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 also features 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.
- **Seal**
  An encapsulated O-ring avoids leakage when mounting the device under pressure.
- **Accurate positioning**
  The precise positioning with respect to immersion depth and orientation is easy to perform, guaranteeing accurate measurement results.

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

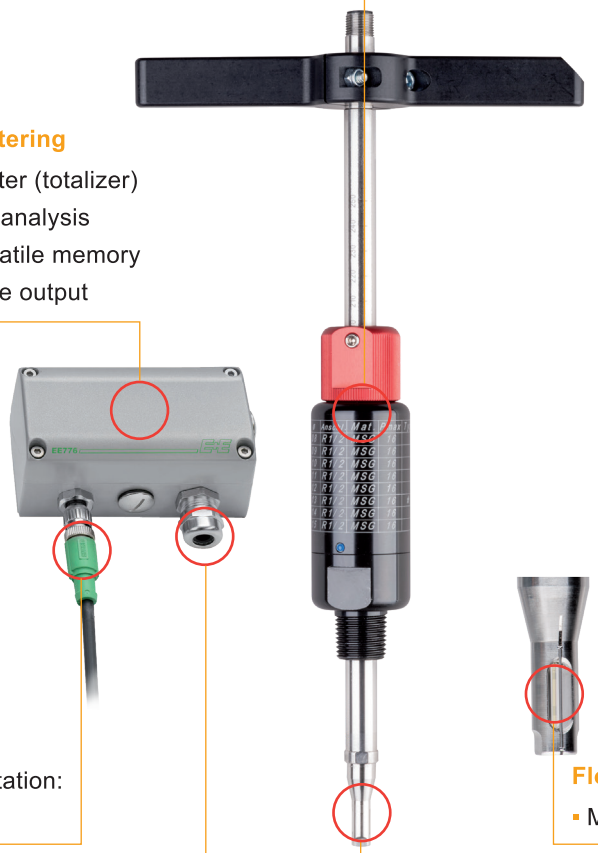
- Standardized volume flow (V'n)
- Mass flow (m')
- Standard flow (vn)
- Temperature (T)
- Standardized consumption (Qn)

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 compenstation: 4 - 20 mA (2-wire; 15 V)

Flow sensor head

- Material: Stainless steel

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 ± 1.5 % of the measured value
- Long-term stablility and high reproducibility
- Factory adjustment under pressure

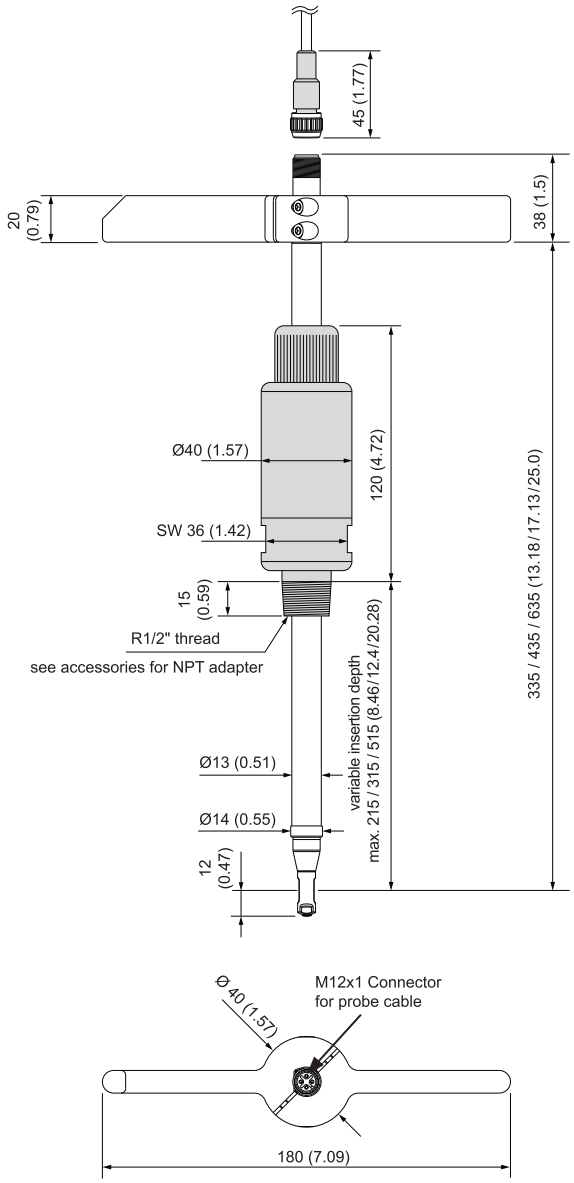
Inspection certificate

According to DIN EN 10204-3.1

Dimensions

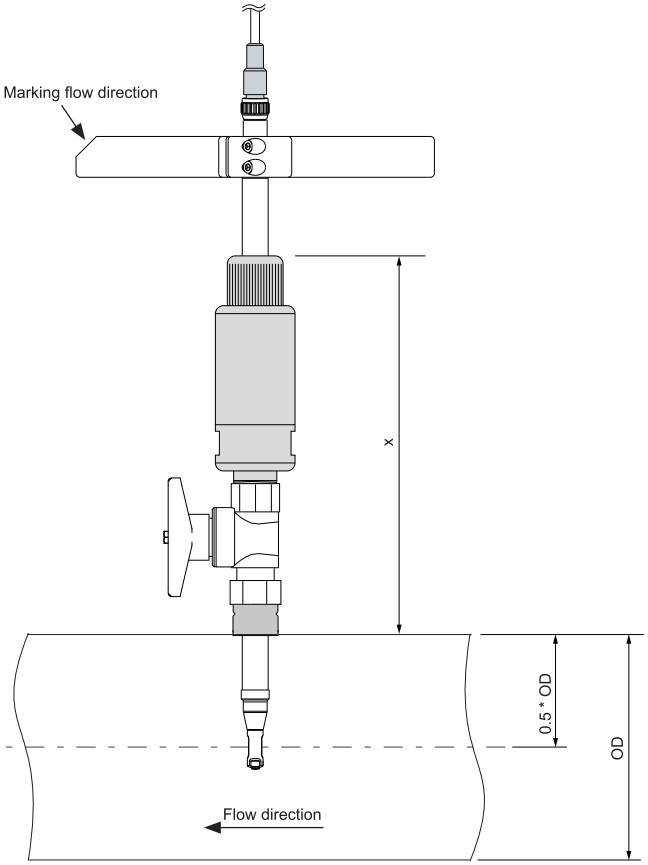
Values in mm (inch)

Sensor probe



Assembly

Insertion depth



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

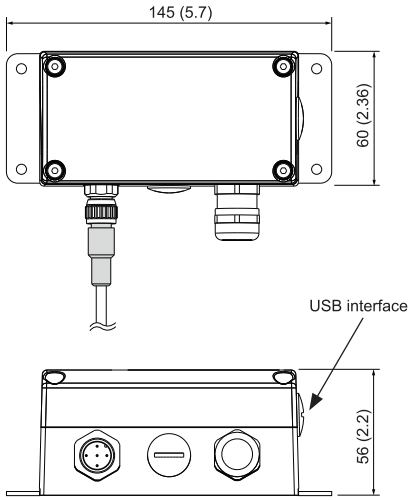
OD... Outside diameter

Dimensions

Values in mm (inch)

Enclosure

Signal conditioning unit

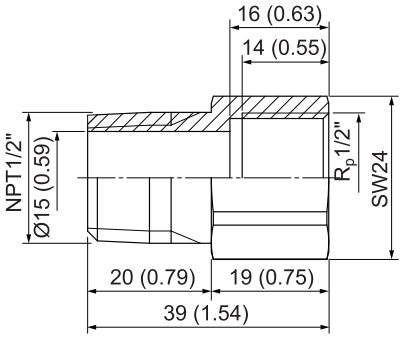


Dimensions of Accessories

Values in mm (inch)

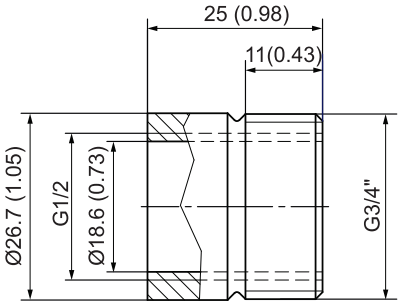
Adapter BSP - NPT

HA074004 Material: brass



Welding nippel

HA074001 Material: stainless steel 1.4301

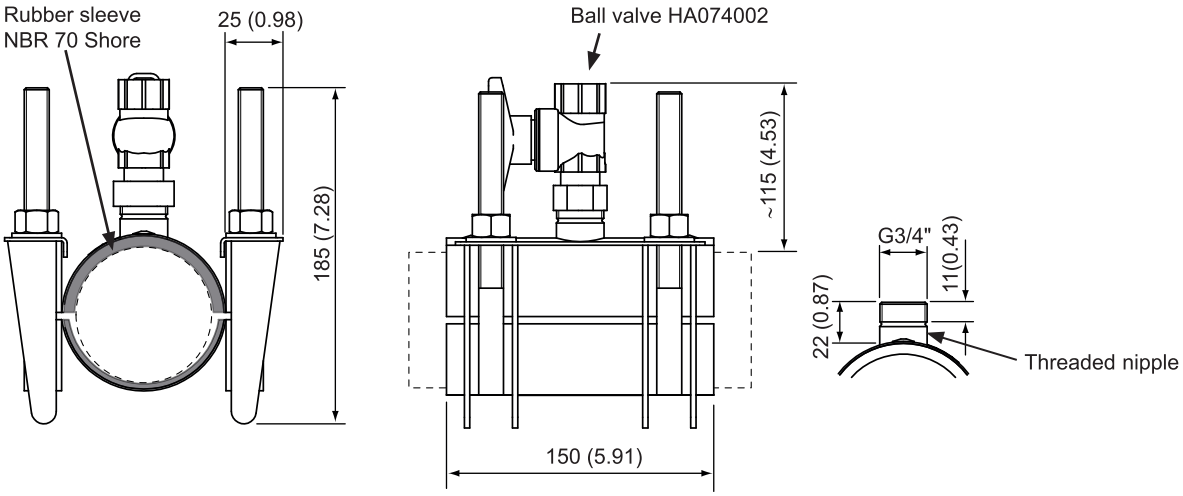


Dimensions of Accessories

Values in mm (inch)

Tapping sleeve (delivery without ball valve)

HA074*xxx* 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

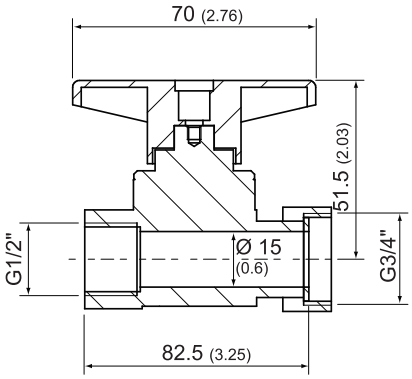
Pipe	Clamping range [mm (inch)]	TÜV certified for working pressure
DN50 (2")	47 - 67 (1.85 - 2.64)	16bar (232 psi)
DN65 (2 1/2")	73 - 93 (2.87 - 3.66)	16bar (232 psi)
DN80 (3")	86 - 106 (3.39 - 4.17)	16bar (232 psi)
DN100 (4")	107 - 127 (4.21 - 5.00)	16bar (232 psi)
DN125 (5")	128 - 148 (5.04 - 5.83)	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)

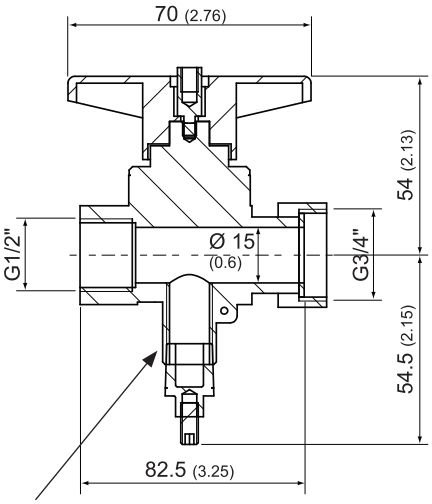
Ball valve 1/2"

HA074002 Material: brass



Ball valve 1/2" for bypass measurement

HA074003 Material: brass



Lateral fitting R_p1/4" for mounting of pressure or dew point sensor

Technical Data

Measurands

Volume Flow (V'n)

Standard conditions	Factory setting according to DIN 1343 pn = 1013.25 mbar (14.7 psi), Tn = 0 °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.) und 23 °C (73 °F) [1)]	±(1.5 % of measured value + 0.8 % of full scale)
Temperature dependency	±(0.1 % of measured value / °C deviating von 20 °C) ±(0.18 % of measured value / °F deviating from 68 °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).
The accuracy specifications apply when using inlet and outlet sections of suitable length, see Accessories and refer to the User Manual.

Temperatur (T)

Measuring range	-20...+80 °C (-4...+176 °F)
Accuracy @ 20 °C	±0.7 °C (±1.26 °F)

Outputs

Analogue

Signal range and measurands are freely configurable				
Analogue output	**Voltage**	0 - 10 V	max. ±1 mA	
	Current	0 - 20 mA 3-wire	R_L < 500 Ω	R_L = load resistance
		4 - 20 mA 3-wire	R_L < 500 Ω	

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 **Factory settings** **Supported Baud rates** **Measured data types**	Modbus RTU 9600 Baud[1)], parity even, 1 stop bit, Modbus address 1 9600, 19200, 38400 und 57600 FLOAT32 and INT16
Protocol **Factory settings** **Supported Baud rates**	M-Bus 2400 Baud[2)], parity even, 1 stop bit, M-Bus address 1 600, 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)

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** **Medium**	-20...+60 °C (-4...+140 °F) -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		CE UKCA

Flow Measuring Range in Dependence on Pipe Diameter

Pipe		Measuring range in m^3/h	
	Inch	**0.2...100 m/s (40...19 685 SFPM)**	**0.2...200 m/s (40...39 370 SFPM)**
DN50	2	1.7...839 m^3/h (0...493.8 SCFM)	1.7...1 679 m^3/h (1.0...987.6 SCFM)
DN65	2 1/2	2.8...1 397 m^3/h (1.6...821.6 SCFM)	2.8...2 793 m^3/h (1.6...1 643.2 SCFM)
DN80	3	3.8...1 923 m^3/h (2.3...1 131.5 SCFM)	3.8...3 847 m^3/h (2.3...2 263.0 SCFM)
DN100	4	6.5...3 242 m^3/h (3.8...1 906.9 SCFM)	6.5...6 483 m^3/h (3.8...3 813.8 SCFM)
DN125	5	9.8...4 902 m^3/h (5.8...2 883.5 SCFM)	9.8...9 803 m^3/h (5.8...5 766.9 SCFM)
DN150	6	14.3...7 171 m^3/h (8.4...4 218.7 SCFM)	14.3...14 343 m^3/h (8.4...8 437.3 SCFM)
DN200	8	24.1...12 051 m^3/h (14.2...7 089.0 SCFM)	24.1...24 101 m^3/h (14.2...14 178.0 SCFM)
DN250	10	38.3...19 163 m^3/h (22.5...11 272.6 SCFM)	38.3...38 325 m^3/h (22.5...22 545.3 SCFM)
DN300	12	54.2...27 105 m^3/h (31.9...15 945.1 SCFM)	54.2...54 211 m^3/h (31.9...31 890.1 SCFM)
DN350	14	65.2...32 591 m^3/h (38.3...19 172.5 SCFM)	65.2...65 183 m^3/h (38.3...38 345.0 SCFM)
DN400	16	85.4...42 719 m^3/h (50.3...25 130.2 SCFM)	85.4...85 438 m^3/h (50.3...50 260.0 SCFM)
DN500	20	133.5...66 749 m^3/h (78,5...39 266.0 SCFM)	133.5...133 498 m^3/h (78.5...78 531.9 SCFM)
DN600	24	193.4...96 712 m^3/h (113.8...56 892.6 SCFM)	193.4...193 425 m^3/h (113.8...11 3785.1 SCFM)
DN700	28	263.4...131 675 m^3/h (154.9...77 459.8 SCFM)	263.4...263 350 m^3/h (154.9...154 919.6 SCFM)

Ordering Guide

Position 1 - Flow sensor

	Feature	Description		Code
Hardware Configuration				EE776-
	Type	Remote		T3
	Measuring range	0.2...100 m/s (0.7... 19685 SFPM)		HV31
		0.2...200 m/s (0.7... 39370 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
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 vn [m/s]		MA22
		Standardized flow vn [ft/min]		MA23
		Mass flow m' [kg/h]		MA80
		Standardized volume flow V'n [m^3/h]		MA83
		Standardized volume 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 vn [m/s]		MB22
		Standardized flow vn [ft/min]		MB23
		Mass flow m' [kg/h]		MB80
		Standardized volume flow V'n [m^3/h]		MB83
		Standardized volume flow V'n [ft^3/min]		MA87
		Standardized consumption[2] Qn [m^3]		MB91
		Standardized consumption[2] Qn [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 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 (40...19685 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 volume flow V'n [m^3/min]
Output signal 1	GA6	4 - 20 mA
Ausgang 2 Messgröße	MB91	Standardized 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	See datasheet EE371 (www.epluse.com/ee371)
Sampling cell for dew point sensor	HA050102
Quick coupling G1/4" ET	HA070203


Instromart
Sensors & Instrumentation