Datasheet CONMONSENSE IEPE M8-4PM THREADED SENSOR M6 - IP65 W/O CABLE (RED - S/N 582 YY XXXX)

General description:

CONMONSense Ultrasound IEPE sensors are standalone ultrasound heterodyned output sensors designed for compatibility with industrial standard measurement systems, including PLC, DCS, SCADA systems, and/or SDT VIGILANT. The IEPE sensor generates an analog signal that reflects the heterodyned ultrasound signal. The design is optimized for permanent installations in challenging environments. IEPE contact sensors are well-suited for applications such as ultrasound-driven lubrication, mechanical monitoring, steam and valve systems, etc. Sensitive to friction, impact, and turbulence, RSIE delivers analog dynamic signals that are adjustable in gain and represent the resonant ultrasonic band-pass.

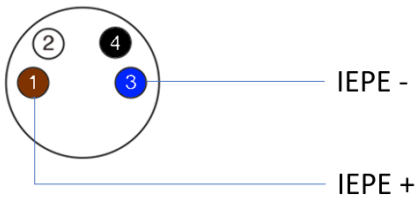
Features:

- IEPE output (heterodyned signal), 2-wire configuration;
- On board amplification stages/changeable sensitivities;
- Built-in analog filters;
- Hardware calibration;
- Non-volatile memory (used to save configuration and recover sensor state/mode upon power outage);
- Unique ID;
- Digital I/O communication for simple use;
- Serial communication for advanced use.

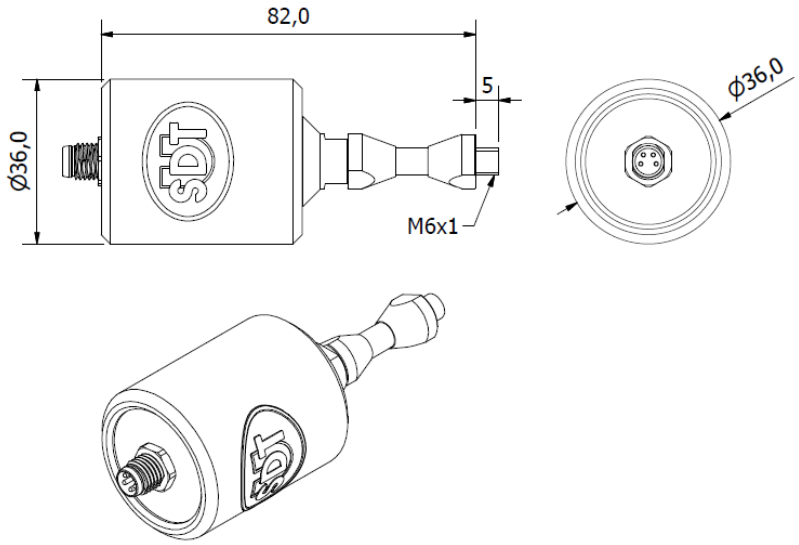
Top view pinout (IEC 60947-5-2 compliant):

1 = IEPE + (Brown)
2 = (SIGNAL – V_{IEPE}) - floating if not used (white)
3 = IEPE -/Ground (Blue)
4 = COMMUNICATION LINE - floating if not used (Black)

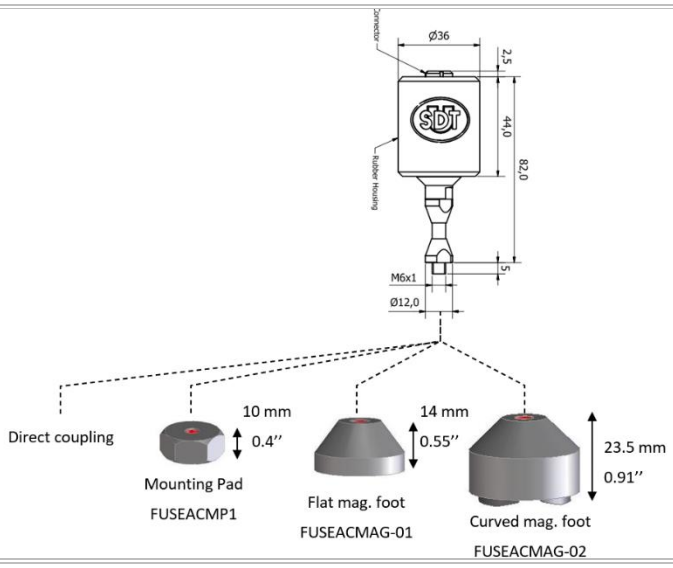
IEPE sensor (2 wire-connection)



Technical specifications:

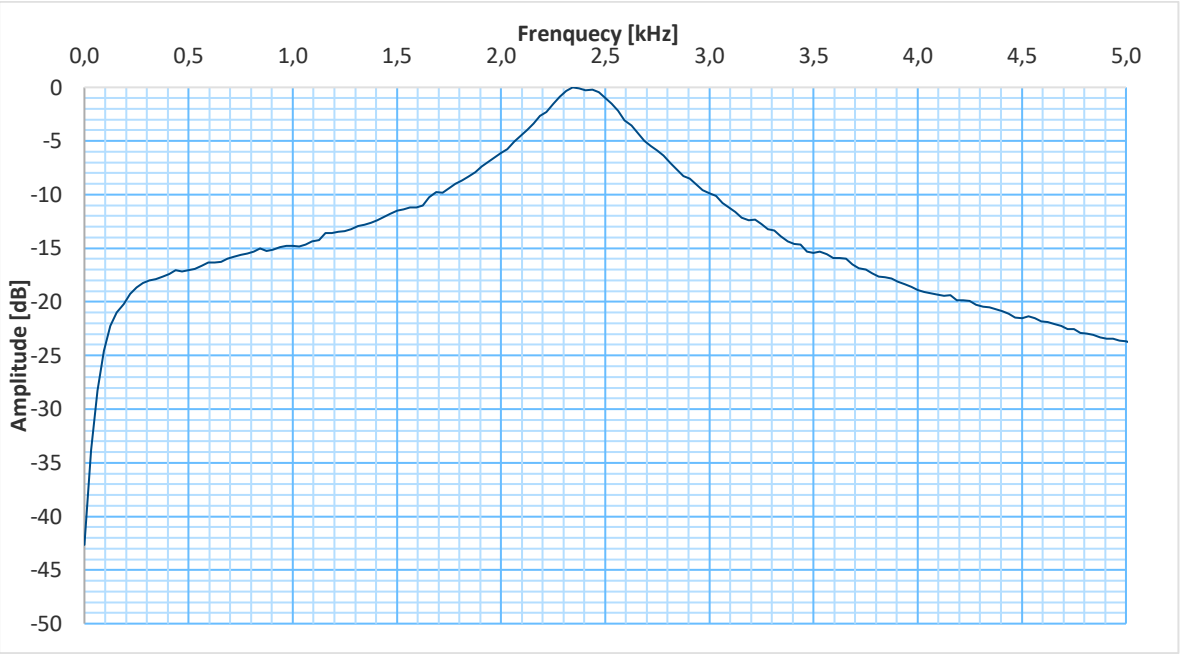
General specifications	
Dimensions [mm]	
Function	Resonant ultrasound contact sensor with heterodyned output
Type of sensor	Integrated Electronics Piezo-Electric (IEPE)
Materials	Housing: Stainless steel Connector plate: Aluminum Protection: Nitrile butadiene rubber
Weight	126 [Gram] / 4.44 [Oz]
IP rating	IP 65
Tests/approvals EMC (Directive 2014/30/EU)	• EN 61326-1:2013
Installation	
Voltage source	18-30 V DC
Maximum consumption	5 mA
Operating temperature	-20 [°C] to +70 [°C]/-4 [°F] to +158 [°F] (see SDT heat sink in section accessories for warmer environments)
Bias output voltage	V_{bias} = 12 V DC
Recommended maximum cable length	30 [m] / 100 [feet]
Recommended tightening torque	2 [N.m] / 17.7 [lbf.in]

Sensor signal (Typical)	
Resonant frequency	37 [kHz] +/- 1 [kHz]
Gain range	0 [dB] to 60 [dB], by stage of +12 [dB]
Connector	M8 - 4 pin – Male, 2-Wire required (IEPE - and IEPE +)
Heterodyned signal (Typical)	
Heterodyne frequency	38.5 [kHz] +/- 1 [kHz]
Bandwidth	[0.25 – 4] [kHz], image of the ultrasonic signal
Sensitivity	40 mV/g +/- 10 % at Gain = 0 dB
Optimal voltage range	+/- 0.5 V centered on V_{Bias}
Factory configuration	
Signal mode	Dynamic (sampleable from 10 kHz, referring to your recording instrument/PLC/VIGILANT dynamic output)
Gain	60 dB
Optional accessories offered by SDT	
Cables with Straight M8 Connector - PUR RAL7021 -25°C.+90°C IP65 - STRAIGHT SHIELDED	
FU.RSC.CABL.01.015-1	SENSOR-/ACTOR CABLE M8 4PF <> FREE END 1.5m
FU.RSC.CABL.01.030-1	SENSOR-/ACTOR CABLE M8 4PF <> FREE END 3.0m
FU.RSC.CABL.01.050-1	SENSOR-/ACTOR CABLE M8 4PF <> FREE END 5.0m
FU.RSC.CABL.01.100-1	SENSOR-/ACTOR CABLE M8 4PF <> FREE END 10.0m
FU.RSC.CABL.01.200-1	SENSOR-/ACTOR CABLE M8 4PF <> FREE END 20.0m
FU.RSC.CABL.01.XXX-1	SENSOR-/ACTOR CABLE M8 4PF <> FREE END XX.Xm
Cables with 90° M8 Connector - PUR RAL7021 -25°C.+90°C IP65 - SHIELDED	
FU.RSC.CABL.02.015-1	SENSOR-/ACTOR CABLE M8 4PF 90° <> FREE END 1.5m
FU.RSC.CABL.02.030-1	SENSOR-/ACTOR CABLE M8 4PF 90° <> FREE END 3.0m
FU.RSC.CABL.02.050-1	SENSOR-/ACTOR CABLE M8 4PF 90° <> FREE END 5.0m
FU.RSC.CABL.02.100-1	SENSOR-/ACTOR CABLE M8 4PF 90° <> FREE END 10.0m
FU.RSC.CABL.02.200-1	SENSOR-/ACTOR CABLE M8 4PF 90° <> FREE END 20.0m
FU.RSC.CABL.02.XXX-1	SENSOR-/ACTOR CABLE M8 4PF 90° <> FREE END XX.Xm
Connector to complete assembly	
SICOCA-M8-4MSS-01	CABLE CONNECTOR M8 4PM SHIELDED STRAIGHT A-KEY w/SCREW TERMINAL

SICOCA-M8-4FSS-01	CABLE CONNECTOR M8 4PF SHIELDED STRAIGHT A-KEY w/SCREW TERMINAL
Cables with straight M8 connector 4PM <> M8 4PF - PUR BLACK -25°C.+80°C IP65 - STRAIGHT SHIELDED	
FU.RSC.CABL.05.015-1	SENSOR-/ACTOR CABLE M8 4PM <> M8 4PF 1.5m
FU.RSC.CABL.05.030-1	SENSOR-/ACTOR CABLE M8 4PM <> M8 4PF 3.0m
FU.RSC.CABL.05.050-1	SENSOR-/ACTOR CABLE M8 4PM <> M8 4PF 5.0m
FU.RSC.CABL.05.100-1	SENSOR-/ACTOR CABLE M8 4PM <> M8 4PF 10m
FU.RSC.CABL.05.200-1	SENSOR-/ACTOR CABLE M8 4PM <> M8 4PF 20m
FU.RSC.CABL.05.XXX-1	SENSOR-/ACTOR CABLE M8 4PM <> M8 4PF XX.Xm
Mounting accessories	
FA.RSC.ACC.002-01	CONMONSense - HEAT SINK - AISI303 Ø30,0 (M6) x74,5mm
FU.SEACMAG-01	Flat Magnetic Foot
FU.SEACMAG-02	Curved Magnetic Foot
FU.SEACMP1	Mounting pad
FU.RSC.ACC.001	 Configuration Interface (see DC.RSC.DAT.015)

The foot is a part of the resonant structure, please do not disassemble it!

Normalized heterodyned response curve (typical):



Output relationships:

- $Sensor\ signal\ [V] = \frac{Voltage\ measured\ [V]}{S\ [V/V]}$

or

- $Sensor\ signal\ [g] = \frac{Voltage\ measured\ [mV]}{Seff\ [mV/g]}$

If necessary, apply a high-pass filter (typically 2 Hz or 10 Hz) to eliminate the DC component (V_{bias}). Check your acquisition system settings for this option. If necessary, apply a high-pass filter (typically 2 Hz or 10 Hz) to eliminate the DC component (V_{bias}). Check your acquisition system settings for this option. Ideally, reinforce the analog built-in filter by applying a band-pass filter corresponding to the sensor specification [250 Hz - 4000 Hz].

Gain $[dB]$	**Sensitivity S [V/V]**	**Offset $[V]$**	**Optimal range [peak in mV]**	**Effective sensitivity S_{eff}[mV/g]**	**Optimal range [peak in g]**
0	1	V_{bias}	+/- 500	40	+/- 13
12	4	V_{bias}	+/- 125	160	+/- 3
24	16	V_{bias}	+/- 32	640	+/- 1
36	64	V_{bias}	+/- 8	2 560	+/- 0.25
48	251	V_{bias}	+/- 2	10 240	+/- 0.06
60	1000	V_{bias}	+/- 0,5	40 960	+/- 0.01

Table 1: Conversion table

Voltage -V_{Bias} [V]	Gain [dB]					
	60	48	36	24	12	0
	Sensor signal [mV]					
<-0,5	Over-amplification					
-0,5	-0,5	-2	-8	-32	-125	-500
0 (V_{bias})	0,0	0,0	0,0	0,0	0,0	0,0
0,5	0,5	2	8	32	125	500
>0,5	Over-amplification					

Table 2: Voltage / voltage equivalence table

SDT recommends calculating the signal RMS and expressing the indicator in [$dB\mu V$RMS] (20xlog(RMS[Sensor signal (V)])+120).

For a correctly amplified signal, the Sum of the RMS expressed in $dB\mu V$RMS + Gain should be around 100 dB +/- 10 dB

Ex: Practical illustration of signal acquisition with different gain settings. Let's consider the signal acquired from an unknown ultrasonic source. We need to determine whether the collected signal is well amplified.

-At Gain = 36 dB (sensitivity = 64 V/V), the measurement instrument displays RMS = 73 $dB\mu V$RMS.

Gain + Measurement = 36 + 73 = 109

-At Gain = 24 dB (sensitivity = 16 V/V), the measurement instrument displays RMS = 72 $dB\mu V$RMS

Gain + Measurement = 24 + 72 = 96

Both settings enable the collection of non-amplified signals. Prefer the second setting (Gain = 24 dB), especially for trending, to prevent saturation. Any other gain setting is not suitable for this unknown source.

Communication:

Using the Configuration interface:

Gain can be changed from a PC using the SDT accessory **FU.RSC.ACC.001**, in a simple way.

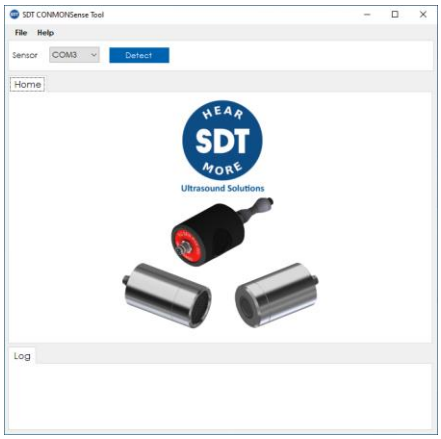
-**Download** then **install** the required SDT CONMONSense tool (compatible windows) at:

https://sdtultrasound.com/support/software/

Connect the sensor and the PC to the configuration interface using the provided cables.

-**Read** & **Edit** the sensor settings

-**Apply** the settings in your acquisition system



Digital output mode

Gain can also be adjusted by generating pulses on the communication line.

Use a switch to create brief impulsions between IEPE- and the communication line.

The default state of the line is +VDD (pulled up internally with a 10 [kΩ] resistor) and a pulse consists in pulling the line down for at least 1 [ms] then releasing the line.

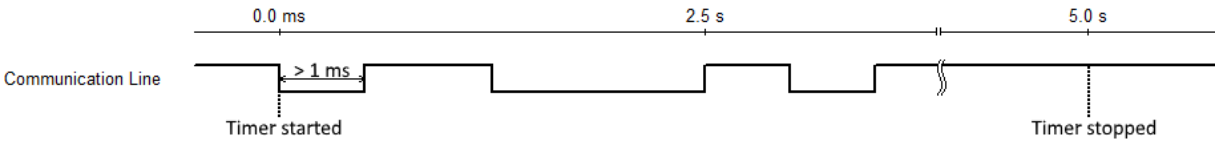
After the first pulse is initiated a 5 [s] internal timer is started. When the 5 [s] timeout occurs, the sensor counts how many pulses it received during this time-lapse:

- 1 pulse: increase the gain by 12 [dB] (has no effect if the gain is already at 60 [dB]);
- 2 pulses: decrease the gain by 12 [dB] (has no effect if the gain is already at 0 [dB]);
- 4 pulses: initialize the sensor in dynamic mode with a gain of 60 [dB] (factory reset).

After any modification, data is saved inside a non-volatile memory and are restored on sensor power on. Once installed, make sure that the sensor is always in a non-saturated configuration (Gain), compatible with your acquisition instrument. To rescale the signal output, please do not forget to set up the input channel of your acquisition instrument according to this datasheet.

Example

- Change the output mode (generate 3 pulses under 5 [s]).



Revision	Writer	Nature of modification	Approved
03			
02			
01	CMA 27/11/2023	Original product version	RGO

The information herein is believed to be accurate to the best of our knowledge.
Due to continuous research and development, specifications are subject to change without prior notice.