

Grundfos Solar Water Supply Systems



With over 13,000 employees and an annual production exceeding 10 million pump units, Grundfos is one of the world's leading pump manufacturers.

Grundfos pumps first came to Australia and New Zealand in 1965 and have earned a reputation for quality and reliability. Whether the application is community water supply, mining, stock water, irrigation or household water supply, Grundfos has a wide range of efficient pump systems to meet almost every application.

With an extensive network of Dealers providing local support in the selection, installation or service of our pumps, you can depend on Grundfos.

➤ Introduction



Community water supply



Stock water

The Grundfos SQFlex Solar Pumping Systems have been developed to solve water supply problems in remote locations.

Whether the challenge is to install a complete new water supply system or replace an existing windmill the SQFlex submersible pump is a flexible solution that can be powered from the sun using photovoltaic modules or a wind turbine. The pump can even be connected to a small AC generator to enable pumping to continue throughout the night to manage peak demands or during extended periods of inclement weather.

Developed by the world's leading submersible pump manufacturer the Grundfos SQFlex is the result of more than 40 years of experience in design and manufacture of submersible pumps and motors including more than 20 years in solar pumping.

APPLICATION

Designed for continuous operation the SQFlex system is ideally suited for water supply applications in remote locations, such as:

- Stock watering
- Remote community water supply
- Conservation areas and National Parks
- Isolated camping grounds
- Pumping from bores, wells and dams
- Floating pump installations

FEATURES

SQFLEX SUBMERSIBLE PUMP

The SQFlex pump range comprises two pump technologies:

Helical rotor pump (3") for high heads and small flows.

Centrifugal pump (4") for low heads and large flows based on the Grundfos SPA pump.



Pump Casing

316 grade stainless steel for long pump life.

Bearings

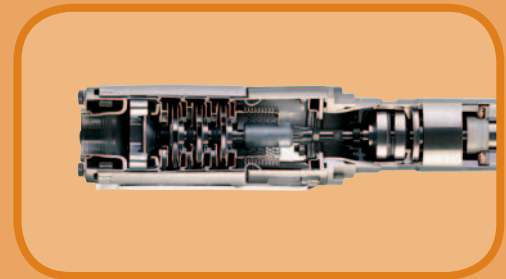
Robust carbon/ceramic bearing system lubricated by water ensures high reliability.

Motor

Only one motor for the entire pump range with unique built-in features. A newly developed segmented stator gives high efficiency.

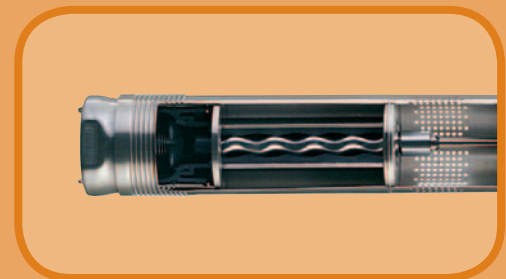
Power Supply

A wide voltage range enables the motor to operate between 30V and 300V DC or 90-240V AC, which makes installation and sizing easy.



Centrifugal Pump (4")

Technology based on 30 years' experience. Stainless steel components give high wear resistance.



Helical Rotor Pump (3")

A well known pumping principle, the helical rotor pump uses simple components for effective pumping - high head and low flow.



Dry-Running Protection

This feature shuts down the pump if it detects water shortage. The sensor is mounted on the motor cable and protects the pump from damage.

*see features and benefits

Maximum Water Output

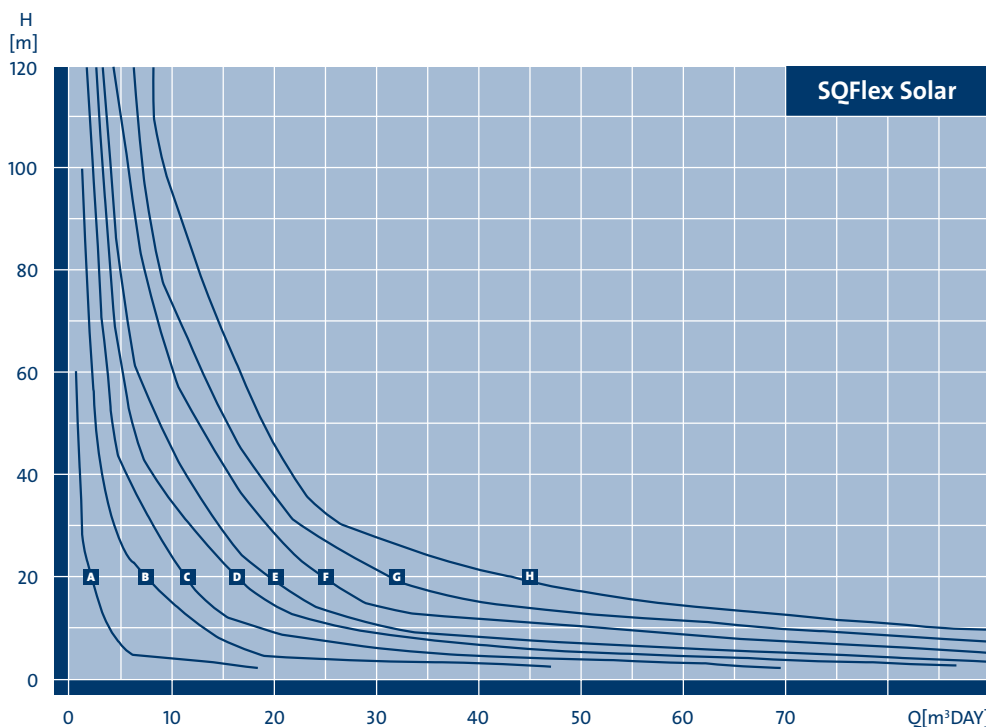
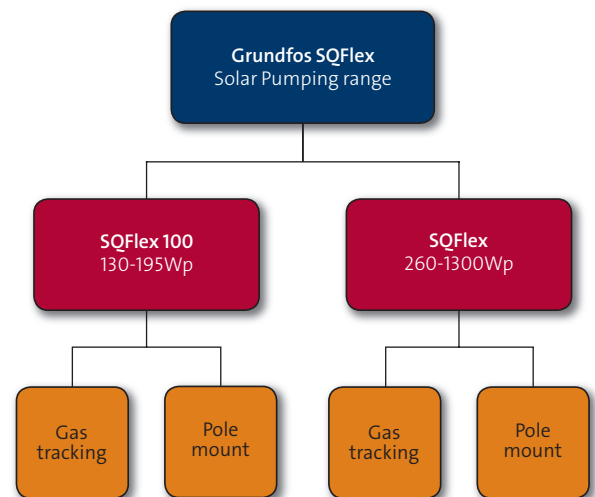
Inbuilt Maximum Power Point Tracking (MPPT) ensures the available power from the solar modules is fully utilised.

➤ The SQFlex Range

For applications requiring less than 200 Watts of solar modules the SQFlex100 is an ideal choice. Included, as standard with the SQFlex 100 is the IO 100 switch box however, the IO 101 with provision for AC input is available as an option.

In higher flow applications where the array power exceeds 200 Watts the Grundfos SQFlex system is supplied as standard with the IO 101 AC back-up switch box.

Where start/stop operation based on water level in tanks, dams, etc is required both the SQFlex 100 and larger SQFlex systems can be automated by the addition of the CU 200 control box.



The SQFlex Solar performance curves are based on:

- Irradiation on a tilted surface equal to 6 kWh/m² day
- 20° tilt angle
- Ambient temperature at 30°C
- 120V DC

- H** 1200W_p
- G** 900W_p
- F** 700W_p
- E** 500W_p
- D** 400W_p
- C** 300W_p
- B** 200W_p
- A** 100W_p

➤ The SQFlex System

The SQFlex system is a reliable water supply system powered by renewable energy sources, such as the sun and wind.

The system components are:

- SQFlex submersible pump
- CU 200 control unit
- IO 100 and IO 101 switch boxes
- Solar panels
- Wind turbine
- Fixed or Sun Tracking options

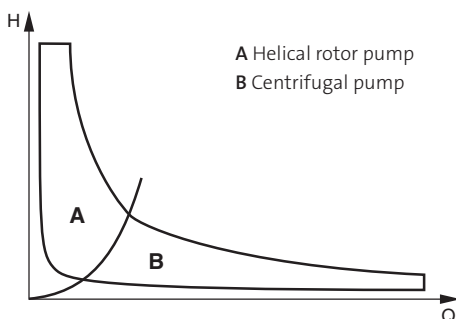
SQFlex Submersible Pump

The SQFlex pump range comprises two pump technologies:

- A 3" Helical rotor pump for high heads
- A 4" Centrifugal pump for low head and higher flows based on the Grundfos SPA pump

All pump types are 316 grade stainless steel.

The performance curve below illustrates pump performance for the two pump technologies:



Motor

The 3" SQFlex motor range comprises only one motor size, the MSF 3 with max. power input (P_i) of 900 Watts. The speed range for the motor depends on the power input and the load. The motor has been developed especially for the SQFlex system.

The SQFlex motor has internal limitations:

- Max. power consumption of 900 W (P_i)
- Max. current of 7 A

The pump delivers its maximum performance when one of the above limits is reached.

The motor is supplied in 316 grade stainless steel.

The motor utilizes the permanent-magnet principle and has a built-in electronic unit.

IO 100 Connection Box

The IO 100 is an on/off switch box designed specifically for solar powered SQFlex systems.

The IO 100 enables manual starting and stopping of the pump and functions as a connection box.



Type Key for Pump

Example	SQF	1.2	2	N
Type range				
Rated flow at 3000rpm [m^3/h]				
Number of stages				
N = Stainless steel				
DIN grade 1.4401, AISI 316				

Voltage Supply

The motor can be supplied with either AC or DC voltage.

1 x 90 - 240V - 10%/+6%, 50/60 Hz, PE.

30 - 300 VDC

IO 101 Connection Box

The IO 101 box incorporates a standard 3 pin AC plug to enable a small 240V generator to be easily connected to the SQFlex pump.

When AC power is supplied the pump will automatically switch to this power source delivering maximum capacity. When the generator is stopped or runs out of fuel, the pump will switch back ready to operate from solar energy when it becomes available.

The IO 101 incorporates an on/off switch and also functions as a connection box for the cable from both the solar array and pump.



Solar Modules

Grundfos solar modules have been selected especially for the SQFlex system. The solar modules are equipped with plugs and sockets enabling easy and simple installation.

Generator

During periods of inclement weather or when additional water volume is required, a small single phase generator can be easily connected to the SQFlex pump.

Wind Turbine

A wind turbine is also available for the SQFlex. The turbine can operate as the primary power source or be combined with solar and AC backup. The turbine is installed on a single pole which can be easily lowered to the ground for maintenance.



CU 200 Control Unit and Solar Modules



Back-up Generator



Optional Wind Turbine

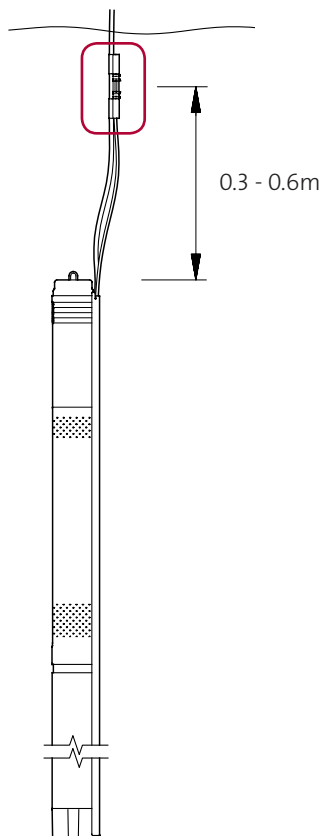
➤ Features and Benefits

Dry-running Protection

The SQFlex pump is protected against dry running in order to prevent damage to the pump. The dry-running protection is activated by a water level electrode placed on the motor cable 0.3 - 0.6 m above the pump depending on the pump type.

When the water level falls below the electrode the pump will be cut out, the pump will automatically restart 5 minutes after water covers the electrode.

Note: Horizontal installation requires the water level electrode to be placed min. 0.3 to 0.6 m above the pump to ensure the dry-running protection.



Vertical Installation

Installation

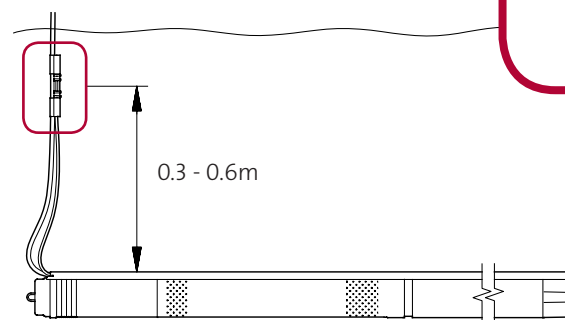
The following features ensure simple installation of the SQFlex pump:

- Low weight ensuring user-friendly handling
- Installation in 3", 4" or larger boreholes
- Only an on/off switch is needed, which means that no extra motor starter / starter box is required

Maximum Power Point Tracking (MPPT)

The built-in electronic unit gives the SQFlex system a number of advantages. One of these advantages is the built-in microprocessor with MPPT (MPPT = Maximum Power Point Tracking).

Thanks to the MPPT function, the pump duty point is continuously regulated according to the input power available. MPPT is only available for pumps connected to DC supply.



Horizontal Installation

Motor Cable

The pump is supplied with a short motor cable and Heat Shrink joint for connection to the required length of standard submersible drop cable.



Dry-run Electrode

➤ CU200 Control Unit and Array Frames

CU 200 CONTROL UNIT

The CU 200 control unit is a combined status, control and communication unit especially developed for the SQFlex pump system. The CU 200 also enables connection of a level or pressure switch to automatically stop and start the pump.

The CU 200 incorporates cable entries for:

- Power supply connection (pos. 6)
- Pump connection (pos. 7)
- Earth connection (pos. 8)
- Level or pressure switch connection (pos. 9)

It is possible to start, stop and reset the pump by means of the on/off button (pos. 1)

The CU 200 control unit offers:

- System monitoring
- Alarm indication

The following indications allow the operation of the pump to be monitored:

- Water reservoir is full (level or pressure switch) (pos. 2)
- Pump is running (pos. 3)
- Input power (pos. 11)

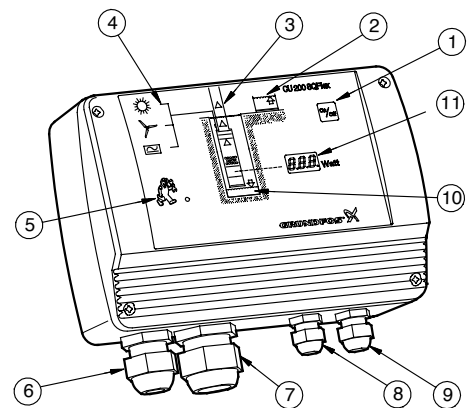
The CU 200 offers the following alarm indications:

- Dry-running (pos. 10)
- Service needed (pos. 5) in case of:
 - No contact to pump
 - Overvoltage
 - Overtemperature
 - Overload

The CU200 can be operated in conjunction with the IO 101 for generator back-up.

ARRAY FRAMES

The two most common methods for mounting solar modules are Fixed and Tracking Array Frames. In fixed installations the modules are mounted to a frame that can be installed on a pole(s) or attached to a foundation, tank or shed roof. Installing solar modules on a frame that follows the sun's movement from east to west during the day is a popular installation method in water pumping applications in Australia.



Grundfos Single Pole Gas Tracker

➤ SQFlex eases lifestyle at remote Adelaide River in the NT

A Grundfos solar powered SQFlex bore hole pump is providing power savings for a Northern Territory family, but more importantly, is delivering a reliable source of water for their home and garden.



Drew Nolan and his family live on 30 acres at Adelaide River, 120 km south east of Darwin. When they purchased their property several years ago water was provided by an old Grundfos SA1500 solar powered pump. Drew eventually installed a three phase electric pump, but 18 months ago replaced it with a Grundfos SQFlex 2.5-2N submersible pump.

The installation took barely 90 minutes, with the majority of the time taken in retrieving the old submersible pump.

The new SQFlex was simply dropped down the bore and connected to the existing solar panels. It has operated without any problems since day one.

Drew is delighted.

“It maintains our 30,000 litre tank, and even on cloudy days pumps at the rate of a litre per second,” says Drew. “This is much better than the electric pump or the original solar powered one.”

“The water at Adelaide River is very harsh and rich in iron, but the Grundfos stainless steel casing seems to handle the corrosive nature of the water with ease.

“Because of the hot weather here, the previous property owner also pumped water to a sprinkler system on the galvanised iron roof to keep the house cool. The roof was ruined inside two years because of the harshness of the water, yet even the old Grundfos pump, when we replaced it with the new one, showed virtually no corrosion.

“The SQFlex system is great. Water is pumped from the bore to the tank, and turned on and off by a float switch. When the tank is full, the water automatically diverts to our garden.

“We also have a turkey nest dam some two kilometres from the house. It is actually more of a swamp, and when the tank is full and the garden watered, we divert the excess water via a pipe to the dam.

“I am really delighted with the Grundfos SQFlex pump’s performance. It is reliable and easily pumps sufficient water for our family of four, as well as the garden. The running costs are virtually zero because it is solar powered.

“My wife and I couldn’t be happier.”

➤ Trafalgar makes hay while the sun shines with new **SQFlex** pump

A Grundfos SQ Flex solar powered submersible borehole pump located at Trafalgar Cattle Station 50 km south west of Charters Towers in Queensland is operating so effectively that it is producing far more water than was anticipated.

Trafalgar Station is one of the most innovative beef cattle properties in Queensland. Established in 1913, it is a leader in conservation and has been featured on the highly regarded ABC program Four Corners for its work in contributing to water quality in local rivers to prevent harmful sediments from flowing out to sea and damaging the Great Barrier Reef.

It also has a strong reputation for preventing soil erosion by each year resting up to 20 percent of its grazing land to rejuvenate grass growth, and uses fire control to manage weeds.

Beef cattle are the property's bread and butter. Covering 33,000 hectare, it runs 3,000 head of Brahman and Limousin stud and beef cattle.

Because of Trafalgar's entrepreneurial and innovative reputation, third generation property owner, Roger Landsberg, was only too pleased to install a Grundfos SQ Flex system.

The system provides water to two large holding tanks of 46,000 litres and 27,000 litre capacities.

The installation, an SQ Flex 2.5-2N, was dropped almost 60 metres down the borehole. It is powered by twelve 7.6W solar panels fixed to a gas operated tracking frame to maximise the sunlight. The whole job took less than a day.

Says Roger Landsberg: "Even though we are in the tropics, and are supposed to have a wet season, water remains our most precious commodity, and so it is essential that our pumps are efficient and reliable," he says. "While we have 16 dams, we rely almost totally on ground water for our stock during dry years.

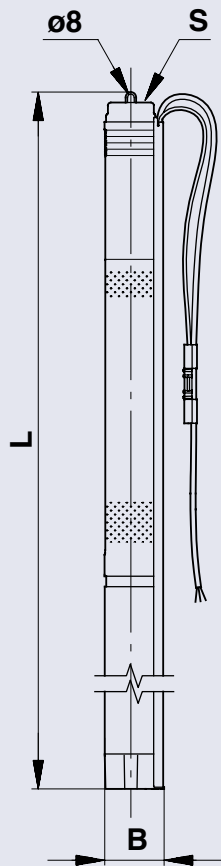
"The SQ Flex is an excellent low maintenance investment that eliminates the annoying mechanical hassles of generators. We only run it for one day a week, yet it still produces more water than is required by the 160 head of cattle it is currently watering.

"There are significant pressures being applied to the land," he says. "Effective water management is becoming increasingly critical, as is effective economic management.

"The cattle farmer of today and in the future will have to forsake more time in the saddle for the office chair if he wants to remain viable. Property workforces are smaller and tougher legislation to protect workers from dangerous practices – such as the rules surrounding windmill maintenance – means we have to work 'smarter'."



MATERIAL SPECIFICATIONS



Pump Specifications

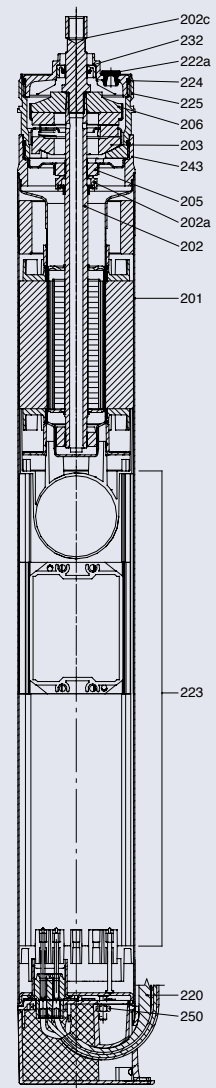
Pump Type	Dimensions			Net Weight (kg)*	Motor Type	Max Power Input	Max Current (A)
	L	B	S				
SQF 0.6-2 (N)	1185	74	Rp 1 ¼	7.6	MSF 3(N)	900	7
SQF 1.2-2 (N)	1225	74	Rp 1 ¼	7.9	MSF 3(N)	900	7
SQF 2.5-2 (N)	1247	74	Rp 1 ¼	8.2	MSF 3(N)	900	7
SQF 5A-3 (N)	815	101	Rp 1 ¼	8.1	MSF 3(N)	900	7
SQF 5A-6 (N)	875	101	Rp 1 ¼	8.8	MSF 3(N)	900	7
SQF 8A-3 (N)	920	101	Rp 2	9.5	MSF 3(N)	900	7
SQF 14A-3 (N)	975	101	Rp 2	10.9	MSF 3(N)	900	7

*Pump complete Electrical data: 30-300 VDC or 1x90 - 240 VAC, 50/60 Hz

Material Specification - Motor

Pos.	Description	Material	AISI
201	Stator with sleeve, complete	Stainless steel	316
202	Rotor	Stainless steel	316
202a	Stop ring	PP	-
202c	Shaft end	Stainless steel	316
203	Thrust bearing, stationery	Stainless steel / carbon	316
205	Bearing plate with radial bearing	Silicone carbide	316
206	Thrust bearing, rotating	SS / aluminium oxide Al ₂ O ₃	316
220	Motor cable with plug	-	-
222a	Filling plug	NBR	-
223	Electronic unit	-	-
224	O-ring	Standard version: NBR N version: FKM	-
225	Top cover	PPS	-
232	Shaft seal	MFS 3: NBR MFS 3 N:FKM	-
243	Thrust-bearing housing	Stainless steel	316
250	Nut (M4)	Stainless steel	316

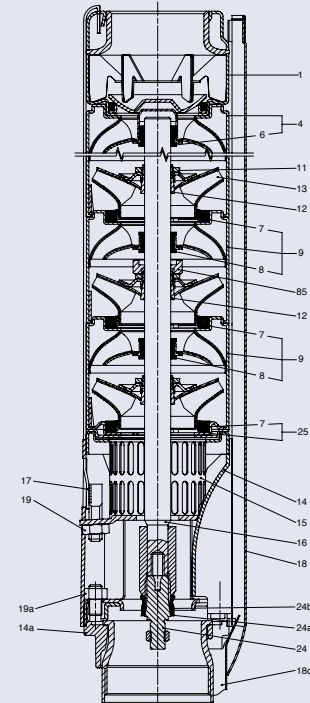
MFS 3



Material Specification - Centrifugal Pump

Pos.	Description	Material	AISI
1	Valve casing	Stainless steel	316
4	Chamber, upper	Stainless steel	316
6	Top bearing	NBR	-
7	Neck ring	NBR/PPS	-
8	Bearing	NBR	-
9	Chamber, complete	Stainless steel	316
11	Nut for split cone	Stainless steel	316
12	Split cone	Stainless steel	316
13	Impeller	Stainless steel	316
14	Inlet part	Stainless steel	316
14a	Connecting piece, complete (MSF 3 adapter)	Stainless steel	316
15	Strainer	Stainless steel	316
16	Shaft, cylindrical	Stainless steel	316
17	Strap	Stainless steel	316
18	Cable guard, pump	Stainless steel	316
18c	Cable guard, motor	Stainless steel	316
19	Nut for strap	Stainless steel	316
19a	Nut	Stainless steel	316
24	Coupling with nut	Stainless steel	329
24a	Supporting ring	Stainless steel	316
24b	Spline protector	NBR	-
25	Retainer for neck ring, complete	Stainless steel	316
85	Stop ring (only SQF 5A and SQFA)	carbon/graphite PTFE	316

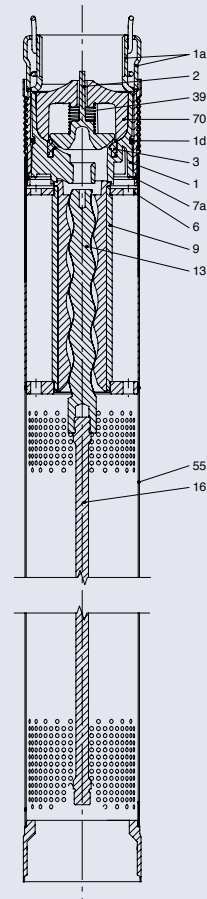
Example: SQF 14A-3



Example: SQF 1.2-2

Material Specification - Helical Rotor Pump

Pos.	Description	Material	AISI
1	Valve casing	Polymide	-
1a	Discharge chamber	Stainless steel	316
1d	O-ring	NBR	-
2	Valve cup	Polymide	-
3	Valve seat	NBR	-
6	Flange, upper	Stainless steel	316
7a	Circlip	Stainless spring steel	310
9	Pump stator	Stainless steel/EPDM	316
13	Pump rotor	Hard-chromed stainless steel	316
16	Torsion shaft	Stainless steel	316
39	Valve spring	Stainless spring steel	316LN
55	Outer sleeve	Stainless steel	316
70	Valve guide	Polymide	-
	Cable guard	Stainless steel	316
	Screws for cable guard	Stainless steel	316



TECHNICAL DATA

Grundfos SQFlex solar pumping systems overview

Feature	Number of Modules																
	SQFlex 100		4	5	6	7	8	10	12	14	15	16	18	20	21-40		
	2	3	Wattage (based on Grundfos GF65c modules)														
	130	195	260	325	390	455	520	650	780	910	975	1040	1170	1300	< 2600		
SQFlex Pump	316 grade stainless steel	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Non return valve	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Dry-run protection	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Over voltage protection	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Over temperature protection	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Heat shrink cable kit	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
Controls	IO 100 basic on/off box	•	•														
	IO 101 on/off with AC input option	0	0	•	•	•	•	•	•	•	•	•	•	•	•		
	CU 200 control box	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Level or pressure switch control	O - add CU200															
	Diagnostic display	O - add CU200															
Array Options	Pole Mount (PM)	0	0	0	0	0	N/A	0	0	0	0	N/A	0	0	0	Δ	
	Electrical connection (GF65c)	S	S	S	S	S		S/P	S/P	S/P	S/P		S/P	S/P	S/P	Δ	
	Modules in series/parallel	2	3	4	5	6		4 x 2	5 x 2	6 x 2	7 x 2		4 x 4	6 x 3	5 x 4	Δ	
	No. and size of array pole	1 x 3"	1 x 3"	1 x 3"	1 x 4"	1 x 4"		1 x 4"	1 x 6"	1 x 6"	1 x 6"		2 x 4"	1x6" + 1x4"	1x6" + 1x4"	Δ	
	Array pole's included	Yes															
	Pre-assembled array kit	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
	Gas Tracking (GT)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Δ
	Electrical connection (GF65c)	S	S	S	S	S	S/P	S/P	S/P	S/P	S/P	S/P	S/P	S/P	S/P	S/P	Δ
	Modules in series/parallel	2	3	4	5	6	7	4x2	5x2	4x3	2x7	3x5	5x3	6 x 3	2 of 5 x 2	Δ	
	No. of trackers	1	1	1	1	1	1	1	1	1	1	1	1	1	2	Δ	
	No. of poles	1	1	1	1	1	2	2	2	2	2	2	2	2	4	Δ	
	Array pole's included	Yes															
Pre-assembled array kit	0	0	0	0	0	Δ	0	Δ	Δ	Δ		Δ	Δ	Δ	Δ		
Ground Mount (GM)	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ		Δ	Δ	Δ	Δ		
Accessories	Drop cable (2 core + earth)	0	0	0	0	0	0	0	0	0		0	0	0	0		
	Safety cable, clamps, bore caps, etc	0	0	0	0	0	0	0	0	0		0	0	0	0		
	Level switch	0	0	0	0	0	0	0	0	0		0	0	0	0		
	Reverse action pressure switch	0	0	0	0	0	0	0	0	0		0	0	0	0		
	Pressure tank	0	0	0	0	0	0	0	0	0		0	0	0	0		
	CU 200 mounting bracket	0	0	0	0	0	0	0	0	0		0	0	0	0		
	IO 100/101 to CU200 connection kit	0	0	0	0	0	0	0	0	0		0	0	0	0		
Poly float assembly	0	0	0	0	0	0	0	0	0		0	0	0	0			

Key	•	0	Δ	S	S/P	N/A
		Standard	Option	Contact Grundfos	Series connection	Series/parallel connection

SQFlex Pump

Supply to pump	30 - 300VDC / 90-240 AC 50Hz
Operation via generator	Voltage: 230 VAC, - 10%/+6% The generator must be minimum 1 kVA
Enclosure class	IP68
Motor protection	Built into the pump Protection against: - Dry-running by means of a water level electrode - Overvoltage and undervoltage - Overload - Overtemperature
Radio noise	SQF comply with EMC Directdrive 89/336EEC Approved according to EN 50081-1 and 50082-2
Power factor	PF=1
Earth leakage circuit breaker	If the pump is connected to an electrical installation where an earth-leakage circuit breaker (ELCB) is used as an additional protection, this circuit breaker must trip out when earth fault currents with DC content (pulsating DC) occur.
Borehole diameter	SQF 0.6, SQ1.2, SQF 2.5: Minimum: 76mm SQF 5A, SQF 8A, SQF 14A: Minimum: 104mm
Installation depth	Min: The pump must be totally submerged in the pumped liquid Max: 150m below the static water table (15bar)
Pumped liquids	pH 5 to 9 Sand content up to 50g/m ³ Max water temp +40°C

IO 100 Switch Box

Voltage	Max 225 VDC, 7A Max 265 VAC, 7A
Enclosure class	IP55
Ambient temp	-30 to +50°C
Dimensions	263 x 199 x 110mm

IO 101 Switch Box

Voltage	230 VAC-15%/+10%, 50/60Hz (internal relay) Max 225 VDC, 7A Max 265 VAC, 7A
Enclosure Class	IP55
Ambient temp	-30 to +50°C
Dimensions	263 x 199 x 110mm

CU200 Control Unit

Voltage	30 - 300VDC / 90-240 AC 50Hz
Ambient temp	-30 to +50°C
Max cable length	200m between SQFlex pump and CU200 100m between level / pressure switch and CU200
Alarm indications	Overvoltage DC >438v / AC > 318v Overtemperature Auto Cut-out >85°C / Auto reset <75°C Overload >7A
Measuring accuracy	Indication of power (w) +/-10%
Dimensions	263 x 199 x 92mm

BE > THINK > INNOVATE >

Being responsible is our foundation
Thinking ahead makes it possible
Innovation is the essence

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