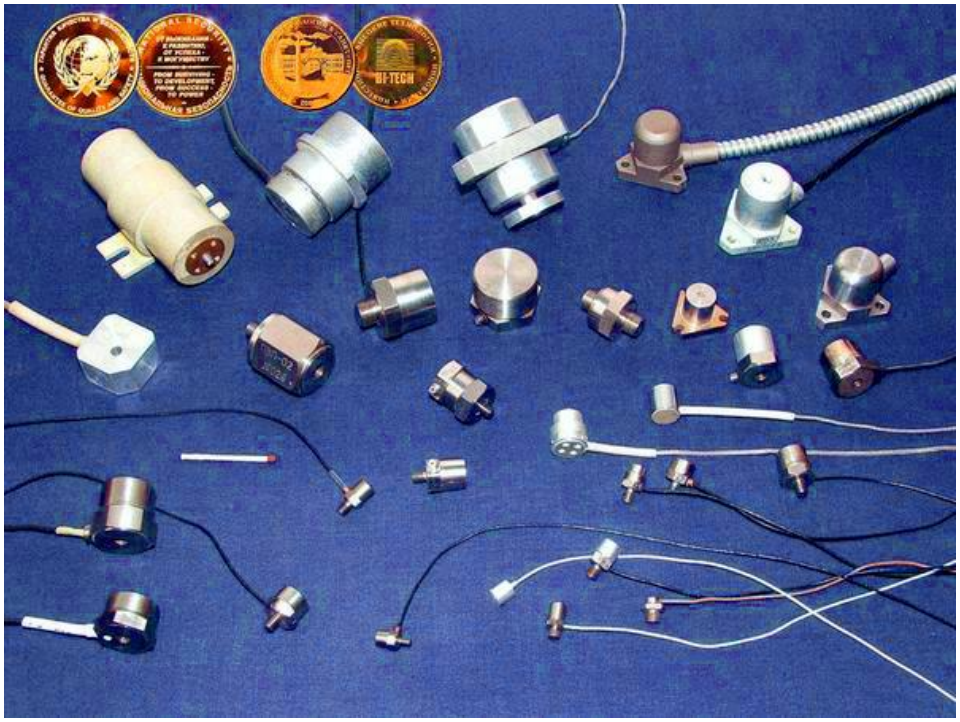
Southern federal University
Institute of high technologies and piezotechnics
SCTB “Piezopribor”

Piezoelectric sensors of vibration (Accelerometers)



Handbook

Russian Federation, Rostov-on-Don, Milchakova st., 10
☏ +7 (863) 222-34-01
piezo@sfedu.ru
https://ivtipt.ru

Introduction

Piezoelectric vibration and shock sensors or accelerometers are designed to measure vibration and shock parameters over a wide range of frequencies, amplitudes, and temperatures.

These sensors are used in mechanical engineering, energy, transport, oil and gas industry and other areas of technology, including vibration control systems, monitoring and diagnostics, security and alarm systems.

These sensors are based on piezoelectric elements developed and manufactured in the SCTB "Piezopribor" and characterized by high reliability and stability of metrological characteristics to the influence of external influences.

Accelerometers developed and mass-produced at the SCTB "Piezopribor" were awarded gold and silver medals at international exhibitions.

Vladimir Yancich.

made a significant contribution to the development of the sensor equipment industry in Russia

Small-sized vibration sensors (accelerometers)

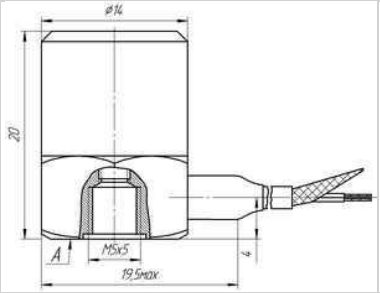
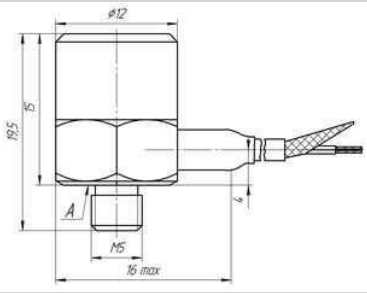
Name	 AK 290-10	 AK 3165-2
Conversion factor: by charge, pCl · m^{-1} · s^2 by voltage, mV · m^{-1} · s^2	10 ± 6 % 2	2 ± 10 % 0,3
Resonance frequency (mounted), kHz	22	55
Operating frequency range, kHz	1 - 7000	1 - 15000
Electric capacitance, nF	5,0	7,0
Relative coefficient of transverse transformation,%, no more	5	5
Operating temperature range, °C	- 60 .. 200	- 60 .. 215
Body material	Titanium	
Maximum vibration acceleration, m · s^{-2}	10000	
Exit	Symmetrical isolated (built-in cable)	
Dimensions, mm	S17x25	S14x20
Weight, g	32	12

Miniature Sensor AK3270

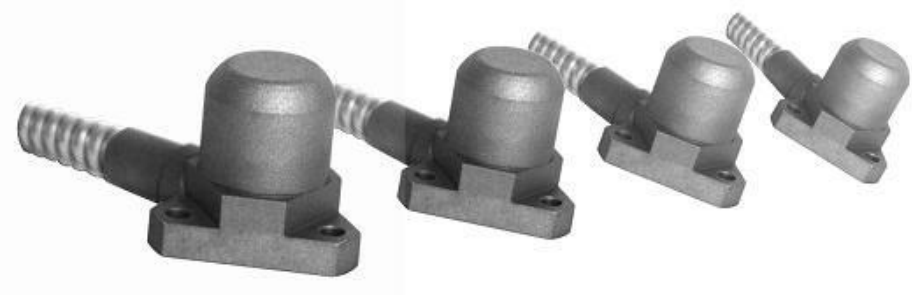
Name	
Conversion coefficient: by charge, pCl · m^{-1} · s^{2} by voltage, mV · m^{-1} · s^{2}	0.35 ± 10% 0.31 ± 10%
Operating frequency range, kHz	2 - 20,000
Operating temperature range, 0C	- 60 .. 200
Electric capacitance, nF	1.2
Relative coefficient of transverse transformation,%, no more	5
Operating temperature range, 0C	From minus 60 to 200
Maximum vibration acceleration, m · s^{-2}	10,000
Body material	Titanium
Exit	Symmetrical insulated th (cable mounted)
Sizes, mm	S10x11
Mass g	3.3

AC21 Accelerometers

Small-sized piezoelectric accelerometers for measuring intense vibration and shock accelerations

Name	 AK2120	 AK2125
Conversion coefficient: by charge, pCl · m $^{-1}$ · s ^{2} by voltage, mV · m $^{-1}$ · s	1 ± 10 % 2	0, ± 10 % 0,2
Resonance frequency (mounted), k Hz	55	80
Range of working frequencies, kHz: - with uneven amplitude-frequency characteristics ± 6 - with uneven amplitude-frequency characteristics ± 12	2 - 10000 2 - 17000	2 - 17000 2 - 25000
Electric capacty , nF	4.0	1.0
Relative conversion coefficient ,%, no more	5	5
limiting operating vibratory e accele ration, m · s $^{-2}$	20000	50000
Extreme working shock acceleration, m · s $^{-2}$	60000	120000
Operating temperature range , $^{\circ}$C	От минус 60 до 200	
Exit	Symmetrical , insulated th (side-mounted cable)	
Body	Titanium	
Mounting method	Hairpin M 5	Projection M 5
Dimensions, mm	S14x20	S12x19.5
Weight, g	11	8
		

Accelerometers of the AK317 series

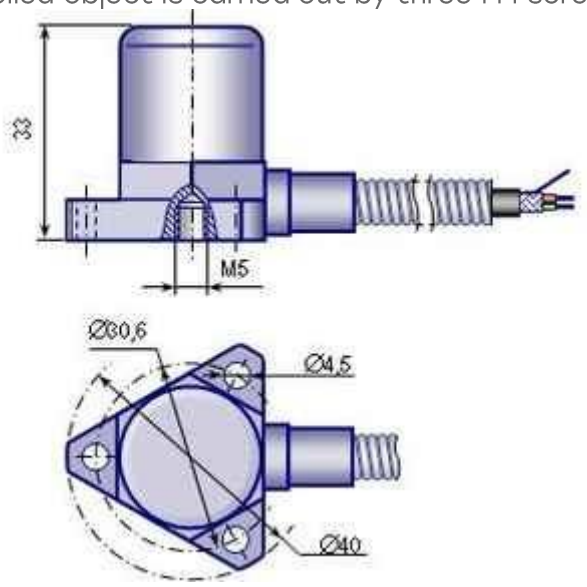


Certificate of type approval of measuring instruments RU.C.28.004.A No. 10666

Name	AK 317-2	AK 317-10	AK 317-25	AK 317-50
The actual value of the conversion coefficient for charge (nominal value), pCl · m $^{-1}$ · s ^{2}	2	10	25	fifty
Deviation of the actual value of the conversion coefficient for charge from the nominal value,%	± 6	± 3	± 6	± 6
The actual value of the voltage conversion coefficient, mV · m $^{-1}$ · s ^{2}, not less	0.3	1	1,1	1,2
Electric capacitance, nF, not less	5	8	18	thirty
Resonant frequency of fixed VIP, kHz, not less than: - in the working direction - in the transverse direction	thirty 10	thirteen 7	thirteen 6	eleven 5
Range of working frequencies, Hz, not less	10-7500	10-3500	10-3500	10-3000
Unevenness of the amplitude-frequency characteristic in the range of operating frequencies,%, no more	± 6	± 6	± 6	± 6
Maximum working vibrational acceleration, m · s $^{-2}$	1000	5000	5000	2500
Non-linearity of the amplitude characteristic in the acceleration range from 1 to 100 m · s $^{-2}$,%, no more	± 2	± 2	± 2	± 2
Electrical insulation resistance under normal conditions, MΩ, not less than ·	1000	1000	1000	100
Relative coefficient of transverse transformation,%, no more	2,5	2,5	2,5	2,5
Operating temperature range, ◦C	from minus 60 to 160	from minus 60 to 160	from minus 60 to 160	from minus 60 to 125
Additional temperature error,% / ◦C	0,045	0,045	0,045	0.125
Reserve operating temperature, about C	200	200	200	160
Weight without cable, g, no more	100	100	100	100

Operational requirements

- the coefficient of influence of deformation of the base is not more than $3x10^{-3}$ ($m \cdot s^{-2}$) / ($\mu m \cdot m^{-1}$)
- coefficient of influence of the magnetic field no more than $2x10^{-5}$ ($m \cdot s^{-2}$) / ($A \cdot m^{-1}$)
- the influence coefficient of the acoustic field is not more than $1x10^{-3}$ ($m \cdot s^{-2}$) / dB
- average service life of at least 10 years
- average uptime of at least 10,000 hours
- fastening on the controlled object is carried out by three M4 screws or M5 pin



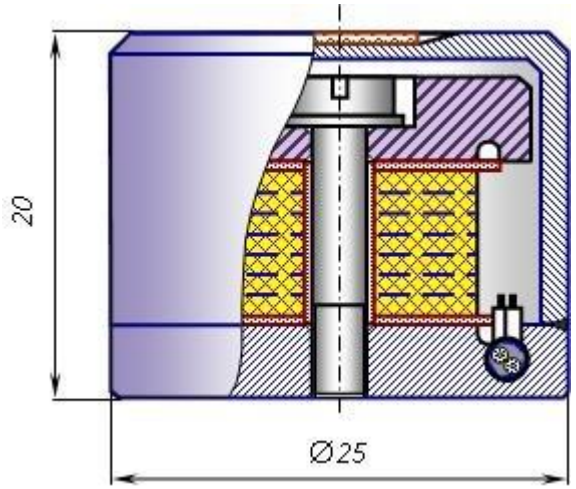
The design is designed for operation in an industrial environment:

- - sealed stainless steel housing;
- - durable anti-interference fluoroplastic anti-vibration cable type AVKTDL;
- - galvanized steel protective metal hose;
- - special multilayer piezoelectric elements from thermostable ceramics;
- - conclusions isolated from the case;
- - the possibility of flange fixing on the controlled object.

Small-sized highly sensitive accelerometer APP2-1

Small-sized, highly sensitive adhesive fastening accelerometer for measuring small levels of vibration in the range of low and medium frequencies.

It is made on the basis of a special multilayer piezoelectric element.



Charge conversion coefficient, pCl · m^{-1}· s^{2}, not less	75
Voltage conversion coefficient, mV · m^{-1}· s^{2}	4,5
Resonant frequency (in the fixed state), kHz	22
Range of working frequencies (with non-uniformity of 6%), Hz	1 - 6000
Electric capacitance, nF	fifteen
The relative coefficient of the transverse transformation,%	<5
Piezoelectric insulation resistance, MΩ, not less	1000
Overall dimensions, mm, no more	Ø25x20
Weight, g, no more	60

- - Case material - titanium alloy.
- - The use of a matching charge amplifier is recommended.

Materials used in this reference
A.E. Panicha, V.V. Yanchicha, Vl. V. Yanchicha
st. Milchakova, 10, Rostov-on-Don, Russia, 344090
tel / fax: +7 (863) 243-48-44
e-mail: piezo@sfedu.ru
https://ivtipt.ru