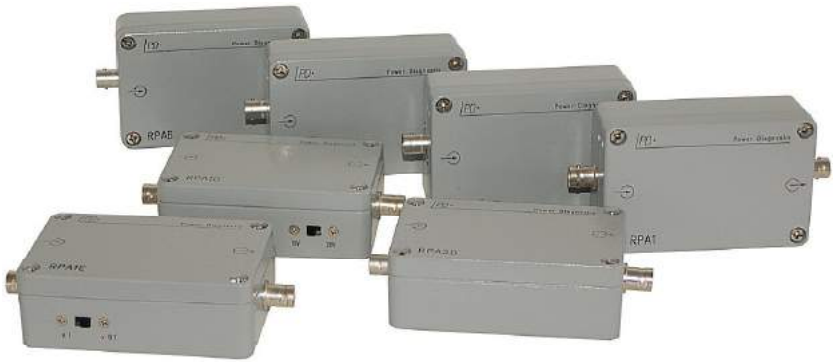
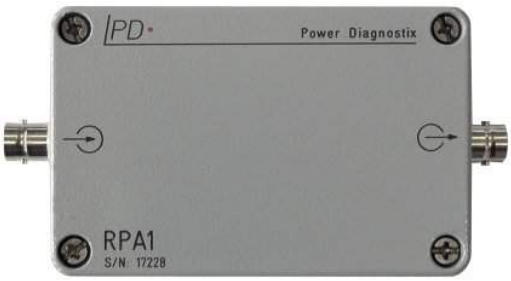
ICM*series* Accessories: Preamplifiers



Some preamplifiers of the RPA series

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 mitigation and can have a strong effect on the appearance of the partial discharge pattern itself.

Power Diagnostix provides a complete line of modular preamplifiers for various testing applications. The most significant difference among the preamplifiers is the frequency range in which they detect partial discharge signals. Other features that distinguish one preamplifier from another are: options for transparency and on/off switching, unipolar vs. bipolar charge detection, and the possibiltiy of galvanic isolation in the test setup.



The RPA1 preamplifier

All of the Power Diagnostix external signal conditioning modules and preamplifiers are remote supplied and remote controlled through a simple coaxial signal cable (RG58). This technique allows placement of these units close to the sensor or signal source. Furthermore, as these modules act as impedance converter and line driver, the weak signal source, such as voltage divider or coupling 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 W cable up to 50 m long.

The **RPA1** is the standard preamplifier for measurements in the low frequency range according to standards such as the IEC60270. The **RPA1D**, **RPA1E**, **RPA1F**, and **RPA1G** are variations on the RPA1.

The **RPA1D** and **RPA1G** are suited to connect directly to ultra-sonic acoustic sensors. To simplify connection, they provide selectable power supply for the sensor (15 V or 28 V DC).

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

The **RPA2** is primarily for measuring the PD signal spectra found with 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 with gas insulated switchgear (GIS).

The **RPA4** is a preamplifier set with fiber optic transmission, offering outstanding isolation properties.

The **RPA6** allows selecting one of three frequency ranges according to the particular application. The logarithmic RPA6 is mainly used with monitoring applications, and as a versatile preamplifier for noise gating.

The **FCU2** is an ultra-wide band frequency converter, covering 300 MHz to 2 GHz. It is mainly used for GIS monitoring e. g. with the AIA*compact*.

The **UHF1** and **UHF2** offer an amplification of 27 dB in the range from 200 MHz to 1 GHz resp. 300 MHz to 2 GHz, and are suitable for boosting weak signals from GIS sensors.

The **HST1B** is an impedance converter for the measurement of voltages. The input impedance is as high as 10 MW and ideal to measure the low-voltage wave from e.g. a voltage divider. The output is to be connected to the SYNC IN of the ICM*system*.

Reference table for commonly used Power Diagnostix preamplifiers

Type	Frequency Range	Input Impedance	Sensitivity Input	Roll-Off	Bipolar	Remarks
RPA1	40 kHz–800 kHz	10 kΩ//50 pF	<200µV	40dB/dec	✓	Standard preamplifier
RPA1D	40 kHz –800 kHz	10 kΩ//50 pF	<200µV	40dB/dec	✓	With built-in sensor supply
RPA1E	40 kHz –800 kHz	10 kΩ//50 pF	<200µV	40dB/dec	✓	0/20 dB attenuation
RPA1F	40 kHz –800 kHz	10 kΩ//50 pF	<200µV	40dB/dec	✓	For the AIAcompact only
RPA1G	40 kHz –800 kHz	10 kΩ//50 pF	<200µV	40dB/dec	✓	Like RPA1D but switchable
RPA1H	40 kHz–20 MHz	1 kΩ//50 pF	<400µV	40dB/dec	✓	Oil/paper cable, DSO
RPA1L	40 kHz–20 MHz	1 kΩ//50 pF	<200µV	40dB/dec	✓	Cable, DSO
RPA2	2 MHz–20 MHz	50 Ω//50 pF	<800µV	40dB/dec		Rotating machines
RPA2B	2 MHz–20 MHz	50 Ω//50 pF	<200µV	40dB/dec		Cable sensors
RPA3	200 MHz–1 GHz	50 Ω//50 pF	<300µV	40dB/dec		GIS sensors
RPA3D	50 MHz–400MHz	50 Ω//50 pF	<300µV	40dB/dec		Nearfield detection
RPA3E	20 MHz–200MHz	50 Ω//50 pF	<300µV	40dB/dec		Nearfield detection
RPA4	40 kHz–800kHz	10 kΩ//50 pF	<200µV	40dB/dec	✓	Fiber optic isolation
RPA6	40 kHz–800 kHz	10 kΩ//50 pF				For gating, selectable frequency range, logarithmic output
	2 MHz–20 MHz	50 Ω//50 pF	<200µV	40dB/dec		
	200 MHz–500 MHz	50 Ω//50 pF				
FCU2	300 MHz–2 GHz	50 Ω//50 pF	<200µV	40dB/dec		Logarithmic output
UHF1	200 MHz–1 GHz	50 Ω//50 pF	--	--		GIS, sensors
UHF2	300 MHz–2 GHz	50 Ω//50 pF	--	--		GIS, sensors
HST1B	20 Hz–400 Hz	10M Ω//200 pF	--	--	✓	ICMsystem, SYNC IN

The versatility of the Power Diagnostix line of PD detection equipment is due in large part to the range of accessories available for the ICM*series* instruments. Each ICM*series* data acquisition unit can be combined with different accessories to suit specific applications.