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Siemens I IA SE S PV
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SINVERT

Weather Station

Technical description

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1 General overview

The standard scope of supply of the SINVERT weather station includes a terminal box with integrated overvoltage protection plus the sensors listed below:

- One (1) irradiation sensor
- One (1) module temperature sensor
- One (1) ambient temperature sensor

The terminal box "weather station" contains terminals for the connection of one additional irradiation sensor.

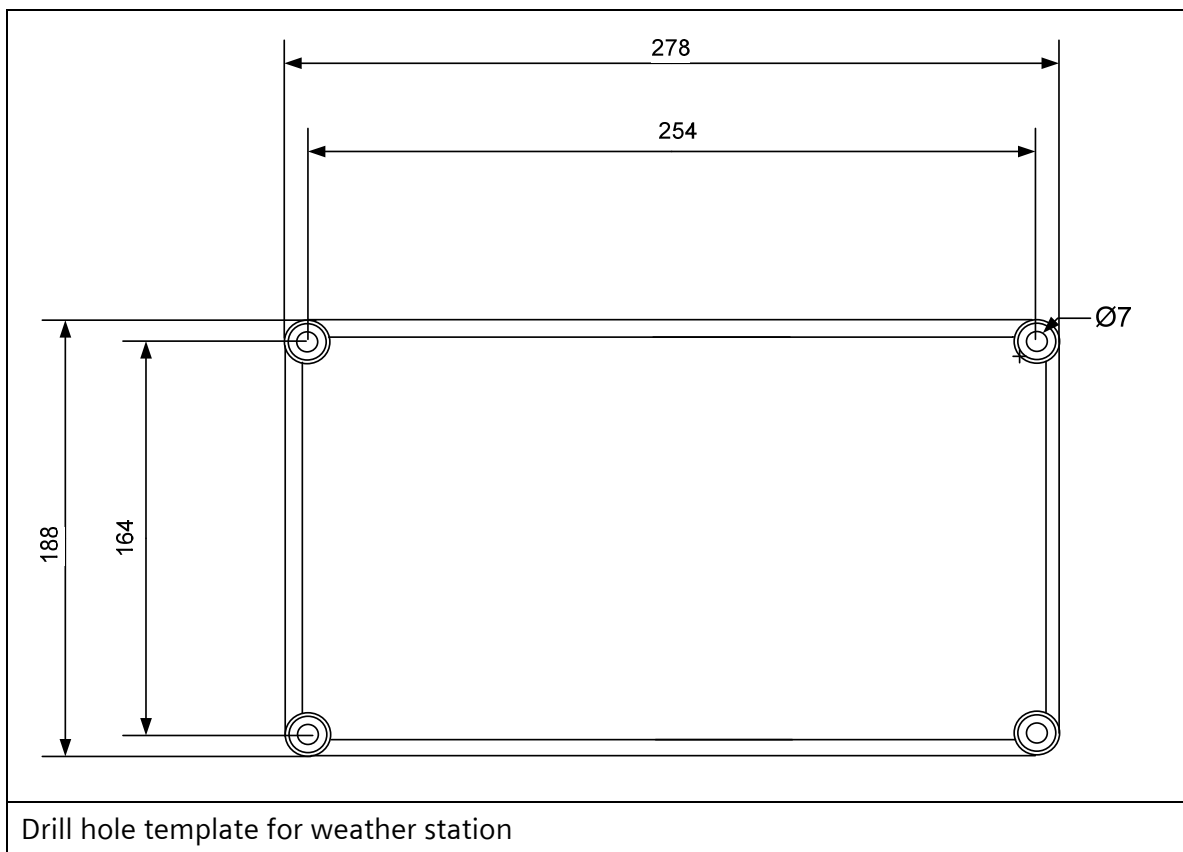


The terminal box must be directly attached to the inverter building so as to afford optimum overvoltage protection!

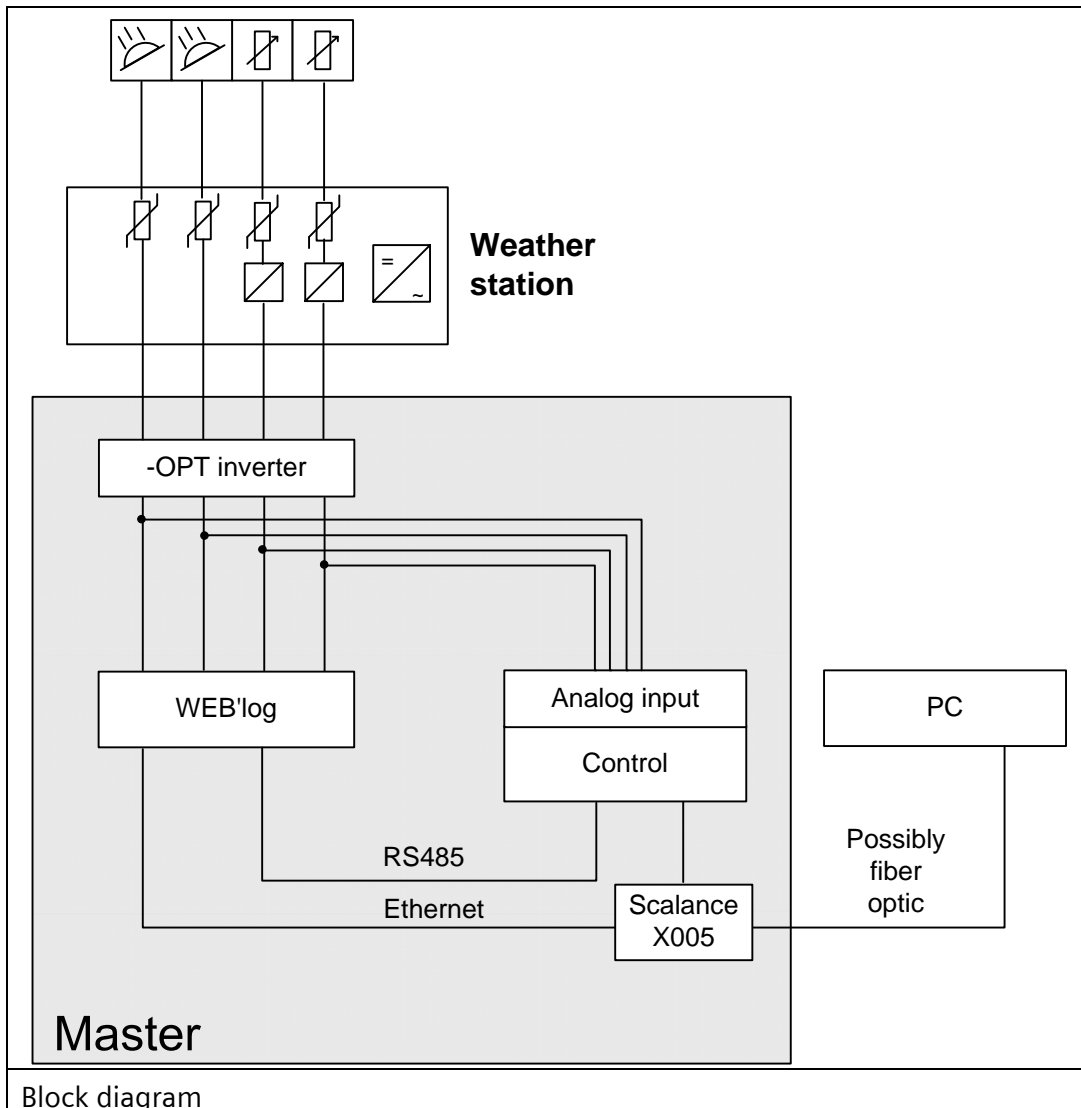
Effective overvoltage protection can be ensured only if the distance between the terminal box and inverter/inverter building does not exceed 5 m.

The cover on the terminal box must be properly closed to prevent the ingress of dust and moisture.

2 Drilling pattern for weather station

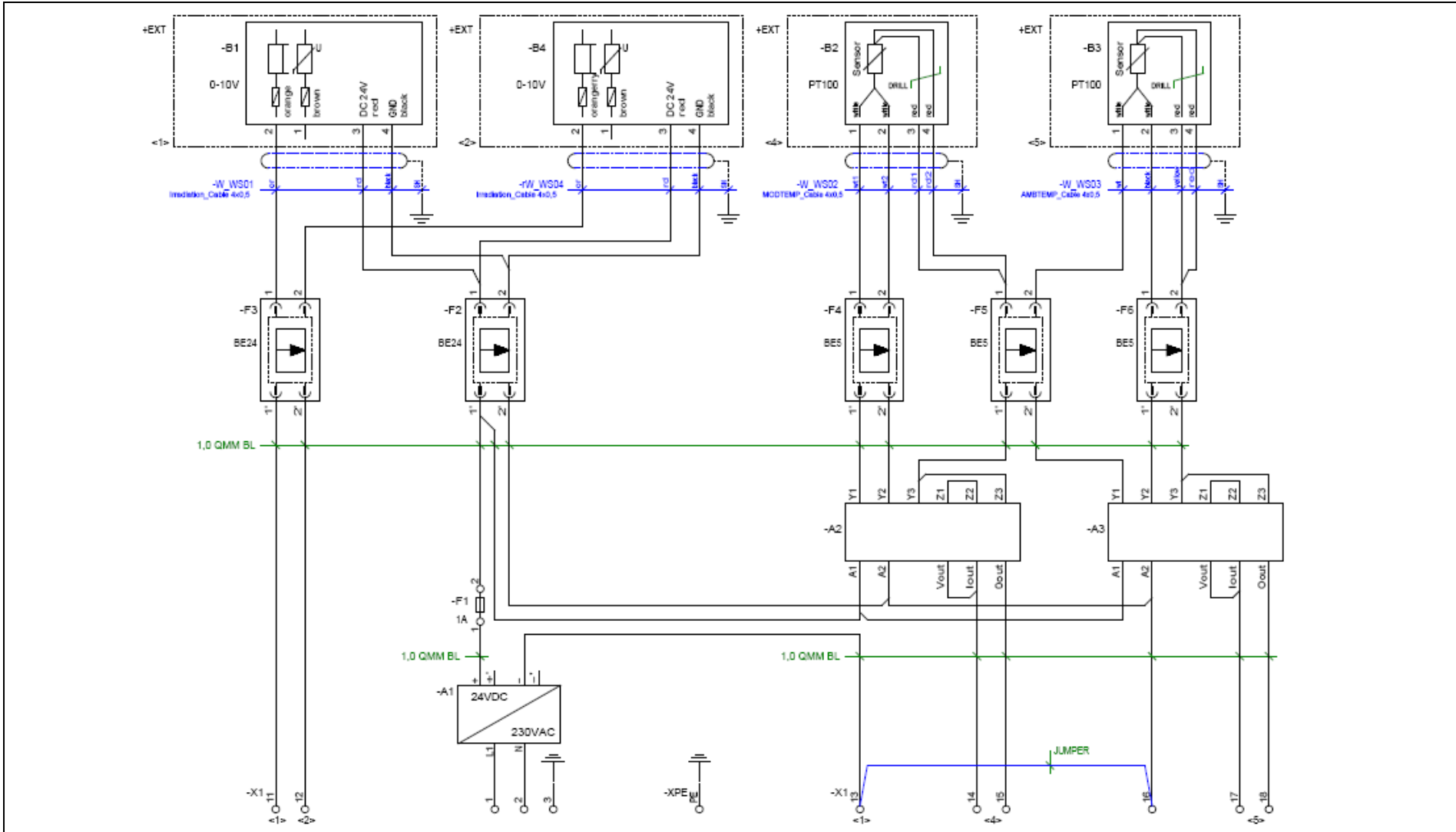


3 Block diagram



Block diagram
The weather station can be connected to either a monitoring system (e.g. WinCC) or a datalogger system (e.g. WEB'log) in the inverter (see Chapter 9).

4 Circuit diagram of weather station



<1>	Irradiation sensor
<2>	Irradiation sensor
<4>	Module temperature sensor
<5>	Ambient temperature
<100>	The module temperature on the insolation sensor is not evaluated for other purposes.

5 Connection to the inverter

The signal cables of the weather station are connected to terminal block –OPT (21 to 29) in the master inverter. From this block, the signals are transferred to the WEB'log and, if installed, to an analog input unit of the control system.

A cable of type LiYCY(TP) 4x2x0.5 (or better) should be used to connect the weather station terminal box to terminal block –OPT in the master inverter.

5.1 Assignments of terminals in the weather station

Signal	Number on terminal block OPT	Number in terminal box	Number on WEB'log
Module temperature	21	14	A11+
	22	15	A11-
Ambient temperature	23	17	A12+
	24	18	A12-
Irradiation 1	25	11	A13+
	26	13	A13-
Irradiation 2	27	12	A14+
	28	16	A14-
Shielding	29	PE	

6 Description of sensors

6.1 Sensor for module temperature

6.1.1 Description

This sensor for the module temperature is housed in a silicone rubber mold under a layer of self-adhesive aluminum foil. After the protective foil has been removed, the sensor can be stuck directly on the rear panel of the module. It must be noted that only a three-wire connection can be made on the temperature converter. For this reason, one core is not connected and remains open.



Sensor for module temperature

6.1.2 Technical data

PT 100 adhesive sensor	
Connecting cable	4 x 0.2 mm ² , insulation PTFE, length 2 m
Sensor element	Resistance thermometer (thin film) with 4 terminals conforming to DIN 43760 and BS1904/1984
Element resistance	100 Ω at 0°C
Operating temperature	-50 °C – 150 °C

6.2 Sensor for ambient temperature



Sensor for ambient temperature

6.2.1 Technical data

This ambient temperature sensor is potted in an external sensor sleeve. This means that it can react faster to temperature changes. The ambient temperature sensor must be mounted in shade, e.g. on the north-facing side of the inverter container. The connecting cable is not supplied with the device.

Ambient temperature sensor PT100	
Sensor sleeve	Stainless steel mat. 1.4571, Ø=6x25mm
Case	Polyamide, white
Degree of protection	IP65 acc. to EN60529
Temperature range of case	-35°C to +90°C
Cable entry	Single M16 for cable with max. D=8mm

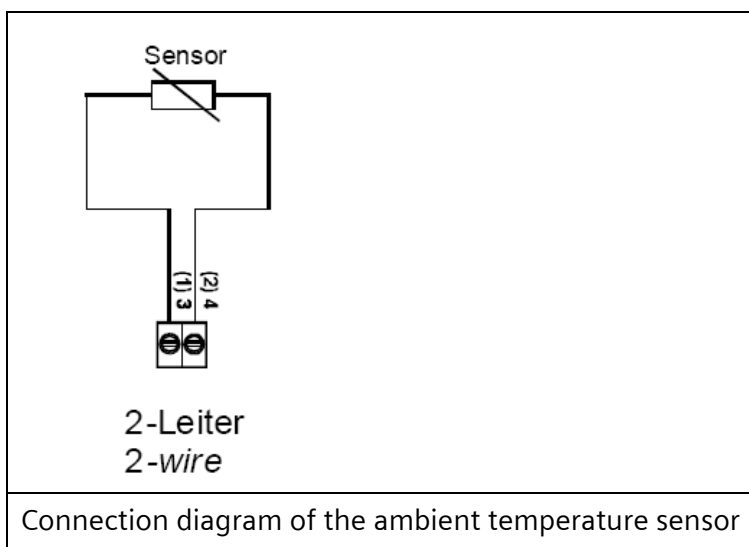
Mounting instructions



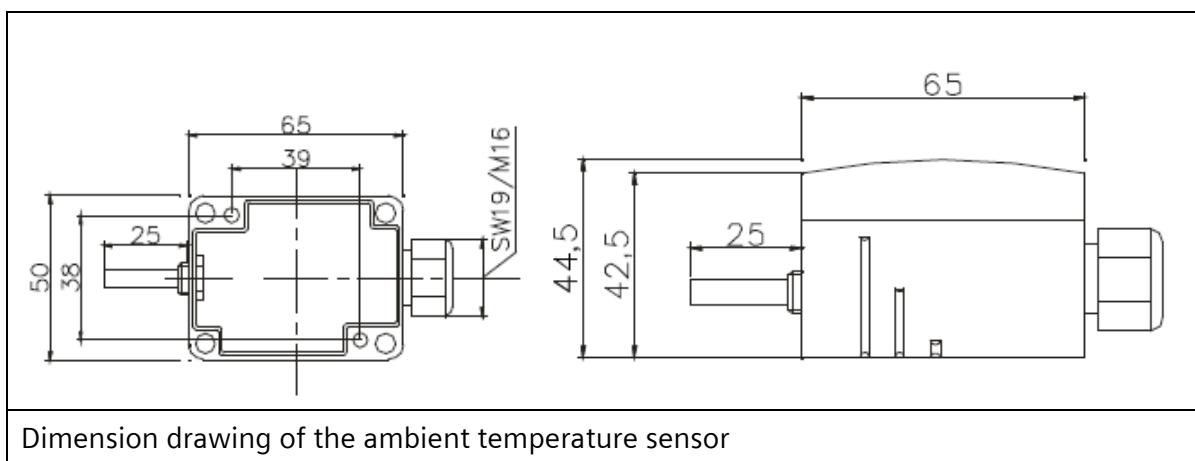
Avoid direct exposure to rain and irradiation when sensor is installed outdoors. Provide sun or rain protection if necessary.

With this two-wire sensor type, the cable resistance of the feeder cable must be taken into account. It must be determined whether the resistance needs to be corrected in the downstream electronics. (See chapter 7 "Calibration of a two-wire sensor".)

6.2.2 Connection diagram

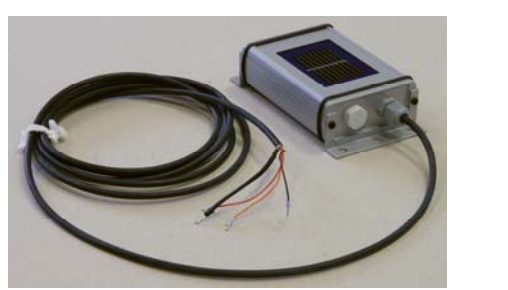


6.2.3 Dimension drawing



6.3 Sensor for irradiation

6.3.1 Description



Sensor for irradiation

The short-circuit current of a silicon solar cell is proportional to irradiation. The irradiation sensor Si-12TC-T employs a monocrystalline solar cell (Schott Solar) which is operated in short circuit across a low resistance. The sensor is capable of active temperature compensation. It is calibrated against a reference cell under artificial sunlight.

The laminated solar cell is integrated into a case of anodized aluminum. The electrical connection is made with a 3 m UV-resistant cable.

The irradiation sensor should be installed on a table in the PV field which is aligned in the same direction as the modules.

The sensor temperature measurement is not utilized, i.e. the wires are not connected.

6.3.2 Technical data

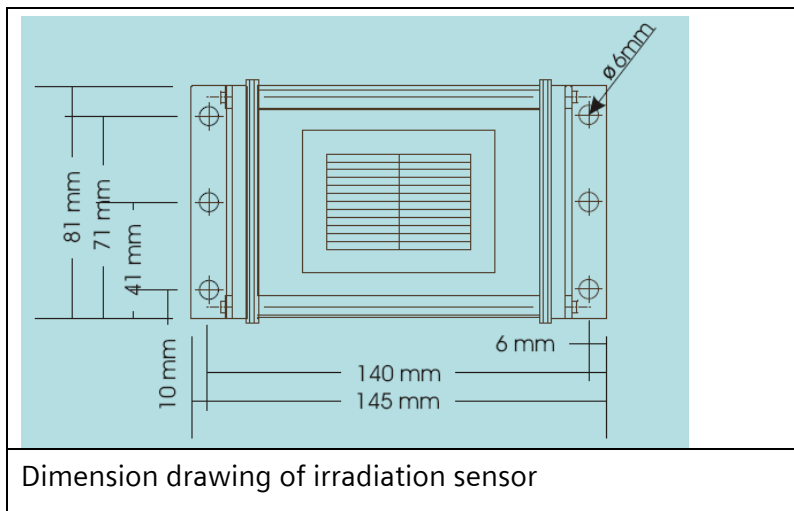
Si-12TC-T	
Current shunt	0.1 Ohm
Operating temperature	-20 °C to +70°C
Measuring range	-20 °C to +80°C
Measuring accuracy	+/- 1.5% at +25 °C
Max. deviation	2 °C
Power supply	12 to 24 V DC
Power consumption	0.3 mA
Cell size	50 x 34 mm
Weight	340 g

Features

- Measurement of irradiation with temperature compensation
- Extended measuring range up to 1200 W/m²
- Easy installation
- 3 m connecting cable (UV-resistant), 4 x 0.14 mm²

Color	Assignment
Orange	Measuring signal irradiation (0-10V)
Red	Supply voltage (+12°C to 24 V DC)
Black	GND
Brown	Measuring signal temperature (0-10V)

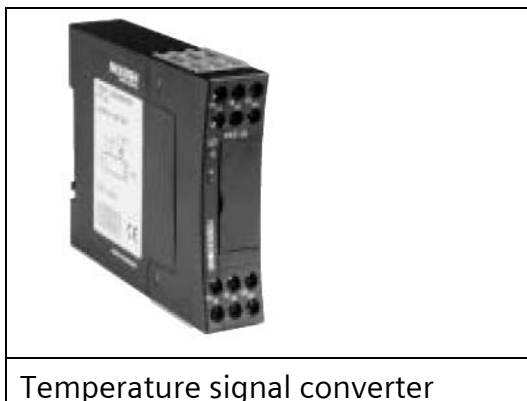
6.3.3 Dimension drawing



7 Temperature signal converter PXT-10

7.1 Description

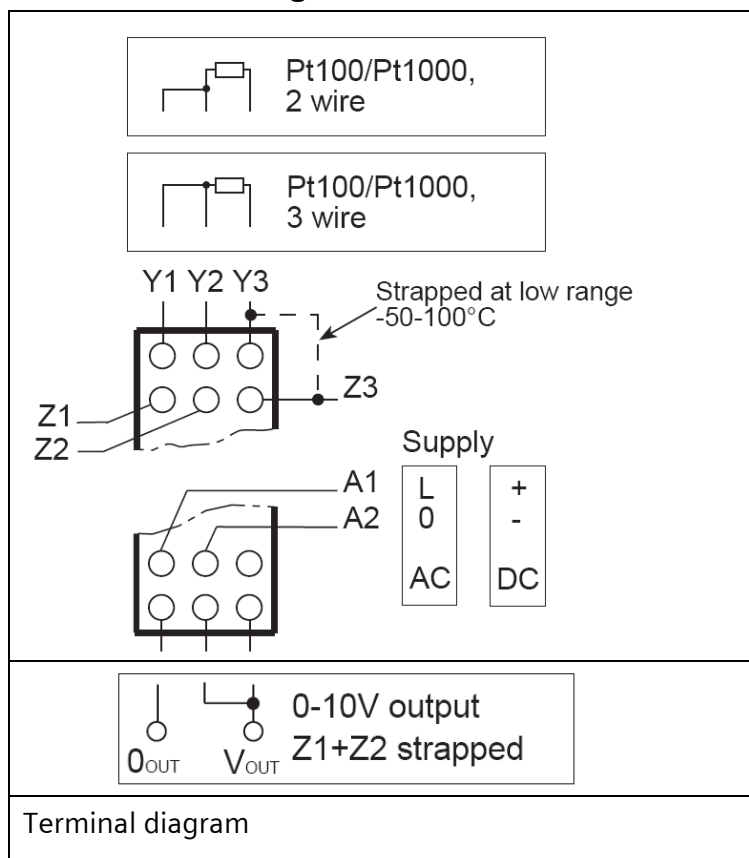
The temperature signal converter PXT-10 is installed in the weather station terminal box. Its purpose is to convert a temperature to an analog/process signal. It operates with a PT100 input in the -50 to 100°C range, converting the signals of the ambient temperature sensor and module temperature sensor to a 0-10V signal. The terminal assignments can be seen in terminal diagram 7.3.



7.2 Technical data

Temperature signal converter	
Temperature range	-50 °C to 100 °C
Output	0 to 10 V
Accuracy	<1% if not scaled
Linearity	<0.05% of the complete scale
Temperature coefficient	0.02%/oC
Ambient temperature	-20 to +55 °C
Connections	Clamping screws. Combination slotted-head screws 0.5 – 0.7 Nm (VDE0609-1). Cable 2 x 2.5 mm ² (2 x 1.5 mm ² with end sleeve).
Degree of protection	IP20
Operating voltage	24 V DC
Compensation (zero) and rangeability (measuring range) of output can be adjusted + 5%	

7.3 Terminal diagram



8 Calibration of a two-wire sensor

8.1 Description

The PT 100 sensor has a resistance value of 100 Ω at 0 °C. The internal resistance of the sensor changes by 0.385 % at 1°. Allowance must be made for the fact that the resistance of the connecting cables is included directly in the measuring result and may falsify it. Cable resistance (copper) changes by approximately 0.4%/K. In order to compensate for cable losses, etc., the output signal on the temperature converter can be adjusted. The tables showing resistance values can be found in the Appendix.

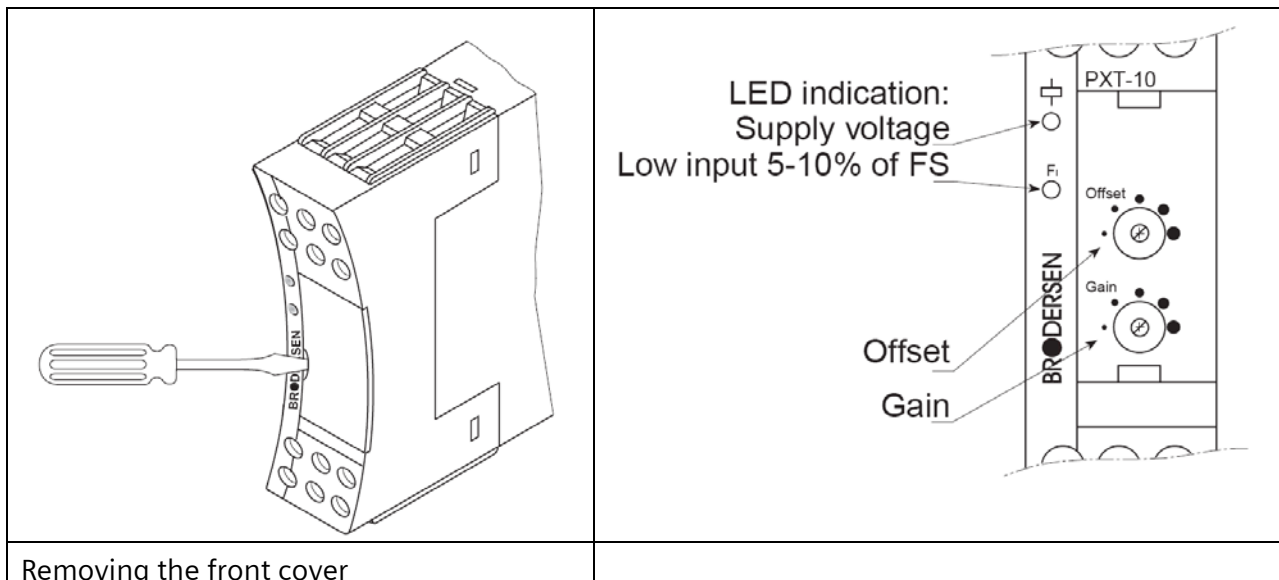


Check whether the values supplied by the sensors are within the expected range. To do this, measure the signals on the terminal block –OPT in the inverter or directly in the terminal box!

The formula for converting the resistance value of a PT100 to an 0-10V signal is given below (this is based on a measuring range of -50 to +100°C):

$$\rightarrow \text{Volt signal (0-10V)} = ((R_{\text{measured}} - 100) / 0.385 + 50) / 15$$

To calibrate the temperature signal converter, the front cover on the unit must be removed first. Compensation (zero) and rangeability (measuring range) can be adjusted by +/- 5% of the maximum signal. It is important to replace the front cover afterwards to protect the relay again from accidental adjustment.



9 Necessary additional options

The weather station can be connected to either a monitoring system (e.g. WinCC) or a data logger system (e.g. WEB´log) in the inverter.



When a weather station is ordered, an interface for connecting the weather station must also be fitted in an inverter (one (1) inverter must be equipped with this type of interface for each weather station ordered). The inverter must be ordered with one of the following options for the weather station:

- "Monitoring System Interface" for a weather station (connection of the weather station to a monitoring system)
- "Datalogger Interface" for a weather station (connection of the weather station to a data logger in the inverter) and "Datalogger Internet Portal"

9.1 "Monitoring System Interface" option for weather station

This option is needed to connect the weather station to a monitoring system (e.g. WinCC) in the inverter. The cable for connecting the weather station to the monitoring system is not included in the scope of supply.

9.2 "Datalogger Interface" option for weather station

This option is needed to connect the weather station to a datalogger system (e.g. WEB´log) in the inverter. The cable for connecting the weather station to the datalogger is not included in the scope of supply.

10 Appendix

For example: A temperature of +23°C corresponds to a resistance value of 108.958 Ω

Resistance values of PT100 sensors – No responsibility of accuracy is accepted										
	0	1	2	3	4	5	6	7	8	9
-200	18,493	18,928	19,358	19,790	20,221	20,653	21,083	21,514	21,944	22,374
-190	22,803	23,232	23,661	24,089	24,517	24,945	25,372	25,799	26,226	26,652
-180	27,078	27,504	27,929	28,354	28,779	29,203	29,627	30,051	30,474	30,897
-170	31,320	31,742	32,165	32,587	33,008	33,429	33,850	34,271	34,691	35,111
-160	35,531	35,951	36,370	36,789	37,208	37,628	38,044	38,462	38,879	39,297
-150	39,714	40,130	40,547	40,963	41,379	41,795	42,210	42,625	43,040	43,455
-140	43,869	44,283	44,697	45,111	45,524	45,937	46,350	46,763	47,175	47,587
-130	47,999	48,411	48,822	49,234	49,645	50,055	50,466	50,876	51,286	51,696
-120	52,108	52,515	52,924	53,333	53,742	54,151	54,559	54,967	55,375	55,783
-110	56,190	56,598	57,005	57,412	57,818	58,225	58,631	59,037	59,443	59,849
-100	60,254	60,659	61,065	61,469	61,874	62,279	62,683	63,087	63,491	63,895
-90	64,299	64,702	65,105	65,508	65,911	66,314	66,717	67,119	67,521	67,923
-80	68,325	68,727	69,129	69,530	69,931	70,332	70,733	71,134	71,534	71,934
-70	72,335	72,735	73,135	73,534	73,934	74,333	74,733	75,132	75,531	75,930
-60	76,328	76,727	77,125	77,523	77,921	78,319	78,717	79,115	79,512	79,910
-50	80,307	80,704	81,101	81,498	81,894	82,291	82,687	83,083	83,479	83,875
-40	84,271	84,667	85,063	85,458	85,853	86,248	86,643	87,038	87,433	87,828
-30	88,222	88,617	89,011	89,405	89,799	90,193	90,587	90,980	91,374	91,767
-20	92,160	92,553	92,946	93,339	93,732	94,125	94,517	94,910	95,302	95,694
-10	96,088	96,478	96,870	97,262	97,653	98,045	98,436	98,827	99,218	99,609
0	100,000	100,391	100,781	101,172	101,562	101,953	102,343	102,733	103,123	103,513
10	103,902	104,281	104,661	105,041	105,420	105,800	106,179	106,558	106,937	107,316
20	107,793	108,161	108,529	108,897	109,265	109,633	110,001	110,369	110,737	111,104
30	111,672	112,039	112,406	112,773	113,140	113,507	113,874	114,241	114,608	114,975
40	115,539	115,905	116,271	116,637	117,003	117,369	117,735	118,101	118,467	118,833
50	119,395	119,759	120,123	120,487	120,851	121,215	121,579	121,943	122,307	122,671
60	123,239	123,602	123,965	124,328	124,691	125,054	125,417	125,780	126,143	126,506
70	127,072	127,434	127,796	128,158	128,520	128,882	129,244	129,606	129,968	130,330
80	130,893	131,254	131,615	131,976	132,337	132,698	133,059	133,420	133,781	134,142
90	134,702	135,063	135,423	135,783	136,143	136,503	136,863	137,223	137,583	137,943
100	138,500	138,859	139,218	139,577	139,936	140,295	140,654	141,013	141,372	141,731
110	142,288	142,646	143,004	143,362	143,720	144,078	144,436	144,794	145,152	145,510
120	146,061	146,418	146,775	147,132	147,489	147,846	148,203	148,560	148,917	149,274
130	149,824	150,180	150,536	150,892	151,248	151,604	151,960	152,316	152,672	153,028
140	153,575	153,930	154,285	154,640	154,995	155,350	155,705	156,060	156,415	156,770
150	157,315	157,669	158,023	158,377	158,731	159,085	159,439	159,793	160,147	160,501
160	161,043	161,396	161,749	162,102	162,455	162,808	163,161	163,514	163,867	164,220
170	164,760	165,112	165,464	165,816	166,168	166,520	166,872	167,224	167,576	167,928
180	168,465	168,816	169,167	169,518	169,869	170,220	170,571	170,922	171,273	171,624
190	172,158	172,508	172,858	173,208	173,558	173,908	174,258	174,608	174,958	175,308
200	175,840	176,189	176,538	176,887	177,236	177,585	177,934	178,283	178,632	178,981
210	179,510	179,858	180,206	180,554	180,902	181,250	181,598	181,946	182,294	182,642
220	183,168	183,515	183,862	184,209	184,556	184,903	185,250	185,597	185,944	186,291
230	186,815	187,161	187,507	187,853	188,199	188,545	188,891	189,237	189,583	189,929
240	190,451	190,796	191,141	191,486	191,831	192,176	192,521	192,866	193,211	193,556
250	194,074	194,418	194,762	195,106	195,450	195,794	196,138	196,482	196,826	197,170
260	197,688	198,031	198,374	198,717	199,060	199,403	199,746	200,089	200,432	200,775
270	201,287	201,629	201,971	202,313	202,655	202,997	203,339	203,681	204,023	204,365
280	204,876	205,217	205,558	205,899	206,240	206,581	206,922	207,263	207,604	207,945
290	208,453	208,793	209,133	209,473	209,813	210,153	210,493	210,833	211,173	211,513
300	212,019	212,358	212,697	213,036	213,375	213,714	214,053	214,392	214,731	215,070

Resistance values of a PT100 sensor 1/3 (source: <http://www.pt100.de>)