

# Ultrasonic Flowmeter USZ 08

**PTB-approved**

7.241

01.04



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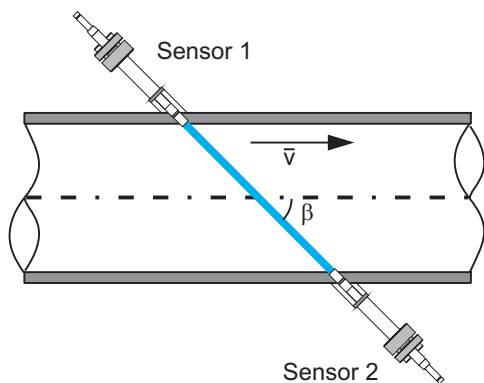


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## Method of operation

By means of the transit times of ultrasonic pulses, the USZ 08 ultrasonic flowmeter measures the flow velocity of the gas from which it calculates the volume flow rate at measurement conditions. Here use is made of the fact that ultrasonic pulses move faster in the direction of flow than in the opposite direction.



Each sensor is an emitter and a receiver at the same time. Measurements are taken alternately in both directions, i.e. after a transit time has been measured, the emitter becomes the receiver and vice versa. In this way, the influence of the velocity of sound which depends on gas types is eliminated.

In order to take the flow profile into account, measurements are taken using a total of 6 acoustic paths in 3 parallel planes. In each plane, there are 2 paths crossing each other.

## Construction

The USZ 08 ultrasonic flowmeter consists of the measuring unit, i.e. a case including 12 sensors, the electronic measuring system, and the ultrasonic control unit.

The sensors are directly attached to the case through flanges and do not extend into the pipeline. The arrangement of the paths is symmetrical with regard to the centre of the gas meter, so that the latter can be used for both directions of flow without being altered or reprogrammed.

The electronic measuring system comprises 3 modules which determine the flow velocity averaged across two paths from the measured transit times for one plane each.

The ultrasonic control unit calculates the flow velocity averaged across the cross section of the pipe from the results of the 3 electronic modules. The totalizer readings for volumes at measurement and base conditions for forward and backward flows are also displayed by the computer.

## Approval

The USZ 08 ultrasonic flowmeter has been approved for custody transfer metering at operating pressures from  $p_{abs}=1 \text{ bar}$  and for diameters up to 24".

PTB approval mark:

7.241  
01.04

Subsequent meter proving is to be carried out in compliance with Technical Guideline AGA 9.

## Applications

Since the USZ 08 ultrasonic flowmeter can take measurements in both directions, it is particularly suitable for use in underground storage facilities. Since the same line can be used for both storing gas in the underground facility and removing it, costs for the gas measuring station will be lower.

Thanks to its wide measuring range, the USZ 08 can also be used in measuring stations with heavy flow rate variations.

This flowmeter also proves to be advantageous when it is used in stations where a low pressure loss is essential. There is almost no pressure loss due to the fact that there are no components located within the cross section of the pipe. Furthermore, no disturbances are caused in the flow and, therefore, the gas meter can be used as inlet section for other gas meters which are permanently connected in line.

## Installation

The USZ 08 can be installed either horizontally or vertically. It requires an inlet section of 10 DN and an outlet section of 3 DN in length. If a perforated plate is used, the length of the inlet section reduces to 5 DN. Any pipe section with the same nominal diameter can serve as inlet or outlet section. The inside diameter must be equal to that of the gas meter or at most 2% smaller or 5% larger.

Due to the possible high flow velocity of up to 40 m/s by comparison with a turbine meter, the next smaller nominal diameter can be chosen while the flow rate remains the same, and this results in a reduction in length of the measuring line.

Resistance thermometers for gas volume correction are installed in the outlet section, 2 to 4 DN downstream of the gas meter, in the case of bidirectional measurements at a distance of 4 DN.

## Features

- **Suitable for pressures from 1 bar.**
- **Pressure rating:**  
PN 40, PN 100, PN 160 (optional PN 250), ANSI 300, ANSI 600, ANSI 900 (optional ANSI 1500).
- **Nominal diameters from DN 100 to DN 1000.**
- **High flow velocity (up to 40 m/s)**  
results in smaller nominal diameters of the gas meters.
- **Calibration with air in conjunction with high-pressure testing.**
- **No mechanically actuated parts.**  
Therefore, the gas meter has a low rate of wear.
- **Measurements are possible in both directions.**  
There are several totalizers available for separate measurements of forward and backward flowing volumes.
- **Proven piezo-electric sensor technology.**
- **One sensor type for all pressure ranges.**
- **Suitable for use in Zone 1.**  
The sensors are explosion-proof and their type of protection is EEx d IIC T6.
- **Robust sensors.**  
The ultrasonic sensors have a full titanium enclosure.
- **Insensitive to soiling.**  
Since measurements with the 6 path meter are taken without sound reflection, dirt deposits on the pipe wall have no influence. Furthermore, the titanium surface of the sensors is dirt-repellent.
- **Independent of pressure variations,**  
since the flow velocity is measured directly and no transmission of force or fluid-mechanic effects are required for measurement.
- **Long-term stability of measurements.**
- **Easy to operate**  
via the USC 2000 ultrasonic control unit.
- **No pressure loss.**
- **Sensor replacement without recalibration.**
- **Sensors can be replaced in pressurized condition (option).**

## Ultrasonic control unit

Operation of the ultrasonic flowmeter is performed through the control unit based on the RMG ERZ 2000 Flow Computer which controls measurements, calculates the flow rate and provides the totalizer readings. All operating parameters are stored here. Official parameters for custody transfer metering are protected by a sealable switch, whereas all the other parameters are protected by a code number.



### Features:

- **Ease of operation:** All configuration data and measured and calculated data are stored in an easy-to-survey table. All the cells of this table can be reached or displayed by pressing arrow keys. Moreover, operation via PC is possible with any internet browser.
- **With integrated volume corrector, data logger and MODBUS interface.**
- **The measured volume can be transmitted to an external volume corrector either digitally (serial link) or via 2 volume pulse outputs and relay contact for the direction of flow.**
- **Error curve linearization, i.e. correction of the measuring error using the error curve obtained during high-pressure testing, is possible.**
- **Rack-mounting case for installation into 19" subracks.**
- **Can be located at a distance of up to 500 m from the measuring element.**
- **4 electrically isolated and freely programmable current outputs.**

# Ultrasonic Flowmeter

## USZ 08

### Measuring ranges / Dimensions

DN mm (in)	Measuring range m <sup>3</sup> /h		Path-Versions	Dimensions mm			Weight kg (ANSI 600)
	Q <sub>min</sub>	Q <sub>max</sub>		Length	Width	Height <sup>1)</sup>	
100 ( 4")	13	1000	3 paths	500	800	500	200
150 ( 6")	20	2500	3 paths	900	920	380	240
200 ( 8")	40	4000	6 paths	1000	970	400	390
250 (10")	65	6500	6 paths	1250	1020	430	580
300 (12")	80	10000	6 paths	1200	1070	450	650
400 (16")	130	16000	6 paths	1200	1150	500	930
500 (20")	200	25000	6 paths	1500	1240	560	1400
600 (24")	320	40000	6 paths	1800	1335	620	2000
700 (28")	400	55000	6 paths	1900	1500	780	2600
750 (30")	500	60000	6 paths	2000	1600	850	3000
800 (32")	600	70000	6 paths	2000	1700	900	3500
900 (36")	750	90000	6 paths	2400	1800	1000	4500
1000 (40")	900	110000	6 paths	2800	2000	1200	5500

1) measured from the centre line of the pipe

### Specifications

<b>Accuracy*:</b>	3 measuring paths: ± 0.5% 6 measuring paths: ± 0.3%
<b>Reproducibility:</b>	≤ 0.1% of reading
<b>Ultrasonic frequency:</b>	100 kHz or 200 kHz
<b>Measuring interval:</b>	1 update / s
<b>Flow velocity:</b>	-40 to +40 m/s
<b>Temperature range:</b>	-20° to +60°C
<b>Pressure range:</b>	0 bar(g) to 100 bar(g) (others on request)
<b>Power supply:</b>	24 VDC or 230 VAC
<b>Power requirement:</b>	Measuring element: approx. 30 W, computer: 35 W
<b>Measured-value transmission:</b>	- serial interface (RS 485, Modbus) - 2 pulse outputs - 4 current outputs (freely programmable, 0/4-20 mA, electrically isolated)
<b>Explosion protection:</b>	II 2 G EEx de IIC T5/T6 / DMT 02 ATEX E 194
<b>Degree of protection:</b>	IP 65

\* with straight inlet / outlet section 10 DN / 3 DN

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