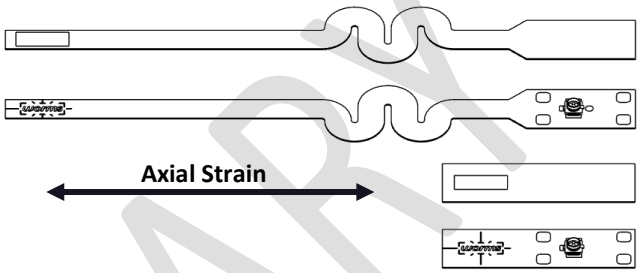
Dragonfly® DGF-UNI-AA204xx-10
Piezoelectric unidirectional strain sensor

Description

The piezoelectric Dragonfly® sensor measures the dynamic and quasistatic strain of any surface. The large bandwidth and high dynamic range enable an exceptionally wide scope of characterization with a single sensor.



REACH RoHS

Features

- Unidirectional strain sensor
- High sensitivity
- Low noise
- High dynamic range
- Wide frequency range
- Flexible & conformable
- Plug & Play
- No power supply required
- Lead-free piezoelectric material

Sectors

- Energy
- Civil Engineering
- Industry 4.0
- Food Industry
- Healthcare
- Aerospace
- Automotive
- Transportation
- Maritime Industry
- Mining Industry

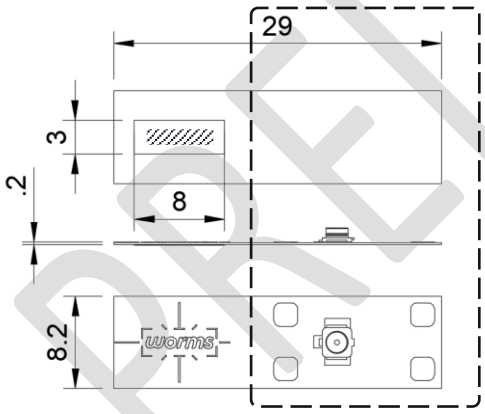
Applications

- Monitoring (SHM, CBM): life span optimisation, predictive maintenance, decision making
- Event detection: collisions, crack initiation, leaks
- Vibration analysis: diagnosis, product development, design validation, material characterization, cutting-edge R&D
- Quality and process control: in-operation control, safety, yields optimization
- Dynamic weighing: counting, load identification, actual wear monitoring
- Human-Machine Interfaces

Technical data

	Conditions	Parameter	DGF-UNI-AA204xx-10	Units
Charge mode	Temperature 25°C	Charge sensitivity	-16.4 ±10%	pC/με
	Temperature [-40°C to +40°C]	Temperature sensitivity	-0.032	%/K
		Bandwidth (-3dB)	[<0.01 to >45k]	Hz
	On Kistler 5167A charge amplifier	RMS noise [0.1 to 10] Hz	4.4	nε
		RMS noise [10 to 20k] Hz	6.0	nε
Voltage mode	Temperature 25°C	Voltage sensitivity	-2.73 ±10%	mV/με
	Temperature [-40°C to +40°C]	Temperature sensitivity	-0.24	%/K
	On Dewesoft 43A referenced	Bandwidth (-3dB)	[2.9 to >100k]	Hz
	voltage input.	RMS noise [0.1 to 10] Hz	46	nε
	Input impedance: 10MΩ	RMS noise [10 to 20k] Hz	5.2	nε
General parameters		Transverse sensitivity Kt	4 ±1	%
		Measurement range	± 3000	με
		Non-linearity	<1	%
	sinus @1kHz, 1Vp-p, 25°C	Capacitance Cp	6.0 ±10%	nF
		Parallel resistance Rp	>50	MΩ
		Series resistance Rs	1	Ohm
		Operating temperature range	[-40 to +140]	°C
		Weight	0.1	g
		Connector	UFL / IPEX1	
Absolute Max. ratings		Maximum generated voltage	30	V
		Maximum applied voltage	30	V
		Absolute maximum temperature rating	150	°C
		Minimum bending radius	2	cm

Dimensions (mm)



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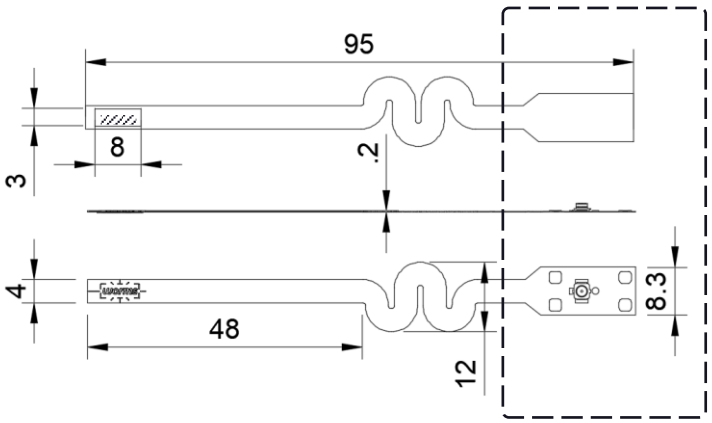


DGF-UNI-AA20406-10

Handling area Piezo active area

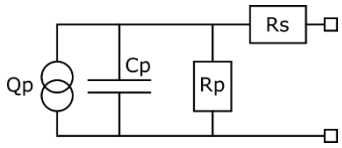
Handling Recommendations

- It is highly recommended to refer to the Dragonfly® User Manual for the installation. Download it on www.wormsensing.com
- Avoid contact with the active area before mounting. Manipulate the device by the recommended handling area.
- Avoid sharp bends of the sensor or localized pressure points.

Electrical model

The sensor behaves as a charge generator Qp, in parallel with a capacitor Cp and a leakage resistor Rp. The cables introduce a small series resistor Rs.

Sensor electrical schematic



Signal conditioning & bandwidth

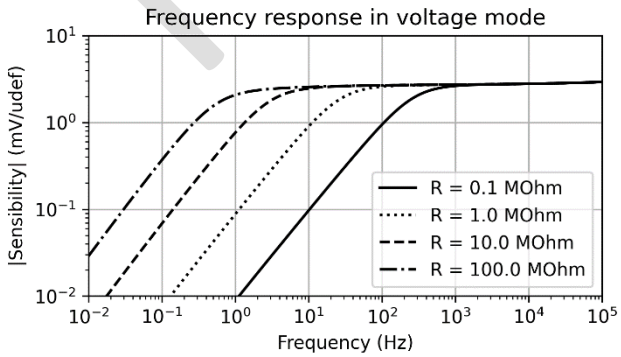
The sensor is passive and does not require any power supply. It can be operated either in charge or voltage mode depending on the application.

Charge mode (using a charge amplifier):

Charge mode is highly recommended for very low frequency measurements. The cut-off frequency is determined by the charge amplifier itself and can be as low as 0.01Hz.

Voltage mode (direct measurement):

The acquisition device's finite input impedance R will limit the minimum measurable frequency.



Sensitivity

The Dragonfly® sensitivity is calibrated with a 4-point bending test on a steel bar with a Poisson's ratio ν_0 = 0.31.

The transverse sensitivity ratio Kt is the ratio (for a unidirectional strain) of the sensitivity in transverse direction over the sensitivity in axial direction.

Dragonfly® output signal in a bi-axial strain used either in charge or voltage mode is given by equation 1:

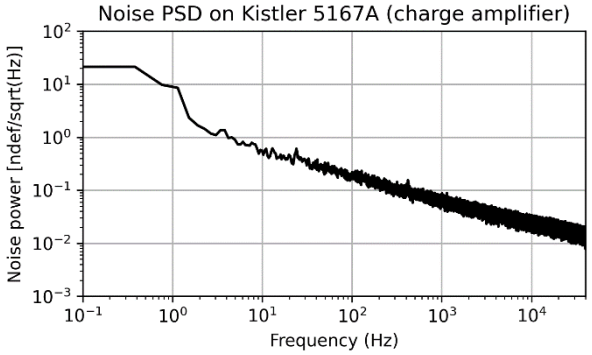
$$\text{output} = \frac{s}{1 - K_t \nu_0}(\epsilon_a + K_t \epsilon_t) \qquad (1)$$

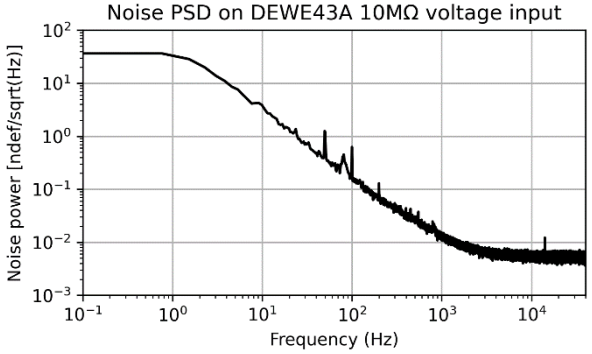
s = sensor's sensitivity
Kt = sensor's transverse sensitivity ratio
ν_0 = 0.31
ϵ_a = axial strain
ϵ_t = transvers strain

Minimal measurable strain

The minimal measurable strain depends on the acquisition system noise PSD integrated over its bandwidth. In both charge and voltage mode, the noise at low frequency is driven by 1/f flicker noise.

- The wider the bandwidth, the higher the RMS noise.
- The lower the cutoff frequency, the higher the RMS noise.





Reference selection

The bellow nomenclature will helps you to select the correct reference to order:

dgf-uni-ii204ff-10

ii	
Interface type	
aa	Passive
w1	IEPE 1mV/µdef
w2	IEPE 10mV/µdef
w3	IEPE 100mV/µdef

ff	
Flex size	
05	short
06	long