

S pumps, range 66

76 to 98 HP
60 Hz ANSI



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1. Introduction

Introduction

This product guide deals with Grundfos heavy-duty sewage pumps called S pumps, range 66.



TM07 0829 0618

Fig. 1 S pump, range 66

S pumps, range 66, are a range of free-flow channel impeller pumps specifically designed for pumping sewage and wastewater in a wide range of municipal, private and industrial applications.

The pumps are made of resistant materials, such as cast iron and stainless steel. These materials ensure a proper operation.

The pumps are fitted with motors from 76 to 98 HP (57 to 73 kW). The motors are 4-8-pole motors, depending on the motor size.

The free passage in the pumps is 4 to 5.5 in (100-140 mm).

The pumps are available for these types of installation:

- submerged installation on auto-coupling system
- submerged installation, free-standing
- dry installation, vertical
- dry installation, horizontal

Applications

S pumps are designed for applications such as these:

- raw-water intake
- wastewater treatment plants
- municipal pumping stations
- public buildings
- residential housing
- blocks of apartments
- industries
- parking garages
- underground car parks
- car-wash areas
- restaurants and hotels

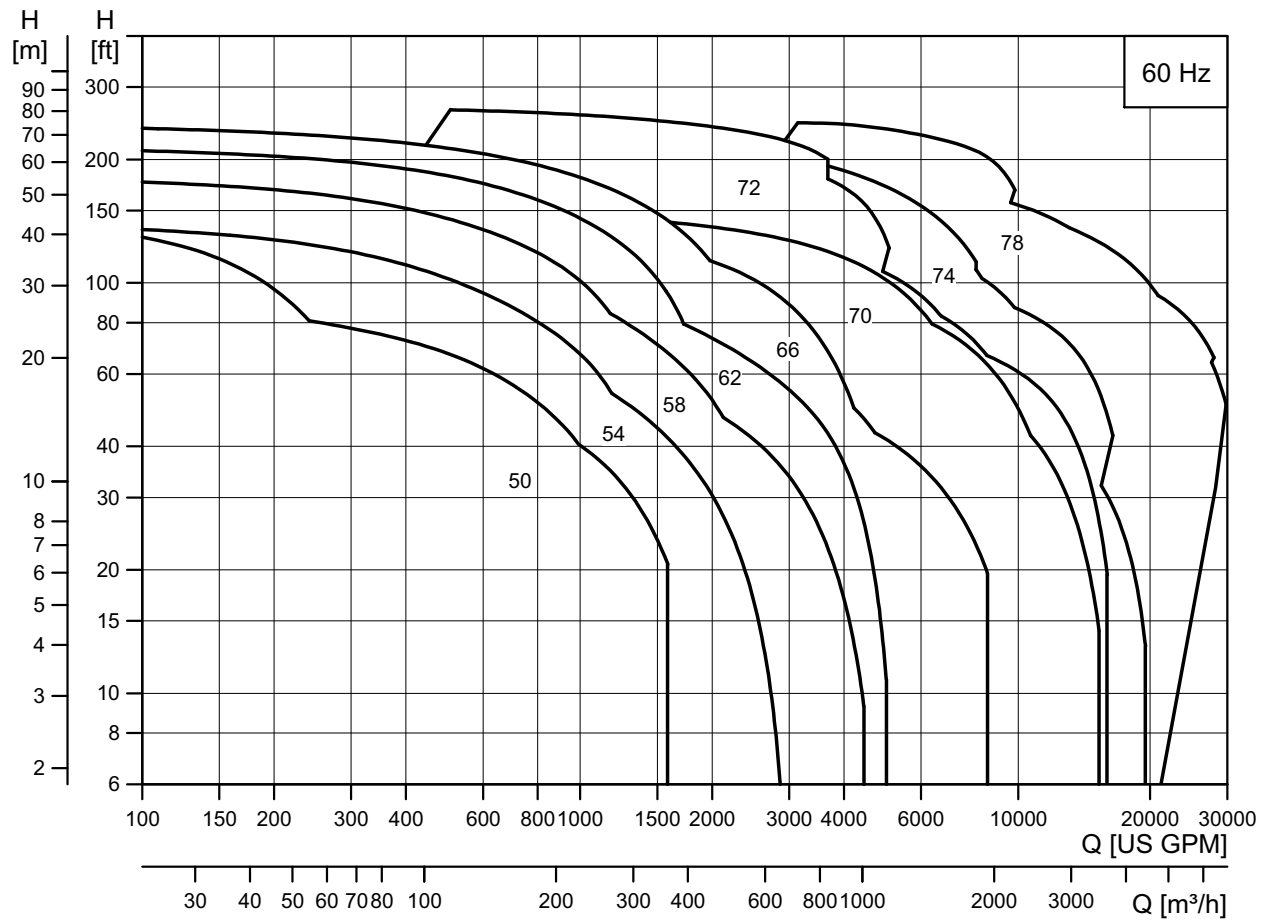
The pumps are suitable for both temporary and permanent installation. The lifting bracket fitted on the pumps facilitates easy transportation as well as installation at the installation site.

Main constructional features

- Leak-proof connections via the Grundfos SmartSeal sealing system.
- double mechanical shaft seal system for reliable sealing between pumped liquid and motor
- watertight cable entry
- moisture switch for continuous monitoring of stator housing and automatic cut-off of power in case liquid penetrates into motor top area or into stator housing.
- self-cleaning channel impeller with long vanes reducing the risk of jamming or clogging
- SmartTrim system allowing easy adjustment of impeller clearance and maintaining maximum pump efficiency over pump lifetime
- motor in insulation class H [356 °F (180 °C)] with class F [311 °F (155 °C)] temperature rise, enclosure class IP68 with three thermal sensors in stator windings
- shaft seal condition monitoring via water-in-oil sensor (optional)
- explosion-proof motors for applications involving potential risk of explosion
- Stainless steel version for use in corrosive or aggressive liquids:
 - stainless steel impeller, cast iron pump and motor housing.

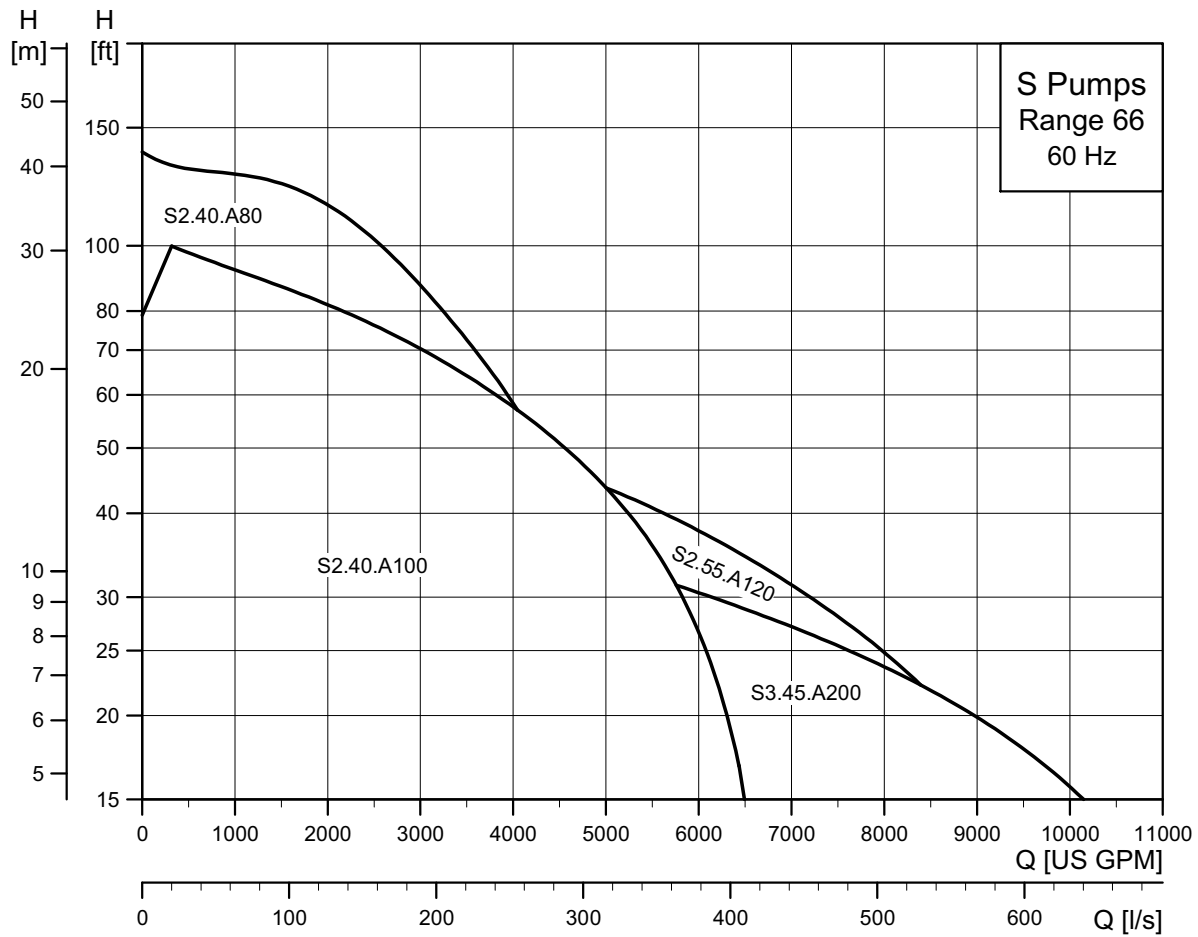
2. Performance range

Performance range overview, S pumps



TM06 4934 3215

Performance range, S pumps, range 66



TM04 6609 4818

List of pump curves

3 x 460 V

Pump type	Pressure range	Curve chart on page
S3.45.A200.760.8...	Low	33
S2.40.A80.980.4...	Medium	35
S2.55.A120.760.8...		37
...	High	
S2.40.A100.760.4...		39

3. Identification

Type key

Please note that the pump type described in this booklet is not necessarily available in all variants.

Example: **S1.40.A80.980.4.66H.S.358.G.Ex.D.611.Z**

Code	Explanation	Designation
S	Grundfos sewage and wastewater pump	Pump type
ST	Multi-channel impeller pump installed in a column pipe	
1	Single-channel impeller	Impeller type
2	Two-channel impeller	
3	Three-channel impeller	
V	SuperVortex impeller	
40	Maximum solids size = code number from type designation / 10 [inch]	Pump passage
A80	Nominal diameter of pump outlet port = code number from type designation / 10 [inch]	Pump outlet, S-type
	Nominal diameter of column pipe = code number from type designation / 10 [inch]	Pump outlet, ST-type
980	P2 = code number from type designation / 10 [HP]	Power output [HP] ¹
2	2-pole motor	Number of poles
4	4-pole motor	
6	6-pole motor	
8	8-pole motor	
10	10-pole motor	
12	12-pole motor	
50	Range 50	Pump range
54	Range 54	
58	Range 58	
62	Range 62	
66	Range 66	
70	Range 70	
S	Super-high	Pressure version
H	High	
M	Medium	
L	Low	
E	Extra-low	
F	Super-low	
S	Submersible installation without cooling jacket	Installation type
C	Submersible installation with cooling jacket	
D	Dry installation, vertical	
H	Dry installation, horizontal	
358	Impeller diameter	Impeller diameter [mm]
G	Cast iron impeller, pump housing and stator housing	Material code for impeller, pump housing and stator housing
Q	Stainless steel impeller, DIN W.-Nr. 1.4408	
N	Non-explosion proof pump	Pump version
Ex	Pump with explosion-proof motor	
B	Pump with built-in SM 113 ²	
C	Not in use	Sensor version
D	Pump without built-in SM 113.	
6	60 Hz	Frequency [Hz]

Code	Explanation	Designation
11	3 x 460 V, Y/D	Voltage code and connection
Z	Custom-built products	Customization

- ¹ The power output (P2) indicated in the type key, which is used to indicate the motor size, can deviate from the actual power output. Please refer to the nameplate or the chapter *Performance curves and technical data* for the exact power output.
- ² PTC sensors are connected directly to IO 113 or other PTC relay.

Pump nameplate

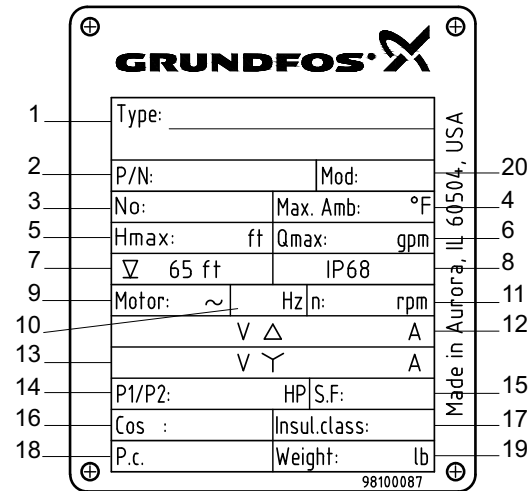


Fig. 2 Pump nameplate

Pos.	Description
1	Type designation
2	Product number
3	Serial number
4	Maximum ambient temperature
5	Maximum head
6	Maximum flow rate
7	Maximum installation depth
8	Enclosure class
9	Number of phases
10	Frequency
11	Rated speed [rpm]
12	Voltage/current, delta connection
13	Voltage/current, star connection
14	Power input/output (P1/P2)
15	Motor service factor
16	Cos ϕ , 1/1 load
17	Insulation class
18	Production code, year and week
19	Weight
20	Generation code

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FM approval plate

The certified pumps (FM pumps) are supplied with an approval plate fixed on motor top cover.

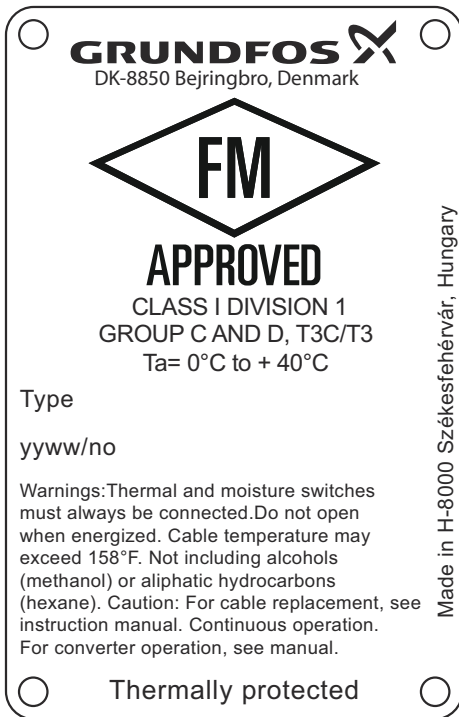


Fig. 3 FM approval plate

The approval plate gives the following details:

	FM approval symbol
Class I	Permitted for locations where flammable gases or vapors may be present.
Division 1	Permitted for locations where flammable or combustible gases can exist under normal operating conditions or because of repair, breakdown or faulty operation of equipment.
Group C and D	Permitted for specific gases or vapors of Group C and D that will be present.
T3C	Temperature class (T code) Surface temperature max. 320 °F (160 °C)
Type	FM listing code (e.g. S50X13.5/4.60)
yyww/no	Production year, week and serial number (e.g. 1052/123456)

FM certification and classification

Pump	Approval
50-70	Class I Division 1 Group C and D Hazardous (Classified) Locations. Temperature class T3C.

4. Selection of product

Ordering the product

When ordering the product you need to take the following four aspects into consideration.

1. pump
2. custom-built variation (option)
3. accessories
4. controller

Pump

Use the online selection tool in Grundfos Product Center to find the best suited pump for your application or use *Product range* on page 9 and *Type key*, page 6 to identify the pump that best fulfils your needs. The list below is a detailed description of the product you get if you order the following pump:

Pump	Product no
S1.40.A80.980.4.66H.C.358.G.Ex.D	96641489

- Pump as specified in the type key.
- 50 ft (15 m) cable.
- Paint: Black, NCS S9000-N/RAL 9005, gloss 30, thickness 150 µm.
- Water-in-oil sensor
- Three thermal switches (Klixon), one in each phase, or three thermal sensors (PTC).
- One moisture switch below the motor top cover and one in the stator housing in the bottom of the motor.
- ANSI centrifugal pump test HI 11.6:2012, acceptance level 3B.

See *Performance curves and technical data*, page 33 for selection of a standard pump.

Note: Product specific data for the pump can also be found online in Grundfos Product Center using product number 96641489.

Custom-built variants

S pumps can be customized to meet individual requirements. Many pump features and options are available for customization, e.g. explosion-proof versions, various cable lengths or special materials.

Variants can be seen in *List of variants*, page 10. For requirements or designs not included in the list, contact Grundfos.

Accessories

Depending on the installation type, you may need to order accessories. See *Accessories* on page 41 for selection of the correct accessories.

Note: Ordered accessories are not fitted from factory.

Controller

Grundfos Dedicated Controls (DC) is available.



Fig. 4 Grundfos Dedicated Controls

Grundfos Dedicated Controls is a control system designed for installation in either commercial buildings or network pumping stations with one to six pumps. As standard, the system is supplied with application optimised software and can be configured to meet your specific pumping needs.

For more information about Grundfos Dedicated Controls, see *Level controllers*, page 21.

TM06 6501 1515

5. Product range

Explosion-proof pumps

All pumps given here can be delivered as non-explosion-proof pumps, if required.

Note: WIO sensor is standard for explosion-proof pumps.

Cast iron, 3 x 460 V

Pump type	Cable length [ft (m)]	Pump	Accessories		
			Horizontal base stand ¹	To be ordered separately	
				Vertical base plate	Auto-coupling system ²
S2.40.A80.980.4.66M.C.301.G.Ex.D.611	50 (15)	97708932	-	-	97506541
S2.40.A80.980.4.66M.D.301.G.Ex.D.611	50 (15)	97708933	-	96236702	-
S2.40.A80.980.4.66M.H.301.G.Ex.D.611	50 (15)	97708934	96308289	-	-
S2.40.A80.980.4.66M.S.301.G.Ex.D.611	50 (15)	97708931	-	-	97506541
S2.40.A100.760.8.66H.C.489.G.Ex.D.611	50 (15)	99442954	-	-	97510048
S2.40.A100.760.8.66H.D.489.G.Ex.D.611	50 (15)	99442955	-	96067312	-
S2.40.A100.760.8.66H.H.489.G.Ex.D.611	50 (15)	99442956	96308208	-	-
S2.40.A100.760.8.66H.S.489.G.Ex.D.611	50 (15)	99442953	-	-	97510048
S2.55.A120.760.8.66M.C.435.G.Ex.D.611	50 (15)	97708928	-	-	97510049
S2.55.A120.760.8.66M.D.435.G.Ex.D.611	50 (15)	97708929	-	96236650	-
S2.55.A120.760.8.66M.H.435.G.Ex.D.611	50 (15)	97708930	96308289	-	-
S2.55.A120.760.8.66M.S.435.G.Ex.D.611	50 (15)	97708927	-	-	97510049
S3.45.A200.760.8.66L.C.371.G.Ex.D.611	50 (15)	97708936	-	-	97510050
S3.45.A200.760.8.66L.D.371.G.Ex.D.611	50 (15)	97708937	-	96177122	-
S3.45.A200.760.8.66L.H.371.G.Ex.D.611	50 (15)	97708938	96308208	-	-
S3.45.A200.760.8.66L.S.371.G.Ex.D.611	50 (15)	97708935	-	-	97510050

¹ Pumps of installation type H include the standard horizontal stand. Pumps with material code G or Q include a painted-steel stand. If another horizontal stand is required, order a pump of installation type D together with the required stand.

² Installation type S and C pumps with outlet flange size ANSI 10" (DN 250) and higher are supplied with guide claw mounted on the flange.

Stainless steel, 3 x 460 V

Pump type	Cable length [ft (m)]	Pump	Accessories		
			Horizontal base stand ¹	To be ordered separately	
				Vertical base plate	Auto-coupling system ²
S1.40.A80.980.4.66H.C.358.Q.Ex.D.611	50 (15)	97723664	-	-	97506541
S1.40.A80.980.4.66H.D.358.Q.Ex.D.611	50 (15)	97723665	-	97643845	-
S1.40.A80.980.4.66H.H.358.Q.Ex.D.611	50 (15)	97723666	96308289	-	-
S1.40.A80.980.4.66H.S.358.Q.Ex.D.611	50 (15)	97723663	-	-	97506541
S2.40.A80.980.4.66M.C.301.Q.Ex.D.611	50 (15)	97723676	-	-	97506541
S2.40.A80.980.4.66M.D.301.Q.Ex.D.611	50 (15)	97723677	-	97643849	-
S2.40.A80.980.4.66M.H.301.Q.Ex.D.611	50 (15)	97723678	96308289	-	-
S2.40.A80.980.4.66M.S.301.Q.Ex.D.611	50 (15)	97723675	-	-	97506541
S2.45.A100.760.8.66H.C.465.Q.Ex.D.611	50 (15)	97723668	-	-	97510048
S2.45.A100.760.8.66H.D.465.Q.Ex.D.611	50 (15)	97723669	-	96236659	-
S2.45.A100.760.8.66H.H.465.Q.Ex.D.611	50 (15)	97723670	96308208	-	-
S2.45.A100.760.8.66H.S.465.Q.Ex.D.611	50 (15)	97723667	-	-	97510048
S2.55.A120.760.8.66M.C.435.Q.Ex.D.611	50 (15)	97723672	-	-	97510049
S2.55.A120.760.8.66M.D.435.Q.Ex.D.611	50 (15)	97723673	-	97643848	-
S2.55.A120.760.8.66M.H.435.Q.Ex.D.611	50 (15)	97723674	96308289	-	-
S2.55.A120.760.8.66M.S.435.Q.Ex.D.611	50 (15)	97723671	-	-	97510049
S3.45.A200.760.8.66L.C.371.Q.Ex.D.611	50 (15)	97723680	-	-	97510050
S3.45.A200.760.8.66L.D.371.Q.Ex.D.611	50 (15)	97723681	-	96825696	-
S3.45.A200.760.8.66L.H.371.Q.Ex.D.611	50 (15)	97723682	96308208	-	-
S3.45.A200.760.8.66L.S.371.Q.Ex.D.611	50 (15)	97723679	-	-	97510050

¹ Pumps of installation type H include the standard horizontal stand. Pumps with material code G or Q include a painted-steel stand. If another horizontal stand is required, order a pump of installation type D together with the required stand.

² Installation type S and C pumps with outlet flange size ANSI 10" (DN 250) and higher are supplied with guide claw mounted on the flange.

6. Variants

List of variants

Motor		
Various cable lengths		33 ft (10 m)
		50 ft (15 m)
		82 ft (25 m)
		165 ft (50 m)
		33 ft (10 m)
EMC power cables	Screened power cables for variable-speed drives	50 ft (15 m)
		82 ft (25 m)
		165 ft (50 m)
Special motor		Special voltage
PTC thermistors in windings		
Special oil	Non-toxic Shell Ondina X420 ¹	
Motor protection		
PTC + moisture switch		FPV1
Klixon + moisture switch + WIO ²		FPV2a
PTC + moisture switch + WIO ²		FPV2b
Klixon + moisture switch + WIO ² + Pt100 at lower and upper bearing + PVS 3		FPV4a
PTC + moisture switch + WIO ² + Pt100 at lower and upper bearing + PVS 3		FPV4b
Materials		
Stainless steel lifting bracket	AISI 316	
Stainless steel impeller	Duplex ASTM 890 Grade 3A, and 316 stainless steel	Variant Q
Stainless steel shaft	AISI 329 / 1.4462	
Ceramic coatings for pump housing, suction cover and impellers	Belzona 1321 and Chesterton ARC 855	
Tests		
Test at specified duty on standard impeller curve		
Trimmed impeller for specified duty test		
Additional test of entire QH curve (including report)	5-10 points from pump performance curve	
Different test standard	Efficiency guaranteed by Grundfos	HI 11.6:2012 grade 1B/1U tolerance
		HI 11.6:2012 grade 2B/2U tolerance
Vibration test (including report)	According to Grundfos factory quality standard	
Performance test on dry test stand	Not yet available	
NPSHr test	Not yet available	
String test	Contact Grundfos	
Witness test	Contact Grundfos	
Miscellaneous		
Special packaging	Contact Grundfos	
Special nameplate	Contact Grundfos	
Other variants	Contact Grundfos	

¹ Shell Ondina should not be used for pumps with WIO sensor.

² WIO sensor is standard for explosion-proof pumps.

7. Construction

Sectional drawings, motors

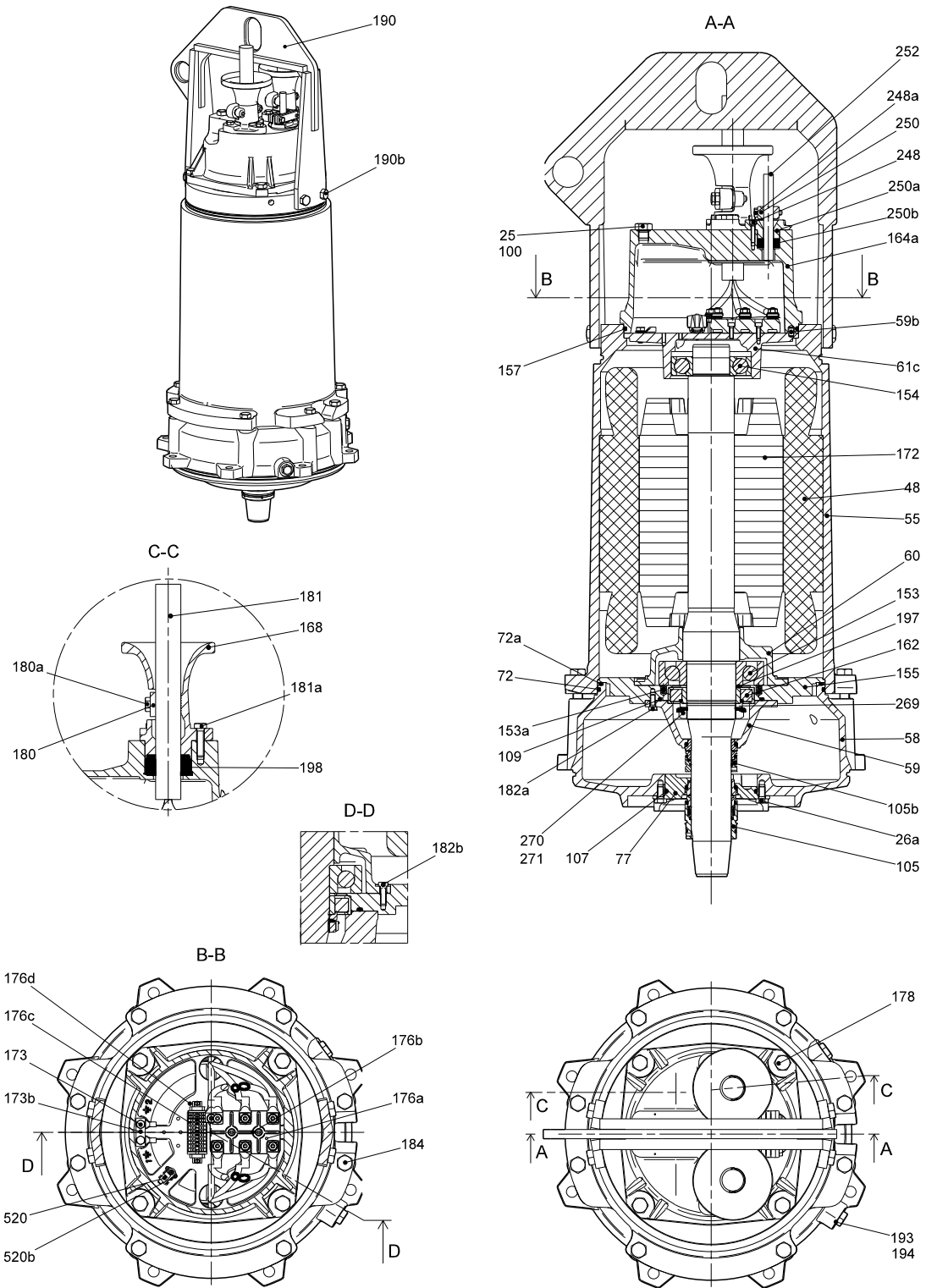


Fig. 5 Explosion-proof motor without cooling jacket (installation type S)

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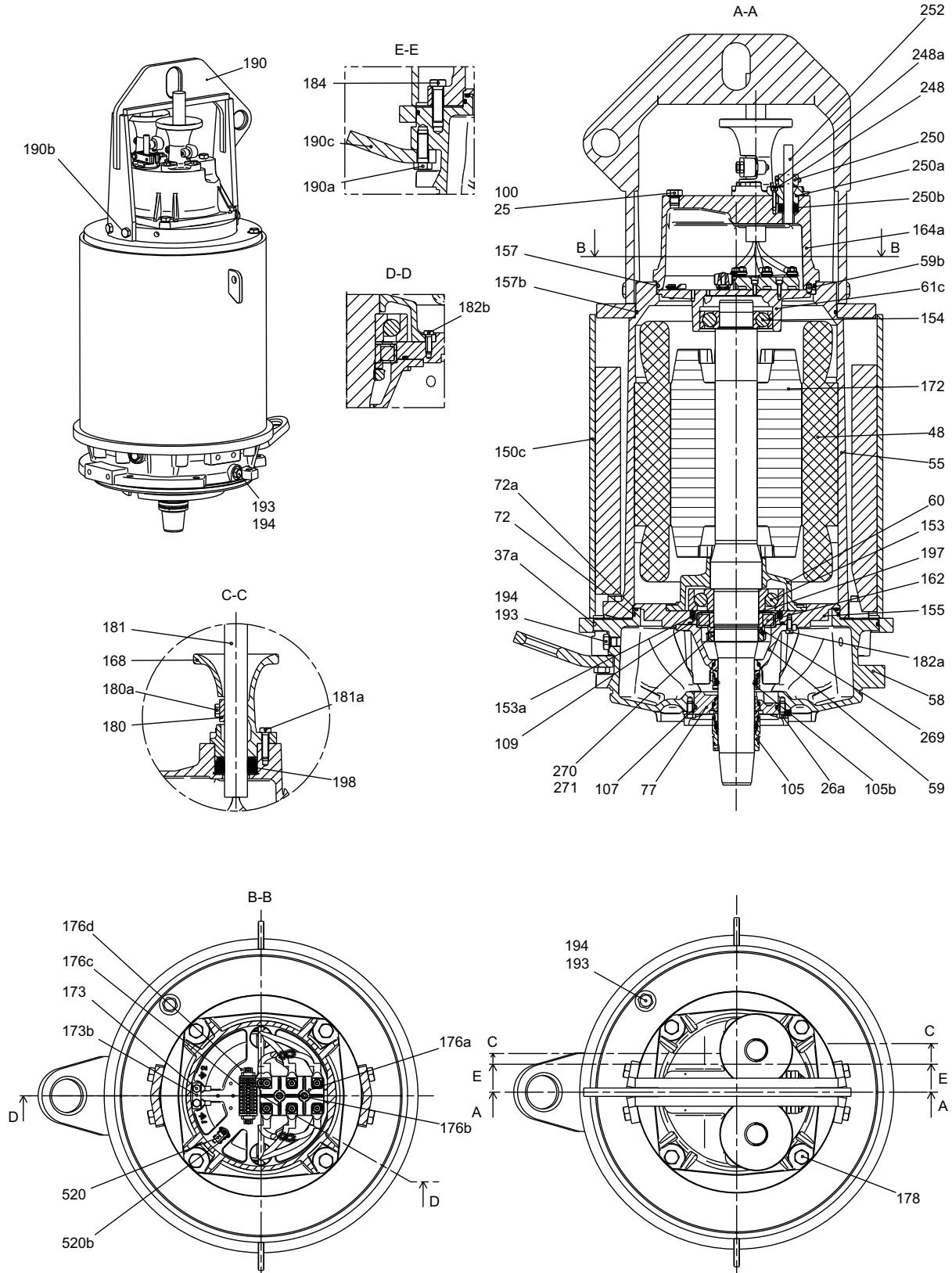


Fig. 6 Explosion-proof motor with cooling jacket (installation types C, D and H)

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Pumps

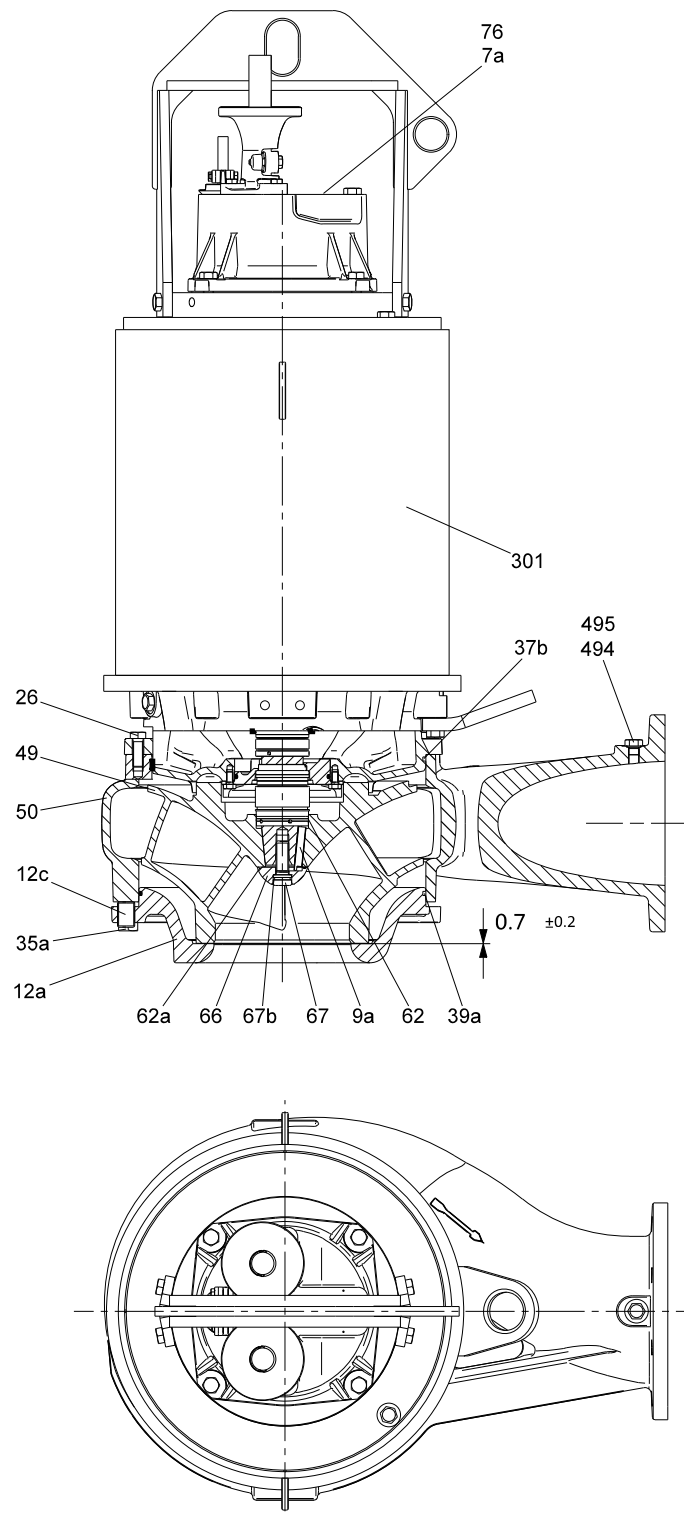


Fig. 7 Basic pump, installation types S and C

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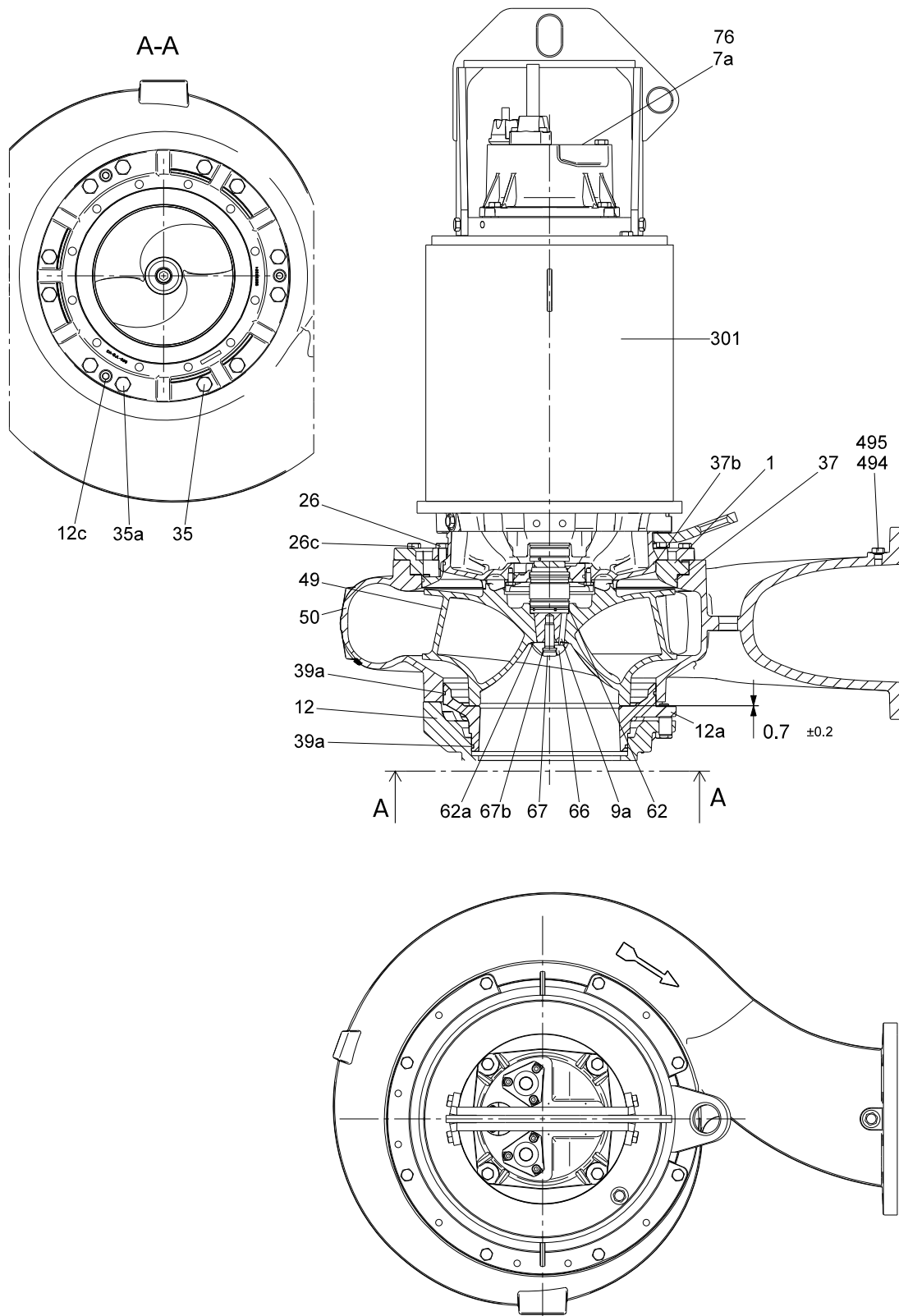


Fig. 8 Basic pump, installation types D and H

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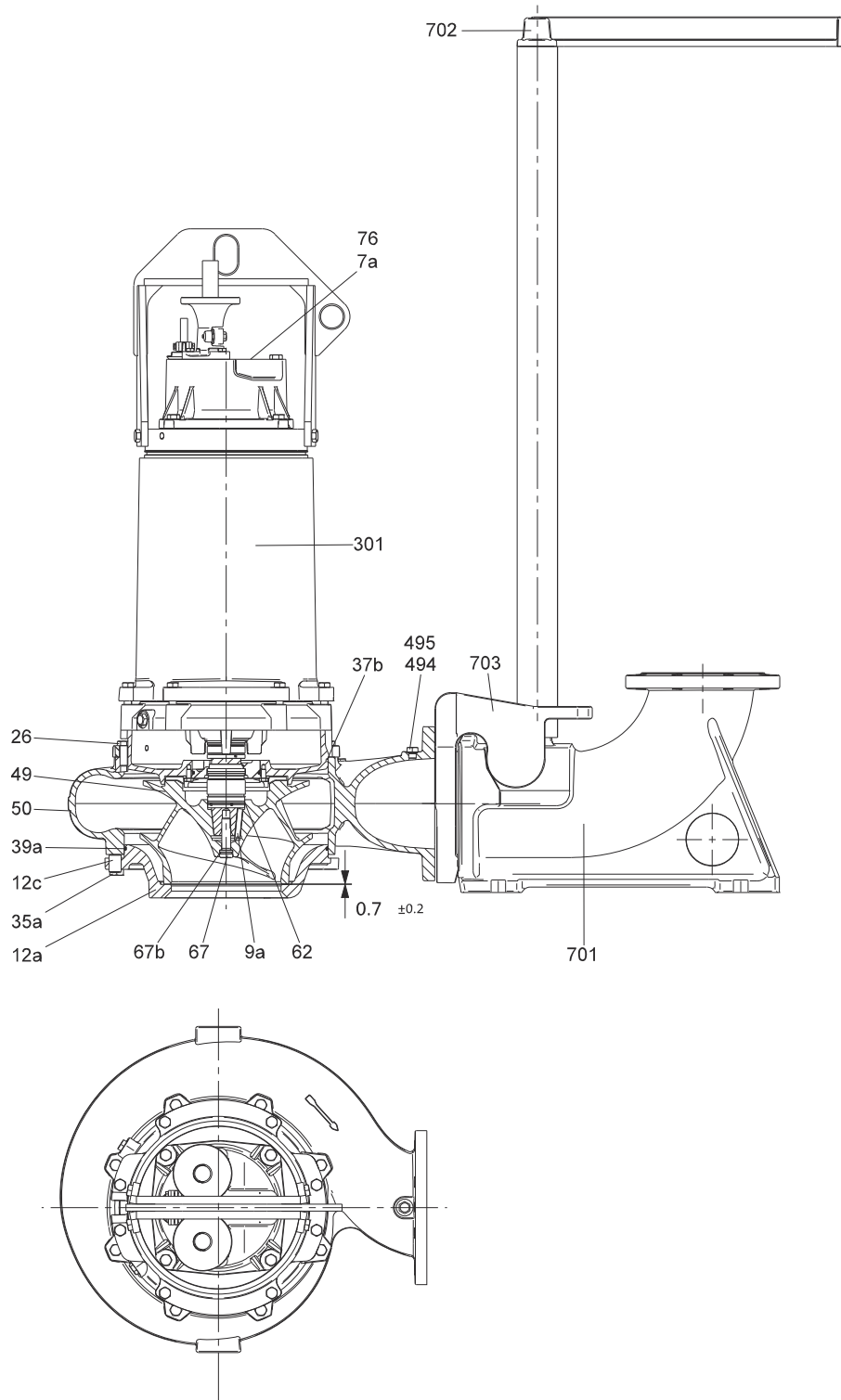


Fig. 9 Installation types S and C pump on auto-coupling

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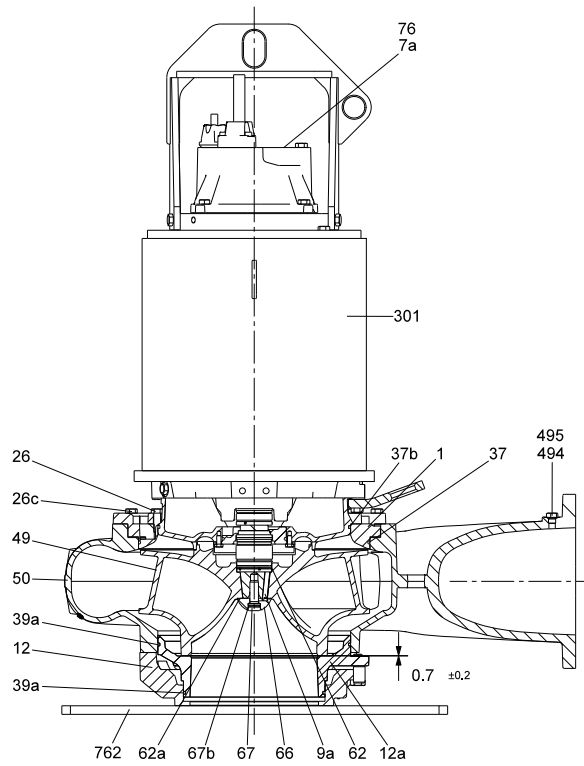


Fig. 10 Installation type D, dry, vertical pump on base plate - version 1

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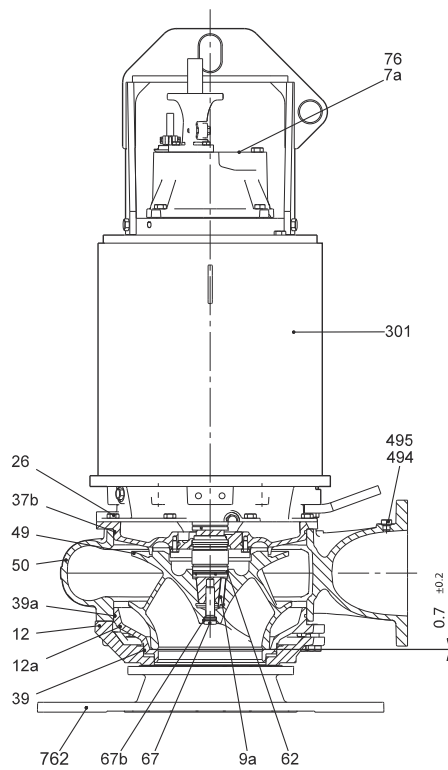
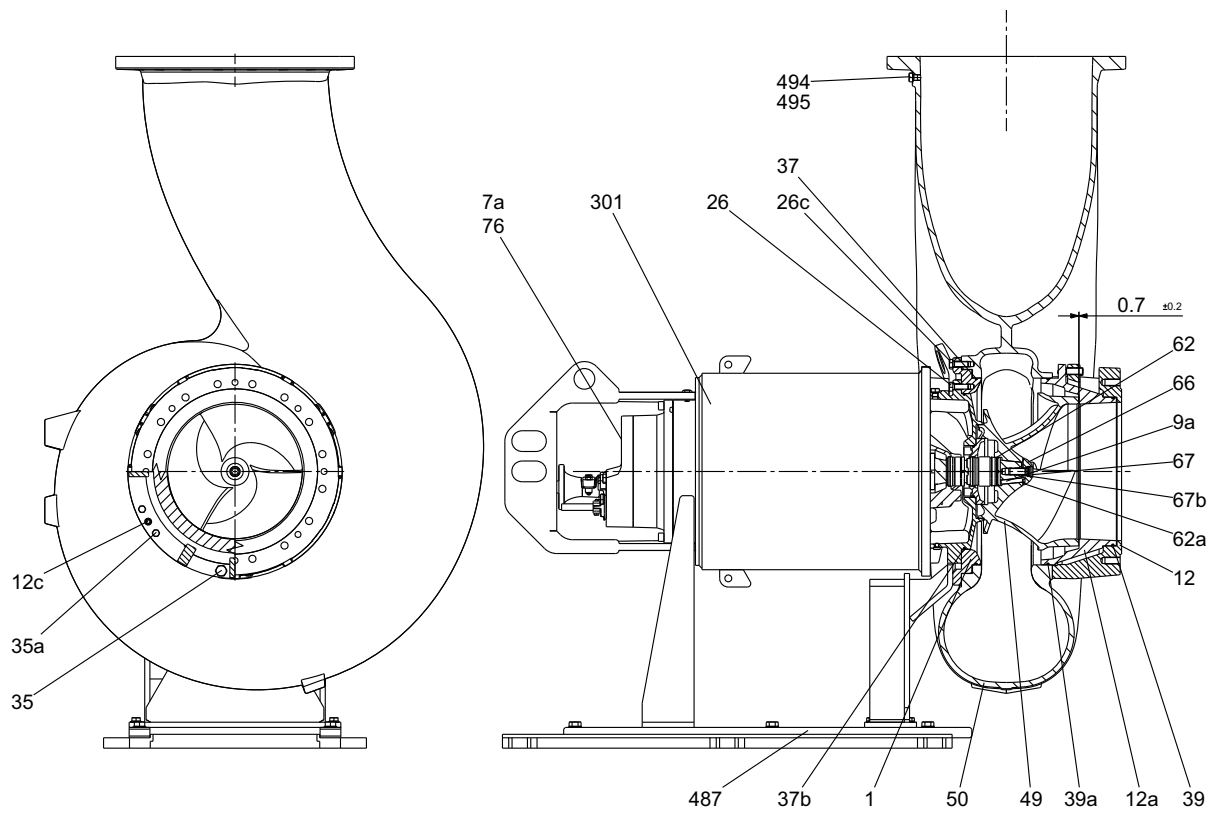


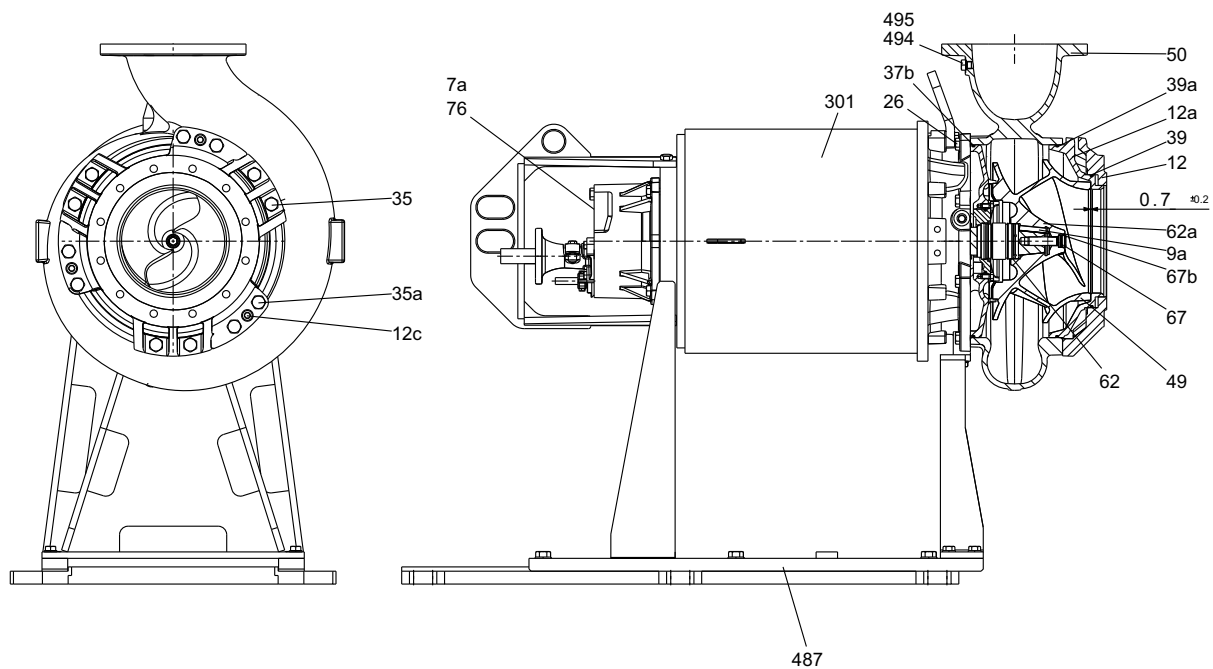
Fig. 11 Installation type D, dry, vertical pump on base plate - version 2

TM04 2588 2708



TM04 2590 2708

Fig. 12 Installation type H, dry, horizontal installation on base stand - version 1



TM04 2591 0817

Fig. 13 Installation type H, dry, horizontal installation on base stand - version 2

Components and material specification

Motor

Pos.	Component	Material	DIN W.Nr./ EN standard	AISI/ ASTM
25	Pressure test plug	Stainless steel	1.4436	316
26a	Screw	Stainless steel	1.4436	316
37a	O-Ring			
48	Stator lamination			
55	Stator housing	Cast iron ¹	EN-GJL-250	A48 class 30
58	Seal housing	Cast iron		
59	Bearing bracket cover			
59b	Pin			
60	Lower bearing bracket cover	Cast iron		
61c	Upper bearing bracket	Cast iron		
72	O-ring	NBR rubber		
72a	O-ring	NBR rubber		
76a	Approval plate			
77	Seal housing cover	Cast iron		
100	O-ring	NBR rubber		
105b	Mechanical seal	SiC/SiC or SiC/ carbon		
105	Mechanical seal	SiC/SiC or SiC/ carbon		
107	O-ring	NBR rubber		
109	O-ring	Viton rubber		
150c	Cooling jacket	Galvanized steel		
153	Ball bearing	Stainless steel		
153a	Spring	Steel		
154	Ball bearing	Stainless steel		
155	Lower bearing bracket	Cast iron ¹		
157b	O-ring	NBR rubber		
157	O-ring	NBR rubber		
162	Roller bearing			
164a	Motor top cover	Cast iron ¹		
168	Cable entry	Cast iron		
172	Shaft with rotor	Stainless steel	1.4462	329
173	Screw	Stainless steel	1.4436	316
173b	Earth terminal			
176a	Terminal block			
176b	Screw	Stainless steel	1.4436	316
176c	Terminal block			
176d	Terminal block			
178	Screw	Stainless steel	1.4436	316
180	Cable clamp	PA or cast iron		
180a	Screw			
181	Cable	ATON		
181a	Screw	Stainless steel	1.4436	316
182a	Screw	Stainless steel		
182b	Screw	Stainless steel	1.4436	316
184	Screw	Stainless steel	1.4436	316
190	Lifting bracket	Stainless steel	1.4436	316
190a	Screw	Stainless steel		
190b	Screw	Stainless steel		
190c	Lifting bracket (lower)	Galvanized steel		
193	Plug	Stainless steel	1.4436	316
194	O-ring	NBR rubber		
197	Washer	Stainless steel	1.4436	316
198	Rubber seal			
248	Screw	Stainless steel	1.4436	316
248a	Screw	Stainless steel	1.4436	316
250	Cable clamp	PA or cast iron		
250a	Cable entry	PA or cast iron		
250b	Rubber seal			
252	Cable	ATON		
269	Angle ring	Steel		

Pos.	Component	Material	DIN W.Nr./ EN standard	AISI/ ASTM
270	Lock nut	Steel		
271	Lock Washer	Steel		
520 ²	Moisture switch			
520b	Nut	Stainless steel	1.4436	316

¹ Available in stainless steel (custom-built option).

² FM versions have two moisture switches.

Pump

Pos.	Component	Material	DIN W.Nr./ EN standard	AISI/ ASTM
1	Intermediate ring	Cast iron		
7a	Rivet	Stainless steel	1.4436	316
9a	Key (for keyway)	Stainless steel	1.4436	316
12	Flange	Cast iron		
12a	Inlet Cover	Cast iron		
12c	Adjusting screw	Stainless steel	1.4436	316
26	Screw	Stainless steel	1.4436	316
26c	Screw	Stainless steel	1.4436	316
35	Screw	Stainless steel	1.4436	316
35a	Screw	NBR rubber		
37	O-ring	NBR rubber		
37b	O-ring	NBR rubber		
39	O-ring	NBR rubber		
39a	O-ring	NBR rubber		
49	Impeller	Cast iron ¹	EN-GJS-500-7	A536 class 70-50-05
50	Pump housing	Cast iron ¹	EN-GJL-250	A48-CL35
62	O-ring	NBR rubber		
62a	O-ring	NBR rubber		
66	Cap	Cast iron or stainless steel		
67	Impeller screw	Cast iron	EN-GJL-250	A48-CL35
67b	O-ring	NBR rubber		
76	Nameplate			
301	Motor housing			
487	Base stand, horizontal	Galvanized steel		
494	Plug	Stainless steel	1.4436	316
495	O-ring	NBR rubber		

¹ Available in stainless steel (custom-built option).

Accessories

Pos.	Component	Material
487	Base stand, horizontal ¹	Cast iron or steel
701	Auto-coupling base unit	Cast iron ²
702	Upper guide rail bracket	Cast iron ²
703	Guide claw ³	Cast iron ²
762	Base plate, vertical	Cast iron or steel

¹ Pumps of installation type H include the standard horizontal stand. Pumps with material code G or Q include a painted-steel stand. If another horizontal stand is required, order a pump of installation type D together with the required stand.

² Available in stainless steel (custom-built option).

³ Guide claws for ANSI 10" (DN 250) outlets or bigger are factory fitted.

8. Product description

Features

SmartTrim

On conventional pumps, maintaining factory-set impeller clearance is a time-consuming and costly task. The pumps need to be disconnected from the pipes and to be totally dismantled, and new parts need to be mounted in order to maintain full pumping efficiency. Not so with Grundfos SmartTrim!

All Grundfos heavy-duty channel-impeller pumps, whether for submerged or dry installation, are equipped with the unique SmartTrim impeller clearance adjustment system. This enables you to easily restore factory-set impeller clearance and maintain peak pumping efficiency. All you need to do is to tighten the adjustment screws on the exterior of the impeller housing. This can be done on site, quickly and easily, without dismantling the pump and without using special tools.

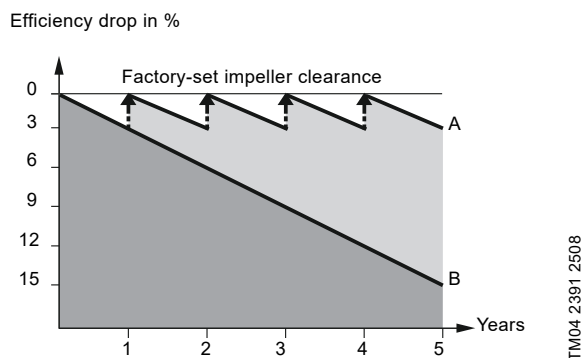


Fig. 14 Impeller clearance adjustment cycle

A: With Grundfos SmartTrim impeller clearance adjustment system

B: Without impeller clearance adjustment system

SmartSeal

For pumps with 10" (DN 250) outlet or larger, the Grundfos SmartSeal auto-coupling sealing mounted on the pump outlet flange provides a completely leak-proof connection between the pump and the base unit of the auto-coupling system. This optimizes the efficiency of the entire pumping system and keeps operating costs at a minimum.

Bearings

The bearings are greased for life.

Main bearings: Double-row angular contact ball bearing. Single or pair mounted angular contact ball bearings for axial forces and cylindrical roller bearing for radial forces.

Support bearings: Single-row deep-groove ball bearing.

Shaft seal

The pumps have a primary and a secondary shaft seal.

The material combination of the primary shaft seal of all pump types is silicon carbide/silicon carbide. For the secondary shaft seal, the material combination is silicon carbide/carbon.

The shaft seals are placed in the oil chamber of the pump. The oil chamber provides reliable sealing between the pumped liquid and the motor.

The shaft seals have no springs or other parts in direct contact with the pumped liquid. This prevents rags and fibres from getting caught. The shaft seals are bidirectional, meaning that they can operate in either direction, thus allowing for opposite rotation caused by back-flow of liquid through the pump.

Motor

The motor is a watertight, totally encapsulated motor.

- Insulation class H [356 °F (180 °C)]
- Temperature rise class F [189 °F (155 K)]
- Enclosure class IP68.

For motor protection and sensors, see *Sensors*, page 20.

Cables

The pumps have H07RN-F AT power cables as standard or screened ATON EMC VSCCB power cables on request.

The pumps have H07RN-F 450/750 V control cables as standard or screened ATON VSCB 450/750 V control cables on request.

The cables are 50 ft (15 m) long as standard. Other cable lengths are available on request. See *List of variants*, page 10.

The number and dimension of cables depend on the motor size.

Motor power [HP (kW)]	Voltage	Cable size [power + control]
76 (57)	3 x 460 V	2 x 4 x 25 mm ² +
98 (73)		1 x 10 x 1.5 mm ²

Power cable

Cable type [mm ²]	Outer cable diameter [inch (mm)]	Weight [lb/ft (kg/m)]	Bending radius [inch (cm)]
4 x 25	1.14-1.23 (28.9-31.4)	1.26 (1.88)	7.5 (19)

Control cable

Cable type [mm ²]	Outer cable diameter [inch (mm)]	Weight [lb/ft (kg/m)]	Bending radius [inch (cm)]
10 x 1.5	0.71 - 0.79 (18.0 - 20.0)	0.34 (0.5)	6 x D

Cable entry

Watertight cast iron cable entry with soft shape and sealing rings to prevent damage of the cable or leaks.

Sensors

As standard the pump is equipped with these switches and sensors:

- Three thermal switches (Klixon), one in each phase.
- Two moisture switches;
 - one under motor top cover
 - one in the stator housing.

Customized sensor options

1. WIO (water-in-oil) sensor

The WIO sensor measures the water content in the oil and converts the value into an analog current signal. The two sensor conductors are for power supply as well as for carrying the signal to the measuring device or controller. The sensor measures the water content from 0 to 20 %. It also sends a signal if the water content is outside the normal range (warning), or if there is air in the oil chamber (alarm). The sensor is fitted in a stainless steel tube for mechanical protection.

The sensor is either built-in with the motor (FM) or installed as an accessory. If the sensor is installed externally, it is fitted in a plastic hose for mechanical protection. The WIO sensor is connected to the Grundfos IO 113 module.

2. PVS3 (pump vibration sensor)

The vibration sensor monitors the vibration level of the pump by using measurements of three axes and combining them into a single measurement outputted in an analog current signal. The sensor acts only as a general indicator of changes in the vibration levels. PVS3 is to be connected to the Grundfos IO 113 and SM 113 modules. A substantial increase in vibration will trigger a warning or an alarm.

An increase in vibrations can be caused by a clogged impeller, worn bearings, closed force main valves, etc. indicating that service inspection should be carried out quickly in order to protect the pump or the pipe system from being damaged.

3. Bearing temperature sensor

Pt100 bearing temperature sensor installed within the motor housing. Sensors to be connected using a SM 113 and IO 113.

Testing

All pumps are tested before leaving the factory. The factory test report is based on ANSI-HI centrifugal pump test 11.6:2012, acceptance level 3B. Test reports can be ordered directly with the pump or can be ordered separately based on the pump serial number.

Other tests or third party inspection certificates are available on request. See *List of variants*, page 10.

Operating conditions**Pumps without cooling jacket in submerged installation (type S):**

- Continuous operation when the pump is fully submerged to the top of the motor.
- Intermittent operation with maximum 20 starts per hour when the pump is submerged to the middle of the motor and with short periods of operation down to the top of the pump housing.

Warning: A motor protection device must be used to cut off power supply in case of overheating.

Note: Explosion-proof pumps must always be fully submerged.

Pumps with cooling jacket in submerged and dry installation (types C, D and H):

- Continuous and intermittent operation with maximum 15 starts per hour with water level down to the top of the pump housing.

Pumped liquidspH value: 4-10

Liquid temperature: 32-104 °F (0-40 °C)

When pumping liquids with a density and/or a kinematic viscosity higher than that of water, use motors with correspondingly higher outputs.

Sound pressure

The sound pressure level of the pump is lower than the limiting values stated in the EC Council directive 2006/42/EC relating to machinery (the EC Machinery Directive).

Motor range

Motor power [HP (kW)]	Number of poles
76 (57)	8
98 (73)	4

Explosion-proof pumps

Use explosion-proof pumps in potentially explosive environments.

Note: All installations must be approved by the local authorities.

Relevant standards/regulations

- FM 3600
- FM 3615
- FM 3615.80
- ANSI/UL 1004-1
- ANSI/UL 1004-3

Explosion protection classification (FMus)

Class I, Division 1, Groups C and D, T3 or T3C

Operation with frequency converter

Only temperature class T3

Notified body

FM Approvals

Level controllers

Grundfos offers dedicated pump controllers for monitoring liquid levels in the wastewater collecting tanks to ensure correct operation and protection of the pumps.

Grundfos pump controllers are ideally suited to Grundfos S pumps, and include:

- Grundfos Dedicated Controls (DC)
- Grundfos LC controllers

Grundfos DC Controllers



Gr-1016086

Fig. 15 Grundfos Dedicated Controls control cabinet

Grundfos Dedicated Controls (DC) is a control system designed for installation in municipal wastewater transportation, commercial buildings or network pumping stations with up to six wastewater pumps and an optional mixer or a flush valve.

Advanced control and data communication are also possible with the Grundfos Dedicated Controls system. The control cabinets are delivered with a built-in main switch and thermal magnetic circuit breaker.

Features and benefits:

- Advanced Flow Calculation
- Automatic energy optimization
- Easy installation and configuration
- Configuration wizard
- Electrical overview
- Advanced data communication
- Advanced alarm and warning priority
- Supports several languages
- Daily emptying
- Mixer control or flush valve
- User-defined functions
- Anti-blocking
- Start level variation
- Advanced pump alternation with pump groups
- SMS scheduling
- Communication to SCADA, BMS, GRM or cell phone.

Dedicated Controls is ordered either with or without a built-in communication interface module (CIM).

The communication module enables the possibility for fieldbus protocol (e.g. PROFIBUS DP, Modbus RTU and PROFINET IO/Modbus TCP) and the communication line.

For further information about Grundfos Dedicated Controls, please see Grundfos Product Center:

- Grundfos Dedicated Controls, brochure <http://net.grundfos.com/qr/i/96925597>
- Grundfos iSolutions, brochure <http://net.grundfos.com/qr/i/99249771>
- Grundfos Controls Guide, product guide <http://net.grundfos.com/qr/i/97954965>

Additional features, CUE or VFD

The CUE/VFD (optional), which is either a Grundfos variable frequency drive or a general variable frequency drive, offers better pump protection and a more steady flow through the pipe system.

In addition, Grundfos CUE, VFD offers these features and benefits:

- Anti-blocking
 - Automatic energy optimization
 - Specific-energy test
 - Output frequency
 - Monitoring of:
 - voltage*
 - current*
 - phase sequence*
 - power*
 - energy*
 - torque*
 - Reverse start**
 - Run flushing
 - Stop flushing
 - PID control.
- * These functions are only available with a Grundfos CUE.
- ** We do not recommend reversing at full speed at any time. When reduced reverse operation settings are set, make sure constant torque is enabled in Variable Frequency Drive (VFD) (i.e. Grundfos CUE, Siemens Simatic, ABB, Schneider Electric etc.) to have maximum torque available when reversing.

Grundfos LC controllers

The LC 231 pump controller is designed for level control, monitoring and protection of Grundfos pumping stations featuring one pump or two pumps, starting direct-on-line. The LC 231 controller is integrated in a polymer cabinet.

The LC 241 is a modular pump controller that has a metal or polymer cabinet and can be customized according to your needs.

It is designed for level control, monitoring and protection of Grundfos pumping stations featuring one pump or two pumps, starting direct-on-line with 0-23 A, star-delta with 0-59 A or soft starter with 0-72 A.

IO 113

The IO 113 module is a protection module for Grundfos wastewater pumps.

IO 113 has inputs for digital and analog pump sensors and can stop the pump if a sensor indicates a pump fault.

IO 113 can be connected to Grundfos Dedicated Controls and allows advanced monitoring functions:

- motor temperature
- moisture in motor
- water in oil
- insulation resistance.

SM 113

The SM 113 module is used for collection and transfer of sensor data in pumps and includes a large number of sensors.

SM 113 can be placed either inside the pump (allowing fewer sensor conductors out of the pump) or in the control cabinet next to the pump installation.

SM 113 works together with IO 113 through a power-line communication using the Grundfos GENIbus protocol.

SM 113 can collect data from:

- 3 current sensors, 4-20 mA
- 3 Pt100 thermal sensors or 3 Pt1000 thermal sensors
- 1 PTC thermal sensor
- 1 digital input.

MP 204

The MP 204 control cabinet can be used as a stand-alone motor protector. MP 204 may also be incorporated in a Grundfos Dedicated Controls system in which it functions as a motor protector. The pump is protected secondarily by measuring the temperature with a Pt100 sensor and a PTC sensor or thermal switch.

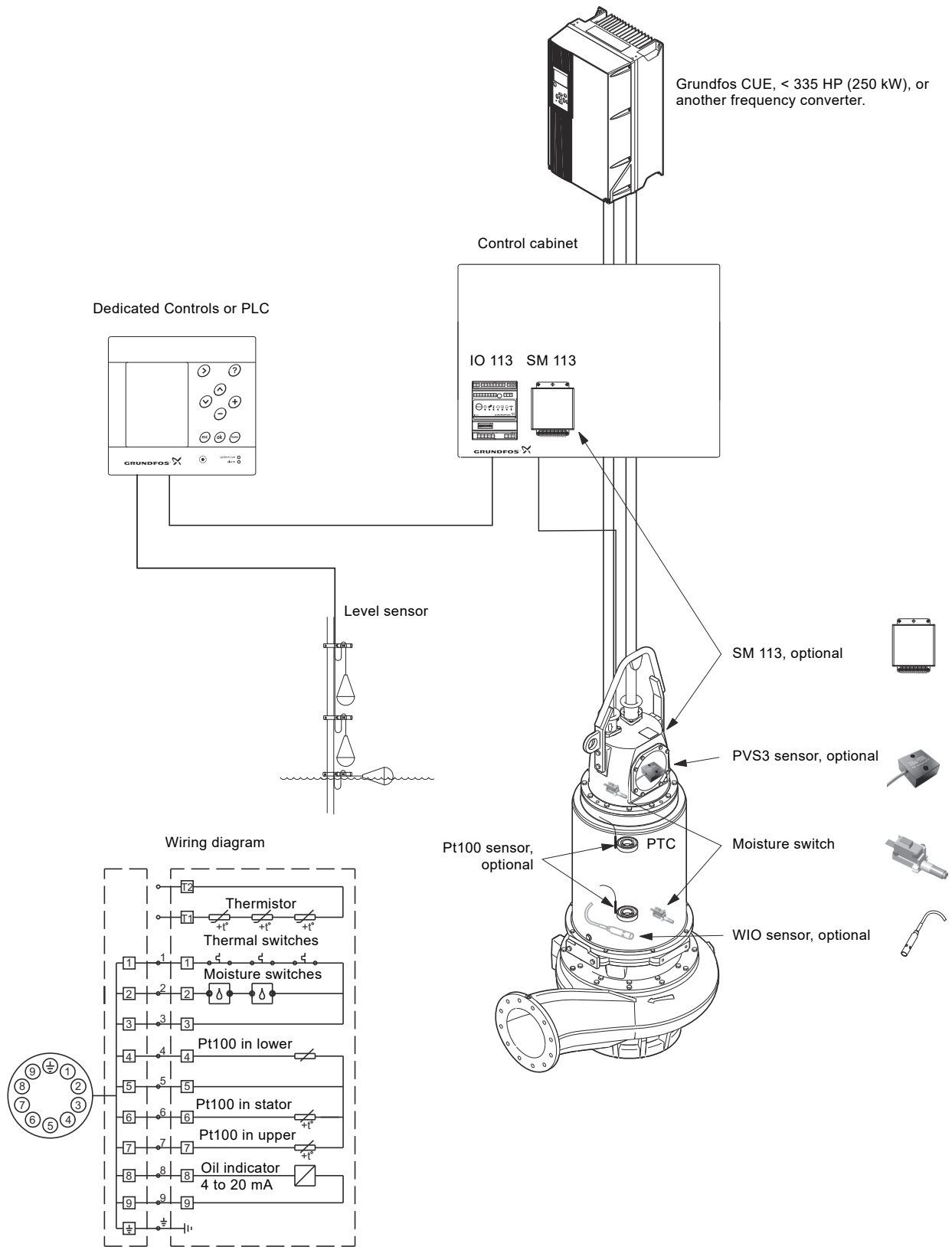


Fig. 16 Pumps with frequency converter operation

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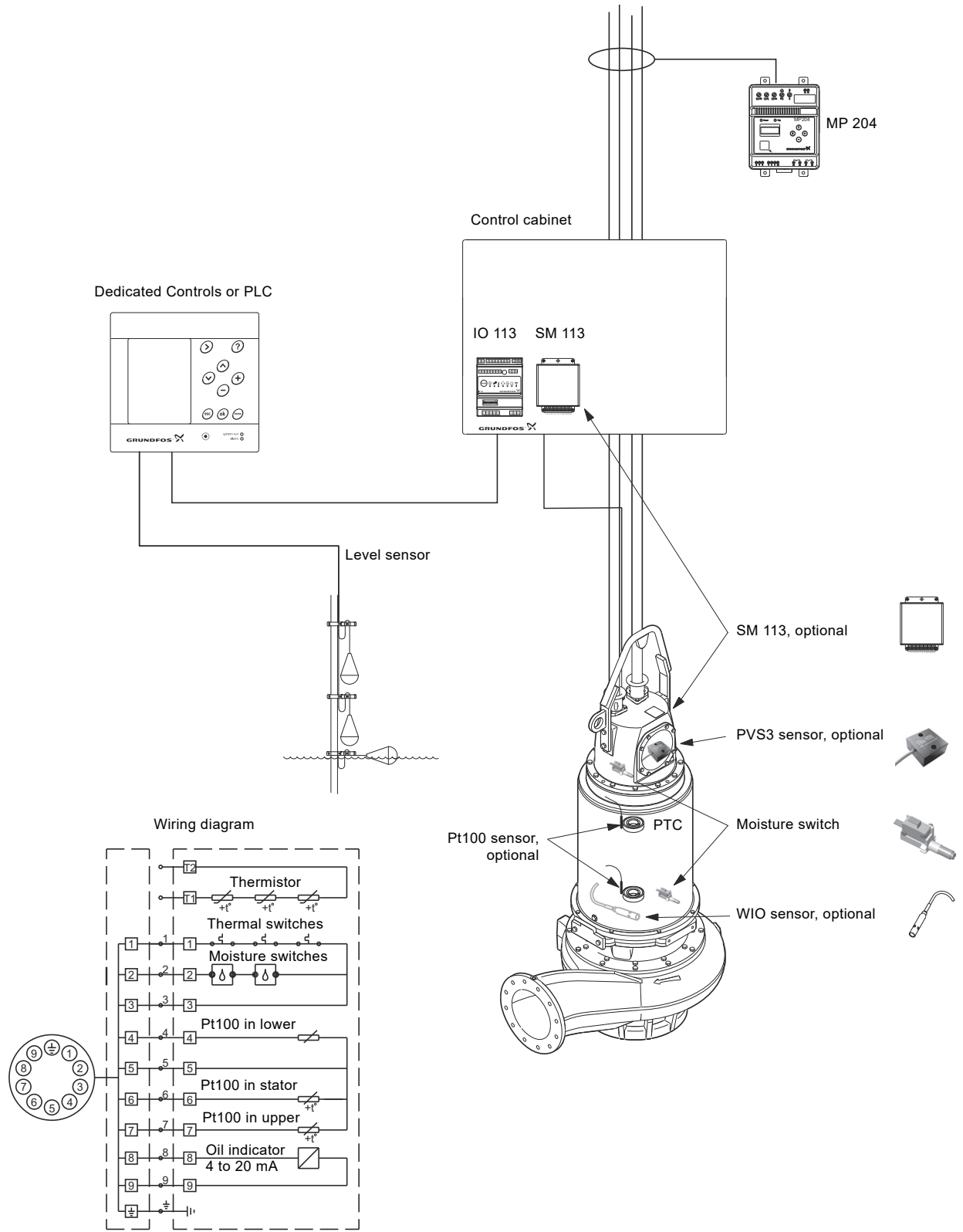


Fig. 17 Pump with MP 204 motor protector

TM06 8754 1117

Wiring diagrams

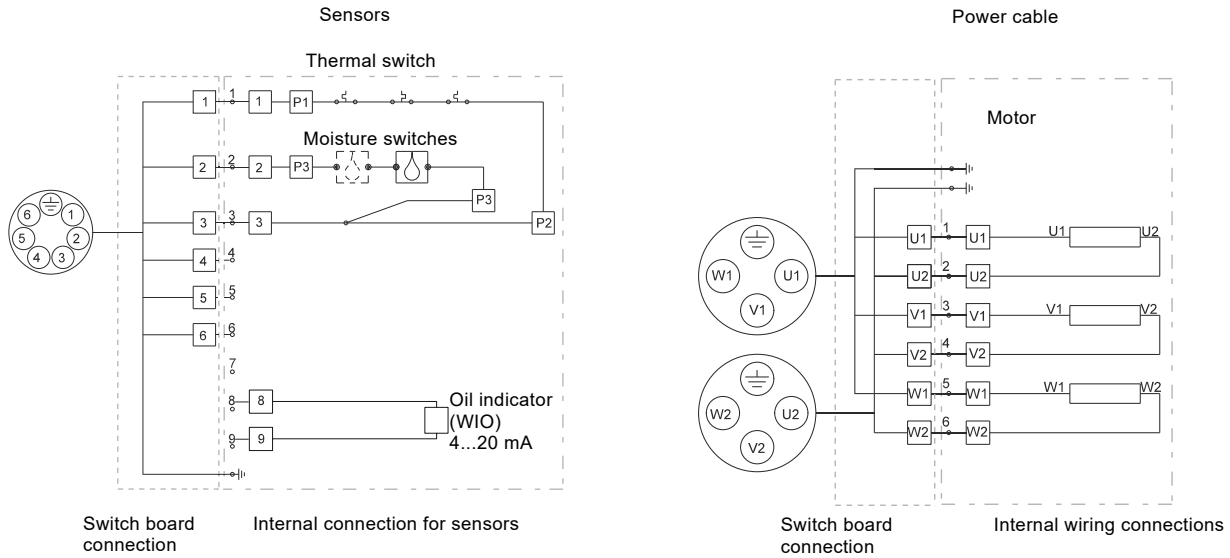


Fig. 18 Wiring diagram Y-connect (460 V) for standard sensors

TM06 4937 3515 - TM05 1758 3611

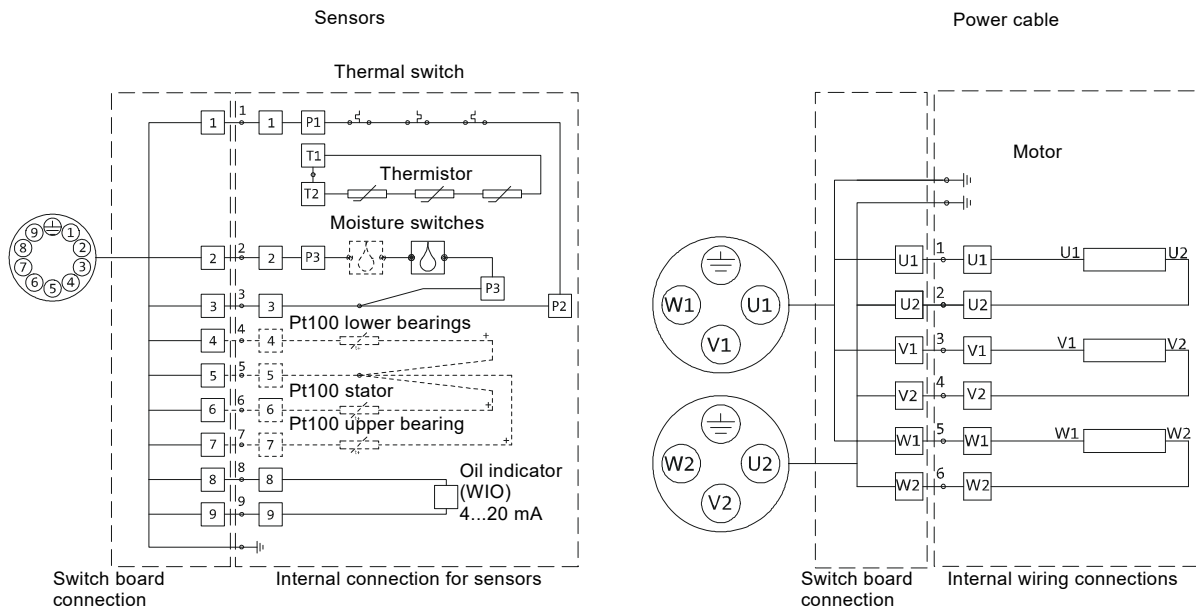


Fig. 19 Wiring diagram for sensors (with WIO sensor)

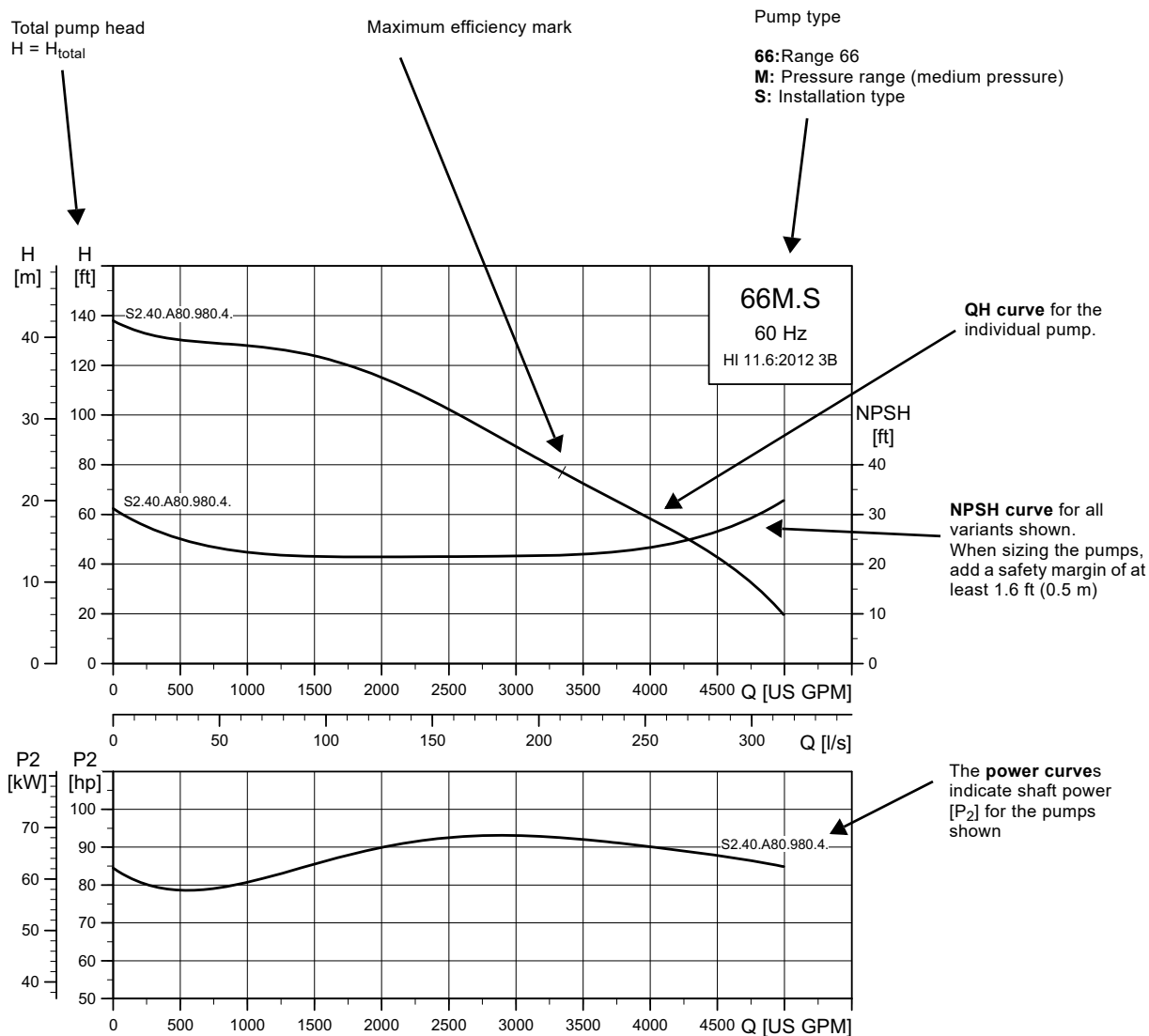
TM06 1919 3414

9. Curve charts and technical data

The following many pages are divided into sections.

On pages 26 to 32 you will find a brief explanation of how to read the curve charts, the curve conditions, etc.

How to read the curve charts



TM04 6593 0114

Note: The pumps are tested according to ANSI HI 11.6:2012 grade 3B tolerance. Testing equipment and measuring instruments are designed and calibrated according to the standards mentioned. The pumps are approved according to tolerances for entire curves, specified in grade 3B.

Curve conditions

The guidelines below apply to the curves shown in the performance charts on page 33 to page 40.

- ANSI centrifugal pump test 11.6:2012, acceptance level 3B.
- The curves show pump performance with different impeller diameters at rated speed.
- The curves apply to the pumping of airless water at a temperature of 68 °F (20 °C) and a kinematic viscosity of 1 cSt (1 mm²/s).
- **NPSH:** The curves show average values measured under the same conditions as the performance curves.
When sizing the pump, add a safety margin of at least 1.6 ft (0.5 m).
- In case of densities other than 133.5 ounces/gallon (1000 kg/m³), the outlet pressure is proportional to the density.
- When pumping liquids with a density higher than 133.5 ounces/gallon (1000 kg/m³), motors with correspondingly higher outputs must be used.

Calculation of total head

The total pump head consists of the height difference between the measuring points + the differential head + the dynamic head.

$$H_{\text{total}} = H_{\text{geo}} + H_{\text{stat}} + H_{\text{dyn}}$$

H_{geo} : Height difference between measuring points.

H_{stat} : Differential head between the inlet and outlet side of the pump.

H_{dyn} : Calculated values based on the velocity of the pumped liquid on the inlet and outlet side of the pump.

Pump performance tests

S pump testers are all capable of performing hydraulic performance tests according to ANSI HI 11.6:2012 requirements.

ANSI HI 11.6:2012 sets standards for "rotodynamic pumps, Hydraulic performance acceptance tests, Grades 1, 2 and 3".

Performance acceptance grades

Six-pump-performance-test acceptance grades, 3B, 2B, 2U, 1B and 1U are defined in ANSI HI 11.6:2012.

Acceptance grade	Mandatory measurements		Optional measurements	
	Q	H	P1	Eta-tot
3B	± 9 %	± 7 %	+9 %	-7 %
2B	± 8 %	± 5 %	+8 %	-5 %
2U	+16 %	+10 %	+16 %	
1B	± 5 %	± 3 %	+4 %	-3 %
1U	+10 %	+ 6 %	+10 %	≥ 0 %

These tolerance grades can be used in the contract between the pump manufacturer and the customer, or they can be used in a default tolerance factor for cases in which no specific tolerance grade has been agreed between the manufacturer and the customer.

The performance acceptance grades are explained in *Specifying acceptance grades*, page 32, showing the performance grades related to an ordinary pump curve.

The guarantee point

According to ANSI HI 11.6:2012 the acceptance-grade tolerance applies to one guarantee point.

A guarantee point is defined by a guaranteed flow rate and a guaranteed head.

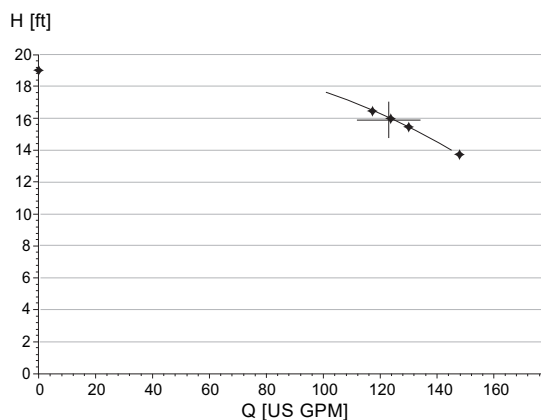
In addition, either minimum total efficiency or maximum total input power may be guaranteed at the specified conditions.

This means that the standard sets guidelines for a duty point guaranteed for the following:

- Q and H, or
- Q, H and total efficiency (Eta-total), or
- Q, H and total consumed power (P1).

The guarantee point is defined by a minimum of five measured test points.

Example on a duty point test living up to ANSI HI 11.6:2012 requirements



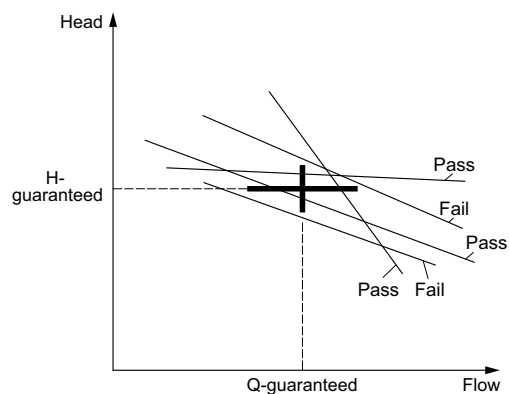
TM07 0448 5117

Fig. 20 Five measured test points are used to verify one guarantee point

Evaluation of performance

The test must show that the measured pump curve touches or passes through a tolerance surrounding the guarantee point, as defined by the selected acceptance grade.

Guarantee-point evaluation must be made at the rated speed, which for S pumps means 50 Hz or 60 Hz.



TM07 1544 1818

Fig. 21 Pump curves that either pass or fail to cross the tolerance cross of the guarantee point

Performance-test types for end-suction pumps

Two types of performance tests are available for S pumps:

- duty-point-verification test
- curve test.

Tests carried out on S pumps

- Tests are saved for at least five years and can be traced using the pump's unique serial number.
- It is not possible to change acceptance grade on an already tested and supplied pump; if required a re-test of the pump is needed.
- Witness testing can be arranged.

Duty-point-verification test, Grades 3B, 2B, 2U, 1B and 1U

This test method offers the possibility to perform a duty-point verification of the following:

- Q and H; or
- Q, H and total efficiency (Eta-tot); or
- Q, H and total consumed power (P1).

Acceptance grade	Mandatory measurements		Optional measurements	
	Q	H	P1	Eta-tot
3B	Standard		On request	
2B	On request		On request	
2U	On request		On request	
1B	On request		On request	
1U	On request		On request	

What Grundfos is able to guarantee for the different acceptance grades will be evaluated on a case-by-case basis. Contact your local sales company on this. Grundfos makes duty-point verification according to ANSI HI 11.6:2012 for one guarantee point at full speed, 50 or 60 Hz. The customer must tell Grundfos which duty point to verify.

The requested duty point is verified by five measured points.

Grade 1U duty-point verification

The following example illustrates performance testing according to Grade 1U.

Flow rate and head are mandatory, and efficiency or power consumption, P1, is optional.

Tolerances for a Grade 1U test are as follows:

- flow rate: 10 %
- Head: 6 %
- Efficiency: 0 %, only equal to or better than the guaranteed value
- P1: 10 %

1. Q, H and Eta-tot are tested and verified

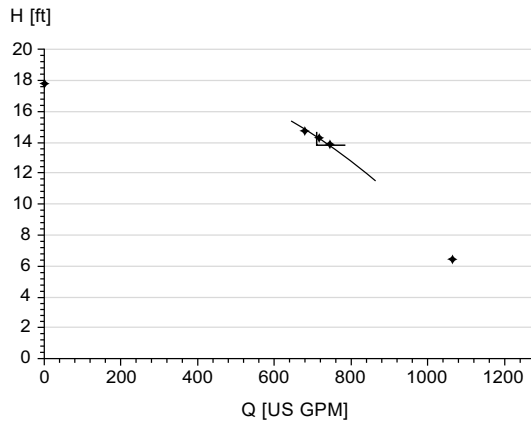


Fig. 22 Measured values for flow rate and head

TM07 1542 1618

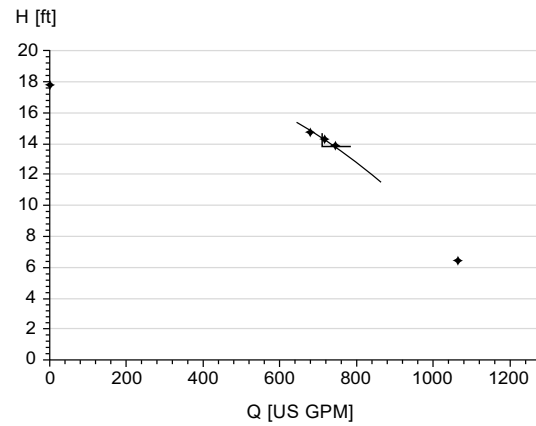


Fig. 24 Measured values for flow rate and head

TM07 1542 1618

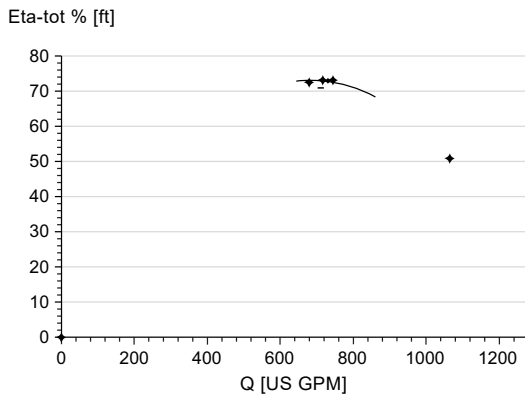


Fig. 23 Measured values for total efficiency

TM07 1543 1618

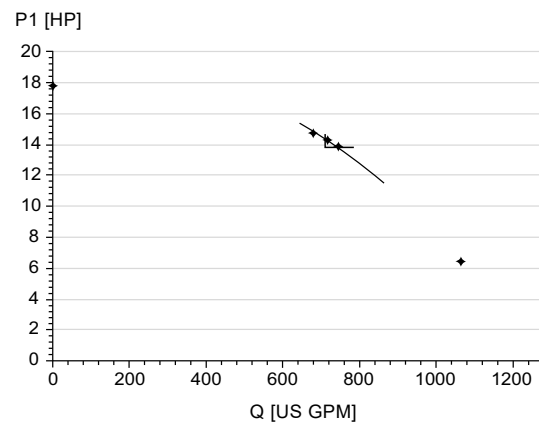


Fig. 25 Measured values for consumed power

TM07 1545 1618

Note that other points than the guarantee point can be measured and displayed in a curve-test report according to Grade 3B tolerances.

2. Q, H and P1 tested and verified

Curve test, Grade 3B

This test method is developed by Grundfos and is based on ANSI HI 11.6:2012 performance acceptance grade 3B tolerances: $Q = \pm 9\%$, $H = \pm 7\%$.

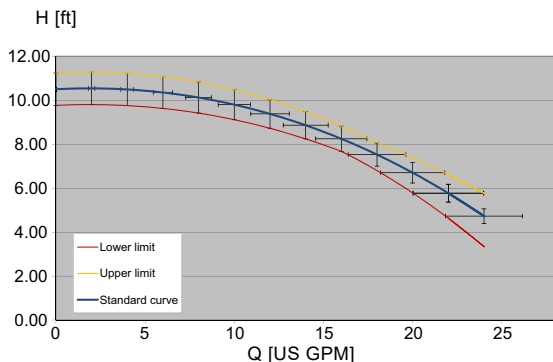


Fig. 26 Q-H curve with tolerance crosses on complete performance range

In fig. 26, tolerance crosses according to Grade 3B have been distributed across the complete performance range of a pump. We generate the upper and lower limit of the performance curve by drawing two curves at the outlines of these crosses.

When the pump is tested, and the measured point is located within the range between upper and lower limit, it is qualified to ANSI HI 11.6:2012 Grade 3B tolerances. This way of qualifying the pump performance is stricter than a duty-point-verification test for Grade 3B.

How does Grundfos perform curve testing for S pumps?

Grundfos applies two types of curve tests:

- a reference curve test
- a performance curve test.

Reference curve test, Grade 3B

A reference curve test is made when no curve test report is specified with the order. Three or four test points are measured depending on production site, and no curve test report is supplied with the pump. Measurements are made to maintain and observe continuous quality and to ensure that the supplied pump is within test grade tolerances. Test grade tolerances are set as for Grade 3B but without certification.

Example of a reference curve test

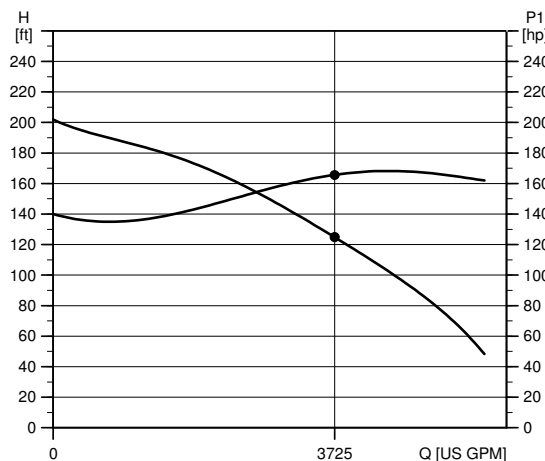


Fig. 27 Measured values for tested pump

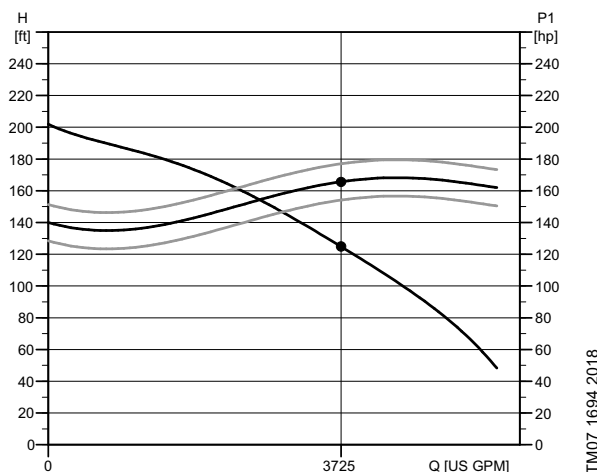


Fig. 28 The values in fig. 27 calculated to reference speed for comparison to a reference performance curve

If a pump performance report is requested at a later stage, only reference test data are available.

Performance curve test, grade 3B

A performance curve test is carried out when a curve test report is specified with the order.

The pump is tested at pre-specified flow rates, and test grade tolerances are set as for Grade 3B but without certification.

Example of an S pump curve test

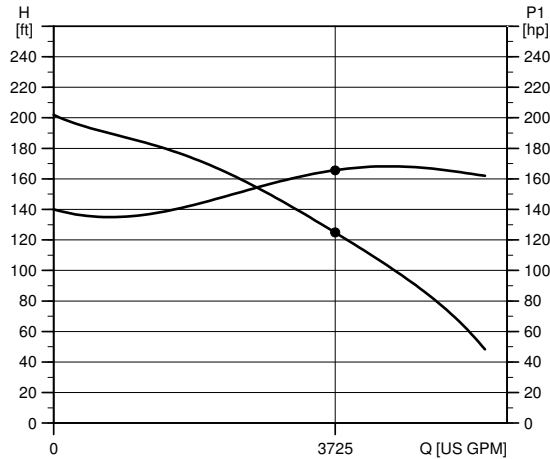


Fig. 29 Measured values for tested pump

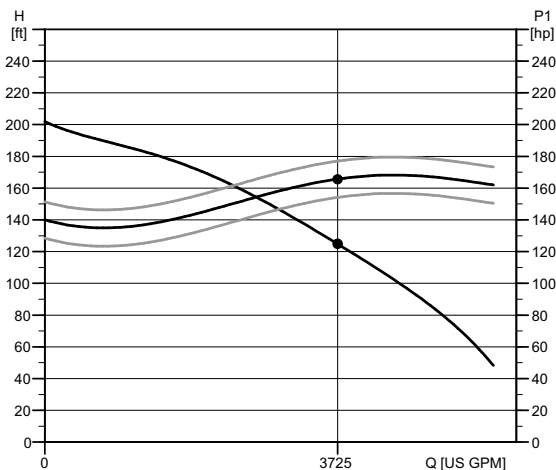


Fig. 30 The values in fig. 29 calculated to a reference speed for comparison to a reference performance

If the customer requires more points on the curve to be checked, individual measurements must be made, and this is not part of the performance curve test.

Static high pressure test

All produced pumps undergo a static high pressure test of 1.5 x PN (nominal pressure of the pump)

Specifying acceptance grades

The graphs in the table on page 32 show the tolerances as stated in the standard, related to an ordinary pump curve. The graphs also show which pump performance to expect if the customer, having the same pump to start with, orders a pump with the same guarantee point for different tolerances (B or U) within the acceptance grades.

In some cases, it will not be possible to fulfil the same guarantee point for a unilateral tolerance as it will for a bilateral tolerance. This is indicated by the lower curve for 'U' grades.

If the requested guarantee point is the same for a Grade U pump as for a Grade B pump, the consequence of the production tolerances could be that a larger pump is required to obtain the requested duty point.

What Grundfos is able to guarantee for the different acceptance grades will be evaluated on a case-by-case basis. Contact your local sales company on this.

Acceptance grades and tolerances

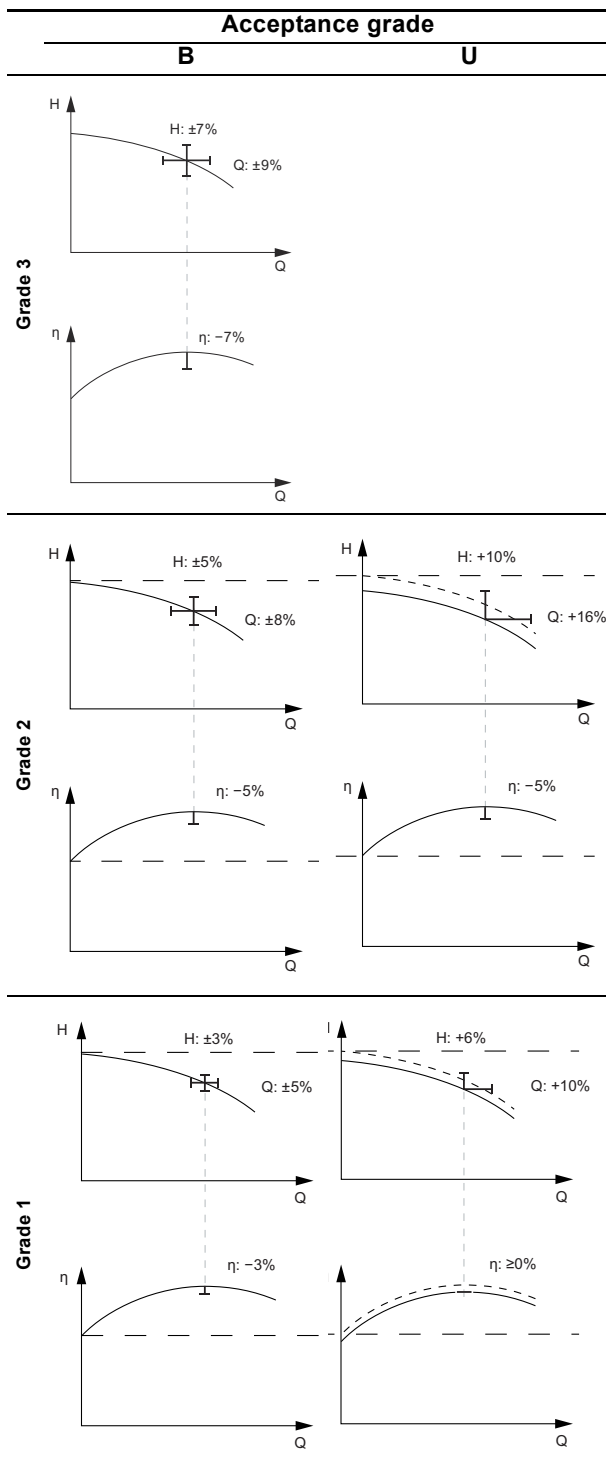
Acceptance grade B

This acceptance grade refers to grades with a bilateral tolerance on flow rate and head and with a tolerance on efficiency.

Acceptance grade U

This acceptance grade refers to a grade with a unilateral tolerance on flow rate and head. For the 2U grade, there is a tolerance on efficiency. For the 1U grade, there is no tolerance on efficiency.

Note that if the acceptance grade changes from Grade 1B to 1U, the customer does not necessarily get a better pump with a higher efficiency. More likely, he gets a pump where the performance is always to the positive side of the guarantee point.



Certificates

Certificates have to be confirmed for every order and are available on request as follows:

- certificate of compliance with the order (EN 10204 - 2.1)
- pump test sheet.

Witness test

When the pumps are being tested or are tested with a certification, it is possible for the customer to witness the testing procedure according to ANSI HI 11.6:2012.

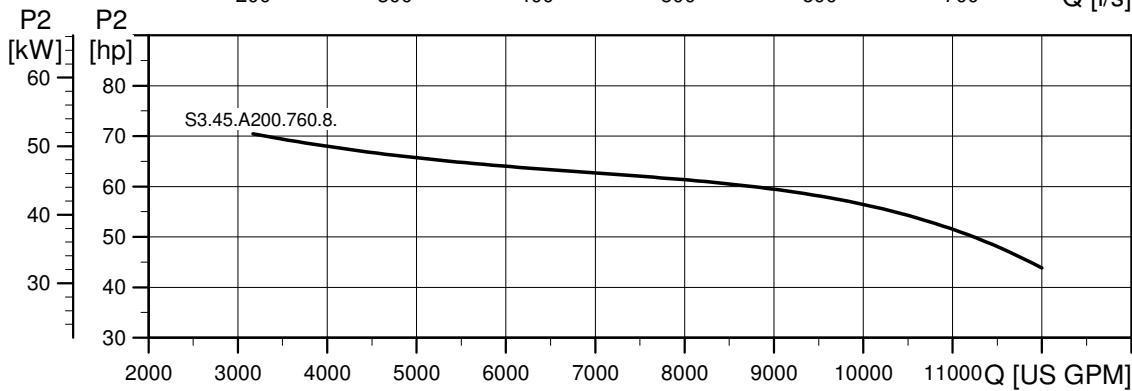
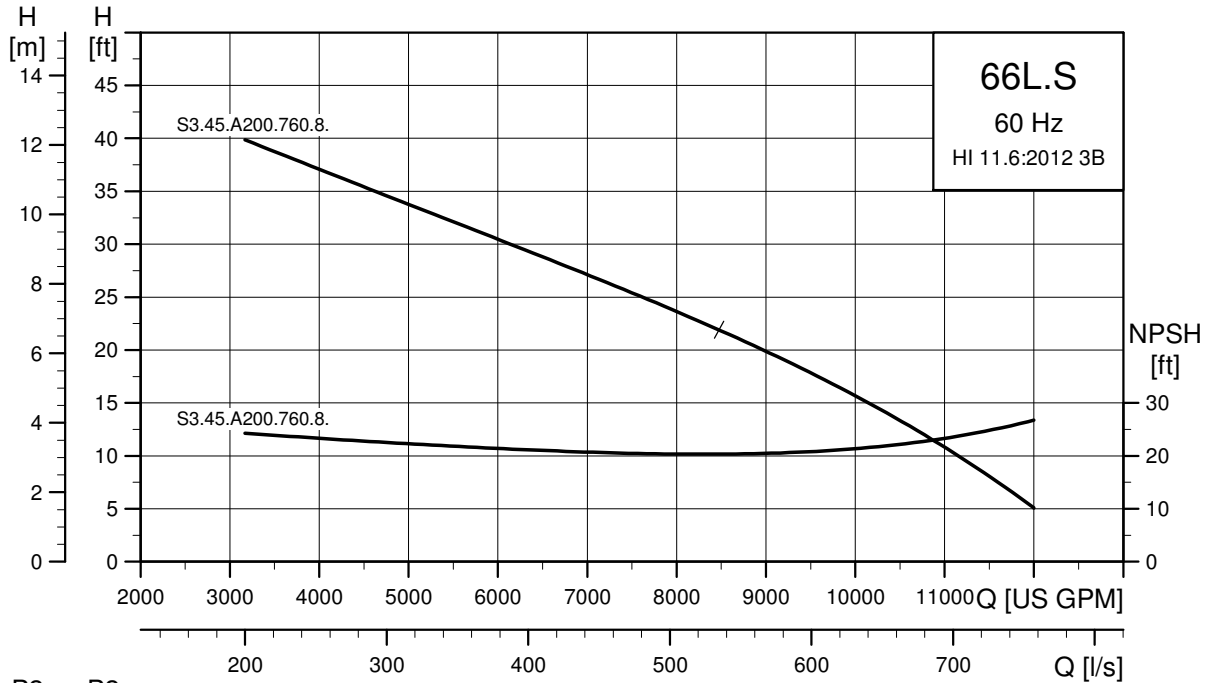
The witness test is not a certificate and will not result in a written statement from Grundfos. The witness itself is the only guarantee that everything is carried out as prescribed in the testing procedure.

If the customer wants to witness the test, place this request on the order.

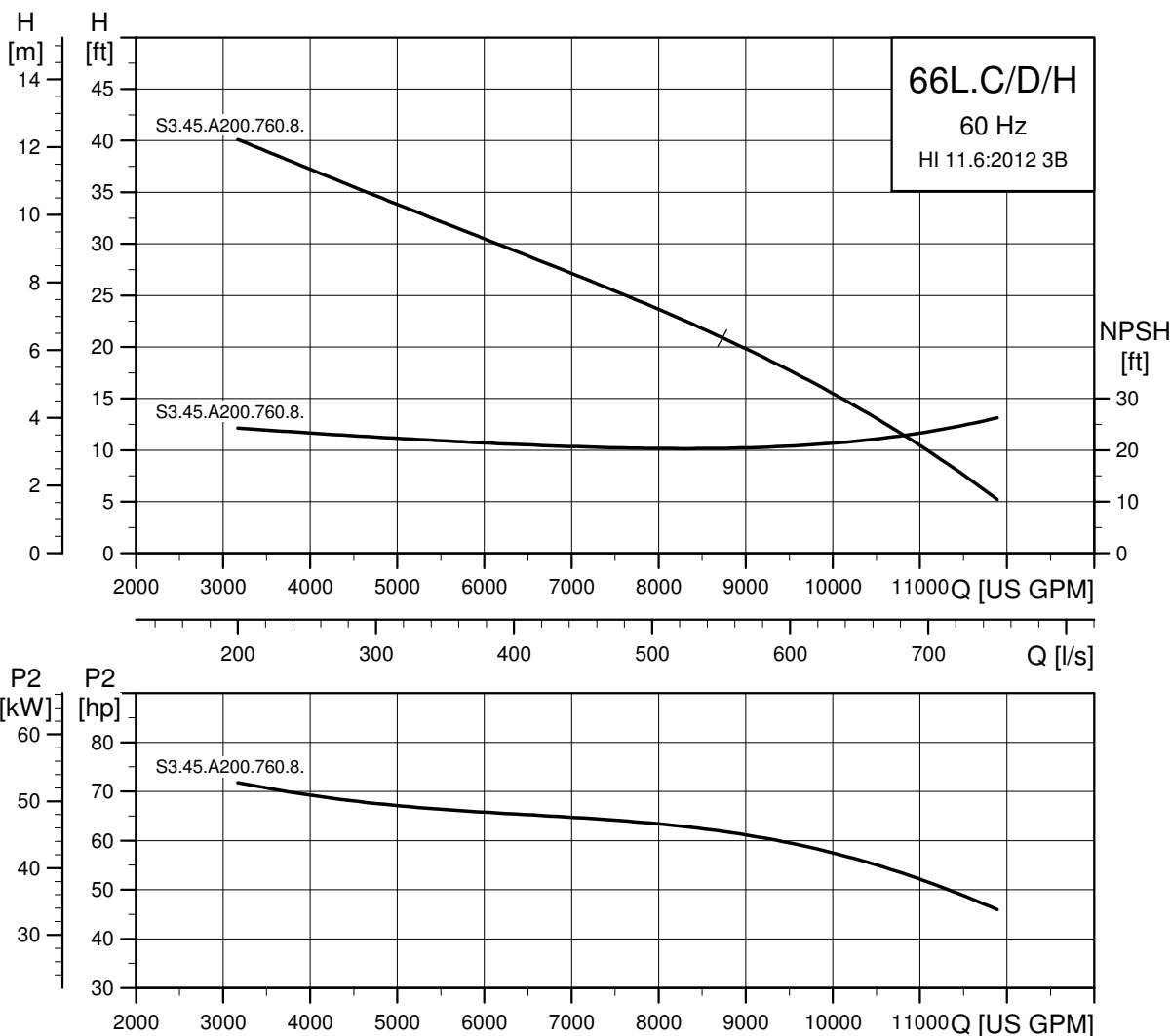
10. Performance curves and technical data

Low pressure - 3 x 460 V

S3.45.A200.760.8



TM04 6589 0817



TM04 6590 0817

Motor data

Pump type	P1 P2		Poles	RPM	Starting method	I _N I _{start}		η _{motor} [%]			Cos φ			Moment of inertia [lbf ² (kgm ²)]	Breakdown torque M _{max} [lbf*ft (Nm)]
	[HP (kW)]	[HP (kW)]				[A]	[A]	1/2	3/4	1/1	1/2	3/4	1/1		
S3.45.A200.760.8.66L...	84 (61)	76 (57)	8	876	Y/D	93	861	92	93	94	0.71	0.78	0.82	49.8 (2.1)	1600.5 (2170)

Note: Enclosure class: IP68

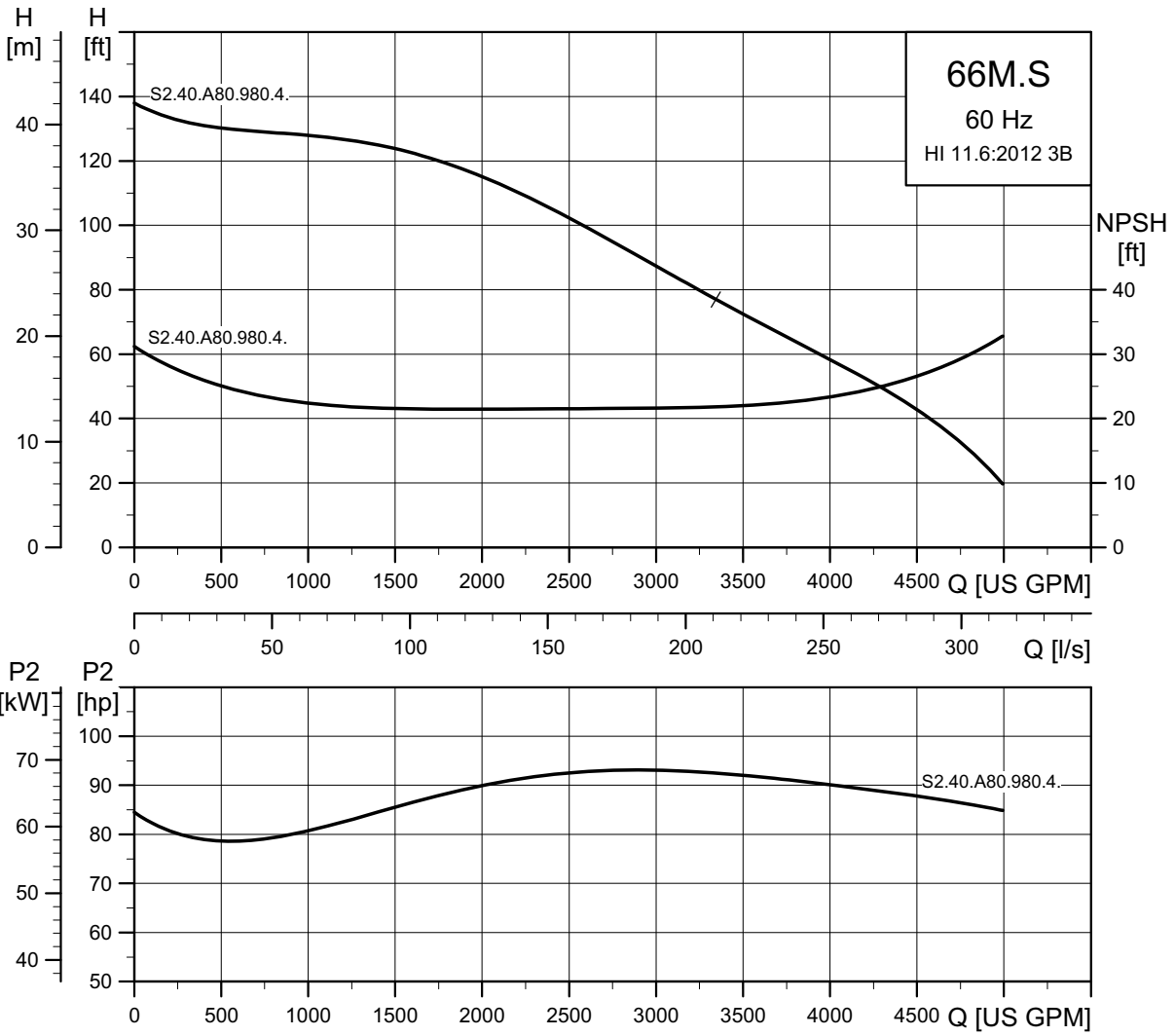
Pump data

Pump type	Impeller diameter	Maximum solids size	Pump housing pressure	Maximum installation depth	Moment of inertia*
	[inch (mm)]	[inch (mm)]	[PSI (PN)]	[ft (m)]	[lbf ² (kgm ²)]
S3.45.A200.760.8.66L.S/C/D/H.371...	14.60 (371)	4.5 (115)	145 (10)	66 (20)	33.86 (1.427)

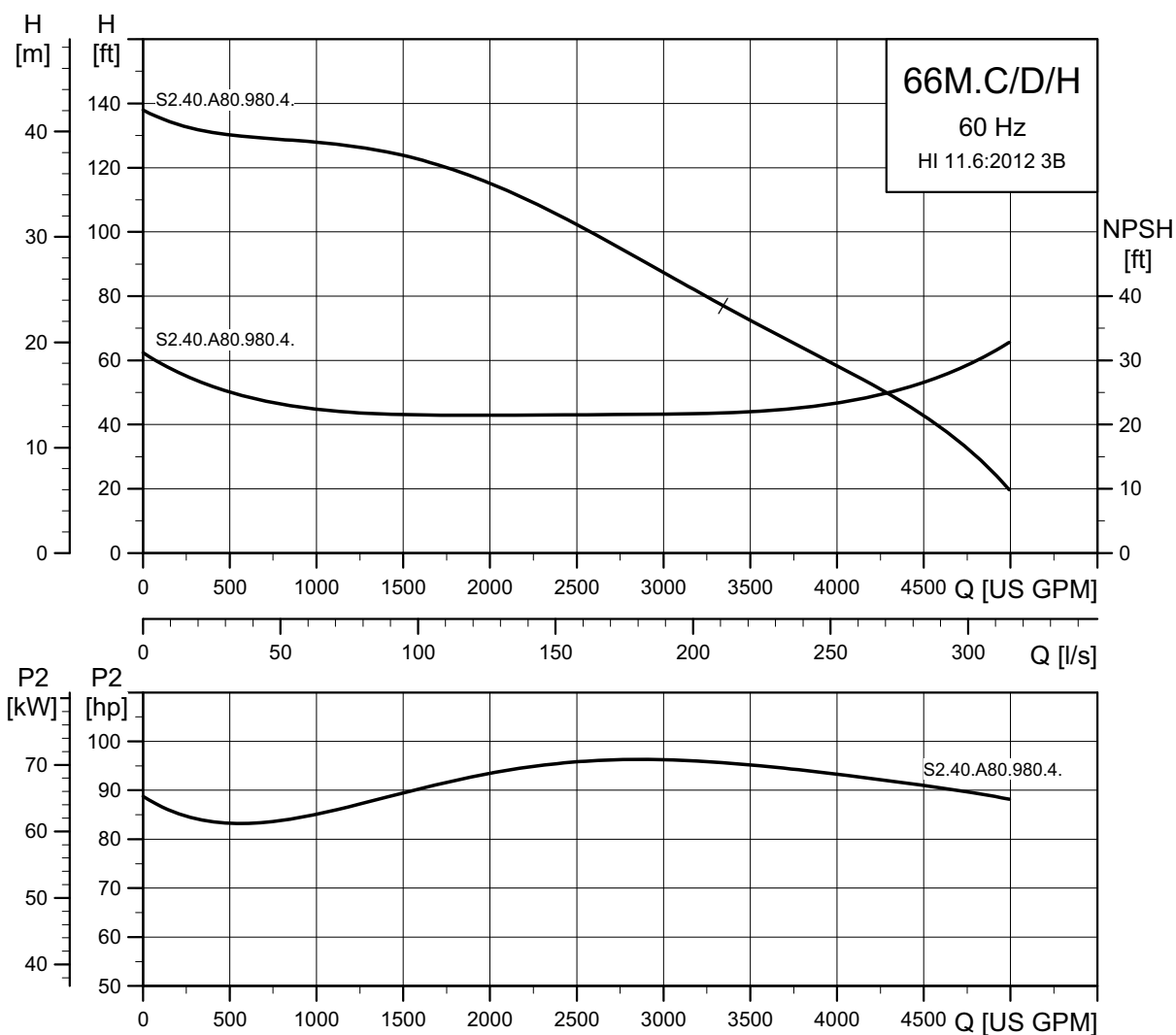
* Applies to material code G (see Type key). For other material codes, please contact Grundfos.

Medium pressure - 3 x 460 V

S2.40.A80.980.4



TM04 6593 1314



TM04 6594 1314

Motor data

Pump type	P1	P2	Poles	RPM	Starting method	I _N		η _{motor} [%]			Cos φ			Moment of inertia [lbf ² (kgm ²)]	Breakdown torque M _{max} [lbf ² ft (Nm)]
	[HP (kW)]	[HP (kW)]				[A]	[A]	1/2	3/4	1/1	1/2	3/4	1/1		
S2.40.A80.980.4.66M...	105 (78)	98 (73)	4	1776	Y/D	114	1105	93	94	94	0.76	0.82	0.86	20.5 (0.85)	1090.9 (1479)

Note: Enclosure class: IP68

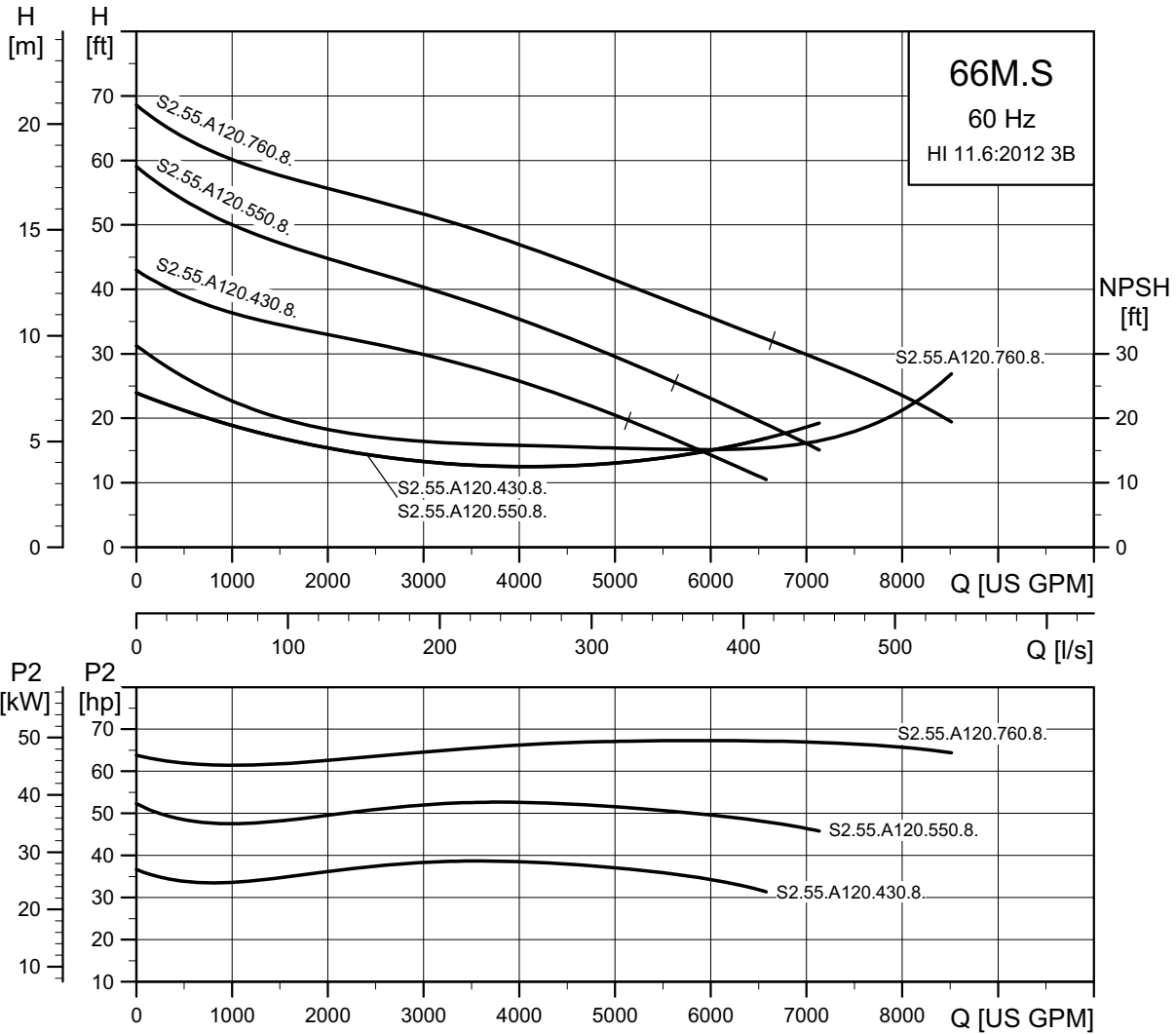
Pump data

Pump type	Impeller diameter	Maximum solids size	Pump housing pressure	Maximum installation depth	Moment of inertia *
	[inch (mm)]	[inch (mm)]	[PSI (PN)]	[ft (m)]	[lbf ² (kgm ²)]
S2.40.A80.980.4.66M.S/C/D/H.301...	11.85 (301)	4 (100)	145 (10)	66 (20)	10.48 (0.442)

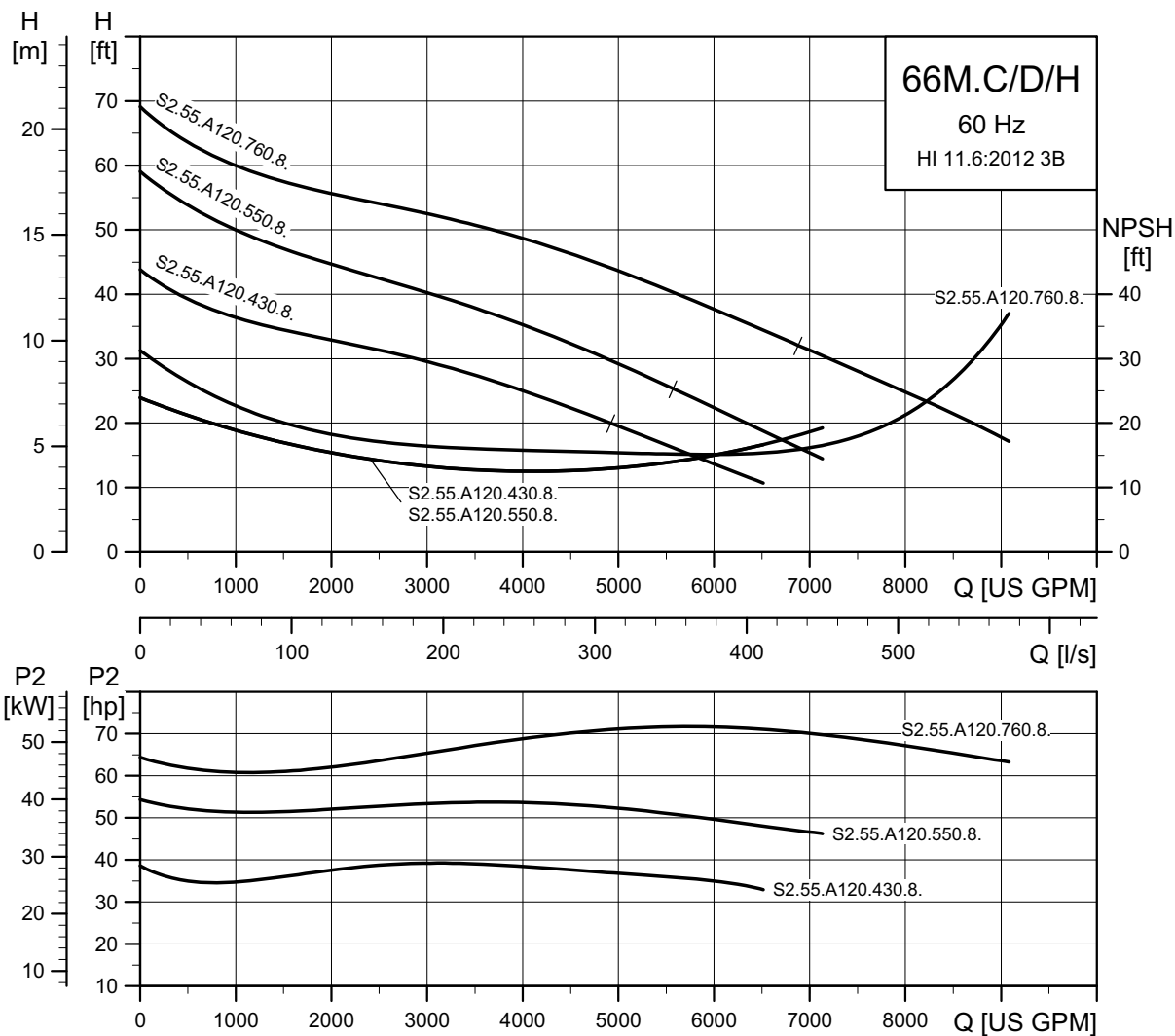
* Applies to material code G (see Type key). For other material codes, please contact Grundfos.

Medium pressure - 3 x 460 V

S2.55.A120.760.8



TM04 6591 1314



TM04 6592 1314

Motor data

Pump type	P1 P2		Poles	RPM	Starting method	I _N [A]	I _{start} [A]	η _{motor} [%]			Cos φ			Moment of inertia [lbf ² (kgm ²)]	Breakdown torque M _{max} [lbf ² ft (Nm)]
	[HP (kW)]	[HP (kW)]						1/2	3/4	1/1	1/2	3/4	1/1		
S2.55.A120.760.8.66M...	84 (61)	76 (57)	8	876	Y/D	93	861	92	93	94	0.71	0.78	0.82	49.8 (2.1)	1600.5 (2170)

Note: Enclosure class: IP68

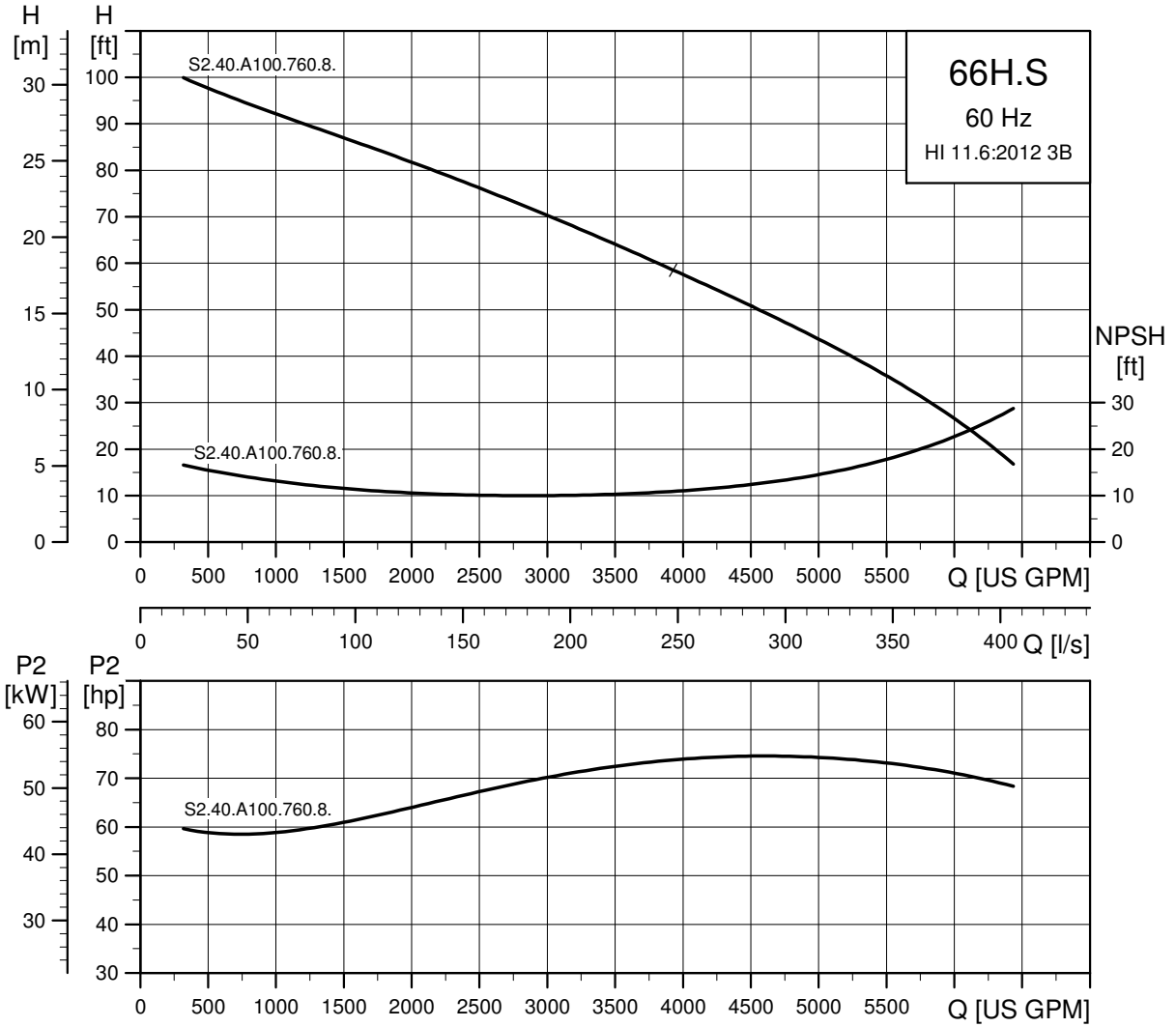
Pump data

Pump type	Impeller diameter	Maximum solids size	Pump housing pressure	Maximum installation depth	Moment of inertia *
	[inch (mm)]	[inch (mm)]	[PSI (PN)]	[ft (m)]	[lbf ² (kgm ²)]
S2.55.A120.760.8.66M.S/C/D/H.435...	17.1 (435)	5.5 (140)	145 (10)	66 (20)	31.82 (1.341)

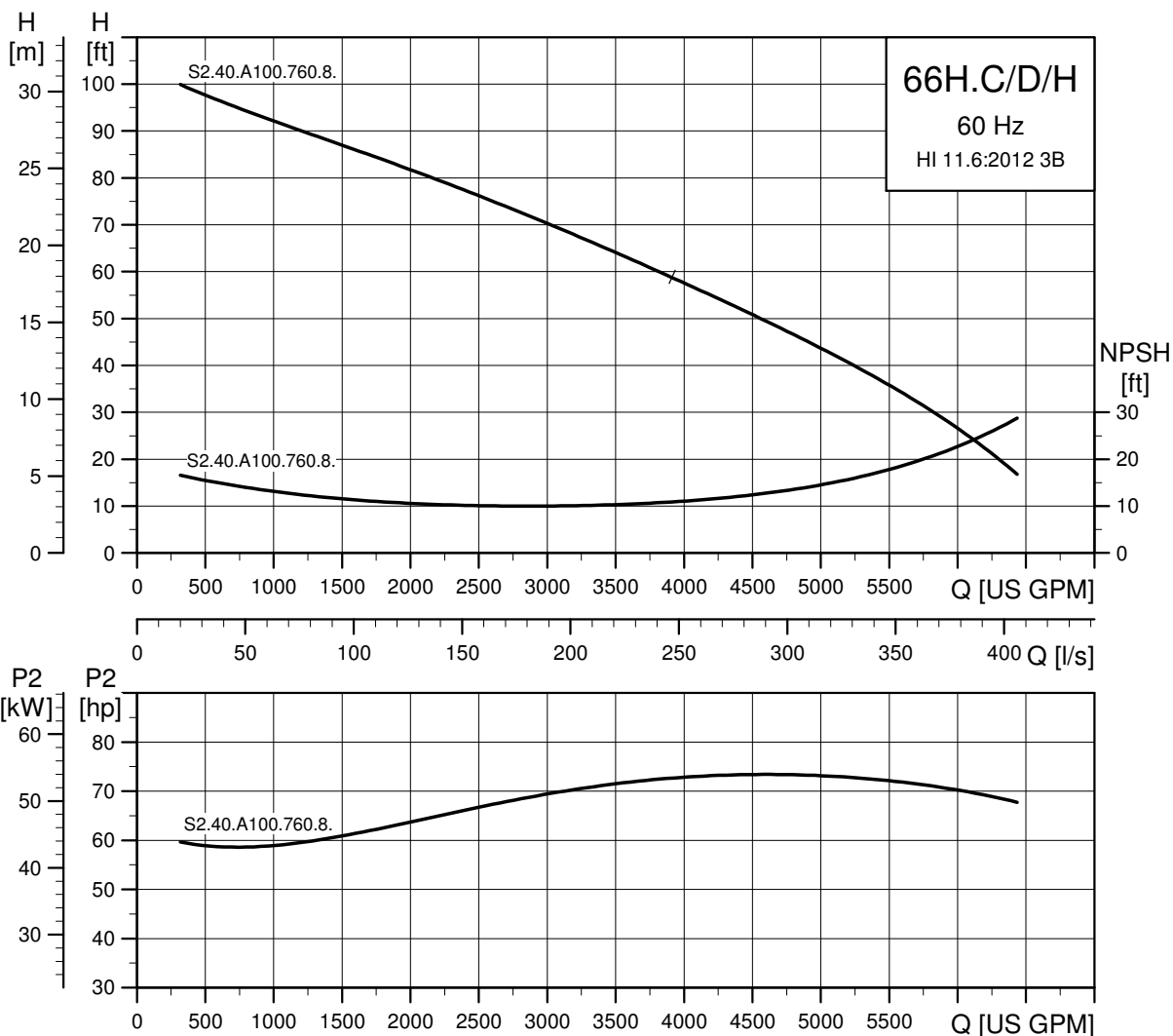
* Applies to material code G (see Type key). For other material codes, please contact Grundfos.

High pressure - 3 x 460 V

S2.40.A100.760.8



TM04 6587 4818



TM04 6588 4818

Motor data

Pump type	P1	P2	Poles	RPM	Starting method	I _N [A]	I _{start} [A]	η _{motor} [%]			Cos φ			Moment of inertia [lbf ² (kgm ²)]	Breakdown torque M _{max} [lbf ² ft (Nm)]
	[HP (kW)]	[HP (kW)]						1/2	3/4	1/1	1/2	3/4	1/1		
S2.40.A100.760.8.66H...	84 (61)	76 (57)	8	876	Y/D	93	861	92	93	94	0.71	0.78	0.82	49.8 (2.1)	1600.5 (2170)

Note: Enclosure class: IP68

Pump data


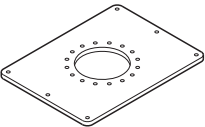
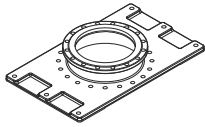
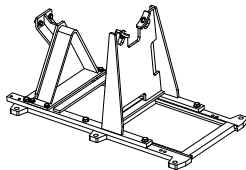
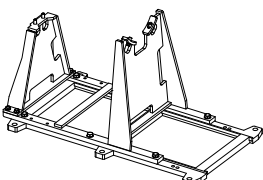
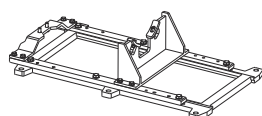
Pump type	Impeller diameter	Maximum solids size	Pump housing pressure	Maximum installation depth	Moment of inertia
	[inch (mm)]	[inch (mm)]	[PSI (PN)]	[ft (m)]	[lbf ² (kgm ²)]
S2.40.A100.760.8.66H.S/C/D/H.489...	19.3 (489)	4.0 (100)	145 (10)	66 (20)	49.83 (2.1)

* Applies to material code G (see Type key). For other material codes, please contact Grundfos.


11. Accessories

Accessories (for installation)

Pump type	Installation accessories
Range 50-70 S and C	ANSI 3"-8" (DN 80-DN 200) without guide claw (guide claw included in auto-coupling kit)
Range 50-70 S and C	ANSI 10"-24" (DN 250-DN 600) with guide claw mounted on the pump
Range 50-70 D	Pump without installation accessories (accessories as separate kit)
Range 50-70 H	Base stand for horizontal, dry installation supplied together with the pump. Pumps of installation type H include the standard horizontal stand. Pumps with material code G or Q include a painted-steel stand. If another horizontal stand is required, order a pump of installation type D together with the required stand.

Pictures	Description	Size	Weight [lbs (kg)]	PSI (PN)	Product number	
	Cast-iron, epoxy-coated auto-coupling system complete with: <ul style="list-style-type: none"> • guide claw¹ • base unit • upper guide rail bracket • gaskets and bolts 	Outlet flange	ANSI 8" (DN 200)	551 (250)	145 (10)	97506541
			ANSI 10" (DN 250)	491 (223)		97510048
			ANSI 12" (DN 300)	595 (270)		97510049
			ANSI 20" (DN 500)	1550 (703)		97510050
	¹ Installation type S and C pumps with outlet flange size ANSI 10" (DN 250) and higher are supplied with guide claw mounted on the flange.					
Intermediate guide rail bracket	For guide rails longer than 19.5 ft (6 m)	ANSI 8"-ANSI 24" (DN 200-DN 600)	17.6 (8)		96255842	
Guide rails	Standard pipes. Not supplied by Grundfos					
	Steel, epoxy-coated. Base plate for vertical, dry installation with: <ul style="list-style-type: none"> • gaskets • bolts. 		ANSI 10" (DN 250)	199 (90)		96857815
			ANSI 12" (DN 300)	192 (87)		96857816
	Cast iron, epoxy-coated. Base plate for vertical, dry installation with: <ul style="list-style-type: none"> • gaskets • bolts. 		ANSI 16"/ANSI 20" (DN 400/DN 500)	430 (195)		96867808
	Base stand for horizontal, dry installation products: <ul style="list-style-type: none"> • S2.40.A100.760.8.66H.H... • S3.45.A200.760.8.66L.H... 	Inlet flange	Version 1	276 (125)		96308208
	Base stand for horizontal, dry installation products: <ul style="list-style-type: none"> • S2.40.A80.980.4.66M.H... • S2.55.A120.760.8.66M.H... 		Version 2	250 (113)		96308289
	Special base stand for horizontal, dry installation with customized height.					Contact Grundfos

Other accessories

Pictures	Description	Size	Product number
	Galvanized lifting chain with lifting link and safety hook. Certified. Maximum lifting capacity 4409 lb (2000 kg).	13 ft (4 m)	98425784
		20 ft (6 m)	98425785
		26 ft (8 m)	98425786
		33 ft (10 m)	98425787
	TM02 6126 5102 Stainless steel lifting chain with lifting link and safety hook. Certified. Maximum lifting capacity 4409 lb (2000 kg).	13 ft (4 m)	98425801
		20 ft (6 m)	98425802
		26 ft (8 m)	98425803
		33 ft (10 m)	98425804

12. Dimensions

Recommendation for pump foundations

Note: This applies only to pumps above 20 HP (15 kW).

All rotating equipment generates vibrations as a mass, such as an impeller or rotor, is turning at high speeds. Proper installation and anchorage of Grundfos pumps and installation accessories is critical to limit vibrations and achieve reliable, trouble-free installation. It is important to note that all mechanically connected pipes, fittings and supports of the pump all part of a single system.

The rotating mass of the entire pump, together with the forces from the motor and hydraulics, will generate disturbances related to the speed of the motor.

Unbalance and blade pass in hydraulics are the two most important frequencies affecting vibration.

When these frequencies coincide with the natural frequency of the entire mechanical system, the vibration level will increase substantially.

Pumps from Grundfos are designed and produced according to the highest quality standards. The method and grade of balancing is specified by the manufacturer in order to achieve acceptable vibration levels. Although the pump itself can withstand rather high vibration levels under operating conditions without considerable lifetime reduction, the pipes and supportive structure might suffer and crack if vibration levels are too high. Furthermore, noticeable noise levels might be generated.

The likelihood of high vibration levels occurring is increased in variable-speed applications where the pump is operated over a range of speeds rather than at a single constant speed. Most variable-speed drives provide the possibility to exclude certain frequency ranges to avoid operating areas with high vibration levels.

To ensure acceptable vibration levels in the field, all parts of the system must be sufficiently stiff and firmly anchored to minimize vibrations:

- The foundation and concrete must be of adequate strength to support the weight of the pump including accessories, the weight of the liquid passing through the pump and the forces generated by the pump.
- As a rule of thumb, the mass of the concrete foundation must be a minimum of three to five times the mass of the supported equipment and must have sufficient rigidity to withstand the axial, transverse and torsional loadings generated by the equipment.
- The foundation must be 6 in (15 cm) wider than the base plate for pumps up to 470 HP (350 kW) and 10 in (25 cm) wider for larger pumps.
- The concrete used in the foundation must have a minimum tensile strength of 362.6 PSI (250 N/cm²). Epoxy grout must always be used to secure the pump base plate to the foundation.

Pull-out strengths for anchor bolts

Submerged installation on auto-coupling (type S and C):

Auto-coupling base unit	Anchor bolts	Pull-out strength [kip (kN)]
ANSI 4" (DN 100)	4 x 5/8" (4 x M16)	1.1 (5)
ANSI 5"/NPS 6" (DN 125/DN 150) ¹		1.8 (8)
ANSI 8" (DN 200)	4 x 1" (4 x M24)	3.6 (16)
ANSI 10" (DN 250)		6.8 (30)
ANSI 12" (DN 300)		
ANSI 20" (DN 500)	6 x 1 1/4" (6 x M30)	9.0 (40)
ANSI 24" (DN 600)		
ANSI 32" (DN 800)		4.5 (20)

¹ Pump outlet ANSI 5" (DN 125) and base plate outlet ANSI 6" (DN 150).

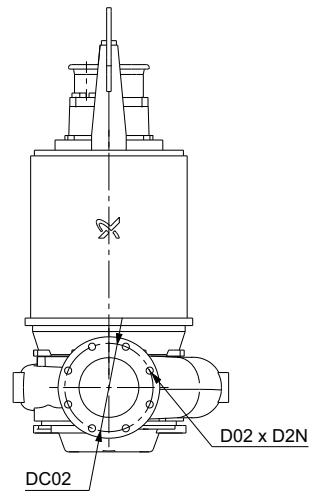
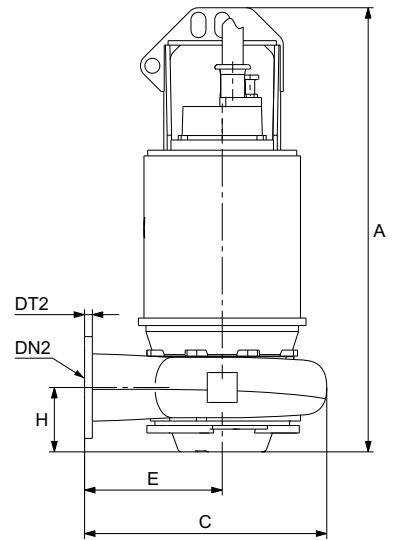
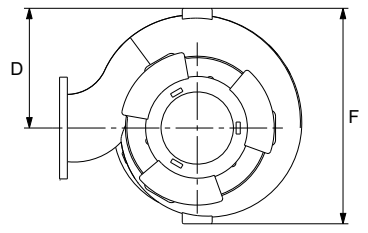
Dry installation (type H and D):

Dry installation	Anchor bolts	Pull-out strength [kip (kN)]
ANSI 4" (DN 100)	3 x 3/4" (3 x M20)	4.0 (18)
ANSI 6" (DN 150)		
ANSI 8" (DN 200)	6 x 1" (6 x M24)	5.6 (25)
ANSI 10" (DN 250)		
ANSI 12" (DN 300)		
ANSI 16" (DN 400)		
ANSI 20"/ANSI 16" (DN500/DN400) ¹		
ANSI 20" (DN 500)		
ANSI 24" (DN 600)		
ANSI 32" (DN 800)		

¹ Base plate inlet ANSI 20" (DN 500) and pump inlet ANSI 16" (DN 400).

Basic pump

Installation types S and C



Installation types D and H

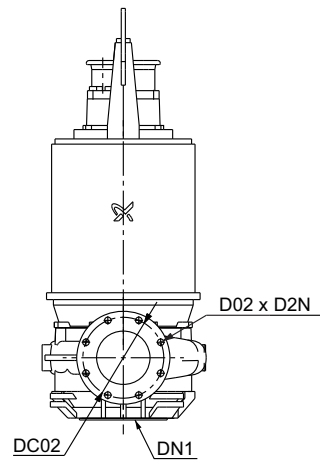
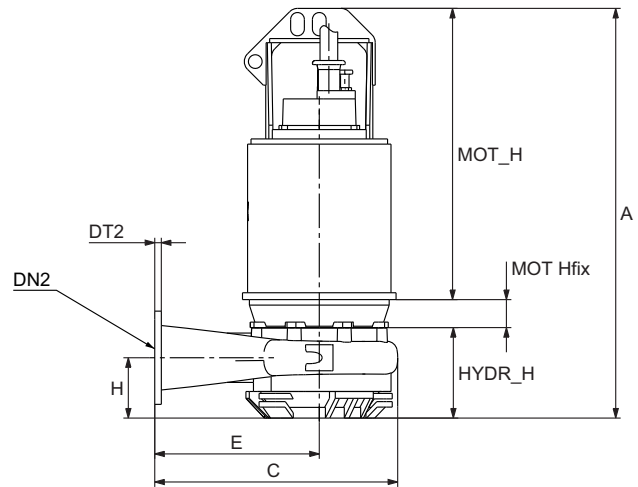
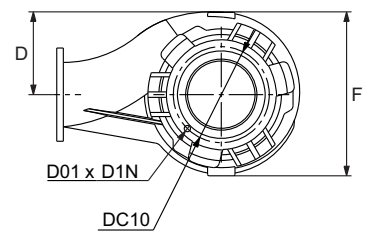


Fig. 31 Basic pumps

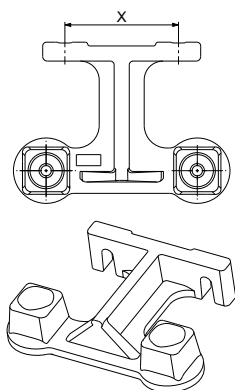
Note: Dimensions D01, D1N, DC10 and DN1 are equal to zero for installation types C and S because of the inlet type.

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Pump type	[inch (mm)]			Pc.								[inch (mm)]							
	A	C	D	D01	D02	D1N	D2N	DC02	DC10	DN1	DN2	DT2	E	F	H	HYDR H	MOT H	MOT Hfix	
S2.40.A80.980.4.66M.C/S	64.5 (1638)	31.9 (809)	15.7 (400)	-	0.9 (24)	-	8	11.7 (296)	-	ANSI 10" (DN 250)	-	1.0 (26)	18.1 (460)	28.3 (720)	8.5 (215)	12.5 (318)	53.1 (1350)	0.8 (20)	
S2.40.A80.980.4.66M.D/H	64.5 (1638)	31.9 (809)	15.7 (400)	3/4" (M20)	0.9 (24)	12	8	11.7 (296)	14.3 (362)	ANSI 10" (DN 250)	ANSI 8" (DN 200)	1.0 (26)	18.1 (460)	28.3 (720)	8.5 (215)	12.5 (318)	53.1 (1350)	0.8 (20)	
S2.40.A100.760.8.66H.C/S	66.5 (1689)	47.0 (1193)	18.8 (478)	-	1.0 (25)	-	12	14.3 (362)	-	ANSI 12" (DN 300)	-	1.2 (30)	29.5 (750)	35.1 (891)	9.3 (235)	14.5 (369)	53.1 (1350)	0.8 (20)	
S2.40.A100.760.8.66H.D/H	70.5 (1790)	47.0 (1193)	18.8 (478)	3/4" (M20)	1.0 (25)	6	12	14.3 (362)	17.0 (432)	ANSI 12" (DN 300)	ANSI 10" (DN 250)	1.2 (30)	29.5 (750)	35.1 (891)	13.2 (336)	18.5 (470)	53.1 (1350)	0.8 (20)	
S2.55.A120.750.8.66M.C/S	75.4 (1915)	44.8 (1139)	20.6 (522)	-	1.0 (25)	-	12	17.0 (432)	-	ANSI 12" (DN 300)	-	1.3 (33)	27.6 (700)	35.7 (907)	17.7 (450)	23.4 (595)	53.1 (1350)	0.8 (20)	
S2.55.A120.750.8.66M.D/H	70.5 (1790)	44.8 (1139)	20.6 (522)	3/4" (M20)	1.0 (25)	6	12	17.0 (432)	17.0 (432)	ANSI 12" (DN 300)	ANSI 12" (DN 300)	1.3 (33)	27.6 (700)	35.7 (907)	12.8 (325)	18.05 (470)	53.1 (1350)	0.8 (20)	
S2.45.A200.760.8.66L.C/S	72.0 (1830)	75.6 (1843)	28.3 (719)	-	1.3 (32)	-	20	25.0 (635)	-	ANSI 16" (DN 400)	-	1.5 (37)	47.2 (1200)	50.0 (1269)	15.0 (380)	20.1 (510)	53.1 (1350)	0.8 (20)	
S2.45.A200.760.8.66L.D/H	76.8 (1951)	75.6 (1843)	28.3 (719)	1" (M24)	1.3 (32)	8	20	25.0 (635)	21.3 (540)	ANSI 16" (DN 400)	ANSI 20" (DN 500)	1.5 (37)	47.2 (1200)	50.0 (1269)	18.2 (461)	24.8 (631)	53.1 (1350)	0.8 (20)	

Installation on auto coupling system

Upper guide rail bracket dimensions

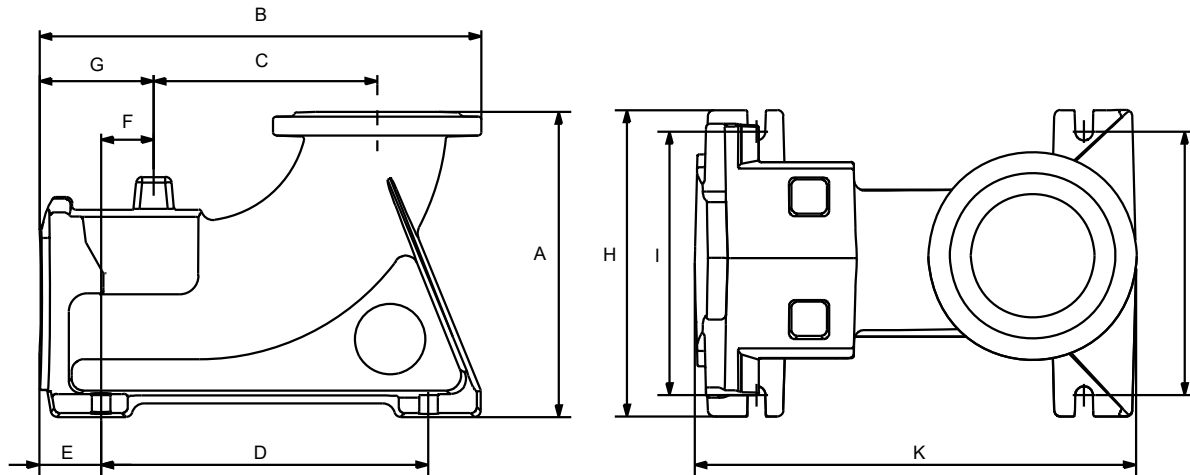


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Fig. 32 Installation dimensions for upper guide rail bracket

Auto-coupling		X [inch (mm)]
Product number	Size	
97506541	ANSI 8" (DN 200)	150
97510048	ANSI 10" (DN 250)	
97510049	ANSI 12" (DN 300)	
97510050	ANSI 20" (DN 500)	

Auto-coupling dimensions



TM06 6497 1516

Fig. 33 Dimension for cast iron base unit

Product number	Size	[inch (mm)]										
		A	B	C	D	E	F	G	H	I	J	K
97506541	ANSI 8" (DN 200)	19.0 (485)	28.0 (710)	14.4 (365)	21.0 (535)	3.5 (89)	3.4 (86)	6.9 (175)	19.7 (500)	16.9 (430)	16.9 (430)	28.0 (710)
97510048	ANSI 10" (DN 250)	21.4 (545)	29.6 (753)	14.8 (375)	22.2 (565)	3.5 (89)	3.4 (86)	6.9 (175)	21.3 (540)	18.5 (470)	18.5 (470)	29.3 (745)
97510049	ANSI 12" (DN 300)	25.6 (650)	33.9 (860)	17.7 (450)	26.4 (670)	3.1 (80)	3.7 (95)	6.9 (175)	24.4 (620)	21.7 (550)	21.7 (550)	33.3 (845)
97510050	ANSI 20" (DN 500)	35.0 (890)	45.2 (1148)	22.2 (564)	28.9/5.9 (735/150) ¹	5.0 (127)	3.9 (99)	8.9 (226)	28.3 (720)	26.0 (660)	26.0 (660)	44.1 (1120)

¹ Six bolt installation: distance between the front bolt hole and the middle bolt hole / distance between the middle bolt hole and the back bolt hole.

Pump installation dimensions

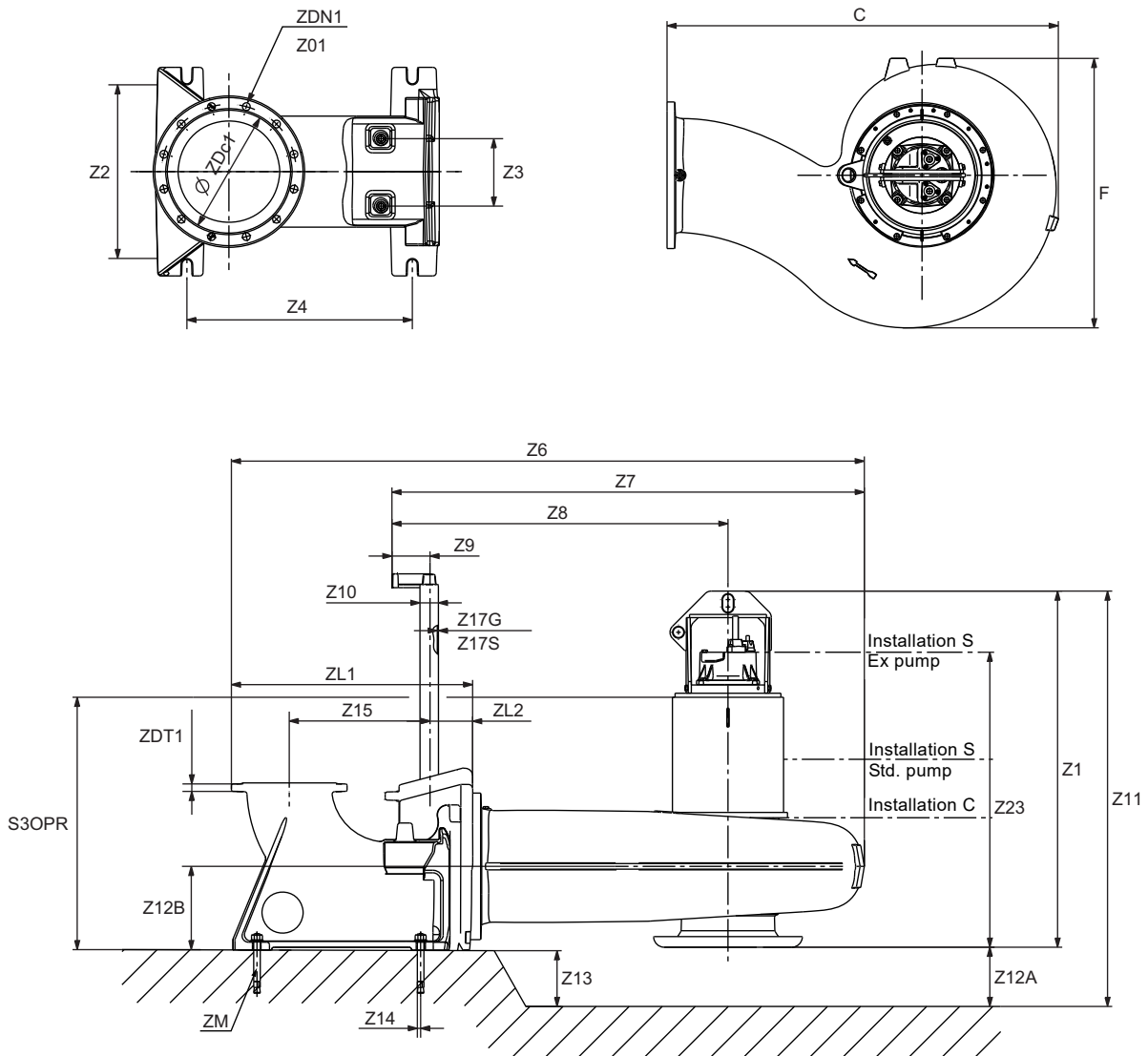


Fig. 34 Installation on auto-coupling system - version 1 (base unit with 4 anchor bolts)

Note: Z12A is the minimum recommended distance from pit bottom to bottom of pump inlet side.

Note: Z11 is the total height of the pump installed on Grundfos installation accessory in the pit.

Note: The pump in this figure might not be equal $Z12A + Z1$.

Pump type	[inch (mm)]													
	C	F	Z01	Z1	Z2	Z3	Z4	Z6	Z7	Z8	Z9	Z10	Z11	Z12A
S2.40.A80.980.4.66M.S/C...	31.9 (809)	28.3 (720)	8 x 0.9 (8 x 23)	64.5 (1638)	16.9 (430)	7.9 (200)	21.1 (535)	61.8 (1570)	47.3 (1201)	33.5 (852)	6.7 (170)	3.5 (88)	69.6 (1769)	5.1 (131)
S2.40.A100.760.8.66H.S/C...	47.0 (1193)	35.1 (891)	12 x 0.9 (12 x 23)	66.5 (1689)	18.5 (471)	7.9 (200)	22.2 (565)	78.4 (1992)	62.4 (1585)	45.0 (1142)	6.7 (170)	3.5 (88)	72.0 (1828)	5.5 (139)
S2.55.A120.760.8.66M.S/C...	44.8 (1139)	35.7 (907)	12 x 0.9 (12 x 23)	75.4 (1915)	21.7 (551)	7.9 (200)	26.4 (670)	80.3 (2040)	60.3 (1531)	43.0 (1092)	6.7 (170)	3.5 (88)	83.5 (2121)	8.1 (209)

Pump type	[inch (mm)]														
	Z12B	Z13	Z14	Z15	Z16	Z17		Z23	S3OPR	ZDC1	ZDN1	ZDT1	ZL1	ZL2	ZM
						G	S								
S2.40.A80.980.4.66M.S...	7.7 (196)	5.9 (150)	3.4 (86)	14.4 (365)	19.1 (485)	0.1 (3.0)	0.1 (3.0)	52.8 (1342)	52.1 (1323)	11.6 (295)	ANSI 8" (DN 200)	1.2 (31)	30.0 (761)	8.7 (222)	4 x 1" (4 x M24)
S2.40.A80.980.4.66M.C...								17.1 (435)	16.4 (416)						
S2.40.A100.760.8.66H.S...	8.8 (224)	5.9 (150)	3.4 (86)	14.8 (375)	21.5 (545)	0.1 (3.0)	0.1 (3.0)	54.8 (1393)	54.4 (1382)	13.8 (350)	ANSI 10" (DN 250)	1.3 (32)	31.5 (799)	8.7 (222)	4 x 1" (4 x M24)
S2.40.A100.760.8.66H.C...								19.1 (486)	18.7 (475)						
S2.55.A120.760.8.66M.S...	10.1 (256)	15.7 (400)	3.7 (95)	17.7 (450)	25.6 (650)	0.1 (3.0)	0.1 (3.0)	63.7 (1619)	56.1 (1425)	15.7 (400)	ANSI 12" (DN 300)	1.3 (32)	35.5 (901)	8.7 (222)	4 x 1" (4 x M24)
S2.55.A120.760.8.66M.C...								28.0 (712)	20.4 (518)						

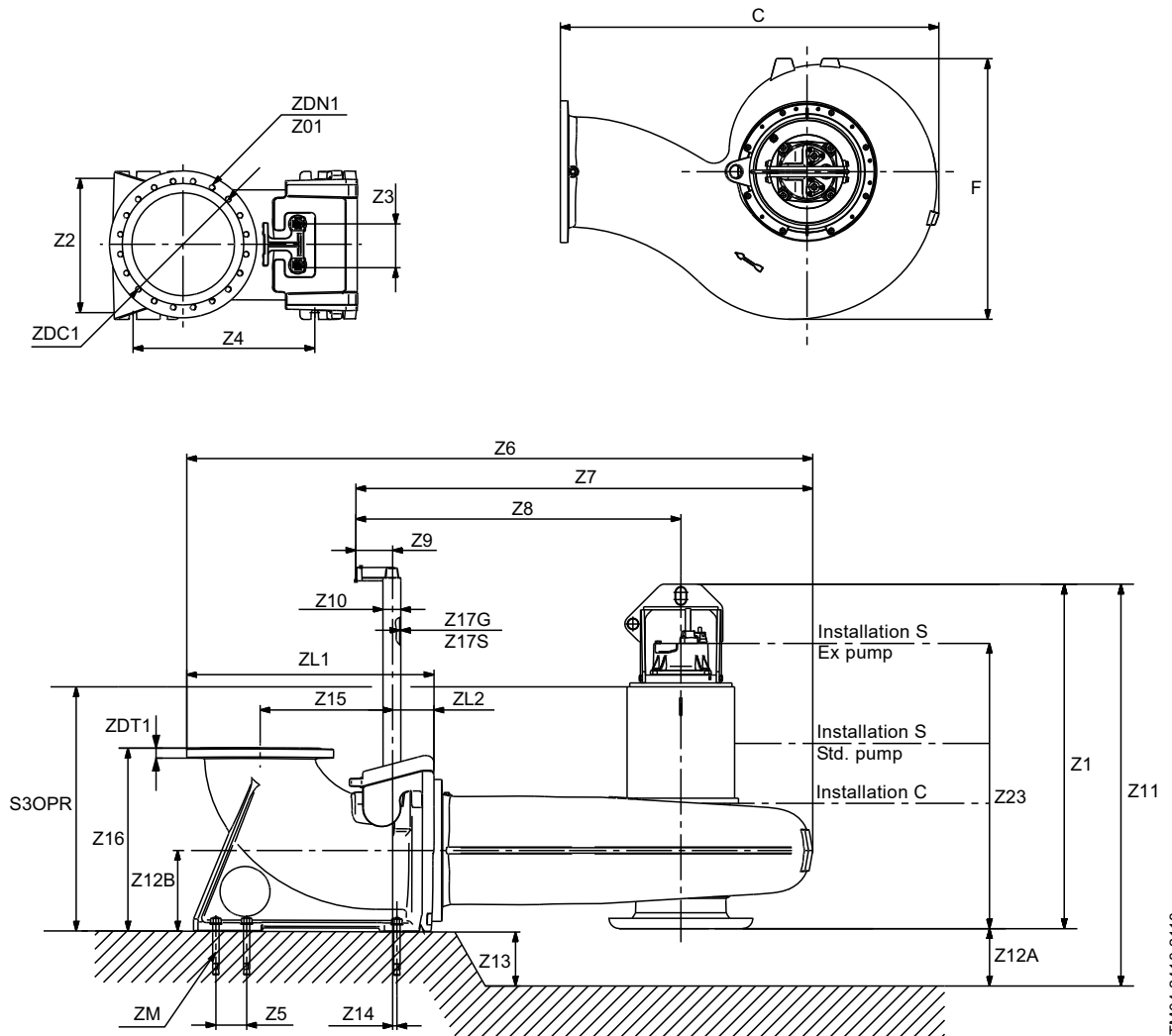


Fig. 35 Installation on auto-coupling system - version 2 (base unit with 6 anchor bolts)

Note: Z12A is the minimum recommended distance from pit bottom to bottom of pump inlet.

Note: Z11 is the total height of the pump installed on Grundfos installation accessory in the pit.

Note: The pump in this figure might not be equal Z12A + Z1.

Pump type	[inch (mm)]														
	C	F	Z01	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12A
S3.45.A200.760.8.66L.S/C...	72.6 (1843)	50.0 (1269)	20 x 1.1 (20 x 27)	72.0 (1830)	25.9 (657)	7.9 (200)	34.8 (885)	5.9 (150)	119.2 (3028)	90.4 (2297)	65.1 (1654)	6.7 (170)	3.5 (88)	81.9 (2080)	9.8 (250)

Pump type	[inch (mm)]														
	Z12B	Z13	Z14	Z15	Z16	Z17		Z23	S3OPR	ZDC1	ZDN1	ZDT1	ZL1	ZL2	ZM
						G	S								
S3.45.A200.760.8.66L.S...	15.0 (380)	9.8 (250)	3.9 (98)	22.2 (565)	35.0 (890)	0.1 (3.0)	0.1 (3.0)	60.4 (1534)	60.4 (1534)	24.4 (620)	ANSI 20"	1.7 (42)	46.7 (1185)	11.2 (284)	6 x 1 1/4" (6 x M30)
S3.45.A200.760.8.66L.C...								24.7 (627)	24.7 (627)						

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Dry pit, vertical installation on concrete foundation

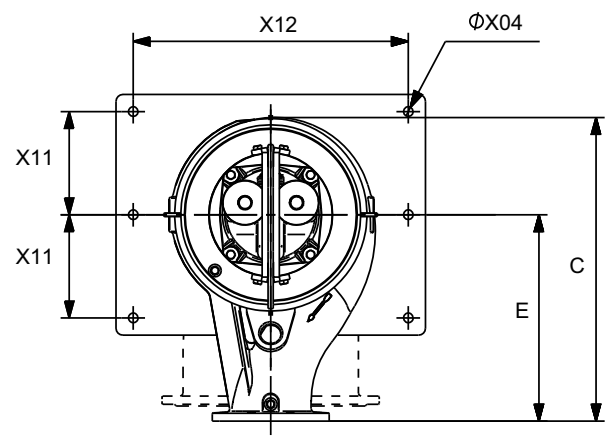
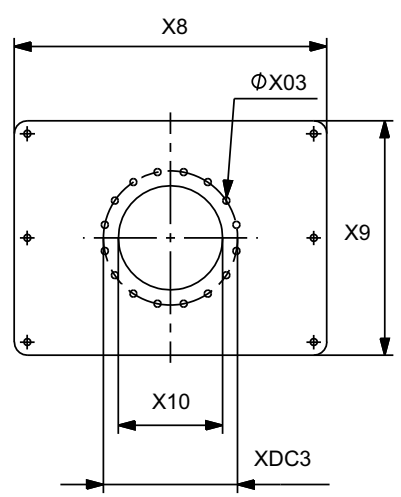
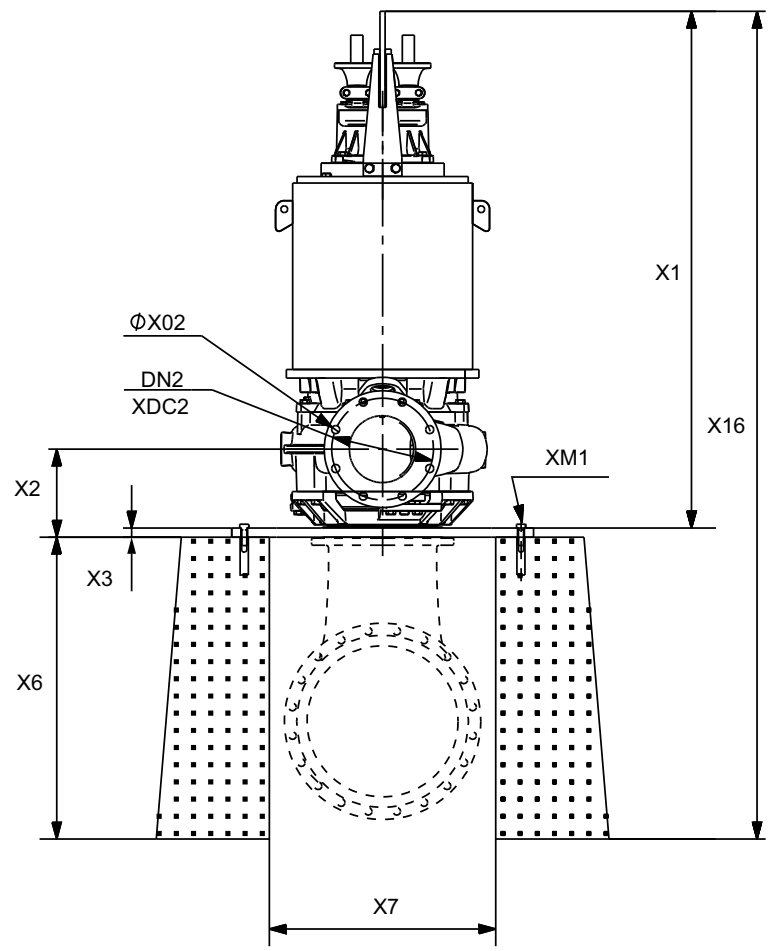


Fig. 36 Dry, vertical installation on concrete foundation

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Pump type	[inch (mm)]										
	C	E	Ø X02	Ø X03	Ø X04	X1	X2	X3	X6	X7	X8
S2.40.A80.980.4.66M.D...	31.9 (809)	18.1 (460)	0.94 (24)	1.0 (25)	1.1 (28)	64.5 (1638)	9.4 (238)	0.9 (23)	27.6 (700)	19.7 (500)	35.4 (900)
S2.40.A100.760.8.66H.D...	47.0 (1193)	29.5 (750)	0.98 (25)	1.0 (25)	1.1 (28)	70.2 (1790)	14.1 (359)	0.9 (23)	31.5 (800)	23.6 (600)	35.4 (900)
S2.55.A120.760.8.66M.D...	44.8 (1139)	27.6 (700)	0.98 (25)	1.0 (25)	1.1 (28)	70.2 (1790)	13.7 (348)	0.9 (23)	31.5 (800)	23.6 (600)	35.4 (900)
S3.45.A200.760.8.66L.D...	72.6 (1843)	47.2 (1200)	1.26 (32)	1.3 (32)	1.1 (28)	76.8 (1951)	24.5 (621)	6.3 (160)	57.1 (57.1)	37.4 (950)	46.6 (1180)

Pump type	[inch (mm)]									
	X9	X10	X11	X12	X16	DT2	XDC2	XDC3	DN2	XM1
S2.40.A80.980.4.66M.D...	27.6 (700)	ANSI 10" (DN 250)	11.8 (300)	31.5 (800)	93.0 (2361)	1.0 (26)	11.6 (296)	14.3 (362)	ANSI 8" (DN 200)	6 x 1" (6 x M24)
S2.40.A100.760.8.66H.D...	27.6 (700)	ANSI 12" (DN 300)	11.8 (300)	31.5 (800)	102.6 (2613)	1.2 (30)	14.3 (362)	17.0 (432)	ANSI 10" (DN 250)	6 x 1" (6 x M24)
S2.55.A120.760.8.66M.D...	27.6 (700)	ANSI 12" (DN 300)	11.8 (300)	31.5 (800)	102.6 (2613)	1.3 (33)	17.0 (432)	17.0 (432)	ANSI 12" (DN 300)	6 x 1" (6 x M24)
S3.45.A200.760.8.66L.D...	27.6 (700)	ANSI 16" (DN 400)	11.8 (300)	43.3 (1100)	140.2 (3561)	1.5 (37)	25.0 (635)	20.3 (515)	ANSI 20" (DN 500)	6 x 1" (6 x M24)

Dry, horizontal installation on base stand

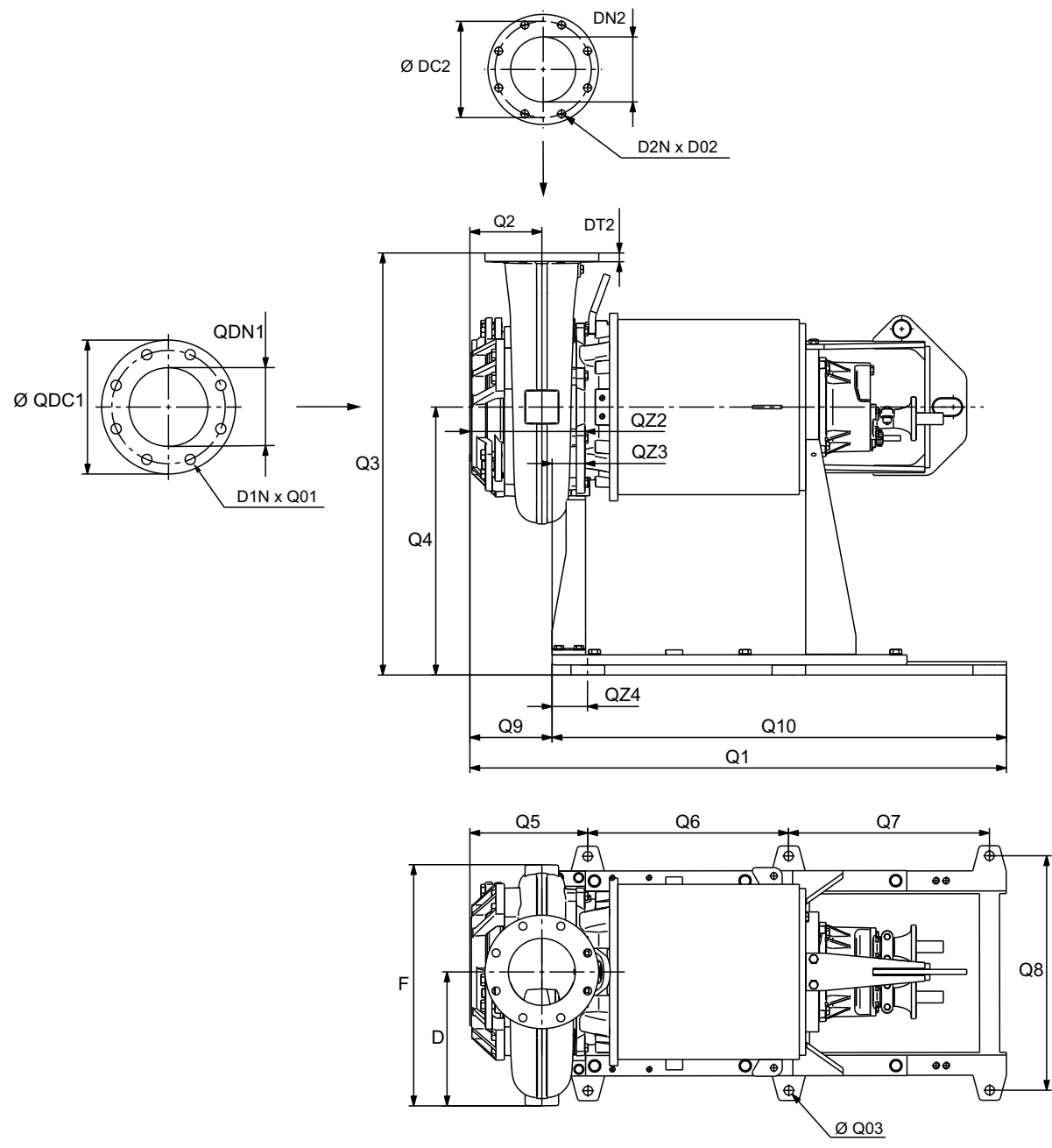


Fig. 37 Dry, horizontal installation on base stand

TM04 24/15 2018

Pump type	[inch (mm)]												
	D	F	Q03	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
S2.40.A80.980.4.66M.H...	15.7 (400)	28.3 (720)	1.1 (28)	64.5 (1638)	8.5 (215)	49.6 (1260)	31.5 (800)	15.5 (395)	23.6 (23.6)	23.6 (23.6)	27.6 (700)	11.3 (288)	53.4 (1357)
S2.40.A100.760.8.66H.H...	18.8 (478)	35.1 (891)	1.1 (28)	70.2 (1790)	13.2 (336)	61.0 (1550)	31.5 (800)	21.3 (547)	23.6 (23.6)	23.6 (23.6)	27.6 (700)	17.0 (440)	53.4 (1357)
S2.55.A120.760.8.66M.H...	20.5 (522)	35.7 (907)	1.1 (28)	70.2 (1790)	12.8 (325)	59.1 (1500)	31.5 (800)	21.3 (547)	23.6 (23.6)	23.6 (23.6)	27.6 (700)	17.0 (440)	53.4 (1357)
S3.45.A200.760.8.66L.H...	28.3 (719)	49.9 (1269)	1.1 (28)	76.8 (1951)	18.1 (461)	78.7 (2000)	31.5 (800)	27.9 (708)	23.6 (23.6)	23.6 (23.6)	27.6 (700)	23.7 (601)	53.4 (1357)

Pump type	[inch (mm)]		Pc.	[inch (mm)]		Pc.	[inch (mm)]					
	QDC1	QDN1		D1N	Q01		DN2	D2N	D02	QZ2	QZ3	QZ4
S2.40.A80.980.4.66M.H...	14.3 (362)	ANSI 10" (DN 250)	12	3/4" (M20)	ANSI 8" (DN 200)	8	0.9 (24)	13.3 (338)	- 2.0 (- 50)	4.2 (107)	11.6 (296)	1.0 (26)
S2.40.A100.760.8.66H.H...	17.0 (432)	ANSI 12" (DN 300)	6	3/4" (M20)	ANSI 10" (DN 250)	12	1.0 (25)	19.0 (490)	- 2.0 (- 50)	4.2 (107)	14.3 (362)	1.2 (30)
S2.55.A120.760.8.66M.H...	17.0 (432)	ANSI 12" (DN 300)	6	3/4" (M20)	ANSI 12" (DN 300)	12	1.0 (25)	19.0 (490)	- 2.0 (- 50)	4.2 (107)	17.0 (432)	1.3 (33)
S3.45.A200.760.8.66L.H...	21.3 (540)	ANSI 16" (DN 400)	8	1" (M24)	ANSI 20" (DN 500)	20	1.3 (32)	25.6 (651)	- 2.0 (- 50)	4.2 (107)	25.0 (635)	1.5 (37)

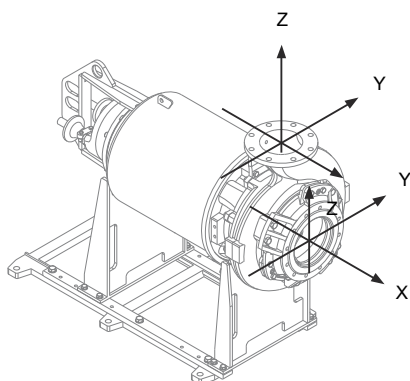
13. Weights

Weights include 50 ft (15 m) cable.

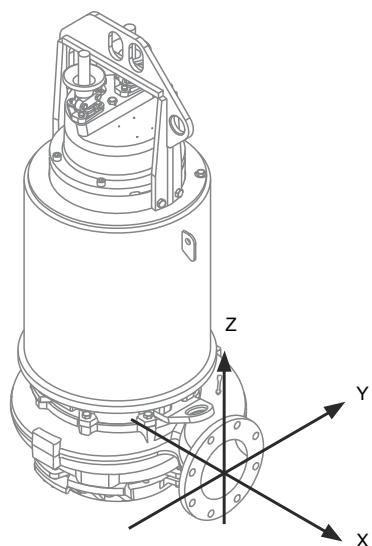
Pump type	Weight [lb (kg)]
S2.40.A80.980.4.66M.S....	1984 (900)
S2.40.A80.980.4.66M.C....	2183 (990)
S2.40.A80.980.4.66M.D....	2381 (1080)
S2.40.A80.980.4.66M.H....	2381 (1080)
S2.40.A100.760.8.66H.S....	2205 (1000)
S2.40.A100.760.8.66H.C....	2425 (1100)
S2.40.A100.760.8.66H.D....	2646 (1200)
S2.40.A100.760.8.66H.H....	2646 (1200)
S2.55.A120.760.8.66M.S....	2535 (1150)
S2.55.A120.760.8.66M.C....	2800 (1270)
S2.55.A120.760.8.66M.D....	3042 (1380)
S2.55.A120.760.8.66M.H....	3042 (1380)
S3.45.A200.760.8.66L.S....	2976 (1350)
S3.45.A200.760.8.66L.C....	3285 (1490)
S3.45.A200.760.8.66L.D....	2976 (1350)
S3.45.A200.760.8.66L.H....	2976 (1350)

14. Flange forces

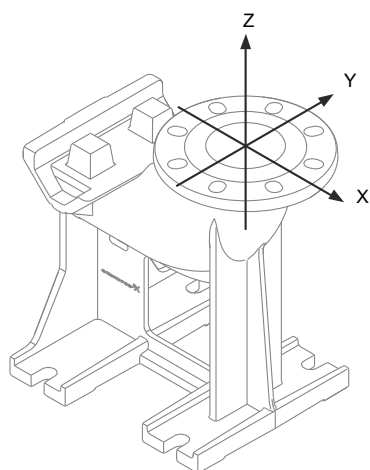
Horizontal installations



Vertical installations



Base unit



The flange forces and moments are according to EN ISO 5199.

Forces can be found for both horizontal and vertical installations in table B.3 in EN ISO 5199, by selecting the correct flange dimension. Forces cannot be used directly for end-suction wastewater pumps without using a coefficient which can be found in table B.5 in EN ISO 5199 by selecting the correct pump family.

For Grundfos wastewater pumps, the pump families and coefficients are as stated below.

Horizontally installed pumps

Pump family A4 = Coefficient 0.35

Vertically installed pumps

Pump family 10A = Coefficient 0.30

TM06 4901 3115 - TM06 4903 3115 - TM06 4902 3115

15. Grundfos Product Center

Online search and sizing tool to help you make the right choice.
<http://product-selection.grundfos.com>

All the information you need in one place

Performance curves, technical specifications, pictures, dimensional drawings, motor curves, wiring diagrams, spare parts, service kits, 3D drawings, documents, system parts. The Product Center displays any recent and saved items - including complete projects - right on the main page.

Downloads

On the product pages, you can download installation and operating instructions, data booklets, service instructions, etc. in PDF format.



TM07 2384

TM07 2383

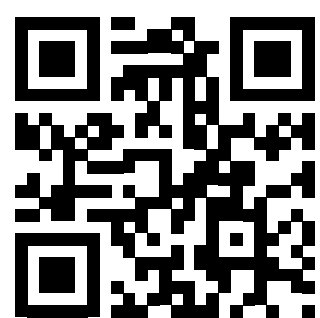
Pos. Description

- | | |
|---|---|
| 1 | This drop-down menu enables you to set the search function to "Products" or "Literature". |
| 2 | SIZING enables you to size a pump based on entered data and selection choices. |
| 3 | CATALOGUE gives you access to the Grundfos product catalogue.
REPLACEMENT enables you to find a replacement product.
Search results will include information on |
| 4 | <ul style="list-style-type: none"> the lowest purchase price the lowest energy consumption the lowest total life cycle cost. |
| 5 | LIQUIDS enables you to find pumps designed for aggressive, flammable or other special liquids. |

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GRUNDFOS Chicago

3905 Enterprise Court
P.O. Box 6620
Aurora, IL 60598-0620
Phone: +1-630-236-5500
Fax: +1-630-236-5511

GRUNDFOS Kansas City

9300 Loiret Boulevard
Lenexa, Kansas 66219
Phone: +1-913-227-3400
Fax: +1-913-227-3500
www.grundfos.us

GRUNDFOS Canada

2941 Brighton Road
Oakville, Ontario L6H 6C9 Canada
Phone: +1-905 829 9533
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C.P. 66600 Apodaca, N.L. Mexico
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