

RELATIVE HUMIDITY, TEMPERATURE, BAROMETRIC PRESSURE, AND CO₂-PERCENTAGE PROBE (RHTP+CO2)

Evvos RHTP 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. An additional measurement of CO₂-percentage (in air) compensated for relative humidity and air temperature is available in the RHTP+CO2 version of the probe.



Applications

- Environmental monitoring
- Weather forecasting solutions
- Industrial data acquisition
- Precision agriculture/farming
- Cold chain and HVAC applications
- Internet of things (IoT)
- CO₂-monitoring in industry/agriculture/farming

Primary parameters

- Relative humidity
- Air temperature
- Barometric pressure
- CO₂-percentage in air

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 options - SDI-12 (v.1.4), RS-485 (Modbus), UART, USB
- 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

RHTP is a high-accuracy, digital probe. It measures 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 circuitries, and durable cable, ensure 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 it is recommended to install a RHTP probe in a solar shield.

Absolute Maximum Ratings

Parameter	Conditions	Min	Max	Units
Supply voltage (VIN)	@25°C	-0.3	25	Vdc
Voltage at any interface pin	Supply voltage 5 Vdc to 24 Vdc	-0.3	5.5	Vdc
Operating temperature range	Supply voltage 5 Vdc to 24 Vdc	-40	85	°C
Operating humidity range	Non-condensing environment	0	100	%
Operating pressure range	Full operating temperature range	300	2000	hPa
Storage temperature	Non-condensing environment	-20	65	°C
Storage humidity	Non-condensing environment	-	60	%
Storage pressure	Non-condensing environment	300	1100	hPa
Bending radius of cable	@25°C	15	-	mm

NOTE: absolute maximum ratings of storage parameters aim to maximize probe's shelf life

Recommended Operating Conditions

Parameter		Min	Nom	Max	Units
Supply voltage (Vin)	@25°C	5	9	12	Vdc
I/O voltage on any interface pin	Interface dependent	2.9	5	5.2	Vdc
Operating temperature range	Humidity range: non-condensing	-20	-	65	°C
Operating humidity range	Temperature range 0°C to 65°C	20	-	80	%
Operating pressure range	Temperature range 0°C to 65°C	700	-	1300	hPa

Electrical Characteristics

Parameter	Conditions	Min	Nom	Max	Units
Supply voltage (Vin)	UART, single-wire, USB, SDI-12	3.3	5	25	Vdc
	RS485	6	-	24	
Current consumption (normal mode)	Full voltage supply range. SDI-12, UART, USB, single-wire interfaces	1.6	1.8	2.5	mA
	Full voltage supply range. RS485 interface, no load	4.9	7.5	9	
Current consumption (shutdown mode)	@12 Vdc supply voltage, electrical interface dependent	170	200	300	uA
Internal voltage regulator accuracy	Full operating temperature range	-	1.4	2	%
Internal voltage regulator line regulation	Full operating temperature range, full supply voltage range	-	-	0.4	%/V
Power-up time		1800	2000	2500	ms
Brownout voltage		2.45	2.5	2.6	V
Sampling rate	Interface specific	0.2	-	2	S/s
Non-volatile memory write/erase cycles		100 000	-	-	cycles
Heater current consumption	Full supply voltage range	-	60	100	mA
Heater duty cycle adjustment	Dependent on supply voltage	0	-	75	%
Heater output power	@12 Vdc supply voltage	-	200	400	mW
ESD protection on power pin	USB, SDI-12, UART, single-wire interfaces (350W TVS diode)		30		kV
	RS485 interface (600 W TVS diode)		30		
ESD protection on data pins	SDI-12, UART, single-wire interfaces (170W TVS diode)		30		kV
	USB interface		2		
	RS485 interface (400 W TVS diode)		30		

Sensing Characteristics

Parameter	Conditions	Min	Typ	Max	Units
Physical range for primary parameters	Temperature	-40	-	+85	°C
	Humidity	0	-	100	%RH
	Pressure	300	-	1200	hPa
	CO ₂ -percentage in air ⁽⁰⁾	0	-	100	%
Accuracy for primary parameters (factory calibration only)	Temperature – standard option (0°C to 85°C)	-	±0.2	±0.3	°C
	Temperature – standard option (-40°C to 0°C)	-	±0.3	±0.5	
	Humidity – standard option (0% to 90%)	-	±2.0	±2.5	%RH
	Humidity – standard option (90% to 100%)	-	±2.0	±3.5	
	Humidity – advanced option (0% to 80%)	-	±1.5	±2.0	
	Humidity – advanced option (80% to 100%)	-	±2.0	±3.0	
	Pressure (-20°C to 60°C)	-	±0.2	±0.5	hPa
	CO ₂ -percentage in air (automatically compensated for relative humidity and air temperature)	-	±3.0	±5.0	%
Precision for primary parameters	Temperature (standard option)	0.02	-	-	°C
	Temperature (advanced option)	0.01	-	-	
	Humidity (all options)	0.08	-	-	%RH
	Pressure	0.06	-	-	hPa
	Onboard voltages	-	±10	-	mV
	MCU temperature	-	0.75	-	°C
	CO ₂ -percentage in air	0.02	-	-	%
Resolution of primary parameters	Temperature	0.01	-	-	°C
	Humidity	0.01	-	-	%RH
	Pressure	0.01	-	-	hPa
	CO ₂ -percentage in air	0.01	-	-	%
Long-term drift for primary parameters	Temperature	-	0.03	-	°C
	Humidity	-	0.5	-	%RH
	Pressure	-	0.2	-	hPa
Relative error for diagnostic parameters	VMCU ⁽¹⁾ (3.0V to 5V)	-	±1.5	±3	%
	VSEN ⁽²⁾ (2.8V to 3.0V)	-	±1.2	±3	
	VIN ⁽³⁾ (3.3V to 25V)	-	±2	±3	
	TMCU ⁽⁴⁾ (-40°C to 85°C)	-	±2	±5	
Relative rounding error in mathematical calculations	Any secondary parameter	-	0.005	0.02	%
Fixed display precision ⁽⁵⁾	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

NOTE:

- (0) Air is defined as mixture of 78.1% nitrogen, 21.0% oxygen and 0.9% argon.
- (1) VMCU – supply voltage for the onboard MCU
- (2) VSEN – supply voltage for the onboard sensing blocks
- (3) VIN – supply voltage for probe
- (4) TMCU – temperature of the onboard MCU
- (5) Valid for all interfaces except for single-wire

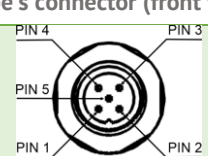
Electrical Interface

Version	Protocol
Environmental version	SDI-12 (SDI-12 protocol v.1.4)
Industrial version	RS-485 (Modbus protocol)
Datalogger version	UART (Modbus protocol)
Developer version	USB

NOTE: all versions of the RHTP probe are equipped with an auxiliary single-wire interface for compatibility with the OneSense transmitters by Evvos.

Connector

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

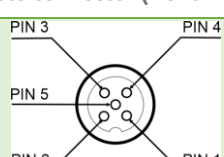
Probe's connector (front view)	Pin function	Pin Number	Note
	System power supply (Vin)	Pin 1	
	System ground (GND)	Pin 2	
	Auxiliary (AUX)	Pin 3	Single-wire interface DATA-pin. Connect to GND if not used.
	DATA1	Pin 4	Interface-specific DATA-pin. Connect to GND if not used
	DATA2	Pin 5	Interface-specific DATA-pin. Connect to GND if not used

NOTE: refer to the wiring label on your probe for interface-specific wiring.

M12-sensor cable

The 1.5 m., 5-position, PUR halogen-free, black-gray RAL 7021, free cable end, on socket straight M-12, A-coded sensor cable is suitable for RHTP versions with SDI-12, single-wire, and UART interfaces.

Parameter	Value	Unit
Cable length	1.5	m
Conductor cross section	0.34	mm ²
Cable diameter	4.6	mm
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	No	-
Sheath material	PUR	-
Sheath colour	Dark grey/black	-
Operational temperature range (fixed installations)	-40 to 80	°C
Operational temperature range (flexible installations)	-25 to 80	°C

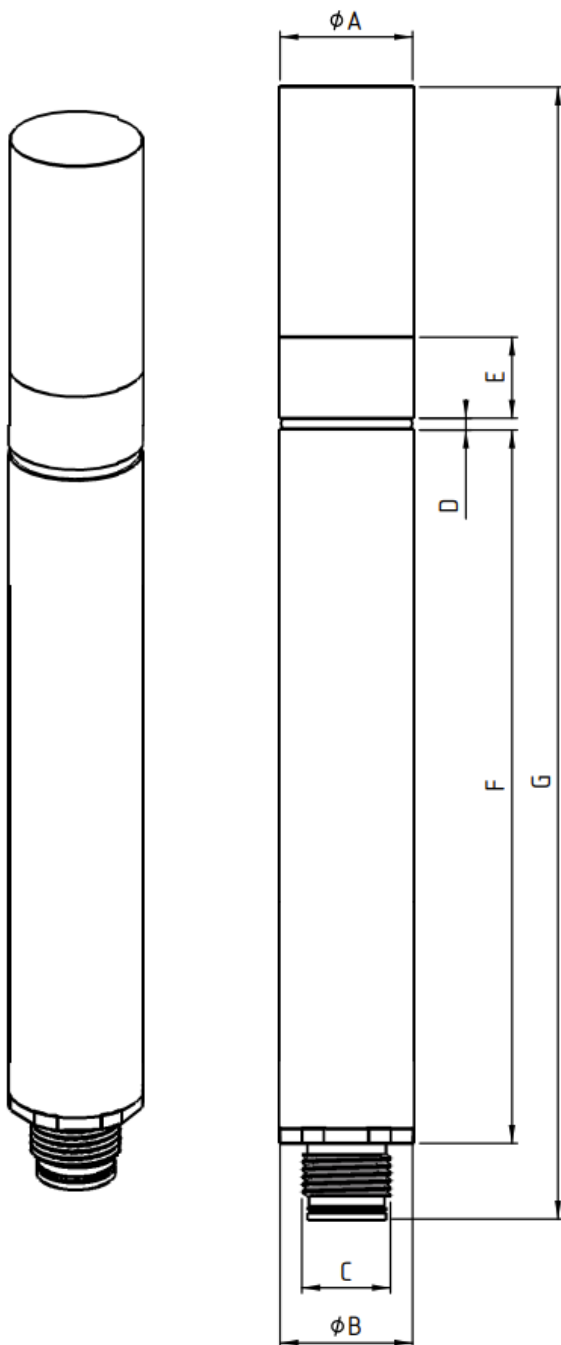
Cable connector (front view)	Cable wires (free end)	Pin Number	Note
	Brown	Pin 1	Mated to Pin 1 of the probe's connector
	White	Pin 2	Mated to Pin 2 of the probe's connector
	Blue	Pin 3	Mated to Pin 3 of the probe's connector
	Black	Pin 4	Mated to Pin 4 of the probe's connector
	Green/yellow	Pin 5	Mated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

Ordering Information

Product	Type	Designation	Interface	Connector / Cable Length in centimeters
SDI-12 (SDI-12 protocol v.1.4)	SN	ERHTPCO2	20	5M12F-150
RS-485 (Modbus protocol)	SN	ERHTPCO2	30	5M12F-150
UART (Modbus protocol)	SN	ERHTPCO2	40	5M12F-150
USB	SN	ERHTPCO2	50	5M12F-150

Example: SN-ERHTPCO2-20-5M12F-150 - relative humidity, air temperature, and barometric pressure sensor with SDI-12 interface, a 5-pin, A-code, male M12 connector, and a 1.5 m PUR halogen-free, black-gray RAL 7021, free cable end, on socket straight M12, A-coded sensor cable.

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	1.1	1.3	1.7	mm
	0.043	0.051	0.067	in
E	9.9	10	10.1	mm
	3.898	3.934	3.976	in
F	102.8	103	103.2	mm
	4.047	4.055	4.063	in
G	153	155	157	mm
	6.024	6.102	6.181	in

OneSense Product Line Highlights



OneSense Pulse

- 3 x Pulse Inputs
- 2 x 0-5V logic level compatible inputs
- 1 x 0-5V input user-configurable, dry contact or logic level compatible
- Selectable high-speed hardware counter with hysteresis input
- Selectable low-power digitally filtered software counter



OneSense Pulse and Current

- 1 x Pulse Input, 2nd Pulse Input (optional)
- 2 x 0-24mA analog inputs
- Buffered analog inputs
- 12-bit resolution, 16-bit resolution - optional
- Low-pass digital filtering
- Internal automatic self-calibration and self-compensation routines



OneSense Pulse and Voltage

- 1 x Pulse Input, 2nd Pulse Input (optional)
- 2 x 0-10V analog inputs
- Buffered analog inputs
- 12-bit resolution, 16-bit resolution - optional
- Low-pass digital filtering
- Internal automatic self-calibration and self-compensation routines
- Auxiliary low-voltage channel



OneSense Temperature

- 1 x Pulse Input, 2nd Pulse Input (optional)
- High precision industrial Pt100 or Pt1000
- Any thermocouple class (user selectable)
- Low-power digital: multiple 1-wire™ temperature sensors



OneSense Agriculture

- Variety of applications in agriculture and environmental monitoring
- Irrigation
- Greenhouses
- Weather monitoring
- Water/liquid level monitoring
- SDI-12, I2C, Voltage (0-5V), Pulse, 1-wire™