

+ Datasheet EE776

**Insertion Flow Sensor for Compressed
Air and Gases DN50 - DN700 (2" - 28")**



EE776

Insertion Flow Sensor for Compressed Air and Gases DN50 - DN700 (2" - 28")

The EE776 employs the thermal mass flow measurement principle and is suitable for pipe diameter DN50 (2") to DN700 (28"). It is ideal for monitoring and metering compressed air, nitrogen, CO₂ and other non-corrosive and non-flammable gases with a pressure up to 16 bar (232 PSI).

Versatility

The EE776 is available for two measuring ranges 0.2...100 m/s (40...19685 SFPM) and 0.2...200 m/s (40...39370 SFPM) and features various probes for maximum immersion depth 165 mm (6.5"), 315 mm (12.4") and 465 mm (18.3").

Wide choice of outputs

The measured data is available on two outputs, which can be configured as analogue current or voltage, switch or pulse signal for consumption metering. Optionally, the EE776 features also Modbus RTU or M-Bus (Meter-Bus) interface.

Easy and safe mounting

The patented non-return protection combines three functions:

- **Non-return protection**

The sensing probe can only slide in one direction during installation. It cannot return (blow out), even if released.

- **Sealing**

An encapsulated O-ring avoids leakage when mounting the device under pressure.

- **Precise positioning**

The design facilitates the precise positioning of the sensing probe (immersion depth and orientation), which is paramount for high accuracy measurement.

User configurable and adjustable

The USB interface and the free software facilitate the EE776 configuration which includes selecting the measurands and the output signals, uploading the working pressure and the pipe diameter and adjusting the device.



Features

Measurands

- Standard volume flow (V'n)
- Mass flow (m')
- Standard flow (vn)
- Temperature (T)
- Consumption (Qn)

Process interface

- Non-return protection for secure mounting
- Assembly/ disassembly under pressure without flow interruption
- Hot-tapping possible
- Pipe diameters DN50 (2") to DN700 (28")
- Pressure rating 16 bar (232 psi)

Consumption metering

- Consumption meter (totalizer) for cost-effective analysis
- Stored in non-volatile memory
- Available on pulse output

Input for pressure sensor

- Dynamic pressure compensation: 4 - 20 mA (2-wire; 15 V)

Output

- User configurable via PC
- 0 - 10 V/4 - 20 mA output
- Two switch outputs
- Pulse output
- Modbus RTU
- M-Bus

Flow sensor head

- Material: Stainless steel

Probe with hot film sensing element

- Robust design in stainless steel
- Highly insensitive to contamination
- Broad measuring range up to 200 m/s (39 370 SFPM)
- High accuracy $\pm 1.5\%$ of the measured value
- Long-term stability and high reproducibility
- Factory adjustment under pressure

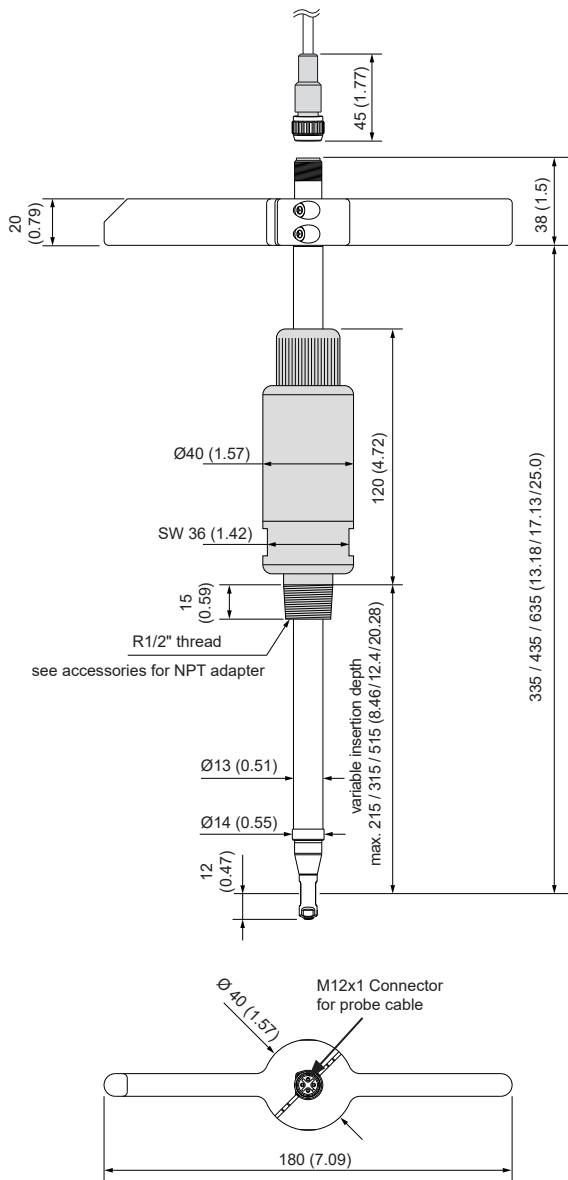
Inspection certificate

According to DIN EN 10204-3.1

Dimensions

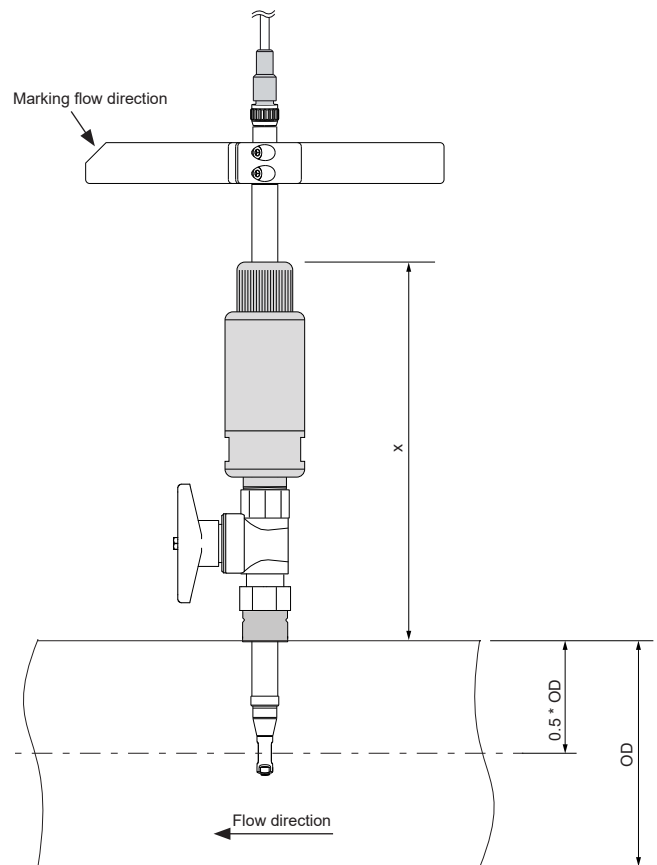
Values in mm (inch)

Sensor probe



Assembly

Insertion depth



$$\text{Insertion depth} = x + \frac{\text{OD}}{2}$$

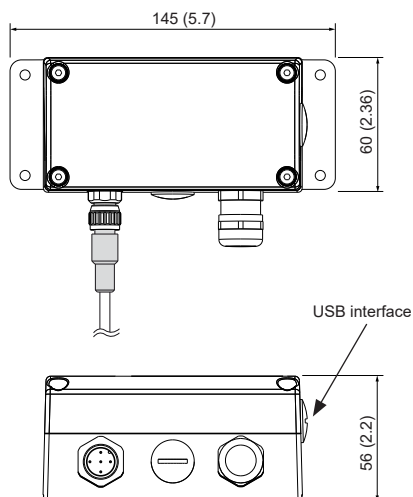
OD... Outside diameter

Dimensions

Values in mm (inch)

Enclosure

Signal conditioning unit

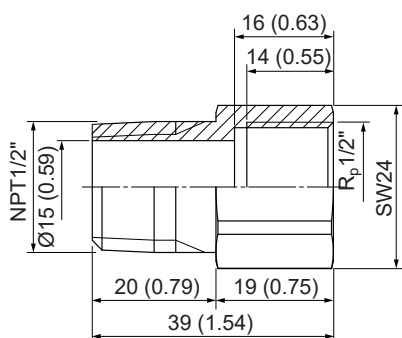


Dimensions of Accessories

Values in mm (inch)

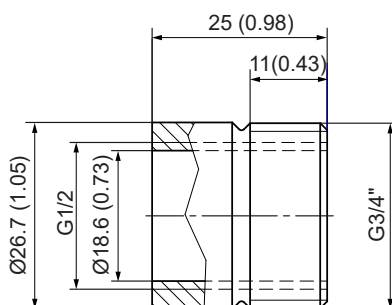
Adapter BSP - NPT

HA074004 Material: brass



Welding nipple

HA074001 Material: stainless steel 1.4301

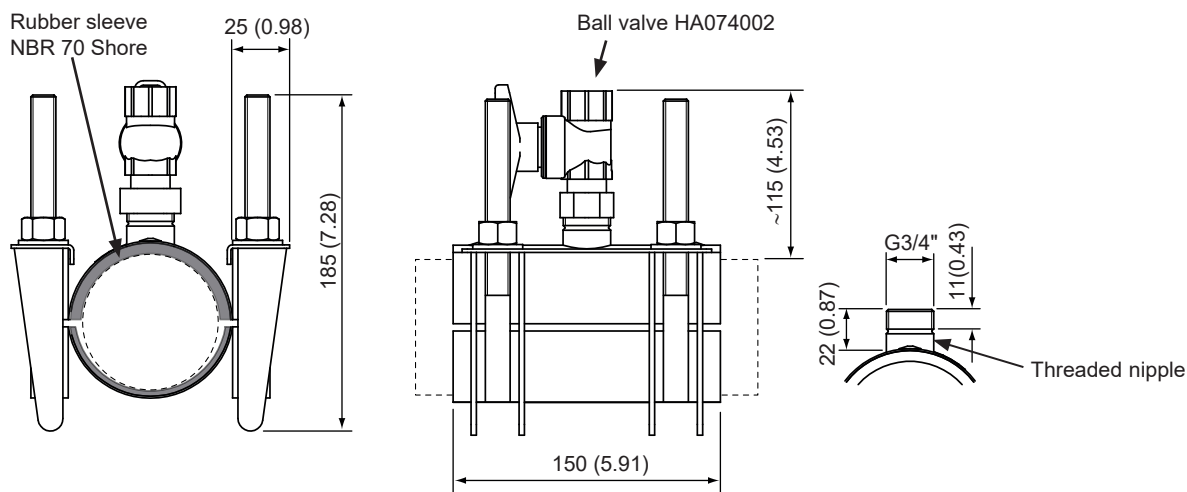


Dimensions of Accessories

Values in mm (inch)

Tapping sleeve (delivery without ball valve)

HA074xxx Material: stainless steel 1.4301



- Slip-proof and oil-resistant rubber sleeve
- Half shell construction for easy assembly
- For installations without flow interruption and welding

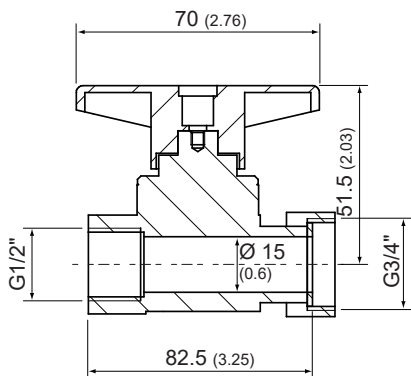
Pipe	Clamping range [mm (inch)]	TÜV certified for working pressure
DN50 (2")	47 - 67 (1.85 - 2.64)	16 bar (232 psi)
DN65 (2 1/2")	73 - 93 (2.87 - 3.66)	16 bar (232 psi)
DN80 (3")	86 - 106 (3.39 - 4.17)	16 bar (232 psi)
DN100 (4")	107 - 127 (4.21 - 5.00)	16 bar (232 psi)
DN125 (5")	128 - 148 (5.04 - 5.83)	16 bar (232 psi)
DN150 (6")	149 - 171 (5.87 - 6.73)	16 bar (232 psi)
DN200 (8")	216 - 236 (8.50 - 9.29)	16 bar (232 psi)
DN250 (10")	260 - 280 (10.24 - 11.02)	10 bar (145 psi)
DN300 (12")	315 - 335 (12.40 - 13.19)	10 bar (145 psi)

Dimensions of Accessories

Values in mm (inch)

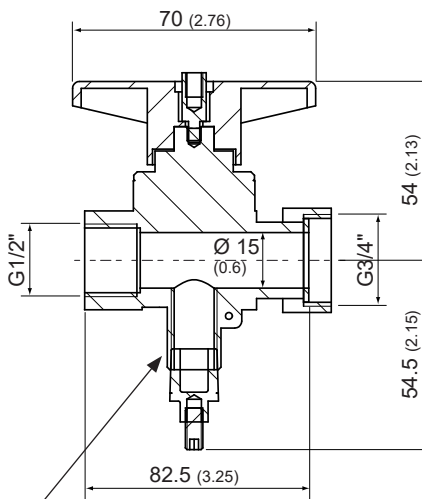
Ball valve 1/2"

HA074002 Material: brass



Ball valve 1/2" for bypass measurement

HA074003 Material: brass



Lateral fitting R_p 1/4" for mounting of pressure or dew point sensor

Technical Data

Measurands

Volume Flow (V'n)

Standard conditions	Factory setting according to DIN 1343 $p_0 = 1013.25 \text{ mbar (14.7 psi)}$, $T_0 = 0 \text{ °C (32 °F)}$, configurable
Measuring range	0.2...100 m/s (40...19685 SFPM) or 0.2...200 m/s (40...39370 SFPM)
Accuracy in air at 9 bar (130.5 psi) (abs.) and 23 °C (73 °F) ¹⁾	$\pm(1.5 \text{ \% of measured value} + 0.8 \text{ \% of full scale})$
Temperature dependency	$\pm(0.1 \text{ \% of measured value / °C deviating from } 20 \text{ °C})$ $\pm(0.18 \text{ \% of measured value / °F deviating from } 68 \text{ °F})$
Response time t_{90}	<1 s
Sampling interval	0.5 s

1) 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).

Temperatur (T)

Measuring range	-20...+80 °C (-4...+176 °F)
Accuracy @ 20 °C	$\pm 0.7 \text{ °C } (\pm 1.26 \text{ °F})$

Outputs

Analogue

Signal range and measurands are freely configurable			
Analogue output	Voltage	0 - 10 V	max. $\pm 1 \text{ mA}$
	Current	0 - 20 mA 3-wire	$R_L < 500 \text{ } \Omega$
		4 - 20 mA 3-wire	$R_L < 500 \text{ } \Omega$
			$R_L = \text{load resistance}$
Relay (switch output)	Potential free		
Switching capacity	Max. 44 V DC, 500 mA		
Pulse output	Totalizer (consumption meter)		
Pulse length	0.02...2 s		

Digital

Digital interface (optional)	RS485 (EE776 = 1 unit load)
Protocol	Modbus RTU
Factory settings	9600 Baud ¹⁾ , parity even, 1 stop bit, Modbus address 1
Supported Baud rates	9600, 19200, 38400 and 57600
Measured data types	FLOAT32 and INT16
Protocol	M-Bus
Factory settings	2400 Baud ²⁾ , parity even, 1 stop bit, M-Bus address 1
Supported Baud rates	600, 1200, 2400, 4800 and 9600

1) For further information, see the User Manual and the Modbus Application Note at www.epluse.com/ee776.




2) For further information, see the User Manual.

Input

Dynamic pressure compensation	4 - 20 mA (2-wire; 15 V) for pressure sensor (relevant for gases other than air and nitrogen)
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Technical Data

General

Power supply class III  USA & Canada: Class 2 supply necessary, max. voltage 30 V DC	18 - 30 V AC/DC
Current consumption , max.	200 mA
Electrical connection	Cable gland M16x1.5 (optional connector M12x1, 8 poles)
Nominal pressure	16 bar/232 psi
Medium	Compressed air or non-corrosive gases
Humidity working range	0...99 %RH, non-condensing
Temperature range	Ambient/Storage -20...+60 °C (-4...+140 °F) Medium -20...+80 °C (-4...+176 °F)
Material	Enclosure Die-cast aluminium (AlSi9Cu3) Probe Stainless steel Probe head/Probe Stainless steel/glass Non-return protection Brass
Enclosure protection rating	IP65/NEMA 4
Electromagnetic compatibility	EN 61326-1 EN 61326-2-3 Industrial environment FCC Part15 Class B ICES-003 Class B
Conformity	 

Flow measuring range in dependence on pipe diameter

Pipe	Inner Ø		Measuring range in m³/h	
	Inch	mm (inch)	0.2...100 m/s (40...19685 SFPM)	0.2...200 m/s (40...39370 SFPM)
DN50	2	54.5 (2.15)	1.7...893 m³/h (0...493.8 SCFM)	1.7...1679 m³/h (1.0...987.6 SCFM)
DN65	2 1/2	70.3 (2.77)	2.8...1397 m³/h (1.6...821.6 SCFM)	2.8...2793 m³/h (1.6...1643.2 SCFM)
DN80	3	82.5 (3.25)	3.8...1923 m³/h (2.3...1131.5 SCFM)	3.8...3847 m³/h (2.3...2263.0 SCFM)
DN100	4	107.1 (4.22)	6.5...3242 m³/h (3.8...1906.9 SCFM)	6.5...6483 m³/h (3.8...3813.8 SCFM)
DN125	5	131.7 (5.19)	9.8...4902 m³/h (5.8...2883.5 SCFM)	9.8...9803 m³/h (5.8...5766.9 SCFM)
DN150	6	159.3 (6.27)	14.3...7171 m³/h (8.4...4218.7 SCFM)	14.3...14343 m³/h (8.4...8437.3 SCFM)
DN200	8	206.5 (8.13)	24.1...12051 m³/h (14.2...7089.0 SCFM)	24.1...24101 m³/h (14.2...14178.0 SCFM)
DN250	10	260.4 (10.25)	38.3...19163 m³/h (22.5...11272.6 SCFM)	38.3...38325 m³/h (22.5...22545.3 SCFM)
DN300	12	309.7 (12.19)	54.2...27105 m³/h (31.9...15945.1 SCFM)	54.2...54211 m³/h (31.9...31890.1 SCFM)
DN350	14	339.6 (13.37)	65.2...32591 m³/h (38.3...19172.5 SCFM)	65.2...65183 m³/h (38.3...38345.0 SCFM)
DN400	16	388.8 (15.31)	85.4...42719 m³/h (50.3...25130.2 SCFM)	85.4...85438 m³/h (50.3...50260.0 SCFM)
DN500	20	486 (19.13)	133.5...66749 m³/h (78.5...39266.0 SCFM)	133.5...133498 m³/h (78.5...78531.9 SCFM)
DN600	24	585 (23.03)	193.4...96712 m³/h (113.8...56892.6 SCFM)	193.4...193425 m³/h (113.8...113785.1 SCFM)
DN700	28	682.6 (26.87)	263.4...131675 m³/h (154.9...77459.8 SCFM)	263.4...263350 m³/h (154.9...154919.6 SCFM)

Ordering Guide

Position 1 - Flow sensor

Feature	Description	Code	
Hardware Configuration	Type	Remote T3	
	Measuring range	0.2...100 m/s (40...19 685 SFPM)	HV31
		0.2...200 m/s (40...39 370 SFPM)	HV33
	Max. Pipe diameter / probe length	DN100 (4") / 215 mm (8.46")	N100
		DN300 (12") / 315 mm (12.4")	N300
		DN700 (28") / 515 mm (20.28")	N700
	Display	Without display	No code
		Display with backlight	D2
	Electrical connection	Cable gland and screw terminals	No code
		Plug for power supply and outputs	E4
	Digital interface	Without digital output	No code
		RS485	J3
M-Bus (Meter-Bus)		J5	
Pipe diameter presetting ¹⁾	DN50 (2")	DN50	
	DN65 (2 1/2")	DN65	
	DN80 (3")	DN80	
	DN100 (4")	DN100	
	DN125 (5")	DN125	
	DN150 (6")	DN150	
	DN200 (8")	DN200	
	DN250 (10")	DN250	
	DN300 (12")	DN300	
	DN350 (14")	DN350	
	DN400 (16")	DN400	
	DN500 (20")	DN500	
	DN600 (24")	DN600	
	DN700 (28")	DN700	
Output 1 measurand	Temperature T [°C]	MA1	
	Temperature T [°F]	MA2	
	Standardized flow v _n [m/s]	MA22	
	Standardized flow v _n [ft/min]	MA23	
	Mass flow m' [kg/h]	MA80	
	Standardized volumetric flow V' _n [m ³ /h]	MA83	
	Standardized volumetric flow V' _n [ft ³ /min]	MA87	
Output signal 1	Analogue output	0 - 5 V	GA2
		0 - 10 V	GA3
		0 - 20 mA	GA5
		4 - 20 mA	GA6
	Switch output	GA9	
Output 2 measurand	Temperature T [°C]	MB1	
	Temperature T [°F]	MB2	
	Standardized flow v _n [m/s]	MB22	
	Standardized flow v _n [ft/min]	MB23	
	Mass flow m' [kg/h]	MB80	
	Standardized volumetric flow V' _n [m ³ /h]	MB83	
	Standardized volumetric flow V' _n [ft ³ /min]	MA87	
Volumetric consumption ²⁾ Q _n [m ³]	MB91		
	Volumetric consumption ²⁾ Q _n [ft ³]	MB93	
Output signal 2	Switch output	GB9	
	Pulse output ²⁾	GB10	
Medium	Air	No code	
	Nitrogen	FU2	
	CO ₂	FU3	
	Argon	FU7	

1) Value of pipe diameter presetting must be equal or smaller than the maximum pipe diameter / probe length selection.

2) Consumption measurement is possible only with pulse output (output 2 = GB10).

Position 2 - Probe connection cable

Connection cable, 5 poles	2 m (6.56 ft)	HA010816
	5 m (16.40 ft)	HA010817
	10 m (32.81 ft)	HA010818

Order Example

Position 1 - Flow sensor

EE776-T3HV31N100DN50MA83GA6MP91GB10

Feature	Code	Description
Type	T3	Remote
Measuring range	HV31	0.2...100 m/s (40...19 685 SFPM)
Max.Pipe diameter/probe length	N100	DN100 (4")/ 215 mm (8.46")
Display	No code	Without display
Electrical connection	No code	Cable gland and screw terminals
Digital interface	No code	Without digital output
Pipe diameter presetting	DN50	DN50 (2")
Output 1 measurand	MA83	Standardized volumetric flow V'n [m ³ /min]
Output signal 1	GA6	4 - 20 mA
Ausgang 2 Messgröße	MB91	Volumetric consumption Qn [m ³]
Output signal 2	GB10	Pulse output
Medium	No code	Air

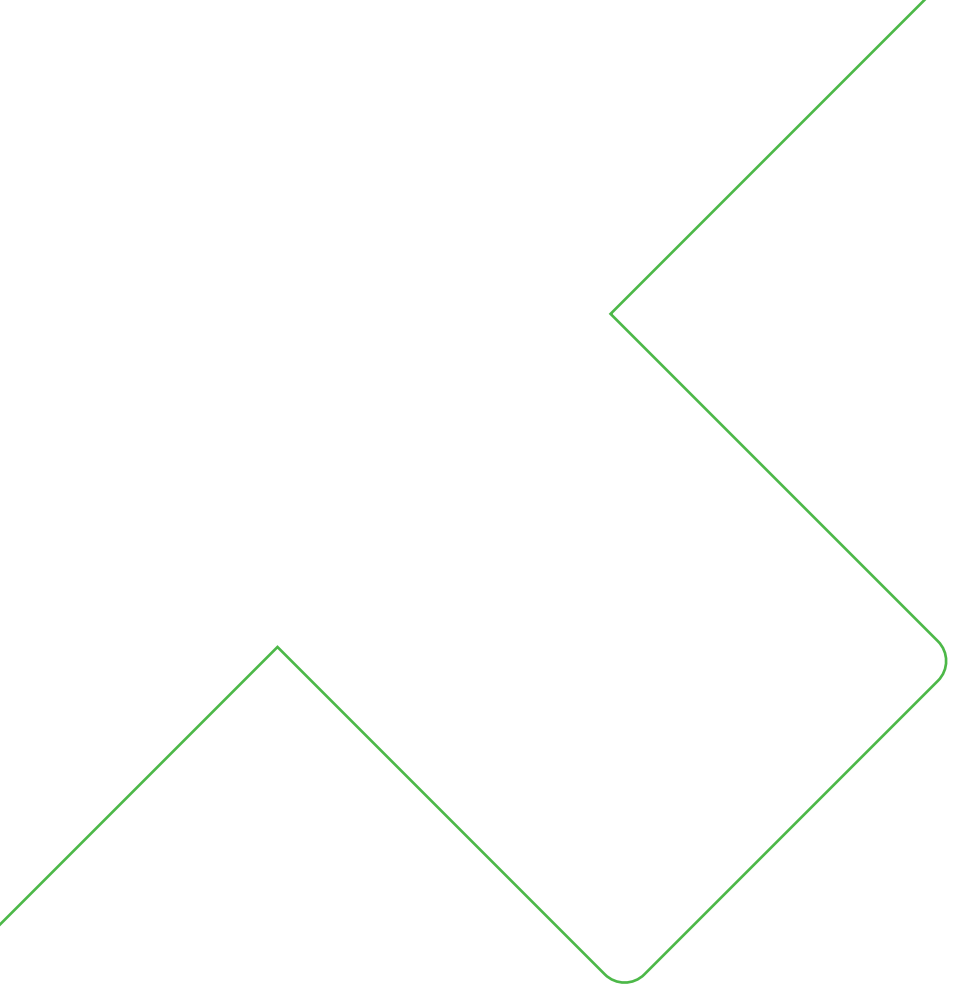
Position 2 - Probe connection cable

Feature	Code	Description
Connection cable, 5 poles	HA010816	2 m (6.56 ft)

Accessories

For further information see datasheet [Accessories](#).

Accessories	Code
Tapping sleeve DN50 (2")	HA074050
Tapping sleeve DN65 (2 1/2")	HA074065
Tapping sleeve DN80 (3")	HA074080
Tapping sleeve DN100 (4")	HA074100
Tapping sleeve DN125 (5")	HA074125
Tapping sleeve DN150 (6")	HA074150
Tapping sleeve DN200 (8")	HA074200
Tapping sleeve DN250 (10")	HA074250
Tapping sleeve DN300 (12")	HA074300
Welding nipple	HA074001
Ball valve 1/2"	HA074002
Ball valve 1/2" for bypass measurement	HA074003
Adapter Rp1/2" IT to NPT 1/2" ET	HA074004
Dew point sensor	See datasheet EE371 (www.epluse.com/ee371)
Sampling cell for dew point sensor	HA050102
Quick coupling G1/4" ET	HA070203



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