SP accessories

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Table of contents

1. General description

This data booklet contain information and data on SP accessories.

For pump related information see pump data booklets:

SP 50 Hz Data Booklet

http://net.grundfos/qr/i/V7165881

SP 60 Hz Data Booklet

http://net.grundfos/qr/i/V7013316

For accessory related mounting instructions see quick guides:

Zinc Anode Quick guide

http://net.grundfos/qr/i/98445638

Flow sleeves Quick guide

http://net.grundfos/qr/i/97759492

Pt 100 / Pt 1000 Quick guide

http://net.grundfos/qr/i/98445663

2. Electrical accessories

MP 204 motor protector

TM055456 3712

Fig. 1 MP 204 motor protector

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

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

The motor protector operates with two sets of limits:

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

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

Some values only have a warning limit.

You can read out the warning with the Grundfos GO.

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

Applications

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

You can monitor the motor protector via a Grundfos GENIbus.

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

The motor protector is designed for single- and three-phase motors. In single-phase motors, the starting and run capacitors are also measured. Cos φ is measured in both single- and three-phase systems.

Benefits

The motor protector offers these benefits:

- suitable for both single- and three-phase motors
- dry-running protection
- overload protection
- very high accuracy
- made for submersible pumps.

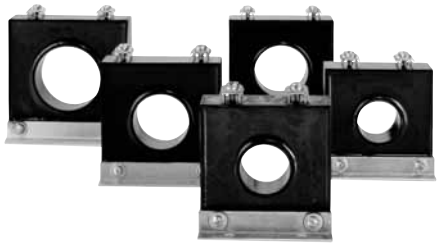
The many monitoring options of the motor protector

The motor protector monitors the following parameters:

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

Five sizes of single-turn transformers, 120-999 A.

Note: Monitoring of motor temperature is not possible when you use single-turn transformers.



TM03 2033 3505

Fig. 2 Single-turn transformers

Product numbers, MP 204

Product	Product number
MP 204	96079927
Single-turn transformers	
Current transformer ratio: 200:5, $I_{max.}$ = 120 A	96095274
Current transformer ratio: 300:5, $I_{max.}$ = 300 A	96095275
Current transformer ratio: 500:5, $I_{max.}$ = 500 A	96095276
Current transformer ratio: 750:5, $I_{max.}$ = 750 A	96095277
Current transformer ratio: 1000:5, $I_{max.}$ = 1000 A	96095278

Technical data, MP 204

Enclosure class	IP20
Ambient temperature	-20 - 60 °C
Relative air humidity	99 %
Voltage range	100-480 VAC
Current range	3-999 A
Frequency	50 to 60 Hz
IEC trip class	1-45
Special Grundfos trip class	0.1 - 30 s
Voltage variation	- 25 %/+ 15 % of rated voltage
Approvals	EN 60947, EN 60335, UL/CSA 508
Marking	CE, cUL, C-tick
Consumption	Max. 5 W
Plastic type	Black PC/ABS

Electrical data, MP 204

	Measuring range	Accuracy	Resolution
Current without external current transformers	3-120 A	± 1 %	0.1 A
Current with external current transformers	120-999 A	± 1 %	1 A
Phase-to-phase voltage	80-610 VAC	± 1 %	1 V
Frequency	47-63 Hz	± 1 %	0.5 Hz
Power	0-1 MW	± 2 %	1 W
Power factor	0 - 0.99	± 2 %	0.01
Energy consumption	0-4 x 10^9 kWh	± 5 %	1 kWh

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

IO 112 module

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

Control MP 204

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

Grundfos GO

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

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

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

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

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

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

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

Mobile interface

The available mobile interface devices are described in the following.

MI 202 and MI 204

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

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

TM05 3887 1612 - TM05 7704 1513

Fig. 3 MI 202 and MI 204

Supplied with the product:

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

MI 301

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

TM05 3887 1612

Fig. 4 MI 301

Supplied with the product:

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

Supported units

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

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

CUE frequency converter

GrA4404 3407

The CUE range

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

When a CUE is installed, the motor requires no further overload protection. If overheating protection of motor windings is desired, Pt100/1000 together with the MCB can provide this protection.

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

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

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

Overview of the CUE range

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

The CUE is available in two enclosure classes:

- IP20/21
- IP54/55.

RFI filters

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

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

Functions

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

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

CUE features

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

Accessories for the CUE

Grundfos offers various accessories for the CUE.

MCB 114 sensor input module

The MCB 114 offers additional analog inputs for the CUE:

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

Output filters

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

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

- dU/dt filters
- sine-wave filters.

Sensors

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

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

Use of output filters

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

The selection depends on these factors:

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

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

The lengths stated apply to the motor cable.

Cables used in CUE installations

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

- installation in EMC-insensitive sites. See fig. 8.
- installation in EMC-sensitive sites. See fig. 9.

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

Note: Drop cables are always unscreened.

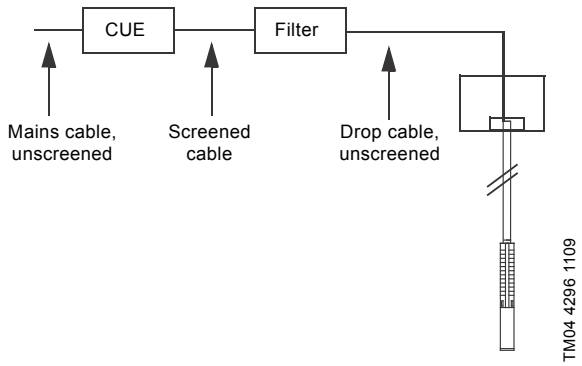


Fig. 5 Example of installation in EMC-insensitive sites

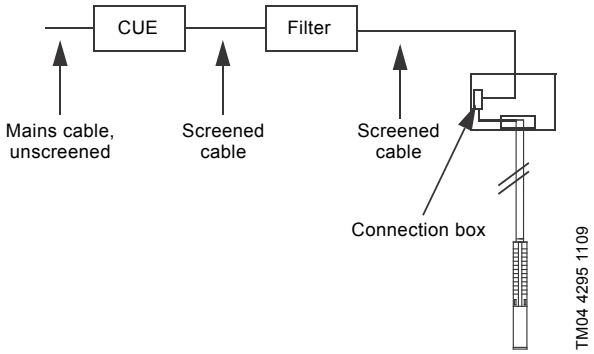


Fig. 6 Example of installation in EMC-sensitive sites

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

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

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

Issues to be considered	Explanation
Ramp (up and down): Maximum 3 seconds.	The journal bearings must be lubricated in order to limit wear and overheating of windings.
Use temperature monitoring by Pt sensor.	Overheating of the motor => low insulation resistance => sensitive to voltage peaks. **Note:** Tempcon sensors do not work with frequency converter operation.
Reduce peak voltages (max. 800 V peaks).	Never exceed peak voltages of 850 V at motor leads.
For MS and MMS, we recommend to use motors with 10 % extra in given duty point. For MMS, always use motors wound PE2-PA.	Grundfos CUE with output filter is a safe solution.
Remember output filter.	Cables act as an amplifier => measure peaks at the motor.
Rise time (dU/dt) must be limited to a maximum of 1000 V/µs. Determined by the equipment in the CUE.	Time between switches is an expression of losses, so in the future, we might have to exceed the limit of 1000 V/µs. The solution is not higher insulation of the motor, but filter in the output from the CUE.
Constant operation at min. 30 Hz.	Too low speed => low flow and thereby poor lubrication of journal bearings.
Size the CUE in respect of the current, not the power output.	Can end up with a too small CUE.
Size cooling provision for stator tube at duty point with lowest flow rate.	Flow min. m/s along the stator housing must be considered.
Ensure that the pump is used within the range of the pump curve.	Focus on discharge pressure and sufficient NPSH, as vibrations will "kill" the motor.

CIU communication interface units

GrA6118 3908

Fig. 7 Grundfos CIU communication interface unit

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

Applications

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

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

Benefits

The CIU offers these benefits:

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

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

TM05 5456 3712 - GrA4 412 3307

Fig. 8 MP 204 motor protector and CUE frequency converter

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

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

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

Product numbers

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

* Antenna not included. See below.

Antennas for CIU 250 and 270/271

Description	Product number
Antenna for roof	97631956
Antenna for desk	97631957

Motor starters for CSIR/CSCR

Applications

SA-SPM control boxes are used as starting units for 1 x 200-240 V, 50 Hz, 3-wire motors, types MS 402B and MS 4000.

TM06 4358 2015

Fig. 9 Motor starter for MS 402 and MS 4000

Product numbers

	Product number	CS	CR
		[µF]	[µF]
Motor starter - CSIR - 0.37 kW	98582272	65	-
Motor starter - CSIR - 0.55 kW	98582277	98	-
Motor starter - CSIR - 0.75 kW, 50 Hz	98582295	119	-
Motor starter - CSIR - 1.1 kW, 50 Hz	98582296	143	40
Motor starter - CSCR - 1.5 kW	98582381	160	50
Motor starter- CSCR - 2.2 kW	98582401	268	60

PSC motor capacitors

The MS 402 and MS 4000 single phase, 3-wire, PSC motors must be connected to the mains via a motor capacitor that is permanently connected during operation.

Product numbers

Capacitors for MS 402 PSC and MS 4000 PSC		
Capacitor size	**Power [kW]**	**Capacitor**
16 ìF, 400 V, 50 Hz	0.37	00ID2970
20 µF, 400 V, 50 Hz	0.55	00ID2971
30 µF, 400 V, 50 Hz	0.75	00ID2973
40 µF, 400 V, 50 Hz	1.1	00ID2974

PR 5714 with Pt100 sensor

The PR 5714 with Pt100 sensor offers these features:

- continuous monitoring of the motor temperature
- protection against too high motor temperature.

Protecting the motor against too high motor temperature is the simplest and cheapest way of avoiding that the motor life is reduced. The Pt100 sensor ensures that the operating conditions are not exceeded and indicates when it is time for service of the motor.

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

- Pt100 sensor
- PR 5714 relay
- cable.

The following temperature limits are preset on delivery:

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

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

Technical data

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

PR 5714 relay with Pt100 sensor and staybolt		Cable length [m]	Material	Product number		
				MS 6000	MMS6 MMS 6000 MMS 8000	MMS 10000 MMS 12000
	GrA3187 3607	20	N-version	96408953	96494596	96437287
		40		96408681	96494597	96437288
		60		96408954	96494598	96437289
		80		96408955	96494599	96437290
		100		96408956	96494610	96437291
		20	R-version	98085606	96494596	-
		40		98086123	96494597	-
		60		98086128	96494598	-
		80		98086146	96494599	-
		100		98086153	96494610	-

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

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

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

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

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

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

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

Sensor cable		Description	Product number
	TM00 7882 2296	Drop cable for extension: 4#1 mm^2 Mention length when ordering. Maximum recommended length: 350 m.	00RM5271

MS motor cables

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

Drinking water approval

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

For more information on sizing motor cables, see *Cable sizing* on page 43.

Note: The maximum permissible voltage drop in the submersible motor cable is 3 %.

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

MS 402 motor cables

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

MS 4000 motor cables

TML-B motor cables with EPR outer sheath (ethylene propylene rubber)					
Motor type	Length [m]	Cross-section [mm^2]	Plug for drop cable	Product numbers	
				Plug steel grade standard	Plug steel grade R
MS 4000	10	4 G 1.5	Yes	00795620	00795861
	20			00795621	00795862
	30			00795622	00795863
	40			00795623	00795864
	50			00795624	00795865
	60			00795625	00799924
	70			00795626	00799923
MS 4000	10		No	00795632	00795873
	20			00795633	00795872
	30			00795634	00795871
	40			00795635	00795870
	50			00795636	00795869
	60			00795637	00799926
	70			00795638	00799925
MS 4000	50	4G 2.5		-	96800534
	80			-	97949530
	130			-	96893810
	150			-	96893838
	170			-	96893844

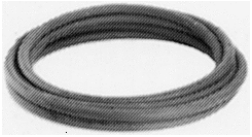
MS 4000 environmental motor cables

PTFE motor cables with teflon outer sheath				
Motor type	Length [m]	Cross-section [mm^2]	Plug for drop cable	Product numbers
				Plug steel grade R
MS 4000	10	4 G 2.5	No	00795667
	20			00795668
	30			00795669
	40			00795670
	50			00795671
	60			00795672
	70			00795673
	80			00795674
	90			00795675
	100			00795676
	110			96476404
	120			96426909
	200			96432567

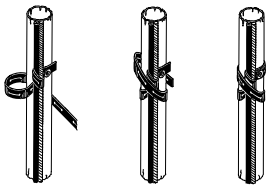
MS 6000 motor cables

TML-B motor cables EPR outer sheath (ethylene propylene rubber)					
Motor type	Length [m]	cross-section [mm^2]	Plug for drop cable	Product numbers	
				Plug steel grade N	Plug steel grade R
MS 6000	10	4G 6.0	No	96164211	96300113
	20			96164212	96300115
	30			96164213	96300117
MS 6000	10	4G 10.0		96164215	96300124
	20			96164216	96300126
	30			96164217	96300128
	40			-	96300129
	50			96164218	96300130

Submersible drop cable

Product	Description	Number of leads and nominal cross-section [mm^2]	Outer cable diameter min./max. [mm]	Weight [kg/m]	Product number
 TM00 7882 2296	Suitable for these applications: • continuous application in groundwater and potable water (approved for potable-water applications) • connection of electrical equipment, such as submersible motors • installation depths up to 600 metres and average loads. Insulation and sheath of special EPR-based elastomer materials adapted to applications in water. Maximum permissible water temperature: 70 °C. Maximum permissible lead service temperature: 90 °C. Further cable sizes are available on request.	1 x 25	12.5 / 16.5	0.410	00ID4072
		1 x 35	14.0 / 18.5	0.560	00ID4073
		1 x 50	16.5 / 21.0	0.740	00ID4074
		1 x 70	18.5 / 23.5	1.000	00ID4075
		1 x 95	21.0 / 26.5	1.300	00ID4076
		1 x 120	23.5 / 28.5	1.650	00ID4077
		1 x 150	26.0 / 31.5	2.000	00ID4078
		1 x 185	27.5 / 34.5	2.500	00ID4079
		4G1.5	10.5 / 13.5	0.190	00ID4063
		4G2.5	12.5 / 15.5	0.280	00ID4064
		4G4.0	14.5 / 18.0	0.390	00ID4065
		4G6.0	16.5 / 22.0	0.520	00ID4066
		4G10	22.5 / 24.5	0.950	00ID4067
		4G16	26.5 / 28.5	1.400	00ID4068
		4G25	32.0 / 34.0	1.950	00ID4069
		4G35	33.0 / 42.5	2.700	96432949
		4G50	38.0 / 48.5	3.600	96432950
		4G70	43.0 / 54.5	4.900	96432951

Cable clips

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

Cable termination kit with plug

Product	Description	Version	Product number	
			N-version	R-version
 TM00 7883 2296	For watertight joining of motor cable and submersible drop cable in an acrylic tube filled with resin. Used for both single- and multi-core cables during installation of submersible pumps. **Note:** Only to be used for MS 402 and MS 400 motor cables with two motor plugs 24 hours of hardening is required.	For cables up to 4 x 2.5 mm^2	00799901	00799955
		For cables up to 4 x 6 mm^2	00799902	00799918

Cable termination kit, type KM

For instruction on how to make the cable termination between motor cable and drop cable, see the KM quick guide available on https://product-selection.grundfos.com (Grundfos Product Center).

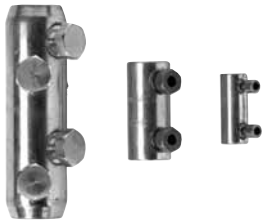
Possible cable termination		Content of kit	Motor cable [mm²]	Drop cable [mm²]	Number of leads	Product number
Motor cable	Drop cable					
			KM kits with pressed connections:			
			1.5 - 6	1.5 - 6	4	00116251
			6-16	6-16	4	00116252
			10-25	10-25	4	00116255
			KM kits with screw connectors:			
			6-35	6-35	4	96636867
			25-70	25-70	4	96636868

Possible cable termination		Content of kit	Motor cable [mm²]	Drop cable [mm²]	Number of leads	Product number
Motor cable	Drop cable					
			KM kits with pressed connections:			
			1.5 - 6	1.5 - 6	4	00116257
			6-16	6-16	4	00116258
			10-50	10-50	4	96637330
			16-70	16-70	4	96637332
			1.5 - 6	1.5 - 6	3	00116253
			10-25	10-25	3	00116254
			10-50	10-50	3	96637318
			16-70	16-70	3	96637331

Possible cable termination		Content of kit	Motor cable [mm²]	Drop cable [mm²]	Number of leads	Product number
Motor cable	Drop cable					
			KM kits with pressed connections:			
			10-70	10-70	1	96828296
			32-120	32-120	1	00116256
			KM kits with screw connectors:			
			70-240	70-240	1	96637279
			Note: A KM termination kit for single leads only consist of material for one connection. When ordering, keep in mind how many kits are needed for a complete cable termination.			

Cable termination kit, types M0 to M4

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

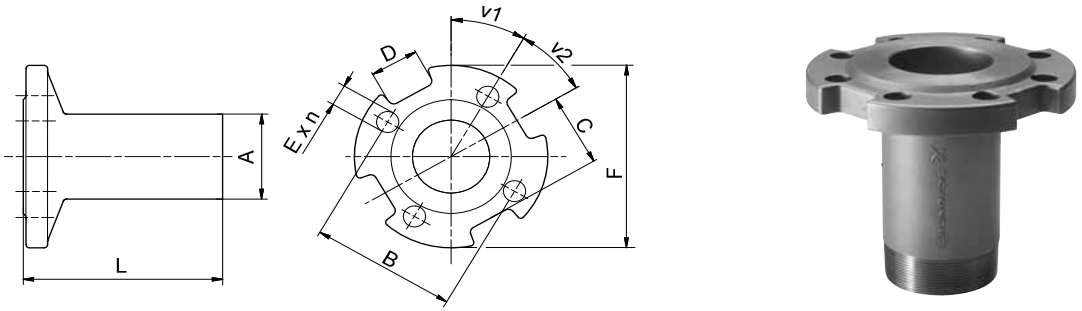
Product	Description	Cross-section of leads [mm^2]	Number of connectors	Product number
 GrA8251 2209	Accessories for cable kits M0 to M4. Screw connectors only.	6-25	4	96626021
		16-95		96626022
		35-185		96626023
		70-240		96626028

3. Mechanical accessories

Connecting pieces

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

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



TM01 2396 4508 - GrA2552 3706

Fig. 10 Dimensional sketch and photo of the connecting piece thread-to-flange

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

Thread-to-thread

TM01 2397 1698 - GrA2555 3706

Fig. 11 Dimensional sketch and photo of the connecting piece thread-to-thread

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

4. Flow sleeves

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

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

Maximum liquid temperature

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

Grundfos motor	Flow velocity past motor [m/s]	Max. liquid temperature [°C]
MS 4"	0.15	40
MS 4" T60	0.15	60
MS 6000	0.15	40
MS 6000 T60	1.00	60
MMS 6" with PVC windings	0.15	25
	0.50	30
MMS 6" with PE/PA windings	0.15	45
	0.50	50
MMS 8", 10", 12" rewindable with PVC windings	0.15	25
	0.50	30
MMS 8", 10", 12" rewindable with PE/PA windings	0.15	40
	0.50	45

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

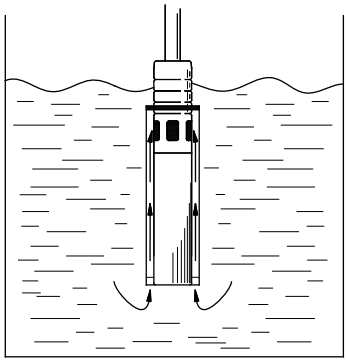
Note: More information about flow sleeves is available on request.

TM01 0751 2197 - TM01 0750 2197

Fig. 12 Flow sleeves

Example of calculated flow sleeve

The flow sleeve is fitted to the submersible motor so that the liquid passes close by the motor on its way towards the pump suction interconnector, thus ensuring optimum cooling of the motor. SeeFig.13.



TM01 0509 1297

Fig. 13 Flow sleeve function

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

Use this formula to calculate flow velocity:

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

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

Submersibke motor diameter

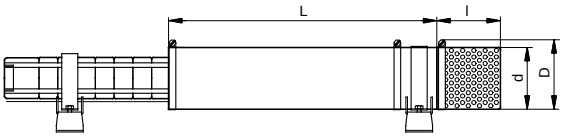
Motor type	Diamenter (d) [mm]
MS402	**95**
MS4000	**95**
MS6000	**139,5**
MMS6	**144**
MMS8000	**192**
MMS10000	**237**
MMS12000	**286**

Over-sized motor

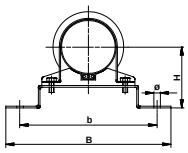
Flow sleeves for pumps with oversize motor and for pumps with non-standard motor are available on request.Flow sleeve selection table, EN 1.4301/AISI 304.

5. Flow sleeve, standard version EN 1.4301/AISI 304

Flow sleeve



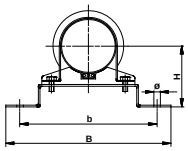
Supporting bracket



Pump type 50 Hz	Pump type 60 Hz	Flow sleeve product number • Dimensions, d (D) x L • Motor type, [kW] • Weight [kg]		Strainer Product number Dimensions d x l Weight	Support bracket Product number Description Dimenbsions
SP1A-9 to -28 SP2A-6 to -18 SP3A-6 to -12 SP5A-4 to -8	SP1A-9 to -22 SP2A-6 to -15 SP3A-5 to -10 SP5A-3 to -7	• d115 (D130) x L400 • Motor 4", up to 0.75 kW • 1.5 kg	96937110		
SP1A-36 to -57 SP2A-23 to -33 SP3A-15 to -25 SP5A-12 to -17 SP7-1 to -12 SP9-1 to -11 SP11-1 to -11 SP14-1 to -6	SP1A-26 to -39 SP2A-21 to -27 SP3A-14 to -18 SP5A-9 to -11 SP 7 - 1 to 8 SP9-4 to -7 SP11-3 to -7 SP14-1 to -4	• d115 (130) x 500 • Motor 4", up to 2.2 kW 7 kg	96937111	97942211 d115 x 117 0.4 kg	96957450 (1 set = 2 brackets) 1.1 kg H100, b185, B220
SP2A-40 to -65 SP3A-29 to -60 SP5A-21 to -60 SP7 - 13 to 42 SP9-5 to -29 SP11-11 to -27 SP14-7 to -23	SP2A-34 to -48 SP3A-24 to -38 SP5A-15 to -39 SP7-8 to -28 SP9-4 to -18 SP11-3 to -18 SP14-5 to -15	• d115 (130) x 800 • Motor 4", up to 5.5 kW • 2.5 kg	96937179		
SP7 -42 to -59 SP9 -30 to -40 SP11 -28 to -37 SP14 -24 to -31	SP7 -29 to -38 SP9 -19 to -25 SP11 -19 to -24 SP14 -16 to -20	• d115 (130) x 1000 • Motor 4", 7.5 kW (MS 4000) • 3.1 kg	96937204		96958279 (1 set = 2 brackets) 1.4 kg H100, b235, B275
SP5A -52 to -60 SP7 - 32 to -59 SP9 -23 to -40 SP11 -21 to -37 SP14-18 to -31	SP5A-39 SP7 -21 to - 38 SP9 -17 to -25 SP11 -14 to -24 SP14 -12 to -20	• d160 (180) x 800 • Motor 6", up to 7.5 kW (MS 6000) • 4.0 kg	96937231		
SP9-41 to -55	SP9-26 to -38	• d160 (180) x 1000 • Motor 6" up to 11 kW (MS 6000) • 4,0 kg	98779730	97942230 d160 x 158 0.8 kg	98557132 (1 set = 2 brackets) 1.4 kg H125, b185, B220
North American version:	SP5A-39 SP8A-18 to -44 SP14A-12 to -16 SP9-23 to -40 SP14-12 to -16	• d160 (180) x 850 • Motor 6", up to 7.5 kW (MS 6000) • 4.0 kg	98618424		
SP2A-75 to -90	SP2A-58 SP3A-56	• d160 (180) x 1000 • Motor 4", 7.5 kW (MS 4000) • d • 4.3 kg	96937205		96957525 (1 set = 2 brackets) 1.4 kg H125, b185, B220
SP5A-75 to -85 SP7 - 60 to 100 SP9-56 to -93	SP3A-56 to -75 SP5A-52 SP7 - 41 to -67 SP9-39 to -63	• d180 (200) x 1000 • Motor 6", up to 18.5 kW (MS 6000) • d • 4.9 kg	96937244	97942218 d180 x 192 0.9 kg	96957529 (1 set = 2 brackets) 1.4 kg H140, b300, B350
North American version:	SP3A-56 to -75 SP5A-52 SP8A-50 to -66	• d180 (200) x 1050 • Motor 6", up to 18.5 kW • (MS 6000) • d • 4.9 kg	98618426		

Flow sleeve

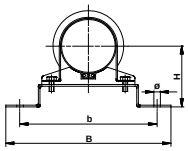
Supporting bracket



Pump type 50 Hz	Pump type 60 Hz	Flow sleeve product number • Dimensions, d (D) x L • Motor type, [kW] • Weight [kg]		Strainer Product number Dimensions d x l Weight	Support bracket Product number Description Dimenbsions
SP17-1		• d145 (160) x 450 • Motor 4", up to 0.55 kW (MS 4000) • 1.9 kg	96937139	97942214 d145 x 158 0.6 kg	96957523 (1 set = 2 brackets) 2.0 kg H115, b185, B220 for pumps up to 50 kg / 4" up to 7.5 kW
SP17-2 SP17-3 (3~) SP30-1 to -2	SP17-1 to -2 SP30-1	• d145 (160) x 550 • Motor 4", up to 2.2 kW (MS 4000) • 2.2 kg	96937140		
SP17-3 (1~) SP17-4 to -7 SP30-3 to -4	SP17-3 to -6 SP30-2 to -3	• d145 (160) x 800 • Motor 4", up to 4 kW (MS 4000) • 3.1 kg	96937180		
SP17-8 to -13 SP30-5 to -8	SP17-7 to -9 SP30-4 to -5	• d145 (160) x 1000 • Motor 4", 5.5 - 7.5 kW (MS 4000) • 3.8 kg	96937182		
SP17-8 to -24 SP30-5 to -15	SP17-5 to -15 SP30-4 to -10	• d180 (200) x 800 • Motor 6", up to 13 kW (MS 6000) • 4.0 kg	96937242	97942218 d180 x 192 0.9 kg	96957529 (1 set = 2 brackets) 2.1 kg H140, b300, B350
SP17-25 to -40 SP30-16 to -26	SP17-16 to -26 SP30-11 to -17	• d180 (200) x 1000 • Motor 6", up to 22 kW (MS 6000) • 4.9 kg	96937245		
SP30-27 to -35	SP17-27 to -30 SP30-18 to -23	• d180 (200) x 1250 • Motor 6", 26 to 30 kW (MS 6000) • 6.0 kg	96937249		
SP30-27 to -35	SP30-24 to -28	• d180 (200) x 1700 • Motor 6", up to 26-30 kW (MMS6MMS6) • 8.5 kg	96937313		96957531 (1 set = 3 brackets) 3.1 kg H140, b300, B350
SP17-43 to -53	SP17-33 to -36	• d200 (220) x 1250 • Motor 6", 26-30 kW (MS 6000) • Pump in sleeve d154 • 6.6 kg	96937246	97942247 d200 x 192 1.0 kg	96957544 (1 set = 2 brackets) 2.3 kg H150, b320, B370
SP17-43 to -60 SP30-39 to -43	SP17-39 to -42	• d200 (220) x 1700 • Motor 6", 26-37 kW (MMS6) • Pump in sleeve d154 • 9.3 kg	96937315		97695369 (1 set = 3 brackets) 3.2 kg H150, b320, B370
SP17-55 to -60 SP30-39 to -49	SP17-45 to -50	• d200 (220) x 1700 • Motor 6", 37-45 kW (Franklin 6") • Pump in sleeve d154 • 9.3 kg	96937447		
SP30-46 to -54	SP17-42 to -50 SP30-29 to -39	• d254 (270) x 1500 • Motor 8", 45-55 kW (MMS 8000/Franklin 8") • Pump in sleeve d154 • 9.8 kg	96937462	97942263 d256 x 325 1.9 kg	96957561 (1 set = 3 brackets) 6.3 kg H200, b380, B430

Flow sleeve

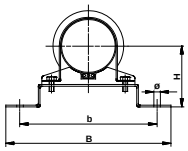
Supporting bracket



Pump type 50 Hz	Pump type 60 Hz	Flow sleeve product number • Dimensions, d (D) x L • Motor type, [kW] • Weight [kg]		Strainer Product number Dimensions d x l Weight	Support bracket Product number Description Dimenbsions
SP46-1-B SP46-1 SP46-2-BB SP60-1-A SP60-1	SP46-1-B SP46-1-B SP46-1-A SP60-1-B	• d180 (200) x 550 • Motor 4", up to 2.2 kW (MS 402/MS 4000) • 2.9 kg	96937178	97942218 d180 x 192 0.9 kg	96957524 (1 set = 2 brackets) 1.2 kg H140, b225, B260 for pumps up to 50 kg / 4" up to 7.5 kW
SP46-2 SP46-3-C SP60-2-B SP60-2	SP46-1 SP46-2-AB SP60-1-A SP60-1 SP60-2-BB	• d180 (200) x 800 • Motor 4" 3.0 - 4.0 kW (MS 4000) • 4.0 kg	96937187		
SP46-3 SP46-4-C SP46-4 SP46-5 SP60-3 SP60-4	SP46-2 SP46-3-BB SP46-3 SP46-4-BC SP60-2 SP60-3-A	• d180 (200) x 1000 • Motor 4", 5.5 - 7.5 kW (MS 4000) • 4.9 kg	96937190		
SP46-3 SP46-4-C SP46-4 to -10 SP60-3 to -9B	SP46-3 SP46-4-BC SP46-4 to 7C SP60-3-A SP60-3 to 6B	• d200 (220) x 800 • Motor 6", up to 15 kW (MS 6000) • 5.4 kg	96937322	97942247 d200 x 192 1.0 kg	96957545 (1 set = 2 brackets) 2.2 kg H150, b320, B370
North American version:	SP46-3 SP46-4-BC SP46-4 to 7C SP60-3-A SP60-3 to 6B	• d200 (220) x 1000 • Motor 6", up to 15 kW (MS 6000) • 5.4 kg	98618901		
SP46-8 to -15 SP60-7 to -12		• d200 (220) x 1000 • Motor 6", up to 22 kW (MS 6000) • 6.4 kg	96937323		
North American version:	SP46-8 to -15 SP60-7 to -12	• d200 (220) x 1100 • Motor 6", up to 22 kW (MS 6000) • 6.6 kg	98618907		
SP46-13 to -20 SP60-11 to -17	SP46-7 to -13 SP60-6 to -11	• d200 (220) x 1250 • Motor 6", 18.5 - 30 kW (MS 6000) • 6.6 kg	96937317		
North American version:	SP46-7 to -13 SP60-6 to -11	• d200 (220) x 1250 • Motor 6", 18.5 - 30 kW (MS 6000) • 6.6 kg	98618907		
SP46-16 to -24 SP60-13 to -21	SP46-14 to -17 SP60-12 to -14	• d200 (220) x 1700 • Motor 6", 26-37 kW (MMS6) • 9.3 kg	96937318		96957549 (1 set = 3 brackets) 3.4 kg H150, b320, B370
SP46-21 to -24 SP60-18 to -22	SP60-12 to -17	• d200 (220) x 1700 • Motor 6", 26-37 kW (Franklin 6") • 9.3 kg	96937448		

Flow sleeve

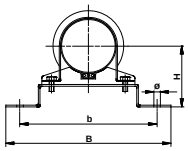
Supporting bracket



Pump type 50 Hz	Pump type 60 Hz	Flow sleeve product number • Dimensions, d (D) x L • Motor type, [kW] • Weight [kg]		Strainer Product number Dimensions d x l Weight	Support bracket Product number Description Dimenbsions
SP46-21 to -24 SP60-18 to -22	SP46-14 to -17 SP60-12 to -14	• d254 (270) x 1500 • Motor 8", 37-45 kW (MMS 8000) • 9.8 kg	96937463	97942263 d256 x 325 1.9 kg	96957592 (1 set = 3 brackets) 6.0 kg H200, b380, B430
SP60-22	SP46-18 to -19 SP60-15 to -18	• d254 (270) x 1250 • Motor 8", 45 kW (Franklin 8") • 8.8 kg	96937465		98095530 (1 set = 2 brackets) 6.0 kg H200, b380, B430
SP46-26 to -35 SP60-24 to -30	SP46-20 to -24 SP60-19 to -20	• d254 (270) x 1500 • Motor 8", 45-55 kW (MMS 8000/Franklin 8") • Pump in sleeve d154 • 9.8 kg	96937472		96957561 (1 set = 3 brackets) 6.3 kg H200, b380, B430
SP46-37	SP60-21	• d254 (270) x 1700 • Motor 8", 63-75 kW (MMS 8000/Franklin 8") • Pump in sleeve d154 • 9.8 kg	96937474		
SP77-1 to -4 SP95-1 to -4B	SP77-1 SP77-2BA SP77-2-A SP77-2 SP77-3-AA SP77-3-A SP95-1-A SP95-1 SP95-2-AB SP95-2-B SP95-2 SP95-3-BB	• d210 (225) x 1000 • Motor 6", up to 18.5 kW (MS 6000) • 5.6 kg	96937332		
North American version:	SP77-1 SP77-2BA SP77-2-A SP77-2 SP77-3-AA SP77-3-A SP95-1-A SP95-1 SP95-2-AB SP95-2-B SP95-2 SP95-3-BB	• d210 (225) x 1100 • Motor 6", up to 18.5 kW (MS 6000) • 5.6 kg	98618926	97942261 d210 x 192 1.1 kg	96957546 (1 set = 2 brackets) 2.5 kg H160, b330, B380
SP77-5 to -9 SP95-4 SP95-5-AB SP95-5 to -7	SP77-3 to -6-B SP95-3-B SP95-3 SP95-4-AB SP95-4 SP95-5-B	• d210 (225) x 1250 • Motor 6", up to 30 kW (MS 6000) • 6.9 kg	96937440		
North American version:	SP77-3 to -6-B SP95-3-B SP95-3 SP95-4-AB SP95-4 SP95-5-B	• d210 (225) x 1300 • Motor 6", up to 30 kW (MS 6000) • 6.9 kg	98618929		
SP77-7 to -11 SP95-8 to -9	SP77-6 SP77-7 SP95-5 SP95-6	• d210 (225) x 1700 • Motor 6", 26-37 kW (MMS6) • 10.6 kg	96937319		96957553 (1 set = 3 brackets) 6.0 kg H160, b330, B370
SP77-10 to -12 SP95-8 to -10	SP77-6 to -8 SP95-5 to -7	• d210 (225) x 1700 • Motor 6", 37-45 kW (Franklin 6") • 9 kg	96937449		

Flow sleeve

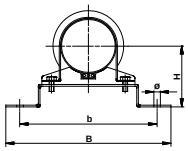
Supporting bracket



Pump type 50 Hz	Pump type 60 Hz	Flow sleeve product number • Dimensions, d (D) x L • Motor type, [kW] • Weight [kg]		Strainer Product number Dimensions d x l Weight	Support bracket Product number Description Dimenbsions
SP77-10 to -15 SP95-8 to -13	SP77-6 to -10 SP95-5 to -8	• d254 (270) x 1500 • Motor 8", 37-55 kW (MMS 8000/Franklin 8") • 12.4 kg	96937475	97942263 d256 x 325 1.9 kg	96957593 (1 set = 3 brackets) 5.8 kg H200, b380, B430
SP77-16 to -21 SP95-14 to -17	SP77-11 to -13 SP95-9 to -11	• d254 (270) x 1700 • Motor 8", 63-75 kW (MMS 8000/Franklin 8") • 11 kg	96937476		
SP77-22 SP95-18 to -20	SP77-14 SP77-15 SP95-12 SP95-13	• d254 (270) x 2000 • Motor 8", up to 92 kW (MMS 8000/Franklin 8") • 13.4 kg	96937477		
SP77-19 to -20 SP95-15 to -17	SP95-11	• d285 (300) x 1500 • Motor 10", up to 75 kW (MMS 10000) • 11.4 kg	96937507	97942269 d285 x 385 2.7 kg	97695337 (1 set = 3 brackets) 10.1 kg H225, b410, B460
SP77-22 SP95-18 to -20	SP95-12 SP95-13	• d285 (300) x 2000 • Motor 10", 92 kW (MMS 10000) • 15.1 kg	96937508		
SP125-1-A SP125-1 SP125-2-AA SP160-1-A SP160-1	SP125-1-A SP125-1 SP160-1-A	• d254 (270) x 1000 • Motor 6", up to 13 kW (MS 6000) • 6.7 kg	96937441	97942263 d256 x 325 1.9 kg	96957548 (1 set = 2 brackets) 3.4 kg H200, b380, B430
SP125-2-A SP125-2 SP125-3/A/AA SP160-2/A/AA SP160-3-AA	SP125-2-AA SP125-2-A SP125-2 SP160-1 SP160-2-AA	• d254 (270) x 1250 • Motor 6", up to 30 kW (MS 6000) • 8.3 kg	96937443		
SP125-3/3A SP125-4/A/AA SP160-2 SP160-3/A/AA	SP125-3-AA SP125-3-A SP160-2-A SP160-2 SP160-3-AA	• d254 (270) x 1700 • Motor 6", 26-37 kW (MMS6) • 11.4 kg	96937320		96957560 (1 set = 3 brackets) 5.2 kg H200, b380, B430
SP125-4/A/AA SP125-5-A/AA SP160-3-A SP160-4-A/AA	SP125-3-AA SP125-3-A SP125-3 SP160-2-A/ -2 SP160-3-AA	• d254 (270) x 1700 • Motor 6", 37-45 kW (Franklin 6") • 11.4 kg	96937450		
SP125-4/A/AA SP125-5/A/AA SP125-6-AA/6-A SP160-3/3-A SP160-4/A/AA SP160-5-AA/5-A	SP125-3-AA SP125-3-A SP125-3 SP125-4-AA SP125-4-A SP160-3-AA SP160-3-A SP160-3	• d285 (300) x 1500 • Motor 8", 37-55 kW (MMS 8000/Franklin 8") • 11.4 kg	96937478		
SP125-6 SP125-7/A/AA SP125-8/A/AA SP160-5 SP160-6/A/AA SP160-7-AA	SP125-4 SP125-5-AA SP125-5-A SP125-5 SP125-6-AA SP160-4-AA SP160-4-A SP160-4	• d285 (300) x 1700 • Motor 8", 63-75 kW (MMS 8000/Franklin 8") • 12.8 kg	96937479	97942269 d285 x 385 2.7 kg	96957595 (1 set = 3 brackets) 10.1 kg H225, b410, B460
SP125-9/A/AA SP125-10/A/AA SP125-11 SP160-7/A SP160-8/A/AA SP160-9/A/AA SP160-10-AA	SP125-6-A/-6 SP125-7-AA SP125-7-A SP125-7 SP160-5-AA SP160-5-A SP160-5 to -6	• d285 (300) x 2250 • Motor 8", up to 92-110 kW (MMS 8000/Franklin 8") • 16.8 kg	96937487		

Flow sleeve

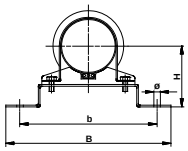
Supporting bracket



Pump type 50 Hz	Pump type 60 Hz	Flow sleeve product number • Dimensions, d (D) x L • Motor type, [kW] • Weight [kg]		Strainer Product number Dimensions d x l Weight	Support bracket Product number Description Dimenbsions
SP125-7/A/AA SP125-8/A/AA SP125-9/A/AA SP125-10/A/AA SP160-6/6-A SP160-7/A/AA SP160-8/A/AA		• d330 (350) x 1700 • Motor 10", 75-92 kW (MMS 10000) • 14.4 kg	96937510	97942268 d330 x 385 1.9 kg	96957597 (1 set = 3 brackets) 10.5 kg H225, b410, B460
	SP125-8 to -10 SP160-7 to -8	• d285 (300) x 2600 • Motor 8", up to 150 kW (Franklin 8") • 19.1 kg	96937503	97942269 d285 x 385 2.7 kg	96957595 (1 set = 3 brackets) 10.1 kg H225, b410, B460
SP125-12 to -13 SP160-9/A/AA SP160-10/A SP160-11	96507609 (2502.0261.260)	• d330 (350) x 2000 • Motor 10", up to 132 kW (MMS 10000) • 17.2 kg	96937522	97942268 d330 x 385 1.9 kg	96957597 (1 set = 3 brackets) 10.5 kg H225, b450, B460
SP125-14 to -17 SP160-12 to -14	SP125-10 to -11 SP160-8 to -9	• d330 (350) x 2500 • Motor 10", up to 147-170 kW (MMS 10000) • 21.2 kg	96937524		
	SP125-11 to -13 SP160-9 to -10	• d380 (400) x 2000 • Motor 12", up to 190 kW (MMS 12000) • 19.6 kg	96937555	97942272 d380 x 385 4.1 kg	96957599 (1 set = 3 brackets) 12.1 kg H270, b550, B600
SP160-15		• d380 (400) x 2250 Motor 12", 190 kW (MMS 12000) • 21.9 kg	96937529		

Flow sleeve

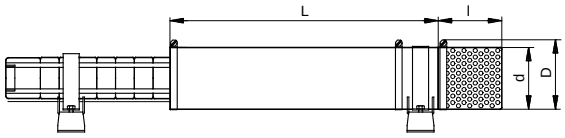
Supporting bracket



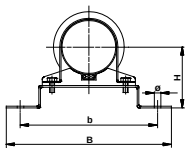
Pump type 50 Hz	Pump type 60 Hz	Flow sleeve product number • Dimensions, d (D) x L • Motor type, [kW] • Weight [kg]		Strainer Product number Dimensions d x l Weight	Support bracket Product number Description Dimenbsions
SP215-1-A SP215-1 SP215-2-AA	SP215-1-A SP215-1	• d330 (350) x 1250 • Motor 6", up to 30 kW (MS 6000) • 10.6 kg	96937446		96958364 (1 set = 2 brackets) 10.0 kg H250, b500, B550
SP215-2-AA SP215-2A	SP215-1	• d330 (350) x 1800 • Motor 6", 30-37 kW (MMS6) • 16.5 kg	96937321		
SP215-2-A SP215-2	SP215-2-AA	• d330 (350) x 1800 • Motor 6", 37-45 kW (Franklin 6") • 16.5 kg	96937451		
SP215-2-A SP215-2 SP215-3-AA SP215-3-A SP215-3 SP215-4-AA SP215-4-A SP215-4	SP215-2 SP215-3-AA	• d330 (350) x 1800 • Motor 8", up to 75 kW (MMS 8000/Franklin 8") • 14.6 kg	96937480		
SP215-5-AA SP215-5-A SP215-5 SP215-6-AA SP215-6-A	SP215-3-A SP215-3 SP215-4-AA SP215-4-A SP215-4	• d330 (350) x 2250 • Motor 8", up to 110 kW (MMS 8000/Franklin 8") • 19.1 kg	96937488	97942268 d330 x 385 1.9 kg	
SP215-7-AA SP215-7-A SP215-7	SP215-5-AA SP215-5-A	• d330 (350) x 2500 • Motor 8", 130 kW (Franklin 8") • 21.1 kg	96937490		96957555 (1 set = 3 brackets) 10.7 kg H250, b500, B550
SP215-8-AA SP215-8-A SP215-8	SP215-5	• d330 (350) x 2700 • Motor 8", 150 kW (Franklin 8") • 22.8 kg	96937491		
SP215-4-AA SP215-4-A SP215-4 SP215-5-AA SP215-5-A SP215-5		• d330 (350) x 1800 • Motor 10", up to 92 kW (MMS 10000) • 16.5 kg	96937526		
SP215-6-AA SP215-6-A SP215-6 SP215-7-AA SP215-7-A SP215-7	SP215-5-AA SP215-5-A	• d330 (350) x 2250 Motor 10", up to 132 kW (MMS 10000) • 19.1 kg	96937527		
SP215-8-AA SP215-8-A SP215-8 SP215-9-AA SP215-9-A SP215-9	SP215-5 SP215-6-AA SP215-6-A SP215-6	• d330 (350) x 2500 • Motor 10", up to 170 kW (MMS 10000) • 21.2 kg	96937528		
SP215-7-AA SP215-7-A SP215-7 SP215-8-AA SP215-8-A SP215-8 SP215-9-AA SP215-9-A SP215-9 SP215-10-AA SP215-10-A SP215-10	SP215-6-AA SP215-6-A SP215-6 SP215-7-AA SP215-7-A SP215-7	• d380 (400) x 2250 • Motor 12", up to 190 kW (MMS 12000) • 21.9 kg	96937531	97942272 d380 x 385 4.0 kg	96957600 (1 set = 3 brackets) 12 kg H270, b550, B600
SP215-11		• d380 (400) x 2500 • Motor 12", 220 kW (MMS 12000) • 24.2 kg	96937553		

6. Flow sleeve, R-version, EN 1.4539/AISI 904L

Flow sleeve

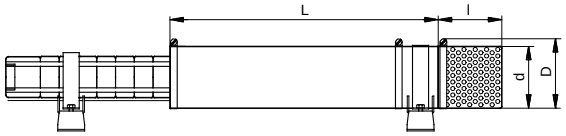


Supporting bracket

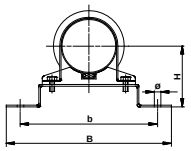


Pump type		Flow sleeve		Strainer	Supporting brackets
50 Hz	**60 Hz**	**Description: Dimensions, d (D) x L Motor type, P2 Weight**	**Product number: Grundfos**	**Product number: Grundfos Dimensions d x l Weight**	**Product number: Grundfos Description**
SP5A-4 to -8	SP5A-3 to -7	• d115 (130) x 400 • Motor 4", up to 0.75 kW (MS 4000) • 1.5 kg	96898594	97941779 d115 x 117 0.4 kg	96958367 (1 set = 2 brackets) 0.7 kgH100, b185, B220 for pumps up to 50 kg / 4" up to 5.5 kW
SP5A-12 to -17 SP7 - 1 to 12 SP9- 1to - 11 SP11-1 to -11 SP14-1 to -6	SP5A-9 to -11 SP 7 - 1 to 8 SP9 -4 to -7 SP11-3 to -7 SP14-1 to -4	• d115 (130) x 550 • Motor 4", up to 1.5 kW (MS 4000) • 1.7 kg	96937598		
SP5A-21 to -60 SP7 - 13 to 42 SP9-8 to -32 SP11-11 to -27 SP14-7 to -23	SP5A-15 to -39 SP7 - 8 to 28 SP9-7 to -19 SP11 -3 to -18 SP14-5 to -15	• d115 (130) x 800 • Motor 4", up to 5.5 kW (MS 4000) • 2.5 kg	96937633		
SP7 - 42 to 59 SP9-32 to -40 SP11-28 to -37 SP14-24 to -31	SP7 - 29 to 38 SP9-19 to -25 SP11-19 to -24 SP14-16 to -20	• d115 (130) x 1000 • Motor 4", 7.5 kW (MS 4000) • 3.1 kg	96898643		96958371 (1 set = 2 brackets) 0.9 kg H100, b235, B275
SP5A-52 to -60 SP7 -32 to -59 SP9-23 to -40 SP11-21 to -37 SP14-18 to -31	SP5A-39 SP7 - 21 to - 38 SP9-21 to -25 SP11-19 to -24 SP14-12 to -20	• d160 (180) x 800 • Motor 6", up to 7.5 kW (MS 6000) • 4.9 kg	96937224	97941790 d160 x 158 0.8 kg	98557134 (1 set = 2 brackets) 1.4 kg H115, b185, B220
SP9 -41 to -55	SP9 -26 to -38	• d160 (180) x 1000 • Motor 4", up to 11 kW (MS 6000) • 4.0 kg	98779731		
SP2A-75 to -90	SP2A-58 SP3A-56	• d160 (180) x 1000 • Motor 4", 7.5 kW (MS 4000) • Pump in sleeve d108 • 4.3 kg	96898645		96958373 (1 set = 2 brackets) 1.4 kg H125, b185, B220
SP5A-75 to -85 SP7 - 60 to 100 SP9 -56 to -93	SP3A-56 to -75 SP5A-52 SP7 - 41 to 67 SP9-39 to -63	• d180 (200) x 1000 • Motor 6", up to 18.5 kW (MS 6000) • Pump in sleeve d108 • 4.9 kg	96937690	97941786 d180 x 192 0.8 kg	96958375 (1 set = 2 brackets) 2.0 kg H140, b300, B350
SP17-1 to 4 SP30-1 to 2		• d145 (160) x 625 • Motor 4", up to 2.2 kW (MS 4000) • 3.7 kg	96898600	97941782 d145 x 158 0.6 kg	96958368 (1 set = 2 brackets) 0.8 kg for pumps up to 50 kg / 4" up to 7.5 kW H115, b185, B220
SP17-2 SP17-3 (3~) SP30-1 to -2	SP17-1 to -2 SP30-1	• d145 (160) x 550 • Motor 4", up to 2.2 kW (MS 4000) • 2.2 kg	96898601		
SP17-3 (1~) SP17-4 to -7 SP30-3 to -4	SP17-3 to -6 SP30-2 to -3	• d145 (160) x 800 • Motor 4", up to 4 kW (MS 4000) • 3.1 kg	96898638		
SP17-8 to -13 SP30-5 to -8	SP17-7 to -9 SP30-4 to -5	• d145 (160) x 1000 • Motor 4", 5.5 - 7.5 kW (MS 4000) • 3.8 kg	96898640		

Flow sleeve

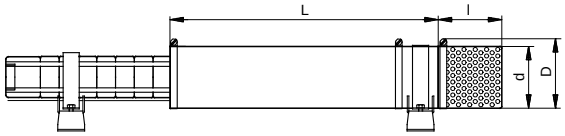


Supporting bracket



Pump type		Flow sleeve		Strainer	Supporting brackets
50 Hz	**60 Hz**	**Description: Dimensions, d (D) x L Motor type, P2 Weight**	**Product number: Grundfos**	**Product number: Grundfos Dimensions d x l Weight**	**Product number: Grundfos Description**
SP17-8 to -24 SP30-5 to -15	SP17-5 to -15 SP30-4 to -10	• d180 (200) x 800 • Motor 6", 6 to 13 kW (MS 6000) • 5.6 kg	96937689	97941786 d180 x 192 0.9 kg	96958375 (1 set = 2 brackets) 2.0 kg H140, b300, B350
SP17-25 to -40 SP30-16 to -26	SP17-16 to -26 SP30-11 to -17	• d180 (200) x 1000 • Motor 6", up to 22 kW (MS 6000) • 5.4 kg	96937691		
SP30-27 to -35	SP17-27 to -30 SP30-18 to -23	• d180 (200) x 1250 • Motor 6", 26 to 30 kW (MS 6000) • 4.9 kg	96937723		
SP30-27 to -35	SP30-24 to -28	• d180 (200) x 1700 • Motor 6", up to 26-30 kW (MMS6) • 8.5 kg	96898633		96958376 (1 set = 3 brackets) 2.3 kg H140, b310, B350
SP17-43 to -53	SP17-33 to -36	• d200 (220) x 1250 • Motor 6", 26-30 kW (MS 6000) • Pump in sleeve d154 • 6.0 kg	96937722	97941767 d200 x 192 1.0 kg	96960265 (1 set = 2 brackets) 2.3 kg H150, b320, B370
SP17-43 to -60 SP30-39 to -43	SP17-39 to -42	• d200 (220) x 1700 • Motor 6", 26-37 kW (MMS6) • Pump in sleeve d154 • 9.3 kg	96898634		97757234 (1 set = 3 brackets) 3.3 kg H150, b340, B370
SP17-55 to -60 SP30-39 to -49	SP17-45 to -50	• d200 (220) x 1700 • Motor 6", 37-45 kW (Franklin 6") • Pump in sleeve d154 • 10.8 kg	96898650		
SP30-46 to -54	SP17-42 to -50 SP30-29 to -39	• d254 (270) x 1500 • Motor 8", 45-55 kW (MMS 8000/Franklin 8") • Pump in sleeve d154 • 9.8 kg	96900228	97941815 d256 x 325 1.9 kg	96958411 (1 set = 3 brackets) 4.7 kg H200, b380, B430
SP46-1-B SP46-1 SP46-2-BB SP60-1-A SP60-1	SP46-1-B SP46-1-B SP46-1-A SP60-1-B	• d180 (200) x 625 Motor 4", up to 2.2 kW (MS 4000) • 2.9 kg	96898632	97941786 d180 x 192 0.9 kg	96958370 (1 set = 2 brackets) 1.2 kg H140, b225, B260 for pumps up to 50 kg / 4" up to 7.5 kW
SP46-2 SP46-3-C SP60-2-B SP60-2	SP46-1 SP46-2-AB SP60-1-A SP60-1 SP60-2-BB	• d180 (200) x 800 • Motor 4" 3.0 - 4.0 kW (MS 4000) • 6.9 kg	96898641		
SP46-3 SP46-4-C SP46-4 SP46-5 SP60-3 SP60-4	SP46-2 SP46-3-BB SP46-3 SP46-4-BC SP60-2 SP60-3-A	• d180 (200) x 1000 • Motor 4", 5.5 - 7.5 kW (MS 4000) • 4.9 kg	96898642		

Flow sleeve



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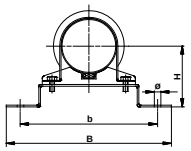
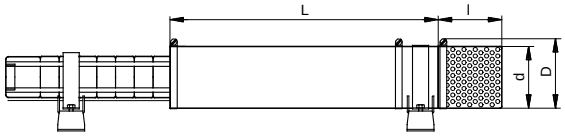
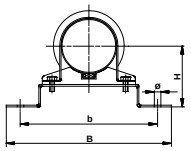


Pump type		Flow sleeve		Strainer	Supporting brackets
50 Hz	**60 Hz**	**Description: Dimensions, d (D) x L Motor type, P2 Weight**	**Product number: Grundfos**	**Product number: Grundfos Dimensions d x l Weight**	**Product number: Grundfos Description**
SP46-3 SP46-4-C SP46-4 to -12 SP60-3 to -10	SP46-3 SP46-4-BC SP46-4 to -8 SP60-3-A SP60-3 to -7	• d200 (220) x 1000 • Motor 6", up to 22 kW (MS 6000) • 5.4 kg	96937744	97941767 d200 x 192 1.0 kg	96958381 (1 set = 2 brackets) 2.2 kg H150, b320, B370
SP46-13 to -20 SP60-11 to -17	SP46-9 to -13 SP60-8 to -11	• d200 (220) x 1250 • Motor 6", 22-30 kW (MS 6000) • 6.6 kg	96898635		
SP46-16 to -24 SP60-13 to -21	SP46-14 to -17 SP60-12 to -14	• d200 (220) x 1700 • Motor 6", 26-37 kW (MMS6) • 9.3 kg	96898636		96958389 (1 set = 3 brackets) 3.4 kg H150, b380, B370
SP46-21 to -24 SP60-18 to -22	SP60-12 to -17	• d200 (220) x 1700 • Motor 6", 26-37 kW (Franklin 6") • 9.3 kg	96898651		
SP46-21 to -24 SP60-18 to -22	SP46-14 to -17 SP60-12 to -14	• d254 (270) x 1500 • Motor 8", 37-45 kW (MMS 8000) • 9.8 kg	96900357		96958412 (1 set = 3 brackets) 6.0 kg H200, b320, B430
SP60-22	SP46-18 to -19 SP60-15 to -18	• d256 (270) x 1250 • Motor 8", 45 kW (Franklin 8") • 10.9 kg	96900358	97941815 d256 x 325 1.9 kg	98095556 (1 set = 2 brackets) 4.5 kg H200, b380, B430
SP46-26 to -35 SP60-24 to -30	SP46-20 to -24 SP60-19 to -20	• d254 (270) x 1500 • Motor 8", 45-55 kW (MMS 8000/Franklin 8") • Pump in sleeve d154 • 9.8 kg	96900360		96958411 (1 set = 3 brackets) 6.3 kg H200, b380, B430
SP46-37	SP60-21	• d254 (270) x 1700 • Motor 8", 63-75 kW (MMS 8000/Franklin 8") • Pump in sleeve d154 • 12.4 kg	96900361		
SP77-1 to -4 SP95-1 to -4B	SP77-1 SP77-2BA SP77-2-A SP77-2 SP77-3-AA SP77-3-A SP95-1-A SP95-1 SP95-2-AB SP95-2-B SP95-2 SP95-3-BB	• d210 (225) x 900 (1000) • Motor 6", up to 15 kW (MS 6000) • 5.6 kg	96937749	97941757 d210 x 192 1.1 kg	96958385 (1 set = 2 brackets) 2.5 kg H160, b330, B380
SP77-5 to -9 SP95-4 SP95-5-AB SP95-5 to -7	SP77-3 to -6-B SP95-3-B SP95-3 SP95-4-AB SP95-4 SP95-5-B	• d210 (225) x 1250 • Motor 6", up to 30 kW (MS 6000) • 6.9 kg	96937750		
SP77-7 to -11 SP95-8 to -9	SP77-6 SP77-7 SP95-5 SP95-6	• d210 (225) x 1700 • Motor 6", 26-37 kW (MMS6) • 10.6 kg	96898646		96958405 (1 set = 3 brackets) 6.0 kg H160, b330, B380
SP77-10 to -12 SP95-8 to -10	SP77-6 to -8 SP95-5 to -7	• d210 (225) x 1700 • Motor 6", 37 kW (Franklin 6" Rw = Rewindable) • 9 kg	96898712		

Flow sleeve



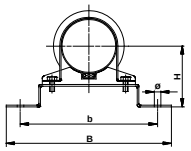
Supporting bracket



Pump type		Flow sleeve		Strainer	Supporting brackets
50 Hz	**60 Hz**	**Description: Dimensions, d (D) x L Motor type, P2 Weight**	**Product number: Grundfos**	**Product number: Grundfos Dimensions d x l Weight**	**Product number: Grundfos Description**
SP77-10 to -15 SP95-8 to -13	SP77-6 to -10 SP95-5 to -8	• d254 (270) x 1500 • Motor 8", 37-55 kW (MMS 8000/Franklin 8") • 9.8 kg	96900372	97941815 d256 x 325 1.9 kg	96958414 (1 set = 3 brackets) 6.0 kg H200, b380, B430
SP77-16 to -21 SP95-14 to -17	SP77-11 to -13 SP95-9 to -11	• d254 (270) x 1700 • Motor 8", 63-75 kW (MMS 8000/Franklin 8") • 11 kg	96900373		
SP77-22 SP95-18 to -20	SP77-14 SP77-15 SP95-12 SP95-13	• d254 (270) x 2000 • Motor 8", up to 92 kW (MMS 8000/Franklin 8") • 13.4 kg	96900374		
SP77-19 to -20 SP95-15 to -17	SP95-11	• d285 (300) x 1500 • Motor 10", up to 75 kW (MMS 10000) • 11.4 kg	96900398	97941547 d285 x 385 2.7 kg	97695339 (1 set = 3 brackets) 10.1 kg H225, b410, B460
SP77-22 SP95-18 to -20	SP95-12 SP95-13	• d285 (300) x 2000 • Motor 10", 92 kW (MMS 10000) • 15.1 kg	96900400		
SP125-1-A R SP160-1-A R	SP125-1-A R SP160-1-A R	• d254 (270) x 1000 • Motor 6", up to 13 kW (MS 6000) • 6.7 kg	96937751	97941815 d256 x 325 1.9 kg	96958386 (1 set = 2 brackets) 3.4 kg H200, b380, B430
SP125-2-A SP125-2 SP125-3/A/AA SP160-2/A/AA SP160-3-AA	SP125-2-AA SP125-2-A SP125-2 SP160-1 SP160-2-AA	• d254 (270) x 1250 • Motor 6", up to 30 kW (MS 6000) • 8.3 kg	96937754		
SP125-3/3A SP125-4/A/AA SP160-2 SP160-3/A/AA	SP125-3-AA SP125-3-A SP160-2-A SP160-2 SP160-3-AA	• d254 (270) x 1700 • Motor 6", 26-37 kW (MMS6) • 11.4 kg	96898647		96958410 (1 set = 3 brackets) 5.2 kg H200, b380, B430
SP125-4/A/AA SP160-3-A	SP125-3-AA SP125-3-A SP160-2-A/ -2	• d254 (270) x 1700 • Motor 6", 37 kW (Franklin 6" Rw*) • 11.4 kg (* Rw = Rewindable)	96900223		
SP125-4/A/AA SP125-5/A/AA SP125-6-AA/6-A SP160-3/3-A SP160-4/A/AA SP160-5-AA/5-A	SP125-3-AA SP125-3-A SP125-3 SP125-4-AA SP125-4-A SP160-3-AA SP160-3-A SP160-3	• d285 (300) x 1500 • Motor 8", 37-55 kW (MMS 8000/Franklin 8") • 11.4 kg	96937759	97941547 d285 x 385 2.7 kg	96958416 (1 set = 3 brackets) 10.1 kg H225, b410, B460
SP125-6 SP125-7/A/AA SP125-8/A/AA SP160-5 SP160-6/A/AA SP160-7-AA	SP125-4 to 125-6AA SP160-4-AA SP160-4-A SP160-4	• d285 (300) x 1700 • Motor 8", 63-75 kW (MMS 8000/Franklin 8") • 12.8 kg	96900376		
SP125-9/A/AA SP125-10/A/AA SP125-11 SP160-7/A SP160-8/A/AA SP160-9/A/AA SP160-10-AA	SP125-6-A/-6 SP125-7-AA SP125-7-A SP125-7 SP160-5-AA SP160-5-A SP160-5 to -6	• d285 (300) x 2250 • Motor 8", up to 92-110 kW (MMS 8000/Franklin 8") • 16.8 kg	96900379		

Flow sleeve

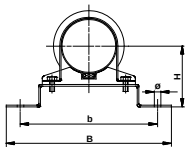
Supporting bracket



Pump type		Flow sleeve		Strainer	Supporting brackets
50 Hz	**60 Hz**	**Description: Dimensions, d (D) x L Motor type, P2 Weight**	**Product number: Grundfos**	**Product number: Grundfos Dimensions d x l Weight**	**Product number: Grundfos Description**
SP125-7/A/AA SP125-8/A/AA SP125-9/A/AA SP125-10/A/AA SP160-6/6-A SP160-7/A/AA SP160-8/A/AA		• d330 (350) x 1700 • Motor 10", 75-92 kW (MMS 10000) • 14.4 kg	96900401	97941751 d330 x 385 1.9 kg	96958418 (1 set = 3 brackets) 10.5 kg H225, b450, B500
	SP125-8 to -10 SP160-7 to -8	• d285 (300) x 2600 • Motor 8", up to 150 kW (Franklin 8") • 19.1 kg	96900394	97941547 d285 x 385 1.9 kg	96958416 (1 set = 3 brackets) 10.1 kg H225, b410, B460
SP125-12 to -13 SP160-9/A/AA SP160-10/A SP160-11		• d330 (350) x 2000 • Motor 10", up to 132 kW (MMS 10000) • 17.2 kg	96900432	97941751 d330 x 385 1.9 kg	96958418 (1 set = 3 brackets) 10.5 kg H225, b450, B500
SP125-14 to -17 SP160-12 to -14	SP125-10 to -11 SP160-8 to -9	• d330 (350) x 2500 • Motor 10", up to 147-170 kW (MMS 10000) • 21.2 kg	96900434		
	SP125-11 to -13 SP160-9 to -10	• d380 (400) x 2000 • Motor 12", up to 190 kW (MMS 12000) • 19.6 kg	96900455	97941817 d380 x 385 4.1 kg	96958419 (1 set = 3 brackets) 12.1 kg H270, b550, B600
SP160-15		• d380 (400) x 2250 Motor 12", 190 kW (MMS 12000) • 21.9 kg	96900439		

Flow sleeve

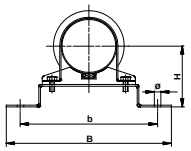
Supporting bracket



Pump type		Flow sleeve		Strainer	Supporting brackets
50 Hz	**60 Hz**	**Description: Dimensions, d (D) x L Motor type, P2 Weight**	**Product number: Grundfos**	**Product number: Grundfos Dimensions d x l Weight**	**Product number: Grundfos Description**
SP215-1- A R		• d330 (350) x 1000 • Motor 6", up to 15 kW • (MS 6000) • 12 kg	96937756		97695341 (1 set = 2 brackets) 10.0 kg H250, b500, B550
SP215-1-A SP215-1 SP215-2-AA	SP215-1-A SP215-1	• d330 (350) x 1250 • Motor 6", up to 30 kW (MS 6000) • 15 kg	96937757		
SP215-2-AA SP215-2A	SP215-1	• d330 (350) x 1800 • Motor 6", 30-37 kW (MMS6) • 16.5 kg	96898649		
SP215-2-A SP215-2	SP215-2-AA	• d330 (350) x 1800 • Motor 6", 37-45 kW (Franklin 6") • 16.5 kg	96900226		
SP215-2-A R		• d330 (350) x 1500 • Motor 8", up to 35 kW (MMS 8000/Franklin 8") • 14.1 kg	96937758		
SP215-2-A SP215-2 SP215-3-AA SP215-3-A SP215-3 SP215-4-AA SP215-4-A SP215-4	SP215-2 SP215-3-AA	• d330 (350) x 1800 • Motor 8", up to 75 kW (MMS 8000/Franklin 8") • 14.6 kg	96900377		
SP215-5-AA SP215-5-A SP215-5 SP215-6-AA SP215-6-A	SP215-3-A SP215-3 SP215-4-AA SP215-4-A SP215-4	• d330 (350) x 2250 • Motor 8", up to 110 kW (MMS 8000/Franklin 8") • 19.1 kg	96900381	97941751 d330 x 385 1.9 kg	97757301 (1 set = 3 brackets) 10.7 kg H250, b500, B550
SP215-7-AA SP215-7-A SP215-7	SP215-5-AA SP215-5-A	• d330 (350) x 2500 • Motor 8", 130 kW (Franklin 8") • 21.2 kg	96900392		
SP215-8-AA SP215-8-A SP215-8	SP215-5	• d330 (350) x 2700 • Motor 8", 150 kW (Franklin 8") • 22.8 kg	96900393		
SP215-4-AA SP215-4-A SP215-4 SP215-5-AA SP215-5-A SP215-5		• d330 (350) x 1800 • Motor 10", up to 92 kW (MMS 10000) • 16.5 kg	96900435		
SP215-6-AA SP215-6-A SP215-6 SP215-7-AA SP215-7-A SP215-7	SP215-5-AA SP215-5-A	• d330 (350) x 2250 Motor 10", up to 132 kW (MMS 10000) • 19.1 kg	96900436		
SP215-8-AA SP215-8-A SP215-8 SP215-9-AA SP215-9-A SP215-9	SP215-5 SP215-6-AA SP215-6-A SP215-6	• d330 (350) x 2500 • Motor 10", up to 170 kW (MMS 10000) • 21.2 kg	96900437		

Flow sleeve

Supporting bracket

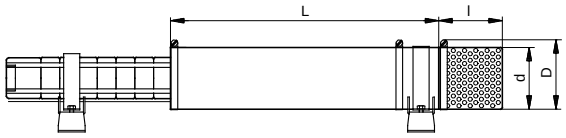


Pump type		Flow sleeve		Strainer	Supporting brackets
50 Hz	**60 Hz**	**Description: Dimensions, d (D) x L Motor type, P2 Weight**	**Product number: Grundfos**	**Product number: Grundfos Dimensions d x l Weight**	**Product number: Grundfos Description**
SP215-7-AA SP215-7-A SP215-7 SP215-8-AA SP215-8-A SP215-8 SP215-9-AA SP215-9-A SP215-9 SP215-10-AA SP215-10-A SP215-10	SP215-6-AA SP215-6-A SP215-6 SP215-7-AA SP215-7-A SP215-7	• d380 (400) x 2250 • Motor 12", up to 190 kW (MMS 12000) • 21.9 kg	96900440	97941817 d380 x 385 4.0 kg	96958420 (1 set = 3 brackets) 12 kg H270, b550, B600
SP215-11		• d380 (400) x 2500 • Motor 12", 220 kW (MMS 12000) • 24.2 kg	96900441		

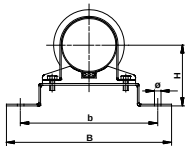
Flow sleeves, strainers and supporting brackets are not available for SPG of EN 1.4539/AISI 904L.

7. Flow sleeve SP-G EN 1.4301/AISI 304

Flow sleeve



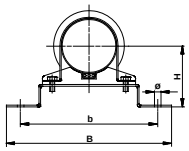
Supporting bracket



Pump type		Flow sleeve		Strainer	Supporting brackets
50 Hz	**60 Hz**	**Dimensions, d (D) x L Motor type, P2 Weight**	**Product number**	**Product number Dimensions d x l Weight**	**Product number Description**
SP270-1L G		• d380 (400) x 1250 • Motor 8", 22 kW (MMS 8000) • 19.8 kg	97535169		97513263 (1 set = 2 brackets) 9.0 kg H270, b500, B550
SP270-1F G to -1D G SP300-1N G to -1L G		• d380 (400) x 1400 • Motor 8", 26-30 kW (MMS 8000) • 27.1 kg	97535185		
SP270-1A G to -2L G SP300-1D G to -1A G	SP270-1G G to -1A G	• d380 (400) x 1500 • Motor 8", 37-45 kW (MMS 8000) • 28.1 kg	97535197		
SP270-2D G to -2A G SP300-2L G to -2F G	SP270-2N G	• d380 (400) x 1800 • Motor 8", 55-63 kW (MMS 8000) • 30.8 kg	97535198		
SP270-V G SP300-2D G to -3L G	SP270-2G G	• d380 (400) x 2000 • Motor 8", 75 kW (MMS 8000) • 32.5 kg	97535200	97942272 d380 x 385 4.1 kg	97512818 (1 set = 3 brackets) 13.3 kg H270, b500, B550
SP270-3A G SP300-3F G	SP270-2A G	• d380 (400) x 2250 • Motor 8", 92 kW (MMS 8000) • 34.9 kg	97535212		
SP270-4D G SP300-3D G		• d380 (400) x 2500 • Motor 8", 110 kW (MMS 8000) • 38.9 kg	97535438		
SP270-4D G SP300-3D G	SP270-3L G	• d380 (400) x 2000 • Motor 10", 110 kW (MMS 10000) • 34.5 kg	97535442		
SP270-4A G to -6W G SP300-3A G to -4F G	SP270-3F G to -3D G	• d380 (400) x 2250 • Motor 10", 132 kW (MMS 10000) • 36.7 kg	97535444		
SP270-6F G SP300-4D G to -5G G	SP270-3A G to -4F G	• d380 (400) x 2500 • Motor 10", 147 kW (MMS 10000) • 39.1 kg	97535445		

Flow sleeve

Supporting bracket



Pump type		Flow sleeve		Strainer	Supporting brackets
50 Hz	**60 Hz**	**Dimensions, d (D) x L Motor type, P2 Weight**	**Product number**	**Product number Dimensions d x l Weight**	**Product number Description**
SP270-6D G to -6A G SP300-5F G to -6F G		• d420 (450) x 2250 • Motor 12", 170-190 kW (MMS 12000) • 34.7 kg	97714558		
SP270-7A G to -8A G SP300-6D G to -7D G		• d420 (450) x 2500 • Motor 12", 220-250 kW (MMS 12000) • 37.4 kg	97549359		
SP360-1L G to -1F G		• d420 (450) x 1500 • Motor 8", 37-45 kW (MMS 8000) • 32.5 kg	97714571		
SP360-1A G to -2N G		• d420 (450) x 1750 • Motor 8", 55-63 kW (MMS 8000) • 36.5 kg	97714573		
SP360-2L G		• d420 (450) x 2000 • Motor 8", 75 kW (MMS 8000) • 37.7 kg	97535440	97942443 d420 x 385 4.5 kg	97512833 (1 set = 3 brackets) 12.5 kg H300, b575, B625
SP360-2F G		• d420 (450) x 2250 • Motor 8", 92 kW (MMS 8000) • 38.9 kg	97535441		
SP360-2A G to -3L G		• d420 (450) x 2500 • Motor 8", 110 kW (MMS 8000) • 41.5 kg	97549345		
SP360-2A G to -3L G		• d420 (450) x 2000 • Motor 10", 110 kW (MMS 10000) • 36.2 kg	97535446		
SP360-3G G to -3F G		• d420 (450) x 2250 • Motor 10", 132 kW (MMS 10000) • 38.7 kg	97549349		
SP360-3D G		• d420 (450) x 2500 • Motor 10", 147 kW (MMS 10000) • 41.3 kg	97549355		
SP360-3A G to -5G G		• d420 (480) x 2250 • Motor 12", 170-190 kW (MMS 12000) • 40.8 kg	97535447	97942462 d420 x 385 5.3 kg	97513065 (1 set = 3 brackets) 14.3 kg H315, b500, B550
SP360-5F G to -6F G		• d420 (480) x 2500 • Motor 12", 220-250 kW (MMS 12000) • 42.8 kg	97535448		

8. Zinc anodes

Galvanic cathodic protection

Applications

Galvanic cathodic protection enables protection of SQF, SP A, SP and SPG pumps as well as submersible motors against corrosion caused by chloride-containing liquids, such as seawater and brackish water.

Pumps in sleeves cannot be protected using zinc anodes.

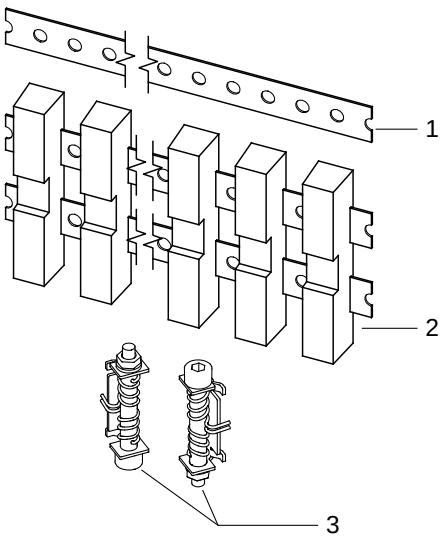
Applicable on these versions:	
Pump/motor	**Version**
Pump	N or R version
Motor, Grundfos	R version
Motor, other makes	Seawater-resistant materials, for example bronze, N or R version

Pumped liquids

Water containing more than 1500 ppm chloride at temperatures up to 35 °C.

We do not recommend galvanic cathodic protection in liquids with a pH value lower than 6.

Construction



TM01 4430 0199

Fig. 1 Anode string

Pos.	Description
1	Stainless-steel clamp
2	Zinc anodes cast around the clamp
3	Spring device ensuring direct metallic contact with pump/motor

During operation, the size of the zinc anodes will be reduced and gradually the anodes become covered by corrosion products obstructing the direct metallic contact between anode and pump/motor. To counteract this, the metallic contact must be ensured via the clamp keeping tight contact with pump/motor by means of the spring device.

Fitting the anode strings

The anode strings are to be fitted according to the installation and operating instructions.

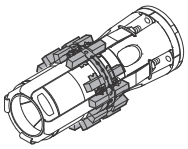
The number of anode strings to be fitted is shown in sections *Anode strings on pumps* and *Anode strings on motors*.

Important: It must be ensured that the anode strings are fastened tightly and that the electric/metallic contact between clamp and pump/motor is good.

The diameter of the pump/motor is increased by min. 40 mm when the anode string is fitted.

Position of anode strings on pumps

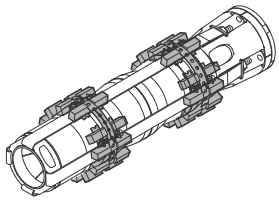
One anode string



TM05 0533 1211

Fig. 2 One anode string

Two anode strings

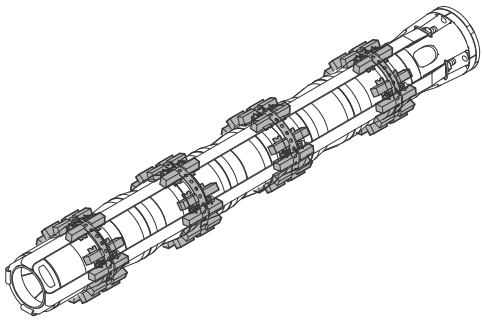


TM05 0534 1211

Fig. 3 Two anode strings

More than two anode strings

The distances between the anode strings must be identical.

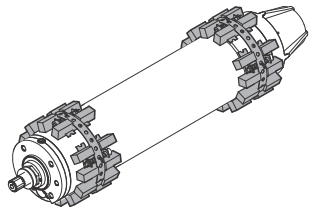


TM05 0535 1211

Fig. 4 More than two anode strings

Position of anode strings on motors

Two anode strings

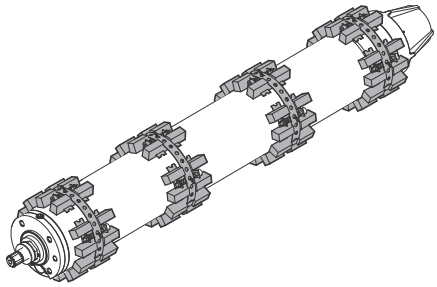


TM05 0536 1211

Fig. 5 Two anode strings

More than two anode strings

The distances between the anode strings must be identical.



TM05 0537 1211

Fig. 6 More than two anode strings

Maintenance

Anode life

The life of a zinc anode is 1 to 4 years, depending on the operating conditions (temperature, flow, content of chloride, etc.).

Inspection

Inspections should be made at regular intervals in order to ensure the functioning of the galvanic cathodic protection system. The first inspection should be made after six months and subsequently approx. once a year.

Precipitation

White/yellow corrosion products will build up on the anodes as these are reduced in size. Furthermore, a thin lime incrustation may build up on the pump. However, such precipitation is harmless.

Replacing the anode string

In order to ensure a good electric/metallic contact between clamp and pump/motor, the surface must be cleaned thoroughly before a new anode string is fitted.

Anode strings on pumps

The following sections show the number of anode strings required per pump and the corresponding product numbers.

DOL = Direct-On-Line starting.

SD = Start-Delta starting.

Product range

The following sections show the number of anode strings required per pump and the corresponding product numbers.
DOL = Direct-On-Line starting.
SD = Start-Delta starting.

SQF

SQF			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
2-7	2	97645697	-

SP1A

SP1A			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
3-36	1	96856060	---
37-57	2		

SP2A

SP2A			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
3-23	1	96856060	96856060
24-55	2		
39 - 60	3		

SP3A

SP3A			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
6 - 15	1	96856060	-
18 - 33	2		
56-60	3		

SP5A

SP5A			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
4 - 21	1	96856060	96856060
25 - 38	2		
44 - 60	3		
52 - 75	4		

SP7/ SP9

SP7 / SP98A			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1 - 7	1	96856060	96856060
8 - 12	2		
13 - 25	3		
26 - 33	4		
34 - 42	5		
43 - 52	6		
53 - 59	7		

SP11/ SP14

SP11 / SP1414A			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1 - 6	1	96856060	96856060
7 - 12	2		
13 - 18	3		
19 - 24	4		
25 - 30	5		
31 - 37	6		

SP17

SP17			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1 - 5	1	97645875	97645875
6 - 13	2		
14 - 25	3		
26 - 35	4		
36 - 42	5		

SP30

SP30			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1 - 3	1	97645875	97645875
4 - 9	2		
10 - 15	3		
16 - 22	4		
23 - 28	5		
29 - 34	6		
35 - 38	7		

SP46

SP46			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1 - 3	1	97645875	97645910
4 - 8	2		
9 - 13	3		
14 - 18	4		
19 - 23	5		
24 - 25	6		

SP60

SP60			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1 - 3	1	97645875	97645910
4 - 8	2		
9 - 13	3		
14 - 18	4		
19 - 23	5		
24 - 25	6		

SP77

SP77			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1	1	97645914	97646114
2 - 5	2		
6 - 10	3		
11 - 14	4		
15 - 18	5		
19 - 22	6		

SP95

SP95			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1	1	97645914	97646114
2 - 5	2		
6 - 10	3		
11 - 14	4		
15 - 18	5		
19 - 22	6		

SP125

SP125			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1	1	97646116	97646117
2 - 4	2		
5 - 8	3		
9 - 11	4		
12 - 14	5		
15 - 17	6		

SP160

SP160			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1	1	97646116	97746117
2 - 4	2		
5 - 8	3		
9 - 11	4		
12 - 14	5		
15 - 17	6		

SP215

SP215			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1	1	97646118	97646137
2 - 3	2		
4 - 6	3		
7 - 8	4		
9 - 11	5		

SPG 270

SPG 270			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1 - 2	2	97646138	97762380
3 - 4	3		
5 - 6	4		
7 - 8	5		

SPG 300

SPG 300			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1 - 2	2	97646138	97762380
3 - 4	3		
5 - 6	4		
7 - 8	5		

SPG 360

SPG 360			
Pump stages	Number of anode strings	Product number	
		Anode string, DOL	Anode string, SD
1 - 2	2	97646138	97762380
3 - 4	3		
5 - 6	4		
7 - 8	5		

Anode strings on motors

The table below shows the number of anode strings required per motor and the corresponding product numbers.

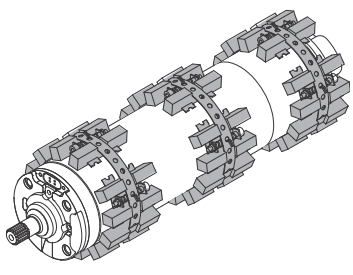


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Fig. 7 Anode strings on MS motor

Zinc anodes for MS and MMS motors			
Motor	**B = length [mm]**	**Number of anode strings**	**Product number**
MS 4000" motor	Up to 350	2	96856060
MS 4000" motor	351 to 680	3	
MS 4000" motor	681 - 780	4	
MS 6000" motor	Up to 690	3	97645910
MS 6000" motor	691 - 975	4	
MS 6000" motor	976 - 1050	5	
MMS 6" motor	Up to 690	3	97645914
MMS 6" motor	691 - 975	4	
MMS 6" motor	976 - 1315	5	
MMS 6" motor	1316 - 1425	6	
MMS 8" motor	Up to 1160	5	97646116
MMS 8" motor	1161 - 1490	6	
MMS 8" motor	1491 - 2060	8	
MMS 10" motor	Up to 1690	7	97646118
MMS 10" motor	1691 - 2070	8	
MMS 10" motor	2071 - 2400	9	
MMS 12" motor	Up to 1980	8	97646138
MMS 12" motor	1981 - 2290	9	

Fig. 8 Length of motor

9. Cable sizing

Cables

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

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

Standard version:

Maximum liquid temperature 70 °C, for short periods up to 90 °C.

Tables indicating cable dimension in borehole

The tables indicate the maximum length of drop cables in metres from motor starter to pump at direct-on-line starting at different cable dimensions.

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

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

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

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

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

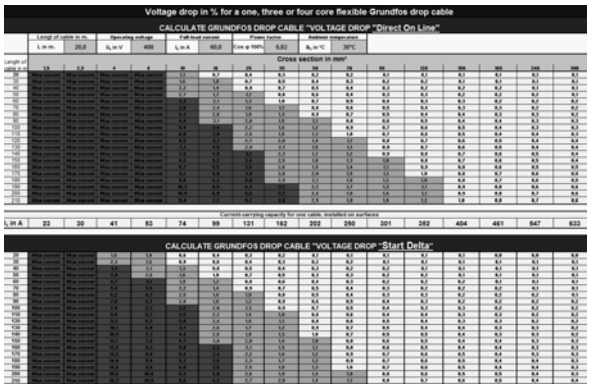

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Fig. 9 Cable sizing tool

Maximum cable length of a single-phase submersible pump:

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

Maximum cable length of a three-phase submersible pump:

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

Formula designations

U = Rated voltage [V]

ΔU = Voltage drop [%]

I = Rated current of the motor [A]

cos φ = Power factor

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

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

sin φ = $\sqrt{1 - \cos^2 \varphi}$

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

Example

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

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

L = 120 m.

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

Voltage drop: 3 %

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

* At particularly favourable heat dissipation conditions. Maximum cable length in metres from motor starter to pump.
For motors with star-delta starting, the cable length can be calculated by multiplying the relevant cable length from the above table by $\sqrt{3}$.

Sizing of cable

Calculation of cable cross-section

Formula designations

U = Rated voltage [V]
ΔU = Voltage drop [%]
I = Rated current of the motor [A]
cos φ = Power factor
ρ = 1/χ
Materials of cable:
Copper: χ = 40 m/Ω x mm^2
Aluminium: χ = 35 m/Ω x mm^2
q = Cross-section [mm^2]
sin φ = $\sqrt{1 - \cos^2\varphi}$
X_L = Inductive resistance 0.078 x 10^{-3} [Ω/m]
L = Length of cable [m]
Δp = Power loss [W].

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

Direct on line

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

Star-delta

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

You can read the values of the rated current (I) and the power factor (cos φ) in the tables on pages 89 to 93.

Calculation of the power loss

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

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

Example

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

Cable selection

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

Calculation of power loss

Choice A

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

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

Δp_A = 745 W.

Choice B

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

Δp_B = 604 W.

Savings

Operating hours/year: h = 4000.

Annual saving (A):

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

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

Operating time: 10 years.

Saving after 10 years (A_{10}):

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

You must calculate the saved amount in the local currency.

10. Table of head losses

Head losses in ordinary water pipes

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

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

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

The table is calculated in accordance with H. Lang's new formula a = 0.02 and for a water temperature of 10 °C.
The head loss in bends, slide valves, T-pieces and non-return valves is equivalent to the metres of straight pipes stated in the last two lines of the table.
To find the head loss in foot valves, multiply the loss in T-pieces by two.

Head losses in plastic pipes

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

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

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

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

11. Grundfos Product Center

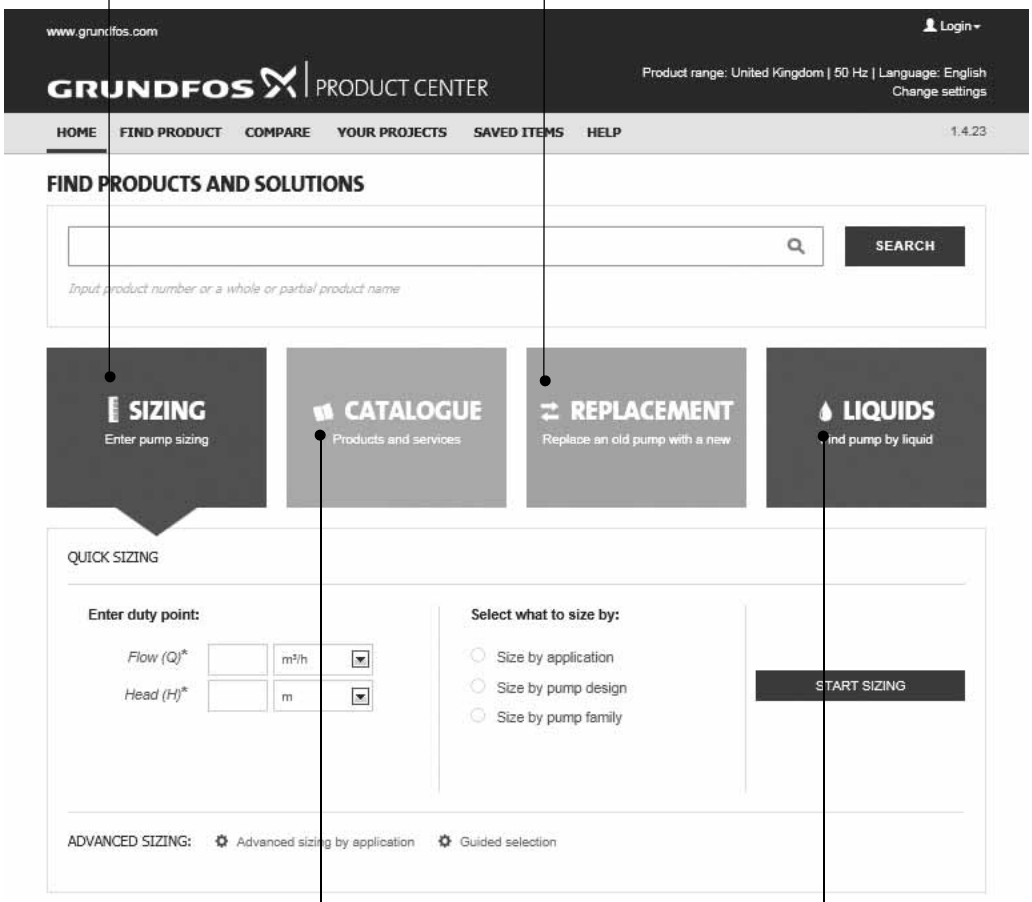
Online search and sizing tool to help you make the right choice.

http://product-selection.grundfos.com

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

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

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



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

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

All the information you need in one place

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

Downloads

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