

CR, CRI, CRN

Custom-built pumps
60 Hz



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GRUNDFOS 

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1. Introduction

This product guide is a supplement to these product guides:

- CR, CRI, CRN, CRE, CRIE, CRNE
- CRT, CRTE
- CR, CRN high-pressure pumps.

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.

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 meet the customers' needs for pumps capable of handling special installation requirements and these liquids:

- 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 motors (CR, CRI, CRN and CRT) or electronically speed-controlled motors (CRE, CRIE, CRNE and CRTE).

Customized pumps from CR 1s to CR 90 are available for these temperature ranges:

- Water-based liquids: -40 °F to +356 °F.
- Thermal oils: -4 °F to +464 °F.

The below pump types are available as customized pumps.

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•	•	•	•	•	•	•

- Available.

Note: CRT(E) 2, 4, 8 and 16 are also available as customized pumps.

Pumps for individual requirements

The CR pumps can be customized to meet individual requirements. This is due to the "mix-and-match" approach to customization, where the many 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/or the pumped liquid itself.

- Power supply systems vary in terms of both frequency and voltage, and required protection methods.
- Your environment may be explosive, very hot and/or very humid. Special conditions also apply at high altitudes.
- The pumped liquid can call for a special motor solution. High or low viscosities and/or high or low 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.

For further information, see section 2. *Overview*.

Shaft seal options

Extreme liquids sometimes call for extreme measures.

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

For further information, see section 2. *Overview*.

Pump options

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

- Horizontal installation 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.

For further information, see section 2. *Overview*.

Connection options

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

For further information, see section 2. *Overview*.

Features and benefits

Customized CR pumps have the following features and benefits:



Grundfos motor

Grundfos motors are remarkably silent and highly efficient. Three-phase motors from 1-10 Hp have premium efficient motors as standard. The three-phase motors greater than 10 Hp are energy efficient. Grundfos motors are available with integrated frequency converter designed for speed-controlled operation.

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. A magnetic drive configuration is also available.

Connections

The Grundfos CR pump can be connected to any system.

Material options

The Grundfos CR pump is available in four different material variants:

- CRT(E): Titanium
- CRN(E): Stainless steel AISI 316
- CRI(E): Stainless steel AISI 304
- CR(E): Stainless steel AISI 304/cast iron.

Wide range of pump sizes

The CR pump comes in 13 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.











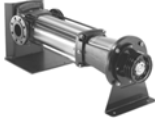








Dry-running protection

The patented Grundfos LiqTec system eliminates the risk of breakdowns due to dry running. If there is no liquid in the pump, the LiqTec will stop the pump immediately.

GR5357

2. Overview



4-pole motors	Explosion-proof motors	Anti-condensation heater	CSA/UL-approved motors	
				
See page 23.	See page 18.	See page 20.	See page 18.	
Shaft seals	Rubber parts	Titanium	Non-cartridge solution	CR pumps with air-cooled top
				
See page 25.	See page 25.	See page 25.	See page 25.	See page 31.
CR high-pressure pumps	Horizontal mounting	All-stainless steel CR pumps	CRH, horizontal end-suction pumps	Low temperature pumps
				
See page 10 and 35.	See page 15 and 39.	See page 37.	See page 42.	See page 12 and 35.
Oval flanges (CR)	ANSI Flanges (CR)	PJE connections (CRI, CRN)	ANSI Flanges (CRI, CRN)	Union and Clamp connections (CRI, CRN)
				
See page 48.	See page 48.	See page 48.	See page 48.	See page 51.

Motor protection

See page 23.

Oversize motors

See page 23.

Special voltage

See page 19.

Enclosure class

See page 23.

Terminal box positions

See page 23.

Alternate NEMA motors

See page 24.

MAGdrive

See page 33.

Back-to-back seal arrangement

See page 26.

CR pump with pressure intensifier

See page 25.

CR pump with barrier liquid

See page 27.

Tandem seal arrangement

See page 29.

Pump rubber parts

See page 45.

CR low-NPSH pumps

See pages 12 and 37.

Belt-driven CR pumps

See pages 16 and 43.

Bearing materials

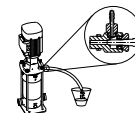
See page 46.

Surface treatment

See page 36.

Dry-running protection

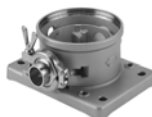
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Accessories

See page 17.

Oval flanges (CRI, CRN)

See page 50.

TriClamp connections (CRN)

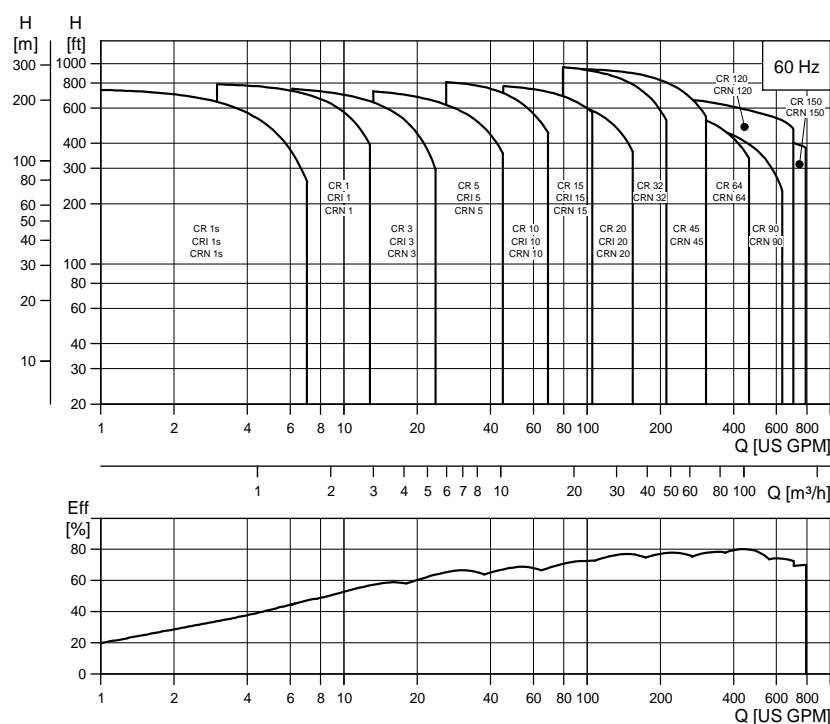
See page 48.

PJE connections

See page 52.

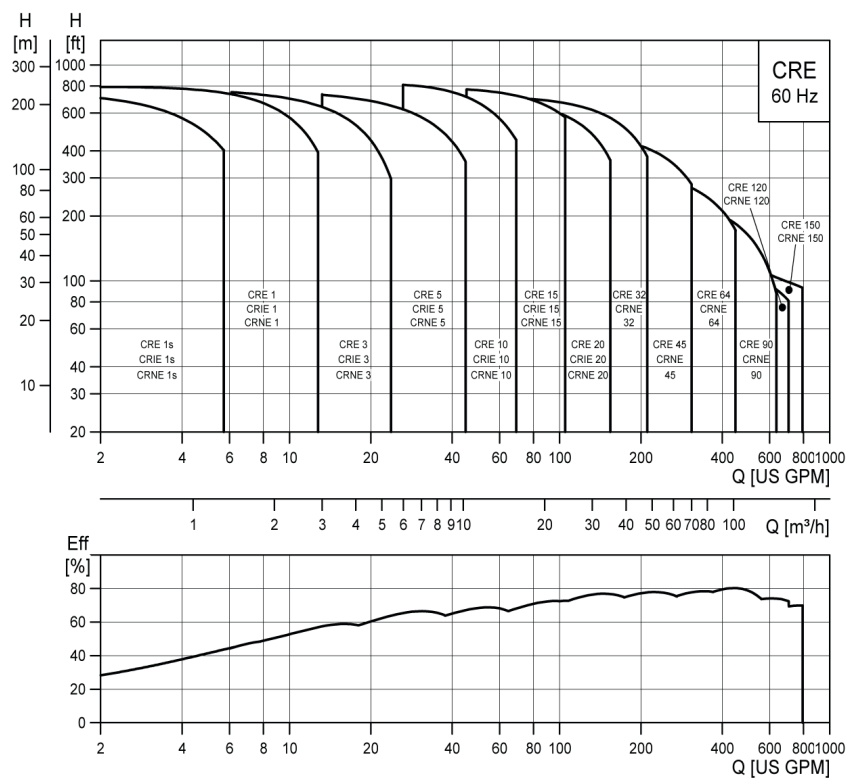
3. Performance range

CR, CRI, CRN – 60 Hz



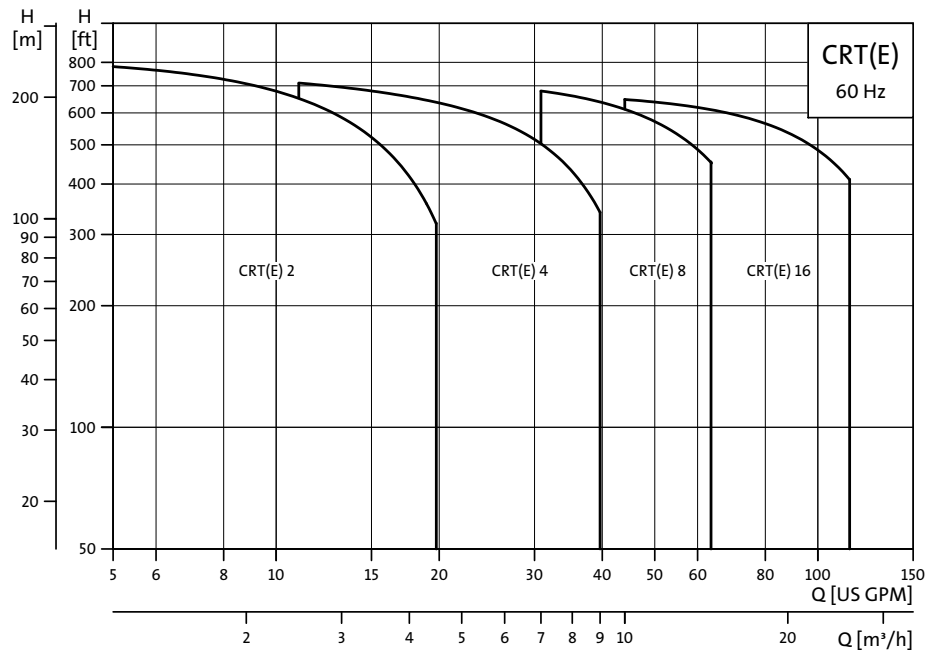
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CRE, CRIE, CRNE – 60 Hz



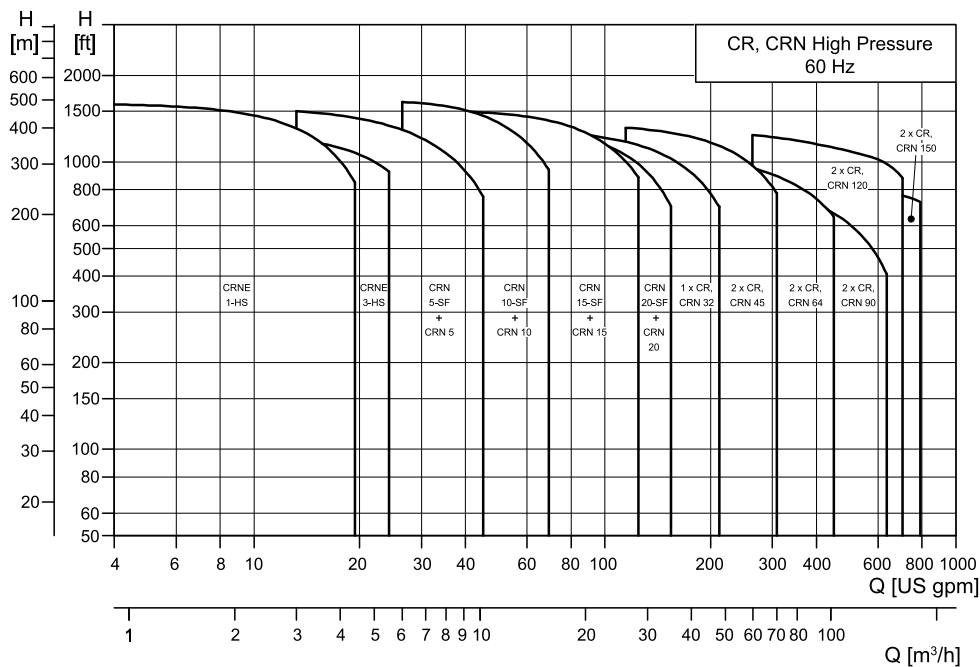
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CRT(E), 60 Hz



Note: CRTE pumps are available.

CR, CRN High Pressure – 60 Hz



Note: CRTE pumps are available.

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TM02 8307 3610

4. Identification

Type keys

CR(E), CRI(E), CRN(E)

Example	CR E 32 (s) -4 -2 -A -G -G -E - HQQE
Type range: CR, CRI, CRN	
Pump with integrated frequency control	
Nominal flow rate [m ³ /h]	
All impellers with reduced diameter (applies only to CR, CRI, CRN 1s)	
Number of impellers	
Number of reduced diameter impellers (CR(E), CRN(E) 32, 45, 64, 90, 120, and 150)	
Code for pump version	
Code for pipe connection	
Code for materials	
Code for rubber parts	
Code for shaft seal	

Codes

Example	A -G -A -E -H QQ E
Pump version	
A Basic version ¹⁾	
B Oversize motor	
E Certificate/approval	
F CR pump for high temperatures (air-cooled top assembly)	
H Horizontal version	
HS High-pressure pump with high speed MLE motor	
I Different pressure rating	
J Pump with different max speed	
K Pump with low NPSH	
M Magnetic drive	
N Fitted with sensor	
P Undersize motor	
R Horizontal version with bearing bracket	
SF High pressure pump	
T Over size motor (two flange sizes bigger)	
U NEMA version ¹⁾	
X Special version	
Pipe connection	
A Oval flange	
B NPT thread	
CA FlexiClamp (CRI(E), CRN(E) 1, 3, 5, 10, 15, 20)	

Example A -G -A -E -H QQ E

CX	Triclamp (CRI(E), CRN(E) 1, 3, 5, 10, 15, 20)
F	DIN flange
G	ANSI flange
J	JIS flange
N	Changed diameter of ports
P	PJE coupling
X	Special version

Materials

A	Basic version
D	Carbon-graphite filled PTFE (bearings)
G	Wetted parts AISI 316
GI	All parts stainless steel, wetted parts AISI 316
I	Wetted parts AISI 304
II	All parts stainless steel, wetted parts AISI 304
K	Bronze (bearings)
S	SiC bearings + PTFE neck rings
X	Special version

Code for rubber parts

E	EPDM
F	FXM
K	FFKM
V	FKM

Shaft seal

A	O-ring seal with fixed driver
B	Rubber bellows seal
E	Cartridge seal with O-ring
H	Balanced cartridge seal with O-ring
K	Metal bellows cartridge seal
O	Double seal, back-to-back
P	Double seal, tandem
X	Special version
B	Carbon, synthetic resin-impregnated
H	Cemented tungsten carbide, embedded (hybrid)
Q	Silicon carbide
U	Cemented tungsten carbide
X	Other ceramics
E	EPDM
F	FXM
K	FFKM
V	FKM

¹⁾ In August 2003 the NEMA version pump code was discontinued for all material numbers created by Grundfos manufacturing companies in North America. The NEMA version pump code will still remain in effect for existing material numbers. NEMA version pumps built in North America after this change will have either an A or U as the pump version code depending on the date the material number was created.

5. Applications

High-pressure applications



Fig. 1 CR high-pressure pumps

GR7767 - TM02 8470 4004

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 at max. 248 °F.

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, the 2-pump solution for flow rates above 24 gpm.

Single-pump solution

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.

2-pump solutions

Our 2-pump solutions are divided into two groups based on pump size:

- CRN 3, 5, 10, 15, 20 SF
- CR(N) 32, 45, 64, 90, 120, 150.

Both solutions consist of two pumps in series. The first pump is a standard pump for feeding. The second pump is a high-pressure pump especially 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.

Further documentation

Information about	see page
Performance range	8
CR high-pressure pumps (standard documentation)	117
Customized pump parts	18-66
Special installation requirements	15
E-pump solutions	60
WebCAPS	117

Supplementary Grundfos pumps

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

Hot-water applications

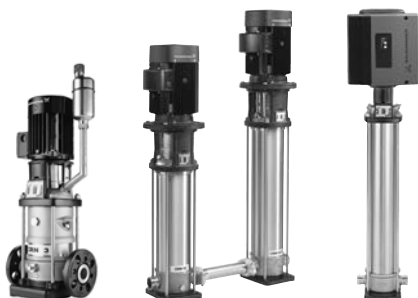


Fig. 2 CR pumps for hot-water applications

GR5228 - GR7767 - TM02 8470 4004

Reference applications

- Boiler feeding
- applications involving poor inlet/suction 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 and/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! We provide solutions for applications involving special requirements:

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

Steady steam production

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

Why speed-controlled pumps are recommended:

- The reaction to changes in the steam consumption is faster compared to the on/off boiler.
- The water level in the boiler is stable.

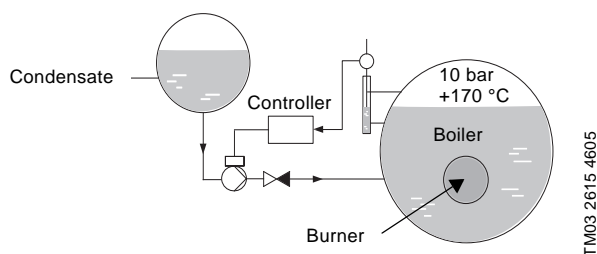


Fig. 3 Boiler-feed application with speed-controlled pump

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 and/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 pump's NPSH value and prevents erosion and destruction of the pump.

For further information about NPSH and the calculation of NPSH-value, see these data booklets:

- CR, CRI, CRN, CRE, CRIE, CRNE
- CR, CRN high pressure
- CRT, CRTE.

High-temperature applications

The pumping of hot liquids demands much of 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 handling liquid temperatures up to 356 °F at 362 psi 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.

Further documentation

Information about	see page
CR low-NPSH pumps	37
CR pumps with air-cooled top	31
CR pumps with oversize motor	23
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Applications involving temperature control



Fig. 4 CRE, CRIE, CRNE pumps with sensor

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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, etc.

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
- high-temperature liquids
- viscous liquids, etc.

Pumping of liquids down to -40 °F

In applications where liquids are pumped at temperatures down to -40 °F, 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 because of thermal expansion, and eventually stoppage of operation.

For low-temperature liquids below -4 °F, we recommend CRN pumps.

Pumping of high-temperature liquids

The pumping of hot liquids demands much of pump parts, such as shaft seals and rubber parts. Examples of such liquids:

- water-based liquids up to 356 °F at 362 psi
- thermal oils up to 464 °F at 232 psi.

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 which 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.

Further documentation

Information about	see page
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CR pumps with air-cooled top	31
Pump rubber parts	45
CR pumps with oversize motor	23
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Aggressive/hazardous liquids



Fig. 5 CR pumps for aggressive/hazardous liquids

GR5954 - GR7369 - GR5216

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 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 will be flushed away by a flushing liquid.

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.

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 by means of 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.

We offer ATEX-approved pumps with these classifications:

- 2G EExe II T3
- 2G EExd IIB T4
- 2G EExd IIC T4
- 2G EExde IIB T4
- 2G EExde IIC T4
- EEx 2D T125 °
- EEx 3D T125 °.

Electropolished pumps

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

We offer electropolished pumps in all CRN pump sizes.

Further documentation

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CR pumps with back-to-back seal arrangement	26
CR pumps with tandem seal arrangement	29
Pumps with magnetic drive (MAGdrive)	33
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Hygienic applications



Fig. 6 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

In hygienic industries, pumps must meet strict requirements on design, materials, surface quality, cleanability, etc.

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, 10, 15, 20, 32, 45, 64, 90, 120, 150	●	●	Ra ≤ 0.8 μm

- Available.

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 page 48.

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

In secondary hygienic applications, it is extremely important to clean the pumps sufficiently to prevent deposits from contaminating the pumped liquid.

For secondary hygienic applications, we recommend CRN(E) pumps which have all 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.

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TM02 1808 2001 - GR7375 - TM02 8470 4004

Special installation requirements



Fig. 7 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, etc.

Horizontally mounted pumps

Horizontally mounted pumps are often chosen in the following cases:

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

For installations with limited height, we recommend horizontally mounted pumps.

For earthquake-prone areas, we recommend horizontally mounted pumps to lower the center of gravity and thus minimize swings during an earthquake. See the example in fig. 8.

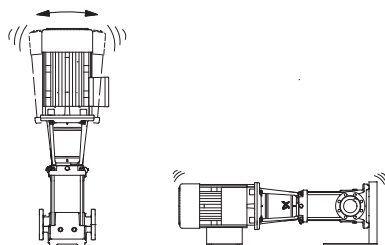


Fig. 8 Vibrations of pumps in earthquake-prone areas

If the chamber stack and staybolts are stressed by repeated swings during an earthquake, they may break.

For earthquake-prone areas and in mobile systems, we recommend CRN pumps, as stainless steel is more reliable than cast iron.

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 motor or other device.

Pumps with alternative mounting

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.

Further documentation

Information about	see page
Horizontally mounted CR pumps	xxx
Belt-driven CR pumps	43
Stainless steel CRN pumps	37
Pump parts designed to match your needs	18-66
CR pumps with certificates	55
E-pump solutions	60
WebCAPS	117

Supplementary Grundfos pumps

For installations with special requirements to a compact design, we recommend CM pumps or BM booster modules.

For further information, see page 117.

Special applications



Fig. 9 CRT, CRNE and CRN pumps

GR7369 - TM02 8470 - TM02 1808

Reference applications

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

Customized solutions

We offer customized solutions for a number of applications not mentioned on the previous pages. Examples:

- Off-shore and maritime applications
- pumping of liquids down to -40 °C
- deep-well pumping in small water supply systems
- special conditions
- special requirements as to approvals, voltage, frequency.

To ensure a stable and reliable operation, we offer customized solutions designed to meet your needs!

Off-shore and maritime applications

In off-shore and maritime applications, pumps must meet stringent requirements to reliability in connection with for instance cooling, fire fighting, cleaning and desalination systems. Pumps are often installed in a corrosive environment.

We offer customized pumps with a wide variety of 3.1C inspection certificates, such as Lloyds Register of Shipping (LRS) and Det Norske Veritas (DNV). For further information, see page 55.

Furthermore, we offer customized pumps with a wide variety of materials, connections, enclosure classes, etc.

For the pumping of seawater, we recommend CRT(E) pumps which have all pump parts in titanium. As its corrosion resistance is not affected by seawater, titanium is the ideal solution.

Pumping of liquids down to -40 °F

In applications with liquid temperatures down to -40 °F, 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 because of thermal expansion, and eventually stoppage of operation.

For liquids below -4 °F, we recommend CRN pumps.

Pumps operating under special conditions

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

Further documentation

Information about	see page
CR pumps for cooling applications	35
CR pumps with oversize motors	23
Pump parts designed to match your needs	18-66
Special installation requirements	15
E-pump solutions	60
CR pumps with certificates	55
WebCAPS	117

6. 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, or a similar product with ATEX approval.

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

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		GKI 60	97754527
	II 2GEx e [ia] IIC T6		GKE 60	97752524

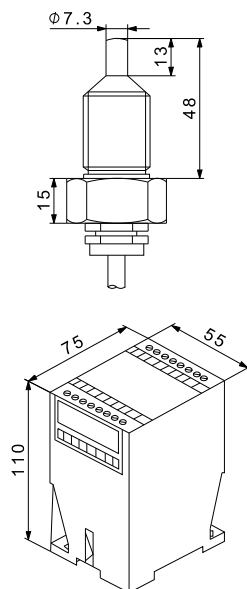


Fig. 10 ATEX-approved flow sensor and amplifier

TM05 1169 3511

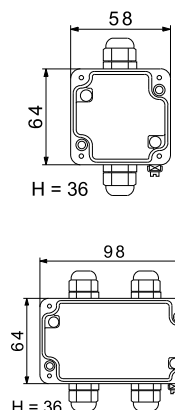


Fig. 11 ATEX-approved extension box

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

TM05 1120 0611

Venting valve with connecting pipe

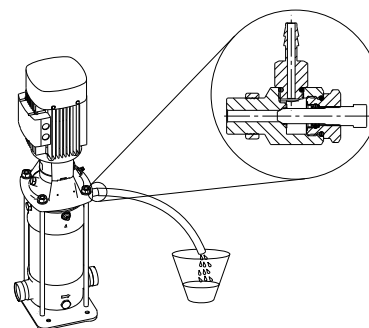


Fig. 12 Venting valve with connecting pipe

The connecting pipe of this special venting valve allows the operator to prime the pump and contain the pumped liquid in 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

TM05 1160 0611

7. Motor

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 heaters
- motors with built-in PTC sensor
- motors with built-in thermal switch
- oversize motors
- motors with alternative enclosure class, etc.
- tropicalized motor windings
- explosion proof motors
- custom NEMA motors

cURus-, UR- and CSA-approved motors

We offer motors with these approvals:

Approval	Motor power - P2 [Hp]
cURus	1/2 - 10 Hp
UR	15 - 100 Hp
CSA	15 - 100 Hp

Other motor approvals

We offer a wide range of motor approvals:

- CCC
- C-tick
- GOST
- BΔ
- TSU
- METI/JQA
- CB
- TSE
- SASO, etc.

ATEX-approved pumps for EEC countries



TM01 6193 4202

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 or dust-ignition-proof motors in accordance with the directive 94/9/EC, 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 will be supplied with serial number, special installation and operating instructions and a nameplate showing the ATEX classification.

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 gasses 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 ¹⁾

¹⁾ 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 ¹⁾	Zone 1 Zone 21
CR pumps available	CR, CRI, CRN, CRT ²⁾ CR, CRI, CRN, CRT
Motors available	2G EEx e II T3 2D 125 °C 2G EEx d II B T4
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) ¹⁾
1999/92/EC ¹⁾	Zone 2 Zone 22
CR pumps available	CR, CRI, CRN, CRT CR, CRI, CRN, CRT
Motors available	2G EEx e II T3 3D 125 °C 2G EEx d II B T4

¹⁾ **Note:** The link between groups, categories and zones is explained in the 1999/92/EC directive. Please note that this is a minimum directive. Some EEC countries may therefore have stricter local rules. The user or installer is always responsible for checking that the group and category of the pump correspond to the zone classification of the installation site.

²⁾ For group II, category 2 G (zone 1), the pump must be protected 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 or tandem). The system for pressurizing or flushing the double-seal system must be ATEX-approved.

We offer the following ATEX-approved motors:

Motor [kW]	Version			
	(2G EExe II T3)	(2G EExd IIB T4)	(2D T125 °)	(3D T125 °)
0.37 - 1.3	●			
1.85 - 4.6	●			
5.5 - 7.5	●			
10 - 15	●			
20 - 28	●			
0.37 - 1.5		●		
2.2 - 4		●		
5.5 - 7.5		●		
11 - 45		●		
0.37 - 45			●	
0.37 - 45				●

All explosion-proof motors have PTC sensors. For further information about PTC sensors, see page 21.

Special voltage

We offer pumps with the following voltages:

Frequency	Voltage
50 Hz	Motor
	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/660-725 YV
60 Hz	3 x 200-230/346-400 V
	3 x 208-230/460 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 575 YV
	Motor with integrated frequency converter
50/60 Hz	1 x 208-230 V
	3 x 208-230 V
	3 x 460-480 V

Note: Other voltages are available on request.

Plug-and-pump solutions for CRE pumps

To facilitate electrical installation and service of our three-phase CRE pumps up to 10 Hp, all motor terminal boxes are equipped with a detachable cable inlet bar.

When the cable inlet bar is removed, it is possible to disconnect all electrical connections.

Figure 13 shows the location of the detachable cable inlet bar on the motor terminal box as well as plugs for power connection, sensor and communication.

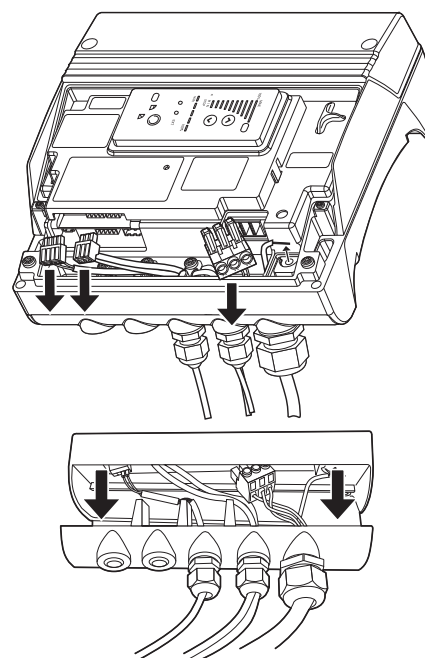


Fig. 13 Location of the detachable cable inlet bar on the motor terminal box as well as plugs for power connection, sensor and communication

TM03 1964 3405 - TM03 1962 3405

Motor with space heater

In applications where condensation in the motor may occur, we recommend to install a motor with a space heater. The space 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 to use motors with space heaters in areas with ambient temperatures below 32°F.

Note: Rapid condensation is not to be confused with the phenomenon which occurs when the pressure inside the motor is lower than the atmospheric pressure. In such cases, moisture is sucked from the atmosphere into the motor through bearings, housing, etc.

Motors from 1/2 - 75 Hp are available with a space heater. Space heater power supply is 1/60/110 or 1/60/230.

Motor with anti-condensation heater



TM03 2440 4305

Fig. 14 Mains-operated motor with anti-condensation heater

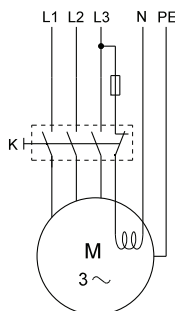
In applications where condensation in the motor may occur, we recommend to install a motor with an anti-condensation heater on the stator coil ends. The heater keeps the motor temperature higher than the ambient temperature and prevents condensation.

High humidity may cause condensation in the motor. Slow condensation occurs as a result of a decreasing ambient temperature; rapid condensation occurs as a result of shock cooling caused by direct sunlight followed by rain. We recommend always to use motors with anti-condensation heater in areas with ambient temperatures below 32°F.

Note: Rapid condensation is not to be confused with the phenomenon which occurs when the pressure inside the motor is lower than the atmospheric pressure. In such cases, moisture is sucked from the atmosphere into the motor through bearings, housings, etc.

In applications with constant high humidity levels 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 to install a motor with anti-condensation heater.

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



TM03 4058 1406

Fig. 15 Three-phase motor with anti-condensation heater

Key

Symbol	Designation
K	Contactors
M	Motor

Note: Connect the anti-condensation heater to the supply voltage so that it is on when the motor is switch off.

Motors from 0.37 to 75 kW are available with anti-condensation heater.

Motor size, 50/60 Hz [kW]	Power of heating unit [W]	
	1 x 115V	1 x 190-250V
2-pole		
0.37 - 1.1	—	23
1.5 - 3.0	—	31
4.0 - 5.5	—	38
7.5 - 22	—	2 x 38
30 - 37	55	55
45 - 55	92	92
75	109	109

Motors with PTC sensors



Fig. 16 PTC sensor incorporated in winding

TM02 7038 2403

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 motors from 5 Hp and up have PTC sensors as standard.

Note: 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 page 46.

Protection according to IEC 60034-11:

- TP 111 (steady overload only)
- TP 211 (steady and rapid overload).

PTC sensors comply with DIN 44 082. Maximum voltage at the terminals, $U_{max} = 2.5$ 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.

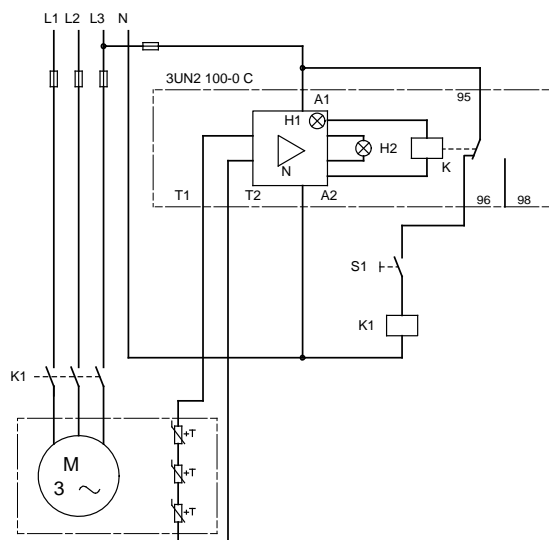


Fig. 17 Three-phase motor with PTC sensors

TM00 3965 1494

Key

Symbol	Designation
S1	On/off switch
K1	Contacteur
+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

Motors with thermal switches



Fig. 18 Thermal switch incorporated in winding

TM02 7042 2403

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 10 Hp with built-in thermal switches.

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

Protection according to IEC 60034-11: TP 211 (steady and rapid overload). As protection against seizure, the motor must be connected to a motor-protective circuit breaker.

Thermal switches tolerate the following maximum loads:

U_{\max}	250 VAC
I_N	1.5 A
I_{\max}	5.0 A (locked-rotor and breaking current)

The Figure below shows a typical circuit of a three-phase motor with built-in bimetallic thermal switches.

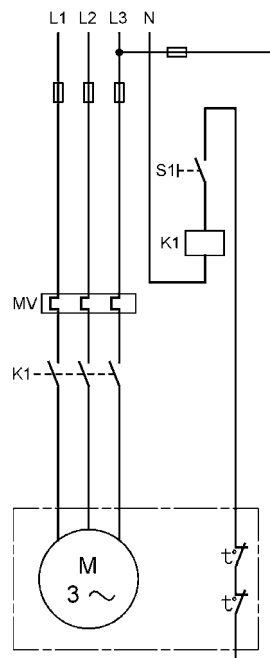


Fig. 19 Three-phase motor with thermal switches

TM00 3964 1494

Key

Symbol	Designation
S1	On/off switch
K1	Contactor
t°	Thermal switch in motor
M	Motor
MV	Motor-protective circuit breaker

Oversize motors

We recommend to use an oversize motor if operating conditions fall outside the operating conditions described in these data booklets:

- CR, CRI, CRN, CRE, CRIE, CRNE
- CR, CRN high pressure
- CRT, CRTE.

We especially recommend oversize motors in these cases:

- The pump is installed at an altitude above 11,483 ft. (ML IE3) or 9,432 ft. (Siemens IE3).
- The ambient temperature exceeds 140 °F (ML IE3), 131 °F (Siemens IE3).
- The viscosity or density of the pumped liquid is higher than that of water.

Motor sizes available for pumps

2-pole

Pump type	Oversize motor
	[Hp]
CR 1s - CR 5	10
CR 10 - CR 20	25
CR 32 - CR 90	60
CR 120 - CR 150	100

4-pole

Pump type	Oversize motor
	[Hp]
CR 1s - CR 5	2
CR 10 - CR 20	5
CR 32 - CR 90	15
CR 120 - CR 150	25

Alternative enclosure class (IP)

The motor enclosure class complies with IEC 60034-5. The enclosure class states the degrees of protection of the motor against ingress of solid objects and water. All motors comply with IP55 as standard.

On request, we offer motors in accordance with IP54 and IP65.

IP class	Description
IP54	<ul style="list-style-type: none"> • The motor is protected against the ingress of dust, i.e. harmful layers of dust. • The motor is protected against water splashing from any direction.
IP55	<ul style="list-style-type: none"> • The motor is protected against the ingress of dust, i.e. harmful layers of dust. • The motor is protected against water being projected by a nozzle from any direction.

Alternative terminal box positions

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

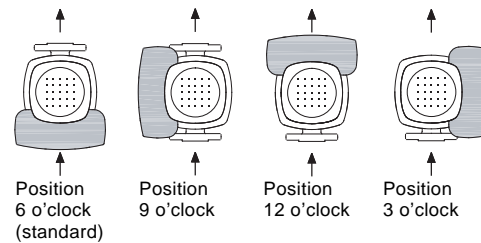


Fig. 20 Possible terminal box positions

TM03 3658 0606

4-pole motors



Fig. 21 4-pole motor

TM03 1711 2805

We offer all CR pumps with 4-pole motors.

4-pole motors are often preferred in these cases:

- A low sound pressure level is required.
- Inlet conditions are poor.

Performance curves and technical data of 4-pole CR pumps, see page 78.

Electrical data of 4-pole CR pumps, see page 110.

Motor efficiency classes

North America

EISA defines the following efficiency classes of low voltage three-phase asynchronous motors:

- Energy efficient
- Premium efficient

Three-phase motors (1-10 Hp) of CR pumps are premium efficient motors as standard. Three-phase motors (15-100 Hp) of CR pumps are energy efficient motors as standard.

EEC Countries

The new EN standard 60034-30:2009 defines the following efficiency classes of low-voltage three-phase asynchronous motors from 0.75 to 375 kW:

- IE1: standard efficiency
- IE2: high efficiency
- IE3: premium efficiency.

IE = International Efficiency.

Three-phase motors (0.75 to 75 kW) of CR pumps are IE3 motors as standard.

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 are all cast iron construction and corrosion resistant epoxy finish. 1.0 service factor when operated with sinewave power. Consult factory when explosion proof motors are operated via variable frequency.

Inverter Duty: Meets or exceeds 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. Nameplate includes "inverter duty" 4:1 turndown.

Inverter Ready: Energy efficiency and premium efficiency, TEFC motors are suitable for operation with VFD. Likewise ODP motors that are built with class F insulation. 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. Nameplate states "inverter ready."

Severe Duty: 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. All cast iron construction. 182TC frames and larger.

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

Dirty Duty: 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. Typically smaller, rolled steel, 56C frame motors.

IEEE-841 Mill and Chem Duty: 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, lead 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 severe duty.

Washdown Duty: 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. Available up to 10 Hp.

8. Shaft seals

Shaft seal arrangements

Depending on the application, CR pumps are available with these shaft seals:

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

CR(E), CRI(E), CRN(E) pumps are fitted with a cartridge shaft seal mounted in a single seal arrangement as standard:

- CR(I,N)1s - CR(I,N)20,
HQQE or HQQV
- CR(N)32 - CR(N)90,
KUBE, KUHE, KUBV or KUHV < 340 psi
HQQE or HQQV > 340 psi
- CR(N)120 - CR(N)150,
KUBE or KUBV, 20 Hp - 60 Hp
HBQE or HBQV, 75 Hp - 125 Hp

CRT(E) are fitted with one AUUE or AUUV O-ring seal as standard.

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

To ensure reliability, these conditions must be considered when selecting a shaft seal:

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

Overview of shaft seals

The below table shows the shaft seals available.

Shaft seal	
As standard	On request
CR(E), CRI(E) and CRN(E)	
HQQE HQQV	HQQE *) HQQV *) HUBE HUBV
HBQE *) HBQV *) KUBE KUHE KUBV KUHV	HUUE HUUV HUBF HUBK HQQK HQQF HQBE HQBv KUUE KUUV
CRT(E)	
AUUE AUUV	AUUK AQQE AQQV DQQE DQQV

*) Only for CR, CRN 120 and 150, 75-125 Hp.
Codes for shaft seals, see page 10.

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 requirements, we offer variants of seal face material and secondary seal material (rubber parts).

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

Shaft seal and seal face variants

Pump type	Shaft seal, seal face variant	Temperature [°F]		Pressure rating [psi]
		Min.	Max.	
CR(E), CRI(E), CRN(E)	HQQx	-40	248	435
	HBQx *)	32	248	435
	HQBx	32	248	435
	HUUX	-40	194	435
	HUBx	32	248	435
	KUBx	-4	248	435
CRT(E)	KUHx	32	194	435
	AQQx	-40	194	362
	DQQx	-40	194	362

*) Only for CR, CRN 120 and 150, 75-125 Hp.

For explanation of codes, shaft seal types and materials, see the type key on page 9, or see the data booklet "Shaft seals" which is available in WebCAPS.

Shaft seals with EPDM O-ring material (HxxE)

We recommend 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:

- heat-resistant from -40 °F to 302 °F
- water-resistant up to 284 °F.

Shaft seals with FKM O-ring material (HxxV)

We recommend 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 -40 °F to 464 °F (oil only)
- water-resistant up to 194 °F.

Shaft seals with FFKM O-ring material (HxxK)

We recommend 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:

- heat-resistant from -4 °F to 302 °F
- water-resistant up to 302 °F.

Shaft seals with FXM O-ring material (HxxF)

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

Temperature range for rubber material:

- 14 °F to 527 °F. For short periods up to 572 °F.

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

For further information about O-ring materials, see the following data booklets available in WebCAPS.

Data booklet	Publication number
CR, CRI, CRN, CRE, CRIE, CRNE, 60 Hz	L-CR-PG-001
CRT, CRTE	L-CRT-PG-01
Shaft seals	96519875

Double seal arrangements

We offer two double seal arrangements:

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

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 these types of liquid:

- toxic, aggressive or flammable liquids
- abrasive or sticky liquids which 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 362 psi and 248 °F with the aim of minimizing the risk of leakage from the pump to the environment.

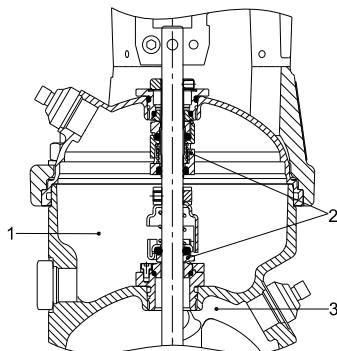


Fig. 22 CR 1s to 5 with back-to-back seal arrangement

TM04 4404 1609

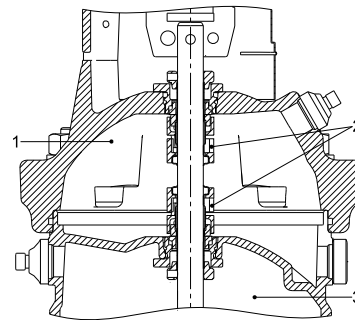


Fig. 23 CR 10 to 20 with back-to-back seal arrangement

TM04 4405 1609

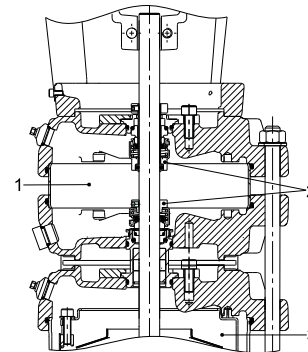


Fig. 24 CR 32 to 90 with back-to-back seal arrangement

TM04 4267 1609

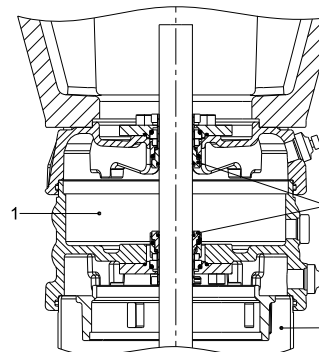


Fig. 25 CR 120 and 150 with back-to-back seal arrangement

TM04 4406 1609

Key to figures 22, 23, 24 and 25

Pos.	Designation
1	Seal chamber
2	Shaft seals
3	Pump

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

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•	•	•	•	•	•	•

• Available.

Dimensions

All dimensions are in inches.

Pump type	Additional height of seal chamber
CRI, CRN 1s, 1, 3, 5	4.25
CRI, CRN 10, 15, 20	3.54
CR, CRN 32	8.27
CR, CRN 45	9.45
CR, CRN 64	6.54
CR, CRN 90	7.24
CR, CRN 120, 150	4.37

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: The barrier liquid will seep through the lower (primary) shaft seal and be mixed with the pumped liquid. The right barrier liquid must therefore be used.

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.

CR (back-to-back seal arrangement) pump with dosing pump

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

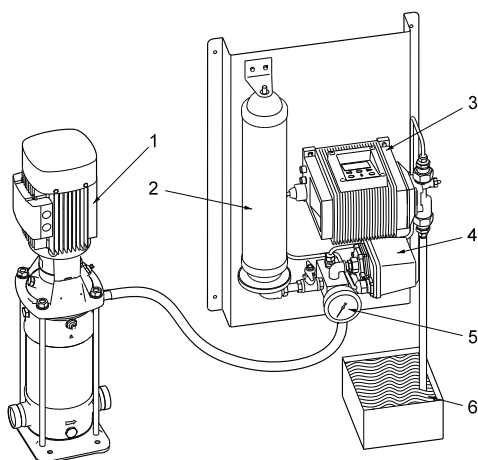


Fig. 26 CR pump with dosing pump

Key

Pos.	Designation
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 means of the pressure switch (pos. 4). When the pressure drops below the setpoint, the dosing pump will start and thus maintain a higher pressure in the seal chamber (max. pressure 232 psi). Barrier liquid is supplied from a reservoir (pos. 6).

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

Connections are all RG 1/2".

Note: Connecting pipes/hoses are not included.

Dimensions of back plate with components

All dimensions are in inches.

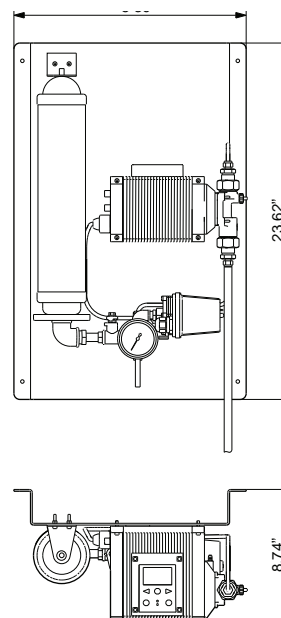


Fig. 27 Dimensional sketch

CR (back-to-back seal arrangement) pump with pressure intensifier



Fig. 28 CR pump with pressure intensifier

TM05 7332 0913

GR5954

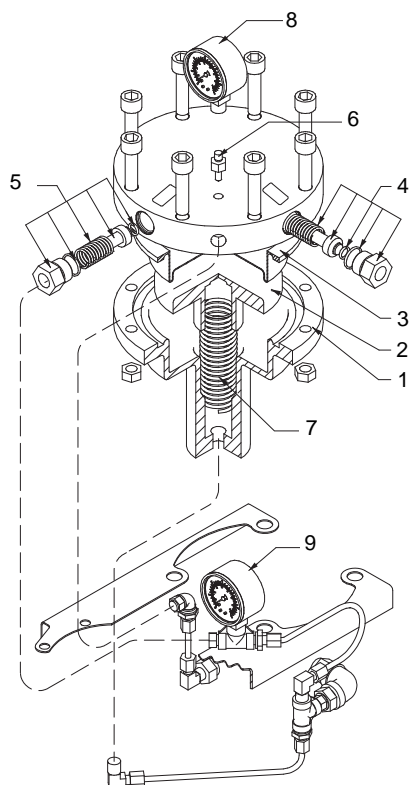


Fig. 29 Components of pressure intensifier

Pos.	Designation
1	Pressure intensifier
2	Piston
3	Diaphragm
4	Non-return 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 non-return valve (pos. 4) until the pressure gauge (pos. 8) reaches 21.7 to 29 psi. The spring (pos. 7) is now preloaded with the barrier liquid pressure. The pump is primed and vented. When the pump is started, the pump pressure + the pressure from the preloaded spring will result in a pressure 21.7 to 29 psi higher in the seal chamber.

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

Maximum operating pressure: 362 psi.

Dimensions

All dimensions are in inches.

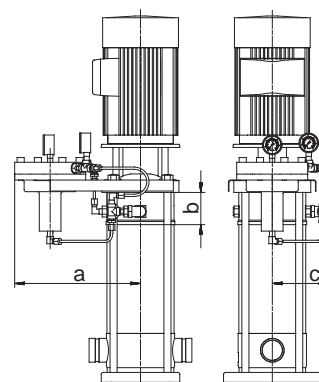


Fig. 30 Dimensional sketch

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
CR, CRN 90	13.98	7.24	6.69
CR, CRN 120, 150	13.98	4.37	6.69

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

TM03 8299 1007

TM01 4459 0399

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.

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

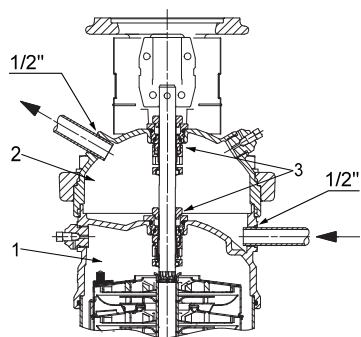


Fig. 31 CR 1s to 20 with tandem seal arrangement

TM03 3657 0606

CR 32, 45, 64 and 90

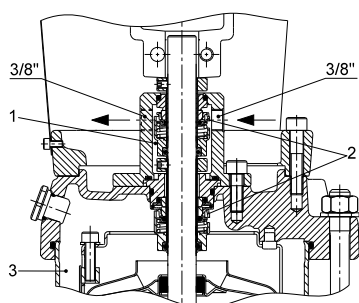


Fig. 32 CR 32 to 90 with tandem seal arrangement

TM03 9158 3507

CR 120 and 150

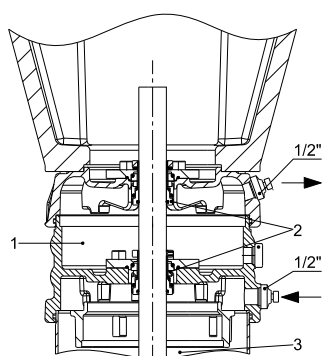


Fig. 33 CR 120 and 150 with tandem seal arrangement

TM04 4164 1609

The tandem type of seal is available for these CR pumps:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	●	●	●	●	●	●	●	●	●	●	●	●	●
CRI(E)	●	●	●	●	●	●	●						
CRN(E)	●	●	●	●	●	●	●	●	●	●	●	●	●

● Available.

Dimensions

All dimensions are in inches.

Pump type	Additional height of seal chamber
CRI, CRN 1s, 1, 3, 5	4.25"
CRI, CRN 10, 15, 20	3.54"
CR, CRN 32, 45, 64, 90	0
CR, CRN 120, 150	4.37"

Key

Pos.	Designation
1	Seal chamber
2	Shaft seals
3	Pump

Flushing-liquid systems

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

Note: The pumped liquid will seep through the lower (primary) shaft seal and be mixed with the flushing liquid. Maximum liquid temperature: 248 °F.

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

Note: 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.

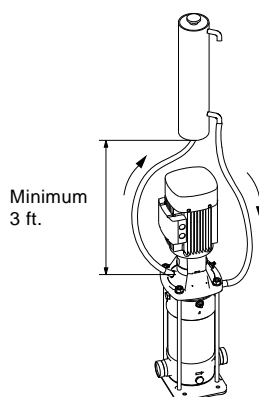


Fig. 34 Tandem seal arrangement with circulating flushing liquid

In figure 34, 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.

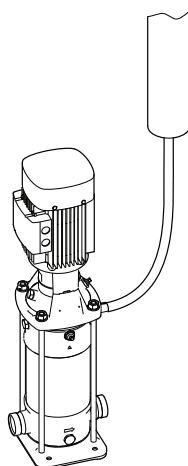


Fig. 35 Tandem seal arrangement with flushing-liquid supply

In figure 35, the flushing liquid enters the seal chamber via a pipe from an elevated tank.

No heat is dissipated from the system.

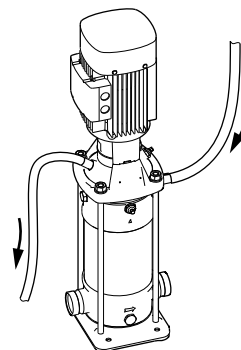


Fig. 36 Tandem seal arrangement with flushing liquid connected to a drain

In figure 36, 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.

TM03 3613 1106

TM04 3217 2408

TM03 3809 1106

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.



Fig. 37 CR pump with an air-cooled top

CR pumps with air-cooled top have a mechanical silicon carbide/silicon carbide/EPDM cartridge shaft seal, type HQQE, as standard. The pumps are able to handle liquid temperatures up to 356 °F at max. 362 psi.

Note: If the pumped liquid is oil, the pumps can handle following liquid temperatures:

- CR 1s to 90: 464 °F at max. 232 psi.
- CR 120 and 150: 356 °F at max. 232 psi.

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

Liquid temperature [°F]	Rubber part material
Water-based liquids	
365 °F	FXM/EPDM
Thermal oils	
464 °F	FKM

Temperatures above 248 °F 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 during operation, a standard Grundfos shaft seal can be used.

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

Note: For safety reasons, fit a pipe in order to lead away steam from the air vent to a drain. Local regulations must be observed.

CR 1s, 1, 3 and 5

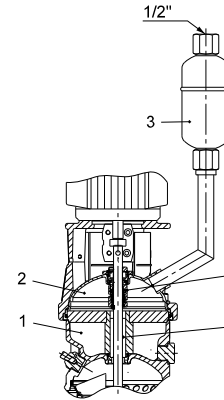


Fig. 38 CR 1s, 1, 3 and 5 with air-cooled top

CR 10, 15 and 20

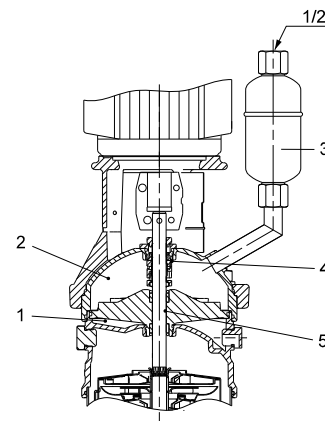


Fig. 39 CR 10, 15 and 20 with air-cooled top

CR 32, 45, 64 and 90

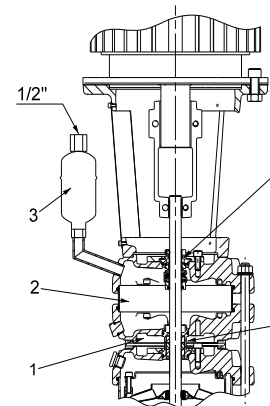


Fig. 40 CR 32, 45, 64 and 90 with air-cooled top

TM03 9159 3507

TM03 9160 3507

TM03 4060 1406

CR 120 and 150

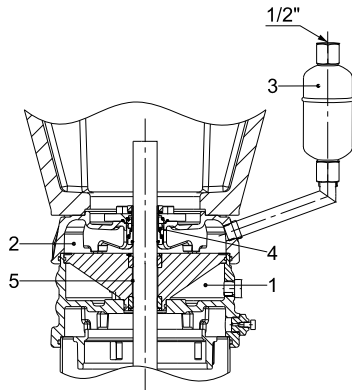


Fig. 41 CR 120 and 150 with air-cooled top

TM04 4165 0909

Key

Pos.	Designation
1	Air chamber
2	Liquid
3	Air vent
4	Shaft seal
5	Cooling channel

Pump range

The air-cooled top is available for these pump types:

Pump type	CR pumps with air-cooled top												
	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)								●	●	●	●	●	●
CRI(E)	●	●	●	●	●	●	●						
CRN(E)	●	●	●	●	●	●	●	●	●	●	●	●	●

● Available.

Note: CRT(E) pumps and CR(E) high pressure pumps are not available with air-cooled top.

Air vent positions on CR pumps with air-cooled top

The air vent of vertical CR pumps with air-cooled top is in line with the discharge port (12 o'clock position) as standard. The air vent is mounted vertically (3 o'clock position) on horizontal pumps.

The possible air vent positions are shown below.

Vertical CR pumps with air-cooled top

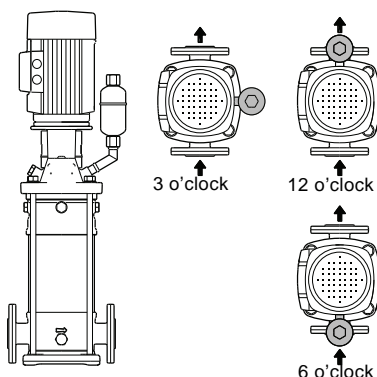


Fig. 42 Air vent positions on vertical CR pumps

TM03 3659 0606

Dimensions

All dimensions are in inches.

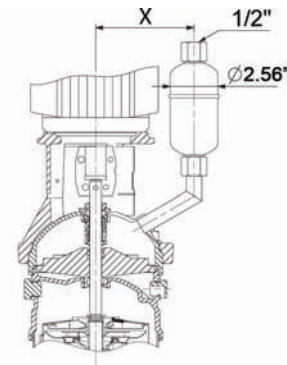


Fig. 43 Air-cooled top

TM05 7333 0913

Pump type	X
CRI, CRN 1s, 1, 3, 5	6.77
CRI, CRN 10, 15, 20 (10 Hp and smaller)	7.32
CRI, CRN 10, 15, 20 (15 Hp and larger)	8.54
CR, CRN 32	6.93
CR, CRN 45, 64	7.32
CR, CRN 90	7.48
CR, CRN 120, 150 (60 Hp and smaller)	7.48
CR, CRN 120, 150 (75-100 Hp)	9.57

Additional pump height

Pump type	Additional pump height
CRI, CRN 1, 3, 5	4.25
CRI, CRN 10, 15, 20	3.54
CR, CRN 32	8.27
CR, CRN 45	9.45
CR, CRN 64	6.54
CR, CRN 90	7.24
CR, CRN 120, 150	4.37

Horizontal CR pumps with air-cooled top

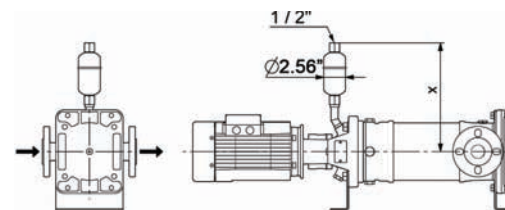


Fig. 44 Air vent positions on horizontal CR pumps with air-cooled top

TM05 7334 0913

Key to fig. 44

Pump type	X
CRI, CRN 1s, 1, 3, 5	12.13
CRI, CRN 10, 15, 20	12.76
CR, CRN 32	15.39
CR, CRN 45, 64	15.67
CR, CRN 90, 120, 150	15.91

Note: 100 Hp motors are higher than distance x.

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 hermetically sealed liquid end, the pump is 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

Fig. 45 CRN MAGdrive pumps

The MAGdrive solution is available for these pumps:

Pump type	CRN pumps with magnetic drive										
	1s	1	3	5	10	15	20	32	45	64	90
CRN(E)	●	●	●	●	●	●	●	●*	●*	●*	●*

- Available.
- * Available up to 30 Hp.

As minimum, a soft starter is required for these motors:

- 2-pole motors: 25 and 30 Hp.
- 4-pole motors: 1.5 Hp and up.

Features and benefits

CRN MAGdrive offers the following special features and benefits:

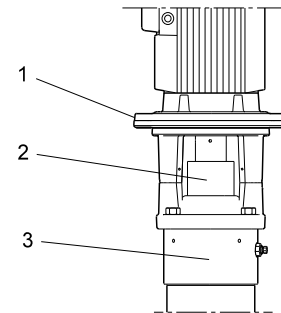
- a hermetically sealed drive system for 100 % leak-free pump operation
- special choice of materials and design for low energy loss
- simple pump design for ease of service
- unique pump design for efficient cooling of magnet by means of the pumped liquid
- ATEX version available for EEC countries.

Applications

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

- **Aggressive or corrosive liquids**
Concentrated sulphuric acid, nitric acid, phosphoric acid, etc.
- **Toxic liquids**
Trichloroethylene, chloroform, phenol, etc.
- **Flammable liquids**
Petrol, jet fuels, LPG, alcohols, etc.
- **Hardening/curing liquids**
Paint, glue, resins, etc.
- **Crystallizing liquids**
Glycol additives, naphthalene, sugar products, salts, etc.
- **Refrigerants**
Ammonia, synthetic chemicals (CFC, HCFC, HCF), etc.

Design



TM03 9149 3407

Fig. 46 MAGdrive system

Pos.	Designation	Materials
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®).

Connections available for CRN MAGdrive pumps:

Connection type	CRN	
	1s, 1, 3, 5, 10, 15, 20	32, 45, 64, 90
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.

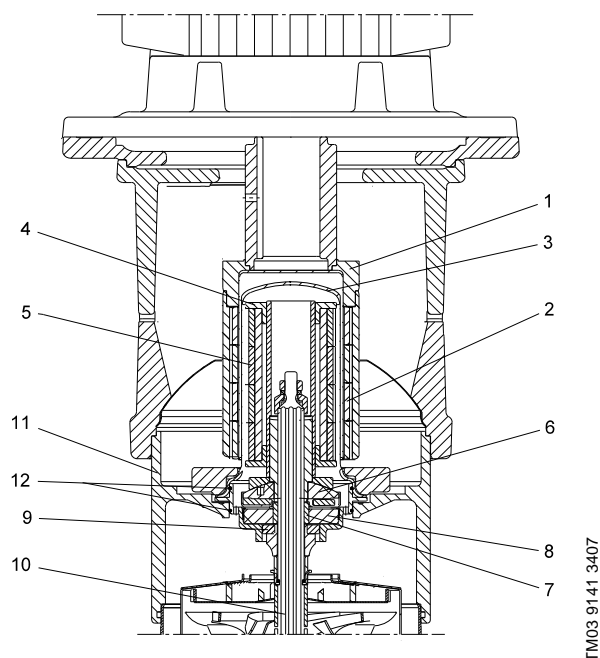


Fig. 47 Sectional drawing of MAGdrive system

Pos.	Designation	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 32-90 : SAF 2205
11	Pump head	CF 8M (cast equiv. of AISI 316 SS)
12	O-ring	EPDM, FKM, FXM, FFKM

Operating conditions

Maximum pressure: 362 psi.

Temperature range: -40 °F to 248 °F.

Viscosity range: 0.25 - 100 centipoise.

Technical data

Motor range: 1/2 Hp to 30 Hp.

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 page 103.

Note: When ordering a Grundfos MAGdrive, please state the data.

The following information is required for the selection of the correct MAGdrive/motor combination.

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

9. Pump

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.



Fig. 48 CR pump with pressure gauge

TM03 4726 2506

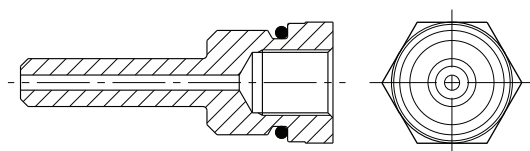


Fig. 49 Insert for measurement of inlet pressure

TM03 4091 1606

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"	96527046
	FKM		96527047
	FFKM		96527049
	FXM		96549173
	CRI, CRN 1s, 1, 3, 5		
	EPDM	NPT 1/4"	96527050
	FKM		96527051
	FFKM		96527052
	FXM		96549174
	CR 10, 15, 20		
	EPDM	NPT 1/4"	96528436
	FKM		96528437
	FFKM		96528438
	FXM		96528439
	CRI, CRN 10, 15, 20		
	EPDM	NPT 1/4"	96528428
	FKM		96528429
	FFKM		96528430
	FXM		96528431

We offer these pump types with tappings:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	●	●	●	●	●	●	●						
CRI(E)	●	●	●	●	●	●	●						
CRN(E)	●	●	●	●	●	●	●						

● Available.

Note: CR(E) and CRN(E) 32, 45, 64 and 90 have tappings 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. The pumps have an oversize neck ring ensuring that impellers do not seize up as a result of thermal expansion.

We offer the above solution for these pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)	●	●	●	●	●	●	●						
CRN(E)	●	●	●	●	●	●	●	○	○	○	○	○	○

● Available (with shaft seal type HQQE).

○ CRN 32, 45, 64 and 90 pumps with shaft seal type HQQE are suitable for liquid temperatures down to -40 °F.

Surface treatment

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 these strict demands, we offer these cleaned dried pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	●	●	●	●	●	●	●	●	●	●	●	●	●
CRI(E)	●	●	●	●	●	●	●						
CRN(E)	●	●	●	●	●	●	●	●	●	●	●	●	●

- Available.

Prior to assembly, all pump parts are cleaned in 140°F to 158°F water with a cleaning agent. All pump parts are then 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.

Note: Silicone-free shaft seals are available as option. Cleaned and dried pumps are not performance tested.

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 to hygiene or corrosion resistance.

Electropolishing removes burrs as well as metallic and non-metallic inclusions, providing a smooth, clean and corrosion-resistant stainless steel surface.

First all components are pickled in a mixture of nitric and hydrofluoric acid. Subsequently, the components are electropolished in a mixture of sulphuric and phosphoric acid. Finally, the components are passivated in nitric acid.

All cast parts of CRN are polished mechanically before being electropolished.

Note: The pump incorporates a standard shaft seal which has not been polished.

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

Pump type	Cast stainless steel	Stainless-steel parts (not cast)	Surface quality
CRN 1s, 1, 3, 5, 10, 15, 20, 32, 45, 64, 90, 120, 150	●	●	Ra ≤ 0.8 µm

- Available.

We offer these electropolished pumps:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)													
CRN(E)	●	●	●	●	●	●	●	●	●	●	●	●	●

- 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 these 100 % carbon-free pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	○	○	○	○	○	○	○	●	●	●	●	●	●
CRI(E)	○	○	○	○	○	○	○						
CRN(E)	○	○	○	○	○	○	○	●	●	●	●	●	●

- Available.
- Pumps with HQQx shaft seal are carbon-free as standard.

CRN all-stainless steel pumps

We offer customized stainless-steel CRN pumps for maritime applications, very humid environments, etc.:

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

We offer the above solutions for these pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)													
CRN(E)	•	•	•	•	•	•	•	•	•	•	•	• ^{*)}	• ^{*)}

• Available.

•^{*)} Only available with stainless steel base and flanges.

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

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 and/or high flow rate.

The CR low-NPSH pump is a pump with a special first-stage design that reduces the pump's NPSH value. In boiler feed applications, a compact system is an advantage.

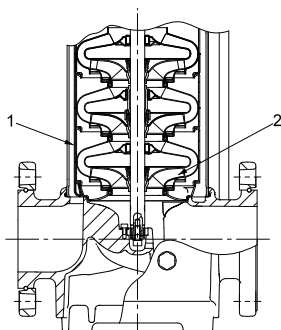


Fig. 50 Sectional drawing of CR low-NPSH pump

Key

Pos.	Designation
1	Special inlet part
2	Special inlet impeller

Pump range

These pump types are available as low-NPSH pumps:

Pump type	CR low-NPSH pumps												
	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)			•	•	•	•	•	•	•	•			
CRI(E)			•	•	•	•	•						
CRN(E)			•	•	•	•	•	•	•	•			

• Available.

Maximum pressure 362 psi

Maximum liquid temperature 248 °F¹⁾

¹⁾ With air-cooled top, the maximum liquid temperature is 356 °F.

For information about dimensions and weights, see page 90.

The performance curves for the CR low-NPSH pumps are provided beginning on page 70.

The continuous feed boiler pumps require a bypass orifice to be placed on the discharge side of the pump to maintain a minimum flow rate. The Bypass Orifice Chart for continuous feed boilers is provided on page 100.

The CR Low NPSH Pump Sizing Chart for on-off feed boilers is provided on page 98.

The CR Low NPSH Pump Sizing Chart for continuous feed boilers is provided on page 99.

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

Additional details of the unique components of the CR low NPSH pump models can be found in the "Service Instruction with Parts List (Low NPSH)" on WebCAPS.

The maximum pressure rating of the CR(I,N) Low NPSH pump is 362 psi.

Due to the larger first stage impeller, some CRI,N) Low NPSH pumps will require a larger motor than the standard CR(I,N) pumps.

Some CR(I,N) Low NPSH pump ends have a taller overall pump height than the standard CR(I,N) pump ends. The taller overall pump height is due to a larger motor stool on some CR(I,N) Low NPSH pump models.

The Grundfos pump material numbers in the sizing charts have a maximum liquid temperature of 248°F. The maximum liquid temperature of the CR(I,N) Low NPSH pump combined with a CR Cool-Top® option is 356°F.

TM03 4063 1406

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 psi to 15 psi higher than the boiler pressure. Some pumps will need to be throttled to meet the flow rate for which it was sized.

The pumps are selected to have a maximum pump NPSH required of 6' at the design flow. The pump NPSH required is available on the performance curve. The NPSH available must be checked for each system.

Use at least a 2' safety margin between the minimum deaerator system NPSHA to the pump and the pump curve HPSHR at the maximum feed flow. A bypass orifice must be placed on the discharge 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 psi to 15 psi higher than the boiler pressure. Some pumps will need to be throttled to meet the flow rate for which it was sized.

The pumps are selected to have a maximum pump NPSH required of 6' at the design flow.

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

Use at least a 2' safety margin between the minimum deaerator system NPSHA to the pump and the pump curve NPSHR at the maximum feed flow.

Horizontal In-line Pumps



Fig. 51 Horizontal CR pump

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

In earthquake areas, horizontal pumps are more reliable than vertical pumps.

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

Pump range

These Grundfos pumps are available for horizontal mounting:

Pump type	Horizontal CR pumps												
	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRI(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRN(E)	•	•	•	•	•	•	•	•	•	•	•	•	•

• Available.

CRT(E) 2, 4, 8 and 16 pumps are also available for horizontal mounting. The pumps are supplied with separate mounting plates for support of motor and pump.

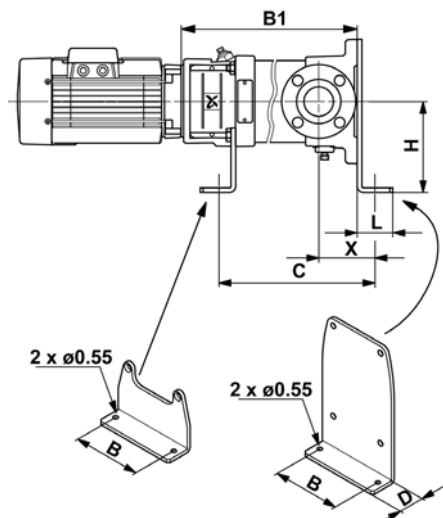
Foot mounted motors are required on CR(E), CRI(E), CRN(E) 5, 10, 15, 20 pumps with a motor size of 7.5 Hp or larger.

A foot mounted motor is required for all CR(E), CRI(E), CRN(E) 32, 45, 64, 90 pumps.

Dimensional drawings

CR(E), CRI(E), CRN(E) 1s, 1, 3, 5 (≤ 5 Hp)

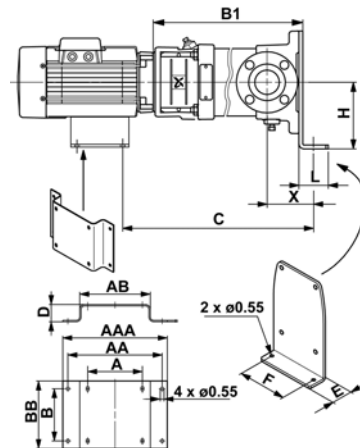
CR(E), CRI(E), CRN(E) 10, 15, 20 (≤ 5 Hp)



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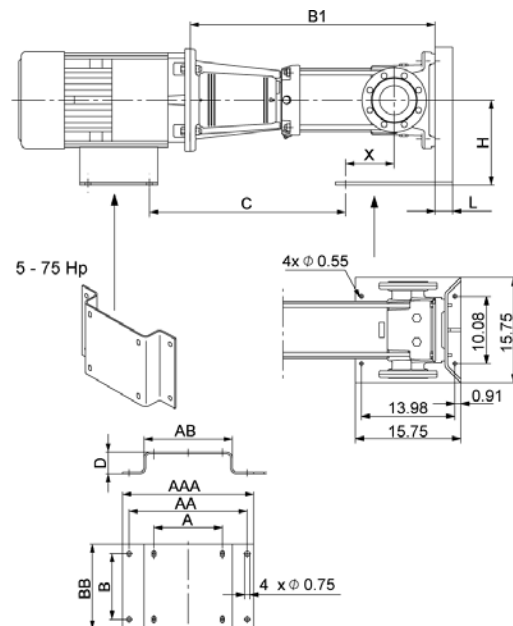
TM05 7335 0913

CR(E), CRI(E), CRN(E) 5 (5.5 - 7.5 Hp)
CR(E), CRI(E), CRN(E) 10, 15, 20 (≥ 7.5 Hp)



TM05 7336 0913

CR(E), CRN(E) 32, 45, 64, 90, 120, 150



5 - 75 Hp

100 Hp

TM05 7337 0913

Dimensions

All dimensions are in inches.

CR(E), CRI(E), CRN(E) 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
0.5 - 2	5.43	B1-3.34"	1.97	5.51	1.97	4.18	3.18
3 - 5	5.43	B1-4.43"	1.97	5.51	1.97	4.18	3.18

Note: For pump height (B1), see the CR(E), CRI(E), CRN(E) data booklet.

CR(E), CRI(E), CRN(E) 5 (7.5 Hp)

Motor [Hp]	A	AA	AAA	AB	B	BB	C	D	E	F	H	L	X	
													ANSI	Oval, PJE, Flexiclamp
7.5	8.5	12.83	14.41	10.87	5.51	7.09	—	2.68	1.97	5.43	7.87	1.97	4.18	3.18

Note: For pump height (B1), see the CR(E), CRI(E), CRN(E) data booklet.

CR(E), CRI(E), CRN(E) 10, 15, 20 (≤ 5 Hp), support for base plate and pump head

Motor [Hp]	B	C	D	H	L	X	
						ANSI, Oval, PJE, FlexiClamp	
0.75 - 2	6.69	B1-3.92"	1.97	6.85	1.97	4.68	
3 - 5	6.69	B1-4.91"	1.97	6.85	1.97	4.68	

Note: For pump height (B1), see the CR(E), CRI(E), CRN(E) data booklet.

CR(E), CRI(E), CRN(E) 10, 15, 20 (≥ 7.5 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	
7.5	8.5	12.83	14.41	10.87	5.51	7.08	—	2.68	1.97	6.69	7.87	1.97	4.68	
10	8.5	12.83	14.41	10.87	5.51	7.08	—	2.68	1.97	6.69	7.87	1.97	4.68	
15	10	15.11	16.69	13.15	8.27	10.24	—	1.57	1.97	6.69	7.87	1.97	4.68	
20	10	15.11	16.69	13.15	8.27	10.24	—	1.57	1.97	6.69	7.87	1.97	4.68	
25	10	15.11	16.69	13.15	8.27	10.24	—	1.57	1.97	6.69	7.87	1.97	4.68	
30	10.98	16.89	18.46	14.92	9.88	12.24	—	0.87	1.97	6.69	7.87	1.97	4.68	

Note: For pump height (B1), see the CR(E), CRI(E), CRN(E) data booklet.

CR(E), CRN(E) 32, 45, 64, 90, 120, 150 (≤ 75 Hp), support for base plate and motor

Motor [Hp]	A	AA	AAA	AB	B	BB	C	D	H	L	X		
											CR(N)32 ANSI	CR(N)45, 64, 90 ANSI	CR(N)120, 150 ANSI
5	7.52	14.57	16.93	10.83	5.51	7.09	—	6.93	11.42	2.36	8.36	6.98	—
7.5	8.50	15.55	17.91	11.81	7.09	8.66	—	6.18	11.42	2.36	8.36	6.98	—
10	8.50	15.55	17.91	11.81	7.09	8.66	—	6.18	11.42	2.36	8.36	6.98	—
15	10.00	17.91	20.28	13.39	10.04	12.20	—	5.16	11.42	2.36	8.36	6.98	—
20	10.00	17.91	20.28	13.39	10.04	12.20	—	5.16	11.42	2.36	8.36	6.98	5.36
25	11.02	19.09	21.46	14.37	11.02	13.39	—	4.41	11.42	2.36	8.36	6.98	5.36
30	11.02	19.09	21.46	14.37	11.02	13.39	—	4.41	11.42	2.36	8.36	6.98	5.36
40	11.02	19.09	21.46	14.37	11.02	13.39	—	4.41	11.42	2.36	8.36	6.98	5.36
50	12.52	21.26	23.62	16.14	12.01	14.37	—	3.43	11.42	2.36	8.36	6.98	5.36
60	14.02	22.83	25.20	17.72	12.28	14.65	—	2.40	11.42	2.36	8.36	6.98	5.36
75	14.02	22.83	25.20	17.72	12.28	14.65	—	2.40	11.42	2.36	—	—	5.36

Note: For pump height (B1), see the CR(E), CRI(E), CRN(E) data booklet.

CR, CRN 120, 150 (100 Hp), support for base plate and motor

Motor [Hp]	A	AA	AAA	BB	C	D	H	L	X	
									CR(N)120, 150 ANSI	
100	12.24	13.74	16.65	3.50	—	1.42	11.42	2.36	5.36	

Note: For pump height (B1), see the CR(E), CRI(E), CRN(E) data booklet.

Horizontal Mounting Kits

Material Number	Description
91134594	Horizontal mount kit CR1s, 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
91136740	Horizontal mount kit LACR(N), 182/184TC
91136741	Horizontal mount kit LACR(N), 213/215TC
91136742	Horizontal mount kit LACR(N), 254/256TC
91136743	Horizontal mount kit LACR(N), 284/286TSC
91136744	Horizontal mount kit LACR(N), 324/326TSC
91136745	Horizontal mount kit LACR(N), 364/365TSC

Horizontal end-suction pumps



Fig. 52 Horizontal end-suction pumps

CR(E)H, CRN(E)H 60 Hz

CRH, CRIH, CRNH 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 pipework.

Pump dimensions comply with the ANSI/ASME B73.1 standard and ensure interchangeability with traditional end-suction pumps with axial suction port and radial center-line discharge port. This makes the CRH a high-efficiency solution designed for ANSI-specified applications. The back pull-out design enables service of most versions without removing the base from the pipework.

CRH, CRIH, CRNH pumps are suitable for a variety of applications from pumping of potable water to pumping of chemicals. The pumps are therefore used in a wide variety of pumping systems where the performance and material of the pump meet specific demands.

Energy efficiency

To reduce loss and thus increase the pump efficiency, CRH, CRIH, CRNH pumps are available in an energy-optimized version with suction and discharge ports with a larger diameter than ANSI specifications.

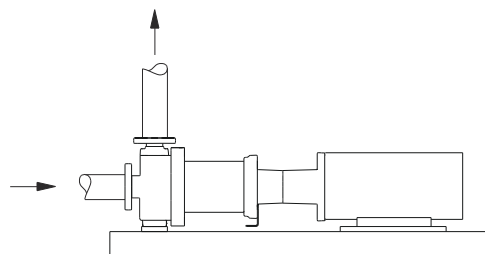
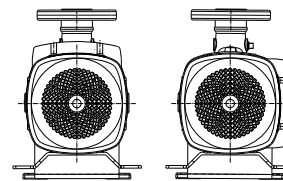


Fig. 53 CRH pump with axial suction port and radial discharge port

Max. pressure: 435 psi.
 Max. liquid temperature: 248°F (air-cooled top 356°F)
 (oil 464°F).
 Max. motor size: 60 Hp.

Terminal box positions



NEMA motor

Pump type	1	1s	3	5	10	15	20	32	45	64	90	120	150
CRH	•	•	•	•	•	•	•	•	•	•	•	•	•
CRNH	•	•	•	•	•	•	•	•	•	•	•	•	•

Dimensions of CRH pumps with NEMA motors, see WebCAPS.

Variants

The same variants and accessories are available for the CRH, CRIH, CRNH pump range as for the standard CR pump range.

Construction

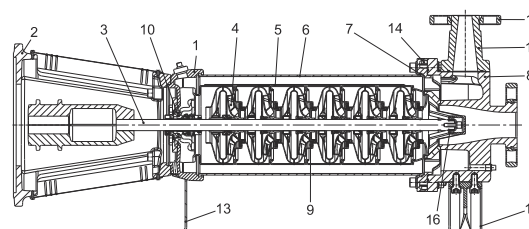


Fig. 54 Sectional drawing

Pos.	Designation	Pos.	Designation
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	Discharge port
8	Base	16	Bottom bearing ring

Belt-driven pumps



Fig. 55 Belt-driven CR pump

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

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

Pump range

These Grundfos pumps are available as belt-driven pumps:

Pump type	Belt-driven CR pumps												
	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR	●	●	●	●	●	●	●	●	●	●	●		
CRI	●	●	●	●	●	●	●						
CRN	●	●	●	●	●	●	●	●	●	●	●		

● Available.

CRT 2, 4, 8 and 16 pumps are also available as belt-driven pumps.

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: The pulley is not supplied with the pump.

By means of 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.

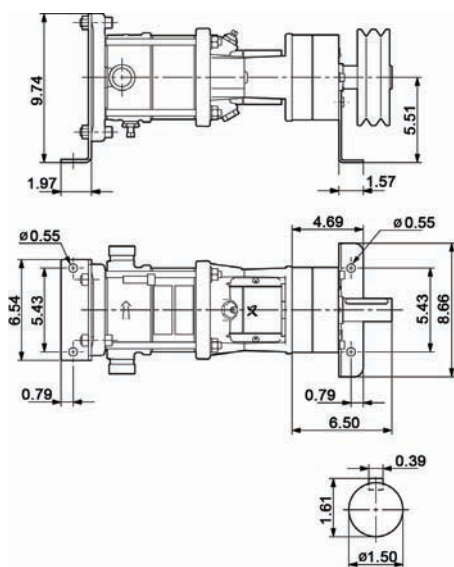
The pulley head is positioned on the motor stool where the motor would normally be fitted. Size and select the CR pumps from the CR 50 Hz. performance curves.

For extended bearing life, we recommend these pulley wheel sizes:

	Type III	Type IV	Type II	Type I
Pulley head	0.5 - 7.5 [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, 90	
Pulley wheel diameter	Ø4.41 - 5.31	Min. Ø7.87	Min. Ø6.30	Min. Ø7.87
V-belts	2	Min. 3	Min. 2	Min. 3
Pump speed [RPM]	Max. 3000 RPM			

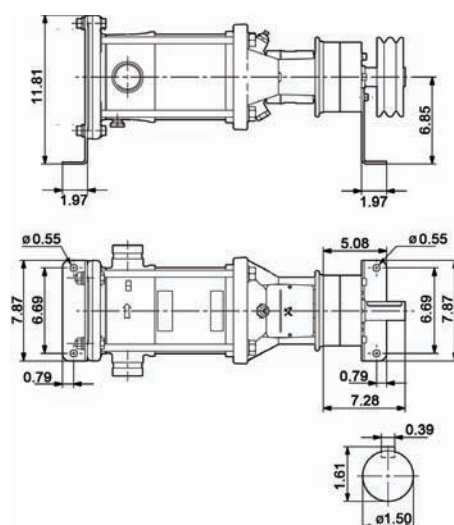
Dimensional drawings

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



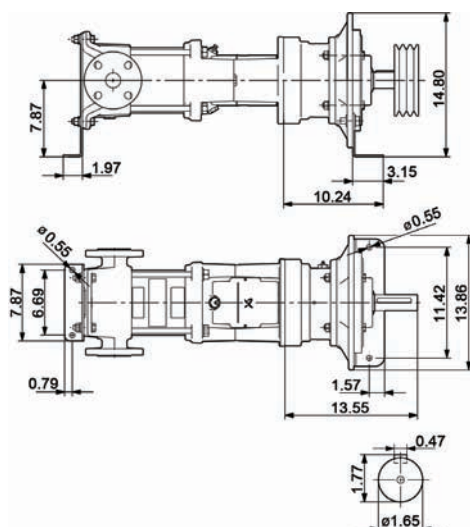
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CR, CRI, CRN 10, 15 and 20 (type III)



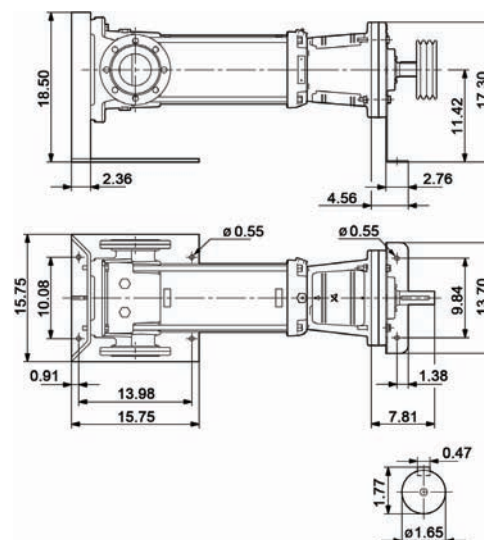
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CR, CRI, CRN 10, 15 and 20 (type IV)



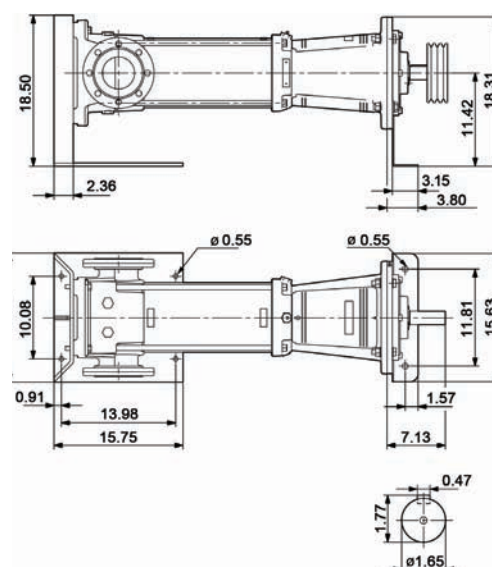
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CR, CRN 32, 45, 64 and 90 (type II)



TM05 7341 0913

CR, CRN 32, 45, 64 and 90 (type I)



TM05 7342 0913

Pump rubber parts

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

EPDM

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

- Good mechanical properties at low temperatures
- Resistant to water up to 248°F
- 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.

- Poor mechanical properties at low temperature
- Resistant to water up to 194°F
- 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.

- Good mechanical properties
- Resistant to water up to 302°F
- 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 gasses 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 fluorized rubber, with excellent resistance to hot water and steam.

- Elastic seal material
- Temperature range: 14°F to 356°F
- 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 industry
 - the aviation and space industry
 - mechanical engineering
 - refineries

Pump type	Rubber material			
	EPDM	FKM	FFKM	FXM
CR, CRI, CRN 1s, 1, 3, 5	●	●	●	●
CR, CRI, CRN 10, 15, 20	●	●	●	●
CR, CRN 32, 45, 64, 90	●	●	● ¹⁾	
CR, CRN 120, 150	●	●		

● Available.

¹⁾ These pumps are fitted with FXM sleeve gaskets. All other rubber parts are of FFKM.

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	—	±	+	—

Legend

Symbol	Meaning
+	Suitable
±	Suitable under certain conditions
—	Not suitable

Empty chambers

We offer customized pumps with empty chambers designed to meet your specific duty point!

CR pumps with a predefined number of chambers are selected from the standard range. We offer pumps with empty chambers for the following pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRI(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRN(E)	•	•	•	•	•	•	•	•	•	•	•	•	•

- Available.

Note: CRT(E) 2, 4, 8 and 16 are also available as customized pumps with empty chambers.

Support bearings

We offer customized pumps with support bearings of bronze for these pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)								•	•	•	•		
CRI(E)								•	•	•	•		
CRN(E)								•	•	•	•		

- Available.

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, 90	Silicon carbide/Graflon/tungsten carbide Graflon/tungsten carbide

We offer customized rubber parts (Flouraz and Kalrez) for these pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRI(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRN(E)	•	•	•	•	•	•	•	•	•	•	•	•	•

- Available.

Pump head positions

The pump head is mounted so that the air vent screw is in line with the discharge port as standard.

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

Note: The air vent of horizontal pumps must always point upwards.

Dry-running protection

LiqTec



GR9415

Fig. 56 LiqTec dry-running protection device

The Grundfos LiqTec immediately turns off power to the motor relay in these cases:

- There is no liquid in the pump.
- The liquid temperature exceeds $266^{\circ}\text{F} \pm 9^{\circ}\text{F}$.
- 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, however, also be used externally.

The LiqTec sends a heat impulse through the sensor and measures the temperature of the sensor. Liquid in the pump cools the sensor.

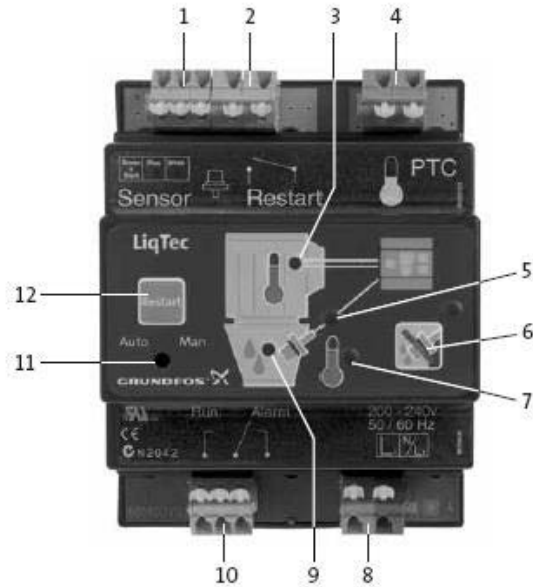
If there is no liquid present, the LiqTec detects a high temperature in the sensor and turns off the pump motor immediately to prevent damage.

The LiqTec also prevents excessive liquid temperatures from damaging the pump. If the LiqTec senses a liquid temperature above 266°F , it turns off the pump motor immediately. The 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 of the pump motor 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 LiqTec turns off the pump motor.



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Fig. 57 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". The 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
Max. pressure	580 psi
Min./max. liquid temperature	-4 °F/248°F
Max. ambient temperature	122°F
Humidity	99 %
Enclosure class	IPX0
Pumped liquid	Any water-based liquid handled by Grundfos pumps
Cable length	16.4 ft.

¹⁾ 49.2 ft. cable is available on request.

Connections – Standard Pipe Connections on CR(E), CRI(E), CRN(E) pumps

Oval Connection (CR)



Oval Connection (CRI)



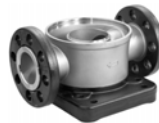
Oval Connection (NPT)

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•						
CRI(E)	•	•	•	•	•	•	•						
CRN(E)													

ANSI Connection (CR)



ANSI Connection (CRI, CRN)



ANSI Connection

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•						

Victaulic Connection (CRN)



Victaulic Connection

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)													
CRN(E)	•	•	•	•	•	•	•						

The ANSI Connection pumps have DIN Connection as standard for these pump types

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•									
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•						

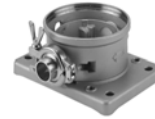
The ANSI Connection pumps have JIS Connection as standard for these pump types

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•						
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•						

Pipe Connections available upon request for CR(E), CRI(E), CRN(E) Pumps

CR pumps with TriClamp connection

TriClamp Connections (CRI, CRN)



A base with TriClamp connection is a sanitary coupling for use in the pharmaceutical and food and beverage industry.

A set consists of one clamping ring, one gasket and one pipe stub.

The connection is in accordance with EN/DIN 32676.

Dimensions

All dimensions are in inches.

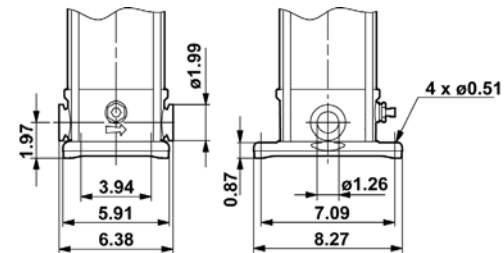


Fig. 58 TriClamp connection for CRI, CRN 1s, 1, 3 and 5

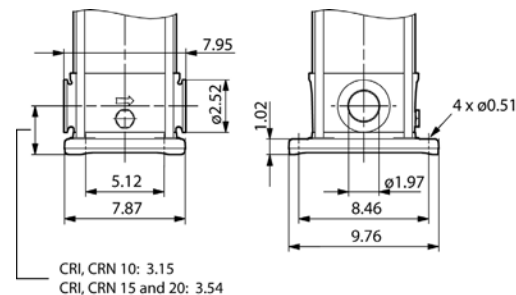
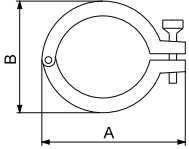
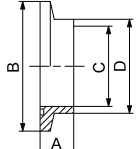
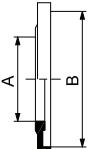


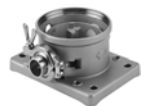
Fig. 59 TriClamp connection for CRI, CRN 10, 15 and 20

		Clamping ring		Pipe Stub				Gasket	
									
		TM03 4645 2406		TM03 4646 2406				TM03 4647 2406	
Pump type	Nominal diameter	A	B	A	B	C	D	A	B
CRI(E), CRN(E) 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			32.0	36.0	32.2	
CRI(E), CRN(E) 10, 15, 20	51.0	104.4	74.0			64.0	48.6	48.0	
	50.0	123.0	75.0			65.0	50.0	50.2	

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.

Connection	Pump type	Pipework connection	Connection material	Gaskets	Pressure [psi]	Coupling sets required	Product number	
	GR5840 CRI(E), CRN(E) 1, 3, 5	1 1/2"	Stainless steel	PTFE	232	2	96515375	
				EPDM	725	2	96515374	
				PTFE	232	2	97549395	
				EPDM	725	2	97549397	
	GR5840 CRI(E), CRN(E) 10, 15, 20	2"		PTFE	232	2	96515377	
				EPDM	725	2	96515376	

We offer TriClamp connections for these pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)	●	●	●	●	●	●	●						
CRN(E)	●	●	●	●	●	●	●						

● Available.

CR pumps with oval connection (NPT)

A base with oval connections is designed for use in a wide range of industrial applications.

Oval Flanges (CRN)



Dimensions

All dimensions are in inches.

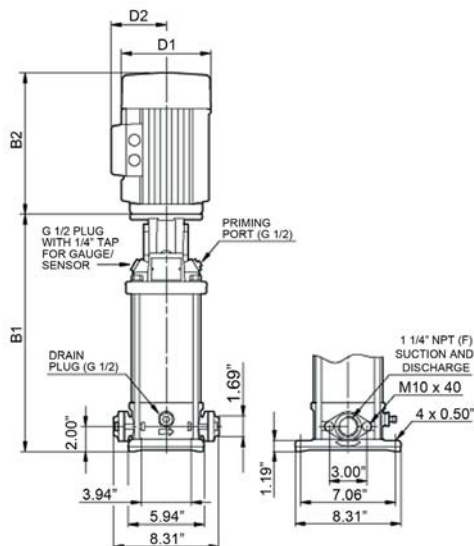


Fig. 60 CRN1S - CRN3

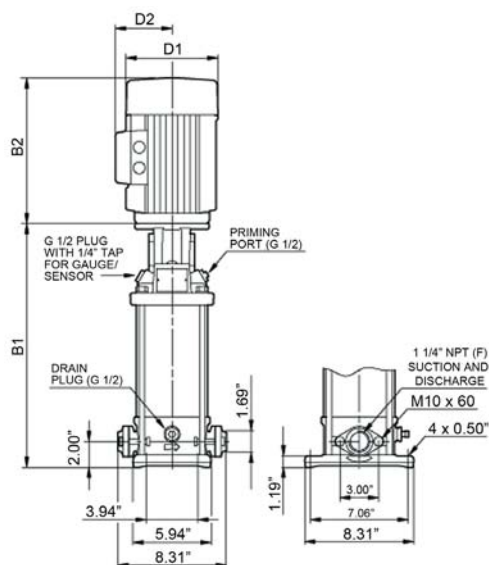


Fig. 61 CRN5

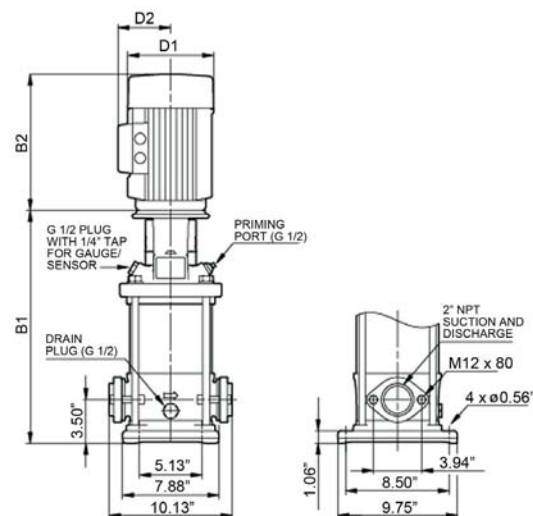


Fig. 62 CRN10 - CRN20

We offer oval connections for these pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)													
CRN(E)	•	•	•	•	•	•	•						

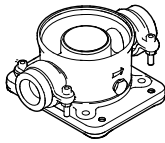
TM05 8880 0713

TM05 8881 0713

TM05 8882 0713

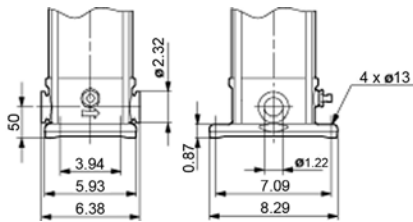
CR pumps with union and clamp connection

Union and Clamp Connection
(CRI, CRN)



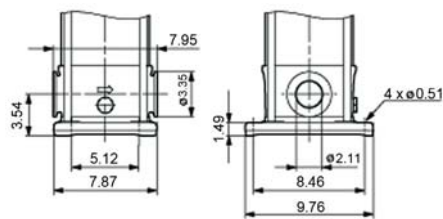
Dimensions

All dimensions are in inches.



TM05 8883 0713

Fig. 63 Union and clamp connection for CRI, CRN 1s, 1, 3 and 5



TM05 8884 0713

Fig. 64 Clamp connection for CRI, CRN 10, 15 and 20

Clamp connection – internal NPT thread

Pump type	Nominal diameter	Socket	
		A	B
CRI(E), CRN(E) 1s, 1, 3, 5	1" NPT	.90	2.32
	1 1/4" NPT	.90	2.32
CRI(E), CRN(E) 10, 15, 20	1.5" NPT	1.12	3.50
	2" NPT	1.12	3.50

TM05 8886 0713

We offer union connections for these pump types:

Clamp connection (internal NPT thread)

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•						

Union connection – external NPT thread

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

TM05 8885 0713

We offer clamp connections for these pump types:

Union connection (external NPT thread)

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)	•	•	•	•									
CRN(E)	•	•	•	•									

CR pumps with connection 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 mm.

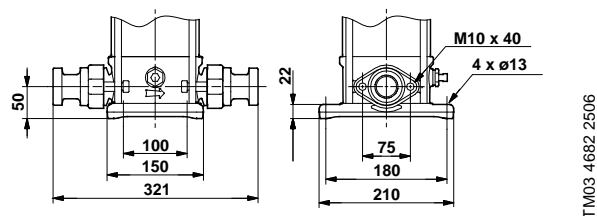


Fig. 65 Connection to EN/DIN 11851 for CRI, CRN 1s, 1, 3 and 5

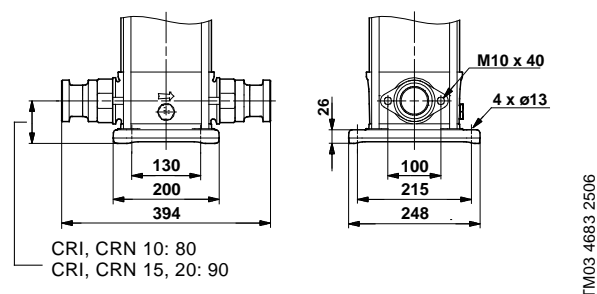


Fig. 66 Connection to EN/DIN 11851 for CRI, CRN 10, 15 and 20

Pump type	Pipework 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 these pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)													
CRN(E)	•	•	•	•	•	•	•						

• Available.

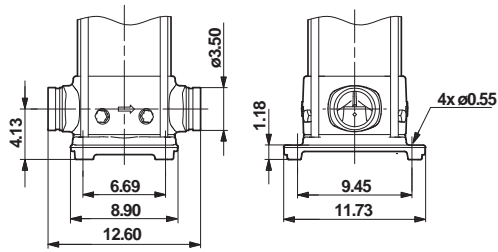
CR pump with PJE coupling

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.

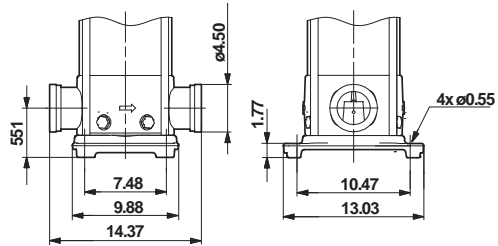
Dimensions

All dimensions are in inches.



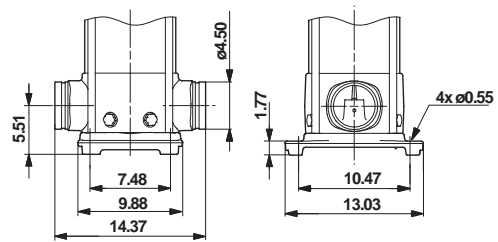
TM03 4719_US 0113

Fig. 67 PJE coupling for CRN 32



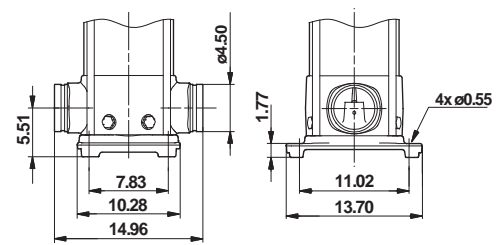
TM03 4720_US 0113

Fig. 68 PJE coupling for CRN 45



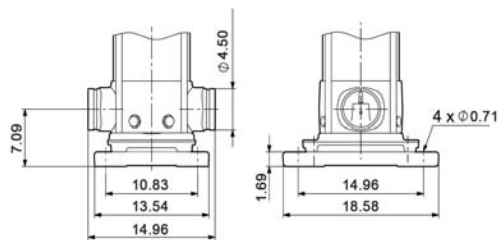
TM03 4721_US 0113

Fig. 69 PJE coupling for CRN 64





TM03 4722_US 0113

Fig. 70 PJE coupling for CRN 90



TM04 4558_US 0113

Fig. 71 PJE coupling for CRN 120 and 150

Part	Designation	Designed for pump type	Size	Product number
	TM00 3712 0894 Victaulic type 77 coupling 3" 4"	CRN 32	3" (NBR seal)	00ID7664
		CRN 45, 64, 90, 120, 150	4" (NBR seal)	96415463
	TM00 3709 0894 Victaulic coupling liner for welding	CRN 32	3" 316 SS	00150574
		CRN 45, 64, 90, 120, 150	4" 316 SS	96416743

We offer PJE couplings for these pump types:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)													
CRN(E)								•	•	•	•	•	•

- Available.

Note: PJE connections are available on CRN, 1s, 1, 3, 5, 10, 15 and 20 pumps as standard.

We also offer these connections:

Oval Connection (Rp)

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•						
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•						

DIN Connection (DN) or JIS Connection

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•	•	•	•	•	•	•

Union (+GF+) Connection

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•						

Clamp Coupling (L-Coupling) Connection

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)													
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•						

For further information about connections, see these data booklets:

- CR, CRI, CRN, CRE, CRIE, CRNE
- CR, CRN high pressure
- CRT, CRTE.

All data booklets are available in WebCAPS.
See page 117.

10. Certificates

CR pumps with certificates

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

Examples:

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

Note: The certificates must be ordered with the pump.

These pumps are available with certificates:

Pump type	1s	1	3	5	10	15	20	32	45	64	90	120	150
CR(E)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRI(E)	•	•	•	•	•	•	•						
CRN(E)	•	•	•	•	•	•	•	•	•	•	•	•	•

- Available.

Note: Certified and approved CRT(E) 2, 4, 8 and 16 pumps are also available.

Certificates

Certificate	Description
Certificate of compliance with the order	According to EN 10204, 2.1. Grundfos document certifying that the pump supplied is in compliance with the order specifications.
Test certificate. Non-specific inspection and testing	According to EN 10204, 2.2. Certificate with inspection and test results of a non-specific pump.
Inspection certificate 3.1	Grundfos document certifying that the pump supplied is in compliance with the order specifications. Inspection and test results are mentioned in the certificate.
Inspection certificate	Grundfos document certifying that the pump supplied is in compliance with the order specifications. Inspection and test results are mentioned in the certificate. Certificate from the surveyor is included. We offer the following inspection certificates: <ul style="list-style-type: none"> • Lloyds Register of Shipping (LRS) • Det Norske Veritas (DNV) • Germanischer Lloyd (GL) • Bureau Veritas (BV) • American Bureau of Shipping (ABS) • Registro Italiano Navale Agenture (RINA) • China Classification Society (CCS) • Russian maritime register of Shipping (RS) • Biro Klassifikasio Indonesia (BKI) • United States Coast Guard (USCG) • Nippon Kaiji Koykai (NKK)
Standard test report	Certifies that the main components of the specific pump are manufactured by Grundfos, and that the pump has been QH-tested, inspected and conforms to the full requirements of the appropriate catalogues, drawings and specifications.
Material specification report	Certifies the material used for the main components of the specific pump.
Duty-point verification report	Certifies a test point specified by the customer. 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	Vibration report indicating the values measured during the performance test of the specific pump according to ISO 10816.
Motor test report	Shows the performance test of the specific motor, including power output, current, temperature, stator windings resistance and insulation test.
Cleaned and dried pump	Confirms that the specific pump has been cleaned and dried, and how it was done.
Electropolished pump	Confirms that the specific pump has been electropolished. The maximum surface roughness is specified in the report.
ATEX-approved pump	Confirms that the specific pump is ATEX-approved according to the EU directive 94/9/EC, the "ATEX directive".

See examples of the certificates on pages 56 to 59.

Note: Other certificates are available on request.

Examples of certificates

Certificate of compliance with the order

BE > THINK > INNOVATE >

GRUNDFOS

Certificate of compliance with the order

EN 10204 2.1

Customer name	
Customer order no.	
Customer Tag no.	
GRUNDFOS order no.	
Product type	

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and/or specifications relative thereto.

GRUNDFOS

Date:

Signature:

Name:

Dept.:

Part no. 96 50 78 95/1001002

TM03 4165 1706

Test certificate

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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 type		Part number
Motor make		Part number
Flow	m ³ /h	
Head	m	
Power P2	kW	
Voltage	V	
Frequency	Hz	
Full load current	A	
Motor speed	min ⁻¹	

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and / or specifications relative thereto.

GRUNDFOS

Date:

Signature:

Name:

Dept.:

Part no.96 50 78 96/1001002

TM03 4163 1706

Inspection certificate 3.1

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GRUNDFOS

Inspection certificate.

EN 10204 3.1

Manufactured by	
GRUNDFOS order no.	
GRUNDFOS DUT id.	
Customer order no.	
Customer name and address	
Shipyard / factory	
Ship / new building	
Customer TAG no.	
Classifying society	GRUNDFOS authorized department

Pump	Motor
Pump type	Make
Part number	Part number
Serial no.	Serial No.
Flow rate (m ³ /h)	P2 (kW)
Head (m)	Voltage (V)
Max. ope. P/t (bar / °C)	Current (A)
	n(min ⁻¹)
Base/Pump head cover	Frequency (Hz)
Impeller/guide vanes	Insulation class
Shaft/sleeve	Power factor

Customer's requirements	
Flow rate (m ³ /h)	Head (m)

Test result ref. requirements				
Q(m ³ /h)	H(m)	n(min ⁻¹)	I(A)	P1(kW)
Hydrostatic test	Bar – no leaks or deformation observed			

GRUNDFOS

Date:

Signature:

Name:

Dept.:

Part no. 96 50 78 97/1014345

TM03 4162 3607

Inspection certificate

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GRUNDFOS

Inspection certificate.

Russian Maritime Register of Shipping

Manufactured by	
GRUNDFOS order no.	
GRUNDFOS DUT id.	
Customer order no.	
Customer name and address	
Shipyard / factory	
Ship / new building	
Customer TAG no.	
Classifying society	Russian Maritime Register of Shipping (RS)

Pump	Motor
Pump type	Make
Part number	Part number
Serial no.	Serial No.
Flow rate (m ³ /h)	P2 (kW)
Head (m)	Voltage (V)
Max. ope. P/t (bar / °C)	Current (A)
Service	n(min ⁻¹)
Medium	Frequency (Hz)
Base/Pump head cover	Insulation class
Impeller/guide vanes	Power factor
Shaft/sleeve	

Customer's requirements	
Flow rate (m ³ /h)	Head (m)

Test result ref. requirements				
Q(m ³ /h)	H(m)	n(min ⁻¹)	I(A)	P1(kW)
Hydrostatic test	Bar – no leaks or deformation observed			
The pump has been marked				

Surveyor signature:

Tested date:

GRUNDFOS

Date:

Signature:

Name:

Dept.:

Part no.96 50 78 25/1014342

TM03 4156 3607

Standard test report

BE THINK INNOVATE		GRUNDFOS
Standard test report		
Customer name		
Customer order no.		
Customer Tag no.		
GRUNDFOS order no.		
Product type		
GRUNDFOS DUT id.		
Part number		
<p>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.</p> <p>The attached test result is from the above mentioned pump.</p>		
GRUNDFOS Date: Signature: Name: Dept.:		
Part no. 96 50 79 30 P01 /A72775		

TM03 4143 1706

Material specification report

BE THINK INNOVATE		GRUNDFOS
Material specification report.		
Customer name		
Customer order no.		
Customer TAG no.		
GRUNDFOS order no.		
Pump type		
GRUNDFOS DUT id.		
Part number		
Production code		
Pump	Materials	DIN W.-Nr. / AISI / ASTM
Pump head		
Pump head cover		
Shaft		
Impeller		
Chamber		
Outer sleeve		
Base		
<p>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.</p>		
GRUNDFOS Date: Signature: Name: Dept.:		
Part no 96 50 79 28/A72775		

TM03 4150 1706

Duty point verification report

BE THINK INNOVATE		GRUNDFOS
Duty point verification report		
Customer name		
Customer order no.		
Customer Tag no.		
GRUNDFOS order no.		
Product type		
GRUNDFOS DUT id.		
Part number		
<p>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.</p>		
GRUNDFOS Date: Signature: Name: Dept.:		
Part no. 96 53 96 99 /A72775		

TM03 4148 1706

Surface-roughness

BE > THINK > INNOVATE >

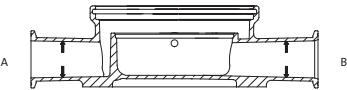
GRUNDFOS

Surface roughness

According to ISO 1302

Customer name	
Customer order no.	
Customer TAG no.	
GRUNDFOS order no.	
Pump type	
GRUNDFOS DUT id.	
Part number	
CRN base part number	

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



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.:

Part no 96 50 79 31/A72775

TM03 4147 3607

Vibration report

BE > THINK > INNOVATE >

GRUNDFOS

Vibration report

According to ISO 10816

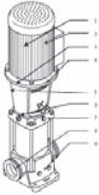
Customer name	
Customer order no.	
Customer TAG no.	
GRUNDFOS order no.	
GRUNDFOS DUT id.	

Measured object	
Pump type	Part number
P2 (kW)	Frequency (Hz)
Number of poles	Serial no.

Test conditions	
The pump is floor-mounted on vibration absorbers.	Voltage (V)
	Flow (m³/h)
	Head (m)
	For vibration velocity measurement positions, see figure.

Remarks	
---------	--

Result of measurement:



Pos	RMS vibration velocity (mm/s)
1	0.25
2	0.45
3	0.71
4	1.12
5	1.8
6	2.8
7	4.5
8	7.1
9	11.2

RMS vibration velocity (mm/s)	Class I	Class II
0.25	A	A
0.45		
0.71		
1.12	B	B
1.8		
2.8	C	C
4.5		
7.1	D	D
11.2		
18		
28		
45		

The machine classifications are as follows:

Class I: Individual parts of engines and machines, integrally connected to the complete machine in its normal operating condition. (Production electrical motors of up to 25 kW are typical examples of machines in this category.)

Class II: Medium-sized machines (typically electrical motors with 25 kW to 75 kW output) without special foundations, rigidly mounted engines or machines (up to 300 kW) on special foundations.

GRUNDFOS

Date:

Signature:

Name:

Dept.:

Part no 96 50 79 32/A72775

TM03 4167 1706

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. 96 50 79 33 /A72775

TM03 4146 1706

Cleaned and dried pump

BE > THINK > INNOVATE >

GRUNDFOS

Cleaned and dried pump

Customer name	
Customer order no.	
Customer TAG no.	
GRUNDFOS order no.	
Pump type	
GRUNDFOS DUT id.	
Part number	
Production code	

GRUNDFOS hereby confirms that the pump mentioned above is manufactured according the specifications mentioned in the "CR, CRI, CRN Custom-built pumps" data booklet. This means that prior to assembly, pump components are washed in pure, hot soap 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.:

Part no 96 50 79 34/A72775



TM03 4145 1706

Electropolished pump

BE > THINK > INNOVATE >		GRUNDFOS																	
Electro-polished pump																			
Customer name																			
Customer order no.																			
Customer TAG no.																			
GRUNDFOS order no.																			
Pump type																			
GRUNDFOS DUT id.																			
Part number																			
Production code																			
<p>Grundfos hereby confirms that the pump mentioned above is manufactured according to the specifications mention in the "CR, CRI, CRN Custom-built pumps" data booklet. This means that prior to assembly, pump components are electro-polished in a mixture of sulphuric acid and phosphoric acid. Finally the components are passivated in nitric acid.</p> <p>The CRN1s, 1, 3, 5, 10, 15, and 20 casted parts are all mechanically polished before being electropolished.</p> <p>The pump will then obtain following surface roughness;</p> <table border="1"> <thead> <tr> <th>Pump type</th> <th>Stainless steel casted parts</th> <th>Stainless steel plate and other non casted parts</th> <th>Surface roughness (µm)</th> </tr> </thead> <tbody> <tr> <td>CRN1s, 1, 3, 5</td> <td>*</td> <td>*</td> <td>equal to or below 0,8</td> </tr> <tr> <td>CRN10, 15, 20</td> <td>*</td> <td>*</td> <td>equal to or below 0,8</td> </tr> <tr> <td>CRN32, 45, 64, 90</td> <td>*</td> <td>*</td> <td>between 10 – 15 equal to or below 0,8</td> </tr> </tbody> </table>				Pump type	Stainless steel casted parts	Stainless steel plate and other non casted parts	Surface roughness (µm)	CRN1s, 1, 3, 5	*	*	equal to or below 0,8	CRN10, 15, 20	*	*	equal to or below 0,8	CRN32, 45, 64, 90	*	*	between 10 – 15 equal to or below 0,8
Pump type	Stainless steel casted parts	Stainless steel plate and other non casted parts	Surface roughness (µm)																
CRN1s, 1, 3, 5	*	*	equal to or below 0,8																
CRN10, 15, 20	*	*	equal to or below 0,8																
CRN32, 45, 64, 90	*	*	between 10 – 15 equal to or below 0,8																
<p style="text-align: right;">GRUNDFOS Date: _____ Signature: _____ Name: _____ Dept.: _____</p>																			
Part no 96 50 79 35/A72773																			

TM03 4144 1706

ATEX-approved pump

BE > THINK > INNOVATE >		GRUNDFOS	
ATEX-approved pump			
			
Customer name			
Customer order no.			
Customer TAG no.			
GRUNDFOS order no.			
Pump type			
GRUNDFOS DUT id.			
Part number			
Production code			
Pump serial no.			
Motor serial no.			
ATEX approval of pump			
Technical file no.	96499604		
<p>GRUNDFOS hereby confirms that the pump mentioned above is manufactured according the ATEX directive. This means the pump is conformity with the ATEX 94/9EEC (ATEX 100) appendix VIII directive as mentioned in the "ATEX Supplement to installation and operating instructions" supplied with the pump.</p>			
<p style="text-align: right;">GRUNDFOS Date: _____ Signature: _____ Name: _____ Dept.: _____</p>			
Part no 96 53 22 40/A72773			

TM03 4166 1706

11. CRE pump solutions



GR9033

Fig. 72 Motors for CRE, CRIE, CRNE, CRTE pumps

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

We offer the following CRE pump solutions:

- CRE pump with extended functional module
- customized CRE pump solutions.

CRE pumps are not dependent on the frequency of the supply voltage and are designed for operation at frequencies between 750 min^{-1} and 6000 min^{-1} .

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. Ball bearing configuration can also be altered to fit load and demands.

CRE pump with extended functional module

CRE pumps with extended functional module enable the control of more than one parameter, such as pressure, differential pressure, temperature, differential temperature or flow rate.

CRE, CRIE, CRNE, CRTE pumps are equipped with these parts as standard:

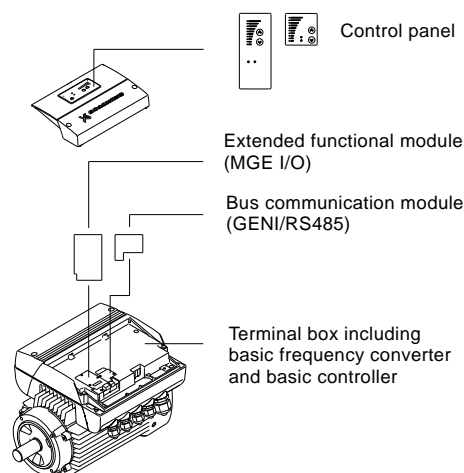
- a control panel on the terminal box front.
- a basic controller with one digital input for start/stop, one analog setpoint input, etc.
- a functional module with three digital inputs, one analog sensor input, one analog sensor output and 24 V supply.
- a GENIbus communication module.

See also page 62.

Note: If the GENIbus communication module is not required, we offer motors without the module.

The version is the same for CRE, CRIE, CRNE, CRTE pumps with and without sensor.

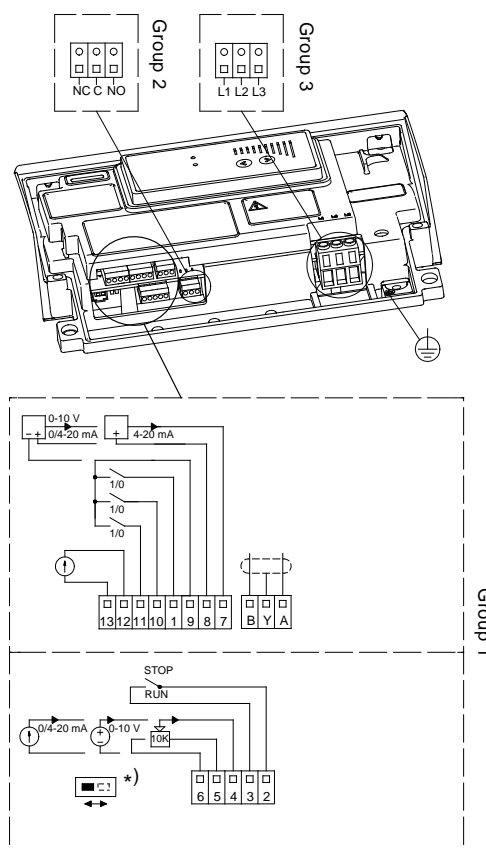
Figure 73 shows the hardware combination of a standard CRE pump with extended functional module.



TM03 8612 2007

Fig. 73 Hardware combination of a standard CRE pump

Figure 74 shows the terminal box of the motor containing a basic controller, an extended functional module and a GENIbus communication module.



TM02 9032 1504

Fig. 74 Customized CRE pump with extended functional module (1/2 - 30 Hp)

Key

Group No	Terminals	Description
1	Basic controller	
	2	Start/stop
	3	GND
	4	Setpoint input
	5	+10 V
	6	GND
	Functional module	
	13	GND
	12	Analog output (0-10 V)
	11	Digital input 4
	10	Digital input 3
	1	Digital input 2
	9	GND
	8	+24 V
	7	Sensor input
	GENIbus communication module	
	B	RS-485B
	Y	Screen
	A	RS-485A
2	Potential-free signal relay	
	NC, C, NO	Outputs for signal relay
3	Voltage supply	
	L1, N, PE:	Single-phase motor
	L1, L2, L3:	Three-phase motor

Customized CRE pump solutions

As an alternative to the other CRE pump solutions, we offer CRE pump solutions for your requirements!

It is possible to put together CRE pumps by selection/deselection:

- Selection of a multi-pump functional module, reduced functional module or other application-specific add-on cards.
- Note:** The motor can only contain one functional module.
- Selection/deselection of a GENIbus communication module. See also page 62.

Our CRE pump solutions make it possible to read in customized configuration files, the so-called gsc files, for optimum operation. The configuration files can be read into the motor during the final test at Grundfos, at start-up or in connection with service by means of Grundfos PC Tool products.

Note: When configuration files have been read in, it is still possible to make adjustments. They can be made by means of the R100 remote control, control panel or PC Tool products. See page 66.

Figure 75 shows the hardware combination of the motor for a customized CRE pump.

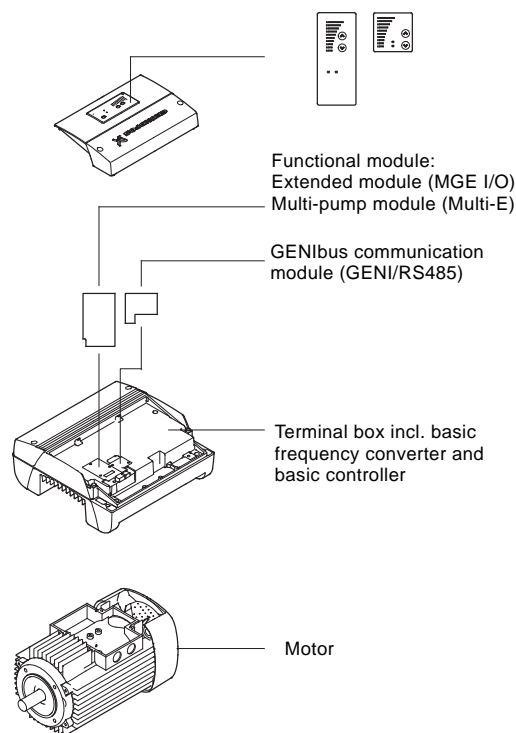


Fig. 75 Motor combination of customized CRE pumps

Control panel

The control panel on the front of the terminal box of the motor enables setpoint setting and communication.

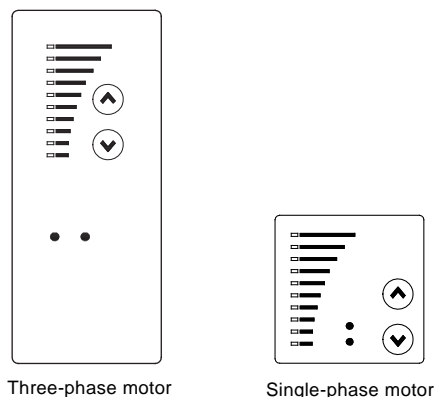


Fig. 76 Buttons ⬆ and ⬇ for manual setting of the setpoint of the pump

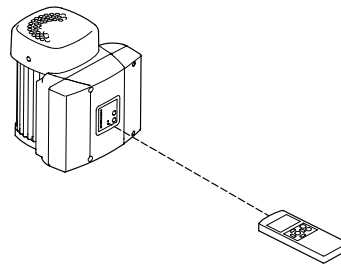
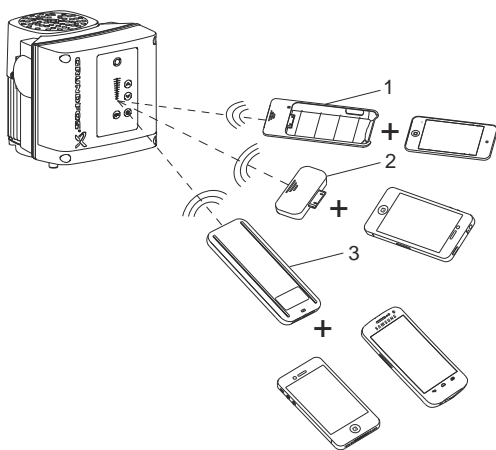


Fig. 77 Communication with the CRE pump by means of the R100 remote control

The R100 remote control is based on IR communication and is to be pointed at the control panel of the motor during communication. With the R100 it is possible to monitor and change settings of the CRE pump.

Grundfos GO Remote

The pump is designed for wireless radio or infrared communication with the Grundfos GO Remote. The Grundfos GO Remote enables setting of functions and gives access to status overviews, technical product information and actual operating parameters. The Grundfos GO Remote offers three different mobile interfaces (MI). See Fig. 78.



TM05 5383 4312

Fig. 78 Grundfos GO Remote communicating with the pump via radio or infrared light

Pos.	Description
1	Grundfos MI 201
2	Grundfos MI 202
3	Grundfos MI 301

MI 201

The MI 201 is a complete solution, consisting of an Apple iPod touch 4G and a Grundfos cover for infrared and radio communication with Grundfos pumps or systems.



TM05 3886 1712

Fig. 79 MI 201

Supplied with the product:

- Apple iPod touch 4G incl. accessories
- Grundfos MI 201 cover
- battery charger
- quick guide.

MI 202

The MI 202 is an add-on module with built-in infrared and radio communication. The MI 202 can be used in conjunction with Apple iPod Touch 4, iPhone 4 or later.



TM05 3887 1712

Fig. 80 MI 202

Supplied with the product:

- Grundfos MI 202
- quick guide.

MI 301

The MI 301 is a module with built-in infrared and radio communication. The MI 301 must be used in conjunction with an Android or iOS-based Smartphone with a Bluetooth connection. The MI 301 has rechargeable Li-ion battery and must be charged separately.



TM05 3890 1712

Fig. 81 MI 301

Supplied with the product:

- Grundfos MI 301
- battery charger
- quick guide.

Product numbers

Grundfos GO Remote variant	Product number
Grundfos MI 201	98140638
Grundfos MI 202	98046376
Grundfos MI 301	98046408

Supported units

Make	Model	Operating system	MI 201	MI 202	MI 301
Apple	iPod touch 4G	iOS 5.0 or later	•	•	•
	iPhone 4G, 4GS		-	•	•
HTC	Desire S	Android 2.3.3 or later	-	-	•
	Sensation	Android 2.3.4 or later	-	-	•
Samsung	Galaxy S II		-	-	•

Note: Similar Android and iOS-based devices may work as well, but are not supported by Grundfos.

GENIbus communication module

The GENIbus communication module enables communication in the following ways:

- internal bus communication between two or more Grundfos units (GENIbus-based network)
- external bus communication via a gateway between a Grundfos unit and an external unit, for instance a computer or superior control system (GENIbus to another network protocol).

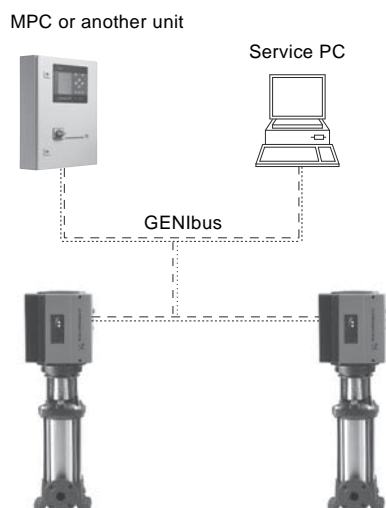


Fig. 82 Internal bus communication

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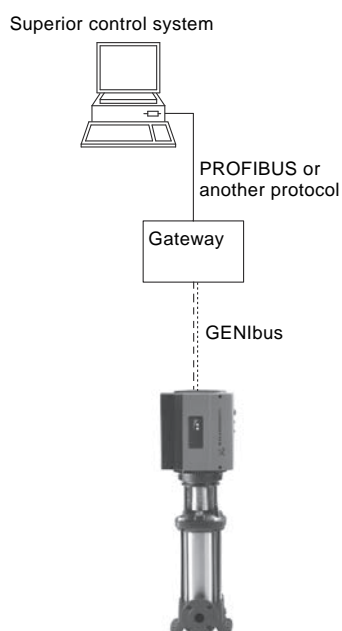


Fig. 83 External bus communication

Gateways can convert GENIbus to other bus protocols.

Bus protocol	Grundfos gateway solutions					Third-party gateway
	CIU/CIM					
	100	150	200	250	270	
LonMark [®]	x					Must support GENibus
PROFIBUS [®]		x				
ModBUS [®]			x			
Interbus S.						
GSM				x		
GRM ^{*)}					x	

^{*)} Grundfos Remote Monitoring. GRM makes it possible to access pump data on the web. Connection to GRM server is done via SMS or GPRS.

GENIbus is an open protocol which can be implemented into third-party SCADA systems. Contact Grundfos for documentation.

Possible functions

The table shows the possible functions of the individual functional modules.

Extended functional module	
Digital input 1	
Start/stop	•
Digital input 2, 3 and 4	
Start/stop	•
Deactivation of input (not active)	•
Maximum pressure	•
Minimum pressure	•
Reverse operation	•
Reset alarm	•
External fault	•
Flow switch	•
Emergency operation	•
Predefined speed	•
Analog output	
Deactivation of output (not active)	•
Actual speed	•
Actual sensor value	•
Actual setpoint value	•
Actual motor current	•
Actual motor load	•
Actual frequency	•

- The function is available.

Connection of signal transmitters to CRE, CRIE, CRNE, CRTE pumps

The functional module enables connection of a number of signal transmitters, such as:

- pressure sensors
- differential pressure sensors
- temperature sensors
- differential temperature sensors
- pH meters
- flow meters
- level sensors.

Any signal transmitters complying with the values and limits mentioned below may be connected to the pump.

Technical data

Inputs/output

Start/stop

External potential-free contact.

Voltage: 5 VDC.

Current: < 5 mA.

Screened cable: 0.25 - 1.5 mm² / 24-16 AWG.

Digital

External potential-free contact.

Voltage: 5 VDC.

Current: < 5 mA.

Screened cable: 0.25 - 1.5 mm² / 24-16 AWG.

Setpoint signals

• Potentiometer

0-10 VDC, 10 kΩ (via internal voltage supply).

Screened cable: 0.5 - 1.5 mm² / 20-16 AWG.

Maximum cable length: 100 m.

• Voltage signal

0-10 VDC, R_i > 50 kΩ.

Tolerance: + 0 %/- 3 % at maximum voltage signal.

Screened cable: 0.5 - 1.5 mm² / 20-16 AWG.

Maximum cable length: 100 m.

• Current signal

DC 0-20 mA/4-20 mA, R_i = 250 Ω.

Tolerance: + 0 %/- 3 % at maximum current signal.

Screened cable: 0.25 - 1.5 mm² / 24-16 AWG.

Maximum cable length: 500 m.

Sensor signals

• Voltage signal

0-10 VDC, R_i > 50 kΩ (via internal voltage supply).

Tolerance: + 0 %/- 3 % at maximum voltage signal.

Screened cable: 0.5 - 1.5 mm² / 20-16 AWG.

Maximum cable length: 100 m.

• Current signal

DC 0-20 mA/4-20 mA, R_i = 250 Ω.

Tolerance: + 0 %/- 3 % at maximum current signal.

Screened cable: 0.25 - 1.5 mm² / 24-16 AWG.

Maximum cable length: 500 m.

Internal power supplies

10 V power supply for external potentiometer:

Max. load: 2.5 mA.

Short-circuit protected.

24 V power supply for sensors:

Max. load: 40 mA.

Short-circuit protected.

Signal relay output

Potential-free changeover contact.

Maximum contact load: 250 VAC, 2 A, cos φ 0.3 - 1.

Minimum contact load: 5 VDC, 10 mA.

Screened cable: 0.5 - 2.5 mm² / 20-14 AWG.

Maximum cable length: 500 m.

Bus input

Grundfos bus protocol, GENibus protocol, RS-485.

Screened 3-core cable: 0.2 - 1.5 mm² / 28-16 AWG.

Maximum cable length: 500 m.

CRE pump operating at power limit

When a pump in operation is running at maximum output power (P_2) in the entire performance range from closed valve to maximum flow, it is said to be operating at power limit.

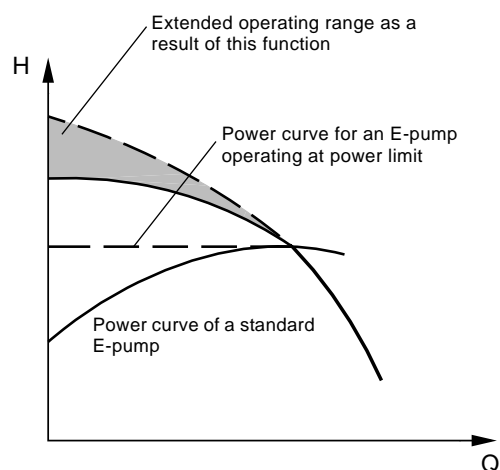


Fig. 84 Power curves of a standard pump and a pump operating at power limit

Purpose and benefits

This function utilizes the fact that often a standard E-pump does not load the MLE motor fully in the entire operating range. By controlling the MLE motor to always put out maximum power, irrespective of the load, it is now possible to extend the performance range of the pump without overloading the MLE motor. See Fig. 84.

In practice, this function provides these benefits:

- The pressure range of the pump can be increased at low flows without using a bigger motor, provided that the pump construction can handle the pressure.
- In some cases, the pump can be fitted with a smaller motor than the corresponding standard pump when the E-pump has a fixed operating range at low flows.

This function is available in these pump sizes:

Single-phase pumps	
2-pole [Hp]	4-pole [Hp]
0.50 - 1.5	0.33 - 1.0
-	-
Three-phase pumps	
2-pole [Hp]	
1.0 - 10	15 - 30
•	•

Applications

This function is most often used in applications with relatively low flow in relation to rated performance where at the same time the demanded maximum pressure corresponds to the maximum pressure that motor and pump can achieve.

Examples of application:

- washing and cleaning
- irrigation
- boiler feed.

Description

As mentioned in section *Purpose and benefits*, there are two primary fields of application for this function:

Increased pressure

Figure 85 illustrates the operating range of a standard 60 Hz E-pump with increased pressure range achieved by using the "pump operating at power limit" function.

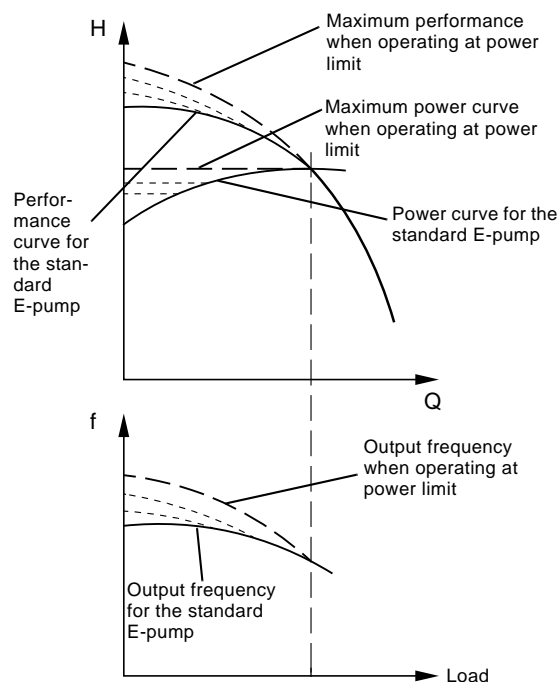


Fig. 85 Standard performance curve vs a performance curve with the "pump operating at power limit" function

The MLE motor is set to a higher speed (f_{max}) than the rated speed of the pump. This leads to a higher pressure at closed valve and low flow.

The pump will operate at a speed corresponding to the set frequency (f_{max}) until the pump reaches the flow where the motor is loaded to its full rated power. If the flow is increased further, the motor will reduce its speed so as not to exceed its rated power.

Note: The pump will be running at oversynchronous speed in the low-flow area which may alter the sound level.

Reduced motor size

Figure 86 shows the operating range of a standard 60 Hz pump where the "pump operating at power limit" function is used to optimize pump performance in relation to the motor size.

A pump operating at low flows and relatively high pressures (1) can be fitted with a smaller motor whose power matches this operating range. At higher flows and relatively lower pressures (2), the motor will reduce its speed when the power limit is exceeded and follow a steeper curve corresponding to the power available.

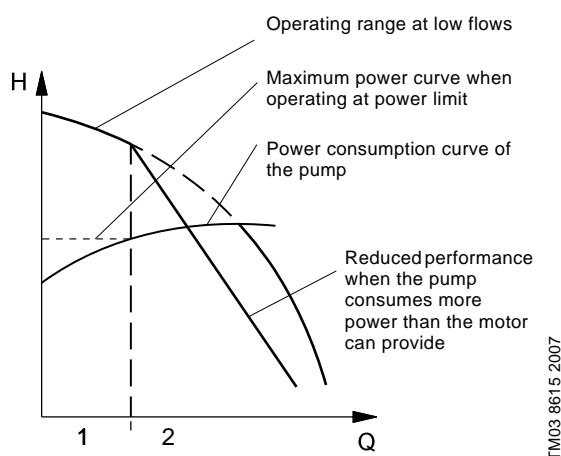


Fig. 86 Standard performance curve vs a curve operated at reduced power limit

Size of pump and MLE motor

No special considerations need to be taken when sizing pump and motor. If the pump is oversized for the motor, the MLE motor will just reduce its speed and thus the pump performance according to the illustration in Fig. 86.

Setup

The "pump operating at power limit" function can be set up via a configuration file downloaded to the product via the Grundfos PC Tool E-products.

Grundfos PC Tool E-products

Connection of a Grundfos PC Tool E-products offers a number of advantages during commissioning, operation and service of E-pumps.

The PC tool E-products enables these functions:

- monitoring of operational status of your E-product
- standard configuration of E-products
- custom configuration of E-products
- saving of logged data from E-products.

Via the PC Tool, it is possible to download special predefined configuration files (gsc files) to the pump. The configuration files may contain application-optimized operating parameters based on your specifications!

Note: When configuration files have been read in, it is still possible to make adjustments.

Description

The Grundfos PC Tool E-products is a common user platform/user interface used throughout the entire production process of an E-pump. Furthermore, PC Tool E-products can be used by the customer for setting up, commissioning and servicing the E-pump.

The Grundfos PC Tool E-products enable configuration or reconfiguration of your product to optimize it to exactly your application. And it is indispensable for fault finding and service.

The software for Grundfos PC Tool E-products must be ordered with the PC Tool Link package which contains hardware and cables. Contact Grundfos for further information.

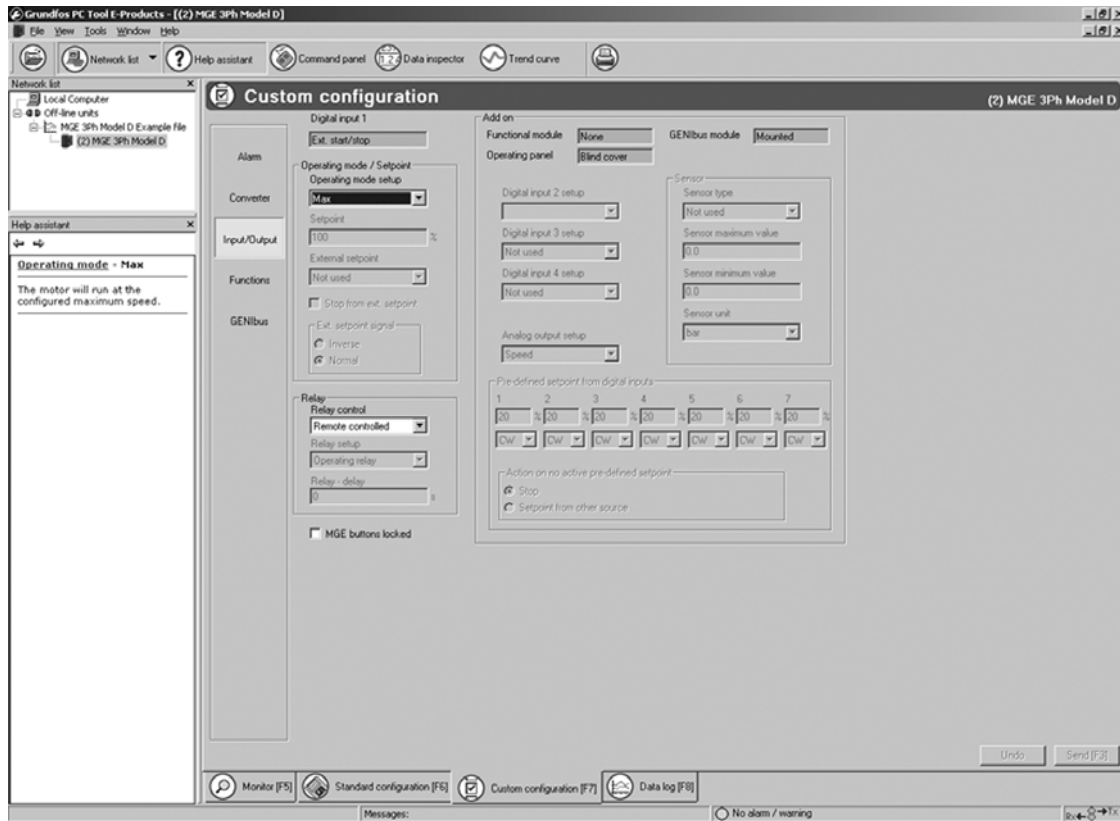


Fig. 87 PC Tool interface

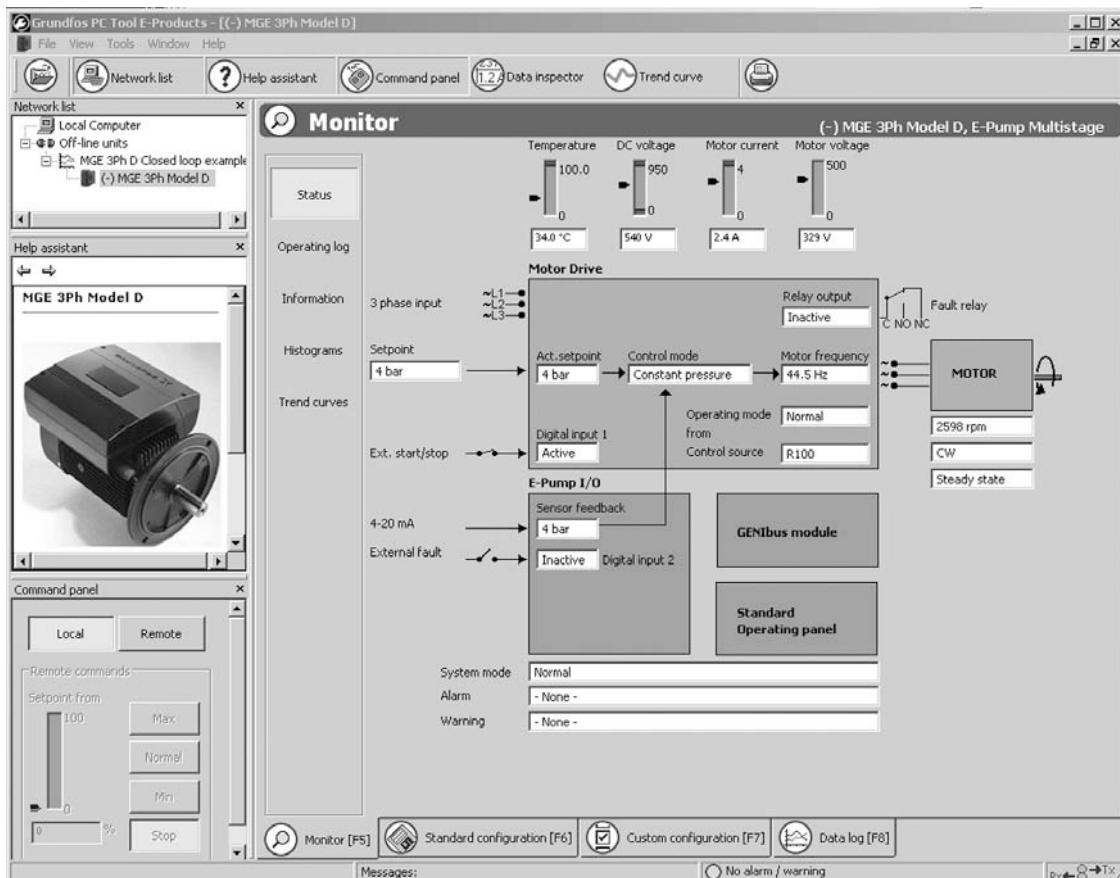


Fig. 88 Monitoring function

Fig. 89 Example of curve chart of CR deep-well

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TM04 4607 1809

12. How to Read the Curve Charts

CR low-NPSH and CR pumps with 4-pole motor

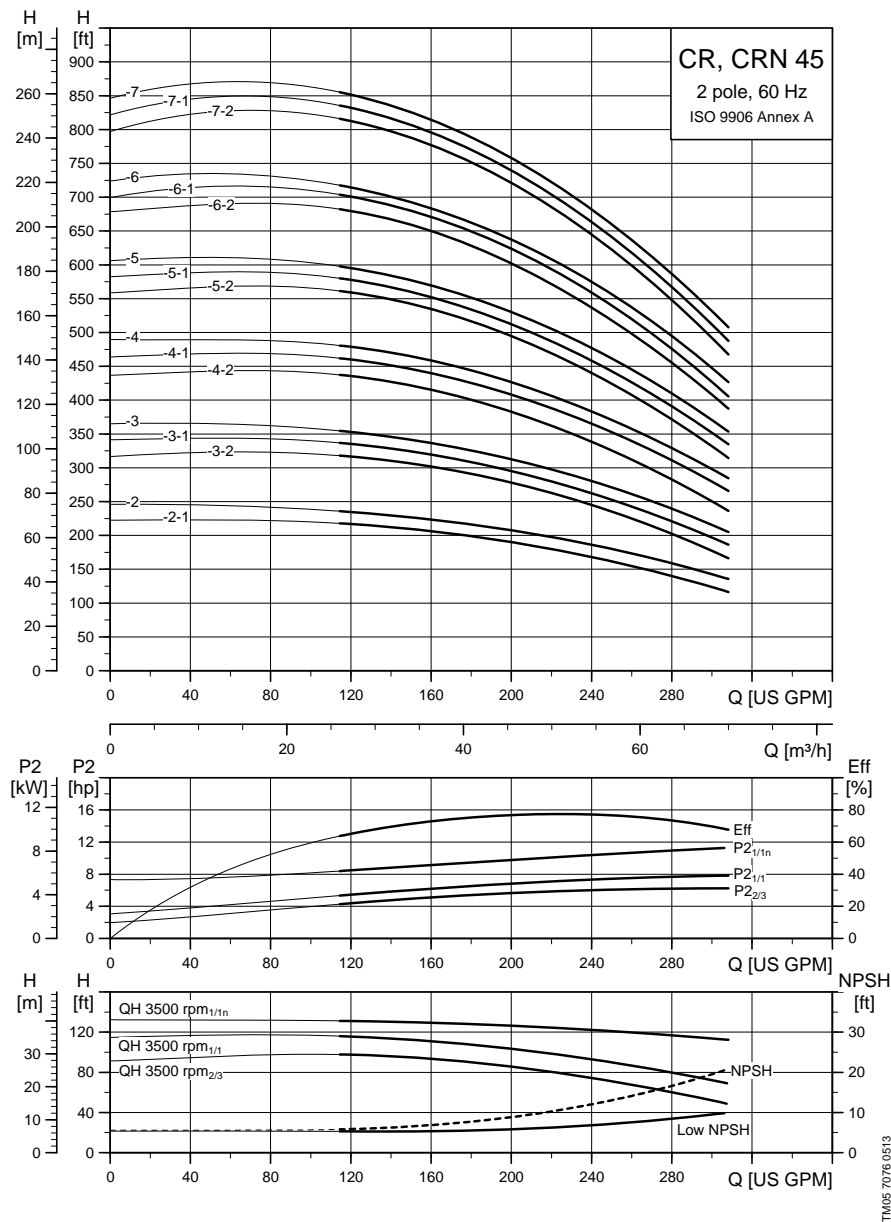


Fig. 90 Example of curve chart of CR low-NPSH

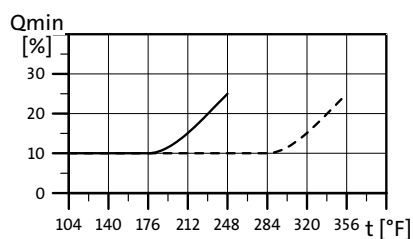
Pos.	Description
1	Number of stages. First figure: Number of stages. Second figure: Number of reduced-diameter impellers.
2	The power curves indicate pump input power per stage. Curves are shown for pump with one stage ($P2_{1/1}$), low-NPSH stage ($P2_{1/n}$) and reduced-diameter impellers ($P2_{2/3}$).
3	Pump type, frequency and ISO standard.
4	QH curve for the individual pump. The bold curves indicate the recommended duty range for best efficiency.
5	The eta curve shows the efficiency of the pump. The eta curve is an average curve of all the pump types shown in the chart. The efficiency of pumps with reduced-diameter impellers is approx. 2 % lower than the eta curve shown in the chart.
6	The NPSH curve is an average curve for all variants shown. When sizing pumps, add a safety margin of at least 2 ft.
7	QH curve for each individual impeller. Curves are shown for pump with one stage ($QH\ 3600RPM_{1/1}$), Low-NPSH stage ($QH\ 3600\ RPM_{1/n}$) and reduced-diameter impellers ($QH\ 3600\ RPM_{2/3}$)

Guidelines to curve charts

The guidelines below apply to the curves shown on the following pages:

- Tolerances to ISO 9906, Annex A, if indicated.
- The motors used for the measurements are standard Grundfos motors (ML or MLE).
- Measurements have been made with airless water at a temperature of 68 °F.
- Kinematic viscosity of (1 cSt).
- Due to the risk of overheating, the pumps should not be used at a flow below the minimum flow rate.
The QH curves apply to a rated motor speed of 3500 RPM. All curves are based on current motor speeds.

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



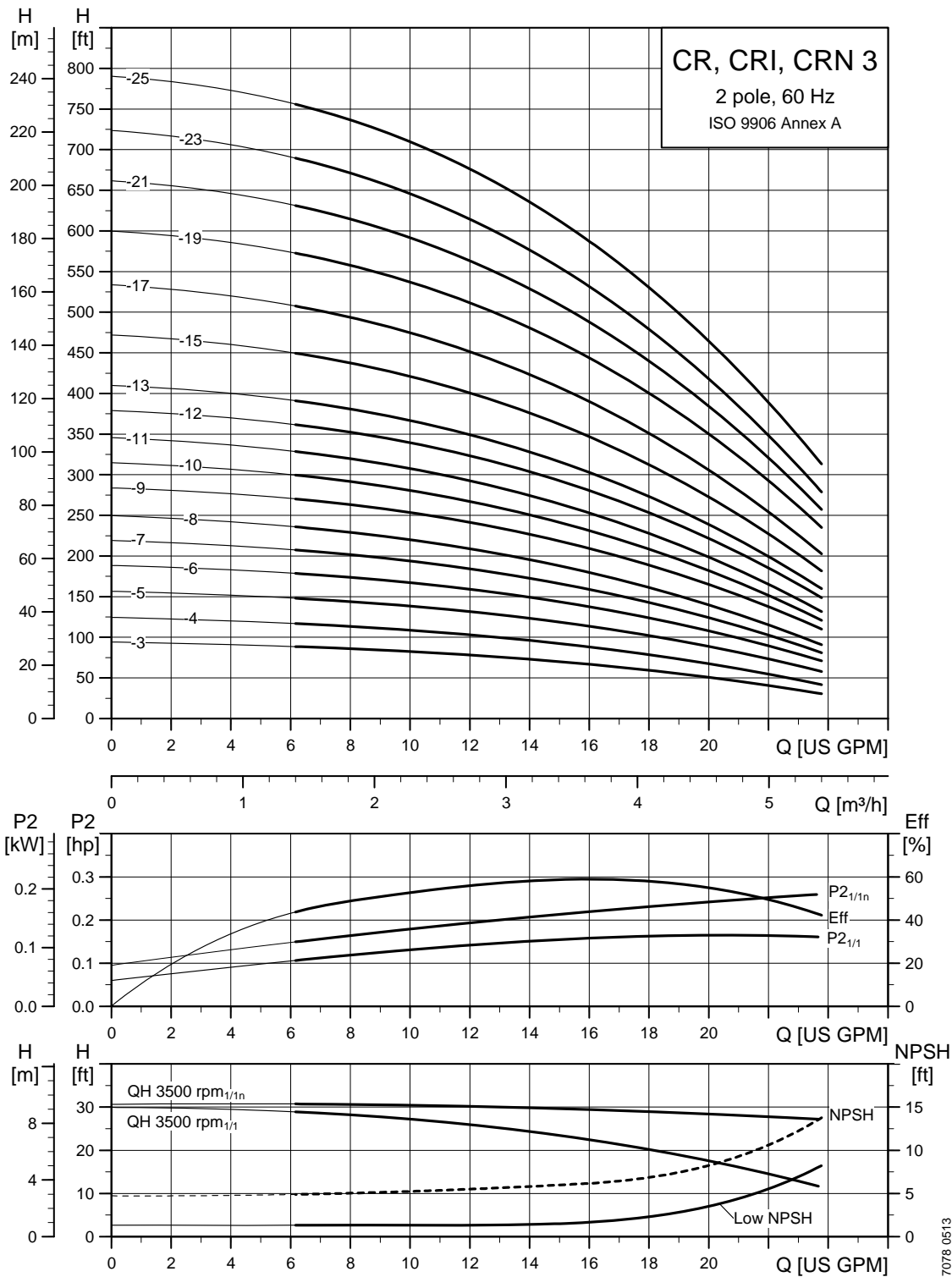
TM02 7538 3703

Fig. 91 Minimum flow rate

13. Performance Curves

Low-NPSH pumps

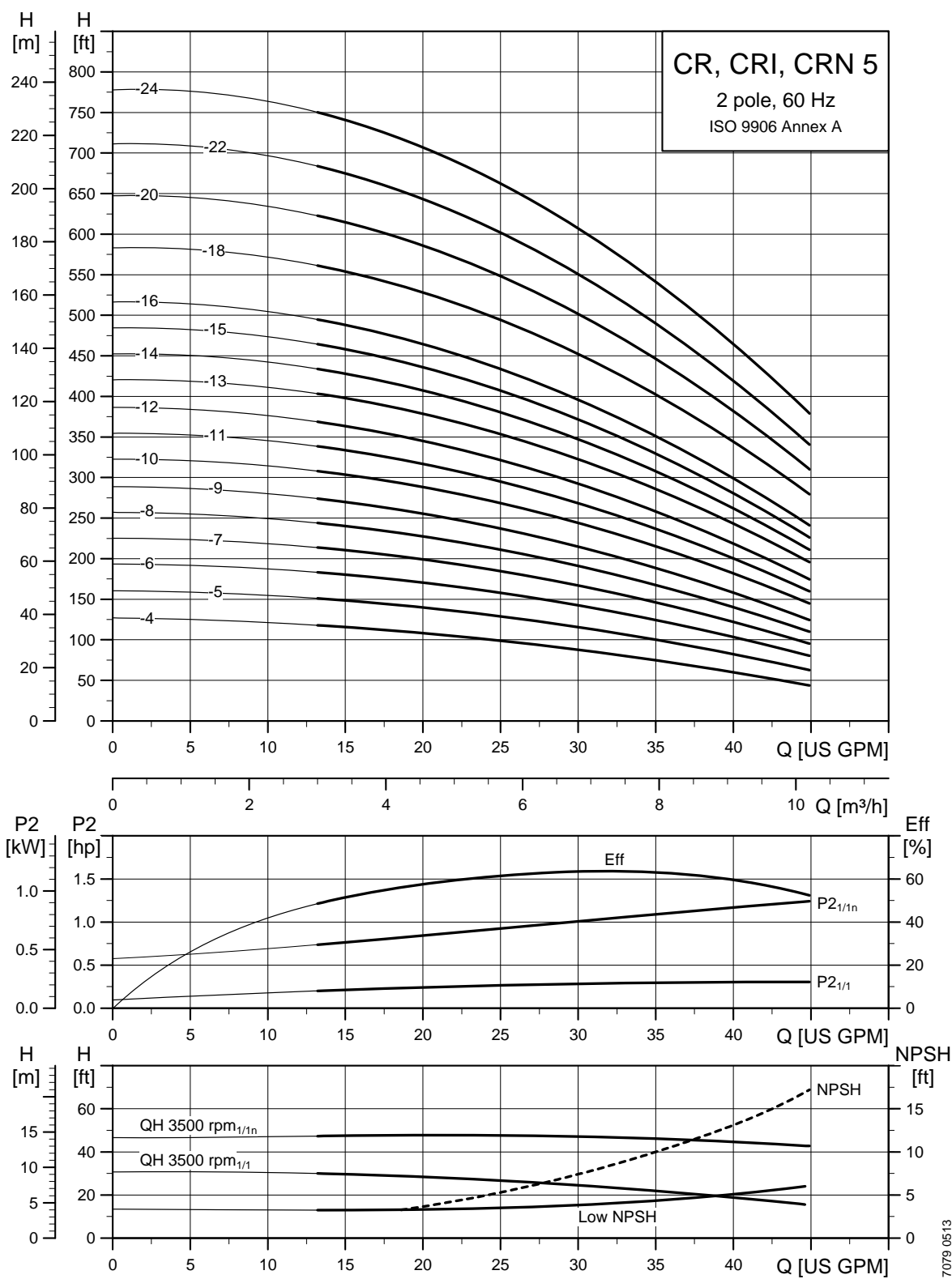
CR, CRI, CRN 3



TM05 7078 0513

For information about dimensions of the individual pumps, see page 93.

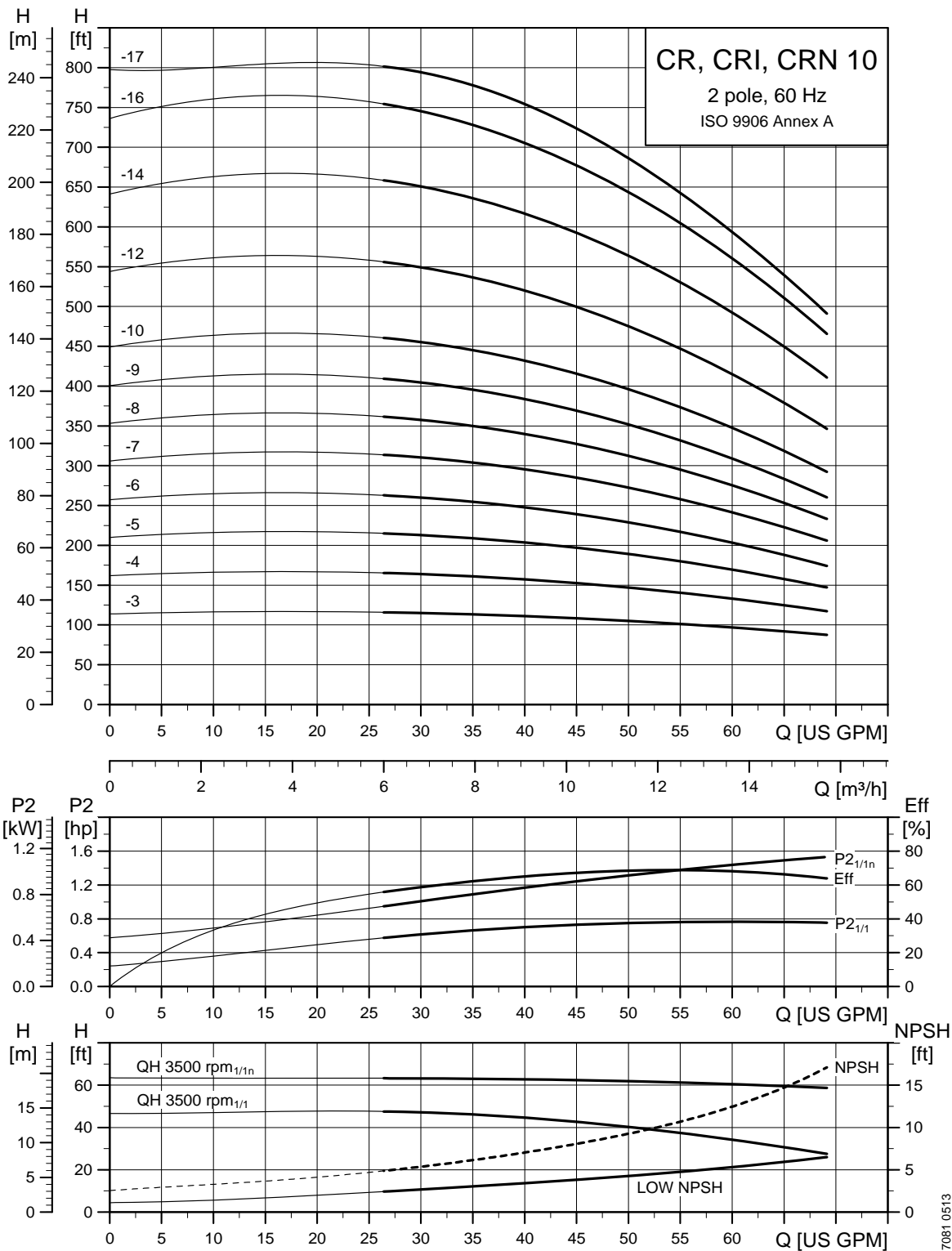
Low-NPSH pumps: CR, CRI, CRN 5



TM05 7079 0513

For information about dimensions of the individual pumps, see page [93](#).

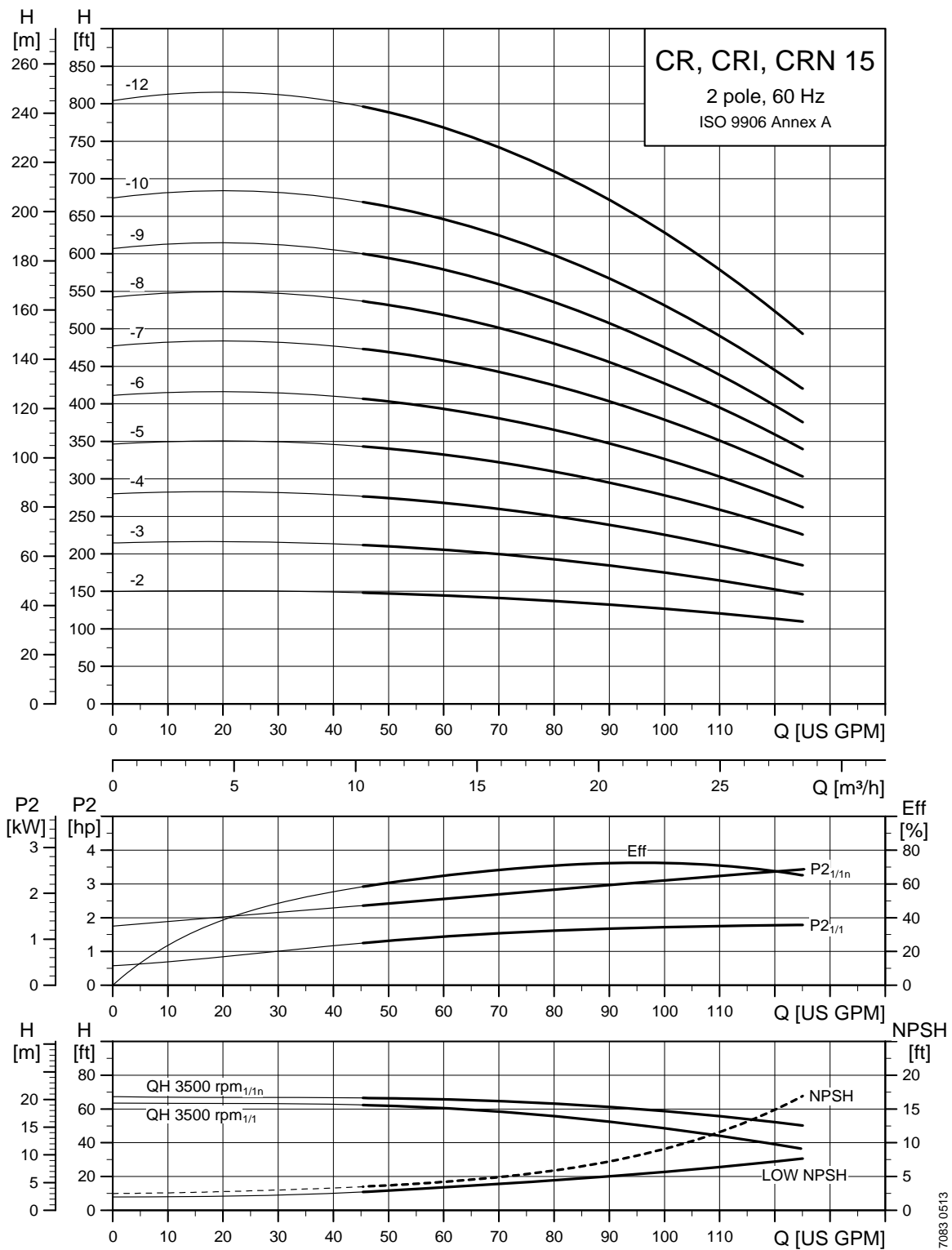
Low-NPSH pumps: CR, CRI, CRN 10



TM05 7081 0513

For information about dimensions of the individual pumps, see page 94.

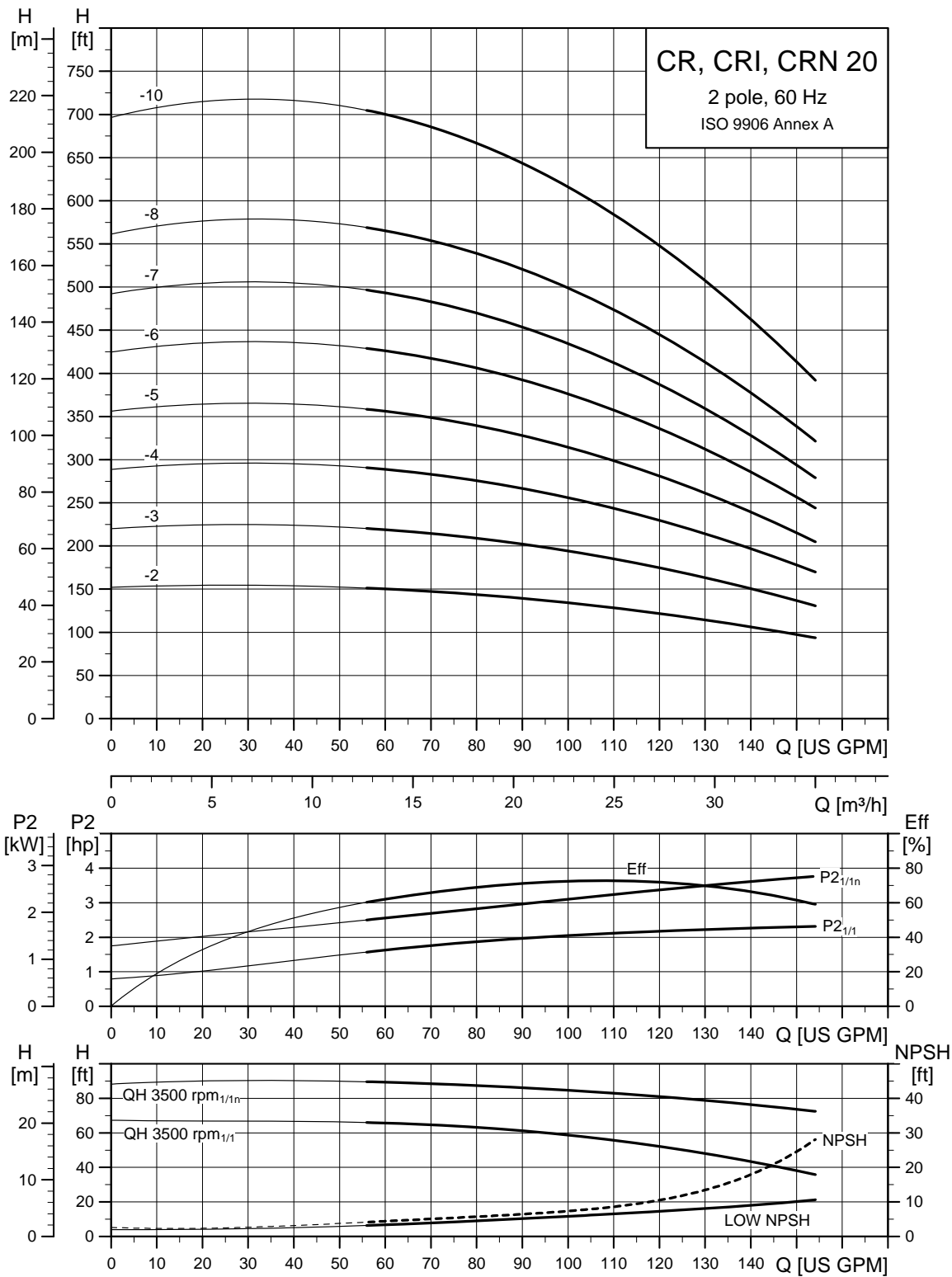
Low-NPSH pumps: CR, CRI, CRN 15



TM05 7083 0513

For information about dimensions of the individual pumps, see page [94](#).

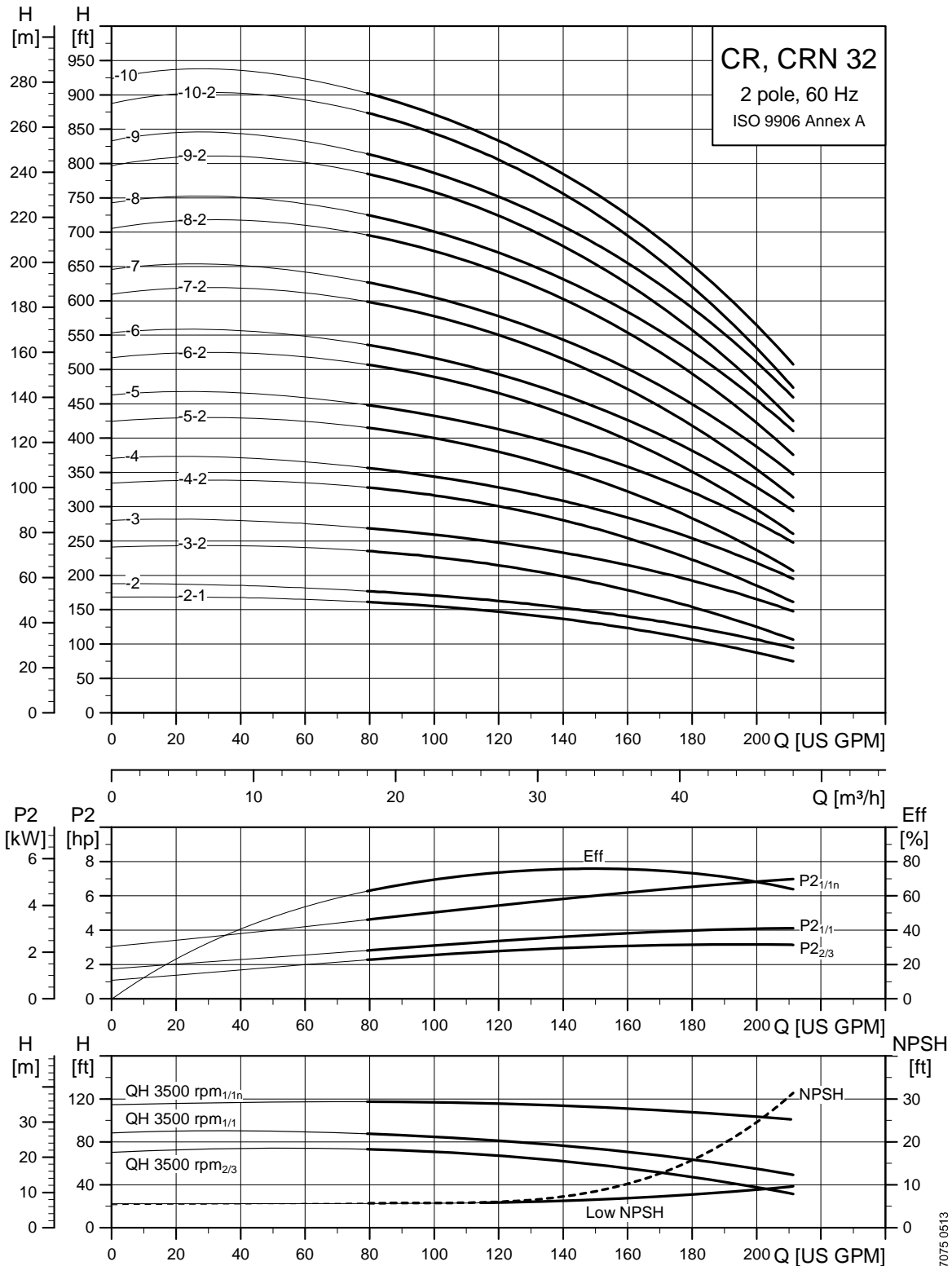
Low-NPSH pumps: CR, CRI, CRN 20



TM05 7085 0613

For information about dimensions of the individual pumps, see page 94.

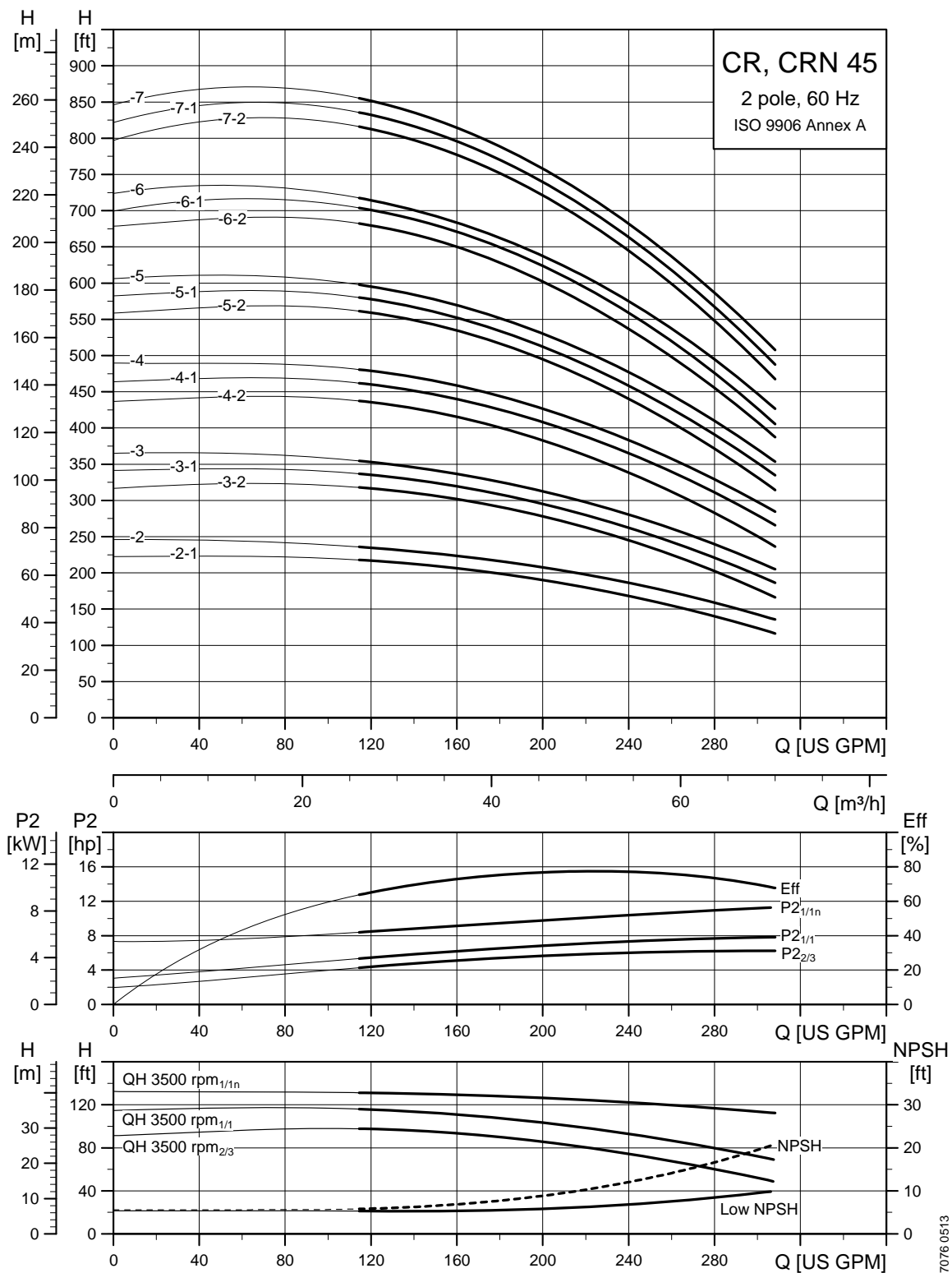
Low-NPSH pumps: CR, CRI, CRN 32



TM05 7075 0513

For information about dimensions of the individual pumps, see page [95](#).

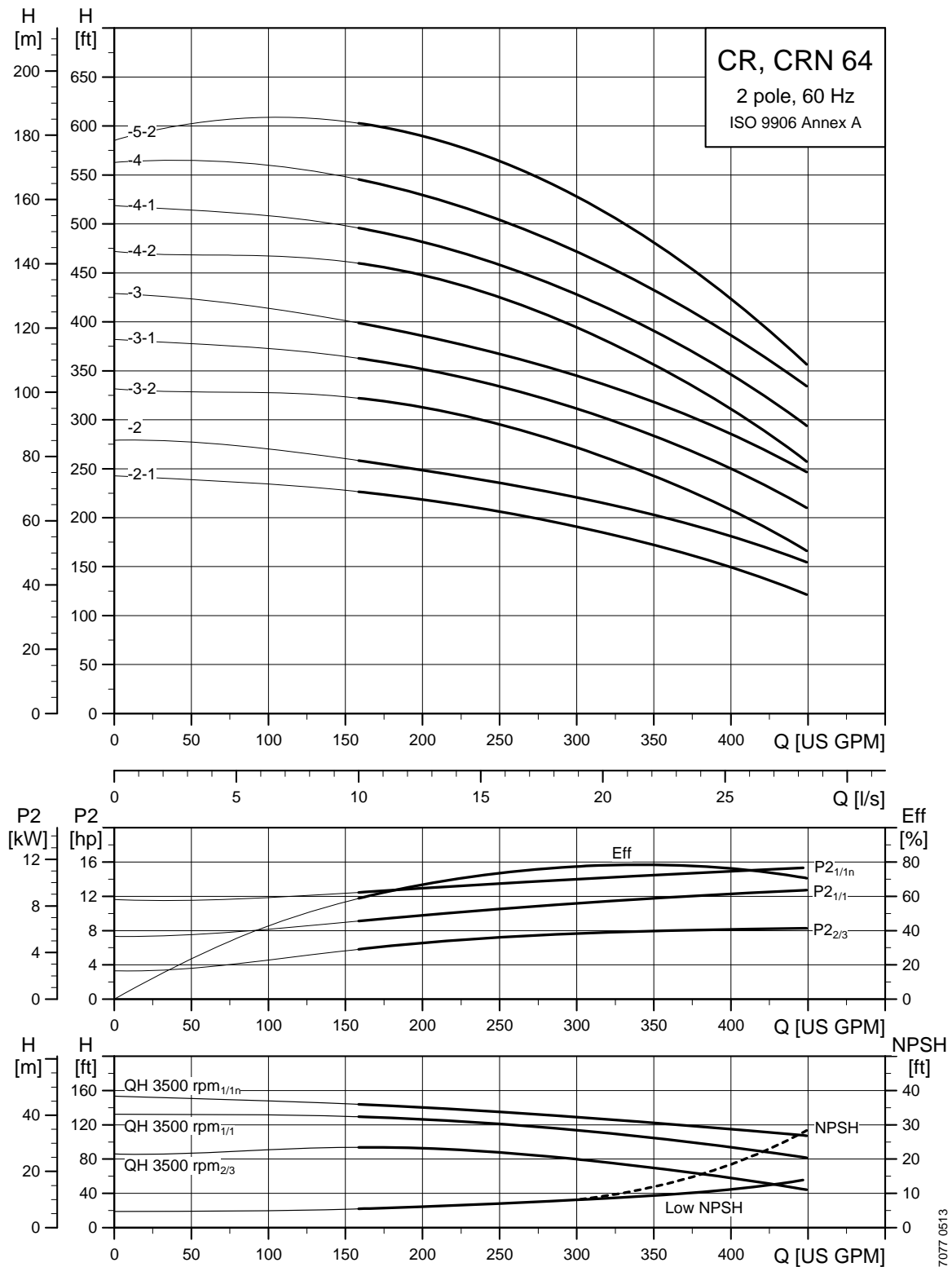
Low-NPSH pumps: CR, CRI, CRN 45



TM05 7076 0513

For information about dimensions of the individual pumps, see page [95](#).

Low-NPSH pumps: CR, CRI, CRN 64

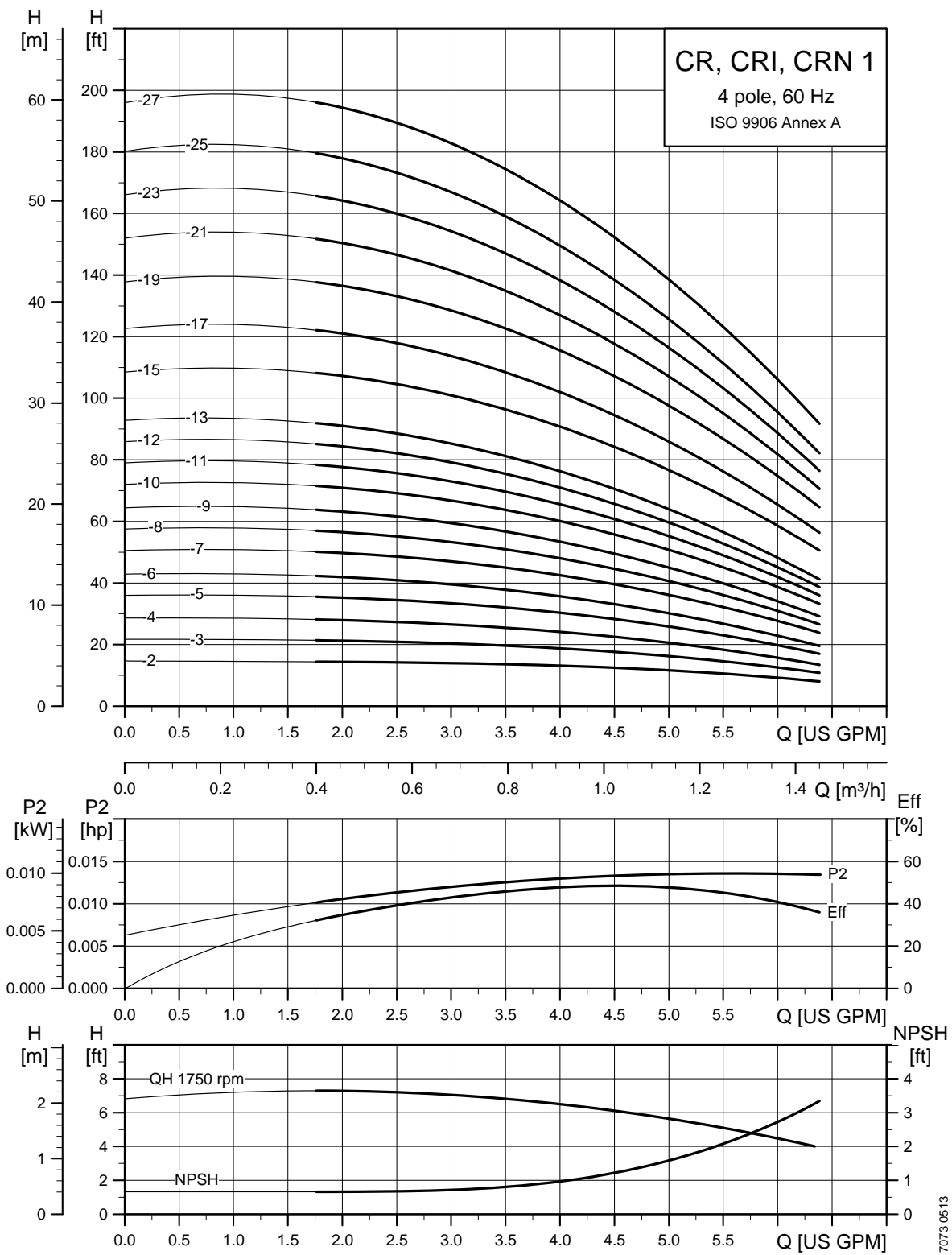


TM05 7077 0513

For information about dimensions of the individual pumps, see page [95](#).

CR pumps with 4-pole motor

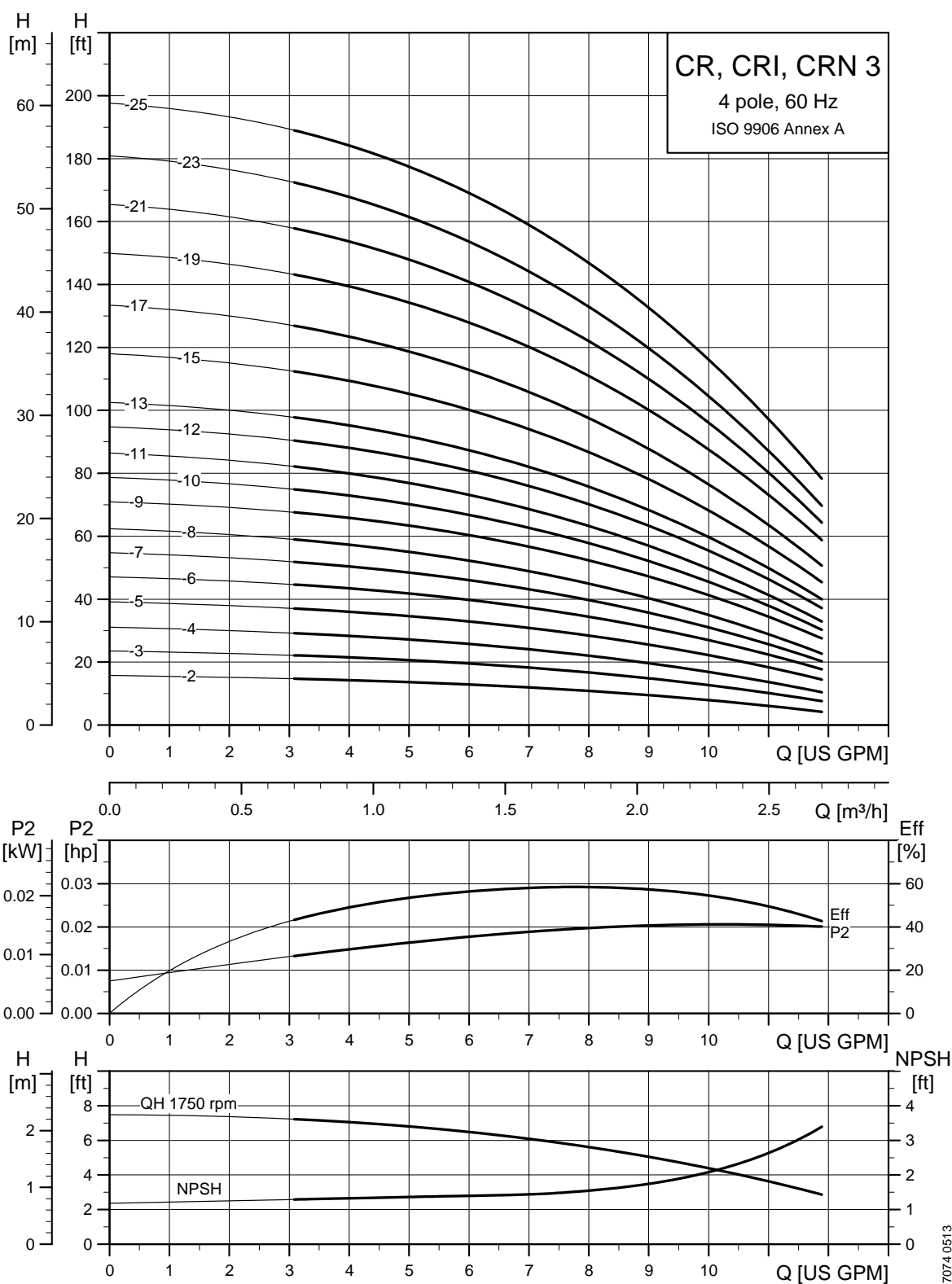
CR, CRI, CRN 1



TM05 7073 0513

For information about dimensions of the individual pumps, see page [96](#).

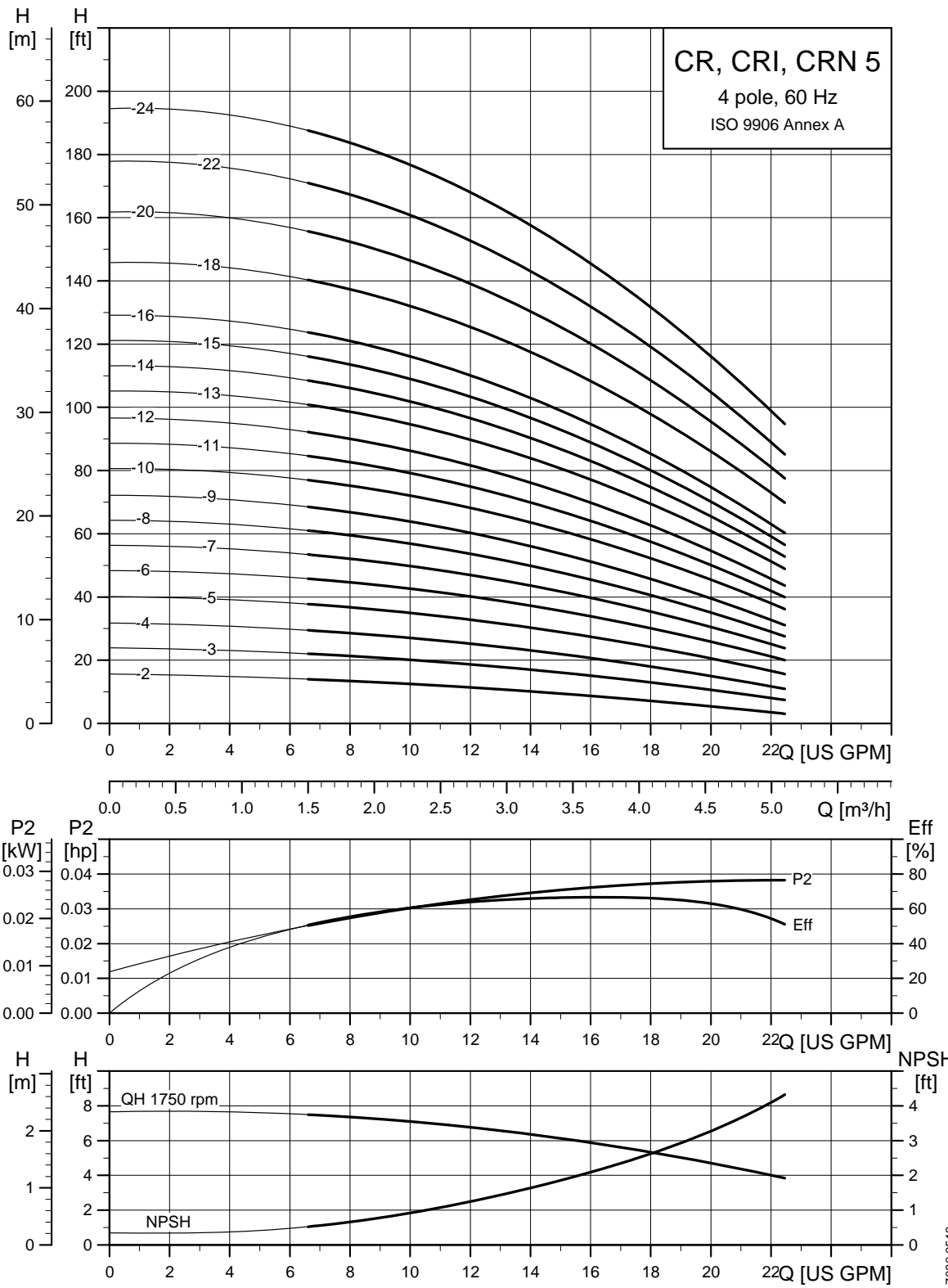
CR pumps with 4-pole motor: CR, CRI, CRN 3



TM05 7074 0513

For information about dimensions of the individual pumps, see page [96](#).

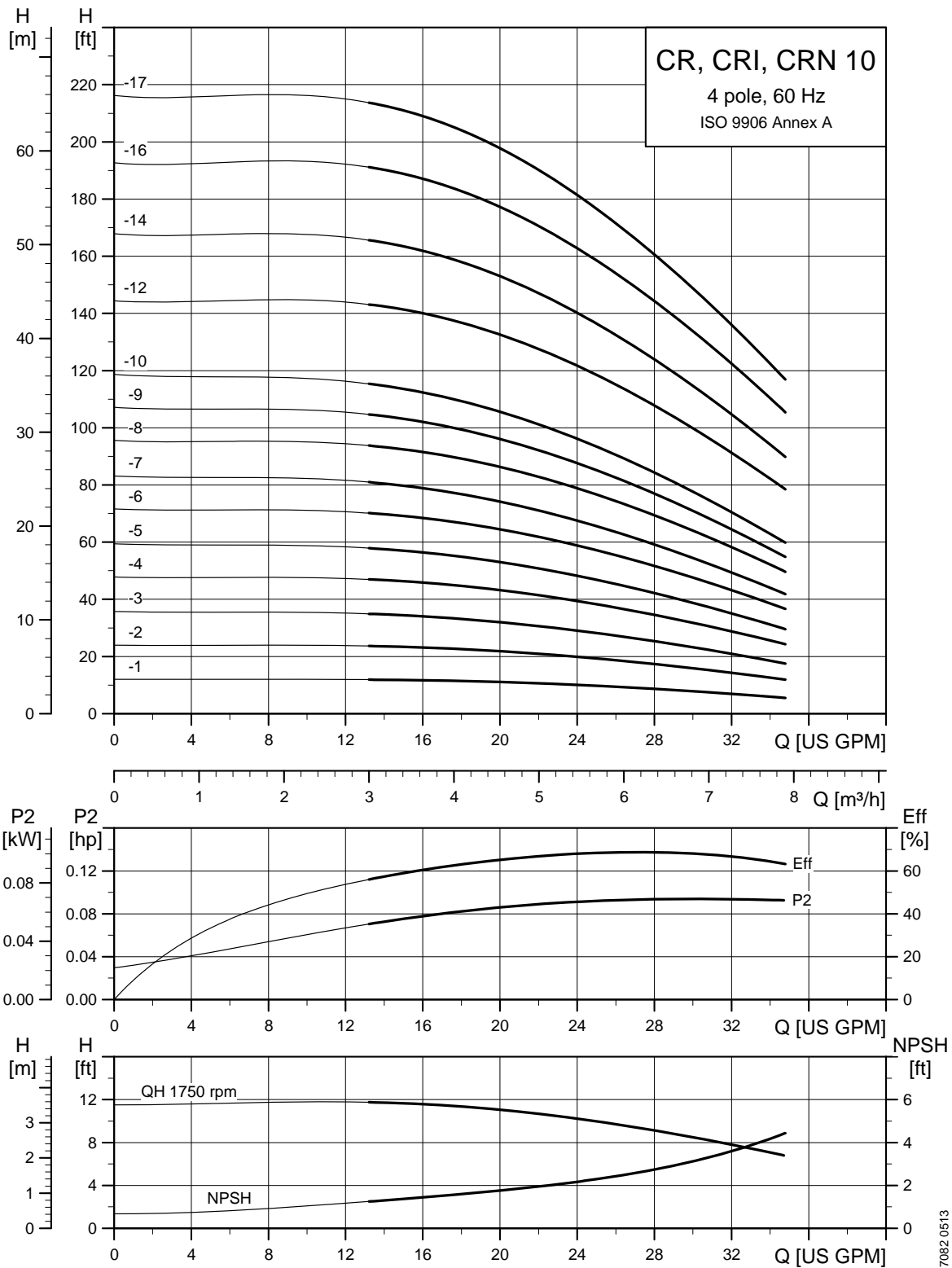
CR pumps with 4-pole motor: CR, CRI, CRN 5



TM05 7080 05/13

For information about dimensions of the individual pumps, see page [96](#).

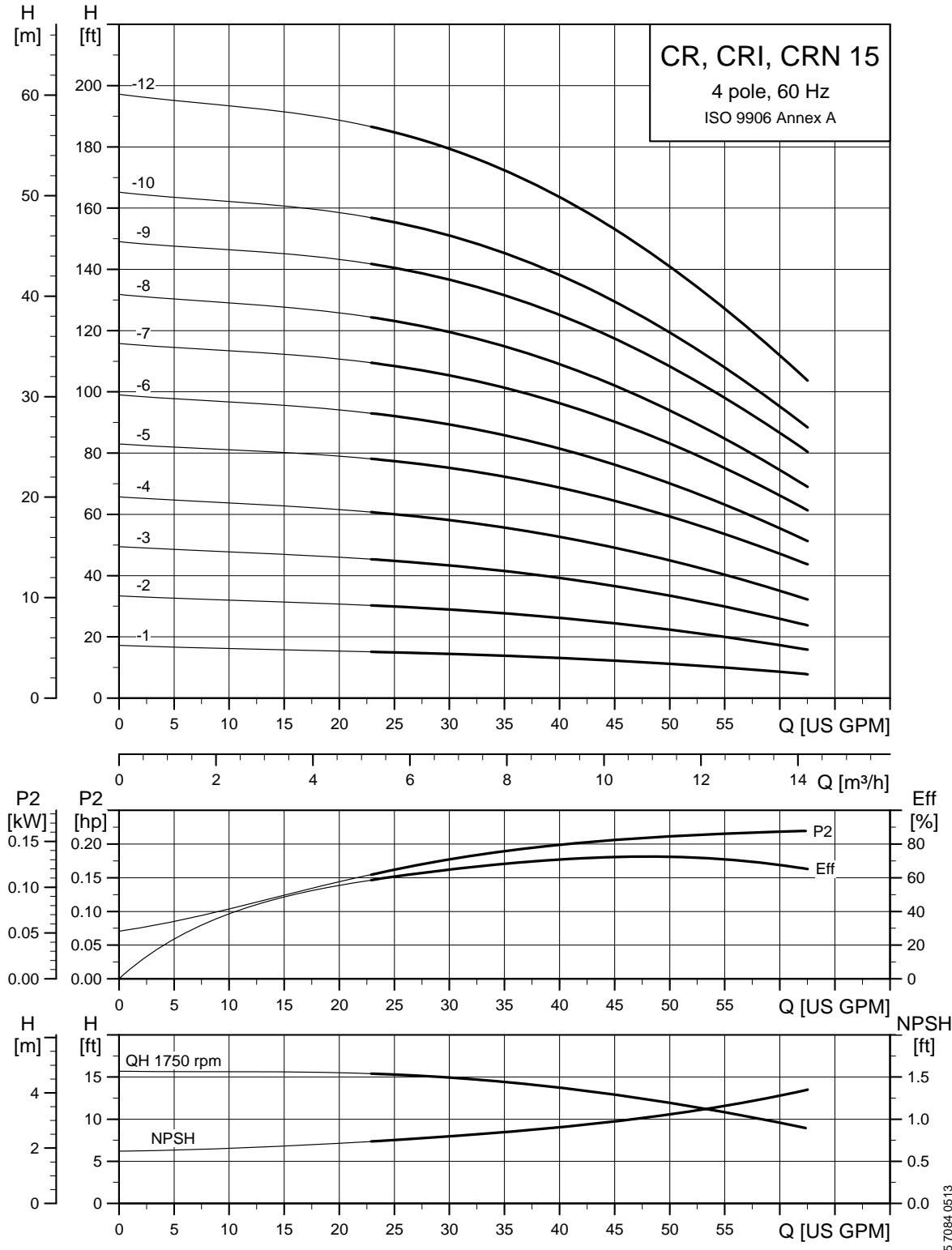
CR pumps with 4-pole motor: CR, CRI, CRN 10



TMD05 7082 0513

For information about dimensions of the individual pumps, see page [96](#).

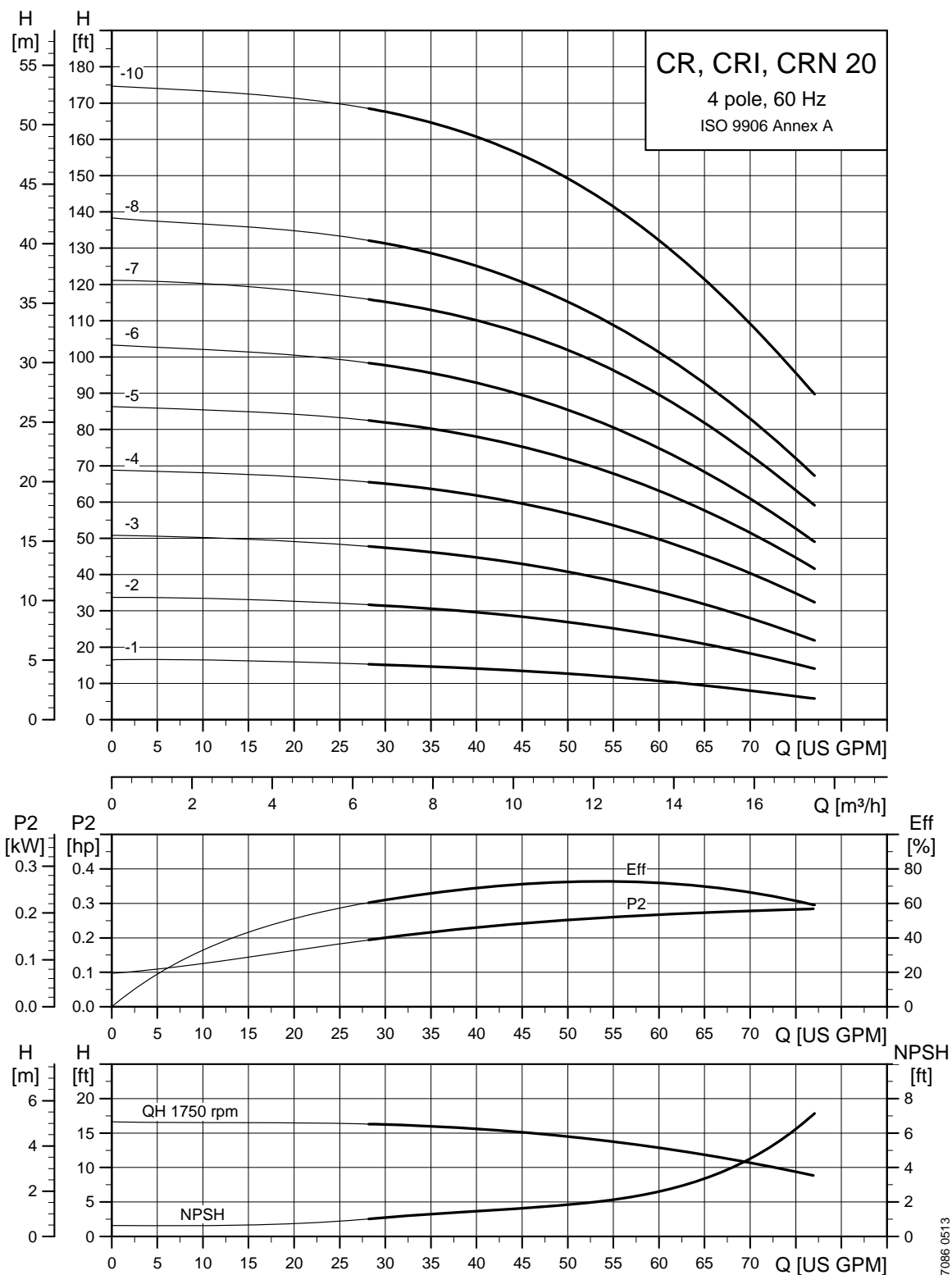
CR pumps with 4-pole motor: CR, CRI, CRN 15



TM05 7084 0513

For information about dimensions of the individual pumps, see page 96.

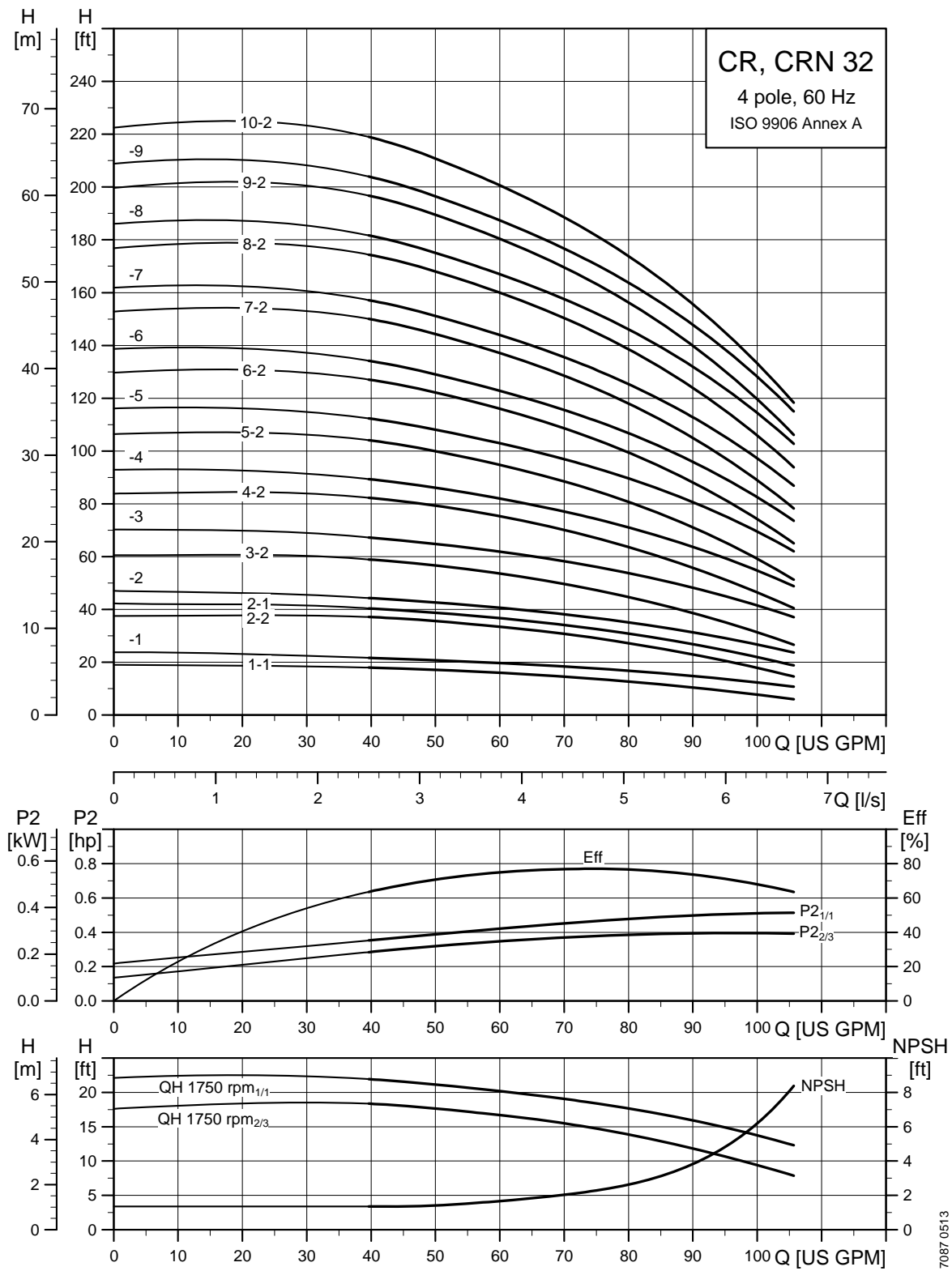
CR pumps with 4-pole motor: CR, CRI, CRN 20



TM05 7086 0513

For information about dimensions of the individual pumps, see page [97](#).

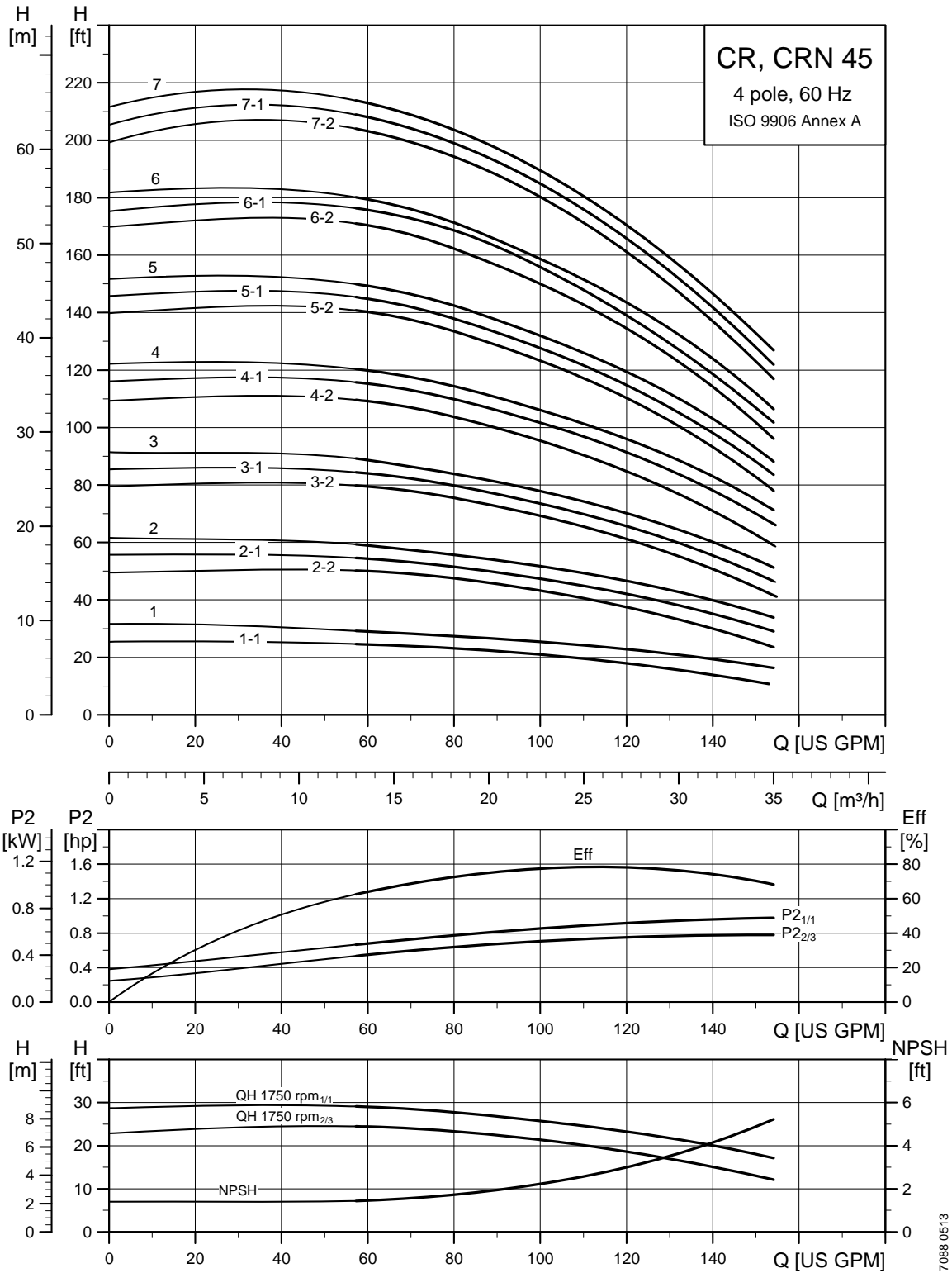
CR pumps with 4-pole motor: CR, CRI, CRN 32



TM05 7087 0513

For information about dimensions of the individual pumps, see page 97.

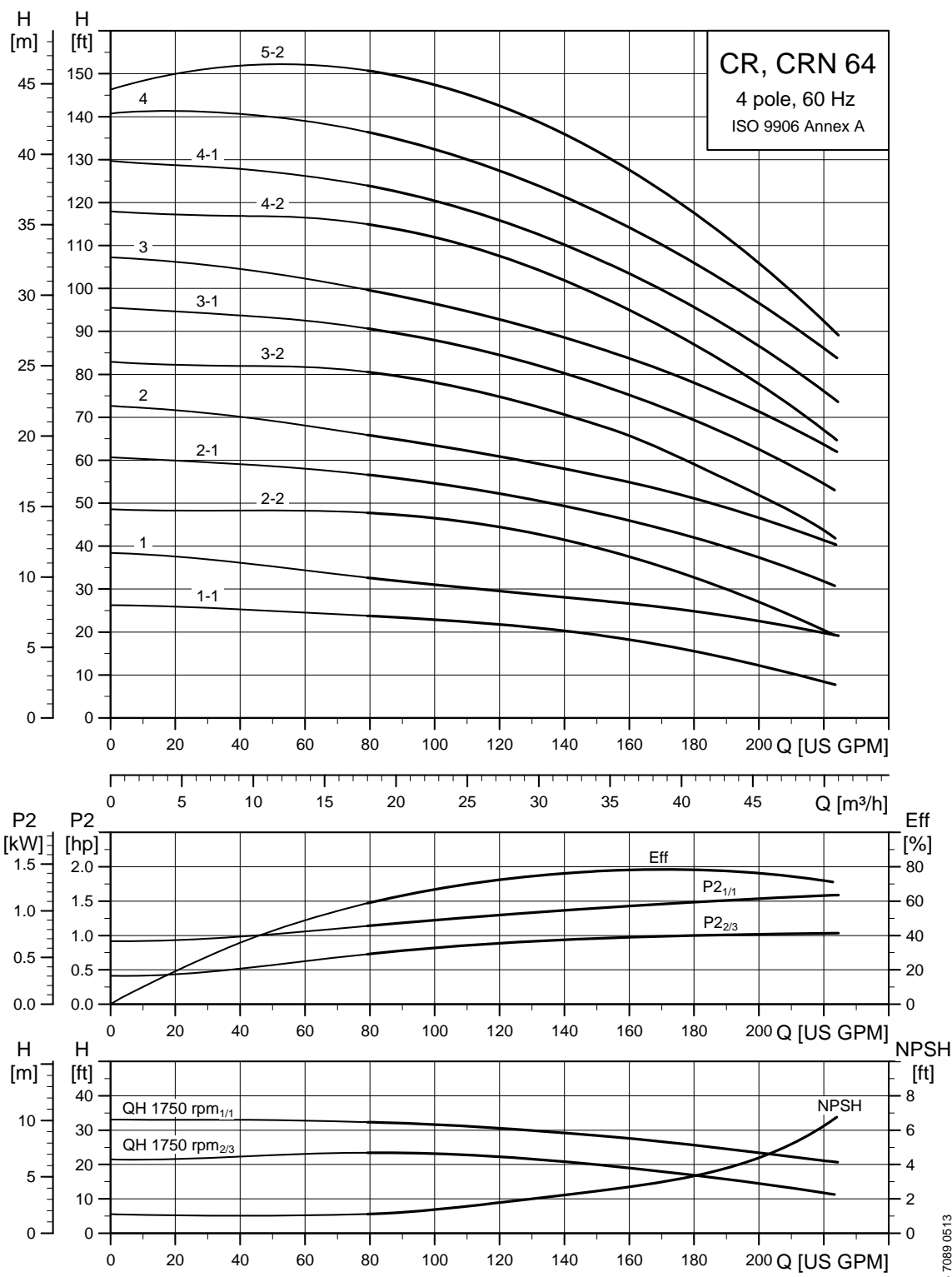
CR pumps with 4-pole motor: CR, CRI, CRN 45



TM05 7088 0513

For information about dimensions of the individual pumps, see page [97](#).

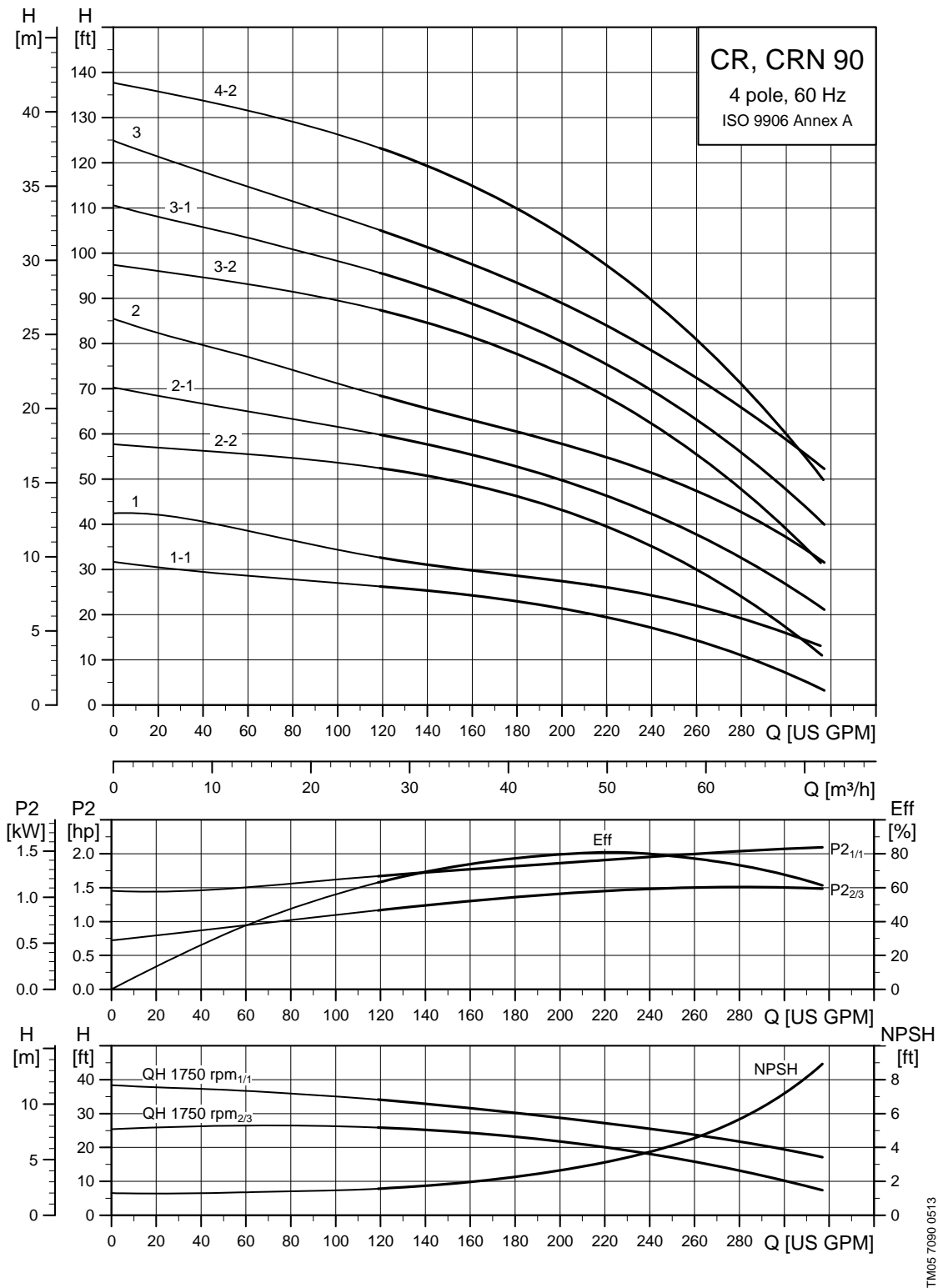
CR pumps with 4-pole motor: CR, CRI, CRN 64



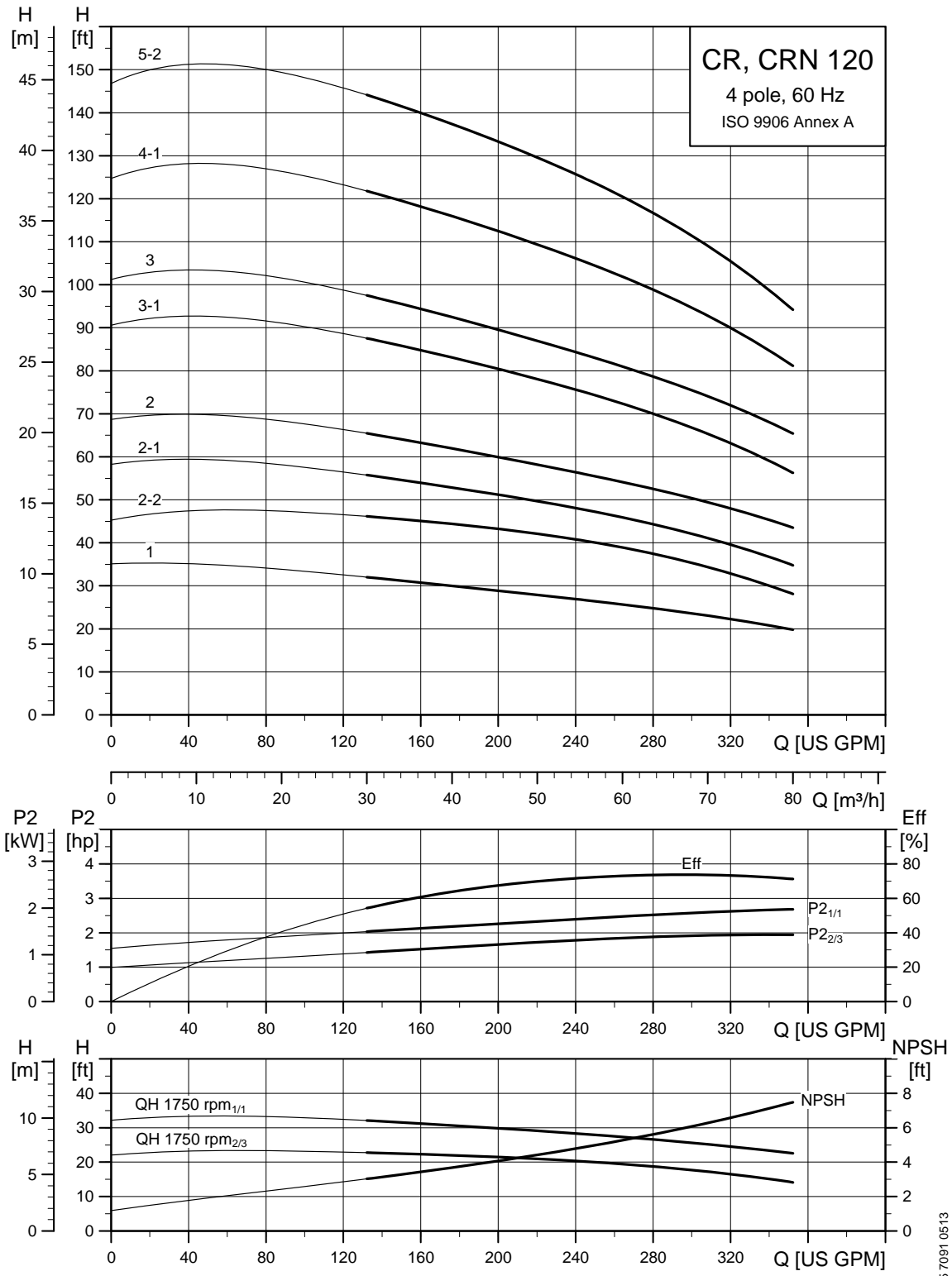
TM05 7089 0513

For information about dimensions of the individual pumps, see page [97](#).

CR pumps with 4-pole motor: CR, CRI, CRN 90

For information about dimensions of the individual pumps, see page [97](#).

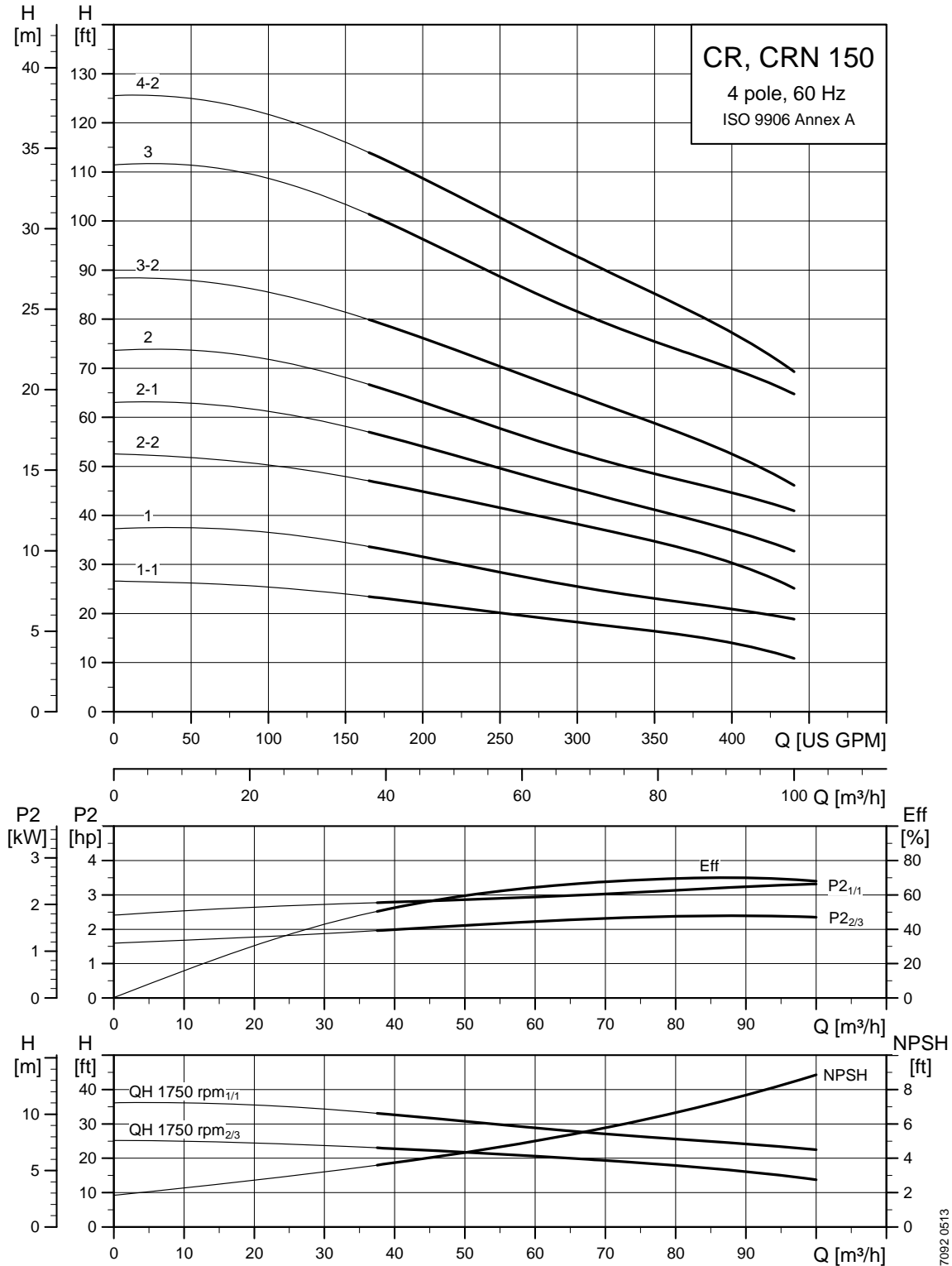
CR pumps with 4-pole motor: CR, CRI, CRN 120



For information about dimensions of the individual pumps, see page 97.

TM05 7091 0513

CR pumps with 4-pole motor: CR, CRI, CRN 150



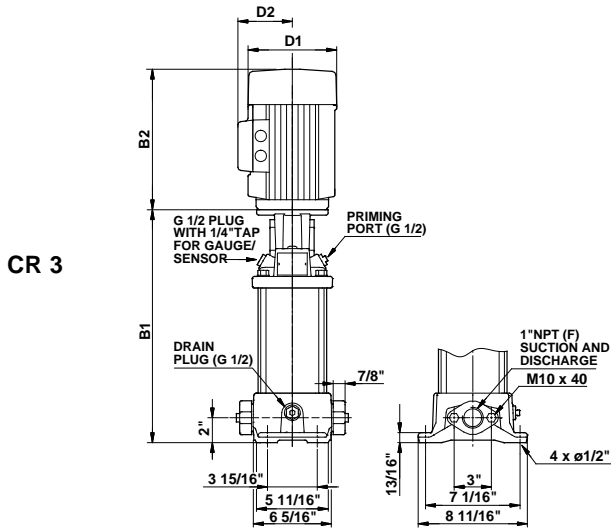
TM05 7092 0513

For information about dimensions of the individual pumps, see page [97](#).

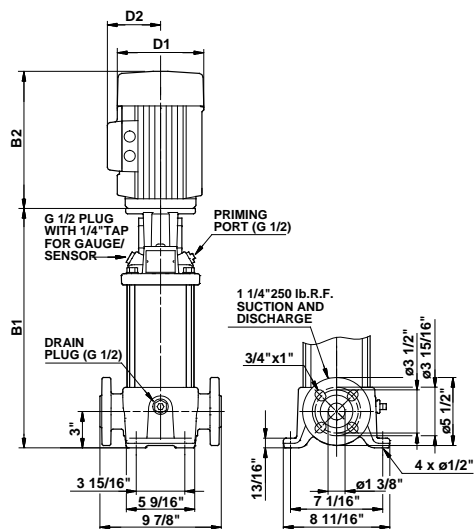
14. Technical data

CR low-NPSH pumps

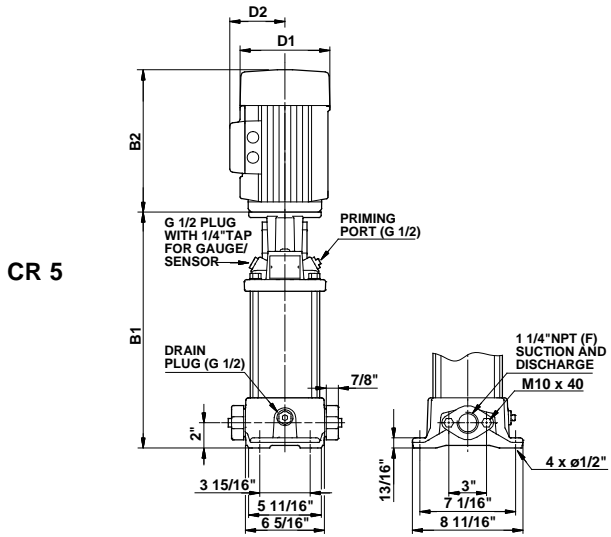
Dimensional drawings - CR 3, CR 5



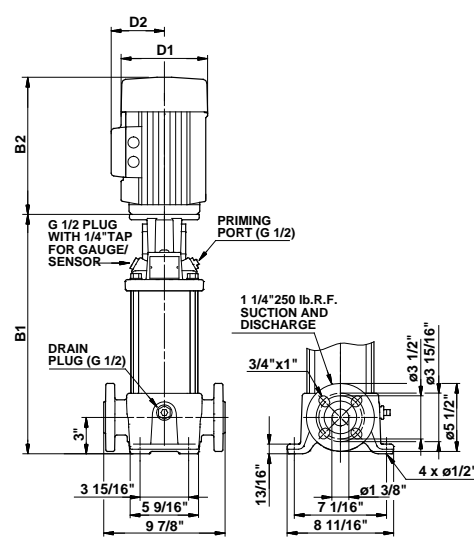
TM03 1450 2205



TM03 1451 2205



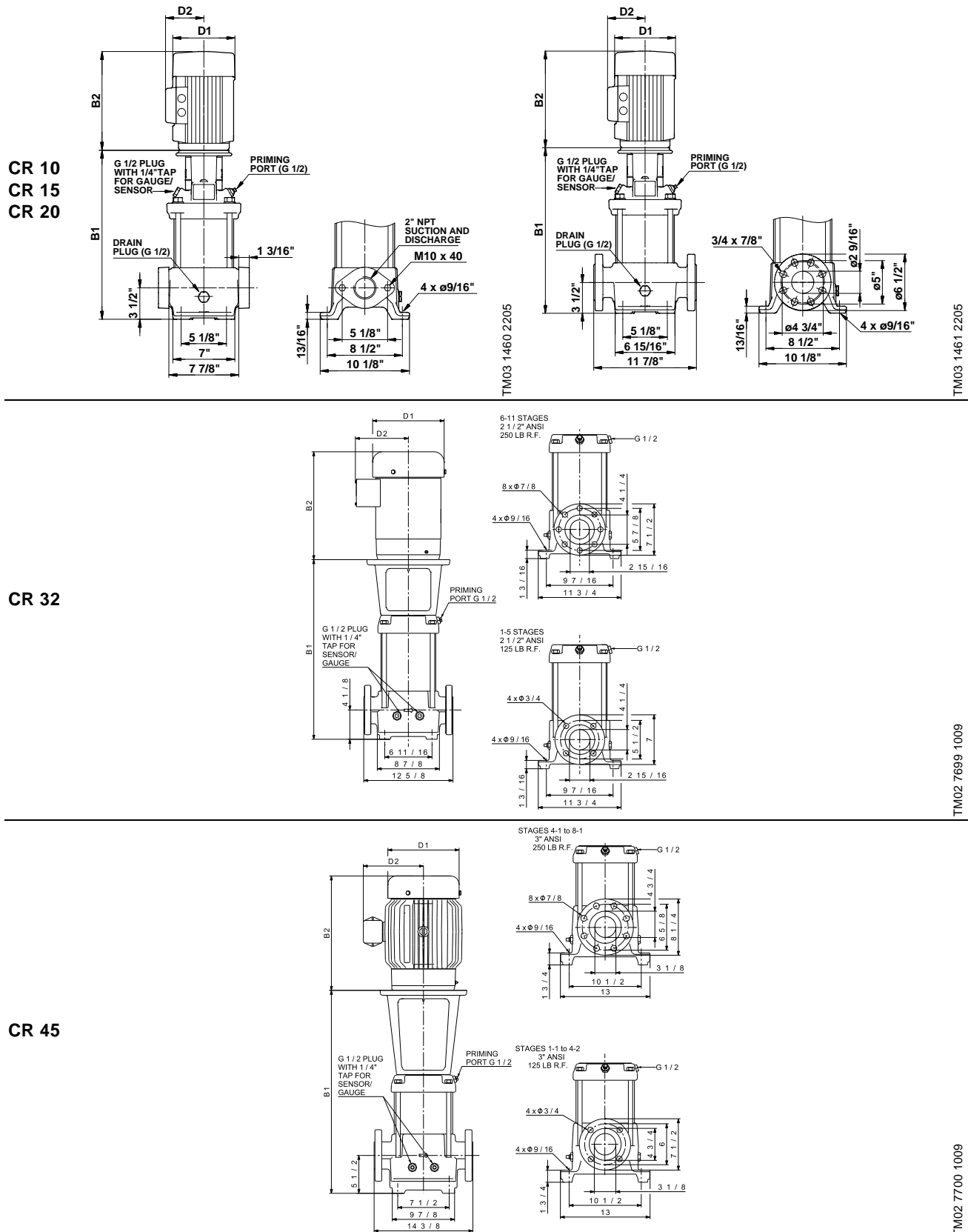
TM03 1455 2205



TM03 1451 2205

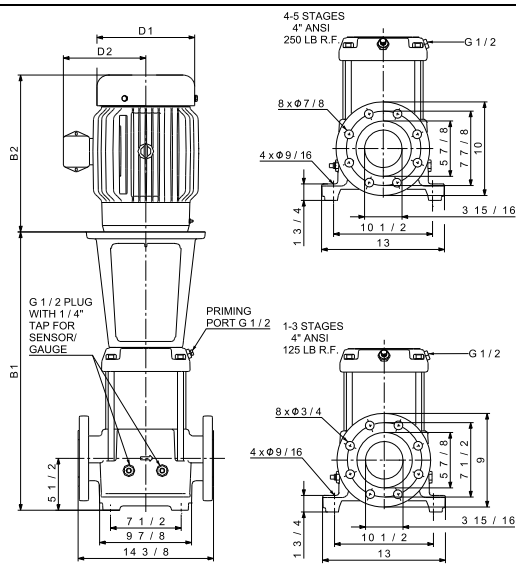
CR low-NPSH pumps

Dimensional drawings - CR 10, CR15, CR20, CR32, CR45



CR low-NPSH pumps
Dimensional drawings - CR 64

CR 64



TM02 7701 1009

CR 3 low-NPSH pumps, 60 Hz

Pump type	HP	PH	NEMA Frame Size	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2
CR3-3	3/4	1	56C	11.97	6.19	5.18	21.88
		3	56C	11.97	5.55	4.57	19.41
CR3-4	1	1	56C	12.68	7.19	5.73	23.87
		3	56C	12.68	5.55	4.57	20.12
CR3-5	1	1	56C	13.39	7.19	5.73	24.58
		3	56C	13.39	5.55	4.57	20.83
CR3-6	1 1/2	1	56C	14.09	7.19	5.73	25.77
		3	56C	14.09	5.55	4.57	22.71
CR3-7	1 1/2	1	56C	14.80	7.19	5.73	26.48
		3	56C	14.80	5.55	4.57	23.42
CR3-8	1 1/2	1	56C	15.51	7.19	5.73	27.19
		3	56C	15.51	5.55	4.57	24.13
CR3-9	2	1	56C	16.22	7.19	5.73	28.78
		3	56C	16.22	7.01	4.33	27.44
CR3-10	2	1	56C	16.93	7.19	5.73	29.49
		3	56C	16.93	7.01	4.33	28.15
CR3-11	2	1	56C	17.64	7.19	5.73	30.20
		3	56C	17.64	7.01	4.33	28.86
CR3-12	3	1	182TC	19.45	8.60	6.87	34.10
		3	182TC	19.45	7.01	4.33	32.68
CR3-13	3	1	182TC	20.16	8.60	6.87	34.81
		3	182TC	20.16	7.01	4.33	33.39
CR3-15	3	1	182TC	21.57	8.60	6.87	36.22
		3	182TC	21.57	7.01	4.33	34.80
CR3-17	3	1	182TC	22.99	8.60	6.87	37.64
		3	182TC	22.99	7.01	4.33	36.22
CR3-19	5	1	182TC	24.41	10.62	7.46	39.93
		3	182TC	24.41	8.66	5.28	39.92
CR3-21	5	1	182TC	25.83	10.62	7.46	41.35
		3	182TC	25.83	8.66	5.28	41.34
CR3-23	5	1	182TC	27.24	10.62	7.46	42.76
		3	182TC	27.24	8.66	5.28	42.75
CR3-25	5	1	182TC	28.66	10.62	7.46	44.18
		3	182TC	28.66	8.66	5.28	44.17

Note: CR 3 low-NPSH pumps are also available as CRI and CRN pumps with PJE and CA connection.
For information about electrical data, see page 110.

CR 5 low-NPSH pumps, 60 Hz

Pump type	HP	PH	NEMA Frame Size	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2
CR5-4	2	1	56C	14.09	7.19	5.73	25.77
		3	56C	14.09	5.55	4.57	22.71
CR5-5	3	1	182TC	16.26	7.19	5.73	28.82
		3	182TC	16.26	7.01	4.33	27.48
CR5-6	3	1	182TC	17.32	7.19	5.73	29.88
		3	182TC	17.32	7.01	4.33	28.54
CR5-7	3	1	182TC	18.39	8.60	6.87	33.04
		3	182TC	18.39	7.01	4.33	31.62
CR5-8	5	1	182TC	19.45	8.60	6.87	34.10
		3	182TC	19.45	7.01	4.33	32.68
CR5-9	5	1	182TC	20.51	8.60	6.87	35.16
		3	182TC	20.51	7.01	4.33	33.74
CR5-10	5	1	182TC	21.57	10.62	7.46	37.09
		3	182TC	21.57	8.66	5.28	37.08
CR5-11	5	1	182TC	22.64	10.62	7.46	38.16
		3	182TC	22.64	8.66	5.28	38.15
CR5-12	5	1	182TC	23.70	10.62	7.46	39.22
		3	182TC	23.70	8.66	5.28	39.21
CR5-13	5	1	182TC	24.76	10.62	7.46	40.28
		3	182TC	24.76	8.66	5.28	40.27
CR5-14	5	1	182TC	25.83	10.62	7.46	41.35
		3	182TC	25.83	8.66	5.28	41.34
CR5-15	7 1/2	1	213TC	27.41	10.62	7.46	42.93
		3	213TC	27.41	8.66	5.28	42.92
CR5-16	7 1/2	1	213TC	28.47	10.62	7.46	43.99
		3	213TC	28.47	8.66	5.28	43.98
CR5-18	7 1/2	1	213TC	30.59	10.22	7.62	46.12
		3	213TC	30.59	8.66	5.28	46.10
CR5-20	7 1/2	1	213TC	32.72	10.22	7.62	48.25
		3	213TC	32.72	8.66	5.28	48.23
CR5-22	7 1/2	1	213TC	34.84	10.22	7.62	50.37
		3	213TC	34.84	8.66	5.28	50.35
CR5-24	10	1	213TC	36.97	10.22	7.62	52.50
		3	213TC	36.97	8.66	5.28	52.48

Note: CR 5 low-NPSH pumps are also available as CRI and CRN pumps with PJE and CA connection.
For information about electrical data, see page 110.

CR 10 low-NPSH pumps, 60 Hz

Pump type	HP	PH	NEMA Frame Size	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR10-3	3	1	182TC	17.20	8.60	6.87	31.85	-	-	-
		3		17.20	7.01	4.33	3.43	-	-	-
CR10-4	5	1	182TC	18.39	8.60	6.87	33.04	-	-	-
		3		18.39	7.01	4.33	31.62	-	-	-
CR10-5	5	1	182TC	19.57	10.62	7.46	35.09	-	-	-
		3		19.57	8.66	5.28	35.08	-	-	-
CR10-6	5	1	182TC	20.75	10.62	7.46	36.27	-	-	-
		3		20.75	8.66	5.28	36.26	-	-	-
CR10-7	7 1/2	1	213TC	22.25	10.22	7.62	37.78	-	-	-
		3		22.25	8.66	5.28	37.76	-	-	-
CR10-8	7 1/2	1	213TC	23.43	10.22	7.62	38.96	-	-	-
		3		23.43	8.66	5.28	38.94	-	-	-
CR10-9	7 1/2	1	213TC	24.61	10.22	7.62	40.14	-	-	-
		3		24.61	8.66	5.28	40.12	-	-	-
CR10-10	10	1	213TC	25.79	10.22	7.62	41.32	-	-	-
		3		25.79	8.66	5.28	41.30	-	-	-
CR10-12	10	1	213TC	28.15	10.23	10.30	44.22	-	-	-
		3		28.15	8.66	5.28	43.66	-	-	-
CR10-14	15	3	254TC	33.06	10.22	8.67	49.64	10.62	7.33	49.37
CR10-16	15	3	254TC	35.43	10.22	8.67	52.01	10.62	7.33	51.74
CR10-17	15	3	254TC	37.80	10.22	8.67	54.38	10.62	7.33	54.11

Note: CR 10 low-NPSH pumps are also available as CRI and CRN pumps with PJE and CA connection.
For information about electrical data, see page 110.

CR 15 low-NPSH pumps, 60 Hz

Pump type	HP	PH	NEMA Frame Size	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR15-2	7 1/2	1	213TC	17.52	10.22	7.62	33.05	-	-	-
		3		17.52	8.66	5.28	33.03	-	-	-
CR15-3	7 1/2	1	213TC	19.29	10.22	7.62	34.82	-	-	-
		3		19.29	8.66	5.28	34.80	-	-	-
CR15-4	10	1	213TC	21.06	10.23	10.30	37.13	-	-	-
		3		21.06	8.66	5.28	36.57	-	-	-
CR15-5	15	3	254TC	25.40	10.22	8.67	41.98	10.62	7.33	41.71
CR15-6	15	3	254TC	27.17	10.22	8.67	43.75	10.62	7.33	43.48
CR15-7	15	3	254TC	28.94	10.22	8.67	45.52	10.62	7.33	45.25
CR15-8	20	3	254TC	30.71	10.22	8.67	47.29	11.50	8.92	50.40
CR15-9	20	3	254TC	32.48	10.22	8.67	49.06	11.50	8.92	52.17
CR15-10	20	3	254TC	34.25	10.22	8.67	50.83	11.50	8.92	53.94
CR15-12	25	3	284TSC	37.17	12.94	11.52	56.99	11.50	8.94	57.98

Note: CR 15 low-NPSH pumps are also available as CRI and CRN pumps with PJE and CA connection.
For information about electrical data, see page 110.

CR 20 low-NPSH pumps, 60 Hz

Pump type	HP	PH	NEMA Frame Size	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR20-2	7 1/2	1	213TC	17.52	10.22	7.62	33.05	-	-	-
		3		17.52	8.66	5.28	33.03	-	-	-
CR20-3	10	1	213TC	19.29	10.23	10.30	35.36	-	-	-
		3		19.29	8.66	5.28	34.80	-	-	-
CR20-4	15	3	254TC	23.62	10.22	8.67	40.20	-	-	-
CR20-5	15	3	254TC	25.39	10.22	8.67	41.97	10.62	7.33	41.70
CR20-6	15	3	254TC	27.17	10.22	8.67	43.75	10.62	7.33	43.48
CR20-7	20	3	254TC	28.94	10.22	8.67	45.52	11.50	8.92	48.63
CR20-8	20	3	254TC	30.71	10.22	8.67	47.29	11.50	8.92	50.40
CR20-10	25	3	284TSC	33.62	12.94	11.52	53.44	11.50	8.94	54.43

Note: CR 20 low-NPSH pumps are also available as CRI and CRN pumps with PJE and CA connection.
For information about electrical data, see page 110.

CR 32 low-NPSH pumps, 60 Hz

Pump type	HP	PH	NEMA Frame Size	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR32-2-1	10	1	213TC	22.83	10.23	10.30	38.90	-	-	-
		3		22.83	8.66	5.28	38.34	-	-	-
CR32-2	15	3	254TC	26.96	10.22	8.67	43.54	10.62	7.33	43.27
CR32-3-2	15	3	254TC	29.72	10.22	8.67	46.30	10.62	7.33	46.03
CR32-3	15	3	254TC	29.72	10.22	8.67	46.30	10.62	7.33	46.03
CR32-4-2	20	3	254TC	32.48	10.22	8.67	49.06	11.50	8.92	52.17
CR32-4	20	3	254TC	32.48	10.22	8.67	49.06	11.50	8.92	52.17
CR32-5-2	25	3	284TSC	35.24	12.94	11.52	55.06	11.50	8.94	56.05
CR32-5	25	3	284TSC	35.24	12.94	11.52	55.06	11.50	8.94	56.05
CR32-6-2	25	3	284TSC	37.99	12.94	11.52	57.81	11.50	8.94	58.80
CR32-6	30	3	284TSC	37.99	15.32	13.11	61.18	11.50	8.94	59.80
CR32-7-2	30	3	284TSC	40.75	15.32	13.11	63.94	11.50	8.94	62.56
CR32-7	40	3	286TSC	40.75	15.32	13.11	63.94	13.25	12.21	64.00
CR32-8-2	40	3	286TSC	43.50	15.32	13.11	66.69	13.25	12.21	66.75
CR32-8	40	3	286TSC	43.50	15.32	13.11	66.69	13.25	12.21	66.75
CR32-9-2	40	3	286TSC	46.26	15.32	13.11	69.45	13.25	12.21	69.51
CR32-9	40	3	286TSC	46.26	15.32	13.11	69.45	13.25	12.21	69.51
CR32-10-2	50	3	324TSC	49.02	16.88	14.12	76.83	13.25	12.21	71.77
CR32-10	50	3	324TSC	49.02	16.88	14.12	76.83	13.25	12.21	71.77

Note: CR 32 low-NPSH pumps are also available as CRN pumps with PJE connection.
For information about electrical data, see page 110.

CR 45 low-NPSH pumps, 60 Hz

Pump type	HP	PH	NEMA Frame Size	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR45-2-1	20	3	254TC	29.49	10.22	8.67	46.07	11.50	8.92	49.18
CR45-2	20	3	254TC	29.49	10.22	8.67	46.07	11.50	8.92	49.18
CR45-3-2	25	3	284TSC	32.64	12.94	11.52	52.46	11.50	8.94	53.45
CR45-3-1	25	3	284TSC	32.64	12.94	11.52	52.46	11.50	8.94	53.45
CR45-3	30	3	284TSC	32.64	15.32	13.11	55.83	11.50	8.94	54.45
CR45-4-2	40	3	286TSC	35.79	15.32	13.11	58.98	13.25	12.21	59.04
CR45-4-1	40	3	286TSC	35.79	15.32	13.11	58.98	13.25	12.21	59.04
CR45-4	40	3	286TSC	35.79	15.32	13.11	58.98	13.25	12.21	59.04
CR45-5-2	40	3	286TSC	38.94	15.32	13.11	62.13	13.25	12.21	62.19
CR45-5-1	50	3	324TSC	38.94	16.88	14.12	66.75	13.25	12.21	61.69
CR45-5	50	3	324TSC	38.94	16.88	14.12	66.75	13.25	12.21	61.69
CR45-6-2	50	3	324TSC	42.09	16.88	14.12	69.90	13.25	12.21	64.84
CR45-6	50	3	324TSC	42.09	16.88	14.12	69.90	13.25	12.21	64.84
CR45-7-2	60	3	364TSC	45.24	19.00	14.90	76.03	15.12	13.19	71.37
CR45-7	60	3	364TSC	45.24	19.00	14.90	76.03	15.12	13.19	71.37

Note: CR 45 low-NPSH pumps are also available as CRN pumps with PJE connection.
For information about electrical data, see page 110.

CR 64 low-NPSH pumps, 60 Hz

Pump type	HP	PH	NEMA Frame Size	ANSI B1	TEFC D1	TEFC D2	ANSI TEFC B1 + B2	ODP D1	ODP D2	ANSI ODP B1 + B2
CR64-2-1	25	3	284TSC	29.69	12.94	11.52	49.51	11.50	8.94	50.50
CR64-2	30	3	284TSC	29.69	15.32	13.11	52.88	11.50	8.94	51.50
CR64-3-2	40	3	286 TSC	32.91	15.32	13.11	56.10	13.25	12.21	56.16
CR64-3-1	40	3	286 TSC	32.91	15.32	13.11	56.10	13.25	12.21	56.16
CR64-3	40	3	286 TSC	32.91	15.32	13.11	56.10	13.25	12.21	56.16
CR64-4-2	50	3	324 TSC	36.18	16.88	14.12	63.99	13.25	12.21	58.93
CR64-4-1	50	3	324TSC	36.18	16.88	14.12	63.99	13.25	12.21	58.93
CR64-4	60	3	364TSC	36.18	19.00	14.90	66.97	15.12	13.19	62.31
CR64-5-2	60	3	364 TSC	39.41	19.00	14.90	70.20	15.12	13.19	65.54

Note: CR 64 low-NPSH pumps are also available as CRN pumps with PJE connection.
For information about electrical data, see pages 110.

CR pumps with 4-pole motor

CR1 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

CR3 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

CR5 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

CR10 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

CR15 with 4-pole motor, 60 Hz

Pump Type	Motor (Hp)
CR 15-1	1/2
CR 15-2	1/2
CR 15-3	1/2
CR 15-4	1/2
CR 15-5	1/2
CR 15-6	1/2
CR 15-7	1/2
CR 15-8	1/2
CR 15-9	1/2
CR 15-10	1/2
CR 15-12	1/2

CR pumps with 4-pole motor (cont.)**CR20 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

CR32 with 4-pole motor, 60 Hz

Pump Type	Motor (Hp)
CR 32-1-1	3
CR 32-1	3
CR 32-2-2	3
CR 32-2-1	3
CR 32-2	3
CR 32-3-2	3
CR 32-3	3
CR 32-4-2	3
CR 32-4	3
CR 32-5-2	3
CR 32-5	3
CR 32-6-2	3
CR 32-6	5
CR 32-7-2	5
CR 32-7	5
CR 32-8-2	5
CR 32-8	5
CR 32-9-2	5
CR 32-9	5
CR 32-10-2	5
CR 32-10	7 1/2
CR 32-11-2	7 1/2

CR45 with 4-pole motor, 60 Hz

Pump Type	Motor (Hp)
CR 45-1-1	3
CR 45-1	3
CR 45-2-2	3
CR 45-2-1	3
CR 45-2	3
CR 45-3-2	3
CR 45-3-1	3
CR 45-3	3
CR 45-4-2	5
CR 45-4-1	5
CR 45-4	5
CR 45-5-2	5
CR 45-5-1	5
CR 45-5	5
CR 45-6-2	7 1/2
CR 45-6	7 1/2
CR 45-7-2	7 1/2
CR 45-7	7 1/2
CR 45-8-1	10

CR64 with 4-pole motor, 60 Hz

Pump Type	Motor (Hp)
CR 64-1-1	3
CR 64-1	3
CR 64-2-2	3
CR 64-2-1	3
CR 64-2	5
CR 64-3-2	5
CR 64-3-1	5
CR 64-3	5
CR 64-4-2	7 1/2
CR 64-4-1	7 1/2
CR 64-4	7 1/2
CR 64-5-2	7 1/2

CR90 with 4-pole motor, 60 Hz

Pump Type	Motor (Hp)
CR 90-1-1	3
CR 90-1	3
CR 90-2-2	3
CR 90-2-1	3
CR 90-2	5
CR 90-3-2	5
CR 90-3-1	5
CR 90-3	5
CR 90-4-2	7 1/2
CR 90-4-1	7 1/2

CR120 with 4-pole motor, 60 Hz

Pump Type	Motor (Hp)
CR 120-1-1	3
CR 120-1	3
CR 120-2-2	5
CR 120-2-1	5
CR 120-2	7 1/2
CR 120-3-2	7 1/2
CR 120-3-1	7 1/2
CR 120-3	10
CR 120-4-2	10
CR 120-4-1	15
CR 120-4	15
CR 120-5-2	15
CR 120-5-1	15

CR150 with 4-pole motor, 60 Hz

Pump Type	Motor (Hp)
CR 150-1-1	3
CR 150-1	5
CR 150-2-2	5
CR 150-2-1	7 1/2
CR 150-2	7 1/2
CR 150-3-2	10
CR 150-3-1	10
CR 150-3	15
CR 150-4-2	15
CR 150-4-1	15

CR Low NPSH Pump Sizing Chart, 60 Hz. - On-Off Feed Boilers

Boiler HP	Pump PSI	Boiler PSI		35 PSI	60 PSI	85 PSI	110 PSI	137 PSI	165 PSI	190 PSI	215 PSI	265 PSI	315 PSI																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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Boiler Evaporation rate GPM	Boiler PSI	Boiler PSI		35 PSI	60 PSI	85 PSI	110 PSI	137 PSI	165 PSI	190 PSI	215 PSI	265 PSI	315 PSI																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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15	1.0	CR 3-3	0.75 HP	CR 3-3	0.75 HP	CR 3-5	1 HP	CR 3-7	1.5 HP	CR 3-9	2 HP	CR 3-11	2 HP	CR 3-13	2 HP	CR 3-15	3 HP	CR 3-17	3 HP	CR 3-19	5 HP	CR 3-21	5 HP	CR 3-23	5 HP	CR 3-25	5 HP	CR 3-27	5 HP	CR 3-29	5 HP	CR 3-31	5 HP	CR 3-33	5 HP	CR 3-35	5 HP	CR 3-37	5 HP	CR 3-39	5 HP	CR 3-41	5 HP	CR 3-43	5 HP	CR 3-45	5 HP	CR 3-47	5 HP	CR 3-49	5 HP	CR 3-51	5 HP	CR 3-53	5 HP	CR 3-55	5 HP	CR 3-57	5 HP	CR 3-59	5 HP	CR 3-61	5 HP	CR 3-63	5 HP	CR 3-65	5 HP	CR 3-67	5 HP	CR 3-69	5 HP	CR 3-71	5 HP	CR 3-73	5 HP	CR 3-75	5 HP	CR 3-77	5 HP	CR 3-79	5 HP	CR 3-81	5 HP	CR 3-83	5 HP	CR 3-85	5 HP	CR 3-87	5 HP	CR 3-89	5 HP	CR 3-91	5 HP	CR 3-93	5 HP	CR 3-95	5 HP	CR 3-97	5 HP	CR 3-99	5 HP	CR 4-1	5 HP	CR 4-3	5 HP	CR 4-5	5 HP	CR 4-7	5 HP	CR 4-9	5 HP	CR 4-11	5 HP	CR 4-13	5 HP	CR 4-15	5 HP	CR 4-17	5 HP	CR 4-19	5 HP	CR 4-21	5 HP	CR 4-23	5 HP	CR 4-25	5 HP	CR 4-27	5 HP	CR 4-29	5 HP	CR 4-31	5 HP	CR 4-33	5 HP	CR 4-35	5 HP	CR 4-37	5 HP	CR 4-39	5 HP	CR 4-41	5 HP	CR 4-43	5 HP	CR 4-45	5 HP	CR 4-47	5 HP	CR 4-49	5 HP	CR 4-51	5 HP	CR 4-53	5 HP	CR 4-55	5 HP	CR 4-57	5 HP	CR 4-59	5 HP	CR 4-61	5 HP	CR 4-63	5 HP	CR 4-65	5 HP	CR 4-67	5 HP	CR 4-69	5 HP	CR 4-71	5 HP	CR 4-73	5 HP	CR 4-75	5 HP	CR 4-77	5 HP	CR 4-79	5 HP	CR 4-81	5 HP	CR 4-83	5 HP	CR 4-85	5 HP	CR 4-87	5 HP	CR 4-89	5 HP	CR 4-91	5 HP	CR 4-93	5 HP	CR 4-95	5 HP	CR 4-97	5 HP	CR 4-99	5 HP	CR 5-1	5 HP	CR 5-3	5 HP	CR 5-5	5 HP	CR 5-7	5 HP	CR 5-9	5 HP	CR 5-11	5 HP	CR 5-13	5 HP	CR 5-15	5 HP	CR 5-17	5 HP	CR 5-19	5 HP	CR 5-21	5 HP	CR 5-23	5 HP	CR 5-25	5 HP	CR 5-27	5 HP	CR 5-29	5 HP	CR 5-31	5 HP	CR 5-33	5 HP	CR 5-35	5 HP	CR 5-37	5 HP	CR 5-39	5 HP	CR 5-41	5 HP	CR 5-43	5 HP	CR 5-45	5 HP	CR 5-47	5 HP	CR 5-49	5 HP	CR 5-51	5 HP	CR 5-53	5 HP	CR 5-55	5 HP	CR 5-57	5 HP	CR 5-59	5 HP	CR 5-61	5 HP	CR 5-63	5 HP	CR 5-65	5 HP	CR 5-67	5 HP	CR 5-69	5 HP	CR 5-71	5 HP	CR 5-73	5 HP	CR 5-75	5 HP	CR 5-77	5 HP	CR 5-79	5 HP	CR 5-81	5 HP	CR 5-83	5 HP	CR 5-85	5 HP	CR 5-87	5 HP	CR 5-89	5 HP	CR 5-91	5 HP	CR 5-93	5 HP	CR 5-95	5 HP	CR 5-97	5 HP	CR 5-99	5 HP	CR 6-1	5 HP	CR 6-3	5 HP	CR 6-5	5 HP	CR 6-7	5 HP	CR 6-9	5 HP	CR 6-11	5 HP	CR 6-13	5 HP	CR 6-15	5 HP	CR 6-17	5 HP	CR 6-19	5 HP	CR 6-21	5 HP	CR 6-23	5 HP	CR 6-25	5 HP	CR 6-27	5 HP	CR 6-29	5 HP	CR 6-31	5 HP	CR 6-33	5 HP	CR 6-35	5 HP	CR 6-37	5 HP	CR 6-39	5 HP	CR 6-41	5 HP	CR 6-43	5 HP	CR 6-45	5 HP	CR 6-47	5 HP	CR 6-49	5 HP	CR 6-51	5 HP	CR 6-53	5 HP	CR 6-55	5 HP	CR 6-57	5 HP	CR 6-59	5 HP	CR 6-61	5 HP	CR 6-63	5 HP	CR 6-65	5 HP	CR 6-67	5 HP	CR 6-69	5 HP	CR 6-71	5 HP	CR 6-73	5 HP	CR 6-75	5 HP	CR 6-77	5 HP	CR 6-79	5 HP	CR 6-81	5 HP	CR 6-83	5 HP	CR 6-85	5 HP	CR 6-87	5 HP	CR 6-89	5 HP	CR 6-91	5 HP	CR 6-93	5 HP	CR 6-95	5 HP	CR 6-97	5 HP	CR 6-99	5 HP	CR 7-1	5 HP	CR 7-3	5 HP	CR 7-5	5 HP	CR 7-7	5 HP	CR 7-9	5 HP	CR 7-11	5 HP	CR 7-13	5 HP	CR 7-15	5 HP	CR 7-17	5 HP	CR 7-19	5 HP	CR 7-21	5 HP	CR 7-23	5 HP	CR 7-25	5 HP	CR 7-27	5 HP	CR 7-29	5 HP	CR 7-31	5 HP	CR 7-33	5 HP	CR 7-35	5 HP	CR 7-37	5 HP	CR 7-39	5 HP	CR 7-41	5 HP	CR 7-43	5 HP	CR 7-45	5 HP	CR 7-47	5 HP	CR 7-49	5 HP	CR 7-51	5 HP	CR 7-53	5 HP	CR 7-55	5 HP	CR 7-57	5 HP	CR 7-59	5 HP	CR 7-61	5 HP	CR 7-63	5 HP	CR 7-65	5 HP	CR 7-67	5 HP	CR 7-69	5 HP	CR 7-71	5 HP	CR 7-73	5 HP	CR 7-75	5 HP	CR 7-77	5 HP	CR 7-79	5 HP	CR 7-81	5 HP	CR 7-83	5 HP	CR 7-85	5 HP	CR 7-87	5 HP	CR 7-89	5 HP	CR 7-91	5 HP	CR 7-93	5 HP	CR 7-95	5 HP	CR 7-97	5 HP	CR 7-99	5 HP	CR 8-1	5 HP	CR 8-3	5 HP	CR 8-5	5 HP	CR 8-7	5 HP	CR 8-9	5 HP	CR 8-11	5 HP	CR 8-13	5 HP	CR 8-15	5 HP	CR 8-17	5 HP	CR 8-19	5 HP	CR 8-21	5 HP	CR 8-23	5 HP	CR 8-25	5 HP	CR 8-27	5 HP	CR 8-29	5 HP	CR 8-31	5 HP	CR 8-33	5 HP	CR 8-35	5 HP	CR 8-37	5 HP	CR 8-39	5 HP	CR 8-41	5 HP	CR 8-43	5 HP	CR 8-45	5 HP	CR 8-47	5 HP	CR 8-49	5 HP	CR 8-51	5 HP	CR 8-53	5 HP	CR 8-55	5 HP	CR 8-57	5 HP	CR 8-59	5 HP	CR 8-61	5 HP	CR 8-63	5 HP	CR 8-65	5 HP	CR 8-67	5 HP	CR 8-69	5 HP	CR 8-71	5 HP	CR 8-73	5 HP	CR 8-75	5 HP	CR 8-77	5 HP	CR 8-79	5 HP	CR 8-81	5 HP	CR 8-83	5 HP	CR 8-85	5 HP	CR 8-87	5 HP	CR 8-89	5 HP	CR 8-91	5 HP	CR 8-93	5 HP	CR 8-95	5 HP	CR 8-97	5 HP	CR 8-99	5 HP	CR 9-1	5 HP	CR 9-3	5 HP	CR 9-5	5 HP	CR 9-7	5 HP	CR 9-9	5 HP	CR 9-11	5 HP	CR 9-13	5 HP	CR 9-15	5 HP	CR 9-17	5 HP	CR 9-19	5 HP	CR 9-21	5 HP	CR 9-23	5 HP	CR 9-25	5 HP	CR 9-27	5 HP	CR 9-29	5 HP	CR 9-31	5 HP	CR 9-33	5 HP	CR 9-35	5 HP	CR 9-37	5 HP	CR 9-39	5 HP	CR 9-41	5 HP	CR 9-43	5 HP	CR 9-45	5 HP	CR 9-47	5 HP	CR 9-49	5 HP	CR 9-51	5 HP	CR 9-53	5 HP	CR 9-55	5 HP	CR 9-57	5 HP	CR 9-59	5 HP	CR 9-61	5 HP	CR 9-63	5 HP	CR 9-65	5 HP	CR 9-67	5 HP	CR 9-69	5 HP	CR 9-71	5 HP	CR 9-73	5 HP	CR 9-75	5 HP	CR 9-77	5 HP	CR 9-79	5 HP	CR 9-81	5 HP	CR 9-83	5 HP	CR 9-85	5 HP	CR 9-87	5 HP	CR 9-89	5 HP	CR 9-91	5 HP	CR 9-93	5 HP	CR 9-95	5 HP	CR 9-97	5 HP	CR 9-99	5 HP	CR 10-1	5 HP	CR 10-3	5 HP	CR 10-5	5 HP	CR 10-7	5 HP	CR 10-9	5 HP	CR 10-11	5 HP	CR 10-13	5 HP	CR 10-15	5 HP	CR 10-17	5 HP	CR 10-19	5 HP	CR 10-21	5 HP	CR 10-23	5 HP	CR 10-25	5 HP	CR 10-27	5 HP	CR 10-29	5 HP	CR 10-31	5 HP	CR 10-33	5 HP	CR 10-35	5 HP	CR 10-37	5 HP	CR 10-39	5 HP	CR 10-41	5 HP	CR 10-43	5 HP	CR 10-45	5 HP	CR 10-47	5 HP	CR 10-49	5 HP	CR 10-51	5 HP	CR 10-53	5 HP	CR 10-55	5 HP	CR 10-57	5 HP	CR 10-59	5 HP	CR 10-61	5 HP	CR 10-63	5 HP	CR 10-65	5 HP	CR 10-67	5 HP	CR 10-69	5 HP	CR 10-71	5 HP	CR 10-73	5 HP	CR 10-75	5 HP	CR 10-77	5 HP	CR 10-79	5 HP	CR 10-81	5 HP	CR 10-83	5 HP	CR 10-85	5 HP	CR 10-87	5 HP	CR 10-89	5 HP	CR 10-91	5 HP	CR 10-93	5 HP	CR 10-95	5 HP	CR 10-97	5 HP	CR 10-99	5 HP	CR 11-1	5 HP	CR 11-3	5 HP	CR 11-5	5 HP	CR 11-7	5 HP	CR 11-9	5 HP	CR 11-11	5 HP	CR 11-13	5 HP	CR 11-15	5 HP	CR 11-17	5 HP	CR 11-19	5 HP	CR 11-21	5 HP	CR 11-23	5 HP	CR 11-25	5 HP	CR 11-27	5 HP	CR 11-29	5 HP	CR 11-31	5 HP	CR 11-33	5 HP	CR 11-35	5 HP	CR 11-37	5 HP	CR 11-39	5 HP	CR 11-41	5 HP	CR 11-43	5 HP	CR 11-45	5 HP	CR 11-47	5 HP	CR 11-49	5 HP	CR 11-51	5 HP	CR 11-53	5 HP	CR 11-55	5 HP	CR 11-57	5 HP	CR 11-59	5 HP	CR 11-61	5 HP	CR 11-63	5 HP	CR 11-65	5 HP	CR 11-67	5 HP	CR 11-69	5 HP	CR 11-71	5 HP	CR 11-73	5 HP	CR 11-75	5 HP	CR 11-77	5 HP	CR 11-79	5 HP	CR 11-81	5 HP	CR 11-83	5 HP	CR 11-85	5 HP	CR 11-87	5 HP	CR 11-89	5 HP	CR 11-91	5 HP	CR 11-93	5 HP	CR 11-95	5 HP	CR 11-97	5 HP	CR 11-99	5 HP	CR 12-1	5 HP	CR 12-3	5 HP	CR 12-5	5 HP	CR 12-7	5 HP	CR 12-9	5 HP	CR 12-11	5 HP	CR 12-13	5 HP	CR 12-15	5 HP	CR 12-17	5 HP	CR 12-19	5 HP	CR 12-21	5 HP	CR 12-23	5 HP	CR 12-25	5 HP	CR 12-27	5 HP	CR 12-29	5 HP	CR 12-31	5 HP	CR 12-33	5 HP	CR 12-35	5 HP	CR 12-37	5 HP	CR 12-39	5 HP	CR 12-41	5 HP	CR 12-43	5 HP	CR 12-45	5 HP	CR 12-47	5 HP	CR 12-49	5 HP	CR 12-51	5 HP	CR 12-53	5 HP	CR 12-55	5 HP	CR 12-57	5 HP	CR 12-59	5 HP	CR 12-61	5 HP	CR 12-63	5 HP	CR 12-65	5 HP	CR 12-67	5 HP	CR 12-69	5 HP	CR 12-71	5 HP	CR 12-73	5 HP	CR 12-75	5 HP	CR 12-77	5 HP	CR 12-79	5 HP	CR 12-81	5 HP	CR 12-83	5 HP	CR 12-85	5 HP	CR 12-87	5 HP	CR 12-89	5 HP	CR 12-91	5 HP	CR 12-93	5 HP	CR 12-95	5 HP	CR 12-97	5 HP	CR 12-99	5 HP	CR 13-1	5 HP	CR 13-3	5 HP	CR 13-5	5 HP	CR 13-7	5 HP	CR 13-9	5 HP	CR 13-11	5 HP	CR 13-13	5 HP	CR 13-15	5 HP	CR 13-17	5 HP	CR 13-19	5 HP	CR 13-21	5 HP	CR 13-23	5 HP	CR 13-25	5 HP	CR 13-27	5 HP	CR 13-29	5 HP	CR 13-31	5 HP	CR 13-33	5 HP	CR 13-35	5 HP	CR 13-37	5 HP	CR 13-39	5 HP	CR 13-41	5 HP	CR 13-43	5 HP	CR 13-45	5 HP	CR 13-47	5 HP	CR 13-49	5 HP	CR 13-51	5 HP	CR 13-53	5 HP	CR 13-55	5 HP	CR 13-57	5 HP	CR 13-59	5 HP	CR 13-61	5 HP	CR 13-63	5 HP	CR 13-65	5 HP	CR 13-67	5 HP	CR 13-69	5 HP	CR 13-71	5 HP	CR 13-73	5 HP	CR 13-75	5 HP	CR 13-77	5 HP	CR 13-79	5 HP	CR 13-81	5 HP	CR 13-83	5 HP	CR 13-85	5 HP	CR 13-87	5 HP	CR 13-89	5 HP	CR 13-91	5 HP	CR 13-93	5 HP	CR 13-95	5 HP	CR 13-97	5 HP	CR 13-99	5 HP	CR 14-1	5 HP	CR 14-3	5 HP	CR 14-5	5 HP	CR 14-7	5 HP	CR 14-9	5 HP	CR 14-11	5 HP	CR 14-13	5 HP	CR 14-15	5 HP	CR 14-17	5 HP	CR 14-19	5 HP	CR 14-21	5 HP	CR 14-23	5 HP	CR 14-25	5 HP	CR 14-27	5 HP	CR 14-29	5 HP	CR 14-31	5 HP	CR 14-33	5 HP	CR 14-35	5 HP	CR 14-37	5 HP	CR 14-39	5 HP	CR 14-41	5 HP	CR 14-43	5 HP	CR 14-45	5 HP	CR 14-47	5 HP	CR 14-49	5 HP	CR 14-51	5 HP	CR 14-53	5 HP	CR 14-55	5 HP	CR 14-57	5 HP	CR 14-59	5 HP	CR 14-61	5 HP	CR 14-63	5 HP	CR 14-65	5 HP	CR 14-67	5 HP	CR 14-69	5 HP	CR 14-71	5 HP	CR 14-73	5 HP	CR 14-75	5 HP	CR 14-77	5 HP	CR 14-79	5 HP	CR 14-81	5 HP	CR 14-83	5 HP	CR 14-85	5 HP	CR 14-87	5 HP	CR 14-89	5 HP	CR 14-91	5 HP	CR 14-93	5 HP	CR 14-95	5 HP	CR 14-97	5 HP	CR 14-99	5 HP	CR 15-1	5 HP	CR 15-3	5 HP	CR 15-5	5 HP	CR 15-7	5 HP	CR 15-9	5 HP	CR 15-11	5 HP	CR 15-13	5 HP	CR 15-15	5 HP	CR 15-17	5 HP	CR 15-19	5 HP	CR 15-21	5 HP	CR 15-23	5 HP	CR 15-25	5 HP	CR 15-27	5 HP	CR 15-29	5 HP	CR 15-31	5 HP	CR 15-33	5 HP	CR 15-35	5 HP	CR 15-37	5 HP	CR 15-39	5 HP	CR 15-41	5 HP	CR 15-43	5 HP	CR 15-45	5 HP	CR 15-47	5 HP	CR 15-49	5 HP	CR 15-51	5 HP	CR 15-53	5 HP	CR 15-55	5 HP	CR 15-57	5 HP	CR 15-59	5 HP	CR 15-61	5 HP	CR 15-63	5 HP	CR 15-65	5 HP	CR 15-67	5 HP	CR 15-69	5 HP	CR 15-71	5 HP	CR 15-73	5 HP	CR 15-75	5 HP	CR 15-77	5 HP	CR 15-79	5 HP	CR 15-81	5 HP	CR 15-83	5 HP	CR 15-85	5 HP	CR 15-87	5 HP	CR 15-89	5 HP	CR 15-91	5 HP	CR 15-93	5 HP	CR 15-95	5 HP	CR 15-97	5 HP	CR 15-99	5 HP	CR 16-1	5 HP	CR 16-3	5 HP	CR 16-5	5 HP	CR 16-7	5 HP</

See pages 37 and 38 for additional details.

CR Low NPSH Pump Sizing Chart, 60 Hz. - Continuous Feed Boilers

Pump PSI Boiler PSI Evaporation rate GPM	20 PSI 10 PSI	35 PSI 25 PSI	60 PSI 50 PSI	85 PSI 75 PSI	110 PSI 100 PSI	137 PSI 125 PSI	165 PSI 150 PSI	190 PSI 175 PSI	215 PSI 200 PSI	265 PSI 250 PSI	315 PSI 300 PSI
Boiler HP	15	20	25	30	40	50	60	80	100	125	150
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
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
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 3-12 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
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 96655990	CR 3-10 2 HP 96728884	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
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 96655990	CR 3-10 2 HP 96728884	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
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 96655990	CR 3-10 2 HP 96728884	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
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 96655990	CR 3-10 2 HP 96728884	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
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 96655990	CR 3-10 2 HP 96728884	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
6.9	CR 3-3 0.75 HP 96640808	CR 3-4 1 HP 97786047	CR 3-7 1.5 HP 96777669	CR 3-9 2 HP 96654135	CR 3-12 3 HP 966580361	CR 3-15 3 HP 97786048	CR 3-17 3 HP 97786061	CR 3-19 5 HP 97786062	CR 3-23 5 HP 97786063	CR 3-27 7.5 HP 97786067	CR 10-17 15 HP 97786808
8.6	CR 3-3 0.75 HP 96640808	CR 3-5 1 HP 96734615	CR 3-7 1.5 HP 96777669	CR 3-10 2 HP 96654135	CR 3-13 3 HP 97786050	CR 3-17 3 HP 97786061	CR 3-20 5 HP 97786063	CR 3-24 7.5 HP 97786065	CR 3-28 10 HP 97786067	CR 3-32 10 HP 97786069	CR 10-17 15 HP 97786808
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 97786061	CR 3-20 5 HP 97786063	CR 3-24 7.5 HP 97786065	CR 3-28 10 HP 97786067	CR 3-32 10 HP 97786069	CR 3-36 10 HP 97786071	CR 10-17 15 HP 97786808
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 97786090	CR 5-17 5 HP 97786093	CR 5-20 7.5 HP 97786096	CR 5-24 10 HP 97786100	CR 5-28 10 HP 97786104	CR 10-17 15 HP 97786808
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 97786089	CR 5-16 7.5 HP 97786092	CR 5-20 10 HP 97786095	CR 5-24 10 HP 97786098	CR 5-28 10 HP 97786102	CR 5-32 10 HP 97786106	CR 10-17 15 HP 97786808
20.7	CR 5-4 2 HP 97786069	CR 5-6 3 HP 97786081	CR 5-9 5 HP 97786083	CR 5-12 5 HP 97786086	CR 5-15 5 HP 97786089	CR 5-18 7.5 HP 97786092	CR 5-22 10 HP 97786095	CR 5-26 10 HP 97786098	CR 5-30 10 HP 97786102	CR 5-34 10 HP 97786106	CR 10-17 15 HP 97786808
24.2	CR 5-5 3 HP 97786070	CR 5-7 3 HP 97786082	CR 5-11 5 HP 97786087	CR 5-14 5 HP 97786090	CR 5-17 5 HP 97786093	CR 5-20 7.5 HP 97786096	CR 5-24 10 HP 97786098	CR 5-28 10 HP 97786102	CR 5-32 10 HP 97786106	CR 5-36 10 HP 97786110	CR 10-17 15 HP 97786808
27.6	CR 10-3 3 HP 97786106	CR 10-3 3 HP 97786106	CR 10-5 5 HP 97786107	CR 10-8 7.5 HP 97786110	CR 10-10 10 HP 97786113	CR 10-13 10 HP 97786116	CR 10-16 10 HP 97786119	CR 10-19 10 HP 97786122	CR 10-22 10 HP 97786125	CR 10-25 10 HP 97786128	CR 10-17 15 HP 97786808
34.5	CR 10-3 3 HP 97786106	CR 10-3 3 HP 97786106	CR 10-5 5 HP 97786107	CR 10-8 7.5 HP 97786110	CR 10-10 10 HP 97786113	CR 10-13 10 HP 97786116	CR 10-16 10 HP 97786119	CR 10-19 10 HP 97786122	CR 10-22 10 HP 97786125	CR 10-25 10 HP 97786128	CR 10-17 15 HP 97786808
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 97786814	CR 15-5 10 HP 97786817	CR 15-8 10 HP 97786820	CR 15-11 10 HP 97786823	CR 15-14 10 HP 97786826	CR 15-17 10 HP 97786829	CR 15-20 10 HP 97786832	CR 10-17 15 HP 97786808
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 97786814	CR 15-5 10 HP 97786817	CR 15-8 10 HP 97786820	CR 15-11 10 HP 97786823	CR 15-14 10 HP 97786826	CR 15-17 10 HP 97786829	CR 15-20 10 HP 97786832	CR 10-17 15 HP 97786808
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 97786814	CR 15-5 10 HP 97786817	CR 15-8 10 HP 97786820	CR 15-11 10 HP 97786823	CR 15-14 10 HP 97786826	CR 15-17 10 HP 97786829	CR 15-20 10 HP 97786832	CR 10-17 15 HP 97786808
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 97786814	CR 15-5 10 HP 97786817	CR 15-8 10 HP 97786820	CR 15-11 10 HP 97786823	CR 15-14 10 HP 97786826	CR 15-17 10 HP 97786829	CR 15-20 10 HP 97786832	CR 10-17 15 HP 97786808
62.1	CR 32-21 10 HP 97781873	CR 32-21 10 HP 97781873	CR 32-2 15 HP 97786846	CR 32-3 15 HP 97786849	CR 32-4 20 HP 97786852	CR 32-5 20 HP 97786855	CR 32-6 20 HP 97786858	CR 32-7 20 HP 97786861	CR 32-8 20 HP 97786864	CR 32-9 20 HP 97786867	CR 10-17 15 HP 97786808
69.0	CR 32-21 10 HP 97781873	CR 32-21 10 HP 97781873	CR 32-2 15 HP 97786846	CR 32-3 15 HP 97786849	CR 32-4 20 HP 97786852	CR 32-5 20 HP 97786855	CR 32-6 20 HP 97786858	CR 32-7 20 HP 97786861	CR 32-8 20 HP 97786864	CR 32-9 20 HP 97786867	CR 10-17 15 HP 97786808
75.9	CR 32-21 10 HP 97781873	CR 32-21 10 HP 97781873	CR 32-2 15 HP 97786846	CR 32-3 15 HP 97786849	CR 32-4 20 HP 97786852	CR 32-5 20 HP 97786855	CR 32-6 20 HP 97786858	CR 32-7 20 HP 97786861	CR 32-8 20 HP 97786864	CR 32-9 20 HP 97786867	CR 10-17 15 HP 97786808
82.8	CR 45-21 20 HP 97787931	CR 45-21 20 HP 97787931	CR 45-2 20 HP 97787931	CR 45-3 25 HP 97787932	CR 45-4 25 HP 97787935	CR 45-5 25 HP 97787938	CR 45-6 25 HP 97787941	CR 45-7 25 HP 97787944	CR 45-8 25 HP 97787947	CR 45-9 25 HP 97787950	CR 10-17 15 HP 97786808
89.7	CR 45-21 20 HP 97787931	CR 45-21 20 HP 97787931	CR 45-2 20 HP 97787931	CR 45-3 25 HP 97787932	CR 45-4 25 HP 97787935	CR 45-5 25 HP 97787938	CR 45-6 25 HP 97787941	CR 45-7 25 HP 97787944	CR 45-8 25 HP 97787947	CR 45-9 25 HP 97787950	CR 10-17 15 HP 97786808
96.6	CR 45-21 20 HP 97787931	CR 45-21 20 HP 97787931	CR 45-2 20 HP 97787931	CR 45-3 25 HP 97787932	CR 45-4 25 HP 97787935	CR 45-5 25 HP 97787938	CR 45-6 25 HP 97787941	CR 45-7 25 HP 97787944	CR 45-8 25 HP 97787947	CR 45-9 25 HP 97787950	CR 10-17 15 HP 97786808
103.5	CR 45-21 20 HP 97787931	CR 45-21 20 HP 97787931	CR 45-2 20 HP 97787931	CR 45-3 25 HP 97787932	CR 45-4 25 HP 97787935	CR 45-5 25 HP 97787938	CR 45-6 25 HP 97787941	CR 45-7 25 HP 97787944	CR 45-8 25 HP 97787947	CR 45-9 25 HP 97787950	CR 10-17 15 HP 97786808

See pages 37 and 38 for additional details.

Bypass Orifices

303 Stainless Steel Bypass Orifices for Continuous Feed Boilers

Grundfos Pump Model	Temp. Range	Min. Flow Rate	Min. Req'd Bypass Line Size (1)	Grundfos Orifice Size (2)	For 1/2" Tap Material No.	For 3/4" NPT Tap Material No.
CR(I,N)1s	2 to 3 4 to 36 (251-280°F w/Cool Top)	0.5 GPM	3/8"	3/32"	91128255	—
				1/16"	91128254	—
CR(I,N)1s	2 to 8 8 to 36 (281-320°F w/Cool Top)	0.7 GPM	3/8"	3/32"	91128255	—
				1/16"	91128254	—
CR(I,N)1s	2 to 4 5 to 21 23 to 36 (321-356°F w/Cool Top)	1.1 GPM	3/8"	1/8"	9600190K	—
				3/32"	91128255	—
CR(I,N)1	2 3 to 12 13 to 36 (251-280°F w/Cool Top)	0.9 GPM	3/8"	1/16"	91128254	—
				3/32"	91128255	—
CR(I,N)1	2 to 5 6 to 36 (281-320°F w/Cool Top)	1.3 GPM	3/8"	1/8"	9600190K	—
				3/32"	91128255	—
CR(I,N)1	2 to 4 5 to 13 15 to 36 (321-356°F w/Cool Top)	2.1 GPM	1/2"	5/32"	91128256	—
				1/8"	9600190K	—
CR(I,N)3	2 to 6 7 to 36 (251-280°F w/Cool Top)	1.6 GPM	1/2"	3/32"	91128255	—
				1/8"	9600190K	—
CR(I,N)3	2 to 5 6 to 15 17 to 36 (281-320°F w/Cool Top)	2.4 GPM	1/2"	5/32"	91128256	—
				1/8"	9600190K	—
CR(I,N)3	2 to 6 7 to 13 15 to 36 (321-356°F w/Cool Top)	4.0 GPM	1/2"	3/16"	9600191K	—
				5/32"	91128256	—
CR(I,N)5	2 to 3 4 to 7 8 to 36 (251-280°F w/Cool Top)	3.0 GPM	1/2"	1/8"	9600190K	—
				3/16"	91128256	—
CR(I,N)5	2 to 3 4 to 6 7 to 16 18 to 36 (281-320°F w/Cool Top)	4.5 GPM	1/2"	1/4"	9600192K	—
				3/16"	9600191K	—
CR(I,N)5	2 to 3 4 to 6 7 to 16 18 to 36 (281-320°F w/Cool Top)	4.5 GPM	1/2"	5/32"	91128256	—
				1/8"	9600190K	—
CR(I,N)5	2 to 9 10 to 18 20 to 36 (321-356°F w/Cool Top)	7.5 GPM	1/2"	1/4"	9600192K	—
				3/16"	9600191K	—
CR(I,N)10	1 to 2 3 to 6 7 to 14 16 to 17 (251-280°F w/Cool Top)	5.0 GPM	3/4"	5/32"	91128256	—
				1/8"	9600190K	9600052
CR(I,N)10	1 to 3 4 to 10 12 to 17 (281-320°F w/Cool Top)	7.5 GPM	3/4"	1/4"	9600192K	9600072
				3/16"	9600191K	9600062
CR(I,N)10	1 2 to 3 4 to 14 16 to 17 (321-356°F w/Cool Top)	12.5 GPM	1"	5/32"	91128256	—
				1/8"	9600190K	9600052
CR(I,N)10	1 2 to 3 4 to 14 16 to 17 (321-356°F w/Cool Top)	12.5 GPM	1"	1/4"	9600192K	9600092
				3/16"	9600191K	9600082
CR(I,N)15	1 2 to 6 7 to 12 (251-280°F w/Cool Top)	9.0 GPM	1"	5/16"	9600193K	9600072
				1/4"	9600192K	9600062
CR(I,N)15	1 2 to 4 5 to 12 (281-320°F w/Cool Top)	13.5 GPM	1"	5/16"	9600193K	9600082
				1/4"	9600192K	9600072
CR(I,N)15	1 to 2 3 to 4 5 to 10 12 (321-356°F w/Cool Top)	22.5 GPM	1 1/4"	7/16"	9600195K	9600102
				3/8"	9600194K	9600092
CR(I,N)20	1 to 2 3 to 7 8 to 10 (251-280°F w/Cool Top)	10.5 GPM	1"	5/16"	9600193K	9600082
				1/4"	9600192K	9600072
CR(I,N)20	1 2 to 5 6 to 10 (281-320°F w/Cool Top)	16.0 GPM	1 1/4"	3/16"	9600191K	9600062
				5/16"	9600193K	9600082
CR(I,N)20	1 2 to 3 4 to 7 8 to 10 (321-356°F w/Cool Top)	26.0 GPM	1 1/4"	1/4"	9600192K	9600072
				7/16"	9600195K	9600102
CR(N)32	1-1 to 1 2-2 to 4-2 4 to 14 (251-280°F w/Cool Top)	14.0 GPM	1 1/4"	3/8"	9600194K	9600092
				5/16"	9600193K	9600082

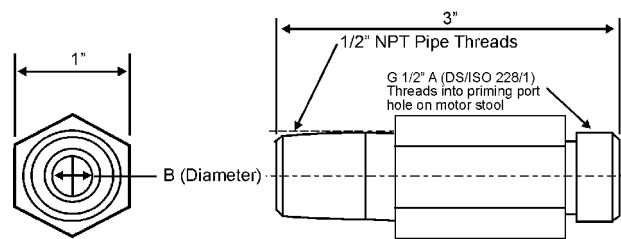
NOTES: (1) Bypass line recommendations are based on the orifice size, the pump's minimum flow rate requirement, and the friction losses in 50 ft. of the recommended bypass line shown. (2) Orifices other than those supplied by Grundfos may have different flow/head characteristics..

Bypass Orifices - 303 Stainless Steel Bypass Orifices for Continuous Feed Boilers

Grundfos Pump Model	Temp. Range	Min. Flow Rate	Min. Req'd Bypass Line Size (1)	Grundfos Orifice Size (2)	For 1" or 1 1/2" Tap Material No.	For 3/4" NPT Tap Material No.
CR(N)32	1-1 to 1 2-2 to 3 4-2 to 8 9-2 to 14 (177-210°F w/Cool Top)	21.0 GPM	1 1/4"	1/2"	—	9600112
				3/8"	—	9600092
				5/16"	—	9600082
				1/4"	—	9600072
CR(N)32	1-1 to 1 2-2 to 3-2 3 to 5-2 5 to 14 (211-250°F w/Cool Top)	35.0 GPM	1 1/2"	9/16"	91122293	—
				1/2"	—	9600112
				7/16"	—	9600102
				3/8"	—	9600092
CR(N)45	1-1 to 1 2-2 to 3 4-2 to 10 (5-176°F w/Cool Top)	22.0 GPM	1 1/4"	7/16"	—	9600102
				3/8"	—	9600092
				5/16"	—	9600082
				—	—	—
CR(N)45	1-1 to 2-2 2-1 to 3 4-2 to 6 7-2 to 10 (177-210°F w/Cool Top)	33.0 GPM	1 1/2"	7/16"	—	9600112
				3/8"	—	9600102
				5/16"	—	9600092
				—	—	9600082
CR(N)45	1-1 to 2-2 2-1 to 3-1 3 to 5-2 5-1 to 10 (211-250°F w/Cool Top)	55.0 GPM	1 1/2"	5/8"	91122294	—
				9/16"	91122293	—
				1/2"	—	9600112
				7/16"	—	9600102
CR(N)64	1-1 to 2-2 2-1 to 3-1 3 to 7-1 (5-176°F w/Cool Top)	34.0 GPM	1 1/2"	1/2"	—	9600112
				7/16"	—	9600102
				3/8"	—	9600092
				—	—	—
CR(N)64	1-1 to 1 2-2 to 2 3-2 to 4-2 4-1 to 7-1 (177-210°F w/Cool Top)	51.0 GPM	1 1/2"	5/8"	91122294	—
				9/16"	91122293	—
				1/2"	—	9600112
				7/16"	—	9600102
CR(N)64	1-1 to 2-2 2-1 to 2 3-2 to 4-2 4-1 to 7-1 (211-250°F w/Cool Top)	85.0 GPM	2"	13/16"	91122297	—
				11/16"	91122295	—
				5/8"	91122294	—
				9/16"	91122293	—
CR(N)90	1-1 to 1 2-2 to 2 3-2 to 6 (5-176°F w/Cool Top)	44.0 GPM	1 1/2"	9/16"	91122293	—
				1/2"	—	9600112
				7/16"	—	9600102
				—	—	—
CR(N)90	1-1 to 1 2-2 to 2-1 2 to 3-1 3 to 6 (177-210°F w/Cool Top)	66.0 GPM	2"	11/16"	91122295	—
				5/8"	91122294	—
				9/16"	91122293	—
				1/2"	—	9600112
CR(N)90	1-1 to 2-2 2-1 to 2 3-2 to 6 (211-250°F w/Cool Top)	110.0 GPM	2"	7/8"	91122298	—
				3/4"	91122296	—
				11/16"	91122295	—
				—	—	—
CR(N)120	1-1 1 2-2 to 2-1 2 to 3-1 3 to 5-1 (5-176°F w/Cool Top)"	61.0 GPM	1 1/2"	3/4"	91122296	—
				11/16"	91122295	—
				5/8"	91122294	—
				9/16"	91122293	—
CR(N)120	1-1 1 2-2 to 2-1 2 to 3-2 3-1 to 4 5-2 to 5-1 (177-210°F w/Cool Top)"	92.0 GPM	2"	1/2"	—	9600112
				7/8"	91122298	—
				13/16"	91122297	—
				3/4"	91122296	—
CR(N)120	1-1 1 2-2 to 2-1 2 to 3-2 3-1 to 4-1 4 to 5-1 (211-250°F w/Cool Top)"	153.0 GPM	2 1/2"	11/16"	91122295	—
				5/8"	91122294	—
				9/16"	91122293	—
				—	—	—
CR(N)120	1-1 1 2-2 to 2-1 2 to 3-2 3-1 to 4-1 4 to 5-1 (211-250°F w/Cool Top)"	153.0 GPM	2 1/2"	1 1/8"	Call Factory	—
				1 1/16"	Call Factory	—
				1"	91122299	—
				7/8"	91122298	—
CR(N)150	1-1 1 2-2 2-1 to 3-2 3-1 to 4-1 (5-176°F w/Cool Top)"	75.0 GPM	2"	13/16"	91122297	—
				3/4"	91122296	—
				11/16"	91122295	—
				5/8"	91122294	—
CR(N)150	1-1 1 2-2 2-1 to 3-2 3-1 to 4-1 (177-210°F w/Cool Top)"	113.0 GPM	2"	9/16"	91122293	—
				1"	91122299	—
				7/8"	91122298	—
				13/16"	91122297	—
CR(N)150	1-1 1 2-2 to 2-1 2 to 3-2 3-1 to 4-1 (211-250°F w/Cool Top)"	188.0 GPM	3"	3/4"	91122296	—
				11/16"	91122295	—
				1 1/4"	Call Factory	—
				1 1/8"	Call Factory	—
CR(N)150	1-1 1 2-2 2-1 to 3-1 3 to 4-1 (211-250°F w/Cool Top)"	188.0 GPM	3"	1 1/16"	Call Factory	—
				1"	91122299	—
				7/8"	91122298	—
				—	—	—

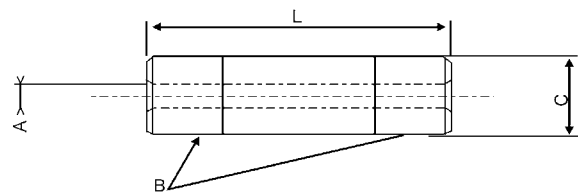
NOTES: (1) Bypass line recommendations are based on the orifice size, the pump's minimum flow rate requirement, and the friction losses in 50 ft. of the recommended bypass line shown. (2) Orifices other than those supplied by Grundfos may have different flow/head characteristics. (3) Orifice sizes 9/16" to 3/4" have 1" NPT threads and Orifice sizes 13/16" to 1" have 1 1/2" NPT threads.

Bypass Orifices - 303 Stainless Steel Bypass Orifices for Continuous Feed Boilers



TM05 7423 0313

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"



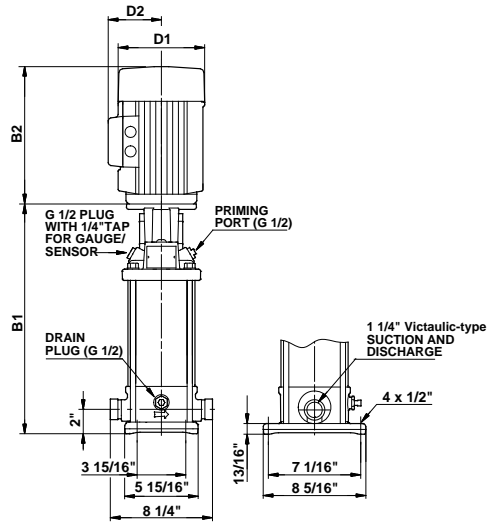
TM05 7424 0313

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"

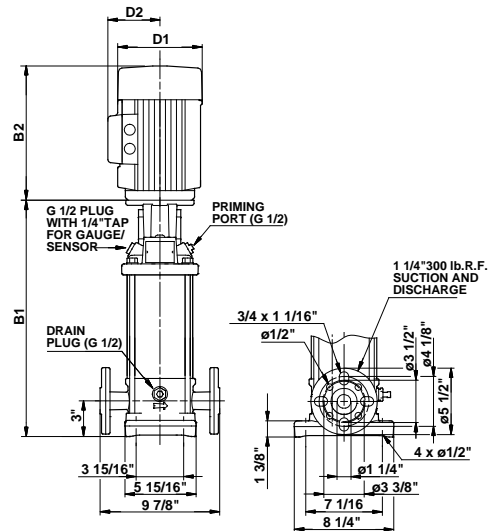
15. CRN pumps with magnetic drive

Dimensions

CRN 1s
CRN(E) 1
CRN(E) 3
CRN(E) 5

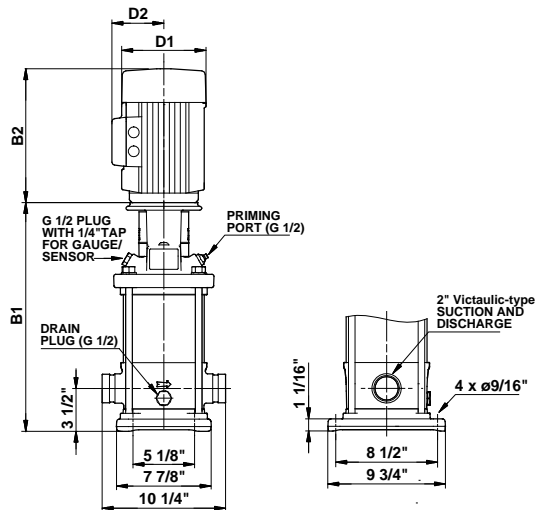


TM03 1454 2205

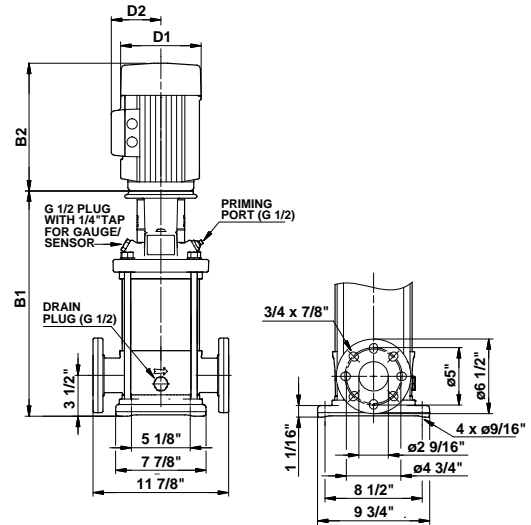


TM03 1453 2205

CRN(E) 10
CRN(E) 15
CRN(E) 20



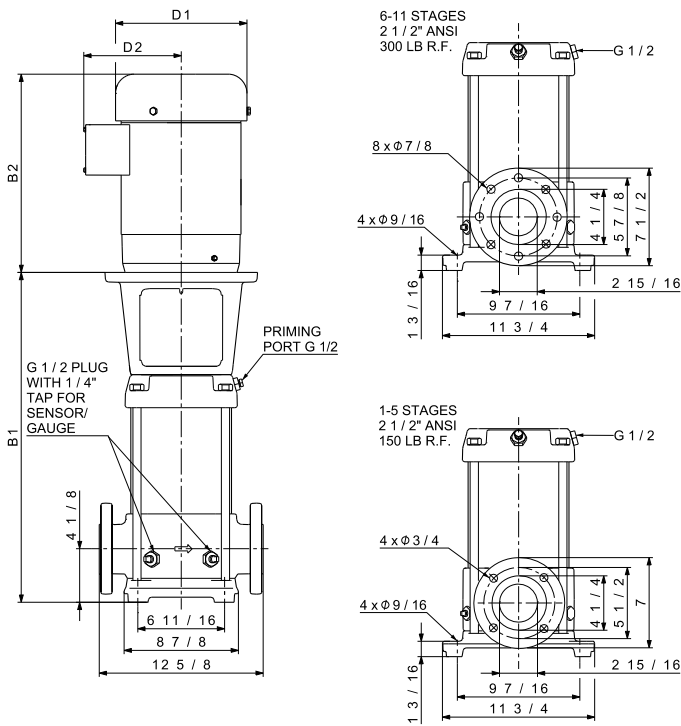
TM03 1457 2205



TM03 1459 2205

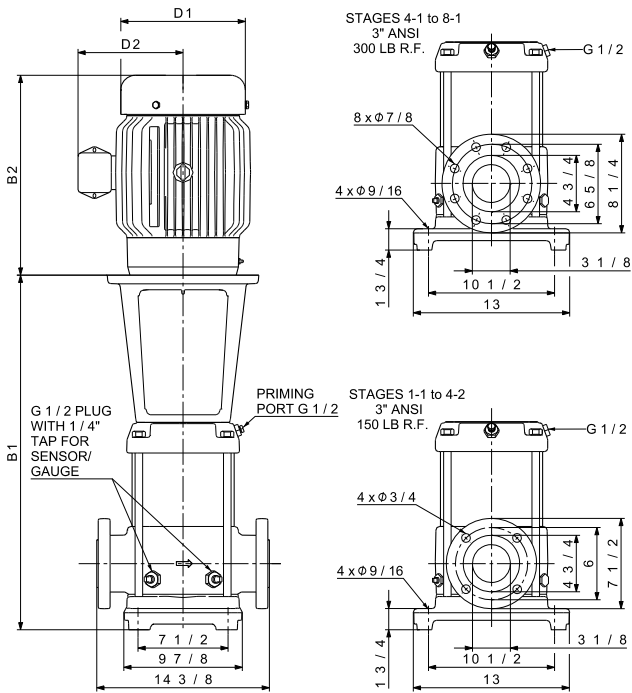
Dimensions

CRN(E) 32



TM02 7703 1009

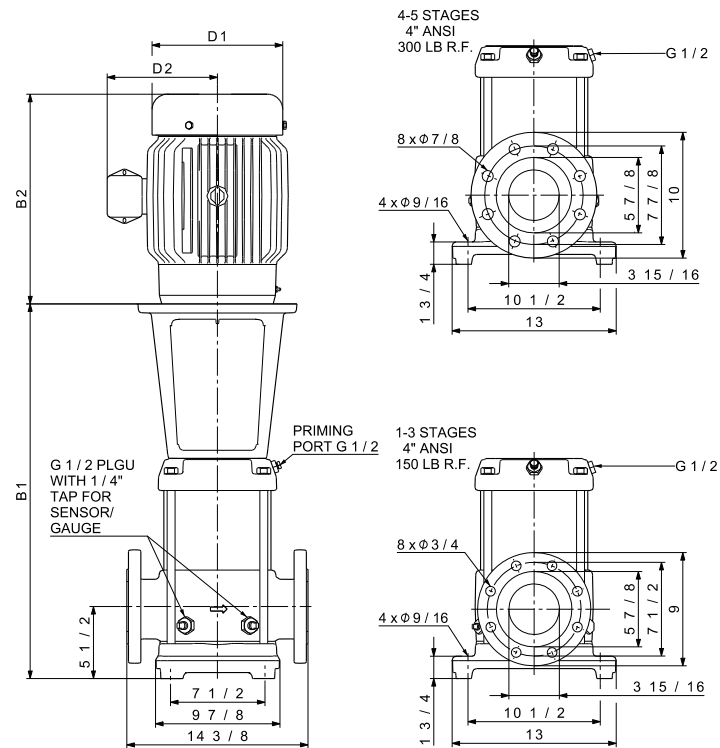
CRN(E) 45



TM02 7704 1009

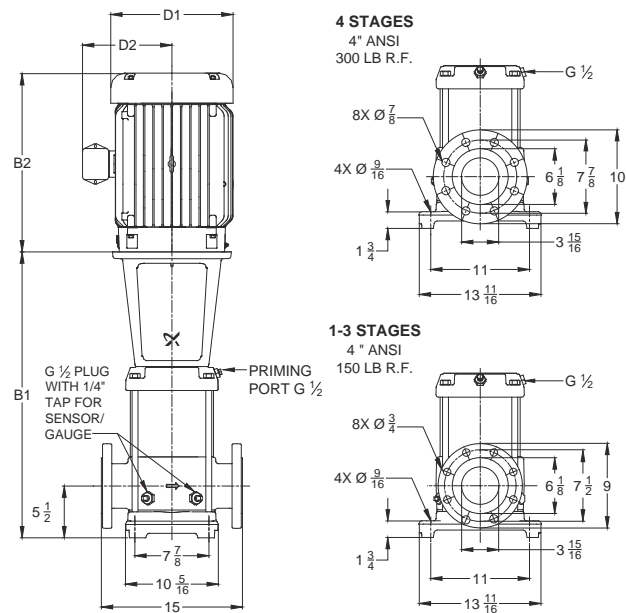
Dimensions

CRN(E) 64



TM02 7705 1009

CRN(E) 90



TM02 7706 1009

Dimensions and Weights

CRN 1 MAGdrive, 60 Hz

Pump type	Hp	Ph	PJE*	Dimensions					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN 1s-2	0.5	3	*	15.47	11.35	6.19	5.19	26.82	73
CRN 1s-3	0.5	3	*	15.47	11.35	6.19	5.19	26.82	73
CRN 1s-4	0.5	3	*	16.18	11.35	6.19	5.19	27.53	74
CRN 1s-5	0.5	3	*	16.88	11.35	6.19	5.19	28.23	75
CRN 1s-6	0.75	3	*	17.59	11.35	6.19	5.19	28.94	76
CRN 1s-7	0.75	3	*	18.30	11.35	6.19	5.19	29.65	77
CRN 1s-8	0.75	3	*	19.01	11.35	6.19	5.19	30.36	78
CRN 1s-9	1	3	*	19.72	11.35	6.19	5.19	31.07	79
CRN 1s-10	1	3	*	20.43	11.35	6.19	5.19	31.78	80
CRN 1s-11	1	3	*	21.14	11.35	6.19	5.19	32.49	81
CRN 1s-12	1	3	*	21.84	11.35	6.19	5.19	33.19	82
CRN 1s-13	1.5	3	*	22.55	11.97	6.19	5.19	34.52	87
CRN 1s-15	1.5	3	*	23.97	11.97	6.19	5.19	35.94	89
CRN 1s-17	1.5	3	*	25.39	11.97	6.19	5.19	37.36	89
CRN 1s-19	2	3	*	26.81	12.85	6.19	5.19	39.66	96
CRN 1s-21	2	3	*	28.22	12.85	6.19	5.19	41.07	98
CRN 1s-23	2	3	*	29.64	12.85	6.19	5.19	42.49	99
CRN 1s-25	3	3	*	32.18	12.55	7.19	5.72	44.73	142
CRN 1s-27	3	3	*	33.59	12.55	7.19	5.72	46.14	144

All pumps are three phase. All dimensions in inches unless otherwise noted.

* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available

CRN(E) 1 MAGdrive, 60 Hz

Pump type	Hp	Ph	PJE*	Dimensions					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN 1-2	0.5	3	*	15.47	11.35	6.19	5.19	26.82	73
CRN 1-3	0.5	3	*	15.47	11.35	6.19	5.19	26.82	73
CRN 1-4	0.75	3	*	16.18	11.35	6.19	5.19	27.53	74
CRN(E) 1-5	0.75	3	*	16.88	11.35	6.19	5.19	28.23	75
CRN 1-6	1	3	*	17.59	11.35	6.19	5.19	28.94	77
CRN(E) 1-7	1	3	*	18.30	11.35	6.19	5.19	29.65	78
CRN 1-8	1.5	3	*	19.01	11.97	6.19	5.19	30.98	83
CRN 1-9	1.5	3	*	19.72	11.97	6.19	5.19	31.69	84
CRN(E) 1-10	1.5	3	*	20.43	11.97	6.19	5.19	32.40	79
CRN 1-11	1.5	3	*	21.14	11.97	6.19	5.19	33.11	81
CRN 1-12	2	3	*	21.84	12.85	6.19	5.19	34.69	87
CRN(E) 1-13	2	3	*	22.55	12.85	6.19	5.19	35.40	88
CRN(E) 1-15	2	3	*	23.97	12.85	6.19	5.19	36.82	109
CRN 1-17	3	3	*	26.51	12.55	7.19	5.72	39.06	127
CRN(E) 1-19	3	3	*	26.81	12.55	7.19	5.72	39.36	132
CRN 1-21	3	3	*	29.32	12.55	7.19	5.72	41.87	172
CRN(E) 1-23	5	3	*	30.74	13.93	8.50	6.87	44.67	193
CRN 1-25	5	3	*	32.16	13.93	8.50	6.87	46.09	195
CRN(E) 1-27	5	3	*	33.58	13.93	8.50	6.87	47.51	197

All pumps are three phase. All dimensions in inches unless otherwise noted.

* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available

Dimensions and Weights

CRN(E) 3 MAGdrive, 60 Hz

Pump type	Hp	Ph	PJE*	Dimensions					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN 3-2	0.5	3	*	15.47	11.35	6.19	5.19	26.82	73
CRN(E) 3-3	0.75	3	*	15.47	11.35	6.19	5.19	26.82	73
CRN 3-4	1	3	*	16.18	11.35	6.19	5.19	27.53	75
CRN(E) 3-5	1	3	*	16.88	11.35	6.19	5.19	28.23	76
CRN(E) 3-6	1.5	3	*	17.59	11.97	6.19	5.19	29.56	81
CRN 3-7	1.5	3	*	18.30	11.97	6.19	5.19	30.27	81
CRN 3-8	2	3	*	19.01	12.85	6.19	5.19	31.86	83
CRN(E) 3-9	2	3	*	19.72	12.85	6.19	5.19	32.57	84
CRN 3-10	2	3	*	20.43	12.85	6.19	5.19	33.28	101
CRN 3-11	3	3	*	22.26	12.55	7.19	5.72	34.81	127
CRN(E) 3-12	3	3	*	22.96	12.55	7.19	5.72	35.51	128
CRN 3-13	3	3	*	23.66	12.55	7.19	5.72	36.21	161
CRN(E) 3-15	5	3	*	25.07	13.93	8.50	6.87	39.00	183
CRN 3-17	5	3	*	26.49	13.93	8.50	6.87	40.42	185
CRN(E) 3-19	5	3	*	27.91	13.93	8.50	6.87	41.84	186
CRN 3-21	5	3	*	29.32	13.93	8.50	6.87	43.25	235
CRN 3-23	5	3	*	30.74	13.93	8.50	6.87	44.67	236
CRN(E) 3-25	5	3	*	32.16	13.93	8.50	6.87	46.09	238

All pumps are three phase. All dimensions in inches unless otherwise noted.

* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available

CRN(E) 5 MAGdrive, 60 Hz

Pump type	Hp	Ph	PJE*	Dimensions					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN(E) 5-2	1	3	*	15.47	11.35	6.19	5.19	26.82	74
CRN(E) 5-3	1.5	3	*	16.53	11.97	6.19	5.19	28.50	79
CRN 5-4	2	3	*	17.59	12.85	6.19	5.19	30.44	81
CRN(E) 5-5	2	3	*	18.66	12.85	6.19	5.19	31.51	98
CRN 5-6	3	3	*	20.84	12.55	7.19	5.72	33.39	121
CRN(E) 5-7	3	3	*	21.89	12.55	7.19	5.72	34.44	125
CRN 5-8	5	3	*	22.95	13.93	8.50	6.87	36.88	179
CRN 5-9	5	3	*	24.01	13.93	8.50	6.87	37.94	181
CRN(E) 5-10	5	3	*	25.07	13.93	8.50	6.87	39.00	184
CRN 5-11	5	3	*	26.14	13.93	8.50	6.87	40.07	226
CRN 5-12	5	3	*	27.20	13.93	8.50	6.87	41.13	231
CRN(E) 5-13	5	3	*	28.26	13.93	8.50	6.87	42.19	232
CRN 5-14	7.5	3	*	30.69	15.43	8.60	5.91	46.12	268
CRN 5-15	7.5	3	*	31.76	15.43	8.60	5.91	47.19	269
CRN(E) 5-16	7.5	3	*	32.82	15.43	8.60	5.91	48.25	270
CRN 5-18	7.5	3	*	34.96	15.43	8.60	5.91	50.39	272
CRN(E) 5-20	7.5	3	*	37.08	15.43	8.60	5.91	52.51	274
CRN 5-22	10	3	*	34.96	15.51	10.28	8.05	50.47	319

All pumps are three phase. All dimensions in inches unless otherwise noted.

* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.

• Available

Dimensions and Weights
CRN(E) 10 MAGdrive, 60 Hz

Pump type	Hp	Ph	PJE*	Dimensions					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN(E) 10-1	1	3	*	18.70	11.35	6.19	5.19	30.05	107
CRN(E) 10-2	2	3	*	18.70	12.85	6.19	5.19	31.55	115
CRN 10-3	3	3	*	20.63	12.55	7.19	5.72	33.18	198
CRN(E) 10-4	5	3	*	21.81	13.93	8.50	6.87	35.74	218
CRN 10-5	5	3	*	22.99	13.93	8.50	6.87	36.92	220
CRN(E) 10-6	7.5	3	*	24.67	15.43	8.60	5.91	40.10	223
CRN 10-7	7.5	3	*	25.67	15.43	8.60	5.91	41.10	228
CRN(E) 10-8	7.5	3	*	26.85	15.43	8.60	5.91	42.28	231
CRN 10-9	10	3	*	28.03	15.51	10.28	8.05	43.54	258
CRN(E) 10-10	10	3	*	29.21	15.51	10.28	8.05	44.72	260
CRN(E) 10-12	15	3	*	34.20	16.57	10.28	9.22	50.77	279
CRN(E) 10-14	15	3	*	36.45	16.57	10.28	9.22	53.02	452
CRN 10-16	15	3	*	38.81	16.57	10.28	9.22	55.38	462
CRN 10-17	20	3	*	41.18	19.57	10.28	9.40	60.75	491

All pumps are three phase. All dimensions in inches unless otherwise noted.
* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.
• Available

CRN(E) 15 MAGdrive, 60 Hz

Pump type	Hp	Ph	PJE*	Dimensions					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN(E) 15-1	3	3	*	19.88	12.55	7.19	5.72	32.43	150
CRN(E) 15-2	5	3	*	20.63	13.93	8.50	6.87	34.56	207
CRN(E) 15-3	7.5	3	*	22.71	15.43	8.60	5.91	38.14	219
CRN(E) 15-4	10	3	*	24.48	15.51	10.28	8.05	39.99	247
CRN(E) 15-5	15	3	*	28.89	16.57	10.28	9.22	45.46	268
CRN(E) 15-6	15	3	*	30.55	16.57	10.28	9.22	47.12	385
CRN 15-7	15	3	*	32.32	16.57	10.28	9.22	48.89	418
CRN 15-8	20	3	*	34.09	19.57	10.28	9.40	53.66	475
CRN 15-9	20	3	*	35.86	19.57	10.28	9.40	55.43	491
CRN 15-10	25	3	*	36.76	22.40	12.94	11.52	59.16	504
CRN 15-12	25	3	*	40.55	22.40	12.94	11.52	62.95	524

All pumps are three phase. All dimensions in inches unless otherwise noted.
* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.
• Available

CRN(E) 20 MAGdrive, 60 Hz

Pump type	Hp	Ph	PJE*	Dimensions					Ship Wt. [lbs]
				B1	B2	D1	D2	B1 + B2	
CRN(E) 20-1	3	3	*	20.63	12.55	7.19	5.72	33.18	156
CRN(E) 20-2	7.5	3	*	21.13	15.43	8.60	5.91	36.56	242
CRN(E) 20-3	10	3	*	22.71	15.51	10.28	8.05	38.22	251
CRN(E) 20-4	15	3	*	27.11	16.57	10.28	9.22	43.68	262
CRN 20-5	15	3	*	28.78	16.57	10.28	9.22	45.35	414
CRN 20-6	20	3	*	30.55	19.57	10.28	9.40	50.12	440
CRN 20-7	20	3	*	32.32	19.57	10.28	9.40	51.89	454
CRN 20-8	25	3	*	33.22	22.40	12.94	11.52	55.62	519

All pumps are three phase. All dimensions in inches unless otherwise noted.
* PJE flanged pump B1 and B1+B2 dimension is one inch less than ANSI flanged pump and weight is approximately 9 lbs. less.
• Available

Dimensions and Weights

CRN(E) 32 MAGdrive, 60 Hz

Pump type	Hp	Ph	Dimensions					Ship Wt. [lbs]
			B1	B2	D1	D2	B1 + B2	
CRN(E) 32-1-1	5	3	19.88	13.93	8.50	6.87	33.81	235
CRN(E) 32-1	7.5	3	20.76	15.43	8.60	5.91	36.19	244
CRN 32-2-2	7.5	3	23.52	15.43	8.60	5.91	38.95	248
CRN 32-2-1	10	3	22.64	15.51	10.28	8.05	38.15	273
CRN(E) 32-2	10	3	22.64	15.51	10.28	8.05	38.15	282
CRN(E) 32-3-2	15	3	29.52	16.57	10.28	9.22	46.09	295
CRN 32-3	15	3	29.72	16.57	10.28	9.22	46.29	386
CRN 32-4-2	20	3	32.48	19.57	10.28	9.40	52.05	416
CRN 32-4	20	3	32.48	19.57	10.28	9.40	52.05	428
CRN 32-5-2	25	3	35.24	22.40	12.94	11.52	57.64	463
CRN 32-5	25	3	35.24	22.40	12.94	11.52	57.64	472
CRN 32-6-2	30	3	37.99	22.40	12.94	11.52	60.39	501
CRN 32-6	30	3	37.99	22.40	12.94	11.52	60.39	513
CRN 32-7-2	30	3	40.75	22.40	12.94	11.52	63.15	658

All pumps are three phase. All dimensions in inches unless otherwise noted.

• Available

CRN(E) 45 MAGdrive, 60 Hz

Pump type	Hp	Ph	Dimensions					Ship Wt. [lbs]
			B1	B2	D1	D2	B1 + B2	
CRN 45-1-1	10	3	22.01	15.51	10.28	8.05	37.52	283
CRN(E) 45-1	10	3	22.01	15.51	10.28	8.05	37.52	292
CRN 45-2-2	15	3	29.49	16.57	10.28	9.22	46.06	396
CRN 45-2-1	20	3	29.49	19.57	10.28	9.40	49.06	420
CRN 45-2	20	3	29.49	19.57	10.28	9.40	49.06	430
CRN 45-3-2	25	3	32.64	22.40	12.94	11.52	55.04	469
CRN 45-3-1	25	3	32.64	22.40	12.94	11.52	55.04	479
CRN 45-3	30	3	32.64	22.40	12.94	11.52	55.04	500

All pumps are three phase. All dimensions in inches unless otherwise noted.

• Available

CRN(E) 64 MAGdrive, 60 Hz

Pump type	Hp	Ph	Dimensions					Ship Wt. [lbs]
			B1	B2	D1	D2	B1 + B2	
CRN 64-1-1	10	3	22.09	15.51	10.28	8.05	37.60	270
CRN 64-1	15	3	26.42	16.57	10.28	9.22	42.99	398
CRN 64-2-2	20	3	29.69	19.57	10.28	9.40	49.26	416
CRN 64-2-1	25	3	29.69	22.40	12.94	11.52	52.09	472
CRN 64-2	30	3	29.69	22.40	12.94	11.52	52.09	503

All pumps are three phase. All dimensions in inches unless otherwise noted.

• Available

CRN(E) 90 MAGdrive, 60 Hz

Pump type	Hp	Ph	Dimensions					Ship Wt. [lbs]
			B1	B2	D1	D2	B1 + B2	
CRN 90-1-1	15	3	26.81	16.57	10.28	9.22	43.38	413
CRN 90-1	20	3	26.81	19.57	10.28	9.40	46.38	421
CRN 90-2-2	30	3	30.43	22.40	12.94	11.52	52.83	519

All pumps are three phase. All dimensions in inches unless otherwise noted.

*Available.

16. Motor data

Standard motors in the CR range

Motors used in the CR pump range are:

- Grundfos ML or MLE motors
- Grundfos specified Baldor® motors

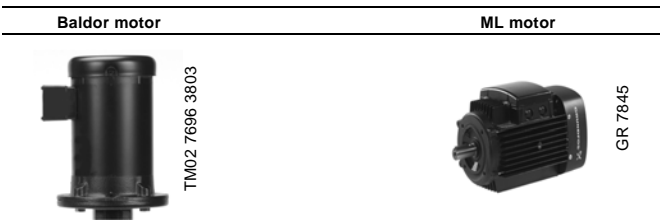
The information in the tables below applies to following motors type and size:

Type	Phase	Motor range [HP]	Cooling method
Baldor	3	1/3 - 10	TEFC
	1	1/3 - 10	TEFC
	3	15 - 100	TEFC
	3	15 - 100	ODP
MLE	1	1/2 - 1 1/2	TEFC
	3	1 - 10	TEFC

Grundfos CR pumps are supplied with heavy-duty 2-pole, NEMA energy efficient C-frame motors built or selected to our rigid specifications. All CR pump motors have heavy-duty bearings for maximum thrust requirements.

TEFC motors (NEMA)

(Totally Enclosed Fan Cooled, constant speed)



HP	PH	Frame	S.F.	Voltage [V]	Mtr. Eff. [%]	Insul. class	KVA code	Full load current [A]	Service Factor current [A]	Start current [A]	Motor type
1/3	1	56C	1.35	115/230	55	B	K	6.0/3.0	7.6/3.8	28/14	Baldor
	3	56C	1.35	208-230/460	78.5	F	L	1.12-1.1/0.55	1.5-1.45/0.75	7.1-7.7/3.9	ML
1/2	1	56C	1.60	115/230	62	B	K	7.4/3.7	9.8/4.9	39/19.5	Baldor
	3	56C	1.25	208-230/460	78.5	F	K	1.64-1.55/0.78	2.0-1.9/0.95	9.7-10.1/5.1	ML
3/4	1	56C	1.25	115/230	66	B	K	9.6/4.8	11.4/5.7	56/28	Baldor
	3	56C	1.25	208-230/460	79	F	K	2.4-2.3/1.2	2.9-2.75/1.4	14.2-15/7.8	ML
1	1	56C	1.25	115/230	66	B	K	12/6.0	14.4/7.2	77/38.5	Baldor
	3	56C	1.25	208-230/460	80	F	J	3.25-3.35/1.68	4.0-3.9/1.95	19.2-21.8/10.9	ML
1 1/2	1	56C	1.30	115/208-230	71	B	K	17/9.5-8.6	20.4/11.3-10.2	106/58.6-53	Baldor
	3	56C	1.15	208-230/460	84	F	M	4.7-4.6/2.3	5.2-5.1/2.55	33.8-36.8/18.4	ML
2	1	56C	1.15	115/208-230	74	F	K	23/12.7-11.5	25.4/14.0-12.7	156/86-78	Baldor
	3	56C	1.15	208-230/460	85.5	F	G	5.7-5.4/2.7	6.55-6.1/3.05	46.2-48.6/24.3	ML
3	1	182TC	1.15	115/208-230	75	F	H	29/16-14.5	31.8/18-15.9	170/94-85	Baldor
	3	182TC	1.15	208-230/460	86.5	F	—	8.34-7.50/3.75	9.10-8.15/4.10	86.8-78.0/39.0	ML
5	1	213TCZ	1.15	208-230	80	F	J	24-22	27-25	188-170	Baldor
	3	182TC	1.15	208-230/460	88.5	F	—	14.1-13.1/7.29	16.2-15.0/8.4	207-193/107	ML
7 1/2	1	213TC	1.15	208-230	82	F	F	33.8-31	38.5-35.5	244-220	Baldor
	3	213TC	1.15	208-230/460	89.5	F	—	19.5-18.1/9.09	22.4-20.8/10.4	289-267/135	ML
10	1	213TC	1.15	230	85.5	F	F	40	46	284	Baldor
	3	213TC	1.15	208-230/460	90.2	F	L	26.5-25.5/12.8	30.5-28.5/14.5	239-252/127	ML
15	3	254TCZ	1.15	208-230/460	90.2	F	K	37.5-34/17	42.5-39/19.5	270-304/152	Baldor
20	3	254TCZ	1.15	208-230/460	90.2	F	K	47-46/23	53-52/26	355-412/206	Baldor
25	3	284TSCZ	1.15	230/460	91	F	J	56/28	64/32	498/249	Baldor
30	3	286TSCZ	1.15	230/460	91	F	G	70/35	78/39	450/225	Baldor
40	3	286TSC	1.15	230/460	91.7	F	G	88/44	102/51	614/307	Baldor
50	3	326TSCZ	1.15	230/460	93	F	G	110/55	128/64	746/393	Baldor
60	3	364TSCZ	1.15	230/460	93	F	G	134/67	154/77	918/459	Baldor
75	3	365TSCZ	1.15	230/460	93	F	G	166/83	188/94	1162/581	Baldor
100	3	405TSCZ	1.15	230/460	93.6	F	G	216/108	246/123	1422/711	Baldor

It is not recommended that an off-the-shelf standard Baldor motor be used on a Grundfos pump. Ideally, the best motor choice would be the Grundfos specified motor.

Single-phase Grundfos specified motors up to 7.5 hp have a built-in thermal overload switch.

Other motor types are available (i.e., Explosion proof, Mill and Chem duty, Premium Efficiency, etc.); consult local Grundfos company for more information.

Pumps supplied by Grundfos Canada are normally supplied with motors from other manufactures. 575 volt motors meet NEMA energy efficient standards. Dimensions and data will vary, contact local Grundfos company for more information.

All values are subject to change without notice.

ODP motors (NEMA)

(Open Drip Proof, constant speed)

HP	PH	ODP Frame	ODP S.F.	ODP Voltage	ODP Mtr. Eff. %	ODP Insul. class	ODP KVA code	ODP Full load current	ODP service Factor current	ODP Start current
15	3	254TCZ	1.15	208-230/460	89.5	F	H	37-35/17.5	40-39.4/19.7	225-248/124
20	3	254TC	1.15	230/460	90.2	B	G	48/24	55/27.5	306/153
25	3	284TSCZ	1.15	208-230/460	91	B	G	64-59/29.5	74-67/33.5	335-374/187
30	3	284TSC	1.15	230/460	91	F	H	70/35	80/40	480/240
40	3	286TSCZ	1.15	230/460	91.7	F	F	94/47	108/54	542/271
50	3	324TSCZ	1.15	230/460	92.4	F	G	116/58	134/67	732/366
60	3	324TSCZ	1.15	230/460	93	B	G	132/66	152/76	876/438
75	3	364TSCZ	1.15	230/460	93	F	G	168/84	192/96	1110/555
100	3	365TSCZ	1.15	230/460	93	F	G	226/113	260/130	1380/690

Baldor motor



TM02 7696

2 Pole MLE motors (NEMA)

(Integrated variable frequency drive)

Hp	Short type designation	Voltage [V]	Ph	NEMA frame Size	Service Factor	Motor full load efficiency [%]	Full load current amps ** [A]	Service factor current amps [A]	Power factor	Full load speed [rpm]	Sound pressure level dB(A)
1/2	MLE71AB-2-56C-C	208-230	1	56C	1.0	71.0*	2.8 - 2.5	-	0.96	3400	63
3/4	MLE71BA-2-56C-C	208-230	1	56C	1.0	74.0*	3.9 - 3.5	-	0.97	3400	63
1	MLE80AA-2-56C-C	208-230	1	56C	1.0	76.0*	5.2 - 4.7	-	0.97	3400	62
1	MLE90CC-2-56C-G	460-480	3	56C	1.25	77.0	1.7	2.10	0.73	3500	65
1 1/2	MLE80BA-2-56C-C	208-230	1	56C	1.0	77.0*	7.5 - 6.8	-	0.97	3400	63
1 1/2	MLE90CC-2-56C-G	208-230	3	56C	1.0	82.5	4.35 - 4.05	-	0.94	3480	65
1 1/2	MLE90CC-2-56C-G	460-480	3	56C	1.15	84.0	2.2	2.50	0.83	3480	65
2	MLE90CC-2-56C-G	208-230	3	56C	1.0	84.0	5.75 - 5.25	-	0.95	3460	70
2	MLE90CC-2-56C-G	460-480	3	56C	1.15	85.5	2.7	3.10	0.87	3460	70
3	MLE90FA-2-182TC-G	208-230	3	182TC	1.0	85.5	8.3 - 7.6	-	0.95	3460	70
3	MLE90FA-2-182TC-G	460-480	3	182TC	1.15	86.5	3.7	4.30	0.91	3460	70
5	MLE112CA-2-184TC-G	208-230	3	184TC	1.0	87.5	13.8 - 13.3	-	0.94	3470	75
5	MLE112CA-2-184TC-G	460-480	3	184TC	1.15	88.5	6.1	7.00	0.92	3470	75
7 1/2	MLE132DA-2-215TC-G	208-230	3	215TC	1.0	88.5	20.0 - 18.5	-	0.94	3450	80
7 1/2	MLE132DA-2-215TC-G	460-480	3	215TC	1.15	88.5	8.9	10.3	0.94	3470	80
10	MLE132FA-2-215TC-G	460-480	3	215TC	1.15	89.5	11.6	13.4	0.93	3500	80
15	MLE160AA-2- 254TC-F	460-480	3	254TC	1.15	90.2	18.0	20.6	0.89	3500	68
20	MLE160AB-2- 256TC-F	460-480	3	256TC	1.15	90.2	24.0	27.5	0.89	3540	68
25	MLE160AC-2- 284TC-F	460-480	3	284TC	1.15	91.0	30.5	35.0	0.88	3540	70
30	MLE180AA-2- 286TC-F	460-480	3	286TC	1.15	91.0	36.5	42.0	0.88	3540	70

2-pole motors, 60 Hz, 230/460V (IEC)

ML Type Designation	KW	60 Hz Voltage	Full Load Current	Power Factor	NEMA	Speed	Full Load	Locked	Locked	Breakdown
					Efficiency		Torque	Rotor Current	Rotor Torque	Torque
					(Cos Phi)		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 motors, 60 Hz, 460V (IEC)

ML Type Designation	KW	60 Hz Voltage	Full Load Current	Power Factor	NEMA	Speed	Full Load	Locked	Locked	Breakdown
					Efficiency		Torque	Rotor Current	Rotor Torque	Torque
					(Cos Phi)		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 motors, 60 Hz, 200V (IEC)

ML Type Designation	KW	60 Hz Voltage	Full Load Current	Power Factor	NEMA	Speed	Full Load	Locked	Locked	Breakdown
					Efficiency		Torque	Rotor Current	Rotor Torque	Torque
					(Cos Phi)		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

0.75KW - 22KW motors meet Premium Efficient per NEMA Standards

1.0 Service factor motors

* Efficiency not defined by NEMA Standards

Flange B14/V18 (0.37kW - 4 kW)

Flange B5/V1 (5.5 kW - 22 kW)

2-pole motors, 50 Hz, 230/400V (IEC)

ML Type Designation	KW	50 Hz Voltage	Full Load Current	Power Factor	Efficiency	Speed	Full Load	Locked	Locked	Breakdown
				(Cos Phi)	%	RPM	Torque	Rotor Current	Rotor Torque	Torque
ML71AB	0.37	220-240/380-415	1.74/1.00	0.80-0.70	78.5*	2850-2880	1.26-1.26	490-530	300-360	330-400
ML71BA	0.55	220-240/380-415	2.50/1.44	0.80-0.70	80.0*	2830-2850	1.86-1.86	580-620	330-390	350-420
ML80AA-H3	0.75	220-240/380-415	3.30/1.90	0.81-0.71	80.7	2840-2870	2.50-2.50	580-620	330-390	370-440
ML80CA-H3	1.1	220-240/380-415	4.35/2.50	0.83-0.76	82.7	2840-2870	3.70-3.60	450-500	300-350	340-410
ML90CC-H3	1.5	220-240/380-415	5.45/3.15	0.87-0.82	84.2	2890-2910	5.00-5.00	850-930	320-390	370-440
ML90FA-H3	2.2	220-240/380-415	7.70/4.45	0.89-0.87	85.9	2890-2910	7.25-7.25	850-950	330-390	370-440
ML100DA-H3	3.0	220-240/380-415	11.0/6.30	0.87-0.82	87.1	2900-2920	9.90-9.90	840-920	320-390	410-460
ML112CA-H3	4.0	220-240/380-415	13.6/7.90	0.87-0.87	88.1	2920-2940	13.0-13.0	1000-1110	400-460	520-520
ML132DA-H3	5.5	220-240/380-415	19.0/11.0	0.87-0.82	89.2	2920-2940	17.8-17.8	1080-1180	370-460	460-550
ML132EA-H3	7.5	220-240/380-415	25.0-24.2/14.4-14.0	0.88-0.82	90.1	2910-2920	24.6-24.6	780-910	220-260	280-330
ML160BA-H3	11	220-240/380-415	36.0-34.5/20.8-19.8	0.88-0.84	91.2	2940-2950	36.0-36.0	660-780	240-280	290-350
ML160BB-H3	15	220-240/380-415	48.5-45.0/28.0-26.0	0.89-0.87	91.9	2930-2950	49.0-49.0	660-780	230-280	280-330
ML160BC-H3	18.5	220-240/380-415	59.5-56.5/34.5-32.5	0.89-0.85	92.4	2940-2950	60.0-60.0	830-980	200-250	350-430
ML180BA-H3	22	220-240/380-415	68.5-64/39.5-37	0.90-0.90	92.7	2950-2950	71.5-71.0	830-830	280-280	320-320

2-pole motors, 50 Hz, 400V (IEC)

ML Type Designation	KW	50 Hz Voltage	Full Load Current	Power Factor	Efficiency	Speed	Full Load	Locked	Locked	Breakdown
				(Cos Phi)	%	RPM	Torque	Rotor Current	Rotor Torque	Torque
ML80AA-H3	0.75	380-415	1.90	0.81-0.71	80.7	2840-2870	2.50-2.50	580-620	330-390	370-440
ML80CA-H3	1.1	380-415	2.50	0.83-0.76	82.7	2840-2870	3.70-3.60	450-500	300-350	340-410
ML90CC-H3	1.5	380-415	3.15	0.87-0.82	84.2	2890-2910	5.00-5.00	850-930	320-390	370-440
ML90FA-H3	2.2	380-415	4.45	0.89-0.87	85.9	2890-2910	7.25-7.25	850-950	330-390	370-440
ML100DA-H3	3.0	380-415	6.30	0.87-0.82	87.1	2900-2920	9.90-9.90	840-920	320-390	410-460
ML112CA-H3	4.0	380-415	7.90	0.87-0.87	88.1	2920-2940	13.0-13.0	1000-1110	400-460	520-520
ML132DA-H3	5.5	380-415	11.0	0.87-0.82	89.2	2920-2940	17.8-17.8	1080-1180	370-460	460-550
ML132EA-H3	7.5	380-415	14.4-14.0	0.88-0.82	90.1	2910-2920	24.6-24.6	780-910	220-260	280-330
ML160BA-H3	11	380-415	20.8-19.8	0.88-0.84	91.2	2940-2950	36.0-36.0	660-780	240-280	290-350
ML160BB-H3	15	380-415	28.0-26.0	0.89-0.87	91.9	2930-2950	49.0-49.0	660-780	230-280	280-330
ML160BC-H3	18.5	380-415	34.5-32.5	0.89-0.85	92.4	2940-2950	60.0-60.0	830-980	200-250	350-430
ML180BA-H3	22	380-415	39.5/22.8	0.90-0.90	92.7	2950-2950	71.5-71.0	830-830	280-280	320-320

2-pole motors, 50 Hz, 200/380V (IEC)

ML Type Designation	KW	50 Hz Voltage	Full Load Current	Power Factor	Efficiency	Speed	Full Load	Locked	Locked	Breakdown
				(Cos Phi)	%	RPM	Torque	Rotor Current	Rotor Torque	Torque
ML71AB	0.37	200-220/346-380	1.90/1.10	0.80-0.70	78.5*	2850-2880	1.26-1.26	490-530	300-360	330-400
ML71BA	0.55	200-220/346-380	2.75/1.58	0.80-0.70	80.0*	2830-2850	1.86-1.86	480-520	330-390	350-420
ML80AA-H3	0.75	200-220/346-380	3.6/2.08	0.81-0.71	80.7	2840-2870	2.50-2.50	580-620	330-390	370-440
ML80CA-H3	1.1	200-220/346-380	4.75/2.75	0.83-0.76	82.7	2840-2870	3.70-3.60	450-500	300-350	340-410
ML90CC-H3	1.5	200-220/346-380	5.95/3.45	0.87-0.82	84.2	2890-2910	5.00-5.00	850-930	320-390	370-440
ML90FA-H3	2.2	200-220/346-380	8.45/4.85	0.89-0.87	85.9	2890-2910	7.25-7.25	850-950	330-390	370-440
ML100DA-H3	3.0	200-220/346-380	12/6.90	0.87-0.82	87.1	2900-2920	9.90-9.90	840-920	320-390	410-460
ML112CA-H3	4.0	200-220/346-380	15.0/8.65	0.87-0.87	88.1	2920-2940	13.0-13.0	1000-1110	400-460	520-520
ML132DA-H3	5.5	200-220/346-380	21/12.2	0.87-0.82	89.2	2920-2940	17.8-17.8	1080-1180	370-460	460-550
ML132EA-H3	7.5	200-220/346-380	27.5-26.5/15.8-15.4	0.88-0.82	90.1	2910-2920	24.6-24.6	780-910	220-260	280-330
ML160BA-H3	11	200-220/346-380	39.5-37.5/22.8-21.8	0.88-0.84	91.2	2940-2950	36.0-36.0	660-780	240-280	290-350
ML160BB-H3	15	200-220/346-380	53.5-49.5/31-28.5	0.89-0.87	91.9	2930-2950	49.0-49.0	660-780	230-280	280-330
ML160BC-H3	18.5	200-220/346-380	65.5-62/38-35.5	0.89-0.85	92.4	2940-2950	60.0-60.0	830-980	200-250	350-430
ML180BA-H3	22	200-220/346-380	75.5-68/43.5-39.5	0.90-0.90	92.7	2950-2950	71.5-71.0	830-830	280-280	320-320

0.75KW - 22KW motors meet IE3 per IEC 60034-30

1.0 Service factor motors

* Efficiency not defined by IEC Standards

Flange B14/V18 (0.37 kW - 4 kW)

Flange B5/V1 (5.5 kW - 22 kW)

17. Pumped liquids

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.

Please 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.

CR(E), CRI(E)

CR(E), CRI(E) pumps are suitable for non-corrosive liquids.

Use CR(E), CRI(E) pumps for liquid transfer, circulation and pressure boosting of cold or hot clean water.

CRN(E)

CRN(E) pumps are suitable for industrial liquids.

Use CRN(E) pumps in systems where all parts in contact with the liquid must be made of high-grade stainless steel.

CRT(E)

For saline or chloride-containing liquids such as sea water or for oxidizing agents such as hypochlorites, Grundfos offers CRT(E) pumps made of titanium.

See the separate data booklet on CRT(E) available on www.Grundfos.com (WebCAPS).

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

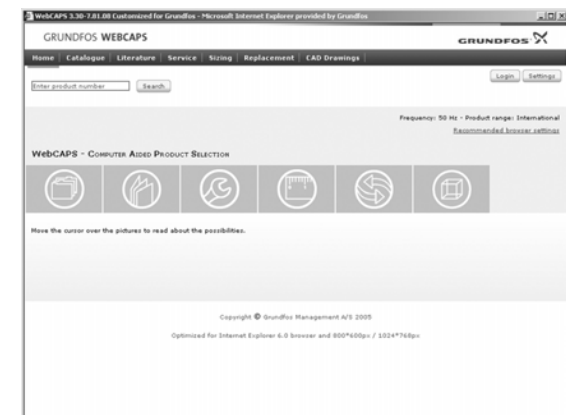
D	Often with additives.
E	The density and/or viscosity differ from that/those of water. Take this factor into account when calculating motor output and pump performance.
F	Pump selection depends on many factors. Contact Grundfos.
H	Risk of crystallization/precipitation in shaft seal.
1	Highly inflammable 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	32, 45, 64, 90, 120, 150	1s, 1, 3, 5, 10, 15, 20	32, 45, 64, 90, 120, 150
Acetic acid CH ₃ COOH		5 %, 68 °F			HQQE	HQQE/HBQE
Acetone CH ₃ COCH ₃	1, F	100 %, 68 °F			HBQE	KUBE/HBQE
Alkaline degreasing agent	D, F		HQQE	KUHE/HBQE		
Ammonium bicarbonate NH ₄ HCO ₃	E	20 %, 86 °F			HQQE	KUHE/HBQE
Ammonium hydroxide NH ₄ OH		20 %, 104 °F	HQQE	KUBE/HBQE		
Aviation fuel	1, 3, 4, F	100 %, 68 °F	HQBV	KUBV/HBQV		
Benzoic acid C ₆ H ₅ COOH	H	0,5 %, 68 °F			HQQV	KUBV/HBQV
Boiler water		<248 °F	HQQE	KUBE/HBQE		
	F	248 °F - 356 °F	-	-		
Calcareous water		< 194 °F	HQQE	KUHE		
Calcium acetate (as coolant with inhibitor) Ca(CH ₃ COO) ₂	D, E	30 %, 122 °F	HQQE	KUHE		
Calcium hydroxide Ca(OH) ₂	E	Saturated solution, 122 °F	HQQE	KUHE		
Chloride-containing water	F	< 86 °F, max. 500 ppm			HQQE	KUHE
Chromic acid H ₂ CrO ₄	H	1 %, 68 °F			HQQV	HQQV/HBQV
Citric acid HOC(CH ₂ CO ₂ H) ₂ COOH	H	5 %, 104 °F			HQQE	KUHE/HBQE
Completely desalinated water (demineralized water)		< 248 °F			HQQE	KUBE/HBQE
Condensate		< 194 °F	HQQE	KUHE/HBQE		
Copper sulfate CuSO ₄	E	10 %, 122 °F			HQQE	KUHE
Corn oil	D, E, 3	100 %, 176 °F	HQQV	KUHV/HBQV		
Diesel oil	2, 3, 4, F	100 %, 68 °F	HQBV	KUBV/HBQV		
Domestic hot water (potable water)		< 248 °F	HQQE	KUBE/HBQE		
Ethanol (ethyl alcohol) C ₂ H ₅ OH	1, F	100 %, 68 °F	HQQE	KUBE/HBQE		
Ethylene glycol HOCH ₂ CH ₂ OH	D, E	50 %, 122 °F	HQQE	KUHE		
Formic acid HCOOH		5 %, 68 °F			HQQE	KUBE/HBQE
Glycerine (glycerol) OHCH ₂ CH(OH)CH ₂ OH	D, E	50 %, 122 °F	HQQE	KUHE/HBQE		
Hydraulic oil (mineral)	E, 2, 3	100 %, 212 °F	HQQV	KUBV/HBQE		
Hydraulic oil (synthetic)	E, 2, 3	100 %, 212 °F	HQQV	KUBV/HBQE		
Isopropyl alcohol CH ₃ CHOHCH ₃	1, F	100 %, 68 °F	HQBV	KUBV/HBQV		
Lactic acid CH ₃ CH(OH)COOH	E, H	10 %, 68 °F			HQQE	KUBE/HBQE
Linoleic acid C ₁₇ H ₃₁ COOH	E, 3	100 %, 68 °F	HQQV	KUBV/HBQV		
Methanol (methyl alcohol) CH ₃ OH	1, F	100 %, 68 °F	HQQE	KUBE/HBQE		
Motor oil	E, 2, 3	100 %, 176 °F	HQQV	KUBV/HBQV		
Naphthalene C ₁₀ H ₈	E, H	100 %, 176 °F	HQQV	KUHV/HBQV		
Nitric acid HNO ₃	F	1 %, 68 °F			HQQE	HQQE/HBQE
Oil-containing water		< 212 °F	HQQV	KUBV/HBQV		
Olive oil	D, E, 3	100 %, 176 °F	HQQV	KUHV/HBQV		
Oxalic acid (COOH) ₂	H	1 %, 68 °F			HQQE	KUBE/HBQE
Ozone-containing water (O ₃)		1 PPM, < 105 °F			HQQE	KUBE/HBQE
Peanut oil	D, E, 3	100 %, 194 °F	HQQV	KUHV/ HBQV		

Pumped liquid	Note	Liquid concentration, liquid temperature	CR		CRN	
			1s, 1, 3, 5, 10, 15, 20	32, 45, 64, 90, 120, 150	1s, 1, 3, 5, 10, 15, 20	32, 45, 64, 90, 120, 150
Petrol/gasoline	1, 3, 4, F	100 %, 68 °F	HQBV	KUBV/HBQV		
Phosphoric acid H ₃ PO ₄	E	20 %, 68 °F			HQQV	KUBV/HBQV
Propanol C ₃ H ₇ OH	1, F	100 %, 68 °F	HQQV	KUBV/HBQV		
Propylene glycol CH ₃ CH(OH)CH ₂ OH	D, E	50 %, 194 °F	HQQE	KUHE		
Potassium carbonate K ₂ CO ₃	E	20 %, 122 °F	HQQE	KUHE		
Potassium formate (as coolant with inhibitor) KOOCH	D, E	30 %, 122 °F	HQQE	KUHE		
Potassium hydroxide KOH	E	20 %, 122 °F			HQQE	KUHE
Potassium permanganate KmnO ₄		5 %, 68 °F			HQQE	HQQE/HBQE
Rape seed oil	D, E, 3	100 %, 176 °F	HQQV	KUHV/HBQV		
Salicylic acid C ₆ H ₄ (OH)COOH	H	0,1 %, 68 °F			HQQE	KUBE/HBQE
Silicone oil	E, 3	100 %	HQQV	KUBV/HBQV		
Sodium bicarbonate NaHCO ₃	E	10 %, 140 °F			HQQE	KUHE/HBQE
Sodium chloride (as coolant) NaCl	D, E	30 %, < 41 °F, pH>8	HQQE	KUHE		
Sodium hydroxide NaOH	E	20 %, 122 °F			HQQE	KUHE
Sodium hypochlorite NaOCl	F	0,1 %, 68 °F			HQQE	HQQE
Sodium nitrate NaNO ₃	E	10 %, 140 °F			HQQE	KUHE/HBQE
Sodium phosphate Na ₃ PO ₄	E, H	10 %, 140 °F			HQQE	KUHE
Sodium sulfate Na ₂ SO ₄	E, H	10 %, 140 °F			HQQE	KUHE/HBQE
Softened water		< 248 °F			HQQE	KUBE/HBQE
Soybean oil	D, E, 3	100 %, 176 °F	HQQV	KUHV/HBQV		
Sulfuric acid H ₂ SO ₄	F	1 %, 68 °F			HQQV	KUHV/KBQV
Sulfurous acid H ₂ SO ₃		1 %, 68 °F			HQQE	KUBE/HBQE
Swimming pool water (low chloride)		Max 5 ppm free chlorine (Cl ₂)	HQQE	KUBE/HBQE		

18. Further product documentation

WebCAPS

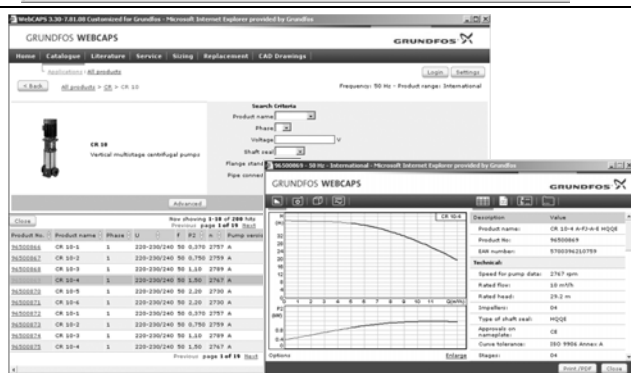


WebCAPS is a **Web-based Computer Aided Product Selection** program available on www.grundfos.com.

WebCAPS contains detailed information on more than 185,000 Grundfos products in more than 20 languages.

In WebCAPS, all information is divided into 6 sections:

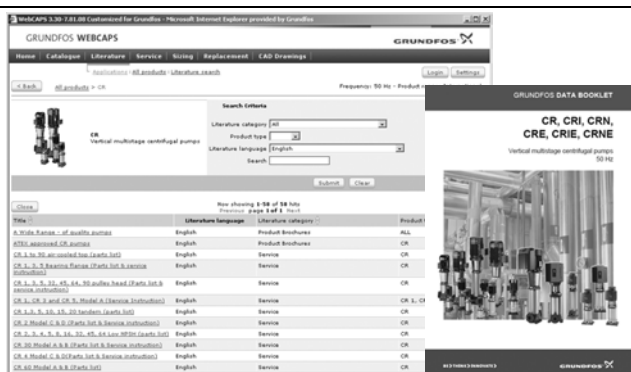
- Catalog Literature
- Service
- Sizing
- Replacement
- CAD drawings.



Catalog

This section is based on fields of application and pump types, and contains

- technical data
- curves (QH, Eta, P1, P2, etc.) which can be adapted to the density and viscosity of the pumped liquid and show the number of pumps in operation
- product photos
- dimensional drawings
- wiring diagrams
- quotation texts, etc.



Literature

In this section you can access all the latest documents of a given pump, such as

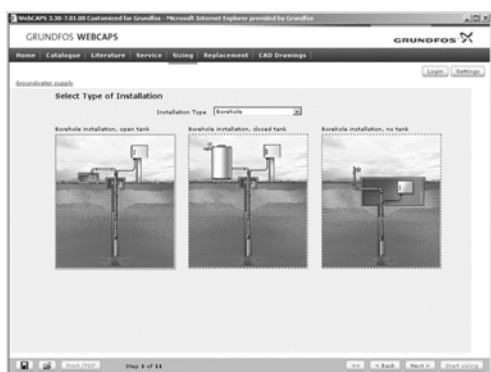
- data booklets
- installation and operating instructions
- service documentation, such as Service kit catalog and Service kit instructions
- quick guides
- product brochures, etc.



Service

This section contains an easy-to-use interactive service catalog. Here you can find and identify service parts of both existing and discontinued Grundfos pumps.

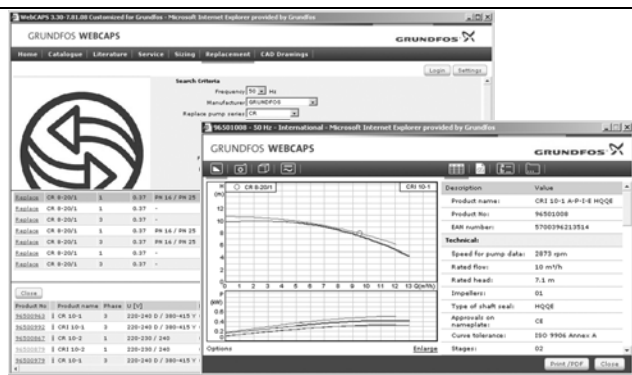
Furthermore, this section contains service videos showing you how to replace service parts.



Sizing

This section is based on different fields of application and installation examples, and gives easy step-by-step instructions in how to

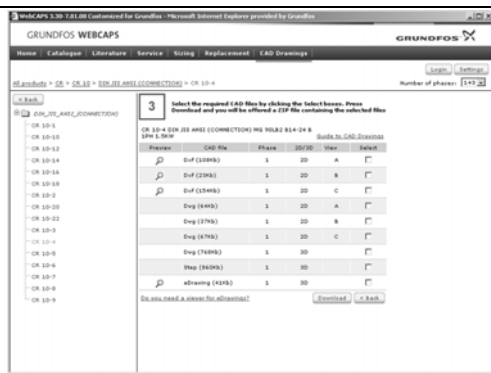
- select the most suitable and efficient pump for your installation
- carry out advanced calculations based on energy consumption, payback periods, load profiles, life cycle costs, etc.
- analyze your selected pump via the built-in life cycle cost tool
- determine the flow velocity in wastewater applications, etc.



Replacement

In this section you find a guide to selecting and comparing replacement data of an installed pump in order to replace the pump with a more efficient Grundfos pump. The section contains replacement data of a wide range of pumps produced by other manufacturers than Grundfos.

Based on an easy step-by-step guide, you can compare Grundfos pumps with the one you have installed on your site. When you have specified the installed pump, the guide will suggest a number of Grundfos pumps which can improve both comfort and efficiency.



CAD drawings

In this section it is possible to download 2-dimensional (2D) and 3-dimensional (3D) CAD drawings of most Grundfos pumps.

These formats are available in WebCAPS:

2-dimensional drawings:

- .dxf, wireframe drawings
- .dwg, wireframe drawings.

3-dimensional drawings:

- .dwg, wireframe drawings (without surfaces)
- .stp, solid drawings (with surfaces)
- .eprt, E-drawings.

WinCAPS



Fig. 92 WinCAPS CD-ROM

WinCAPS is a **Windows-based Computer Aided Product Selection** program containing detailed information on more than 185,000 Grundfos products in more than 20 languages.

The program contains the same features and functions as WebCAPS, but is an ideal solution if no Internet connection is available.

WinCAPS is available on CD-ROM and updated once a year.

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