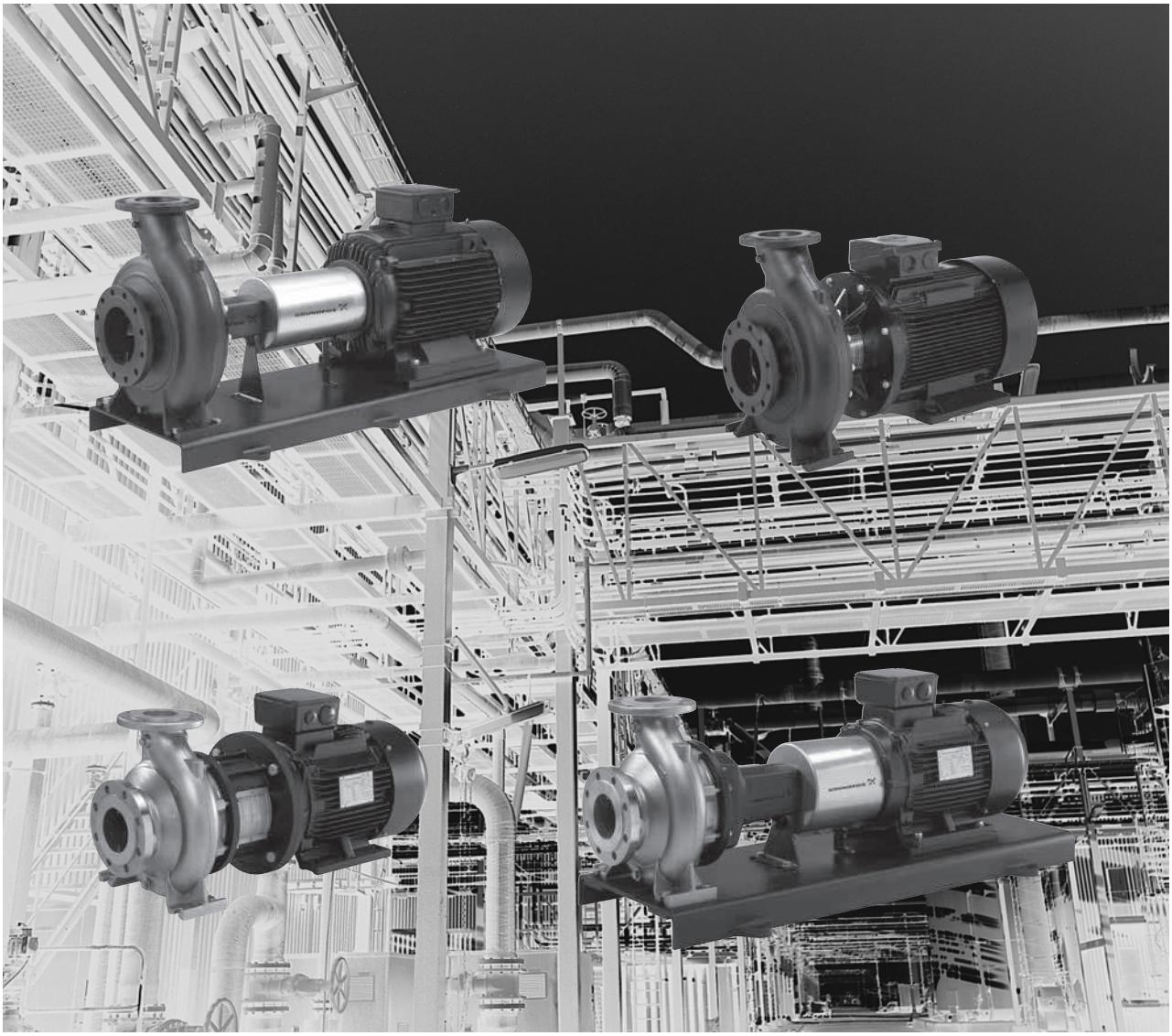
GRUNDFOS **DATA BOOKLET**

NBG, NBGE, NKG, NKGE

Single-stage end-suction pumps according to ISO 2858
50 Hz



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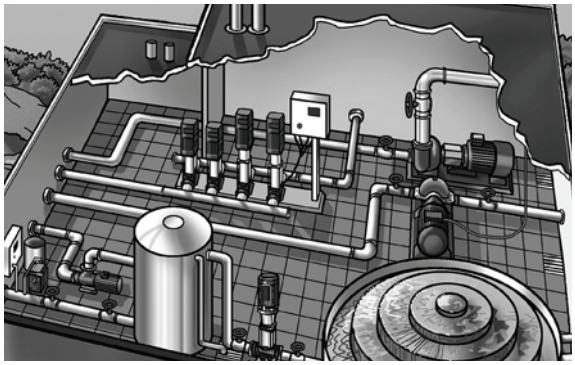
Introduction

NBG and NKG are multi-purpose pumps suitable for a variety of different applications demanding reliable and cost-efficient supply.

NBG and NKG pumps are used in five main fields of application:

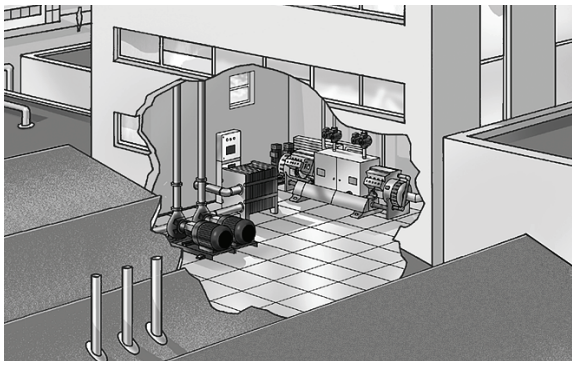
- water supply
- industrial pressure boosting
- industrial liquid transfer
- HVAC
- irrigation.



Water supply

Besides general water supply in municipal and industrial waterworks, the NBG and NKG pumps are used for these specific applications:

- filtration and transfer at waterworks
- pressure boosting in mains
- pressure boosting in high-rise buildings, hotels, etc.
- pressure boosting in industrial buildings
- various swimming bath applications.



Industrial pressure boosting

Pressure boosting in:

- industrial washing and cleaning systems
- industrial washdown systems
- vehicle washing tunnels
- fire protection systems.

Industrial liquid transfer

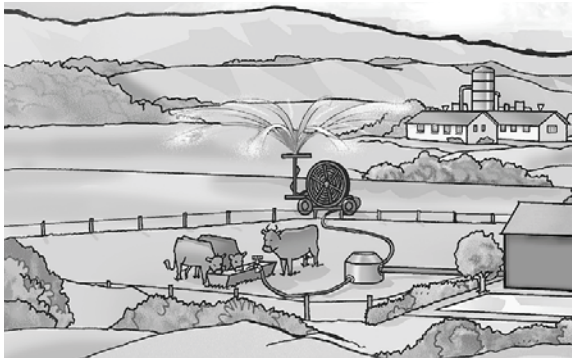
Liquid transfer in:

- cooling and air-conditioning systems (refrigerants)
- boiler-feed and condensate systems
- aquafarming
- industrial heating systems
- district heating plants.

HVAC

Liquid transfer in:

- heating systems
- ventilation systems
- air-conditioning systems



Irrigation

Irrigation covers these applications:

- field irrigation (flooding)
- sprinkler irrigation
- drip-feed irrigation.

Features and benefits

NBG and NKG pumps present these features and benefits:

- All NKG pumps are according to ISO 5199.
- The pumps are non-self-priming, single-stage, centrifugal volute pumps with axial suction port, radial discharge port and horizontal shaft.
- Suction and discharge flanges are PN 16 according to EN 1092-2.
- Dimensions and rated performance are according to ISO 2858 (16 bar).
- The NBG pump is close-coupled with a totally enclosed fan-cooled standard motor with main dimensions to IEC and DIN standards
- The NKG pump is long-coupled with a totally enclosed fan-cooled standard motor with main dimensions to IEC and DIN standards and mounting designation B3 (IM 1001).
- The mechanical shaft seal has dimensions according to EN 12756.
- NBG and NKG pumps offer flow rates from 2 to 1200 m^3/h and heads from 2 to 160 m. Motor sizes fall in the 0.25 to 355 kW range.
- Pumps with power requirement of 1.1 to 22 kW are available with motors with built-in frequency converter. These pumps are called NBGE and NKGE.
- All pumps are statically balanced according to ISO 1940 class 6.3.
  Impellers are hydraulically balanced.
- The NKG pump and motor are mounted on a common, steel base frame in accordance with EN 23661.
- The NBG and NKG product ranges are available in two product series, "standard range" and "premium range". Premium-range products are available with EFF1 motors; standard-range products with EFF2 motors.
- The pumps are of the back pull-out design enabling removal of the motor, coupling, bearing bracket and impeller without disturbing the pump housing or pipework. Even the largest pumps can thus be serviced by a single person with a crane. See fig. 1 and fig. 2.

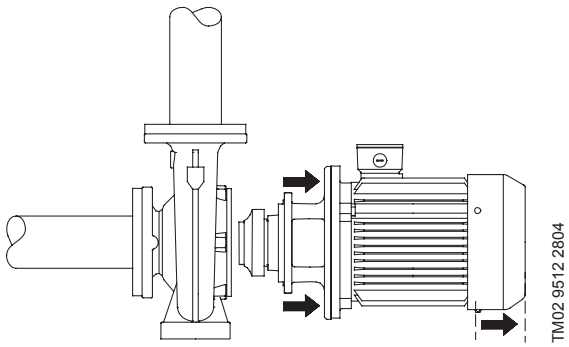


Fig. 1 NBG back pull-out design

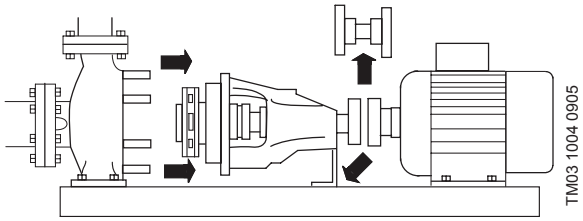


Fig. 2 NKG back pull-out design

High-efficiency motors

Premium range 2- and 4-pole NBG and NKG pumps with motor sizes from 1.1 to 90 kW are fitted with high-efficiency motors (EFF1). EFF1 is the highest efficiency class defined by CEMEP (European Committee of Manufacturers of Electrical Machines and Power Electronics).

Features and benefits

Pumps with electronic speed control

NBG and NKG pumps equipped with a motor with built-in frequency converter and the necessary application software to achieve an all-in-one solution enable electronic speed control. These pumps are called NBGE and NKGE.

Electronic speed control enables continuously variable control of motor speed which again enables adaptation of the performance to a given requirement.

The pump materials of NBGE and NKGE pumps are the same as those of the NBG and NKG pump range.

If a sensor is installed, NBGE and NKGE pumps allow for any of these configurations and control methods:

- constant pressure
- temperature control
- constant flow.

Why select an NBGE, NKGE pump?

Select an NBGE, NKGE pump if

- controlled operation is required
- constant pressure is required
- communication with the pump is required.

This furthermore gives these obvious advantages:

- energy savings
- increased comfort.

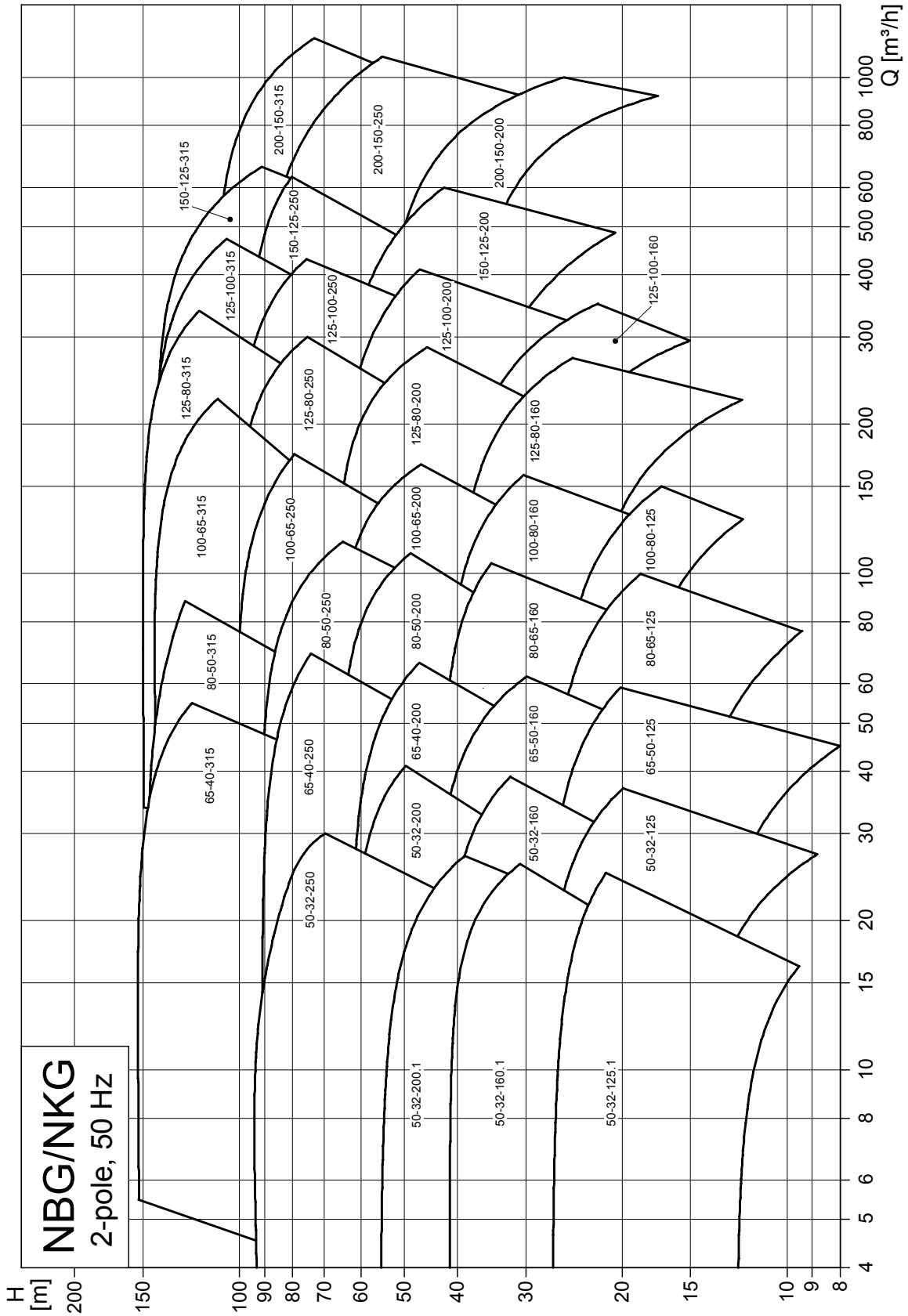
For further information on electronic speed control, see section "Speed-controlled NBG and NKG pumps" on page 33.

ATEX-approved NBG and NKG pumps

On request, Grundfos offers NBG and NKG pumps with ATEX-approval in accordance with Directive 94/9/EC (group II, category 3G and 3D). If an ATEX-approved dry-running protection is installed, the pump can be upgraded to category 2G.

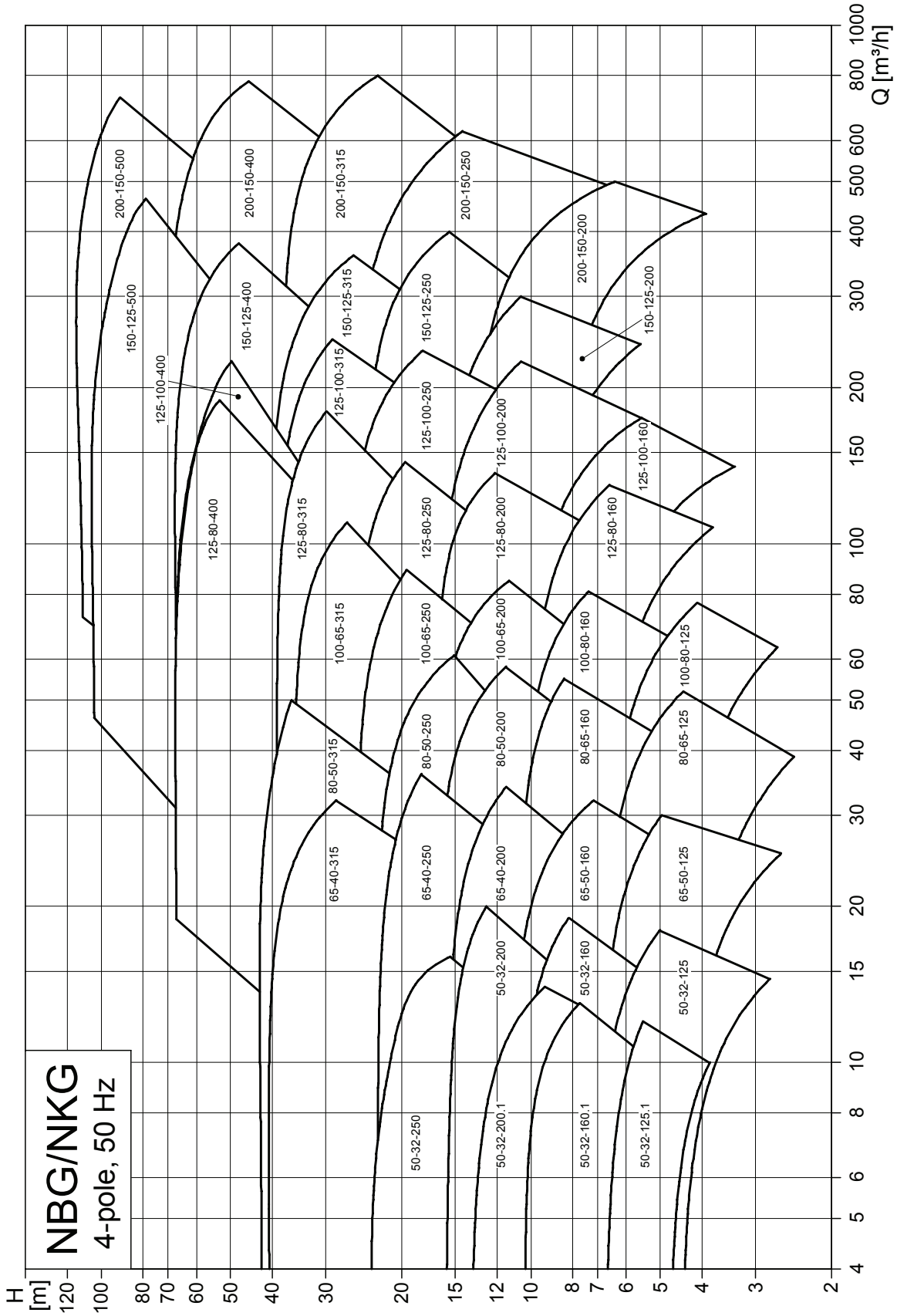
Performance range

NBG, NKG, 2-pole



Performance range

NBG, NKG, 4-pole



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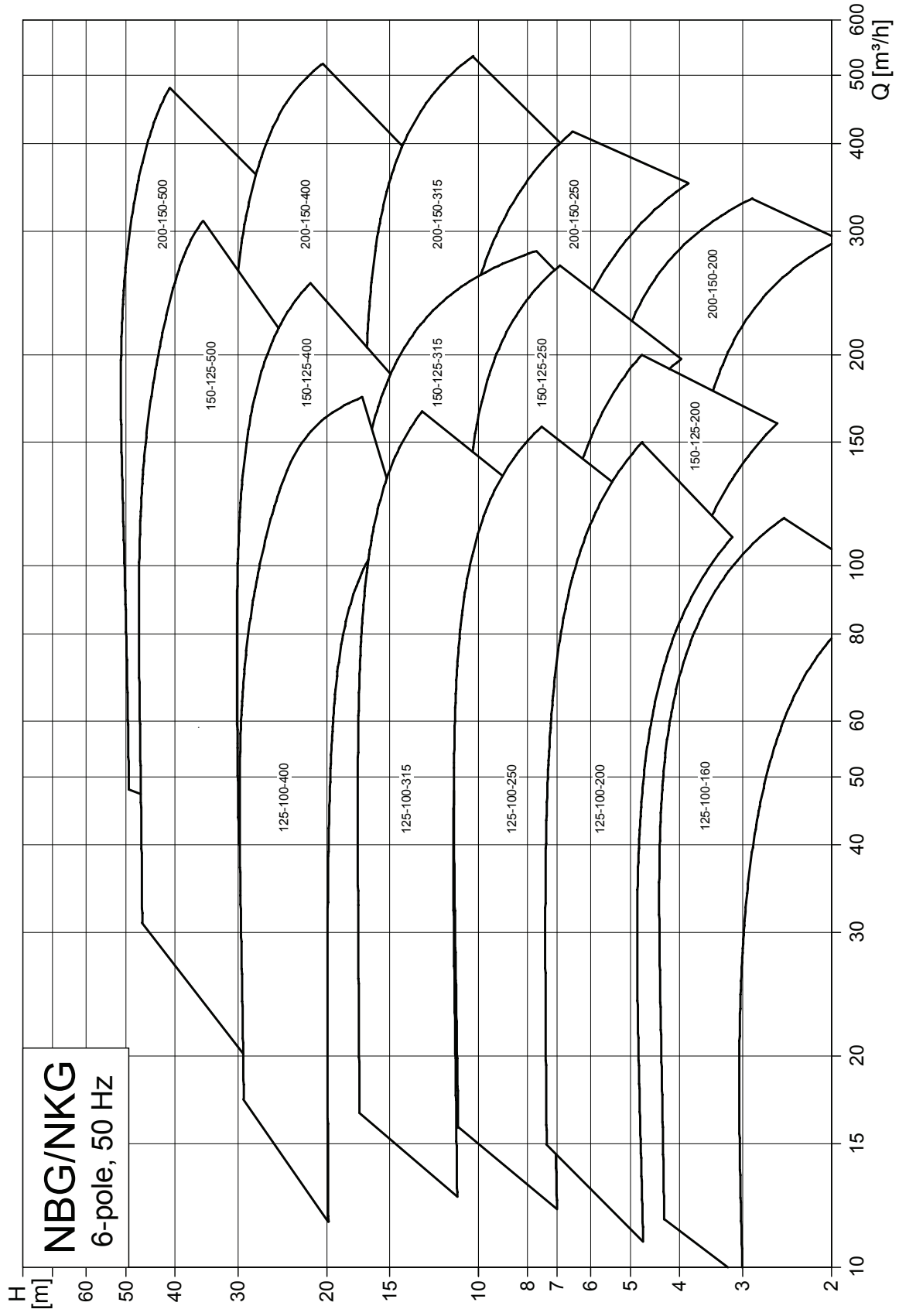
Performance range

NBG, NKG, 6-pole



Product range

The tables on the following pages show the complete NGB, NBGE and NKG, NKGE product ranges. The product range includes the pumps in WinCAPS.

The standard range has been combined on the basis of the following parameters:

- Pump housings have discharge flanges from DN 32 to DN 150.
- Motors are 50 Hz.
- NBG and NKG pumps are available with 2-, 4- and 6-pole motors, NBGE and NKGE with 2- and 4-pole motors.
- NBG and NKG pumps are available with Premium range and Standard range motors.
- Motors with power rating up to and including 4 kW are available for "low voltage"; motors as from 2.2 kW are available for "high voltage".
- The range of pumps with electronically speed-controlled motors (three-phase) covers 2-pole motors from 1.5 to 22 kW and 4-pole motors from 0.75 to 22 kW.

To a great extent the pumps can be adapted to the requirements of the individual customer. For customized solutions, please contact Grundfos.

NBG, NKG, 2-pole

Pump type 50 Hz, 2-pole	NKG model	NBG design	Available in stainless steel	Available as NBGE/NKGE	Pressure stage PN 16	P_2 [kW]
50-32-125.1	B	A			●	0.75
		A			●	1.1
		A		●	●	1.5
		A		●	●	2.2
50-32-160.1	B	A		●	●	1.5
		A		●	●	2.2
		A		●	●	3
		A		●	●	4
50-32-200.1	B	A		●	●	3
		A		●	●	4
		A		●	●	5.5
		A		●	●	7.5
50-32-125	B	A		●	●	1.1
		A		●	●	1.5
		A		●	●	2.2
		A		●	●	3
50-32-160	B	A		●	●	2.2
		A		●	●	3
		A		●	●	4
		A		●	●	5.5
50-32-200	B	A		●	●	4
		A		●	●	5.5
		A		●	●	7.5
		A		●	●	11
50-32-250	B	A	●	●	●	5.5
		A	●	●	●	7.5
		C	●	●	●	11
		C	●	●	●	15
65-50-125	B	A	●	●	●	1.5
		A	●	●	●	2.2
		A	●	●	●	3
		A	●	●	●	4
		A	●	●	●	5.5
65-50-160	B	A	●	●	●	4
		A	●	●	●	5.5
		A	●	●	●	7.5
		C	●	●	●	11
65-40-200	B	A	●	●	●	5.5
		A	●	●	●	7.5
		B	●	●	●	11
		B	●	●	●	15
65-40-250	B	B	●	●	●	11
		B	●	●	●	15
		B	●	●	●	18.5
		B	●	●	●	22
		B	●		●	30
65-40-315	B	C	●	●	●	22
		C	●		●	30
		C	●		●	37
		C	●		●	45
		C	●		●	55

Pump type 50 Hz, 2-pole	NKG model	NBG design	Available in stainless steel	Available as NBGE/NKGE	Pressure stage PN 16	P_2 [kW]
80-65-125	B	A	●	●	●	3
		A	●	●	●	4
		A	●	●	●	5.5
		A	●	●	●	7.5
80-65-160	B	A	●	●	●	5.5
		A	●	●	●	7.5
		B	●	●	●	11
		B	●	●	●	15
80-50-200	B	B	●	●	●	11
		B	●	●	●	15
		B	●	●	●	18.5
		B	●	●	●	22
80-50-250	B	B	●	●	●	15
		B	●	●	●	18.5
		B	●	●	●	22
		B	●		●	30
		B	●		●	37
80-50-315	B	C	●		●	30
		C	●		●	37
		C	●		●	45
		C	●		●	55
		C	●		●	75
		C	●		●	90
100-80-125	B	A	●	●	●	4
		A	●	●	●	5.5
		A	●	●	●	7.5
		C	●	●	●	11
100-80-160	B	A	●	●	●	7.5
		C	●	●	●	11
		C	●	●	●	15
		C	●	●	●	18.5
100-65-200	B	C	●	●	●	11
		C	●	●	●	15
		C	●	●	●	18.5
		C	●	●	●	22
		C	●		●	30
		C	●		●	37
100-65-250	B	C	●		●	30
		C	●		●	37
		C	●		●	45
		C	●		●	55
		C	●		●	75
100-65-315	B	C	●		●	55
		C	●		●	75
		C	●		●	90
		C	●		●	110
125-80-160	B	C	●	●	●	11
		C	●	●	●	15
		C	●	●	●	18.5
		C	●	●	●	22
		C	●		●	30

Product range

Pump type 50 Hz, 2-pole	NKG model	NBG design	Available in stainless steel	Available as NBGE/NKGE	Pressure stage PN 16	P_2 [kW]
125-80-200	B	C	●	●	●	22
		C	●		●	30
		C	●		●	37
		C	●		●	45
		C	●		●	55
125-80-250	B	C	●		●	45
		C	●		●	55
		C	●		●	75
		C	●		●	90
125-80-315	B	C	●		●	90
		C	●		●	110
		C	●		●	132
		C	●		●	160
		C	●		●	200
125-100-160	B	C		●	●	22
		C			●	30
		C			●	37
125-100-200	B	C			●	30
		C			●	37
		C			●	45
		C			●	55
		C			●	75
125-100-250	B	C			●	55
		C			●	75
		C			●	90
		C			●	110
		C			●	132
125-100-315	B	C			●	110
		C			●	132
		C			●	160
		C			●	200
		-			●	250
150-125-200	B	C			●	45
		C			●	55
		C			●	75
		C			●	90
		C			●	110
150-125-315	B	C			●	90
		C			●	110
		C			●	132
		C			●	160
		C			●	200
150-125-315	B	C			●	132
		C			●	160
		C			●	200
		-			●	250
200-150-200	B	C			●	75
		C			●	90
		C			●	110
200-150-250	B	C			●	132
		C			●	160
		C			●	200
		-			●	250
200-150-315	B	-			●	250
		-			●	315
		-			●	355

NBG, NKG, 4-pole

Pump type 50 Hz, 4-pole	NKG model	NBG design	Available in stainless steel	Available as NBGE/NKGE	Pressure stage PN 16	P_2 [kW]
50-32-125.1	B	A			●	0.25
		A			●	0.25
		A			●	0.37
50-32-160.1	B	A			●	0.25
		A			●	0.25
		A			●	0.37
		A			●	0.55
50-32-200.1	B	A			●	0.37
		A			●	0.55
		A		●	●	0.75
50-32-125	B	A			●	0.25
		A			●	0.25
		A			●	0.37
50-32-160	B	A			●	0.25
		A			●	0.37
		A			●	0.55
		A		●	●	0.75
50-32-200	B	A			●	0.55
		A		●	●	0.75
		A		●	●	1.1
		A		●	●	1.5
50-32-250	B	A	●	●	●	0.75
		A	●	●	●	1.1
		A	●	●	●	1.5
		A	●	●	●	2.2
65-50-125	B	A	●		●	0.25
		A	●		●	0.37
		A	●		●	0.55
65-50-160	B	A	●		●	0.37
		A	●		●	0.55
		A	●	●	●	0.75
		A	●	●	●	1.1
65-40-200	B	A	●	●	●	0.75
		A	●	●	●	1.1
		A	●	●	●	1.5
		A	●	●	●	2.2
65-40-250	B	A	●	●	●	1.5
		A	●	●	●	2.2
		A	●	●	●	3
65-40-315	B	A	●	●	●	3
		A	●	●	●	4
		A	●	●	●	5.5
		A	●	●	●	7.5
80-65-125	B	A	●		●	0.37
		A	●		●	0.55
		A	●	●	●	0.75
		A	●	●	●	1.1
80-65-160	B	A	●	●	●	0.55
		A	●	●	●	0.75
		A	●	●	●	1.1
		A	●	●	●	1.5
		A	●	●	●	2.2

Pump type 50 Hz, 4-pole	NKG model	NBG design	Available in stainless steel	Available as NBGE/NKGE	Pressure stage PN 16	P_2 [kW]
80-50-200	B	A	●	●	●	1.1
		A	●	●	●	1.5
		A	●	●	●	2.2
		A	●	●	●	3
80-50-250	B	A	●	●	●	2.2
		A	●	●	●	3
		A	●	●	●	4
80-50-315	B	A	●	●	●	4
		A	●	●	●	5.5
		A	●	●	●	7.5
		C	●	●	●	11
100-80-125	B	A	●		●	0.55
		A	●	●	●	0.75
		A	●	●	●	1.1
100-80-160	B	A	●	●	●	0.75
		A	●	●	●	1.1
		A	●	●	●	1.5
		A	●	●	●	2.2
100-65-200	B	A	●	●	●	1.5
		A	●	●	●	2.2
		A	●	●	●	3
		A	●	●	●	4
100-65-250	B	A	●	●	●	3
		A	●	●	●	4
		A	●	●	●	5.5
		A	●	●	●	7.5
100-65-315	B	A	●	●	●	5.5
		A	●	●	●	7.5
		B	●	●	●	11
		B	●	●	●	15
125-80-160	B	A	●	●	●	1.5
		A	●	●	●	2.2
		A	●	●	●	3
		A	●	●	●	4
125-80-200	B	A	●	●	●	2.2
		A	●	●	●	3
		A	●	●	●	4
		A	●	●	●	5.5
		A	●	●	●	7.5
125-80-250	B	A	●	●	●	5.5
		A	●	●	●	7.5
		B	●	●	●	11
125-80-315	B	C	●	●	●	11
		C	●	●	●	15
		C	●	●	●	18.5
		C	●	●	●	22
125-80-400	B	C	●	●	●	18.5
		C	●	●	●	22
		C	●		●	30
		C	●		●	37
		C	●		●	45

Product range

Pump type 50 Hz, 4-pole	NKG model	NBG design	Available in stainless steel	Available as NBGE/NKGE	Pressure stage PN 16	P_2 [kW]
125-100-160	B	A		●	●	2.2
		A		●	●	3
		A		●	●	4
125-100-200	B	A		●	●	4
		A		●	●	5.5
		A		●	●	7.5
		C		●	●	11
125-100-250	B	A		●	●	7.5
		C		●	●	11
		C		●	●	15
		C		●	●	18.5
125-100-315	B	C		●	●	15
		C		●	●	18.5
		C		●	●	22
		C			●	30
125-100-400	B	C		●	●	22
		C			●	30
		C			●	37
		C			●	45
		C			●	55
150-125-200	B	A		●	●	5.5
		A		●	●	7.5
		C		●	●	11
		C		●	●	15
150-125-250	B	C		●	●	11
		C		●	●	15
		C		●	●	18.5
		C		●	●	22
		C			●	30
150-125-315	B	C		●	●	18.5
		C		●	●	22
		C			●	30
		C			●	37
		C			●	45
150-125-400	B	C			●	37
		C			●	45
		C			●	55
		C			●	75
		C			●	90
150-125-500	B	C			●	55
		C			●	75
		C			●	90
		C			●	110
		C			●	132
		C			●	160
200-150-200	B	A		●	●	7.5
		C		●	●	11
		C		●	●	15
200-150-250	B	C		●	●	15
		C		●	●	18.5
		C		●	●	22
		C			●	30
		C			●	37
		C			●	45

Pump type 50 Hz, 4-pole	NKG model	NBG design	Available in stainless steel	Available as NBGE/NKGE	Pressure stage PN 16	P_2 [kW]
200-150-315	B	C			●	37
		C			●	45
		C			●	55
		C			●	75
		C			●	90
200-150-400	B	C			●	55
		C			●	75
		C			●	90
		C			●	110
		C			●	132
		C			●	160
200-150-500	B	C			●	132
		C			●	160
		C			●	200
		-			●	250
		-			●	315

NBG, NKG, 6-pole

Pump type 50 Hz, 6-pole	NKG model	NBG design	Available in stainless steel	Available as NBGE/NKGE	Pressure stage PN 16	P_2 [kW]
125-100-160	B	A			●	0.55
		A			●	0.75
		A			●	1.1
125-100-200	B	A			●	1.1
		A			●	1.5
		A			●	2.2
		A			●	3
125-100-250	B	A			●	2.2
		A			●	3
		A			●	4
		A			●	5.5
125-100-315	B	A			●	4
		A			●	5.5
		C			●	7.5
		C			●	11
125-100-400	B	C			●	7.5
		C			●	11
		C			●	15
		C			●	18.5
150-125-200	B	A			●	1.5
		A			●	2.2
		A			●	3
		A			●	4
150-125-250	B	A			●	3
		A			●	4
		A			●	5.5
					●	7.5
150-125-315	B	A			●	5.5
		C			●	7.5
		C			●	11
		C			●	15
150-125-400	B	C			●	11
		C			●	15
		C			●	18.5
		C			●	22
		C			●	30
150-125-500	B	C			●	18.5
		C			●	22
		C			●	30
		C			●	37
		C			●	45
		C			●	55
200-150-200	B	A			●	2.2
		A			●	3
		A			●	4
200-150-250	B	A			●	4
		A			●	5.5
		C			●	7.5
		C			●	11
200-150-315	B	C			●	11
		C			●	15
		C			●	18.5
		C			●	22
200-150-400	B	C			●	18.5
		C			●	22
		C			●	30
		C			●	37
		C			●	45
200-150-500	B	C			●	37
		C			●	45
		C			●	55
		C			●	75
		C			●	90

Identification

NBG type key

The example shows an NBG 50-32-125.1, 50 Hz, with a 142 mm impeller, made of cast iron and with a BAQE shaft seal.

Example	NBG	50-32	-125	.1	/142	A	-F	-A	-BAQE

Type range

Nominal diameter of suction and discharge port (DN)

Nominal impeller diameter [mm]

Reduced performance = .1

Actual impeller diameter [mm]

Code for pump version (the codes may be combined)
- A = Basic version
- B = Oversize
- C = Without motor
- D = Pump housing with feet
- E = With ATEX approval, certificate or test report
- X = Special version

Code for pipework connection:
- F = DIN flange (EN 1092-2)

Code for materials:
- A = EN-GJL-250 pump housing, EN-GJL-200 impeller and bronze wear ring
- B = EN-GJL-250 pump housing and bronze CuSn10 impeller, bronze wear ring
- S = EN-GJL-250 pump housing and 1.4408 impeller, bronze wear ring
- N = 1.4408 pump housing and impeller, Graflon wear ring
- R = 1.4517 pump housing and impeller, Graflon wear ring
- P = 1.4408 pump housing, 1.4517 impeller, Graflon wear ring
- K = 1.4408 pump housing and impeller, 1.4517 wear ring
- L = 1.4517 pump housing, impeller and wear ring
- M = 1.4408 pump housing, 1.4517 impeller and wear ring
- X = Special version

Code for mechanical shaft seal and rubber pump parts

NKG type key

The example shows an NKG 50-32-125.1, 50 Hz, with a 142 mm impeller and a standard coupling, made of cast iron and with a BAQE shaft seal.

Example	NKG	50-32	-125	.1	/142	A1	-F	-A	-BAQE

Type range

Nominal diameter of suction and discharge port (DN)

Nominal impeller diameter [mm]

Reduced performance = .1

Actual impeller diameter [mm]

Code for pump version (the codes may be combined)
- A1 = Basic version with standard coupling
- A2 = Basic version with spacer coupling
- AH = Bare shaft pump
- C = Without motor
- E = With ATEX approval, certificate or test report
- X = Special version

Code for pipework connection:
- F = DIN flange (EN 1092-2)

Code for materials:
- A = EN-GJL-250 pump housing, EN-GJL-200 impeller and bronze wear ring
- B = EN-GJL-250 pump housing and bronze CuSn10 impeller, bronze wear ring
- S = EN-GJL-250 pump housing and 1.4408 impeller, bronze wear ring
- N = 1.4408 pump housing and impeller, Graflon wear ring
- R = 1.4517 pump housing and impeller, Graflon wear ring
- P = 1.4408 pump housing, 1.4517 impeller, Graflon wear ring
- K = 1.4408 pump housing and impeller, 1.4517 wear ring
- L = 1.4517 pump housing, impeller and wear ring
- M = 1.4408 pump housing, 1.4517 impeller and wear ring
- X = Special version

Code for mechanical shaft seal and rubber pump parts

Shaft seals

NBG and NKG pumps are available with a BAQE shaft seal as standard. Other shaft seal variants are available on request.

Codes for shaft seals

The positions (1) - (4) cover information about the shaft seal:

Example	(1)	(2)	(3)	(4)
Grundfos type designation				
Material, rotating seal face				
Material, stationary seat				
Material, secondary seal and other rubber and composite parts, except the wear ring				

The following table explains the positions (1), (2), (3) and (4).

Pos.	Type	Short description of seal
(1)	A	O-ring seal with fixed driver
	B	Rubber bellows seal
	G	Bellows seal, type B, with reduced seal faces
	D	O-ring seal, balanced
Pos.	**Type**	**Material**
(2) and (3)		Synthetic carbons:
	A	Carbon, metal-impregnated (antimony; not approved for potable water)
	B	Carbon, resin-impregnated
		Carbides:
	Q	Silicon carbide
Pos.	**Type**	**Material**
(4)	E	EPDM
	V	FKM
	F	FXM

Sectional drawing NBG

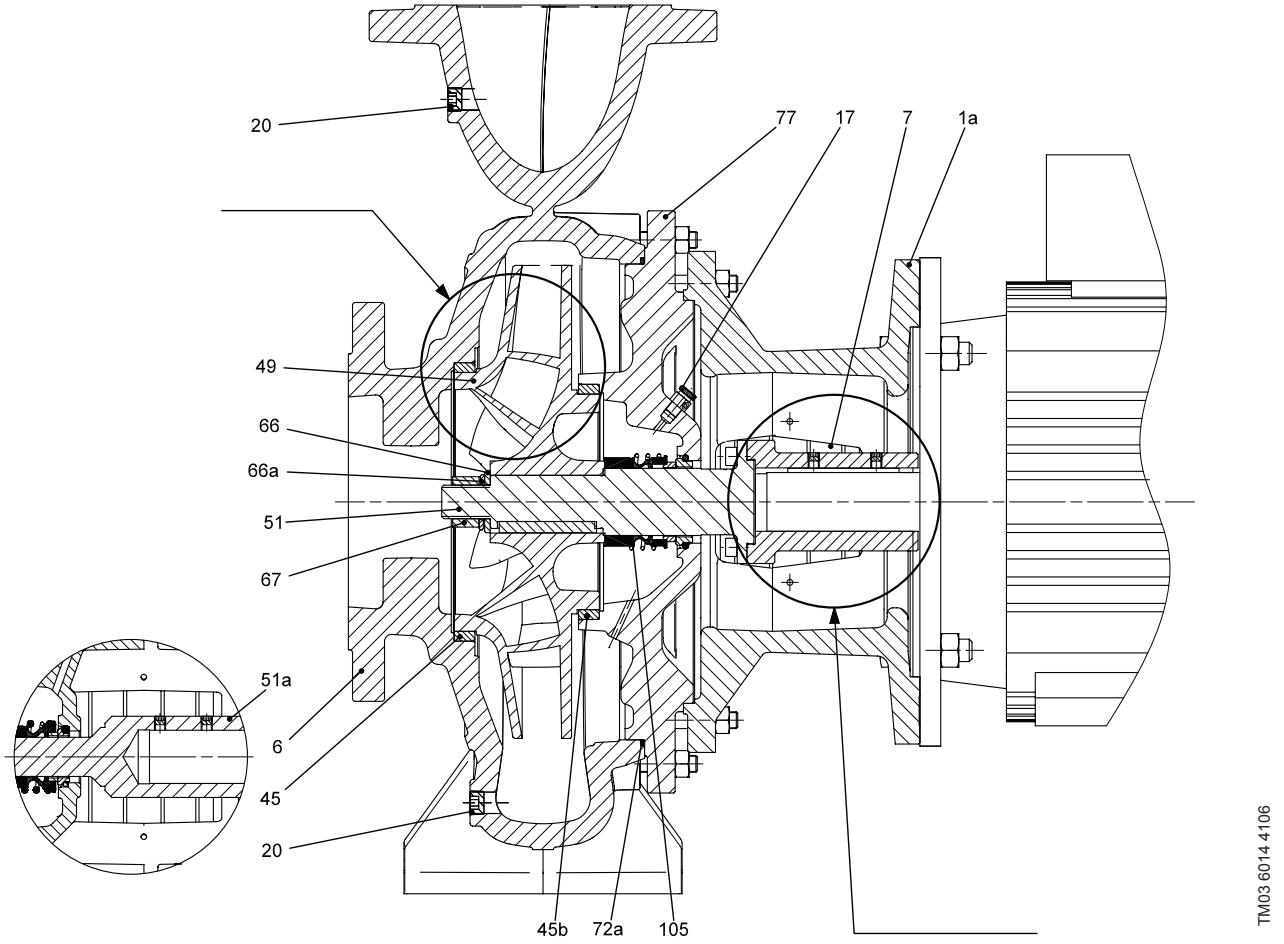
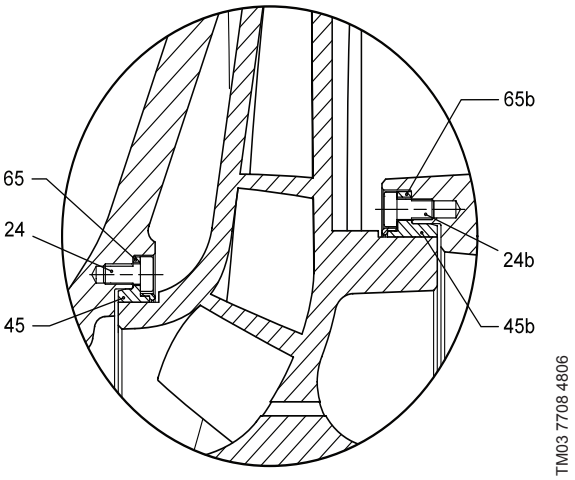


Fig. 3 Sectional drawing NBG

Cast iron pump

Pos.	Component	A-version Cast iron impeller	B-version Bronze impeller	S-version Stainless steel impeller
1a	Motor stool	EN-GJL-250	EN-GJL-250	EN-GJL-250
6	Pump housing	EN-GJL-250	EN-GJL-250	EN-GJL-250
7	Coupling guard	1.4016/AISI 430	1.4016/AISI 430	1.4016/AISI 430
17	Air vent plug	2.0401/CuZn44Pb2	2.0401/CuZn44Pb2	2.0401/CuZn44Pb2
20	Plug	ISO898 8.8 carbon steel	ISO898 8.8 carbon steel	ISO898 8.8 carbon steel
45	Wear ring	CuSn10	CuSn10	CuSn10
45b	Wear ring	CuSn10	CuSn10	CuSn10
49	Impeller	EN-GJL-200	CuSn10	1.4408/CF8M
51	2-part stub shaft	1.4301+1.0301/AISI 304+ carbon steel C10	1.4301+1.0301/AISI 304+ carbon steel C10	1.4401+1.0301/AISI 316+ carbon steel C10
51a	Stub shaft	1.4301/AISI 304	1.4301/AISI 304	1.4401/AISI 316
66	Washer	1.4301/AISI 304	1.4301/AISI 304	1.4401/AISI 316
66a	Spring lock washer	1.4301/AISI 304	1.4301/AISI 304	1.4401/AISI 316
67	Impeller nut	1.4301/AISI 304	1.4301/AISI 304	1.4401/AISI 316
72a	O-ring	EPDM or FKM	EPDM or FKM	EPDM or FKM
77	Cover	EN-GJL-250	EN-GJL-250	EN-GJL-250
105	Shaft seal	Burgmann 1.4401/AISI 316	Burgmann 1.4401/AISI 316	Burgmann 1.4401/AISI 316

Stainless steel pump



Pos.	Component	N-version	R-version
1a	Motor stool	EN-GJL-250	EN-GJL-250
6	Pump housing	1.4408/CF8M	1.4517/CD4MCuN
7	Coupling guard	1.4016/AISI 430	1.4016/AISI 430
17	Air vent plug	1.4401/AISI 316	1.4539/AISI 904L
20	Plug	1.4401/AISI 316	1.4539/AISI 904L
24	Hexagon socket head cap screw	ISO898 1.4401/AISI 316	ISO898 1.4539/AISI 904L
24b	Hexagon socket head cap screw	ISO898 1.4401/AISI 316	ISO898 1.4539/AISI 904L
45	Wear ring	Graflon	Graflon
45b	Wear ring	Graflon	Graflon
49	Impeller	1.4408/CF8M	1.4517/CD4MCuN
51	2-part stub shaft	1.4401+1.0301/AISI 316+ carbon steel C10	1.4462+1.0301/ASTM J92205+ carbon steel C10
65	Wear ring retainer	1.4517/CD4MCuN	1.4517/CD4MCuN
65b	Wear ring retainer	1.4517/CD4MCuN	1.4517/CD4MCuN
66	Washer	1.4401/AISI 316	1.4539/AISI 904L
66a	Spring lock washer	1.4401/AISI 316	1.4539/AISI 904L
67	Impeller nut	1.4401/AISI 316	1.4539/AISI 904L
72a	O-ring	EPDM or FKM	EPDM or FKM
77	Cover	1.4408/CF8M	1.4517/CD4MCuN
105	Shaft seal	Burgmann 1.4401/AISI 316	Burgmann 2.4610/Hastelloy C-4

Sectional drawing NKG

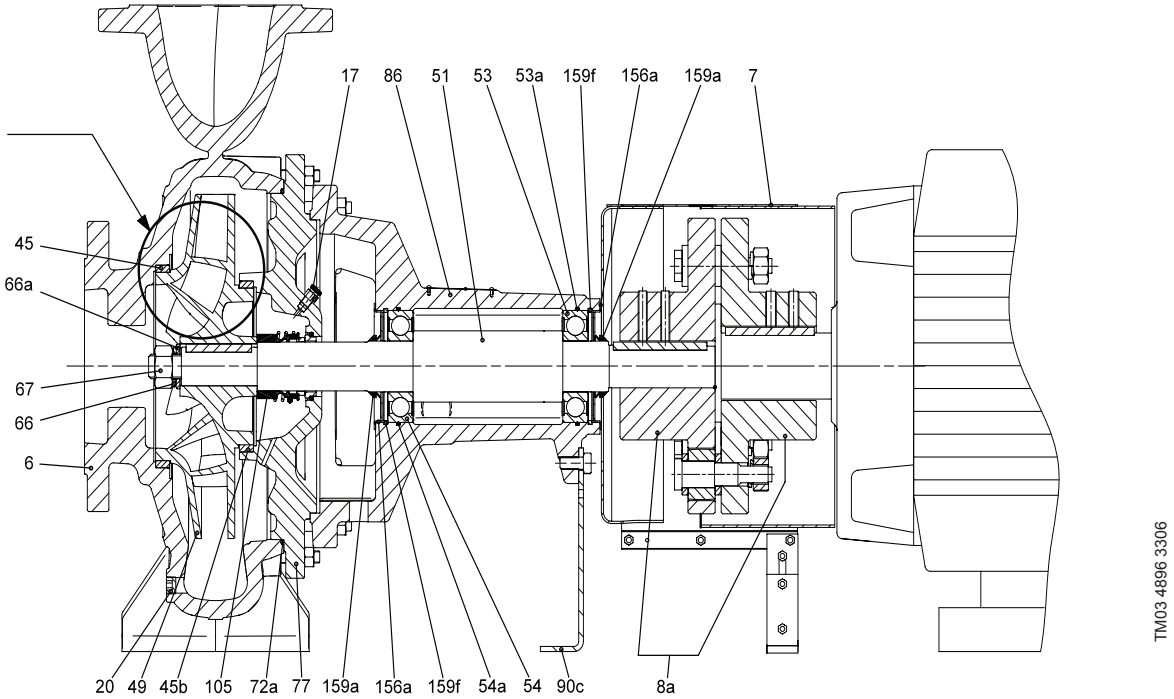


Fig. 4 Sectional drawing NKG, model B

Cast iron pump

Pos.	Component	A-version Cast iron impeller	B-version Bronze impeller	S-version Stainless steel impeller
6	Pump housing	EN-GJL-250	EN-GJL-250	EN-GJL-250
7	Coupling guard	1.4301/AISI 304	1.4301/AISI 304	1.4301/AISI 304
8a	Coupling assembly	★	★	★
17	Air vent plug	2.0401/CuZn44Pb2	2.0401/CuZn44Pb2	2.0401/CuZn44Pb2
20	Plug	ISO898 8.8 carbon steel	ISO898 8.8 carbon steel	ISO898 8.8 carbon steel
45	Wear ring	CuSn10	CuSn10	CuSn10
45b	Wear ring	CuSn10	CuSn10	CuSn10
49	Impeller	EN-GJL-200	CuSn10	1.4408/CF8M
51	Shaft	1.4034+ 1.0301/AISI 420 + carbon steel C10	1.4034+1.0301/AISI 420 + carbon steel C10	1.4401+1.0301/AISI 316 + carbon steel C10
53	Deep-groove ball bearings	2ZR.C3	2ZR.C3	2ZR.C3
53a	O-ring	EPDM	EPDM	EPDM
54	Deep-groove ball bearings	2ZR.C3	2ZR.C3	2ZR.C3
54a	O-ring	EPDM	EPDM	EPDM
66	Washer	1.4301/AISI 304	1.4301/AISI 304	1.4401/AISI 316
66a	Spring lock washer	1.4301/AISI 304	1.4301/AISI 304	1.4401/AISI 316
67	Impeller nut	1.4301/AISI 304	1.4301/AISI 304	1.4401/AISI 316
72a	O-ring	EPDM or FKM	EPDM or FKM	EPDM or FKM
77	Cover	EN-GJL-250	EN-GJL-250	EN-GJL-250
86	Bearing bracket	EN-GJL-250	EN-GJL-250	EN-GJL-250
90c	Foot	EN-GJL-250 / 1.0338/carbon steel DC04	EN-GJL-250 / 1.0338/carbon steel DC04	EN-GJL-250 / 1.0338/carbon steel DC04
105	Shaft seal	Burgmann 1.4401/AISI 316	Burgmann 1.4401/AISI 316	Burgmann 1.4401/AISI 316
156a	Cover (bearing)	1.0338/carbon steel DC04	1.0338/carbon steel DC04	1.0338/carbon steel DC04
159a	Thrower	EPDM	EPDM	EPDM
159f	Lock ring (circlip)	DIN472(C75 DIN17 222)	DIN472(C75 DIN17 222)	DIN472(C75 DIN17 222)

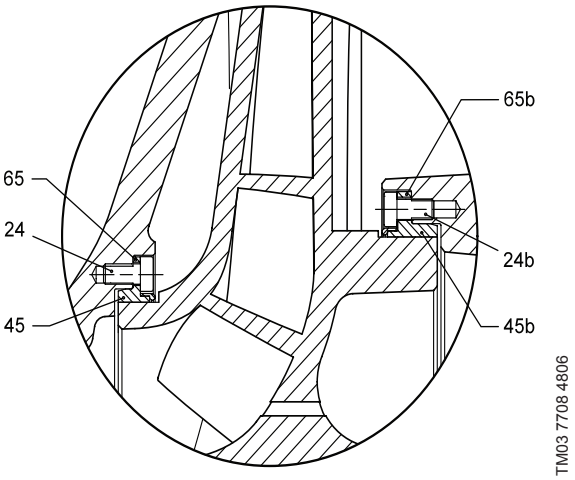
★ Material of male and female part

Standard coupling EN-GJL-250	2-pole	up to 22 kW
	4-pole	up to 30 kW
	6-pole	up to 37 kW

Standard coupling EN-GJS-450-10	2-pole	from 30 kW
	4-pole	from 37 kW
	6-pole	from 45 kW

Spacer coupling (not shown) for all outputs: EN-GJL-250

Stainless steel pump



Pos.	Component	N-version	R-version
6	Pump housing	1.4408/CF8M	1.4517/CD4MCuN
7	Coupling guard	1.4301/AISI 304	1.4301/AISI 304
8a	Coupling assembly	★	★
17	Air vent plug	1.4401/AISI 316	1.4539/AISI 904L
20	Plug	1.4401/AISI 316	1.4539/AISI 904L
24	Hexagon socket head cap screw	1.4401/AISI 316	1.4539/AISI 904L
24b	Hexagon socket head cap screw	1.4401/AISI 316	1.4539/AISI 904L
45	Wear ring	Graflon	Graflon
45b	Wear ring	Graflon	Graflon
49	Impeller	1.4408/CF8M	1.4517/CD4MCuN
51	Shaft	1.4401+1.0301/AISI 316 + Carbon steel C10	1.4462+1.0301/ASTM J92205 + Carbon steel C10
53	Deep-groove ball bearings	2ZR.C3	2ZR.C3
53a	O-ring	EPDM	EPDM
54	Deep-groove ball bearings	2ZR.C3	2ZR.C3
54a	O-ring	EPDM	EPDM
65	Wear ring retainer	1.4517/CD4MCuN	1.4517/CD4MCuN
65b	Wear ring retainer	1.4517/CD4MCuN	1.4517/CD4MCuN
66	Washer	1.4401/AISI 316	1.4539/AISI 904L
66a	Spring lock washer	1.4401/AISI 316	1.4539/AISI 904L
67	Impeller nut	1.4401/AISI 316	1.4539/AISI 904L
72a	O-ring	EPDM or FKM	EPDM or FKM
77	Cover	1.4408/CF8M	1.4517/CD4MCuN
86	Bearing bracket	EN-GJL-250	EN-GJL-250
90c	Foot	EN-GJL-250 / 1.0338/carbon steel DC04	EN-GJL-250 / 1.0338/carbon steel DC04
105	Shaft seal	Burgmann 1.4401/AISI 316	Burgmann 2.4610/Hastelloy C-4
156a	Cover (bearing)	1.0338/Carbon steel DC04	1.0338/Carbon steel DC04
159a	Thrower	EPDM	EPDM
159f	Lock ring (circlip)	DIN472(C75 DIN17 222)	DIN472(C75 DIN17 222)

★ Material of male and female part

Standard coupling EN-GJL-250	2-pole	up to 22 kW
	4-pole	up to 30 kW
	6-pole	up to 37 kW

Standard coupling EN-GJS-450-10	2-pole	from 30 kW
	4-pole	from 37 kW
	6-pole	from 45 kW

Spacer coupling (not shown) for all outputs: EN-GJL-250

Mechanical construction

Mounting (NBG)

NBG pumps come in three different designs:

- Design A: Pump housing with feet
- Design B: Motor with feet
- Design C: Pump housing and motor with feet.

See the figures below.

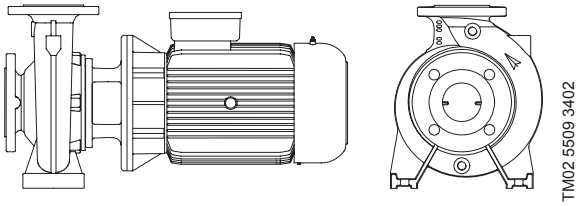


Fig. 5 NBG pump design A

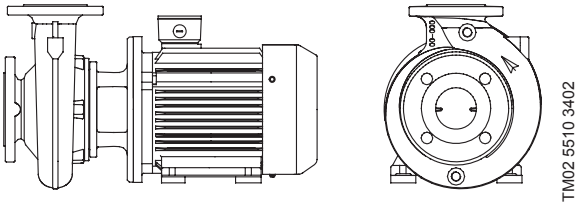


Fig. 6 NBG pump design B

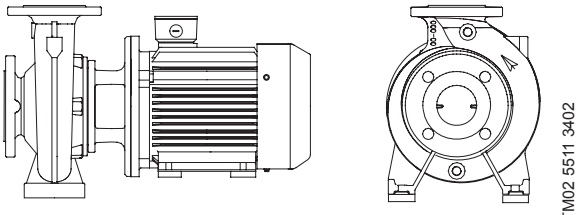


Fig. 7 NBG pump design C

Pump housing

The volute pump housing has an axial suction port and a radial discharge port. Flange dimensions are in accordance with EN 1092-2.

The pump houses have both a priming and a drain hole closed by plugs.

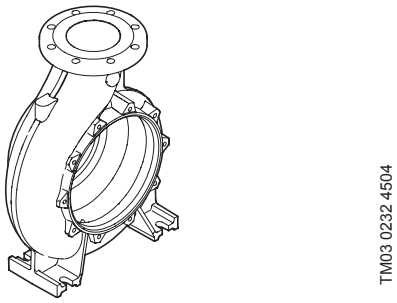


Fig. 8 NBG and NKG pump housing

Bearing bracket and shaft (NKG)

The bearing bracket has two sturdy antifriction, lubricated-for-life bearings. The bearing bracket is made of cast iron EN-GJL-250.

The shaft is made of stainless steel. Shaft diameter d5 is either ø24, 32, 42, 48 or 60.

A thrower on the shaft prevents liquid from entering the bearing bracket. In stuffing box versions, the shaft is protected by a stainless steel sleeve.

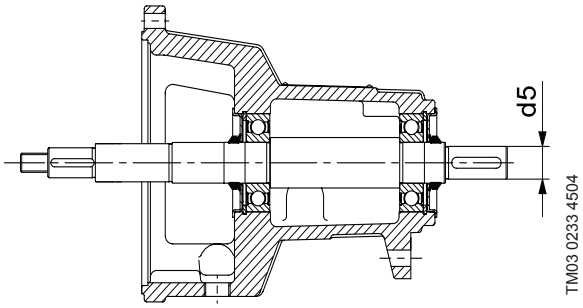


Fig. 9 Bearing bracket and shaft

All NKG pumps are fitted with one of five shaft, shaft seal and bearing sizes. As the bearings and shafts are large, the NKG pumps can be driven by a belt drive or a diesel engine, if required.

Motor stool and cover (NBG)

The cover is provided with a manual air vent screw for the venting of the pump housing and the shaft seal chamber. An O-ring forms the seal between cover and pump housing.

Coupling guards are fitted to the motor stool.

The mounting designations of motors for NBG, NBGE are as follows:

- IM B5: Up to and including frame size 132.
- IM B35: As from frame size 160 and upwards.

The flange size of the motor stool is according to IEC 60034.

Shaft (NBG)

The stainless steel shaft is ø28, ø38, ø48, ø55 or ø60.

The coupling end of the shaft is cylindrical and has two drilled holes for the set screws of the coupling.

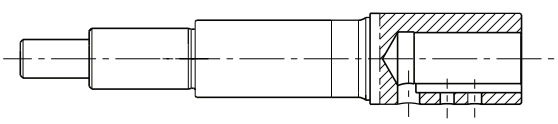


Fig. 10 Stub shaft, NBG pump

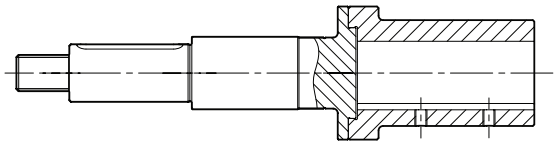


Fig. 11 2-part stub shaft, NBG pump

Coupling (NKG)

NKG pumps are available with two types of coupling:

- standard coupling
- spacer coupling.

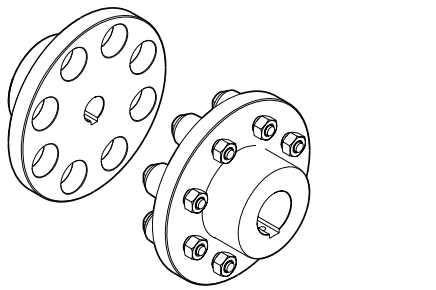


Fig. 12 Standard coupling, NKG pump

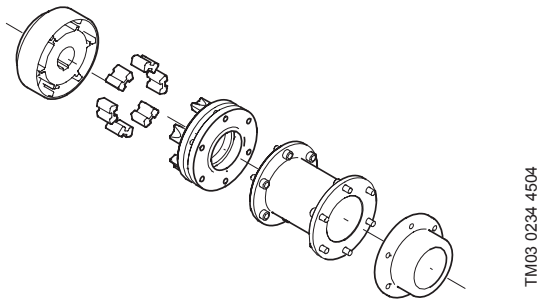


Fig. 13 Spacer coupling

Pumps fitted with a spacer coupling can be serviced without dismantling the motor from the base frame and without removing the pump housing from the pipework. This saves realignment of pump and motor after service.

Impeller

The impeller is a closed impeller with double-curved blades with smooth surfaces. This ensures high efficiency.

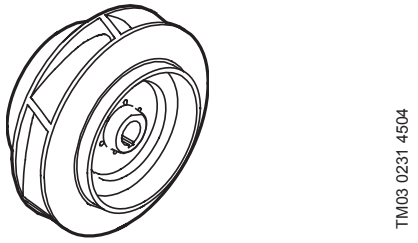


Fig. 14 Impeller, NBG and NKG pumps

All impellers are statically and hydraulically balanced. The hydraulic balancing compensates for axial thrust.

The direction of rotation of the impeller is clockwise when viewed from the motor.

All impellers are adapted to the duty point as requested by the customer.

Base frame (NKG)

Pump and motor are mounted on a common steel base frame in accordance with EN 23661.

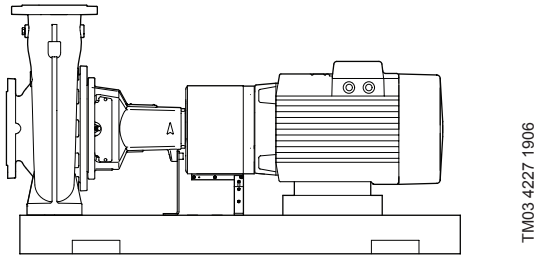


Fig. 15 Schematic view of NKG pump-motor unit mounted on a base frame

A base frame prepared for grouting is available as an option, see "Foundation (NKG)" on page 30.

Surface treatment

NBG and NKG

The cast-iron parts of NBG and NKG have an epoxy-based coating made in a cathodic electro-deposition (CED) process. CED is a high-quality dip-painting process where an electrical field around the products ensures deposition of paint particles as a thin, well-controlled layer on the surface. An integral part of the process is a pretreatment. The entire process consists of these elements:

1. Alkaline-based cleaning.
2. Zinc phosphating.
3. Cathodic electro-deposition.
4. Curing to a dry film thickness 18-22 μm.

The colour code for the finished product is NCS 9000/ RAL 9005.

For low-temperature applications at high humidity Grundfos offers NBG and NKG pumps with extra surface treatment to avoid corrosion. These pumps are available on request.

Test pressure

Pressure testing was made with +20°C water containing corrosion inhibitor.

Pressure stage	Operating pressure		Test pressure	
	bar	MPa	bar	MPa
PN 16	16	1.6	24	2.4

Motor

The motor is a totally enclosed, fan-cooled standard motor with main dimensions according to IEC and DIN standards.

The tables below show the motors available for NBG and NKG.

As appears from the tables you can choose between standard range with EFF2 (efficiency 2) motors and premium range with EFF1 (efficiency 1) motors for NBG and NKG, and E-motor range for NBGE and NKGE.

Standard motor range

<table>
<tr><th colspan="4">Standard range - including EFF2 motors</th></tr>
<tr><th>Output P_2 [kW]</th><th>2-pole</th><th>4-pole</th><th>6-pole</th></tr>
<tr><td>0.25</td><td rowspan="3"></td><td rowspan="4">MG model C</td><td rowspan="3"></td></tr>
<tr><td>0.37</td></tr>
<tr><td>0.55</td></tr>
<tr><td>0.75</td><td>MG model C</td><td rowspan="15">MMG model E</td></tr>
<tr><td>1.1</td><td rowspan="8">MG model C
EFF 2</td><td rowspan="8">MG model C
EFF 2</td></tr>
<tr><td>1.5</td></tr>
<tr><td>2.2</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td></tr>
<tr><td>5.5</td></tr>
<tr><td>7.5</td></tr>
<tr><td>11</td><td rowspan="9">MMG model E
EFF 2</td><td rowspan="9">MMG model E
EFF 2</td></tr>
<tr><td>15</td></tr>
<tr><td>18.5</td></tr>
<tr><td>22</td></tr>
<tr><td>30</td></tr>
<tr><td>37</td></tr>
<tr><td>45</td></tr>
<tr><td>55</td></tr>
<tr><td>75</td></tr>
<tr><td>90</td></tr>
<tr><td>110</td><td rowspan="6">MMG model E</td><td rowspan="6">MMG model E</td></tr>
<tr><td>132</td></tr>
<tr><td>160</td><td rowspan="5"></td></tr>
<tr><td>200</td></tr>
<tr><td>250</td></tr>
<tr><td>315</td></tr>
<tr><td>355</td><td></td></tr>
</table>

EFF1 is the highest efficiency class of the CEMEP efficiency classes.

Note: The CEMEP list of minimum requirements for high-efficiency motors covers the range from 1.1 kW to 90.0 kW, 2-pole and 4-pole motors, see bold frame. Consequently, only the motors within this range may be designated EFF1 and EFF2.

Premium motor range

<table>
<tr><th colspan="4">Premium range - including EFF1 motors</th></tr>
<tr><th>Output P_2 [kW]</th><th>2-pole</th><th>4-pole</th><th>6-pole</th></tr>
<tr><td>0.25</td><td rowspan="3"></td><td rowspan="4">MG model C</td><td rowspan="3"></td></tr>
<tr><td>0.37</td></tr>
<tr><td>0.55</td></tr>
<tr><td>0.75</td><td>MG model C</td></tr>
<tr><td>1.1</td><td rowspan="6">MG model D EFF1</td><td rowspan="4">MG model D EFF1</td><td rowspan="17">Siemens</td></tr>
<tr><td>1.5</td></tr>
<tr><td>2.2</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td rowspan="13">Siemens EFF1</td><td rowspan="12">Siemens EFF1</td></tr>
<tr><td>5.5</td></tr>
<tr><td>7.5</td></tr>
<tr><td>11</td></tr>
<tr><td>15</td></tr>
<tr><td>18.5</td></tr>
<tr><td>22</td></tr>
<tr><td>30</td></tr>
<tr><td>37</td></tr>
<tr><td>45</td></tr>
<tr><td>55</td></tr>
<tr><td>75</td></tr>
<tr><td>90</td></tr>
<tr><td>110</td><td rowspan="8">Siemens</td><td rowspan="7">Siemens</td><td rowspan="8"></td></tr>
<tr><td>132</td></tr>
<tr><td>160</td></tr>
<tr><td>200</td></tr>
<tr><td>250</td></tr>
<tr><td>315</td></tr>
<tr><td>355</td><td></td></tr>
</table>

E-motor range

<table>
<tr><th colspan="3">Electronically speed-controlled motors</th></tr>
<tr><th>Output P_2 [kW]</th><th>2-pole</th><th>4-pole</th></tr>
<tr><td>0.75</td><td rowspan="2"></td><td rowspan="7">MGE</td></tr>
<tr><td>1.1</td></tr>
<tr><td>1.5</td><td rowspan="7">MGE</td></tr>
<tr><td>2.2</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td></tr>
<tr><td>5.5</td></tr>
<tr><td>7.5</td><td rowspan="5">MMGE</td><td rowspan="5">MMGE</td></tr>
<tr><td>11</td></tr>
<tr><td>15</td></tr>
<tr><td>18.5</td></tr>
<tr><td>22</td></tr>
</table>

Pump location

The pump is designed for installation in a non-aggressive and non-explosive atmosphere.

The relative air humidity must not exceed 95%.

Sound pressure level

Motor [kW]	Maximum sound pressure level [dB(A)] - ISO 3743		
	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	62	63
7.5	68	62	66
11	70	66	66
15	70	66	66
18.5	70	63	66
22	70	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	-
200	76	70	-
250	82	73	-
315	82	73	-
355	77	-	-

Ambient temperature and altitude

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.

Ambient temperature must not exceed:

- +40°C for EFF2 motors
- +60°C for EFF1 motors.

If the ambient temperature exceeds +40°C (+60°C) or if the motor is installed more than 1000 m (3500 m) above sea level, 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.

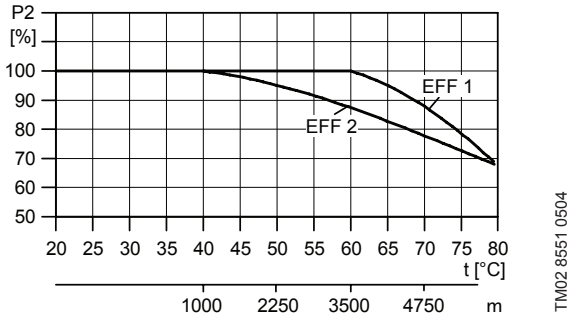


Fig. 16 Motor P2 depends on temperature/altitude

Example:

Fig. 16 shows that the load of an EFF2-motor must be reduced to 88% when installed 3500 m above sea level.

At an ambient temperature of 70°C the load of an EFF2-motor must be reduced to 78% of the rated output.

In such situations an oversize motor can be used.

Pumped liquids

NBG and NKG pumps are suitable for pumping clean, thin and non-explosive liquids, not containing any solid particles.

The effect of viscosity on centrifugal pump performance

A viscous liquid affects a centrifugal pump in several ways.

- The power consumption will be increased, i.e. a larger motor is required.
- Head, flow rate and pump efficiency will be reduced.

The effect of high density on centrifugal pump performance

A high density liquid only affects the power consumption of a centrifugal pump.

- The head, flow rate and pump efficiency will remain unchanged.
- The power consumption will increase at a ratio corresponding to the increase in density. A liquid with a specific gravity of 1.2 will thus require a 20% larger power input.
- An oversize motor will often be required.

WinCAPS can help you select the right pump for liquids with viscosity/density different from those of water.

Operating conditions

Liquid temperatures

The NBG and NKG pump range covers the temperature range from –25°C to +140°C. The permissible liquid temperature depends on the mechanical shaft seal type and pump type. See also the table below.

Be aware that the maximum liquid temperature limits stated by Grundfos may be overruled by local regulations and various laws.

The maximum liquid temperature is stamped on the nameplate.

Relationship between mechanical shaft seals and temperature

Shaft seal diameter [mm]	**NBG**		**28, 38**	**48**	**55**	**60**
d5 [mm]	**NKG**		**24, 32**	**42**	**48**	**60**
	Code	**Temperature range**	**Maximum pressure [bar]**			
Rubber bellows seal, metal-impregnated carbon/silicon carbide, EPDM	BAQE	0°C to +120°C	16	16	16	16
Rubber bellows seal, metal-impregnated carbon/silicon carbide, FKM	BAQV	0°C to +90°C	16	16	16	16
Rubber bellows seal, silicon carbide/silicon carbide, EPDM	BQQE	0°C to +90°C	16	16	16	16
Rubber bellows seal, silicon carbide/silicon carbide, FKM	BQQV	0°C to +90°C	16	16	16	16
Bellows seal, type B, with reduced seal faces, silicon carbide/silicon carbide, EPDM	GQQE	–25°C to +90°C	16	16*	16*	16*
Bellows seal, type B, with reduced seal faces, silicon carbide/silicon carbide, FKM	GQQV	–20°C to +90°C	16	16*	16*	16*
O-ring seal with fixed seal driver, silicon carbide/silicon carbide, EPDM	AQQE	0°C to +90°C	25	25	16	16
O-ring seal with fixed seal driver, silicon carbide/silicon carbide, FKM	AQQV	0°C to +90°C	25	25	16	16
O-ring seal with fixed seal driver, silicon carbide/metal-impregnated carbon, EPDM	AQAE	0°C to +120°C	25	25	25	25
O-ring seal with fixed seal driver, silicon carbide/metal-impregnated carbon, FKM	AQAV	0°C to +90°C	25	25	25	25
Rubber bellows seal, silicon carbide/resin-impregnated carbon, EPDM	BQBE	0°C to +140°C	16	-	-	-
O-ring seal, balanced, metal-impregnated carbon/silicon carbide, FXM	DAQF	0°C to +140°C	25	25	25	25
Rubber bellows seal, resin-impregnated carbon/silicon carbide, EPDM	BBQE	0°C to +120°C	16	16	16	16

*) Max. 60 °C

EPDM

Mechanical shaft seals with EPDM (xxxE) rubber are primarily suitable for water.

If the water contains oil or if chemicals or other liquids than water are pumped, you may have to replace the rubber parts of the mechanical shaft seal.

FKM

Mechanical shaft seals with FKM (xxxV) rubber have excellent resistance against oil and a number of chemicals.

Carbon/silicon carbide

Mechanical shaft seals with carbon/silicon carbide (xAQx) seal faces have a wide range of applications and are especially suitable if there is risk of dry running and/or if the temperature is high. These mechanical shaft seals are not suitable for liquids containing abrasive particles as the carbon parts will be worn. At temperatures below 0°C, corrosion inhibitors containing abrasive particles will usually be added to the pumped liquid, and xAQx seals will thus not be suitable.

Silicon carbide/silicon carbide

Mechanical shaft seals with silicon carbide/silicon carbide (xQQx) seal faces also have a very wide range of applications. These seals are very resistant to abrasive particles and well suited at liquid temperatures up to +90°C. At higher temperatures, the reduced lubricating properties of the pumped liquid may cause noise problems and limit the life of the seal faces.

Pump speed relative to impeller material and size

The below table shows the relationship between pump speed, impeller material and size.

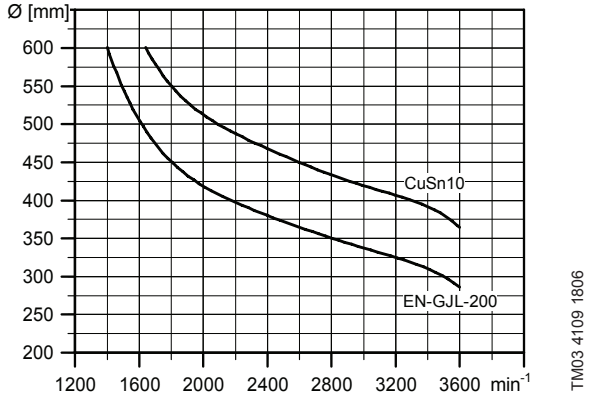


Fig. 17 Maximum permissible speed

For stainless steel impellers (1.4408/1.4517) the limit is 3600 min^{-1} regardless of impeller size.

Inlet pressure

Maximum inlet pressure

The actual inlet pressure + pressure when the pump is running against a closed valve must always be lower than the maximum permissible operating pressure.

Minimum inlet pressure

The minimum inlet pressure must be according to the NPSH curve + a safety margin of at least 0.5 m + correction for vapour pressure. It is, however, advisable to calculate the inlet pressure if:

- the liquid temperature is high
- the flow rate is considerably higher than the pump's rated 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.

Calculation of maximum suction lift for water in open systems

To avoid cavitation, make sure that there is a minimum pressure on the suction side of the pump. The maximum suction lift "H" in metres head can be calculated as follows:

$H = p_b \times 10.2 - NPSH - H_f - H_v - H_s$ [m]

p_b = Barometric pressure in bar. (Barometric pressure can be set to 1 bar.) In closed systems, p_b indicates the system pressure in bar.

NPSH = Net Positive Suction Head in metres head. (To be read from the NPSH curve at the highest flow the pump will be delivering.)

H_f = Friction loss in suction pipe in metres head. (At the highest flow the pump will be delivering.)

H_v = Vapour pressure in metres head. (To be read from the vapour pressure scale. "H_v" depends on the liquid temperature "T_m".)

H_s = Safety margin = minimum 0.5 metres head.

If the "H" calculated is positive, the pump can operate at a suction lift of maximum "H" metres head.

If the "H" calculated is negative, an inlet pressure of minimum "H" metres head is required.

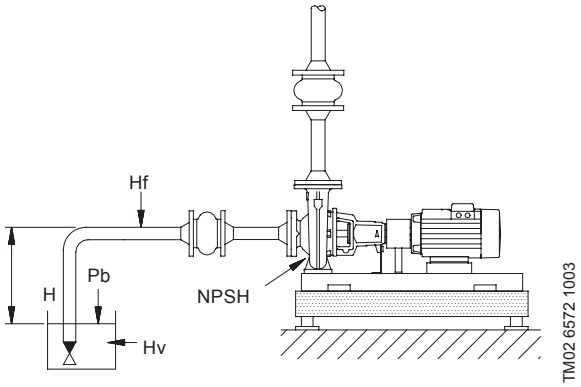


Fig. 18 Schematic view of open system with an NKG pump

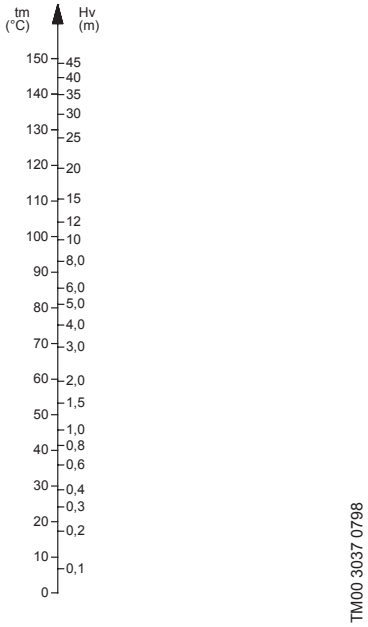


Fig. 19 Relation between liquid temperature and vapour pressure

Foundation (NKG)

We recommend that you install the pump on a plane and rigid concrete foundation which is heavy enough to provide permanent support for the entire pump. The foundation must be capable of absorbing any vibration, normal strain or shock. As a rule of thumb, the weight of the concrete foundation should be 1.5 times the pump weight. Base frame prepared for grouting is available as an option, see Fig. 23.

The foundation should be 100 mm larger than the base frame on all four sides, see Fig. 20.

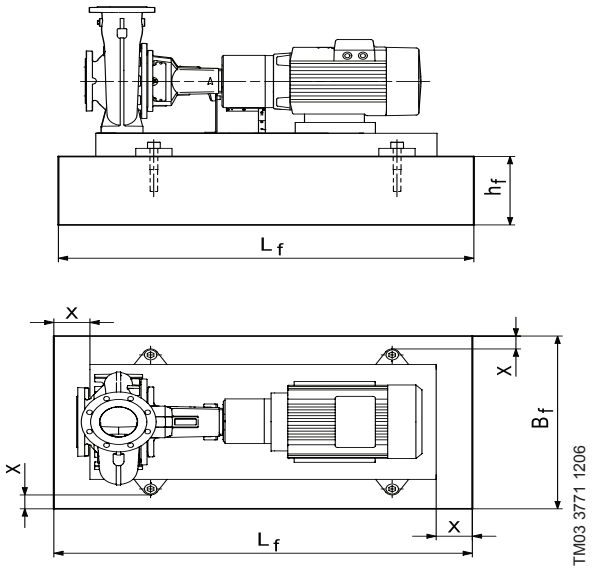


Fig. 20 Foundation

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

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

The density (δ) of concrete is usually taken as 2200 kg/m³.

Place the pump on the foundation and fasten it. The base frame must be supported under its entire area, see Fig. 21.

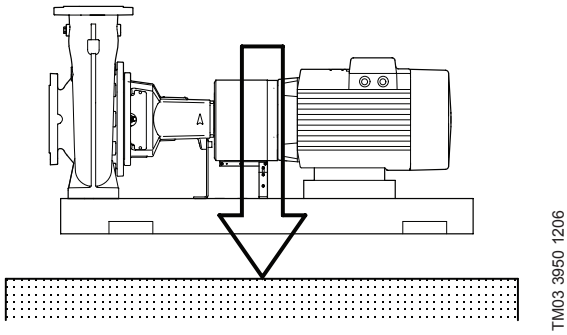


Fig. 21 Correct foundation

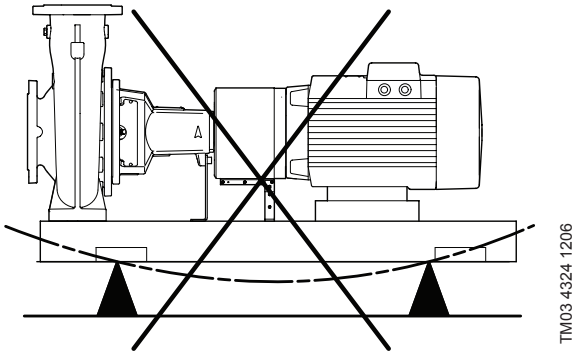


Fig. 22 Incorrect foundation

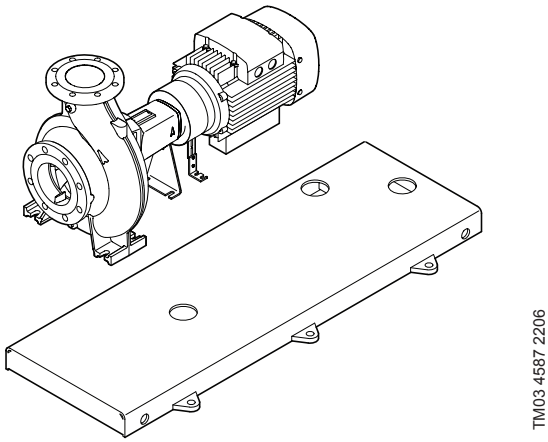


Fig. 23 Base frame prepared for grouting

Piping

When installing the pipes, make sure that the pump housing is not stressed by the pipework.

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

Install the pipes so that air locks are avoided, especially on the suction side of the pump, see Fig. 24

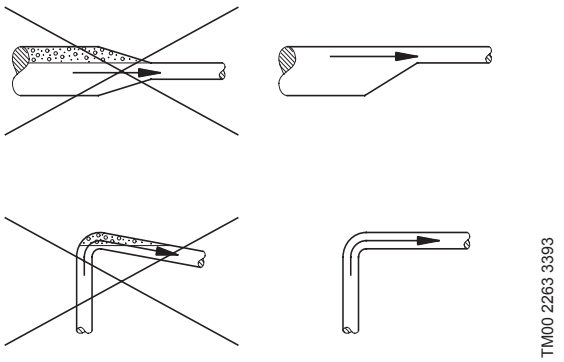


Fig. 24 Pipelines

Fit isolating valves on either side of the pump to avoid having to drain the system if the pump needs to be cleaned or repaired.

Make sure the pipes are adequately supported as close to the pump as possible, both on the suction and the discharge side. The counter flanges should lie true against the pump flanges without being stressed as this will cause damage to the pump.

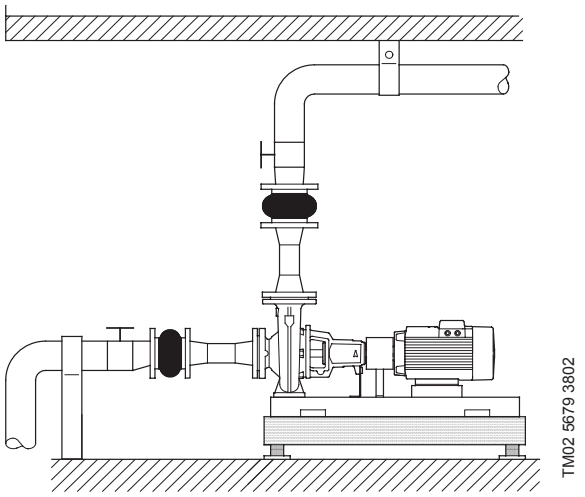


Fig. 25 Pipeline mounting

Elimination of noise and vibrations

In order to achieve optimum operation and minimum noise and vibration, consider vibration dampening of the pump. Generally, always consider this for pumps with motors above 11 kW. 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 remaining system.

Elimination of noise and vibrations is best achieved by means of vibration dampers and expansion joints.

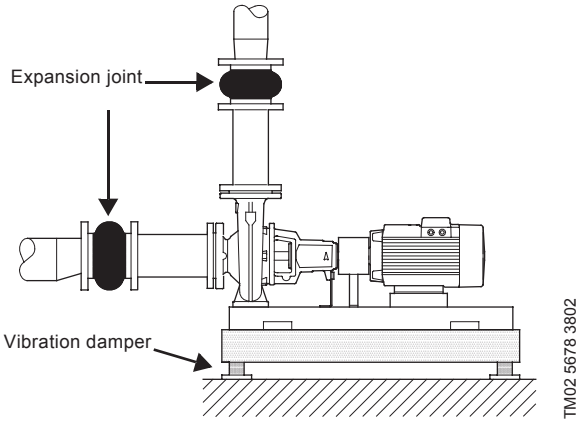


Fig. 26 NKG pump with expansion joints and vibration dampers

Vibration dampers

To prevent the transmission of vibrations to buildings, we recommend you to isolate the pump foundation from building parts by means of vibration dampers.

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

- forces transmitted through the damper
- motor speed considering speed control, if any
- required dampening in % (suggested value is 70%).

Which is the right damper varies from installation to installation, and a wrong damper may increase the vibration level. Vibration dampers should therefore be sized by the supplier.

Expansion joints

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.

Install expansion joints to

- absorb expansions/contractions in the pipework caused by changing liquid temperature
- reduce mechanical strains in connection with pressure surges in the pipework
- isolate mechanical structure-borne noise in the pipework (only rubber bellows expansion joints).

Note: Do not install expansion joints to compensate for inaccuracies in the pipework such as centre displacement of flanges.

Fit expansion joints at a distance of minimum 1 to 1½ times the nominal flange diameter away from the pump on the suction as well as on the discharge side. This will prevent the development of turbulence in the expansion joints, resulting in better suction conditions and a minimum pressure loss on the pressure side. At high water velocities (> 5 m/s) we recommend you to install larger expansion joints corresponding to the pipework.

We always recommend expansion joints with limiting rods for flanges larger than DN 100.

Alignment (NKG)

In a complete pump unit assembled and supplied from factory, the coupling halves have been accurately aligned. Alignment is made by inserting shims under the pump and motor mounting surfaces as required.

The pump/motor alignment may be affected during transport. Always check alignment after the pump has been installed.

If misalignment has occurred due to radial or angular shifting, realign by inserting/removing shims under the feet of the pump or the motor.

Take care to align carefully as this will increase the working lives of the coupling, bearings and shaft seals considerably.
Note: Check the final alignment when the pump has obtained its operating temperature under normal operating conditions.

Speed-controlled pumps

Most NBG and NKG pumps are available with motors with integrated speed control. These pumps are called NBGE and NKGE.

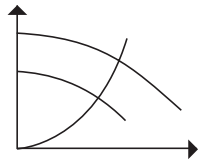
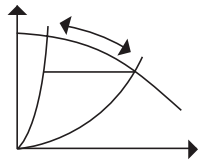
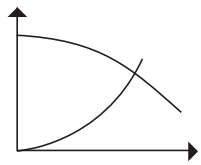
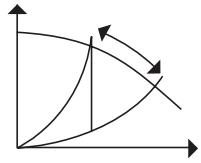
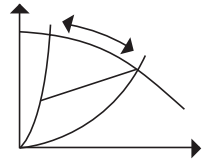
Alternatively, all NBG and NKG pumps with three-phase motors can be connected to an external frequency converter.

NBGE and NKGE pump applications

NBGE and NKGE pumps with integrated speed control enable automatic adaptation of performance to current conditions. This keeps the energy consumption at a minimum.

Depending on the nature of the application, NBGE and NKGE pumps offer energy-savings, increased comfort or improved processing.

The charts below show possible control modes of NBGE and NKGE pumps in different applications.

Control mode	Applications
Constant curve	
	Single-pipe heating systems Systems with three-way valves Heating and cooling surfaces Chiller pumps (Sensor not required)
Constant pressure	
	Pressure boosting systems (Sensor required)
Temperature control	
	Single-pipe heating systems Systems with three-way valves Cooling towers Chiller pumps Domestic hot-water recirculation systems (Sensor required)
Constant flow	
	Heating and cooling surfaces Cooling towers Flow filters (Sensor required)
Proportional differential pressure (measured)	
	System with two-way valves (Differential pressure sensor is located in the system)

Constant curve

In constant curve control mode, the pump will adjust its speed to meet the required flow without using throttle valves.

In this control mode the pump can be set to operate within 12-100% of the maximum performance range.

A sensor is not required for this control mode.

Constant pressure

In constant pressure-control mode, the pump will adjust its speed to keep a constant pressure where the sensor is fitted.

We recommend constant-pressure control mode in pressure-holding systems.

A pressure sensor with a suitable operating range is required.

Temperature control

In the temperature control mode, the pump will adjust its speed to keep a constant temperature or a differential temperature.

We recommend this control mode in systems with three-way valves and systems without control valves.

A temperature sensor or a differential temperature sensor is required for this control mode.

Example

In an industrial cooling system, an NKGE pump continuously adapts its performance to the changing demands reflected in the differences in temperature of the liquid circulating in the cooling system. The lower the demand for cooling, the smaller the quantity of liquid circulated in the system and vice versa.

Constant flow

In the constant-flow control mode, the pump will adjust its speed to keep a constant flow irrespective of variations of the system characteristics.

We recommend this control mode in systems where a constant flow is required.

In this control mode either an electronic flowmeter or a differential pressure sensor is required.

Proportional differential pressure (measured)

In the proportional differential pressure (measured) mode, the pump will adjust its speed to keep the differential pressure in a reference point in the system.

This control mode is recommended in large circulation systems where the NBGE or NKGE pump functions as a secondary pump. A differential pressure sensor is required for this control mode.

Example

In a two-pipe heating system or an air-conditioning system with variable flow, the pressure sensor can be fitted in a reference point away from the NKGE pump.

As the flow increases, the NKGE pump continuously adapts its speed to maintain the same differential pressure in the reference point.

Affinity equations

Normally, NBGE and NKGE pumps are used in applications characterised by a **variable** flow. Consequently, it is not possible to select a pump that is constantly operating at its optimum efficiency.

In order to achieve optimum operating economy, the pump should be selected on the basis of the following criteria:

- The max. duty point required should be as close as possible to the QH curve of the pump.
- The flow rate at the duty point required should be close to the optimum efficiency (eta) for most operating hours.

Between the min. and max. performance curve, NBGE and NKGE pumps have an infinite number of performance curves each representing a specific speed. It may therefore not be possible to select a duty point close to the max. curve.

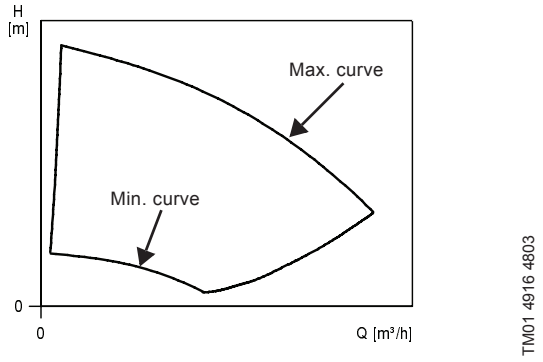


Fig. 27 Min. and max. performance curves

In situations where it is not possible to select a duty point close to the max. curve, use the affinity equations below. The head (H), the flow (Q) and the input power (P) are the appropriate variables you need to be able to calculate the motor speed (n).

Note: The approximated formulas apply on condition that the system characteristic remains unchanged for nn and nx and that it is based on the formula H = k x Q2, where k is a constant.

The power equation implies that the pump efficiency is unchanged at the two speeds. In practice this is **not** quite correct.

Finally, it is worth noting that the efficiencies of the frequency converter and the motor **must** be taken into account if a precise calculation of the power saving resulting from a reduction of the pump speed is wanted.

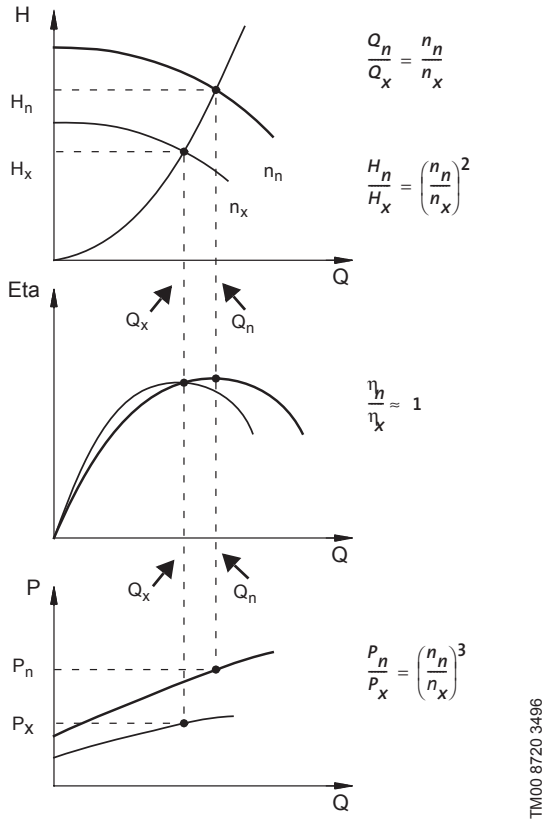


Fig. 28 Affinity equations

Legend

H_n	Rated head in metres
H_x	Current head in metres
Q_n	Rated flow in m^3/h
Q_x	Current flow rate in m^3/h
P_n	Rated input power in kW
P_x	Current input power in kW
n_n	Rated motor speed in min^{-1}
n_x	Current motor speed in min^{-1}
η_h	Rated efficiency in %
η_x	Current efficiency in %

WinCAPS and WebCAPS

WinCAPS and WebCAPS are both selection programs offered by Grundfos.

The two programs make it possible to calculate the specific duty point and energy consumption of an NBGE or NKGE pump.

When you enter the pump data, WinCAPS and WebCAPS can calculate the exact duty point and energy consumption. For further information, see page 254.

Communication with NBGE/NKGE pumps

Communication with NBGE, NKGE pumps is possible via a central building management system, remote control (Grundfos R100) or a control panel.

Central building management system

The operator can communicate with the NBGE, NKGE pump even though he is not present near the pump. Communication can take place via a central building management system allowing the operator to monitor and change control modes and setpoint settings.

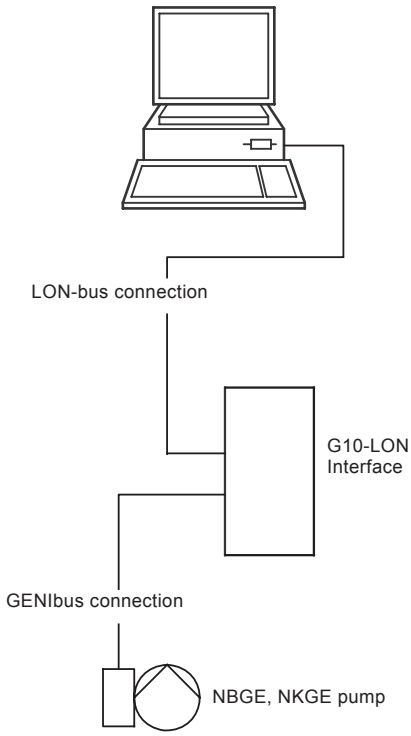


Fig. 29 Structure of a central building management system

Remote control

The R100 remote control produced by Grundfos is available as an accessory.

The operator can communicate with the NBGE, NKGE pump by pointing the IR-signal transmitter at the control panel of the NBGE, NKGE pump terminal box.

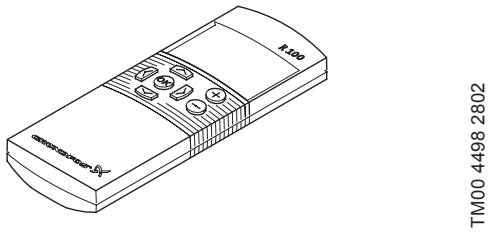


Fig. 30 R100 remote control

The operator can monitor and change control modes and settings of the NBGE, NKGE pump via the R100 display.

Control panel

The operator can change the setpoint settings manually on the control panel of the NBGE, NKGE pump terminal box.

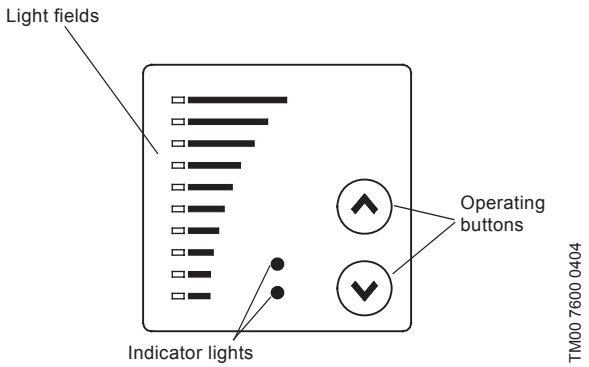


Fig. 31 Control panel of an NBGE, NKGE pump

Pump size

Selection of pump size should be based on:

- required flow rate and pressure at the draw-off point
- pressure loss as a result of height differences
- friction loss in the pipework.
  It may be necessary to account for pressure loss in connection with long pipes, bends or valves, etc.
- best efficiency at the estimated duty point.

Efficiency

If you expect the pump to always operate in the same duty point, select a pump which is operating in a duty point corresponding to the best efficiency of the pump.

In case of controlled operation or varying consumption, select a pump whose best efficiency falls within the duty range covering the greater part of the duty time.

Material

The material variant should be selected on the basis of the liquid to be pumped, see "List of pumped liquids", page 37.

Motor size

Selection of motor size should be based on the power required to achieve the duty point of the chosen pump. This information can be found in the power chart below each performance chart. See performance curves on page 50 to page 234.

Find the power curve corresponding to the required QH-value (or interpolate between curves).

To select the motor size, read the value of the P2 curve at the duty point and add a 5% safety margin.

If the motor size must be selected according to ISO 5199, see the table below.

Safety margins according to ISO 5199

Required pump power up to [kW]	Motor power P_2 [kW]
322	355
286	315
227	250
181	200
145	160
120	132
100	110
81	90
68	75
49	55
40	45
32.5	37
26	30
19	22
15.9	18.5
12.8	15
9.1	11
6.1	7.5
4.3	5.5
3.2	4
2.3	3
1.7	2.2
1.1	1.5
0.81	1.1
0.55	0.75
0.40	0.55
0.27	0.37
0.18	0.25

Pumped liquids

We recommend NBG and NKG pumps for thin, clean and non-explosive liquids, not containing solid particles or fibres. The liquid must not attack the pump materials chemically or mechanically.

If you pump liquids with a density and/or viscosity higher than those of water, use motors with correspondingly higher outputs. See "List of pumped liquids".

The mechanical shaft seal must be suitable for the liquid.

Water in heating and ventilating systems often contains additives to prevent negative effects, such as system corrosion or calcareous deposits. If you want to use the pump for such liquids, and if the temperature is above 80°C, use special shaft seals to avoid crystallization/ precipitation between the seal faces.

Liquid temperature: –25°C to +140°C.

For heating systems, the water quality should meet VDI 2035.

List of pumped liquids

The list on the following pages gives an overview of liquids which may typically be pumped by NBG and NKG pumps.

The list states the recommended shaft seals. Other shaft seals may be applicable, but we consider those stated in the list to be the best choices.

The list is intended as a general guide only, and it cannot replace actual testing of pumped liquids and pump materials under specific working conditions.

However, use the list with some caution, as factors may affect the chemical resistance of a specific pump version. The factors are

- operating conditions
- solids
- cleaning procedures
- contaminants
- pressure.

Legend for notes in the list

a	To minimize the risk of corrosion, the pump must run continuously, i.e. standstills must not exceed 6-8 hours.
b	May contain additives or impurities which can cause shaft seal problems.
c	The pump should run continuously to prevent discoloration of pool tiles. For intermittent use, the N version should be used.
d	Density and viscosity may differ from those of water. Consider this when calculating motor and pump performance.
e	In order to avoid corrosion, the liquid must be free of oxygen.
f	Flammable or combustible liquid.
g	Risk of crystallization/precipitation at the shaft seal.

Pumped liquids

Pumped liquids	Notes	Additional information	Material version					Shaft seal
			A	B	S	N	R	
Water								
Acidic minewater		Low pH value, high chloride content				x	x	BQQE
Boiler-feed water		<120°C	x					BAQE
		120°C - 140°C	x					BQBE/DAQF [1]
Brackish water	a	30°C, 2000 ppm chloride				x		BQQE
Condensate		<90°C	x					BQQE
		90°C - 120°C	x					BAQE
		120°C - 140°C	x					BQBE/DAQF [1]
Cooling and cutting lubricant			x					BQQV
Demineralized water		<90°C				x		BQQE
District heating water		<120°C						BAQE
		120°C - 140°C	x					BQBE/DAQF [1]
Groundwater		<90°C	x	x	x			BQQE
		>90°C	x	x	x			BAQE [2]/BQBE
Oil containing water		<90°C	x					BQQV
Softened water		<90°C		x	x			BQQE
		90°C - 120°C		x	x			BAQE [2]
Seawater	a	<35°C					x	BQQE
Swimming-pool water, chlorinated	c	40°C, 150 ppm Cl- (< 2 ppm free chlorine)		x	x			BQQE
Coolants								
Calcium chloride	b, d, e, g	<5°C, 30%	x					BQQE/GQQE
Ethylene glycol	b, d	<50°C	x					BQQE/GQQE
Glycerine (glycerol)	b, d	<50°C	x					BQQE/GQQE
Hydrocarbon-based coolant	d, f	50°C	x					BQQV/GQQV
Potassium acetate (inhibited)	b, d, e, g	<20°C	x	x	x			BQQE/GQQE
Potassium formate (inhibited)	b, d, e, g	<20°C	x	x	x			BQQE/GQQE
Propylene glycol	b, d	<50°C	x					BQQE/GQQE
Sodium chloride	b, d, e, g	<5°C, 30%	x					BQQE/GQQE
Fuels								
Biodiesel	f		x					BAQV
Diesel oil	f		x					BAQV
Jet fuel	f		x					BAQV
Kerosene	f		x					BAQV
Naphta	f		x					BAQV
Petrol	f		x					BAQV
Mineral oils								
Crude oil	b, d, f	<20°C			x			BQQV
Mineral lubricating oil	d, f		x					BAQV/BQQV
Mineral motor oil	d, f		x					BAQV/BQQV
Synthetic oils								
Synthetic lubricating oil	d, f		x					BAQV/BQQV
Synthetic motor oil	d, f		x					BAQV/BQQV
Silicone oil	d		x					BAQV/BQQV
Vegetable oils								
Corn oil	b, d		x		x			BAQV/BQQV
Olive oil	b, d		x		x			BAQV/BQQV
Peanut oil	b, d		x		x			BAQV/BQQV
Rape seed oil	b, d		x		x			BAQV/BQQV
Soya oil	b, d		x		x			BAQV/BQQV
Cleaning								
Alkaline degreasing agent	b, h	<80°C	x		x			BQQE/DAQF [4]
Soap (salts of fatty acids)	b	<80°C	x	x	x			BQQV
Organic solvents								
Acetone	f	40°C	x					BAQE [3]/BBQE
Ethyl alcohol (ethanol)	f	40°C	x					BAQE [3]/BBQE
Hydrogen peroxide		20°C, 5%				x		BQQE
Isopropyl alcohol	f	40°C	x					BAQE [3]/BBQE
Methyl alcohol (methanol)	f	40°C	x					BAQE [3]/BBQE

Pumped liquids

Pumped liquids	Notes	Additional information	Material version					Shaft seal
			A	B	S	N	R	
Oxidants								
Sodium hypochlorite		20°C, 0.1%					x	BQQV
Salts								
Ammonium bicarbonate	b, d	20°C, 15%	x					BQQE
		60°C, 20%				x		BQQE
Copper sulphate	b, d, g	60°C, 20%				x	x	BQQE
Ferric sulphate	b, d, g	20°C, 20%				x	x	BQQE
Potassium bicarbonate	b, d	20°C, 20%	x					BQQE
		60°C, 20%				x		BQQE
Sodium carbonate	b, d, g	20°C, 20%			x			BQQE
		60°C, 20%				x		BQQE
Potassium permanganate	b, d	20°C, 1%			x			BQQE
		50°C, 10%				x		BQQE
Sodium nitrate	b, d	20°C, 5%			x			BQQE
		60°C, 20%				x		BQQE
Sodium nitrite	b, d	20°C, 20%	x					BQQE
		60°C, 20%				x		BQQE
Sodium phosphate (mono)	b, d	60°C, 20%				x		BQQE
Sodium phosphate (di)	b, d	30°C, 20%			x			BQQE
		60°C, 20%				x		BQQE
Sodium phosphate (tri)	b, d, g	20°C, 10%			x			BQQE
		70°C, 20%				x		BQQE
Sodium sulphate	b, d, g	60°C, 20%				x		BQQE
Sodium sulphite	b, d, g	20°C, 1%			x			BQQE
		60°C, 20%				x		BQQE
Acids								
Acetic acid		20°C, 15%				x		BQQE
Chromic acid		20°C, 10%					x	BQQE
Citric acid	d	50°C, 20%				x		BQQE
Formic acid	d	20°C, 30%				x		BQQE
Nitric acid	d	20°C, 40%				x		BQQE
Oxalic acid	g	20°C, 10%					x	BQQE
Phosphoric acid	b, d, g	70°C, 40%				x		BQQE
Sulphuric acid	b, d	20°C, 20%					x	BQQV
Sulphurous acid		20°C, 5%					x	BQQV
Alkalies								
Ammonium hydroxide		30°C, 30%	x					BQQE
Calcium hydroxide	b	30°C, 5%			x			BQQE
Potassium hydroxide	d, g	20°C, 20%			x			BQQE
		60°C, 20%				x		BQQE
Sodium hydroxide	d, g	20°C, 20%			x			BQQE
		80°C, 20%				x		BQQE

1) Shaft diameters measured at the shaft end (d5) are either 24, 32, 42, 48 or 60 mm. BQBE shaft seals can be used for shaft end diameter (d5) 24 or 32 mm. DAQF shaft seals can be used for all five shaft diameters.
2) Do not use BAQE for potable water. For potable water, we recommend BBQE shaft seals.
3) If diluted with water, use BBQE.
4) If oil residuals are present, use DAQF.

Electrical data

The tables below give all electrical data for motors for NBG(E) and NKG(E) pumps.

Note: For information about electrical data of MMG model E motors, TECO EFF1 and TECO EFF2, see page 245 to 248.

Electrical data, mains-operated motors

NBG/NKG, standard motor range, 2-pole

Motor	Frame size	Voltage	P2 [kW]	$I_{1/1}$ [A]	η [%]	Cos $\varphi_{1/1}$	n [min^{-1}]	$\frac{I_{start}}{I_{1/1}}$
MG	80A-C	3x220-240D/380-415Y	0.75	3.3/1.9	80-80	0.81-0.71	2840-2870	5.8-6.2
MG	80B-C		1.1	4.5/2.6	81-81	0.81-0.75	2820-2850	5.8-6.3
MG	90SA-C		1.5	5.9/3.4	82-82	0.85-0.79	2860-2890	6.3-6.9
MG	90LA-C		2.2	8.25/4.75	84-84	0.87-0.82	2860-2890	7.0-7.6
MG	100LB-C		3	10.8/6.25	85-85	0.88-0.82	2880-2910	7.8-8.5
MG	112MB-C		4	13.8/8.0	86-86	0.90-0.87	2900-2910	8.7-9.5
MG	90LA-C	3x380-415Δ	2.2	4.75	84-84	0.87-0.82	2860-2890	7.0-7.6
MG	100LB-C		3	6.25	85-85	0.88-0.82	2880-2910	7.8-8.5
MG	112MB-C		4	8.0	86-86	0.90-0.87	2900-2910	8.7-9.5
MG	132SB-C		5.5	11.0	87.5-87.5	0.89-0.86	2890-2910	8.9-9.7
MG	132SC-C		7.5	15.2	88-88	0.87-0.81	2890-2910	9.1-9.9
MMG	160MA-E	3x380-415Δ/660-690Y	11	20.2/11.6	89.3	0.89	2930	5.6
MMG	160MB-E		15	26.5/15.2	91.0	0.87	2940	5.8
MMG	160L-E		18.5	32.5/18.8	91.6	0.89	2940	6.5
MMG	180M-E		22	39.5/22.8	91.0	0.89	2950	7.4
MMG	200LA-E		30	57.5/33.0	92.2	0.88	2960	7.0
MMG	200LB-E		37	65.0/37.5	92.0	0.89	2960	7.6
MMG	225M-E		45	78.0/45.0	93.5	0.89	2980	7.4
MMG	250M-E		55	96.5/55.5	93.0	0.90	2960	7.9
MMG	280S-E		75	130/75.0	94.0	0.89	2970	6.6
MMG	280M-E		90	154/89.0	95.0	0.90	2980	7.2
MMG	315S-E		110	188/108	94.0	0.90	2980	7.2
MMG	315M-E		132	222/128	95.0	0.90	2980	7.5
MMG	315LA-E		160	270/156	95.7	0.91	2980	6.0
MMG	315LB-E		200	330/190	95.0	0.92	2980	5.8
MMG	355M-E		250	435/250	95.5	0.92	2980	6.2
MMG	355L-E		315	525/303	95.5	0.91	2980	6.9
MMG	355L-E		355	630/360	95.4	0.90	2980	7.1

NBG/NKG, standard motor range, 4-pole

Motor	Frame size	Voltage	P2 [kW]	$I_{1/1}$ [A]	η [%]	Cos $\varphi_{1/1}$	n [min^{-1}]	$\frac{I_{start}}{I_{1/1}}$
MG	71A-C	3x220-240D/380-415Y	0.25	1.48/0.85	69-69	0.75-0.65	1400-1420	4.0-4.4
MG	71B-C		0.37	1.9/1.1	71-71	0.77-0.67	1400-1420	4.0-4.4
MG	80A-C		0.55	2.6/1.5	77-77	0.79-0.70	1390-1410	4.3-4.7
MG	80B-C		0.75	3.3/1.9	78-78	0.79-0.70	1390-1410	4.3-4.7
MG	90SA-C		1.1	5.0/2.9	78-78	0.78-0.71	1420-1440	4.3-4.7
MG	90LA-C		1.5	6.4/3.7	80-80	0.80-0.74	1420-1430	5.0-5.5
MG	100LB-C		2.2	9.2/5.3	82-82	0.80-0.73	1420-1440	5.2-5.7
MG	112MA-C		3	12.0/6.9	85-85	0.80-0.74	1440-1450	6.2-6.7
MG	112MB-C		4	15.4/8.9	86.5-87	0.82-0.76	1440-1450	6.6-7.2
MG	100 LA-D	3x380-415Δ	2.2	5.3	83.5-84	0.79-0.76	1430-1440	5.4-5.9
MG	112LB-D		3	6.9	85-85	0.80-0.74	1440-1450	6.2-6.7
MG	112MB-C		4	8.9	86.5-87	0.82-0.76	1440-1450	6.6-7.2
MG	132SC-C		5.5	12.6	87-87	0.80-0.74	1430-1450	6.3-6.9

Motor	Frame size	Voltage	P2 [kW]	$I_{1/1}$ [A]	η [%]	Cos $\varphi_{1/1}$	n [min^{-1}]	$\frac{I_{start}}{I_{1/1}}$
MMG	132SB-E		7.5	14.4/8.3	89.1	0.84	1445	7.8
MMG	160MA-E		11	21.0/12.2	89.8	0.84	1460	7.4
MMG	160MB-E		15	28.5/16.4	89.4	0.85	1460	7.8
MMG	180M-E		18.5	33.5/19.4	91.2	0.86	1465	7.6
MMG	180L-E		22	39.0/22.6	91.4	0.86	1465	7.8
MMG	200L-E		30	53.5/31.0	91.5	0.88	1470	7.5
MMG	225S-E		37	71.0/41.0	92.0	0.89	1480	6.9
MMG	225M-E		45	78.0/45.0	92.5	0.89	1480	7.5
MMG	250M-E	3x380-415Δ/660-690Y	55	95.0/55.0	93.0	0.89	1480	7.5
MMG	280S-E		75	128/74.0	94.5	0.87	1480	7.4
MMG	280M-E		90	150/86.5	94.0	0.88	1480	7.5
MMG	315S-E		110	192/110	94.5	0.91	1490	7.3
MMG	315M-E		132	226/130	95.0	0.89	1490	6.7
MMG	315LA-E		160	270/156	95.0	0.89	1490	6.7
MMG	315LB-E		200	340/196	95.5	0.89	1490	5.5
MMG	355M-E		250	410/236	95.5	0.91	1490	6.4
MMG	355L-E		315	525/300	96.0	0.89	1490	6.8

NBG/NKG, standard motor range, 6-pole

Motor	Frame size	Voltage	P2 [kW]	$I_{1/1}$ [A]	η [%]	Cos $\varphi_{1/1}$	n [min^{-1}]	$\frac{I_{start}}{I_{1/1}}$
MMG	80B-E		0.55	1.7/0.98	66.0	0.72	890	3.0
MMG	90S-E		0.75	2.15/1.24	70.3	0.72	910	3.5
MMG	90L-E		1.1	2.95/1.7	73.0	0.74	910	3.6
MMG	100L-E	3x220-240D/380-415Y	1.5	3.7/2.14	76.3	0.77	920	4.3
MMG	112M-E		2.2	5.2/3.0	81.4	0.75	950	5.0
MMG	132S-E		3	6.7/3.85	84.1	0.77	960	6.0
MMG	132MA-E		4	8.85/5.1	84.7	0.77	960	6.4
MMG	112M-E		2.2	3.0/1.73	81.4	0.75	950	5.0
MMG	132S-E		3	3.85/2.2	84.1	0.77	960	6.0
MMG	132MA-E		4	5.1/2.94	84.7	0.77	960	6.4
MMG	132MB-E		5.5	11.4/6.65	86.4	0.80	960	5.9
MMG	160M-E		7.5	16.0/9.2	87.1	0.78	960	5.8
MMG	160L-E		11	22.8/12.2	88.5	0.79	970	7.3
MMG	180L-E		15	31.5/18.2	80.5	0.67	940	5.9
MMG	200LA-E		18.5	35.5/20.4	90.5	0.83	980	7.8
MMG	200LB-E	3x380-415Δ/660-690Y	22	41.5/24.0	91.5	0.84	980	6.6
MMG	225M-E		30	55.0/32.0	91.5	0.85	980	7.0
MMG	250M-E		37	65.5/37.5	92.5	0.88	980	7.0
MMG	280S-E		45	79.0/45.5	92.5	0.87	990	7.3
MMG	280M-E		55	97.0/56.0	93.5	0.87	990	7.2
MMG	315S-E		75	134/77.0	94.0	0.86	990	6.3
MMG	315M-E		90	158/91.0	94.5	0.87	990	5.9
MMG	315L-E		110	192/112	95.0	0.87	990	6.0
MMG	315LB-E		132	250/144	94.2	0.87	990	6.2

NBG/NKG, premium motor range, 2-pole

Motor	Frame size	Voltage	P2 [kW]	$I_{1/1}$ [A]	η [%]	Cos $\varphi_{1/1}$	n [min^{-1}]	$\frac{I_{start}}{I_{1/1}}$
MG	80A-C	3x220-240Δ/380-415Y	0.75	3.3/1.9	80-80	0.81-0.71	2840-2870	5.8-6.2
MG	90SA-D		1.1	4.1/2.35	84-84	0.87-0.82	2890-2910	7.4-8.0
MG	90SB-D		1.5	5.45/3.15	85.5-85.5	0.87-0.82	2890-2910	8.5-9.3
MG	90LC-D		2.2	7.7/4.45	87.5-87.5	0.89-0.87	2890-2910	8.5-9.5
MG	100LC-D		3	10.9/6.3	87.5-87.5	0.87-0.82	2900-2920	8.4-9.2
MG	112MC-D		4	13.9/8.0	89-89	0.88-0.84	2910-2930	11.2-12.3
MG	90LC-D	3x380-415Δ	2.2	4.45	87.5-87.5	0.89-0.87	2890-2910	8.5-9.5
MG	100LC-D		3	6.3	87.5-87.5	0.87-0.82	2900-2920	8.4-9.2
MG	112MC-D		4	8.0	89-89	0.88-0.84	2910-2930	11.2-12.3
MG	132SC-D		5.5	11.2	90-90	0.88-0.84	2910-2930	10.7-11.7
MG	132SD-D		7.5	15.2	89.5-89.5	0.87-0.80	2900-2920	10.0-11.1
Siemens	160M	3x380-415Δ/660-690Y	11	19.4/11.2	91.0	0.90	2945	7.0
Siemens	160M		15	26.3/15.2	91.5	0.90	2945	7.0
Siemens	160L		18.5	31.5/18.2	92.3	0.92	2940	7.0
Siemens	180M		22	38.0/21.9	93.0	0.89	2945	7.2
Siemens	200L		30	52.0/30.0	93.5	0.89	2950	7.0
Siemens	200L		37	64.0/37.0	94.0	0.89	2950	7.0
Siemens	225M		45	77.0/44.5	94.9	0.89	2965	7.3
Siemens	250M		55	93.0/53.7	95.3	0.90	2975	6.8
Siemens	280S		75	128/73.9	95.2	0.89	2975	7.0
Siemens	280M		90	150/86.6	95.6	0.90	2978	7.6
Siemens	315S		110	182/105	95.8	0.91	2982	6.9
Siemens	315M		132	220/127	96.0	0.91	2982	7.1
Siemens	315L		160	260/150	96.4	0.92	2982	7.1
Siemens	315L		200	320/185	96.5	0.93	2982	6.9
Siemens	315		250	415/240	96.0	0.90	2979	7.0
Siemens	315		315	520/300	96.6	0,91	2980	7.0
Siemens	355		355	590/341	96.6	0,90	2982	6.5

NBG/NKG, premium motor range, 4-pole

Motor	Frame size	Voltage	P2 [kW]	$I_{1/1}$ [A]	η [%]	Cos $\varphi_{1/1}$	n [min^{-1}]	$\frac{I_{start}}{I_{1/1}}$
MG	71A-C	3x220-240Δ/380-415Y	0.25	1.48/0.85	69-69	0.75-0.65	1400-1420	4.0-4.4
MG	71B-C		0.37	1.9/1.1	71-71	0.77-0.67	1400-1420	4.0-4.4
MG	80A-C		0.55	2.6/1.5	77-77	0.79-0.70	1390-1410	4.3-4.7
MG	80B-C		0.75	3.3/1.9	78-78	0.79-0.70	1390-1410	4.3-4.7
MG	90SB-D		1.1	4.7/2.7	83.8	0.78	1440	7.0
MG	90LC-D		1.5	6.2/3.6	85	0.77	1440	6.0
MG	100LB-D		2.2	8.5/4.9	86.4	0.82	1440	6.5
MG	100LC-D		3	11.8/6.75	87.4	0.81	1450	6.7
MG	112MC-D		4	15.4/8.9	88.3	0.81	1450	7.3
MG	100LB4-D	3x380-415Δ	2.2	5.35	86.4	0.77/0.7	1440	6.2/6.7
MG	100LC4-D		3	7.2	87.4	0.77/0.7	1440	6.1/6.7
MG	112MC4-D		4	8.9	88.3	0.81/0.75	1450	7.3/8.0

Motor	Frame size	Voltage	P2 [kW]	$I_{1/1}$ [A]	η [%]	Cos $\varphi_{1/1}$	n [min^{-1}]	$\frac{I_{start}}{I_{1/1}}$
Siemens	132S	3x380-415Δ/660-690Y	5.5	10.6/6.1	89.5	0.84	1455	7.0
Siemens	132M		7.5	14.3/8.3	90.3	0.84	1455	7.0
Siemens	160M		11	20.5/11.8	91.5	0.85	1460	6.9
Siemens	160L		15	27.5/15.9	92.0	0.86	1460	7.0
Siemens	180M		18.5	34.5/19.9	92.5	0.84	1465	7.0
Siemens	180L		22	40.5/23.4	93.0	0.84	1465	7.3
Siemens	200L		30	53.0/30.6	93.5	0.87	1465	7.0
Siemens	225S		37	67.0/38.7	94.0	0.85	1480	6.8
Siemens	225M		45	81.0/46.8	94.5	0.85	1480	6.9
Siemens	250M		55	96.0/55.4	95.1	0.87	1485	7.5
Siemens	280S		75	130/75.0	95.1	0.87	1485	6.8
Siemens	280M		90	158/91.2	95.4	0.86	1486	7.5
Siemens	315S		110	190/110	95.9	0.87	1488	7.1
Siemens	315MA		132	225/130	96.1	0.88	1488	7.3
Siemens	315MB		160	275/159	96.3	0.88	1490	7.4
Siemens	315L		200	340/196	96.4	0.88	1490	7.6
Siemens	315		250	425/245	96,0	0.88	1488	6.5
Siemens	315		315	540/312	96,3	0.88	1488	6.8

NBG/NKG, premium motor range, 6-pole

Motor	Frame size	Voltage	P2 [kW]	$I_{1/1}$ [A]	η [%]	Cos $\varphi_{1/1}$	n [min^{-1}]	$\frac{I_{start}}{I_{1/1}}$
Siemens	80B	3x220-240Δ/380-415Y	0.55	2.77/1.60	67.0	0.74	910	3
Siemens	90S		0.75	3.46/2.00	75.5	0.72	925	4
Siemens	90L		1.1	4.85/2.80	82.0	0.70	940	6
Siemens	100L		1.5	6.32/3.65	85.0	0.70	950	6
Siemens	112M		2.2	9.35/5.40	84.0	0.70	955	6
Siemens	132SA		3	10.5/6.10	84.0	0.85	955	7
Siemens	132MA		4	14.7/8.50	84.0	0.81	950	6
Siemens	112M	3x380-415Δ/660-690Y	2.2	5.40/3.12	84.0	0.70	955	6
Siemens	132SA		3	6.10/3.50	84.0	0.84	955	7
Siemens	132MA		4	8.50/4.91	84.0	0.81	950	6
Siemens	132MB		5.5	12.0/6.93	86.0	0.77	960	7
Siemens	160M		7.5	17.1/9.87	88.0	0.72	965	6
Siemens	160L		11	23.0/13.3	88.5	0.78	960	7
Siemens	180L		15	31.5/18.2	91.0	0.75	970	7
Siemens	200LA		18.5	38.0/21.9	91.0	0.77	975	6
Siemens	200LB		22	45.0/26.0	91.5	0.77	975	6
Siemens	225M		30	56.0/32.3	93.2	0.83	980	7
Siemens	250M		37	69.0/39.8	93.7	0.83	985	7
Siemens	280S		45	81.0/46.8	94.4	0.85	988	7
Siemens	280M		55	99.0/57.2	94.6	0.85	988	7
Siemens	315S		75	138/79.7	95.0	0.83	990	7
Siemens	315MA		90	160/92.4	95.3	0.85	990	7
Siemens	315MB		110	196/113	95.6	0.85	990	7
Siemens	315L		132	235/136	95.8	0.85	990	8

Electrical data, motors with built-in frequency converter

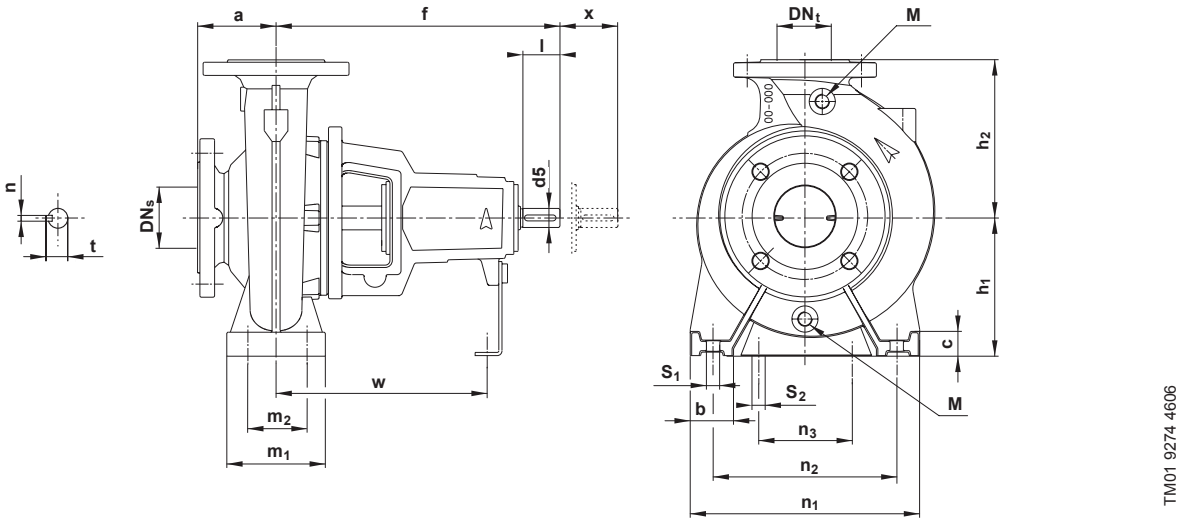
NBGE/NKGE range, 2-pole

Motor	Frame size	Voltage	P2 [kW]	$I_{1/1}$ [A]
MGE	90SB-D	3 x 380-480 V	1.5	3.3 - 2.7
MGE	90LC-D		2.2	4.6 - 3.8
MGE	100LC-D		3	6.2 - 5.0
MGE	112MC-D		4	8.1 - 6.6
MGE	132SC-D		5.5	11.0 - 8.8
MGE	132SD-D		7.5	15.0 - 12.0
MMGE	160M	3 x 380-415 V	11	21.4
MMGE	160MX		15	28.0
MMGE	160L		18.5	34.0
MMGE	180M		22	42.0

NBGE/NKGE range, 4-pole

Motor	Frame size	Voltage	P2 [kW]	$I_{1/1}$ [A]
MGE	90SA-D	3 x 380-480 V	0.75	1.8-1.9
MGE	90SB-D		1.1	2.5 - 2.2
MGE	90LC-D		1.5	3.3 - 2.9
MGE	100LB-D		2.2	4.6 - 3.8
MGE	112LC-D		3	6.2 - 5.0
MGE	112MC-D		4	8.1 - 6.6
MGE	132SC-D	3 x 380-415 V	5.5	11.3 - 10.5
MMGE	160M		7.5	14.7
MMGE	160M		11	21.7
MMGE	160L		15	28.5
MMGE	180M		18.5	34.7
MMGE	180L		22	41.0

NKG model B



M Drain plug/priming plug

Type	Pump [mm]							Supporting feet [mm]										Shaft [mm]					Weight [kg]	
	DNs	DNt	a	f	h1	h2	M	b	m1	m2	n1	n2	n3	w	S1	S2	c	d5	l	x	t	n	CI(1	SS(2
NKG 50-32-125.1	50	32	80	385	112	140	3/8"	50	100	70	190	140	110	285	M12	M12	14	24	50	100	27	8	44	-
NKG 50-32-160.1	50	32	80	385	132	160	3/8"	50	100	70	240	190	110	285	M12	M12	18	24	50	100	27	8	45	-
NKG 50-32-200.1	50	32	80	385	160	180	3/8"	50	100	70	240	190	110	285	M12	M12	18	24	50	100	27	8	54	-
NKG 50-32-125	50	32	80	385	112	140	3/8"	50	100	70	190	140	110	285	M12	M12	14	24	50	100	27	8	44	-
NKG 50-32-160	50	32	80	385	132	160	3/8"	50	100	70	240	190	110	285	M12	M12	18	24	50	100	27	8	46	-
NKG 50-32-200	50	32	80	385	160	180	3/8"	50	100	70	240	190	110	285	M12	M12	18	24	50	100	27	8	54	-
NKG 50-32-250	50	32	100	500	180	225	3/8"	65	125	95	320	250	110	370	M12	M12	26	32	80	100	35	8	83	85
NKG 65-50-125	65	40	80	385	112	140	3/8"	50	100	70	210	160	110	285	M12	M12	18	24	50	100	27	8	47	49
NKG 65-50-160	65	40	80	385	132	160	3/8"	50	100	70	240	190	110	285	M12	M12	18	24	50	100	27	8	48	48
NKG 65-40-200	65	40	100	385	160	180	3/8"	50	100	70	265	212	110	285	M12	M12	18	24	50	100	27	8	55	57
NKG 65-40-250	65	40	100	500	180	225	3/8"	65	125	95	320	250	110	370	M12	M12	19	32	80	100	35	8	81	85
NKG 65-40-315	65	40	125	500	200	250	1/2"	65	125	95	345	280	110	370	M12	M12	24	32	80	100	35	8	124	116
NKG 80-65-125	65	50	100	385	132	160	3/8"	50	100	70	240	190	110	385	M12	M12	18	24	50	100	27	8	50	51
NKG 80-65-160	65	50	100	385	160	180	3/8"	50	100	70	265	212	110	385	M12	M12	18	24	50	100	27	8	52	54
NKG 80-50-200	65	50	100	385	160	200	3/8"	50	100	70	265	212	110	385	M12	M12	18	24	50	100	27	8	58	59
NKG 80-50-250	65	50	125	500	180	225	3/8"	65	125	95	320	250	110	370	M12	M12	19	32	80	100	35	8	86	88
NKG 80-50-315	65	50	125	500	225	280	1/2"	65	125	95	345	280	110	370	M12	M12	31	32	80	100	35	8	130	119
NKG 100-80-125	80	65	100	385	160	180	3/8"	65	125	95	280	212	110	385	M12	M12	19	24	50	100	27	8	55	55
NKG 100-80-160	80	65	100	500	160	200	3/8"	65	125	95	280	212	110	370	M12	M12	19	32	80	100	35	8	72	71
NKG 100-65-200	80	65	100	500	180	225	3/8"	65	125	95	320	250	110	370	M12	M12	19	32	80	140	35	8	81	82
NKG 100-65-250	80	65	125	500	200	250	1/2"	80	160	120	360	280	110	370	M16	M12	23	32	80	140	35	10	111	110
NKG 100-65-315	80	65	125	530	225	280	3/8"	80	160	120	400	315	110	370	M16	M12	23	42	110	140	45	10	141	145
NKG 125-80-160	100	80	125	500	180	225	3/8"	65	125	95	320	250	110	370	M12	M12	19	32	80	140	35	8	81	83
NKG 125-80-200	100	80	125	500	180	250	3/8"	65	125	95	345	280	110	370	M12	M12	19	32	80	140	35	8	95	100
NKG 125-80-250	100	80	125	500	225	280	3/8"	80	160	120	400	315	110	370	M16	M12	23	32	80	140	35	10	115	119
NKG 125-80-315	100	80	125	530	250	315	3/8"	80	160	120	400	315	110	370	M16	M12	23	42	110	140	45	10	152	158
NKG 125-80-400	100	80	125	530	280	355	1/2"	80	160	120	435	355	110	370	M16	M12	31	42	110	140	45	10	225	201
NKG 125-100-160	125	100	125	500	200	280	3/8"	80	160	120	360	280	110	370	M16	M12	21	32	80	140	35	10	99	-
NKG 125-100-200	125	100	125	500	200	280	1/2"	80	160	120	360	280	110	370	M16	M12	23	32	80	140	35	10	107	-
NKG 125-100-250	125	100	140	530	225	225	1/2"	80	160	120	400	315	110	370	M16	M12	24	42	110	140	45	12	133	-
NKG 125-100-315	125	100	140	530	250	315	1/2"	80	160	120	400	315	110	370	M16	M12	23	42	110	140	45	12	161	-
NKG 125-100-400	125	100	140	530	280	355	1/2"	100	200	150	500	400	110	370	M20	M12	30	42	110	140	45	12	242	-
NKG 150-125-200	150	125	140	500	250	315	1/2"	80	160	120	400	315	110	370	M16	M12	23	42	110	140	45	12	135	-
NKG 150-125-250	150	125	140	530	250	355	1/2"	80	160	120	400	315	110	370	M16	M12	23	42	110	140	45	12	158	-
NKG 150-125-315	150	125	140	530	280	355	1/2"	100	200	150	500	400	110	370	M20	M12	26	42	110	140	45	12	190	-
NKG 150-125-400	150	125	140	530	315	400	1/2"	100	200	150	500	400	110	370	M20	M12	38	42	110	140	45	12	254	-
NKG 150-125-500	150	125	180	670	400	500	1/2"	125	200	150	625	500	140	500	M20	M16	49	60	110	180	64	18	503	-