KSC-2 HIGH PERFORMANCE SIGNAL CONDITIONER FOR KULITE SENSOR PRODUCTS

KULITE KSC-2 FEATURES

- Two channels per system
- 0.1% overall DC accuracy
- 6-pole low-pass filters with programmable flat/pulse characteristics
- Cutoff frequencies programmable from 500 Hz to 127.5 kHz
- Patent pending REZCOMP™ transducer resonance compensation to extend useable bandwidth of resonant sensors (Option C3)
- Precise digital calibration of gain, excitation and DC offset
- Bipolar Constant Voltage Excitation with Remote Sense
- Unipolar Excitation Mode to power internally regulated transducers
- Automatic or manual bridge balance/suppress
- Balanced Differential Input
- Programmable AC/DC input coupling
- 7 nV/ $\sqrt{Hz}$ maximum input noise
- Pre-Filter Gain: x1 to x128 in binary steps
- Post-Filter Gain: x1/16 to x16 with 0.025% minimum resolution
- Input and output overload detection with programmable threshold
- Front-panel auto-balance and overload reset with fault LED indicators
- Calibration/Zero Input
- USB control interface with field upgradable firmware
- GUI interface for control of up to 8 KSC-2 units
- Compact stackable chassis design with link kit to lock units together
- Side-by-side rack-mount option
- 12.5 x 8.6 x 1.6 inches (LxWxH)
- 3.5 lb. net
- 0°C to 55°C (operating); –20°C to 85°C (storage)
- 2 ea. 9-pin Female D-Sub on Front Panel
- 2 ea. Isolated BNC on Rear Panel

KSC-2 DESCRIPTION

The KSC-2 is a compact, rugged dual-channel high precision amplifier/filter with programmable constant voltage excitation optimized for conditioning Kulite pressure sensors and microphone products. Fully programmable bipolar excitation with remote sense provides voltage for bridge type sensors while a unipolar excitation mode is supplied to condition sensors having internal regulation. Automatic or manual balance modes are supported.

A low-noise, high common-mode rejection balanced differential input is supplied with programmable AC/DC input coupling. Sharp, programmable precision low-pass filters support two response characteristics that are optimized for making time domain or frequency domain measurements. Amplification is distributed as pre and post filter gain, allowing for elimination of out-of-band energy such as transducer resonances that can cause non-linearities due to clipping of the amplifier. Overload detectors alert the user to output overloads as well as pre-filter overloads that may be masked by the low-pass filter.

The KSC-2 features an optional patent pending REZCOMP™ transducer resonant compensation technology that extends the useable frequency response of sensors with recess mounting, device packaging or seismic resonances. Based on a characterization of the sensor Q and resonant frequency, the REZCOMP technique extends the usable sensor bandwidth to as much as 80% of the sensor resonant frequency, or in some cases, even beyond the sensor resonant frequency.

A high level command interface is available to control the KSC-2 via USB 2.0. A spreadsheet style graphical user interface is supplied to control up to eight KSC-2 units as a single system. Configurations may be saved/recalled from the host computer. Settings may be saved to non-volatile memory for deployment without a host computer. Front panel LED indicators alert the user to overloads, excitation and autobalance status. In addition, autobalance can be initiated via a momentary front panel switch. The KSC-2 is supplied with an external AC to DC universal supply or may be powered using an external 10 to 30 VDC input.

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KSC-2 CONSTANT VOLTAGE EXCITATION

Type: Programmable Constant Voltage Excitation

Mode: Programmable Bipolar or Unipolar

Bipolar Mode:

Level: 0 to 12.5 V in 1.25 mV steps

Accuracy: ±0.1% of setting ±5 mV

Noise: 100 µVrms, 3 Hz to 100 kHz

Drift: ±0.0025%/°C of setting or ±50 µV/°C

Unipolar Mode:

Level: 14 Vdc ±5%

KSC-2 INPUT CHARACTERISTICS

Type: Balanced differential input with AC/DC coupling

Common Mode Voltage: ±10V operating

Input Level: ±10 Vpk

Input Impedance: 10 MΩ per side

Drift: 1 µV/°C, RTI

CMRR (input gain >x16): 110 dB, DC to 1000 Hz

Spectral Noise:

7 nV/ $\sqrt{Hz}$ at 1 kHz and pre-filter gain >64

KSC-2 AMPLIFIER CHARACTERISTICS

Pre-Filter Gain:

x1 to x128 in x2 steps with overload detection

Post-Filter Gain: x1/16 to x16 in 0.025% min step

Output Overload Detector:

Level programmable from 0.1 to 10.2 V

Overall DC Accuracy:

±0.1 % after auto-adjust at any gain setting.
Includes filter and compensator.

Temperature Coefficient: ±0.004% / C

DC Linearity:

0.005% re: full scale output, best-fit straight line

Wideband Frequency Response:

DC to 127.5 kHz: 0 dB ±0.1 dB; –3 dB typical at 500 kHz

KSC-2 OUTPUT CHARACTERISTICS

Type:

DC coupled, single-ended output

Impedance: 10 Ω

Max Output: ±10 Vpk, ±25 mA pk

Offset: <5 mV after auto-adjust at any gain setting

Offset Drift: 1 µV/°C, RTI + 150 µV /°C RTO, typical

Noise: 2.8 µV rms RTI + 60 µV rms RTO, 3 Hz to 100 kHz

Crosstalk: –80 dB, DC to 100 kHz

KSC-2 FILTER CHARACTERISTICS

Type:

Programmable Flat/Pulse Low-Pass 6-pole, 6-zero low-pass filter. Programmable for maximally flat pass-band (LP6F) or linear phase (LP6P).

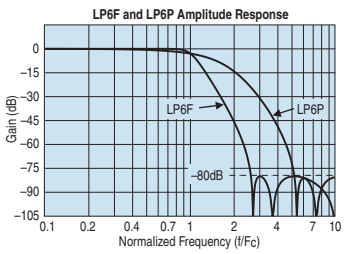
Cutoff Frequencies: 500 Hz to 127.5 kHz in 500 Hz steps

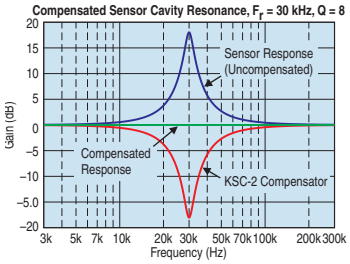
Pass-Band Accuracy: ±0.2 dB maximum to 0.8 Fc

Amplitude Match: ±0.2 dB maximum to 0.8 Fc

Phase Match: ±2° max to 0.8 Fc

Wideband Fc: 500 kHz, 3-pole Butterworth response





KSC-2 FREQUENCY RESPONSE CORRECTOR

Transducer Cavity Resonance Compensator:

Patent pending transducer cavity resonance correction for sensor as characterized by Q and resonant frequency (Fr).

Compensation Q:

1 to 20 in 0.1 steps; 20 to 50 in 0.5 steps

Compensation Frequencies (Fr):

Low-Range: 10 Hz to 2.55 kHz in 10 Hz steps

Mid-Range: 2.6 kHz to 51 kHz in 200 Hz steps

High-Range: 52 kHz to 255 kHz in 1 kHz steps

Accuracy:

Low-Range:

±0.1 dB DC to 0.8 Fr; 1.25 Fr ≤ f ≤ 10 kHz

Q ≤ 10: ±0.2 dB; 0.8 Fr < f < 1.25 Fr
Q > 10: ±0.02 dB * Q; 0.8 Fr < f < 1.25 Fr

Mid-Range:

±0.15 dB DC to 0.8 Fr; 1.25 Fr ≤ f ≤ 100 kHz

Q ≤ 10: ±0.25 dB; 0.8 Fr < f < 1.25 Fr
Q > 10: ±0.025 dB * Q; 0.8 Fr < f < 1.25 Fr

High-Range:

±0.2 dB; DC to 0.6 Fr;
±0.5 dB; 1.7 Fr ≤ f ≤ 255 kHz

Q ≤ 10: ±1.25 dB; 0.6 Fr < f < 1.7 Fr or 255 kHz whichever is less
Q > 10: ±0.125 dB * Q; 0.6 Fr < f < 1.7 Fr or 255 kHz whichever is less

Phase Match:

±2°, DC to 0.8 Fr Low and Mid-Ranges;
DC to 0.6 Fr High-Range

Amplitude Match:

±0.2 dB, DC to 0.8 Fr Low and Mid-Ranges;
DC to 0.6 Fr High-Range

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