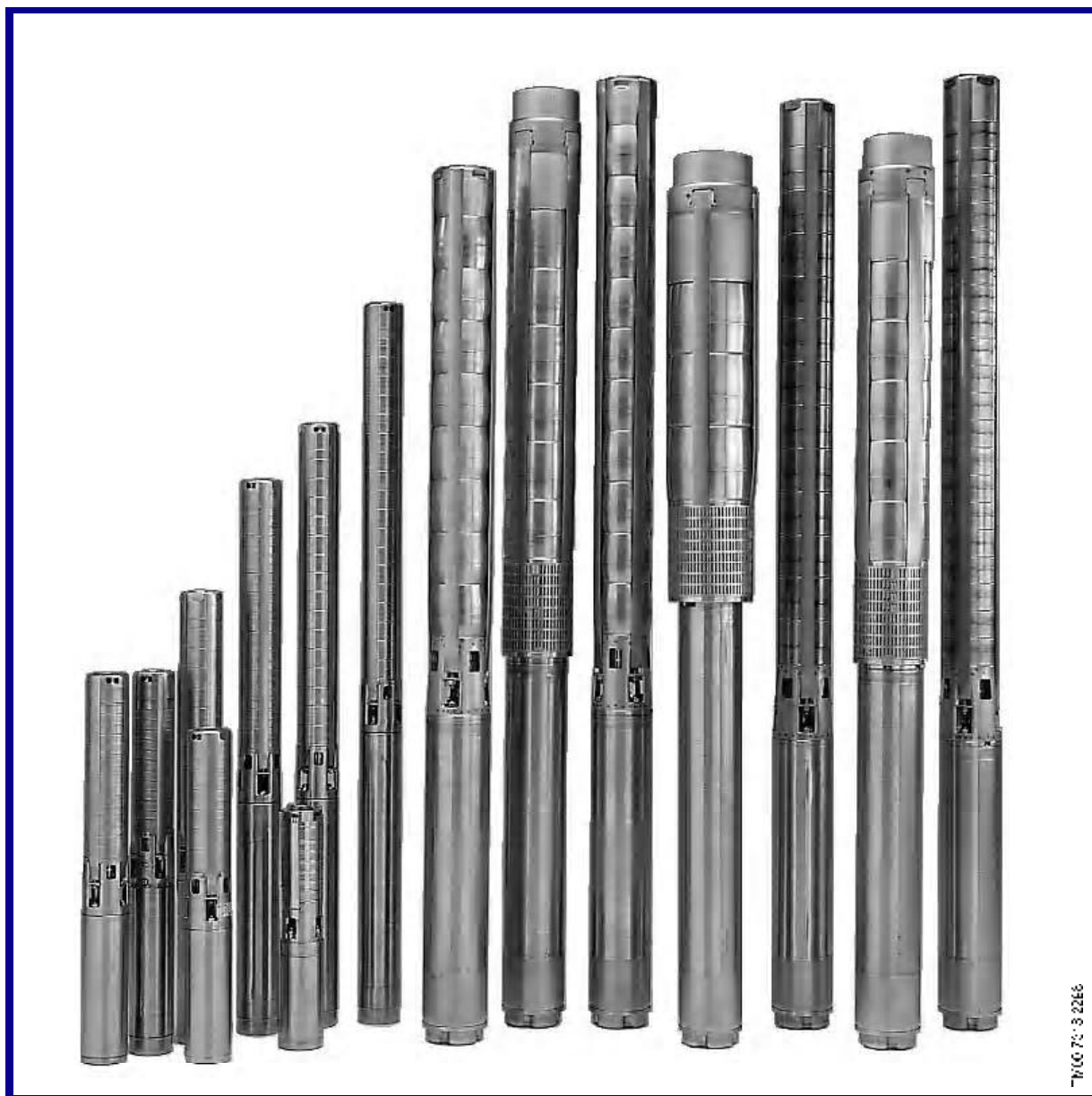


SP A, SP

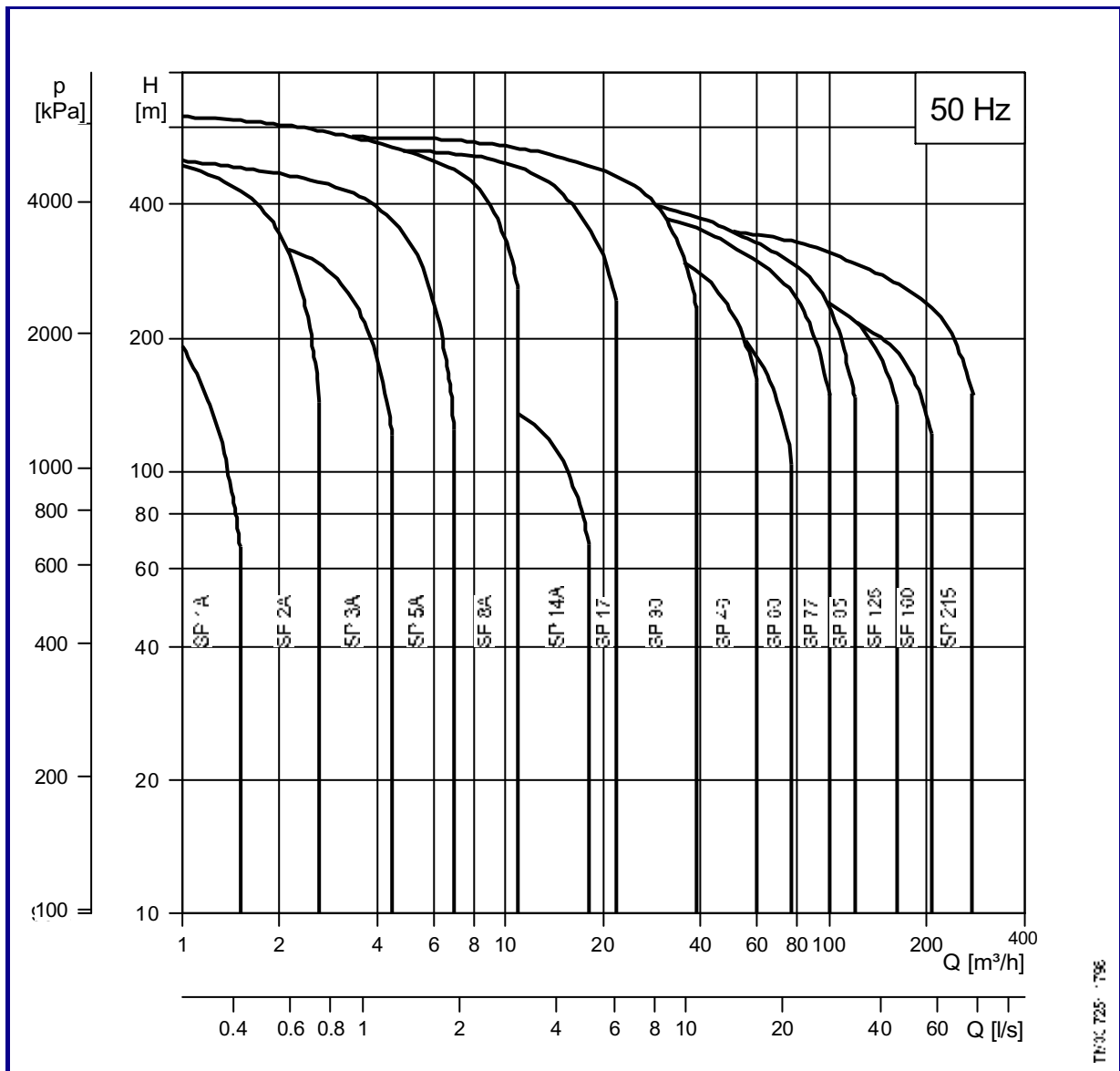
Submersible Pumps Submersible Motors Accessories

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

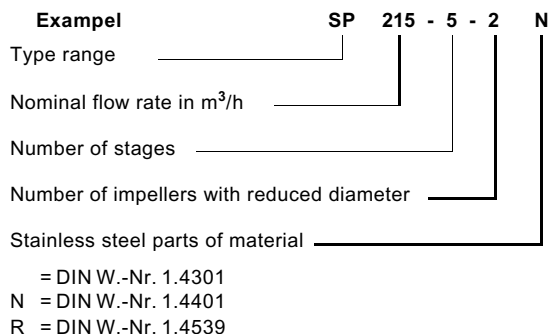
50 Hz



Performance Range



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: 0,1-280 m³/h.
Head, H: Maximum 600 m.

Maximum Liquid Temperature:

Motor	Installation		
	Flow velocity-past motor	Vertical	Horizontal
Grundfos 4" and 6"	Free convection 0 m/s	20°C	Flow sleeve-recommended
Grundfos 4" and 6"	0.15 m/s	40°C	40°C
Franklin 4"	0.08 m/s	30°C	30°C
Franklin 6" and 8"	0.16 m/s	30°C	30°C
Mercury	0.15 m/s	25°C	25°C

Operating pressure: Maximum. 6 MPa (60 bar).

Curve Conditions

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

General

- Curve tolerances according to ISO 2548, Annex B.
- The performance curves show pump performance at actual speed cf. standard motor range.
The speed of the motors is approximately:
4" motors : n = 2870 min⁻¹
6" motors : n = 2870 min⁻¹
8" and 12" motors : n = 2900 min⁻¹
- The measurements were made with airless water at a temperature of 20°C. The curves apply to a kinematic viscosity of 1mm². 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 Curver

- **Q/H:** The curves are inclusive of valve and inlet losses at the actual speed.
- **Power Curve:** P₂ shows pump power input per stage.
- **Efficiency Curve:** Eta shows pump stage efficiency.

SP Curver

- **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:** P₂ 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 1¼ (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]	0.37	0.55	0.75	1.1	1.5	2.2	3.0	4.0	5.5	7.5	9.2	11	13	15	18.5	22	26	30	37	45	55	75	93	110	130	150	185	220	
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 is available from 5.5 kW.

Motor Protection Range

Motor Output [kW]	0.37	0.55	0.75	1.1	1.5	2.2	3.0	4.0	5.5	7.5	9.2	11	13	15	18.5	22	26	30	37	45	55	75	93	110	130	150	185	220	
MTP 75 *			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+											
CU 3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
R100	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
RS-485 communica- tion module	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
G100	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
SM100 sensor module	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Vertical flow sleeve	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Horizontal flow sleeve	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

*Requires motor with built-in temperature transmitter.

Motor protection of single-phase motor, see "Electrical Data" page 40.

Features and Benefits

A Wide Pump Range

Grundfos offers submersible pumps with energy-efficient duty points ranging from 0.1 to 280 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 \$ 60,000 will be saved if a pump/motor having a 10% higher efficiency is chosen and the price is \$ 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)

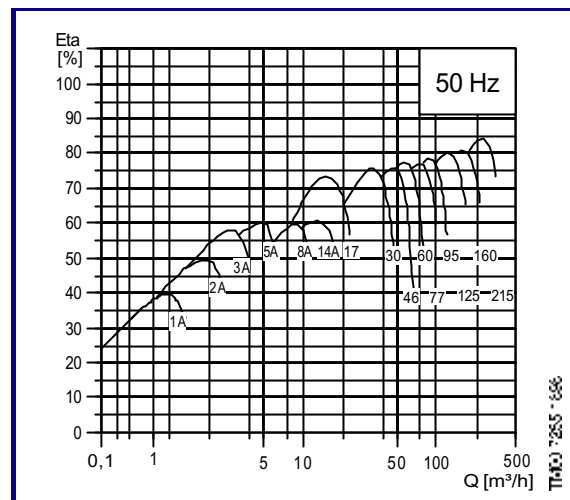
SP R: DIN W.-Nr. 1.4539 (AISI 904L)

Alternatively, a complete range of zinc anodes for cathodic protection is available, see page 76. 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 Viton.

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.

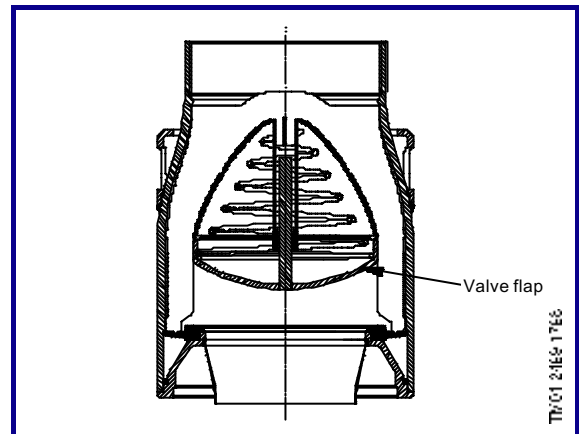


Non-Return Valve

All pumps are equipped with a reliable non-return valve in the valve 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.

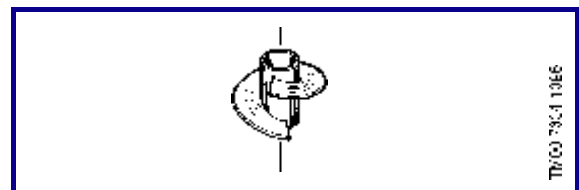


Priming Screw

All Grundfos 4" 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 this lubrication is automatically provided for.

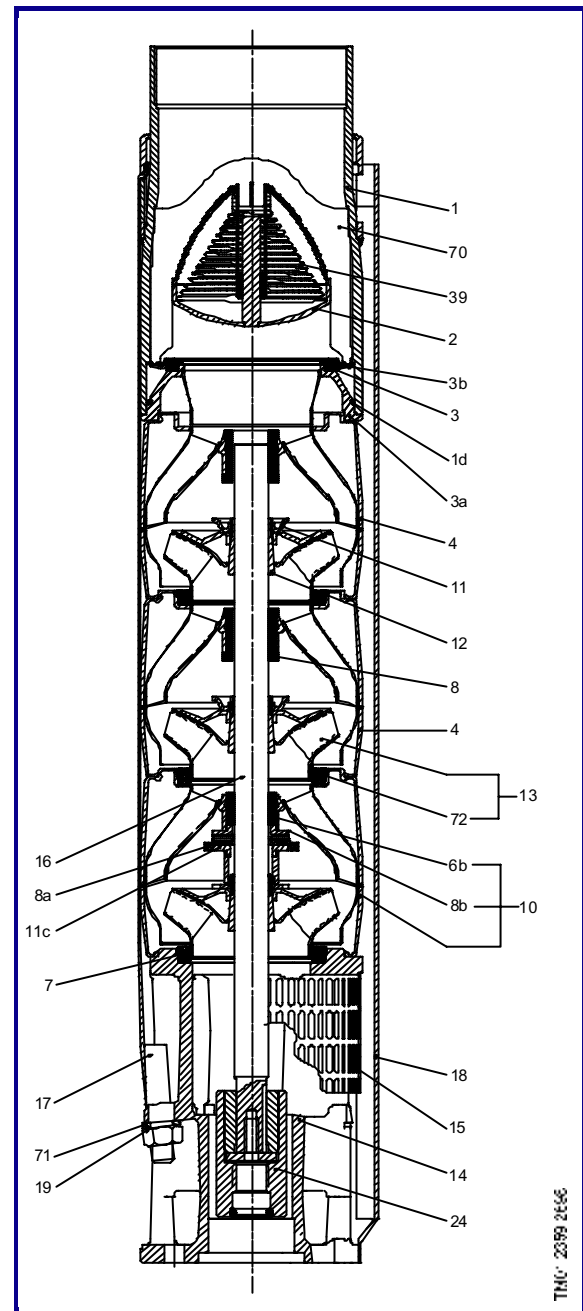
However, it applies to all pump types that if the water table is lowered to a level below the pump inlet neither pump nor motor will be protected against dry running.



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	Intermediate 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/ graphiteHY22 in Teflon mass		
8b	Stop ring	Stainless steel	1.4401 316	1.4401 316
10	Bottom intermediate chamber 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 inter-connector	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



Features and Benefits

A Complete Motor Range

Grundfos offers a complete submersible motor range in different voltages:

- 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

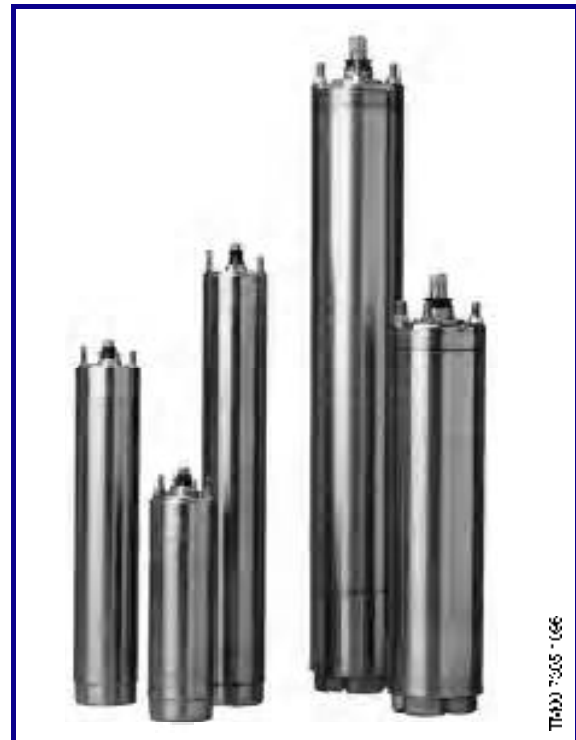
High Motor Efficiency

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.

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 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.



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.

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.

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.

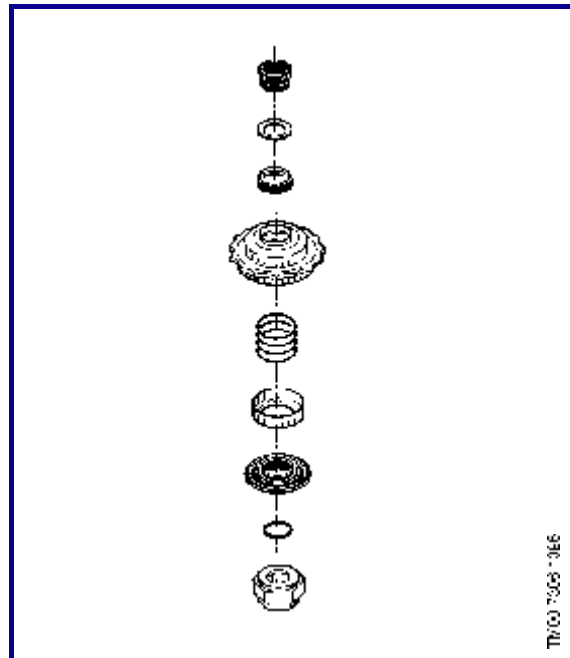
Reduced Risk of Short-Circuit

The embedded stator winding 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.

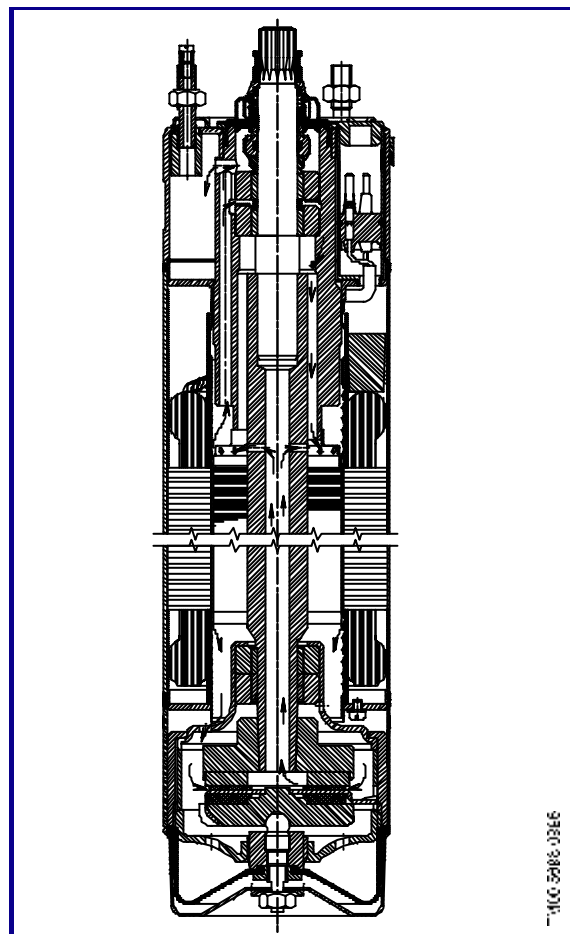
Built-in Cooling Chambers

In all Grundfos submersible pumps 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. As long as the required flow velocity past the motor is maintained (see Operating Conditions page 5) cooling of the motor will be efficient.

Example: MS 4000



Example: MS 4000



Material Specification

Standard Version Motor

Pos.	Part	MS 402	MS 4000 MS 6000	Franklin	Mercury
1	Shaft (DIN W.-Nr.)	1.4057	1.4057	1.4305	1.4021
2	Shaft seal (DIN W.-Nr.)	NBR rubber	Tungsten carbide/ ceramic	1.4301/ ceramic	Rubber/ stainless steel
3	Motor sleeve (DIN W.-Nr.)	1.4301	1.4301	1.4301	1.4301
4	Motor end shield (DIN W.-Nr.)		1.4301	GG 20 powder coated	G 20 cast iron
5	Radial bearing	Ceramic	Ceramic/ tungsten carbide	GG 20 powder coated	Bronze ASTM
6	Axial bearing	Ceramic/ carbon	Ceramic/ carbon	1.4301/ GG 20 + carbon	1.4021/ carbon
	Rubber parts	NBR rubber	NBR rubber	Buna N	

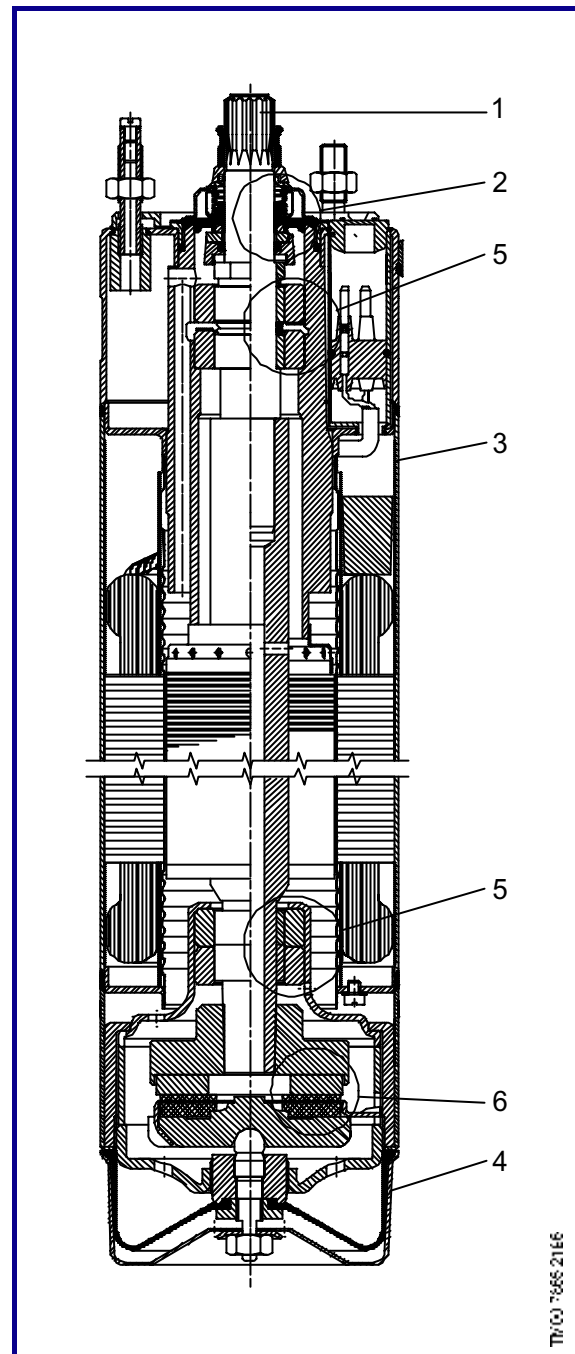
N-Version Motor

Pos.	Part	Franklin	Mercury
1	Shaft (DIN W.-Nr.)		1.4401
2	Shaft seal (DIN W.-Nr.)	Ceramic/ Buna N +1.4301	Rubber/stainless steel
3	Motor sleeve (DIN W.-Nr.)	1.4571	1.4401
4	Motor end shield (DIN W.-Nr.)	1.4408	1.4401
5	Radial bearing		Bronze ASTM B 144/Stahl ASTM A 235-55 chromium-plated
6	Thrust bearing (DIN W.-Nr.)		1.4401/carbon
	Rubber parts	Buna N	

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



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