CR, CRN 95-155

Installation and operating instructions
Original installation and operating instructions
These installation and operating instructions describe Grundfos CR, CRN 95 to 255.
Sections 1-4 give the information necessary to be able to unpack, install and start up the product in a safe way.
Sections 5-10 give important information about the product, as well as information on service, fault finding and disposal of the product.

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<td>Electrical data</td>
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<tr>
<td>11.</td>
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</tr>
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</table>

Prior to installation, read the documents supplied with the product. Installation and operation must comply with local regulations and accepted codes of good practice.
1. Limited warranty

Products manufactured by Grundfos Pumps Corporation (Grundfos) are warranted to the original user only to be free of defects in material and workmanship for a period of 24 months from date of installation, but not more than 30 months from date of manufacture. Grundfos’ liability under this warranty shall be limited to repairing or replacing at Grundfos’ option, without charge, F.O.B. Grundfos’ factory or authorized service station, any product of Grundfos manufacture. Grundfos will not be liable for any costs of removal, installation, transportation, or any other charges that may arise in connection with a warranty claim.

Products which are sold, but not manufactured by Grundfos, are subject to the warranty provided by the manufacturer of said products and not by Grundfos’ warranty.

Grundfos will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with Grundfos' printed installation and operating instructions and accepted codes of good practice. The warranty does not cover normal wear and tear.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of Grundfos’ products from which it was purchased together with proof of purchase and installation date, failure date and supporting installation data. Unless otherwise provided, the distributor or dealer will contact Grundfos or an authorized service station for instructions. Any defective product to be returned to Grundfos or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

Grundfos will not be liable for any incidental or consequential damages, losses, or expenses arising from installation, use, or any other causes. There are no express or implied warranties, including merchantability or fitness for a particular purpose, which extend beyond those warranties described or referred to above. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last. Therefore the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

Products which are repaired or replaced by Grundfos or authorized service center under the provisions of these limited warranty terms will continue to be covered by Grundfos warranty only through the remainder of the original warranty period set forth by the original purchase date.

2. General information

2.1 Hazard statements

The symbols and hazard statements below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

**DANGER**

Indicates a hazardous situation which, if not avoided, will result in death or serious personal injury.

**WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.

**CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

The hazard statements are structured in the following way:

**SIGNAL WORD**

Description of hazard

- Consequence of ignoring the warning.
- Action to avoid the hazard.
2.2 Notes
The symbols and notes below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

FM
Observe these instructions for explosion-proof products.

A blue or grey circle with a white graphical symbol indicates that an action must be taken.

A red or grey circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.

If these instructions are not observed, it may result in malfunction or damage to the equipment.

Tips and advice that make the work easier.

2.3 Safety information for the motor
Read the safety information specific for the motor in the instructions for the motor which are supplied with the pump.

3. Receiving the product

3.1 Transporting the product

WARNING
Falling objects
Death or serious personal injury
- Keep the product in a stable and fixed position during transportation.
- Wear personal protective equipment.

3.2 Unpacking the product

WARNING
Falling objects
Death or serious personal injury
- Keep the product in a stable position during unpacking.
- Wear personal protective equipment.

3.3 Inspecting the product
Before you install the product, do the following:
1. Check that the product is as ordered.
2. Check that no visible parts have been damaged.
If parts are damaged or missing, contact your local Grundfos sales company.

3.4 Lifting the product

WARNING
Falling objects
Death or serious personal injury
- Follow the lifting instructions.
- Use lifting equipment which is approved for the weight of the product.
- Persons must keep a safe distance to the product during lifting operations.
- Wear personal protective equipment.

When lifting a pump fitted with a motor that contains an integrated frequency converter, make sure that the terminal box does not come into contact with the lifting equipment.

The following sections describe various lifting situations and the lifting instructions which must be followed in order to obtain safe lifting of the product:
- Horizontal lift: See section 3.4.1 Lifting the product in horizontal position.
- Raising or laying down the product: See section 3.4.2 Raising or laying down the product.
- Vertical lift: See section 3.4.3 Lifting the product in vertical position.
3.4.1 Lifting the product in horizontal position

Fig. 1  Horizontal lift of pumps with 7.5 hp (5.5 kW) Grundfos ML, MLE and MG, MGE motors

Fig. 2  Horizontal lift of pumps with 10-30 hp (7.5 - 22 kW) Grundfos ML, MLE and MG, MGE motors

Fig. 3  Horizontal lift of pumps with 7.5 - 250 hp (5.5 - 200 kW) motors of other makes than Grundfos ML, MLE and MG, MGE motors

Fig. 4  Horizontal lift of pumps without motor

3.4.2 Raising or laying down the product

Fig. 5  Raising or laying down pumps with 7.5 hp (5.5 kW) Grundfos ML, MLE and MG, MGE motors

Fig. 6  Raising or laying down pumps with 10-30 hp (7.5 - 22 kW) Grundfos ML, MLE and MG, MGE motors
Fig. 7  Raising or laying down pumps with 7.5 - 250 hp (5.5 - 200 KW) motors of other makes than Grundfos ML, MLE and MG, MGE motors

Fig. 8  Raising or laying down pumps without motor

3.4.3 Lifting the product in vertical position

Fig. 9  Vertical lift of pumps with 7.5 hp (5.5 kW) Grundfos ML, MLE and MG, MGE motors

Fig. 10  Vertical lift of pumps with 10-30 hp (7.5 - 22 kW) Grundfos ML, MLE and MG, MGE motors

Fig. 11  Vertical lift of pumps with 7.5 - 250 hp (5.5 - 200 KW) motors of other makes than Grundfos ML, MLE and MG, MGE motors

Fig. 12  Vertical lift of pumps without motor
4. Installing the product

4.1 Mechanical installation

4.1.1 Lifting the product

**WARNING**

Falling objects
Death or serious personal injury
- Follow the lifting instructions.
- Use lifting equipment which is approved for the weight of the product.
- Persons must keep a safe distance to the product during lifting operations.
- Wear personal protective equipment.

For lifting instructions, see section 3.4 Lifting the product.

4.1.2 Installation guidelines

The pump must be secured to a horizontal, plane and solid foundation with bolts through the holes in the base plate. When installing the pump, be aware of the information below in order to avoid damaging the pump.

<table>
<thead>
<tr>
<th>Illustration</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Arrows on the pump base plate show the direction of flow of liquid through the pump.</td>
</tr>
</tbody>
</table>
| 2            | These dimensions are stated on page 26:  
- port-to-port lengths  
- dimensions of the base plate  
- pipe connections  
- diameter and position of anchor bolts. |
| 3            | The pump can be installed vertically and horizontally. If you wish to install a pump horizontally, it must be ordered with support brackets fitted from factory and a foot-mounted motor. |
| 3a           | Additional support. As the centre of gravity of the pump is relatively high, we recommend that pumps installed on ships, in areas with risk of earth quake or in systems which can be moved, are equipped with an additional support bracket. You can fit the bracket from the motor stool to the bulkhead of the ship, a rigid wall in a building or to a rigid part. |
To minimise possible noise from the pump, we recommend that you fit expansion joints on either side of the pump. Build a foundation and carry out mechanical installation as described in section 4.1.3 Foundation. Fit isolating valves on either side of the pump to avoid draining the system if the pump needs to be removed for cleaning, repair or replacement. Always protect the pump against backflow by means of a non-return valve.

Install the pipes so that air pockets do not occur.

Fit a vacuum valve close to the pump if the installation has one of these characteristics:
- The outlet pipe slopes downwards away from the pump.
- There is a risk of siphon effect.
- Protection against backflow of unclean liquids is needed.
4.1.3 Foundation

**WARNING**

- **Falling objects**
  - Keep the product in a stable and fixed position before installing it.
  - Make sure that the foundation is suitable for the weight of the product.

We recommend that you install the pump on a concrete foundation which is heavy enough to provide permanent and rigid support for the entire pump. The foundation must be capable of absorbing any vibration, normal strain or shock. The concrete foundation must have an absolutely level and even surface.

Place the pump on the foundation, and fasten it. The base plate must be supported on the whole area.

The following instruction applies when mounting the pump in both vertical and horizontal position. Place the pump on the foundation, and fasten it. See fig. 13.

![Fig. 13 Correct installation](image)

**Fig. 13** Correct installation

The recommended length and width of the foundation are shown in fig. 14. Note that for pumps with motor size below or equal to 40 hp (30 kW), the length and width of the foundation must be 7.87 inches (200 mm) larger than the base plate.

For pumps with motor size equal to 50 hp (37 kW) or above, the length and width (L_f x W_f) must always be 4.9 x 4.9 ft (1.5 x 1.5 m).

**Fig. 14** Foundation, vertical mounting

The foundation length and width must always be 7.87 inches (200 mm) larger than the length and width of the pump. See fig. 15.

The mass of the foundation must be at least 1.5 times the total mass of the pump. The minimum height of the foundation (h_f) can then be calculated:

\[
    h_f = \frac{M_{\text{pump}} \times 1.5}{L_f \times W_f \times \delta_{\text{concrete}}}
\]

The density (\(\delta\)) of concrete is usually taken as 137.3 lb/ft\(^3\) (2200 kg/m\(^3\)).

In installations where noise-less operation is particularly important, we recommend that you use a foundation with a mass up to 5 times that of the pump.

The foundation must be provided with anchor bolts for fixing the base plate. See fig. 16.

**Fig. 15** Foundation, horizontal mounting

**Fig. 16** Bolt in foundation
When the anchor bolts are in position, place the pump on the foundation. Then align the base plate using shims, if necessary, so that it is completely horizontal. See fig. 17.

**Fig. 17** Alignment with shims

### 4.1.4 Vibration dampening

Elimination of noise and vibrations is best achieved by means of a concrete foundation, vibration dampers and expansion joints.

If you use vibration dampers, install them under the foundation. For pumps with motor size below or equal to 40 hp (30 kW), you can use vibration dampers as shown in fig. 18.

For pumps with motor size equal to 50 hp (37 kW) or above, you can use a Sylomer® plate as shown in fig. 19.

**Fig. 18** Pump on vibration dampers

**Fig. 19** Pump on Sylomer® plate

### 4.1.5 Outdoor installation

When the pump is installed outdoors, we recommend that you provide the motor with a rain cover. We also recommend that you open one of the drain holes in the motor flange.
4.1.6 Tightening torques

**WARNING**

Flange gasket blowout
Death or serious personal injury
- Tighten flange bolts according to the torque values stated in the installation and operating instructions.

**WARNING**

Falling objects
Death or serious personal injury
- Tighten the base plate anchor bolts according to the torque values stated in the installation and operating instructions.

The tables show the recommended torques for base plate anchor bolts and flange bolts.
The bolt quality must be minimum class 8.8.

**Base plate anchor bolts**

**UNC bolts:**

<table>
<thead>
<tr>
<th>CR, CRN</th>
<th>Bolt size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UNC 5/8-11</td>
<td>75 100</td>
</tr>
<tr>
<td>95-155</td>
<td>(∅0.7&quot; free hole)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UNC 3/4-10</td>
<td>135 180</td>
</tr>
<tr>
<td></td>
<td>(∅0.87&quot; free hole)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UNC 1-8</td>
<td>140 100</td>
</tr>
<tr>
<td></td>
<td>(∅1.02&quot; free hole)</td>
<td></td>
</tr>
</tbody>
</table>

**Metric bolts:**

<table>
<thead>
<tr>
<th>CR, CRN</th>
<th>Bolt size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M16</td>
<td>70 52</td>
</tr>
<tr>
<td>95-155</td>
<td>(∅18 free hole)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M20</td>
<td>160 118</td>
</tr>
<tr>
<td></td>
<td>(∅22 free hole)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td>130 96</td>
</tr>
<tr>
<td></td>
<td>(∅26 free hole)</td>
<td></td>
</tr>
</tbody>
</table>

**Flange bolts**

**UNC bolts and ANSI flanges:**

<table>
<thead>
<tr>
<th>CR, CRN</th>
<th>Bolt size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-155</td>
<td>UNC 5/8-11</td>
<td>75 100</td>
</tr>
<tr>
<td></td>
<td>UNC 3/4-10</td>
<td>100 136</td>
</tr>
<tr>
<td></td>
<td>UNC 1-8</td>
<td>160 217</td>
</tr>
<tr>
<td></td>
<td>UNC 1 1/8-7</td>
<td>170 230</td>
</tr>
</tbody>
</table>

**Metric bolts and DIN/EN, JIS flanges:**

<table>
<thead>
<tr>
<th>CR, CRN</th>
<th>Bolt size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-155</td>
<td>M16</td>
<td>100 75</td>
</tr>
<tr>
<td></td>
<td>M20</td>
<td>150 110</td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td>200 147</td>
</tr>
<tr>
<td></td>
<td>M27</td>
<td>200 147</td>
</tr>
</tbody>
</table>
4.1.7 Flange forces and torques

If not all loads reach the maximum permissible value stated in the tables below, one of these values may exceed the normal limit. Contact Grundfos for further information.

![Fig. 20 Flange forces and torques](image)

Y-direction: Inlet or outlet  
Z-direction: Direction of chamber stack  
X-direction: 90 ° from inlet or outlet

The following tables represent the values that apply according to the material quality.

**Force limits for CR pumps**

<table>
<thead>
<tr>
<th>Flange</th>
<th>CR</th>
<th>Force, Y-direction [lbf (N)]</th>
<th>Force, Z-direction [lbf (N)]</th>
<th>Force, X-direction [lbf (N)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” ANSI (DN 100)</td>
<td>95</td>
<td>282 (1256)</td>
<td>228 (1013)</td>
<td>253 (1125)</td>
</tr>
<tr>
<td>6” ANSI (DN 150)</td>
<td>125 and 155</td>
<td>422 (1875)</td>
<td>342 (1519)</td>
<td>380 (1688)</td>
</tr>
</tbody>
</table>

**Force limits for CRN pumps**

<table>
<thead>
<tr>
<th>Flange</th>
<th>CR</th>
<th>Force, Y-direction [lbf (N)]</th>
<th>Force, Z-direction [lbf (N)]</th>
<th>Force, X-direction [lbf (N)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” ANSI (DN 100)</td>
<td>95</td>
<td>565 (2513)</td>
<td>455 (2025)</td>
<td>506 (2250)</td>
</tr>
<tr>
<td>6” ANSI (DN 150)</td>
<td>125 and 155</td>
<td>843 (3750)</td>
<td>683 (3038)</td>
<td>759 (3375)</td>
</tr>
</tbody>
</table>

**Torque limits for CR pumps**

<table>
<thead>
<tr>
<th>Flange</th>
<th>CR</th>
<th>Torque, Y-direction [lbf (N)]</th>
<th>Torque, Z-direction [lbf (N)]</th>
<th>Torque, X-direction [lbf (N)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” ANSI (DN 100)</td>
<td>95</td>
<td>84 (375)</td>
<td>107 (475)</td>
<td>141 (625)</td>
</tr>
<tr>
<td>6” ANSI (DN 150)</td>
<td>125 and 155</td>
<td>141 (625)</td>
<td>174 (775)</td>
<td>225 (1000)</td>
</tr>
</tbody>
</table>

**Torque limits for CRN pumps**

<table>
<thead>
<tr>
<th>Flange</th>
<th>CR</th>
<th>Torque, Y-direction [lbf (N)]</th>
<th>Torque, Z-direction [lbf (N)]</th>
<th>Torque, X-direction [lbf (N)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” ANSI (DN 100)</td>
<td>95</td>
<td>169 (750)</td>
<td>214 (950)</td>
<td>281 (1250)</td>
</tr>
<tr>
<td>6” ANSI (DN 150)</td>
<td>125 and 155</td>
<td>281 (1250)</td>
<td>349 (1550)</td>
<td>450 (2000)</td>
</tr>
</tbody>
</table>
4.2 Electrical connection

Follow the instructions for the motor when carrying out the electrical connections.

The electrical connection must be carried out by an authorised electrician in accordance with local regulations.

**WARNING**

**Electric shock**
Death or serious personal injury
- Before starting any work on the product, make sure that the power supply has been switched off and that it cannot be accidentally switched on.
- Connect the pump to an external main switch close to the pump and to a motor-protective circuit breaker or a CUE frequency converter. Make sure you can lock the main switch in OFF position (isolated). Type and requirements as specified in EN 60204-1, 5.3.2.

5. Starting up the product

**WARNING**

**Corrosive liquids**
Death or serious personal injury
- Wear personal protective equipment.

**WARNING**

**Toxic liquids**
Death or serious personal injury
- Wear personal protective equipment.

**CAUTION**

**Hot or cold liquid**
Minor or moderate personal injury
- Wear personal protective equipment.
- Pay attention to the direction of the vent hole when you fill the pump with liquid and vent it.
- Make sure that no persons are hurt by the escaping liquid.

Fill the pump with liquid and vent it before you start the pump.

Pay attention to the direction of the vent hole during liquid filling and venting. Make sure that the escaping liquid does not cause damage to the motor or other components.

![Fig. 21 Vent valve, standard and an optional solution with hose connection](TM0511600611-TM0580981913)

Follow the instructions on page 29.
5.1 Shaft seal run-in

**WARNING**
Corrosive liquids
Death or serious personal injury
- Wear personal protective equipment.

**WARNING**
Toxic liquids
Death or serious personal injury
- Wear personal protective equipment.

**CAUTION**
Hot or cold liquid
Minor or moderate personal injury
- Wear personal protective equipment.

Make sure that a leakage does not cause damage to the equipment.

The seal faces are lubricated by the pumped liquid, meaning that there may be a certain amount of leakage from the shaft seal.

When you start the pump for the first time, or when you install a new shaft seal, a certain run-in period is required before the leakage is reduced to an acceptable level. The time required for this depends on the operating conditions, that is every time the operating conditions change, a new run-in period will be started.

Under normal conditions, the leaking liquid will evaporate. As a result, no leakage will be detected.

6. Product introduction

6.1 Identification

6.1.1 Nameplate

The information on the pump nameplate are described below.

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Type designation</td>
</tr>
<tr>
<td>2</td>
<td>Model</td>
</tr>
<tr>
<td>3</td>
<td>Product number</td>
</tr>
<tr>
<td>4</td>
<td>Serial number</td>
</tr>
<tr>
<td>5</td>
<td>Rated flow rate</td>
</tr>
<tr>
<td>6</td>
<td>Frequency</td>
</tr>
<tr>
<td>7</td>
<td>Head at rated flow rate</td>
</tr>
<tr>
<td>8</td>
<td>Rated speed</td>
</tr>
<tr>
<td>9</td>
<td>Power at rated flow rate and rated speed</td>
</tr>
<tr>
<td>10</td>
<td>Maximum head</td>
</tr>
<tr>
<td>11</td>
<td>Weight excluding motor</td>
</tr>
<tr>
<td>12</td>
<td>Hydraulic efficiency at rated flow rate</td>
</tr>
</tbody>
</table>
| 13   | Maximum system pressure/maximum liquid temperature  
Note: This field may have two sets of data, separated with a semicolon.  
| 14   | KEMA technical file number (stated if the pump is ATEX classified) or customer specific information |
| 15   | Production code |
| 16   | Country of origin |
| 17   | ATEX category (stated if the pump is ATEX classified) |
| 18   | Minimum efficiency index |
| 19   | Direction of rotation  
CCW: Counterclockwise  
CW: Clockwise |
| 20   | Approval marks |
6.2 Intended use of the product

Only use the CR, CRN pumps according to the specifications stated in these installation and operating instructions.

6.2.1 Applications

CR, CRN pumps are suitable for industrial applications such as:

- water supply
- cooling
- heating
- pressure boosting
- water treatment
- liquid transfer of cold or hot clean liquids.

6.2.2 Pumped liquids

**DANGER**

Fire and explosion
Death or serious personal injury
- Do not use the pump for flammable, combustible or explosive liquids.

**WARNING**

Chemical attack and leakage
Death or serious personal injury
- Do not use the pump for liquids which can attack the pump materials chemically.
- Contact Grundfos if in doubt.

**WARNING**

Corrosive liquids
Death or serious personal injury
- Wear personal protective equipment.

**WARNING**

Toxic liquids
Death or serious personal injury
- Wear personal protective equipment.

**CAUTION**

Hot or cold liquid
Minor or moderate personal injury
- Wear personal protective equipment.

CR, CRN pumps are suitable for pumping liquids which are thin, clean, non-flammable, non-combustible or non-explosive liquids, not containing solid particles or fibres.

When pumping liquids with a density and/or viscosity higher than that of water, use motors with correspondingly higher outputs, if required. Whether a pump is suitable for a particular liquid depends on a number of factors of which the most important are chloride content, pH value, temperature, content of chemicals and oils. Please consult Grundfos for information about which pump types are suitable for a specific liquid.
6.3 Operating the product

For operating the product safely, observe the following hazard statements.

**WARNING**
Airborne noise
- Death or serious personal injury
- Wear personal protective equipment.

See sound pressure levels on page 27.

**WARNING**
Too high pressure and leakage
- Death or serious personal injury
- Do not run the pump against a closed outlet valve.

**CAUTION**
Hot or cold surface
- Minor or moderate personal injury
- Make sure that no one can accidentally come into contact with hot or cold surfaces.

7. Servicing the product

**DANGER**
Electric shock
- Death or serious personal injury
- Before starting any work on the product, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

**WARNING**
Falling objects
- Death or serious personal injury
- Follow the lifting instructions.
- Use lifting equipment which is approved for the weight of the product.
- Persons must keep a safe distance to the product during lifting operations.
- Wear personal protective equipment.

For lifting instructions, see section 3.4 Lifting the product.

**WARNING**
Falling objects
- Death or serious personal injury
- Keep the product in a stable and fixed position when working on it.

**WARNING**
Corrosive liquids
- Death or serious personal injury
- Wear personal protective equipment.

**WARNING**
Toxic liquids
- Death or serious personal injury
- Wear personal protective equipment.

**CAUTION**
Hot or cold liquid
- Minor or moderate personal injury
- Wear personal protective equipment.

**CAUTION**
Hot or cold surface
- Minor or moderate personal injury
- Make sure that no one can accidentally come into contact with hot or cold surfaces.

We recommend that you repair pumps with motors of 10 hp (7.5 kW) and up at the installation site. Necessary lifting equipment must be available.

7.1 Contaminated pumps

**CAUTION**
Biological hazard
- Minor or moderate personal injury
- Flush the pump thoroughly with water and rinse the pump parts in water after dismantling.

The product will be classified as contaminated if it has been used for a liquid which is injurious to health or toxic.

If you request Grundfos to service the product, contact Grundfos with details about the liquid before returning the product for service. Otherwise, Grundfos can refuse to accept the product for service.

Any application for service must include details about the liquid.

Clean the product in the best possible way before you return it.

Costs of returning the product are to be paid by the customer.
7.2 Service documentation

7.2.1 Pump
You can find detailed information about how to service your product in the service instructions which can be accessed via the QR code or link below:

Service instructions

http://net.grundfos.com/qr/i/99233360

Additional service documentation including service videos are available in Grundfos Product Center > http://product-selection.grundfos.com/.

7.2.2 Motor
Grundfos MG, MGE and ML, MLE motors
Service documentation is available in Grundfos Product Center > http://product-selection.grundfos.com/.

Motors of other makes
Contact the motor manufacturer.

7.3 Maintaining the product

**WARNING**

Electric shock
Death or serious personal injury
- Before starting any work on the product, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

**WARNING**

Falling objects
Death or serious personal injury
- Follow the lifting instructions.
- Use lifting equipment which is approved for the weight of the product.
- Persons must keep a safe distance to the product during lifting operations.
- Wear personal protective equipment.

For lifting instructions, see section **3.4 Lifting the product**.

CAUTION

Hot or cold liquid
Minor or moderate personal injury
- Wear personal protective equipment.

CAUTION

Hot or cold surface
Minor or moderate personal injury
- Make sure that no one can accidentally come into contact with hot or cold surfaces.

7.3.1 Pump
The pump bearings and the shaft seal are maintenance-free.

7.3.2 Motor
Carry out maintenance as described in the instructions for the motor which are supplied with the pump.
8. Taking the product out of operation

8.1 Frost protection

CAUTION

Hot or cold liquid
Minor or moderate personal injury
- Pay attention to the direction of the vent hole and drain plug when draining the pump. Make sure that the escaping liquid does not cause injury to persons.
- Wear personal protective equipment.

Pay attention to the direction of the vent hole and drain plug when draining the pump. Make sure that the escaping liquid does not cause damage to the motor or other components.

Drain pumps which are not being used during periods of frost to avoid damage.
To drain the pump loosen the vent screw in the pump head and remove all drain plugs from one side of the pump base.
Do not tighten the vent screw and replace the drain plug until the pump is to be used again.

8.2 Taking the product permanently out of operation

Observe the following if the pump is to be permanently taken out of operation and removed from the pipe system.

DANGER

Electric shock
Death or serious personal injury
- Before starting any work on the product, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

WARNING

Falling objects
Death or serious personal injury
- Keep the product in a stable and fixed position when working on it.

WARNING

Corrosive liquids
Death or serious personal injury
- Wear personal protective equipment.

WARNING

Toxic liquids
Death or serious personal injury
- Wear personal protective equipment.

CAUTION

Hot or cold liquid
Minor or moderate personal injury
- Wear personal protective equipment.

CAUTION

Hot or cold surface
Minor or moderate personal injury
- Make sure that no one can accidentally come into contact with hot or cold surfaces.

WARNING

Falling objects
Death or serious personal injury
- Follow the lifting instructions.
- Use lifting equipment which is approved for the weight of the product.
- Persons must keep a safe distance to the product during lifting operations.
- Wear personal protective equipment.

For lifting instructions, see section 3.4 Lifting the product.
9. Fault finding the product

**DANGER**

**Electric shock**
Death or serious personal injury
- Before starting any work on the product, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

**WARNING**

**Corrosive liquids**
Death or serious personal injury
- Wear personal protective equipment.

**WARNING**

**Toxic liquids**
Death or serious personal injury
- Wear personal protective equipment.

**CAUTION**

**Falling objects**
Death or serious personal injury
- Keep the product in a stable and fixed position when working on it.

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The motor does not run when started.</td>
<td>a) Supply failure.</td>
<td>Connect the power supply.</td>
</tr>
<tr>
<td></td>
<td>b) The fuses are blown.</td>
<td>Replace the fuses.</td>
</tr>
<tr>
<td></td>
<td>c) The motor-protective circuit breaker has tripped.</td>
<td>Reactivate the motor-protective circuit breaker.</td>
</tr>
<tr>
<td></td>
<td>d) The thermal protection has tripped.</td>
<td>Reactivate the thermal protection.</td>
</tr>
<tr>
<td></td>
<td>e) The main contacts in the motor-protective circuit breaker are not making contact or the coil is faulty.</td>
<td>Replace the contacts or the magnetic coil.</td>
</tr>
<tr>
<td></td>
<td>f) The control circuit is defective.</td>
<td>Repair the control circuit.</td>
</tr>
<tr>
<td></td>
<td>g) The motor is defective.</td>
<td>Replace the motor.</td>
</tr>
<tr>
<td>2. The motor-protective circuit breaker trips immediately when the power supply is switched on.</td>
<td>a) One fuse is blown or the automatic circuit breaker has tripped.</td>
<td>Replace the fuse or cut in the circuit breaker.</td>
</tr>
<tr>
<td></td>
<td>b) The contacts in the motor-protective circuit breaker are faulty.</td>
<td>Replace the motor-protective circuit breaker contacts.</td>
</tr>
<tr>
<td></td>
<td>c) The cable connection is loose or faulty.</td>
<td>Fasten or replace the cable connection.</td>
</tr>
<tr>
<td></td>
<td>d) The motor winding is defective.</td>
<td>Replace the motor.</td>
</tr>
<tr>
<td></td>
<td>e) The pump is mechanically blocked.</td>
<td>Remove the mechanical blocking of the pump.</td>
</tr>
<tr>
<td></td>
<td>f) The motor-protective circuit breaker setting is too low.</td>
<td>Set the motor-protective circuit breaker correctly.</td>
</tr>
<tr>
<td></td>
<td>b) Low voltage at peak times.</td>
<td>Ensure a stable power supply.</td>
</tr>
<tr>
<td>4. The motor-protective circuit breaker has not tripped, but the pump does not run.</td>
<td>a) Check 1 a), b), d), e) and f).</td>
<td></td>
</tr>
<tr>
<td>Fault</td>
<td>Cause</td>
<td>Remedy</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>5. The pump performance is not constant.</td>
<td>a) The pump inlet pressure is too low (cavitation).</td>
<td>Check the inlet conditions.</td>
</tr>
<tr>
<td></td>
<td>b) The inlet pipe or pump is partly blocked by impurities.</td>
<td>Clean the inlet pipe or pump.</td>
</tr>
<tr>
<td></td>
<td>c) The pump draws in air.</td>
<td>Check the inlet conditions.</td>
</tr>
<tr>
<td>6. The pump runs, but gives no water.</td>
<td>a) The inlet pipe or pump is blocked by impurities.</td>
<td>Clean the inlet pipe or pump.</td>
</tr>
<tr>
<td></td>
<td>b) The foot or non-return valve is blocked in closed position.</td>
<td>Repair the foot or non-return valve.</td>
</tr>
<tr>
<td></td>
<td>c) There is a leakage in the inlet pipe.</td>
<td>Repair the inlet pipe.</td>
</tr>
<tr>
<td></td>
<td>d) There is air in the inlet pipe or pump.</td>
<td>Check the inlet conditions.</td>
</tr>
<tr>
<td></td>
<td>e) The motor runs in the wrong direction of rotation.</td>
<td>Change the direction of rotation of the motor.</td>
</tr>
<tr>
<td>7. The pump runs backwards when switched off.</td>
<td>a) There is a leakage in the inlet pipe.</td>
<td>Repair the inlet pipe.</td>
</tr>
<tr>
<td></td>
<td>b) The foot or non-return valve is defective.</td>
<td>Repair the foot or non-return valve.</td>
</tr>
<tr>
<td>8. Leakage in the shaft seal.</td>
<td>a) The shaft seal is defective.</td>
<td>Replace the shaft seal.</td>
</tr>
<tr>
<td></td>
<td>b) The pump does not rotate freely due to frictional resistance as a result of incorrect pump shaft position.</td>
<td>Adjust the pump shaft as described in the service documentation. See section 7.2 Service documentation.</td>
</tr>
<tr>
<td></td>
<td>c) Frequency converter operation.</td>
<td>See the instructions for the motor which are supplied with the pump.</td>
</tr>
</tbody>
</table>
10. Technical data

10.1 Operating conditions

10.1.1 Ambient temperature and altitude
See the instructions for the motor which are supplied with the pump.

10.1.2 Maximum system pressure and liquid temperature
The maximum permissible system pressure and liquid temperature are stated on the nameplate which is placed on the pump. For identification of the nameplate data, see section 6.1.1 Nameplate.

10.1.3 Maximum permissible operating pressure and liquid temperature for the shaft seal
The operating range of a shaft seal depends on the operating pressure, the liquid temperature and the type of shaft seal.
The selection charts show which shaft seals are suitable at a given temperature and a given pressure.
See figs 23 and 24. The charts apply to clean water.

Shaft seals for \( \varnothing 22 \) shaft ends: CR, CRN with motors up to and including 75 hp (55 kW)

Shaft seals for \( \varnothing 28 \) (100-150 hp (75-110 kW)) and \( \varnothing 36 \) (175-250 hp (132-200 kW)) shaft ends

---

**Fig. 23** Maximum permissible operating pressure and liquid temperature for pumps with \( \varnothing 22 \) shaft seal (≤ 75 hp (55 kW))

**Fig. 24** Maximum permissible operating pressure and liquid temperature for pumps with \( \varnothing 28 \) shaft ends (100-150 hp (75-110 kW)) and \( \varnothing 36 \) shaft ends (175-250 hp (132-200 kW))
10.1.4 Minimum inlet pressure

Fig. 25  Schematic view of open system with a CR pump

Calculate the maximum suction lift "H" in ft (m) head as follows:

\[ H = \text{Pb} - \text{NPSH} - \text{Hf} - \text{Hv} \]  

If the calculated "H" is positive, the pump can operate at a suction lift of maximum "H" ft (m) head. If the calculated "H" is negative, an inlet pressure of minimum "H" ft (m) head is required. There must be a pressure equal to the calculated "H" during operation.

**Example with result in feet**

Pb = 33.46 ft.
Pump type: CR 95.
Flow rate: 418 GPM.
NPSH (from page 24): 11.48 ft head.
Hf = 9.84 ft head.
Liquid temperature: +140 °F.
Hv (from Fig. E on page 27): 6.9 ft head.

\[ H = \text{Pb} - \text{NPSH} - \text{Hf} - \text{Hv} = 5.24 \text{ ft head.} \]

Pressure in psi:
\[ 5.24 \times 0.433 \times \text{specific gravity of pumped fluid} = 2.27 \text{ psi.} \]

**Example with result in meters**

Pb = 1 bar
Pump type: CR 95
Flow rate: 95 m³/h
NPSH (from page 24): 3.5 m head.
Hf = 3.0 m head.
Liquid temperature: +60 °C.
Hv (from Fig. E on page 27): 2.1 m head.

\[ H = \text{Pb} \times 10.2 - \text{NPSH} - \text{Hf} - \text{Hv} = 1.6 \text{ m head.} \]

This means that the pump can operate at a suction lift of maximum 1.6 m head.

Pressure in bar: 1.6 \times 0.0981 = 0.157 bar.
Pressure in kPa: 1.6 \times 9.81 = 15.7 kPa

Pb = Barometric pressure in feet absolute (bar).
NPSH = Net Positive Suction Head in ft (m) head, to be read from the NPSH curve on page 24 at the highest flow the pump will be delivering.
Hf = Friction loss in the inlet pipe in ft (m) head at the highest flow the pump will be delivering.
Hv = Vapour pressure in ft (m) head. See Fig. E on page 28.
tm = Liquid temperature.
10.1.5 Maximum permissible inlet pressure
The table on page 25 states the maximum permissible inlet pressure for vertically mounted pumps. However, the actual inlet pressure + the maximum pump pressure at no flow must always be lower than the maximum permissible system pressure which is stated on the pump nameplate. For identification of the nameplate data, see section 6.1.1 Nameplate.
The pumps are pressure-tested at a pressure of 1.5 times the maximum permissible system pressure.

10.1.6 Minimum flow rate

**WARNING**

Too high pressure and leakage
Death or serious personal injury
- Do not run the pump against a closed outlet valve.

Due to the risk of overheating, do not use the pump at flows below the minimum flow rate.
The curves below show the minimum flow rate as a percentage of the rated flow rate in relation to the liquid temperature.
--- = air-cooled top.

![Graph showing minimum flow rate in percentage of nominal flow](image)

**Fig. 26** Minimum flow rate in percentage of nominal flow

10.1.7 Frequency of starts and stops
See the instructions for the motor which are supplied with the pump.

10.2 Dimensions and weights
Dimensions: see page 26.
Weights: see label on the packing.

10.3 Electrical data
See the motor nameplate.

11. Disposing of the product
This product or parts of it must be disposed of in an environmentally sound way:
1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.
See also end-of-life information on www.grundfos.com.
Appendix

Fig. A

NPSH

CR 95, CRN 95

CR 125, CRN 125

CR 155, CRN 155
## Maximum inlet pressure for CR, CRN

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Maximum inlet pressure [psi (bar)]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CR, CRN 95</strong></td>
<td></td>
</tr>
<tr>
<td>CR, CRN 95-1 → CR, CRN 95-1-1</td>
<td>58 (4)</td>
</tr>
<tr>
<td>CR, CRN 95-2 → CR, CRN 95-3-2</td>
<td>145 (10)</td>
</tr>
<tr>
<td>CR, CRN 95-3 → CR, CRN 95-5-1</td>
<td>218 (15)</td>
</tr>
<tr>
<td><strong>CR, CRN 125</strong></td>
<td></td>
</tr>
<tr>
<td>CR, CRN 125-1 → CR, CRN 125-2-2</td>
<td>145 (10)</td>
</tr>
<tr>
<td>CR, CRN 125-2 → CR, CRN 125-4</td>
<td>218 (15)</td>
</tr>
<tr>
<td>CR, CRN 125-5 → CR, CRN 125-7-2</td>
<td>290 (20)</td>
</tr>
<tr>
<td><strong>CR, CRN 155</strong></td>
<td></td>
</tr>
<tr>
<td>CR, CRN 155-1 → CR, CRN 155-1-1</td>
<td>145 (10)</td>
</tr>
<tr>
<td>CR, CRN 155-2 → CR, CRN 155-3-2</td>
<td>218 (15)</td>
</tr>
<tr>
<td>Pump type</td>
<td>PJE</td>
</tr>
<tr>
<td>-----------</td>
<td>-----</td>
</tr>
<tr>
<td>CR 95</td>
<td>14.96 (380)</td>
</tr>
<tr>
<td>CRN 95</td>
<td>14.96 (380)</td>
</tr>
<tr>
<td>CR 125</td>
<td>19.09 (485)</td>
</tr>
<tr>
<td>CRN 125</td>
<td>19.09 (485)</td>
</tr>
<tr>
<td>CR 155</td>
<td>19.09 (485)</td>
</tr>
<tr>
<td>CRN 155</td>
<td>19.09 (485)</td>
</tr>
</tbody>
</table>
Airborne noise emitted by pumps with motors fitted by Grundfos:

<table>
<thead>
<tr>
<th>Motor [hp]</th>
<th>L_{PA} [dB(A)]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(ISO3743-2 / ISO1680 60 Hz)</td>
</tr>
<tr>
<td>15</td>
<td>64.5</td>
</tr>
<tr>
<td>20</td>
<td>65</td>
</tr>
<tr>
<td>25</td>
<td>65.5</td>
</tr>
<tr>
<td>30</td>
<td>70.5</td>
</tr>
<tr>
<td>40</td>
<td>75</td>
</tr>
<tr>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td>75</td>
<td>79</td>
</tr>
<tr>
<td>100</td>
<td>78</td>
</tr>
<tr>
<td>125</td>
<td>78</td>
</tr>
<tr>
<td>150</td>
<td>83</td>
</tr>
<tr>
<td>200</td>
<td>78</td>
</tr>
<tr>
<td>250</td>
<td>82</td>
</tr>
<tr>
<td>300</td>
<td>88</td>
</tr>
</tbody>
</table>
GB  Startup

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Close the isolating valve on the outlet side of the pump and open the isolating valve on the inlet side.</td>
</tr>
<tr>
<td>2</td>
<td>Remove the priming plug from the pump head and slowly fill the pump with liquid. Replace the priming plug and tighten securely.</td>
</tr>
<tr>
<td>3</td>
<td>See the correct direction of rotation of the pump on the motor fan cover.</td>
</tr>
<tr>
<td>4</td>
<td>Start the pump and check the direction of rotation.</td>
</tr>
<tr>
<td>5</td>
<td>Vent the pump by means of the vent valve in the pump head. At the same time, open the outlet isolating valve a little.</td>
</tr>
<tr>
<td>6</td>
<td>Continue to vent the pump. At the same time, open the outlet isolating valve a little more.</td>
</tr>
<tr>
<td>7</td>
<td>Close the vent valve when a steady stream of liquid runs out of it. Completely open the outlet isolating valve.</td>
</tr>
<tr>
<td>8</td>
<td>For further information, see page 13.</td>
</tr>
</tbody>
</table>
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