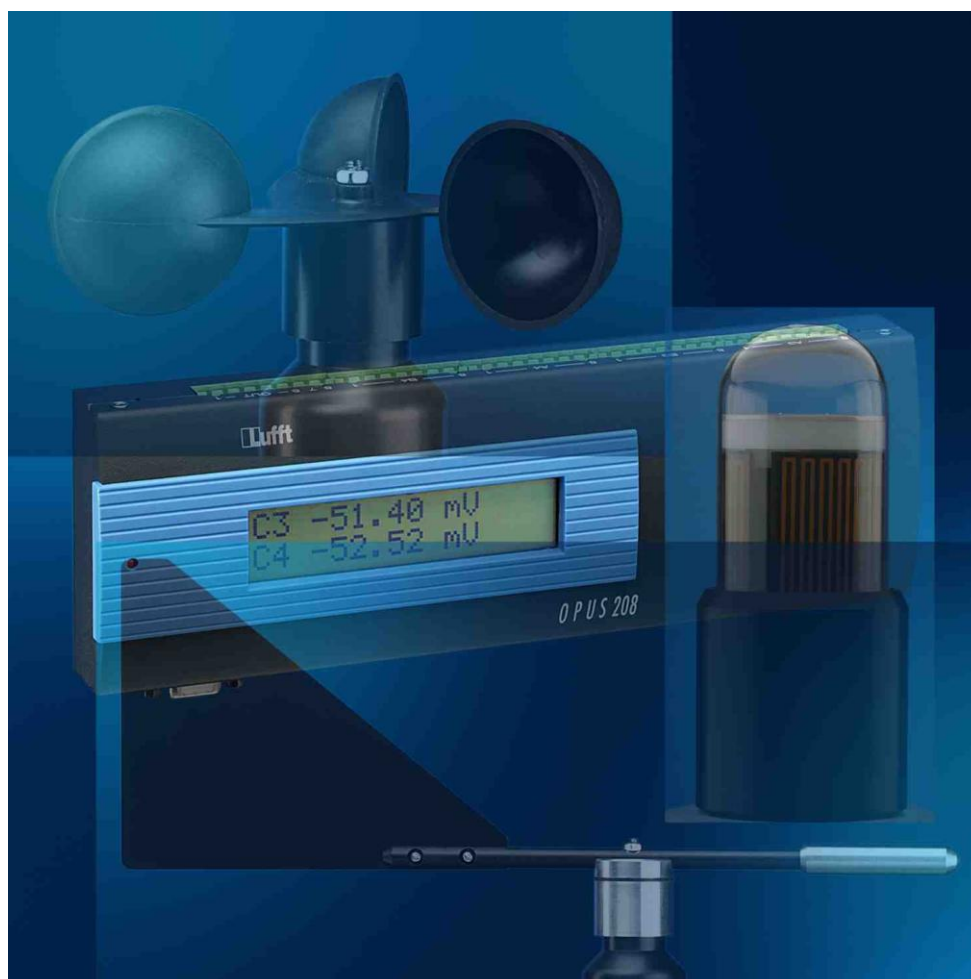


# Manual **OPUS 200/300/208**

Meteorological sensors

Version V12/ 27.08.2007



 **Lufft**

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## 1 General

The following pages describe the electrical connection of the sensors to the OPUS200/300/208 and the required configuration of the SmartControl software.

Please note that incorrect connection of a sensor or sensors can destroy the OPUS200/300/208.

If you connect sensors that are not described in this manual, please refer to the OPUS200/300/208 operating manual.

The current operating manuals can be downloaded from the the Lufft website:

<http://www.lufft.com>

**Important:** note that, contrarily to OPUS200/300, the numerical sequence of the connector on the OPUS208 goes from right to left, i.e. Pin 1 on the OPUS208 is located on the right and Pin 8 on the OPUS208 is located on the left.

In addition, there are limitations in the channel configuration on the OPUS208. The following table shows the possible connection configurations.

Sensor Type / Channel Number / Channel Identification	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
	A1	B1	A2	B2	A3	B3	A4	B4
Frequency	●	●	●	●	●	●		
Pulse	●	●	●	●	●	●		
Voltage	●	●	●	●	●	●	●	●
Current	●	●	●	●	●	●	●	●
Thermo-element (E, J, K, N, R, S)	●	●	●	●	●	●	●	●
Resistance	●	●	●	●	●	●	●	●
PT100	●	●	●	●	●	●	●	●
PT1000	●	●	●	●	●	●	●	●
Air pressure	●	●	●	●	●	●	●	●
Luxmeter	●	●	●	●	●	●	●	●
Pyranometer	●	●	●	●	●	●	●	●
Precipitation ③	●	●	●	●	●	●		
Wind speed ①	●		●		●		●	
Wind direction ①		●		●		●		●
Leaf wetness	●	●	●	●	●	●		
Soil humidity	●	●	●	●	●	●		
Temp./rel. humidity Sensor (TFF) ②	●	●	●	●	●	●	●	●
	(T1)	(H1)	(T2)	(H2)	(T3)	(H3)	(T4)	(H4)

Table: Possible connection configurations on the OPUS208

The OPUS208 has 4 channel pairs which are identified as A1/B2, A2/B2, A3/B3 and A4/B4. The connection pin corresponding to a channel pair gets the identification x.An or x.Bn : x (1...8) is namely the Pin Number and n (1..4) the number of the channel pair.

OPUS200/300 has only one channel pair.

The inputs of the OPUS200/300/208 are differential inputs. These inputs must not be connected to the earth/ground line of the OPUS200/300/208 mains unit!

❶ Up to four wind speed meters and up to four combined meters for wind speed and wind direction can be connected to an OPUS208.

Combined meters are to be connected to channels A1/B1 , A2/B2 , A3/B3 or A4/B4.

Wind speed must be connected to channels A1, A2, A3, A4 and wind direction to channels B1, B2, B3, B4.

❷ Up to four combined meters for temperature and relative humidity can be connected to an OPUS208. Combined meters are to be connected to channels A1/B1 , A2/B2 A3/B3 and A4/B4. Temperature must be connected to channels A1, A2, A3, A4 and relative humidity to channels B1, B2, B3, B4.

❸ If a precipitation sensor is connected to either channel An or Bn of an OPUS 200 or OPUS 208, the respective other channel cannot bear any sensor which requires PIN 8 for auxiliary power supply. Sensors which use Pin 8 as auxiliary power supply are for example air pressure, leaf wetness, soil moisture and all 4..20 mA sensors in two-wire technique.

## 2 Air pressure (8355.03)

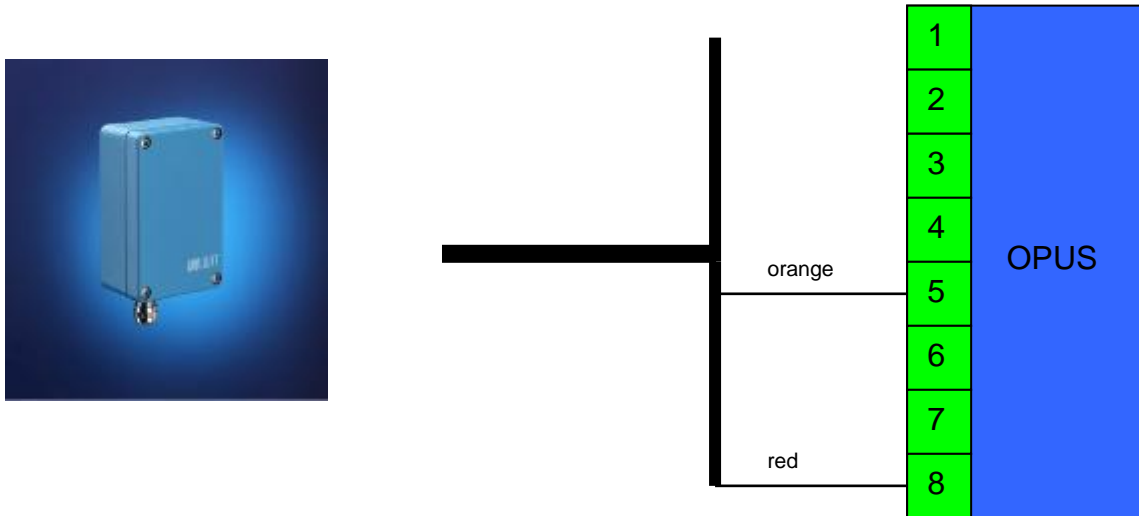


Figure: connecting the air pressure sensor to the OPUS200/300/208

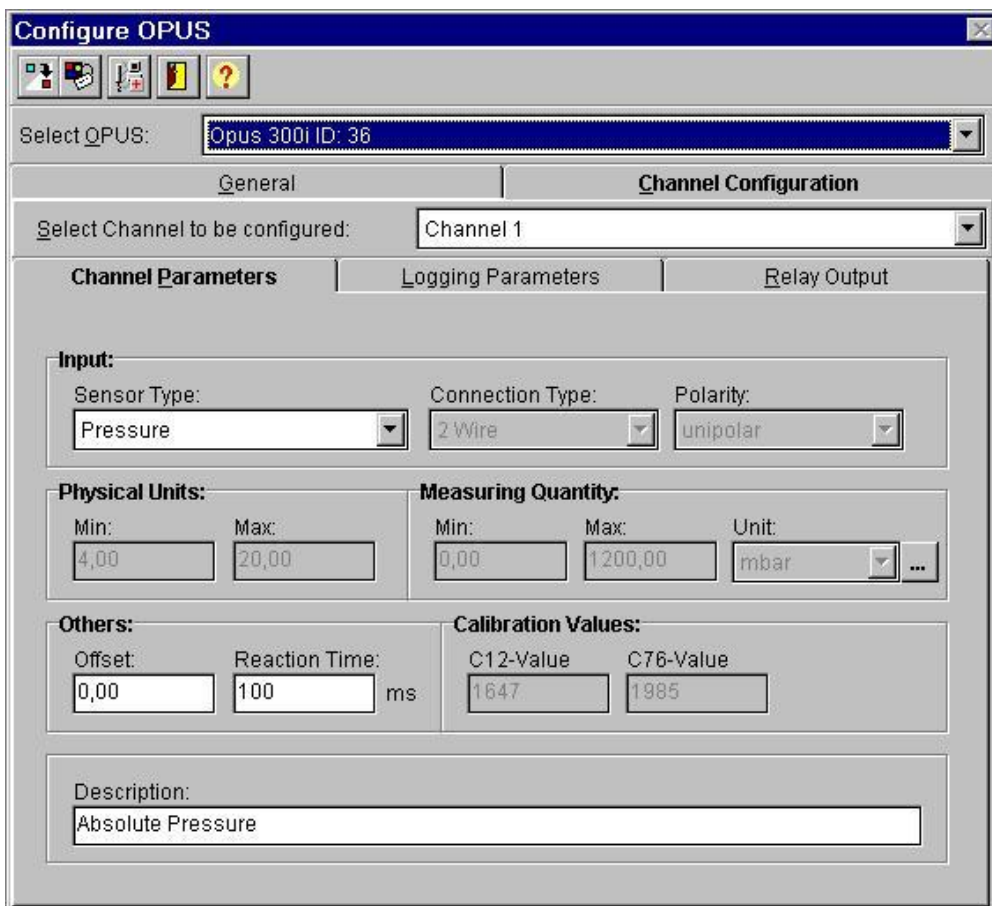


Figure: channel configuration in SmartControl

### 3 Pyranometer (8346.00)

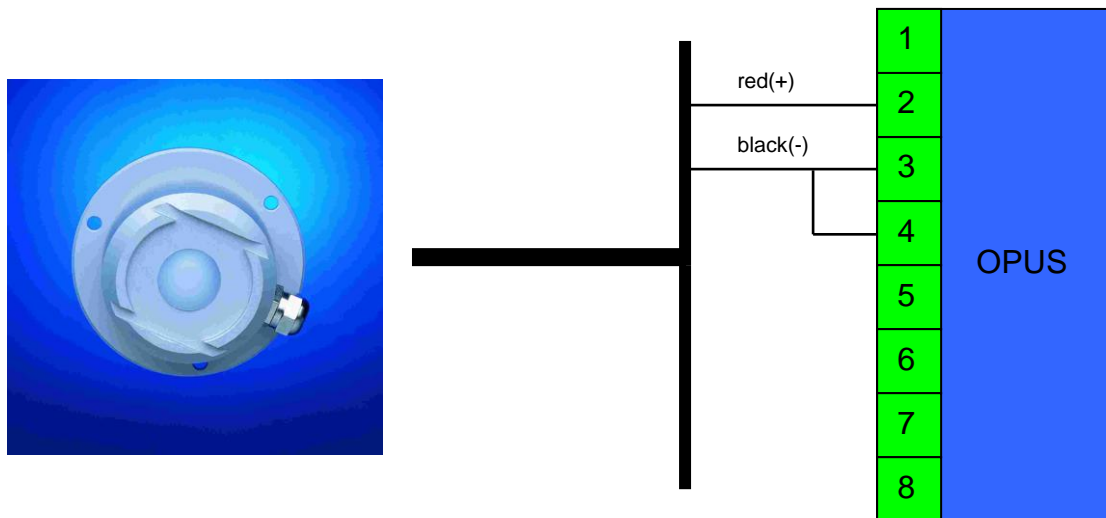


Figure: connecting the Solar130 pyranometer to the OPUS200/300/208

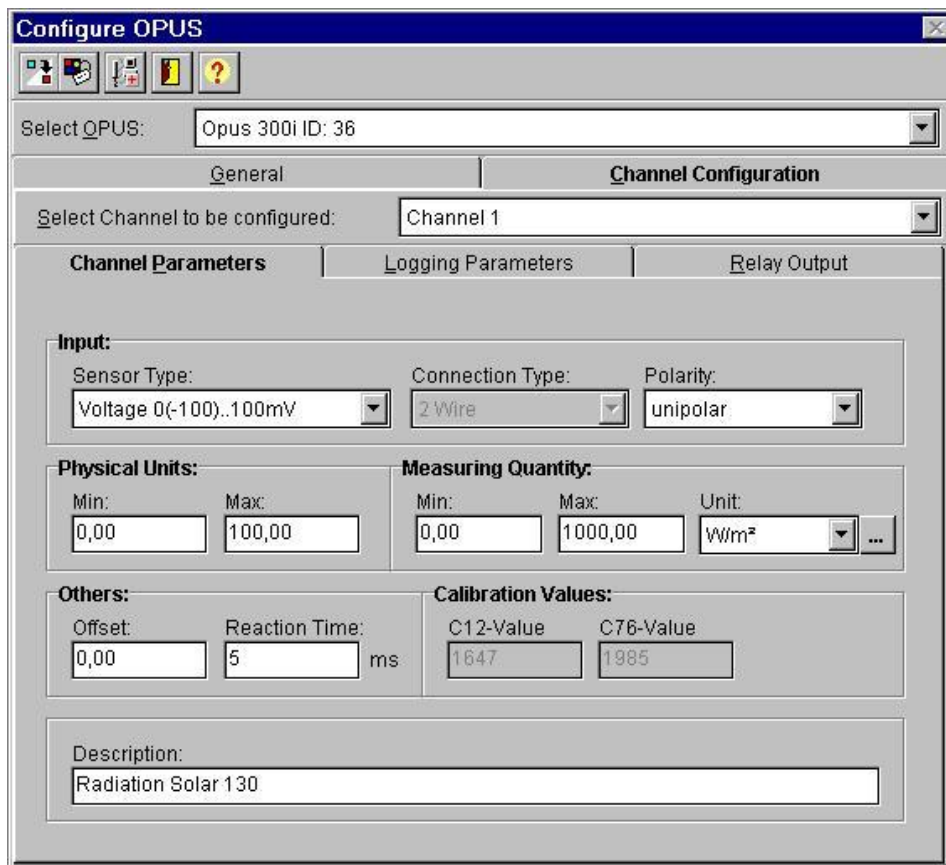


Figure: channel configuration in SmartControl

## 4 Precipitation, unheated

Type: unheated 0,1mm resolution (no. 8353.02)

Type: unheated 0,2mm resolution (no. 8353.04)

Type: unheated 1,0mm resolution (no. 8353.05)

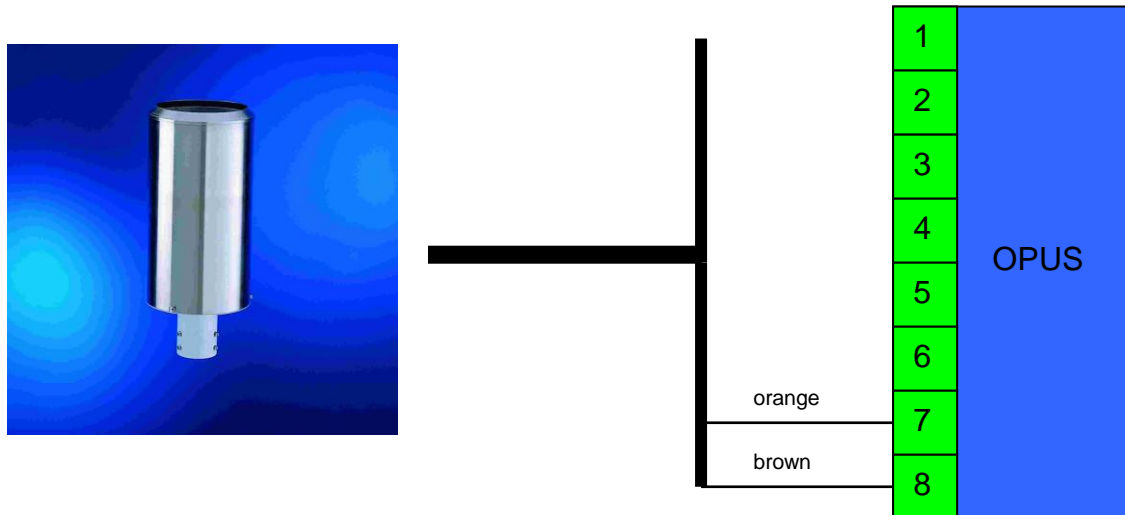
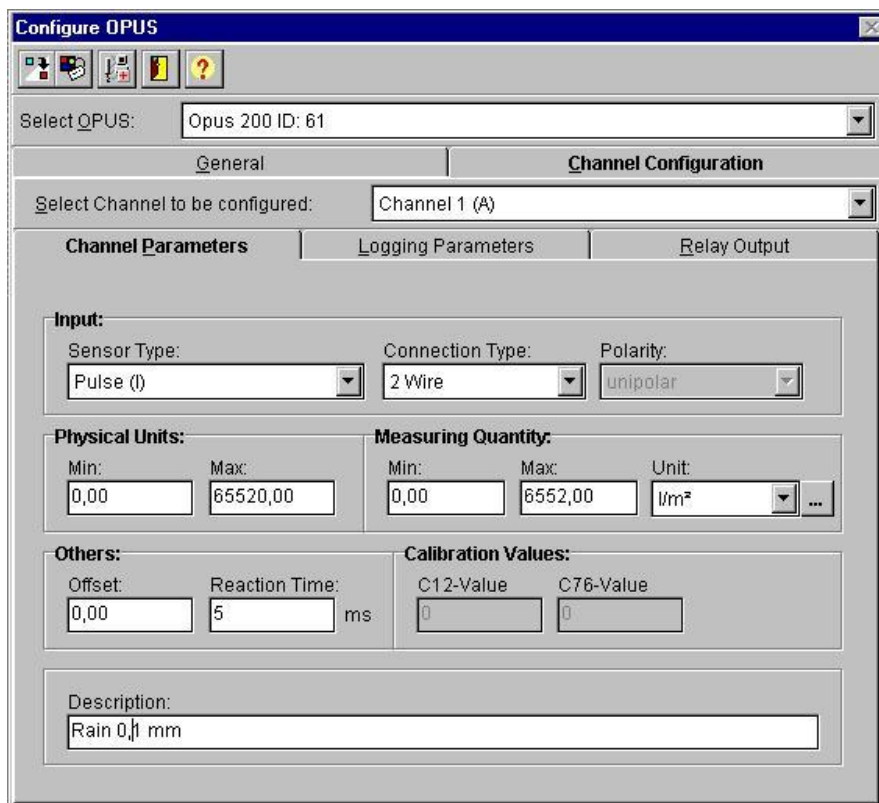


Figure: connecting a precipitation gauge to the OPUS200/300/208



Measuring Quantity
<b>Max. Value</b>
8353.02: 6552
8353.04: 13104
8353.05: 65520
<b>Min. Value:</b>
0 for all sensors
<b>Set Sensor Type</b>
8353.02: Pulse (I)
8353.04: Pulse (U)
8353.05: Pulse (U)
<b>Set Logging Parameters:</b>
Saving of "Sum"

Figure: channel configuration in SmartControl

## 5 Precipitation, heated (8353.01)

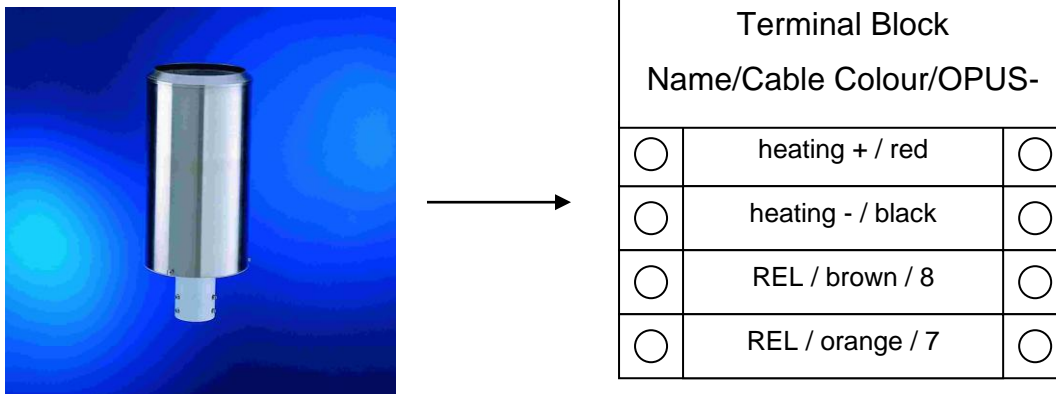


Figure: Connecting a precipitation gauge to the OPUS200/300/208

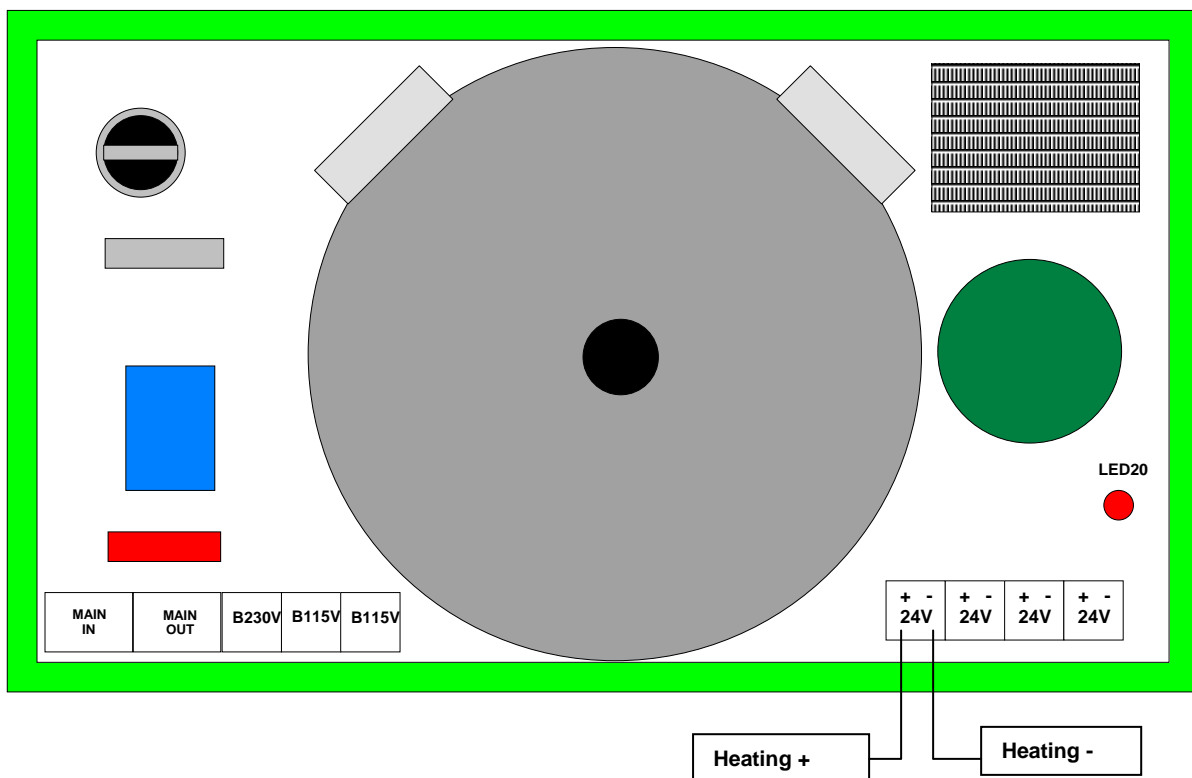


Figure: connecting the heating to the power supply unit 8161.SV4

Installation:

- Connect the four leads for the heating and the relay contact to the terminal block.
- Connect the two outputs of the heating mains unit in parallel and connect these to the terminal block.
- Connect the bridge B230 or the bridges B115, independently of the mains power supply.
- Connect the relay contact of the sensor to the OPUS200/300/208 as on the unheated version.
- Connect the mains power supply. The two LED's of the outputs must now light up.

**Important:** The mains unit must not be used for the heating of the sensor! The additional connection of an OPUS200/300 is not permissible!

SmartControl settings as for the unheated version.

## 6 Radar precipitation (R2S)

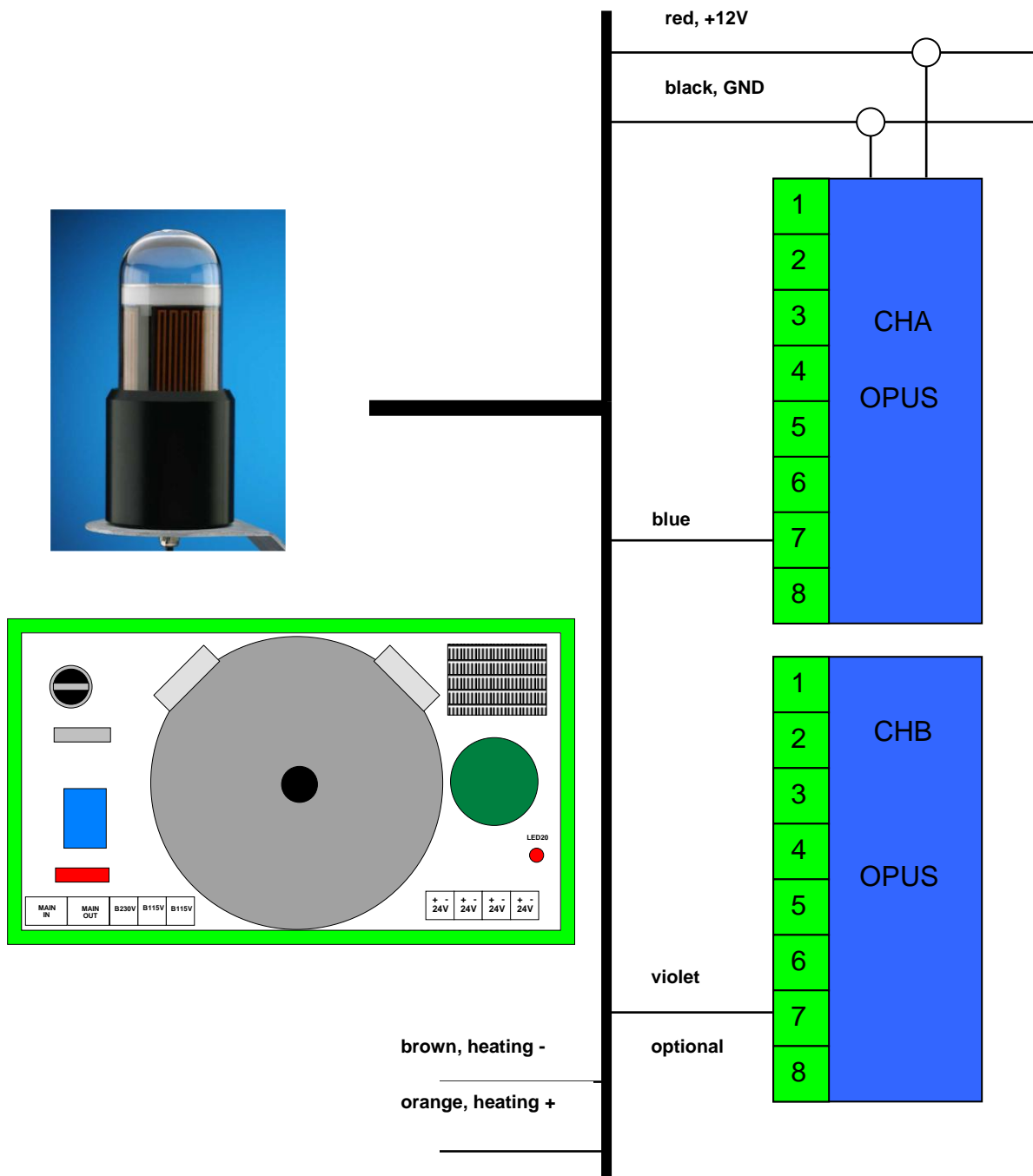
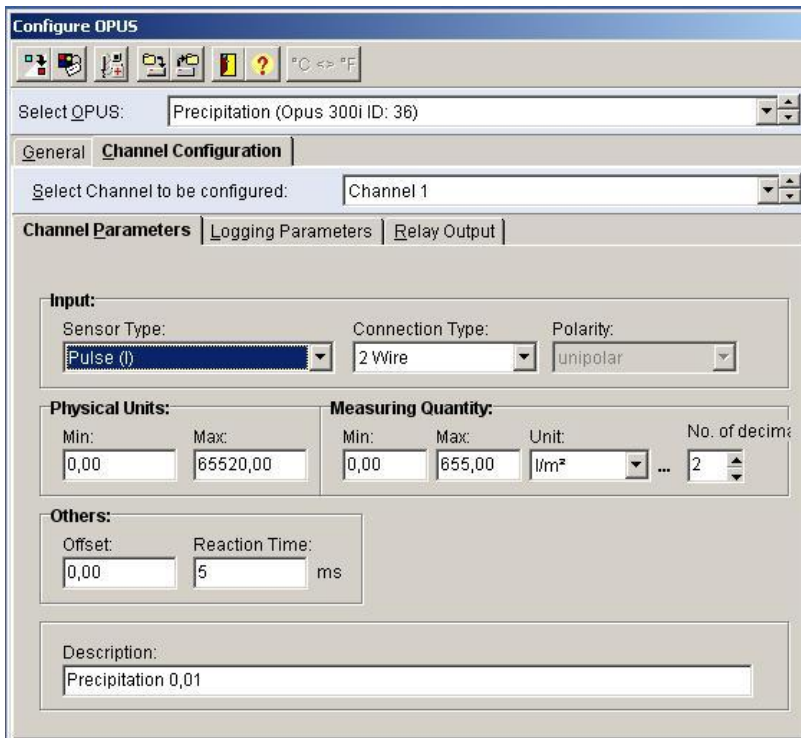


Figure: connecting the radar precipitation to the OPUS200/300/208

**Important:** the voltage supply of the R2S must be connected in parallel to the power supply of the OPUS200.



Measuring Quantity

**Set Max. Value**

Resolution 0.01mm : 655 \*

Resolution 0.1mm : 6552

Resolution 1.0mm : 65520

**Set Min. Value:**

0 for all sensors

**Set Logging Parameters:**

Saving of "Sum"

**\* Factory setting**

Figure: channel configuration A (1) in SmartControl

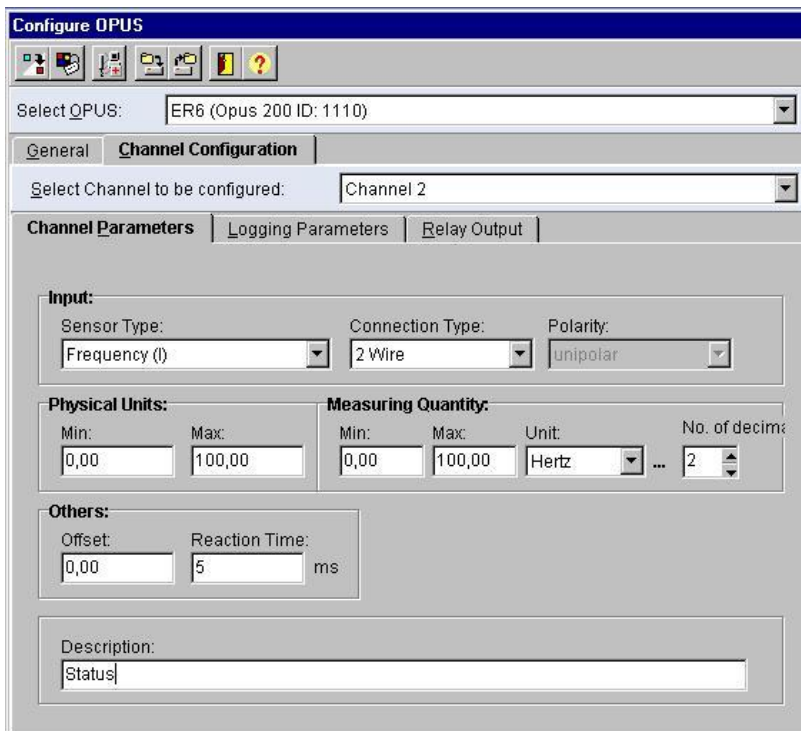


Figure: channel configuration B (2) in SmartControl

## 7 Wind speed, unheated (8368.03)

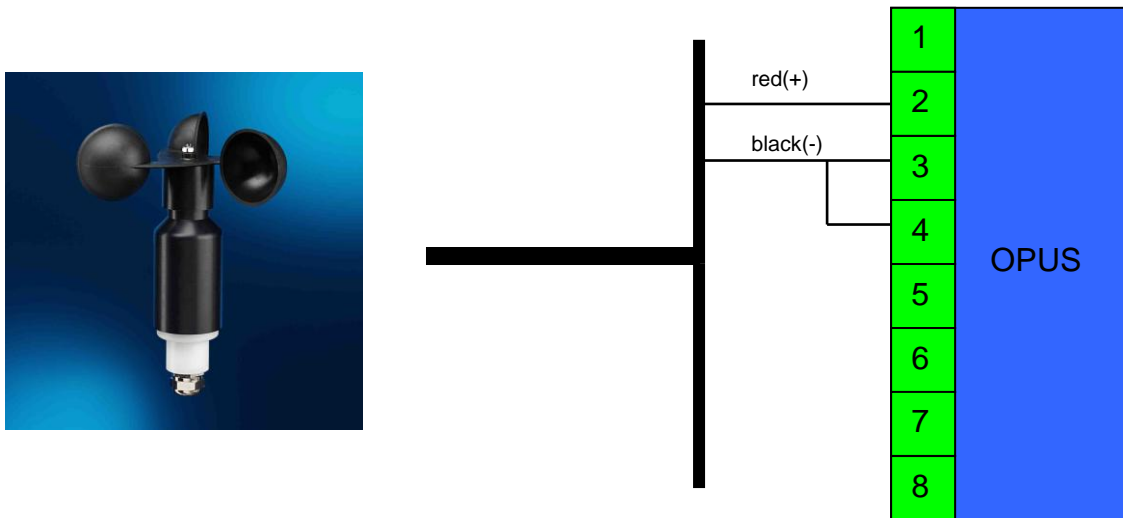


Figure: connecting the wind speed sensor to the OPUS200/300/208

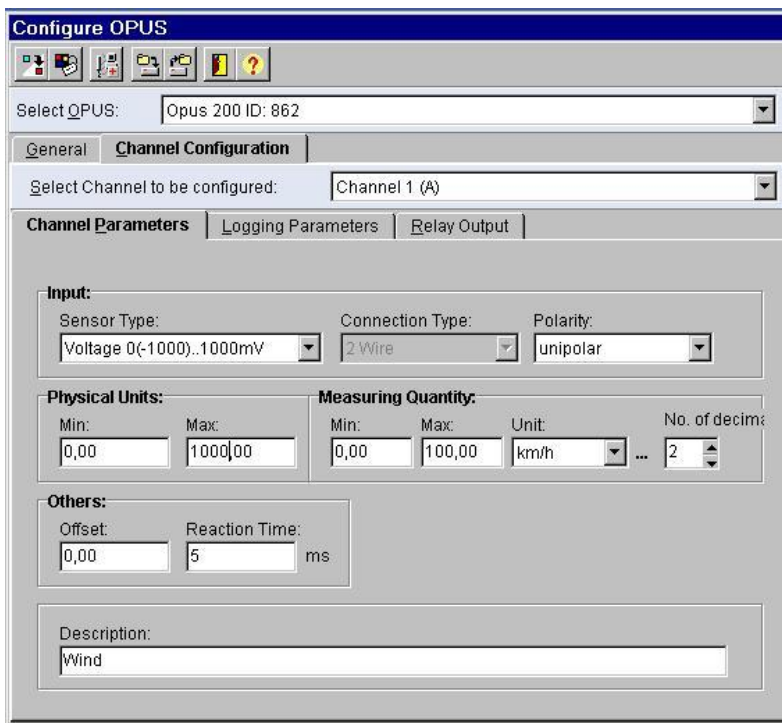


Figure: channel configuration in SmartControl

## 8 Wind speed, heated (8368.04)

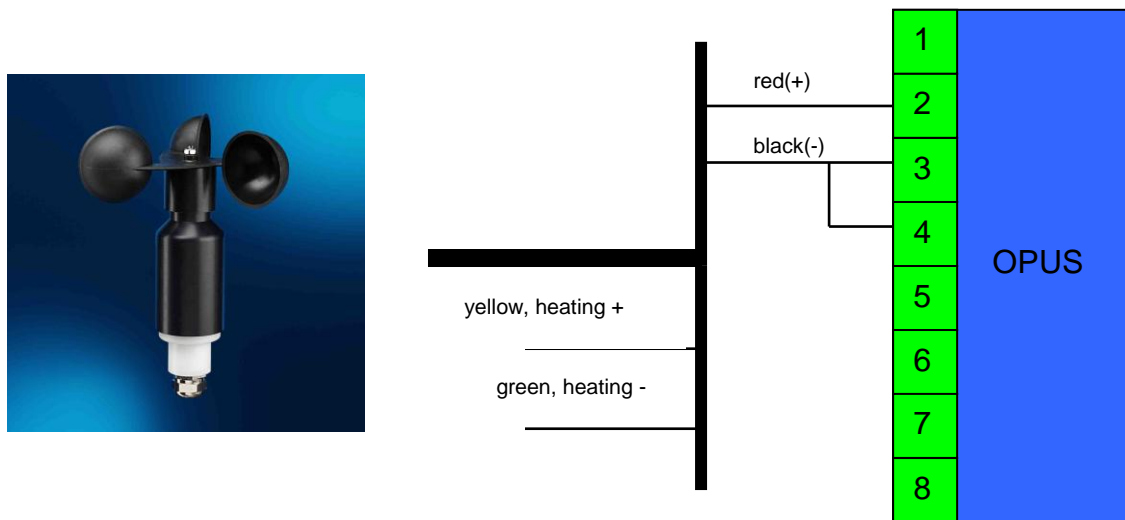


Figure: connecting the wind speed sensor to the OPUS200/300/208

The screenshot shows the 'Configure OPUS' software interface. The 'Channel Configuration' tab is active. The 'Select Channel to be configured:' dropdown is set to 'Channel 1 (A)'. The 'Channel Parameters' section is expanded, showing the following settings:

- Input:** Sensor Type: Voltage 0(-1000)..1000mV, Connection Type: 2 Wire, Polarity: unipolar
- Physical Units:** Min: 0,00, Max: 1000,00
- Measuring Quantity:** Min: 0,00, Max: 100,00, Unit: km/h, No. of decimals: 2
- Others:** Offset: 0,00, Reaction Time: 5 ms
- Description:** Wind

**Important: the sensor supports 2 measuring ranges (0...100km/h and 0...50m/s). The measuring range is selected by connecting the corresponding cable and configuring the software accordingly:**

**Connection „red“:**

Measuring Quantity:		
Min:	Max:	Unit:
0,00	100,00	km/h

**Connection „orange“:**

Measuring Quantity:		
Min:	Max:	Unit:
0,00	50,00	m/s

Figure : channel configuration in SmartControl

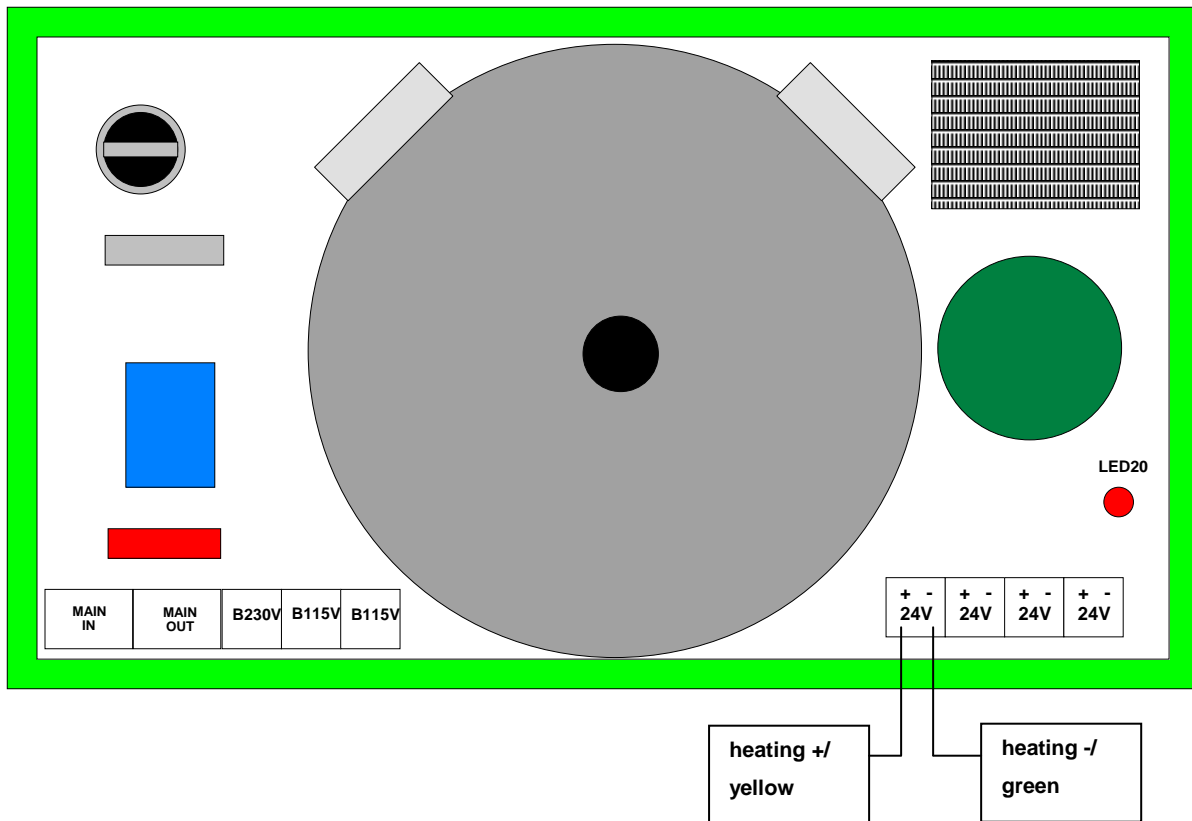


Figure: connecting the heating to the power supply 8161.SV4

Installation:

- Connect the red and the black leads of the wind sensor to the OPUS200.
- Connect the yellow and the green leads to the the 24V power supply unit for the heating.
- Connect the bridges B230 or the bridges B115, independently of the mains power supply.
- Connect the mains power supply. The two LED's of the outputs must now light up.

**Important:** The mains unit must not be used for the heating of the sensor! The additional connection of an OPUS200/300 is not permissible!

9 Wind speed and wind direction, unheated (8368.01)

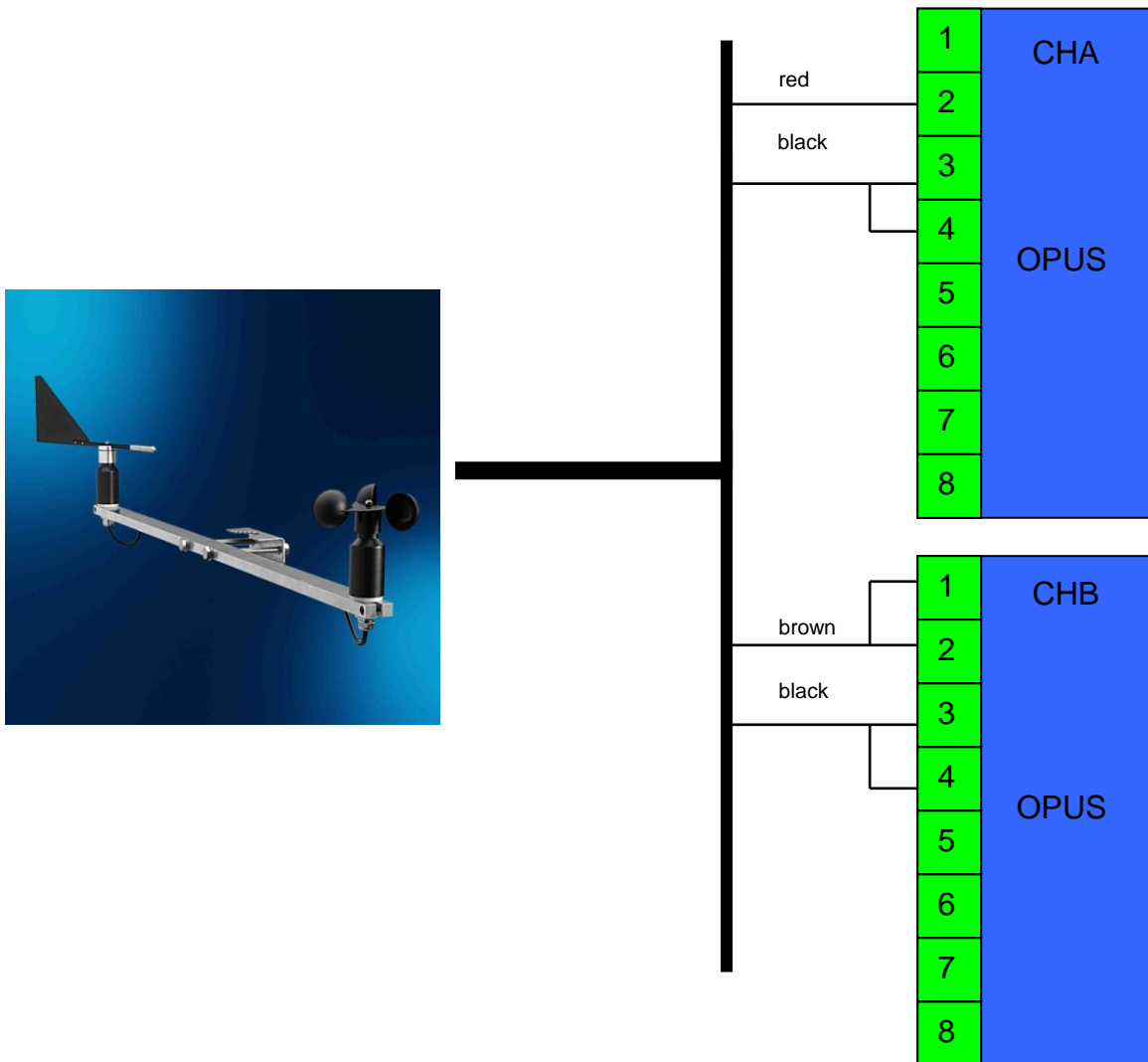
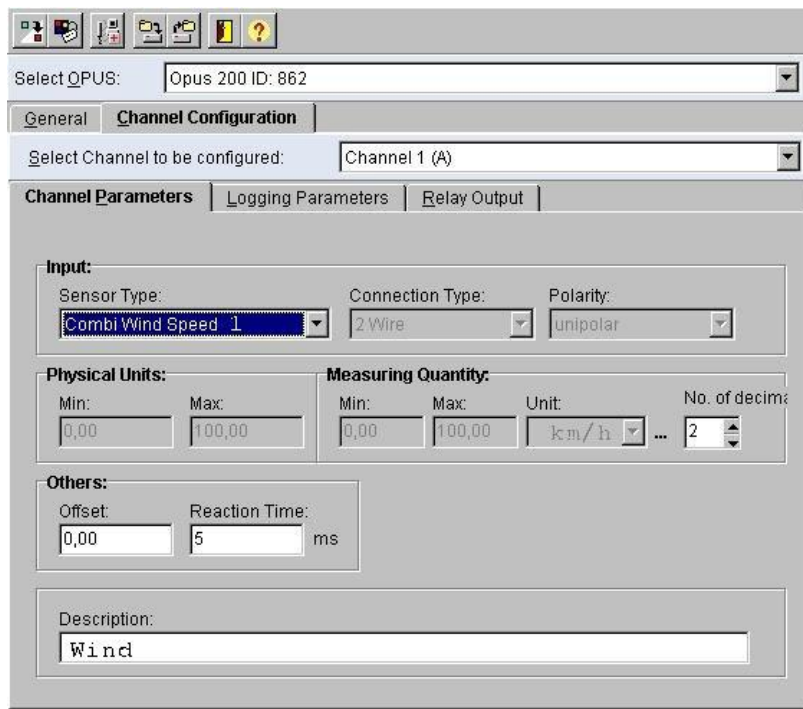


Figure: connecting the combined wind sensor to the OPUS200/300/208

Select the sensor type: "Combi Wind Meter" in SmartControl under channel configuration. Make sure that the channel Bn (n: 1...4) shows "Combi Wind Dir" under "Sensor Type".



**Important: the sensor supports 2 measuring ranges (0...100km/h and 0...50m/s). The measuring range is selected by connecting the corresponding cable and configuring the software accordingly**

**Connection „red“  $\triangleq$  0...100km/h**

**Connection „orange“  $\triangleq$  0...50m/s**

Figure: channel configuration in SmartControl with measuring range 0...100km/h

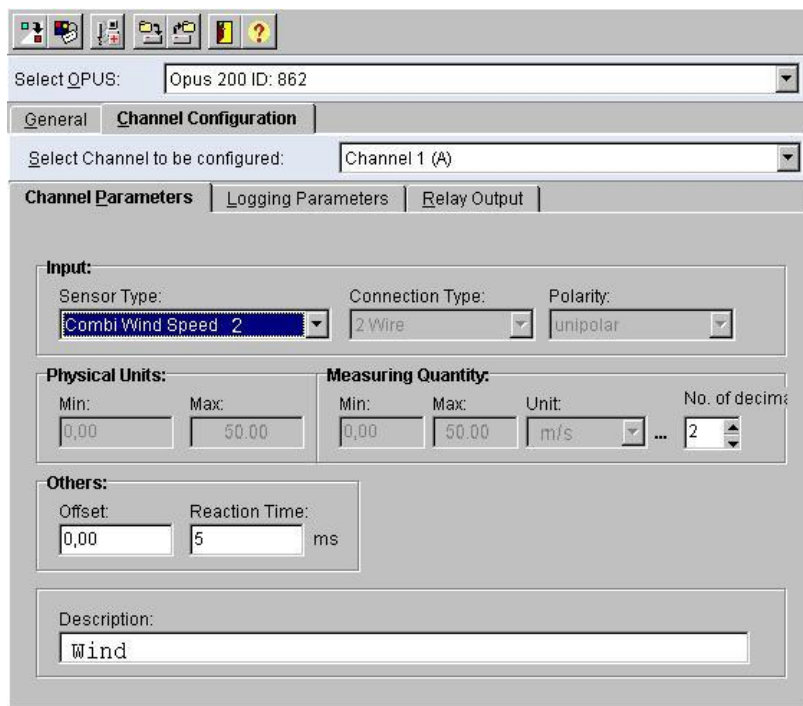


Figure: channel configuration in SmartControl with measuring range 0...50m/s

10 Wind speed and wind direction, heated (8368.02)

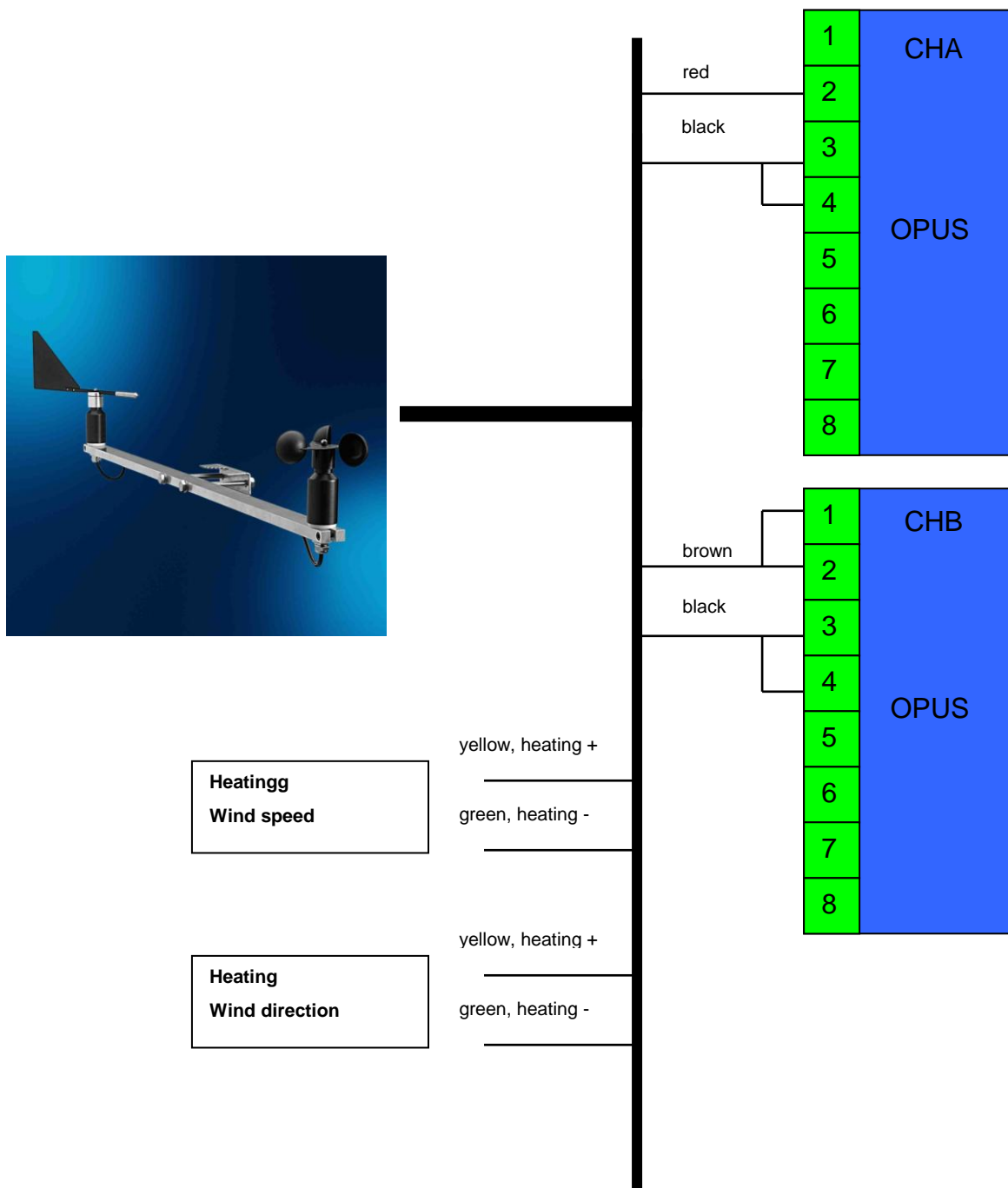


Figure: connecting the combined wind sensor to the OPUS200/300/208

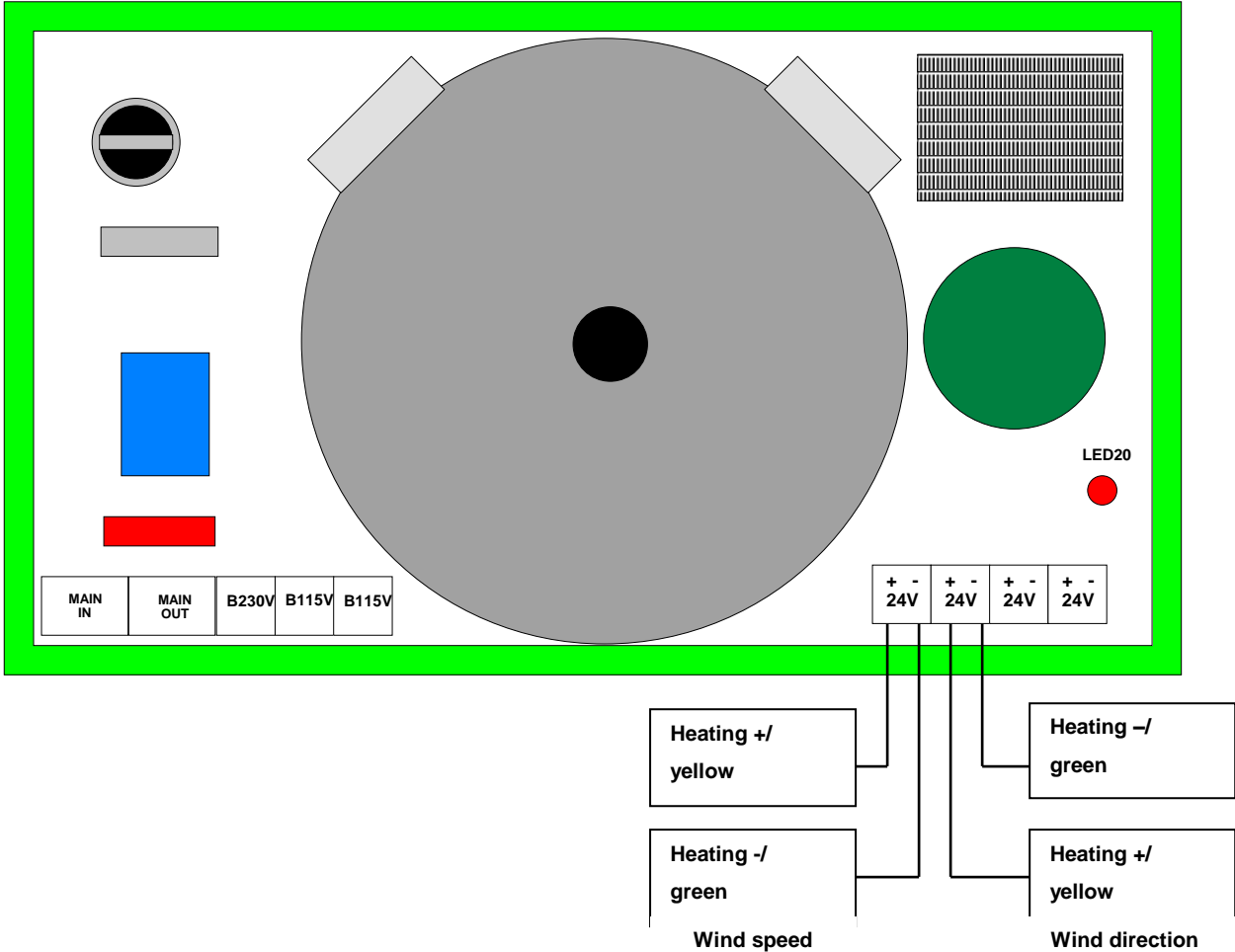


Figure: connecting the heating to the power supply 8161.SV4

Installation:

- Connect the red and the black leads of the wind sensor to the OPUS200.
- Connect the yellow and the green leads to the the 24V power supply unit for the heating.
- Connect the bridges B230 or the bridges B115, independently of the mains power supply.
- Connect the mains power supply. The two LED's of the outputs must now light up.

**Important:** The mains unit must not be used for the heating of the sensor! The additional connection of an OPUS200/300 is not permissible!

SmartControl settings as for the unheated version.

## 11 Wind speed and direction, heated (8352.02)



Terminal Block		
Name/CableColour/OPUS-		
<input type="radio"/>	Heating + /Red	<input type="radio"/>
<input type="radio"/>	Heating - / Black	<input type="radio"/>
<input type="radio"/>	UV+ / Brown / 2.A	<input type="radio"/>
<input type="radio"/>	UV- / Yellow / 3.A,4.A	<input type="radio"/>
<input type="radio"/>	PD1 / Orange / 1.B,2.	<input type="radio"/>
<input type="radio"/>	PD2 / Green / 3.B,4.B	<input type="radio"/>

Figure: connecting the wind sensor to the OPUS200/300/208

Select OPUS: Opus 200 ID: 862

General Channel Configuration

Select Channel to be configured: Channel 1 (A)

Channel Parameters | Logging Parameters | Relay Output

**Input:**

Sensor Type: **Combi Wind Speed 1** Connection Type: 2 Wire Polarity: unipolar

**Physical Units:** Min: 0,00 Max: 100,00

**Measuring Quantity:** Min: 0,00 Max: 100,00 Unit: km/h No. of decimals: 2

**Others:** Offset: 0,00 Reaction Time: 5 ms

Description: Wind

**Important: the sensor supports measuring range 0...100km/h. Select the following sensor type in the software:**

**Combi Wind Speed 1**

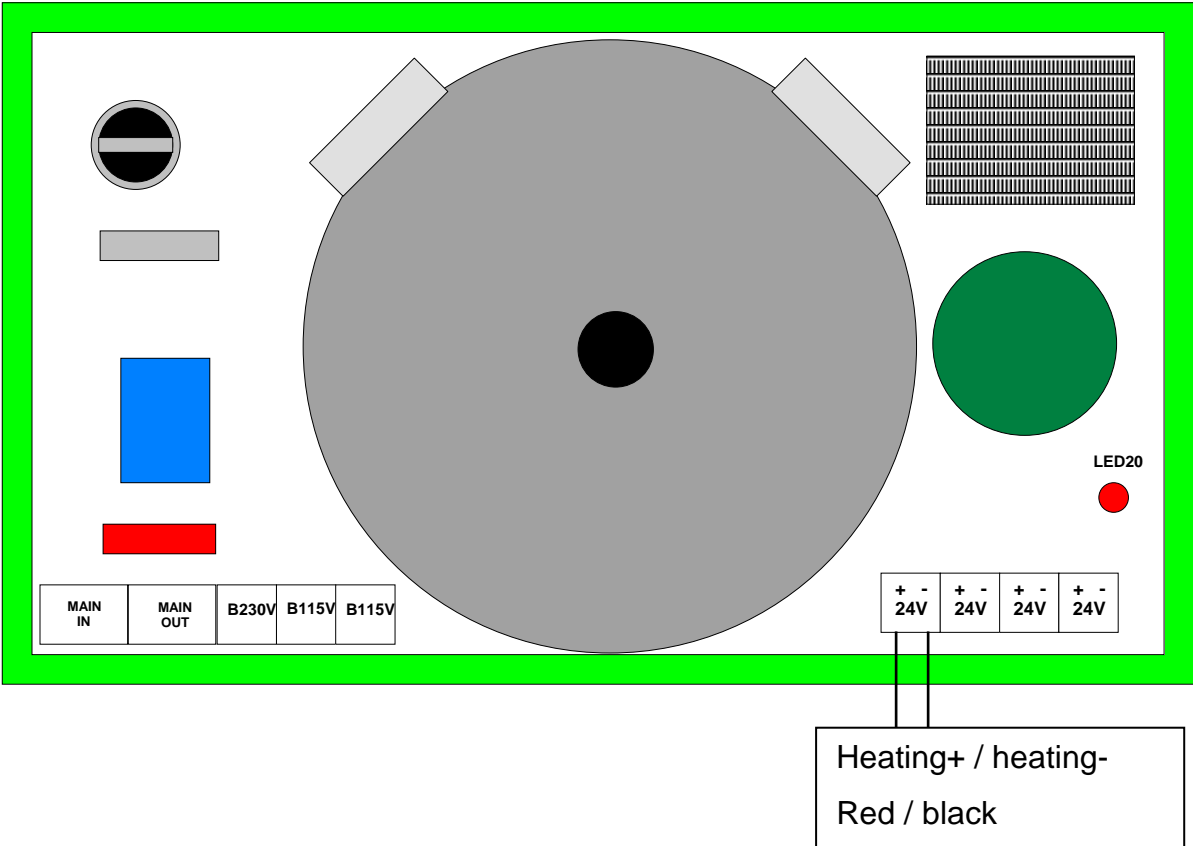


Figure: connecting the heating to the power supply unit 8161.SV4

Installation:

- Connect the sensor leads to the terminal block (take care with the colours!).
- Connect the heating (Heat+/-) from the terminal block to the mains unit. Take care with the polarity of the voltages.
- Connect the leads UV+/UV-, PD1 and PD2 in accordance with the connection table.

Connection Table	OPUS200/300/208	Terminal Block
PIN. (Channel An), (n:	2.An	UV+
PIN. (Channel An), (n:	3.An and 4.An	UV-
PIN. (Channel Bn), (n:	1.Bn and 2.Bn	PD1
PIN. (Channel Bn), (n:	3.Bn and 4.Bn	PD2

- Connect the bridges B230 or the bridges B115, independently of the mains power supply.
- Connect the mains power supply. The two LED's of the outputs must now light up.

**Important:** The mains output used must only be used for the heating/power supply of the sensor! The additional connection of an OPUS200/300/208 on the same output is not permissible! The second output of the mains unit can be used to power an OPUS200/300/208.

SmartControl settings as for the unheated version.

12 ULTRASONIC, heated (8352.03)

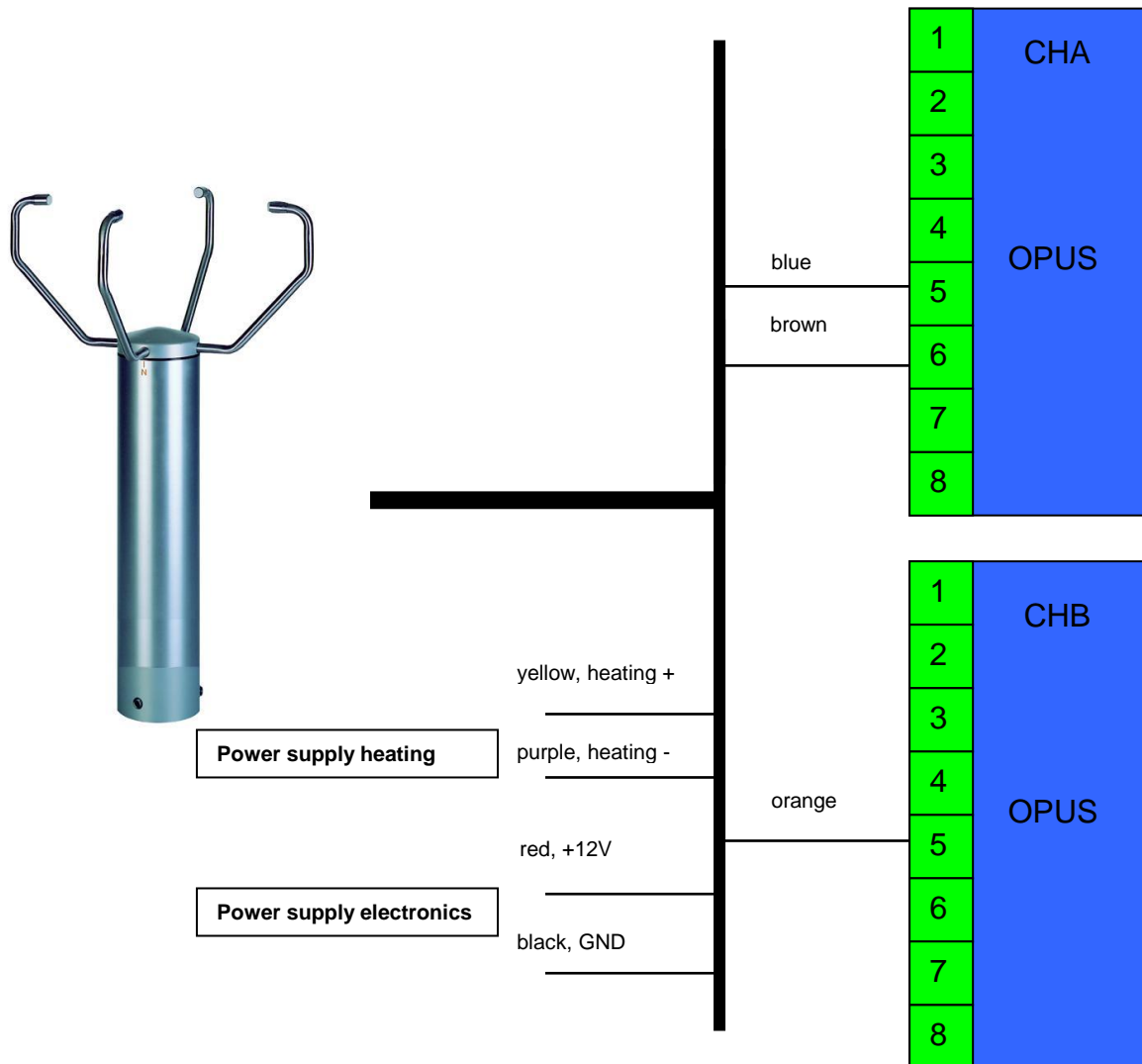


Figure: connecting the ultrasonic to the OPUS200/300/208

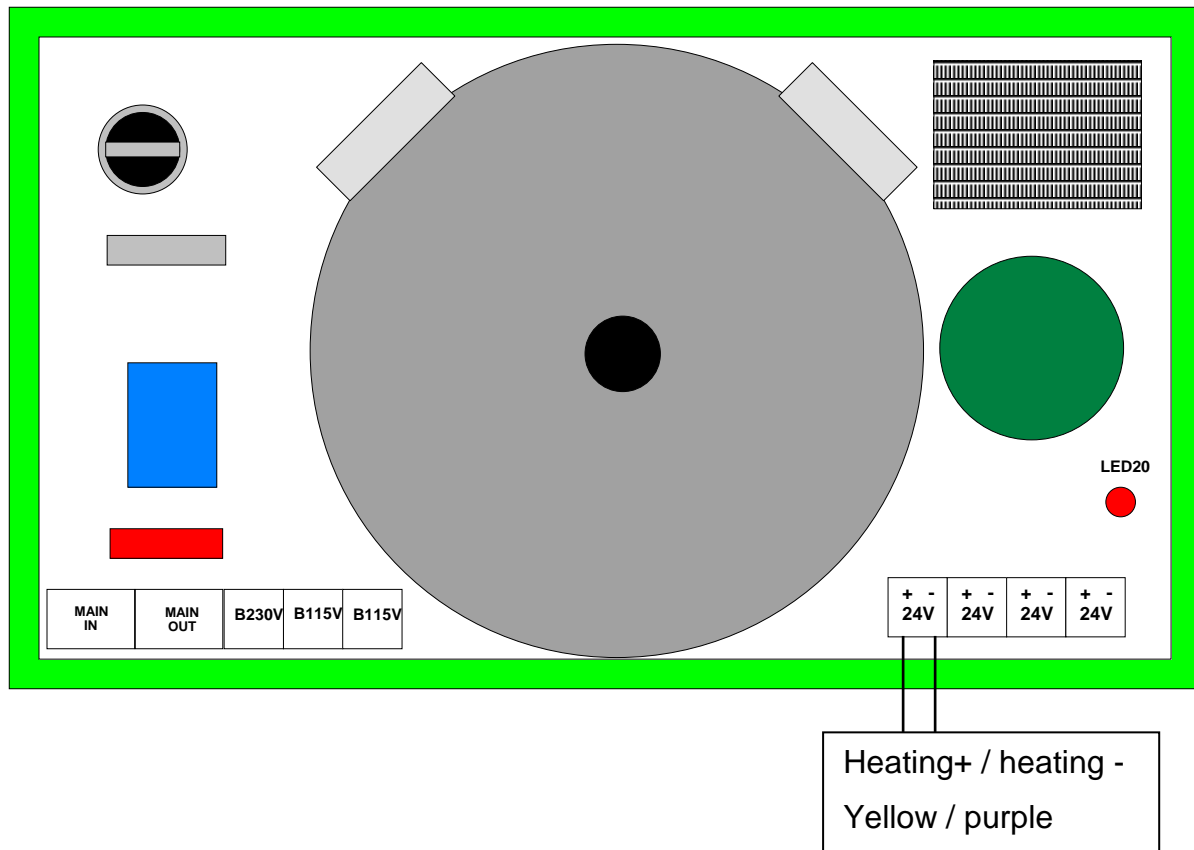


Figure: connecting the heating / power supply to the 8161.SV4

Installation:

- Connect the sensor leads to the OPUS200 (observe the colours!).
- Connect the heating (Heat+/-) and the power supply leads (Uv+/-) from the terminal block to the mains unit. Observe the polarity of the voltages.
- Connect the bridges B230 or the bridges B115, independently of the mains power supply.
- Connect the mains power supply. The two LED's of the outputs must now light up.

**Important:** the power supply must be used only for the heating and power supply of the sensor! The additional connection of an OPUS200/300/208 is not permissible!

Select USONIC as sensor type in SmartControl.

### 13 Leaf wetness (8359.02)

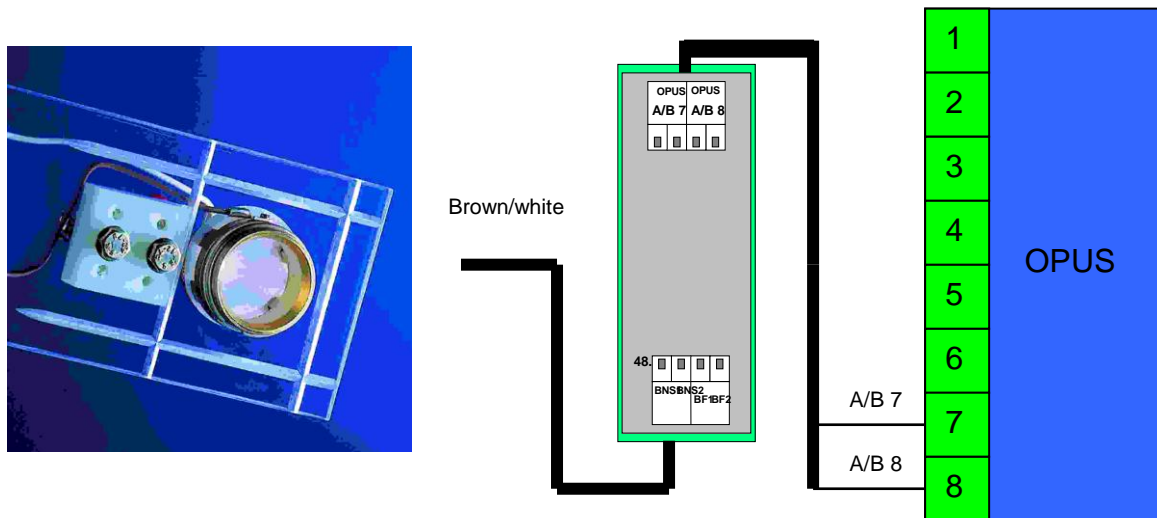


Figure: connecting a leaf wetness sensor to the OPUS200/300/208

**Important:** The leaf wetness sensor is connected through a converter. The converter is supplied with the sensor. The polarity of BNS1 and BNS2 is freely selectable.

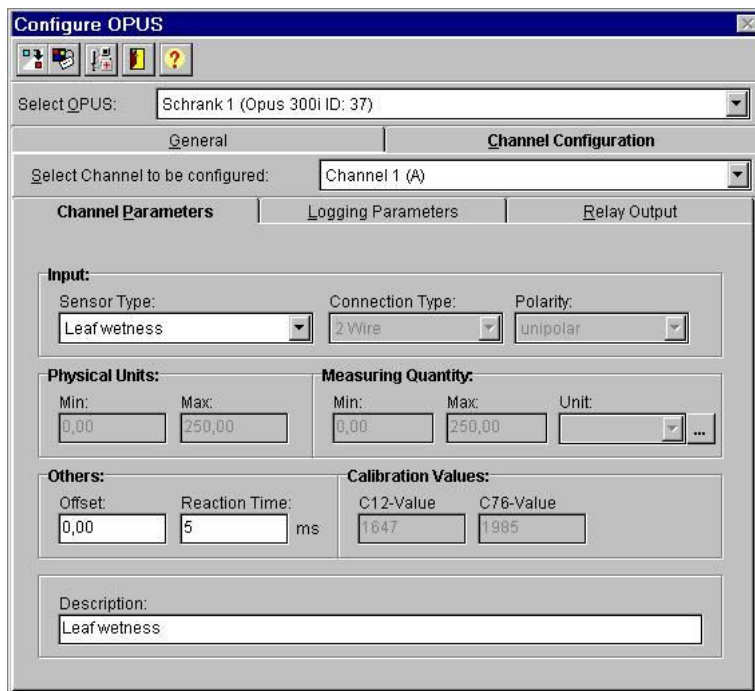


Figure: channel configuration in SmartControl

## 14 Soil humidity (8358.01)

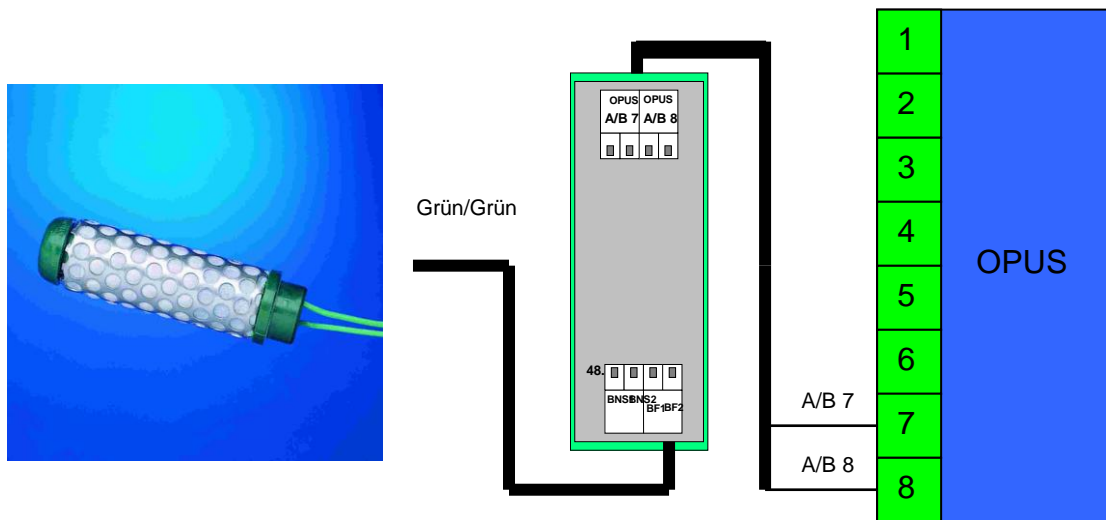


Figure: connecting a soil humidity sensor to the OPUS200/300/208

**Important:** The soil humidity sensor is connected through a converter. The converter is supplied with the sensor. The polarity of BNS1 and BNS2 is freely selectable.

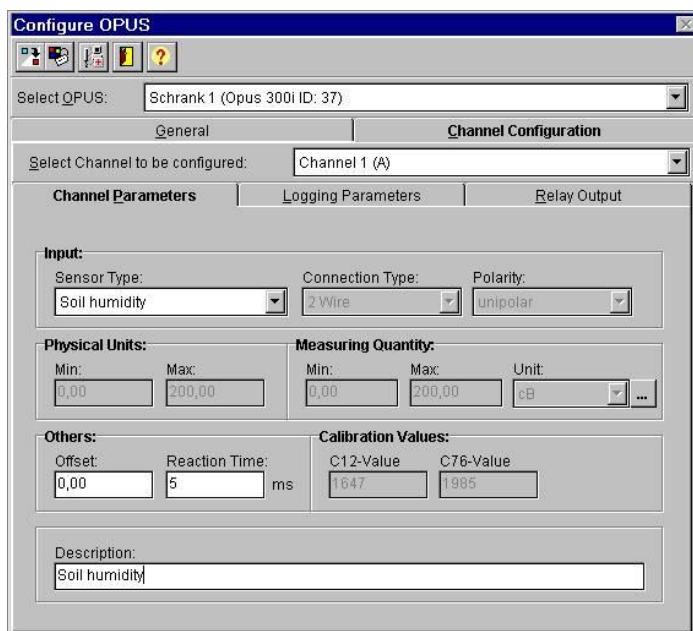
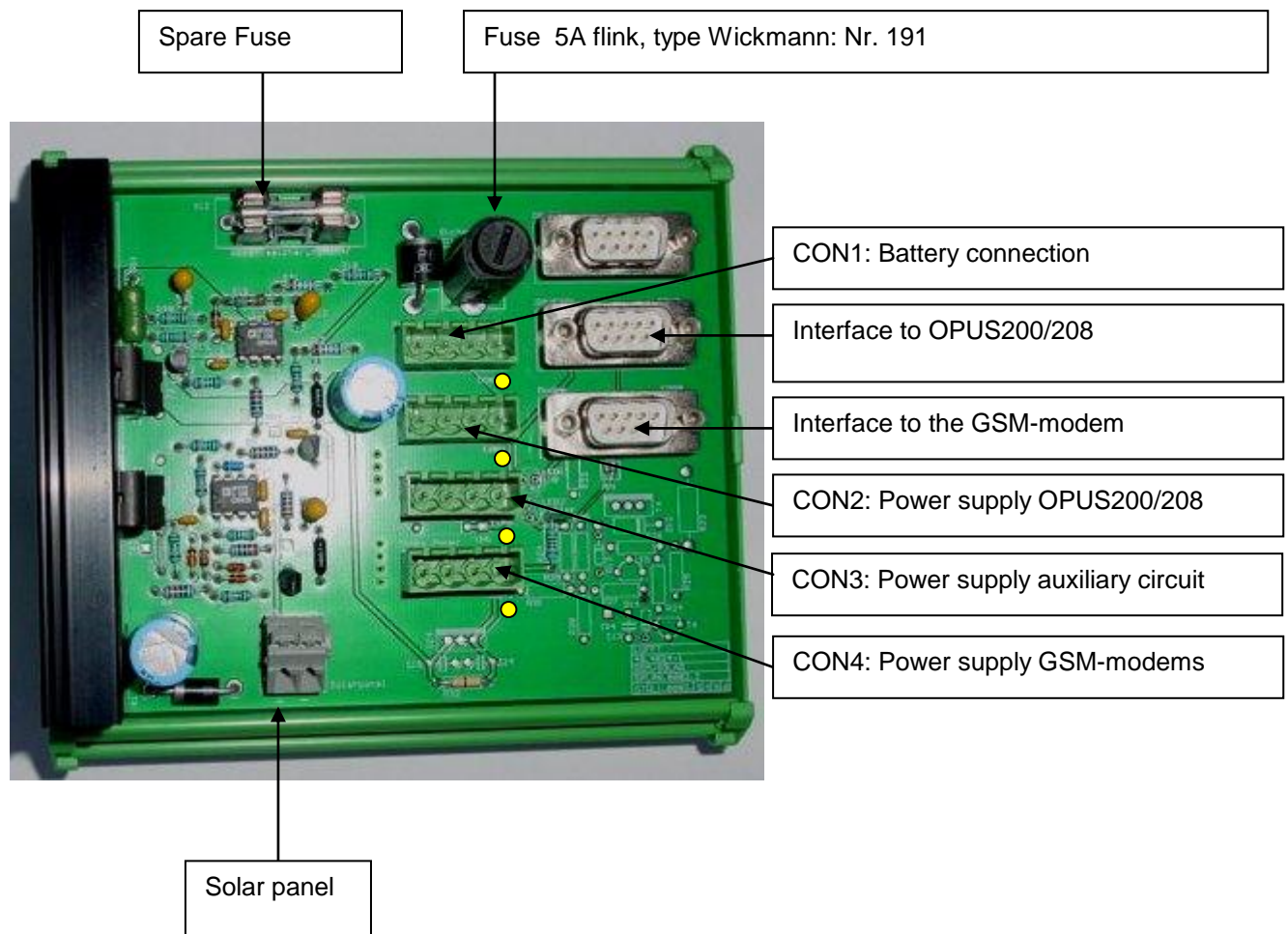


Figure: channel configuration in SmartControl

## 15 Solar power supply (8160.SOL2)



Connector	CON1 (BAT)	CON2 (OPUS20x)	CON3 (AUX)	CON4 (Modem)
PIN1 <span style="color: yellow;">●</span>	BAT(+)	+12V_OPUS20x	+n.c.	V_Modem (+)
PIN2	BAT(-)	GND_OPUS20x	GND_AUX	V_Modem (-)
PIN3	n.c.	CAN_H	CAN_H	n.c.
PIN4	n.c.	CAN_L	CAN_L	n.c.

Connector assignment CON1....CON4

Connect the following components in the sequence mentioned below:

1. Interface to OPUS200/208
2. Interface to GSM-Modem
3. Power supply for OPUS200/208
4. Power supply for GSM-Modems
5. Battery (max. 12AH, \* check the polarity!)
6. Solar panel (max. 40W/12V, \* check the polarity!)

**Important:** Make sure to use only the original Lufft components for operation. Other components may lead to incorrect operation or may destroy the system.

## 16 Sizing a solar installation with OPUS200

In order to size a solar installation the average power consumption of a system must be calculated. The average power consumption consists of the standby consumption plus the dynamic consumption during measurement.

The typical standby consumption of an OPUS200/300 is 100µA. The power consumption during measurement is ca. 50mA (excluding external power supply of sensors). The measurement time is ca. 100ms + the preset reaction time of the sensor.

The average power consumption of an OPUS200/300 module is therefore given by:

$$I_{av.} = I_{stby} + I_{dyn} \times (t_{on} / t_{off})$$

where:

$I_{av}$	:	Average energy consumption
$I_{stby}$	:	Standby energy consumption (ca. 100µA)
$I_{dyn}$	:	Dynamic energy consumption (ca. 50mA)
$t_{on}$	:	Measurement time + sensor reaction time
$t_{off}$	:	Time between two measuring intervals

Example:

Sizing a 10 channel datalogger with a sampling rate of 60s. External sensor power supply not connected. The reaction time is 0s.

$$I_{av.} = 100\mu A + 50mA (0.1s/60s) = 183.3\mu A \text{ per OPUS200}$$

The power consumption of the total system is 416.7µA (5 Opus200).

**Important:** The average power consumption increases with every data transmission. The M20 GSM-Modem has average standby power consumption of ca. 50mA under optimum receiving conditions. With a GSM-Modem, the average power consumption in our example would be higher by a factor of 100.

In order to obtain a positive charge balance (charge current > discharge current), the solar power supply in our example must be at least 417µA or 50,417mA (with GSM data transmission). The following figure shows that the solar installation provides sufficient power for GSM operation from mid March to end September.

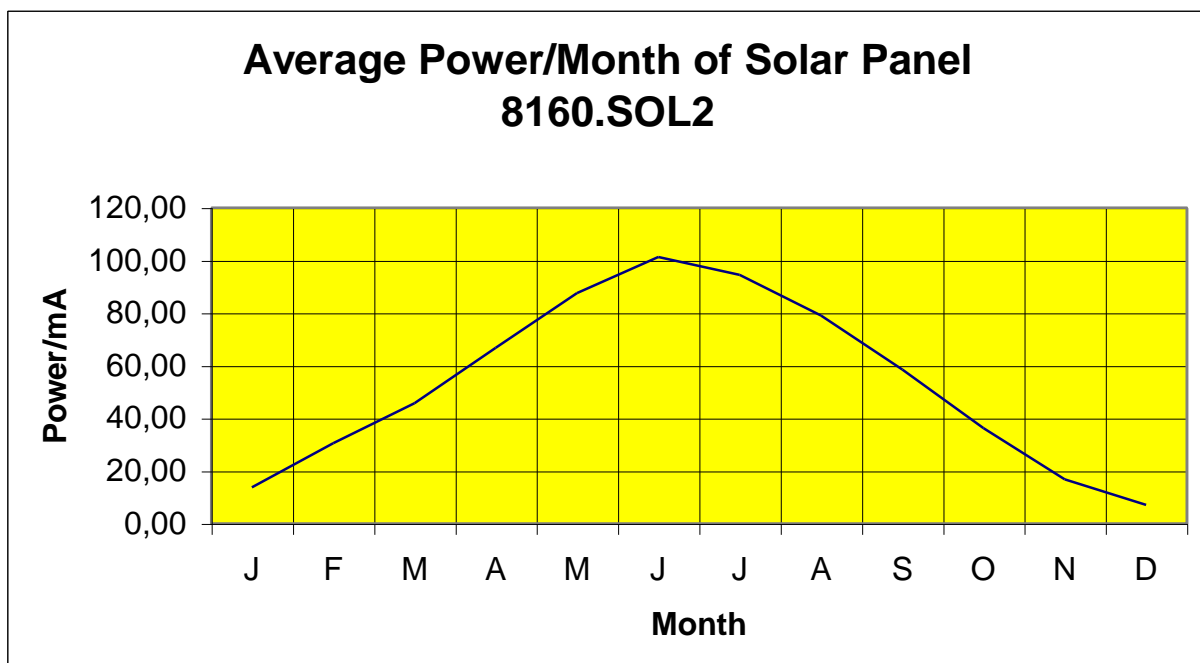


Figure: average power/month of solar panel 8160.SOL2 for southern Germany

## 17 Mains operation

Mains units 8160.SV3 or 8161.SV3 can be used for mains power supply. Mains unit 8160.SV3 can power up to 10 OPUS200/208 and mains unit 8161.SV3 up to 3 OPUS200/208.

Please see the connection details of the OPUS200/300/208 in the following connection table:

Connection Table	OPUS200/300/208 (4 pole)	OPUS_POW
PIN	Earth/Ground	4 ( GND)
PIN	UB 12/24	5 (UB)

## 18 Mounting on a mast

A mast mounting kit is provided for most sensors.

This mounting kit is suitable for masts with a diameter of 40...80mm.