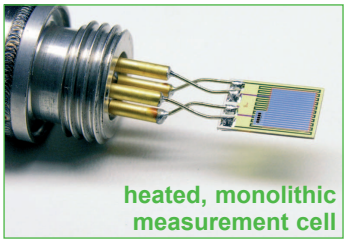
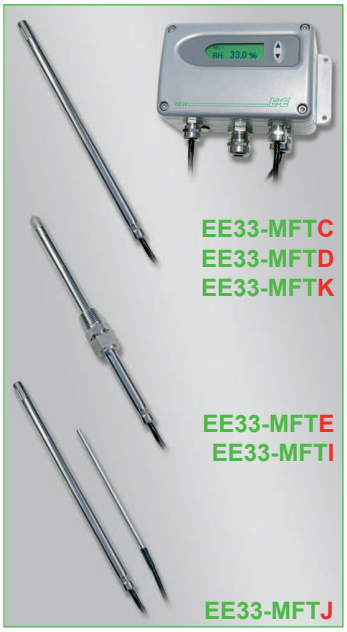
EE33

Humidity / Temperature Transmitter for High Humidity and Chemical Applications

The highly accurate EE33 series are designed for fast and reliable measurement of relative humidity / dew point temperature / absolute humidity / ...under the most demanding conditions.
Neither condensation nor heavy chemical pollutions will affect prompt and reliable measurements. Process pressures as high as 100 bar (1450 psi) and continuous high humidity are also no problem for the EE33 series.
The core of the EE33 series is the new monolithic measurement cell type HMC1, manufactured in thin-film technology by E+E Elektronik.
Chemical contamination and also condensation will actually evaporate due to the innovative design of the HMC1 measurement cell. The monolithic construction of the sensor allows a fast return to normal conditions and a continuation of the measurement.
Additionally, with the inimitable E+E sensor coating the HMC1 measurement cell is even better protected against corrosive and short-circuit-causing conductive soils.
Distinctive models and mounting versions allow the EE33 series to be utilized in numerous applications:


heated, monolithic measurement cell



- **Measurement of relative humidity during temporary condensation:**
  the measurement cell is briefly heated, but very intense
- **Measurement of dew point temperature at continuous high humidity:**
  the measurement cell is controlled and heated continuously
- **Measurement of relative humidity at continuous high humidity:**
  the measurement cell is controlled and heated continuously;
  an additional temperature sensor is added
- **Measurement of relative humidity at high chemical exposure and average humidity:**
  the measurement cell is briefly heated, but very intense
- **Measurement of relative humidity at process pressure up to 100bar (1450psi) and average humidity:**
  the measurement cell is installed in a special high pressure probe

The configuration software included in the scope of supply allows user friendly setup of the operation / sensor heating mode as well as selection and adjustment of the electrical outputs.

Model	Environmental Conditions
C - remote sensing probe up to 120°C (248°F)	chemical pollution, temporary condensation
D - remote sensing probe up to 180°C (356°F)	chemical pollution, temporary condensation
E - remote sensing probe, pressure tight up to 20bar (300psi)	chemical pollution, temporary condensation
I - remote sensing probe, pressure tight up to 100bar (1450psi)	chemical pollution, temporary condensation
J - 2 remote sensing probes (RH-measurement), pressure tight up to 20bar (300psi)	continuous high humidity and condensation
K - remote sensing probe (Td-measurement) pressure tight up to 20bar (300psi)	continuous high humidity and condensation

Typical Applications

pharmaceutical and food industry
dryers for ceramics, wood, concrete, polyester, etc
mushroom farms
high-humidity storage rooms
climate, test and curing chambers
meteorology

Features

heated, monolithic measurement cell
working range 0...100% RH / -40...+180°C (-40...356°F)
measurement near condensation
fast recovery after condensation
chemical purge after chemical exposure
pressure tight up to 100bar (1450psi)
calculation of additional physical quantities
optional sensor coating

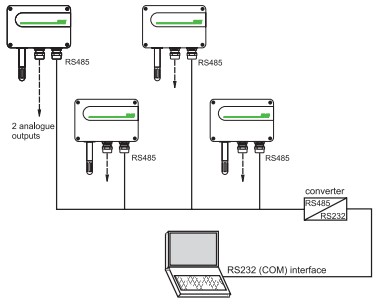
Functions

	Comment
Measurement of humidity and temperature	✓
Calculation h, r, dv, Tw, Td, Tf, e	✓
2 freely scaleable and configurable analogue outputs	✓
Remote sensing probe up to 20m (65.6ft)	✓
On-site adjustment for relative humidity and temperature	✓
LED indication of transmitter status / error diagnosis of probes	✓
RS232 for transmitter configuration via PC	✓
Configuration software	✓
Alternating display with MIN/MAX indication	optional
2 freely configurable alarm outputs	optional
Removeable sensing probe	optional
Sensor protection with coating	optional
Pluggable electrical connections	optional
Data output via RS232 interface	✓
Data output via RS485 interface	optional
Networking for up to 32 transmitters via RS485 bus	optional
Ethernet interface for networking and remote monitoring	optional
Data logging and analysis PC software	optional
ARC-Module for external triggering of sensor-heating	optional

Networkability / Ethernet Interface

The optional RS485 interface (order code N) allows for building a network of up to 32 transmitters.
The measurement data can be collected in a shared database and made available for all kinds of further processing.

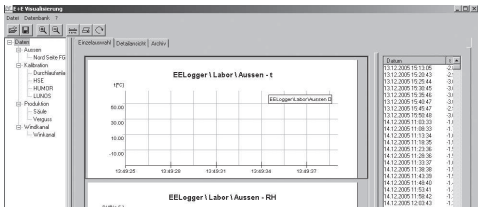
Additionally, the transmitters can be networked with an Ethernet module (order code E) for remote monitoring.



Software

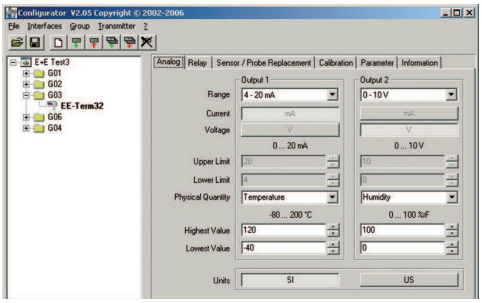
Configuration Software (included in the scope of supply):

The configuration software allows flexible and simple adjustment of the analogue and alarm outputs in accordance with the requirements. The adjustment / calibration of the humidity and temperature outputs is possible as well. Furthermore the settings of the start and duration of the heating of the measurement cell can be defined.



Data Logging / Analysis Software (optional):

An additional software package enables data recording and management, including alerts by e-mail or text message when set points are triggered.
It is also possible to present the collected measurement data on a PC in graphs or tables. If the option N (RS485) or E (Ethernet) is selected in the ordering code, the data logging and analysis software will be included in the scope of supply.



Integrated Display

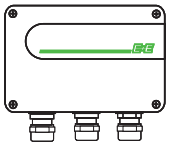
The actual measurement data and the corresponding Min/Max values can be indicated in an optional display (order code D05). The physical quantity to be displayed is selected by the push buttons next to the display.

Alarm Outputs

An optional alarm module with 2 relay outputs is available for control and alarm purposes (order code SW). The selection of the physical quantity and the setting of threshold and hysteresis can be made with the configuration software included in the scope of supply.

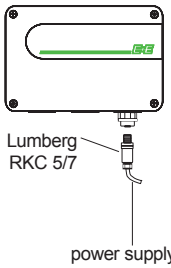
Connection Versions

standard

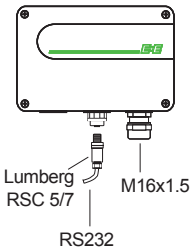


3x M16 x 1.5

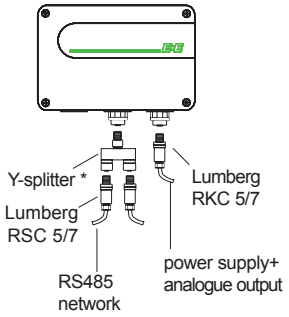
plug option C03



plug option C06



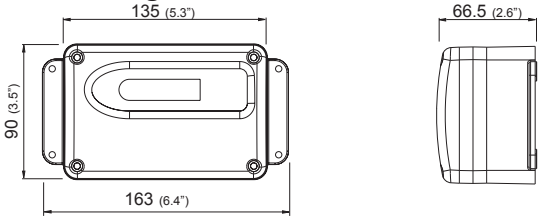
plug option C08



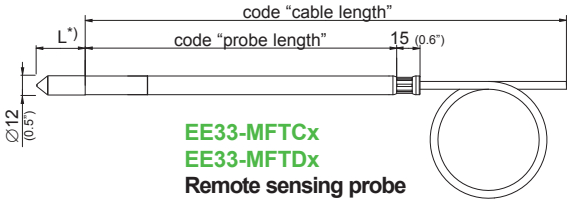
* Siemens 6ES7 194-1KA01-0XA0

Dimensions (mm)

Housing:

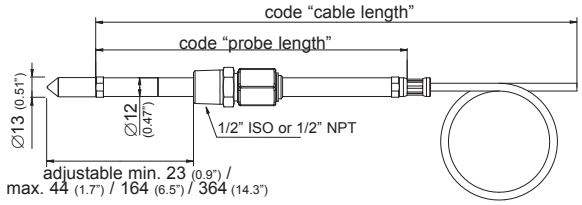


Remote Probe:

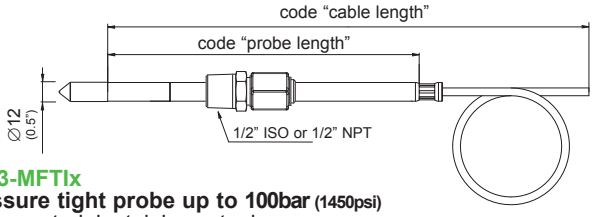


EE33-MFTCx
EE33-MFTDx
Remote sensing probe
Probe material: stainless steel

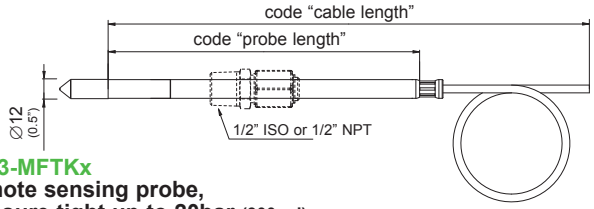
Sensing probes:



EE33-MFTEx
Pressure tight probe up to 20bar (300psi)
Probe material: stainless steel

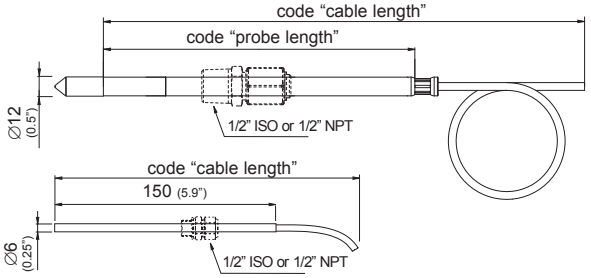


EE33-MFTIx
Pressure tight probe up to 100bar (1450psi)
Probe material: stainless steel



EE33-MFTKx
Remote sensing probe,
pressure tight up to 20bar (300psi)
(screw connection is not included in the scope of supply)
Probe material: stainless steel

screw connection:	order code:
1/2" ISO Ø12mm	HA011102
1/2" NPT Ø12mm	HA011103



EE33-MFTJx
Two remote sensing probes,
pressure tight up to 20bar (300psi)
(screw connections are not included in the scope of supply)
Probe material: stainless steel

screw connection:	order code:
1/2" ISO Ø12mm	HA011102
1/2" NPT Ø12mm	HA011103
1/2" ISO Ø6mm	HA011104
1/2" NPT Ø6mm	HA011105

*) L = Filter length: refer to data sheet "Accessories"

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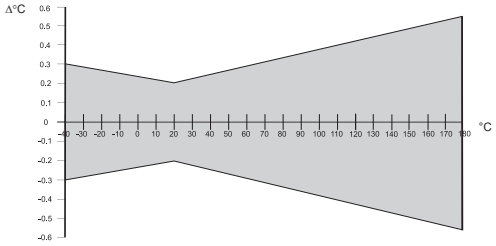
Technical Data

Measurement values

Relative humidity

Humidity sensor[1]		heated, monolithic measurement cell HMC1
Working range[1]		0...100% RH
Accuracy*) (including hysteresis, non-linearity and repeatability, traceable to intern. standards, administrated by NIST, PTB, BEV...)		
-15...40°C (5...104°F)	≤90% RH	± (1.3 + 0.3%*mv) % RH
-15...40°C (5...104°F)	>90% RH	± 2.3% RH
-25...70°C (-13...158°F)		± (1.4 + 1%*mv) % RH
-40...180°C (-40...356°F)		± (1.5 + 1.5%*mv) % RH
Temperature dependence of electronics		typ. ± 0.01% RH/°C (0.0055% RH/°F)
Response time with metal grid filter at 20°C (68°F) / t_{90}		< 15s

Temperature

Temperature sensor element	monolithic measurement cell HMC1
Working range sensing head	EE33-MFTC: -40...120°C (-40...248°F) EE33-MFTD/E/I/J/K: -40...180°C (-40...356°F)
Accuracy	
Temperature dependence of electronics	typ. ± 0.005°C/°C
External temperature probe	Pt1000 (DIN A)

Outputs[2]

Two freely selectable and scaleable analogue outputs	0 - 1V	-1mA < I_L < 1mA
	0 - 5V	-1mA < I_L < 1mA
	0 - 10V	-1mA < I_L < 1mA
	4 - 20mA	R_L < 500 Ohm
	0 - 20mA	R_L < 500 Ohm
Digital interface	RS232	optional: RS485 or ethernet

Max. adjustable measurement range[2)3)]

		from	to			Unit
			EE33-C	EE33-D/E/I/J	EE33-K	
Humidity	RH	0	100	100	/	% RH
Temperature	T	-40 (-40)	120 (248)	180 (356)	/	°C (°F)
Dew point temperature	Td	-40 (-40)	100 (212)	100 (212)	100	°C (°F)
Frost point temperature	Tf	-40 (-40)	0 (32)	0 (32)	0	°C (°F)
Wet bulb temperature	Tw	0 (32)	100 (212)	100 (212)	/	°C (°F)
Water vapour partial pressure	e	0 (0)	1100 (15)	1100 (15)	/	mbar (psi)
Mixture ratio	r	0 (0)	999 (9999)	999 (9999)	/	g/kg (gr/lb)
Absolute humidity	dv	0 (0)	700 (300)	700 (300)	/	g/m3 (gr/ft³)
Specific enthalpy	h	0 (0)	2800 (99999)	2800 (99999)	/	kJ/kg (Btu/lb)

General

Supply voltage		8...35V DC 12...30V AC (optional 100...240V AC, 50/60Hz)
Current consumption	- 2x voltage output	for 24V DC/AC: typ. 40mA / 80mA
	- 2x current output	typ. 80mA / 160mA
Pressure range for pressure tight probe		EE33-MFTEx/Jx/Kx: 0.01...20bar (0.15...300psi) EE33-MFTIx: 0...100bar (0...1450psi)
System requirements for software		WINDOWS 2000 or later; serial interface
Housing / protection class		Al Si 9 Cu 3 / IP65; (Nema 4)
Cable gland		M16 x 1.5 cable Ø 4.5 - 10 mm (0.18 - 0.39")
Electrical connection		screw terminals up to max. 1.5mm² (AWG 16)
Working and storage temperature range of electronics		-40...60°C (-40...140°F) -20...50°C (-4...122°F) - housing with display
Electromagnetic compatibility according to		EN61326-1 EN61326-2-3 ICES-003 ClassB Industrial Environment FCC Part15 ClassB CE

1) Refer to the working range of the humidity sensor. 2) Can be easily changed by software. 3) Refer to accuracies of calculated values (page 152)

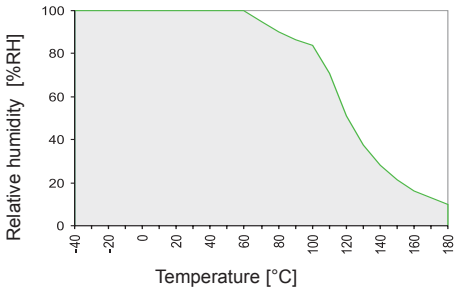
*) The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation). The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

Technical Data for Options

Display	graphical LC display (128x32 pixels), with integrated push-buttons for selecting parameters and MIN/MAX function
Alarm outputs	2 x 1 switch contact 250V AC / 6A 28V DC / 6A threshold + hysteresis: can be adjusted with configuration software switching parameters:

freely selectable between		EE33-MFTC/D/E/I/J	EE33-MFTK
RH	Relative humidity	✓	
T	Temperature	✓	
Td	Dew point temperature	✓	✓
Tf	Frost point temperature	✓	✓
Tw	Wet bulb temperature	✓	
e	Water vapour partial pressure	✓	
r	Mixture ratio	✓	
dv	Absolute humidity	✓	
h	Specific enthalpy	✓	

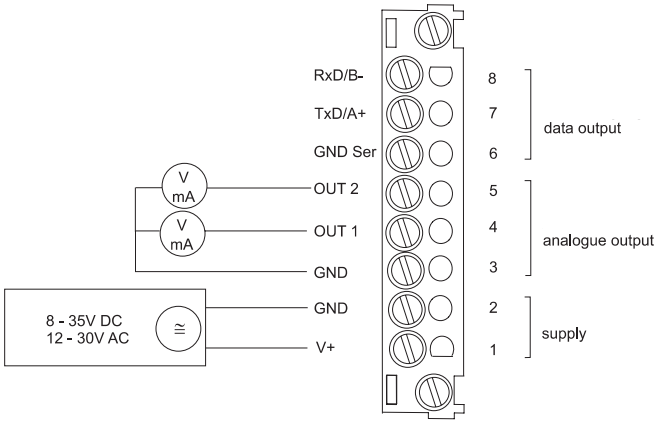
Working Range Humidity Sensor



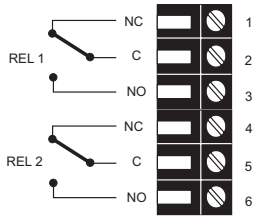
The grey area shows the allowed measurement range for the humidity sensor.

Operating points outside of this range do not lead to destruction of the sensor, but the specified measurement accuracy cannot be guaranteed.

Connection Diagram



Terminal configuration - Alarm output
(order code SW)



Accessories / Replacement Parts
(For further information, see data sheet "Accessories")

- Filter caps	(HA0101xx)	- Drip water protection	(HA010503)
- Display + housing cover	(D05M)		
- Interface cable for PCB	(HA010304)	- Calibration set	(HA0104xx)
- Interface cable for plug C06	(HA010311)	- Pressure tight screw connections	
- ½“ NPT-adapter for configuration	(HA011101)	1/2” ISO ∅12mm	(HA011102)
- Mounting flange 12mm (RH probe)	(HA010201)	1/2” NPT ∅12mm	(HA011103)
- Mounting flange 6mm (T probe)	(HA010207)	1/2” ISO ∅6mm	(HA011104)
- Adapter M16x1.5 to NPT ½"	(HA011101)	1/2” NPT∅6mm	(HA011105)
- RS485 Kit (HW + SW) for networking	(HA010601)	- Radiation shield for RH-probe	(HA010502)
- Data logging / analysis software	(HA010602)	- Radiation shield for T-probe	(HA010506)

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Ordering Guide

		EE33-	EE33-	EE33-	EE33-	EE33-	EE33-
Hardware Configuration							
Housing	metal housing	M	M	M	M	M	M
	polycarbonate					P	
Type	humidity	FT	FT	FT	FT	FT	FT
Model		C	D	E	I	J	K
Filter	PTFE stainless steel filter					2	2
	stainless steel sintered filter	3	3	3	3		
	PTFE filter	5	5	5	5		
	H_2O_2 filter	8	8	8	8		
	stainless steel grid filter(up to 180°C/ 356°F)	9	9	9	9	9	9
Cable length	2m (6.6ft)	02	02	02	02	02	02
(incl. probe length)	5m (16.4ft)	05	05	05	05	05	05
	10m (32.8ft)	10	10	10	10	10	10
Probe length	65mm (2.6") (for model E: 80mm (3.1"))	2	2	2		2	2
	200mm (7.9")	5	5	5	5	5	5
	400mm (15.8")	6	6	6		6	6
Pressure tight feedthrough	1/2" male thread			HA03	HA03		
	1/2" NPT thread			HA07	HA07		
Interface[1) 5)]	RS232						
	RS485	N	N	N	N	N	N
	ethernet interface[5)]	E	E	E	E	E	E
Display	without display						
	with display	D05	D05	D05	D05	D05	D05
Alarm output[1)]	without relay						
	with relay	SW	SW	SW	SW	SW	SW
ARC-Module[1) 2) 4)]	without external triggering of sensor-heating						
	with external triggering of sensor-heating[4)]	ARC	ARC	ARC	ARC	ARC	ARC
Plug[1)]	cable glands						
	1 plug for power supply and outputs	C03	C03	C03	C03	C03	C03
	1 cable gland / plug for RS232	C06	C06	C06	C06	C06	C06
	2 plugs for power supply / outputs and RS485 network	C08	C08	C08	C08	C08	C08
Sensing probe	fixed						
	connectable in the housing	P03	P03	P03	P03	P03	P03
Coating sensor	no						
	yes	HC01	HC01	HC01	HC01	HC01	HC01
Supply voltage	8...35V DC / 12...30V AC						
	integrated power supply 100 ...240V AC, 50/60Hz[1) 3)]	V01	V01	V01	V01	V01	V01

Software Configuration						Select according to Ordering Guide (A - J)	C
Physical parameters of outputs	Relative humidity	RH	[%]	(A)	Output 1		
	Temperature	T	[°C]	(B)			
	Dew point temperature	Td	[°C]	(C)	Output 2	Select according to Orderin Guide (A-J)	D
	Frost point temperature	Tf	[°C]	(D)			
	Wet bulb temperature	Tw	[°C]	(E)			
	Water vapour partial pres.	e	[mbar]	(F)			
	Mixture ratio	r	[g/kg]	(G)			
	Absolute humdity	dv	[g/m³]	(H)			
	Specific enthalpy	h	[kJ/kg]	(J)			

		EE33-	EE33-	EE33-	EE33-	EE33-	EE33-
Type of output signal	0-1V	1	1	1	1	1	1
	0-5V	2	2	2	2	2	2
	0-10V	3	3	3	3	3	3
	0-20mA	5	5	5	5	5	5
	4-20mA	6	6	6	6	6	6
Measured value units	metric / SI						
	non metric / US	E01	E01	E01	E01	E01	E01

T-Scaling	-40...60 (T02)	-20...100 (T14)	Output T	Select according to Ordering Guide (Txx)	
Td-Scaling	-10...50 (T03)	+20...120 (T15)			
Tf-Scaling	0...50 (T04)	0...120 (T16)	Output Td	Select according to Ordering Guide (Tdxx)	
Tw-Scaling	0...100 (T05)	0...80 (T21)			
(in °C or °F)	0...60 (T07)	-40...80 (T22)	Output Tf	Select according to Ordering Guide (Tfxx)	
	-30...70 (T08)	-20...80 (T24)			
	-30...120 (T09)	-40...160 (T33)	Output Tw	Select according to Ordering Guide(Twxx)	
	-20...120 (T10)	+20...180 (T40)		Other T/Td/Tf/Tw-scaling refer to data sheet „T-Scalings“	
	-40...120 (T12)	-40...180 (T52)			

1) Following combinations are not possible: RS485 / Ethernet / alarm output / ARC-Module / integrated power supply
2) If using an ARC-Module the transmitter has to be supplied with 24V AC/DC +/- 20%
3) Integrated power supply includes 2 plugs for power supply and outputs / further plug options are not possible
4) RS232 interface occupied
5) only C03 plug possible

Order Example

EE33-MFTD5025ND05SW/BC3-T02-Td07

Hardware Configuration:

Housing:	metal	Display:	with display
Type:	humidity + temperature	Alarm output:	with relay
Model:	remote sensing probe	ARC-Module:	without
Filter:	PTFE filter	Plug:	cable glands
Cable length:	2m (6.6ft)	Sensing probe:	fixed
Probe length:	200mm (7.9")	Coating sensor:	no
Interface:	RS485	Supply voltage:	8...35V DC / 12...30V AC

Software Configuration:

Output 1:	T
Output 2:	Td
Output signal:	0-10V
Measurand value unit:	metric / SI
T-Scaling:	-40...60°C
Td-Scaling:	0...60°C