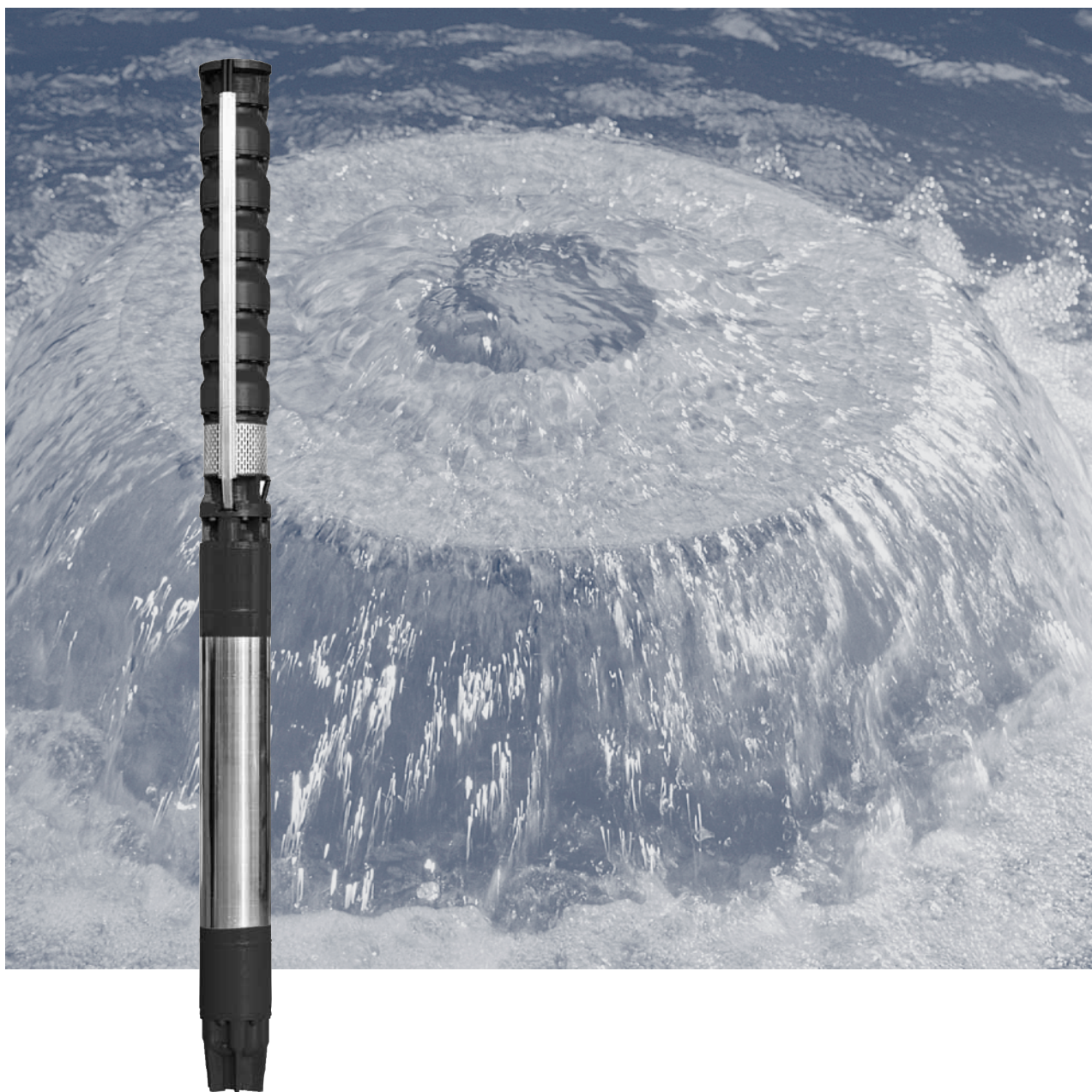


# SP-G

Submersible pumps, submersible motors, accessories  
50 Hz



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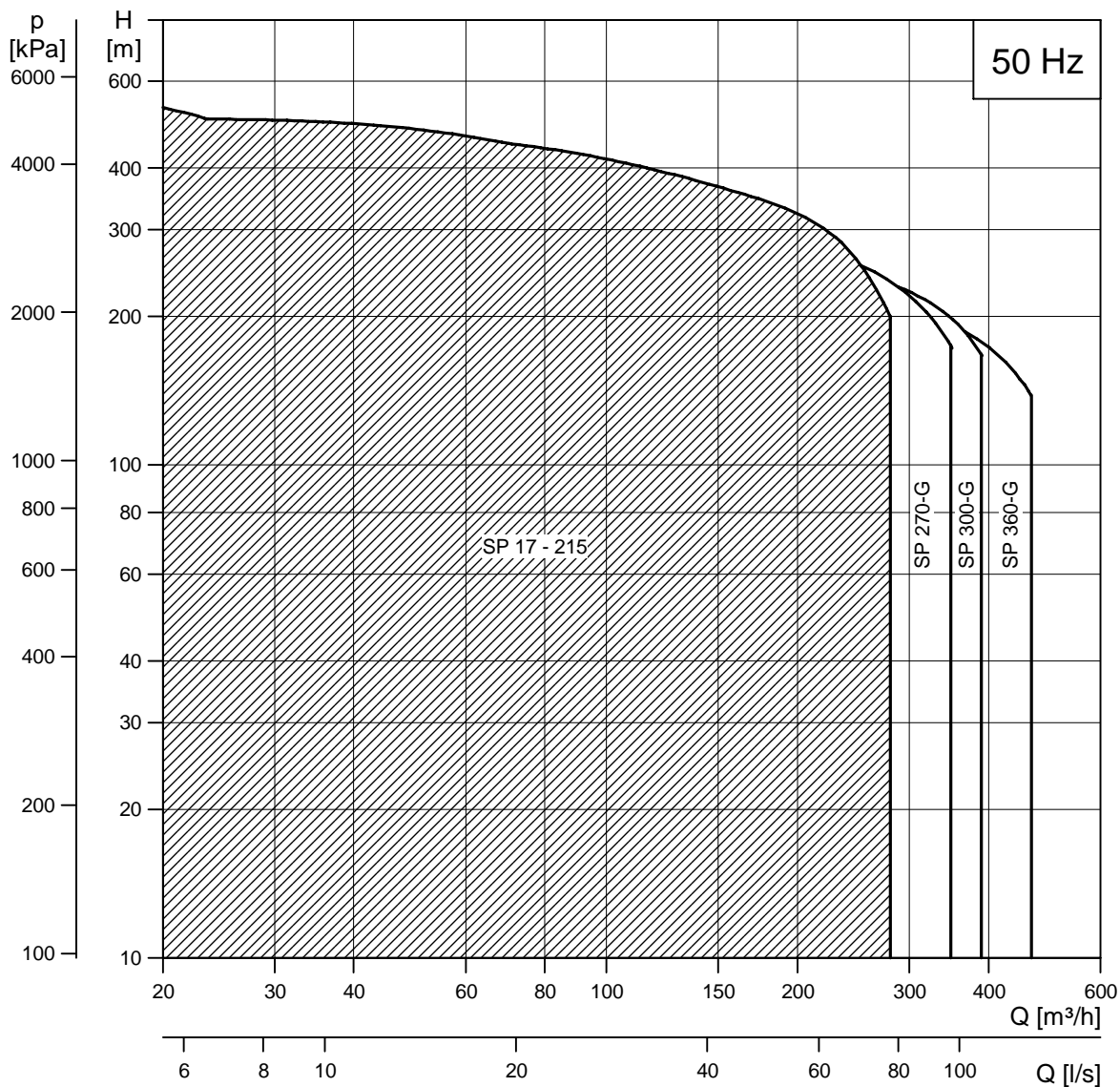
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## Performance range



TM01 6548 0408

**Fig. 1** Performance range, 50 Hz

For pump types SP 17 to SP 215, see SP databooklet.

## Pump range

Description	SP 270-G	SP 300-G	SP 360-G
Cast iron	●	●	●
DIN connection	DN 175	DN 175	DN 175

## Motor range

Description	Motor output 22-250 kW
Three-phase	●
Rewindable motor	●
Stainless steel DIN/EN 1.4401, AISI 316	●
Cast iron EN-JL1040	●

Direct-on-line starting is recommended up to 75 kW.

Soft starter or autotransformer is recommended above 75 kW, see Soft starting. The MMS motors can be operated via frequency converter, see Frequency converter operation.

Motors with star-delta is available for all motor sizes.

## Type key

Example	SP	360-	2	A	G
Type range	----- ----- ----- ----- -----				
Rated flow in m <sup>3</sup> /h	----- ----- ----- ----- -----				
Number of impellers	----- ----- ----- ----- -----				
Impeller type	----- ----- ----- ----- -----				
Parts of material	----- ----- ----- ----- -----				
G = Cast iron EN-JL1040					

## Pumped liquids

Clean, thin, non-aggressive liquids without solid particles or fibres.

Maximum sand contents: 50 g/m<sup>3</sup>.

## Operating conditions

Flow rate, Q:	27-450 m <sup>3</sup> /h
Head, H:	Maximum 425 m
Operating pressure:	Maximum 60 bar
Storage temperature:	Pump: -20 °C to +60 °C Motor: -20 °C to +70 °C.

## Maximum liquid temperature

Motor	Installation		
	Flow velocity past motor	Vertical	Horizontal
MMS with PVC windings	0.15 m/s	25 °C	25 °C
	0.5 m/s	30 °C	30 °C
MMS with PE/PA windings	0.15 m/s	40 °C	40 °C
	0.5 m/s	45 °C	45 °C

## Operating range

Pump type	Q <sub>min.</sub>	Q <sub>rated</sub>	Q <sub>max.</sub>
	[m <sup>3</sup> /h]		
SP 270-G	27	270	350
SP 300-G	30	300	390
SP 360-G	36	360	460

## Motor data

Frequency	50 Hz	
Enclosure class	IP58	
Insulation class	Y from 22 kW to 250 kW	
Starting frequency	MMS 8000:	Max. 10/h
	MMS 10000:	Max. 8/h
Starting frequency	MMS 12000:	Max. 5/h
	Voltage variations	-10 % / +6 % for all motor sizes

## Installation

Motor	Installation	
	Vertical	Horizontal
MMS 8000	22-110 kW	22-92 kW
MMS 10000	75-190 kW	75-170 kW
MMS 12000	147-250 kW	147-190 kW

## Motor protection range and communication tools

Description	Motor output	
	22-190 kW	220-250 kW
Pt100 (connected to PR 5714 or MP 204)	●	●
MP 204	●	
R100	●	
G100	●	

## Standard voltage

The MMS motors are available in the following voltages and sizes.

Direct-on-line starting		Star-delta starting	
Voltage	Power [kW]	Voltage	Power [kW]
3 x 230 V	22 - 110	3 x 230 V	22 - 110
3 x 380-415 V	22 - 250	3 x 380-415 V	22 - 250
3 x 500 V	22 - 250	3 x 500 V	22 - 250

Voltages up to 1000 V are available on request.

## Frequency converter operation

In principle, all SP-G submersible pumps can be operated via a frequency converter.

However, the conditions are:

- Min. frequency: 30 Hz;  
max. frequency: 60 Hz (check motor output rating).
- It is recommended to select a motor with minimum 10% reserve capacity or a industrial motor with lower thermal load.
- Ensure sufficient cooling of the motor (flow sleeve).
- The motor must be protected against unacceptably high transients.
- Proportional adjustment of voltage/frequency ( $U/f = \text{constant}$ ).
- The converter must be selected according to the rated current of the submersible motor selected.

For further information, please contact Grundfos.

## Soft starting

The starting voltage is at least 55 % of the rated voltage.

If a higher locked-rotor torque is required or the power supply is not optimum, the starting voltage must be higher.

Run-up time (before reaching the rated voltage):

Max. 3 sec

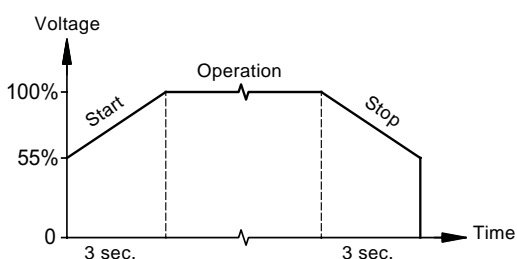
Run-out time: Max. 3 sec.

If the above run-up and run-out times are followed, unnecessary heating of the motor is avoided.

If the soft starter is equipped with bypass contacts, it will only be in operation during run-up and run-out.

This reduces the soft starter load and offers energy savings compared to operation without bypass contacts.

A soft starter must not be used in connection with generator operation.



TM00 5691 1395

**Fig. 2** Soft start/stop

## Features and benefits

### Pump range

The SP-G pump range consists of pumps which can deliver a higher pressure or a higher flow compared to the rest of the SP pump range offered by Grundfos.

SP 270-G, SP 300-G and SP 360-G are semi-axial pumps. They are suitable for applications requiring a flow up to 450 m<sup>3</sup>/h and a head up to 425 m head.

All pumps are available with an optional number of stages to match any duty point.

## Product features

### Bearings with sand channels

All bearings are constructed in such a way that channels are formed along the shaft enabling sand, if any, to leave the pump with the pumped liquid.

The bearings in SP 270-G, SP 300-G and SP 360-G are square on the inside.

### Inlet strainer

The inlet strainer prevents particles over a certain size from entering and damaging the pump.

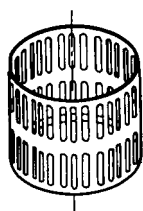
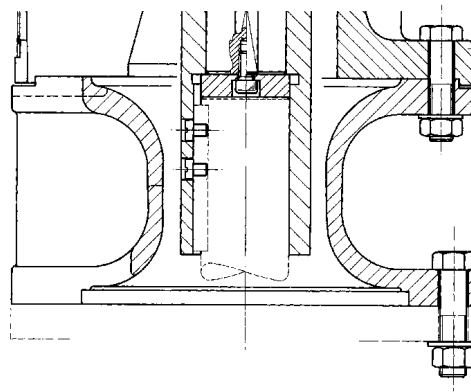


Fig. 3 Inlet strainer

TM00 7302 1096

### Protection against upthrust

The pump range has a screwed connection between the coupling of the pump and the motor shaft ensuring that upthrust in the pump, if any, is transferred to the stop ring of the motor.



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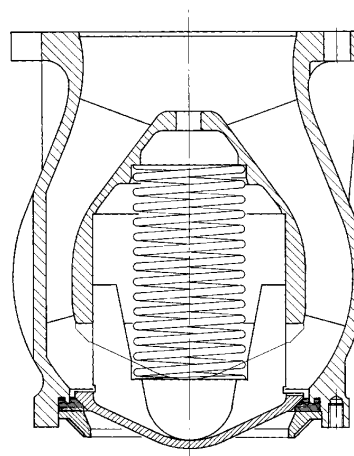
Fig. 4 Protection against upthrust

### Valve casing

All pumps are equipped with a reliable non-return valve in the valve casing preventing back flow in connection with pump stoppage.

The valve casing is designed for optimum hydraulic properties to minimise the pressure loss across the valve and thus contribute to minimising the total pressure loss of the pump.

Furthermore, the short closing time of the non-return valve means that the risk of destructive water hammer is reduced to a minimum.



TM01 5002 1399

Fig. 5 Non-return valve in the valve casing

### Neck ring

All pumps have a replaceable neck ring in each chamber.

This means that the neck ring can be replaced easily in case of wear.

## Material specification

Pos.	Components	Materials	DIN/EN	AISI
1	Valve casing	Cast iron	EN-JL1040	
1d	O-ring	NBR		
2	Valve cup	Bronze	2.0975.03	
3	Valve seat	NBR		
4	Chamber	Cast iron	EN-JL1040	
7	Neck ring	Bronze	2.1182.03	
8	Bearing	Steel + NBR		
13	Impeller	Zinc-free bronze	2.1050.01	
14	Suction interconnector	Cast iron	EN-JL1040	
15	Strainer	Stainless steel	1.4301	304
16	Shaft	Stainless steel	1.4028	420
16a	Key	Stainless steel	1.4301	304
18	Cable guard	Stainless steel	1.4301	304
24	Coupling	Stainless steel	1.4028	420
35a	Staybolt	Stainless steel	1.4301	304
35b	Nut	Stainless steel	1.4301	304
39	Spring for valve cup	Stainless steel	1.4401	316
73	Connecting piece	Cast iron	EN-JS1030	

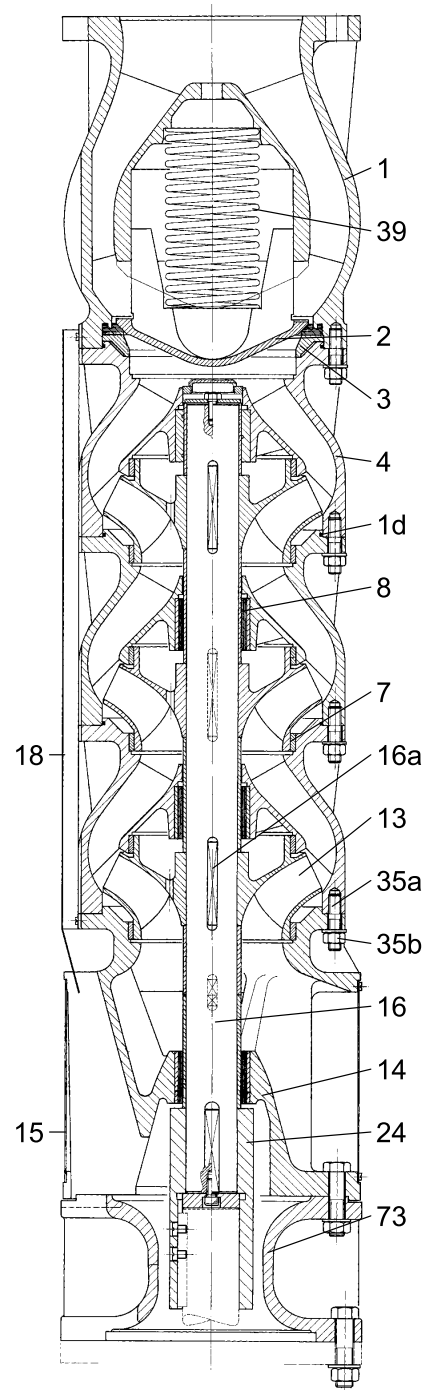


Fig. 6 SP 300-G

TM01 4984 2399

## Features and benefits

### Motor range

All SP-G pumps are fitted with a two-pole three-phase submersible rewindable motor (MMS).

The MMS motors are available in sizes 8", 10" and 12" (MMS 8000, MMS 10000 and MMS 12000) and in different voltages and sizes from 22 kW to 250 kW.

The MMS motors are available in the following sizes:

Motor type	Motor power [kW]
MMS 8000	22-110
MMS 10000	110-190
MMS 12000	170-250

### Materials

As standard, the end shields of the MMS motors are made of cast iron and the motor sleeve is made of stainless steel to DIN/EN 1.4401 (AISI 316).

### High motor efficiency

The complete motor range offered by Grundfos is characterised by high efficiency, which contributes to improved economy of the total pump system.

### Rewindable motors

All MMS motors are wet-type, and they are easily rewinded. The windings of the stator are made of a special water-proof wire allowing direct contact between the windings and the liquid. This means that an efficient cooling of the windings is obtained.

### Protection against upthrust

In case of a very low counter-pressure in connection with start-up, there is a risk that the entire pump body may rise, for instance in connection with fountain applications. This is called upthrust, and it may cause damage to both pump and motor. Therefore, the MMS motors are fitted with a stop ring which prevents upthrust in the critical start-up phase.

### Motor liquid

Type SML-3 which is frost-proof down to  $-20\text{ }^{\circ}\text{C}$ .

The motor liquid has an anti-corrosive and lubricating function. To obtain the best protection, a concentration of 40 % to 60 % in water is recommended.

Should the SML-3 mixed with water not be allowed for special applications, MMS motors may be filled even with fresh water.

Motors not filled with motor liquid are available on request.

### Overtemperature protection

For protection against overtemperature Grundfos offers an optional, Pt100 temperature sensor for the MMS motors.

To obtain the overtemperature protection, the Pt100 is fitted in the motor and connected to a PR5714 relay or directly to the MP 204 motor protector. The low cost temperature controller CU220 is available in 1x230V 50Hz, it is connected to a Pt1000 sensor. The controller is available for front panel mounting.

If the temperature rises too high, the motor will cut out and damage to the motor is avoided.



Fig. 7 MMS motors

TM01 7873 4999



## Material specification for MMS motors

### Submersible rewindable motors

Pos.	Component	Material	DIN/EN
202	Shaft	Steel	1.0533
202a	Shaft ends	Stainless steel	1.4460
203/ 206	Thrust bearing Stationary/ rotating part	12" 8" - 10" 8" and 10"	Hardened steel/ EPDM Ceramics/carbon Carbon
204	Bearing bush	12"	Stainless steel/ NBR
205	Bearing housing, upper	Cast iron	EN-JL1040
212	Diaphragm	CR	
213	Motor end shield	Cast iron	EN-JL1040
218	Motor sleeve	Stainless steel	1.4301
220	Motor cable	EPDM	
226	Shaft seal	Ceramic/carbon	
235	Intermediate housing	Cast iron	EN-JL1040
236	Bearing housing, lower	Cast iron	EN-JL1040

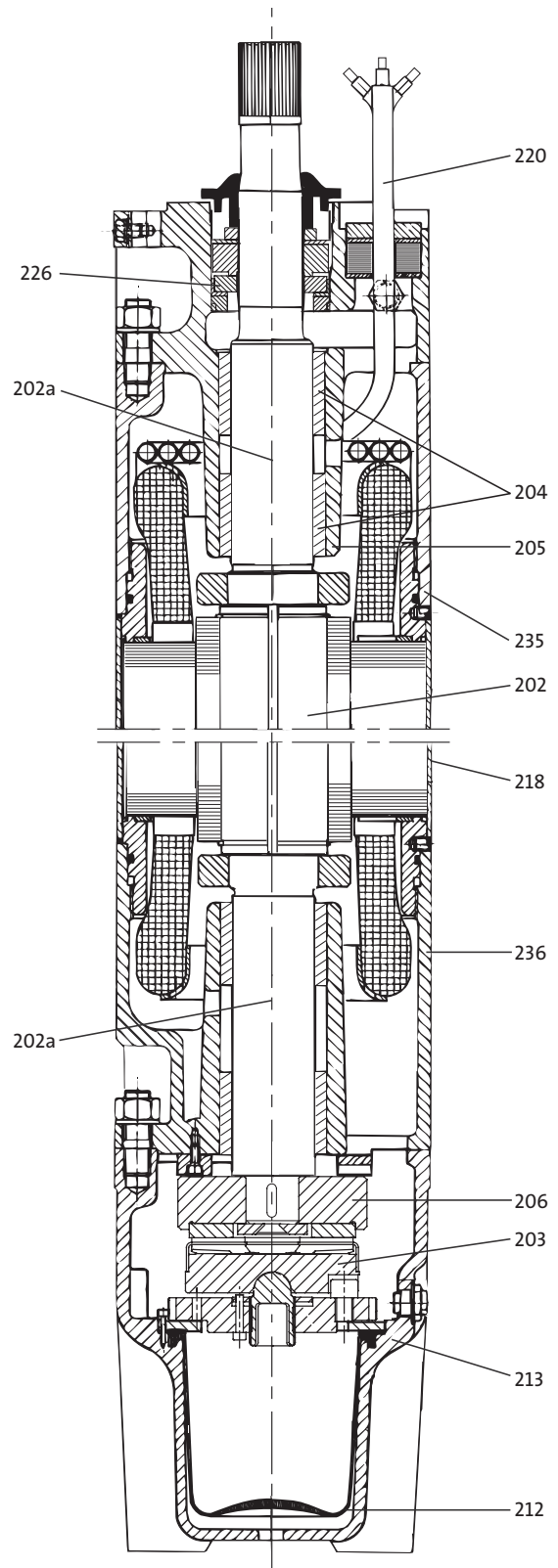


Fig. 8 MMS 10000

TM01 4985 0404

## Curve conditions

The conditions below apply to the curves on pages 11 to 22:

### General

- Curve tolerances according to ISO 9906, Annex A.
- The performance curves show pump performance at actual speed cf. standard motor range.

The speed of the motors is approximately:

8" to 12" motors:  $n = 2900 \text{ min}^{-1}$ .

The measurements were made with airless water at a temperature of 20 °C. The curves apply to a kinematic viscosity of 1 mm<sup>2</sup>/s (1cSt). When pumping liquids with a density higher than that of water, motors with correspondingly higher outputs must be used.

- The bold curves indicate the recommended performance range.
- The performance curves include possible losses such as non-return valve loss.

### SP-G curves

- **Q/H:** The curves include valve and inlet losses at the actual speed.
- Operation without a non-return valve will increase the actual head at nominal performance by 0.5 to 1.0 m.
- **NPSH:** The curve includes suction inter-connector and shows required inlet pressure.
- **Power curve:** P<sub>2</sub> shows the pump power input at the actual speed for each individual pump size.
- **Efficiency curve:** Eta shows the pump stage efficiency for pumps with impeller type F. The efficiency pumps with few impellers or impellers with diameter other than that of impeller type F is lower than the eta curve shown in the chart. The actual efficiency at an exact duty point can be calculated as shown in the following section.

### Calculation of efficiency

To calculate the exact pump efficiency of a pump with a standard motor, use the following equation:

$$\eta_p = \frac{Q \times H}{P_2 \times 367} \times 100$$

where

Q = Flow in m<sup>3</sup>/h at duty point

H = Head in m at duty point

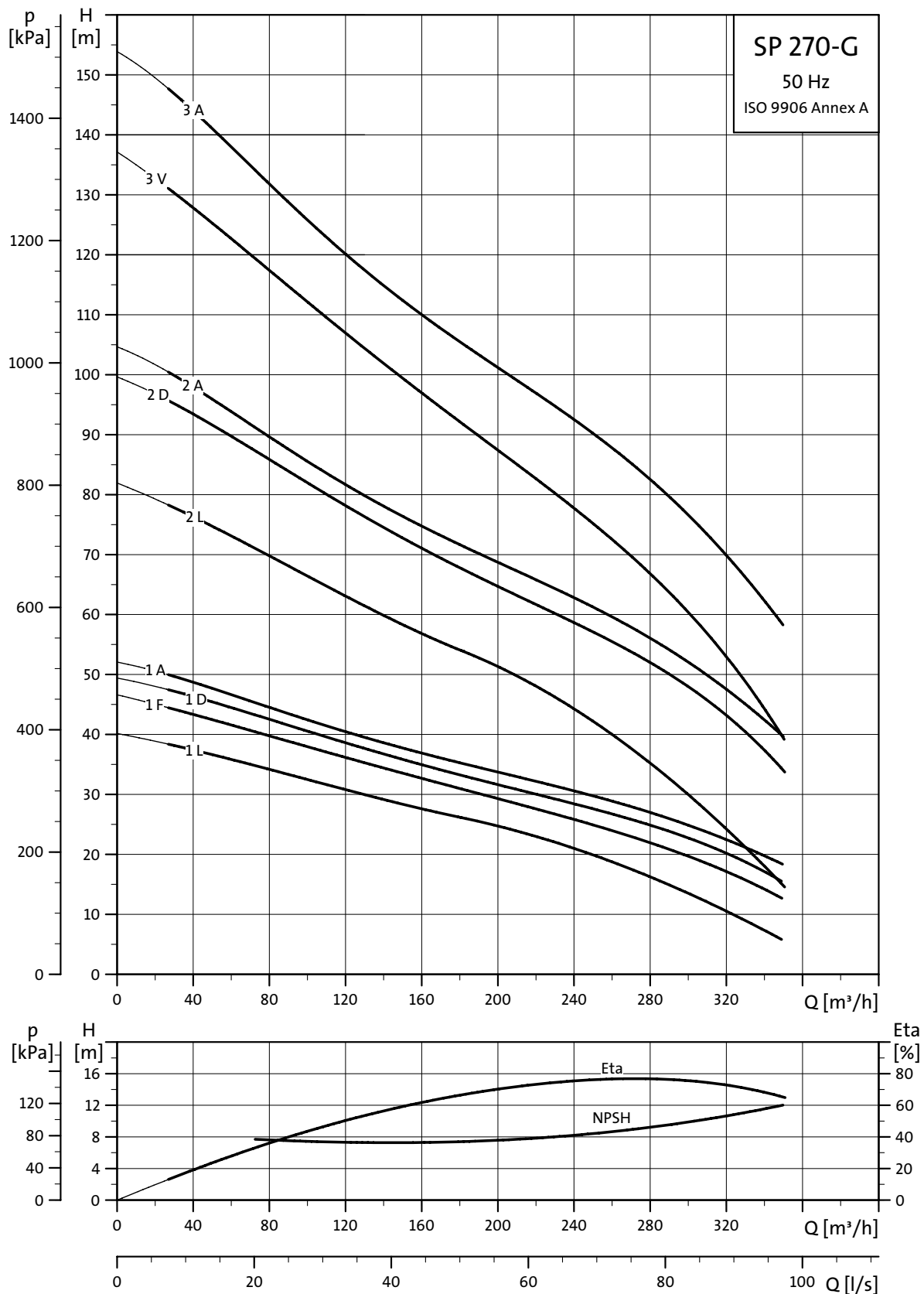
P<sub>2</sub> = Required power in kW at duty point from curve set

$\eta_p$  = Calculated pump efficiency at duty point.

# Performance curves/ Technical data

Submersible pumps  
SP 270-G

## SP 270-G

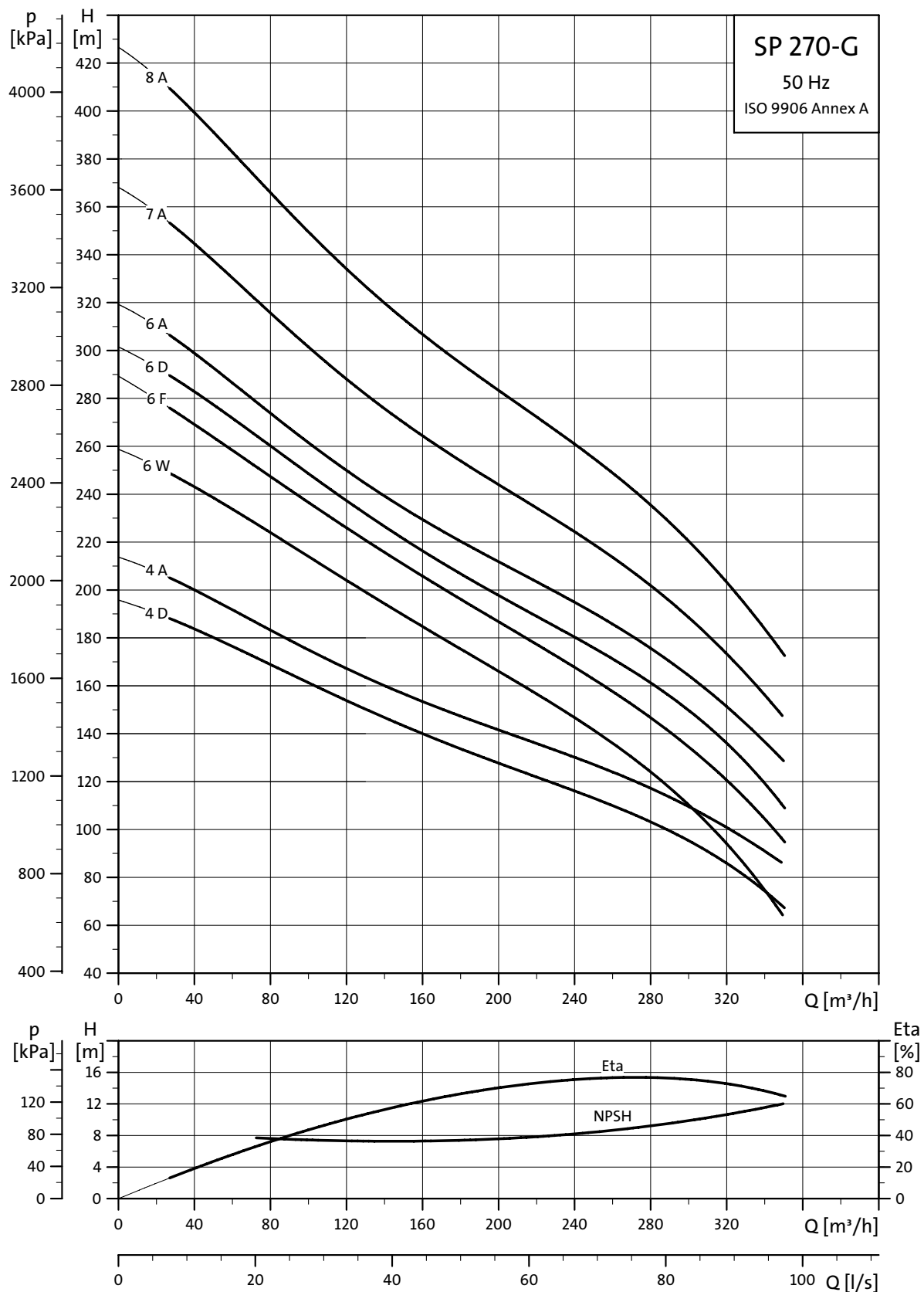


**Note:** The NPSH is the same for all impeller types. Eta is shown for impeller type F.  
For all other impeller types, please calculate the value of Eta. See "Calculation of efficiency" on page 10.

TM01 4847 3303

# Performance curves

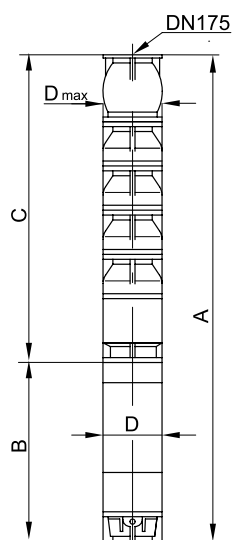
Submersible pumps  
SP 270-G



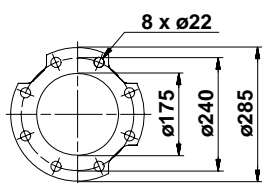
TM/01 4848 3303

**Note:** The NPSH is the same for all impeller types. Eta is shown for impeller type F.  
For all other impeller types, please calculate the value of Eta. See "Calculation of efficiency" on page 10.

### Dimensions and weights



TM01 4158 2700



TM01 6664 3199

Pump type	Motor		Dimensions [mm]				Net weight [kg]	Ship. vol. [m <sup>3</sup> ]
	Type	Power [kW]	C	B	A	D		
SP 270-1L G	MMS 8000	22	881	1010	1891	192	266	0.455
SP 270-1F G	MMS 8000	26	881	1050	1931	192	274	0.455
SP 270-1D G	MMS 8000	30	881	1110	1991	192	286	0.455
SP 270-1A G	MMS 8000	37	881	1160	2041	192	296	0.455
SP 270-2L G	MMS 8000	45	1061	1270	2331	192	342	0.494
SP 270-2D G	MMS 8000	55	1061	1350	2411	192	357	0.494
SP 270-2A G	MMS 8000	63	1061	1490	2551	192	383	0.553
SP 270-3V G	MMS 8000	75	1241	1590	2831	192	427	0.613
SP 270-3A G	MMS 8000	92	1241	1830	3071	192	473	0.692
SP 270-4D G	MMS 8000	110	1421	2060	3481	192	523	0.765
SP 270-4D G	MMS 10000	110	1421	1690	3111	237	605	0.705
SP 270-4A G	MMS 10000	132	1421	1870	3290	237	655	0.705
SP 270-6W G	MMS 10000	132	1781	1870	3651	237	705	0.806
SP 270-6F G	MMS 10000	147	1781	2070	3851	237	770	0.806
SP 270-6D G	MMS 12000	170	1807	1880	3687	286	890	0.765
SP 270-6A G	MMS 12000	190	1807	1980	3787	286	935	0.806
SP 270-7A G	MMS 12000	220	1987	2110	4097	286	1010	0.886
SP 270-8A G	MMS 12000	250	2167	2280	4447	286	1100	0.926

D<sub>max</sub> for SP 270-1L G - SP 270-6F G (8" and 10") Direct-on-line: 290 mm.

D<sub>max</sub> for SP 270-6D G - SP 270-8A G (12") Direct-on-line: 294 mm.

D<sub>max</sub> for SP 270-G (8", 10" and 12") Star-delta: 291 mm.

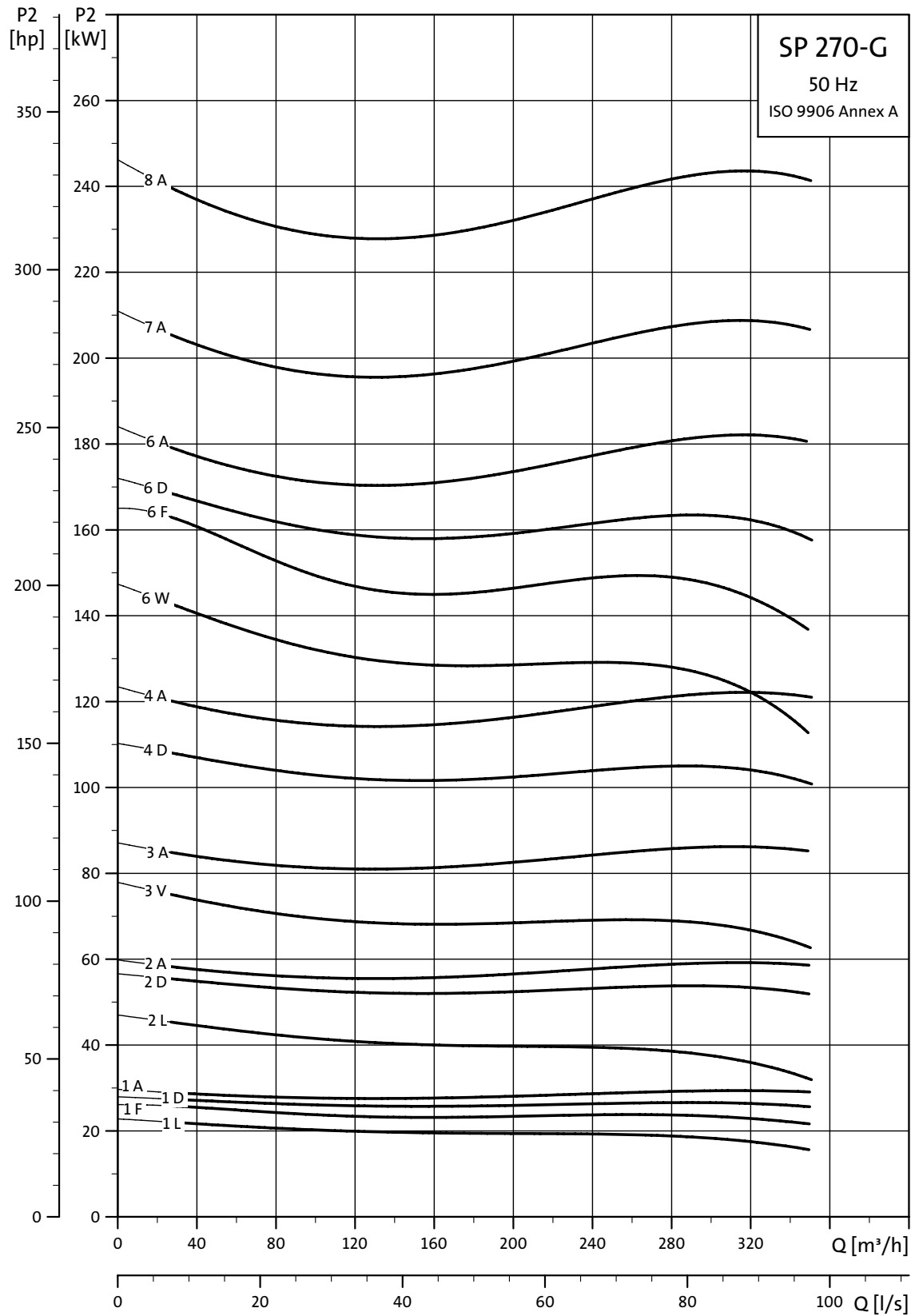
### Electrical data

3 x 400 V

Type	Motor		Rated current I <sub>1/1</sub> [A]	Motor efficiency [%]			Power factor			I <sub>start</sub> / I <sub>1/1</sub>
	Size	Power [kW]		η <sub>50 %</sub>	η <sub>75 %</sub>	η <sub>100 %</sub>	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %	
MMS 8000	8"	22	48.0	80	82	82	0.72	0.81	0.84	5.3
MMS 8000	8"	26	56.5	80	82	82	0.76	0.83	0.85	5.1
MMS 8000	8"	30	64.0	82	84	84	0.74	0.82	0.85	5.7
MMS 8000	8"	37	78.5	82	84	84	0.74	0.82	0.85	5.7
MMS 8000	8"	45	96.5	84	86	86	0.65	0.76	0.82	6.0
MMS 8000	8"	55	114	84	86	86	0.72	0.81	0.85	5.9
MMS 8000	8"	63	132	85	87	87	0.66	0.78	0.83	5.7
MMS 8000	8"	75	152	86	87	87	0.71	0.82	0.86	5.8
MMS 8000	8"	92	186	87	88	87	0.72	0.82	0.86	5.9
MMS 8000	8"	110	224	80	82	82	0.72	0.81	0.84	5.8
MMS 10000	10"	110	228	85	87	88	0.70	0.79	0.84	5.7
MMS 10000	10"	132	270	85	88	88	0.72	0.81	0.84	5.7
MMS 10000	10"	147	315	84	87	87	0.64	0.75	0.81	6.2
MMS 12000	12"	170	345	85	87	88	0.69	0.79	0.85	6.1
MMS 12000	12"	190	390	85	87	88	0.68	0.80	0.84	6.2
MMS 12000	12"	220	445	85	87	88	0.69	0.80	0.85	6.1
MMS 12000	12"	250	505	85	87	88	0.69	0.80	0.85	5.9

# Power curves

Submersible pumps  
SP 270-G

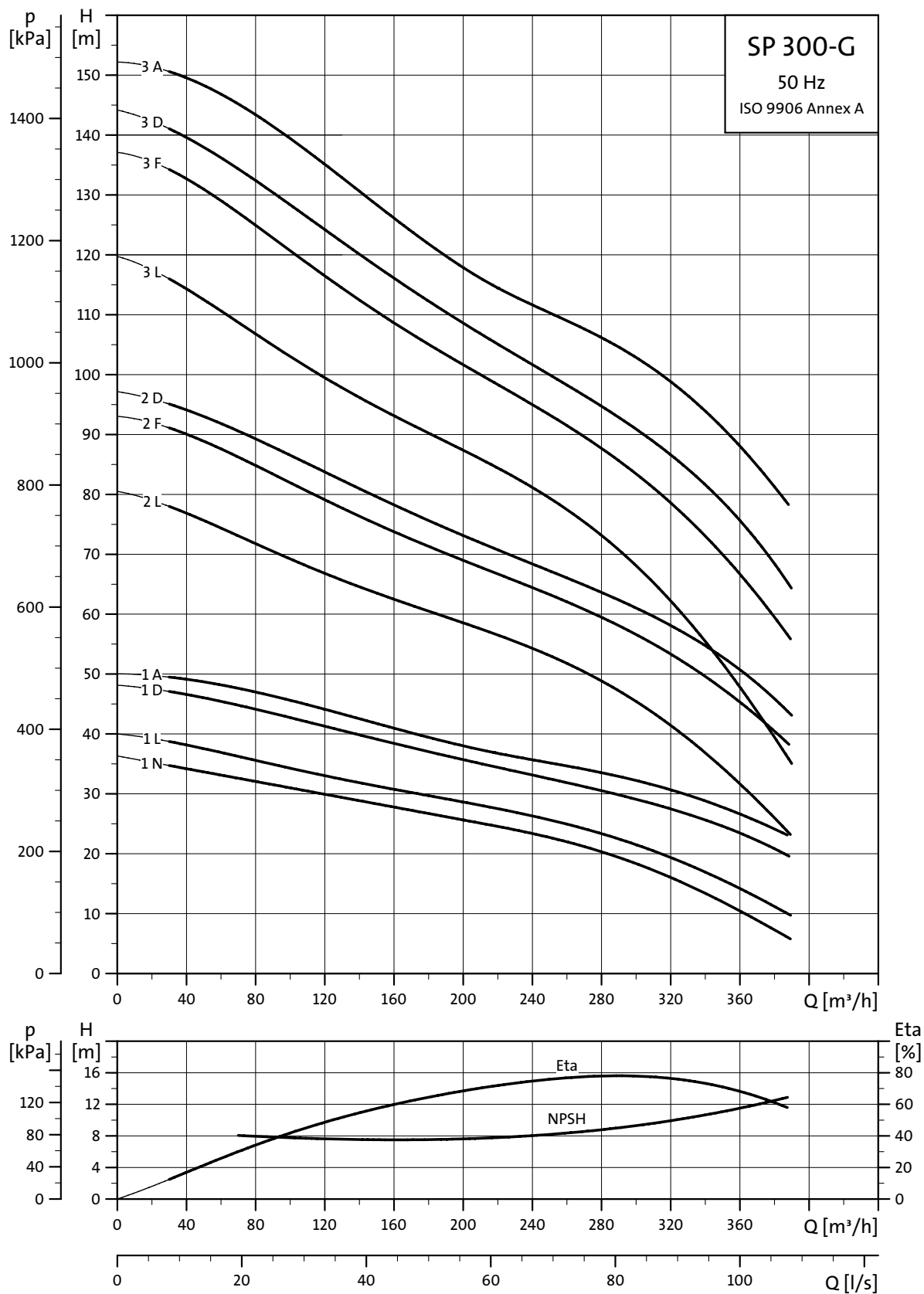


TM01 4849 1104

# Performance curves

Submersible pumps  
SP 300-G

## SP 300-G

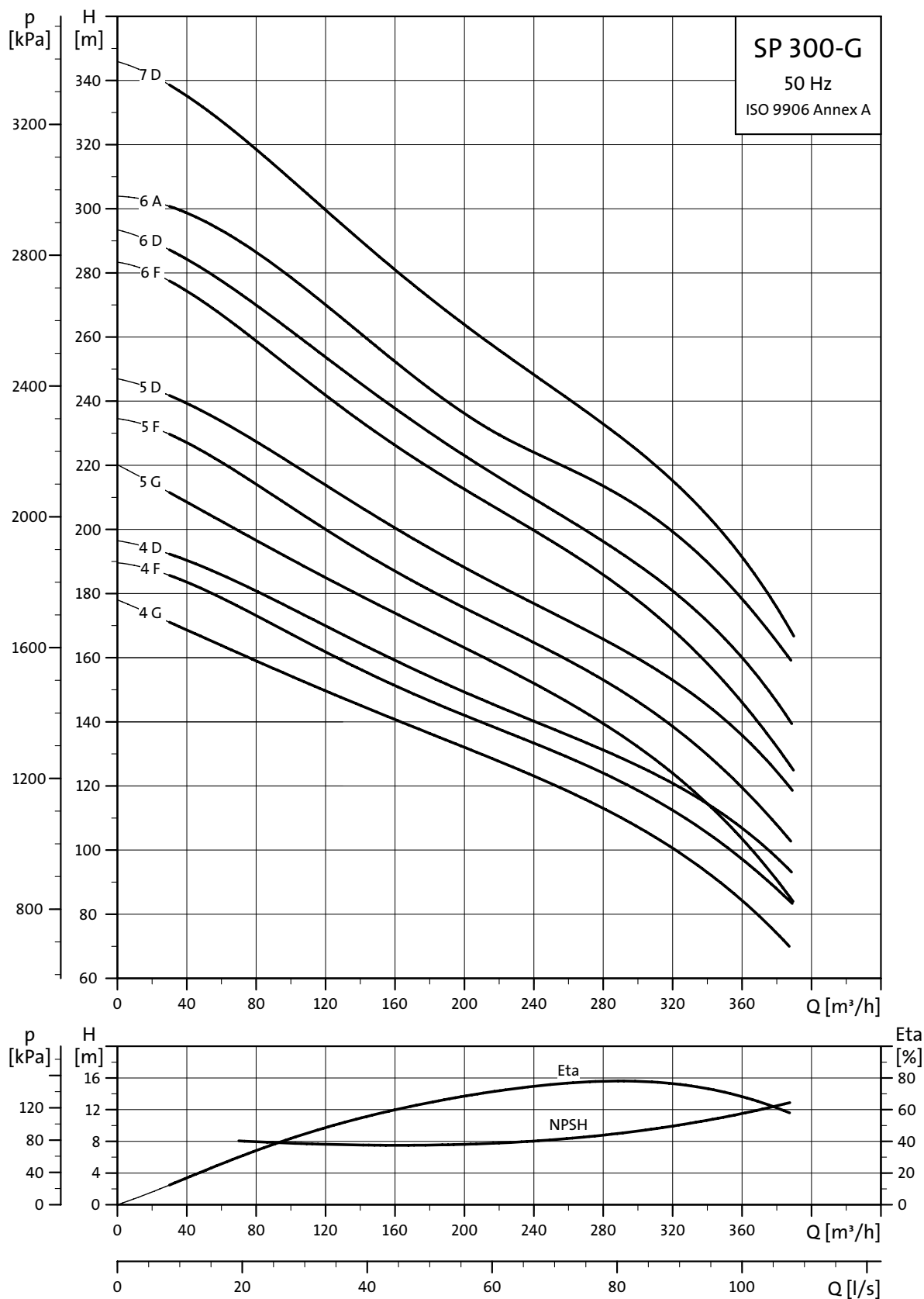


TM01 4850 3303

**Note:** The NPSH is the same for all impeller types. Eta is shown for impeller type F.  
For all other impeller types, please calculate the value of Eta. See "Calculation of efficiency" on page 10.

# Performance curves

Submersible pumps  
SP 300-G

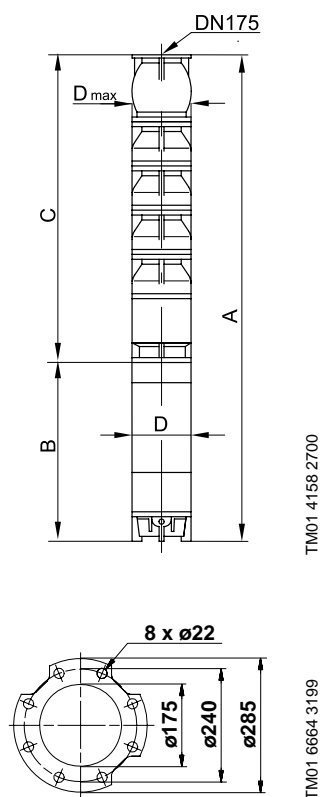


**Note:** The NPSH is the same for all impeller types. Eta is shown for impeller type F.  
For all other impeller types, please calculate the value of Eta. See "Calculation of efficiency" on page 10.

TM01 4851 3303



### Dimensions and weights



Pump type	Motor		Dimensions [mm]				Net weight [kg]	Ship. vol. [m <sup>3</sup> ]
	Type	Power [kW]	C	B	A	D		
SP 300-1N G	MMS 8000	26	881	1050	1931	192	266	0.415
SP 300-1L G	MMS 8000	30	881	1110	1991	192	286	0.415
SP 300-1D G	MMS 8000	37	881	1160	2041	192	296	0.455
SP 300-1A G	MMS 8000	45	881	1270	2151	192	317	0.455
SP 300-2L G	MMS 8000	55	1061	1350	2411	192	357	0.494
SP 300-2F G	MMS 8000	63	1061	1490	2551	192	383	0.553
SP 300-2D G	MMS 8000	75	1061	1590	2651	192	402	0.533
SP 300-3L G	MMS 8000	75	1241	1590	2931	192	427	0.613
SP 300-3F G	MMS 8000	92	1241	1830	3071	192	473	0.692
SP 300-3D G	MMS 8000	110	1241	2060	3301	192	523	0.705
SP 300-3D G	MMS 10000	110	1241	1690	2931	237	580	0.624
SP 300-3A G	MMS 10000	132	1241	1870	3111	237	630	0.705
SP 300-4G G	MMS 10000	132	1421	1870	3291	237	655	0.705
SP 300-4F G	MMS 10000	132	1421	1870	3291	237	655	0.705
SP 300-4D G	MMS 10000	147	1421	2070	3491	237	720	0.765
SP 300-5G G	MMS 10000	147	1601	2070	3671	237	745	0.765
SP 300-5F G	MMS 12000	170	1627	1880	3507	286	865	0.765
SP 300-5D G	MMS 12000	190	1627	1980	3607	286	910	0.846
SP 300-6F G	MMS 12000	190	1807	1980	3787	286	935	0.846
SP 300-6D G	MMS 12000	220	1807	2110	3917	286	985	0.846
SP 300-6A G	MMS 12000	250	1807	2280	4087	286	1060	0.846
SP 300-7D G	MMS 12000	250	1987	2280	4267	286	1085	0.886

D<sub>max</sub> for SP 300-1N G - SP 300-5G G (8" and 10") Direct-on-line: 290 mm.

D<sub>max</sub> for SP 300-5F G - SP 300-7D G (12") Direct-on-line: 294 mm.

D<sub>max</sub> for SP 300-G (8", 10" and 12") Star-delta: 291 mm.

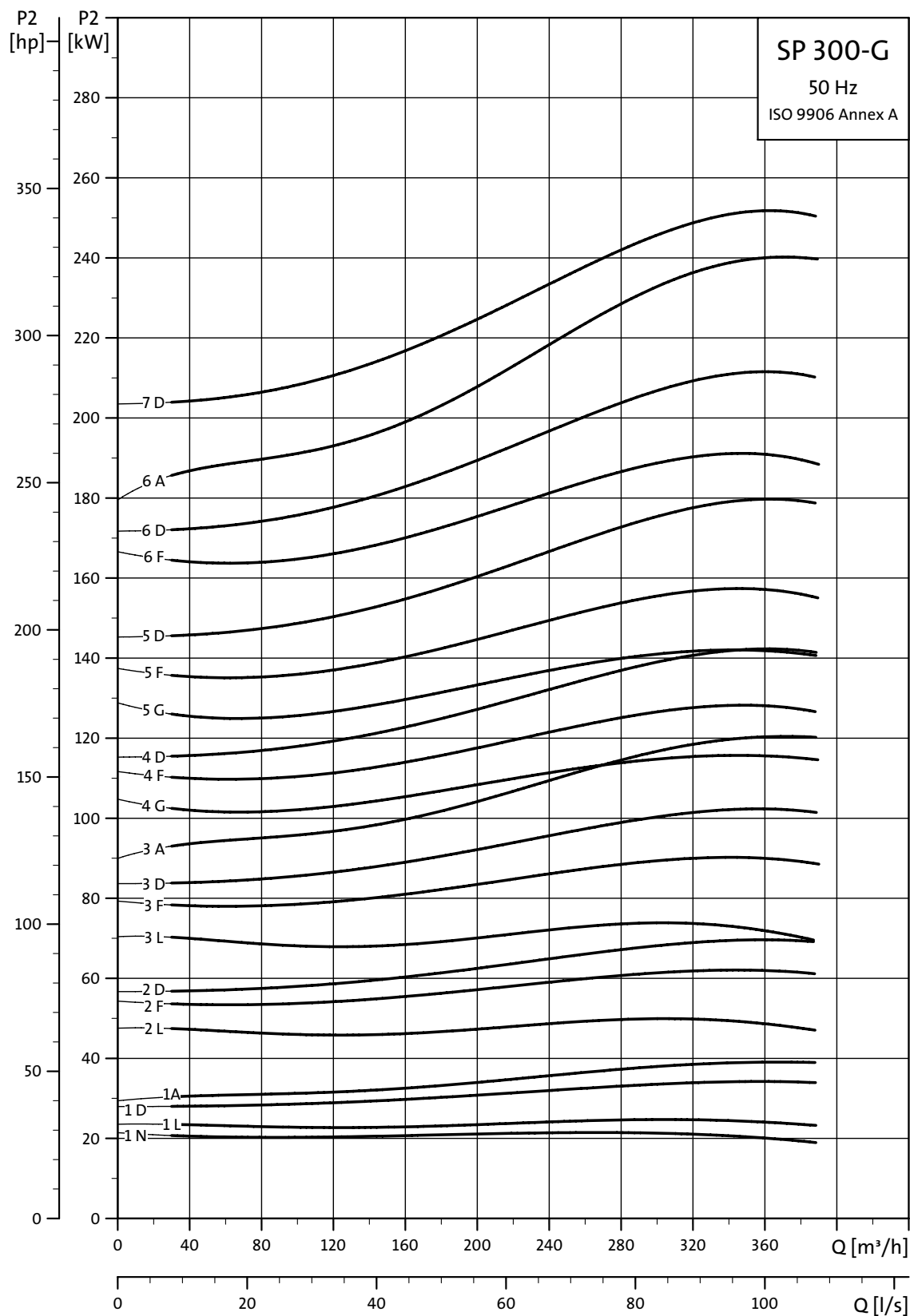
### Electrical data

3 x 400 V

Type	Motor		Rated current I <sub>1/1</sub> [A]	Motor efficiency [%]			Power factor			I <sub>start</sub> / I <sub>1/1</sub>
	Size	Power [kW]		η <sub>50 %</sub>	η <sub>75 %</sub>	η <sub>100 %</sub>	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %	
MMS 8000	8"	26	56.5	80	82	82	0.76	0.83	0.85	5.1
MMS 8000	8"	30	64.0	82	84	84	0.74	0.82	0.85	5.7
MMS 8000	8"	37	78.5	82	84	84	0.74	0.82	0.85	5.7
MMS 8000	8"	45	96.5	84	86	86	0.65	0.76	0.82	6.0
MMS 8000	8"	55	114	84	86	86	0.72	0.81	0.85	5.9
MMS 8000	8"	63	132	85	87	87	0.66	0.78	0.83	5.7
MMS 8000	8"	75	152	86	87	87	0.71	0.82	0.86	5.8
MMS 8000	8"	92	186	87	88	87	0.72	0.82	0.86	5.9
MMS 8000	8"	110	224	86	87	87	0.73	0.83	0.87	5.8
MMS 10000	10"	110	228	85	87	88	0.70	0.79	0.84	5.7
MMS 10000	10"	132	270	85	88	88	0.72	0.81	0.84	5.7
MMS 10000	10"	147	315	84	87	87	0.64	0.75	0.81	6.2
MMS 12000	12"	170	345	85	87	88	0.69	0.79	0.85	6.1
MMS 12000	12"	190	390	85	87	88	0.68	0.80	0.84	6.2
MMS 12000	12"	220	445	85	87	88	0.69	0.80	0.85	6.1
MMS 12000	12"	250	505	85	87	88	0.69	0.80	0.85	5.9

# Power curves

Submersible pumps  
SP 300-G

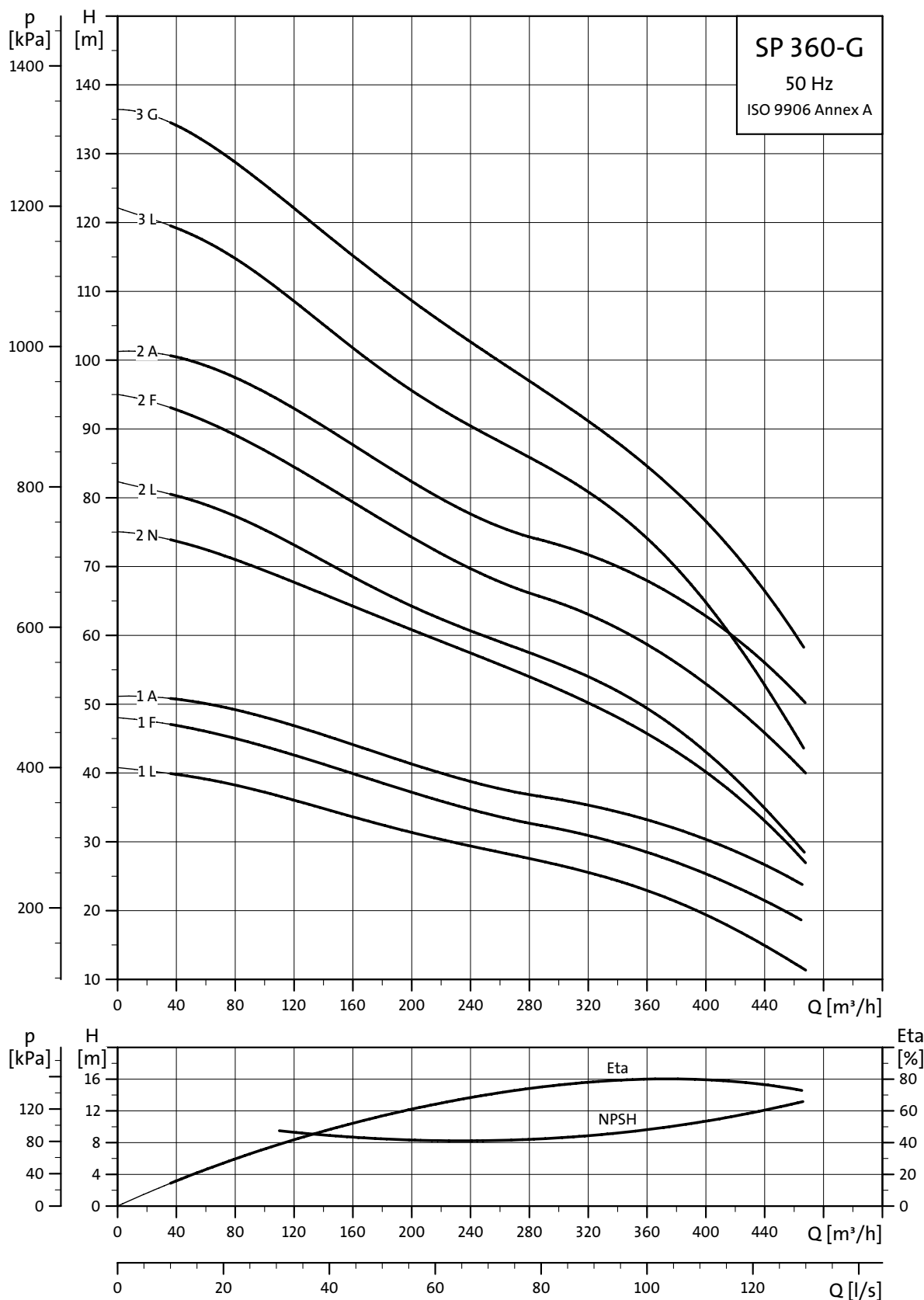


TM01 4852 1104

# Performance curves

Submersible pumps  
SP 360-G

## SP 360-G

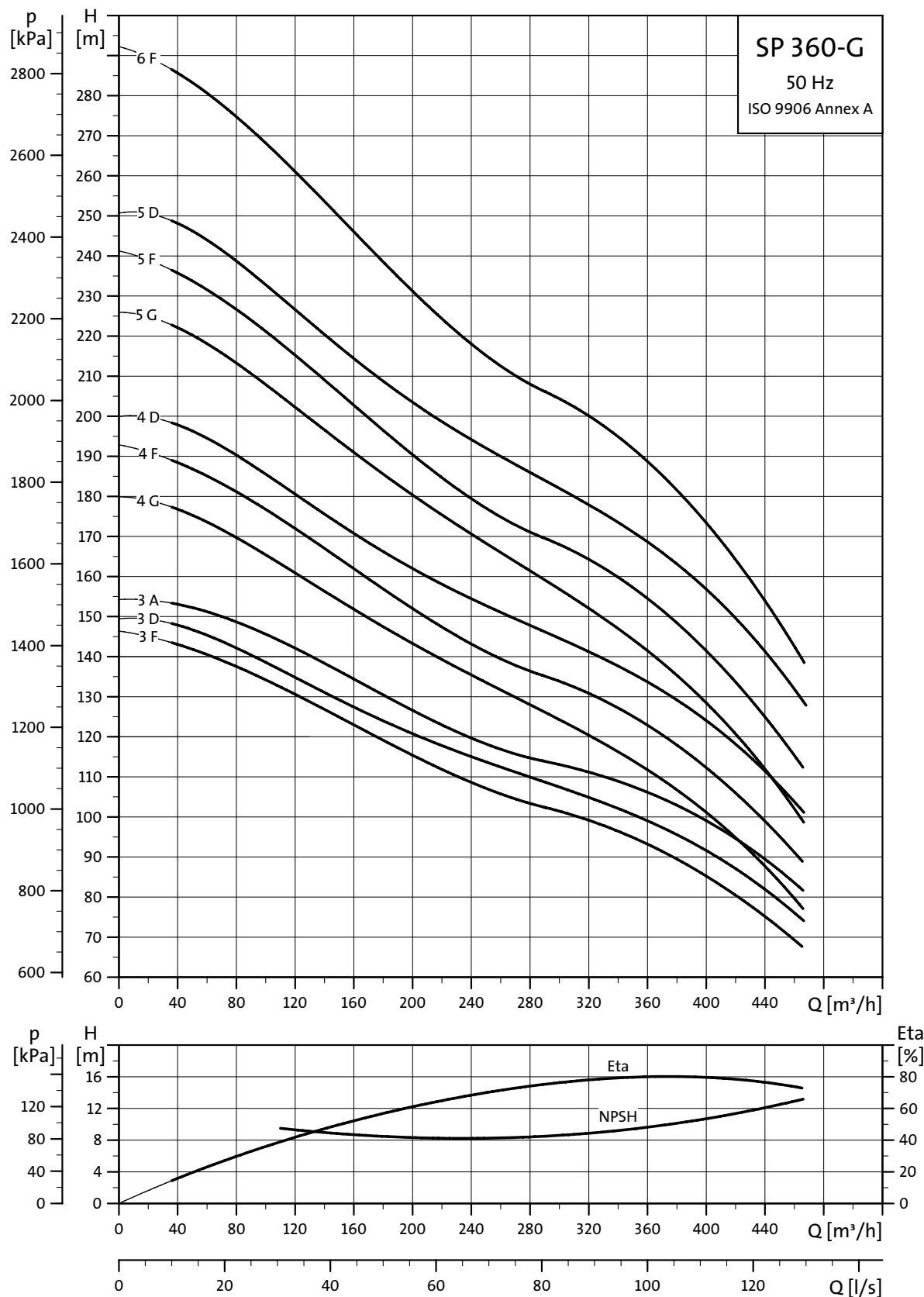


**Note:** The NPSH is the same for all impeller types. Eta is shown for impeller type F.  
For all other impeller types, please calculate the value of Eta. See "Calculation of efficiency" on page 10.

TM01 4853 3303

# Performance curves

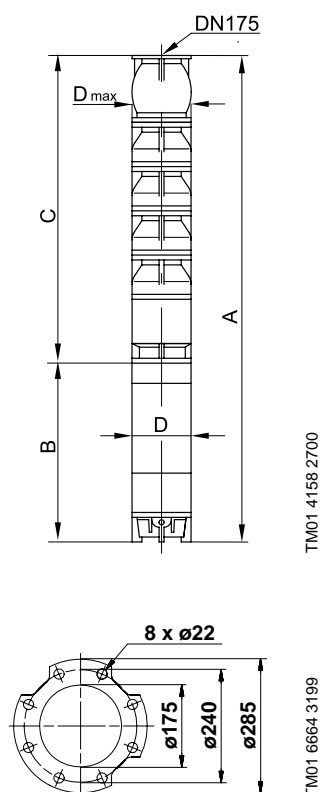
Submersible pumps  
SP 360-G



TM01 4854 3303

**Note:** The NPSH is the same for all impeller types. Eta is shown for impeller type F.  
For all other impeller types, please calculate the value of Eta. See "Calculation of efficiency" on page 10.

### Dimensions and weights



Pump type	Motor		Dimensions [mm]				Net weight [kg]	Ship. vol. [m <sup>3</sup> ]
	Type	Power [kW]	C	B	A	D		
SP 360-1L G	MMS 8000	37	881	1160	2041	192	296	0.455
SP 360-1F G	MMS 8000	45	881	1270	2151	192	317	0.455
SP 360-1A G	MMS 8000	55	881	1350	2231	192	332	0.494
SP 360-2N G	MMS 8000	63	1061	1490	2551	192	383	0.613
SP 360-2L G	MMS 8000	75	1061	1590	2651	192	402	0.613
SP 360-2F G	MMS 8000	92	1061	1830	2891	192	448	0.613
SP 360-2A G	MMS 8000	110	1061	2060	3121	192	498	0.705
SP 360-3L G	MMS 8000	110	1241	2060	3301	192	523	0.705
SP 360-2A G	MMS 10000	110	1061	1690	2751	237	555	0.624
SP 360-3L G	MMS 10000	110	1241	1690	2931	237	580	0.624
SP 360-3G G	MMS 10000	132	1241	1870	3111	237	630	0.705
SP 360-3F G	MMS 10000	132	1241	1870	3111	237	630	0.705
SP 360-3D G	MMS 10000	147	1241	2070	3311	237	695	0.705
SP 360-3A G	MMS 12000	170	1267	1880	3147	286	805	0.705
SP 360-4G G	MMS 12000	170	1447	1880	3327	286	840	0.705
SP 360-4F G	MMS 12000	170	1447	1880	3327	286	840	0.705
SP 360-4D G	MMS 12000	190	1447	1980	3427	286	885	0.765
SP 360-5G G	MMS 12000	190	1627	1980	3607	286	910	0.765
SP 360-5F G	MMS 12000	220	1627	2110	3737	286	960	0.806
SP 360-5D G	MMS 12000	250	1627	2280	3907	286	1035	0.806
SP 360-6F G	MMS 12000	250	1807	2280	4077	286	1060	0.967

D<sub>max</sub> for SP 360-1L G - SP 360-3D G (8" and 10") Direct-on-line: 290 mm.

D<sub>max</sub> for SP 360-3A G - SP 360-6F G (12") Direct-on-line: 294 mm.

D<sub>max</sub> for SP 360-G (8", 10" and 12") Star-delta: 291 mm.

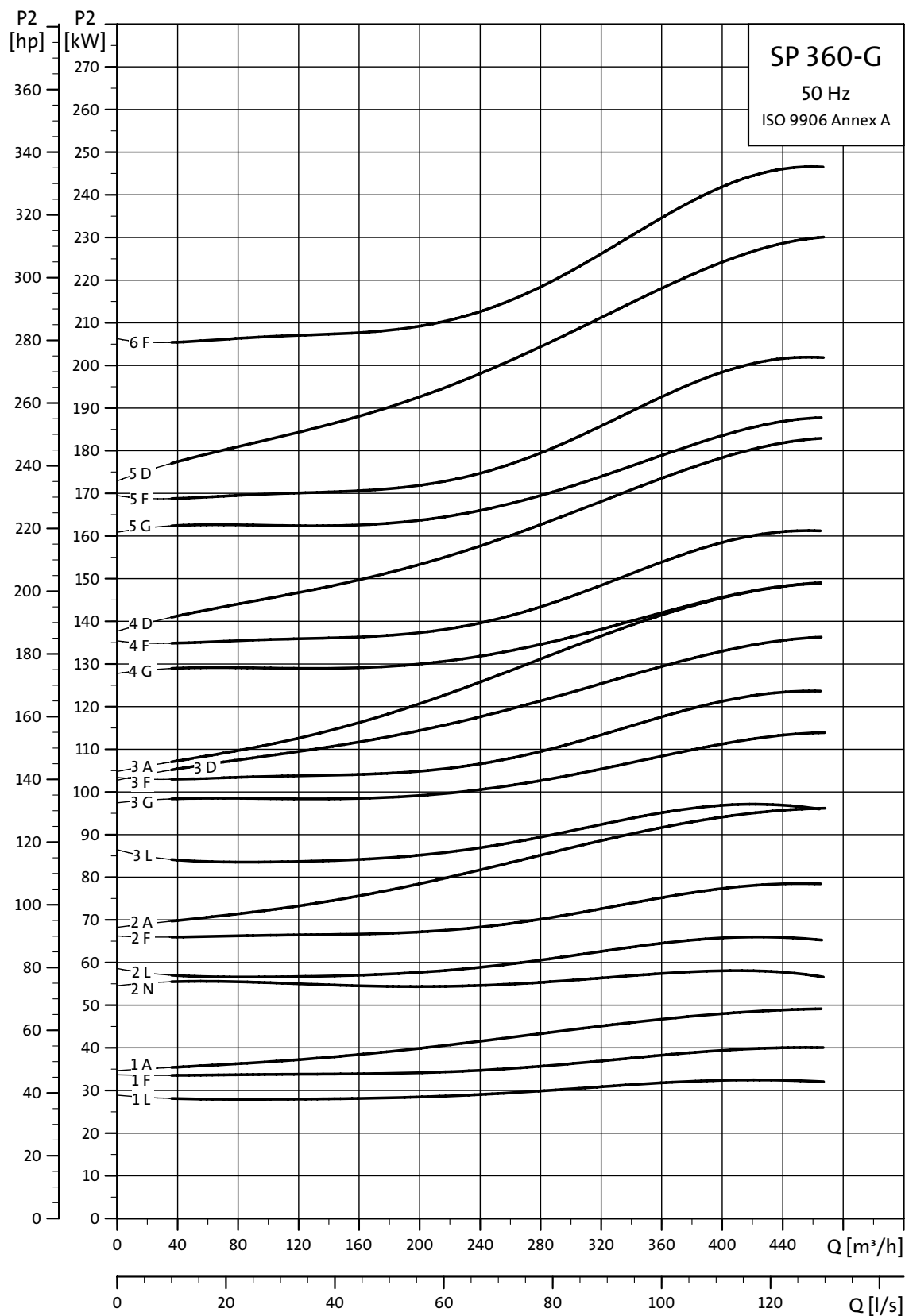
### Electrical data

3 x 400 V

Type	Motor		Rated current I <sub>1/1</sub> [A]	Motor efficiency [%]			Power factor			I <sub>start</sub> / I <sub>1/1</sub>
	Size	Power [kW]		η <sub>50 %</sub>	η <sub>75 %</sub>	η <sub>100 %</sub>	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %	
MMS 8000	8"	37	78.5	82	84	84	0.74	0.82	0.85	5.7
MMS 8000	8"	45	96.5	84	86	86	0.65	0.76	0.82	6.0
MMS 8000	8"	55	114	84	86	86	0.72	0.81	0.85	5.9
MMS 8000	8"	63	132	85	87	87	0.66	0.78	0.83	5.7
MMS 8000	8"	75	152	86	87	87	0.71	0.82	0.86	5.8
MMS 8000	8"	92	186	87	88	87	0.72	0.82	0.86	5.9
MMS 8000	8"	110	224	86	87	87	0.73	0.83	0.87	5.8
MMS 10000	10"	110	270	85	88	88	0.72	0.81	0.84	5.7
MMS 10000	10"	132	315	84	87	87	0.64	0.75	0.81	6.2
MMS 10000	10"	147	365	84	86	87	0.64	0.75	0.81	6.0
MMS 12000	12"	170	345	85	87	88	0.69	0.79	0.85	6.1
MMS 12000	12"	190	390	85	87	88	0.68	0.80	0.84	6.2
MMS 12000	12"	220	445	85	87	88	0.69	0.80	0.85	6.1
MMS 12000	12"	250	505	85	87	88	0.69	0.80	0.85	5.9

# Power curves

Submersible pumps  
SP 360-G



TM01 4855 1104

## 3 x 220 V

Type	Motor			Rated current $I_{1/1}$ [A]	Motor efficiency [%]			Power factor			$\frac{I_{start}}{I_{1/1}}$
	Size	Power [kW]	Power [hp]		$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	Cos $\phi$ 50 %	Cos $\phi$ 75 %	Cos $\phi$ 100%	
MMS 8000	8"	22.0	30	84.5	81	84	84	0.76	0.83	0.86	4.8
MMS 8000	8"	26.0	35	99.5	81	83	83	0.80	0.85	0.86	4.5
MMS 8000	8"	30.0	40	114	83	85	85	0.76	0.83	0.86	5.2
MMS 8000	8"	37.0	50	138	84	86	86	0.78	0.84	0.86	5.3
MMS 8000	8"	45.0	60	166	85	88	88	0.69	0.79	0.85	5.6
MMS 8000	8"	55.0	75	212	85	87	88	0.64	0.76	0.82	5.4
MMS 8000	8"	63.0	85	218	87	89	88	0.84	0.89	0.90	5.4
MMS 10000	10"	75.0	100	280	84	86	86	0.78	0.85	0.87	5.3
MMS 10000	10"	92.0	125	350	84	86	86	0.72	0.81	0.85	5.2
MMS 10000	10"	110	150	405	85	86	85	0.84	0.88	0.88	5.4

## 3 x 230 V

Type	Motor			Rated current $I_{1/1}$ [A]	Motor efficiency [%]			Power factor			$\frac{I_{start}}{I_{1/1}}$
	Size	Power [kW]	Power [hp]		$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	Cos $\phi$ 50 %	Cos $\phi$ 75 %	Cos $\phi$ 100%	
MMS 8000	8"	22.0	30	82.5	71	80	84	0.80	0.84	0.84	5.3
MMS 8000	8"	26.0	35	95.5	76	83	86	0.81	0.84	0.84	5.1
MMS 8000	8"	30.0	40	110	71	80	84	0.83	0.85	0.86	5.7
MMS 8000	8"	37.0	50	134	73	82	85	0.83	0.86	0.86	5.7
MMS 8000	8"	45.0	60	168	62	74	81	0.84	0.87	0.88	6
MMS 8000	8"	55.0	75	214	57	70	77	0.84	0.87	0.88	5.9
MMS 8000	8"	63.0	85	210	81	87	90	0.87	0.89	0.89	5.7
MMS 10000	10"	75.0	100	270	72	81	85	0.84	0.86	0.86	5.4
MMS 10000	10"	92.0	125	345	65	77	82	0.83	0.85	0.86	5.6
MMS 10000	10"	110	150	385	80	86	88	0.85	0.86	0.86	5.7

## 3 x 380 V

Type	Motor			Rated current $I_{1/1}$ [A]	Motor efficiency [%]			Power factor			$\frac{I_{start}}{I_{1/1}}$
	Size	Power [kW]	Power [hp]		$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	Cos $\phi$ 50 %	Cos $\phi$ 75 %	Cos $\phi$ 100%	
MMS 8000	8"	22.0	30	50.0	80	82	82	0.78	0.84	0.86	4.8
MMS 8000	8"	26.0	35	59.0	80	82	81	0.80	0.86	0.87	4.5
MMS 8000	8"	30.0	40	66.5	82	84	83	0.79	0.85	0.87	5.2
MMS 8000	8"	37.0	50	81.5	83	84	84	0.79	0.85	0.87	5.3
MMS 8000	8"	45.0	60	95.5	85	86	86	0.76	0.84	0.88	5.6
MMS 8000	8"	55.0	75	116	85	86	86	0.79	0.86	0.88	5.4
MMS 8000	8"	63.0	85	132	86	87	86	0.78	0.86	0.89	5.4
MMS 8000	8"	75.0	100	156	86	87	86	0.78	0.85	0.89	5.2
MMS 8000	8"	92.0	125	194	87	88	86	0.80	0.86	0.88	5.2
MMS 8000	8"	110	150	230	86	87	86	0.80	0.87	0.89	5.2
MMS 10000	10"	75.0	100	160	85	87	87	0.77	0.84	0.86	5.3
MMS 10000	10"	92.0	125	198	85	87	87	0.75	0.83	0.85	5.2
MMS 10000	10"	110	150	323	85	87	87	0.77	0.84	0.86	5.4
MMS 10000	10"	132	180	275	86	88	88	0.79	0.85	0.87	5.3
MMS 10000	10"	147	200	315	85	87	88	0.73	0.82	0.85	5.8
MMS 10000	10"	170	230	365	85	87	87	0.73	0.82	0.85	5.7
MMS 10000	10"	190	260	420	85	87	87	0.69	0.79	0.84	5.8
MMS 12000	12"	147	200	310	84	87	88	0.75	0.83	0.87	5.9
MMS 12000	12"	170	230	350	85	87	88	0.77	0.85	0.88	5.8
MMS 12000	12"	190	260	390	85	88	88	0.77	0.85	0.88	5.8
MMS 12000	12"	220	300	450	86	88	88	0.78	0.85	0.89	5.8
MMS 12000	12"	250	340	515	86	88	88	0.78	0.86	0.89	5.4

## 3 x 400 V

Type	Motor			Rated current $I_{1/1}$ [A]	Motor efficiency [%]			Power factor			$\frac{I_{start}}{I_1 / 1}$
	Size	Power [kW]	Power [hp]		$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	Cos $\phi$ 50 %	Cos $\phi$ 75 %	Cos $\phi$ 100%	
MMS 8000	8"	22.0	30	48.0	80	82	82	0.72	0.81	0.84	5.3
MMS 8000	8"	26.0	35	56.5	80	82	82	0.76	0.83	0.85	5.1
MMS 8000	8"	30.0	40	64.0	82	84	84	0.74	0.82	0.85	5.7
MMS 8000	8"	37.0	50	78.5	82	84	84	0.74	0.82	0.85	5.7
MMS 8000	8"	45.0	60	96.5	84	86	86	0.65	0.76	0.82	6.0
MMS 8000	8"	55.0	75	114	84	86	86	0.72	0.81	0.85	5.9
MMS 8000	8"	63.0	85	132	85	87	87	0.66	0.78	0.83	5.7
MMS 8000	8"	75.0	100	152	86	87	87	0.71	0.82	0.86	5.8
MMS 8000	8"	92.0	125	186	87	88	87	0.72	0.82	0.86	5.9
MMS 8000	8"	110	150	224	86	87	87	0.73	0.83	0.87	5.8
MMS 10000	10"	75.0	100	156	84	86	87	0.70	0.80	0.84	5.4
MMS 10000	10"	92.0	125	194	84	87	87	0.67	0.78	0.82	5.6
MMS 10000	10"	110	150	228	85	87	88	0.70	0.79	0.84	5.7
MMS 10000	10"	132	180	270	85	88	88	0.72	0.81	0.84	5.7
MMS 10000	10"	147	200	315	84	87	87	0.64	0.75	0.81	6.2
MMS 10000	10"	170	230	365	84	86	87	0.64	0.75	0.81	6.0
MMS 10000	10"	190	260	425	83	86	87	0.60	0.72	0.79	5.9
MMS 12000	147	200	305	84	87	88	66	0.77	0.83	0.62	147
MMS 12000	170	230	345	85	87	88	69	0.79	0.85	0.61	170
MMS 12000	190	260	390	85	87	88	68	0.80	0.84	0.62	190
MMS 12000	220	300	445	85	87	88	69	0.80	0.85	0.61	220
MMS 12000	250	340	505	85	87	88	69	0.80	0.85	0.59	250

## 3 x 415 V

Type	Motor			Rated current $I_{1/1}$ [A]	Motor efficiency [%]			Power factor			$\frac{I_{start}}{I_1 / 1}$
	Size	Power [kW]	Power [hp]		$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	Cos $\phi$ 50 %	Cos $\phi$ 75 %	Cos $\phi$ 100%	
MMS 8000	8"	22.0	30	47.5	79	82	82	0.67	0.77	0.82	5.6
MMS 8000	8"	26.0	35	55.0	79	82	82	0.72	0.80	0.84	5.5
MMS 8000	8"	30.0	40	63.0	81	84	84	0.69	0.79	0.83	6.0
MMS 8000	8"	37.0	50	77.0	82	84	84	0.69	0.79	0.83	5.9
MMS 8000	8"	45.0	60	96.0	82	85	86	0.61	0.73	0.80	6.8
MMS 8000	8"	55.0	75	112	83	86	86	0.66	0.77	0.83	6.3
MMS 8000	8"	63.0	85	130	83	86	86	0.63	0.76	0.82	5.9
MMS 8000	8"	75.0	100	152	85	87	87	0.66	0.78	0.84	5.8
MMS 8000	8"	92.0	125	186	86	87	87	0.66	0.81	0.83	6.2
MMS 8000	8"	110	150	222	85	87	87	0.67	0.78	0.84	6.0
MMS 10000	10"	75.0	100	156	83	86	87	0.65	0.76	0.81	5.6
MMS 10000	10"	92.0	125	196	84	86	87	0.61	0.73	0.79	5.7
MMS 10000	10"	110	150	228	84	87	88	0.64	0.75	0.81	6.0
MMS 10000	10"	132	180	270	85	87	88	0.65	0.76	0.81	5.9
MMS 10000	10"	147	200	320	83	86	87	0.57	0.70	0.77	6.3
MMS 10000	10"	170	230	375	83	86	87	0.57	0.69	0.77	6.0
MMS 10000	10"	190	260	440	82	85	86	0.53	0.66	0.74	5.9
MMS 12000	12"	147	200	315	83	86	87	0.58	0.71	0.79	6.3
MMS 12000	12"	170	230	350	84	87	88	0.61	0.74	0.81	6.3
MMS 12000	12"	190	260	395	84	87	88	0.60	0.73	0.80	6.2
MMS 12000	12"	220	300	450	84	87	88	0.62	0.74	0.81	6.2
MMS 12000	12"	250	340	510	84	87	88	0.62	0.74	0.81	6.1



## 3 x 500 V

Type	Motor			Rated current $I_{1/1}$ [A]	Motor efficiency [%]			Power factor			$\frac{I_{start}}{I_1}$
	Size	Power [kW]	Power [hp]		$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	Cos $\phi$ 50 %	Cos $\phi$ 75 %	Cos $\phi$ 100%	
MMS 8000	8"	22.0	30	37.5	81	83	83	0.79	0.85	0.87	4.7
MMS 8000	8"	26.0	35	44.0	81	84	83	0.80	0.85	0.86	4.8
MMS 8000	8"	30.0	40	49.5	83	85	85	0.78	0.85	0.86	5.6
MMS 8000	8"	37.0	50	60.5	84	85	85	0.82	0.87	0.87	5.6
MMS 8000	8"	45.0	60	72.0	85	87	87	0.73	0.82	0.86	6.2
MMS 8000	8"	55.0	75	88.5	86	88	88	0.71	0.81	0.86	6.1
MMS 8000	8"	63.0	85	96.5	87	89	88	0.82	0.88	0.90	6.1
MMS 8000	8"	75.0	100	114	88	89	88	0.85	0.89	0.90	5.6
MMS 8000	8"	92.0	125	142	88	87	88	0.81	0.87	0.89	5.3
MMS 8000	8"	110	150	182	86	88	88	0.67	0.78	0.84	5.3
MMS 10000	10"	75.0	100	122	85	87	87	0.77	0.84	0.86	5.3
MMS 10000	10"	92.0	125	150	85	87	87	0.74	0.82	0.85	5.3
MMS 10000	10"	110	150	178	85	87	88	0.76	0.84	0.86	5.4
MMS 10000	10"	132	180	210	86	88	87	0.82	0.87	0.88	5.0
MMS 10000	10"	147	200	236	85	88	88	0.74	0.83	0.86	5.8
MMS 10000	10"	170	230	270	86	88	88	0.78	0.85	0.87	5.4
MMS 10000	10"	190	260	305	86	88	87	0.80	0.86	0.87	5.3
MMS 12000	12"	147	305	218	86	89	90	0.80	0.88	0.91	6.9
MMS 12000	12"	170	345	265	87	89	90	0.74	0.82	0.86	6.0
MMS 12000	12"	190	390	275	88	90	91	0.85	0.91	0.93	7.8
MMS 12000	12"	220	445	335	88	90	90	0.79	0.86	0.88	5.8
MMS 12000	12"	250	505	375	87	90	91	0.75	0.85	0.89	6.3

## Motor cables

The 8", 10" and 12" motors are connected by means of three single-core cables, approved for use with drinking water.

All cables are round.

The cable outlet of motors for star-delta starting are displaced by 90 °.

Being an integrated part of the motor, the motor cable cannot be fitted/removed once the motor is assembled.

Cable length for all motor sizes: 8 m.

**Note:** Sizing of the motor cable requires that it is submerged in water.

Motor type	Motor power		Cross-section [mm <sup>2</sup> ]					
			3 x 220-230 V		3 x 380-415 V		3 x 500 V	
	P <sub>2</sub> [kW]	P <sub>2</sub> [hp]	DOL 3 x 1	SD 6 x 1	DOL 3 x 1	SD 6 x 1	DOL 3 x 1	SD 6 x 1
MMS 8000	22	30	16	10	16	10	16	10
MMS 8000	26	35	16	10	16	10	16	10
MMS 8000	30	40	16	10	16	10	16	10
MMS 8000	37	50	16	16	16	10	16	10
MMS 8000	45	60	25	16	16	10	16	10
MMS 8000	55	75	25	16	16	16	16	16
MMS 8000	63	85	25	16	16	16	16	16
MMS 8000	75	100			16	16	16	16
MMS 8000	92	125			25	16	25	16
MMS 8000	110	150			25	16	25	16
MMS 10000	75	100	50	35	50	35	50	35
MMS 10000	92	125	50	35	50	35	50	35
MMS 10000	110	150	50	35	50	35	50	35
MMS 10000	132	180			50	35	50	35
MMS 10000	147	200			50	35	50	35
MMS 10000	170	230			50	35	50	35
MMS 10000	190	260			50	35	50	35
MMS 12000	147	200			70	50	70	50
MMS 12000	170	230			70	50	70	50
MMS 12000	190	260			70	50	70	50
MMS 12000	220	300			70	50	70	50
MMS 12000	250	340			70	50	70	50

## Outer dimensions

Cross-section [mm <sup>2</sup> ]	Type of cable	Outer dimensions, max. [mm]
10	Round	8.8
16	Round	10.7
25	Round	12.1
35	Round	14.2
50	Round	16.1
70	Round	18.5

## Wiring diagram

MMS motors are available for both direct-on-line and star-delta starting.

Motors wound for star-delta starting can also be connected for direct-on-line.

The starting wiring diagrams are shown below.

### MMS motor, direct-on-line starting

The connection of MMS wound for direct-on-line starting:



Fig. 9 Motors wound for direct-on-line starting

TM03 2099 3705

### MMS motor, star-delta starting

The connection of MMS wound for star-delta starting:

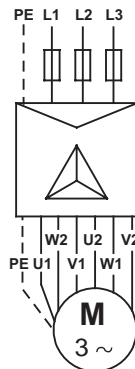


Fig. 10 Motors wound for star-delta starting

TM03 2100 3705

If star-delta starting is not required, but direct-on-line starting is, the MMS motor should be connected as shown in fig. 11.

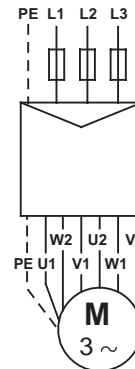


Fig. 11 Motors wound for direct-on-line starting

TM03 2101 3705

## MP 204

The MP 204 is an electronic motor protector, designed for the protection of an asynchronous motor or a pump.

The motor protector consists of:

- a cabinet incorporating transformers and electronics
- a control panel with operating buttons and display for reading of data.

The MP 204 operates with two sets of limits:

- a set of warning limits and
- a set of trip limits.

If one or more of the warning limits are exceeded, the motor continues to run, but the warnings will appear in the MP 204 display.

Some values only have a warning limit.

The warning can also be read out by means of the Grundfos R100 remote control.

If one of the trip limits is exceeded, the trip relay will stop the motor. At the same time, the signal relay is operating to indicate that the limit has been exceeded.

### Applications

The MP 204 can be used as a stand-alone motor protector.

The MP 204 can be monitored via a Grundfos GENibus.

The power supply to the MP 204 is in parallel with the supply to the motor. Motor currents up to 120 A are passed directly through the MP 204. The MP 204 protects the motor primarily by measuring the motor current by means of a true RMS measurement. The MP 204 disconnects the contactor if, for example, the current exceeds the preset value.

Secondarily, the pump is protected via temperature measuring by a Tempcon sensor, a Pt100/Pt1000 sensor and a PTC sensor/thermal switch.

The MP 204 is designed for single- and three-phase motors. In single-phase motors, the starting and run capacitors are also measured. Cos  $\phi$  is measured in both single- and three-phase systems.

### Benefits

The MP 204 offers these benefits:

- suitable for both single- and three-phase motors
- dry-running protection
- overload protection
- very high accuracy
- made for submersible pumps.

## The MP 204 - many monitoring options

The MP 204 monitors the following parameters:

- Insulation resistance before start-up
- Temperature (Tempcon, Pt sensor and PTC/thermal switch)
- Overload/underload
- Overvoltage/undervoltage
- Phase sequence
- Phase failure
- Power factor
- Power consumption
- Harmonic distortion
- Operating hours and number of starts.

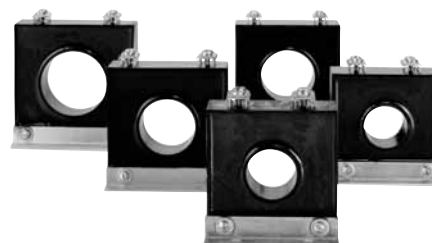


TM03 1471 2205

Fig. 12 MP 204

Five sizes of single-turn transformers, 120-999 A.

**Note:** Monitoring of motor temperature is not possible when single-turn transformers are used.



TM03 2033 3505

Fig. 13 Single-turn transformers

### Product numbers

Product	Product number
MP 204	96079927
R100	96615297
<b>Single-turn transformers</b>	
- Current transformer ratio= 200:5, $I_{max.}$ = 120 A	96095274
- Current transformer ratio= 300:5, $I_{max.}$ = 300 A	96095275
- Current transformer ratio= 500:5, $I_{max.}$ = 500 A	96095276
- Current transformer ratio= 750:5, $I_{max.}$ = 750 A	96095277
- Current transformer ratio= 1000:5, $I_{max.}$ = 1000 A	96095278

## Functions

- Phase-sequence monitoring
- Indication of current or temperature (user selection)
- Indication of temperature in °C or °F (user selection)
- 4-digit, 7-segment display
- Setting and status reading with the R100
- Setting and status reading via GENIbus.

## Tripping conditions

- Overload
- Underload (dry running)
- Temperature (Tempcon, Pt sensor and PTC/thermal switch)
- Phase failure
- Phase sequence
- Overvoltage
- Undervoltage
- Power factor ( $\cos \varphi$ )
- Current unbalance.

## Warnings

- Overload
- Underload
- Temperature (Tempcon and Pt sensor)
- Overvoltage
- Undervoltage
- Power factor ( $\cos \varphi$ )  
**Note:** In connection with single- and three-phase connection.
- Run capacitor (single-phase operation)
- Starting capacitor (single-phase operation)
- Loss of communication in network
- Harmonic distortion.

## Learning function

- Phase sequence (three-phase operation)
- Run capacitor (single-phase operation)
- Starting capacitor (single-phase operation)
- Identification and measurement of Pt100/Pt1000 sensor circuit.

## External current transformers

When fitted with external current transformers, the MP 204 can handle currents from 120 to 999 A. Grundfos can supply approved current transformers from stock (200/5A, 300/5A, 500/5A, 750/5A, 1000/5A).

## R100 remote control

The R100 remote control from Grundfos allows for wireless infrared remote control of your MP 204 motor protector.

With the R100, you get access to a full range of options such as factory setting adjustment, service and fault finding.


## Ready for bus communication

The MP 204 allows for monitoring and communication via GENIbus – a Grundfos-designed bus for exchange of pump data, alarms, status information, and setpoints. This enables users to connect the MP 204 to, for instance, SCADA systems.

## Technical data - MP 204

Enclosure class	IP20
Ambient temperature	-20 °C to +60 °C
Relative air humidity	99 %
Voltage range	100-480 VAC
Current range	3-999 A
Frequency	50 to 60 Hz
IEC trip class	1-45
Special Grundfos trip class	0.1 to 30 s
Voltage variation	- 25 %/+ 15 % of nominal voltage
Approvals	EN 60947, EN 60335, UL/CSA 508
Marking	CE, cUL, C-tick
Consumption	Max. 5 W
Plastic type	Black PC / ABS

	Measuring range	Accuracy	Resolution
Current without external current transformers	3-120 A	± 1 %	0.1 A
Current with external current transformers	120-999 A	± 1 %	1 A
Phase-to-phase voltage	80-610 VAC	± 1 %	1 V
Frequency	47-63 Hz	± 1 %	0.5 Hz
Power	0-1 MW	± 2 %	1 W
Power factor	0-0.99	± 2 %	0.01
Energy consumption	0-4x10 <sup>9</sup> kWh	± 5 %	1 kWh

IO 112	Description	Product number
	<p>The IO 112 is a measuring module and a 1-channel protection unit for use in connection with the MP 204 motor protection unit. The module can be used for protection of pump against other factors than the electrical conditions, for instance dry-running. It can also be used as a stand-alone protection module.</p> <p>The IO 112 interface has three inputs for measured values one potentiometer for setting of limits indicator lights indicating the</p> <ul style="list-style-type: none"> <li>• measured value of the input</li> <li>• value of the limit set</li> <li>• alarm source</li> <li>• pump status.</li> </ul> <p><b>Electrical data:</b></p> <ul style="list-style-type: none"> <li>• Supply voltage: 24 VAC ±10% 50/60 Hz or 24 VDC ±10%</li> <li>• Supply current: Min. 2.4 A; max. 8 A</li> <li>• Power consumption: Max. 5 W</li> <li>Ambient temperature: -25°C to +65°C</li> <li>• Enclosure class: IP20</li> </ul>	96651601

## Control functions

This table describes the protection provided by the MP 204.

Control parameter	Function	Problem	Advantage
Temperature	<p><b>MS</b></p> <p>The motor temperature is measured by means of the built-in Tempcon temperature transmitter and a signal is sent to the MP 204, via the phase leads. In the MP 204 the measured temperature is compared with the factory-set value (75°C).</p>	Overload, frequent starts/stops, operation against blocked discharge pipe, insufficient flow velocity past the motor.	Longer motor life, safe operating conditions, service indication.
	<p><b>MMS</b></p> <p>The motor temperature is measured by means of the Pt100. The signal is sent to the MP 204 where the measured temperature is compared with the factory-set value. Temperature protection requires a submersible motor with a Pt100.</p> <p>The motor temperature must be monitored during frequency converter operation.</p>		
	<p>If the set trip value is exceeded, the motor will stop.</p>	The installation is close to a transformer. The mains do not absorb load variations.	Important installation parameter, possibility of improving operating conditions.
Overvoltage/undervoltage			
Overload	The motor power input is measured on each of the three phases. The registered power input is an average of these three values. If the factory-set value is exceeded, the motor will stop.	Incorrect sizing of pump/motor, voltage supply failure, defective cable, blocking, wear or corrosion.	Longer pump life, safe operating conditions, service indication.
Underload (dry running)	The motor power input is measured on each of the three phases. The registered power input is an average of these three values. If the average value is lower than the factory-set value, the motor will stop.	Pump exposed to dry running or underload, for example caused by wear.	Conventional dry-running protection is no longer necessary, no extra cables.
Current unbalance	The power input of the motor is measured on each of the three phases.	Mains load is uneven, incipient motor defect, phase voltages diverging.	Motor protection against overload, service indication.
Phase sequence	The MP 204 and motor are installed so that the phase sequence corresponds to correct direction of rotation. The MP 204 monitors changes in the phase sequence.	Two phases are wrongly connected.	Ensures correct pump performance.
Phase failure	The MP 204 checks the phases connected. Phase failure will cause an alarm.	Phase failure.	Indication of phase failure, and alarm.

## R100 menus

### 0. GENERAL

See the operating instructions for the R100.

### 1. OPERATION

- Operating mode
- Actual trip
- Actual warning 1
- Actual warning 2
- Alarm log 1
- Alarm log 2
- Alarm log 3
- Alarm log 4
- Alarm log 5.

### 2. STATUS

Display of

- Supply overview
- Average current
- Average voltage
- Tempcon sensor
- Pt100/Pt1000 sensor
- Power input and energy consumption (described in the following)
- Energy trip counter
- Phase sequence
- Current unbalance
- Operating hours and number of starts
- Trip counter of hours and starts
- Starting capacitor
- Run capacitor
- Insulation resistance
- Cos  $\varphi$
- Harmonic distortion.

### 3. LIMITS

Display and setting of warning and trip limits.

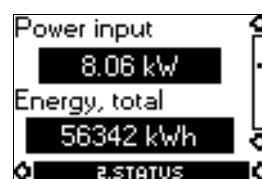
- Tempcon sensor
- Pt sensor
- Tripping current
- Current warning
- Nominal voltage
- Voltage limits
- Current unbalance
- Starting capacitor
- Run capacitor
- Insulation resistance
- Cos  $\varphi$  trip
- Cos  $\varphi$  warning.

## 4. INSTALLATION

Setting and display of

- Supply mains
- **Trip class** (described in the following)
- Trip delay
- External current transformers
- Power-on delay
- **Restarting** (described in the following)
- **Automatic restarting** (described in the following)
- Tempcon sensor
- Pt sensor
- Insulation resistance measurement
- PTC/thermal switch
- Resetting of trip counters
- Service interval
- Number of automatic restarts
- Units/display
- MP 204 display
- GENIbus ID number
- Learning function.

### Power input and energy consumption



Actual power input and motor energy consumption.

The energy consumption is an accumulated value which cannot be reset.

The power is calculated like this:

$$U_{\text{average}} = \frac{U_{L1-L2} + U_{L2-L3} + U_{L3-L1}}{3} [\text{V}]$$

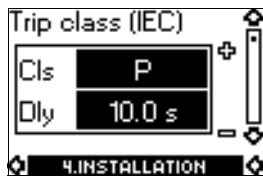
$$I_{\text{average}} = \frac{I_{L1} + I_{L2} + I_{L3}}{3} [\text{A}]$$

$$\cos \varphi_{\text{average}} = \frac{\cos \varphi_{L1} + \cos \varphi_{L2} + \cos \varphi_{L3}}{3} [-]$$

$$P = U_{\text{average}} \cdot I_{\text{average}} \cdot \sqrt{3} \cdot \cos \varphi_{\text{average}} [\text{W}]$$



## Trip class



Line 1: Select IEC trip class (1 to 45).

If manual indication of trip delay in the case of overload is required, select trip class "P".

### Factory setting:

- Cls (trip class): P.

Line 2: Select trip delay.

### Factory setting:

- Dly (trip delay): 10 s.

## Restarting



Set whether restarting after tripping is to be

- **Automatic** (factory setting)
- *Manual*.

Setting of time, see section "Automatic restarting".

## Automatic restarting



Set the time after which the MP 204 is to attempt automatic restarting of motor after cut-out.

The time runs from the moment when the value which triggered the fault has returned to normal.

### Factory setting:

- 300 s.

## G100 gateway for communication with Grundfos products

The G100 offers a wide selection of options for integration of Grundfos products provided with GENIbus interface into main control and monitoring systems.

The G100 enables a pump installation to meet future demands for optimum pump operation in terms of reliability, operating costs, centralisation and automation.



GR5940

Fig. 14 G100

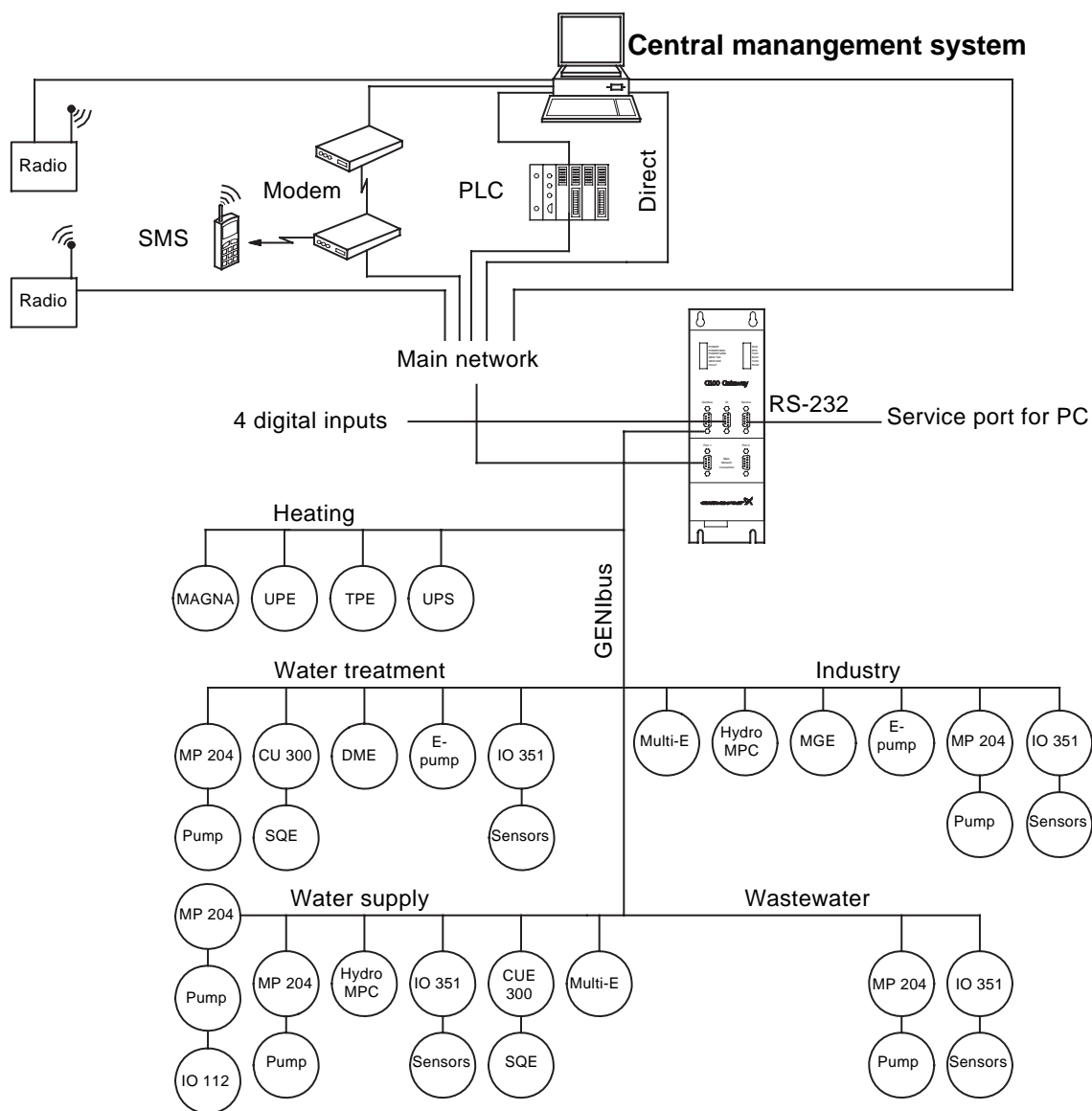


Fig. 15 Examples of G100 applications

TM03 9224 3607

## Product description

The G100 Gateway enables communication of operating data, such as measured values and setpoints, between Grundfos products with GENIbus interface and a main network for control and monitoring.

As indicated in the illustration on page 34, the G100 is suitable for use in applications such as water supply, water treatment, wastewater, building automation and industry.

Common to the above applications is that downtime is usually costly, and extra investments are therefore often made to achieve maximum reliability by monitoring selected operating variables.

The day-to-day operation, such as starting and stopping of pumps and changing of setpoints, can also be effected from the main system by communication with the G100. In addition, the G100 can be set up to send event-controlled status indications such as alarms via the SMS to mobile phones, and to make automatic alarm call-backs to a central management system.

## Data logging

Besides the possibility of data communication, the G100 offers logging of up to 350,000 time-stamped data. The logged data can be transmitted to the main system or a PC for further analysis in a spreadsheet or similar program.

For the data logging, the "PC Tool G100 Data Log" software tool is used. The tool is part of the PC Tool G100 package, which is supplied with the G100.

## Other features

- Four digital inputs.
- Stop of all pumps in case of failing communication with the management system (optional).
- Access code for modem communication (optional).
- Alarm log.

## Installation

Installation of the G100 is effected by the system integrator. The G100 is connected to the GENIbus as well as to the main network. All units on the GENIbus can thus be controlled from a central management system on the main network.

The "G100 Support Files" CD-ROM supplied with the G100 contains examples of programs to be used when the G100 is connected to the various main network systems. Included is also a description of the data points available in Grundfos products with GENIbus interface.

The "PC Tool G100" software tool included can be used for the installation and use of the G100.

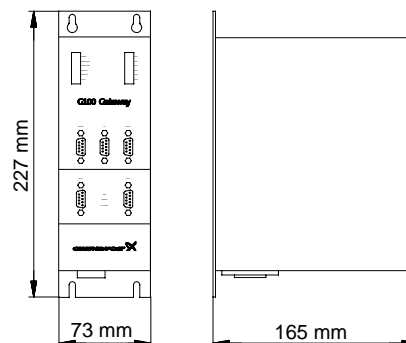


Fig. 16 Dimensional sketch

TM01 0621 1102

## Technical data

### Overview of protocols

Main system	Software protocol
PROFIBUS-DP	DP
Radio	Satt Control COMLI/Modbus
Modem	Satt Control COMLI/Modbus
PLC	Satt Control COMLI/Modbus
GSM mobile phone	SMS, UCP

### Other possible connections

GENIbus RS-485:	Connection of up to 32 units
Service port RS-232:	For direct connection to a PC or via radio modem
Digital inputs:	4
Voltage supply:	1 x 110-240 V, 50/60 Hz
Ambient temperature:	In operation: -20 °C to +60 °C
Enclosure class:	IP20
Weight:	1.8 kg.

### Accessories

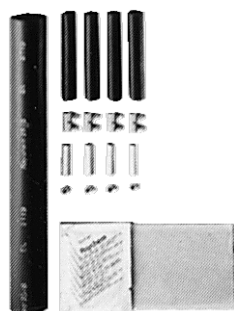
- PC Tool G100 package (supplied with the product).
- "G100 Support Files" CD-ROM (supplied with the product).

### Product numbers

Product	Product number
G100 with PROFIBUS-DP expansion board*	96411135
G100 with Radio/Modem/PLC expansion board*	96411136
G100 Basic Version*	96411137
PC Tool G100 package	96415783

\* CD-ROM with G100 Support Files included.

## Cable termination kit type KM

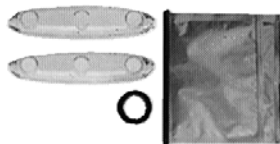


TM00 7885 2296

Description	Version		Product number	
	Motor cable	[mm <sup>2</sup> ] Number of leads		
For watertight shrink-joining of motor cable and submersible drop cable.	Flat cable	6-10	4	116252
		10-16	3	
Enables the joining of	Flat cable	16-25	3	116255
			4	
• cables of equal size.	3 single leads	1.5-6.0	3	116253
		10-25	3	
• cables of different sizes.	4 single leads	1.5-4.0	4	116257
		6-16	4	
• a cable lead and a single lead.	4 single leads	6-16	4	116258
The joint is ready for use after a few minutes and requires no long hardening time as do resin joints.	Single leads★	35-120	1	116256
For watertight joining of motor cable and submersible drop cable means of shrink-screw-glue casting	Screw-shrinking	6 - 50	4	96636867
		19 - 95		96636868
		35 - 185		96637278
		70 - 240		96637279
Reduce from 3 or 4 to one as from drop cable to single leads	Reducer-shrinking	10 - 50	3	96637318
		10 - 50	4	96637330
		16 - 70	3	96637331
		16 - 70	4	96637332

★ Is used for the repair or joining of single leads. When ordering kits, please state the number required.

## Cable termination kit, type M0 to M6



TM00 7884 2296

Description	Version		Product number	
	Type	Diameter of cable joint [mm <sup>2</sup> ] Fit cables with outer diameter of		
For watertight shrink-joining of motor cable and submersible drop cable.	M0	Ø40	Ø6 to Ø15	ID8903
	M1	Ø46	Ø9 to Ø23	ID8904
	M2	Ø52	Ø17 to Ø31	ID8905
	M3	Ø77	Ø26 to Ø44	ID8906
	M4	Ø97	Ø29 to Ø55	91070700
	M5	Ø110	Ø40 to Ø62	96496918
	M6	Ø144	Ø50 to Ø80	96496919
Accessories for cable kit, type M0-6 Screw connectors only		Diameter of the lead [mm <sup>2</sup> ]	Number of connectors	Product number
		6 - 50	4	96626021
		19 - 95		96626022
		35 - 185		96626023
	70 - 240	96626028		

## Submersible drop cable



TM00 7882 2296

Suitable for

- continuous application in groundwater and potable water (approved for potable applications)
- connection of electrical equipment such as submersible motors
- installation depths up to 500 metres and average loads.

Insulation and sheath are made of special EPR-based elastomer materials adapted to applications in water.  
 Maximum permissible water temperature: 60 °C.  
 Maximum permissible lead service temperature: 90 °C.  
 Further cable sizes are available on request.

Description				
	Number of leads and nominal cross section [mm <sup>2</sup> ]	Outer diameter Min./Max. [mm <sup>2</sup> ]	Weight [kg/m]	Product number
	1 x 25	12.5 / 16.5	0.410	ID4072
	1 x 35	14.0 / 18.5	0.560	ID4073
	1 x 50	16.5 / 21.0	0.740	ID4074
	1 x 70	18.5 / 23.5	1.000	ID4075
	1 x 95	21.0 / 26.5	1.300	ID4076
	1 x 120	23.5 / 28.5	1.650	ID4077
	1 x 150	26.0 / 31.5	2.000	ID4078
	1 x 185	27.5 / 34.5	2.500	ID4079
	3 x 25	26.5 / 34.0	1.450	ID4062
	4G1.5	10.5 / 13.5	0.190	ID4063
	4G2.5	12.5 / 15.5	0.280	ID4064
	4G4.0	14.5 / 18.0	0.390	ID4065
	4G6.0	16.5 / 22.0	0.520	ID4066
	4G10	22.5 / 24.5	0.950	ID4067
	4G16	26.5 / 28.5	1.400	ID4068
	4G25	32.0 / 34.0	1.950	ID4069
	4G35	33.0 / 42.5	2.700	96432949
	4G50	38.0 / 48.5	3.600	96432950
	4G70	43.0 / 54.5	4.900	96432951

## Pt100

The Pt100 sensor offers these features:

- Continuous monitoring of the motor temperature
- Protection against too high motor temperature.

Protecting the motor against too high motor temperature is the simplest and cheapest way of avoiding reduced lifetime of the motor. The Pt100 ensures that operating conditions are not exceeded and indicates when it is time for service of the motor.

Monitoring and protection by means of a Pt100 require the following parts:


- Pt100 sensor
- PR 5714 relay
- Cable.

The PR 5714 relay is fitted with a Pt100 module. For both relays the following temperature limits are preset on delivery:


- 60 °C warning limit
- 75 °C stop limit.

### Technical data


PR 5714 relay	
Enclosure class	IP65 (mounted in a control panel)
Ambient temperature	-20 °C to +60 °C
Relative air humidity	95 % (condensating)
Voltage variation	<ul style="list-style-type: none"> <li>• 1 x 24-230 VAC ± 10 %, 50-60 Hz.</li> <li>• 24-250 VDC ± 20 %.</li> </ul>
Approvals	UL, DNV
Mark	CE

Pt100 sensor with/without PR 5714 relay and cable	Cable length [m]	PR 5714	Product number	
			MMS 6000, MMS 8000	MMS 10000, MMS 12000
	20	Yes	96494596	96437287
	40	Yes	96494597	96437288
	60	Yes	96494598	96437289
	80	Yes	96494599	96437290
	100	Yes	96494610	96437291
	20	No	96658629	96658633
	40	No	96658630	96658634
	60	No	96658631	96658635
	80	No	96658632	96658636
	100	No	96658639	96658640

GrA3186 + GrA3190

PR 5714 relay	Voltage	Product number
	24-230 VAC, 50/60 Hz / 24-250 VDC	96621274

GrA3186

Pt100 sensor including cable	Cable length [m]	Product number	
		MMS 6000 MMS 8000	MMS 10000 MMS 12000
	20	96408957	96437784
	40	96408684	96437785
	60	96408958	96437786
	80	96408959	96437787
	100	96408960	96437788

GrA3190

## Drop cables

Grundfos offers submersible drop cables for all types of applications: 3-core cable, 4-core cable, single leads.

The submersible drop cable is chosen according to application and type of installation.

Standard version: Maximum liquid temperature +60 °C.

### Tables indicating cable dimension in borehole

The tables indicate the maximum length of drop cables in metres from motor starter to pump at direct-on-line starting, and at different cable dimensions.

The lengths of the cables are calculated by means of the maximum current for cables according to IEC 364 and HD 384.

If, for example, the operating current is 10 % lower than the rated current, the cable may be 10 % longer than indicated in the table.

The calculation of the cable length is based on a maximum voltage drop of 1 % and 3 % of the rated voltage and a water temperature of maximum 30 °C.

To minimise operating losses, the cable cross-section may be increased compared to what is indicated in the table.

### This is economical only if

- the borehole provides the necessary space,
- the operational time of the pump is long or
- the operating voltage is below the rated voltage.

The table values are calculated on the basis of the following formula.

### Maximum cable length of a three-phase submersible pump

$$L = \frac{U \times \Delta U}{I \times 1.73 \times 100 \times \left( \cos \varphi \times \frac{\rho}{q} + \sin \varphi \times X_L \right)} \text{ [m]}$$

where

U = Rated voltage [V]

ΔU = Voltage drop [%]

I = Rated current of the motor [A]

q = Cross-section of submersible dropcable [mm<sup>2</sup>]

X<sub>L</sub> = Inductive resistance: 0.078 x 10<sup>-3</sup> [Ω/m]

cos φ = Power factor

sin φ =  $\sqrt{1 - \cos^2 \varphi}$

ρ = Specific resistance: 0.02 [Ωmm<sup>2</sup>/m].

### Example

Motor size:	30 kW, MMS 8000
Rated current:	64.0 A
Rated voltage:	3 x 400 V, 50 Hz
Starting method:	Direct-on-line
Power factor:	cos φ = 0.85
Voltage drop:	3 %
Cross-section:	25 mm <sup>2</sup>
sin φ:	0.54

$$L = \frac{400 \times 3}{64.0 \times 1.73 \times 100 \times \left( 0.85 \times \frac{0.02}{25} + 0.54 \times 0.078 \times 10^{-3} \right)}$$

L = 150 m.

**Cable dimensions at 3 x 400 V, 50 Hz**  
Voltage drop: 1 %

Motor	[kW]	I <sub>1N</sub> [A]	Cos φ 100 %	Maximum cable length in metres from motor starter to pump																
				Cross-section [mm <sup>2</sup> ]																
				1.5	2.5	4	6	10	16	25	35	50	70	95	120	150	185	240	300	
8"	22	48	0.84					28	44	67	92	127	170	220	264	312	361	428	489	
8"	26	56.5	0.85					23	37	57	78	107	144	186	224	265	307	365	418	
8"	30	64	0.85						33	50	68	95	127	164	197	234	271	322	369	
8"	37	78.5	0.85						27	41	56	77	104	134	161	191	221	263	301	
8"	45	96.5	0.82							34	47	64	86	110	132	155	180	212	241	
8"	55	114	0.85								38	53	71	92	111	131	152	181	207	
8"	63	132	0.83									47	62	80	96	113	131	155	177	
8"	75	152	0.86									40	53	69	83	98	114	136	156	
8"	92	186	0.86										43	56	68	80	94	111	128	
8"	110	224	0.87											47	56	67	78	93	107	
10"	75	156	0.84										52	68	81	96	111	132	151	
10"	92	194	0.82										43	55	66	77	89	105	120	
10"	110	228	0.84											46	56	66	76	90	103	
10"	132	270	0.84												47	55	64	76	87	
10"	147	315	0.81													48	55	65	74	
10"	170	365	0.81															56	63	
10"	190	425	0.79																48	54
12"	147	305	0.83													49	57	67	77	
12"	170	345	0.85														50	60	68	
12"	190	390	0.84															53	60	
12"	220	445	0.85																53	
12"	250	505	0.85																	
Max. current for cable [A]*				18.5	25	34	43	60	80	101	126	153	196	238	276	319	364	430	497	

\* At particularly favourable heat dissipation conditions.

**Cable dimensions at 3 x 400 V, 50 Hz**  
Voltage drop: 3 %

Motor	[kW]	I <sub>1N</sub> [A]	Cos φ 100 %	Maximum cable length in metres from motor starter to pump																	
				Cross-section [mm <sup>2</sup> ]																	
				1.5	2.5	4	6	10	16	25	35	50	70	95	120	150	185	240	300		
8"	22	48	0.84					84	132	202	276	382	511	659	792	935					
8"	26	56.5	0.85					70	111	170	233	322	432	557	671	794	922				
8"	30	64	0.85						98	150	205	284	381	492	592	701	814	967			
8"	37	78.5	0.85						80	122	168	232	311	401	483	572	664	789	903		
8"	45	96.5	0.82							102	140	193	257	330	396	466	539	635	723		
8"	55	114	0.85								115	159	214	276	333	394	457	543	622		
8"	63	132	0.83									140	187	240	289	340	394	466	531		
8"	75	152	0.86										119	160	206	249	295	343	409	469	
8"	92	186	0.86											130	169	203	241	281	334	383	
8"	110	224	0.87												140	169	200	233	279	321	
10"	75	156	0.84										157	203	244	288	334	395	452		
10"	92	194	0.82										128	164	197	232	268	316	360		
10"	110	228	0.84											139	167	197	228	271	309		
10"	132	270	0.84												141	166	193	228	261		
10"	147	315	0.81													143	165	194	221		
10"	170	365	0.81																168	190	
10"	190	425	0.79																	143	162
12"	147	305	0.83													147	170	202	230		
12"	170	345	0.85														151	179	205		
12"	190	390	0.84																158	181	
12"	220	445	0.85																	159	
12"	250	505	0.85																		
Max. current for cable [A]*				18.5	25	34	43	60	80	101	126	153	196	238	276	319	364	430	497		

\* At particularly favourable heat dissipation conditions.



## Data required for pump sizing

1. Flow rate  $Q = (\text{m}^3/\text{h})$
2. Head  $H = (\text{m})$
3. Temperature  $t = (^\circ\text{C})$
4. Pumped liquid

### Total head formula

$$H (\text{m}) = H_{\text{geo}} + H_v + H_k.$$

$H_{\text{geo}} (\text{m})$  = Distance between dynamic water level and outlet.

$H_v (\text{m})$  = Friction loss in pipes connected to the submersible pump including possible losses in fittings.

$H_k (\text{m})$  = Required pressure at outlet.

### Example

- |                  |                                 |
|------------------|---------------------------------|
| 1. Flow rate     | $Q = 120 \text{ m}^3/\text{h}$  |
| 2. Head          | $H = 200 \text{ m}$             |
| 3. Temperature   | $t = 30 \text{ }^\circ\text{C}$ |
| 4. Pumped liquid | Water.                          |

### Additional requirements

- |                      |   |
|----------------------|---|
| 5. Rated voltage     | $U_{1/1} = 3 \times 400 \text{ V}, 50 \text{ Hz}$ |
| 6. Starting method   | Star-delta  |
| 7. Cable length      | $L = 100 \text{ m}$                               |
| 8. Borehole diameter | $F = 10''$ .                                      |

### Pump sizing – SP 270-6W G

#### Technical data

- |                                |   |
|--------------------------------|---|
| 1. Motor                       | MMS 10000                                   |
| 2. Motor power                 | $P_2 = 132 \text{ kW}$                      |
| 3. Rated current               | $I_{1/1} = 270 \text{ A}$                   |
| 4. Rated voltage               | $U_{1/1} = 3 \times 400 \text{ V Y}/\Delta$ |
| 5. Largest pump-motor diameter | $\varnothing = 291 \text{ mm}$ .            |

**Cable sizing, see page 41.**

## Motor protection

The submersible motor must be connected to a motor starter for protection against voltage drop, phase failure, overload or overtemperature caused by seizing of the motor.

## Motor cooling

Calculation of flow velocity:

$$v = \frac{Q_{\text{min}}}{2826 \times D_i^2 - d_A^2} = \text{m/s}$$

## Required data

Flow rate  $Q_{\text{min}}$  in  $\text{m}^3/\text{h}$ .

Borehole diameter  $D_i$  in metres.

Motor diameter  $d_A$  in metres.

## Minimum flow velocity

$v = 0.15 \text{ m/s}$ .

## Head losses in ordinary water pipes (steel)

Upper figures indicate the velocity of water in m/sec.

Lower figures indicate head loss in metres per 100 metres of straight pipes.

Quantity of water			Head losses in ordinary water pipes			
m <sup>3</sup> /h	Litres/min.	Litres/sec.	Nominal pipe diameter in inches and internal diameter in mm			
			4" 105.0	5" 130.0	6" 155.5	8" 206.0
30	500	8.33	0.962	0.628	0.439	0.250
			1.254	0.445	0.187	0.032
36	600	10.0	1.155	0.753	0.526	0.300
			1.757	0.623	0.260	0.051
42	700	11.7	1.347	0.879	0.614	0.350
			2.345	0.831	0.347	0.067
48	800	13.3	1.540	1.005	0.702	0.400
			3.009	1.066	0.445	0.083
54	900	15.0	1.732	1.130	0.790	0.450
			3.762	1.328	0.555	0.101
60	1000	16.7	1.925	1.256	0.877	0.500
			4.595	1.616	0.674	0.133
75	1250	20.8	2.406	1.570	1.097	0.625
			7.010	2.458	1.027	0.205
90	1500	25.0	2.887	1.883	1.316	0.750
			9.892	3.468	1.444	0.294
105	1750	29.2	3.368	2.197	1.535	0.875
			13.30	4.665	1.934	0.395
120	2000	33.3	3.850	2.511	1.754	1.000
			17.16	5.995	2.496	0.518
150	2500	41.7	4.812	3.139	2.193	1.250
			26.26	9.216	3.807	0.808
180	3000	50.0		3.767	2.632	1.500
				13.05	5.417	1.153
240	4000	66.7		5.023	3.509	2.000
				22.72	8.926	2.044
300	5000	83.3			4.386	2.500
					14.42	3.183
360	6000	100				3.000
						4.580
420	7000	117				3.500
						6.241
480	8000	133				4.000
						8.152
540	9000	150				4.500
						10.317
90 ° bends, slide valves			1.7	2.0	2.5	3.7
T-pieces, non-return valves			7.0	8.0	9.0	13

The table is calculated in accordance with H. Lang's new formula  $a = 0.02$  and for a water temperature of 10 °C.

The head loss in bends, slide valves, T-pieces and non-return valves is equivalent to the metres of straight pipes stated in the last two lines of the table.

To find the head loss in foot valves, multiply the loss in T-pieces by two.

## SP 270-G

### Direct-on-line

3 x 380-415 V

Pump type	Motor type	Motor power [kW]	Product number
SP 270-1L	MMS 8000	22	96430962
SP 270-1F		26	96430963
SP 270-1D		30	96430964
SP 270-1A		37	96430965
SP 270-2L		45	96430966
SP 270-2D		55	96430967
SP 270-2A		63	96430968
SP 270-3V		75	96430969
SP 270-3A		92	96430970
SP 270-4D		110	96430971
SP 270-4D	110	96430972	
SP 270-4A	MMS 10000	132	96430973
SP 270-6W		147	96430974
SP 270-6F		147	96430975
SP 270-6D	MMS 12000	170	96430976
SP 270-6A		190	96430977
SP 270-7A		220	96430978
SP 270-8A		250	96430979

### Direct-on-line

3 x 500 V

Pump type	Motor type	Motor power [kW]	Product number
SP 270-1L	MMS 8000	22	96431303
SP 270-1F		26	96431304
SP 270-1D		30	96431305
SP 270-1A		37	96431306
SP 270-2L		45	96431307
SP 270-2D		55	96431308
SP 270-2A		63	96431309
SP 270-3V		75	96431310
SP 270-3A		92	96431311
SP 270-4D		110	96431312
SP 270-4D	110	96431313	
SP 270-4A	MMS 10000	132	96431314
SP 270-6W		147	96431315
SP 270-6F		147	96431316
SP 270-6D	MMS 12000	170	96431317
SP 270-6A		190	96431318
SP 270-7A		220	96431319
SP 270-8A		250	96431320

## Star-delta

3 x 380-415 V

Pump type	Motor type	Motor power [kW]	Product number
SP 270-1L	MMS 8000	22	96431066
SP 270-1F		26	96431067
SP 270-1D		30	96431068
SP 270-1A		37	96431069
SP 270-2L		45	96431070
SP 270-2D		55	96431071
SP 270-2A		63	96431072
SP 270-3V		75	96431073
SP 270-3A		92	96431074
SP 270-4D		110	96431075
SP 270-4D	110	96431076	
SP 270-4A	MMS 10000	132	96431077
SP 270-6W		147	96431078
SP 270-6F		147	96431079
SP 270-6D	MMS 12000	170	96431080
SP 270-6A		190	96431081
SP 270-7A		220	96431082
SP 270-8A		250	96431083

## Star-delta

3 x 500 V

Pump type	Motor type	Motor power [kW]	Product number
SP 270-1L	MMS 8000	22	96431382
SP 270-1F		26	96431383
SP 270-1D		30	96431384
SP 270-1A		37	96431385
SP 270-2L		45	96431386
SP 270-2D		55	96431387
SP 270-2A		63	96431388
SP 270-3V		75	96431389
SP 270-3A		92	96431390
SP 270-4D		110	96431391
SP 270-4D	110	96431392	
SP 270-4A	MMS 10000	132	96431393
SP 270-6W		147	96431394
SP 270-6F		147	96431395
SP 270-6D	MMS 12000	170	96431396
SP 270-6A		190	96431397
SP 270-7A		220	96431398
SP 270-8A		250	96431399

## SP 300-G

### Direct-on-line 3 x 380-415 V

Pump type	Motor type	Motor power [kW]	Product number	
SP 300-1N	MMS 8000	26	96430980	
SP 300-1L		30	96430981	
SP 300-1D		37	96430982	
SP 300-1A		45	96430983	
SP 300-2L		55	96430984	
SP 300-2F		63	96430985	
SP 300-2D		75	96430986	
SP 300-3L		75	96430987	
SP 300-3F		92	96430988	
SP 300-3D		110	96430989	
SP 300-3D	MMS 10000	110	96430990	
SP 300-3A		132	96430991	
SP 300-4G		132	96430992	
SP 300-4F		132	96430993	
SP 300-4D		147	96430994	
SP 300-5G		147	96430995	
SP 300-5F		170	96430996	
SP 300-5D		190	96430997	
SP 300-6F		MMS 12000	190	96430998
SP 300-6D			220	96430999
SP 300-6A	250		96431000	
SP 300-7D	250		96431001	

### Direct-on-line 3 x 500 V

Pump type	Motor type	Motor power [kW]	Product number	
SP 300-1N	MMS 8000	26	96431321	
SP 300-1L		30	96431322	
SP 300-1D		37	96431323	
SP 300-1A		45	96431324	
SP 300-2L		55	96431325	
SP 300-2F		63	96431326	
SP 300-2D		75	96431327	
SP 300-3L		75	96431328	
SP 300-3F		92	96431329	
SP 300-3D		110	96431330	
SP 300-3D	MMS 10000	110	96431331	
SP 300-3A		132	96431332	
SP 300-4G		132	96431333	
SP 300-4F		132	96431334	
SP 300-4D		147	96431335	
SP 300-5G		147	96431336	
SP 300-5F		170	96431337	
SP 300-5D		190	96431338	
SP 300-6F		MMS 12000	190	96431339
SP 300-6D			220	96431340
SP 300-6A	250		96431341	
SP 300-7D	250		96431342	

### Star-delta 3 x 380-415 V

Pump type	Motor type	Motor power [kW]	Product number	
SP 300-1N	MMS 8000	26	96431084	
SP 300-1L		30	96431085	
SP 300-1D		37	96431086	
SP 300-1A		45	96431087	
SP 300-2L		55	96431088	
SP 300-2F		63	96431089	
SP 300-2D		75	96431090	
SP 300-3L		75	96431091	
SP 300-3F		92	96431092	
SP 300-3D		110	96431093	
SP 300-3D	MMS 10000	110	96431094	
SP 300-3A		132	96431095	
SP 300-4G		132	96431096	
SP 300-4F		132	96431097	
SP 300-4D		147	96431098	
SP 300-5G		147	96431099	
SP 300-5F		170	96431100	
SP 300-5D		190	96431101	
SP 300-6F		MMS 12000	190	96431102
SP 300-6D			220	96431103
SP 300-6A	250		96431104	
SP 300-7D	250		96431105	

### Star-delta 3 x 500 V

Pump type	Motor type	Motor power [kW]	Product number	
SP 300-1N	MMS 8000	26	96431400	
SP 300-1L		30	96431401	
SP 300-1D		37	96431402	
SP 300-1A		45	96431403	
SP 300-2L		55	96431404	
SP 300-2F		63	96431405	
SP 300-2D		75	96431406	
SP 300-3L		75	96431407	
SP 300-3F		92	96431408	
SP 300-3D		110	96431409	
SP 300-3D	MMS 10000	110	96431410	
SP 300-3A		132	96431411	
SP 300-4G		132	96431412	
SP 300-4F		132	96431413	
SP 300-4D		147	96431414	
SP 300-5G		147	96431415	
SP 300-5F		170	96431416	
SP 300-5D		190	96431417	
SP 300-6F		MMS 12000	190	96431418
SP 300-6D			220	96431419
SP 300-6A	250		96431420	
SP 300-7D	250		96431421	

## SP 360-G

### Direct-on-line

### 3 x 380-415 V

Pump type	Motor type	Motor power [kW]	Product number
SP 360-1L	MMS 8000	37	96431002
SP 360-1F		45	96431003
SP 360-1A		55	96431004
SP 360-2N		63	96431005
SP 360-2L		75	96431006
SP 360-2F		92	96431007
SP 360-2A		110	96431008
SP 360-3L		110	96431009
SP 360-2A		110	96431010
SP 360-3L		110	96431011
SP 360-3G	MMS 10000	132	96431012
SP 360-3F		132	96431013
SP 360-3D		147	96431014
SP 360-3A	MMS 12000	170	96431015
SP 360-4G		170	96431016
SP 360-4F		170	96431017
SP 360-4D		190	96431018
SP 360-5G		190	96431019
SP 360-5F		220	96431020
SP 360-5D		220	96431021
SP 360-6F		250	96431022

### Star-delta

### 3 x 380-415 V

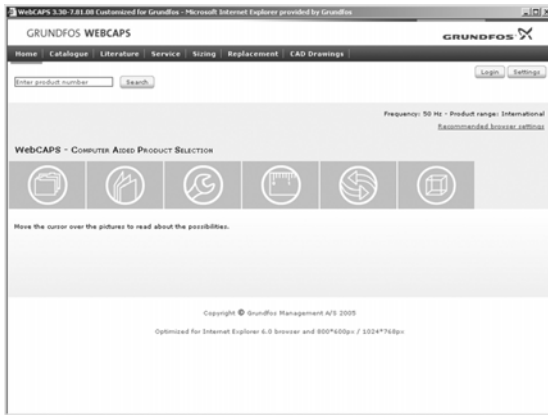
Pump type	Motor type	Motor power [kW]	Product number
SP 360-1L	MMS 8000	37	96431106
SP 360-1F		45	96431107
SP 360-1A		55	96431108
SP 360-2N		63	96431109
SP 360-2L		75	96431110
SP 360-2F		92	96431111
SP 360-2A		110	96431112
SP 360-3L		110	96431113
SP 360-2A		110	96431114
SP 360-3L		110	96431115
SP 360-3G	MMS 10000	132	96431116
SP 360-3F		132	96431117
SP 360-3D		147	96431118
SP 360-3A	MMS 12000	170	96431119
SP 360-4G		170	96431120
SP 360-4F		170	96431121
SP 360-4D		190	96431122
SP 360-5G		190	96431123
SP 360-5F		220	96431124
SP 360-5D		220	96431125
SP 360-6F		250	96431126

### Direct-on-line

### 3 x 500 V

Pump type	Motor type	Motor power [kW]	Product number
SP 360-1L	MMS 8000	37	96431343
SP 360-1F		45	96431344
SP 360-1A		55	96431345
SP 360-2N		63	96431346
SP 360-2L		75	96431347
SP 360-2F		92	96431348
SP 360-2A		110	96431349
SP 360-3L		110	96431350
SP 360-2A		110	96431351
SP 360-3L		110	96431352
SP 360-3G	MMS 10000	132	96431353
SP 360-3F		132	96431354
SP 360-3D		147	96431355
SP 360-3A	MMS 12000	170	96431356
SP 360-4G		170	96431357
SP 360-4F		170	96431358
SP 360-4D		190	96431359
SP 360-5G		190	96431360
SP 360-5F		220	96431361
SP 360-5D		220	96431362
SP 360-6F		250	96431363

## WebCAPS

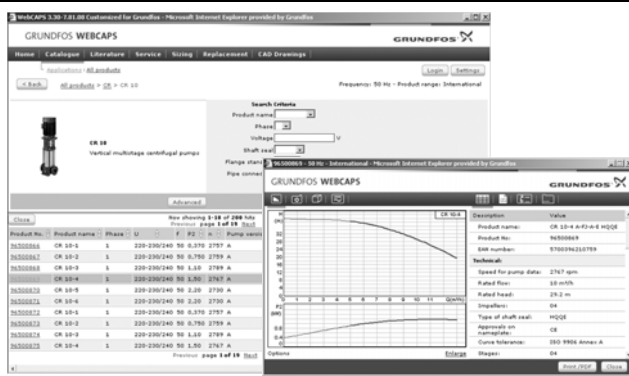


WebCAPS is a **Web-based Computer Aided Product Selection** program available on [www.grundfos.com](http://www.grundfos.com).

WebCAPS contains detailed information on more than 185,000 Grundfos products in more than 20 languages.

In WebCAPS, all information is divided into 6 sections:

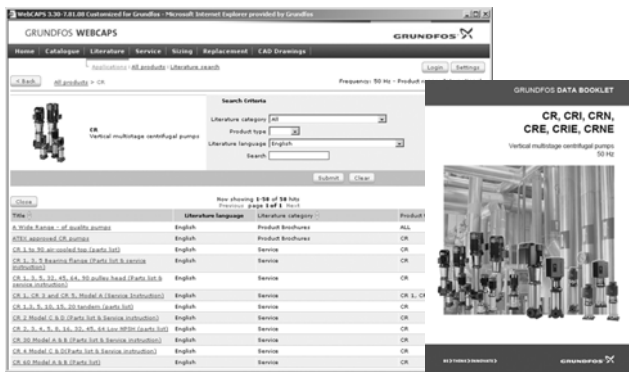
- Catalogue
- Literature
- Service
- Sizing
- Replacement
- CAD drawings.



### Catalogue

This section is based on fields of application and pump types, and contains

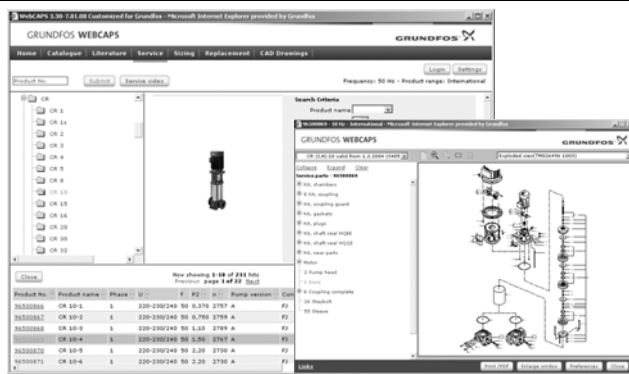
- technical data
- curves (QH, Eta, P1, P2, etc.) which can be adapted to the density and viscosity of the pumped liquid and show the number of pumps in operation
- product photos
- dimensional drawings
- wiring diagrams
- quotation texts, etc.



### Literature

In this section you can access all the latest documents of a given pump, such as

- data booklets
- installation and operating instructions
- service documentation, such as Service kit catalogue and Service kit instructions
- quick guides
- product brochures.



### Service

This section contains an easy-to-use interactive service catalogue. Here you can find and identify service parts of both existing and discontinued Grundfos pumps.

Furthermore, this section contains service videos showing you how to replace service parts.



## Sizing

This section is based on different fields of application and installation examples, and gives easy step-by-step instructions in how to

- select the most suitable and efficient pump for your installation
- carry out advanced calculations based on energy consumption, payback periods, load profiles, life cycle costs, etc.
- analyse your selected pump via the built-in life cycle cost tool
- determine the flow velocity in wastewater applications, etc.



## Replacement

In this section you find a guide to selecting and comparing replacement data of an installed pump in order to replace the pump with a more efficient Grundfos pump. The section contains replacement data of a wide range of pumps produced by other manufacturers than Grundfos.

Based on an easy step-by-step guide, you can compare Grundfos pumps with the one you have installed on your site. When you have specified the installed pump, the guide will suggest a number of Grundfos pumps which can improve both comfort and efficiency.



## CAD drawings

In this section it is possible to download 2-dimensional (2D) and 3-dimensional (3D) CAD drawings of most Grundfos pumps.

These formats are available in WebCAPS:

- 2-dimensional drawings:
- .dxf, wireframe drawings
  - .dwg, wireframe drawings.
- 3-dimensional drawings:
- .dwg, wireframe drawings (without surfaces)
  - .stp, solid drawings (with surfaces)
  - .eprt, E-drawings.

## WinCAPS



Fig. 17 WinCAPS CD-ROM

WinCAPS is a **Windows-based Computer Aided Product Selection** program containing detailed information on more than 185,000 Grundfos products in more than 20 languages.

The program contains the same features and functions as WebCAPS, but is an ideal solution if no Internet connection is available.

WinCAPS is available on CD-ROM and updated once a year.

V7149569 0808	<b>GB</b>
Repl. V7149569 0308	

Subject to alterations.