

## DIFFERENTIAL PRESSURE SENSING QUARTZ CRYSTAL RESONATOR BLOCK

### BRKM-P

#### APPLICATIONS

BRKM-P is a quartz crystal resonator assembly, which consists of a measuring and a reference quartz crystal, both packaged in a rectangular enclosure. The resonance frequency varies with pressure-induced stress. BRKM-P is designed as a component for precision electronic differential pressure transducers, manometers and controllers with a frequency output for conversion of absolute pressure or differential pressure to frequency.

#### FEATURES

- High resolution and accuracy
- Long term quartz crystal stability
- Wide temperature range (-55...+80 °C)
- Low power consumption
- Suitable for precision pressure equipment



In gauges of differential pressure BRKM-P is used to convert a pressure difference to a differential frequency output signal  $f_{out} = f_{MEASURING} - f_{REFERENCE}$ . An absolute pressure ( or differential pressure)  $P_1$  is applied to diaphragm (1), while the absolute atmospheric pressure (basic pressure)  $P_2$  acts on diaphragm (3) (see drawing below), which stresses the reference resonator through the metal pipe (6). One end of the connecting pipe is attached to an outlet of the quartz block, and the second one to an internal cavity of the case of the gauge (5) where BRKM-P is subjected to the pressure  $P_1$ . The internal cavity of the gauge is usually filled up by oil.

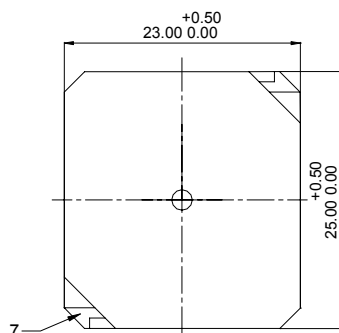
#### ELECTRICAL CHARACTERISTICS (at normal climatic conditions) / OPERATING CONDITIONS

PARAMETERS			SPECIFICATIONS AND REMARKS		UNITS		
Electrical characteristics							
Frequency Range, $f_0$			32.000...48.000		kHz		
Resonance Resistance typ./max., $R_r$			200 / 250		k $\Omega$		
Drive Level max., $D_L$			3.0		$\mu$ W		
Insulation Resistance min.			400		M $\Omega$		
Motional characteristics							
$f(P) = f_0 + A_1 * P + A_2 * P^2 + A_3 * P^3$							
where: $f(P)$ – crystal frequency at pressure $P$ (Hz),							
$f_0$ – crystal's frequency(in Hz) at zero value of pressure $P$ ,							
$A_1$ – Linear coefficient = Sensitivity							
$A_2, A_3$ – Second and the third order coefficients*. Nonlinearity less than 0.4% FS.							
Operation conditions							
Model	Pressure Range	UNIT	Sensitivity (Linear Coefficient $A_1$ )		UNIT	Overall Dimensions / Weight	UNIT
			measuring crystal	reference crystal			
BRKM-0.16	0 – 0.16	MPa	7959 $\pm$ 5...20%FS		Hz/MPa	25 x 23 x 4.5 / 6.0	mm / g
BRKM-0.5	0 – 0.50	MPa	3367 $\pm$ 5...20%FS		Hz/MPa	25 x 23 x 5.1 / 7.0	mm / g
BRKM-1.5	0 – 1.50	MPa	1235 $\pm$ 5...20%FS		Hz/MPa	25 x 23 x 7.0 / 9.5	mm / g
BRKM-6.0	0 – 6.00	MPa	304 $\pm$ 5...20%FS		Hz/MPa	25 x 23 x 10.4 / 17.0	mm / g
BRKM-16.0	0 – 16.00	MPa	127 $\pm$ 5...20%FS		Hz/MPa	25 x 23 x 12.2 / 18.5	mm / g
Pressure Range, $P$			0.1...25.0				MPa
Pressure range of Reference Crystal			79.98...106.64				kPa
Variation of frequency difference over any 10K within the operating temperature range			< 0.1				%
Operating temperature range, $T_{OPR}$ (typ/max)			-55...+80 / -40...+100; -269...+250**				$^{\circ}$ C
Storage temperature, $T_{STR}$			+5...+40				$^{\circ}$ C
Maximum deviation over temperature			0.75				%
Relative deviation of linear coefficient $A_1$ from its average value			$\pm$ 5... $\pm$ 20				%
Aging first year/next years max.			$\pm$ 5 / $\pm$ 25				ppm
FS Pressure Hysteresis			< 0.02				%
Reproducibility of temperature dependence of crystal frequency $f_T = f_0 + B_1 * T + B_2 * T^2$			0.05				%
Vibration Resistance, $\Delta f/f_0$			5g / 50-2000 Hz, 8 hours / $\pm$ 7 ppm max.				ppm

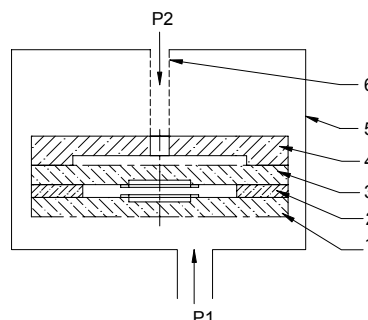
\* $A_1, A_2$  and  $A_3$  coefficients are specified on request.

\*\*Temperature range can be increased from -269 to +250  $^{\circ}$ C on request.

Temperature sensing quartz crystal RKT206 is used for compensation of a temperature deviation of BRKM-P.



#### PACKAGE DIMENSIONS



UNITS: millimeters

- 1 – bottom diaphragm
- 2 – gasket
- 3 – upper diaphragm
- 4 – cover
- 5 – gauge internal cavity
- 6 – connecting pipe
- 7 – contact leads