

RELATIVE HUMIDITY, TEMPERATURE AND BAROMETRIC PRESSURE PROBE

Evvos RHTP probe combines meteorological grade sensors for relative humidity, air temperature, 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
- 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
- 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.

Measured Parameters and Units

ERHTP Environmental Parameters

Parameter	Unit	Description
air_temperature	°C / °F	Air temperature (dry-bulb temperature)
relative_humidity	%	Relative humidity of air
barometric_pressure	hPa	Barometric pressure
sea_level_pressure	hPa	Reduced to sea level atmospheric pressure
dew_point	°C	Dew point (Dew temperature)
absolute_humidity	g/m ³	Absolute humidity of air
vapor_pressure	hPa	Vapor pressure in humid air
saturated_vapor_pressure	hPa	Saturated vapor pressure in humid air
heat_index	°C	Physiological heat index in humid air
speed_of_sound	m/s	Speed of sound in humid air
mixing_ratio	g/kg	Mixing ratio of moisture in air
specific_enthalpy	kJ/kg	Thermodynamic specific enthalpy of humid air
water_activity	-	Water activity in humid air
water_boiling_point	°C	Boiling point of water
wet_bulb_temperature	°C	Thermodynamic wet-bulb temperature
CO2_percentage	%	RHTP-CO2 version only: concentration (percentage) of CO ₂ in air

ERHTP Diagnostic Parameters

Parameter	Unit	Description
MCU_voltage	mV	Internally regulated voltage supply for the on-board microcontroller
SEN_voltage	mV	Internally regulated voltage supply for the sensor circuits
VIN_voltage	mV	Unregulated voltage supply fed to the probe
MCU_temperature	°C	Temperature of the on-board microcontroller
MCU_errors	-	A register of errors occurred in the MCU of a probe
reset_cause	-	A register of the most recent MCU reset cause code
power_errors	-	A register of error in the power circuitry of a probe
sensor_errors	-	A register of errors occurred during sensing
errors_count	-	Total count of errors occurred in a probe
wet_bulb_iterations	-	Count of iterations to solve the equation for wet_bulb_temperature
break_duration	-	Duration the SDI-12 break symbol generated by the master and measured by the probe

SDI-12 Symbols and Parameters

Parameter	Description
a, <addr>	SDI-12 address of a probe
new_addr	New SDI-12 address when changing probe's address
n	Count of parameters to be returned by a probe
ttt	Time (in seconds) between issuing Start measurement Command and Read Measurement Command
±	Positive/negative sign of a numerical value
<CR>	Carriage return ASCII character as per SDI-12 convention
<LF>	Line feed ASCII character as per SDI-12 convention

Examples

SDI-12 Quick Start: Example of Reading Environmental Data

Sequence of Commands	Description	Issued by
0M!	Issue a Start Measurement Command aM! (a = ERHTP's SDI-12 address ¹). It starts measurements of all environmental parameters except wet_bulb_temperature	user
00023 (or 00024)	Wait for 2-3 sec. while the aM!- command is being executed within the probe.	probe
0D0!	Issue Read Data Commands ² starting with aD0!	user
0+26.67+58.23+997.51 (or 0+26.67+58.23+997.51+1.21)	<addr>±<air_temperature>+<relative_humidity>+<barometric_pressure> (or <addr>±<air_temperature>+<relative_humidity>+<barometric_pressure>+<CO2_percentage>)	probe
0D1!	Keep issuing aDx!-commands to read more parameters (optional)	user
0+2660+5820+99750 (or 0+2660+5820+99750+120)	Compatibility mode integer format: <addr>±<air_temperature>+<relative_humidity>+<barometric_pressure> (or <addr>±<air_temperature>+<relative_humidity>+<barometric_pressure>+<CO2_percentage>)	probe
0D2!	Keep issuing aDx!-commands to read more parameters (optional)	user
0+26.67+17.76+28.00+80.01	<addr>±<air_temperature°C>±<dew_point>±<heat_index>±<air_temperature°F>	probe
0D3!	Keep issuing aDx!-commands to read more parameters (optional)	user
0+58.23+14.706+12.953	<addr>+<relative_humidity>+<absolute_humidity>+<mixing_ratio>	probe
0D4!	Keep issuing aDx!-commands to read more parameters (optional)	user
0+997.51+20.35+34.96	<addr>+<sea_level_pressure>+<vapor_pressure>+<saturated_vapor_pressure>	probe
0D5!	Keep issuing aDx!-commands to read more parameters (optional)	user
0+348.77+59.849+0.5820+99.56	<addr>+<speed_of_sound>+<specific_enthalpy>+<water_activity>+<water_boiling_point>	probe

⁽¹⁾ Default SDI-12 address for ERHTP probes is 0 (zero).

⁽²⁾ additional values may be returned to 0D0!-command for extended model probes (e.g. ERHTP-CO2).

NOTE: units available in "Measured Parameter and Units" Table.

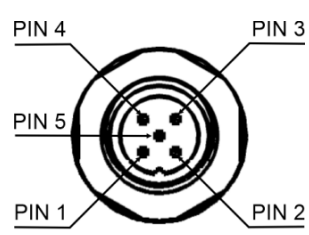
SDI-12 Quick Start: Example of Reading Wet-bulb Temperature

Sequence of Commands	Description	Issued by
0M!	Issue a Start Measurement Command aM!. It starts measurements of all environmental parameters except wet_bulb_temperature	user
00023	Wait for 2-3 sec. while the aM!- command is being executed within the probe.	probe
0M6!	Issue a Start Measurement Command aM6! to start the calculation of wet_bulb_temperature	user
00054	Wait for 5 sec. conversion time while the 0M6!- command is being executed.	probe
0D6!	Issue Read Data Command aD6! to read wet_bulb_temperature	user
0+20.50+26.73+17.57+159	<addr>±<wet_boulb_temperature>±<air_temperature°C>±<dew_point>+<wet_bulb_iterations>	probe

NOTE: units available in "Measured Parameter and Units" Table

Wiring

Pinout of the M12-connector on ERHTP probe (SDI-12 Version)

Probe's connector (front view)	Pin function	Pin number	Wire colour ⁽¹⁾	Note
	System power supply (Vin)	Pin 1	Brown	
	System ground (GND)	Pin 2	White	Internally connected to casing.
	Auxiliary (AUX)	Pin 3	Blue	Single-wire interface bidirectional DATA-pin. Connect to GND when SDI-12 mode is in use.
	Unused	Pin 4	Black	Unused wire. Leave floating. Do not connect to any electrical potential.
	SDI-12 DATA	Pin 5	Yellow	SDI-12 interface bidirectional DATA-port.

⁽¹⁾ Wire colour valid when probe is equipped with the optional patch cable by Evvos.

