

EE300Ex-HT

Humidity/Temperature Transmitter for Intrinsically Safe Applications



The EE300Ex humidity / temperature transmitter has been designed specifically for measurement in explosion hazard areas. It complies with the classifications for **Europe (ATEX), International (IECEX) and USA / Canada (FM)**.

Accurate measurement over the full range of 0...100 % RH and -40...180 °C (-40...356 °F) is also possible in applications under pressure from 0.01... 300 bar (4351 psi).

The EE300Ex can be used in flammable gas and dust applications. The entire transmitter can be placed in an explosion hazardous area. With the remote sensing probe a temperature classification up to T6 can be reached.

With a stainless steel enclosure and sensing probe the EE300Ex is the ideal transmitter for challenging industrial applications. The 2-part construction facilitates simple installation and rapid replacement of the measuring section without time consuming wiring. The well proven E+E humidity sensors ensure reliable measurement performance and long term stability.

Based on 2-wire technology, the transmitter can be powered by any intrinsically safe power source or via Zener barriers. The measured values are available on two 4...20 mA analogue outputs. In addition to the measured values for humidity and temperature, the EE300Ex calculates dew point, frost point, absolute humidity, mixing ratio and other humidity related physical quantities.

When outside of the hazardous measurement area, the setup of the EE300Ex can be easily customized by using the supplied configuration software. This includes the configuration of the analogue outputs and the calibration of the humidity and temperature during service.

Measurement of moisture in oil:

Besides measurement in the air, the EE300Ex can be employed for measurement of both absolute water content (x) in ppm or relative water activity (aw) in oils.

Typical applications include oil purifiers and online monitoring of lubrication and hydraulic oils on off shore oil rigs.

The USA and Canada approval is valid for air and gas measurement only.



EE300Ex - wall mounting



EE300Ex - remote sensing probe

Typical Applications

- chemical process control
- pharmaceutical applications
- explosive / hazardous storage rooms
- flour mills
- moisture in oil measurement

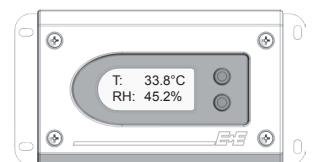
Features

- approved for gas and dust installation in zone 0 / Div. 1
- calculation of related physical quantities
- stainless steel housing and probe
- highest accuracy up to 180 °C (356 °F)
- pressure tight up to 300 bar (4351 psi)

Display

Two of the measured or calculated physical quantities can be selected with push buttons on the front cover to be shown on the optional display.

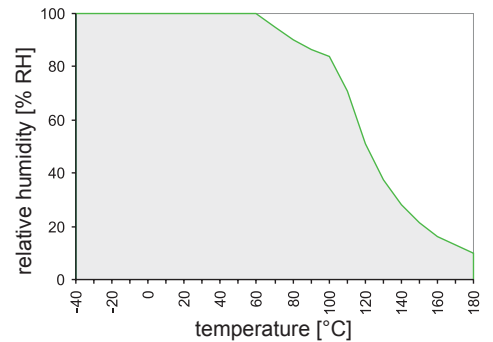
EE300Ex version with display is not available for environments with combustible dust, Fibers and Flyings and gases with EPL Ga IIC (Group A&B).



Humidity Sensor - Working Range and Coating

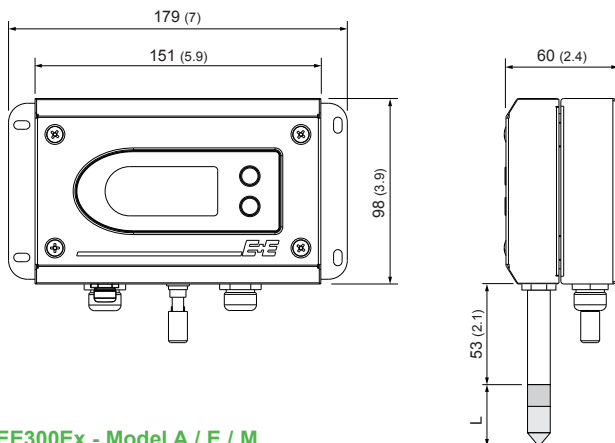
The gray area shows the allowed measurement range for the humidity sensor. Operating points outside of this range do not lead to destruction of the sensing element, but the specified measurement accuracy cannot be guaranteed.

Harsh industrial processes as well as heavily contaminated and/or corrosive environments may affect the humidity sensor and lead to measurement drift. The E+E proprietary coating significantly reduces these effects and considerably improves the long-term stability of the transmitter.



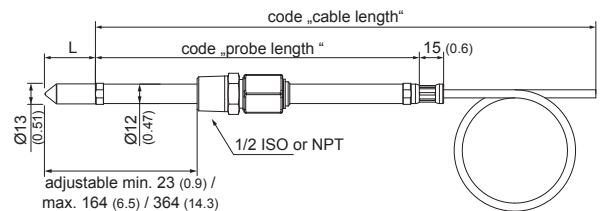
Models and Dimensions in mm (inches)

| Model | pressure range | working range | Ø-probe |
|--|----------------------------------|----------------------------|-------------------|
| A - wall mounting | | -40...60 °C (-40...140°F) | 12 (0.47) |
| remote sensing probe up to 20 bar (300 psi) | 0.1...20 bar (1.5...300 psi) | -40...180 °C (-40...356°F) | 12 (0.47) |
| E - remote sensing probe up to 20 bar (300 psi) with sliding fitting for assembly / disassembly under pressure | 0.1...20 bar (1.5...300 psi) | -40...180 °C (-40...356°F) | 13 (0.51) |
| M - remote sensing probe up to 300 bar (4351 psi) | 0.01...300 bar (0.15...4351 psi) | -40...180 °C (-40...356°F) | 12 (0.47) |
| U - remote sensing probe for sensor retraction tool PN250 | 0.01...300 bar (0.15...4351 psi) | -40...180 °C (-40...356°F) | 12/15 (0.47/0.59) |

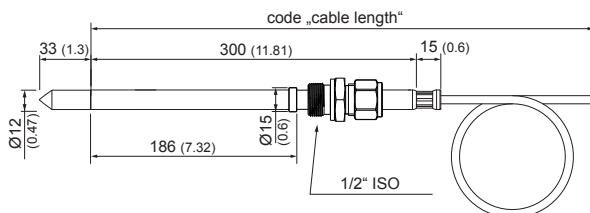


EE300Ex - Model A / E / M
wall mounting / housing remote sensing probe

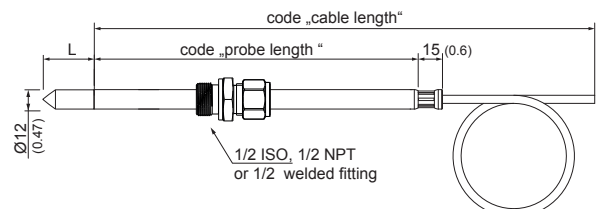
| L - length of filter [mm] | |
|---------------------------------|------------|
| stainless steel sintered filter | 33 (1.3") |
| PTFE-filter | 33 (1.3") |
| stainless steel grid filter | 39 (1.5") |
| oil filter | 32 (1.26") |



EE300Ex - Model E
remote sensing probe 20 bar (300 psi) with sliding fitting



EE300Ex - Model U
remote sensing probe for sensor retraction tool 250 bar (3625 psi)



EE300Ex - Model E / M
remote sensing probe 20 bar (300 psi) / 300 bar (4351 psi) with cut-in fitting

Technical Data EE300Ex

Measuring values

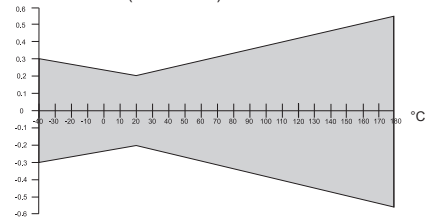
Relative humidity

| | |
|--|------------------------|
| Humidity sensor ¹⁾ | HC1000 |
| Measuring range ¹⁾ | 0...100 % RH |
| Accuracy ²⁾ (including hysteresis, non-linearity and repeatability, traceable to international 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 electronics | typ. 0.03 % RH/°C |
| Response time with filter at 20 °C (68 °F) / t ₉₀ | < 30 sec. |

Temperature

| | |
|-----------------------------|---|
| Temperature sensor | Pt1000 (Tolerance class A, DIN EN 60751) |
| Measuring range sensor head | wall mounting: -40...60 °C (-40...140 °F) |
| | remote sensing probe: Δ°C -40...180 °C (-40...356 °F) |

Accuracy



Temperature dependence of electronics typical 0.005 °C/°C

Calculation functions

| | | from | to | unit |
|-----------------------|-------|-----------|---------------|----------------------|
| | | | wall mounting | remote sensing probe |
| Dew/Frost point temp. | Td/Tf | -40 (-40) | 60 (140) | 100 (212) |
| Wet bulb temperature | Tw | 0 (32) | 60 (140) | 100 (212) |
| Water vapour pressure | e | 0 (0) | 200 (3) | 1100 (15) |
| Mixing ratio | r | 0 (0) | 425 (2900) | 999 (9999) |
| Absolute humidity | dv | 0 (0) | 150 (60) | 700 (300) |
| Specific enthalpy | H | 0 (0) | 400 (150000) | 2800 (999999) |
| Water activity | aw | 0 | - | 1 |
| Water content | x | 0 | - | 100000 |

Outputs

freely selectable and scalable outputs 2 x 4 - 20 mA (2-wire) galvanically isolated R_L=(V_{cc}-9V)/20mA
 Output 1 (CH1) must be connected!

General

| | |
|--|---|
| Supply voltage (Class III) | V _{cc min} =(9+R _L *0.02) VDC V _{cc max} =28 V DC |
| Current consumption | max 20 mA per channel |
| Pressure range for pressure tight sensor probe | refer to model |
| Serial interface for communication ³⁾ | RS232 |
| System requirements for software | WINDOWS XP or later |
| Protection class of housing | IP65 / Nema 4 |
| Cable gland | M16 for cable diameter 5 - 10 mm (0.2" - 0.4") |
| Electrical connection | screw terminals max. 1.5 mm ² (AWG 16) |
| Temperature range | sensor head according measuring range |
| | electronic -40...60 °C (-40...140 °F) |
| | electronic with display -20...60 °C (-4...140 °F) |
| Storage temperature range | electronic and sensor head -20...60 °C (22...140 °F) |
| Electromagnetic compatibility according | EN61326-1 EN61326-2-3 ICES-003 ClassB Industrial Environment FCC Part15 ClassB |
| Material | |
| Housing | Stainless Steel 1.4404 |
| Probe cable | PTFE |
| Probe (without Filter) | Stainless Steel 1.4301 |

1) Refer to the working range of the humidity sensor.

2) 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).

3) Configuration adapter E-PCA and cable HA011061 necessary.



Ex - Classifications

Europe (ATEX)

Certificate: TPS 13 ATEX 38892 003 X by TÜV SÜD Product Service GmbH
Safety factors: $U_i = 28V$; $I_i = 100mA$; $P_i = 700mW$; $C_i = 2.2nF$; $L_i \approx 0mH$

Ex-Designation:

| | | | |
|-----------------------------|---------------------------|---|------------------------------------|
| Transmitter without display | II 1 G Ex ia IIC T4 Ga | / | II 1 D Ex ia IIIC T80°C Da |
| Transmitter with display | II 2 G Ex ia IIC T4 Gb | / | II 1 G Ex ia IIB T4 Ga |
| Remote sensing probe | II 1 G Ex ia IIC T6-T1 Ga | / | II 1 D Ex ia IIIC T80°C...220°C Da |

International (IECEx)

Certificate: IECEx FMG 14.0017 X by FM Approvals
Safety factors: $6.4 Vdc \leq U_i \leq 28Vdc$; $I_i = 100mA$; $P_i = 700mW$; $C_i = 2.2nF$; $L_i = 0mH$

Ex-Designation:

| | | | |
|-----------------------------|--|---|------------------------------------|
| Transmitter without display | Ex ia IIC T4 Ta = -40°C to 60°C Ga | / | Ex ia IIIC T131°C Da |
| Transmitter with display | Ex ia IIC T4 Ta = -40°C to 60°C Gb | / | Ex ia IIB T4 Ta = -40°C to 60°C Ga |
| Remote sensing probe | Ex ia IIC T6-T1 Ta = -70°C to 200°C Ga | / | Ex ia IIIC T80°C Da |

USA and Canada (FM)

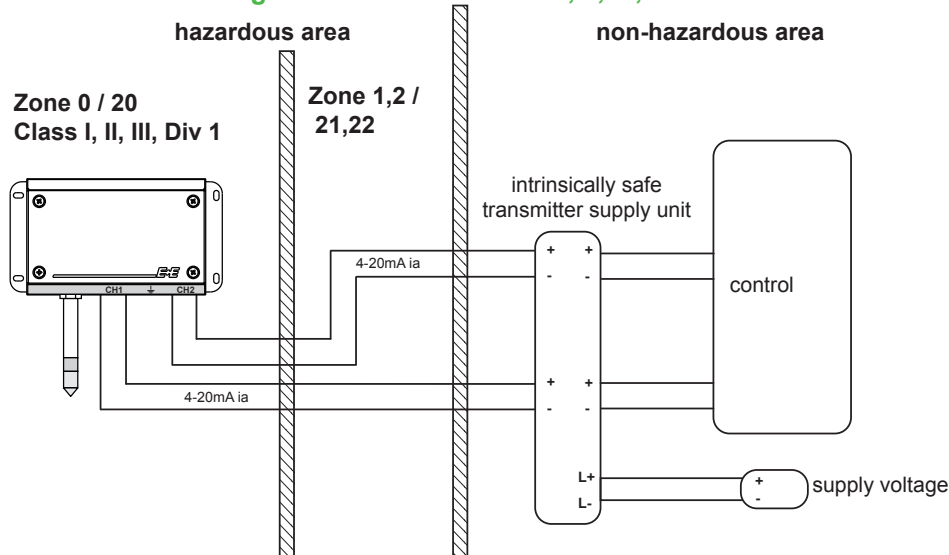
Certificate: by FM Approvals
Safety factors: $6.4 Vdc \leq V_{max}$ (or U_i) $\leq 28Vdc$; I_{max} (or I_i) = 100mA; $P_i = 700mW$; $C_i = 2.2nF$; $L_i = 0mH$

Ex-Designation:

| | |
|-----------------------------|---|
| Transmitter without display | IS/I,II,III/1/ABCDEFGH/T4 -40°C < Ta < 60°C; Entity – M1_1309080; IP65 USA: NI/I,II,III/2/ABCDEFGH/T4 -40°C < Ta < 60°C Canada: NI/I/2/ABCD/T4 -40°C < Ta < 60°C I/0/AEx ia IIC T4 -40°C < Ta < 60°C; Entity – M1_1309080; IP65 I/0/Ex ia IIC T4 -40°C < Ta < 60°C Ga; Entity – M1_1309080; IP65 20/AEx ia IIIC T131°C -40°C < Ta < 60°C; Entity – M1_1309080; IP65 |
| Transmitter with display | IS/II/1/CD/T4 -40°C < Ta < 60°C; Entity – M1_1309080 IS/II/2/ABCD/T4 -40°C < Ta < 60°C; Entity – M1_1309080 NI/II/2/ABCD/T4 -40°C < Ta < 60°C I/0/AEx ia IIB T4 -40°C < Ta < 60°C; Entity – M1_1309080 I/1/AEx ia IIC T4 -40°C < Ta < 60°C; Entity – M1_1309080 I/0/Ex ia IIB T4 -40°C < Ta < 60°C Ga; Entity – M1_1309080 I/1/Ex ia IIC T4 -40°C < Ta < 60°C Gb; Entity – M1_1309080 |
| Remote sensing probe | IS/I,II,III/1/ABCDEFGH/T6-T1 Entity – M1_1309080; IP65 USA: NI/I,II,III /2/ABCDEFGH/T6-T1 Canada: NI/II/2/ABCD/T6-T1 I/0/AEx ia IIC T6-T1 Entity – M1_1309080; IP65 I/0/Ex ia IIC T6-T1 Ga Entity – M1_1309080; IP65 20/AEx ia IIIC T80°C Entity – M1_1309080; IP65 |

Mounting Example

EE300Ex - wall mounting in zone 0 or 20 / Class I, II, III; Div. 1:



Ordering Guide EE300Ex-HT

| | | EE300Ex-HT6S | | | | |
|--|---|---|--|----|----|--|
| | | A | E | M | U | |
| Hardware Configuration | Model | wall mounting | | | | |
| | | remote sensing probe up to 20 bar (300 psi) | | | | |
| | | remote sensing probe up to 300 bar (4351 psi) | | | | |
| | | remote sensing probe for sensor retraction tool PN250 | | | U | |
| | Display | without display | x | x | x | |
| | | with display ¹⁾ | D | D | D | |
| | Electrical Connection | 2 x M16 cable gland | B | B | B | |
| | Probe - Cable Length | wall mounting | x | | | |
| | | 1 m (3.3 ft) | | C | C | |
| | | 2 m (6.6 ft) | | E | E | |
| 5 m (16.4 ft) | | | G | G | | |
| 10 m (32.8 ft) | | | H | H | | |
| Probe Length | wall mounting | x | | | | |
| | 65 mm (2.56") ²⁾ | | C | C | | |
| | 200 mm (7.9) | | F | F | | |
| | 300 mm (11.8) | | | | | |
| Zone Feedthrough (probe fitting) | 400 mm (15.8) | | H | H | | |
| | without probe fitting | x | x | x | | |
| | 1/2 ISO - cut-in fitting; 12 mm (0.47") | | A | A | | |
| | 1/2 weld cut-in fitting; 12 mm (0.47") | | B | B | | |
| | 1/2 NPT - cut-in fitting; 12 mm (0.47") | | C | C | | |
| Filter | 1/2 ISO - sliding fitting; 13 mm (0.51") | | F | F | | |
| | 1/2 NPT - sliding fitting; 13 mm (0.51") | | H | H | | |
| | stainless steel sintered filter | D | D | D | | |
| | PTFE filter ³⁾ | E | E | E | | |
| | stainless steel grid filter on stainless steel body | I | I | I | | |
| Sensor Protection | H ₂ O ₂ filter ³⁾ | L | L | L | | |
| | oil filter | M | M | M | | |
| | without coating | x | x | x | | |
| | with coating ⁴⁾ | 1 | 1 | 1 | | |
| Ex-Certification | Europe (ATEX) | AT | AT | AT | | |
| | International (IECEX) | IC | IC | IC | | |
| | USA / Canada (FM) | FM | FM | FM | | |
| Software Configuration | Measured Value Units | metric / SI [°C] | M | M | M | |
| | | non metric / US [°F] | N | N | N | |
| | Physical Parameters Output 1 | relative humidity | UW | UW | UW | |
| | | temperature | Tx | Tx | Tx | |
| | | dew point temperature | TD | TD | TD | |
| | | frost point temperature | TF | TF | TF | |
| | | wet bulb temperature | TW | TW | TW | |
| | | water vapour partial pressure | Ex | Ex | Ex | |
| | | mixture ratio | Rx | Rx | Rx | |
| | | absolute humidity | DV | DV | DV | |
| | | specific enthalphy | Hx | Hx | Hx | |
| | | water activity | | AW | AW | |
| | | water content in mineral transformer oil | | Xm | Xm | |
| | | water content customized oil | | Xk | Xk | |
| | Scaling Range Output 1 | UW, Tx,... | yyy (select according „scaling ranges“, next page) | | | |
| | Physical Parameters Output 2 | relative humidity | UW | UW | UW | |
| | | temperature | Tx | Tx | Tx | |
| | | dew point temperature | TD | TD | TD | |
| | | frost point temperature | TF | TF | TF | |
| wet bulb temperature | | TW | TW | TW | | |
| water vapour partial pressure | | Ex | Ex | Ex | | |
| mixture ratio | | Rx | Rx | Rx | | |
| absolute humidity | | DV | DV | DV | | |
| specific enthalphy | | Hx | Hx | Hx | | |
| water activity | | | AW | AW | | |
| water content in mineral transformer oil | | | Xm | Xm | | |
| water content customized oil | | | Xk | Xk | | |
| Scaling Range Output 2 | UW, TD,... | yyy (select according „scaling ranges“, next page) | | | | |

¹⁾ No display possible for environments with combustible dust, fibers and flyings and in gases with EPL Ga IIC (Group A&B)

²⁾ Not possible with sliding fitting (Code F, H)

³⁾ Filter cap must not be used in EPL Ga IIC (Gas Group A&B)

⁴⁾ Do not use in oil

Scaling Ranges

| UW - Relative Humidity [% RH] | | | | | | | | | |
|---|-----------|-----|------------|-----|------------|-----|-----------|--|--|
| 001 | 0...100 | | | | | | | | |
| Tx - Temperature / TD - Dew Point Temperature / TF- Frost Point Temperature / TW- Wet Bulb Temperature [°C or °F] | | | | | | | | | |
| 002 | -40...60 | 007 | 0...60 | 015 | 20...120 | 083 | -40...140 | | |
| 003 | -10...50 | 008 | -30...70 | 022 | -40...80 | | | | |
| 004 | 0...50 | 012 | -40...120 | 024 | -20...80 | | | | |
| 005 | 0...100 | 014 | -20...100 | 052 | -40...180 | | | | |
| Ex - Water vapour partial pressure [mbar] | | | | | | | | | |
| 001 | 0...200 | 002 | 0...1000 | | | | | | |
| Rx - Mixture ratio [g/kg] | | | | | | | | | |
| 001 | 0...400 | 002 | 0...900 | | | | | | |
| DV - Absolute Humidity [g/m³] | | | | | | | | | |
| 001 | 0...150 | 002 | 0...700 | | | | | | |
| Hx - Specific Enthalpy [kJ/kg] | | | | | | | | | |
| 001 | -50...400 | 002 | -50...2800 | | | | | | |
| AW - Water Activity [] | | | | | | | | | |
| 001 | 0...1 | | | | | | | | |
| Xm or Xk - Water Content [ppm] | | | | | | | | | |
| 001 | 0...100 | 005 | 0...6000 | 009 | 0...20000 | | | | |
| 002 | 0...500 | 006 | 0...5000 | 010 | 0...200 | | | | |
| 003 | 0...1000 | 007 | 0...300 | 011 | 0...100000 | | | | |
| 004 | 0...10000 | 008 | 0...30000 | | | | | | |

Other scaling ranges on request.

Order Example

Example 1:

EE300EX-HT6SMBHFAD1AT/MTx052UW001

Model: remote sensing probe up to 300 bar
 Display: with display
 Electrical Connection: 2 x M16 cable gland
 Probe - Cable Length: 10 m (32.8 ft)
 Probe Length: 200 mm (7.9)
 Zone feedthrough: 1/2 ISO - cut-in fitting
 Filter: stainless steel sintered filter
 Sensor Protection: with coating
 Ex-Certification: ATEX

Measured Value Units: metric
 Physical Parameters Output 1: temperature
 Scaling Range Output 1: -40...180 °C (-40...356 °F)
 Physical Parameters Output 2: relative humidity
 Scaling Range Output 2: 0...100 % RH

Example 2:

EE300EX-HT6SAxBxxxlxFM/NTx083TD083

Model: wall mounting
 Display: without display
 Electrical Connection: 2 x M16 cable gland
 Probe - Cable Length: wall mounting
 Probe Length: wall mounting
 Zone feedthrough: without probe fitting
 Filter: stainless steel grid filter
 Sensor Protection: without coating
 Ex-Certification: USA / Canada (FM)

Measured Value Units: non metric
 Physical Parameters Output 1: temperature
 Scaling Range Output 1: -40...140 °F (-40...284 °F)
 Physical Parameters Output 2: dew point temperature
 Scaling Range Output 2: -40...140 °F (-40...284 °F)

Accessories

| | |
|--|---------------------|
| Configuration adapter for PC | (EE-PCA) |
| ATEX Connection cable with protective circuit - EE300Ex to configuration adapter | (HA011061) |
| Blank cover for housing base | (HA011401) |
| Safety Barrier, 1-channel, STAHL 9002/13-280-093-001 | (HA011410) |
| Intrinsically safe Transmitter Supply Unit, 1-channel, STAHL 9160/13-11-11 | (HA011405) |
| Intrinsically safe Transmitter Supply Unit, 2-channel, STAHL 9160/23-11-11 | (HA011406) |
| Sealing plug for unused cable glands | (HA011402) |
| Ball valve with 1/2 ISO female thread with Ex-Certification | (HA011403) |
| Sensor retraction tool PN250 | (ZM-WA-025-040-EST) |
| Sensor retraction tool PN40 | (BG-WA-103-045-EST) |