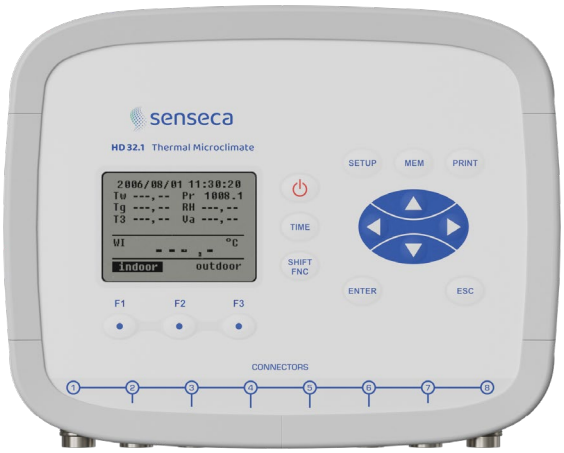
HD32.1



HD32.1 – MULTIPARAMETER INSTRUMENT FOR THERMAL MICROCLIMATE ANALYSIS

HD32.1 is a portable multichannel instrument designed for microclimate analysis in workplaces and for the assessment of thermal comfort, heat and cold stress, and local thermal discomfort. Thanks to the wide range of available SICRAM probes, the instrument can measure temperature, relative humidity, air velocity and flow rate, barometric pressure, photometric and radiometric quantities, CO_2 concentration and CO concentration.

Eight inputs allow several probes to be connected simultaneously. The SICRAM module stores the probe calibration data and enables automatic probe recognition when the instrument is switched on.

HD32.1 also features an integrated data logger, an internal barometric pressure sensor, a backlit graphic display and RS232 and USB interfaces for data transfer to a PC.

ONE PLATFORM, THREE MEASUREMENT PROGRAMS

PROGRAM A – MICROCLIMATE ANALYSIS

The Microclimate program measures the quantities required to assess thermal conditions in workplaces:

- natural wet-bulb temperature Tnw;
- globe temperature Tg;
- dry-bulb air temperature Ta;
- barometric pressure Pr;
- relative humidity RH;
- air velocity Va.

The instrument directly calculates:

- indoor WBGT, in the absence of solar radiation;
- outdoor WBGT, in the presence of solar radiation;
- mean radiant temperature Tr;
- turbulence intensity TU;
- Wind Chill Index WCI.

The DeltaLog10 software can also be used to calculate:

- DR – Draft Rate;
- PMV – Predicted Mean Vote;
- PPD – Predicted Percentage of Dissatisfied;
- IREQ – required clothing insulation;
- Dlim – limit exposure time;
- RT – recovery time;
- PHS – Predicted Heat Strain indices;
- additional thermal and discomfort indices.

PROGRAM B – LOCAL DISCOMFORT ANALYSIS

The Local Discomfort program measures the parameters required to assess thermal discomfort caused by vertical air temperature differences, floor temperature and radiant temperature asymmetry:

- air temperature at head level;
- air temperature at abdomen level;
- air temperature at ankle level;
- floor temperature;
- net radiometer temperature;
- net radiation;
- radiant temperature asymmetry.

The acquired data can be processed using DeltaLog10 to calculate:

- PDv – percentage dissatisfied due to vertical air temperature difference;
- PDf – percentage dissatisfied due to floor temperature;
- PD – percentage dissatisfied due to radiant temperature asymmetry.

PROGRAM C – PHYSICAL QUANTITIES

The Physical Quantities program allows HD32.1 to be used as a multiparameter instrument for measuring:

- temperature;
- relative humidity;
- air velocity and flow rate;
- illuminance;
- luminance;
- PAR photon flux;
- irradiance;
- UVA, UVB, UVC and UVBC irradiance;
- effective irradiance in the blue-light spectral band;
- carbon dioxide concentration, CO_2;
- carbon monoxide concentration, CO.

When used with the LP471PHOT photometric probe, the DeltaLog10 software can also calculate the daylight factor FLD.

DATA ACQUISITION AND MANAGEMENT

HD32.1 can store up to 67,600 records for each of its eight inputs. The memory is divided into 64 logging sessions.

The logging interval can be selected from:

15 seconds, 30 seconds, 1 minute, 2 minutes, 5 minutes, 10 minutes, 15 minutes, 20 minutes, 30 minutes and 1 hour.

The automatic start function allows the starting and ending date and time of a logging session to be scheduled.

The instrument also displays the minimum, maximum and average values of the measured quantities and features a real-time clock.

Data can be transferred to a PC through the RS232 or USB interface and processed using the DeltaLog10 software, available for download from the Senseca website.

MAIN APPLICATIONS

- Microclimate assessment in workplaces
- Heat and cold stress analysis
- Thermal comfort and local discomfort assessment
- Measurement of environmental parameters in buildings
- Air velocity and flow rate measurements
- Indoor air quality monitoring
- Photometric and radiometric measurements
- Measurement and documentation of exposure conditions

REFERENCE STANDARDS

HD32.1 provides the measurements required for assessments according to the main international standards relating to thermal environments:

- ISO 7726 – Instruments for measuring physical quantities in thermal environments
- ISO 7730 – Analytical determination and interpretation of thermal comfort using PMV and PPD indices and local thermal comfort criteria
- ISO 7243 – Assessment of heat stress using the WBGT index
- ISO 7933 – Analytical determination and interpretation of heat stress using the PHS method
- ISO 11079 – Determination and interpretation of cold stress using required clothing insulation IREQ and local cooling effects

Instrument technical specifications	
Power supply	4 x 1.5 V C size alkaline batteries 12 Vdc/1 A external power supply unit (**SWD10**)
Battery life	200 hours of continuous operation with 7800 mAh batteries and temperature and RH probes 100 hours of continuous operation with 7800 mAh batteries and hot-wire air speed probe @ 5 m/s Current consumption when the instrument is off <45 µA
Logging interval	Configurable 15/30 seconds, 1/2/5/10/15/20/30 minutes, 1 hour
Storage capacity	67,600 entries for each of the 8 inputs The memory is divided in 64 blocks
Inputs	8 inputs with 8-pole DIN45326 connector for probes with SICRAM module
Display	Backlit dot matrix LCD Visible area 56x38 mm, 128x64 pixels
Connectivity	RS232C or USB 2.0, 8-pole M12 connector
Uncertainty	± 1 digit @ 20 °C (only the instrument)
Operating conditions	-5...50 °C, 0...90 %RH no condensation
Storage Temperature	-25...65 °C
Materials	ABS and aluminum
Dimensions	220x180x50 mm
Weight	1100 g (with batteries)
Degree of protection	IP 64

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MEASUREMENT SPECIFICATIONS

The measurement specifications for external probes apply to the instrument in line with the probe.

Barometric pressure (internal sensor)	
Sensor	Piezoresistive
Measuring range	600...1100 hPa
Resolution	0.1 hPa
Accuracy	± 0.5 hPa @ T=20°C
Long term stability	1 hPa / year
Response time	1 s
TP3275 and TP3276 temperature probes	
Sensor	Pt100
Measuring range	-30...120 °C
Resolution	0.1 °C
Accuracy	1/3 DIN
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector, cable L=2 m
Globe dimensions	Ø=150 mm (TP3275), Ø=50 mm (TP3276)
Stem dimensions	Ø=14 mm, L=110 mm (TP3275) Ø=8 mm, L=170 mm (TP3276)
Response time T_{95} (1)	15 minutes
TP3207 temperature probe	
Sensor	Pt100
Measuring range	-40...100 °C
Resolution	0.1 °C
Accuracy	1/3 DIN
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	Ø=14 mm, L=140 mm
Response time T_{95} (1)	15 minutes
HP3201 natural ventilation wet bulb probe	
Sensor	Pt100
Measuring range	4...80 °C
Resolution	0.1 °C
Accuracy	Class A
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	Shaft: Ø=14 mm, L=110 mm Reservoir: Ø=30 mm, L=35 mm
Cotton wick length	10 cm approx.
Reservoir capacity	15 cc, autonomy 96 hours @ RH=50% and t=23 °C
Response time T_{95} (1)	15 minutes
TP3204S natural ventilation wet bulb probe	
Sensor	Pt100
Measuring range	4...80 °C
Resolution	0.1 °C
Accuracy	Class A
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	L x W x H = 140 x 65 x 178,5 mm (reservoir + bottle)
Cotton wick length	10 cm approx.
Reservoir capacity	500 cc, autonomy 15 days @ t=40 °C
Response time T_{95} (1)	15 minutes
HP3217DM combined dry bulb and natural ventilation wet bulb probe	
Sensor	Pt100
Measuring range	-30...100 °C (dry bulb) / 4...80 °C (wet bulb)
Resolution	0.1 °C
Accuracy	Class A
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	Shaft: Ø=14 mm, L=170 mm Sensors support disk: Ø=59 mm, L=30 mm
Cotton wick length	10 cm approx.
Reservoir	Capacity 15 cc, autonomy 96 hours @ RH=50% and t=23 °C
Response time T_{95} (1)	4 minutes (dry bulb) / 30 minutes (wet bulb)
HP3217R temperature and relative humidity combined probe	
Sensor	Temperature: Pt100 R.H.: capacitive
Measuring range	Temperature: -40...100 °C R.H.: 0...100%
Resolution	0.1 °C / 0.1 %RH
Accuracy	Temperature: 1/3 DIN R.H.: ±1.5% (0...90%RH) / ±2% (90...100%RH) @ T=15...35 °C (1.5 + 1.5% measure)% @ T= remaining range
Temperature drift @ 20 °C	0.02 %RH/°C
Long term stability	0.1 %RH/year
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	Ø=14 mm, L=150 mm
Response time T_{95} (1)	15 minutes
AP3203 and AP3203F omnidirectional hot wire air speed probes	
Sensor	NTC 10 kΩ
Measuring range	0.02...5 m/s 0...80 °C (AP3203) / -30...30 °C (AP3203F)
Resolution	0.01 m/s
Accuracy	± (0,05 + 5% measure) m/s
Temperature drift @ 20 °C	0.06 %/°C
Long term stability	0.12 °C/year
Connection	8-pole female DIN45326 connector, cable L=2 m
Stem dimensions	Ø=8 mm, L=230 mm
Protection dimensions	Ø=100 mm

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TP3227K dual temperature probe	
Sensor	Pt100
Measuring range	-10…100 °C
Resolution	0.1 °C
Accuracy	1/3 DIN
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	Ø=14 mm, L=490 mm (probe rod) + 450 mm (extension rod) Adjustable lower sensor height
Response time T_{95} (1)	15 minutes (upper sensor) / 4 minutes (lower sensor)
TP3207P and TP3227PC temperature probes	
Sensor	Pt100
Measuring range	-10…100 °C
Resolution	0.1 °C
Accuracy	1/3 DIN
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	Ø=70 mm, H=32 mm (TP3207P) / 100 mm (TP3227PC)
Response time T_{95} (1)	20 minutes (floor) / 4 minutes (ankles, only TP3227PC)
TP3207TR combined probe for the measurement of radiant temperature	
Sensor	Thermopile / NTC
Thermopile typical sensitivity	10 µV/(Wm^{-2})
Temperature measuring range	0…60 °C
Resolution	0.1 °C / 1 Wm^{-2}
Temperature accuracy	±0,15 °C
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	Shaft: Ø=16 mm / Head: Ø=80 mm
Response time T_{95} (1)	20 minutes (temperature) / 90 seconds (net radiation)
HD320B2 CO_2 probe	
Sensor	Non-dispersive infrared rays (NDIR)
Measuring range	0…5000 ppm
Resolution	1 ppm
Accuracy	±(50 ppm + 3% of measure) @ 20 °C, 50 %RH and 1013 hPa
Temperature drift @ 20 °C	0.2 %/°C typical
Long term stability	5% of measuring range / 5 years typical
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	Shaft: Ø=14 mm, L=110 mm / Head: Ø=40 mm, L=90 mm
Response time T_{63} (2)	2 minutes
Operating conditions	-5…50 °C / 0…95 %RH non condensing The effect of atmospheric pressure is compensated with the sensor integrated in the instrument
HD320A2 CO probe	
Sensor	Electrochemical cell
Measuring range	0…500 ppm
Resolution	0.1 ppm
Accuracy	±(3 ppm + 3% of measure) @ 20 °C, 50 %RH and 1013 hPa
Long term stability	5% of measure / year typical
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	Ø=30 mm, L=57 mm
Response time T_{63} (2)	1 minute
Operating conditions	-5…50 °C / 0…95 %RH non condensing
Expected sensor life	5 years typical under normal environmental conditions

(1) The response time T_{95} is the time needed to reach 95% of the final value.

(2) The response time T_{63} is the time needed to reach 63% of the final value.

4-wire Pt100 temperature probes for general use

Model	Type	Measuring range	Accuracy
TP472I	Immersion	-196…500 °C	±0.1°C (@ 0 °C) ±0.2°C (-50 °C ≤ t ≤ 250 °C) ±0.3°C (t < -50 °C; t > 250 °C)
TP472I.O	Immersion	-50…300 °C	
TP473P.I	Penetration	-50…400 °C	
TP473P.O	Penetration	-50…300 °C	
TP474C.O	Contact	-50…300 °C	
TP475A.O	Air	-50…250 °C	
TP472I.5	Penetration	-50…400 °C	
TP472I.10	Penetration	-50…400 °C	

Common specifications

Resolution: 0.01 °C in the range ±199.99 °C / 0.1 °C outside

Temperature drift @ 20 °C: 0.003 %/°C

Note: the instrument measuring range is -200…650 °C; the actual measurement range may be limited by the probe operating temperature.

Combined relative humidity and temperature probes

Model	Temp. sensor	Measuring range		Accuracy	
		R.H	Temp.	R.H	Temp.
HP472ACR	Pt100	0…100%	-20…80 °C	±1.5% (0…85%RH) ±2.5% (85…100%RH) @ T=15…35 °C (2 + 1.5% measure)% @ T=remaining range	±0.3 °C
HP473ACR			-20…80 °C		±0.3 °C
HP474ACR			-40…150 °C		±0.3 °C
HP475ACR			-40…150 °C		±0.3 °C
HP475AC1R			-40…170 °C		±0.3 °C
HP477DCR			-40…100 °C		±0.3 °C
HP478ACR			-40…150 °C		±0.3 °C

Common features

Relative humidity

Sensor	Capacitive
Resolution	0.1 %RH
Temperatuere drift @ 20 °C	0.02 %RH/°C
Response time at constant temperature	10 s (10→80 %RH; air speed=2 m/s)

Temperature

Sensor	Pt100
Resolution	0.01 °C
Temperatuere drift @ 20 °C	0.003 %/°C

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HOT-WIRE AIR SPEED PROBES

	AP471S1 AP471S3	AP471S2	AP471S4
Sensor			
Speed	NTC Thermistor	Omnidirectional NTC thermistor	
Temperature	NTC Thermistor	NTC thermistor	
Measuring range			
Speed	0.02...40 m/s	0.02...5 m/s	
Temperature	-25...80 °C	-25...80 °C	-25...80 °C
Air temperature compensation	0...80 °C		
Resolution			
Speed	0.01 m/s - 0.1 km/h - 1 ft/min - 0.1 mph - 0.1 knot		
Temperature	0.1°C		
Accuracy			
Speed	±0.2 m/s (0.10...0.99 m/s) ±0.4 m/s (1.00...9.99 m/s) ±0.8 m/s (10.00...40.00 m/s)	±0.05 m/s (0.10...0.99 m/s) ±0.15 m/s (1.00...5.00 m/s)	
Temperature	±0.8 °C (-10...80°C)	±0.8 °C (-10...80 °C)	
Minimum speed	0.02 m/s		
Cable length	~2 m		

VANE AIR SPEED PROBES

	AP472S1	AP472S2
Sensor		
Speed	Propeller ∅100 mm	Propeller ∅60 mm
Temperature	Tc K	----
Measuring range		
Speed	0.6...25 m/s	0.5...20 m/s
Temperature	-25...80 °C	----
Resolution		
Speed	0.01 m/s - 0.1 km/h - 1 ft/min - 0.1 mph - 0.1 knot	
Temperature	0.1 °C	----
Accuracy		
Speed	±(0.4 m/s + 1.5% f.s.)	±(0.4 m/s + 1.5% f.s.)
Temperature	±0.8 °C	----
Minimum speed	0.6 m/s	0.5 m/s
Operating temperature	-25...80 °C	
Length del cable	~2 m	

PROBE FOR THE MEASUREMENT OF ILLUMINANCE **LP471PHOT**

Measuring range (lux)	0.10...199,99	...1999.9	...19999	...199.99x10^3
Resolution(lux)	0.01	0.1	1	0.01 x 10^3
Spectral range	in accordance with standard photopic curve V(λ)			
α (temperature coefficient) f_6(T)	<0.05% K			
Calibration uncertainty	<4%			
f'$_1$ (accordance with photopic response V(λ))	<6%			
f_2 (response as law of cosines)	<3%			
f_3 (linearity)	<1%			
f_4 (error in instrument reading)	<0.5%			
f_5 (fatigue)	<0.5%			
Class	B			
1 year drift	<1%			
Operating temperature	0...50 °C			
Reference standard	CIE n°69 – UNI 11142			

PROBE FOR THE MEASUREMENT OF LUMINANCE **LP471LUM2**

Measuring range (cd/m^2)	1...1999.9	...19999	...199.99x10^3	...1999.9x10^3
Resolution(cd/m^2)	0.1	1	0.01 x 10^3	0.1 x 10^3
Angle of view	2°			
Spectral range	in accordance with standard photopic curve V(λ)			
α (temperature coefficient) f_6(T)	<0.05% K			
Calibration uncertainty	<5%			
f'$_1$ (accordance with photopic response V(λ)	<8%			
f_3 (linearity)	<1%			
f_4 (error in instrument reading)	<0.5%			
f_5 (fatigue)	<0.5%			
Class	C			
1 year drift	<1%			
Operating temperature	0...50 °C			
Reference standard	CIE n°69 – UNI 11142			

QUANTUM-RADIOMETRIC PROBES FOR THE MEASUREMENT OF PHOTON FLUX IN THE PAR CHLOROPHYLL FIELD) **LP471PAR / LP471PAR02**

Measuring range (μmol/m^{2}s)	0.1... 199.99	200,0...1999.9	2000...10000
Resolution(μmol/m^{2}s)	0.01	0.1	1
Spectral range	400...700 nm		
Calibration uncertainty	<5%		
f_2 (response as law of cosines)	<6%		
f_3 (linearity)	<1%		
f_4 (error in instrument reading)	±1 digit		
f_5 (fatigue)	<0.5%		
1 year drift	<1%		
Operating temperature	0...50 °C		

PROBE FOR THE MEASUREMENT OF IRRADIANCE **LP471RAD**

Measuring range (W/m^2)	1x10^{-3}...999.9x10^{-3}	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution(W/m^2)	0.1x10^{-3}	0.001	0.01	0.1
Spectral range	400...1050 nm			
Calibration uncertainty	<5%			
f_2 (response as law of cosines)	<6%			
f_3 (linearity)	<1%			
f_4 (error in instrument reading)	±1 digit			
f_5 (fatigue)	<0.5%			
1 year drift	<1%			
Operating temperature	0...50 °C			

PROBE FOR THE MEASUREMENT OF UVA IRRADIANCE **LP471UVA**

Measuring range (W/m^2)	1x10^{-3}... 999.9x10^{-3}	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution (W/m^2)	0,1x10^{-3}	0,001	0,01	0,1
Spectral range	315...400 nm (Peak 365 nm)			
Calibration uncertainty	<5%			
f_3 (linearity)	<1%			
f_4 (error in instrument reading)	±1 digit			
f_5 (fatica)	<0,5%			
Deriva ad un anno	<2%			
Temperatura di lavoro	0...50 °C			

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PROBE FOR THE MEASUREMENT OF UVB IRRADIANCE **LP471UVB**

Measuring range (W/m^2)	$1x10^{-3}$...$999.9x10^{-3}$	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution(W/m^2)	$0.1x10^{-3}$	0.001	0.01	0.1
Spectral range	280...315 nm (Peak 305 nm)			
Calibration uncertainty	<5%			
f_3 (linearity)	<2%			
f_4 (error in instrument reading)	±1 digit			
f_5 (fatigue)	<0.5%			
1 year drift	<2%			
Operating temperature	0...50 °C			

PROBE FOR THE MEASUREMENT OF UVC IRRADIANCE **LP471UVC**

Measuring range (W/m^2)	$1x10^{-3}$...$999.9x10^{-3}$	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution(W/m^2)	$0.1x10^{-3}$	0.001	0.01	0.1
Spectral range	220...280 nm (Peak 260 nm)			
Calibration uncertainty	<5%			
f_3 (linearity)	<1%			
f_4 (error in instrument reading)	±1digit			
f_5 (fatigue)	<0.5%			
1 year drift	<2%			
Operating temperature	0...50 °C			

PROBE FOR THE MEASUREMENT OF UVBC IRRADIANCE **LP471UVBC**

Measuring range (W/m^2)	$1x10^{-3}$...$999.9x10^{-3}$	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution(W/m^2)	$0.1x10^{-3}$	0.001	0.01	0.1
Spectral range	210...355 nm (Peak 265 nm)			
Calibration uncertainty	<7% (calibration @ 254 nm)			
f_3 (linearity)	<2%			
f_4 (error in instrument reading)	±1digit			
f_5 (fatigue)	<0.5%			
1 year drift	<2%			
Operating temperature	0...50 °C			

PROBE FOR THE MEASUREMENT OF EFFECTIVE IRRADIANCE IN BLUE LIGHT SPECTRAL BAND **LP471BLUE**

Measuring range (W/m^2)	$1x10^{-3}$...$999.9x10^{-3}$	1.000...19.999	20.00...199.99	200.0...1999.9
Resolution(W/m^2)	$0.1x10^{-3}$	0.001	0.01	0.1
Spectral range	380...550 nm, action curve for blue-light induced damage B(λ)			
Calibration uncertainty	<10%			
f_2 (risposta come legge del coseno)	<6%			
f_3 (linearity)	<3%			
f_4 (error in instrument reading)	±1 digit			
f_5 (fatigue)	<0.5%			
1 year drift	<2%			
Operating temperature	0...50 °C			

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ORDERING CODES

HD32.1 - Portable multiparameter instrument for thermal microclimate, thermal comfort and local discomfort analysis. Equipped with eight inputs for SICRAM probes, internal barometric pressure sensor, backlit graphic display, internal memory and RS232 and USB interfaces. The instrument is supplied with 4 × 1.5 V C-size alkaline batteries.

DeltaLog10 software is available for download from the Senseca website. Probes, external power supply, PC connection cables, mounting accessories and carrying case must be ordered separately.

PROBES

SICRAM PROBES FOR PROGRAM A – MICROCLIMATE ANALYSIS	
TP3207	Dry bulb
TP3275	Globe thermometer probe, Pt100 sensor. Globe Ø150 mm. Stem Ø14 mm, L=110 mm. Cable 2 m.
TP3276	Globe thermometer probe, Pt100 sensor. Globe Ø50 mm. Stem Ø8 mm, L=170 mm. Cable 2 m.
HP3201	Natural ventilation wet bulb temperature probe, Pt100 sensor. Stem Ø14 mm, L=110 mm. Cable 2 m. Supplied with spare cotton wick and 50 cc of distilled water.
TP3204S	Natural ventilation wet bulb temperature probe for long-lasting measurements, Pt100 sensor. Stem Ø14 mm. Cable 2 m. Supplied with spare cotton wick and 500 cc bottle.
HP3217DM	Combined dry bulb and natural ventilation wet bulb temperature probe, Pt100 sensors. Stem Ø14 mm, L=170 mm. Cable 2 m. Supplied with spare cotton wick and 50 cc of distilled water.
HP3217R	Relative humidity and temperature combined probe. Capacitive RH sensor and Pt100 temperature sensor. Stem Ø14 mm, L=150 mm. Cable 2 m.
AP3203	Omnidirectional hot-wire air speed probe. Measuring range 0.02...5 m/s, 0...80 °C. Stem Ø8 mm, L=230 mm. Cable 2 m.
AP3203F	Omnidirectional hot-wire air speed probe. Measuring range 0.02...5 m/s, -30...30 °C. Stem Ø8 mm, L=230 mm. Cable 2 m.
SICRAM PROBES FOR PROGRAM B – LOCAL DISCOMFORT ANALYSIS	
TP3227K	Probe consisting of two independent temperature probes, Pt100 sensors. Adjustable lower sensor height. It can be used for the discomfort analysis of standing or seated subjects. Stem Ø14 mm, L=490 mm + extension L=450 mm. Cable 2 m.
TP3227PC	Probe consisting of two independent probes for the measurement of the temperature at floor level and ankle height, Pt100 sensors. Ø=70 mm, H=100 mm. Cable 2 m.
TP3207P	Probe for the measurement of floor temperature, Pt100 sensor. Ø=70 mm, H=32 mm. Cable 2 m.
TP3207TR	Net radiometer. Stem Ø16 mm, head Ø80 mm. Cable 2 m.
TP3227K	Probe consisting of two independent temperature probes, Pt100 sensors. Adjustable lower sensor height. It can be used for the discomfort analysis of standing or seated subjects. Stem Ø14 mm, L=490 mm + extension L=450 mm. Cable 2 m.
TP3227PC	Probe consisting of two independent probes for the measurement of the temperature at floor level and ankle height, Pt100 sensors. Ø=70 mm, H=100 mm. Cable 2 m.
TP3207P	Probe for the measurement of floor temperature, Pt100 sensor. Ø=70 mm, H=32 mm. Cable 2 m.
SICRAM PROBES FOR PROGRAM C – PHYSICAL QUANTITIES	
Temperature	
TP472I	Pt100 immersion probe. Stem Ø3 mm, L=300 mm. Cable 2 m.
TP472I.O	Pt100 immersion probe. Stem Ø3 mm, L=230 mm. Cable 2 m.
TP473P.I	Pt100 penetration probe. Stem Ø4 mm, L=150 mm. Cable 2 m.
TP473P.O	Pt100 penetration probe. Stem Ø4 mm, L=150 mm. Cable 2 m.
TP474C.O	Pt100 contact probe. Stem Ø4 mm, L=230 mm, contact surface Ø5 mm. Cable 2 m.
TP475A.O	Pt100 air probe. Stem Ø4 mm, L=230 mm. Cable length 2 m.
TP472I.5	Pt100 penetration probe. Stem Ø6 mm, L=500 mm. Cable 2 m.
TP472I.10	Pt100 penetration probe. Stem Ø6 mm, L=1000 mm. Cable 2 m.
Relative humidity and temperature combined probes	
HP472ACR	%RH and temperature combined probe. Ø26x170 mm. Cable 2 m.
HP473ACR	%RH and temperature combined probe. Handle Ø26x130 mm, stem Ø14x120 mm. Cable 2 m.
HP474ACR	%RH and temperature combined probe. Handle Ø26x130 mm, stem Ø14x215 mm. Cable 2 m.
HP475ACR	%RH and temperature combined probe. Handle Ø26x110 mm. Stainless steel stem Ø12x560 mm. Tip Ø13,5x75 mm. Cable 2 m.
HP475AC1R	%RH and temperature combined probe. Handle 80mm. Stainless steel stem Ø14x480 mm. Cable 2 m.
HP477DCR	%RH and temperature combined sword probe. Handle Ø26x110 mm. Probe stem 18x4 mm, length 520 mm. Cable 2 m.
HP478ACR	%RH and temperature combined probe. Stainless steel stem Ø14x130 mm. Cable 5 m.
Hot-wire air speed probes	
AP471S1	Extensible hot-wire probe. Measuring range 0.02...40 m/s. Cable 2 m.
AP471S2	Omnidirectional extensible hot-wire probe. Measuring range 0.02...5 m/s. Cable 2 m.
AP471S3	Extensible hot-wire probe with shapeable end. Measuring range 0.02...40 m/s. Cable 2 m.
AP471S4	Omnidirectional extensible hot-wire probe with base. Measuring range 0.02...5 m/s. Cable 2 m.
Vane air speed probes	
AP472 S1	Vane probe with thermocouple K, Ø100 mm. Measuring range 0.6...25 m/s, -25...80 °C. Cable 2 m.
AP472 S2	Vane probe, Ø60 mm. Measuring range 0.5...20 m/s. Cable 2 m.
Photo-radiometric probes	
LP471PHOT	Photometric probe for the measurement of **illuminance**. Spectral response according to standard photopic vision, diffuser for cosine correction. Measuring range 0.1...200x10^3 lux. Cable 1.5 m.
LP471RAD	Radiometric probe for the measurement of **irradiance** in the spectral range 400...1050 nm. Diffuser for cosine correction. Measuring range 1x10^{-3}...2000 W/m^2. Cable 1.5 m.
LP471PAR	Quantum-radiometric probe for the measurement of photon flux in the **PAR** chlorophyll field (photosynthetically Active Radiation 400...700 nm). Diffuser for cosine correction. Measuring range 0.1...10x10^3 µmol/m^2s. Cable 1.5 m.
LP471PAR02	Quantum-radiometric probe for the measurement of photon flux in the **PAR** chlorophyll field (photosynthetically Active Radiation 400...700 nm). **Quartz** diffuser for cosine correction. Measuring range 0.1...10x10^3 µmol/m^2s. Cable 1.5 m.
LP471UVA	Radiometric probe for the measurement of **irradiance** in the 315...400 nm **UVA** spectral range, peak at 365 nm. Quartz diffuser for cosine correction. Measuring range 1x10^{-3}...2000 W/m^2. Cable 1.5 m.
LP471UVB	Radiometric probe for the measurement of **irradiance** in the 280...315 nm **UVB** spectral range, peak at 305 nm. Quartz diffuser for cosine correction. Measuring range 1x10^{-3}...2000 W/m^2. Cable 1.5 m.
LP471UVC	Radiometric probe for the measurement of **irradiance** in the 220...280 nm **UVC** spectral range, peak at 260 nm. Quartz diffuser for cosine correction. Measuring range 1x10^{-3}...2000 W/m^2. Cable 1.5 m.
LP471UVBC	Radiometric probe for the measurement of **irradiance** in the 210...355 nm **UVBC** spectral range, peak at 265 nm. Quartz diffuser for cosine correction. Measuring range 1x10^{-3}...2000 W/m^2. Cable 1.5 m.

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LP471LUM2	Radiometric probe for the measurement of **effective irradiance** in the **Blue** light spectral band. Spectral range 380…550 nm, diffuser for cosine correction. Measuring range 1x10^{-3}…2000 W/m^2. Cable 1.5 m.
LP471BLUE	Radiometric probe for the measurement of effective irradiance in the Blue light spectral band. Spectral range 380…550 nm, diffuser for cosine correction. Measuring range 1x10^{-3}…2000 W/m^2. Cable 1.5 m.
LP32F/R	Support for fixing LP471… a photo-radiometric probe to SP32TC.8.
CO_2 AND CO PROBES	
HD320B2	CO_2 probe. Double source infrared sensor. Measuring range 0…5000 ppm. Cable 2 m.
HD320A2	CO probe. 2-electrode electrochemical sensor. Measuring range 0…500 ppm. Cable 2 m.
HD320AS2	Magnetic support for fixing the probe HD320A2 to the probe HD320B2.
HD37.37	Connection tube kit between probe and nitrogen cylinder for CO_2 calibration.
HD37.36	Connection tube kit between probe and nitrogen cylinder for CO calibration.
Accessories	
VTRAP	Tripod, max. height 1310 mm (SP32TC.8 support not included).
SP32TC.8	Holder for instrument and 8 probes with cable. To be fixed to VTRAP tripod.
9CPRS232	RS232C null-modem cable, Sub-D 9-pole female connector on both sides.
CP22	USB 2.0 cable, connector type A on one side, type B on the other side.
BAG32	Aluminum carrying case for the instrument and its accessories.
SWD10	100-240 Vac/12 Vdc-1 A stabilized mains power supply.
AQC	200 cc distilled water.

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