NK

Installation and operating instructions

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Installation and operating instructions
(all available languages)
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GRUNDFOS

NK

Original installation and operating instructions

Table of contents

1. General information

Read this document before you install the product. Installation and operation must comply with local regulations and accepted codes of good practice.

1.1 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 the hazard

Consequence of ignoring the warning

- Action to avoid the hazard.

1.2 Notes

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

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.

1.3 Target group

These installation and operating instructions are intended for professional installers and for the operators of the product.

We recommend that installation is carried out by skilled persons with technical qualifications required by the specific legislation in force.

2. Product introduction

2.1 Product description

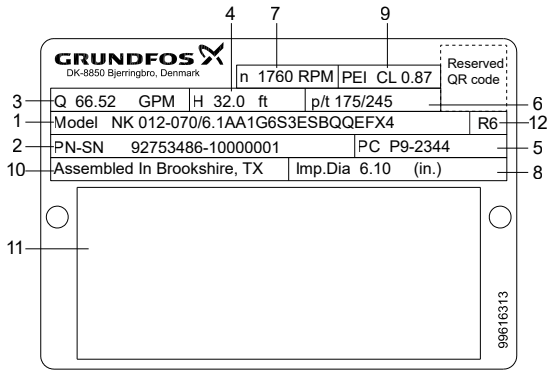
The product is a non-self-priming, single stage, centrifugal volute pump with axial inlet port and radial outlet port.

2.1.1 Pumped liquids

Pumped liquids must be clean, thin, non-explosive and without particles or fibers. The pumped liquid must not attack the pump materials chemically.

2.2 Identification

2.2.1 Nameplate



Example of NK nameplate

Pos.	Description
1	Type designation
2	Product number and production serial number
3	Flow
4	Head
5	Production code
6	Pressure and temperature
7	Pump speed
8	Impeller diameter
9	PEI CL: Pump Energy Index, constant load
	PEI VL: Pump Energy Index, variable load
10	Place of production
11	Field for approval marks and associated texts
12	Range identification (service range code)

2.2.2 Type key, NK, NKE

Example 1: NK 025-095/8.43AA1G6S3ESBQQELX4
Example 2: NK 030-110/1094-1063AA1G6S3ESBQQEOX4
Example 3: NKE 040-070/4.96ASA1G6S3ESBQQEHCA

Pos.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Example 1	NK	025	-095	/8.43		A		A1	G	6	S3	E	S	BQQE	L	X	4
Example 2	NK	030	-110	/1094-1063		A		A1	G	6	S3	E	S	BQQE	O	X	4
Example 3	NKE	040	-070	/4.96		A	S	A1	G	6	S3	E	S	BQQE	H	C	A

Pos.	Explanation
1	Type range
2	Nominal diameter of outlet port (DN)
3	Nominal impeller diameter [inch]
4	Actual impeller diameter [inch]
5	**Impeller type** 'blank': Closed impeller, cylindrical trim. If one dimension is shown the impeller has a cylindrical trim, for example 16.77 'blank': Closed impeller, conical trim. If two dimensions are shown the impeller has a conical trim, for example 12.91-12.76 S: Special open impeller V: Super vortex impeller
6	**Hydraulic version** A: 1st version B: 2nd version C: 3rd version D: 4th version
7	**Sensor/motor version** 'blank': Pump without sensor C: Without built-in sensor, one cable and one pressure sensor are supplied with the pump. S: Pump with built-in differential-pressure sensor, Series 2000 G: Non -E pump/ -E pump with semi-integrated VFD/CUE: Motor with Grounding ring: Non drive-end H: Non -E pump/ -E pump with semi-integrated VFD/CUE: Motor with hybrid bearing (HYB): Non drive-end I: Non -E pump/ -E pump with semi-integrated VFD/CUE: Motor with insulated bearing: Non drive-end
8	**Code for pump version; the codes may be combined** A1: Basic version, grease-lubricated standard bearing design, standard coupling A2: Basic version, grease-lubricated standard bearing design, spacer coupling B: Oversize motor (+E): With ATEX approval, certificate or test report, the second character of the pump version code is an E G1: Grease-lubricated heavy-duty bearing design, standard coupling G2: Grease-lubricated heavy-duty bearing design, spacer coupling I1: Pump without motor, grease-lubricated standard bearing design, standard coupling I2: Pump without motor, grease-lubricated standard bearing design, spacer coupling J1: Pump without motor, grease-lubricated heavy-duty bearing design, standard coupling J2: Pump without motor, grease-lubricated heavy-duty bearing design, spacer coupling Y1: Bare shaft pump, grease-lubricated standard bearing design W1: Bare shaft pump, grease-lubricated heavy-duty bearing design Z1: Bare shaft pump, oil-lubricated heavy-duty bearing design X: Special version; used in case of further customization than already listed
9	**Pipe connection** G: ANSI flange
10	**Flange pressure rating (PN - rated pressure)** 5: Other pressure rating 6: Class 125, 175 PSI 7: Class 300, 363 PSI

Pos.	Explanation
11	**Code for materials**

Code	Pump housing	Impeller	Wear ring	Shaft
S3	A48 Class 35	304	No wear ring	1.0503 shaft + 304 sleeve
S4	A48 Class 35	304	No wear ring	316
S5	A48 Class 35	304	No wear ring	SAF 2205
S8	A48 Class 35	316	No wear ring	316
S9	A48 Class 35	316	No wear ring	SAF 2205
SB	70-50-05	304	No wear ring	1.0503 shaft + 304 sleeve
SC	70-50-05	304	No wear ring	316
SD	70-50-05	304	No wear ring	SAF 2205
SG	70-50-05	316	No wear ring	316
SH	70-50-05	316	No wear ring	SAF 2205
SI	70-50-05	304	No wear ring	SAF 2507
SJ	70-50-05	316	No wear ring	SAF 2507
SK	A48 Class 35	304	No wear ring	SAF 2507
SL	A48 Class 35	316	No wear ring	SAF 2507
T2	A48 Class 35	CD4MCuN/A890	No wear ring	SAF 2205
T3	A48 Class 35	CD4MCuN/A890	No wear ring	SAF2507
TA	70-50-05	CD4MCuN/A890	No wear ring	SAF 2205
TB	70-50-05	CD4MCuN/A890	No wear ring	SAF 2507
X	Special version			

Pos.	Explanation
12	**Rubber parts in pump** E: EPDM F: FXM (Fluoraz®) K: FFKM (Kalrez®) M: FEPS (PTFE-sheathed silicone O-ring) O: HNBR V: FKM (Viton®)
13	**Shaft seal arrangement** S: Single seal
14	**Shaft seal(s) in pump** Letter for mechanical shaft seal and shaft seal rubber parts • 4 letters: Single mechanical shaft seal, such as BQQE
15	Code for rated motor power [kW]. See Codes for rated motor power.
16	Code for DOE identification. See Code for DOE identification.
17	Code for speed variant [rpm]. See Codes for speed variant.

Example 1: NK 025-095/8.43AA1G6S3ESBQQELX4 shows an NK 025-095 pump with these characteristics:

- 8.43 inch closed impeller, cylindrical trim
- hydraulic version A
- pump without sensor
- basic version, grease-lubricated standard bearing design
- standard coupling
- ANSI flange to ASME/ANSI B16.1
- Class 125, 175 PSI
- pump housing, A48 Class 35
- impeller, 304
- no wear ring
- shaft 1.0503 + 304 sleeve
- EPDM O-rings
- single shaft seal arrangement
- BQQE shaft seal
- 7.5 hp motor, US DOE regulated motor, 4-pole, 60 Hz.

Example 2: NK 030-110/1094-1063AA1G6S3ESBQQEOX4 shows an NK 030-110 pump with these characteristics:

- 10.94 - 10.63 inch closed impeller, conical trim
- hydraulic version A
- pump without sensor
- basic version, grease-lubricated standard bearing design
- standard coupling
- ANSI flange to ASME/ANSI B16.1
- Class 125, 175 PSI
- pump housing, A48 Class 35
- impeller, 304
- no wear ring
- shaft 1.0503 + 304 sleeve
- EPDM O-rings
- single shaft seal arrangement
- BQQE shaft seal
- 20 hp motor, US DOE regulated motor, 4-pole, 60 Hz.

Example 3: NKE 040-070/4.96ASA1G6S3ESBQQEHCA shows an NKE 040-070 pump with these characteristics:

- 4.96 inch closed impeller, cylindrical trim
- hydraulic version A
- pump with built-in sensor
- basic version, grease-lubricated standard bearing design
- standard coupling
- ANSI flange to ASME/ANSI B16.1
- Class 125, 175 PSI
- pump housing, A48 Class 35
- impeller, 304
- no wear ring
- shaft 1.0503 + 304 sleeve
- EPDM O-rings
- single shaft seal arrangement
- BQQE shaft seal
- 2 hp motor, MLE 3 x 440-480 V, 1450-2200 RPM.

2.2.2.1 Letter codes for shaft seals

Pos. 14 in NK type key example.

Code	Description	Explanation
B	Shaft seal type	A: O-ring seal with fixed driver B: Rubber bellows seal D: O-ring seal, balanced H: Cartridge seal, balanced
Q	Material of rotating seal face	A: Carbon, metal-impregnated with antimony which is not approved for potable water B: Carbon, resin-impregnated Q: Silicon carbide
Q	Material of stationary seal	A: Carbon, metal-impregnated with antimony which is not approved for potable water Q: Silicon carbide
E	Material of secondary seal and other rubber and composite parts, except the wear ring	E: EPDM V: FKM (Viton®) F: FXM (Fluoraz®) K: FFKM (Kalrez®) X: HNBR U: Dynamic O-rings in FFKM and static O-rings in PTFE

2.2.2.2 Codes for rated motor power

Pos. 15 in NK type key example.

Code	Description	
	[hp]	[kW]
A	0.16	0.12
B	0.25	0.18
C	0.33	0.25
D	0.5	0.37
E	0.75	0.55
F	1	0.75
G	1.5	1.1
H	2	1.5
I	3	2.2
J	4	3
K	5 (5.5 [1])	3.7 (4 [1])
L	7.5	5.5
M	10	7.5
N	15	11
O	20	15
P	25	18.5
Q	30	22
R	40	30
S	50	37
T	60	45
U	75	55
V	100	75
W	125	90
X	Bare shaft pump	
Y	> 200 [2]	> 150 [2]
1	150	110
2	175	132
3	200	150
4	215 [3]	160 [3]
5	250 [3]	185 [3]
6	-	26

1) Value in bracket is for the standard IEC motor size. Value outside bracket is for the motor size according to NEMA standards.

2) Used for pumps where the pump shaft input power exceeds 200 hp (150 kW) and is not regulated under the DOE pump rule.

3) Special cases with power sizes above 200 hp (150 kW) which are still regulated under the DOE pump rule. For example: Pump has a P2 value of 198 hp (147.6 kW) in its duty point (in DOE scope) but customer wants the 215 hp (160 kW) motor instead of the 200 hp (150 kW). The pump is in scope of the DOE regulation and requires a PEI value and a motor code.

2.2.2.3 Code for DOE identification

Pos. 16 in NK type key example.

Code	Description
A	DOE reported with E-motor (ECM [4]), 1 × 200-240 V
B	DOE reported with E-motor (ECM [4]), 3 × 200-240 V
C	DOE reported with E-motor (ECM [4]), 3 × 440-480 V
D	DOE reported with E-motor (ECM [4]), 3 × 380-500 V
E	DOE reported with E-motor (ECM [4]), 3 x 525-600 V
F	DOE reported with E-motor (ECM [4]), 3 x 525-690 V
W	In DOE scope but not compliant with or not for sale in North America
X	DOE reported, sell as bare shaft pump or DOE regulated Motor (CC marked motor)
Y	Pumps not subject to the DOE regulation
Z	DOE reported with Asynchronous E-Motor

4) ECM: Electronically Commutated Motor.

2.2.2.4 Codes for speed variant

Pos. 17 in NK type key example.

Code	Description
A	1450-2200 RPM, E-motor (ECM [5])
B	2900-4000 RPM, E-motor (ECM [5])
C	4000-5900 RPM, E-motor (ECM [5])
D	1450-2200 RPM, CUE + WEG PM motor
E	2900-4000 RPM, CUE + WEG PM motor
1	2-pole, 50 Hz (Asynchronous motor)
2	2-pole, 60 Hz (Asynchronous motor)
3	4-pole, 50 Hz (Asynchronous motor)
4	4-pole, 60 Hz (Asynchronous motor)
5	6-pole, 50 Hz (Asynchronous motor)
6	6-pole, 60 Hz (Asynchronous motor)
7	8-pole, 50 Hz (Asynchronous motor)
8	8-pole, 60 Hz (Asynchronous motor)

5) ECM: Electronically Commutated Motor.

3. Receiving the product

3.1 Delivery

The pumps are not tested for performance before leaving the factory unless it was specifically ordered. Test certificates are available from Grundfos. After the installation, the alignment of pump and motor must be checked again. See section Alignment of pump and motor.

3.2 Transporting the product

WARNING

Overhead load

Death or serious personal injury

- Pay attention to the pump weight, and take precautions to prevent personal injury if the pump topples or falls by accident.

- Always transport the pump in the specified position.
- Securely fasten the pump to prevent damage to the shaft and shaft seal caused by excessive vibrations and knocks.
- Do not lift the pump by the shaft.

3.3 Inspecting the product

- Confirm that the product received is in accordance with the order.
- Confirm that the voltage, phase and frequency of the product match the voltage, phase and frequency of the installation site. See Identification.
- Check the product for defects or damages immediately upon receipt. Any accessory ordered will be packed in a separate container and shipped with the product.
- If any equipment is damaged in transit, report it immediately to the carrier's agent. Make complete notations on the freight bill.

3.4 Storage after delivery

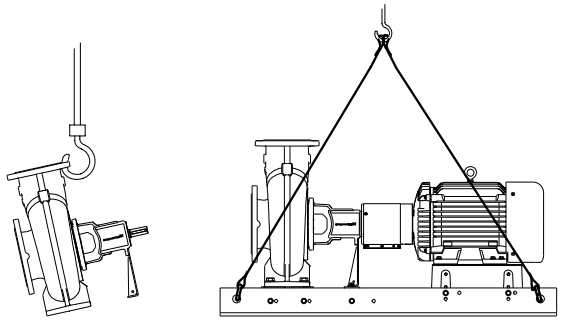
The contractor must inspect the equipment on delivery and make sure it is stored so as to avoid corrosion or damage. See Storing the product.

3.5 Lifting the product

Weight: See the label on the packing.

For motors which come with lifting eyes, the lifting eyes must not be used for lifting the entire pump unit.

- Lift the pumps by means of nylon straps and shackles.



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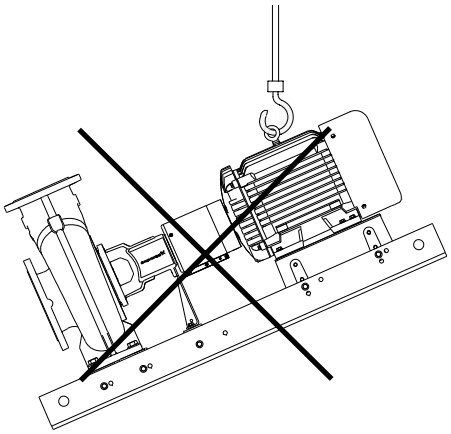
Correct lifting of pump



TM085749

Incorrect lifting of pump

4. Installation requirements

4.1 Location

CAUTION

Hot or cold surface

Minor or moderate personal injury

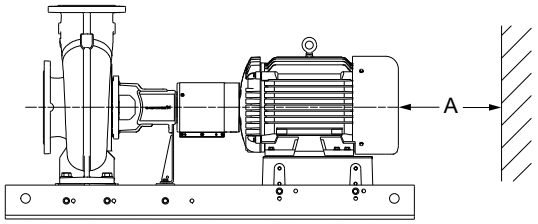
- When pumping hot or cold liquids, make sure that no one can accidentally come into contact with hot or cold surfaces.

The pump must be sited in a well-ventilated, but frost-free location.

4.1.1 Minimum clearance

For inspection and repair, allow suitable clearance for pump and motor removal.

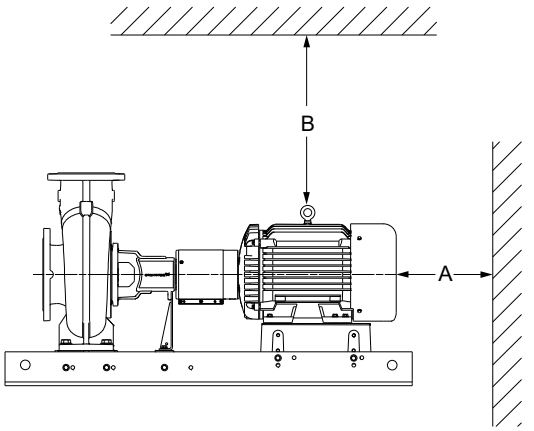
- Pumps fitted with motors up to and including 5 hp (4 kW) require a 12 inches (0.3 m) clearance behind the motor.



TM085750

Motor	Minimum clearance, A
0.33 - 5 hp (0.25 - 4 kW)	12 inches (0.3 m)

- Pumps fitted with motors of 7.5 hp (5.5 kW) and up require a 12 inches (0.3 m) clearance behind the motor and at least a clearance of 40 inches (1 m) above the motor to allow for the use of lifting equipment.



TM085751

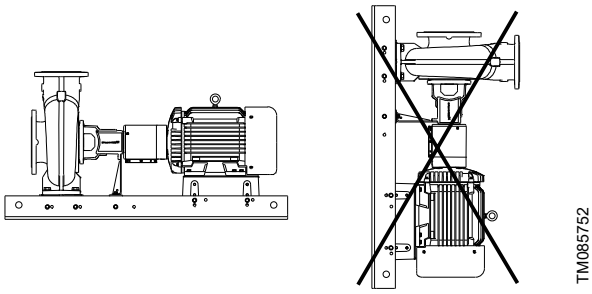
Motor	Minimum clearance	
	A	B
≥ 7.5 hp (5.5 kW)	12 inches (0.3 m)	40 inches (1 m)

4.2 Installation positions

Arrows on the pump housing show the direction of the flow of liquid through the pump.

Only horizontal installation is allowed for NK pumps. Contact Grundfos for information on extra installation requirements if special installation positions are needed.

The motor must never be positioned below the horizontal plane. Horizontal motors with feet must always be supported.

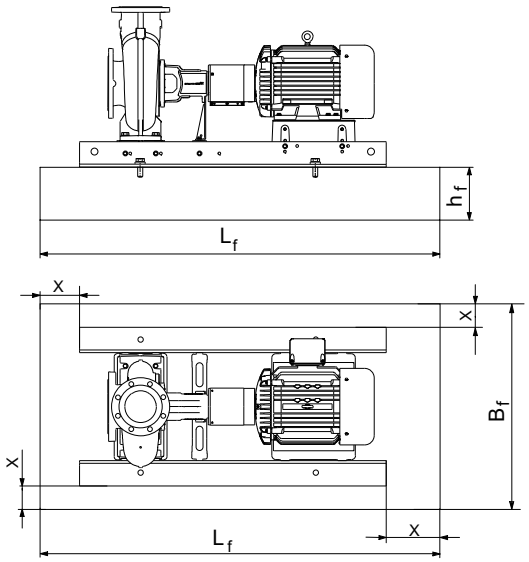


TM085752

5. Mechanical installation

5.1 Foundation

- We recommend that you install the pump on a plane and rigid concrete foundation which is heavy enough to provide permanent support for the entire pump.
- The foundation must be capable of absorbing any vibration, normal strain or shock.
- As a rule of thumb, the weight of the concrete foundation should be at least 1.5 times the weight of the pump.
- The foundation must be at least 4 inches (100 mm) larger than the base frame on all four sides.



TM085753

Foundation, X equal to minimum 100 mm

The minimum height of the foundation, h_f, can then be calculated:

$$h_f = \frac{m_{pump} \times 1.5}{L_f \times B_f \times \delta_{concrete}}$$

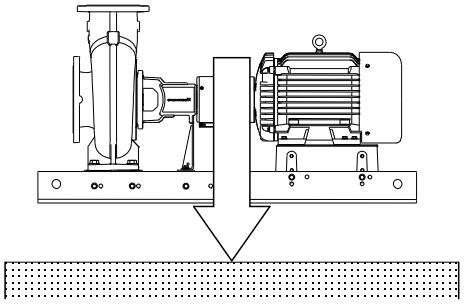
h_f	Height of the foundation [in] [m]
L_f	Length of the foundation [in] [m]
B_f	Width of the foundation[in] [m]
m_{pump}	Mass of the pump [lbs] [kg]
$\delta_{concrete}$	Density of the concrete [lb/in^3] [kg/m^3]

The density of concrete, indicated by δ, is usually taken as 0.08 lb/in^3 (2,200 kg/m^3)

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

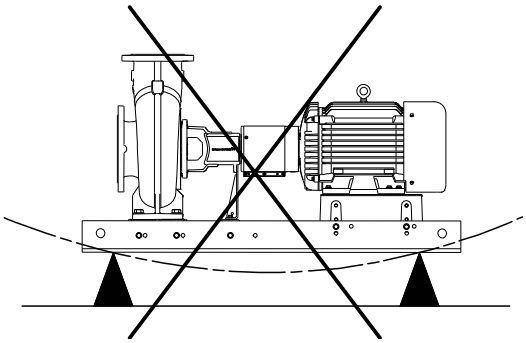
After installation is finished, tighten the screws connecting the flange, feet and the anchor bolts according to the tightening torques. You must apply an anti-loose method, such as mounting lock washers.

The base frame must be supported under its entire area.



TM085754

Correct foundation



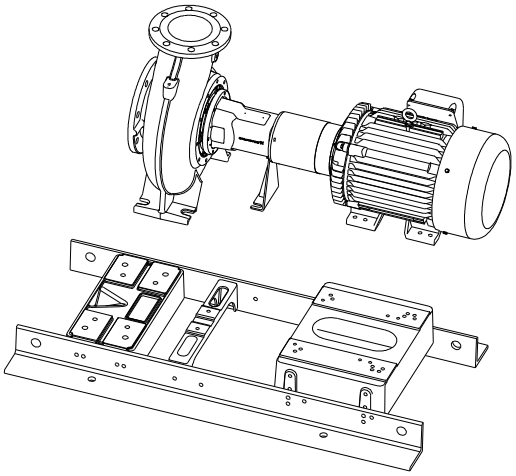
TM085755

Incorrect foundation

5.1.1 Grouting of horizontally mounted NK pumps

For NK pumps with 2-pole motors equal to or bigger than 60 hp (45 kW) grouting of the base frame is mandatory in order to prevent vibration energy from the rotating motor and liquid flow to evolve.

	P2 lower than or equal to 50 hp (37 kw)	P2 equal to or higher than 60 hp (45 kW)
2-pole	Grouting optional	Grouting mandatory
4-pole	Grouting optional	
6-pole	Grouting optional	



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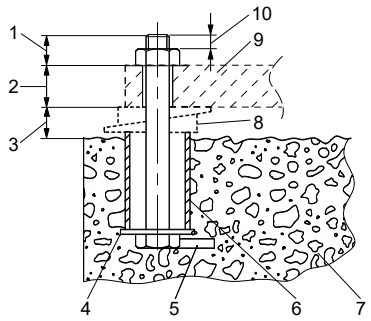
Base frame cavities to be filled with grout

5.1.2 Preparing the foundation

We recommend the following procedures to ensure a good foundation:

1. Pour the foundation without interruption to 0.75 - 1.25 in. (19-32 mm) of the final level.
   Use an approved, non-shrinking concrete. Contact your concrete supplier for advice if any doubts.
2. Use vibrators to ensure that the concrete is evenly distributed. The top surface must be well scored and grooved before the concrete sets. This provides a bonding surface for the grout.
3. Embed anchor bolts in the concrete.
   Allow enough bolt length to reach through grout, shims, the lower part of the support rail, nuts and washers.



TM075514

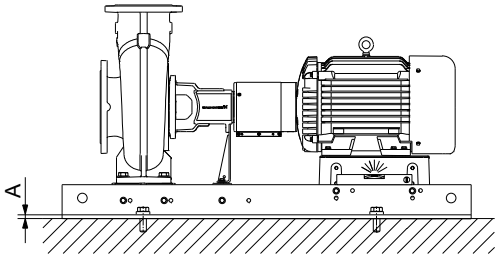
Pos.	Description
1	Bolt length above the support rail
2	Thickness of the support rail
3	0.75 - 1.25 in. (19-32 mm) allowance for grout
4	Washer
5	Lug
6	Pipe sleeve
7	Foundation with rough top
8	Wedges and shims left in place
9	Support rail
10	0.2 - 0.4 in. (5-10 mm)

4. Let the foundation cure for several days before levelling and grouting the support rail.

5.1.3 Levelling the base frame

Follow the steps below to level the base frame:

1. Lift or jack up the base frame to the final level 0.75 - 1.25 inches (19-32 mm) above the concrete foundation, and support the base frame by means of blocks and shims both at the anchor bolts and midway between bolts.



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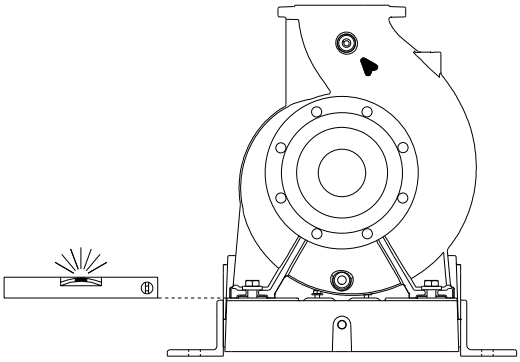
A: 0.75 - 1.25 inches (19-32 mm)

2. Level the base frame by adding or removing shims under the base frame.



TM085758

3. Tighten the anchor bolt nuts against the base frame.
4. Make sure the piping can be aligned to the pump flanges without putting strain on pipes or flanges.

5.1.4 Preliminary alignment

DANGER

Electric shock

Death or serious personal injury

- Before starting work on the pump, make sure that the power supply has been switched off and cannot be accidentally switched on again.

The pump and motor are pre-aligned on the base frame from the factory. Some deformation of the base frame may occur during transport and it is therefore essential to check the alignment at the installation site before the final grouting.

A flexible coupling will only compensate for minor misalignments and must not be used to compensate for excessive misalignment of the pump and motor shafts. Inaccurate alignment results in vibration and excessive wear on the bearings, shaft or wear rings.

Carry out alignment of the motor by placing shims of different thickness under the motor. If possible, replace several thin shims with one thick shim.

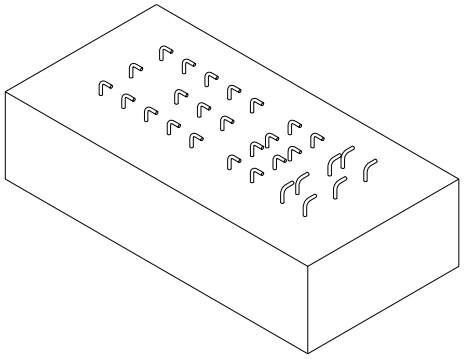
Carry out alignment of the motor only, as pipe strain will occur if the pump is shifted.

5.1.5 Grouting

If you have questions or doubts about the grouting, please contact an expert on grouting.

Grouting compensates for an uneven foundation, distributes the weight of the unit, dampens vibrations and prevents shifting. Follow the steps below to do the grouting:

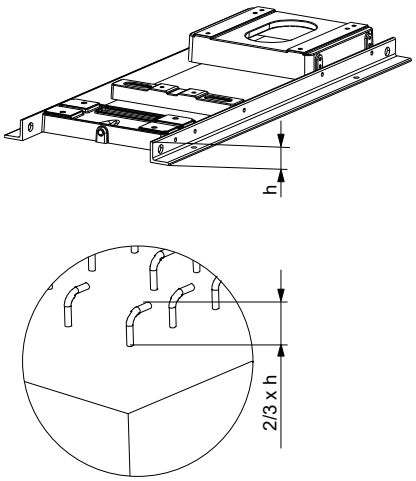
1. Use an approved, non-shrinking grout.
2. Embed reinforcing steel bars into the foundation by means of 2K anchor adhesive glue.
3. The number of steel bars depends on the size of the base frame, but we recommend that you distribute a minimum of 20 bars evenly over the whole area of the base frame.



TM040491

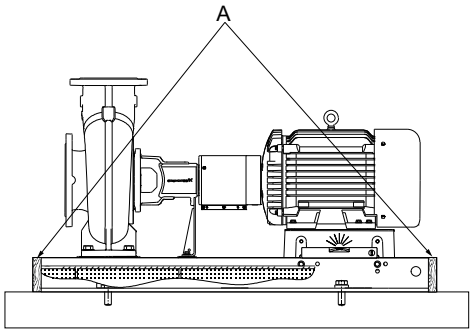
Example of foundation with minimum 20 bars

4. The free end of the steel bar must be 2/3 the height of the base frame to ensure a proper grouting.



TM086094

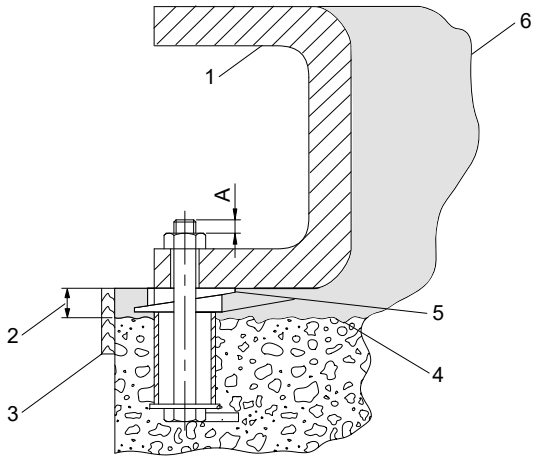
5. Connect the drainage pipe if the base frame has a drain hole. Or leave space for the pipe from grout for future connection.
6. Soak top of concrete foundation thoroughly, then remove surface water.
7. Ensure proper shuttering at both ends of the base frame.



TM085759

A: shuttering

8. If necessary, check the levelling of the base frame again before grouting.
9. Pour non-shrinking grout through the openings of the base frame until the space underneath the base frame has been filled completely.
10. Fill the formwork with grout up to the base frame top level.
11. Allow the grout to dry thoroughly before attaching piping to the pump. 24 hours is sufficient time with approved grouting procedure.
12. When the grout has thoroughly hardened, check the anchor bolt nuts, and tighten, if necessary.
13. Approximately two weeks after pouring the grout, or when the grout has thoroughly dried, apply an oil-based paint to the exposed edges of the grout to prevent the grout from getting into contact with air and moisture.



TM032946

Pos.	Description
1	Base frame
2	19-32 mm (0.75 - 1.25 in) grout
3	Formwork
4	Foundation with rough top
5	Levelling wedges and shims left in place
6	Grout
A	5-10 mm (0.2 - 0.4 in.)

After installation is finished, tighten the screws connecting the flange, feet and the anchor bolts according to the tightening torques. You must apply an anti-loose method, such as mounting lock washers.

5.2 Alignment of pump and motor

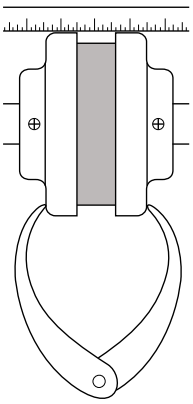
When a complete unit is supplied assembled from the factory, the coupling halves have been accurately aligned by means of foil inserted under the pump and motor mounting surfaces as required.

As the pump/motor alignment may be affected during transport and installation, it must always be checked again before starting the pump.

It is important to check the final alignment when the pump has obtained its operating temperature under normal operating conditions.

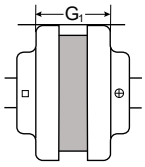
It is very important that the pump/motor alignment is carried out correctly. Follow the procedure below.

1. Check parallel alignment by
   a. placing a straight-edge across the two coupling flanges and measuring the maximum offset at various points around the periphery of the coupling without rotating the coupling.
      If the maximum offset exceeds the limit given under of “Parallel” in the table Sleeve couplings., realign the shafts.



TM085860

2. Check angular alignment with a caliper by
   a. measuring the distance of the two flanges at intervals around the periphery of the coupling.
   b. determining the maximum and minimum dimensions without rotating the coupling.
      The difference between the maximum and minimum must not exceed the limit given under “Angular” in the table Sleeve couplings.
      If a correction is necessary, be sure to recheck the parallel alignment.

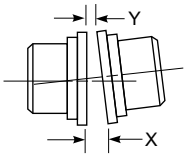


TM085861

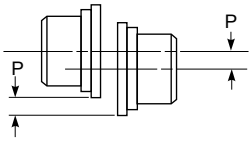
Sleeve couplings

Sleeve Size	G_1 (ref)		Parallel		Angular	
	inch	mm	inch	mm	inch	mm
3	1.2	30	0.010	0.25	0.035	0.89
4	1.5	38	0.010	0.25	0.043	1.09
5	1.9	49	0.015	0.38	0.056	1.42
6	2.4	60	0.015	0.38	0.070	1.78
7	2.6	65	0.020	0.51	0.081	2.06
8	2.9	75	0.020	0.51	0.094	2.39
9	3.5	89	0.025	0.64	0.109	2.80
10	4.1	103	0.025	0.64	0.128	3.21
11	4.9	124	0.032	0.81	0.151	3.89
12	5.7	145	0.032	0.81	0.175	4.44

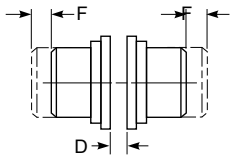
Angular misalignment



Parallel offset misalignment



End float



Misalignment limits for grid coupling

Size	Installation limits						Cover fastener tightening torque values Inch or Metric series fastener		Lube weight	
	Parallel offset-P		Angular (X-Y)		Hub gap (D) 10%					
	Max. inch	Max. mm	Max. inch	Max. mm	Max. inch	Max. mm	(lb-in)	(Nm)	lb	kg
1020T	0.006	0.15	0.003	0.08	0.125	3	100	11.3	0.06	0.03
1030T	0.006	0.15	0.003	0.08	0.125	3	100	11.3	0.09	0.04
1040T	0.006	0.15	0.003	0.08	0.125	3	100	11.3	0.12	0.05
1050T	0.008	0.2	0.004	0.1	0.125	3	200	22.6	0.15	0.07
1060T	0.008	0.2	0.005	0.13	0.125	3	200	22.6	0.19	0.09
1070T	0.008	0.2	0.005	0.13	0.125	3	200	22.6	0.25	0.11
1080T	0.008	0.2	0.006	0.15	0.125	3	200	22.6	0.38	0.17
1090T	0.008	0.2	0.007	0.18	0.125	3	200	22.6	0.56	0.25
1100T	0.010	0.25	0.008	0.2	0.188	5	312	35	0.94	0.43
1110T	0.010	0.25	0.009	0.23	0.188	5	312	35	1.1	0.51

Misalignment limits for spacer coupling

Size	Installation limits						Fastener tightening torque values			Lube weight	
	Parallel offset-P		Angular (X-Y		Hub gap (D) ±10%		Cover		Flange		
	Max. inch	Max. mm	Max. inch	Max. mm	Max. inch	Max. mm	In. series fasteners (lb-in)	Metric fasteners (Nm)	In. series fasteners (lb-in)	lb	kg
1020T	0.006	0.15	0.003	0.08	0.188	5	100	11.3	120	0.06	0.03
1030T	0.006	0.15	0.003	0.08	0.188	5	100	11.3	120	0.09	0.04
1040T	0.006	0.15	0.003	0.08	0.188	5	100	11.3	120	0.12	0.05
1050T	0.008	0.2	0.004	0.1	0.188	5	200	23.6	250	0.15	0.07
1060T	0.008	0.2	0.005	0.13	0.188	5	200	23.6	440	0.19	0.09
1070T	0.008	0.2	0.005	0.13	0.188	5	200	23.6	440	0.25	0.11
1080T	0.008	0.2	0.006	0.15	0.188	5	200	23.6	825	0.38	0.17
1090T	0.008	0.2	0.007	0.18	0.188	5	200	23.6	1640	0.56	0.25
1100T	0.010	0.25	0.008	0.2	0.250	6	312	35	2940	0.94	0.43
1110T	0.010	0.25	0.009	0.23	0.250	6	312	35	2940	1.1	0.51

5.3 Re-greasing the grid coupling

A grid coupling must be re-greased at intervals. Normally, the interval is one year, but it can be shorter if the environment is aggressive or the operating conditions are harsh.

Use the same grease for the coupling as for the ball bearings. Grundfos recommends SKF SYSTEM 24 lubricators, type LAGD 125/HP2 or LAGD 60/HP2.

To re-grease the grid coupling, follow the steps below:

1. Remove the coupling guards.
2. Remove the two lubricating plugs.
3. Pump grease into one of the lubricating holes to push the old grease out of the opposite hole.
4. Keep pumping until the fresh grease comes out.
5. Refit and fasten the two plugs.
6. Mount the coupling guards again.

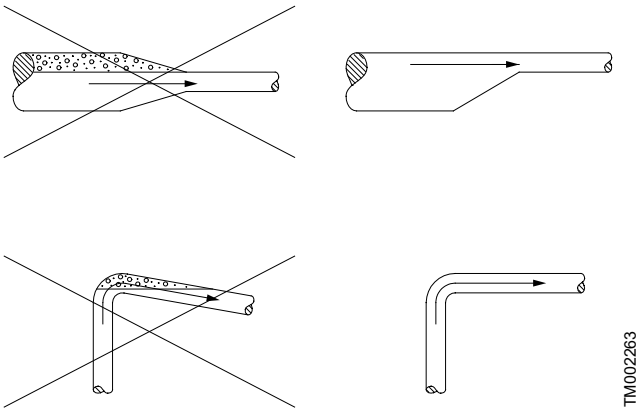
5.4 Pipes and connections

5.4.1 Pipe system

When installing the pipes, the pump housing must not be stressed by the pipes.

The inlet and outlet pipes must be of an adequate size, taking the pump inlet pressure into account.

The pipes must be installed in a way that air pockets are avoided, especially on the inlet side of the pump.



Recommended pipe installation to avoid friction and air pockets

The pipes must be as straight as possible, so as to avoid unnecessary bends and fittings. Where necessary, use 45 ° or long-sweep 90 ° pipe bends to decrease friction loss.

Where flanged joints are used, internal diameters must match properly and mounting holes must be aligned.

Do not apply force to pipes when making any connections.

5.4.2 Connecting the inlet pipes

- Run the inlet pipe as direct as possible, and optimally, make sure the length is at least ten times the pipe diameter. A short inlet pipe can be the same diameter as the inlet port. A long inlet pipe must be one or two sizes larger than the inlet port, depending on the length, and with a reducer between the pipe and the inlet port.
- If possible, run a horizontal inlet line along an even gradient. We recommend a gradual upward slope to the pump under suction lift conditions, and a gradual downward slope under positive inlet pressure conditions.
- Avoid any high points, such as pipe loops, as this may create air pockets and throttle the system, or cause erratic pumping.
- Install a valve on the inlet line to allow for isolation of the pump during shutdown and maintenance, and to facilitate pump removal.

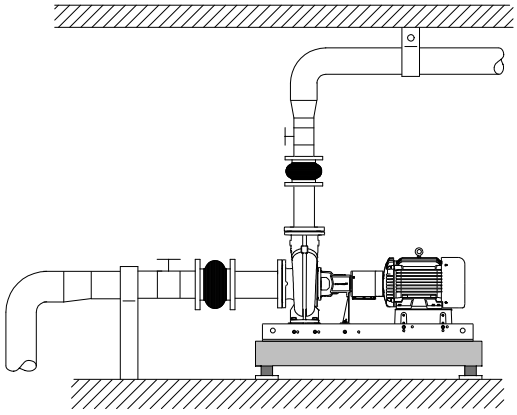
  Where two or more pumps are connected to the same inlet line, install valves to isolate each pump from the line.

- Always install valves in positions that do not yield air pockets.
- During pumping operation, the valves on the inlet line must always be fully open.

5.4.3 Connecting the outlet pipes

We recommend that you use long horizontal outlet pipes.

- Install a valve near the outlet port to allow for isolation of the pump during shutdown and maintenance, and to facilitate pump removal.
- Avoid high points in the outlet pipe because it might entrap air or gas, and thus retard pump operation.
- If water hammer occurs, for example when check valves are used, close the outlet valve before pump shutdown.
- Make sure the pipes are adequately supported as close to the pump as possible, both on the inlet and the outlet side.



Pump installation

The counterflanges must be properly aligned so that the pump is not strained while the flange bolts are tightened.

5.4.4 Bypass

DANGER

Explosion hazard

Death or serious personal injury

- The pump is not allowed to run against a closed valve except during startup. Operating against a closed valve at an extended period of time will cause an increase in temperature and the formation of steam and may result in damages to or explosion of the pump housing. The valve must be kept open during operation.

If there is any danger of the pump running against a closed valve, ensure a minimum liquid flow through the pump by connecting a bypass or drain to the outlet pipe. The minimum flow rate must be at least 10 % of the maximum flow rate. The flow rate and head are stated on the pump nameplate.

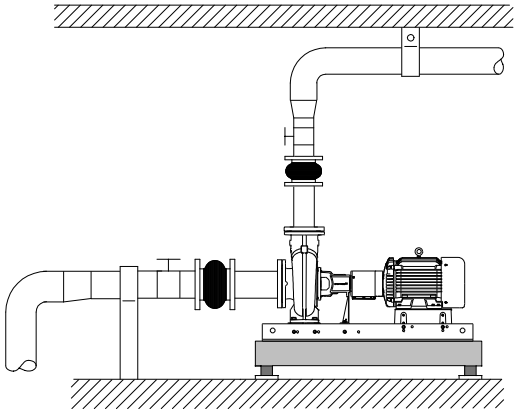
5.5 Vibration damping

5.5.1 Elimination of noise and vibrations

In order to achieve optimum operation and minimum noise and vibration, consider vibration damping of the pump. Generally, always consider this for pumps with motors of 15 hp (11 kW) and up. Vibration damping is mandatory for motors of 125 hp (90 kW) and up. Smaller motor sizes, however, may also cause undesirable noise and vibration.

Noise and vibration are generated by the revolutions of the motor and pump and by the flow in pipes and fittings. The effect on the environment is subjective and depends on correct installation and the state of the rest of the system.

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



TM085789

5.5.2 Vibration dampers

To prevent the transmission of vibrations to buildings, we recommend that you isolate the pump foundation from building parts by means of vibration dampers. This decision must be made by the customer or designer or consultant of the installation.

The selection of the right vibration damper requires the following data:

- forces transmitted through the damper
- motor speed, taking speed control, if any, into consideration
- required damping in % - suggested value is 70 %.

The selection of vibration damper will differ from installation to installation. In certain cases, a wrong damper may increase the vibration level. Vibration dampers must therefore be sized by the supplier of the vibration dampers.

If you install the pump on a foundation with vibration dampers, always fit expansion joints on the pump flanges. This is important to prevent the pump from "hanging" in the flanges.

5.6 Expansion joints

Expansion joints provide these advantages:

- absorption of thermal expansion and contraction of pipes caused by variations in liquid temperature
- reduction of mechanical influences in connection with pressure surges in the pipes
- isolation of structure-borne noise in the pipes, applying only to rubber bellows expansion joints.

! Do not install expansion joints to make up for inaccuracies in the pipes, such as center displacement or misalignment of flanges.

The expansion joints must be fitted at a minimum distance of 1 to 1.5 times of the pipe diameter away from the pump on the inlet and the outlet side. This will prevent turbulence in the expansion joints, thus ensuring optimum inlet conditions and minimum pressure loss on the outlet side. At flow velocities greater than 16.4 ft/s (5 m/s), we recommend that you fit larger expansion joints matching the pipes.

The figures below show examples of rubber bellows expansion joints with or without limiting rods.

TM024979

Rubber bellows expansion joint with limiting rods

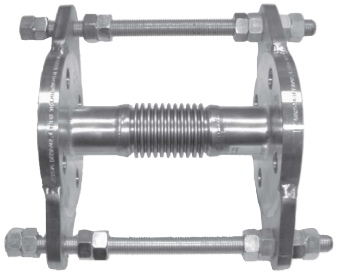
TM024981

Rubber bellows expansion joint without limiting rods

We always recommend that you use expansion joints with limiting rods for flanges larger than 4 inches in order to reduce the effects of the expansion or contraction forces on the pipes.
Follow the supplier’s instructions and pass them on to advisers or pipe installers.

You must anchor the pipes in such a way that they do not stress the expansion joints and the pump.

The figure below shows an example of a metal bellows expansion joint with limiting rods.



TM024980

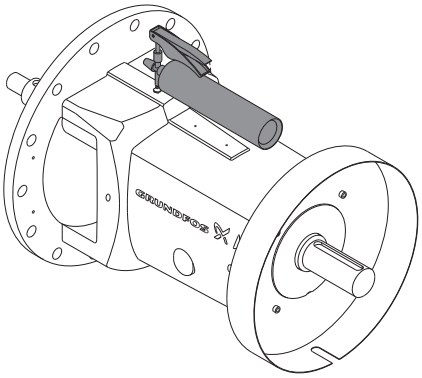
Metal bellows expansion joint with limiting rods

Due to the risk of rupture of the rubber bellows, we recommend that you use metal bellows expansion joints at temperatures above 212 °F (100 °C) combined with high pressure.

5.7 Bearing bracket

5.7.1 Lubricating bearing bracket with grease

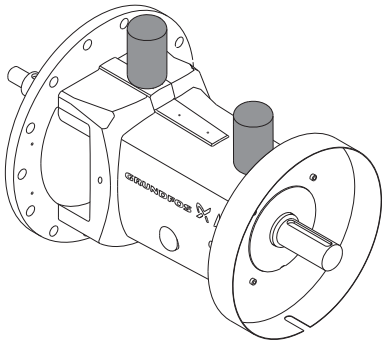
- For bearing bracket with grease nipples, relubricate the bearings using a grease gun.



TM061826

For recommended re-lubricating intervals, see section Grease-lubricated bearings.

- For bearing bracket with automatic grease lubricators, the lubricators are supplied separately.
  1. Remove the grease nipples.
  2. Fit the grease lubricators on top of the bearing bracket.
  3. Set the grease lubricators to empty within 12 months according to the instructions supplied with the lubricators.



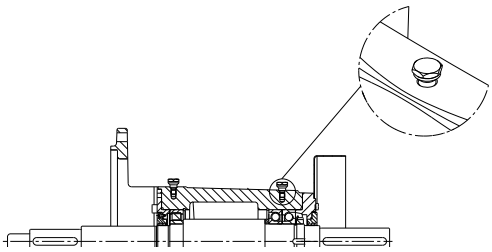
TM045173

5.8 Bearing monitoring

5.8.1 Vibration level

The vibration level gives an indication of the condition of the bearings.

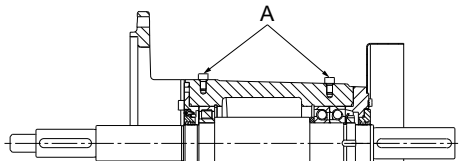
Bearing brackets with constant-level oiler are prepared for vibration measurement by means of the shock pulse method (SPM).



TM044925

Bearing bracket with SPM measuring points

Bearing brackets with automatic grease lubricators or grease nipples are prepared for retrofitting of SPM fittings. Holes are plugged from factory.



TM063500

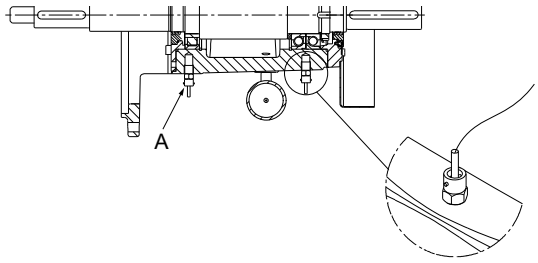
- A: plugged holes for SPM fitting

Bearing bracket for retrofitting of SPM measuring equipment

5.8.2 Temperature

Bearing brackets with automatic grease lubricators, grease nipples or constant-level oiler have tappings for Pt100 sensors for monitoring the temperature of the bearings.

These sensors can be factory-fitted, but can also be retrofitted. A Grundfos sensor is available.



TM077129

- A: 1/4" tapping for Pt100 sensor

Pt100 sensors fitted in bearing bracket

5.9 Pressure gauge and mano-vacuum gauge

To ensure continuous monitoring of the operation, we recommend that you install a pressure gauge on the outlet side and a mano-vacuum gauge on the inlet side. The pressure gauge tappings must only be opened for test purposes. The measuring range of the gauges must be 20 % above the maximum pump pressure.
When measuring with pressure gauge on the pump flanges, note that a pressure gauge does not register dynamic pressure.

On all pumps, the diameters of the inlet and outlet flanges are different which results in different flow velocities at the two flanges. Consequently, the pressure gauge on the outlet flange will not show the pressure stated in the technical documentation, but a value which may be up to 22 PSI (1.5 bar) or approximately 50 ft (15 m) of head lower.

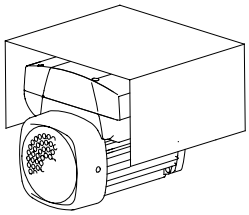
5.10 Ammeter

We recommend connecting an ammeter to check the motor load.

5.11 Condensation cover

When installing the pumps outdoors, provide the motor with a suitable cover to avoid condensation.

When mounting the condensation cover on top of the motor, make sure to leave enough space for the air to cool the motor.



TM1040101

Motors with condensation cover

6. Electrical connection

The electrical connection must be carried out by a qualified electrician in accordance with local regulations.

DANGER

Electric shock

Death or serious personal injury

- Before removing the terminal box cover, and before removing or dismantling the pump, make sure that the power supply has been switched off and that it cannot be accidentally switched on again. Use lockout-tagout if available. The pump must be connected to an external main switch.

DANGER

Explosive environment

Death or serious personal injury

- Whenever powered equipment is used in explosive surroundings, the rules and regulations generally or specifically imposed by the relevant authorities or trade organisationsorganizations must be observed.

The operating voltage and frequency are stated on the nameplate. Make sure that the motor is suitable for the power supply of the installation site.

The electrical connection must be carried out as shown in the wiring diagram inside the terminal box cover.

6.1 Voltage and frequency variation

The motor will operate satisfactorily under the following voltage and frequency variations, but not necessarily in accordance with the standards established for operation under rated conditions:

- The voltage variation must not exceed 10 % above or below the rating specified on the motor nameplate.
- The frequency variation must not exceed 5 % above or below the motor rating.

6.2 Motor protection

DANGER

Automatic startup

Death or serious personal injury

- Before starting any repair work on motors incorporating a thermal switch or thermistors, make sure that the motor cannot restart automatically after cooling.

Three-phase motors must be connected to a motor-protective circuit breaker. The electrical connection must be carried out as shown in the wiring diagram on the back side of the terminal box cover.

6.3 Synchronous motors

Pumps fitted with synchronous motors must be connected to a Grundfos CUE frequency converter.

TM044289

Example of installation without filter

Symbol	Designation
1	CUE
4	Standard motor
One line	Unscreened cable
Double line	Screened cable

Synchronous motors must not be connected directly to mains supply.

The CUE must be of T/C CUE203 followed by additional numbers and characters. See the CUE Installation and operating instruction to setup frequency driver together with synchronous motor.

If another frequency driver brand other than CUE is required or specified, contact Grundfos.

TM077181

Example of CUE nameplate

Text description	
T/C	CUE (product name) 203... (internal code)

6.4 Frequency converter operation

All three-phase motors can be connected to frequency converters.

Frequency converter operation will often expose the motor insulation system to a heavier load causing the motor to be noisier than usual due to eddy currents caused by voltage peaks.

A large motor driven by a frequency converter will be loaded with bearing currents.

Check these operating conditions if the pump is driven by a frequency converter:

Operating conditions	Requirements
2-, 4- and 6-pole motors, 100 hp (75 kW) and above	The motor must have an Aegis ground ring and the bearings must be electrically isolated. Contact Grundfos.
Noise-critical applications	An output filter must be fitted between the motor and the frequency converter. This reduces the voltage peaks and thus the noise.
Particularly noise-critical applications	A sinusoidal filter must be fitted.
Cable length	A cable must be fitted that meets the specifications provided by the frequency converter supplier.
Supply voltage	The motor voltage must be suitable for frequency converter operation.
High-peak voltages	A sinusoidal filter must be fitted between the motor and the frequency converter. The motor must have reinforced insulation.
High voltage or current harmonics or harmonic sensitivity applications	A sinusoidal filter must be fitted and the motor must have reinforced insulation.

7. Startup

Do not start the pump until it has been filled with liquid and vented.

7.1 Flushing the pipe system

CAUTION

Biological hazard

Minor or moderate personal injury

- When pumping drinking water, the pump must be flushed thoroughly with clean water before startup in order to remove any foreign matters, such as preservatives, test liquid, or grease.

- Before starting up the pump, thoroughly clean, flush and fill the pipe system with clean water.

The warranty does not cover any damage caused by flushing the pipe system by means of the pump.

The pump is not designed to pump liquids containing solid particles such as pipe debris and welding slag.

7.2 Priming

7.2.1 Priming the product in closed systems or open systems where the liquid level is above the pump inlet

1. Close the isolating valve in the outlet pipe and slowly open the isolating valve in the inlet pipe. Both the pump and the inlet pipe must be completely filled with liquid.

WARNING

Escaping liquid

Death or serious personal injury

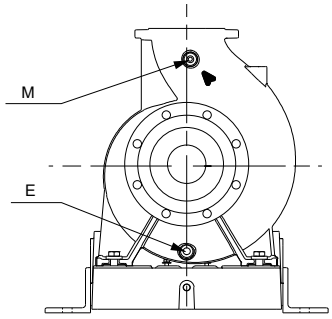
- Pay attention to the orientation of the priming hole to ensure that the escaping liquid does not cause personal injury or damage to the motor or other components.
- In hot-liquid installations, pay special attention to the risk of personal injury caused by scalding hot liquid.
- In cold-liquid installations, pay special attention to the risk of personal injury caused by cold liquid.

2. Loosen the priming plug in order to vent the pump. Once liquid runs out, tighten the priming plug.

7.2.2 Priming the product in inlet operation with non-return valve

The inlet pipe and the pump must be filled with liquid and vented before the pump is started.

1. Close the isolating valve in the outlet pipe and slowly open the isolating valve in the inlet pipe.
2. Remove the priming plug indicated by M.
3. Pour liquid through the hole until the inlet pipe and the pump are completely filled with liquid.
4. Fit the priming plug indicated by M.
5. The inlet pipe may be filled and vented via the priming plug. Alternatively, a priming device with funnel can be installed before the pump.

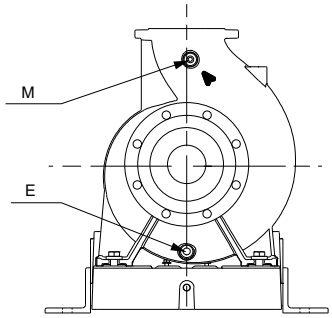


TM085790

Drain plug (E), priming and venting plug (M)

7.2.3 Priming the product in open systems where the liquid level is below the pump inlet

1. If an isolating valve is fitted on the inlet side of the pump, the valve must be fully open.
2. Close the isolating valve in the outlet pipe, and tighten the priming and drain plugs.



TM085790

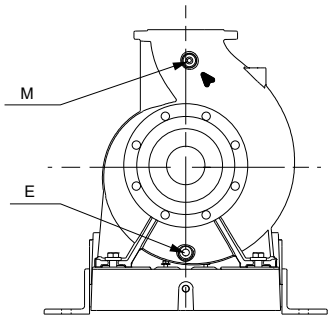
Drain plug (E), priming and venting plug (M)

3. Connect a manual venting pump with the funnel instead of a priming device.
4. Install a slide valve between the venting pump and the centrifugal pump in order to protect the venting pump against excessive pressure.
5. Once the slide valve at the manual venting pump has been opened, vent the inlet pipe using short, rapid pump strokes until the liquid runs out on the outlet side.
6. Close the valve at the venting pump.

7.3 Checking the direction of rotation

The pump must be filled with liquid when checking the direction of rotation.

The correct direction of rotation is shown by arrows on the pump housing. See the figure below.



TM085790

Drain plug (E), priming and venting plug (M)

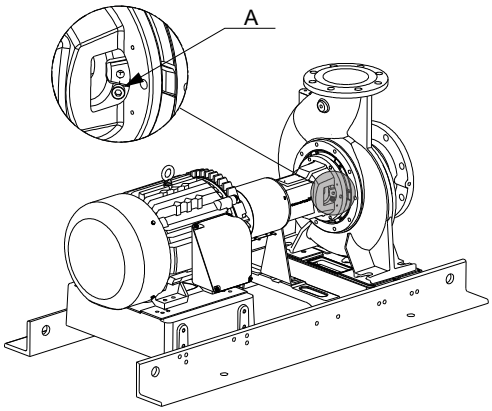
1. Check the direction of rotation by watching the motor fan rotation.
2. Turn the motor on for a brief while to ensure that the direction of rotation is correct as indicated by the arrow cast into the pump housing.

   This should only be done for three-phase motors.
3. If the direction of rotation is incorrect, interchange two wires at the motor starter terminals T1 and T2.

Use extreme caution to ensure that motors are turned on only briefly when determining proper direction of rotation.

7.4 Starting up the pump

1. Fully open the isolating valve on the inlet side of the pump and leave the isolating valve on the outlet side almost closed.
2. Start the pump.
3. Vent the pump during startup by loosening the air vent screw/ plug in the pump head or pump head cover until a steady stream of liquid runs out of the vent hole.



TM085791

Position of vent screw (A)/plug

WARNING

Escaping liquid

Death or serious personal injury

- Pay attention to the orientation of the vent hole to ensure that the escaping liquid does not cause personal injury or damage to the motor or other components.
- In hot-liquid installations, pay special attention to the risk of personal injury caused by scalding hot liquid.
- In cold-liquid installations, pay special attention to the risk of personal injury caused by cold liquid.

4. When the pipes have been filled with liquid, slowly open the isolating valve on the outlet side until it is fully open.
5. Check the overload by measuring the motor current consumption and comparing the value to the rated current stated on the motor nameplate. In case of overload, throttle the valve on the outlet side until the motor is no longer overloaded.

   If the pump is fitted with a motor with an output selected on the basis of a specific maximum flow rate, the motor may be overloaded if the differential pressure is lower than anticipated.
6. Always measure the motor current consumption during startup.

   At the moment of startup, the input current of the pump motor is up to six times higher than the full-load current stated on the motor nameplate.

7.5 Shaft seal run-in period

The seal faces are lubricated by the pumped liquid, meaning that there may be a certain amount of leakage from the shaft seal. When the pump is started for the first time, or when a new shaft seal is installed, a certain run-in period is required before the leakage is reduced to an acceptable level. The time required depends on the operating conditions, that is, every time the operating conditions change, a new run-in period is started.

Under normal conditions, the leaking liquid evaporates, and as a result, no leakage will be detected.

Liquids such as kerosene do not evaporate, and drops are visible, but it is not a shaft seal failure.

7.5.1 Mechanical shaft seals

Mechanical shaft seals are precision components. If the mechanical shaft seal of a recently installed pump fails, it normally happens within the first few hours of operation. The main cause of such failures is improper installation of the shaft seals and/or mishandling of the pump during installation.

7.6 Reference readings of monitoring equipment

We recommend taking initial readings of these parameters:

- vibration level - use SPM measuring points
- bearing temperature - if sensors have been fitted
- inlet and outlet pressure - use pressure gauges.

The readings can be used as reference in case of abnormal operation.

8. Service

DANGER

Moving machine parts

Death or serious personal injury

- Before any inspection, maintenance, service or repair of the product, make sure the motor controls are in the "OFF" position, locked and tagged.

DANGER

Electric shock and unintended pump start

Death or serious personal injury

- Before starting work on the product, switch off the power supply. Make sure the power supply cannot be accidentally switched on. Use logout-tagout if available.

8.1 Contaminated products

CAUTION

Biological hazard

Minor or moderate personal injury

- Flush the pump thoroughly with clean water and rinse the pump parts in water after disassembling.

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 pumped 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 pumped 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.

8.2 Maintenance

DANGER

Moving machine parts

Death or serious personal injury

- Before any inspection, maintenance, service or repair of the product, make sure the motor controls are in the "OFF" position, locked and tagged.

DANGER

Electric shock and unintended pump start

Death or serious personal injury

- Before starting work on the product, switch off the power supply. Make sure the power supply cannot be accidentally switched on. Use logout-tagout if available.

8.2.1 Maintenance of the pump

The pump is maintenance-free.

8.2.1.1 Maintaining the mechanical shaft seals

Mechanical shaft seals are maintenance-free, working almost without any leakages.

- If any considerable or increasing seepage occurs, check the mechanical shaft seal immediately.
- If the sliding surfaces are damaged, replace the entire shaft seal. Treat mechanical shaft seals with utmost care.

End suction pumps equipped with mechanical shaft seals are matched to the operating conditions for which the pump was sold. Observe the following precautions to avoid shaft seal damage and achieve maximum shaft seal life.

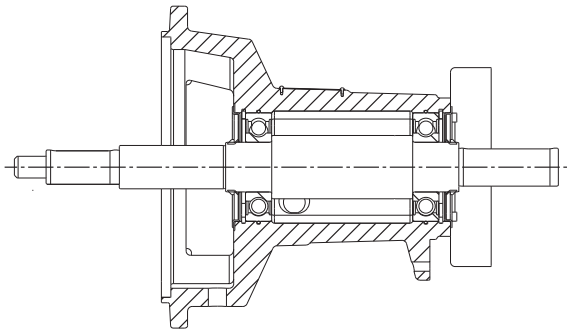
Do not run the pump dry or against a closed valve. Dry running will cause shaft seal failure.

Do not exceed the temperature or pressure limitations for the mechanical shaft seal in use.

8.2.2 Lubrication of bearings in bearing bracket

8.2.2.1 Grease-lubricated bearings

Pump with greased-for-life bearings



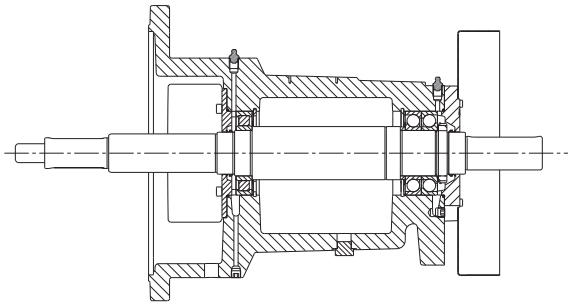
TM044771

Bearing bracket with closed, greased-for-life bearings

The bearing bracket with closed, greased-for-life bearings is maintenance-free. Under optimum operating conditions, the bearing life will be approximately 17,500 operating hours. After that period, we recommend that you replace the bearings. See section Taking the product out of operation.

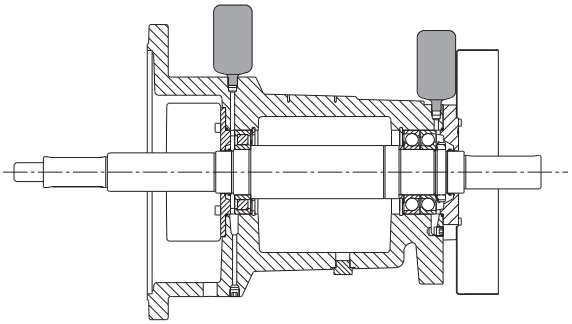
To check the bearings, regularly listen to them by means of a solid rod. There are no SPM measuring points for this type of bearing bracket.

Pump with lubrication nipples or automatic grease lubricators



TM061827

Bearing bracket with open roller bearing and double angular contact bearing lubricated via grease nipples



TM061828

Bearing bracket with open roller bearing and double angular contact bearing lubricated via automatic grease lubricators

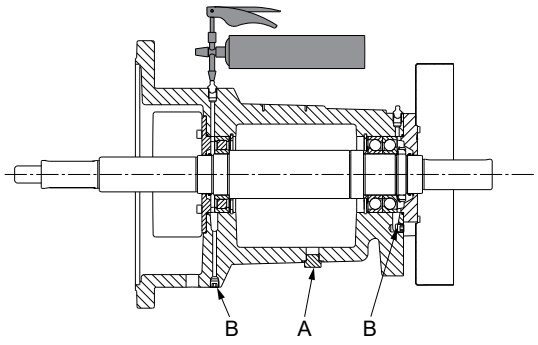
If the pump has grease nipples or automatic grease lubricators, the grease in the bearings must be renewed during the whole life time.

Under optimum operating conditions, the bearing life will be approximately 100,000 operating hours. After that period, we recommend that you replace the bearings. See section Taking the product out of operation. New bearings must be filled with grease according to Grundfos specifications. Clean up all the used grease in the bearing bracket before replacing the new bearing.

Installing automatic grease lubricators

Replace lubricators every 12 months. When replacing the lubricators, follow this procedure:

1. Remove the main drain plug in the bottom of the bearing bracket for one hour during operation to remove old and excess grease.
2. Fit the new lubricators on top of the bearing bracket and set them to empty within 12 months according to the instruction supplied with the lubricators.



TM061829

- A: Main drain plug
- B: Grease drain plugs

3. Refit the main drain plug in the bottom of the bearing bracket.
   Grundfos recommends SKF SYSTEM 24 lubricators, type LAGD 125/HP2 or LAGD 60/HP2.

Quantity	Product number
2 x LAGD 125/HP2	96887371
2 x LAGD 60/HP2	97776374

Relubrication via grease nipples

Grundfos recommends the following relubricating intervals and grease quantities:

Diameter of shaft [mm]	Relubricating interval [operating hours]	Grease quantity [g]	
		Roller bearing	Angular contact bearing
24	7500	11	15
32	4500	13	20
42	4500	22	30
48	3500	27	38
60	3500	30	41

Diameter of shaft [mm]	Max. RPM	Relubricating interval [operating hours]	Grease quantity [g]	
			6320	2 x 6322
100	1500	4000	51	-
		1290	-	120
100	1000	6230	51	-
		5650	-	120
100	750	7780	51	-
		7230	-	120

The relubricating interval is an estimated value, valid for an operating temperature up to 70 °C. We recommend to halve the intervals for every 15 °C increase in operating temperature above 70 °C.

Renewing the grease

If there is visible grease leakage, we recommend that you open the bearing bracket cover and replace the V ring. See section Taking the product out of operation.

If the pump has been stored or is out of operation for more than six months, we recommend you to replace the grease before the pump is put into operation.

In case of ingress of contamination, more frequent relubrication than indicated by the relubricating interval will reduce the negative effects of foreign particles. This will reduce the damaging effects caused by overrolling the particles. Liquid contaminants, such as water or process liquids, also call for shorter relubricating intervals. In case of severe contamination, consider continuous relubrication.

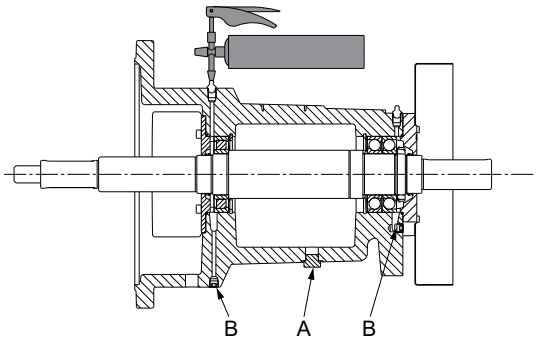
Never mix greases with different thickeners, such as a lithium-based grease with a sodium-based grease, before checking with the suppliers.

Never mix a mineral oil with a synthetic oil.

Some lubricants are compatible, but assessing the compatibility of two lubricants can be difficult. As a general rule, always relubricate a bearing with the same lubricant as was used originally.

Follow this procedure to renew grease:

1. Place a suitable container under the bearing bracket to collect used grease.
2. Remove the grease drain plugs.
3. Fill the bearing bracket with the recommended quantity of grease by means of a grease gun.



TM061829

- A: Main drain plug
- B: Grease drain plugs

Renewing the grease

Grundfos recommends SKF LGHP2 grease for relubrication. See the table below.

Basic characteristics	
Code, DIN 51825	K2N-40
Consistency class, NLGI	2-3
Thickener	Polyurea (di-urea)
Base oil	Mineral
Operating temperature	-40 to +150 °C, -40 to +302 °F
Dropping point, ISO 2176	240 °C, 464 °F
Density, DIN 5175	At 20 °C, 68 °F: 0.85 - 0.95 g/cm^3
Base oil viscosity	
40 °C, 104 °F	96 mm^2/s
100 °C, 212 °F	10.5 mm^2/s

4. Refit the drain plugs.

8.2.3 Monitoring equipment

We recommend that you take weekly readings of these parameters:

- vibration level - use SPM measuring points
- bearing temperature - if sensors have been fitted
- inlet and outlet pressure - use pressure gauges.

Alternatively, follow the maintenance plan laid out for your application.

8.2.4 Maintaining the motor

It is important to keep the motor clean in order to ensure adequate ventilation.

- Check the motor at regular intervals.
- If the pump is installed in a dusty environment, check and clean it regularly.

8.2.4.1 Lubrication of motor

Always follow the motor manufacturer's lubricating instructions.

Some information is stated on the motor nameplate, and additional information can be found in the installation and operating manual from the motor manufacturer.

8.2.5 Lubrication of motor bearings

8.2.5.1 Other motors

For other motor makes with grease nipples, lubricate the motor according to the indications on the motor nameplate. Grease specifications: See section Bearing grease.

8.2.5.2 Bearing grease

The lithium-based grease used should meets the following specifications:

- NLGI class 2 or 3
- viscosity of basic oil: 70 to 150 cSt at +40 °C
- temperature range: -30 °C to +140 °C during continuous operation.

8.3 Applying sealant to plugs

Remember to clean the threads and apply sealant to the plug when assembling it.

8.4 Service kits

Service kits for the products, see Grundfos Product Center in *www.grundfos.com* or Service Kit Catalogue.

9. Taking the product out of operation

9.1 Protecting the pump during periods of inactivity and frost

Pumps that are not being used during periods of frost must be drained to avoid damage.

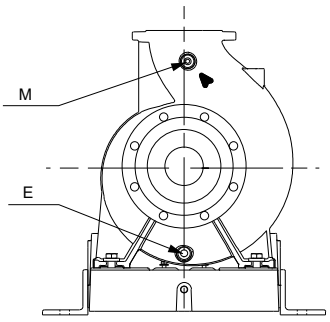
WARNING

Escaping liquid

Death or serious personal injury

- Ensure that the escaping liquid does not cause personal injury or damage to the motor or other components.
- In hot-liquid installations, pay special attention to the risk of personal injury caused by scalding hot liquid.
- In cold-liquid installations, pay special attention to the risk of personal injury caused by cold liquid.

1. Drain the pump by removing the drain plug.



TM085790

Drain plug (E), priming and venting plug (M)

2. Do not tighten the priming plug or replace the drain plug until the pump is to be used again.
3. If the pump is to be drained before a long period of inactivity, inject a few drops of silicone oil on the shaft at the bearing bracket. This will prevent the shaft seal faces from seizing up.

9.2 Short-term shutdown

For overnight or temporary shutdown periods under nonfreezing conditions, the pump may remain filled with liquid. The pump must be fully primed before restarting.

For short or frequent shutdown periods under freezing conditions, the liquid must be kept moving within the pump housing and the pump exterior must be insulated or heated to prevent freezing.

9.3 Long-term shutdown

For long shutdown periods, or to isolate the pump for maintenance, the inlet gate valve must be closed. If no inlet valve is used and the pump has positive inlet pressure, all liquid must be drained from the inlet line to stop the liquid flow from entering the pump inlet. The plug in the pump drain and vent holes must be removed, as required, and all liquid must be drained from the pump housing.

If there are freezing conditions during long shutdown periods, the pump must be drained completely, and all liquid passages and pockets must be blown out with compressed air. Freezing of the pumped liquid can also be prevented by filling the pump with antifreeze solution.

9.4 Storing the product

1. The contractor must inspect the equipment on delivery and make sure that it is stored in such a way that corrosion and damage are avoided.
2. If you do not operate the pump soon after arrival, store it in a clean, dry place under slow, moderate changes in ambient temperature.
3. Protect the pump from moisture, dust, dirt and foreign bodies. Before and during storage we recommend the following precautions:
   a. Make sure that the bearings are filled with the recommended grease to prevent moisture from entering around the shaft.
   b. Make sure that the inlet and outlet ports and all other openings are covered with cardboard, wood or masking tape to prevent foreign objects from entering the pump.
   c. If the unit is to be stored where there is no protective covering, cover it with a tarpaulin or waterproof material, or other suitable covering.
   d. Rotate the shaft two turns every two weeks to prevent corrosion of the bearing surfaces and the stuffing box or shaft seal faces caused by moisture.
4. If the pump is to be stored for more than six months before being put into operation, apply a suitable corrosion inhibitor to the internal pump parts.

   Make sure that the corrosion inhibitor used does not affect the rubber parts with which it comes into contact.

   Commercially available preservatives can be used for this purpose. Please observe the manufacturer’s instructions for application or removal.
5. Keep all openings covered until the pipes are ready to be fitted to prevent water and dust from entering the pump.

   The cost of having to dismantle the pump during startup to remove foreign objects can be very high.

10. Fault finding the product

DANGER

Electric shock

Death or serious personal injury

- Before removing the terminal box cover and before removing or dismantling the pump, make sure that the power supply has been switched off and that it cannot be accidentally switched on again.

WARNING

Escaping liquid

Death or serious personal injury

- Pay attention to the orientation of the vent hole to ensure that the escaping liquid does not cause personal injury or damage to the motor or other components.
- In hot-liquid installations, pay special attention to the risk of personal injury caused by scalding hot liquid.
- In cold-liquid installations, pay special attention to the risk of personal injury caused by cold liquid.

CAUTION

Hot or cold surface

Minor or moderate personal injury

- When pumping hot or cold liquids, make sure that persons cannot accidentally come into contact with hot or cold surfaces.

Fault	Cause	Remedy
1. The pump delivers no or too little liquid.	a) The electrical connection is wrong, for instance two phases.	1. Check the electrical connection. 2. Remedy, if necessary.
	b) The direction of rotation is wrong.	• Interchange two phases of the power supply.
	c) There is air in inlet pipe.	• Vent the inlet pipe or the pump.
	d) The counterpressure is too high.	1. Set the duty point according to the flow and head that the pump is selected for. 2. Check the system for debris. 3. Clean the system, if necessary.
	e) The inlet pressure is too low.	• Increase the liquid level on the inlet side. • Open the isolating valve in the inlet pipe. • Make sure that all the conditions in section Pipes and connections are complied with.
	f) The inlet pipe or impeller is blocked by debris.	• Clean the inlet pipe or pump.
	g) The pump draws in air due to a defective seal.	1. Check the pipeline seals, pump housing gaskets and shaft seals. 2. Replace gaskets and seals, if necessary.
	h) The pump draws in air due to low liquid level.	1. Increase the liquid level on the inlet side. 2. Keep the liquid level as constant as possible.
2. The motor-protective circuit breaker has tripped because the motor is overloaded.	a) The pump is blocked by debris.	• Clean the pump.
	b) The pump is running above rated duty point.	• Set the duty point according to the flow and head that the pump is selected for.
	c) The density or viscosity of the liquid is higher than specified upon order.	• If less flow is sufficient, reduce the flow on the outlet side. • If less flow is insufficient, fit a more powerful motor.
	d) The motor-protective circuit breaker overload setting is incorrect.	1. Check the setting of the motor-protective circuit breaker. 2. Adjust the setting if necessary.
	e) The motor runs on two phases.	1. Check the electrical connection. 2. Replace the fuse, if defective.
	f) The motor may be faulty	1. Check the motor. 2. Replace the motor if necessary.

Fault	Cause	Remedy
3. The pump makes too much noise. The pump runs unevenly and vibrates.	a) The inlet pressure is too low, resulting in cavitation in the pump.	• Increase the liquid level on the inlet side. • Open the isolating valve in the inlet pipe. • Make sure that all the conditions in section Pipes are complied with.
	b) There is air in the inlet pipe or pump.	• Vent the inlet pipe or the pump.
	c) The counterpressure is lower than specified.	• Set the duty point according to the flow and head that the pump is selected for.
	d) The pump draws in air due to low liquid level.	• Increase the liquid level on the inlet side and keep it as constant as possible.
	e) The impeller is out of balance or the impeller blades are clogged.	1. Clean the impeller. 2. Check the impeller blades, clean them if necessary.
	f) The split coupling is out of balance.	1. Check coupling gap and that set screws in split coupling are tightened. 2. Disassemble split coupling to inspect keys and keyways and their alignment with coupling pieces.
	g) The inner parts are worn.	• Replace the defective parts.
	h) The pump is stressed by the pipes thus causing starting noise.	• Mount the pump so that it is not stressed. • Support the pipes.
	i) The bearings are defective.	• Replace the bearings.
	j) The motor fan is defective.	• Replace the fan.
	k) There are foreign bodies in the pump.	• Clean the pump.
	l) Frequency converter operation causes noise.	• Find the different remedies in Frequency converter operation section. See section Frequency converter operation.
4. The pump, connections or mechanical shaft seal is leaking.	a) The pump is stressed by the pipes which causes leaks in the pump housing or at connections.	• Mount the pump so that it is not stressed. • Support the pipes.
	b) Pump housing gaskets and gaskets at connections are defective.	• Replace the pump housing gaskets or gaskets at connections.
	c) The mechanical shaft seal is dirty or stuck together.	• Check and clean the mechanical shaft seal.
	d) The mechanical shaft seal is defective.	• Replace the mechanical shaft seal.
	e) The shaft surface is defective.	• Replace the shaft.
5. The temperature in the pump or motor is too high.	a) There is air in the inlet pipe or pump.	1. Vent the inlet pipe or the pump. 2. Fill up the inlet pope and the pump again.
	b) The inlet pressure is too low.	• Increase the liquid level on the inlet side. • Open the isolating valve in the inlet pipe. • Make sure that all the conditions in section Pipes are complied with.
	c) The bearings are lubricated with too little, too much or unsuitable lubricant.	• Replenish, reduce or replace the lubricant.
	d) The axial pressure is too high.	1. Check the relief holes of the impeller on the inlet side. 2. Clean the holes, if necessary
	e) The motor-protective circuit breaker is defective or the setting is incorrect.	1. Check the setting of the motor-protective circuit breaker. 2. Replace the circuit breaker if necessary.
	f) The motor is overloaded.	• Reduce the flow rate.
6. Oil is leaking from the bearing bracket.	a) The bearing bracket has been filled with too much oil through the filling hole, resulting in an oil level above the bottom of the shaft.	Drain off oil until the constant-level oiler starts to operate, that is when air bubbles can be seen in the reservoir.
	b) The oil seals are defective.	Replace the oil seals.
7. Oil is leaking from the reservoir.	The threads on the reservoir are damaged.	Replace the reservoir.

11. Technical data

11.1 Operating conditions

11.1.1 Ambient temperature and altitude

The ambient temperature and the installation altitude are important factors for the motor.

All motors are able to operate without power derating for temperatures up to +104 °F (+40 °C) or below altitude of 3280.8 ft (1000 m) above sea level. Above these two limits, it may be necessary to use a motor with a higher output, or de-rated. Contact the motor manufacturer if the motor is to be operated above these limits. Consult the motor manufacturer before operating the motor above these limits.

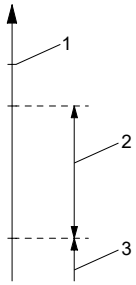
11.1.2 Liquid temperature

Liquid temperature: -40 to 284 °F (-40 to +140 °C).

The maximum liquid temperature is stated on the pump nameplate, and depends on the shaft seal chosen.

11.1.3 Maximum operating pressure

Do not exceed the maximum operating pressure stated on the pump nameplate.



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Pressures in the pump

Pos.	Description
1	Maximum operating pressure, that is pressure above atmospheric pressure
2	Pump pressure
3	Inlet pressure

The total value of the inlet pressure and the pump pressure must be lower than the maximum operating pressure stated on the pump nameplate. Operation against a closed valve gives the highest operating pressure.

11.1.4 Minimum inlet pressure

Pay attention to the minimum inlet pressure to avoid cavitation. The risk of cavitation is higher in the following situations:

- The liquid temperature is high.
- The flow rate is considerably higher than the pump's nominal flow rate.
- The pump is operating in an open system with suction lift.
- The liquid is sucked through long pipes.
- The inlet conditions are poor.
- The operating pressure is low.

11.1.5 Maximum inlet pressure

The total value of the inlet pressure and the pump pressure must be lower than the maximum operating pressure stated on the pump nameplate. Operation against a closed valve yields the highest operating pressure.

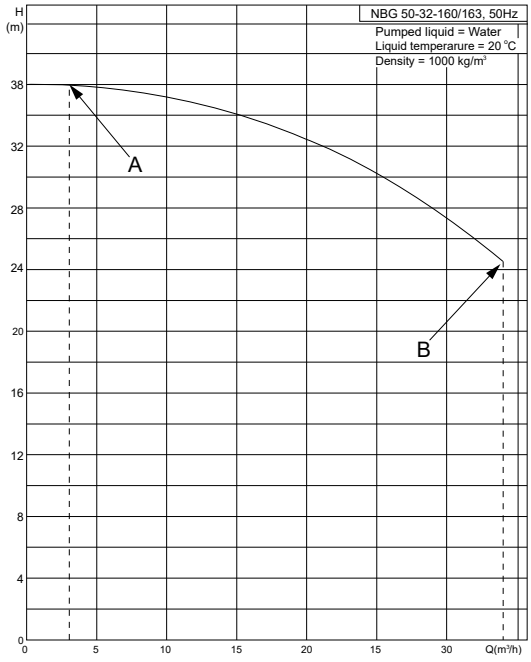
11.1.6 Minimum flow rate

The pump must not run against a closed valve as it causes an increase in temperature and a formation of steam in the pump. That may result in shaft damage, impeller erosion, short life of bearings and damage to the stuffing boxes or mechanical shaft seals due to stress or vibration. The continuous stable flow rate must be at least 10 % of the rated flow rate. The rated flow rate is stated on the pump nameplate.

11.1.7 Maximum flow rate

Do not exceed the maximum flow rate, otherwise there is a risk of cavitation or overload, for instance.

The minimum and maximum flow rates are indicated either on the performance curve pages in the relevant data booklets, or on a curve for a specific pump when selecting it in the Grundfos Product Center. See www.grundfos.com.



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Example from Grundfos Product Center in www.grundfos.com showing minimum and maximum flow rate

Pos.	Description
A	Minimum flow rate
B	Maximum flow rate

11.1.8 Shaft seals

The operating range of the seals is described for two main applications: pumping of water or pumping of coolants.

Seals with a temperature range of 32 °F (0 °C) and up are mainly used for pumping water, while seals for temperatures below 32 °F (0 °C) are mainly intended for coolants.

We do not recommend that you operate the pump at maximum temperature and maximum pressure at the same time, as it results in reduced seal life and the occurrence of periodic noise.

Shaft seal diameter [mm]						**20**	**28, 38**	**48**	**55**	**60**
Shaft seal type		**Seal faces**	**Rubber**	**Code**	**Temperature range**	**Max. pressure [PSI] ([bar])**				
	Bellows seal, type B, unbalanced	BQ_7	EPDM	BBQE	32-248 °F (0-120 °C)	232 (16)	232 (16)	232 (16)	232 (16)	232 (16)
		BQ_7	FKM	BBQV	32-194 °F (0-90 °C)	232 (16)	232 (16)	232 (16)	232 (16)	232 (16)
		Q_7Q_7	EPDM	BQQE	-13 to +248 °F (-25 to +120 °C)	232 (16)	232 (16)	232 (16)	232 (16)	232 (16)
		Q_7Q_7	FKM	BQQV	14 to 194 °F (-10 to +90 °C)	232 (16)	232 (16)	232 (16)	232 (16)	232 (16)
	O-ring seal, type D, balanced	AQ_7	FXM	DAQF	32-284 °F (0-140 °C)	363 (25)	363 (25)	363 (25)	363 (25)	363 (25)
		Q_6Q_7	EPDM	DQQE	-4 to +284 °F (-20 to +140 °C)	363 (25)	363 (25)	363 (25)	363 (25)	363 (25)

11.2 Electrical data

See the motor nameplate.

11.3 Operation with combustion engine

When operating with petrol or diesel engines, the engine manufacturer's installation and operating instructions must be strictly observed. Particularly the direction of rotation is very important.

- Viewed from the drive shaft end, the pump rotates to the right, clockwise.
- Viewed from the drive shaft end, the motor must therefore rotate to the left, counterclockwise.
- The correct direction of rotation is indicated by the arrow on the pump housing.
- If the engine is installed in a closed area, the combustion air data as well as data for exhaust gases must be particularly noted.
- When draining the tank, make sure to have containers of adequate size ready for this purpose.

12. 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.

The crossed-out wheelie bin symbol on a product means that it must be disposed of separately from household waste. When a product marked with this symbol reaches its end of life, take it to a collection point designated by the local waste disposal authorities. The separate collection and recycling of such products will help protect the environment and human health.

See also end-of-life information at *www.grundfos.com/product-recycling*.

13. Document quality feedback

To provide feedback about this document, scan the QR code using your phone's camera or a QR code app.

FEEDBACK93048245

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1. Limited consumer warranty

This Limited Warranty is provided for Consumer Products sold in the United States only and applies to Consumer Transactions as defined in and applicable under the Magnusson-Moss Warranty Act and any other applicable Federal and/or State laws. In case of non-Consumer Products, please refer to Grundfos' warranty terms defined in clause 10 of Grundfos US Terms and Conditions of Sale of Product and Services available at *https://www.grundfos.com/legal/grundfos-customer-terms/usa-grundfos-general-terms-for-sales-of-products-and-services*

This Limited Warranty gives you specific legal rights, and you may also have other rights which vary from State to State.

New products manufactured by Grundfos are warranted to the original purchaser only and are to be free from defects in design, material and workmanship under normal use and service for no greater than a period of thirty (30) months from the date of manufacture which is set forth on the product's nameplate and on the product's packaging or the minimum period required by the applicable State law. For New Jersey, the applicable period is one year from the date of purchase.

The warranty period for replacement products, parts and components expires thirty (30) months from the original date of manufacture of the product originally purchased, unless a longer period is required under the applicable State law. For New Jersey, the warranty period for replacement products, parts and components expires one year from the original date of purchase of the product, not the date of replacement.

Products sold by Grundfos that are manufactured by others are not covered by this warranty.

Note that when purchasing a Grundfos product online, it is important to check the date of manufacture and the duration of the warranty with the seller as the product might no longer be covered under this Limited Warranty.

When a product is subject to this Limited Warranty a purchaser should contact the seller from which it purchased the product to make a claim.

If the seller of a product is no longer in business, the purchaser should contact a Grundfos Authorized Service Partner, which can be found at *www.grundfos.com/us* under > Support > Contact Service.

As part of making a claim, a purchaser shall return a defective product at the purchaser's cost, to the extent allowed by applicable law, along with proof of purchase and an explanation of the defect, date the defect occurred and circumstances surrounding the defect. For New Jersey there is no prohibition on returning a defective product at a purchaser's cost. If Grundfos is required by applicable State law to pay for the cost of shipment under applicable State law, then a purchaser should contact a Grundfos Authorized Service Partner to arrange for shipment. A purchaser also needs to promptly respond to Grundfos as to any inquiries regarding a warranty claim.

Grundfos' liability under this Limited Warranty to purchaser is limited to the repair or replacement of a product (at Grundfos' decision) that is the sole and exclusive remedy for purchaser to the extent permissible by applicable law. For New Jersey this limitation is permissible.

This warranty does not cover the following: ordinary wear and tear; use of a product for applications for which it is not intended; use of a product in an unsuitable environment; modifications, alterations or repair undertaken by anyone not acting with Grundfos' written authorization; failure to follow Grundfos' instructions, operations manuals, any other guidelines or good industry practice; use of faulty or inadequate ancillary equipment in combination with a product; application of spare or replacement parts not provided or authorized by Grundfos; accidental or intentional damage or misuse of a product.

The time period for making a claim under the implied warranty of merchantability and implied warranty of fitness are limited to the same time period as provided by this warranty to the extent permissible by applicable law. For residents of New Jersey, this limitation is permissible, but note that some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

Grundfos shall not be liable for any incidental and consequential damages in connection with a product to the extent permissible by applicable law. For residents of New Jersey, this limitation is permissible, but note that some states do not allow limitations of incidental or consequential damages, so the above limitation may not apply to you.

2. Garantía limitada del consumidor

Esta garantía limitada se proporciona únicamente para los productos de consumo vendidos en los Estados Unidos y es aplicable a las transacciones de consumo tal y como se define en y resulta aplicable en virtud de la ley de Garantías Magnusson-Moss y cualquier otra legislación federal y/o estatal aplicable. Para el caso de productos que no sean de consumo, consulte los términos de la garantía de Grundfos definidos en la cláusula 10 de los términos y condiciones de venta de productos y servicios de Grundfos para los EE. UU., disponibles en *https://www.grundfos.com/legal/grundfos-customer-terms/usa-grundfos-general-terms-for-sales-of-products-and-services*.

Esta garantía limitada le confiere derechos legales específicos. Puede que también tenga otros derechos en virtud de su jurisdicción estatal.

Se garantiza únicamente al comprador original que los productos fabricados por Grundfos estarán libres de defectos de diseño, materiales y mano de obra en condiciones normales de uso y servicio durante un periodo no mayor a treinta (30) meses a partir de la fecha de fabricación que figura en la placa de datos del producto y en el empaque del mismo o el periodo mínimo exigido por la legislación estatal aplicable. Para Nueva Jersey, el periodo aplicable es de un año a partir de la fecha de compra.

El periodo de garantía para los productos, partes y componentes de repuesto vence a los treinta (30) meses contados a partir de la fecha de fabricación original del producto adquirido en primer lugar, a menos que la legislación estatal aplicable exija un periodo más largo. Para Nueva Jersey, el periodo de garantía de los productos, partes y componentes de repuesto vence un año contado a partir de la fecha original de compra del producto, no de la fecha de sustitución.

Los productos vendidos por Grundfos que sean producidos por otros fabricantes no están cubiertos por esta garantía.

Tenga en cuenta que, al comprar un producto Grundfos en línea, es importante revisar la fecha de fabricación y la duración de la garantía con el vendedor, ya que es posible que el producto ya no esté cubierto por esta garantía limitada.

Cuando un producto esté sujeto a esta garantía limitada, el comprador deberá ponerse en contacto con el vendedor al que haya comprado el producto para presentar una reclamación.

Si el vendedor de un producto ya no está en el negocio, el comprador debe ponerse en contacto con socio de servicio autorizado por Grundfos, que puede encontrar en la dirección *www.grundfos.com/us*, en la sección “Support” > “Contact Service”.

Como parte de la presentación de una reclamación, el comprador deberá devolver el producto descompuesto a su costa, en la medida en la que lo permita la legislación aplicable, junto con el comprobante de compra y una explicación del defecto, la fecha en que este se haya producido y las circunstancias en torno al defecto. En Nueva Jersey no existe ninguna prohibición de devolver un producto descompuesto a costa del comprador. Si la legislación estatal aplicable obliga a Grundfos a hacerse cargo de los gastos de envío, el comprador deberá ponerse en contacto con un servicio técnico autorizado por Grundfos para organizar el envío. El comprador también debe responder con prontitud a Grundfos cualquier consulta relacionada con una reclamación de garantía.

La responsabilidad de Grundfos hacia el comprador en virtud de esta garantía limitada se limita a la reparación o sustitución de un producto (a decisión de Grundfos), que es el único y exclusivo remedio para el comprador en la medida permitida por la legislación aplicable. Para Nueva Jersey, esta limitación resulta permisible.

Esta garantía no cubre lo siguiente: el desgaste ordinario; el uso de un producto para aplicaciones para las que no está diseñado; el uso de un producto en un entorno inadecuado; las modificaciones, alteraciones o reparaciones realizadas por cualquier persona que no actúe con la autorización por escrito de Grundfos; el incumplimiento de las instrucciones, manuales de operación, cualquier otro lineamiento o las buenas prácticas industriales de Grundfos; el uso de equipos auxiliares descompuestos o inadecuados en combinación con un producto; el uso de repuestos o partes de sustitución no proporcionados ni autorizados por Grundfos; el daño accidental o deliberado o el uso indebido de un producto.

El periodo para presentar una reclamación en virtud de la garantía implícita de comerciabilidad y la garantía implícita de idoneidad se limita al mismo periodo previsto por esta garantía en la medida permitida por la legislación aplicable. Para los residentes de Nueva Jersey, esta limitación resulta permisible, si bien se debe tener en cuenta que algunos estados no permiten limitaciones en cuanto a la duración de una garantía implícita, por lo que la limitación anterior puede no resultar aplicable en su caso.

Grundfos no será responsable de ningún daño indirecto o consecuente en relación con un producto en la medida en la que lo permita la legislación aplicable. Para los residentes de Nueva Jersey, esta limitación resulta permisible, si bien debe tenerse en cuenta que algunos estados no permiten limitaciones en cuanto a daños indirectos o consecuentes, por lo que la limitación anterior puede no resultar aplicable en su caso.

1. Limited manufacturer's warranty

This Limited Manufacturer’s Warranty outlines applicable coverage and claims procedures for the pumps manufactured by Grundfos (the "Product").

This Limited Manufacturer’s Warranty is provided for consumer products sold and used in Canada only and applies to consumer transactions as defined in the applicable provincial and territorial laws. In case of non-consumer products, please refer to Grundfos’ warranty terms defined in clause 10 of Grundfos Canada Terms and Conditions of Sale of Product and Services available at: *https://www.grundfos.com/ca/legal/general-terms-and-conditions-of-sales-and-delivery*

This Limited Manufacturer’s Warranty provides specific rights and limitations. Some of the limitations may not apply to you, and you may also have other rights that vary from province to province.

Scope of the Limited Manufacturer’s Warranty

Subject to the following warranty terms and conditions, Grundfos Canada Inc. of 2941 Brighton Rd, Oakville, ON L6H 6C9, Canada ("Grundfos"), warrants to the original consumer (the "Purchaser") that the new Product manufactured by Grundfos is free from defects in design, material and workmanship under normal use and service for a period of twenty-four (24) months from the date of retail purchase but no greater than a period of thirty (30) months from the date of manufacture which is set forth on the Product’s nameplate and on the Product’s packaging (the "Warranty Period").

Note that when purchasing a Grundfos Product online, it is important to check the date of manufacture and the duration of the warranty with the seller as the Product might no longer be covered under this Limited Manufacturer’s Warranty.

This Limited Manufacturer’s Warranty applies exclusively to a new Grundfos Product sold and used in Canada. This Limited Manufacturer’s Warranty does not apply to any Product sold "as is" or “sales final”. This Limited Manufacturer’s Warranty is not transferrable by the original Purchaser. Products sold by Grundfos that are manufactured by others are not covered by this warranty.

The sole and exclusive remedy under this Limited Manufacturer’s Warranty is the repair or, at the discretion of Grundfos, the replacement of the Product, as set out below. Defects or damages are not covered by the Limited Manufacturer’s Warranty if they are due to:

- ordinary wear and tear;
- use of the Product for an application for which it is not intended;
- installation of the Product in an environment not suitable for the Product;
- any modification, alteration or repair of the Product undertaken by the Purchaser or a third party (not acting on Grundfos’ behalf);
- failure to follow Grundfos’ instructions, including in the installation manual, operation manual, maintenance manual or service manual;
- installation, commissioning, operation (including the use of the Product or any Grundfos product outside its specifications) or maintenance of the Product other than in accordance with Grundfos installation manual, operation manual, maintenance manual or service manual or with good industry practice;
- use of faulty or inadequate ancillary equipment in combination with the Product;
- the application of spare parts of poor quality (excluding the application of any Grundfos original spare parts);
- accidental or intentional damage or misuse of the Products or services by the Purchaser or a third party (not acting on Grundfos’ behalf); or
- the non-compliance of the Purchaser or of the Purchaser’s own products with applicable law and regulation.

How to get service under the Limited Manufacturer’s Warranty:

When a Product is subject to this Limited Manufacturer’s Warranty, the Purchaser should contact the seller from which it purchased the Product to make a claim within 24 months from the date of retail purchase but no later than thirty (30) months from the date of manufacture which is set forth on the Product’s nameplate and on the Product’s packaging (the "Warranty Notification Period").

If the seller of a Product is no longer in business, the Purchaser should contact Grundfos Service at *www.grundfos.com/us* under **Support** > **Contact Service**.

To exercise the rights under this Limited Manufacturer’s Warranty, the Purchaser shall return a defective Product at the Purchaser’s cost, to the extent allowed by applicable law, along with proof of purchase and an explanation of the defect, date the defect occurred and circumstances surrounding the defect.

The Purchaser is responsible for any expenses for dismounting and mounting the Product and for any and costs related to removal, reinstallation, transportation, and insurance. If Grundfos is required by applicable provincial or territorial law to pay for the cost of transportation, then the Purchaser should contact Grundfos Service Partner to arrange for shipment. The Purchaser also needs to promptly respond to Grundfos as to any inquiries regarding a warranty claim.

Unless requested by Grundfos, the Product may not be disassembled prior to remedy. Any failure to comply herewith will render this Limited Manufacturer’s Warranty void.

Grundfos will either arrange the repair of the defective Product under this Limited Manufacturer’s Warranty or, at Grundfos’ option, provide the Purchaser with a replacement of the defective Product. The replacement unit can be new or remanufactured.

To the extent permissible by applicable law, Grundfos shall not be liable for any incidental and consequential damages or losses of any kind whatsoever arising under, relating to or in connection with the Product, use of the Product or the inability to use the Product.

2. Garantie limitée du fabricant

Cette garantie limitée du fabricant décrit la couverture applicable et les procédures de réclamation pour les pompes fabriquées par Grundfos (ci-après le « Produit »).

Cette garantie limitée du fabricant est fournie pour les produits de consommation vendus et utilisés au Canada uniquement et s'applique aux transactions de consommateurs telles que définies dans les lois provinciales et territoriales applicables. Dans le cas de produits non destinés aux consommateurs, se référer aux conditions de garantie de Grundfos définies à l'article 10 des Conditions générales de vente des produits et services de Grundfos Canada, qui sont disponibles à l'adresse suivante : *https://www.grundfos.com/ca/fr/legal/general-terms-and-conditions-of-sales-and-delivery*

Cette garantie limitée du fabricant prévoit des droits et des limitations spécifiques. Certaines des limitations peuvent ne pas s'appliquer à vous, et vous pouvez également bénéficier d'autres droits qui varient d'une province à l'autre.

Champ d'application de la garantie limitée du fabricant

Sous réserve des conditions générales de garantie suivantes, Grundfos Canada Inc., dont le siège social est situé au 2941, Brighton Rd, Oakville, ON L6H 6C9, Canada (ci-après « Grundfos »), garantit au consommateur initial (ci-après « l'Acheteur ») que le nouveau Produit fabriqué par Grundfos est exempt de défauts de conception, de matériaux et de fabrication dans des conditions normales d'utilisation et d'entretien pendant une période de vingt-quatre (24) mois à compter de la date d'achat au détail, mais pas plus de trente (30) mois à compter de la date de fabrication indiquée sur la plaque signalétique et sur l'emballage du Produit (« Période de garantie »).

Lors de l'achat d'un Produit Grundfos en ligne, il est important de vérifier la date de fabrication et la durée de la garantie auprès du vendeur, car le Produit pourrait ne plus être couvert par cette garantie limitée du fabricant.

Cette garantie limitée du fabricant s'applique exclusivement à un Produit Grundfos neuf vendu et utilisé au Canada. Cette garantie limitée du fabricant ne s'applique pas aux Produits vendus « en l'état » ou « vente finale ». La présente garantie limitée du fabricant n'est pas transférable par l'Acheteur initial. Les produits vendus par Grundfos qui sont fabriqués par des tiers ne sont pas couverts par cette garantie.

Le seul et unique recours dans le cadre de cette garantie limitée du fabricant est la réparation ou, à la discrétion de Grundfos, le remplacement du Produit, comme indiqué ci-dessous. Les défauts ou dommages ne sont pas couverts par la garantie limitée du fabricant s'ils sont dus à :

- l'usure normale ;
- l'utilisation du Produit pour une application pour laquelle il n'est pas prévu ;
- l'installation du Produit dans un environnement non adapté au Produit ;
- toute modification, altération ou réparation du Produit entreprise par l'Acheteur ou un tiers (n'agissant pas pour le compte de Grundfos) ;
- la non-observation des instructions de Grundfos, y compris dans les notices d'installation, d'utilisation, de maintenance ou d'entretien ;
- l'installation, la mise en service, l'utilisation (y compris l'utilisation du Produit ou de tout produit Grundfos en dehors de ses spécifications) ou l'entretien du Produit autrement que conformément aux notices d'installation, d'utilisation, de maintenance ou d'entretien Grundfos ou aux bonnes pratiques de l'industrie ;
- l'utilisation d'un équipement auxiliaire défectueux ou inadéquat en combinaison avec le Produit ;
- l'utilisation de pièces de rechange de mauvaise qualité (à l'exclusion de l'utilisation de pièces de rechange d'origine Grundfos) ;
- tout dommage accidentel ou intentionnel ou toute mauvaise utilisation des Produits ou des services par l'Acheteur ou un tiers (n'agissant pas pour le compte de Grundfos) ; ou
- la non-conformité de l'Acheteur ou de ses propres produits aux lois et règlements applicables.

Procédure à suivre pour bénéficier d'un service dans le cadre de la garantie limitée du fabricant :

Lorsqu'un Produit est soumis à la présente garantie limitée du fabricant, l'Acheteur doit contacter le vendeur auprès duquel il a acheté le produit pour faire une réclamation dans les 24 mois suivant la date d'achat au détail, mais au plus tard trente (30) mois à compter de la date de fabrication indiquée sur la plaque signalétique du Produit et sur l'emballage du Produit (« Période de notification de garantie »).

Si le vendeur d'un Produit n'est plus en activité, l'Acheteur doit contacter le service Grundfos à l'adresse *www.grundfos.com/us* sous **Support** > **Contact Service**.

Pour exercer les droits prévus par la présente garantie limitée du fabricant, l'Acheteur doit renvoyer le Produit défectueux à ses frais, dans la mesure où la loi applicable le permet, accompagné de la preuve d'achat et d'une explication du défaut, de la date à laquelle le défaut s'est produit et des circonstances entourant le défaut.

L'Acheteur est responsable de tous les frais de démontage et de montage du Produit et de tous les frais liés à l'enlèvement, à la réinstallation, au transport et à l'assurance. Si Grundfos est tenu par la loi provinciale ou territoriale applicable de payer les frais de transport, l'Acheteur doit contacter le partenaire de service Grundfos pour organiser l'expédition. L'Acheteur doit également répondre rapidement à Grundfos pour toute demande concernant une réclamation au titre de la garantie.

Sauf demande de Grundfos, le Produit ne doit pas être démonté avant d'être remis en état. Tout manquement à ces dispositions entraînera l'annulation de la présente garantie limitée du fabricant.

Grundfos procédera à la réparation du Produit défectueux dans le cadre de cette garantie limitée du fabricant ou, à la convenance de Grundfos, fournira à l'Acheteur un produit de remplacement du Produit défectueux. L'unité de remplacement peut être neuve ou refabriquée.

Dans la mesure autorisée par la loi applicable, Grundfos ne sera pas responsable des dommages accessoires et indirects ou des pertes de quelque nature que ce soit découlant de, liés à ou en rapport avec le Produit, l'utilisation du Produit ou l'incapacité d'utiliser le Produit.

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