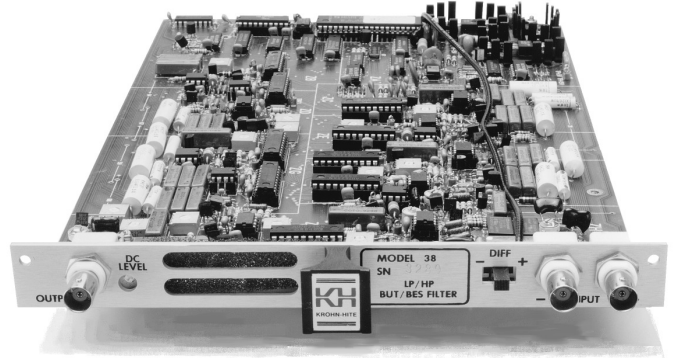


Model 38

0.03Hz to 1MHz, High-Pass/Low-Pass Butterworth/Bessel Plug-In Filter Card

- Cutoff Tunable Range: 0.03Hz to 1MHz
- Attenuation: 48dB/Octave
- Filter Modes: Low-Pass and High-Pass
- Response: Butterworth and Bessel
- Input Gain (pre-filter): 50dB in 10dB Steps
- Output Gain (post-filter): 20dB in 0.1dB Steps
- Input Type: Differential and Single-Ended
- Gain Only Mode: 70dB Pre-Amplifier



DESCRIPTION

The Krohn-Hite Model 38 Butterworth/Bessel, plug-in filter card is one of a family of filter cards used in Krohn-Hite Programmable Filter System Mainframes. It is carefully designed with the user in mind, providing ease of operation, reliability and price competitiveness.

The 38 provides a tunable frequency range from 0.03Hz to 1MHz in the low-pass mode and 0.03Hz to 300kHz in the high-pass mode. Both modes are extended down to 0.003Hz with the 002 option. The frequency response characteristic is either maximally flat (Butterworth) for clean filtering in the frequency domain, or linear phase (Bessel) to provide superior pulse or complex filtering is operator selectable.

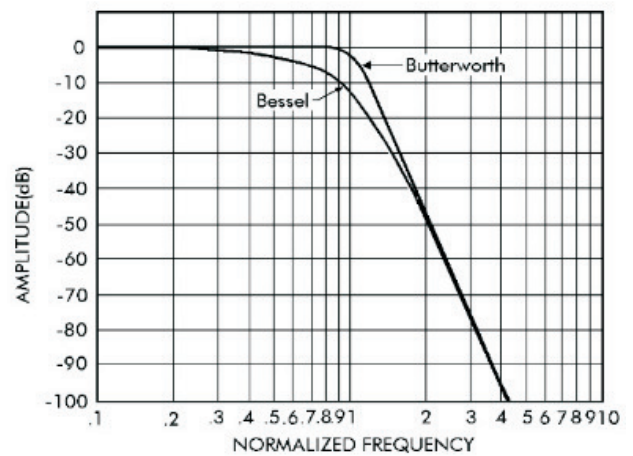
The 38 is an 8-pole, wide range, low-pass/high-pass filter or an amplifier providing gains to 70dB in 0.1dB steps. The 38 will accept input signals of $\pm 10V$ peak at 0dB gain and has selectable ac or dc coupling. Overload detectors are standard and assist the user in detecting input signals or incorrect gain settings.

APPLICATIONS

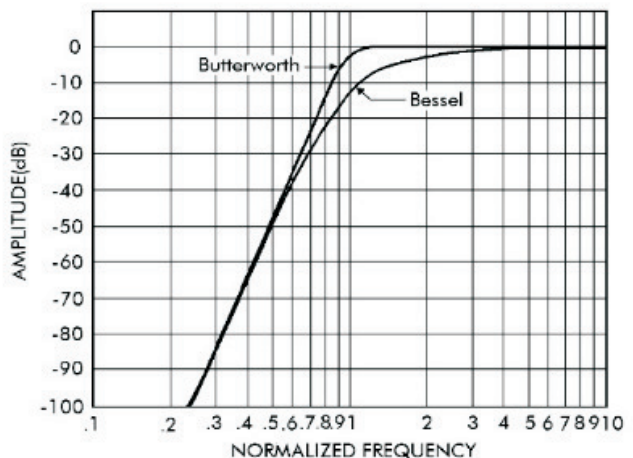
Applications of the Model 38 are ultra-sound measurements, random noise testing, sound recording, suppressing interference in audio communications and related fields of medical, geological, geophysical, oceanographic, military and many more.

MAINFRAMES

The 38 is a plug-in card for two mainframes; Models 3905B/3905C and 3916B. The 3905B/C is a 3" high chassis, allowing up to 5 filter/amplifier cards. The 3916B allows up to 16 cards.



Low-Pass Amplitude Response



High-Pass Amplitude Response

SPECIFICATIONS

FUNCTION: Low-pass filter, high-pass filter; voltage gain amplifier.

FILTER MODE

Type: 8-pole, Butterworth, Bessel.

Attenuation Slope: 48dB/octave.

Tunable Frequency Range f_c :

Low-Pass: 0.03Hz to 1MHz

High-Pass: 0.03Hz to 300kHz

Option 002: Tuning range from 0.03Hz to 0.003Hz.

Frequency Resolution: 3 digits, 0.1Hz to max f_c ; 2 digits, 0.03Hz to 0.099Hz; (option 002, 1 digit, 0.003Hz to 0.009Hz; 2 digits, 0.01Hz to 0.099Hz).

Cutoff Frequency Accuracy: $\pm 1\%$, 0.5Hz to 50kHz; $\pm 2\%$, 50.1kHz to max f_c ; $\pm 5\%$, 0.03Hz to 0.5Hz (option 002, $\pm 5\%$, 0.003Hz to 0.5Hz).

Relative Gain at f_c : -3dB , Butterworth; -12.6dB , Bessel.

High-Pass Bandwidth (0dB gain): $>4\text{MHz}$.

Stopband Attenuation: $>100\text{dB}$.

Maximum Input: $\pm 10\text{V}$ peak at 0dB gain reduced in proportion to gain setting; ± 7 peak for LP, $f_c > 500\text{kHz}$, $f_{sig} > 500\text{kHz}$.

Pre-Filter Gain: 0dB, 10dB, 20dB, 30dB, 40dB, 50dB, $\pm 0.2\text{dB}$.

Post-Filter Gain: 0dB to 20dB in 0.1dB steps, $\pm 0.2\text{dB}$.

Wideband Noise (2MHz bandwidth detector): 0dB gain, $<300\mu\text{Vrms}$ for $f_c \leq 5\text{kHz}$, $<500\mu\text{Vrms}$ for $f_c \leq 50\text{kHz}$, $\leq 1\text{mVrms}$ for $f_c > 50\text{kHz}$. Max. gain, $<25\mu\text{Vrms RTI}$.

Harmonic Distortion: -80dB at 1kHz.

DC Stability (RTI): Typically $\pm 2\text{mV}/^\circ\text{C}$.

AMPLIFIER MODE

Bandwidth: $>7\text{MHz}$ min. gain; $>700\text{kHz}$ max. gain.

Response: $\pm 0.1\text{dB}$ typical, $\pm 0.5\text{dB}$ max.

Gain: 0dB to 70dB in 0.1dB steps, $\pm 0.2\text{dB}$.

Input: Differential or single-ended +(in phase), -(inverted).

CMRR: $>60\text{dB}$ to 10kHz; $>50\text{dB}$ to 100kHz.

Sensitivity: 3mV peak with 70dB total gain for 10V peak output.

Maximum Input: $\pm 10\text{V}$ peak at 0dB gain reduced in proportion to gain setting.

Impedance: 1 megohm in parallel with 100pf.

Coupling: ac (0.16Hz) or dc.

Maximum DC Component: $\pm 100\text{V}$ in ac coupled mode.

Output:

Maximum Voltage (open circuit): $\pm 10\text{V}$ peak.

Maximum Current: $\pm 80\text{mA}$ peak.

Impedance: 50 ohms.

DC Offset: Adjustable to zero volts.

Harmonic Distortion (1V output): -80dB (0.01%) to 10kHz; -60dB (0.1%) to 100kHz..

Wideband Noise (RTI, 2MHz BW detector): $200\mu\text{Vrms}$ min. gain; $25\mu\text{Vrms}$ max. gain.

DC Stability (RTI): Typically $\pm 10\text{mV}/^\circ\text{C}$.

GENERAL

Crosstalk Between Channels: -85dB below full scale with input source <50 ohms.

Low-Pass Phase Match Between Channels: $\pm 2^\circ$ to 500kHz, $\pm 5^\circ$ to 1MHz. Only for cards purchased at the same time.

High-Pass Phase Match Between Channels: For $f_c \leq 100\text{kHz}$, $\pm 2^\circ$ for $f_{sig} \leq 500\text{kHz}$, 2° times $f_{sig}/500\text{kHz}$ for f_{sig} to 2MHz; for $f_c > 100\text{kHz}$, $\pm 5^\circ$ for $f_{sig} \leq 500\text{kHz}$, 5° times $f_{sig}/500\text{kHz}$ for f_{sig} to 2MHz. Only cards purchased at the same time.

Gain Match Between Channels: $\pm 0.2\text{dB}$ max. to 100kHz.

Switch: For selection of Input, +(in phase), Differential or -(inverted).

Input/Output Connectors: BNC.

Power: 15 watts.

Weights: 1.75 lbs (.79kg).

Accessories: Operating manual.

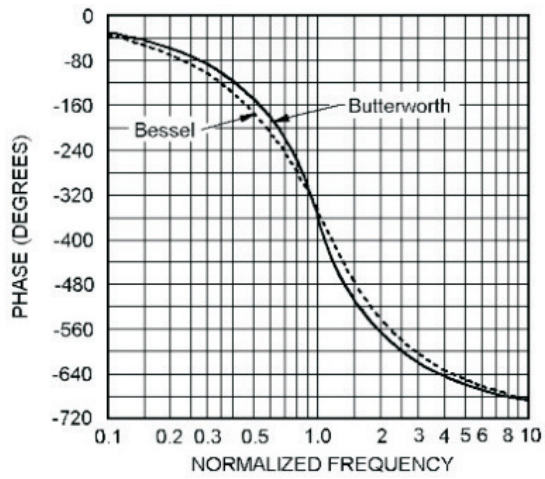
OPTIONS

002: extends low end cutoff to 0.003Hz.

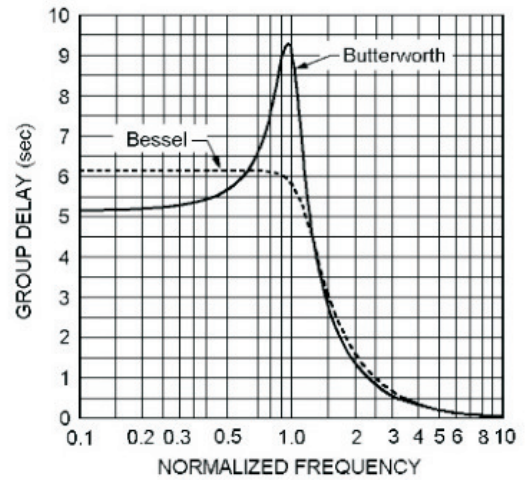
Extended 1 Year Warranty: Part No. EW38.

Specifications apply at 25°C , $\pm 5^\circ\text{C}$.

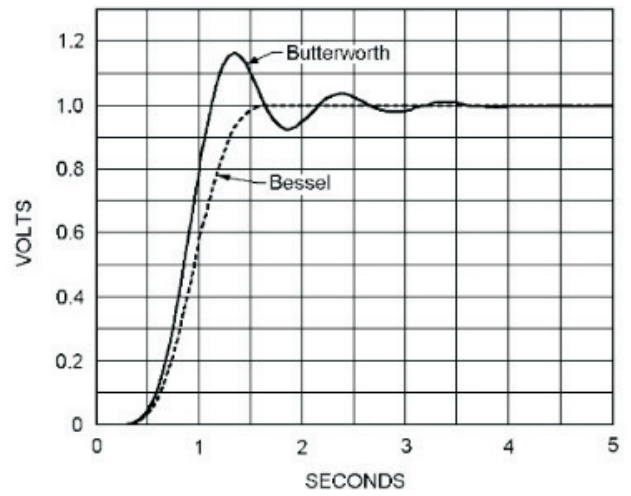
Specifications subject to change without notice.



Phase Response



Group Delay



Transient Response

8-Pole High-Pass Butterworth

Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (Deg)	Delay (1) (sec)
0.10	-160.00	691.00	0.819
0.20	-112.00	661.00	0.828
0.30	-83.70	631.00	0.843
0.40	-63.70	600.00	0.867
0.50	-48.20	568.00	0.903
0.60	-35.50	535.00	0.956
0.70	-24.80	499.00	1.040
0.80	-15.60	459.00	1.190
0.85	-11.60	437.00	1.290
0.90	-8.060	413.00	1.400
0.95	-5.150	386.00	1.480
1.00	-3.010	360.00	1.460
1.20	-0.229	275.00	0.873
1.40	-0.020	226.00	0.540
1.60	-0.002	194.00	0.380
1.80	0.000	170.00	0.287
2.00	0.000	152.00	0.226
2.50	0.000	120.00	0.139
3.00	0.000	99.20	0.094
4.00	0.000	74.00	0.052
5.00	0.000	59.00	0.033
6.00	0.000	49.00	0.023
7.00	0.000	42.10	0.017
8.00	0.000	36.80	0.013
9.00	0.000	32.70	0.010
10.00	0.000	29.40	0.008

Note (1)

Normalized Group Delay: is normalized to a frequency of 1.0Hz. The actual delay is the normalized delay divided by the actual corner frequency (fc).

8-Pole Low-Pass Bessel

Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (Deg)	Delay (1) (sec)
0.00	0.000	0.00	0.506
0.10	-0.029	-18.20	0.506
0.20	-0.117	-36.40	0.506
0.30	-0.264	-54.70	0.506
0.40	-0.470	-72.90	0.506
0.50	-0.737	-91.10	0.506
0.60	-1.06	-109	0.506
0.70	-1.45	-128	0.506
0.80	-1.91	-146	0.506
0.85	-2.16	-155	0.506
0.90	-2.42	-164	0.506
0.95	-2.71	-173	0.506
1.00	-3.01	-182	0.506
1.10	-3.67	-200	0.506
1.20	-4.40	-219	0.506
1.30	-5.20	-237	0.506
1.40	-6.10	-255	0.505
1.50	-7.08	-273	0.504
1.60	-8.16	-291	0.502
1.70	-9.36	-309	0.498
1.80	-10.7	-327	0.492
1.90	-12.1	-345	0.482
2.00	-13.7	-362	0.468
2.25	-18.1	-402	0.417
2.50	-23.1	-436	0.352
2.75	-28.3	-465	0.291
3.00	-33.4	-489	0.241
3.25	-38.3	-509	0.201
3.50	-43.1	-526	0.170
4.00	-51.8	-552	0.126
5.00	-66.8	-587	0.077
6.00	-79.2	-610	0.052
7.00	-89.8	-626	0.038
8.00	-99.0	-638	0.029
9.00	-107.0	-647	0.023
10.00	-114.0	-655	0.018

Note (1)

Normalized Group Delay: is normalized to a frequency of 1.0Hz. The actual delay is the normalized delay divided by the actual corner frequency (fc).