



Air Bubble Detector

Type SONOCHECK ABD05.100

Suitable for medical applications.

## Technical Data

SONOCHECK type ABD05.100		
Air Bubble Detector		
<b>Measuring method</b>	Ultrasound	
<b>Sensor types</b>	<b>Sensor Type</b>	<b>SONOTEC Order No.</b>
	SONOCHECK ABD05.100	200 02 0138
<b>Bubble sensitivity</b>	Configured to high bubble sensitivity, threshold 3.0 dB Reliable detection of Bubbles $\geq 12 \mu\text{l}$ ( <i>worst case</i> ) <i>Test Condition: Plastic tubing, PVC, OD 6.8 mm and ID 4.3 mm, water, full inserted</i> <i>Note: Bubble sensitivity is depending from mounting position on tubing.</i> <i>The most sensitive position is side upwards. The worst sensitive position is bottom side up. The exact characteristics will be evaluated with samples later.</i>	
<b>Tubing</b>	Plastic, PVC, OD 6.8 mm and ID 4.3 mm Other similar tubing or materials are possible.  Pay attention: The guaranteed bubble sensitivity (see above) depends on the kind of tubing. It is in responsibility of customer to proof the suitability in combination with the machine and the used safety concept.	
<b>Measuring cycle</b>	200 $\mu\text{s}$	
<b>Response time</b>	< 2 ms (AIR to LIQUID and vice versa)	
<b>Holding time</b>	No holding time (other on request)	
<b>Operating temperature</b>	+15 °C to +50 °C	
<b>Storage temperature</b>	-20 °C to +70 °C	
<b>Materials / Housing</b>	Housing: ABS, black Sensor is backside potted with PUR, blue	
<b>Mounting</b>	2 x threads with steel insert UTS #4-40 on back side	

<b>Requirements for liquid</b>	Low-viscosity liquids, like human blood or saline			
<b>Protection</b>	IP67 (potted)			
<b>Operating voltage</b>	+5 ± 0.5 VDC / max. 50 mA			
<b>Current consumption</b>	<b>Pay Attention:</b> <ul style="list-style-type: none"> <li>▪ No protection against reverse polarity integrated into the sensor.</li> <li>▪ Power supply must be protected against overvoltage &gt; 5.5 V.</li> <li>▪ Power supply must be limited to max. current of 200 mA by means of suitable equipment in machine (fuse/ regulator/ ...).</li> </ul>			
<b>Connecting line</b>	<b>Cable:</b> 4 x wires in different colors, 0.14 mm <sup>2</sup> , length 10" ± 0.5"			
	<b>Connector:</b> MOLEX Series SL (50-57-9404), 4 pins, female			
<b>Inputs and outputs</b>	<b>Connection</b>	<b>Specification</b>	<b>Pin Connector</b>	<b>Color</b>
	Operating voltage	+5 ± 0.5 VDC	1	red
	Ground (GND)	Ground	2	blue
	Tx	Output, 5V logic, TTL, max. 8 mA	3	white
	Rx	Input, 5V logic, TTL	4	yellow
<b>Interface to machine / Safety</b>	<p>Sensor architecture supports different possibilities to reach a high level of patient safety. The set up of concept of interface is in responsibility of manufacturer of medical device.</p> <p>The aim of interface concept is to reach a secured data transmission from sensor to machine, to avoid a misinterpreting of signals in case of e.g. broken wires/ short circuit between wires, power-off, crashed SW</p>			
<b>Serial interface</b>	Sensor operates in Mode 2			
	Principle: Safe interface by secured serial data transmission			
	Tx, Output	Configured as serial output, 115.200 kBaud. Sensor transmits cyclically frames within time interval of 1 ms. Mode 2: Frame of 5 bytes, data to bubble alarm/ device fault/ sequence counter/ sampled service data/ secured by CRC  <i>Note: For detailed information see Specification of Serial Interface SONOCHECK</i>		
Rx, Input	Configured as serial input, 115.200 kBaud, used for service and for controlling (Bubble Test / Restart)			
<b>Start procedure</b>	After power on or on restart the init interval is started. Inside this period the sensors acts to commands of serial interface.			
<b>Initial interval / Initial test</b>	After init interval the initial test will be performed. This includes test routines for the Tx output. Level on output will be changed several times.  Both, init interval and initial test, takes approx. 1.1 ... 1.3 s, at least 1 s.			

**Labeling (on connection line)**

**SONOTEC** PN 200 02 0151  
 ABD05.100 / 053 SN10030

**Settings**

Sensors are delivered with following settings, archived in:  
 ABD05100\_v143\_P01.hex

**Settings**

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**Basic Setting**

Gate Begin [µs]   
 Gate Width [µs]

**Adjusting**

Liquid Up Limit   
 Threshold Air - Liquid   
 Speed of Adj. Up   
 Speed of Adj. Down   
 Bubble Averaging

**Specification**

**Start Configuration**

Mode 2   
 IN : Serial  
 OUT: Serial long

LED  AUTO

**Output Specification**

dB	OUT	PWM	Switch/ LED
0,0	0	20,0	L <input type="checkbox"/>
1,0	80	40,0	L <input type="checkbox"/>
2,0	160	60,0	L <input type="checkbox"/>
3,0	240	80,0	H <input type="checkbox"/>
4,0	240	80,0	H <input type="checkbox"/>
6,0	240	80,0	H <input type="checkbox"/>
7,2	240	80,0	H <input type="checkbox"/>
8,0	240	80,0	H <input type="checkbox"/>
Alarm	240	80,0	H <input type="checkbox"/>
Fault	241	89,8	H <input type="checkbox"/>

linear  --> okay

**Switching Output**

Hold Time   
 Voltage

**Settings**

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**Safety**

**Self Tests**

CRC Test  
 RAM Test  
 CPU Test  
 Watchdog Test  
 Gain Test  
 Ampl Test  
 Switch Test

CRC \$D291

**Gain Step Test**

Gain	1	1	2	2	3	3
0	130	095	017	000	005	000
1	235	200	115	080	015	000
2	255	250	220	180	027	000
3	255	250	255	250	130	090
4	255	250	255	250	215	170

Gain Test Error

**Special Parameters**

Send Pulse [µs]   
 Test Send Pulse [µs]   
 Count of Burst Pulses    
 Count of Burst Pulses Test    
 Gate Width Zero [µs]   
 Zero Down Limit   
 Zero Up Limit   
 Zero Averaging    
 Adjusting Up Threshold   
 Adjusting Down Threshold   
 Max. Difference [dB]   
 Init Interval   
 Time Limit Service Mode [s]   
 Limit of Bubbles [dB]   
 Ampl Test Threshold [dB]   
 External Reset Time [ms]

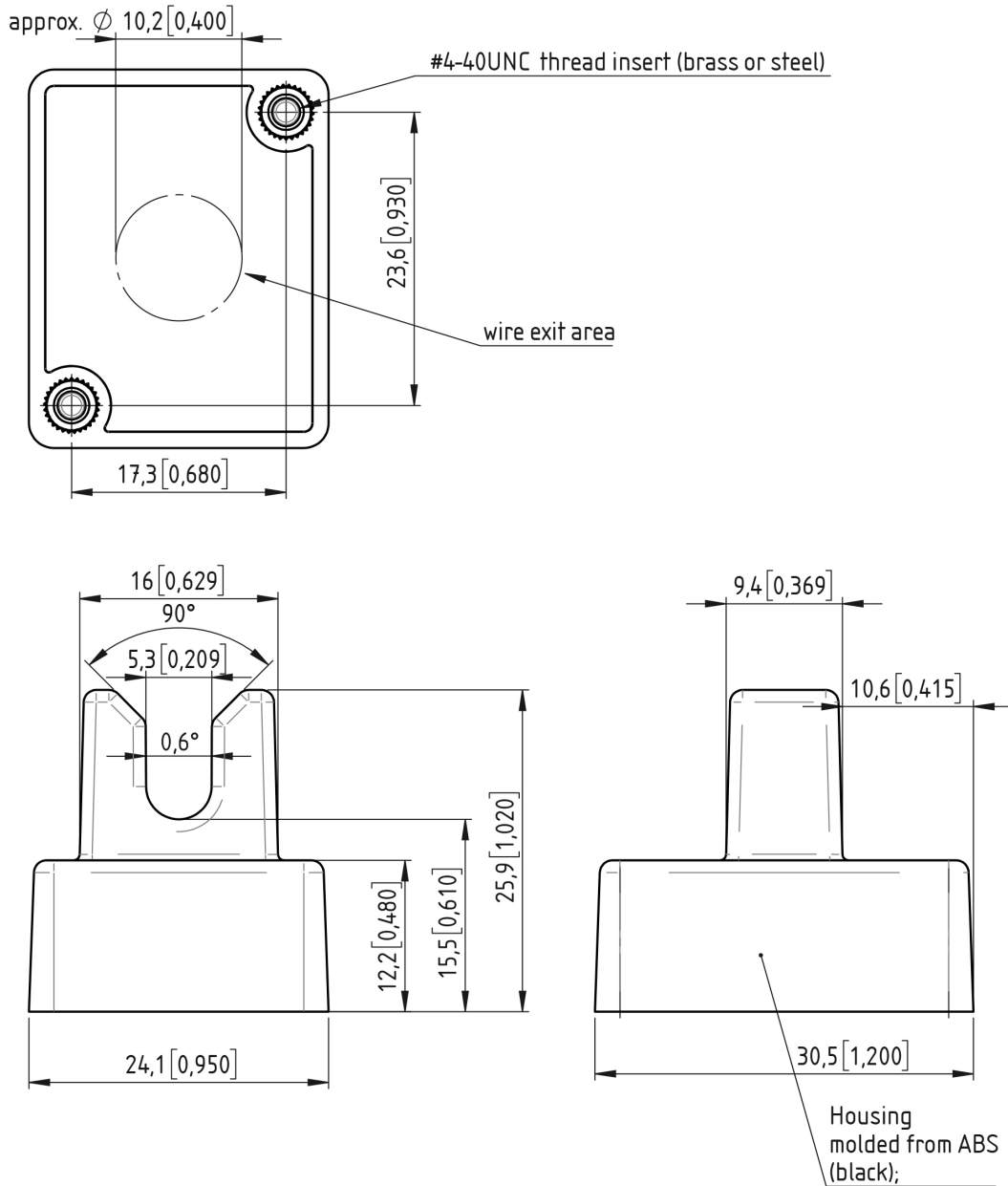
**Ceramic**

R1  
 R2  
 T1  
 T2

alternate

<p><b>Safety</b></p>	<p>Fail-Safe-Architecture, one channel</p> <p><b>Pay Attention:</b></p> <p>Sensor must be tested completely in periods of max. 24 h. That means, Initial Test must be performed at least once in 24 h.</p> <p>Power cycling or serial commands can be used to initiate a restart. Subsequent the Initial Test is performed, including test routines for outlet.</p>
<p><b>Service option</b></p>	<p>The sensor is configured for serial communication and acts to commands. Such a way the boot loader could be reached and settings of sensor can be changed or verified.</p> <p>The ABD Monitor in combination with USB Data Converter Type 007 supports setting operating and the required time management.</p>
<p><b>Configuration (optional)</b></p>	<p><b>ABD Monitor</b></p> <p>Using computer software ABD Monitor you can observe the behavior of sensor and the reaction of varied level. For debugging or archiving you can export data into Excel or Text files.</p> <p>Even configuration can be adjusted to special conditions of application. Please ask our staff for detailed information.</p>
<p><b>Connection to USB Data Converter</b></p>	<p><b>USB Data Converter Type 007</b></p> <p>For service and diagnostics the sensor should be connected via USB Data Converter to a free USB port of the computer. USB device has to be installed according provided installation routine.</p> <p>The sensor is powered directly via USB.</p> <p style="text-align: center;">blue yellow white red</p>
<p><b>Revisions</b></p>	<p>ABD05.100, HW V1.0 / SW ABD05100_V01.43.05.00 / Settings P01</p>
<p><b>Directives / Standards</b></p>	<ul style="list-style-type: none"> <li>• EMC complying with EN 60601-1-2:2016 (4th edition)</li> <li>• Safety requirements from IEC 60601-1:2005 (3rd edition)</li> <li>• Acoustic output of medical diagnostic ultrasonic equipment complying with EN 61157:2007</li> <li>• Failsafe in compliance with EN 60601</li> <li>• SONOTEC is certified according to ISO 9001 and EN ISO 13485</li> </ul>

Technical Drawings



Drawings are not to scale. Dimensions in mm, unless otherwise specified. Information is subject to change without notice!

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