NK, NKG

Installation and operating instructions







NK NKG Installation and operating instructions (all available languages) http://net.grundfos.com/qr/i/96646512



NK, NKG

English (GB)	
Installation and operating instructions4	
Appendix A	
Appendix B	

English (GB) Installation and operating instructions

Original installation and operating instructions Table of contents

1.	General information 4
1.1	Hazard statements
1.2	Notes
2.	Product introduction 5
2.1	Product description
2.2	Identification 6
3.	Receiving the product
3.1	Delivery
3.2	Transporting the product
3.3	Inspecting the product
3.4	Storage after delivery
4.	Installing the product
4.1	
5.	Mechanical installation
5 .1	Lifting the product
5.2	Foundation of horizontally mounted NK,
J.Z	NKG pumps
5.3	Alignment of pump and motor
5.4	Pipes
5.5	Vibration damping
5.6	Expansion joints
5.7	Stuffing box piping
5.8	Bearing bracket
5.9	Bearing monitoring
5.10	Pressure gauge and mano-vacuum
0.10	gauge
5.11	Ammeter
5.12	Condensation cover
6.	Electrical connection
6.1	Motor protection
6.2	Cable entry and screwed connection, MG
	motor
6.3	Torque for terminal cover of MG motors 34
6.4	Synchronous motors
6.5	Frequency converter operation
7.	Starting up the product
7.1	Checking pumps with stuffing box 36
7.2	Flushing the pipe system
7.3	Priming
7.4	Checking the direction of rotation
7.5	Starting up the pump
7.6	Shaft seal run-in period
7.7	Number of motors starting or stopping 39
7.8	Reference readings of monitoring
	equipment

8.	Storing the product
9. 9.1 9.2	Servicing the product
10.	Maintaining the product
10.1	Maintenance of the pump
10.2	Lubrication of bearings in bearing bracket 41
10.3	Monitoring equipment
10.4	Maintaining the motor
10.5	Lubrication of motor bearings
10.6	Applying sealant to plugs
11. 11.1	Taking the product out of operation 45 Protecting the pump during periods of inactivity and frost
	Protecting the pump during periods of
11.1	Protecting the pump during periods of inactivity and frost
11.1 12.	Protecting the pump during periods of inactivity and frost45 Fault finding the product46
11.1 12. 13.	Protecting the pump during periods of inactivity and frost. 45 Fault finding the product 46 Technical data 49
11.1 12. 13. 13.1	Protecting the pump during periods of inactivity and frost. 45 Fault finding the product 46 Technical data 49 Operating conditions 49
11.1 12. 13. 13.1 13.2	Protecting the pump during periods of inactivity and frost. 45 Fault finding the product 46 Technical data 49 Operating conditions 49 Electrical data 51
11.1 12. 13. 13.1 13.2 13.3	Protecting the pump during periods of inactivity and frost. 45 Fault finding the product 46 Technical data 49 Operating conditions 49 Electrical data 51 Sound pressure level 52

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 explosionproof products.



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



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



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



Tips and advice that make the work easier.

2. Product introduction

2.1 Product description

NK, NKG are non-self-priming, single stage, centrifugal volute pumps with axial inlet port and radial outlet port.

NK pumps comply with EN 733.

NKG pumps comply with ISO 2858.

2.1.1 Pumped liquids

NK, NKG pumps are suitable for clean, thin, nonexplosive liquids without solid particles or fibres. The pumped liquid must not attack the pump materials chemically.

2.2 Identification

2.2.1 Nameplate

		1 10	8	3		
	Type/Model			GR		
1 —	NKGE125-100-160/16	0-140	BSA1F2A	ESBC	QEKW3	
2	PN-SN 9943197510	odoo	1		PC P32132 R1	
3	Q 113.3 m ³ /h H	1	04.90	m	ⁿ 1450 min ⁻¹	-12
7—	MEI≥ 0.70 PEI	0.8	39 50/60) Hz	η _p 77.1 %	- 6
5	p/t 16/120 bar,	′°С _{мах}	Imp.[Dia.	13.56 (in.)	— 9
11—	Made in China				WRAS 23C	-13
					,	
					reserved QR code	486
						83
					927	LM083489
	<u> </u>					-

Example of NK, NKG nameplate

Pos.	Descriptio	n					
1	Type designation						
2	Identification code						
	99431975	Product number					
	10000001	Serial number					
	P3	Production site code					
	2132	Production year and week (YYWW)					
	R1	Range identification (service range code)					
3	Nominal flo	w rate					
4	Nominal pu	mp head					
5	Pressure rating and maximum temperature						
6	Hydraulic e	fficiency at best efficiency point					
7	Minimum e	fficiency index					
8	Frequency						
9	Actual impe	eller diameter					
	Pump Ener	gy Index (PEI)					
10	PEI _{CL} : con	stant load					
	PEI _{VL} : variable load						
11	Country of	origin					
12	Rated pum	p speed					
13	WRAS app	roval					

Example 1: NKGE 125-100-160/160-140BSA1F2AESBAQERW1 Example 2: NKGE 200-150-315.2/317ACA1F3AESDAQFYW4 Example 3: NKG 100-65-200/219SAZ1F2KESBQQEXX4 Example 4: NK 32-125/97AA1F1AESBQQEHX2 Example 5: NK 80-200/222VAXEF1BESBQQEWX2

Pos.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Example 1	NKGE	125	-100	-160	/160-140		В	S	A1	F	2	А	Е	s	BAQE	R	W	1
Example 2	NKGE	200	-150	-315.2	/317		А	С	A1	F	3	А	Е	s	DAQF	Υ	W	4
Example 3	NKG	100	-65	-200	/219	S	А		Z1	F	2	Κ	Е	s	BQQE	Х	Х	4
Example 4	NK		32	-125	/97		А		A1	F	1	А	Е	s	BQQE	н	Х	2
Example 5	NK		80	-200	/222	V	А		XE	F	1	В	Е	s	BQQE	W	Х	2

Pos.	Explanation
1	Type range
2	Nominal diameter of inlet port (DN)
3	Nominal diameter of outlet port (DN)
4	Nominal impeller diameter [mm]
5	Actual impeller diameter [mm]
6	Impeller type 'blank': Closed impeller, cylindrical trim. If one dimension is shown, the impeller has a cylindrical trim, for example 317 'blank': Closed impeller, conical trim. If two dimensions are shown, the impeller has a conical trim, for example 160-140 S: Special open impeller V: Super vortex impeller Hydraulic version A: 1st version B: 2nd version
	C: 3rd version D: 4th version
8	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

Pos.	Explanation
	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
	H1: Oil-lubricated heavy-duty bearing design, standard coupling
	H2: Oil-lubricated heavy-duty bearing design, spacer coupling
9	11: 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
	K1: Pump without motor, oil-lubricated heavy-duty bearing design, standard coupling
	K2: Pump without motor, oil-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 customisation than already listed
	Pipe connection
	E: Table E flange
10	F: DIN flange
	G: ANSI flange
	J: JIS flange
	Flange pressure rating (PN - rated pressure)
	1: 10 bar
11	2: 16 bar
11	3: 25 bar
	4: 40 bar
	5: Other pressure rating

Pos. Explanation

Code for materials

Code	Pump housing	Impeller	Wear ring	Shaft
A	EN-GJL-250	EN-GJL-200	Bronze/brass	1.0503/1.4034
A1	EN-GJL-250	EN-GJL-200	Bronze/brass	1.4462
В	EN-GJL-250	Bronze CuSn10	Bronze/brass	1.0503/1.4034
B1	EN-GJL-250	Bronze CuSn10	Bronze/brass	1.4462
С	EN-GJL-250	EN-GJL-200	Bronze/brass	1.4401
D	EN-GJL-250	Bronze CuSn10	Bronze/brass	1.4401
E	EN-GJL-250	EN-GJL-200	EN-GJL-250	1.0503/1.4034
E1	EN-GJL-250	EN-GJL-200	EN-GJL-250	1.4462
F	EN-GJL-250	Bronze CuSn10	EN-GJL-250	1.0503/1.4034
F1	EN-GJL-250	Bronze CuSn10	EN-GJL-250	1.4462
G	EN-GJL-250	EN-GJL-200	EN-GJL-250	1.4401
Н	EN-GJL-250	Bronze CuSn10	EN-GJL-250	1.4401
I	1.4408	1.4408	1.4517	1.4462
J	1.4408	1.4408	Carbon-graphite-filled PTFE (Graflon [®])	1.4462
K	1.4408	1.4408	1.4517	1.4401
L	1.4517	1.4517	1.4517	1.4462
М	1.4408	1.4517	1.4517	1.4401
N	1.4408	1.4408	Carbon-graphite-filled PTFE (Graflon [®])	1.4401
Р	1.4408	1.4517	Carbon-graphite-filled PTFE (Graflon [®])	1.4401
R	1.4517	1.4517	Carbon-graphite-filled PTFE (Graflon [®])	1.4462
S	EN-GJL-250	1.4408	Bronze/brass	1.4401
S1	EN-GJL-250	1.4408	Bronze/brass	1.4462
Т	EN-GJL-250	1.4517	Bronze/brass	1.4462
J	1.4408	1.4517	1.4517	1.4462
W	1.4408	1.4517	Carbon-graphite-filled PTFE (Graflon [®])	1.4462
Z	1.4469	1.4469	1.4410	1.4410
Х	Special version			

Pos. Explanation Rubber parts in pump

E: EE
F: FF
G: FE
H: KE
I: KM
J: KV
K: KK
M: MN
N: ME

0: 00

V: VV

13

14

15

The first letter indicates material of elastomer between pump housing and cover, and elastomer between cover and split cover.

· The second letter indicates material of elastomer between split cover and seal housing.

See the material description in the table below.

Code	Material description
E	EPDM
F	FXM (Fluoraz [®])
К	FFKM (Kalrez®)
М	FEPS (PTFE-sheathed silicone O-ring)
0	HNBR
V	FKM (Viton [®])

Shaft seal arrangement

- B: Stuffing box
- C: Cartridge seal, single
- D: Cartridge seal, double
- O: Back-to-back, double seal
- P: Tandem, double seal
- S: Single seal

Shaft seal(s) in pump

Letter or digit code for mechanical shaft seal and shaft seal rubber parts

- 4 letters: Single mechanical shaft seal, such as BQQE, or single cartridge seal, such as HBQV
- 4 digits:
 - double seal solution; example 2716, where 27 is DQQV, primary seal, and 16 is BQQV, secondary seal;
 - double cartridge seal; example 5150, where 51 is HQQU, primary seal, and 50 is HBQV, secondary seal

The relation between letters and digits of the shaft seals is described in Codes for shaft seals.

16	Code for rated motor power [kW]. See Codes for rated motor power.
17	Code for phase and voltage [V] or other information. See Codes for phase and voltage or other information.
18	Code for speed variant [rpm]. See Codes for speed variant.

Example 1: NKGE

125-100-160/160-140BSA1F2AESBAQERW1 shows

an NKGE 125-100-160 pump with these characteristics:

- · 160-140 mm closed impeller, conical trim
- hydraulic version B
- · with built-in differential-pressure sensor
- · grease-lubricated standard bearing design
- standard coupling
- DIN flange to EN 1092-2 pipe connection
- 16 bar flange pressure rating
- cast iron pump housing, EN-GJL-250
- cast iron impeller, EN-GJL-200
- bronze/brass wear ring
- stainless steel shaft, EN 1.0503/1.4034
- EPDM O-rings for pump cover and seal cover
- · EPDM O-ring for pump cover
- · single shaft seal arrangement
- BAQE shaft seal
- 30 kW motor, not for sale in North America, 2pole, 50 Hz.

Example

2: NKGE 200-150-315.2/317ACA1F3AESDAQFYW4

shows an NKG 200-150-315.2 pump with these characteristics:

- 317 mm closed impeller, cylindrical trim
- hydraulic version A
- without built-in sensor, one cable and one pressure sensor are supplied with the pump.
- grease-lubricated standard bearing design
- standard coupling
- DIN flange to EN 1092-2 pipe connection
- · 25 bar flange pressure rating
- cast iron pump housing, EN-GJL-250
- cast iron impeller, EN-GJL-200
- bronze/brass wear ring
- stainless steel shaft, EN 1.0503/1.4034
- · EPDM O-rings for pump cover and seal cover
- EPDM O-ring for seal housing
- single shaft seal arrangement
- DAQF shaft seal
- motor size outside DOE scope, not for sale in North America, 4-pole, 60 Hz.

Example 3: NKG

100-65-200/219SAZ1F2KESBQQEXX4 shows an NKG 100-65-200 pump with these characteristics:

- · 219 mm semi-open impeller
- · hydraulic version A
- bare shaft pump, oil-lubricated heavy-duty bearing design
- DIN flange to EN 1092-2 pipe connection
- 16 bar flange pressure rating
- stainless steel pump housing, EN 1.4408
 - stainless steel impeller, EN 1.4408
- stainless steel wear ring, EN 1.4517
- stainless steel shaft, EN 1.4401
- · EPDM O-rings for pump cover and seal cover
- EPDM O-ring for seal housing
- single shaft seal arrangement
- BQQE shaft seal
- bare shaft pump without motor, for 4-pole operation, 60 Hz.

Example 4: NK 32-125/97AA1F1AESBQQEHX2

shows an NK 32-125 pump with these characteristics:

- · 97 mm closed impeller, cylindrical trim
- hydraulic version A
- grease-lubricated standard bearing design
 - · standard coupling
 - · DIN flange to EN 1092-2 pipe connection
 - · 10 bar flange pressure rating
 - cast iron pump housing, EN-GJL-250
 - cast iron impeller, EN-GJL-200
 - · bronze/brass wear ring
 - stainless steel shaft, EN 1.0503/1.4034
 - · EPDM O-rings for pump cover and seal cover
 - EPDM O-ring for seal housing
 - · single shaft seal arrangement
 - · BQQE shaft seal
 - 1.5 kW motor, US DOE regulated motor, 2-pole, 60 Hz.

Example 5: NK 80-200/222VAXEF1BESBQQEWX2

shows an NK 80-200 pump with these characteristics:

- 222 mm super vortex impeller
- hydraulic version A
- · PWIS-free certificate included
- DIN flange to EN 1092-2 pipe connection
- 10 bar flange pressure rating
- cast iron pump housing, EN-GJL-250
- bronze CuSn10 impeller
- bronze/brass wear ring
- stainless steel shaft, EN 1.0503/1.4034
- EPDM O-rings for pump cover and seal cover
- EPDM O-ring for seal housing
- · single shaft seal arrangement
- BQQE shaft seal
- 90 kW motor, US DOE regulated motor, 2-pole, 60 Hz.

2.2.2.1 Codes for shaft seals

The digits are only used for double shaft seal solutions.

Digita	Lottors	Description
Digits	Letters	Description
10	BAQE	Single mechanical shaft seal
12	BBQE	Single mechanical shaft seal
13	BBQV	Single mechanical shaft seal
15	BQQE	Single mechanical shaft seal
16	BQQV	Single mechanical shaft seal
19	AQAE	Single mechanical shaft seal
20	AQAV	Single mechanical shaft seal
21	AQQE	Single mechanical shaft seal
22	AQQV	Single mechanical shaft seal
23	AQQX	Single mechanical shaft seal
24	AQQK	Single mechanical shaft seal
25	DAQF	Single mechanical shaft seal
26	DQQE	Single mechanical shaft seal
27	DQQV	Single mechanical shaft seal
28	DQQX	Single mechanical shaft seal
29	DQQK	Single mechanical shaft seal
50	HBQV	Cartridge seal
51	HQQU	Cartridge seal
52	HAQK	Cartridge seal
	SNEA	Stuffing box
	SNEB	Stuffing box
	SNEC	Stuffing box
	SNED	Stuffing box
	SNOA	Stuffing box
	SNOB	Stuffing box
	SNOC	Stuffing box
	SNOD	Stuffing box
	SNFA	Stuffing box
	SNFB	Stuffing box
	SNFC	Stuffing box
	SNFD	Stuffing box

2.2.2.2 Letter codes for shaft seals

Pos. 15 in NK, NKG type key example.

Code	Description	Explanation
в	Shaft seal type	A: O-ring seal with fixed driver
		B: Rubber bellows seal
D		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: EPDM
E	Material of secondary seal and other rubber and composite parts, except the	V: FKM (Viton [®])
		F: FXM (Fluoraz [®])
		K: FFKM (Kalrez [®])
		X: HNBR
	wear ring	U: Dynamic O-rings in FFKM and static O-rings in PTFE

2.2.2.3 Letter codes for stuffing boxes Example: SNEA

Code	Description	Explanation
S	Stuffing box type	S: Packing type stuffing box
Ν	Cooling method	N: Uncooled stuffing box
		E: With internal barrier liquid
Е	Barrier liquid	F: With external barrier liquid
		O: Without barrier liquid
		A: PTFE-impregnated fibre packing rings (Buraflon [®]) and EPDM O-rings in the pump housing B: Graphite-PTFE
A	Material	compound packing rings (Thermoflon [®]) and EPDM O-ring in the pump housing
		C: PTFE-impregnated fibre packing rings (Buraflon [®]) and FKM O- ring in the pump housing D: Graphite-PTFE
		compound packing rings (Thermoflon [®]) and FKM O-ring in the pump housing

For a thorough description of shaft seal types and materials, see the data booklet "NB, NBG, NK, NKG, NBE, NBGE, NKE, NKGE - Custom-built pumps according to EN 733 and ISO 2858".

For a thorough description of stuffing boxes and materials, see the data booklet "NB, NBG, NK, NKG, NBE, NBGE, NKE, NKGE - Custom-built pumps according to EN 733 and ISO 2858".

2.2.2.4 Codes for rated motor power

Pos. 16 in NK, NKG type key example.

	Description	
Code	[hp]	[kW]
А	0.16	0.12
В	0.25	0.18
С	0.33	0.25
D	0.5	0.37
Е	0.75	0.55
F	1	0.75
G	1.5	1.1
Н	2	1.5
I	3	2.2
J	4	3
К	5 (5.5 ¹⁾)	3.7 (4 ¹⁾)
L	7.5	5.5
М	10	7.5
Ν	15	11
0	20	15
Р	25	18.5
Q	30	22
R	40	30
S	50	37
Т	60	45
U	75	55
V	100	75
W	125	90
х	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

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

- 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.

2.2.2.5 Codes for phase and voltage or other information

Pos. 17 in NK, NKG type key example.

Code	Description
А	E-motor (ECM ⁴⁾), 1 x 200-240 V
В	E-motor (ECM ⁴⁾), 3 x 200-240 V
С	E-motor (ECM ⁴⁾), 3 x 440-480 V
D	E-motor (ECM ⁴⁾), 3 x 380-500 V
W	Not for sale in North America
х	No motor or US DOE regulated motor (CC marked motor)
Y	Out of DOE scope
Z	E-motor, asynchronous motor

4) ECM: Electronically Commutated Motor.

2.2.2.6 Codes for speed variant

Pos. 18 in NK, NKG type key example.

Code	Description
A	1450-2200 RPM, E-motor (ECM 5))
В	2900-4000 RPM, E-motor (ECM ⁵⁾)
С	4000-5900 RPM, E-motor (ECM ⁵⁾)
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 tested 100 % before leaving the factory. The test includes a function test where the pump performance is measured to ensure that the pump meets the requirements of relevant standards. 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.

Related information

5.3 Alianment 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.

Related information

8. Storing the product



4. Installing the product

4.1 Location



CAUTION

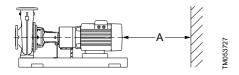
Hot or cold surface Minor or moderate personal injury

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

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

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

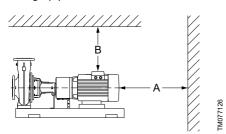
 Pumps fitted with motors up to and including 4 kW require a 0.3 m clearance behind the motor.



Clearance behind the motor

Motor	Minimum clearance, A
0.25 - 4 kW	0.3 m

 Pumps fitted with motors of 5.5 kW and up require a 0.3 m clearance behind the motor and at least a 1 m clearance above the motor to allow the use of lifting equipment.



Clearance behind and above the motor

Motor –	Minimum clearance	
	Α	В
5.5 kW and up	0.3 m	1 m

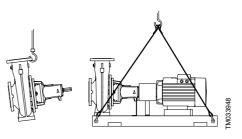
5. Mechanical installation

5.1 Lifting the product

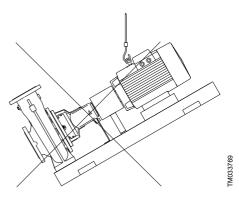


Motors from 4 kW and up are supplied with lifting eyes which must not be used for lifting the entire pump unit.

Lift the pumps by means of nylon straps and shackles.



Correct lifting of pump

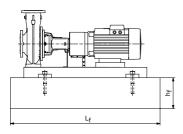


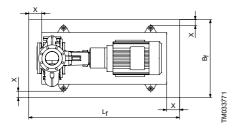
Incorrect lifting of pump

5.2 Foundation of horizontally mounted NK, NKG pumps

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 at least be 1.5 times the weight of the pump.

The foundation must be at least 100 mm larger than the base frame on all four sides.





Foundation, X equal to minimum 100 mm

The minimum height of the foundation, $h_{\text{f}},$ can then be calculated:

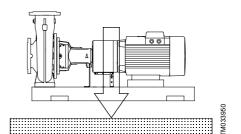
 $h_f = \frac{m_{\text{pump}} \times 1.5}{L_f \times B_f \times \delta_{\text{concrete}}}$

h _f	Height of the foundation [m]
L _f	Length of the foundation [m]
B _f	Width of the foundation [m]
m _{pump}	Mass of the pump [kg]
δ _{concrete}	Density of the concrete [kg/m ³]

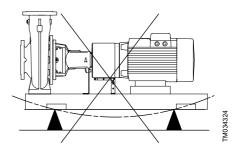


The density, $\delta,$ of concrete is usually taken as 2,200 kg/m^3.

Place the pump on the foundation, and fasten it. The base frame must be supported under its entire area.



Correct foundation



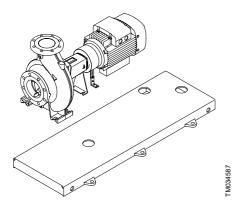
Incorrect foundation

5.2.1 Grouting of horizontally mounted NK, NKG pumps

For NK, NKG pumps with 2-pole motors equal to or bigger than 55 kW, grouting of the base frame is mandatory in order to prevent vibration energy from the rotating motor and liquid flow to evolve.

Grouting requirements apply to both EN/ISO and Cchannel base frames.

	P2 lower than or equal to 45 kW	P2 equal to or higher than 55 kW
2-pole	Grouting optional	Grouting mandatory
4-pole	Grouting optional	
6-pole	Grouting optional	



EN/ISO base frame with pouring holes

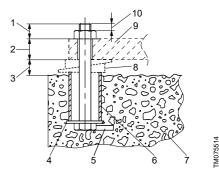
5.2.2 Preparing the foundation

We recommend the following procedures to ensure a good foundation:

 Pour the foundation without interruption to 19 to 32 mm of the final level.

Use an approved, non-shrinking concrete. Contact your concrete supplier for advice if any doubts.

- 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.
- 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.



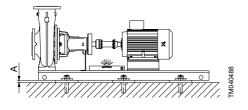
Pos.	Description
1	Bolt length above the support rail
2	Thickness of the support rail
3	19-32 mm allowance for grout
4	Washer
5	Lug
6	Pipe sleeve
7	Foundation with rough top
8	Wedges and shims left in place
9	Support rail
10	5-10 mm

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

5.2.3 Levelling the base frame

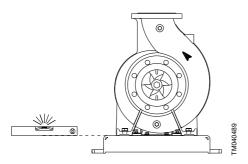
Follow the steps below to level the base frame:

 Lift or jack up the base frame to the final level 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.



A: 19-32 mm

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



- 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.

5.2.4 Preliminary alignment

DANGER Electric shock



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.

Death or serious personal injury

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.

Related information

5.3 Alignment of pump and motor

5.2.5 Grouting

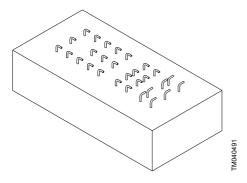


If you have questions or doubts about the grouting, please contact an expert on grouting.

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:

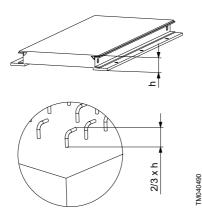
- 1. Use an approved, non-shrinking grout.
- 2. Embed reinforcing steel bars into the foundation by means of 2K anchor adhesive glue.

- English (GB)
- 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.

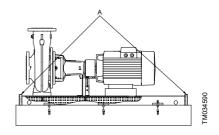


Example of foundation with minimum 20 bars

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



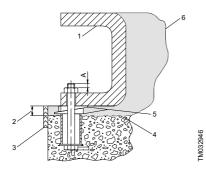
- 5. Soak top of concrete foundation thoroughly, then remove surface water.
- 6. Ensure proper shuttering at both ends of the base frame.



A: shuttering

- 7. If necessary, check the levelling of the base frame again before grouting.
- Pour non-shrinking grout through the openings of the base frame until the space underneath the base frame has been filled completely.
- 9. Fill the formwork with grout up to the base frame top level.
- 10. Allow the grout to dry thoroughly before attaching piping to the pump. 24 hours is sufficient time with approved grouting procedure.
- 11. When the grout has thoroughly hardened, check the anchor bolt nuts, and tighten, if necessary.

12. 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.



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
А	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.

5.3 Alignment of pump and motor

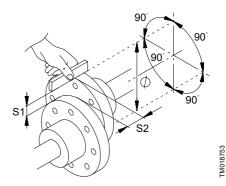
When a complete unit is supplied assembled from the factory, the coupling halves have been accurately aligned by means of foil inserted under the pump and motor mounting surfaces as required.

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.

The values for \emptyset and S2 can be found in the following table. The value for S1 is 0.2 mm.



Alignment

5.3.1 Aligning the pump and motor with a straightedge ruler

1. Make a rough alignment of pump and motor, and tighten the screws in the base frame to the correct torque.



TM038340

See the table Tightening torques.

2. Make a mark on the coupling, for instance with a marker pen.



 Hold a straightedge ruler against the coupling, and determine the inaccuracy, if any, with a feeler gauge.



TM038300

-M038301

4. Turn the coupling 90 °, and repeat the measurement with straightedge and feeler gauge.



TM038302

- If the measured values are less than 0.2 mm, the alignment is complete. Go to step 8.
- 5. Adjust the position of the motor. Loosen the screws that hold the motor in place.



6. Insert shims with the required thickness.



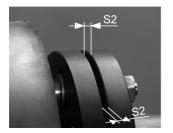
Tighten the screws to the correct torque. Go to step 3, and check the alignment once more.



TM038321

TM038322

8. Check the gap S2 both vertically and horizontally.



TM038325

- If the air-gap width is within the tolerances, the alignment is complete.
- · If not, go to step 6.

See the table Air-gap width S2.

Related information

5.3.3 Tightening torques

5.3.4 Air-gap width S2

5.3.2 Aligning the pump and motor with laser equipment

 Make a rough alignment of pump and motor, and tighten the screws in the base frame to the correct torque.



See the table Tightening torques.

2. Fasten one laser bracket to the pump coupling.



TM038303

FM038340

3. Fasten the other laser bracket to the motor coupling.



- TM038304
- Place laser unit S, stationary, on the stationary part and laser unit M, movable, on the movable part.



FM038305

5. Interconnect the laser units, and connect one laser unit to the control box.



6. Make sure that the laser units are at the same height.



FM038306

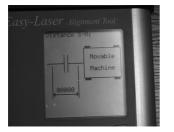
7. Measure the distance between the white lines on the laser units.



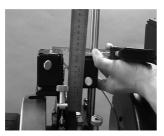
TM038309

FM038308

8. Enter the distance.



9. Measure the distance between the S unit and the centre of the gap between the couplings.



10. Enter the distance.



11. Measure the distance from the S unit to the first screw on the motor.



TM038312

12. Enter the distance.



TM038313

13. Measure the distance from the S unit to the rear screw on the motor.



TM038314

14. The control box shows that the laser units must be turned to position 9 o'clock.



TM038315

TM038310

English (GB)



19. If the measured values are less than 0.1 mm, the alignment is complete. Go to step 24.

TM038321

TM038320

TM038322

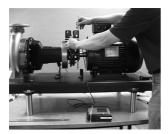
15. Turn the laser units to position 9 o'clock.



16. Confirm on the control box.



17. Turn the laser units to position 12 o'clock. Confirm on the control box.



18. Turn the laser units to position 3 o'clock. Confirm on the control box.



TM038318

TM038316

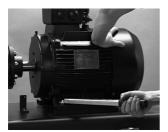
TM038319

TM038317

21. Insert shims with the required thickness.



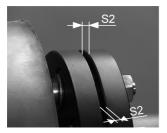
22. Tighten the screws to the correct torque again.



23. Repeat the alignment until the values are within the tolerances. Go to step 14.



24. Check the gap S2.



See the table Air-gap width S2.

Related information

5.3.3 Tightening torques

5.3.4 Air-gap width S2

5.3.3 Tightening torques

Description	Dimensions	Tightening torque [Nm]
Hexagon head screw	M6	10 ± 2
	M8	12 ± 2.4
	M10	23 ± 4.6
	M12	40 ± 8
	M16	80 ± 16
	M20	120 ± 24
	M24	120 ± 24

TM038325

TM038320

5.3.4 Air-gap width S2



Measure S2 all the way around the coupling. The maximum permissible deviation between the largest and the smallest measurement is 0.2 mm.



After the installation is finished, tighten the screws connecting the flange, feet and the anchor bolts according to the tightening torques. Anti-loose method should be applied.

Outside	Air-gap width S2 [mm]			
coupling diameter	Standard	d coupling	Spacer coupling	
[mm]	Nominal	Tolerance	Nominal	Tolerance
80			4	
95		-	4	
110		4		
125	- 4	0/-1	4	
140			4	0/-1
160			4	
200			6	
225			6	
250			8	

If the coupling and motor are not supplied by Grundfos, make sure to follow the coupling manufacturer's instructions.

WARNING Crushing hazard

Death or serious personal injury



To protect persons from rotating machine parts, always install all guards after the installation is complete and before starting the pump.

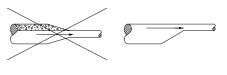
5.4 Pipes

5.4.1 Pipe installation

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.

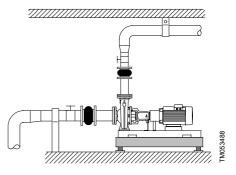




TM002263

Pipelines

The isolating valves must be fitted on either side of the pump to avoid having to drain the system if the pump needs to be cleaned or repaired. The pipes must be adequately supported as close to the pump as possible, both on the inlet and the outlet side. The counterflanges must lie true against the pump flanges without being stressed as stress would cause damage to the pump.



Pump installation

5.4.2 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.

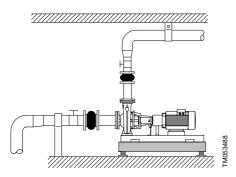
5.5 Vibration damping

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 11 kW and up. Vibration damping is mandatory for motors of 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.



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 centre displacement or misalignment of flanges.

The expansion joints must be fitted at a minimum distance of 1 to 1.5 times of the pipe diameters 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 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.

FM024981



FM024979

Rubber bellows expansion joint with limiting rods



Rubber bellows expansion joint without limiting rods

We always recommend that you use expansion joints with limiting rods for flanges larger than DN 100 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 belows expansion joint with limiting rods.



TM024980

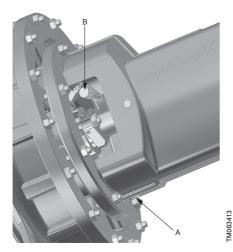
Metal bellows expansion joint with limiting rods

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

5.7 Stuffing box piping

Pumps with stuffing box will always have a continuous leakage during normal operation. We recommend to connect a drainage pipe to the drain hole (A) of the bearing bracket, G1/2, to collect the leaking liquid.

For pumps with stuffing box, type SNF, and external barrier liquid, connect the external flush pipe to the pipe (B) with an outer diameter of 8 mm before starting the pump.

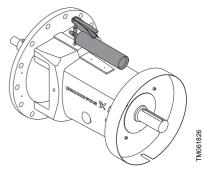


Pipe connections for stuffing box operation

5.8 Bearing bracket

5.8.1 Lubricating bearing bracket with grease

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

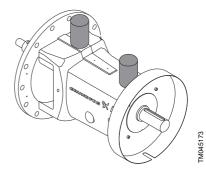


For recommended re-lubricating intervals, see section Grease-lubricated bearings.

- 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.
- Set the grease lubricators to empty within 12 months according to the instructions supplied with the lubricators.



Related information

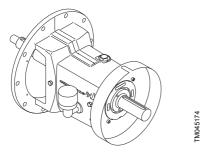
10.2.1.1 Pump with greased-for-life bearings

5.8.2 Bearing bracket with constant-level oiler



There is no oil in bearing bracket when it is delivered.

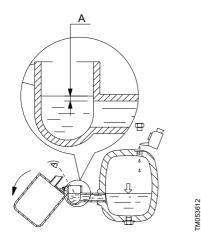
Fit the constant-level oiler on the bearing bracket before filling oil into the bearing bracket. See instructions on the label on the reservoir.



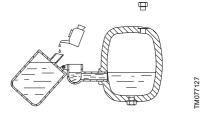
Bearing bracket with constant-level oiler

5.8.2.1 Filling the oil

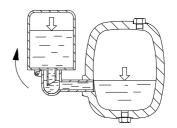
- 1. Remove the filling plug.
- Hinge down the constant-level oiler, and pour the oil through the filling hole until the oil reaches level in the connection elbow.



- A: 1-3 mm
- Fill the reservoir of the constant-level oiler with oil, and snap it back into operating position. Now oil will be filled into the bearing bracket. Air bubbles can be seen in the reservoir during this process. Continue until the correct oil level is reached.



 When no bubbles appear in the reservoir, refill the reservoir, and snap it back into operating position.



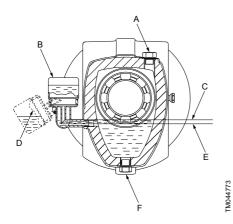
TM077128

5. Fit the filling plug.



The oil level in the bearing bracket must always be as shown in the figure below.

Check the oil level regularly during operation, and add oil, if necessary. The oil level must always be visible in the sight glass.



Code	Description
A	Filling plug
В	Full constant-level oiler
С	Correct oil level in bearing bracket with constant-level oiler during operation
D	Oil level in constant-level oiler when being filled with oil
E	Oil level when filling
F	Drain plug

5.8.2.2 Checking the oil level

The oil level in the bearing bracket will be correct as long as the function of the constant-level oiler is correct.

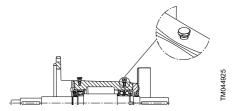
 To check the function of the constant-level oiler, slowly drain oil through the drain plug until the constant-level oiler starts to operate, that is until air bubbles can be seen in the reservoir.

5.9 Bearing monitoring

5.9.1 Vibration level

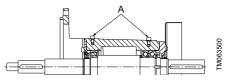
The vibration level gives an indication of the condition of the bearings.

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



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.



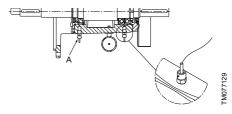
A: plugged holes for SPM fitting

Bearing bracket for retrofitting of SPM measuring equipment

5.9.2 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.



A: 1/4" tapping for Pt100 sensor

Pt100 sensors fitted in bearing bracket

5.10 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 1.5 bar or approximately 15 m of head lower.

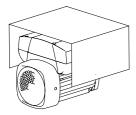
5.11 Ammeter

We recommend connecting an ammeter to check the motor load.

5.12 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.



-M1040101

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 iniury



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 Motor protection

DANGER

Electric shock

Death or serious personal injury

- The motor must be protected against overload by an external motorprotective circuit breaker with IEC trip class 10 or 20.
- Grundfos recommends using trip class 20.
- The current setting of the motorprotective circuit breaker must be adjusted to the nominal current stated on the motor nameplate.

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 motorprotective circuit breaker.

All three-phase Grundfos MG and MMG motors of 3 kW and up incorporate a thermistor. See the instructions in the motor terminal box.

The electrical connection must be carried out as shown in the wiring diagram on the back side of the terminal box cover.

6.2 Cable entry and screwed connection, MG motor

All motors are supplied without screwed cable entries. The table below shows the numbers and sizes of cable entry holes of the terminal box of Grundfos MG motors according to the standard EN 50262.

Frame size	Model	Number x dimensions	Description	
MG 71 and 80	B, C	2 x M20 x 1.5	The holes have precast threads and are closed with knock-out cable entries.	
MG 90 and 100	B, C, D	4 x M20	- The holes are	
MG 112 and 132	C, D, F, H	4 x M25	closed with knock-out cable	
MG 160 and 180	F, H	4 x M40 2 x M20	entries.	

6.3 Torque for terminal cover of MG motors

For pumps with below MG motors, torque specification should be followed to avoid breaking the terminal cover.

Туре	Thread size (mm)	Tightening torque (Nm)
MG 71/80	d 5.0	1.8 - 2.2
MG 90/100	d 5.0	3-4
MG 112/132	d 5.0	3-4
MG 160/180	d 6.0	4-6

6.4 Synchronous motors

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



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.



6.5 Frequency converter operation All three-phase motors can be connected to a

frequency converter. Frequency converter operation will often expose the motor insulation system to a heavier load and cause the motor to be more noisy than usual due to eddy

currents caused by voltage peaks. A large motor driven via a frequency converter will be loaded by bearing currents.

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

Operating conditions	Action
2-pole motors from 45 kW, 4-pole motors from 37 kW and 6-pole	Check that one of the motor bearings is electrically isolated. Contact Grundfos.
Noise critical applications	Fit an output filter between the motor and the frequency converter. This reduces the voltage peaks and thus the noise.
Particularly noise critical applications	Fit a sinusoidal filter.
Cable length	Fit a cable that meets the specifications laid down by the frequency converter supplier. The length of the cable between motor and frequency converter affects the motor load.
Supply voltage up to 500 V	Check that the motor is suitable for frequency converter operation.
Supply voltage between 500 V and 690 V	Fit a sinusoidal filter between the motor and the frequency converter which reduces the voltage peaks and thus the noise, or check that the motor has reinforced insulation.
Supply voltage of 690 V and higher	Fit a sinusoidal filter and check that the motor has reinforced insulation.

Example of CUE nameplate

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

7. Starting up the product

7.1 Checking pumps with stuffing box



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

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.

- In the case of pumps with stuffing box, check that the stuffing box gland is correctly fitted. It must be possible to turn the pump shaft manually.
- 2. If the pump has been inactive for a long period, turn it manually to make sure it has not got stuck.
- 3. Loosen the stuffing box or remove the packing.

7.2 Flushing the pipe system



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.

7.3 Priming

- 7.3.1 Priming the product in closed systems or open systems where the liquid level is above the pump inlet
- 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.

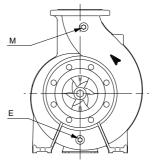


- In hot-liquid installations, pay special attention to the risk of personal injury caused by scalding hot liquid.
- In cold-liquid installations, pay special attention to the risk of personal injury caused by cold liquid.
- Loosen the priming plug in order to vent the pump. Once liquid runs out, tighten the priming plug.

7.3.2 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.

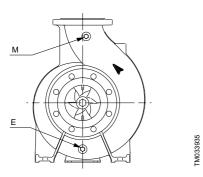


Drain plug (E), priming and venting plug (M)

7.3.3 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.



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

- 3. Connect a manual venting pump with the funnel instead of a priming device.
- Install a slide valve between the venting pump and the centrifugal pump in order to protect the venting pump against excessive pressure.
- 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.

7.4 Checking the direction of rotation



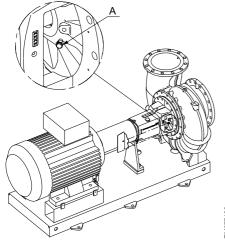
Do not start the pump to check the direction of rotation until it has been filled with liquid.

The correct direction of rotation is shown by arrows on the pump housing, and can visibly be checked by means of the motor fan. Looking at the motor fan, the direction of rotation must be clockwise.

7.5 Starting up the pump

- 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.

- English (GB
- 3. Vent the pump during startup by loosening the air vent screw in the pump head or pump head cover until a steady stream of liquid runs out of the vent hole.



FM077183

WARNING

Position of vent screw (A)

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.

7.6 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.

7.6.1 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.

7.6.2 Stuffing box

The stuffing box gland must not be too tight during startup in order to let sufficient liquid lubricate the shaft and the packing rings. Once the stuffing box housing and the stuffing box gland have reached approximately the same temperature as the pump parts, the running-in of the stuffing box gland is complete. If the stuffing box leaks too much, retighten the gland slightly and evenly while the pump is running. To ensure continuous lubrication, a few drops should always drop from the stuffing box to protect the packing rings or shaft sleeve. We recommend 40 to 60 drops/minute.

7.7 Number of motors starting or stopping

	Maximum	number of m per hour	otor starts
Frame size ⁻	Number of poles		
-	2	4	6
56-71	100	250	350
80-100	60	140	160
112-132	30	60	80
160-180	15	30	50
200-225	8	15	30
250-315	4	8	12

7.8 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. Storing the product

- 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.
- 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.
- 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.

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.

9. Servicing the product

9.1 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 dismantling.

The product will be classified as contaminated if it has been used for a liquid which is injurious to health or toxic. If you request Grundfos to service the product, contact Grundfos with details about the pumped liquid before returning the product for service. Otherwise, Grundfos can refuse to accept the product for service.

The product must be cleaned thoroughly before you return it.

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

9.2 Service kits

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

Related information

- NK Service Kit Catalogue
- NKG Service Kit Catalogue

10. Maintaining the product

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 that the power supply cannot be accidentally switched on.

10.1 Maintenance of the pump

The pump is maintenance-free.

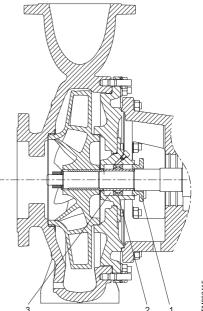
10.1.1 Maintenance of the mechanical shaft seals

Mechanical shaft seals are maintenance-free, working almost without any leakages. If any considerable and 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 the greatest care.

10.1.2 Stuffing box

If the stuffing box leaks too much and cannot be further tightened, the stuffing box must be repacked. After removal, clean and check the shaft sleeve, chamber and stuffing box gland. For further information, see the service instructions for NK.

10.1.3 Replacing the packing rings



⁻M063415

Sectional view of a stuffing box

Description
Stuffing box gland
Packing ring
Distribution ring

Follow these steps when replacing the packing rings:

- 1. Loosen stuffing box gland and remove it.
- Remove old packing ring, distribution ring, if any, and packing rings behind the distribution ring, using a packing ring hook.
- Insert two new packing rings one at a time. Push them firmly into position, staggering the joints 120 degrees.
- 4. Insert distribution ring, if any.
- For D24/D32, insert one, and for D42/D48/D60, insert two more packing rings, staggering the joints 120 degrees. If no distribution ring is used, two extra packing rings will be required.
- 6. Reinstall stuffing box gland.

10.1.3.1 Starting pumps with new packing rings

Packing rings require lubrication. Therefore, the stuffing box must always be allowed to leak 40 to 60 drops per minute. Never overtighten the stuffing box gland.

For suction lift applications, it can be necessary to slightly overtighten the gland while starting the pump to avoid air from entering the pump. Air in the pump in this situation will result in the pump being unable to draw the liquid to the pump.

- 1. Loosen the gland immediately when the pump delivers liquid allowing a leakage of 40 to 60 drops per minute.
- 2. Readjust after a few hours of operation if leakage increases.

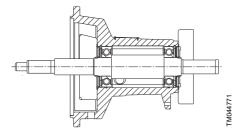
10.1.4 Shaft sleeve replacement

The shaft sleeve can be worn out as the sleeve life depends on the application. When the leakage is too high even with new packing rings in combination with a slight overtightening, the shaft sleeve needs to be replaced.

10.2 Lubrication of bearings in bearing bracket

10.2.1 Grease-lubricated bearings

10.2.1.1 Pump with greased-for-life bearings



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.

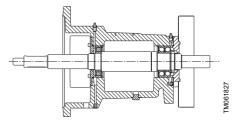


To check the bearings, regularly listen to them by means of a solid rod. There are no SPM measuring points for this type of bearing bracket.

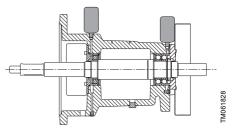
Related information

11.1 Protecting the pump during periods of inactivity and frost

10.2.1.2 Pump with lubrication nipples or automatic grease lubricators



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



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.

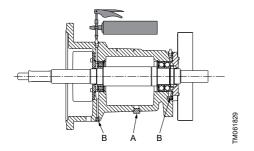
Related information

11.1 Protecting the pump during periods of inactivity and frost

10.2.1.3 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.
- 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.



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

10.2.1.4 Relubrication via grease nipples

Grundfos recommends the following relubricating intervals and grease quantities:

Relubricating	Grease quantity [g]	
interval [operating hours]	Roller bearing	Angular contact bearing
7500	11	15
4500	13	20
4500	22	30
3500	27	38
3500	30	41
	interval [operating hours] 7500 4500 4500 3500	interval [operating hours] Roller bearing 7500 11 4500 13 4500 22 3500 27



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.

10.2.1.5 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.

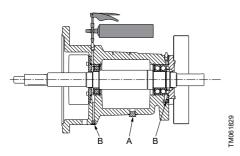
Never mix greases with different thickeners, such as a lithium-based grease with a sodium-based grease, before checking with the suppliers.

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.



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

Renewing the grease

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

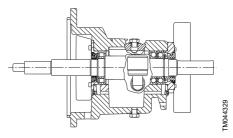
Basic characteristics	
Code, DIN 51825	K2N-40
Consistency class, NLGI	2-3
Thickener	Polyurea (di-urea)
Base oil	Mineral
Operating temperature	-40 to +150 °C,
	-40 to +302 °F
Dropping point, ISO 2176	240 °C, 464 °F
Density, DIN 5175	At 20 °C, 68 °F: 0.85 -
	0.95 g/cm ³
Base oil viscosity	
40 °C, 104 °F	96 mm²/s
100 °C, 212 °F	10.5 mm ² /s

4. Refit the drain plugs.

Related information

11.1 Protecting the pump during periods of inactivity and frost

10.2.2 Lubricating the bearings with oil



Bearing bracket with oil-lubricated roller and double angular contact bearings

Under optimum operating conditions, the life of the roller and double angular contact bearings 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.



٠

To monitor the bearing condition, regularly measure vibration levels using the SPM measuring points on the bearing bracket. See section Vibration level.

Lubricate the bearings with mineral oil. Intervals for oil change as well as the required quantities are specified below.

Bearing temperature	Initial oil change	Subsequent oil changes
Up to 70 °C	After 400	Every 4400 hours
70-90 °C	hours	Every 2200 hours

Bearing type	Diameter of coupling shaft [mm]	Approximate oil quantity [ml]
Roller and	42	850
angular contact	48	1700
bearings	60	1350

Related information

5.9.1 Vibration level

11.1 Protecting the pump during periods of inactivity and frost

10.2.3 Changing the oil

- 1. Place a suitable container under the bearing bracket to collect used oil.
- 2. Remove the filling plug and the drain plug.
- After drainage of the bearing bracket, fit the drain plug, and fill the bearing bracket with new oil. See section Bearing bracket with constant-level oiler.



Check the oil level regularly during operation, and add oil, if necessary. The level must always be visible in the sight glass.

Basic characteristics Shell Omala 68	Test method	
Viscosity grade	ISO	68
AGMA EP Gear Oil Grade		68
Old AGMA Grade		2 EP
Viscosity		
At 40 °C, 104 °F	D 445	68 mm²/s
At 100 °C, 212 °F	D 445	8.8 mm ² /s
Flash point, COC, °F	D 92	405
Pour point, °F	D 97	-15

Related information

5.8.2 Bearing bracket with constant-level oiler

10.3 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.

10.4 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.

10.5 Lubrication of motor bearings

10.5.1 MG motors

The bearings of motors up to 11 kW are greased for life and require no lubrication.

The bearings of motors of 11 kW and up must be greased in accordance with the indications on the motor nameplate.

10.5.2 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.

10.5.3 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.

10.6 Applying sealant to plugs

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

11. Taking the product out of operation

11.1 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

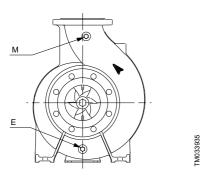
Escaping liquid

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.



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.
- 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.

12. 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
	a) The electrical connection is wrong, for instance two phases.	Check the electrical connection and remedy, if necessary.
	b) The direction of rotation is wrong.	Interchange two phases of the power supply.
	c) There is air in the inlet pipe.	Vent and fill the inlet pipe and pump.
1. The pump delivers no or too little liquid.	d) The counterpressure is too high.	Set the duty point in accordance with the data sheet. Check the system for impurities.
	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 <i>Stuffing</i> <i>box piping</i> are complied with.
	f) The inlet pipe or impeller is blocked by impurities.	Clean the inlet pipe or pump.
	g) The pump draws in air due to a defective seal.	Check the pipeline seals, pump housing gaskets and shaft seals. Replace gaskets and seals, if necessary.
	h) 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.

English (GB)

Fault	Cause	Remedy
2. The motor- protective circuit breaker has tripped because the motor is	a) The pump is blocked by impurities.	Clean the pump.
	b) The pump is running above rated duty point.	Set the duty point in accordance with the data sheet.
	c) The density or viscosity of the liquid is higher than specified when ordering.	If less flow is sufficient, reduce the flow on the outlet side. Otherwise, fit a more powerful motor.
overloaded.	d) The motor-protective circuit breaker overload setting is incorrect.	Check the setting of the motor-protective circuit breaker and replace, if necessary.
	e) The motor runs on two phases.	Check the electrical connection. Replace the fuse, if defective.
	a) The inlet pressure is too low, that is the pump cavitates.	Increase the liquid level on the inlet side. Open the isolating valve in the inlet pipe. Make sure that all the conditions in <i>Stuffing</i> <i>box piping</i> are complied with.
	b) There is air in the inlet pipe or pump.	Vent and fill the inlet pipe or pump.
	c) The counterpressure is lower than specified.	Set the duty point in accordance with the data sheet.
	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.
3. The pump makes	e) The impeller is out of balance or the impeller blades are clogged.	Clean and check the impeller.
too much noise. The pump runs unevenly	f) The inner parts are worn.	Replace the defective parts.
and vibrates.	g) The pump is stressed by the pipes thus causing starting noise.	Mount the pump so that it is not stressed. Support the pipes.
	h) The bearings are defective.	Replace the bearings.
	i) The motor fan is defective.	Replace the fan.
	j) The coupling is defective.	Replace the coupling. Align the coupling. See related information for <i>Alignment of</i> <i>pump and motor</i> .
	k) There are foreign bodies in the pump.	Clean the pump.
	I) Frequency converter operation.	See related information for Frequency converter operation.
4) The pump, connections, shaft seal or stuffing box are leaking.	a) The pump is stressed by the pipes thus causing leaks in the pump housing or 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 stuffing box is defective.	Retighten the stuffing box. Repair or replace the stuffing box.
	f) The shaft surface or shaft sleeve is defective.	Replace the shaft or the shaft sleeve. Replace the packing rings in the stuffing box.

English (GB)

Fault	Cause	Remedy
	a) There is air in the inlet pipe or pump.	Vent the inlet pipe or the pump and replenish.
	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 <i>Stuffing</i> <i>box piping</i> are complied with.
	c) The bearings are lubricated with too little, too much or unsuitable lubricant.	Replenish, reduce or replace the lubricant.
5) The temperature in the pump or motor is too high.	d) The pump with bearing seatis stressed by the pipes.	Mount the pump so that it is not stressed. Support the pipes. Check the alignment of the coupling.
		See related information for <i>Alignment of</i> pump and motor.
	e) The axial pressure is too high.	Check the relief holes of the impeller and the lock rings on the inlet side.
	f) The motor-protective circuit breaker is defective or the setting is incorrect.	Check the setting of the motor-protective circuit breaker and replace, if necessary.
	g) 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.

Related information

- 5.3 Alignment of pump and motor
- 5.7 Stuffing box piping

13. Technical data

13.1 Operating conditions

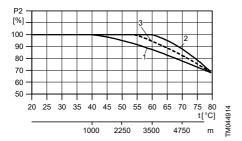
13.1.1 Ambient temperature and altitude



Do not exceed the allowable maximum ambient temperature stated on the motor nameplate. If nothing is stated, then the maximum allowed ambient temperature is 40 °C.

The ambient temperature and the installation altitude are important factors for the motor life as they affect the life of the bearings and the insulation system.

If the ambient temperature exceeds the recommended maximum ambient temperature or the installation altitude exceeds the recommended maximum altitude above sea level, seeing the figure below, the motor must not be fully loaded due to the low density and consequently low cooling effect of the air. In such cases, it may be necessary to use a motor with a higher output.



The maximum motor output depends on the ambient temperature and altitude

-	• • • •
Pos.	Description
1	0.25 - 0.55 kW MG motors
	0.75 - 22 kW MG motors, IE2/IE3
2	0.75 - 450 kW MMG-H motors, IE2
	0.25 - 200 kW MMG-H motors, IE3
	0.75 - 462 kW Siemens motors, IE2
3	0.25 - 462 kW Siemens motors, IE3
	0.75 - 462 kW Siemens motors, IE4

Example: A pump with a 1.1 kW IE2 MG motor: If this pump is installed 4750 m above sea level, the motor must not be loaded more than 88 % of the rated output. At an ambient temperature of 75 °C, the motor must not be loaded more than 78 % of the rated output. If the pump is installed 4750 m above

sea level at an ambient temperature of 75 °C, the motor must not be loaded more than 88 % x 78 % = 68.6 % of the rated output.

13.1.2 Liquid temperature

Liquid temperature: -40 to +140 °C

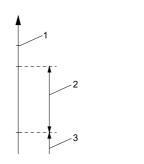
The maximum liquid temperature is stated on the pump nameplate. It depends on the shaft seal chosen.

For EN-GJL-250 cast-iron pump housings, local regulations may not allow liquid temperatures above 120 °C.

13.1.3 Maximum operating pressure

 \bigcirc

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



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.

M075513

13.1.4 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.

13.1.5 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.

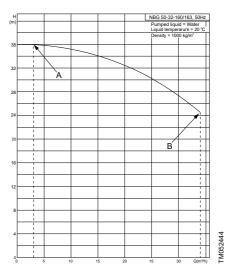
13.1.6 Minimum flow rate

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.

13.1.7 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.



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

Pos.	Description		
A	Minimum flow rate		
В	Maximum flow rate		

13.1.8 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 0 °C and up are mainly used for pumping water, while seals for temperatures below 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 the seal life will be reduced and periodic noise will occur.

English (GB)

Shaft seal dia	ameter [mm]				28, 38	48	55	60
Shaft seal typ	De	Seal faces	Rubber Code	Temperature range	Max.	pre [bai		re
		AQ ₁	EPDM BAQE	0-120 °C	16	16	16	16
		BQ ₁	EPDM BBQE	0-120 °C	16	16	16	16
	Bellows seal, type B,	BQ ₁	FKM BBQV	0-90 °C	16	16	16	16
	unbalanced	Q ₇ Q ₇	EPDM BQQE	-25 to +120 °C	16	16	16	16
		Q ₇ Q ₇	FKM BQQV	-10 to +90 °C	16	16	16	16
	O-ring seal, type A, unbalanced	Q ₁ A	EPDM AQAE	0-120 °C	16	16	16	16
		Q ₁ A	FKM AQAV	0-90 °C	16	16	16	16
		Q_1Q_1	EPDM AQQE	-25 to +90 °C	16	16	16	16
		Q_1Q_1	FKM AQQV	-10 to +90 °C	16	16	16	16
F		Q_1Q_1	HNBR AQQX	-15 to +90 °C	16	16	16	16
۲		Q_1Q_1	FFKM AQQK	0-90 °C	16	16	16	16
		AQ ₁	FXM DAQF	0-140 °C	25	25	25	25
	O-ring seal, type D, balanced	Q_6Q_6	EPDM DQQE	-20 to +120 °C	25	25	25	25
		Q_6Q_6	FKM DQQV	-10 to +90 °C	25	25	25	25
	O-mig seal, type D, balanceu	Q_6Q_6	HNBR DQQX	-15 to +120 °C	25	25	25	25
		Q_6Q_6	FFKM DQQK	0-120 °C	25	25	25	25

13.1.9 Stuffing box

Stuffing box type	Code	Temperature range	Max. pressure [bar]
Stuffing box without cooling, with internal barrier liquid	SNE	-30 - +120 °C	16
Stuffing box without cooling, without barrier liquid	SNO	-30 - +120 °C	16
Stuffing box without cooling, with external barrier liquid	SNF	-30 - +120 °C	16

13.2 Electrical data

See the motor nameplate.

13.3 Sound pressure level

The data in this table applies for pumps including motor, such as MG, MMG and Siemens motors.

The values stated are maximum sound pressure levels. Tolerances are according to ISO 4871.

50 Hz motor

2-pole:	n = 2900 min ⁻¹
4-pole:	n = 1450 min ⁻¹
6-pole:	n = 970 min ⁻¹

		i sound pres B(A)] - ISO 37				
Motor [kW]	Three-phase motors					
	2-pole	4-pole	6-pole			
0.25	56	41	-			
0.37	56	45	-			
0.55	57	42	40			
0.75	56	42	43			
1.1	59	50	43			
1.5	58	50	47			
2.2	60	52	52			
3	59	52	63			
4	63	54	63			
5.5	63	57	63			
7.5	60	58	66			
11	60	60	66			
15	60	60	66			
18.5	60	63	66			
22	66	63	66			
30	71	65	59			
37	71	66	60			
45	71	66	58			
55	71	67	58			
75	73	70	61			
90	73	70	61			
110	76	70	61			
132	76	70	61			
160	76	70	65			
200	76	70	-			
250	82	73	-			

Motor FkM/	Maximum sound pressure level [dB(A)] - ISO 3743 Three-phase motors				
Motor [kW]					
	2-pole	4-pole	6-pole		
315	82	73	-		
355	77	75	-		
400	-	75	-		

60 Hz motor

2-pole:	n = 3500 min ⁻¹
4-pole:	n = 1750 min ⁻¹
6-pole:	n = 1170 min ⁻¹

Motor [kW]	Maximum sound pressure level [dB(A)] - ISO 3743 Three-phase motors			
	2-pole	4-pole	6-pole	
0.25	-	-	-	
0.37	-	-	-	
0.55	-	-	-	
0.75	-	-	-	
1.1	64	51	-	
1.5	64	52	62	
2.2	65	55	60	
3	54	57	67	
4	68	56	67	
5.5	68	62	67	
7.5	73	62	70	
11	70	66	70	
15	70	66	57	
18.5	70	63	57	
22	70	63	59	
30	71	65	59	
37	71	65	61	
45	75	65	64	
55	75	68	64	
75	77	71	63	
90	77	71	63	
110	81	75	62	
132	81	75	62	
132	81	75	6	

	Maximum sound pressure level [dB(A)] - ISO 3743				
Motor [kW]	Three-phase motors				
	2-pole	4-pole	6-pole		
160	81	75	66		
200	81	75	70		
280	86	-	72		
288	-	77	75		
353	86	-	-		
362	-	77	-		
398	81	-	-		
408	-	79	-		
460	-	79	-		

13.4 Belt drive

If the unit is belt-driven, the following data must not be exceeded:

Speed n	Max. m	otor po	wer [kW	/] for sh	aft end
[min ⁻¹]	Ø24	Ø32	Ø42	Ø48	Ø60
1000	4	7	11	18	22
1500	5	10	25	32	38
2000	6	14	25	-	-
2500	7	17.5	-	-	-
3000	10	20	-	-	-

For higher power outputs, mount an intermediate shaft with pedestal bearings.

13.5 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.

14. 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*.

A.1. 中国 RoHS

产品中有害物质的名称及含量

		有害物质					
部件名称	铅	汞	镉	六价铬	多溴联苯	多溴联苯醚	
	(Pb)	(Hg)	(Cd)	(Cr6+)	(PBB)	(PBDE)	
泵壳	Х	0	0	0	0	0	
紧固件	Х	0	0	0	0	0	
管件	Х	0	0	0	0	0	
定子	Х	0	0	0	0	0	
转子	Х	0	0	0	0	0	

本表格依据 SJ/T 11364 的规定编制

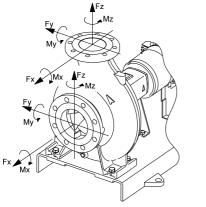
O:表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 该规定的限量要求。



该产品环保使用期限为10年,标识如左图所示。 此环保期限只适用于产品在安装与使用说明书中所规定的条件下工作

B.1. Flange forces and torques



TM045621

Flange forces and torques

Cast iron flanges	Diameter DN	Force [N]				Torque [N-m]				
		Fy	Fz	Fx	ΣF ¹⁾	Му	Mz	Мx	ΣM ¹⁾	
	25	245	298	263	455	210	245	315	455	
	32	298	368	315	578	263	298	385	560	
	40	350	438	385	683	315	368	455	665	
	50	473	578	525	910	350	403	490	718	
	65	595	735	648	1155	385	420	525	770	
	80	718	875	788	1383	403	455	560	823	
	100	945	1173	1050	1838	438	508	613	910	
Horizontal pump, x-axis, inlet port	125	1120	1383	1243	2170	525	665	735	1068	
	150	1418	1750	1575	2643	613	718	875	1278	
	200	1890	2345	2100	3658	805	928	1138	1680	
	250	2700	3460	2980	5220	1260	1460	1780	2620	
	300	3220	4000	3580	6260	1720	1980	2420	3560	
	350	3760	4660	4180	7300	2200	2540	3100	4560	
	400	4300	5320	4780	8340	2760	3180	3880	5720	
	450	4840	5980	5380	9380	3400	3920	4780	7040	
	500	5380	6640	5980	10420	4100	4720	5780	8520	

Coot iven florance	Diamates DN		Forc	e [N]		Torque [N-m]				
Cast iron flanges	Diameter DN	Fy	Fz	Fx	ΣF ¹⁾	Му	Mz	Мх	ΣM ¹	
	32	315	298	368	578	263	298	385	560	
	40	385	350	438	683	315	368	455	665	
	50	525	473	578	910	350	403	490	718	
Horizontal pump, x-axis, outlet port	65	648	595	735	1155	385	420	525	770	
	80	788	718	875	1383	403	455	560	823	
	100	1050	945	1173	1838	438	508	613	910	
	125	1243	1120	1383	2170	525	665	735	106	
	150	1575	1418	1750	2748	613	718	875	127	
	200	2100	1890	2345	3658	805	928	1138	168	
	250	2980	2700	3340	5220	1260	1460	1780	2620	
	300	3580	3220	4000	6260	1720	1980	2420	392	
	350	4180	3760	4660	7300	2200	2540	3100	4560	
	400	4780	4300	5320	8340	2760	3180	3880	5720	
	450	5380	5080	5980	9380	3400	3920	4780	7040	
	500	5980	5380	6640	10420	4100	4720	5780	8520	

1) ΣF and ΣM are vector sums of the forces and torques

Stainless steel flanges	Diameter DN		Forc	e [N]		Torque [N-m]				
		Fy	Fz	Fx	ΣF ²⁾	Му	Mz	Mx	ΣM ²⁾	
	25	490	595	525	910	420	490	630	910	
	32	595	735	630	1155	525	595	770	1120	
	40	700	875	770	1365	630	735	910	1330	
	50	945	1155	1050	1820	700	805	980	1435	
	65	1190	1470	1295	2310	770	840	1050	1540	
	80	1435	1750	1575	2765	805	910	1120	1645	
Horizontal pump, x-axis, inlet port	100	1890	2345	2100	3675	875	1015	1225	1820	
	125	2240	2765	2485	4340	1050	1330	1470	2135	
	150	2835	3500	3150	5285	1225	1435	1750	2555	
	200	3780	4690	4200	7315	1610	1855	2275	3360	
	250	4725	6055	5215	9135	2205	2555	3115	4585	
	300	5635	7000	6265	10955	3010	3465	4235	6230	
	350	6580	8155	7315	12775	3850	4445	5425	7980	
	400	7525	9310	8365	14595	4830	5565	6790	10010	
	450	8470	10465	9415	16415	5950	6860	8365	12320	
	500	9415	11620	10465	18235	7175	8260	10115	14910	

Stainless steel flanges	Diameter DN	Force [N]				Torque [N-m]				
		Fy	Fz	Fx	ΣF ²⁾	Му	Mz	Мx	ΣM ²⁾	
	32	630	595	735	1155	525	595	770	1120	
	40	770	700	875	1365	630	735	910	1330	
	50	1050	945	1155	1820	700	805	980	1435	
	65	1295	1190	1470	2310	770	840	1050	1540	
Horizontal pump, x-axis, outlet port	80	1575	1435	1750	2765	805	910	1120	1645	
	100	2100	1890	2345	3675	875	1015	1225	1820	
	125	2485	2240	2765	4340	1050	1330	1470	2135	
	150	3150	2835	3500	5495	1225	1435	1750	2555	
	200	4200	3780	4690	7315	1610	1855	2275	3360	
	250	5215	4725	5845	9135	2205	2555	3115	4585	
	300	6265	5635	7000	10955	3010	3465	4235	6860	
	350	7315	6580	8155	12775	3850	4445	5425	7980	
	400	8365	7525	9310	14595	4830	5565	6790	10010	
	450	9415	8890	10465	16415	5950	6860	8365	12320	
	500	10465	9415	11620	18235	7175	8260	10115	14910	

2) ΣF and ΣM are vector sums of the forces and torques

If not all loads reach the maximum permissible value, one of the values is allowed to exceed the normal limit. Contact Grundfos for further information.

Argentina

Bombas GRUNDFOS de Argentina S.A. Ruta Panamericana km. 37.500industin 1619 - Garín Pcia. de B.A. Tel.: +54-3327 414 444 Fax: +54-3327 45 3190

Australia

GRUNDFOS Pumps Pty. Ltd. P.O. Box 2040 Regency Park South Australia 5942 Tel.: +61-8-8461-4611 Fax: +61-8-8340-0155

Austria

GRUNDFOS Pumpen Vertrieb Ges.m.b.H. Grundfosstraße 2 A-5082 Grödig/Salzburg Tel.: +43-6246-883-0 Fax: +43-6246-883-30

Belaium

N.V. GRUNDFOS Bellux S.A. Boomsesteenweg 81-83 B-2630 Aartselaar Tel.: +32-3-870 7300 Fax: +32-3-870 7301

Bosnia and Herzegovina

GRUNDFOS Sarajevo Zmaja od Bosne 7-7A BiH-71000 Sarajevo Tel.: +387 33 592 480 Fax: +387 33 590 465 www.ba.grundfos.com E-mail: grundfos@bih.net.ba

Brazil

BOMBAS GRUNDFOS DO BRASIL Av. Humberto de Alencar Castelo Branco, 630 CEP 09850 - 300 São Bernardo do Campo - SP Tel.: +55-11 4393 5533 Fax: +55-11 4343 5015

Bulgaria

Grundfos Bulgaria EOOD Slatina District Liztochna Tangenta street no. 100 BG - 1592 Sofia Tel.: +359 2 49 22 200 Fax: +359 2 49 22 201 E-mail: bulgaria@grundfos.bg

Canada

GRUNDFOS Canada inc. 2941 Brighton Road Oakville, Ontario L6H 6C9 Tel.: +1-905 829 9533 Fax: +1-905 829 9512

China

GRUNDFOS Pumps (Shanghai) Co. Ltd. 10F The Hub, No. 33 Suhong Road Minhang District Shanghai 201106 PRC Tel.: +86 21 612 252 22 Fax: +86 21 612 253 33

Columbia

GRUNDFOS Colombia S.A.S. Km 1.5 vía Siberia-Cota Conj. Potrero Chico, Parque Empresarial Arcos de Cota Bod. 1A. Cota, Cundinamarca Tel.: +57(1)-2913444 Fax: +57(1)-8764586

Croatia

GRUNDFOS CROATIA d.o.o. Buzinski prilaz 38, Buzin HR-10010 Zagreb Tel.: +385 1 6595 400 Fax: +385 1 6595 499 www.hr.grundfos.com

Czech Republic

GRUNDFOS Sales Czechia and Slovakia s.r.o. Čajkovského 21 779 00 Olomouc Tel.: +420-585-716 111

Denmark

GRUNDFOS DK A/S Martin Bachs Vej 3 DK-8850 Bjerringbro Tel.: +45-87 50 50 50 Fax: +45-87 50 51 51 E-mail: info_GDK@grundfos.com www.grundfos.com/DK

Estonia

GRUNDFOS Pumps Eesti OÜ Peterburi tee 92G 11415 Tallinn Tel.: + 372 606 1690 Fax: + 372 606 1691

Finland

OY GRUNDFOS Pumput AB Trukkikuja 1 FI-01360 Vantaa Tel.: +358-(0) 207 889 500

France

Pompes GRUNDFOS Distribution S.A. Parc d'Activités de Chesnes 57, rue de Malacombe F-382:90 St. Quentin Fallavier (Lyon) Tel.: +33-4 74 82 15 15 Fax: +33-4 74 94 10 51

Germany

GRUNDFÓS GMBH Schlüterstr. 33 40699 Erkrath Tel.: +49-(0) 211 929 69-0 Fax: +49-(0) 211 929 69-3799 E-mail: infoservice@grundfos.de Service in Deutschland: kundendienst@grundfos.de

Greece

GRUNDFOS Hellas A.E.B.E. 20th km. Athinon-Markopoulou Av. P.O. Box 71 GR-19002 Peania Tel.: +0030-210-66 83 400 Fax: +0030-210-66 46 273

Hong Kong

GRUNDFOS Pumps (Hong Kong) Ltd. Unit 1, Ground floor, Siu Wai industrial Centre 29-33 Wing Hong Street & 68 King Lam Street, Cheung Sha Wan Kowloon Tel.: +852-27861706 / 27861741 Fax: +852-27858664

Hungary

GRUNDFOS South East Europe Kft. Tópark u. 8 H-2045 Törökbálint Tel: +36-23 511 110 Fax: +36-23 511 111

India

GRUNDFOS Pumps india Private Limited 118 Old Mahabalipuram Road Thoraipakkam Chennai 600 097 Tel:: +91-44 2496 6800

Indonesia

PT GRUNDFOS Pompa Graha intirub Lt. 2 & 3 Jln. Cililitan Besar No.454. Makasar, Jakarta Timur ID-Jakarta 13650 Tel.: +62 21-469-51900 Fax: +62 21-460 6910 / 460 6901

Ireland

GRUNDFOS (Ireland) Ltd. Unit A, Merrywell Business Park Ballymount Road Lower Dublin 12 Tel.: +353-1-4089 800 Fax: +353-1-4089 830

Italy

GRÚNDFOS Pompe Italia S.r.I. Via Gran Sasso 4 I-20060 Truccazzano (Milano) Tel.: +39-02-95838112 Fax: +39-02-95309290 / 95838461

Japan

GRUNDFOS Pumps K.K. 1-2-3, Shin-Miyakoda, Kita-ku Hamamatsu 431-2103 Japan Tel.: +81 53 428 4760 Fax: +81 53 428 5005

Kazakhstan

Grundfos Kazakhstan LLP 7' Kyz-Zhibek Str., Kok-Tobe micr. KZ-050020 Almaty Kazakhstan Tel.: +7 (727) 227-98-55/56

Korea

GRUNDFOS Pumps Korea Ltd. 6th Floor, Aju Building 679-5 Yeoksam-dong, Kangnam-ku, 135-916 Seoul, Korea Tel.: +82-2-5317 600 Fax: +822-25633 725

Latvia

SIA GRUNDFOS Pumps Latvia Deglava biznesa centrs Augusta Deglava ielā 60 LV-1035, Rīga, Tel.: + 371 714 9640, 7 149 641 Fax: + 371 914 9646

Lithuania

GRUNDFOS Pumps UAB Smolensko g. 6 LT-03201 Vilnius Tel.: + 370 52 395 430 Fax: + 370 52 395 431

Malaysia

GRUNDFOS Pumps Sdn. Bhd. 7 Jalan Peguam U1/25 Glenmarie industrial Park 40150 Shah Alam, Selangor Tel.: +60-3-5569 2922 Fax: +60-3-5569 2866

Mexico

Bombas GRUNDFOS de México S.A. de C.V. Boulevard TLC No. 15 Parque industrial Stiva Aeropuerto Apodaca, N.L. 66600 Tel.: +52-81-8144 4000 Fax: +52-81-8144 4010

Netherlands

GRUNDFOS Netherlands Veluwezoom 35 1326 AE Almere Postbus 22015 1302 CA ALMERE Tel.: +31-88-478 6336 Fax: +31-88-478 6332 E-mail: info_gnl@grundfos.com

New Zealand

GRUNDFOS Pumps NZ Ltd. 17 Beatrice Tinsley Crescent North Harbour Industrial Estate Albany, Auckland Tel.: +64-9-415 3250

Norway

GRUNDFOS Pumper A/S Strømsveien 344 Postboks 235, Leirdal N-1011 Oslo Tel.: +47-22 90 47 00 Fax: +47-22 32 21 50

Poland

GRUNDFOS Pompy Sp. z o.o. ul. Klonowa 23 Baranowo k. Poznania PL-62-081 Przeźmierowo Tel.: (+48-61) 650 13 00 Fax: (+48-61) 650 13 50

Portugal

Bombaš GRUNDFOS Portugal, S.A. Rua Calvet de Magalhães, 241 Apartado 1079 P-2770-153 Paço de Arcos Tel.: +351-21-440 76 00 Fax: +351-21-440 76 90

Romania

GRUNDFOS Pompe România SRL S-PARK BUSINESS CENTER, Cládirea A2, etaj 2 Str. Tipografilor, Nr. 11-15, Sector 1, Cod 013714 Bucuresti, Romania Tel.: 004 021 2004 100 E-mail: romania@grundfos.ro

Serbia

Grundfos Srbija d.o.o. Omladinskih brigada 90b 11070 Novi Beograd Tel.: +381 11 2258 740 Fax: +381 11 2281 769 www.rs.grundfos.com

Singapore

GRUNDFOS (Singapore) Pte. Ltd. 25 Jalan Tukang Singapore 619264 Tel.: +65-6681 9688 Faxax: +65-6681 9689

Slovakia

GRUNDFOS s.r.o. Prievozská 4D 821 09 BRATISLAVA Tel.: +421 2 5020 1426 sk.grundfos.com

Slovenia

GRUNDFOS LJUBLJANA, d.o.o. Leskoškova 9e, 1122 Ljubljana Tel.: +386 (0) 1 568 06 10 Fax: +386 (0)1 568 06 19 E-mail: tehnika-si@grundfos.com

South Africa

GRUNDFOS (PTY) LTD 16 Lascelles Drive, Meadowbrook Estate 1609 Germiston, Johannesburg Tel.: (+27) 10 248 6000 Fax: (+27) 10 248 6002 E-mail: Igradidge@grundfos.com

Spain

Bombas GRUNDFOS España S.A. Camino de la Fuentecilla, s/n E-28110 Algete (Madrid) Tel.: +34-91-848 8800 Fax: +34-91-628 0465

Sweden

GRUNDFOS AB Box 333 (Lunnagårdsgatan 6) 431 24 Mölndal Tel.: +46 31 332 23 000 Fax: +46 31 331 94 60

Switzerland

GRUNDFOS Pumpen AG Bruggacherstrasse 10 CH-8117 Fällanden/ZH Tel.: +41-44-806 8111 Fax: +41-44-806 8115

Taiwan

GRUNDFOS Pumps (Taiwan) Ltd. 7 Floor, 219 Min-Chuan Road Taichung, Taiwan, R.O.C. Tel.: +886-4-2305 0868 Fax: +886-4-2305 0878

Thailand

GRUNDFOS (Thailand) Ltd. 92 Chaloem Phrakiat Rama 9 Road Dokmai, Pravej, Bangkok 10250 Tel. + 66-2-725 8999 Fax: +66-2-725 8998

Turkey

GRUNDFOS POMPA San. ve Tic. Ltd. Sti. Gebze Organize Sanayi Bölgesi Ihsan dede Caddesi 2. yol 200. Sokak No. 204 41490 Gebze/ Kocaeli Tel.: +90 - 262-679 7979 Fax: +90 - 262-679 7905 E-mail: satis@grundfos.com

Ukraine

ТОВ "ГРУНДФОС УКРАїНА" Бізнес Центр Європа Столичне шосе, 103 м. Київ, 03131, Україна ТеІ.: (+38 044) 237 04 00 Fax: (+38 044) 237 04 01 E-mail: ukraine@grundfos.com

United Arab Emirates

GRUNDFOS Gulf Distribution P.O. Box 16768 Jebel Ali Free Zone, Dubai Tel.: +971 4 8815 166 Fax: +971 4 8815 136

United Kingdom

GRUNDFOS Pumps Ltd. Grovebury Road Leighton Buzzard/Beds. LU7 4TL Tel.: +44-1525-850000 Fax: +44-1525-850011

U.S.A.

Global Headquarters for WU 856 Koomey Road Brookshire, Texas 77423 USA Phone: +1-630-236-5500

Uzbekistan

Grundfos Tashkent, Uzbekistan The Representative Office of Grundfos Kazakhstan in Uzbekistan 38a, Oybek street, Tashkent Tel.: (+998) 71 150 3290 / 71 150 3291 Fax: (+998) 71 150 3292

96646512 03.2024

ECM: 1391025



www.grundfos.com