

<p>blue</p>  <p>Sunshine Works Centennial, CO 80112 (833) 469-7861</p>	<p>DOCUMENT NAME</p> <p>Grundfos IO50, IO101, and CU200 wiring</p> <p>Revision B Updated 2022.11.11</p>
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Grundfos SQFlex wiring

1 Introduction

Often times people have questions regarding the wiring for a specific configuration of controllers, solar panels, generators and the like for their Grundfos SQFlex series of pumps including the 3SQF2, 3SQF3, 6SQF2, 6SQF3 and 11SQF2 pumps.

1.1 Parts Description

The IO-50 is a simple On/Off switch that can be used to switch AC power (grid or generator) or DC power (solar panels or battery bank).

The IO-101 is a combination power switch and automatic changeover for generator input.

The CU-200 is a combined status and control unit for the SQFlex pump system. The CU-200 enables the connection of a float switch (open tank) or pressure switch (pressure tank or pressurized pipes) activation/deactivation.

1.2 Notes

Some content is copyright Grundfos Holding A/S and/or Wikipedia Commons. PE means Protective Earth, also known as Ground. Check the NEC and/or rules in your local jurisdiction regarding the use of grounding and other safety requirements. The + and – symbols mean a DC voltage, the ~ symbol means AC voltage. MC4 connectors along with PV (PhotoVoltaic) cable are weather and sunlight resistant.

1.3 MC4 connectors

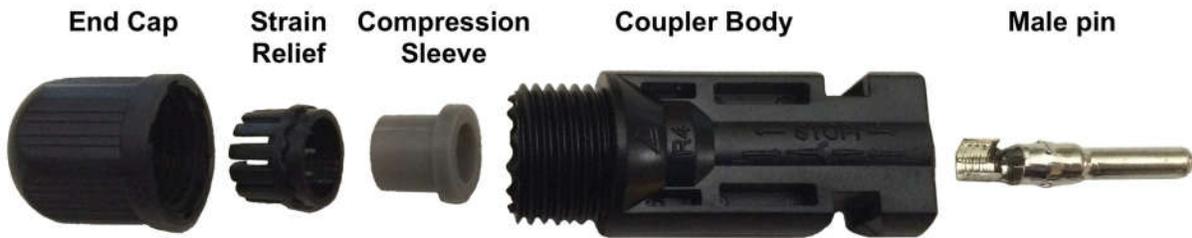
MC4, named for the original inventor, Multi-Contact (now Staubli), is a 4mm diameter connector used on the vast majority of solar panels in the 100W to 500W classes. These connectors are polarized and typically shown from the point of view of the **power source**. The Female MC4 connector shown below is positive at the **source (i.e. solar panel)**, and sometimes connects to the Male MC4 connector of the **load**. When connecting panels in series, the Female MC4 of one panel will go to the Male MC4 of the next panel.

Likewise, the Male MC4 connector is negative at the **source**, and connects to the Female MC4 connector of the **load**. Often times the load equipment (pumps, charge controllers etc.) will have a stripped wire on one end and an MC4 connector to the solar panels on the other end.

Female MC4 Coupler (positive +)



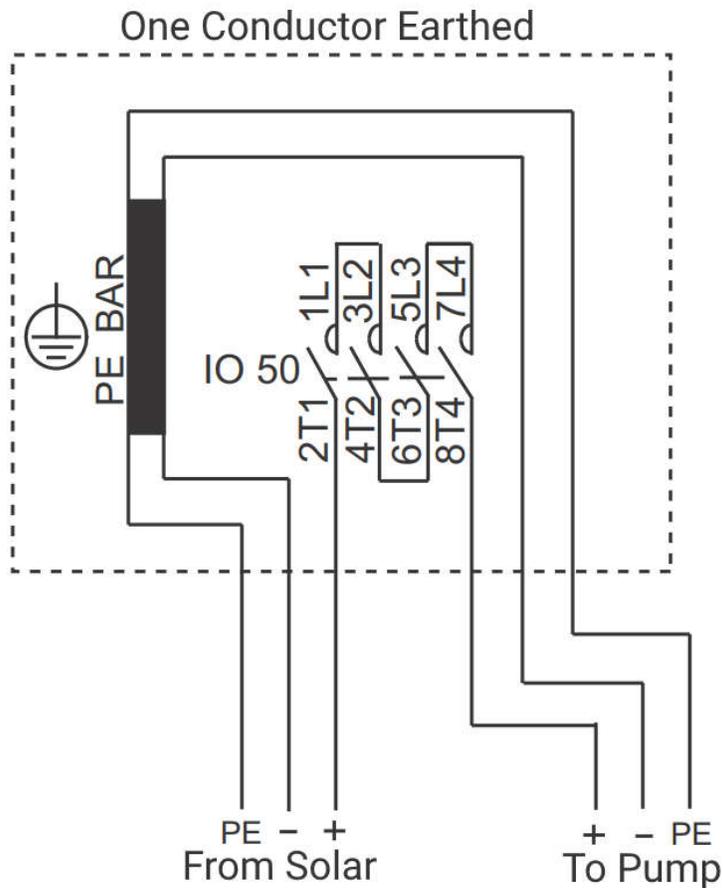
Male MC4 Coupler (negative -)



2 Pump and Power Configurations

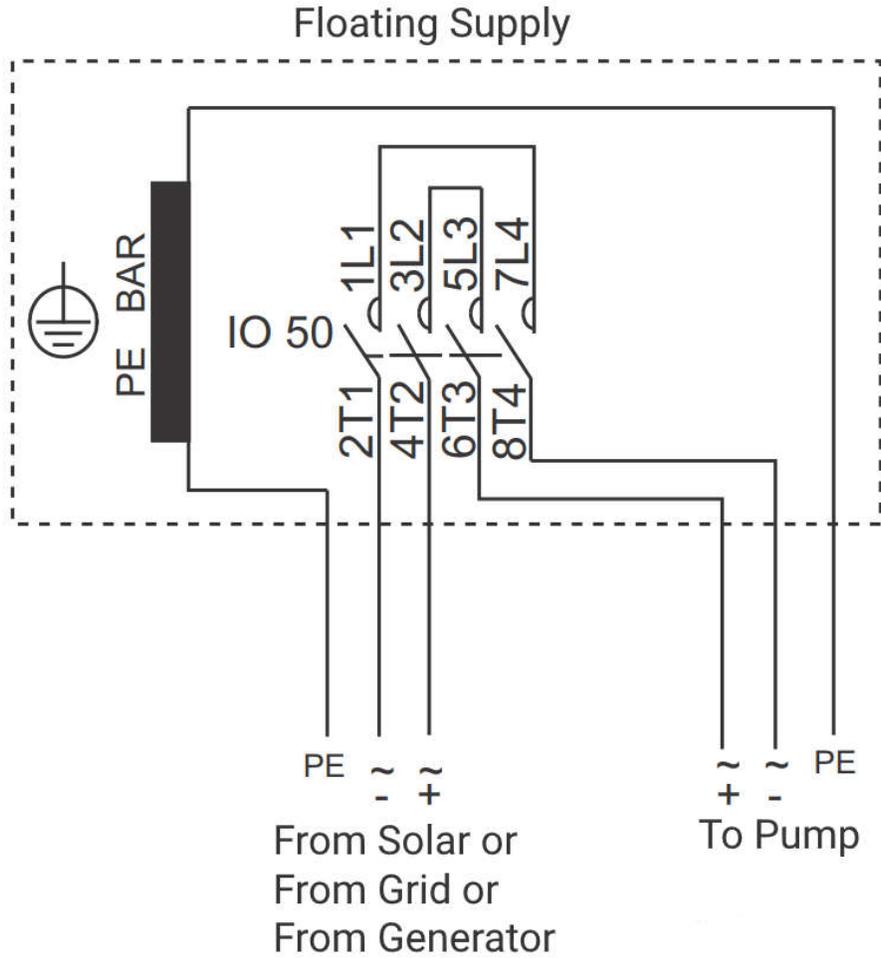
2.1 Single Power Source from Solar

This configuration uses the IO-50 as the main shutoff. Note the +/- or ~ connections of the output may be connected to either of the +/- or L and N wires of the pump.



2.2 Single Power Source from Solar, Grid or Generator

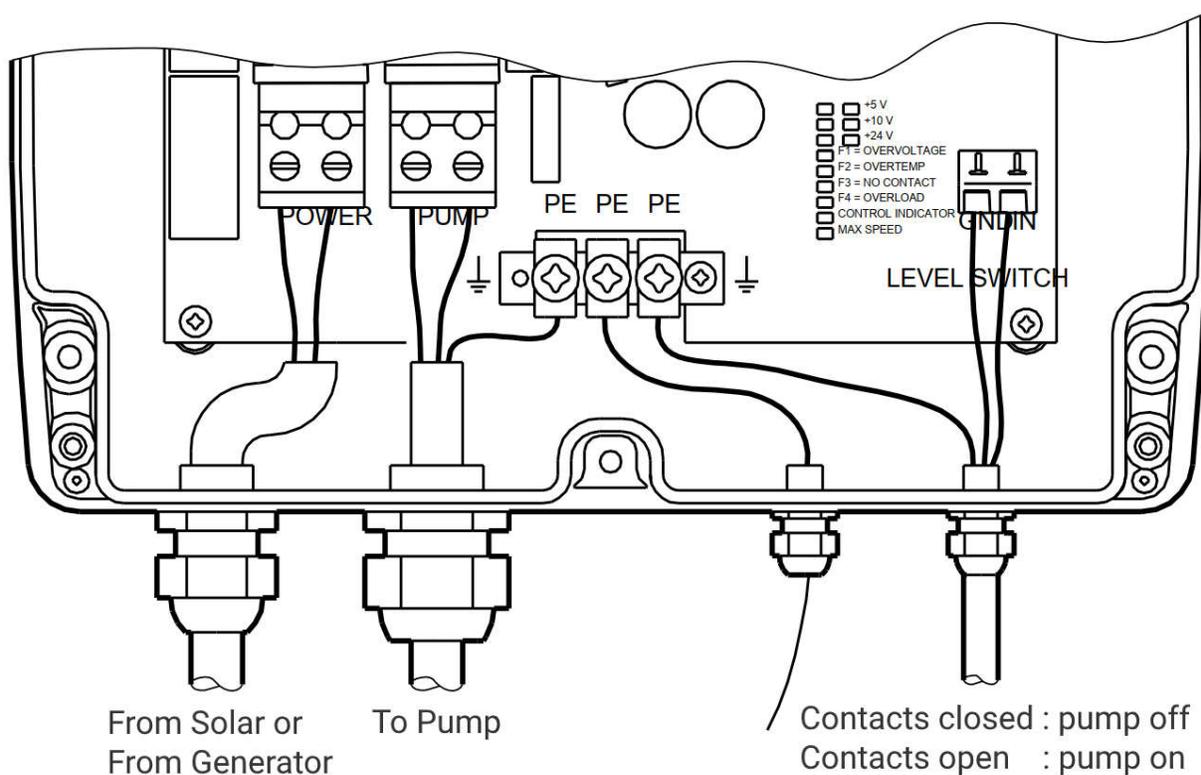
This configuration uses the IO-50 as the main shutoff. Note the +/- or ~ connections of the output may be connected to either of the +/- or L and N wires of the pump.



2.3 Single Power Source, Solar or Generator w/level switch

This configuration uses the CU-200 as the main shutoff and uses a tank level switch to shut off the pump when the tank is full. The wires coming in to the POWER terminals may use either terminal as the +/- from the PV array or NEU and HOT from the generator (or grid). The wires going from the terminal to the pump may use either wire as the connection to the +/- or L and N wires of the pump. The LEVEL SWITCH is a low voltage contact switch and either wire from the switch may go to either terminal.

Please note that using the CU-200 as the pump shutoff does not disconnect input power to the CU-200. Hazardous voltage may be present on the power input terminals. You may want to use the IO-50 as the main shutoff to disconnect power from the CU-200, or, at minimum, unplug both MC4 connectors from your solar array or unplug your generator before performing any internal wiring.

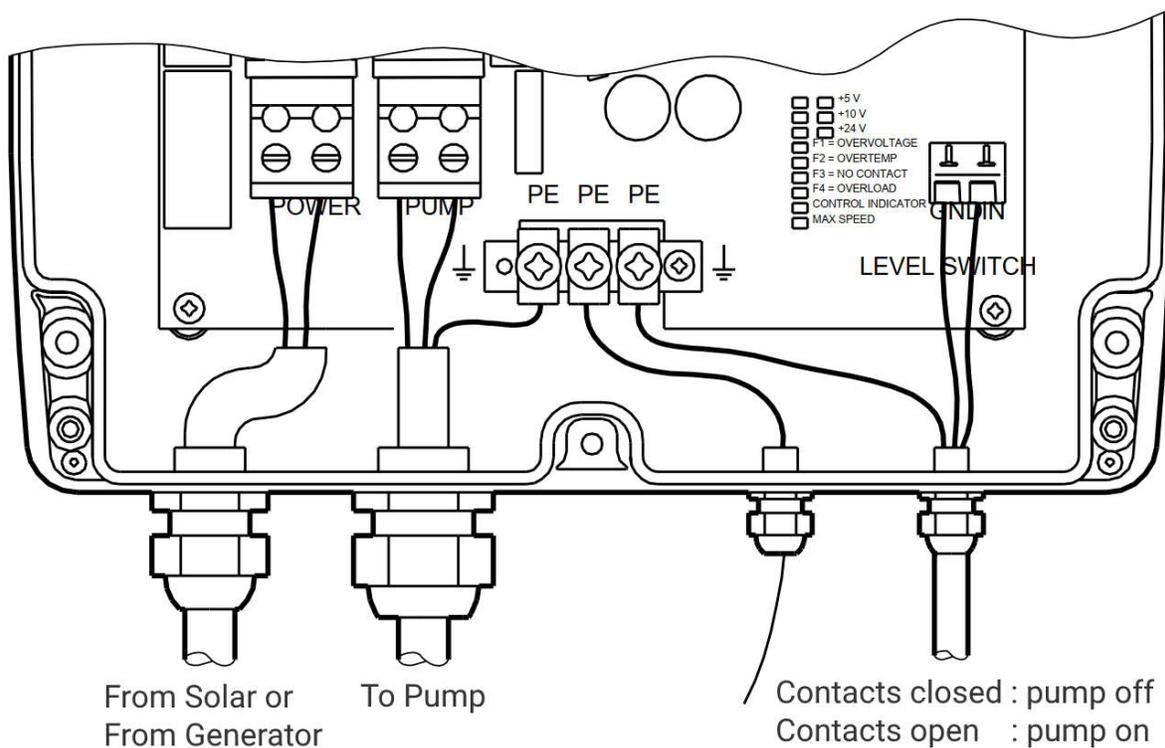


2.4 Single Power Source, Solar or Generator w/pressure switch

This configuration uses the CU-200 as the main shutoff and uses a pressure switch to turn off the pump when the system reaches the desired pressure,. Note that most pressure switches on domestic supplies close the contacts to turn the pump on when the water pressure falls below the set point (nominally 60psi with hysteresis down to 40psi) and the pump turns on. The switch contacts then open when the system is charged back to 60psi and the motor shuts off. The CU-200 must use a “reverse action” type of pressure switch that closes contacts to turn the pump off. The Square D **Reverse Action Pressure Switch** (30-50psi) will work with the CU-200. The Square D part number is 9013FRG2J35. Other Square D Reverse Action Pressure Switches are available at Grainger.com.

Resist the temptation to use your existing pressure switch in line with the supply side from solar panels as most domestic normal action pressure switch contacts are not rated for DC voltage and may arc when opening or weld together when turning on.

Please note that using the CU-200 as the pump shutoff does not disconnect input power to the CU-200. Hazardous voltage may be present on the power input terminals. You may want to use the IO-50 as the main shutoff to disconnect power from the CU-200, or, at minimum, unplug both MC4 connectors from your solar array or unplug your generator (or grid) before performing any internal wiring.



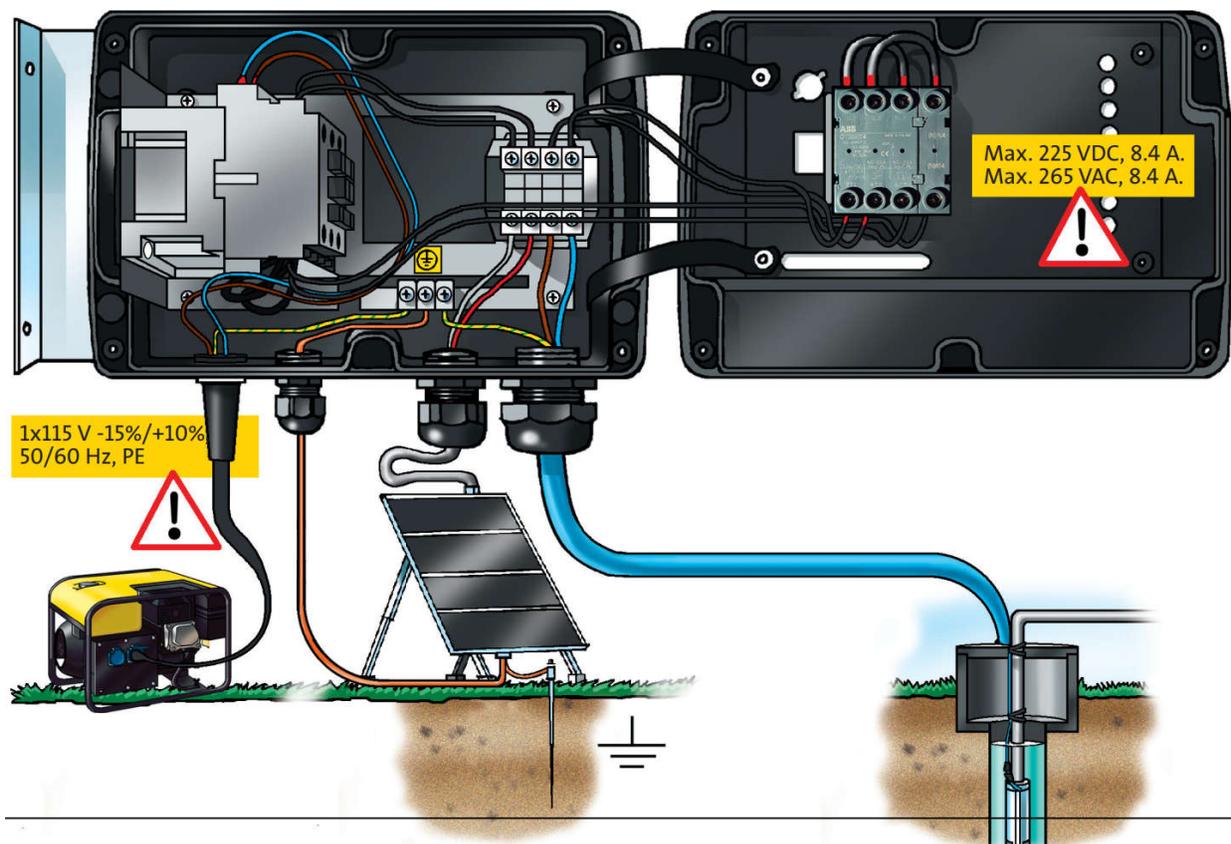
2.5 Dual Power Source, Solar with Generator backup

This configuration uses the IO-101 to switch between solar and generator (or grid) input. The IO-101 is typically used with a smaller 120V generator, but a 240V version can be special ordered (rare).

Using the table below, one can see the combinations of solar or generator power being supplied to the pump.

Switch	Solar Array	Generator	Pump
OFF	Sun or Dark	OFF or ON	OFF
ON	Dark	OFF	OFF
ON	Sun	OFF	ON (Solar Power)
ON	Sun or Dark	ON	ON (Gen Power)

- GREEN ↔ PE, green/yellow wire.
- WHITE ↔ BLUE
- BLACK ↔ BROWN



2.6 Dual Power Source, Solar with Generator w/ level/pressure switch

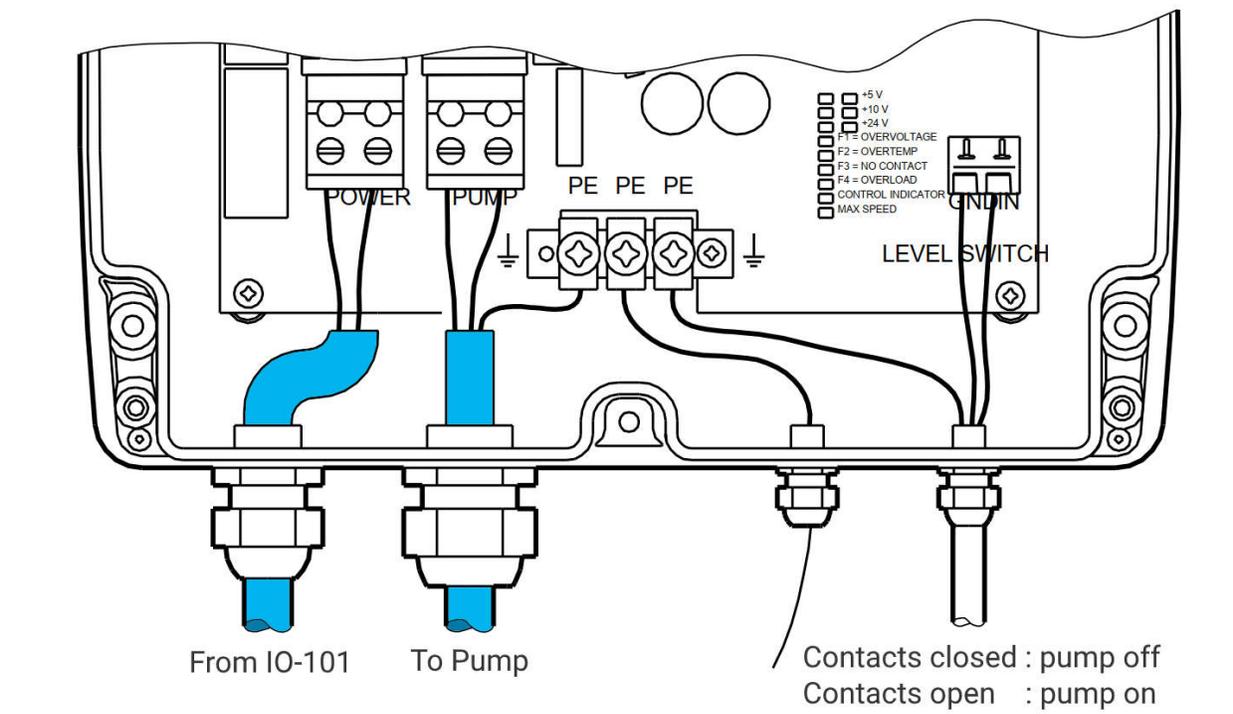
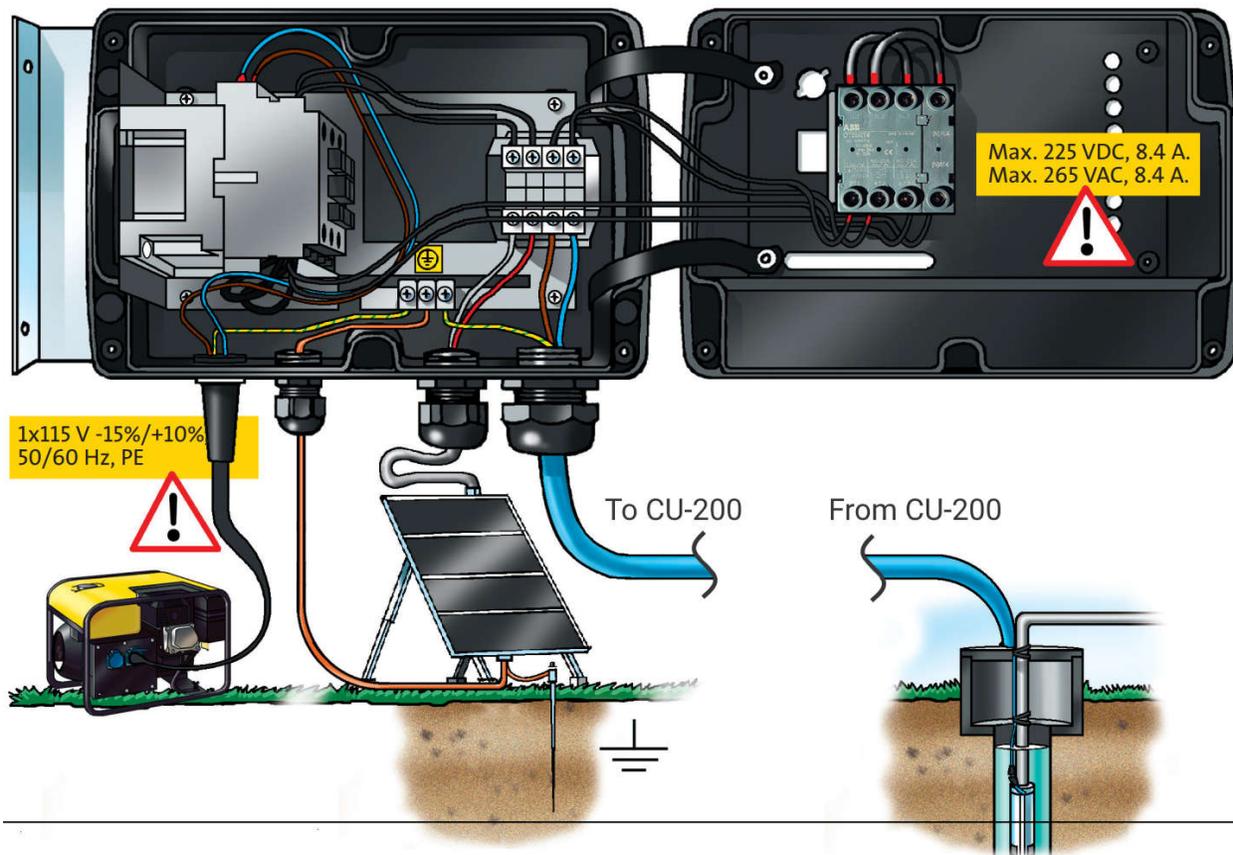
This configuration, shown on page 10, combines the dual input capability of the IO-101 with the status and tank full monitoring of the CU-200. The combination of the 2 controls is straightforward. The big difference is that the output of the IO-101 is routed thru the CU-200 before being routed to the pump.

The graphic on page 10 intentionally shows the rerouting of the wires from the IO-101 to the CU-200 and then to the pump.

See section 2.5 for information about connecting solar panels and a generator to the IO-101.

See section 2.3 for information regarding the level/float switch operation of the CU-200.

See section 2.4 for information regarding the pressure switch operation of the CU-200.



3 Pressure Switches

The Grundfos CU200 requires a reverse action pressure switch to operate properly.

It is important to note that pressure switches have a hysteresis, meaning that they act differently as the pressure is rising from when the pressure is falling.

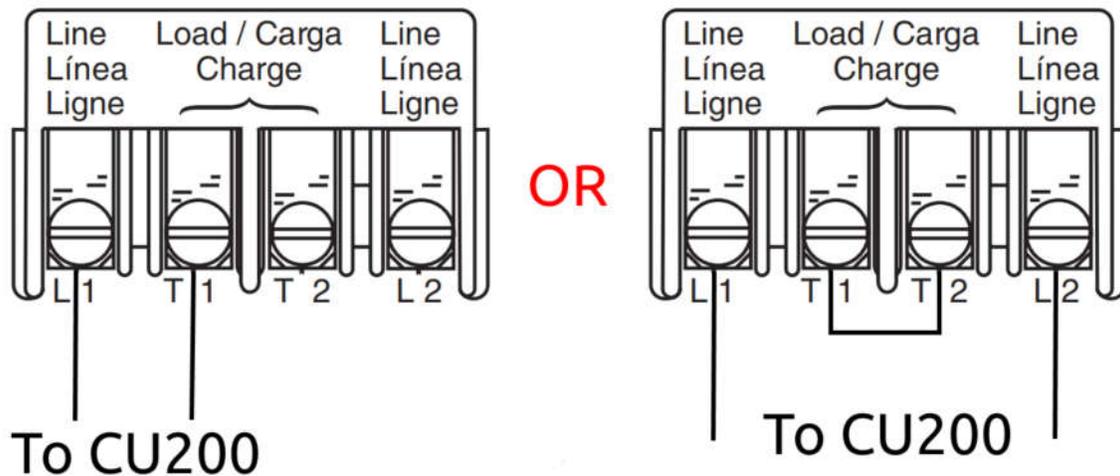
The table below shows the switch states of a typical 30-50psi pressure switch and a reverse action switch when the pressure starts at 0 and rises past the switch max.

Pressure (rising)	Typical 30-50 switch contacts	Reverse action contacts
20 and below	CLOSED	OPEN (CU200 on)
30	CLOSED	OPEN (CU200 on)
40	CLOSED	OPEN (CU200 on)
50	OPEN (shuts off pump here)	CLOSED (CU200 off)
60 and above	OPEN	CLOSED (CU200 off)

The table below shows the switch states of a typical 30-50psi pressure switch and a reverse action switch when the pressure starts at 60 and falls past the switch min.

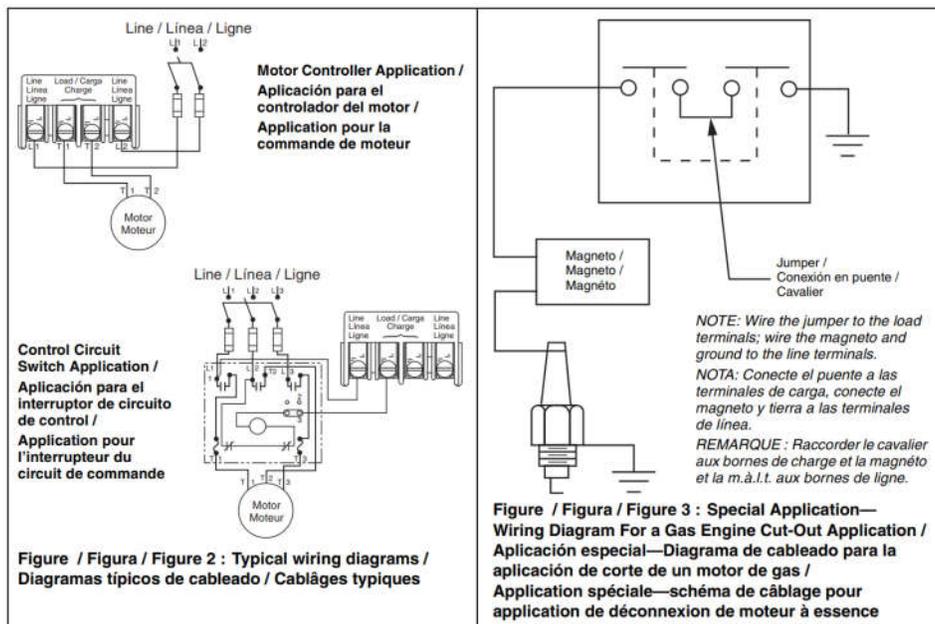
Pressure (falling)	Typical 30-50 switch contacts	Reverse action contacts
60 and above	OPEN	CLOSED (CU200 off)
50	OPEN	CLOSED (CU200 off)
40	OPEN	CLOSED (CU200 off)
30	CLOSED (turns on pump here)	OPEN (CU200 on)
20 and below	CLOSED	OPEN (CU200 on)

The diagram below shows a typical wiring for the reverse action pressure switch. For the CU 200 the switch DOES NOT go in line with the load. It is used as a signal to the CU200 so that it can shut off the pump.



Note that a typical installation would route the MAINS power lines thru the switch to the pump. DO NOT do this with the DC lines for the Grundfos pumps. The contacts are not rated for high DC voltage and the contacts may arc or weld together.

4 Solar



Calculations Math Tutorial for Solar Energy Power Systems

If you would like some additional information regarding solar panels, their connections and how they may affect pump performance, please visit the Sunshine Works website:

<https://sunshineworks.com/pages/solar-calculations-math-tutorial-for-solar-energy-power-systems>

