

Simply a question of better measurement



Flow Sensor EM 20700

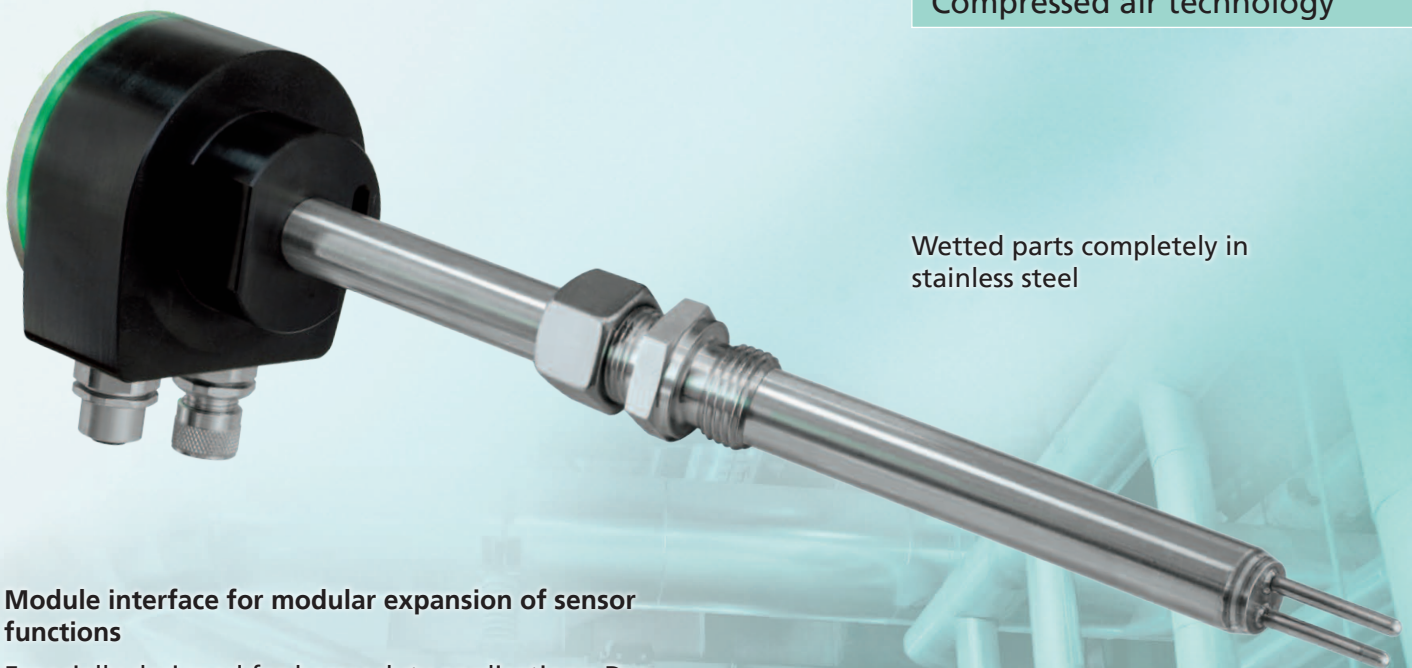
A robust flow sensor for highly demanding heavy-duty applications in air and other gases

- Sensor elements completely encapsulated in stainless steel
- Wide flow measuring range from 0.1 to 220 m/s
- Temperature operating range from -20 to +120 °C
- For air and other gases in applications with harsh conditions (medium with aggressive components, contamination, high humidity)
- PWIS conform (order option)
- Very robust design and overpressure resistant up to 16 bar
- Easy cleaning due to encapsulated stainless steel surface
- Sensor configuration by module interface

Heavy-Duty applications

Industrial processes

Compressed air technology



Wetted parts completely in
stainless steel

Module interface for modular expansion of sensor functions

Especially designed for heavy-duty applications: Due to completely encapsulated sensor elements in stainless steel ideally suited for demanding applications and furthermore resistant to aggressive media.



Flow rate volumes of gases – an important parameter in industrial processes

Actions to save energy and to assure quality in the production process are of particular importance in industrial processes. The ability to measure volumetric flow rates and volumetric flow of gases precisely is essential for this purpose. The requirements imposed on the flow rate sensor used for this are demanding: the sensor has to be capable of delivering precise measuring results for different gases, at high overpressures and across wide ranges of temperature. It also has to be able to do so under the most difficult environmental conditions. A further decision factor is the prevention of maintenance and its attendant high secondary costs. Simple assembly and reliable measuring values for many years are expected.

The “true professional” for industrial processes and compressed air technology

The thermal Flow Sensor EM 20700 is the perfect solution for extremely demanding industrial applications. It can be used for a diverse range of applications, such as compressed air monitoring, gas monitoring on process burners, consumption recording of gases and a great deal more.

The double-pin sensor head has been designed to meet the needs of so-called „heavy-duty applications“ and, due to the sensor elements being completely encapsulated in stainless steel these are ideally suited for extremely demanding applications such as exhaust air measurement in digestors. The sensor is also resistant against aggressive media.

The EM 20700 records flow velocity as well as media temperatures up to 120 °C. It can be used in small tubes starting from DN40 up-wards and involve a sensor length up to 600 mm to measure the volumetric flow rate in large channels and ducts. The sensor can be used in overpressure up to 16 bar.

This sensor is very easy to install: screw in sensor using the compression fitting included, align sensor in gas flow and centrally in the pipe, connect it electrically – ready!

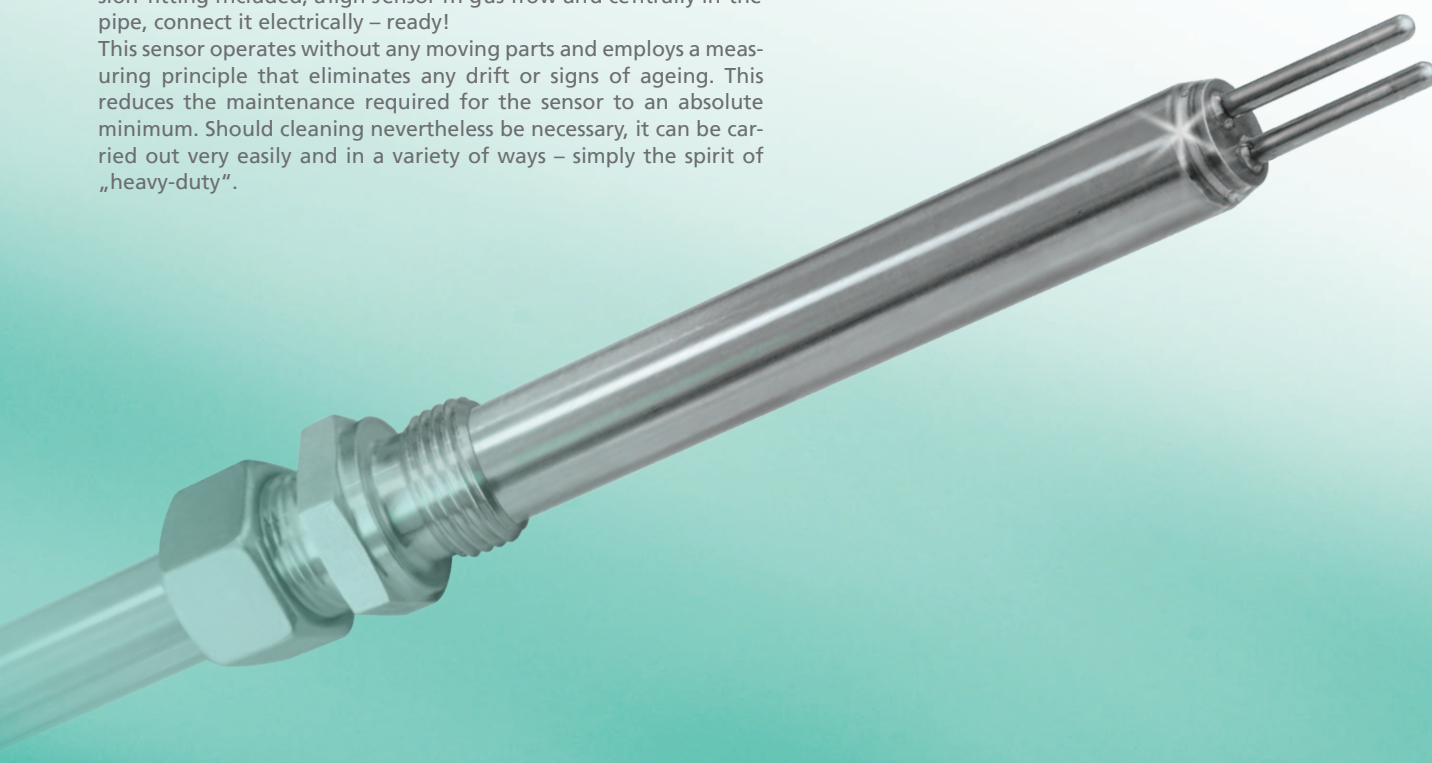
This sensor operates without any moving parts and employs a measuring principle that eliminates any drift or signs of ageing. This reduces the maintenance required for the sensor to an absolute minimum. Should cleaning nevertheless be necessary, it can be carried out very easily and in a variety of ways – simply the spirit of „heavy-duty“.

High gas speeds or special gases? The EM 20700 can do both!

The sensor with its special double-pin sensor head records flow speeds of 0.1 m/s up to 220 m/s. In order to obtain precise measuring results across this very broad speed range, every sensor is individually adjusted and calibrated in an elaborate pressurized wind tunnel. To enable this sensor to be used in different gases, a range of individual versions are available, e.g. pure oxygen, nitrogen, argon, CO₂ and more.

How does it work?

The two sensor elements for measuring flow velocity and medium temperature are positioned in two separate stainless steel sleeves and perfectly protected from harmful influences by the encapsulation. The flow sensor is heated to a defined temperature above the temperature of the medium. The power required to maintain this positive temperature differential (“overtemperature”) is an indicator for the flow rate speed that the sensor issues as “normal speed” (linear current / voltage / impulse signal). This is a great advantage of the measuring principle: No additional measurement of pressure or temperature of the medium are required.



Individually adapted to suit every application – your choice!

For optimum installation in different pipe diameters, 2 standard sensor lengths can be selected. A remote version is available for difficult installation conditions. Cable length between sensor and enclosure (max. 10 m) can be defined by the customer.

To enable the sensor to be adapted to flow rate conditions, different standard measuring ranges are available, extending up to 220 m/s. The volumetric flow rate is the result of flow velocity, multiplied by the pipe's cross-sectional area and a profile factor. Customer-specific measuring ranges can also be supplied in increments of 1 m/s. The advantage is a desired maximum volumetric flow rate determines the measuring range of the sensor depending on pipe diameter. Example: Maximum volumetric flow rate of 450 m³/h with a pipe diameter of DN65 yields a maximum flow rate measuring range for the sensor of approx. 48 m/s (= 20 mA or 10 V). For simple conversion, the homepage features a flow rate calculator that also determines the profile factor, which is dependent on the pipe cross-section.

For evaluation systems with impulse inputs, the EM 20700 offers two additional impulse outputs for flow rate signal. There is a standard measuring range of 0...100 Hz available or, if the pipe diameter is indicated, impulses per m³ as a customer-specific output as an option.

Measure other gas media, too? Absolutely!

Often the measurement medium is not air, but consists of other gases or gas mixtures. For these special applications, gas-specific versions of the EM 20700 can be supplied.

With these versions, the sensor has a specific correction – based on adjustment in air – programmed. These correction factors were established individually for each gas on real gas channels. For gas mixtures, each correction is calculated on the basis of an individual customer specification. For media with an oxygen content of > 21 Vol.-% all components in contact with the media must be cleaned to remove greases, oils and / or other combustible elements. Two specific versions "Oxygen O₂ > 21 %" and "PWIS conform" provide the required safety for such applications.

Accuracy – in black & white

The EM 20700 is adjusted to air in a highly accurate reference wind tunnel. The subsequent calibration is also valid for pure oxygen and nitrogen. The high accuracy and reproducibility is documented in a factory calibration certificate (order option). This calibration can be renewed as specified by the user.

All at a glance!

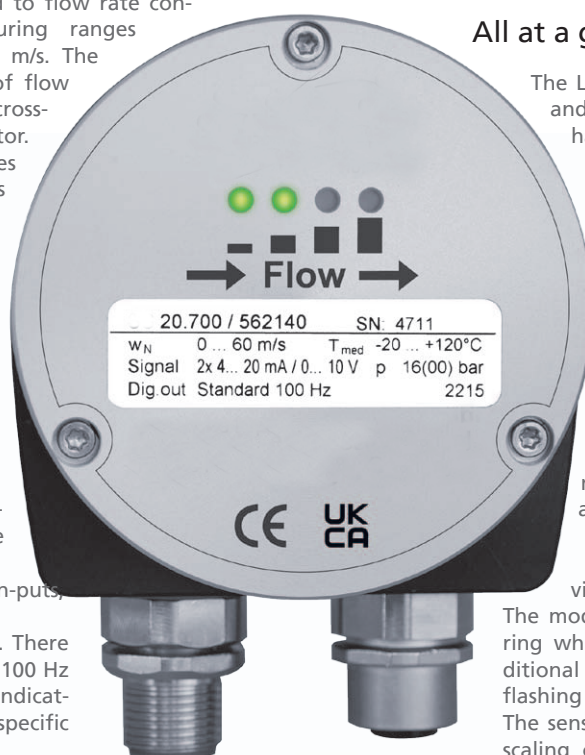
The LED display is used for function monitoring and quick error analysis on site. The EM 20700 has four LEDs embedded in the cover, which indicate the current flow range and can also signal an error code in the event of a fault.

Modular expansion of sensor functions

In addition, the EM 20700 has a module interface for modular expansion of the sensor's range of functions. Through the module interface, the sensor can be parameterized, a *Bluetooth*® wireless transmission to the Sensor App can be realized or an additional 7-segment display EMD 10020 can be connected. The data logger EMDL 10010 can also be operated via the module interface.

The module interface also has an LED illuminated ring which signals communication with other additional modules by means of different colors and flashing sequences.

The sensor parameterization enables, for example, scaling of the measuring range to individual requirements, setting of a damping and more.



Connect and you are ready

Flexible connection of the analogue outputs is possible due to automatic V or mA switching depending on the connected load (Auto-U/I).



Accessories

Probe ball valve

A choice of probe ball valves are available to facilitate fast removal and installation in 1" to 2" pipework. Advantage: Even while the system is under pressure, it is no problem to install or remove the sensor. A straight-run ball valve is available for larger pipework diameters.



LED measured value display

For visualization purposes directly on site, an LED unit is available to display measuring values. Features:

- Display in m/s or m³/h
- Programmable output signal
- Two programmable relay outputs
- Power supply: 85 – 250 V AC or 24 V DC
- Power supply for the connected sensor
- Separate version with "summing" function



Extension modules

PC Programming Kit

- Cable-connected transmission of standard volume flow and medium temperature
- Configuration of the sensor (e. g. scaling of measuring range to individual requirements, setting of a damping and more)
- Display and real-time recording of measured values via Sensor App (scope of delivery) on a Windows terminal device (e. g. PC, notebook, tablet)
- Processing of recorded data

Bluetooth® Module EMBT 10010

- Wireless *Bluetooth*® connection to an end device
- Visualisation, real-time processing and logging of flow velocity and medium temperature via the supplied Sensor App
- Configuration of sensor parameters (damping, measuring ranges etc.)



Data Logger EMDL 10010

- For recording of measurement data over a longer period of time
- Evaluation of the recorded data via a Windows device (e. g. PC, notebook, tablet)

Measuring value module EM-MD

- 2-line display module
- Direct output of standard volume flow and medium temperature
- Remote display for optimal readability
- No extra power supply necessary
- Plug-and-Play



Connection cable available in various lengths

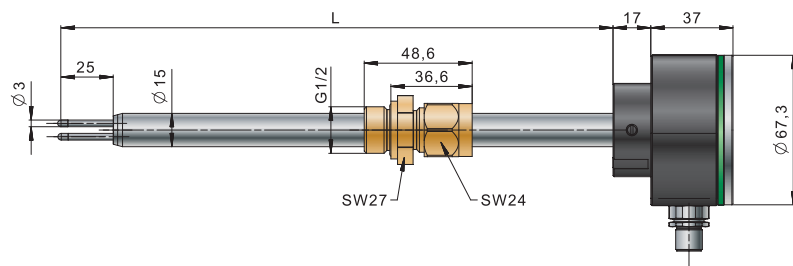


Coupler socket with screw type terminals

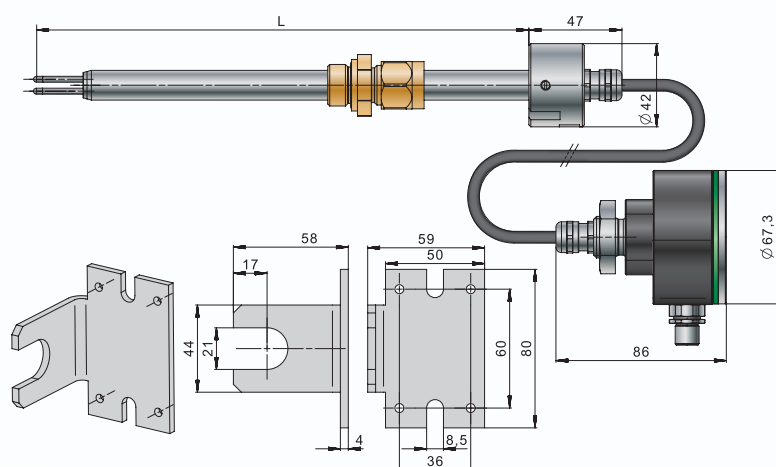


Welding steel sleeves or stainless steel

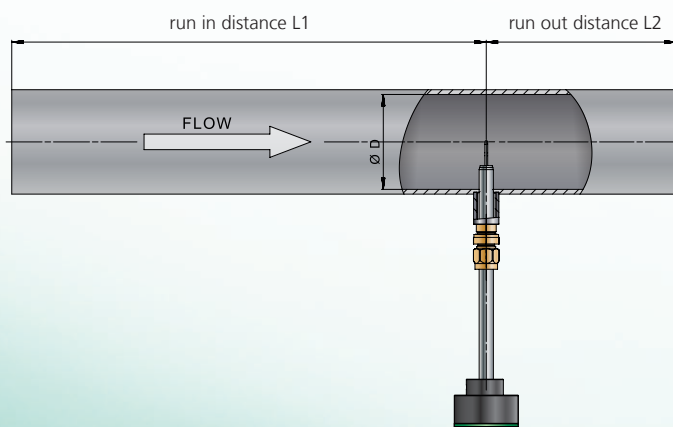
Dimensions of basic sensor



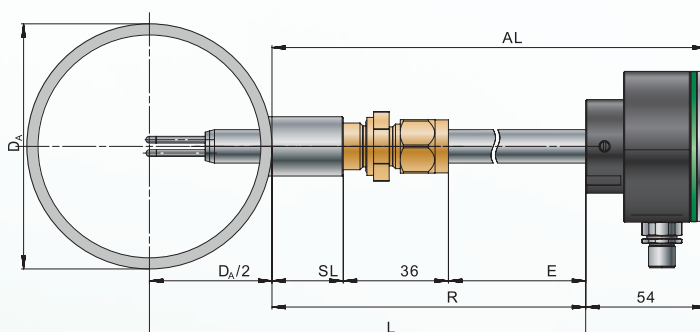
Remote sensor (including wall-mounting bracket)



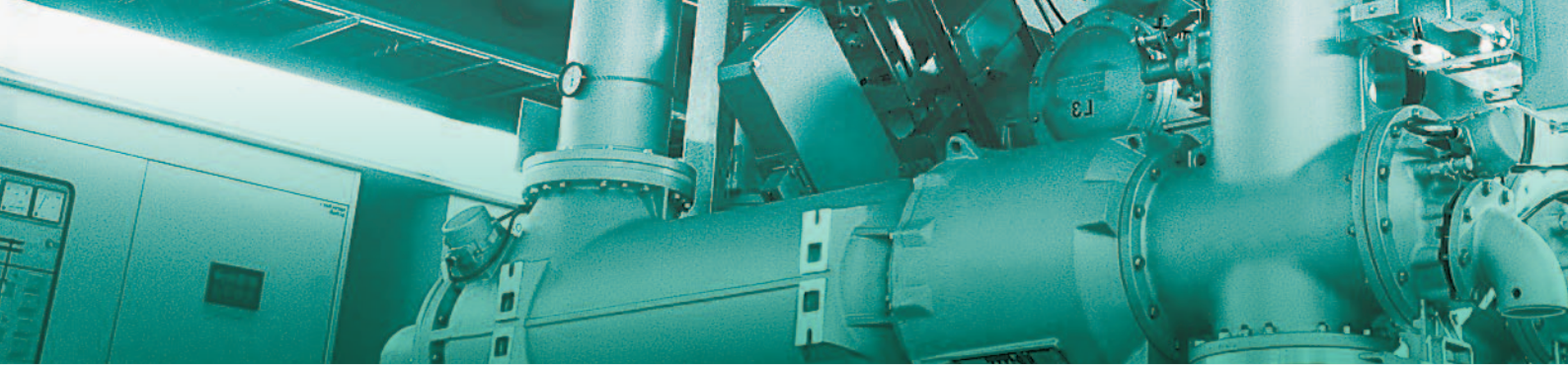
Mounting instructions



Mounting parameters



- D_A = Outer diameter of tube
- SL = Length of welding sleeve
- E = Adjustable length of sensor tube
- AL = Extended length of compact sensor
- R = Reference length
- L = Length of sensor
- All dimensions in mm



Technical Data

Measurement-specific data	
Measuring values	Standard velocity w_N of air, based on standard conditions of 20 °C and 1,013.25 hPa Temperature of medium T_M
Medium to be measured	Standard: air or nitrogen Optional: pure oxygen, argon, CO ₂ and others (on request)
Measuring range w_N	Standard: 0 ... 10 / 20 / 60 / 90 / 140 / 220 m/s Special: 10 ... 220 m/s (in steps of 1 m/s)
Lower detection limit w_N	0.1 m/s
Measuring range T_M	-20 ... +120 °C
Measuring accuracy ¹⁾	
Standard w_N	$\pm(3\% \text{ of measured value} + [0.4\% \text{ of fmr; min. } 0.08 \text{ m/s}])$ ²⁾
Response time (t_{90}) w_N	10 s (jump of w_N from 0 to 5 m/s in air)
Measuring accuracy T_M ($w_N > 2 \text{ m/s}$)	$\pm 1 \text{ K}$ ($T_M = 10 \dots 30 \text{ °C}$) $\pm 2 \text{ K}$ (remaining measuring range)
Operating temperature	
Sensor probe	-20 ... +120 °C
Electronics	-20 ... +70 °C
Storage temperature	-20 ... +85 °C
Material	
Enclosure	Anodized aluminum
Sensor tube	Stainless steel 1.4571
Compression fitting	Stainless steel 1.4571, NBR (or FKM, depending on version)
Sensor head	Stainless steel 1.4404
Sensor cable (remote sensor)	Sheathing TPE, halogen-free
General data	
Humidity range	Measuring mode: non-condensing (< 95 % RH)
Operating overpressure (max.)	16 bar
Display	Stripe of 4 dual LEDs (green / red / orange), LED ring
Supply voltage U_B	24 VDC $\pm 20 \%$
Current consumption	Approx. 80 mA (without pulse outputs); max. 200 mA ³⁾
Analog outputs - Type: Auto-U/I Switching Auto-U/I - Voltage output - Current output	Flow velocity, temperature of medium Automatic switching of signal mode based on load R_L 0 ... 10 V for $R_L \geq 550 \Omega$ 4 ... 20 mA for $R_L \leq 500 \Omega$
Pulse outputs - Signalling: - Pulse output 1: - Pulse output 2:	0 ... 100 Hz; Option: 1 pulse / 1 m ³ 1 pulse / 0.1 m ³ 1 pulse / 0.01 m ³ (max. 100 Hz) High-side driver connected to U_B (without galvanic separation) Semiconductor relay (output galvanically separated) max. 30 V _{DC} / 21 V _{AC,eff} / 50 mA
Electrical connection	Main connector: M12, male, A-coded, 8-pin Module connector: M12, female, A-coded, 5-pin
Maximum cable length ⁴⁾	100 m
Installation position (relative to g-vector)	Arbitrary (exception: Temperature element may never be placed "above" heater element)
Direction / mounting tolerance	Unidirectional / $\pm 3^\circ$ relative to flow direction
Minimum immersion depth	DN40
Type of protection	IP65 (enclosure), IP67 (sensor probe)
Protection class	III (SELV or PELV)
Probe length - Compact sensor - Remote sensor	Standard: 250 / 600 mm Probe: 250 / 600 mm Cable: 1 ... 10 m (steps: 1 m)
Weight	Approx. 500 g max. (without connecting cable)

¹⁾ under reference conditions

²⁾ fmr = final measuring range

³⁾ without signal current of pulse output 2 (relay)

⁴⁾ voltage mode: using of AGND and $R_L \geq 10 \text{ k}\Omega$ (mass offset)

Order information Flow Sensor EM 20700

	Description	Article Number									
Basic sensor	Flow Sensor EM 20700 Basic version: w _N and T _M ; 16 bar; compact version Output signals: 2 x Auto-U/I; 2 x pulse outputs Incl. pressure-tight compressing fitting (stainless steel) and pressure protection kit	562 140-	A	B	C	D	E	F	G	DD	
	Options										
Version	Standard		1								
Mechanical type	Sensor length 250 mm			1							
	Sensor length 600 mm			2							
	Remote sensor, incl. wall bracket: - sensor length 250 / 600 mm - cable length (1 ... 10 m; in steps of 1 m): ____ m			9							
	Pressure-tight compression fitting stainless steel G ½				1						
	Pressure-tight compression fitting stainless steel R ½ (PT)				2						
Measuring ranges ¹⁾ and calibration	Measuring range 0 ... 10 m/s					1					
	Measuring range 0 ... 20 m/s					2					
	Measuring range 0 ... 60 m/s					3					
	Measuring range 0 ... 90 m/s					4					
	Measuring range 0 ... 140 m/s					5					
	Measuring range 0 ... 220 m/s					6					
	Special measuring range (10 m/s ... 220 m/s; in steps of 1 m/s): ____ m/s					9					
	Standard adjustment						1				
	Standard adjustment with factory calibration certificate						2				
	Standard adjustment with correction for CO ₂						5				
	Standard adjustment with correction for argon						8				
	Standard adjustment with correction for special gases and gas mixtures						9				
Impulse output	Standard 100 Hz (= measuring end value w _N)							1			
	1 Impulse / 1 m³ for tube Ø (round): ____ mm							2			
	1 Impulse / 0.1 m³ for tube Ø (round): ____ mm							3			
	1 Impulse / 0.01 m³ for tube Ø (round): ____ mm							4			
Protection type	Standard								1		
	Oxygen O ₂ > 21 % (only for C = 1)								2		
	PWIS conform (paint-wetting impairment substances) , with pressure tight compression fitting stainless steel G ½ with cutting sealing (only for C = 1)								3		
Pressure range	00 (atmospheric) ... 16 bar (overpressure)									00 ... 16	

¹⁾ Select the appropriate measurement range

Other gases on request.

Order information Flow Sensor EM 20700

	Description	Article number
Accessories	Connecting cable, 8 pole, length 5 m, with coupler socket and open cable end	524 921
	Connecting cable, 8 pole, length selectable, with cable end sleeves, free of halogen	524 942
	Coupler socket, 8 pole, with screw terminals, for cable $\varnothing$ 6 ... 8 mm	524 929
	Welding sleeve steel G ½ acc. to EN 10241, 5 pieces	524 916
	Welding sleeve stainless steel 1.4571 G ½ acc. to EN 10241, 2 pieces	524 882
	Power supply: output 24 V DC / 1A; input 115 / 230 V AC	535 282
	LED display EMD 10010; in wall housing to show volume flow and flow velocity, 85 ... 230 V AC and sensor supply	527 320
	LED display EMD 10010; similar to 527 320, but with 24 V DC voltage supply	528 240
	LED display MD 10015; in wall-mounted housing, similar to 527 320 but with additional sum function and second measuring input	527 330
	LED display MD 10015; similar to 527 330, but with 24 V DC voltage supply	528 250
	Assembly kit for pipe assembly, suitable for EMD 10010 / 10015, including pipe clamps and collar for adjustment to pipe diameter	531 394
	Probe ball valve 1" inside thread, connection to flow sensor: ½" inside thread incl. plug and chain	530 940
	Probe ball valve 1¼" inside thread, connection to flow sensor: ½" inside thread incl. plug and chain	530 941
	Probe ball valve 1½" inside thread, connection to flow sensor: ½" inside thread incl. plug and chain	530 942
	Probe ball valve 2" inside thread, connection to flow sensor: ½" inside thread incl. plug and chain	530 943
	Straight-run probe ball valve ¾" inside thread, with threaded adapter for ½" full-length screw connection ¾"	532 355
	Welded socket, steel, outside thread ¾", 5 pieces	531 200
	Welded socket, stainless steel, outside thread ¾", 2 pieces	531 201
	Bluetooth® Module EMBT 10010 for parameterization, sensor analysis as well as real-time data display and recording of Flow Sensors with integrated module interface (via Bluetooth® wireless technology)	560 500
	PC Programming Kit for wired parameterization, sensor analysis as well as real-time data display and recording of Flow Sensors with integrated module interface (for PC, laptop, notebook; Windows)	564 710
	Data Logger EMDL 10010 for recording of measurement data over a longer period of time and evaluating recorded data via a Windows device (e. g. PC, notebook, tablet)	569 300
	Measuring value module EM-MD, 7 segment display, incl. 0.6 m connection cable for Flow Sensors with integrated module interface	554 900

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