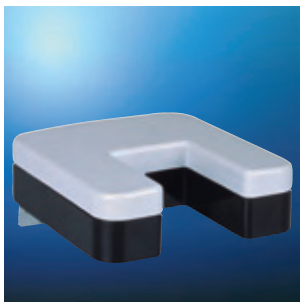
RADIATION

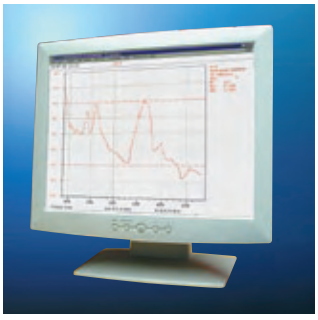
Thies CLIMA

THE WORLD OF WEATHER DATA

THE WORLD OF WEATHER DATA

Measurement and Documentation: Thies' range of service for meteorology, environmental protection and industry





Today more than ever the measurement, processing and analysis of meteorological data requires a high degree of measurement instrument precision and an optimal adaptation of the data acquired to the task at hand.

For more than 60 years, we have been developing, producing and supplying practical instruments and systems for the analysis of weather data. Today, we are one of the world's largest suppliers of such equipment.

Our close cooperation with scientific institutions and governmental agencies in many countries guarantees a constant and up-to-date flow of information about all aspects of individual national problems and projects and the rapid implementation of state-of-the-art developments and measurement techniques. Our instruments and systems fulfil in all respects both to the requirements of national weather services as well as those of the World Meteorological Organization in Geneva.

Meteorological observations without computer-aided measurement and documentation systems are unthinkable today.

THIES develops complete ready-for-use-systems which include precision data transmitters, data loggers, power supply units and personal computers with adapted software.

Radiation
Glossary

Albedo
The albedo is the measure for the reflected radiation power. It is calculated from the ratio of the radiation, reflected by the ground, to the totally infalling global radiation from the atmosphere.

Albedometer
Instrument for the measurement of the short-wave radiation balance and the reflex-radiation of the ground, and the global radiation and the short-wave radiation, reflected by the ground. The albedometer measures the radiation in the range from 300 to 2800 nm.

Azimuth Angle
Horizontal angle (0-360°)

Brightness Intensity
The brightness intensity (E) states the ratio of the striking luminous flux (F) to the illuminated area (A).
Unit lux [lx]: $E = F / A$ F = luminous flux in Lumen
A = area

Diffuse Radiation (Sky Radiation)
Solar radiation which is diffused on its way through the atmosphere by clouds, water- and dust-particles, and reaches the earth's surface.

Direct Radiation
Direct radiation is the share of the solar radiation which spreads out without striking an obstacle and which reaches the earth's surface coming from directly from the sun.

Elevation Angle
Elevation angle, also called altitude angle, is the angle between the horizontal plane und a high-located arrival point (for ex. sun) over the horizon.

Global Radiation
Global radiation is the solar radiation which strikes the earth's surface on a horizontal area.
The global radiation consists of the directly infalling radiation (direct radiation) and the radiation which reaches the earth's surface, diffused by clouds, water- and dust-particles (diffuse radiation).
The spectral range extends in the short-wave range.
(approx. 290 nm to 4000 nm)

Infrared Radiation
The wave length range extends from 780 nm to 1 mm. Infrared radiation is divided into the short-wave IR-A radiation with a wave length from 780 to 1400 nm, the IR-B radiation (1400 to 3000 nm), and the long-wave partition, the IR-C radiation (3000 nm to 1 nm).

Short-wave Radiation
Solar radiation in the spectral range 290-4000 nm.
The radiation source is the sun, the solar radiation is absorbed to some extend in the atmosphere, and partly on the earth's surface.

Long-wave Radiation
Terrestrial radiation in the spectral range 4000-100 000 nm.
It is irradiated by the atmosphere and the earth's surface.

Net Radiation
Difference from short-wave global radiation, and long-wave atmospheric counter radiation on the one hand, and short-wave reflex-radiation and long-wave temperature radiation of the earth on the other hand

Net Radiometer
Instrument for the measurement of the net radiation. The sensor consists of thermopiles. The acquired spectral range is approx. between 200 and 100 000 nm.

Radiation
Glossary

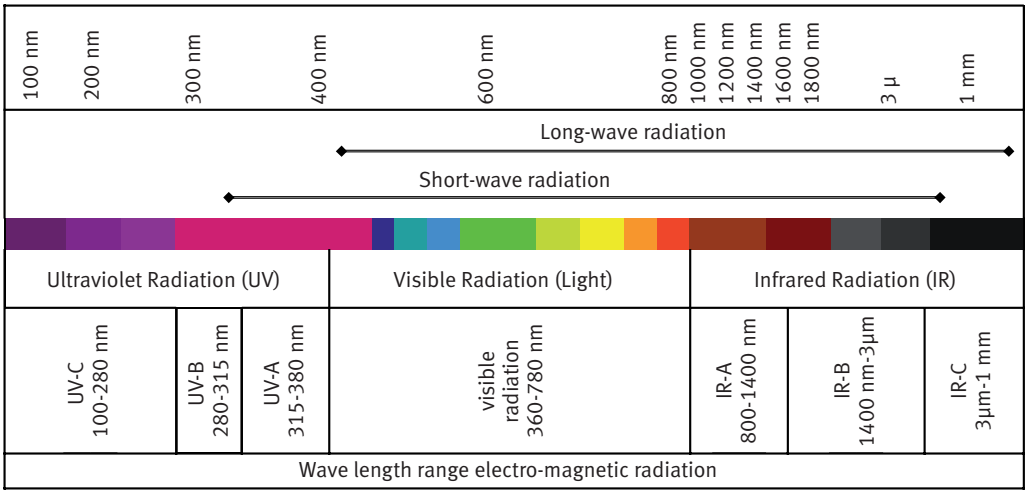
PAR	Photo-synthetically active radiation in the spectral range 400-700 nm. It is an essential factor for plant growth (Forming of chlorophyll). (PAR = Photo-synthetically Active Radiation)
Pyrradiometer	Instrument for the measurement of the radiation balance in the total spectrum (short- and long-wave range) of the solar radiation 300 - › 60 000 nm. Two separate thermo-elements acquire the infalling and reflected radiation and output them as electric voltage. The reference temperature is measured by a Pt100.
Pyranometer	Instrument for the measurement of the short-wave. The sensor consists of thermo-elements. The acquired spectral range is approx. between 300 und 2800 nm.
Silicon Pyranometer	The sensor-element of this instrument is a special silicon-photodiode. The acquired spectral range is approx. between 350 und 1000 nm.
Silicon Photodiode	Semi-conductor diodes, converting visible light, or IR-, UV as well, into electric power.
Visible Radiation	The light perceived by the human eye in the spectral range 360 ... 780 nm
Solar Constant	Radiation power of the solar radiation out of atmosphere. Mean value determined by WMO : 1367 W/m^2
Sunshine Duration	Time period of the direct solar radiation in a certain place.
Solar Radiation	The solar radiation is the radiation of the sun. The maximum power of the electro-magnetic radiation is the visible light, however, comprises also other electro-magnetic waves from X-rays and UV- radiation up to radio waves.
Radiation Balance	Difference from infalling global radiation and the reflected radiation of the ground.
Radiation Balance Meter	Two contra-connected thermopiles form a difference: the global radiation infalling from above, and the radiation of the ground reflected from below. The difference is the radiation balance and is output as electric voltage.
Radiation Intensity	Radiation flux density (W/m^2)
Thermopile	Consisting of blackened area and thermo-elements, which are affiliated with each others. Radiation is converted into heat and is output as thermo-voltage.
UV Radiation	Ultra-violet radiation, below the visible radiation. The ultra-violet spectrum comprises wave-lengths from 1 nm to 380 nm

UV-A Radiation
Radiation in the spectral range 380-315 nm.
It is essential for the strengthening of the human immunity system, and is responsible for the sun tan of the skin.

UV-B Radiation
Radiation in the spectral range 280-315 nm
It is dangerous for irreversible damages of the human skin (cancer of the skin).

WMO
World Meteorological Organization

Units
1 cal cm^{-2} min^{-1} = 697.8 Wm^{-2}
1 Wm^{-2} = 0.001433 cal cm^{-2} min^{-1}
1 cal cm^{-2} d^{-1} = 0.0116 kWh m^{-2}



Radiation

Sunshine

Sunshine Recorder
acc. to Campbell-Stokes

Registers the sunshine duration for one entire day. A cut glass sphere focuses the sun's rays and leave an image line on the strip chart.
The length of the image line corresponds to the duration of sunshine.
The shipment includes the following strip charts
140 sheets for summer
140 sheets for winter
100 sheets for spring and autumn

Recording charts for:
7.1400.10.000
7.1405.10.000

Model Brief	Order No.	Technical Data	
	7.1400.10.000	North. and southern hemisphere, latitude	0-40°
	7.1405.10.000	North. and southern hemisphere, latitude	25-60°
		Measuring value	sunshine duration
		Degree of latitude	adjustable
		Recording period	1 day per strip chart
		Dimensions	205 x 185 x 145 mm
		Weight	5 kg
	205210		
	205213		

Silicon Sunshine Indicator SDE 9.1
Instrument to measure the global radiation and the sunshine duration.

The threshold of sunshine duration is stated by the German Weather Service (DWD) with 120 W/m2. The sensor delivers a digital Yes-/No-information for the sunshine duration and a voltage as information for the global radiation. The measurement is cos-corrected.

Delivery includes calibration certificate.

7.1420.00.000	Measuring range	0 - ca. 1300 W/m²
	Spectral range	380-1100 nm
	max. spectr. sensitivity	780 nm
	Ambient temp.	-20 °C ... +60 °C
	Linearity	‹ ±5%
	Cos-correction	error f2 ‹ 3%
	Absolute error	‹ ±10%
	Signal output	0-5 V (global rad.)
	Sunshine duration	yes 4.5 V-5.0 V no 0 V-0,6 V
	Threshold	120 W/m²
	Operating voltage	9 V-24 V DC
	Diffusor	PTFE
	Dome	optical glass
	Sensor type	silicon photo diode
	Connection	plug with 5 m cable
	Dimensions	Ø 80 mm, 82 mm high
	Weight	0.3 kg

Sunshine Duration Sensor CSD 3
Instrument to measure the sunshine duration and direct radiation.

The sunshine duration is defined as period, in which the direct solar radiation exceeds the threshold of ›120 W/m.

The sensor sends a digital Yes/No-information for the sunshine duration, and a voltage as information for the direct radiation.

Connectable heating avoids a possible dewing on the instrument.

Delivery includes a test certificate.

7.1421.03.000	Meas. value 1	Sunshine duration
	Sunshine	yes @ › 120W/m² no @ ‹ 120W/m²
	Electr. output	yes 1±0.1 V DC no 0±0.1 V DC
	Accuracy of the sunshine hours	±10% per month
	Meas. value 2	Direct radiation
	Meas. range	0...1000 W/m²
	Electr. output	1 mV per W/m²
	Accuracy	±10% @ 1000W/m²
	General spectral range	400-1100 nm
	Ambient temperature	-30 °C ... +70 °C
	Operating voltage	
	W/o heating	9-15 V DC / 0.1 W
	Heating level 1	9-15 V DC / 1 W
	Heating level 2	9-15 V DC / 10 W
	Connection	plug with 15 m cable
	Dimensions	approx.304x131 mm
	Weight	approx. 1.2 kg

Brightness

Brightness Transmitter

The instrument serves for the acquisition of the illumination intensity of the daylight, and is adapted to the sensitivity of the human eye.
The linearized electrical output signal can be used for the control of shading devices, heating systems, and irrigation plants.

Order No.: 7.1414.10.xxx, 7.1414.12.xxx, 7.1414.15.xxx, 7.1414.22.xxx, 7.1414.25.xxx, .040, .041, .061

Technical Data	
Meas. range	0-100 000 lux 0- 20 000 lux 0- 5 000 lux 0- 2 000 lux 0- 50 000 lux
Electr. output	0-20mA (600 Ω) 4-20 mA (600 Ω) 0-10 V (max. 10 mA)
Accuracy	±3% of meas.range.
Spectral range	420-675 nm
Half angle	±55°
Operating voltage	24 V AC/DC
Ambient temperature	-30 ... +70 °C
Connection	clamp connection, screwed cable gland
Protection	IP 65
Dimension	80 x 82 x 65 mm
Weight	0.15 kg

Brightness Transmitter

The instrument serves for the acquisition of the illumination intensity of the daylight.

The electrical output can be used for the control of shading devices, heating systems, and irrigation plants.

The acquisition is carried out in the upper part (dome) of the instrument. The acquisition angle is ±90 degree.

The model with „heating“ avoids a possible dewing on the dome.

Order No.: 7.1414.40.102, .112, .141, .152

Meas. range:	electr. output
0-100 000 lux	0-10 V DC
0- 10 000 lux	0-10 V DC
0- 1 000 lux	4-20 mA
0- 5 000 lux	0-10 V DC
Spectral range	420-675 nm
Acquisition angle	
Elevation	0 ... 90°
Azimuth	0 ... 360°
Accuracy	±2% of calibration standard
Operating voltage Electronics	15-28 V DC or 24 V AC, 10 mA (10 mA + I out)
Heating	24 V AC/DC, 300 mA
Ambient temperature	-30 ... +70 °C
Connection	clamp connection, screwed cable gland
Protection	IP 65
Dimensions	80 x 82 x 112 mm (B x H x T)
Weight	0.15 kg

Brightness Transmitter

Description ref. to 7.1414.40.1xx
however, without heating

Order No.: 7.1414.40.002

Meas. range	0-100 000 lux
Operating voltage	15-28 V DC or 24 V AC, 10 mA
Electr. output	0-10 V DC

Radiation

Brightness Transmitter

Brightness Transmitter
The instrument serves for the acquisition of the illumination intensity of the daylight, depending on the position of the sun.

The illumination intensity of model 7.1414.60.000 is acquired by eight independent photo diodes, which are arranged in 45°-segments. (N, NE, E, SE, S, SW, W, NW).

The illumination intensity of model 7.1414.61.000 is acquired by three independent photo diodes, which are arranged in 90°-segments (East, South, West).

The connected electronics converts the light into voltage signals and provides them for further processing to the 8 (3) individual outputs.

The model with “heating“ avoids a possible dewing on the dome.

Order No.
7.1414.60.xxx
7.1414.61.xxx
.000
.040
.041

Technical Data

Design	8 channel 3 channel
Electr. output each channel	0-10 V DC 0-20 mA 4-20 mA
Meas. range	0-100 000 lux
Spectral range	400-1 100 nm
Acquisition angle	
Elevation	0 ... 90°
Azimuth	8 x ±22.5° (360°)
Azimuth	3 x ±45° (270°)
Accuracy	±2% of calibration standard
Operating voltage	12-28 V DC or 24 V AC
Power consumption	
7.1414.6x.000	max. 200 mA
7.1414.6x.040/041	200 mA + I out
Load	
Voltage output	›1 000 Ω
Current output	400 Ω
Ambient temperature	-30 ... +70 °C
Connection	clamp connection, screwed cable gland
Protection	IP 65
Dimensions	80 x 82 x 96 mm (B x H x T)
Weight	0.15 kg

Brightness Transmitter

Measuring sensor for the acquisition of the illumination intensity.
It can be used for the regulation of shading devices, heating- and irrigation plants in automatically controlled green houses or as twilight sensor.

There are two analogue outputs available: output
1 offers different, selectable measuring ranges. Output 2 is used as fixed measuring range, particularly for the twilight range. The output signals can be delivered as voltage or current.

Order No.
7.1414.51.150

Technical Data

Measuring range Output1 programmable	 0-150 000 lux 0-100 000 lux 0- 50 000 lux 0- 10 000 lux
Measuring range Output 2	 0-1000 lux
Electr. output programmable	0-20 mA (350 Ω) 4-20 mA (350 Ω) 0-10 V
Spectral range	350-820 nm
Accuracy	±3% v. Mb.
Acquisition angle	
Elevation	0 ... 90°
Azimuth	0 ... 360°
operating voltage	15-36 V DC oder 15-24 V AC
Temp. range	-30 ... +70 °C
Protection	IP 65
Connection	cable, 5 m long
Dimensions	Ø 70 x 73 mm
Weight	0.15 kg (w/o cable)

Brightness Transmitter

Description and more techn. details ref. to 7.1414.51.150

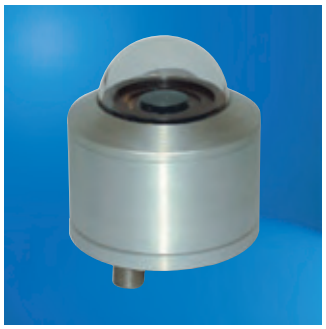
Order No.
7.1414.51.550

Technical Data

Measuring range Output 1 programmable	 0-750 / 500 / 250 / 50 lux
Measuring range Output 2	 0-5 lux
Connection	cable, 12 m long

Model Brief	Order No.	Technical Data		
Global Radiation				
Pyranometer CMP 11 For the measurement of the global radiation on plane surfaces. The global radiation results from the sum of direct radiation and diffuse radiation. The WMO-recommended measuring value transmitter meets the ISO 9060 -classification “Secondary Standard“ Adjustable feet and a level allow an easy horizon-adjustment. Delivery includes calibration certificate.	**7.1415.01.001**	Meas. range Sensitivity Typ. signal output Spectral range Non-linearity Internal resistance Response time Sensor type Ambient temperature Connection Dimensions Weight	max. 4 000 W/m² 7-14 µV/W/m² 0-15 mV 310-2 800 nm ‹ 0.2% (‹ 1000 W/m²)2 10-100 Ω ‹ 1.7 sec @ 63% of final value ‹ 5 sec @ 95% of final value thermo-element with 32 single elements -40 ... +80 °C Plug with 10 m cable Ø 150 x 92 mm 0.9 kg	
Pyranometer CMP 6 For the measurement of the global radiation on plane surfaces. The global radiation results from the sum of direct radiation and diffuse radiation. The WMO-recommended measuring value transmitter meets the ISO 9060 –classification “First class“ Adjustable feet and a level allow an easy horizon-adjustment. Delivery includes calibration certificate.	**7.1415.02.002**	Meas. range Sensitivity Typ. Signal output Spectral range Non-linearity Internal resistance Response time Sensor type Ambient temp.. Connection Dimension Weight	max. 2000 W/m² 5-15 µV/W/m² 0-15 mV 310-2800 nm ‹ 1% (‹ 1000 W/m²) 20-200 Ω ‹ 6 sec @ 63% of final value ‹ 18 sec @ 95% of final value thermo-element with 64 single elements -40 ... +80 °C plug with10 m cable Ø 150 x 92 mm 0.9 kg	
Pyranometer CMP 3 For the measurement of the global radiation on plane surfaces. The global radiation results from the sum of direct radiation and diffuse radiation. The WMO-recommended measuring value transmitter meets the ISO 9060 classification “second class“ Adjustable feet and a level allow an easy horizon-adjustment. Delivery includes calibration certificate.	**7.1415.03.003**	Meas. range Sensitivity Typ. Signal output Spectral range Non-linearity Internal resistance Response time Sensor type Ambient temp.. Connection Dimension Weight	max. 2000 W/m² 5-20 µV/W/m² 0-15 mV 310-2800 nm ‹ 2.5% (‹ 1000 W/m²) 20-200 Ω ‹ 18 sec @ 95% of the final value thermo-element -40 ... +80 °C plug with 10 m cable Ø 110 x 92 mm 0.9 kg	

Radiation



Pyranometer GSM 10.7

Electrical measuring instrument to measure the global radiation.

The measurement is cos-corrected.

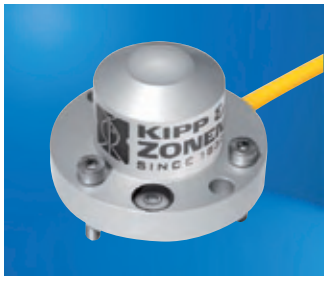
Delivery includes calibration certificate.

Order No. 7.1415.05.xxx

.040	
.041	
.051	
.061	

Technical Data

Measuring range	0-1300 W/m²
Electrical output	0-20 mA
	4-20 mA
	0-5 V
	0-10 V
Sensor type	thermocouples
Spectral range	380-2800 nm
max. spectr. sensitivity	380-2500 nm
Cos - correction	error f2 ‹ 3%
Linearity	‹ ±5%
Abs. error	‹ ±10%
Diffuser	PTFE
Dome	optical glass
Ambient temp.	-20 ... +60 °C
Operating voltage	+9 ... +24 V DC
for output 10 V	+14 ... +24 V DC
Connection	plug with 5 m cable
Dimensions	Ø 80 x 86 mm
Weight	0.3 kg



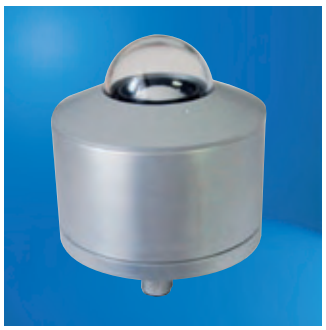
Silicon Pyranometer SP-Lite

Electrical measuring instrument to measure the global radiation.
The sensor element consists of a silicium-photodiode; it delivers a voltage signal in direct proportion to the radiation.
Delivery includes calibration certificate.

Order No. 7.1415.08.000

Technical Data

Measuring range	0-2000 W/m²
Measuring element	silicon photo diode
Spectral range	400-1100 nm
Sensitivity	60-10µV/W/m²
Typ. signal output	0-0,2 V
Cos-error	‹ 10%
Temperature error	0.15% / °C
Ambient temp.	-30 ... +70 °C
Response time	‹ 1 esc
Typ. internal resistance	50 Ω
Impedance	50 Ω
Connection	cable, 5 m long
Dimensions	Ø 54 x 34 mm
Weight	0.15 kg



Silicon Pyranometer GSM 3.3

Electrical measuring instrument to measure the global radiation.

The measurement is cos-corrected.

Delivery includes calibration certificate.

Order No. 7.1415.09.xxx

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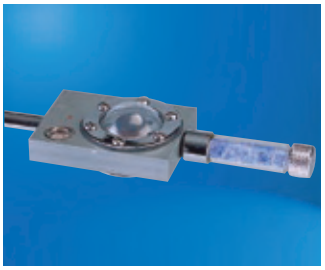
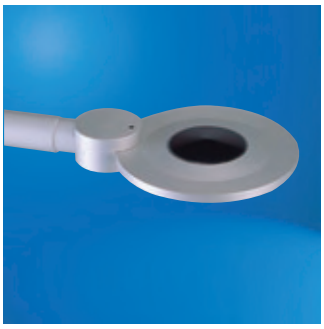
.051	
.061	

Technical Data

Measuring range	0-1300 W/m²
Electrical output	0-20 mA
	4-20 mA
	0-5 V
	0-10 V
Sensor type	silicon photo diode
Spectral range	380-1 100 nm
Max. spectr. sensitivity	780 nm
Cos-correction	error f2 ‹ 3%
Linearity	‹ ±5%
Abs. error	‹ ±10%
Diffuser	PTFE
Dome	PMMA
Ambient temp.	-20 ... +60 °C
Operating voltage	9-24 V DC
for output 10 V	14-24 V DC
Connection	plug with 5 m cable
Dimensions	Ø 80 x 95 mm
Weight	0.3 kg

Model Brief	Order No.	Technical Data		
Net Radiation				
Net Radiation Transmitter For the direct measurement of the net radiation in the short-wave and long-wave range. Two identical contra-connected thermopiles measure the global- and the reflex-radiation; they output the difference as measuring value. The instrument comes up to "First Class" acc. to WMO. Delivery includes calibration certificate.	**7.1415.10.000**	Meas. range Sensitivity Spectral range Internal resistance Time constant Linearity Dome Sensor type Temp. range Connection Dimensions Weight	-300-1500 W/m² approx. 15 µV/ W/m² 300-100 000 nm 5 Ω 25 sec at 95% ±2% (0,5-1 330W/m²) Lupolene thermo elements -40 ... +60 °C cable, 10 m long 127 x 50 x 35 mm 0.35 kg	
Pyrradiometer For the measurement of the net radiation in the short-wave and long-wave range. The measuring values of the global- and reflex-radiation are output separately. The instrument has the status "First class" acc. to WMO. Incl. PT100 sensor for the measurement of the block temperature. Delivery includes calibration certificate.	**7.1415.20.000**	Meas. range Sensitivity Spectral range Internal resistance Time constant Linearity Response time Sensor type Temp. range Connection Dimensions Weight	2 x 0-1500 W/m² approx. 15 µV/W/m² 300-100 000 nm 190 Ω each per sensor ‹ 2% (0,5-1330 W/m²) 25 sec at 95% 45 sec at 99% thermo elements -40 ... +60 °C cable, 5 m long Ø 90 x 88 mm 1.25 kg	
Albedometer CMA 6 For the measurement of the global radiation and/or the Albedo on different surfaces. The upper Pyranometer measures the infalling global radiation, and the lower instrument the radiation reflected by the surface. The Albedo is to be calculated from both measurements. The Albedometer consists of two Pyranometers in one case with mounting rod for mast-mounting. The electrical signals of both instruments are output separately. The WMO-recommended measuring value transmitter meets the ISO 9060 –classification "First Class". Delivery includes calibration certificate.	**7.1415.25.001**	Meas. range Sensitivity Typ. signal output Spectral range Non-linearity Internal resistance Response time Sensor type Ambient temperature Connection Dimensions Weight	max. 2 x 2000 W/m² 5-15 µV/W/m² 0-15 mV 310-2 800 nm ‹ 1% (‹ 1000 W/m²) 20-200 Ω ‹ 6 sec @ 63% of final value ‹ 18 sec @ 95% of final value thermo-element with 64 single elements -40 ... +80 °C 1 x plug with10 m cable Ø 150 x 114 mm 1.2 kg	

Radiation



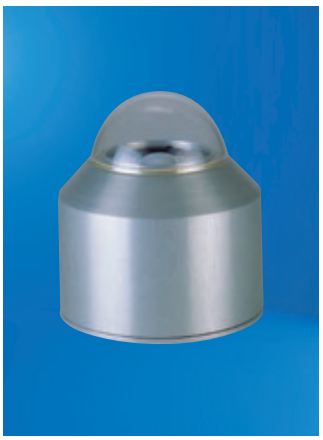
Net Radiometer NR Lite

Instrument for the measurement of the net radiation, that means the instrument forms the difference between the global radiation from above (solar radiation and long-wave atmospheric counter radiation) and the global radiation from below (short-wave and long-wave reflection radiation of the earth) The output signal is in proportion to the net radiation, and can be interpreted as radiation energy which is absorbed from the earth's surface.

Order No.: **7.1415.40.000**

Technical Data	
Measuring range	-2000 ... +2000 W/m²
Sensitivity	10 µV/W/m²
Spectral range	200-100 000 nm
Typ. signal output	-25 ... +24 mV
Response time	20 sec
Sensor type	thermocouple
Ambient temp.	-30 ... +70 °C
Connection	cable, 15 m long
Dimensions	Ø 80 mm
Support Arm	Ø 120 x 400 mm
Weight	0.26 kg

UV Radiation



Silicon UVAB Sensor E 1.1

The sensor acquires the radiations UV-A and UV-B independently from each other.
The measuring results correspond to the erythem-curve acc. to DIN 5050. They give direct information about the medically and biologically relevant correlation of these radiation fields.

The measurement is cos-corrected.
Delivery includes calibration certificate.

Order No.: **7.1416.10.040**, **.041**, **.051**, **.061**

Technical Data	
Electrical output	0-20 mA
	4-20 mA
	0-5 V
	0-10 V
UV-B	
Measuring range	0- approx. 0.7 W /m²
Spectral range	265-315 nm
max. sensitivity	297 nm
UV-A	
Measuring range	0- approx. 100 W /m²
Spectral range	310-400 nm
max. sensitivity	335 nm
Dome	glass
Sensor type	silicon photo diode
Operating voltage	9-24 V DC
for output 10 V	14-24 V DC
Ambient temp.	-30 °C ... +60 °C
Switch on time	‹ 1 sec
Switch off time	‹ 12 sec
Cos-correction	error f2 ‹ ±2%
Linearity	‹ ±3%
Absolute error	‹ ±10%
Temp. coeff.	‹ 0,2% /K
Connection	plug with 5 m cable
Dimensions	Ø 80 x 82 mm
Weight	0.3 kg

Silicon UVB Sensor E 1.c

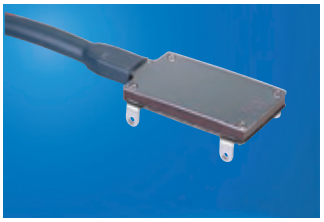
Measuring transmitter for short-wave radiation, which can cause irreversible damages of the human skin.

The relative spectral sensitivity of the sensor is especially suited to the erythem-curve acc. to DIN 5050. This sensor determines exactly the skin-damaging components of the spectral range.
Delivery includes calibration certificate.

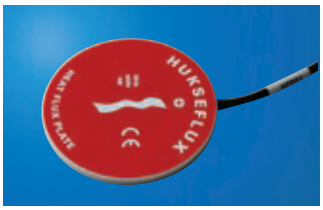
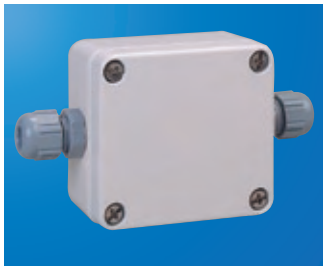
Order No.: **7.1416.20.040**, **.041**, **.051**, **.061**

Technical Data	
Electrical output	0-20 mA
	4-20 mA
	0-5 V
	0-10 V
Measuring range	0- approx. 0.5 W /m²
Spectral range	265-315 nm
Max. spectr. sensitivity	297 nm
Ambient temp.	-20 °C ... +60 °C
Switch on time	‹ 1 sec
Switch off time	‹ 12 sec
Cos-correction	error f2 ‹ ±6%
Linearity	‹ ±5%
Absolute error	‹ ±10%
Dome	plastics
Sensor type	silicon photo diode
Operating voltage	9-24 V DC
for output 10 V	14-24 V DC
Connection	5 m cable

Model Brief	Order No.	Technical Data	
Silicon PV Sensor The silicon PV sensor serves for the measurement of the solar radiation in W/m² and the temperature. The output signal is delivered as voltage proportionally to the measuring range. The efficiency factor of a photovoltaic system can be determined in correlation with the system-yield. The measurement of the solar radiation is done by a precision silicon photo diode. The measurement of the surface temperature is carried out by means of a blackbody (full radiator) and a PT 100.	**7.1419.00.061**	Solar radiation Measuring range Electrical output Spectral range Sensor type Accuracy Temperature Measuring range Electrical output Sensor type Accuracy General Acquisition angle Elevation Azimut Operating voltage Power consumption Load Ambient temperature Connection Protection Dimensions Weight	 0 ... 1400 W /m² 0 ... 10 V 380 ... 1100 nm Silicon photo diode ±2% of m.r. -20 ... +80 °C 0 ... 10V PT100 ±0.3 °C @ 25 °C ±1.5 °C @ 80 °C 0 ... 90° 0 ... 360° 12 ... 28 V DC 5 mA ≥ 10 kΩ -30 ... +80 °C Clamp connection, screwed cable gland IP 65 80 x 82 x 56 mm 0.15 kg
Photo Synthesis			
Silicon Sensor PAR 5.3 With the PAR-sensor the photochemical growth processes of outdoor- and greenhouse-plants can be optimized. The sensitivity corresponds to the optimal degree of effect of chlorophyll. The measuring results make it possible to assess reliably the developmental conditions of the plants. Delivery includes calibration certificate.	**7.1418.00.040** **.041** **.051** **.061**	Electrical output Measuring range Spectral range Max. spectr. sensitivity Switch on time Switch off time Cos-correction Linearity Abs. error Dome Sensor type Ambient temp. Operating voltage for output 10 V Connection Dimensions Weight	0-20 mA 4-20 mA 0-5 V 0-10 V 0-500 W/m² (0 ... 2255 µmol/sm² 380-700 nm 420-600 nm ‹ 1 sec ‹ 12 sec error f2 ‹ 3% ‹ ±5% ‹ ±10% PMMA silicon photo diode -30 °C ... +60 °C 9-24 V DC 14-24 V DC plug with 5 m cable Ø 80 x 95 mm 0.3 kg
Heat Flux			
Heat Flux Plate CN 3 Measures the temperature balance through a surface. Consists of 250 Cu-CuNi thermocouples between two stainless steel plates. Delivery includes calibration certificate.	**7.1417.00.000**	Sensitivity Impedance Accuracy Time response Temp. coeff. Connection Dimensions Weight	20 µV/W/m² 20 Ω ±5% 30 s in air (95%) 0,2% / °C cable, 2 m long 48 x 33 x 6 mm 0.22 kg



Radiation

	Model Brief	Order No.	Technical Data	
	**Heat Flux Plate HFP01** Measures the temperature balance in a wall or in the earth.	**7.1417.10.000**	Measuring range Sensitivity Typ. signal output Sensor type Impedance Time response Temp. coeff. Ambient temp. Connection Dimension Weight	+2 000 ... -2000 W/m² 50 µ V/W/m² -10 ... +75 mV thermocouples 2 Ω ±4 min. 0.1% / °C -30 ... +70 °C 5 m cable Ø 80 x 5 mm 0.2 kg
	Transducer			
	**Preamplifier** Instrument for transforming small mV-signals from the radiation sensor into a standardized voltage signal. Suited for: Pyranometer CMP 11 / 6 / 3	**7.1415.00.100** **7.1415.00.061**	Electr. output Electr. input Ambient temp. Operating voltage Protection Connection Dimension Weight	0-5 V (0-1300 W/m²) 0-10 V (0-1300 W/m²) mV, acc. to certificate of the sensor -30 °C ... +50 °C 6-18 V DC resp. 13-18 V DC IP 65 3 m cable, connected 58 x 35 x 64 mm 0.18 kg
	**Universal Solar Amplifier** The Universal Solar Amplifier serves for the connection of different radiation sensors and measuring value transmitters, respectively. It transforms the measuring value signals into - analogue output parameters and into - serial data telegrams The individual calibration constant of the applied sensor as well as the output parameter of the universal amplifier are settable via the serial interface. The serial number and the calibration date can be stored additionally. For ex. suitable for: 7.1415.01.001 7.1415.02.002 7.1415.03.003 7.1415.08.000 7.1415.10.000 7.1415.20.000 7.1415.25.001 7.1417.00.000 7.1417.10.000	**7.1415.00.200**	Electr. output Output parameter (selectable) Serial interface Electr. input Input parameter (selectable) Operating voltage Current consumption Ambient temperature Protection Connection Dimension Weight	4 x analogue, 1 x serial 0 ... 1.2 V / 0 ... 5 V/ 0 ... 10V / 0 ... 20mA/ 4 ... 20mA RS 422 / RS 485 4 x analogue -100mV ... +10V 0 ... 20mA Pt100 / Pt1000 / NTC / PTC 7 ... 35 V DC Typ. 5 mA (+ I out) -40 °C ... +80 °C IP 65 Terminal strip, screwed cable gland 120 x 80 x 55 mm 0.25 kg

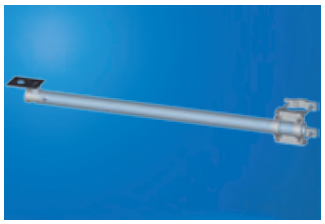
Model Brief	Order No.	Technical Data	
Solar Transmitter Type: ST 10 Instrument for transforming small mV-signals from the radiation sensor into a standardized measuring value signal. Suited for: Pyranometer CMP 11 / 6 / 3	**7.1415.01.200**	Electr. output Electr. input Operating voltage Ambient temp. Protection Connection Dimension Weight	4-20 mA (0-1300 W/m²) mV, acc. to certificate of the sensor 10-34 V DC -30 °C ... +50 °C IP 65 terminal strip screwed cable gland 75 x 80 x 57 mm 0.35 kg
Sensor Signal Amplifier Type: AMPBOX Instrument for transforming small mV-signals from the radiation sensor into a standardized measuring value signal. Suited for Pyranometer: CMP 3 / 6 / 11 / 21 / 22	**7.1415.01.541**	Electr. output Electr. input Operating voltage Ambient temp. Protection Connection Dimension Weight	4-20 mA (0-1600 W/m²) -12 ... +150 mV, acc. to certificate of the sensor 7,2-35 V DC -40 °C ... +85 °C IP 66 terminal strip screwed cable gland 98 x 64 x 34 mm 0.25 kg

Digital Displays

Digital Indicator S for Installation Flat-section indicator for connection to available radiation data transmitters or measuring transducer. The measured value is indicated digitally with red LED digits. Designed for installation in switch panels or front panels. The background of the indicator is black to facilitate reading.	**7.1044.10.xxx** **7.1044.11.xxx** **.040** **.041** **.061**	Display range Electrical Input Resolution Display Operating voltage Model Protection Dimensions Weight	0-1300 W/m² -300-1000 W/m² 0-20 mA 4-20 mA 0-10 V ±1 digit LED, red, 13 mm high 230 V / 50 Hz switch panel installation IP 20 96 x 48 x 135 mm 0.3 kg

Radiation

Accessories



Hanger 1 m

The hanger is used for laterally mounting of a radiation- or brightness transmitter onto a mast

An adapter, included in delivery, connects the holder with the measuring value transmitter.

Suitable for:
7.1414.10/12/15/22/25.0xx
7.1414.60/61.000
7.1415.01.001
7.1415.02.002
7.1415.03.003
7.1415.08.000
7.1415.09.000
7.1415.05.0xx
7.1416.10.0xx
7.1418.00.0xx
7.1419.00.061

Order No.: 4.3185.xx.009
.00.
.01.
.02.

Technical Data	
Clamp range for masts	Ø 60-132 mm Ø 40-80 mm Ø 48-58 mm
Length	approx. 1 m
Tube diameter	50 mm
Material	Aluminium
Weight	1.8 kg

Traverse

For mounting of 2 radiation transmitters or respectively 2 brightness transmitters together onto a mast.

The optional adapter 506345 connects the traverse with the measuring value transmitter

Order No.: 4.3171.30.000
.31.

Technical Data	
Clamp range for masts	Ø 48-102 mm Ø 116-200 mm
Sensor distance	0.8 m
Material	Aluminium / stainless steel
Weight	0.35 kg

Traverse, short

For mounting of a radiation transmitter or respectively a brightness transmitter onto a mast.

The optional adapter 506345 connects the traverse with the measuring value transmitter

Order No.: 4.3171.40.000
.41.

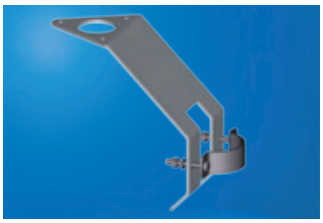
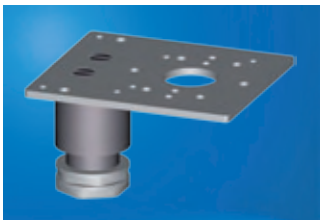
Technical Data	
Clamp range for masts	Ø 48-102 mm Ø 116-200 mm
Sensor distance	0,4 m from mast
Material	Aluminium / stainless steel
Weight	0.35 kg

Traverse 0,8 m

For mounting of a Pyranometer CMP11 / 6 / 3 And a sunshine duration sensor-CSD3 onto a mast.

Order No.: 4.3171.40.002

Technical Data	
Clamp range For masts	Ø 48-102 mm
Sensor distance	0.8/0.4 m from mast
Material	Aluminium / stainless steel
Weight	1 kg

Model Brief	Order No.	Technical Data		
Holder „compact“ The holder serves for mounting a radiation transmitter or brightness transmitter onto a mast. The optional adapter 506345 connects the holder with the measuring value transmitter.	**506347**	Clamp range For masts Sensor distance Material Weight	Ø 35-50 mm 80 x 150 mm Stainless steel non-corrosive 0.35 kg	
Adapter The adapter serves for mounting a radiation transmitter or brightness transmitter onto a traverse (4.3171.30.000, 4.3171.40.000) or holder (506 347). Adaptation for: 7.1414.10/12/15/22/25.0xx 7.1414.60/61.000 7.1415.01.001 7.1415.02.002 7.1415.03.003 7.1415.08.000 7.1415.09.000 7.1415.05.0xx 7.1416.10.0xx 7.1418.00.0xx 7.1419.00.061	**506345**	Material Dimensions Weight	Aluminium, anodized 100 x 115 x 65 mm 0.5 kg	
Shadow Ring CM 121 B Serves for shading the Pyranometer from direct solar radiation. Thus, only the diffuse solar radiation is measured. Suitable sensors : Pyranometer CMP 11 Pyranometer CMP 6 Remark: Pyranometer not included in delivery	**7.1415.01.121**	Material Height (max.) Ring outer Ring width Ring width / Ring radius ratio Cover bracket Weight	Aluminium 800 mm Ø 620 mm 55 mm 0.185 10,6° 6 kg	

Your Notice

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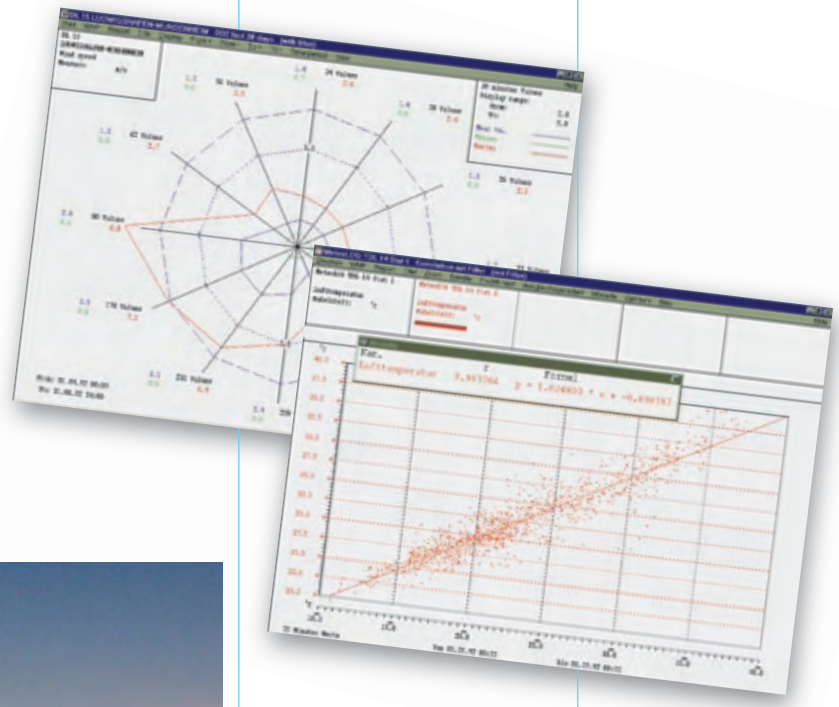

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