

# PAM 102

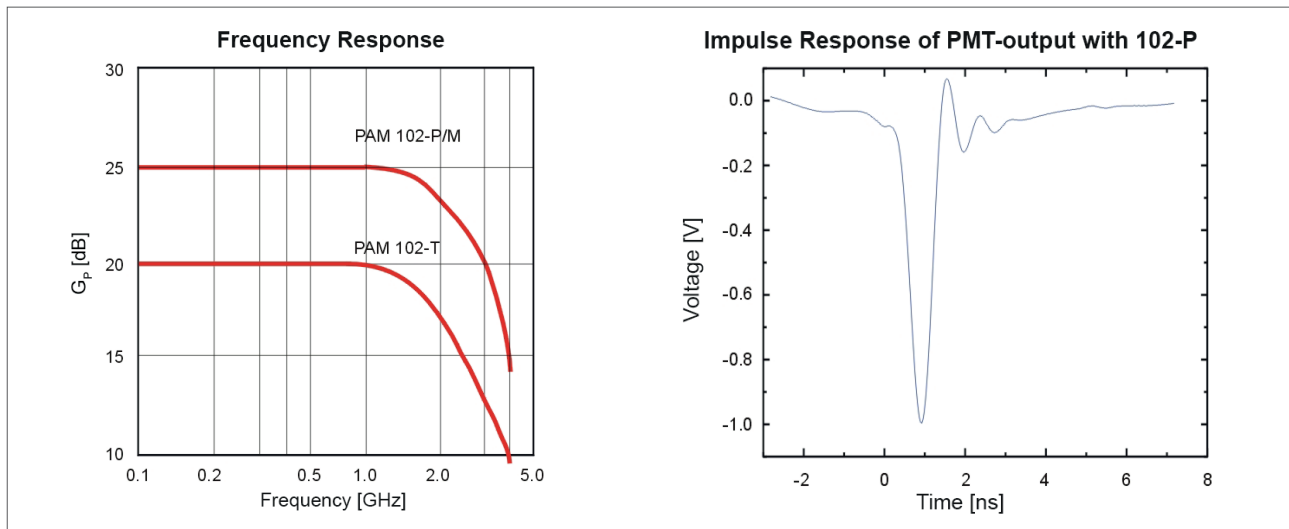
## Pre-amplifier Module

- Fast rise time / wide bandwidth
- Low jitter
- Ideal for low output fast photon detectors like MCP and PMT
- 3 dB bandwidth up to 1.8 GHz
- Gain up to 25 dB
- Gain flatness of  $\pm 1.0$  dB
- $P_{1\text{dB}}$  up to 10 dBm



## Applications

- Amplification of detector pulses from Photomultiplier, Microchannel Plate Photomultiplier or Photodiodes in timing sensitive set-ups such as TCSPC
- General purpose broadband signal amplification



The PAM 102 pre-amplifier is specially targeted at timing sensitive applications such as Time-Correlated Single Photon Counting (TCSPC) with fast photon detectors like Microchannel Plate PMTs (MCP) or standard PMTs. Such detectors produce very small output pulses with extremely short pulse widths, usually too small for direct interfacing with TCSPC electronics or other counters.

### Amplifier parameters matched to common detector types

The pulse rise times (or fall times) of fast photon detectors are typically 150 ps to 500 ps, and the pulse widths (FWHM) are correspondingly small. Therefore, an amplifier with an appropriately fast rise time is needed between the detector and the timing discriminator of the TCSPC system. The rise time of an amplifier is directly related to its bandwidth. A fast rise time corresponds to a wide bandwidth. On the other hand, the wider the bandwidth, a pre-amplifier contributes more electronic noise to the signal. All amplitude noise on the signal adds to the timing jitter, when the signal is processed by a timing discriminator of the TCSPC electronics. This is because the signal is not infinitely steep and any fluctuation in amplitude will be translated to a timing uncertainty inversely proportional to the steepness  $dV/dt$  of the timing edge of the signal. There are,

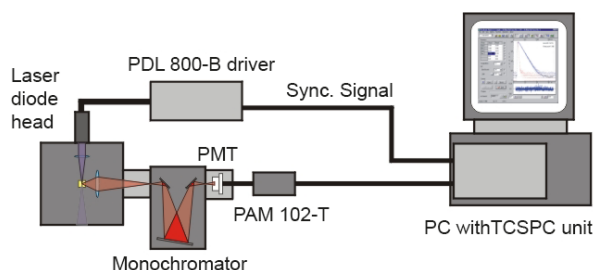
therefore, contradicting demands for the selection of the appropriate amplifier bandwidth. Best timing resolution is usually achieved when the amplifier rise time is comparable to the detector rise time. For common modern detectors this corresponds to an optimum amplifier bandwidth of 1 GHz to 2.5 GHz as used in the PAM 102.

### Different pre-amplifier for different detector types

The PAM 102 is available in three different versions: Non-inverting, 25 dB Gain version for PMTs (P-version) and MCP-PMTs (M-version). Those two version differ in the threshold level for the overload protection signal. Another option is the 18 dB inverting version for PMTs (T-version). All PAM 102 come with a wide range input (110-240V AC) power supply unit. Signal input and output are standard 50 Ohms SMA connectors. The housing is gold plated for maximum RF immunity.

## Typical Set-up

Typical measurement system for time-resolved fluorescence spectroscopy utilizing a PDL 800-B and a LDH Series laser diode head for excitation. The signal from the PMT is amplified by a PAM 102 and then processed directly by a TCSPC unit (TimeHarp 260, PicoHarp 300 or HydraHarp 400).



## Specifications

	PAM 102-T	PAM 102-P	PAM 102-M
<b>Applications</b>	PMT's	PMT's	MCP-PMT's
<b>Electrical Parameters</b>			
Puls polarity	inverting	non-inverting	non-inverting
Gain	18 dB	25 dB	25 dB
Bandwidth	1.1 GHz	1.8 GHz	1.8 GHz
1 dB compression	+ 9 dBm	+ 10 dBm	+ 10 dBm
Overload threshold	- 100 $\mu$ A	- 100 $\mu$ A	- 0.1 $\mu$ A
<b>Input Amplitude</b>	100 mV max.		
<b>Connectors, Input &amp; Output</b>	50 Ohm SMA female		
<b>Power Supply</b>			
Input	110/240 VAC 50/60 Hz		
Output	12 VDC plug-in power supply		
Power consumption	0.8 Watts max.		
<b>Dimensions</b>	62 mm (with flange) $\times$ 51 mm $\times$ 27 mm (w $\times$ d $\times$ h)		



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