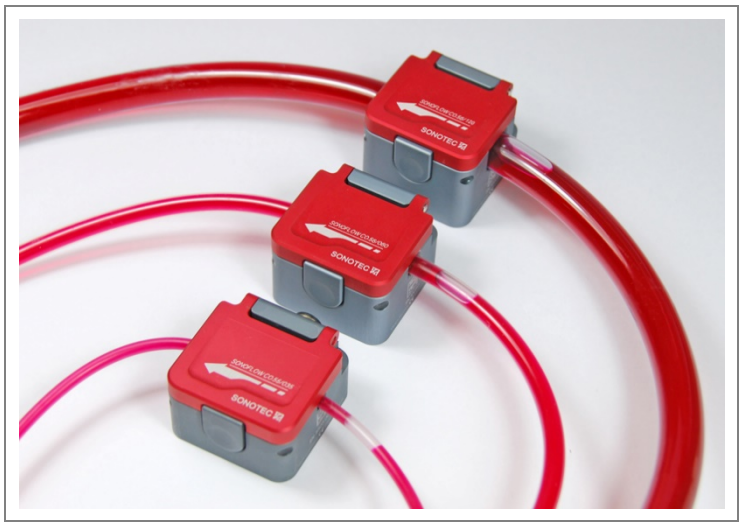


The sensor series **SONOFLOW CO.56** – designed as clamp-on-sensors – detect the flow rate of liquids in plastic tubes of different diameters or materials within a few milliseconds.

With extended functionality the sensors are also applicable for the detection of air bubbles.

The sensors have no contact to the medium or product and are suitable for applications in fields with strict hygienic standards e.g. the medical technology, biotechnology and pharmaceutical industry as well as chemical and semiconductor industry. The **SONOFLOW CO.56** sensors with complete built-in electronics can be installed in machines or apparatuses.

In addition to our standard sensors, we also manufacture customer-specific solutions regarding housing materials, colors, mechanical dimensions, customized output specifications and parameter settings.

Overview sensors

Specification SONOFLOW	Order-No.	Max. Flow Range	Measuring channel (☐ CH = CW)	Dimensions (L x W x H)	Weight
CO.56/035	200 04 0009	3 000 ml/min	3.5 mm	44 x 44 x 28 mm	120 g
CO.56/044	200 04 0010	5 000 ml/min	4.4 mm	44 x 44 x 30 mm	125 g
CO.56/060	200 04 0011	6 000 ml/min	6.0 mm	44 x 44 x 32 mm	130 g
CO.56/080	200 04 0012	8 000 ml/min	8.0 mm	44 x 44 x 34 mm	135 g
CO.56/120	200 04 0013	12 000 ml/min	12.0 mm	44 x 44 x 36 mm	140 g
CO.56/140	200 04 0014	14 000 ml/min	14.0 mm	44 x 44 x 38 mm	145 g

Tubing properties

The selection of the right sensor depends on tubing dimensions as well as on tubing properties. If possible, please provide us with a tubing sample (minimum length 50 cm).

Specification SONOFLOW	Tubing OD	Tubing ID	Material and product ID of tube manufacturer
CO.56/035	4.0 mm	3.0 mm	PVC, 3500304 *
CO.56/044	5.0 mm	3.0 mm	PVC, 702101031099 **
CO.56/060	7.0 mm	5.0 mm	PVC, 702101051099 **
CO.56/080	9.0 mm	6.0 mm	PVC, 702101061599 **
CO.56/120	14.0 mm	10.0 mm	PVC, 702101102050 **
CO.56/140	16.0 mm	12.0 mm	PVC, 702101122050 **

Manufacturer:

* Deutsch & Neumann GmbH, 10585 Berlin (Germany) | ** ESSKA.de GmbH, 20537 Hamburg (Germany);

Other materials and diameters upon request. Contact our service.

Calibration and conditions of use

Calibration	Sensors are factory calibrated under the following conditions: ▪ PVC tubing as listed in table above (Tubing properties) ▪ Water at 23 °C ± 2 °C ▪ Warm up: at least 30 min (to compensate thermal effects) ▪ Zero calibration just before measurement procedure ▪ Normal pressure Calibration to customer tubing, fluid, flow range, temperature, etc. on request.
Media	Water, human blood or other acoustically transparent liquids ⚠ **NOTE**: SONOTEC does not operate with human blood within the company premises. With respect to calibration, the difference between water and saline solution is negligible. For applications with blood (hemoglobin: Hb = 9 ± 2 g/dl) some special factors/settings can be modified after calibration (→ observe the instruction in the next chapter.)

Accuracy depends on tubing, temperature, fluid properties and other conditions. Absolute accuracy is influenced by zero stability, resolution and zero offset effects. For details see next chapter.

Conditions of use	⚠ **CAUTION:** The sensors need to be adjusted individually to special operating conditions ▪ in case of operation with tubing not listed in the table 'Tubing properties', because the accuracy of flow measurement and bubble detection can be affected and ▪ if the sensor is intended to measure with human blood at normally 37 °C and hemoglobin between 6 g/dl to 12 g/dl. Contact our service for details! ⚠ **NOTE:** Generally, the sensors are able to measure liquids in an extended operating temperature range of +1 to +50 °C and to measure blood within the ranges of Hb = 0 to 6 g/dl or Hb = 12 to 18.5 g/dl, but with limited accuracy only.

Flow accuracy / repeatability

Specification SONOFLOW	**Flow measurement accuracy after 30 min sensor warm-up, no thermal gradients, normal removing / inserting of tubing.** Flow measurement repeatability at constant conditions, after 30 min warm-up, no thermal gradients, lid remains closed, no removing / inserting of tubing, no movements of sensor or tubing.			
CO.56/035	< 300 ml/min:	**± 15 ml/min** ± 6 ml/min	≥ 300 ml/min:	**± 5 %*** ± 2 %*
CO.56/044	< 500 ml/min:	**± 25 ml/min** ± 10 ml/min	≥ 500 ml/min:	**± 5 %*** ± 2 %*
CO.56/060	< 600 ml/min:	**± 30 ml/min** ± 12 ml/min	≥ 600 ml/min:	**± 5 %*** ± 2 %*
CO.56/080	< 800 ml/min:	**± 40 ml/min** ± 16 ml/min	≥ 800 ml/min:	**± 5 %*** ± 2 %*
CO.56/120	<1 200 ml/min:	**± 60 ml/min** ± 24 ml/min	≥ 1 200 ml/min:	**± 5 %*** ± 2 %*
CO.56/140	< 1 400 ml/min:	**± 70 ml/min** ± 28 ml/min	≥ 1 400 ml/min:	**± 5 %*** ± 2 %*

* of reading

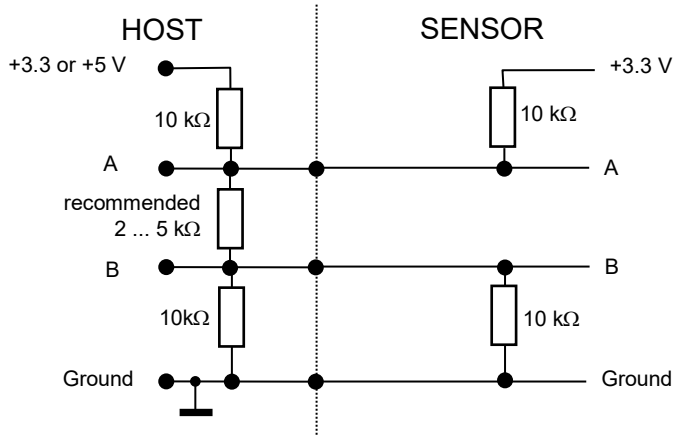
Zero point stability: Flow measurement drifts less than 0.02 l/min in 24 h at zero flow.

Bubble detection and sensitivity

If bubbles with a size larger than the threshold are detected, bubble alarm is set. The threshold depends on sensor type. The sensitivity depends on diameter of tube and mounting position.

Bubble sensitivity	Bubbles larger than approx. 30 % of internal tube diameter are detected
Reaction time	Internal evaluation of bubbles within intervals of max. 1.6 ms
Response time	< 10 ms; faster response time possible if needed

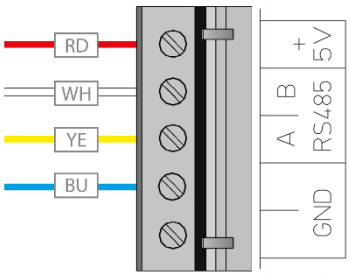
Technical data

SONOFLOW CO.56 **Flow Bubble Sensor for liquids**	
Measuring method	Ultrasound, dry coupling, no couplant required
Mounting	Fixed installation: 4 fixing holes M4, 8 mm deep ⚠ **NOTE**: The metallic housing of sensor has to be connected to ground of machine by means of mounting or by shielded connection line!
Tube insertion	Tube shall be put in dryly without coupling gel. It is essential to close the lid before measurement.
Sensor materials	Measuring channel: PMMA black Housing: aluminum, anodized grey/red (optional: stainless steel, plastics)
Output (others on request)	RS485 interface, half-duplex mode, on demand mode Baud rate 115.2 kBaud, 8 data bit, 1 stop bit, no parity bit Query cycle: 20 ... 200 ms (typically)
RS485 interface	Half-duplex operation / 115.200 baud / no parity / 1 stop bit / no handshaking ⚠ **NOTE:** Description of the serial protocol for details upon request.  Recommended electrical connection of the RS 485 interface

RS485 Bus operation	The sensor supports bus operation with max. 12 subscribers. The default address is #01. ⚠ **NOTE:** The address can be changed with the help of the SONOFLOW Monitor. Permitted are addresses from #01 … #12. → Menu: Identification | RS485 address
Operating voltage	5 VDC +0.5/-0.1 VDC Internal suppressor diode to protect the sensor: Overvoltage protection: 5 V / 600 W, shortly Inverse-polarity protection: In case of inverse polarity, the sensor is protected by the diode. A high short-circuit current flows.
Current consumption	< 150 mA ⚠ **ATTENTION**: Current must be limited externally to max. 250 mA (e.g. fuse)
Operating temperature	+10 … +50 °C (see also chapter 'Calibration and conditions of use')
Ambient / Media temperature	+10 … +50 °C, other temperatures available on request
Storage temperature	-20 ... +70 °C
Protection class	IP67
Directives and standards	▪ EMC: IEC 60601-1-2:2007 ▪ Medical safety: IEC 60601-1 3rd edition ▪ Software developed acc. to IEC 62304:2006, class C ▪ RoHS: 011/65/EU, exception: III 7cl/ IV 15 ▪ Acoustic emission: IEC 61157
Maintenance	Maintenance-free
Scope of delivery	▪ SONOFLOW CO.56/xxx according to specification ▪ User documentation
Optional accessories	▪ Calibration protocol SONOFLOW Monitor for setting parameters, recording measurements, diagnostics and tuning consisting of ▪ USB Data Converter, type 012 for the connection to a computer ▪ USB cable, type A-B, length 2 m ▪ CD or Download with Software SONOFLOW Monitor and driver for Windows

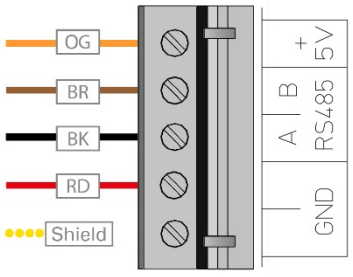
Type HW V1.0

Electrical connection			
Type	4x wire, LiY / 0.14 mm²		
Length	1.0 m ± 0.1 m		
Connector	WECO terminal block		
Assignment	**Color**	**Connection**	**WECO Terminal**
	Red	+5 V	1
	White	RS485 B	2
	Yellow	RS485 A	3
	Blue	GND	4
			5
Grounding	The metallic part of housing must be grounded by means of mounting screws. If the panel is not conductive, an additional grounding line has to be fixed on one of the four screws.		

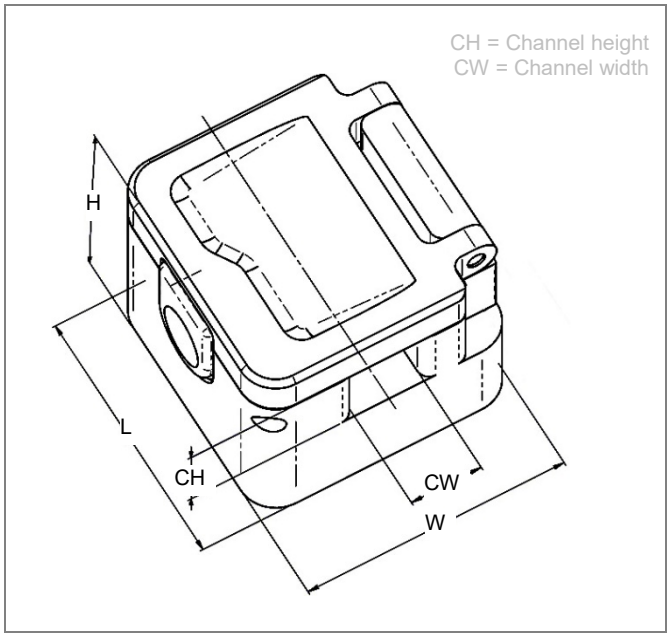


Type HW V1.1

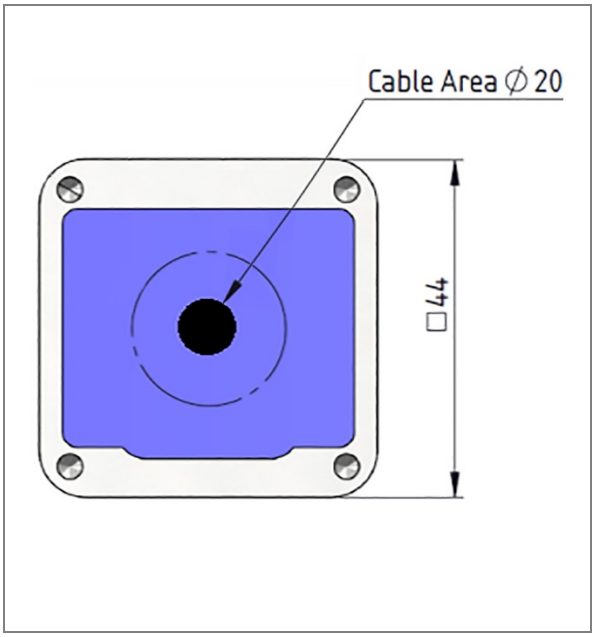
Electrical connection			
Type	UL-LifYDY / 5 x 0.08 mm² / shielded / Ø 3.5 ± 0.1 mm		
Length	2.5 m ± 10 cm		
Connector	WECO terminal block		
Assignment	**Color**	**Connection**	**WECO Terminal**
	Orange	VCC	1
	Brown	RS485 - B	2
	Black	RS485 - A	3
	Red	GND	4
	Shield / Yellow	Housing of sensor	5
Grounding	The metallic part of housing must be grounded by means of mounting screws or by shield of connection line.		



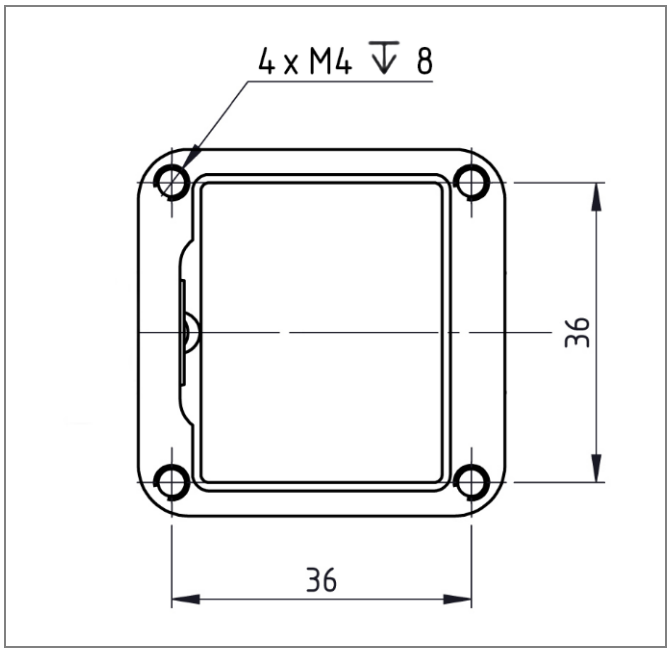
Technical drawings



Dimensions SONOFLOW CO.56



Rear side of sensor



Dimensions of drill holes for mounting

Drawings are not to scale. Information is subject to change without notice!

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