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

MesoScale®

Applications

- Condition monitoring of lubricating oils
- Fuel identification in storage tanks and tanker vehicles
- Quality and condition monitoring of fuels

Special features

- For real-time monitoring of the viscosity, temperature and density of fuels and lubricating oils
- Wetted parts made of 316L stainless steel
- Suitable for hazardous areas, ATEX/IECEx-certified (zone 0) and FM-certified Class I Div I
- Patented design allowing for fast response time and high repeatability

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, the key basic properties of liquids: viscosity, temperature and density. This enables the condition of lubricating oils to be monitored and the fuel and oil quality to be checked during production or transport.

Depending on the version, the kinematic viscosity (measuring range: 30 to 300 cSt) can be provided instead of the dynamic viscosity (measuring range: 1 to 100 cP).

In addition, the sensor calculates confidence factors in real time. These factors give insight into the quality and validity of the measurements.

The VTL-30 is based on an innovative microresonator technology originating from the microsystems industry. This principle provides accurate measuring results in a wide range of liquids and operating conditions.
Due to its high computational power, the measuring results can be output at a frequency of 1 Hz.

The compact sensor housing allows for easy integration, and the robust design, with no moving parts, makes it resistant to harsh conditions. Due to its approval for use in hazardous areas, the model VTL-30 is ideally suited for embedding in OEM applications or for large-scale deployments in industrial and field environments.

Smart in sensing

Data sheets showing similar products:
Density and temperature sensor, model DTL-30; see data sheet: SP 89.01
Gas density and temperature sensor, model DTG-30; see data sheet: SP 89.03

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/m³	1.5 kg/m³
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/m³	650 ... 1,150 kg/m³

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

→ Other process connections on request.

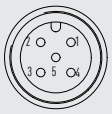
Output signal	
Signal type	
Analogue	4 … 20 mA
Digital	Modbus® RTU (RS-485)
Settings of available outputs	
0	→ See “Pin assignment”, for information about outputs → Not available for RS-485
6	→ See “Pin assignment”, for information about outputs
Voltage supply	
Auxiliary power	DC 12 ... 24 V
Power consumption	< 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.

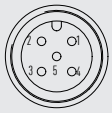
Pin assignment

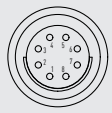
Angular connector, 4-pin	Pin	Name	Signal type: RS-485 [1], Settings: 6	Signal type: 4 ... 20 mA
	1	PVIN+	Power supply terminal	Power supply terminal
	2	A / A1+	RS-485-A	4 ... 20 mA, temperature
	3	B / A2+	RS-485-B	■ 4 ... 20 mA, dynamic viscosity for setting 0 ■ 4 ... 20 mA, kinematic viscosity for setting 6
	4/GDS	0 V	Ground	Ground

1) Available outputs for RS-485, settings 6: temperature, density, dynamic viscosity, kinematic viscosity

Circular connector M12 x 1, 5-pin	Pin	Name	Signal type: RS-485, Settings: 6
	1	0 V	Ground
	2	PVIN+	Power supply terminal
	3	0 V	Ground
	4	A	RS-485-A
	5	B	RS-485-B

1) Available outputs for RS-485, settings 6: temperature, density, dynamic viscosity, kinematic viscosity

Circular connector M12 x 1, 5-pin	Pin	Name	Signal type: 4 ... 20 mA, settings: 0	Signal type: 4 ... 20 mA, settings: 6
	1	PVIN+	Power supply terminal	Power supply terminal
	2	A1+	4 ... 20 mA, temperature	4 ... 20 mA, temperature
	3	A2+	4 ... 20 mA, density	4 ... 20 mA, density
	4	A3+	4 ... 20 mA, dynamic viscosity	4 ... 20 mA, kinematic viscosity
	5	0 V	Ground	Ground

Circular connector, 8-pin	Pin	Name	Signal type: RS-485 Settings: 6 [1]	Signal type: 4 ... 20 mA, settings 0 and 6
	1	A	RS-485-A	Must be disconnected
	2	A1+	Must be disconnected	4 ... 20 mA, temperature
	3	0 V	Ground	Ground
	4	PVIN+	Power supply terminal	Power supply terminal
	5	0 V	Ground	Ground
	6	A3+	Must be disconnected	■ 4 ... 20 mA, dynamic viscosity for setting 0 ■ 4 ... 20 mA, kinematic viscosity for setting 6
	7	B	RS-485-B	Must be disconnected
	8	A2+	Must be disconnected	4 ... 20 mA, density

1) Available outputs for RS-485, settings 6: temperature, density, dynamic viscosity, kinematic viscosity

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 [2]	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
CE	**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
Ex	**EU declaration of conformity**	European Union
	ATEX directive Hazardous areas - Ex ia Zone 0 gas — II 1G Ex ia IIC T4 Ga	
IEC IECEx	**IECEx** Hazardous areas - Ex ia Zone 0 gas — Ex ia IIC T4 Ga	International
FM APPROVED	**FM** Hazardous areas CL I, Div I, GPS A, B, C, D T4	USA and Canada

Patents, property rights

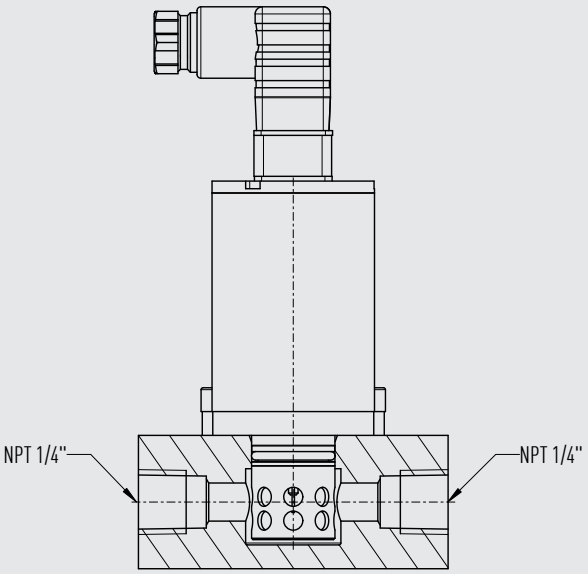
Patent number	Description
US 9.719.904	Density and viscosity sensor and measurement procedure

→ For approvals and certificates, see website

Dimensions in mm [in]

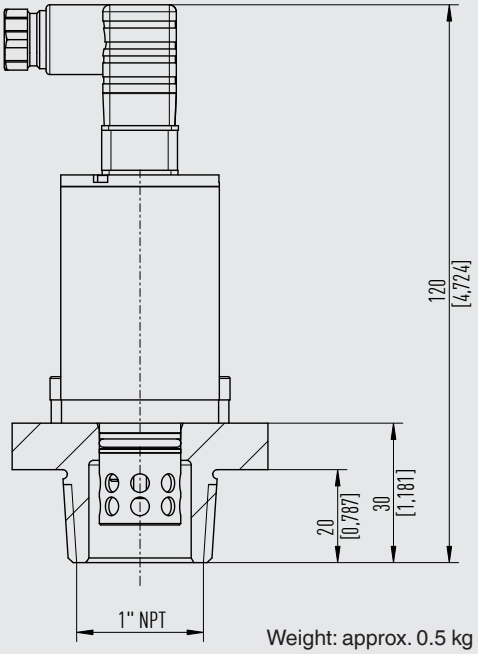
DIN EN 175301-803 C angular connector, 4-pin

Mounted on ¼ NPT base plate



Weight: approx. 0.5 kg [1.1 lb]

Mounted on 1 NPT screw adapter



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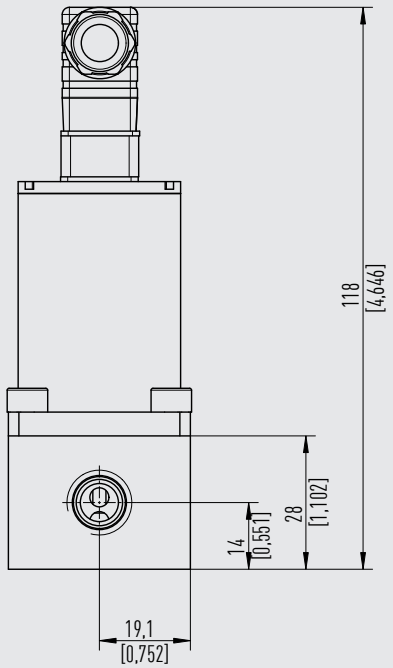
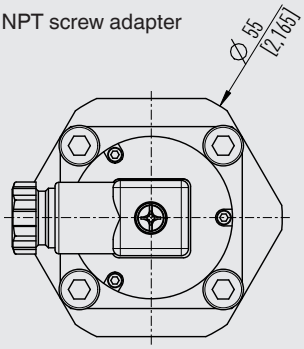
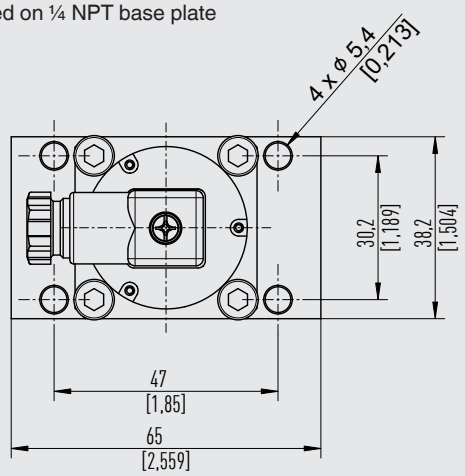


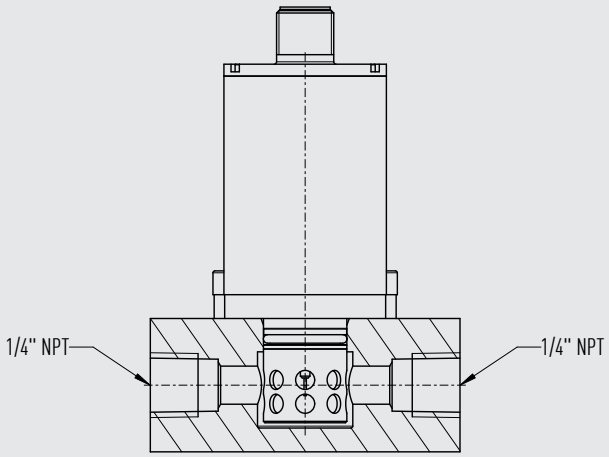
Mounted on 1 NPT screw adapter



Mounted on ¼ NPT base plate



Mounted on ¼ NPT base plate



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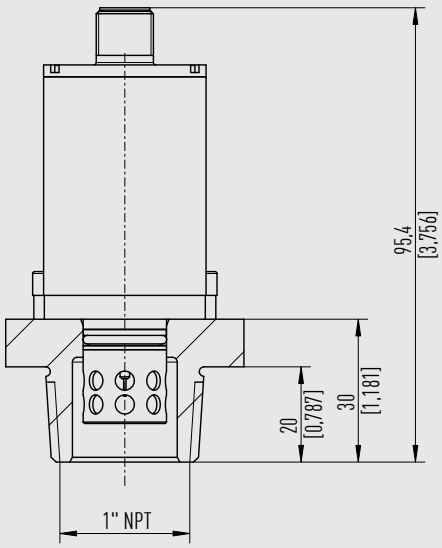

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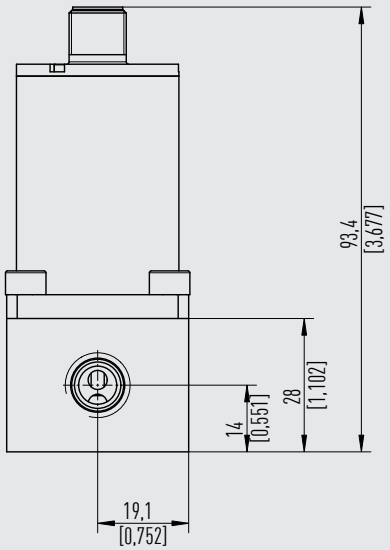
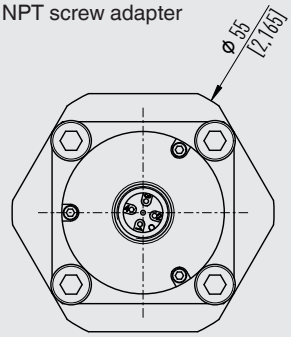
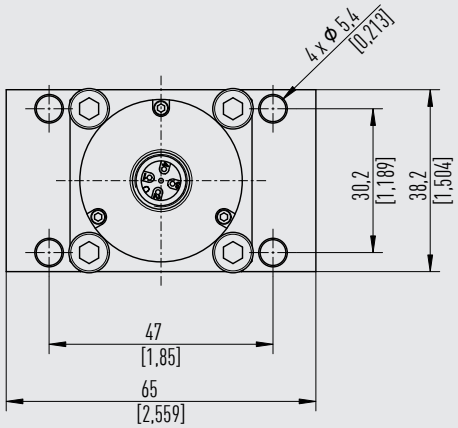


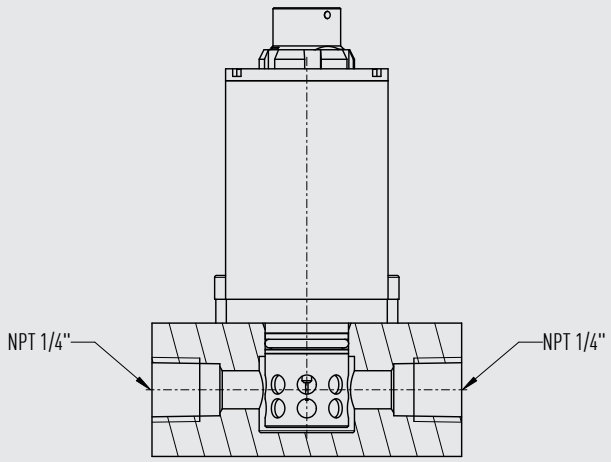
Mounted on 1 NPT screw adapter



Mounted on ¼ NPT base plate



Mounted on ¼ NPT base plate



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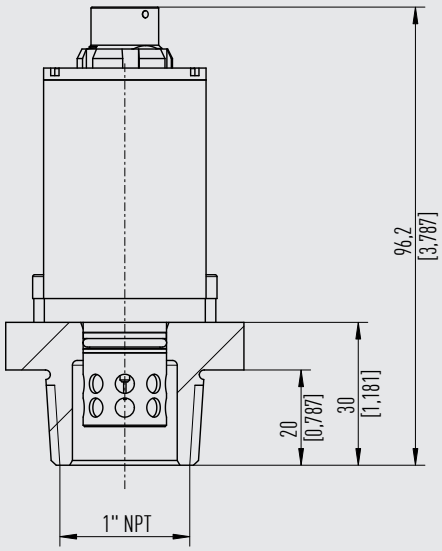
Mounted on 1 NPT screw adapter



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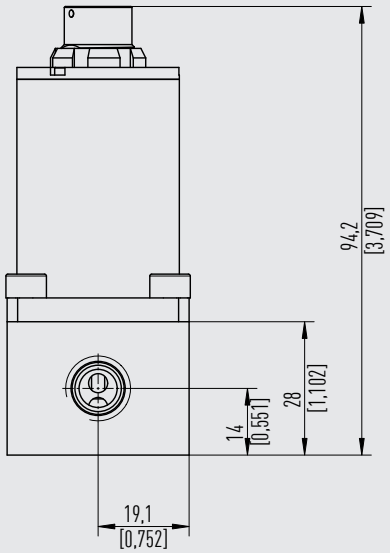

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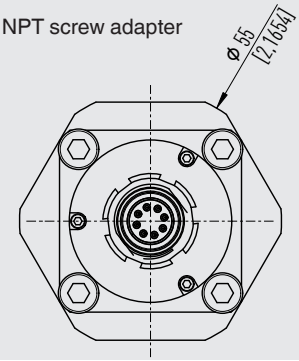

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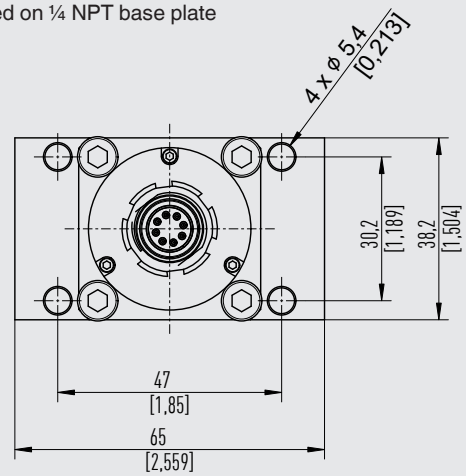

Accessories and spare parts

Model	Description	Order number
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.	On request
	For 4 ... 20mA analog outputs, applications in hazardous areas	On request
	For RS-485 digital outputs, applications in hazardous areas	On request

Ordering information

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

MesoScale® is a trademark of WIKA Tech.

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