

Simply a question of
better measurement

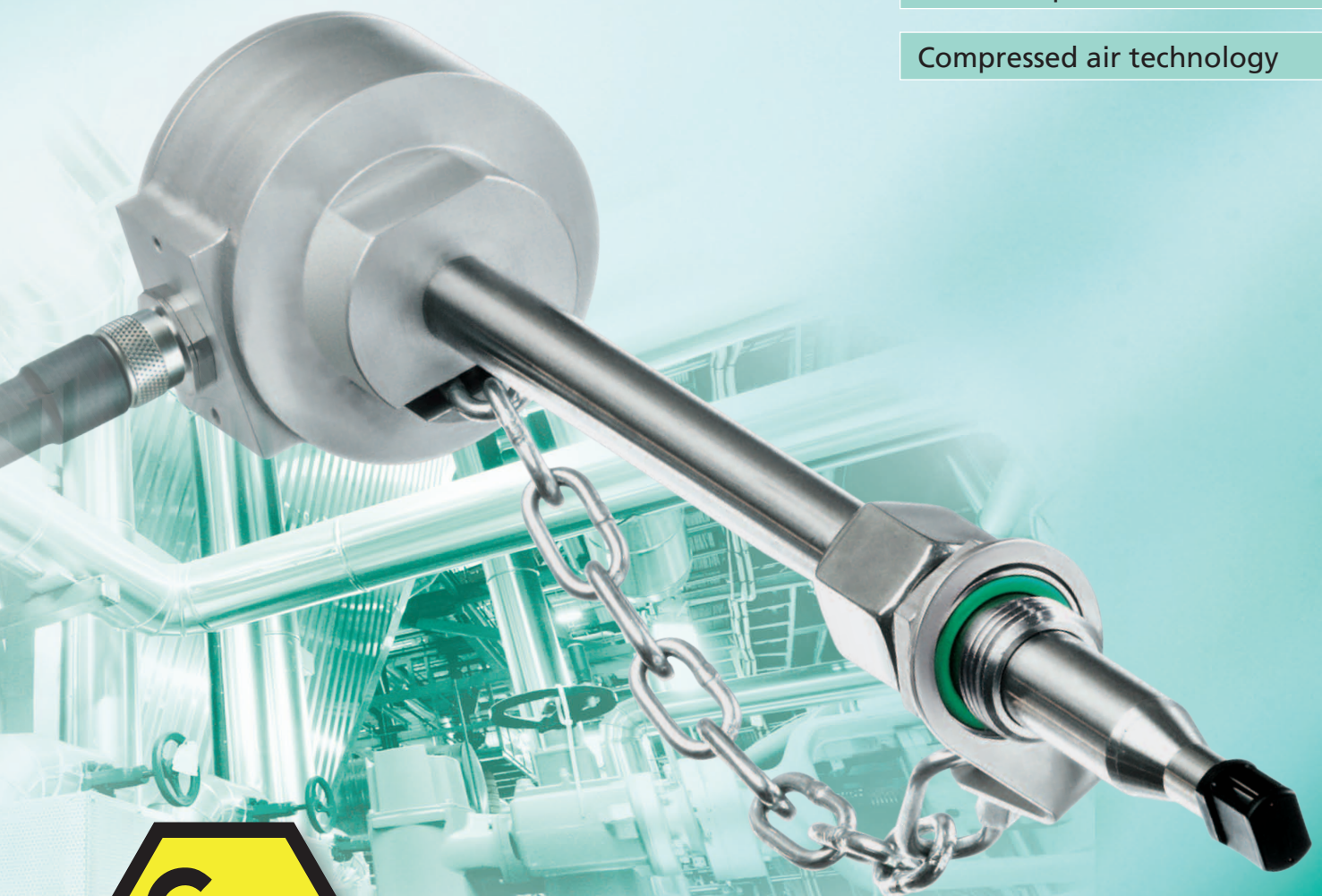


Flow Sensor EM 20600

The powerful industrial professional
for demanding applications invol-
ving air and gases.

Industrial processes

Compressed air technology





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

Measures 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 has an important role to play in this. 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 such as explosive areas. A further criterion involved in the selection of a suitable sensor is the prevention of maintenance and its attendant high secondary costs. Ease of assembly and reliable measuring values for many years: that is the objective.

The “true professional” for industrial processes and pneumatic technology

The thermal **Flow Sensor EM 20600** is the perfect solution for 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 sensor records flow speed as well as media temperatures of up to 120 °C. It can be used in small tubes from DN25 upwards and can involve a sensor length of up to 1 metre to measure the volumetric flow rate in large channels and ducts. If the standard version is not sufficient for overpressure of up to 16 bar, a version rated for up to 40 bar can be selected.

This sensor is very easy to install: screw down the sensor using the compression fitting included, align the sensor in the gas flow and centrally in the pipe, connect up its electrical wiring – and job done!

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 – depending on how contaminated the medium becomes – to the occasional need for the sensor head to be blown through (air blast) or rinsed in water.

High gas speeds, special gases or explosion protection? The **EM 20600** can do (almost) everything!

The special chamber head sensor records flow speeds of 0.2 m/s up to 220 m/s. In order to obtain precise measuring results across this very broad speed range, every sensor is individually checked and compared in a highly precise pressurised wind tunnel.

To enable this sensor to be used in different gases, a range of individual versions is available, e.g. for pure oxygen, CO₂, methane and biogas. For use in other media in potentially explosive atmospheres and environments, the sensor is optionally available in an explosion-protected version (ATEX).

Increased media resistance can be achieved with the optional Parylene coating (sensor head in stainless steel).

Individually adapted to suit every application – you have the choice!

For optimum installation in the various different pipe diameters, 4 standard sensor lengths as well as special lengths of 120 to 1,000 mm can be selected. A remote version is available for difficult installation conditions. The probe length itself and the cable length between sensor and housing can be selected.

To enable the sensor to be adapted to flow rate conditions, 6 standard measuring ranges are available, extending up to 220 m/s. The volumetric flow rate is the result of the flow rate speed, multiplied by the pipe cross-sectional surface area and a profile factor. However, customer-specific measuring ranges can also be supplied in increments of 0.1 m/s. The advantage of this is that 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/hr with a pipe diameter of DN65 yields a maximum flow rate measuring range for the sensor of 48.1 m/s (= 20 mA or 10 V). For the purposes of 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 20600** offers an additional impulse output for the 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!

More often than not, the medium being measured is not air, but instead comprises other gases or gas mixtures. For these special applications, gas-specific versions of the **EM 20600** can be supplied. With these versions, the sensor has a specific correction – based on adjustment in air – programmed in. 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 % of volume all components in contact with the media must be cleaned to remove greases, oils and/or other combustible elements. A specific O₂ > 21 % variant provides the required safety for this application.

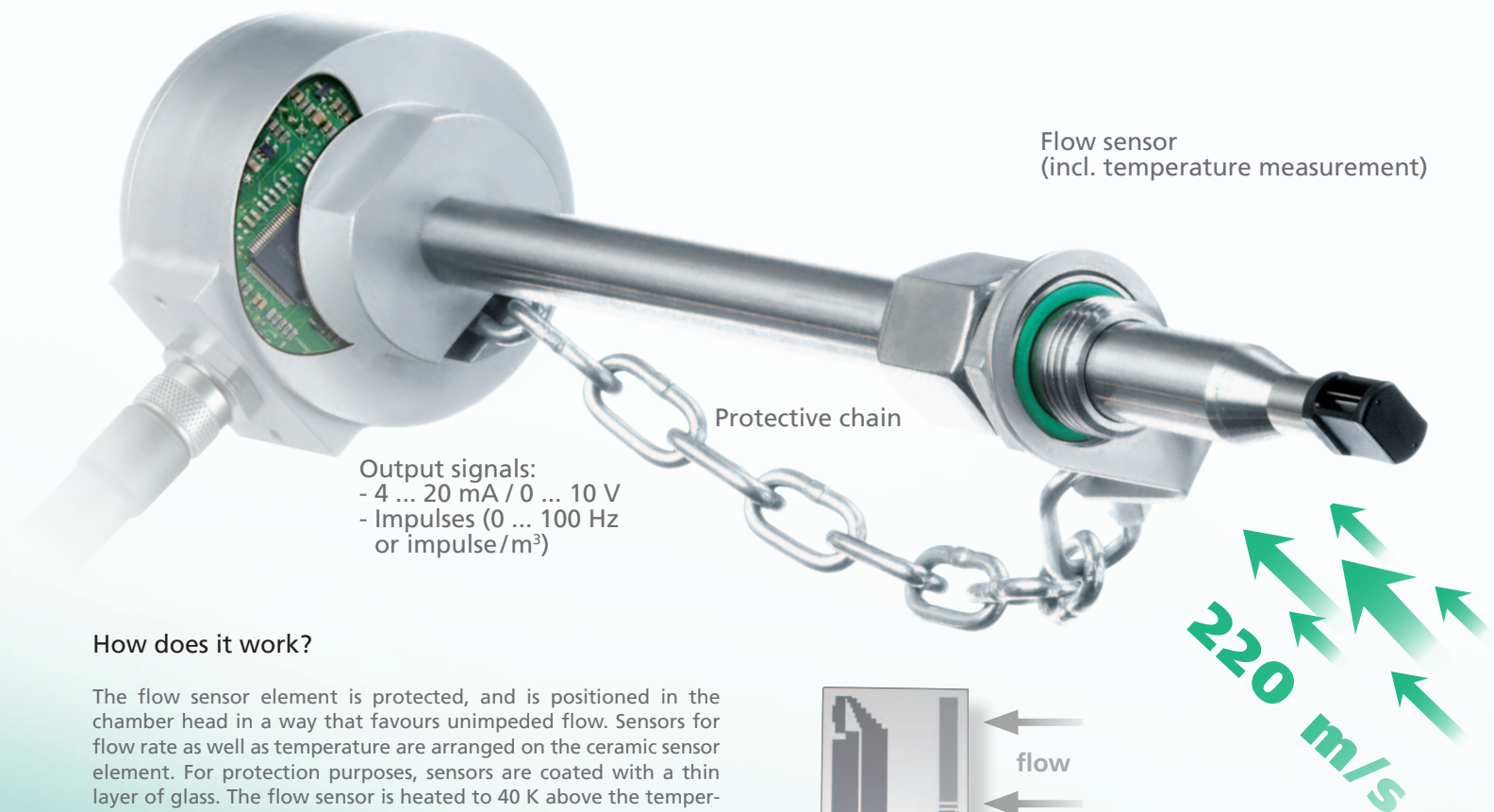
Accuracy – in black & white

As an option, the **EM 20600** can be supplied with a high precision adjustment for air that can also be used for pure oxygen and nitrogen. This measurement is carried out at **EM**. The high levels of precision and reproducibility are documented in a factory calibration certificate (order option). This factory calibration can be renewed to suit user definitions.

Practical examples

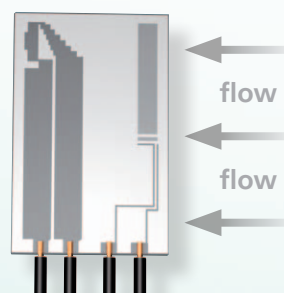
Branch	Application	The solution with SS 20.600
Industrial processes	Measurement of incoming air to control industrial burners/incinerators	- High flow rate speeds of up to 220 m/s - Measurement of standard volumetric flow rate independent of pressure and temperature - O₂ version for pure oxygen
	Recording of inert gas volumes (nitrogen)	- Specific versions for gas and gas mixtures - High media resistant version with Parylene coating - Resistant to overpressure up to 40 bar
	Control of combustion gas volume (natural gas, methane, ...)	- ATEX version - For pipe diameters from DN25
	Detection of gas consumption	- Acquisition of the flow rates of "almost zero" to the maximum value (detection gas slippage) - From - 40 °C temperature of medium usable (ATEX version)
Compressed air technology	Compressed air consumption, compressor control	- Extremely wide measuring ranges for flow rate - Simple signal processing: Impulse per volume (e.g. 1 m³)
	Leakage measurement	- Measurement from 0.2 m/s - Design principle eliminates age-dependent drift
	Monitoring of minimum flow rate	- High-precision adjustment (1 % precision) - Very fast response speed

Evaluation electronics



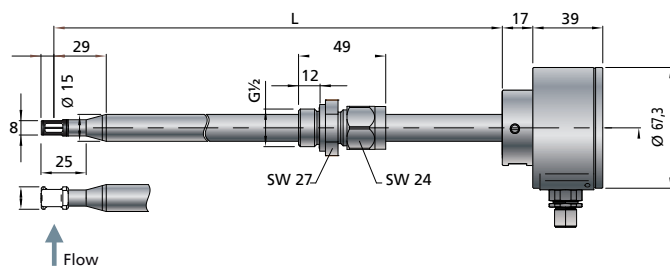
How does it work?

The flow sensor element is protected, and is positioned in the chamber head in a way that favours unimpeded flow. Sensors for flow rate as well as temperature are arranged on the ceramic sensor element. For protection purposes, sensors are coated with a thin layer of glass. The flow sensor is heated to 40 K 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 the pressure or temperature of the medium is required.

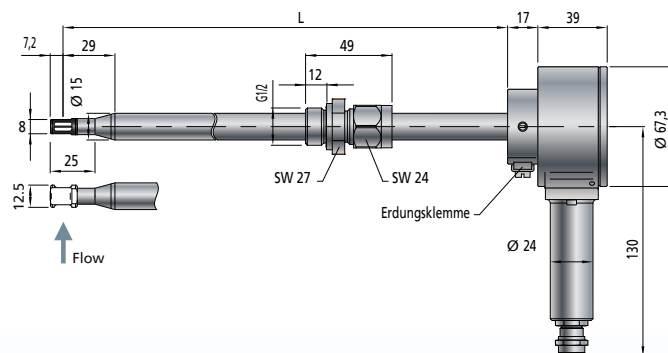




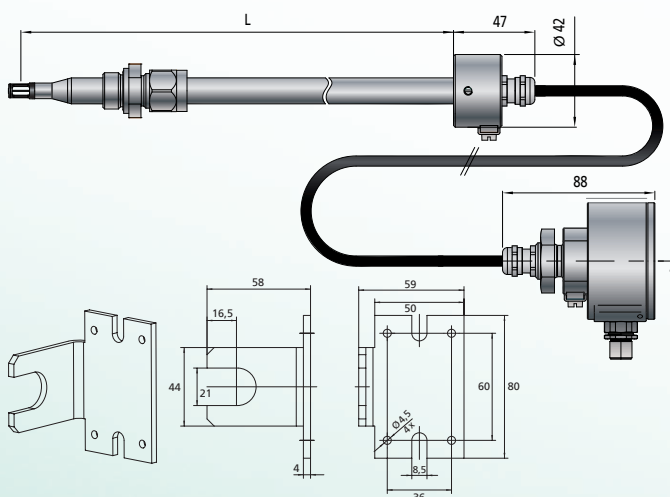
Dimensions of the basic sensor



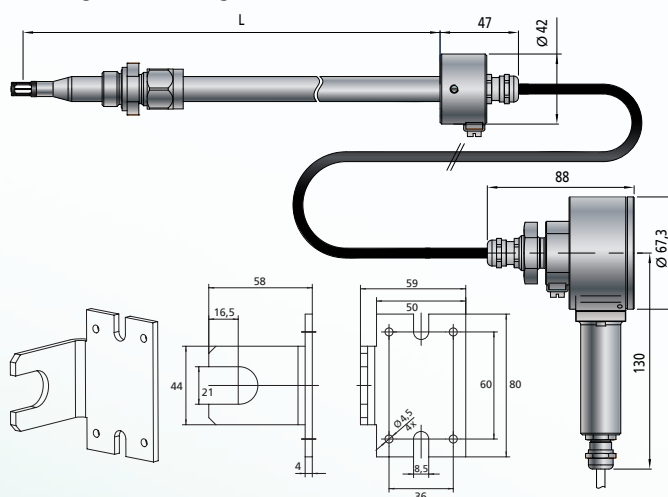
ATEX version EM 20600 Ex (optional)



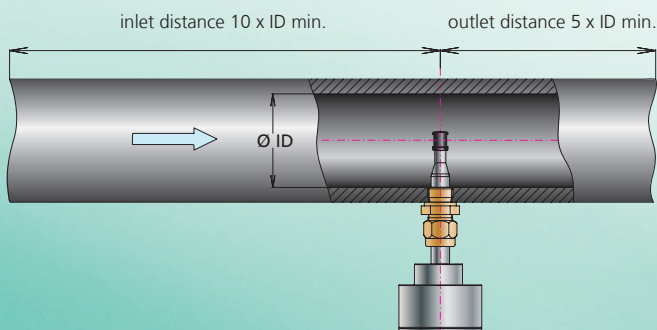
Remote sensor including wall mounting bracket



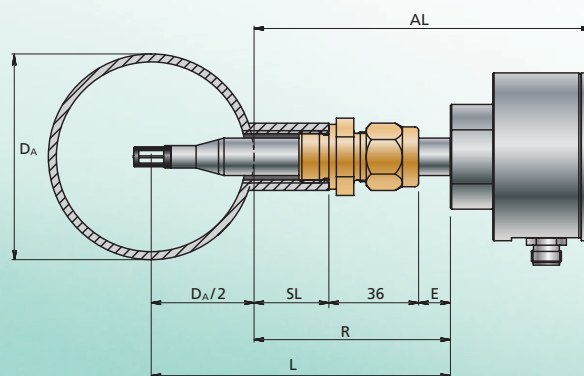
Remote sensor, ATEX version (optional) including wall mounting bracket



Mounting instructions



Mounting parameters



Everything in view

The LED display is dual function. In "normal" operation the 4 x LED's illuminate steady green in sequence. In "fault" condition reportable faults are indicated by red flashing LED's. The instrument will output V and mA and change-over is automatic.

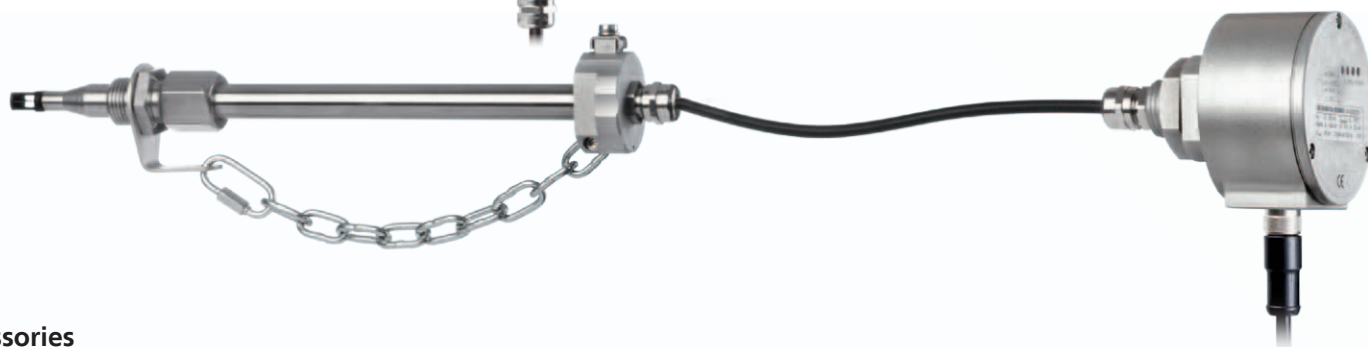


D_A = Outer diameter of tube
 SL = Length of welding sleeve
 E = Adjustable length of sensor tube
 AL = Projection length of compact sensor
 R = Reference length
 L = Length of sensor
 All dimensions in mm



Use in combustible or explosive media

The optional ATEX version **EM 20600 Ex** is designed for use in both zone 2 explosive gas atmospheres and zone 22 explosive dust atmospheres. For this, specific protection functions are incorporated, among other things, one example being a protective sleeve for the plug connector and the ground / earth terminal on the housing or, on the remote version, with an additional one on the sensor tube. This version enables a minimum medium temperature of -40°C to be reached.



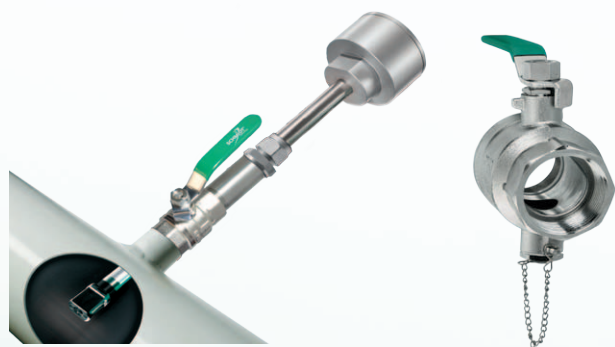
Accessories

Probe ball valve

(see separate brochure)

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

(see separate brochure)

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

The advantages:

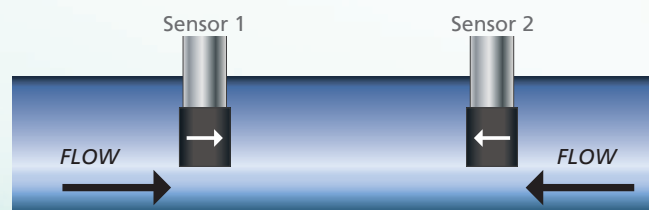
- Display in m/s or m^3/h
- Programmable output signal
- Two programmable relay outputs
- Power supply: 85 – 230 V AC or 24 V DC
- Power supply to the connected sensor
- Separate version with "sum" function
- Detection of flow direction by the use of two **EM 20600** units arranged at 180° to one another

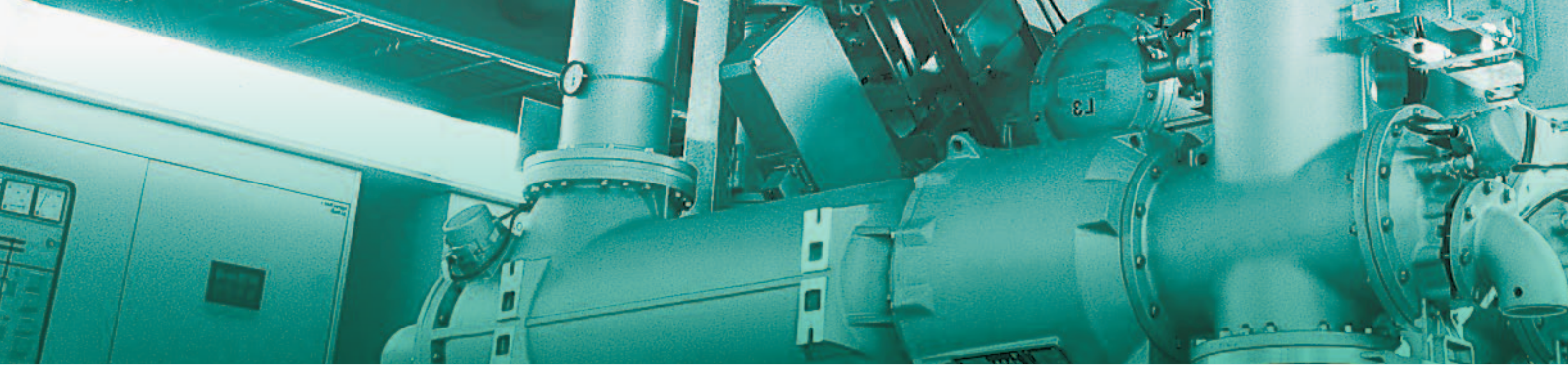
Extended connection options with field bus modules

As an option, the following variants are available for integrating the **EM 20600** into existing BUS systems:

- DeviceNet
- ProfiBUS DP
- Others on request

The BUS modules are housed in a rugged auxiliary housing. The standard outputs are available in addition to the BUS signal.





Technical Data

Measuring data	
Measuring values	Standard flow velocity w_N normalized to 20 °C and 1,013.25 hPa; temperature of the medium T_M
Measuring fluid	Air, nitrogen; optional: Methan, natural gas, biogas, CO ₂ , oxygen, special gases and gas mixtures
Measuring range w_N	0 ... 10/20/60/90/140/220 m/s; optional: customised measuring ranges in 0.1 m/s-steps
Lower detection limit w_N	0.2 m/s
Measuring range T_M	-20 ... +120 °C; SS 20.600 Ex: -40 ... +120 °C; O ₂ : -20 ... +60 °C
Accuracy	
Standard w_N ¹⁾	±(3 % of measured value + [0.4 % of fmr; min. 0.08 m/s])
High precision w_N (optional, for air, nitrogen, oxygen only) ¹⁾	±(1 % of measured value + [0.4 % of fmr; min. 0.08 m/s])
Response time (t_{90}) w_N	1 s (jump from 0 to 5 m/s air)
Temperature gradient w_N	< 8 K/min at $w_N = 5$ m/s
Measurement accuracy T_M ($w_N > 2$ m/s)	±1 K (10 ... 30 °C); ±2 K remaining measuring range
Operating temperature	
Sensor	-20 ... +120 °C; ATEX: -40 ... +120 °C; O ₂ : -20 ... +60 °C
Electronics	-20 ... +70 °C
Storage temperature	-20 ... +85 °C
Material	
Housing	Aluminium, anodized
Sensor tube, screw connection	Stainless steel 1.4571
Sensor head	Platinum resistor element (glass-passivated), PPO / PA; option: sensor head out of stainless steel with Parylene coating
Protective sleeve	Aluminium, anodized
Sensor cable (on remote sensor)	Jacket PUR, halogen-free, UL
General Data	
Humidity	Measuring mode: Non-condensing (< 95 % RH)
Maximum pressure	16 / 40 bar; oxygen (O ₂ > 21 %): 20 bar
Display	4 x Duo LEDs green/red/orange
Supply voltage	24 VDC ± 20 %
Current intake	Approx. 50 mA (without impulse outputs); max. 250 mA
Analogue outputs for temperature and flow rate Auto U/I	2 outputs (w_N and T_M) $R_L > 550 \Omega$: 0 ... 10 V / $R_L < 500 \Omega$: 4 ... 20 mA (Hysteresis: $\Delta R_L = 50 \Omega$)
Impulse outputs	Frequency 0 ... 100 Hz, optional: 1 impulse / 1 m ³ ; 1 impulse/0.1 m ³ ; 1 impulse/0.01 m ³ (max. 100 Hz) 1. Highside driver to supply voltage (not galvanically isolated) High level: > supply voltage -3 V Short circuit current limitation: 100 mA 2. Semiconductor relay (galvanically isolated); max. 30 V / 50 mA
Electrical connection	Plug-in connector M12 (A coded), screwed, 8-pin, male
Maximum line length	Voltage signal: 15 m, current signal/impulse: 100 m
Mounting position	Any (with vertical downdraft: lower limit of measuring range 2 m/s @ 16 bar)
Installation tolerance	±3° to flow direction, unidirectional
Minimum tube diameter	DN25
Type/class of protection	IP65 (housing), IP67 (sensor) / III (SELV) or PELV
ATEX category	Zone 2 (gas): II 3G Ex ec ic IIC T4 Gc Zone 22 (dust): II 3D Ex ic tc IIIC 135°C Dc
Sensor length	Compact sensor: 120 / 250 / 400 / 600 mm; special lengths from 120 to 1,000 mm, steps of 10 mm
Weight	Approx. 500 g max. (without connection cable)

¹⁾ under reference conditions, related to adjustment reference
fmr = final measuring range

Order information for the Flow Sensor EM 20600

	Description	Article number									
Basic sensor	Flow Sensor EM 20600; 2 analog outputs for w _N (flow velocity) and T _M (media temperature) with 4 ... 20 mA and 0 ... 10 V each; 2 pulse outputs; incl. pressure-tight stainless steel compression fitting	524 600	A	B	C	D	E	F	G	H	PP
	Options										
Mechanical type	Sensor length 120 mm		1								
	Sensor length 250 mm		2								
	Sensor length 400 mm		3								
	Sensor length 600 mm		4								
	Special sensor length: >120 ... 1,000 mm, 10 mm-steps (order spec.)		8								
	Remote probe: 120 / 250 / 400 / 600 mm Cable length (probe to electronics): 1 ... 10 m; 1 m-steps; order spec.)		9								
	Pressure-tight compression fitting, stainless steel G ½			1							
	Pressure-tight compression fitting, stainless steel R ½ (PT)			2							
Measuring ranges and adjustment ¹	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 ... 220 m/s in 0.1 m/s-steps (order spec.)				9						
	Standard adjustment					1					
	Standard adjustment with factory calibration certificate					0					
	High-precision adjustment with factory calibration certificate					2					
	Standard adjustment with conversion factor for methane ²⁾ w _N max: 90 m/s					3					
	Standard adjustment with conversion factor for biogas ²⁾ (60 % methane, 40 % CO ₂) w _N max: 35 m/s					4					
	Standard adjustment with conversion factor for CO ₂ ²⁾ w _N max: 60 m/s					5					
	Standard adjustment with conversion factor for natural gas ²⁾ with 88 % methane, w _N max. 160 m/s					7					
Standard adjustment with conversion factor for special gases and mixtures ²⁾					9						
Impulse outputs	Standard 100 Hz (= final value of measuring range w _N)						1				
	Special impulse output: 1 ... 100 Hz						9				
	1 impulse / 1 m³ for pipe diameter (round) (order spec.)						2				
	1 impulse / 0.1 m³ for pipe diameter (round) (order spec.)						3				
	1 impulse / 0.01 m³ for pipe diameter (round) (order spec.)						4				
Additional outputs	Without communication module							1			
	Communication module for Profi-BUS DP-V0							2			
	Communication module for DeviceNet							3			
Protection type ATEX	Without ATEX design (SS 20.600)								1		
	ATEX design (SS 20.600 Ex) ²⁾								2		
Scope of application	For standard application									1	
	Oxygen: O ₂ > 21 % (p _{max} = 20 bar; T _{M,max} = 60 °C)									2	
	Parylene coating (sensor head out of stainless steel 1.4571)									3	
Overpressure	Operating pressure DD: 00 (atmospheric) ... 16 bar										00 ... 16
	Operating pressure DD: 17 ... 40 ²⁾										17 ... 40

¹⁾ Select the appropriate measurement range

²⁾ Not available in combination with the option "special lengths"

³⁾ Not available in combination with ATEX

Order information Flow Sensor EM 20600

	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 Ø 6 ... 8 mm	524 929
	Welding sleeve steel G ½ acc. to EN 10241, 5 pieces	524 916
	Welding sleeve stainless steel G ½ acc. to EN 10241, 2 pieces	524 882
	Power supply: output 24 V DC / 1 A; input 115 / 230 V AC	535 282
	LED display EMD 10010; in wall housing to show the 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 EMD 10015; in wall-mounted housing, similar to 527 320 but with additional sum function and second measuring input	527 330
	LED display EMD 10015; similar to 527 330, but with 24 V DC voltage supply	528 250
	Assembly kit for pipe assembly, suitable for EMD 1010 / 10015, including pipe clamps and collar for adjustment to the 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 1 ¼" inside thread, connection to flow sensor: ½" inside thread incl. plug and chain	530 941
	Probe ball valve 1 ½" 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



Shielded connection cable available in various lengths



Coupler socket with screw type terminals
Type no. 524 929



Welding steel sleeves Type no. 524 916
or stainless steel Type no. 524 882