GRUNDFOS **CR RANGE**

CUSTOMIZED SOLUTIONS

BE › THINK › INNOVATE ›

GRUNDFOS

Welcome to the Grundfos world of **customized pumps...**

The Grundfos CR pump range

The basic CR pump range, which applies to almost any industrial solution, is in itself the broadest range available. With our modular approach, we have made it even broader.

The basics

The basic CR pump range is available in four different materials – including cast iron, two grades of stainless steel, and all-titanium versions – in 13 flow sizes, capable of producing almost 725 psi of pressure, and with a variety of shaft seals, rubbers, and supply voltages.

In order to make the CR pumps suitable for even more industrial applications, we have redesigned some of the vulnerable pump parts to enable them to handle difficult liquids or demanding operating conditions. The modular concept of the CR pump range makes it possible to put together a specialized pump for any particular application by selecting the modules best suited for the job from the existing, comprehensive range of module variants.

The modular approach

At Grundfos, we look at the CR pump range as a building system with four interrelated modules including:

Motors - page 6-7
Seal arrangements - page 8-9
Pump parts - page 10-11
Other options - page 12-13

All modules described are tested, qualified, documented and proven, just like any standard Grundfos pump. You can mix and match to suit almost any pump requirement to handle aggressive, abrasive, toxic, explosive, hardening, crystallizing or otherwise difficult liquids.

If your installation has specifications such as limited space, earthquake risk, high altitude, certification requirements, surface roughness, special connections, or you simply want the pump in your company colors – it's all at hand with the CR pump range.

Adding up all CR pump variants available, we have passed one million – and counting!

High pressure applications

Main applications

- Filtration
- Reverse osmosis
- Steam boiler feeding
- Washing & cleaning
- Industrial processes

High-pressure pumps are subject to demanding operating conditions. High pressure causes increased wear on pump parts and reduces pump life. To avoid unexpected downtime, we provide special pump and shaft seal designs, bearings, etc.

Situation	Consequence	Solution	See page
High system pressure	Reduced life of shaft seal	Use special CRN-high pressure or CRN-high speed	11
	Pump breakage	Use reinforced pump design to handle up to 725 psi	11
High pump pressure	Too many stages to reach desired pressure, i.e. pump too tall	Use special CRN-high pressure or CRN-high speed	11
Limited space for installation	Pump is too high and may not fit into installation area	MLE high-speed motor solution or horizontal design and bracket mounting	6 10
Varying frequencies and voltages around the world	Need for different frequencies and voltages	Choose among our wide range of motors with different frequencies and voltages	6

Hot liquid applications

Main applications

- Steam boiler feed
- Washing & cleaning
- Mineral oils
- Industrial processes
- Chemical industries

Hot water exposes pumps to operating conditions which may lead to cavitation and/or cause wear on pump parts, thus reducing pump life. To avoid downtime we provide solutions for steady steam production, poor inlet conditions, hot temperatures, etc.

Situation	Consequence	Solution	See page
Poor inlet conditions	Risk of cavitation	Use low NPSH pump to reduce NPSH curve	10
High temperature	Shaft seal destroyed	Special Grundfos shaft seal designed to handle hot liquids up to 356°F	9
Fluctuating steam demand	Pump performance must adapt	CRE, speed controlled pumps	6
Limited space for installation	Pump is too tall and may not fit into installation area	MLE high-speed motor solution or horizontal design and bracket mounting	6 10
Varying frequencies and voltages around the world	Need for different frequencies and voltages	Choose from our wide range of motors with different frequencies and voltages	6

Difficult liquid applications

Main applications

- Chemical industries
- Pharmaceutical industries
- Petrochemical industries
- Refineries
- Distilling plants
- Paint industries
- Mining

When pumping dangerous and aggressive liquids, safety is critical. We provide solutions for aggressive and abrasive liquids, hazardous and hardening liquids, and flammable liquids.

Situation	Consequence	Solution	See page
Abrasive liquids	Excessive wear of shaft seal faces	Use double shaft seal (tandem or back-to-back)	8
Toxic liquids	Contamination of environment or people	Use MAGdrive or double shaft seal	8/9
Flammable liquids	Risk of explosion or fire	Explosion-proof motor for explosive environments	6
Crystallizing liquids	Leakage due to crystallization between shaft seal faces	Double shaft seal (tandem or back-to-back)	8
Aggressive liquids	Corroded pump metal parts or swollen rubber	Special material (e.g. titanium and resistant rubber)	8/9

Temperature control

Main applications

Cooling systems for:

- Electronic data processing
- Laser equipment
- Medical equipment
- Industrial cooling and freezing processes

Temperature control systems for:

- Casting and moulding tools
- Oil processing
- Chemical processes

Pumps used in applications involving temperature control are exposed to very low, very high, or fluctuating temperatures. These extremes stress the materials due to thermal expansion or contraction.

Situation	Consequence	Solution	See page
Secondary refrigerants	Standard pumps cannot handle very low temperatures	Special pump capable of handling liquids down to -40°F	10
Thermal oils	Very high temperatures	Special shaft seal designed to handle oil up to 464°F	9
Viscous or dense liquids	High viscosity or liquid density causes motor overload	Oversize motor	7
Temperature control	Adapt pump performance	CRE, speed-controlled pumps	6
Explosive environment	Risk of explosion or fire	Explosion-proof motor	6
Limited space for installation	Pump is too tall and may not fit into installation area	MLE high-speed motor solution or horizontal design and bracket mounting	6 10
Varying frequencies and voltages around the world	Need for different frequencies and voltages	Choose from our wide range of motors with different frequencies and voltages	6

Hygienic applications

Main applications

- Pharmaceutical industries
- Biotechnological industries
- Food and beverage
- Chemical processes

Pumps used in industries where hygienic production is crucial have to comply with strict requirements around design, materials, surface quality, and cleanability. To ensure safe production, we provide solutions for applications with special requirements in secondary hygienic processes.

Situation	Consequence	Solution	See page
Bacteria growth	Surface roughness < 0.8 µm	Electropolished pump	13
	Drainable base	Standard feature	-
Hygienic connections	Avoid microbial growth Standard connections cannot be used	TriClamp connection	13

Special installation requirements

Main applications

- Ships
- Mobile applications
- Fire fighting
- Earthquake prone areas
- Remote areas
- Space-limiting areas

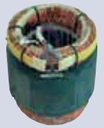
Certain types of installations require a different pump design than the traditional vertical pump. We provide solutions for applications involving horizontally mounted pumps, belt-driven pumps, ejector pumps, etc.

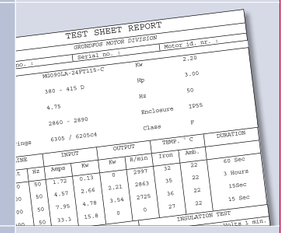
Situation	Consequence	Solution	See page
Marine insurance required	Inspection certificates required	Lloyds(LRS),Veritas (DNV), American (ABS) etc.	13
Installation on ships or other vehicles	Pump stressed due to vibrations	Horizontal installation	10
No electricity available	Pump must be powered by non-electrical source	Pump with belt drive (e.g. for diesel engines)	11
Special color required	(E.g. fire fighting pumps or pumps in company colors)	Customized solution offered	13
Limited space for installation	Pump is too tall and may not fit into installation area	MLE high-speed motor solution or horizontal design and bracket mounting	6 10
Pump certification required	Pump must be classified according to international classification societies	Various certificates available	13

MOTORS

- NEMA premium efficiency motors are available on every CR pump and cover virtually any application. The motors are available in a variety of configurations to meet the demands of the pumping environment and/or the pumped liquid itself.
- What follows is an overview of some of the most common motor variants offered by Grundfos. However, the overview covers only a fragment of the total motor range. Please do not hesitate to contact Grundfos if your requirements are not covered by the overview.

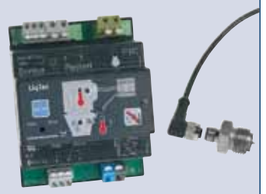
- **Variety of efficiency levels**
- **Special supply voltages**
- **Extreme operating conditions**
- **Special motor protection**
- **Specific approval**
- **Special motor design**

Solution	Description	Photo
Explosion proof motors	A full range of special explosion-proof and dust ignition-proof motors are available.	
MLE motors	The Grundfos MLE motor with integrated frequency converter can operate at different speeds to optimize pump performance in the application. Low speed, to obtain: - gentle handling of the liquid - pumping at low NPSH level - reduced noise emission Over-synchronous speed, to obtain: - high dynamics - compact physical size The advanced control can measure and adapt to special applications, including: - Extended protection of process - Extended protection of pump and drive - Pump performance curve adjusted to match individual applications Standard MLE motors have built-in motor protection, pump monitoring, and on-board regulator and sensor supply for control of primary process. If special control is required, the MLE can be equipped with extended I/O cards and a BUS connection. Customized software and add-on hardware can be tailored to match special demands. The MLE motor can be controlled by a variety of interfaces such as: - buttons on the pump - advanced R100 infra-red remote control - standard analog signals - BUS communication	
Heating units	Anti-condensation heating can be supplied by a built-in heating unit.	
Thermal protection	Motors with a built-in bimetallic thermal protector (PTO) or a temperature controlled PTC thermistor are available.	
Special voltage	Motors suitable for any supply voltage, single or three-phase, as well as dual voltage options.	

Solution	Description	Photo
cURus approval	Grundfos motors are available with the cURus approval covering USA and Canada as standard. Dual frequency: 60 Hz 3 x 208-230/460 V 50 Hz 3 x 400 V	
Certificates	The Grundfos laboratory is authorized to issue various certificates for motors: - noise - vibration - performance - efficiency	
Four-pole motor	Four-pole motors for applications where very low noise levels are required or for applications where reduced turbulence of the pumped liquid is desired.	
Over or undersized motors	For use where the viscosity or density is different from that of water, or installations where the altitude exceeds 3280 feet or, where the ambient temperature is very high.	
Terminal box position	The terminal box can be placed on any of the four sides of the pump depending on installation area.	
Enclosure class	TEFC Enclosure class is standard on Grundfos motors. Enclosure class ODP and other options are available.	

SHAFT SEALS

- Extreme liquids call for extreme measures. Most pumps are used for watery liquids at temperatures below 248°F and pressures lower than 435 psi. When liquids go beyond these limits, special shaft seal solutions are required to guarantee reliable operation.
- What follows is an overview of some of the most common shaft seal variants offered by Grundfos. However, the overview covers only a fragment of the total shaft seal range. Please do not hesitate to contact Grundfos if your requirements are not covered by the overview.
- **Aggressive or corrosive liquids**
- **Abrasive liquids**
- **Poisonous and/or explosive liquids**
- **High-viscosity and/or sticky liquids**
- **Extraordinary high pressure**
- **Extraordinary high or low temperature**

Solution	Description	Photo
Double shaft seal back-to-back	For applications involving dangerous, flammable, or very aggressive liquids, a double shaft seal, back-to-back, fitted in a pressure chamber is available. The pressure in the chamber must be higher than the pump pressure to prevent leakage. The barrier fluid pressure can be supplied by either a Grundfos dosing pump arrangement (up to 232 psi) or an intensifier for pressure requirements above 232 psi.	
Double shaft seal tandem	For applications involving a high risk of crystallization (e.g. sugar solutions) or hardening (e.g. oil or paint) as well as pumps handling vacuum, a special double shaft seal in a tandem arrangement is available. Grundfos offers a quenching fluid system for the flushing of the shaft seal.	
Titanium shaft seal	For applications involving a high risk of corrosion, an all-titanium shaft seal variant is available for the all-titanium CRT pumps.	
LiqTec™ dry running protection	The Grundfos LiqTec™ is an electronic anti-dry-running sensor that stops the pump immediately if it senses no liquid. The LiqTec™ can also monitor the flow and temperature of the pumped liquid and can operate as a PTC relay for the motor to monitor motor overload.	

Solution	Description	Photo
MAGdrive (sealless)	MAGdrive pumps are completely leak-free. They use the power of strong magnets to turn the pump shaft from the outside, so there are no seals or openings for the liquid to escape through. The result is safe, hermetically-sealed pumping.	
Shaft seal variants	Grundfos offers a wide range of balanced cartridge shaft seals with different seal faces such as silicon carbide, carbon and tungsten carbide to handle almost any industrial liquid.	
Rubber materials	Chemical-resistant Fluoraz® (FXM) or Kalrez® (FFKM) rubber O-rings are available in applications where the liquid may damage standard o-rings. [Standard o-ring materials are ethylene-propylene (EPDM), Viton® (FKM)].	
High temperatures	Pumps that handle high temperatures are fitted with a special air-cooled shaft seal chamber enabling them to withstand water temperatures of up to 356°F, (thermal oil of up to 464°F). No external cooling is required.	

PUMP MODULES

- All the made-to-stock CR pump modules can handle the most demanding of liquids and pressures – and can be adjusted for virtually any requirement. The modules can be combined in multiple ways making it possible for us to provide you with a pump solution that matches your specific needs. CR pumps come in many flow sizes and various grades of corrosion-resistant stainless steel – and an all-titanium variant.

- What follows is an overview of some of the most common pump variants offered by Grundfos. However, the overview covers only a fragment of the total pump range. Please do not hesitate to contact Grundfos if your requirements are not covered by the overview.

- **High inlet pressure**
- **High-pressure pump systems required (up to 725 psi)**
- **Pumping of gas or particle-entrained liquids**
- **Pumping of high-viscosity or sticky liquids**
- **Low NPSH level**
- **Horizontal pump mounting**
- **No carbon or silicone allowed**
- **Special materials required**

Solution	Description	Photo
Low NPSH-pump	For applications involving poor inlet conditions, (e.g. boiler feed), special low NPSH versions are available to reduce NPSH and eliminate cavitation.	
All stainless steel	For applications exposed to a corrosive environment, (e.g. maritime applications), or where frequent wash-down occurs, a stainless steel base plate and motor stool are available. All parts exposed to the corrosive environment is made of stainless steel.	
Horizontal mounting	Certain situations require the pumps to be mounted horizontally. The CR pumps can be designed to fit installations with limited height, on vehicles, or ships, or in earthquake prone areas.	
Refrigerant pump	For applications handling temperatures down to -40°F, special coolant pumps are available. Because of different thermal coefficient of expansion, special design is required.	
Carbon-free solution	For processes that require carbon-free installations (e.g. electronics industry).	

Solution	Description	Photo
Silicon-reduced solution	For processes that require no silicon, (e.g. paint industry), 100% silicon-reduced solutions are available.	
Rubber materials	Chemical-resistant Fluoraz® (FXM) or Kalrez® (FFKM) rubber O-rings are available in applications where the liquid may damage standard o-rings. [Standard o-ring materials are ethylene-propylene (EPDM), Viton® (FKM)].	
Pump bearings	A wide variety of bearing materials are available to suit any application, [(e.g. silicium carbide, bronze, tungsten carbide, and carbon-filled polytetrafluoruethylene (PTFE)].	
High pressure pumps	For high-pressure applications, special single or double-pump solutions are available. These pumps are capable of generating up to nearly 725 psi pressure. To avoid high pressure near the vulnerable shaft seal, the hydraulic design of high-pressure pumps ensures that the highest pressure is generated at the base of the pump, farthest away from the shaft seal.	
Belt-drive	For applications in remote areas or mobile applications where electric power is not available, belt-driven pumps powered by another means such as a diesel engine or a steam turbine, can be supplied.	

OTHER OPTIONS

- In addition to the range of variants relating to the motor, shaft seal, or pump module of the CR products presented on the foregoing pages, Grundfos offers a variety of other customized solutions to suit almost any conceivable need or requirement that you may have. For instance, a variety of connection options are available, as are pump models for additional corrosion requirements, hygienic demands, or pumps in special colors.
- The following overview presents only a fraction of the many possibilities that we offer. Please do not hesitate to contact Grundfos if your requirements are not covered by the overview.

What you need. Guaranteed.

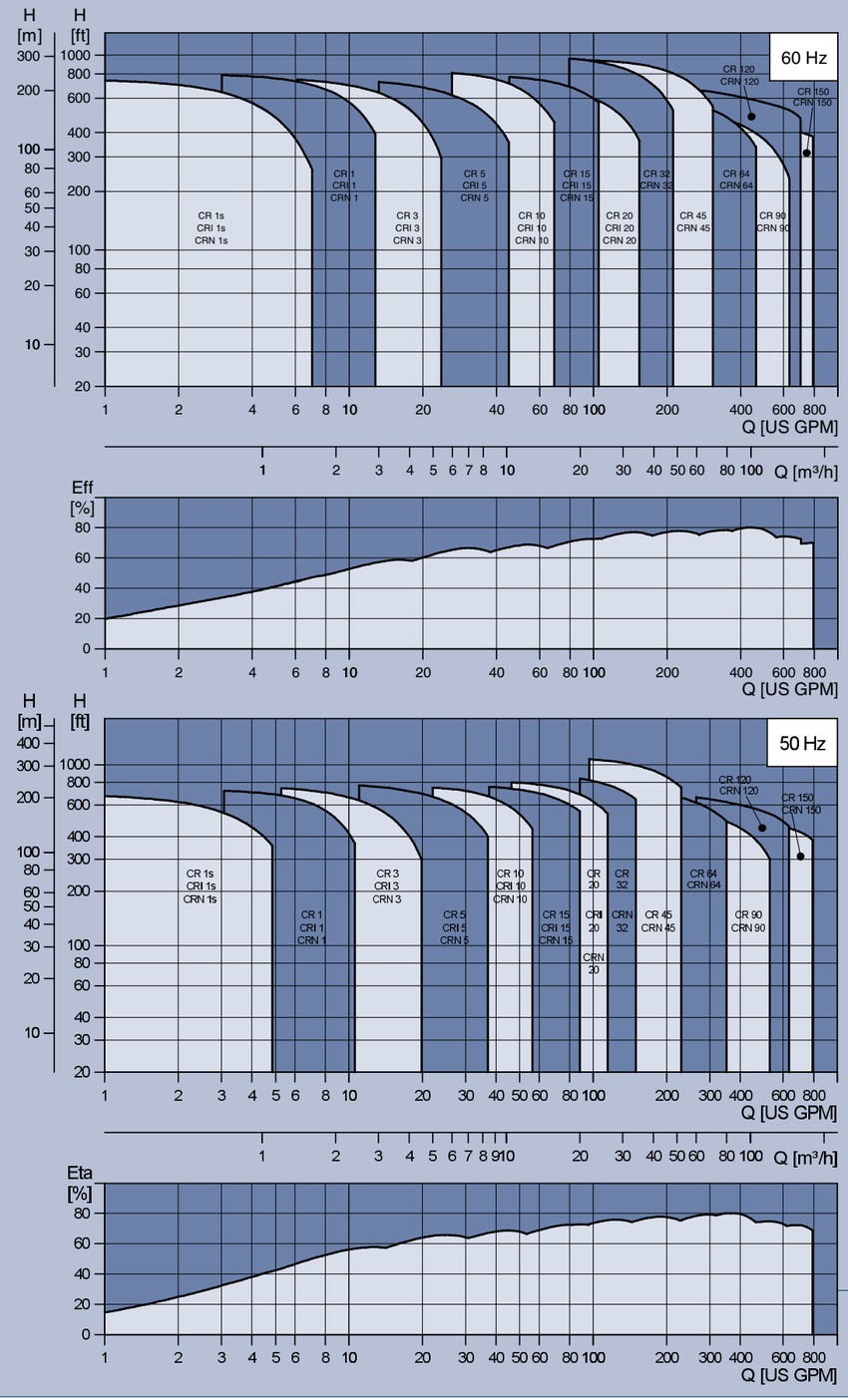
It is more than likely that we will be able to create exactly the right pump for you by combining the elements and options already available within the CR range. But if you have special requirements or a specific design in mind, let us know. We will do our best to provide full satisfaction.

Great tools are just a mouse-click away!

Grundfos offers the market's most comprehensive, 24-hour, on-line access to everything you need to maintain or service your system, from CAD drawings to installation videos and operating instructions. Go to www.grundfos.us, choose "WinCAPS and WebCAPS" under "Resources" and select "WebCAPS Grundfos on-line catalog". Find detailed technical information, drawings, wiring diagrams, dimensioning – everything!

Solution	Description	Photo
Hygienic	For applications in the pharmaceutical and biotechnology industry, special hygienic solutions are available (e.g. electropolished pumps with TriClamp connections).	
Additional corrosion resistance	For applications with a need for improved corrosion resistance, electropolished stainless steel or all-titanium pumps are available.	
Cleaned and dried pump components	For applications with very strict requirements and/or cleanliness. All pump parts have been cleaned in hot soapy water, rinsed in de-ionized water, and packed in silicon-free plastic bags.	
Special colors	Pumps are available in a multitude of colors to match any requirement.	
Certificates	A wide range of pump and material certificates are available, (e.g. inspection certificates including Lloyds(LRS), Veritas (DNV), American (ABS) etc.), as well as material specification, duty-point verification, surface roughness, vibration test, motor test, ATEX, and much more.	
Multi packaging	Pumps can be delivered on pallets without any additional packaging (cardboard).	

PERFORMANCE CURVES AND TECHNICAL DATA



	CR 1s	CR 1	CR 3	CR 5	CR 10	CR 15	CR 20	CR 32	CR 45	CR 64	CR 90	CR 120	CR 150
Range:													
Temperature range (°F)				-4 to +250						-22 to +250 1) & 2)			
On request (°F)				-40 to +356						-40 to +356			
Nominal flow rate (US GPM)	4.5	8.5	15	30	55	95	110	140	220	340	440	610	750
CR: Flow range (US GPM)	0.5 - 5.7	1 - 12.8	1.5 - 23.8	3 - 45	5.5 - 70	9.5 - 125	11 - 155	14 - 210	22 - 310	34 - 450	44 - 630	61 - 700	75 - 790
Max. pump efficiency (%)	35	49	59	67	70	72	72	76	78	79	80	75	73
Max. working pressure (psi)	362	362	362	362	362	362	362	435	435	435	435	435	435
Max. working pressure (psi) - on request	-	725	725	725	725	725	725	580	580	580	580	580	580
Version:													
CR (AISI 304 / Cast Iron)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRI (AISI 304)	•	•	•	•	•	•	•	-	-	-	-	-	-
CRN (AISI 316)	•	•	•	•	•	•	•	•	•	•	•	•	•
CRT (Titanium)	-	-	CRT 2	CRT 4	CRT 8	CRT 16	-	-	-	-	-	-	-
CR, CRE pipe connection:													
Oval Flange (NPT)	1"	1"	1"	1 1/4"	2"	2"	2"	-	-	-	-	-	-
On request (NPT)	1 1/4"	1 1/4"	1 1/4"	1"	1 1/2"	-	-	-	-	-	-	-	-
ANSI Flange Size	1 1/4"	1 1/4"	1 1/4"	1 1/4"	2"	2"	2"	2 1/2"	3"	4"	4"	5"	5"
On request	-	-	-	-	-	-	-	3"	4"	5"	5"	6"	6"
ANSI Flange Class	250 lb.	250 lb.	250 lb.	250 lb.	250 lb.	250 lb.	250 lb.	125/250 lb.	125/250 lb.	125/250 lb.	125/250 lb.	125/250 lb.	125/250 lb.
CRI, CRIE pipe connection:													
Oval Flange (NPT)	1"	1"	1"	1 1/4"	2"	2"	2"	-	-	-	-	-	-
On request - (NPT)	1 1/4"	1 1/4"	1 1/4"	1"	1 1/2"	-	-	-	-	-	-	-	-
ANSI Flange Size	1 1/4"	1 1/4"	1 1/4"	1 1/4"	2"	2"	2"	-	-	-	-	-	-
ANSI Flange Class	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.	-	-	-	-	-	-
On request - PJE coupling (Victaulic)	1 1/4"	1 1/4"	1 1/4"	1 1/4"	2"	2"	2"	-	-	-	-	-	-
On request - Clamp coupling (NPT)	1", 1 1/4"	1", 1 1/4"	1", 1 1/4"	1", 1 1/4"	1 1/2", 2"	1 1/2", 2"	2", 2 1/2"	-	-	-	-	-	-
On request - Union (NPT ext. thread)	2"	2"	2"	2"	-	-	-	-	-	-	-	-	-
CRN, CRNE pipe connection:													
PJE Coupling (Victaulic)	1 1/4"	1 1/4"	1 1/4"	1 1/4"	2"	2"	2"	-	-	-	-	-	-
On request - PJE	-	-	-	-	-	-	-	3"	4"	4"	4"	4"	4"
ANSI Flange Size	1 1/4"	1 1/4"	1 1/4"	1 1/4"	2"	2"	2"	2 1/2"	3"	4"	4"	5"	5"
On request - ANSI	-	-	-	-	-	-	-	3"	4"	5"	5"	6"	6"
ANSI Flange Class	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.	300 lb.	150/300 lb.	150/300 lb.	150/300 lb.	150/300 lb.	150/300 lb.	150/300 lb.
On request - Clamp coupling (NPT)	1", 1 1/4"	1", 1 1/4"	1", 1 1/4"	1", 1 1/4"	1 1/2", 2"	1 1/2", 2"	2", 2 1/2"	-	-	-	-	-	-
On request - Union (NPT ext. thread)	2"	2"	2"	2"	-	-	-	-	-	-	-	-	-
CRT pipe connection:													
PJE coupling (Victaulic)	-	-	1 1/4"	1 1/4"	2"	2"	-	-	-	-	-	-	-
On request - ANSI Flange Adapter	-	-	-	-	2"	2"	-	-	-	-	-	-	-

• :Available
- :Not available
1) CRN 32 to CRN 90 with HQQE shaft seal: –40 °F to +250 °F
2) CR, CRN 120 and 150 with 75 or 100 Hp motors with HBQE shaft seal: 0 °F to +250 °F

BE > THINK > INNOVATE >

Being responsible is our foundation
Thinking ahead makes it possible
Innovation is the essence

The CR range from Grundfos

Grundfos was the first company ever to develop a multi-stage in-line pump. The present-day CR pump series is the most extensive in-line pump program on the market and remains second to none. With many innovative features unique to Grundfos, CR pumps provide superior reliability and the lowest possible cost of ownership to customers worldwide.

Customization made easy

In order to meet all customer requirements with complete precision, Grundfos has developed a unique mix-and-match approach to customization. The elements of the CR range can be combined any which way to create the solution that is exactly right for you.

Grundfos: a pump for every purpose

Impressive as the CR range is, Grundfos offers much more. A complete range of pump solutions means that all applications – industrial and domestic – can benefit from the Grundfos touch.

Customers can always rely on our complete dedication to quality and service.

L-CR-SL-008	Rev. 02/10
PRINTED IN USA	

U.S.A.
GRUNDFOS Pumps Corporation
17100 West 118th Terrace
Olathe, Kansas 66061
Phone: (913) 227-3400
Telefax: (913) 227-3500

Canada
GRUNDFOS Canada Inc.
2941 Brighton Road
Oakville, Ontario
L6H 6C9
Phone: (905) 829-9533
Telefax: (905) 829-9512

Mexico
Bombas GRUNDFOS de Mexico S.A. de C.V.
Boulevard TLC No. 15
Parque Industrial Stiva Aeropuerto
C.P. 66600 Apodaca, N.L. Mexico
Phone: 011-52-81-8144 4000
Telefax: 011-52-81-8144 4010

www.grundfos.com/CR

GRUNDFOS®