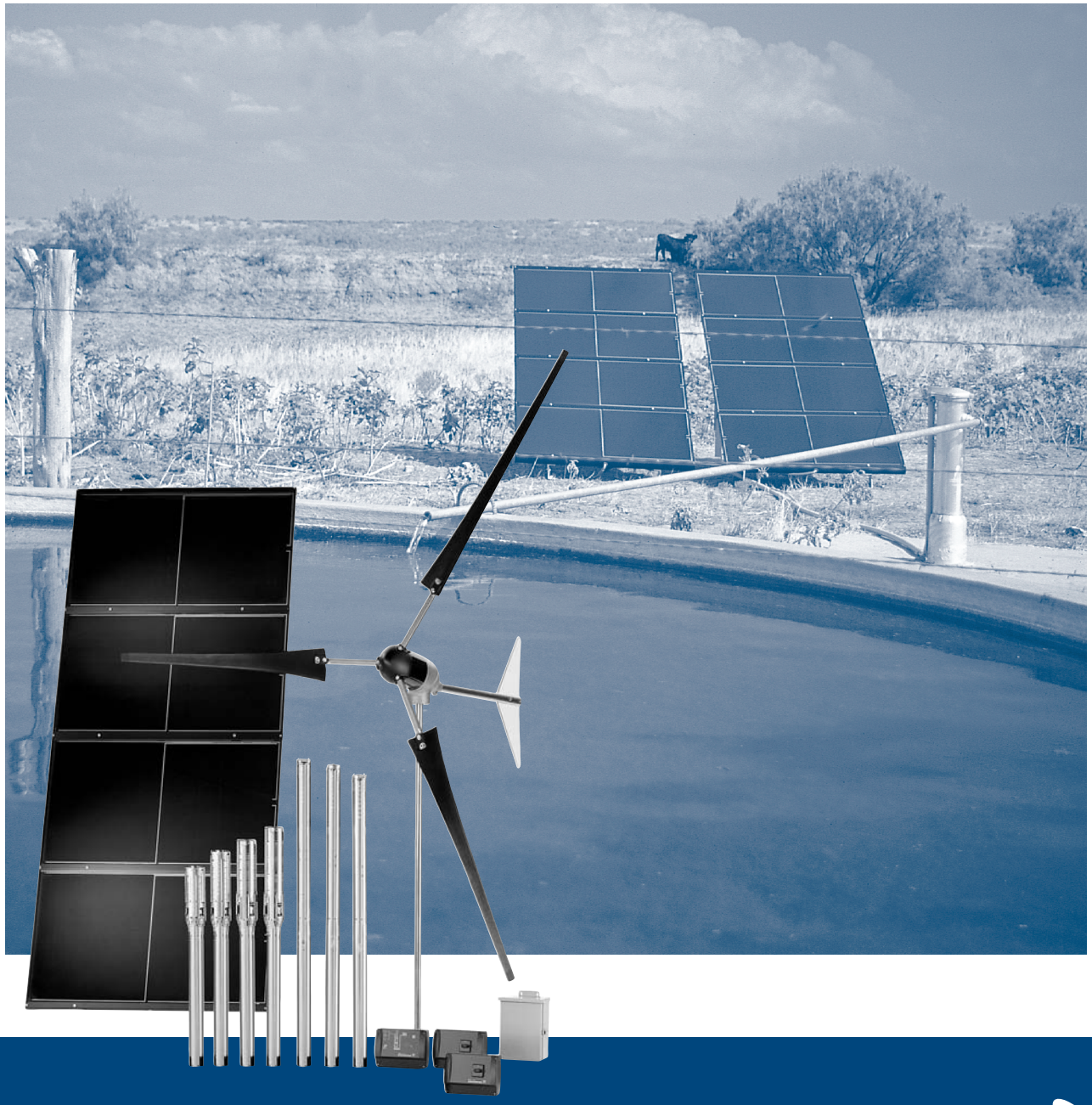
SQFlex pumping system

The SQFlex is a reliable water supply system especially suitable for remote locations not connected to the electricity supply grid. The SQFlex system is equipped with the SQFlex submersible pump.

The SQFlex system is powered by renewable energy sources.



Mission

- to successfully develop, produce, and sell high quality pumps and pumping systems worldwide, contributing to a better quality of life and healthier environment.

GBJ - Bjerringbro, Denmark

GMU - Fresno, California

GPU - Olathe, Kansas

GMX - Monterrey, Mexico

GPA - Allentown, Pennsylvania

GCA - Oakville, Ontario

- One of the 3 largest pump companies in the world
- The second largest manufacturer of submersible motors in the world
- World's largest manufacturer of circulator pumps
- World headquarters in Denmark
- North American headquarters in Kansas City - Manufacturing in Fresno, California
- 80 companies in 45 countries
- More than 16 million motors and pumps produced annually worldwide
- North American companies operating in USA, Canada and Mexico
- Continuous reinvestment in growth and development enables the company to
- **BE** responsible, **THINK** ahead, and **INNOVATE**

Service instructions

SQFlex water supply systems

Table of contents

GRUNDFOS

1. SQFlex components

1.1 Pumps

Two pump types are used, the helical rotor pump type and the centrifugal pump type.

Nameplate, helical rotor pump

The nameplate is engraved into the pump sleeve.

Fig. 1 Nameplate, helical rotor pump

Key to nameplate, helical rotor pump

Pos.	Code	Description
1	PROD. NO. 96078012	Product number
	MODEL A	Pump generation
	P1 0110	Production code - Bjerringbro (P1) + production year and week
2	xx SQF - x	Type designation, see section Type key on page 6
3	• Weight: x,x kg • MADE IN DENMARK • CE	• Pump net weight • Country of origin • Mark of approval.
4	Rp 1 1/4	Type and size of connecting thread

Nameplate, centrifugal pump

The nameplate is attached to the suction interconnector.

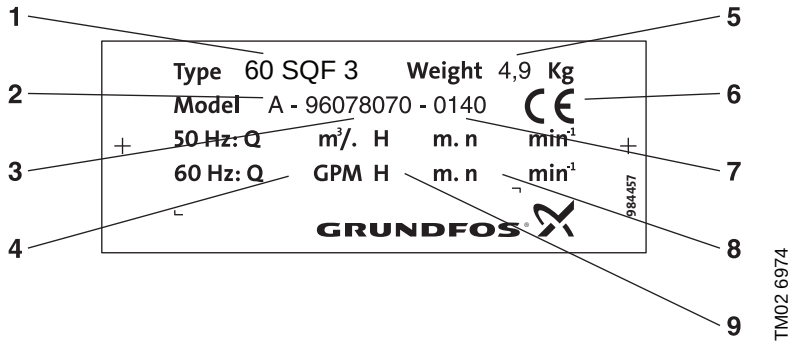


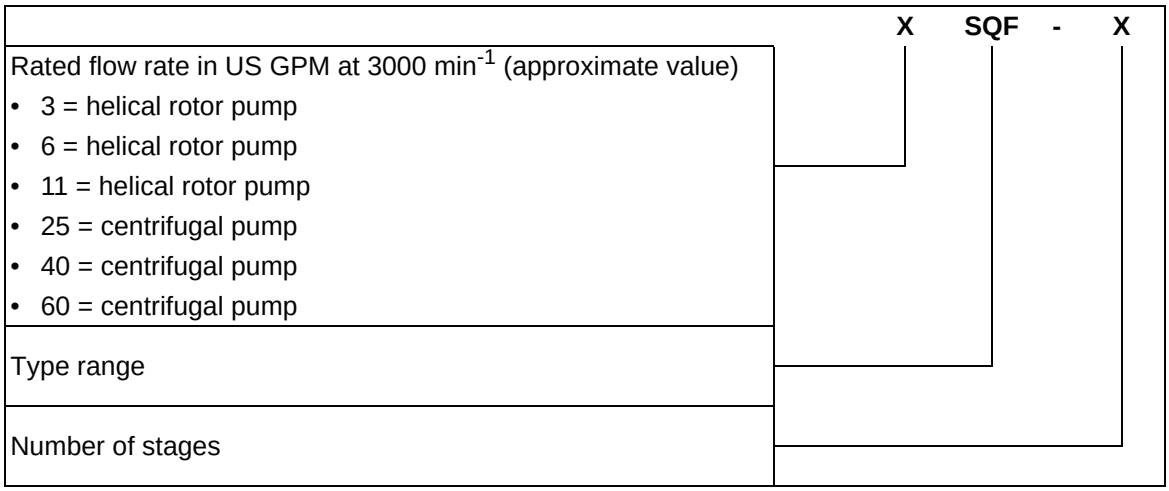
Fig. 2 Nameplate, centrifugal pump

Key to nameplate, centrifugal pump

Pos.	Code	Description
1	Type 60 SQF -3	Type designation, see section Type key on page 6
2	MODEL A	Pump generation
3	96078070	Product number
4	Q m^3	Rated flow rate (not indicated)
5	Weight 4.9 kg	Pump net weight in kg
6	CE	Mark of approval
7	0140	Production year and week
8	n min^{-1}	Speed (not indicated)
9	H	Head at rated flow rate (not indicated)

Type key

The type key is common for helical rotor pump and centrifugal pump.



Centrifugal pumps come in two main types: with splined pump shaft and with cylindrical pump shaft.
25 SQF-3 and 25 SQF-6 have a splined pump shaft. 40 SQF-3 and 60 SQF-3 have a cylindrical shaft.

1.2 Motor

The MSF 3 motor is a sealed construction made of stainless steel. It is a brushles, electronically commutated DC-motor with a permanent-magnet rotor.

Nameplate, motor

The nameplate is engraved into the stator sleeve.

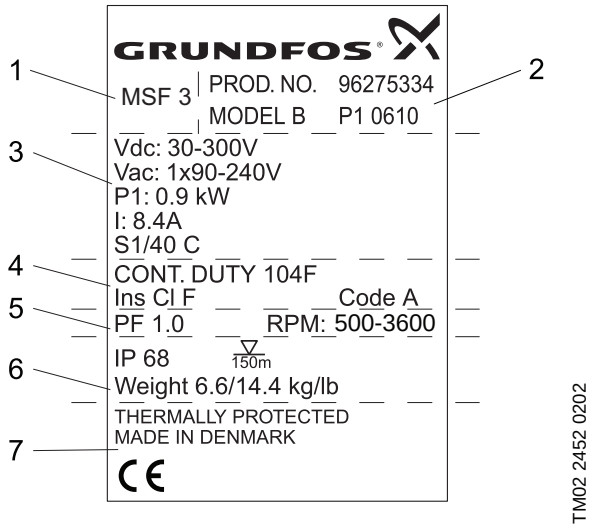


Fig. 3. Nameplate, motor

Key to nameplate, motor

Pos.	Code	Description
1	MSF 3	Type designation
2	PROD. NO. 96040989	Product number
	MODEL A	Pump generation
	P1 0110	Production code - Bjerringbro (P1) + production year and week
3	VDC: 30-300 V VAC: 1 x 90-240 V	The motor can be supplied with either DC or AC voltage: • DC: 30-300 V or • AC: 1 x 90-240 V
	P1: 0.9 kW	Maximum input power [kW]
	I: 7 A	Maximum input current [A]
	S1/40 C	Suitable for continuous operation up to 40×C
4	CONT. DUTY 104F	Suitable for continuous operation at 104°F
	Ins Cl F Code A	Insulation class F. Start-kVA is 0-3.15 per hp
5	PF 1.0 RPM 500 - 3600	Power factor = 1. Rated speed 500 - 3600 rpm
6	IP 68 150 m	Enclosure class: IP 68. Max submerged depth: 150 m
	Weight 6.55/14.4 kg/lb	Motor net weight in kg and pounds
7	THERMALLY PROTECTED	Temperature sensor built into the electronic unit
	MADE IN DENMARK	Country of origin
	CE	Mark of approval

1.3 Control and switch boxes

1.3.1 CU 200 SQFlex control unit

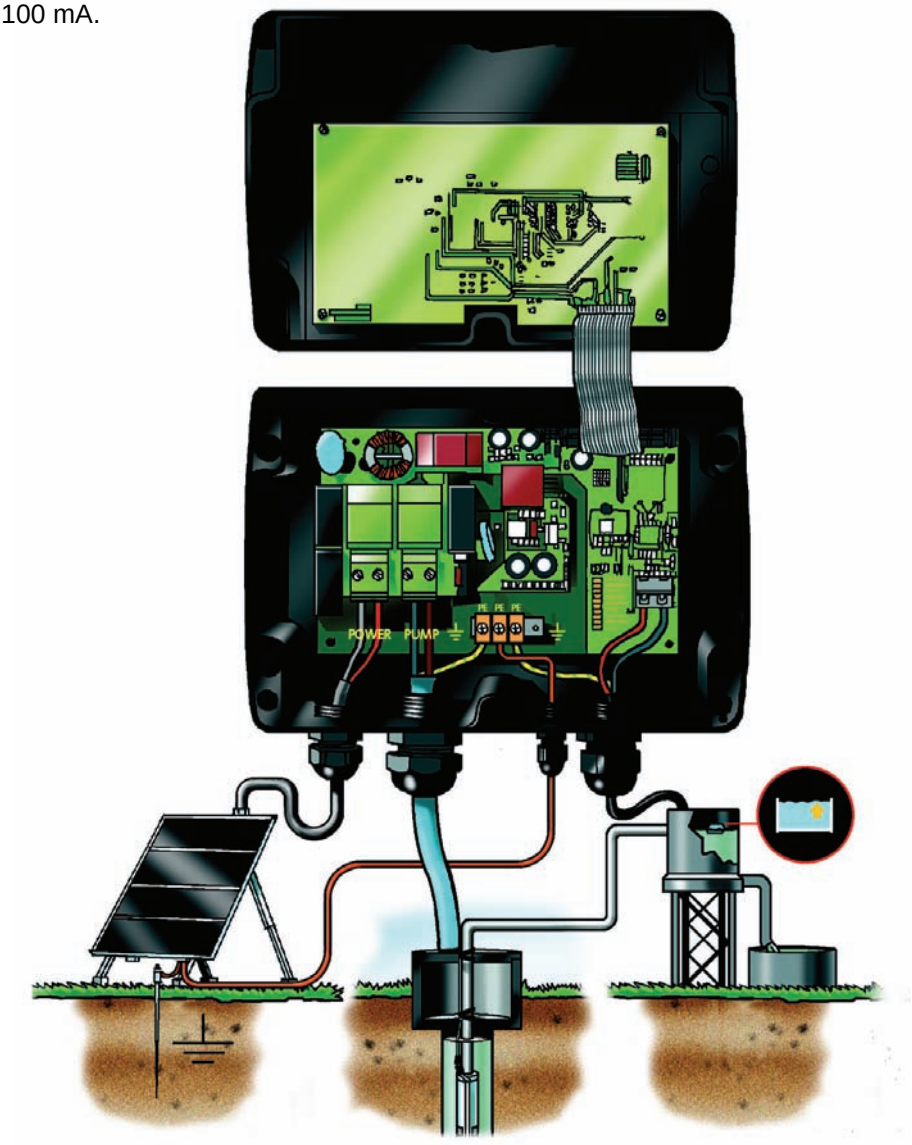
The CU 200 SQFlex control unit offers:

- system monitoring on the basis of sensor signals
- system control on the basis of sensor signals
- monitoring of pump operation and alarm indication.

Technical data

- 30-300 VDC, PE.
- 1 x 90-240 V –10%/+6%, 50/60 Hz, PE.

Maximum load: 100 mA.



Internal (and external) wiring of CU 200 SQFlex control unit

CU 200 SQFlex display and indicator lights

The front cover of CU 200 features a button and various indications:

ON/OFF button

- Green light on: The system has been switched on.
- Red light on: The system has been switched off.
- Both lights off: The system lacks the required power to light the display.
- Flashing green light: The system has adequate power to light the display but lacks sufficient power to start the pump.

Full water reservoir

The yellow light indicates that the water reservoir is full.

Pump operation

A running green light indicates that the pump is operating at more than 500 rpm.

Fault indicator

Red light indicates fault.

Dry running

Red light indicates lack of water.

Power and fault codes

The display indicates 0 Watt until the power supply is sufficient to run the pump at 500 rpm; upon startup, the power consumption of the pump is indicated in kW.

When the fault indicator is on, the display indicates fault codes, see Trouble-shooting by means of CU 200 on page 10.

F1 = overvoltage

F2 = overtemperature

F3 = no contact to the pump

F4 = overload

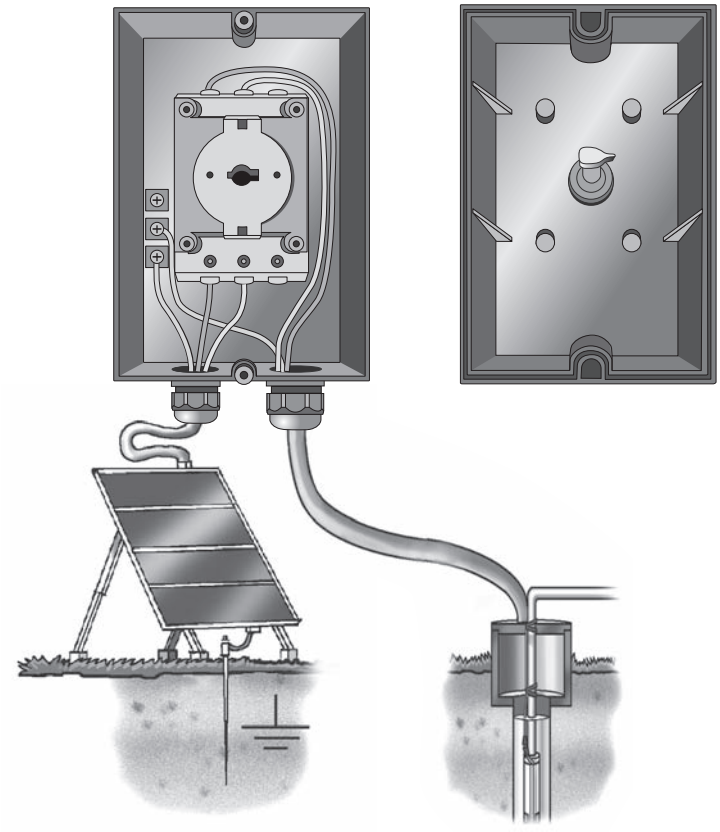
Trouble-shooting by means of CU 200

Indication/Fault	Possible cause	Remedy
1. No light in front cover. Pump does not deliver water.	No voltage supply.	• Reestablish the voltage supply.
	Position of ribbon cable connector is wrong or cable is defective.	• Correct the position of the cable or replace it.
2. No light in front cover, and pump does not deliver water. But the LEDs inside CU 200 indicating 5 V, 10 V and 24 V internal supply voltage are on, and the 'CONTROL INDICATOR' LED is not flashing.	CU 200 is defective.	• Replace the CU 200.
3. Pump does not start. Green indicator light in ON/OFF button is on. No fault indicated.	CU 200 or pump is defective.	• Check that the 'CONTROL INDICATOR' LED is flashing. If not, replace the CU 200. • Check that there is sufficient voltage on the PUMP terminals. If no voltage can be measured, replace the CU 200. If a supply voltage to the pump can be detected, continue as follows: • Switch off the energy supply and wait for one minute. • Switch on the energy supply and observe what happens: If the green indicator light in the ON/OFF button is on and the pump still does not start, the pump or pump cable is defective. • Repair or replace pump or cable.
4. Off light in the ON/OFF button is on.	Pump has been stopped.	• Press the ON/OFF button on the CU 200 to start the pump.
5. CU 200 indicates 'F3 = no contact to pump'.	CU 200 defective.	• Check - the connection in the CU 200 - the pump cable - the end cover with socket on the pump.
	Pump cable or connections defective.	
	Pump is defective.	• Repair or replace the pump.
6. CU 200 indicates 'F1 = overvoltage'	Supply voltage is above permissible range.	• Disconnect the solar modules to allow the voltage to drop. • Reconfigure the modules and reconnect them. If a different supply source is used, check that the voltage is within the recommended voltage range. **Note:** As the voltage is detected at the motor, allow for the voltage drop in the pump cable.
7. CU 200 indicates 'F2 = overtemperature'.	Too high water temperature.	• Ensure that the water temperature is below the maximum permissible level.
	Incrustations on motor.	• Remove incrustations on the motor.
	Pump is defective.	• Repair or replace the pump.

Indication/Fault	Possible cause	Remedy
8. CU 200 indicates 'F4 = overload'.	Too low input voltage.	• Increase the supply voltage, to 30 VDC or higher.
	Pump is defective.	• Repair or replace the pump.
	Only helical rotor pumps. Pumped liquid is contaminated with oil or similar substance.	• Clean the liquid and replace the pump.
	Motor liquid low / Missing.	• Check or refill motor liquid.
9. Green indicator light in ON/OFF button is flashing.	Insufficient power supply.	• Increase the number of solar modules or connect an alternative energy supply, such as wind turbine, batteries or generator.
	Pump has seized up.	• Clean the pump.
10. Running light on CU 200 but low wattage.	System not grounded.	• Check system for adequate grounding
	Pump is defective.	• Repair or replace the pump. If a centrifugal pump is used: Check that the riser pipe is not blocked.
11. No light in front cover. Pump delivers water.	CU 200 is defective.	• Replace the CU 200.
	Ribbon cable not mounted.	• Mount the ribbon cable.
12. Pump does not stop when water reservoir is full. Fault indicator light on CU 200 is off.	Level switch is dirty or defective.	• Clean or replace the level switch.
	Cable on level switch is damaged.	• Replace the cable.
13. Pump does not stop when water reservoir is full. Fault indicator light on CU 200 is on.	CU 200 is defective.	• Replace the CU 200.
14. Pump does not start when water reservoir is empty. Water reservoir indicator is on.	Level switch is defective.	• Replace the level switch.
	Cable on level switch is damaged.	• Replace the cable.
	CU 200 is defective.	• Replace the CU 200.

1.3.2 IO 50 SQFlex switch box

The IO 50 enables manual starting and stopping of the pump in a solar-powered SQFlex system. In addition, the IO 50 functions as a connection point for all necessary cables.



Internal (and external) wiring of IO 50 SQFlex switch box

Technical data:

DC: Max. 225 V, PE.

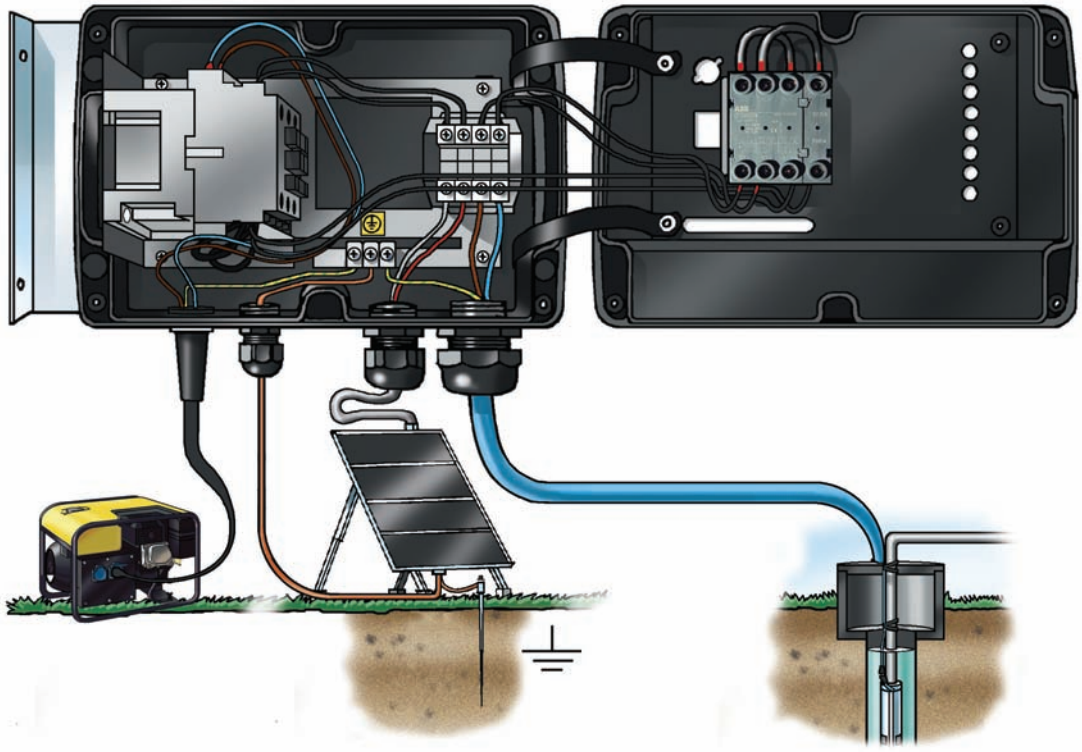
AC: Max. 265 V, 50/60 Hz, PE.

1.3.3 IO 101 SQFlex switch box

The IO 101 SQFlex switch box makes it possible to

- switch off the voltage supply to the pump and
- connect a back-up generator.

A back-up generator is useful in periods of insufficient solar energy or in case of an immediate requirement for water supply or a need for water at night.



Internal (and external) wiring of IO 101 SQFlex switch box

Technical data:

- DC: Max. 225 V, PE.
- AC: Max. 265 V, 50/60 Hz, PE.

The internal relay in the IO 101 has the following rated voltage:

- 115 V –15%/+10%, 50/60 Hz, PE.

1.3.4 IO 102 SQFlex breaker box

The IO 102 is applicable in SQFlex systems powered exclusively by a wind turbine

The IO 102 SQFlex breaker box makes it possible to

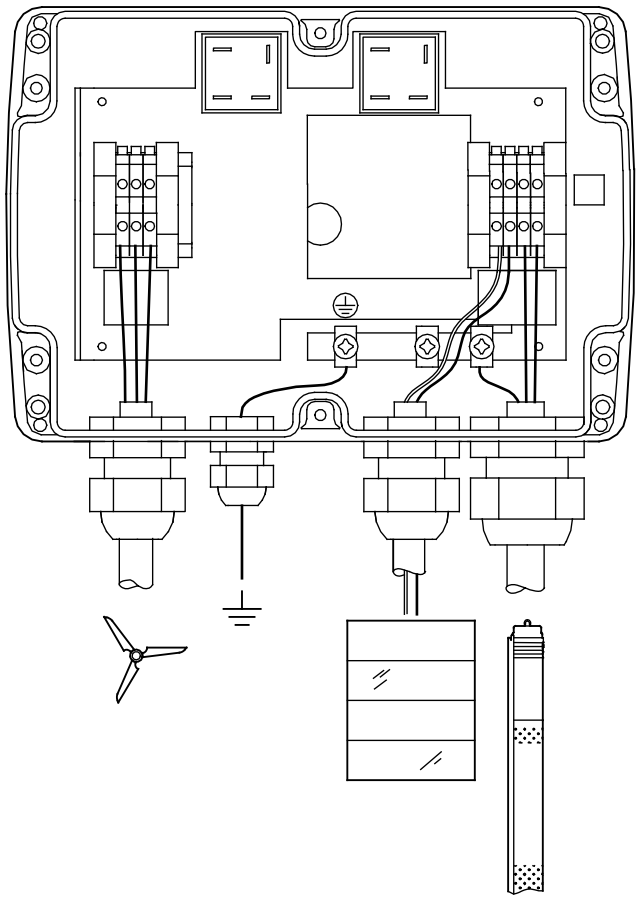
- switch off the voltage supply to the pump, and
- Stop the wind turbine blades
- connect solar modules as well as a wind turbine.

The IO 102 is applicable in SQFlex systems provided the system voltages mentioned below are not exceeded.

Technical data:

- DC: Max. 225 V, PE
- AC: Max. 265 V, 50/60 Hz, PE.

IO 102



Internal (and external) wiring of IO 102 SQFlex breaker box

1.4 Solar modules

Positioning

Solar modules located in the **northern hemisphere** should face south. Use a compass to position the modules as precisely as possible. Due to the magnetic declination it may be necessary to turn the modules some degrees away from the direction of the compass. In case of positive declination, turn the modules some degrees to the west, in case of negative declination, turn the modules some degrees to the east. See *Fig. 4*.

Solar modules located in the **southern hemisphere** should face north. Use a compass to position the modules as precisely as possible. Due to the magnetic declination it may be necessary to turn the modules some degrees away from the direction of the compass. In case of positive declination, turn the modules some degrees to the east, in case of negative declination, turn the modules some degrees to the west. See *Fig. 4*.

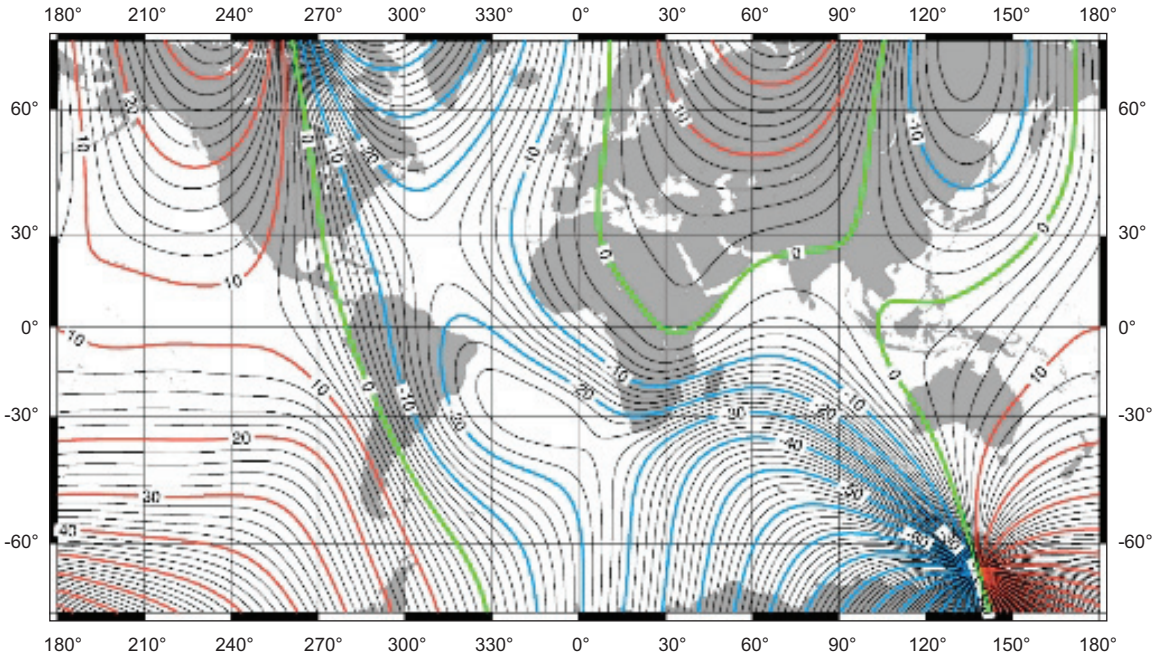


Fig. 4. The map illustrates the differences in magnetic declination in different parts of the world. Declination is caused by the fact that the geographic north pole and the magnetic north pole are not located in the same place. Depending on your location on the globe you must turn the solar modules away from the direction of the compass. How much appears from the map.

Mounting

The solar modules must be mounted on a support structure.

When mounting the solar modules, make sure that the module frames overlap in order to allow for rain water to run off.

For further information on the installation of solar modules, see installation and operating instructions for the modules.

Tilt angle

For maximum utilisation of the solar radiation the tilt angle of the support structure can normally be adjusted from 15° to 45°.

1.4.1 GF 80 solar modules

TM04 5085 2609

The GF 80 solar modules are equipped with plugs and sockets for easy connection of several modules in parallel or series. The solar modules must be mounted on a support structure, tilted at an angle ensuring optimum utilization of the solar energy.

This module is UL, Tüv, CE and IEC 61215 approved.

	GF 80	
Peak power (P_{Max})	80	W
Voltage ($V_{mp)}$	33.3	V
Current (I_{mp})	2.4	A
Open circut voltage (V_{oc})	41.5	V
Short circut current (I_{sc})	2.6	A
Reference cell temperature (T_{cref})	25	°C
Solar irradiation at reference cell temperature (I_{tref})	1000	W/m^2

Visual inspection of solar modules

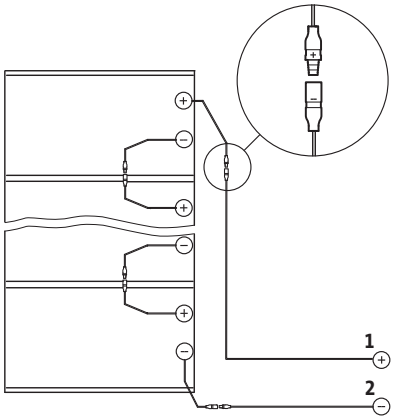
- Check that the solar modules are intact.
- Make sure that trees, grass, bushes, buildings, etc. do not cast a shadow on the solar modules.

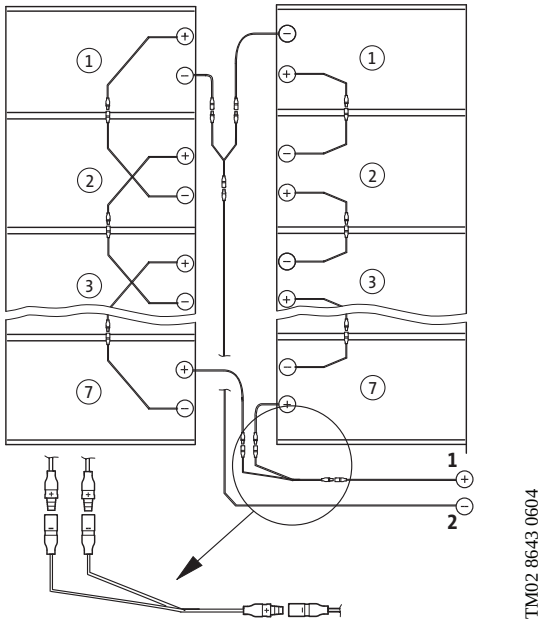
Electrical connection GF 80 solar modules

Note: Before making any electrical connections, make sure that the solar modules are covered with a non-transparent covering material to ensure that the modules are dead.

- The cover must be removed before measuring is made.
- Measurements must be made when the solar modules are not connected.
- The current to be measured is the short-circuit current I_{SC}.

Electrical connection GF 80 solar modules (continued)





The solar panels must be connected to earth via a Protective Earth (PE) conductor

Note: To achieve good earth connection and thus to protect persons, it is of decisive importance to fit the earth clips and earth terminals

Cable sizing chart

Panels	Power (Wp)	Volts (Vmp)	Amps (Imp)	Volts (Voc)	Amps (Isc)	14 AWG	12 AWG	10 AWG	series	parallel
1	80	33	2.4	42	2.6	82	130	207	1	
2	160	67	2.4	83	2.6	164	261	415	2	
3	240	100	2.4	125	2.6	246	391	622	3	
4	320	133	2.4	166	2.6	328	522	829	4	
5	400	167	2.4	208	2.6	410	652	1037	5	
6	480	200	2.4	249	2.6	493	783	1244	6	
7	560	233	2.4	291	2.6	575	913	1451	7	
8	640	266	2.4	332	2.6	657	1044	1659	8	
8	640	133	4.8	166	5.2	164	261	415	4	2
9	720	100	7.2	125	7.8	82	130	207	3	3
10	800	167	4.8	208	5.2	205	326	518	5	2
12	960	200	4.8	249	5.2	246	391	622	6	2
14	1120	233	4.8	291	5.2	287	457	726	7	2
15	1200	167	7.2	208	7.8	137	217	346	5	3
16	1280	133	9.6	166	10.4	82	130	207	4	4
18	1440	200	7.2	249	7.8	164	261	415	6	3

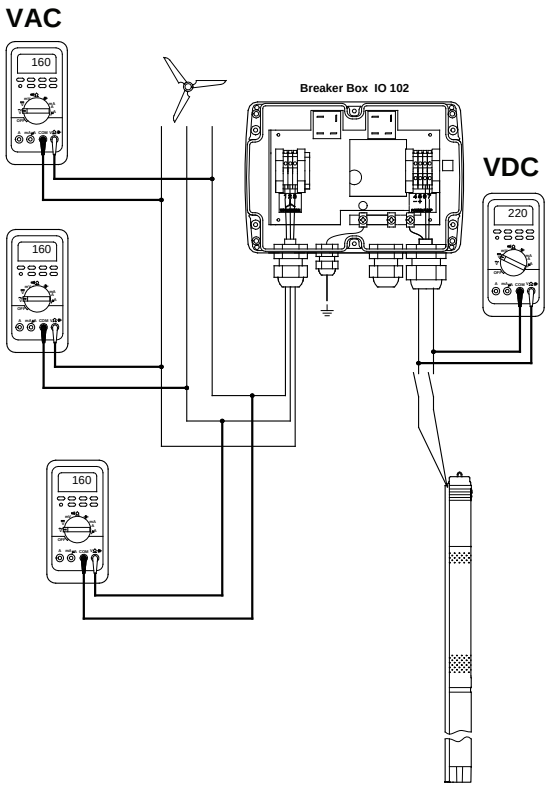
Note: max. cable length in feet; uses a max. 3 % voltage drop

Max. cable length between CU200 and SQF = 650 ft.

SQ Flex is most efficient at 120V and above. Grundfos recommends combining panels to produce 120 or above.

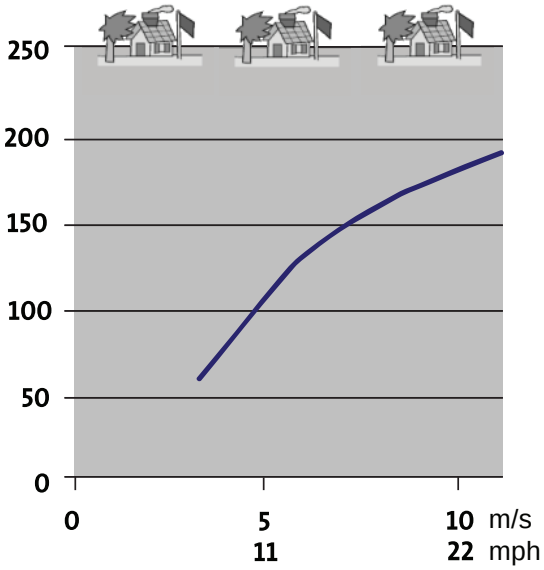
1.5 Wind turbine

TM04 5087 2609

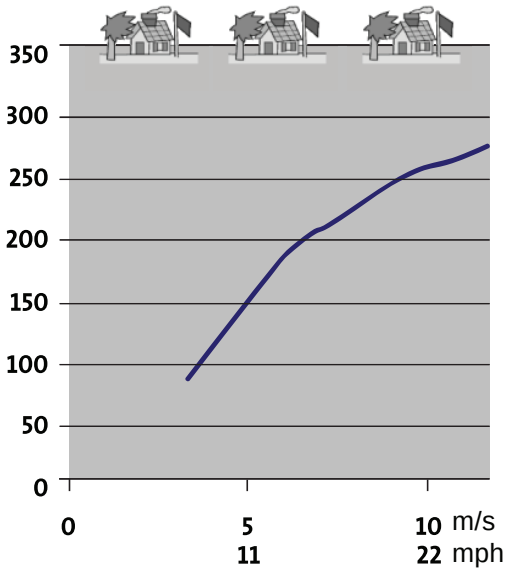


Measurement of VAC and VDC

Wind turbine
voltage [VAC]



IO 102
voltage [VDC]



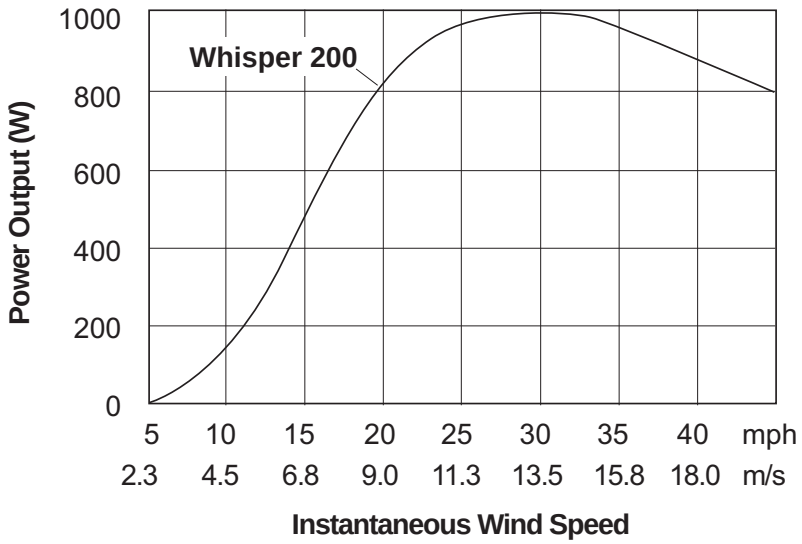
Values measured between the three phases must be identical.

1.5.1 Trouble-shooting

1. Find out if the problem is mechanical or electrical.
   - Propeller cannot turn = Mechanical problem, see Mechanical problems on page 20.
   - Propeller turns slowly = Electrical problem, see Electrical problems on page 21.
     Electrical problems may be in the wind turbine or the IO 102 breaker box. Determine which as follows:
2. Disconnect the three wires from the wind turbine one at a time at the IO 102 breaker box. If the propeller starts, the wire that allowed it to start leads to a defective rectifier in the IO 102 breaker box. Replace the breaker box, see Overview of possible system combinations on page 26.
3. If the propeller still does not start, the problem is in the tower wiring or the wind turbine.
4. The propeller is running, but may have an electrical problem. Using a voltmeter, read the voltage across the leads and see the list below as a guide to possible problems.
   - The voltage increases and decreases slowly with wind speed and equally across all wires = Everything OK.
   - No voltage across two wires = One wire from wind turbine is not carrying power. Check in order:
     -the tower wiring to ensure it is properly wired.
     -slip rings and brushes,
     -stator connections and stator windings for obvious damage.
   - The voltage is significantly higher across two wires than the others = Contact the distributor or the factory.
   - Voltage is produced even after ON/OFF switch is activated = Possibly a faulty ON/OFF switch or a wire has been short circuited to the other two wires or an internal fault has occurred in the IO 102 breaker box.
   - The voltage is significantly lower across two wires than the others = Bad connection at the wind turbine voltage connections or faulty stator winding.
5. Should these steps not solve the problem, proceed directly to Electrical problems on page 21.

Wind turbine power outpout

Instantaneous speed



Mechanical problems

Fault	Cause	Remedy
1. Propeller is stationary, even in high winds.	• Ice in wind turbine, or uneven ice on propeller. • Debris between rotor and stator. • Loose magnet. • Worn-out bearing.	• Remove ice, or wait for warm weather. • Turn propeller gently by hand and blow or use piece of paper to dislodge debris. • Contact distributor. • Contact distributor.
2. a) Propeller will not turn at all except in high wind b) Scraping or rubbing sound at low rpm c) Propeller always stops in the same position.	• Same as above. • Swelled wire keepers due to high moisture.	• Same as above. • Contact distributor.
3. a) Propeller is difficult to start b) Output is low c) more propeller noise than usual. d) Propeller seems out of balance.	• Ice on blade. • Dirty blade. • Split, warped or damaged blade. • One or more blades fitted wrongly.	• Remove ice, or wait for warm weather. • Clean with soap or bug cleaner. • Replace broken or damaged blade. • Fit blade(s) correctly.
4. Propeller turns a little, but never starts properly.	• Blades fitted wrongly.	• Fit blades correctly. Leading edge should move clockwise when viewing propeller from the front.
5. Tail, wind turbine and tower vibrate.	• Blade out of balance. • Blade not tracking.	• Contact distributor.
6. Rattling or clunking sound from wind turbine.	• wind turbine loose in tower. • Loose rotor (magnet can) on shaft, loose tail, missing rubber bumper, wires slapping inside of mast, governor pivot bolt loose. • Worn bearings. • Shaft broken.	• Retighten mounting screws. Use Loctite or equivalent thread-locking compound. • Repair as required. • Contact distributor. • Contact distributor.

Electrical problems

Note: Always be aware of the danger of high voltage. Do not directly touch the wires.

Fault	Possible cause	Remedy
1. Pump does not operate and propeller do not turn or turns slowly even in high winds.	• The wind speed is too slow.	• Wait for the wind speed to increase.
	• The IO 102 ON/OFF switch is set to OFF.	• Set the IO 102 ON/OFF switch to ON.
	• Pump defective or pump cable short circuit.	• Set IO 102 ON/OFF switch to OFF. Disconnect the pump from IO 102. Set ON/OFF switch to ON. If the propeller starts to turn, either the pump or the pump cable is defective. Set IO 102 ON/OFF switch to OFF. Replace the defective part and reconnect to IO 102. Set ON/OFF switch to ON.
	• IO 102 is defective.	• Set IO 102 ON/OFF switch to ON. Disconnect the three wires from the wind turbine one at the time at the IO 102. if the proppeler starts to turn the IO 102 is defective. Replace the IO 102.
2. Pump does not operate and propeller turns fast.	• Wires between IO 102 and pump may be disconnected.	• Set IO 102 ON/OFF switch to OFF. Reconnect the wires. Set IO 102 ON/OFF switch to ON.
	• Pump defective.	• Set IO 102 ON/OFF switch to OFF. Replace the pump. Set IO 102 ON/OFF switch to ON.
3. Pump does not operate. Propeller turns fast and are not alowing down when IO 102 ON/OFF switch is set to OFF.	• One or more wires between wind turbine and IO 102 may be disconnected.	• Set IO 102 ON/OFF switch to OFF. Reconnect the wires. Set IO 102 ON/OFF switch to ON.
	• Wind turbine defective.	• Set IO 102 ON/OFF switch to OFF. Replace wind turbine. Set IO 102 ON/OFF switch to ON.
	• IO 102 defective.	• Try to disconnect the three wires from the wind turbine in the IO 102 and short circute them. If the propeller slows down or stops, the IO 102 is defective. Replace the IO 102.

2. Start-up

The starting sequence has three steps:

1. Charging the capacitor
2. positioning of the rotor
3. start.

Consequently, during start-up the motor will make small rotations in order to bring the rotor into the correct starting position. These rotations also ensure that there is water in the pump and that the pump parts are lubricated.

During start-up current consumption will be uneven but when the motor has started, current consumption will be constant.

Helical rotor pumps:

- If sufficient energy is available the pump will normally be running within one minute.
- If sufficient energy is available and the motor does not start within 15 minutes, the pump rotor may be stuck due to dryness. This situation can arise if the pump has been stocked for some time. Dismantle the pump and loosen the rotor, or add water to the pump rotor/stator assembly.
- If sufficient energy is not available the starting sequence will be repeated.

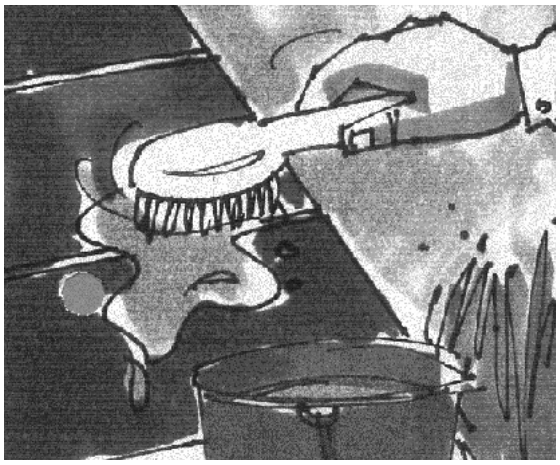
Please note that after the pump has started running, it will take a while to fill the riser pipe. How long depends on the energy available, the installation depth and the dimensions of the riser pipe. At moderate energy supply and high head, it may take up to one hour.

3. Maintenance

This section describes how to maintain solar modules and wind turbines. Under normal operating conditions the pumps and the controls are maintenance-free.

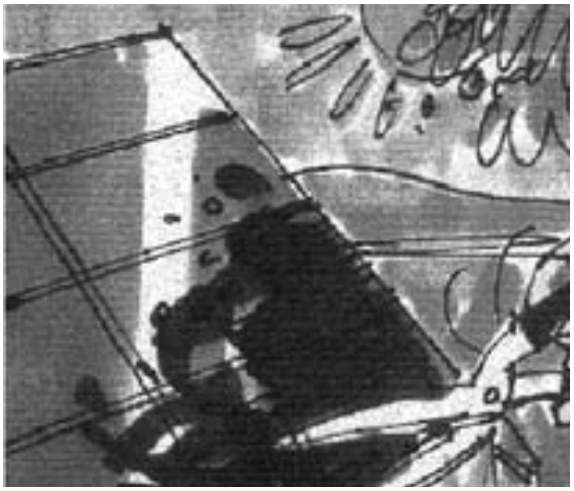
3.1 Solar modules

Routine maintenance



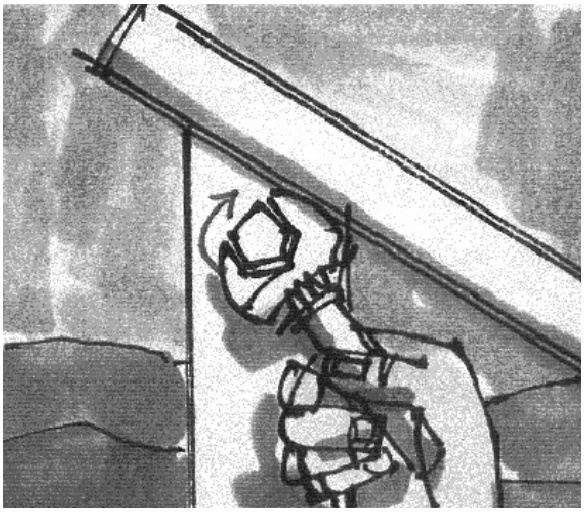
Cleaning

- The solar modules must be cleaned when they are dirty. Use only clean water without soap and a soft brush or cloth. Make sure there is no sand or other abrasive particles in the water.
- There is no need to clean the modules underneath.



Clearing

- Make sure that the sun can shine directly on the modules.
- Cut down grass or trees that cast a shadow on the solar modules.

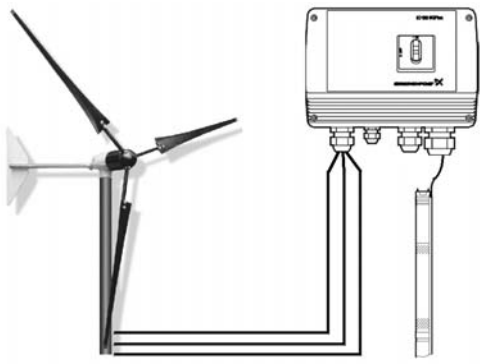


Tighten

- Tighten screws and nuts on the support structure if they have loosened.

3.2 Wind turbine

Monthly maintenance

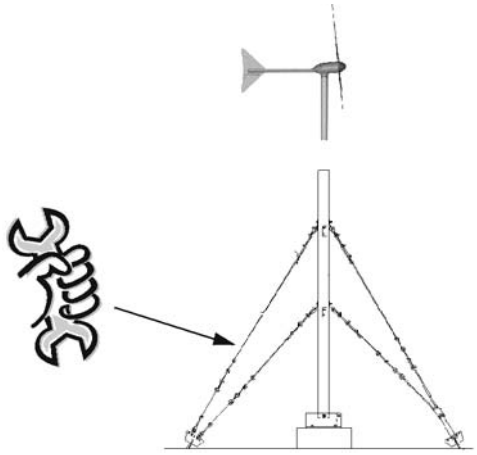


Test brake

(This checks electrical wiring.)
Stop the wind turbine in a moderate wind (charging but not furling). No unusual difficulty or noise should be experienced in stopping the propeller. A noise during braking can indicate a disconnected wire.

Check mechanical condition

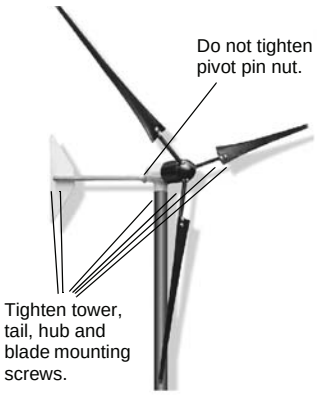
Watch and listen from the tower base.
Use binoculars. The propeller and tail must not wobble. There should be no mechanical noise, rattle or vibration.
Lower or climb the tower for inspection, if required. There should be no buzzing either heard or felt with your hand on the tower mast. Go to section Electrical problems on page 21, if required.



Inspect the tower

Follow all inspection and maintenance requirements of the tower manufacturer. Tighten all nuts and screws, especially wire clips. Check for cracks and bent or broken parts at the anchors and base structure. Check for broken wire strands and tighten guys.

Annual maintenance



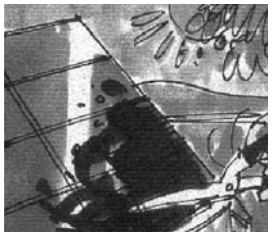
Complete mechanical check

- Lower the tower
- Repair or replace any worn or loose parts.
- Check tightness of all tower mounting nuts and screws and propeller mounting screws.
- Check all bearings. Just perceptible play is acceptable.
- Clean the propeller with mild detergent to remove all dirt and debris. Replace blades if they are cracked or damaged.

4. Trouble-shooting

Visual/general inspection of main components

Before starting specific Trouble-shooting, go through these simple visual inspections first.



Visual inspection of solar modules

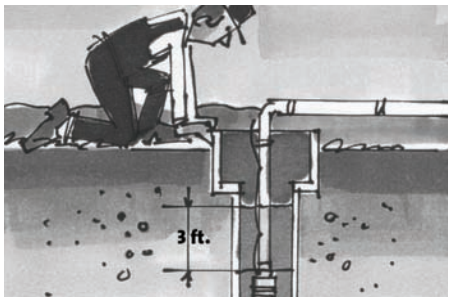
- Check that the solar modules are intact.
- Make sure that trees, grass, bushes, buildings, etc. do not cast a shadow on the solar modules.

Visual inspection of the wind turbine,

see Check mechanical condition on page 24

Visual inspection of cables

- Check that the cables are intact.

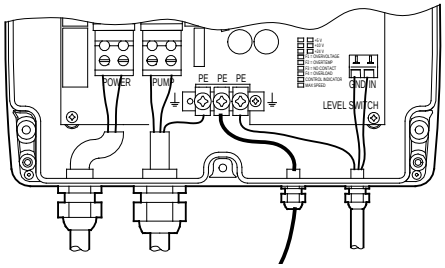


Visual inspection of the water level

The water level must be at least 3 ft. above the pump.
The dry running sensor must be under water.

Visual inspection of pipes and hoses

- Check that hoses or pipes are intact.

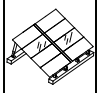
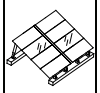
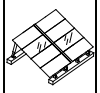
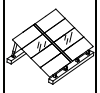
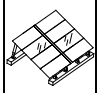


Test by means of a service CU 200

If available, a CU 200 can be used for testing systems without a CU 200. Connect the CU 200 and proceed according to the instructions in section 1.3.1 CU 200 SQFlex control unit on page 8.

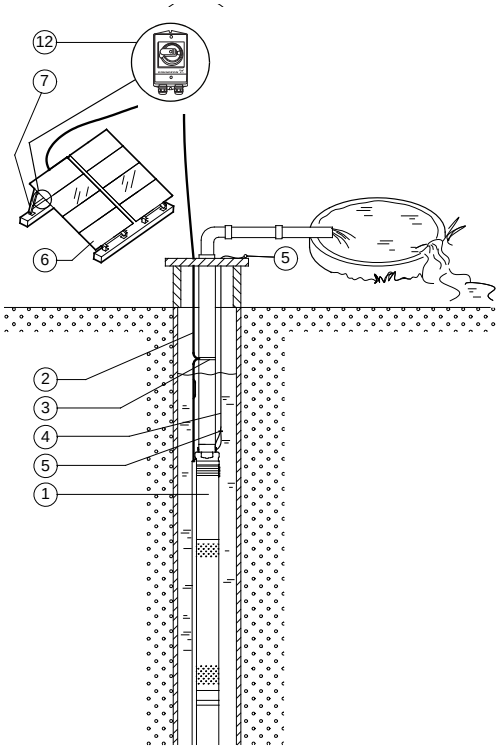
Overview of possible system combinations

1. **In the table below find the system corresponding to your system.**
2. Follow the Trouble-shooting instructions for your system.
   In systems with solar modules Trouble-shooting must be carried out in the middle of an unclouded day.
   In systems with wind turbine Trouble-shooting must be carried out at a wind speed of minimum 3.5 m/s (8 mph).
3. Find the faulty component and repair/replace it or contact the Grundfos Service Centre stating the data from the component's nameplate.

System	System components						
	Pump	Solar panel	Wind turbine with IO 102	Generator/ supply network	Switch box	CU 200 control unit	Level switch
4.1 Solar-powered system on page 27					 IO 50		
4.2 Solar-powered system with CU 200 control unit and level switch on page 29							
4.3 Solar-powered system with generator back-up on page 31					 IO 101		
4.4 Wind-powered system on page 33							
4.5 Wind-powered system with CU 200 control unit and level switch on page 35							
4.6 Combined system on page 37							
4.7 Combined system with CU 200 control unit and level switch on page 39							
4.8 Options with generator as back-up source on page 41		*	*		 IO 101	*	*

* May be a component in the system.

4.1 Solar-powered system



Pos.	Component
1.	SQF pump
2.	Submersible drop cable
3.	Cable clips
4.	Straining wire
5.	Wire clamps
6.	Solar modules
7.	Support structure
12.	IO 50 SQFlex switch box

Fig. 5. Solar-powered system and its main components

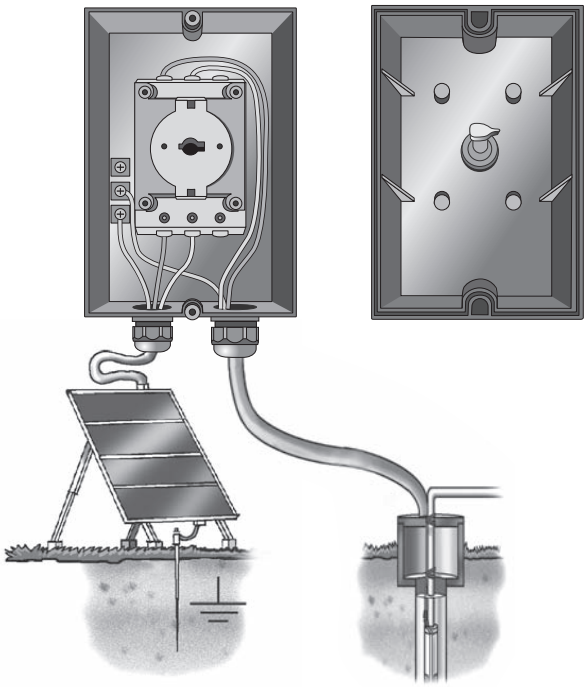


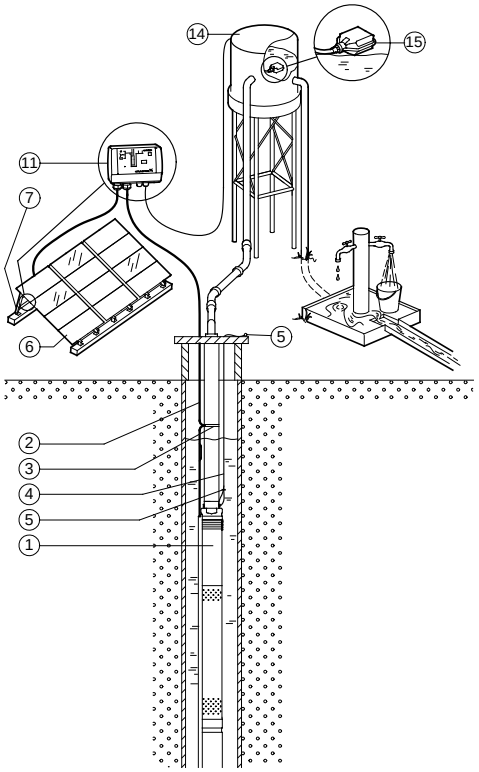
Fig. 6. Internal (and external) wiring of IO 50 SQFlex switch box.

If the system does not work properly, follow the instructions in section 4.1.1 Trouble-shooting of a solar-powered system on page 28.

4.1.1 Trouble-shooting of a solar-powered system

1. **Disconnect the pump**
   - Set the IO 50 switch to off.
   - Disconnect the pump cable from the terminals (6T3, N, 8T4).
2. **Check the solar modules**
   - Measure the voltage and short-circuit current across the terminals (2T1, 4T2).
     See electrical connection in Section 1.4.
     If the DC voltage or DC current is outside the range, one or more of the solar modules is faulty.
     Replace the faulty solar module/s.
3. **Check the IO 50 box**
   - Set the IO 50 switch to on.
   - Measure the DC voltage across the terminals using a voltmeter.
   - Measure the DC current through the wires using an ammeter.
     If the values differ from the values measured under step 2, the IO 50 is defective.
     Replace the IO 50 box.
4. **Check the pump**
   - Set the IO 50 switch to Off.
   - Reconnect the pump cable to the terminals.
   - Switch on the pump by setting the IO 50 switch to On.
     Note that the dry running sensor is covered with water.
     If the pump starts, it was stopped due to dry running and has now been reset.
     - Wait five minutes.
       If the pump does not start, it is defective. Repair or replace the pump.

4.2 Solar-powered system with CU 200 control unit and level switch



Pos.	Component
1.	SQF pump
2.	Submersible drop cable
3.	Cable clips
4.	Straining wire
5.	Wire clamps
6.	Solar modules
7.	Support structure
11.	CU 200 control unit
14.	Water reservoir
15.	Level switch (optional)

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Fig. 7. Solar-powered system with CU 200 and level switch

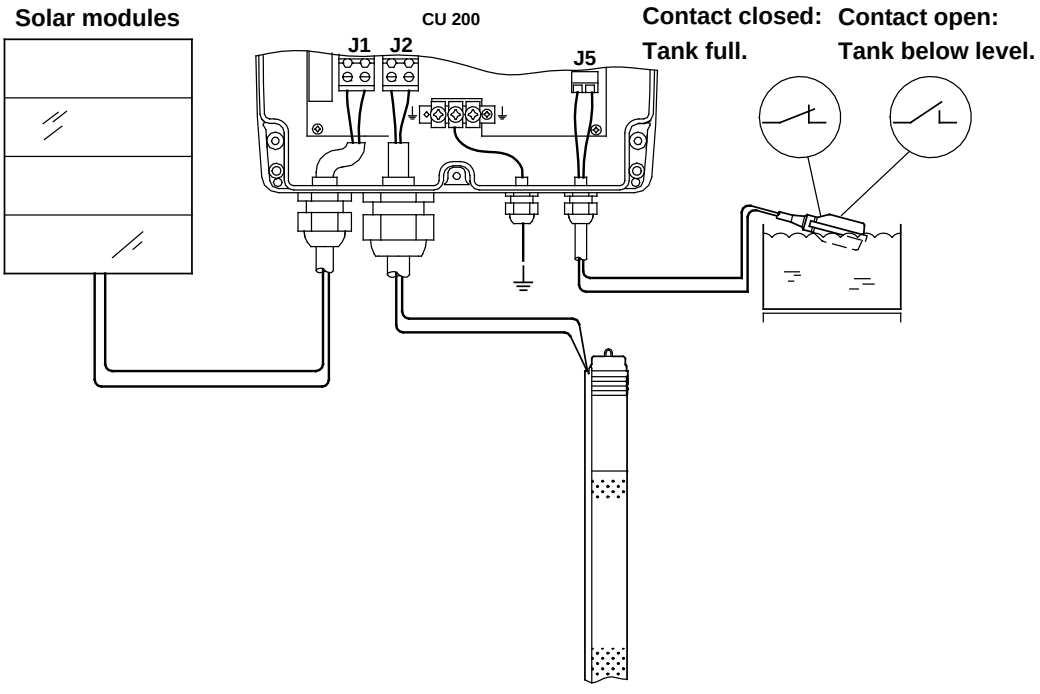

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Fig. 8. Internal (and external) wiring of CU 200 SQFlex control unit

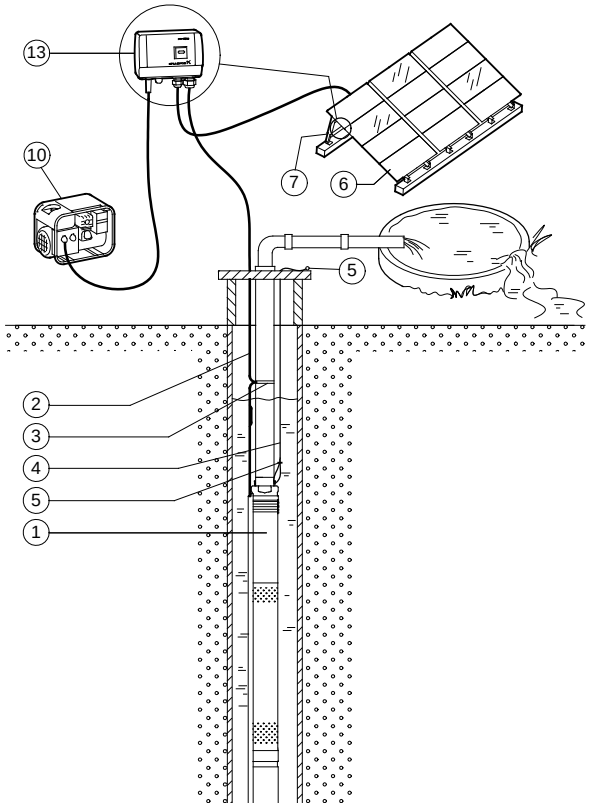
If the system does not work properly, follow the instructions in section 4.2.1 Trouble-shooting of a solar-powered system with CU 200 control unit and level switch on page 30.

4.2.1 Trouble-shooting of a solar-powered system with CU 200 control unit and level switch

All measuring points/terminal designations in the following refer to the CU 200 control unit.

1. **Check the system by means of the CU 200**
   If the CU 200 indicates fault, proceed according to section Trouble-shooting by means of CU 200 on page 10.
2. **Disconnect the pump**
   - Switch off the pump by pressing the ON/OFF button at the CU 200. The OFF light must be on.
   - Disconnect the pump cable from the terminal J2.
3. **Check the solar modules**
   - Measure the voltage and short-circuit current across the terminals (2T1, 4T2).
     See electrical connection in Section 1.4.
     If the DC voltage or DC current is outside the range, one or more of the solar modules is faulty.
     Replace the faulty solar module/s.
4. **Check the level switch in the water reservoir**
   - Disconnect the level switch cable from the terminal J5.
   - Measure the disconnected level switch cable with an ohmmeter.
   - Turn the level switch upwards => the contact in the level switch is closed. The measured value must be approx. 0 Ω.
   - Turn the level switch downwards => the contact in the level switch is open. The measured value must be ∞ Ω.
     If one of the two values is not correct, the level switch is defective. Replace the level switch.
5. **Check the CU 200 control unit**
   - Let the level switch remain disconnected.
   - Measure the voltage and current across the terminals for the pump (J2).
     If the values measured differ from the values measured under step 3, the CU 200 is defective.
     Replace the CU 200.
6. **Check the pump**
   - Make sure that CU 200 is set to off by pressing ON/OFF button. The OFF light must be on.
   - Reconnect the pump cable to the terminal J2.
   - Reconnect lewel switch to J5.
     the lewel switch must point downwards to send a starting signal to the CU 200.
   - Switch on the pump by pressing the ON/OFF button. The on light must be on.
     Note that the dry running sensor is covered with water.
     If the pump starts, it was stopped due to dry running and has now been reset.
     - Wait five minutes.
       If the pump does not start, it is defective. Repair or replace the pump.

4.3 Solar-powered system with generator back-up



Pos.	Component
1	SQF pump
2	Submersible drop cable
3	Cable clips
4	Straining wire
5	Wire clamps
6	Solar modules
7	Support structure
10	Diesel or petrol powered generator
13	IO 101 switch box

Fig. 9. Solar-powered system with IO 101 and generator

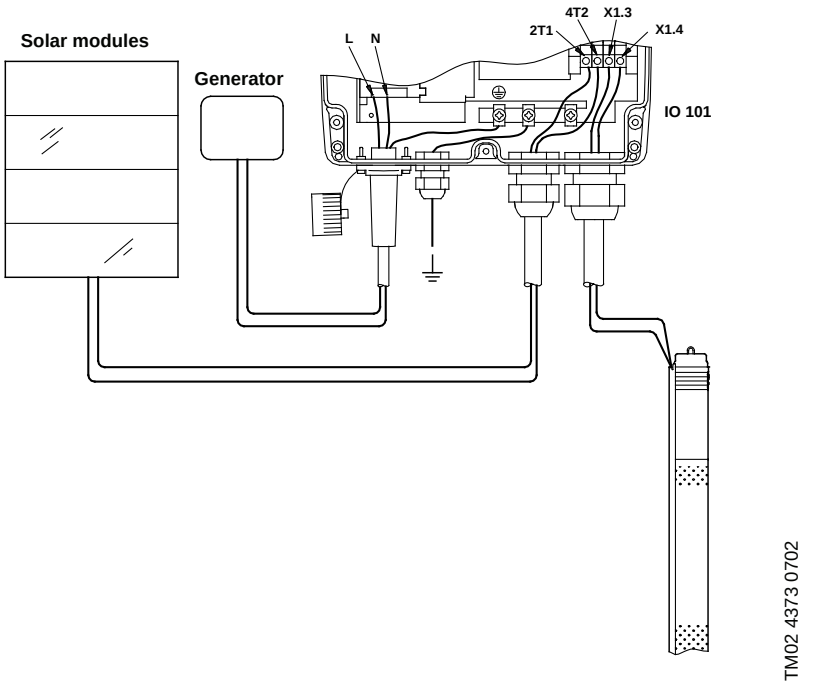


Fig. 10. Internal (and external) wiring of IO 101 SQFlex switch box

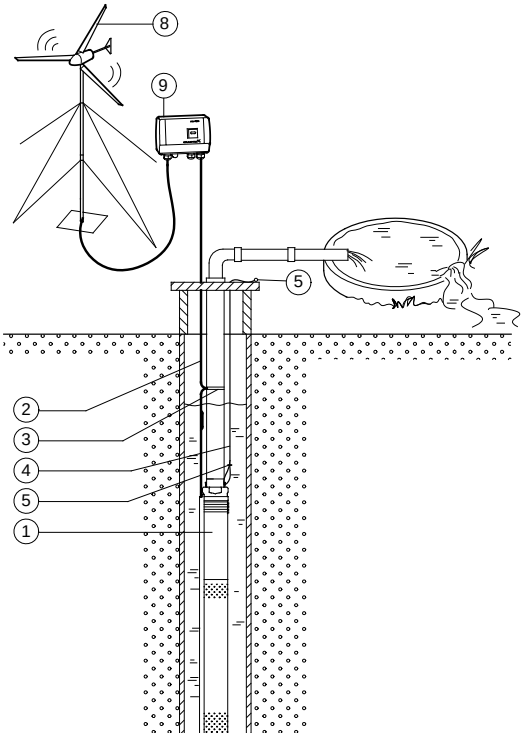
If the system does not work properly, follow the instructions in section 4.3.1 Trouble-shooting of a solar-powered system with generator back-up.

4.3.1 Trouble-shooting of a solar-powered system with generator back-up

All measuring points/terminal designations in the following refer to the IO 101 switch box

1. **Disconnect the pump**
   - Make sure that the generator has been turned off.
   - Set the IO 101 switch to Off.
   - Disconnect the pump cable from the terminals (X1.3, X1.4).
2. **Check the solar modules**
   - Measure the DC voltage and short-circuit DC current across the terminals (2T1, 4T2).
     See electrical connection in Section 1.4.
     If the DC voltage or DC current is outside the range, one of the solar modules is faulty. Replace the solar module.
3. **Check the IO 101 box**
   - Set the IO 101 switch to on.
   - Measure the DC voltage and DC current across the terminals (X1.3, X1.4).
     If the values differ from the values measured under step 2, the IO 101 is defective. Replace the IO 101.
4. **Check the generator**
   - Set the IO 101 switch to off.
   - Turn on the generator.
   - Measure the AC voltage across the terminals (L, N).
     The voltage (U) = rated generator voltage (see generator nameplate).
     If the value is not correct, the generator is faulty. Repair or replace the generator.
5. **Check the IO 101 box during generator operation**
   - The generator must be running. Set the IO 101 switch to on.
   - Measure the AC voltage across the terminals (X1.3, X1.4).
     The voltage (U) = rated generator voltage (see generator nameplate).
     If the value is not correct, the IO 101 is faulty. Replace the IO 101.
6. **Check the pump**
   - Set the IO 101 switch to off.
   - Reconnect the pump cable to the terminals (X1.3, X1.4).
   - Set the IO 101 switch to on.
     Note that the dry running sensor is covered with water.
     If the pump starts, it was stopped due to dry running and has now been reset.
     - Wait five minutes.
       If the pump does not start, it is defective. Repair or replace the pump.

4.4 Wind-powered system



Pos.	Component
1.	SQF pump
2.	Submersible drop cable
3.	Cable clips
4.	Straining wire
5.	Wire clamps
8.	Wind turbine
9.	IO 102 breaker box

Fig. 11. The wind-powered system main components.

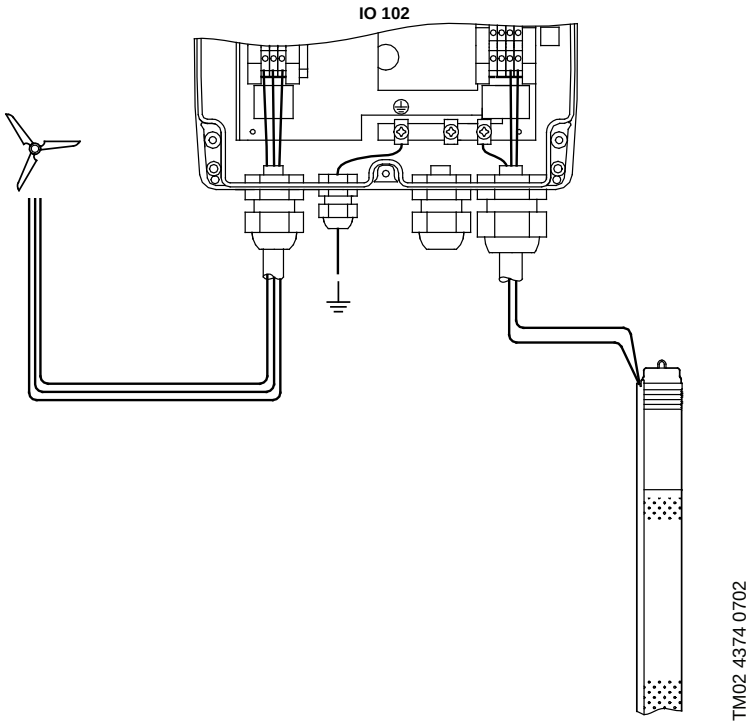


Fig. 12. Internal (and external) wiring of IO 102 SQFlex breaker box

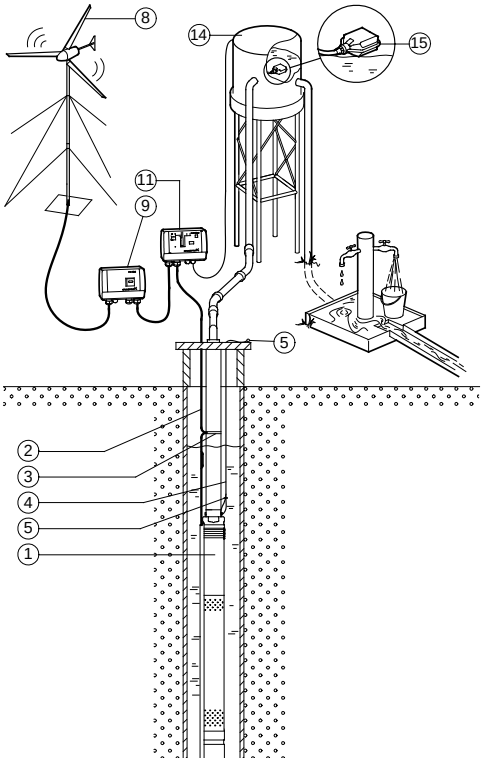
If the system does not work properly, follow the instructions in section 4.4.1 Trouble-shooting of a wind-powered system on page 34.

4.4.1 Trouble-shooting of a wind-powered system

All measuring points/terminal designations in the following refer to the IO 102 breaker box.

1. **Disconnect the pump**
   - Stop the wind turbine and turn off the pump, by turning the ON/OFF switch to off.
   - Disconnect the pump cable from the terminals in the IO 102 breaker box.
   - Release the wind turbine by turning the ON/OFF switch to on.
2. **Check the wind turbine**
   - Measure the AC voltage across the terminals for the wind turbine, i.e. one measurement between each of the three phases.
     The voltage (U) = 0-250 VAC. The voltage depends on the wind speed, see Wind turbine on page 18.
     The three values measured must be identical. If they differ, or if no voltage is measured and the propeller is turning, the wind turbine is faulty. Repair or replace the wind turbine.
3. **Check the IO 102 breaker box**
   - Measure the DC voltage across the terminals for the pump.
     The voltage (U) = 0-300 VDC. The voltage depends on the wind speed, see Wind turbine on page 18.
     If no voltage is measured and the Propeller is turning, the breaker box is faulty. Replace the breaker box.
4. **Check the pump**
   - Stop the wind turbine by turning the ON/OFF switch to off.
   - Reconnect the pump cable to the terminals.
   - Release the wind turbine and turn on the pump, by turning the ON/OFF switch to on.
     Note that the dry running sensor is covered with water.
     If the pump starts, it was stopped due to dry running and has now been reset.
     - Wait five minutes.
       If the pump does not start, it is defective. Repair or replace the pump.

4.5 Wind-powered system with CU 200 control unit and level switch



Pos.	Component
1.	SQF pump
2.	Submersible drop cable
3.	Cable clips
4.	Straining wire
5.	Wire clamps
8.	Wind turbine
9.	IO 102 breaker box
11.	CU 200 control unit
14.	Water reservoir
15.	Level switch

Fig. 13. Wind-powered system with CU 200 and level switch

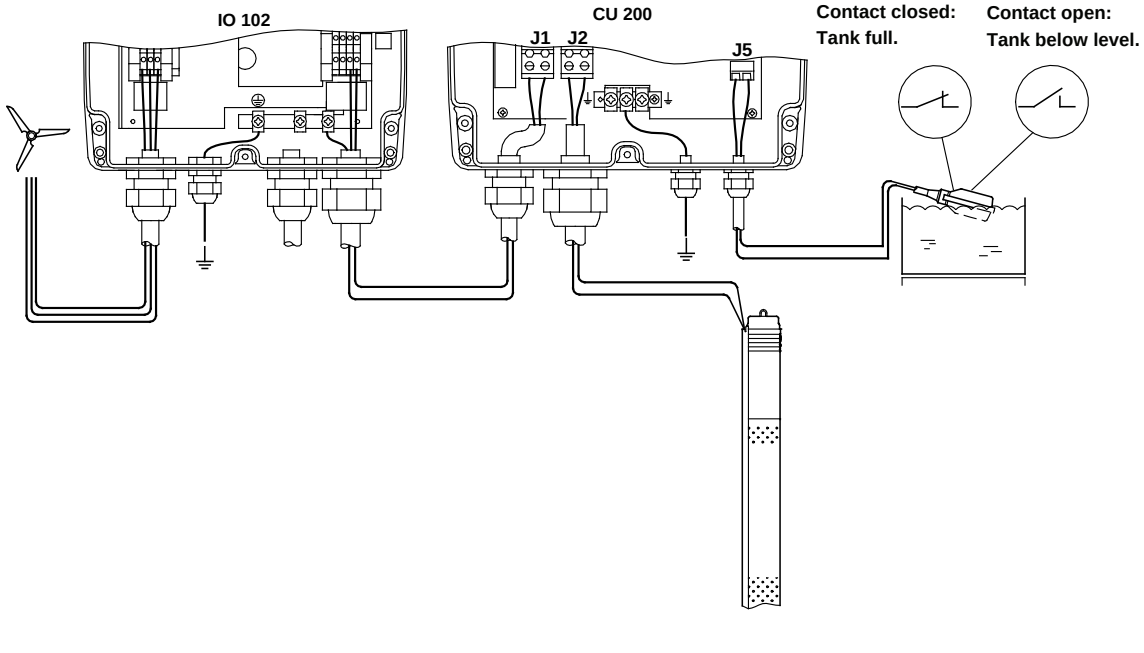


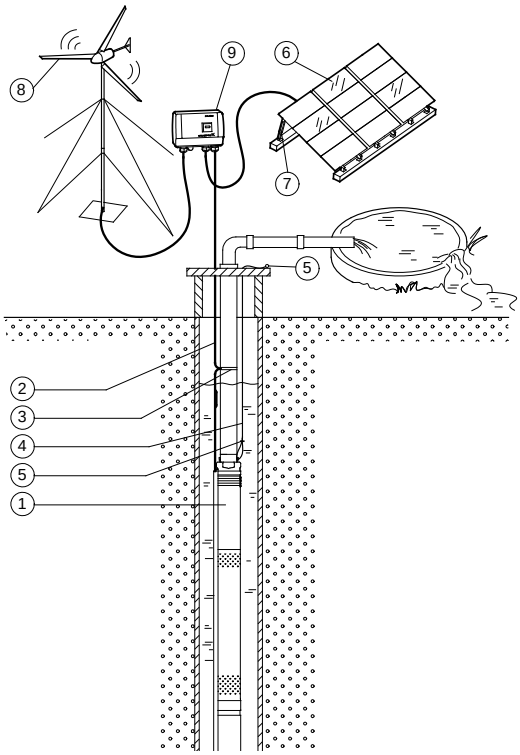
Fig. 14. Internal (and external) wiring of IO 102 breaker box and CU 200 SQFlex control unit

If the system does not work properly, follow the instructions in section 4.5.1 Trouble-shooting of a wind-powered system with CU 200 control unit and level switch on page 36.

4.5.1 Trouble-shooting of a wind-powered system with CU 200 control unit and level switch

1. **Check the system by means of the CU 200**
   If the CU 200 indicates fault, proceed according to section Trouble-shooting by means of CU 200 on page 10.
2. **Disconnect the pump**
   - Switch off the pump by pressing the ON/OFF button at the CU 200. The OFF light must be on.
   - Disconnect the pump cable from the terminal J2.
3. **Check the wind turbine**
   - Measure the AC voltage across the terminals for the wind turbine, i.e. one measurement between each of the three phases.
     U = 0-250 VAC. The voltage depends on the wind speed, see Wind turbine on page 18.
     The three values measured must be identical. If they differ, or if no AC voltage is measured and the Propeller is turning, the wind turbine is faulty. Repair or replace the wind turbine.
4. **Check the IO 102 breaker box**
   - Measure the DC voltage across the terminals for the CU 200 in the breaker box.
     U = 0-300 VDC. The voltage depends on the wind speed, see Wind turbine on page 18.
     If no DC voltage is measured and the Propeller is turning, the breaker box is faulty. Replace the breaker box.
5. **Check the level switch in the water reservoir**
   - Disconnect the level switch cable from the terminal J5 in CU 200.
   - Measure the disconnected level switch cable with an ohmmeter.
   - Turn the level switch upwards => the contact in the level switch is closed. The measured value must be approx. 0 Ω.
   - Turn the level switch downwards => the contact in the level switch is open. The measured value must be ∞ Ω.
     If one of the two values is not correct, the level switch is defective. Replace the level switch.
6. **Check the CU 200 control unit**
   - Let the level switch remain disconnected.
   - Measure the DC voltage across the terminal for the pump (J2) in CU 200.
     The value must correspond to the value measured under step 4.
     If the value differs, the CU 200 is defective. Replace the CU 200.
7. **Check the pump**
   - Make sure that CU 200 is set to off by pressing ON/OFF button. The OFF light must be on.
   - Reconnect the pump cable to the terminal J2.
   - Connect the level switch cable to the terminal J5.
     The level switch must point downwards to send a starting signal to the CU 200.
   - Switch on the pump by pressing the ON/OFF button. The on light must be on.
     Note that the dry running sensor is covered with water.
     If the pump starts, it was stopped due to dry running and has now been reset.
     - Wait five minutes.
       If the pump does not start, it is defective. Repair or replace the pump.

4.6 Combined system



Pos.	Component
1.	SQF pump
2.	Submersible drop cable
3.	Cable clips
4.	Straining wire
5.	Wire clamps
6.	Solar modules
7.	Support structure
8.	Wind turbine
9.	IO 102 breaker box

Fig. 15. Combined system main components

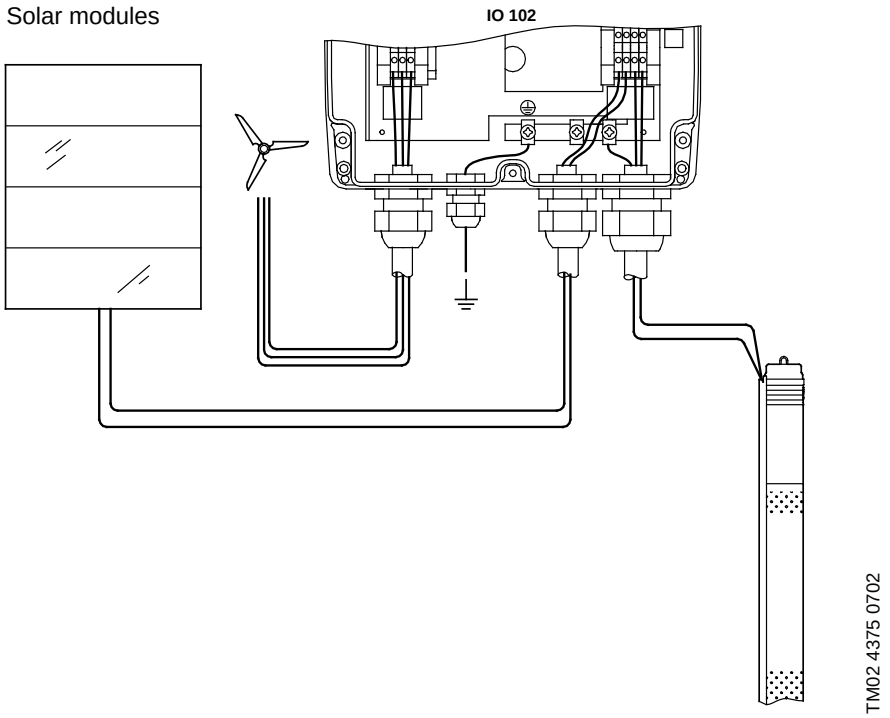


Fig. 16. Internal (and external) wiring of IO 102 SQFlex breaker box

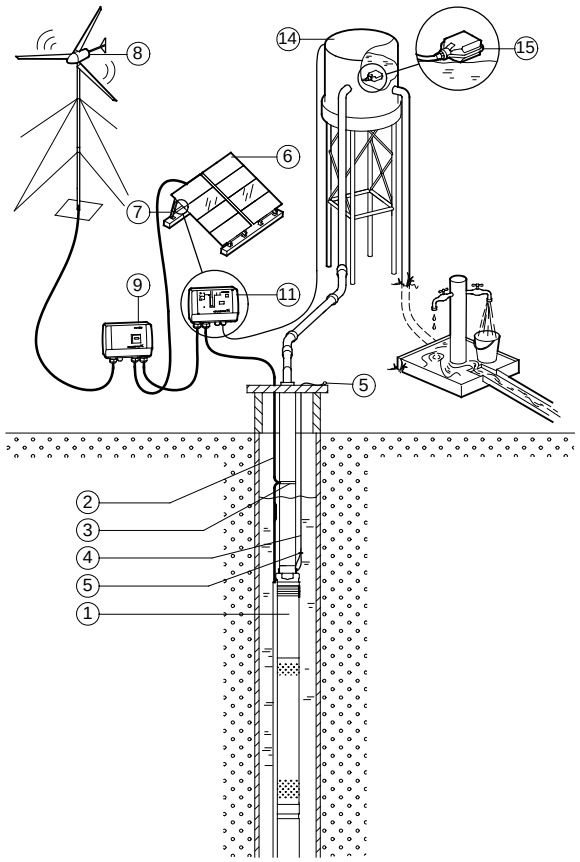
If the SQFlex system does not work properly, follow the instructions in section 4.5.1 Trouble-shooting of a wind-powered system with CU 200 control unit and level switch on page 36.

4.6.1 Trouble-shooting of a combined system

All measuring points/terminal designations in the following refer to the IO 102 breaker box.

1. **Disconnect the pump**
   - Set the IO 102 switch to off.
   - Disconnect the pump cable from the terminals.
   - Disconnect plus or minus from the solar modules.
     WARNING: Do not touch the wire due to high voltage.
     Release the wind turbine by setting the IO 102 switch to on.
2. **Check the wind turbine**
   - Measure the AC voltage across the terminals for the wind turbine, i.e. one measurement between each of the three phases.
     U = 0-250 VAC. The voltage depends on the wind speed, see Wind turbine on page 24.
     The three values measured must be identical. If they differ (more than 10 V), or if no voltage is measured and the wind turbine is turning, the wind turbine is faulty. Repair or replace the wind turbine.
3. **Check the IO 102 breaker box with wind turbine connected**
   - Measure the DC voltage across the terminals for the CU 200 in the breaker box.
     U = 0-300 VDC. The voltage depends on the wind speed, see Wind turbine on page 24.
     If no DC voltage is measured and the wind turbine is turning, the breaker box is faulty. Replace the breaker box.
4. **Check the solar modules**
   - Disconnect the three wires from the wind turbine one by one and short-circuit all three wires to each other in order to stop the turbine.
     WARNING: Do not touch the wire due to high voltage.
   - Reconnect the wire from the solar panel which was disconnected under step 1.
   - Measure the DC voltage and short-circuit DC current across the terminals (2T1, 4T2).
     See electrical connection in Section 1.4.
     If the DC voltage or DC current is outside the range, one ore more of the solar modules is faulty. Replace the faulty solar module/s.
5. **Check the IO 102 breaker box with solar modules connected**
   - Connect the solar modules by setting the IO 102 switch to on.
   - Measure the DC voltage and short circuit DC current, across the terminals for the pump.
     The values must correspond to the values measured under step 4.
     If the values differ, the breaker box is defective. Replace the breaker box.
6. **Reset of dry-running alarm**
   - Set the IO 102 switch to off.
   - Reconnect the pump cable to the terminals.
   - Set the IO 102 switch to on.
     Note that the dry running sensor is covered with water.
     If the pump starts, it was stopped due to dry running and has now been reset.
     - Wait five minutes.
       If the pump does not start, it is defective. Repair or replace the pump.

4.7 Combined system with CU 200 control unit and level switch



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Pos.	Component
1.	SQF pump
2.	Submersible drop cable
3.	Cable clips
4.	Straining wire
5.	Wire clamps
6.	Solar modules
7.	Support structure
8.	Wind turbine
9.	IO 102 breaker box
11.	CU 200 control unit
14.	Water reservoir
15.	Level switch

Fig. 17. Combined system with CU 200 and level switch

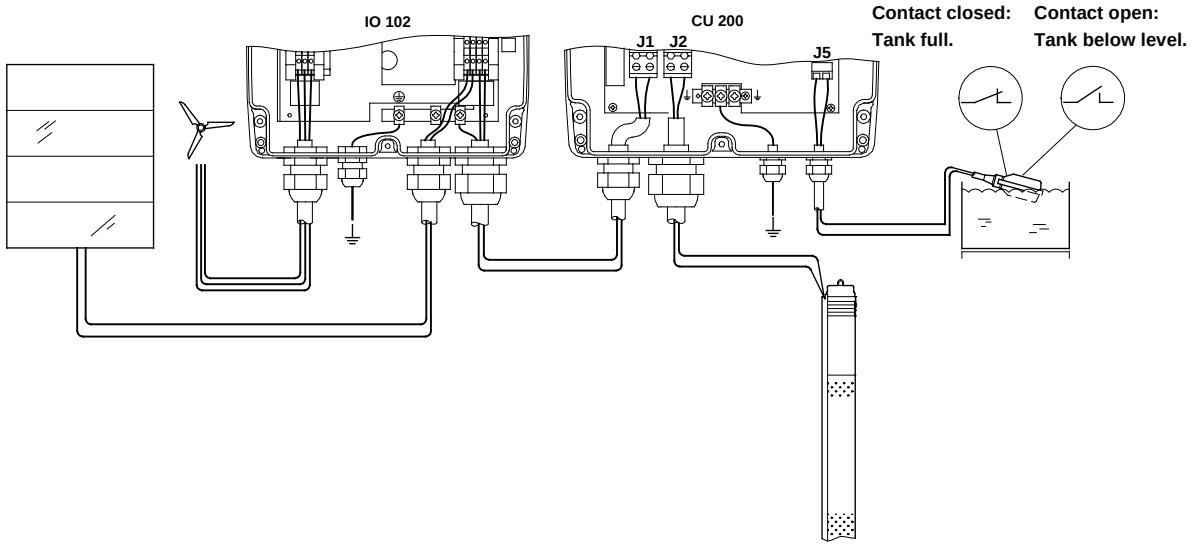

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Fig. 18. Internal (and external) wiring for IO 102 SQFlex breaker box and CU 200 SQFlex control unit

If the system does not work properly, follow the instructions in section 4.7.1 Trouble-shooting of a combined system with CU 200 control unit and level switch on page 40.

4.7.1 Trouble-shooting of a combined system with CU 200 control unit and level switch

Measuring points/terminal designations in the following refer to the IO 102 breaker box or the CU 200.

1. **Disconnect the pump**
   - Set the IO 102 switch to off.
   - Disconnect plus or minus from the solar modules.
     WARNING: Do not touch the wire due to high voltage.
   - Disconnect the pump cable from the terminal J2.
   - Release the wind turbine by setting the IO 102 switch to on.
2. **Check the wind turbine**
   - Measure the AC voltage across the terminals for the wind turbine, i.e. one measurement between each of the three phases.
     U = 0-250 VAC. The voltage depends on the wind speed, see Wind turbine on page 24.
     The three values measured must be identical. If they differ, or if no voltage is measured and the wind turbine is turning, the wind turbine is faulty. Repair or replace the wind turbine.
3. **Check the IO 102 breaker box with wind turbine connected**
   - Measure the DC voltage across the terminals for the CU 200 in the breaker box.
     U = 0-300 VDC. The voltage depends on the wind speed, see Wind turbine on page 24.
     If no voltage is measured and the wind turbine is turning, the breaker box is faulty. Replace the breaker box.
4. **Check the solar modules**
   - Disconnect the three wires from the wind turbine one by one and short-circuit all three wires to each other in order to stop the turbine.
     WARNING: Do not touch the wire due to high voltage.
   - Reconnect the wire from the solar panel which was disconnected under step 1.
   - Measure the DC voltage and short-circuit DC current across the terminals (2T1, 4T2).
     See electrical connection in Section 1.4.

   If the DC voltage or DC current is outside the range, one or more of the solar modules is faulty. Replace the faulty solar module/s.
5. **Check the IO 102 breaker box with solar modules**
   - Connect the solar modules by setting the IO 102 switch to on.
   - Measure the DC voltage and short circuit DC current, across the terminals for the pump.
     The values must correspond to the values measured under step 4.
     If the values differ, the breaker box is defective. Replace the breaker box.
6. **Check level switch in the water reservoir**
   - Release the wind turbine by setting the IO 102 switch to on.
   - Disconnect the level switch cable from the terminal J5.
   - Measure the disconnected level switch cable with an ohmmeter.
   - Turn the level switch upwards => the contact in the level switch is closed. The measured value must be approx. 0 Ω.
   - Turn the level switch downwards => the contact in the level switch is open. The measured value must be ∞ Ω.
     If one of the two values is not correct, the level switch is defective. Replace the level switch.
7. **Check the CU 200 control unit**
   - Let the level switch remain disconnected.
   - Measure the DC voltage across the terminals for the pump (J2).
     The value must correspond to the value measured under step 3 or 5.
     Note: The sun and wind conditions may have changed since the measurements in point 3 or 5 were made
     If the value differs, the CU 200 is defective. Replace the CU 200.
8. **Check the pump**
   - Make sure that CU 200 is set to off by pressing ON/OFF button. The OFF light must be on.
   - Reconnect the pump cable to the terminal J2.
   - Connect the level switch cable to the terminal J5.
     The level switch must point downwards to send a starting signal to the CU 200.
   - Press the ON/OFF button the on light must be on.
     Note that the dry running sensor is covered with water.
     If the pump starts, it was stopped due to dry running and has now been reset.
     - Wait five minutes.
       If the pump does not start, it is defective. Repair or replace the pump.

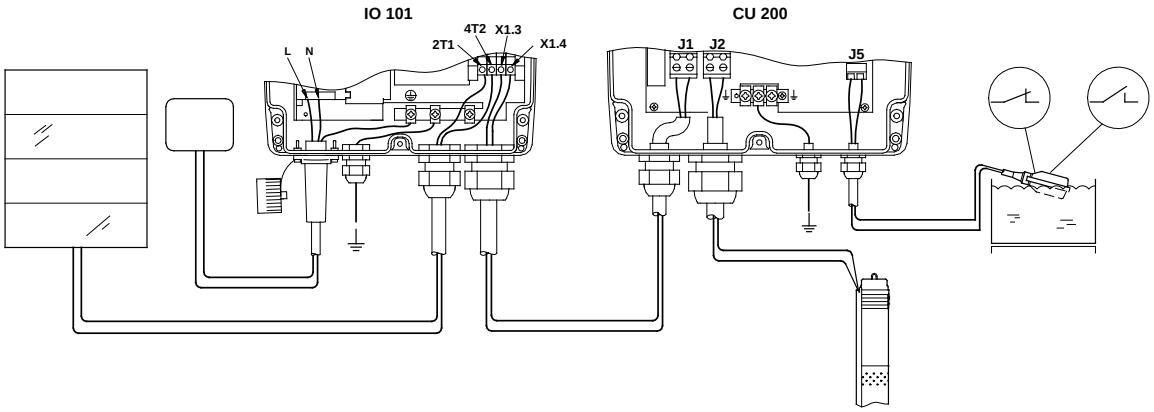
4.8 Options with generator as back-up source

Below are wiring diagrams for options with generator as a power supply back-up source.

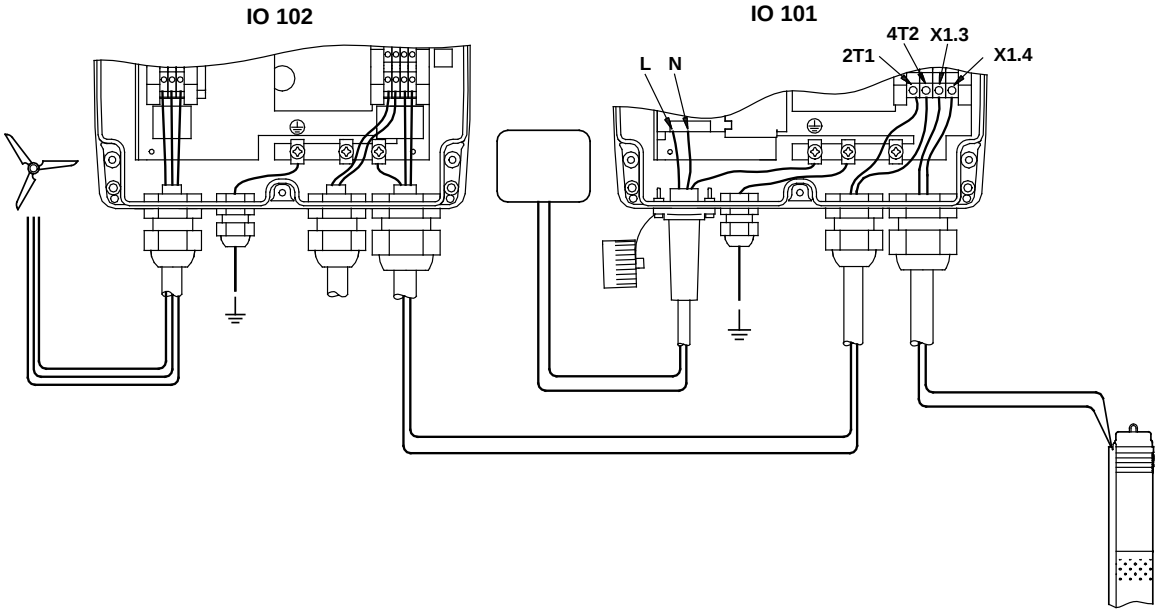
For Trouble-shooting of the individual components see sections 3.1 to 3.7.

For application overview see section Overview of possible system combinations on page 26.

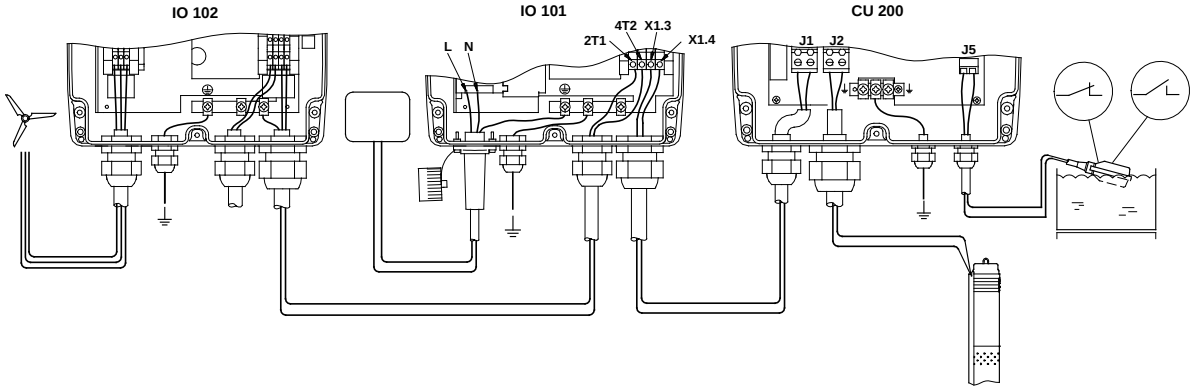
Solar-powered system with CU 200 control unit and level switch



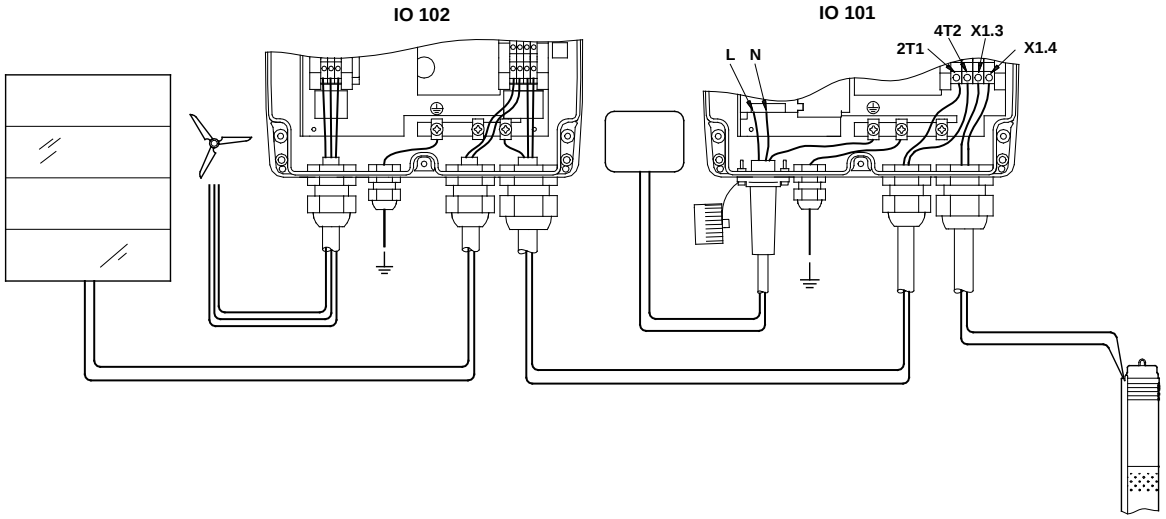
Wind-powered system



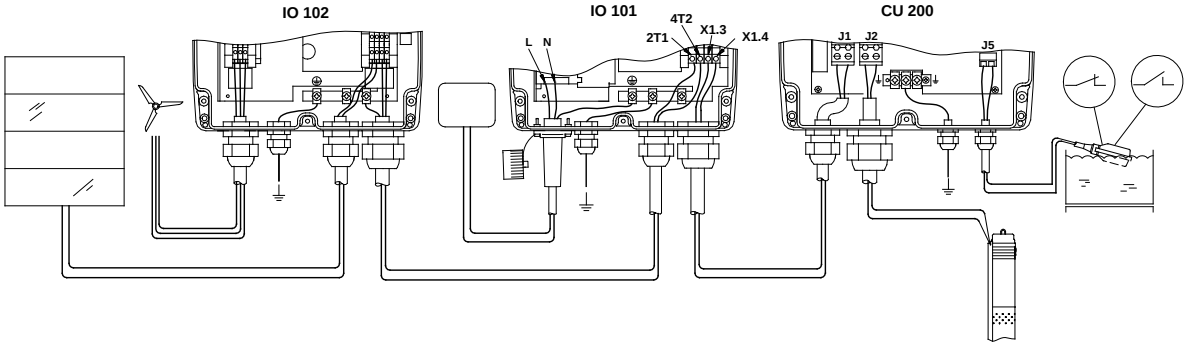
Wind-powered system with CU 200 control unit and level switch



Combined system



Combined system with CU 200 control unit and level switch



5. Service of pump and motor

5.1 General information

Helical rotor pumps cannot be separated from the motor as a unit. If the motor or the pump has to be replaced, the pump must be dismantled, see section 5.4 Helical pump type on page 47.

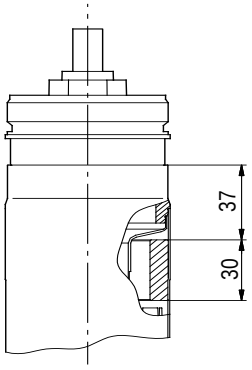


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Fig. 19. When fixing the motor in a vice, tighten only on the 30 mm wide area starting 37 mm from the upper edge of the motor sleeve.

Position numbers refer to exploded views, sectional drawings and parts lists; tool letters refer to ection 5.2 Service tools on page 44.

5.1.1 Before dismantling

- Disconnect the electricity supply to the motor.

5.1.2 Before assembly

- Clean all parts and check them for fractures and wear.
- Order the necessary service kits and/or parts.
- Replace defective parts by new parts.
- Moisten rubber parts with soapy water before fitting them.

5.1.3 During assembly

- Lubricate and/or tighten screws and rubber parts according to section 5.3 Torques and lubricants on page 46.
- Before connecting the pump to the motor, fill the motor with GRUNDFOS motor liquid SML 2.

Filling of motor liquid

1. Place the motor in vertical position with an inclination of approx. 10°.
2. Remove the filling plug using a screwdriver or a similar tool.
3. Inject motor liquid SML 2, into the motor with a filling syringe or the like.
4. To allow possible air to escape, move the motor from side to side.
5. Refit the filling plug and make sure that it is tight.

Fit the pump to the motor, see section 5.5.2 Fitting pump to motor on page 48 (centrifugal pump) or section 5.4.2 Assembly on page 47 (helical pumps)

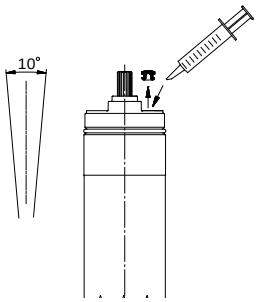

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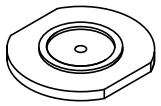
Fig. 20. Filling of motor

5.1.4 After assembly

- Test the head and flow according to the test specifications, see section 5.9 Testing the pump by means of CU 200 SQFlex control unit on page 52.

5.2 Service tools

A

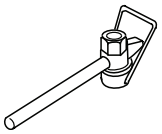


B

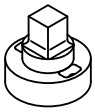
C

D

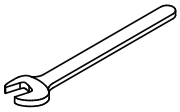
E



F

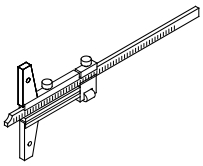


G



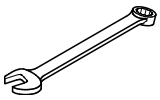
H

I

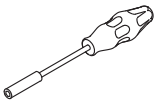


J

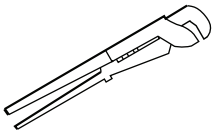
K



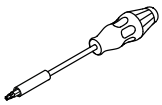
L



M

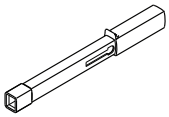


N

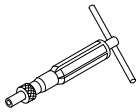


O

P



Q



R

S

T

Special tools

	Designation	To be used for	Supplementary information	Helical pump	25 SQF	40 SQF	75 SQF
A	Mounting plate				SV0049		
B	Spline pin with screw				SV0226		
C	Spacing pipe		∅13 / ∅8.5 x 39.5		SV0006[a]		
			∅13 / ∅8.5 x 39.0			SV0008	SV0008
D	Hexagon socket head screw with washer	J	M8 x 65		SV0074		
E	Key for split cone nut	11-12	22 mm		SV0182	SV0187	
			27 mm				SV0217
F	Key for discharge chamber	1a		SV0064			
G	Open-end spanner	1a	62 mm	SV2080			
H	Measuring template	24			96079961		
I	Depth gauge	14-16			Standard		

a. Only for 25 SQF N

Standard tools

Pos.	Designation	To be used for	Supplementary information	Helical pump	25 SQF	40 SQF	75 SQF
J	Hexagon key	D	6 mm		SV1204		
K	Ring/open-end spanner	16-24	10 mm (two pcs. needed for pos.16)	SV0083			
		19-19a	13 mm		SV0055		
L	Nut driver with socket	250	7 mm	SV0065			
M	Pipe wrench	13	1"	standard			
		14a	4"		standard		
N	Screwdriver (torx)	18a	T10	SV0066			
O	Socket for hexagon head screws	250-R	7 mm 1/4"	SV0457			

Torque tools

Pos.	Designation	To be used for	Supplementary information	Helical pump	25 SQF	40 SQF	75 SQF
P	Torque wrench	R-T	4-20 Nm 9x12		SV0292		
		F	40-200 Nm14x18	SV0400			
Q	Torque screwdriver	R	1-6 Nm 1/4"	SV0438			
R	Adapter for torque screwdriver	N-O	1/4"	SV0437			
S	Ring insert tool	P-19-19a	13 mm 9x12		SV0294		
T	Open-end spanner	E-P-11-12	22 mm 9x12			SV0622	
		P-16	10 mm 9x12	SV0610			

5.3 Torques and lubricants

This section shows the screws and nuts that must be tightened to a certain torque and the lubricants to be used.

Pos.	Description	Pump type	Torque [Nm]	Lubricant
	Pump / motor	Helical	55	
1a	Discharge chamber*	Helical	100	Rocol
13/16	Pump rotor / torsion shaft	Helical	18	
14a	Connecting piece	Centrifugal		
16	Torsion shaft / motor shaft	Helical	18	
19	Screw	Centrifugal, splined shaft	18	Gardolube
	Nut	Centrifugal, cylindrical shaft		
19a	Nut	Centrifugal	18	Gardolube
19b	Nut	Centrifugal, splined shaft	11	Gardolube
24	Shaft end (nut)	Centrifugal	18	
	End cover with cable	All		Rocol
	Nut	All	1,5	

Rocol Sapphire Aqua-Sil, part no. RM2924 (0.5 l).

Gardolube L 6034, part no. SV9995 (1 l).

It is not necessary to lubricate screws and nuts treated with "Delta Seal", as this coat is anti-corrosive and lubricating.

* The thread of the discharge chamber **must** be lubricated.

5.4 Helical pump type

Helical pumps cannot be separated from the motor as a unit. If the motor or the pump must be replaced, the pump must be dismantled.

5.4.1 Dismantling

1. Fix the motor in a vice. **Note:** Tighten only on the area shown in fig. 19.
2. Refer to section 5.9.1 Drawings on page 55. Unscrew the screws pos. 18a and 18b and remove them together with the cable guard pos. 18.
3. If the motor is intact, the cable need not to be removed. If the motor is defective, remove the nuts for end cover with socket at the bottom of the motor and pull the end cover with cable and socket out of the motor.
4. Remove the discharge chamber pos. 1a with valve casing complete using the key for discharge chamber F. Hold the pump by means of the pipe wrench M on the weld just above the upper strainer.
5. Loosen the outer sleeve pos. 55 with pump stator pos. 9 from the motor using the pipe wrench M on the weld just above the upper strainer. Hold the motor with the open-end spanner G.
6. Pull the outer sleeve pos. 55 with pump stator pos. 9 free of the pump rotor pos. 13 and torsion shaft pos. 16 with a bump.
7. Remove the pump stator pos. 9 and flange pos. 6 by knocking the discharge end of the outer sleeve hard against a solid wooden surface such as a workbench or table.
8. Remove the torsion shaft pos. 16 from the motor shaft using two ring/open-end spanners K.
9. Remove the pump rotor pos. 13 from the torsion shaft pos. 16 using the pipe wrench M. Hold the torsion shaft with the ring/open-end spanner K.
10. If the parts of the valve casing complete are defective, replace these parts. Prise the retaining ring pos. 7a out of the recess of the discharge chamber pos. 1a and press the parts down and out of the discharge chamber.

5.4.2 Assembly

1. Fill the motor with liquid, see Filling of motor liquid on page 43
2. Fit the pump rotor pos. 13 to the torsion shaft pos. 16 and tighten to correct torque, see 5.3. Hold the pump rotor using the pipe wrench M on the cylindrical part below the pump rotor.
3. Fit the torsion shaft to the motor shaft and tighten to the correct torque, see 5.3.
4. Fit the pump stator pos. 9 with the conical stator inlet against the strainer into the outer sleeve pos. 55 .
5. Fit the flange pos. 6 into the outer sleeve and press it on the upper part of the stator, fixing the stator in the centre of the outer sleeve.

   11SQF-2: Turn the flange pos. 6 with the even surface against the stator pos. 9.
6. Assemble the valve and discharge chamber if it has been dismantled.
   - Place the valve casing complete on a plane surface with the bearing pos. 6 downwards.
   - Lubricate the O-ring pos. 1d with grease and fit it in the outside recess of the valve casing.
   - Press the discharge chamber pos. 1a over the valve casing. Turn the discharge chamber and fit the retaining ring pos. 7a in the recess of the discharge chamber.
   - Grease the thread of the discharge chamber with valve casing complete and screw it into the top of the sleeve.
7. Fit the discharge chamber pos. 1a with valve casing complete and tighten to the correct torque by means of the key for discharge chamber F. Hold the pump using the pipe wrench M or fix it in a vice. The jaws must be placed on the weld just above the upper strainer.
8. Moisten the pump rotor pos. 13 with clean water and fit the pump on the motor. Tighten to the correct torque, see 5.3 by means of the key for discharge chamber F.
9. Push the end cover with socket and cable into the motor if it has been removed. Fit and tighten the nuts using the socket for hexagon head screws O, the adapter for torque screwdriver R and the torque screwdriver Q.
10. Fit the cable guard pos. 18. Press the two upper flaps under the outer sleeve and fit the screws pos. 18a and 18b. If the accessible holes in the outer sleeve at the lower strainer are not threaded, they must be tapped using the tapping screw included in the cable guard service kit and the assembly kit or by means of an M3 set screw.
11. Test the pump performance using a CU 200 control unit, if available. See section 5.9 Testing the pump by means of CU 200 SQFlex control unit on page 52
12. Install the pump. See section 2. Start-up on page 22.

5.5 Centrifugal pump and motor

5.5.1 Detaching pump from motor

1. Fix the motor in a vice.
   Note: Tighten only on the area shown in fig. 19.
2. Unscrew the screws pos. 18a and remove them together with the cable guard pos. 18c.
3. Unscrew the screws pos. 18b and remove them (if any) together with the cable guard pos. 18.
4. If the motor is intact, the cable need not be removed. If the motor is defective, remove the nuts for the end cover with socket and pull the end cover with cable and socket out of the motor.
5. Remove the nuts pos. 19a and lift the pump off the motor
6. Remove the spline protector pos. 24b and supporting ring pos. 24a from the pump shaft.
7. Remove the shaft end pos. 24 from the motor shaft.
8. Remove the connecting piece pos. 14a from the motor by means of the pipe wrench M. Hold the motor using the open-end spanner G.

5.5.2 Fitting pump to motor

1. Fill the motor with liquid, see Filling of motor liquid on page 43.
2. Screw the shaft end pos. 24 on to the motor shaft and push it home. Adjust the height to 88.15 mm ±0.2 mm by means of the measuring template H, see fig. 21.
3. Tighten the nut to the correct torque, see 5.3. Check that the height is still 88.15 mm ±0.2 mm.
4. Fit the supporting ring pos. 24a and the spline protector pos. 24b.
5. Fit the connecting piece pos. 14a and tighten using the pipe wrench M.

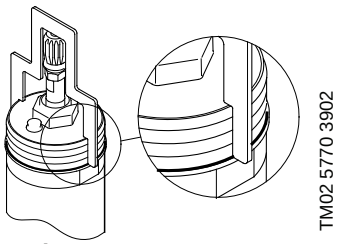


Fig. 21.

6. Fit the pump to the motor. The cable recesses in the suction interconnector pos. 14 and the connecting piece pos. 14a must be next to each other. Fit the four nuts pos. 19a and tighten diagonally to the correct torque, see 5.3.
7. Push the end cover with cable into the motor if it has been removed. Fit and tighten the nuts, see 5.3 using the socket for hexagon head screws O, the adapter for torque screwdriver R and the torque screwdriver Q.
8. Fit the cable guard pos. 18c and secure it with screws pos. 18a.
9. Fit the cable guard pos. 18 and secure with screws pos. 18b (25 SQF).
10. Test the pump performance using a CU 200 control unit, if available. See section 5.9 Testing the pump by means of CU 200 SQFlex control unit on page 52.
11. Install the pump, see section 2. Start-up on page 22.

5.6 Centrifugal pump type with splined shaft

5.6.1 Dismantling

1. Fit the and tighten the spline pin with screw B on the mounting plate A.
   Note: Make sure that the mounting plate is positioned correctly so that the recess of the mounting plate and the suction interconnector pos. 14 fit into each other.
2. Place the pump on the mounting plate A.
3. Unscrew and remove the screws pos. 19 together with the washers pos. 71. Remove the strap pos. 17.
4. Dismantle the pump in the following order until the last chamber has been removed:
   - discharge piece pos. 1b
   - valve casing complete pos. 1
   - nut pos. 19b
   - washer pos. 76
   - impeller pos. 13
   - chamber pos. 9.
5. Pull the pump shaft pos. 16 with priming disc pos. 64 up and out of the suction interconnector pos. 14 and the bottom chamber pos. 10.
6. Lift the suction interconnector pos. 14 and the bottom chamber pos. 10 free of the mounting plate A.
7. Replace worn wear parts, if any, see section 5.8 Checking and replacing wear parts of centrifugal pumps on page 51

5.6.2 Assembly

1. Fit the suction interconnector pos. 14 to the mounting plate A.
2. Press the bottom chamber pos. 10 into the suction interconnector pos. 14.
3. Slide the priming disc pos. 64 over the pump shaft pos. 16 and push until it touches the coupling.
   Note: The dogs of the priming disc must point upwards.
4. Fit the pump shaft to the spline pin with screw B.
5. Fit the first impeller pos. 13 and press it until it engages with the neck ring pos. 7 in the bottom chamber pos. 10.
6. Fit the chamber pos. 9 and the impeller pos. 13 until the last impeller has been fitted.
7. Fit the washer pos. 76 (with the three grooves upwards) and the nut pos. 19b.
8. Make sure that the top impeller engages with the splined shaft and tighten the nut pos. 19b to the correct torque, see 5.3.
   Note: Check that the impellers can be raised and lowered, as it is important that the nut is tightened against the impellers.
9. Fit the valve casing complete pos. 1 and the discharge piece pos. 1b.
   Note: Turn the discharge piece so that the slots for the cable guard are located above the screw holes for the screws pos. 18b in the suction interconnector pos. 14.
10. Lubricate the threads of the screws pos. 19, and fit the straps pos. 17, washers pos. 71 and screws pos. 19. Tighten diagonally to the correct torque, see 5.3.
11. Remove the pump from the mounting plate A and fit the pump to the motor, see section 5.5.2 Fitting pump to motor on page 48.

5.7 Centrifugal pump type with cylindrical shaft

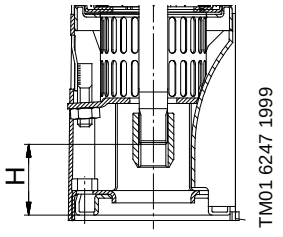
5.7.1 Dismantling

1. Fit the mounting plate A to the suction interconnector pos. 14 by means of the spacing pipe C and the hexagon socket head screw with washer D.
   Note: Make sure that the mounting plate is positioned correctly so that the recess of the mounting plate and the projection of the suction interconnector pos. 14 fit into each other.
   Fix the mounting plate in a vice.
2. Slacken and remove the nuts pos. 19. Remove the strap pos. 17.
3. Remove the valve housing complete pos. 1 and the top chamber pos. 4 (25 SQF N chamber pos. 9.) Remove the stop ring pos. 85 of 25 SQF N.
4. Loosen the split cone nut pos. 11 using the key for split cone nut E. Knock the split cone pos. 12 down through and out of the impeller pos. 13 using the key for split cone nut E.
5. Remove the impeller pos. 13, split cone pos. 12, split cone nut pos. 11 and chamber pos. 9.
6. Repeat steps 4. and 5. until all impellers and chambers have been removed.
   Remove the stop ring pos. 85 of 75 SQF.
7. Loosen the guide pos. 25 from the recess of the suction interconnector pos. 14 (only 75 SQF). Lift the suction interconnector off the mounting plate A.
8. Remove the hexagon socket head screw with washer D, spacing pipe C and pump shaft pos. 16.
9. Check and replace wear parts, see section 5.8 Checking and replacing wear parts of centrifugal pumps on page 51.

5.7.2 Assembly

1. Fit the shaft pos. 16 to the mounting plate A by means of the spacing pipe C and hexagon socket head screw with washer D.
   Note: Make sure that the mounting plate is positioned correctly so that the recess of the mounting plate and the projection of the suction interconnector pos. 14 fit into each other.
   Fix the mounting plate in a vice.
2. Slide the suction interconnector pos. 14 over the shaft so that the projection of the suction interconnector engages with the recess of the mounting plate. Press the bottom chamber pos. 10 / guide pos. 25 home in the suction interconnector.
3. Fit the split cone pos. 12, impeller pos. 13 (the impeller collar must point downwards) and split cone nut pos. 11. Give the split cone nut a few turns. Press the impeller home against the chamber pos. 10 / guide pos. 25 using the key for split cone nut E and tighten to the correct torque, see 5.3.
4. Fit the chamber pos. 9.
5. Repeat steps 3. and 4. until all impellers and chambers have been fitted.
   Note: For each section, make sure that the chamber and the impeller are fitted correctly before the split cone nut is tightened.
   Note: Fit the stop ring pos. 85 after the middle impeller of 25 SQF and 75 SQF. In 75 SQF the small recess of the stop ring must be downwards.
   Note: The top chamber of 40 SQF and 75 SQF is pos. 4.
6. Fit the valve housing pos. 1 so that the holes for the straining wire are opposite the motor cable (cable opening in the suction interconnector) and that the slots for the straps are aligned to the points where the straps are attached to the suction interconnector.
7. Fit the strap pos. 17 and nuts pos. 19. Tighten diagonally to the correct torque, see 5.3.
8. Remove the pump from the mounting plate A and fit it on the motor, see section 5.5.2 Fitting pump to motor on page 48.
9. Check the axial clearance of the pump shaft by measuring the distance between the contact surface of the suction interconnector and the shaft end using a slide gauge or depth gauge. Measure with the shaft in its top and bottom position, see below.

	25 SQF	75 SQF	40 SQF
Bottom position H_{max}	37.5	37.15	37.15
Top position H_{min}	38.4	39.15	40.15

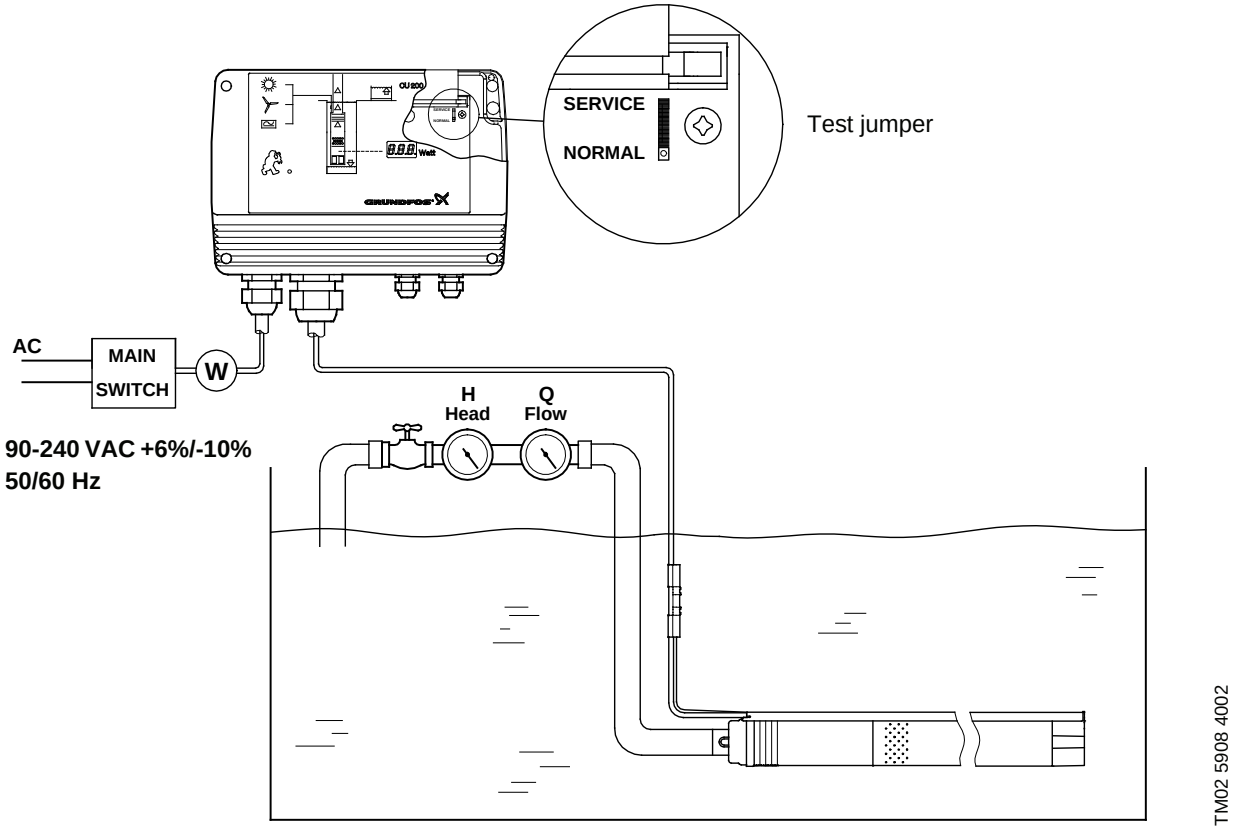


5.8 Checking and replacing wear parts of centrifugal pumps

Bearing pos. 8	
Check	**Replace**
• Check whether the bearings are defective due to sand or dry running.	• Remove the bearing pos. 8 by pressing it out of the chamber pos. 9. • Press a new bearing into the chamber from the bottom side with the largest bearing diameter against the bottom side of the chamber.
Top bearing pos. 6	
Check	**Replace**
• Check whether the bearing is defective.	• Press the bearing pos. 6 out of the valve housing (cylindrical shaft). 25 SQF (splined shaft): Press the bearing out using a screwdriver, if necessary. • Press the new bearing into the valve housing from the bottom side.
Valve seat pos. 3 (only in 25 SQF)	
Check	**Replace**
• Check whether the rubber is hard or compressed so that the valve cup pos. 2 touches the metal.	• Free the valve guide pos. 70 where it is positioned under the recess of the valve casing. Pull the guide and the valve cup pos. 2 out of the valve housing. • Push the valve seat pos. 3 out of the valve housing by inserting a screwdriver between the valve seat and the valve housing. • Press the valve seat home in the valve housing with the flat side downwards.
Neck ring pos. 7	
Check	**Replace**
• Check whether the rubber is hard or worn as this may reduce the head or flow rate.	• Prize the neck ring pos. 7 free of the chamber pos. 9/10 or guide pos. 25 by inserting a screwdriver between the neck ring and the chamber/guide. • Press the neck ring home in the chamber pos. 9/10 or guide pos. 25. The following side of the neck ring must be up: • 25 SQF smooth surface • 40 SQF "This side up" • 75 SQF lip

5.9 Testing the pump by means of CU 200 SQFlex control unit

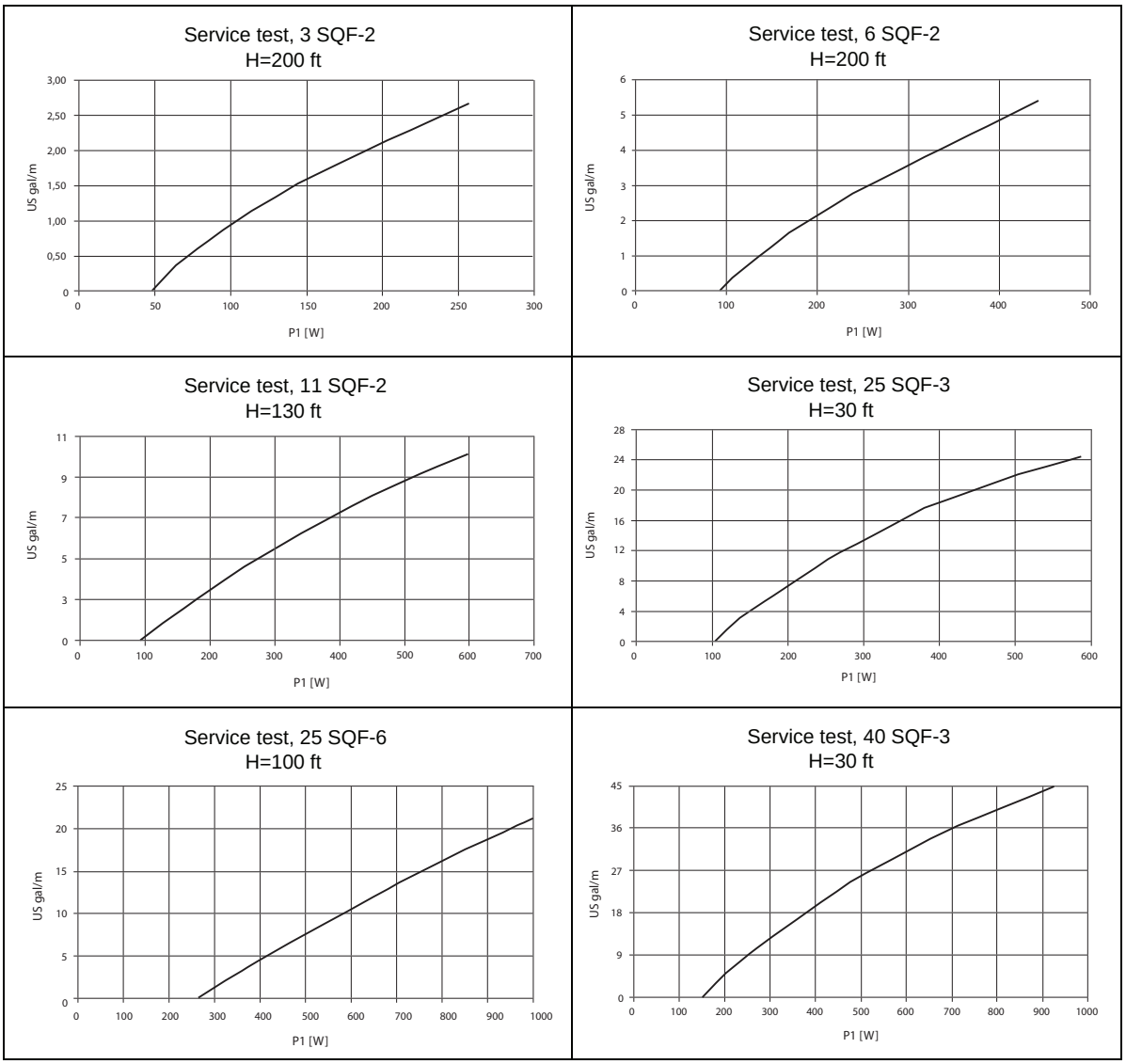
The pump must deliver a flow rate (m³/h) at a given power consumption and head. The “Test value curves ‘ on page 61 apply to the head stated for each pump. The curve values are minimum values.



1. Open the discharge valve completely to reduce the counter-pressure to a minimum.
2. Disconnect the power supply to the pump.
3. Remove the front cover of the CU 200, and set the test jumper to service position, see illustration. Refit the front cover.
4. Connect the power supply.
5. Make sure that the system is off. The red indicator light of the ON/OFF button must be on. If the system is not off, press the ON/OFF button once.
6. Press the ON/OFF button for at least four seconds. Release the button. The CU 200 is now in test mode. (The bottom flow indicator is permanently on, and the pump is running slowly.)
7. Press the ON/OFF button twice (the upper flow indicator is permanently on). The pump now adjusts its speed.
8. Adjust the counter-pressure to the value stated for each pump in the curves in section 5.9.1 Test value curves on page 61.
9. Read the flow rate Q [m³/h] using a flowmeter or a similar device and the power consumption P1 [W] using a wattmeter.
10. In the relevant curve chart, find the intersection point of the values read for flow (Q) and power consumption P1 [W].
    - If the intersection is above the minimum curve, the flow rate is sufficient.
    - If the intersection is below the minimum curve, the flow rate is insufficient, and the pump should be checked and defective parts replaced.
11. Press the ON/OFF button once. The CU 200 is no longer in test mode.
12. Disconnect the power supply, and disconnect the pump and the CU 200.
13. Move the test jumper from service to normal position.

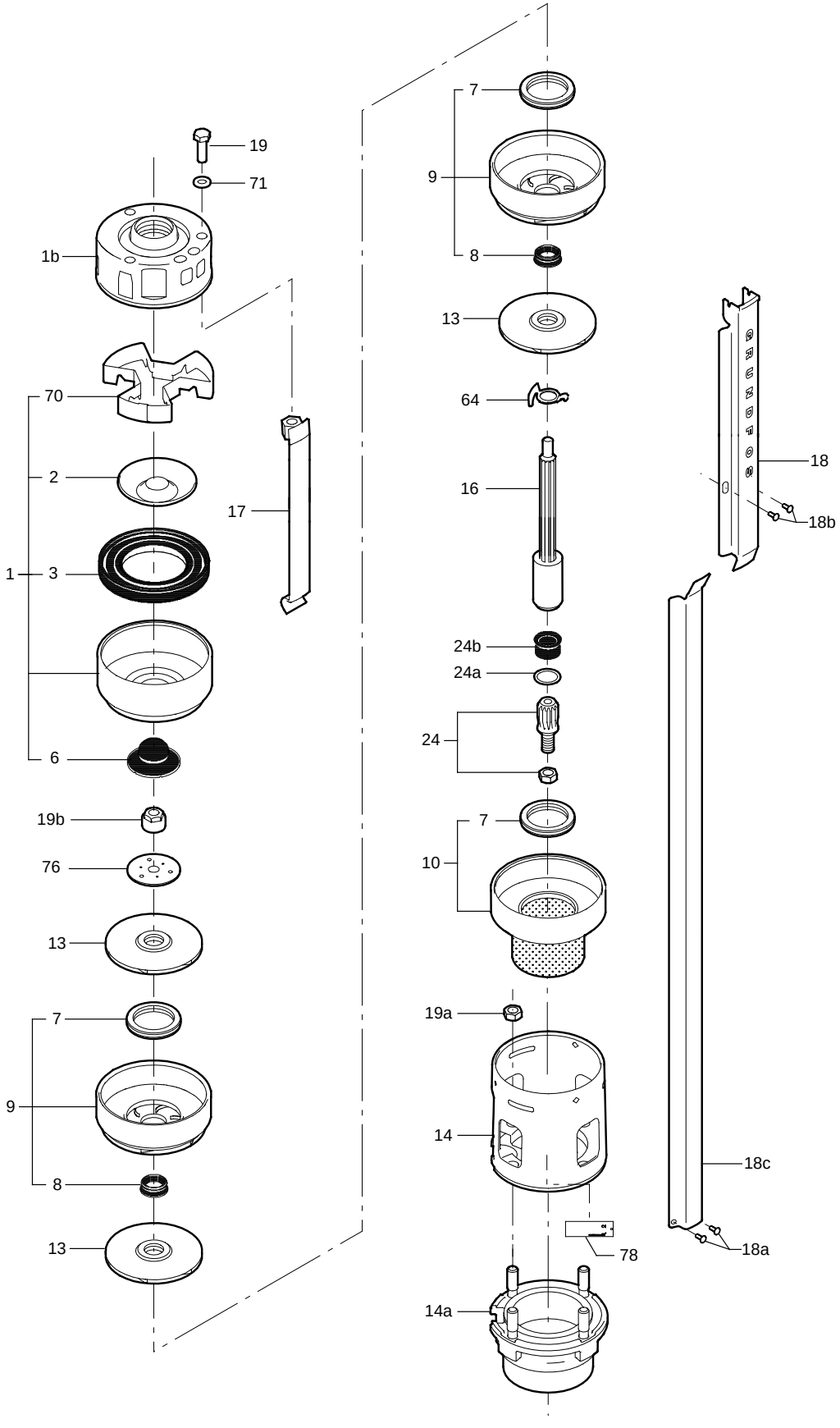
5.9.1 Test value curves

The curve shown in the curve charts below is the minimum performance curve for the pump.

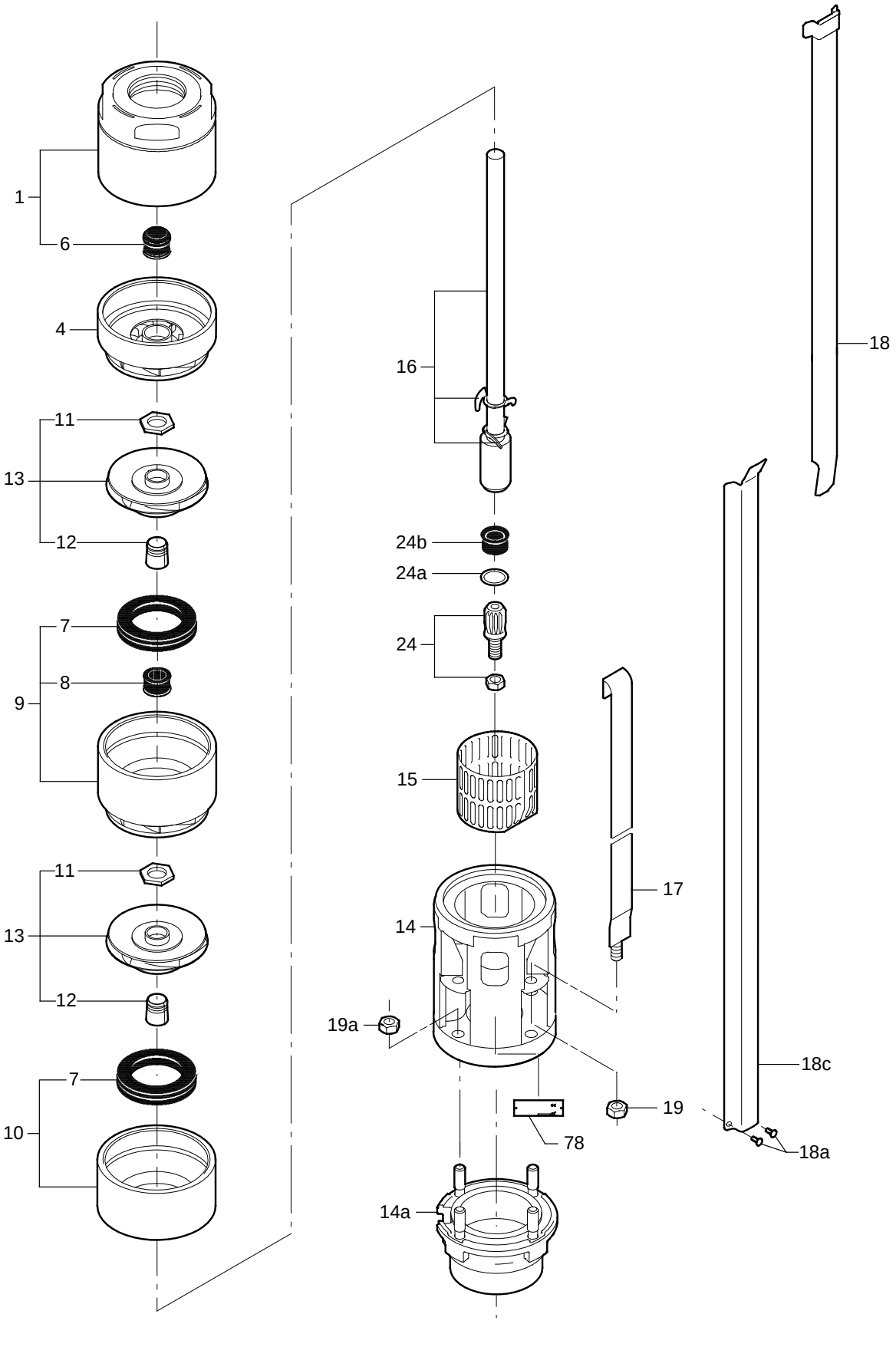


5.9.2 Drawings

25 SQF-3



40 SQF-3



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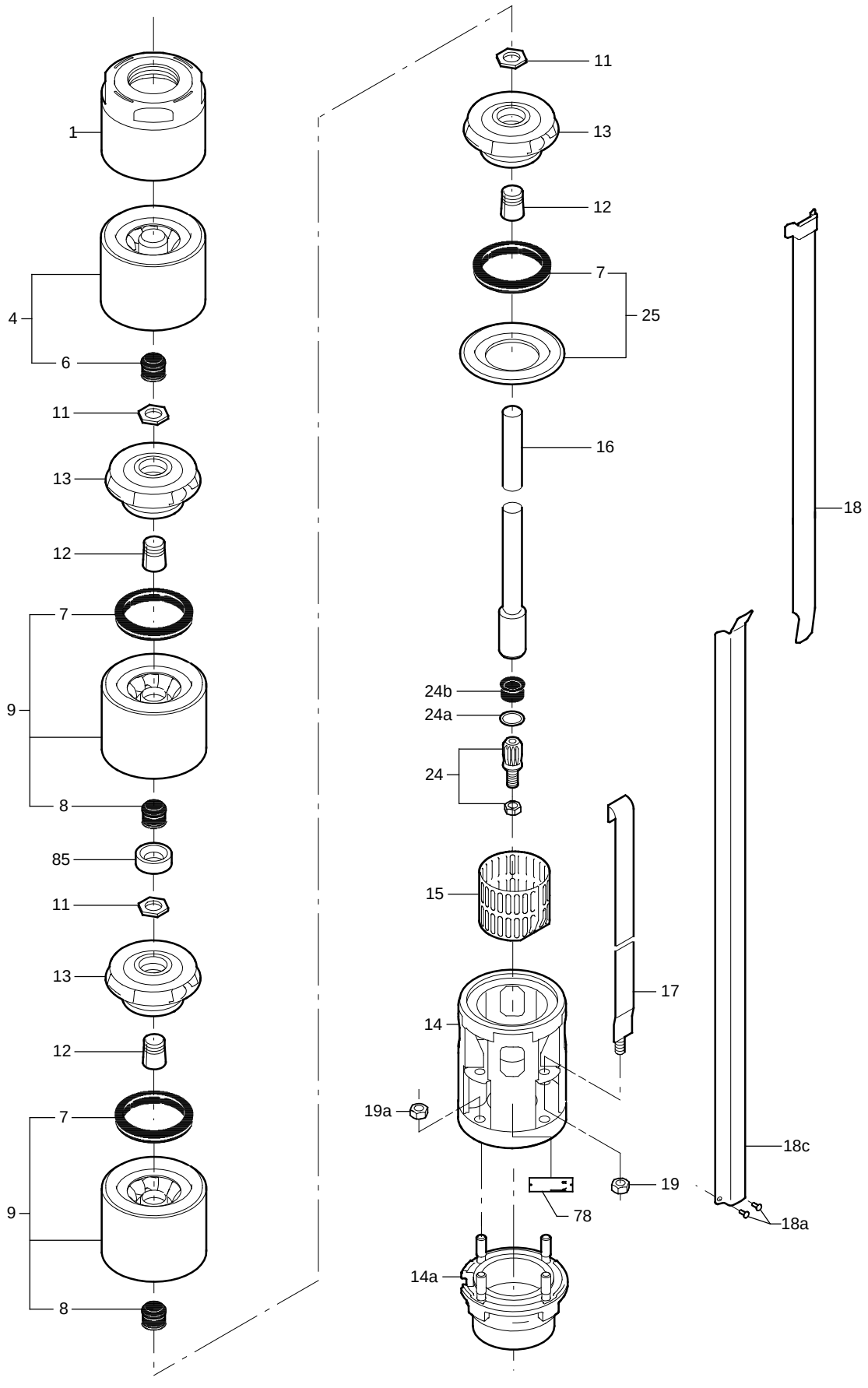
60 SQF-3


1
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6
11
13
12
7
9
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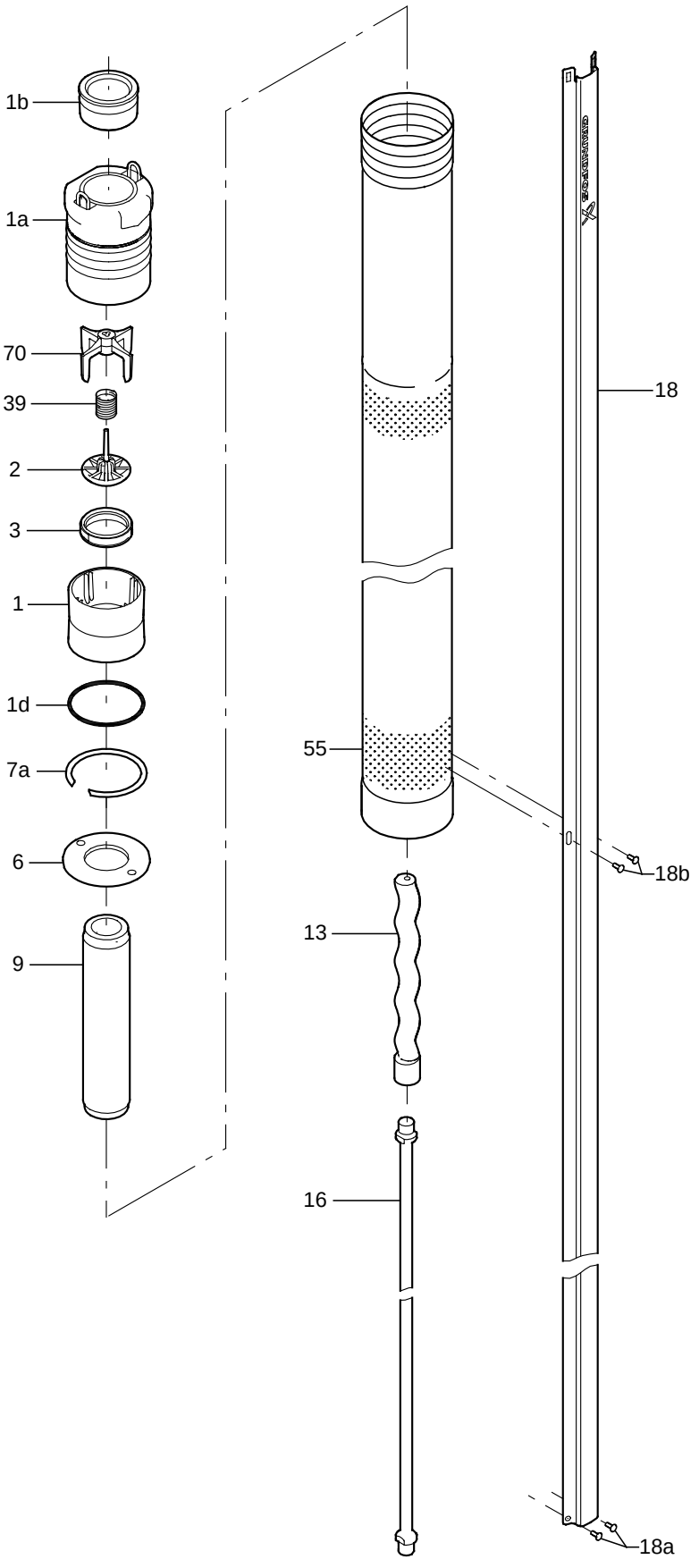
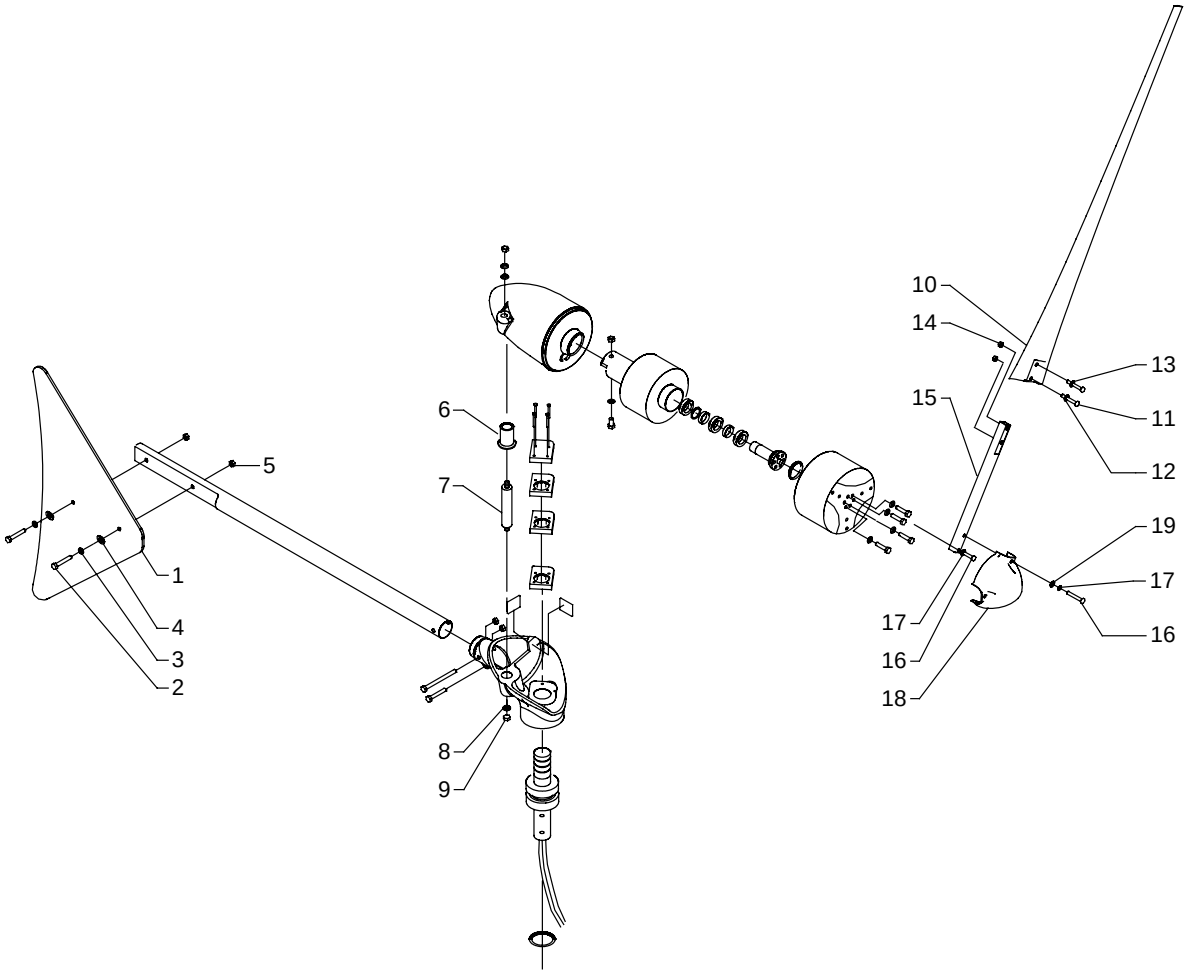
85
11
13
12
7
9
8
11
13
12
7
25
16
18
24b
24a
24
15
17
14
19a
19
78
14a
18c
18a
TM02 2438 4301

Helical 3 SQF-2, 6 SQF-2, 11 SQF-2



Windturbine



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

L-SQ-TL-031 1009

Repl. Rev. 09/04 **US**

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