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Datasheet TDS501

Dew Point Sensor down to -70 °C Td (-94 °F Td)

Modbus

www.epluse.com

TDS501

Dew Point Sensor down to -70 °C Td (-94 °F Td)

The compact TDS501 sensor measures dew point temperature (Td) down to −70 °C (-94 °F). It is designed for very low humidity levels where even small changes are critical for product quality and process stability. Along with Td, the sensor provides other humidity-related measurands such as frost point temperature (Tf) and volume concentration (Wv).

Innovative Measurement Method

The core of TDS501 is the new E+E Quattro Sensor technology which combines four robust in-house developed and manufactured capacitive sensing elements in a continuously measuring system. The technology allows for in-line process montoring without interuption, while the sensor system is still able to perform periodic auto-calibrations to ensure reliable and long-term stable measurements.

Functionality and Robustness

The extremely robust stainless steel construction and filter options ensure dependable operation even under harsh conditions. TDS501's wettable sensing elements withstand temporary condensation which can occur during dynamic load changes or at start-up.

Fast Response Time and Process Reliability

The TDS501 responds immediately to dew point changes at all times, without any output freeze during auto-calibration. Stainless steel filter options provide an optimal balance of protection and response speed. For applications requiring maximum dynamics, such as in cleanrooms, an optional open filter cap option further accelerates the response time.

High Accuracy and Long-term Stability

High repeatability and an accuracy of ±2 °C Td enable the TDS501 to reliably monitor processes where the dew point is a key parameter. The E+E Quattro Sensor technology minimises the risk of drift and maintains measurement stability, even during temperature changes or abnormal operating conditions. This supports consistent performance in dry environments, improved yield and the early detection of system deviations.

Interface and Configuration

The TDS501 sensor integrates easily into industrial environments through both, analogue and digital interfaces.
With a pressure rating of up to 80 bar, it can be installed directly in high-pressure compressed-air systems. Use the free PCS10 Product Configuration Software and the optional adapter for configuration and adjustment of the TDS501.

TDS501 - ISO

TDS501 - NPT

Features

Configurable and adjustable

- Service interface
- Free PCS10 Product Configuration Software

Outputs

- Modbus RTU or
- Current output 4 - 20 mA, wide scaling range
- Industrial M12x1 connector

Measurement performance

- Dew point, frost point, volume concentration
- E+E Quattro Sensor technology with auto-calibration
- Dew point measuring range -70...+30 °C (-94...+86 °F)
- Accuracy ±2 °C (±3.6 °F)
- Temporarily wettable

Enclosure

- Protection rating IP65
- Stainless steel 1.4404

Process connection

- Stainless steel
- G 1/2" ISO or 1/2" NPT
- Pressure rating 80 bar (1160 psi)

Inspection certificate

According to DIN EN 10204-3.1

Features

Auto-calibration and E+E Quattro Sensor Technology

The TDS501's auto-calibration feature is based on the E+E Quattro Sensor platform that periodically corrects and optimises performance at the dry end of the dew point measurement range. Additionally, a sensor evaluation algorithm calculates an environment temperature compensation of the measured dew point temperature value. This ensures accurate measurements over the entire working range and extends re-calibration intervals. Previous generation sensors freeze the Td output signal during auto-calibration for several minutes to the measured value prior to the procedure. The new generation provides a continuous output signal using the innovative E+E Quattro Sensor technology. Simple and efficient, one sensing element performs the measurement, while the second part periodically determines the required auto-calibration correction.

E+E Modular Sensor Platform

The TDS501 is compatible with the Sigma 05 host device of the E+E Modular Sensor Platform. Together they become a versatile, modular plug-and-play Td sensor with analogue outputs and optional display. Besides TDS501, Sigma 05 accommodates also other E+E intelligent sensing probes. See www.epluse.com/sigma05 for further details.

TDS501 with Sigma 05

Accredited Traceable Calibration Certificate

Internationally recognised certificates for the calibration of measuring instruments from accredited laboratories document the traceability of the measurements to the International System of Units (SI). The E+E Elektronik calibration laboratory offers two levels of traceable calibrations.

- As a Designated Institute (DI) of the Republic of Austria, the E+E calibration laboratory maintains Austria's national measurement standards for humidity, dew point temperature, air velocity and CO_2. This authorises the E+E calibration laboratory to issue calibration certificates at the level of a National Metrological Institute (NMI).
- The E+E calibration laboratory is accredited by Akkreditierung Austria in accordance with DIN EN ISO/IEC 17025 with the identification number 0608. This allows the laboratory to issue ISO 17025 certificates for the measurands humidity, temperature, dew point temperature, air velocity, flow, pressure and CO_2.

Visit www.eplusecal.com for detailed information on calibration and to enquire a certificate of accredited traceable calibration for the TDS501 from the Designated Institute.

ISO 9001 Calibration Certificate

An ISO 9001 calibration certificate documents the comparative measurement of a device against high quality reference equipment (factory level standard). The comparison is performed in accordance with internal procedures that comply with ISO 9001 and provides information on the specimen's measuring accuracy. The reference equipment is traceable to national standards, however, the calibration process is not accredited. Therefore, an ISO 9001 calibration is neither traceable nor internationally comparable.

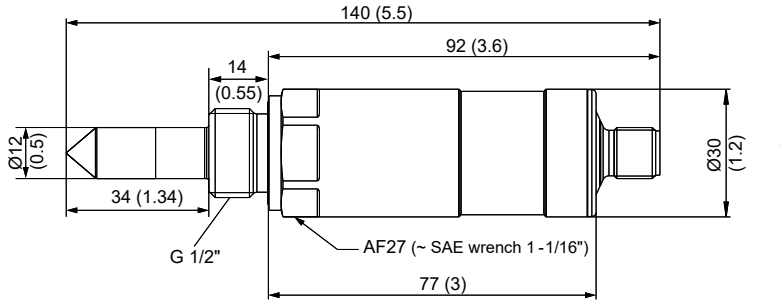
Visit www.epluse.com/iso9001cal for detailed information on calibration and to enquire an ISO 9001 calibration certificate.

Dimensions

Values in mm (inch)

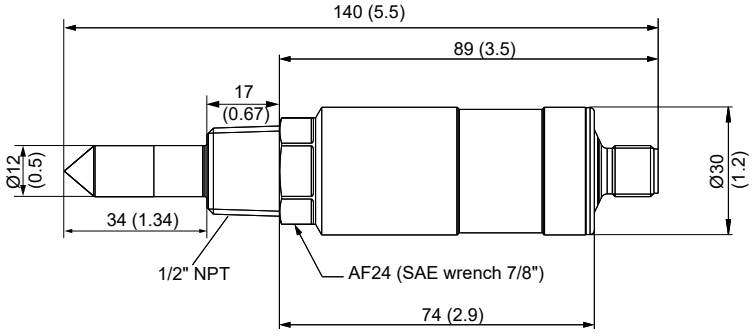
ISO

G 1/2"



NPT

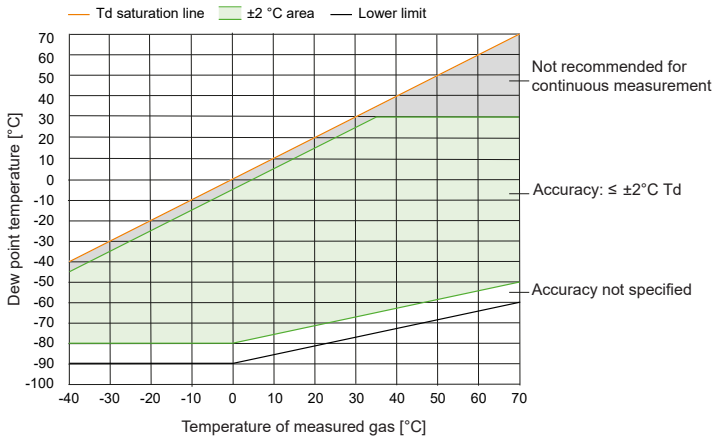
1/2"



Technical Data

Measurands

Dew Point Temperature (Td)

Measuring range	-70...+30 °C Td (-94...86 °F Td)
Accuracy[1)]	
Response time t_{63} (t_{90}), typ. **With stainless steel sintered filter cap** **With perforated stainless steel filter cap** (available as accessory)	 Step dry (-70 °C/-94 °F Td) → wet (-20 °C/-4 °F Td): <15s (<30s) Step wet (-20 °C/-4 °F Td) → dry (-70 °C/-94 °F Td): <1 min 30 s (<5 min) Step dry (-70 °C/-94 °F Td) → wet (-20 °C/-4 °F Td): < 5s (< 10s) Step wet (-20 °C/-4 °F Td) → dry (-70 °C/-94 °F Td): < 25s (< 40s)

1) Traceable to international standards, administrated by NIST, PTB, BEV,....
The accuracy statement includes the uncertainty of the factory calibration with a coverage factor k=2 (2-times standard deviation).
The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

Volume Concentration (Wv)[1)]

Measuring range @ 1013 mbar (14.7 psi)	0.1...42 000 ppm
Accuracy @ 20 °C (68 °F) and 1013 mbar (14.7 psi)	±(1.5 ppm + 12 % from measured value)

1) The measurand derives from the dew point temperature and can be determined with the E+E Humidity Calculator.

Supported quantities

Parameter		from	to	Unit
Dew point temperature	Td	-70 (-94)	30 (86)	°C (°F)
Frost point temperature[1)]	Tf	-65 (-85)	0 (32)	°C (°F)
Volume concentration	Wv	0.1	42 000	ppm
Water vapor partial pressure	e	0.001 ($1.45 \cdot 10^{-5}$)	50 (0.73)[2)]	mbar (psi)

1) Equals Td above 0 °C (32 °F).
2) Ambient pressure / customer setting.

Technical Data

Outputs

Analogue

Scalable output **Td, Tf or Wv**	4 - 20 mA 3-wire R_L < 600 Ω R_L = load resistance
Max. configurable scaling	-100...+80 °C Td (-148...+176 °F Td) 0...200 000 ppm
Resolution	0.4 µA
Accuracy of current output @ 20 °C (68 °F)	±4 µA
Temperature coefficient, typ.	<50 ppm of the measuring range / °C deviation from 20 °C (68 °F)

Digital

Digital interface	RS485 (TDS501 = 1 unit load)
Protocol **Factory settings**[1)] **Supported Baud rates** **Measured data types**	Modbus RTU 9 600 Baud, parity even, 1 stop bit, Modbus address 229 (0xE5) 9 600, 19 200 and 38 400 FLOAT32

1) Find more details about communication setting in the User Manual and the Modbus Application Note at www.epluse.com/tds501.

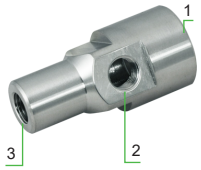
General

Power supply class III USA & Canada: Class 2 supply necessary **TDS501 with current output** **TDS501 with digital Interface**	 13 - 30 V DC 10 - 30 V DC
Power consumption @ 24 V DC	<30 mW + load (max. 240 mW @ 600 Ω and 20 mA) + 200 mW during auto-calibration
Electrical connection **TDS501 with current output** **TDS501 with digital Interface**	 M12x1, 5 poles, stainless steel 1.4404 M12x1, 4 poles, stainless steel 1.4404
Filter	Stainless steel sintered
Pressure working range	0...80 bar (0...1 160 psi)
Humidity working range	0...100 %RH
Temperature working range	-40...+70 °C (-40...+158 °F)
Storage conditions (as delivered ex works with protective cap and drying tablet)	-40...+60 °C (-40...+140 °F) 0...95 %RH, non-condensing
Enclosure **Material** **Protection rating**	Stainless steel 1.4404 (AISI 316L) IP65 / NEMA 4X (when plugged into an appropriate M12x1 socket)
Electromagnetic compatibility	EN 61326-1 EN 61326-2-3 Industrial environment FCC Part15 Class B ICES-003 Class B
Conformity	CE UKCA
Configuration and adjustment	PCS10 Product Configuration Software (free download: www.epluse.com/pcs10) and configuration adapter

Sampling Cells

Basic Sampling Cell

The basic sampling cell is suitable for the pressure range 0...64 bar (0...928 psi). It allows for easy installation of the dew point sensor into an existing or self-constructed sampling system.

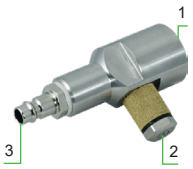


HA050103 ISO / HA050105 NPT

Number	HA050103 ISO	HA050105 NPT
1	G 1/2"	1/2"
2	G 1/4"	1/4"
3	G 1/4"	1/4"

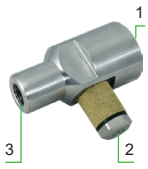
Sampling Cell with Quick Connector and Bleed Screw

The sampling cell is optimized for the pressure range 0...10 bar (0...145 psi). The air flow can be adjusted with the bleed screw. The G ½" ISO version features a quick connector suitable for standard DN 7.2 connection, which allows for the sampling cell to be mounted and removed without process interruption.



HA050102 ISO

Number	HA050102 ISO
1	G 1/2"
2	Bleed screw
3	Quick connection



HA050107 NPT

Number	HA050107 NPT
1	1/2"
2	Bleed screw
3	1/4"

Sampling Cell for Atmospheric Dew Point

The sampling cell is optimized for measuring the athmospheric dew point temperature of compressed air with pressure range 0...10 bar (0...145 psi). It features a quick connector suitable for standard DN7.2 air connection, which allows for the sampling cell to be mounted and removed without process interruption. The pressure in the sampling cell can be adjusted via the needle valve.

HA050106 ISO

Number	HA050106 ISO
1	G 1/2"
2	Quick connection

Ordering Guide

	Feature	Description	Code	
			TDS501-	
Hardw. Conf.	Model	Td	M4	
	Type	Standard	T34	
	Process connection	G 1/2" ISO thread	PA1	
		1/2" NPT thread	PA2	
	Measuring range	Down to -70 °C (-94 °F) Td	HV68	
	Output	Analogue 4 - 20 mA	A19	
		RS485 with Modbus RTU		J3
Software Setup - Outputs	Output 1 measurand	Dew point temperature Td [°C]	No code	
		Dew point temperature Td [°F]	MA53	
		Frost point temperature Tf [°C] (for Td > 0 °C output is Td)	MA65	
		Frost point temperature Tf [°F] (for Td > 32 °F output is Td)	MA66	
		Volume concentration Wv [ppm]	MA75	
	Output 1 scaling low	-80	No code	
		Value	SAL*Value*	
	Output 1 scaling high	20	No code	
		Value	SAH*Value*	

Order Examples

TDS501-M4T34PA1HV68J3

Feature	Code	Description
Model	M4	Td
Type	T34	Standard
Process connection	PA1	G 1/2" ISO thread
Measuring range	HV68	Down to -70 °C Td
Output	J3	RS485 with Modbus RTU

TDS501-M4T34PA2HV68A19MA66SAH50

Feature	Code	Description
Model	M4	Td
Type	T34	Standard
Process connection	PA2	1/2” NPT thread
Measuring range	HV68	Down to -70 °C Td
Output	A19	Analogue 4 - 20 mA
Output 1 measurand	MA66	Frost point temperature Tf [°F] (for Td > 32 °F output is Td)
Output 1 scaling low	No code	-80 °F
Output 1 scaling high	SAH50	50 °F

Accessories

For further information please refer to the Accessories datasheet.

Description	Code
PCS10 Product Configuration Software (free download: www.epluse.com/pcs10)	**PCS10**
Modbus configuration adapter for analogue TDS501	**HA011013**
Modbus configuration adapter for digital TDS501	**HA011018**
Sensor connection cable, shielded, 5 poles, **M12x1 socket ←→ wire ferrules, PUR insulation** **1.5 m (4.9 ft)** **5 m (16.4 ft)** **10 m (32.8 ft)**	 **HA010819** **HA010820** **HA010821**
Sampling cell G 1/2" with quick connector	**HA050102**
Sampling cell NPT with bleed screw	**HA050107**
Sampling cell G 1/2" for atmospheric dew point	**HA050106**
Basic sampling cell G 1/2"	**HA050103**
Basic sampling cell NPT	**HA050105**
Stainless steel perforated filter for accelerated response time in clean environments (e.g. clean room, semiconductor production, compressed air class 251 or better)	**HA010110**

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