



CUSTOMISED SOLUTIONS



Welcome to the Grundfos world of customised pumps...

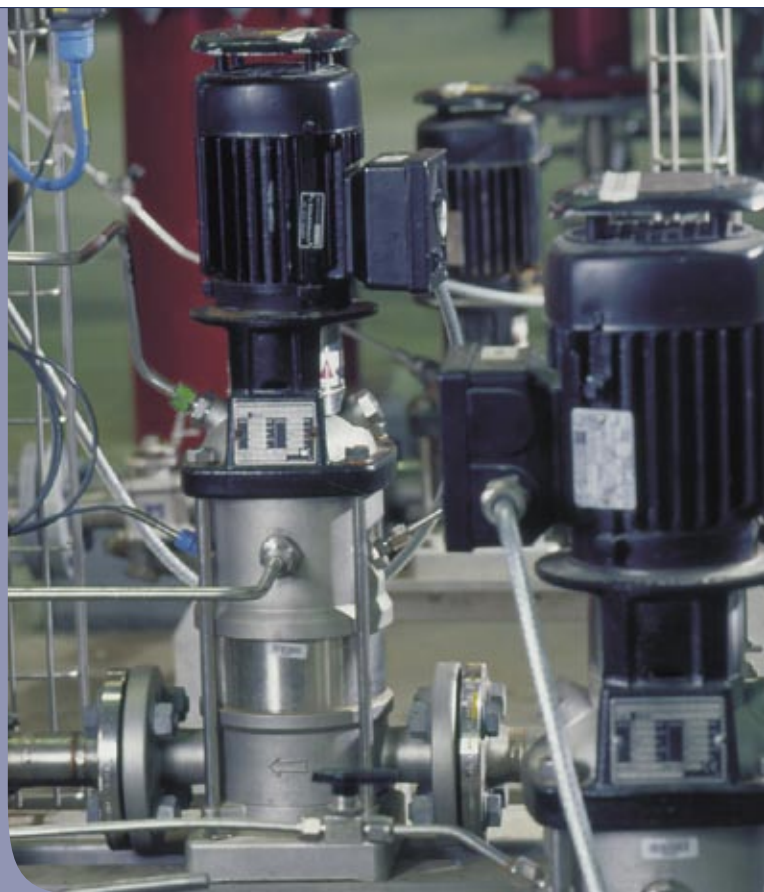
The Grundfos CR pump range

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 eleven flow sizes, capable of producing almost 50 bars 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 vital but, normally, vulnerable pump parts to enable them to handle difficult liquids or stand up to particularly demanding operating conditions. This means that we do not need to create a completely new pump model to deal with such applications – the modular concept of the CR pump range makes it possible to put together a specialised 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 consisting of four interrelated modules:

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, crystallising or otherwise difficult liquids.

If your installation has special specifications such as limited space, earthquake risk, high altitude, certification requirements, surface roughness, special connections, or you simply want the pump in your company colours – 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 and cleaning
- Industrial processes

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

Situation	Consequence	Solution	See page
High inlet pressure	Motor bearings overloaded	Use bearing flanges to eliminate forces on motor bearings	11
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 50 bar	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	MGE 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 and 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 and thus reduce 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 180°C	9
Fluctating steam demand	Pump performance must adapt	CRE, speed controlled pumps	6
Limited space for installation	Pump is too high and may not fit into installation area	MGE 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



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 all important. We provide solutions for aggressive and abrasive liquids, hazardous and hardening liquids as well as flammable liquids.

Situation	Consequence	Solution	See page
Abrasive liquids	Excessive wear of shaft seal faces	Use double shaft seal	8
Toxic liquids	Contamination of environment or people	Use MAGdrive or double shaft seal	8/9
Flammable liquids	Risk of explosion or fire	ATEX approved motor and pump for explosive environments	6
Crystallising liquids	Leakage due to crystallisation 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 or very high temperatures as well as fluctuations. This extreme exposure stresses 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°C	10
Thermal oils	Very high temperatures	Special shaft seal designed to handle oil up to 240°C	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	ATEX-approved motor and pump	6
Limited space for installation	Pump is too high and may not fit into installation area	MGE 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

Hygienic applications

Main applications

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



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

Situation	Consequence	Solution	See page
Bacteria growth	Surface roughness < 0.8 microns	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
- Deep-well pumping
- Limited space for installation

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 colour required	E.g. fire fighting pumps or pumps in company colours	Customised solution offered	13
Limited space for installation	Pump is too high and may not fit into installation area	MGE 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

I MOTORS

- EFF 1 motors, developed and produced by Grundfos, are standard in 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.

- **Special supply voltages**
- **Extreme operating conditions**
- **Special motor protection**
- **Specific approval**
- **Special motor design**



Solution	Description
ATEX-approved	A full range of special explosion-proof and dust ignition-proof motors is available with ATEX approved pumps.
MGE motors	<p>The Grundfos MGE motor with integrated frequency converter can operate at different speeds in order to optimise pump performance to the application:</p> <p>Low speed, to obtain e.g.</p> <ul style="list-style-type: none"> - gentle handling of the liquid - pumping at low NPSH level - reduced noise emission <p>Oversynchronous speed, to obtain e.g.</p> <ul style="list-style-type: none"> - high dynamics - compact physical size <p>The advanced control can measure and adapt to special applications, e.g.:</p> <ul style="list-style-type: none"> - Extended protection of process - Extended protection of pump and drive - Pump performance curve adjusted to match individual applications <p>Standard MGE 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 MGE can be equipped with extended I/O cards and BUS connection. Customised software and add-on hardware can be tailored to match special demands.</p> <p>The MGE motor can be controlled by a variety of interfaces, i.e.</p> <ul style="list-style-type: none"> - buttons on the pump - advanced R100 infra-red remote control - standard analogue signals - BUS communication
Heating units	Anti-condensation heating can be supplied by a built-in heating unit.
Multi-plug	Our motors are available with a multi-plug (Harting® plug) according to HAN 10 ES for fast mains connections.
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
cURus approval	Grundfos motors are available with the cURus approval covering USA and Canada. Dual frequency: 60 Hz: 3 x 400 V 50 Hz: 3 x 208-230/460 V
Certificates	The Grundfos laboratory is authorised 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 that do not allow whipping of the pumped liquid.
VIK approved motors	VIK approved motors are available according to German industrial electrical standard.
Over or undersize motors	For use where the viscosity or density is different from that of water, installations where the altitude exceeds 1000m or where the ambient temperature is very high.
Terminal box position	The terminal box can be placed on either four sides of the pump depending on installation area.
Enclosure class	Enclosure class IP 55 is standard on Grundfos motors. Enclosure class IP 65, IP 54 and IP 44 are available as options.



TEST SHEET REPORT

GRUNDFOS MOTOR DIVISION

Serial No. 1

Motor ID. No. 1

NOV901A-24F115-C	Kv	2.20
380 - 415 D	Wp	3.00
4.75	Hz	50
2860 - 2890	Enclosure	IP55
6305 / 620504	Class	Y

T	HR	INPUT		OUTPUT		TEMP. °C		DURATION
		Wp	Kv	Kv	S/Min	Iron	AMB.	
0	50	1.72	0.13	0	2997	32	22	60 Sec
30	50	4.57	2.66	2.21	2863	35	22	3 Hours
60	50	7.95	4.78	3.54	2725	36	22	15 Sec
90	50	33.1	15.8	0	0	27	22	15 Sec

INSULATION TEST

1 min.



SHAFT SEALS

- › Extreme liquids call for extreme measures. Most pumps are used for watery liquids at temperatures below 120°C and pressures lower than 30 bar. 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
Double shaft seal Back-to-back	<p>For applications involving dangerous, flammable, or very abrasive 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.</p> <p>The barrier fluid pressure can be supplied by either a Grundfos Dosing pump arrangement (up to 16 bar) or an intensifier for pressure requirements above 16 bar.</p>
Double shaft seal Tandem	<p>For applications involving a high risk of crystallisation (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.</p> <p>Grundfos offers a quenching fluid system for the flushing of the shaft seal.</p>
Titanium shaft seal	<p>For applications involving a high risk of corrosion, an all titanium shaft seal variant is available for the all titanium CRT pumps.</p>
LiqTec™ dry running protection	<p>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 monitoring motor overload.</p>

Photo	Solution	Description	Photo
	MAGdrive	For industrial processes involving aggressive and dangerous liquids, a hermetically sealed magnetic driven pump is available.	
	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	Seals fitted with chemical resistant FXM (Fluoraz [®]) or FFKM (Kalrez [®]) rubber O-rings are available for applications where the liquid may damage standard O-ring materials, EPDM, FKM (Viton [®]).	
	High temperatures	Pumps that have to handle high temperatures are fitted with a special air-cooled shaft seal chamber enabling them to withstand water temperatures of up to 180°C, (thermal oil of up to 240°C). No external cooling is required.	

I PUMP MODULES

- › All the made-to-stock CR pump modules can handle the most demanding of liquids and pressures – and be adjustable to virtually any requirement. Of course, 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 50 bar)**
- › **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
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.
Deep-well	For applications involving pumping from deep boreholes (down to 90 metres) a special deep-well CR pump with an ejector for above-ground installation is available.
All stainless steel	For applications exposed to corrosive atmosphere, 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 installation environment is thus 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, vehicles, ships or earthquake prone areas.
Refrigerant pump	For applications handling temperatures down to -40°C , 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.

Photo	Solution	Description	Photo
	Silicon-free solution	For processes that require no silicon, e.g. paint industry, 100% silicon-free solutions are available.	
	Rubber materials	Pumps fitted with chemical resistant FXM (Fluoraz®) or FFKM (Kalrez®) rubber O-rings are available for applications, where the liquid may damage standard O-ring materials, EPDM, FKM (Viton®).	
	Pump bearings	A wide variety of bearing materials are available to suit any application, e.g. silicon carbide, bronze, tungsten carbide, and carbon-filled PTFE.	
	Bearing flange	For applications with extremely high inlet pressures a special flange is necessary to counterhold the shaft. It also allows mounting of standard IEC34 or NEMA motors.	
	High pressure pumps	For high-pressure applications, special single or double-pump solutions are available. These pumps are capable of generating up to nearly 50 bar 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 e.g. 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 customised 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 colours.
- › 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

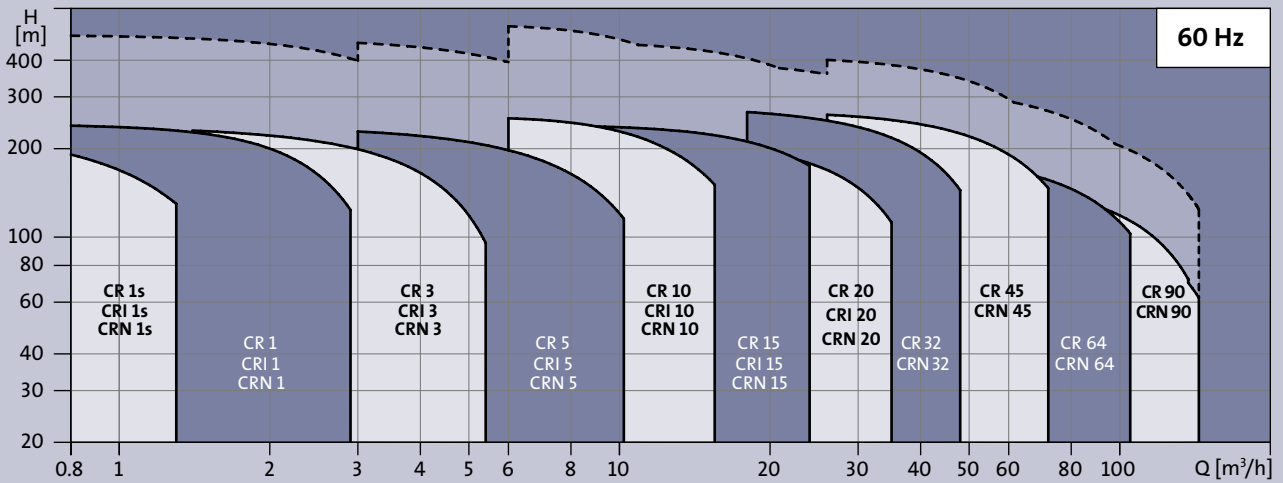
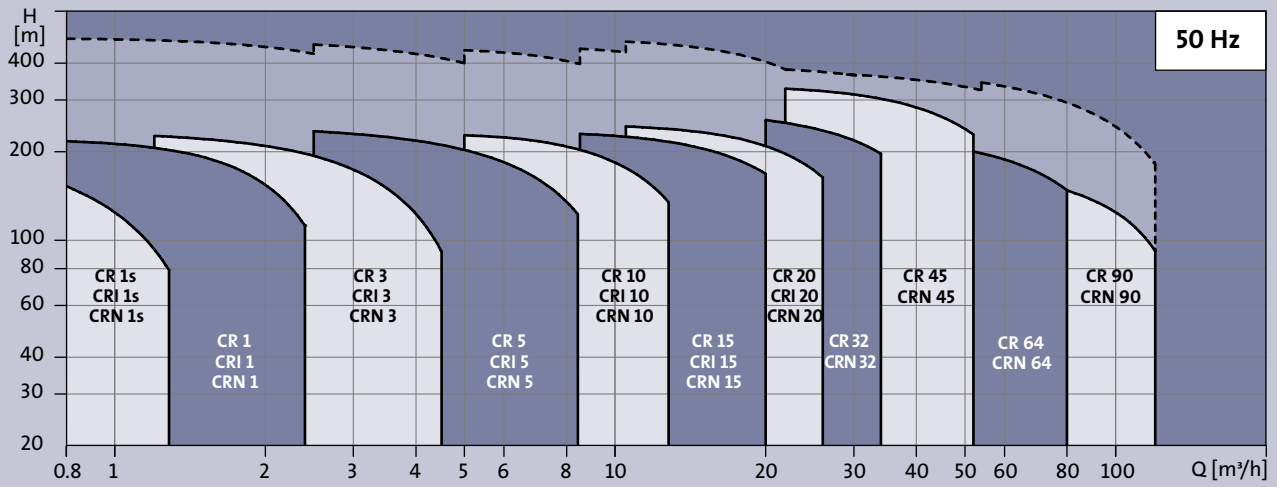
It is more than likely that we will be able to create exactly the right pump for you by combining the elements and options already available within the CR range. But if you have special requirements or a specific design in mind, let us know. We will do our best to provide full satisfaction.

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.com, choose the WebCAPS symbol, and you're there: detailed technical information, drawings, wiring diagrams, dimensioning – everything!

Solution	Description	Photo
Hygienic	For applications in the pharmaceutical and biotechnology industry, special hygiene 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 to cleanliness. All pump parts have been cleaned in hot soap water, rinsed in de-ionised water and packed in silicon-free plastic bags.	
Special colours	Pumps are available in a multitude of colours to match any requirement.	
Certificates	A wide range of pump and material certificates are available, e.g. inspection certificates (Lloyds(LRS), Veritas (DNV), American (ABS) etc.), 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	
Range:												
Temperature range (°C)	-20 to +120							-30 to +120				
On request (°C)	-40 to +180							-40 to +180				
Max. pump efficiency (%)	35	48	58	66	70	72	73	78	79	80	81	
Flow range (m³/h)	0.3-1.1	0.7-2.4	1.2-4.5	2.5-8.5	5-13	9-24	11-29	15-40	22-58	30-85	45-120	
Version:												
CR (AISI 304/Cast Iron)	x	x	x	x	x	x	x	x	x	x	x	
CRI (AISI 304)	x	x	x	x	x	x	x					
CRN (AISI 316)	x	x	x	x	x	x	x	x	x	x	x	
CRT (Titanium)		x*	x*	x*	x*	x*						
CR pipe connection:												
Oval flange (BSP)	Rp 1	Rp 1	Rp 1	Rp 1¼	Rp 1½	Rp 2	Rp 2½					
On request (BSP)	Rp 1¼	Rp 1¼	Rp 1¼	Rp 1	Rp 1¼ Rp 2	Rp 2½	Rp 2					
Flange	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 40	DN 50	DN 50	DN 65	DN 80	DN 100	DN 100	
On request					DN 50	DN 65	DN 65	DN 80	DN 100	DN 125	DN 125	
CRI pipe connection:												
Oval flange (BSP)	Rp 1	Rp 1	Rp 1¼	Rp 1¼	Rp 1½	Rp 2	Rp 2					
On request (BSP)	Rp 1¼	Rp 1¼	Rp 1	Rp 1	Rp 2							
Flange	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 40	DN 50	DN 50					
On request					DN 50	DN 65	DN 65					
PJE coupling (Victaulic)	Rp 1¼	Rp 1¼	Rp 1¼	Rp 1¼	Rp 2	Rp 2	Rp 2					
	DN 32	DN 32	DN 32	DN 32	DN 50	DN 50	DN 50					
Clamp coupling (L-coupling)	Ø48.3	Ø48.3	Ø48.3	Ø48.3	Ø60.3	Ø60.3	Ø60.3					
Union (+GF+)	Rp 2	Rp 2	Rp 2	Rp 2	Rp 2½	Rp 2½	Rp 2½					
CRN pipe connections:												
Flange	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 25/ DN 32	DN 40	DN 50	DN 50	DN 65	DN 80	DN 100	DN 100	
On request					DN 50	DN 65	DN 65	DN 80	DN 100	DN 125	DN 125	
PJE coupling (Victaulic)	Rp 1¼	Rp 1¼	Rp 1¼	Rp 1¼	Rp 2	Rp 2	Rp 2	Rp 3	Rp 4	Rp 4	Rp 5	
	DN 32	DN 32	DN 32	DN 32	DN 50	DN 50	DN 50					
Clamp coupling	x	x	x	x	x	x	x					
Union (+GF+)	x	x	x	x	x	x	x					
CRT pipe connections:												
PJE coupling (Victaulic)		x*	x*	x*	x*	x*						
Flange (on request)		x*	x*	x*	x*	x*						

*CRT 2,4,8 and 16.

The CR range from Grundfos

Grundfos was the first company ever to develop a multistage in-line pump. The present-day CR pump series is the most extensive in-line pump programme 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.

Customisation made easy

In order to meet all customer requirements with complete precision, Grundfos has developed a unique mix-and-match approach to customised pumps. 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.