



Sensors of the **SONOFLOW CO.56 Pro** series are used to measure the flow rate of liquids and to detect air bubbles in tubes of various diameters.

The lightweight non-invasive sensors with small footprint are intended to be clamped around the tubing, free-hanging. Specifically designed for implementation in medical devices such as cardiopulmonary bypass and dialysis machines the sensors fulfil explicitly high medical safety standards. Via RS485 interface the sensors are ready for bus operation up to 12 devices.

### Overview sensors

Specification SONOFLOW CO.56 Pro	Channel width (see Drawing)	Dimensions L x W x H	Max. weight
1/4"x 1/16"	8.2 mm	46 x 35 x 32 mm	105 g
1/4"x 3/32"	10 mm	46 x 35 x 34 mm	100 g
3/8"x 3/32"	12.3 mm	46 x 35 x 36 mm	110 g

### Suitable tubing

The sensors are calibrated to the following tubing:

Material: PVC

Manufacturer: RAUMEDIC-ECC-Blood Line

Specification SONOFLOW CO.56 Pro	Tubing OD	Tubing ID	Wall thickness
1/4"x 1/16"	3/8"	1/4"	1/16"
1/4"x 3/32"	7/16"	1/4"	3/32"
3/8"x 3/32"	9/16"	3/8"	3/32"

Other materials and sizes upon request.

## Accuracy and calibration

Specification SONOFLOW CO.56 Pro	Maximum range	Accuracy for water: adjusted at 23 °C ± 2 K and 1 bar on specified tube (listed)	
1/4" x 1/16"	4 000 ml/min	0 ... 400 ml/min: ± 40 ml/min	400 ... 4 000 ml/min: ± 5 %
1/4" x 3/32"			
3/8" x 3/32"	10 000 ml/min	0 ... 1 000 ml/min: ± 50 ml/min	1 000 ... 10 000 ml/min: ± 5 %

Absolute accuracy is influenced by zero stability, resolution and zero offset effects. Stated values are applicable when zero offset is null. The stated accuracy is applicable for the specified tube and a pre-heat time of at least 30 min. The above stated accuracy rates can only be achieved if the tolerance of the inner diameter of the relevant tubing is not bigger than ± 1.25 %.

⚠ **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 are modified after calibration. 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 restricted accuracy only. Other calibration (to customer tubing, fluid, flow range, temperature) on request.

## Technical data

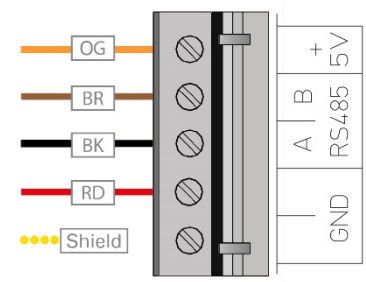
SONOFLOW CO.56 Pro FlowBubble Sensor for liquids	
<b>Measuring method</b>	Ultrasonic transit time difference measurement in transmission with two redundant measurement paths, dry coupling, no couplant required
<b>Media</b>	Water, isotonic saline solution, human blood (or other acoustically transparent liquids)
<b>FLOW MEASUREMENT</b>	
<b>Calibration</b>	Sensors are factory calibrated for water at 23 °C ± 2 K, tube end depressurized (0 bar), see details above
<b>Zero point stability</b>	Flow measurement drifts less than 0.02 l/min in 24 h at zero flow
<b>BUBBLE DETECTION</b>	
<b>Bubble sensitivity</b>	Configurable: Safe detection of bubbles with diameter up 3.0 mm
<b>Reaction time to bubbles</b>	Internal evaluation of bubbles within intervals of max. 1.6 ms

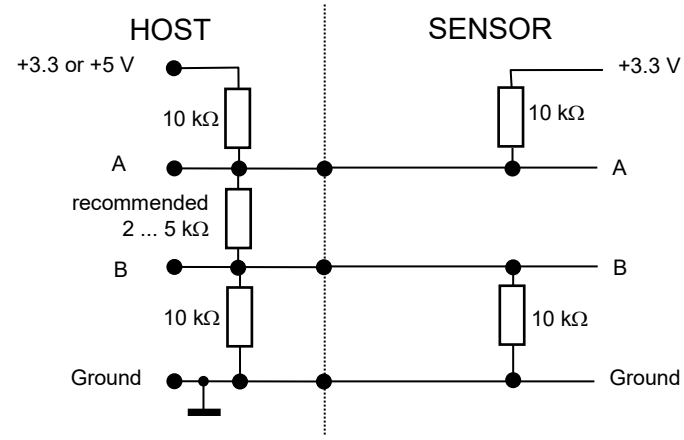
<b>Operating voltage</b>	5 VDC +0.5/-0.1 VDC Internal suppressor diode to protect the sensor: Overvoltage protection: 5 V / 600 W, shortly Inverse-polarity protection: In case of inverse polarity, the sensor is protected by the diode. A high short-circuit current flows.
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<b>Current consumption</b>	≤ 150 mA Power supply of the sensor needs a current limiter, e.g. a fuse with 250 mA (minimize risk of a heating / fire as consequence of short-circuit)
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<b>Electrical connection</b>	Type: UL-LifYDY / 5 x 0.08 mm <sup>2</sup> / shielded / Ø 3.5 ±0.1 mm Length: 2.0 m (± 10 cm), strain reliefs at each end, WECO terminal block for connection of SONOFLOW Monitor
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Assignment	Colour	Connection	WECO Terminal
	Orange	VCC	1
	Brown	RS485 - B	2
	Black	RS485 - A	3
	Red	GND	4
	Shield / Yellow	Housing of sensor	5



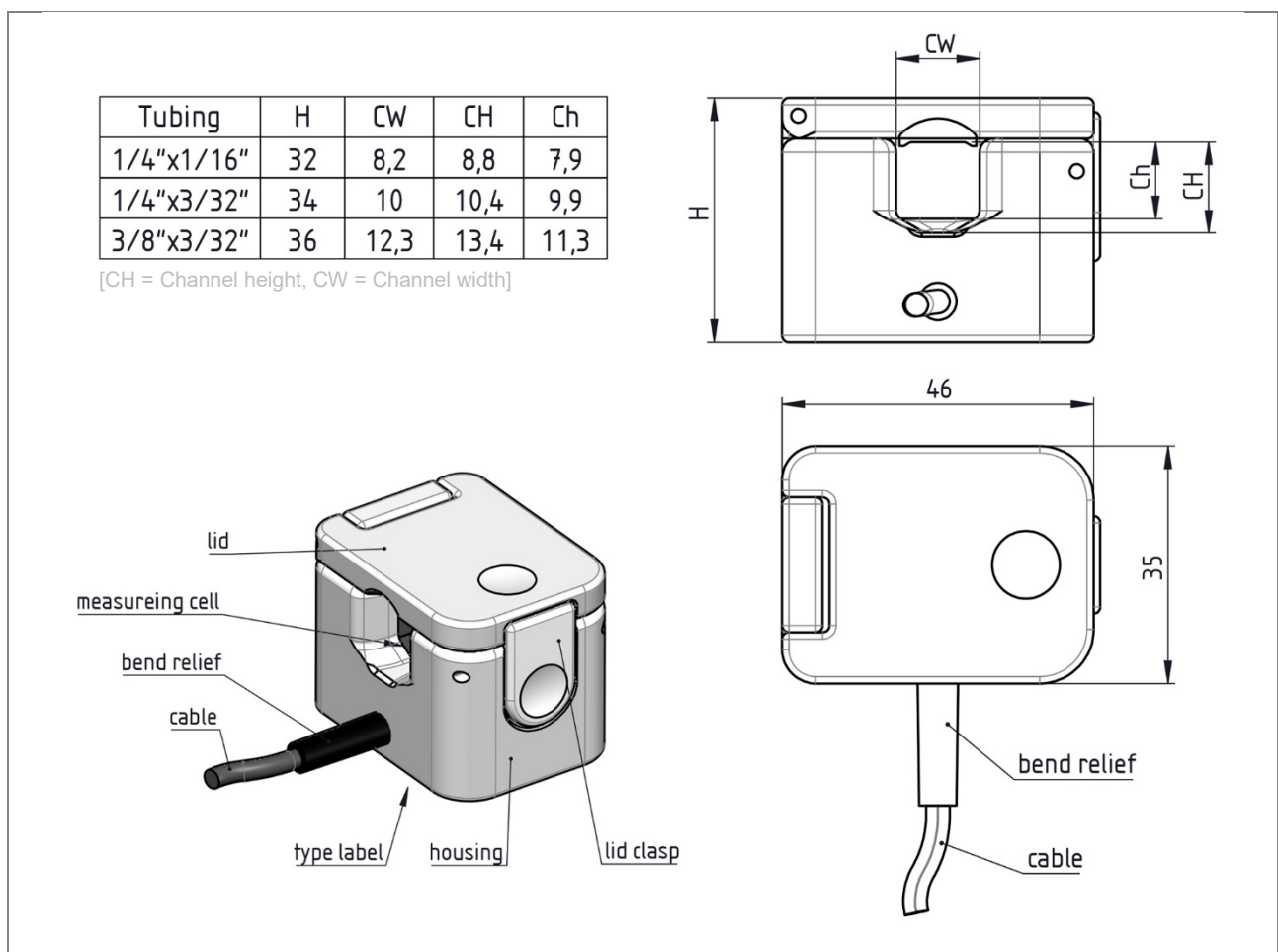
<b>RS485 interface</b>	<p>Half-duplex operation / 115.2 kbaud / 8 bit data 1 stop bit / no parity bit/ no handshaking</p> <p>Dialog mode (on demand): machine is intended to ask results cyclically, sensor does not have an own alarm equipment)</p> <p>Query cycle: 20 ... 200 ms (typically)</p> <p>⚠ <b>NOTE:</b> Description of serial protocol with details upon request.</p> 
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<b>RS485 Bus operation</b>	Bus operation supported up to 12 subscribers, default address is #01 (can be changed with the help of SONOFLOW Monitor, permitted are addresses from #01 ... #12)
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<b>Directives and standards</b>	<ul style="list-style-type: none"> <li>• EMC: IEC 61000-4-2/3/4/5/6/8/11 /EMC field strength of 3 V/m</li> <li>• ESD: IEC 61000-4-2 ESD 15 kV air discharge</li> <li>• Medical safety: IEC 60601-1</li> <li>• Software development: DIN EN 62304, class C</li> <li>• RoHS: 011/65/EU, exception: III 7c/ IV 15</li> <li>• Acoustic emission: IEC 61157</li> </ul>
<b>Medical safety</b>	<ul style="list-style-type: none"> <li>• PESS (Programmable Electrical Sub System) according to the IEC 60601.</li> <li>• One-Channel architecture / Fail Safe</li> <li>• Cyclical self-tests of safe functionality of all essential components</li> <li>• Output secured by watchdog: in case of major errors (for example software crashes), the output will be blocked</li> <li>• After power on or software reset: initial test procedure (check of output circuit, watchdog functionality and locking of output)</li> </ul>
<b>Medical approval</b>	The manufacturer of the medical device is responsible for the medical approval. SONOTEC as supplier supports the approval process and shares documents with a notified body (3rd party).
<b>FFT / MFTT</b>	FTT: 0.7 s (cycle time of self-test), MFTT: 24 h
<b>Mounting</b>	Clamped on the tube, hanging freely (cable outlet at the side of the sensor)
<b>Maintenance</b>	Maintenance-free
<b>Sensor materials</b>	Measuring channel: PMMA black, Housing: aluminium, anodized black (optional: individual colors) Rating plate with label: stainless steel Bend relief and cable: plastics black
<b>Labeling</b>	Laser engraving: arrow on lid indicating flow direction; size of specified tube on lid inside; rating plate: label on rear side (sensor type, hardware version, serial number, manufacturer with address); others upon request
<b>Operating temperature</b>	+10 ... +50 °C
<b>Ambient- / Media temperature</b>	+15 ... +43 °C
<b>Storage and transportation temperature</b>	-20 ... +60 °C
<b>Atmospheric pressure</b>	70 ... 106 kPa
<b>Humidity</b>	10 ... 95 % (values below not tested), non-condensing
<b>Degree of protection</b>	IP67

<b>Scope of delivery</b>	<ul style="list-style-type: none"> <li>SONOFLOW CO.56 Pro according to specification</li> <li>User documentation</li> </ul>
<b>Optional accessories</b>	<ul style="list-style-type: none"> <li>Calibration protocol</li> </ul> <p>SONOFLOW Monitor for setting parameters, recording measurements and update of sensor software consisting of</p> <ul style="list-style-type: none"> <li>USB Data Converter (type 012), for the connection to a computer</li> <li>USB cable, type A-B, length 2 m</li> <li>CD with Software SONOFLOW Monitor and driver for Windows</li> </ul>

**Technical drawings**



Dimensions SONOFLOW CO.56 Pro

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

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