MPD 500

Partial discharge measuring system for routine test applications

Partial discharge measurement

The MPD 500 partial discharge measuring system has been specially designed for providing fast and reliable results in a high-throughput environment. The MPD 500 benefits from the experience of hundreds of MPD 600 units in daily use. Hence, the MPD 500 becomes the ideal solution for state-of-the-art routine testing, clear „pass / fail" decisions and most easy reporting.

Reliable evaluation of insulating systems

Partial discharges (PD) are defined as localized electrical discharge that only partially bridge the insulation between conductors, often preceding an insulation breakdown. Therefore, PD measurements are well established and widely accepted for quality assurance and factory testing of medium- and high-voltage assets in a variety of power and industrial segments.

Modern PD measurement systems based on apparent charge [pC], in accordance with IEC 60270, reveals faulty spots in electrical insulations with a high degree of sensitivity.

Radio Influence Voltage (RIV) measurements express partial discharge activities as a voltage that appears on conductors of electric equipment. The RIV value is displayed in µV according to CISPR 16-1-1 and the still referenced NEMA 107-1987.

The most convenient way to measure PD

The MPD 500 benefits from the experience of hundreds of MPD 600 units in daily use by major cable-, transformer-, and rotating machine manufacturers worldwide.

By incorporating a wide range of leading-edge technologies, highly sensitive and accurate results can be obtained by the MPD 500 as easily as operating a voltmeter. The user-friendly software provides full remote control of the measurement devices and delivers very easy automated reporting of PD / RIV measurements. The MPD 500 also holds simultaneous multi-channel abilities, without the need for a multiplexer.

300 kV high-voltage laboratory
PFIFFNER Instrument Transformers Ltd. / Switzerland

Results at one glance

Advantages of the intuitive MPD 500 software:

- Concise visualization of single as well as multi-channel measurements
- User-friendly “pass / fail” functionality
- Detailed diagrams for in-depth analysis

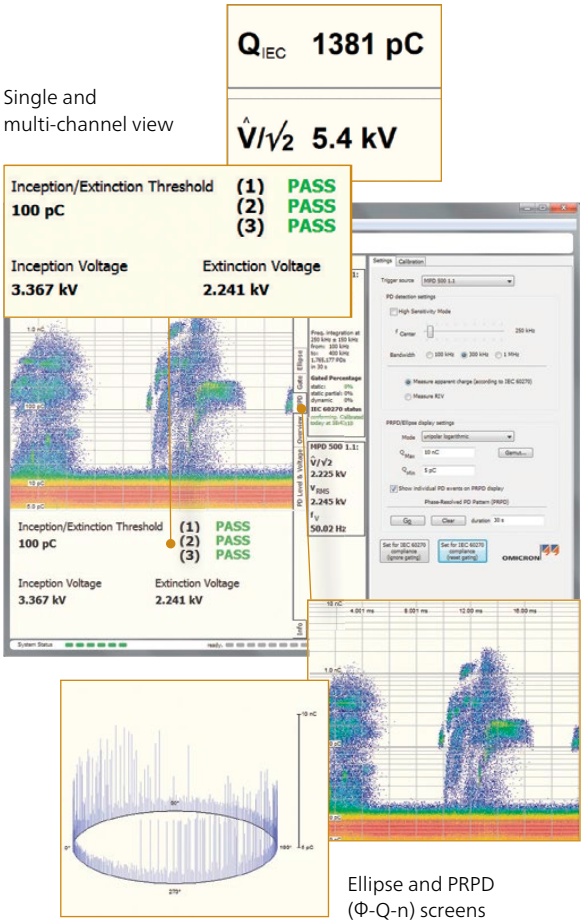
For factory routine testing the conclusive “pass / fail” function is ideal for fast decisions. Adjusting the thresholds is most easy, as are the inception and extinction voltage.

Using the MPD’s multi-channel ability allows to display multiple actual PD measurement values simultaneously on one screen, contrasting old-fashioned multiplexer solutions. This makes the MPD 500 ideal for PD measurements in high-throughput environments.

For advanced analysis classic ellipse and state-of-the-art PRPD (φ-Q-n) visualizations show partial discharge activities in real time.

The center frequency and bandwidth are set automatically for convenient and reliable measuring according to IEC standard 60270.

Single and multi-channel view

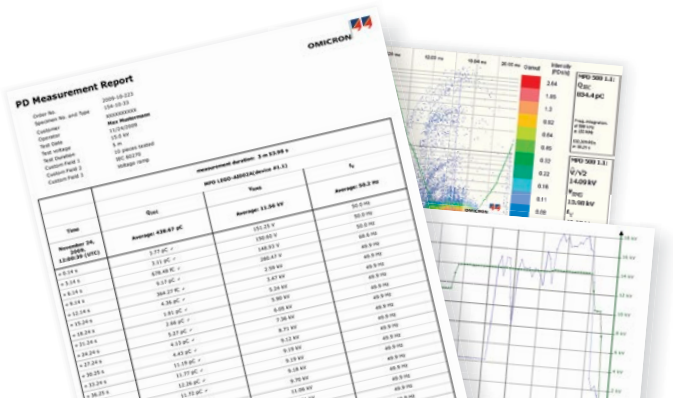


Ellipse and PRPD (Φ-Q-n) screens

Automate your reports

The optional comprehensive electronic reporting function automatically provides a concise test protocol within seconds. These reports contain information about the tested object, the measurement, and all data in definable intervals, as well as diagrams showing Q(t), U(t), and Q(U).

Individual screenshots can be inserted during measurement at any time by simply hitting a hotkey.



MPD 500

- Economical – PD and RIV are combined within one instrument
- Time effective, easy operation
- Fast, automatic measuring according to IEC standard 60270
- Decision support with clear “pass / fail” indication
- Efficient multi-channel testing with several results displayed simultaneously
- Save time – Fast and easy automated reporting

www.omicron.at/mpd500

Excellent noise suppression

There are many sources of interference, which can complicate the measurement of partial discharges. The MPD 500 provides effective features for reducing or eliminating the effect of these disturbances, making the measurements more reliable and accurate.

Advantages of fiber-optic communication

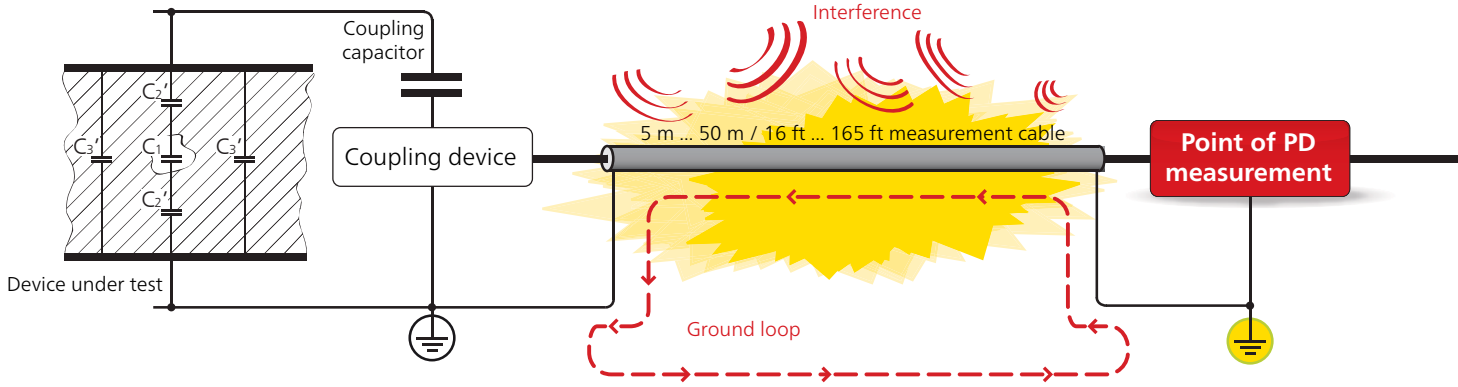
Both MPD 500 and MPD 600 utilize the “point of PD measurement”, processing and digitizing in close proximity to the coupling device as shown below. The digitized signal is transferred to the operator’s control room using optical communication.

This principle minimizes the effective ground loop and the influence of external interferences resulting in a significantly reduced background noise level.

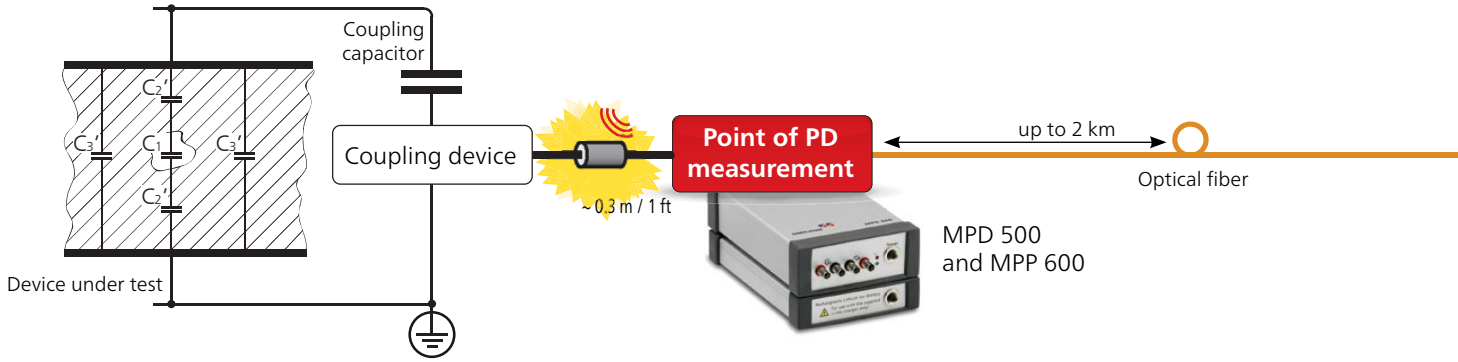
Electromagnetic disturbances of nearby HV equipment have no influence on optical fibers, therefore cable routing is fast and easy, without special precautions. Safety comes first – the fully galvanic isolation between “point of PD measurement” and control room sets new standards of operational safety even during a breakdown of the test object.

Very long fiber-optic connections may be used without degrading the instrument’s performance. The distance between PD detection and operator could get up to 2 km / 1.2 miles.

Conventional PD detection



Innovative PD detection with the MPD 500



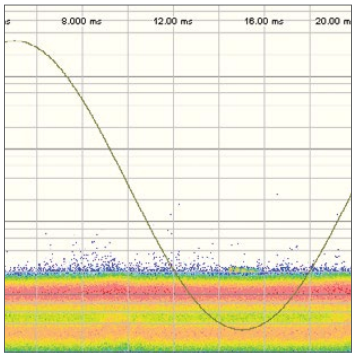
Active noise suppression

The center frequency can comfortably be adjusted via slider from 0 MHz to 2.5 MHz. Together with three selectable bandwidths, the MPD 500 can be tuned away from noise to a more "quiet" frequency range, focusing optimally on the test object's PD signals.

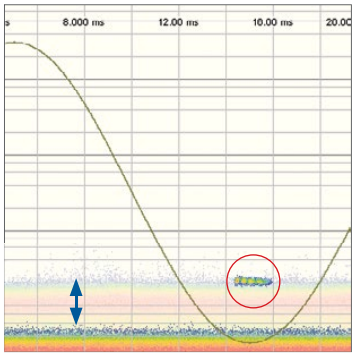
Simply use the mouse to enable an unlimited number of phase amplitude gates for effective suppression of phase-fixed disturbances.

Battery-powered portability

In addition to the advanced "point of measurement" principle, even further circuit sensitivity can be realized by eliminating noise from the mains that power the MPD 500. Every unit is supplied with a battery attachment, that has the capability of powering the system for up to 20 hours of continuous operation.



PD signals obscured in the noise band



PD signal with reduced noise level

Routine factory testing

Routine PD measurements become easy with the integrated "pass / fail" functionality. Set the MPD 500 to the desired PD threshold level for the device under test. When this level is exceeded, it is clearly displayed in the main window.

For further investigations the MPD 500 provides advanced visualization and diagnosis tools such as ellipse and PRPD (φ-Q-n), typically only found in high-end PD measurement systems.

Wide range of applications

Upgrade your testing facility to the latest technical benchmark in partial discharge measurements. The MPD 500 is ideal for examining PD faults in electrical insulations of transformers, bushings, generators, motors, and other types of electrical equipment in screened factory routine-testing environments, testing laboratories and industrial areas.

Adaptable to 19" format, the MPD 500 fills in for outdated built-in instruments. This drop-in boosts control rooms to state-of-the-art PD measuring abilities, with all benefits of a contemporary PD system. Each replacement gets optimized to the individual demands. Contact your OMICRON sales representative for further details.

Let the equipment grow with your needs

If necessary the MPD 500 can be upgraded to OMICRON's well-established high-end MPD 600 PD measurement and analysis system at any time, even after several years in operation. This makes the MPD 500 the only risk-free choice for PD measurements, even if your demands grow.

Measurement setup and ordering information

MPD packages

	Order no.
MPD 500 PD package	VE004500
1 x MPD 500 acquisition unit 1 x MCU 502 controller 1 x CPL 542 impedance 1 x MPP 600 power supply package 1 x fiber optical cable + Software for PD measurements	
MPD 500 RIV package	VE004501
1 x MPD 500 acquisition unit 1 x MCU 502 controller 1 x CPL 542 impedance 1 x MPP 600 power supply package 1 x fiber optical cable + Software for RIV measurements	
Additional MPD 500 measuring channel	VE004502
1 x MPD 500 acquisition unit 1 x MPP 600 power supply package 1 x fiber optical cable	
A maximum of two additional measuring channels can be combined with the MPD 500 (non-synchrounous).	
System upgrade	VE004503
Upgrade MPD 500 to MPD 600, the most advanced PD measurement system	

Software and setup components

	Order no.
1 Software packages & upgrades	
Software for PD or RIV measurement (depending on MPD 500 package)	included
MPD 500 PD software upgrade	VESM4500
MPD 500 RIV software upgrade	VESM4501
MPD 500 XML report functionality	VESM4502
MPD 500 COM interface	VESM4503
2 Fiber optical bus controller	
MCU 502: Bus controller for MPD 500/600	VE004300
3 Duplex fiber optical cables	
Duplex fiber optical cable, 20 m / 65 ft	VEHK4001
Duplex fiber optical cable, 50 m / 165 ft (on cable drum)	VEHK4002
4 Lithium-ion battery	
MPP 600 power supply package (consisting of battery, fastener, and charger with power cord)	VEHZ4105
MPP 600 lithium-ion battery	VEHZ4106
5 Protection cases	
MPC 600 protection case	VEHP0041
6 Transportation cases	
For up to three MCT 120	VEHP0047
MBT 600 (for a complete 4-channel MPD system)	VEHP0045

MPD 500 system
Application and setup

Accessories — Order no.

1 Charge calibrators/injectors

CAL 542:	Version A (0.1 pC ... 10 pC)	VE004200
CAL 542:	Version B (1 pC ... 100 pC)	VE004210
CAL 542:	Version C (10 pC ... 1 000 pC)	VE004220
CAL 542:	Version D (0.1 nC ... 10 nC)	VE004230

2 RIV calibrators

RIV1-NEMA:	Output impedance = <2 Ω	VE004250
RIV1-CISPR:	Output impedance = 20 kΩ	VE004251

3 Measuring impedances

CPL 542	0.5 A type	VEHZ4100
CPL 542	2 A type	VEHZ4101
CPL 543	5 A type	VEHZ4103

Accessories — Order no.

4 Coupling capacitors[1]

MCC 112:	12 kV, 1.2 nF	VEHZ4118
MCC 124:	24 kV, 1.2 nF	VEHZ4138
MCC 205:	50 kV, 1.0 nF (on mobile base)[2]	VEHZ4116
MCC 205L:	50 kV, 1.0 nF (on mobile base)	VEHZ4119
MCC 210:	100 kV, 1.0 nF (on mobile base)[2]	VEHZ4117
MCC 210L:	100 kV, 1.0 nF (on mobile base)	VEHZ4126

5 Bushing adapters[1] (incl. transport case)

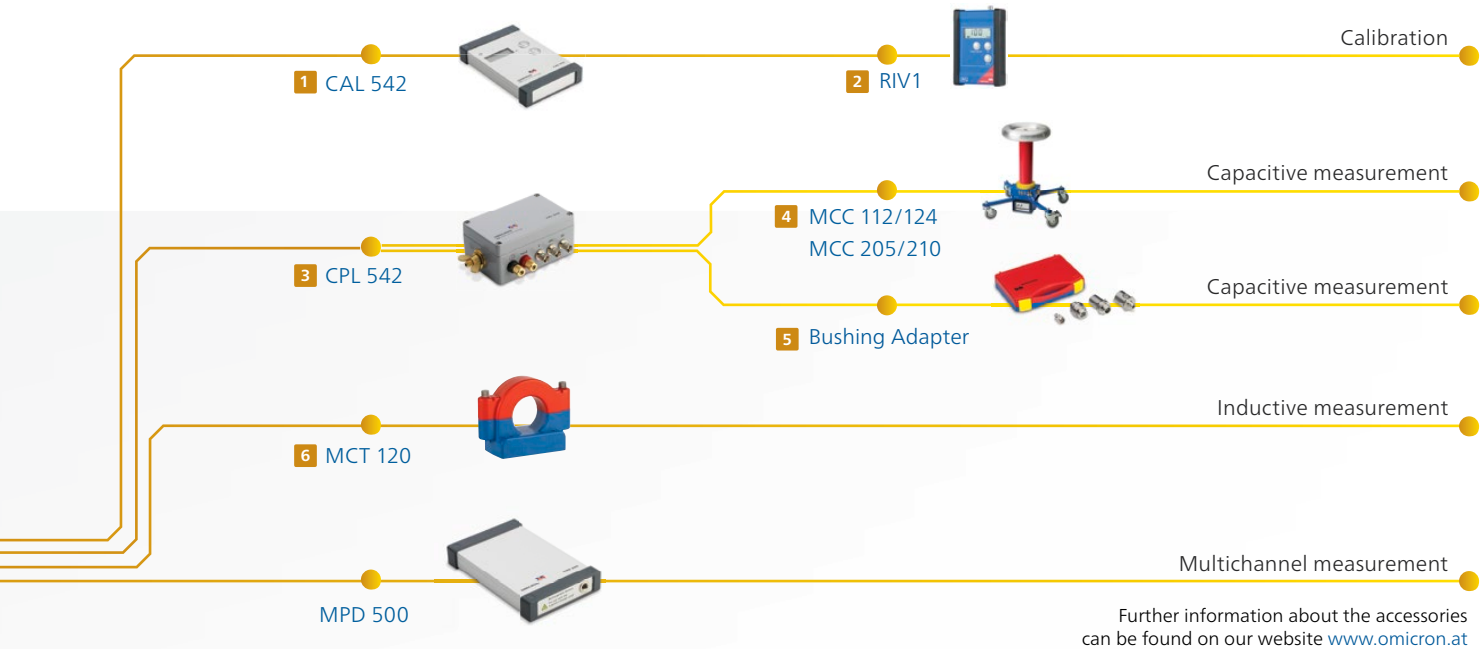
Basic adapter:	G3/4" inside ... 5/8"	VEHZ4121
F&G/HSP adapter:	M24 ... G3/4"	VEHZ4122
HSP adapter:	M30x1.5 ... G3/4"	VEHZ4123

6 High frequency current transformer

MCT 120 high frequency current transformer	VEHZ4148

[1] Customized articles available on request
[2] Including CPL measuring impedance with 4 µf low-arm capacity

Application areas with accessories



Further information about the accessories can be found on our website www.omicron.at

Technical data

MPD 500

Input

Center frequency range	0 Hz ... 2.5 MHz
Input frequency bandwidth	100 kHz, 300 kHz, 1 MHz (RIV package: 9 kHz)
Input frequency range	V input: 0 Hz ... 2.1 kHz PD input: 0 Hz ... 2.5 MHz
Input impedance	V input: 1 MΩ, in parallel 1 µF PD input: 50 Ω
Input voltage (max)	V input: 60 V_{rms} PD input: 10 V_{rms}
Dynamic range	V input: 102 dB, PD input: 132 dB (overall)

PC requirements

Hardware (minimum)	Pentium® 4 or later, Athlon® 64 or later / 1 GB RAM / USB 2.0
PC operating system	Windows 2000 Pro™ to Windows 7™ Windows XP, Windows Vista, Windows 8, Windows 8.1

Accuracy

PD event time resolution	< 2 ns
Input channels	PD level: ± 2 % of calibrated PD value Voltage: ± 0.05 % of calibrated voltage Frequency: ± 1 ppm (typical)

Dimensions and ambient condition

Humidity	5 % ... 95 %, non condensing
Ambient temperature	Operating: 0 °C ... 55 °C (32 °F ... 89 °F) Storage: -10 °C ... 70 °C (14 °F ... 158 °F)
Dimension (W × D × H)	110 × 44 × 190 mm (4.3 × 7.5 × 1.7 in.)
Weight	600 g (1.3 lbs.)
Power supply	8 ... 12 V DC via ext. power supply or MPP 600 Li-Poly battery

MCU Fiber Optic Bus Controller

Technical Data	MCU 502
Dimensions (W x H x D)	110 x 30 x 180 mm (4.3 x 1.2 x 7.1 in.)
Weight	590 g (1.3 lbs.)
Connectors	
USB 2.0 type B (with USB cable, 2 m)	1 x
Fiber optical network (600 series)	2 x

MPP 600 – Lithium-Ion Power Pack with Battery Charger

Technical Data	
Dimensions (W x H x D)	110 x 30 x 170 mm (4.3 x 1.2 x 6.7 in.)
Weight	810 g (1.8 lbs.)
Power Rating	11.1 V nominal, 8 Ah

Accessories

1 CAL – Charge calibrator/injector

The CAL 542 charge calibrator is used to inject a defined charge into and verify the measurement circuit.

Technical Data	CAL 542
Pulse repetition frequency	300 Hz
Pulse rise time	< 4 ns
Dimensions (W x H x D)	110 x 30 x 185 mm (4.3 x 1.2 x 7.3 in.)
Weight (incl.battery)	520 g (1.2 lbs)
Output connector	1 × BNC (with BNC adapter, cables and connection clamps)
Power supply	Lithium Battery 9 V, Lifetime > 10 years

2 RIV1 – RIV Test calibrator

The RIV1 calibrator enables the reliable calibration of the MPD system for PD measurement based on Radio Influence Voltage (RIV) according to NEMA and CISPR standards.

Technical Data	RIV1-NEMA	RIV1-CISPR
Frequency range	100 kHz ... 2 MHz (50 kHz steps)	100 kHz ... 2 MHz (50 kHz steps)
Magnitude	10 µV ... 10 mV	10 µV ... 10 mV @300 Ohm
Magnitude Accuracy	<2%	<2%
Output Impedance	<2 Ohm	20 kOhm
Standards met	NEMA 107 - 1987, IEEE C57.12.90-2008	IEC 60437, CISPR 18-2 (2)
Accessory (Quadripole)	CPL 542 NEMA 0.5A, CPL 542 NEMA 1.2A	CPL 542 CISPR 0.5A, CPL 542 CISPR 2A
Connectors	1 x BNC	
Dimensions (W × H × D)	120 x 40 x 183 mm (4.72 x 1.57 x 7.20 in.)	
Weight	680 g (1.5 lbs.)	
Material	Extruded aluminum	
Operating temperature	0 °C ... 50 °C (-4 °F ... 122 °F)	
Storage temperature	-20 °C ... 70 °C (14°F ... 158 °F)	
Humidity	10 ... 95 %, non-condensing	

3 CPL – Measuring impedance

The CPL quadripoles are an external measuring impedance for PD measurements. Both include an integrated 90 V_{Peak} overvoltage protection device.

Technical Data	CPL 542	CPL 543
Max. currents	0.5 A or 2 A	5 A
Frequency range (PD output)	20 kHz ... 5 MHz	29 kHz ... 5 MHz
Low-arm capacitance	30 µF (for 0.5 A version) 120 µF (for 2 A version)	272 µF
Input connectors	2 × 4 mm terminals[5] 1 × GND	2 × 4 mm terminals[5] 1 × GND
Output connectors	2 × BNC (PD & V), 1 × BNC (TTL signal)	2 × BNC (PD & V)
Dimensions (W x H x D)	150 × 60 × 100 mm (5.9 × 2.4 × 4.0 in.)	150 × 60 × 100 mm (5.9 × 2.4 × 4.0 in.)
Weight	700 g (1.5 lbs.)	700 g (1.5 lbs.)

[5] For connecting coupling capacitor

4 MCC – Coupling capacitor

The coupling capacitor connects the MPD 500/600 to the high-voltage test object. Different MCC coupling capacitors are available for various voltage levels. The MCC 112 and MCC 124 are designed for direct connection to the MPD 500/600. The MCC 205 and MCC 210 are designed with a built-in quadripole measuring impedance with 4 µf low-arm capacity. Without the quadripole, they are available as MCC 205-L and MCC 210-L.

Technical Data	MCC 112	MCC 124	MCC 205 / MCC 205-L	MCC 210 / MCC 210-L
U_{max} (rms /phase-to-ground)	12 kV	24 kV	50 kV	100 kV
$C_{Nominal}$	1.2 nF (± 20%)	1.2 nF (± 20%)	1.0 nF (± 10%)	1.0 nF (± 10%)
Withstand Voltage (1 min)	28 kV	50 kV	60 kV	120 kV
Q_{PD}	< 2 pC @ 13.2 kV	< 2 pC @ 26.4 kV	< 1 pC @ 50 kV	< 1 pC @ 100 kV
Weight	4.5 kg (9.9 lbs.)	6 kg (13.2 lbs.)	7.6 kg (16.8 lbs.)	10 kg (22.1 lbs.)
Dimensions (W × H × D)	182 × 158 × 182 mm (7.2 × 6.2 × 7.2 in.)	182 × 238 × 182 mm (7.2 × 9.4 × 7.2 in.)	450 × 582 × 450 mm (17.5 × 23 × 17.5 in.)	450 × 736 × 450 mm (17.5 × 29 × 17.5 in.)
Scope of delivery	> Adapter (TNC to BNC) > BNC connection cable	> Adapter (TNC to BNC) > BNC connection cable	> BNC connection cables	> BNC connection cables

5 Bushing adapters

A selection of combinable adapters for secure connections to bushings, delivered in a handy case.

Technical Data	Basic Adapter	M24-F&G	M30-HSP
Bushing manufacturer	Micafil / ABB	F&G, HSP	HSP (new types)
Measurement tap side (thread / connector)	G 3/4" inside female 4 mm / 0,2 in	M 24 inside male 4 mm / 0,2 in	M 30 x 1.5 female 4 mm / 0,2 in
Diagnosis system side	N-Type female (incl. BNC adapter)	Connects to basic adapter	Connects to basic adapter
Surge arrester	included	–	–

6 MCT 120 – High frequency CT

The MCT 120 is a high-frequency current transformer (HFCT), which picks up partial discharge signals in moderate heights and at a safe distance from high-voltage.

Technical Data	
Frequency Range (-6 dB)	100 kHz ... 25 MHz (0 mm gap)
Inner hole dimensions	ø ~53.5 mm (2.11 in.)
Outer dimensions	114 x 154 x 62 mm (4.49 x 6.07 x 2.45 in.)
Ferrite core	Split
Connector	BNC, 50 Ohm, female
Weight	1.2 kg (2.65 lbs.)
Operating temperature	-20 °C ... 55 °C (-4 °F ... 130 °F)

MPD 500/600 system comparison

		MPD 500 PD or RIV Package	**MPD 600** Basic SW Package
Visualization	Display of ellipse and phase-resolved pattern (PRPD)	■	■
	3-phase viewing of phase-resolved pattern with Q_{IEC}	–	■
	Voltage curve visualization	■	■
	FFT display	–	■
	Oscilloscope function	–	■
	3D histogram visualization	–	■
Measurement	Simultaneous multi-channel measurements	■ (max. 3 channels)	■
	Synchronous multi-channel measurements	–	■
	Software support for RIV measurements	– / ■	■
	Inception and extinction voltage	■	■
Gating and noise surpression	Unit gating (Antenna gating)	–	□
	Amplitude-phase window gating	■	■
	3FREQ (Advanced package mandatory)	–	□
	3PARD (Advanced package)	–	□
Mode	Cable Mode	–	□
	Advanced package (for Expert Mode)	–	□
Reporting and exporting	Generating XML reports (VESM4502)	□	■
	Automation via Microsoft COM interface (Module "Report" – VESM4103)	–	□

■ included □ optional – not included

MPD 500
Partial discharge measuring system for routine and acceptance tests

MPD 500

MPD 600

	MPD 500 PD or RIV Package	**MPD 600** Basic SW Package
Center frequency range	0 Hz ... 2.5 MHz	0 Hz ... 32 MHz
Input frequency bandwidths	100 kHz, 300 kHz, 1 MHz, (RIV package: 9 kHZ)	9 kHz, 30 kHz, 40 kHz, 100 kHz, 160 kHz, 300 kHz, 650 kHz, 1 MHz, 1.5 MHz, 3 MHz
Record/replay functionality	–	included
System noise	< 0.015 pC	< 0.015 pC
Spectrum analyzer view	–	Real-time spectrum analyzer view for PD input, including spectral probability visualization
Overview panel for PD patterns	–	Showing PD patterns of several channels at once
Support for UHF 620 bandwidth converter	–	optional
Additional expert tools	–	Q(U), H(Q), trending, DC measurement
User modes	1 user mode	3 user modes
Statistics function (Advanced Package)	–	included
Trigger for PDL 650	–	included
3D view	–	included
Scope view	–	included

MPD 500

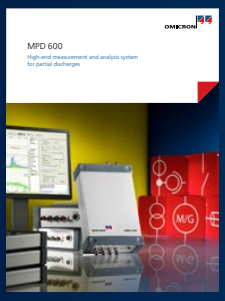
MPD 600

MPD 600
High-end measuring and analysis system for partial discharges

OMICRON is an international company serving the electrical power industry with innovative testing and diagnostic solutions. The application of OMICRON products allows users to assess the condition of the primary and secondary equipment on their systems with complete confidence. Services offered in the area of consulting, commissioning, testing, diagnosis and training make the product range complete.

Customers in more than 140 countries rely on the company's ability to supply leading-edge technology of excellent quality. Service centers on all continents provide a broad base of knowledge and extraordinary customer support. All of this together with our strong network of sales partners is what has made our company a market leader in the electrical power industry.

The following publications provide further information on the solutions described in this brochure:



MPD 600 Brochure

For more information, additional literature, and detailed contact information of our worldwide offices please visit our website.

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