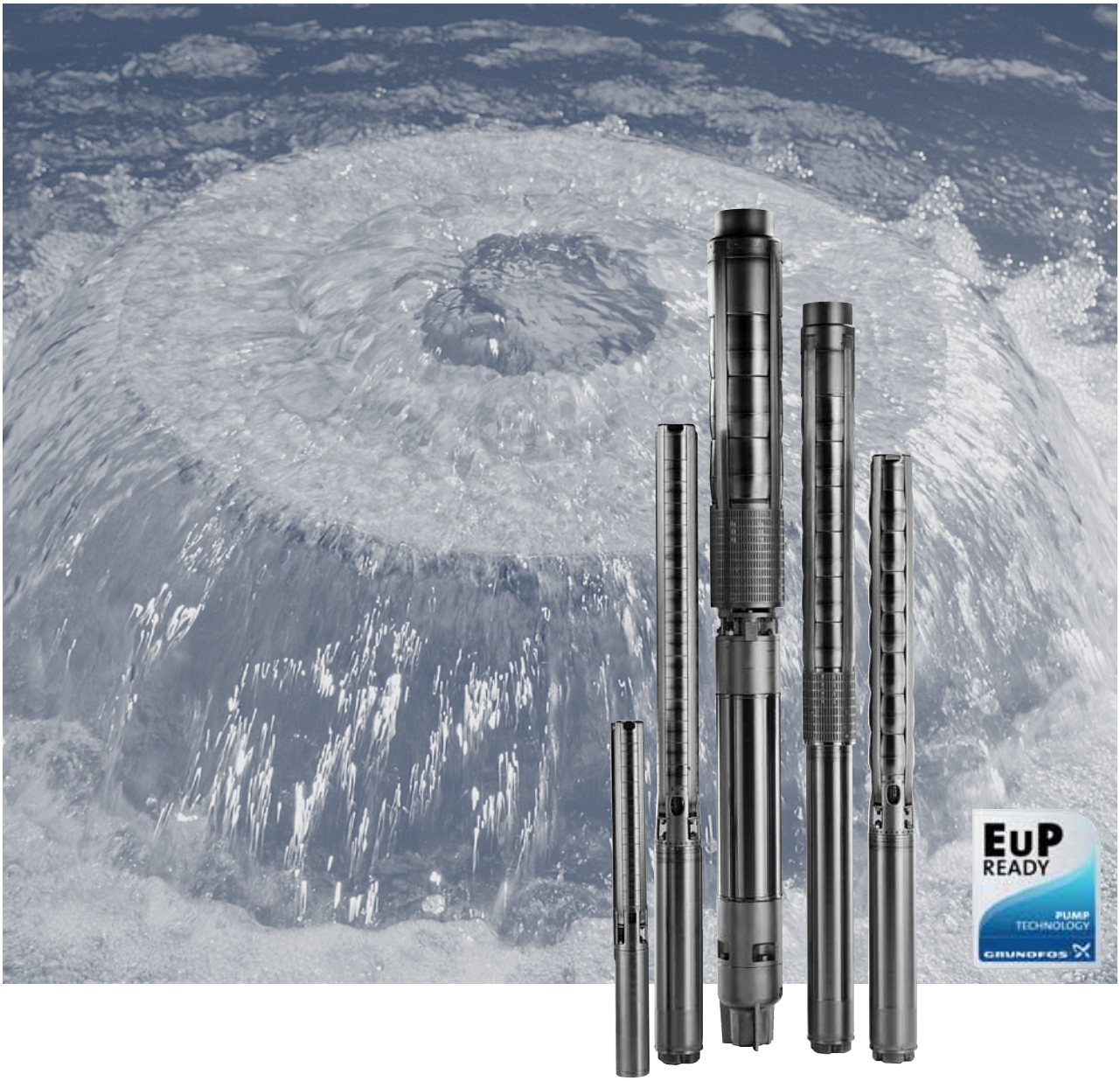
SP A, SP

Submersible pumps, motors and accessories
50 Hz



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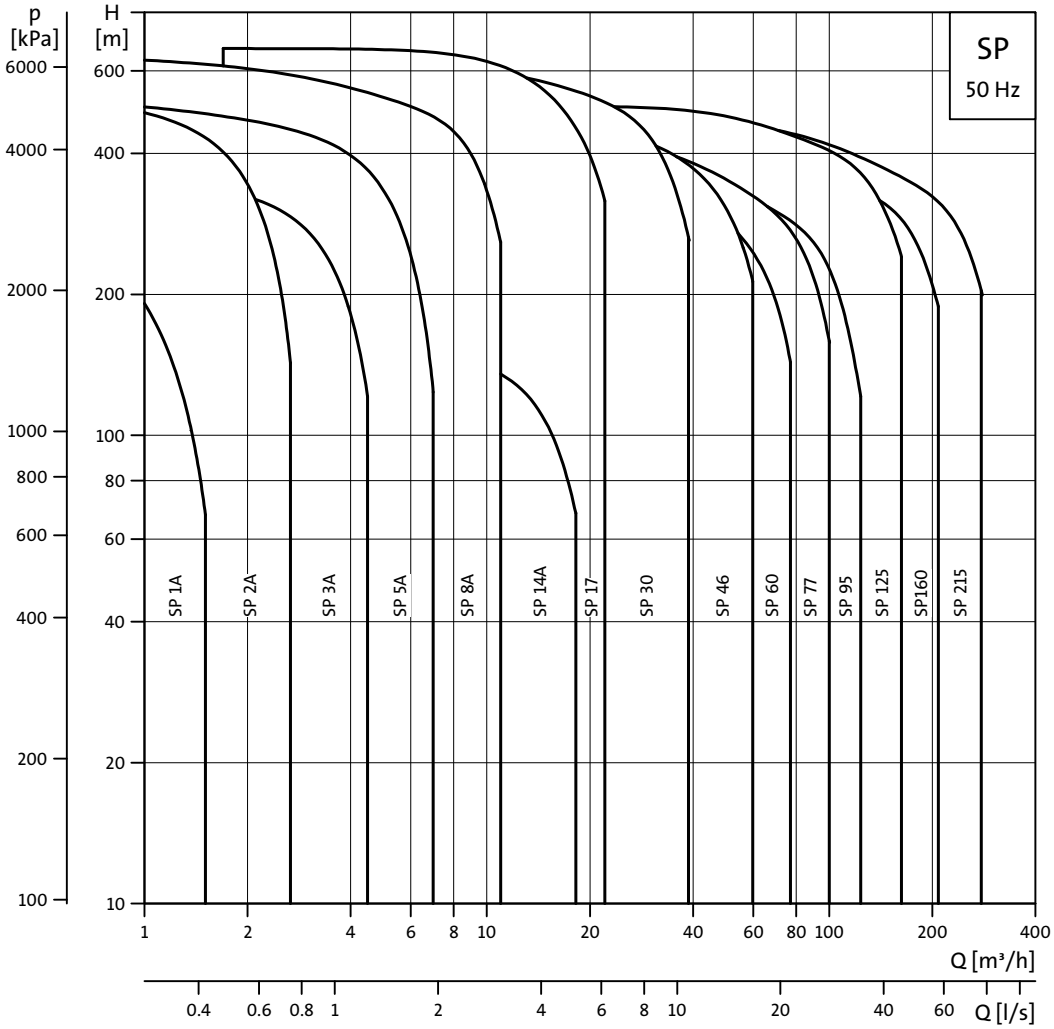
1. General description

Performance range



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EuP ready

The SP A, SP pumps are energy-optimised and comply with the EuP Directive (Commission Regulation (EC) No 547/2012) which will be effective as from 1 January 2013. As from this date, all pumps will be classified/graduated in a new energy efficiency index (MEI).

MEI index

Minimum Efficiency Index (MEI) is the dimensionless scale unit for hydraulic pump efficiency at best efficiency point, part load and overload.
EU regulations set efficiency requirements to MEI ≥ 0.1 as from 1 January 2013 and MEI ≥ 0.4 as from 1 January 2015. An indicative benchmark for the best-performing water pumps available on the market in 2012 is MEI ≥ 0.70.

Effeciency and MEI index for SP pumps

Pump type	Pump size	Efficiency [%]	MEI
SP 1A-9	4"	39	≥ 0.80
SP 2A-9	4"	50	≥ 0.80
SP 3A-9	4"	58	≥ 0.80
SP 5A-12	4"	60	≥ 0.56
SP 8A-10	4"	61	≥ 0.14
SP 11A-9	4"	60	≥ 0.10
SP 14A-10	4"	61	≥ 0.10
SP 17-9	6"	74	≥ 0.76
SP 30-9	6"	75	≥ 0.50
SP 46-9	6"	76	≥ 0.50
SP 60-9	6"	77	≥ 0.60
SP 77-9	8"	78	≥ 0.44
SP 95-9	8"	79	≥ 0.50
SP 125-9	10"	79	≥ 0.37
SP 160-9	10"	80	≥ 0.39
SP 215-9	10"	83	≥ 0.46

For more information about the new energy directive and MEI index please visit:
energy.grundfos.com
europump.eu/efficiencycharts

Applications

The SP A and SP pumps are suitable for the following applications:

- raw-water supply
- irrigation
- groundwater lowering
- pressure boosting
- fountain applications
- mining applications
- off-shore applications.

Type key

Example	SP	95	-	5	-	A	B	N

Type range (SP A, SP)

Rated flow rate in m^3/h

Number of impellers

First reduced-diameter impeller (A, B or C)

Second reduced-diameter impeller (A, B or C)

Stainless-steel parts of material
= EN 1.4301
N = EN 1.4401
R = EN 1.4539

Pumped liquids

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

The special SP A-N and SP-N versions made of stainless steel to EN 1.4401 and SP A-R and SP-R versions made of stainless steel to EN 1.4539 are available for applications involving aggressive liquids.

Operating conditions

Maximum liquid temperature

Grundfos motor	Flow velocity past motor [m/s]	Max. liquid temperature [°C]
MS 4"	0.15	40
MS 6000	0.15	30
MS 4" industrial versions	0.15	60
MS 6000 industrial versions	0.15	60
MMS 6" with PVC in the windings	0.15	25
	0.50	30
MMS 6" with PE/PA in the windings	0.15	45
	0.50	50
MMS 8", 10", 12" rewindable with PVC in the windings	0.15	25
	0.50	30
MMS 8", 10", 12" rewindable with PE/PA in the windings	0.15	40
	0.50	45

Note: For MMS 6", 37 kW, MMS 8", 110 kW, and MMS 10", 170 kW, the maximum liquid temperature is 5 °C lower than the values stated in the table above. For MMS 10", 190 kW, the temperature is 10 °C lower.

Operating pressure

Grundfos motor	Maximum operating pressure
MS 402	1.5 MPa (15 bar)
MS 4000 and 6" MMS 6", 8", 10", 12" rewindable	6 MPa (60 bar)

Curve conditions

The conditions below apply to the curves on pages 14 to 70.

General conditions

- Curve tolerances according to ISO 9906, 2012 Grade 3B.
- The performance curves show pump performance at actual speed, cf. standard motor range.
  Approximate motor speeds:
  4" motors: n = 2870 min^{-1}
  6" motors: n = 2870 min^{-1}
  8" to 12" motors: n = 2900 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^2/s (1 cSt). When pumping liquids with a density higher than that of water, use motors with correspondingly higher outputs.
- The bold curves indicate the recommended performance range.
- The performance curves are inclusive of possible losses such as non-return valve loss.

SP A, SP curves

- **Q/H:** The curves are inclusive of valve and inlet losses at the actual speed.
  Operation without non-return valve will increase the actual head at rated performance by 0.5 to 1.0 m.
- **NPSH:** The curve is inclusive of pressure loss in the suction interconnector and shows required inlet pressure.
- **Power curve:** P2 shows the pump power input of each stage for the individual pump size when the pump is running at the rated speed.
- **Efficiency curve:** Eta shows pump stage efficiency. If Eta for the actual pump size is needed, please consult www.grundfos.com (WebCAPS).

Pump range

Type	SP 1A	SP 2A	SP 3A	SP 5A	SP 8A	SP 14A	SP 17	SP 30	SP 46	SP 60	SP 77	SP 95	SP 125	SP 160	SP 215
Steel: EN 1.4301 AISI 304	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Steel: (N) EN 1.4401 AISI 316			•	•	•	•	•	•	•	•	•	•	•	•	•
Steel: (R) EN 1.4539 AISI 904L				•	•		•	•	•	•	•	•	•	•	•
Connection*	Rp 1 1/4	Rp 1 1/4 (R 1 1/4)	Rp 1 1/4	Rp 1 1/2 (R 1 1/2)	Rp 2 (R 2)	Rp 2	Rp 2 1/2 (R 3)	Rp 3 (R 3)	Rp 3 Rp 4 (R 4)	Rp 3 Rp 4	Rp 5	Rp 5	Rp 6	Rp 6	Rp 6
Flange connection: Grundfos flange											5"	5"	6"	6"	6"

* Figures in brackets ( ) indicate connection for pumps with sleeve.

Motor range

Motor output [kW]	0.37	0.55	0.75	1.1	1.5	2.2	3.0	3.7	4.0	5.5	7.5	9.2	11	13	15	18.5	22	26	30	37	45	55	63	75	92	110	132	147	170	190	220	250
MS 402	•	•	•	•	•	•																										
MS 4000 (R)			•	•	•	•	•	•	•	•	•																					
MS 4000I (R)						•	•	•	•	•																						
MS 6000 (R)										•	•	•	•	•	•	•	•	•	•													
MS 6000I (R)										•	•	•	•	•	•	•	•															
MMS 6 (N, R)								•	•	•	•	•	•	•	•	•	•	•	•	•												
MMS 8000 (N, R)																	•	•	•	•	•	•	•	•	•	•						
MMS 10000 (N, R)																								•	•	•	•	•	•	•		
MMS 12000 (N)																												•	•	•	•	•

Direct-on-line starting is recommended up to 75 kW.
Soft starter or autotransformer is recommended above 75 kW.
Motors with star-delta starting are available from 5.5 kW.
MS 4000(I) and MS 6000(I) are available with a built-in temperature transmitter (Tempcon).

Motor protection and controllers

Motor output [kW]	0.37	0.55	0.75	1.1	1.5	2.2	3.0	3.7	4.0	5.5	7.5	9.2	11	13	15	18.5	22	26	30	37	45	55	63	75	92	110	132	147	170	190	220	250
CUE		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
MP 204	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
IO 112	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
PR 5714	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CU 220	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Pt100	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Pt1000	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Zinc anode	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Flow sleeve	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
SA-SPM	•	•	•	•	•	•																										
R100	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CIU	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Motor protection of single-phase motors, see section *5. Electrical data*, page 71.

2. Submersible pumps

Features and benefits

A wide pump range

Grundfos offers energy-efficient submersible pumps ranging from 1 to 280 m^3/h. The pump range consists of many pump sizes, and each pump size is available with an optional number of stages to match any duty point.

High pump efficiency

Often pump efficiency is a neglected factor compared to the price. However, the observant user will notice that price variations are without importance to water supply economics compared to the importance of pump and motor efficiencies.

Example

When pumping 200 m^3/h at a head of 100 m for a period of 10 years, EUR 60,000 will be saved if a pump/motor having a 10 % higher efficiency is chosen and the price is EUR 0.10 per kWh.

Material and pumped liquids

Grundfos offers a complete range of pumps and motors which, as standard, are made completely of stainless steel to EN 1.4301 (AISI 304). This ensures good wear resistance and a reduced risk of corrosion when pumping ordinary cold water with a minor chloride content.

A pump range made of upgraded stainless steel is available for more aggressive liquids:

SP N: EN 1.4401 (AISI 316)

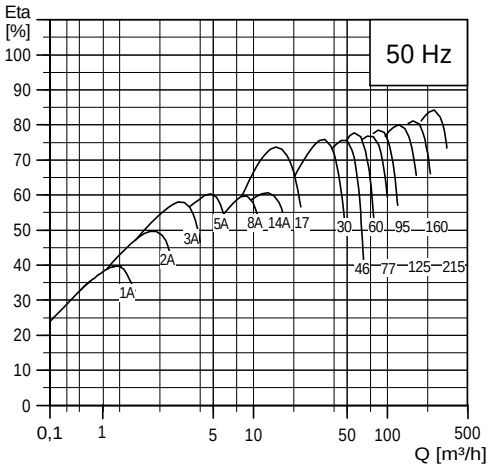
SP R: EN 1.4539 (AISI 904L).

Alternatively, a complete range of zinc anodes for cathodic protection is available. See page 87. For example, this may be advisable for seawater applications.

For slightly polluted liquids containing for example oil, Grundfos offers a complete range of stainless-steel SP NE pumps to EN 1.4401 (AISI 316) with all rubber parts made of FKM.

Low installation costs

Stainless steel means low weight facilitating the handling of pumps and resulting in low equipment costs and reduced installation and service time.



TM00 7255 1898

Fig. 1 Pump/motor efficiencies in relation to flow

Gr6389 2806

Fig. 2 Various SP pumps

Bearings with sand channels

All bearings are water-lubricated and have a squared shape enabling sand particles, if any, to leave the pump together with the pumped liquid.

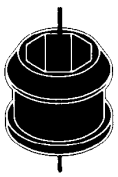


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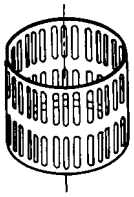
Fig. 3 Bearing

Inlet strainer

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



TM00 7302 1096

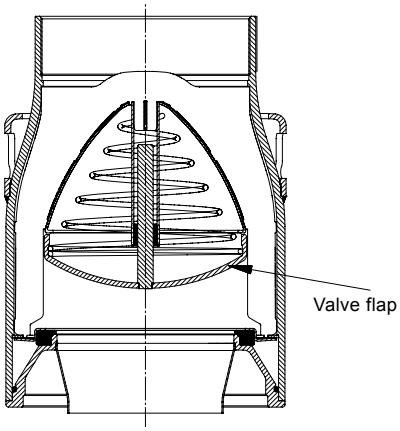
Fig. 4 Inlet strainer

Non-return valve

All pumps have a reliable non-return valve in the valve casing preventing backflow in connection with pump stoppage.

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

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



TM01 2499 1798

Fig. 5 Non-return valve

Priming screw

All Grundfos pumps with radial impellers are fitted with a priming screw. Consequently, dry running is prevented because the priming screw will ensure that the pump bearings are always lubricated.

SP pumps with semi-axial impellers require no priming screw. The pumps are primed automatically.
It applies to all pump types, however, that neither pump nor motor will be protected against dry running if the water table is lowered to a level below the pump inlet.

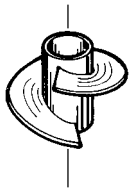


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Fig. 6 Priming screw

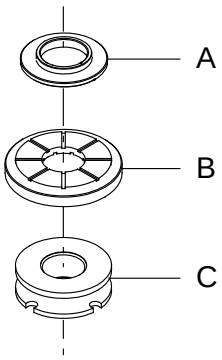
Stop ring

The stop ring prevents damage to the pump during transport and in case of up-thrust in connection with start-up.

The stop ring, which is designed as a thrust bearing, limits axial movements of the pump shaft.

The stationary part of the stop ring (A) is secured in the upper chamber.

The rotating part (B) is fitted above the split cone (C).



TM01 3327 3898

Fig. 7 Stop ring (rotating and stationary parts) and split cone

Material specification

Pos.	Component	Material	Standard	N-version	R-version
			EN/AISI		
1	Valve casing	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
1d	O-ring	NBR			
2	Valve cup	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
3	Valve seat	Standard/ N-version: NBR R-version: FKM			
3a	Lower valve seat retainer	Stainless steel	1.4308	1.4408/ 316	1.4517
3b	Upper valve seat retainer	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
4	Top chamber	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
6	Upper bearing	Stainless steel/ NBR	1.4401/ 304	1.4401/ 316	1.4539/ 904L
7	Neck ring	NBR/PPS			
8	Bearing	NBR			
8a	Washer for stop ring	Carbon/graphite HY22 in PTFE mass			
8b	Stop ring	Stainless steel	1.4401/ 316	1.4401/ 316	1.4539/ 904L
9	Chamber	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
11	Split cone nut	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
11c	Nut for stop ring	Stainless steel	1.4401/ 316	1.4401/ 316	1.4539/ 904L
12	Split cone	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
13	Impeller	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
14	Suction interconnector	Cast stainless steel	1.4308	1.4408/ 316	1.4517
15	Strainer	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
16	Shaft complete	Stainless steel	1.4057/ 431	1.4460/ 329	1.4462/ 904L
17	Strap	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
18	Cable guard	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
19	Nut for strap	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
39	Spring for valve cup	Stainless steel	1.4301/ 304	1.4401/ 316	1.4462/ SAF 2205
70	Valve guide	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L
71	Washer	Stainless steel	1.4401/ 316	1.4401/ 316	1.4539/ 904L
72	Wear ring	Stainless steel	1.4301/ 304	1.4401/ 316	1.4539/ 904L

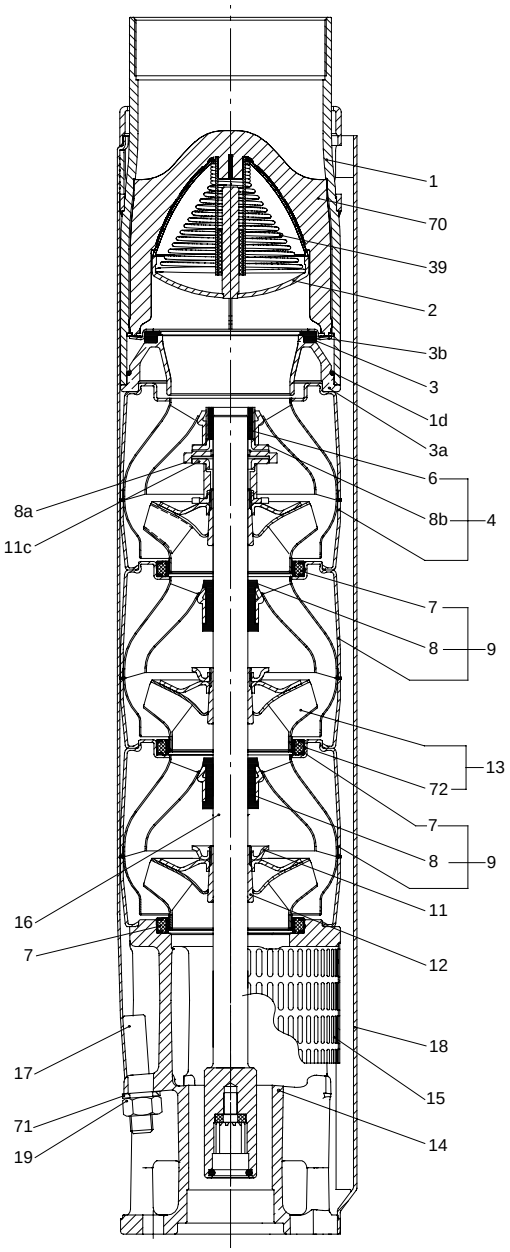


Fig. 8 SP 77

3. Submersible motors

Features and benefits

A complete motor range

Grundfos offers a complete range of submersible motors in different voltages:

Submersible motors, MS

- 4" motors, single-phase up to 2.2 kW:
  - 2-wire
  - 3-wire
  - PSC (permanent split capacitor)
- 4" motors, three-phase up to 7.5 kW
- 4" industrial motors, three-phase up to 5.5 kW
- 6" motors, three-phase from 5.5 to 30 kW
- 6" industrial motors, three-phase up to 22 kW.

Submersible, rewindable motors, MMS

- 6" motors, three-phase from 3.7 to 37 kW
- 8" motors, three-phase from 22 to 110 kW
- 10" motors, three-phase from 75 to 190 kW
- 12" motors, three-phase from 147 to 250 kW.

High motor efficiency

Within the area of high motor efficiency, Grundfos is a market leader.

Rewindable motors

The 2-pole Grundfos MMS submersible motors are all easy to rewind. The windings of the stator are made of a special water-proof wire of pure electrolytic copper sheathed with special non-hydroscopic thermoplastic material. The fine dielectric properties of this material allow direct contact between the windings and the liquid for efficient cooling of the windings.

Industrial motors

For heavy-duty applications, Grundfos offers a complete motor range of industrial motors with up to 5 % higher efficiency than that of Grundfos' standard motors. The industrial motors are available in sizes 2.2 to 22 kW. The cooling of the motor is very efficient due to the large motor surface. The efficient cooling makes it possible to increase the liquid temperature to 60 °C at a minimum flow of 0.15 m/s past the motor. The industrial motors are for customers who value low operating costs and long life higher than price.

Grundfos industrial motors are developed for difficult operating conditions. These motors will stand a higher thermal load than standard motors and thus have a longer life when subjected to high load. This applies whether the high load is caused by bad power supply, hot water, bad cooling conditions, high pump load, etc.

Please note that heavy-duty motors are longer than motors for standard conditions.

TM00 7305 1096

Fig. 9 MS motors

TM01 7873 4799 - GrA4575 3908

Fig. 10 MMS motors

Overtemperature protection

Protecting the motor against too high motor temperature is the simplest and cheapest way of avoiding that the motor life is reduced.

Accessories for protection against overtemperature are available for both Grundfos MS and MMS submersible motors. When the temperature becomes too high, the protection device will cut out, and damage to the pump and motor will be avoided.

MS

The Grundfos MS submersible motors, except MS 402, are available with built-in Tempcon temperature sensor for protection against overtemperature. By means of this sensor it is possible to read out and/or monitor the motor temperature via an MP 204 motor protector.

MMS

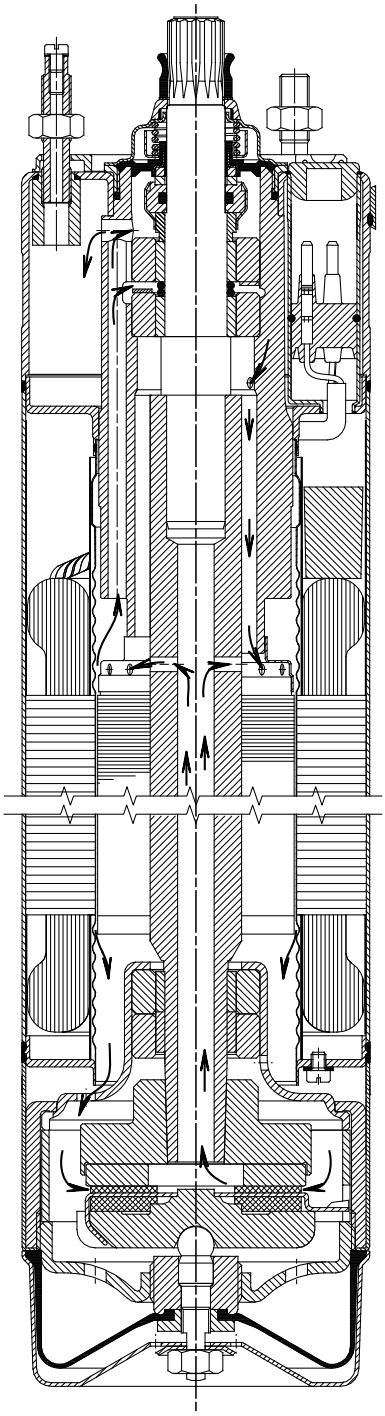
The Grundfos MMS submersible motors are not available with built-in Tempcon temperature sensor. For these motors, we offer Pt100 and Pt1000 sensors for temperature monitoring. Together with either an MP 204 motor protector, a PR 5714 relay or a CU 220 control unit, the sensor ensures that the operating conditions are not exceeded.

Protection against upthrust

In case of a very low counter pressure in connection with start-up, there is a risk that the entire chamber stack may rise. This is called upthrust. Upthrust may damage both pump and motor. Therefore, both Grundfos pumps and motors are protected against upthrust as standard, preventing upthrust from occurring in the critical start-up phase. The protection consists of either a built-in stop ring or hydraulic balancing.

Built-in cooling chambers

In all Grundfos MS submersible motors, an efficient cooling is ensured by cooling chambers at the top and at the bottom of the motor and by an internal circulation of motor liquid. See fig. 11. As long as the required flow velocity past the motor is maintained (see section *Operating conditions*, page 4), cooling of the motor will be efficient.



TM00 5698 0996

Fig. 11 MS 4000

Lightning protection

The smallest Grundfos submersible motors, i.e. MS 402, are all insulated in order to minimise the risk of motor burnout caused by stroke of lightning.

Reduced risk of short-circuit

The embedded stator winding in the Grundfos MS submersible motor is hermetically enclosed in stainless steel. The result is high mechanical stability and optimum cooling. Also, this eliminates the risk of short-circuit of the windings caused by condensed water.

Shaft seal

MS 402

The shaft seal is of the lip seal type characterised by low friction against the rotor shaft.

The choice of rubber offers good wear resistance, good elasticity and resistance to particles. The rubber material is approved for use in drinking water.

MS 4000, MS 6000

The material is ceramic/tungsten carbide providing optimum sealing, optimum wear resistance and long life.

The spring-loaded shaft seal is designed with a large surface and a sand shield. The result is a minimum exchange of pumped liquid and motor liquid and no penetration of particles. Motors, version R, have a SiC/SiC shaft seal according to DIN 24960. Other combinations are available on request.

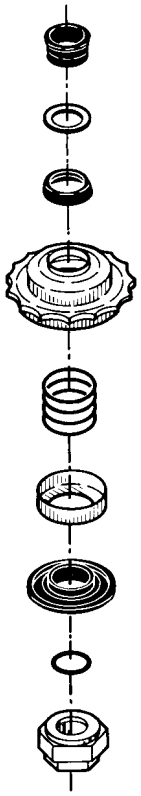
MMS rewindable motors

The standard shaft seal is a ceramic/carbon mechanical shaft seal. The shaft seal is replaceable.

The material provides good wear resistance and resistance to particles.

Together with the shaft seal housing, the sand shield forms a labyrinth seal, which during normal operating conditions prevents penetration of sand particles into the shaft seal.

On request, motors can be supplied with a SiC/SiC seal according to DIN 24960.



TM00 7306 2100

Fig. 12 Shaft seal, MS 4000

Material specification for MS motors

MS 402 and MS 4000 submersible motors

Pos.	Component	MS 402	MS 4000 MS 6000
1	Shaft	EN 1.4057	EN 1.4057
2	Shaft seal	NBR	Ceramic/tungsten carbide
3	Motor sleeve	EN 1.4301	EN 1.4301
4	Motor end shield		EN 1.4301
5	Radial bearing	Ceramic	Ceramic/tungsten carbide
6	Axial bearing	Ceramic/carbon	Ceramic/carbon
	Rubber parts	NBR	NBR

R-version motor

Pos.	Component	MS 4000 MS 6000
1	Shaft	EN 1.4462
2	Shaft seal	NBR/ceramic
3	Motor sleeve	EN 1.4539
4	Motor end shield	EN 1.4539
5	Radial bearing	Ceramic/tungsten carbide
6	Thrust bearing	Ceramic/carbon
	Rubber parts	NBR

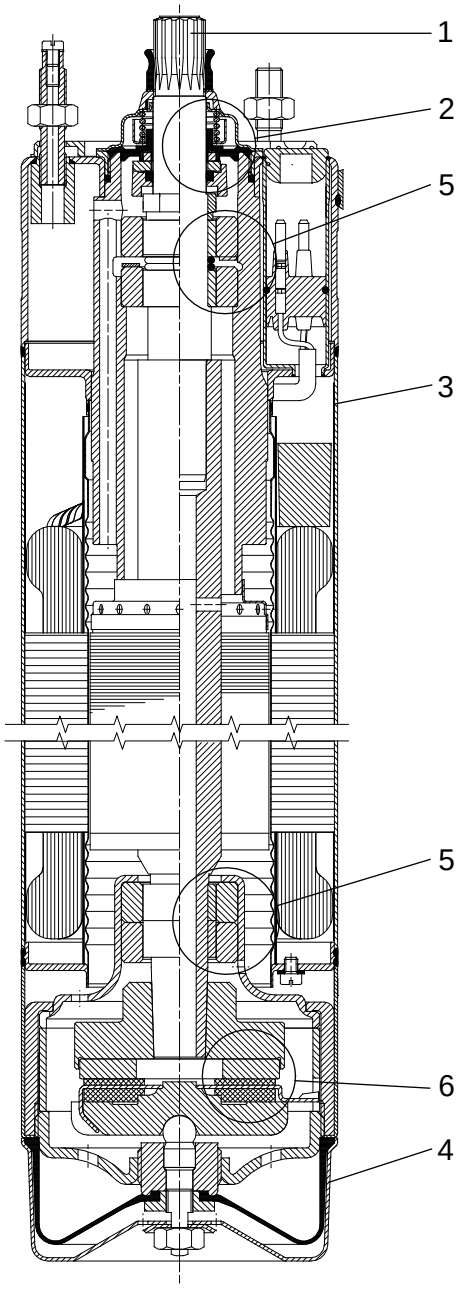


Fig. 13 MS 4000

Material specification for MMS motors

Submersible, rewindable motors

Pos.	Component		Material	EN
202	Shaft		Steel	1.0533
202a	Shaft ends		Stainless steel	1.4460
203/206	Thrust bearing Stationary/rotating part	6" 3.7 to 15 kW	Hardened steel/EPDM	
		12"		
		6" 18.5 to 37 kW	Ceramic/carbon	
		8" to 10"		
204	Bearing bush	6" to 10"	Carbon	
		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

N- and R-versions of MMS motors

Pos.	Component	Material	Version N	Version R
			EN	EN
202	Shaft	Steel	1.0533	1.0533
202a	Shaft ends	Stainless steel	1.4460	1.4462
203/206	Thrust bearing Stationary/rotating part: • 6" (3.7 to 15 kW) • 12"	Hardened steel/EPDM		
	Thrust bearing Stationary/rotating part: • 6" (18.5 to 37 kW) • 8" to 10"	Ceramic/carbon		
204	Bearing bush • 6" to 10"	Carbon		
	Bearing bush • 12"	Stainless steel/NBR		
205	Bearing housing, upper	Stainless steel	1.4401	1.4539
212	Diaphragm	CR		
213	Motor end shield	Stainless steel	1.4401	1.4539
218	Motor sleeve	Stainless steel	1.4401	1.4539
220	Motor cable	EPDM		
226	Shaft seal	Ceramic/carbon		
235	Intermediate housing	Stainless steel	1.4401	1.4539
236	Bearing housing, lower	Stainless steel	1.4401	1.4539

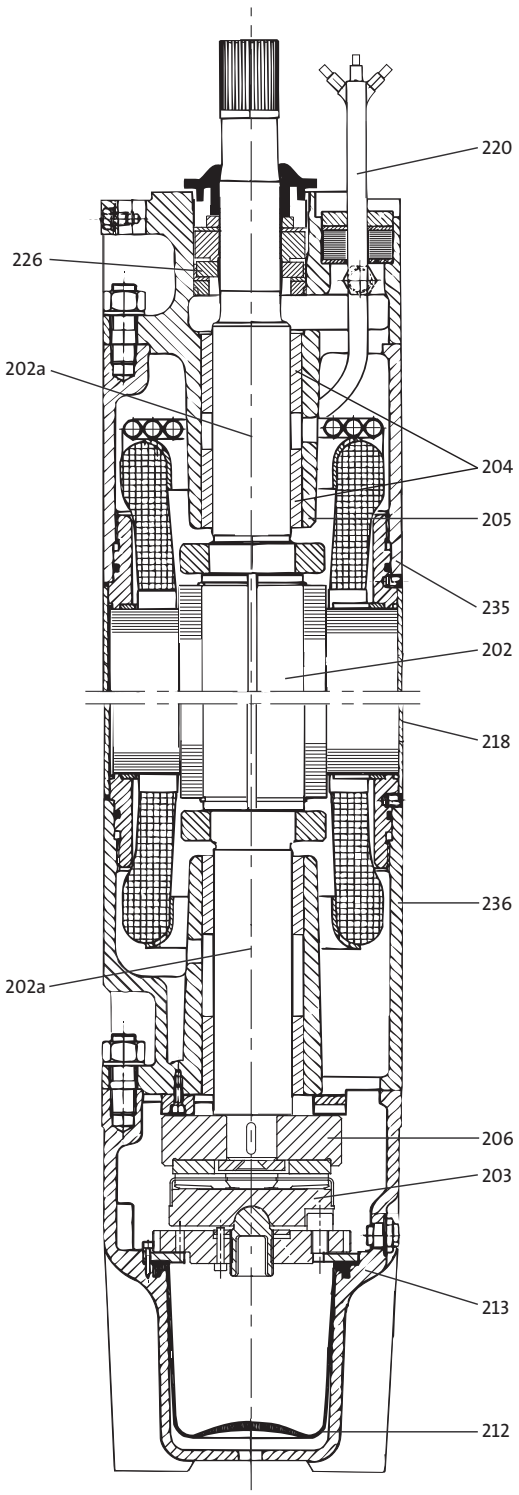
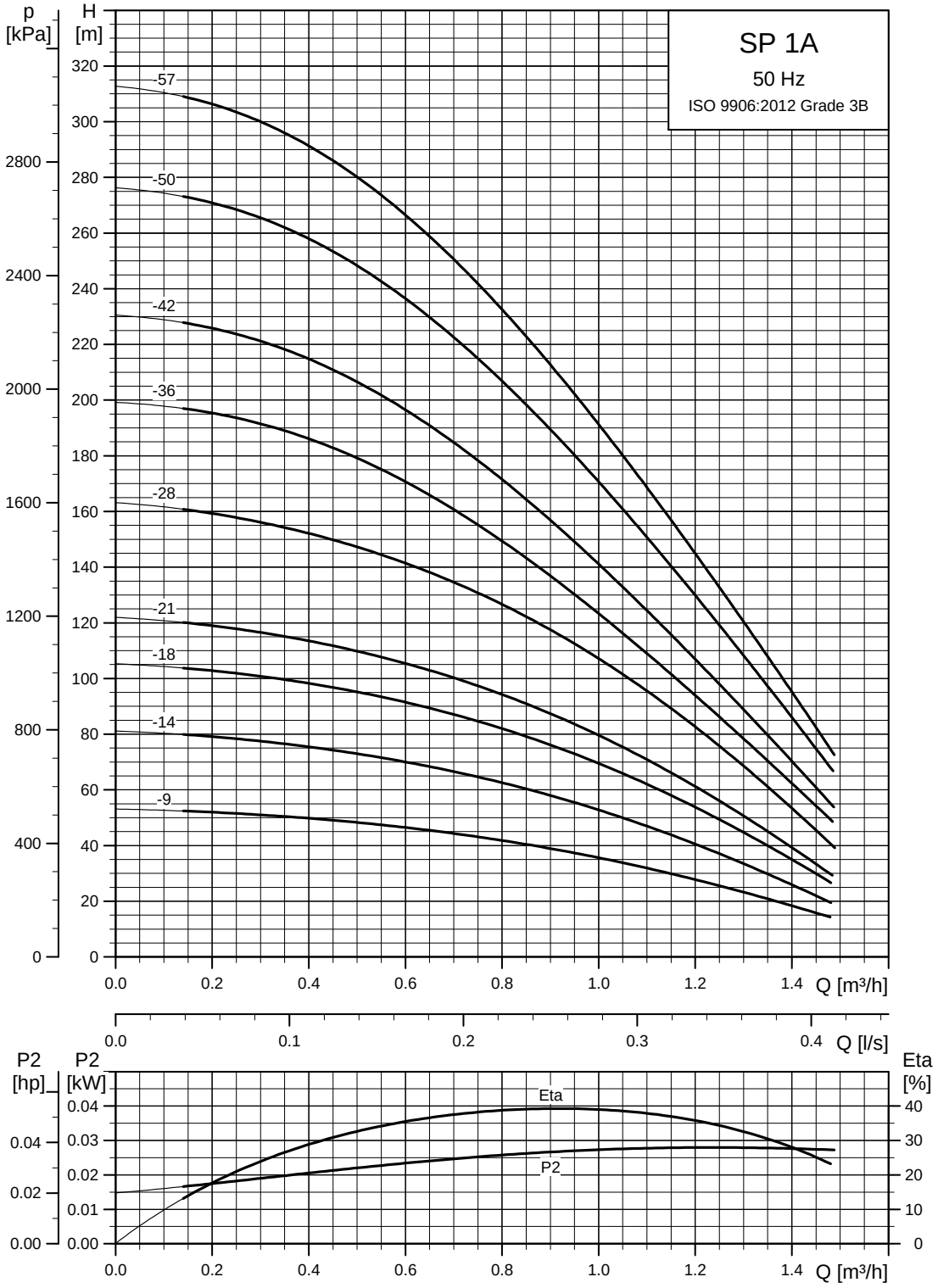


Fig. 14 MMS 10000

4. Performance curves and technical data

SP 1A

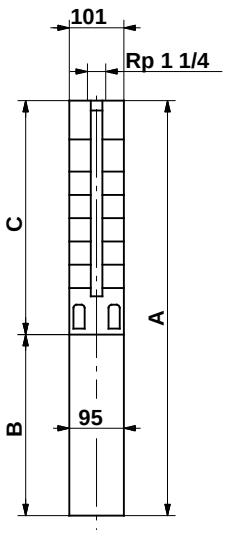
Performance curves



TM00 7271 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



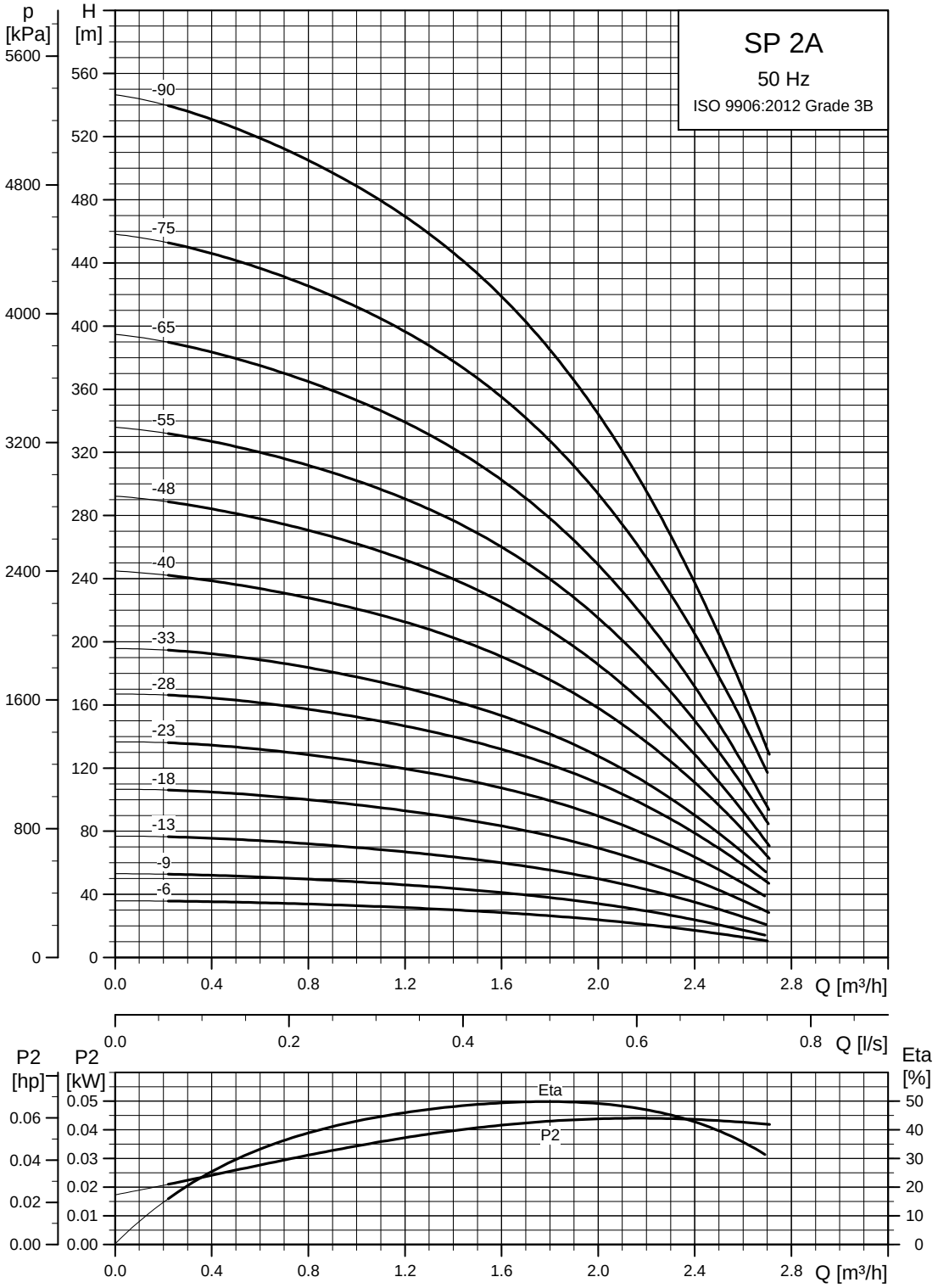
TM00 0955 1196

101 mm = Maximum diameter of pump inclusive of cable guard and motor.

Pump type	Motor			Dimensions [mm]				Net weight [kg]	
				B		A			
	Type	Power [kW]	C	1x230V	3x230V 3x400V	1x230V	3x230V 3x400V	1x230V	3x230V 3x400V
SP 1A-9	MS 402	0.37	344	256	226	600	570	11	9
SP 1A-14	MS 402	0.37	449	256	226	705	675	12	10
SP 1A-18	MS 402	0.55	533	291	241	824	774	14	12
SP 1A-21	MS 402	0.55	596	291	241	887	837	14	12
SP 1A-28	MS 402	0.75	743	306	276	1049	1019	16	15
SP 1A-36	MS 402	1.1	956	346	306	1302	1262	25	23
SP 1A-42	MS 402	1.1	1082	346	306	1428	1388	27	25
SP 1A-50	MS 402	1.5	1250	346	346	1596	1596	30	29
SP 1A-57	MS 402	1.5	1397	346	346	1743	1743	32	32

SP 2A

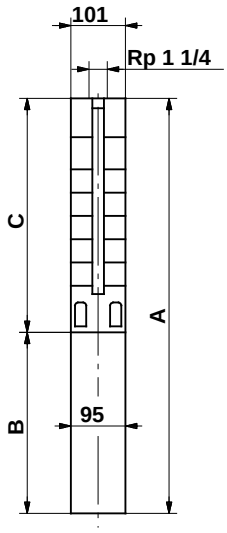
Performance curves



TM00 7272 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 0955 1196

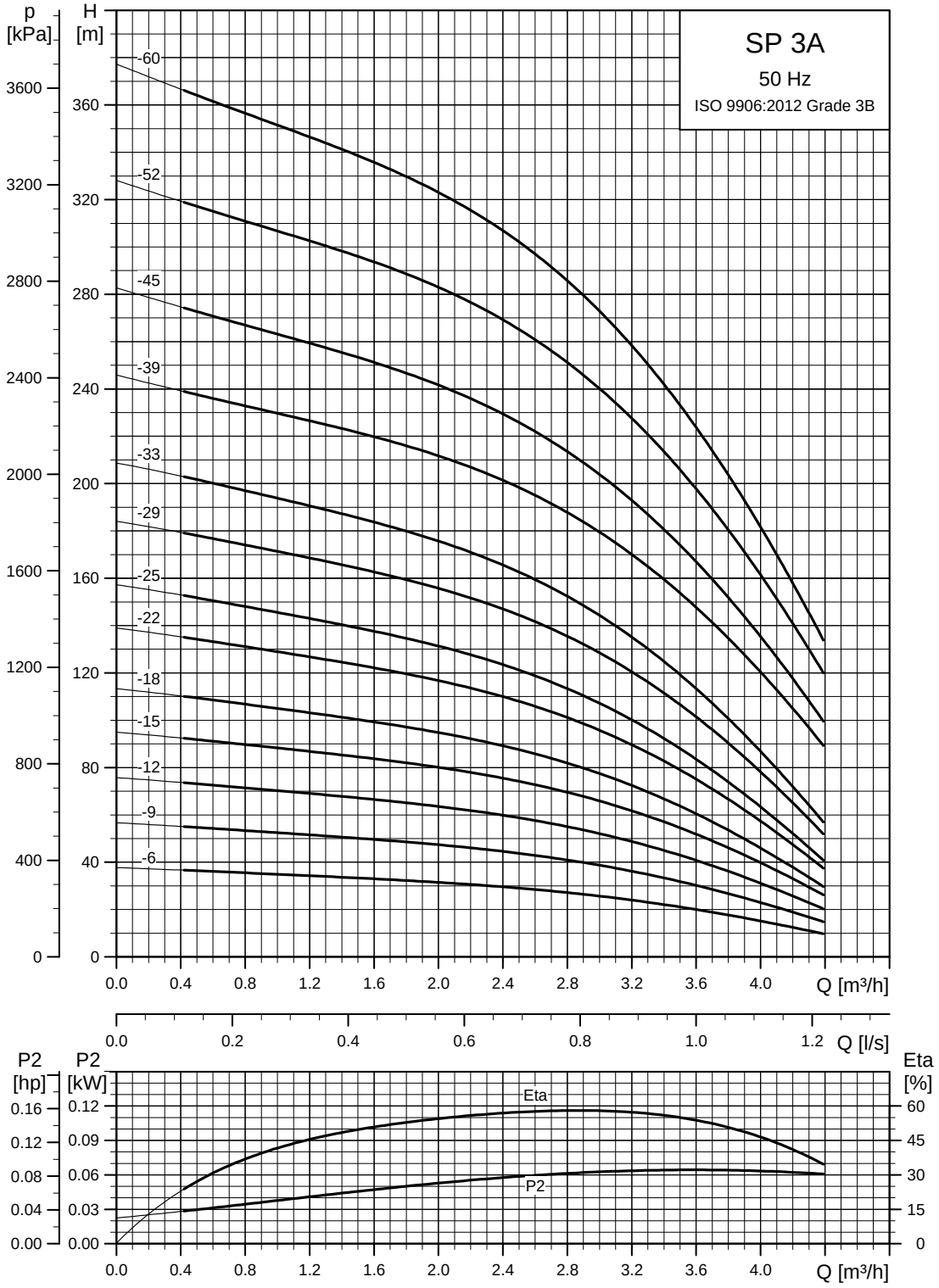
Pump type	Motor			Dimensions [mm]				Net weight [kg]	
				B		A			
	Type	Power [kW]	C	1x230V	3x230V 3x400V	1x230V	3x230V 3x400V	1x230V	3x230V 3x400V
SP 2A-6	MS 402	0.37	281	256	226	537	507	10	9
SP 2A-9	MS 402	0.37	344	256	226	600	570	11	9
SP 2A-13	MS 402	0.55	428	291	241	719	669	13	11
SP 2A-18	MS 402	0.75	533	306	276	839	809	15	13
SP 2A-23	MS 402	1.1	638	346	306	984	944	17	16
SP 2A-28	MS 402	1.5	743	346	346	1089	1089	19	18
SP 2A-33	MS 402	1.5	844	346	346	1190	1190	20	19
SP 2A-40	MS 4000	2.2	1040	573		1613		37	
SP 2A-40	MS 402	2.2	1040		346		1386		27
SP 2A-48	MS 4000	2.2	1208	573		1781		39	
SP 2A-48	MS 402	2.2	1208		346		1554		30
SP 2A-55	MS 4000	3.0	1355		493		1848		38
SP 2A-65	MS 4000	3.0	1565		493		2058		41
SP 2A-75	MS 4000	4.0	1954		573		2527		57
SP 2A-90	MS 4000	4.0	2269		573		2842		64

101 mm = Maximum diameter of pump inclusive of cable guard and motor.

SP 2A-75 and SP 2A-90 are mounted in sleeve for R 1 1/4 connection and with a maximum diameter of 108 mm.

SP 3A

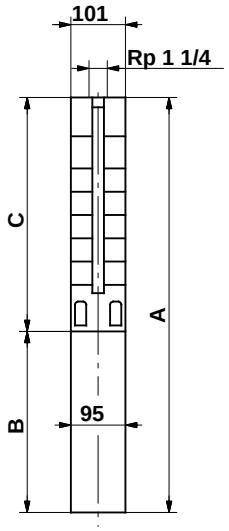
Performance curves



TM00 7273 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



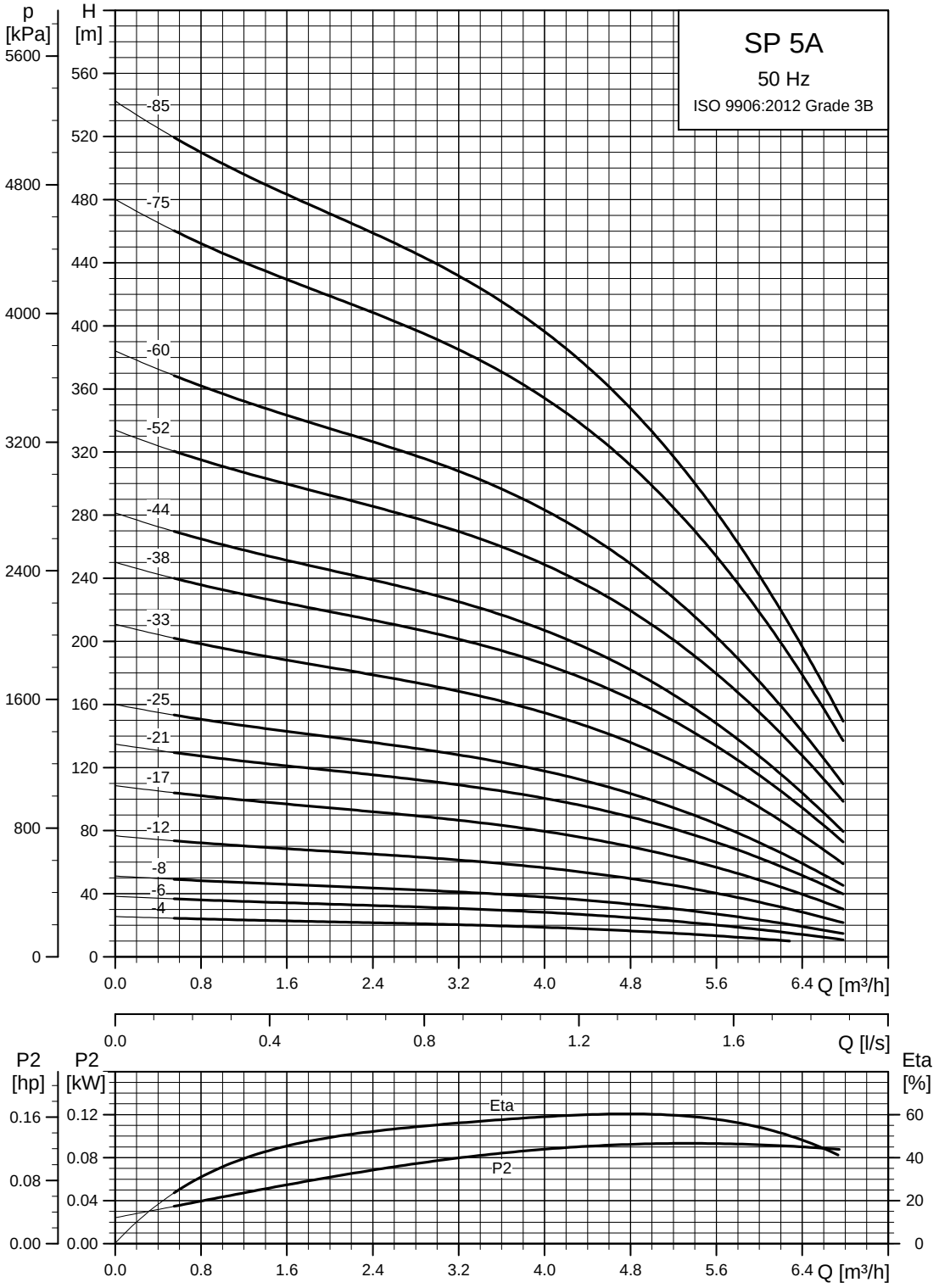
101 mm = Maximum diameter of pump inclusive of cable guard and motor.

Pump type	Motor		C	Dimensions [mm]				Net weight [kg]	
				B		A			
	Type	Power [kW]		1x230V	3x230V 3x400V	1x230V	3x230V 3x400V	1x230V	3x230V 3x400V
SP 3A-6*	MS 402	0.37	281	256	226	537	507	10	9
SP 3A-6N	MS 4000R	2.2	326	573		899		26	
SP 3A-6N	MS 4000R	0.75	326		398		724		18
SP 3A-9*	MS 402	0.55	344	291	241	635	585	12	10
SP 3A-9N	MS 4000R	2.2	389	573		962		27	
SP 3A-9N	MS 4000R	0.75	389		398		787		19
SP 3A-12*	MS 402	0.75	407	306	276	713	683	13	12
SP 3A-12N	MS 4000R	2.2	452	573		1025		28	
SP 3A-12N	MS 4000R	0.75	452		398		850		20
SP 3A-15*	MS 402	1.1	470	346	306	816	776	16	14
SP 3A-15N	MS 4000R	2.2	515	573		1088		29	
SP 3A-15N	MS 4000R	1.1	515		413		928		22
SP 3A-18*	MS 402	1.1	533	346	306	879	839	16	15
SP 3A-18N	MS 4000R	2.2	578	573		1151		30	
SP 3A-18N	MS 4000R	1.1	578		413		991		23
SP 3A-22*	MS 402	1.5	617	346	346	963	963	18	17
SP 3A-22N	MS 4000R	2.2	662	573		1235		31	
SP 3A-22N	MS 4000R	1.5	662		413		1075		24
SP 3A-25*	MS 402	1.5	680	346	346	1026	1026	18	18
SP 3A-25N	MS 4000R	2.2	725	573		1298		32	
SP 3A-25N	MS 4000R	1.5	725		413		1138		25
SP 3A-29*	MS 4000	2.2	764	573		1337		29	
SP 3A-29*	MS 402	2.2	764		346		1110		20
SP 3A-29N	MS 4000R	2.2	809	573	453	1382	1262	33	28
SP 3A-33*	MS 4000	2.2	848	573		1421		30	
SP 3A-33*	MS 402	2.2	848		346		1194		21
SP 3A-33N	MS 4000R	2.2	893	573	453	1466	1346	34	29
SP 3A-39	MS 4000	3.0	1019		493		1512		32
SP 3A-45	MS 4000	3.0	1145		493		1638		34
SP 3A-52	MS 4000	4.0	1292		573		1865		41
SP 3A-60	MS 4000	4.0	1460		573		2033		43

* Pumps with spline shaft are only available in stainless steel EN 1.4301/AISI 304.
Note: All other pumps listed above are also available in N- and R-versions. See page 5.

SP 5A

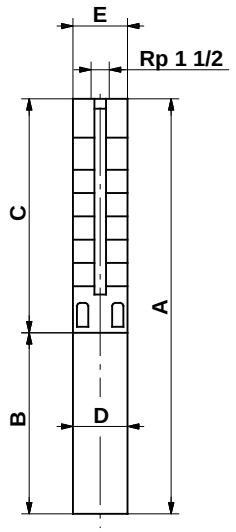
Performance curves



TM00 7274 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 0956 1196

SP 5A-75 and SP 5A-85 are mounted in sleeve for R 1 1/2 connection.

Pump type	Motor			Dimensions [mm]						Net weight [kg]	
				B		A		D	E		
	Type	Power [kW]	C	1x230V	3x230V 3x400V	1x230V	3x230V 3x400V			1x230V	3x230V 3x400V
SP 5A-4*	MS 402	0.37	240	256	226	496	466	95	101	10	8
SP 5A-4N	MS 4000R	2.2	284	573		857		95	101	25	
SP 5A-4N	MS 4000R	0.75	284		398		682	95	101		17
SP 5A-6*	MS 402	0.55	282	291	241	573	523	95	101	11	10
SP 5A-6N	MS 4000R	2.2	326	573		899		95	101	26	
SP 5A-6N	MS 4000R	0.75	326		398		724	95	101		18
SP 5A-8*	MS 402	0.75	324	306	276	630	600	95	101	13	11
SP 5A-8N	MS 4000R	2.2	368	573		941		95	101	27	
SP 5A-8N	MS 4000R	0.75	368		398		766	95	101		19
SP 5A-12*	MS 402	1.1	408	346	306	754	714	95	101	15	13
SP 5A-12N	MS 4000R	2.2	452	573		1025		95	101	28	
SP 5A-12N	MS 4000R	1.1	452		413		865	95	101		21
SP 5A-17*	MS 402	1.5	513	346	346	859	859	95	101	17	16
SP 5A-17N	MS 4000R	2.2	557	573		1130		95	101	29	
SP 5A-17N	MS 4000R	1.5	557		413		970	95	101		22
SP 5A-21*	MS 4000	2.2	597	573		1170		95	101	27	
SP 5A-21*	MS 402	2.2	597		346		943	95	101		18
SP 5A-21N	MS 4000R	2.2	641	573	453	1214	1094	95	101	30	25
SP 5A-25*	MS 4000	2.2	681	573		1254		95	101	28	
SP 5A-25*	MS 402	2.2	681		346		1027	95	101		19
SP 5A-25N	MS 4000R	2.2	725	573	453	1298	1178	95	101	32	27
SP 5A-33*	MS 4000	3.0	849		493		1342	95	101		26
SP 5A-33N	MS 4000R	3.0	893		493		1386	95	101		30
SP 5A-38	MS 4000	4.0	998		573		1571	95	101		36
SP 5A-44	MS 4000	4.0	1124		573		1697	95	101		38
SP 5A-52	MS 4000	5.5	1292		673		1965	95	101		46
SP 5A-60	MS 4000	5.5	1460		673		2133	95	101		48
SP 5A-52	MS 6000	5.5	1354		541		1895	138	138		60
SP 5A-60	MS 6000	5.5	1522		541		2063	138	138		63
SP 5A-75	MS 6000	7.5	2146		571		2717	138	140		86
SP 5A-85	MS 6000	7.5	2356		571		2927	138	140		92

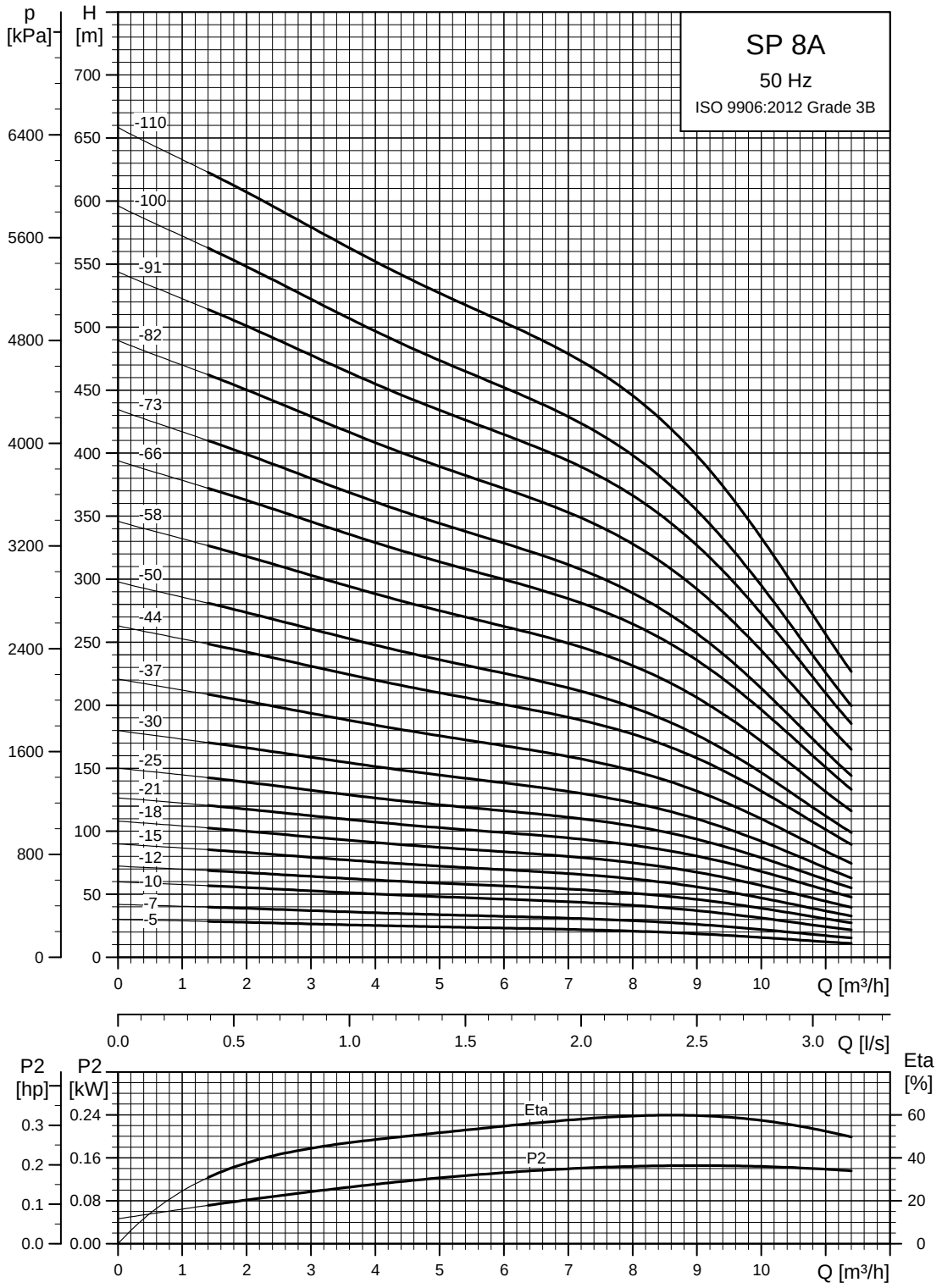
E = Maximum diameter of pump inclusive of cable guard and motor.

* Pumps with spline shaft are only available in stainless steel EN 1.4301/AISI 304.

Note: All other pumps listed above are also available in N- and R-versions. See page 5.
Pumps mounted in sleeve are only available in standard and N-versions.

SP 8A

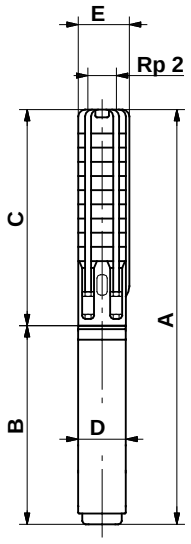
Performance curves



TM00 7275 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 0957 1196

SP 8A-58(N) to SP 8A-110(N) are mounted in sleeve for R 2 connection.

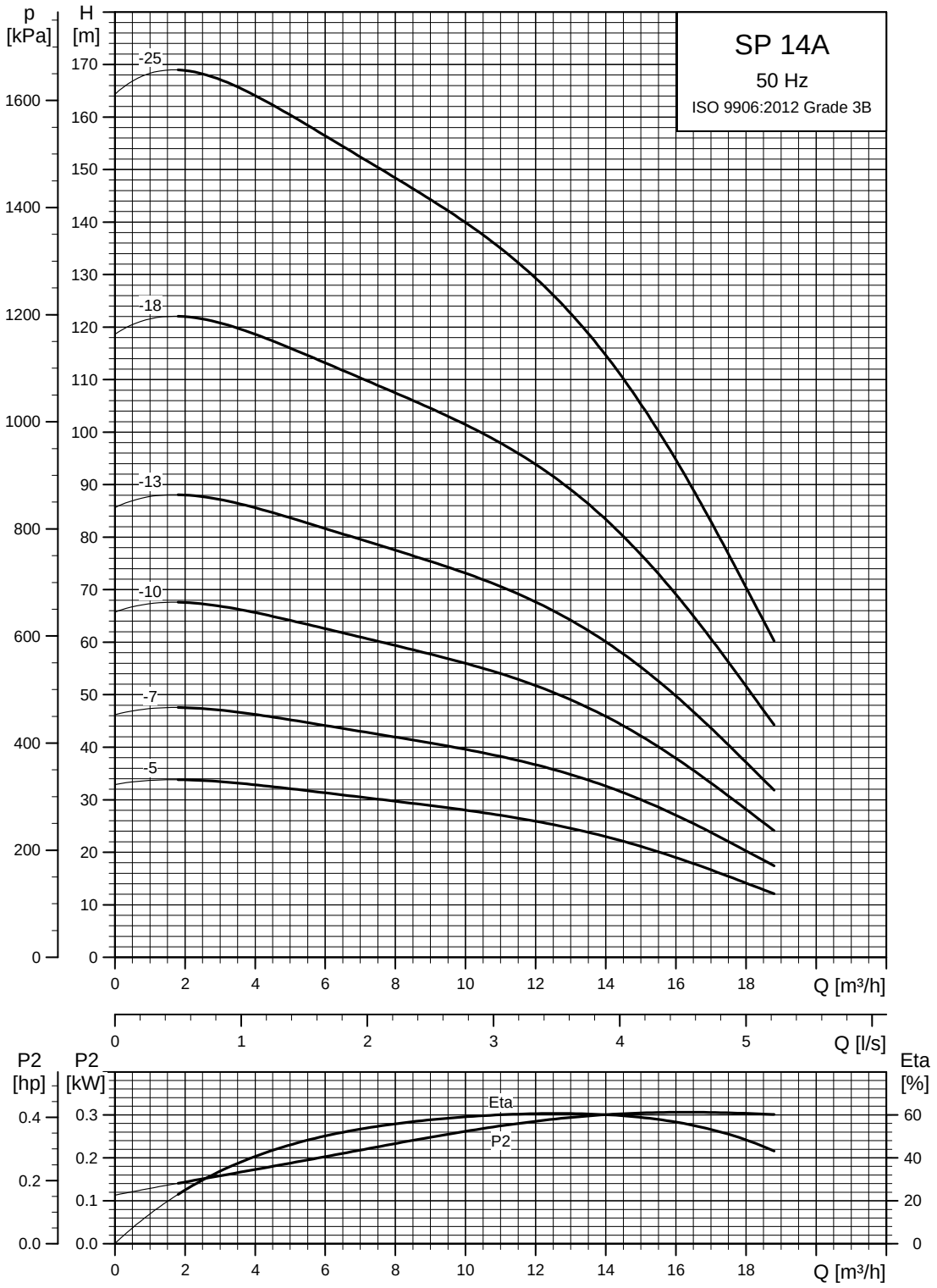
Pump type	Motor		Dimensions [mm]							Net weight [kg]	
	Type	Power [kW]	C	B		A		D	E		
				1x230V	3x230V 3x400V	1x230V	3x230V 3x400V			1x230V	3x230V 3x400V
SP 8A-5	MS 402	0.75	409	306	276	715	685	95	101	15	13
SP 8A-5	MS 4000	2.2	409	573		982		95	101	27	
SP 8A-5	MS 4000R	0.75	409		398		807	95	101		19
SP 8A-7	MS 402	1.1	493	346	306	839	799	95	101	17	16
SP 8A-7	MS 4000	2.2	493	573		1066		95	101	28	
SP 8A-7	MS 4000R	1.1	493		413		906	95	101		21
SP 8A-10	MS 402	1.5	619	346	346	965	965	95	101	19	19
SP 8A-10	MS 4000	2.2	619	573		1192		95	101	30	
SP 8A-10	MS 4000R	1.5	619		413		1032	95	101		23
SP 8A-12	MS 4000	2.2	703	573		1276		95	101	30	
SP 8A-12	MS 402	2.2	703		346		1049	95	101		21
SP 8A-12	MS 4000	2.2	703	573	453	1276	1156	95	101	30	25
SP 8A-15	MS 4000	2.2	829	573		1402		95	101	32	
SP 8A-15	MS 402	2.2	829		346		1175	95	101		23
SP 8A-15	MS 4000	2.2	829	573	453	1402	1282	95	101	32	27
SP 8A-18	MS 4000	3.0	955		493		1448	95	101		29
SP 8A-21	MS 4000	4.0	1081		573		1654	95	101		35
SP 8A-25	MS 4000	4.0	1249		573		1822	95	101		37
SP 8A-30	MS 4000	5.5	1459		673		2132	95	101		45
SP 8A-37	MS 4000	5.5	1753		673		2426	95	101		49
SP 8A-30	MS 6000	5.5	1521		541		2062	138	138		56
SP 8A-37	MS 6000	5.5	1521		541		2356	138	138		60
SP 8A-44	MS 4000	7.5	1815		773		2824	95	101		60
SP 8A-44	MS 6000	7.5	2109		571		2680	138	138		66
SP 8A-50	MS 4000	7.5	2303		773		3076	95	101		64
SP 8A-50	MS 6000	7.5	2361		571		2932	138	138		70
SP 8A-58	MS 6000	9.2	3013		601		3614	138	140		104
SP 8A-66	MS 6000	11.0	3349		631		3980	138	140		114
SP 8A-73	MS 6000	11.0	3643		631		4274	138	140		120
SP 8A-82	MS 6000	13.0	4021		661		4682	138	140		131
SP 8A-91	MS 6000	15.0	4399		696		5095	138	140		143
SP 8A-100	MS 6000	15.0	4777		696		5473	138	140		150
SP 8A-110	MS 6000	18.5	5197		751		5948	138	140		164

E = Maximum diameter of pump inclusive of cable guard and motor.

Note: The pump types above are also available in N- and R-versions. See page 5.
Pumps mounted in sleeve are only available in standard and N-versions.

SP 14A

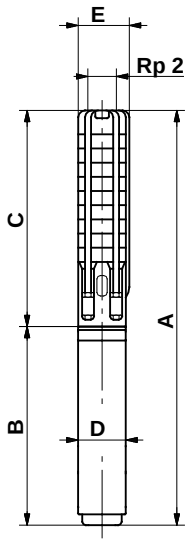
Performance curves



TM00 7276 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 0957 1196

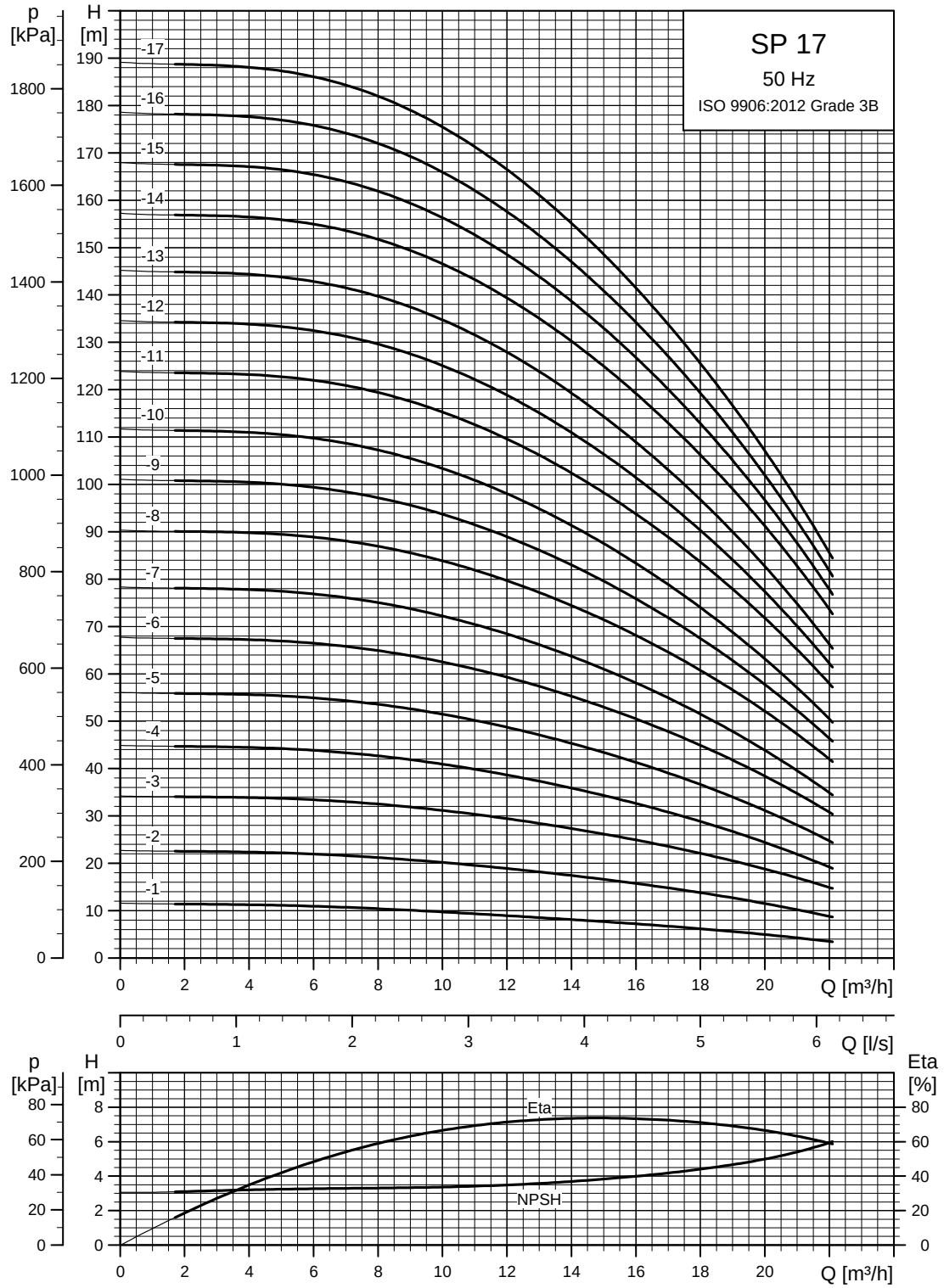
Pump type	Motor			Dimensions [mm]						Net weight [kg]	
				B		A		D	E		
	Type	Power [kW]	C	1x230V	3x230V 3x400V	1x230V	3x230V 3x400V			1x230V	3x230V 3x400V
SP 14A-5	MS 402	1.5	510	346	346	856	856	95	101	18	17
SP 14A-7	MS 4000	2.2	640	573		1213		95	101	29	
SP 14A-7	MS 402	2.2	640		346		986	95	101		19
SP 14A-10	MS 4000	3.0	835		493		1328	95	101		27
SP 14A-13	MS 4000	4.0	1030		573		1603	95	101		33
SP 14A-18	MS 4000	5.5	1355		673		2028	95	101		41
SP 14A-25	MS 4000	7.5	1810		773		2584	95	101		67
SP 14A-18	MS 6000	5.5	1417		541		1958	138	138		52
SP 14A-25	MS 6000	7.5	1872		571		2443	138	138		60

E = Maximum diameter of pump inclusive of cable guard and motor.

Note: The pump types above are also available in N-versions. See page 5.

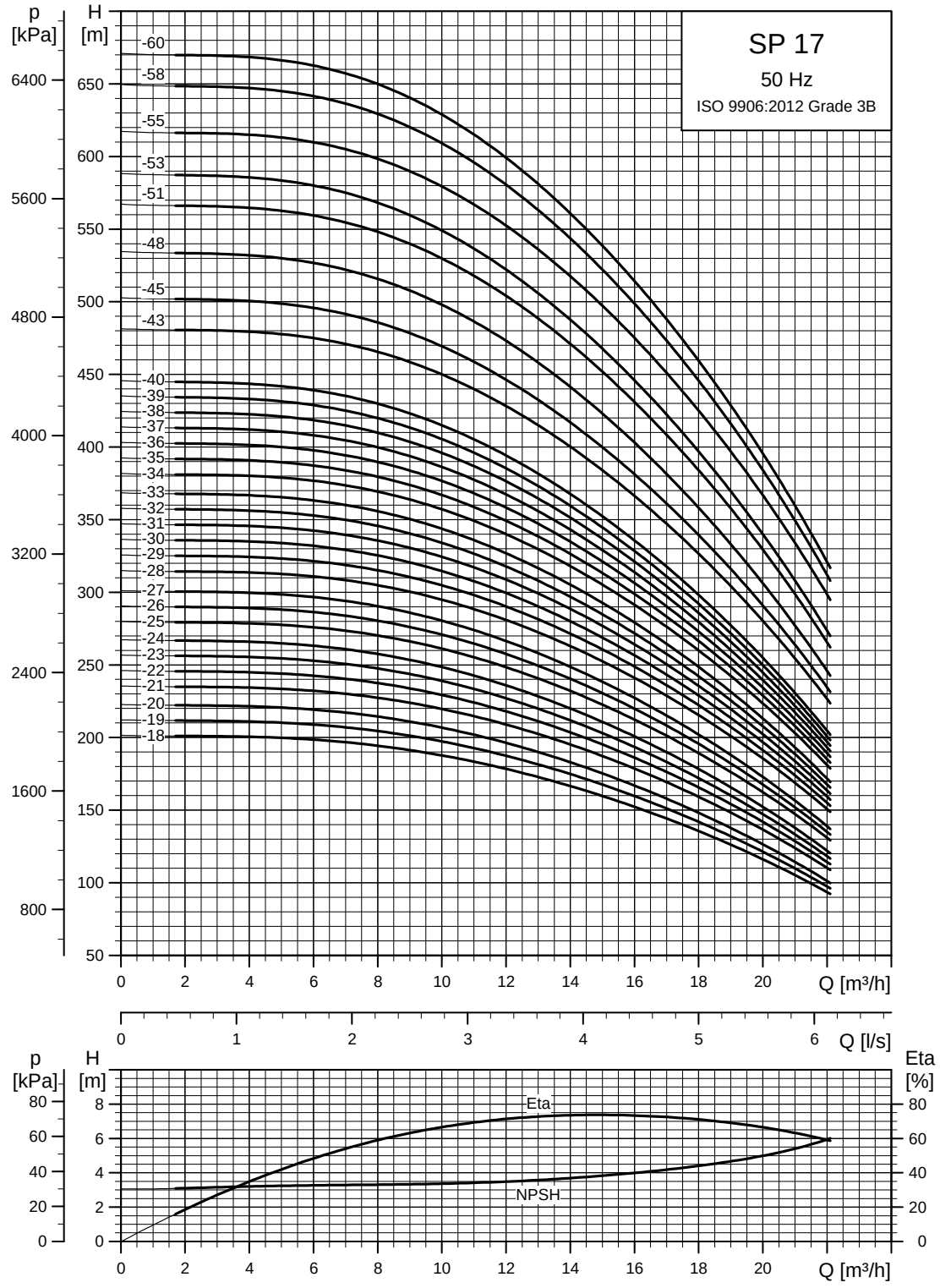
SP 17

Performance curves



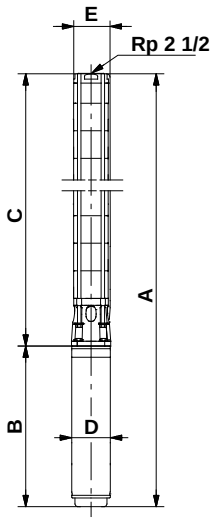
TM01 8757 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.



Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM01 2435 1798

SP 17-43 to SP 17-60 are mounted in sleeve for R 3 connection.

The pump types listed are also available in N- and R-versions. See page 5.

Pumps mounted in sleeve are only available in standard and N-versions.

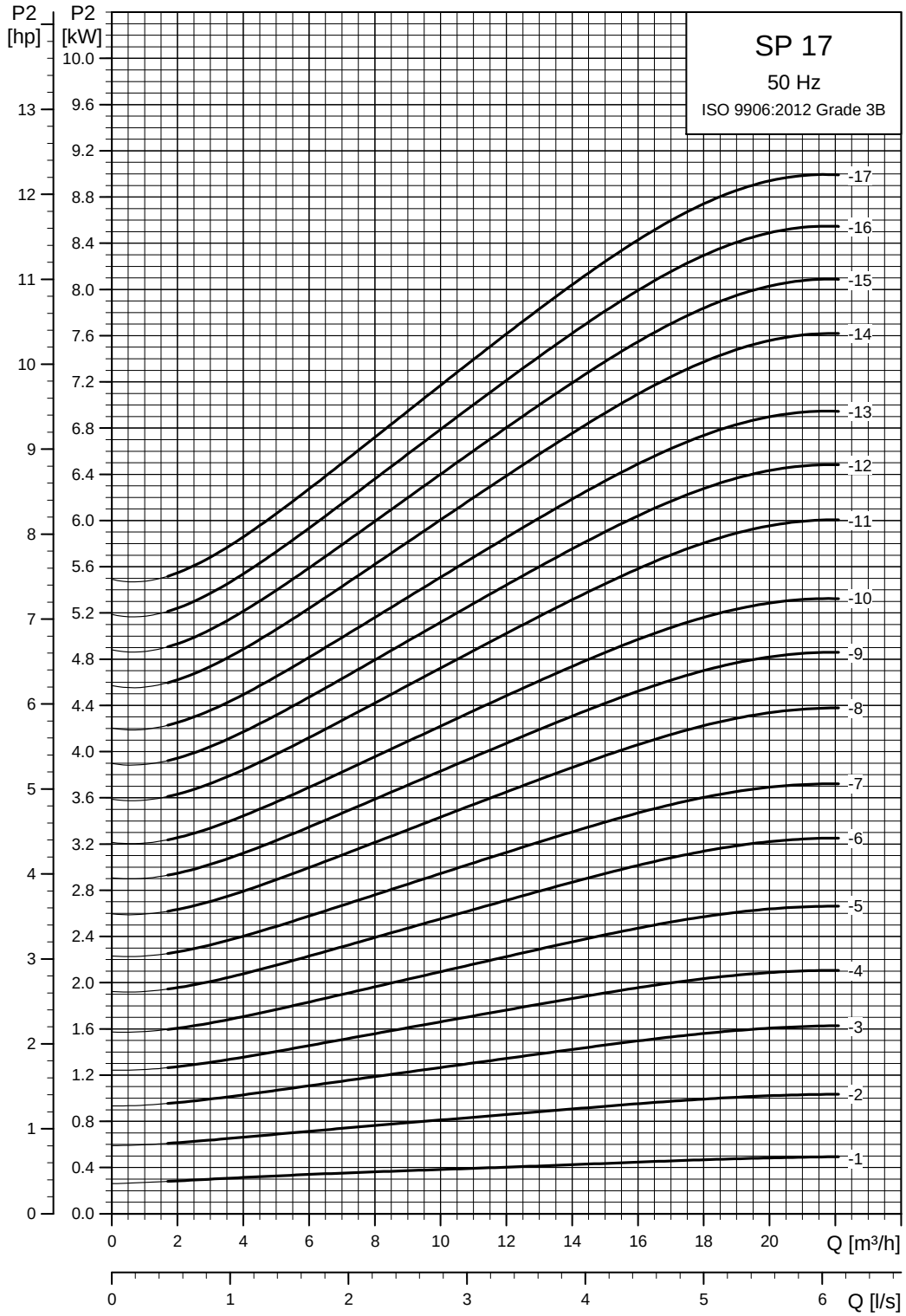
Other types of connection are possible by means of connecting pieces. See page 83.

* Maximum diameter of pump with one motor cable.

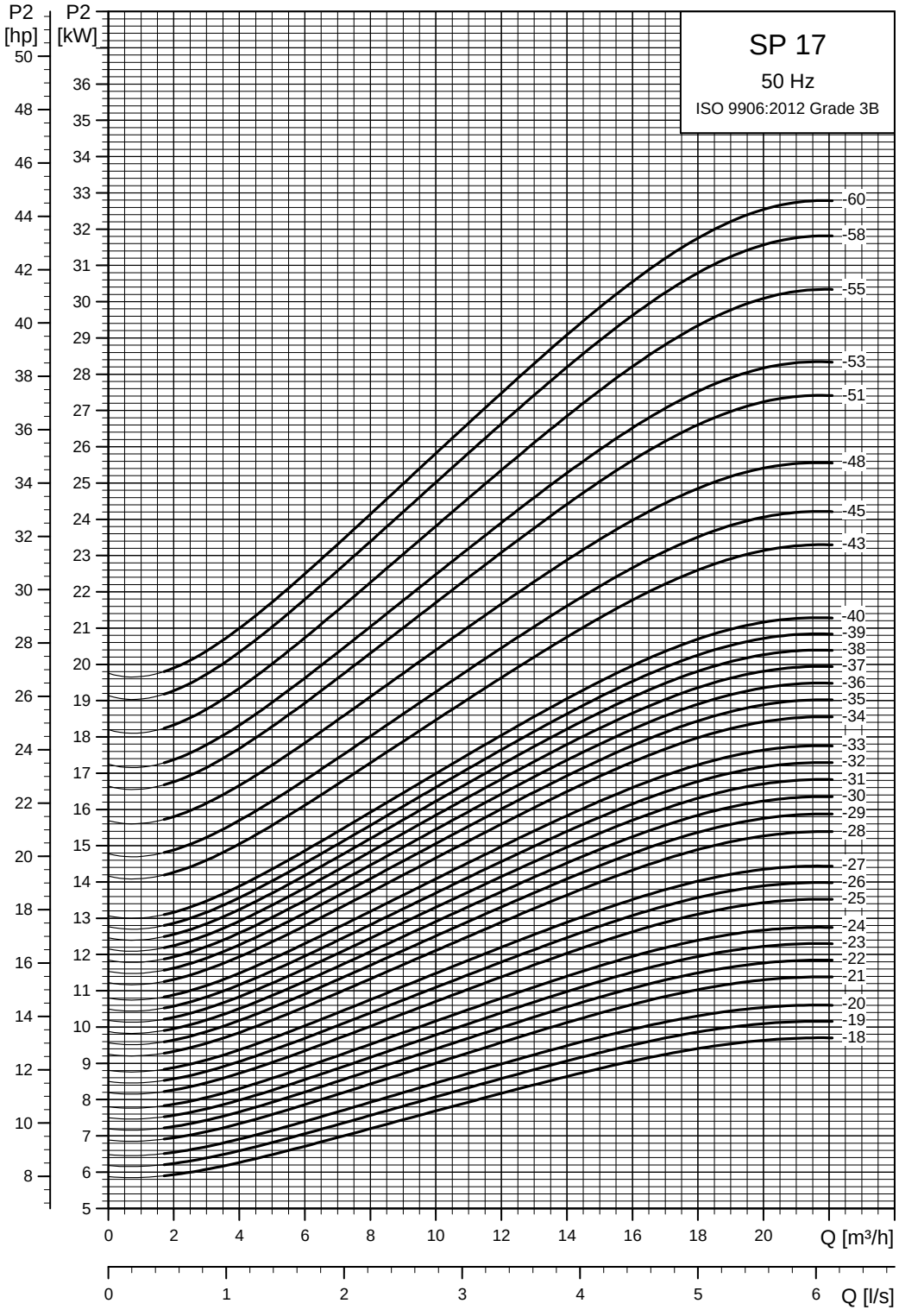
** Maximum diameter of pump with two motor cables.

Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	C	B	A	D	E*	E**	
Single-phase, 1 x 230 V									
SP 17-1	MS 402	0.55	324	317	641	95	134		12
SP 17-1	MS 4000	2.2	324	577	901	95	134		26
SP 17-2	MS 402	1.1	384	387	771	95	134		17
SP 17-2	MS 4000	2.2	384	577	961	95	134		27
SP 17-3	MS 4000	2.2	444	577	1021	95	134		28
SP 17-4	MS 4000	2.2	504	577	1081	95	134		30
Three-phase, 3 x 230 V / 3 x 400 V									
SP 17-1	MS 402	0.55	324	282	606	95	134		11
SP 17-1	MS 4000	0.75	324	402	726	95	134		18
SP 17-2	MS 402	1.1	384	347	731	95	134		15
SP 17-2	MS 4000	1.1	384	417	801	95	134		20
SP 17-3	MS 402	2.2	444	387	831	95	134		19
SP 17-3	MS 4000	2.2	444	457	901	95	134		23
SP 17-4	MS 402	2.2	504	387	891	95	134		21
SP 17-4	MS 4000	2.2	504	457	961	95	134		25
SP 17-5	MS 4000	3.0	564	497	1061	95	134		27
SP 17-6	MS 4000	4.0	624	577	1201	95	134		32
SP 17-7	MS 4000	4.0	684	577	1261	95	134		34
SP 17-8	MS 4000	5.5	744	677	1421	95	134		40
SP 17-9	MS 4000	5.5	804	677	1481	95	134		42
SP 17-10	MS 4000	5.5	864	677	1541	95	134		43
SP 17-11	MS 4000	7.5	924	777	1701	95	134		50
SP 17-12	MS 4000	7.5	984	777	1761	95	134		51
SP 17-13	MS 4000	7.5	1044	777	1821	95	134		53
SP 17-8	MS 6000	5.5	763	544	1307	143	142	144	49
SP 17-9	MS 6000	5.5	823	544	1367	143	142	144	50
SP 17-10	MS 6000	5.5	883	544	1427	143	142	144	52
SP 17-11	MS 6000	7.5	943	574	1517	143	142	144	56
SP 17-12	MS 6000	7.5	1003	574	1577	143	142	144	58
SP 17-13	MS 6000	7.5	1063	574	1637	143	142	144	59
SP 17-14	MS 6000	9.2	1123	604	1727	143	142	144	66
SP 17-15	MS 6000	9.2	1183	604	1787	143	142	144	67
SP 17-16	MS 6000	9.2	1243	604	1847	143	142	144	69
SP 17-17	MS 6000	9.2	1303	604	1907	143	142	144	70
SP 17-18	MS 6000	11	1363	634	1997	143	142	144	75
SP 17-19	MS 6000	11	1423	634	2057	143	142	144	76
SP 17-20	MS 6000	11	1483	634	2117	143	142	144	77
SP 17-21	MS 6000	13	1543	664	2207	143	142	144	82
SP 17-22	MS 6000	13	1603	664	2267	143	142	144	83
SP 17-23	MS 6000	13	1663	664	2327	143	142	144	84
SP 17-24	MS 6000	13	1723	664	2387	143	142	144	86
SP 17-25	MS 6000	15	1783	699	2482	143	142	144	91
SP 17-26	MS 6000	15	1843	699	2542	143	142	144	92
SP 17-27	MS 6000	15	1903	699	2602	143	142	144	94
SP 17-28	MS 6000	18.5	1963	754	2717	143	142	144	101
SP 17-29	MS 6000	18.5	2023	754	2777	143	142	144	102
SP 17-30	MS 6000	18.5	2083	754	2837	143	142	144	103
SP 17-31	MS 6000	18.5	2143	754	2897	143	142	144	105
SP 17-32	MS 6000	18.5	2203	754	2957	143	142	144	106
SP 17-33	MS 6000	18.5	2263	754	3017	143	142	144	108
SP 17-34	MS 6000	22	2323	814	3137	143	142	144	115
SP 17-35	MS 6000	22	2383	814	3197	143	142	144	116
SP 17-36	MS 6000	22	2443	814	3257	143	142	144	118
SP 17-37	MS 6000	22	2503	814	3317	143	142	144	119
SP 17-38	MS 6000	22	2563	814	3377	143	142	144	120
SP 17-39	MS 6000	22	2623	814	3437	143	142	144	122
SP 17-40	MS 6000	22	2683	814	3497	143	142	144	123
SP 17-43	MS 6000	26	3215	874	4089	143	175	181	164
SP 17-45	MS 6000	26	3335	874	4209	143	175	181	167
SP 17-48	MS 6000	26	3515	874	4389	143	175	181	173
SP 17-51	MS 6000	30	3695	944	4639	143	175	181	186
SP 17-53	MS 6000	30	3815	944	4759	143	175	181	189
SP 17-55	MMS6	37	3935	1312	5247	144	175	181	234
SP 17-58	MMS6	37	4115	1312	5427	144	175	181	240
SP 17-60	MMS6	37	4235	1312	5547	144	175	181	243

Power curves



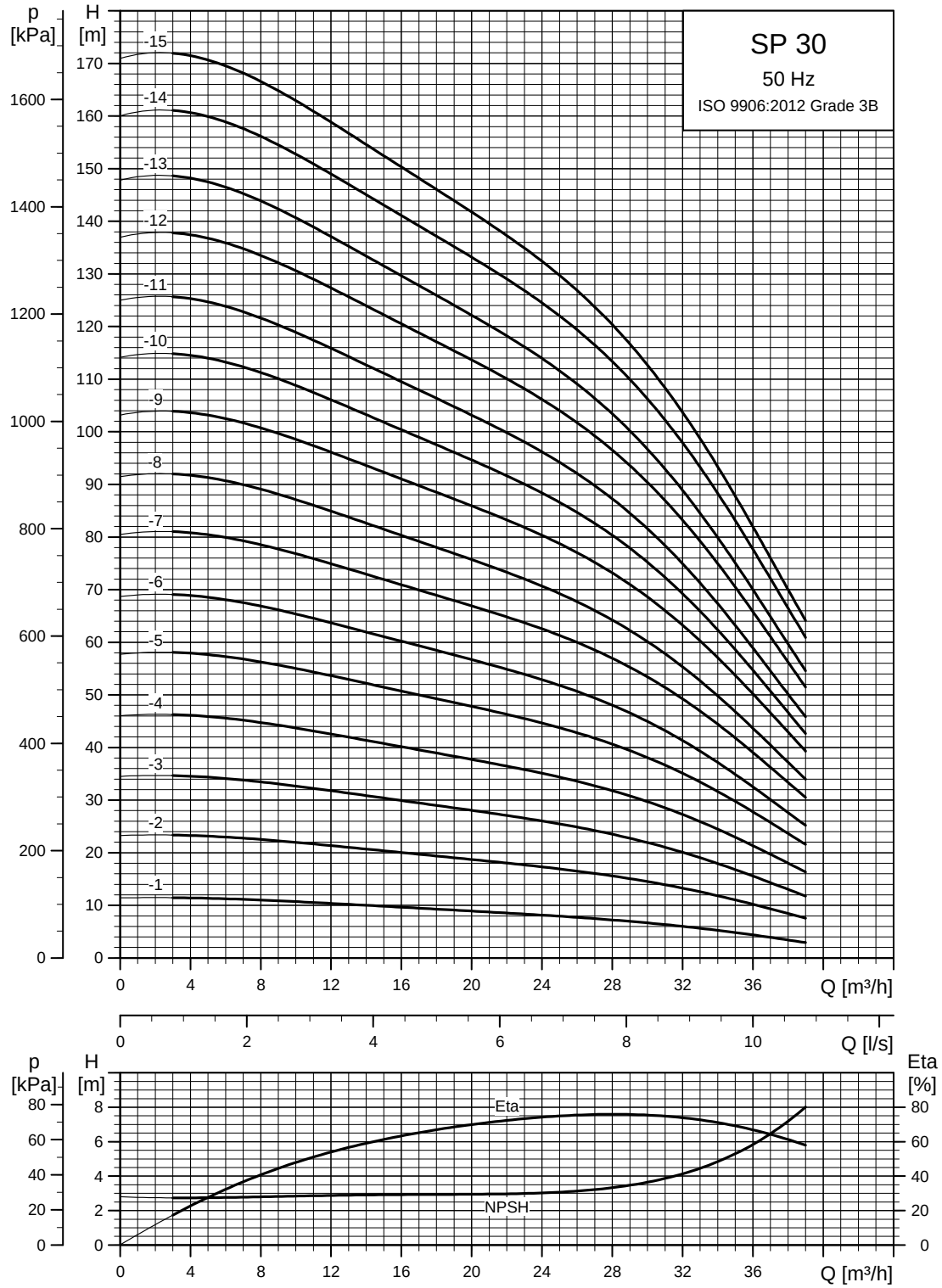
TM01 8759 4702



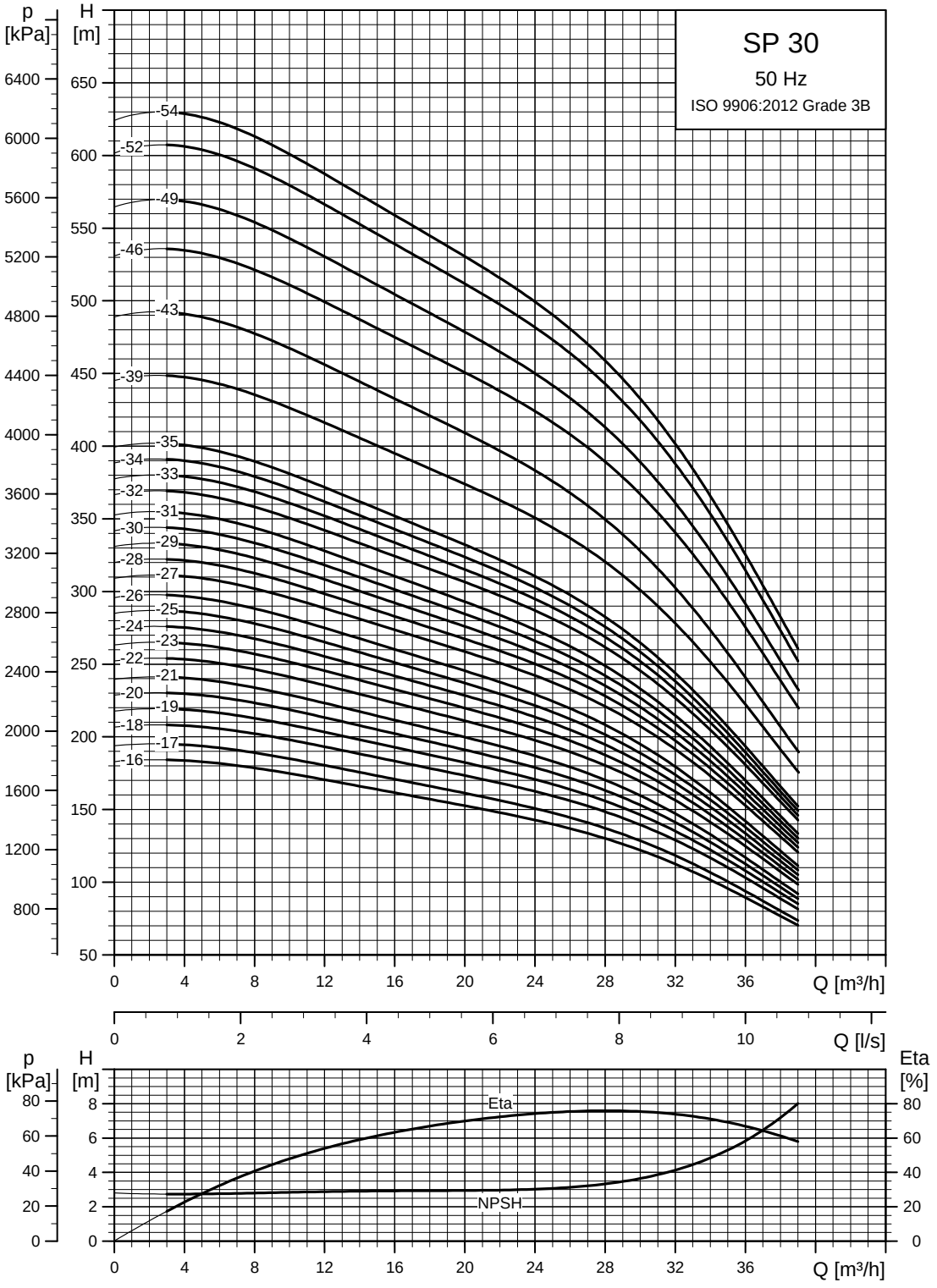
TM01 8760 4702

SP 30

Performance curves



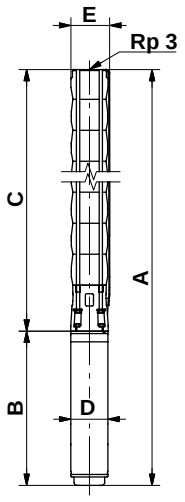
Explanation of efficiency curve, please see *Curve conditions*, page 4.



TM01 8762 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



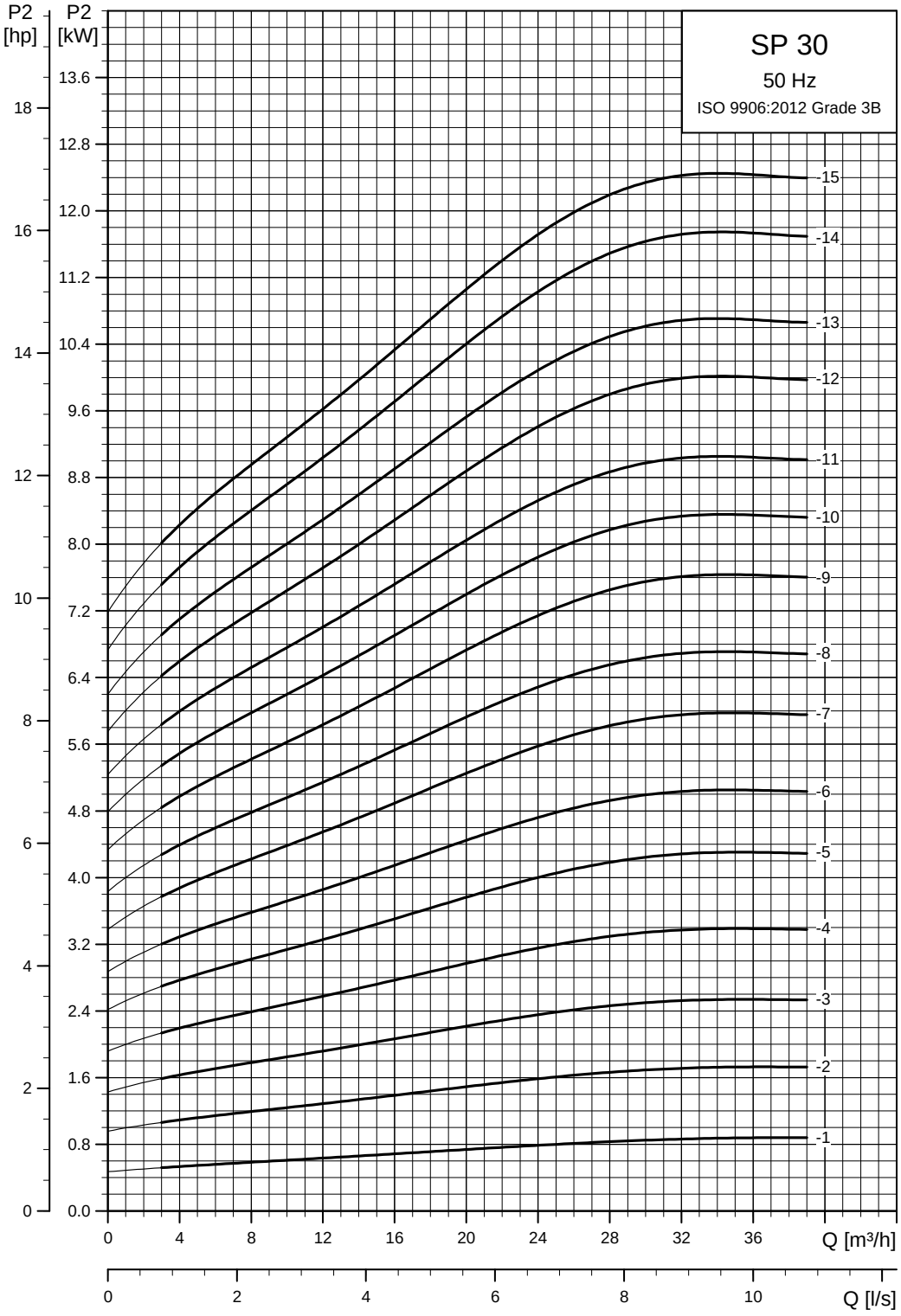
TM00 0960 1196

SP 30-39 to SP 30-54 are mounted in sleeve for R 3 connection.

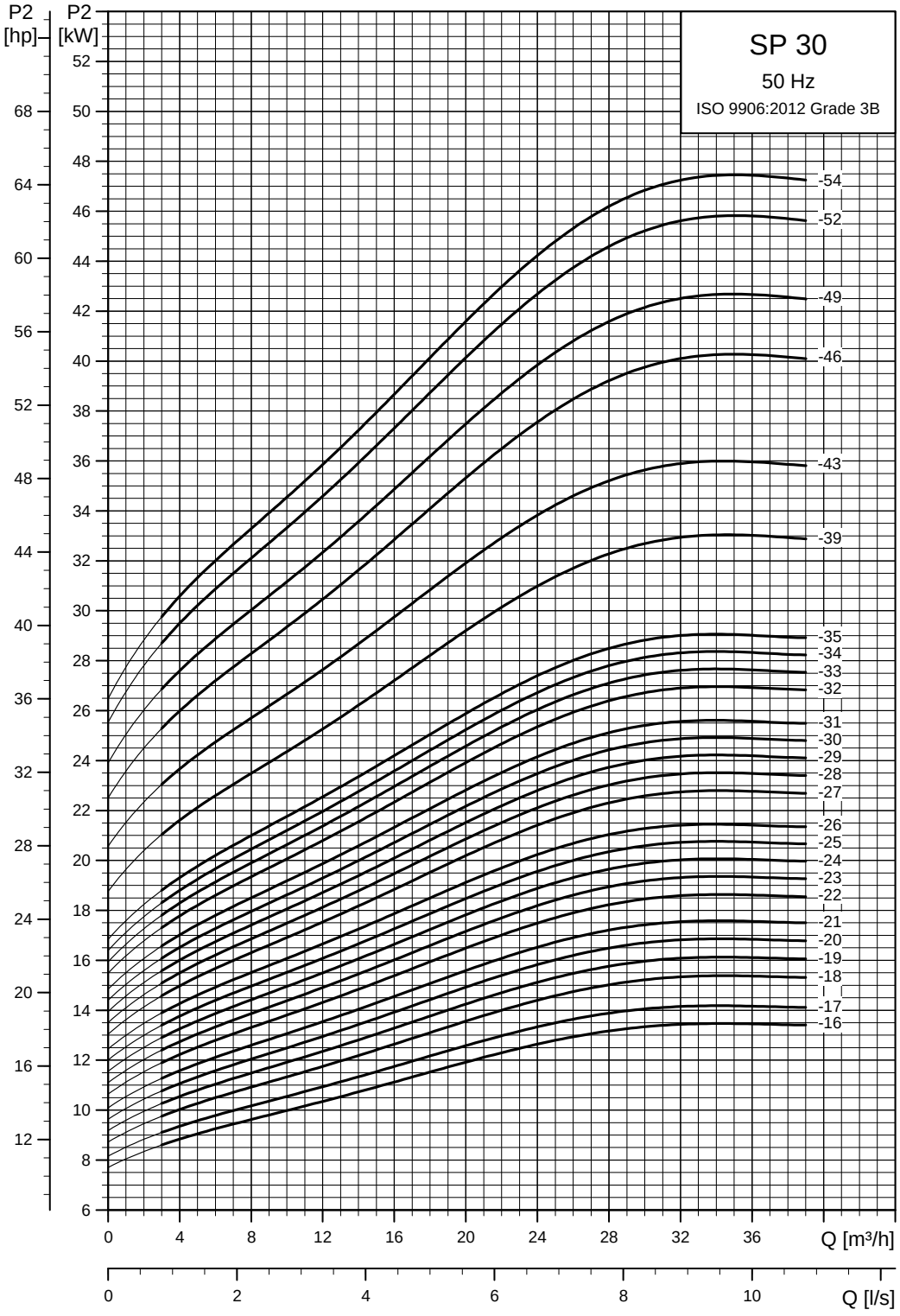
Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	C	B	A	D	E*	E**	
Single-phase, 1 x 230 V									
SP 30-1	MS 402	1.1	358	387	745	95	134		16
SP 30-1	MS 4000	2.2	358	577	935	95	134		27
SP 30-2	MS 4000	2.2	454	577	1031	95	134		29
Three-phase, 3 x 230 V / 3 x 400 V									
SP 30-1	MS 402	1.1	358	347	705	95	134		15
SP 30-1	MS 4000	1.1	358	417	775	95	134		20
SP 30-2	MS 402	2.2	387	457	844	95	134		19
SP 30-2	MS 4000	2.2	454	457	911	95	134		24
SP 30-3	MS 4000	3.0	550	497	1047	95	134		26
SP 30-4	MS 4000	4.0	646	577	1223	95	134		32
SP 30-5	MS 4000	5.5	742	677	1419	95	134		39
SP 30-6	MS 4000	5.5	838	677	1515	95	134		41
SP 30-7	MS 4000	7.5	934	777	1711	95	134		48
SP 30-8	MS 4000	7.5	1030	777	1807	95	134		50
SP 30-5	MS 6000	5.5	761	544	1305	143	142	144	47
SP 30-6	MS 6000	5.5	857	544	1401	143	142	144	49
SP 30-7	MS 6000	7.5	953	574	1527	143	142	144	55
SP 30-8	MS 6000	7.5	1049	574	1623	143	142	144	57
SP 30-9	MS 6000	9.2	1145	604	1749	143	142	144	64
SP 30-10	MS 6000	9.2	1241	604	1845	143	142	144	66
SP 30-11	MS 6000	9.2	1337	604	1941	143	142	144	68
SP 30-12	MS 6000	11	1433	634	2067	143	142	144	73
SP 30-13	MS 6000	11	1529	634	2163	143	142	144	75
SP 30-14	MS 6000	13	1625	664	2289	143	142	144	80
SP 30-15	MS 6000	13	1721	664	2385	143	142	144	82
SP 30-16	MS 6000	15	1817	699	2516	143	142	144	88
SP 30-17	MS 6000	15	1913	699	2612	143	142	144	90
SP 30-18	MS 6000	18.5	2009	754	2763	143	142	144	97
SP 30-19	MS 6000	18.5	2105	754	2859	143	142	144	99
SP 30-20	MS 6000	18.5	2201	754	2955	143	142	144	101
SP 30-21	MS 6000	18.5	2297	754	3051	143	142	144	103
SP 30-22	MS 6000	22	2393	814	3207	143	142	144	111
SP 30-23	MS 6000	22	2489	814	3303	143	142	144	113
SP 30-24	MS 6000	22	2585	814	3399	143	142	144	115
SP 30-25	MS 6000	22	2681	814	3495	143	142	144	117
SP 30-26	MS 6000	22	2777	814	3591	143	142	144	119
SP 30-27	MS 6000	26	2873	874	3747	143	142	144	126
SP 30-28	MS 6000	26	2969	874	3843	143	142	144	128
SP 30-29	MS 6000	26	3065	874	3939	143	142	144	130
SP 30-30	MS 6000	26	3161	874	4035	143	142	144	132
SP 30-31	MS 6000	26	3257	874	4131	143	142	144	134
SP 30-32	MS 6000	30	3353	944	4297	143	142	144	144
SP 30-33	MS 6000	30	3449	944	4393	143	142	144	146
SP 30-34	MS 6000	30	3545	944	4489	143	142	144	148
SP 30-35	MS 6000	30	3641	944	4585	143	142	144	150
SP 30-39	MMS6	37	4377	1312	3982	144	175	181	248
SP 30-43	MMS6	37	4761	1312	4095	144	175	181	259
SP 30-46	MMS 8000	45	4993	1270	4781	192	192	192	326
SP 30-49	MMS 8000	45	5281	1270	5007	192	192	192	334
SP 30-52	MMS 8000	55	5569	1350	5652	192	192	192	357
SP 30-54	MMS 8000	55	5761	1350	5878	192	192	192	362

The pump types above are also available in N- and R-versions. See page 5.
Pumps mounted in sleeve are only available in standard and N-versions.
Other types of connection are possible by means of connecting pieces. See page 83.

Power curves



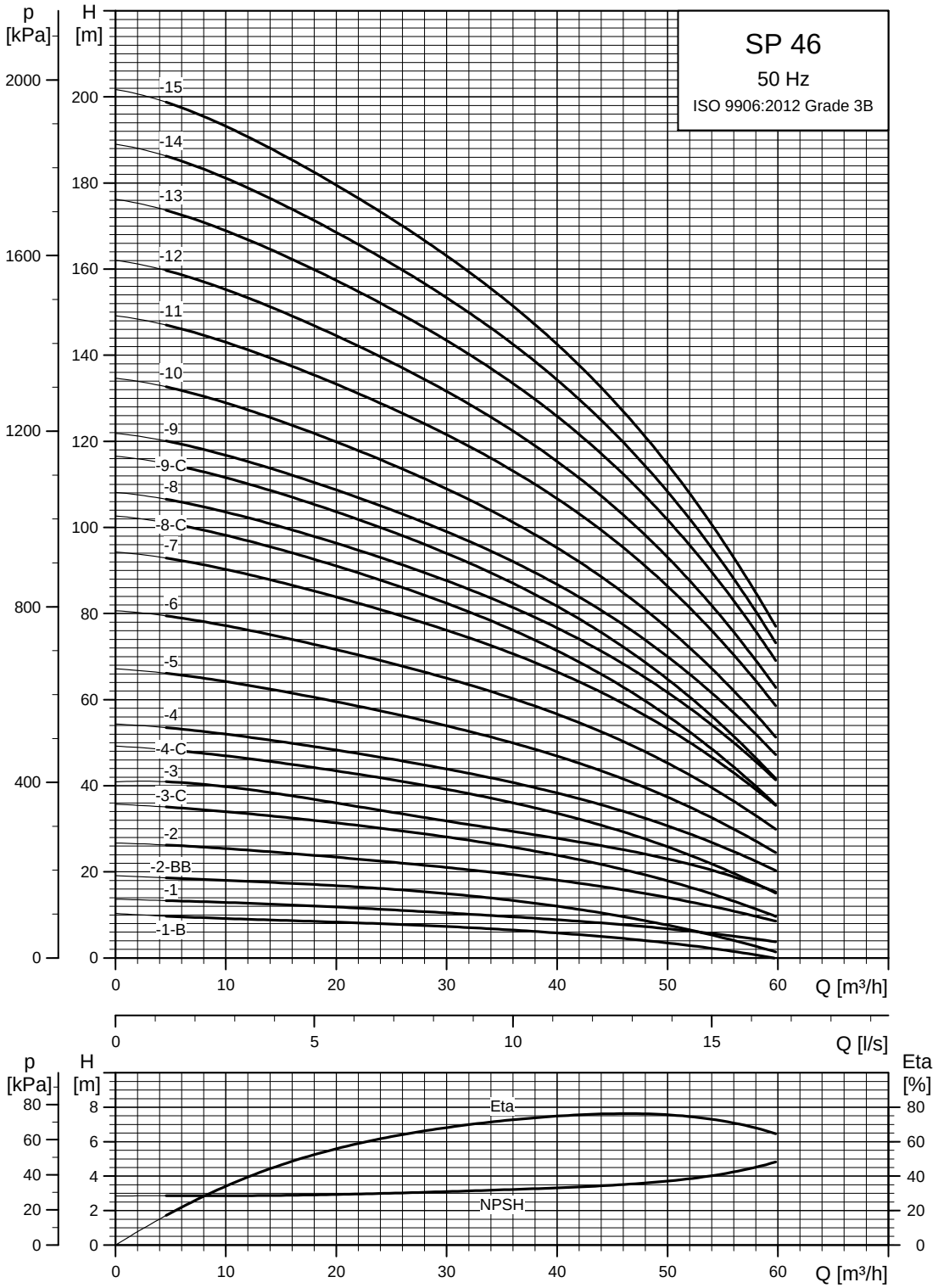
TM01 8763 4702



TM01 8764 4702

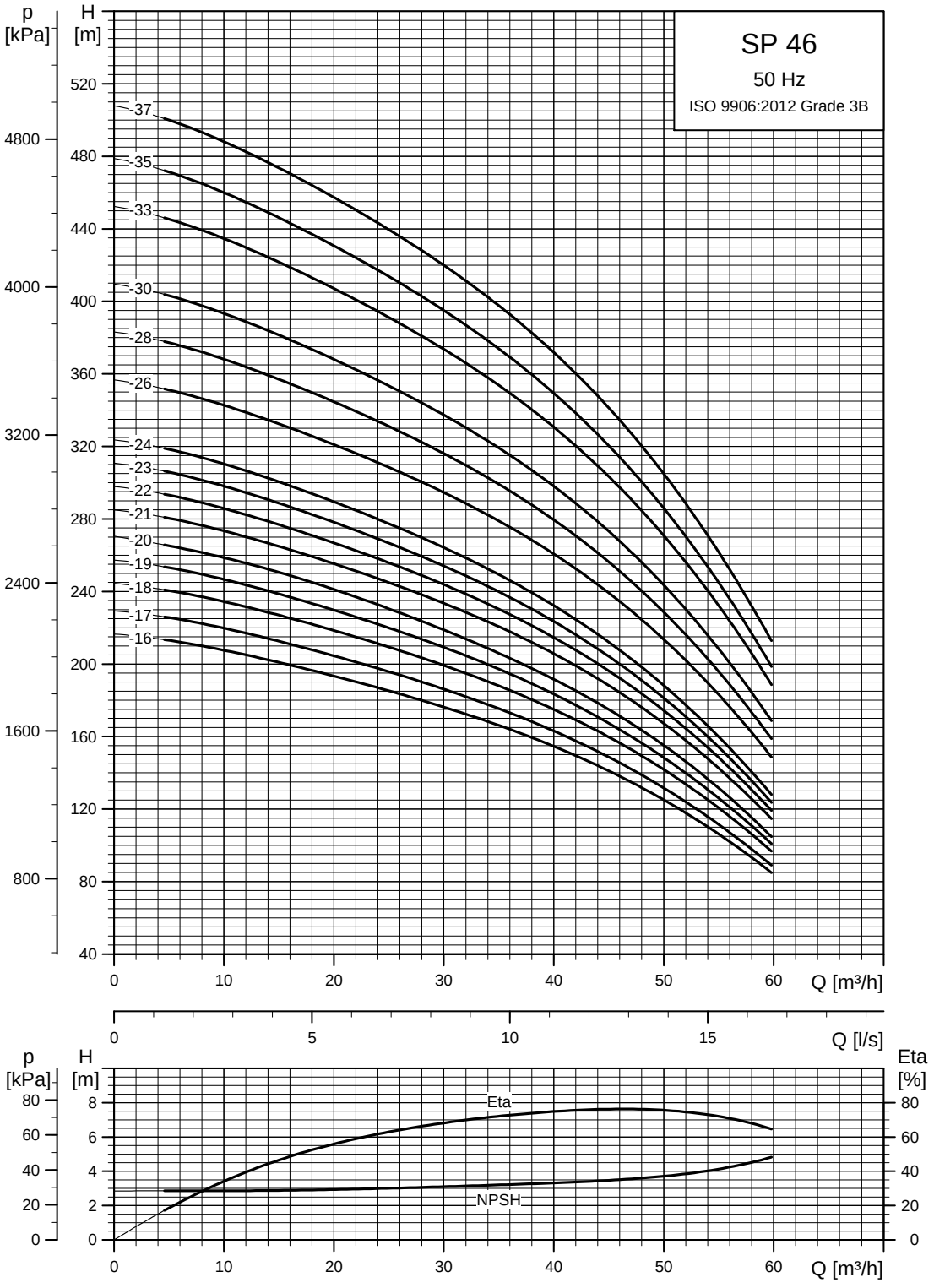
SP 46

Performance curves



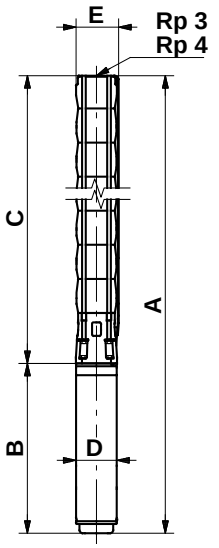
TM01 8765 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.



Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 0961 1196

SP 46-26 to SP 46-37 are mounted in sleeve for R 4 connection.

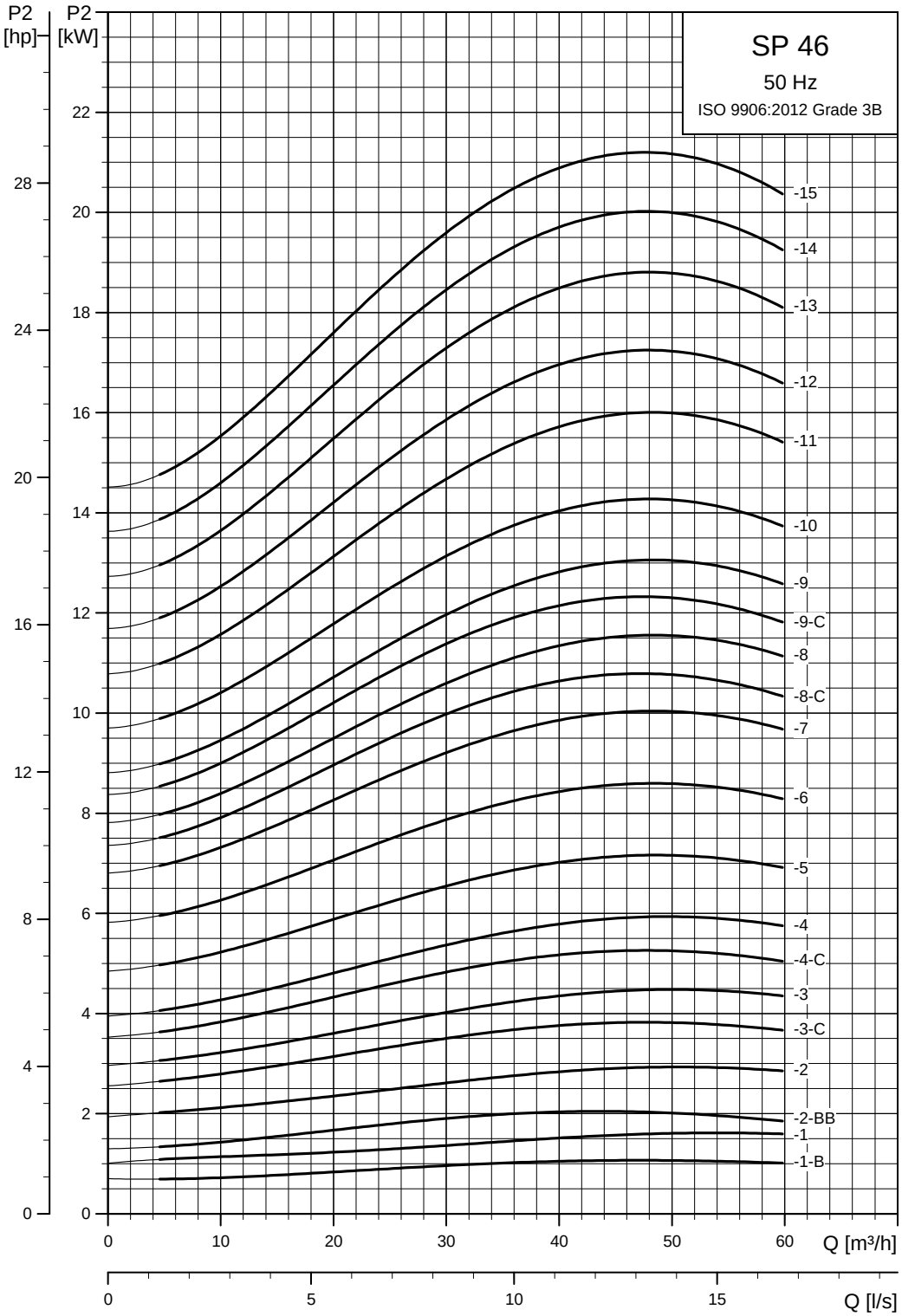
Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	Rp 3/Rp 4 connection				B	D	
			A	C	E*	E**			
SP 46-1-B	MS 4000	1.1	795	378	146		417	95	21
SP 46-1	MS 4000	2.2	835	378	146		457	95	23
SP 46-2-BB	MS 4000	2.2	948	491	146		457	95	26
SP 46-2	MS 4000	3.0	988	491	146		497	95	27
SP 46-3-C	MS 4000	4.0	1181	604	146		577	95	33
SP 46-3	MS 4000	5.5	1281	604	146		677	95	38
SP 46-4-C	MS 4000	5.5	1394	717	146		677	95	40
SP 46-4	MS 4000	7.5	1494	717	146		777	95	45
SP 46-5	MS 4000	7.5	1607	830	146		777	95	48
SP 46-3	MS 6000	5.5	1164	620	148	151	544	143	48
SP 46-4-C	MS 6000	5.5	1277	733	148	151	544	143	51
SP 46-4	MS 6000	7.5	1307	733	148	151	574	143	54
SP 46-5	MS 6000	7.5	1420	846	148	151	574	143	57
SP 46-6	MS 6000	9.2	1563	959	148	151	604	143	64
SP 46-7	MS 6000	11	1706	1072	148	151	634	143	70
SP 46-8-C	MS 6000	11	1819	1185	148	151	634	143	72
SP 46-8	MS 6000	13	1849	1185	148	151	664	143	75
SP 46-9-C	MS 6000	13	1962	1298	148	151	664	143	78
SP 46-9	MS 6000	15	1997	1298	148	151	699	143	82
SP 46-10	MS 6000	15	2110	1411	148	151	699	143	84
SP 46-11	MS 6000	18.5	2278	1524	148	151	754	143	92
SP 46-12	MS 6000	18.5	2391	1637	148	151	754	143	94
SP 46-13	MS 6000	22	2580	1766	148	151	814	143	103
SP 46-14	MS 6000	22	2693	1879	148	151	814	143	106
SP 46-15	MS 6000	22	2806	1992	148	151	814	143	108
SP 46-16	MS 6000	26	2979	2105	148	151	874	143	116
SP 46-17	MS 6000	26	3092	2218	148	151	874	143	118
SP 46-18	MS 6000	30	3275	2331	148	151	944	143	129
SP 46-19	MS 6000	30	3388	2444	148	151	944	143	131
SP 46-20	MS 6000	30	3501	2557	148	151	944	143	134
SP 46-21	MMS6	37	3982	2670	150	153	1312	144	176
SP 46-22	MMS6	37	4095	2783	150	153	1312	144	179
SP 46-23	MMS6	37	4208	2896	150	153	1312	144	181
SP 46-24	MMS6	37	4321	3009	150	153	1312	144	183
SP 46-26	MMS 8000	45	4781	3511	192	192	1270	192	278
SP 46-28	MMS 8000	45	5007	3737	192	192	1270	192	284
SP 46-30	MMS 8000	45	5233	3963	192	192	1270	192	290
SP 46-33	MMS 8000	55	5652	4302	192	192	1350	192	314
SP 46-35	MMS 8000	55	5878	4528	192	192	1350	192	320
SP 46-37	MMS 8000	63	6244	4754	192	192	1490	192	352

* Maximum diameter of pump with one motor cable.

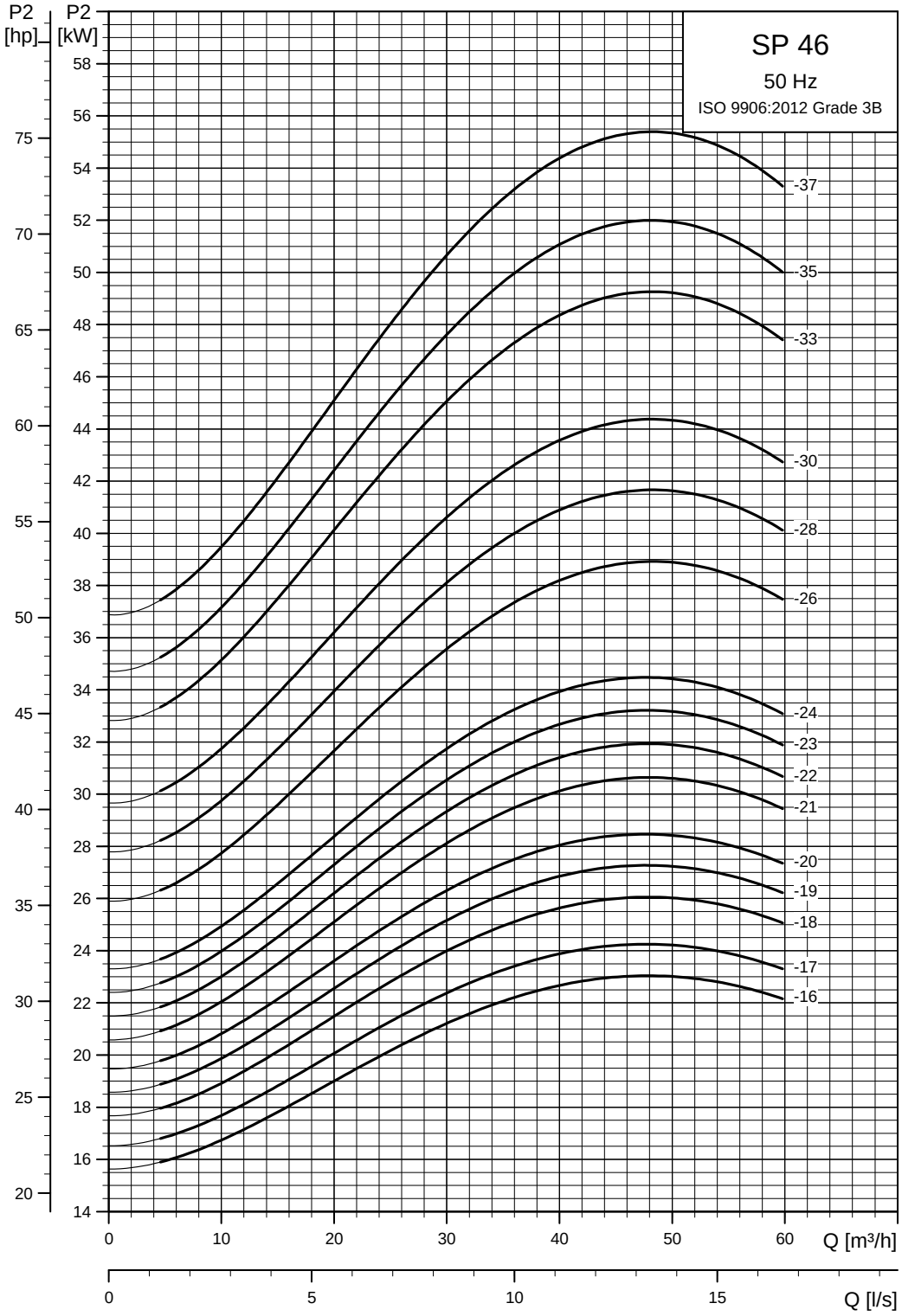
** Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 5.
Pumps mounted in sleeve are only available in standard and N-versions.
Other types of connection are possible by means of connecting pieces. See page 83.

Power curves



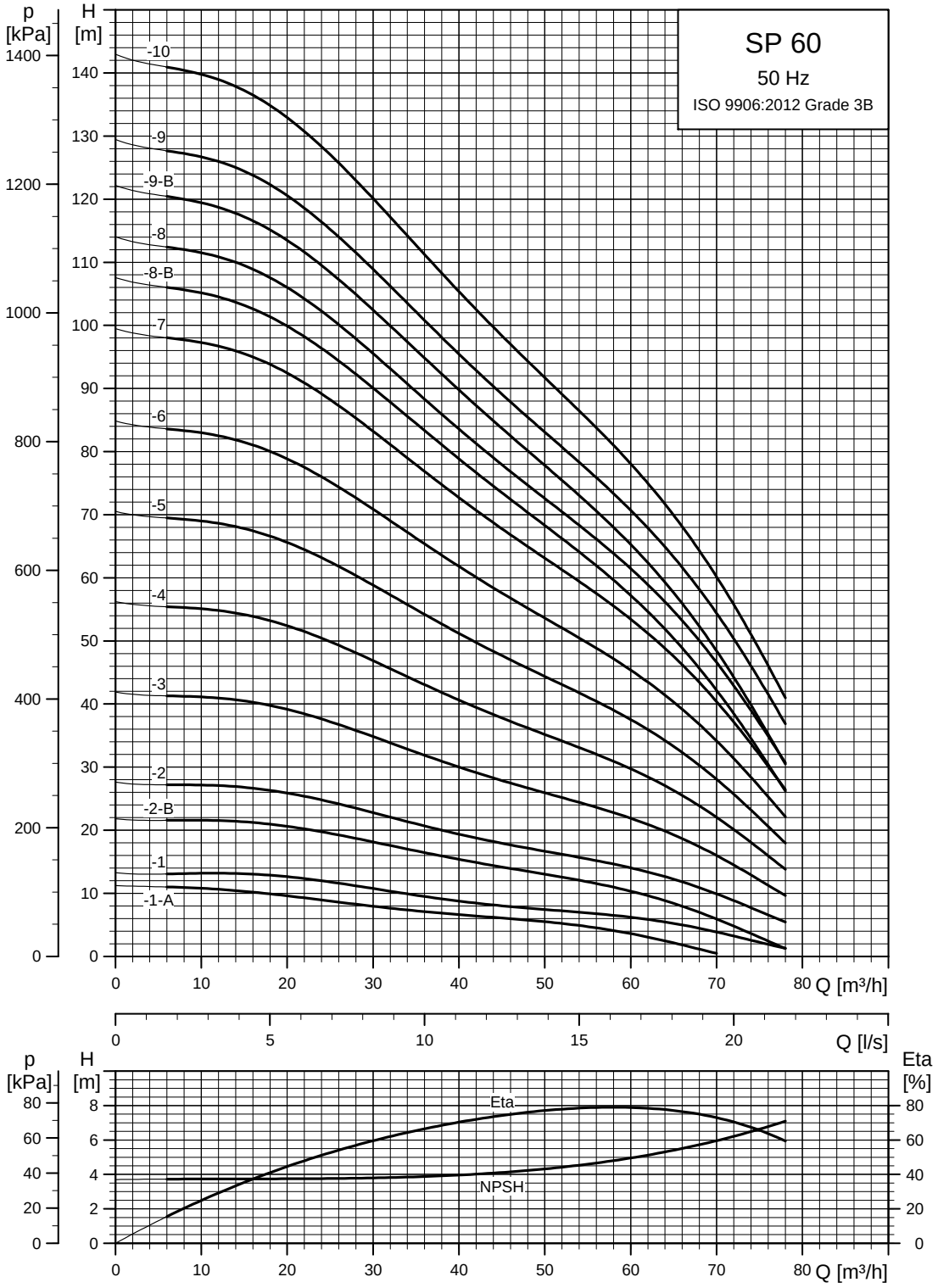
TM01 8767 4702



TM01 8768 4702

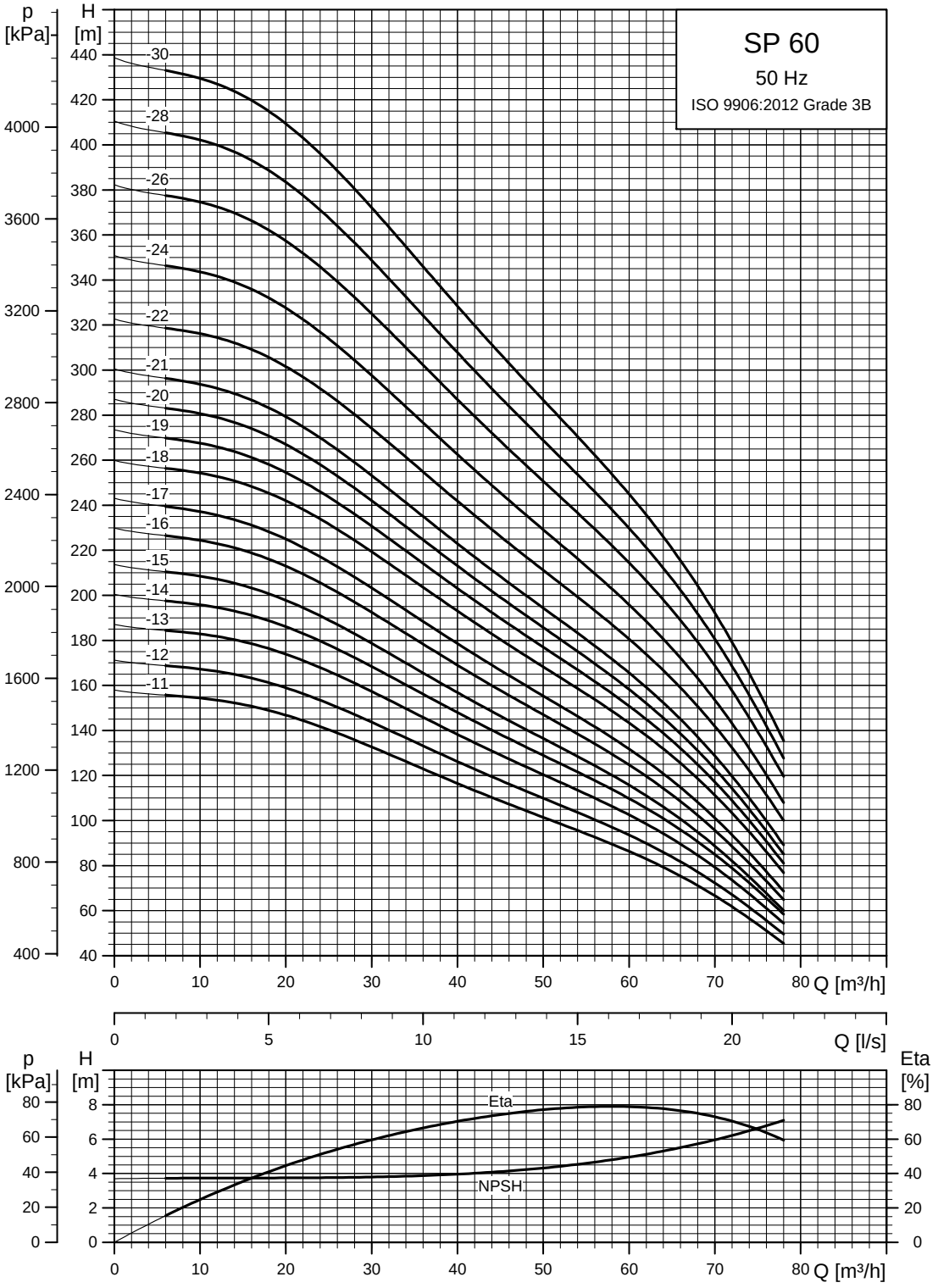
SP 60

Performance curves



TM01 8826 4702

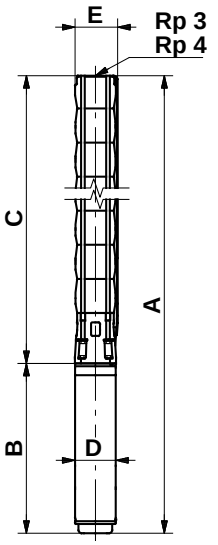
Explanation of efficiency curve, please see *Curve conditions*, page 4.



TM01 8827 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 0961 1196

SP 60-24 to SP 60-30 are mounted in sleeve for R4 connection

Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	Rp 3/Rp 4 connection				B	D	
			A	C	E*	E**			
SP 60-1-A	MS 4000	1.5	795	378	146		417	95	21
SP 60-1	MS 4000	2.2	835	378	146		457	95	23
SP 60-2-B	MS 4000	3.0	988	491	146		497	95	27
SP 60-2	MS 4000	4.0	1068	491	146		577	95	31
SP 60-3	MS 4000	5.5	1281	604	146		677	95	38
SP 60-4	MS 4000	7.5	1494	717	146		777	95	45
SP 60-3	MS 6000	5.5	1164	620	148	151	544	143	48
SP 60-4	MS 6000	7.5	1307	733	148	151	574	143	54
SP 60-5	MS 6000	9.2	1450	846	148	151	604	143	62
SP 60-6	MS 6000	11	1593	959	148	151	634	143	67
SP 60-7	MS 6000	13	1736	1072	148	151	664	143	73
SP 60-8-B	MS 6000	13	1849	1185	148	151	664	143	75
SP 60-8	MS 6000	15	1884	1185	148	151	699	143	79
SP 60-9-B	MS 6000	15	1997	1298	148	151	699	143	82
SP 60-9	MS 6000	18.5	2052	1298	148	151	754	143	87
SP 60-10	MS 6000	18.5	2165	1411	148	151	754	143	90
SP 60-11	MS 6000	22	2338	1524	148	151	814	143	98
SP 60-12	MS 6000	22	2451	1637	148	151	814	143	100
SP 60-13	MS 6000	26	2640	1766	148	151	874	143	109
SP 60-14	MS 6000	26	2753	1879	148	151	874	143	111
SP 60-15	MS 6000	26	2866	1992	148	151	874	143	114
SP 60-16	MS 6000	30	3049	2105	148	151	944	143	124
SP 60-17	MS 6000	30	3162	2218	148	151	944	143	126
SP 60-18	MMS6	37	3643	2331	150	153	1312	144	169
SP 60-19	MMS6	37	3756	2444	150	153	1312	144	171
SP 60-20	MMS6	37	3869	2557	150	153	1312	144	174
SP 60-21	MMS6	37	3982	2670	150	153	1312	144	176
SP 60-22	MMS 8000	45	4082	2812	192	192	1270	192	239
SP 60-24	MMS 8000	45	4555	3285	192	192	1270	192	272
SP 60-26	MMS 8000	55	4861	3511	192	192	1350	192	293
SP 60-28	MMS 8000	55	5087	3737	192	192	1350	192	299
SP 60-30	MMS 8000	55	5313	3963	192	192	1350	192	305

* Maximum diameter of pump with one motor cable.

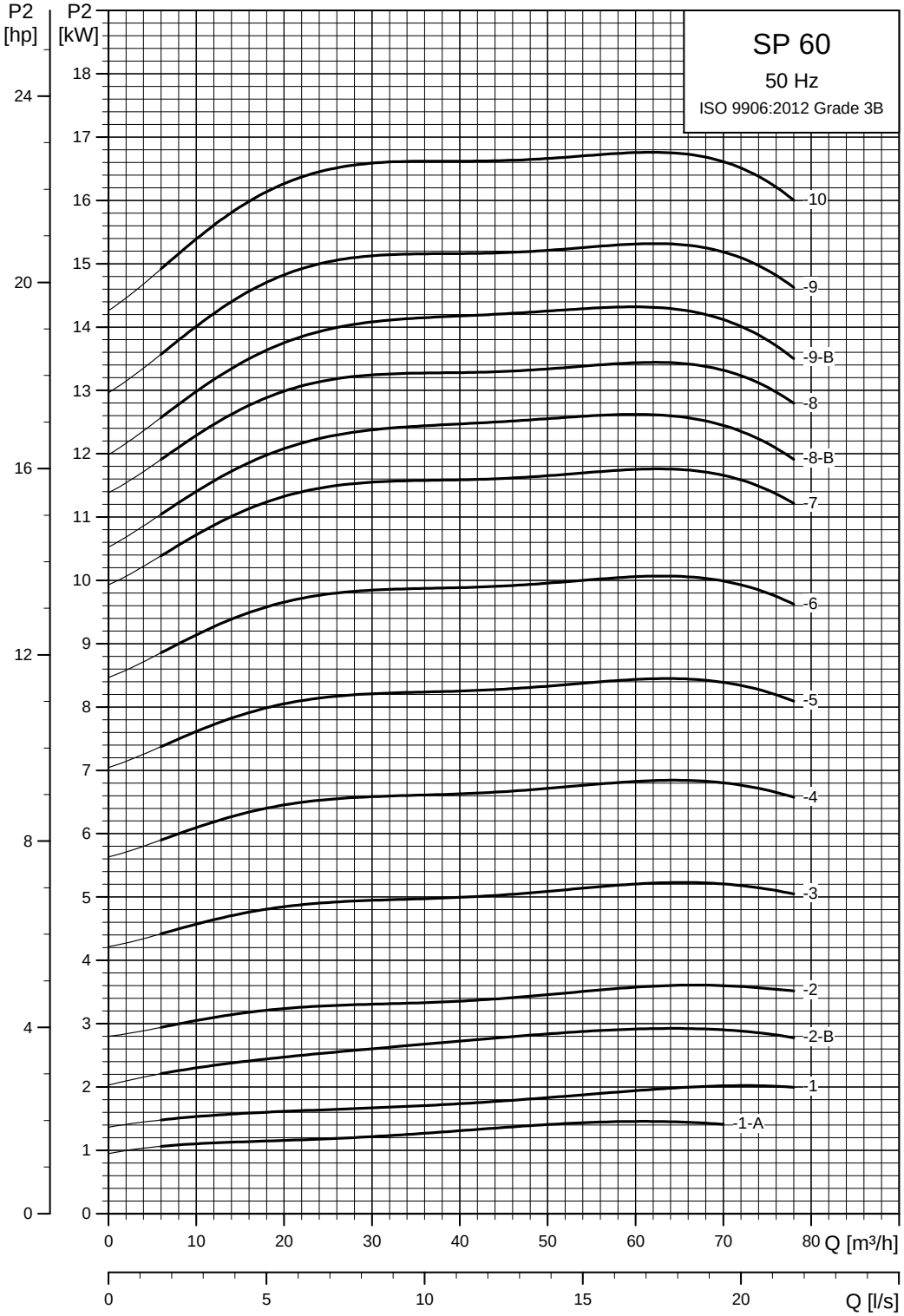
** Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 5.

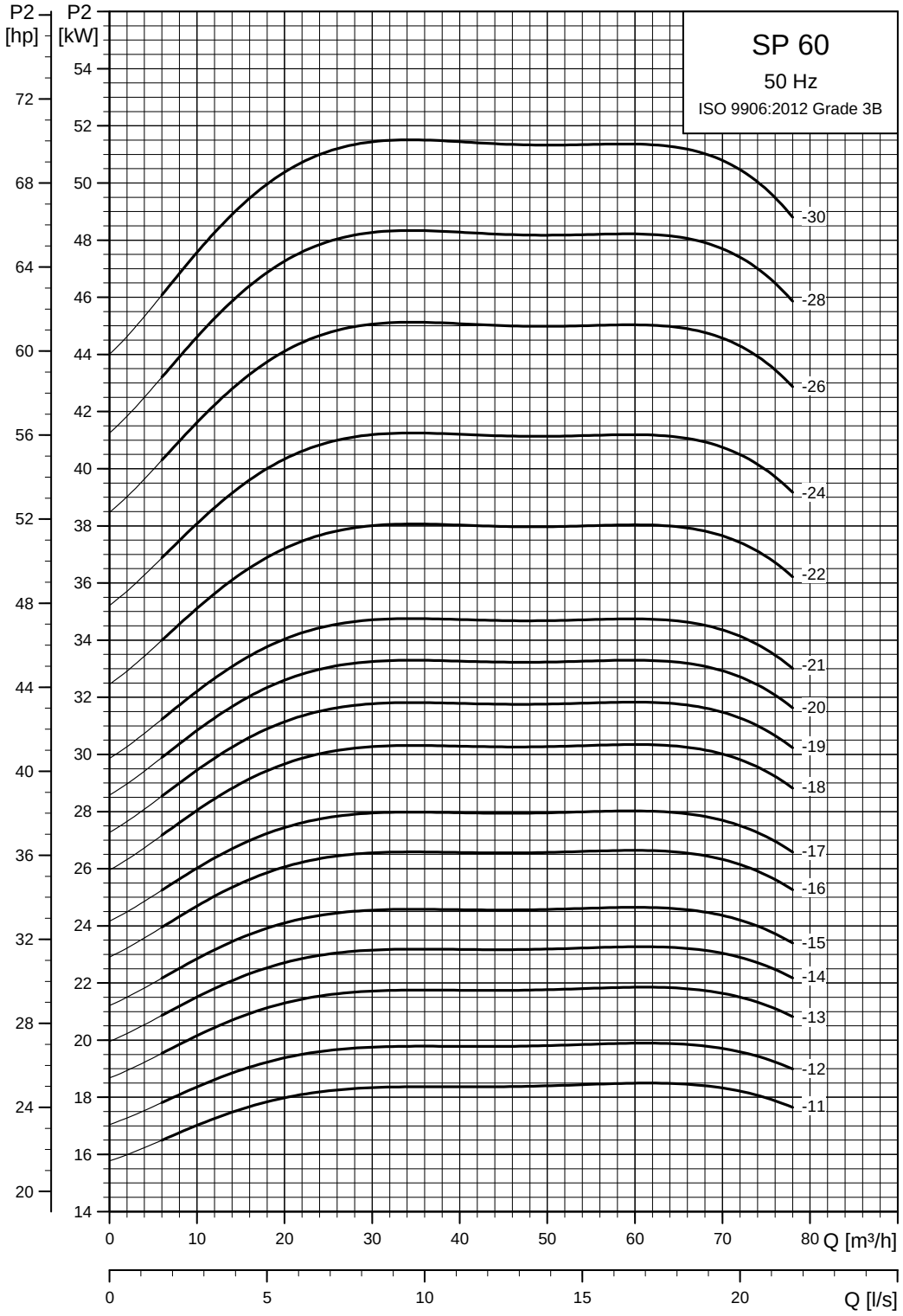
Pumps mounted in sleeve are only available in standard and N-versions.

Other types of connection are possible by means of connecting pieces. See page 83.

Power curves



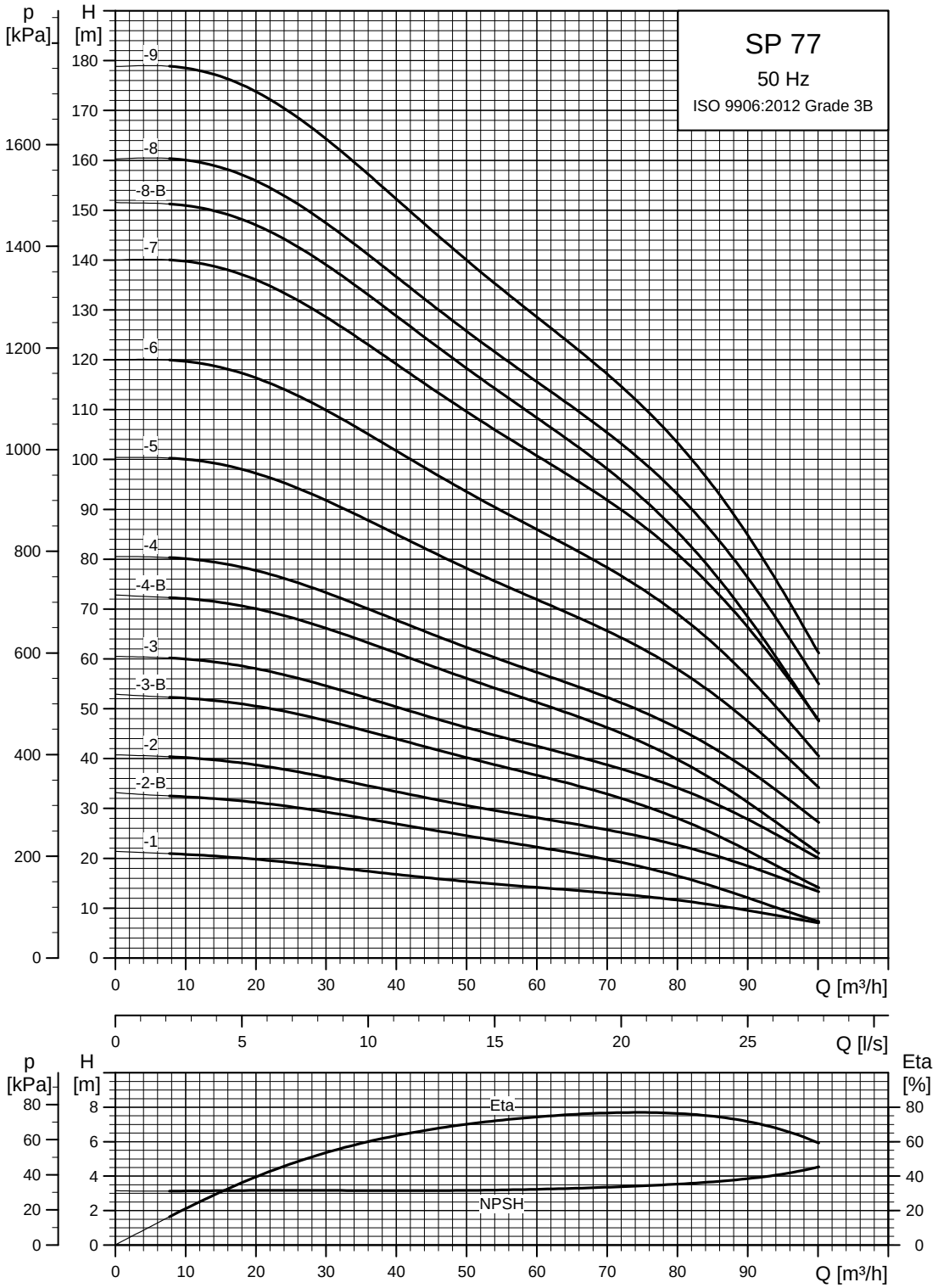
TM01 8828 4702



TM01 8829 4702

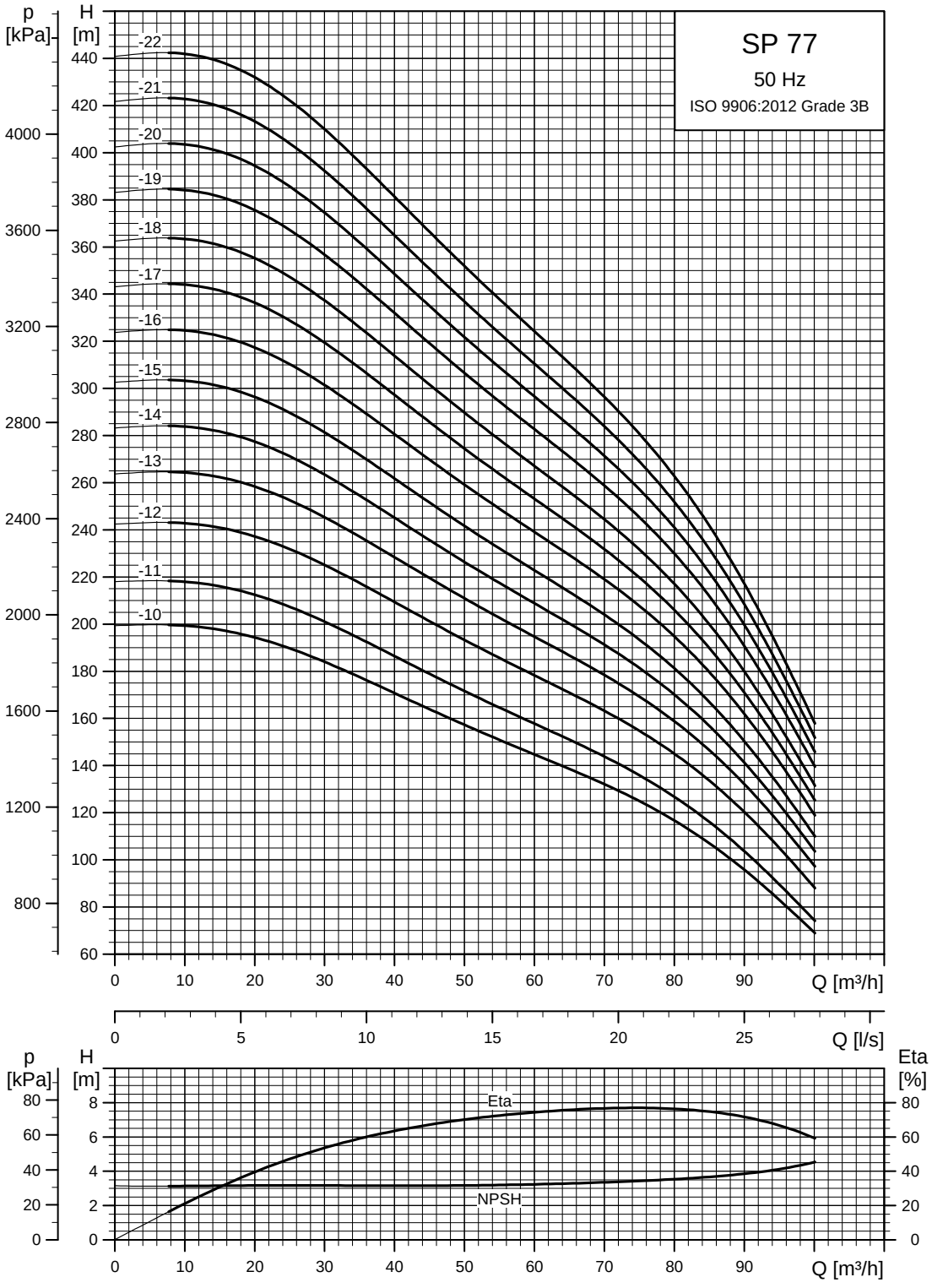
SP 77

Performance curves



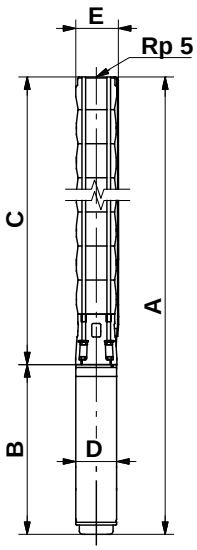
TM01 8769 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

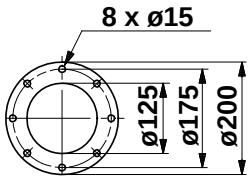


Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 7872 2196



TM00 7323 1798

Pump with Grundfos flange

Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 5 connection				5" Grundfos flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 77-1	MS 6000	5.5	1162	618	178	186	1162	618	200	200	544	138	55
SP 77-2-B	MS 6000	5.5	1290	746	178	186	1290	746	200	200	544	138	59
SP 77-2	MS 6000	7.5	1320	746	178	186	1320	746	200	200	574	138	63
SP 77-3-B	MS 6000	9.2	1478	874	178	186	1478	874	200	200	604	138	72
SP 77-3	MS 6000	11	1508	874	178	186	1508	874	200	200	634	138	75
SP 77-4-B	MS 6000	13	1667	1003	178	186	1667	1003	200	200	664	138	82
SP 77-4	MS 6000	15	1702	1003	178	186	1702	1003	200	200	699	138	86
SP 77-5	MS 6000	18.5	1885	1131	178	186	1885	1131	200	200	754	138	95
SP 77-6	MS 6000	22	2073	1259	178	186	2073	1259	200	200	814	138	105
SP 77-7	MS 6000	26	2261	1387	178	186	2261	1387	200	200	874	138	114
SP 77-8-B	MS 6000	26	2389	1515	178	186	2389	1515	200	200	874	138	118
SP 77-8	MS 6000	30	2459	1515	178	186	2459	1515	200	200	944	138	126
SP 77-9	MS 6000	30	2587	1643	178	186	2587	1643	200	200	944	138	129
SP 77-10	MMS6	37	3083	1771	178	186	3083	1771	200	200	1312	143	176
SP 77-11	MMS6	37	3226	1898	178	186	3210	1898	200	200	1312	143	179
SP 77-12	MMS 8000	45	3313	2043	200	204	3313	2043	209	209	1270	192	240
SP 77-13	MMS 8000	55	3522	2172	200	204	3522	2172	209	209	1350	192	259
SP 77-14	MMS 8000	55	3650	2300	200	204	3650	2300	209	209	1350	192	263
SP 77-15	MMS 8000	55	3779	2429	200	204					1350	192	266
SP 77-16	MMS 8000	63	4047	2557	200	204					1490	192	296
SP 77-17	MMS 8000	63	4175	2685	200	204					1490	192	300
SP 77-18	MMS 8000	63	4304	2814	200	204					1490	192	304
SP 77-19	MMS 8000	75	4826	3236	200	204					1590	192	334
SP 77-20	MMS 8000	75	4954	3364	200	204					1590	192	338
SP 77-21	MMS 8000	75	5082	3492	200	202					1590	192	342
SP 77-22	MMS 8000	92	5450	3620	200	202					1830	192	391

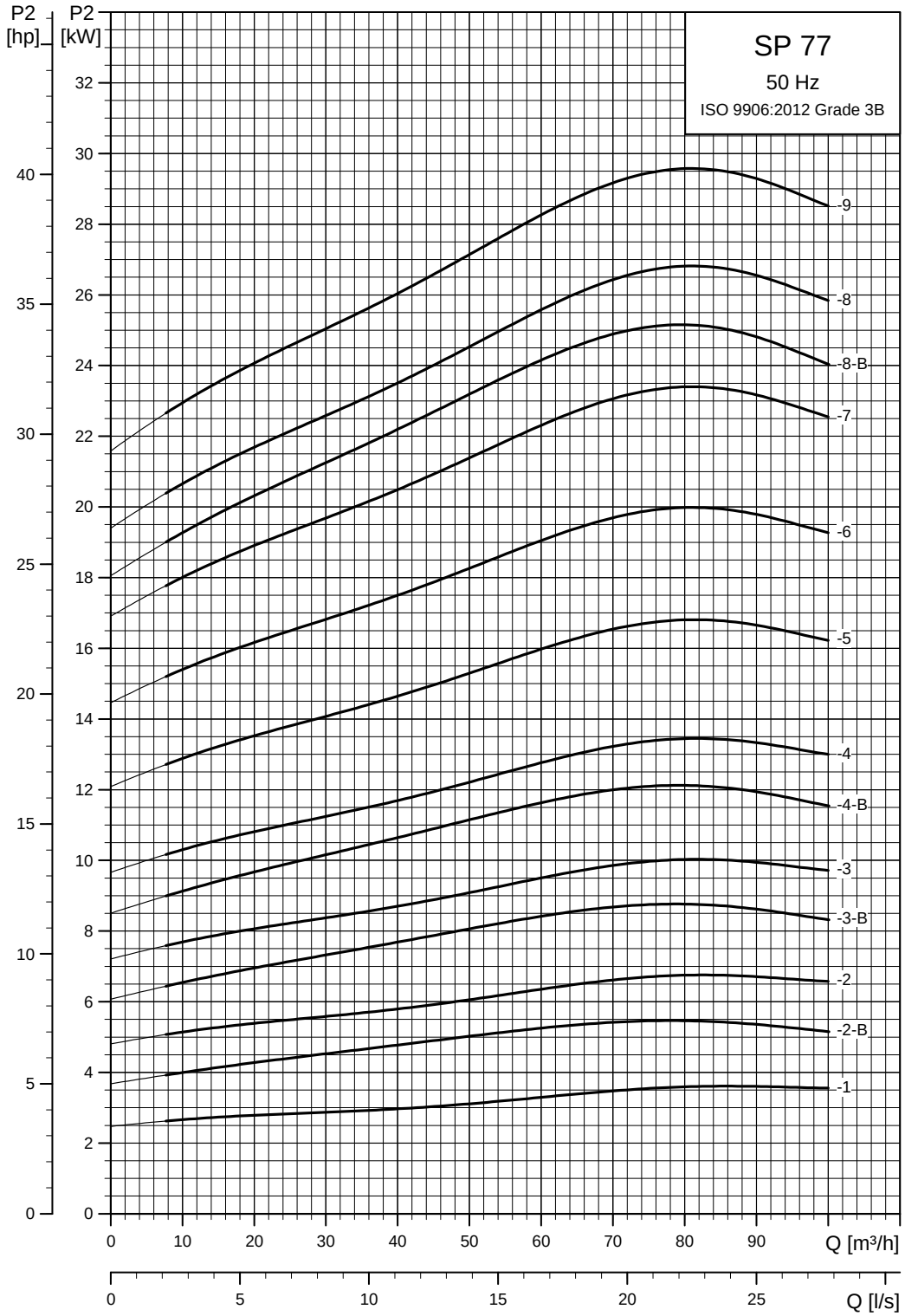
* Maximum diameter of pump with one motor cable.

** Maximum diameter of pump with two motor cables.

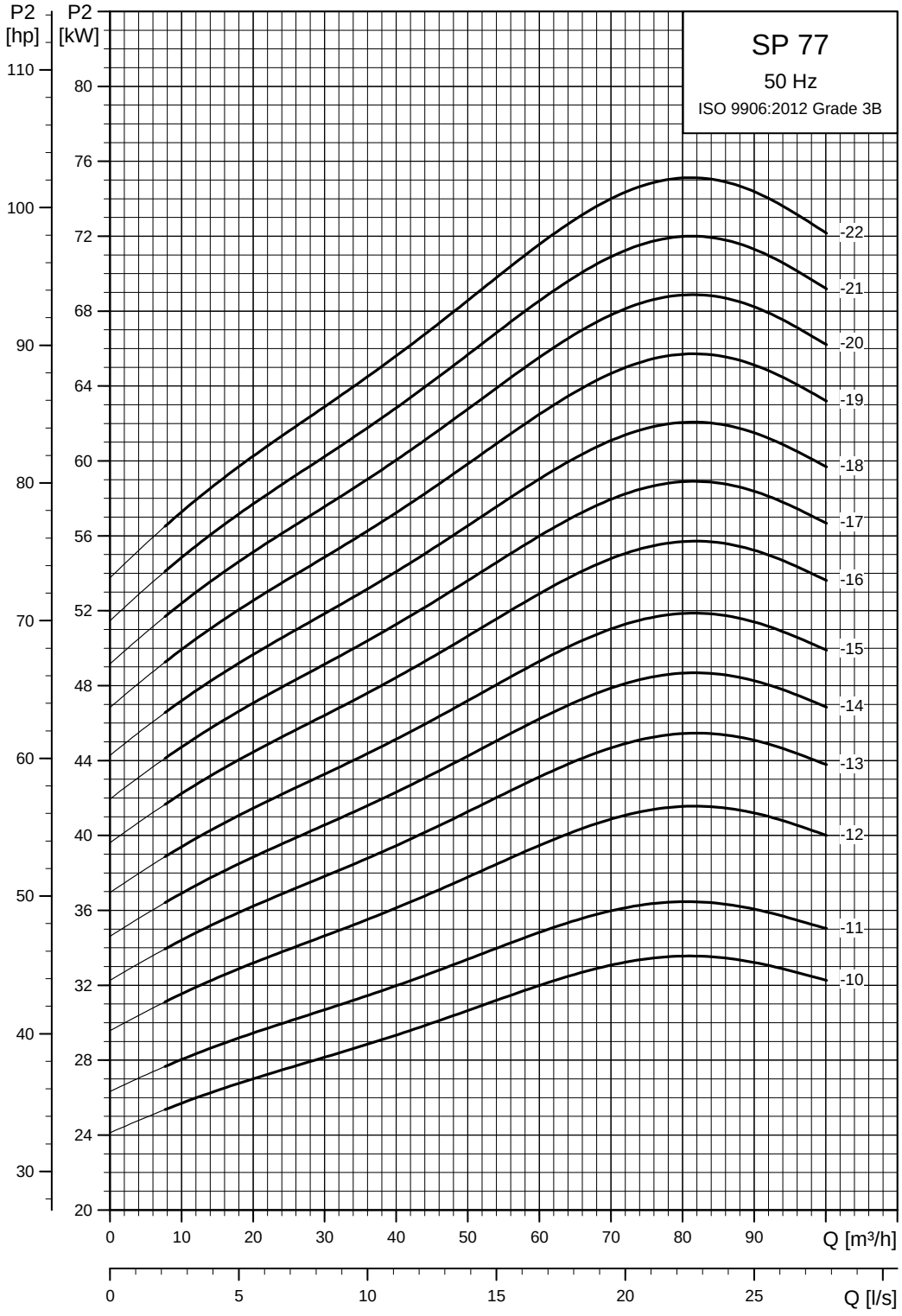
The pump types above are also available in N- and R-versions. See page 5.

Other types of connection are possible by means of connecting pieces. See page 83.

Power curves



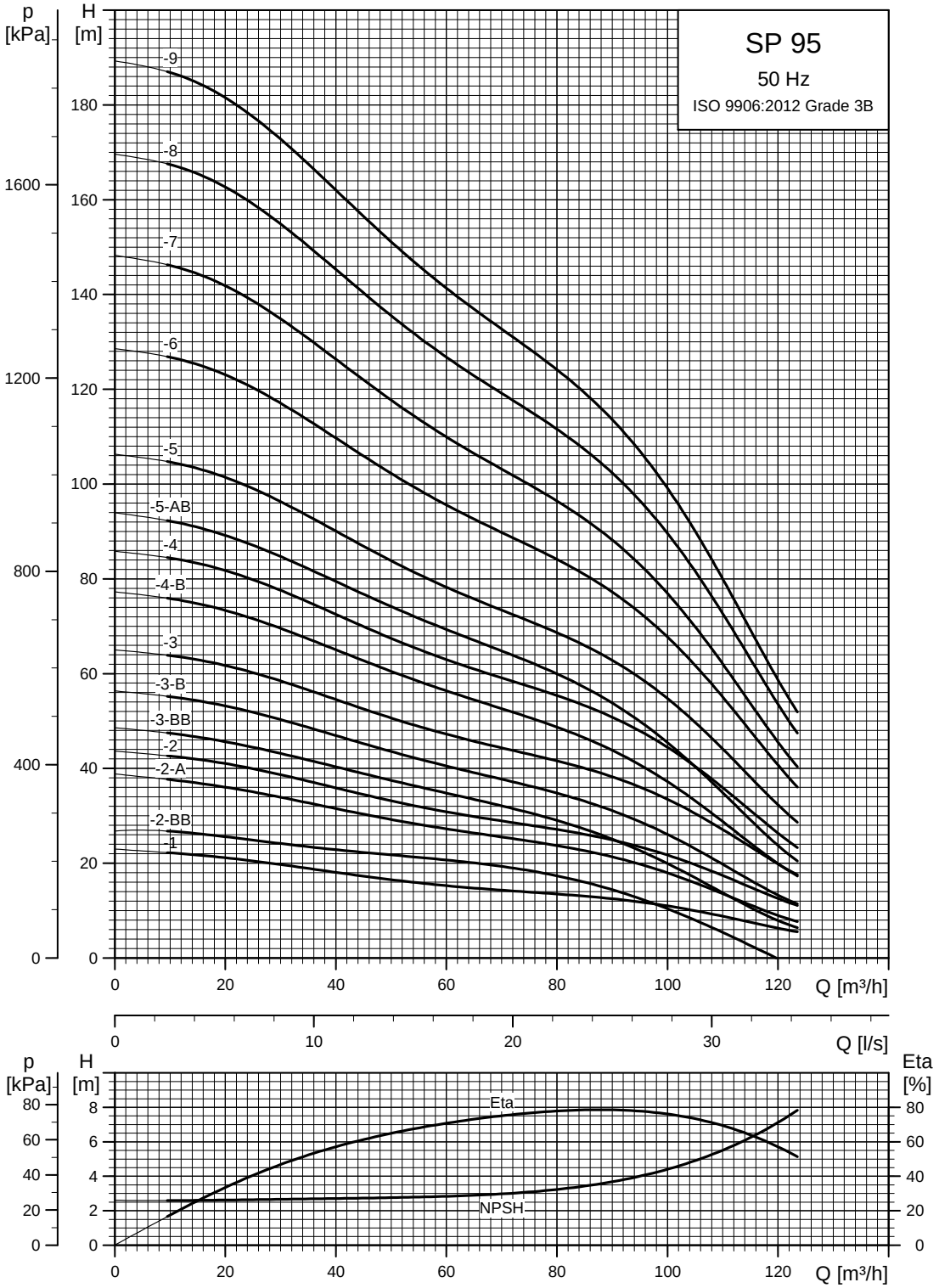
TM01 8771 4702



TM01 8772 4702

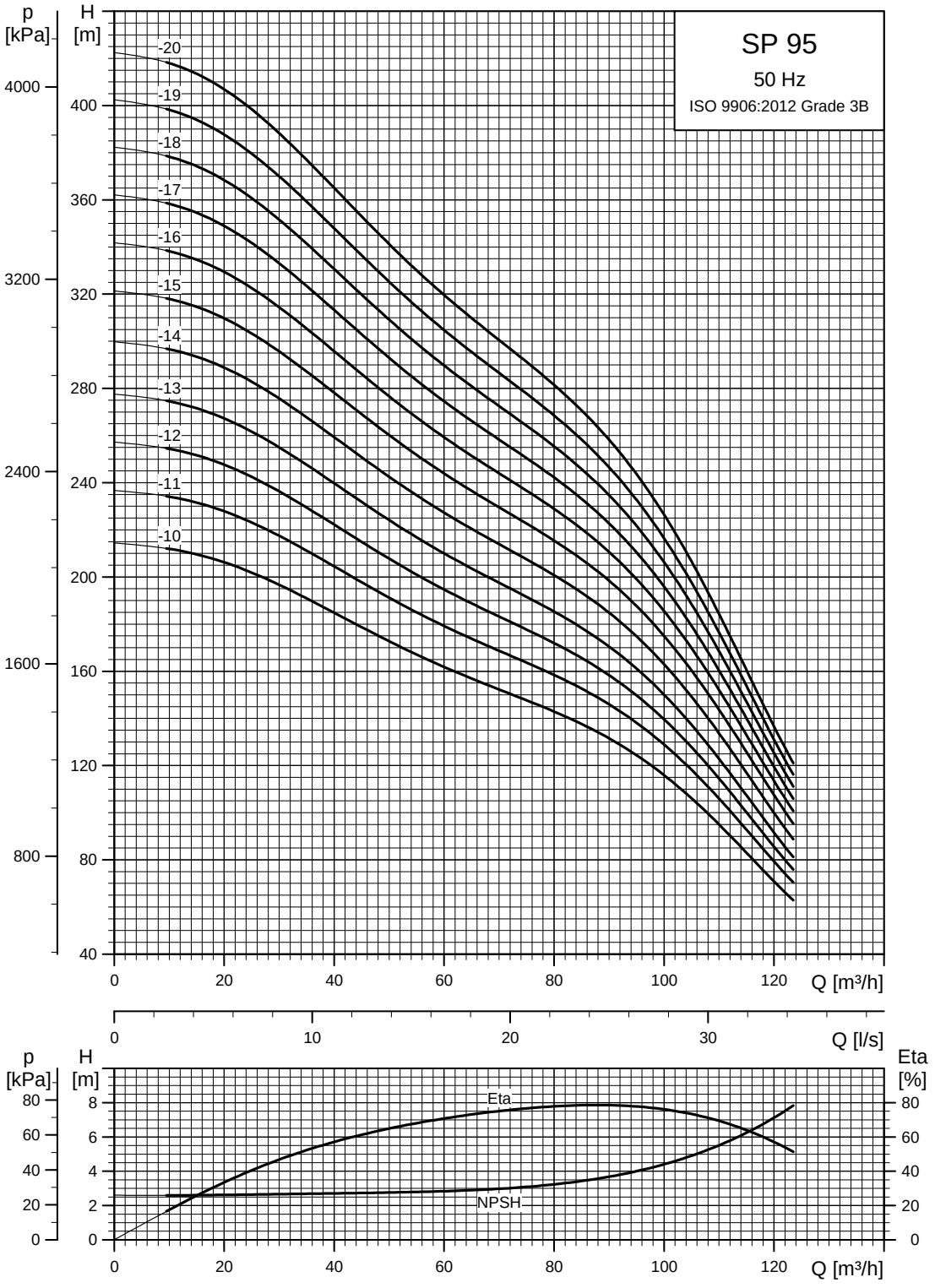
SP 95

Performance curves



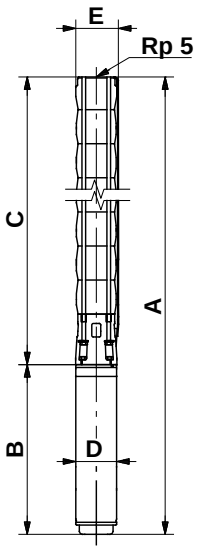
TM01 8773 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

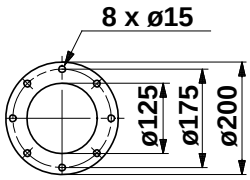


Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 7872 2196



TM00 7323 1798

Pump with Grundfos flange

Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 5 connection				5" Grundfos flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 95-1	MS 6000	5.5	1162	618	178	186	1162	618	200	200	544	138	55
SP 95-2-BB	MS 6000	5.5	1290	746	178	186	1290	746	200	200	544	138	72
SP 95-2-A	MS 6000	7.5	1320	746	178	186	1320	746	200	200	574	138	63
SP 95-2	MS 6000	9.2	1350	746	178	186	1350	746	200	200	604	138	68
SP 95-3-BB	MS 6000	9.2	1478	874	178	186	1478	874	200	200	604	138	72
SP 95-3-B	MS 6000	11	1508	874	178	186	1508	874	200	200	634	138	75
SP 95-3	MS 6000	13	1538	874	178	186	1538	874	200	200	664	138	78
SP 95-4-B	MS 6000	15	1702	1003	178	186	1702	1003	200	200	699	138	86
SP 95-4	MS 6000	18.5	1757	1003	178	186	1757	1003	200	200	754	138	91
SP 95-5-AB	MS 6000	18.5	1885	1131	178	186	1885	1131	200	200	754	138	95
SP 95-5	MS 6000	22	1945	1131	178	186	1945	1131	200	200	814	138	101
SP 95-6	MS 6000	26	2133	1259	178	186	2133	1259	200	200	874	138	110
SP 95-7	MS 6000	30	2331	1387	178	186	2331	1387	200	200	944	138	122
SP 95-8	MMS6	37	2827	1515	178	186	2827	1515	200	200	1312	143	168
SP 95-9	MMS6	37	2954	1642	178	186	2954	1642	200	200	1312	143	172
SP 95-10	MMS 8000	45	3055	1785	196	204	3055	1785	205	205	1270	192	233
SP 95-11	MMS 8000	55	3264	1914	196	204	3264	1914	205	205	1350	192	251
SP 95-12	MMS 8000	55	3393	2043	196	204	3393	2043	205	205	1350	192	255
SP 95-13	MMS 8000	55	3522	2172	196	204	3522	2172	205	205	1350	192	259
SP 95-14	MMS 8000	63	3790	2300	196	204	3790	2300	205	205	1490	192	289
SP 95-15	MMS 8000	75	4019	2429	196	204					1590	192	311
SP 95-16	MMS 8000	75	4147	2557	196	204					1590	192	315
SP 95-17	MMS 8000	75	4275	2685	196	204					1590	192	319
SP 95-18	MMS 8000	92	4938	3108	196	204					1830	192	376
SP 95-19	MMS 8000	92	5066	3236	196	204					1830	192	380
SP 95-20	MMS 8000	92	5194	3364	196	204					1830	192	384

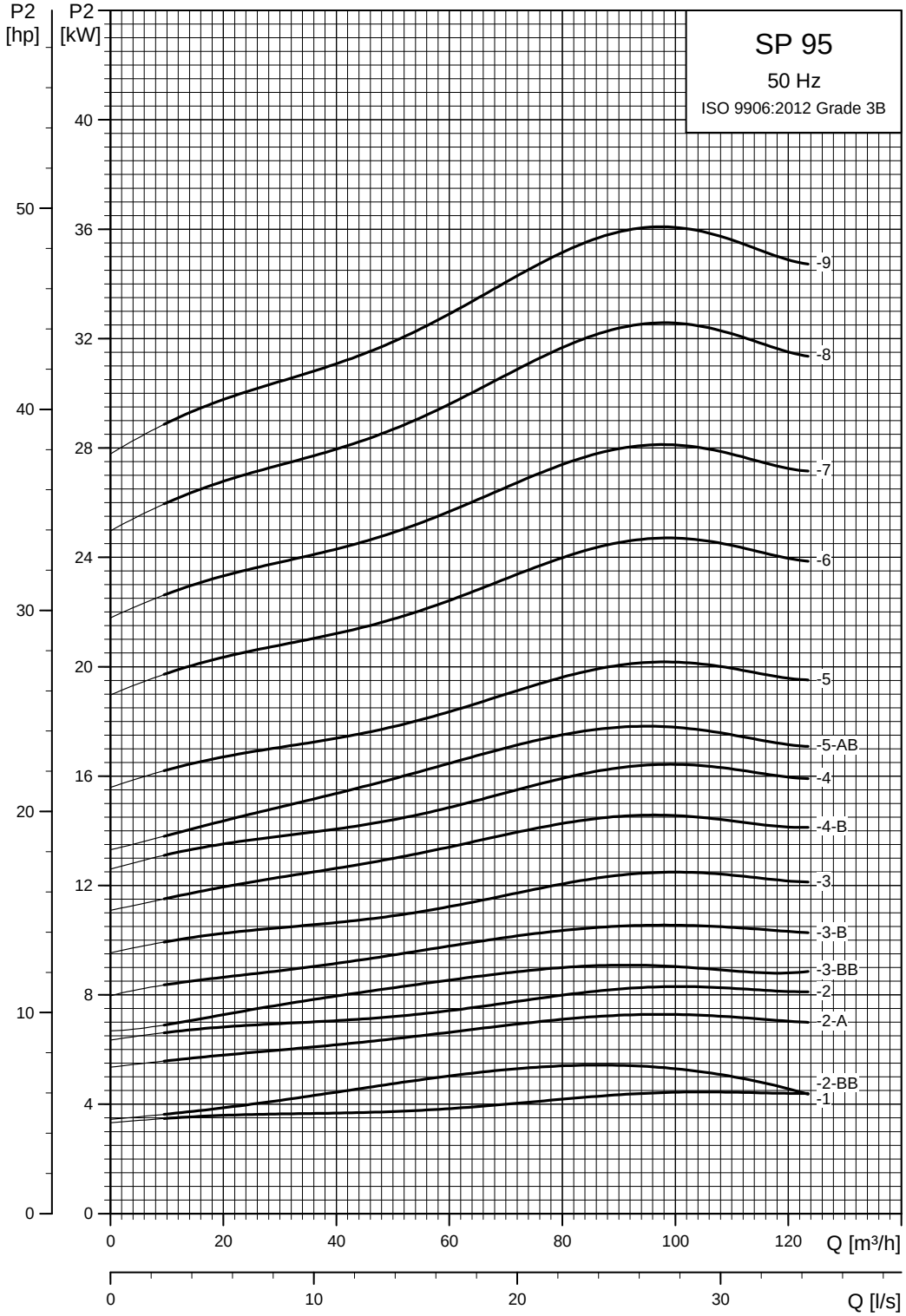
* Maximum diameter of pump with one motor cable.

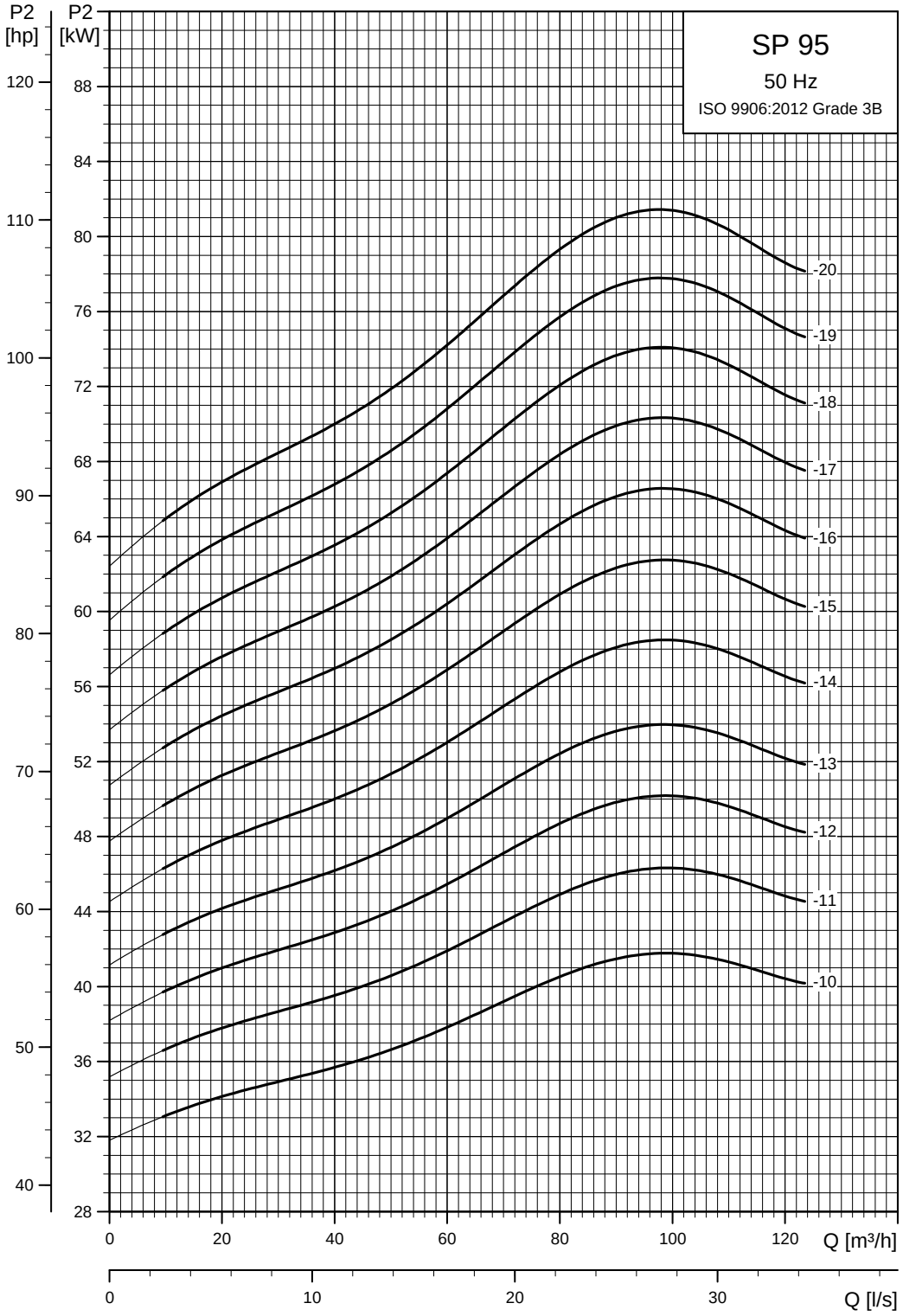
** Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 5.

Other types of connection are possible by means of connecting pieces. See page 83

Power curves

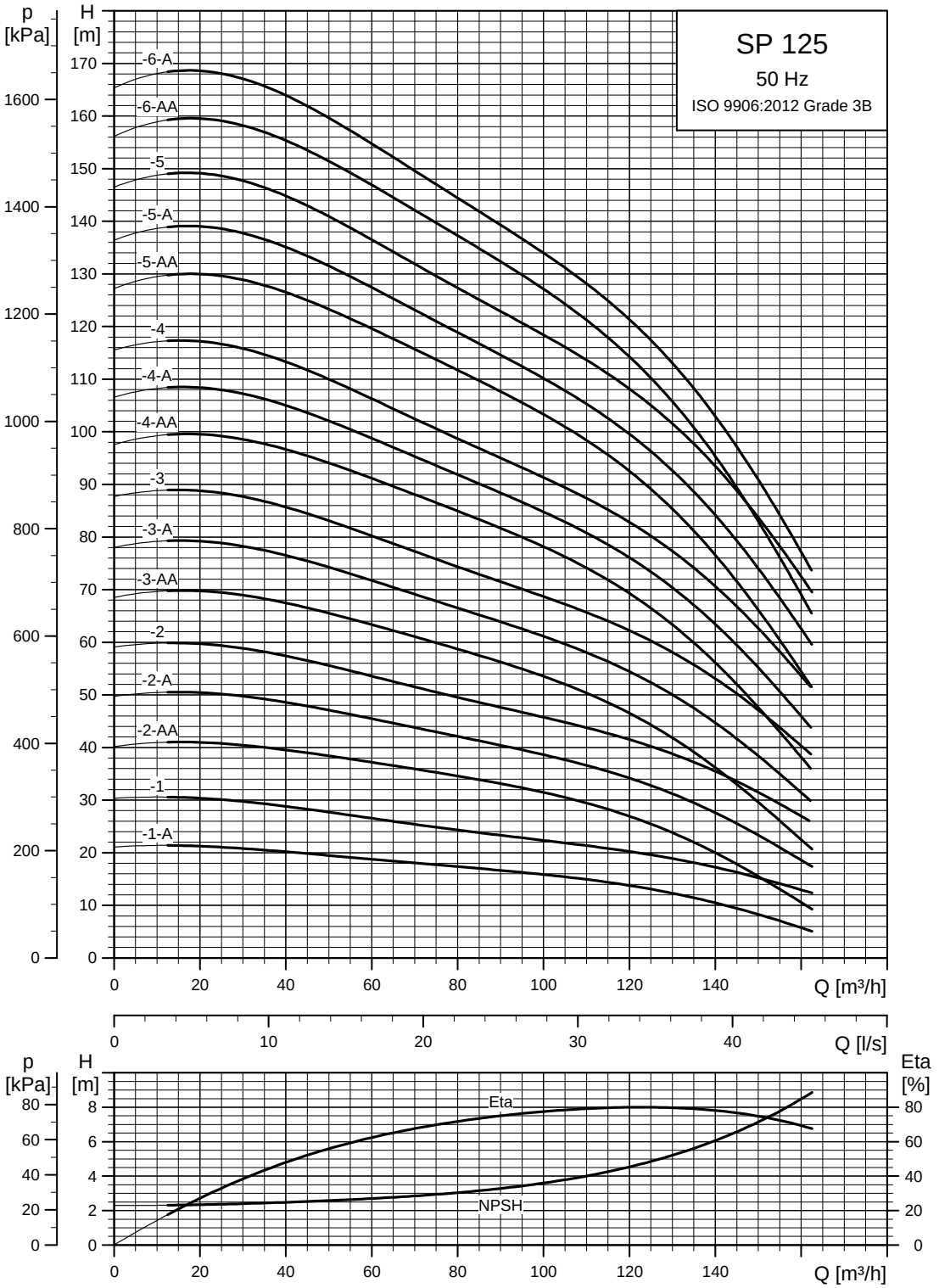




TM01 8776 4702

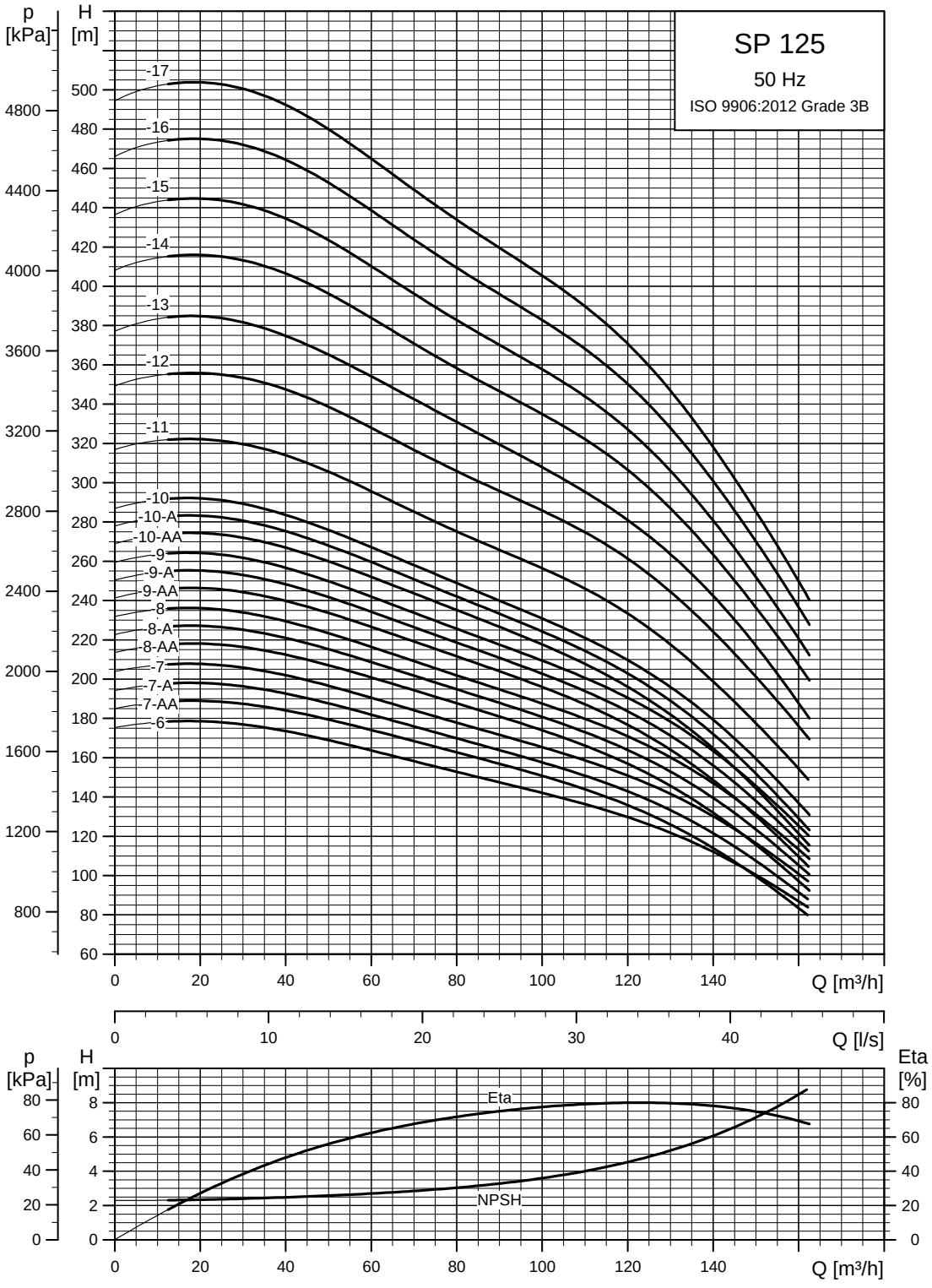
SP 125

Performance curves



TM01 8777 4702

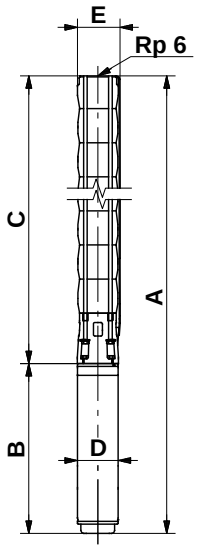
Explanation of efficiency curve, please see *Curve conditions*, page 4.



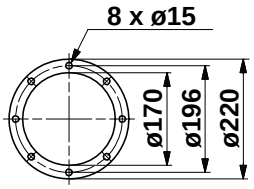
TM01 8778 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 8760 3596



TM00 7324 1798

Pump with Grundfos flange

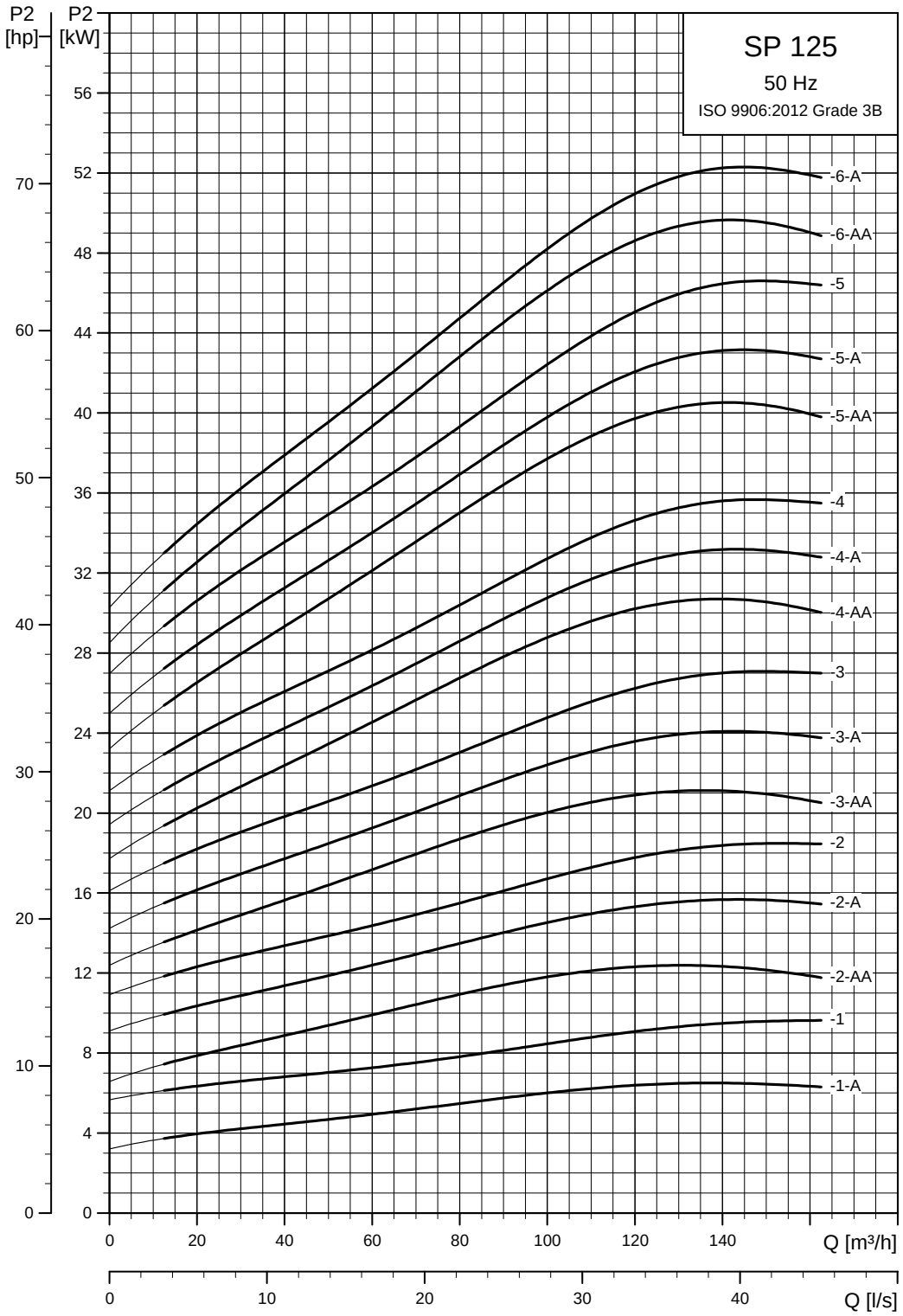
Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 6 connection				6" Grundfos flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 125-1-A	MS 6000	7.5	1225	651	211	218	1225	651	222	226	574	138	70
SP 125-1	MS 6000	11	1285	651	211	218	1285	651	222	226	634	138	79
SP 125-2-AA	MS 6000	13	1471	807	211	218	1471	807	222	226	664	138	88
SP 125-2-A	MS 6000	18.5	1561	807	211	218	1561	807	222	226	754	138	97
SP 125-2	MS 6000	22	1621	807	211	218	1621	807	222	226	814	138	103
SP 125-3-AA	MS 6000	22	1777	963	211	218	1777	963	222	226	814	138	109
SP 125-3-A	MS 6000	26	1837	963	211	218	1837	963	222	226	874	138	115
SP 125-3	MS 6000	30	1907	963	211	218	1907	963	222	226	944	138	123
SP 125-4-AA	MMS6	37	2431	1119	211	218	2431	1119	222	226	1312	143	171
SP 125-4-A	MMS6	37	2431	1119	211	218	2431	1119	222	226	1312	143	171
SP 125-4	MMS6	37	2431	1119	211	218	2431	1119	222	226	1312	143	171
SP 125-5-AA	MMS 8000	45	2545	1275	213	218	2545	1275	223	226	1270	192	236
SP 125-5-A	MMS 8000	45	2545	1275	213	218	2545	1275	223	226	1270	192	236
SP 125-5	MMS 8000	55	2625	1275	213	218	2625	1245	223	226	1350	192	251
SP 125-6-AA	MMS 8000	55	2781	1431	213	218	2781	1431	223	226	1350	192	257
SP 125-6-A	MMS 8000	55	2781	1431	213	218	2781	1431	223	226	1350	192	257
SP 125-6	MMS 8000	63	2921	1431	218	227	2921	1431	229	232	1490	192	283
SP 125-7-AA	MMS 8000	63	3077	1587	218	227	3077	1587	229	232	1490	192	289
SP 125-7-A	MMS 8000	63	3077	1587	218	227	3077	1587	229	232	1490	192	289
SP 125-7	MMS 8000	75	3177	1587	218	227	3177	1587	229	232	1590	192	308
SP 125-8-AA	MMS 8000	75	3333	1743	218	227					1590	192	314
SP 125-8-A	MMS 8000	75	3333	1743	218	227					1590	192	314
SP 125-8	MMS 8000	75	3333	1743	218	227					1590	192	314
SP 125-9-AA	MMS 8000	92	3729	1899	218	227					1830	192	366
SP 125-9-A	MMS 8000	92	3729	1899	218	227					1830	192	366
SP 125-9	MMS 8000	92	3729	1899	218	227					1830	192	366
SP 125-10-AA	MMS 8000	92	3885	2055	218	227					1830	192	372
SP 125-10-A	MMS 8000	92	3885	2055	218	227					1830	192	372
SP 125-10	MMS 8000	92	3885	2055	218	227					1830	192	372
SP 125-11	MMS 8000	110	4567	2507	218	227					2060	192	438
SP 125-12	MMS 10000	132	4584	2714	237	237					1870	237	556
SP 125-13	MMS 10000	132	4740	2870	237	237					1870	237	562
SP 125-14	MMS 10000	147	5095	3025	237	237					2070	237	633
SP 125-15	MMS 10000	147	5251	3181	237	237					2070	237	639
SP 125-16	MMS 10000	170	5556	3336	237	237					2220	237	685
SP 125-17	MMS 10000	170	5712	3492	237	237					2220	237	691

* Maximum diameter of pump with one motor cable.

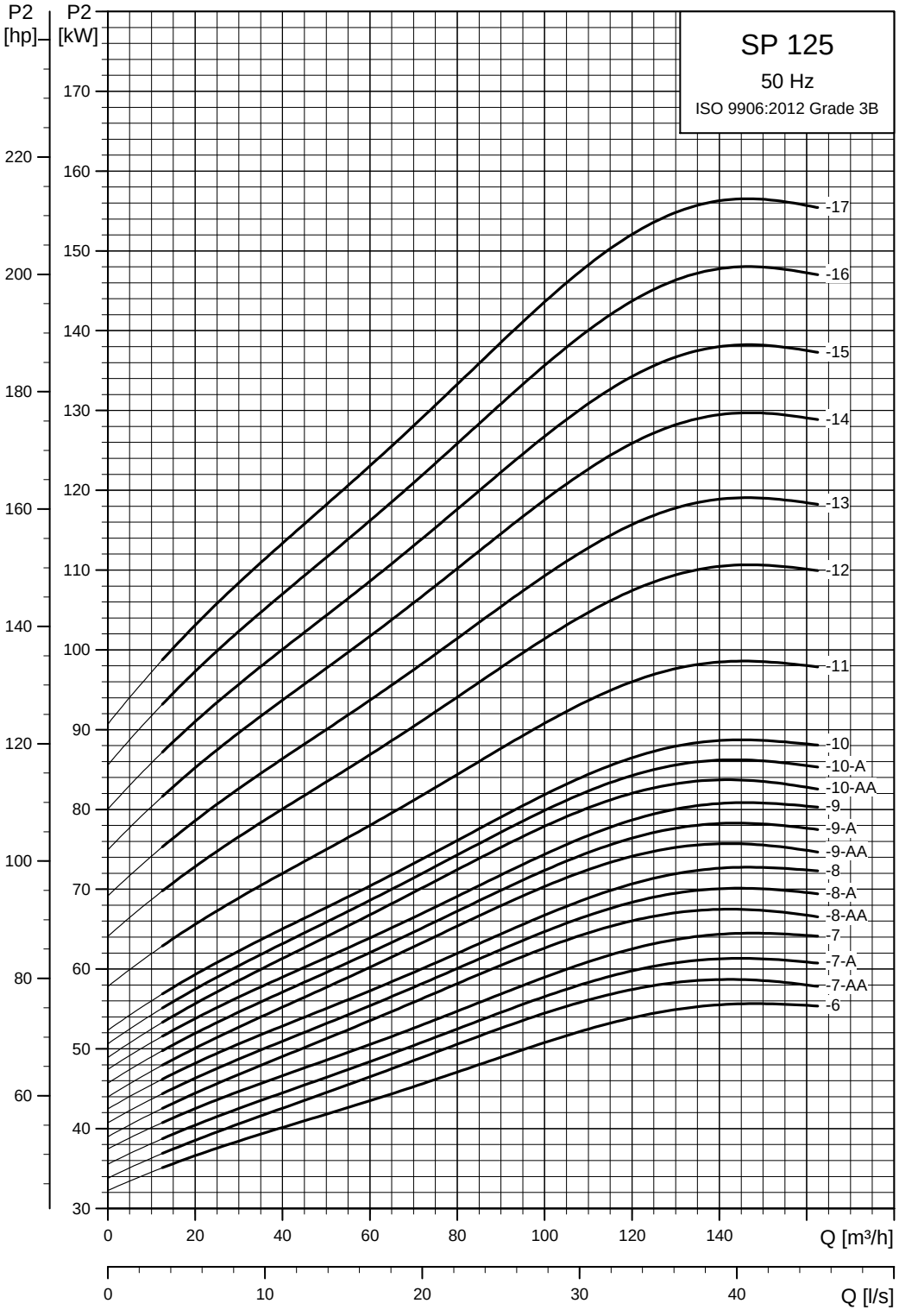
** Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 5.
Other types of connection are possible by means of connecting pieces. See page 83.

Power curves



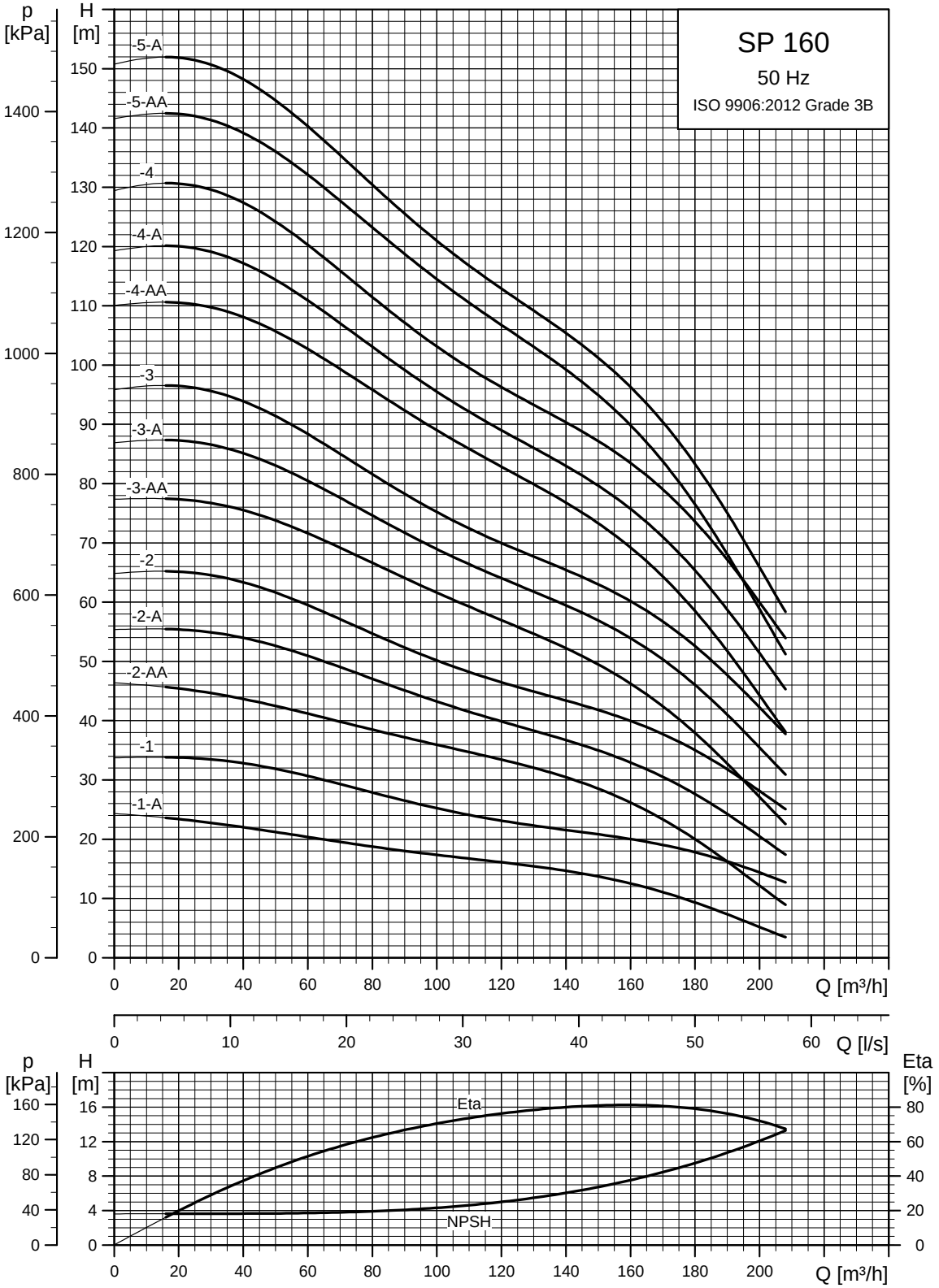
TM01 8779 4702



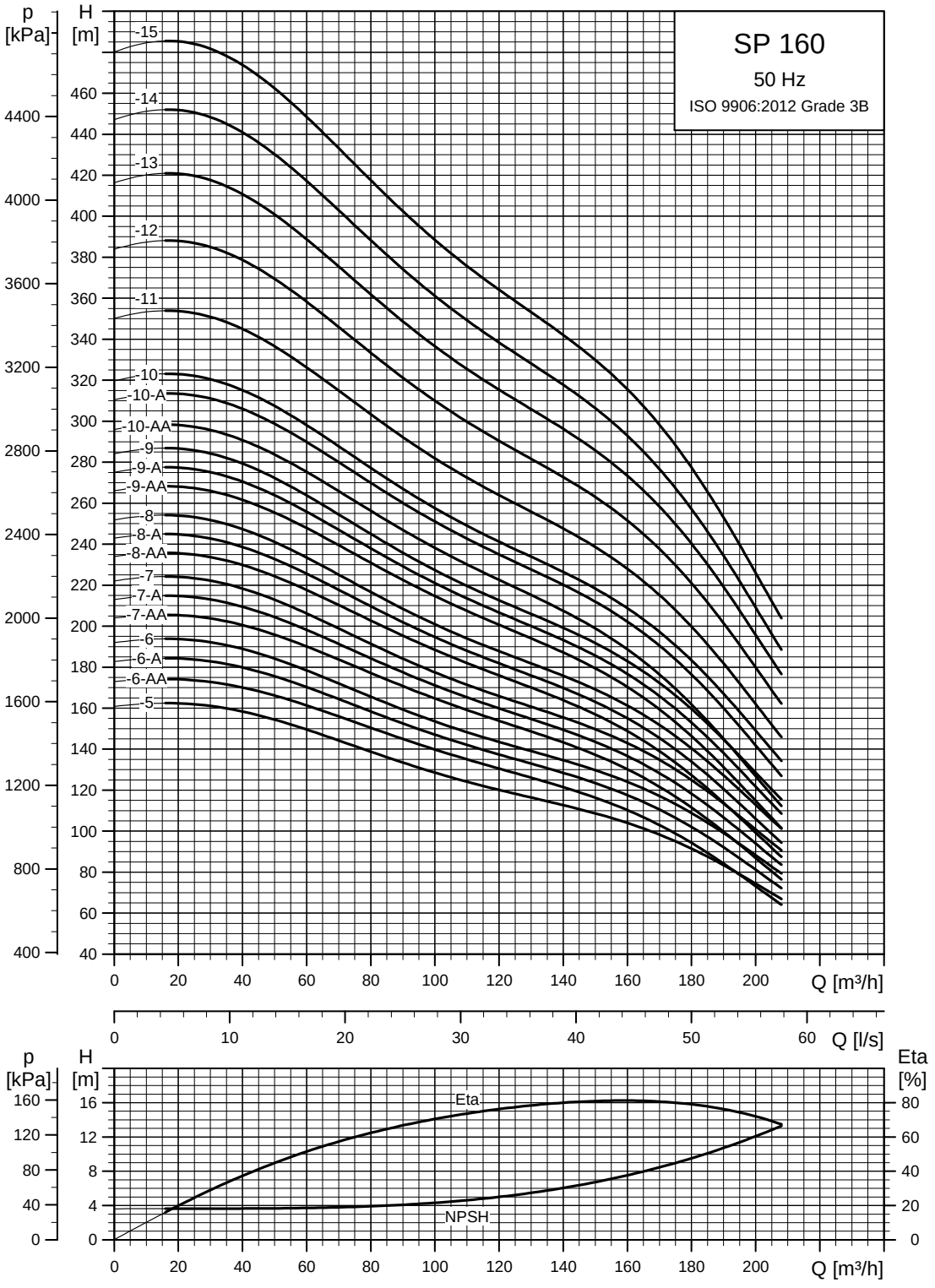
TM01 8780 4702

SP 160

Performance curves



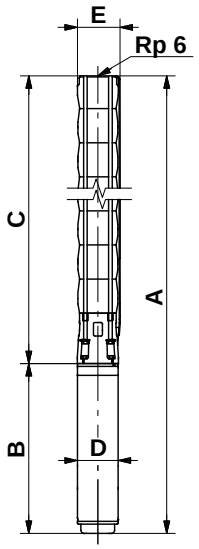
Explanation of efficiency curve, please see *Curve conditions*, page 4.



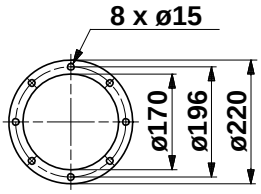
TM00 8782 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 8760 3596



TM00 7324 1798

Pump with Grundfos flange

Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 6 connection				6" Grundfos flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 160-1-A	MS 6000	9.2	1255	651	211	218	1255	651	222	226	604	138	76
SP 160-1	MS 6000	13	1315	651	211	218	1315	651	222	226	664	138	82
SP 160-2-AA	MS 6000	18.5	1561	807	211	218	1561	807	222	226	754	138	97
SP 160-2-A	MS 6000	22	1621	807	211	218	1621	807	222	226	814	138	103
SP 160-2	MS 6000	26	1681	807	211	218	1681	807	222	226	874	138	109
SP 160-3-AA	MS 6000	30	1907	963	211	218	1907	963	222	226	944	138	123
SP 160-3-A	MMS6	37	2275	963	211	218	2275	963	222	226	1312	143	165
SP 160-3	MMS6	37	2275	963	211	218	2275	963	222	226	1312	143	165
SP 160-4-AA	MMS 8000	45	2389	1119	218	227	2389	1119	229	232	1270	192	230
SP 160-4-A	MMS 8000	45	2389	1119	218	227	2389	1119	229	232	1270	192	230
SP 160-4	MMS 8000	55	2469	1119	218	227	2469	1119	229	232	1350	192	245
SP 160-5-AA	MMS 8000	55	2625	1275	218	227	2625	1275	229	232	1350	192	251
SP 160-5-A	MMS 8000	55	2625	1275	218	227	2625	1275	229	232	1350	192	251
SP 160-5	MMS 8000	63	2765	1275	218	227	2765	1275	229	232	1490	192	277
SP 160-6-AA	MMS 8000	63	2921	1431	218	227	2921	1431	229	232	1490	192	283
SP 160-6-A	MMS 8000	75	3021	1431	218	227	3021	1431	229	232	1590	192	302
SP 160-6	MMS 8000	75	3021	1431	218	227	3021	1431	229	232	1590	192	302
SP 160-7-AA	MMS 8000	75	3177	1587	218	227					1590	192	302
SP 160-7-A	MMS 8000	92	3417	1587	218	227					1830	192	354
SP 160-7	MMS 8000	92	3417	1587	218	227					1830	192	354
SP 160-8-AA	MMS 8000	92	3573	1743	218	227					1830	192	360
SP 160-8-A	MMS 8000	92	3573	1743	218	227					1830	192	360
SP 160-8	MMS 8000	92	3573	1743	218	227					1830	192	360
SP 160-9-AA	MMS 8000	110	3959	1899	218	227					2060	192	416
SP 160-9-A	MMS 8000	110	3959	1899	218	227					2060	192	416
SP 160-9	MMS 8000	110	3959	1899	218	227					2060	192	416
SP 160-10-AA	MMS 8000	110	4411	2351	218	227					2060	192	432
SP 160-10-A	MMS 10000	132	4273	2403	237	237					1870	237	544
SP 160-10	MMS 10000	132	4273	2403	237	237					1870	237	544
SP 160-11	MMS 10000	132	4429	2559	237	237					1870	237	550
SP 160-12	MMS 10000	147	4784	2714	237	237					2070	237	621
SP 160-13	MMS 10000	170	5090	2870	237	237					2220	237	667
SP 160-14	MMS 10000	170	5245	3025	237	237					2220	237	673
SP 160-15	MMS 12000	190	5239	3259	286	286					1980	286	803

* Maximum diameter of pump with one motor cable.

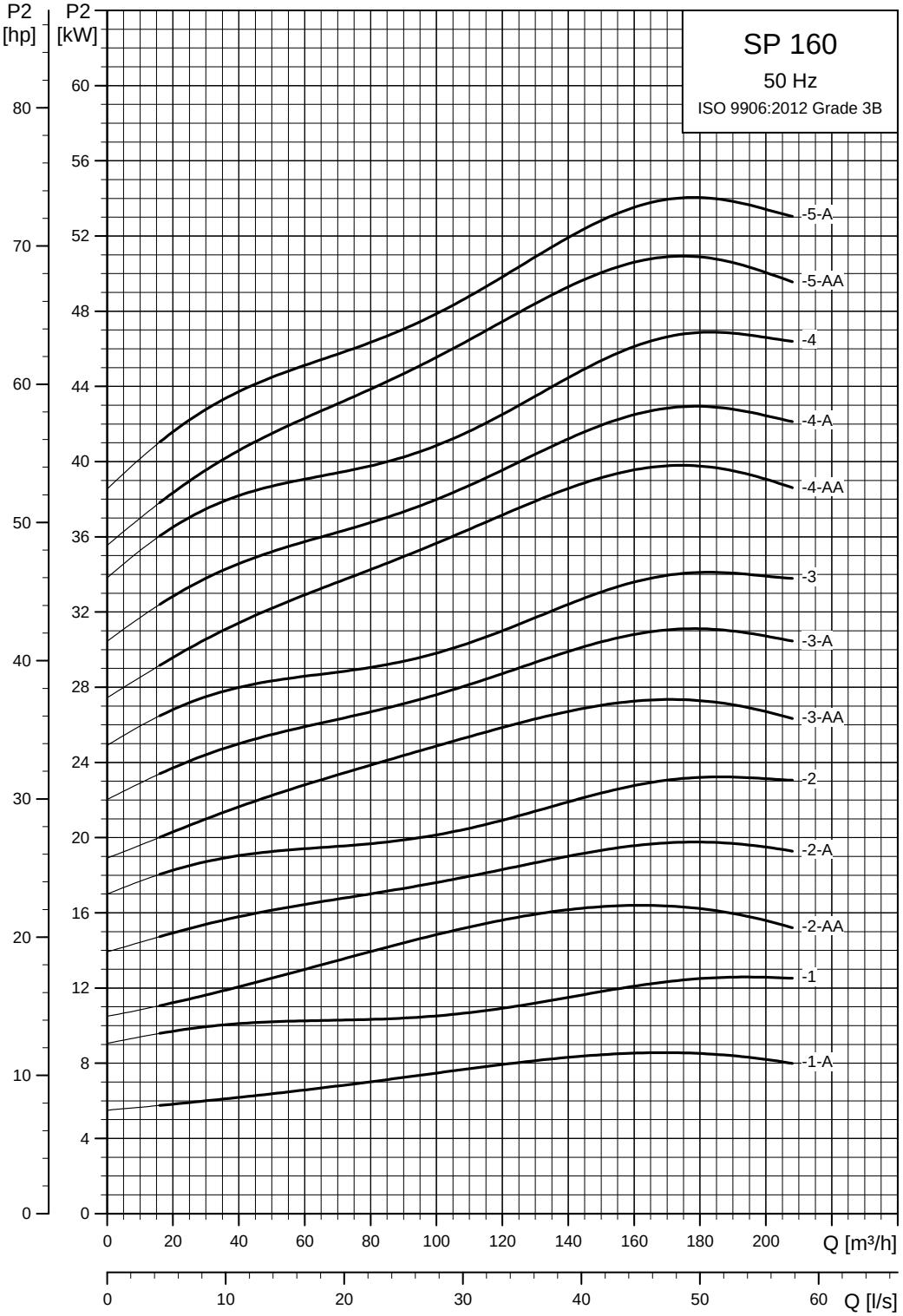
** Maximum diameter of pump with two motor cables.

The pump types above are also available in N-versions. See page 5.

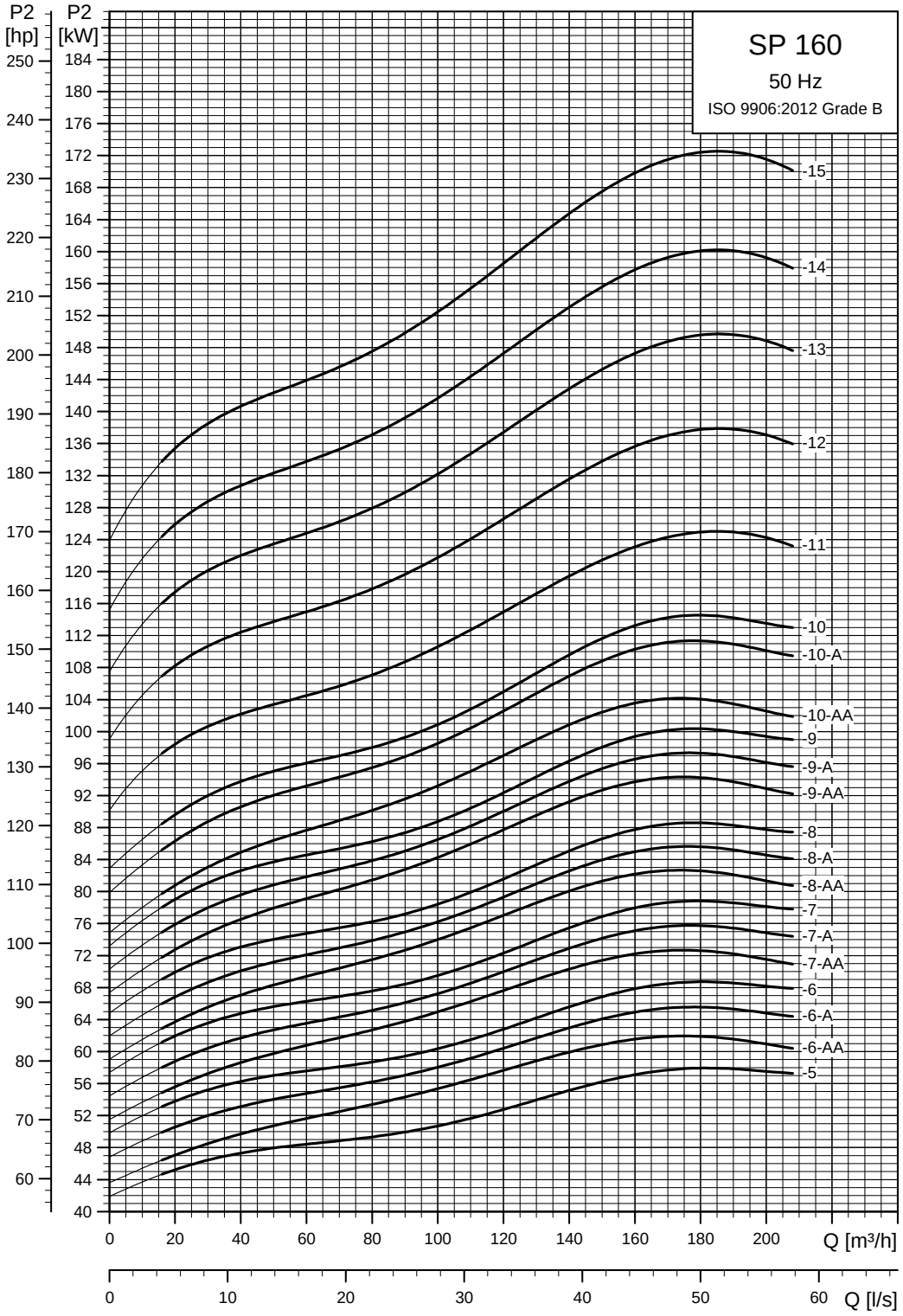
SP 160-1-A to SP 160-14 are also available in R-versions. See page 5.

Other types of connection are possible by means of connecting pieces. See page 83.

Power curves



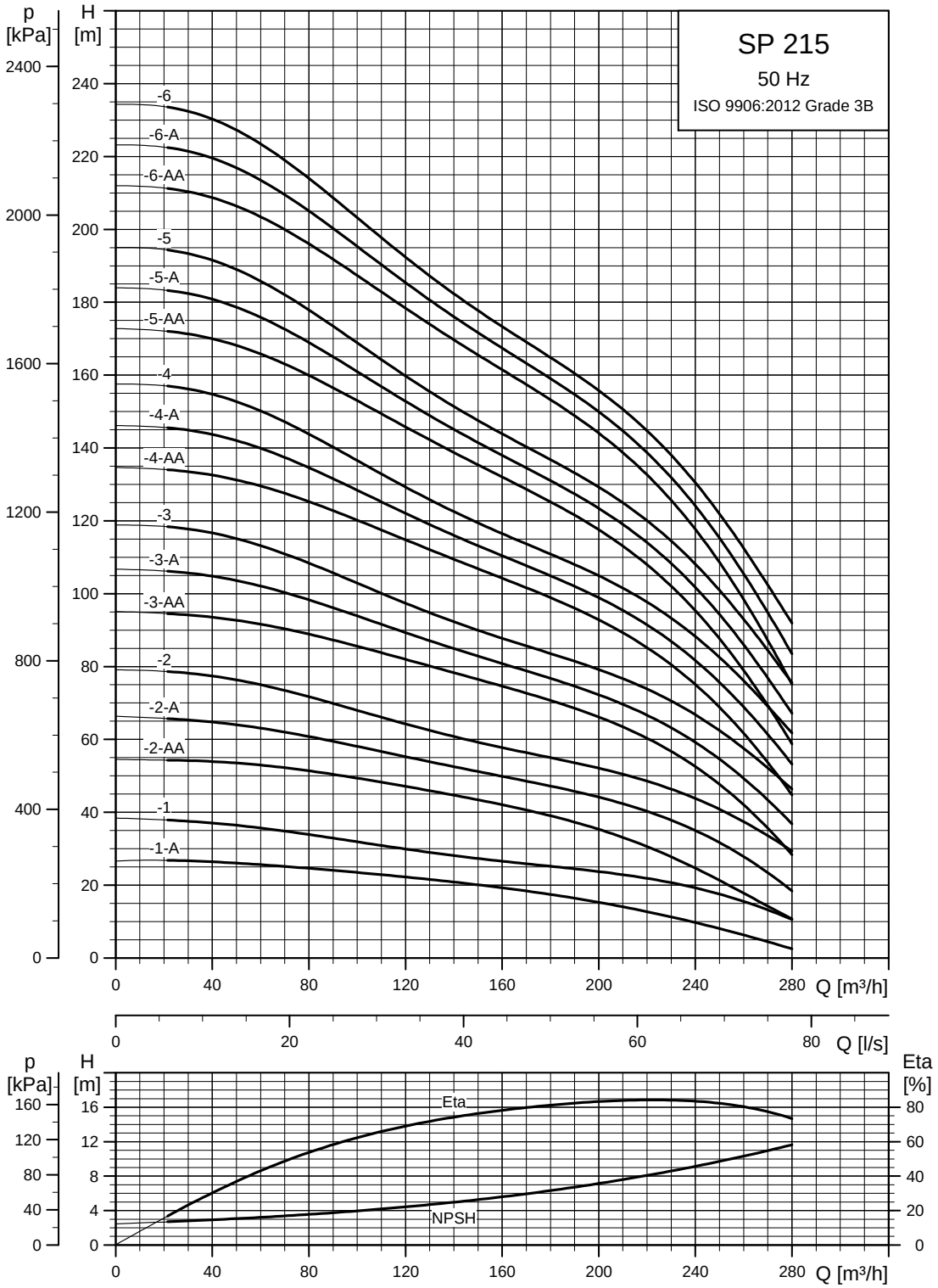
TM00 8783 4702



TM00 8784 4702

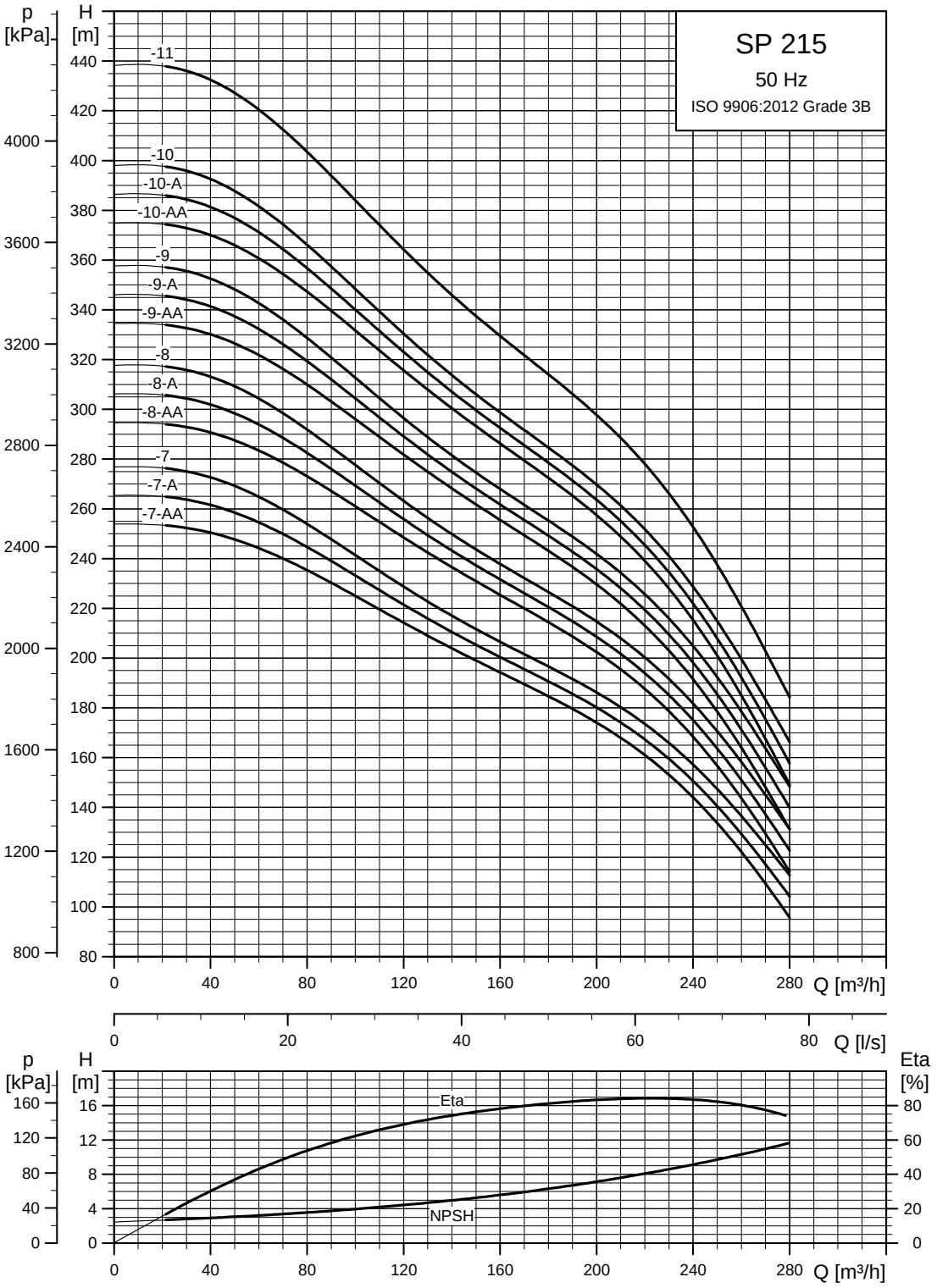
SP 215

Performance curves



TM00 8785 4702

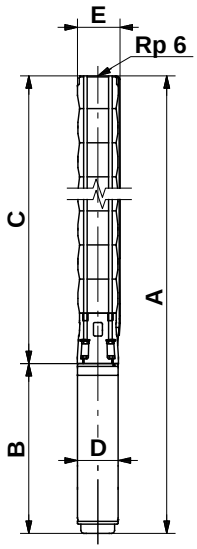
Explanation of efficiency curve, please see *Curve conditions*, page 4.



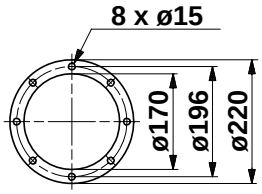
TM01 8786 4702

Explanation of efficiency curve, please see *Curve conditions*, page 4.

Dimensions and weights



TM00 8760 3596



TM00 7324 1798

Pump with Grundfos flange

Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 6 connection				6" Grundfos flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 215-1-A	MS 6000	15	1489	790	241	247	1489	790	241	247	699	138	92
SP 215-1	MS 6000	18.5	1544	790	241	247	1544	790	241	247	754	138	97
SP 215-2-AA	MS 6000	30	1910	966	241	247	1910	966	241	247	944	138	127
SP 215-2-A	MMS6	37	2278	966	241	247	2278	966	241	247	1312	143	169
SP 215-2	MMS 8000	45	2236	966	241	247	2236	966	241	247	1270	192	228
SP 215-3-AA	MMS 8000	55	2492	1142	241	247	2492	1142	241	247	1350	192	253
SP 215-3-A	MMS 8000	55	2492	1142	241	247	2492	1142	241	247	1350	192	253
SP 215-3	MMS 8000	63	2632	1142	241	247	2632	1142	241	247	1490	192	279
SP 215-4-AA	MMS 8000	75	2908	1318	241	247	2908	1318	241	247	1590	192	308
SP 215-4-A	MMS 8000	75	2908	1318	241	247	2908	1318	241	247	1590	192	308
SP 215-4	MMS 8000	75	2908	1318	241	247	2908	1318	241	247	1590	192	308
SP 215-5-AA	MMS 8000	92	3324	1494	241	247	3324	1494	241	247	1830	192	364
SP 215-5-A	MMS 8000	92	3324	1494	241	247	3324	1494	241	247	1830	192	364
SP 215-5	MMS 8000	92	3554	1494	241	247	3554	1494	241	247	1830	192	364
SP 215-6-AA	MMS 8000	110	3730	1670	241	247	3730	1670	241	247	2060	192	424
SP 215-6-A	MMS 8000	110	3730	1670	241	247	3730	1670	241	247	2060	192	424
SP 215-6	MMS 8000	110	3730	1670	241	247	3730	1670	241	247	2060	192	424
SP 215-7-AA	MMS 10000	132	4016	2146	241	247					1870	237	547
SP 215-7-A	MMS 10000	132	4016	2146	241	247					1870	237	547
SP 215-7	MMS 10000	132	4016	2146	241	247					1870	237	547
SP 215-8-AA	MMS 10000	147	4392	2322	241	247					2070	237	622
SP 215-8-A	MMS 10000	147	4392	2322	241	247					2070	237	622
SP 215-8	MMS 10000	147	4392	2322	241	247					2070	237	622
SP 215-9-AA	MMS 10000	170	4718	2498	276	276					2220	237	672
SP 215-9-A	MMS 10000	170	4718	2498	276	276					2220	237	672
SP 215-9	MMS 10000	170	4718	2498	276	276					2220	237	672
SP 215-10-AA	MMS 12000	190	4654	2674	276	276					1980	286	793
SP 215-10-A	MMS 12000	190	4654	2674	276	276					1980	286	793
SP 215-10	MMS 12000	190	4654	2674	276	276					1980	286	793
SP 215-11	MMS 12000	220	4990	2850	286	286					2140	286	853

* Maximum diameter of pump with one motor cable.

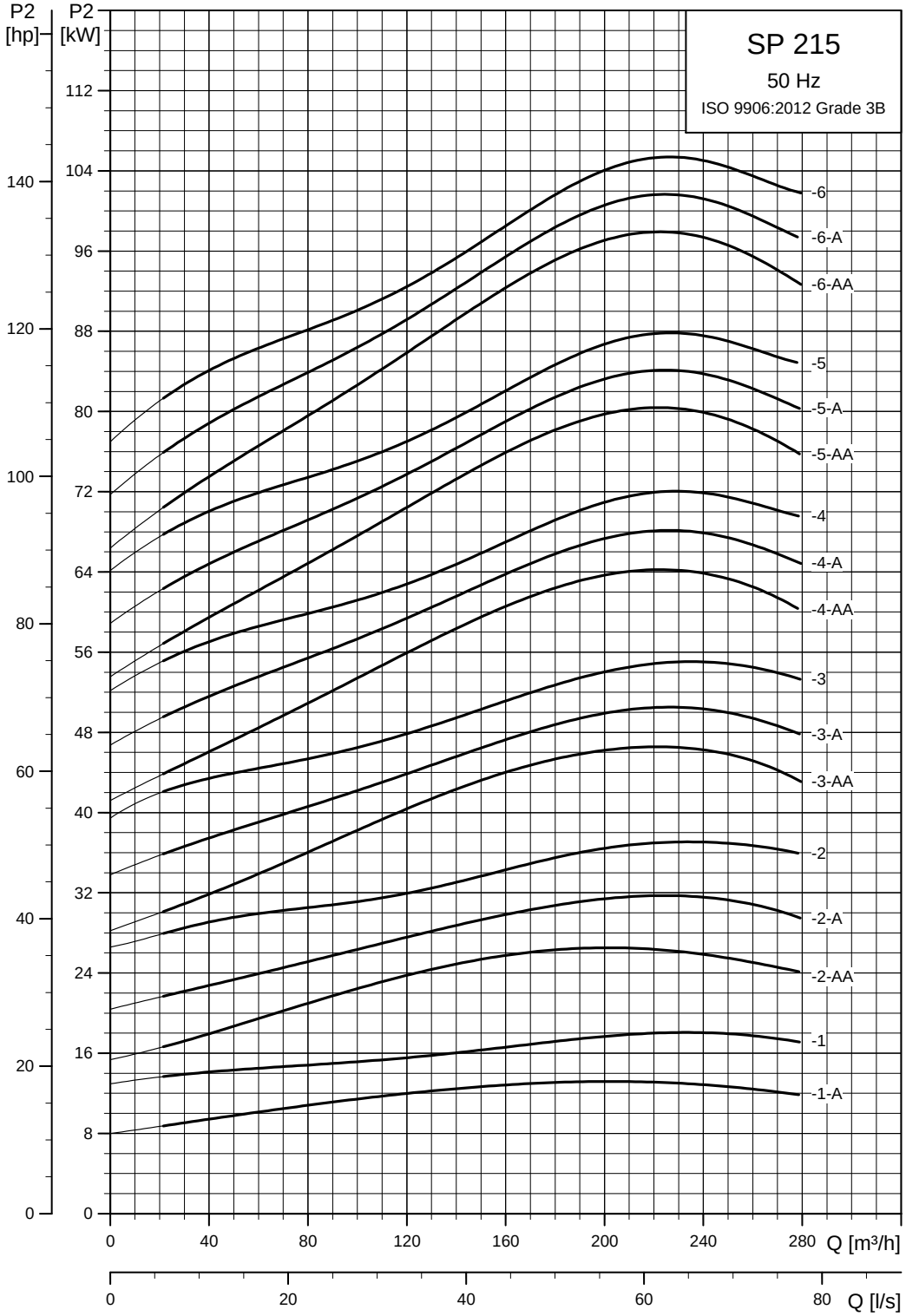
** Maximum diameter of pump with two motor cables.

The pump types above are also available in N-versions. See page 5.

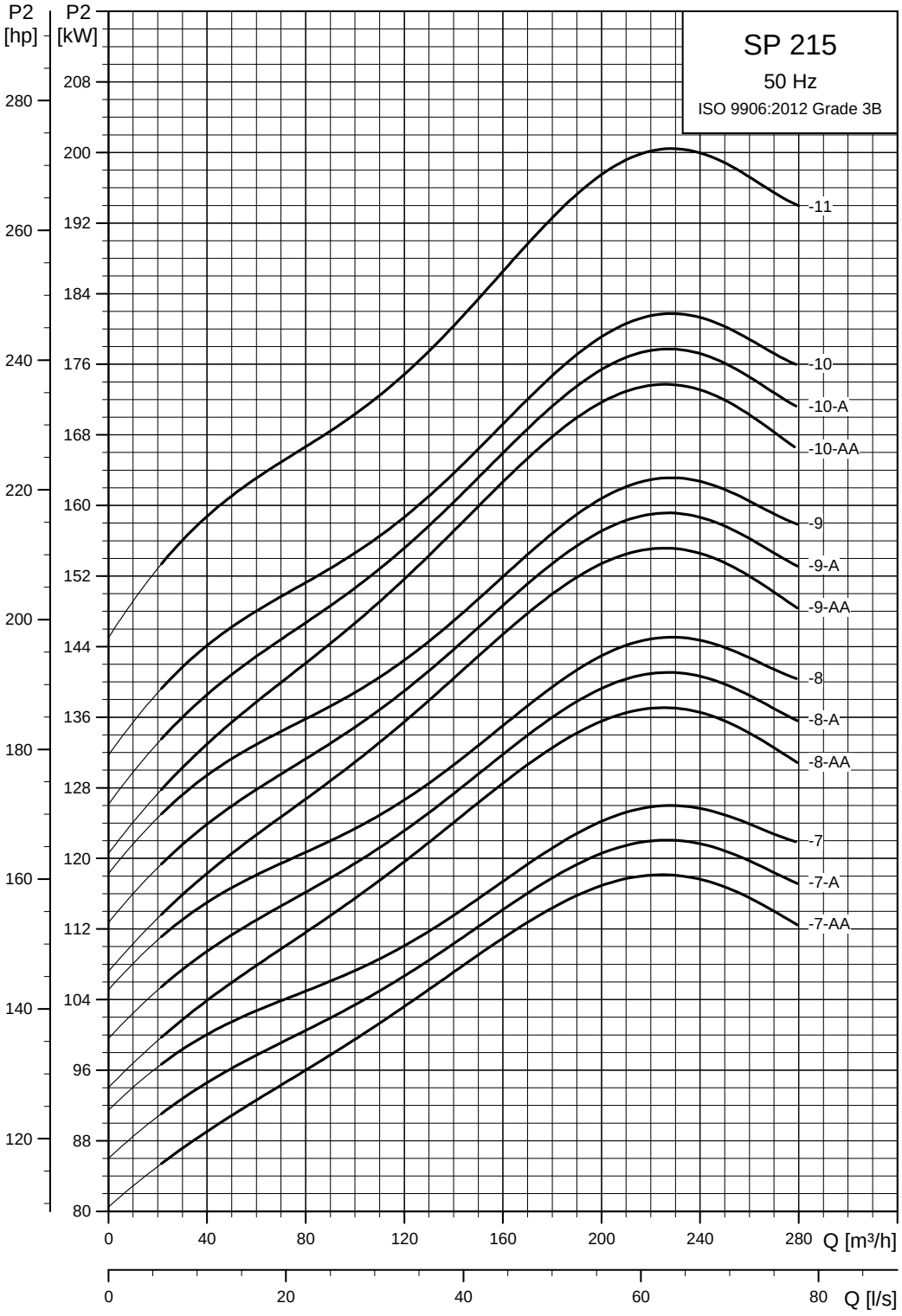
SP 215-1-A to SP 215-9 are also available in R-versions. See page 5.

Other types of connection are possible by means of connecting pieces. See page 83.

Power curves



TM01 8787 4702



TM01 8788 4702

5. Electrical data

1 x 230 V, submersible motors

Electrical data													Dimensions	
Motor			Full-load current I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Control box for 3-wire motors	Capacitor for PSC motors	Length [mm]	Weight [kg]
Type	Size	Power [kW]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %					
MS 402	4"	0.37	3.95	48.0	54.0	57.0	0.58	0.68	0.77	3.4*	SA-SPM 2	16 µF, 400 V, 50 Hz	256	6.8
MS 402	4"	0.55	5.80	49.5	56.5	59.5	0.52	0.65	0.74	3.5*	SA-SPM 2	20 µF, 400 V, 50 Hz	291	8.2
MS 402	4"	0.75	7.45	52.0	58.0	60.0	0.57	0.69	0.79	3.6*	SA-SPM 2	30 µF, 400 V, 50 Hz	306	8.9
MS 402	4"	1.1	7.30	62.0	69.5	72.5	0.99	0.99	0.99	4.3*	SA-SPM 3	40 µF, 400 V, 50 Hz	346	10.5
MS 402	4"	1.5	10.2	56.5	66.5	71.0	0.91	0.96	0.98	3.9	SA-SPM 3	-	346	11.0
MS 4000 (R)	4"	2.2	14.0	67.0	73.0	75.0	0.91	0.94	0.96	4.4	SA-SPM 3	-	576	21.0

* Applies to 3-wire motors.

MS 402 2-wire motors incorporate motor protection and can therefore be connected directly to the mains.

3 x 230 V, submersible motors

Electrical data												Dimensions	
Motor			Full-load current I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
Type	Size	Power [kW]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %			
MS 402	4"	0.37	2.55	51.0	59.5	64.0	0.44	0.55	0.64	3.7	226	5.5
MS 402	4"	0.55	4.00	48.5	57.0	64.0	0.42	0.52	0.64	3.5	241	6.3
MS 402	4"	0.75	4.20	64.0	69.5	73.0	0.50	0.62	0.72	4.6	276	7.7
MS 4000R	4"	0.75	3.35	66.8	71.1	72.9	0.66	0.76	0.82	5.1	401	13.0
MS 402	4"	1.1	6.20	62.5	69.0	73.0	0.47	0.59	0.72	4.6	306	8.9
MS 4000R	4"	1.1	5.00	69.1	73.2	75.0	0.57	0.70	0.78	5.2	416	14.0
MS 402	4"	1.5	7.65	68.0	73.0	75.0	0.50	0.64	0.75	5.0	346	10.5
MS 4000R	4"	1.5	7.40	66.6	71.4	72.9	0.53	0.66	0.74	4.5	416	14.0
MS 402	4"	2.2	10.0	72.5	75.5	76.0	0.56	0.71	0.82	4.7	346	11.9
MS 4000 (R)	4"	2.2	11.6	64.5	70.8	73.3	0.44	0.58	0.69	4.2	456	16.0
MS 4000 (R)	4"	3.0	14.6	67.5	72.8	74.6	0.48	0.62	0.73	4.4	496	17.0
MS 4000 (R)	4"	4.0	17.6	73.9	77.4	77.9	0.52	0.67	0.77	4.9	576	21.0
MS 4000 (R)	4"	5.5	24.2	76.0	78.8	79.6	0.51	0.66	0.76	4.9	676	26.0
MS 6000 (R)	6"	5.5	24.8	77.0	79.0	80.0	0.51	0.64	0.73	4.5	544	35.5
MS 6000 (R)	6"	7.5	32.0	79.0	82.0	82.0	0.55	0.68	0.77	4.6	574	37.0
MS 6000 (R)	6"	9.2	39.5	77.0	80.0	80.0	0.56	0.70	0.78	4.8	604	42.5
MS 6000 (R)	6"	11	45.0	81.0	82.5	82.5	0.60	0.72	0.79	4.8	634	45.5
MS 6000 (R)	6"	13	54.5	81.0	82.5	82.5	0.58	0.71	0.78	4.8	664	48.5
MS 6000 (R)	6"	15	62.0	82.0	83.5	83.5	0.59	0.71	0.78	5.2	699	52.5
MS 6000 (R)	6"	18.5	76.5	82.5	84.5	84.0	0.56	0.69	0.77	5.3	754	58.0
MS 6000 (R)	6"	22	87.5	84.5	85.0	84.0	0.61	0.74	0.81	5.2	814	64.0
MS 6000 (R)	6"	26	104	83.5	84.0	83.5	0.61	0.73	0.81	5.0	874	69.5
MS 6000 (R)	6"	30	120	83.0	84.0	83.0	0.59	0.72	0.80	5.0	944	77.5

MS 402: Data apply to 3 x 220 V.

3 x 230 V, submersible rewindable motors

Motor			Full-load current I_n [A]	Electrical data							Dimensions	
				Motor efficiency [%]			Power factor					
Type	Size	Power [kW]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %	$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
MMS6 (N, R)	6"	5.5	25.0	71	75	76	0.61	0.72	0.78	3.5	807	50
MMS6 (N, R)	6"	7.5	33.5	72	76	77	0.59	0.71	0.78	3.5	837	53
MMS6 (N, R)	6"	9.2	40.5	74	77	78	0.59	0.71	0.78	3.6	867	55
MMS6 (N, R)	6"	11	50.0	74	78	79	0.53	0.66	0.74	3.8	897	60
MMS6 (N, R)	6"	13	56.0	77	80	80	0.57	0.69	0.77	3.9	927	65
MMS6 (N, R)	6"	15	62.5	79	82	82	0.58	0.71	0.79	4.3	997	77
MMS6 (N, R)	6"	18.5	75.0	80	82	82	0.61	0.75	0.81	4.2	1057	83
MMS6 (N, R)	6"	22	87.0	82	84	83	0.61	0.74	0.81	5.3	1087	95
MMS6 (N, R)	6"	26	106	81	83	83	0.57	0.7	0.78	5.6	1157	105
MMS6 (N, R)	6"	30	118	82	83	82	0.63	0.76	0.82	4.8	1212	110
MMS6 (N, R)	6"	37	148	82	84	83	0.59	0.72	0.81	5.4	1312	120
MMS 8000 (N, R)	8"	22	82.5	80	84	84	0.71	0.80	0.84	5.3	1010	126
MMS 8000 (N, R)	8"	26	95.5	81	84	84	0.76	0.83	0.86	5.1	1050	134
MMS 8000 (N, R)	8"	30	110	83	85	86	0.71	0.80	0.84	5.7	1110	146
MMS 8000 (N, R)	8"	37	134	83	86	86	0.73	0.82	0.85	5.7	1160	156
MMS 8000 (N, R)	8"	45	168	84	87	88	0.62	0.74	0.81	6.0	1270	177
MMS 8000 (N, R)	8"	55	214	84	87	88	0.57	0.70	0.77	5.9	1350	192
MMS 8000 (N, R)	8"	63	210	87	89	89	0.81	0.87	0.90	5.7	1490	218
MMS 10000 (N, R)	10"	75	270	84	86	86	0.72	0.81	0.85	5.4	1500	330
MMS 10000 (N, R)	10"	92	345	83	85	86	0.65	0.77	0.82	5.6	1690	385
MMS 10000 (N, R)	10"	110	385	85	86	86	0.80	0.86	0.88	5.7	1870	435

3 x 400 V, submersible motors

Motor			Full-load current I_n [A]	Electrical data							Dimensions	
				Motor efficiency [%]			Power factor					
Type	Size	Power [kW]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %	$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
MS 402	4"	0.37	1.40	51.0	59.5	64.0	0.44	0.55	0.64	3.7	226	5.5
MS 402	4"	0.55	2.20	48.5	57.0	64.0	0.42	0.52	0.64	3.5	241	6.3
MS 402	4"	0.75	2.30	64.0	69.5	73.0	0.50	0.62	0.72	4.7	276	7.7
MS 4000R	4"	0.75	1.84	68.1	71.6	72.8	0.69	0.79	0.84	4.9	401	13.0
MS 402	4"	1.1	3.40	62.5	69.0	73.0	0.47	0.59	0.72	4.6	306	8.9
MS 4000R	4"	1.1	2.75	70.3	74.0	74.4	0.62	0.74	0.82	5.1	416	14.0
MS 402	4"	1.5	4.20	68.0	73.0	75.0	0.50	0.64	0.75	5.0	346	10.5
MS 4000R	4"	1.5	4.00	69.1	72.7	73.7	0.55	0.69	0.78	4.3	416	14.0
MS 402	4"	2.2	5.50	72.5	75.5	76.0	0.56	0.71	0.82	4.7	346	11.9
MS 4000 (R)	4"	2.2	6.05	67.9	73.1	74.5	0.49	0.63	0.74	4.5	456	16.0
MS 4000 (R)	4"	3.0	7.85	71.5	74.5	75.2	0.53	0.67	0.77	4.5	496	17.0
MS 4000 (R)	4"	4.0	9.60	77.3	78.4	78.0	0.57	0.71	0.80	4.8	576	21.0
MS 4000 (R)	4"	5.5	13.0	78.5	80.1	79.8	0.57	0.72	0.81	4.9	676	26.0
MS 4000 (R)	4"	7.5	18.8	75.2	78.2	78.2	0.52	0.67	0.78	4.5	776	31.0
MS 6000 (R)	6"	5.5	13.6	78.0	80.0	80.5	0.55	0.67	0.77	4.4	544	35.5
MS 6000 (R)	6"	7.5	17.6	81.5	82.0	82.0	0.60	0.73	0.80	4.3	574	37.0
MS 6000 (R)	6"	9.2	21.8	78.0	80.0	79.5	0.61	0.73	0.81	4.6	604	42.5
MS 6000 (R)	6"	11	24.8	82.0	83.0	82.5	0.65	0.77	0.83	4.7	634	45.5
MS 6000 (R)	6"	13	30.0	82.5	83.5	82.0	0.62	0.74	0.81	4.6	664	48.5
MS 6000 (R)	6"	15	34.0	82.0	83.5	83.5	0.64	0.76	0.82	5.0	699	52.5
MS 6000 (R)	6"	18.5	42.0	83.5	84.5	83.5	0.62	0.73	0.81	5.1	754	58.0
MS 6000 (R)	6"	22	48.0	84.5	85.0	83.5	0.67	0.77	0.84	5.0	814	64.0
MS 6000 (R)	6"	26	57.0	84.5	85.0	84.0	0.66	0.77	0.84	4.9	874	69.5
MS 6000 (R)	6"	30	66.5	84.5	85.0	84.0	0.64	0.77	0.83	4.9	944	77.5

3 x 400 V, submersible industrial motors (60 °C)

Electrical data												Dimensions	
Motor			Full-load current I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
Type	Size	Power [kW]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %			
MS 4000I (R)	4"	2.2	5.9	72.5	76.5	77.0	0.59	0.71	0.80	5.0	496	17.0
MS 4000I (R)	4"	3.0	7.5	75.0	79.0	80.0	0.58	0.71	0.79	5.4	576	21.0
MS 4000I (R)	4"	4.0	9.75	75.5	79.5	79.5	0.67	0.78	0.84	5.3	676	26.0
MS 4000I (R)	4"	5.5	14.4	77.5	79.6	79.8	0.55	0.69	0.79	5.0	776	42.5
MS 6000I (R)	6"	5.5	13.2	75.0	79.0	80.0	0.63	0.74	0.80	6.0	604	42.5
MS 6000I (R)	6"	7.5	17.0	79.5	81.0	81.5	0.71	0.80	0.84	4.9	634	45.5
MS 6000I (R)	6"	9.2	20.2	80.0	82.5	82.5	0.72	0.80	0.85	5.5	664	48.5
MS 6000I (R)	6"	11	24.2	82.0	83.0	83.0	0.74	0.83	0.86	5.0	699	52.5
MS 6000I (R)	6"	13	28.5	82.0	83.5	84.0	0.71	0.80	0.84	5.4	754	58.0
MS 6000I (R)	6"	15	33.0	82.0	83.5	84.0	0.68	0.79	0.84	5.9	814	64.0
MS 6000I (R)	6"	18.5	39.5	84.0	85.5	85.0	0.71	0.80	0.85	5.8	874	69.5
MS 6000I (R)	6"	22	48.0	83.5	84.5	84.5	0.71	0.80	0.85	5.6	944	77.5

3 x 400 V, submersible rewindable motors

Motor			Electrical data								Dimensions	
				Motor efficiency [%]			Power factor					
Type	Size	Power [kW]	Full-load current I_n [A]	η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %	$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
MMS6 (N, R)	6"	5.5	14.4	71	75	76	0.60	0.71	0.77	3.5	807	50
MMS6 (N, R)	6"	7.5	19.2	72	76	77	0.59	0.71	0.78	3.6	837	53
MMS6 (N, R)	6"	9.2	22.8	75	78	78	0.61	0.73	0.79	3.5	867	55
MMS6 (N, R)	6"	11	27.5	74	78	78	0.58	0.71	0.79	3.7	897	60
MMS6 (N, R)	6"	13	32.0	77	79	79	0.63	0.75	0.79	3.8	927	65
MMS6 (N, R)	6"	15	36.5	76	79	79	0.59	0.72	0.80	4.2	997	77
MMS6 (N, R)	6"	18.5	43.5	79	81	81	0.60	0.72	0.80	4.5	1057	83
MMS6 (N, R)	6"	22	51.5	81	83	83	0.57	0.70	0.79	5.5	1087	95
MMS6 (N, R)	6"	26	61.0	81	83	83	0.57	0.70	0.78	5.7	1157	105
MMS6 (N, R)	6"	30	68.2	83	84	84	0.61	0.73	0.81	5.0	1212	110
MMS6 (N, R)	6"	37	84.5	82	84	83	0.60	0.73	0.81	5.1	1312	120
MMS 8000 (N, R)	8"	22	48.0	80	82	82	0.72	0.81	0.84	5.3	1010	126
MMS 8000 (N, R)	8"	26	56.5	80	82	82	0.76	0.83	0.85	5.1	1050	134
MMS 8000 (N, R)	8"	30	64.0	82	84	84	0.74	0.82	0.85	5.7	1110	146
MMS 8000 (N, R)	8"	37	78.5	82	84	84	0.74	0.82	0.85	5.7	1160	156
MMS 8000 (N, R)	8"	45	96.5	84	86	86	0.65	0.76	0.82	6.0	1270	177
MMS 8000 (N, R)	8"	55	114	84	86	86	0.72	0.81	0.85	5.9	1350	192
MMS 8000 (N, R)	8"	63	132	85	87	87	0.66	0.78	0.83	5.7	1490	218
MMS 8000 (N, R)	8"	75	152	86	87	87	0.71	0.82	0.86	5.8	1590	237
MMS 8000 (N, R)	8"	92	186	87	88	87	0.72	0.82	0.86	5.9	1830	283
MMS 8000 (N, R)	8"	110	224	86	87	87	0.73	0.83	0.87	5.8	2060	333
MMS 10000 (N, R)	10"	75	156	84	86	87	0.70	0.80	0.84	5.4	1400	280
MMS 10000 (N, R)	10"	92	194	84	87	87	0.67	0.78	0.82	5.6	1500	330
MMS 10000 (N, R)	10"	110	228	85	87	88	0.70	0.79	0.84	5.7	1690	385
MMS 10000 (N, R)	10"	132	270	85	88	88	0.71	0.81	0.84	5.7	1870	435
MMS 10000 (N, R)	10"	147	315	84	87	87	0.64	0.75	0.81	6.2	2070	500
MMS 10000 (N, R)	10"	170	365	84	86	87	0.64	0.75	0.81	6.0	2220	540
MMS 10000 (N, R)	10"	190	425	83	86	87	0.60	0.72	0.79	5.9	2400	580
MMS 12000 (N)	12"	147	305	84	87	88	0.66	0.77	0.83	6.2	1790	565
MMS 12000 (N)	12"	170	345	85	87	88	0.69	0.79	0.85	6.1	1880	605
MMS 12000 (N)	12"	190	390	85	87	88	0.68	0.79	0.84	6.2	1980	650
MMS 12000 (N)	12"	220	445	85	87	88	0.69	0.80	0.85	6.1	2140	700
MMS 12000 (N)	12"	250	505	85	87	88	0.69	0.80	0.85	5.9	2290	775

3 x 500 V, submersible motors

Motor			Full-load current I_n [A]	Electrical data							Dimensions	
				Motor efficiency [%]			Power factor					
Type	Size	Power [kW]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %	$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
MS 4000R	4"	0.75	1.5	69.1	72.7	73.7	0.55	0.69	0.78	4.7	401	13.0
MS 4000R	4"	1.1	2.2	70.3	74.0	74.4	0.62	0.74	0.82	5.0	416	14.0
MS 4000R	4"	1.5	3.2	69.1	72.7	73.7	0.55	0.69	0.78	4.4	416	14.0
MS 4000 (R)	4"	2.2	4.9	67.9	73.1	74.5	0.49	0.63	0.74	4.3	456	16.0
MS 4000 (R)	4"	3.0	6.3	71.5	74.5	75.2	0.53	0.67	0.77	4.6	496	17.0
MS 4000 (R)	4"	4.0	7.7	77.3	78.4	78.0	0.57	0.71	0.81	4.8	576	21.0
MS 4000 (R)	4"	5.5	10.4	78.5	80.1	79.8	0.57	0.72	0.81	4.9	676	26.0
MS 4000 (R)	4"	7.5	15.0	75.2	78.2	78.2	0.52	0.67	0.78	4.5	776	31.0
MS 6000 (R)	6"	5.5	10.8	78.0	80.0	80.5	0.56	0.67	0.77	4.4	544	35.5
MS 6000 (R)	6"	7.5	14.0	81.0	82.5	82.5	0.60	0.72	0.8	4.5	574	37.0
MS 6000 (R)	6"	9.2	17.4	78.0	80.0	80.0	0.62	0.73	0.81	4.6	604	42.5
MS 6000 (R)	6"	11	19.8	82.0	83.5	82.0	0.65	0.77	0.83	4.7	634	45.5
MS 6000 (R)	6"	13	24.0	82.5	83.5	82.5	0.62	0.74	0.81	4.6	664	68.5
MS 6000 (R)	6"	15	27.0	82.0	83.0	83.0	0.65	0.76	0.82	5.0	699	52.5
MS 6000 (R)	6"	18.5	33.5	83.5	84.5	84.0	0.61	0.73	0.81	5.1	754	58.0
MS 6000 (R)	6"	22	38.5	84.5	85.0	84.0	0.67	0.77	0.84	5.0	814	64.0
MS 6000 (R)	6"	26	45.5	84.5	85.0	84.0	0.66	0.77	0.84	4.9	874	69.5
MS 6000 (R)	6"	30	53.0	85.0	84.5	83.5	0.64	0.76	0.83	4.9	945	77.5

3 x 500 V, submersible industrial motors

Motor			Full-load current I_n [A]	Electrical data							Dimensions	
				Motor efficiency [%]			Power factor					
Type	Size	Power [kW]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %	$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
MS 4000I (R)	4"	2.2	4.7	72.5	76.5	77.0	0.59	0.71	0.80	4.9	496	17.0
MS 4000I (R)	4"	3.0	6.2	75.0	79.0	80.0	0.58	0.71	0.79	5.4	576	21.0
MS 4000I (R)	4"	4.0	7.8	75.5	79.5	79.5	0.67	0.78	0.84	5.2	676	26.0
MS 4000I (R)	4"	5.5	11.6	77.0	79.5	80.0	0.55	0.68	0.78	5.0	776	31.0
MS 6000I (R)	6"	5.5	10.6	75.0	78.5	80.0	0.63	0.74	0.80	6.0	604	42.5
MS 6000I (R)	6"	7.5	13.6	79.5	81.0	81.5	0.71	0.80	0.84	4.9	634	45.5
MS 6000I (R)	6"	9.2	16.2	80.0	83.0	83.0	0.72	0.81	0.84	5.5	664	48.5
MS 6000I (R)	6"	11	19.4	82.0	83.5	83.5	0.74	0.82	0.86	5.0	699	52.5
MS 6000I (R)	6"	13	22.8	82.5	83.5	84.0	0.71	0.80	0.84	5.4	754	58.0
MS 6000I (R)	6"	15	26.4	82.0	84.0	84.5	0.71	0.79	0.84	5.9	814	64.0
MS 6000I (R)	6"	18.5	31.5	84.5	85.5	85.0	0.71	0.81	0.85	5.8	874	69.5
MS 6000I (R)	6"	22	38.5	84.0	84.5	84.5	0.71	0.80	0.85	5.6	944	77.5

3 x 500 V, submersible rewindable motors

Motor			Electrical data								Dimensions	
				Motor efficiency [%]			Power factor					
Type	Size	Power [kW]	Full-load current I_n [A]	η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %	$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
MMS6 (N, R)	6"	9.2	18.6	72	75	75	0.61	0.74	0.81	3.5	867	55
MMS6 (N, R)	6"	11	21.8	74	77	76	0.64	0.75	0.81	3.5	897	60
MMS6 (N, R)	6"	13	25.0	76	78	78	0.62	0.75	0.81	3.7	927	65
MMS6 (N, R)	6"	15	28.0	77	80	79	0.65	0.77	0.82	3.9	997	77
MMS6 (N, R)	6"	18.5	34.5	78	80	79	0.65	0.77	0.83	4.0	1057	83
MMS6 (N, R)	6"	22	39.5	82	82	80	0.69	0.80	0.84	4.8	1087	95
MMS6 (N, R)	6"	26	47.0	81	82	80	0.67	0.79	0.84	5.0	1157	105
MMS6 (N, R)	6"	30	54.5	80	81	79	0.67	0.79	0.84	4.5	1212	110
MMS6 (N, R)	6"	37	66.5	81	82	80	0.66	0.78	0.85	5.1	1312	120
MMS 8000 (N, R)	8"	22	37.5	81	83	83	0.79	0.85	0.87	4.7	1010	126
MMS 8000 (N, R)	8"	26	44.0	81	84	83	0.80	0.85	0.86	4.8	1050	134
MMS 8000 (N, R)	8"	30	49.5	83	85	85	0.78	0.85	0.86	5.6	1110	146
MMS 8000 (N, R)	8"	37	60.5	84	85	85	0.82	0.87	0.87	5.6	1160	156
MMS 8000 (N, R)	8"	45	72.0	85	87	87	0.73	0.82	0.86	6.2	1270	177
MMS 8000 (N, R)	8"	55	88.5	86	88	88	0.71	0.81	0.86	6.1	1350	192
MMS 8000 (N, R)	8"	63	96.5	87	89	88	0.82	0.88	0.90	6.1	1490	218
MMS 8000 (N, R)	8"	75	114	88	89	88	0.85	0.89	0.90	5.6	1590	237
MMS 8000 (N, R)	8"	92	142	88	87	88	0.81	0.87	0.89	5.3	1830	283
MMS 8000 (N, R)	8"	110	182	86	88	88	0.67	0.78	0.84	5.3	2060	333
MMS 10000 (N, R)	10"	75	122	85	87	87	0.77	0.84	0.86	5.3	1400	280
MMS 10000 (N, R)	10"	92	150	85	87	87	0.74	0.82	0.85	5.3	1500	330
MMS 10000 (N, R)	10"	110	178	85	87	88	0.76	0.84	0.86	5.4	1690	385
MMS 10000 (N, R)	10"	132	210	86	88	87	0.82	0.87	0.88	5.0	1870	435
MMS 10000 (N, R)	10"	147	236	85	88	88	0.74	0.83	0.86	5.8	2070	500
MMS 10000 (N, R)	10"	170	270	86	88	88	0.78	0.85	0.87	5.4	2220	540
MMS 10000 (N, R)	10"	190	305	86	88	87	0.80	0.86	0.87	5.3	2400	580
MMS 12000 (N)	12"	147	218	86	89	90	0.80	0.88	0.91	6.9	1790	565
MMS 12000 (N)	12"	170	265	87	89	90	0.74	0.82	0.86	6.0	1880	605
MMS 12000 (N)	12"	190	220	88	90	91	0.85	0.91	0.93	7.8	1980	650
MMS 12000 (N)	12"	220	335	88	90	90	0.79	0.86	0.88	5.8	2140	700
MMS 12000 (N)	12"	250	375	87	90	91	0.75	0.85	0.89	6.3	2290	775

6. Accessories

CUE frequency converter

The Grundfos CUE is a series of external frequency converters designed for speed control of a wide range of Grundfos pumps.

When a CUE is installed, the motor requires no further motor protection.

The CUE offers quick and easy set-up and commissioning compared to a standard frequency converter because of the start-up guide. Simply key in application-specific variables such as motor data, pump family, control function (for example constant pressure), sensor type and setpoint, and the CUE will automatically set all necessary parameters.

The CUE enables gentle pumping and thereby protects the water reservoir and the rest of the distribution system, as water hammer can be avoided by adjusting ramp times up and down.

Overview of the CUE range

Supply voltage [V]	Power range [kW]						
	0.55	0.75	1.1	7.5	11	45	250
3 x 525-690					■	■	■
3 x 525-600		■	■	■			
3 x 380-500	■	■	■	■	■	■	■
3 x 200-240		■	■	■	■	■	
1 x 200-240			■	■			

The CUE is available in two enclosure classes:

- IP20/21
- IP54/55.

RFI filters

To meet the EMC requirements, the CUE comes with the following types of built-in radio frequency interference filter (RFI).

Voltage [V]	Typical shaft power, P2 [kW]	RFI filter type	Application
1 x 200-240	1.1 - 7.5	C1	Domestic
3 x 200-240	0.75 - 45	C1	
3 x 380-500	0.55 - 90	C1	
	110 - 250	C2	Domestic/ industry
3 x 525-600	0.75 - 7.5	C3	Industry
3 x 525-690	11 - 25	C3	

GrA4404 3407

Fig. 15 The CUE range

Functions

The CUE has a wide range of pump-specific functions, such as:

- constant pressure
- constant level
- constant flow rate
- constant temperature
- constant curve.

CUE features

- Start-up guide
  The CUE incorporates an innovative start-up guide for the general setting of the CUE including the setting of the correct direction of rotation.
  The start-up guide is started the first time the CUE is connected to the power supply.
- Check of direction of rotation.
- Duty/standby operation.
- Dry-running protection.
- Low-flow stop function.

Accessories for the CUE

Grundfos offers various accessories for the CUE.

MCB 114 sensor input module

The MCB 114 offers additional analog inputs for the CUE:

- 1 analog input, 0/4-20 mA
- 2 inputs for Pt100 and Pt1000 temperature sensors.

Output filters

Output filters are used primarily to protect the motor against overvoltage and increased operating temperature. However, output filters can also be used to reduce acoustic noise from the motor.

Grundfos offers two types of output filter as accessories for the CUE:

- dU/dt filters
- sine-wave filters.

Sensors

The following sensors can be used in connection with the CUE. All sensors are with 4-20 mA output signal.

- pressure sensors, up to 25 bar
- temperature sensors
- differential-pressure sensors
- differential-temperature sensors
- flowmeters
- potentiometer box for external setpoint setting.

Use of output filters

The table below shows in which cases an output filter is required. From the table, it can be seen if a filter is needed, and which type to use.

The selection depends on these factors:

- pump type
- motor cable length
- the required reduction of acoustic noise from the motor.

Pump type	Typical shaft power, P2	dU/dt filter	Sine-wave filter
SP with 380 V motor and up	Up to 7.5 kW	-	0-300 m
	11 kW and up	0-150 m	150-300 m

The lengths stated apply to the motor cable.

Cables used in CUE installations

Note: When the CUE is installed in connection with SP pumps, we distinguish between two types of installation:

- installation in EMC-insensitive sites. See fig. 16.
- installation in EMC-sensitive sites. See fig. 17.

The two types of installation are different when it comes to the use of screened cable.

Note: Drop cables are always unscreened.

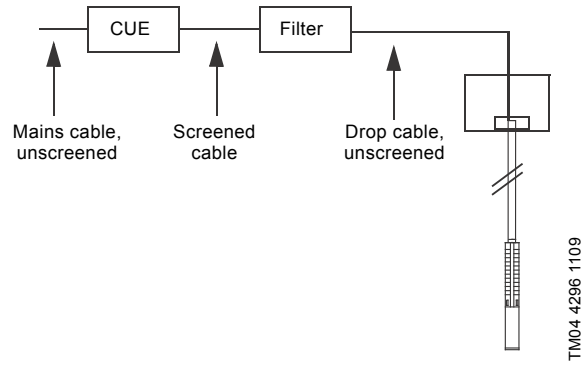


Fig. 16 Example of installation in EMC-insensitive sites

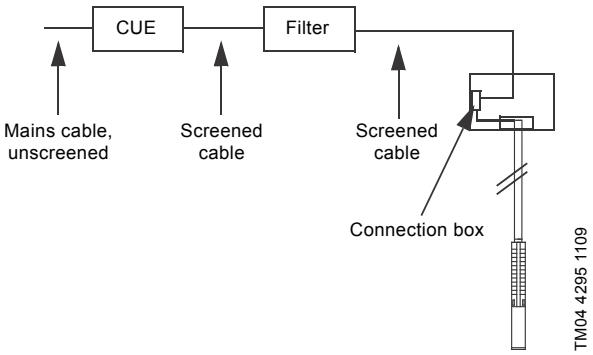


Fig. 17 Example of installation in EMC-sensitive sites

Screened cables are required in those parts of the installation where the surroundings must be protected against EMC.

The CUE is the right choice of frequency converter in SP installations as it meets all basic issues.
The CUE has a pre-installed start-up guide which takes the installer through all the necessary settings.

The table below shows the different issues to be considered when using frequency converters in SP installations.

Issues to be considered	Explanation
Ramp (up and down): Maximum 3 seconds.	The journal bearings must be lubricated in order to limit wear and overheating of windings.
Use temperature monitoring by Pt sensor.	Overheating of the motor => low insulation resistance => sensitive to voltage peaks.
Reduce peak voltages (max. 800 V peaks).	Never exceed peak voltages of 850 V at motor leads.
For MS and MMS, we recommend to use motors with 10 % extra in given duty point. For MMS, always use motors wound PE2-PA.	Grundfos CUE with output filter is a safe solution.
Remember output filter.	Cables act as an amplifier => measure peaks at the motor.
Rise time (dU/dt) must be limited to a maximum of 1000 V/µs. Determined by the equipment in the CUE.	Time between switches is an expression of losses, so in the future, we might have to exceed the limit of 1000 V/µs. The solution is not higher insulation of the motor, but filter in the output from the CUE.
Min. 30 Hz. Use a 60 Hz motor for larger range.	Too low speed => no lubrication of journal bearings.
Size the CUE in respect of the current, not the power output.	Can end up with a too small CUE.
Size cooling provision for stator tube at duty point with lowest flow rate.	Flow min. m/s along the stator housing must be considered.
Ensure that the pump is used within the range of the pump curve.	Focus on discharge pressure and sufficient NPSH, as vibrations will "kill" the motor.

MP 204 motor protector

TM055456 3712

Fig. 18 MP 204 motor protector

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

The MP 204 cannot be used in installations where a frequency converter is installed.

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 will continue 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 with 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 MP 204 protects the motor primarily by measuring the motor current by means of a true RMS measurement.

The MP 204 is designed for single- and three-phase motors. In single-phase motors, the starting and run capacitors are also measured. Cos φ 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 many monitoring options of the MP 204

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.

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. 19 Single-turn transformers

Product numbers, MP 204

Product	Product number
MP 204	96079927
R100	96615297
Single-turn transformers	
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

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 rated voltage
Approvals	EN 60947, EN 60335, UL/CSA 508
Marking	CE, cUL, C-tick
Consumption	Max. 5 W
Plastic type	Black PC/ABS

Electrical data, MP 204

	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	0-4 x 10^9 kWh	± 5 %	1 kWh

IO 112 module

Product	Description	Product number
	The IO 112 is a measuring module and a single-channel protection unit for use in connection with the MP 204 motor protector. The module can be used for protection of the pump against other factors than the electrical conditions, for instance dry running. It can also be used as a stand-alone protection module. The IO 112 interface has three inputs for measured values, one potentiometer for setting of limits and indicator lights indicating the following: • measured value of the input • value of the limit set • alarm source • pump status. **Electrical data** • Supply voltage: 24 VAC ± 10 %, 50/60 Hz or 24 VDC ± 10 %. • Supply current: Min. 2.4 A, max. 8 A. • Power consumption: Max. 5 W. • Ambient temperature: -25 °C to +65 °C. • Enclosure class: IP20. TM03 5811 3906	96651601

Control MP 204

Product	Description	Product number
	The Control MP 204 control cabinets are supplied with all necessary components. Three types of control cabinets are available, depending on functions and starting method. The control cabinets are designed for installation in a control cabinet for outdoor use. The Control MP 204 control cabinets have a built-in main switch and a thermal magnetic circuit breaker. **Functions:** **Digital input** • Float switch or pressure relay (if no IO 112 is used). **Analog input** • Too high motor temperature (Tempcon) • thermistor/PTC, pump • pressure sensor, 4-20 mA (with IO 112). **Relay output** • Pump alarm. **Communication** • Grundfos Remote Management. • GSM/GPRS (IO 112 not supported) • Modbus RTU wired (IO 112 not supported) • Profibus DP (IO 112 not supported). **Protection** • Protects the pump against short-circuit. TM05 3695 1612	Consult WebCAPS on www.grundfos.com for product selection.

CIU communication interface units

GrA6118 3908

Fig. 20 Grundfos CIU communication interface unit

The Communication Interface Unit (CIU) enables data communication via open and interoperable networks, such as Profibus DP, Modbus RTU, LonWorks, BACnet MS/TP, GSM/GPRS or Grundfos Remote Management (GRM) for complete control of pump systems.

Applications

The range of Grundfos CIU communication interface units offers ease of installation and commissioning as well as user-friendliness. All units are based on standard functional profiles for an easy integration into the network.

The CIU units enable communication of operating data, such as measured values and setpoints, between pumps and PLCs, SCADA system and building management system.

Benefits

The CIU offers these benefits:

- open communication standards
- complete process control
- one concept for Grundfos products
- 24-240 VAC/DC power supply in CIU modules
- simple configuration and easy to install
- prepared for DIN rail or wall mounting.

For data communication between an SP pump and a main network, a CIU unit together with a CUE frequency converter or an MP 204 motor protector is required.

TM05 5456 3712 - GrA4 412 3307

Fig. 21 MP 204 motor protector and CUE frequency converter

Fieldbus support for these products is shown in the following table:

CIU unit	Fieldbus protocol	CUE	MP 204
CIU 100	LonWorks	●	-
CIU 150	Profibus DP	●	●
CIU 200	Modbus RTU	●	●
CIU 250	GSM/GPRS	●	●
CIU 270/271*	GRM	●	●
CIU 300	BACnet MS/TP	●	-

* Grundfos Remote Management (GRM) is an easy-to-install low-cost solution for wireless monitoring and management of Grundfos products.

Product numbers

CIU unit	Fieldbus protocol	Product number
CIU 100	LonWorks	96753735
CIU 150	Profibus DP	96753081
CIU 200	Modbus RTU	96753082
CIU 250*	GSM/GPRS	96787106
CIU 270*	GRM	98176136
CIU 271*	GRM	96898819
CIU 300	BACnet MS/TP	96893769

* Antenna not included. See below.

Antennas for CIU 250 and 270/271

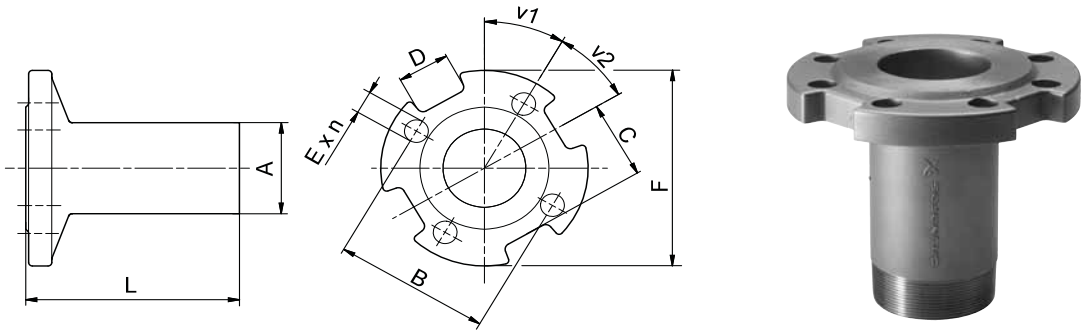
Description	Product number
Antenna for roof	97631956
Antenna for desk	97631957

For further information about data communication via CIU units and fieldbus protocols, see the CIU documentation available on www.grundfos.com (WebCAPS).

Connecting pieces

The tables below show the range of connecting pieces for connection of thread-to-flange and thread-to-thread.

Thread-to-flange (standard flange to EN 1092-1)



TM01 2396 4508 - GrA2552 3706

Fig. 22 Dimensional sketch and photo of the connecting piece thread-to-flange

Type	Pump outlet	Connecting piece	Thread-to-flange										Product number	
			A	Dimensions [mm]						v1	v2	n		
				B	C	D	E	F	L				EN 1.4308	EN 1.4517
SP 17	Rp 2 1/2	R 2 1/2 → DN 50 PN 16/40	R 2 1/2	125	65	40	∅19	∅165	170	60	90	4	120125	120911
		R 2 1/2 → DN 65 PN 16/40	R 2 1/2	145	71	30	∅19	∅185	170	22.5	45	8	120126	120910
		R 2 1/2 → DN 80 PN 16/40	R 2 1/2	160	82.5	40	∅19	∅200	170	22.5	45	8	120127	120909
SP 30	Rp 3	R 3 → DN 65 PN 16/40	R3 3	145	71	30	∅19	∅185	170	22.5	45	8	130187	130920
		R 3 → DN 80 PN 16/40	R 3	160	82.5	40	∅19	∅200	170	22.5	45	8	130188	130921
		R 3 → DN 100 PN 16/40	R 3	180/190	100	40	∅19/∅23	∅235	170	22.5	45	8	130189	130922
SP 46 **SP 60**	Rp 3 Rp 4	R 3 → DN 65 PN 16/40	R 3	145	71	30	∅19	∅185	170	22.5	45	8	130187	130920
		R 3 → DN 80 PN 16/40	R 3	160	82.5	40	∅19	∅200	170	22.5	45	8	130188	130921
		R 3 → DN 100 PN 16/40	R 3	180/190	100	40	∅19/∅23	∅235	170	22.5	45	8	130189	130922
		R 4 → DN 100 PN 16/40	R 4	180/190	100	40	∅19/∅23	∅235	180	22.5	45	8	140071	140577
SP 77 **SP 95**	Rp 5	R 5 → DN 100 PN 16/40	R 5	180/190	82	35	∅19/∅23	∅235	195	22.5	45	8	160148	160646
		R 5 → DN 125 PN 16/40	R 5	210/220	99	37	∅19/∅28	∅270	195	22.5	45	8	160149	160647
		R 5 → DN 150 PN 16/40	R 5	240/250	115	36	∅23/∅28	∅300	195	22.5	45	8	160150	160648
SP 125 **SP 160** **SP 215**	Rp 6	R 6 → DN 125 PN 16/40	R 6	210/220	99	36	∅19/∅28	∅270	195	22.5	45	8	170159	170596
		R 6 → DN 150 PN 16/40	R 6	240/250	114	36	∅23/∅28	∅300	195	22.5	45	8	170160	170597
		R 6 → DN 200 PN 16	R 6	295	134	36	∅23	∅340	195	15	30	12	170161	170598
		R 6 → DN 200 PN 40	R 6	320	151	36	∅31	∅375	200	15	30	12	170162	170599

Thread-to-thread

TM01 2397 1698 - GrA2555 3706

Fig. 23 Dimensional sketch and photo of the connecting piece thread-to-thread

Type	Pump outlet	Connecting piece	Dimensions			Product number		
			Thread-to-thread		L [mm]			
			A	B		EN 1.4301	EN 1.4401	EN 1.4539
SP 77 **SP 95**	Rp 5	R 5 → Rp 4	R 5	Rp 4	121	190063	190585	96917293
		R 5 → Rp 6	R 5	Rp 6	150	190069	190591	96917296
	5" NPT	5" NPT → 4" NPT	5" NPT	4" NPT	121	190064	190586	-
		5" NPT → 6" NPT	5" NPT	6" NPT	150	190070	190592	-
SP 125 **SP 160** **SP 215**	Rp 6	R 6 → Rp 5	R 6	Rp 5	150	200130	200640	200971
	6" NPT	6" NPT → 5" NPT	6" NPT	5" NPT	150	200135	200645	-

Cable termination kit with plug

Product	Description	Version	Product number	
			N-version	R-version
	For watertight joining of motor cable and submersible drop cable in an acrylic tube filled with resin. Used for both single- and multi-core cables during installation of submersible pumps. 24 hours of hardening is required.	For cables up to 4 x 2.5 mm^2	799901	799955
		For cables up to 4 x 6 mm^2	799902	799918

TM00 7883 2296

Cable termination kit, type KM

Product	Description	Version			Product number
		Motor cable	[mm^2]	Number of leads	
	For watertight shrink-joining of motor cable and submersible drop cable: • cables of equal size • cables of different sizes • a cable lead and a single lead. The joint is ready for use after a few minutes and requires no long hardening time as do resin joints. The joint cannot be separated.	Flat cable	1.5 - 6.0	3	116251
			1.5 - 4.0	4	
		Flat cable	6 - 10	4	116252
			10 - 16	3	
		Flat cable	16 - 25	3	116255
				4	

TM04 4977 3511

	For watertight shrink-joining of motor cable and submersible drop cable: • cables of equal size • cables of different sizes • a cable lead and a single lead. The joint is ready for use after a few minutes and requires no long hardening time as do resin joints. The joint cannot be separated.	Single lead	10 - 70	1	96828296
		Single lead	35 - 120	1	116256
		Screw-shrinking	70 - 240	1	96637279

TM04 4978 2309

	For watertight joining of motor cable and submersible drop cable by means of shrink-screw-glue casting.	Screw-shrinking	6 - 35	1	96636867
			19 - 95		96636868
			35 - 185		96637278

TM04 4978 2309

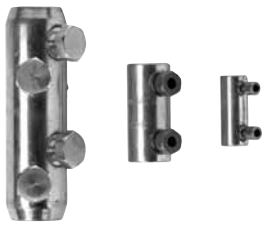
Product	Description	Version			Product number
		Motor cable	[mm^2]	Number of leads	
 TM04 4980 2309	Reducing from three or four to one as from drop cable to single leads.	Reducer-shrinking	10 - 50	3	96637318
			10 - 50	4	96637330
			16 - 70	3	96637331
			16 - 70	4	96637332
		Three single leads	1.5 - 6.0	3	116253
		Three single leads	10 - 25	3	116254
		Four single leads	1.5 - 4.0	4	116257
		Four single leads	6 - 16	4	116258

Mastik for flat cables

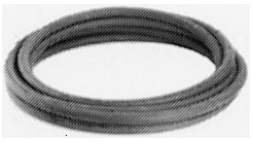
Product	Description	Product number
 TM05 3693 1612	Mastik for cable termination kit, type KM, for cables with separate earth, 48 pcs.	96871223

Cable termination kit, types M0 to M4

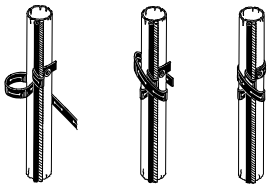
Product	Description	Version			Product number
		Type	Diameter of cable joint [mm]	Outer cable diameter [mm]	
 TM04 4981 2309	For watertight joining of motor cable and submersible drop cable. The joint is encapsulated by the glue which is part of the kit.	M0	∅40	∅6 - ∅15	ID8903
		M1	∅46	∅9 - ∅23	ID8904
		M2	∅52	∅17 - ∅31	ID8905
		M3	∅77	∅26 - ∅44	ID8906
		M4	∅97	∅29 - ∅55	91070700

Product	Description	Cross-section of leads [mm^2]	Number of connectors	Product number
 GrA8251 2209	Accessories for cable kits M0 to M4. Screw connectors only.	6-25	4	96626021
		16-95		96626022
		35-185		96626023
		70-240		96626028

Submersible drop cable

Product	Description	Number of leads and nominal cross-section [mm^2]	Outer cable diameter min./max. [mm]	Weight [kg/m]	Product number
 TM00 7882 2296	Suitable for these applications: • continuous application in groundwater and potable water (approved for potable-water applications) • connection of electrical equipment, such as submersible motors • installation depths up to 600 metres and average loads. Insulation and sheath of special EPR-based elastomer materials adapted to applications in water. Maximum permissible water temperature: 70 °C. Maximum permissible lead service temperature: 90 °C. Further cable sizes are available on request.	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
		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

Cable clips

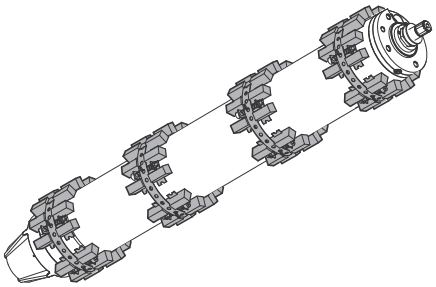
Product	Description	Product number
 TM00 1369 5092	For fastening of cable and straining wire to the riser pipe. The clips should be fitted every 3 metres. One set for approx. 45 m riser pipe. • 16 cable buttons. • 7.5 m rubber band.	115016

Zinc anodes

Applications

Cathodic protection by means of zinc can be used for corrosion protection of SP pumps in chloride-containing liquids, such as brackish water and seawater.

Sacrificial anodes are placed on the outside of the pump and motor as protection against corrosion. See fig. 24.



TM05 0537 1211

Fig. 24 Submersible motor fitted with anode strings

The number of anodes required depends on the pump and motor in question.

Please contact Grundfos for further details.

Flow sleeves

Grundfos offers a complete range of stainless-steel flow sleeves for both vertical and horizontal operation. Flow sleeves are recommended for all applications in which motor cooling is insufficient. The result is a general extension of motor life. Flow sleeves are to be fitted in these cases:

- If the submersible pump is exposed to high thermal load such as current unbalance, dry running, overload, high ambient temperature and bad cooling conditions.
- If aggressive liquids are pumped, since corrosion is doubled for every 10 °C the temperature rises.
- If sedimentation or deposits occur around and/or on the motor.

Note: More information about flow sleeves is available on request.

TM01 0751 2197 - TM01 0750 2197

Fig. 25 Flow sleeves

SA-SPM control boxes

Applications

SA-SPM control boxes are used as starting units for single-phase, 3-wire motors, types MS 402B and MS 4000.

TM05 2214 4611

Fig. 26 SA-SPM

Product numbers

Product	Product number	I_N	Supply voltage	CS	CR	PSC
		[A]	[V]	[µF]	[µF]	[µF]
SA-SPM 7 - GSIR - 0.37 kW, 50 Hz	96802243	4.0	220-240	63-80	-	-
SA-SPM 7 - CSIR - 0.55 kW, 50 Hz	96786467	6.0		80-100	-	-
SA-SPM 7 - CSIR - 0.75 kW, 50 Hz	96786468	7.5		100-125	-	-
SA-SPM 8 - CSCR - 1.1 kW, 50 Hz	96786469	7.5		125-160	40	-
SA-SPM 8 - CSCR - 1.5 kW, 50 Hz	96786470	10.4		160-200	50	-
SA-SPM 8 - CSCR - 2.2 kW, 50 Hz	96786471	14.8		250-315	60	-
SA-SPM 9 - PSC - 0.37 kW, 50 Hz	96786482	3.0		-	-	16
SA-SPM 9 - PSC - 0.55 kW, 50 Hz	96786483	4.5		-	-	20
SA-SPM 9 - PSC - 0.75 kW, 50 Hz	96786484	6.0		-	-	30
SA-SPM 9 - PSC - 1.1 kW, 50 Hz	96786485	8.5		-	-	40

Capacitors for MS 402B PSC

MS 402B PSC motors must be connected to the mains via a run capacitor that is permanently connected during operation.

Product numbers

Capacitors for MS 402B PSC			
Capacitor size	Power [kW]	Capacitor	Control box
16 µF, 400 V, 50 Hz	0.37	ID2970	96023791
20 µF, 400 V, 50 Hz	0.55	ID2971	96023792
30 µF, 400 V, 50 Hz	0.75	ID2973	96023793
40 µF, 400 V, 50 Hz	1.1	ID2974	96023794

PR 5714 with Pt100 sensor

The PR 5714 with 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 that the motor life is reduced. The Pt100 sensor ensures that the 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 following temperature limits are preset on delivery:

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

Technical data

	Relay type
	PR 5714
Enclosure class	IP65 (fitted in a control panel)
Ambient temperature	-20 °C to +60 °C
Relative air humidity	95 % (condensating)
Voltage variation	• 1 x 24-230 VAC ± 10 %, 50-60 Hz • 24-250 VDC ± 20 %
Approvals	UL, DNV
Marking	CE

PR 5714 relay with Pt100 sensor and staybolt		Cable length [m]	Material	Product number		
				MS6 MS 6000	MMS6 MMS 6000 MMS 8000	MMS 10000 MMS 12000
	GrA3187 3607	20	N-version	96408953	96494596	96437287
		40		96408681	96494597	96437288
		60		96408954	96494598	96437289
		80		96408955	96494599	96437290
		100		96408956	96494610	96437291
		20	R-version	96658626	96494596	-
		40		96658627	96494597	-
		60		96658628	96494598	-
		80		96658637	96494599	-
		100		96658638	96494610	-

PR 5714 relay		Voltage	Product number
	GrA3186 0407	24-230 VAC, 50/60 Hz / 24-250 VDC	96913234

Pt100 sensor, including cable		Cable length [m]	Product number
	GrA3190 0407	20	96913237
		40	96913253
		60	96913256
		80	96913260
		100	96913263

Staybolt kits for Pt100 in MS6 and MS 6000		Description	Product number
	GrA3191 0407	Staybolt kit for Pt100/Pt1000. Material: EN 1.4401/AISI 316.	97550639
		Staybolt kit for Pt100. Material: EN 1.4539/AISI 90L.	96803373

Insertion probe for MMS 10000 and MMS 12000		Description	Product number
	TM04 3560 4508	Insertion probe for Pt100/Pt1000 in MMS 10000 and MMS 12000. Material: EN 1.4401/316 (N-version).	96913215

Extension kit for sensor cable for Pt100		Description	Product number
	TM00 7885 2296	Extension kit for Pt100 sensor cable. For watertight shrink-joining of the sensor cable. Extra sensor cable must be ordered separately.	96571480

Sensor cable		Description	Product number
	TM00 7882 2296	Drop cable for extension. Mention length when ordering. Maximum recommended length: 350 m.	RM5271

CU 220 with Pt1000 sensor

The CU 220 with Pt1000 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 that the motor life is reduced. The Pt1000 sensor ensures that the operating conditions are not exceeded and indicates when it is time for service of the motor.

Monitoring and protection by means of a Pt1000 require the following parts:

- Pt1000 sensor
- CU 220 control unit
- cable
- staybolt kit for Pt1000.

The following temperature limits are preset on delivery:

- 50 °C warning limit
- 60 °C stop limit.

The Pt1000 sensor works within the temperature range of -60 °C to +120 °C.

Technical data

	CU 220
Enclosure class	IP65 (fitted in a control panel)
Ambient temperature	0 °C to +55 °C
Relative air humidity	20 to 80 % (condensating)
Voltage variation	1 x 230 V - 15 %/+ 10 %, 50 Hz
Approvals	UR
Marking	CE

CU 220 control unit with Pt1000 sensor, cable and staybolt or insertion probe		Cable length [m]	Material	Product number			
				MS 402 MS 4000	MS6 MS 6000	MMS6 MMS 6000 MMS 8000	MMS 10000 MMS 12000
	TM04 3563 4508 - TM04 3560 4508	20	N-version	98090296	96803207	96803233	96803238
		40		98090311	96803241	96803252	96803253
		60		98090313	96803254	96803255	96803257
		80		98090318	96803258	96803292	96803294
		100		98090319	96803301	96803312	96803313
	TM04 3561 4508 - TM04 3562 4508	20	R-version	98090363	98085486	96803233	-
		40		98090364	98085489	96803252	-
		60		98090365	98085579	96803255	-
		80		98090366	98085601	96803292	-
		100		98090367	98085602	96803312	-

CU 220 control unit		Voltage	Product number
	TM04 3561 4508	1 x 230 V - 15 %/+ 10 %, 50 Hz	96797484

Pt1000 sensor, including cable		Cable length [m]	Product number
	TM04 3563 4508	20	96804042
		40	96804044
		60	96804064
		80	96804065
		100	96804067

Staybolt kits for Pt1000 in MS 402 and MS 4000		Description	Product number
	TM05 3694 1612	Staybolt kit for Pt1000. Material: EN 1.4401/AISI 316.	98090278
		Staybolt kit for Pt1000. Material: EN 1.4539/AISI 904.	98090341

Staybolt kits for Pt1000 in MS6 and MS 6000		Description	Product number
	GrA3191 0407	Staybolt kit for Pt100/Pt1000. Material: EN 1.4401/AISI 316.	97550639
		Staybolt kit for Pt100/Pt1000. Material: EN 1.4539/AISI 904L.	96803373

Insertion probe for MMS 10000 and MMS 12000		Description	Product number
	TM04 3560 4508	Insertion probe for Pt100/Pt1000 in MMS 10000 and MMS 12000. Material: EN 1.4401/316 (N-version).	96913215

Extension kit for sensor cable for Pt1000		Description	Product number
	TM00 7885 (tm	Extension kit for Pt100/Pt1000 sensor cable. For watertight shrink-joining of the sensor cable. Extra sensor cable must be ordered separately.	96571480

Sensor cable		Description	Product number
	TM00 7882 2296	Drop cable for extension. Mention length when ordering. Maximum recommended length: 350 m.	RM5271

7. Energy consumption

Energy consumption of submersible pumps

The percentage distribution of service life costs of a submersible pump for water supply is as follows:

- 5 % initial costs (pump)
- 85 % operating costs / energy consumption
- 10 % maintenance costs.

It is obvious that the highest savings can be achieved within energy consumption!

The annual energy consumption, E, of a submersible pump can be calculated as follows:

E = c x h x P1 (EUR)

c = specific energy price (EUR/kWh)

h = operating hours/year (hours)

P1 = power input of the submersible pump (kW).

Example: Calculation of the annual energy consumption of the submersible pump, type SP 125-3.

SP 125-3 with MS 6000, 30 kW, 3 x 400 V, 50 Hz.

Duty point

Flow rate:	Q = 120 m^3/h
Total head:	H = 63 m
Specific energy price:	c = EUR 0.1/kWh (consisting of day and night rate)
Operating hours/year:	h = 3200.

$$P1 = \frac{Q \times H \times \rho}{367 \times \eta_{pump} \times \eta_{motor}} \text{ in kW}$$

Q = m^3/h

H = m

Density ρ = kg/dm^3 (assumed 1)

367 = conversion factor

η_{pump} = (not to be confused with the stage efficiency curve)

η_{motor} = (example 84.5 %, in equation 0.845).

By showing the P2/Q curve we make it easier for you to calculate the energy consumption.

$$P1 = \frac{P2}{\eta_{motor}}$$

P2 = 26 kW (power requirement of SP 125-3 pump at 120 m^3/h, from curve P2/Q on page 56).

Calculation of motor efficiency at duty point

As standard, the SP 125-3 is fitted with a 30 kW MS 6000 motor.

At duty point (Q = 120 m^3/h), the pump requires 26 kW, thus:

a motor load of 87 % (26 kW / 30 kW) and a power reserve of 13 %.

From the table on page 71, the motor efficiency can be read as:

85 % at a load of 75 % ($\eta_{75\,\%}$)
84 % at a load of 100 % ($\eta_{100\,\%}$)
The interpolated value in this example is
η_{motor} = 84.5 %, η_{motor} = 0.845.

$$P1 = \frac{26}{0.845} = 30.77 \text{ kW}$$

E = 0.1 EUR/kWh x 3200 h x 30.77 kW.
The annual energy costs amount to EUR 9,846.

If we compare the energy costs of this energy-efficient Grundfos submersible pump with a submersible pump, type SP 120-4, from 1995, (Q = 110 to 120 m^3/h; H = 63 to 58 m; η_{motor} = 82 %), we see that at the same annual total flow of 384,000 m^3 and the same current price of 0.1 EUR/kWh, the annual energy consumption of the old pump amounts to EUR 12,777.

Wear and deposits on the motor and the pump were not taken into account.

The pay-off time, A (months), is calculated as follows:

$$A = \frac{\text{Purchase price of energy-efficient pump}}{\text{Energy savings/year}} \times 12$$

The purchase price of the energy-efficient pump is EUR 4,090.

$$A = \frac{4090}{(\text{EUR } 12{,}777 - \text{EUR } 9{,}846)} \times 12 = 16.7 \text{ months}$$

The pay-off time is 16.7 months.

Note: The complete system should be sized for energy efficiency (cable/discharge pipes).

Cable sizing

In order to obtain an economical duty of the pump, the voltage drop should be low.

Today, large water works already size cables for a maximum voltage drop of 1 %.

The hydraulic resistance in the discharge pipe should be as low as possible.

8. Cable sizing

Cables

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

Cables for Grundfos 4" submersible motors are available with or without plugs. The submersible drop cable is chosen according to application and type of installation.

Standard version:

Max. liquid temperature +70 °C, for short periods up to +90 °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 at different cable dimensions.

If star-delta starting is used, the current will be reduced by $\sqrt{3}$ (I x 0.58), meaning that the cable length may be $\sqrt{3}$ longer (L x 1.73) than indicated in the tables.

If, for example, the operating current is 10 % lower than the full-load current, the cable may be 10 % longer than indicated in the tables.

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

In order to minimise operating losses, the cable cross-section may be increased compared to what is indicated in the tables. This is only economical if the borehole provides the necessary space, and if the operational time of the pump is long, especially if the operating voltage is below the rated voltage.

The table values are calculated on the basis of the formula:

Max. cable length of a single-phase submersible pump:

$$L = \frac{U \times \Delta U}{I \times 2 \times 100 \times (\cos\varphi \times \frac{\rho}{q} + \sin\varphi \times X_L)} \text{ [m]}$$

Max. cable length of a three-phase submersible pump:

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

Formula designations

U = Rated voltage [V]

ΔU = Voltage drop [%]

I = Rated current of the motor [A]

cos φ = Power factor

ρ = Specific resistance: 0.025 [Ω mm^2]

q = Cross-section of submersible drop cable [mm^2]

sin φ = $\sqrt{1 - \cos^2\varphi}$

X_L = Inductive resistance: 0.078 x 10-3 [Ω/m].

Example

Motor size:	30 kW, MMS 8000
Starting method:	Direct on line
Rated voltage (U):	3 x 400 V, 50 Hz
Voltage drop (ΔU):	3 %
Rated current (I):	64.0 A
Power factor (cos φ):	0.85
Specific resistance (ρ):	0.025
Cross-section (q):	25 mm^2
sin φ:	0.54
Inductive resistance (X_L):	0.078 x 10^{-3} [Ω/m]

$$L = \frac{400 \times 3}{64.0 \times 1.73 \times 100 \times (0.85 \times \frac{0.025}{25} + 0.54 \times 0.078 \times 10^{-3})}$$

L = 120 m.

Cable dimensions at 3 x 400 V, 50 Hz, DOL

Voltage drop: 3 %

Motor	kW	I_n [A]	Cos φ 100 %	Dimensions [mm²]														
				1.5	2.5	4	6	10	16	25	35	50	70	95	120	150	185	240	300
4"	0.37	1.4	0.64	462	767														
4"	0.55	2.2	0.64	294	488	777													
4"	0.75	2.3	0.72	250	416	662	987												
4"	1.1	3.4	0.72	169	281	448	668												
4"	1.5	4.2	0.75	132	219	348	520	857											
4"	2.2	5.5	0.82	92	153	244	364	602	951										
4"	3	7.85	0.77	69	114	182	271	447	705										
4"	4	9.6	0.8	54	90	143	214	353	557	853									
4"	5.5	13	0.81	39	66	104	156	258	407	624	855								
4"	7.5	18.8	0.78	28	47	75	112	185	291	445	609	841							
6"	4	9.2	0.82	55	91	146	218	359	566	867									
6"	5.5	13.6	0.77	40	66	105	157	258	407	622	850								
6"	7.5	17.6	0.8	29	49	78	117	193	304	465	637	882							
6"	9.2	21.8	0.81	23	39	62	93	154	243	372	510	706	950						
6"	11	24.8	0.83		34	53	80	132	209	320	440	610	823						
6"	13	30	0.81		28	45	68	112	176	270	370	513	690	893					
6"	15	34	0.82			39	59	97	154	236	324	449	604	783	947				
6"	18.5	42	0.81				48	80	126	193	265	366	493	638	770	914			
6"	22	48	0.84				41	67	107	164	225	313	422	549	665	793	927		
6"	26	57	0.84					57	90	138	189	263	355	462	560	667	781	937	
6"	30	66.5	0.83					49	78	119	164	227	307	398	482	574	670	803	926
6"	37	85.5	0.79						63	97	133	183	246	317	382	452	525	624	714
8"	22	48	0.84				41	67	107	164	225	313	422	549	665	793	927		
8"	26	56.5	0.85					57	90	138	189	263	356	464	563	672	787	947	
8"	30	64	0.85					50	79	122	167	233	314	409	497	593	695	836	968
8"	37	78.5	0.85						65	99	136	190	256	334	405	483	567	682	789
8"	45	96.5	0.82						54	83	114	158	213	276	334	396	462	553	636
8"	55	114	0.85							68	94	131	177	230	279	333	390	469	544
8"	63	132	0.83								83	115	155	201	243	289	338	404	466
8"	75	152	0.86								70	97	132	171	208	249	292	353	409
8"	92	186	0.86									79	107	140	170	204	239	288	335
8"	110	224	0.87										89	116	141	169	198	240	279
10"	75	156	0.84								69	96	130	169	205	244	285	343	396
10"	92	194	0.82									79	106	137	166	197	230	275	316
10"	110	228	0.84										89	116	140	167	195	234	271
10"	132	270	0.84											98	118	141	165	198	229
10"	147	315	0.81												103	122	142	169	194
10"	170	365	0.81													105	122	146	168
10"	190	425	0.79														106	125	144
12"	147	305	0.83												105	125	146	175	202
12"	170	345	0.85												92	110	129	155	180
12"	190	390	0.84													98	114	137	158
12"	220	445	0.85														100	120	139
12"	250	505	0.85															106	123
Max. current for cable [A]*				23	30	41	53	74	99	131	162	202	250	301	352	404	461	547	633

* At particularly favourable heat dissipation conditions. Maximum cable length in metres from motor starter to pump.

For motors with star-delta starting, the cable length can be calculated by multiplying the relevant cable length from the above table by $\sqrt{3}$.

Sizing of cable

Calculation of cable cross-section

Formula designations

U = Rated voltage [V]

ΔU = Voltage drop [%]

I = Rated current of the motor [A]

cos φ = Power factor

ρ = 1/χ
Materials of cable:
Copper: χ = 40 m/Ω x mm^2
Aluminium: χ = 35 m/Ω x mm^2

q = Cross-section [mm^2]

sin φ = $\sqrt{1 - \cos^2\varphi}$

X_L = Inductive resistance 0.078 x 10^{-3} [Ω/m]

L = Length of cable [m]

Δp = Power loss [W]

For calculation of the cross-section of the submersible drop cable, use this formula:

Direct on line

$$q = \frac{I \times 1.73 \times 100 \times L \times \rho \times \cos\varphi}{U \times \Delta U - (I \times 1.73 \times 100 \times L \times X_L \times \sin\varphi)}$$

Star-delta

$$q = \frac{I \times 100 \times L \times \rho \times \cos\varphi}{U \times \Delta U - (I \times 100 \times L \times X_L \times \sin\varphi)}$$

The values of the rated current (I) and the power factor (cos φ) can be read in the tables on pages 71 to 76.

Calculation of the power loss

For calculation of the power loss in the submersible drop cable, use this formula:

$$\Delta p = \frac{3 \times L \times \rho \times I^2}{q}$$

Example

Motor size:	45 kW, MMS 8000
Voltage:	3 x 400 V, 50 Hz
Starting method:	Direct on line
Rated current (I_n):	96.5 A
Required cable length (L):	200 m
Water temperature:	30 °C.

Cable selection

Choice A:	3 x 150 mm^2.
Choice B:	3 x 185 mm^2.

Calculation of power loss

Choice A

$$\Delta p_A = \frac{3 \times L \times \rho \times I^2}{q}$$

$$\Delta p_A = \frac{3 \times 200 \times 0.02 \times 96.5^2}{150}$$

Δp_A = 745 W.

Choice B

$$\Delta p_B = \frac{3 \times 200 \times 0.02 \times 96.5^2}{185}$$

Δp_B = 604 W.

Savings

Operating hours/year: h = 4000.

Annual saving (A):

A = (Δp_A - Δp_B) x h = (745 W - 604 W) x 4000 = 564,000 Wh = 564 kWh.

By choosing the cable size 3 x 185 mm^2 instead of 3 x 150 mm^2, an annual saving of 564 kWh is achieved.

Operating time: 10 years.

Saving after 10 years (A_{10}):

A_{10} = A x 10 = 564 x 10 = 5640 kWh.

The saved amount must be calculated in the local currency.

9. Table of head losses

Head losses in ordinary water pipes

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											
			Nominal pipe diameter in inches and internal diameter in [mm]											
m^3/h	Litres/min.	Litres/sec.	1/2" 15.75	3/4" 21.25	1" 27.00	1 1/4" 35.75	1 1/2" 41.25	2" 52.50	2 1/2" 68.00	3" 80.25	3 1/2" 92.50	4" 105.0	5" 130.0	6" 155.5
0.6	10	0.16	0.855 9.910	0.470 2.407	0.292 0.784									
0.9	15	0.25	1.282 20.11	0.705 4.862	0.438 1.570	0.249 0.416								
1.2	20	0.33	1.710 33.53	0.940 8.035	0.584 2.588	0.331 0.677	0.249 0.346							
1.5	25	0.42	2.138 49.93	1.174 11.91	0.730 3.834	0.415 1.004	0.312 0.510							
1.8	30	0.50	2.565 69.34	1.409 16.50	0.876 5.277	0.498 1.379	0.374 0.700	0.231 0.223						
2.1	35	0.58	2.993 91.54	1.644 21.75	1.022 6.949	0.581 1.811	0.436 0.914	0.269 0.291						
2.4	40	0.67		1.879 27.66	1.168 8.820	0.664 2.290	0.499 1.160	0.308 0.368						
3.0	50	0.83		2.349 41.40	1.460 13.14	0.830 3.403	0.623 1.719	0.385 0.544	0.229 0.159					
3.6	60	1.00		2.819 57.74	1.751 18.28	0.996 4.718	0.748 2.375	0.462 0.751	0.275 0.218					
4.2	70	1.12		3.288 76.49	2.043 24.18	1.162 6.231	0.873 3.132	0.539 0.988	0.321 0.287	0.231 0.131				
4.8	80	1.33			2.335 30.87	1.328 7.940	0.997 3.988	0.616 1.254	0.367 0.363	0.263 6.164				
5.4	90	1.50			2.627 38.30	1.494 9.828	1.122 4.927	0.693 1.551	0.413 0.449	0.269 0.203				
6.0	100	1.67			2.919 46.49	1.660 11.90	1.247 5.972	0.770 1.875	0.459 0.542	0.329 0.244	0.248 0.124			
7.5	125	2.08			3.649 70.41	2.075 17.93	1.558 8.967	0.962 2.802	0.574 0.809	0.412 0.365	0.310 0.185	0.241 0.101		
9.0	150	2.50				2.490 25.11	1.870 12.53	1.154 3.903	0.668 1.124	0.494 0.506	0.372 0.256	0.289 0.140		
10.5	175	2.92				2.904 33.32	2.182 16.66	1.347 5.179	0.803 1.488	0.576 0.670	0.434 0.338	0.337 0.184		
12	200	3.33				3.319 42.75	2.493 21.36	1.539 6.624	0.918 1.901	0.659 0.855	0.496 0.431	0.385 0.234	0.251 0.084	
15	250	4.17				4.149 64.86	3.117 32.32	1.924 10.03	1.147 2.860	0.823 1.282	0.620 0.646	0.481 0.350	0.314 0.126	
18	300	5.00					3.740 45.52	2.309 14.04	1.377 4.009	0.988 1.792	0.744 0.903	0.577 0.488	0.377 0.175	0.263 0.074
24	400	6.67					4.987 78.17	3.078 24.04	1.836 6.828	1.317 3.053	0.992 1.530	0.770 0.829	0.502 0.294	0.351 0.124
30	500	8.33						3.848 36.71	2.295 10.40	1.647 4.622	1.240 2.315	0.962 1.254	0.628 0.445	0.439 0.187
36	600	10.0						4.618 51.84	2.753 14.62	1.976 6.505	1.488 3.261	1.155 1.757	0.753 0.623	0.526 0.260
42	700	11.7							3.212 19.52	2.306 8.693	1.736 4.356	1.347 2.345	0.879 0.831	0.614 0.347
48	800	13.3							3.671 25.20	2.635 11.18	1.984 5.582	1.540 3.009	1.005 1.066	0.702 0.445
54	900	15.0							4.130 31.51	2.964 13.97	2.232 6.983	1.732 3.762	1.130 1.328	0.790 0.555
60	1000	16.7							4.589 38.43	3.294 17.06	2.480 8.521	1.925 4.595	1.256 1.616	0.877 0.674
75	1250	20.8								4.117 26.10	3.100 13.00	2.406 7.010	1.570 2.458	1.097 1.027
90	1500	25.0								4.941 36.97	3.720 18.42	2.887 9.892	1.883 3.468	1.316 1.444
105	1750	29.2									4.340 24.76	3.368 13.30	2.197 4.665	1.535 1.934
120	2000	33.3									4.960 31.94	3.850 17.16	2.511 5.995	1.754 2.496
150	2500	41.7										4.812 26.26	3.139 9.216	2.193 3.807
180	3000	50.0											3.767 13.05	2.632 5.417
240	4000	66.7											5.023 22.72	3.509 8.926
300	5000	83.3												4.386 14.42
90 ° bends, slide valves			1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.7	2.0	2.5
T-pieces, non-return valves			4.0	4.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	7.0	8.0	9.0

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.

Head losses in plastic pipes

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

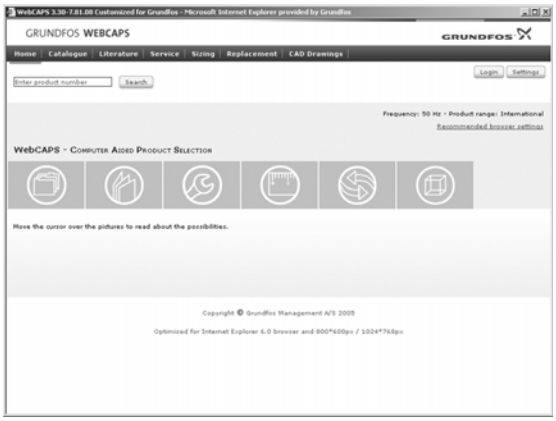
Lower figures indicate head loss in metres per 100 metres of straight pipes.

Quantity of water			PELM/PEH PN 10											
			PELM						PEH					
m^3/h	Litres/min.	Litres/sec.	25 20.4	32 26.2	40 32.6	50 40.8	63 51.4	75 61.4	90 73.6	110 90.0	125 102.2	140 114.6	160 130.8	180 147.2
0.6	10	0.16	0.49 1.8	0.30 0.66	0.19 0.27	0.12 0.085								
0.9	15	0.25	0.76 4.0	0.46 1.14	0.3 0.6	0.19 0.18	0.12 0.63							
1.2	20	0.33	1.0 6.4	0.61 2.2	0.39 0.9	0.25 0.28	0.16 0.11							
1.5	25	0.42	1.3 10.0	0.78 3.5	0.5 1.4	0.32 0.43	0.2 0.17	0.14 0.074						
1.8	30	0.50	1.53 13.0	0.93 4.6	0.6 1.9	0.38 0.57	0.24 0.22	0.17 0.092						
2.1	35	0.58	1.77 16.0	1.08 6.0	0.69 2.0	0.44 0.70	0.28 0.27	0.2 0.12						
2.4	40	0.67	2.05 22.0	1.24 7.5	0.80 3.3	0.51 0.93	0.32 0.35	0.23 0.16	0.16 0.063					
3.0	50	0.83	2.54 37.0	1.54 11.0	0.99 4.8	0.63 1.40	0.4 0.50	0.28 0.22	0.2 0.09					
3.6	60	1.00	3.06 43.0	1.85 15.0	1.2 6.5	0.76 1.90	0.48 0.70	0.34 0.32	0.24 0.13	0.16 0.050				
4.2	70	1.12	3.43 50.0	2.08 18.0	1.34 8.0	0.86 2.50	0.54 0.83	0.38 0.38	0.26 0.17	0.18 0.068				
4.8	80	1.33		2.47 25.0	1.59 10.5	1.02 3.00	0.64 1.20	0.45 0.50	0.31 0.22	0.2 0.084				
5.4	90	1.50		2.78 30.0	1.8 12.0	1.15 3.50	0.72 1.30	0.51 0.57	0.35 0.26	0.24 0.092	0.18 0.05			
6.0	100	1.67		3.1 39.0	2.0 16.0	1.28 4.6	0.8 1.80	0.56 0.73	0.39 0.30	0.26 0.12	0.2 0.07			
7.5	125	2.08		3.86 50.0	2.49 24.0	1.59 6.6	1.00 2.50	0.70 1.10	0.49 0.50	0.33 0.18	0.25 0.10	0.20 0.055		
9.0	150	2.50			3.00 33.0	1.91 8.6	1.20 3.5	0.84 1.40	0.59 0.63	0.39 0.24	0.30 0.13	0.24 0.075		
10.5	175	2.92			3.5 38.0	2.23 11.0	1.41 4.3	0.99 1.80	0.69 0.78	0.46 0.30	0.36 0.18	0.28 0.09		
12	200	3.33			3.99 50.0	2.55 14.0	1.60 5.5	1.12 2.40	0.78 1.0	0.52 0.40	0.41 0.22	0.32 0.12	0.25 0.065	
15	250	4.17				3.19 21.0	2.01 8.0	1.41 3.70	0.98 1.50	0.66 0.57	0.51 0.34	0.40 0.18	0.31 0.105	0.25 0.06
18	300	5.00				3.82 28.0	2.41 10.5	1.69 4.60	1.18 1.95	0.78 0.77	0.61 0.45	0.48 0.25	0.37 0.13	0.29 0.085
24	400	6.67					3.21 19.0	2.25 8.0	1.57 3.60	1.05 1.40	0.81 0.78	0.65 0.44	0.50 0.23	0.39 0.15
30	500	8.33					4.01 28.0	2.81 11.5	1.96 5.0	1.31 2.0	1.02 1.20	0.81 0.63	0.62 0.33	0.49 0.21
36	600	10.0					4.82 37.0	3.38 15.0	2.35 6.6	1.57 2.60	1.22 1.50	0.97 0.82	0.74 0.45	0.59 0.28
42	700	11.7					5.64 47.0	3.95 24.0	2.75 8.0	1.84 3.50	1.43 1.90	1.13 1.10	0.87 0.60	0.69 0.40
48	800	13.3						4.49 26.0	3.13 11.0	2.09 4.5	1.62 2.60	1.29 1.40	0.99 0.81	0.78 0.48
54	900	15.0						5.07 33.0	3.53 13.5	2.36 5.5	1.83 3.20	1.45 1.70	1.12 0.95	0.08 0.58
60	1000	16.7						5.64 40.0	3.93 16.0	2.63 6.7	2.04 3.90	1.62 2.2	1.24 1.2	0.96 0.75
75	1250	20.8							4.89 25.0	3.27 9.0	2.54 5.0	2.02 3.0	1.55 1.6	1.22 0.95
90	1500	25.0							5.88 33.0	3.93 13.0	3.05 8.0	2.42 4.1	1.86 2.3	1.47 1.40
105	1750	29.2							6.86 44.0	4.59 17.5	3.56 9.7	2.83 5.7	2.17 3.2	1.72 1.9
120	2000	33.3								5.23 23.0	4.06 13.0	3.23 7.0	2.48 4.0	1.96 2.4
150	2500	41.7								6.55 34.0	5.08 18.0	4.04 10.5	3.10 6.0	2.45 3.5
180	3000	50.0								7.86 45.0	6.1 27.0	4.85 14.0	3.72 7.6	2.94 4.4
240	4000	66.7									8.13 43.0	6.47 24.0	4.96 13.0	3.92 7.5
300	5000	83.3										8.08 33.0	6.2 18.0	4.89 11.0

The table is based on a nomogram.
Roughness: K = 0.01 mm.
Water temperature: t = 10 °C.

10. Further product documentation

WebCAPS

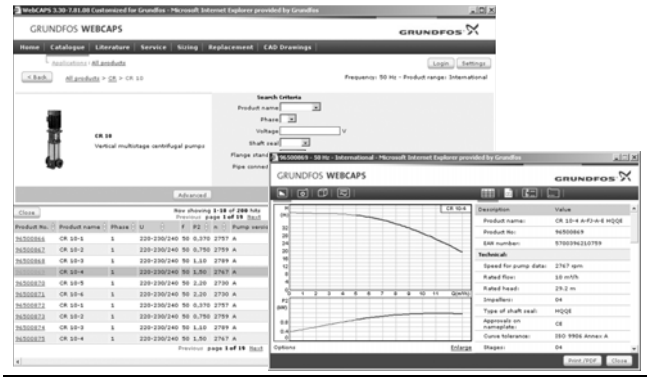


WebCAPS is a **Web**-based **C**omputer **A**ided **P**roduct **S**election program available on www.grundfos.com.

WebCAPS contains detailed information on more than 220,000 Grundfos products in more than 30 languages.

Information in WebCAPS is divided into six sections:

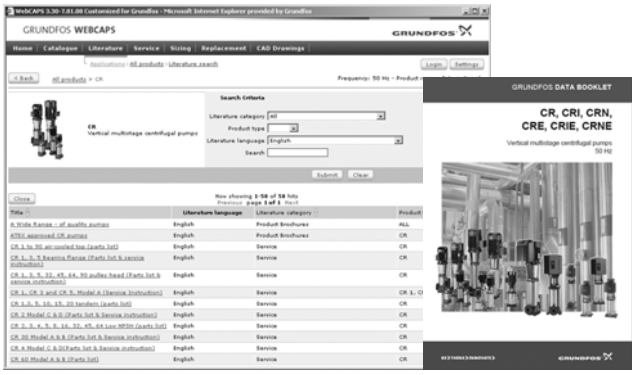
- Catalogue
- Literature
- Service
- Sizing
- Replacement
- CAD drawings.



Catalogue

Based on fields of application and pump types, this section contains the following:

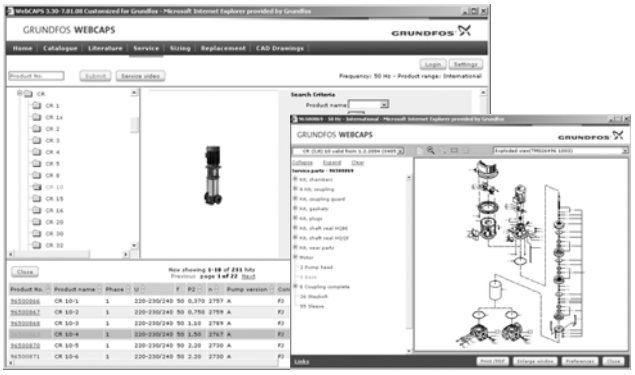
- technical data
- curves (QH, Eta, P1, P2, etc.) which can be adapted to the density and viscosity of the pumped liquid and show the number of pumps in operation
- product photos
- dimensional drawings
- wiring diagrams
- quotation texts, etc.



Literature

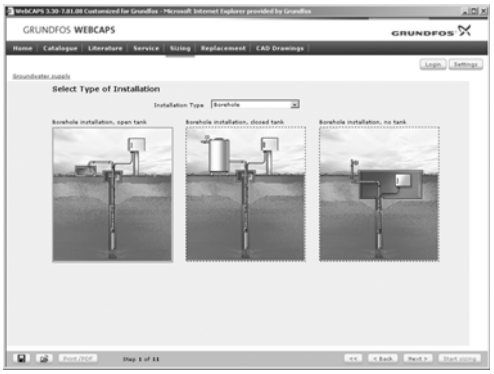
This section contains all the latest documents of a given pump, such as

- 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, the 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 size a product:

- 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. 27 WinCAPS DVD

WinCAPS is a **Win**dows-based **C**omputer **A**ided **P**roduct **S**election program containing detailed information on more than 220,000 Grundfos products in more than 30 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 DVD and updated once a year.

Subject to alterations.

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