RELATIVE HUMIDITY, TEMPERATURE, BAROMETRIC PRESSURE PROBE (HTP)

The Evvos HTP probe combines meteorological grade sensors for relative humidity, air temperature, and barometric pressure measurements. It is designed to provide high-quality environmental data, real-time measurements, and calculation of multiple derivative parameters. The Evvos HTP probe is also available in extended versions capable of extra measurements such as CO2-percentage (in air) compensated for relative humidity and air temperature.

Applications

- Environmental monitoring
- Weather forecasting solutions
- Industrial data acquisition
- Precision agriculture/farming
- Internet of Things (IoT)

Primary parameters

- Relative humidity
- Air temperature
- Barometric pressure
- CO_2 - (% in air- HTPCO2 version only)

Secondary parameters

- Absolute humidity
- Dew point
- Wet-bulb temperature
- Vapour pressure
- Saturated vapour pressure
- Atmospheric pressure at sea level
- Heat index
- Mixing ratio
- Specific enthalpy
- Boiling point of water
- Speed of sound in air
- Water activity in air

Highlights

- Stainless steel enclosure and filter cap engineered to shield sensing elements in harsh environments.
- Waterproof protection, and internal electronics sealed in resin.
- Multiple electrical interfacing and data protocol options - SDI-12 (protocol v.1.4), RS-485 (Modbus), RS-422 (NMEA0183), UART (Modbus, NMEA0183), USB (upon request – contact us for more information).
- Low-power consumption, suitable for battery-powered applications. On-board heater included.
- Extensive command sets for operational options and probe diagnostics.
- UV-protected and oil-resistant flexible cable (optional).

Description

EHTP is a high-accuracy digital probe for measuring multiple environmental parameters. Due to its low power consumption, versatile electrical interfacing options, and wide-range power supply, the probe is compatible with a variety of battery-operated dataloggers and industrial data acquisition systems. A stainless-steel enclosure in combination with weatherproof electronic circuitry ensures proper long-term operation even in harsh outdoor and demanding industrial conditions. All primary parameters are sensed by physical sensors. The secondary parameters are calculated based on values measured by the probe's physical sensors. For optimal results in outdoor applications an EHTP probe must be installed in a solar shield.

Absolute Maximum Ratings

Parameter	Conditions	Min	Max	Units
Supply voltage (Vin)	@25°C	3.3	33	Vdc
Voltage at any interface pin	Supply voltage 7 Vdc to 32 Vdc	-0.3	5.5	Vdc
Operating temperature range	Supply voltage 7 Vdc to 32 Vdc	-40	65	°C
Operating humidity range	Condensing environment	0	100	%
Operating pressure range	Full operating temperature range	300	1250	hPa

NOTE: Supply voltages above 24Vdc may cause excessive self-heating within a probe and loss of accuracy at operating temperatures over 65°C.

Recommended Storage Conditions

Parameter	Conditions	Min	Max	Units
Storage temperature	Non-condensing environment	-10	40	°C
Storage humidity	Non-condensing environment	-	60	%
Storage pressure	Non-condensing environment	300	1100	hPa

NOTE: recommended ratings of storage parameters aim to maximize probe's shelf life.

Recommended Operating Conditions

Parameter		Min	Nom	Max	Units
Supply voltage (Vin)	@25°C, interface dependent	-	-	24	Vdc
I/O voltage on any interface pin	Interface dependent	2.9	5	5.2	Vdc
Operating temperature range	Non-condensing environment	-20	-	60	°C
Operating humidity range	Temperature range 0°C to 65°C	20	-	80	%
Operating pressure range	Temperature range 0°C to 65°C	700	-	1100	hPa

NOTE: refer to Electrical Characteristics for a description of the full operating capabilities.

Electrical Characteristics

Parameter	Conditions	Min	Nom	Max	Units
Supply voltage (Vin)	UART, single-wire versions	3.3	5	32	Vdc
	SDI-12, Modbus over RS485, NMEA0183 over RS422 versions	7	-	32	
	USB version (power over the USB port)	-	5	-	
Current consumption (active mode)	Full supply voltage range. All versions. Heater OFF	0.7	3	7	mA
Current consumption (shutdown mode)	Version-specific	200	400	600	uA
Power-up time	All versions	800	2000	2200	ms
Sampling rate	Version-specific	0.2	-	2	S/s
Heater output power	Full supply voltage range	-	200	220	mW
Surge protection on power pin	All versions	0.9	-	-	J
ESD protection on data pins	SDI-12, UART, single-wire versions (170W TVS diode)		30		kV
	USB version		2		
	Modbus over RS485, NMEA0183 over RS422 versions (400 W TVS diode)		30		

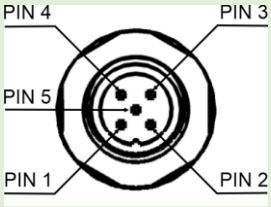
Sensing Characteristics

Parameter	Conditions	Min	Typ	Max	Units
Physical range for primary parameters	Temperature	-30	-	+65	°C
	Humidity	0	-	100	%RH
	Pressure	300	-	1250	hPa
	CO2-percentage in air(0)	1	-	100	%
Accuracy for primary parameters (default values; no user calibration applied)	Temperature (-30°C to 5°C)	-	±0.2	±0.3	°C
	Temperature (5°C to 60°C)	-	±0.1	±0.3	
	Temperature (60°C to 65°C)	-	±0.15	±0.3	
	Humidity (0% to 20%) at 25°C	-	±1.5	±2.0	%RH
	Humidity (20% to 70%) at 25°C	-	±1.0	±2.0	
	Humidity (70% to 90%) at 25°C	-	±1.5	±2.0	
	Humidity (90% to 100%) at 25°C	-	±1.75	±3.0	
	Pressure (300hPa to 880hPa) at 25°C	-	±1	±3	hPa
	Pressure (880hPa to 1150hPa) at 25°C	-	±0.5	±2	
	Pressure (1150hPa to 1250hPa) at 25°C	-	±1	±3	
	C02-percentage in air (automatically compensated for relative humidity and air temperature) in ***HTP-CO2 version only***	-	±3.0	±5.0	%
Precision for primary parameters	Temperature	0.02	-	-	°C
	Humidity	0.08	-	-	%RH
	Pressure	0.06	-	-	hPa
	Onboard voltages	-	±10	-	mV
	MCU temperature	-	0.75	-	°C
Resolution of primary parameters	Temperature	0.01	-	-	°C
	Humidity	0.01	-	-	%RH
	Pressure	0.01	-	-	hPa
Long-term drift for primary parameters	Temperature	-	0.04	-	°C/year
	Humidity	-	0.2	-	%RH/year
	Pressure	-	1	-	hPa/year
Relative error for diagnostic parameters	V_{MCU}(1) (3.3V to 5V)	-	±1.5	±3	%
	V_{SEN}(2) (2.8V to 3.3V)	-	±1.2	±3	
	V_{IN}(3) (3.3V to 5.5V)	-	±2	±3	
	T_{MCU}(4) (-40°C to 85°C)	-	±2	±5	
Relative rounding error in mathematical calculations	Any secondary parameter	-	0.005	0.02	%
Fixed display precision	Air temperature	-	0.01	-	°C
	Relative humidity	-	0.01	-	%
	Barometric pressure	-	0.01	-	hPa
	Absolute humidity	-	0.001	-	g/kg
	Dew point	-	0.01	-	°C
	Wet bulb temperature	-	0.01	-	°C
	Vapour pressure	-	0.01	-	hPa
	Saturated vapour pressure	-	0.01	-	hPa
	Atmospheric pressure at sea level	-	1	-	hPa
	Heat index	-	1	-	°C
	Mixing ratio	-	0.001	-	g/kg
	Specific enthalpy	-	0.001	-	kJ/kg
	Boiling point of water	-	0.01	-	°C
	Speed of sound in air	-	0.01	-	m/s
	Water activity in air	-	0.0001	-	-
	Onboard voltages (VMCU, VSEN, VIN)	-	1	-	mV

(0) Air is defined as a mixture of 78.1% nitrogen, 21.0% oxygen and 0.9% argon.
(1) V_{MCU} – supply voltage for the onboard MCU.
(2) V_{SEN} – supply voltage for the onboard sensing blocks.
(3) V_{IN} – supply voltage from the input SMPS.
(4) T_{MCU} – temperature of the onboard MCU.

Connector

All versions of the HTP probe are equipped with a standard industrial M12, 5-pin, A-coded male waterproof connector.

Probe's connector (front view)	Pin function	Pin Number	Note
	System power supply (V_{IN})	Pin 1	
	System ground (GND)	Pin 2	
	DATA1	Pin 3	Interface-specific DATA-pin. Refer to the User's Manual of the specific HTP product about connecting the pin if unused
	DATA2	Pin 4	Interface-specific DATA-pin. Refer to the User's Manual of the specific HTP product about connecting the pin if unused
	Auxiliary (AUX)	Pin 5	Single-wire interface DATA-pin. Connect to GND or leave floating if unused

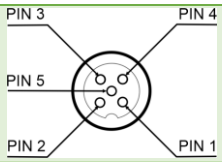
NOTE: refer to the User's Manual or the wiring label on your probe for interface-specific wiring.

Optional M12 patch cable

The optional M12-to-bare-wire cable provides a quick solution for connecting an HTP probe to a controller/master.

Parameter	Value	Unit
M12 connector type	A-coded/5-pin/female	-
Bare wires length (individually insulated)	45	mm
Overall cable length	1.5	m
Conductor cross section	0.34	mm^2
Cable diameter	4.6	mm
Twisted-pair wires	Not available	-
Wire material	Cu litz	-
Minimal bending radius of cable	46	mm
UV resistance	Yes	-
Chemicals resistance	Yes	-
Cold resistance	Yes	-
Halogen-free	Yes	-
Shield of cable	Not available	-
Sheath material	PUR	-
Sheath colour	Dark grey (RAL 7021)	-
Operational temperature range (fixed installations)	-40 to 80	°C
Operational temperature range (flexible installations)	-25 to 80	°C

NOTE: the optional M12 patch cable is not suitable for applications based on differential interfaces such as RS485 and USB.

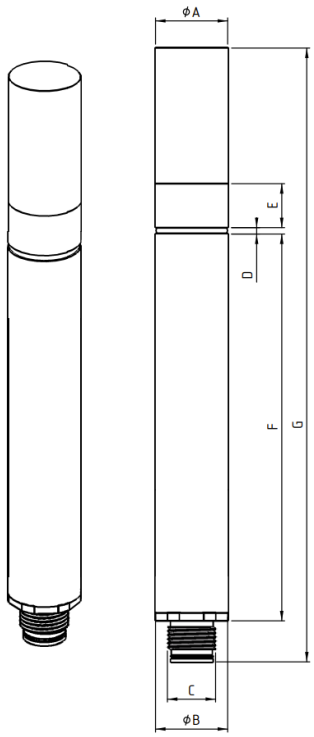
Cable connector (front view)	Cable wires (free end)	Pin Number	Note
	Brown	Pin 1	Mated to Pin 1 of the probe's connector
	White	Pin 2	Mated to Pin 2 of the probe's connector
	Blue	Pin 3	Mated to Pin 3 of the probe's connector
	Black	Pin 4	Mated to Pin 4 of the probe's connector
	Green/yellow	Pin 5	Mated to Pin 5 of the probe's connector

Ordering Information

The M12 patch cable must be ordered separately.
Abbreviations: AT – air temperature, RH – relative humidity, BP – barometric pressure, CO2 – (% of CO2 in air).

	Primary measurements				
Supported Protocol and Interface	***AT***	***RH***	***BP***	***CO2 (% in air)***	**SKU code**
SDI-12 (protocol v.1.4)	•	•	•		HTP-21
SDI-12 (protocol v.1.4)	•	•	•		HTP-21A (advanced version with high-accuracy digital temperature sensor)
SDI-12 (protocol v.1.4) over UART	•	•	•		HTP-22
Modbus RTU/ASCII over RS-485	•	•	•		HTP-31
Modbus RTU/ASCII over RS-485	•	•	•		HTP-31A (advanced version with high-accuracy digital temperature sensor)
Modbus RTU/ASCII over UART (user-selectable 3.3V/5V Tx/Rx-levels)	•	•	•		HTP-32
NMEA 0183 over RS-422	•	•	•		HTP-41
NMEA 0183 over UART (fixed 5V Tx/Rx-levels)	•	•	•		HTP-42
USB (emulated serial port)	•	•	•		HTP-43 (upon request – contact us for more information)
SDI-12 (protocol v.1.4)	•	•	•	•	HTPCO2-21
SDI-12 (protocol v.1.4) over UART	•	•	•	•	HTPCO2-22
Modbus RTU/ASCII over RS-485	•	•	•	•	HTPCO2-31
Modbus RTU/ASCII over UART (user-selectable 3.3V/5V Tx/Rx-levels)	•	•	•	•	HTPCO2-32
NMEA 0183 over RS-422	•	•	•	•	HTPCO2-41
NMEA 0183 over UART (fixed 5V Tx/Rx-levels)	•	•	•	•	HTPCO2-42
USB (emulated serial port)	•	•	•	•	HTPCO2-43 (upon request – contact us for more information)

NOTE 1: all versions are equipped with an auxiliary single-wire interface for compatibility with the proprietary DAQ systems by Evvos.
NOTE 2: advanced version of the probe can be supplied for all SKUs upon request. Please contact us – sales@evvos.com



Dimensions

Dimension	Min	Nom	Max	Unit
A	17.9	18	18.1	mm
	0.705	0.709	0.713	in
B	17.9	18	18.1	mm
	0.705	0.709	0.713	in
C	-	M12x1.5	-	mm
	-	-	-	in
D	1.2	1.5	1.8	mm
	0.047	0.059	0.071	in
E	9.9	109.9	10.1	mm
	3.898	3.934	3.976	in
F	97.2	97.3	97.4	mm
	3.827	3.831	3.835	in
G	144.2	144.5	144.8	mm
	5.677	5.689	5.701	in

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Document Revision

Table 1. Document Revisions and Updates

Revision	Description	Date
1.0	Initial Release	21-Sep-2022
1.1	Updated compliance with SDI-12 v1.4	9-Mar-2023
1.2	Document re-formatted	17-Apr-2023
2.0	Initial release ERHTP Probe v.2	14-Aug-2023
2.7	Document edited	20-Aug-2023
3.0	Initial release HTP and HTPCO2 probes (new generation)	14-Aug-2024