

SP

Common data and descriptions

PI-005/A



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1. Common data and descriptions

This Product Information consists of the data and descriptions common to all SP pumps. For pump specific information, see the Product Information on the individual SP pump types. The Product Information documents on the SP pump types all have the same structure, i.e.

- **General information:**
Brief general description.
- **Product range:**
Product range for 50 and 60 Hz pumps.
- **Product number key:**
Explanation of the individual elements of the product number.
- **Curves:**
Curves showing performance, power input, single-stage performance, single-stage power and single-stage axial thrust.
- **Dimensions and weights:**
Dimensions and weights of pump and motor separately as well as of pump + motor.
- **Technical data:**
Starting and connection, moment of inertia and recommended minimum borehole diameter.
- **Construction:**
Exploded view, sectional drawing, material specification and description of components.

2. Application

2.1 General information

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

2.2 Areas of application

SP pumps are suitable for applications such as

- groundwater supply
- water supply for gardening or farming
- groundwater lowering and
- pressure boosting.

3. Pumped liquids

3.1 General information

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

Maximum content of sand: 50 g/m³.

A larger content of sand will reduce pump life.

3.2 Special liquids

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

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

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

REFERENCE: In case of doubt, contact Grundfos Management A/S.

3.3 Risk of corrosion

Organic activity, for instance in harbour water, as well as various reducing agents may destroy the oxide film protecting the stainless steel and cause corrosion.

4. Thermal protection

4.1 MS motors with temperature transmitter

Some of the Grundfos MS submersible motors used for the SP standard product range are fitted with a built-in Tempcon temperature transmitter.

Used together with a CU 3 control unit or an MTP 75 motor temperature monitoring and motor protection device, the Tempcon sends a temperature signal via the phase leads. In the CU 3 or MTP 75, the temperature measured is compared with the factory-set value.

4.2 MS motors with Tempcon

Material DIN W.-Nr.	Power
1.4301	5.5 - 30 kW
1.4401 1.4539	Below 30 kW

4.3 MS motors without Tempcon

Material DIN W.-Nr.	Power
1.4301	4 kW or below
	37 kW or above
1.4401 1.4539	37 kW or above

5. Installation

5.1 General information

Installation describes some basic rules to be followed in connection with the installation of SP pumps.

See also the Installation and Operating Instructions on the individual pump.

5.2 Installation rules

5.2.1 Note

For the sake of cooling and lubrication of bearings and neck rings, do not start the pump unless the suction interconnector is completely submerged in the liquid.

5.2.2 Long pumps

When the number of stages is equal to or above the number stated in the table below, the pump part and motor are supplied as separate units.

Pump type	Stages as from...	
	50 Hz	60 Hz
SP 77	19	14
SP 95	18	-
SP 125	11	8
SP 160	10	7
SP 215	7	5

Note: The motor must be in the vertical position when the pump is mounted on the motor.

The pump part should be mounted on the motor according to the following guidelines:

1. Use pipe clamps when handling the motor.
2. Place the motor in the vertical position at the borehole seal, see [Fig. 1](#).

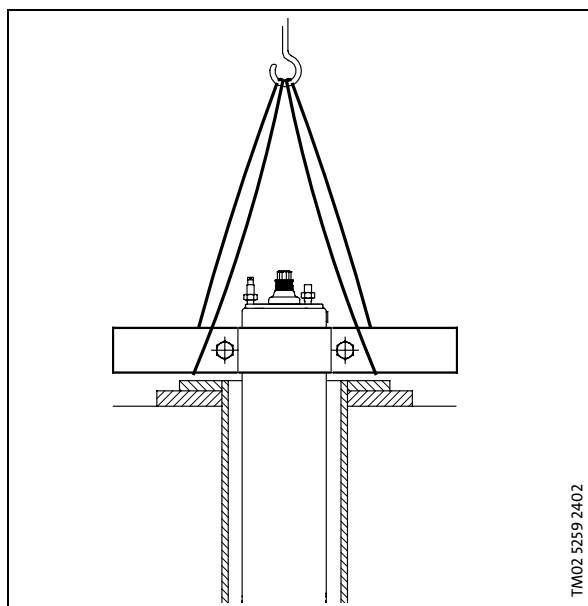


Fig. 1 Handling of submersible motor by means of pipe clamp

3. Lift the pump part by means of pipe clamps fitted to the extension pipe, see [Fig. 2](#).

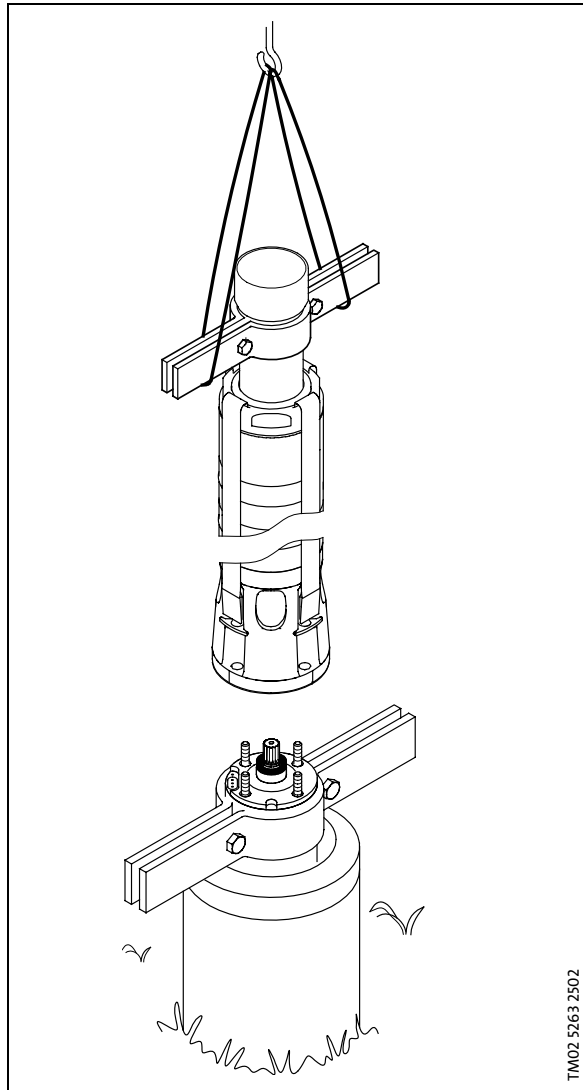


Fig. 2

4. Place the pump part on top of the motor.

5. Fit and tighten the four nuts.

The bolts and nuts securing the straps to the pump must be tightened diagonally to the torques stated in the following table:

Straps bolt/nut	Torque [Nm]
M8	18
M10	35
M12	45
M16	120
SP 215, 50 Hz, with more than 8 stages SP 215, 60 Hz, with more than 5 stages	150

Note: Make sure that the coupling between pump and motor engages properly.

When fitting the motor to the pump part, the nuts must be tightened diagonally to the torques stated in the following table:

Pump/motor staybolt diameter	Torque [Nm]
M8	18
M12	70
M16	150
M20	280

Note: Make sure that the pump chambers are aligned when assembly has been completed.

5.2.3 Installation

The pump is suitable for vertical and horizontal installation. Never install the pump below the horizontal plane.

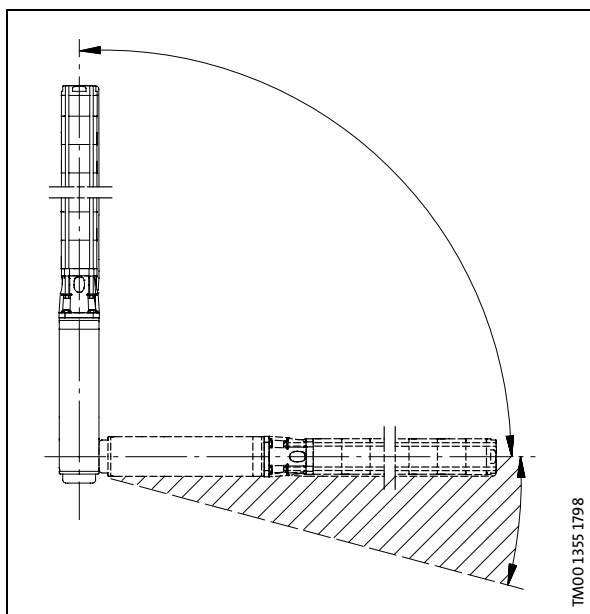


Fig. 3

Install the pump in such a way that the water level is never below the suction interconnector of the pump during operation.

5.2.4 Nameplate

For reference purposes, fit the additional nameplate supplied with the SP pump close to the site of installation.

5.3 Start-up rules

5.3.1 Note

For the sake of cooling and lubrication of bearings and neck rings, the suction interconnector must be completely submerged in the liquid before the pump is started.

5.3.2 Start-up

Connected correctly and submerged in the liquid to be pumped, the pump can be started. The discharge valve should be closed off to approx. 1/3 of its maximum volume of water.

In case of impurities in the water, open the valve gradually as the water becomes clearer. Do not stop the pump until the water is completely clean, as otherwise pump parts and the non-return valve may choke up.

Simultaneously with opening the valve to the required capacity, check the drawdown of the water level to ensure that the pump remains submerged.

Make sure that the dynamic water level is always above the suction interconnector of the pump, see [Fig. 4](#).

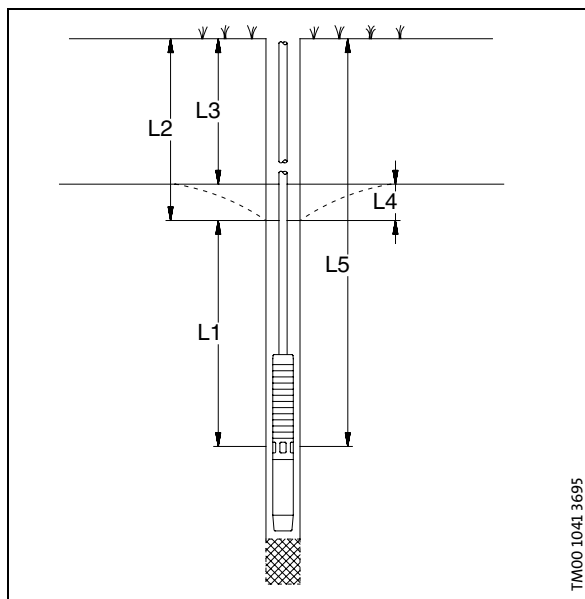


Fig. 4

Key:

Code	Description
L1	Minimum installation depth below dynamic water level. A minimum of 1 metre is recommended.
L2	Depth to dynamic water level.
L3	Depth to static water level.
L4	Drawdown = the difference between the dynamic and static water levels.
L5	Installation depth.

5.3.3 Dry-running protection

If the pump can pump more than the well can yield, it is recommended to fit a Grundfos CU 3 control unit or some other type of dry-running protection.

Without dry-running protection, the water level may be drawn down to the suction interconnector of the pump, which will consequently draw in air.

Prolonged operation with water containing air may damage the pump and cause insufficient cooling of the motor.

5.3.4 Motors suitable for horizontal installation

Motor type	Power output 50 Hz	Power output 60 Hz
	[kW]	[kW]
MS	All sizes	All sizes
MMS 6000	3.7 to 18.5	3.7 to 18.5
MMS 8000	22 to 55	22 to 55
MMS 10000	75 to 110	75 to 110
MMS 12000	147 to 190	-
Mercury	All sizes	All sizes

If Franklin 4" submersible motors up to and including 2.2 kW are started more than 10 times a day, it is recommended to install the motor at an angle of minimum 15° above the horizontal plane in order to minimize upthrust disc wear.

Note: During operation, the suction interconnector of the pump must always be completely submerged in the pumped liquid.

In special conditions, it may be required to submerge the pump even deeper, depending on the operating conditions of the actual pump and the NPSH value.

6. Technical data

6.1 Liquid temperatures

6.1.1 General information

For protection of pump and motor rubber parts, the liquid temperature must not exceed 40°C (~150°F).

Operation at liquid temperatures between 40 and 60°C (~150 and 140°F) is possible, provided that all rubber parts are replaced every three year. Alternatively, the pump can be fitted with bearings made of FKM material, resistant to liquid temperatures of up to 90°C.

6.1.2 Maximum liquid temperature

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

Motor	Flow velocity past motor	Installation	
		Vertical	Horizontal
MS 6000	Free convection, 0 m/s	20°C (~68°F)	Cooling sleeve recommended
MS 6000	0.15 m/s	40°C (~105°F)	40°C (~105°F)
MS industrial version 4" and 6"	0.15 m/s	60°C (~140°F)	60°C (~140°F)
MMS rewindable, 6" to 12"	Free convection, 0 m/s	20°C (~68°F)	20°C (~68°F)
	0.15 m/s	25°C (~77°F)	25°C (~77°F)
	0.50 m/s	30°C (~85°F)	30°C (~85°F)
Franklin	0.16 m/s	30°C (~85°F)	30°C (~85°F)
Mercury 12"	0.15 m/s	25°C (~77°F)	25°C (~77°F)

6.1.3 Reference

See also Product Information FB-040 on MS 6000 motors, the MMS data booklet, SP installation and operating instructions as well as Franklin Electric's home page <http://www.franklin-electric.com/> and Mercury's motor catalogues.

6.2 Operating limitations

6.2.1 General information

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

6.2.2 Inlet pressure

The minimum inlet pressure is indicated by the NPSH-curves in the single-stage curve charts. The minimum safety margin of the NPSH-curves should always be 1.0 m head.

6.2.3 Minimum flow rate

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

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

6.2.4 Maximum flow rate

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

6.2.5 Installation depth

The maximum installation depth below water level is stated in the table below.

Motor	Installation depth below water level		
	[m]	[bar]	[MPa]
MS 402	150	15	1.5
MS 4000	600	60	6
MS 6000	600	60	6
MMS	250	25	2.5
Franklin	350	35	3.5
Mercury	50	5	0.5
Pleuger	350	35	3.5

6.2.6 Flow rates

The performance of the individual pump is found in the performance curve charts, see the Product Information on the pump in question.

Below table states the flow rates at 50 and 60 Hz.

The recommended flow rate is the most economical flow rate of the pump.

Pump type	Nominal flow		Recommended flow	
	[m³/h]	[US GPM]	[m³/h]	[US GPM]
50 Hz				
SP 17	17	75	9 - 21	40 - 92
SP 30	30	132	20 - 35	88 - 154
SP 46	46	202	32 - 57	141 - 251
SP 60	60	264	45 - 70	198 - 308
SP 77	77	339	52 - 95	229 - 418
SP 95	95	418	60 - 110	264 - 484
SP 125	125	550	80 - 135	352 - 594
SP 160	160	704	105 - 205	462 - 902
SP 215	215	946	140 - 255	616 - 1122
60 Hz				
SP 17	19.3	85	12 - 24	53 - 105
SP 30	36	158	24 - 42	105 - 185
SP 46	55	243	38 - 68	167 - 299
SP 60	72	317	50 - 85	220 - 374
SP 77	92	405	60 - 115	264 - 506
SP 95	114	502	70 - 130	308 - 572
SP 125	150	660	100 - 160	440 - 704
SP 160	192	845	125 - 245	550 - 1078
SP 215	258	1136	160 - 300	704 - 1320

6.2.7 Voltages

See the Product Information on the individual pumps.

6.2.8 Operation mode

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

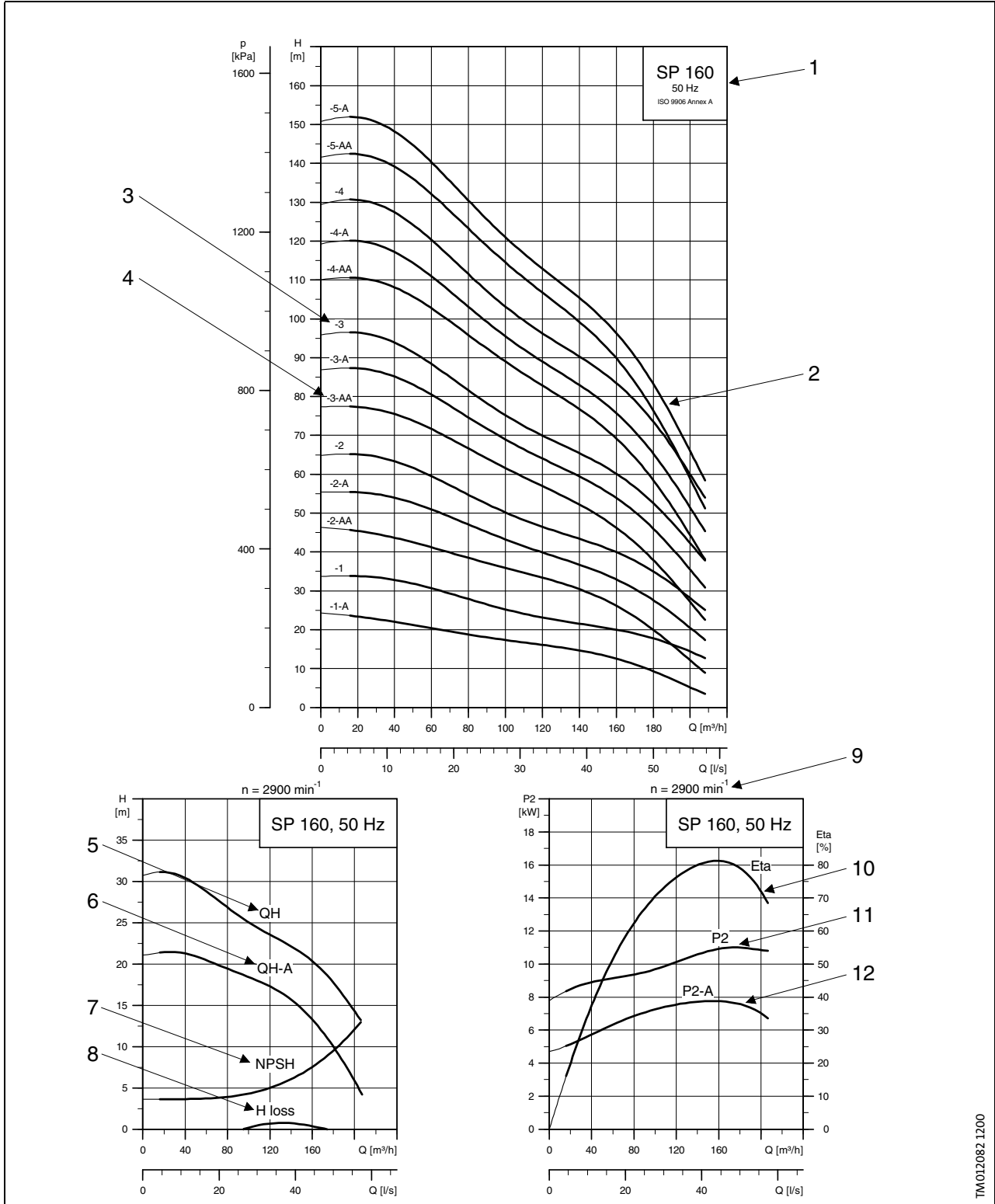
Motor type	Recommended number of starts
MS 402	Min. 1 per year. Max. 100 per hour. Max. 300 per day.
MS 4000	Min. 1 per year. Max. 100 per hour. Max. 300 per day.
MS 6000	Min. 1 per year. Max. 30 per hour. Max. 300 per day.
MMS 6000	Min. 1 per year. Max. 15 per hour. Max. 360 per day.
MMS 8000	Min. 1 per year. Max. 10 per hour. Max. 240 per day.
MMS 10000	Min. 1 per year. Max. 8 per hour. Max. 190 per day.
MMS 12000	Min. 1 per year. Max. 5 per hour. Max. 120 per day.
Franklin	Min. 1 per year. Max. 100 per day.
Mercury 6"	Min. 1 per year. Max. 20 per hour.
Mercury 8"	Min. 1 per year. Max. 15 per hour.
Mercury 10"	Min. 1 per year. Max. 10 per hour.
Mercury 12"	Min. 1 per year. Max. 6 per hour.
Pleuger	Min. 1 per year. Max. 100 per day.

6.3 Transportation and storage

Pump and motor can stand storage temperatures from -20°C to $+60^{\circ}\text{C}$ (-4°F to $+140^{\circ}\text{F}$).
Motor and cables must be protected against direct sunlight. The packaging is clearly marked.

7. How to read the curve charts

7.1 Curve chart example



TM012082 1200

7.2 General information

Below is a description of how to read the curve charts. The curves of the individual SP pump types are found in the Product Information on the respective pumps.

7.2.1 Performance curves

No.	Explanation
1	Pump type and frequency.
2	QH curves for the individual pumps at actual speed. The bold curves indicate the recommended performance range. The thin curves are only intended as a guide.
3	Number of stages.
4	Number of stages with indication of reduced-diameter impellers (1 or 2), see <i>Product number key</i> in the Product Information on the individual pumps.

7.2.2 Single-stage performance curves

No.	Explanation
5	Single-stage QH curves at fixed speed, see 7.3.6 Single-stage curves .
6	Single-stage QH curves for reduced-diameter impellers.
7	NPSH: The curve shows average values measured under the same conditions as the performance curves.
8	H_{loss} : The curve shows the pressure loss in suction interconnector and valve.

7.2.3 Single-stage power curves

No.	Explanation
9	Fixed speed for single-stage curves.
10	The Eta curve shows pump stage efficiency.
11	Single-stage power curve.
12	Single-stage power curve for reduced-diameter impellers.

7.3 Curve conditions

7.3.1 General information

The following curve charts are based on a number of conditions in respect of

- pumped liquid
- tolerances and
- speed.

7.3.2 Pumped liquid

The measurements are based on the following conditions:

- Test liquid: Airless water.
- Water temperature: 20°C.
- Kinematic viscosity: 1 mm²/s (1 cSt).

7.3.3 Tolerances

The curves indicate mean values according to ISO 9906 Annex A. The conversion between head H (m) and pressure p (kPa) applies to water with a density of 1000 kg/m³.

Note: The curves must not be used as guarantee curves.

7.3.4 Performance curves

The performance curves show the pump performance at the actual speed for pumps fitted with a standard motor.

7.3.5 Power curves

The power curves show the pump input power at the actual speed of pumps fitted with a standard motor.

7.3.6 Single-stage curves

Single-stage curves apply to the following speeds:

- at 50 Hz, $n = 2900 \text{ min}^{-1}$
- at 60 Hz, $n = 3450 \text{ min}^{-1}$.

8. Type key, 50 Hz

Example	SP	95	-	3	-	B	B	N
Type range								
Nominal flow rate in m ³ /h								
Number of stages								
Impeller with reduced diameter (A, B or C)								
Second impeller with reduced diameter (A, B or C)								
Material: Blank = DIN W.-Nr. 1.4301 N = DIN W.-Nr. 1.4401 R = DIN W.-Nr. 1.4539 (for SP 17 to SP 60 inclusive)								

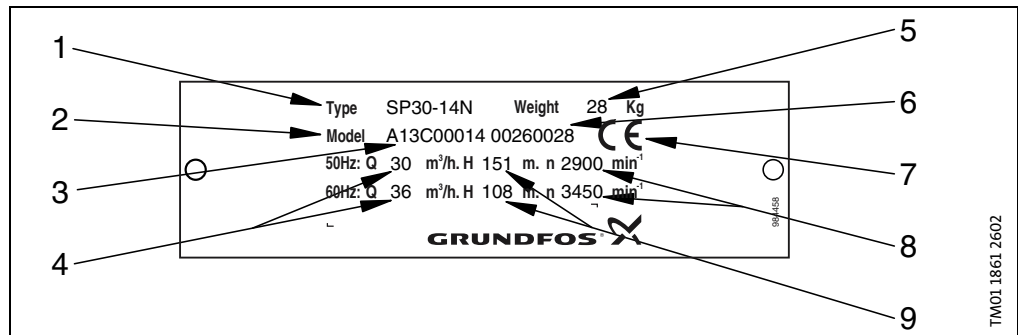
8.1 Nameplate, 50 Hz

8.1.1 Position

The nameplate is located on the pump suction interconnector or valve casing.

For reference purposes, the additional nameplate supplied with the pump must be fitted close to the site of installation.

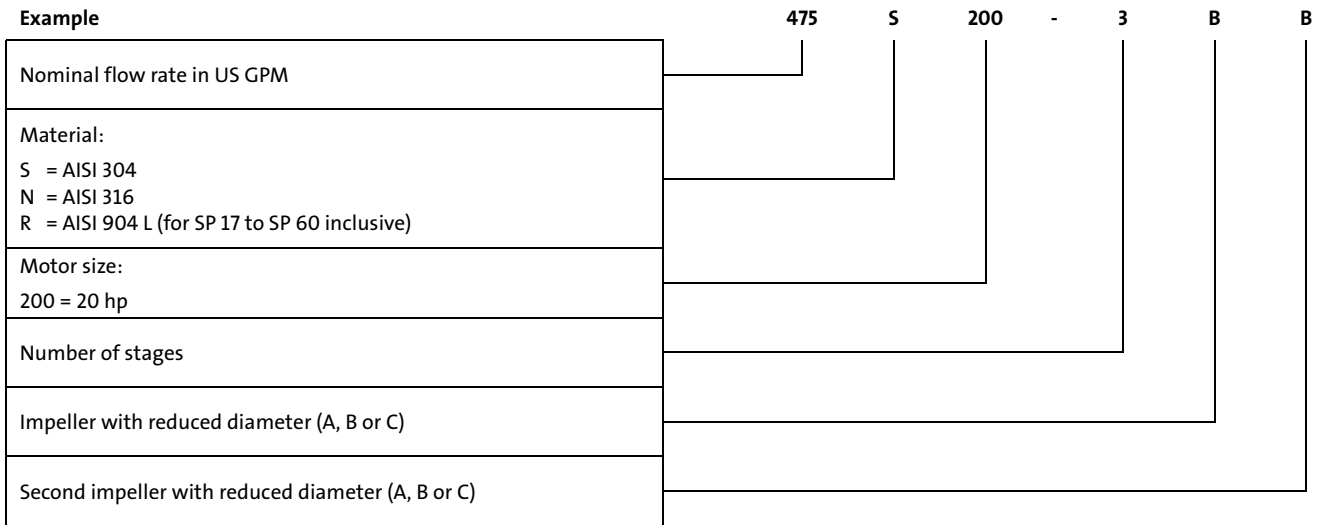
8.1.2 Nameplate



8.1.3 Key

Pos.	Description
1	Type designation
2	Model
3	Product number. See the product number key of the individual pump.
4	Nominal flow rate
5	Weight
6	Production year and week
7	CE mark
8	Speed
9	Head at nominal flow rate

9. Type key, USA, 60 Hz



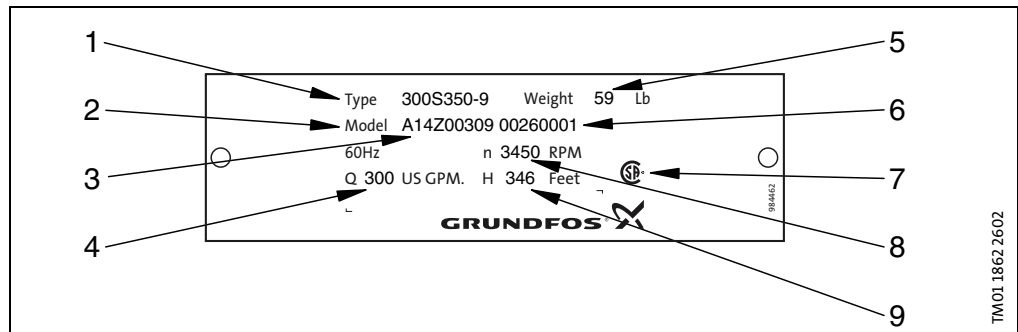
9.1 Type key, USA

9.1.1 Position

The nameplate is placed on the pump suction interconnector.

It is recommended that, for reference purposes, the additional nameplate supplied with the pump is fitted close to the site of installation.

9.1.2 Type key



9.1.3 Key

Pos.	Description
1	Type designation
2	Model
3	Product number. See the <i>product number key</i> of the individual pump.
4	Nominal flow rate
5	Weight
6	Production year and week
7	Approval
8	Speed
9	Head at nominal flow rate

10. Accessories

For accessories to the SP pumps, see the following Product Information documents:

- FB-041, Cable termination kit, type KM
- FB-050:
 - FB-050/A, CU 3 control unit
 - FB-050/B, CU 3 with R100
 - FB-050/C, CU 3 with communication module
 - FB-050/D, Sensor module SM 100
- FB-060, Flow sleeves for submersible motors
- FB-062, MTP 75
- FB-073, G100 Gateway
- FB-079, Cathodic protection of SP pumps.

