

Viscosity, temperature and density sensor For real-time monitoring of lubricating oils and fuels Model VTL-30

WIKA data sheet SP 89.02



MesoScale®

Applications

- Condition monitoring of lubricating and heavy fuel oils
- Fuel identification in storage tanks and tanker vehicles
- Amine solution monitoring in carbon capture

Special features

- Compact design for easy integration
- Innovative technology with real-time measurement and high repeatability
- Low maintenance and robust design
- Measurement technology for carbon capture efficiency monitoring



Model VTL-30 viscosity sensor; with M12 x 1 circular connector, IEC-61075-2-101 (5-pin)

Description

The model VTL-30 measures, continuously and in real time, key basic properties of liquids: viscosity, temperature and density. This allows condition monitoring of lubricating oil, verification of heavy fuel oil and supervision of oil quality during production and transport.

Compact design for easy integration

The compact sensor design allows for easy integration. Depending on the process connection, the instrument measures only 10 cm along its length. This makes the VTL-30 suitable for integration into a variety of applications, whether OEM products like analyzers or fuel/oil condition monitoring systems.

Innovative technology with real-time measurement and high repeatability

The VTL-30 is based on the innovative MesoScale® technology. This microresonator-based sensor technology delivers accurate measurement results in a wide range of liquids. It enables short response times and high repeatability.

Additionally, the sensor calculates confidence factors in real time, providing information about the quality and validity of the measurements.

Low maintenance and robust design

The robust construction combined with 316L stainless steel wetted parts ensures high resistance under harsh operating conditions. The VTL-30 offers measurements with very low drift over time. It has no moving parts, thus avoiding the need for regular calibration.

The VTL-30 is approved for use in hazardous areas in accordance with ATEX, IECEx and FM.

Measurement technology for carbon capture efficiency monitoring

Among the main technologies used for carbon capture, amine solutions today are one of the most used. Through viscosity and density measurement, the VTL-30 is suitable to monitor amine concentration as the key parameter for the performance of these solutions.

Specifications

Accuracy specifications	Measuring range 1 ... 100 cP	Measuring range 30 ... 300 cSt
Accuracy		
Dynamic viscosity	< 40 cP: ± 2 cP > 40 cP: ± 5 % of the measured value	-
Kinematic viscosity	-	< 60 cSt: ± 3 cSt > 60 cSt: ± 5 % of the measured value
Temperature	± 0.5 °C	± 0.5 °C
Density	< 10 cP: ± 4.75 kg/m³ > 10 cP: ± 8 kg/m³	< 100 cSt: ± 8 kg/m³ > 100 cSt: ± 10 kg/m³
Repeatability		
Viscosity	< 10 cP: 0.2 cP > 10 cP: 2 % of the measured value	2 % of the measured value
Temperature	0.1 °C	0.1 °C
Density	1.5 kg/m ³	1.5 kg/m ³
Measuring rate	1/s	1/s

Measuring range	1 ... 100 cP	30 ... 300 cSt
Dynamic viscosity	1 ... 100 cP	-
Kinematic viscosity	-	30 ... 300 cSt
Temperature	0 ... 85 °C [32 ... 185 °F]	10 ... 60 °C [50 ... 140 °F]
Density	650 ... 1,150 kg/m ³	650 ... 1,150 kg/m ³

Process connection	
Thread size	■ Base plate (flow through): ¼ NPT
	■ Screw adapter: 1 NPT

→ Other process connections on request.

Output signal	
Signal type	
Analogue	4 ... 20 mA
Digital	Modbus® RTU (RS-485)
Settings of available outputs	
0	→ See "Pin assignment", for information about outputs → Not available for RS-485
6	→ See "Pin assignment", for information about outputs
Voltage supply	
Auxiliary power	DC 12 ... 24 V
Power consumption	< 600 mW
Dynamic behaviour	
Switch-on time	≤ 3 s

Electrical connection	
Connection type	■ Angular connector, DIN EN 175301-803 C, 4-pin ■ Circular connector M12 x 1, IEC-61076-2-101, 5-pin ■ Circular connector, DBPLU 104 Z066-130VGF, 8-pin, 2 m [6.56 ft] cable length ■ Circular connector, DBPLU 104 Z066-130VGF, 8-pin, 5 m [16.40 ft] cable length ■ Circular connector, DBPLU 104 Z066-130VGF, 8-pin, 10 m [32.81 ft] cable length
Ingress protection (IP code) per IEC 60529	IP65 → The stated IP codes only apply when plugged in using mating connectors that have the appropriate IP code.

Pin assignment

Angular connector, 4-pin	Pin	Name	Signal type: RS-485	Signal type: 4 ... 20 mA
	1	PVIN+	Power supply terminal	Power supply terminal
	2	A / A1+	RS-485-A (N1) ¹⁾	4 ... 20 mA, temperature (A1)
	3	B / A2+	RS-485-B (N2) ¹⁾	4 ... 20 mA, output 2 (A2) ²⁾
	4/GDS	0 V	Ground	Ground

1) Outputs available for RS-485, setting 6: temperature, density, dynamic viscosity, kinematic viscosity

2) Outputs available for 4 ... 20 mA, setting 0: dynamic viscosity, setting 6: kinematic viscosity

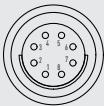
Circular connector M12 x 1, 5-pin	Pin	Name	Signal type: RS-485
	1	0 V	Ground
	2	PVIN+	Power supply terminal
	3	0 V	Ground
	4	A	RS-485-A (N1) ¹⁾
	5	B	RS-485-B (N2) ¹⁾

1) Outputs available for RS-485, setting 6: temperature, density, dynamic viscosity, kinematic viscosity

Circular connector M12 x 1, 5-pin	Pin	Name	Signal type: 4 ... 20 mA
	1	PVIN+	Power supply terminal
	2	A1+	4 ... 20 mA, temperature (A1)
	3	A2+	4 ... 20 mA, output 2 (A2) ¹⁾
	4	A3+	4 ... 20 mA, output 3 (A3) ²⁾
	5	0 V	Ground

1) Outputs available for 4 ... 20 mA, setting 0 and 6: density

2) Outputs available for 4 ... 20 mA, setting 0: dynamic viscosity, setting 6: kinematic viscosity

Circular connector, 8-pin	Pin	Name	Signal type: Function RS-485	Signal type: Function 4 ... 20 mA	Wiring
	1	A	RS-485-A (N1) ¹⁾	Must be disconnected	Purple
	2	A1+	Not connected ⁴⁾	4 ... 20 mA, temperature (A1)	Orange
	3	0V	Ground	Ground	Black
	4	PVIN+	Power supply terminal	Power supply terminal	Red
	5	0 V	Ground	Ground	Brown
	6	A3+	Not connected ⁴⁾	4 ... 20 mA, output 3 (A3) ²⁾	Green
	7	B	RS-485-B (N2) ¹⁾	Must be disconnected	Blue
	8	A2+	Not connected ⁴⁾	4 ... 20 mA, output 2 (A2) ³⁾	Yellow

1) Outputs available for RS-485, setting 6: temperature, density, dynamic viscosity, kinematic viscosity

2) Outputs available for 4 ... 20 mA, setting 0: dynamic viscosity, setting 6: kinematic viscosity

3) Outputs available for 4 ... 20 mA, settings 0 and 6: density

4) Can be connected to Ground

Material	
Material (wetted)	Stainless steel 316L
Material (in contact with the environment)	
Seal	■ FPM/FKM ■ FFKM

Operating conditions		
Medium temperature limit	■ -40 ... +105 °C [-40 ... +221 °F] ■ -40 ... +85 °C [-40 ... +185 °F] for instruments with explosion protection	
Ambient temperature limit	■ -40 ... +105 °C [-40 ... +221 °F] ■ -40 ... +85 °C [-40 ... +185 °F] for instruments with explosion protection	
Max. operating pressure	25 bar [360 psi]	
Density	650 ... 1,150 kg/m ³	
Flow velocity	< 0.5 m/s recommended	
Recommended mounting position ¹⁾	Vertical (sensor element upward to avoid trapped bubbles) → Check the flow direction at the sensor → Inserted in a straight section of the liquid line or in a bypass line	
Vibration resistance	2g per IEC 60068-2-6 0.1 ... 5.8g per IEC 60068-2-64	
Shock resistance per IEC 60068-2-27	40g	
EMC tests	In addition, observe the installation instructions of the operating instructions	
Immunity per IEC 61000-4-3	At 80 MHz to 1.4 GHz	10 V/m
	At 1.4 GHz to 6 GHz	3 V/m
Burst per IEC 61000-4-4	1 kV	
Surge immunity per IEC 61000-4-5	2 kV/1kV common mode	
ESD per IEC 61000-4-2	4 kV/8 kV, contact/air	
High-frequency fields per IEC 61000-4-6	3 V	

1) Other factors such as the presence of bubbles, particles, risk of contamination, cavitation, turbulence, etc. must be taken into account to determine the best mounting position.

Approvals

Logo	Description	Region
	EU declaration of conformity	European Union
	EMC directive	
	EN 61326 emission (group 1, class B) and immunity (industrial application)	
	RoHS directive	

Optional approvals

Logo	Description	Country
	EU declaration of conformity	European Union
	ATEX directive Hazardous areas - Ex ia Zone 0 gas II 1G Ex ia IIC T4 Ga	
	IECEX Hazardous areas - Ex ia Zone 0 gas Ex ia IIC T4 Ga	International
	FM Hazardous areas CL I, Div I, GPS A, B, C, D T4	USA and Canada

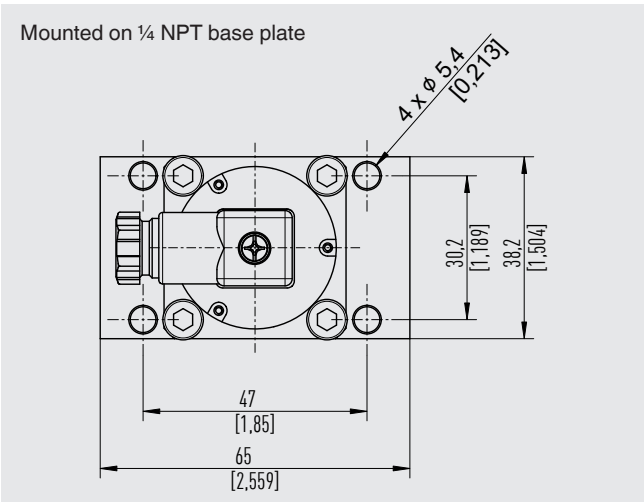
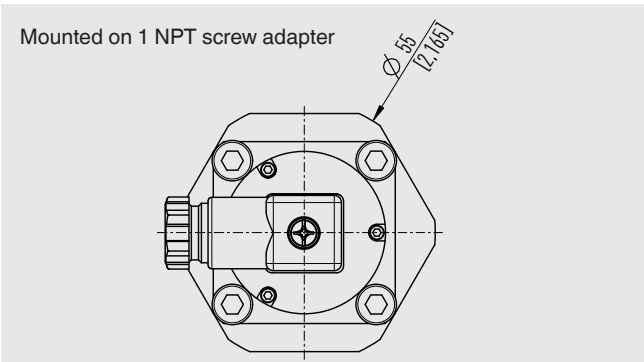
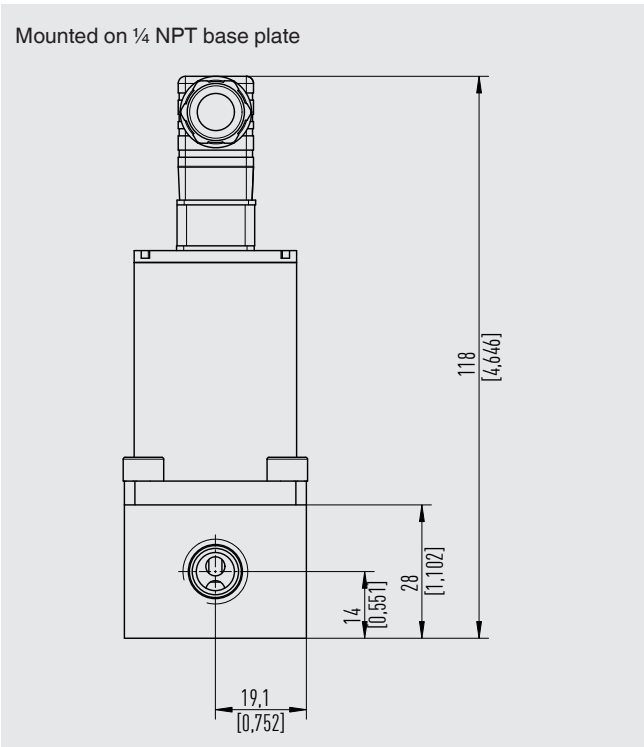
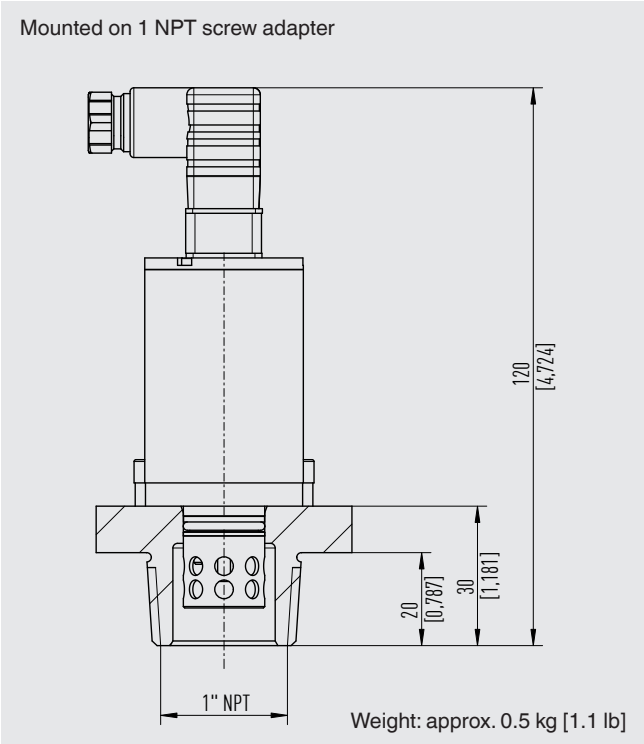
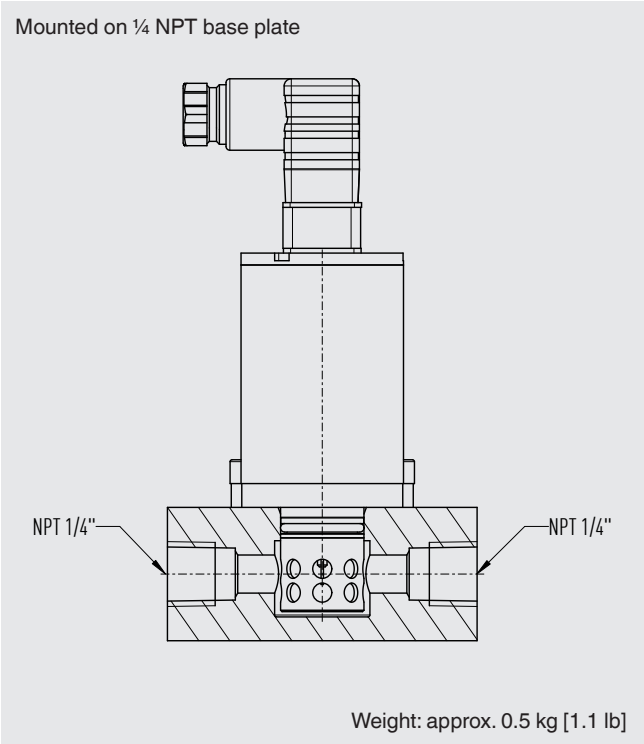
Patents, property rights

Patent number	Description
US 9.719.904	Density and viscosity sensor and measurement procedure

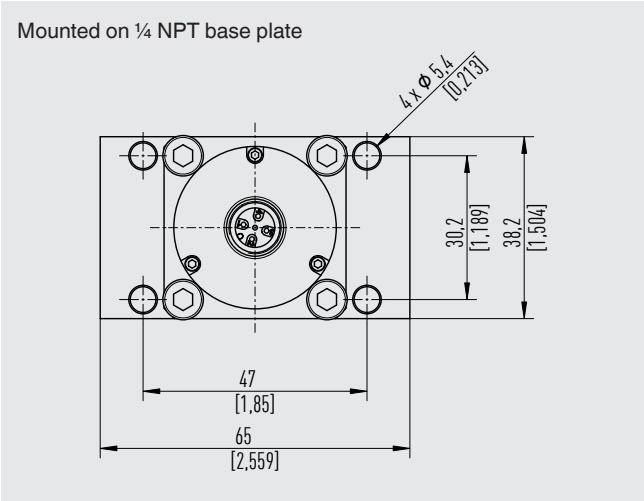
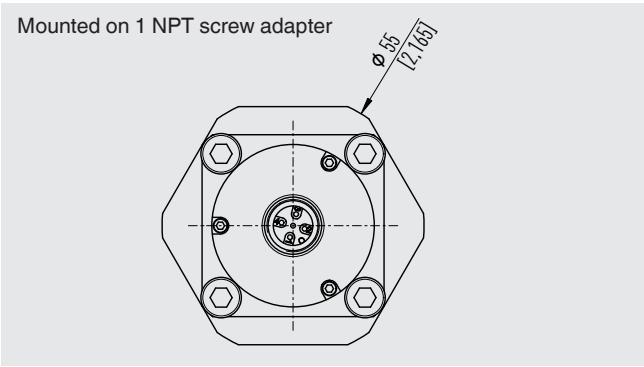
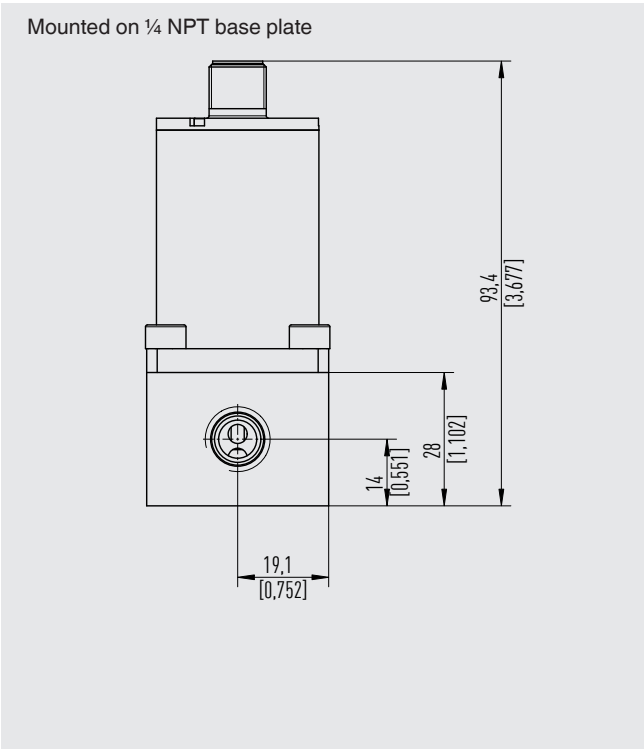
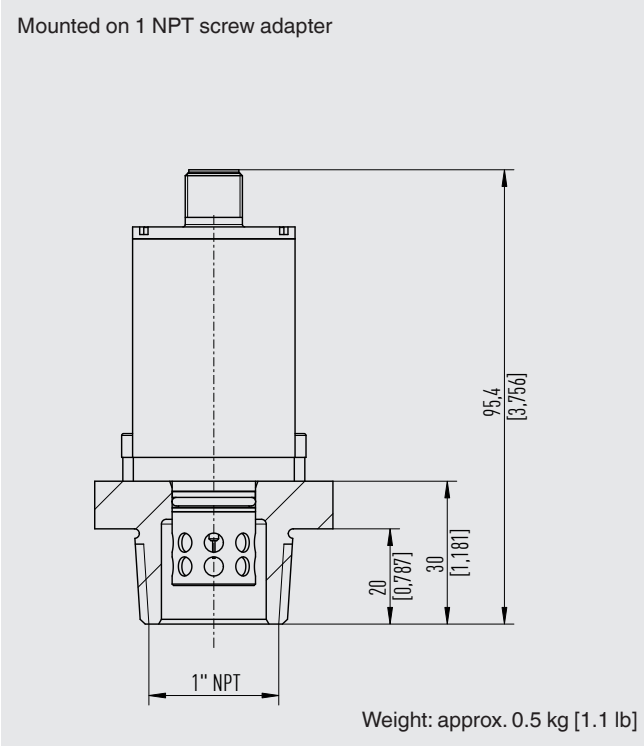
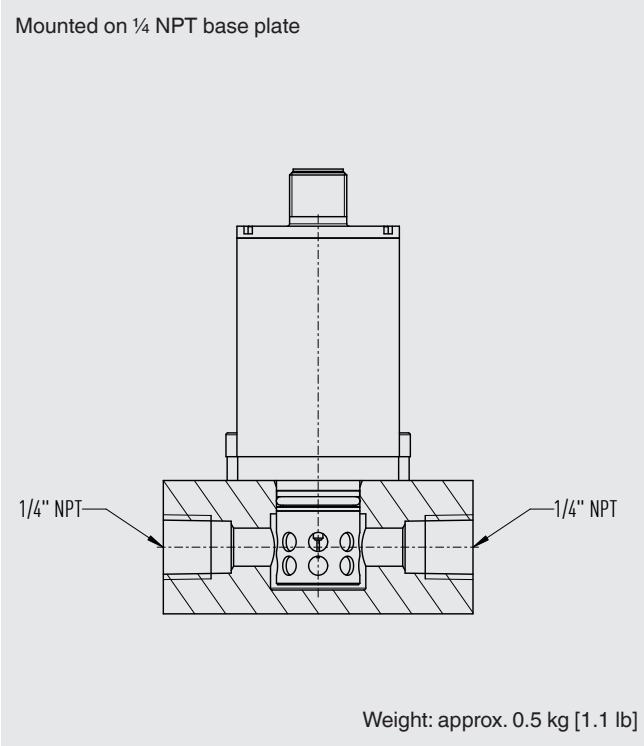
→ For approvals and certificates, see website

Dimensions in mm [in]

Angular connector DIN EN 175301-803 C, 4-pin

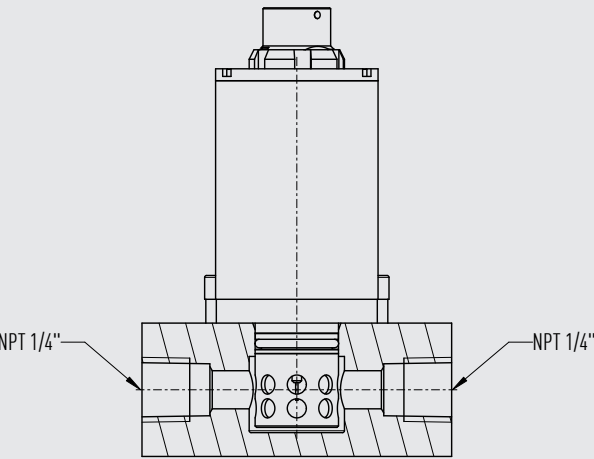


Circular connector M12 x 1 IEC-61076-2-101 , 5-pin



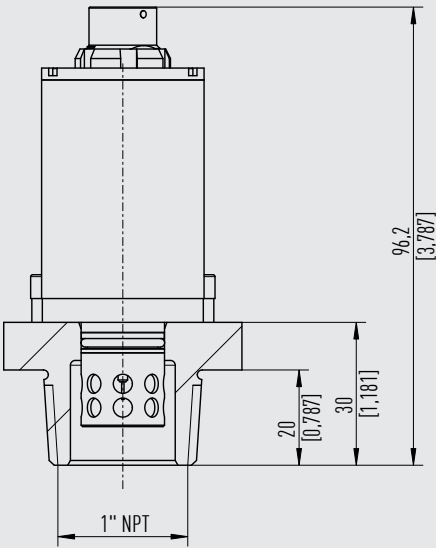
Circular connector DBPLU 104 Z066-130VGF, 8-pin

Mounted on 1/4 NPT base plate



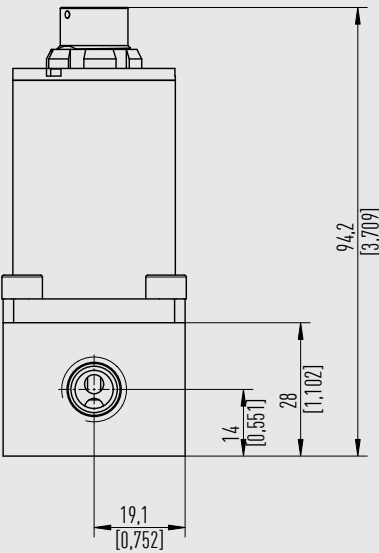
Weight: approx. 0.5 kg [1.1 lb]

Mounted on 1 NPT screw adapter

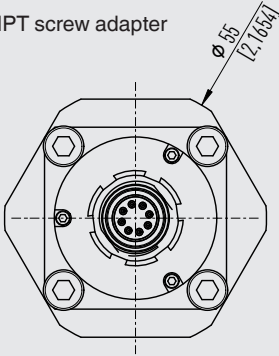


Weight: approx. 0.5 kg [1.1 lb]

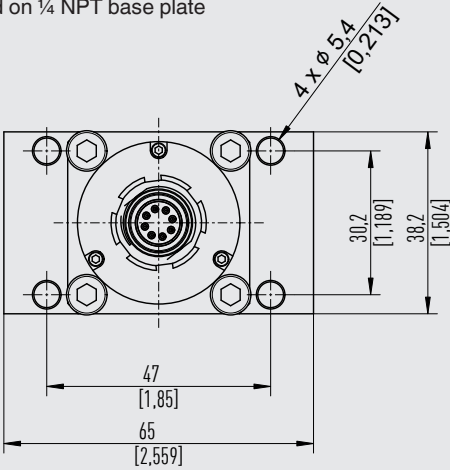
Mounted on 1/4 NPT base plate



Mounted on 1 NPT screw adapter



Mounted on 1/4 NPT base plate



Accessories and spare parts

Model	Description
Cable	
For circular connector M12 x 1, IEC-61076-2-101, 5-pin, analog	■ 2 m [6.56 ft] ■ 5 m [16.40 ft] ■ 10 m [32.81 ft] ■ 2 m [6.56 ft], right angle ■ 5 m [16.40 ft], right angle ■ 10 m [32.81 ft], right angle
For circular connector M12 x 1, IEC-61076-2-101, 5-pin, digital	■ 2 m [6.56 ft] ■ 5 m [16.40 ft] ■ 10 m [32.81 ft] ■ 2 m [6.56 ft], right angle ■ 5 m [16.40 ft], right angle ■ 10 m [32.81 ft], right angle
For circular connector, DBPLU 104 Z066-130VGF, 8-pin	■ 2 m [6.56 ft] ■ 5 m [16.40 ft] ■ 10 m [32.81 ft]
Ex protection	→ For a detailed description of the appropriate Ex protection, see the additional operating instructions of the product.
Intrinsically safe isolated barrier	For the power supply, applications in hazardous areas.
	For 4 ... 20mA analog outputs, applications in hazardous areas
	For RS-485 digital outputs, applications in hazardous areas

Ordering information

Model / Electrical connection / Process connection / Output signal / Cable length / Settings / Measuring range / Seal / Approvals / Accessories

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We reserve the right to make modifications to the specifications and materials.



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