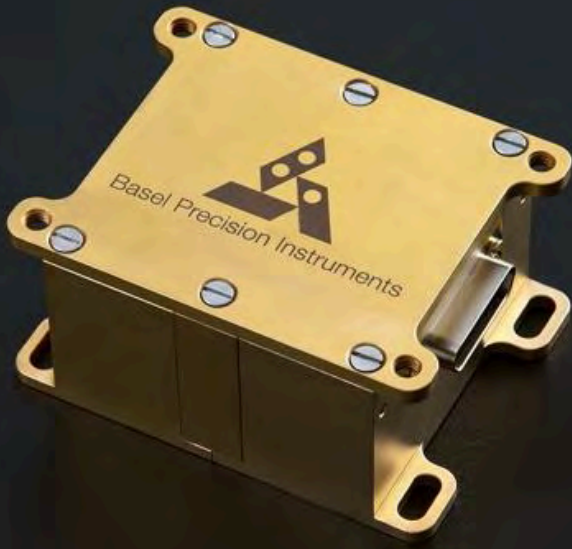




Basel Precision Instruments



# Cryogenic Microwave Filter & Thermalizer (MFT)

**high attenuation, low cutoff frequency, strong thermalization**

- 25 filtered lines in a compact non-magnetic box
- Easy to mount at 10 mK
- **Exponentially strong attenuation**, free of resonances (plot on next page)
- More than 100 dB attenuation above ~100 MHz
- **Strong thermalization** (filter wire embedded in silver epoxy)
- Ultra-low resistance for high current applications: **~25 mΩ @ 4K**
- Ultra-low capacitance, reduced noise in current measurements: **2.5 nF**
- Resistance to ground > 1 TΩ; **negligible leakage current**
- **NEW: 2-pole RCRC stage option with 3dB cutoff down to kHz, integrated into the same compact box**

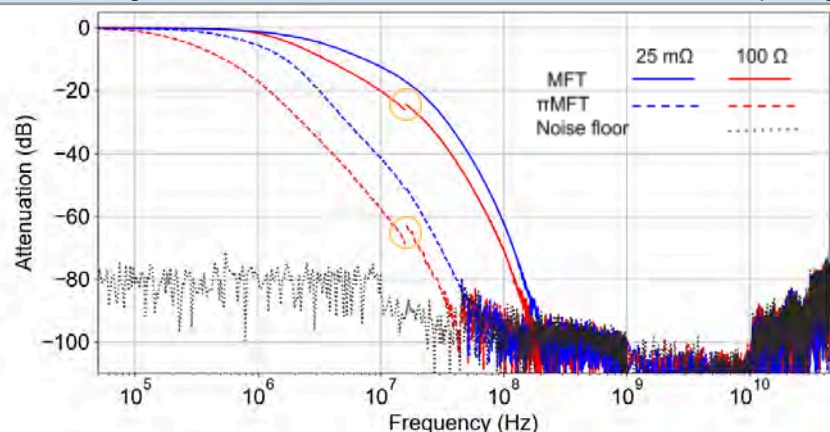


Single Filter Models		MFT-100 $\Omega$	$\pi$ MFT-100 $\Omega$	MFT-25m $\Omega$	$\pi$ MFT-25m $\Omega$
		Resistive for optimum thermalization		Ultra-low (m $\Omega$ ) resistance for high-currents	
Connector type		SMA, MCX, or customized			
Dimensions (not including connector)		Length ~ 25 mm, Diameter ~ 6 mm			
Capacitance	300 K / 4.2 K	$\leq 2.5$ nF	$\leq 12$ nF	$\leq 2.5$ nF	$\leq 12$ nF
In-line resistance	T = 300 K	$\leq 100 \Omega$		$\leq 2.5 \Omega$	
	T = 4.2 K	$\leq 100 \Omega$		$\leq 25$ m $\Omega$	
Attenuation	3 dB cutoff *	~ 1.3 MHz **	~ 0.2 MHz **	~ 2 MHz	~ 0.6 MHz
	20 dB cutoff *	~ 10 MHz **	~ 1.2 MHz **	~ 20 MHz	~ 3 MHz
	100 dB cutoff *	~ 180 MHz	~ 45 MHz	~ 220 MHz	~ 70 MHz
Maximum applied voltage		100 V			
Maximum applied current	300 K	10 mA		30 mA	
	10 mK	0.2 mA***		10 mA***	
Resistance to ground		> 1 T $\Omega$			

Table shows typical specs; \* Variations of up to  $\pm 20\%$  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.

25-line Filter Box Models	MFT25-100 $\Omega$	MFT25-25m $\Omega$
Number of filtered lines	25	
Filter type	MFT-100 $\Omega$	MFT-25m $\Omega$
Connector type	Micro-D connector	
Weight and dimensions	400 gr, 30 x 56 x 68 mm (without Micro-D) for mounting: 4 x M4 with 39.5 to 44 mm flexible & 60 mm fixed spacing	

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 20 MHz. Disclaimer: measurement results depend on the total setup and load impedance (real and imaginary). The jump observed (yellow circles) is caused by switching the input impedance from 1 M $\Omega$  to 50  $\Omega$ .





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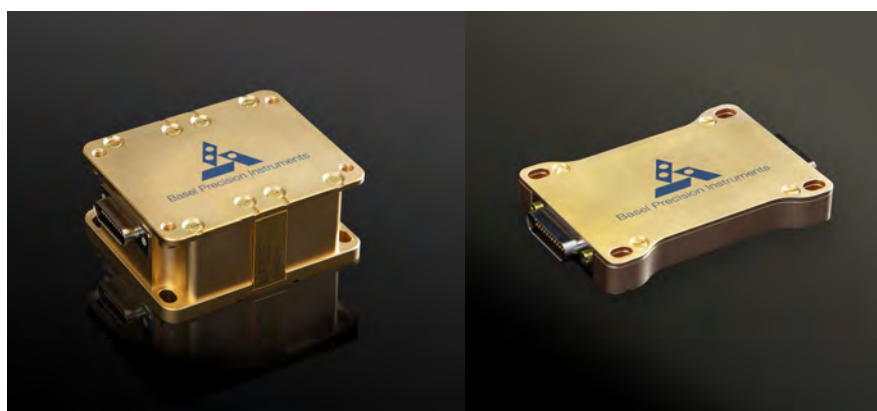
# Introducing the SlimMFT25

**One third of the volume, same performance!**

- 25 filtered lines in a compact non-magnetic copper box
- Micro-D connectors
- Same excellent thermalization and attenuation as our Standard MFT25
- Same ultra-low resistance & capacitance ( $\sim 25 \text{ m}\Omega$  and  $2. \text{f nF@ 4K}$ ) as our Standard MFT25
- Dimensions: 10 x 48 x 70 mm (10 x 48 x  $\sim 90$  mm with RCRC)

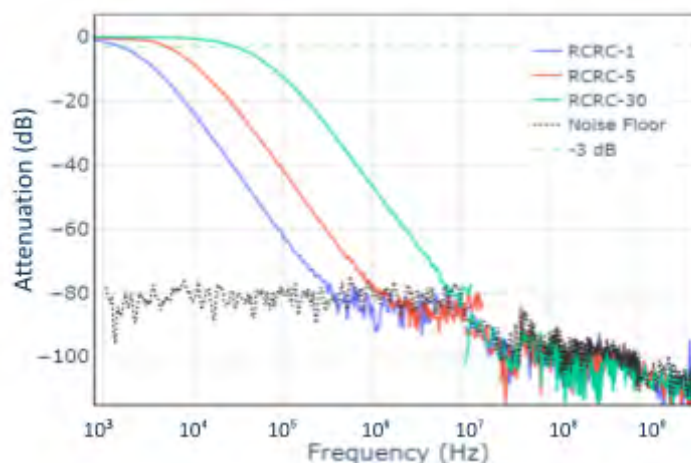
# Integrated 2-pole RCRC stage for kHz cutoff

Integrated inside the Compact MFT25 or SlimMFT25 Box



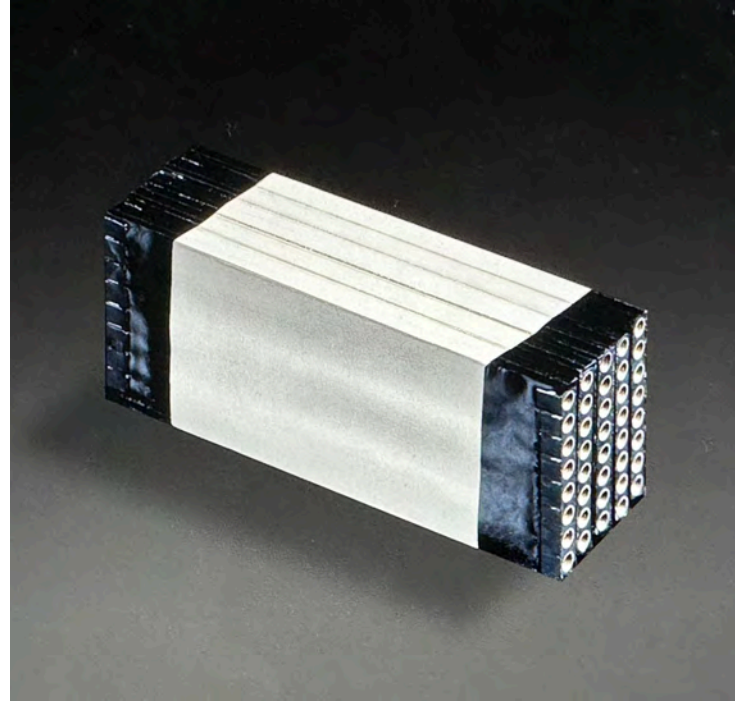
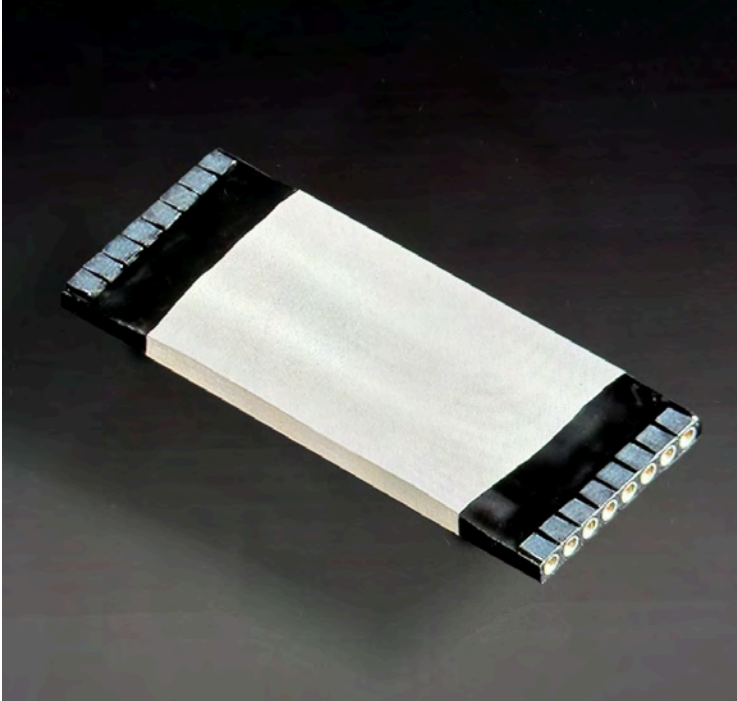
2-pole RCRC options	3 dB Cutoff	Maximum R	Maximum C
RCRC-1	1 - 2 kHz	15 - 25 kΩ	17 - 14 nF
RCRC-5	5 - 7 kHz	4.5 - 12 kΩ	14 - 6.5 nF
RCRC-10	10 - 15 kHz	2 - 5 kΩ	12 - 4 nF
RCRC-30	30 - 35 kHz	2 - 5 kΩ	7 - 2.5 nF
RCRC-C	customized cutoff with R and C values based on application requirements		

Figure shows typical room-temperature attenuation characteristics of individual MFT filters with an RCRC-1, RCRC-5 and an RCRC-30 stage. A spectrum analyzer with 1 MΩ input impedance was used for the measurements.





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# Slim Cryogenic Microwave Filter & Thermalizer (SlimMFT8)

## Stackable slim MFT package for small dilution fridge inserts

- Slim ultra-compact MFT package for small (50 mm) dilution fridge inserts
- Ultra-low resistance ultra-low capacitance silver epoxy based microwave filter and thermalizer (MFT)
- One SlimMFT8 package includes 8 filtered lines (photo on the top left)
- 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
- SIP-socket connectors for easy plugging/unplugging
- Easy mounting on cold finger





		SlimMFT8-30mΩ	SlimMFT8-100Ω
<b>Number of filtered lines per SlimMFT8 unit</b>		8	
<b>Connector Type</b>		SIP-Socket connectors	
<b>Weight and dimensions</b>		12 gr, ~ 52 x 21 x 3.2 mm	
<b>Capacitance</b>	300 K / 4.2 K	1.9 nF	2.8 nF
<b>Resistance</b>	T = 300 K	~ 3 Ω	~ 100 Ω
	T = 4.2 K	~ 30 mΩ	~ 100 Ω
<b>Attenuations</b>	3 dB cutoff *	~ 2.3 MHz	~ 0.8 MHz**
	20 dB cutoff *	~ 35 MHz	~ 8 MHz**
	100 dB cutoff *	~ 330 MHz	~ 200 MHz
<b>Maximum applied voltage</b>		100 V	
<b>Maximum applied current</b>	300 K	30 mA	10 mA
	10 mK	10 mA***	0.2 mA***
<b>Resistance to ground</b>		> 1 TΩ	

Table shows typical specs: \* Variations of up to  $\pm 20\%$  in cutoff frequencies can be expected; \*\* Extracted from measurements with 1 MΩ input impedance; all other cutoff frequencies are extracted with 50 Ω input impedance (typical spectra plotted below); \*\*\* Maximum current at 10 mK is calculated to keep dissipation below 10 μW.

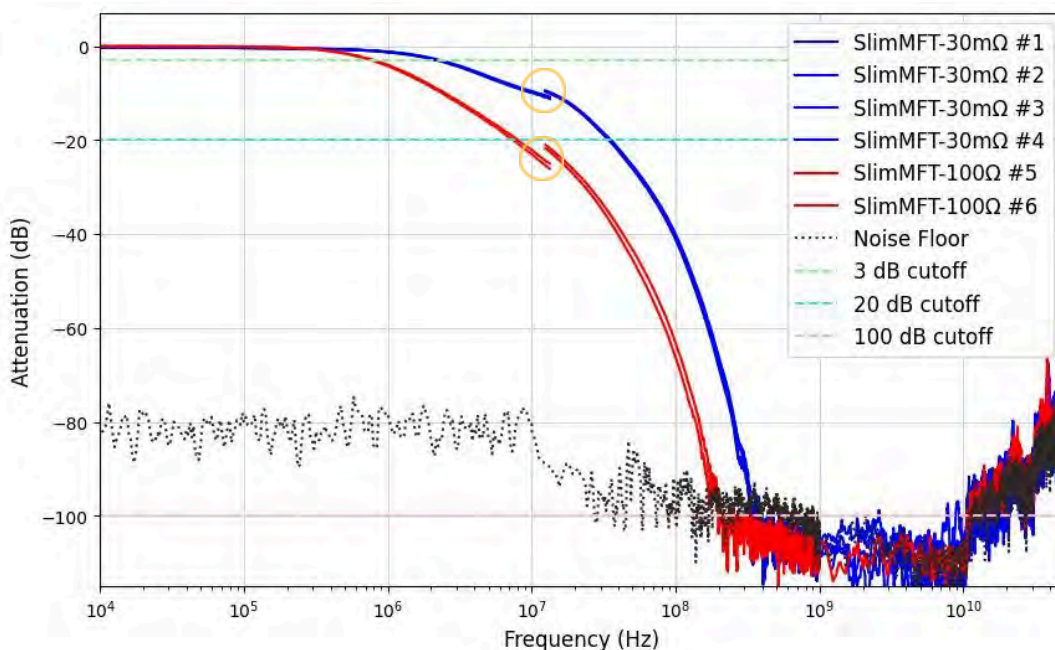


Figure shows typical room-temperature attenuation characteristics of individual MFT filters. A vector network analyzer with 50 Ω input was used. For 100 Ω filters (red curves), a spectrum analyzer with 1 MΩ input impedance was used below 20 MHz. Disclaimer: measurement results depend on the total setup and load impedance (real and imaginary). The jump observed (yellow circles) is caused by switching the input impedance from 1 MΩ to 50 Ω.

