

FA series

Anti-aliasing filters

apparateq

Electronics for Research and Science

PRELIMINARY INFORMATION



- Low-noise passive filters
- High stop-band attenuation
- Selection of different cut-off frequencies
- Pseudo-elliptic characteristics
- Small delay variations
- Optimized for high load impedance
- Single channel
- Dual channel versions available
- Customized versions available

The FA series of anti-aliasing filters is designed to unleash the full potential of today's high-resolution acquisition systems.

Any digitalization of signals calls for an anti-aliasing filter. The requirements to the filter depends on the type of A/D-converter, the resolution and the level of unwanted signals, and whether some filtering is already present before the conversion.

In particular, general-purpose data acquisition equipment does not typically include an anti-aliasing filter, due to the wide range of applications in which the equipment is used. In this case, it is the responsibility of the user to limit the level of unwanted signals that may result in aliasing.

The FA series is easily inserted between your signal source and your digitizer, and is available with different cut-off frequencies to suit typical ranges of sampling rates.

The FA series has a high stop-band attenuation, and the pseudo-elliptic characteristics provide a flat group delay through large parts of the passband. The filters are optimized for a low-impedance feed (50 Ω), and a high-impedance load (1 M Ω).

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Specifications and characteristics

	FA-10S	FA-25S	FA-50S	FA-100S	FA-250S	FA-500S
Passband (-1 dB)	DC - 10 kHz	DC - 25 kHz	DC - 50 kHz	DC - 100 kHz	DC - 250 kHz	DC - 500 kHz
Rejection 1)	70 dB, ≥ 32 kHz 90 dB, 40 kHz – 1 MHz	70 dB, ≥ 80 kHz 90 dB, 100 kHz – 1 MHz	70 dB, ≥ 160 kHz 90 dB, 200 kHz – 1 MHz	70 dB, ≥ 320 kHz 85 dB, 400 kHz – 2 MHz	70 dB, ≥ 800 kHz 80 dB, 1 MHz – 5 MHz	70 dB, ≥ 1.6 MHz 80 dB, 2 MHz – 10 MHz
Recomm. fs 2)	≥ 40 kHz	≥ 100 kHz	≥ 200 kHz	≥ 400 kHz	≥ 1 MHz	≥ 2 MHz
Group delay 1)	50 – 65 μ s, ≤ 12.5 kHz ≤ 75 μ s @ 25 kHz	20 – 25 μ s, ≤ 12.5 kHz ≤ 30 μ s @ 25 kHz	10 – 13 μ s, ≤ 12.5 kHz ≤ 15 μ s @ 25 kHz	5 – 7 μ s, ≤ 12.5 kHz ≤ 8 μ s @ 25 kHz	2 – 3 μ s, ≤ 12.5 kHz ≤ 3.5 μ s @ 25 kHz	1 – 1.5 μ s, ≤ 12.5 kHz ≤ 2 μ s @ 25 kHz
Source 3)	50 Ω nom., BNC	50 Ω nom., BNC	50 Ω nom., BNC	50 Ω nom., BNC	50 Ω nom., BNC	50 Ω nom., BNC
Load 3)	≥ 10 k Ω , BNC	≥ 10 k Ω , BNC	≥ 10 k Ω , BNC	≥ 10 k Ω , BNC	≥ 10 k Ω , BNC	≥ 10 k Ω , BNC
Measures (L x W x H)	105 mm (L) x 63 mm (W) x 35 mm (H)	105 mm (L) x 63 mm (W) x 35 mm (H)	105 mm (L) x 63 mm (W) x 35 mm (H)	105 mm (L) x 63 mm (W) x 35 mm (H)	105 mm (L) x 63 mm (W) x 35 mm (H)	105 mm (L) x 63 mm (W) x 35 mm (H)

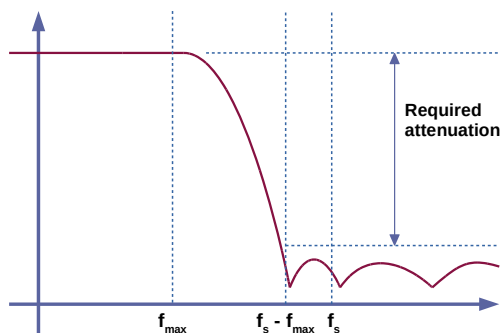
1) Preliminary specifications; The parameters are yet to be fully characterized.

2) The minimum recommended sampling frequency f_s provides the intended attenuation of aliasing components; Lower f_s may be used at the risk of increased aliasing.

3) The response of the filters is specified at 50 Ω source and 1 M Ω load

The FA series targets systems with a sampling frequency of at least 4 times the highest frequency of the signal-of-interest. Also, care is taken to provide stop-band characteristics that match systems with a resolution of 16 bits or more. The proprietary, pseudo-elliptic filter design provides a flat passband with low amplitude and phase ripple over a wide frequency range, while having a deep stop-band attenuation.

To select your filter, take a look at the figure below. Your signals of interest should be within the filter's specified passband, while your sampling frequency should be within the recommended range.

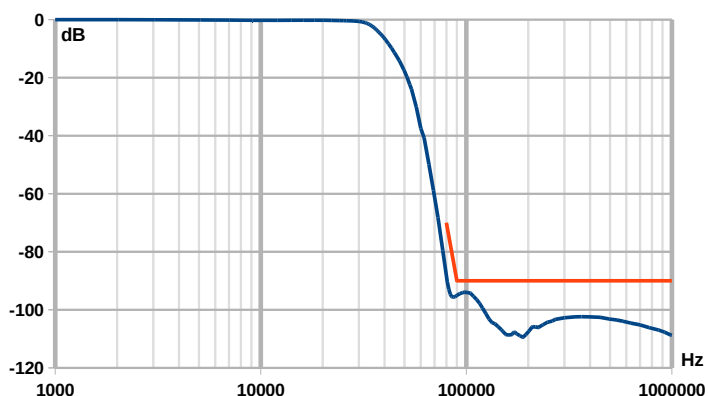


Above: An anti-aliasing filter must give the required attenuation from a frequency equal to the sampling frequency f_s minus the maximum frequency f_{max} of the signal of interest.

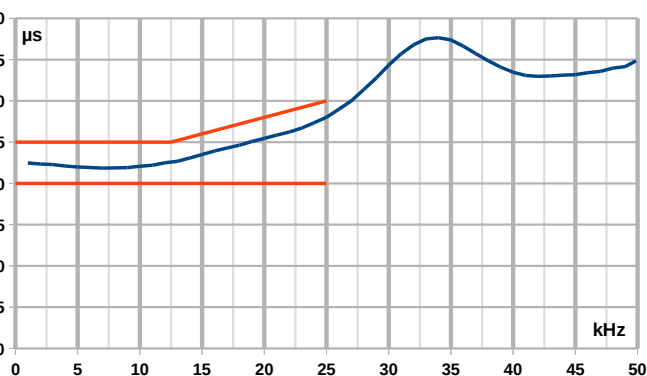
The FA series is specifically made for digitizers and other kinds of laboratory equipment with a high input impedance to ensure the best voltage transfer characteristics, and ease-of-use. The source impedance should be 50 Ω in order to preserve the characteristics of the filter. Typically, a pre-amplifier would be the source for the filter, but any device with a 50 Ω output impedance can be connected to the FA series.

Need other cut-off frequencies or special characteristics? Consult Apparateq to hear about customized filters.

Need perhaps filtering of power supplies? Consider our PS or PSC series of power supply filters, or perhaps our optical power isolators which provide the ultimate noise suppression and isolation.



The graph above shows the guaranteed rejection (in orange), and an example (in blue) of a measured response, in this case of an FA-25S filter. The source impedance is 50 Ω , and the load impedance is 1 M Ω .



The graph above shows the guaranteed delay range (in orange), and an example (in blue) of a measured response, in this case of an FA-25S filter. The source impedance is 50 Ω , and the load impedance is 1 M Ω .