	ANSI ship wt. [lbs (kg)]
CRE 15-2	7 1/2	3	200-240	213TC	●	0.41	4.13 (104.80)	17.52 (445)	6.50 (165.10)	5.00 (127)	15.55 (395)	33.07 (840)	260 (118)
		3	440-480	213TC	●	0.40	4.13 (104.80)	17.52 (445)	6.50 (165.10)	5.00 (127)	14.65 (372)	32.17 (817)	185 (84)
CRE 15-3	7 1/2	3	200-240	213TC	●	0.41	4.13 (104.80)	19.29 (490)	6.50 (165.10)	5.00 (127)	15.55 (395)	34.84 (885)	262 (119)
		3	440-480	213TC	●	0.40	4.13 (104.80)	19.29 (490)	6.50 (165.10)	5.00 (127)	14.65 (372)	33.94 (862)	179 (81)
CRE 15-4	10	3	440-480	213TC	●	0.40	4.13 (104.80)	21.06 (535)	6.50 (165.10)	5.00 (127)	15.55 (395)	36.61 (930)	284 (129)
CRE 15-7	15	3	440-480	254TC		0.40	4.13 (104.80)	28.94 (735)	6.50 (165.10)	5.00 (127)	15.59 (396)	44.53 (1131)	313 (142)
CRE 15-10	20	3	440-480	254TC		0.40	4.13 (104.80)	34.25 (870)	6.50 (165.10)	5.00 (127)	19.21 (488)	53.46 (1358)	419 (190)
CRE 15-12	25	3	440-480	284TC		0.40	4.13 (104.80)	37.17 (944)	6.50 (165.10)	5.00 (127)	20.24 (514)	57.4 (1458)	456 (207

[32] For oval flanged pumps, the B1 and B1+B2 dimensions are one inch less than for ANSI flanged pumps, and the weight is approximately 3 lbs. (1.3 kg) less.

● Available.

CRE 20 low-NPSH pumps dimensional data

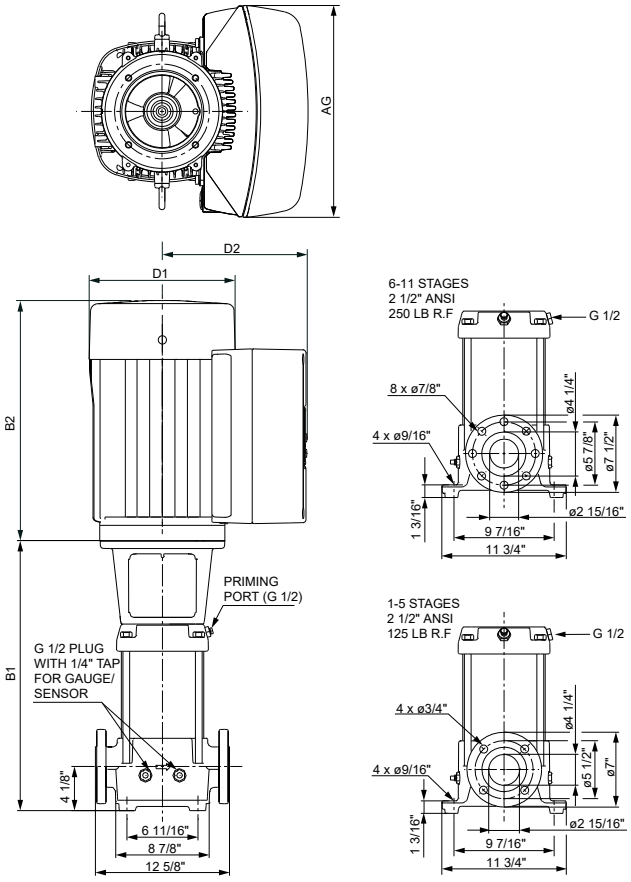


Pump type	hp	PH	Voltage [V]	NEMA frame size	Oval [33]	PEI_{VL}	Impeller diameter [in (mm)]	ANSI B1 [in (mm)]	MLE D1 [in (mm)]	MLE D2 [in (mm)]	AG [in (mm)]	ANSI MLE B1+B2 [in (mm)]	ANSI ship wt. [lbs (kg)]
CRE 20-2	7 1/2	3	200-240	213TC	•	0.43	4.13 (104.80)	17.52 (445)	6.50 (165.10)	5.00 (127)	15.55 (395)	33.07 (840)	269 (122)
		3	440-480	213TC	•	0.42	4.13 (104.80)	17.52 (445)	6.50 (165.10)	5.00 (127)	14.65 (372)	32.17 (817)	176 (80)
CRE 20-3	10	3	440-480	213TC	•	0.42	4.13 (104.80)	19.29 (490)	6.50 (165.10)	5.00 (127)	15.55 (395)	34.84 (885)	271 (123)
CRE 20-6	15	3	440-480	254TC		0.42	4.13 (104.80)	27.17 (690)	6.50 (165.10)	5.00 (127)	15.59 (396)	42.76 (1086)	320 (145)
CRE 20-8	20	3	440-480	254TC		0.42	4.13 (104.80)	30.71 (780)	6.50 (165.10)	5.00 (127)	19.21 (488)	49.92 (1268)	410 (186)
CRE 20-10	25	3	440-480	284TC		0.42	4.13 (104.80)	33.62 (854)	6.50 (165.10)	5.00 (127)	20.24 (514)	53.86 (1368)	450 (204)

[33] For oval flanged pumps, the B1 and B1+B2 dimensions are one inch less than for ANSI flanged pumps, and the weight is approximately 3 lbs (1.3 kg) less.

● Available.

CRE 32 low-NPSH pumps dimensional data



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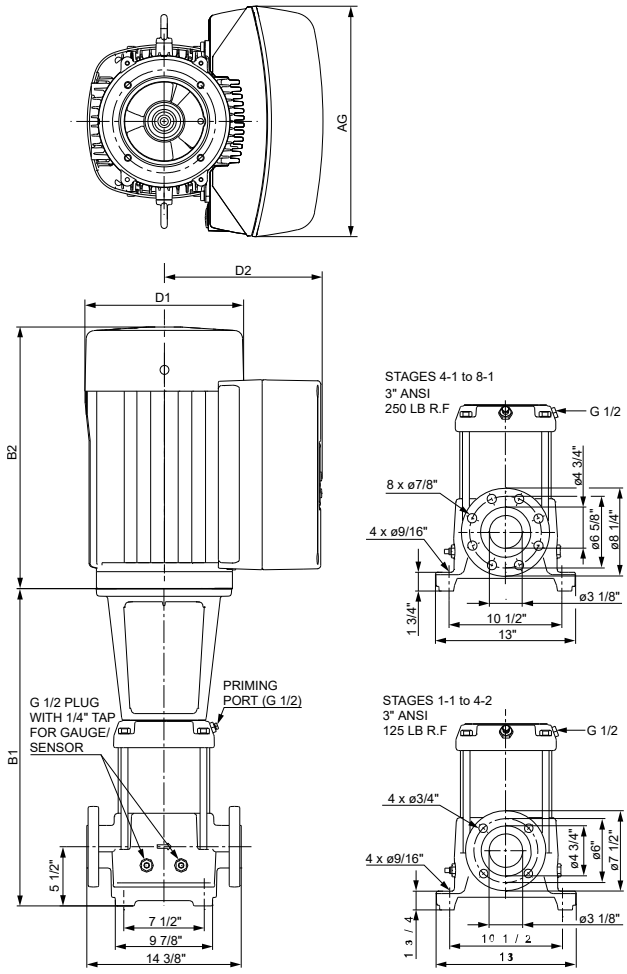
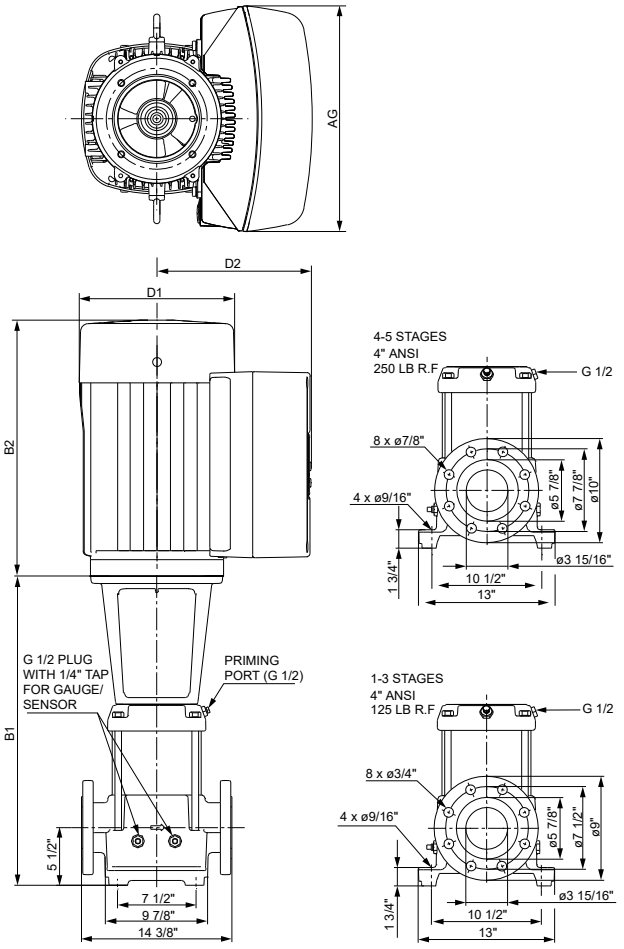
Pump type	hp	PH	Voltage [V]	NEMA frame size	PEI_{VL}	Impeller diameter [in (mm)]	ANSI B1 [in (mm)]	MLE D1 [in (mm)]	MLE D2 [in (mm)]	AG [in (mm)]	ANSI MLE B1+B2 [in (mm)]	ANSI ship wt. [lbs (kg)]
CRE 32-2-1	10	3	440-480	213TC	0.39	4.66 (118.40)	22.64 (575)	7.00 (177.80)	5.50 (139.70)	15.55 (395)	38.19 (970	231 (105)
CRE 32-3	15	3	440-480	254TC	0.39	4.66 (118.40)	29.72 (755)	7.00 (177.80)	5.50 (139.70)	15.59 (396)	45.21 (1151)	272 (124)
CRE 32-4	20	3	460-480	254TC	0.39	4.66 (118.40)	32.48 (825)	7.00 (177.80)	5.50 (139.70)	19.21 (488)	51.69 (1313)	343 (156)
CRE 32-6-2	25	3	460-480	284TC	0.39	4.66 (118.40)	37.99 (965)	7.50 (190.50)	5.88 (149.23)	20.24 (514)	58.23 (1479)	390 (177)
CRE 32-7-2	30	3	460-480	284TC	0.39	4.66 (118.40)	40.75 (1035)	7.50 (190.50)	5.88 (149.23)	20.24 (514)	60.98 (1549)	406 (184)

CRE 45 low-NPSH pumps dimensional data



Pump type	hp	P69	Voltage [V]	NEMA frame size	PEI_{VL}	Impeller diameter [in (mm)]	ANSI B1 [in (mm)]	MLE D1 [in (mm)]	MLE D2 [in (mm)]	AG [in (mm)]	ANSI MLE B1+B2 [in (mm)]	ANSI ship wt. [lbs (kg)]
CRE 45-2	20	3	440-480	254TC	0.40	5.34 (135.63)	29.49 (749)	7.50 (190.50)	6.00 (152.40)	19.21 (488)	48.70 (1237)	351 (159)
CRE 45-3-1	25	3	440-480	284TC	0.40	5.34 (135.63)	32.64 (829)	7.50 (190.50)	6.00 (152.40)	20.23 (514)	52.87 (1343)	392 (178)
CRE 45-3	30	3	440-480	284TC	0.40	5.34 (135.63)	32.64 (829)	7.50 (190.50)	6.00 (152.40)	20.23 (514)	52.87 (1343)	401 (182)

CRE 64 low-NPSH pumps dimensional data



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Pump type	hp	Ph	Voltage [V]	NEMA frame size	PEI_{VL}	Impeller diameter [in (mm)]	ANSI B1 [in (mm)]	MLE D1 [in (mm)]	MLE D2 [in (mm)]	AG [in (mm)]	ANSI MLE B1+B2 [in (mm)]	ANSI ship wt. [lbs (kg)]
CRE 64-2-1	25	3	440-480	284TC	0.42	5.59 (143)	29.69 (754)	9.00 (228.60)	7.50 (190.50)	20.23 (514)	49.92 (1268)	394 (179)
CRE 64-2	30	3	440-480	284TC	0.42	5.59 (143)	29.69 (754)	9.00 (228.60)	7.50 (190.50)	20.23 (514)	49.92 (1268)	404 (183)

CR pumps with 4-pole motor

CR 1 with 4-pole motor, 60 Hz	
Pump type	**Motor [hp]**
CR 1-2	1/2
CR 1-3	1/2
CR 1-4	1/2
CR 1-5	1/2
CR 1-6	1/2
CR 1-7	1/2
CR 1-8	1/2
CR 1-9	1/2
CR 1-10	1/2
CR 1-11	1/2
CR 1-12	1/2
CR 1-13	1/2
CR 1-15	1/2
CR 1-17	1/2
CR 1-19	1/2
CR 1-21	1/2
CR 1-23	1/2
CR 1-25	1/2
CR 1-27	1/2

CR 3 with 4-pole motor, 60 Hz	
Pump type	**Motor [hp]**
CR 3-2	1/2
CR 3-3	1/2
CR 3-4	1/2
CR 3-5	1/2
CR 3-6	1/2
CR 3-7	1/2
CR 3-8	1/2
CR 3-9	1/2
CR 3-10	1/2
CR 3-11	1/2
CR 3-12	1/2
CR 3-13	1/2
CR 3-15	1/2
CR 3-17	1/2
CR 3-19	1/2
CR 3-21	1/2
CR 3-23	1/2
CR 3-25	3/4

CR 5 with 4-pole motor, 60 Hz	
Pump type	**Motor [hp]**
CR 5-2	1/2
CR 5-3	1/2
CR 5-4	1/2
CR 5-5	1/2
CR 5-6	1/2
CR 5-7	1/2
CR 5-8	1/2
CR 5-9	1/2
CR 5-10	1/2
CR 5-11	1/2
CR 5-12	1/2
CR 5-13	3/4
CR 5-14	3/4
CR 5-15	3/4
CR 5-16	3/4
CR 5-18	3/4
CR 5-20	1
CR 5-22	1
CR 5-24	1

CR 10 with 4-pole motor, 60 Hz	
Pump type	**Motor [hp]**
CR 10-1	1/2
CR 10-2	1/2
CR 10-3	1/2
CR 10-4	1/2
CR 10-5	1/2
CR 10-6	3/4
CR 10-7	3/4
CR 10-8	1
CR 10-9	1
CR 10-10	1
CR 10-12	1 1/2
CR 10-14	1 1/2
CR 10-16	2
CR 10-17	2
CR 10-18	2
CR 10-20	2
CR 10-22	3

CR 15 with 4-pole motor, 60 Hz	
Pump type	**Motor [hp]**
CR 15-1	1/2
CR 15-2	1/2
CR 15-3	3/4
CR 15-4	1
CR 15-5	1 1/2
CR 15-6	1 1/2
CR 15-7	1 1/2
CR 15-8	2
CR 15-9	2
CR 15-10	3
CR 15-12	3

CR 20 with 4-pole motor, 60 Hz	
Pump type	**Motor [hp]**
CR 20-1	1/2
CR 20-2	3/4
CR 20-3	1
CR 20-4	1 1/2
CR 20-5	2
CR 20-6	2
CR 20-7	3
CR 20-8	3
CR 20-10	5

CR 32 with 4-pole motor, 60 Hz			
Pump type	**Motor [hp]**	**PEI_{CL} pump with motor**	**Impeller diameter [in]**
CR 32-1-1	3	0.90	4.66
CR 32-1	3	0.90	4.66
CR 32-2-2	3	0.90	4.66
CR 32-2-1	3	0.90	4.66
CR 32-2	3	0.90	4.66
CR 32-3-2	3	0.90	4.66
CR 32-3	3	0.90	4.66
CR 32-4-2	3	0.90	4.66
CR 32-4	3	0.90	4.66
CR 32-5-2	3	0.90	4.66
CR 32-5	3	0.90	4.66
CR 32-6-2	3	0.90	4.66
CR 32-6	5	0.90	4.66
CR 32-7-2	5	0.90	4.66
CR 32-7	5	0.90	4.66
CR 32-8-2	5	0.90	4.66
CR 32-8	5	0.90	4.66
CR 32-9-2	5	0.90	4.66
CR 32-9	5	0.90	4.66
CR 32-10-2	5	0.90	4.66
CR 32-10	7 1/2	0.90	4.66
CR 32-11-2	7 1/2	0.90	4.66

CR 45 with 4-pole motor, 60 Hz			
Pump type	**Motor [hp]**	**PEI_{CL} pump with motor**	**Impeller diameter [in]**
CR 45-1-1	3	0.91	5.34
CR 45-1	3	0.91	5.34
CR 45-2-2	3	0.91	5.34
CR 45-2-1	3	0.91	5.34
CR 45-2	3	0.91	5.34
CR 45-3-2	3	0.91	5.34
CR 45-3-1	3	0.91	5.34
CR 45-3	3	0.91	5.34
CR 45-4-2	5	0.91	5.34
CR 45-4-1	5	0.91	5.34
CR 45-4	5	0.91	5.34
CR 45-5-2	5	0.91	5.34
CR 45-5-1	5	0.91	5.34
CR 45-5	5	0.91	5.34
CR 45-6-2	7 1/2	0.91	5.34
CR 45-6	7 1/2	0.91	5.34
CR 45-7-2	7 1/2	0.91	5.34
CR 45-7	7 1/2	0.91	5.34
CR 45-8-1	10	0.91	5.34

CR 64 with 4-pole motor, 60 Hz			
Pump type	**Motor [hp]**	**PEI_{CL} pump with motor**	**Impeller diameter [in]**
CR 64-1-1	3	0.94	5.59
CR 64-1	3	0.94	5.59
CR 64-2-2	3	0.94	5.59
CR 64-2-1	3	0.94	5.59
CR 64-2	5	0.94	5.59
CR 64-3-2	5	0.94	5.59
CR 64-3-1	5	0.94	5.59
CR 64-3	5	0.94	5.59
CR 64-4-2	7 1/2	0.94	5.59
CR 64-4-1	7 1/2	0.94	5.59
CR 64-4	7 1/2	0.94	5.59
CR 64-5-2	7 1/2	0.94	5.59

CR 95 with 4-pole motor, 60 Hz			
Pump type	Motor [hp]	PEI_{CL} pump with motor	Impeller diameter [in]
CR 95-1	15	0.94	6.07
CR 95-2	15	0.94	6.07
CR 95-3	15	0.94	6.07
CR 95-4	15	0.94	6.07
CR 95-5	15	0.94	6.07
CR 95-6	15	0.94	6.07
CR 95-7	15	0.94	6.07
CR 95-8	20	0.94	6.07
CR 95-9	20	0.94	6.07
CR 95-10	20	0.94	6.07
CR 95-11	25	0.94	6.07
CR 95-12	25	0.94	6.07

CR 125 with 4-pole motor, 60 Hz			
Pump type	Motor [hp]	PEI_{CL} pump with motor	Impeller diameter [in]
CR 125-1	15	0.94	6.38
CR 125-2	15	0.94	6.38
CR 125-3	15	0.94	6.38
CR 125-4	15	0.94	6.38
CR 125-5	15	0.94	6.38
CR 125-6	20	0.94	6.38
CR 125-7	20	0.94	6.38
CR 125-8	25	0.94	6.38
CR 125-9	30	0.94	6.38
CR 125-10	30	0.94	6.38
CR 125-11	40	0.94	6.38
CR 125-12	40	0.94	6.38

CR 155 with 4-pole motor, 60 Hz			
Pump type	Motor [hp]	PEI_{CL} pump with motor	Impeller diameter [in]
CR 155-1	15	0.95	6.64
CR 155-2	15	0.95	6.64
CR 155-3	15	0.95	6.64
CR 155-4	15	0.95	6.64
CR 155-5	20	0.95	6.64
CR 155-6	25	0.95	6.64
CR 155-7	30	0.95	6.64
CR 155-8	30	0.95	6.64
CR 155-9	40	0.95	6.64

CR 155 with 4-pole motor, 60 Hz			
Pump type	Motor [hp]	PEI_{CL} pump with motor	Impeller diameter [in]
CR 155-10	40	0.95	6.64
CR 155-11	50	0.95	6.64
CR 155-12	50	0.95	6.64

CR 185 with 4-pole motor, 60 Hz			
Pump type	Motor [hp]	PEI_{CL} pump with motor	Impeller diameter [in]
CR 185-1	40	0.95	7.36
CR 185-2	40	0.95	7.36
CR 185-3	40	0.95	7.36
CR 185-4	40	0.95	7.36
CR 185-5	40	0.95	7.36
CR 185-6	40	0.95	7.36
CR 185-7	40	0.95	7.36
CR 185-8	50	0.95	7.36
CR 185-9	50	0.95	7.36

CR 215 with 4-pole motor, 60 Hz			
Pump type	Motor [hp]	PEI_{CL} pump with motor	Impeller diameter [in]
CR 215-1	40	0.96	7.80
CR 215-2	40	0.96	7.80
CR 215-3	40	0.96	7.80
CR 215-4	40	0.96	7.80
CR 215-5	40	0.96	7.80
CR 215-6	50	0.96	7.80
CR 215-7	60	0.96	7.80
CR 215-8	75	0.96	7.80
CR 215-9	75	0.96	7.80

CR 255 with 4-pole motor, 60 Hz			
Pump type	Motor [hp]	PEI_{CL} pump with motor	Impeller diameter [in]
CR 255-1	40	0.97	7.72
CR 255-2	40	0.97	7.72
CR 255-3	40	0.97	7.72
CR 255-4	40	0.97	7.72
CR 255-5	50	0.97	7.72
CR 255-6	60	0.97	7.72
CR 255-7	75	0.97	7.72
CR 255-8	75	0.97	7.72

Boiler feed pumps

CR low-NPSH pump sizing chart for on-off feed boilers, 60 Hz

Pump PSI		20 PSI	35 PSI	60 PSI	85 PSI	110 PSI	137 PSI	165 PSI	190 PSI	215 PSI	265 PSI	315 PSI
Boiler PSI		10 PSI	25 PSI	50 PSI	75 PSI	100 PSI	125 PSI	150 PSI	175 PSI	200 PSI	250 PSI	300 PSI
Boiler HP	Boiler Evaporation rate GPM											
15	1.0	CR 3-3 0.75 HP 96640808	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-7 1.5 HP 96575984	CR 3-9 2 HP 96654135	CR 3-11 2 HP 96580361	CR 3-13 3 HP 97786050	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-21 5 HP 97786064	CR 3-25 5 HP 97786067
20	1.4	CR 3-3 0.75 HP 96640808	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-7 1.5 HP 96575984	CR 3-9 2 HP 96654135	CR 3-11 2 HP 96580361	CR 3-13 3 HP 97786050	CR 3-15 3 HP 97786061	CR 3-19 5 HP 97786063	CR 3-21 5 HP 97786064	CR 3-25 5 HP 97786067
25	1.7	CR 3-3 0.75 HP 96640808	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-7 1.5 HP 96575984	CR 3-9 2 HP 96654135	CR 3-11 2 HP 96580361	CR 3-13 3 HP 97786050	CR 3-15 3 HP 97786061	CR 3-19 5 HP 97786063	CR 3-21 5 HP 97786064	CR 3-25 5 HP 97786067
30	2.1	CR 3-3 0.75 HP 96640808	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-7 1.5 HP 96575984	CR 3-9 2 HP 96654135	CR 3-11 2 HP 96580361	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 3-25 5 HP 97786067
40	2.8	CR 3-3 0.75 HP 96640808	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-7 1.5 HP 96575984	CR 3-9 2 HP 96654135	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 5-24 10 HP 97786105
50	3.5	CR 3-3 0.75 HP 96640808	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-8 1.5 HP 96585990	CR 3-10 2 HP 91129894	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 5-24 10 HP 97786105
60	4.1	CR 3-3 0.75 HP 96640808	CR 3-4 1 HP 96777669	CR 3-6 1.5 HP 96777669	CR 3-8 1.5 HP 96585990	CR 3-10 2 HP 91129894	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 5-24 10 HP 97786105
80	5.5	CR 3-3 0.75 HP 96640808	CR 3-4 1 HP 96777669	CR 3-6 1.5 HP 96777669	CR 3-8 1.5 HP 96585990	CR 3-10 2 HP 91129894	CR 3-13 3 HP 97786050	CR 3-15 3 HP 97786061	CR 3-19 5 HP 97786063	CR 3-21 5 HP 97786064	CR 3-25 5 HP 97786067	CR 10-16 15 HP 97786805
100	6.9	CR 3-3 0.75 HP 96640808	CR 3-4 1 HP 96777669	CR 3-6 1.5 HP 96777669	CR 3-9 2 HP 96654135	CR 3-11 2 HP 96580361	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-21 5 HP 97786064	CR 5-22 7.5 HP 97786104	CR 10-16 15 HP 97786805
125	8.6	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-7 1.5 HP 96575984	CR 3-10 2 HP 91129894	CR 3-13 3 HP 97786050	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 3-25 5 HP 97786067	CR 5-22 7.5 HP 97786104	CR 10-16 15 HP 97786805
150	10.4	CR 3-4 1 HP 96777669	CR 3-6 1.5 HP 96777669	CR 3-9 2 HP 96654135	CR 3-13 3 HP 97786050	CR 3-17 3 HP 97786062	CR 3-21 5 HP 97786064	CR 3-25 5 HP 97786067	CR 5-18 7.5 HP 97786103	CR 5-20 7.5 HP 96994432	CR 5-24 10 HP 97786105	CR 10-17 15 HP 97786808
200	13.8	CR 5-4 2 HP 97786069	CR 5-4 2 HP 97786069	CR 5-6 3 HP 97786081	CR 5-9 5 HP 97786085	CR 5-11 5 HP 97786087	CR 5-14 5 HP 97713914	CR 5-16 7.5 HP 97786102	CR 5-18 7.5 HP 97786103	CR 5-22 7.5 HP 97786104	CR 10-14 15 HP 97786127	CR 10-17 15 HP 97786808
250	17.3	CR 5-4 2 HP 97786069	CR 5-5 3 HP 97786070	CR 5-8 5 HP 97786083	CR 5-10 5 HP 97786086	CR 5-13 5 HP 96758079	CR 5-16 7.5 HP 97786102	CR 5-20 7.5 HP 96994432	CR 5-22 7.5 HP 97786104	CR 5-24 10 HP 97786105	CR 10-16 15 HP 97786805	CR 10-17 15 HP 97786808
300	20.7	CR 5-4 2 HP 97786069	CR 5-6 3 HP 97786081	CR 5-9 5 HP 97786085	CR 5-13 5 HP 96758079	CR 5-16 7.5 HP 97786102	CR 5-20 7.5 HP 96994432	CR 5-24 10 HP 97786105	CR 10-12 10 HP 96645542	CR 10-14 15 HP 97786127	CR 10-16 15 HP 97786805	CR 15-12 25 HP 96621673
350	24.2	CR 10-3 3 HP 97786106	CR 10-3 3 HP 97786106	CR 10-4 5 HP 96771299	CR 10-6 5 HP 97786108	CR 10-7 7.5 HP 97786109	CR 10-9 7.5 HP 97786110	CR 10-10 10 HP 96765677	CR 10-12 10 HP 96645542	CR 10-14 15 HP 97786127	CR 10-16 15 HP 97786805	CR 15-12 25 HP 96621673
400	27.6	CR 10-3 3 HP 97786106	CR 10-3 3 HP 97786106	CR 10-5 5 HP 97786107	CR 10-6 5 HP 97786108	CR 10-8 7.5 HP 96580366	CR 10-10 10 HP 96765677	CR 10-12 10 HP 96645542	CR 10-14 15 HP 97786127	CR 10-16 15 HP 97786805	CR 15-10 20 HP 97786838	CR 15-12 25 HP 96621673
500	34.5	CR 15-2 7.5 HP 96620406	CR 15-2 7.5 HP 96620406	CR 15-3 7.5 HP 97786811	CR 15-4 10 HP 97684764	CR 15-5 15 HP 97786816	CR 15-6 15 HP 97786834	CR 15-7 15 HP 97786835	CR 15-8 20 HP 97786836	CR 15-9 20 HP 97786837	CR 15-12 25 HP 96621673	CR 32-9-2 40 HP 97786890
600	41.4	CR 15-2 7.5 HP 96620406	CR 15-2 7.5 HP 96620406	CR 15-3 7.5 HP 97786811	CR 15-4 10 HP 97684764	CR 15-5 15 HP 97786816	CR 15-6 15 HP 97786834	CR 15-7 15 HP 97786835	CR 15-8 20 HP 97786836	CR 15-9 20 HP 97786837	CR 32-8-2 40 HP 97786885	CR 32-9-2 40 HP 97786890
700	48.3	CR 15-2 7.5 HP 96620406	CR 15-2 7.5 HP 96620406	CR 15-3 7.5 HP 97786811	CR 15-4 10 HP 97684764	CR 15-5 15 HP 97786816	CR 15-7 15 HP 97786835	CR 15-8 20 HP 97786836	CR 15-9 20 HP 97786837	CR 15-10 20 HP 97786838	CR 32-8-2 40 HP 97786885	CR 32-9-2 40 HP 97786890
750	51.8	CR 15-2 7.5 HP 96620406	CR 15-2 7.5 HP 96620406	CR 15-3 7.5 HP 97786811	CR 15-4 10 HP 97684764	CR 15-5 15 HP 97786816	CR 15-7 15 HP 97786835	CR 15-8 20 HP 97786836	CR 15-10 20 HP 97786838	CR 15-12 25 HP 96621673	CR 32-8-2 40 HP 97786885	CR 32-9-2 40 HP 97786892
800	55.2	CR 32-2-1 10 HP 97781873	CR 32-2-1 10 HP 97781873	CR 32-2-1 10 HP 97781873	CR 32-3-2 15 HP 97786847	CR 32-4-2 20 HP 97786855	CR 32-5-2 25 HP 97786871	CR 32-5-2 25 HP 96627357	CR 32-6-2 25 HP 29253602	CR 32-7-2 30 HP 96869369	CR 32-8-2 40 HP 97786885	CR 32-10-2 50 HP 97786894
900	62.1	CR 32-2-1 10 HP 97781873	CR 32-2-1 10 HP 97781873	CR 32-2 15 HP 97786846	CR 32-3 15 HP 97786849	CR 32-4-2 20 HP 97786855	CR 32-5-2 25 HP 97786871	CR 32-6-2 25 HP 29253602	CR 32-6 30 HP 97786872	CR 32-7-2 30 HP 96869369	CR 32-8 40 HP 97786887	CR 32-10-2 50 HP 97786894
1000	69.0	CR 32-2-1 10 HP 97781873	CR 32-2-1 10 HP 97781873	CR 32-2 15 HP 97786846	CR 32-3 15 HP 97786849	CR 32-4-2 20 HP 97786855	CR 32-5-2 25 HP 97786871	CR 32-6-2 25 HP 29253602	CR 32-7-2 30 HP 96869369	CR 32-7 40 HP 97786883	CR 32-9-2 40 HP 97786890	CR 45-7-2 60 HP 97787962
1100	75.9	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-3-2 25 HP 96631054	CR 45-3 30 HP 97787933	CR 45-4-2 40 HP 97787934	CR 45-5-2 40 HP 97787937	CR 45-5-2 40 HP 97787937	CR 45-6-2 50 HP 96698363	CR 45-7-2 60 HP 97787962
1200	82.8	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2 20 HP 97787932	CR 45-3-2 25 HP 96631054	CR 45-4-2 40 HP 97787934	CR 45-4-2 40 HP 97787934	CR 45-5-2 40 HP 97787937	CR 45-5-1 50 HP 97787938	CR 45-6 50 HP 35253482	CR 45-7 60 HP 97787963
1300	89.7	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2 20 HP 97787932	CR 45-3-2 25 HP 96631054	CR 45-4-2 40 HP 97787934	CR 45-4-1 40 HP 97787935	CR 45-5-2 40 HP 97787937	CR 45-5 50 HP 97787939	CR 45-6 50 HP 35253482	CR 45-7 60 HP 97787963
1400	96.6	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-2 25 HP 97787932	CR 45-3-2 25 HP 96631054	CR 45-4-2 40 HP 97787934	CR 45-4-1 40 HP 97787935	CR 45-5-2 40 HP 97787937	CR 45-5-2 40 HP 97787939	CR 45-6 50 HP 35253482	CR 45-7 60 HP 97787963
1500	103.5	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-3-2 25 HP 96631054	CR 45-3-2 25 HP 96631054	CR 45-4-2 40 HP 97787934	CR 45-4-2 40 HP 97787936	CR 45-5-2 40 HP 97787937	CR 45-6-2 50 HP 96698363	CR 45-7-2 60 HP 97787962	-

BOILER_FEED_PUMP_SIZING_CHARTS_ON-OFF

CR low-NPSH pump sizing chart for continuous feed boilers, 60 Hz

Pump PSI	20 PSI	35 PSI	60 PSI	85 PSI	110 PSI	137 PSI	165 PSI	190 PSI	215 PSI	265 PSI	315 PSI
Boiler PSI	10 PSI	25 PSI	50 PSI	75 PSI	100 PSI	125 PSI	150 PSI	175 PSI	200 PSI	250 PSI	300 PSI
Boiler HP / Boiler Evaporation rate GPM											
15 / 1.0	CR 3-3 0.75 HP 96640808	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-7 1.5 HP 96575984	CR 3-9 2 HP 96654135	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 5-24 10 HP 97786105
20 / 1.4	CR 3-3 0.75 HP 96640808	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-7 1.5 HP 96575984	CR 3-9 2 HP 96654135	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 5-24 10 HP 97786105
25 / 1.7	CR 3-3 0.75 HP 96640808	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-8 1.5 HP 96585990	CR 3-10 2 HP 91129894	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 5-24 10 HP 97786105
30 / 2.1	CR 3-3 0.75 HP 96640808	CR 3-3 0.75 HP 96640808	CR 3-6 1.5 HP 96777669	CR 3-8 1.5 HP 96585990	CR 3-10 2 HP 91129894	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 10-17 15 HP 97786808
40 / 2.8	CR 3-3 0.75 HP 96640808	CR 3-4 1 HP 97786047	CR 3-6 1.5 HP 96777669	CR 3-8 1.5 HP 96585990	CR 3-10 2 HP 91129894	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 10-17 15 HP 97786808
50 / 3.5	CR 3-3 0.75 HP 96640808	CR 3-4 1 HP 97786047	CR 3-6 1.5 HP 96777669	CR 3-8 1.5 HP 96585990	CR 3-10 2 HP 91129894	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 10-17 15 HP 97786808
60 / 4.1	CR 3-3 0.75 HP 96640808	CR 3-4 1 HP 97786047	CR 3-6 1.5 HP 96777669	CR 3-8 1.5 HP 96585990	CR 3-10 2 HP 91129894	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-25 5 HP 97786067	CR 10-17 15 HP 97786808
80 / 5.5	CR 3-3 0.75 HP 96640808	CR 3-4 1 HP 97786047	CR 3-6 1.5 HP 96777669	CR 3-8 1.5 HP 96585990	CR 3-11 2 HP 96580361	CR 3-13 3 HP 97786050	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-21 5 HP 97786064	CR 3-25 5 HP 97786067	CR 10-17 15 HP 97786808
100 / 6.9	CR 3-3 0.75 HP 96640808	CR 3-4 1 HP 97786047	CR 3-7 1.5 HP 96575984	CR 3-9 2 HP 96654135	CR 3-12 3 HP 97786048	CR 3-15 3 HP 97786061	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 5-22 7.5 HP 97786104	CR 10-17 15 HP 97786808
125 / 8.6	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-7 1.5 HP 96575984	CR 3-10 2 HP 91129894	CR 3-13 3 HP 97786050	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 5-18 7.5 HP 97786067	CR 5-24 10 HP 97786105	CR 10-17 15 HP 97786808
150 / 10.4	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-9 2 HP 96654135	CR 3-12 3 HP 97786048	CR 3-17 3 HP 97786062	CR 3-19 5 HP 97786063	CR 3-23 5 HP 97786066	CR 5-18 7.5 HP 97786103	CR 5-20 7.5 HP 96994432	CR 5-24 10 HP 97786105	CR 10-17 15 HP 97786808
200 / 13.8	CR 5-4 2 HP 97786069	CR 5-4 2 HP 97786069	CR 5-6 3 HP 97786081	CR 5-9 5 HP 97786085	CR 5-11 5 HP 97786087	CR 5-14 5 HP 97713914	CR 5-16 7.5 HP 97786102	CR 5-18 7.5 HP 97786103	CR 5-22 7.5 HP 97786104	CR 10-16 15 HP 97786805	CR 10-17 15 HP 97786808
250 / 17.3	CR 5-4 2 HP 97786069	CR 5-5 3 HP 97786070	CR 5-8 5 HP 97786083	CR 5-10 5 HP 97786086	CR 5-13 5 HP 96758079	CR 5-16 7.5 HP 97786102	CR 5-20 7.5 HP 96994432	CR 5-22 7.5 HP 97786104	CR 5-24 10 HP 97786105	CR 10-16 15 HP 97786805	CR 10-17 15 HP 97786808
300 / 20.7	CR 5-4 2 HP 97786069	CR 5-6 3 HP 97786081	CR 5-9 5 HP 97786085	CR 5-12 5 HP 97786088	CR 5-15 7.5 HP 97786090	CR 5-18 7.5 HP 97786103	CR 5-22 7.5 HP 97786104	CR 10-10 10 HP 96765677	CR 10-12 10 HP 96645542	CR 10-16 15 HP 97786127	CR 15-12 25 HP 96621673
350 / 24.2	CR 5-5 3 HP 97786070	CR 5-7 3 HP 97786082	CR 5-11 5 HP 97713914	CR 5-14 5 HP 97713914	CR 5-18 7.5 HP 97786103	CR 10-10 10 HP 96765677	CR 10-12 10 HP 96645542	CR 10-14 15 HP 97786127	CR 10-16 15 HP 97786805	CR 15-12 25 HP 96621673	CR 32-9-2 40 HP 97786890
400 / 27.6	CR 10-3 3 HP 97786106	CR 10-3 3 HP 97786106	CR 10-5 5 HP 97786107	CR 10-6 5 HP 97786108	CR 10-8 7.5 HP 96580386	CR 10-10 10 HP 96765677	CR 10-12 10 HP 96645542	CR 10-14 15 HP 97786127	CR 10-16 15 HP 97786805	CR 15-12 25 HP 96621673	CR 32-9-2 40 HP 97786890
500 / 34.5	CR 10-3 3 HP 97786106	CR 10-3 3 HP 97786106	CR 10-5 5 HP 97786107	CR 10-7 7.5 HP 97786109	CR 10-9 7.5 HP 97786110	CR 10-12 10 HP 96645542	CR 10-14 15 HP 97786127	CR 10-16 15 HP 97786805	CR 10-17 15 HP 97786808	CR 15-12 25 HP 96621673	CR 32-9-2 40 HP 97786890
600 / 41.4	CR 15-2 7.5 HP 96620406	CR 15-2 7.5 HP 96620406	CR 15-3 7.5 HP 97786811	CR 15-4 10 HP 97684764	CR 15-5 15 HP 97786816	CR 15-6 15 HP 97786834	CR 15-7 15 HP 97786835	CR 15-9 20 HP 97786837	CR 15-10 20 HP 97786838	CR 15-12 25 HP 96621673	CR 32-9 40 HP 97786892
700 / 48.3	CR 15-2 7.5 HP 96620406	CR 15-2 7.5 HP 96620406	CR 15-3 7.5 HP 97786811	CR 15-4 10 HP 97684764	CR 15-5 15 HP 97786816	CR 15-7 15 HP 97786835	CR 15-8 20 HP 97786836	CR 15-9 20 HP 97786837	CR 15-10 20 HP 97786838	CR 32-8-2 40 HP 97786885	CR 32-9 40 HP 97786892
750 / 51.8	CR 15-2 7.5 HP 96620406	CR 15-2 7.5 HP 96620406	CR 15-3 7.5 HP 97786811	CR 15-4 10 HP 97684764	CR 15-5 15 HP 97786816	CR 15-7 15 HP 97786835	CR 15-8 20 HP 97786836	CR 15-9 20 HP 97786837	CR 15-10 20 HP 97786838	CR 32-8-2 40 HP 97786885	CR 32-9 40 HP 97786892
800 / 55.2	CR 15-2 7.5 HP 96620406	CR 15-2 7.5 HP 96620406	CR 15-3 7.5 HP 97786811	CR 15-4 10 HP 97684764	CR 15-5 15 HP 97786816	CR 15-7 15 HP 97786835	CR 15-8 20 HP 97786836	CR 15-10 20 HP 97786838	CR 15-12 25 HP 96621673	CR 32-8-2 40 HP 97786885	CR 32-10-2 50 HP 97786894
900 / 62.1	CR 32-2-1 10 HP 97781873	CR 32-2-1 10 HP 97781873	CR 32-2 15 HP 97786846	CR 32-3 15 HP 97786849	CR 32-4-2 20 HP 97786855	CR 32-5-2 25 HP 97786871	CR 32-6-2 25 HP 29253602	CR 32-6 30 HP 97786872	CR 32-7-2 30 HP 96869369	CR 32-8 40 HP 97786887	CR 32-10-2 50 HP 97786894
1000 / 69.0	CR 32-2-1 10 HP 97781873	CR 32-2-1 10 HP 97781873	CR 32-2 15 HP 97786846	CR 32-3 15 HP 97786849	CR 32-4-2 20 HP 97786855	CR 32-5-2 25 HP 97786871	CR 32-6-2 25 HP 29253602	CR 32-7-2 30 HP 96869369	CR 32-7 40 HP 97786883	CR 32-9-2 40 HP 97786890	CR 32-10 50 HP 97786896
1100 / 75.9	CR 32-2-1 10 HP 97781873	CR 32-2-1 10 HP 97781873	CR 32-2 15 HP 97786846	CR 32-3 15 HP 97786849	CR 32-4-2 20 HP 97786855	CR 32-5-2 25 HP 97786871	CR 32-6-2 25 HP 29253602	CR 32-7-2 30 HP 96869369	CR 32-7 40 HP 97786883	CR 32-9-2 40 HP 97786890	CR 45-7 60 HP 97787963
1200 / 82.8	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2 20 HP 97787932	CR 45-3-2 25 HP 96631054	CR 45-4-2 40 HP 97787934	CR 45-4-1 40 HP 97787935	CR 45-5-2 40 HP 97787937	CR 45-5 50 HP 97787939	CR 45-6 50 HP 352533482	CR 45-7 60 HP 97787963
1300 / 89.7	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2 20 HP 97787932	CR 45-3-2 25 HP 96631054	CR 45-4-2 40 HP 97787934	CR 45-4-1 40 HP 97787935	CR 45-5-2 40 HP 97787937	CR 45-5 50 HP 97787939	CR 45-6 50 HP 352533482	CR 45-7 60 HP 97787963
1400 / 96.6	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-3-2 25 HP 96631054	CR 45-3-2 25 HP 96631054	CR 45-4-2 40 HP 97787934	CR 45-4 40 HP 97787936	CR 45-5-2 40 HP 97787937	CR 45-6-2 50 HP 96698363	CR 45-7-2 60 HP 97787962	-
1500 / 103.5	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-2-1 20 HP 97787931	CR 45-3-2 25 HP 96631054	CR 45-3-2 25 HP 96631054	CR 45-4-2 40 HP 97787934	CR 45-4 40 HP 97787936	CR 45-5-2 40 HP 97787937	CR 45-6-2 50 HP 96698363	CR 45-7-2 60 HP 97787962	-

BOILER_FEED_PUMP_SIZING_CHARTS_CONT

Bypass orifices for continuous feed boilers

Bypass orifices for CR, CRI, CRN 1s-20, continuous feed boilers

303 Stainless steel bypass orifices for continuous feed boilers

Grundfos pump model		Temperature range [°F (°C)]	Min. flow rate	Min. required bypass line size [34]	Grundfos orifice size [35] [36]	For 1/2" tap material no.	For 3/4" NPT tap material no.
CR, CRI, CRN 1s	2 to 3 4 to 36	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	0.5 GPM	3/8"	3/32" 1/16"	91128255 91128254	
CR, CRI, CRN 1s	2 to 8 8 to 36	177-210 (80-99) w/Cool Top: 281-320 (138-160)	0.7 GPM	3/8"	3/32" 1/16"	91128255 91128254	
CR, CRI, CRN 1s	2 to 4 5 to 21 23 to 36	211-250 (99-121) w/Cool Top: 321-356 (160-180)	1.1 GPM	3/8"	1/8" 3/32" 1/16"	9600190K 91128255 91128254	
CR, CRI, CRN 1	2 3 to 12 13 to 36	5-176 (-15-80) w/Cool Top: 251-280 (121-138)	0.9 GPM	3/8"	1/8" 3/32" 1/16"	9600190K 91128255 91128254	
CR, CRI, CRN 1	2 to 5 6 to 36	177-210 (80-99) w/Cool Top: 281-320 (138-160)	1.3 GPM	3/8"	1/8" 3/32"	9600190K 91128255	
CR, CRI, CRN 1	2 to 4 5 to 13 15 to 36	211-250 (99-121) w/Cool Top: 321-356 (160-180)	2.1 GPM	1/2"	5/32" 1/8" 3/32"	91128256 9600190K 91128255	
CR, CRI, CRN 3	2 to 6 7 to 36	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	1.6 GPM	1/2"	1/8" 3/32"	9600190K 91128255	
CR, CRI, CRN 3	2 to 5 6 to 15 17 to 36	177-210 (80-99) w/Cool Top: 281-320 (138-160)	2.4 GPM	1/2"	5/32" 1/8" 3/32"	91128256 9600190K 91128255	
CR, CRI, CRN 3	2 to 6 7 to 13 15 to 36	211-250 (99-121) w/Cool Top: 321-356 (160-180)	4.0 GPM	1/2"	3/16" 5/32" 1/8"	9600191K 91128256 9600190K	
CR, CRI, CRN 5	2 to 3 4 to 7 8 to 36	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	3.0 GPM	1/2"	3/16" 5/32" 1/8"	9600191K 91128256 9600190K	
CR, CRI, CRN 5	2 to 3 4 to 6 7 to 16 18 to 36	177-210 (80-99) w/Cool Top: 281-320 (138-160)	4.5 GPM	1/2"	1/4" 3/16" 5/32" 1/8"	9600192K 9600191K 91128256 9600190K	
CR, CRI, CRN 5	2 to 9 10 to 18 20 to 36	211-250 (99-121) w/Cool Top: 321-356 (160-180)	7.5 GPM	1/2"	1/4" 3/16" 5/32"	9600192K 9600191K 91128256	
CR, CRI, CRN 10	1 to 2 3 to 6 7 to 14 16 to 17	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	5.0 GPM	3/4"	1/4" 3/16" 5/32" 1/8"	9600192K 9600191K 91128256 9600190K	9600072 9600062 9600052
CR, CRI, CRN 10	1 to 3 4 to 10 12 to 17	177-210 (80-99) w/Cool Top: 281-320 (138-160)	7.5 GPM	3/4"	1/4" 3/16" 5/32"	9600192K 9600191K 91128256	9600072 9600062
CR, CRI, CRN 10	1 2 to 3 4 to 14 16 to 17	211-250 (99-121) w/Cool Top: 321-356 (160-180)	12.5 GPM	1"	3/8" 5/16" 1/4" 3/16"	9600194K 9600193K 9600192K 9600191K	9600092 9600082 9600072 9600062

303 Stainless steel bypass orifices for continuous feed boilers

Grundfos pump model		Temperature range [°F (°C)]	Min. flow rate	Min. required bypass line size [34]	Grundfos orifice size [35] [36]	For 1/2" tap material no.	For 3/4" NPT tap material no.
CR, CRI, CRN 15	1	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	9.0 GPM	1"	5/16"	9600193K	9600082
	2 to 6				1/4"	9600192K	9600072
	7 to 12				3/16"	9600191K	9600062
CR, CRI, CRN 15	1	177-210 (80-99) w/Cool Top: 281-320 (138-160)	13.5 GPM	1"	3/8"	9600194K	9600092
	2 to 4				5/16":	9600193K	9600082
	5 to 12				1/4":	9600192K	9600072
CR, CRI, CRN 15	1 to 2	211-250 (99-121) w/Cool Top: 321-356 (160-180)	22.5 GPM	1 1/4"	7/16"	9600195K	9600102
	3 to 4				3/8"	9600194K	9600092
	5 to 10				5/16"	9600193K	9600082
	12				1/4"	9600192K	9600072
CR, CRI, CRN 20	1 to 2	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	10.5 GPM	1"	5/16"	9600193K	9600082
	3 to 7				1/4"	9600192K	9600072
	8 to 10				3/16"	9600191K	9600062
CR, CRI, CRN 20	1	177-210 (80-99) w/Cool Top: 281-320 (138-160)	16.0 GPM	1 1/4"	3/8"	9600194K	9600092
	2 to 5				5/16"	9600193K	9600082
	6 to 10				1/4"	9600192K	9600072
CR, CRI, CRN 20	1	211-250 (99-121) w/Cool Top: 321-356 (160-180)	26.0 GPM	1/1/4"	1/2"	9600196K	9600112
	2 to 3				7/16"	9600195K	9600102
	4 to 7				3/8"	9600194K	9600092
	8 to 10				5/16"	9600193K	9600082

[34] Bypass line recommendations are based on the orifice size, the pump's minimum flow rate requirement, and the friction losses in 50 ft. (15.24 m) of the recommended bypass line shown.

[35] Orifices other than those supplied by Grundfos may have different flow/head characteristics.

[36] Orifice sizes 9/16" to 3/4" have 1" NPT threads and orifice sizes 13/16" to 1" have 1 1/2" NPT threads.

Bypass orifices for CR, CRN 32-155, continuous feed boilers

303 Stainless steel bypass orifices for continuous feed boilers

Grundfos pump model		Temperature range [°F (°C)]	Min. flowrate	Min. required bypass line size [37]	Grundfos orifice size [38) 39)]	For 1" or 1 1/2" tap material no.	For 3/4" NPT tap material no.
CR, CRN 32	1-1 to 1 2-2 to 4-2 4 to 14	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	14.0 GPM	1 1/4"	7/16" 5/16" 1/4"		9600102 9600082 9600072
CR, CRN 32	1-1 to 1 2-2 to 3 4-2 to 8 9-2 to 14	177-210 (80-99) w/Cool Top: 281-320(138-160)	21.0 GPM	1 1/4"	1/2" 3/8" 5/16" 1/4"		9600112 9600092 9600082 9600072
CR, CRN 32	1-1 to 1 2-2 to 3-2 3 to 5-2 5 to 14	211-250 (99-121) w/Cool Top: 321-356 (160-180)	35.0 GPM	1 1/2"	9/16" 1/2" 7/16" 3/8"	91122293	9600112 9600102 9600092
CR, CRN 45	1-1 to 1 2-2 to 3 4-2 to 10	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	22.0 GPM	1 1/4"	7/16" 3/8" 5/16"		9600102 9600092 9600082
CR, CRN 45	1-1 to 2-2 2-1 to 3 4-2 to 6 7-2 to 10	177-210 (80-99) w/Cool Top: 281-320(138-160)	33.0 GPM	1 1/2"	1/2" 7/16" 3/8" 5/16"		9600112 9600102 9600092 9600082
CR, CRN 45	1-1 to 2-2 2-1 to 3-1 3 to 5-2 5-1 to 10	211-250 (99-121) w/Cool Top: 321-356 (160-180)	55.0 GPM	1 1/2"	5/8" 9/16" 1/2" 7/16"	91122294 91122293	9600112 9600102
CR, CRN 64	1-1 to 2-2 2-1 to 3-1 3 to 7-1	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	34.0 GPM	1 1/2"	1/2" 7/16" 3/8"		9600112 9600102 9600092
CR, CRN 64	1-1 to 1 2-2 to 2 3-2 to 4-2 4-1 to 7-1	177-210 (80-99) w/Cool Top: 281-320(138-160)	51.0 GPM	1 1/2"	5/8" 9/16" 1/2" 7/16"	91122294 91122293	9600112 9600102
CR, CRN 64	1-1 to 2-2 2-1 to 2 3-2 to 4-2 4-1 to 7-1	211-250 (99-121) w/Cool Top: 321-356 (160-180)	85.0 GPM	2"	13/16" 11/16" 5/8" 9/16"	91122297 91122295 91122294 91122293	
CR, CRN 95	1-1 to 1 2-2 to 2 3-2 to 3 4-2 to 5-1	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	50.0 GPM	1 1/2"	5/8" 9/16" 1/2" 7/16"	91122294 91122293	9600112 9600102
CR, CRN 95	1-1 to 1 2-2 to 2-1 3-2 to 3 4-2 to 4 5-2 to 5-1	177-210 (80-99) w/Cool Top: 281-320 (138-160)	75.0 GPM	2"	3/4" 11/16" 5/8" 9/16" 1/2"	91122296 91122295 91122294 91122293	9600112
CR, CRN 95	1-1 to 1 2-1 to 2 3-2 to 3 4-2 to 5-2	211-250 (99-121) w/Cool Top: 321-356 (160-180)	125.0 GPM	2"	1" 7/8" 3/4" 11/16"	91122299 91122298 91122296 91122295	
CR, CRN 125	1-1 1 2-2 to 2-1 2 to 4 5-2 to 7-2	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	68.0 GPM	2"	3/4" 11/16" 5/8" 9/16" 1/2"	91122296 91122295 91122294 91122293	9600112

303 Stainless steel bypass orifices for continuous feed boilers

Grundfos pump model		Temperature range [°F (°C)]	Min. flowrate	Min. required bypass line size [37]	Grundfos orifice size [38] [39]	For 1" or 1 1/2" tap material no.	For 3/4" NPT tap material no.
CR, CRN 125	1-1	177-210 (80-99) w/Cool Top: 281-320 (138-160)	102.0 GPM	2"	7/8"	91122298	
	1				13/16"	91122297	
	2-2 to 2				3/4"	91122296	
	3-2 to 3				11/16"	91122295	
	4-2 to 5-2				5/8"	91122294	
	5-1 to 7-2				9/16"	91122293	
CR, CRN 125	1-1	211-250 (99-121) w/Cool Top: 321-356 (160-180)	170.0 GPM	2 1/2"	1 1/8"	Call Factory	
	1				1 1/16"	Call Factory	
	2-2 to 2				1"	91122299	
	3-2 to 3-1				7/8"	91122298	
	3 to 4				13/16"	91122297	
	5-2 to 6-1				3/4"	91122296	
	6 to 7-2				11/16"	91122295	
CR, CRN 155	1-1	5-176 (-15-80) w/Cool Top: 251-280 (122-138)	75.0 GPM	2"	3/4"	91122296	9600112
	1				11/16"	91122295	
	2-2 to 2				5/8"	91122294	
	3-2 to 3				9/16"	91122293	
	4-2 to 5-2				1/2"		
CR, CRN 155	1-1	177-210 (80-99) w/Cool Top: 281-320 (138-160)	113.0 GPM	2"	1"	91122299	
	1				7/8"	91122298	
	2-2 to 2				3/4"	91122296	
	3-2 to 3				11/16"	91122295	
	4-2 to 5-1				5/8"	91122294	
CR, CRN 155	1-1	211-250 (99-121) w/Cool Top: 321-356 (160-180)	188.0 GPM	3"	1 3/16"	Call Factory	
	1				1 1/8 "	Call Factory	
	2-2 to 2				1"	91122299	
	3-2 to 3				7/8"	91122298	
	4-2 to 4				13/16"	91122297	
	5-2 to 5-1				3/4"	91122296	

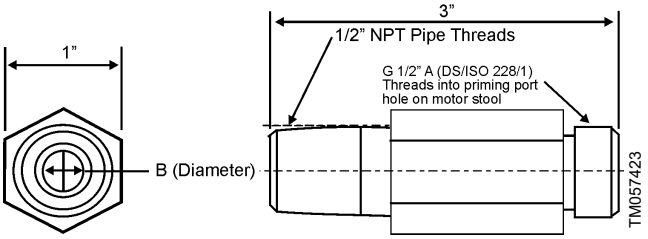
37) Bypass line recommendations are based on the orifice size, the pump's minimum flow rate requirement, and the friction losses in 50 ft. (15.24 m) of the recommended bypass line shown.

38) Orifices other than those supplied by Grundfos may have different flow/head characteristics.

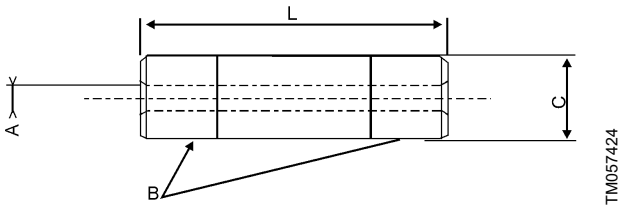
39) Orifice sizes 9/16" to 3/4" have 1" NPT threads and orifice sizes 13/16" to 1" have 1 1/2" NPT threads.

Bypass orifices dimensions

303 stainless steel bypass orifices for continuous feed boilers



Material number	B
91128254	1/16"
91128255	3/32"
91128256	5/32"
9600190K	1/8"
9600191K	3/16"
9600192K	1/4"
9600193K	5/16"
9600194K	3/8"
9600195K	7/16"

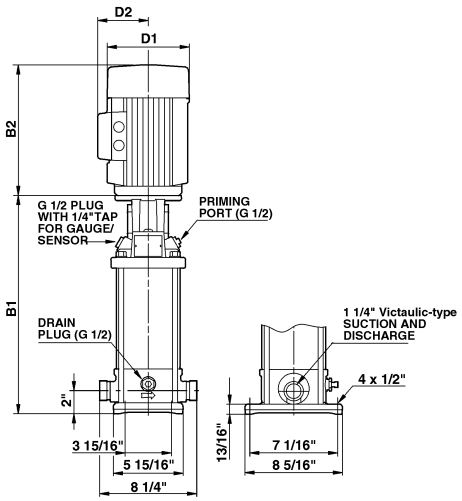


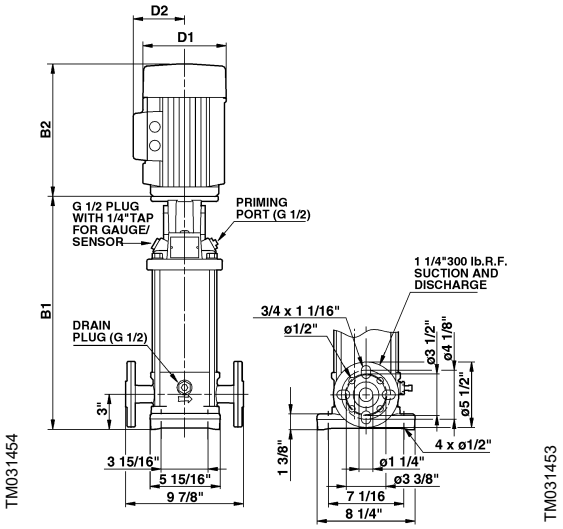
Material number	A	B	C	L
9600052	1/8"	3/4" NPT	1"	3"
9600062	3/16"	3/4" NPT	1"	3"
9600072	1/4"	3/4" NPT	1"	3"
9600082	5/16"	3/4" NPT	1"	3"
9600092	3/8"	3/4" NPT	1"	3"
9600102	7/16"	3/4" NPT	1"	3"
9600112	1/2"	3/4" NPT	1"	3"
91122293	9/16"	1" NPT	1.33"	4"
91122294	5/8"	1" NPT	1.33"	4"
91122295	11/16"	1" NPT	1.33"	4"
91122296	3/4"	1" NPT	1.33"	4"
91122297	13/16"	1.5" NPT	1.9"	4"
91122298	7/8"	1.5" NPT	1.9"	4"
91122299	1"	1.5" NPT	1.9"	4"

CRN pumps with magnetic drive

Dimensional drawings - CRN pumps with magnetic drive

CRN 1s
CRN, CRNE 1
CRN, CRNE 3
CRN, CRNE 5

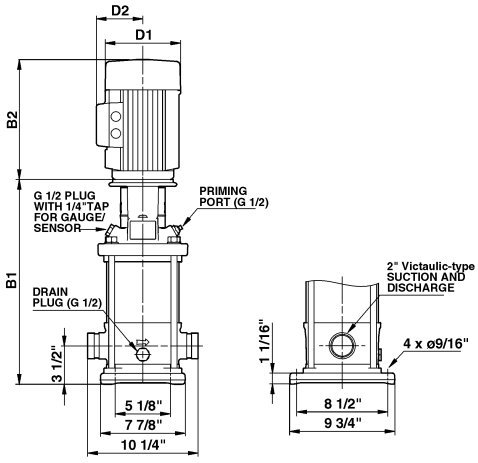


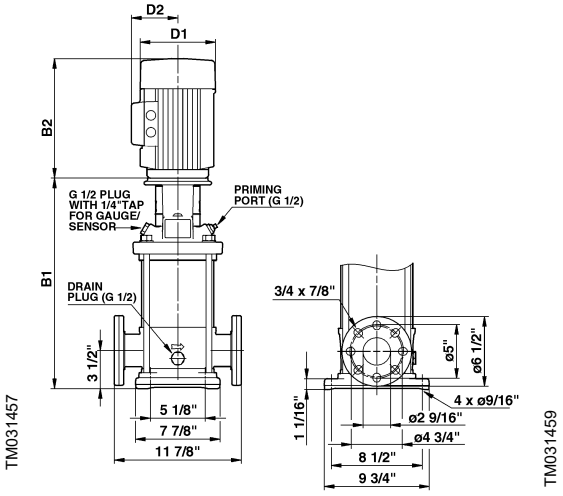


TM031454

TM031453

CRN, CRNE 10
CRN, CRNE 15
CRN, CRNE 20



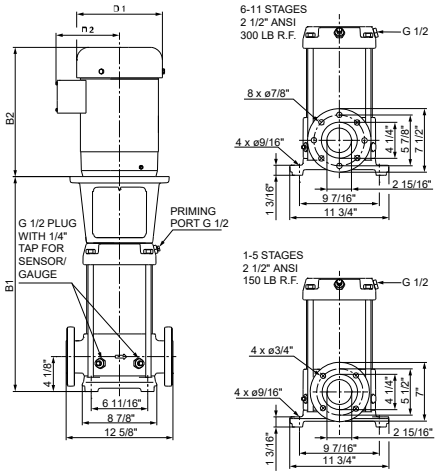


TM031457

TM031459

Dimensional drawings - CRN pumps with magnetic drive

CRN, CRNE 32



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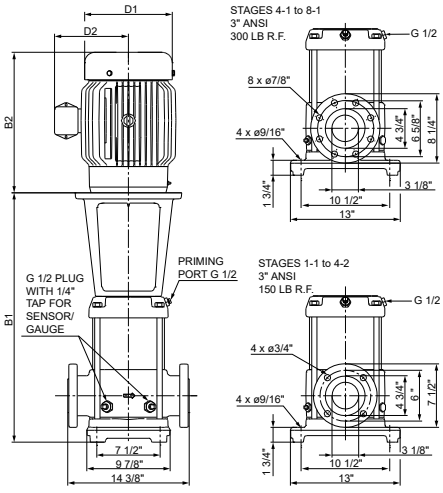
CRN, CRNE 45



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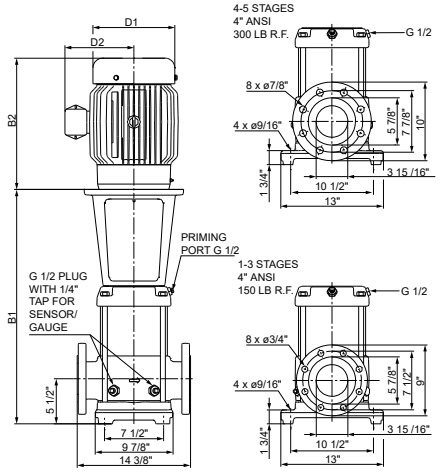
Dimensional drawings - CRN pumps with magnetic drive

CRN, CRNE 64



TM027705_1009

Dimensions and weights - CRN pumps with magnetic drive

CRN 1s MAGdrive, 60 Hz

Pump type	hp	PH	PJE [40]	Dimensions [in]					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN 1s-2	1/2	3	●	15.47	8.65	6.69	5.52	24.12	74
CRN 1s-3	1/2	3	●	15.47	8.65	6.69	5.52	24.12	74
CRN 1s-4	1/2	3	●	16.18	8.65	6.69	5.52	24.83	75
CRN 1s-5	1/2	3	●	16.88	8.65	6.69	5.52	25.53	76
CRN 1s-6	3/4	3	●	17.59	9.04	6.69	5.52	26.63	82
CRN 1s-7	3/4	3	●	18.30	9.04	6.69	5.52	27.34	83
CRN 1s-8	3/4	3	●	19.01	11.68	7.64	5.88	30.69	100
CRN 1s-9	3/4	3	●	19.72	11.68	7.64	5.88	31.4	101
CRN 1s-10	1	3	●	20.43	11.68	7.64	5.88	32.11	96
CRN 1s-11	1	3	●	21.14	11.68	7.64	5.88	32.82	98
CRN 1s-12	1	3	●	21.84	12.46	7.64	5.88	34.3	88
CRN 1s-13	1 1/2	3	●	22.55	12.46	7.64	5.88	35.01	90
CRN 1s-15	1 1/2	3	●	23.97	12.46	7.64	5.88	36.43	110
CRN 1s-17	1 1/2	3	●	25.39	13.72	9.45	6.69	40.23	143
CRN 1s-19	2	3	●	26.81	13.72	9.45	6.69	40.53	147
CRN 1s-21	2	3	●	28.22	13.72	9.45	6.69	43.04	187
CRN 1s-23	2	3	●	29.64	15.29	9.45	6.69	46.03	191
CRN 1s-25	3	3	●	32.18	15.29	9.45	6.69	47.45	193
CRN 1s-27	3	3	●	33.59	15.29	9.45	6.69	48.87	195

[40] PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs (4 kg) less.

● Available.

CRN, CRNE 1 MAGdrive, 60 Hz

Pump type	hp	PH	PJE [41]	Dimensions [in]					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN 1-2	1/2	3	●	15.47	8.65	6.69	5.52	24.12	74
CRN 1-3	1/2	3	●	15.47	8.65	6.69	5.52	24.12	74
CRN 1-4	3/4	3	●	16.18	8.65	6.69	5.52	24.83	75
CRN, CRNE 1-5	3/4	3	●	16.88	8.65	6.69	5.52	25.53	76
CRN 1-6	1	3	●	17.59	9.04	6.69	5.52	26.63	82
CRN, CRNE 1-7	1	3	●	18.30	9.04	6.69	5.52	27.34	83
CRN 1-8	1 1/2	3	●	19.01	11.68	7.64	5.88	30.69	100
CRN 1-9	1 1/2	3	●	19.72	11.68	7.64	5.88	31.40	101
CRN, CRNE 1-10	1 1/2	3	●	20.43	11.68	7.64	5.88	32.11	96
CRN 1-11	1 1/2	3	●	21.14	11.68	7.64	5.88	32.82	98
CRN 1-12	2	3	●	21.84	12.46	7.64	5.88	34.30	88
CRN, CRNE 1-13	2	3	●	22.55	12.46	7.64	5.88	35.01	90
CRN, CRNE 1-15	2	3	●	23.97	12.46	7.64	5.88	36.43	110
CRN 1-17	3	3	●	26.51	13.72	9.45	6.69	40.23	143
CRN, CRNE 1-19	3	3	●	26.81	13.72	9.45	6.69	40.53	147
CRN 1-21	3	3	●	29.32	13.72	9.45	6.69	43.04	187
CRN, CRNE 1-23	5	3	●	30.74	15.29	9.45	6.69	46.03	191
CRN 1-25	5	3	●	32.16	15.29	9.45	6.69	47.45	193
CRN, CRNE 1-27	5	3	●	33.58	15.29	9.45	6.69	48.87	195

41) PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs (4 kg) less.

● Available

CRN, CRNE 3 MAGdrive, 60 Hz

Pump type	hp	PH	PJE [42]	Dimensions [in]					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN 3-2	1/2	3	●	15.47	8.65	6.69	5.52	24.12	74
CRN, CRNE 3-3	3/4.75	3	●	15.47	8.65	6.69	5.52	24.12	74
CRN 3-4	1	3	●	16.18	9.04	6.69	5.52	25.22	80
CRN, CRNE 3-5	1	3	●	16.88	9.04	6.69	5.52	25.92	81
CRN, CRNE 3-6	1 1/2	3	●	17.59	11.68	7.64	5.88	29.27	98
CRN 3-7	1 1/2	3	●	18.30	11.68	7.64	5.88	29.98	98
CRN 3-8	2	3	●	19.01	12.46	7.64	5.88	31.47	85
CRN 3-9	2	3	●	19.72	12.46	7.64	5.88	32.18	85
CRNE 3-9	2	3	●	19.72	12.46	7.64	5.88	32.18	90
CRN 3-10	2	3	●	20.43	12.46	7.64	5.88	32.89	103
CRN 3-11	3	3	●	22.26	13.72	9.45	6.69	35.98	143
CRN, 3-12	3	3	●	22.96	13.72	9.45	6.69	36.68	143
CRNE 3-12	3	3	●	22.96	13.72	9.45	6.69	36.68	148
CRN 3-13	3	3	●	23.66	13.72	9.45	6.69	37.38	176
CRN, CRNE 3-15	5	3	●	25.07	15.29	9.45	6.69	40.36	181
CRN 3-17	5	3	●	26.49	15.29	9.45	6.69	41.78	183
CRN, CRNE 3-19	5	3	●	27.91	15.29	9.45	6.69	43.20	184
CRN 3-21	5	3	●	29.32	15.29	9.45	6.69	44.61	233
CRN 3-23	5	3	●	30.74	15.29	9.45	6.69	46.03	234
CRN, CRNE 3-25	5	3	●	32.16	15.29	9.45	6.69	47.45	236

[42] PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs (4 kg) less.

● Available.

CRN, CRNE 5 MAGdrive, 60 Hz

Pump type	hp	PH	PJE [43]	Dimensions [in]					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN, CRNE 5-2	1	3	●	15.47	9.04	6.69	5.52	24.51	79
CRN, CRNE 5-3	1 1/2	3	●	16.53	11.68	7.64	5.88	28.21	96
CRN 5-4	1 1/2	3	●	17.59	11.68	7.64	5.88	29.27	98
CRN 5-5	2	3	●	18.66	12.46	7.64	5.88	31.12	99
CRNE 5-5	2	3	●	18.66	12.46	7.64	5.88	31.12	104
CRN 5-6	3	3	●	20.84	13.72	9.45	6.69	34.56	136
CRN 5-7	3	3	●	21.89	13.72	9.45	6.69	35.61	141
CRNE 5-7	3	3	●	21.89	13.72	9.45	6.69	35.61	145
CRN 5-8	5	3	●	22.95	15.29	9.45	6.69	38.24	177
CRN 5-9	5	3	●	24.01	15.29	9.45	6.69	39.30	179
CRN, CRNE 5-10	5	3	●	25.07	15.29	9.45	6.69	40.36	182
CRN 5-11	5	3	●	26.14	15.29	9.45	6.69	41.43	224
CRN 5-12	5	3	●	27.20	15.29	9.45	6.69	42.49	229
CRN, CRNE 5-13	5	3	●	28.26	15.29	9.45	6.69	43.55	230
CRN 5-14	7 1/2	3	●	30.69	16.95	10.96	7.97	47.64	305
CRN 5-15	7 1/2	3	●	31.76	16.95	10.96	7.97	48.71	306
CRN, CRNE 5-16	7 1/2	3	●	32.82	16.95	10.96	7.97	49.77	307
CRN 5-18	7 1/2	3	●	34.96	16.95	10.96	7.97	51.91	309
CRN, CRNE 5-20	7 1/2	3	●	37.08	16.95	10.96	7.97	54.03	311
CRN 5-22	10	3	●	34.96	18.83	10.96	7.97	53.79	368

[43] PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs (4 kg) less.

● Available.

CRN, CRNE 10 MAGdrive, 60 Hz

Pump type	hp	PH	PJE [44]	Dimensions [in]					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN, CRNE 10-1	1	3	●	18.70	9.04	6.69	5.52	27.74	112
CRN10-2	2	3	●	18.70	12.46	7.64	5.88	31.16	116
CRNE 10-2	2	3	●	18.70	12.46	7.64	5.88	31.16	121
CRN 10-3	3	3	●	20.63	13.72	9.45	6.69	34.35	213
CRN, CRNE 10-4	5	3	●	21.81	15.29	9.45	6.69	37.10	216
CRN 10-5	5	3	●	22.99	15.29	9.45	6.69	38.28	218
CRN, CRNE 10-6	7 1/2	3	●	24.67	16.95	10.96	7.97	41.62	260
CRN 10-7	7 1/2	3	●	25.67	16.95	10.96	7.97	42.62	265
CRN, CRNE 10-8	7 1/2	3	●	26.85	16.95	10.96	7.97	43.80	268
CRN 10-9	10	3	●	28.03	18.83	10.96	7.97	46.86	307
CRN, CRNE 10-10	10	3	●	29.21	18.83	10.96	7.97	48.04	309
CRN 10-12	15	3	●	34.20	18.81	13.18	9.45	53.01	271
CRNE 10-12	15	3	●	34.20	18.81	13.18	9.45	53.01	271
CRN 10-14	15	3	●	36.45	18.81	13.18	9.45	55.26	444
CRNE 10-14	15	3	●	36.45	18.81	13.18	9.45	55.26	444
CRN 10-16	15	3	●	38.81	18.81	13.18	9.45	57.62	454
CRN 10-17	20	3	●	41.18	19.60	13.18	9.45	60.78	450

[44] PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs (4 kg) less.

● Available.

CRN, CRNE 15 MAGdrive, 60 Hz

Pump type	hp	PH	PJE [45)]	Dimensions [in]					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN 15-1	3	3	●	19.88	13.72	9.45	6.69	33.60	165
CRNE 15-1	3	3	●	19.88	13.72	9.45	6.69	33.60	170
CRN, CRNE 15-2	5	3	●	20.63	15.29	9.45	6.69	35.92	205
CRN, CRNE 15-3	7 1/2	3	●	22.71	16.95	10.96	7.97	39.66	256
CRN, CRNE 15-4	10	3	●	24.48	18.83	10.96	7.97	43.31	296
CRN 15-5	15	3	●	28.89	18.81	13.18	9.45	47.70	260
CRNE 15-5	15	3	●	28.89	18.81	13.18	9.45	47.70	260
CRN 15-6	15	3	●	30.55	18.81	13.18	9.45	49.36	377
CRNE 15-6	15	3	●	30.55	18.81	13.18	9.45	49.36	377
CRN 15-7	15	3	●	32.32	18.81	13.18	9.45	51.13	410
CRN 15-8	20	3	●	34.09	19.60	13.18	9.45	53.69	434
CRN 15-9	20	3	●	35.86	19.60	13.18	9.45	55.46	450
CRN 15-10	25	3	●	36.76	23.58	14.17	11.08	60.34	538
CRN 15-12	25	3	●	40.55	23.58	14.17	11.08	64.13	558

45) PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs (4 kg) less.

● Available.

CRN, CRNE 20 MAGdrive, 60 Hz

Pump type	hp	PH	PJE [46]	Dimensions [in]					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN 20-1	3	3	●	20.63	13.72	9.45	6.69	34.35	171
CRNE 20-1	3	3	●	20.63	13.72	9.45	6.69	34.35	176
CRN, CRNE 20-2	7 1/2	3	●	21.13	16.95	10.96	7.97	38.08	279
CRN, CRNE 20-3	10	3	●	22.71	18.83	10.96	7.97	41.54	300
CRN 20-4	15	3	●	27.11	18.81	13.18	9.45	45.92	254
CRNE 20-4	15	3	●	27.11	18.81	13.18	9.45	45.92	254
CRN 20-5	15	3	●	28.78	18.81	13.18	9.45	47.59	406
CRN 20-6	20	3	●	30.55	19.60	13.18	9.45	50.15	399
CRN 20-7	20	3	●	32.32	19.60	13.18	9.45	51.92	413
CRN 20-8	25	3	●	33.22	23.58	14.17	11.08	56.80	553

[46] PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs (4 kg) less.

● Available.

CRN, CRNE 32 MAGdrive, 60 Hz

Pump type	hp	PH	Dimensions [in]					Ship Wt. [lbs]
			B1	B2	D1	D2	B1 + B2	
CRN, CRNE 32-1-1	5	3	19.88	15.29	9.45	6.69	35.17	233
CRN, CRNE 32-1	7 1/2	3	20.76	16.95	10.96	7.97	37.71	281
CRN 32-2-2	7 1/2	3	23.52	16.95	10.96	7.97	40.47	285
CRN 32-2-1	10	3	22.64	18.83	10.96	7.97	41.47	322
CRN, CRNE 32-2	10	3	22.64	18.83	10.96	7.97	41.47	331
CRN 32-3-2	15	3	29.52	18.81	13.18	9.45	48.33	287
CRNE 32-3-2	15	3	29.52	18.81	13.18	9.45	48.33	287
CRN 32-3	15	3	29.72	18.81	13.18	9.45	48.53	378
CRN 32-4-2	20	3	32.48	19.60	13.18	9.45	52.08	375
CRN 32-4	20	3	32.48	19.60	13.18	9.45	52.08	387
CRN 32-5-2	25	3	35.24	23.58	14.17	11.08	58.82	497
CRN 32-5	25	3	35.24	23.58	14.17	11.08	58.82	506
CRN 32-6-2	30	3	37.99	23.58	14.17	11.08	61.57	518
CRN 32-6	30	3	37.99	23.58	14.17	11.08	61.57	530
CRN 32-7-2	30	3	40.75	23.58	14.17	11.08	64.33	675

CRN, CRNE 45 MAGdrive, 60 Hz

Pump type	hp	PH	Dimensions [in]					Ship Wt. [lbs]
			B1	B2	D1	D2	B1 + B2	
CRN 45-1-1	10	3	22.01	18.83	10.96	7.97	40.84	332
CRN, CRNE 45-1	10	3	22.01	18.83	10.96	7.97	40.84	341
CRN 45-2-2	15	3	29.49	18.81	13.18	9.45	48.30	388
CRN 45-2-1	20	3	29.49	19.60	13.18	9.45	49.09	379
CRN 45-2	20	3	29.49	19.60	13.18	9.45	49.09	389
CRN 45-3-2	25	3	32.64	23.58	14.17	11.08	56.22	503
CRN 45-3-1	25	3	32.64	23.58	14.17	11.08	56.22	513
CRN 45-3	30	3	32.64	23.58	14.17	11.08	56.22	517

CRN, CRNE 64 MAGdrive, 60 Hz

Pump type	hp	PH	Dimensions [in]					Ship Wt. [lbs]
			B1	B2	D1	D2	B1 + B2	
CRN 64-1-1	10	3	22.09	18.83	10.96	7.97	40.92	319
CRN 64-1	15	3	26.42	18.81	13.18	9.45	45.23	390
CRN 64-2-2	20	3	29.69	19.60	13.18	9.45	49.29	375
CRN 64-2-1	25	3	29.69	23.58	14.17	11.08	53.27	506
CRN 64-2	30	3	29.69	23.58	14.17	11.08	53.27	520

14. Motor data

Standard motors in the CR range

Motors used in the CR and CRE pump range are:

- Grundfos-specified WEG motors
- Grundfos ML motors
- Grundfos MLE motors with integrated frequency converter.

Type	Phase	Motor range [hp]	Enclosure
WEG	1	1/3 - 10	TEFC
	3	1/3 - 300	TEFC
	3	15 - 300	ODP
ML	3	1/3 - 30	TEFC
MLE	1	1/2 - 2	TEFC
	3	1 -30	TEFC

WEG motors 1/4 to 20 hp

- rolled steel construction
- service factor 1.15
- suitable for VFD operation per NEMA MG 1 part 31.4.4.2
- certified Class I, Division 2, Groups A, B, C, D
- certified Class II, Division 2, Groups F, G (three-phase only).

WEG motors 25 to 300 hp

- Cast iron frame
- rated for severe duty
- service factor 1.25 (25 to 100 hp)
- service factor 1.15 (125 to 300 hp)
- inverter rated per NEMA MG 1 part 31
- certified Class I, Division 2, Groups A, B, C, D
- certified Class II, Division 2, Groups F, G.

Grundfos-specified motors

Grundfos CR pumps are supplied with heavy-duty 2-pole, NEMA energy-efficient C-frame motors built or selected according to rigid Grundfos specifications. All CR pump motors have heavy-duty bearings for maximum thrust requirements.

We do not recommend that you use an off-the-shelf standard WEG motor on a Grundfos pump. Ideally, the best motor choice would be the Grundfos-specified motor.

Three-phase Grundfos-specified motors are NEMA Premium Efficiency (EISA compliant).

Single-phase Grundfos-specified motors up to 7 1/2 hp have a built-in thermal overload switch.

Other motor types are available, for example Explosion-proof, inverter-duty, IEEE 841. Contact your local Grundfos company for more information.

Motor dimensions and data on pumps supplied by Grundfos Canada may vary. Contact your local Grundfos company for more information. All values are subject to change without notice.

2-pole TEFC motors (WEG)

Totally Enclosed Fan Cooled, constant speed

TM077440

hp	Ph	Frame	Service factor	Voltage [V]	Motor eff. η [%]	Full-load current $I_{1/1}$ [A]	Service-factor current [A]	Starting current I_{start} [A]	Power factor Cos $\varphi_{1/1}$	Speed [rpm]
1/3	1	56C	1.15	115/230	54.0	5.2/2.87-2.6	5.98/2.87-2.99	36.4/20.1-18.2	0.76	3490
	3	56C	1.15	230/460	72.0	1.31-1.15/0.57	1.31-1.32/0.66	9.3-8.17/4.05	0.76	3450
	3	56C	1.15	575	72.0	0.46	0.53	3.25	0.76	3450
1/2	1	56C	1.15	115/230	60.0	7/3.87-3.5	8.05/3.87-4.03	56/31.0-28.0	0.76	3500
	3	56C	1.15	230/460	74.0	1.73-1.57/0.78	1.73-1.81/0.9	13.3-12.1/6.01	0.80	3435
	3	56C	1.15	575	74.0	0.63	0.72	4.83	0.80	3435
3/4	1	56C	1.15	115/230	66.0	8/4.42-4.0	9.2/4.42-4.6	64/35.4-32.0	0.91	3500
	3	56C	1.15	230/460	77.0	2.48-2.24/1.12	2.48-2.58/1.29	20.1-18.1/9.07	0.80	3440
	3	56C	1.15	575	77.0	0.896	1.03	7.26	0.80	3440
1	1	56C	1.15	115/230	70.0	10.1/5.64-5.06	11.6/5.64-5.82	84.8/47.4-42.5	0.92	3500
	3	56C	1.15	230/460	78.5	3.32-3.0/1.5	3.32-3.45/1.73	29.2-26.4/13.2	0.80	3435
	3	56C	1.15	575	78.5	1.2	1.38	10.6	0.80	3435
1 1/2	1	56C	1.15	115/230	75.0	13.2/7.3-6.6	15.2/7.3-7.59	106/58.4-52.8	0.97	3500
	3	56C	1.15	230/460	84.0	4.14-3.74/1.87	4.14-4.3/2.15	37.7-34.0/17	0.88	3520
	3	56C	1.15	575	84.0	1.5	1.73	13.7	0.88	3520
2	1	56C	1.15	115/230	77.0	17.5/9.62-8.73	20.1/9.62-10.0	137/75.0-68.1	0.97	3495
	3	56C	1.15	230/460	85.5	5.46-4.94/2.47	5.46-5.68/2.84	54.1-48.9/24.5	0.89	3520
	3	56C	1.15	575	85.5	1.98	2.28	19.6	0.89	3520
3	1	182TC	1.15	115/230	80.0	24.2/19.7-12.1	27.8/19.7-13.9	169/138-84.7	0.99	3510
	3	182TC	1.15	230/460	86.5	8.12-7.34/3.67	8.12-8.44/4.22	71.5-64.6/32.3	0.87	3515
	3	182TC	1.15	575	86.5	2.94	3.38	25.9	0.87	3515
5	1	184TC	1.15	230	84.0	31.7-25.3	31.7-27.0	254-202	0.98	3515
	3	184TC	1.15	230/460	88.5	13.1-11.8/5.9	13.1-13.6/6.79	102-92/46	0.89	3500
	3	184TC	1.15	575	88.5	4.72	5.43	36.8	0.89	3500
7 1/2	1	213TC	1.15	230	84.0	31.7-38.8	31.7-44.6	225-275	0.99	3515
	3	213TC	1.15	230/460	89.5	19.2-17.3/8.67	19.2-19.9/9.97	33.3-131.0/65.9	0.89	3530
	3	213TC	1.15	575	89.5	6.94	7.98	52.7	0.89	3530
10	1	215TC	1.15	230	86.5	42.5-38.1	42.5-43.8	306-274	0.99	3510
	3	215TC	1.15	230/460	90.2	25.4-23.0/11.5	25.4-26.5/13.2	191-173/86.3	0.91	3530
	3	215TC	1.15	575	90.2	9.2	10.6	69	0.91	3530
15	3	254TC	1.15	230/460	91.0	38.5-34.8/17.4	38.5-40.0/20	262-237/118	0.87	3525
	3	254TC	1.15	575	91.0	13.9	16.0	114	0.89	3520
20	3	256TC	1.15	230/460	91.0	50.2-45.4/22.7	50.2-52.2/26.1	331-300/150	0.91	3515
	3	256TC	1.15	575	91.0	18.2	20.9	120	0.91	3515
25	3	284TSC	1.25	230/460	91.7	63.6-57.6/28.8	63.6-72.0/36	401-363/181	0.88	3545
	3	284TSC	1.25	575	91.7	23	28.8	145	0.88	3545
30	3	286TSC	1.25	230/460	91.7	73.8-67.6/33.8	73.8-84.5/42.3	465-426/213	0.89	3540
	3	286TSC	1.25	575	91.7	27	33.8	170	0.89	3540

hp	Ph	Frame	Service factor	Voltage [V]	Motor eff. η [%]	Full-load current $I_{1/1}$ [A]	Service-factor current [A]	Starting current I_{start} [A]	Power factor Cos $\varphi_{1/1}$	Speed [rpm]
40	3	324TSC	1.25	230/460	92.4	101-92.6/46.3	101-116/57.9	636-583/292	0.88	3560
	3	324TSC	1.25	575	92.4	37	46.3	233	0.88	3560
50	3	326TSC	1.25	230/460	93.0	124-112/56.1	124-140/70.1	769-694/348	0.89	3550
	3	326TSC	1.25	575	93.0	44.9	56.1	278	0.89	3550
60	3	364TSC	1.25	230/460	93.6	148-134/67	148-168/83.8	977-884/442	0.90	3560
	3	364TSC	1.25	575	93.6	53.6	67.0	354	0.90	3560
75	3	365TSC	1.25	230/460	93.6	181-164/81.9	181-205/102	1213-1099/549	0.90	3555
	3	365TSC	1.25	575	93.6	65.6	82	440	0.90	3555
100	3	405TSD	1.25	460	94.1	112	140	728	0.89	3545
	3	405TSD	1.25	575	94.1	89.6	112	582	0.89	3545
125	3	444TSD	1.15	460	95.0	134	154	884	0.89	3570
	3	444TSD	1.15	575	95.0	107	123	706	0.89	3570
150	3	445TSD	1.15	460	95.0	163	187	1060	0.89	3570
	3	445TSD	1.15	575	95.0	130	150	845	0.89	3570
200	3	447TSD	1.15	460	95.4	222	255	1443	0.89	3570
	3	447TSD	1.15	575	95.4	178	205	1157	0.89	3570
250	3	447TSD	1.15	460	95.8	269	309	1802	0.90	3573
	3	447TSD	1.15	575	95.8	215	247	1441	0.90	3573
300	3	449TSD	1.15	460	95.8	320	368	2176	0.90	3570
	3	449TSD	1.15	575	95.8	256	294	1741	0.90	3570

Note that motors with a nameplate stating 230/460 V are suitable for operation at 208 V.

4-pole TEFC motors (WEG)

Totally Enclosed Fan Cooled, constant speed

hp	Ph	Frame	Service factor	Voltage [V]	Motor eff. η [%]	Full-load current $I_{1/1}$ [A]	Service-factor current [A]	Starting current I_{start} [A]	Power factor Cos $\varphi_{1/1}$	Speed [rpm]
1/4	1	56C	1.15	115/230	57.0	4.6/2.54-2.3	5.29/2.54-2.65	24.4/13.5-12.2	0.60	1735
	3	56C	1.15	230/460	70.0	1.06-0.94/0.47	1.06-1.08/0.54	5.94-5.26/2.63	0.69	1740
1/3	1	56C	1.15	115/230	61.0	6/3.32-3.0	6.9/3.32-3.45	33.6/18.6-16.8	0.59	1735
	3	56C	1.15	230/460	74.0	1.38-1.25/0.62	1.38-1.44/0.72	8.56-7.75/3.84	0.68	1740
1/2	1	56C	1.15	115/230	64.0	8/4.42-4.0	9.2/4.42-4.6	45.6/25.2-22.8	0.63	1730
	3	56C	1.15	230/460	78.5	1.72-1.56/0.78	1.72-1.79/0.89	11.0-9.98/4.99	0.76	1730
3/4	1	56C	1.15	115/230	68.5	10.6/5.86-5.3	12.2/5.86-5.3	67.8/37.5-33.9	0.67	1745
	3	56C	1.15	230/460	81.5	2.63-2.38/1.19	2.63-2.74/1.37	20.3-18.3/9.16	0.71	1760
1	1	56C	1.15	115/230	71.0	13.6/7.52-6.8	15.6/7.52-7.82	91.1/50.4-45.6	0.68	1745
	3	56C	1.15	230/460	85.5	3.25-2.94/1.47	3.25-3.38/1.69	28.0-25.3/12.6	0.75	1765
1 1/2	1	56C	1.15	115/230	77.0	15/8.27-7.48	17.3/8.27-8.6	120/66.2-59.8	0.83	1745
	3	56C	1.15	230/460	86.5	4.47-4.04/2.02	4.47-4.65/2.32	36.7-33.1/16.6	0.79	1750
2	1	56C	1.15	115/230	78.5	20/11.1-10.0	23/11.1-11.5	160/88.8-80.0	0.82	1745
	3	56C	1.15	230/460	86.5	6.02-5.44/2.72	6.02-6.26/3.13	49.4-44.6 / 22.3	0.80	1745
3	1	182TC	1.15	115/230	81.5	24.7/13.7-12.4	28.4/13.7-14.3	173/95.9-86.8	0.95	1755
	3	182TC	1.15	230/460	89.5	8.43-7.62/3.81	8.43-8.76/4.38	74.2-67.1/33.5	0.81	1765
5	1	213TC	1.15	230	82.5	22.1-19.9	22.1-22.9	175-157	0.98	1755
	3	184TC	1.15	230/460	89.5	14.4-13/6.49	14.4-15.0/7.46	101-91/45.4	0.80	1750
7.5	1	213TC	1.15	230	84.0	32.3-28.8	32.3-33.1	220-196	0.99	1745
	3	213TC	1.15	230/460	91.7	20.1-18.1/9.07	20.1-20.8/10.4	147-132/66.2	0.82	1770
10	3	215TC	1.15	230/460	91.7	27.4-24.8/12.4	27.4-28.5/14.3	175-159/79.4	0.83	1765
15	3	254TC	1.15	230/460	92.4	40.3-36.4/18.2	40.3-41.9/20.9	262-237/118	0.82	1770
20	3	256TC	1.15	230/460	93.0	54.6-49.4/24.7	54.6-56.8/28.4	366-331/165	0.82	1765
25	3	284TSC	1.25	230/460	93.6	65.2-59/29.5	65.2-73.8/36.9	404-366/183	0.84	1765
30	3	286TSC	1.25	230/460	93.6	77.6-70.2/35.1	77.6-87.8/43.9	473-428/214	0.84	1765
40	3	324TSC	1.25	230/460	94.1	104-94.2/47.1	104-117/58.9	634-575/287	0.85	1770
50	3	326TSC	1.25	230/460	94.5	131-118/59.2	131-148/74	812-732/367	0.83	1775
60	3	364TSC	1.25	230/460	95.0	151-143/71.6	151-179/89.5	936-887/444	0.83	1780
75	3	365TSC	1.25	230/460	95.4	186-174/87.2	186-218/109	1190-1114/558	0.83	1780

Motors with a nameplate stating 230/460 V are suitable for operation at 208 V.

2-pole ODP motors (WEG)

Open Drip-Proof, constant speed

TM077440

hp	Ph	Frame	Service factor	Voltage [V]	Motor eff. η [%]	Full-load current $I_{1/1}$ [A]	Service-factor current [A]	Starting current I_{start} [A]	Power factor Cos $\varphi_{1/1}$	Speed [rpm]
15	3	254TC	1.15	230/460	90.2	38.9-35.2/17.6	38.9-40.5/20.2	292-264/132	0.87	3545
	3	254TC	1.15	575	90.2	14.1	16.2	106	0.87	3545
20	3	256TC	1.15	230/460	91.0	52.6-47.6/23.8	52.6-54.7/27.4	316-286/143	0.87	3525
	3	256TC	1.15	575	91.0	19.0	21.9	114	0.87	3525
25	3	284TSC	1.25	230/460	91.7	64.4-58.2/29.1	64.4-72.8/36.4	425-384/192	0.87	3544
	3	284TSC	1.25	575	91.7	23.3	29.1	154	0.87	3544
30	3	284TSC	1.25	230/460	91.7	77.4-70.0/35	77.4-87.5/43.8	488-441/221	0.86	3550
	3	284TSC	1.25	575	91.7	28.0	35.0	176	0.86	3550
40	3	324TSC	1.25	230/460	92.4	104-93.7/46.8	104-117/58.5	634-572/285	0.87	3557
	3	324TSC	1.25	575	92.4	37.5	46.9	229	0.87	3557
50	3	324TSC	1.25	230/460	93.0	131-119/59.4	131-149/74.3	825-750/374	0.84	3560
	3	324TSC	1.25	575	93.0	47.5	59.4	299	0.85	3560
60	3	326TSC	1.25	230/460	93.6	157-142/71	157-178/88.8	989-895/447	0.85	3560
	3	326TSC	1.25	575	93.6	56.8	71.0	358	0.85	3560
75	3	365TSC	1.25	230/460	93.6	188-170/84.8	188-213/106	1241-1122/560	0.87	3555
	3	365TSC	1.25	575	93.6	67.8	84.8	447	0.87	3555
100	3	404TSD	1.25	460	93.6	115	144	782	0.87	3557
125	3	405TSD	1.25	460	94.1	136	170	925	0.88	3557
150	3	444TSD	1.15	460	94.1	169	194	1099	0.86	3570
200	3	444TSD	1.15	460	95.0	225	259	1463	0.88	3570
250	3	445TSD	1.15	460	95.0	278	320	1863	0.88	3570
300	3	445TSD	1.15	460	95.4	329	378	2139	0.88	3570

Motors with a nameplate stating 230/460 V are suitable for operation at 208 V.

2-pole E-motors (Grundfos MLE)

Permanent-magnet motors with integrated variable frequency drive (VFD)
Totally Enclosed Fan Cooled, constant speed

TM085712

hp [47]	Voltage [V]	PH	Frame size	Service factor	Motor full-load efficiency [%] [48]	Full-load current amps [A]	Service factor current amps [A]	Power factor	Full-load speed [rpm]	Sound pressure level [dB(A)]
1/2	200-240	1	56C	1	84	2.40 - 2.10		0.96	3400	58
3/4	200-240	1	56C	1	85.3	3.45 - 2.90		0.98	3400	58
1	200-240	1	56C	1	85.2	4.70 - 3.90		0.99	3400	58
1	440-480	3	56C	1.25	86.4	1.65	2.10	0.73	3480	58
1 1/2	200-240	1	56C	1	86.9	6.70 - 5.60		0.99	3400	58
1 1/2	200-240	3	56C	1.15	89.3	4.00 - 3.40	4.60 - 3.90	0.91	3480	55
1 1/2	440-480	3	56C	1.15	89.6	2.05	2.40	0.84	3480	58
2	200-240	1	56C	1	87.4	9.10 - 7.60		0.99	3400	64
2	200-240	3	56C	1.00	88.90	5.40 - 4.50		0.92	3480	55
2	440-480	3	56C	1.15	89.4	2.65	3.00	0.87	3480	64
3	200-240	3	182TC	1.15	88.70	7.90 - 6.60	9.10 - 7.60	0.94	3480	62
3	440-480	3	182TC	1.15	90.7	3.8	4.30	0.89	3480	64
5	200-240	3	182TC	1.15	90.90	13.2 - 10.9	14.90 - 12.40	0.94	3480	66
5	440-480	3	182TC	1.15	92.5	6.20 - 5.80	7.00 - 6.60	0.90	3500	60
7 1/2	200-240	3	213TC	1.15	90.20	20.0 - 16.6	23.0 - 19.3	0.94	3480	70
7 1/2	440-480	3	213TC	1.15	92.4	9.10 - 8.50	10.4 - 9.70	0.91	3500	60
10	440-480	3	213TC	1.15	92.5	12.4 - 11.5	14.2 - 13.0	0.91	3500	65
15	440-480	3	254TC	1.15	93.2	17.9 - 16.6	20.5 - 19.0	0.92	3500	65
20	440-480	3	256TC	1.15	93	23.1 - 21.8	27.3 - 24.8	0.93	3600	74
25	440-480	3	284TSC	1.15	93	28.5 - 26.4	32.9 - 30.2	0.94	3600	72
30	440-480	3	286TSC	1.15	94.1	34.3 - 31.6	39.4 - 36.2	0.94	3600	72

47) Permanent-magnet motor

48) Efficiency of motor and VFD

2-pole TEFC motors (Grundfos ML)

Totally Enclosed Fan Cooled, constant speed



hp	Ph	Frame	Service factor	Voltage [V]	Motor eff. η [%]	Full-load current $I_{1/1}$ [A]	Service-factor current [A]	Starting current I_{start} [A]	Power factor Cos $\varphi_{1/1}$	Speed [rpm]
1/3	3	56C	1.35	208-230/460	79.3	1.12-1.10/0.55	1.5-1.45/0.75	7.1 - 7.7 / 3.9	0.81-0.75	3450-3480
1/2	3	56C	1.25	208-230/460	80.6	1.64-1.55/0.78	2.0-1.9/0.95	9.7 - 10.1 / 5.1	0.84-0.78	3430-3460
3/4	3	56C	1.25	208-230/460	80.1	2.4-2.3/1.2	2.9-2.75/1.4	14.2 - 15 / 7.8	0.84-0.78	3430-3460
1	3	56C	1.25	208-230/460	77.0	3.25-3.35/1.68	4.0-3.9/1.95	19.2 - 21.8 / 10.9	0.81-0.72	3430-3460
1 1/2	3	56C	1.15	208-230/460	84.1	4.45-4.30/2.16	5.1-4.95/2.48	32-31/15.6	0.84-0.78	3440-3480
2	3	56C	1.15	208-230/460	85.5	6.0-5.8/2.9	6.8-6.6/3.3	48.0-52.8/26.4	0.81-0.78	3500-3520
3	3	182TC	1.15	208-230/460	86.5	8.5-8.2/4.1	9.6-9.2/4.6	72.3-79.5/39.8	0.85-0.82	3500-3520
5	3	182TC	1.15	208-230/460	88.5	14.1-13.1/7.29	16.2-15.0/8.4	141.0-192.6/107.2	0.89-0.86	3525-3540
7 1/2	3	213TC	1.15	208-230/460	89.5	19.5-18.1/9.09	22.4-20.8/10.4	198.9-267.9/134.5	0.89-0.86	3490-3520
10	3	215TC	1.15	208-230/460	90.2	26.5-24.6/12.4	30.5-28.3/14.3	180.2-221.4/111.6	0.87	3480-3500
15	3	254TC	1.15	208-230/460	91.0	37.5-34.0/17	43-39/19.6	255-306/153	0.91-0.89	3490-3530
20	3	256TC	1.15	208-230/460	91.0	50.5-46.0/23	58-53/26.5	308-373/186	0.92-0.90	3490-3530
25	3	284TSC	1.15	208-230/460	91.7	62-56/28	71.5-64.5/32	341-420/210	0.92-0.91	3490-3530
30	3	286TSC	1.15	208-230/460	91.7	74-67/33.5	85-77/38.5	400-489/245	0.92-0.91	3490-3540

Grundfos ML motors are rated for 208-230/460 V.

2-pole ML motors, 230/460 V (60 Hz, IEC)

ML type designation	kW	60 Hz voltage	Full-load current	Power factor	NEMA Efficiency	Speed	Full-load Torque	Locked Rotor current	Locked Rotor torque	Breakdown Torque
				(Cos Phi)	%	rpm	NM	%	%	%
ML71AB	0.37	220-255/380-440	1.50 - 1.44 / 0.87 - 0.83	0.85 - 0.76	80.0*	3410-3470	1.04 - 1.04	550-650	260-350	300-400
ML71BA	0.55	220-255/380-440	2.15 - 2.05 / 1.25 - 1.20	0.85 - 0.76	83.0*	3390-3460	1.54 - 1.54	500-600	290-390	320-430
ML80AA-H3	0.75	220-255/380-440	2.95 - 2.75 / 1.70 - 1.60	0.86 - 0.77	77.0	3410-3470	2.10 - 2.10	600-740	280-380	330-440
ML80CA-H3	1.1	220-255/380-440	4.15 - 4.00 / 2.40 - 2.30	0.88 - 0.80	84.0	3420-3470	3.10 - 3.05	430-500	240-310	280-380
ML90CC-H3	1.5	220-277/380-480	5.35 - 4.70 / 3.10 - 2.70	0.90 - 0.81	85.5	3470-3530	4.10 - 4.10	780-1050	270-430	330-530
ML90FA-H3	2.2	220-277/380-480	7.70 - 6.35 / 4.45 - 3.70	0.91 - 0.85	86.5	3470-3530	6.00 - 6.00	780-1100	280-450	330-530
ML100DA-H3	3.0	220-277/380-480	10.8 - 9.35 / 6.20 - 5.40	0.91 - 0.84	87.5	3480-3530	8.25 - 8.10	860-1100	280-450	370-540
ML112CA-H3	4.0	220-277/380-480	13.6 - 11.8 / 7.80 - 6.80	0.91 - 0.82	88.5	3510-3540	10.8 - 10.8	1000-1470	330-530	420-670
ML132DA-H3	5.5	220-277/380-480	18.4 - 16.2 / 10.6 - 9.30	0.90 - 0.80	89.5	3510-3550	15.0 - 15.0	1020-1480	320-530	400-660
ML132EA-H3	7.5	220-277/380-480	24.6 - 20.8 / 14.2 - 12.0	0.90 - 0.82	90.2	3490-3530	20.6 - 20.6	680-1050	200-310	240-370
ML160BA-H3	11	220-277/380-480	36.0 - 30.0 / 20.8 - 17.2	0.89 - 0.83	91.0	3520-3550	30.0 - 30.0	580-890	220-350	240-390
ML160BB-H3	15	220-277/380-480	48.5 - 39.0 / 28.0 - 22.4	0.90 - 0.86	91.0	3520-3550	40.5 - 40.5	580-890	200-330	230-370
ML160BC-H3	18.5	220-277/380-480	59.5 - 48.5 / 34.5 - 28.0	0.89 - 0.84	91.7	3520-3560	50.0 - 50.0	670-1100	140-260	280-490
ML180BA-H3	22	220-277/380-480	69.5 - 56.5 / 40.0 - 32.5	0.91 - 0.91	91.7	3520-3560	59.5 - 59.5	650-1040	210-340	250-390

2-pole ML motors, 460 V (60 Hz, IEC)

ML type designation	kW	60 Hz voltage	Full-load current	Power factor	NEMA Efficiency	Speed	Full-load Torque	Locked Rotor current	Locked Rotor torque	Breakdown Torque
				(Cos Phi)	%	rpm	NM	%	%	%
ML80AA-H3	0.75	380-440	1.70 - 1.60	0.86 - 0.77	77.0	3410-3470	2.10 - 2.10	600-740	280-380	330-440
ML80CA-H3	1.1	380-440	2.40 - 2.30	0.88 - 0.80	84.0	3420-3470	3.10 - 3.05	430-500	240-310	280-380
ML90CC-H3	1.5	380-480	3.10 - 2.70	0.90 - 0.81	85.5	3470-3530	4.10 - 4.10	780-1050	270-430	330-530
ML90FA-H3	2.2	380-480	4.45 - 3.70	0.91 - 0.85	86.5	3470-3530	6.00 - 6.00	780-1100	280-450	330-530
ML100DA-H3	3.0	380-480	6.20 - 5.40	0.91 - 0.84	87.5	3480-3530	8.25 - 8.10	860-1100	280-450	370-540
ML112CA-H3	4.0	380-480	7.80 - 6.80	0.91 - 0.82	88.5	3510-3540	10.8 - 10.8	1000-1470	330-530	420-670
ML132DA-H3	5.5	380-480	10.6 - 9.30	0.90 - 0.80	89.5	3510-3550	15.0 - 15.0	1020-1480	320-530	400-660
ML132EA-H3	7.5	380-480	14.2 - 12.0	0.90 - 0.82	90.2	3490-3530	20.6 - 20.6	680-1050	200-310	240-370
ML160BA-H3	11	380-480	20.8 - 17.2	0.89 - 0.83	91.0	3520-3550	30.0 - 30.0	580-890	220-350	240-390
ML160BB-H3	15	380-480	28.0 - 22.4	0.90 - 0.86	91.0	3520-3550	40.5 - 40.5	580-890	200-330	230-370
ML160BC-H3	18.5	380-480	34.5 - 28.0	0.89 - 0.84	91.7	3520-3560	50.0 - 50.0	670-1100	140-260	280-490
ML180BA-H3	22	380-480	40.0 - 32.5	0.91 - 0.91	91.7	3520-3560	59.5 - 59.5	650-1040	210-340	250-390

2-pole ML motors, 200 V (60 Hz, IEC)

ML type designation	kW	60 Hz voltage	Full-load current	Power factor	NEMA Efficiency	Speed	Full-load Torque	Locked Rotor current	Locked Rotor torque	Breakdown Torque
				(Cos Phi)	%	rpm	NM	%	%	%
ML71AB	0.37	200-230/346-400	1.65 - 1.50 / 0.96 - 0.87	0.85 - 0.76	80.0	3410-3470	1.04 - 1.04	550-650	260-350	300-400
ML71BA	0.55	200-230/346-400	2.36 - 2.14 / 1.36 - 1.24	0.85 - 0.76	83.0	3390-3460	1.54 - 1.54	500-600	290-390	320-430
ML80AA-H3	0.75	200-255/346-440	3.25 - 3 / 1.86 - 1.76	0.86 - 0.77	77.0	3410-3470	2.10 - 2.10	600-740	280-380	330-440
ML80CA-H3	1.1	200-255/346-440	4.55 - 4.4 / 2.65 - 2.5	0.88 - 0.80	84.0	3420-3470	3.10 - 3.05	430-500	240-310	280-380
ML90CC-H3	1.5	200-255/346-440	5.85 - 4.95 / 3.4 - 2.85	0.90 - 0.81	85.5	3470-3530	4.10 - 4.10	780-1050	270-430	330-530
ML90FA-H3	2.2	200-230/346-400	8.45 - 7.65 / 4.85 - 4.45	0.91 - 0.87	86.5	3470-3530	6.00 - 6.00	780-1100	280-450	330-530
ML100DA-H3	3.0	200-230/346-400	11.8 - 11 / 6.80 - 6.30	0.91 - 0.87	87.5	3480-3530	8.25 - 8.10	860-1100	280-450	370-540
ML112CA-H3	4.0	200-230/346-400	15.0 - 13.8 / 8.55 - 7.95	0.91 - 0.82	88.5	3510-3540	10.8 - 10.8	1000-1470	330-530	420-670
ML132DA-H3	5.5	200-230/346-400	20.2 - 18.8 / 11.7 - 10.8	0.90 - 0.85	89.5	3510-3550	15.0 - 15.0	1020-1480	320-530	400-660
ML132EA-H3	7.5	200-230/346-400	22.2 - 24.7 / 15.5 - 14.3	0.90 - 0.86	90.2	3490-3530	20.6 - 20.6	680-1050	200-310	240-370
ML160BA-H3	11	200-230/346-400	39.5 - 35.9 / 22.8 - 21	0.89 - 0.86	91.0	3520-3550	30.0 - 30.0	580-890	220-350	240-390
ML160BB-H3	15	200-230/346-400	53.5 - 47.6 / 30.7 - 28.7	0.90 - 0.88	91.0	3520-3550	40.5 - 40.5	580-890	200-330	230-370
ML160BC-H3	18.5	200-230/346-400	65 - 58.6 / 37.8 - 34	0.89 - 0.87	91.7	3520-3560	50.0 - 50.0	670-1100	140-260	280-490
ML180BA-H3	22	200-230/346-400	76 - 68.5 / 44 - 39.5	0.91 - 0.91	91.7	3520-3560	59.5 - 59.5	650-1040	210-340	250-390

- 0.75 to 22 kW motors meet EISA requirements
- service factor: 1.0
- flange B14/V18 (0.37 - 4 kW)
- flange B5/V1 (5.5 - 22 kW)

15. Pumped liquids

The pumps are suitable for pumping 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, use oversized motors, 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.

Note that aggressive liquids, such as 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, CRE, CRI, CRIE

- Non-corrosive liquids.

For liquid transfer, circulation and pressure boosting of cold or hot clean water.

CRN, CRNE

- Industrial liquids.

In systems where all parts in contact with the liquid must be made of high-grade stainless steel.

List of pumped liquids

A number of typical liquids are listed below.

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. However, use the list with some caution. Factors such as those mentioned below may affect the chemical resistance of a specific pump version:

- concentration of the pumped liquid
- liquid temperature
- pressure.

Take safety precautions when pumping dangerous liquids.

Notes

D	Often with additives.
E	The density and/or viscosity differ from that/those of water. Take this factor into account 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	Highly flammable liquid.
2	Combustible liquid.
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, 95, 125, 155, 185, 215, 255	32, 45, 64	1s, 1, 3, 5, 10, 15, 20, 95, 125, 155, 185, 215, 255	32, 45, 64
Acetic acid CH_3COOH		5 %, 68 °F			HQQE	HQQE/HBQE
Acetone CH_3COCH_3	1, F	100 %, 68 °F			HBQE [49] HQQE [50]	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 [49] HQQE [50]	HQQV/HBQV		
Lactic acid $CH_3CH(OH)COOH$	E, H	10 %, 68 °F			HQQE [49] HQQV [50]	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, 95, 125, 155, 185, 215, 255	32, 45, 64	1s, 1, 3, 5, 10, 15, 20, 95, 125, 155, 185, 215, 255	32, 45, 64
Phosphoric acid H_3PO_4	E	20 %, 68 °F			HQQV [49] HQQE [50]	HQQV/HBQV
Propanol C_3H_7OH	1, F	100 %, 68 °F	HQQV [49] HQQE [50]	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 [49] HQQV [50]	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		

[49] CR 1s, 1, 3, 5, 10, 15, 20

[50] CR 95, 125, 155, 185, 215, 255

16. Grundfos Product Center

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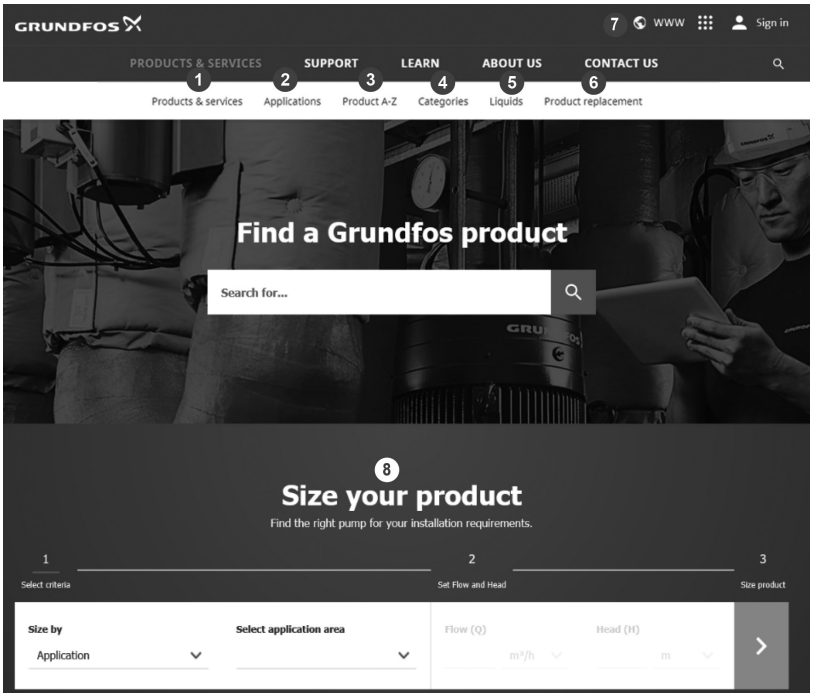

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