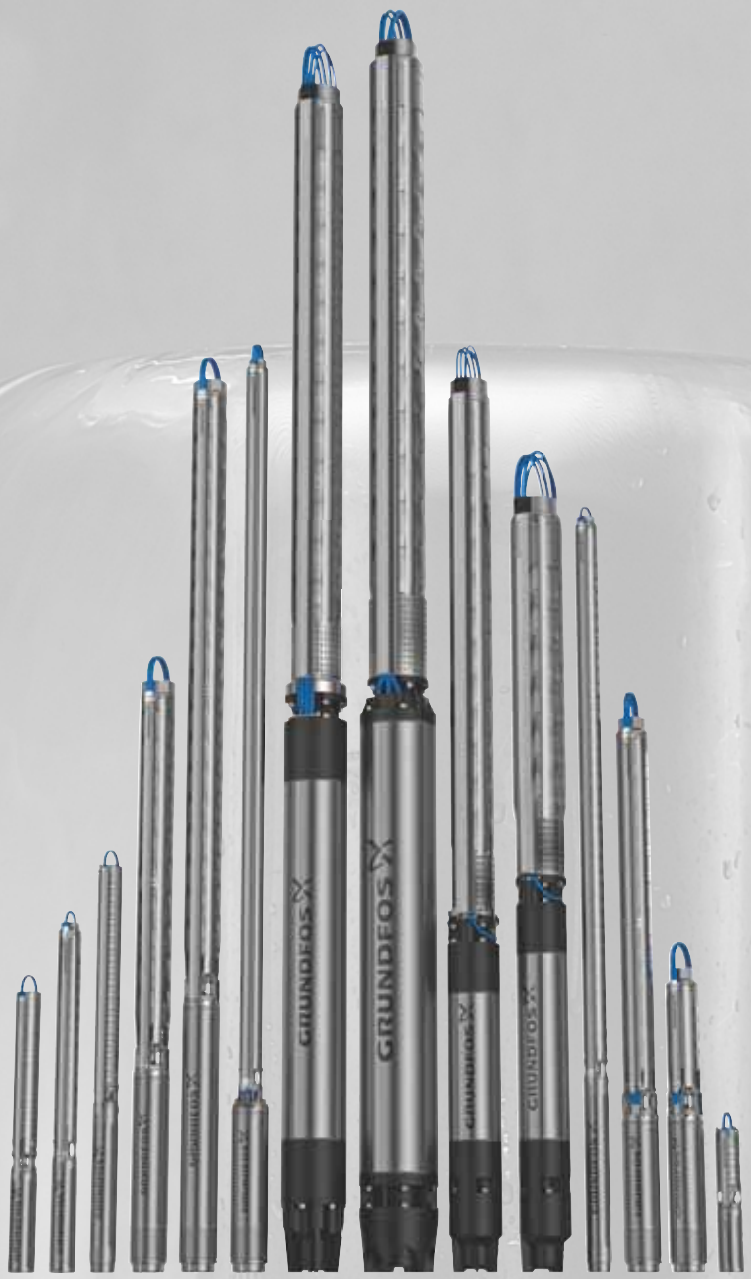
SP A, SP

Submersible pumps, motors and accessories

60 Hz



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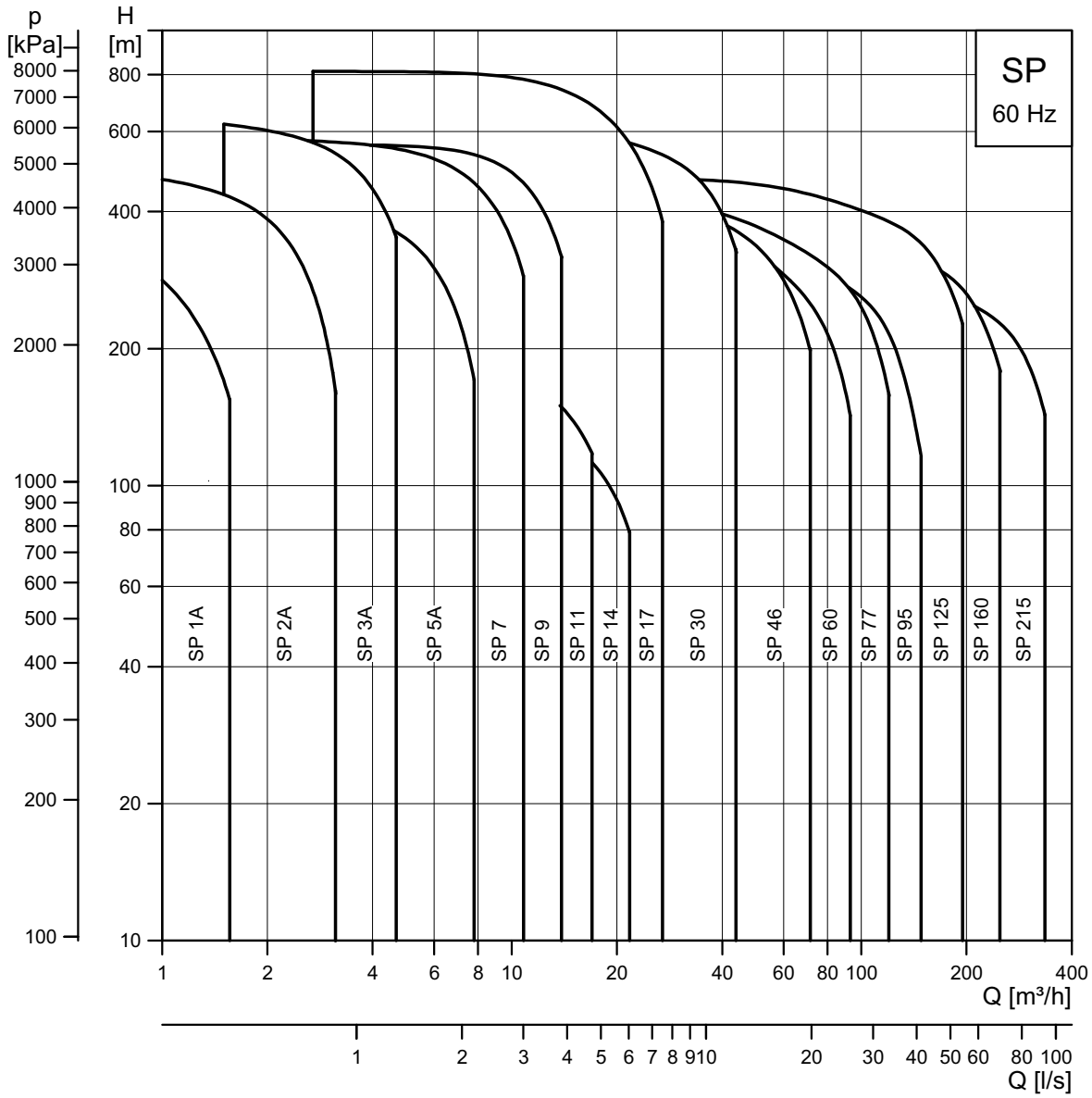
1. General description

Performance range



TM00 7574 3214

ErP ready

The SP A, SP 4" and 6" pumps are energy-optimised and comply with the ErP Directive (Commission Regulation (EC) No 547/2012) which has been effective as from 1 January 2013. As from this date, all pumps are classified/graduated in a new energy efficiency index (MEI).

Efficiency and MEI index for SP pumps

Pump type	Pump size	Pump stage efficiency [%]	MEI
SP 1A	4"	39	≥ 0.70
SP 2A	4"	50	≥ 0.70
SP 3A	4"	58	≥ 0.70
SP 5A	4"	60	≥ 0.40
SP 7	4"	69	≥ 0.70
SP 9	4"	71	≥ 0.70
SP 11	4"	70	≥ 0.60
SP 14	4"	70	≥ 0.50
SP 17	6"	74	≥ 0.70
SP 30	6"	75	≥ 0.50
SP 46	6"	76	≥ 0.40
SP 60	6"	77	≥ 0.40
SP 77	8"	78	-
SP 95	8"	79	-
SP 125	10"	79	-
SP 160	10"	80	-
SP 215	10"	83	-

Type key

Example of pump	**SP 46**	**-**	**9**	**E**		**E**	**Rp4**	**6"**			**50/60**	**SD**		
Example of pump with motor	**SP 125**	**-**	**10**	**AA**	**N**		**Rp6**	**8"**	**3 x 380-415**		**50**	**SD**	**92 kW**	

Type range (SPXA, SP)

Number of impellers

Reduced impellers (A, B, C max. 2)

Stainless-steel parts of material

= EN 1.4301
N = EN 1.4401
R = EN 1.4539

Rubber parts of material

SP 1A - SP 5A	SP 9 - SP 14	SP 17 - SP 60	SP 77 - SP 215
= NBR	= LSR/NBR/TPU	= LSR/NBR	= NBR
E = FKM	E = FKM	E = FKM	E = FKM

Connection

Rp thread (RpX)
R thread (RX)
NPT thread (XNPT)
Grundfos flange (GrX)

Inlet motor size

Voltage [V]

Frequency [Hz]

Starting method

= DOL (Direct-on-line)
SD = SD (Star-delta)

Motor power [kW]

Applications

SP pumps are primarily used to pump raw water from the underground. The pumps are installed in boreholes or wells, submerged below the water level.

For industrial purposes, you can place the pump in for example a tank.

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.

Pump range

Type	Steel EN 1.4301	Steel (N) EN 1.4401	Steel (R) EN 1.4539	Connection*	Flange connection Grundfos flange
SP 1A	•			Rp 1 1/4	
SP 2A	•			Rp 1 1/4 (R 1 1/4)	
SP 3A	•	•		Rp 1 1/4	
SP 5A	•	•	•	Rp 1 1/2 (R 1 1/2)	
SP 7	•	•	•	Rp 1 1/2 (R 1 1/2)	
SP 9	•	•	•	Rp 2 (R 2)	
SP 11	•	•	•	Rp 2	
SP 14	•	•	•	Rp 2	
SP 17	•	•	•	Rp 2 1/2 (R 3)	
SP 30	•	•	•	Rp 3 (R 3)	
SP 46	•	•	•	Rp 3 Rp 4 (R 4)	
SP 60	•	•	•	Rp 3 Rp 4 (R 4)	
SP 77	•	•	•	Rp 5	5"
SP 95	•	•	•	Rp 5	5"
SP 125	•	•	•	Rp 6	6"
SP 160	•	•	•	Rp 6	6"
SP 215	•	•	•	Rp 6	6"

* Figures in brackets ( ) indicate connection for pumps within a 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, R)																												•	•	•	•	•

We recommend that you use a soft starter or auto transformer above 75 kW.
Motors with star-delta starting are available from 5.5 kW.
MS 4000 and MS 6000 are available with a built-in temperature transmitter (Tempcon).

2. Submersible pumps

Features and benefits

A wide pump range

Grundfos offers energy-efficient submersible pumps ranging from 1 to 330 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, a normal pump consumes about 688,000 kWh. If the pump/motor efficiency is enhanced by 5 %, you can save about 34,000 EUR in energy cost, if the price is EUR 0.10/kWh.

Material and pumped liquids

To ensure the right wear resistance and reduce risk of corrosion, the pump ranges are available with different steel variants.

- **SP:** EN 1.4301
- **SP N:** EN 1.4401
- **SP R:** EN 1.4539

See specified material variants in *Pump range* on page 6.
For further protection to corrosive environments, a complete range of zinc anodes for cathodic protection is available. See page 107.

Rubber components

For pumping liquid with risk of chemical residue or liquids > 60 °C, all pumps can be supplied with rubber components made of FKM elastomer.

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.

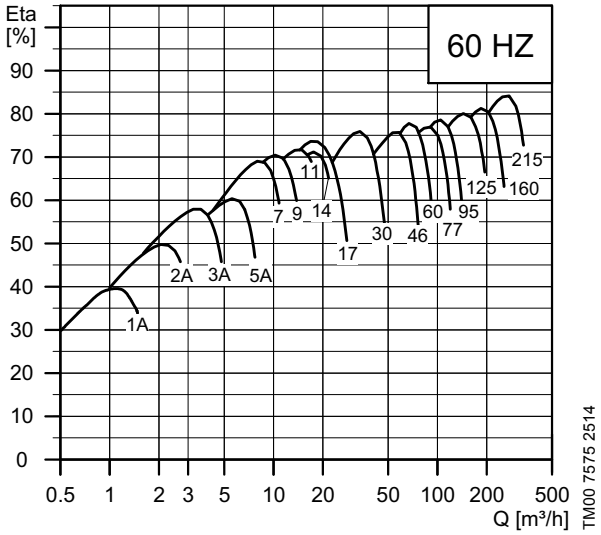


Fig. 1 Pump efficiencies in relation to flow

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.

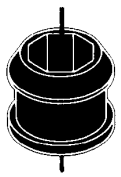


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Fig. 3 Bearing

Inlet strainer

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

SP 1A to SP 5A with spline shaft strainer hole size: Ø2.5 mm.

SP 1A to SP 5A with smooth shaft strainer hole size: 2 x 20 mm.

SP 7 to SP 215 all smooth shaft strainer hole size: 4 x 20 mm.

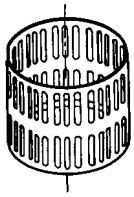

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Fig. 4 Inlet strainer

Non-return valve

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

You can get the pump with and without non-return valve and also with a hole in so the raiser pipe can be emptied over time.

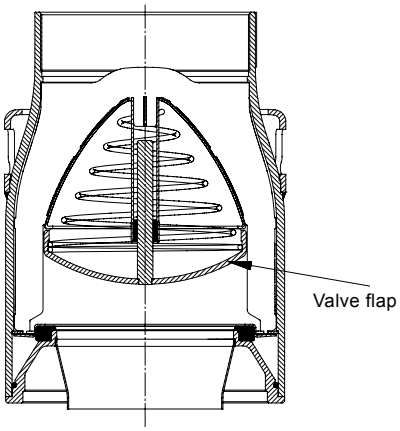

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Fig. 5 Non-return valve

Priming screw

All Grundfos pumps with radial impellers are fitted with a priming screw. Consequently, dry running is prevented because the priming screw ensures 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, neither pump nor motor will be protected against dry running if the water table is lowered to a level below the pump inlet.

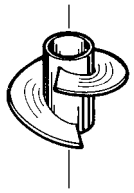

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Fig. 6 Priming screw

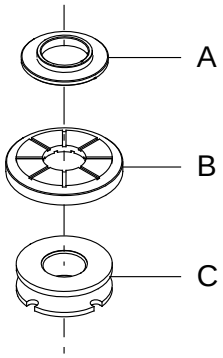
Stop ring

The stop ring prevents damage to the pump during transport and in case of upthrust in connection with startup.

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 (SP 1A - SP 5A)

Pos.	Component	Material	Standard	N-version (only SP3A, SP5A)	R-version (only SP 5A)
				EN	
1	Valve casing	Stainless steel	1.4301	1.4401	1.4539
2	Valve cup	Stainless steel	1.4301	1.4401	1.4539
3	Valve seat	Rubber type	NBR-FKM	NBR-FKM	NBR-FKM
7	Neck ring	Rubber type	NBR-FKM	NBR-FKM	NBR-FKM
8	Bearing	Rubber type	NBR-FKM	NBR-FKM	NBR-FKM
	Washer for stop ring	Carbon		Carbon/ graphite HY22 in PTFE mass	
9	Chamber	Stainless steel	1.4301	1.4401	1.4539
12	Impeller	Stainless steel	1.4301	1.4401	1.4539
14	Suction interconnector	Cast stainless steel	1.4308	1.4408	1.4517
	Strainer	Stainless steel	1.4301	1.4401	1.4539
16	Shaft complete	Stainless steel	1.4057	1.4460	1.4462
17	Strap	Stainless steel	1.4301	1.4401	1.4539
18	Cable guard	Stainless steel	1.4301	1.4401	1.4539

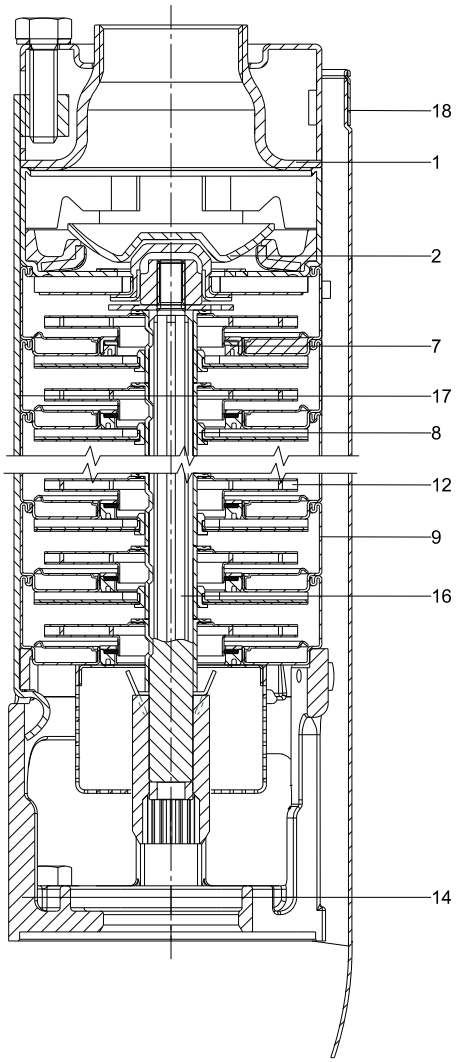


Fig. 8 Example SP 3A, pump with spline shaft.

Material specification (SP 7 - SP 14)

Pos.	Component	Material	Standard	N-version	R-version
			EN		
1	Valve casing	Cast stainless steel	1.4301	1.4401	1.4517
2	Valve cup	Cast stainless steel	1.4301	1.4401	1.4539
3	Valve seat	NBR-FKM	NBR-FKM	NBR-FKM	NBR-FKM
7	Neck ring	TPU/PPS-FKM	TPU/ PPS-FKM	TPU/ PPS-FKM	TPU/ PPS-FKM
8	Bearing	LSR/FKM	LSR/FKM	LSR/FKM	LSR/FKM
8a	Washer for stop ring	Carbon/graphite HY22 in PTFE mass			
9	Chamber	Stainless steel	1.4301	1.4401	1.4539
13	Impeller	Stainless steel	1.4301	1.4401	1.4539
14	Suction interconnector	Cast stainless steel	1.4308	1.4408	1.4517
15	Strainer	Stainless steel	1.4301	1.4401	1.4539
16	Shaft complete	Stainless steel	1.4057	1.4460	1.4462
17	Strap	Stainless steel	1.4301	1.4401	1.4539
18	Cable guard	Stainless steel	1.4301	1.4401	1.4539

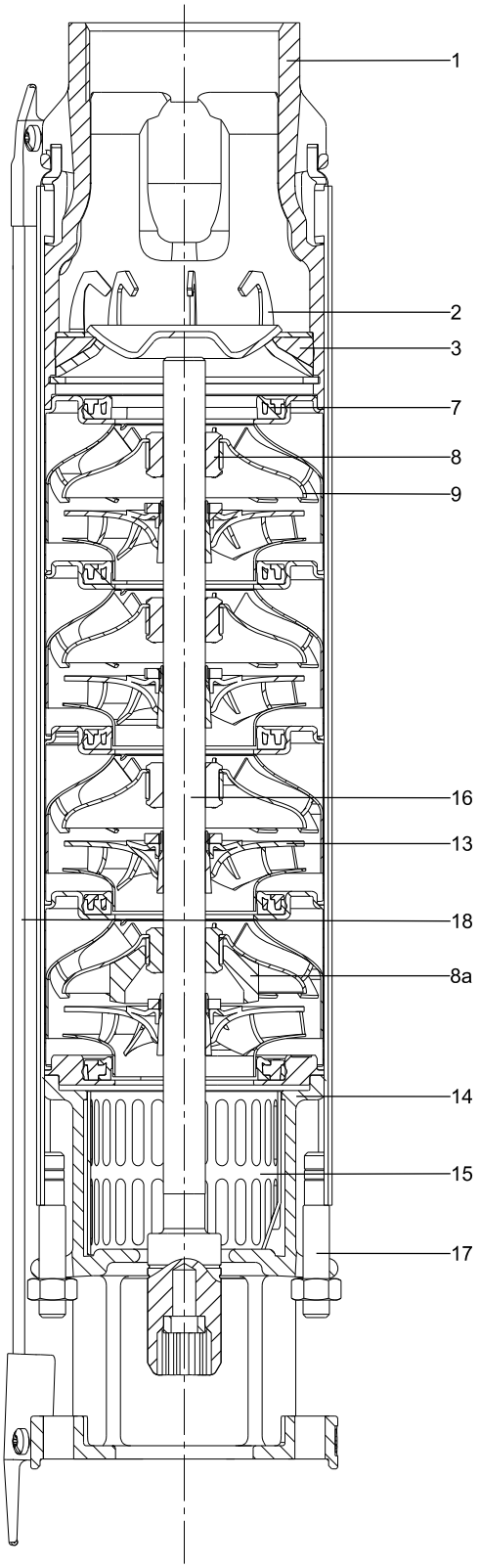


Fig. 9 Example SP 9

Material specification (SP 17 - SP 60)

Pos.	Component	Material	Standard	N-version	R-version
			EN		
1	Valve casing	Stainless steel	1.4301	1.4401	1.4517
2	Valve cup	Stainless steel	1.4301	1.4401	1.4539
	Valve seat	NBR-FKM	NBR-FKM	NBR-FKM	NBR-FKM
7	Neck ring	NBR-FKM	NBR-FKM	NBR-FKM	NBR-FKM
8	Bearing	NBR-FKM-LSR	NBR-FKM-LSR	NBR-FKM-LSR	NBR-FKM-LSR
8a	Washer for stop ring	Carbon/graphite HY22 in PTFE mass			
9	Chamber	Stainless steel	1.4301	1.4401	1.4539
13	Impeller	Stainless steel	1.4301	1.4401	1.4539
14	Suction interconnector	Cast stainless steel	1.4308	1.4408	1.4517
	Strainer	Stainless steel	1.4301	1.4401	1.4539
16	Shaft complete	Stainless steel	1.4057	1.4460	1.4462
17	Strap	Stainless steel	1.4301	1.4401	1.4539
18	Cable guard	Stainless steel	1.4301	1.4401	1.4539

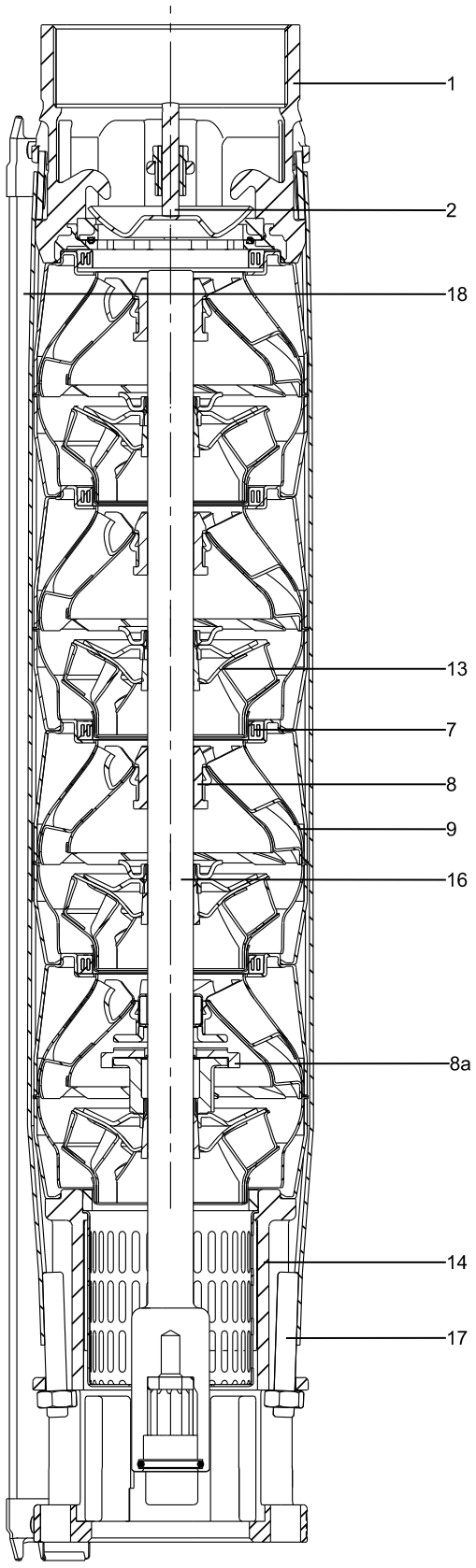


Fig. 10 Example SP 46

Material specification (SP 77 - SP 215)

Pos.	Component	Material	Standard	N-version	R-version
			EN		
1	Valve casing	Stainless steel	1.4301	1.4401	1.4539
2	Valve cup	Stainless steel	1.4301	1.4401	1.4539
	Valve seat	NBR-FKM	NBR-FKM	NBR-FKM	NBR-FKM
7	Neck ring	NBR-FKM	NBR-FKM	NBR-FKM	NBR-FKM
8	Bearing	NBR-FKM	NBR-FKM	NBR-FKM	NBR-FKM
	Washer for stop ring	Carbon/graphite HY22 in PTFE mass			
9	Chamber	Stainless steel	1.4301	1.4401	1.4539
13	Impeller	Stainless steel	1.4301	1.4401	1.4539
14	Suction interconnector	Cast stainless steel	1.4308	1.4408	1.4517
	Strainer	Stainless steel	1.4301	1.4401	1.4539
16	Shaft complete	Stainless steel	1.4057	1.4460	1.4462
17	Strap	Stainless steel	1.4301	1.4401	1.4539
18	Cable guard	Stainless steel	1.4301	1.4401	1.4539

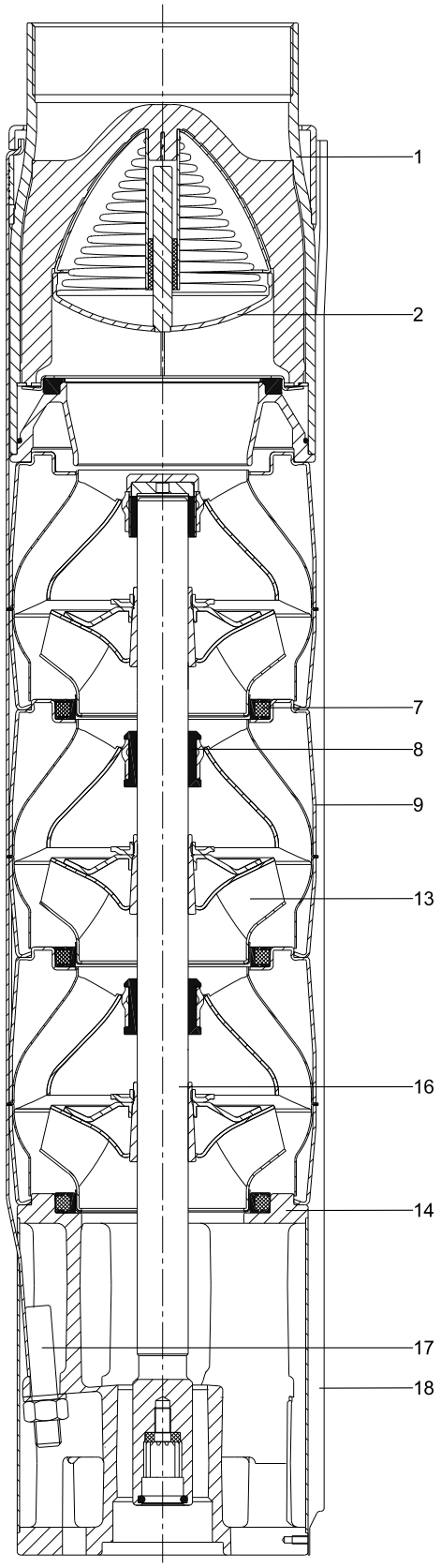


Fig. 11 Example SP 77

3. Submersible motors

For further information about Grundfos submersible motors, see the MS and MMS motor literature available in Grundfos Product Center at https://product-selection.grundfos.com.

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 from 0.37 to 2.2 kW:
  - 2-wire
  - 3-wire
  - PSC (permanent split capacitor)
- 4" motors, three-phase from 0.37 to 7.5 kW
- 4" T60 motors, three-phase from 2.2 to 5.5 kW
- 6" motors, three-phase from 5.5 to 30 kW
- 6" T60 motors, three-phase from 5.5 to 22 kW.

Submersible, rewindable motors, MMS

- 6" motors, three-phase from 3.7 to 45 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 waterproof 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 (T60)

For heavy-duty applications, Grundfos offers a complete motor range of T60 motors with up to 5 % higher efficiency than that of Grundfos' standard motors. The T60 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 1 m/s past the motor. The T60 motors are for customers who value low operating costs and long life higher than price.

Grundfos T60 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, for example, bad power supply, hot water, bad cooling conditions, high pump load.

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

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Fig. 12 MS motors

TM01 7873 4799 - GrA4575 3908

Fig. 13 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 cut outs, and thereby avoids damage to the pump and motor.

MS

The Grundfos MS submersible motors, except MS 402, are available with a built-in Tempcon temperature sensor for protection against overtemperature. By means of this sensor connected to the MP 204 motor protector via the power line, you can read out and/or monitor the motor temperature. As an alternative, you can fit the MS motors with Pt100 and Pt1000 sensors for temperature monitoring via a control unit.

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 a control unit, the sensor ensures that the maximum operating temperature is not exceeded.

Protection against upthrust

In case of a very low counter pressure in connection with startup, 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 startup phase. The protection consists of either a built-in stop ring or hydraulic balancing.

Built-in cooling chambers

In all Grundfos MS submersible motors, cooling chambers at the top and at the bottom of the motor and internal circulation of motor liquid ensure efficient cooling. See fig. 14. As long as the required flow velocity past the motor is maintained (see *Operating conditions* on page 18), cooling of the motor will be efficient.

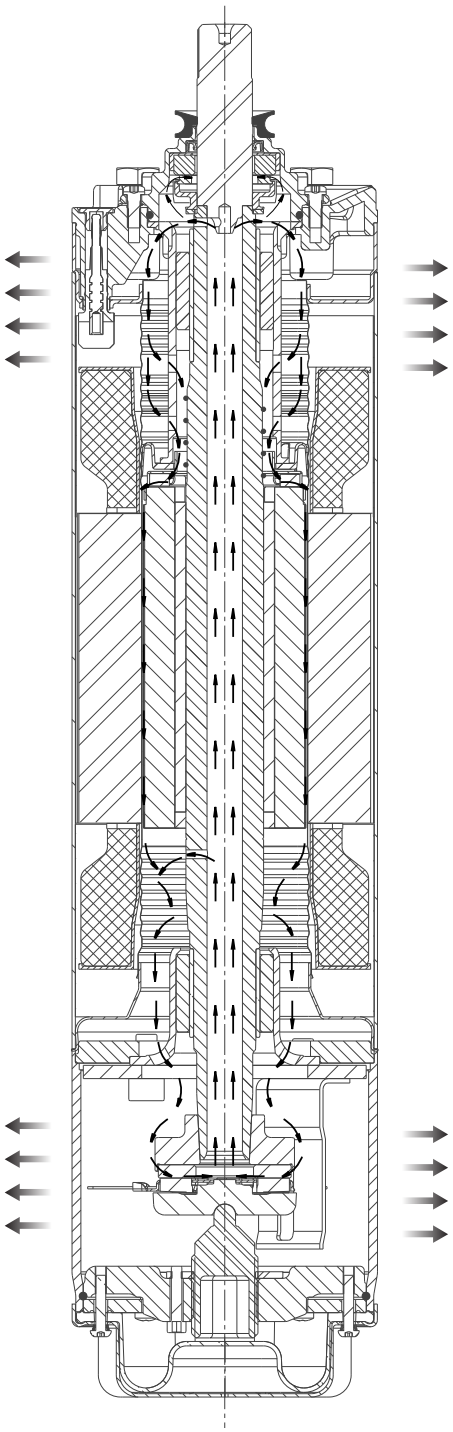

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Fig. 14 MS 6000

Lightning protection

Grundfos recommends that you use extra lightning protection to minimise the risk of motor burnout caused by lightning strike.

Reduced risk of short circuit

The stator is hermetically encapsulated in stainless steel. The stator windings are embedded in polymer compound. This results in high mechanical stability, optimum cooling and eliminates the risk of short circuits in the windings caused by condensing 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 potable water.

MS 4000, MS 6000

The material is ceramic/carbon 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.

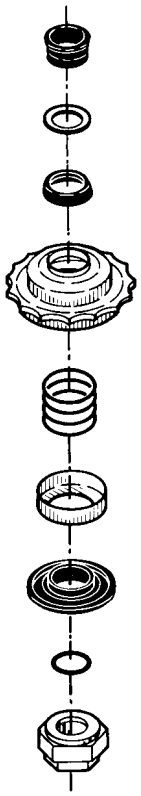
MMS rewindable motors

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. 15 Shaft seal, MS 4000

Material specification for MS motors

MS 402, MS 4000 and MS 6000 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	SiC/SiC
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

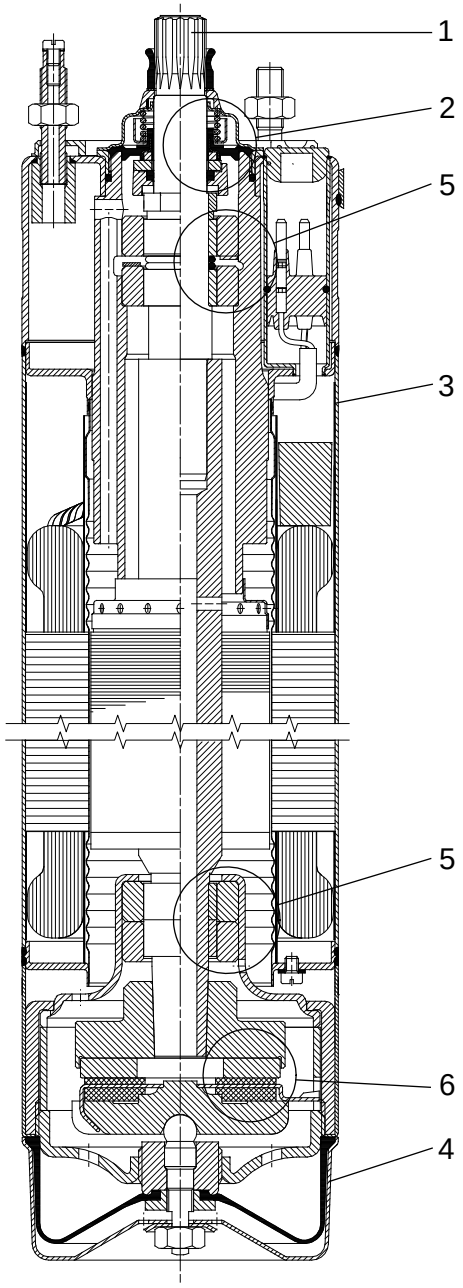


Fig. 16 MS 4000

Material specification for MMS motors

Cast-iron version

Pos.	Component	Material	Version		
			-	N	R
			EN	EN	EN
202	Shaft with rotor	Stainless steel	1.4301	1.4401	1.4462
203/ 206	Thrust bearing/ rotating thrust bearing part	Hardened steel/ stainless steel	1.4125	1.4125	1.4125
		Ceramic/carbon	-	-	-
204	Radial bearing	Carbon	-	-	-
205	NEMA flange	Cast iron/ stainless steel	GJL-250	1.4408	1.4517
208a	Thrust ring	Stainless steel	1.4016	1.4016	1.4016
208b	Thrust bearing support	Stainless steel	1.4016	1.4016	1.4016
212	Diaphragm	EPDM	-	-	-
213	End cover	Cast iron/ stainless steel	GJL-250	1.4408	1.4517
216	Lock nut	Steel, BN1235	-	-	-
216a	Washer	Stainless steel	1.4301	1.4301	1.4301
219	Thrust bearing housing	Stainless steel	1.4308	1.4308	1.4517
221	Stator with sleeve	Stainless steel	1.4306	1.4404	1.4539
222b	O-ring	Fibronit	-	-	-
223b	Plug	Stainless steel	1.4401	1.4401	1.4539
224	O-ring	NBR	-	-	-
226	Shaft seal housing	Cast iron/ stainless steel	GJL-250	1.4401	1.4539
226a	Shaft seal, stationary part	Ceramic/carbon	●	●	-
		SiC/SiC	●	●	●
226b	Shaft seal, rotating part	SiC	-	-	-
229	Sand shield	FKM	-	-	-
231	O-ring	NBR	-	-	-
232	Lip seal ring	FKM	-	-	-
235	Intermediate housing	Cast iron/ stainless steel	GJL-250	1.4408	1.4517
236	Bearing housing, lower	Cast iron/ stainless steel	GJL-250	1.4408	1.4517
236a	Hexagon socket head screw	Steel	-	-	-
242	Upthrust spacer	PP	-	-	-
247	Screw		1.4401	1.4401	1.4539
	Motor cable	EPDM	-	-	-

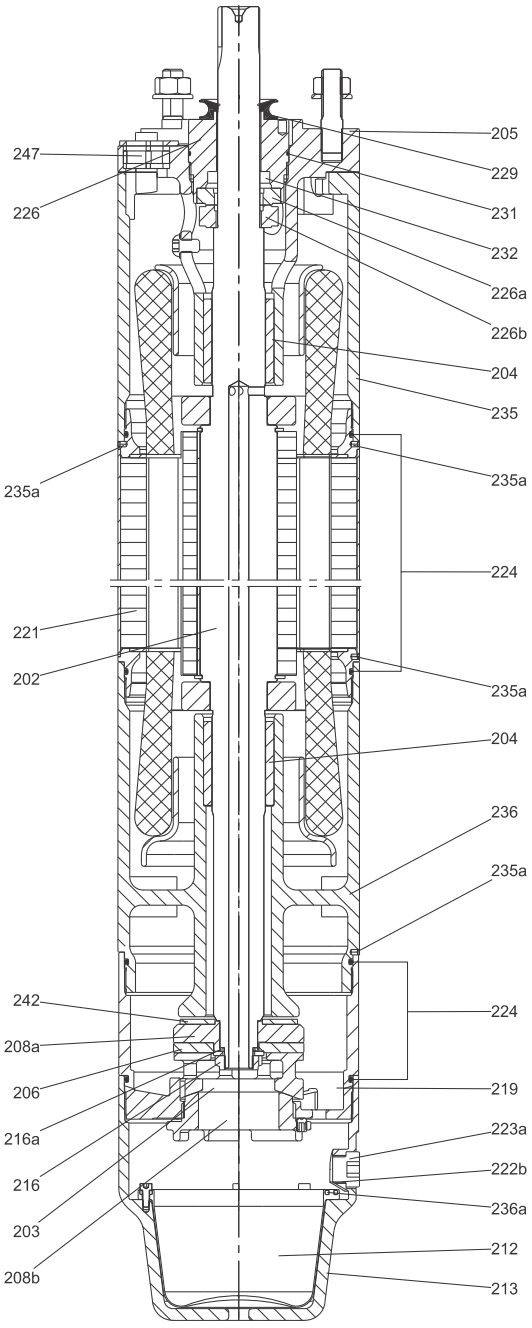


Fig. 17 MMS 6

4. Operating conditions

To ensure long and trouble-free pump life, it is important that the following is observed.

Inlet pressure

The minimum inlet pressure is indicated by the NPSH-curves in the single-stage curve charts.

The minimum safety margin of the NPSH-curves must always be 0.5 m head.

Minimum flow rate

To ensure sufficient cooling of the motor, the pump must not run continuously at a flow rate below 0.1 x nominal flow rate.

Operation of the pump against a closed valve must be limited to a maximum of 30 seconds due to the risk of local heating of the pumped liquid and the consequent damage to the pump and motor.

Maximum flow rate

The pump must not run continuously at a flow rate above 1.3 x nominal flow rate due to the risk of upthrust and cavitation.

Pumped liquids

SP A and SP pumps are capable of pumping clean, thin, non-aggressive liquids, not containing solid particles or fibres larger than sand grains.

Pump type	Maximum content of sand [ppm]
SP 1A - SP 5A	50
SP 7 - SP 14	150
SP 17 - SP 60	100
SP 77 - SP 215	50

Special liquids

A larger content of sand will reduce pump life.

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.

Pumping of liquids with a higher density than that of water requires a motor with a correspondingly higher output.

Pumping of liquids with a higher viscosity than that of water may result in

- increased pressure loss
- reduced hydraulic performance
- increased pump power input.

In case of doubt, contact Grundfos.

Liquid temperature

For protection of pump and motor rubber parts, the liquid temperature must not exceed 60 °C.

Alternatively, you can fit the pump with bearings made of FKM material, resistant to liquid temperatures of up to 90 °C.

Maximum liquid temperature

The maximum liquid temperature allowed depends on the flow velocity of the liquid past the motor, see the table below.

Grundfos motor	Flow velocity past motor [m/s]	Max. liquid temperature [°C]
MS 4" T40	0.15	40
MS 4" T60	0.15	60
MS 6000 T40	0.15	40
MS 6000 T60	1.00	60
MMS 6" T30 with PVC windings	0.15	25
	0.50	30
MMS 6" T50 with PE/PA windings	0.15	45
	0.50	50
MMS 8", 10" T30 rewindable with PVC windings	0.15	25
	0.50	30
MMS 8", 10" T45 rewindable with PE/PA 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.

Maximum operating pressure

Grundfos motor	Maximum operating pressure
MS 402	1.5 MPa (15 bar)
MS 4000 and MS 6000	6 MPa (60 bar)
MMS 6", 8", 10", 12" rewindable	

Service

If you request Grundfos to service the pump, contact Grundfos with details about the pumped liquid before you return the pump for service. Otherwise, Grundfos can refuse to accept the pump for service.

Possible costs of returning the pump are paid by the customer.

However, any application for service, no matter to whom it may be made, must include details about the pumped liquid if the pump has been used for liquids which are injurious to health or toxic.

Before you return a pump, clean it in the best possible way.

Maximum start/stop frequency

The SP pump is suitable for continuous as well as intermittent operation:

Motor type		Number of starts
MS 402		• Minimum 1 per year is recommended. • Maximum 100 per hour. • Maximum 300 per day.
MS 4000		• Minimum 1 per year is recommended. • Maximum 100 per hour. • Maximum 300 per day.
MS 6000		• Minimum 1 per year is recommended. • Maximum 30 per hour. • Maximum 300 per day.
MMS 6	**PVC windings**	• Minimum 1 per year is recommended. • Maximum 3 per hour. • Maximum 40 per day.
	PE/PA windings	• Minimum 1 per year is recommended. • Maximum 10 per hour. • Maximum 70 per day.
MMS 8000	**PVC windings**	• Minimum 1 per year is recommended. • Maximum 3 per hour. • Maximum 30 per day.
	PE/PA windings	• Minimum 1 per year is recommended. • Maximum 8 per hour. • Maximum 60 per day.
MMS 10000	**PVC windings**	• Minimum 1 per year is recommended. • Maximum 2 per hour. • Maximum 20 per day.
	PE/PA windings	• Minimum 1 per year is recommended. • Maximum 6 per hour. • Maximum 50 per day.
MMS 12000	**PVC windings**	• Minimum 1 per year is recommended. • Maximum 2 per hour. • Maximum 15 per day.
	PE/PA windings	• Minimum 1 per year is recommended. • Maximum 5 per hour. • Maximum 40 per day.

Sound pressure level

The sound pressure level has been measured in accordance with the rules laid down in the EC machinery directive 2006/42/EC.

Sound pressure level of pumps

The values apply to pumps submerged in water without an external regulating valve.

Pump type	$\overline{L}_{pA}$ [dB(A)]
SP 1A	< 70
SP 2A	< 70
SP 3A	< 70
SP 5A	< 70
SP 7	< 70
SP 9	< 70
SP 11	< 70
SP 14	< 70
SP 17	< 70
SP 30	< 70
SP 46	< 70
SP 60	< 70
SP 77	< 70
SP 95	< 70
SP 125	79
SP 160	79
SP 215	82

Sound pressure level of motors

The sound pressure level of Grundfos MS and MMS motors is lower than 70 dB(A).

Other motor makes: See installation and operating instructions for these motors.

Moment of inertia

Calculate the moment of inertia by use of one of the formulas below. Choose the formula from pump and motor size 4", 6", 8", 10" or 12" and insert the number of stages.

Pump type		Moment of inertia [kgm^2]				
		Motor size 4"	Motor size 6"	Motor size 8"	Motor size 10"	Motor size 12"
SP 1A	Splined shaft	$(9.4 + n \times 21.4) \times 10^{-6}$				
	Smoot shaft	$(11.7 + n \times 27.8) \times 10^{-6}$				
SP 1.5A	Splined shaft	$(9.4 + n \times 20.4) \times 10^{-6}$				
SP 2A	Splined shaft	$(9.4 + n \times 28.4) \times 10^{-6}$				
	Smoot shaft	$(11.7 + n \times 40.8) \times 10^{-6}$				
SP 3A	Splined shaft	$(9.4 + n \times 27.9) \times 10^{-6}$				
	Smoot shaft	$(11.7 + n \times 40.7) \times 10^{-6}$	$(415.68 + n \times 40.7) \times 10^{-6}$			
SP 5A	Splined shaft	$(9.4 + n \times 27.9) \times 10^{-6}$				
	Smoot shaft	$(11.7 + n \times 41.7) \times 10^{-6}$	$(415.97 + n \times 41.7) \times 10^{-6}$			
SP 7		$(0.5 + n \times 2.0) \times 10^{-4}$	$(4.0 + n \times 2.0) \times 10^{-4}$			
SP 9		$(0.5 + n \times 2.0) \times 10^{-4}$	$(4.0 + n \times 2.0) \times 10^{-4}$			
SP 11		$(0.5 + n \times 2.0) \times 10^{-4}$	$(4.0 + n \times 2.0) \times 10^{-4}$			
SP 14		$(0.5 + n \times 2.0) \times 10^{-4}$	$(4.0 + n \times 2.0) \times 10^{-4}$			
SP 17		$(0.5 + n \times 2.0) \times 10^{-4}$	$(4.0 + n \times 2.0) \times 10^{-4}$			
SP 30		$(0.5 + n \times 5.1) \times 10^{-4}$	$(4.0 + n \times 5.1) \times 10^{-4}$	$(6.0 + n \times 5.1) \times 10^{-4}$		
SP 46		$(0.5 + n \times 3.6) \times 10^{-4}$	$(4.0 + n \times 3.6) \times 10^{-4}$	$(6.0 + n \times 3.6) \times 10^{-4}$		
SP 60		$(0.5 + n \times 4.1) \times 10^{-4}$	$(4.0 + n \times 4.1) \times 10^{-4}$	$(6.0 + n \times 4.1) \times 10^{-4}$		
SP 77			$(5.5 + n \times 19) \times 10^{-4}$	$(7.0 + n \times 19) \times 10^{-4}$		
SP 95			$(5.5 + n \times 22) \times 10^{-4}$	$(20 + n \times 22) \times 10^{-4}$		
SP 125			$(5.5 + n \times 33) \times 10^{-4}$	$(20 + n \times 33) \times 10^{-4}$	$(25 + n \times 33) \times 10^{-4}$	$(25 + n \times 33) \times 10^{-4}$
SP 160			$(5.5 + n \times 33) \times 10^{-4}$	$(20 + n \times 33) \times 10^{-4}$	$(25 + n \times 33) \times 10^{-4}$	$(25 + n \times 33) \times 10^{-4}$
SP 215			$(25 + n \times 100) \times 10^{-4}$	$(25 + n \times 100) \times 10^{-4}$	$(30 + n \times 100) \times 10^{-4}$	$(30 + n \times 100) \times 10^{-4}$

n = number of stages.

Recommended minimum borehole diameter

If you use a connecting piece in the installation, the recommended minimum borehole diameter is the largest diameter of either pump or connecting piece.

The following table shows the recommended minimum borehole diameter of SP pumps with standard connections.

Pumps size	Starting	Motor size	Minimum borehole diameter [mm]							
			Rp 1 1/4"	Rp 2 1/2"	Rp 3"	Rp 4"	R 5"	5" GRF	Rp 6"	6" GRF
SP 1A - SP 5A	DOL	4"	105							
		6"	145							
		4"[1)]	113							
		6"[1)]	145							
SP 7 / SP 9	DOL	4"		105						
		6"		145						
		6"[1)]			145					
SP 11 / SP 14	DOL	4"		105						
		6"		145						
SP 17	DOL	4"		140						
		6"		145						
		6"[1)]		190	190					
	Y/D	6"		150						
		6"[1)]		180	180					
SP 45 / SP 60	DOL	4"			150	155				
		6"			155	155				
		8"[1)]			200	200				
	Y/D	6"			160	160				
		8"[1)]			200	200				
SP 77 / SP 95	DOL	6"				188	188	215		
		8"				206	206	215		
	Y/D	6"				196	196	215		
		8"				200	200	215		
SP 125 / SP 160	DOL	6"					215		215	230
		8"					225		225	240
	Y/D	6"					215		225	235
		8"					235		240	255
SP 215	DOL	6"							246	246
		8"							246	246
		10"							257	257
		12"							300	300
	Y/D	6"							257	257
		8"							257	257
		10"							268	268
		12"							300	300

[1)] Pump in sleeve.

How to read the curve charts

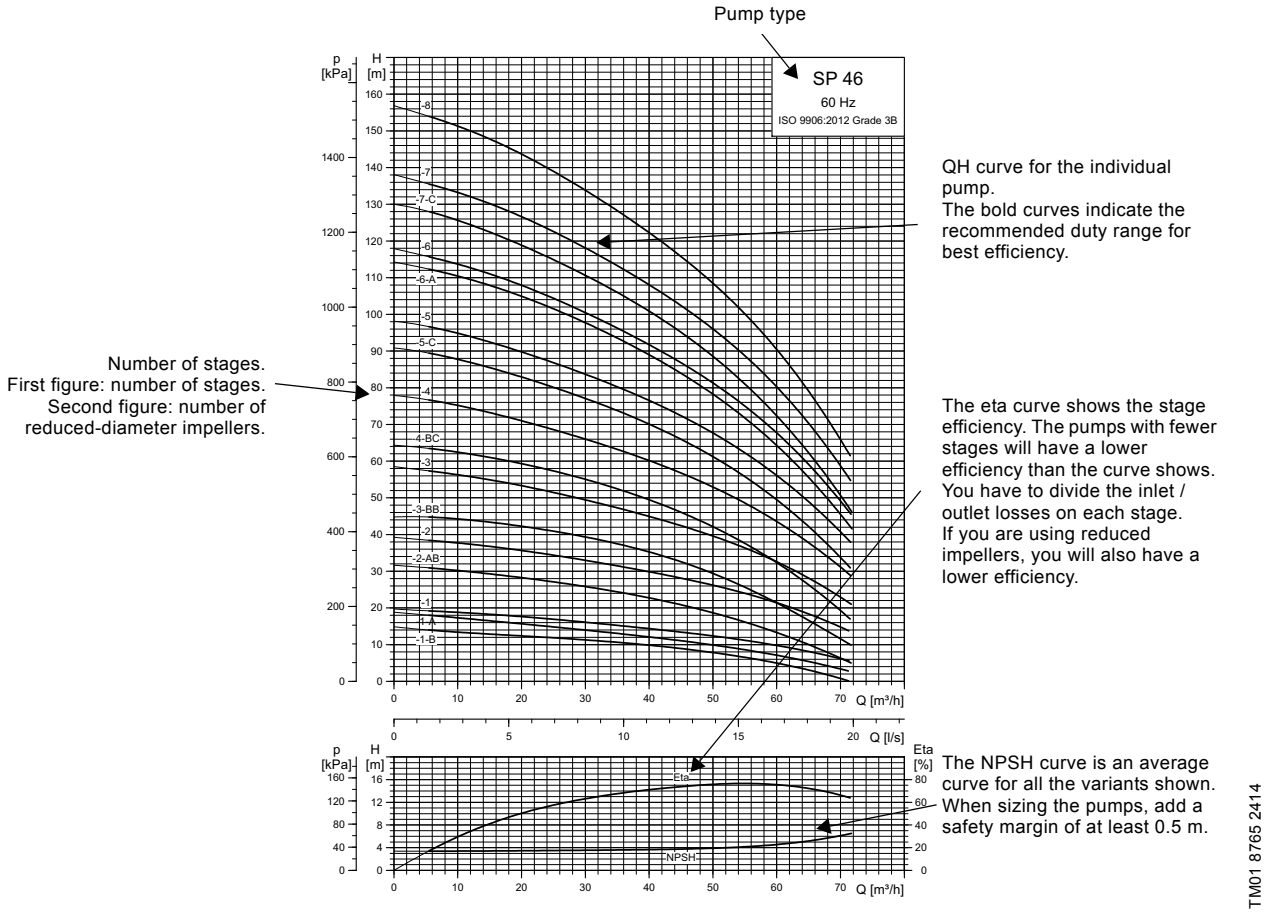


Fig. 18 How to read the curve charts

Curve conditions

The conditions below apply to the curves on pages 24 to 88.

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 include possible losses such as non-return valve loss.

SP A, SP curves

- **Q/H:** The curves include valve and inlet losses at the actual speed.
  Operations without a non-return valve 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 the 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 https://product-selection.grundfos.com (Grundfos Product Center).

SP certificates

For more information about SP certificates, see *Certificates* on page 113.

Cavitation

Cavitation does not normally take place in submersible pumps. If, however, the following two factors occur at the same time, cavitational damage on both pump and motor may arise at low installation depths:

– Invasive air bubbles
– Reduction of counter pressure caused for instance by pipe fracture, severe corrosion of riser main and extremely high consumption.

To calculate the required installation depth to prevent cavitation, the following formula is applied:

$H = H_b - NPSH - H_{loss} - H_v - H_s$

H_b = barometric pressure

NPSH = Net Positive Suction Head

H_{loss} = pressure loss in suction pipe

H_v = vapour pressure

H_s = safety factor

When the formula gives a positive H value, this means that the pump will be able to operate at suction lift. In that case, the standard indication of minimum installation depth is valid.

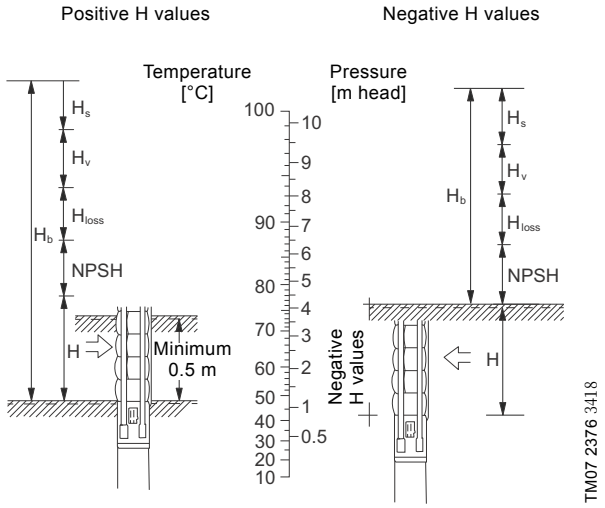


Fig. 19 Installation depth

Example:

An SP 60 at a flow of 78 m^3/h.

H_b	10.0 m
NPSH from data sheet	4.2 m
H_{loss}	0.0 m
H_v at 32 °C	0.5 m
H_s	1.0 m

H = 10 - 4.2 - 0 - 0.5 - 1.0 = 4.3 m

As H is positive, this means that the pump is able to create a vacuum of 0.43 bar without being damaged. That means that no special precautions have to be taken. In case of corrosion of the riser main resulting in a 20 mm hole, there will be no counter pressure and the pump flow will increase to more than 90 m^3/h.

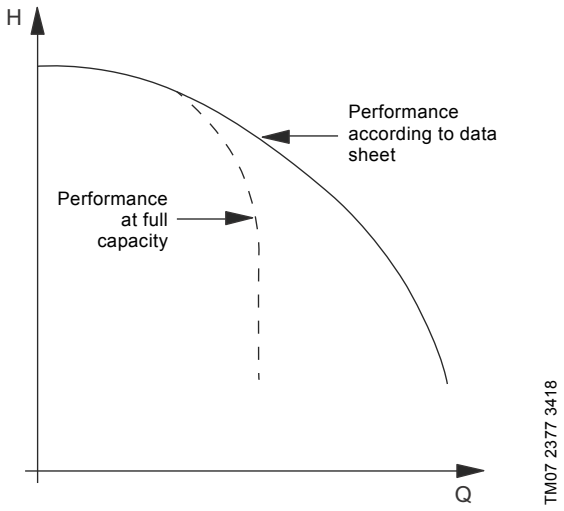
H_b is unchanged	10.0 m
NPSH will increase to	8.0 m
H_{loss}	0.0 m
H_v will increase due to recirculation in well to	4.6 m
H_s is unchanged	1.0 m

This will give

H = 10 - 8 - 0 - 4.6 - 1.0 = -3.6 m

This value of H means that the pump inlet must be at least 3.6 m below the dynamic water level, otherwise the pump will cavitate.

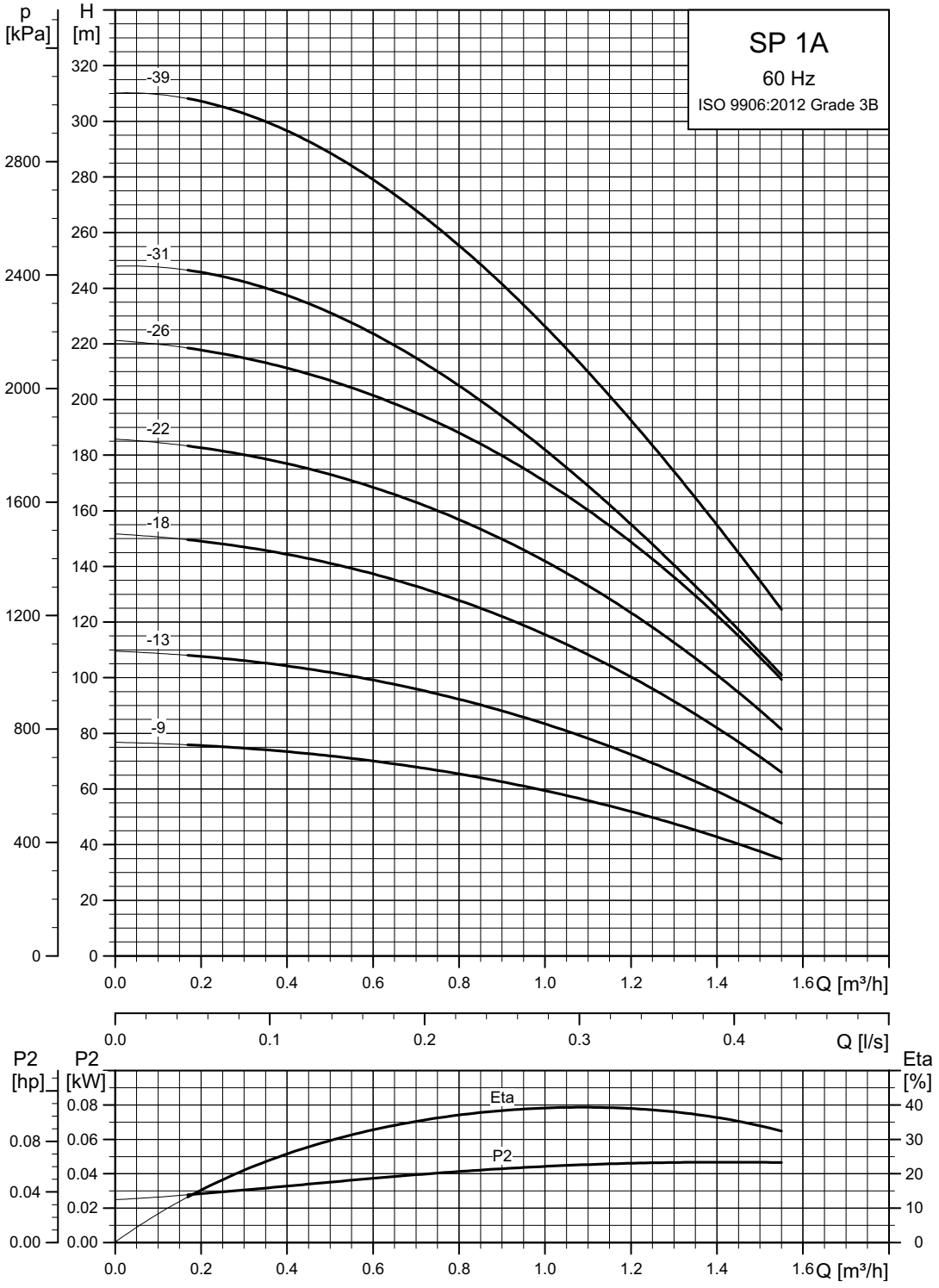
If a pump cavitates, it will not give full performance, see figure below.



5. Performance curves and technical data

SP 1A

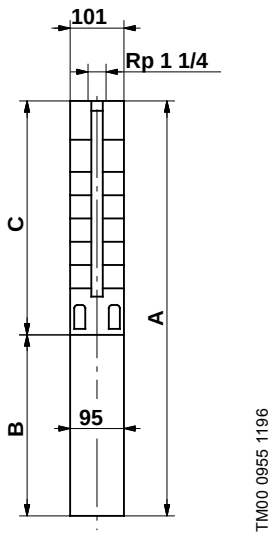
Performance curves



See also *Curve conditions*, page 19.

NPSH: Minimum inlet pressure 0.5 m.

Dimensions and weights



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

Pump type	Motor		Dimensions [mm]			Net weight [kg]
	Type	Power [kW]	C	B	A	
				3 x 220 V 3 x 380 V 3 x 460 V	3 x 220 V 3 x 380 V 3 x 460 V	3 x 220 V 3 x 380 V 3 x 460 V
SP 1A-9	MS 402	0.37	344	226	570	9
SP 1A-13	MS 402	0.37	428	226	654	10
SP 1A-18	MS 402	0.55	533	241	774	12
SP 1A-22	MS 402	0.75	617	276	893	14
SP 1A-26	MS 402	1.1	701	306	1007	16
SP 1A-31	MS 402	1.1	851	306	1157	22
SP 1A-39	MS 402	1.5	1019	346	1365	26

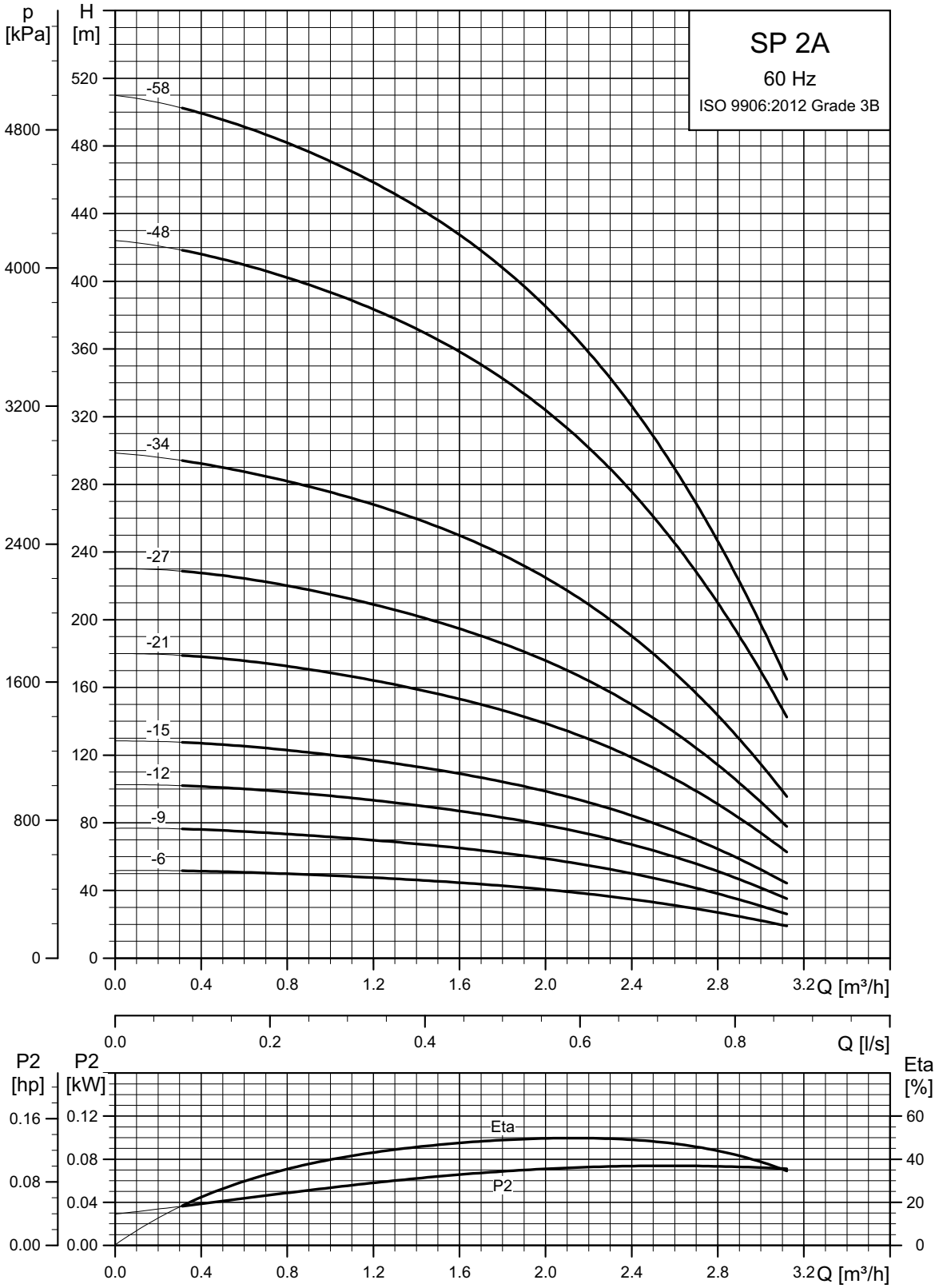
SP 1A-9 up to SP 1A-26 are pumps with spline shaft.

SP 1A-31 up to SP 1A-39 are pumps with smooth shaft.

All the pumps are only available in stainless steel EN 1.4301/ AISI 304.

SP 2A

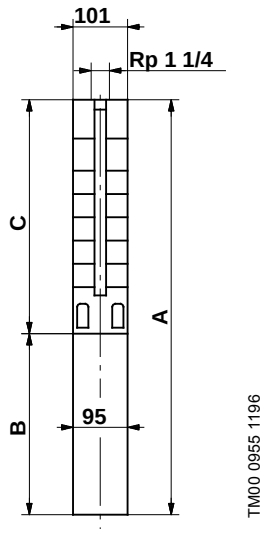
Performance curves



See also *Curve conditions*, page 19.

NPSH: Minimum inlet pressure 0.5 m.

Dimensions and weights



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	1 x 220 V	3 x 220 V 3 x 380 V 3 x 460 V	1 x 220 V	3 x 220 V 3 x 380 V 3 x 460 V	1 x 220 V	3 x 220 V 3 x 380 V 3 x 460 V
SP 2A-6	MS 402	0.25	281	256		537		10	
SP 2A-6	MS 402	0.37	281		226		507		9
SP 2A-9	MS 402	0.37	344	276	226	620	570	12	9
SP 2A-12	MS 402	0.55	407	291	241	698	648	13	11
SP 2A-15	MS 402	0.75	470	306	276	776	746	14	13
SP 2A-21	MS 402	1.1	596	346	306	942	902	17	15
SP 2A-27	MS 402	1.5	722		346		1068		18
SP 2A-34	MS 4000	2.2	914		453		1367		30
SP 2A-48	MS 4000	4.0	1208		573		1781		39
SP 2A-58[1)]	MS 4000	4.0	1597	4	573		2170		50

[1)] SP 2A-58 are mounted in sleeve for R 1 1/4 connection and with a maximum diameter of 108 mm.

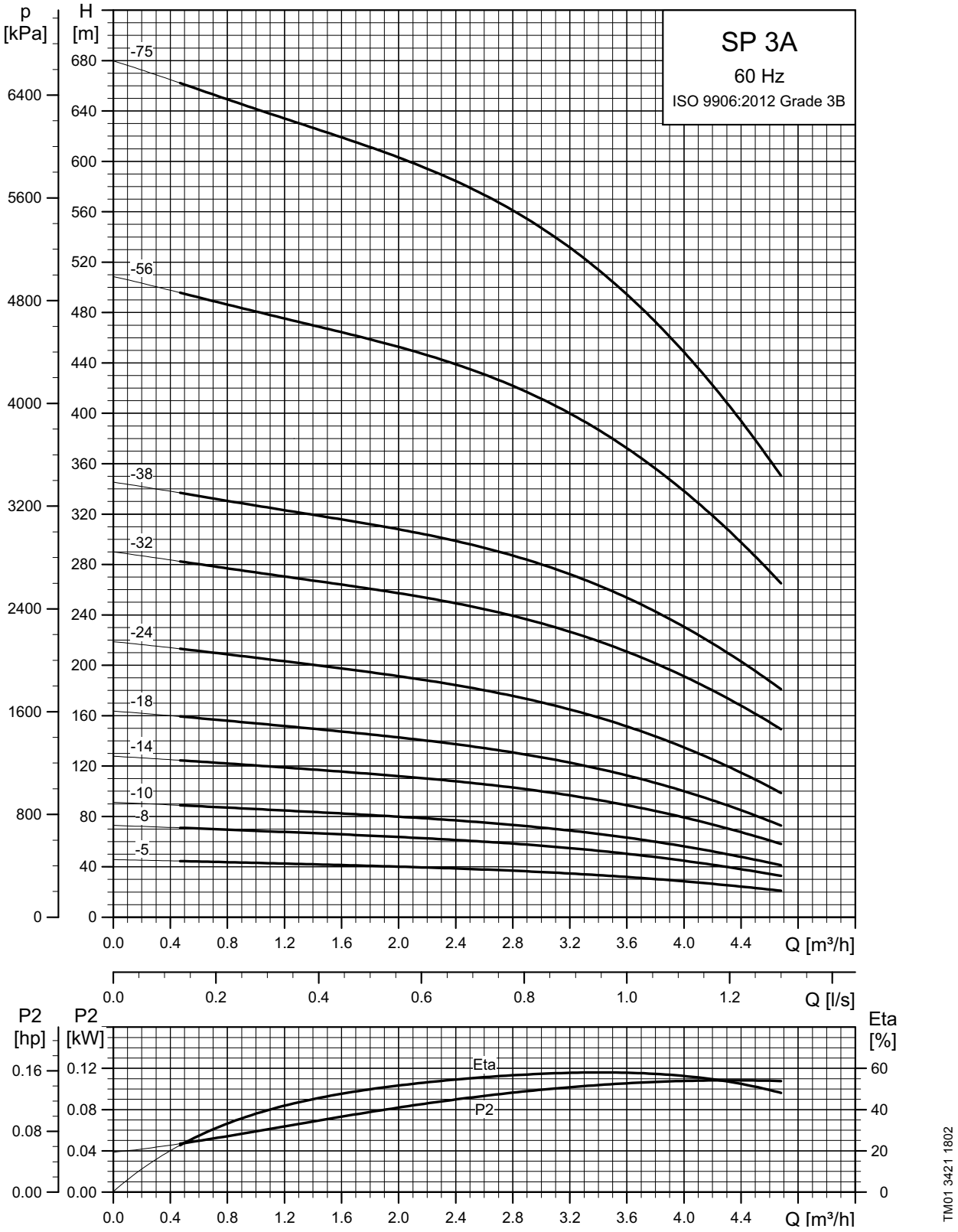
SP 2A-6 up to SP 2A-21 are pumps with spline shaft.

SP 2A-27 up to SP 2A-58 are pumps with smooth shaft.

All the pumps are only available in stainless steel EN 1.4301/ AISI 304.

SP 3A

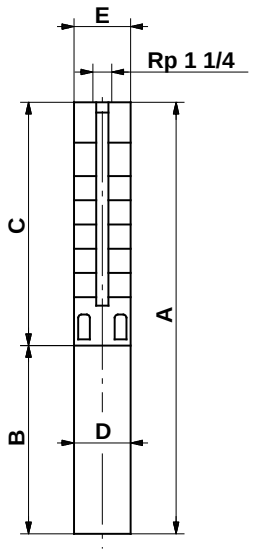
Performance curves



See also *Curve conditions*, page 19.

NPSH: Minimum inlet pressure 0.5 m.

Dimensions and weights



TM00 8521 3196

SP 3A-56 and SP 3A-75 are mounted in sleeve for R 1 1/4 connection.

Pump type	Motor			Dimensions [mm]						Net weight [kg]	
				B		A		D	E		
	Type	Power [kW]	C	1 x 220 V	3 x 220 V 3 x 380 V 3 x 460 V	1 x 220 V	3 x 220 V 3 x 380 V 3 x 460 V			1 x 220 V	3 x 220 V 3 x 380 V 3 x 460 V
SP 3A-5	MS 402	0.37	260	256	226	516	486	95	101	11	8
SP 3A-8	MS 402	0.55	323	291	241	614	564	95	101	12	10
SP 3A-10	MS 402	0.75	365	306	276	671	641	95	101	13	12
SP 3A-14	MS 402	1.1	449	346	306	795	755	95	101	15	14
SP 3A-18	MS 402	1.5	533		346		879	95	101		16
SP 3A-24	MS 4000	2.2	659		453		1112	95	101		23
SP 3A-32	MS 4000	3.0	872		493		1365	95	101		30
SP 3A-38	MS 4000	4.0	998		573		1571	95	101		36
SP 3A-56	MS 4000	5.5	1747		673		2420	95	101		65
SP 3A-56	MS 6000	5.5	1747		541		2228	138	140		75
SP 3A-75	MS 6000	7.5	2146		571		2717	139.5	140		86

SP 3A-6 up to SP 3A-24 are pumps with spline shaft as standard

SP 3A-32 up to SP 3A-75 are pumps with smooth shaft as standard.

Pumps with spline shaft are only available in stainless steel EN 1.4301.

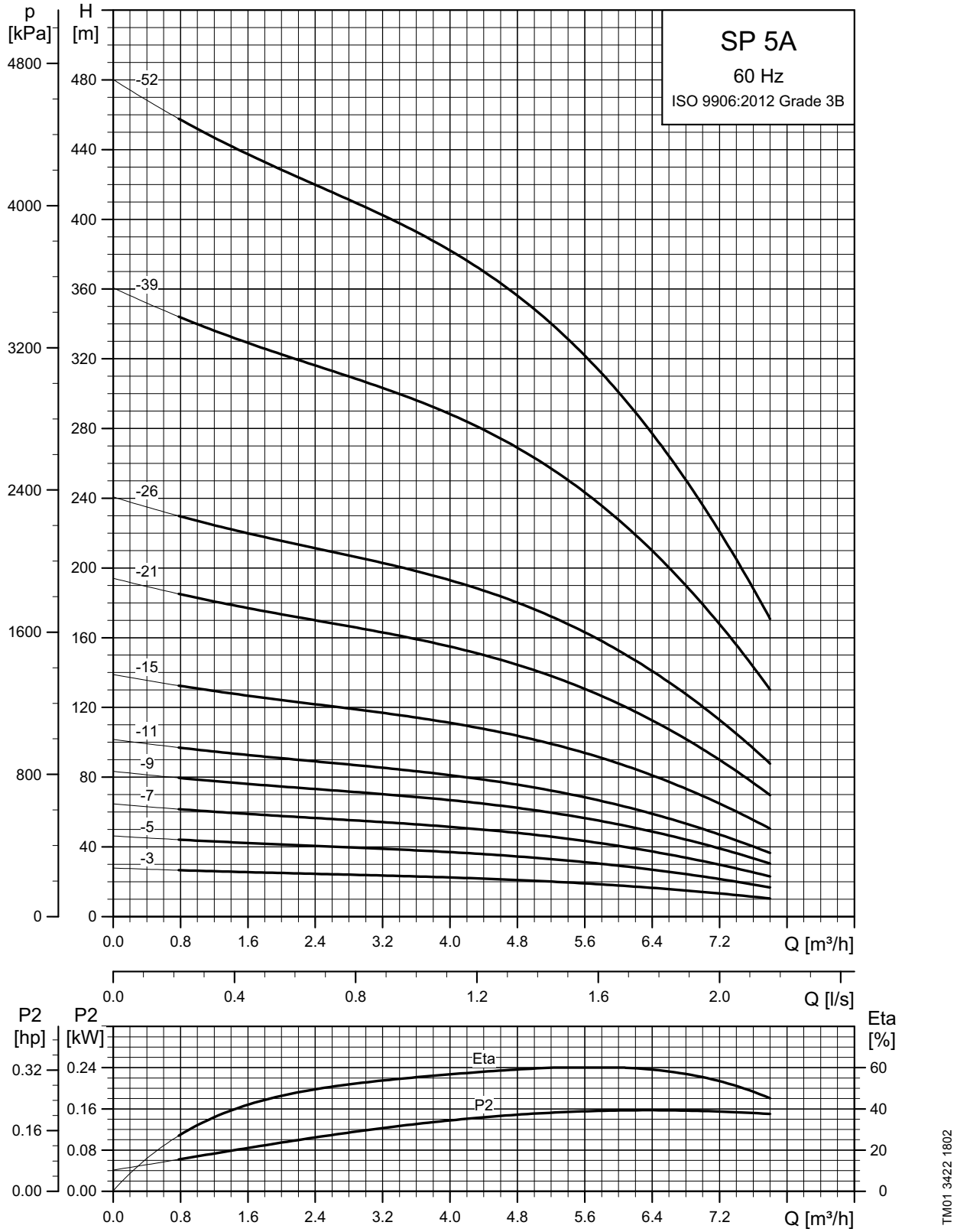
Pumps with smooth shaft are also available in N (EN 1.4401) version with MS4000R or MS6000R. See page 6.

It is also possible to get SP 3A-6 and up with smooth shaft.

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

SP 5A

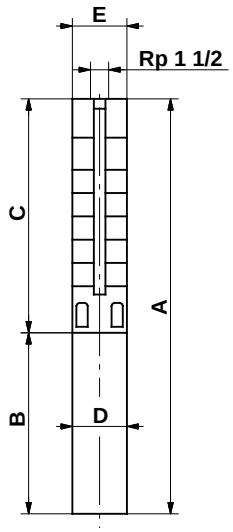
Performance curves



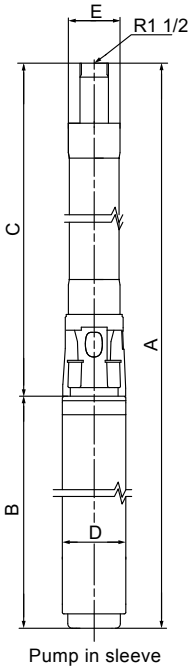
See also *Curve conditions*, page 19.

NPSH: Minimum inlet pressure 0.5 m.

Dimensions and weights



TM00 0956 1196



Pump in sleeve

TM01 4202 4218

Pump type	Motor			Dimensions [mm]						Net weight [kg]	
				B		A		D	E		
	Type	Power [kW]	C	1 x 220 V	3 x 220 V 3 x 380 V 3 x 460 V	1 x 220 V	3 x 220 V 3 x 380 V 3 x 460 V			1 x 220 V	3 x 220 V 3 x 380 V 3 x 460 V
SP 5A-3	MS 402	0.37	219	276	226	495	445	95	101	10	8
SP 5A-5	MS 402	0.55	261	291	241	552	502	95	101	11	9
SP 5A-7	MS 402	0.75	303	306	276	609	579	95	101	12	11
SP 5A-9	MS 402	1.1	345	346	306	691	651	95	101	14	13
SP 5A-11	MS 402	1.5	387		346		733	95	101		15
SP 5A-15	MS 4000	2.2	471		453		924	95	101		21
SP 5A-21	MS 4000	3.0	597		493		1090	95	101		23
SP 5A-26	MS 4000	4.0	702		573		1275	95	101		29
SP 5A-39	MS 4000	5.5	1019		673		1692	95	101		41
SP 5A-39	MS 6000	5.5	1081		541		1622	139.5	139.5		55
SP 5A-52[1)]	MS 6000	7.5	1663		571		2234	139.5	140		74

[1)]SP 5A-52 are mounted in sleeve for R 1 1/2 connection.

SP 5A-3 up to SP 5A-26 are pumps with spline shaft as standard.

SP 5A-27 up to SP 5A-52 are pumps with smooth shaft as standard.

Pumps with spline shaft are only available in stainless steel EN 1.4301.

Pumps with smooth shaft are also available in N (EN 1.4401) and R (EN 1.4539) version with MS4000R or MS6000R See page 6.

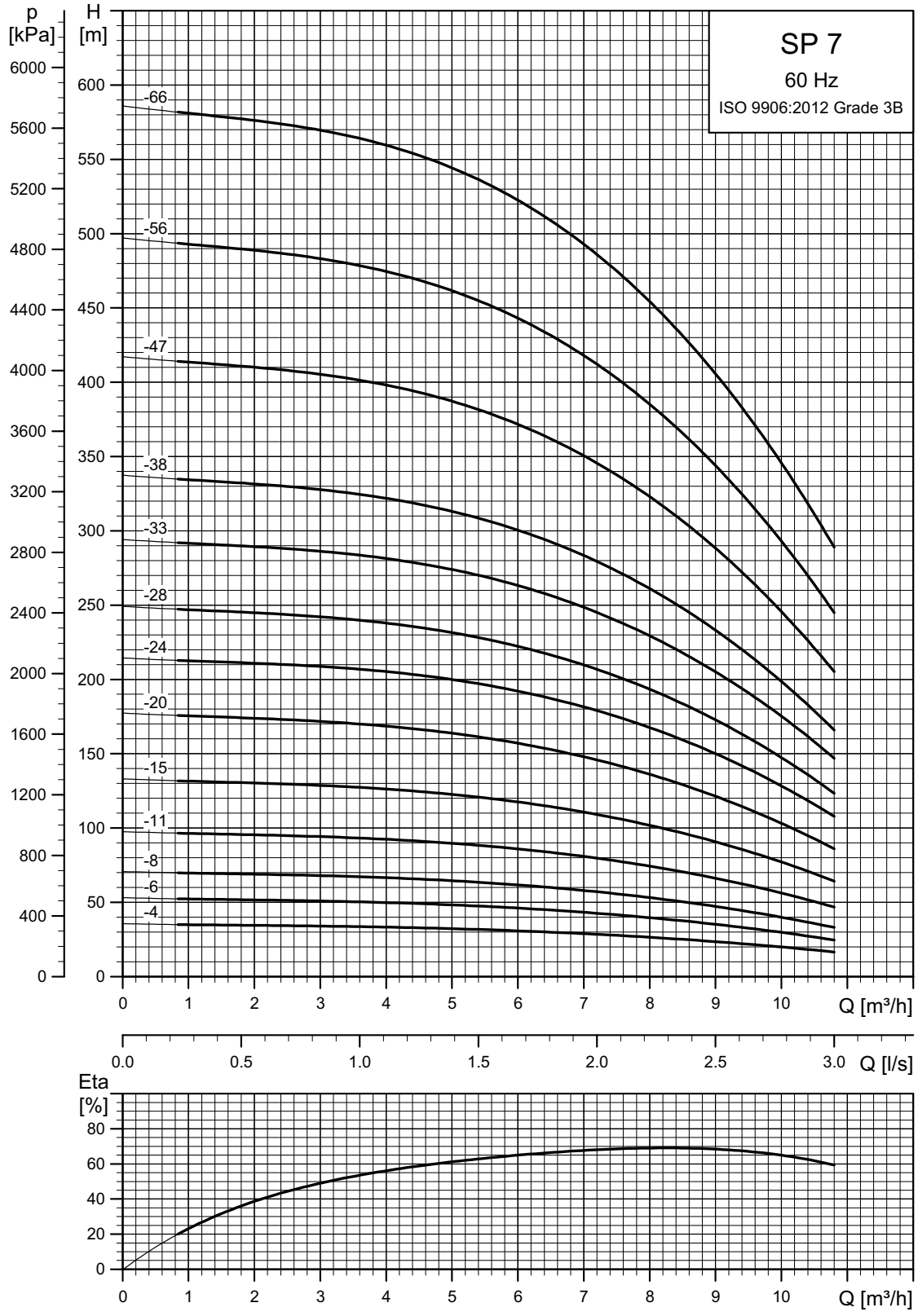
It is also possible to get SP 5A-3 and up with smooth shaft.

Pumps mounted in sleeve "SP5A-52 "are only" available in standard and N-versions.

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

SP 7

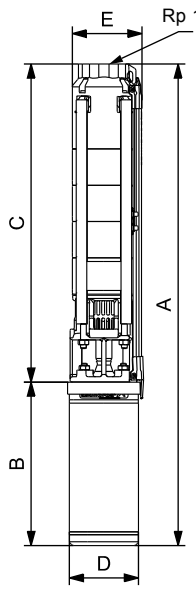
Performance curves



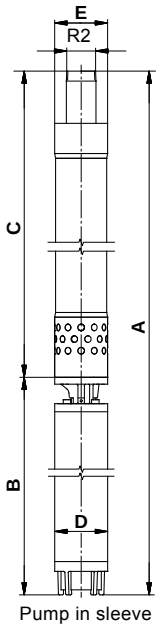
See also *Curve conditions*, page 19.

NPSH: Minimum inlet pressure 0.5 m.

Dimensions and weights



TM06 5396 0818



Pump in sleeve

TM01 4197 4118

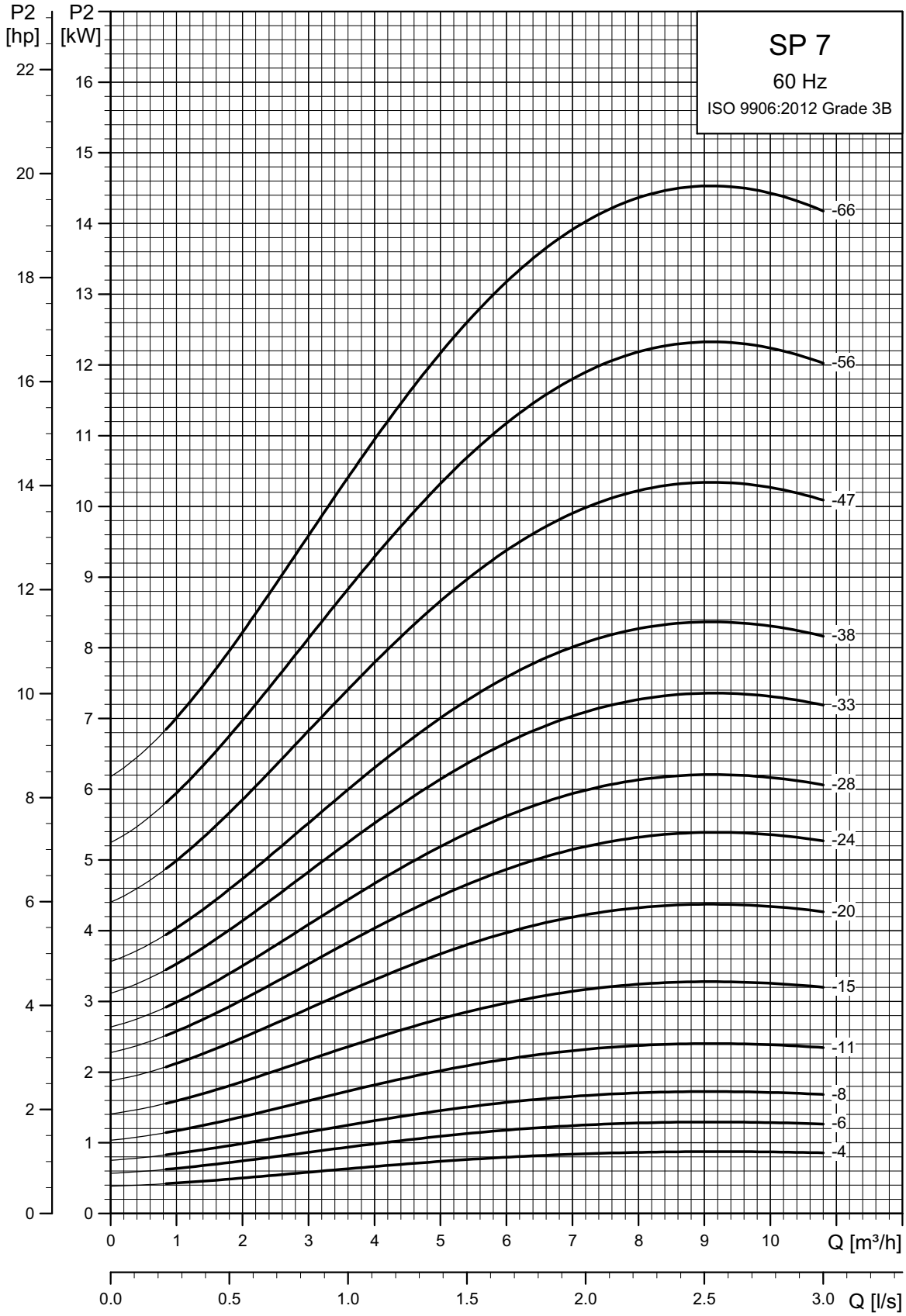
Pump type	Motor		Dimensions [mm]					Net weight [kg]
	Type	Power [kW]	C	B	A	D	E	
Three-phase. 3 x 380-400 V / 3 x 440-460-480 V								
SP 7-4	MS 402	0.75	438	317	755	95	101	14.6
SP 7-6	MS 402	1.1	538	347	885	95	101	17.1
SP 7-8	MS 402	1.5	638	387	1025	95	101	20.0
SP 7-11	MS 402	2.2	788	387	1175	95	101	23.0
SP 7-4	MS 4000	0.75	438	402	840	95	101	19.2
SP 7-6	MS 4000	1.1	538	417	955	95	101	21.3
SP 7-8	MS 4000	1.5	638	417	1055	95	101	22.5
SP 7-11	MS 4000	2.2	788	457	1245	95	101	26.2
SP 7-15	MS 4000	3	988	497	1485	95	101	30.5
SP 7-20	MS 4000	4	1238	577	1815	95	101	37.4
SP 7-24	MS 4000	5.5	1438	677	2115	95	101	44.8
SP 7-28	MS 4000	5.5	1638	677	2315	95	101	47.1
SP 7-33	MS 4000	7.5	1888	777	2665	95	101	54.0
SP 7-38	MS 4000	7.5	2138	777	2915	95	101	56.9
SP 7-24	MS 6000	5.5	1501	547	2048	139.5	139.5	55.6
SP 7-28	MS 6000	5.5	1701	547	2248	139.5	139.5	58.0
SP 7-33	MS 6000	7.5	1951	577	2528	139.5	139.5	64.0
SP 7-38	MS 6000	7.5	2201	577	2778	139.5	139.5	66.9
SP 7-47[1)]	MS 6000	9.2	2946	607	3553	139.5	140	99.2
SP 7-56[1)]	MS 6000	11	3396	637	4033	139.5	140	110
SP 7-66[1)]	MS 6000	13	3896	667	4563	139.5	140	121.7

[1)] SP 7-47 to SP 7-66 are mounted in sleeve for R2 connection.

The pump types above are also available in N- and R-versions. See page 6.

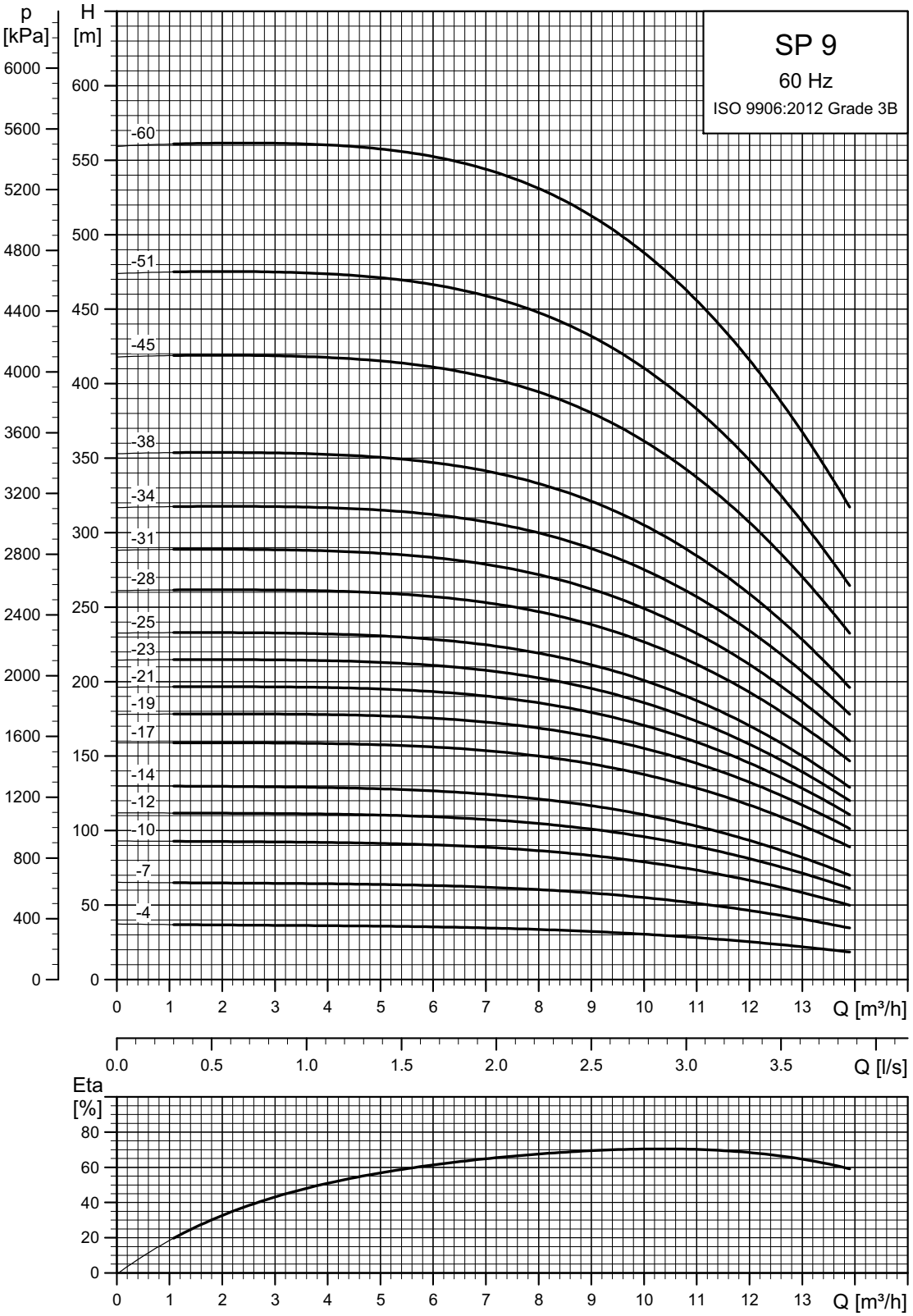
E = Maximum diameter of pump inclusive of cable guard and motor.

Power curves



SP 9

Performance curves

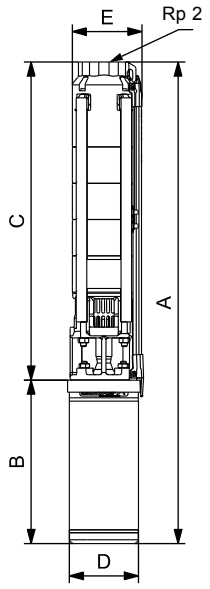


TM06 1690 3214

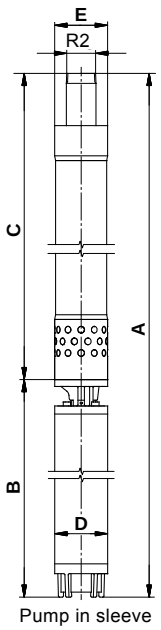
See also *Curve conditions*, page 19.

NPSH: Minimum inlet pressure 0.5 m.

Dimensions and weights



TM06 5396 0818



Pump in sleeve

TM01 4197 4118

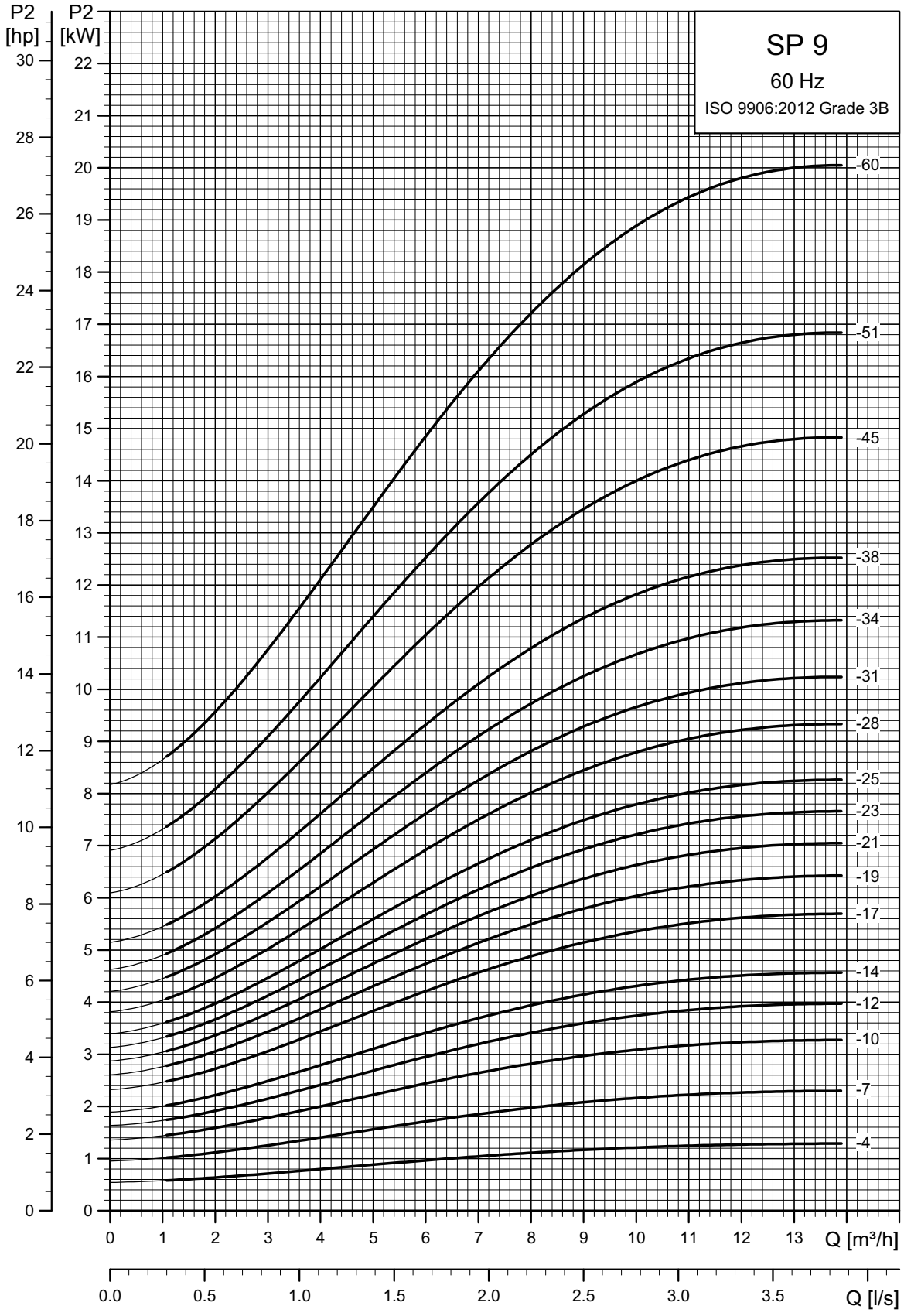
Pump type	Motor		Dimensions [mm]					Net weight [kg]
	Type	Power [kW]	C	B	A	D	E	
Three-phase. 3 x 380-400 V / 3 x 440-460-480 V								
SP 9-4	MS 402	1.1	438	347	785	95	101	16.0
SP 9-7	MS 402	2.2	588	387	975	95	101	20.7
SP 9-4	MS 4000	1.1	438	417	855	95	101	20.2
SP 9-7	MS 4000	2.2	588	457	1045	95	101	23.9
SP 9-10	MS 4000	3	738	497	1235	95	101	27.6
SP 9-12	MS 4000	4	838	577	1415	95	101	32.8
SP 9-14	MS 4000	4	938	577	1515	95	101	34.0
SP 9-17	MS 4000	5.5	1088	677	1765	95	101	40.7
SP 9-19	MS 4000	7.5	1188	777	1965	95	101	45.9
SP 9-21	MS 4000	7.5	1288	777	2065	95	101	47.0
SP 9-23	MS 4000	7.5	1388	777	2165	95	101	48.2
SP 9-25	MS 4000	7.5	1488	777	2265	95	101	49.3
SP 9-17	MS 6000	5.5	1151	547	1698	139.5	139.5	51.5
SP 9-19	MS 6000	7.5	1251	577	1828	139.5	139.5	55.7
SP 9-21	MS 6000	7.5	1351	577	1928	139.5	139.5	56.8
SP 9-23	MS 6000	7.5	1451	577	2028	139.5	139.5	58.0
SP 9-25	MS 6000	7.5	1551	577	2128	139.5	139.5	59.2
SP 9-28	MS 6000	9.2	1701	607	2308	139.5	139.5	68.3
SP 9-31	MS 6000	9.2	1851	607	2458	139.5	139.5	70.1
SP 9-34	MS 6000	11	2001	637	2638	139.5	139.5	75.0
SP 9-38	MS 6000	11	2201	637	2838	139.5	139.5	77.5
SP 9-45[1)]	MS 6000	13	2846	667	3513	139.5	140	103.4
SP 9-51[1)]	MS 6000	15	3146	702	3848	139.5	140	113.9
SP 9-60[1)]	MS 6000	18.5	3596	757	4353	139.5	140	126.2

[1)] SP 9-43 to SP 9-60 are mounted in sleeve for R2 connection.

The pump types above are also available in N- and R-versions. See page 6.

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

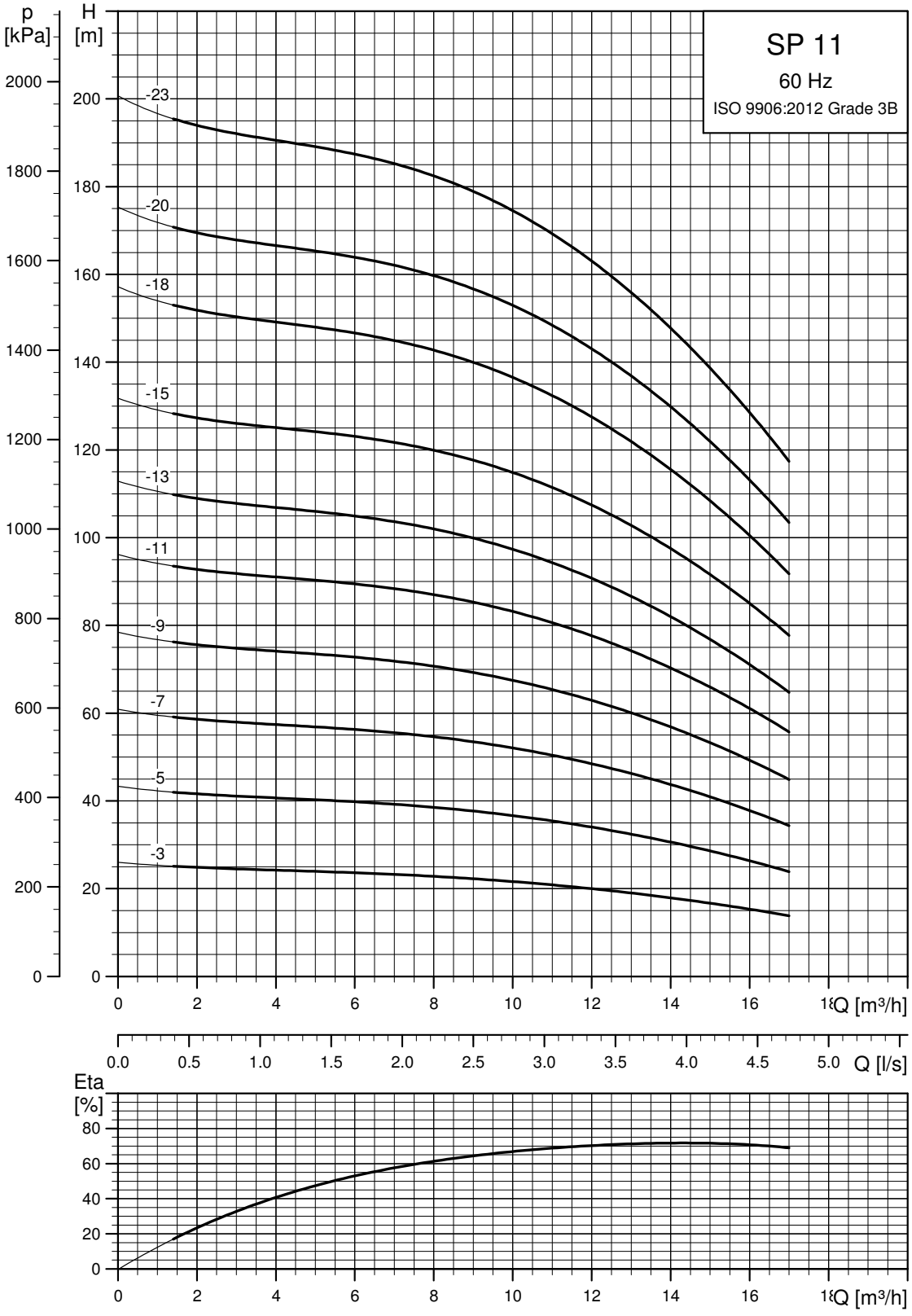
Power curves



TM06 1691 2414

SP 11

Performance curves

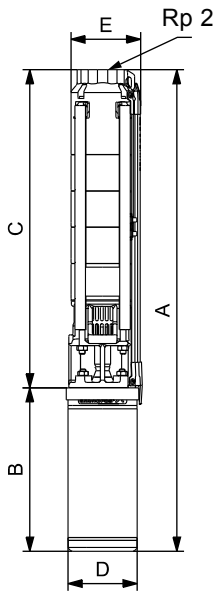


TM06 1692 2414

See also *Curve conditions*, page 19.

NPSH: Minimum inlet pressure 0.5 m.

Dimensions and weights



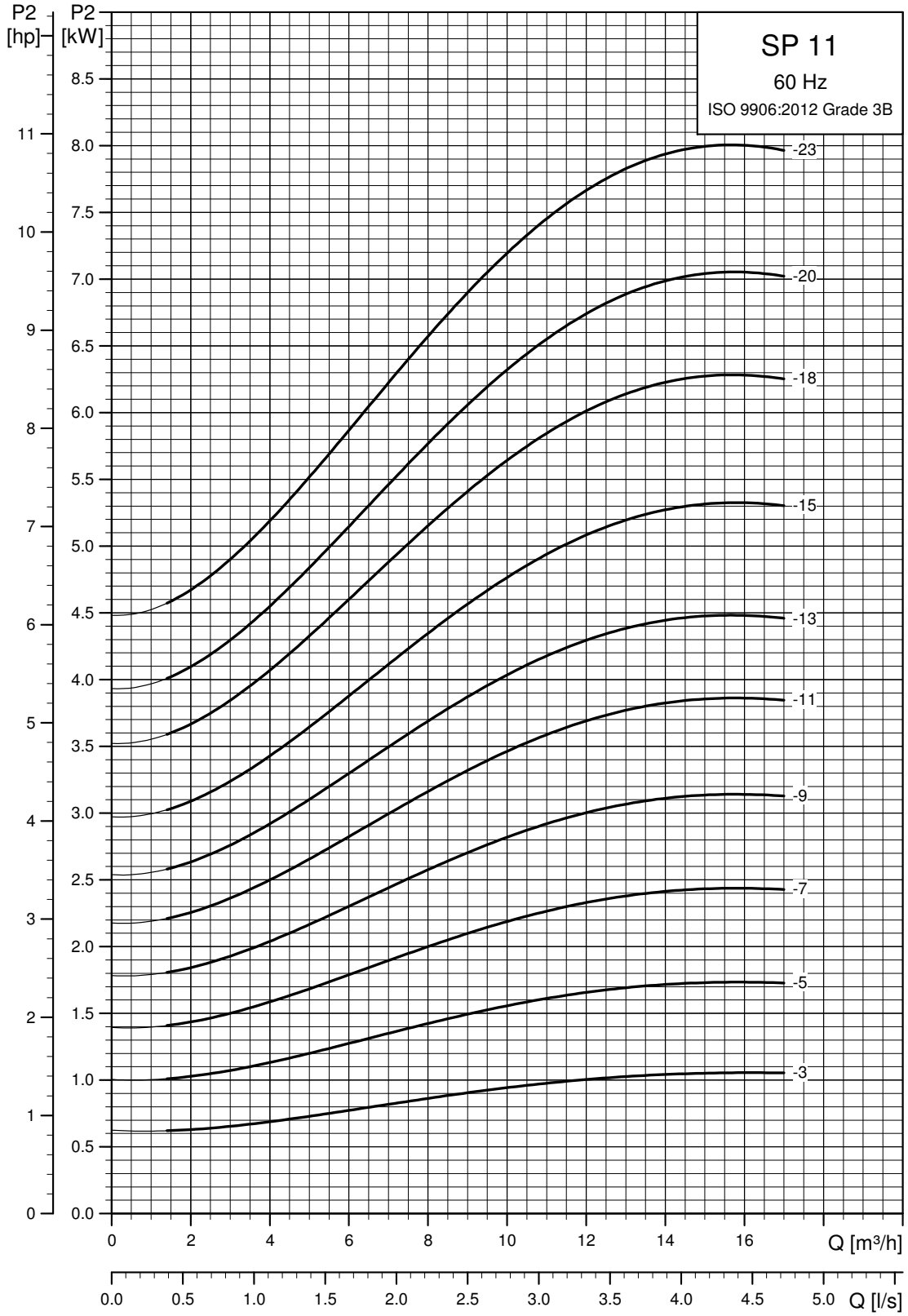
TM06 5396 0818

Pump type	Motor		Dimensions [mm]					Net weight [kg]
	Type	Power [kW]	C	B	A	D	E	
Three-phase. 3 x 380-400 V / 3 x 440-460-480 V								
SP 11-3	MS 402	0.75	463	317	780	95	101	14.7
SP 11-5	MS 402	1.5	613	387	1000	95	101	19.4
SP 11-7	MS 402	2.2	763	387	1150	95	101	22.3
SP 11-3	MS 4000	0.75	463	402	865	95	101	19.3
SP 11-5	MS 4000	1.5	613	417	1030	95	101	21.9
SP 11-7	MS 4000	2.2	763	457	1220	95	101	25.5
SP 11-9	MS 4000	3	913	497	1410	95	101	29.1
SP 11-11	MS 4000	4	1063	577	1640	95	101	34.7
SP 11-13	MS 4000	4	1213	577	1790	95	101	36.3
SP 11-15	MS 4000	5.5	1363	677	2040	95	101	42.9
SP 11-18	MS 4000	5.5	1588	677	2265	95	101	45.4
SP 11-20	MS 4000	7.5	1738	777	2515	95	101	51.0
SP 11-23	MS 4000	7.5	1963	777	2740	95	101	53.3
SP 11-15	MS 6000	5.5	1426	547	1973	139.5	139.5	53.3
SP 11-18	MS 6000	5.5	1651	547	2198	139.5	139.5	55.7
SP 11-20	MS 6000	7.5	1801	577	2378	139.5	139.5	60.3
SP 11-23	MS 6000	7.5	2026	577	2603	139.5	139.5	62.6

The pump types above are also available in N- and R-versions. See page 6.

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

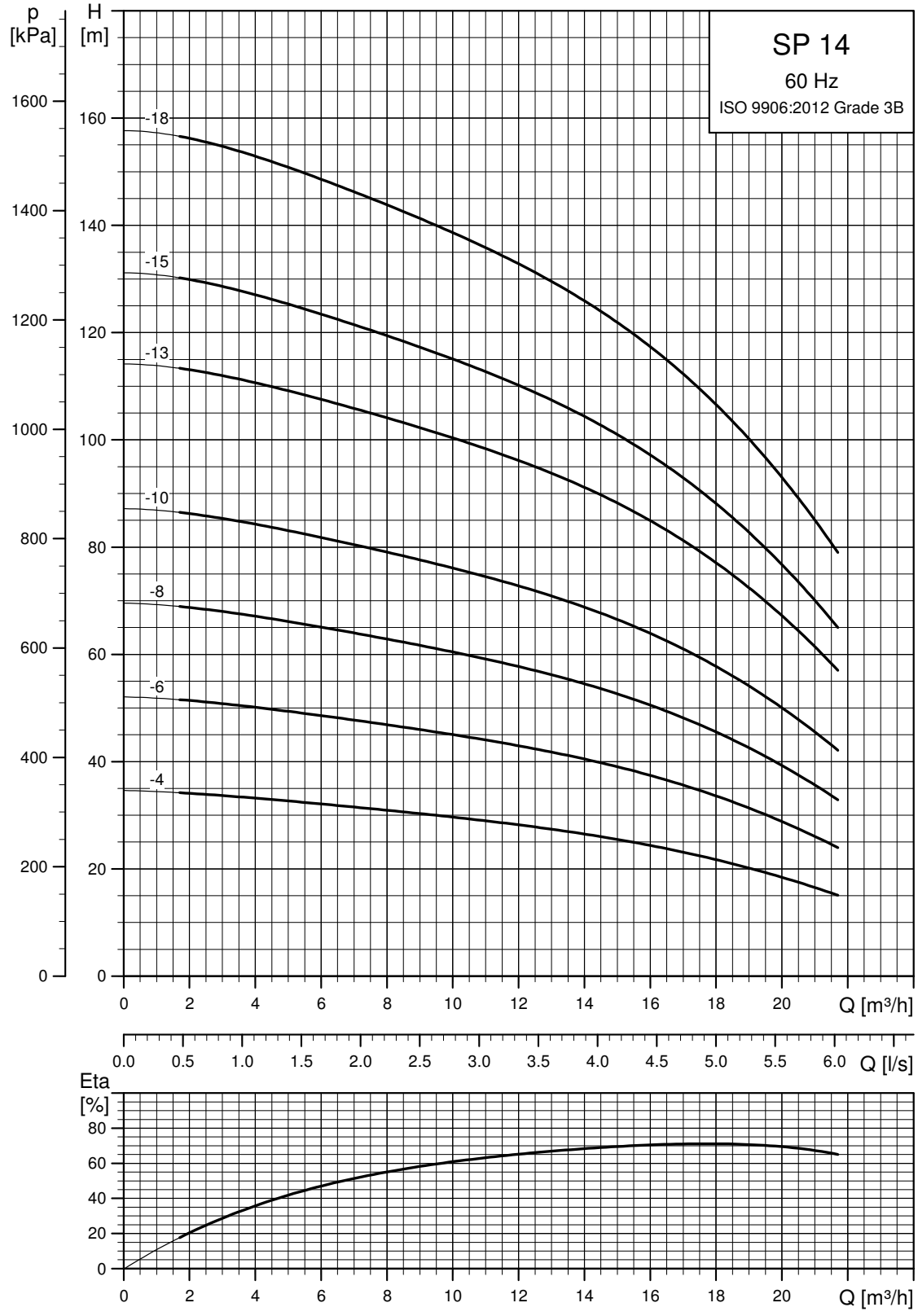
Power curves



TM06 1693 2414

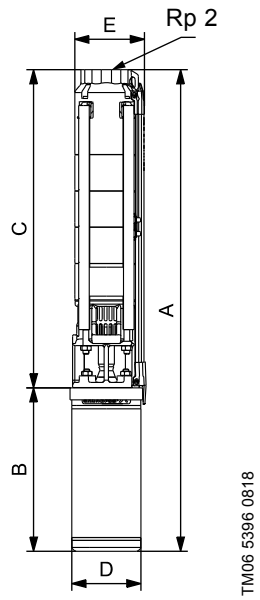
SP 14

Performance curves



See also *Curve conditions*, page 19.
NPSH: Minimum inlet pressure 0.5 m.

Dimensions and weights



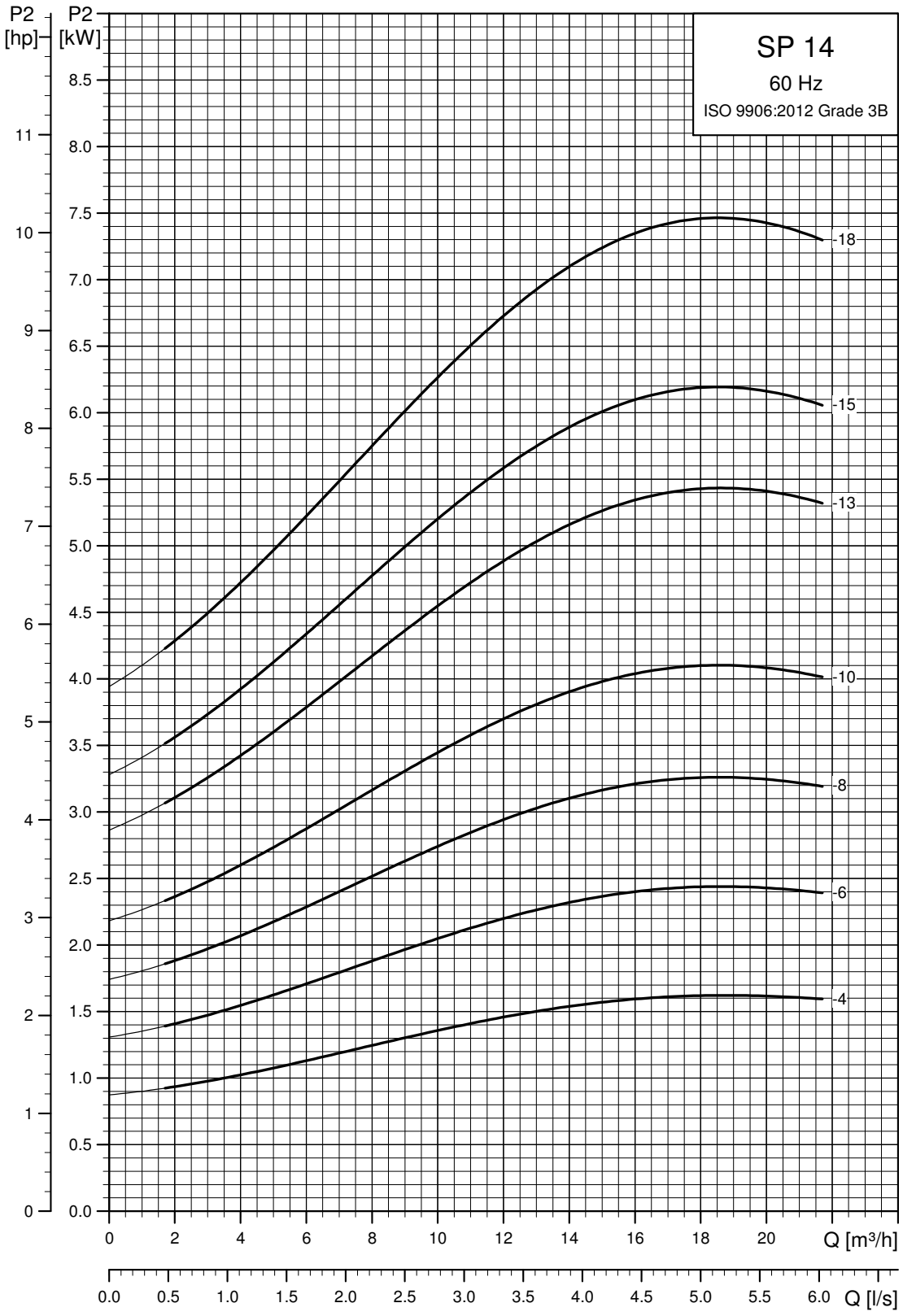
TM06 5396 0818

Pump type	Motor		Dimensions [mm]					Net weight [kg]
	Type	Power [kW]	C	B	A	D	E	
Three-phase. 3 x 380-400 V / 3 x 440-460-480 V								
SP 14-4	MS 402	1.5	538	387	925	95	101	18.6
SP 14-6	MS 402	2.2	688	387	1075	95	101	21.5
SP 14-4	MS 4000	1.5	538	417	955	95	101	21.1
SP 14-6	MS 4000	2.2	688	457	1145	95	101	24.7
SP 14-8	MS 4000	3	838	497	1335	95	101	28.3
SP 14-10	MS 4000	4	988	577	1565	95	101	33.9
SP 14-13	MS 4000	5.5	1213	677	1890	95	101	41.3
SP 14-15	MS 4000	5.5	1363	677	2040	95	101	42.9
SP 14-18	MS 4000	7.5	1588	777	2365	95	101	49.4
SP 14-13	MS 6000	5.5	1276	547	1823	139.5	139.5	51.7
SP 14-15	MS 6000	5.5	1426	547	1973	139.5	139.5	53.3
SP 14-18	MS 6000	7.5	1651	577	2228	139.5	139.5	58.7

The pump types above are also available in N- and R- versions. See page 6.

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

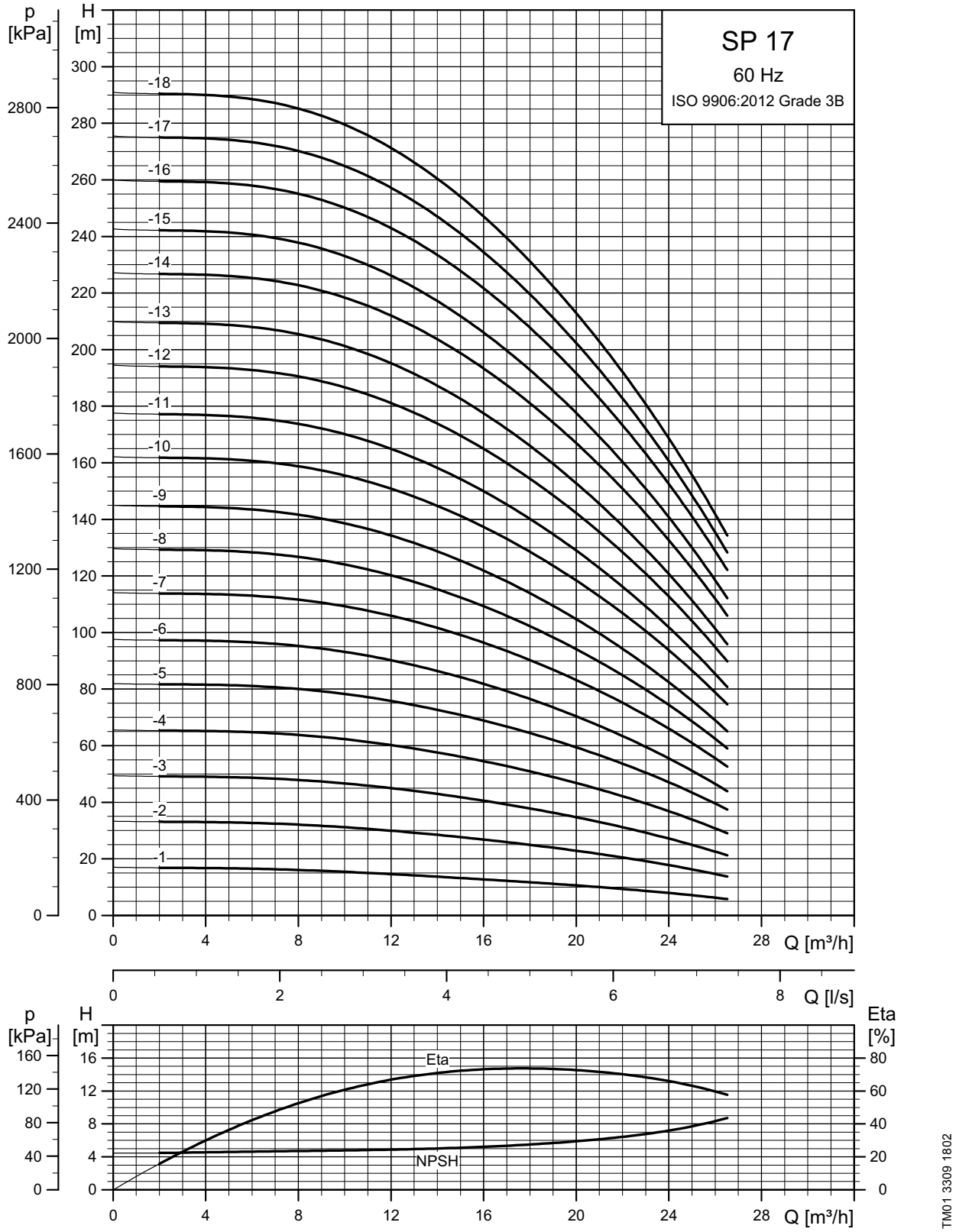
Power curves



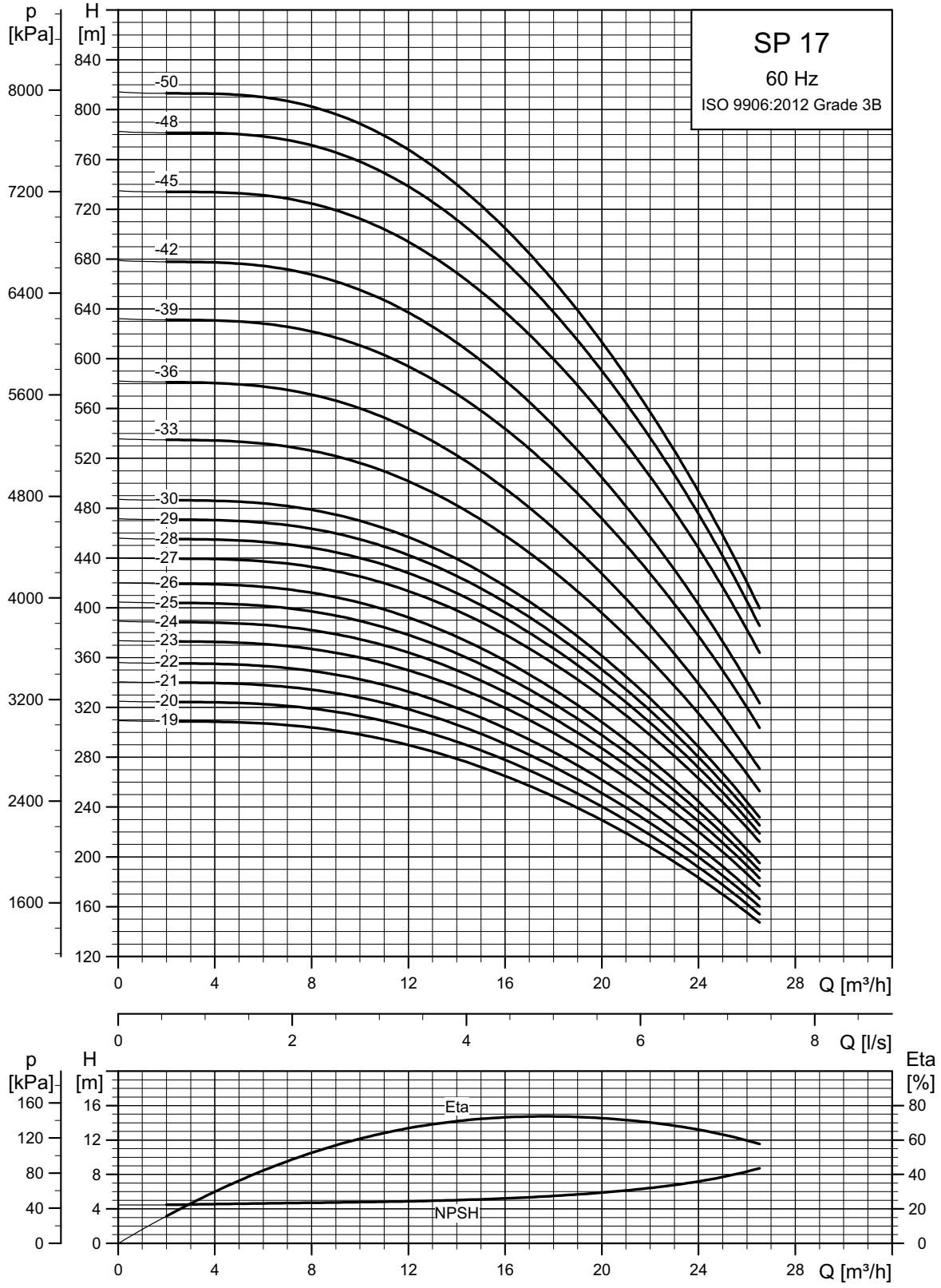
TM06 1695 2414

SP 17

Performance curves

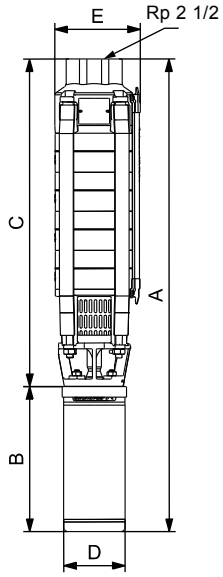


See also *Curve conditions*, page 19.

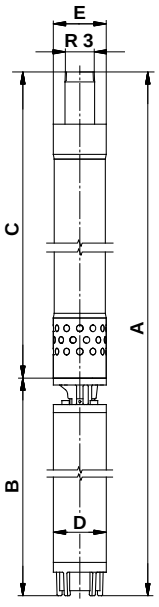


See also *Curve conditions*, page 19.

Dimensions and weights



TM06 5397 0818



Pump in sleeve

TM01 4197 4118

Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	C	B	A	D	E[1)]	E[2)]	
SP 17-1	MS 402	1.1	324	347	671	95	134		14
SP 17-1	MS 4000	1.1	324	417	741	95	134		19
SP 17-2	MS 4000	2.2	384	457	841	95	134		22
SP 17-3	MS 4000	3.0	444	497	941	95	134		24
SP 17-4	MS 4000	4.0	504	577	1081	95	134		30
SP 17-5	MS 4000	5.5	564	677	1241	95	134		36
SP 17-6	MS 4000	5.5	624	677	1301	95	134		37
SP 17-7	MS 4000	7.5	684	777	1461	95	134		44
SP 17-8	MS 4000	7.5	744	777	1521	95	134		45
SP 17-9	MS 4000	7.5	804	777	1581	95	134		47
SP 17-5	MS 6000	5.5	583	544	1307	139.5	142	144	45
SP 17-6	MS 6000	5.5	643	544	1307	139.5	142	144	46
SP 17-7	MS 6000	7.5	703	574	1337	139.5	142	144	51
SP 17-8	MS 6000	7.5	763	574	1337	139.5	142	144	52
SP 17-9	MS 6000	7.5	823	574	1397	139.5	142	144	54
SP 17-10	MS 6000	9.2	883	604	1487	139.5	142	144	61
SP 17-11	MS 6000	9.2	943	604	1547	139.5	142	144	62
SP 17-12	MS 6000	11	1003	634	1637	139.5	142	144	66
SP 17-13	MS 6000	11	1063	634	1697	139.5	142	144	68
SP 17-14	MS 6000	13	1123	664	1787	139.5	142	144	72
SP 17-15	MS 6000	13	1183	664	1847	139.5	142	144	73
SP 17-16	MS 6000	15	1243	699	1942	139.5	142	144	79
SP 17-17	MS 6000	15	1303	699	2002	139.5	142	144	80
SP 17-18	MS 6000	15	1363	699	2062	139.5	142	144	82
SP 17-19	MS 6000	18.5	1423	754	2177	139.5	142	144	88
SP 17-20	MS 6000	18.5	1483	754	2237	139.5	142	144	90
SP 17-21	MS 6000	18.5	1543	754	2297	139.5	142	144	91
SP 17-22	MS 6000	18.5	1603	754	2357	139.5	142	144	92
SP 17-23	MS 6000	22	1663	814	2477	139.5	142	144	100
SP 17-24	MS 6000	22	1723	814	2537	139.5	142	144	101
SP 17-25	MS 6000	22	1783	814	2597	139.5	142	144	103
SP 17-26	MS 6000	22	1843	814	2657	139.5	142	144	104
SP 17-27	MS 6000	26	1903	874	2777	139.5	142	144	111
SP 17-28	MS 6000	26	1963	874	2837	139.5	142	144	112
SP 17-29	MS 6000	26	2023	874	2897	139.5	142	144	114
SP 17-30	MS 6000	26	2083	874	2957	139.5	142	144	115
SP 17-33[3)]	MS 6000	30	2615	944	3559	139.5	175	181	156
SP 17-36[3)]	MS 6000	30	2795	944	3739	139.5	175	181	161
SP 17-39[3)]	MMS 6	37	2975	1312	4287	144	175	181	208
SP 17-42[3)]	MMS 6	37	3155	1312	4467	144	175	181	213
SP 17-45[3)]	MMS 8000	45	3279	1270	4549	192	192	192	285
SP 17-48[3)]	MMS 8000	45	3459	1270	4729	192	192	192	290
SP 17-50[3)]	MMS 8000	45	3579	1270	4849	192	192	192	293

[1)] Maximum diameter of pump with one motor cable.

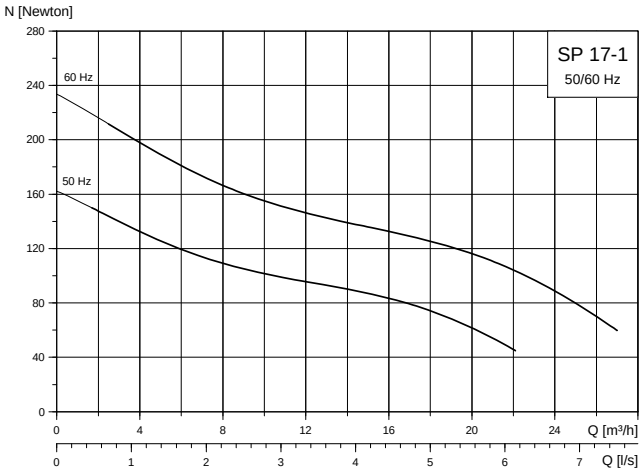
[2)] Maximum diameter of pump with two motor cables.

[3)] SP 17-33 to SP 17-50 are mounted in sleeve for R 3 connection.
Pumps mounted in sleeve are only available in standard and N-versions.

SP 17-1 to SP 17-30 are also available in N- and R-versions. See page 6.

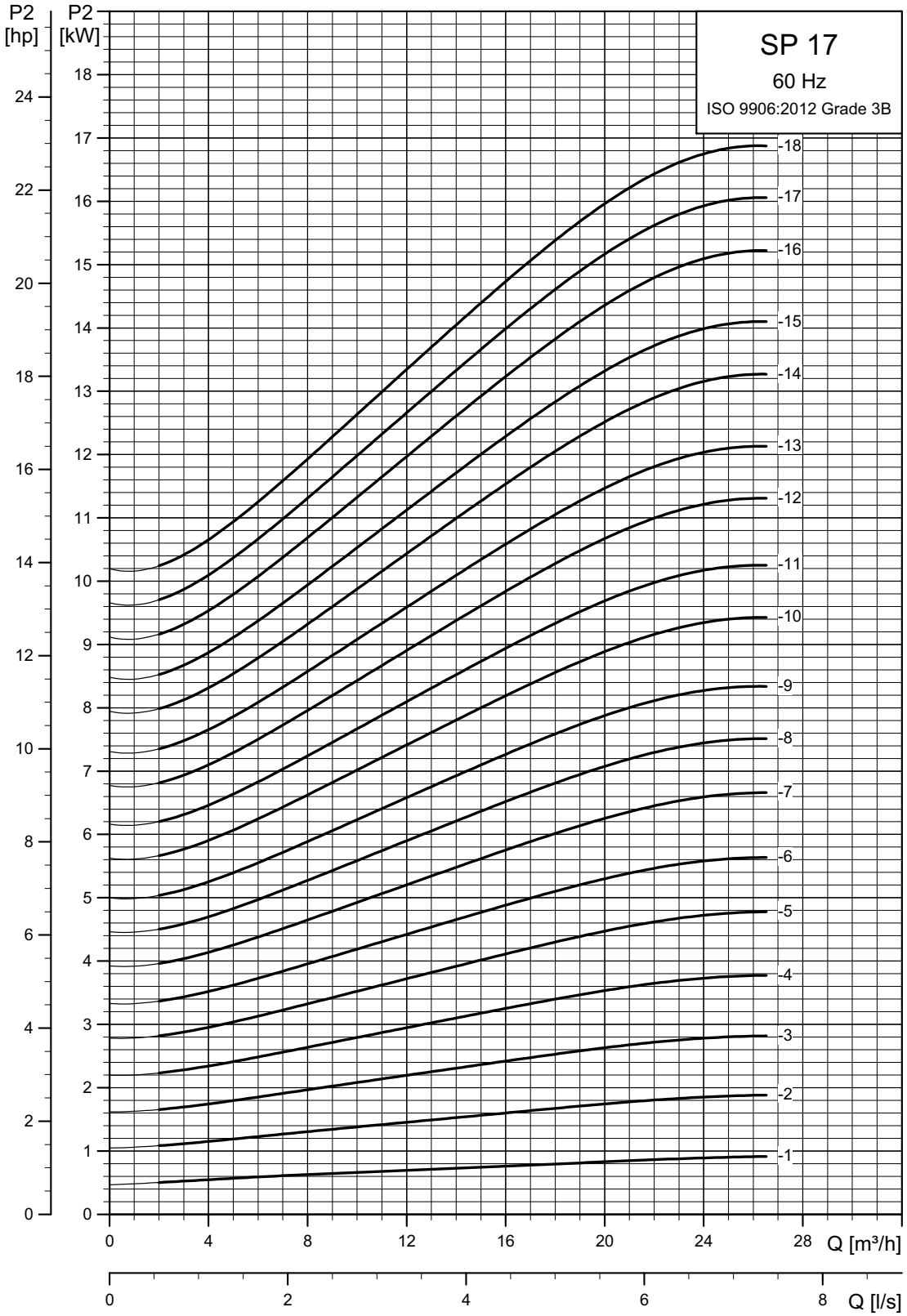
Other types of connection are possible by means of connecting pieces. See page 110.

Single-stage curves, axial thrust

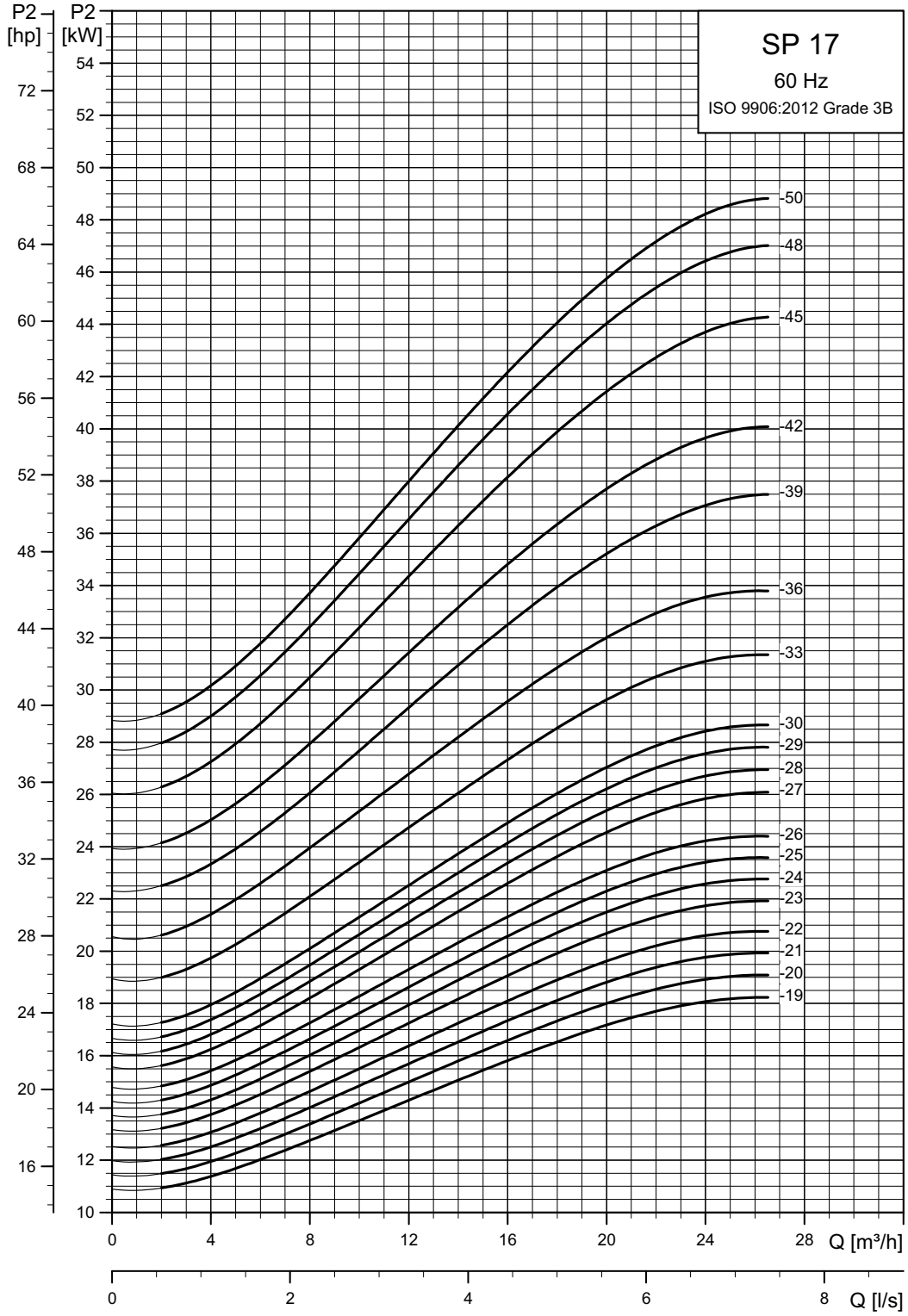


TM01 9009 1100

Power curves



TM01 2342 1802

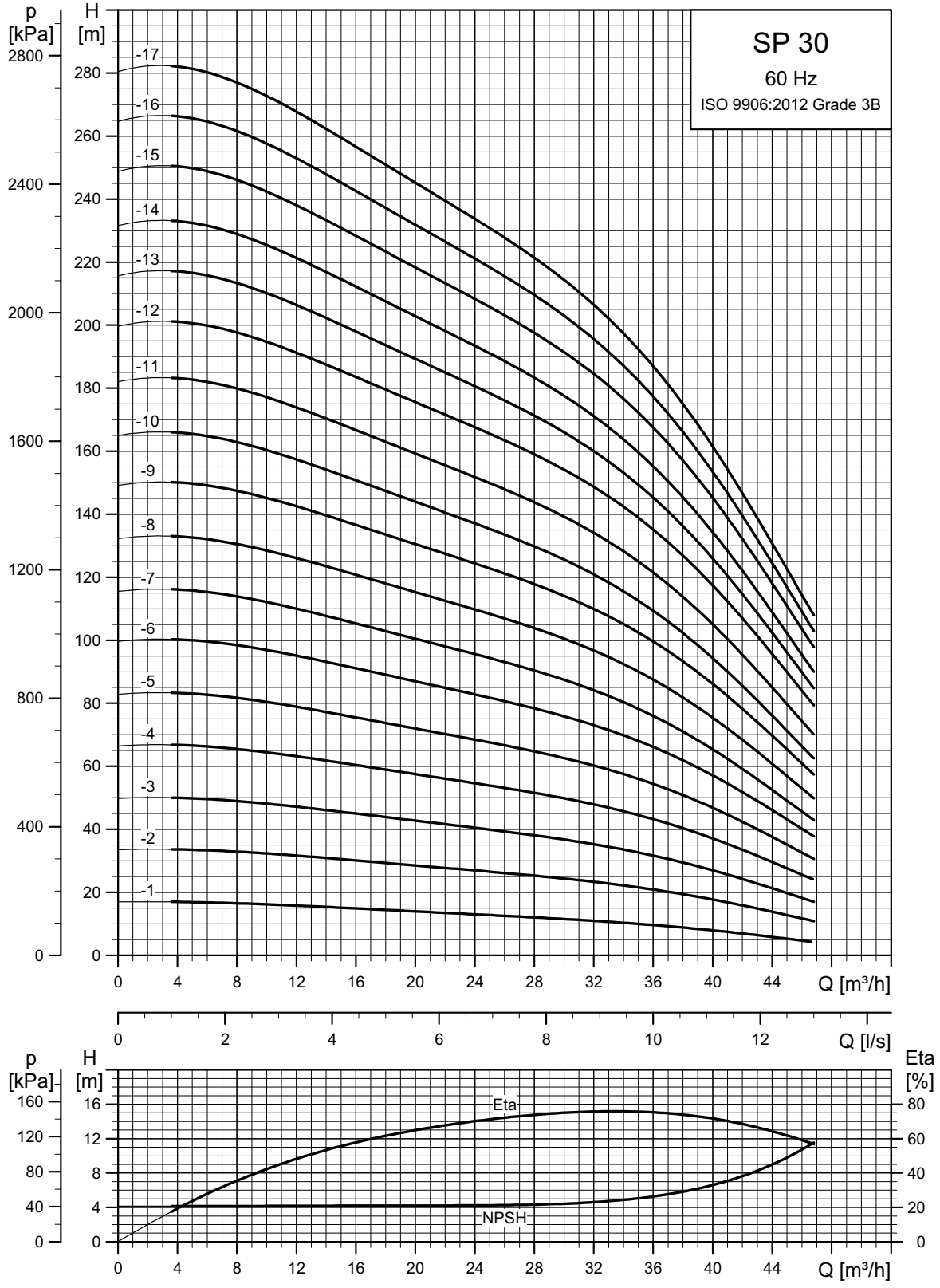


TM01 9243 1802

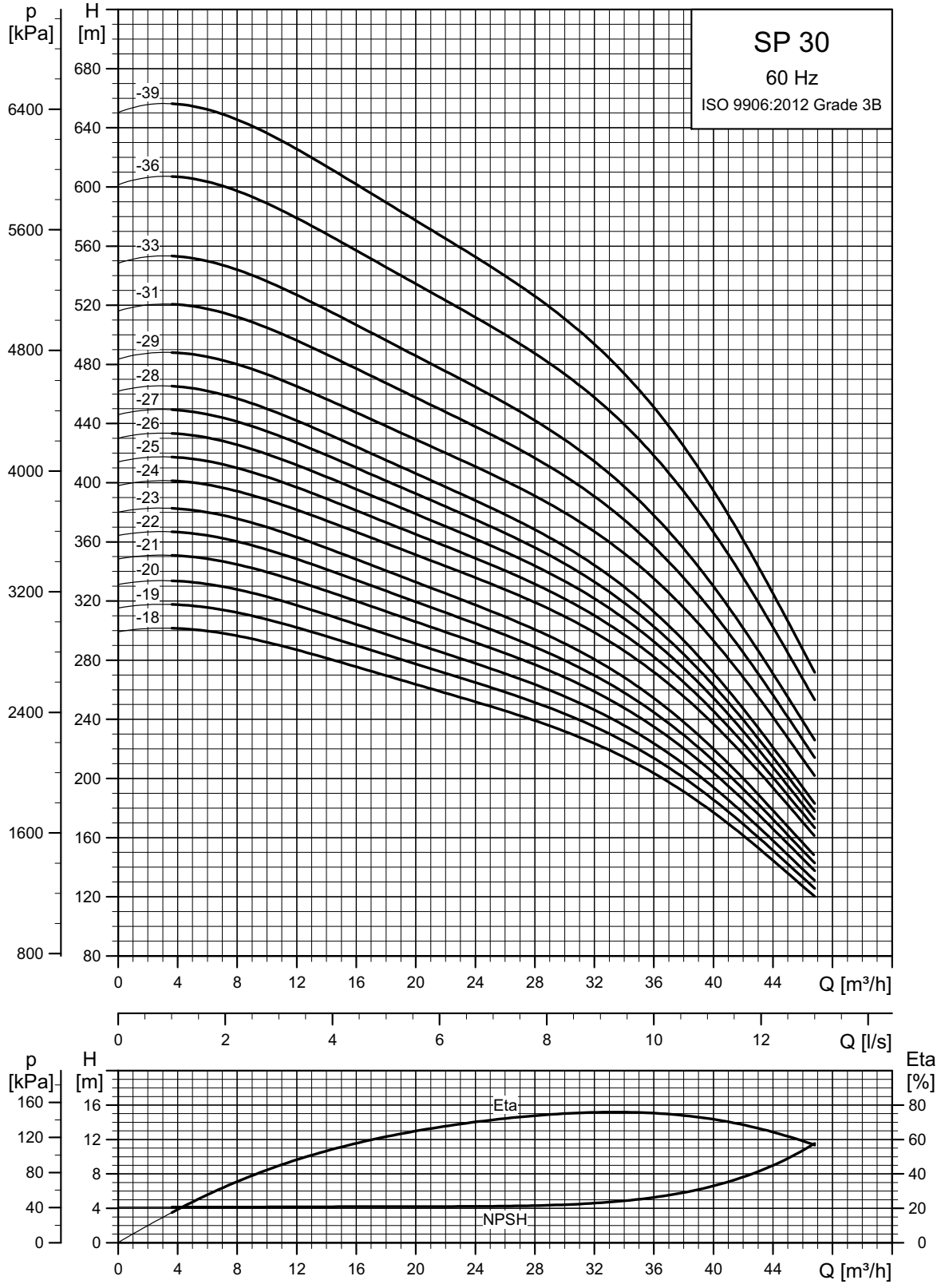
See also *Curve conditions*, page 19.

SP 30

Performance curves

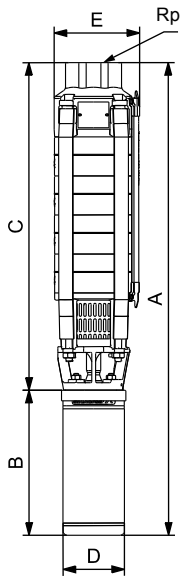


See also *Curve conditions*, page 19.

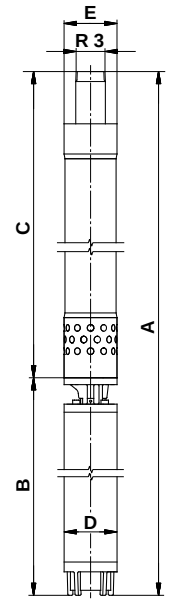


See also *Curve conditions*, page 19.

Dimensions and weights



TM06 5398 0818



TM01 4197 4118

Pump in sleeve

Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	C	B	A	D	E[1]	E[2]	
SP 30-1	MS 402	1.5	358	387	745	95	134		16
SP 30-1	MS 4000	1.5	358	417	775	95	134		20
SP 30-2	MS 4000	3.0	454	457	911	95	134		25
SP 30-3	MS 4000	4.0	550	577	1127	95	134		30
SP 30-4	MS 4000	5.5	646	677	1323	95	134		37
SP 30-5	MS 4000	7.5	742	777	1519	95	134		44
SP 30-3	MS 6000	5.5	569	544	1113	139.5	142	144	43
SP 30-4	MS 6000	5.5	665	544	1209	139.5	142	144	45
SP 30-5	MS 6000	7.5	761	574	1335	139.5	142	144	51
SP 30-6	MS 6000	9.2	857	604	1461	139.5	142	144	58
SP 30-7	MS 6000	9.2	953	604	1557	139.5	142	144	60
SP 30-8	MS 6000	11	1049	634	1683	139.5	142	144	65
SP 30-9	MS 6000	13	1145	664	1809	139.5	142	144	70
SP 30-10	MS 6000	13	1241	664	1905	139.5	142	144	72
SP 30-11	MS 6000	15	1337	699	2036	139.5	142	144	78
SP 30-12	MS 6000	18.5	1433	754	2187	139.5	142	144	85
SP 30-13	MS 6000	18.5	1529	754	2283	139.5	142	144	87
SP 30-14	MS 6000	18.5	1625	754	2379	139.5	142	144	89
SP 30-15	MS 6000	22	1721	814	2535	139.5	142	144	97
SP 30-16	MS 6000	22	1817	814	2631	139.5	142	144	99
SP 30-17	MS 6000	22	1913	814	2727	139.5	142	144	101
SP 30-18	MS 6000	26	2009	874	2883	139.5	142	144	109
SP 30-19	MS 6000	26	2105	874	2979	139.5	142	144	110
SP 30-20	MS 6000	26	2201	874	3075	139.5	142	144	112
SP 30-21	MS 6000	30	2297	944	3241	139.5	142	144	122
SP 30-22	MS 6000	30	2393	944	3337	139.5	142	144	124
SP 30-23	MS 6000	30	2489	944	3433	139.5	142	144	126
SP 30-24	MMS 6	37	2585	1312	3897	144	145	147	171
SP 30-25	MMS 6	37	2681	1312	3993	144	145	147	173
SP 30-26	MMS 6	37	2777	1312	4089	144	145	147	175
SP 30-27	MMS 6	37	2873	1312	4185	144	145	147	176
SP 30-28	MMS 6	37	2969	1312	4281	144	145	147	178
SP 30-29[3]	MMS 8000	45	3361	1270	3361	192	192	192	280
SP 30-31[3]	MMS 8000	45	3553	1270	3553	192	192	192	286
SP 30-33[3]	MMS 8000	45	3745	1270	3745	192	192	192	291
SP 30-36[3]	MMS 8000	55	4033	1350	4033	192	192	192	314
SP 30-39[3]	MMS 8000	55	4321	1350	4321	192	192	192	322

[1] Maximum diameter of pump with one motor cable.

[2] Maximum diameter of pump with two motor cables.

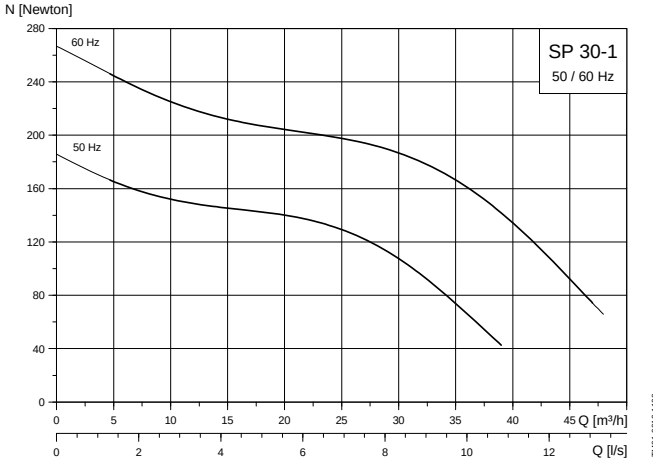
[3] SP 30-29 to SP 30-39 are mounted in sleeve for R3 connection.

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

SP30-1 to SP30-28 are also available in N- and R-versions. See page 6.

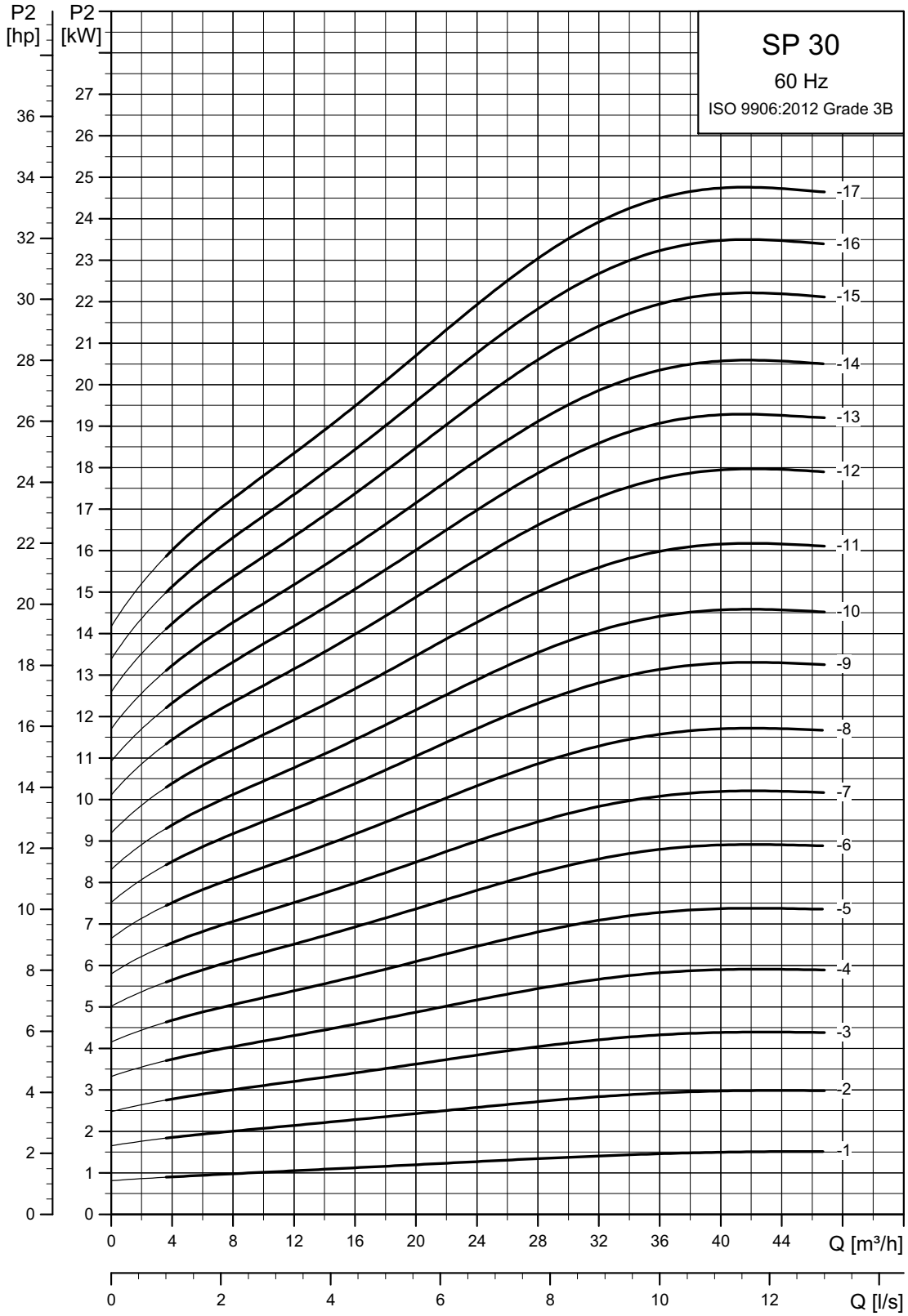
Other types of connection are possible by means of connecting pieces. See page 110.

Single-stage curves, axial thrust

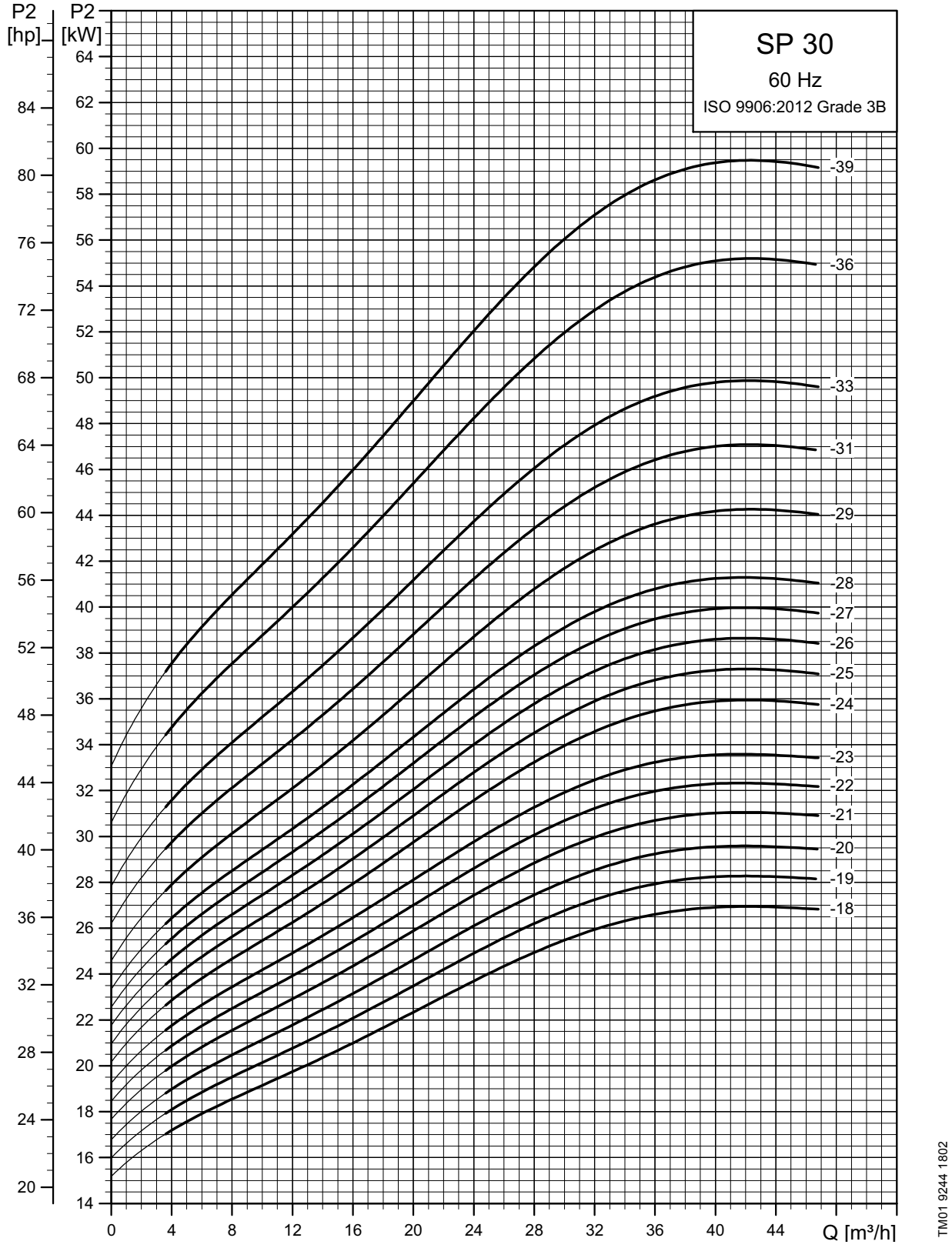


TM01 9010 1100

Power curves

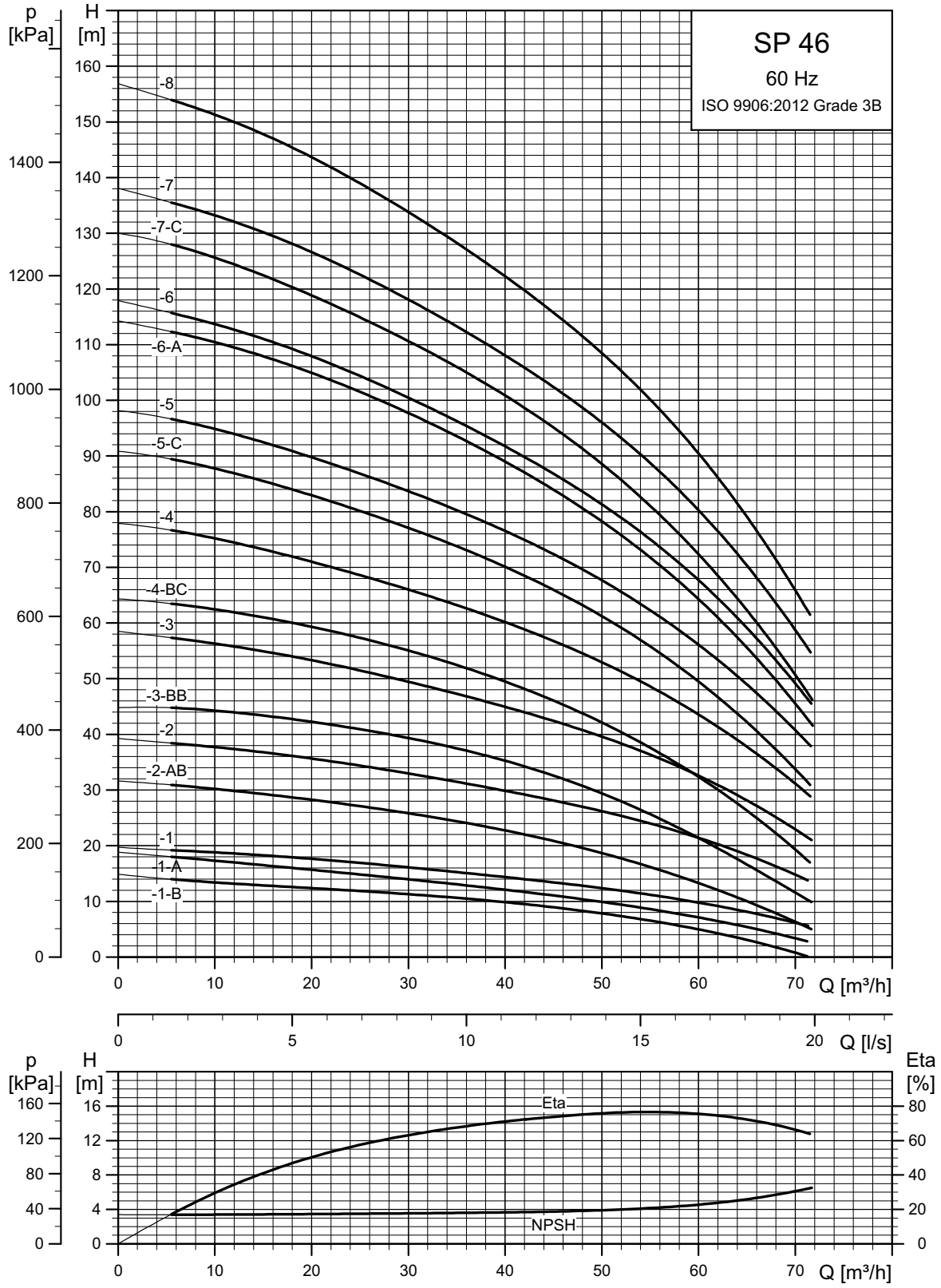


See also *Curve conditions*, page 19.

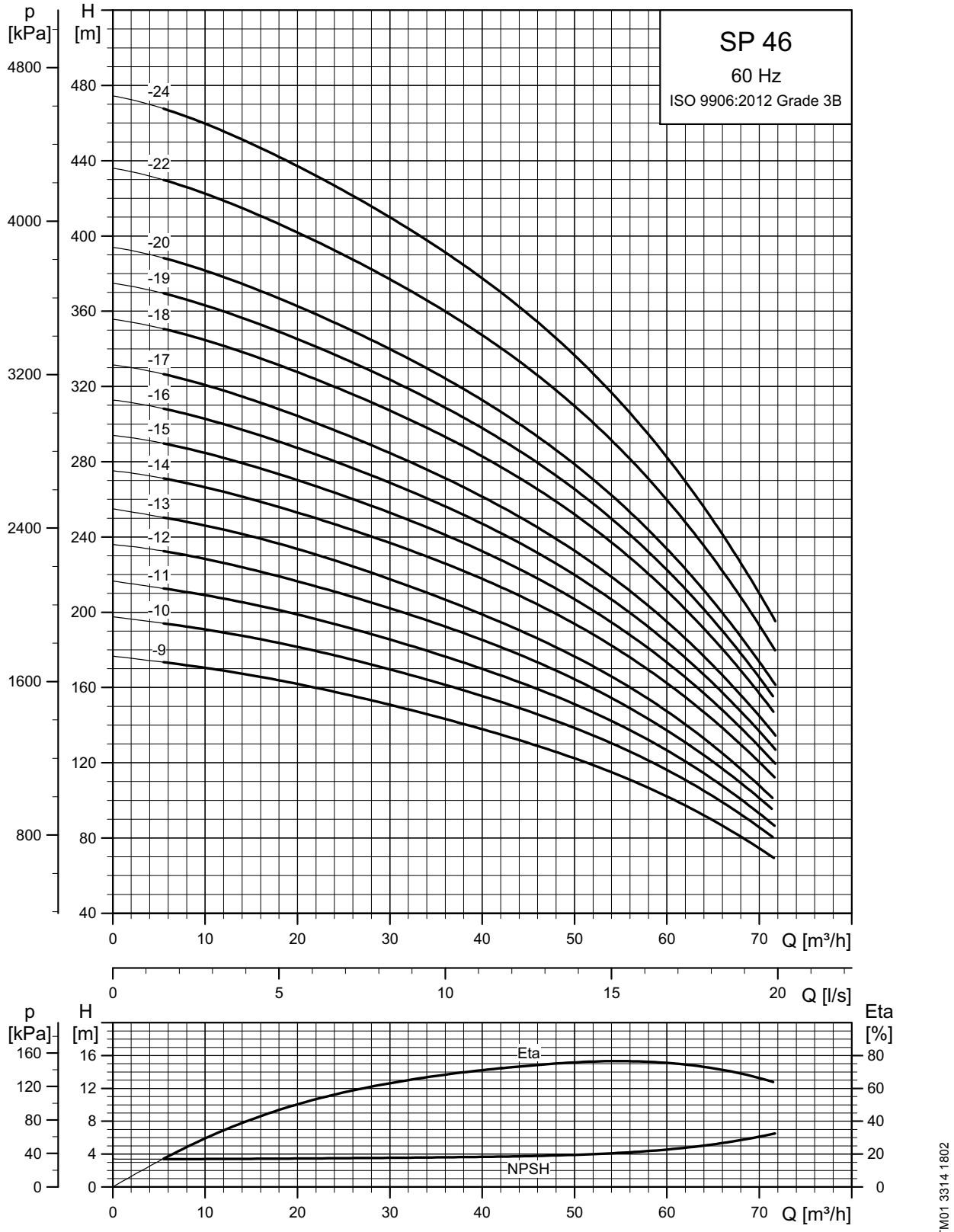

SP 30
60 Hz
ISO 9906:2012 Grade 3B
P2 [hp]
P2 [kW]
Q [m³/h]
-39
-36
-33
-31
-29
-28
-27
-26
-25
-24
-23
-22
-21
-20
-19
-18
TM01 9244 1802

SP 46

Performance curves

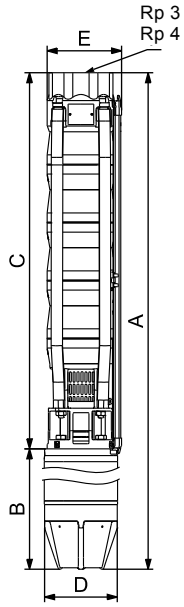


See also *Curve conditions*, page 19.

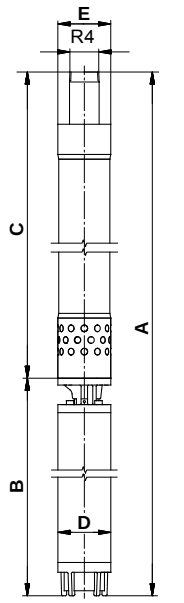


See also *Curve conditions*, page 19.

Dimensions and weights



TM06 5399 0818



Pump in sleeve

TM01 4197 4118

Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	Rp 3/Rp 4 connection				B	D	
			A	C	E[1)]	E[2)]			
SP 46-1-B	MS 4000	1.5	795	378	146		417	95	21
SP 46-1-A	MS 4000	2.2	835	378	146		457	95	23
SP 46-1	MS 4000	3.0	875	378	146		497	95	24
SP 46-2-AB	MS 4000	4.0	1068	491	146		577	95	31
SP 46-2	MS 4000	5.5	1168	491	146		677	95	36
SP 46-3-BB	MS 4000	5.5	1281	604	146		677	95	38
SP 46-3	MS 4000	7.5	1381	604	146		777	95	43
SP 46-4-BC	MS 4000	7.5	1494	717	146		777	95	45
SP 46-2	MS 6000	5.5	1051	507	148	151	544	139.5	46
SP 46-3-BB	MS 6000	5.5	1164	620	148	151	544	139.5	48
SP 46-3	MS 6000	7.5	1194	620	148	151	574	139.5	52
SP 46-4-BC	MS 6000	7.5	1307	733	148	151	574	139.5	54
SP 46-4	MS 6000	9.2	1337	733	148	151	604	139.5	60
SP 46-5-C	MS 6000	11	1480	846	148	151	634	139.5	65
SP 46-5	MS 6000	13	1510	846	148	151	664	139.5	68
SP 46-6-A	MS 6000	13	1623	959	148	151	664	139.5	70
SP 46-6	MS 6000	15	1658	959	148	151	699	139.5	74
SP 46-7-C	MS 6000	15	1771	1072	148	151	699	139.5	77
SP 46-7	MS 6000	18.5	1826	1072	148	151	754	139.5	82
SP 46-8	MS 6000	18.5	1939	1185	148	151	754	139.5	85
SP 46-9	MS 6000	22	2112	1298	148	151	814	139.5	93
SP 46-10	MS 6000	22	2225	1411	148	151	814	139.5	96
SP 46-11	MS 6000	26	2398	1524	148	151	874	139.5	103
SP 46-12	MS 6000	30	2581	1637	148	151	944	139.5	114
SP 46-13	MS 6000	30	2710	1766	148	151	944	139.5	117
SP 46-14	MMS 6	37	3191	1879	150	153	1312	144	159
SP 46-15	MMS 6	37	3304	1992	150	153	1312	144	162
SP 46-16	MMS 6	37	3417	2105	150	153	1312	144	164
SP 46-17	MMS 6	37	3530	2218	150	153	1312	144	167
SP 46-18	MMS 8000	45	3630	2360	192	192	1270	192	230
SP 46-19	MMS 8000	45	3743	2473	192	192	1270	192	232
SP 46-20[3)]	MMS 8000	45	4103	2833	192	192	1270	192	261
SP 46-22[3)]	MMS 8000	55	4409	3059	192	192	1350	192	282
SP 46-24[3)]	MMS 8000	55	4635	3285	192	192	1350	192	288

[1)] Maximum diameter of pump with one motor cable.

[2)] Maximum diameter of pump with two motor cables.

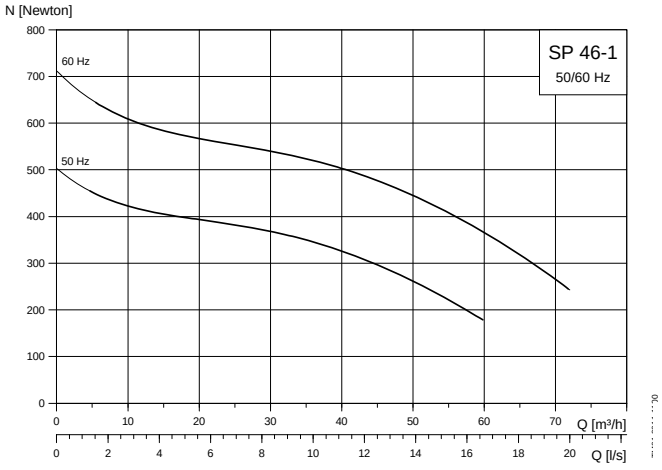
[3)] SP 46-20 to SP 46-24 are mounted in sleeve for R4 connection.

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

SP46-1 to SP46-19 are also available in N-and R-versions. See page 6.

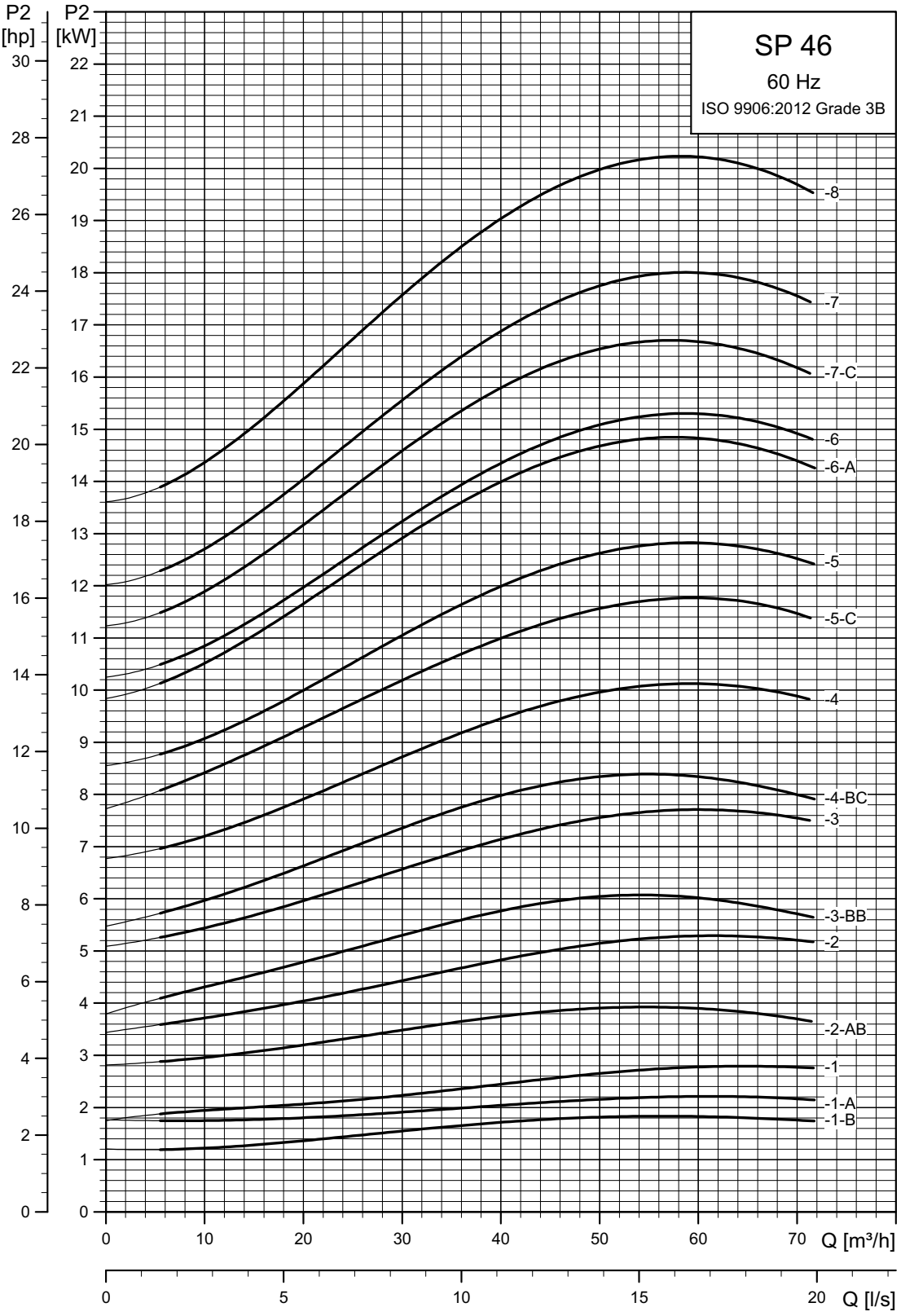
Other types of connection are possible by means of connecting pieces. See page 110.

Single-stage curves, axial thrust

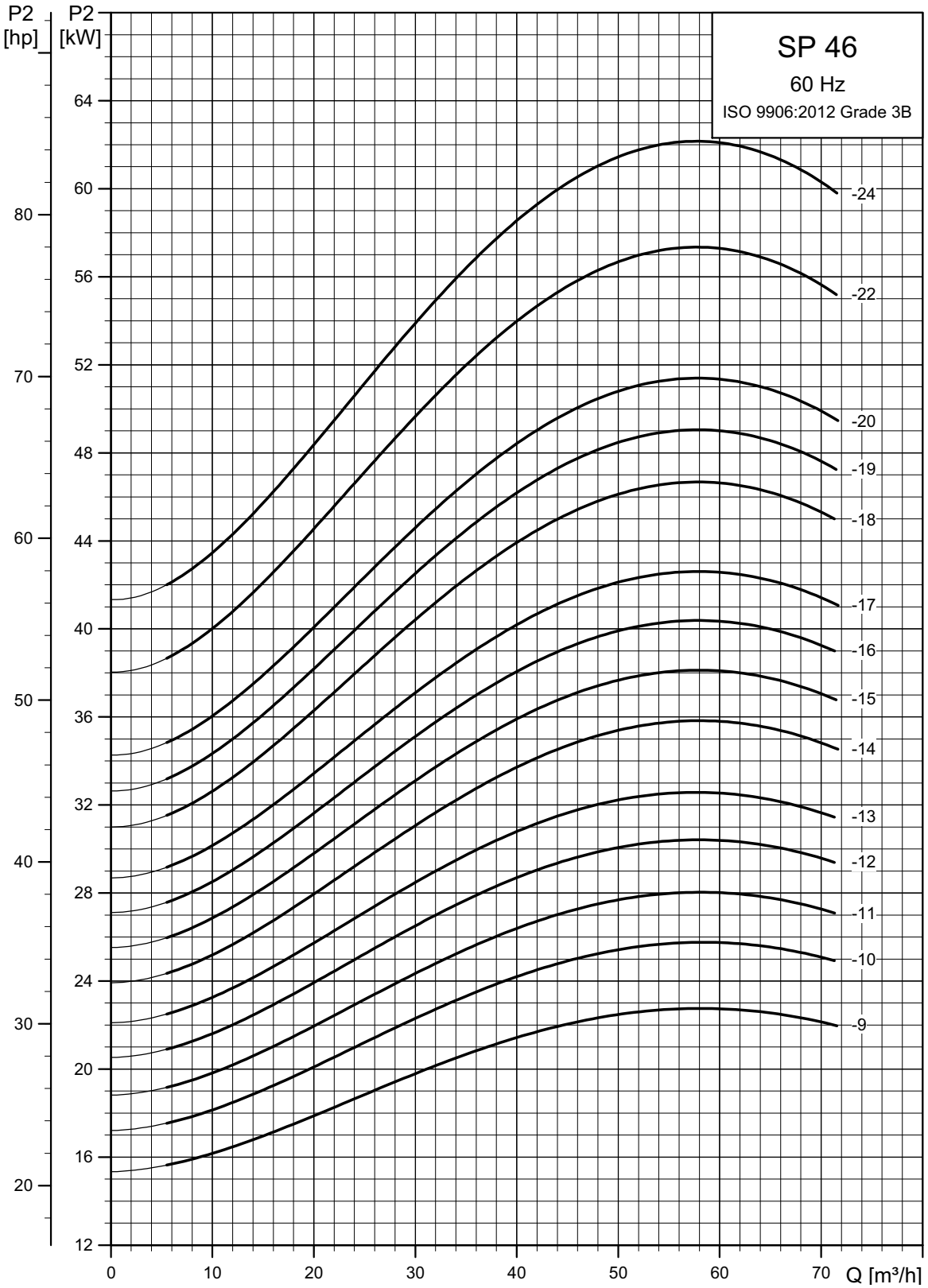


TM01 9011 1100

Power curves

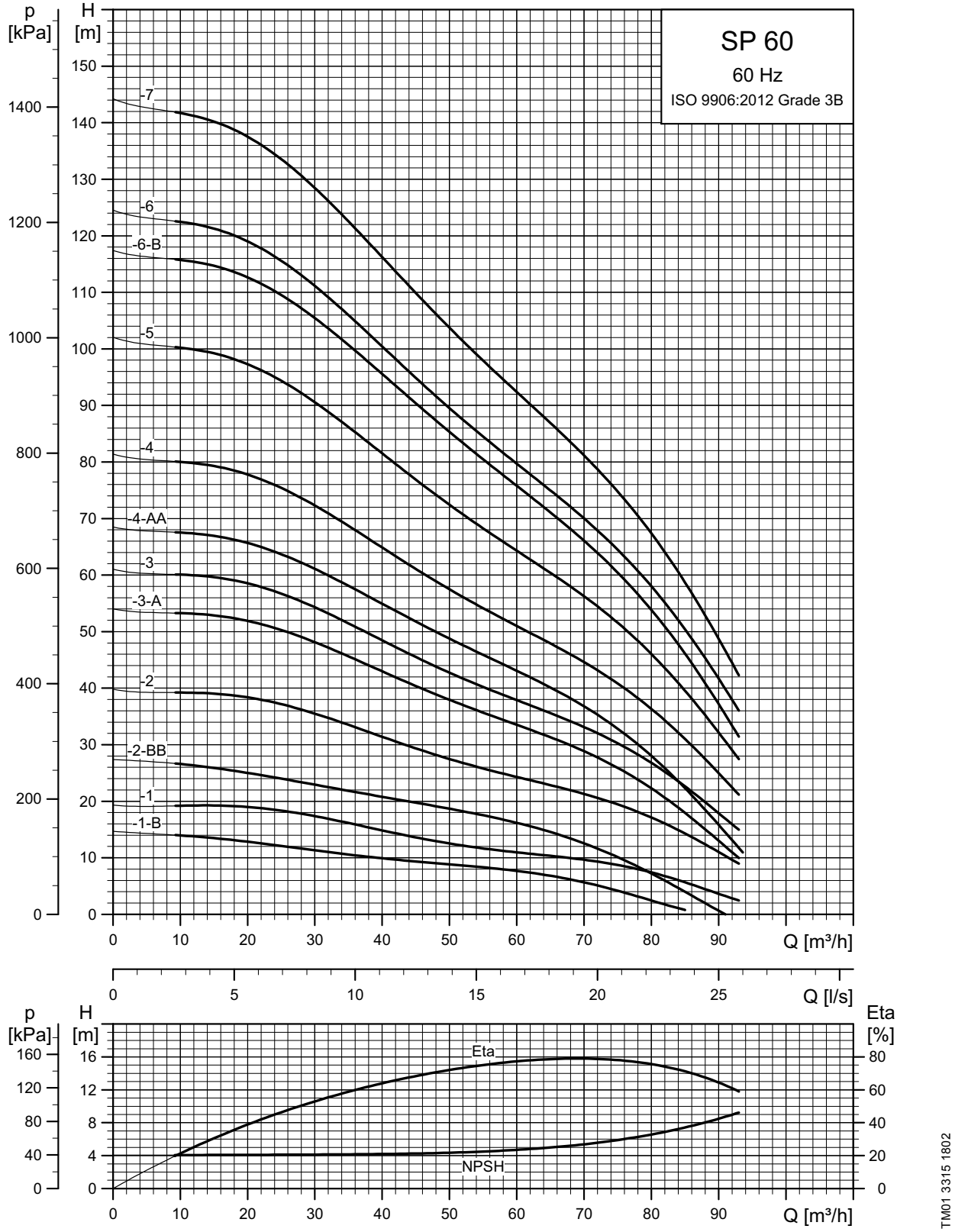


TM00 7515 1802

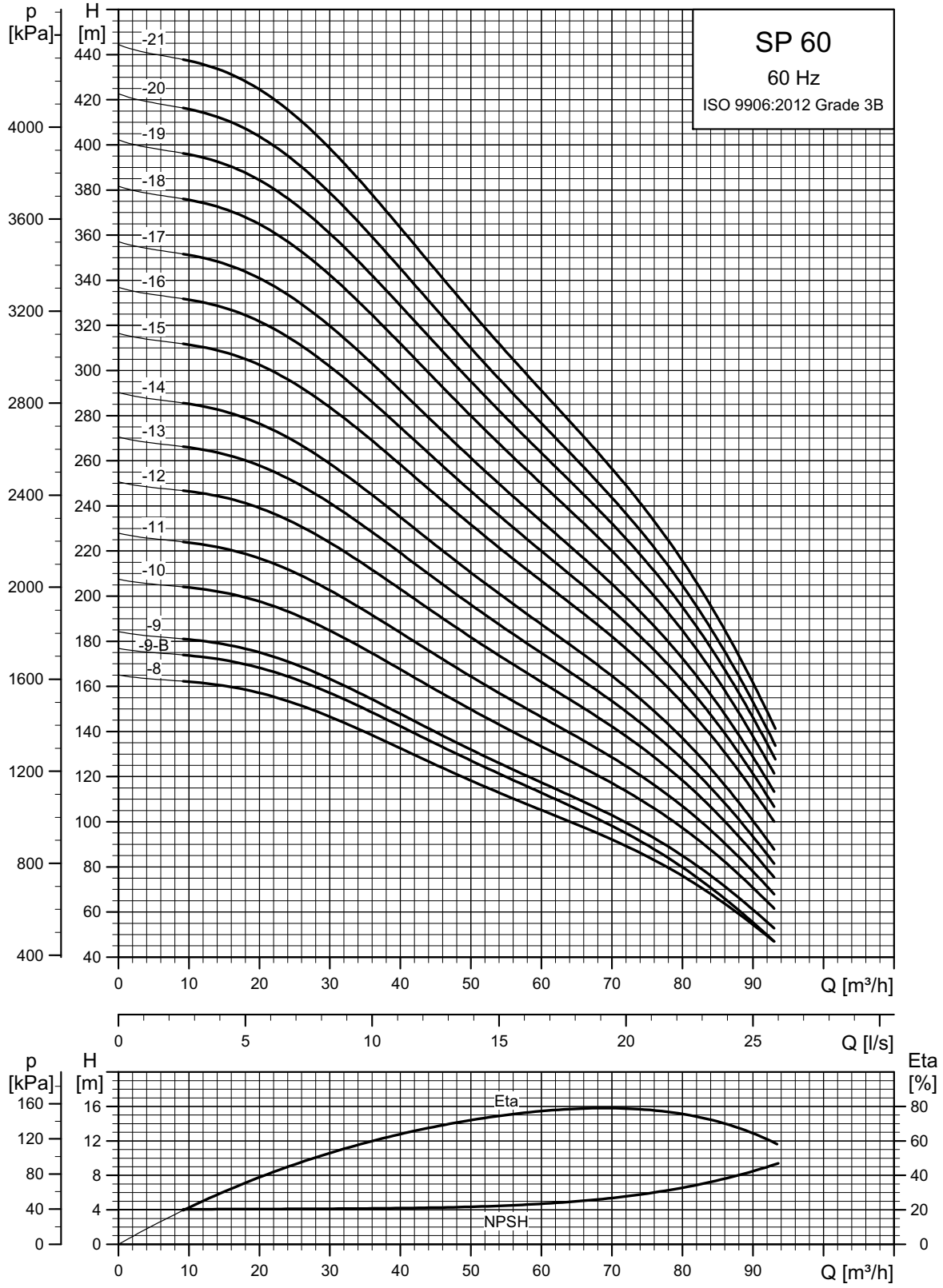

SP 46
60 Hz
ISO 9906:2012 Grade 3B
P2 [hp]
P2 [kW]
-24
-22
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
Q [m³/h]
TM01 9245 1802

SP 60

Performance curves

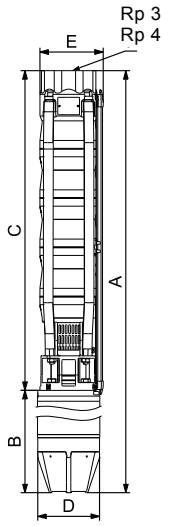


See also *Curve conditions*, page 19.

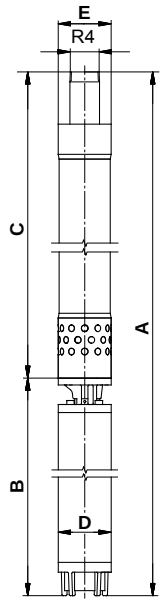


See also *Curve conditions*, page 19.

Dimensions and weights



TM00 0961 1196



Pump in sleeve

TM01 4197 4118

Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	Rp 3/Rp 4 connection				B	D	
			A	C	E[1)]	E[2)]			
SP 60-1-B	MS 4000	2.2	835	378	146		457	95	23
SP 60-1	MS 4000	4.0	955	378	146		577	95	28
SP 60-2-BB	MS 4000	4.0	1068	491	146		577	95	31
SP 60-2	MS 4000	5.5	1168	491	146		677	95	36
SP 60-3-A	MS 4000	7.5	1381	604	146		777	95	43
SP 60-2	MS 6000	5.5	1051	507	148	151	544	139.5	46
SP 60-3-A	MS 6000	7.5	1194	620	148	151	574	139.5	52
SP 60-3	MS 6000	9.2	1224	620	148	151	604	139.5	57
SP 60-4-AA	MS 6000	9.2	1337	733	148	151	604	139.5	60
SP 60-4	MS 6000	11	1367	733	148	151	634	139.5	63
SP 60-5	MS 6000	13	1510	846	148	151	664	139.5	68
SP 60-6-B	MS 6000	15	1658	959	148	151	699	139.5	74
SP 60-6	MS 6000	18.5	1713	959	148	151	754	139.5	80
SP 60-7	MS 6000	18.5	1826	1072	148	151	754	139.5	82
SP 60-8	MS 6000	22	1999	1185	148	151	814	139.5	91
SP 60-9-B	MS 6000	22	2112	1298	148	151	814	139.5	93
SP 60-9	MS 6000	26	2172	1298	148	151	874	139.5	99
SP 60-10	MS 6000	26	2285	1411	148	151	874	139.5	101
SP 60-11	MS 6000	30	2468	1524	148	151	944	139.5	111
SP 60-12	MMS 6	37	2949	1637	150	153	1312	144	154
SP 60-13	MMS 6	37	3078	1766	150	153	1312	144	157
SP 60-14	MMS 6	37	3191	1879	150	153	1312	144	159
SP 60-15	MMS 8000	45	3291	2021	192	192	1270	192	223
SP 60-16	MMS 8000	45	3404	2134	192	192	1270	192	225
SP 60-17	MMS 8000	45	3737	2247	192	192	1490	192	268
SP 60-18	MMS 8000	55	3710	2360	192	192	1350	192	245
SP 60-19[3)]	MMS 8000	55	4070	2720	192	192	1350	192	272
SP 60-20[3)]	MMS 8000	55	4183	2833	192	192	1350	192	275
SP 60-21[3)]	MMS 8000	63	4436	2946	192	192	1490	192	304

[1)] Maximum diameter of pump with one motor cable.

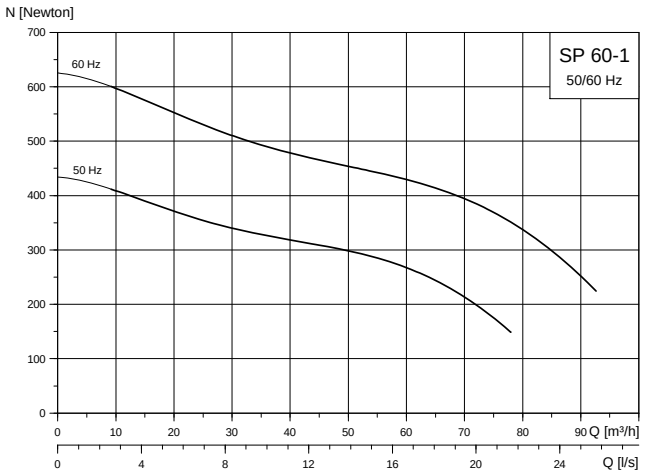
[2)] Maximum diameter of pump with two motor cables.

[3)] SP 60-19 to SP 60-21 are mounted in sleeve for R4 connection. Pumps mounted in sleeve are only available in standard and N-versions.

SP 60-1 to SP 60-18 are also available in N- and R-versions. See page 6.

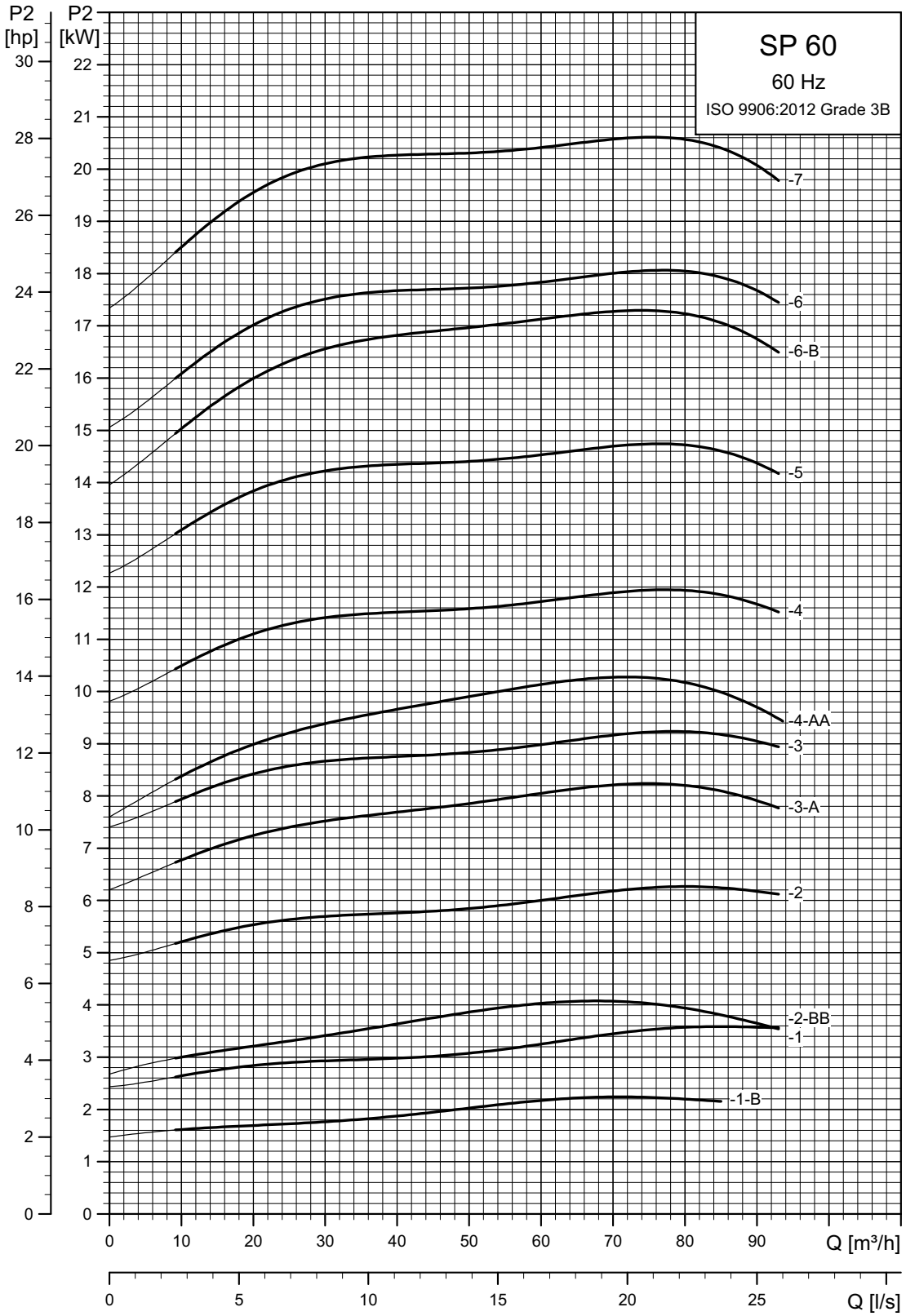
Other types of connection are possible by means of connecting pieces. See page 110.

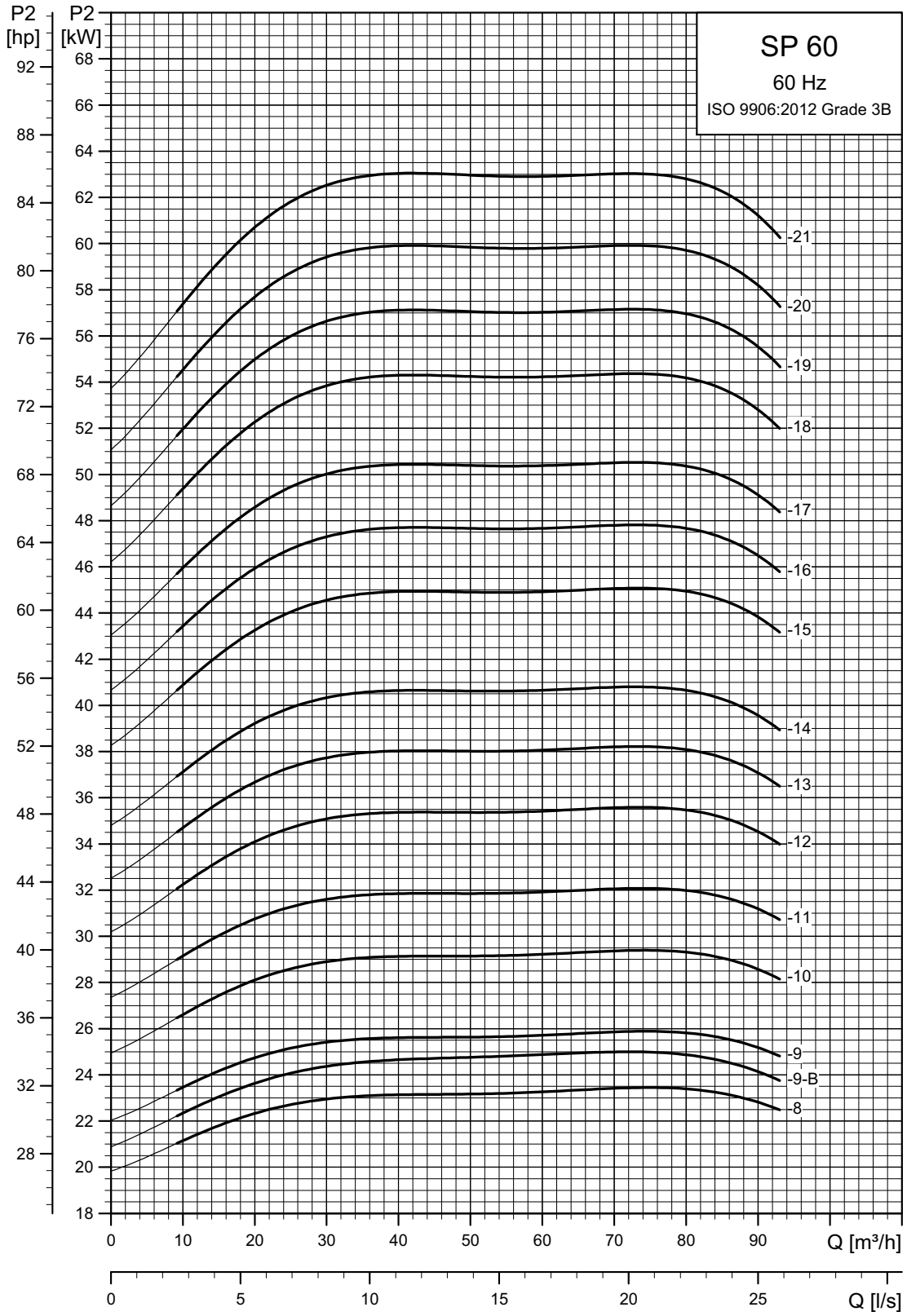
Single-stage curves, axial thrust



TM01 9012 1100

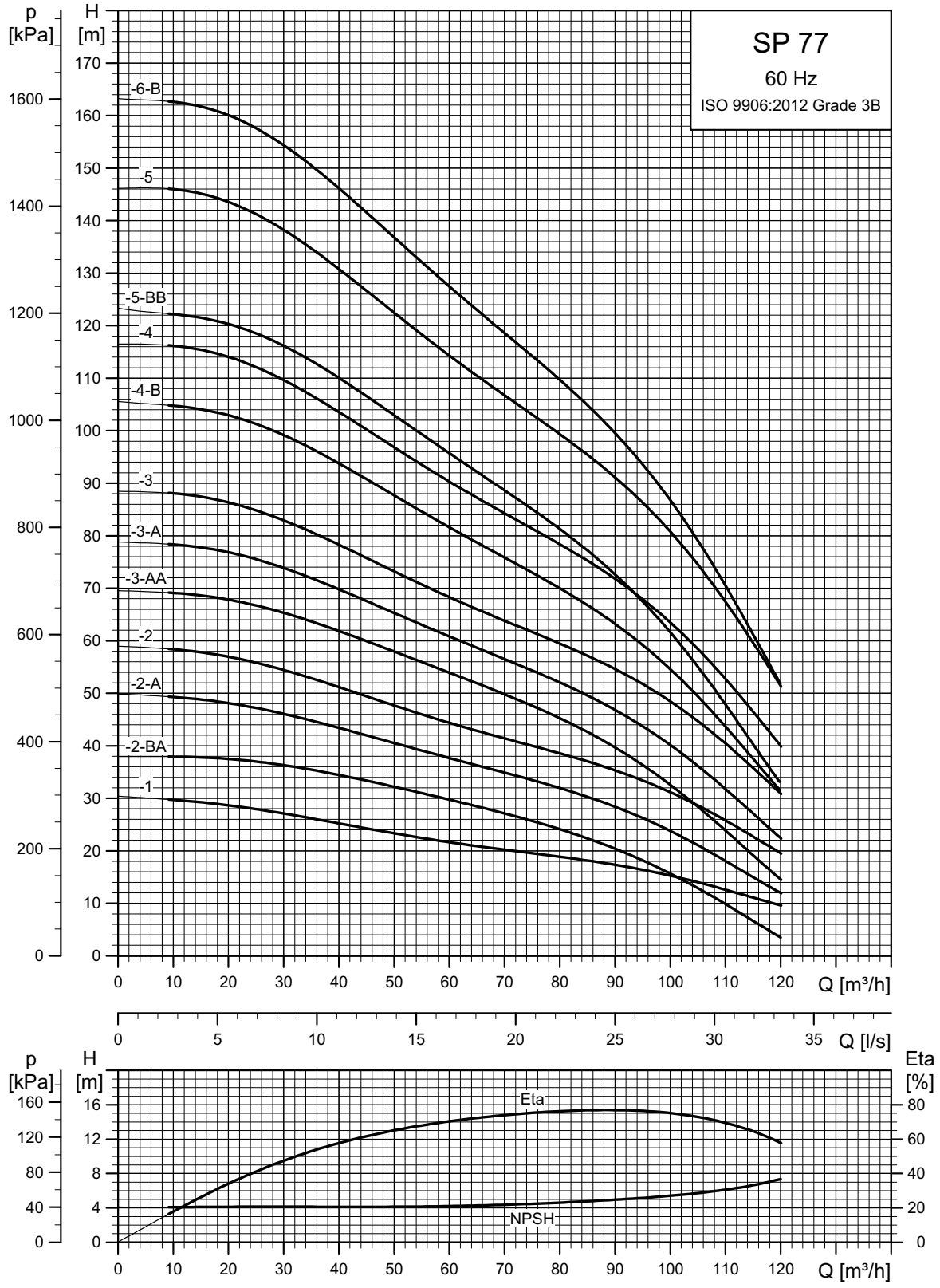
Power curves



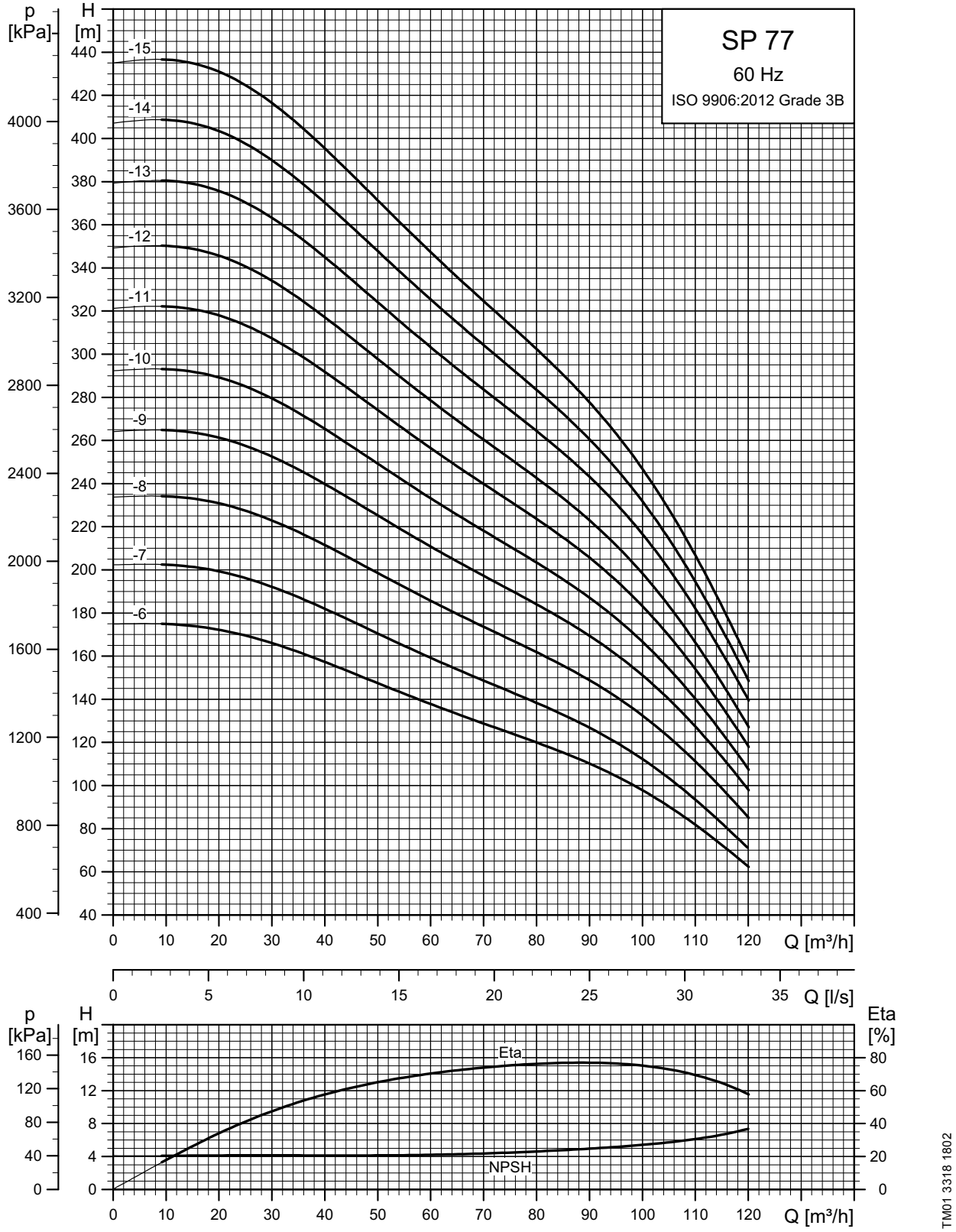

SP 60
60 Hz
ISO 9906:2012 Grade 3B
P2 [hp]
P2 [kW]
-21
-20
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10
-9
-9-B
-8
Q [m³/h]
Q [l/s]
TM01 9246 1802

SP 77

Performance curves

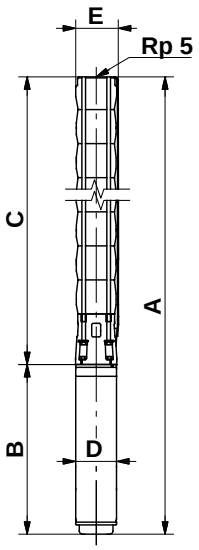


See also *Curve conditions*, page 19.

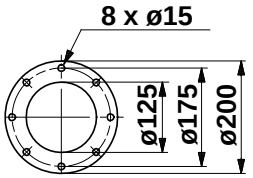


See also *Curve conditions*, page 19.

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[1]	E[2]	A	C	E[1]	E[2]			
SP 77-1	MS 6000	5.5	1162	618	178	186	1162	618	200	200	544	139.5	55
SP 77-2-BA	MS 6000	7.5	1320	746	178	186	1320	746	200	200	574	139.5	63
SP 77-2-A	MS 6000	9.2	1350	746	178	186	1350	746	200	200	604	139.5	69
SP 77-2	MS 6000	11	139.50	746	178	186	1380	746	200	200	634	139.5	71
SP 77-3-AA	MS 6000	13	1538	874	178	186	1538	874	200	200	664	139.5	78
SP 77-3-A	MS 6000	15	1573	874	178	186	1573	874	200	200	699	139.5	82
SP 77-3	MS 6000	18.5	1628	874	178	186	1628	874	200	200	754	139.5	87
SP 77-4-B	MS 6000	18.5	1756	1002	178	186	1756	1002	200	200	754	139.5	91
SP 77-4	MS 6000	22	1816	1002	178	186	1816	1002	200	200	814	139.5	97
SP 77-5-BB	MS 6000	22	1944	1130	178	186	1944	1130	200	200	814	139.5	101
SP 77-5	MS 6000	26	2004	1130	178	186	2004	1130	200	200	874	139.5	106
SP 77-6-B	MS 6000	30	2202	1258	178	186	2202	1258	200	200	944	139.5	118
SP 77-6	MMS 6	37	2570	1145	179	183	2570	1145	200	200	1312	144	161
SP 77-7	MMS 6	37	2683	1273	179	183	2683	1273	200	200	1312	144	164
SP 77-8	MMS 8000	45	2798	1528	200	204	2798	1528	205	205	1270	192	225
SP 77-9	MMS 8000	55	3006	1656	200	204	3006	1656	205	205	1350	192	244
SP 77-10	MMS 8000	55	3134	1784	200	204	3134	1784	205	205	1350	192	248
SP 77-11	MMS 8000	63	3402	1912	200	204	3402	1912	205	205	1490	192	277
SP 77-12	MMS 8000	63	3530	2040	200	204					1490	192	281
SP 77-13	MMS 8000	75	3758	2168	200	204					1590	192	304
SP 77-14	MMS 8000	92	4426	2596	200	202					1830	192	361
SP 77-15	MMS 8000	92	4554	2724	200	202					1830	192	365

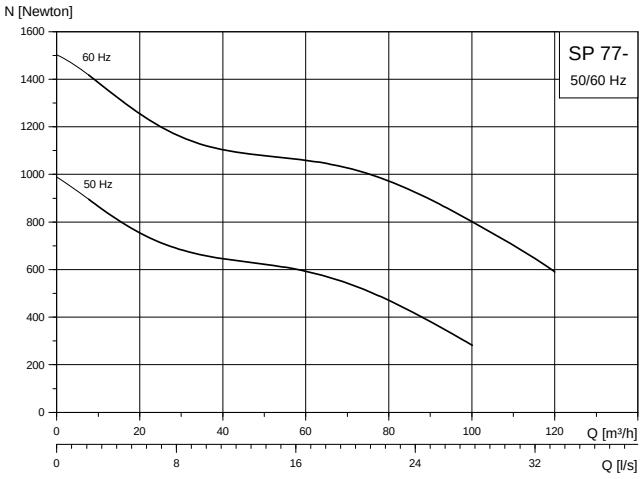
[1] Maximum diameter of pump with one motor cable.

[2] Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 6.

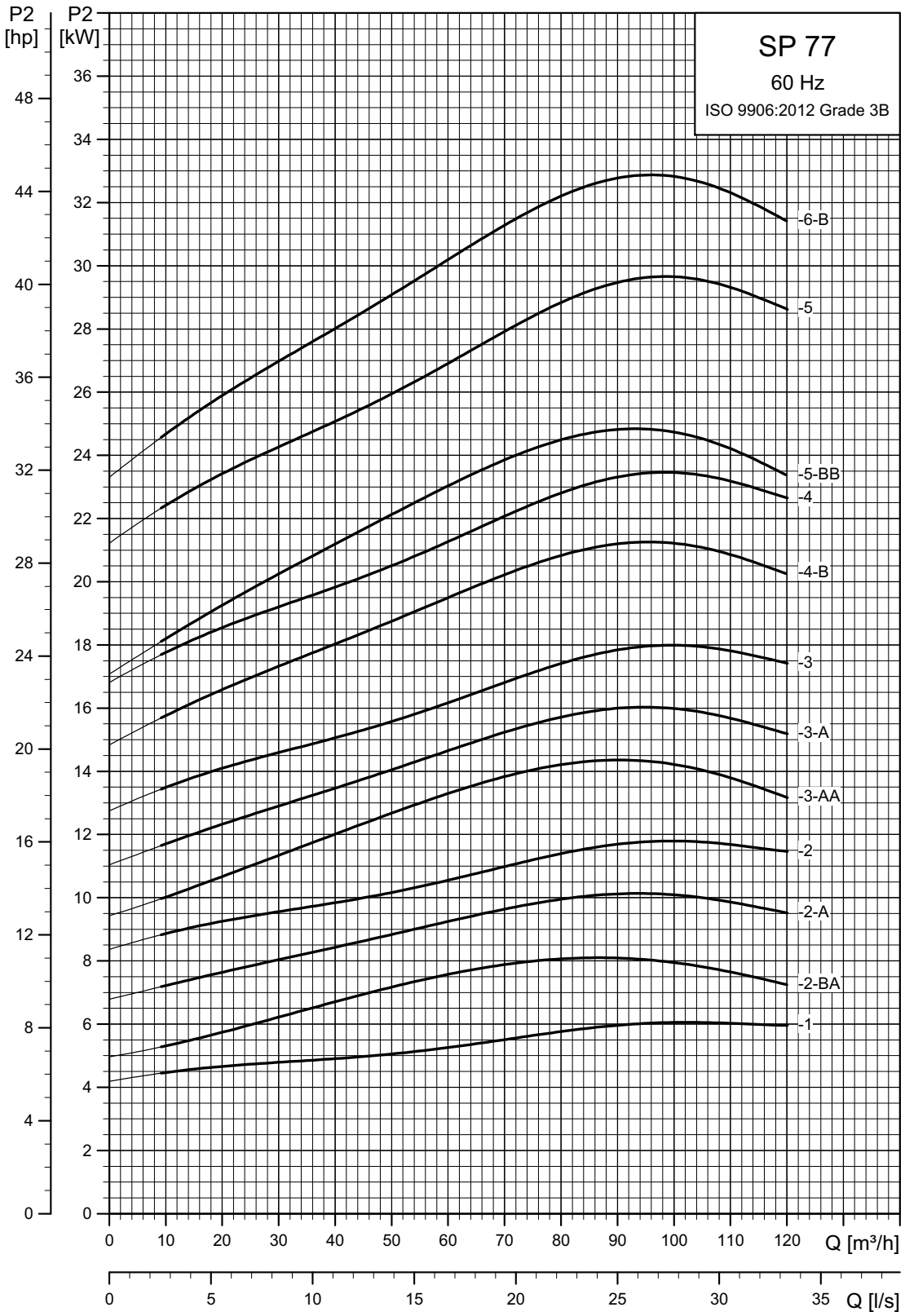
Other types of connection are possible by means of connecting pieces. See page 110.

Single-stage curves, axial thrust

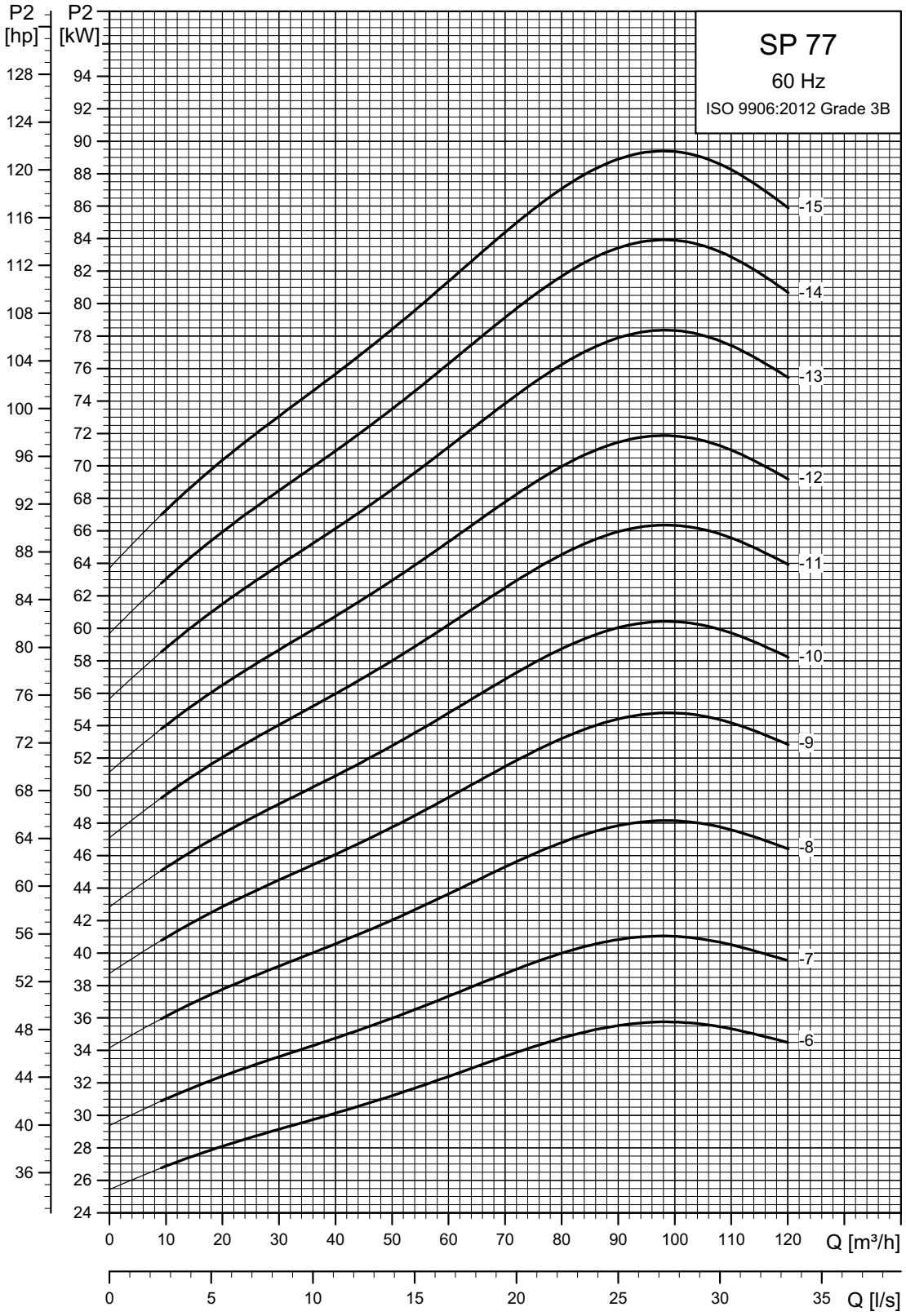


TM01 9013 1100

Power curves



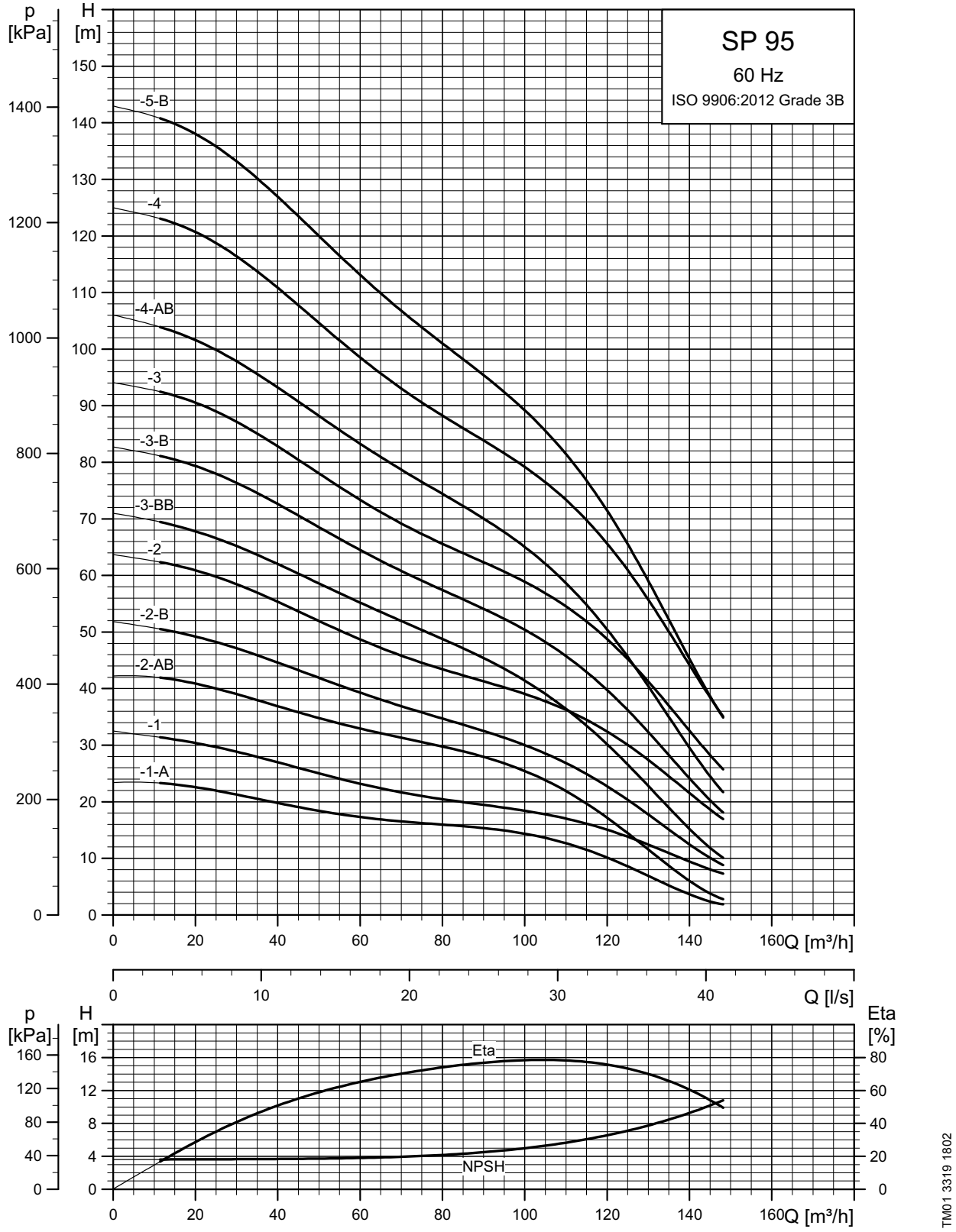
TM00 7450 1802



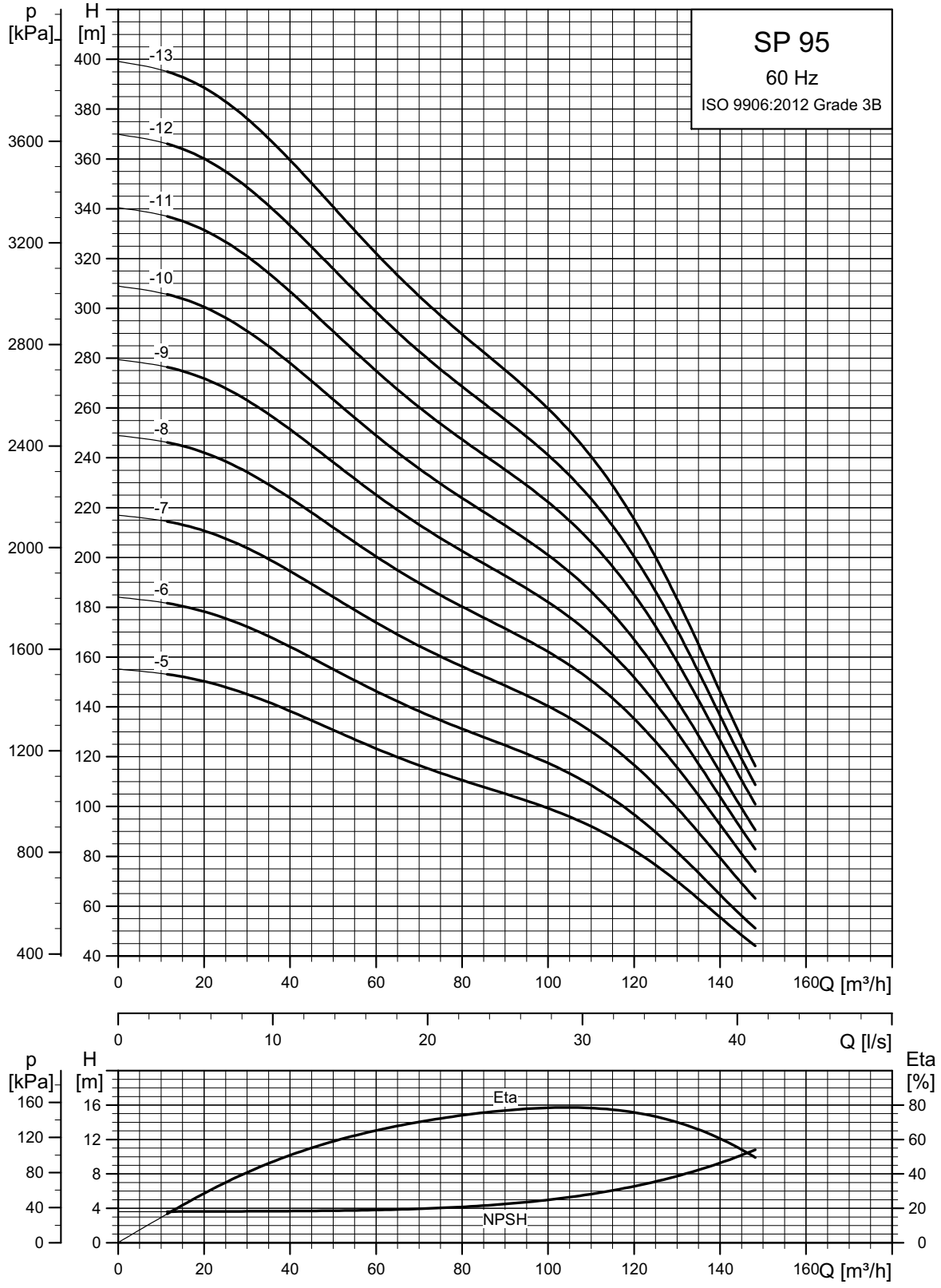
TM01 9247 1802

SP 95

Performance curves

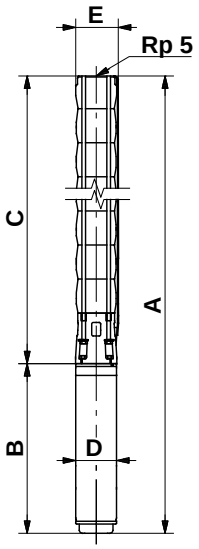


See also *Curve conditions*, page 19.

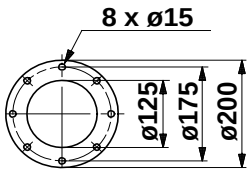


See also *Curve conditions*, page 19.

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[1)]	E[2)]	A	C	E[1)]	E[2)]			
SP 95-1-A	MS 6000	5.5	1162	618	179	183	1162	618	200	200	544	139.5	55
SP 95-1	MS 6000	7.5	1192	618	179	183	1192	618	200	200	574	139.5	59
SP 95-2-AB	MS 6000	9.2	1350	746	179	183	1350	746	200	200	604	139.5	69
SP 95-2-B	MS 6000	11	1380	746	179	183	1380	746	200	200	634	139.5	71
SP 95-2	MS 6000	13	1410	746	179	183	1410	746	200	200	664	139.5	74
SP 95-3-BB	MS 6000	15	1573	874	179	183	1573	874	200	200	699	139.5	82
SP 95-3-B	MS 6000	18.5	1628	874	179	183	1628	874	200	200	754	139.5	87
SP 95-3	MS 6000	22	1688	874	179	183	1688	874	200	200	814	139.5	93
SP 95-4-AB	MS 6000	22	1816	1002	179	183	1816	1002	200	200	814	139.5	97
SP 95-4	MS 6000	26	1876	1002	179	183	1876	1002	200	200	874	139.5	103
SP 95-5-B	MS 6000	30	2074	1130	179	183	2074	1130	200	200	944	139.5	114
SP 95-5	MMS 6	37	2442	1017	179	183	2555	1130	200	200	1312	144	158
SP 95-6	MMS 6	37	2570	1145	179	183	2570	1145	200	200	1312	144	161
SP 95-7	MMS 8000	45	2670	1400	205	205	2670	1400	200	202	1270	192	221
SP 95-8	MMS 8000	55	2878	1528	205	205	2878	1528	200	202	1350	192	240
SP 95-9	MMS 8000	63	3146	1656	205	205	3146	1656	200	202	1490	192	270
SP 95-10	MMS 8000	63	3274	1784	205	205	3274	1784	200	202	1490	192	274
SP 95-11	MMS 8000	75	3502	1912	205	205					1590	192	296
SP 95-12	MMS 8000	92	3870	2040	205	205					1830	192	346
SP 95-13	MMS 8000	92	3998	2168	205	205					1830	192	350

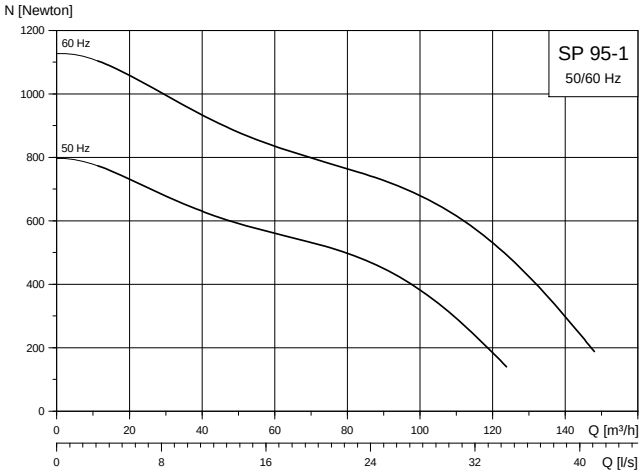
[1)] Maximum diameter of pump with one motor cable.

[2)] Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 6.

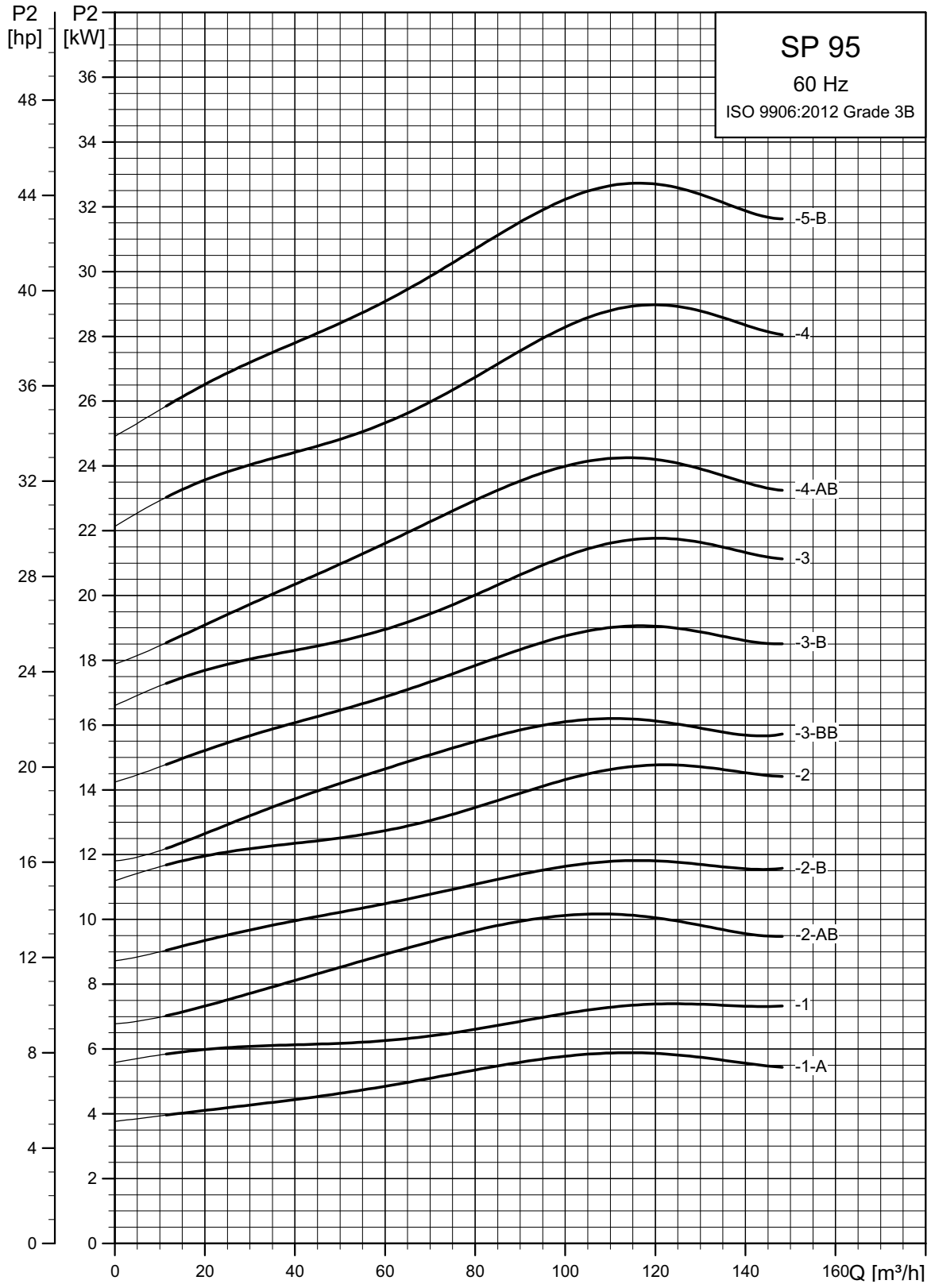
Other types of connection are possible by means of connecting pieces. See page 110.

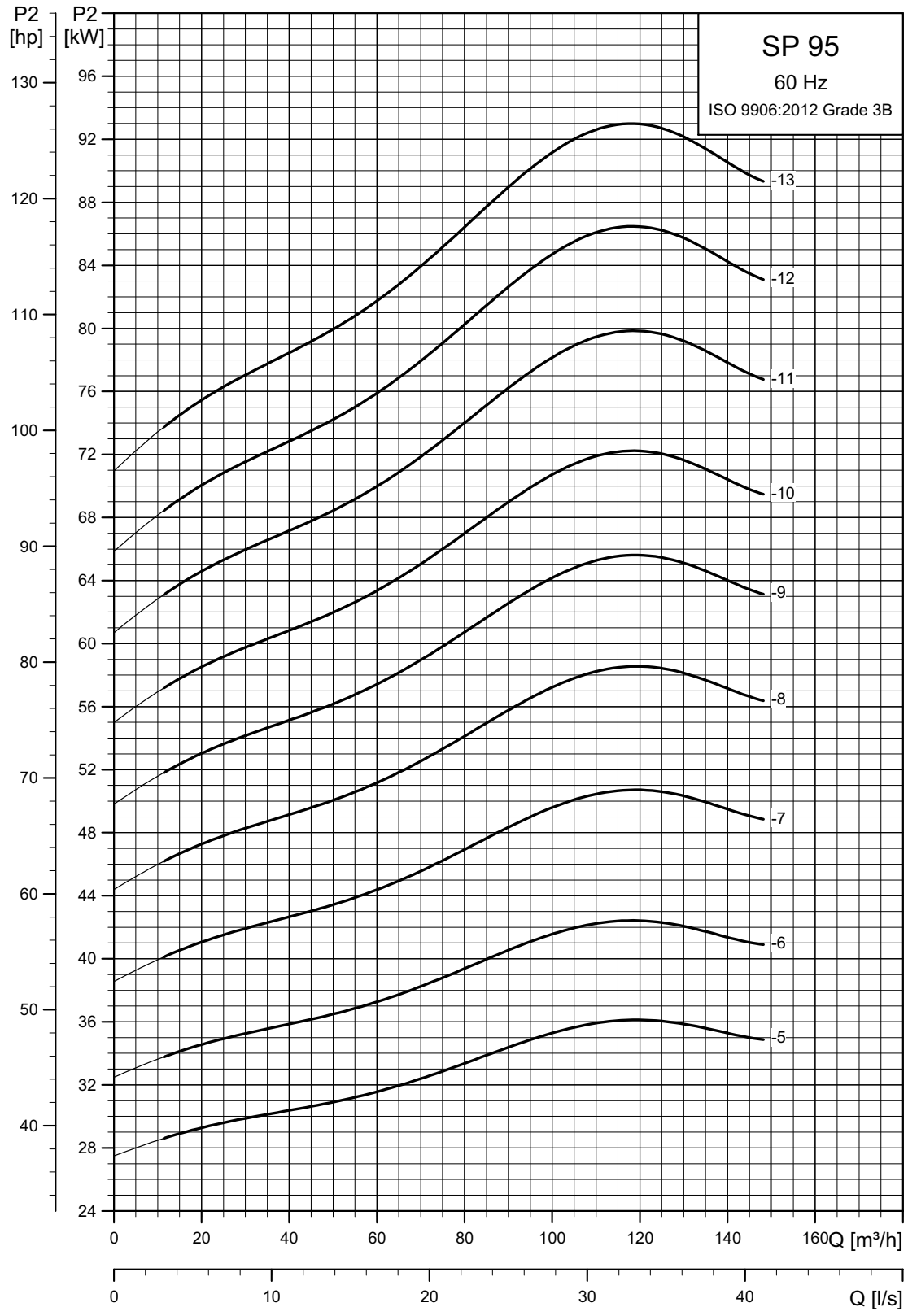
Single-stage curves, axial thrust



TM01 9014 1100

Power curves

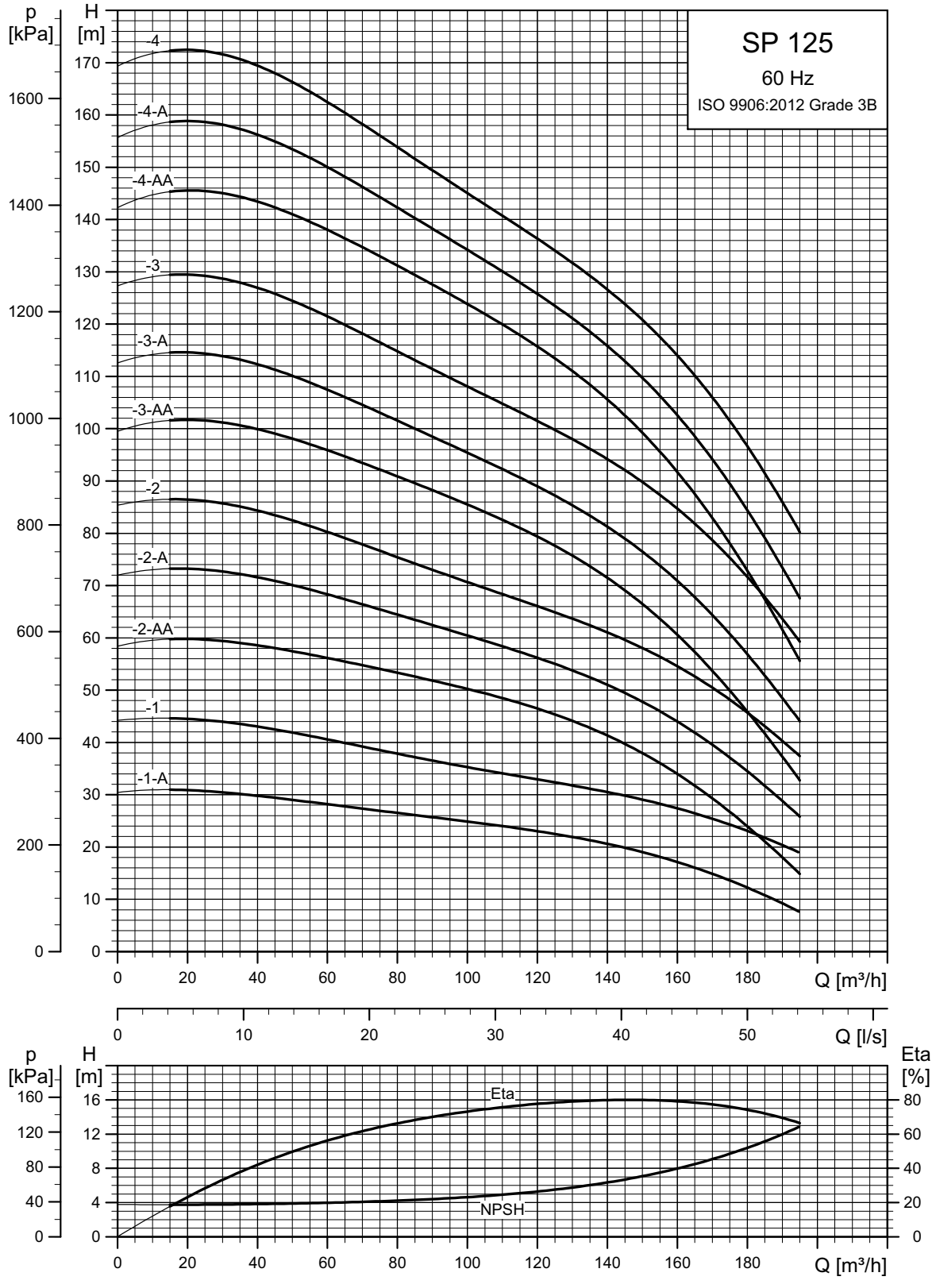




TM01 9248 1802

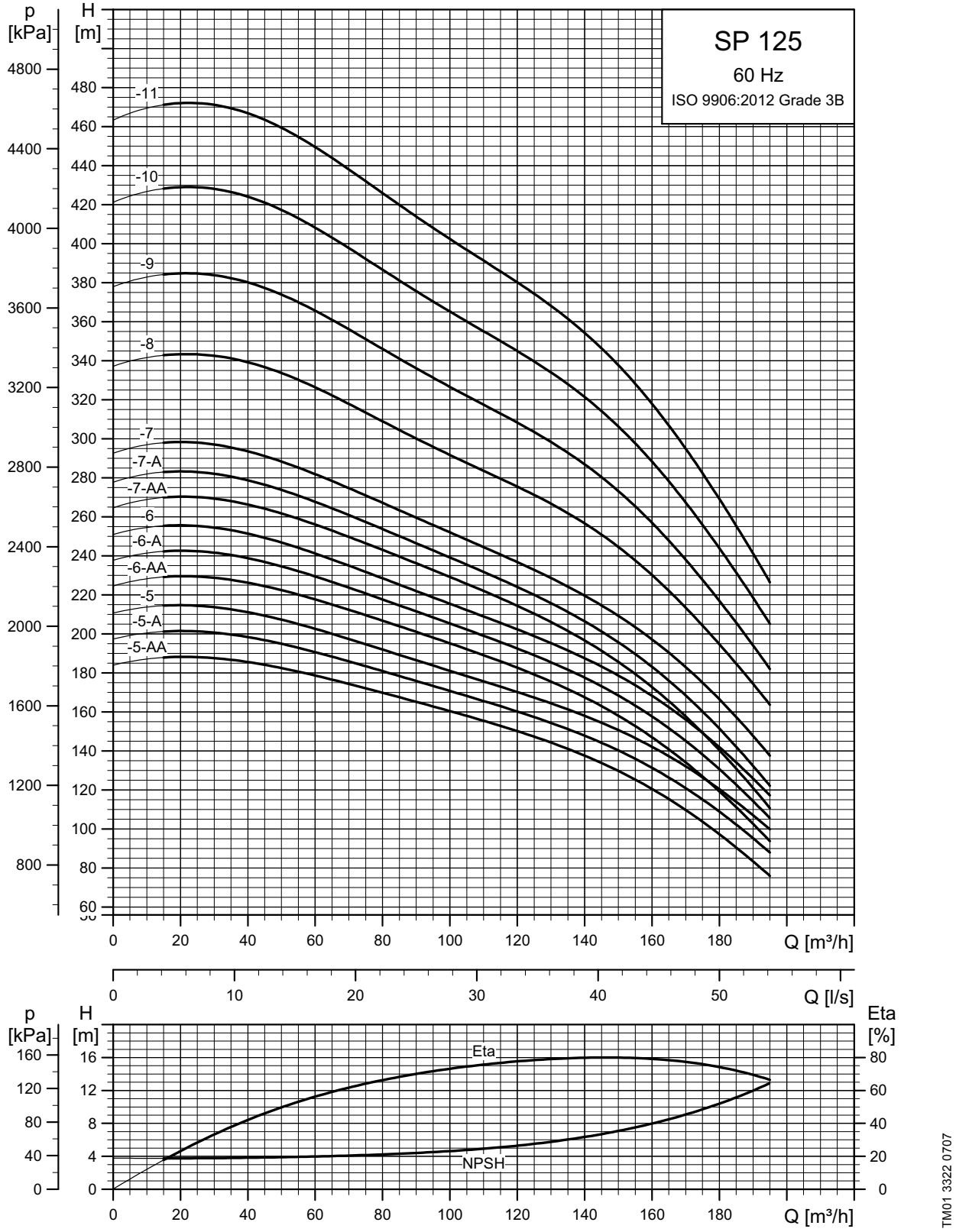
SP 125

Performance curves



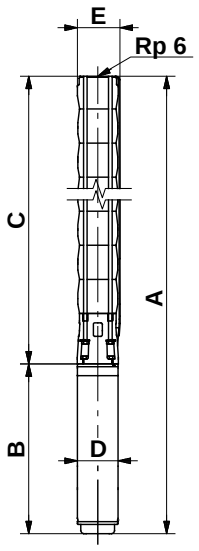
See also *Curve conditions*, page 19.

19

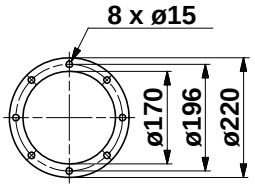


See also *Curve conditions*, page 19.

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[1)]	E[2)]	A	C	E[1)]	E[2)]			
SP 125-1-A	MS 6000	11	1286	652	211	215	1286	652	222	226	634	139.5	81
SP 125-1	MS 6000	18.5	1406	652	211	215	1406	652	222	226	754	139.5	93
SP 125-2-AA	MS 6000	22	1621	807	211	215	1621	807	222	226	814	139.5	105
SP 125-2-A	MS 6000	26	1681	807	211	215	1681	807	222	226	874	139.5	111
SP 125-2	MS 6000	30	1751	807	211	215	1751	807	222	226	944	139.5	119
SP 125-3-AA	MMS 6	37	2275	850	211	215	2275	850	222	226	1312	144	167
SP 125-3-A	MMS 6	37	2275	850	211	215	2275	850	222	226	1312	144	167
SP 125-3	MMS 8000	45	2233	963	213	219	2233	963	229	232	1270	192	226
SP 125-4-AA	MMS 8000	55	2468	1118	213	219	2468	1118	229	232	1350	192	247
SP 125-4-A	MMS 8000	55	2468	1118	213	219	2468	1118	229	232	1350	192	247
SP 125-4	MMS 8000	63	2608	1118	213	219	2608	1118	229	232	1490	192	273
SP 125-5-AA	MMS 8000	75	2864	1274	213	219					1590	192	296
SP 125-5-A	MMS 8000	75	2864	1274	213	219					1590	192	296
SP 125-5	MMS 8000	75	2864	1274	213	219					1590	192	296
SP 125-6-AA	MMS 8000	75	3019	1429	213	219					1590	192	302
SP 125-6-A	MMS 8000	92	3259	1429	213	219					1830	192	348
SP 125-6	MMS 8000	92	3259	1429	213	219					1830	192	348
SP 125-7-AA	MMS 8000	92	3415	1585	213	219					1830	192	354
SP 125-7-A	MMS 8000	92	3415	1585	213	219					1830	192	354
SP 125-7	MMS 8000	110	3645	1585	213	219					2060	192	404
SP 125-8	MMS 10000	132	3962	2092	237	237					1870	237	532
SP 125-9	MMS 10000	132	4118	2248	237	237					1870	237	538
SP 125-10	MMS 10000	147	4473	2403	237	237					2070	237	609
SP 125-11	MMS 10000	170	4779	2559	237	237					2220	237	655

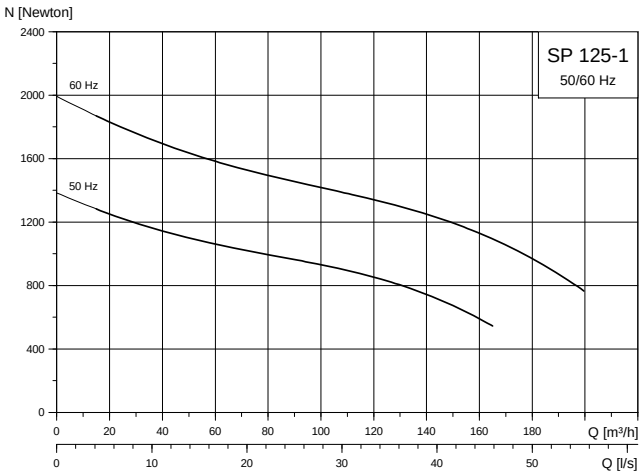
[1)] Maximum diameter of pump with one motor cable.

[2)] Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 6.

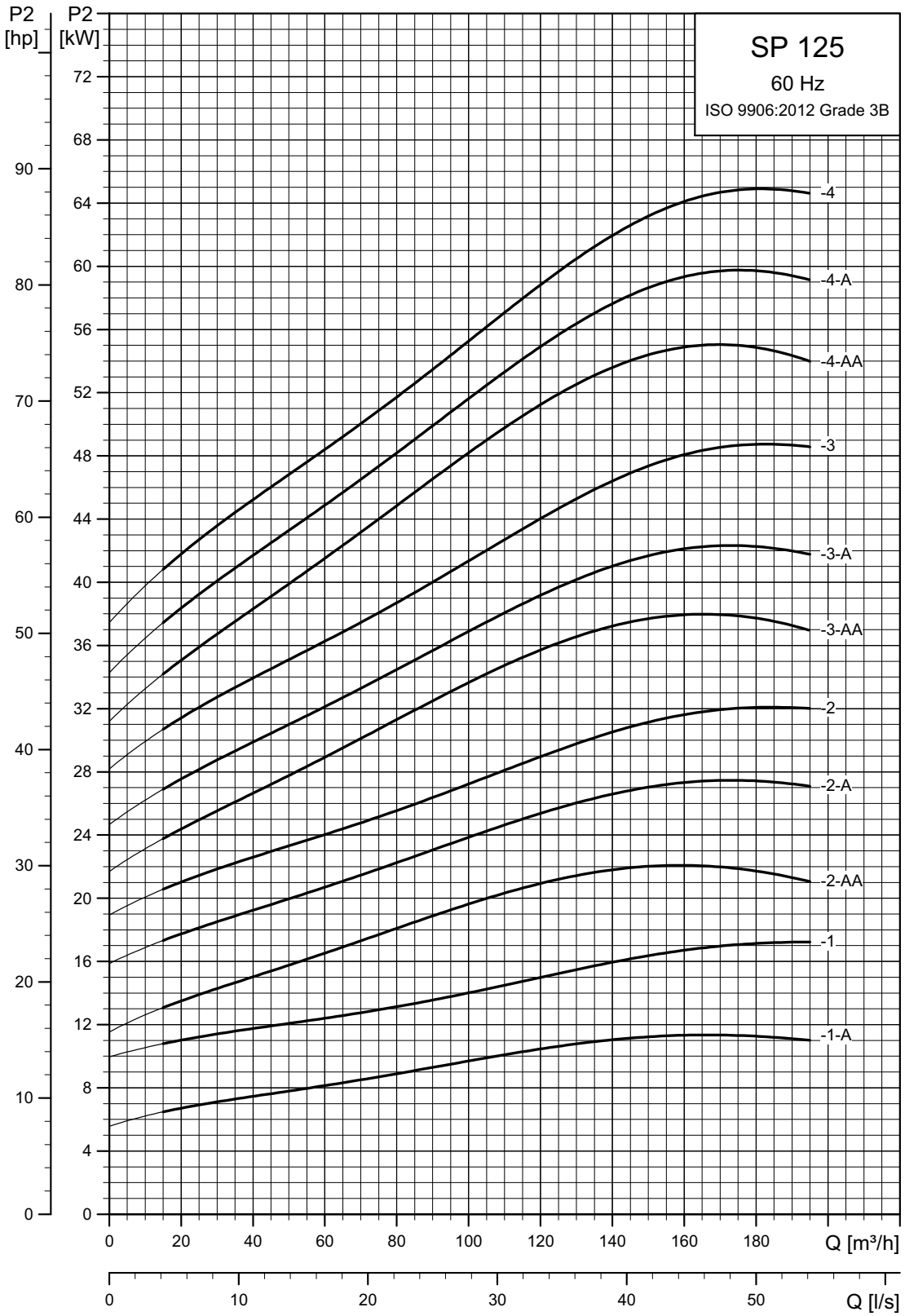
Other types of connection are possible by means of connecting pieces. See page 110.

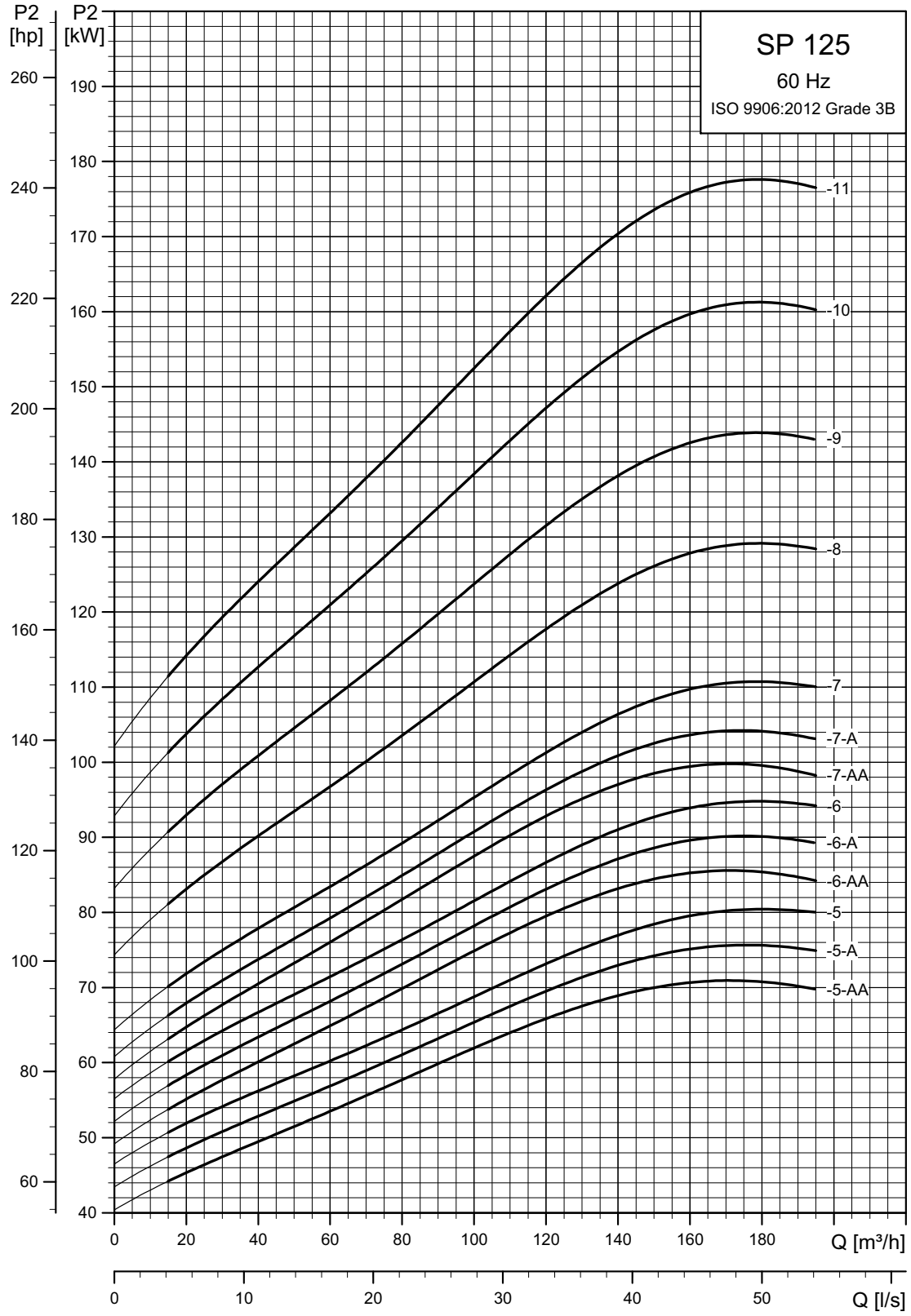
Single-stage curves, axial thrust



TM01 9015 1100

Power curves

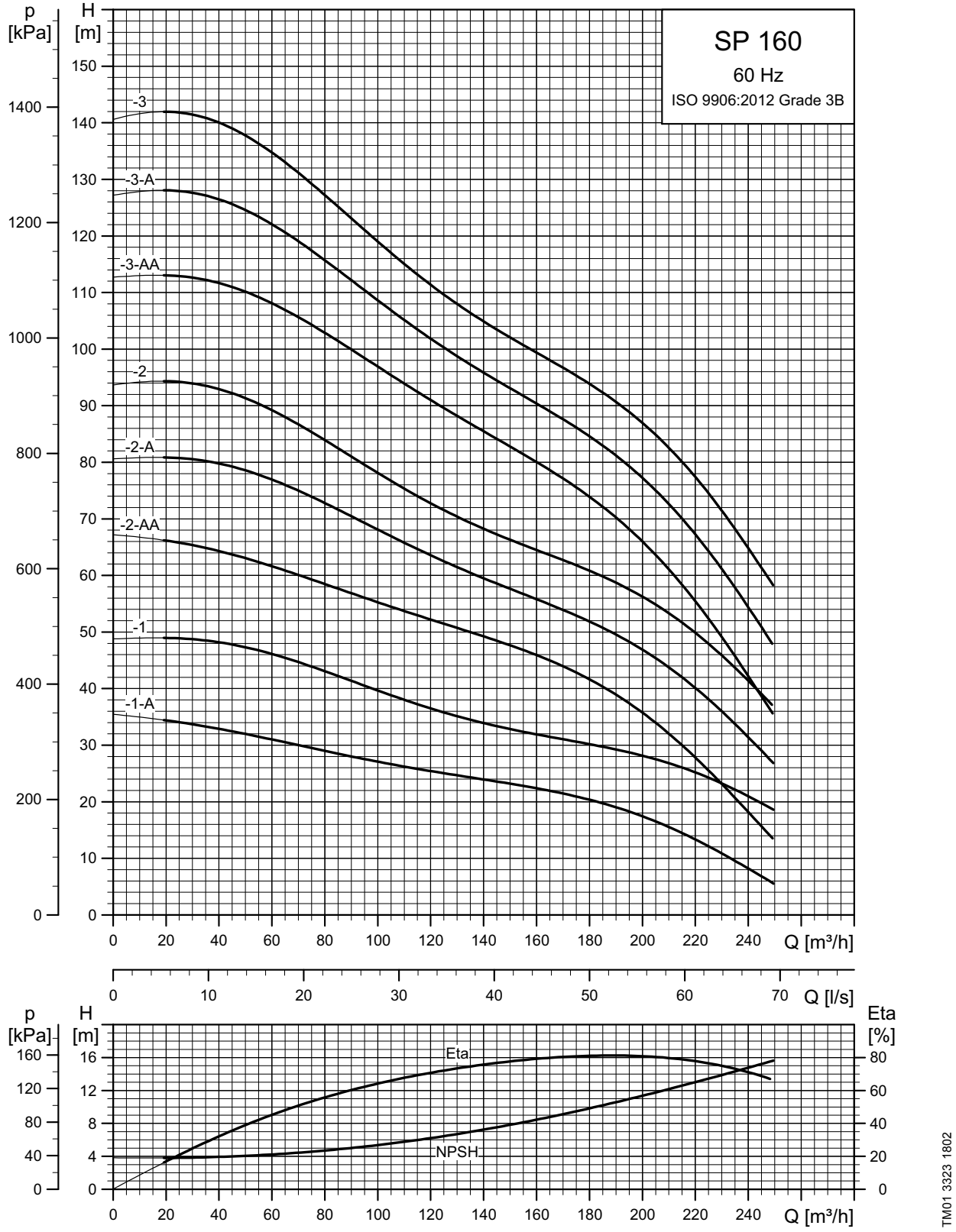




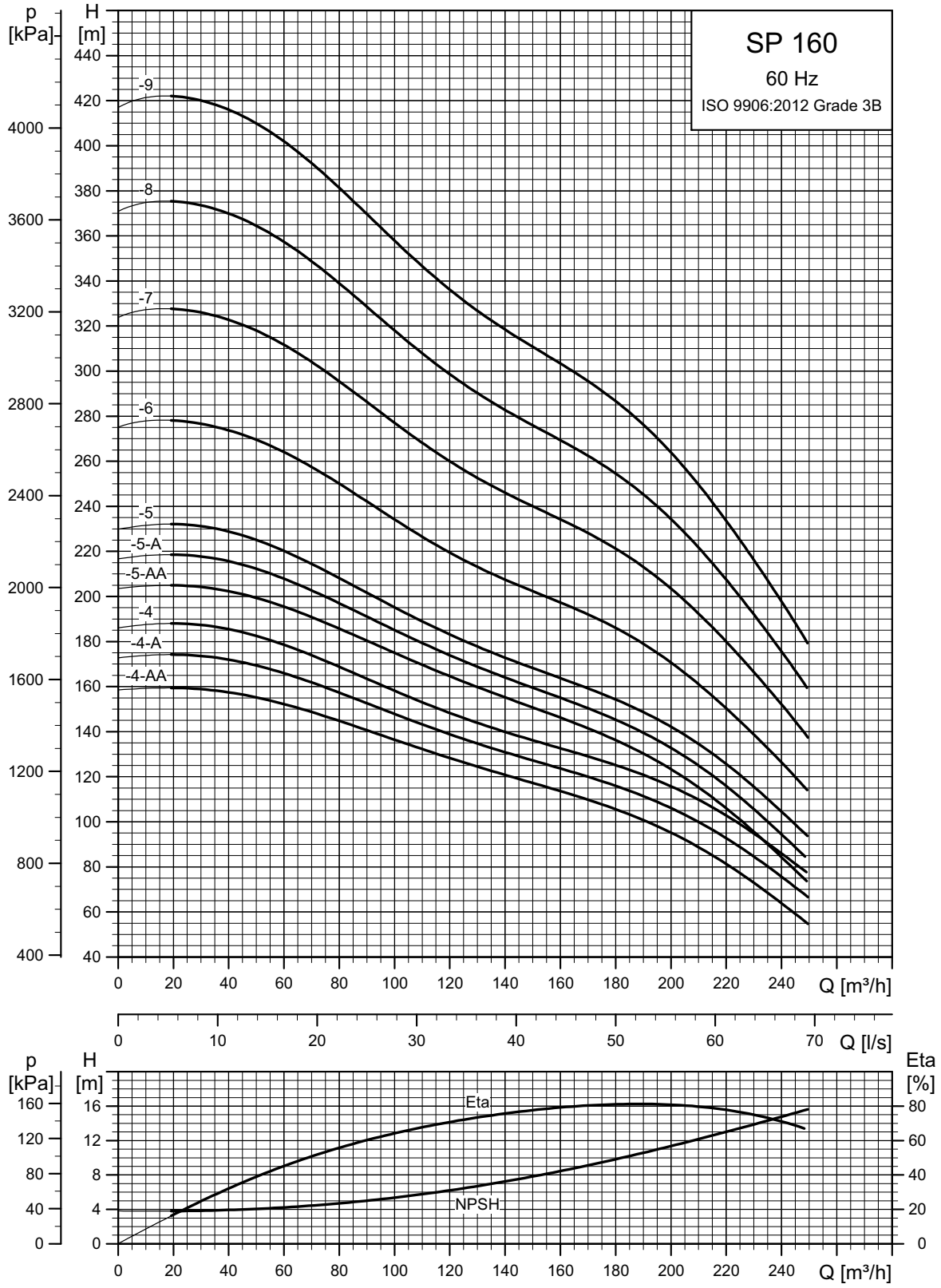
TM01 9249 0707

SP 160

Performance curves

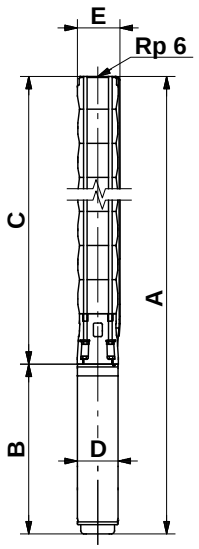


See also *Curve conditions*, page 19.



See also *Curve conditions*, page 19.

Dimensions and weights



TM00 8760 3596

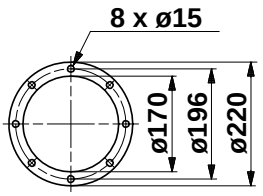
Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 6 connection				6" Grundfos flange				B	D	
			A	C	E[1]	E[2]	A	C	E[1]	E[2]			
SP 160-1-A	MS 6000	15	1351	652	211	215	1351	652	222	226	699	139.5	88
SP 160-1	MS 6000	22	1466	652	211	215	1466	652	222	226	814	139.5	99
SP 160-2-AA	MS 6000	26	1681	807	211	215	1681	807	222	226	874	139.5	111
SP 160-2-A	MMS 6	37	2119	694	211	215	2119	694	222	226	1312	144	161
SP 160-2	MMS 6	37	2119	694	211	215	2119	694	222	226	1312	144	161
SP 160-3-AA	MMS 8000	45	2233	963	213	219	2233	963	229	232	1270	192	226
SP 160-3-A	MMS 8000	55	2313	963	213	219	2313	963	229	232	1350	192	241
SP 160-3	MMS 8000	55	2313	963	213	219	2313	963	229	232	1350	192	241
SP 160-4-AA	MMS 8000	63	2608	1118	213	219					1490	192	271
SP 160-4-A	MMS 8000	75	2708	1118	213	219					1590	192	290
SP 160-4	MMS 8000	75	2708	1118	213	219					1590	192	290
SP 160-5-AA	MMS 8000	92	3104	1274	213	219					1830	192	342
SP 160-5-A	MMS 8000	92	3104	1274	213	219					1830	192	342
SP 160-5	MMS 8000	92	3104	1274	213	219					1830	192	342
SP 160-6	MMS 8000	110	3789	1729	213	219					2060	192	408
SP 160-7	MMS 10000	132	3807	1937	237	237					1870	237	526
SP 160-8	MMS 10000	147	4162	2092	237	237					2070	237	597
SP 160-9	MMS 10000	170	4468	2248	237	237					2220	237	643

[1] Maximum diameter of pump with one motor cable.

[2] Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 6.

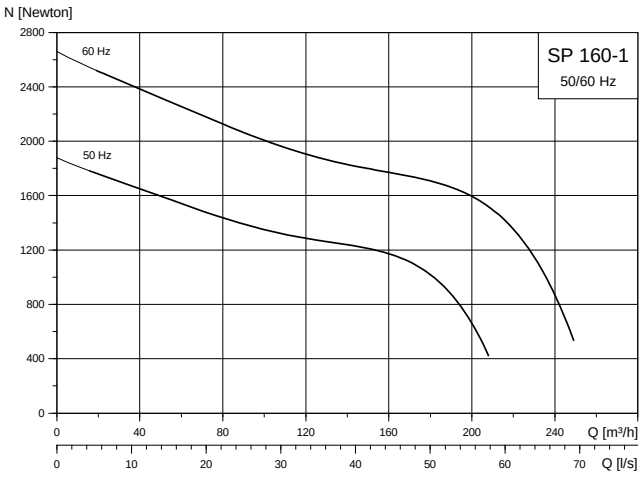
Other types of connection are possible by means of connecting pieces. See page 110.



TM00 7324 1798

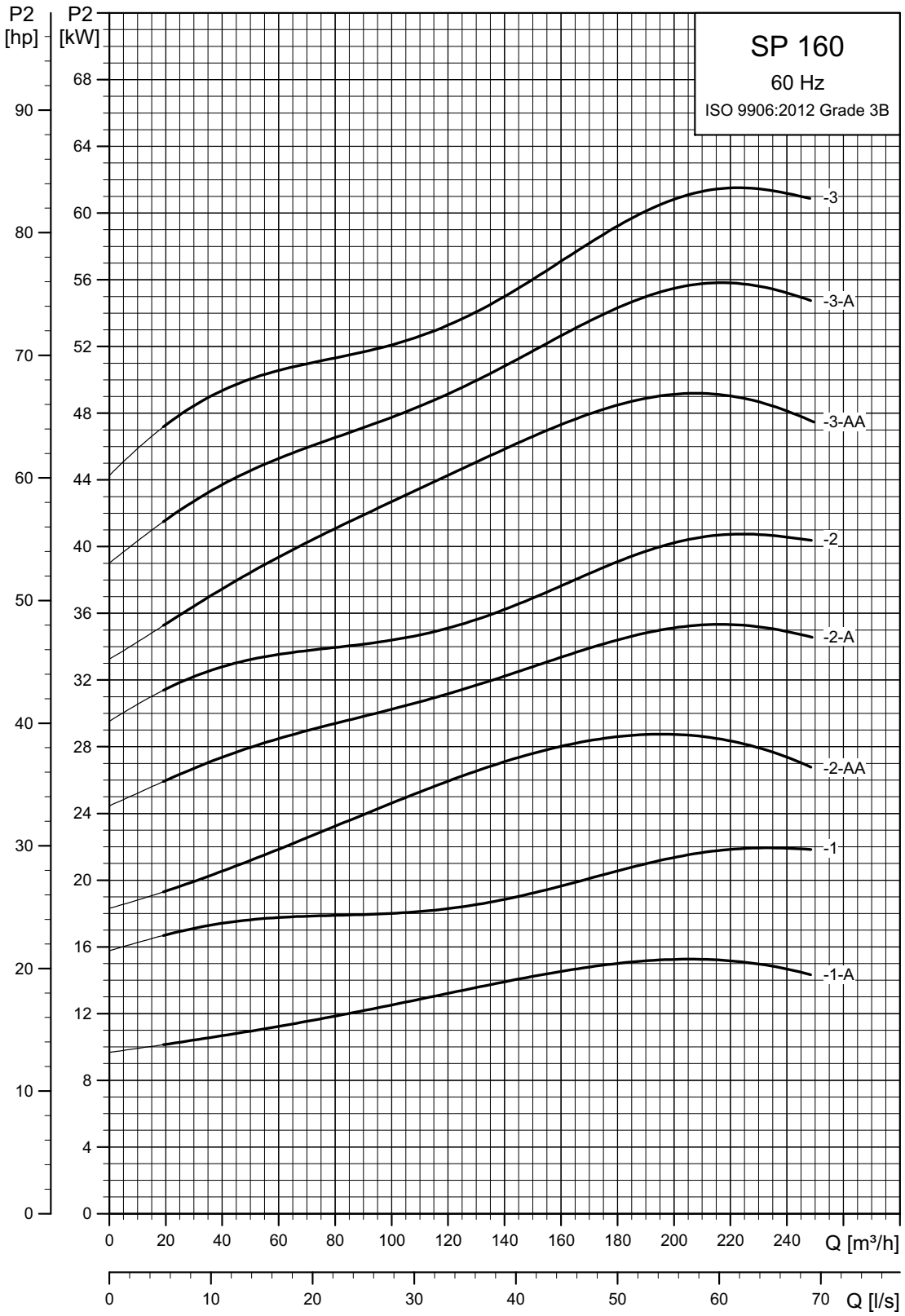
Pump with Grundfos flange

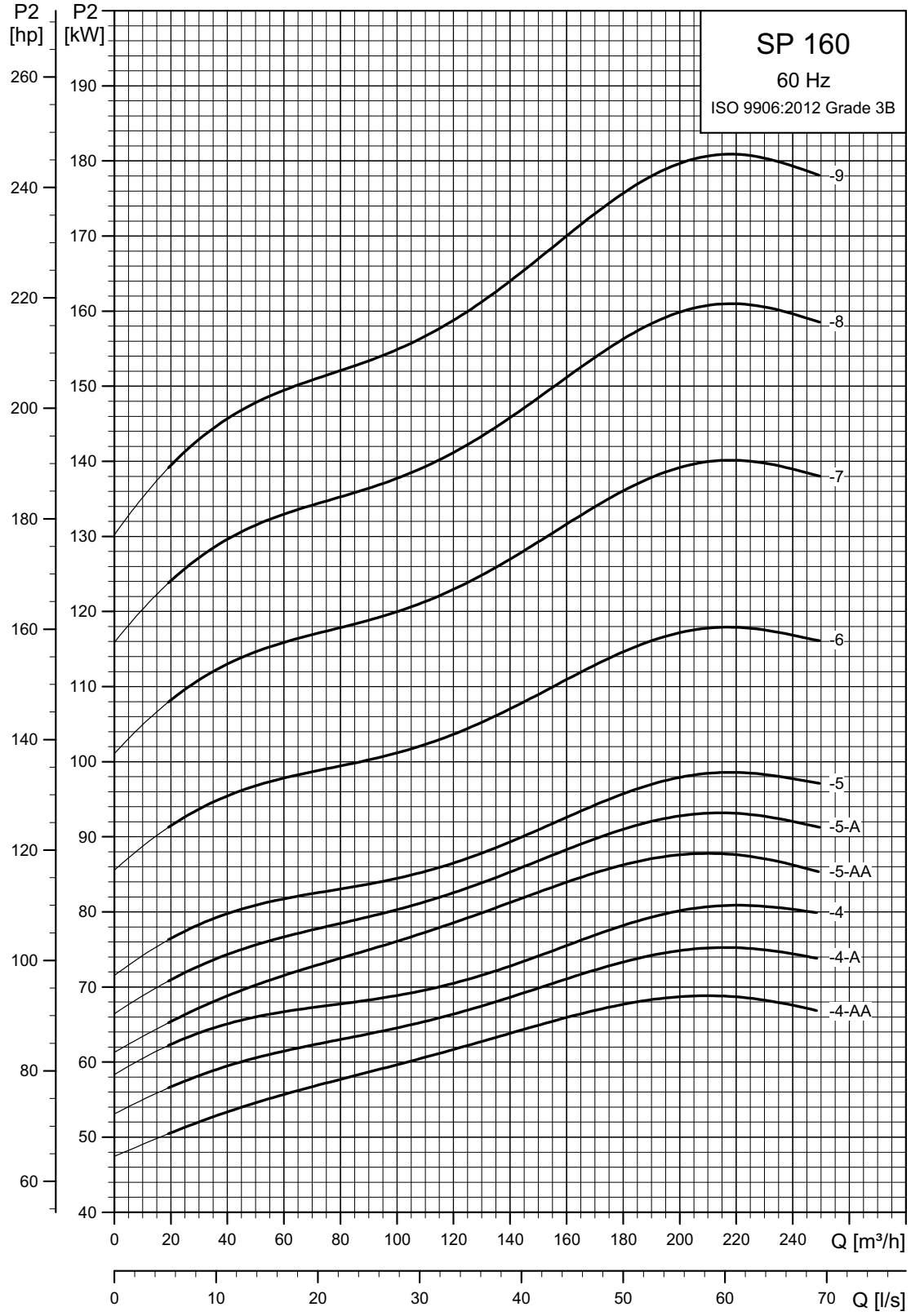
Single-stage curves, axial thrust



TM01 9016 1100

Power curves

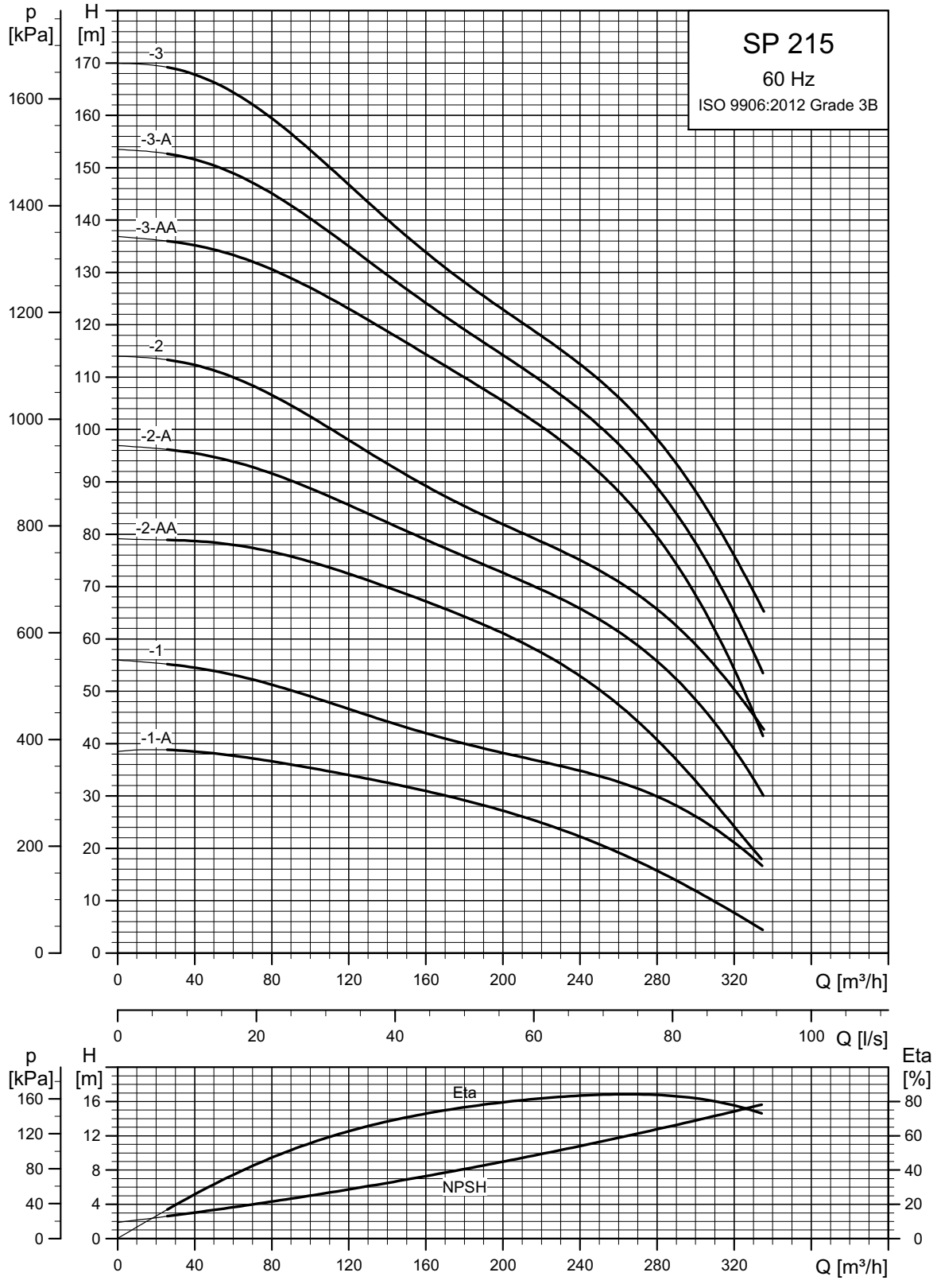




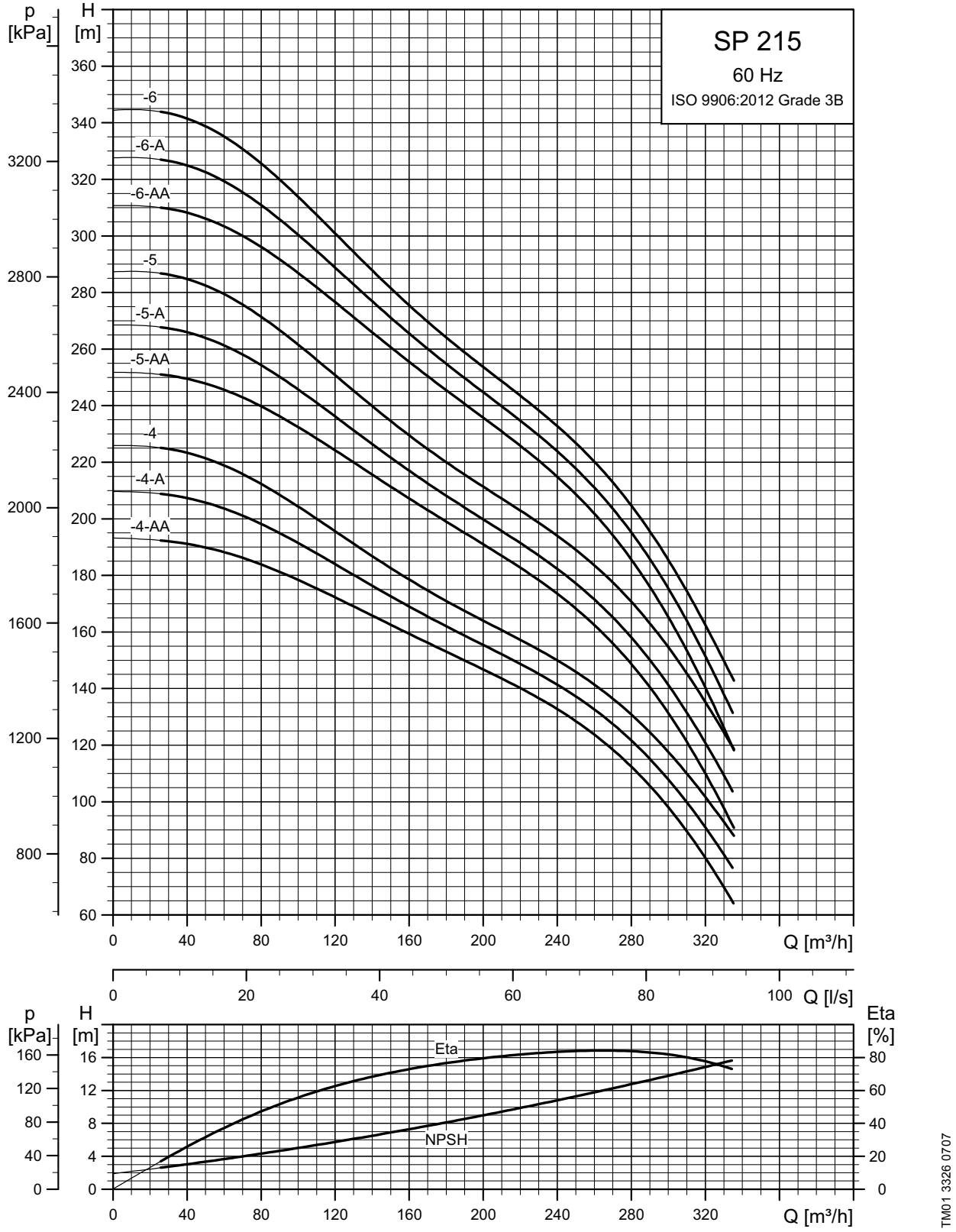
TM01 9250 0707

SP 215

Performance curves

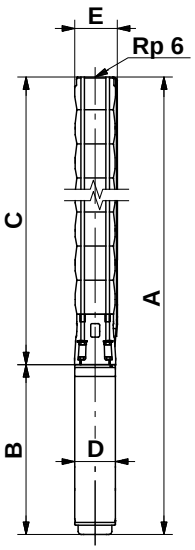


See also *Curve conditions*, page 19.

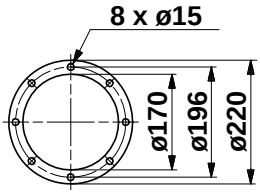


See also *Curve conditions*, page 19.

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[1)]	E[2)]	A	C	E[1)]	E[2)]			
SP 215-1-A	MS 6000	22	1693	790	236	239	1693	790	241	247	903	143	106
SP 215-1	MS 6000	30	1813	790	236	239	1813	790	241	247	1023	143	120
SP 215-2-AA	MMS 8000	45	2236	966	239	244	2236	966	241	247	1270	192	231
SP 215-2-A	MMS 8000	55	2316	966	239	244	2316	966	241	247	1350	192	246
SP 215-2	MMS 8000	63	2456	966	239	244	2456	966	241	247	1490	192	272
SP 215-3-AA	MMS 8000	75	2732	1142	239	244	2732	1142	241	247	1590	192	301
SP 215-3-A	MMS 8000	92	2972	1142	239	244	2972	1142	241	247	1830	192	347
SP 215-3	MMS 8000	92	2972	1142	239	244	2972	1142	241	247	1830	192	347
SP 215-4-AA	MMS 8000	110	3378	1318	239	244	3378	1318	241	247	2060	192	407
SP 215-4-A	MMS 8000	110	3378	1318	239	244	3378	1318	241	247	2060	192	407
SP 215-4	MMS 8000	110	3378	1318	239	244	3378	1318	241	247	2060	192	407
SP 215-5-AA	MMS 10000	132	3364	1494	250	254					1870	237	519
SP 215-5-A	MMS 10000	132	3364	1494	250	254					1870	237	519
SP 215-5	MMS 10000	147	3564	1494	250	254					2070	237	584
SP 215-6-AA	MMS 10000	170	3890	1670	250	254					2220	237	634
SP 215-6-A	MMS 10000	170	3890	1670	250	254					2220	237	634
SP 215-6	MMS 10000	170	3890	1670	250	254					2220	237	634

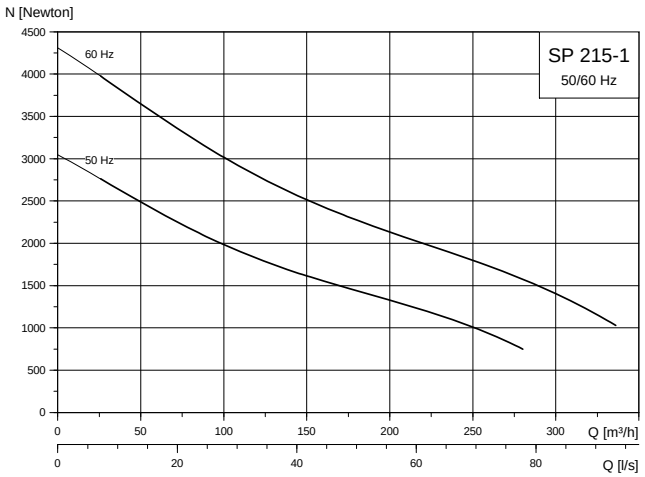
[1)]Maximum diameter of pump with one motor cable.

[2)]Maximum diameter of pump with two motor cables.

The pump types above are also available in N- and R-versions. See page 6.

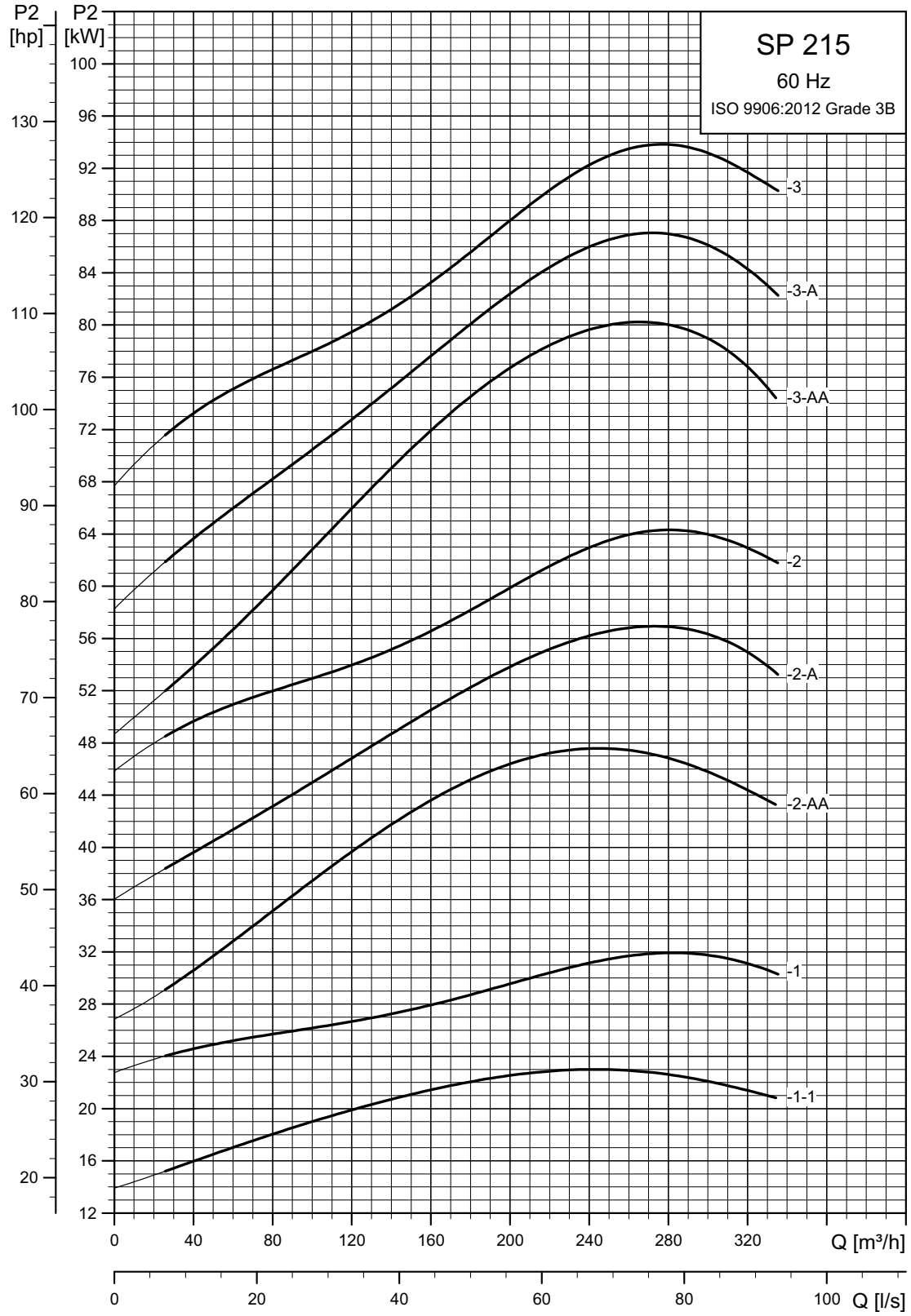
Other types of connection are possible by means of connecting pieces. See page 110.

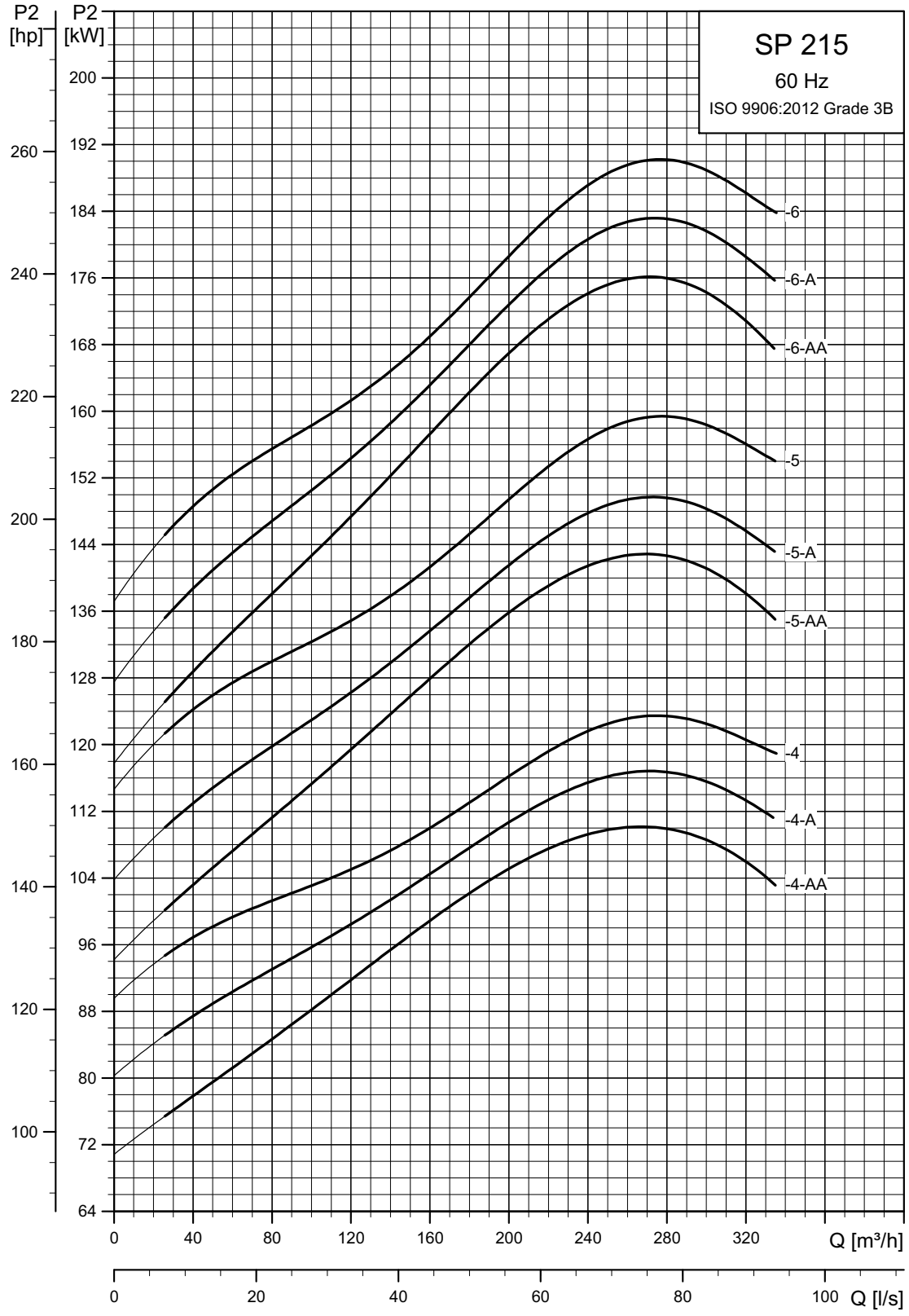
Single-stage curves, axial thrust



TM01 9017 1100

Power curves





TM01 9251 0707

6. Electrical data

Service factor

Service factor indicates to what extend the specific motor can be overloaded. Find values for specific motor sizes in below table.

Output		Service factor
kW	hp	
0.37	0.5	1.6
0.55	0.75	1.5
0.75	1.0	1.4
1.1	1.5	1.3
1.5	2.0	1.25
1.5 <	2.0 <	1.15

1 x 220 V, submersible motors "MS" (SF 1.15 - 1.6)

	Electrical data											Dimensions		
Type	Motor			Max. load current incl. SF I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Diameter [mm]	Length [mm]	Weight [kg]
	Size	Power [kW]	Power [hp]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %				
MS 402	4"	0.25	0.33	4.40	39.0	49.0	54.0	0.48	0.51	0.64	3.0*	95	256	6.8
MS 402	4"	0.37	0.5	5.90	43.0	52.5	56.0	0.46	0.54	0.62	3.6*	95	256	6.8
MS 402	4"	0.55	0.75	8.00	42.5	51.0	57.0	0.47	0.56	0.63	3.7*	95	291	8.2
MS 402	4"	0.75	1.0	9.60	47.0	55.5	60.0	0.50	0.60	0.70	3.8*	95	306	8.9
MS 402	4"	1.1	1.5	11.5	53.5	62.0	67.0	0.60	0.73	0.82	4.0*	95	346	10.5
MS 402	4"	1.1	1.5	13.1	-	-	88.0	-	-	0.63	4.4**	95	346	10.5

* Applies to 2- and 3-wire motors.
** Applies to 2-wire motors.
MS 402 2-wire motors incorporate motor protection and you can connect them directly to the mains.

1 x 230 V, submersible motors "MS" (SF 1.15)

	Electrical data											Dimensions		
Type	Motor			Max. load current incl. SF I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Diameter [mm]	Length [mm]	Weight [kg]
	Size	Power [kW]	Power [hp]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %				
MS 4000	4"	1.5	2.0	13.2	0.53	0.56	0.57	0.70	0.80	0.86	4.3*	95	496	17.0
MS 4000	4"	2.2	3.0	17.0	0.61	0.63	0.62	0.85	0.92	0.94	4.7*	95	576	20.5
MS 4000	4"	3.7	5.0	27.5	0.58	0.63	0.66	0.89	0.94	0.96	4.3*	95	676	25.5

MS 4000 3-wire motors come as CSCR versions and do not incorporate motor protection, the motor is connected via a Grundfos SA-SPM control box.

3 x 220 V, submersible motors "MS" (SF 1.0)

Type	Electrical data											Dimensions		
	Motor			Max. load current incl. SF I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Diameter [mm]	Length [mm]	Weight [kg]
	Size	Power [kW]	Power [hp]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %				
MS 402	4"	0.37	0.5	3.30	57.5	65.0	68.0	0.52	0.63	0.72	5.0	95	241	5.5
MS 402	4"	0.55	0.75	4.80	58.0	65.5	68.0	0.47	0.59	0.70	4.8	95	256	6.3
MS 402	4"	0.75	1.0	5.65	61.0	67.5	71.0	0.50	0.63	0.73	5.0	95	276	7.7
MS 4000R	4"	0.75	1.0	4.60	70.5	72.0	71.1	0.81	0.86	0.88	3.9	95	398	13.0
MS 402	4"	1.1	1.5	7.60	65.0	71.0	73.5	0.50	0.67	0.72	5.5	95	306	8.9
MS 4000R	4"	1.1	1.5	6.10	71.4	74.7	74.8	0.73	0.82	0.86	4.6	95	413	14.0
MS 402	4"	1.5	2.0	9.10	67.0	73.0	75.5	0.54	0.67	0.75	5.5	95	346	10.5
MS 4000R	4"	1.5	2.0	8.20	73.0	74.8	74.5	0.67	0.78	0.85	4.1	95	413	14.0
MS 4000 (R)	4"	2.2	3.0	11.4	73.9	76.6	77.2	0.58	0.71	0.80	4.7	95	453	16.0
MS 4000 (R)	4"	3.0	4.0	14.8	76.9	79.0	78.3	0.60	0.74	0.82	4.7	95	493	17.0
MS 4000 (R)	4"	4.0	5.5	19.0	77.6	79.7	79.2	0.68	0.79	0.85	5.4	95	573	21.0
MS 4000 (R)	4"	5.5	7.5	25.0	80.0	80.5	78.0	0.67	0.80	0.87	5.1	95	673	26.0
MS 6000 (R)	6"	5.5	7.5	16.0	75.5	80.0	80.5	0.56	0.68	0.76	4.5	139.5	541	35.5
MS 6000 (R)	6"	7.5	10.0	20.6	79.5	81.5	82.0	0.61	0.73	0.79	4.6	139.5	571	37
MS 6000 (R)	6"	9.2	12.5	26.0	76.5	80.0	80.5	0.62	0.73	0.80	4.7	139.5	601	42.5
MS 6000 (R)	6"	11.0	15.0	29.5	79.5	82.5	82.5	0.66	0.77	0.82	4.7	139.5	631	45.5
MS 6000 (R)	6"	13.0	17.5	35.0	80	83.5	83.0	0.63	0.74	0.81	4.8	139.5	661	48.5
MS 6000 (R)	6"	15.0	20.0	40.0	80.5	83.5	84.0	0.64	0.76	0.81	5.2	139.5	696	52.5
MS 6000 (R)	6"	18.5	25.0	49.5	81.5	84.0	84.5	0.62	0.74	0.80	5.3	139.5	751	58
MS 6000 (R)	6"	22.0	30.0	56.5	82.5	85.0	85.0	0.67	0.77	0.83	5.1	139.5	811	64

3 x 220 V, submersible rewindable motors "MMS" (SF 1.15)

Type	Electrical data											Dimensions		
	Motor			Max. load current incl. SF I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Diameter [mm]	Length [mm]	Weight [kg]
	Size	Power [kW]	Power [hp]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %				
MMS 6 (N, R)	6"	5.5	7.5	27	65	71	0.77	0.62	0.71	74	3.4	144	807	50
MMS 6 (N, R)	6"	7.5	10	36	68	74	0.76	0.59	0.70	76	3.5	144	837	53
MMS 6 (N, R)	6"	9.2	12	42	72	77	0.78	0.62	0.72	78	3.5	144	867	55
MMS 6 (N, R)	6"	11	15	50.5	73	78	0.76	0.58	0.69	80	3.7	144	897	60
MMS 6 (N, R)	6"	13	18	57.5	75	80	0.78	0.60	0.72	81	3.8	144	927	65
MMS 6 (N, R)	6"	15	20	65.5	76	80	0.78	0.59	0.71	82	4.2	144	997	77
MMS 6 (N, R)	6"	18.5	25	78.5	77	81	0.81	0.63	0.74	82	4.1	144	1057	83
MMS 6 (N, R)	6"	22	30	90.5	81	83	0.81	0.64	0.75	83	5.3	144	1087	95
MMS 6 (N, R)	6"	26	35	106	81	84	0.81	0.64	0.75	84	5.4	144	1157	105
MMS 6 (N, R)	6"	30	40	120	83	85	0.82	0.67	0.78	84	4.7	144	1212	110
MMS 6 (N, R)	6"	37	50	152	81	84	0.84	0.61	0.74	81	5.5	144	1312	120
MMS 8000 (N, R)	8"	22	30	102	75	79	80	0.80	0.85	0.86	4.4	192	1010	126
MMS 8000 (N, R)	8"	26	35	118	75	79	80	0.82	0.87	0.87	4.3	192	1050	134
MMS 8000 (N, R)	8"	30	40	134	77	81	82	0.77	0.84	0.87	5.2	192	1110	146
MMS 8000 (N, R)	8"	37	50	164	78	82	82	0.77	0.84	0.86	5.0	192	1160	156
MMS 8000 (N, R)	8"	45	60	192	80	84	85	0.75	0.83	0.86	5.7	192	1270	177
MMS 8000 (N, R)	8"	55	75	232	82	85	85	0.79	0.86	0.88	5.3	192	1350	192
MMS 8000 (N, R)	8"	63	85	265	83	85	85	0.84	0.89	0.90	4.8	192	1490	218
MMS 8000 (N, R)	8"	75	100	315	83	86	85	0.85	0.89	0.90	4.8	192	1590	237
MMS 10000 (N, R)	10"	75	100	320	83	85	84	0.83	0.87	0.88	4.7	237	1400	280
MMS 10000 (N, R)	10"	92	125	395	82	85	85	0.77	0.84	0.87	4.9	237	1500	330
MMS 10000 (N, R)	10"	110	150	470	82	85	85	0.85	0.88	0.89	4.5	237	1690	385
MMS 10000 (N, R)	10"	132	180	570	82	85	84	0.86	0.89	0.89	4.2	237	1870	435

3 x 380 V, submersible motors "MS" (SF 1.15 - 1.6)

Type	Electrical data											Dimensions		
	Motor			Max. load current incl. SF I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Diameter [mm]	Length [mm]	Weight [kg]
	Size	Power [kW]	Power [hp]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %				
MS 402	4"	0.37	0.5	1.90	57.0	67.0	69.0	0.52	0.64	0.72	5.0	95	241	5.5
MS 402	4"	0.55	0.75	2.80	58.0	65.5	69.0	0.47	0.59	0.70	4.8	95	256	6.3
MS 402	4"	0.75	1.0	3.25	61.0	67.0	71.0	0.50	0.63	0.73	5.0	95	276	7.7
MS 4000R	4"	0.75	1.0	2.65	68.8	71.3	71.3	0.77	0.83	0.87	4.2	95	398	13.0
MS 402	4"	1.1	1.5	4.40	65.0	72.0	72.0	0.49	0.62	0.72	5.5	95	306	8.9
MS 4000R	4"	1.1	1.5	3.65	72.9	74.8	74.4	0.68	0.79	0.85	4.9	95	413	14.0
MS 402	4"	1.5	2.0	5.25	67.5	73.0	76.0	0.53	0.67	0.75	5.5	95	346	10.5
MS 4000R	4"	1.5	2.0	4.90	72.0	74.5	75.2	0.60	0.73	0.82	4.5	95	413	14.0
MS 4000 (R)	4"	2.2	3.0	7.00	70.0	75.0	76.2	0.52	0.66	0.75	4.9	95	453	16.0
MS 4000 (R)	4"	3.0	4.0	9.10	73.4	77.3	78.0	0.54	0.68	0.78	4.9	95	493	17.0
MS 4000 (R)	4"	4.0	5.5	11.4	77.1	79.8	79.9	0.60	0.74	0.82	5.7	95	573	21.0
MS 4000 (R)	4"	5.5	7.5	15.2	79.5	80.7	81.0	0.60	0.74	0.82	5.3	95	673	26.0
MS 6000 (R)	6"	5.5	7.5	16	75.5	80	80.5	0.56	0.68	0.76	4.5	139.5	541	35.5
MS 6000 (R)	6"	7.5	10	20.6	79.5	81.5	82	0.61	0.73	0.79	4.6	139.5	571	37
MS 6000 (R)	6"	9.2	12.5	26	76.5	80	80.5	0.62	0.73	0.80	4.7	139.5	601	42.5
MS 6000 (R)	6"	11	15	29.5	79.5	82.5	82.5	0.66	0.77	0.82	4.7	139.5	631	45.5
MS 6000 (R)	6"	13	17.5	35	80	83.5	83	0.63	0.74	0.81	4.8	139.5	661	48.5
MS 6000 (R)	6"	15	20	40	80.5	83.5	84	0.64	0.76	0.81	5.2	139.5	696	52.5
MS 6000 (R)	6"	18.5	25	49.5	81.5	84	84.5	0.62	0.74	0.80	5.3	139.5	751	58
MS 6000 (R)	6"	22	30	56.5	82.5	85	85	0.67	0.77	0.83	5.1	139.5	811	64
MS 6000 (R)	6"	26	35	67	82.5	84.5	85	0.67	0.77	0.83	5	139.5	871	69.5
MS 6000 (R)	6"	30	40	77.5	83	85	85	0.66	0.76	0.82	5	139.5	941	77.5

3 x 380 V, submersible rewindable motors "MMS" (SF 1.15)

Type	Electrical data											Dimensions		
	Motor			Max. load current incl. SF I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Diameter [mm]	Length [mm]	Weight [kg]
	Size	Power [kW]	Power [hp]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %				
MMS 6 (N, R)	6"	5.5	7.5	15.6	66	72	74	0.62	0.71	0.77	3.4	144	807	50
MMS 6 (N, R)	6"	7.5	10	20.8	68	74	76	0.59	0.70	0.76	3.5	144	837	53
MMS 6 (N, R)	6"	9.2	12	24.2	72	77	78	0.62	0.72	078	3.5	144	867	55
MMS 6 (N, R)	6"	11	15	30.0	71	76	78	0.57	0.69	0.76	3.8	144	897	60
MMS 6 (N, R)	6"	13	18	34.5	73	78	79	0.57	0.69	0.77	3.9	144	927	65
MMS 6 (N, R)	6"	15	20	38.5	74	79	81	0.58	0.70	0.78	4.3	144	997	77
MMS 6 (N, R)	6"	18.5	25	45.5	78	81	83	0.60	0.72	0.79	4.3	144	1057	83
MMS 6 (N, R)	6"	22	30	53.5	81	84	84	0.59	0.71	0.79	5.7	144	1087	95
MMS 6 (N, R)	6"	26	35	61.5	81	84	85	0.62	0.73	0.80	5.9	144	1157	105
MMS 6 (N, R)	6"	30	40	67.0	82	84	84	0.65	0.76	0.81	5.0	144	1212	110
MMS 6 (N, R)	6"	37	50	88.5	81	84	84	0.59	0.72	0.80	5.8	144	1312	120
MMS 8000 (N, R)	8"	22	30	59.0	75	79	80	0.80	0.85	0.86	4.4	192	1010	126
MMS 8000 (N, R)	8"	26	35	69.0	75	79	80	0.81	0.86	0.87	4.4	192	1050	134
MMS 8000 (N, R)	8"	30	40	77.0	77	81	82	0.78	0.84	0.87	5.1	192	1110	146
MMS 8000 (N, R)	8"	37	50	94.0	79	83	83	0.79	0.85	0.87	4.9	192	1160	156
MMS 8000 (N, R)	8"	45	60	110	81	85	85	0.80	0.86	0.88	5.5	192	1270	177
MMS 8000 (N, R)	8"	55	75	132	82	85	86	0.83	0.88	0.89	5.0	192	1350	192
MMS 8000 (N, R)	8"	63	85	152	83	85	85	0.81	0.87	0.89	5.3	192	1490	218
MMS 8000 (N, R)	8"	75	100	182	84	86	85	0.86	0.89	0.90	4.7	192	1590	237
MMS 8000 (N, R)	8"	92	125	220	85	87	86	0.85	089	0.90	4.8	192	1830	283
MMS 10000 (N, R)	10"	75	100	182	82	85	86	0.81	0.86	0.88	5.0	237	1400	280
MMS 10000 (N, R)	10"	92	125	224	82	86	87	0.77	0.84	0.87	5.1	237	1500	330
MMS 10000 (N, R)	10"	110	150	265	83	86	87	0.84	0.88	0.89	4.7	237	1690	385
MMS 10000 (N, R)	10"	132	180	315	84	86	87	0.84	0.88	0.89	4.8	237	1870	435
MMS 10000 (N, R)	10"	147	200	355	83	86	87	0.78	0.85	0.87	5.6	237	2070	500
MMS 10000 (N, R)	10"	170	230	415	83	86	87	0.75	0.83	0.86	5.4	237	2220	540
MMS 10000 (N, R)	10"	190	260	475	82	86	87	0.69	0.79	0.85	5.7	237	2400	580

3 x 460 V, submersible motors "MS" (SF 1.15 - 1.6)

Type	Electrical data											Dimensions		
	Motor			Max. load current incl. SF I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Diameter [mm]	Length [mm]	Weight [kg]
	Size	Power [kW]	Power [hp]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %				
MS 402	4"	0.37	0.5	1.60	58.0	65.0	68.5	0.51	0.64	0.73	5.0	95	241	5.5
MS 402	4"	0.55	0.75	2.30	58.5	65.5	68.5	0.47	0.59	0.69	4.8	95	256	6.3
MS 402	4"	0.75	1.0	2.70	61.5	67.0	71.0	0.50	0.63	0.73	5.0	95	276	7.7
MS 4000R	4"	0.75	1.0	2.20	68.0	71.2	71.3	0.76	0.83	0.87	4.5	95	398	13.0
MS 402	4"	1.1	1.5	3.65	64.5	70.5	73.5	0.49	0.62	0.72	5.5	95	306	8.9
MS 4000R	4"	1.1	1.5	3.00	72.0	74.5	75.0	0.69	0.79	0.85	5.0	95	413	14.0
MS 402	4"	1.5	2.0	4.35	68.0	72.5	75.5	0.54	0.66	0.76	5.5	95	346	10.5
MS 4000R	4"	1.5	2.0	4.05	71.0	74.5	75.2	0.60	0.73	0.82	4.4	95	413	14.0
MS 4000 (R)	4"	2.2	3.0	5.80	70.0	75.0	76.2	0.52	0.65	0.75	4.8	95	453	16.0
MS 4000 (R)	4"	3.0	4.0	7.50	73.4	77.3	78.0	0.54	0.68	0.78	4.9	95	493	17.0
MS 4000 (R)	4"	4.0	5.5	9.45	77.1	79.8	80.0	0.60	0.74	0.82	5.7	95	573	21.0
MS 4000 (R)	4"	5.5	7.5	12.6	79.5	80.7	81.0	0.60	0.74	0.82	5.3	95	673	26.0
MS 4000 (R)	4"	7.5	10	18.0	78.5	80.7	80.6	0.56	0.69	0.79	5.2	95	773	31.0
MS 6000 (R)	6"	5.5	7.5	13.2	76	79.5	80.5	0.56	0.68	0.76	4.5	139.5	541	35.5
MS 6000 (R)	6"	7.5	10	17	78	79	81.5	0.61	0.73	0.79	4.6	139.5	571	37
MS 6000 (R)	6"	9.2	12.5	21.4	77	80	80.5	0.62	0.73	0.80	4.7	139.5	601	42.5
MS 6000 (R)	6"	11	15	24.5	79.5	82.5	82.5	0.66	0.76	0.82	4.7	139.5	631	45.5
MS 6000 (R)	6"	13	17.5	29	80	83	82.5	0.64	0.74	0.81	4.8	139.5	661	48.5
MS 6000 (R)	6"	15	20	33	81	83.5	84	0.64	0.75	0.82	5.2	139.5	696	52.5
MS 6000 (R)	6"	18.5	25	41	81	84	84.5	0.62	0.73	0.80	5.3	139.5	751	58
MS 6000 (R)	6"	22	30	46.5	82.5	85	85	0.67	0.78	0.83	5.1	139.5	811	64
MS 6000 (R)	6"	26	35	55.5	82.5	84.5	85	0.67	0.77	0.83	5	139.5	871	69.5
MS 6000 (R)	6"	30	40	64	82.5	84.5	85	0.66	0.76	0.85	5.6	139.5	941	77.5

3 x 460 V, submersible rewindable motors "MMS" (SF 1.15)

Type	Electrical data											Dimensions		
	Motor			Max. load current incl. SF I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Diameter [mm]	Length [mm]	Weight [kg]
	Size	Power [kW]	Power [hp]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %				
MMS 6 (N, R)	6"	5.5	7.5	13	66	72	74	0.61	0.70	0.76	3.4	144	807	50
MMS 6 (N, R)	6"	7.5	10	17.2	69	74	76	0.59	0.69	0.76	3.5	144	837	53
MMS 6 (N, R)	6"	9.2	12	20.2	71	76	78	0.61	0.72	0.78	3.5	144	867	55
MMS 6 (N, R)	6"	11	15	24.2	72	77	78	0.58	0.70	0.77	3.7	144	897	60
MMS 6 (N, R)	6"	13	20	31	76	79	80	0.63	0.74	0.80	3.9	144	927	65
MMS 6 (N, R)	6"	15	20	32	74	78	80	0.58	0.70	0.78	4.3	144	997	77
MMS 6 (N, R)	6"	18.5	25	38	77	81	82	0.59	0.71	0.79	4.6	144	1057	83
MMS 6 (N, R)	6"	22	30	45	80	83	84	0.57	0.69	0.77	6.15	144	1087	95
MMS 6 (N, R)	6"	26	35	53	80	83	84	0.57	0.69	0.77	6.05	144	1157	105
MMS 6 (N, R)	6"	30	40	58.8	82	85	85	0.61	0.72	0.80	5.2	144	1212	110
MMS 6 (N, R)	6"	37	50	71.5	81	84	83	0.60	0.72	0.82	5.0	144	1312	120
MMS 8000 (N, R)	8"	22	30	48.5	75	79	81	0.73	0.81	0.84	5.3	192	1010	126
MMS 8000 (N, R)	8"	26	35	56.5	76	80	81	0.77	0.83	0.86	5.1	192	1050	134
MMS 8000 (N, R)	8"	30	40	64.0	78	82	83	0.74	0.82	0.85	5.8	192	1110	146
MMS 8000 (N, R)	8"	37	50	78.0	80	83	84	0.74	0.82	0.85	5.5	192	1160	156
MMS 8000 (N, R)	8"	45	60	92.5	82	85	86	0.71	0.80	0.85	6.4	192	1270	177
MMS 8000 (N, R)	8"	55	75	112	82	85	86	0.73	0.82	0.86	5.8	192	1350	192
MMS 8000 (N, R)	8"	63	85	126	83	86	86	0.72	0.82	0.86	6.0	192	1490	218
MMS 8000 (N, R)	8"	75	100	150	84	86	87	0.72	0.82	0.86	5.7	192	1590	237
MMS 8000 (N, R)	8"	92	125	184	85	87	87	0.74	0.83	0.87	6.0	192	1830	283
MMS 8000 (N, R)	8"	110	150	220	84	86	86	0.75	0.83	0.87	5.8	192	2060	333
MMS 10000 (N, R)	10"	75	100	154	81	85	87	0.72	0.80	0.84	5.7	237	1400	280
MMS 10000 (N, R)	10"	92	125	190	82	86	87	0.69	0.78	0.83	5.5	237	1500	330
MMS 10000 (N, R)	10"	110	150	224	82	86	88	0.72	0.80	0.84	5.8	237	1690	385
MMS 10000 (N, R)	10"	132	180	265	83	86	88	0.73	0.82	0.85	5.7	237	1870	435
MMS 10000 (N, R)	10"	147	200	305	82	86	87	0.66	0.77	0.82	6.2	237	2070	500
MMS 10000 (N, R)	10"	170	230	355	82	86	87	0.66	0.76	0.82	5.9	237	2220	540
MMS 10000 (N, R)	10"	190	260	405	82	85	87	0.62	0.73	0.79	6.1	237	2400	580

3 x 460 V, submersible T60 "MS" (SF 1.15)

Type	Electrical data											Dimensions		
	Motor			Max. load current incl. SF I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Diameter [mm]	Length [mm]	Weight [kg]
	Size	Power [kW]	Power [hp]		η50 %	η75 %	η100 %	Cos φ 50 %	Cos φ 75 %	Cos φ 100 %				
MS 4000 T60	4"	2.2	3.0	5.70	72.4	76.3	77.8	0.62	0.74	0.81	5.3	95	493	17
MS 4000 T60	4"	3.0	4.0	7.55	75.2	78.6	80.3	0.61	0.74	0.81	5.6	95	573	21
MS 4000 T60	4"	3.7	5.0	9.05	75.4	79.0	79.6	0.68	0.79	0.83	5.7	95	673	26
MS 4000 T60	4"	4.0	5.5	9.55	75.9	78.8	80.0	0.69	0.70	0.85	5.3	95	673	26
MS 4000 T60	4"	5.5	7.5	13.8	76.2	79.9	81.3	0.55	0.68	0.77	5.5	95	773	31
MS 6000 T60	6"	5.5	7.5	13.2	70.0	75.5	78.0	0.65	0.74	0.80	5.9	139.5	601	42.5
MS 6000 T60	6"	7.5	10.0	16.8	75.0	80.0	81.5	0.71	0.79	0.84	5.9	139.5	568	45.5
MS 6000 T60	6"	9.2	12.5	20.2	78.0	81.5	82.0	0.72	0.80	0.84	5.3	139.5	661	48.5
MS 6000 T60	6"	11.0	15.0	24.2	78.5	82.0	82.0	0.74	0.82	0.85	4.8	139.5	696	52.5
MS 6000 T60	6"	13.0	17.5	28.5	79.5	83.0	83.5	0.72	0.80	0.84	5.3	139.5	751	58.0
MS 6000 T60	6"	15.0	20.0	33.0	78.0	82.5	83.5	0.70	0.79	0.83	5.8	139.5	811	64.0
MS 6000 T60	6"	18.5	25.0	39.5	81.0	84.0	84.5	0.72	0.81	0.85	5.7	139.5	871	69.5
MS 6000 T60	6"	22.0	30.0	47.5	81.0	83.5	84.0	0.71	0.80	0.84	5.6	139.5	941	77.5

7. Electrical accessories

MP 204 motor protector

TM055456 3712

Fig. 20 MP 204 motor protector

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

You cannot use the motor protector in installations where a frequency converter is installed.

The motor protector operates with two sets of limits:

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

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

Some values only have a warning limit.

You can read out the warning with Grundfos GO.

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

Applications

You can use MP 204 as a stand-alone motor protector.

You can monitor the motor protector via a Grundfos GENIbus.

The motor protector protects the motor primarily by measuring the motor current by means of a true RMS measurement.

The motor protector 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 motor protector offers these benefits:

- suitable for both single- and three-phase motors
- dry-running protection
- overload protection
- very high accuracy
- made for submersible pumps.
- monitor motor temperature via motor cable (only motors with tempcon sensor.)

The many monitoring options of the motor protector

The motor protector monitors the following parameters:

- insulation resistance before startup
- temperature (Tempcon, Pt sensor and PTC/thermal switch)
- overload and underload
- overvoltage and undervoltage
- phase sequence
- phase failure
- power factor
- power consumption
- harmonic distortion
- operating hours and number of starts.

Note that monitoring of motor temperature is not possible when you use single-turn transformers.

TM03 2033 3505

Fig. 21 Single-turn transformers

Product numbers, MP 204

Product	Product number
MP 204	96079927
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 to +60 °C
Relative 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 - 30 s
Voltage variation	- 25 %/+ 15 % of rated voltage
Approvals	EN 60947, EN 60335, UL/CSA 508
Marking	CE, cUL, C-tick
Consumption	Maximum 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

For further information about MP 204 and pump controls, see the literature available in Grundfos Product Center at https://product-selection.grundfos.com.

Grundfos GO

The pump is designed for wireless communication with the Grundfos GO app which communicates with the pump via radio communication.

Note that the radio communication between the pump and Grundfos GO is encrypted to protect against misuse.

The Grundfos GO app is available from Apple App Store and Android market.

The Grundfos GO app must be used in conjunction with one of the following mobile interface devices:

Mobile interface	Product number
Grundfos MI 202	98046376
Grundfos MI 204	98424092
Grundfos MI 301	98046408

The Grundfos GO concept replaces the Grundfos R100 remote control. This means that all products supported by the R100 are supported by Grundfos GO.

For functions and connection to the pump, see separate installation and operating instructions for the desired type of Grundfos GO setup.

Mobile interface

The available mobile interface devices are described in the following.

MI 202 and MI 204

MI 202 and MI 204 are add-on modules with built-in infrared and radio communication. MI 202 can be used in conjunction with Apple devices with 30-pin connector (iPhone 4, 4S and iPod touch 4G).

MI 204 can be used in conjunction with Apple devices with lightning connector (iPhone 5, 5C, 5S and iPod touch 5G, and newer IOS devices).

Fig. 22 MI 202 and MI 204

The following are supplied with the product:

- Grundfos MI 202 or 204
- sleeve
- quick guide
- charger cable.

MI 301

MI 301 is a module with built-in infrared and radio communication. MI 301 must be used in conjunction with an Android or iOS-based Smartphone with a Bluetooth connection. MI 301 has a rechargeable Li-ion battery that you must charge separately.

Fig. 23 MI 301

The following are supplied with the product:

- Grundfos MI 301
- sleeve
- battery charger
- quick guide.

Supported units

Make	Model	Operating system	MI 202	MI 204	MI 301
Apple	iPod touch 4G	iOS 5.0 or later	•	-	•
	iPhone 4, 4S		•	-	•
	iPod touch 5G and newer versions	iOS 6.0 or later	-	•	•
	iPhone 5, 5C, 5S and newer versions		-	•	•
HTC	Desire S	Android 2.3.3 or later	-	-	•
	Sensation	Android 2.3.4 or later	-	-	•
Samsung	Galaxy S II		-	-	•
	Galaxy Nexus	Android 4.0 or later	-	-	•
LG	Google Nexus 4	Android 4.2 or later	-	-	•

Note that similar Android and iOS-based devices may work as well, but Grundfos does not support these devices.

CUE frequency converter

GrA4404 3407

Fig. 24 The CUE range

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 overload protection. If overheating protection of motor windings is desired, Pt100/1000 together with MCB 114 sensor input module can provide this protection.

If the motors have built in Tempcon sensor, this sensor will be disconnected when exposed to frequency convert drive. A internal fuse in the motor blows and cannot be replaced. The motor will work without the sensor, but it is not possible to restore tempcon functionality.

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

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			•	•			

CUE is available in two enclosure classes:

- IP20/21
- IP54/55.

RFI filters

To meet the EMC requirements, 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 and industry
3 x 525-600	0.75 - 7.5	C3	Industry
3 x 525-690	11-25	C3	

Functions

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

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

CUE features

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

Sensors

The following sensors can be used in connection with 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.

Accessories for CUE

Grundfos offers various accessories for CUE.

MCB 114 sensor input module

MCB 114 offers additional analog inputs for CUE:

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

Output filters

Output filters protect the motor from overvoltage and increased operating temperature. The filters reduce voltage stress on the motor windings and stress on the motor insulation system. The filters also decrease acoustic noise from the frequency converter-driven motor.

Grundfos offers two types of output filters as CUE accessories

- dU/dt filters
- sine-wave filters.

dU/dt filters

dU/dt filters reduce the voltage peaks and dU/dt of the pulses at the motor terminals. The voltage at the motor terminals is pulse-shaped; the motor current has a sine-wave shape without commutation spikes.

Sine-wave filters

Sine-wave filters have a higher degree of filtering, resulting in high reduction of motor insulation stress and elimination of switching acoustic noise from the motor. The motor losses are reduced as the motor is fed with a sine-wave voltage and because the filter eliminates the pulse reflections in the motor cable.

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. For MS and MMS motors, Grundfos recommends sine-wave filters.

The selection depends on these factors:

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

Pump type	Motor type	dU/dt filter [motor cable length]	Sine-wave filter [motor cable length]
SP with up to 380 V motor	MS, MMS	0-100 m	0-300 m
SP with above 380 V motor	MS, MMS	NA	0-300 m

Cables used in CUE installations

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

- installation in EMC-insensitive sites. See fig. 25.
- installation in EMC-sensitive sites. See fig. 26.

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

Note that drop cables are always unscreened.

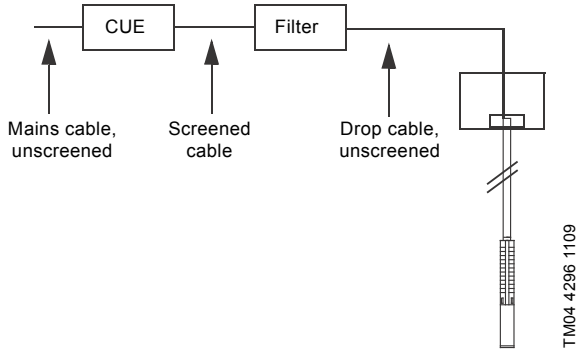


Fig. 25 Example of installation in EMC-insensitive sites

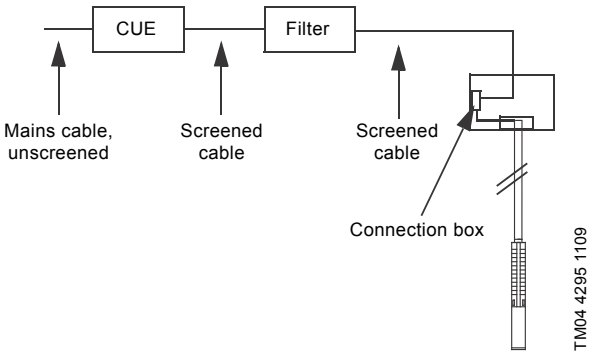


Fig. 26 Example of installation in EMC-sensitive sites

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

CUE is the right choice of frequency converter in SP installations as it meets all basic issues.

CUE has a pre-installed startup 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. Note that Tempcon sensors do not work with frequency converter operation.
Reduce peak voltages (maximum 800 V peaks).	Never exceed peak voltages of 850 V at motor leads.
For MS and MMS, we recommend using 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. It is determined by the equipment in 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 CUE.
Constant operation at minimum 30 Hz.	Too low speed => low flow and thereby poor lubrication of journal bearings.
Size 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 minimum m/s along the stator housing must be considered.
Ensure that the pump is used within the range of the pump curve.	Focus on outlet pressure and sufficient Net Positive Suction Head, as vibrations will 'kill' the motor.

CIU communication interface units

GrA6118 3908

Fig. 27 Grundfos CIU communication interface unit

The Communication Interface Unit (CIU) enables data communication via open and interoperable networks, such as:

– PROFIBUS DP
– PROFINET
– Modbus RTU
– Modbus TPC
– LONWorks
– BACnet MS/TP
– BACnet/IP
– GSM/GPRS
– 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

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. 28 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	•	-
CIU 500	PROFINET Modbus TPC BACnet/IP GRM IP**	•	•

* Grundfos Remote Management (GRM) is an easy-to-install low-cost solution for wireless monitoring and management of Grundfos products.
** Requires external 3G/4G modem

CIU Product numbers

CIU unit	Fieldbus protocol	Product number
CIU 100	LONWorks	96753735
CIU 150	PROFIBUS	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
CIU 500	PROFINET Modbus TPC BACnet/IP GRM IP**	96953894

* Antenna not included. See below.

Antennas for CIU 250 and 270/271

Description	Product number
Antenna for roof	97631956
Antenna for desk	97631957

SA-SPM 6 control boxes

TM03 8150 3908

SA-SPM 6 control boxes are used as starting units for single-phase, 3-wire motors.

SA-SPM 6 is available in two versions, standard and DeLuxe.

- Standard: Incorporates a motor-protective circuit breaker and thus protects the motor against overload.
- Deluxe: Identical to the standard version, but also incorporates a motor contactor for connection and disconnection of the power supply.

Technical data

Enclosure class	IP42/NEMA Type 3R
Ambient temperature	-20 to +60 °C
Relative airhumidity	Maximum 95 %, normal non-aggressive atmosphere

Product number

Motor size kW/hp	Standard	Deluxe	Product number
0.37 / 0.5	•		98315251
0.55 / 0.75	•		98315252
0.75 / 1.0	•		98315253
1.1 / 1.5	•		98315254
1.1 / 1.5		•	98315255
1.5 / 2.0	•		98315256
1.5 / 2.0		•	98315257
2.2 / 3.0	•		98315258
2.2 / 3.0		•	98315259
3.7 / 5.0	•		98315260
3.7 / 5.0		•	98315261

PR 5714 with Pt100 sensor

GrA3187

Fig. 29 PR 5714 with Pt100 sensor

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.

To set the warning limit, observe the temperature at normal operation and add 10 °C. Additionally add 10 °C for stop limit.

Technical data

	PR 5714
Enclosure class	IP65 (fitted in a control panel)
Ambient temperature	-20 to +60 °C
Relative 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		Voltage	Product number
	GrA3186 0407	24-230 VAC, 50/60 Hz / 24-250 VDC	96913234

Pt100 sensor, including cable for standard-, N- and R-versions		Cable length [m]	Product number
	GrA3190 0407	20	96913237
		40	96913253
		60	96913256
		80	96913260
		100	96913263

Staybolt kits for Pt100 in 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
		Insertion probe for Pt100/Pt1000 in MMS 10000 and MMS 12000. Material: EN 1.4539/AISI 904L (R-version)	99298250

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

Extension kit for sensor cable for Pt100/Pt1000		Description	Product number
	TM00 7885 2296	Extension kit for Pt100/Pt1000 sensor cable. For watertight shrink-joining of the sensor cable. Extra sensor cable must be ordered separately.	99039717

Sensor cable		Description	Product number
	TM00 7882 2296	Drop cable for extension: 4x1 mm^2 Mention length when ordering. Maximum recommended length: 350 m.	00RM5271

MS motor cables

See the following tables for information about additional motor cables for the MS 402, MS 4000, and MS 6000 range.

Drinking water approval

TML-B cables are drinking water compatible with ACS and KTW approvals.

For more information on sizing cables, see *Cable sizing*, page 117.

Note that the maximum permissible voltage drop in the motor cable is 3 %.

Note that always dimension motor cables that are not submerged in the pumped liquid as submersible drop cables.

MS 402 three-phase motor cables

TML-B motor cables with EPR outer sheath (ethylene propylene rubber)

Motor type	Length [m]	Plug steel grade	Cross-section [mm^2]	Plug for drop cable	Product number
MS 402	10	Standard	4 G 1.5	No	00795752
	15				00795753
	20				00795754
	30				00795755
	40				00798890
	50				00795800
	60				98115565
	70				98162757
	80				98162787
	90				98162790
	110				98162804
	120				98163288
MS 402	1.7	Standard	4 G 1.5	Yes	00795712
	2.5				00795739
	5				00798891
	10				00798892

MS 4000 three-phase motor cables

TML-B motor cables with EPR outer sheath (ethylene propylene rubber)					
Motor type	Length [m]	Cross-section [mm²]	Plug for drop cable	Product numbers	
				Plug steel grade standard	Plug steel grade R
MS 4000	10	4 G 1.5	Yes	00795620	00795861
	20			00795621	00795862
	30			00795622	00795863
	40			00795623	00795864
	50			00795624	00795865
	60			00795625	00799924
	70			00795626	00799923
MS 4000	10		No	00795632	00795873
	20			00795633	00795872
	30			00795634	00795871
	40			00795635	00795870
	50			00795636	00795869
	60			00795637	00799926
	70			00795638	00799925
MS 4000	50	4G 2.5		-	96800534
	80			-	97949530
	130			-	96893810
	150			-	96893838
	170			-	96893844

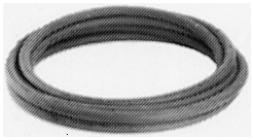
MS 4000 environmental three-phase motor cables

PTFE motor cables with teflon outer sheath				
Motor type	Length [m]	Cross-section [mm²]	Plug for drop cable	Product numbers
				Plug steel grade R
MS 4000	10	4 G 2.5	No	00795667
	20			00795668
	30			00795669
	40			00795670
	50			00795671
	60			00795672
	70			00795673
	80			00795674
	90			00795675
	100			00795676
	110			96476404
	120			96426909
	200			96432567

MS 6000 three-phase motor cables

TML-B motor cables with EPR outer sheath (ethylene propylene rubber)					
Motor type	Length [m]	Cross-section [mm²]	Plug for drop cable	Product numbers	
				Plug steel grade N	Plug steel grade R
MS 6000	10	4G 6.0	No	96164211	96300113
	20			96164212	96300115
	30			96164213	96300117
MS 6000	10	4G 10.0		96164215	96300124
	20			96164216	96300126
	30			96164217	96300128
	40			99522680	96300129
	50			96164218	96300130

Submersible drop cable

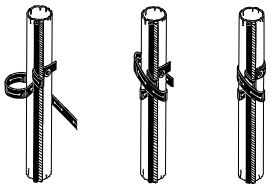
Product	Description	Number of leads and nominal cross-section [mm²]	Outer cable diameter min. / max. [mm]	Weight [kg/m]	Product number
 TM00 7882 2296	Suitable for these applications: • continuous application in groundwater and potable water (approved for potable-water applications) • connection of electrical 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	00ID4072
		1 x 35	14.0 / 18.5	0.560	00ID4073
		1 x 50	16.5 / 21.0	0.740	00ID4074
		1 x 70	18.5 / 23.5	1.000	00ID4075
		1 x 95	21.0 / 26.5	1.300	00ID4076
		1 x 120	23.5 / 28.5	1.650	00ID4077
		1 x 150	26.0 / 31.5	2.000	00ID4078
		1 x 185	27.5 / 34.5	2.500	00ID4079
		4G1.5	10.5 / 13.5	0.190	00ID4063
		4G2.5	12.5 / 15.5	0.280	00ID4064
		4G4.0	14.5 / 18.0	0.390	00ID4065
		4G6.0	16.5 / 22.0	0.520	00ID4066
		4G10	22.5 / 24.5	0.950	00ID4067
		4G16	26.5 / 28.5	1.400	00ID4068
		4G25	32.0 / 34.0	1.950	00ID4069
		4G35	33.0 / 42.5	2.700	96432949
		4G50	38.0 / 48.5	3.600	96432950
		4G70	43.0 / 54.5	4.900	96432951

Submersible drop cables with plug

Submersible drop cable with plug to MS402 MS4000 with 2 plug motor cable.

Product	Cable length [m]	Product number
 Gr-1016935	4 x 1.5 mm²	
	15	0079H001
	20	0079H002
	25	0079H003
	30	0079H004
	40	0079H005
	50	0079H006
	70	0079H008
	100	0079H009
	4 x 2.5 mm²	
	15	0079H021
	20	0079H022
	25	0079H023
	30	0079H024
	40	0079H025
	50	0079H026
	70	0079H028
	100	0079H029
	4 x 4 mm²	
	15	0079H041
	20	0079H042
	25	0079H043
	30	0079H044
	40	0079H045
	50	0079H046
	70	0079H048

Cable clips

Product	Description	Product number
 TM00 1369 5092	For fastening of cable and straining wire to the riser pipe. The clips must be fitted every 3 metres. One set for approximately 45 m riser pipe. • 16 cable buttons. • 7.5 m rubber band.	00115016

Cable termination kit with plug for MS4000 and MS402

Product	Description	Version	Product number	
			N-version	R-version
 TM00 7883 2296	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	00799901	00799955
		For cables up to 4 x 6 mm^2	00799902	00799918

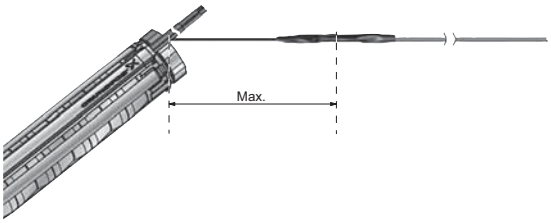
Cable termination kit, type KM

For instruction on how to make the cable termination between motor cable and drop cable, see the KM quick guide available in Grundfos Product Center at http://net.grundfos.com/qr/i/V7065924.

Grundfos recommendation

First termination of motor cable and drop cable should be placed maximum 1/2 meter above the pump end.

Do not attempt to join two cables that have a larger cross-section span than stated in the following table.



TM06 9876 0817

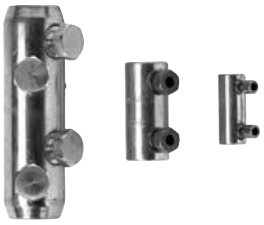
Motor cable [mm^2]	Drop cable, maximum increase per step. [mm^2]			
2.5	6.0	16.0	50.0	-
6.0	16.0	35.0	70.0	150.0
10.0	25.0	50.0	120.0	240.0
16.0	50.0	120.0	240.0	-
25.0	70.0	150.0	240.0	-
35.0	70.0	150.0	240.0	-
50.0	120.0	240.0	-	-
70.0	150.0	240.0	-	-

Possible cable termination		Content of kit	Motor cable [mm^2]	Drop cable [mm^2]	Number of leads	Product number
Motor cable	Drop cable					
			KM kits with pressed connections:			
			1.5 - 6	1.5 - 6	4	00116251
			6-16	6-16	4	00116252
			10-25	10-25	4	00116255
			KM kits with screw connectors:			
			6-35	6-35	4	96636867
			25-70	25-70	4	96636868

Possible cable termination		Content of kit	Motor cable [mm^2]	Drop cable [mm^2]	Number of leads	Product number
Motor cable	Drop cable					
			KM kits with pressed connections:			
			1.5 - 6	1.5 - 6	4	00116257
			6-16	6-16	4	00116258
			10-50	10-50	4	96637330
			16-70	16-70	4	96637332
			1.5 - 6	1.5 - 6	3	00116253
			10-25	10-25	3	00116254
			10-50	10-50	3	96637318
			16-70	16-70	3	96637331

Possible cable termination		Content of kit	Motor cable [mm^2]	Drop cable [mm^2]	Number of leads	Product number
Motor cable	Drop cable					
			KM kits with pressed connections:			
			10-70	10-70	1	96828296
			32-120	32-120	1	00116256
			KM kits with screw connectors:			
			95-240	95-240	1	96637279
			Note that a KM termination kit for single conductors only consist of material for one connection. When ordering, keep in mind how many kits are needed for a complete cable termination.			

Cable termination kit, types M0 to M4

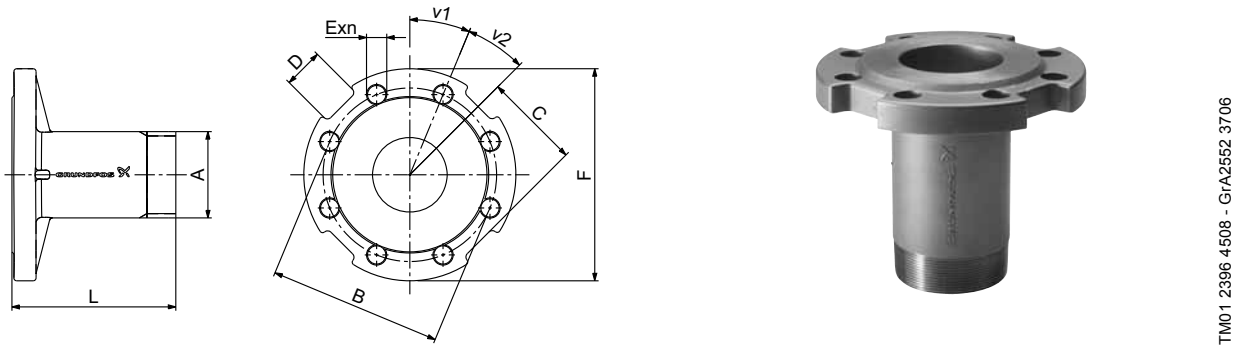
Product	Description	Version			Product number
		Type	Diameter of cable joint [mm]	Outer cable diameter [mm]	
 TM04 4981 2309	For watertight joining of motor cable and submersible drop cable. The joint is encapsulated by the glue which is part of the kit.	M0	∅40	∅6 - ∅15	ID8903
		M1	∅46	∅9 - ∅23	ID8904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

8. Mechanical accessories

Connecting pieces / Adaptors

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)

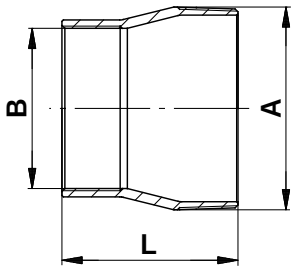


TM01 2396 4508 - GrA2552 3706

Fig. 30 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	30	30	4	00120125	00120911
		R 2 1/2 → DN 65 PN 16/40	R 2 1/2	145	71	30	∅19	∅185	170	22.5	22.5	8	00120126	00120910
		R 2 1/2 → DN 80 PN 16/40	R 2 1/2	160	82.5	40	∅19	∅200	170	22.5	22.5	8	00120127	00120909
SP 30 SP 46 SP 60	Rp 3	R 3 → DN 65 PN 16/40	R 3	145	71	30	∅19	∅185	170	22.5	22.5	8	00130187	00130920
		R 3 → DN 80 PN 16/40	R 3	160	82.5	40	∅19	∅200	170	22.5	22.5	8	00130188	00130921
		R 3 → DN 100 PN 40	R 3	190	100	40	∅23	∅235	170	22.5	22.5	8	00130189	00130922
		R 3 → DN 100 PN 16	R 3	180	100	40	∅19	∅220	170	22.5	22.5	8	00130210	00130867
SP 46 SP 60	Rp 4	R 4 → DN 100 PN 16	R 4	180	100	40	Ø19	Ø235	180	22.5	22.5	8	00140077	00140737
		R 4 → DN 100 PN 40	R4	190	100	40	Ø23	Ø235	180	22.5	22.5	8	00140071	00140577
SP 77 SP 95	Rp 5	R 5 → DN 100 PN 16	R 5	180	82	35	∅19	∅220	195	22.5	22.5	8	00160159	00160657
		R 5 → DN 100 PN 40	R 5	190	82	35	∅23	∅235	195	22.5	22.5	8	00160148	00160646
		R 5 → DN 125 PN 16	R 5	210	99	37	∅19	∅250	195	22.5	22.5	8	00160157	00160655
		R 5 → DN 125 PN 40	R 5	220	99	37	∅28	∅270	195	22.5	22.5	8	00160149	00160647
		R 5 → DN 150 PN 16	R 5	240	115	36	∅23	∅285	195	22.5	22.5	8	00160161	00160659
		R 5 → DN 150 PN 40	R 5	250	115	36	∅28	∅300	195	22.5	22.5	8	00160150	00160648
SP 125 SP 160 SP 215	Rp 6	R 6 → DN 125 PN 16	R 6	210	99	36	∅19	∅250	195	22.5	22.5	8	00170170	00170694
		R 6 → DN 125 PN 40	R 6	220	99	36	∅28	∅270	195	22.5	22.5	8	00170159	00170596
		R 6 → DN 150 PN 16	R 6	240	114	36	∅23	∅285	195	22.5	22.5	8	98518437	98518487
		R 6 → DN 150 PN 40	R 6	250	114	36	∅28	∅300	195	22.5	22.5	8	00170160	00170597
		R 6 → DN 200 PN 16	R 6	295	134	36	∅23	∅340	195	15	15	12	00170161	00170598
		R 6 → DN 200 PN 40	R 6	320	151	36	∅31	∅375	200	15	15	12	00170162	00170599

Thread-to-thread



TM01 2397 4508 - TM06 9783 3317

Fig. 31 Dimensional sketch and photo of a connecting piece thread-to-thread

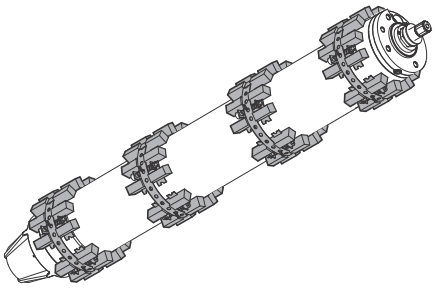
Type	Pump outlet	Connecting piece	Dimensions			Product number		
			Thread-to-thread		L [mm]			
			A	B		EN 1.4301	EN 1.4401	EN 1.4539
SP 77 SP 95	Rp 5	R 5 → Rp 4	R 5	Rp 4	121	00190063	00190585	96917293
		R 5 → Rp 6	R 5	Rp 6	150	00190069	00190591	96917296
	5" NPT	5" NPT → 4" NPT	5" NPT	4" NPT	121	00190064	00190586	00190964
		5" NPT → 6" NPT	5" NPT	6" NPT	150	00190070	00190592	00190965
SP 125 SP 160 SP 215	Rp 6	R 6 → Rp 5	R 6	Rp 5	150	00200130	00200640	00200971
	6" NPT	6" NPT → 5" NPT	6" NPT	5" NPT	150	00200135	00200645	00200970

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. 32.



TM05 0537 1211

Fig. 32 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.

More information about zinc anodes and product numbers are available in SP accessories data booklet.

Flow sleeves

Grundfos offers a complete range of stainless-steel flow sleeves for both vertical and horizontal operation. We recommend flow sleeves 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 a 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.

See example.

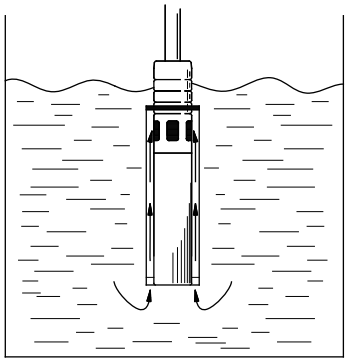
More information about flow sleeves and product numbers are available in SP accessories data booklet.

TM01 0751 2197 - TM01 0750 2197

Fig. 33 Flow sleeves

Example of calculated flow sleeve

The flow sleeve is fitted to the submersible motor so that the liquid passes close by the motor on its way towards the pump suction interconnector, thus ensuring optimum cooling of the motor. See fig. 34.



TM01 0509 1297

Fig. 34 Flow sleeve function

The flow sleeve is designed so that the flow velocity past the motor is minimum 0.5 m/s and maximum 3 m/s to ensure optimum pump operating conditions.

Use this formula to calculate the flow velocity:

$$V = \frac{Q \times 353}{D^2 - d^2} \text{ [m/s]}$$

Q	m^3/h	Flow rate
D	mm	Sleeve diameter
d	mm	Pump diameter

9. Certificates

Grundfos SP offers a number of certificates and reports.

When you want a certificate or a report, the request must be stated on the order.

The certificate or the report will then be put into the bill of materials and thus included in the product number of the pump.

Certificates or reports have to be confirmed for every order.

SP certificates

Part number	Description
96643421	Test certificate non- specified. Inspec+test
96643425	Inspection certificate internal
96699829	Inspection certificate 3. party
96643428	Material specification report
96643430	Cleaned and dried pump report
96553738	Certificate of compliance with the order

ISO 9906:2012 test report

Part number	Test report title
96643427	F. SP pump Grade 3B
98354724	F. SP pump Grade 3B, Witness
97686936	F. SP Pump Grade 2B
98354729	F. SP Pump Grade 2B, Witness
98354721	F. SP pump Grade 2U
98354735	F. SP Pump Grade 2U, Witness
97686935	F. SP pump Grade 1B
98354726	F. SP pump Grade 1B, Witness
98354697	F. SP pump Grade 1U
98354731	F. SP pump Grade 1U, Witness
98354699	F. SP pump Grade 1E
98354734	F. SP pump Grade 1E, Witness

ISO 9906:2012 tolerance factors

	Grade 1			Grade 2		Grade 3	Independent of grade P2 <= 10 kW	
	1U	1E	1B	2B	2U	3B		
Flow rate [τ_Q]	+ 10 %	± 5 %	± 5 %	± 8 %	± 16 %	± 9 %	± 10 %	Mandatory
Head [τ_H]	+ 6 %	± 3 %	± 3 %	± 5 %	± 10 %	± 7 %	± 8 %	
Efficiency [τ_η]	≥ 0 %	≥ 0 %	- 3 %	- 5 %	- 5 %	- 7 %	$-[10(1-\frac{P_2}{10})+7]$ %	Optional

Note that acc. to ISO 9906:2012 these tolerance factors apply ≤ 10 kW independent of Grade. However Grundfos has decided not to use this possibility.

Example of certificate

Test certificate non- specified. Inspec+test

Test certificate
Non-specific inspection and testing

EN 10204 2.2

Complete pump :

Customer name	
Customer order no.	
Manufactured by.	Grundfos A/S - DK
Grundfos order no.	

Pump		
Pump type		Part number
Motor make		Part number
Flow	m^3/h	
Head	m	
Power P2	kW	
Voltage	V	
Frequency	Hz	
Full load current	A	
Motor speed	min^{-1}	

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and / or specifications relative thereto.

Grundfos authorized Department

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no 96643421

be think innovate GRUNDFOS

TM07 3151 4718

Inspection certificate internal

Inspection certificate 3.1/3.2 (Annex A)
EN 10204

Complete pump :

Customer name	
Customer order no.	
Manufactured by	Grundfos A/S - DK
Grundfos order no.	

Pump		Motor	
Pump type		Make	
Part number		Part number	
Serial number	-	Serial number	-
Flow rate (m^3/h)		P2 (kW)	
Head (m)		Voltage (V)	
	Din / EN.	Current (A)	
Chamber		n (min^{-1})	
Impeller		Frequency (Hz)	
Shaft		Insulation class	
Suction Interconnector		Power factor	
Valve casing			
Straps			

Costumer's requirements			
Flow rate (m^3/h)		Head (m)	

Test result ref. requirements. According to ISO9906, Annex A									
Q(m^3/h)		H(m)		n(min^{-1})		I(A)		P1(kW)	

The pump has been marked :

Inspected by : Grundfos authorized Department

Surveyor signature:
Tested date:

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no 96643425

be think innovate GRUNDFOS

TM07 3152 4718

Inspection certificate 3rd party

Inspection certificate 3.1/3.2 (Annex A)
EN 10204

Complete pump :

Customer name	
Customer order no.	
Manufactured by	Grundfos A/S - DK
Grundfos order no.	

Pump		Motor	
Pump type		Make	
Part number		Part number	
Serial number		Serial number	
Flow rate (m^3/h)		P2 (kW)	
Head (m)		Voltage (V)	
	Din / EN	Current (A)	
Chamber		n (min^{-1})	
Impeller		Frequency (Hz)	
Shaft		Insulation class	
Suction Interconnector		Power factor	
Valve casing			
Straps			

Costumer's requirements			
Flow rate (m^3/h)		Head (m)	

Test result ref. requirements. According to ISO9906, Annex A									
Q(m^3/h)		H(m)		n(min^{-1})		I(A)		P1(kW)	

The pump has been marked	
Inspected by	

Surveyor signature:

Tested date:

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no 96699829

be think innovate GRUNDFOS

TM07 3153 4718

Material specification report

Material specification report.

Complete pump :

Customer name	
Customer order no.	
Manufactured by	Grundfos A/S - DK
Grundfos order no.	

Pump type	
Part number	
Production code	

Pump	Raw Material no.	DIN W.-Nr.	AISI / ASTM
Chamber			
Impeller			
Shaft			
Suction Interconnector			
Valve casing			
Straps			

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and/or specifications relative thereto.

Grundfos authorized Department

GRUNDFOS
Date:

Signature:
Name:
Dept.:

Part no 96643428

be think innovate GRUNDFOS

TM07 3154 4718

Cleaned and dried pump report

Cleaned and dried pump

Complete pump :

Customer name	
Customer order no.	
Manufactured by	Grundfos A/S - DK
Grundfos order no.	

Pump type	
Part number	
Produktion code	

Grundfos hereby confirms that prior to assembly, pump components are washed in pure, hot soap water, rinsed in de-ionized water and dried.

The pump is wrapped in a plastic bag before being packed.

The pump has not been performance-tested.

Grundfos authorized Department.

GRUNDFOS
Date:

Signature:

Name:

Dept.:

Part no 96643430

be think innovate GRUNDFOS

TM07 3155 4718

Certificate of compliance with the order

Certificate of compliance with the order

Complete pump :

Customer name	
Customer order no.	
Manufactured by	Grundfos A/S - DK
Grundfos order no.	
Product type	

We the undersigned hereby guarantee and certify that the materials and/or parts for the above mentioned product were manufactured by Grundfos, tested, inspected, and conform to the full requirements of the appropriate catalogues, drawings and/or specifications relative thereto.

Grundfos authorized Department

GRUNDFOS

Date:

Signature:

Name:

Dept.:

Part no 96553738

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TM07 3156 4718

ISO 9906:2012 test report - F. SP pump Grade 3B

Test Report for SP Pump

ISO 9906: 2012 Grade 3B

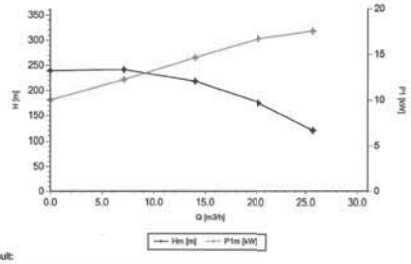
Customer:
Order Number:
Operator:
Certificate Part Number: 96643427

Serial number: 98357225p312410001
Date: 18/10/2012 13:38
Testbed: 508276

Pump type: SP1715 RP 2 1/2
Product Number: 98357225

Motor manufacturer MS60 00

Measured values for tested pump



Result:

	Qm [m3/h]	Hm [m]	n [1/min]	η_total [%]	EsQ [kWh/m3/h]	EsQH [kWh/m3/h/m]
Point 1	25.67	121.05	3457	48	0.68	0.007
Point 2	20.32	176.02	3463	58	0.82	0.007
Point 3	14.02	218.39	3479	57	1.05	0.008
Point 4	7.13	241.53	3500	38	1.72	0.011
Point 5	0.00	239.45	3519	0	0.00	0

	U1 [V]	U2 [V]	U3 [V]	f [Hz]	I_Avg [A]	I1 [A]	I2 [A]	I3 [A]	Cos(ϕ)	P1m [kW]
Point 1	441.0	439.0	439.0	60	26.78	27.04	26.94	26.26	0.86	17.56
Point 2	441.0	439.0	440.0	60	25.64	25.82	25.81	25.30	0.86	16.75
Point 3	440.0	439.0	439.0	60	22.81	22.99	22.92	22.51	0.84	14.65
Point 4	441.0	439.0	440.0	60	19.67	19.90	19.61	19.49	0.81	12.23
Point 5	440.0	439.0	440.0	60	16.92	17.03	16.86	16.88	0.78	10.01

GRUNDFOS

TM07 2188 4718

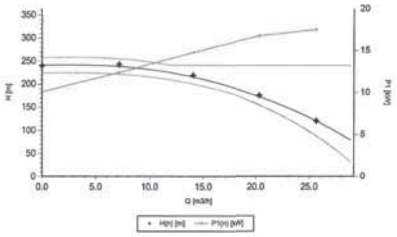
Test Report for SP Pump

ISO 9906: 2012 Grade 3B

Customer:
Order Number:
Operator:
Certificate Part Number: 96643427

Serial number: 98357225p312410001
Date: 18/10/2012 13:38
Testbed: 508276

Measured values calculated to nominal speed n_nom



Result:

	Q(n) [m3/h]	H(n) [m]	P1(n) [kW]	n_nom [1/min]
Point 1	25.63	120.75	17.50	3452.83
Point 2	20.32	176.00	16.75	3462.9
Point 3	14.04	219.12	14.73	3484.89
Point 4	7.16	242.99	12.38	3510.61
Point 5	0.00	240.16	10.06	3534.34

GRUNDFOS

TM07 2189 4718

Test Report for SP Pump

ISO 9906: 2012 Grade 3B

Customer:
Order Number:
Operator:
Certificate Part Number: 96643427

Serial number: 98357225p312410001
Date: 18/10/2012 13:38
Testbed: 508276

Measured values

U	=	Voltage	Cos(ϕ)	=	Power factor
f	=	Frequency	n	=	Speed
I_Avg	=	Average current			
Qm	=	Measured flow			
Hm	=	Measured Total Head			
P1m	=	Measured Motor Power Input			

Calculated values

Q(n)	=	Flow at nominal speed	η_total	=	Total Efficiency
H(n)	=	Total Head at nominal speed	η_pump	=	Pump efficiency
P1(n)	=	Motor Power Input at nominal speed	EsQ	=	Specific energy consumption
			EsQH	=	Specific energy consumption

Formulas

Q(n)	=	Qm x (n_nom/n)	H	=	Head_Sta + Head_Dyn + Head_Geo + Head_f
H(n)	=	Hm x (n_nom/n)²	Head_Static	=	Static Pressure head
P1(n)	=	P1m x (n_nom/n)³	Head_Dyn	=	Dynamic head
η_total	=	(g x Qm x Hm x ρ) / P1m	Head_Geo	=	Geometric elevation head
η_pump	=	η_total / η_motor	Head_f	=	Friction head
EsQ	=	P1m / Qm	EsQH	=	P1m / Qm / Hm

Legend and test conditions:

- Measurements were made with sinkless water at approximately 20 °C and a kinematic viscosity of 1mm²/s (= 1 cSt)
- The test bed is calibrated according to ISO 9001

Calibration Date:

Test Facility:

Grundfos Danmark
GL. Viborgvej 79
Aalestrup
9620
Danmark
Phone:
Fax:

Tested Date

Signed by

24/01/2013 13:02:04
www.grundfos.com

GRUNDFOS

TM07 2190 4718

10. Cable sizing

Cables

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

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. See *Submersible drop cable*, page 106.

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.

Note that a cable sizing tool is available at www.grundfos.com

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

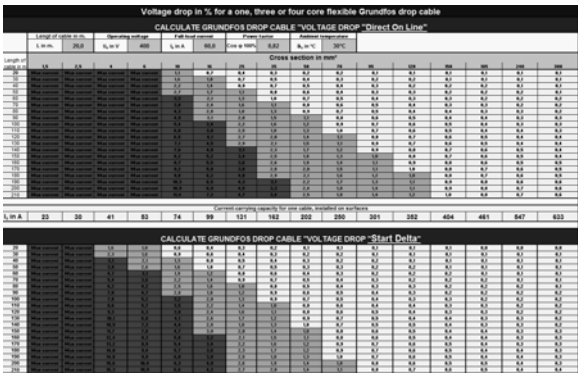


Fig. 35 Cable sizing tool

Maximum cable length for a single-phase submersible pump:

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

Maximum cable length for 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.

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

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

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

You can read the values of the rated current (I) and the power factor (cos φ) in the tables on pages 119.

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, you achieve an annual saving of 564 kWh.

Operating time: 10 years.

Saving after 10 years (A_{10}):

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

You must calculate the saved amount in the local currency.

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 $\sqrt{3}$.

11. 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.

12. Grundfos Product Center

Online search and sizing tool to help you make the right choice.

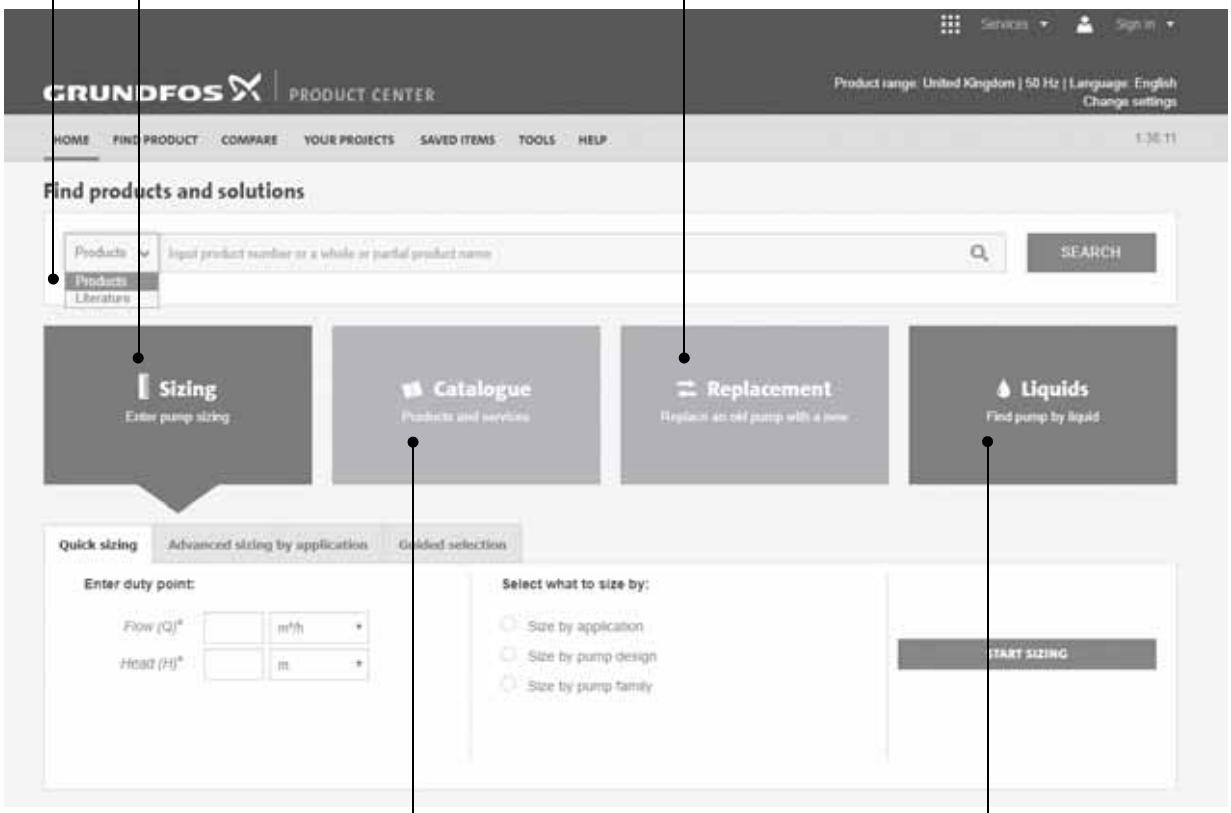
http://product-selection.grundfos.com

This drop-down menu enables you to set the search function to "Products" or "Literature".

"SIZING" enables you to size a pump based on entered data and selection choices.

"REPLACEMENT" enables you to find a replacement product. Search results will include information on the following:

- the lowest purchase price
- the lowest energy consumption
- the lowest total life cycle cost.



"CATALOGUE" gives you access to the Grundfos product catalogue.

"LIQUIDS" enables you to find pumps designed for aggressive, flammable or other special liquids.

All the information you need in one place

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

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