

Data Sheet no. 6.32/2

Preamplifiers for PD Measurement

Preamplifiers serve to condition, filter and amplify the partial discharge signal to be measured. Because the frequency range in which PD signals are measured is strongly dependent on the preamplifier used, proper selection of a preamplifier is an important part of noise reduction and can have a strong effect on the appearance of the PD pattern itself.

A complete line of modular preamplifiers of various testing applications is available. The most significant difference among the preamplifiers is the frequency range in which they detect partial discharge signals. Other features are: options for on/off switching, unipolar vs. bipolar charge detection and the possibility of galvanic isolation in the test setup.

All preamplifiers are remote supplied and controlled through a simple coaxial signal cable (RG58). This technique allows placement of the preamplifiers close to the sensor or signal source. Furthermore, as these preamplifiers act as impedance converter and line driver, the weak signal source, such as impedance, is not loaded by the cable capacitance or impedance. This technique also provides enhanced over-voltage protection. All preamplifiers of the RPA series can drive a 50 Ω cable up to a length of 50 m.

Description of available types

The **RPA1** (Fig. 1) is the standard preamplifier for measurements in the low frequency range according to standards based on IEC 60270: 2000. The RPA1B, RPA1C and RPA1D are variations on the RPA1. RPA1B and RPA1C put the signal through when the supply is turned off. The **RPA1D** is suited to be connected directly to ultra-sonic acoustic sensors. To simplify the connection, the RPA1D provides the power supply for the sensor.

The **RPA1L** and **RPA1H** are primarily intended for measurements on medium and high-voltage power cables using the *ICM compact*.

The **RPA2** is primarily intended for measuring the PD signal spectra, which is typical for rotating machines, while the RPA2B is used with capacitive sensors to monitor cables and cable accessories at a higher sensitivity.

The **RPA3** module is well-suited for measuring PD signal spectra detected by sensors and antennas installed at gas insulated switchgear (GIS).

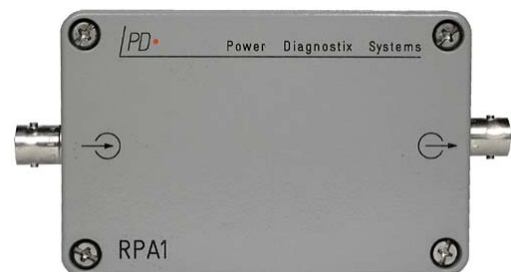


Fig 1: The RPA1 preamplifier
(size approx. 100 mm x 65 mm)

The **RPA4** is a preamplifier set with fibre optic transmission that offers outstanding insulation properties. The **RPA6** allows selecting one of three frequency ranges according to the particular application. The logarithmic RPA6 is mainly used for monitoring applications, and as a versatile preamplifier for noise gating. The RPA6C is an ultra-wide band version of the RPA6 covering 300 MHz to 2 GHz. This preamplifier is mainly used for GIS monitoring. The **UHF1** offers an amplification of 27 dB in the range from 200 MHz to 1 GHz and is suitable for boosting weak signals from GIS sensors. A further preamplifier is needed.

The following table summarizes the specifications and applications of preamplifiers. It is recommended to use it for selection of the optimum type.

Type	Frequency Range	Input Impedance	Input Sensitivity	Roll-Off	Bipolar	Remarks
RPA1	40 kHz - 800 kHz	10 k Ω //50 pF	< 200 μ V	40dB/dec	✓	Standard Preamplifier
RPA1D	40 kHz - 800 kHz	10 k Ω //50 pF	< 200 μ V	40dB/dec	✓	Built-in Sensor Supply
RPA1E	40 kHz - 800 kHz	10 k Ω //50 pF	< 200 μ V	40dB/dec	✓	0 / 20 dB Attenuation
RPA1F	40 kHz - 800 kHz	10 k Ω //50 pF	< 200 μ V	40dB/dec	✓	For the AICompact only
RPA1G	40 kHz - 800 kHz	10 k Ω //50 pF	< 200 μ V	40dB/dec	✓	Like RPA1D but switchable
RPA1H	40 kHz - 20 MHz	1 k Ω //50 pF	< 400 μ V	40dB/dec	✓	Oil/Paper Cable, DSO*
RPA1L	40 kHz - 20 MHz	1 k Ω //50 pF	< 200 μ V	40dB/dec	✓	Cable, DSO*
RPA2	2 MHz - 20 MHz	50 Ω //50 pF	< 800 μ V	40dB/dec		Rotating Machines
RPA2B	2 MHz - 20 MHz	50 Ω //50 pF	< 200 μ V	40dB/dec		Cable Sensors
RPA3	200 MHz - 1 GHz	50 Ω //50 pF	< 300 μ V	40dB/dec		GIS Sensors
RPA3D	50 MHz - 400 MHz	50 Ω //50 pF	< 300 μ V	40dB/dec		Nearfield Detection
RPA3E	20 MHz - 1 GHz	50 Ω //50 pF	< 300 μ V	40dB/dec		Nearfield Detection
RPA4	40 kHz - 800 kHz	10 k Ω //50 pF	< 200 μ V	40dB/dec	✓	Fibre Optic Insulation
RPA6	40 kHz - 800 kHz 2 MHz - 20 MHz 200 Hz - 500 MHz	10 k Ω //50 pF 50 Ω //50 pF 50 Ω //50 pF	< 200 μ V	40dB/dec		For Gating, Selectable Frequency Range, Logarithmic Output
RPA6C	300 MHz - 2 GHz	50 Ω //50 pF	< 200 μ V	40dB/dec		Logarithmic Output
UHF1	200 MHz - 1 GHz	50 Ω //50 pF	--	--		GIS, Sensors
UHF2	200 MHz - 2 GHz	50 Ω //50 pF	--	--		GIS, Sensors
HST1B	20 Hz - 400 Hz	10 M Ω //200 pF	--	--		ICMsystem, SYNC IN

* DSO means digital storage oscilloscope applied for PD fault location.

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