

+ 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 (Q_n)

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

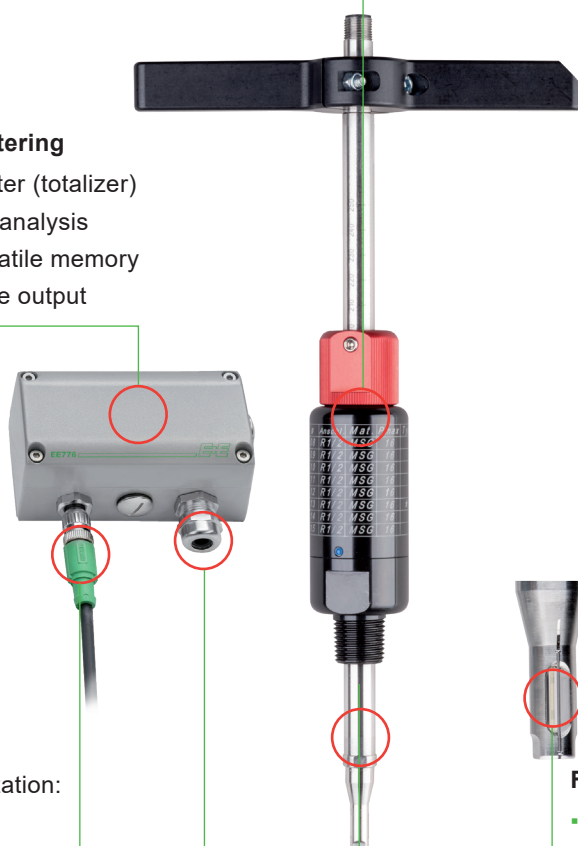
- User configurable via PC
- 0 - 10 V / 4 - 20 mA output
- Two switch outputs
- Pulse output
- Modbus RTU
- M-Bus

Probe with hot film sensing element

- Robust design in stainless steel
- Highly insensitive to contamination
- Broad measuring range up to 200 m/s (39370 SFPM)
- High accuracy $\pm 1.5\%$ of the measured value
- Long-term stability and high reproducibility
- Factory adjustment under pressure

Flow sensor head

- Material: Stainless steel



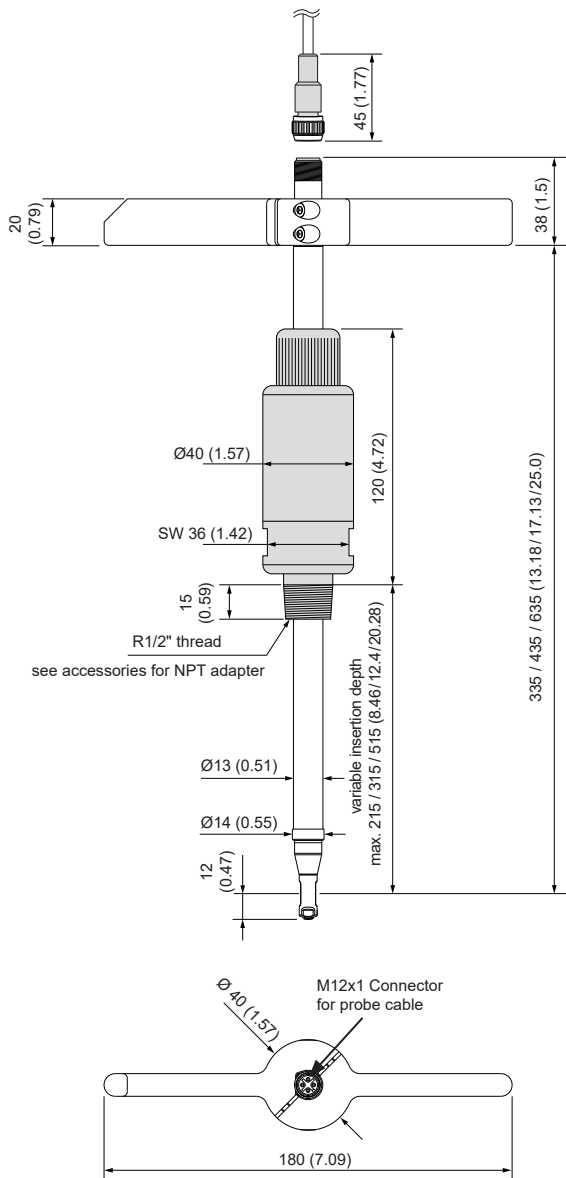
Inspection certificate

According to DIN EN 10204-3.1

Dimensions

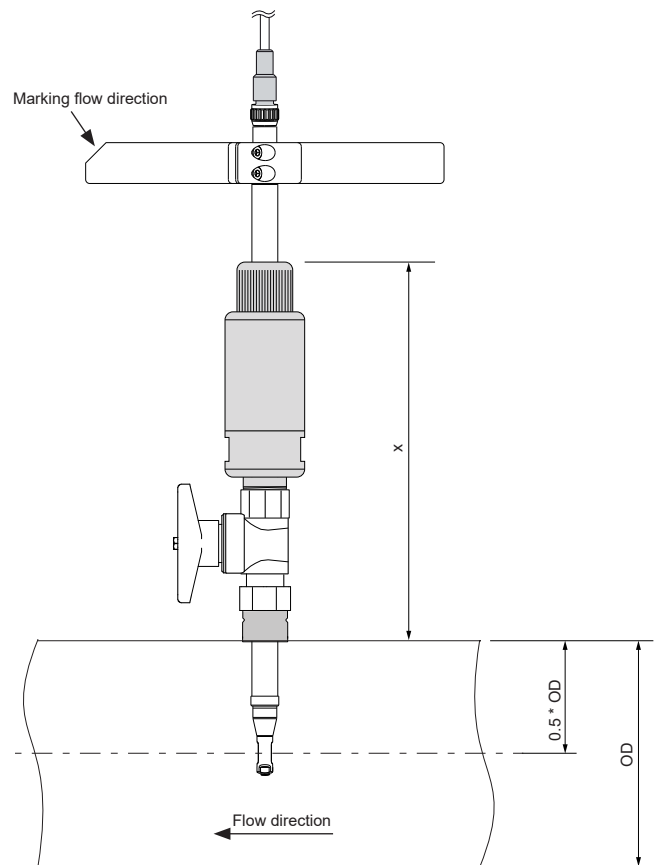
Values in mm (inch)

Sensor probe



Assembly

Insertion depth



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

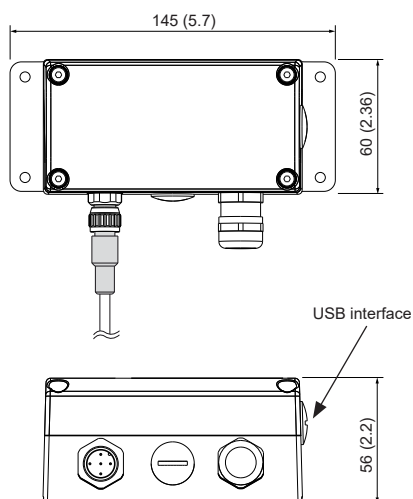
OD... Outside diameter

Dimensions

Values in mm (inch)

Enclosure

Signal conditioning unit

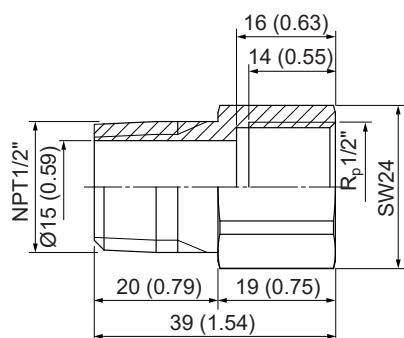


Dimensions of Accessories

Values in mm (inch)

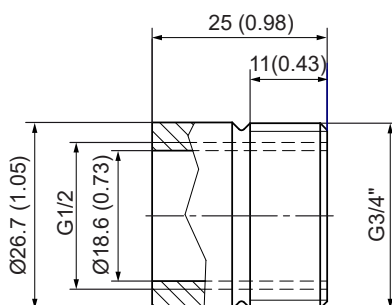
Adapter BSP - NPT

HA074004 Material: brass



Welding nipple

HA074001 Material: stainless steel 1.4301

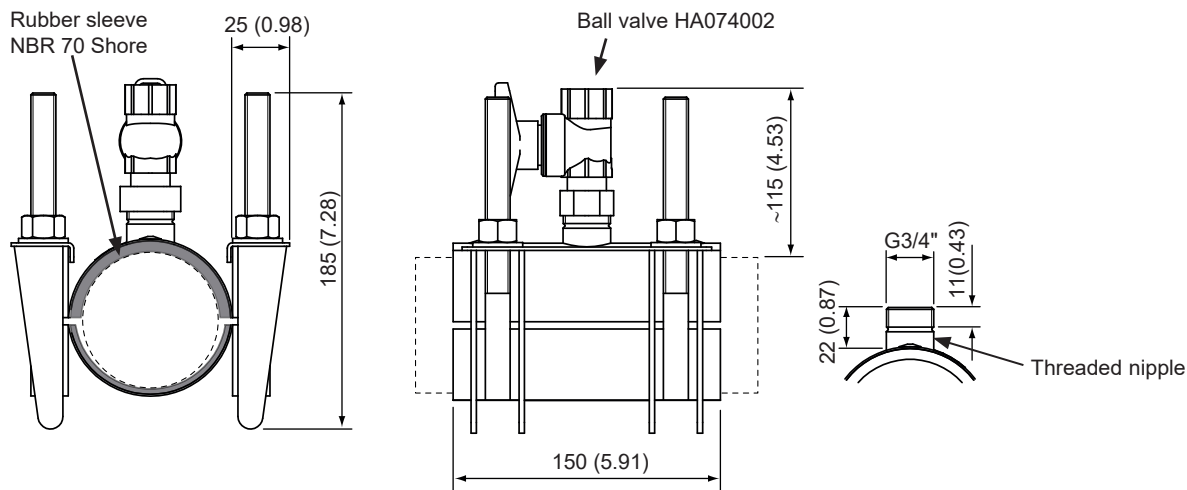


Dimensions of Accessories

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

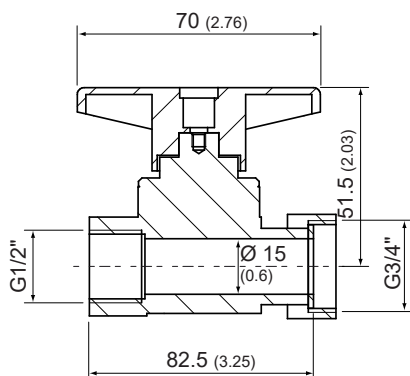
Pipe	Clamping range [mm (inch)]	TÜV certified for working pressure
DN50 (2")	47 - 67 (1.85 - 2.64)	16bar (232 psi)
DN65 (2 1/2")	73 - 93 (2.87 - 3.66)	16bar (232 psi)
DN80 (3")	86 - 106 (3.39 - 4.17)	16bar (232 psi)
DN100 (4")	107 - 127 (4.21 - 5.00)	16bar (232 psi)
DN125 (5")	128 - 148 (5.04 - 5.83)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

Dimensions of Accessories

Values in mm (inch)

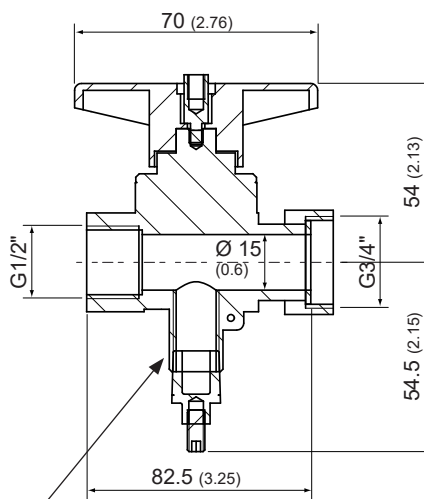
Ball valve 1/2"

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) oder 0.2...200 m/s (40...39370 SFPM)
Accuracy in air at 9 bar (130.5 psi) (abs.) und 23 °C (73 °F) ¹⁾	$\pm(1.5 \text{ \% of measured value} + 0.8 \text{ \% of full scale})$
Temperature dependency	$\pm(0.1 \text{ \% of measured value / °C abweichend von } 20 \text{ °C})$
Pressure dependency ²⁾	+0.5 % of measured value / bar
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).
2) The flow meter is calibrated at 9 bar (130.5 psi) abs. If the working pressure is different from 9 bar (130.5 psi) you can compensate the error by setting the actual pressure with the configuration software.

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 und 57600
Measured data types	FLOAT32 und 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 und 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
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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 pole)
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 Probe Probe head/Probe Non-return protection	Die-cast aluminium (AlSi9Cu3) Stainless steel Stainless steel/glass 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	EE776-T3	
	Measuring range	0.2...100 m/s (0.7... 328.1 SFPM)	HV31	
		0.2...200 m/s (0.7... 656.2 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	Kein Code	
		Display with backlight	D2	
	Electrical connection	Cable gland and screw terminals	Kein Code	
		Plug for power supply and outputs	E4	
Digital interface	Without digital output	Kein Code		
	RS485	J3		
	M-Bus (Meter-Bus)	J5		
Software Setup Outputs	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 [m³/h]	MA83	
		Standardized volumetric flow V' _n [ft³/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 [m³/h]	MB83	
		Standardized volumetric flow V' _n [ft³/min]	MA87	
		Volumetric consumption ²⁾ Q _n [m³]	MB91	
		Volumetric consumption ²⁾ Q _n [ft³]	MB93	
	Output signal 2	Switch output	GB9	
		Pulse output ²⁾	GB10	
	Medium	Air	Kein 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 pole	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 (0.7... 328.1 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

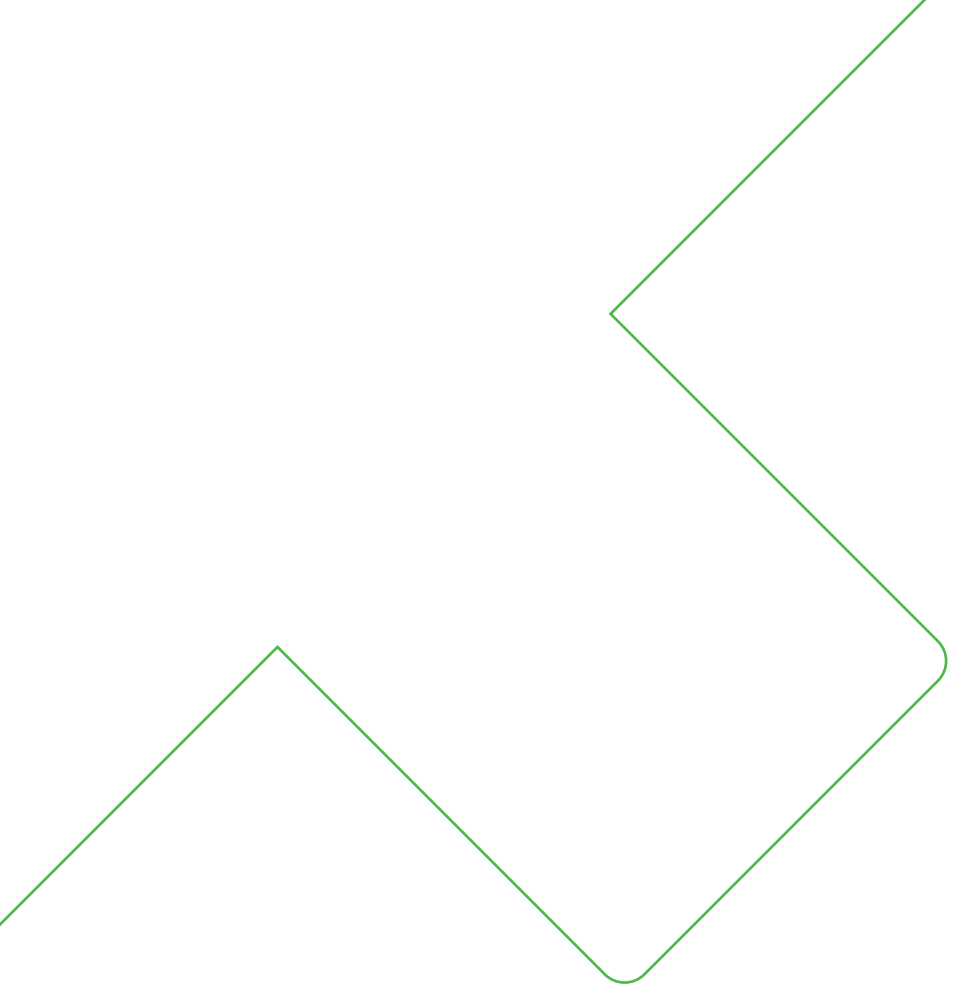
Position 2 - Probe connection cable

Feature	Code	Description
Connection cable, 5 pole	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	siehe Datenblatt EE371
Sampling cell for dew point sensor	HA050102
Quick coupling G1/4" ET	HA070203



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