



# Cryogenic Microwave Filter & Thermalizer Single-line

- Single-line Microwave Filter and Thermalizer (MFT)
- SMA, SMP, SMPM, MCX and other RF connectors
- Non-magnetic gold-plated copper housing
- Shielded and mechanically robust
- Easy thermalization through connectors at mK

#### **Our MFT line offers:**

- Exponentially strong attenuation, free of resonances
- More than 100 dB attenuation starting from ~50 MHz
- Strong thermalization
- Ultra-low resistance for high current applications: ~30 m $\Omega$  @ 4K
- Ultra-low capacitance, reduced noise in current measurements: ~1.2 nF @ 4K

Single Filter Models		MFT-100 $\Omega$	$\pi$ MFT-100 $\Omega$	MFT-m $\Omega$	$\pi$ MFT-m $\Omega$
		Resistive for optimum thermalization		Ultra-low (m $\Omega$ ) resistance for high-currents	
Connector type		SMA, SMP, MCX, or customized			
Dimensions (not including connector)		Length ~ 32 mm, Diameter ~ 9 mm			
Capacitance	T = 300 K	~ 2.1 nF	$\leq$ 12 nF	~ 1.8 nF	$\leq$ 12 nF
	T = 4.2 K	~ 1.3 nF	$\leq$ 11 nF	~ 1.1 nF	$\leq$ 11 nF
In-line resistance	T = 300 K	~ 85 $\Omega$		~ 3 $\Omega$	
	T = 4.2 K	~ 75 $\Omega$		~ 30 m $\Omega$	
Attenuation (T = 300 K)	3 dB cutoff *	~ 1 MHz **	~ 0.17 MHz **	~ 2 MHz	~ 0.65 MHz
	20 dB cutoff *	~ 8 MHz **	~ 1.1 MHz **	~ 23 MHz	~ 3 MHz
	100 dB cutoff *	~ 160 MHz	~ 45 MHz	~ 250 MHz	~ 60 MHz
Maximum applied voltage		100 V			
Maximum applied current	300 K	10 mA		30 mA	
	10 mK	0.3 mA***		15 mA***	
Resistance to ground		> 1 T $\Omega$			

Table shows typical specs; \* Variations of up to  $\pm 25\%$  in cutoff frequencies can be expected; \*\* Extracted from measurements with 1 M $\Omega$  input impedance; all other cutoff frequencies are extracted with 50  $\Omega$  input impedance (typical spectra plotted below); \*\*\* Maximum current at 10 mK is calculated to keep dissipation below 10  $\mu$ W.

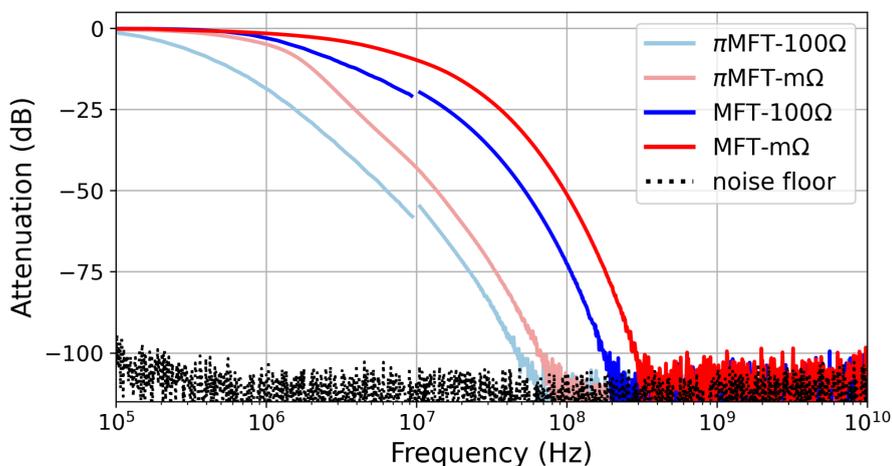


Figure shows typical room-temperature attenuation characteristics of individual MFT filters. A vector network analyzer with 50  $\Omega$  input was used. For 100  $\Omega$  filters (blue curves), a spectrum analyzer with 1 M $\Omega$  input impedance was used below 10 MHz. Disclaimer: measurement results depend on the total setup and load impedance (real and imaginary).



# Cryogenic Microwave Filter & Thermalizer

## Compact 25-line units: MFT25 & SlimMFT25

- 25 MFT lines in a compact unit with micro-D connectors
- Non-magnetic gold-plated copper housing
- Easy to mount at 10 mK
- 2-pole RCRC stage option with cutoff down to kHz

### Our MFT line offers:

- Exponentially strong attenuation, free of resonances
- More than 100 dB attenuation starting from ~50 MHz
- Strong thermalization
- Ultra-low resistance for high current applications:  $\sim 30 \text{ m}\Omega$  @ 4K
- Ultra-low capacitance, reduced noise in current measurements:  $\sim 1.2 \text{ nF}$  @ 4K

Compact 25-Line Models	MFT25 -mΩ	MFT25 -100Ω	SlimMFT25 -mΩ	SlimMFT25 -100Ω
Number of filtered lines	25			
Filter type	MFT-mΩ	MFT-100Ω	MFT-mΩ	MFT-100Ω
Connector type	Micro-D connector*			
Weight and dimensions (Dimensions do not include the Micro-D)	~400 gr 30 x 56 x 68 mm		~230 gr, 12 x 49 x 75 mm with π or RCRC stage: ~250 gr, 12 x 49 x 95 mm	
Mounting	4 x M4 with 39.5 to 44 mm flexible spacing & 60 mm fixed spacing		4 x M4 with 38 to 42 mm flexible spacing & 60 mm fixed spacing (with π or RCRC stage 80mm)	
Available options	Integrated π and RCRC stage		Integrated π and RCRC stage	

\*To avoid ground loops, the cable shield (outer conductor) is not connected through the mated micro-D connector pair. Electrical grounding and thermal anchoring are provided by mechanically mounting the filter boxes to the mixing-chamber plate.

### Two-pole RCRC standard options for kHz cutoff Integrated inside MFT25 or SlimMFT25 or as a stand-alone unit

2-pole RCRC options	3 dB Cutoff	Maximum R	Maximum C
RCRC-1	1 - 2 kHz	15 - 25 kΩ	17 - 14 nF
RCRC-5	5 - 7 kHz	4.5 - 12 kΩ	14 - 6.5 nF
RCRC-10	10 - 15 kHz	2 - 5 kΩ	12 - 4 nF
RCRC-30	30 - 35 kHz	2 - 5 kΩ	7 - 2.5 nF
RCRC-100	100 kHz	0.5 - 1 kΩ	4 - 2.5 nF
RCRC-C	Customised cutoff with R & C values based on application requirements		

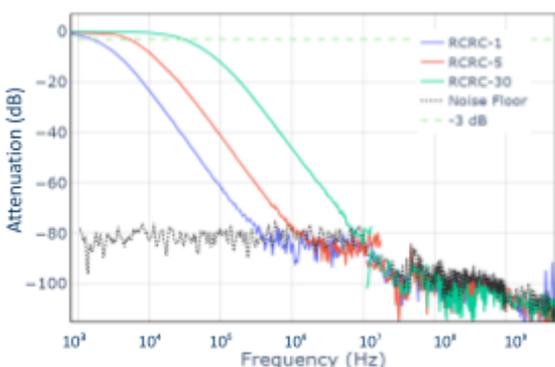
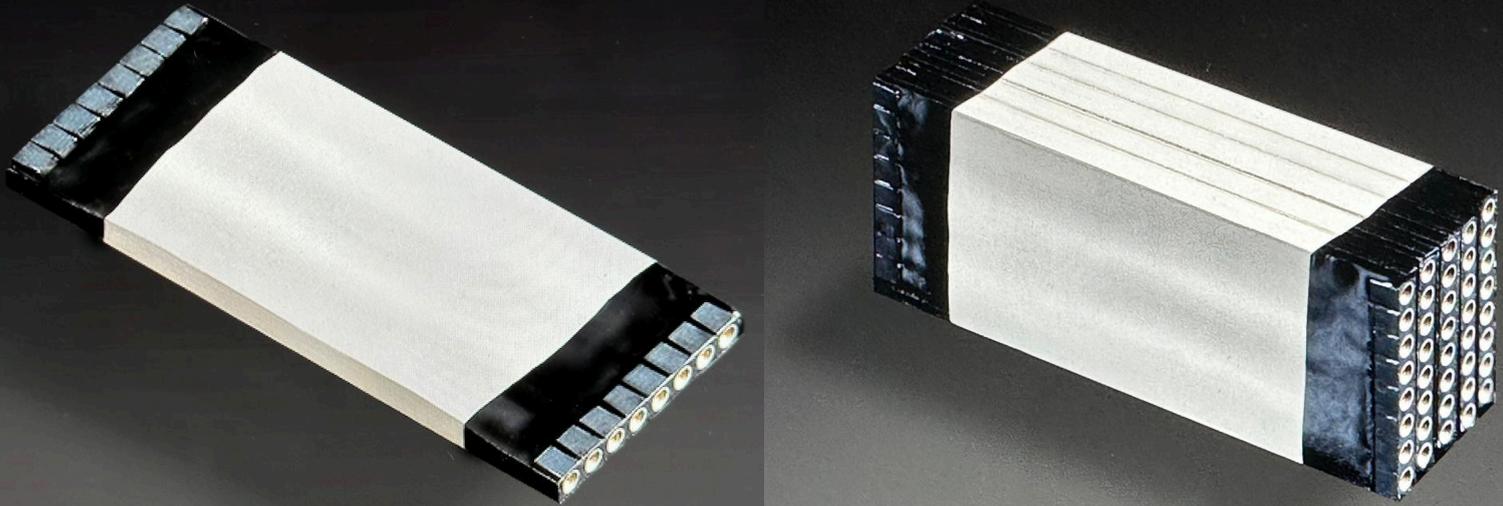


Figure shows typical room-temperature attenuation of individual MFT filters with an RCRC-1, RCRC-5 and an RCRC-30 stage. Measurements were performed using a spectrum analyzer with 1MΩ input impedance



Basel Precision Instruments



# Cryogenic Microwave Filter & Thermalizer SlimMFT8

- Slim ultra-compact 8-line MFT package for small dilution fridge inserts
- Several packages can be stacked on top of each other (photo top right)
- Up to 6 packages (48 filtered lines) fit in a 50 mm insert
- Dimensions of one SlimMFT8 package: ~ 52 x 21 x 3.2 mm

## **Our MFT line offers:**

- Exponentially strong attenuation, free of resonances
- More than 100 dB attenuation above ~50 MHz
- Strong thermalization
- Ultra-low resistance for high current applications: ~30 m $\Omega$  @ 4K
- Ultra-low capacitance, reduced noise in current measurements: ~1.2 nF @ 4K

Model		SlimMFT8-m $\Omega$	SlimMFT8-100 $\Omega$
Number of filtered lines per SlimMFT8 unit		8	
Connector type		SIP-Socket connectors	
Weight and dimensions		12 gr, ~ 52 x 21 x 3.2 mm	
Capacitance	T = 300 K	~2.2 nF	~2.4 nF
	T = 4.2 K	~1.3 nF	~1.5 nF
In-line resistance	T = 300 K	~ 3.5 $\Omega$	~ 100 $\Omega$
	T = 4.2 K	~ 35 m $\Omega$	~ 90 $\Omega$
Attenuation (T = 300 K)	3 dB cutoff *	~ 3 MHz	~ 0.75 MHz**
	20 dB cutoff *	~ 40 MHz	~ 7 MHz**
	100 dB cutoff *	~ 400 MHz	~ 200 MHz
Maximum applied voltage		100 V	
Maximum applied current	300 K	30 mA	10 mA
	10 mK	15 mA***	0.3 mA***
Resistance to ground		> 1 T $\Omega$	

Table shows typical specs; \* Variations of up to  $\pm 25\%$  in cutoff frequencies can be expected; \*\* Extracted from measurements with 1 M $\Omega$  input impedance; all other cutoff frequencies are extracted with 50  $\Omega$  input impedance (typical spectra plotted below); \*\*\* Maximum current at 10 mK is calculated to keep dissipation below 10  $\mu$ W.

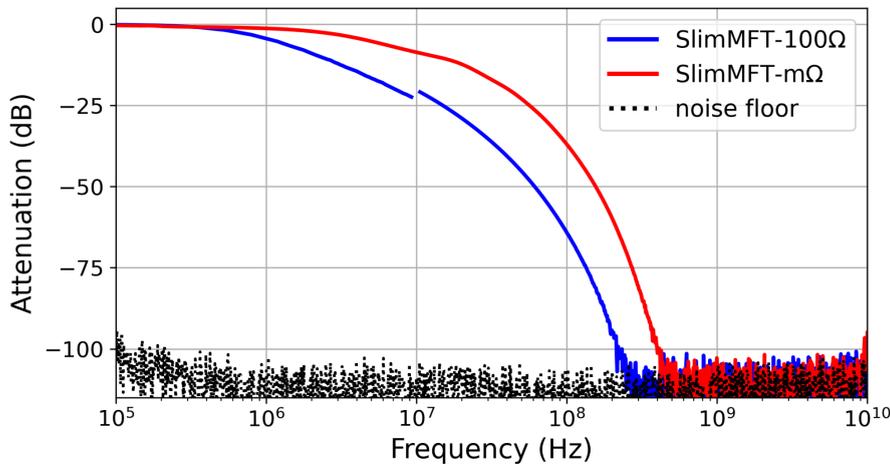


Figure shows typical room-temperature attenuation characteristics of individual MFT filters. A vector network analyzer with 50  $\Omega$  input was used. For 100  $\Omega$  filters (red curves), a spectrum analyzer with 1 M $\Omega$  input impedance was used below 10 MHz. Disclaimer: measurement results depend on the total setup and load impedance (real and imaginary). The jump observed is caused by switching the input impedance from 1 M $\Omega$  to 50  $\Omega$ .