SP A, SP

Submersible pumps
Submersible motors
Accessories

For raw water supply, irrigation systems, groundwater lowering, pressure boosting and various industrial applications.

60 Hz

TM00 7318 2298

GRUNDFOS®

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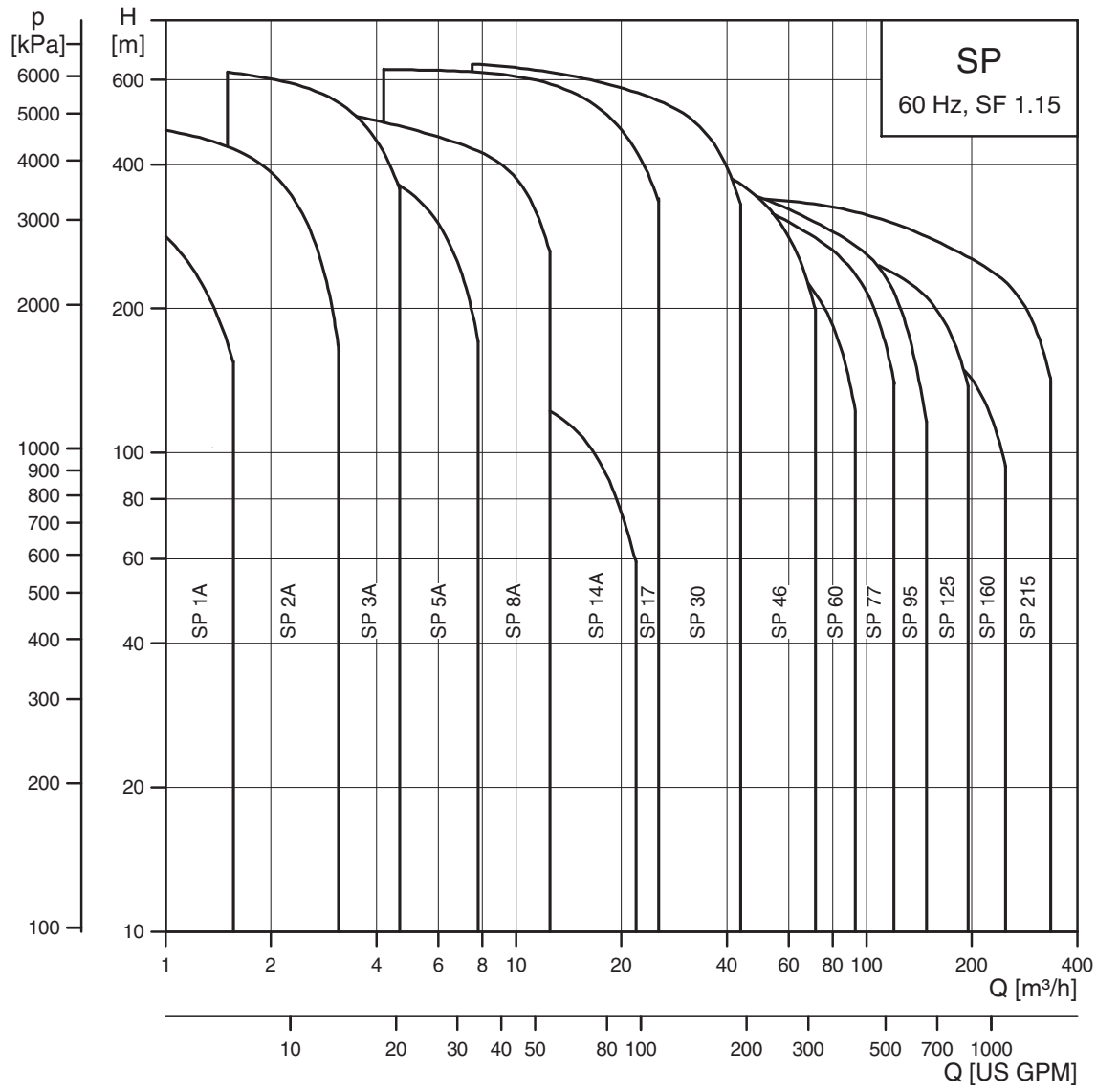
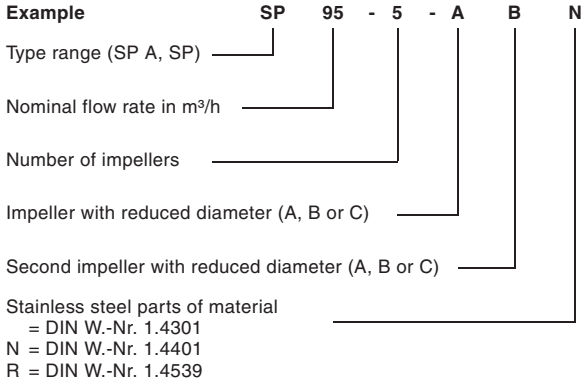
Performance range



General data

Type key



Pumped liquids

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

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

Operating conditions

Flow rate, Q: 0.1-335 m³/h.
Head, H: Maximum 646 m.

Maximum liquid temperature:

Motor	Installation		
	Flow velocity past motor	Vertical	Horizontal
Grundfos MS 4" and 6"	Free convection 0 m/s	20°C	Flow sleeve-recommended
Grundfos MS 4" and 6"	0.15 m/s	40°C	40°C
Grundfos MS industry versions 4" and 6"	0.15 m/s	60°C	60°C
Grundfos MMS 6" to 12" rewindable	Free convection 0 m/s	20°C	20°C
	0.15 m/s	25°C	25°C
	0.50 m/s	30°C	30°C

Note: For MMS 6000, 37 kW, MMS 8000, 110 kW, and MMS 10000, 170 kW, the maximum liquid temperature is 5°C lower than the values stated in the table above. For MMS 10000, 190 kW the temperature is 10°C lower.

Operating pressure:

Motor	Maximum operating pressure
Grundfos MS 4" and 6"	6 MPa (60 bar)
Grundfos MMS 6" to 12" rewindable	2.5 MPa (25 bar)

Curve conditions

The conditions below apply to the curves shown on the following pages:

General

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

  The speed of the motors is approximately:
  4" motors : n = 3470 min^{-1}
  6" motors : n = 3460 min^{-1}
  8" to 12" motors : n = 3525 min^{-1}
- The measurements were made with airless water at a temperature of 20°C. The curves apply to a kinematic viscosity of 1 mm²/s (1 cSt). When pumping liquids with a density higher than that of water, motors with correspondingly higher outputs must be used.
- The bold curves indicate the recommended performance range.
- The performance curves are inclusive of possible losses such as non-return valve loss.

SP A curves

- **Q/H:** The curves are inclusive of valve and inlet losses at the actual speed.
- **Power curve:** P_2 shows pump power input at the actual speed for each individual pump size.
- **Efficiency curve:** Eta shows pump stage efficiency.

SP curves

- **Q/H:** The curves are inclusive of valve and inlet losses at the actual speed.
  Operation without non-return valve will increase the actual head at nominal performance by 0.5 to 1.0 m.
- **NPSH:** The curve is inclusive of suction interconnector and shows required inlet pressure.
- **Power curve:** P_2 shows pump power input at the actual speed for each individual pump size.
- **Efficiency curve:** Eta shows pump stage efficiency.

Pump range

Type	SP1A	SP2A	SP3A	SP5A	SP8A	SP14A	SP17	SP30	SP46	SP60	SP77	SP95	SP125	SP160	SP215
Steel: DIN 1.4301 AISI 304	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Steel: DIN 1.4401 AISI 316			+	+	+		+	+	+	+	+	+	+	+	+
Steel: DIN 1.4539 AISI 904L					+		+	+	+	+					
Connection *	Rp 1¼	Rp 1¼ (R 1¼)	Rp 1¼	Rp 1½ (R 1½)	Rp 2 (R 2)	Rp 2	Rp 2½ (R 3)	Rp 3 (R 3)	Rp 3 Rp 4 (R 4)	Rp 3 Rp 4	Rp 5	Rp 5	Rp 6	Rp 6	Rp 6
Flange connection: Grundfos flange											5"	5"	6"	6"	6"

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

Motor range

Motor output [kW]	0.25	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
Single-phase	+	+	+	+	+	+	+																							
Three-phase		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Industrial motor							+	+	+	+	+	+	+	+	+	+	+	+												
Rewindable motor									+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Steel: DIN 1.4301 AISI 304	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+										
Steel: DIN 1.4301 and cast iron									+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Steel: DIN 1.4401 AISI 316									+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Steel: DIN 1.4539 AISI 904L				+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+										
Built-in temperature transmitter in motor				+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+										

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

Soft starter or autotransformer is recommended above 75 kW.

Motors with star/delta are available from 5.5 kW.

Motor protection and controllers

Motor output [kW]	0.37	0.55	0.75	1.1	1.5	2.2	3.0	3.7	4.0	5.5	7.5	9.2	11	13	15	18.5	22	26	30	37	45	55	63	75	92	110	132	147	170	190
MTP 75 *			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+											
CU 3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Pt100								+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Zinc anode				+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Vertical flow sleeve	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Horizontal flow sleeve	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+											
SA-SPM	+	+	+	+	+	+																								
R100	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
RS-485 communi-cation module	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
G100	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
SM100 sensor module	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

* Requires motor with built-in temperature transmitter.

Motor protection af single-phase motor, see "Technical data" page 71.

Features and benefits

A wide pump range

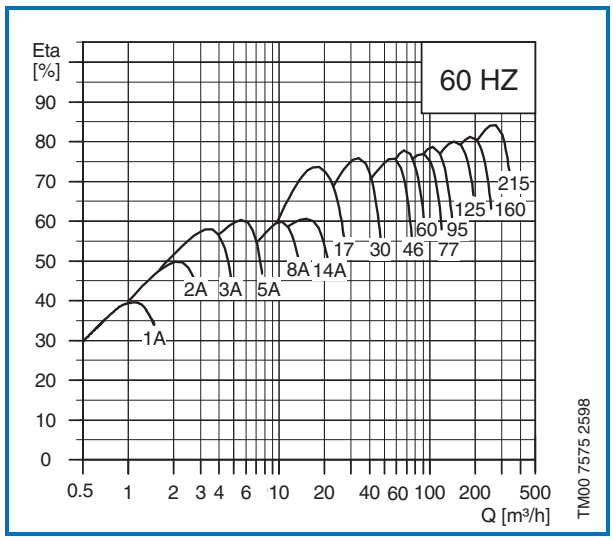
Grundfos offers submersible pumps with energy-efficient duty points ranging from 0.1 to 335 m³/h. The pump range consists of many pump sizes - and each pump size is available with an optional number of stages to match any duty point.

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 m³/h with a head of 100 m for a period of 10 years EURO 60,000 will be saved if a pump/motor having a 10% higher efficiency is chosen and the price is EURO 0.10 per kWh.



Applications

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

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

SP N: DIN W.-Nr. 1.4401 (AISI 316)
SP R: DIN W.-Nr. 1.4539 (AISI 904L)

Alternatively, a complete range of zinc anodes for cathodic protection is available, see page 88. For example this may be advisable for sea water applications.

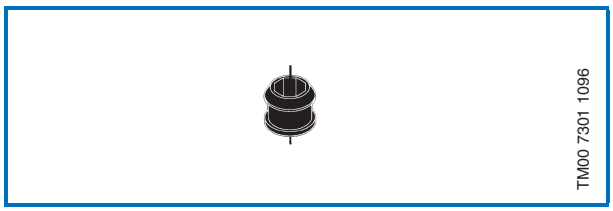
For slightly polluted liquids containing for example oil, Grundfos offers a complete range (SP NE) in stainless steel to DIN W.-Nr. 1.4401 (AISI 316) with all rubber parts made of FKM.

Low installation costs

Stainless steel means low weight facilitating the handling of pumps and resulting in low equipment costs and reduced installation and service time. In addition pumps will be as new after service due to the high wear resistance of stainless steel.

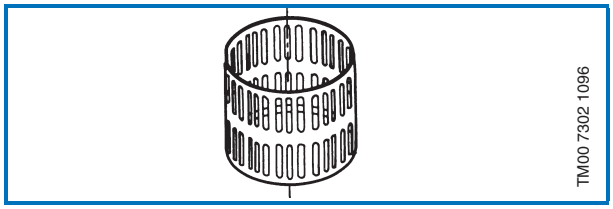
Bearings with sand channels

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



Inlet strainer

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

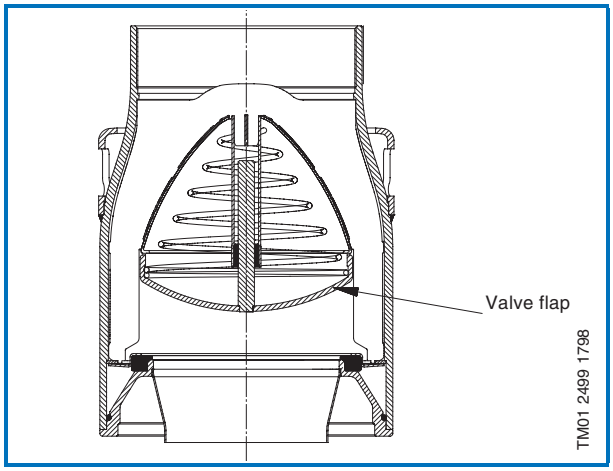


Non-return valve

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

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

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

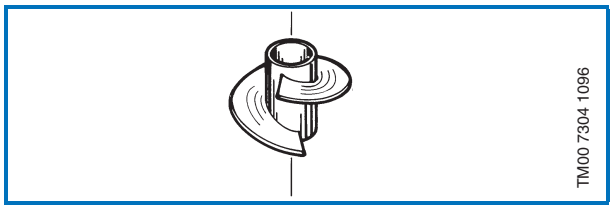


Priming screw

All SP A and SP 17 pumps are fitted with a priming screw. Consequently, dry running is prevented, because the priming screw will make sure that pump bearings are always lubricated.

Due to the semi-axial impellers of large SP pumps (except for SP 17) this priming is automatically provided.

However, it applies to all pump types that if the water table is lowered to a level below the pump inlet neither pump nor motor will be protected against dry running.



Stop ring

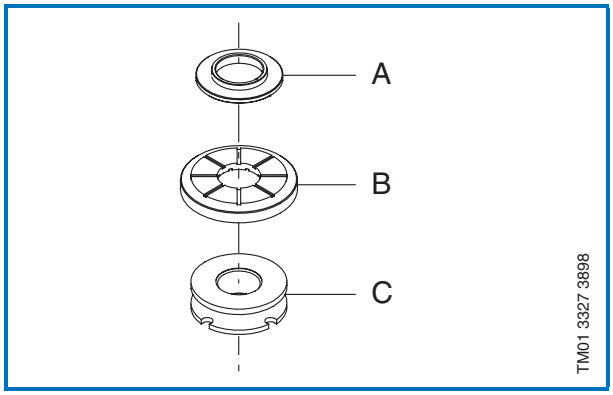
The stop ring prevents damage to the pump during transport and in case of up-thrust in connection with start-up.

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

Example: SP 77

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

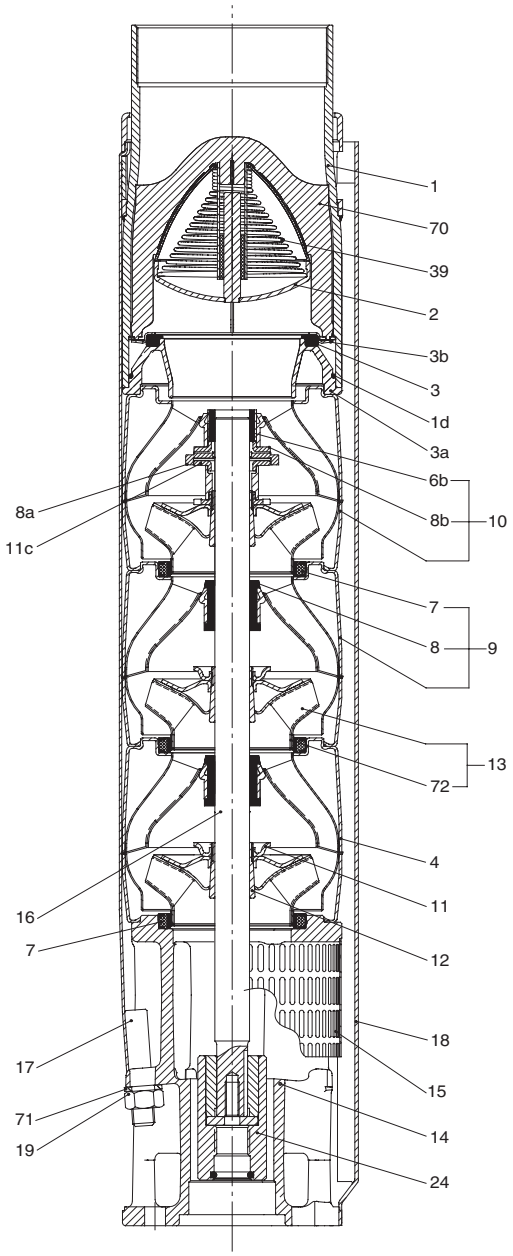
The rotating part (B) is fitted above the split cone (C).



Material specification

Pos.	Components	Materials	Standard		N-version	
1	Valve casing	Stainless steel	1.4301	304	1.4401	316
1d	O-ring	NBR				
2	Valve cup	Stainless steel	1.4301	304	1.4401	316
3	Valve seat	Stainless steel	1.4301	304	1.4401	316
3a	Lower valve seat retainer	Stainless steel	1.4301	304	1.4401	316
3b	Upper valve seat retainer	Stainless steel	1.4301	304	1.4401	316
4	Bottom chamber	Stainless steel	1.4301	304	1.4401	316
6b	Lower bearing	Stainless steel/ NBR	1.4301	304	1.4401	316
7	Neck ring	NBR/PPS				
8	Intermediate bearing	NBR				
8a	Spacing washer for stop ring	Carbon/graphite HY22 in PTFE mass				
8b	Stop ring	Stainless steel	1.4401	316	1.4401	316
9	Intermediate chamber	Stainless steel	1.4301	304	1.4401	316
10	Upper inter-mediate cham-ber with stop ring	Stainless steel	1.4301	304	1.4401	316
11	Split cone nut	Stainless steel	1.4301	304	1.4401	316
11c	Nut for stop ring	Stainless steel	1.4401	316	1.4401	316
12	Split cone	Stainless steel	1.4301	304	1.4401	316
13	Impeller	Stainless steel	1.4301	304	1.4401	316
14	Suction interconnector	Stainless steel	1.4301	304	1.4401	316
15	Strainer	Stainless steel	1.4301	304	1.4401	316
16	Shaft	Stainless steel	1.4057	431	1.4460	329
17	Strap	Stainless steel	1.4301	304	1.4401	316
18	Cabel guard	Stainless steel	1.4301	304	1.4401	316
19	Nut for strap	Stainless steel	1.4301	304	1.4401	316
24	Coupling	Stainless steel	1.4460	329	1.4460	329
39	Spring for valve cup	Stainless steel	1.4301	304	1.4401	316
70	Valve guide	Stainless steel	1.4301	304	1.4401	316
71	Washer	Stainless steel	1.4401	316	1.4401	316
72	Wear ring	Stainless steel	1.4301	304	1.4401	316

Example: SP 77



Submersible motors

Features and benefits

A complete motor range

Grundfos offers a complete submersible motor range in different voltages:

Submersible motors, MS:

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

Submersible rewindable motors, MMS:

- 6" motors, three-phase from 3.7 kW up to 37 kW
- 8" motors, three-phase from 22 kW up to 110 kW
- 10" motors, three-phase from 75 kW up to 190 kW

High motor efficiency

Within the area of high motor efficiency Grundfos is a market leader. This is due to a newly developed motor concept which is introduced with the MS 4000 and MS 6000 motors.

Rewindable motors

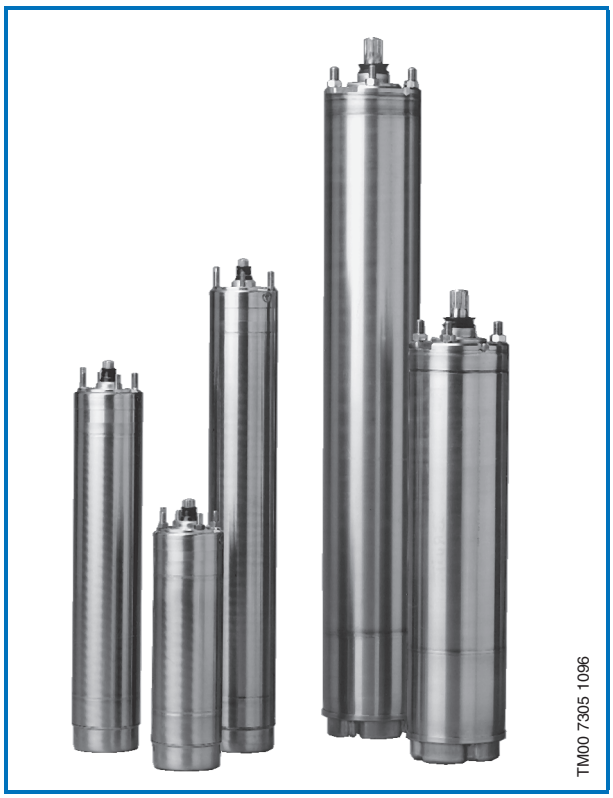
The two pole Grundfos MMS submersible motors, which are all of the canned-rotor type, are easily rewinded. The windings of the stator are made of a special water-proof wire of pure electrolytic copper sheathed with special non-hydroscopic thermoplastic material. The high dielectric strength properties of this material allow direct contact between the windings and the liquid for efficient cooling of the windings.

Industrial motors

For heavy-duty applications Grundfos offers a complete motor range of industrial motors with up to 5% higher efficiency than that of Grundfos' standard motors. The industrial motors are available in sizes from 2.2 kW up 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 flow of minimum 0.15 m/s past the motor.The industrial motors are for customers who value low operating costs and long life higher than price.

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

MS motors



MMS motors

Overtemperature protection

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

Restart of the motor after cut-out can be achieved in two ways:

- manual restart or
- automatic restart.

Automatic restart means that the CU 3 control unit attempts to restart the motor after 15 min. If the first attempt is not successful, restarting will be reattempted at 30-minute intervals.

MS:
The Grundfos MS submersible motors are available with a built-in Tempcon temperature transmitter for protection against overtemperature. By means of the transmitter it is possible to read out and/or monitor the motor temperature via an MTP 75 or a CU 3 control unit.

The Grundfos MS 6000 submersible motors can be fitted with a Pt100. The Pt100 is fitted in the motor and connected via a relay (EDM 35 or PR 2202), which can be connected to the CU 3 control unit.

MMS:
For the protection of the Grundfos MMS submersible motors against overtemperature Grundfos offers the Pt100 temperature sensor as an optional extra.

The Pt100 is fitted in the motor and connected via a relay (EDM 35 or PR 2202), which can be connected to the CU 3 control unit.

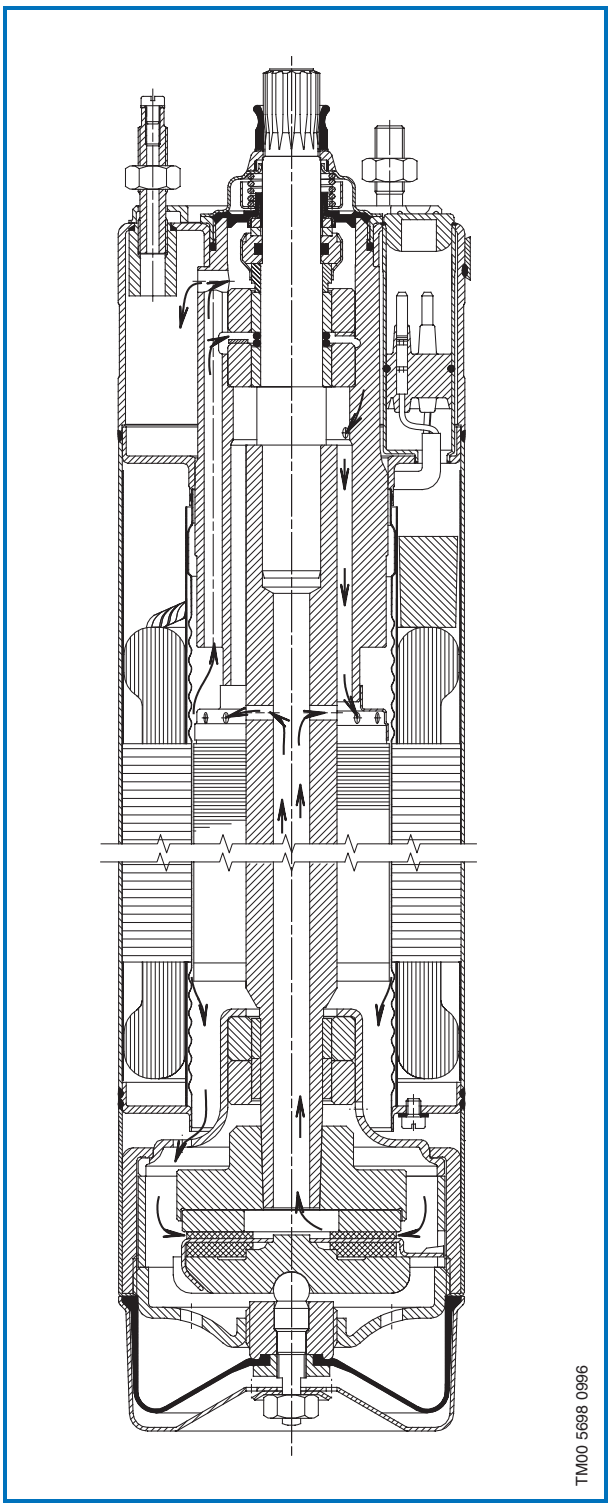
Protection against upthrust

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

Built-in cooling chambers

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

Example: MS 4000



Lightning protection

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

Reduced risk of short-circuit

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

Shaft seal

MS 402

The shaft seal is of the lip seal type characterized by low friction against the rotor shaft.
The choice of rubber offers good wear resistance, good elasticity and resistance to particles. The rubber material is approved for use in drinking water.

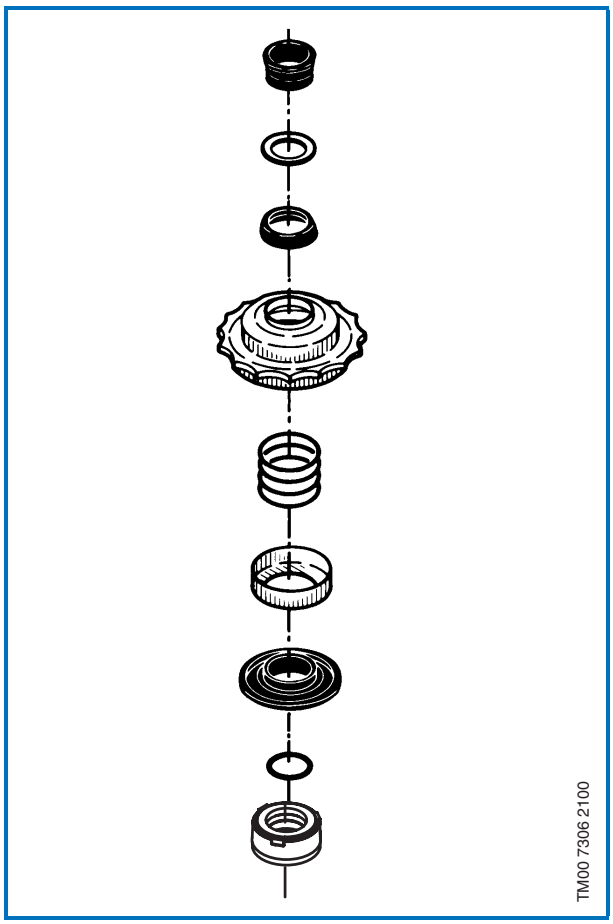
MS 4000, MS 6000

The choice of material is ceramic/tungsten carbide providing optimum sealing, optimum wear resistance and long life.
The spring loaded shaft seal is designed with a large surface and a sand shield. The result is a minimum exchange of pumped and motor liquids and no penetration of particles.

MMS rewindable motors

The standard shaft seal is a rubber lip type. The shaft seal is replaceable.
The material features 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.

Example: MS 4000



Material specification for MS motors

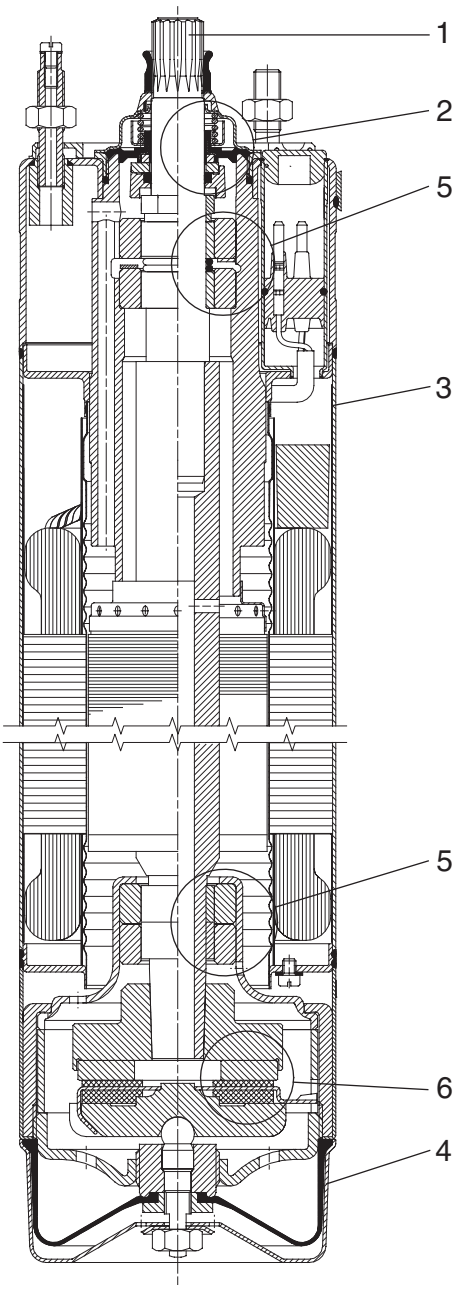
Submersible motors

Pos.	Part	MS 402	MS 4000 MS 6000
1	Shaft (DIN W.-Nr.)	1.4057	1.4057
2	Shaft seal (DIN W.-Nr.)	NBR rubber	Tungsten carbide/ ceramic
3	Motor sleeve (DIN W.-Nr.)	1.4301	1.4301
4	Motor end shield (DIN W.-Nr.)		1.4301
5	Radial bearing	Ceramic	Ceramic/ tungsten carbide
6	Axial bearing	Ceramic/ carbon	Ceramic/ carbon
	Rubber parts	NBR rubber	NBR rubber

R-version motor

Pos.	Part	MS 4000 MS 6000
1	Shaft (DIN W.-Nr.)	1.4462
2	Shaft seal	NBR/ceramic
3	Motor sleeve (DIN W.-Nr.)	1.4539
4	Motor end shield (DIN W.-Nr.)	1.4539
5	Radial bearing	Ceramic/ tungsten carbide
6	Thrust bearing	Ceramic/carbon
	Rubber parts	NBR

Example: MS 4000

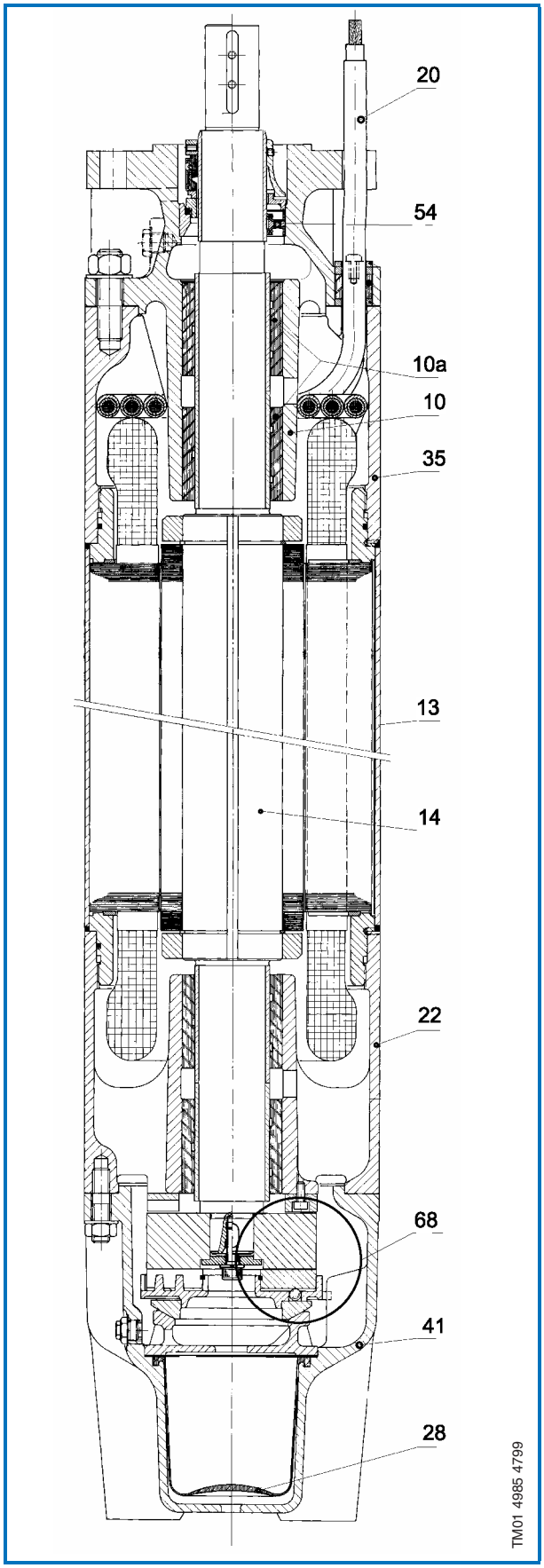


Material specification for MMS motors

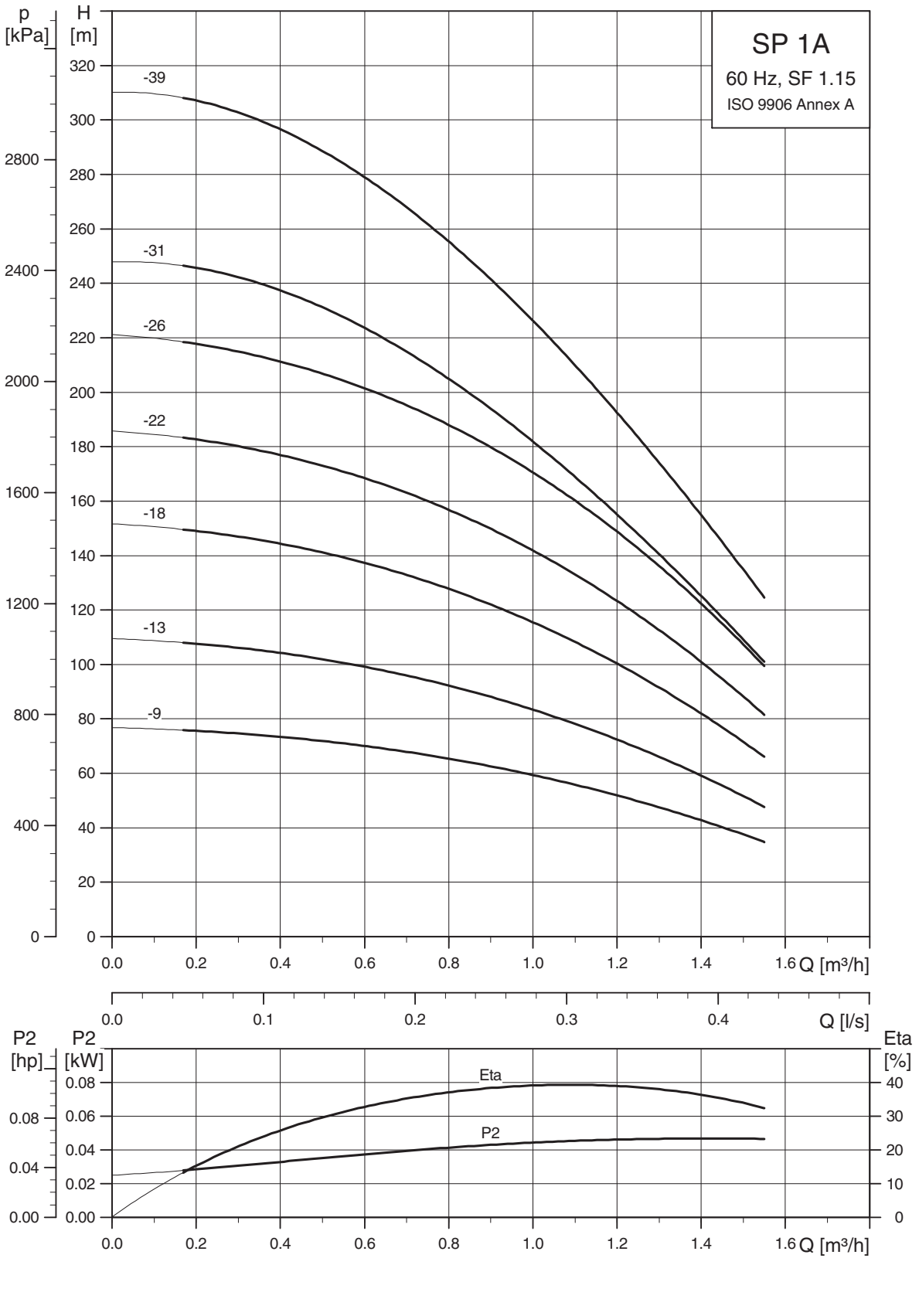
Submersible rewindable motors

Pos. no.	Component		Material	DIN W.-Nr.
10	Bearing housing, upper		Cast iron	0.6025
10a	Radial bearing	6"-10"	Graphite	
		12"	Stainless steel/NBR	
13	Motor sleeve		Stainless steel	1.4301
14	Shaft	Up to 75 kW	Stainless steel	1.4401
		From 75 kW		1.4462
20	Motor cable		EPDM	
22	Bearing housing, lower		Cast iron	0.6025
28	Diaphragm		CR	
35	Intermediate housing		Cast iron	0.6025
41	Motor end shield		Cast iron	0.6025
54	Shaft seal		Rubber lip type	
68	Thrust bearing		Hardened steel EPDM	

Example: MMS 10000

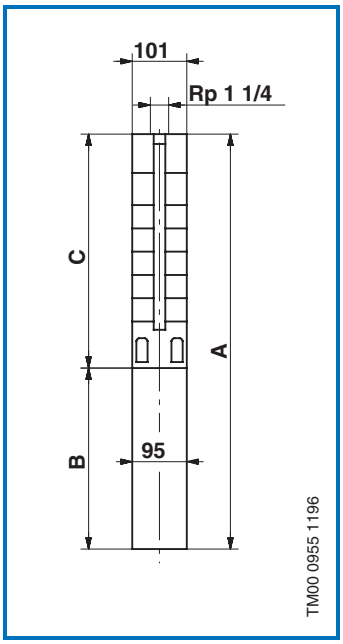


Performance curves



GRUNDFOS

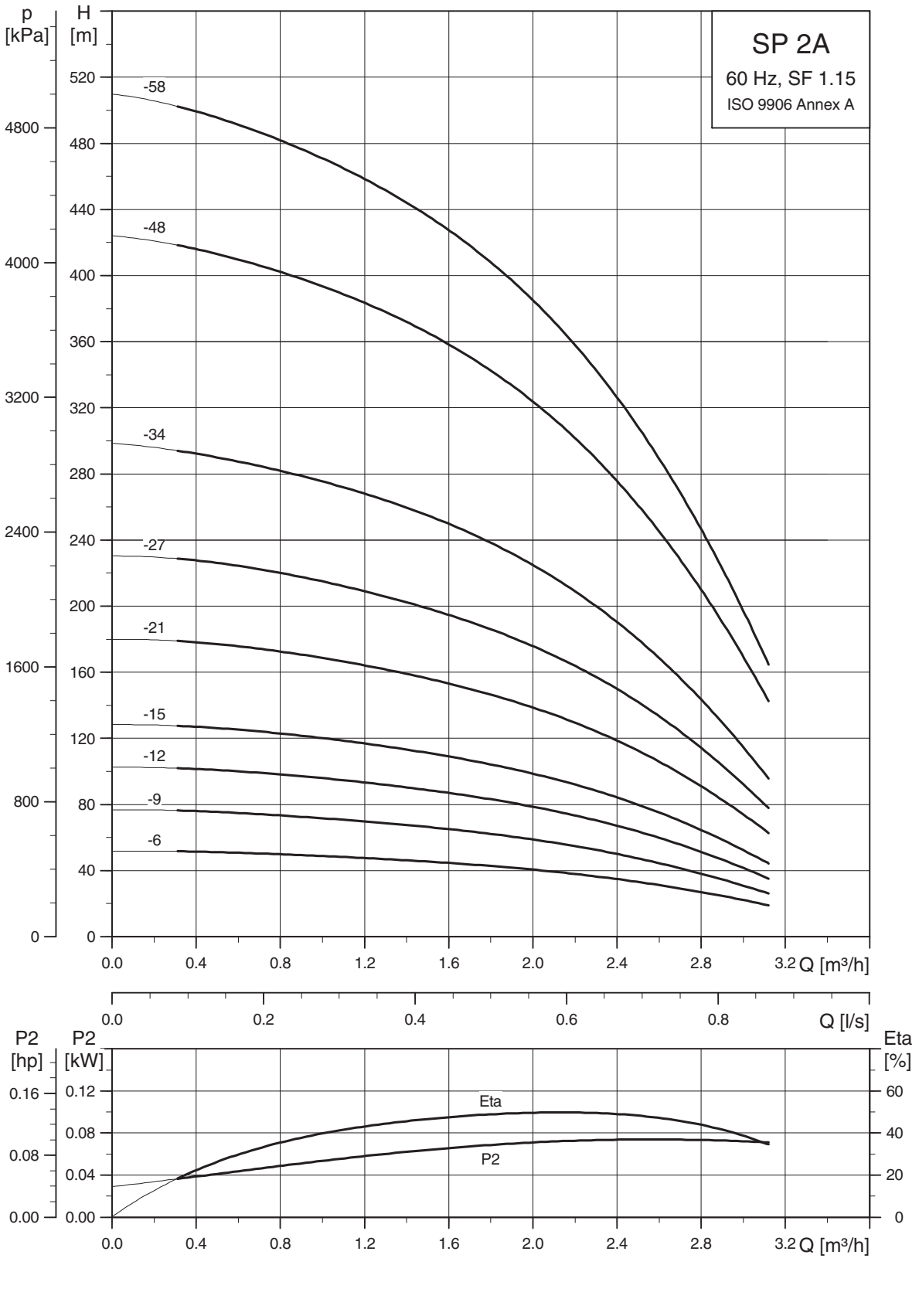
Dimensions and weights



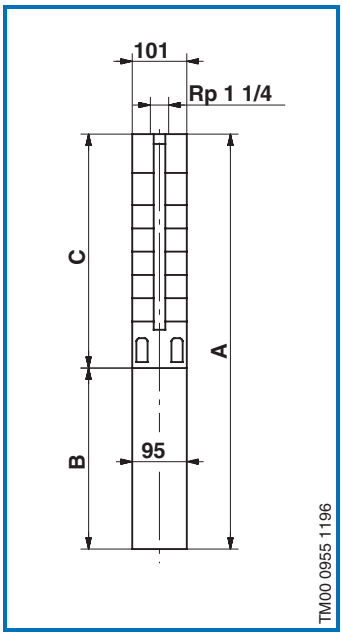
101 mm = Maximum diameter of pump inclusive of cable guard and motor.

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

Performance curves



Dimensions and weights

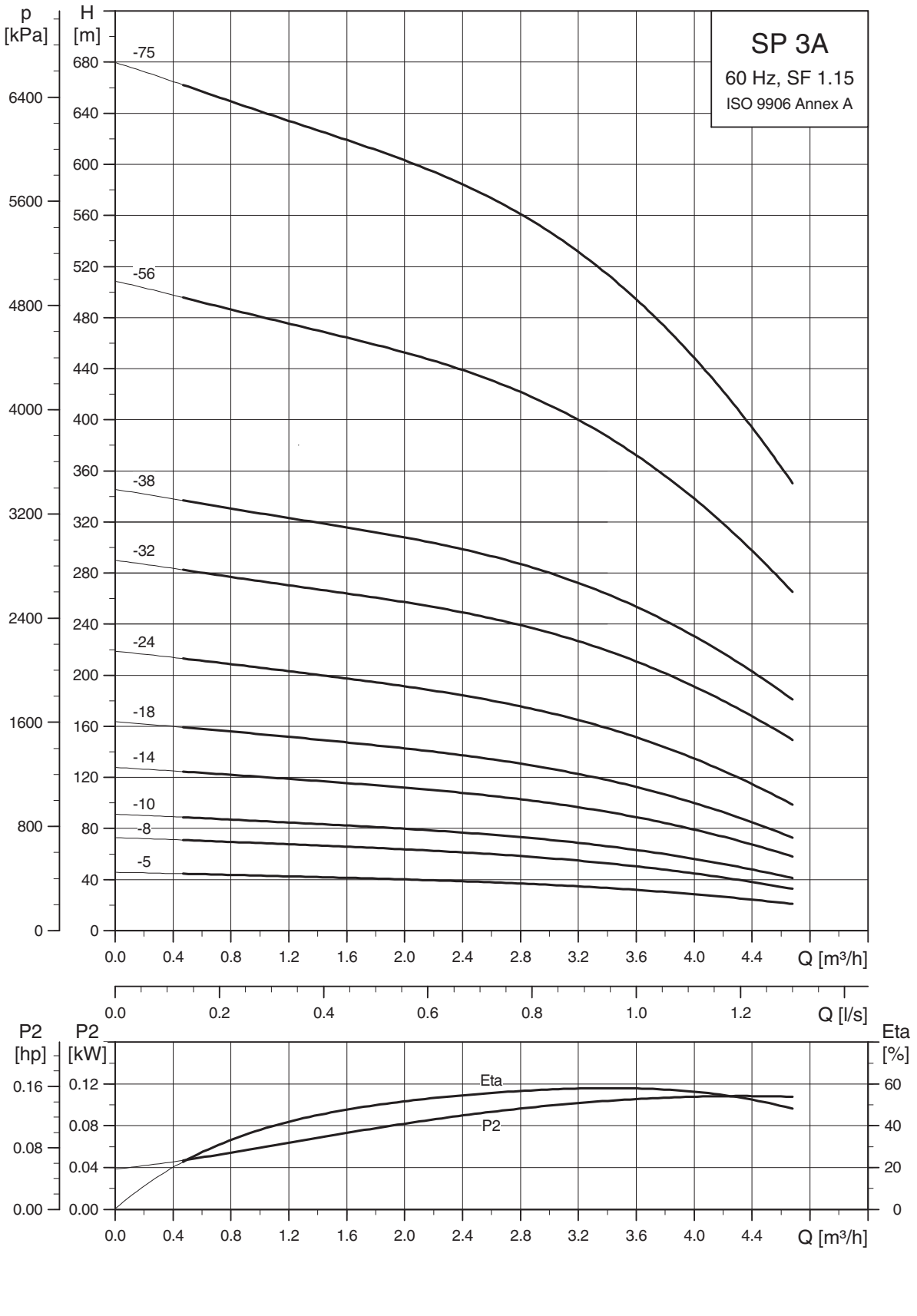


101 mm = Maximum diameter of pump inclusive of cable guard and motor.

SP 2A-58 are mounted in sleeve for R 1¼ connection and with max. diameter 108 mm.

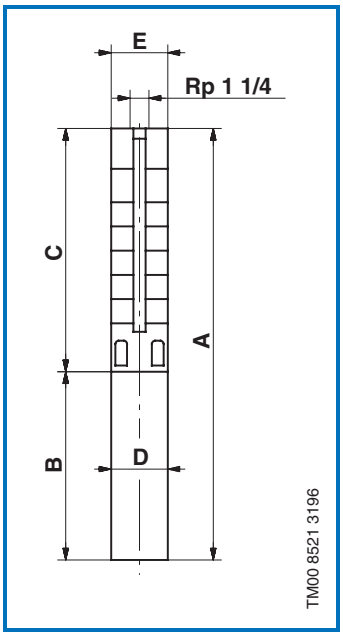
Pump type	Motor		Dimensions [mm]					Net weight [kg]	
	Type	Power [kW]	C	B		A			
				1x220V	3x220V 3x380V 3x460V	1x220V	3x220V 3x380V 3x460V	1x220V	3x220V 3x380V 3x460V
SP 2A-6	MS 402	0.25	281	256		537		10	
SP 2A-6	MS 402	0.37	281		226		507		9
SP 2A-9	MS 402	0.37	344	276	226	620	570	12	9
SP 2A-12	MS 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	MS 4000	4.0	1597		573		2170		50

Performance curves



GRUNDFOS

Dimensions and weights

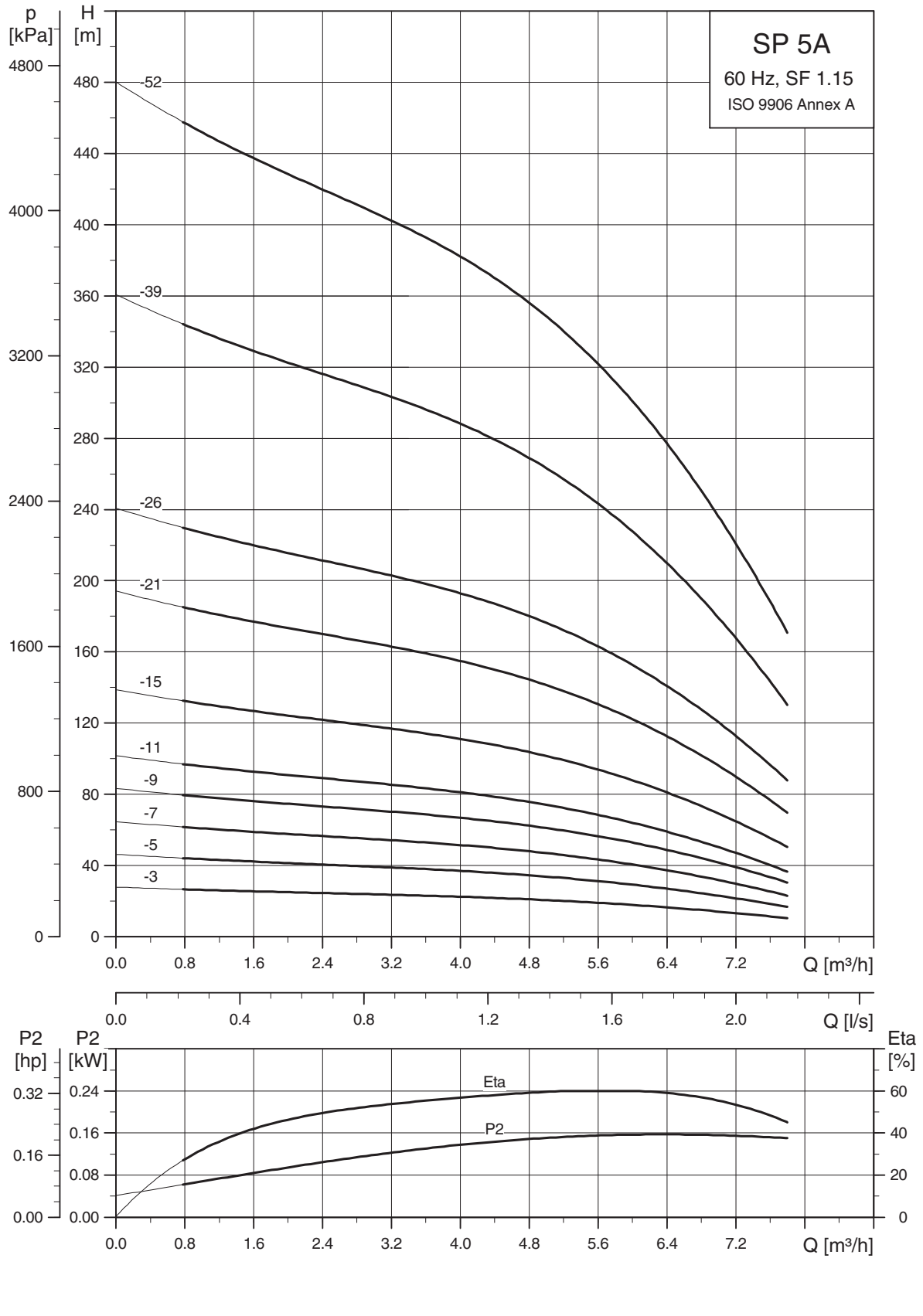


SP 3A-56 and SP 3A-75 are mounted in sleeve for R 1¼ connection.

Pump type	Motor		Dimensions [mm]							Net weight [kg]	
	Type	Power [kW]	C	B		A		D	E		
				1x220V	3x220V 3x380V 3x460V	1x220V	3x220V 3x380V 3x460V			1x220V	3x220V 3x380V 3x460V
SP 3A-5	MS 402	0.37	260	256	226	516	486	95	101	11	8
SP 3A-5N	MS 4000R	0.75	305		398		703	95	101		17
SP 3A-8	MS 402	0.55	323	291	241	614	564	95	101	12	10
SP 3A-8N	MS 4000R	0.75	368		398		766	95	101		18
SP 3A-10	MS 402	0.75	365	306	276	671	641	95	101	13	12
SP 3A-10N	MS 4000R	0.75	410		398		808	95	101		19
SP 3A-14	MS 402	1.1	449	346	306	795	755	95	101	15	14
SP 3A-14N	MS 4000R	1.1	494		413		907	95	101		21
SP 3A-18	MS 402	1.5	533		346		879	95	101		16
SP 3A-18N	MS 4000R	1.5	578		413		991	95	101		23
SP 3A-24	MS 4000	2.2	659		453		1112	95	101		23
SP 3A-24N	MS 4000R	2.2	704		453		1157	95	101		27
SP 3A-32	MS 4000	3.0	872		493		1365	95	101		30
SP 3A-32N	MS 4000R	3.0	872		493		1365	95	101		30
SP 3A-38	MS 4000	4.0	998		573		1571	95	101		36
SP 3A-38N	MS 4000R	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	138	140		86

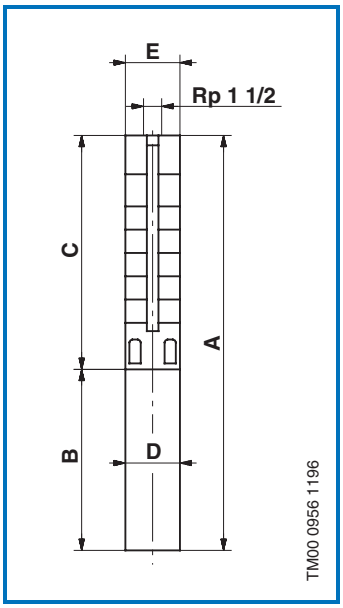
E = Maximum diameter of pump inclusive of cable guard and motor.

Performance curves



GRUNDFOS

Dimensions and weights

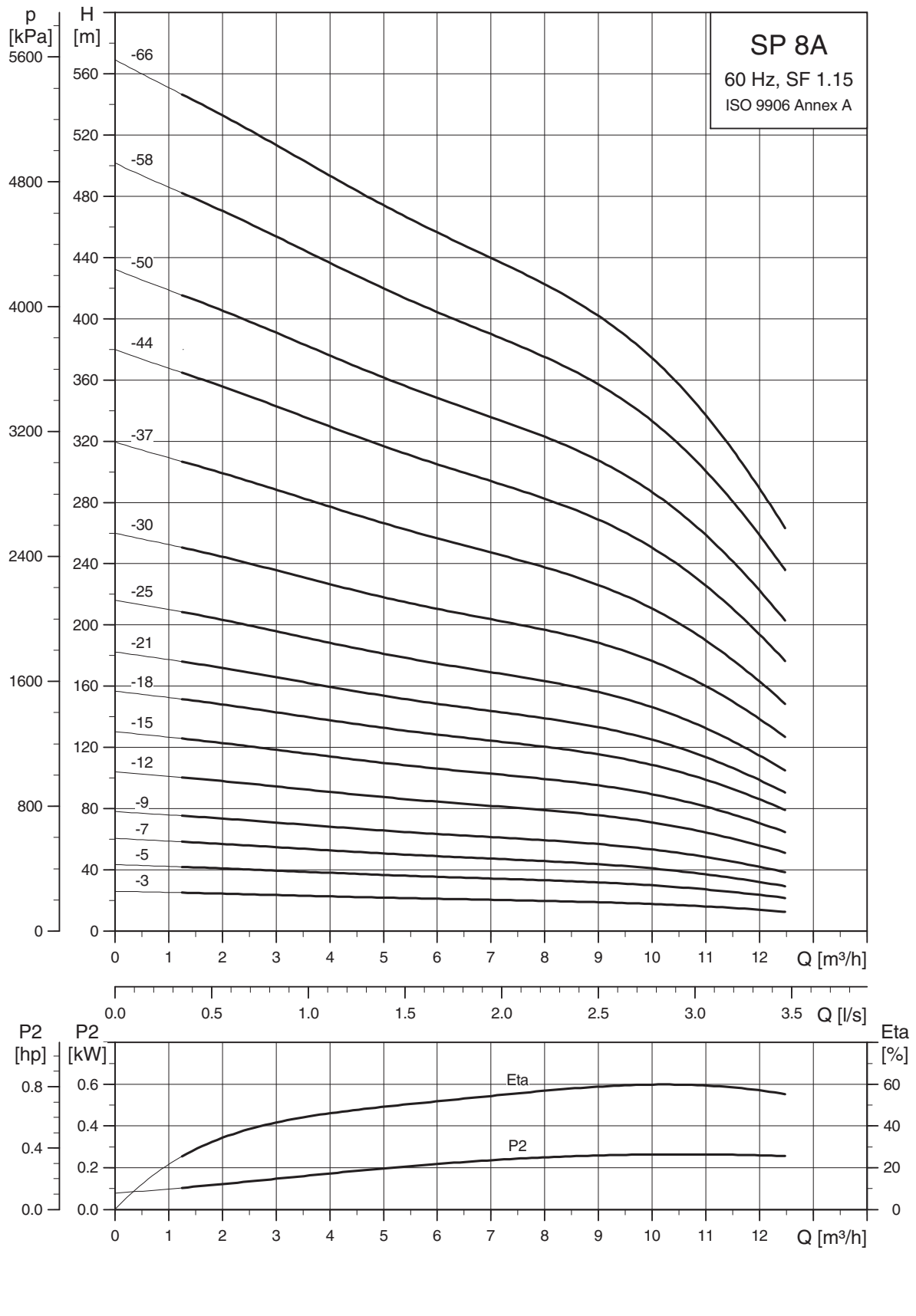


SP 5A-52 are mounted in sleeve for R 1½ connection.

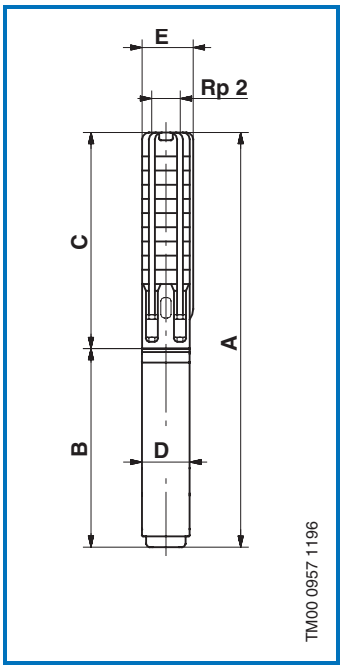
Pump type	Motor		Dimensions [mm]							Net weight [kg]	
	Type	Power [kW]	C	B		A		D	E		
				1x220V	3x220V 3x380V 3x460V	1x220V	3x220V 3x380V 3x460V			1x220V	3x220V 3x380V 3x460V
SP 5A-3	MS 402	0.37	219	276	226	495	445	95	101	10	8
SP 5A-3N	MS 4000R	0.75	263		398		661	95	101		17
SP 5A-5	MS 402	0.55	261	291	241	552	502	95	101	11	9
SP 5A-5N	MS 4000R	0.75	305		398		703	95	101		17
SP 5A-7	MS 402	0.75	303	306	276	609	579	95	101	12	11
SP 5A-7N	MS 4000R	0.75	347		398		745	95	101		18
SP 5A-9	MS 402	1.1	345	346	306	691	651	95	101	14	13
SP 5A-9N	MS 4000R	1.1	389		413		802	95	101		20
SP 5A-11	MS 402	1.5	387		346		733	95	101		15
SP 5A-11N	MS 4000R	1.5	431		413		844	95	101		20
SP 5A-15	MS 4000	2.2	471		453		924	95	101		21
SP 5A-15N	MS 4000R	2.2	515		453		968	95	101		24
SP 5A-21	MS 4000	3.0	597		493		1090	95	101		23
SP 5A-21N	MS 4000R	3.0	641		493		1134	95	101		26
SP 5A-26	MS 4000	4.0	702		573		1275	95	101		29
SP 5A-26N	MS 4000R	4.0	746		573		1319	95	101		32
SP 5A-39	MS 4000	5.5	1019		673		1692	95	101		41
SP 5A-39N	MS 4000R	5.5	1019		673		1692	95	101		41
SP 5A-39	MS 6000	5.5	1081		541		1622	138	138		55
SP 5A-39N	MS 6000R	5.5	1081		541		1622	138	138		55
SP 5A-52	MS 6000	7.5	1663		571		2234	138	140		74

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

Performance curves



Dimensions and weights

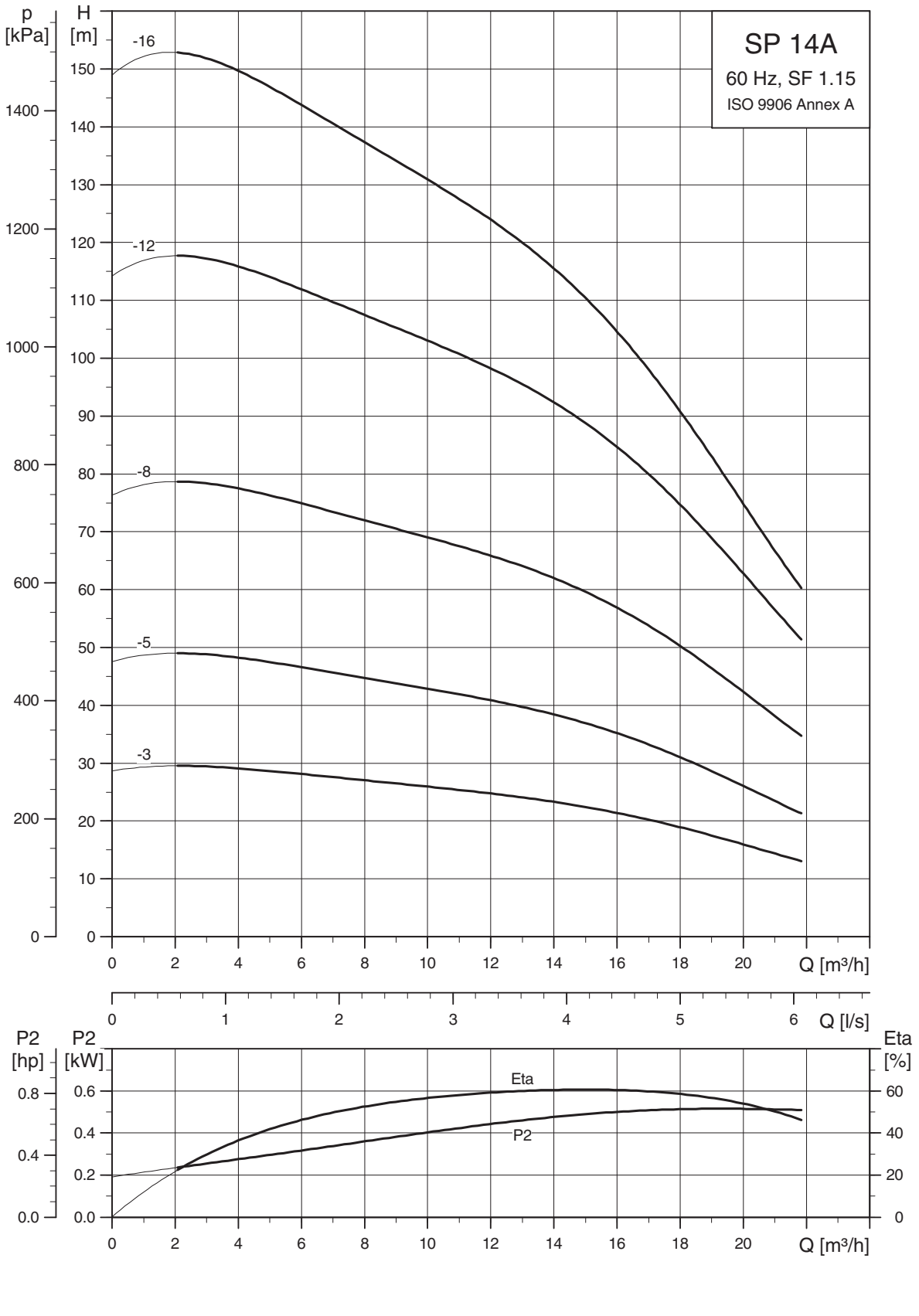


SP 8A-50(N) to SP 8A-66(N) are mounted in sleeve for R 2 connection.

Pump type	Motor		Dimensions [mm]							Net weight [kg]	
	Type	Power [kW]	C	B		A		D	E		
				1x220V	3x220V 3x380V 3x460V	1x220V	3x220V 3x380V 3x460V			1x220V	3x220V 3x380V 3x460V
SP 8A-3	MS 402	0.55	325	291	241	616	566	95	101	13	11
SP 8A-3N	MS 4000R	0.75	325		398		723	95	101		18
SP 8A-3R	MS 4000	0.75	325		398		723	95	101		18
SP 8A-5	MS 402	1.1	409	346	306	755	715	95	101	16	15
SP 8A-5N	MS 4000R	1.1	409		413		822	95	101		20
SP 8A-5R	MS 4000	1.1	409		413		822	95	101		20
SP 8A-7	MS 402	1.5	493		346		839	95	101		17
SP 8A-7N	MS 4000R	1.5	493		413		906	95	101		21
SP 8A-7R	MS 4000	1.5	493		413		906	95	101		21
SP 8A-9	MS 4000	2.2	577		453		1030	95	101		24
SP 8A-9N	MS 4000R	2.2	577		453		1030	95	101		24
SP 8A-9R	MS 4000	2.2	577		453		1030	95	101		24
SP 8A-12	MS 4000	3.0	703		493		1196	95	101		26
SP 8A-12N	MS 4000R	3.0	703		493		1196	95	101		26
SP 8A-12R	MS 4000	3.0	703		493		1196	95	101		26
SP 8A-15	MS 4000	4.0	829		573		1402	95	101		32
SP 8A-15N	MS 4000R	4.0	829		573		1402	95	101		32
SP 8A-15R	MS 4000	4.0	829		573		1402	95	101		32
SP 8A-18	MS 4000	5.5	955		673		1628	95	101		38
SP 8A-18N	MS 4000R	5.5	955		673		1628	95	101		38
SP 8A-21	MS 4000	5.5	1081		673		1754	95	101		40
SP 8A-21N	MS 4000R	5.5	1081		673		1754	95	101		40
SP 8A-25	MS 4000	5.5	1249		673		1922	95	101		42
SP 8A-25N	MS 4000R	5.5	1249		673		1922	95	101		42
SP 8A-30	MS 4000	7.5	1459		773		2232	95	101		50
SP 8A-30N	MS 4000R	7.5	1459		773		2232	95	101		50
SP 8A-18	MS 6000	5.5	1017		541		1558	138	138		50
SP 8A-18N	MS 6000R	5.5	1017		541		1558	138	138		50
SP 8A-21	MS 6000	5.5	1143		541		1684	138	138		51
SP 8A-21N	MS 6000R	5.5	1143		541		1684	138	138		51
SP 8A-25	MS 6000	5.5	1311		541		1852	138	138		53
SP 8A-25N	MS 6000R	5.5	1311		541		1852	138	138		53
SP 8A-30	MS 6000	7.5	1521		571		2092	138	138		59
SP 8A-30N	MS 6000R	7.5	1521		571		2092	138	138		59
SP 8A-37	MS 6000	9.2	1815		601		2416	138	138		69
SP 8A-37N	MS 6000R	9.2	1815		601		2416	138	138		69
SP 8A-44	MS 6000	11.0	2109		631		2740	138	138		75
SP 8A-44N	MS 6000R	11.0	2109		631		2740	138	138		75
SP 8A-50	MS 6000	13.0	2677		661		3338	138	140		103
SP 8A-50N	MS 6000R	13.0	2677		661		3338	138	140		103
SP 8A-58	MS 6000	15.0	3013		696		3709	138	140		114
SP 8A-58N	MS 6000R	15.0	3013		696		3709	138	140		114
SP 8A-66	MS 6000	15.0	3349		696		4045	138	140		121
SP 8A-66N	MS 6000R	15.0	3349		696		4045	138	140		121

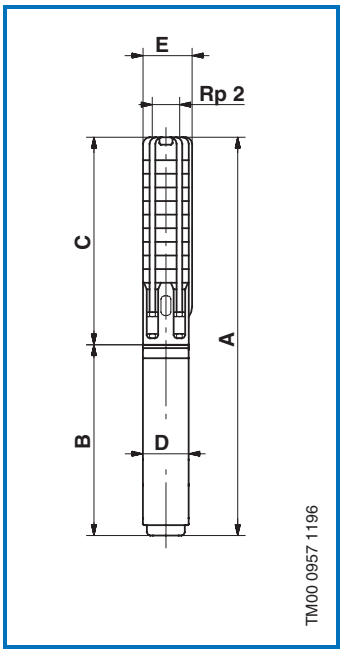
E = Maximum diameter of pump inclusive of cable guard and motor.

Performance curves



GRUNDFOS

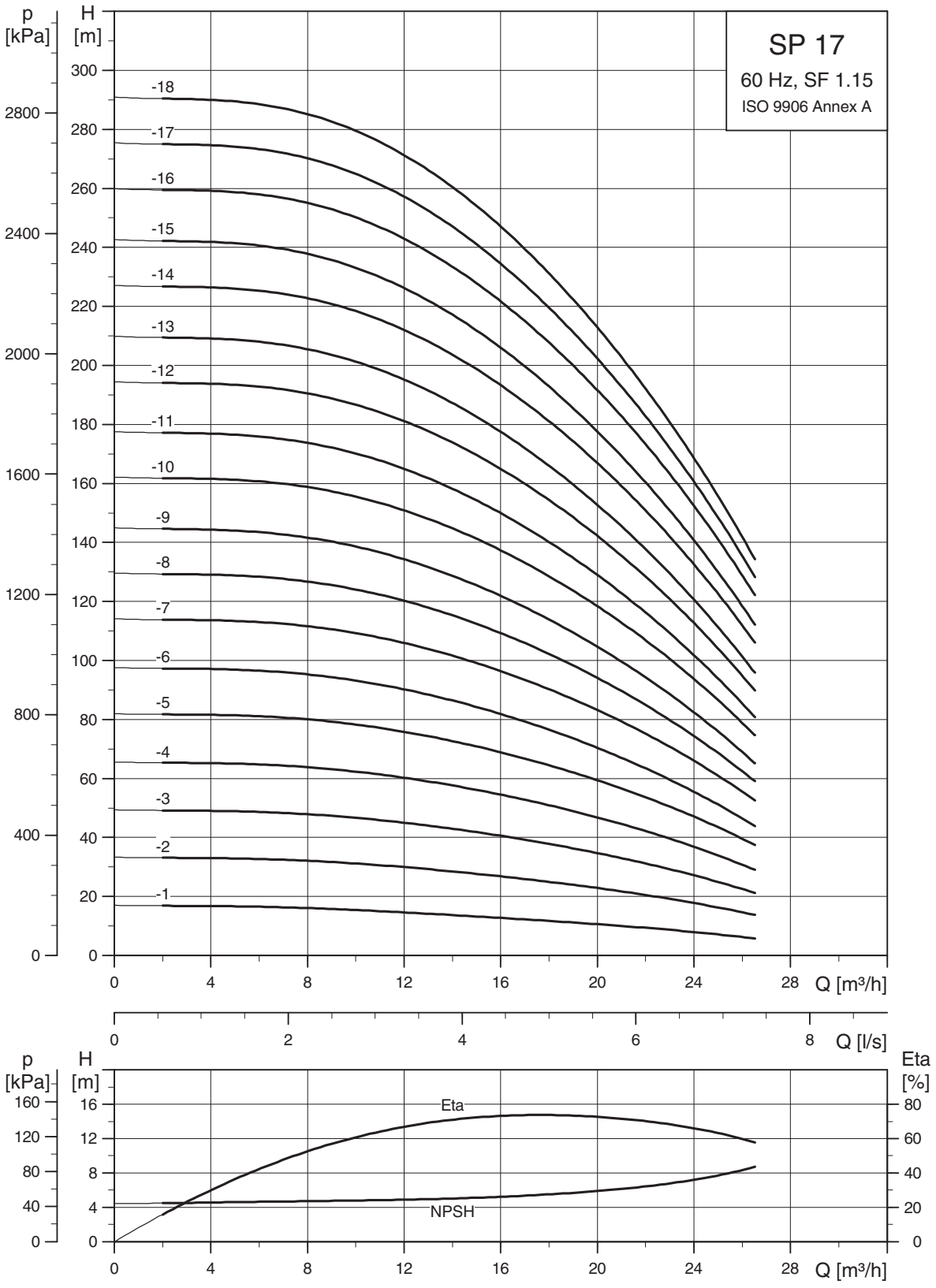
Dimensions and weights



Pump type	Motor		Dimensions [mm]					Net weight [kg]
	Type	Power [kW]	C	B	A	D	E	
				3x220V 3x380V 3x460V	3x220V 3x380V 3x460V			3x220V 3x380V 3x460V
SP 14A-3	MS 402	1.5	380	346	726	95	101	16
SP 14A-5	MS 4000	2.2	510	453	963	95	101	23
SP 14A-8	MS 402	4.0	705	573	1278	95	101	30
SP 14A-12	MS 4000	5.5	965	673	1638	95	101	37
SP 14A-16	MS 4000	7.5	1225	773		95	101	50
SP 14A-12	MS 6000	5.5	1027	541	1568	138	138	48
SP 14A-16	MS 6000	7.5	1287	571	1858	138	138	54

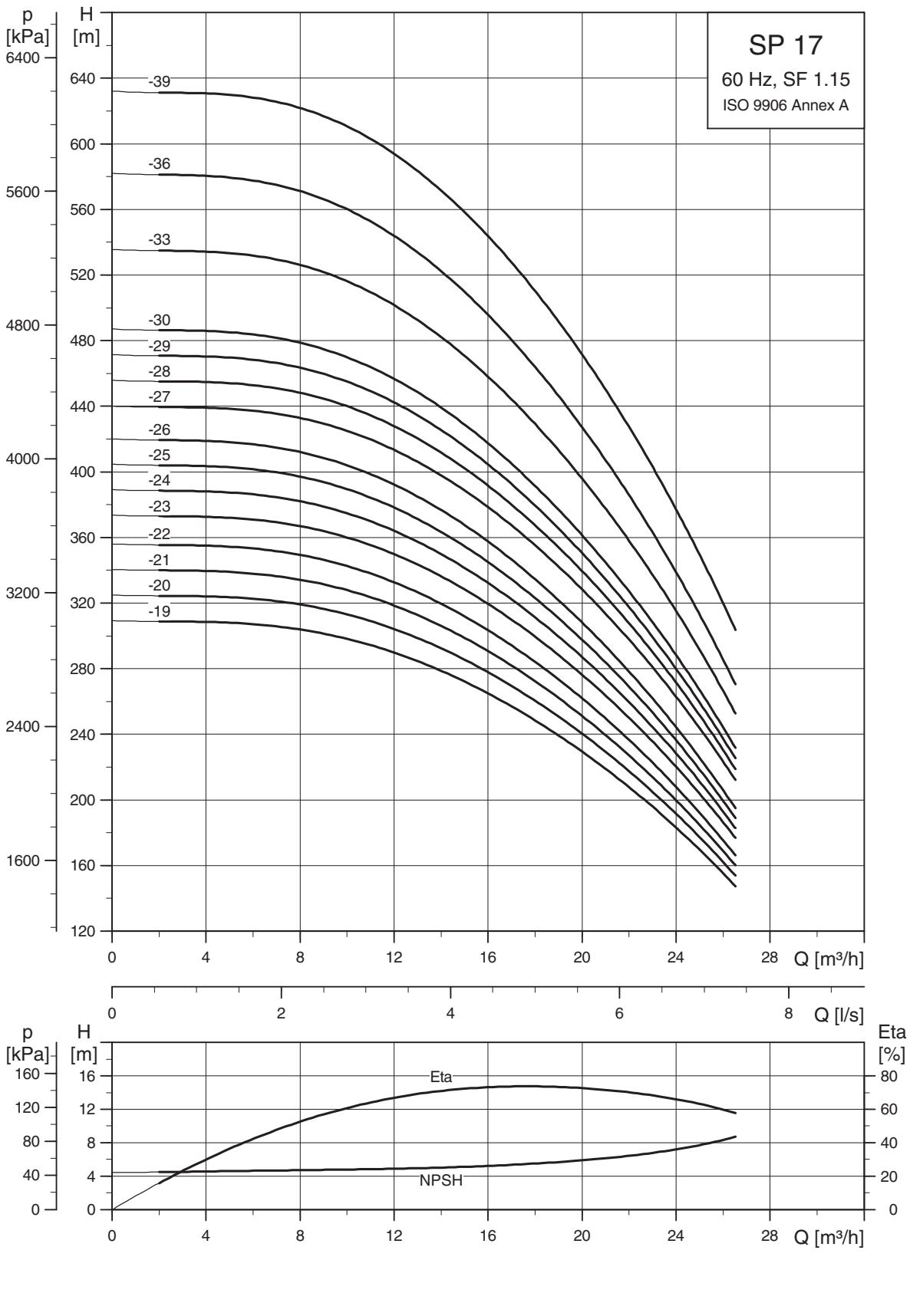
E = Maximum diameter of pump inclusive of cable guard and motor.

Performance curves



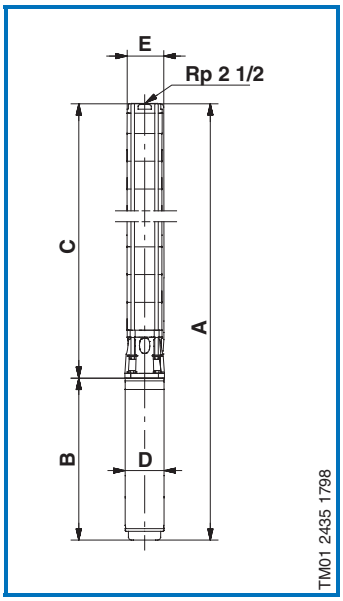
GRUNDFOS

Performance curves



GRUNDFOS

Dimensions and weights



SP 17-33 to SP 17-39 are mounted in sleeve for R 3 connection.

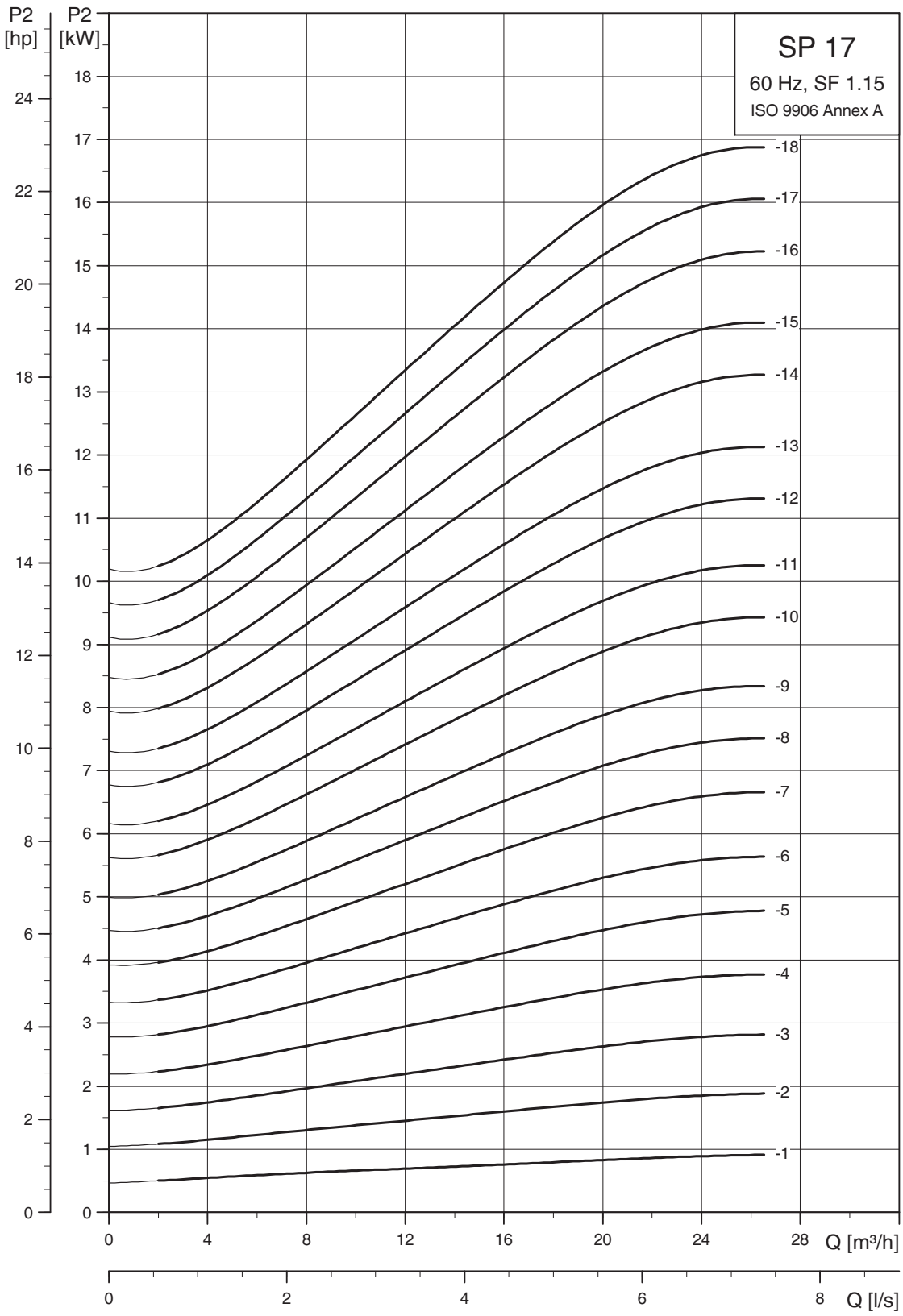
Pump type	Motor		Dimensions [mm]					Net weight [kg]
	Type	Power [kW]	C	B	A	D	E*	
SP 17-1	MS 4000	1.1	314	413	727	95	131	18
SP 17-2	MS 4000	2.2	374	454	828	95	131	22
SP 17-3	MS 4000	3	435	494	929	95	131	24
SP 17-4	MS 4000	4	495	574	1069	95	131	29
SP 17-5	MS 4000	5.5	556	674	1230	95	131	35
SP 17-6	MS 4000	5.5	616	674	1290	95	131	36
SP 17-7	MS 4000	7.5	677	773	1450	95	131	43
SP 17-8	MS 4000	7.5	737	773	1510	95	131	44
SP 17-9	MS 4000	7.5	798	773	1571	95	131	45
SP 17-5	MS 6000	5.5	572	544	1116	138	142	47
SP 17-6	MS 6000	5.5	632	544	1176	138	142	48
SP 17-7	MS 6000	7.5	693	574	1267	138	142	50
SP 17-8	MS 6000	7.5	753	574	1327	138	142	51
SP 17-9	MS 6000	7.5	814	574	1388	138	142	52
SP 17-10	MS 6000	9.2	874	604	1478	138	142	59
SP 17-11	MS 6000	9.2	935	604	1539	138	142	60
SP 17-12	MS 6000	11	995	634	1629	138	142	64
SP 17-13	MS 6000	11	1056	634	1690	138	142	65
SP 17-14	MS 6000	13	1116	664	1780	138	142	69
SP 17-15	MS 6000	13	1177	664	1841	138	142	71
SP 17-16	MS 6000	15	1237	699	1936	138	142	76
SP 17-17	MS 6000	15	1298	699	1997	138	142	77
SP 17-18	MS 6000	15	1358	699	2057	138	142	78
SP 17-19	MS 6000	18.5	1419	754	2173	138	142	85
SP 17-20	MS 6000	18.5	1479	754	2233	138	142	87
SP 17-21	MS 6000	18.5	1540	754	2294	138	142	88
SP 17-22	MS 6000	18.5	1600	754	2354	138	142	89
SP 17-23	MS 6000	22	1661	814	2475	138	142	96
SP 17-24	MS 6000	22	1721	814	2535	138	142	97
SP 17-25	MS 6000	22	1782	814	2596	138	142	99
SP 17-26	MS 6000	22	1842	814	2656	138	142	100
SP 17-27	MS 6000	26	1903	874	2777	138	142	106
SP 17-28	MS 6000	26	1963	874	2837	138	142	107
SP 17-29	MS 6000	26	2024	874	2898	138	142	108
SP 17-30	MS 6000	26	2084	874	2958	138	142	110
SP 17-33	MS 6000	30	2513	944	3457	138	175	155
SP 17-36	MS 6000	30	2694	944	3638	138	175	160
SP 17-39	MMS 6000	37	2876	1405	4281	136	175	203

* Maximum diameter of pump with one motor cable.

SP 17-1 to SP 17-36 are also available in N and R versions with motors in R version. Dimensions as above.

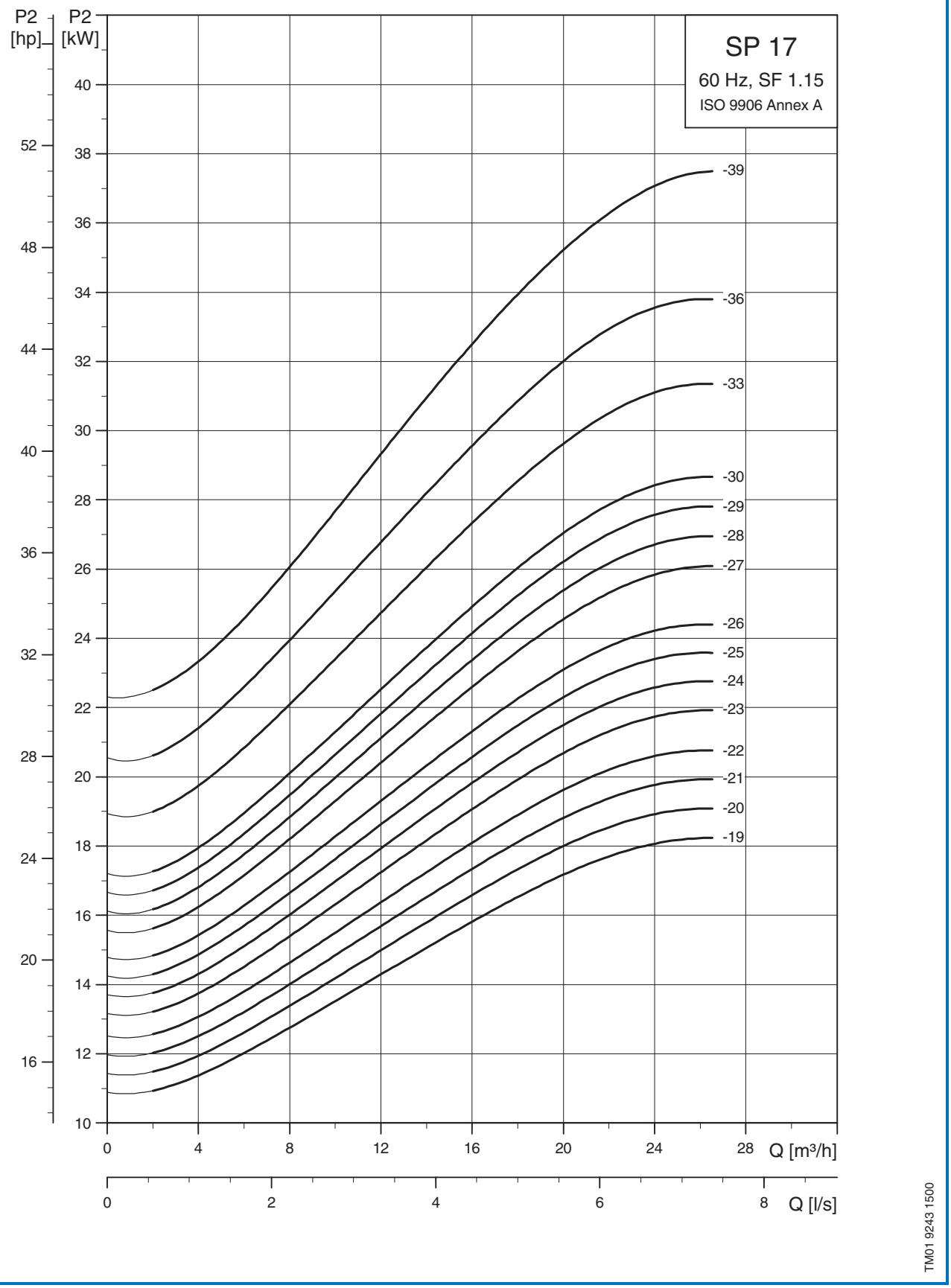
Other types of connection are possible by means of connecting flanges, see page 86

Power curves

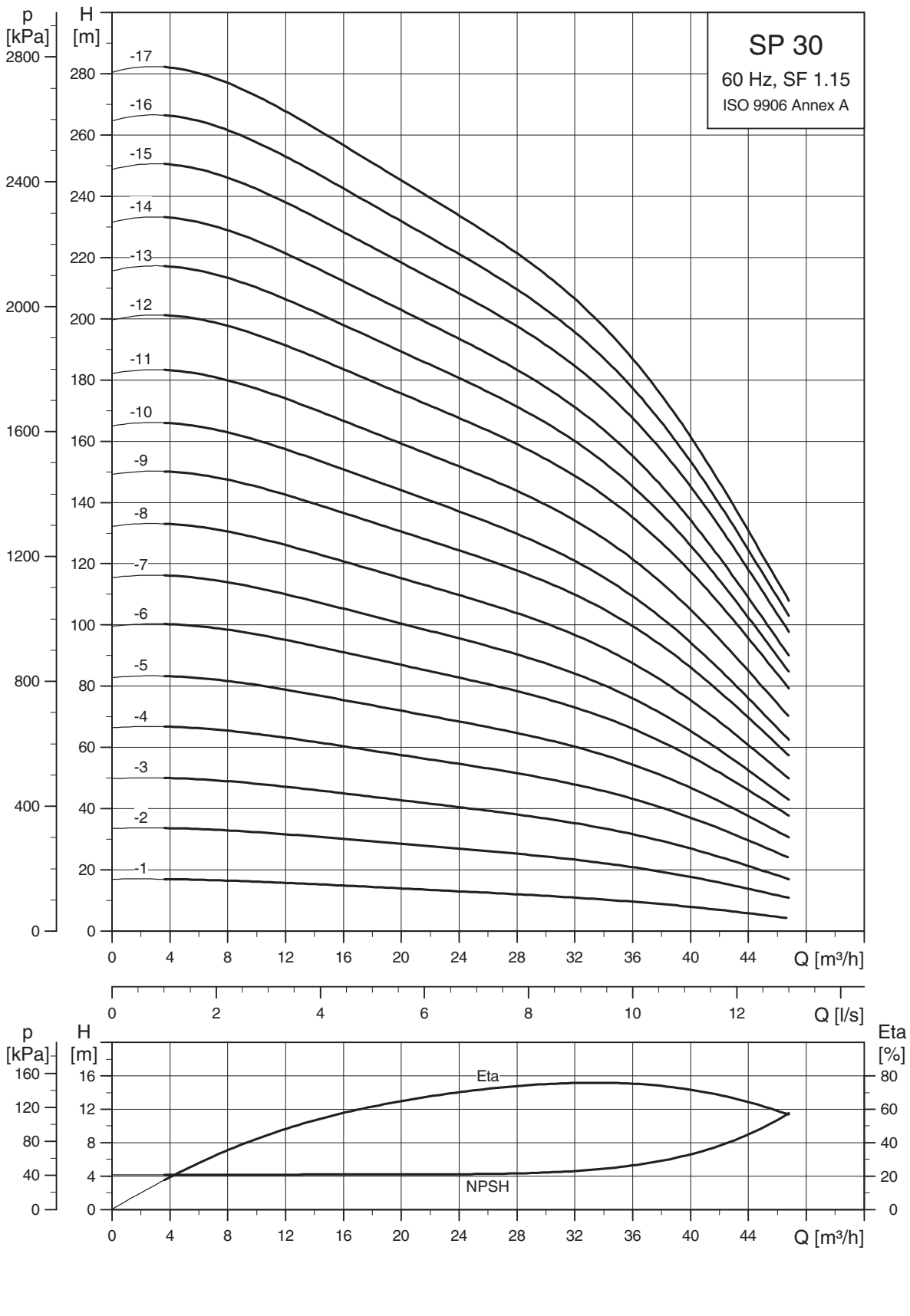


TM01 2342 1500

GRUNDFOS

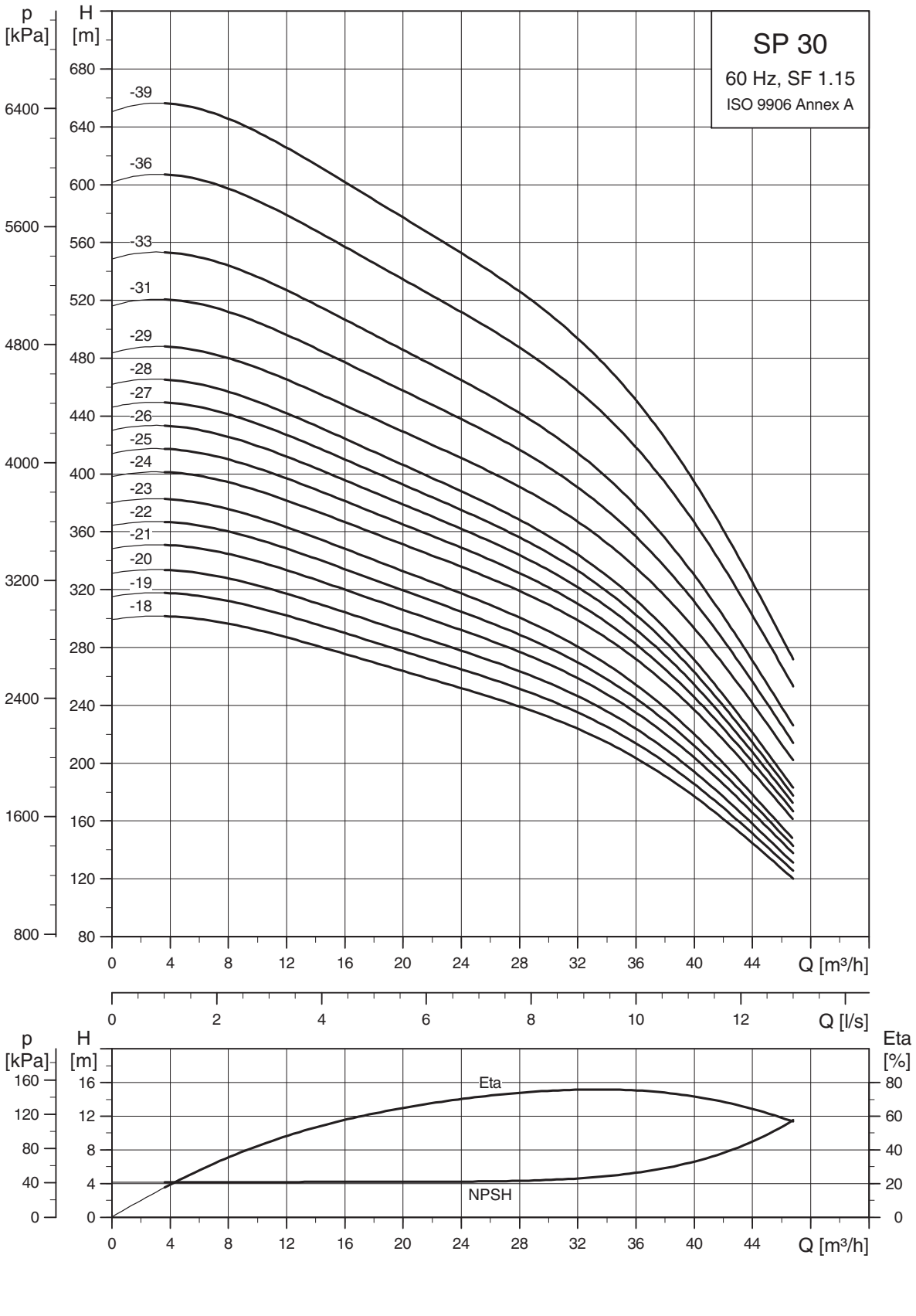

SP 17
60 Hz, SF 1.15
ISO 9906 Annex A
P2 [hp]
P2 [kW]
-39
-36
-33
-30
-29
-28
-27
-26
-25
-24
-23
-22
-21
-20
-19
Q [m³/h]
Q [l/s]
TM01 9243 1500

Performance curves



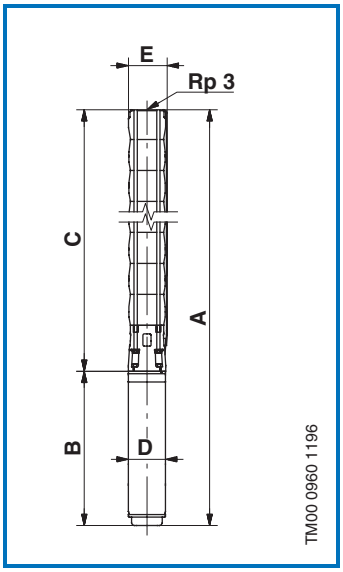
GRUNDFOS

Performance curves



GRUNDFOS

Dimensions and weights



SP 30-24 to SP 30-39 are mounted in sleeve for R 3 connection.

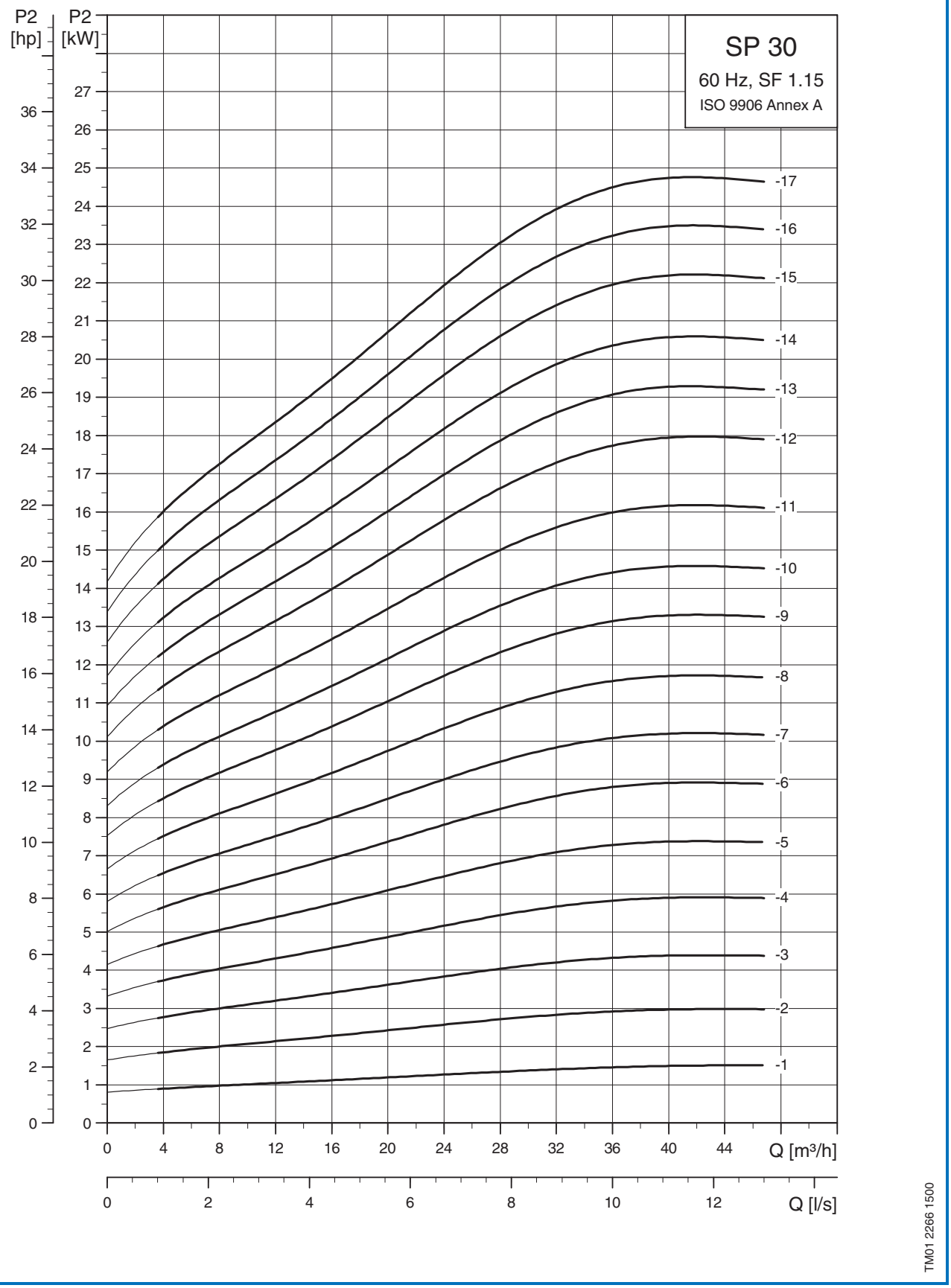
Pump type	Motor		Dimensions [mm]						Net weight [kg]
	Type	Power [kW]	C	B	A	D	E*	E**	
SP 30-1	MS 4000	1.5	349	454	828	95	131		21
SP 30-2	MS 4000	3	445	494	939	95	131		24
SP 30-3	MS 4000	4	541	574	1115	95	131		29
SP 30-4	MS 4000	5.5	637	674	1311	95	131		36
SP 30-5	MS 4000	7.5	733	773	1506	95	131		43
SP 30-4	MS 6000	5.5	653	544	1197	138	142	142	47
SP 30-5	MS 6000	7.5	749	574	1323	138	142	142	50
SP 30-6	MS 6000	9.2	845	604	1449	138	142	142	57
SP 30-7	MS 6000	9.2	941	604	1545	138	142	142	59
SP 30-8	MS 6000	11	1037	634	1671	138	142	142	63
SP 30-9	MS 6000	13	1133	664	1797	138	142	142	68
SP 30-10	MS 6000	13	1229	664	1893	138	142	142	70
SP 30-11	MS 6000	15	1325	699	2024	138	142	142	75
SP 30-12	MS 6000	18.5	1421	754	2175	138	142	142	83
SP 30-13	MS 6000	18.5	1517	754	2271	138	142	142	84
SP 30-14	MS 6000	18.5	1613	754	2367	138	142	142	86
SP 30-15	MS 6000	22	1709	814	2523	138	142	142	94
SP 30-16	MS 6000	22	1805	814	2619	138	142	142	95
SP 30-17	MS 6000	22	1901	814	2715	138	142	142	97
SP 30-18	MS 6000	26	1997	874	2871	138	142	142	104
SP 30-19	MS 6000	26	2093	874	2967	138	142	142	106
SP 30-20	MS 6000	26	2189	874	3063	138	142	142	108
SP 30-21	MS 6000	30	2285	944	3229	138	144	145	117
SP 30-22	MS 6000	30	2381	944	3325	138	144	145	119
SP 30-23	MS 6000	30	2477	944	3421	138	144	145	121
SP 30-24	MMS 6000	37	2573	1425	3998	144	142	142	170
SP 30-25	MMS 6000	37	2669	1425	4094	144	142	142	171
SP 30-26	MMS 6000	37	2765	1425	4190	144	142	142	173
SP 30-27	MMS 6000	37	2861	1425	4286	144	142	142	175
SP 30-28	MMS 6000	37	2957	1425	4382	144	142	142	176
SP 30-29	MMS 8000	45	3249	1270	4519	192	192	192	280
SP 30-31	MMS 8000	45	3441	1270	4711	192	192	192	285
SP 30-33	MMS 8000	45	3633	1270	4903	192	192	192	290
SP 30-36	MMS 8000	55	3921	1350	5271	192	192	192	313
SP 30-39	MMS 8000	55	4209	1350	5559	192	192	192	322

* Maximum diameter of pump with one motor cable.

** Maximum diameter of pump with two motor cables.

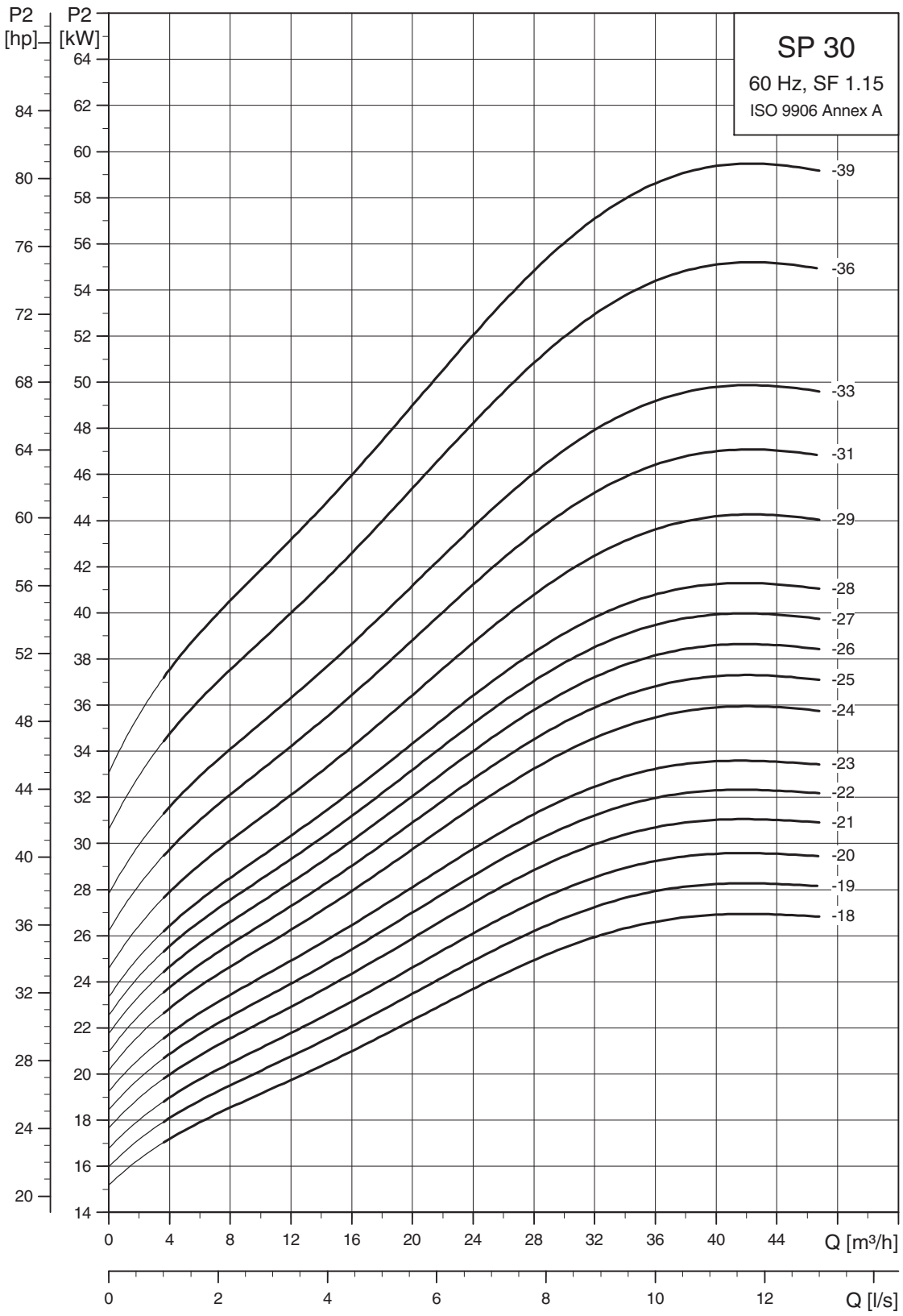
SP 30-1 to SP 30-23 are also available in N and R versions with motors in R version.
Dimensions as above.
Other types of connection are possible by means of connecting pieces, see page 86.

Power curves

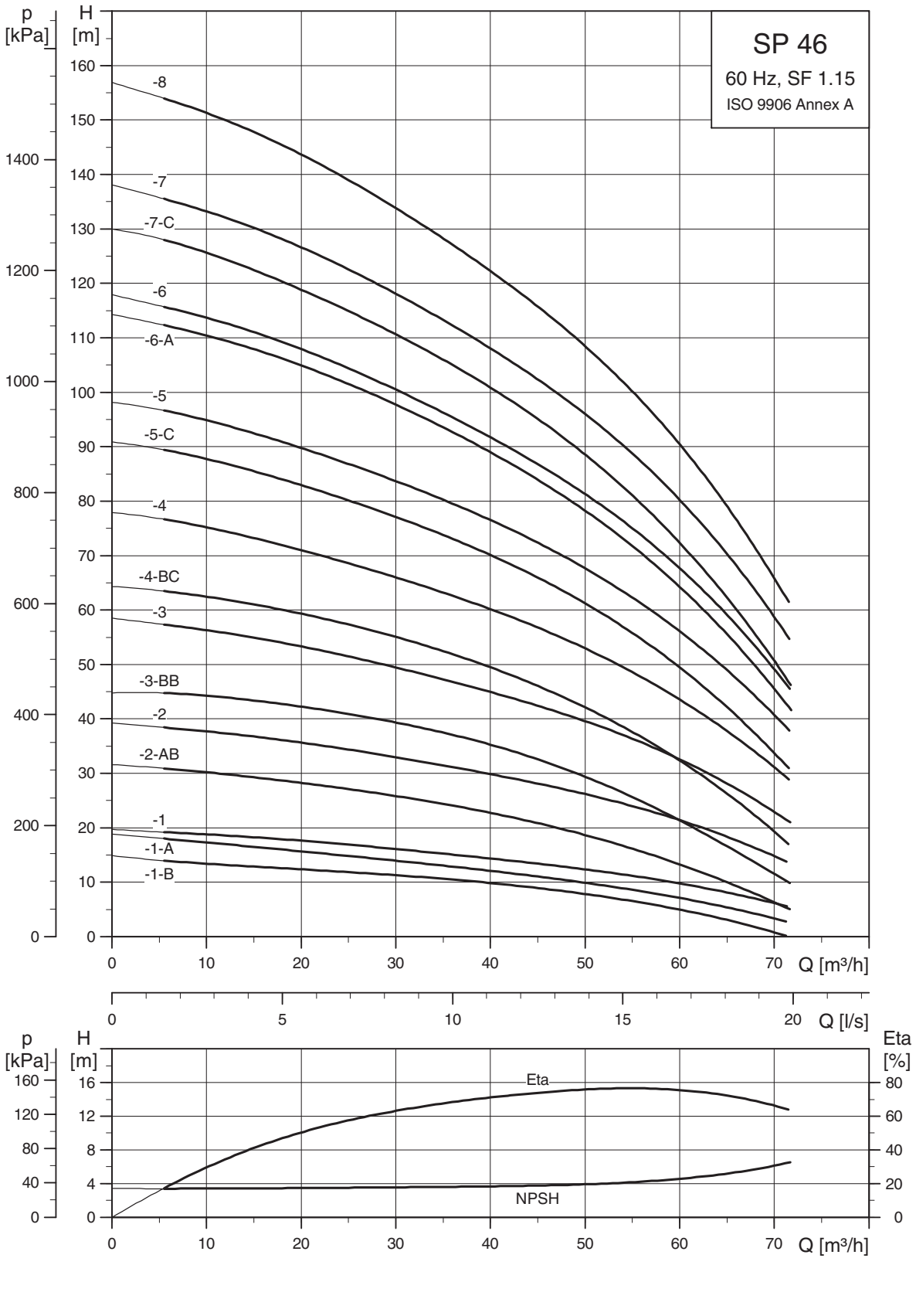


GRUNDFOS

Power curves



Performance curves



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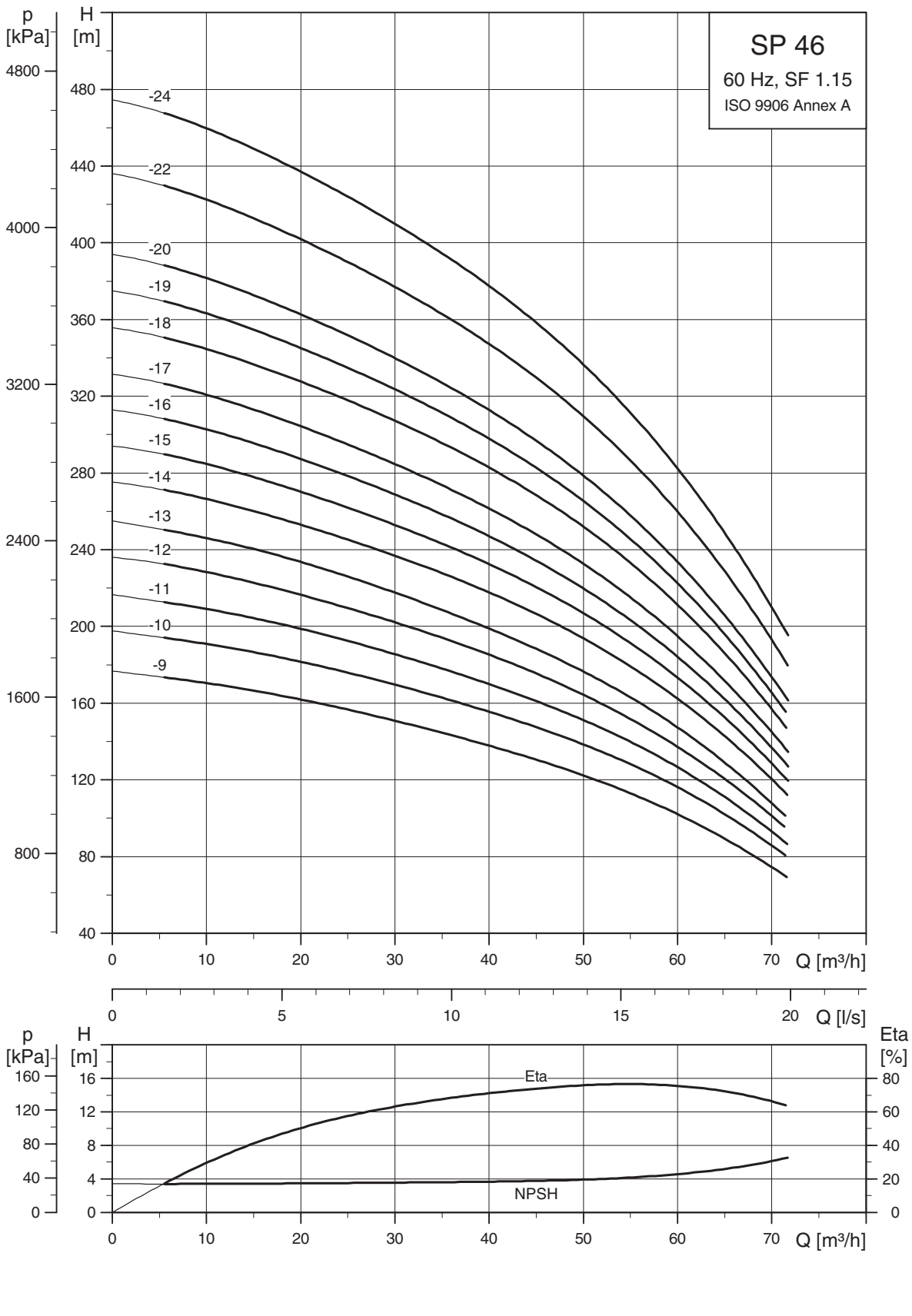
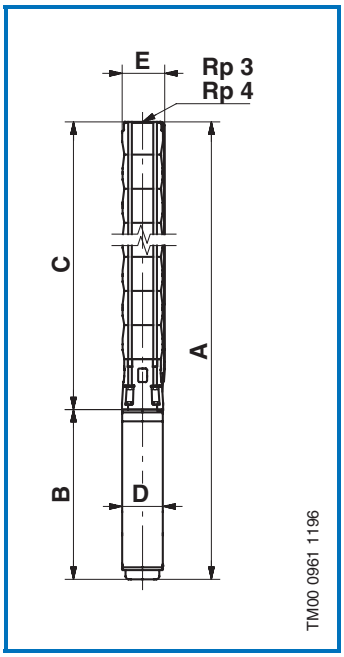
GRUNDFOS

Performance curves



Dimensions and weights



SP 46-20 to SP 46-24 are mounted in sleeve for R 4 connection.

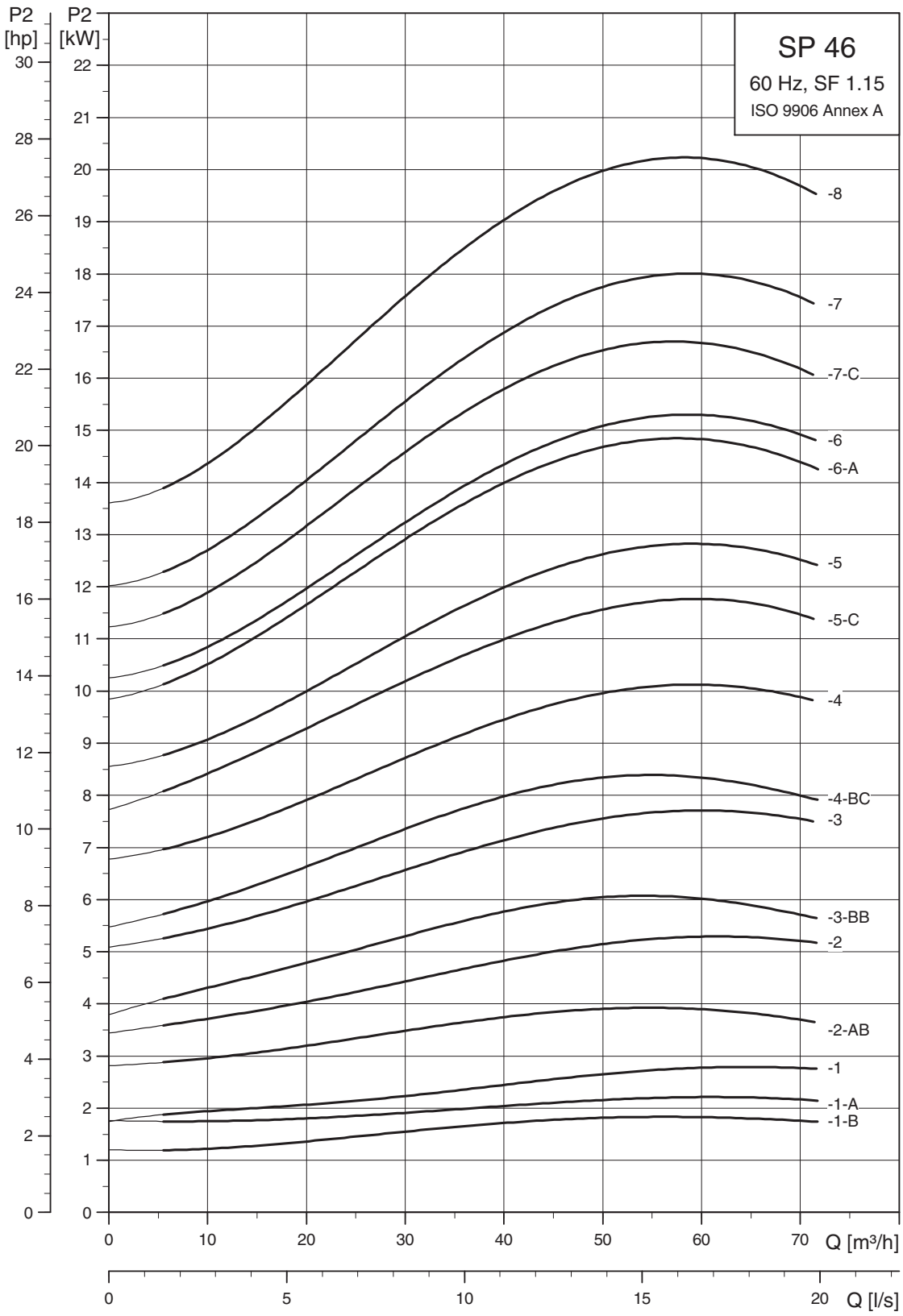
Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 3 connection				Rp 4 connection				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 46-1-B	MS 4000	1.5	780	367	146	148	783	370	146	148	413	95	20
SP 46-1-B	MS 402	1.5	713	367	146	148	716	370	146	148	346	95	16
SP 46-1-A	MS 4000	2.2	821	367	146	148	824	370	146	148	454	95	22
SP 46-1	MS 4000	3	861	367	146	148	864	370	146	148	494	95	23
SP 46-2-AB	MS 4000	3.7	974	480	146	148	977	483	146	148	494	95	25
SP 46-2	MS 4000	5.5	1154	480	146	148	1157	483	146	148	674	95	34
SP 46-3-BB	MS 4000	5.5	1267	593	146	148	1267	593	146	148	674	95	37
SP 46-3	MS 4000	7.5	1367	593	149	152	1370	596	149	152	774	95	42
SP 46-3	MS 6000	7.5	1183	609	149	152	1186	612	149	152	574	138	49
SP 46-4-BC	MS 6000	7.5	1296	722	149	152	1299	725	149	152	574	138	52
SP 46-4	MS 6000	9.2	1326	722	149	152	1329	725	149	152	604	138	57
SP 46-5-C	MS 6000	11	1469	835	149	152	1472	838	149	152	634	138	63
SP 46-5	MS 6000	13	1499	835	149	152	1502	838	149	152	664	138	66
SP 46-6-A	MS 6000	13	1612	948	149	152	1615	951	149	152	664	138	68
SP 46-6	MS 6000	15	1647	948	149	152	1650	951	149	152	699	138	72
SP 46-7-C	MS 6000	15	1760	1061	149	152	1763	1064	149	152	699	138	75
SP 46-7	MS 6000	18.5	1815	1061	149	152	1818	1064	149	152	754	138	80
SP 46-8	MS 6000	18.5	1928	1174	149	152	1931	1177	149	152	754	138	83
SP 46-9	MS 6000	22	2101	1287	149	152	2104	1290	149	152	814	138	91
SP 46-10	MS 6000	22	2214	1400	149	152	2217	1403	149	152	814	138	94
SP 46-11	MS 6000	26	2387	1513	149	152	2390	1516	149	152	874	138	102
SP 46-12	MS 6000	30	2570	1626	149	152	2573	1629	149	152	944	138	112
SP 46-13	MS 6000	30	2683	1739	149	152	2686	1742	149	152	944	138	115
SP 46-14	MMS 6000	37	3357	1932	149	152	3360	1935	149	152	1425	138	168
SP 46-15	MMS 6000	37	3470	2045	149	152	3473	2048	149	152	1425	138	170
SP 46-16	MMS 6000	37	3583	2158	149	152	3586	2161	149	152	1425	138	173
SP 46-17	MMS 6000	37	3696	2271	149	152	3699	2274	149	152	1425	138	175
SP 46-18	MMS 8000	45	3603	2333	192	192	3606	2336	192	192	1270	192	228
SP 46-19	MMS 8000	45	3717	2446	192	192	3719	2449	192	192	1270	192	231
SP 46-20	MMS 8000	45	3829	2559	192	192	3832	2562	192	192	1270	192	234
SP 46-22	MMS 8000	55	4298	2948	193	195	4301	2951	193	195	1350	192	281
SP 46-24	MMS 8000	55					4527	3177	193	195	1350	192	287

* Maximum diameter of pump with one motor cable.

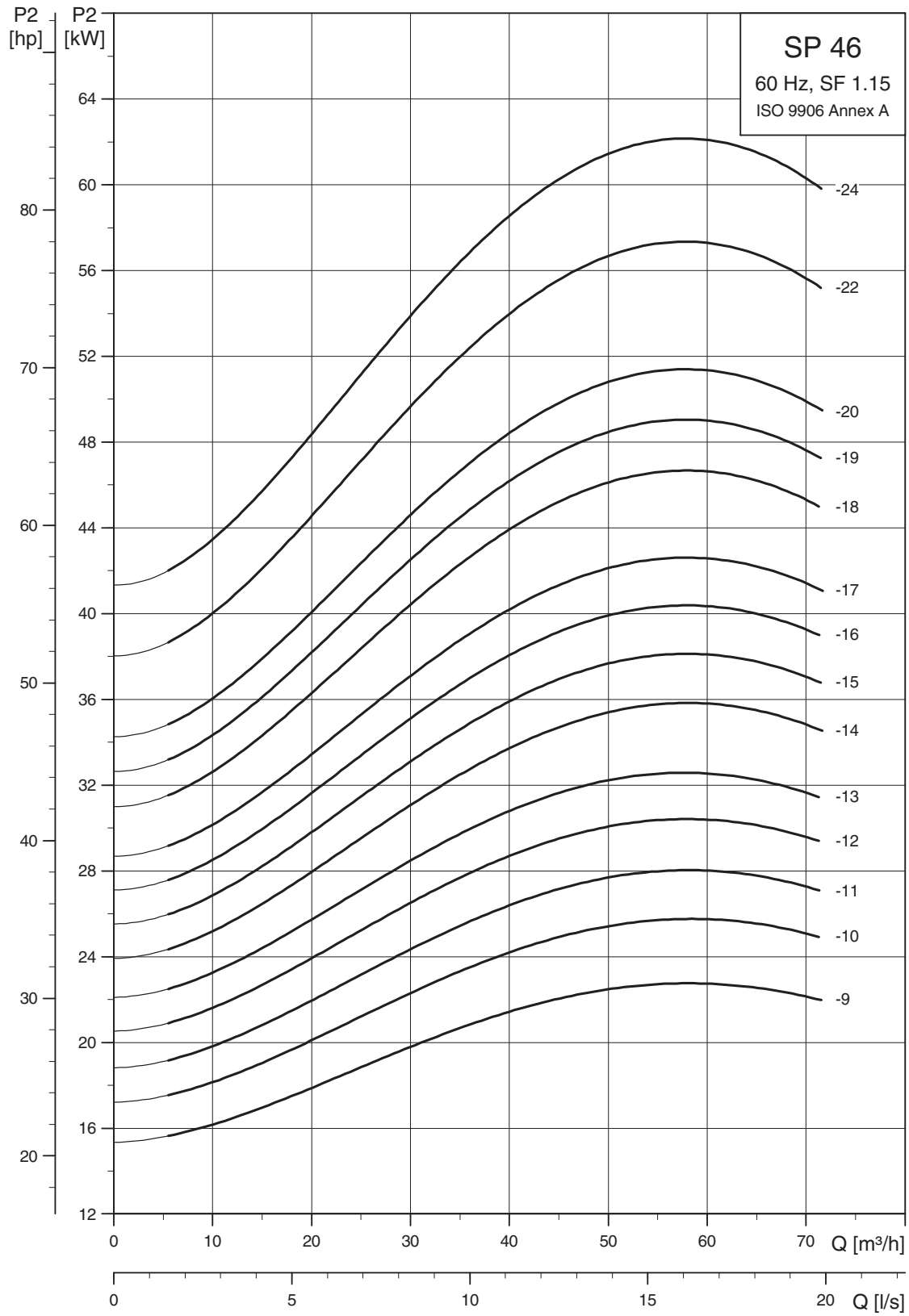
** Maximum diameter of pump with two motor cables.

All pumps are also available in N version with motors up to 30 kW in R version (not MS 402). Dimensions as above.
SP 46-1 to SP 46 -13 pumps are also available in R version with motors in R version. Dimensions as above.
Other types of connection are possible by means of connecting pieces, see page 86.

Power curves

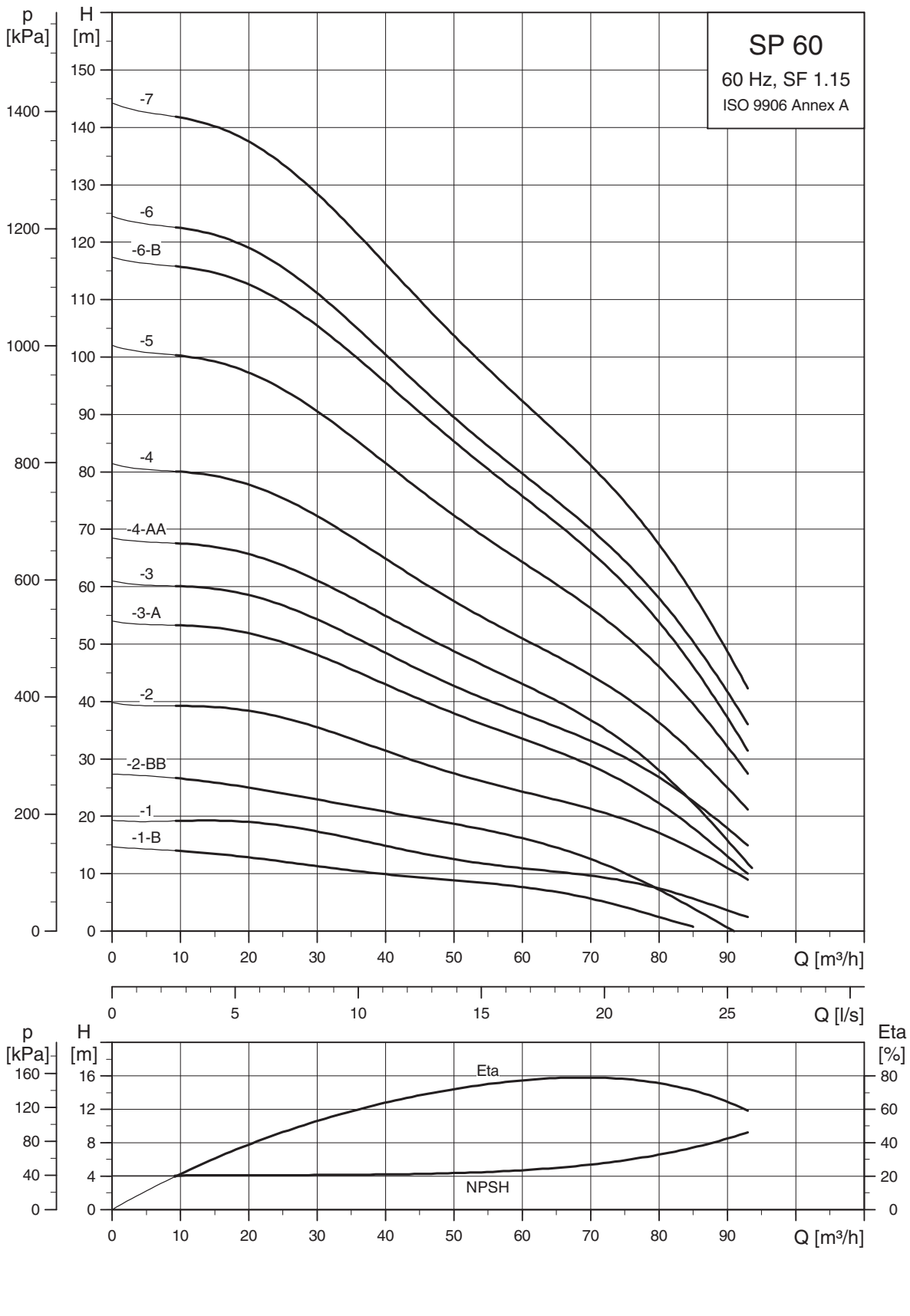


Power curves



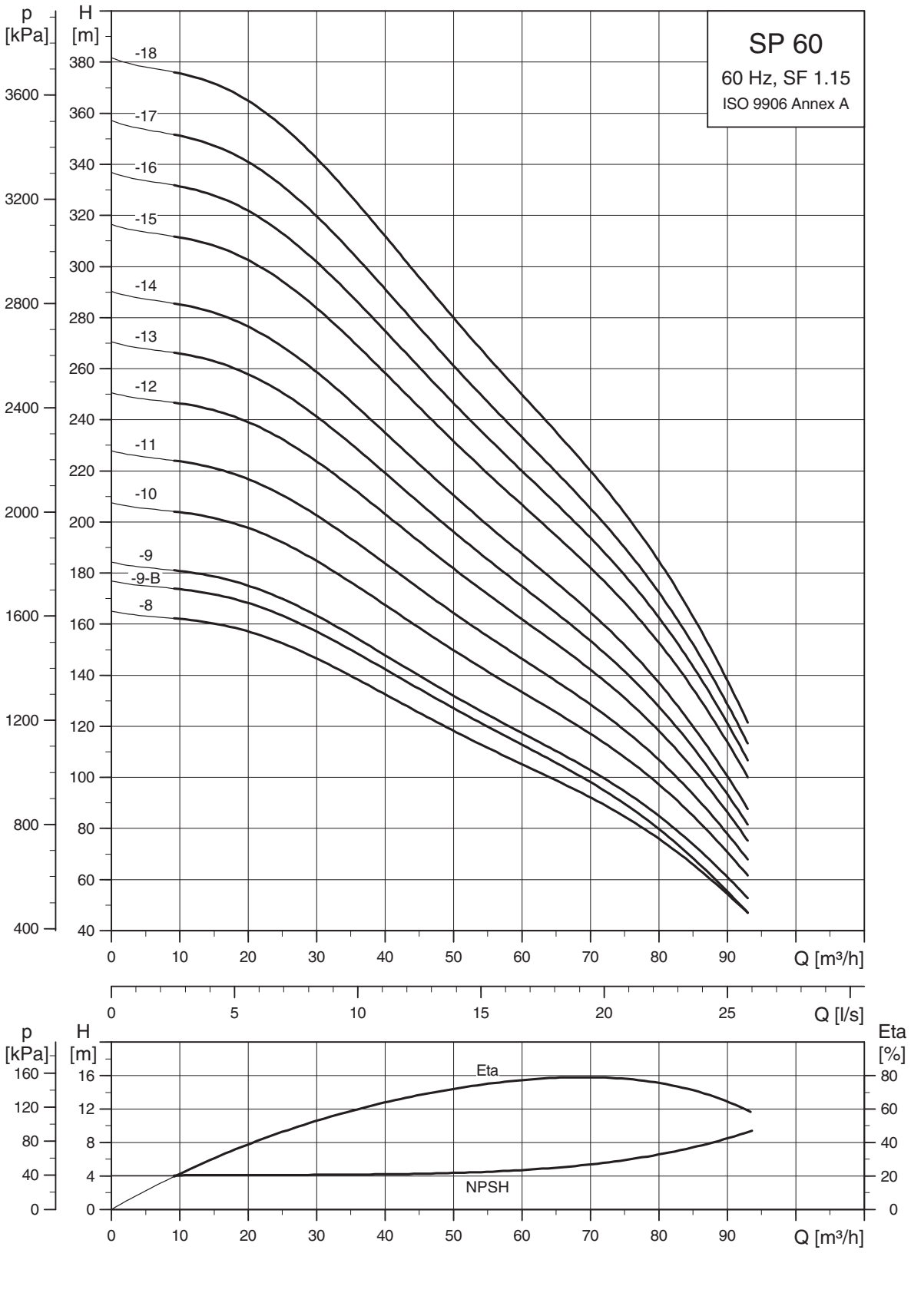
GRUNDFOS

Performance curves



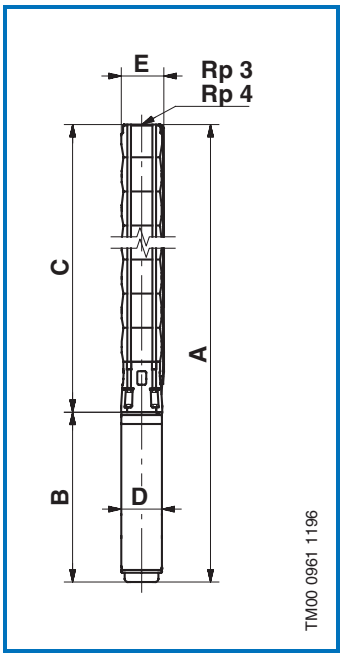
GRUNDFOS

Performance curves



GRUNDFOS

Dimensions and weights



Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 3 connection				Rp 4 connection				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 60-1-B	MS 4000	2.2	821	367	146	148	824	370	146	148	454	95	22
SP 60-1-A	MS 4000	3.7					864	370	146	148	494	95	23
SP 60-1	MS 4000	4	941	367	146	148	944	370	146	148	574	95	27
SP 60-2-BB	MS 4000	3.7	974	480	146	148	977	483	146	148	494	95	25
SP 60-2	MS 4000	5.5	1154	480	146	148	1157	483	146	148	674	95	34
SP 60-3-A	MS 4000	7.5	1367	593	146	148	1370	596	146	148	774	95	39
SP 60-3-A	MS 6000	7.5	1183	609	152	156	1186	612	152	156	574	138	49
SP 60-3	MS 6000	9.2	1213	609	152	156	1216	612	152	156	604	138	55
SP 60-4-AA	MS 6000	9.2	1326	722	152	156	1329	725	152	156	604	138	57
SP 60-4	MS 6000	11	1356	722	152	156	1359	725	152	156	634	138	60
SP 60-5	MS 6000	13	1499	835	152	156	1502	838	152	156	664	138	66
SP 60-6-B	MS 6000	15	1647	948	152	156	1650	951	152	156	699	138	72
SP 60-6	MS 6000	18.5	1702	948	152	156	1705	951	152	156	754	138	78
SP 60-7	MS 6000	18.5	1815	1061	152	156	1818	1064	152	156	754	138	80
SP 60-8	MS 6000	22	1988	1174	152	156	1991	1177	152	156	814	138	89
SP 60-9-B	MS 6000	22	2101	1287	152	156	2104	1290	152	156	814	138	91
SP 60-9	MS 6000	26	2161	1287	152	156	2164	1290	152	156	874	138	97
SP 60-10	MS 6000	26	2274	1400	152	156	2277	1403	152	156	874	138	100
SP 60-11	MS 6000	30	2457	1513	152	156	2460	1516	152	156	944	138	110
SP 60-12	MMS 6000	37	3131	1706	152	156	3134	1709	152	156	1425	138	163
SP 60-13	MMS 6000	37	3244	1819	152	156	3247	1822	152	156	1425	138	165
SP 60-14	MMS 6000	37					3360	1935	152	156	1425	138	168
SP 60-15	MMS 8000	45					3267	1997	192	192	1270	192	221
SP 60-16	MMS 8000	45					3380	2110	192	192	1270	192	223
SP 60-17	MMS 8000	45					3493	2223	192	192	1270	192	226
SP 60-18	MMS 8000	55					3686	2336	192	192	1350	192	243

* Maximum diameter of pump with one motor cable.

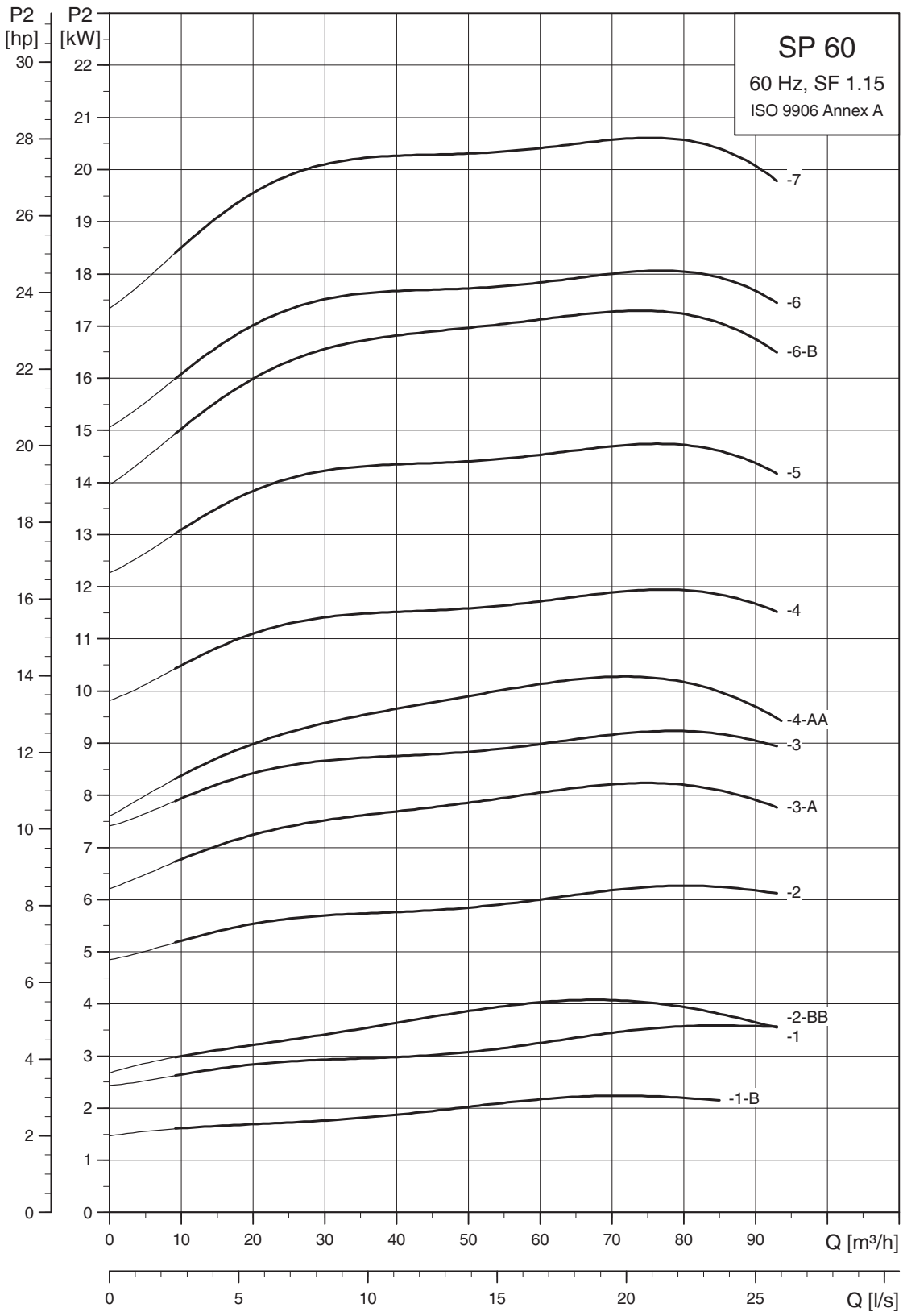
** Maximum diameter of pump with two motor cables.

All pumps are also available in N version with motors up to 30 kW in R version.
Dimensions as above.

SP 60-1 to SP 60-11 are also available in R version with motors in R version. Dimensions as above.

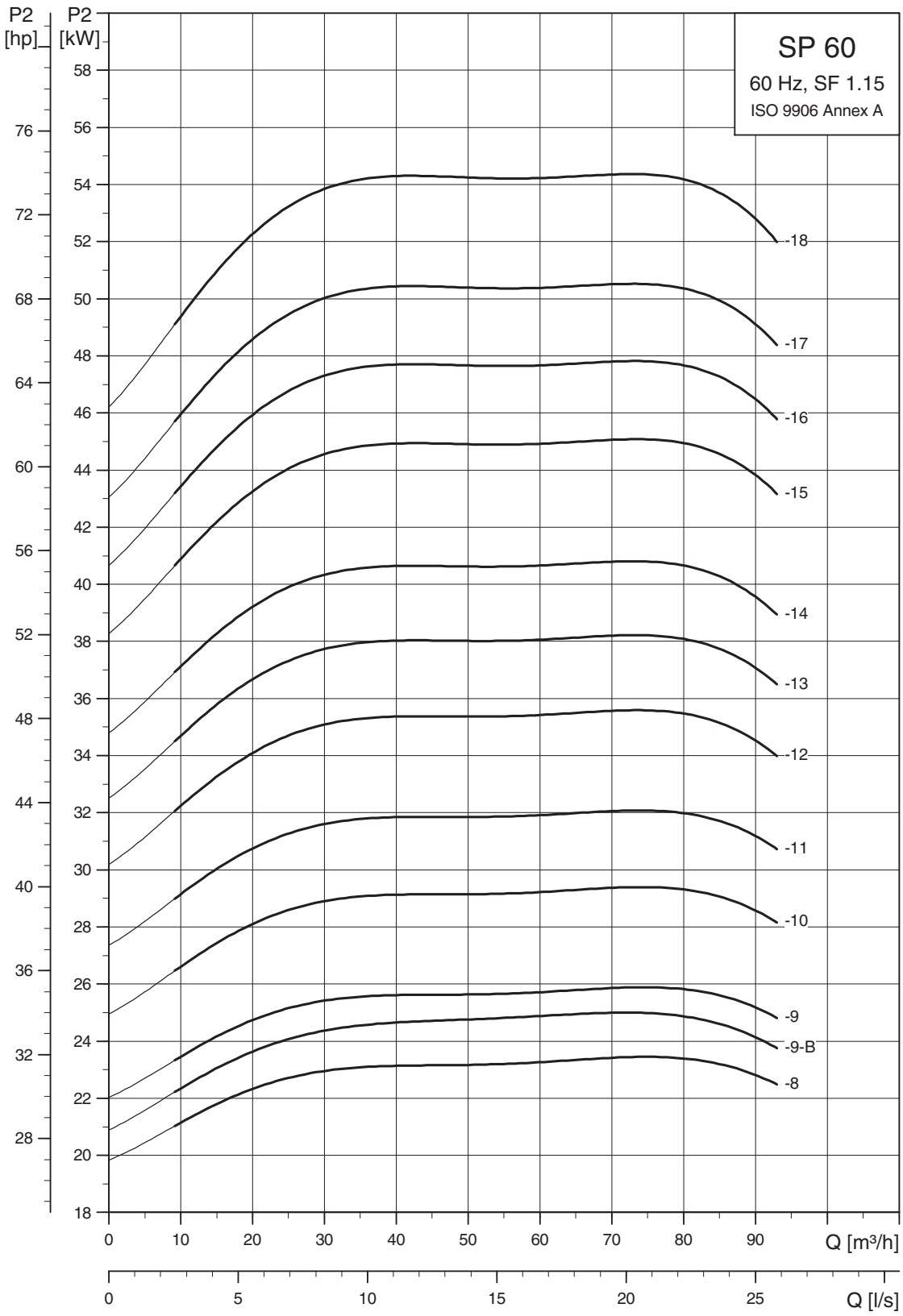
Other types of connection are possible by means of connecting pieces, see page 86.

Power curves



GRUNDFOS

Power curves



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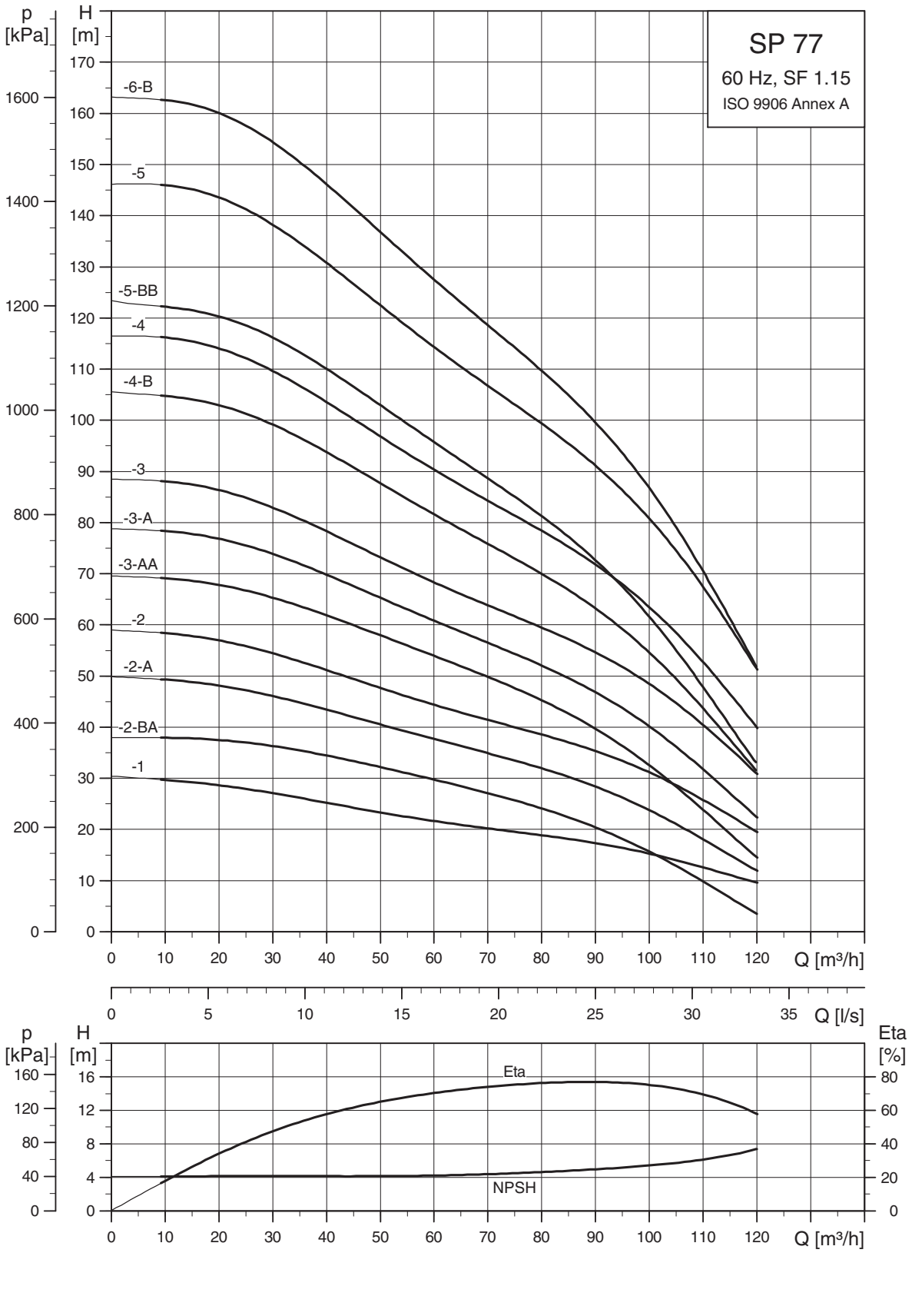
GRUNDFOS

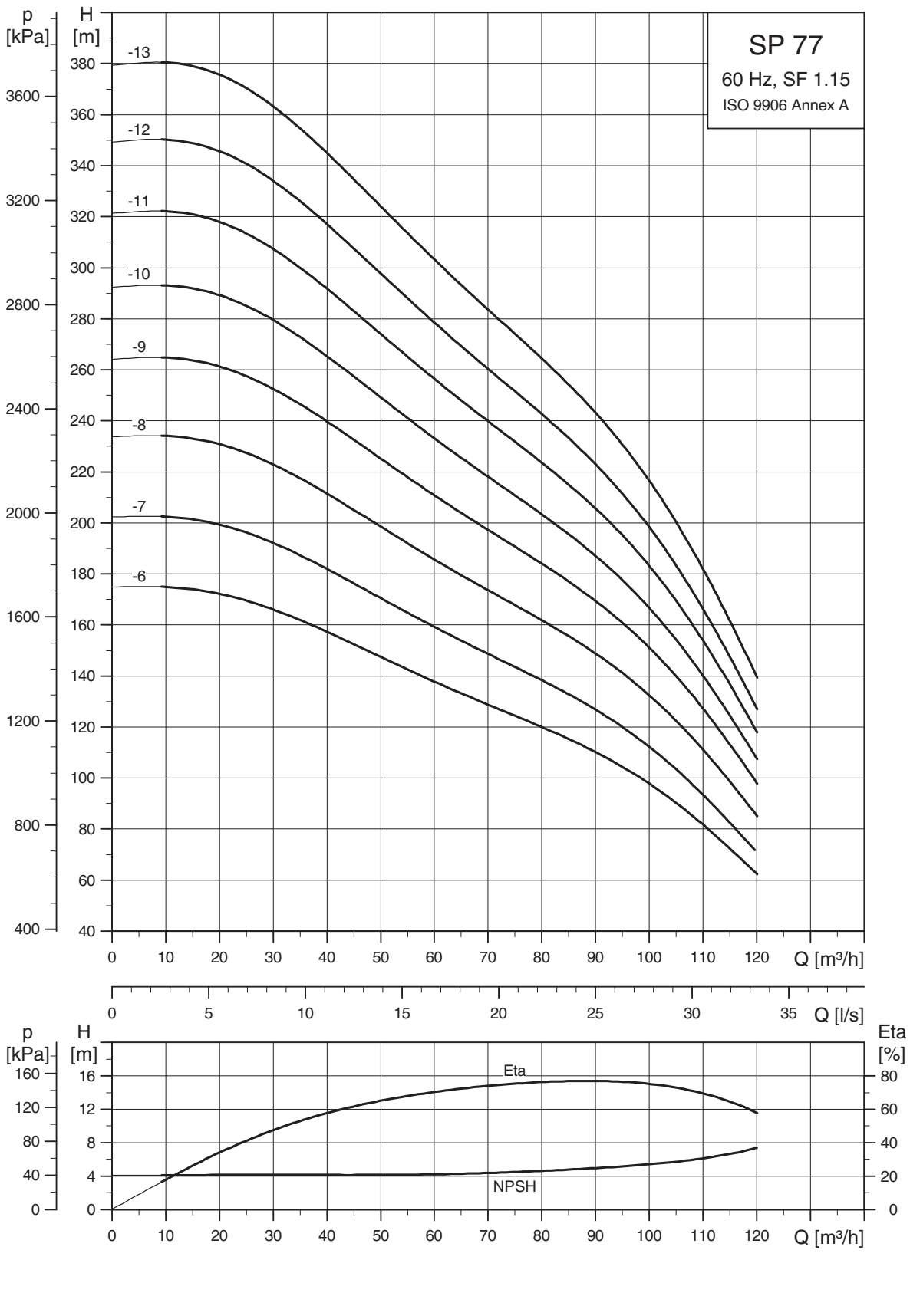
Performance curves



TM01 3317 1500

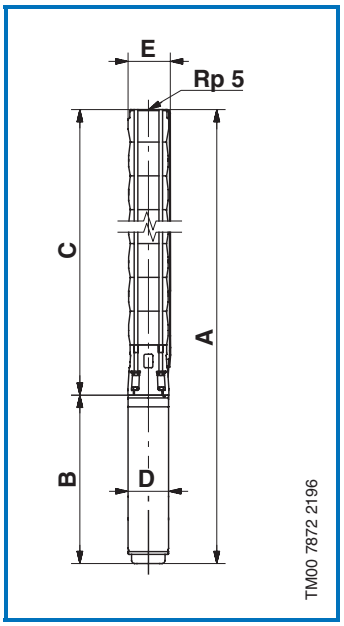
GRUNDFOS

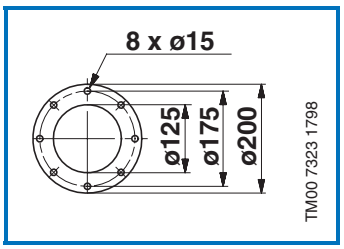
Performance curves



GRUNDFOS

Dimensions and weights





Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 5 connection				5" Grundfos flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 77-1	MS 6000	5.5	1162	618	178	186	1162	618	200	200	544	138	55
SP 77-2-BA	MS 6000	7.5	1320	746	178	186	1320	746	200	200	574	138	63
SP 77-2-A	MS 6000	9.2	1350	746	178	186	1350	746	200	200	604	138	69
SP 77-2	MS 6000	11	1380	746	178	186	1380	746	200	200	634	138	71
SP 77-3-AA	MS 6000	13	1538	874	178	186	1538	874	200	200	664	138	78
SP 77-3-A	MS 6000	15	1573	874	178	186	1573	874	200	200	699	138	82
SP 77-3	MS 6000	18.5	1628	874	178	186	1628	874	200	200	754	138	87
SP 77-4-B	MS 6000	18.5	1756	1002	178	186	1756	1002	200	200	754	138	91
SP 77-4	MS 6000	22	1816	1002	178	186	1816	1002	200	200	814	138	97
SP 77-5-BB	MS 6000	22	1944	1130	178	186	1944	1130	200	200	814	138	101
SP 77-5	MS 6000	26	2004	1130	178	186	2004	1130	200	200	874	138	106
SP 77-6-B	MS 6000	30	2202	1258	178	186	2202	1258	200	200	944	138	118
SP 77-6	MMS 6000	37	2683	1258	178	186	2683	1258	200	200	1425	138	166
SP 77-7	MMS 6000	37	2811	1386	178	186	2811	1386	200	200	1425	138	169
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	3530	2040	205	205	1490	192	281
SP 77-13	MMS 8000	75	3758	2168	200	204	3758	2168	205	205	1590	192	304

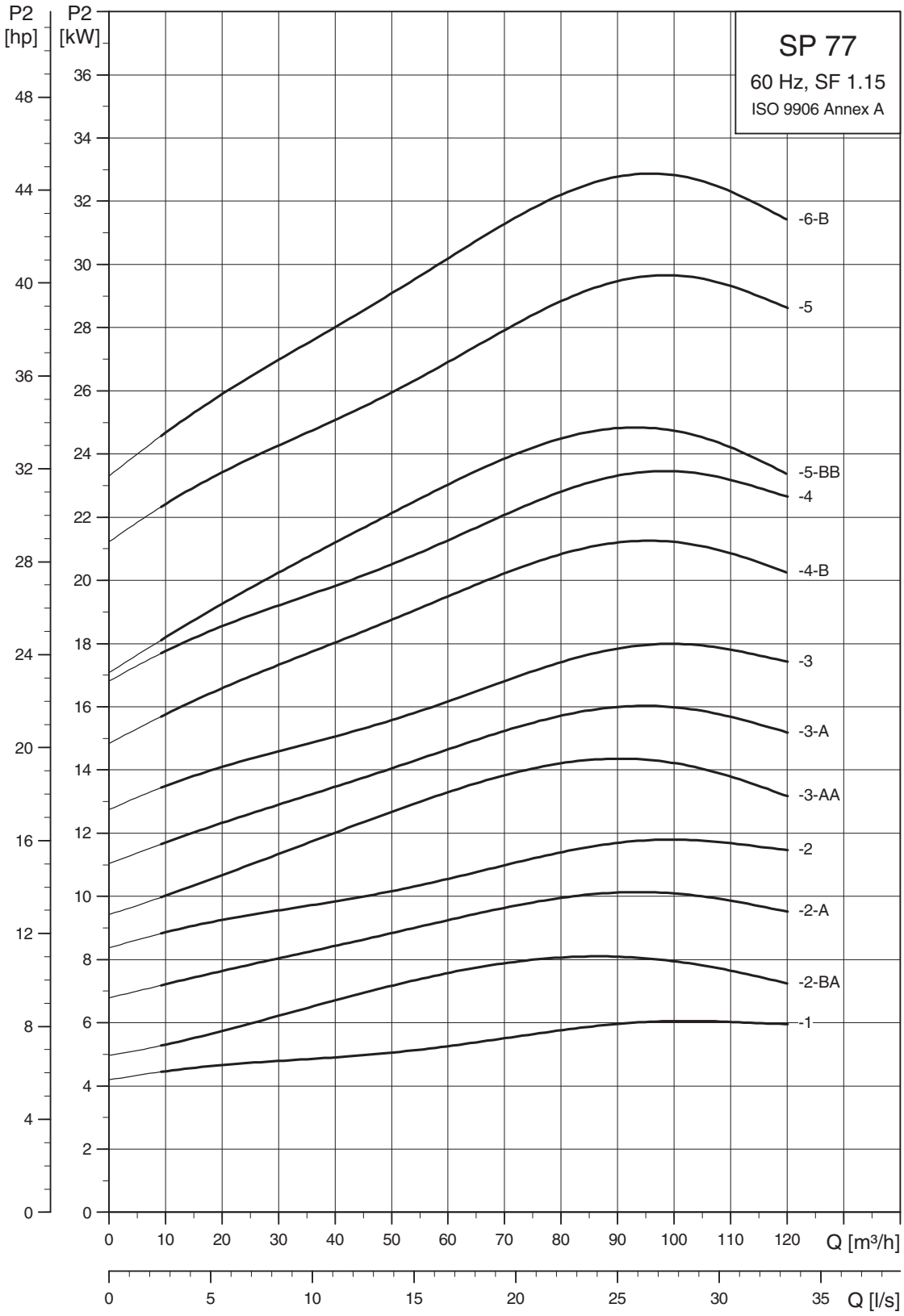
* Maximum diameter of pump with one motor cable.

** Maximum diameter of pump with two motor cables.

All pumps are also available in N version with motors up to 30 kW in R version.
Dimensions as above.

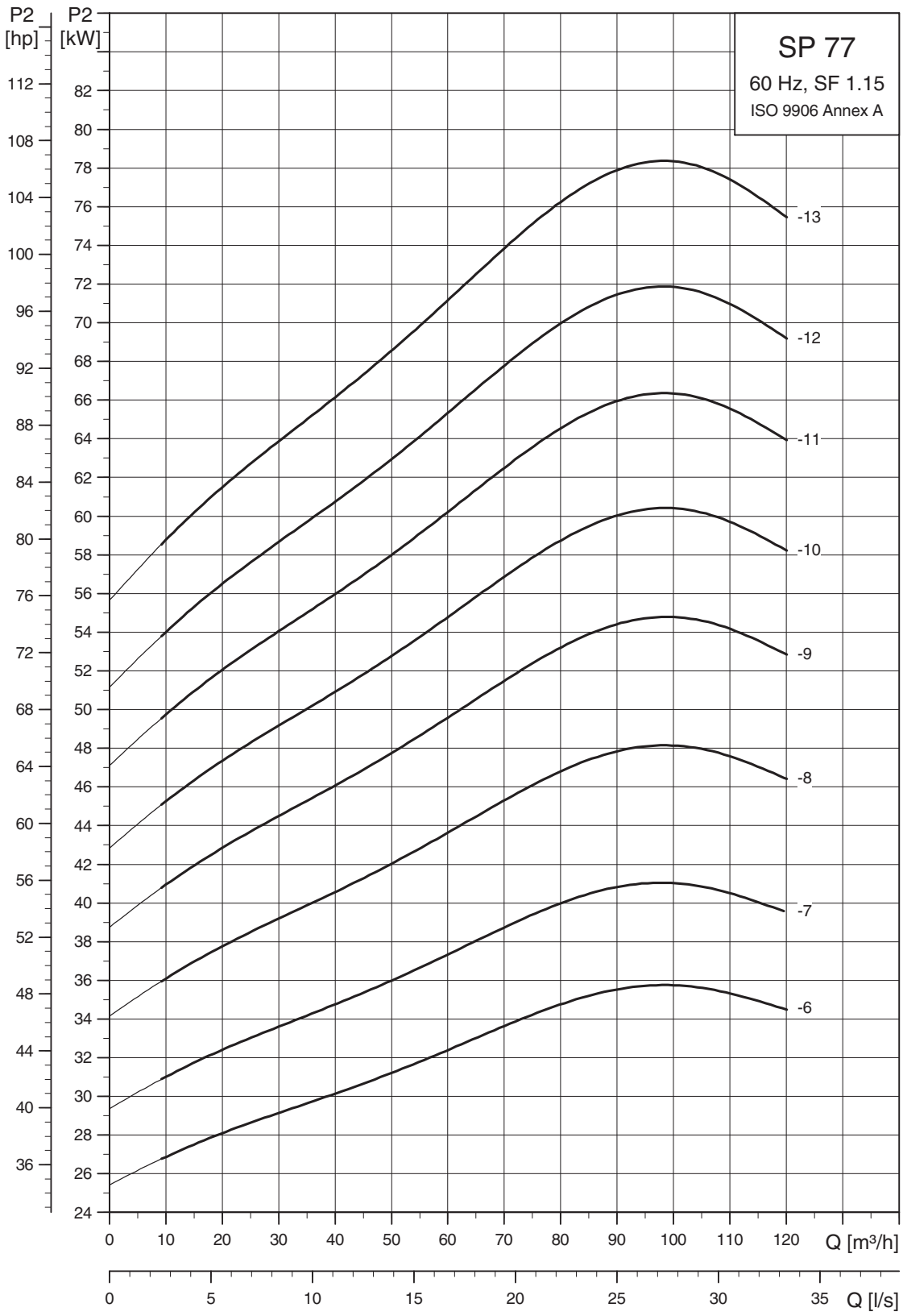
Other types of connection are possible by means of connecting pieces, see page 86.

Power curves

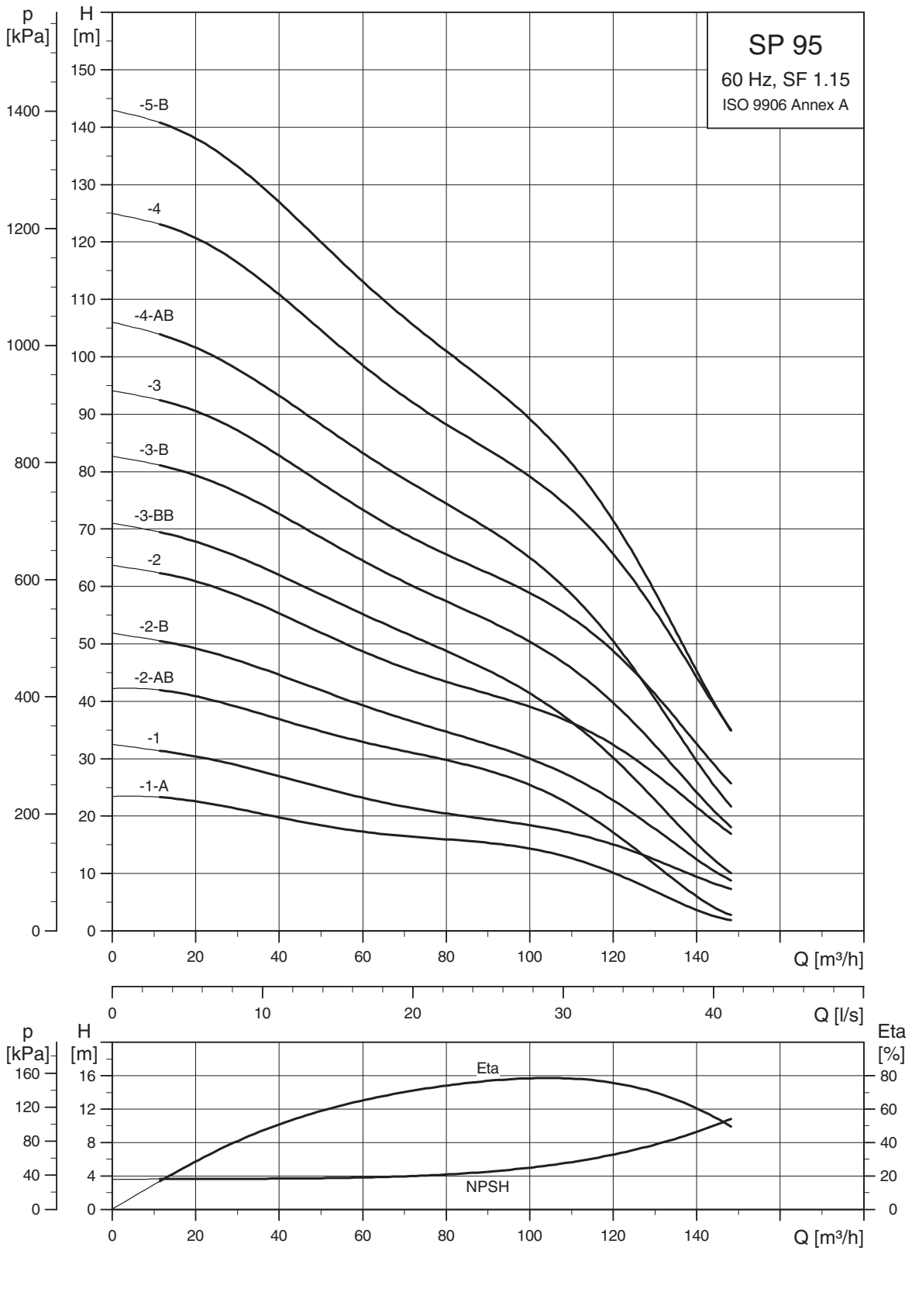


TM00 7450 1500

GRUNDFOS

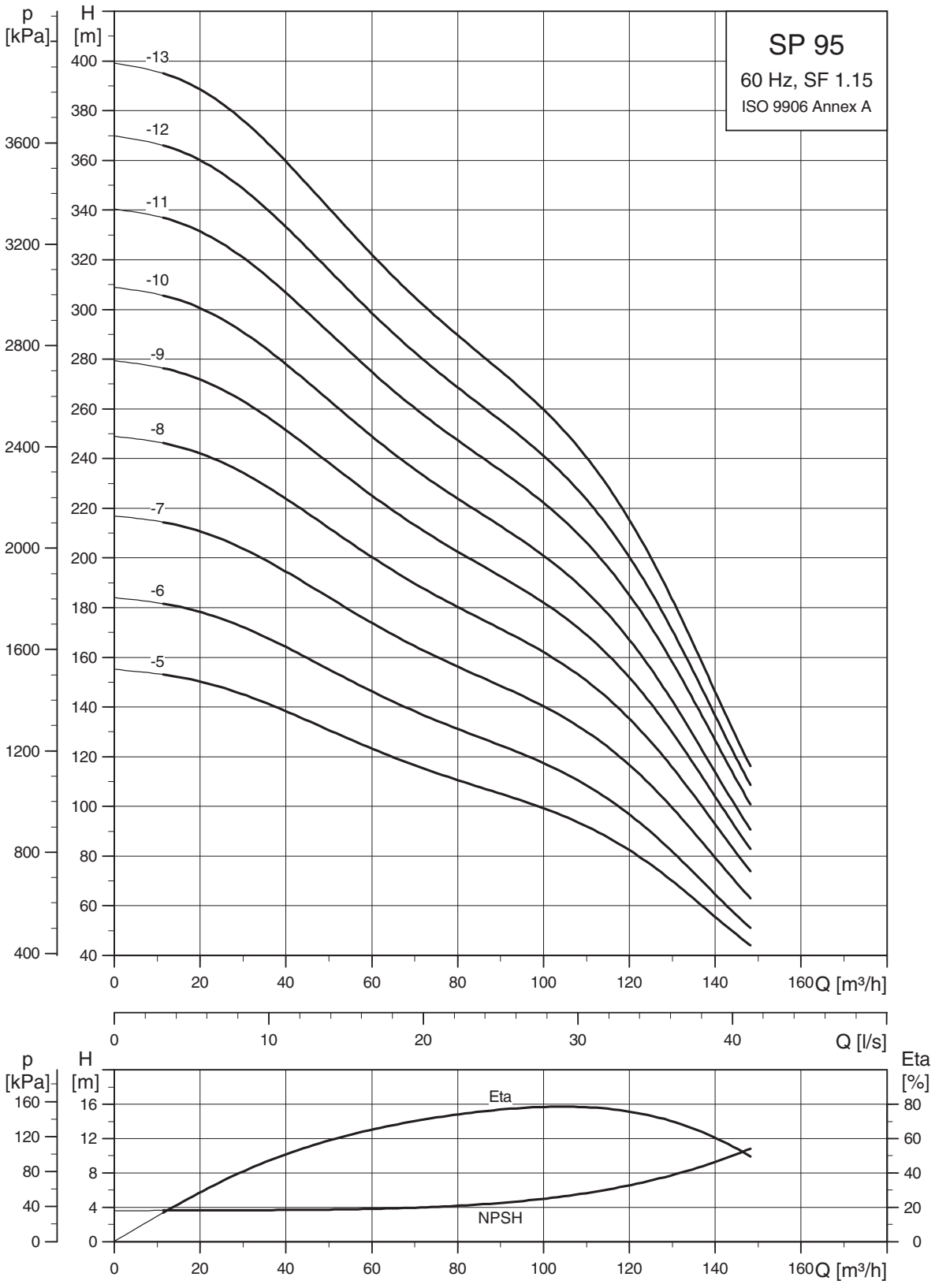

P2 [hp]
P2 [kW]
SP 77
60 Hz, SF 1.15
ISO 9906 Annex A
-13
-12
-11
-10
-9
-8
-7
-6
Q [m³/h]
Q [l/s]
TM01 9247 1500

Performance curves



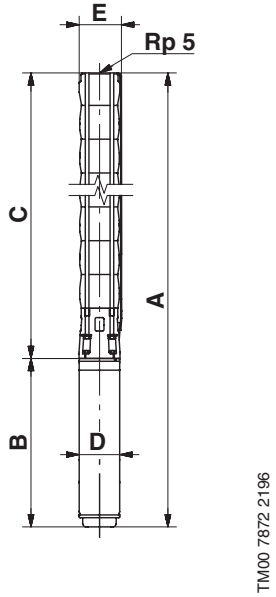
GRUNDFOS

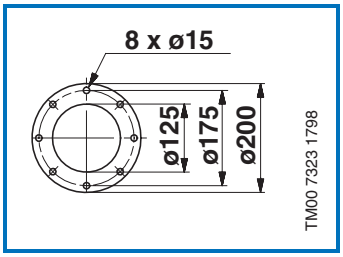
Performance curves



GRUNDFOS

Dimensions and weights





Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 5 connection				5" Grundfos flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 95-1-A	MS 6000	5.5	1162	618	179	183	1162	618	200	200	544	138	55
SP 95-1	MS 6000	7.5	1192	618	179	183	1192	618	200	200	574	138	59
SP 95-2-AB	MS 6000	9.2	1350	746	179	183	1350	746	200	200	604	138	69
SP 95-2-B	MS 6000	11	1380	746	179	183	1380	746	200	200	634	138	71
SP 95-2	MS 6000	13	1410	746	179	183	1410	746	200	200	664	138	74
SP 95-3-BB	MS 6000	15	1573	874	179	183	1573	874	200	200	699	138	82
SP 95-3-B	MS 6000	18.5	1628	874	179	183	1628	874	200	200	754	138	87
SP 95-3	MS 6000	22	1688	874	179	183	1688	874	200	200	814	138	93
SP 95-4-AB	MS 6000	22	1816	1002	179	183	1816	1002	200	200	814	138	97
SP 95-4	MS 6000	26	1876	1002	179	183	1876	1002	200	200	874	138	103
SP 95-5-B	MS 6000	30	2074	1130	179	183	2074	1130	200	200	944	138	114
SP 95-5	MMS 6000	37	2555	1130	179	183	2555	1130	200	200	1425	138	162
SP 95-6	MMS 6000	37	2683	1258	179	183	2683	1258	200	200	1425	138	166
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

* Maximum diameter of pump with one motor cable.

** Maximum diameter of pump with two motor cables.

All pumps are also available in N version with motors up to 30 kW in R version.
Dimensions as above

Other types of connection are possible by means of connecting pieces, see page 86.

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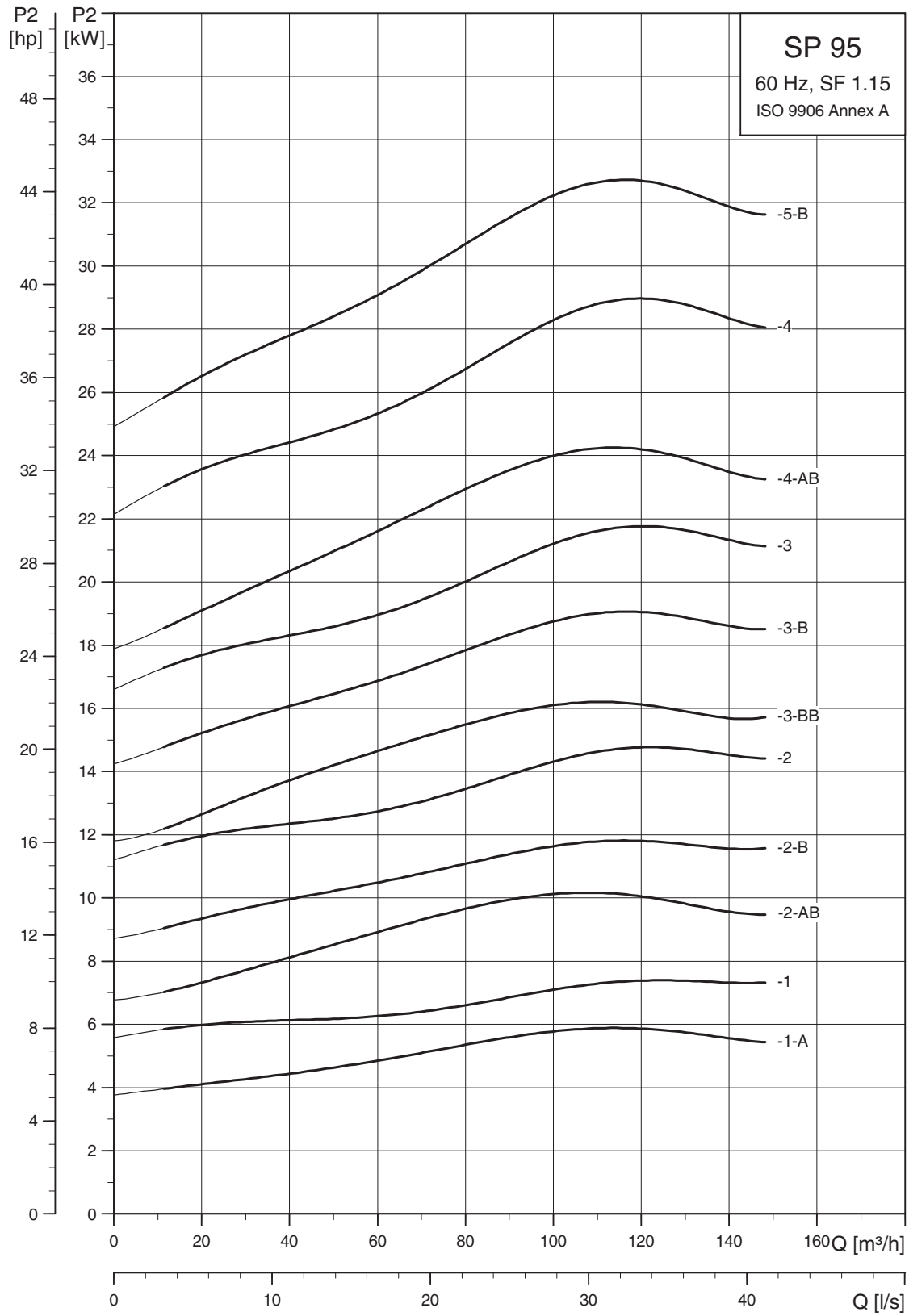
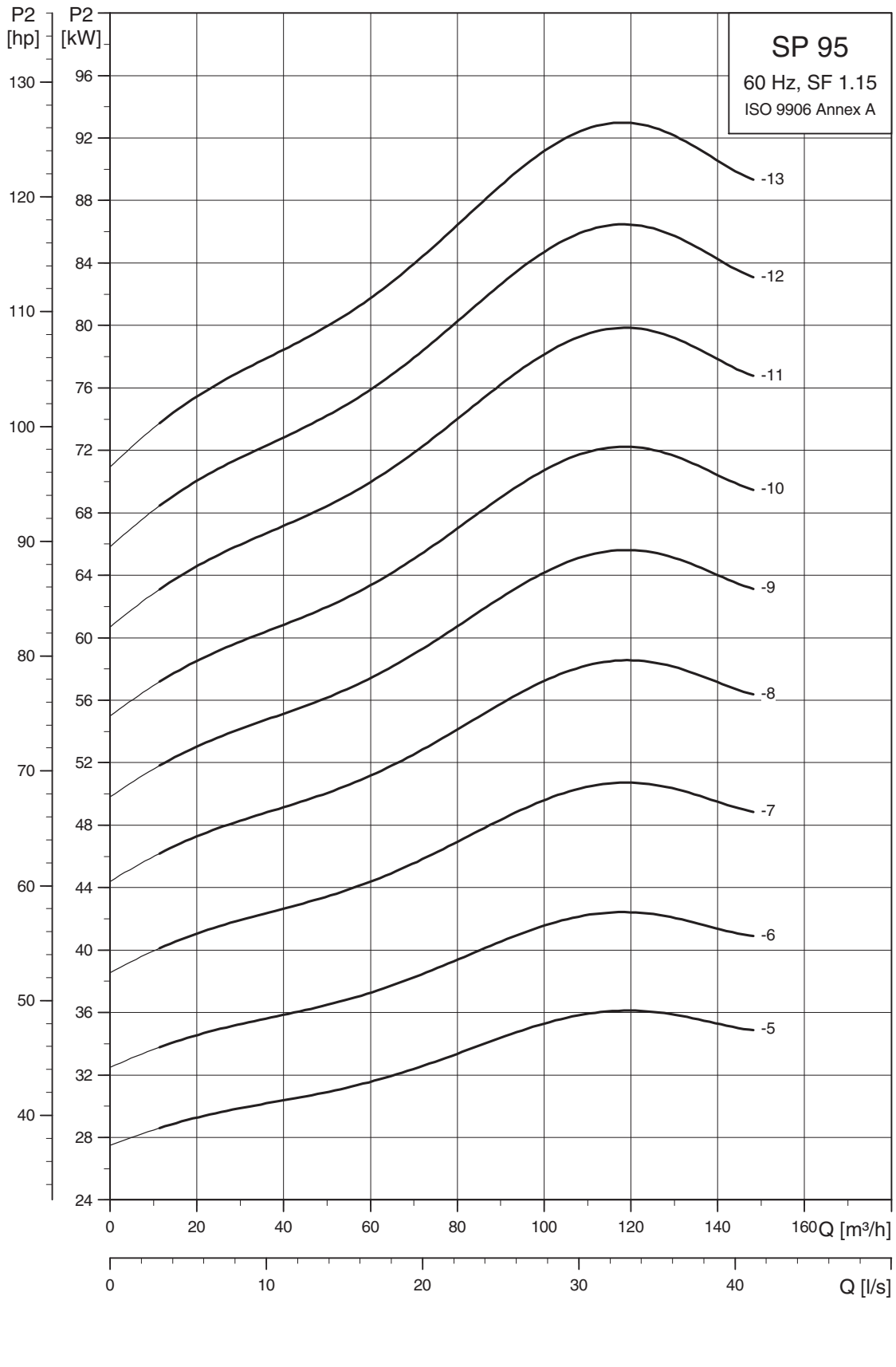
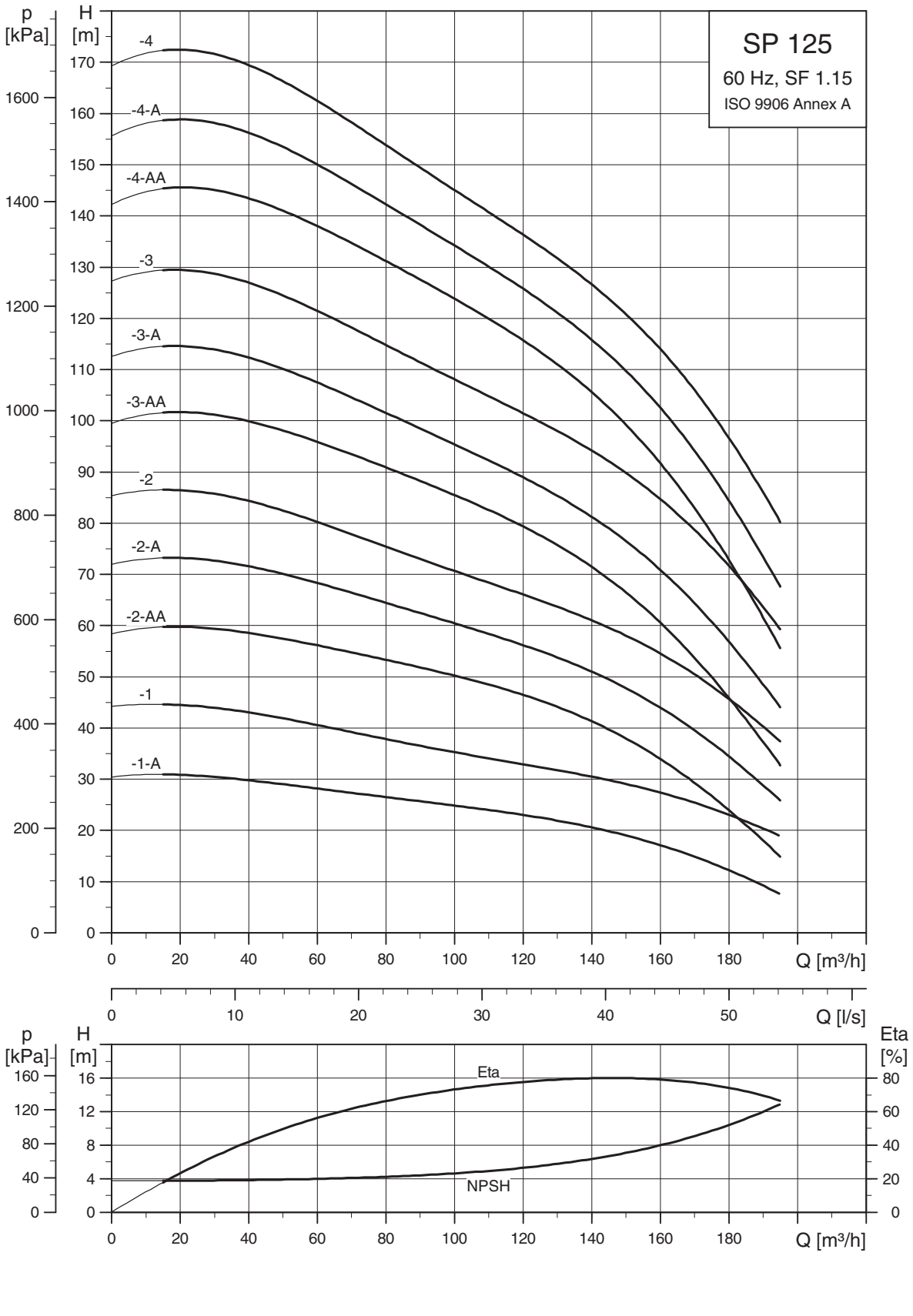
Power curves



Power curves

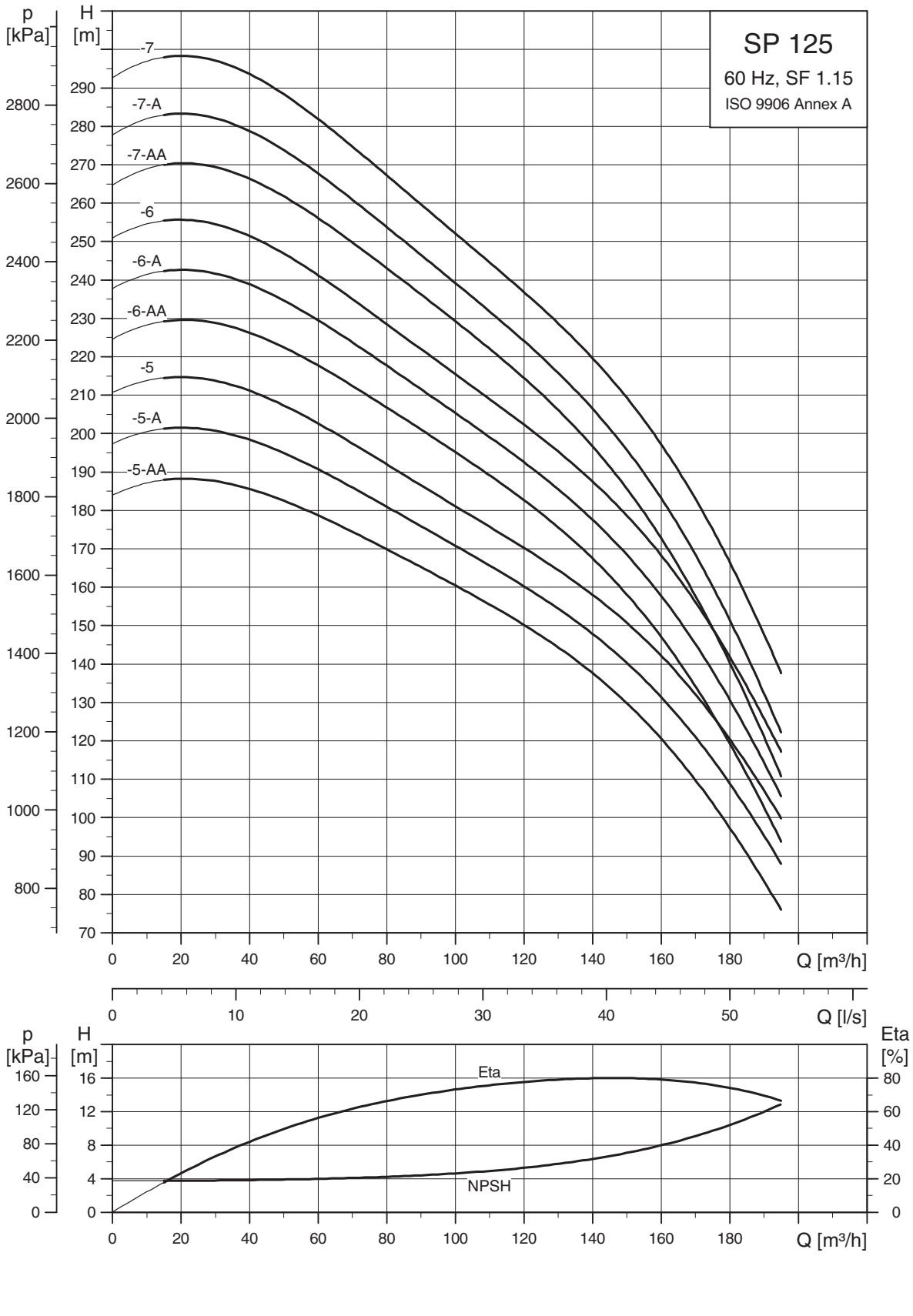


Performance curves



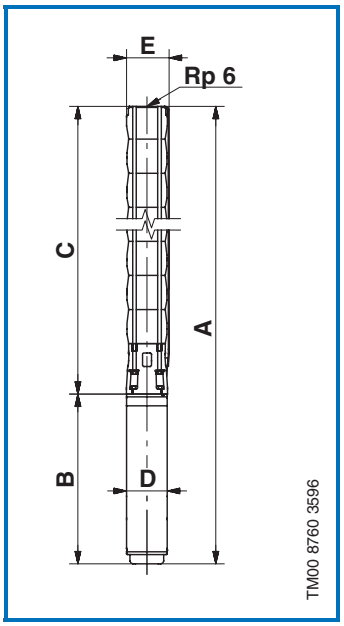
GRUNDFOS

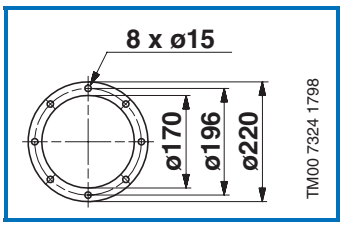
Performance curves



GRUNDFOS

Dimensions and weights





Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 6 connection				6" Grundfos flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 125-1-A	MS 6000	11	1286	652	211	215	1286	652	222	226	634	138	81
SP 125-1	MS 6000	18.5	1406	652	211	215	1406	652	222	226	754	138	93
SP 125-2-AA	MS 6000	22	1621	807	211	215	1621	807	222	226	814	138	105
SP 125-2-A	MS 6000	26	1681	807	211	215	1681	807	222	226	874	138	111
SP 125-2	MS 6000	30	1751	807	211	215	1751	807	222	226	944	138	119
SP 125-3-AA	MMS 6000	37	2388	963	211	215	2388	963	222	226	1425	138	172
SP 125-3-A	MMS 6000	37	2388	963	211	215	2388	963	222	226	1425	138	172
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

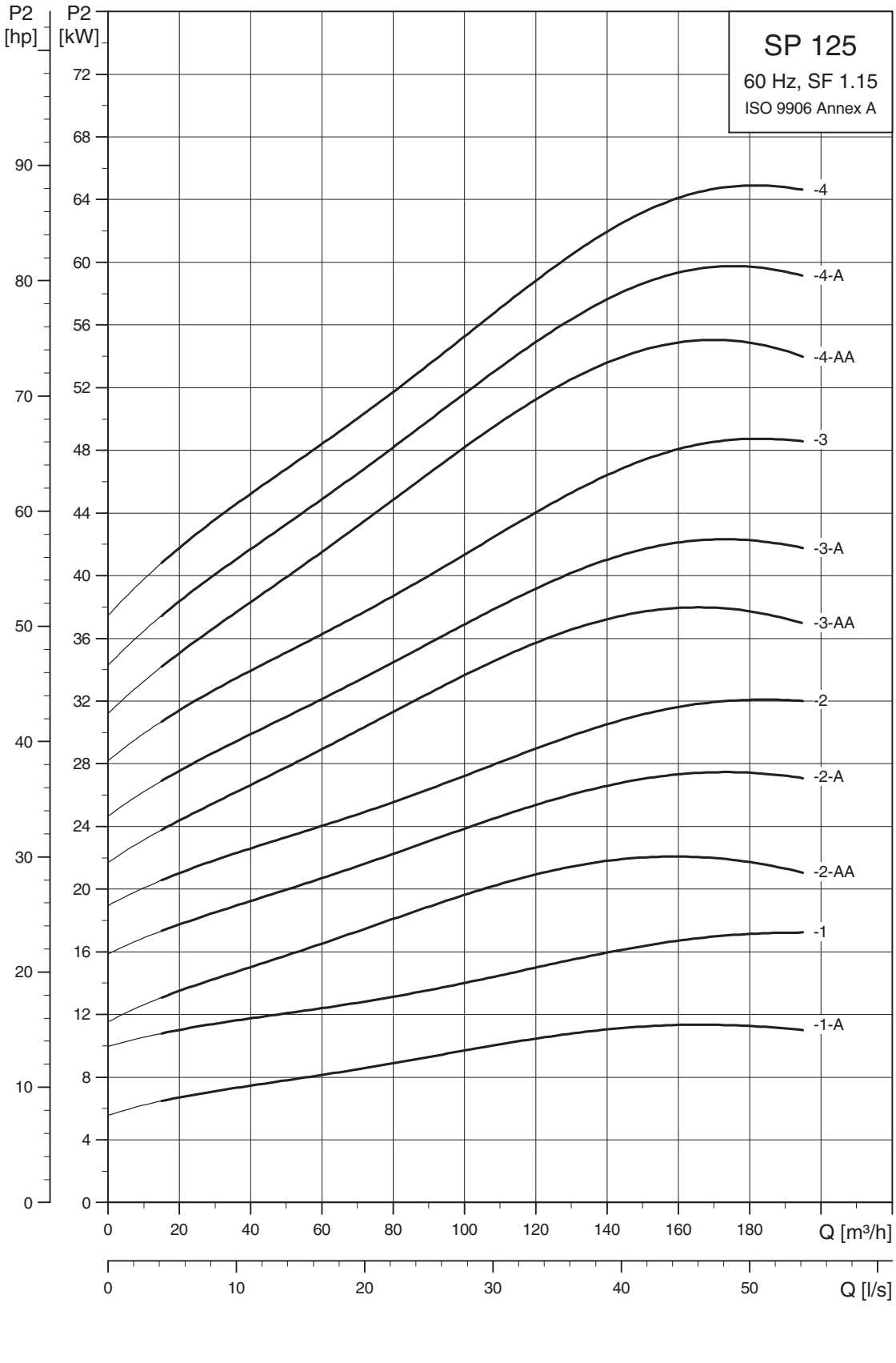
* Maximum diameter of pump with one motor cable.

** Maximum diameter of pump with two motor cables.

All pumps are also available in N version with motors up to 30 kW in R version. Dimensions as above.

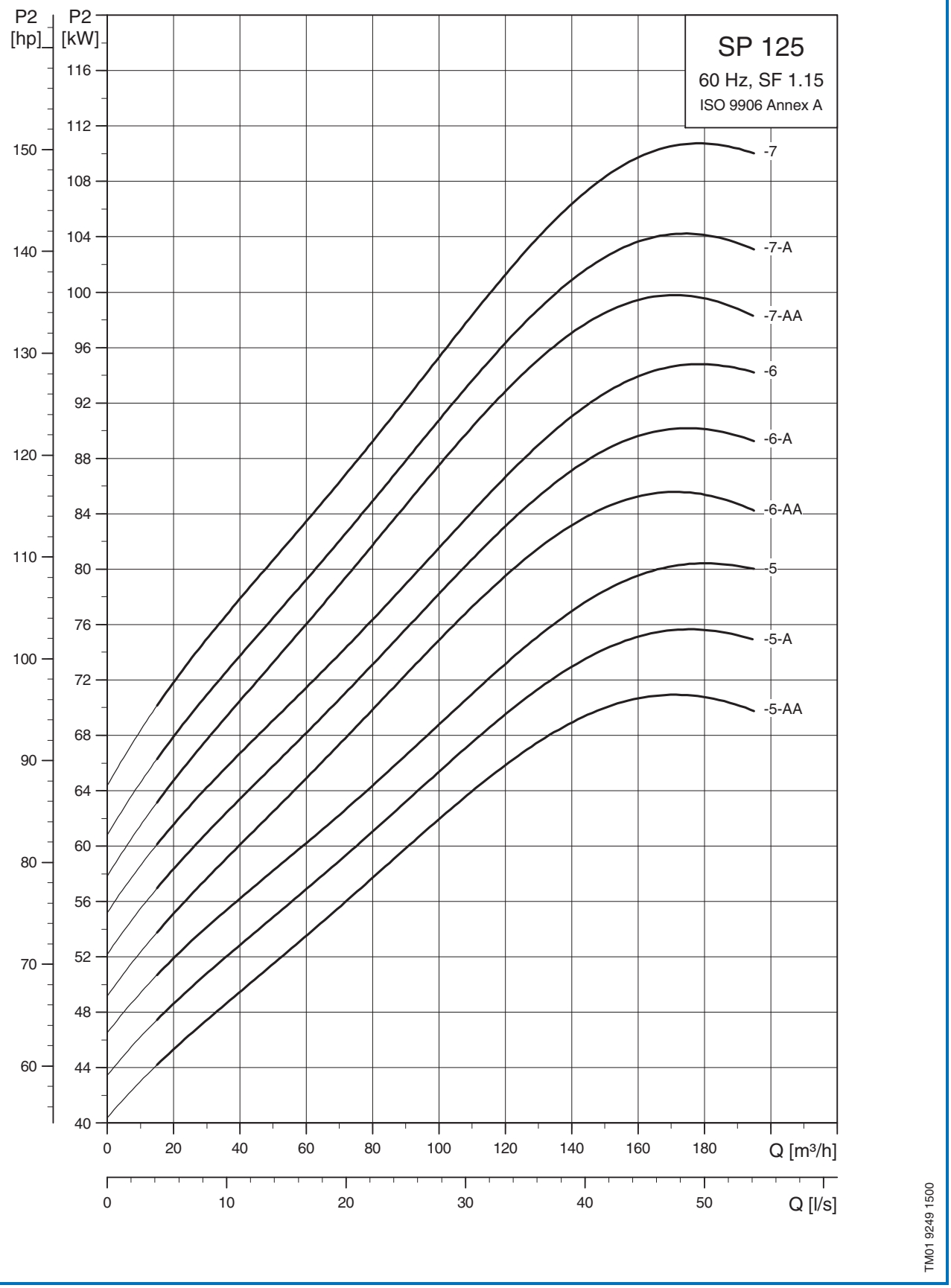
Other types of connection are possible by means of connecting pieces, see page 86.

Power curves



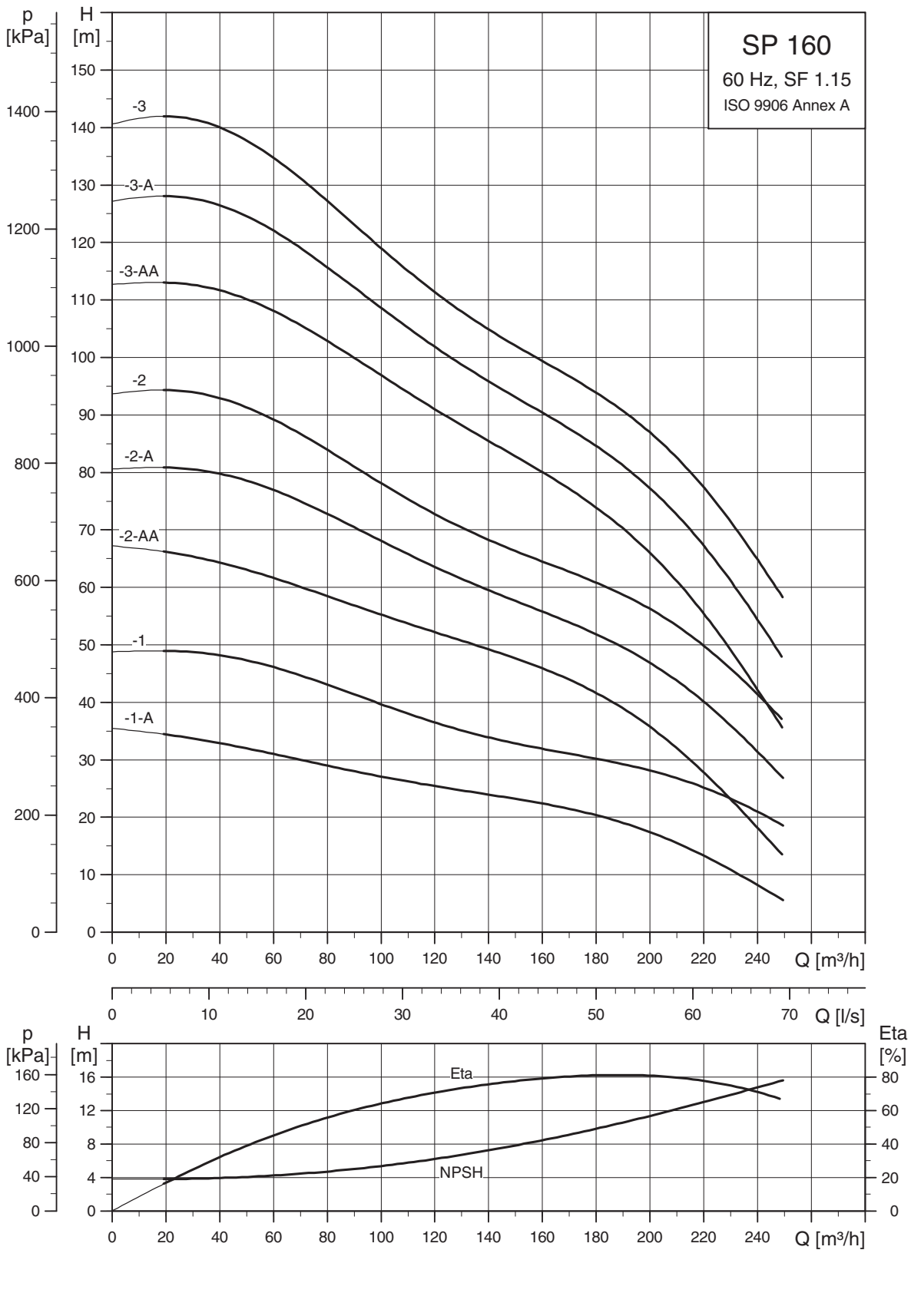
GRUNDFOS

Power curves



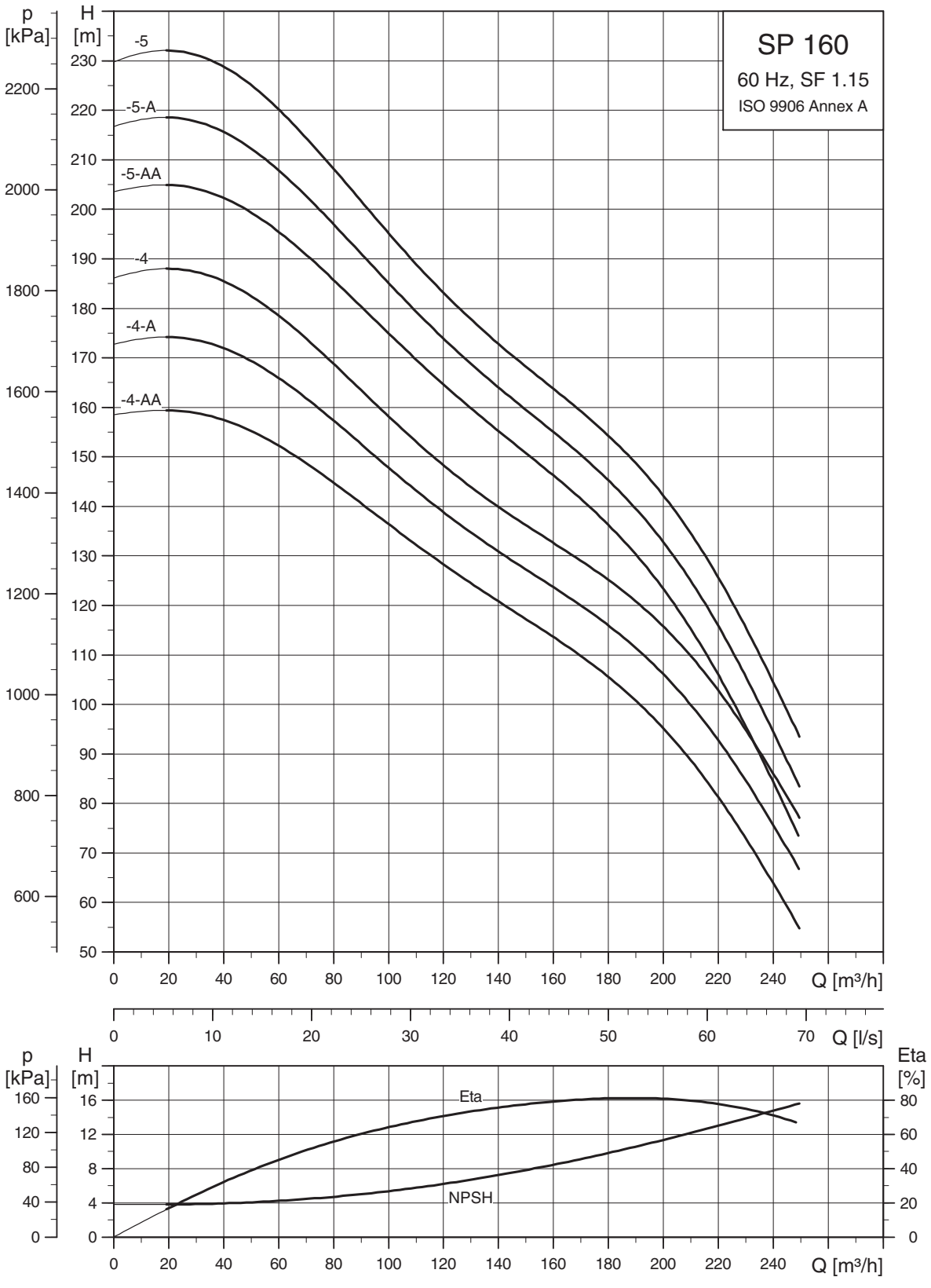
GRUNDFOS

Performance curves



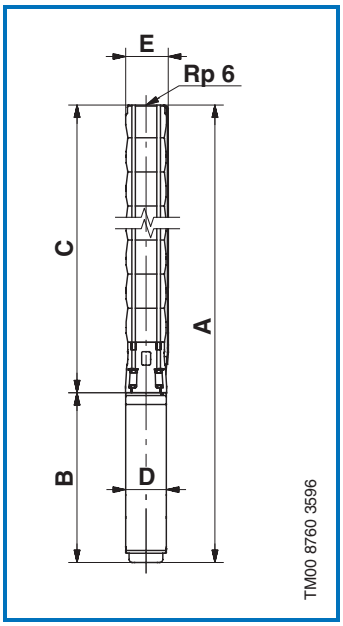
GRUNDFOS

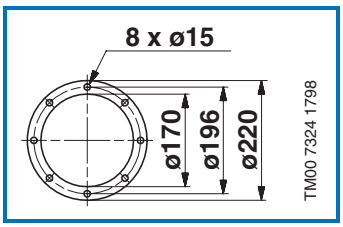
Performance curves



GRUNDFOS

Dimensions and weights





Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 6 connection				6" Grundfos flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 160-1-A	MS 6000	15	1351	652	211	215	1351	652	222	226	699	138	88
SP 160-1	MS 6000	22	1466	652	211	215	1466	652	222	226	814	138	99
SP 160-2-AA	MS 6000	26	1681	807	211	215	1681	807	222	226	874	138	111
SP 160-2-A	MMS 6000	37	2232	807	211	215	2232	807	222	226	1425	138	166
SP 160-2	MMS 6000	37	2232	807	211	215	2232	807	222	226	1425	138	166
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

* Maximum diameter of pump with one motor cable.

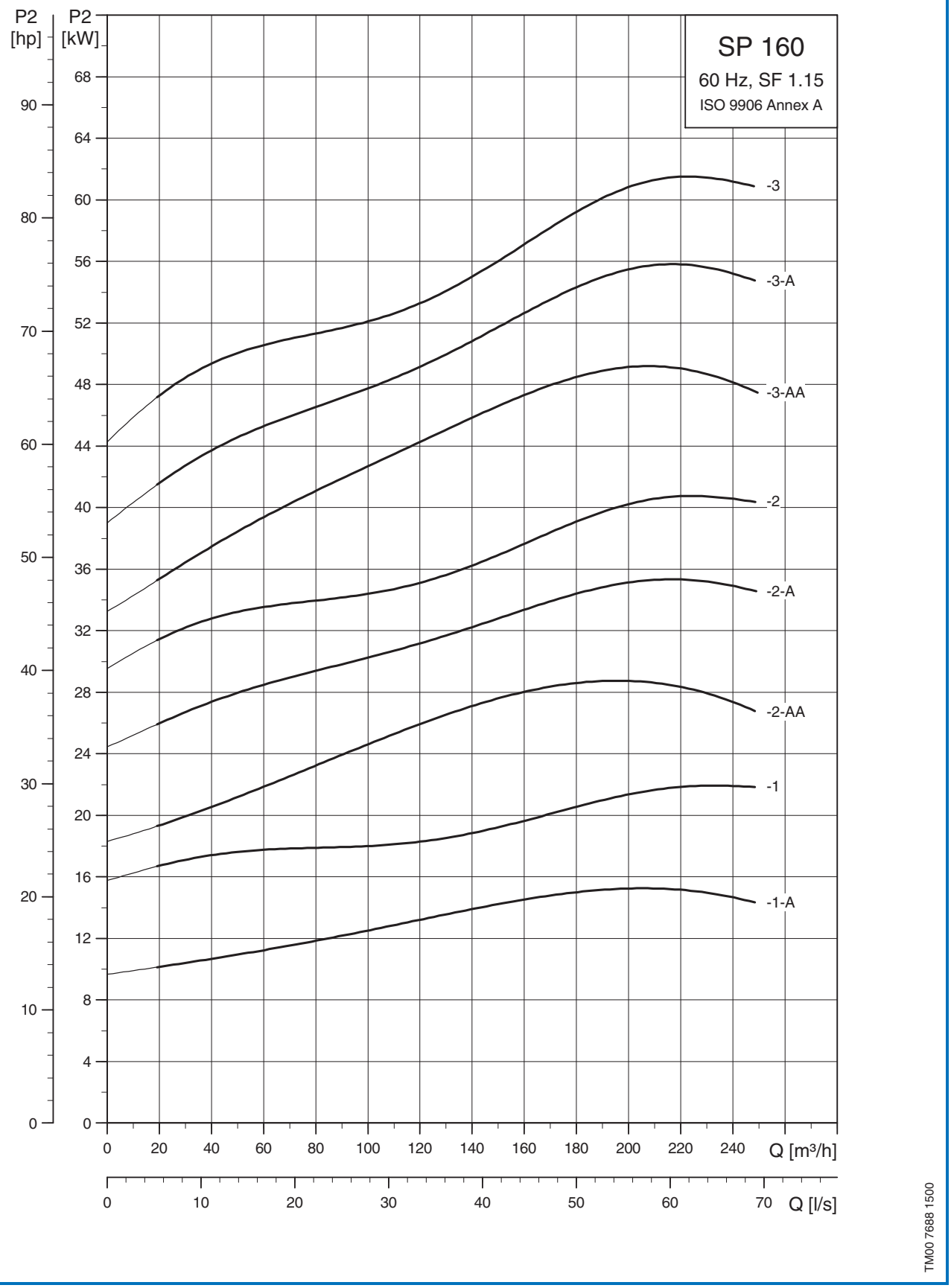
** Maximum diameter of pump with two motor cables.

All pumps are also available in N version with motors up to 26 kW in R version.

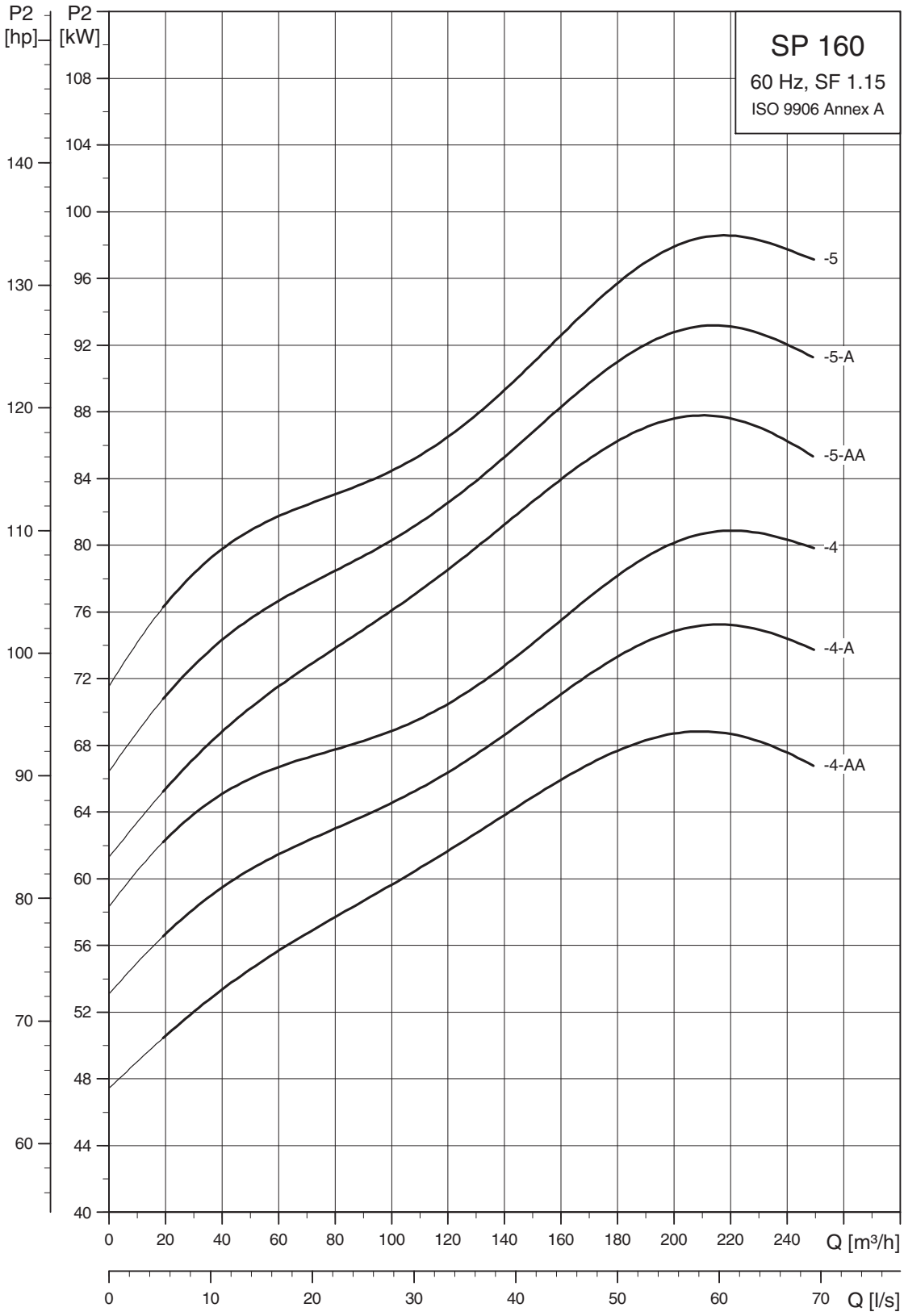
Dimensions as above.

Other types of connection are possible by means of connecting pieces, see page 86.

Power curves



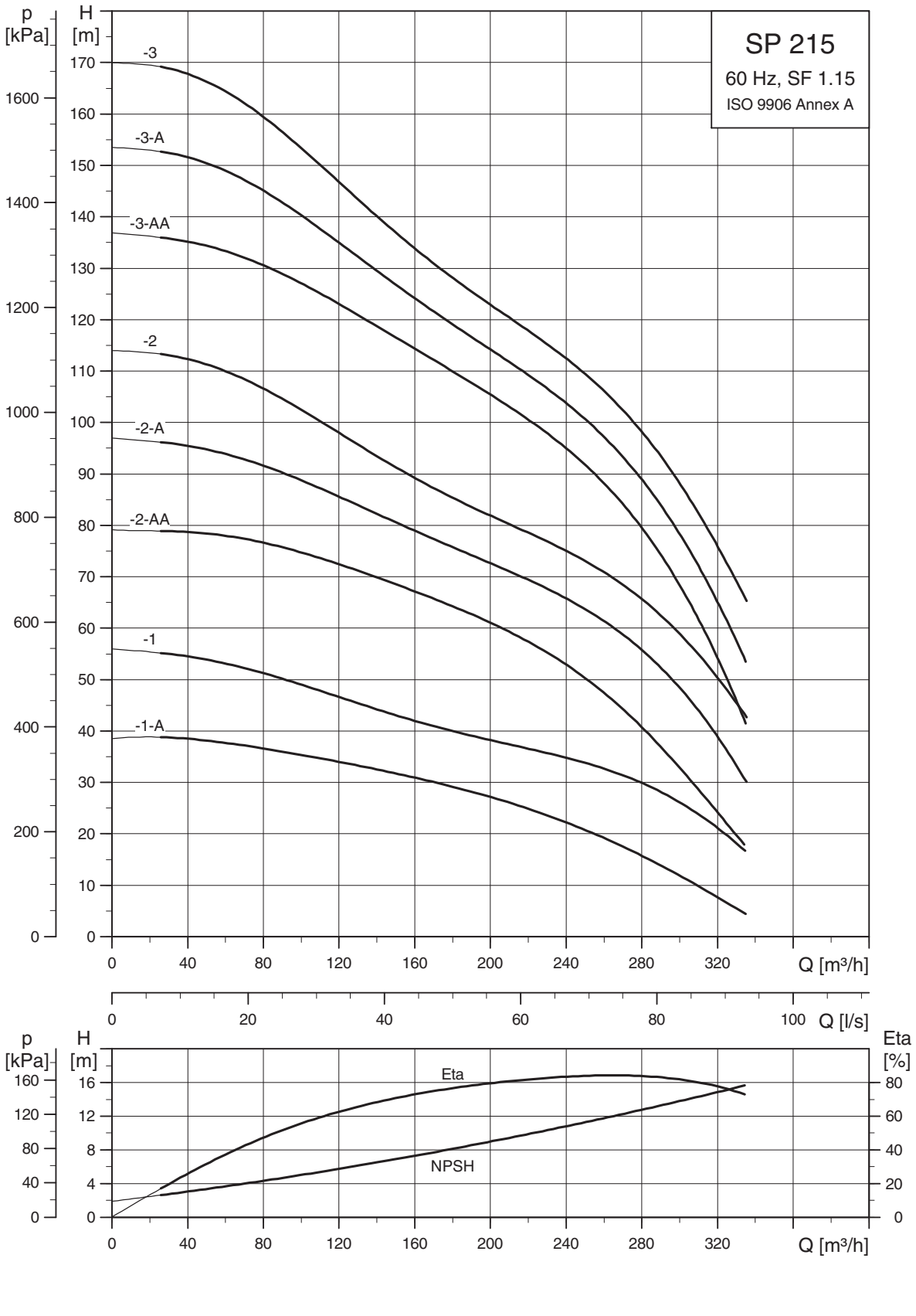
Power curves



TM01 9250 1500

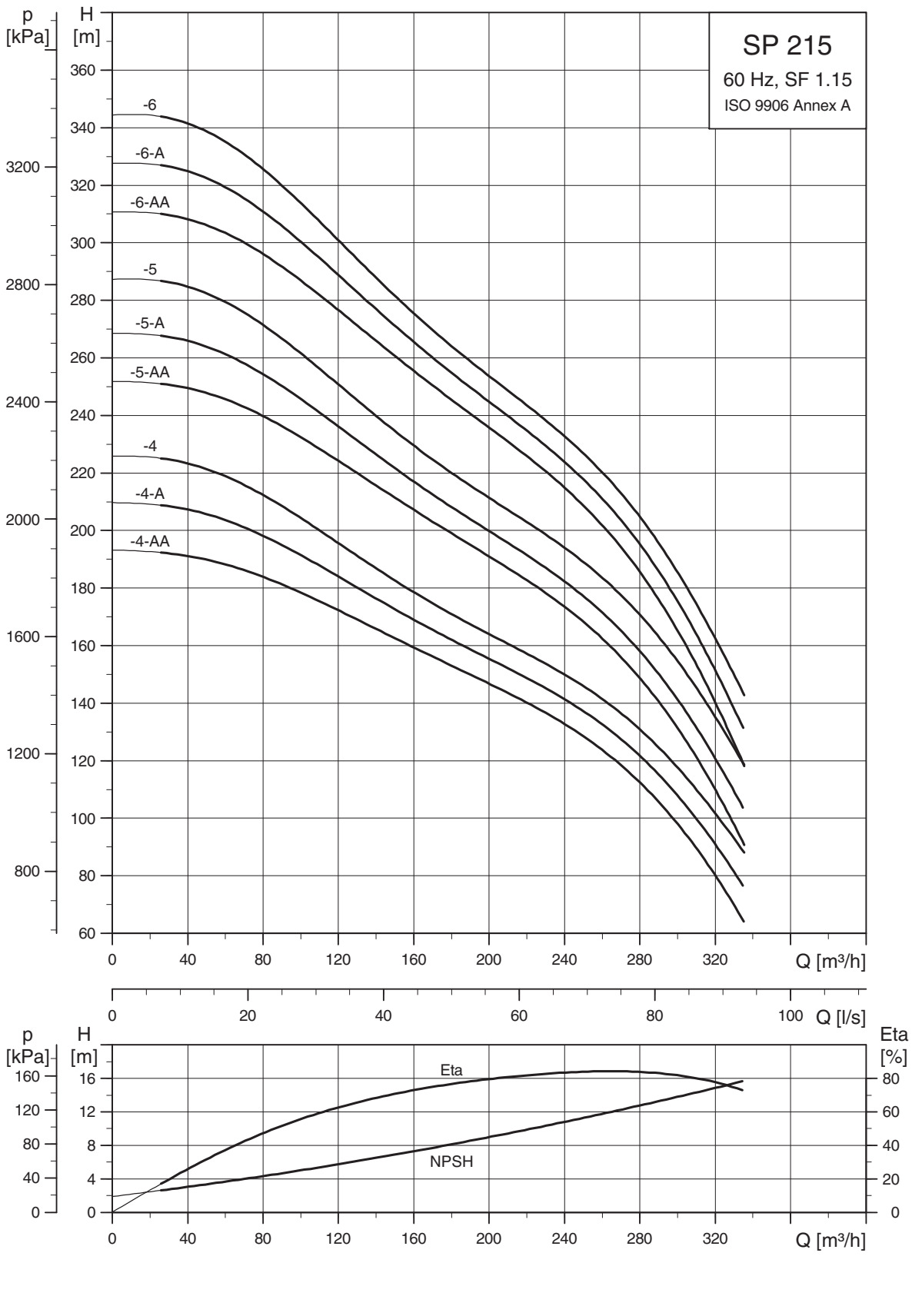
GRUNDFOS

Performance curves



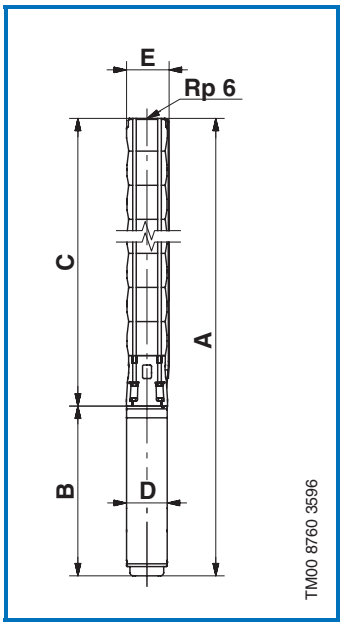
GRUNDFOS

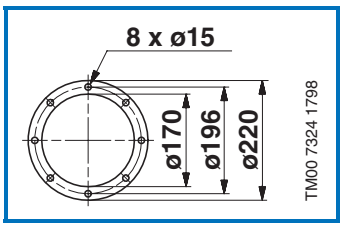
Performance curves



GRUNDFOS

Dimensions and weights





Pump type	Motor		Dimensions [mm]										Net weight [kg]
	Type	Power [kW]	Rp 6 connection				6" Grundfos flange				B	D	
			A	C	E*	E**	A	C	E*	E**			
SP 215-1-A	MS 6000	22	1604	790	236	239	1604	790	241	247	814	138	106
SP 215-1	MS 6000	30	1734	790	236	239	1734	790	241	247	944	138	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

* Maximum diameter of pump with one motor cable.

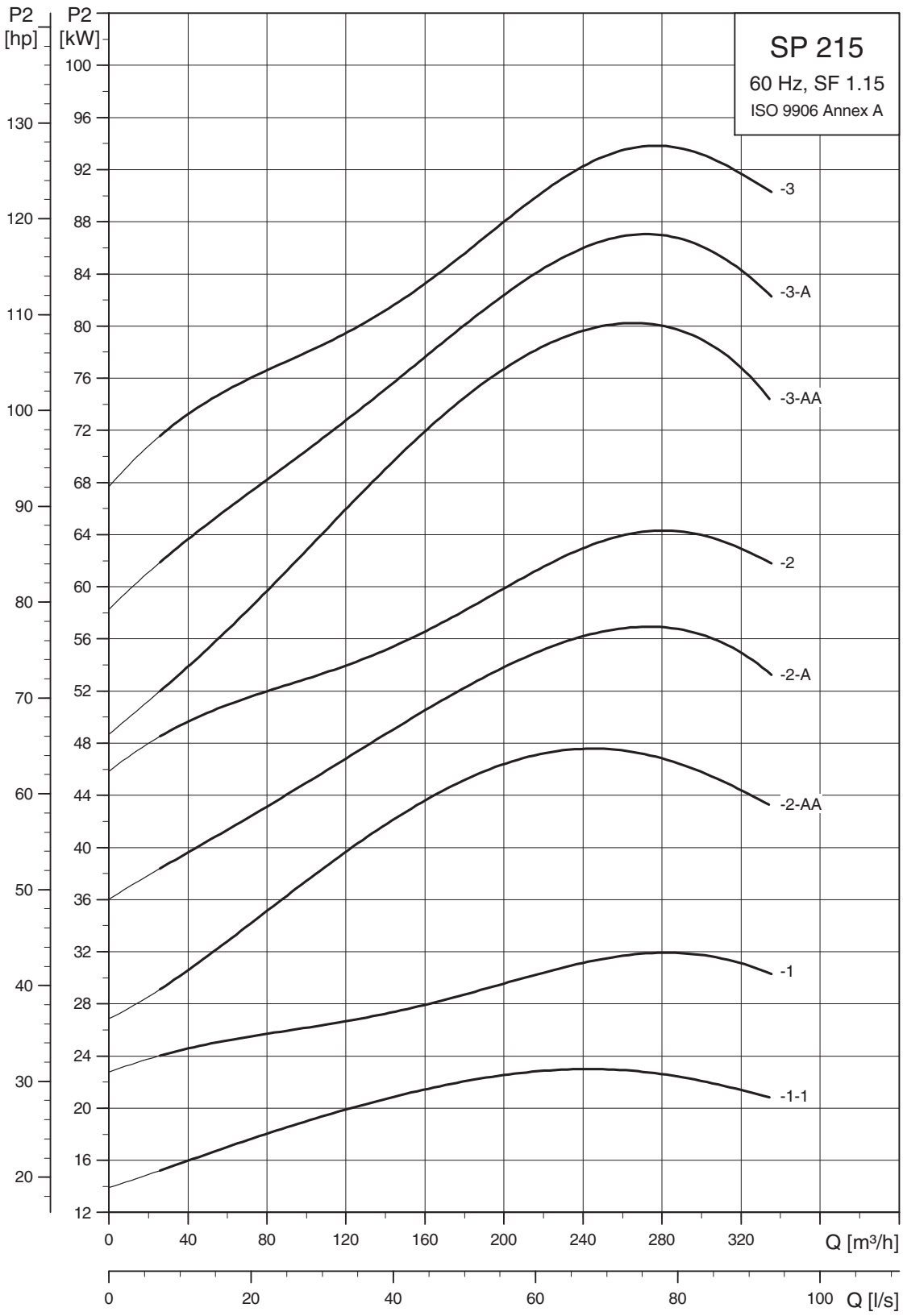
** Maximum diameter of pump with two motor cables.

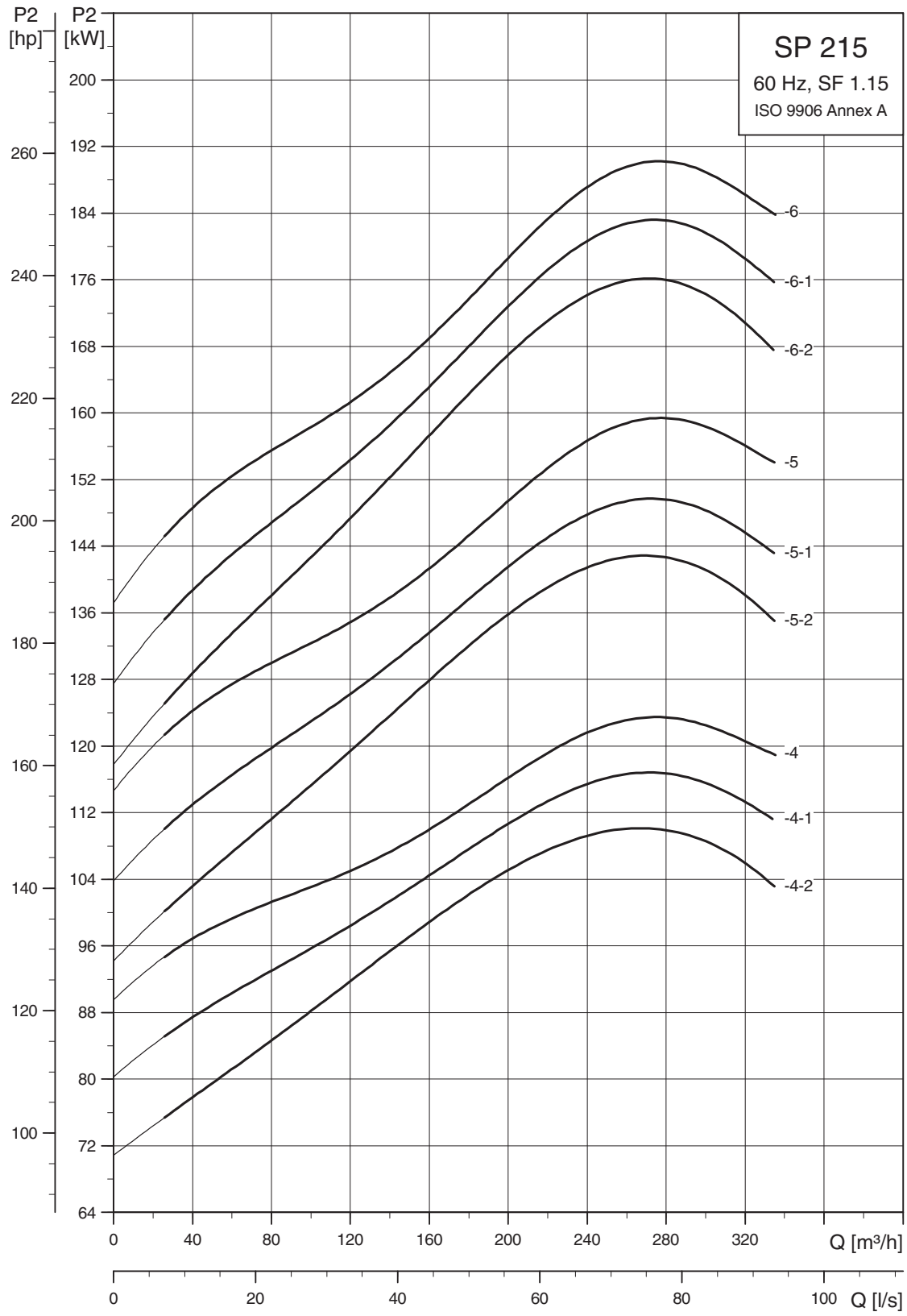
All pumps are also available in N version with motors up to 30 kW in R version.

Dimensions as above.

Other types of connection are possible by means of connecting pieces, see page 86.

Power curves




P2 [hp]
P2 [kW]
SP 215
60 Hz, SF 1.15
ISO 9906 Annex A
-6
-6-1
-6-2
-5
-5-1
-5-2
-4
-4-1
-4-2
260
240
220
200
180
160
140
120
100
200
192
184
176
168
160
152
144
136
128
120
112
104
96
88
80
72
64
0
40
80
120
160
200
240
280
320
Q [m³/h]
0
20
40
60
80
100
Q [l/s]
TM01 9251 1500

1 x 220 V, submersible motors

Electrical data													Dimensions	
Motor				Full-load current I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Control box for 3-wire	Length [mm]	Weight [kg]
Type	Size	Power [kW]	Power [hp]		$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	Cos $\varphi_{50\%}$	Cos $\varphi_{75\%}$	Cos $\varphi_{100\%}$				
MS 402	4"	0.25	0.33	4.40	39.0	49.0	54.0	0.48	0.51	0.64	3.0*	SA-SPM 4	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*	SA-SPM 4	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*	SA-SPM 4	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*	SA-SPM 4	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*	SA-SPM 4	346	10.5
MS 402	4"	1.1	1.5	13.1			88.0			0.63	4.4**		346	10.5

* Applies to 2- and 3-wire motors.
** Applies to 2-wire motors.

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

3 x 220 V, submersible motors

Electrical data												Dimensions	
Motor				Full-load current I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
Type	Size	Power [kW]	Power [hp]		$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	Cos $\varphi_{50\%}$	Cos $\varphi_{75\%}$	Cos $\varphi_{100\%}$			
MS 402	4"	0.37	0.5	3.30	57.5	65.0	68.0	0.52	0.63	0.72	5.0	226	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	241	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	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	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	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	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	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	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	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	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	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	673	26.0
MS 6000 (R)	6"	5.5	7.5	26.4	77.5	80.0	80.5	0.63	0.73	0.80	4.3	541	35.5
MS 6000 (R)	6"	7.5	10	35.0	80.0	82.0	82.5	0.67	0.78	0.83	4.3	571	37.0
MS 6000 (R)	6"	9.2	12.5	43.5	78.0	81.0	80.5	0.68	0.78	0.83	4.4	601	42.5
MS 6000 (R)	6"	11	15	51.0	79.5	82.5	82.5	0.71	0.81	0.85	4.3	631	45.5
MS 6000 (R)	6"	13	17.5	59.0	81.0	83.5	83.0	0.69	0.84	0.84	4.5	661	48.5
MS 6000 (R)	6"	15	20	67.0	82.0	84.0	84.5	0.70	0.81	0.84	4.9	696	52.5
MS 6000 (R)	6"	18.5	25	84.0	82.0	84.5	84.5	0.68	0.79	0.83	5.0	751	58.0
MS 6000 (R)	6"	22	30	96.0	84.0	85.0	85.0	0.73	0.81	0.85	4.7	811	64.0
MS 6000 (R)	6"	26	35	116.0	83.5	85.0	85.0	0.73	0.82	0.86	4.6	871	69.5
MS 6000 (R)	6"	30	40	134.0	83.5	84.5	84.5	0.72	0.81	0.85	4.6	941	77.5

3 x 220 V, submersible rewindable motors

Electrical data												Dimensions	
Motor				Full-load current I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
Type	Size	Power [kW]	Power [hp]		η 50%	η 75%	η 100%	Cos φ 50%	Cos φ 75%	Cos φ 100%			
MMS 6000	6"	3.7	5.0	18.7	66.3	71.8	73.7	0.68	0.76	0.80	4.2	630	45
MMS 6000	6"	5.5	7.5	26.4	73.8	76.9	76.7	0.72	0.80	0.83	3.9	660	48
MMS 6000	6"	7.5	10	35.2	76.9	79.3	78.6	0.73	0.81	0.84	3.9	690	50
MMS 6000	6"	9.2	12.5	43.0	74.3	77.3	77.1	0.74	0.82	0.85	4.3	720	55
MMS 6000	6"	11	15	49.2	78.8	80.9	80.2	0.77	0.84	0.86	4.1	780	60
MMS 6000	6"	13	17.5	57.7	79.9	81.9	81.2	0.78	0.82	0.85	4.4	915	72
MMS 6000	6"	15	20	68.7	79.9	81.7	80.5	0.82	0.86	0.86	4.6	975	78
MMS 6000	6"	18.5	25	80.3	82.9	84.1	82.8	0.85	0.88	0.88	5.2	1085	90
MMS 6000	6"	22	30	95.5	82.7	83.8	82.4	0.84	0.88	0.88	5.2	1195	100
MMS 6000	6"	26	35	109	83.2	84.8	84.2	0.77	0.84	0.87	5.0	1315	115
MMS 6000	6"	30	40	124	83.8	85.3	84.7	0.77	0.84	0.87	5.1	1425	125
MMS 6000	6"	37	50	158	83.0	84.6	84.1	0.68	0.88	0.84	5.5	1425	125
MMS 8000	8"	22	30	96.7	74.6	79.0	80.4	0.80	0.85	0.86	4.9	1010	126
MMS 8000	8"	26	35	113	75.1	79.2	80.3	0.82	0.87	0.87	4.6	1050	134
MMS 8000	8"	30	40	127	76.7	80.8	82.1	0.77	0.84	0.86	5.3	1110	146
MMS 8000	8"	37	50	156	78.1	81.7	82.5	0.77	0.84	0.86	5.2	1160	156
MMS 8000	8"	45	60	184	80.3	83.9	85.0	0.75	0.83	0.86	5.9	1270	177
MMS 8000	8"	55	75	220	81.9	84.8	85.4	0.79	0.86	0.88	5.9	1350	192
MMS 8000	8"	63	85	250	82.7	85.2	85.4	0.84	0.89	0.90	6.0	1490	218
MMS 8000	8"	75	100	299	83.4	85.5	85.4	0.85	0.89	0.90	6.0	1590	237
MMS 10000	10"	75	100	304	81.6	84.5	85.1	0.83	0.87	0.88	5.6	1400	280
MMS 10000	10"	92	125	374	81.5	84.6	85.4	0.77	0.84	0.87	6.4	1500	330
MMS 10000	10"	110	150	446	82.4	84.8	85.0	0.85	0.88	0.89	6.5	1690	385
MMS 10000	10"	132	180	542	82.8	84.8	84.6	0.86	0.89	0.89	6.8	1870	435

3 x 380 V, submersible motors

Electrical data												Dimensions	
Motor				Full load current I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
Type	Size	Power [kW]	Power [hp]		$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	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	226	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	241	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	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	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	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	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	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	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	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	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	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	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	541	35.5
MS 6000 (R)	6"	7.5	10	20.6	79.5	81.5	82.0	0.61	0.73	0.79	4.6	571	37.0
MS 6000 (R)	6"	9.2	12.5	26.0	76.5	80.0	80.5	0.62	0.73	0.80	4.7	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	631	45.5
MS 6000 (R)	6"	13	17.5	35.0	80.0	83.5	83.0	0.63	0.74	0.81	4.8	661	48.5
MS 6000 (R)	6"	15	20	40.0	80.5	83.5	84.0	0.64	0.76	0.81	5.2	696	52.5
MS 6000 (R)	6"	18.5	25	49.5	81.5	84.0	84.5	0.62	0.74	0.80	5.3	751	58.0
MS 6000 (R)	6"	22	30	56.5	82.5	85.0	85.0	0.67	0.77	0.83	5.1	811	64.0
MS 6000 (R)	6"	26	35	67.0	82.5	84.5	85.0	0.67	0.77	0.83	5.0	871	69.5
MS 6000 (R)	6"	30	40	77.5	83.0	85.0	85.0	0.66	0.76	0.82	5.0	941	77.5

3 x 380 V, submersible rewindable motors

Electrical data												Dimensions	
Motor				Full-load current I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
Type	Size	Power [kW]	Power [hp]		η 50%	η 75%	η 100%	Cos φ 50%	Cos φ 75%	Cos φ 100%			
MMS 6000	6"	3.7	5.0	10.9	66.3	71.9	73.8	0.69	0.77	0.80	4.2	630	45
MMS 6000	6"	5.5	7.5	15.3	73.9	77.0	76.8	0.72	0.80	0.83	3.9	660	48
MMS 6000	6"	7.5	10	20.4	77.1	79.4	78.7	0.73	0.81	0.84	3.9	690	50
MMS 6000	6"	9.2	12.5	24.9	74.4	77.5	77.3	0.75	0.82	0.85	4.3	720	55
MMS 6000	6"	11	15	28.3	79.0	81.0	80.4	0.77	0.84	0.86	4.1	780	60
MMS 6000	6"	13	17.5	33.3	80.1	82.1	81.6	0.75	0.82	0.85	4.4	915	72
MMS 6000	6"	15	20	38.5	79.4	81.7	81.2	0.78	0.84	0.86	4.6	975	78
MMS 6000	6"	18.5	25	44.4	82.4	84.5	84.2	0.79	0.85	0.87	5.2	1085	90
MMS 6000	6"	22	30	52.7	82.7	84.8	84.6	0.78	0.85	0.87	5.2	1195	100
MMS 6000	6"	26	35	62.4	83.6	85.2	84.5	0.78	0.85	0.87	5.0	1315	115
MMS 6000	6"	30	40	71.9	83.8	85.4	84.9	0.76	0.84	0.87	5.1	1425	125
MMS 6000	6"	37	50	90.0	84.1	85.1	84.0	0.76	0.84	0.87	5.5	1425	125
MMS 8000	8"	22	30	56.0	74.6	79.1	80.5	0.80	0.85	0.86	4.9	1010	126
MMS 8000	8"	26	35	65.0	75.0	79.3	80.5	0.81	0.86	0.87	4.6	1050	134
MMS 8000	8"	30	40	73.1	77.0	81.0	82.3	0.78	0.84	0.87	5.3	1110	146
MMS 8000	8"	37	50	89.4	79.0	82.6	83.5	0.79	0.85	0.87	5.2	1160	156
MMS 8000	8"	45	60	105	81.2	84.5	85.5	0.80	0.86	0.88	5.9	1270	177
MMS 8000	8"	55	75	127	82.5	85.3	85.8	0.83	0.88	0.89	5.9	1350	192
MMS 8000	8"	63	85	144	82.5	85.2	85.7	0.81	0.87	0.89	6.0	1490	218
MMS 8000	8"	75	100	173	83.6	85.6	85.5	0.86	0.89	0.90	6.0	1590	237
MMS 8000	8"	92	125	209	84.5	86.5	86.5	0.85	089	0.90	6.2	1830	283
MMS 8000	8"	110	150	250	83.4	85.8	86.1	0.84	0.89	0.90	6.1	2060	333
MMS 10000	10"	75	100	174	82.0	85.3	86.2	0.81	0.86	0.88	5.6	1400	280
MMS 10000	10"	92	125	214	82.4	85.6	86.6	0.77	0.84	0.87	6.4	1500	330
MMS 10000	10"	110	150	252	83.2	86.1	86.8	0.84	0.88	0.89	6.5	1690	385
MMS 10000	10"	132	180	302	83.6	86.4	87.0	0.84	0.88	0.89	6.8	1870	435
MMS 10000	10"	147	200	337	82.5	85.8	86.9	0.78	0.85	0.87	7.3	2070	500
MMS 10000	10"	170	230	393	82.7	85.8	86.7	0.75	0.83	0.86	7.3	2220	540
MMS 10000	10"	190	260	452	82.1	85.5	86.5	0.69	0.79	0.85	7.3	2400	580

3 x 460 V, submersible motors

Electrical data												Dimensions	
Motor				Full load current I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
Type	Size	Power [kW]	Power [hp]		$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	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	226	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	241	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	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	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	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	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	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	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	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	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	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	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	773	31.0
MS 6000 (R)	6"	5.5	7.5	13.2	76.0	79.5	80.5	0.56	0.68	0.76	4.5	541	35.5
MS 6000 (R)	6"	7.5	10	17.0	78.0	79.0	81.5	0.61	0.73	0.79	4.6	571	37.0
MS 6000 (R)	6"	9.2	12.5	21.4	77.0	80.0	80.5	0.62	0.73	0.80	4.7	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	631	45.5
MS 6000 (R)	6"	13	17.5	29.0	80.0	83.0	82.5	0.64	0.74	0.81	4.8	661	48.5
MS 6000 (R)	6"	15	20	33.0	81.0	83.5	84.0	0.64	0.75	0.82	5.2	696	52.5
MS 6000 (R)	6"	18.5	25	41.0	81.0	84.0	84.5	0.62	0.73	0.80	5.3	751	58.0
MS 6000 (R)	6"	22	30	46.5	82.5	85.0	85.0	0.67	0.78	0.83	5.1	811	64.0
MS 6000 (R)	6"	26	35	55.5	82.5	84.5	85.0	0.67	0.77	0.83	5.0	871	69.5
MS 6000 (R)	6"	30	40	64.0	82.5	84.5	85.0	0.66	0.76	0.85	5.6	941	77.5

3 x 460 V, submersible rewindable motors

Electrical data												Dimensions	
Motor				Full-load current I_n [A]	Motor efficiency [%]			Power factor			$\frac{I_{st}}{I_n}$	Length [mm]	Weight [kg]
Type	Size	Power [kW]	Power [hp]		η 50%	η 75%	η 100%	Cos φ 50%	Cos φ 75%	Cos φ 100%			
MMS 6000	6"	3.7	5.0	8.30	64.2	68.9	69.9	0.63	0.74	0.80	4.6	630	45
MMS 6000	6"	5.5	7.5	11.5	73.3	75.9	75.4	0.63	0.74	0.80	4.2	660	48
MMS 6000	6"	7.5	10	15.2	76.6	78.9	78.6	0.61	0.73	0.79	4.2	690	50
MMS 6000	6"	9.2	12.5	18.4	74.4	77.3	77.3	0.65	0.76	0.81	4.6	720	55
MMS 6000	6"	11	15	21.2	78.3	80.3	79.8	0.65	0.76	0.82	4.4	780	60
MMS 6000	6"	13	17.5	24.5	79.8	81.8	81.3	0.65	0.76	0.82	4.8	915	72
MMS 6000	6"	15	20	27.8	79.6	81.8	81.6	0.68	0.78	0.83	5.0	975	78
MMS 6000	6"	18.5	25	33.0	82.6	84.9	85.1	0.65	0.77	0.83	5.5	1085	90
MMS 6000	6"	22	30	39.0	83.1	85.2	85.2	0.67	0.78	0.83	5.6	1195	100
MMS 6000	6"	26	35	45.2	84.3	85.7	85.2	0.69	0.80	0.85	5.4	1315	115
MMS 6000	6"	30	40	52.1	84.8	86.1	85.5	0.68	0.79	0.85	5.5	1425	125
MMS 6000	6"	37	50	69.2	84.1	85.7	85.4	0.58	0.71	0.79	5.8	1425	125
MMS 8000	8"	22	30	46.1	74.9	79.3	80.8	0.73	0.81	0.84	5.3	1010	126
MMS 8000	8"	26	35	53.9	75.6	79.8	81.1	0.77	0.83	0.86	5.0	1050	134
MMS 8000	8"	30	40	61.1	77.8	81.6	82.7	0.74	0.82	0.85	5.8	1110	146
MMS 8000	8"	37	50	74.1	79.6	83.0	83.9	0.74	0.82	0.85	5.7	1160	156
MMS 8000	8"	45	60	87.9	81.5	84.6	85.6	0.71	0.80	0.85	6.3	1270	177
MMS 8000	8"	55	75	106	81.6	84.8	85.8	0.63	0.75	0.81	6.4	1350	192
MMS 8000	8"	63	85	120	82.9	85.7	86.5	0.72	0.82	0.86	6.4	1490	218
MMS 8000	8"	75	100	143	83.5	86.1	86.7	0.72	0.82	0.86	6.4	1590	237
MMS 8000	8"	92	125	175	84.8	86.9	87.1	0.74	0.83	0.87	6.7	1830	283
MMS 8000	8"	110	150	209	84.0	86.3	86.7	0.75	0.83	0.86	6.6	2060	333
MMS 10000	10"	75	100	146	81.3	85.0	86.7	0.72	0.80	0.84	6.0	1400	280
MMS 10000	10"	92	125	181	81.9	85.5	86.9	0.69	0.78	0.83	6.8	1500	330
MMS 10000	10"	110	150	213	82.3	86.0	87.3	0.72	0.80	0.84	7.0	1690	385
MMS 10000	10"	132	180	253	83.0	86.4	87.6	0.73	0.82	0.85	7.3	1870	435
MMS 10000	10"	147	200	290	81.7	85.6	87.1	0.66	0.77	0.82	7.7	2070	500
MMS 10000	10"	170	230	337	82.1	85.6	87.0	0.66	0.76	0.82	7.7	2220	540
MMS 10000	10"	190	260	387	81.8	85.4	86.8	0.62	0.73	0.79	7.7	2400	580

3 x 460 V, submersible industrial motors

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

CU 3

The CU 3 control unit is an electronic motor starter for monitoring and protecting installations with rated voltages of 200 - 575 V, 50 - 60 Hz, and a maximum power consumption of 400 A.

The CU 3 monitors the following parameters:

System insulation resistance to earth before start.
Motor temperature.
Motor current consumption and current unbalance.
Voltage supply.
Phase sequence.

The CU 3 protects against:

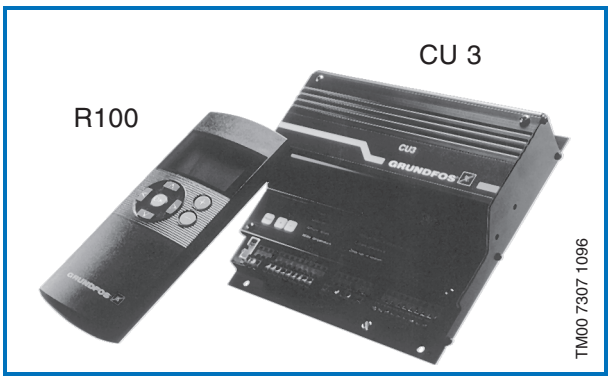
Dry running.
Incipient motor defect.
Too high motor temperature.
Motor burnout.

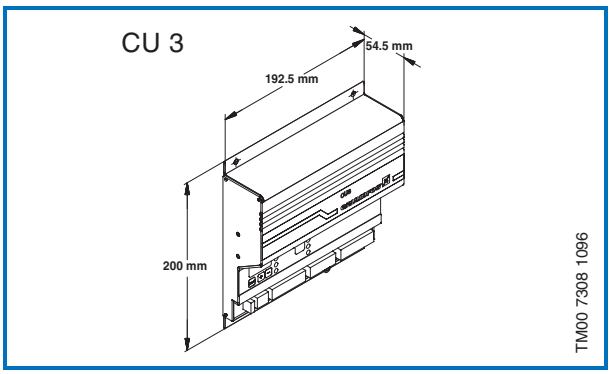
As standard, the CU 3 incorporates:

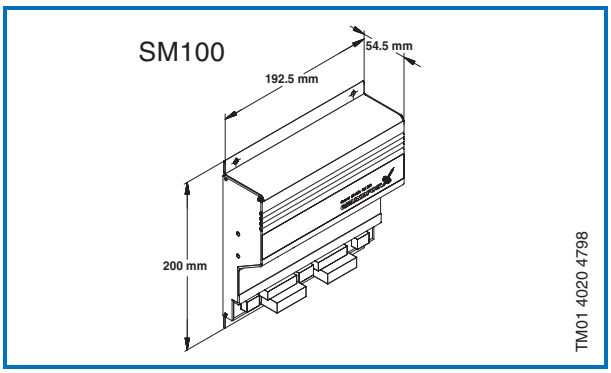
- Time relay for star-delta starting and autotransformer starting.
- Relay output for external fault indication.

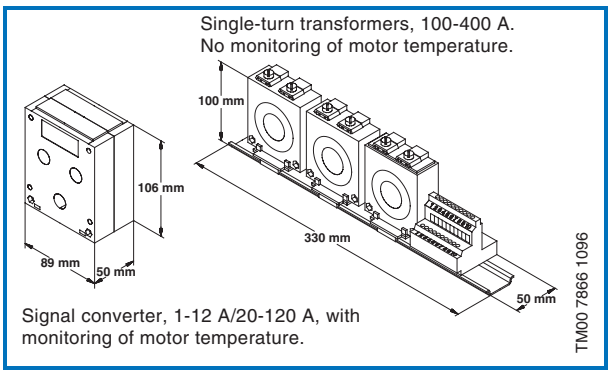
In addition CU 3 can be expanded to offer the following functions:

- **Remote control R100:** Wireless infra-red remote control by means of the R100. This function enables the user to change factory settings and to monitor the installation by calling up actual operating data, e.g. current consumption, supply voltage and operating hours.
- **External sensors SM 100:** Reception of data from external sensors by means of an SM100 sensor module and control according to the data received, e.g. flow rate, pressure, water level and conductivity.
- **Communication module:** Monitoring and communication via a data BUS (GENIbus), a modem or radio, e.g. PC-based control/monitoring.









Technical data

Enclosure class:	IP 20.
Ambient temp.:	–20°C to +60°C.
Relative humidity:	99%.
Voltage variation:	–25/+15% of nominal voltage.
Frequency:	45 Hz to 65 Hz.
Max. back-up fuse:	10 A.
Relay output:	Max. 415 V, 3 A, AC 1.
Approvals:	The CU 3 complies with: VDE, DEMKO, EN, UL and CSA.
Marking:	CE.

Control functions

This table describes the protection provided by CU 3.

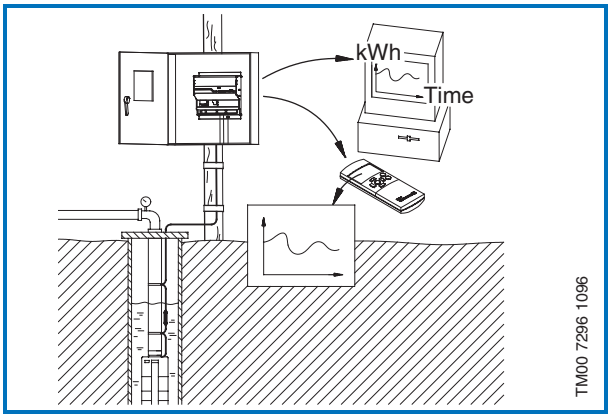
Control parameters	Function	Problem	Advantages
Ground failure	Insulation resistance is measured only when motor is not operating. A high-impedance voltage is applied to the motor leads and leakage to ground is measured. If the factory-set value is higher than the one measured the motor cannot be started.	Damaged or decomposed insulation in motor, cable or cable joint.	Possibility of failure indication on motor, cable and cable joint, service indication.
Temperature	**MS** The actual motor temperature is measured by means of the built-in Tempcon temperature transmitter and a signal is sent to CU 3 via the phase-leads. In CU 3 the measured temperature is compared with the factoryset value. **MMS** The actual motor temperature is measured by means of the Pt100. Via a relay, the signal is sent to the CU 3 where the measured temperature is compared with the factory-set value. Temperature protection requires a submersible motor with a Pt100.	Overload, frequent starts/stops, operation against blocked discharge pipe, insufficient flow velocity past the motor.	Longer motor life, safe operating conditions, service indication.
Overvoltage/ undervoltage	If the factory-set values are exceeded, a fault indication is given. If the CU 3 receives a temperature signal, the voltage is no longer monitored, but the motor will continue to run. Therefore, the motor and consequently the pump operation will be affected by voltage variations critical to the life of the motor. If there is **no** temperature signal, the motor will be stopped in case of overvoltage/undervoltage.	The installation is close to a transformer, the mains do not absorb load variations.	Important installation parameter, possibility of improving operating conditions.
Overload	The motor power input is measured on each of the three phases. The registered power input is average of these three values. If the factory-set value is exceeded, the motor will stop.	Incorrect dimensioning of pump/motor, voltage supply failure, defective cable, blocking, wear or corrosion.	Longer pump lift, safe operating conditions, service indication.
Dry running	The motor power input is measured on each of the three phases. The registered power input is an average of these three values. If the average value is lower than the factory-setting value, the motor will stop.	Pump exposed to dry running or underload, for example caused by wear.	Traditional dry-running protection is no longer necessary, no extra cables.
Current unbalance	The power input of the motor is measured on each of the three phases.	Mains load is uneven, incipient motor defect, phase voltages diverging.	Motor protection against overload, service indication.
Phase sequence	CU 3 and motor are installed so that the phase sequence corresponds to correct direction of rotation. CU 3 monitors changes in the phase sequences.	Two phases are wrongly connected.	Ensures correct pump performance.

Features and benefits

Selecting the right pump

The Grundfos CU 3 control unit and a flowmeter provide for a constant monitoring of energy consumption and performance of the pump thus making it possible to ensure that the right pump is selected for the application in question.

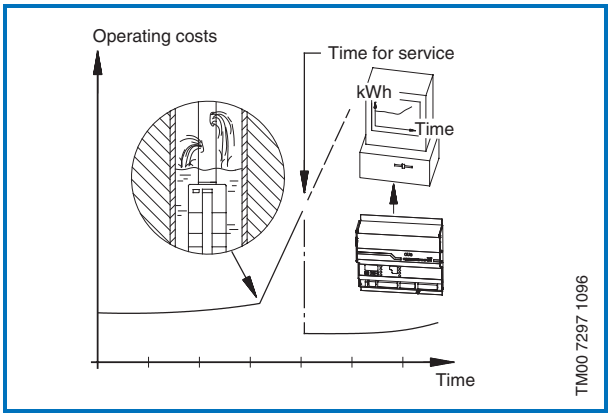
The CU 3 control unit makes it possible to choose the borehole(s) to be in operation which offer(s) the lowest operating costs.



Choosing the right time for service

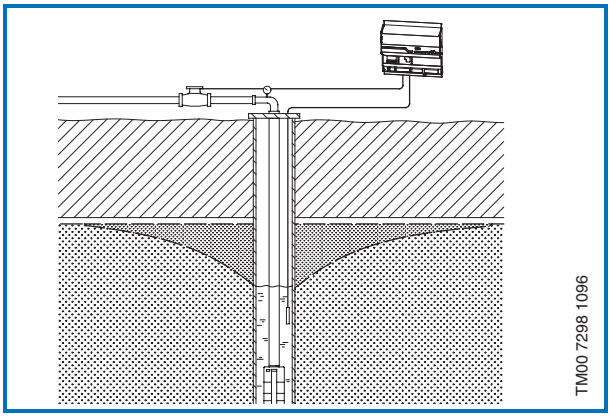
The constant monitoring by the CU 3 control unit makes it possible to service the pump, i.e. clean it and replace wear parts, at the best possible time.

Today service and maintenance work is often carried out at regular intervals or when actual downtime occurs. Both are unlikely to result in an optimum energy-efficient operation.



Avoiding overpumping

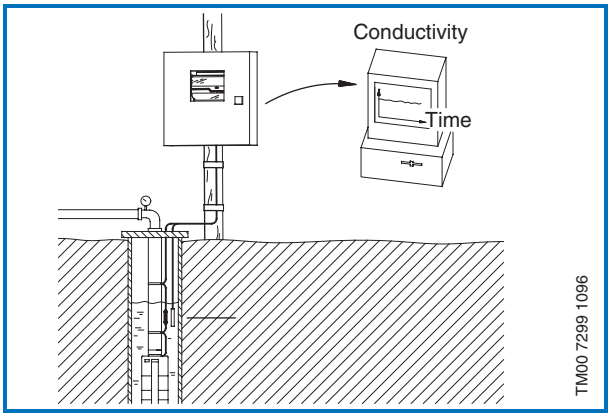
Using the Grundfos CU 3 control unit and a water level sensor it is possible to carry out test pumping of each borehole. This is done by measuring the water table level and the volume of water which is pumped. The purpose is to ensure that only the water naturally running to the borehole is pumped. As a result operations will provide for optimum efficiency. Consequently, the lives of both borehole and pump will increase, since both water aeration and the risk of ingress of aggressive water are reduced.



Reducing costs of water treatment

By minimizing the risk of overpumping and thus the pumping of impure ground water the costs of water treatment can be reduced to a minimum.

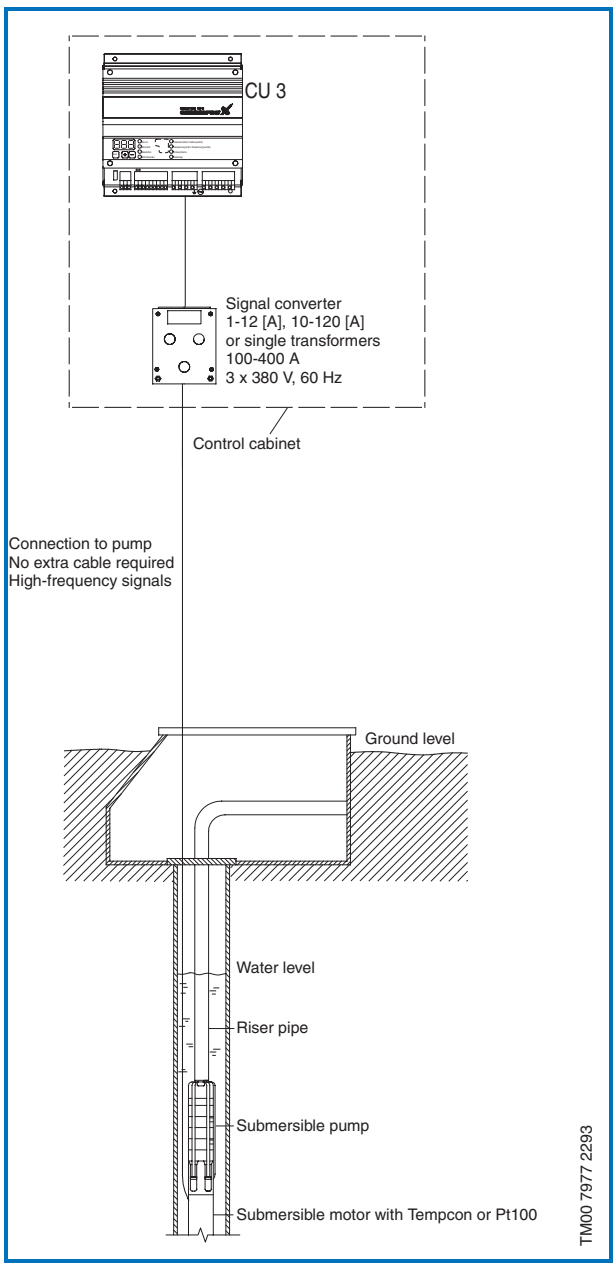
Using the Grundfos CU 3 control unit and a sensor it is possible to measure water conductivity in each borehole. This provides for the possibility of selecting the borehole (or boreholes) to be in operation which supplies the best water quality at any time.



Motor protection via CU 3

Monitoring parameters (Diodes)

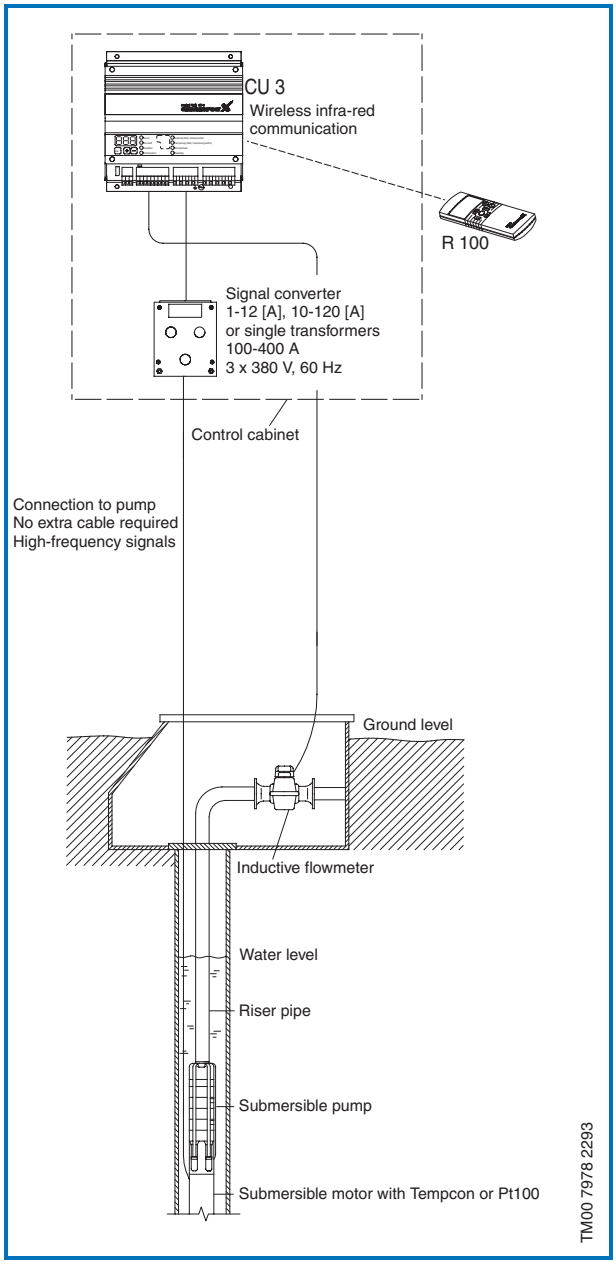
- Power on
- Motor on
- Motor temperature
- Ground failure
- Overload/dry running
- Overvoltage/undervoltage
- Current unbalance
- Direction of rotation



Control unit CU 3 with R100 remote control and printer

Monitoring parameters (Diodes)

- Power on
- Motor on
- Motor temperature
- Ground failure
- Overload/dry running
- Overvoltage/undervoltage
- Current unbalance
- Direction of rotation



R100 Menus

0. General

1. Operation

1.1 Warning and stop indication
1.2 Indication of automatically reset fault indications
Possibility of start and stop.

2. Status

Indication of:

2.1 Motor temperature
2.2 Current and voltage values
2.3 Average supply voltage
2.4 Average input current of the three phases
2.5 Actual current unbalance
2.6 Actual insulation resistance to earth
2.7 Phase sequence and frequency
2.8 Actual power input and total power consumption
2.9 Accumulated number of operating hours
2.10 Value measured by an external sensor
2.11 Energy consumption per m³ pumped liquid
2.12 Actual flow
2.13 Accumulated flow.

The R100 offers a number of setting possibilities:

3. Limits

Indication and setting of:

3.1 Motor temperature
3.2 Current stop limits
3.3 Current warning limits
3.4 Voltage variations
3.5 Insulation resistance
3.6 Current unbalance
3.7 Stop for external sensor.
3.8 Warning limits for external sensor

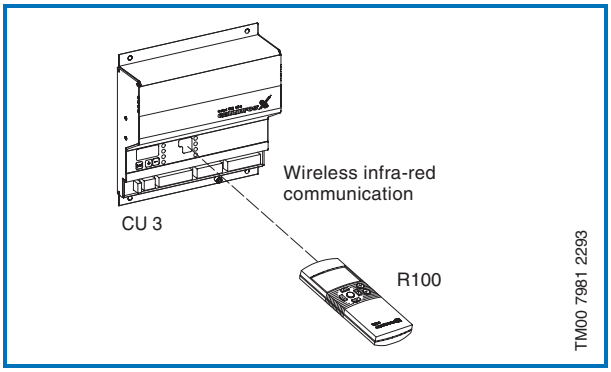
4. Installation

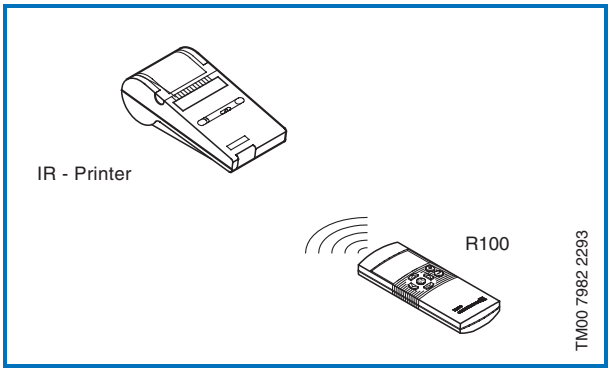
Setting possibilities:

4.1 Automatic or manual resetting of fault indications
4.2 Release time for fault indications
4.3 Star connection time for star-delta or auto-transformer starting
4.4 Starting delay when first started, e.g. after supply failure
4.5 Minimum start cycle time
4.6 On/off of groundwater lowering function
4.7 Run/stop times for groundwater lowering
4.8 Electronic numbering of CU 3 units
4.9 On/off of power and temperature measuring function
4.10 External sensor type
On/off of external analog sensor with or without zero offset
Maximum value of external analog sensor
4.11 Groundwater lowering by means of level sensors
Filling and emptying function
4.12 On/off of external digital sensor.

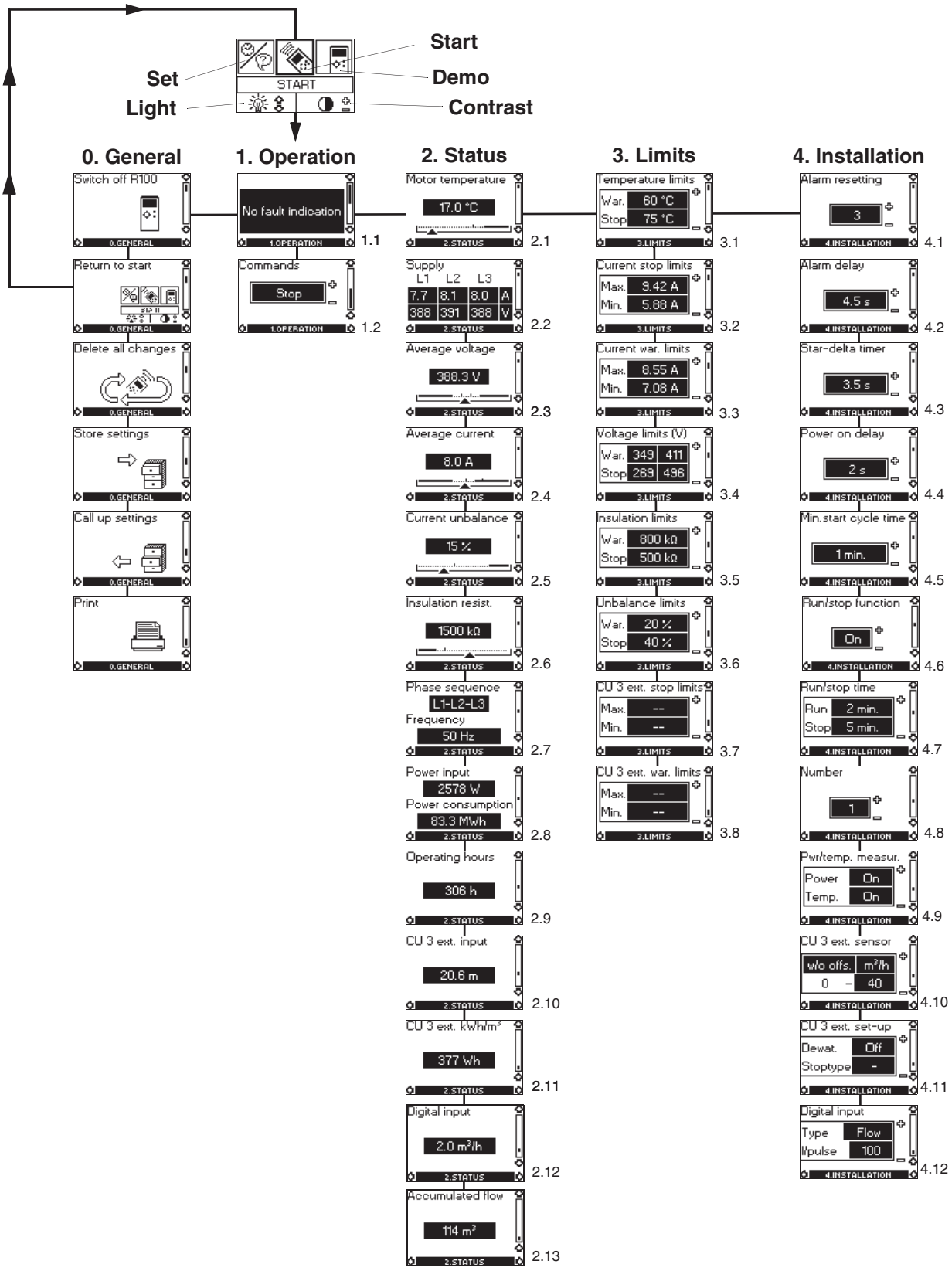
Status report

All settings and measured values can be transferred to a portable printer via wireless infra-red communication and be printed in a status report.





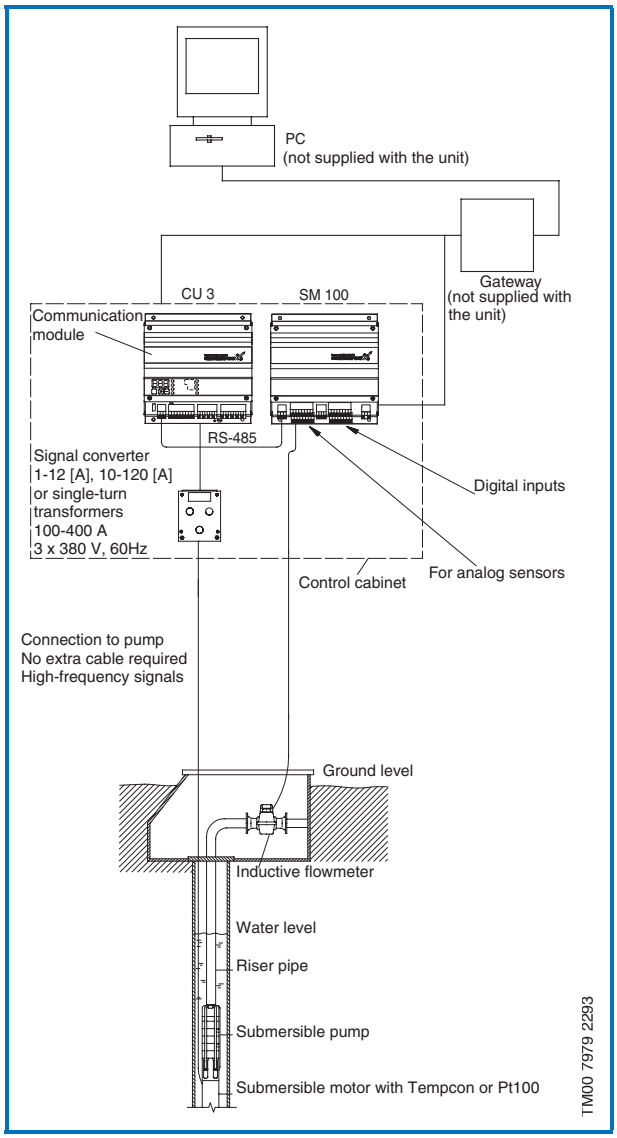
Menu structure of the R100 remote control



Complete borehole monitoring system with CU 3 and SM 100

Monitoring parameters (Diodes)

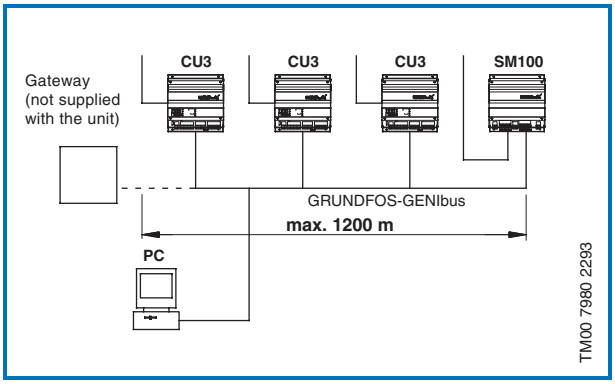
- Power on
- Motor on
- Motor temperature
- Ground failure
- Overload/dry running
- Overvoltage/undervoltage
- Current unbalance
- Direction of rotation



SM 100

The SM 100 sensor module can be connected to eight analog sensors and have eight digital inputs for sensors, e.g. monitoring

- pH value
- conductivity
- O_2
- pressure
- etc.



Maximum connection to the GENIbus:

- 28 CU 3 units, or
- 14 CU 3 units and 14 SM 100 units, or
- 27 CU 3 and 1 SM 100.

Product numbers

CU 3 - 3 x 380 V			
Product number	Current range for signal converter [A]		
	1-12	10-120	100-400
62 50 02 60	●		
62 50 02 61		●	
62 50 02 62			●

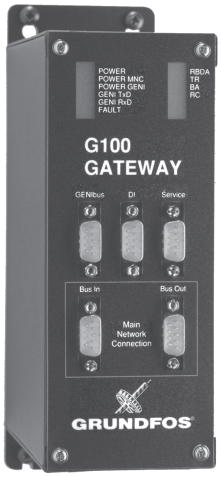
CU 3 expansion possibilities		
Product	Range	Product number
Sensor module SM 100	3 x 400 [V]	00 62 61 91
Communication module RS 485	-	00 62 61 59
Remote control R100 HP printer for R100	- -	00 62 53 33 00 62 04 80
Signal converter	1 - 12 [A]	00 62 04 97
	10 - 120 [A]	00 62 04 98
	100 - 400 [A] ★	00 62 61 48

★ Single-turn transformers

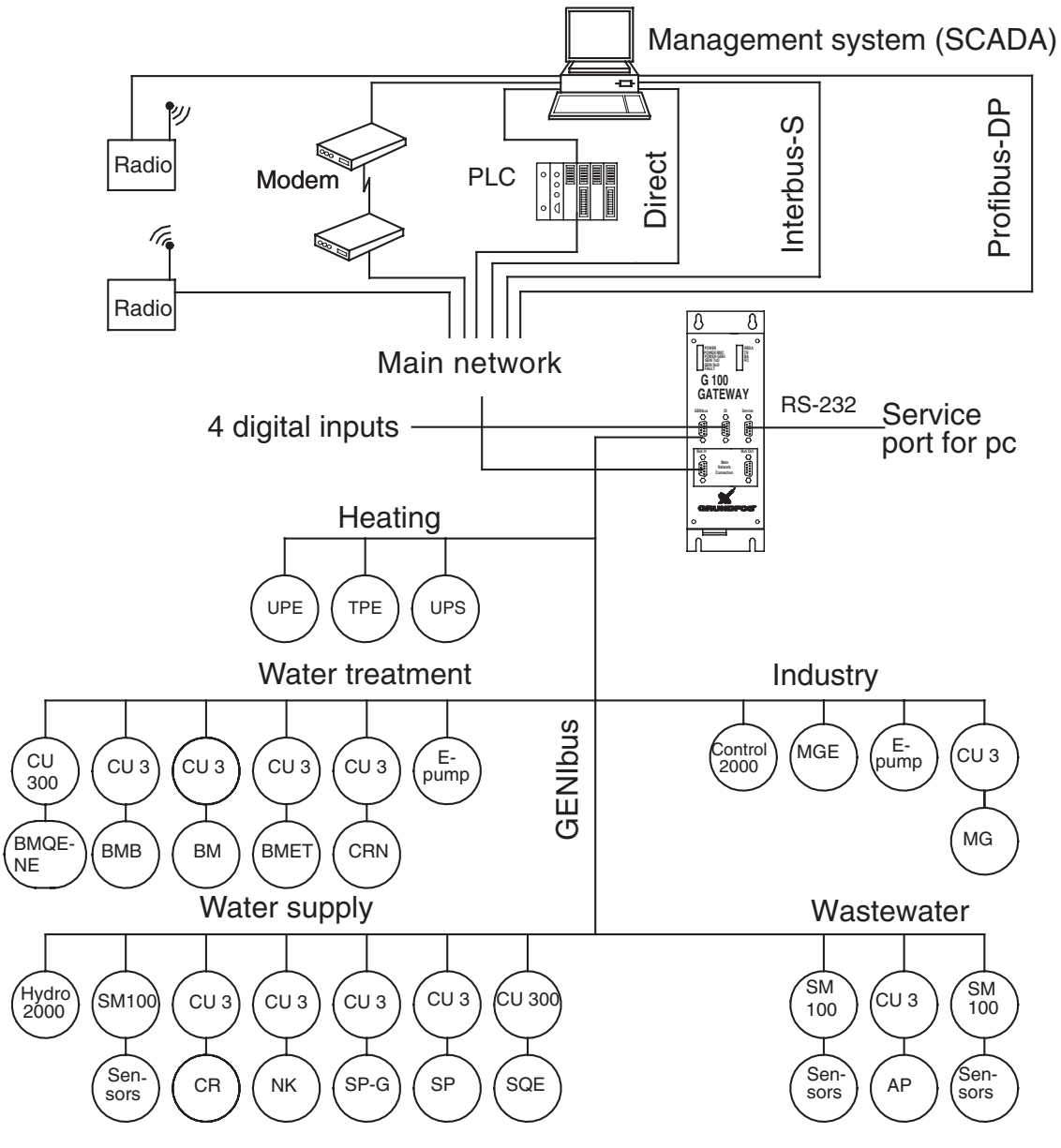
G100 - Gateway for communication with Grundfos products

Through G100 Grundfos offers optimum integration of Grundfos products into main control and monitoring systems.

G100 is a product meeting future requirements of optimum pump operation, e.g. as to reliability and low operating costs.



TM01 1787 1098



TM01 1804 3400

Product description

G100 is a gateway enabling communication of operating data, e.g. measured values and setpoints, between Grundfos products equipped with a Grundfos GENIbus interface and a main network for control, adjustment and monitoring of operation.

Furthermore, G100 has 4 digital inputs for optional use. As an example, a digital input could be used for the monitoring of an Uninterruptible Power Supply (UPS).

Data logging

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

For the data logging the software tool "PC Tool G100 Data Log" is used. This is a part of the PC Tool G100 package which must be ordered seperately.

Applications

As shown in the illustration on page 83, G100 can be used within various areas, e.g. water supply, water treatment, wastewater, building automation and industry.

Such applications are characterized by the fact that downtime causes high costs and that extra investments are often made to achieve maximum reliability.

G100 is made for customers requiring continuous, optimum operation, and who need to know specific operating data from each individual pump unit and who are not satisfied by calculated operating data or total measurings that are often based on many units.

Installation

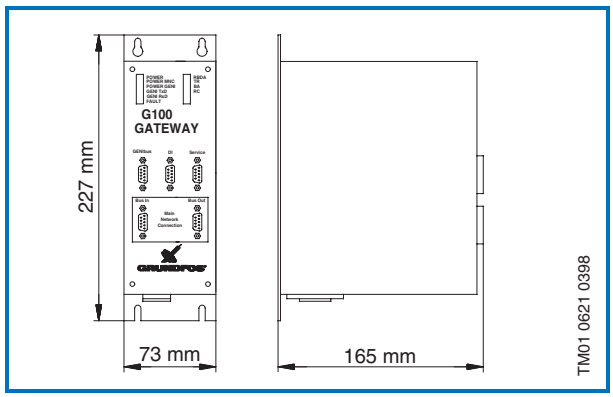
G100 is installed by the system integrator. G100 is connected to Grundfos GENIbus and to the main network. From a management system on the main network all units on the Grundfos GENIbus can then be controlled.

The floppy disks "G100 Support Files" comprises examples of programs to be used when G100 is connected to the various main network systems, and a description of the data points available in Grundfos products with GENIbus interface.

When G100 is installed, the software tool "PC Tool G100" can be used. This is a part of the PC Tool G100 package which must be ordered seperately.

Accessories

- PC Tool G100 package (ordered separately)
- G100 Support Files (supplied with product)



Technical data

Overview of protocols

Main system	Software protocol
Interbus-S	PCP
Profibus-DP	DP
Radio	Satt Control COMLI/MODbus
Modem	Satt Control COMLI/MODbus
PLC	Satt Control COMLI/MODbus
Future systems	...

Other connection features

GENIbus RS-485: Up to 32 units can be connected.
Service port RS-232: For direct connection to PC or via modem.

Digital inputs: 4.

Logging capacity

2 Mb ~ approx. 350,000 time-stamped data

Voltage supply: 1 x 110 - 240 V, 50/60 Hz

Ambient temperature: In operation: –20°C to +60°C

Enclosure class: IP 20

Weight: 1.8 kg

Product numbers

Product	Product number
G100 with Interbus-S expansion board*	96 41 11 34
G100 with Profibus-DP expansion board*	96 41 11 35
G100 with Radio/Modem/PLC-expansion board*	96 41 11 36
G100 Basic Version*	96 41 11 37
PC Tool G100 package	96 41 57 83

*Floppy disk with G100 Support Files included.

MTP 75 motor protection

Long motor life

The MTP 75 protects against too high motor temperature. This is the most simple and the cheapest way of ensuring long motor life. The customer is certain that operating conditions are observed and is given indication of the time when a service check should be made.

Too high motor temperature may be caused by:

- Overload
- Frequent starting/stopping (hunting)
- Operation against closed valve/frozen discharge pipe
- Insufficient flow of liquid past the motor
- Pumping of too hot water
- Deposits on the motor
- Overvoltage
- Undervoltage
- Current unbalance
- Dry running (Note that the pump is not protected if the water table is below the pump inlet. For example this may occur if several boreholes are located close to each other).

Application and installation

The MTP 75 can be used only for motors with built-in temperature transmitter and should be installed for instance in a control cabinet. The MTP 75 may be installed in any type of control cabinet containing a thermal relay with differential release and contactor. The thermal relay is necessary to protect against blocking or phase failure, since this will cause the temperature to rise much faster than the MTP 75 is able to register.

The MTP 75 is supplied with base for mounting on DIN rail.

Operation

The temperature transmitter will send a high-frequency signal indicating the motor temperature through the motor supply cable. The MTP 75 will stop the motor via the contactor if the temperature rises above 75°C. The temperature limit is factory-set and cannot be changed.

Display:

No light: Motor stopped. No supply voltage or electrical fault at temperature measuring.

Green light: Motor in operation and motor temperature OK, i.e. below 75°C.

Red light: Motor stopped and motor temperature too high, i.e. above 75°C.

The MTP 75 is reset manually by pressing the reset button on the front cover or by switching off the voltage supply to the MTP 75.

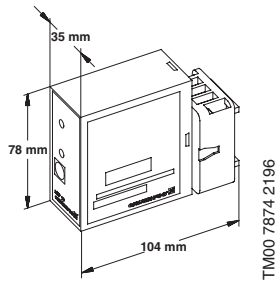
No unnecessary downtime

Since the MTP 75 measures only the temperature and no other parameters causing a temperature rise, the motor and thus the pump will stop only when the motor temperature is too high.

Reliability

The MTP 75 is reliable due to its simple construction and because it requires no extra cables in the borehole.

TM00 7309 1096



TM00 7874 2196

Technical data of MTP 75

Supply voltage:	2 variants: 1 x 200-240 V ±10%, 50/60 Hz. 3 x 380-415 V ±10%, 50/60 Hz. A transformer is required for voltages over 415 V.
Control voltage:	Contact load: Maximum 415 V/3 A. Minimum 12 V/20 mA.
Enclosure class:	IP 20.
Operating conditions:	Min. temperature: –20°C. Max. temperature: +60°C. Relative humidity: 99%.
Storage:	Min. temperature: –20°C. Max. temperature: +60°C Relative humidity: 99%.
Approvals:	Complying with the regulations of VDE and DEMKO.

Product numbers

MTP 75 without plug-in base, capacitor and signal transformer:

Voltage range [V]	Product number
1 x 200-240	00 62 51 78
3 x 380-415	00 62 51 79

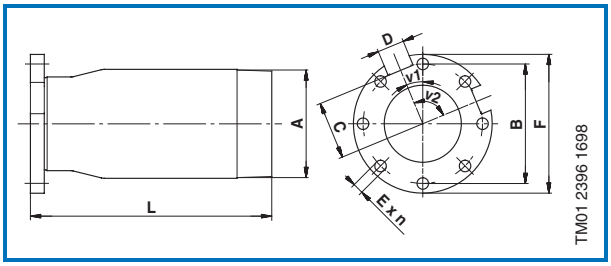
MTP 75 complete with plug-in base, capacitor and signal transformer:

Voltage range [V]	Product number
1 x 200-240	00 62 58 04
3 x 380-415	00 62 58 05

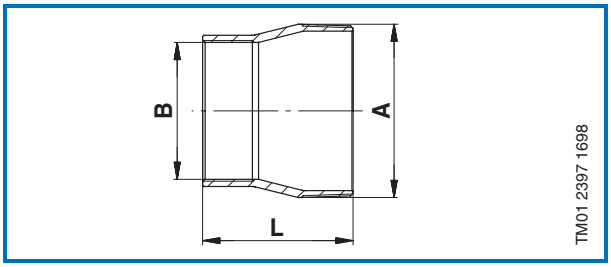
Connecting pieces

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

Thread - Flange



Thread - Thread



Type	Pump outlet	Connecting piece	Thread - Flange										Product number	
			A	Dimensions [mm]						v_1	v_2	n	DIN W.-Nr. 1.4301	DIN W.-Nr. 1.4401
				B	C	D	E	F	L					
SP 17	Rp 2.5	R 2½ → JIS 2	R 2½	100	50.5	30	ø11	125	200	30	120	6	00 12 51 22	00 12 56 18
		R 2½ → JIS 2.5	R 2½	115	57	30	ø11	140	200	22.5	90	8	00 12 51 23	00 12 56 19
		R 2½ → DIN 50 PN 16	R 2½	125	62.5	22	ø18	165	95	45	180	4		ID 81 42
		R 2½ → DIN 50 PN 40	R 2½	125	62.5	22	ø18	165	97	45	180	4		ID 81 43
		R 2½ → DIN 65 PN 16	R 2½	145	72.5	22	ø18	185	100	45	180	4		ID 81 44
		R 2½ → DIN 65 PN 40	R 2½	145	72.5	25	ø18	185	110	22.5	180	8		ID 81 45
		R 2½ → DIN 80 PN 16	R 2½	160	80	25	ø18	200	95	22.5	180	8		ID 81 46
		R 2½ → DIN 80 PN 40	R 2½	160	80	25	ø18	200	99	22.5	180	8		ID 81 47
SP 30	Rp 3	R 3 → JIS 3	R 3	136	66	35	ø15	165	200	22.5	90	8	00 13 51 21	00 13 56 17
		R 3 → DIN 65 PN 16	R 3	145	72.5	22	ø18	185	105	45	180	4		ID 81 52
		R 3 → DIN 65 PN 40	R 3	145	72.5	25	ø18	185	109	22.5	180	8		ID 81 53
		R 3 → DIN 80 PN 16	R 3	160	80	25	ø18	200	110	22.5	180	8		ID 81 54
		R 3 → DIN 80 PN 40	R 3	160	80	25	ø18	200	120	22.5	180	8		ID 81 55
		R 3 → DIN 100 PN 16	R 3	180	90	25	ø18	220	107	22.5	180	8		ID 81 56
		R 3 → DIN 100 PN 40	R 3	190	95	25	ø22	220	109	22.5	180	8		ID 81 57
SP 46 SP 60	Rp 3 Rp 4	R 4 → JIS 4	R 4	155	72	35	ø15	180	200	22.5	90	8	00 15 51 24	00 15 56 22
		R 3 → DIN 65 PN 16	R 3	145	72.5	22	ø18	185	105	45	180	4		ID 81 52
		R 3 → DIN 65 PN 40	R 3	145	72.5	25	ø18	185	109	22.5	180	4		ID 81 53
		R 3 → DIN 80 PN 16	R 3	160	80	25	ø18	200	110	22.5	180	8		ID 81 54
		R 3 → DIN 80 PN 40	R 3	160	80	25	ø18	200	120	22.5	180	8		ID 81 55
		R 3 → DIN 100 PN 16	R 3	180	90	25	ø18	220	107	22.5	180	8		ID 81 56
		R 3 → DIN 100 PN 40	R 3	190	95	25	ø22	220	109	22.5	180	8		ID 81 57
		R 4 → DIN 100 PN 16	R 4	180	90	25	ø18	220	120	22.5	180	8		ID 81 58
		R 4 → DIN 100 PN 40	R 4	190	95	25	ø22	235	130	22.5	180	8		ID 81 59
SP 77 SP 95	Rp 5	R 5 → JIS 4	R 5	155	75	35	ø15	180	313	22.5	90	8	00 19 50 42	00 19 55 45
		R 5 → JIS 5	R 5	190	97	45	ø19	225	315	22.5	90	8	00 19 50 43	00 19 55 46
		R 5 → DIN 100 PN 16	R 5	180	95	45	ø18	225	315	22.5	90	8	00 19 89 26	00 19 89 76
		R 5 → DIN 100 PN 40	R 5	190	102.5	45	ø22	240	314	22.5	90	8	00 19 89 27	00 19 89 77
		R 5 → DIN 125 PN 16	R 5	210	110	45	ø18	250	317	22.5	90	8	00 19 89 14	00 19 89 64
		R 5 → DIN 125 PN 40	R 5	220	120	45	ø26	270	317	22.5	90	8	00 19 89 15	00 19 89 65
		R 5 → DIN 150 PN 16	R 5	240	127.5	45	ø22	285	317	22.5	90	8	00 19 89 04	00 19 89 54
		R 5 → DIN 150 PN 40	R 5	250	135	45	ø26	300	323	22.5	90	8	00 19 89 05	00 19 89 55
SP 125 SP 160 SP 215	Rp 6	R 6 → JIS 5	R 6	190	97	45	ø19	225	316	22.5	90	8	00 20 51 28	00 20 56 28
		R 6 → JIS 6	R 6	224	111	45	ø19	252	317	22.5	90	8	00 20 51 29	00 20 56 29
		R 6 → DIN 125 PN 16	R 6	210	110	45	ø18	250	317	22.5	90	8	00 19 89 28	00 19 89 78
		R 6 → DIN 125 PN 40	R 6	220	120	45	ø26	270	321	22.5	90	8	00 19 89 29	00 19 89 79
		R 6 → DIN 150 PN 16	R 6	240	127.5	45	ø22	285	317	22.5	90	8	00 19 89 16	00 19 89 66
		R 6 → DIN 150 PN 40	R 6	250	135	45	ø26	300	323	22.5	90	8	00 19 89 17	00 19 89 67
		R 6 → DIN 200 PN 16	R 6	295	155	45	ø22	340	317	15	90	12	00 19 89 06	00 19 89 56
		R 6 → DIN 200 PN 40	R 6	320	172.5	45	ø30	375	327	15	90	12	00 19 89 07	00 19 89 57

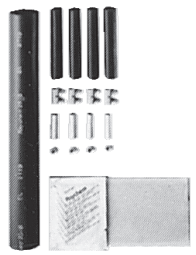
Type	Pump outlet	Connecting piece	Thread - Thread		Product number	
			A	Dimensions		
				Length [mm]	DIN W.-Nr. 1.4301	DIN W.-Nr. 1.4401
SP 77 SP 95	Rp 5	R 5 → Rp 4	R 5	121	19.00 63	19.05 85
		R 5 → Rp 6	R 5	150	19.00 69	19.05 91
	NPT 5	NPT 5 → NPT 4	NPT 5	121	19.00 64	19.05 86
		NPT 5 → NPT 6	NPT 5	150	19.00 70	19.05 92
SP 125 SP 160 SP 215	Rp 6	R 6 → Rp 5	R 5	150	20.01 30	20.06 40
	NPT 6	NPT 6 → NPT 5	NPT 6	150	20.01 35	20.06 45

Cable termination kit with plug

TM00 7883 2296

Description	Version	Prod. no.
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.	**MS 402 and MS 4000 up to 7.5 kW:**	
	For cables up to 4 x 2.5 mm²	79 99 01
	For cables up to 4 x 6 mm²	79 99 02

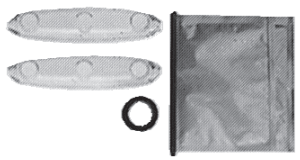
Cable termination kit type KM



TM00 7885 2296

Description	Version			Prod. no.
	Motor cable	**[mm²]**	**Number of leads**	
For watertight shrink-joining of motor cable and submersible drop cable. Enables the joining of: - cables of equal size. - cables of different sizes. - a cable lead and a single-lead. The joint is ready for use after a few minutes and requires no long hardening time as do resin joints. The joint cannot be separated.	Flat cable	1.5 - 6.0 1.5 - 4.0	3 4	00 11 62 51
	Flat cable	6 - 10 10 - 16	4 3	00 11 62 52
	Flat cable	16 - 25	3 4	00 11 62 55
	3 single leads	1.5 - 6.0	3	00 11 62 53
	3 single leads	10 - 25	3	00 11 62 54
	4 single leads	1.5 - 4.0	4	00 11 62 57
	4 single leads	6 - 16	4	00 11 62 58

Cable termination kit



TM00 7884 2296

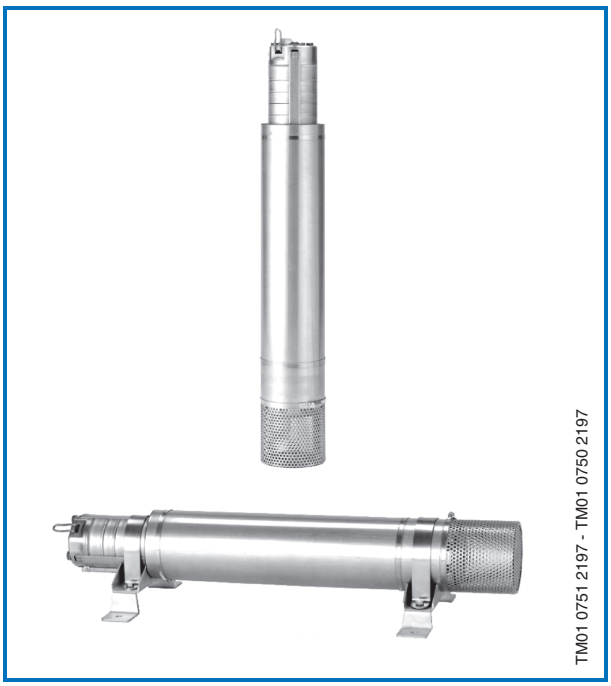
Description	Version			Prod. no.
For watertight joining of motor cable and submersible drop cable.	**Type**	**Diameter of joint**	**For outer cable diameter [mm]**	
For 4" motors and cables up to 4 x 6 mm²	M 0	ø40	app. 6-15	00 ID 89 03
For 6" motors and cables up to 4 x 10 mm²	M 1	ø46	app. 9-23	00 ID 89 04
For 6" motors and cables up to 4 x 16 mm²	M 2	ø52	app. 17-31	00 ID 89 05
For 8" and 10" motors and cables up to 4 x 35 mm²	M 3	ø77	app. 26-44	00 ID 89 06
For 8" and 10" motors and cables up to 4 x 70 mm²	M 4	ø97	app. 29-55	91 07 07 00

Flow sleeves

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

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

Note: More information about accessories is available on request.



Zinc anodes

Application

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

Sacrificial anodes are placed on the outside of the pump and motor as protection against corrosion.
The number of anodes required depends on the pump and motor in question.

Please contact Grundfos for further details.

Liquid temperatures

Sea water: Up to 35°C.
Brackish water (min. 1500 g/m³ chloride): Up to 35°C.

Anode life

The zinc anodes have a life of one to four years, depending on operating conditions (temperature, flow and chloride content).

Product numbers of zinc anodes

Zinc anodes for pumps									
Product number	Used for pump type								
	SP 17	SP 30	SP 46	SP 60	SP 77	SP 95	SP 125	SP 160	SP 215
96 42 14 45	●	●	●	●					
96 42 14 47					●	●			
96 42 14 48						●			
96 42 14 49							●		
96 41 14 50							●	●	●

Zinc anodes for motors			
4" Motors	6" Motors	8" Motors	12" Motors
96 42 14 44	96 42 14 46	96 42 14 50	96 42 14 51

Pt100

The Pt100 sensor allows

- 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 motor lifetime is reduced. Pt100 ensures that operating conditions are not exceeded and indicates when it is time for service of the motor.

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

- Pt100 sensor with cable.
- Relay type EDM 35 or PR 2202.

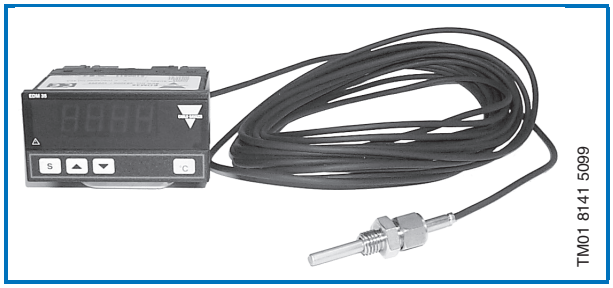
The EDM 35 relay is fitted with a Pt100 module. For both relays the following temperature limits are pre-set on delivery:

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

Technical data

	Relay type	
	EDM 35	PR 2202
Enclosure class	IP 65	IP 50
Ambient temp.	0°C to +50°C	–20°C to +60°C
Relative humidity	90%	90%
Voltage variation	–10/+10% of nominal voltage	24 VDC –20/+20% of nominal voltage
Frequency	50/60 Hz	
Approvals	UL, CSA, SEV	
Mark	CE	

Example: Pt100 for Grundfos MMS submersible motors



Product range

Pt100 sensor including EDM 35 relay and cable

Cable length	Product number					
	Voltage					
	24 V, 50/60 Hz		115 V, 50/60 Hz		230 V, 50/60 Hz	
	MS 6000	MMS	MS 6000	MMS	MS 6000	MMS
20 m	96 42 08 69	96 43 72 77	96 42 08 64	96 43 72 82	96 40 89 53	96 43 72 87
40 m	96 42 08 70	96 43 72 78	96 42 08 65	96 43 72 83	96 40 86 81	96 43 72 88
60 m	96 42 08 71	96 43 72 79	96 42 08 66	96 43 72 84	96 40 89 54	96 43 72 89
80 m	96 42 08 72	96 43 72 80	96 42 08 67	96 43 72 85	96 40 89 55	96 43 72 90
100 m	96 42 08 73	96 43 72 81	96 42 08 68	96 43 72 86	96 40 89 56	96 43 72 91

EDM 35 relay

Voltage	Product number
24 VAC, 50/60 Hz	96 42 07 19
115 VAC, 50/60 Hz	96 42 07 18
230 VAC, 50/60 Hz	96 40 86 88

PR 2202 relay

Voltage	Product number
24 VAC, 50/60 Hz	96 43 98 05

Pt100 sensor including cable

Cable length	Product number	
	MS 6000	MMS
20 m	96 40 89 57	96 43 77 84
40 m	96 40 86 84	96 43 77 85
60 m	96 40 89 58	96 43 77 86
80 m	96 40 89 59	96 43 77 87
100 m	96 40 89 60	96 43 77 88

Energy consumption of submersible pumps

The percentage distribution of service life costs occurring with a submersible pump for water supply is:

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

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

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

E = c x h x P_1 (EURO)
c = specific energy price (EURO/kWh)
h = operating hours/year (hours)
P_1 = power input of the submersible pump (kW).

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

SP 125-3 with MMS 8000, 45 kW, 3 x 460 V, 60 Hz.

Duty point:

Flow rate	Q = 120 m³/h
Total head	H = 102 m
Specific energy price	c = EURO 0.1/kWh (consisting of day and night rate)
Operating hours/year	h = 3200.

$$P_1 = \frac{Q \times H \times \rho}{367 \times \eta_{pump} \times \eta_{motor}} \text{ in kW}$$

Q	= m³/h
H	= m
Density ρ	= kg/dm³ (assumed 1)
367	= conversion factor
η_{motor}	= (example 84.5%, in equation 0.845)
η_{pump}	= (not to be confused with the stage efficiency curve).

By showing the P_2/Q curve we make it easier for you to calculate the energy consumption.

$$P_1 = \frac{P_2}{\eta_{motor}}$$

P_2 = 44 kW (power requirement of SP 125-3 pump at 120 m³/h, from curve P_2 / Q on page 59).

Calculation of motor efficiency at duty point

As standard the SP 125-3 is equipped with a 45 kW MMS 8000 motor.

At duty point (Q = 120 m³/h) the pump requires 44 kW, thus:

a motor load of 98% (44 kW/45 kW) and a power reserve of 2%.

From the table on page 74 the motor efficiency can be read as:

84.6% at a load of 75%. ($\eta_{75\%}$)
85.6% at a load of 100%.($\eta_{100\%}$)
The interpolated value in this example is
η_{motor} = 85.1%, η_{motor} = 0.851.

$$P_1 = \frac{44}{0.851} = 51.7 \text{ kW}$$

E = 0.1 EURO/kWh x 3200 h x 51.7 kW.
The annual energy costs account to EURO 16544.

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

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

Cable sizing:

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

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

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

Cables

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

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

Standard version: Max. liquid temperature +60°C.

Hot water version: Max. liquid temperature +70°C, for short periods up to +90°C (For MS only).

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 must be 10% longer than indicated in the tables.

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

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

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

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

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

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

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

where

U = Rated voltage [V]

ΔU = Voltage drop [%]

I = Rated current of the motor [A]

q = Cross-section of submersible drop cable [mm²]

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

$\cos\varphi$ = Power factor

$\sin\varphi = \sqrt{1 - \cos^2\varphi}$

ρ = Specific resistance: 0.02 [Ω mm²/m]

Example:

Motor size:	30 kW, MMS 8000
Rated current:	53.5 A
Rated voltage:	3 x 460 V, 60 Hz
Starting method:	Direct-on-line
Power factor:	$\cos\varphi$ = 0.85
Voltage drop:	3%
Cross-section:	10 mm²
$\sin\varphi$:	0.53

$$L = \frac{460 \cdot 3}{53.5 \cdot 1.73 \cdot 100 \cdot \left(0.85 \cdot \frac{0.02}{10} + 0.53 \cdot 0.078 \times 10^{-3} \right)}$$

L = 84 m

Cable dimensions at 1 x 220 V, 60 Hz

Motor	kW	I_n [A]	1.5 mm²	2.5 mm²	4 mm²	6 mm²	10 mm²
4"	0.25	3.3	96	159	254	379	624
	0.37	4.4	73	121	192	286	472
	0.55	6.6	48	80	127	189	311
	0.75	7.7	37	62	98	147	243
	1.1	9.0	30	50	79	118	196

Maximum cable length in metres from motor starter to pump.

Cable sizing

Cable dimensions at 3 x 460 V, 60 Hz
Voltage drop: 1%.

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	1.6	0.73	170	282	448	668												
4"	0.55	2.3	0.69	125	207	329	490	804											
4"	0.75	2.7	0.73	101	167	266	396	650											
4"	0.75	2.2	0.87	104	172	275	411	679											
4"	1.1	3.65	0.72	75	125	199	296	487	763										
4"	1.1	3.0	0.85	78	129	206	308	508	802										
4"	1.5	4.35	0.76	60	100	159	236	389	610	927									
4"	1.5	4.05	0.82	60	99	158	236	389	613	936									
4"	2.2	5.8	0.75	46	76	120	179	295	463	703	954								
4"	3.0	7.5	0.78	34	56	90	134	220	346	526	716	981							
4"	4.0	9.45	0.82	26	43	68	101	167	263	401	548	754							
4"	5.5	12.6	0.82	19	32	51	76	125	197	301	411	566	756	970					
4"	7.5	18	0.79	14	23	37	55	91	143	217	296	406	539	689	822	963			
6"	5.5	11.5	0.8	22	36	57	85	140	221	336	458	630	839						
6"	7.5	15.2	0.79	17	27	44	65	107	169	257	350	480	639	816	973				
6"	9.2	18.4	0.81	13	22	35	53	87	136	208	284	390	521	667	799	939			
6"	11	21.2	0.82		19	30	45	74	117	179	244	336	449	577	691	814	940		
6"	13	24.5	0.82		16	26	39	64	101	155	211	291	389	499	598	704	813	959	
6"	15	27.8	0.83			23	34	56	88	135	185	254	340	438	525	620	717	848	967
6"	18.5	33.0	0.83			19	29	47	74	114	155	214	287	369	443	522	604	714	814
6"	22	39.0	0.83				24	40	63	96	132	181	243	312	374	442	511	604	689
6"	26	45.2	0.85					34	53	81	112	154	207	267	322	380	442	525	601
6"	30	52.1	0.85					29	46	71	97	134	180	232	279	330	383	455	521
6"	37	69.2	0.79						37	56	77	105	140	179	214	251	288	338	382
8"	22	46.1	0.84					33	53	81	110	152	204	263	316	373	433	513	586
8"	26	53.9	0.86					28	44	68	93	128	173	223	269	319	371	442	507
8"	30	61.1	0.85						39	60	83	114	153	198	238	281	327	388	445
8"	37	74.1	0.85						32	50	68	94	126	163	196	232	270	320	367
8"	45	87.9	0.85							42	57	79	106	137	165	196	227	270	309
8"	55	106	0.81								49	68	90	116	139	163	188	221	251
8"	63	120	0.86								42	58	78	100	121	143	167	199	228
8"	75	143	0.86									48	65	84	101	120	140	167	191
8"	92	175	0.87										53	68	83	98	115	137	157
10"	110	209	0.86											58	69	82	96	114	131
10"	92	181	0.83										52	67	81	95	110	130	148
10"	110	213	0.84											57	68	81	94	111	127
10"	132	253	0.85												57	68	79	94	107
10"	147	290	0.82													59	69	81	92
10"	170	337	0.82														59	70	79
10"	190	387	0.79															60	68
Max. current for cable [A]*				18.5	25	34	43	60	80	101	126	153	196	238	276	319	364	430	497

* At particularly favourable heat dissipation conditions.

Maximum cable length in metres from motor starter to pump.

Cable sizing

Cable dimensions at 3 x 460 V, 60 Hz
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	1.6	0.73	509	845														
4"	0.55	2.3	0.69	374	621	988													
4"	0.75	2.7	0.73	302	501	797													
4"	0.75	2.2	0.87	311	517	825													
4"	1.1	3.65	0.72	226	375	597	889												
4"	1.1	3.0	0.85	233	388	619	924												
4"	1.5	4.35	0.76	180	299	476	709												
4"	1.5	4.05	0.82	179	298	475	708												
4"	2.2	5.8	0.75	137	227	361	538	885											
4"	3.0	7.5	0.78	102	169	269	401	660											
4"	4.0	9.45	0.82	77	128	203	303	500	788										
4"	5.5	12.6	0.82	58	96	153	228	375	591	903									
4"	7.5	18.0	0.79	42	70	111	165	272	428	651	887								
6"	5.5	11.5	0.8	65	107	171	255	421	662										
6"	7.5	15.2	0.79	50	82	131	196	322	506	771									
6"	9.2	18.4	0.81	40	66	106	158	260	409	624	851								
6"	11	21.2	0.82		57	91	135	223	351	536	732								
6"	13	24.5	0.82		49	78	117	193	304	464	634	873							
6"	15	27.8	0.83			68	102	168	265	405	554	763							
6"	18.5	33.0	0.83			58	86	142	223	341	466	643	860						
6"	22	39.0	0.83				73	120	189	289	395	544	728	936					
6"	26	45.2	0.85					101	160	244	335	463	621	801	965				
6"	30	52.1	0.85					88	139	212	290	401	539	695	837	990			
6"	37	69.2	0.79						111	169	231	316	421	538	641	752	864		
8"	22	46.1	0.84					100	158	242	331	457	612	789	948				
8"	26	53.9	0.86					84	133	203	278	385	518	669	807	957			
8"	30	61.1	0.85						118	181	248	342	459	593	714	844	981		
8"	37	74.1	0.85						97	149	204	282	379	489	588	696	809	961	
8"	45	87.9	0.85							126	172	238	319	412	496	587	682	810	927
8"	55	106	0.81								148	203	271	348	416	489	564	664	754
8"	63	120	0.86								125	173	233	301	363	430	500	596	684
8"	75	143	0.86									145	195	252	304	361	420	500	574
8"	92	175	0.87										159	205	248	295	344	410	472
10"	110	209	0.86											173	208	247	287	342	392
10"	92	181	0.83										157	202	242	286	330	391	445
10"	110	213	0.84											171	205	242	281	333	380
10"	132	253	0.85												172	204	237	281	322
10"	147	290	0.82													178	206	243	277
10"	170	337	0.82														177	209	238
10"	190	387	0.79															181	205
Max. current for cable [A]*				18.5	25	34	43	60	80	101	126	153	196	238	276	319	364	430	497

* At particularly favourable heat dissipation conditions.

Maximum cable length in metres from motor starter to pump.

Dimensioning of cable

Calculation of the cross-section of the cable

Formula designations

U = Rated voltage [V]

ΔU = Voltage drop [%]

I = Rated current of the motor [A]

q = Cross-section [mm²]

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

cosφ = Power factor

sinφ = $\sqrt{1 - \cos^2\varphi}$

L = Length of cable [m]

Δp = Power loss [W]

ρ = 1/χ
Materials of cable:
Cubber: χ = 52 m/Ω x mm²
Aluminium: χ = 35 m/Ω x mm²

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

DOL

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

Star-delta

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

The values of the rated current (I) and the power factor (cosφ) can be read in the tables on the pages 71-75.

Calculation of the power loss

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

$$\Delta p = \frac{3 \cdot L \cdot p \cdot I^2 \cdot \cos\varphi}{q}$$

Example:

Motor size:	45 kW, MMS 8000
Rated current:	I_n = 77.7 A
Voltage:	3 x 460 V, 60 Hz
Starting method:	Direct-on-line
Required cable length:	200 m
Power factor:	Cos $\varphi_{100\%}$ = 0.85
Water temperature:	30°C

Cable selection:
Choice A: **3 x 150 mm²**
Choice B: **3 x 185 mm²**

Calculation of power loss

Choice A:

$$\Delta p_A = \frac{3 \cdot L \cdot \rho \cdot I^2 \cdot \cos\varphi}{q} =$$

$$\Delta p_A = \frac{3 \cdot 200 \cdot 0.02 \cdot 77.7^2 \cdot 0.85}{150} =$$

$$\Delta p_A = \mathbf{411\ W}$$

Choice B:

$$\Delta p_B = \frac{3 \cdot 200 \cdot 0.02 \cdot 77.7^2 \cdot 0.85}{185} =$$

$$\Delta p_B = \mathbf{333\ W}$$

Savings

Operating hours/year: h = 4000.

Annual saving (A):

$$A = (\Delta p_A - \Delta p_B) \cdot h = 411W - 333W \cdot 4000 = 312000wh = 312kWh$$

By choosing the cable size 3 x 185 mm² instead of 3 x 150 mm², an annual saving of 312 kWh is achieved.

Operating time: 10 years

Saving after 10 years (A_{10}):

$$A_{10} = A \cdot 10 = 312 \cdot 10 = \mathbf{3120\ kWh}$$

The saving in amount must be calculated in the local currency.

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]											
m³/h	Litres/min.	Litres/sec.	½" 15.75	¾" 21.25	1" 27.00	1¼" 35.75	1½" 41.25	2" 52.50	2½" 68.00	3" 80.25	3½" 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.

Table of head losses

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							
m³/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.

V7 01 33 16 12 00
Repl. V7 01 33 16 10 98
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Subject to alterations.

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