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Datasheet HTS801

**Humidity and Temperature Sensor for
High Humidity and Chemically
Polluted Conditions**



HTS801

Humidity and Temperature Sensor for High Humidity and Chemically Polluted Conditions

The HTS801 sensors are designed to meet highest demands of stable and highly accurate measurement of relative humidity (RH) and temperature (T) under most challenging conditions. HTS801 is suitable for a wide range of applications from -80 °C to 180 °C (-112 °F to 356 °F) and 300 bar (4 350 psi).

Outstanding Measurement Performance

The heated high-end E+E RH and T sensing element enables reliable and long-term stable measurement in extremely humid or chemically polluted environment. The monolithic structure of the RH/T sensing element, protected by the E+E proprietary coating, allows for fast recovery after condensation or chemical contamination.

Versatile and Robust

The six HTS801 versions are available with several probe and cable lengths. With various heating modes, the HTS801 can be perfectly tailored to the specific needs of each measurement task. It features an IP65/NEMA 4 polycarbonate or stainless-steel enclosure which can accommodate various interface modules and electrical connection options.

Outputs and Configuration

The measured data is available on two freely scalable analogue outputs, on the RS485 (Modbus RTU) or Ethernet-PoE (Modbus TCP) interface and on the alarm (relay) outputs. The configuration and the RH and T adjustment of the HTS801 can be performed with the free PCS10 Product Configuration Software. An optional 3.5" colour display with push-buttons is available for configuration and visualisation.



HTS801 with polycarbonate enclosure and display



Sensing probes



HTS801 with stainless steel enclosure and display

Features

Measurement performance

- Highest RH/T accuracy
- Working range -80...+180 °C (-112...+356 °F) and up to 300 bar (4 350 psi)
- Designed for chemical contamination and continuous high humidity conditions
- All RH related physical quantities

3.5" TFT colour display

- Shows up to 4 measurands simultaneously
- Layout and measurands freely selectable
- Data logger for 20 000 values per measurand
- Logged data shown graphically
- Diagnosis functions
- Intuitive device setup with push-buttons

Enclosure

- IP65/NEMA 4X protection rating
- Polycarbonate or stainless steel
- Easy mounting and service
- Versatile connection options

Outputs

- 2 freely scalable analogue outputs current / voltage
- Error indication according to NAMUR
- Modbus RTU / Modbus TCP
- 2 alarm outputs
- Configurable via software or push-buttons

USB service interface

- Configuration, adjustment and firmware update
- Download logged data
- 5 status LEDs

RH/T sensing element

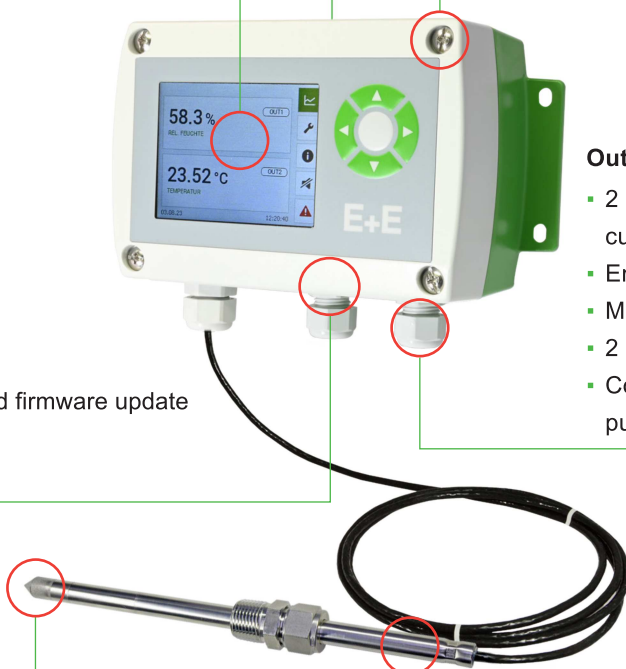
- Operating modes
 - Condensation Guard (CG)
 - High Humidity Guard (H²G)
- Automatic ReCcovery (ARC)
- Protected by:
 - E+E proprietary coating
 - Wide choice of filter caps

Sensing Probes

- rapidX intelligent pluggable probe with included sensing element data
- Six probes depending on
 - T range
 - p range
 - Environmental condition
- Various probe and cable lengths
- T28 with specific design for best fit in high-end radiation shields

Inspection certificate

According to DIN EN 10204-3.1



Features

rapidX Smart Probe

The HTS801 with PC7 option (see ordering guide) features the intelligent pluggable rapidX probe, which enables a plug-and-play probe exchange. Any HTS801 rapidX Smart Probe automatically uploads its specific parameters upon connecting it to the HTS801 electronics and can be replaced even during operation without any configuration, adjustment or calibration. This is particularly useful for excluding down time and its corresponding costs in harsh industrial environment, where the probe can get occasionally damaged.

Protective Sensor Coating

The E+E proprietary sensor coating is a protective layer applied to the sensing elements, their leads and soldering points. The coating substantially extends sensor lifetime and ensures optimal measurement performance in corrosive environment (salts, off-shore applications). Additionally, it improves the long term stability in dusty, dirty or oily applications by preventing stray impedance caused by deposits on the active sensor surface or on the electrical connections.

Automatic ReCover (ARC) Function

Automatic ReCover (ARC) is available for all HTS801 types and is used to remove chemical pollution and thus eliminate possible drift effects of the RH/T sensing element. This is achieved with an intense heating of the sensing element. The function can be perfectly tailored to the application requirements being triggered:

- manually via PCS10 or display and push-buttons,
- by a certain cyclic time interval configurable via PCS10,
- using RS485 or Ethernet with Modbus commands, or
- using the ARC module option (AM1).

Type-specific Operating Modes

Condensation Guard (CG)

HTS801 sensors with Condensation Guard (CG) are designed for applications with variable humidity over the full range 0...100 %RH where condensation may occur for a short time. The CG protects the RH/T sensing element by targeted heating and prevents temporary condensation and its negative effects on the measurement results. The CG heating is triggered by a predefined RH setpoint factory set via ordering guide. The setpoint is configurable with PCS10 and display and push buttons.

High Humidity Guard (H²G)

HTS801 sensors with High Humidity Guard (H²G) enable accurate RH measurement even in permanent high humidity and condensing conditions. Continuous, adaptive heating of the sensing element and of the probe body (dual heating system) prevents drift effects and condensation on the sensor element. The monolithic construction of the sensing element enables fast RH response times under condensing conditions.

Operating Mode	HTS801 Type	Use in environments with	Function Trigger
Condensation Guard (CG)	T5/T9/T10	Temporary condensation	RH setpoint ¹⁾
High Humidity Guard (H ² G)	T7/T17/T28	Continuous high humidity and condensation	Always on

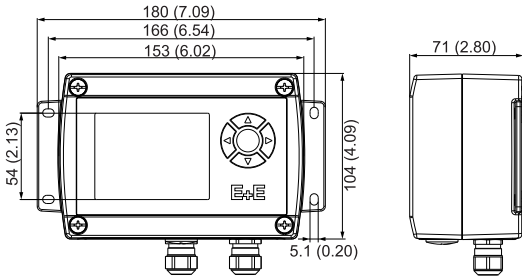
1) Factory setting: acc. to ordering guide

Dimensions

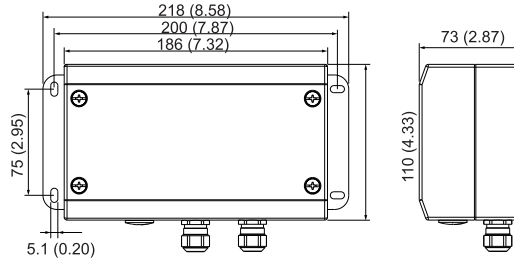
Values in mm (inch)

Enclosure

Polycarbonate (with and without display)

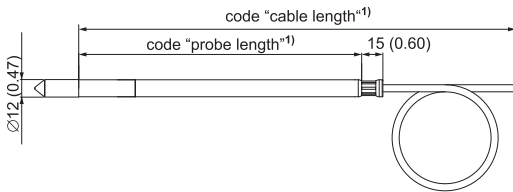


Stainless steel (with and without display)



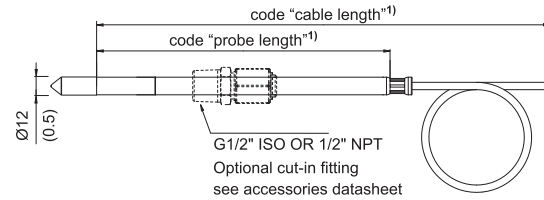
Type T5 Probe

Up to 180 °C (356 °F)



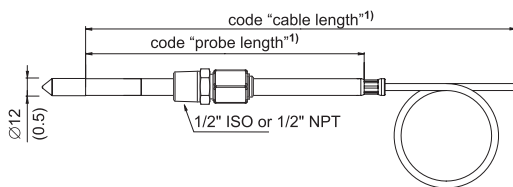
Type T7 Probe

Pressure-tight up to 20 bar (300 psi) for Td measurement



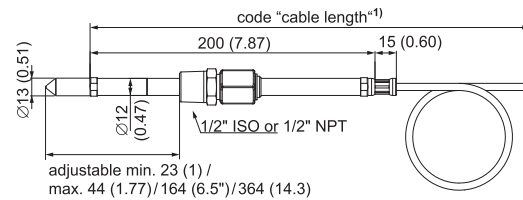
Type T9 Probe

Pressure-tight up to 300 bar (4 350 psi) with cut-in fitting



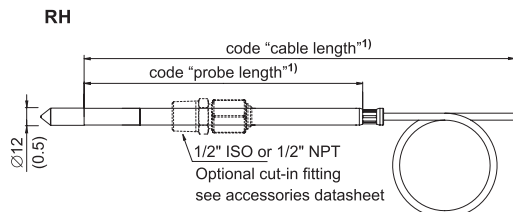
Type T10 Probe

Pressure-tight up to 20 bar (300 psi) with sliding fitting



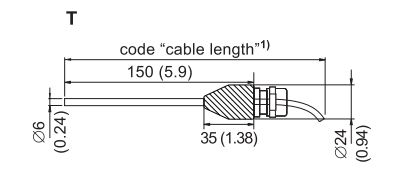
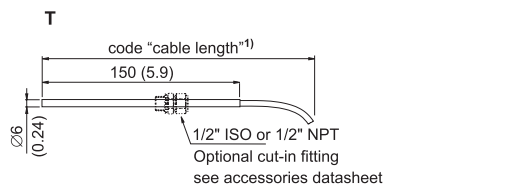
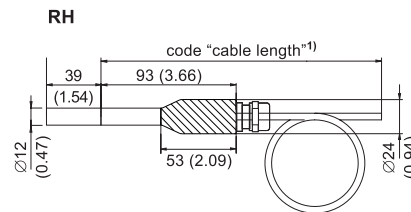
Type T17 Probe

Pressure-tight up to 20 bar (300 psi) with optional cut-in fitting



Type T28 Probe

For meteorological applications



1) Refer to ordering guide

Technical Data

Measurands

Relative Humidity (RH)

Measuring range	0...100 %RH	
Accuracy¹⁾ , incl. hysteresis, non-linearity and repeatability	-15...+40 °C (5...104 °F) RH ≤90 % -15...+40 °C (5...104 °F) RH >90 % -25...+70 °C (-13...+158 °F) -40...+180 °C (-40...+356 °F) -70... -40°C (-94...-40 °F)	$\pm(0.95 + 0.0013 \cdot mv) \%RH$ $\pm 1.8 \%RH$ $\pm(1.05 + 0.0084 \cdot mv) \%RH$ $\pm(1.15 + 0.013 \cdot mv) \%RH$ $\pm 3.85 \%RH$
Factory calibration uncertainty²⁾	0...90 %RH 90...100 %RH	$\pm(0.7 + 0.003 \cdot mv) \%RH$ $\pm 1 \%RH$
Temperature dependency of electronics, typ.	±0.01 % RH / °C (0.0056 %RH / °F)	
Response time t₉₀ with metal grid filter at 20 °C (68 °F)	<15 s	

mv = measured value

mv = measured value

1) Defined against E+E calibration reference.

2) Defined at 23 °C with an enhancement factor k=2, corresponding to a confidence level of 95 %.

Temperature (T)

Measuring range probe	Types T5/T7/T9/T10 Type T17 Type T28	-70...+180 °C (-94...+356 °F) -80...+180 °C (-112...+356 °F) -80...+60 °C (-112...+140 °F)
Accuracy¹⁾	<p>The graph plots accuracy ±ΔT [°C] on the y-axis (0 to 0.5) against temperature T [°C] on the x-axis (-80 to 180). A shaded area represents the accuracy range. The accuracy is approximately 0.34°C at -80°C, decreases to a minimum of 0.1°C at 20°C, and increases to approximately 0.47°C at 180°C. A vertical dashed line at -80°C is marked with an asterisk (*).</p>	
Factory calibration uncertainty²⁾ @ 23 °C (73 °F)	±0.05 °C	
Temperature dependency of electronics, typ.	±0.001 °C / °C	

*) T17/T28 T measurement down to -80 °C (-112 °F), RH measurement down to -70 °C (-94 °F)

1) Defined against E+E calibration reference.

2) Defined at 23 °C with an enhancement factor k=2, corresponding to a confidence level of 95 %.

Calculated Physical Quantities

	from	up to		unit	
		HTS801-xT5/T9/T10/T17	HTS801-xT7		
Dew point temperature	Td	-80 (-112)	100 (212)	100 (212)	°C (°F)
Frost point temperature¹⁾	Tf	-80 (-112)	0 (32)	0 (32)	°C (°F)
Wet bulb temperature	Tw	-5 (23)	100 (212)	–	°C (°F)
Water vapour partial pressure	e	0 (0)	1100 (15)	–	mbar (psi)
Mixing ratio	r	0 (0)	999 (9999)	–	g/kg (gr/lb)
Absolute humidity	dv	0 (0)	700 (300)	–	g/m ³ (gr/ft ³)
Specific enthalpy	h	0 (0)	2800 (1250)	–	kJ/kg (BTU/lb)

1) Equals Td above 0 °C (32 °F)

Technical Data

Outputs

Analogue

Two freely selectable and scalable analogue outputs	0 - 1 / 5 / 10 V 0 - 20 mA / 4 - 20 mA (3-wire) Both outputs have the same electrical quantity (U, I)	-1 mA < I _L < 1 mA R _L < 500 Ω	I _L = load current R _L = load resistance
Accuracy @23 °C (68 °F)	±0.05 % FS		FS = full scale (20 mA, 10 V)
Temperature dependency ¹⁾	±0.005 % FS / °C		FS = full scale (20 mA, 10 V)
Two alarm outputs with option AM2 ²⁾	2x changeover contact 250 V AC / 6 A 28 V DC / 6 A Measurand, threshold and hysteresis configurable via PCS10 or display and push-buttons		




1) Deviating from 23 °C (68 °F), defined at 12 mA or 5 V, respectively

2) Appropriate for outdoor use, wet location, degree of pollution 2, overvoltage category II, altitude up to 3 000 m (9 843 ft)

Digital

Digital interface Protocol Factory settings Supported Baud rates	RS485 (HTS801 = 1 unit load) Modbus RTU 9600 Baud, parity even, 1 stop bit, Modbus address 230 9600, 19200, 38400, 57600 and 76800
Digital interface Protocol Factory settings	Ethernet-PoE Modbus TCP IP address 192.168.0.64 (static)

General

Power supply class III  USA & Canada: Class 2 supply necessary, max. voltage 30 V DC	8 - 35 V DC 12 - 30 V AC 100 - 240 V AC, 50/60 Hz with option AM3 ¹⁾ PoE with option J4
Current consumption, (typ.) @ 24 V DC/AC 2 voltage outputs 2 current outputs additionally for display additionally for Ethernet	40 mA / 80 mA _{rms} 80 mA / 160 mA _{rms} 50 mA / 150 mA _{rms} 30 mA / 90 mA _{rms}
Electrical connection	Screw terminals max. 1.5 mm ² (AWG 16)
Cable glands for polycarbonate enclosure for metal enclosure	M16x1.5, for cable Ø3...7 mm (0.12...0.28") M16x1.5, for cable Ø4.5...10 mm (0.18...0.39")
Pressure range for pressure-tight probe Type T7/T10/T17 Type T9	0.01...20 bar (0.15...300 psi) 0.01...300 bar (0.15...4350 psi)
Temperature range electronics board operation and storage without display with display	-40...+60 °C (-40...+140 °F) -20...+50 °C (-4...+122 °F)
Probe body Material Protection rating	Stainless steel 1.4404 / AISI 316L IP65
Enclosure Material Protection rating	Polycarbonate, UL94 V-0 approved or Stainless steel 1.4404 / AISI 316 L IP65/NEMA 4X
Electromagnetic compatibility	EN 61326-1 EN 61326-2-3 Industrial Environment FCC Part15 ClassA ICES-003 ClassA
Conformity	 
Configuration Software Interface	PCS10 Product Configuration Software (free download) USB-C, configuration cable HA010327

1) Appropriate for outdoor use, wet location, degree of pollution 2, overvoltage category II, altitude up to 3 000 m (9 843 ft)

Ordering Guide HTS801

Feature	Description	Code					
		HTS801-					
Model	RH + T	M1					
	Td					M4	
Type	Remote probe up to 180 °C (356 °F)	T5					
	Remote probe, pressure-tight up to 20 bar (300 psi) and 180 °C (356 °F)		T10				
	Remote probe, pressure-tight up to 300 bar (4350 psi) and 180 °C (356 °F)			T9			
	Two remote probes, pressure-tight up to 20 bar (300 psi) and 180 °C (356 °F)				T17		
	Two remote probes for meteorological applications					T28	
	Remote probe for cut-in fitting, pressure-tight up to 20 bar (300 psi) and 180 °C (356 °F)						T7
Enclosure material	PC (Polycarbonate)	No code					
	Stainless steel	HS2	HS2	HS2	HS2		HS2
Filter	Stainless steel sintered	F4	F4	F4			
	PTFE (Polytetrafluoroethylene)	F5	F5	F5			
	Stainless steel grid, stainless steel body (180 °C / 356 °F)	F9	F9	F9	F9		F9
	PTFE membrane, stainless steel body				F11	F11	F11
Probe cable length	1 m (3.3 ft)					K1	
	2 m (6.6 ft)	K2	K2	K2	K2	K2	K2
	5 m (16.4 ft)	K5	K5	K5	K5		K5
	10 m (32.8 ft)	K10	K10	K10	K10		K10
Probe length	65 mm (2.56")	L65			L65		L65
	80 mm (3.15")		L80				
	200 mm (7.87")	L200	L200	L200	L200		L200
	400 mm (15.75")	L400	L400		L400		L400
	Only with Type T28: RH: 132 mm (5.2"), T: 150 mm (5.9")					No code	
Process connection	G1/2" ISO - sliding fitting, Ø13 mm (0.51")		PA23				
	1/2" NPT - sliding fitting, Ø13 mm (0.51")		PA25				
	G1/2" ISO - cut-in fitting, Ø12 mm (0.47")			PA20			
	1/2" NPT - cut-in fitting, Ø12 mm (0.47")			PA22			
Electrical connection	Standard ¹⁾	No code					
	1 x plug for power supply and outputs	E4					
	2 x plugs for power supply + outputs and RS485	E6					
Digital Interface	Without digital interface	No code					
	RS485 with Modbus RTU	J3					
	Ethernet-PoE with Modbus TCP ²⁾³⁾⁴⁾	J4					
Display	Without display	No code					
	3.5" TFT display with integrated data logger	D2					
Probe connection	Fixed	No code					
	Intelligent pluggable probe (plug-and-play)	PC7	PC7		PC7		
Sensing element protection	Without, for very low temperature applications only -70 °C...-40 °C (-94 °F...-40 °F)	C0					
	E+E proprietary coating	C1					
Additional module	Without additional module	No code					
	ARC module for external trigger of sensor heating ³⁾⁴⁾	AM1					
	Alarm output with relay ³⁾	AM2					
	Integrated power supply 100 - 240 V AC 50/60 Hz ³⁾	AM3					

1) Standard = 2 x M16 cable glands, except for AM3 option: 2 plugs for power supply and outputs
 2) With polycarbonate enclosure only, no Additional Module available.
 3) With electrical connection standard only (no plug options possible), no combination with other Additional Modules (AMx, J4) possible.
 4) Sensor needs to be supplied with 24V AC/DC ±20 %

Ordering Guide HTS801 (cont'd)

		T5	T10	T9	T17	T28	T7	
Software Setup Analogue Outputs	Output signal ⁵⁾	0 - 1 V			GA1			
		0 - 5 V			GA2			
		0 - 10 V			GA3			
		0 - 20 mA			GA5			
		4 - 20 mA			GA6			
	Output 1 measurand	Relative humidity RH [%]		No code				
		Other measurand (<i>xx</i> see measurand code below)		MAxx				MAxx ⁶⁾
	Output 1 scaling low	0		No code				
		Value		SAL Value				SAL Value
	Output 1 scaling high	100		No code				
Value			SAH Value				SAH Value	
Output 2 measurand	Temperature T [°C]		No code					
	Other measurand (<i>xx</i> see measurand code below)		MBxx				MBxx ⁶⁾	
Output 2 scaling low	-40		No code					
	Value		SBL Value				SBL Value	
Output 2 scaling high	60		No code					
	Value		SBH Value				SBH Value	
SW Config Options	ARC configuration	Manual or External trigger ⁷⁾			No code			
		Cyclic automatic time trigger (24 h)			ARC1			
		@ power on + cyclic automatic time trigger (24 h)			ARC2			
	Condensation Guard (CG)	Disabled		No code				
Enabled, no lock time			CG1					
Enabled, lock time 30 min.			CG2					
CG trigger	CG level 99 %RH		No code					
	CG level 95 %RH		SFT95					

5) Applies to both outputs

6) Only with Measurand Codes Mx52/53/65/66

7) Manual: via PCS10 or display and push-buttons; External: via Modbus, ARC module

Measurand Code

For Output 1 and 2 in the Ordering Guide

Measurand	Unit	Code
		MAxx / MBxx
Relative humidity	RH %	10
Temperature	T °C °F	1
		2
Dew point	Td °C °F	52
		53
Frost point	Tf °C °F	65
		66
Mixing ratio	r g/kg gr/lb	60
		61
Absolute humidity	dv g/m ³ gr/ft ³	56
		57
Wet bulb temperature	Tw °C °F	54
		55
Water vapour partial pressure	e mbar psi	50
		51
Specific enthalpy	h kJ/kg BTU/lb	62
		64

i PLEASE NOTE

No mix of SI/US units allowed.

Order Example

HTS801-M1T10HS2F9K2L200PA23E6J3D2C1GA6

Feature	Code	Description
Model	M1	RH + T
Type	T10	Remote probe, pressure-tight up to 20 bar (300 psi) and 180 °C (356 °F)
Enclosure material	HS2	Stainless steel
Filter	F9	Stainless steel grid, stainless steel body (180 °C / 356 °F)
Probe cable length	K2	2 m (6.6")
Probe length	L200	200 mm (7.87")
Process connection	PA23	G1/2" ISO - sliding fitting, Ø13 mm (0.51")
Electrical connection	E6	2 x plugs for power supply + outputs and RS485
Digital interface	J3	RS485 with Modbus RTU
Display	D2	3.5" display with integrated data logger
Probe connection	No code	Fixed
Sensing element protection	C1	E+E proprietary coating
Additional module	No code	Without additional module
Output signal	GA6	4 - 20 mA
Output 1 measurand	No code	Relative humidity RH [%]
Output 1 scaling low	No code	0
Output 1 scaling high	No code	100
Output 2 measurand	No code	Temperature T [°C]
Output 2 scaling low	No code	-40
Output 2 scaling high	No code	60
ARC configuration	No code	Manual or External trigger
Condensation Guard (CG)	No code	Disabled
CG trigger	No code	CG level 99 %RH

Accessories

For further information see datasheet [Accessories](#).

Accessories	Code
E+E Product Configuration Software (Free download: www.epluse.com/pcs10)	PCS10
USB configuration cable for PC connection (USB-A to USB-C)	HA010327
Stainless steel mounting flange Ø12 mm (0.47")	HA010201
Stainless steel mounting flange for Ø6 mm (0.24") T probe	HA010207
Stainless steel wall mounting clip Ø12 mm (0.47")	HA010225
Pressure-tight feedthrough For probe assembly up to 20 bar (300 psi)	
G1/2" ISO Ø12 mm	HA011102
1/2" NPT Ø12 mm	HA011103
G1/2" ISO Ø6 mm	HA011104
1/2" NPT Ø6 mm	HA011105
Humidity calibration kit	see Humidity Calibration Kit data sheet
Conduit adapter M16x1.5 to NPT 1/2"	HA011101
Drip water protection	HA010503
Radiation shield with artificial ventilation for HTS801-M1T28	HA010508
Radiation shield for RH probe	HA010502
Radiation shield for T probe	HA010506
Bracket for DIN rail mounting ¹⁾	HA010203
Immersion well, stainless steel Ø6x135 mm (0.25 x 5.4")	
1/2" ISO	HA400202
1/2" NPT	HA400212

1) For polycarbonate enclosure only. Two pieces are necessary for each HTS801.



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