

# MPD 800

Universal partial discharge measurement and analysis system



# The next level in partial discharge testing: MPD 800

## 20 years of reliability and experience

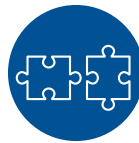
The MPD 800 is the successor to our MPD 500 and MPD 600 partial discharge (PD) measurement and analysis systems. After 20 years of experience in this sector, it was time to bring PD testing to a new level.

Established features were redesigned, resulting in the most powerful, accurate and robust test system on the market. MPD 800 is ideal for factory and on-site testing, even in the most demanding environments. Due to its excellent filtering features, even the smallest PD pulses can be separated from interference and analyzed.



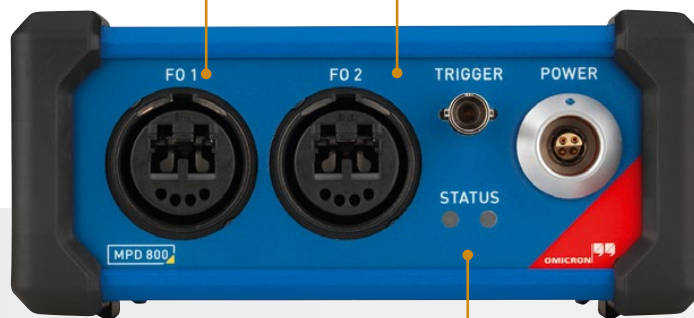
### FAST AND EASY

The two robust fiber-optic input channels are easy to connect. The improved MPD Suite software can be further simplified by defining individual user profiles. Both features help you to save time.



### SYNCHRONOUS, SCALABLE SYSTEM

The MPD 800 system can be easily expanded by connecting multiple devices. It allows you to perform synchronous PD measurements with up to 20 measurement units.



### STANDARDS-COMPLIANT TESTING

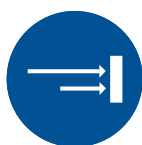
MPD 800 provides standard-compliant PD measurements according to IEEE and IEC standards. With just the click of a button, all parameters can be automatically set or reports generated.

## One device for all assets and testing applications

You can use the MPD 800 for a wide range of testing applications, beginning with the traditional power supply sector, at manufacturers or repair shops, in laboratories or, for example, during diagnostic testing of motors in the industry sector.

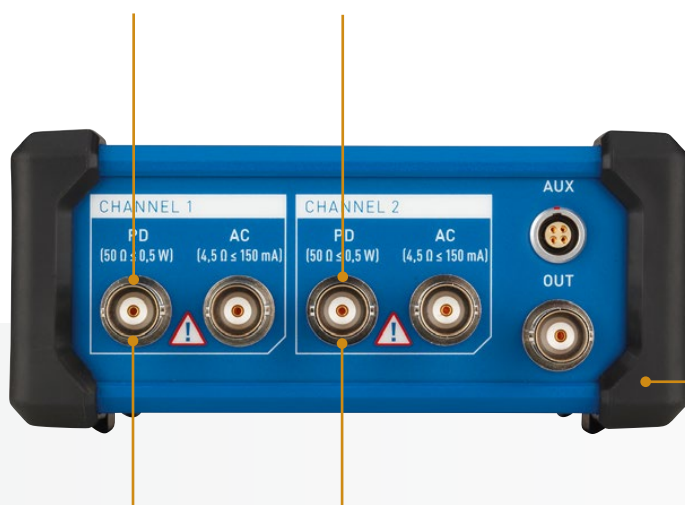
It supports you during standards-compliant PD testing for routine and type testing, factory and site acceptance testing, as well as for troubleshooting to localize or investigate PD sources in:

- > Power transformers
- > Power cables
- > Rotating machines
- > Gas-insulated switchgear (GIS) and medium-voltage switchgear
- > Industrial drives
- > Railway transportation
- > High-voltage components such as bushings, insulators, capacitors, cable terminations, busbars



### MULTI-CHANNEL TESTING

Future ready, the two PD measurement channels allow synchronous, multi-channel measurements, and enable gating to suppress disturbances.



### OUTSTANDING SPECS

MPD 800's cutting-edge specifications make it ready for all upcoming measurement challenges. Its input bandwidth of up to 35 MHz, the 125 MS/s sample rate and the PD pulse rate of up to 2 Mio./s guarantee that you will never miss a PD event.



### POWERFUL NOISE SUPPRESSION

For reliable PD testing in noisy industry environments, the MPD 800 enables PD source and disturbance separation using the latest 3PARD and 3FREQ technology.

# Measuring principle to minimize the impact of on-site interferences

## Challenges during partial discharge detection

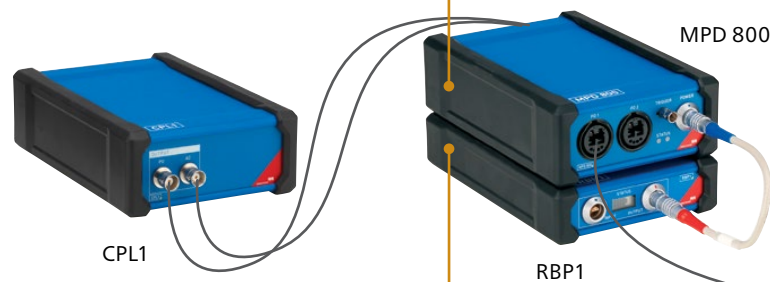
The challenge when analyzing partial discharge (PD) is to detect and evaluate discharges in the range of pico-coulombs (pC), while dealing with test voltages of up to several hundred kilovolts (kV) and large test set-ups which act as radio-frequency (RF) antennas.

External interference and noise from nearby equipment, for example caused by corona or other radio-frequency sources, may overlay these highly sensitive PD measurements.



### HIGH SENSITIVITY AND DIGITAL FILTER

The MPD 800 is placed as close as possible to the measurement point of the test object in order to keep the length of the BNC cable between the test object and the MPD 800 to a minimum. The short connection cable and flexible digital filters increase the sensitivity of the PD measurement by reducing influences from the surroundings.



### BATTERY-OPERATED

Due to the battery-based power supply, noise from the mains power supply cannot affect the measuring circuit. The RBP1 allows on-site PD testing of more than 16 hours\* and this time period can be easily extended by using multiple RBP1 units.

\* applies to new batteries and operation at room temperature

Schematic example showing the measuring principle for cable testing using MPD technology

## Measuring principle using MPD technology

The MPD 800 system consists of an MPD 800 measurement device, the MCU2 control unit and the MPD Suite software. Depending on the measurement, the MCU2 is connected to a single or multiple MPD 800 devices using fiber-optic technology. The MPD 800 devices and RBP1 batteries are connected to the test object either directly or via CPL1 or CPL2 coupling devices. The MCU2 is connected via USB to a laptop or PC with the installed MPD analysis software. This approach results in several advantages:

- > Safe testing approach due to galvanic isolation
- > Battery-operated power supply
- > Minimum of influences from the surroundings
- > High synchronicity to improve PD analysis



### SAFE APPROACH

You benefit from a clear separation of the high-voltage and working areas as only the measurement equipment must be placed in the high-voltage area. The test engineer can work safely on the computer in the working area due to the provided galvanic isolation.

## WORKING AREA



MCU2



### MINIMIZED INFLUENCES

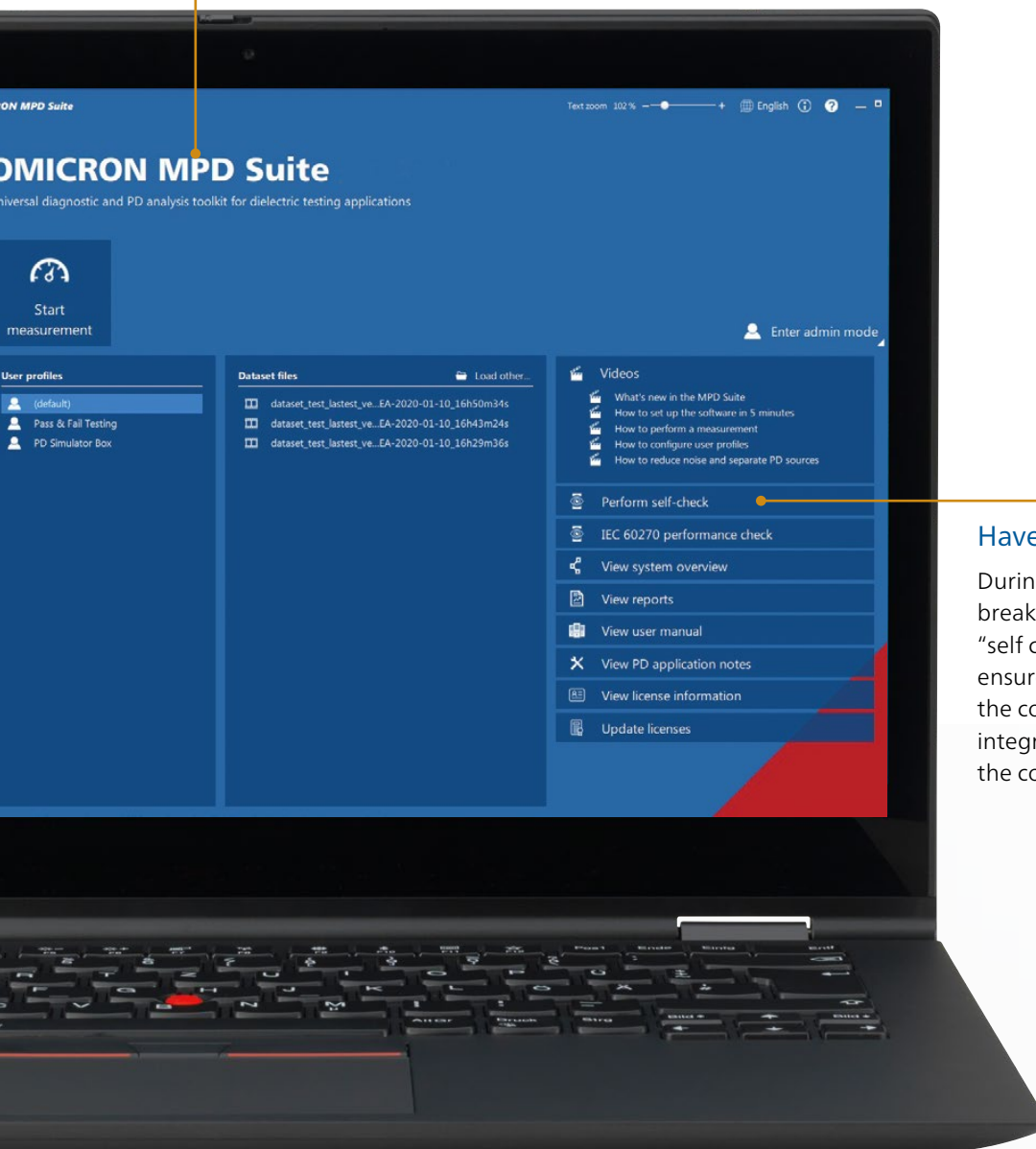
The fiber-optic cable to the MCU2 unit reduces the influence of interference coupling, minimizes ground loops and ensures a safe approach. Compared to conventional wires, fiber-optic cables enable precise synchronicity of all connected units down to the nanosecond range.

# How to prepare partial discharge measurements

## Flexible application-oriented packages

The MPD Suite software offers different software packages, software add-ons and modules for our MPD 800 system. You can choose between a set of software packages from essential to universal, and tailored application-oriented software packages.

Dedicated software modules provide you with specific functionalities, such as a .COM and web-based interface for easy automation, or for partial discharge (PD) measurement during DC voltage testing.



## Have peace of mind

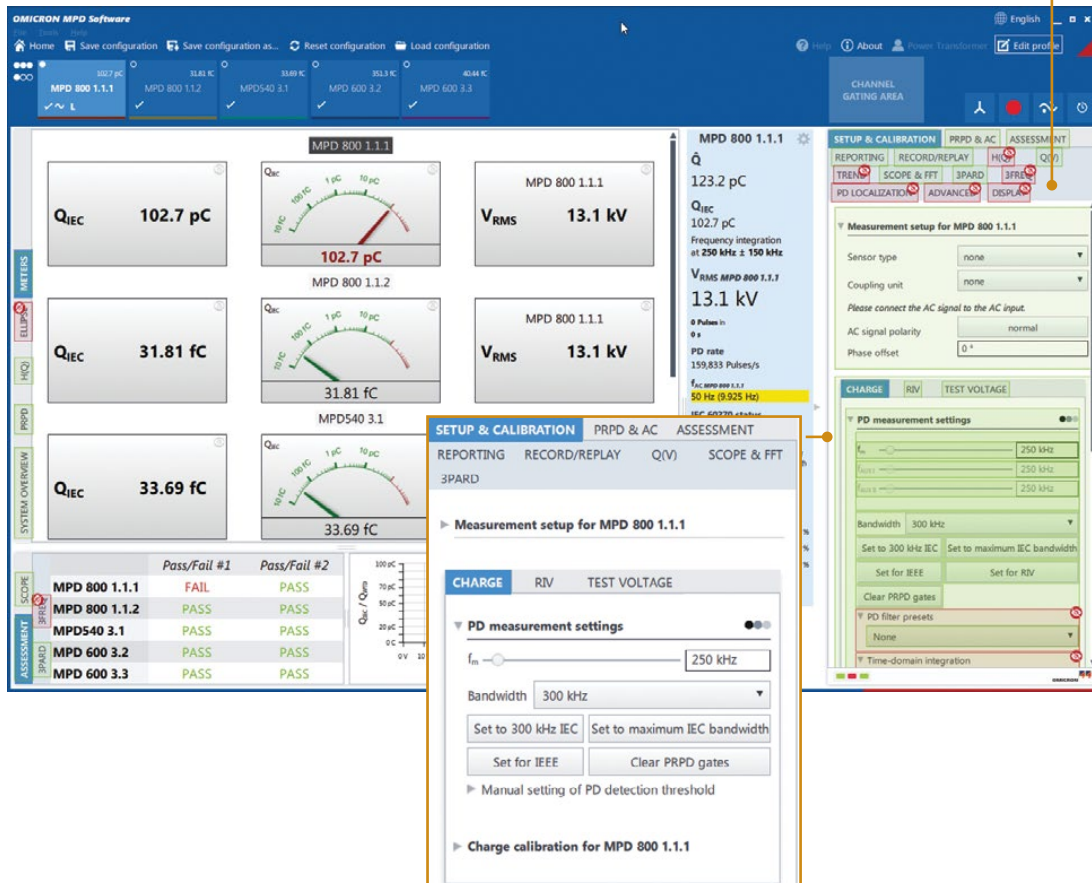
During high-voltage testing, flashovers and breakdowns can occur. The integrated “self check” functionality helps you to ensure the correct and reliable operation of the connected MPD 800 units. It verifies all integrated components as well as checking the communication with the software.

The start page provides you with a wide range of helpful information such as application notes or the MPD 800 user manual. In addition, it gives you easy access to recorded dataset files and created reports.

## Simplify your user profiles

The MPD Suite software can be completely customized depending on your needs. You can set individual test specifications, such as frequency range, filters, assessment levels or hide individual software components such as tabs, diagrams, buttons, or feature groups.

This is useful, for example, in cases of dedicated testing applications, such as PD analysis on rotating machines or cables where you do not need all of the features the software offers.



The screenshot displays the OMICRON MPD Software interface. The main window shows several measurement displays for different MPD units:

- MPD 800 1.1.1:**  $Q_{IEC}$  102.7 pC,  $Q_{IEC}$  102.7 pC,  $V_{RMS}$  13.1 kV.
- MPD 800 1.1.2:**  $Q_{IEC}$  31.81 fC,  $Q_{IEC}$  31.81 fC,  $V_{RMS}$  13.1 kV.
- MPD540 3.1:**  $Q_{IEC}$  33.69 fC,  $Q_{IEC}$  33.69 fC.

The interface also includes a table for assessment results:

	Pass/Fail #1	Pass/Fail #2
MPD 800 1.1.1	FAIL	PASS
MPD 800 1.1.2	PASS	PASS
MPD540 3.1	PASS	PASS
MPD 600 3.2	PASS	PASS
MPD 600 3.3	PASS	PASS

Configuration panels are visible, including 'SETUP & CALIBRATION' and 'PD measurement settings'. The 'PD measurement settings' panel shows:

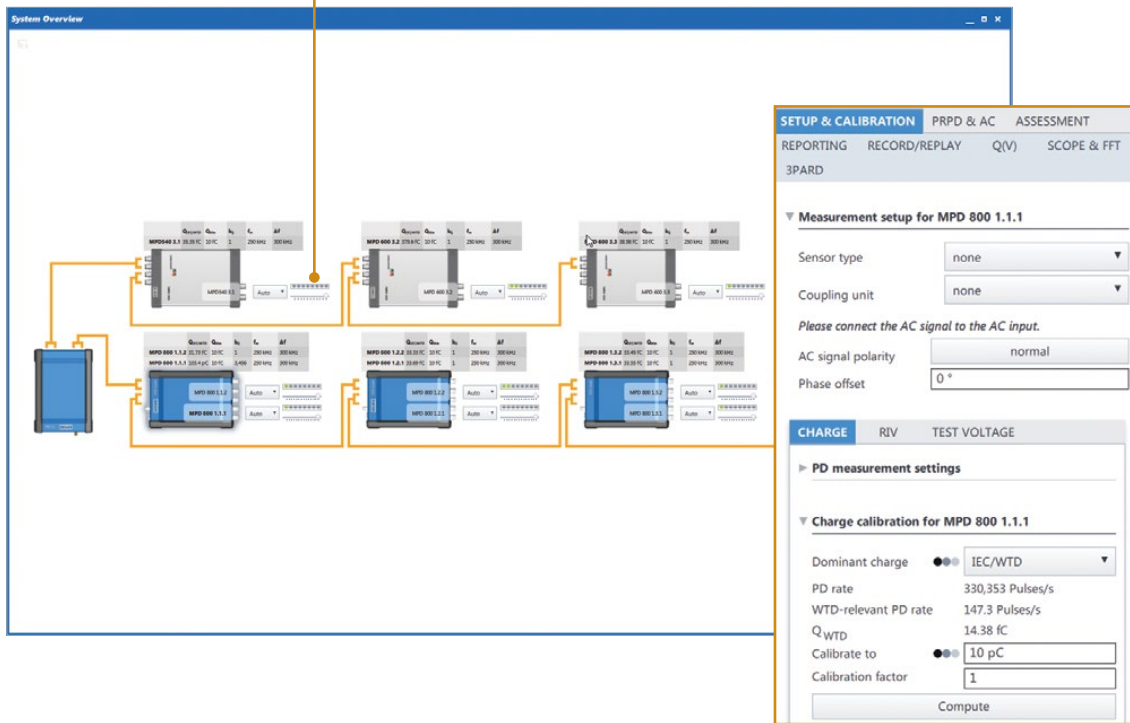
- Frequency integration at 250 kHz ± 150 kHz
- Bandwidth: 300 kHz
- Set to 300 kHz IEC
- Set to maximum IEC bandwidth
- Set for IEEE
- Clear PRPD gates
- Manual setting of PD detection threshold
- Charge calibration for MPD 800 1.1.1

By changing the software settings and defining dedicated user profiles, you can simplify the user interface and save time.

# How to set and perform partial discharge measurements

## Keep an overview

Commonly, multiple MPD 800 devices are in use for multi-channel measurements or testing of transformers, generators, or on-site cable testing. The “system overview” functionality provides a clear overview of your measurement setup. It displays all connected MPD 800 units and shows the most important partial discharge (PD) measurement values and settings of each PD channel. Thus, you can keep an overview of the MPD measurement setup.



## Configure your measurement

PD events can sometimes be overlaid by disturbances in certain frequencies. MPD 800 allows you to select individual measurement settings by adapting the center frequency and choosing between various bandwidths. By doing so, the frequencies with noise can be excluded and the analysis will target the real PD.

## Calibrate your setup

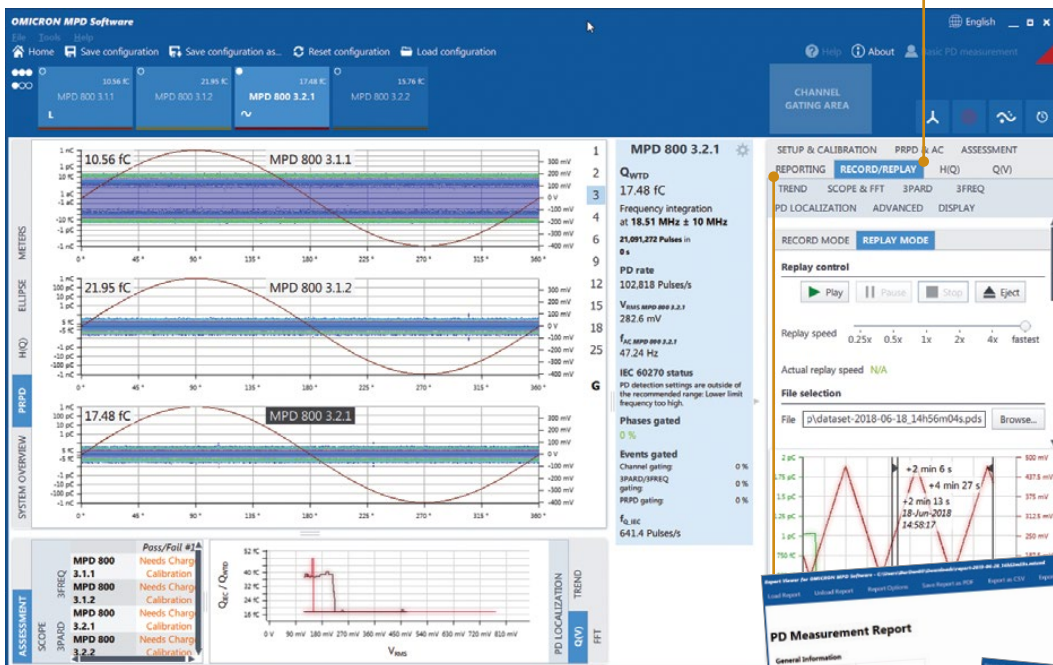
Using the MPD 800 system, you can calibrate charge according to IEC or RIV (Radio Influence Voltage), which is mandatory according to IEC 60270, IEEE/NEMA and CISPR standards. Besides this, you can also use the MPD 800 to calibrate the test voltage. This ensures a comparability of the gained results.



## Powerful recording and replay

MPD 800 records dedicated PD and RIV events into dataset files. These files contain unprocessed raw data and include all measured values and all relevant system settings. That way, measurements become traceable and you can use all kinds of analysis, gating and reporting functions for post-analysis.

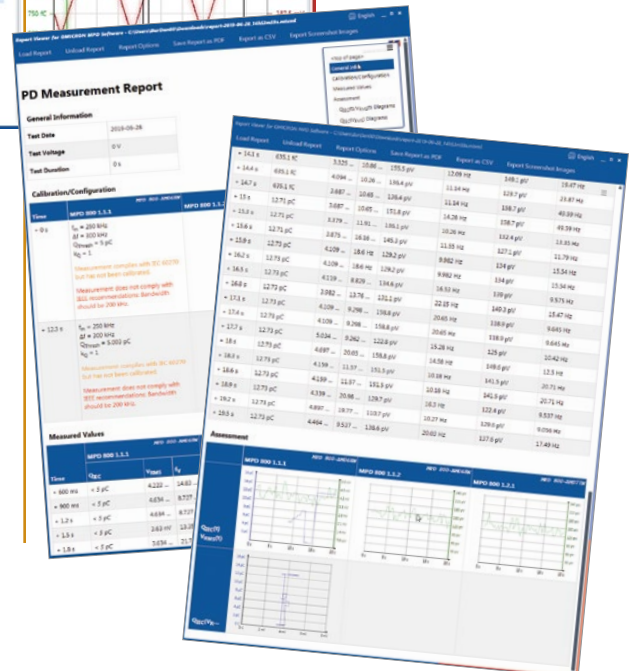
The recorded dataset files can be cut individually, for example, to focus on relevant PD events. As the playback speed can be freely selected, some sections can be played back more slowly in order to be analyzed in greater detail.



## Customize your reports

You can record specific PD events, export the measurement data afterwards as .xml or as .csv files, and save diagrams on an individual basis.

In addition, you can adapt the report by selecting all included parts, reordering information, add screenshots or your company logo. At the end, reports can be stored as PDF files.

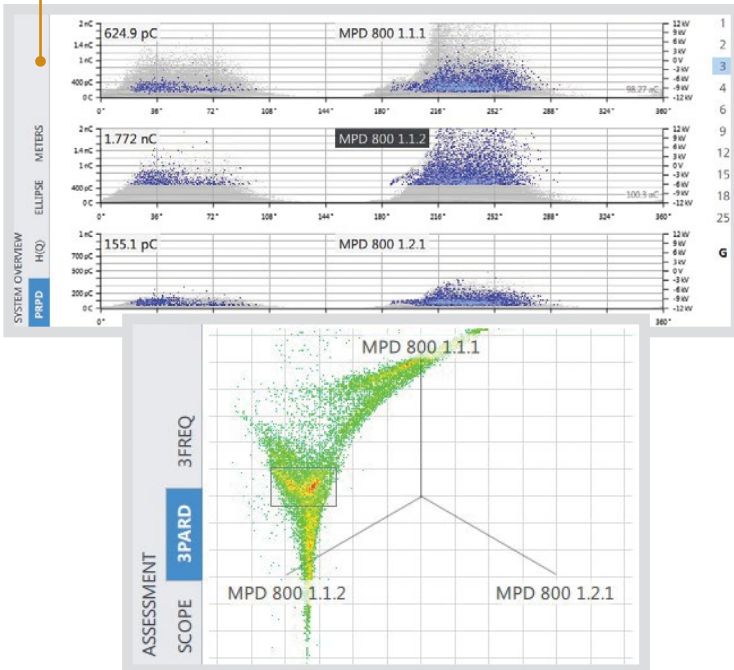


# How to suppress noise and separate partial discharge sources for re

## Three-phase filtering tool 3PARD

Partial discharge (PD) events closer to one phase can also be detected on the other phases. The 3PARD (3-phase amplitude relation diagram) tool simplifies the differentiation of various PD sources and PD interferences. It relies on a synchronous three-phase measurement of a test object.

The combined results are displayed in a single diagram, the 3PARD star diagram, which facilitates result comparison and PD pattern selection. To further increase the testing reliability, the PRPD diagram can be used to show filtered out pulses in real time while greying out the residual pulses in the background.

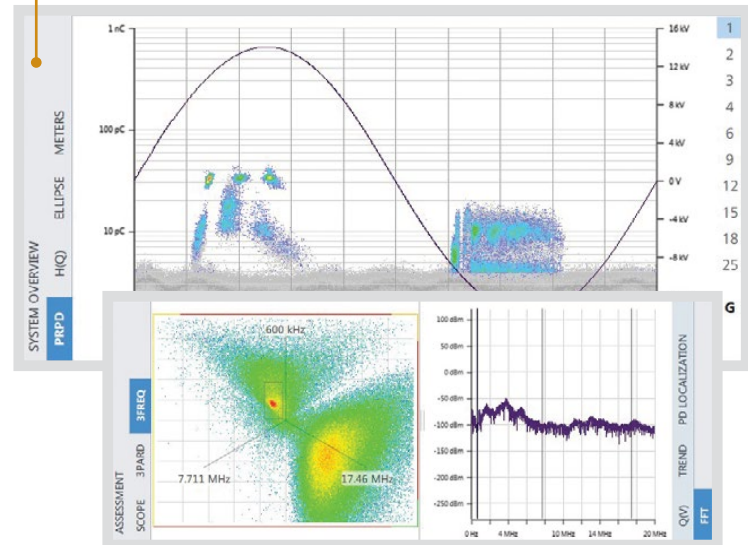


The 3PARD filter analyzes partial discharge on all three phases. Therefore you need at least three channels and respectively two MPD 800 devices in order to cover all phases.

## Single-phase filtering tool 3FREQ

The 3FREQ (3-center frequencies relation diagram) is a one-channel filtering tool using three digital filter frequencies. It characterizes PD sources by their frequency signature.

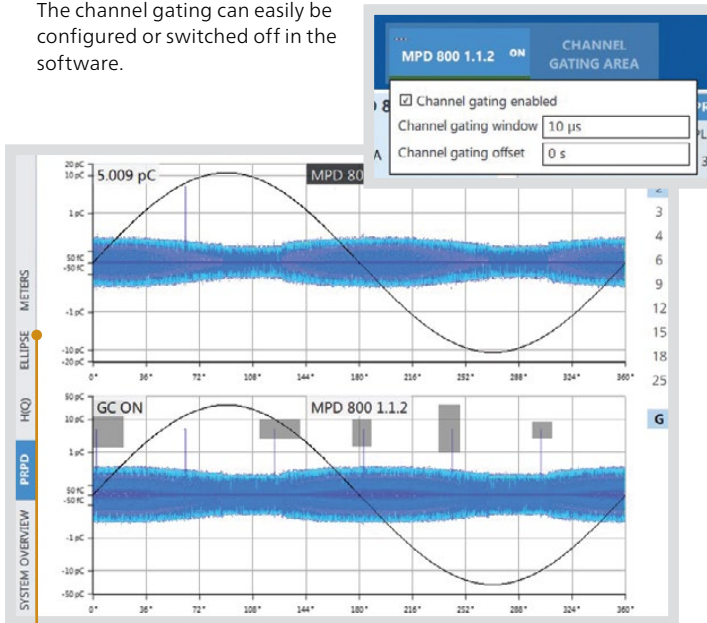
Using a 3FREQ diagram, you can separate PD events such as surface discharge, corona and internal void from disturbances. As with 3PARD, the PRPD diagram shows filtered out pulses while greying out the residual pulses in the background to improve the testing reliability.



The 3FREQ filter uses three different center frequencies for PD analysis. Due to the one-channel measurement approach you only need one MPD 800 device.

# liable analysis

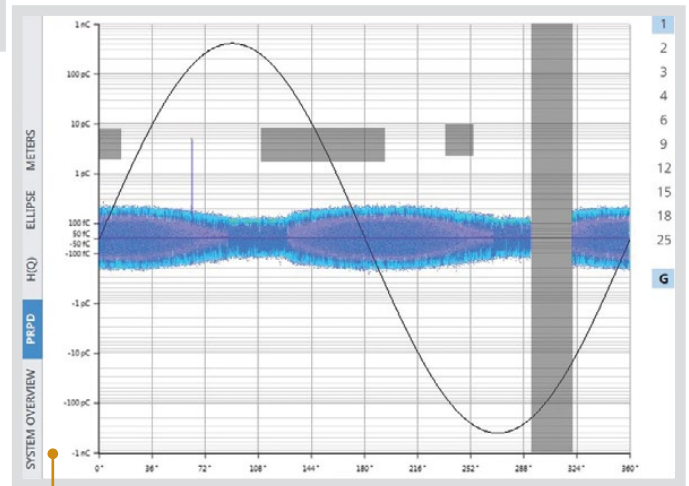
The channel gating can easily be configured or switched off in the software.



The 2-channel PRPD overview shows the filtered pulses (disturbances) and the measured PD pulses in real-time.

## Channel gating: Second channel for gating

To reduce the effect of frequency-variable disturbances, such as inverter noise on the measurement results, you can connect an additional MPD 800 channel as a gating channel.



Measurement example using phase/amplitude window gating in the PRPD diagram.

## PRPD gating: Window gating of phase and amplitude

Phase/amplitude gates allow the MPD 800 to eliminate frequency-stable signals with a certain amplitude and fixed phase position, for example converter pulses, drives, irrelevant PD. You can easily define the gating areas by marking them with the mouse. These areas will be excluded during the subsequent PD measurement.

# Partial discharge measurements on power transformers

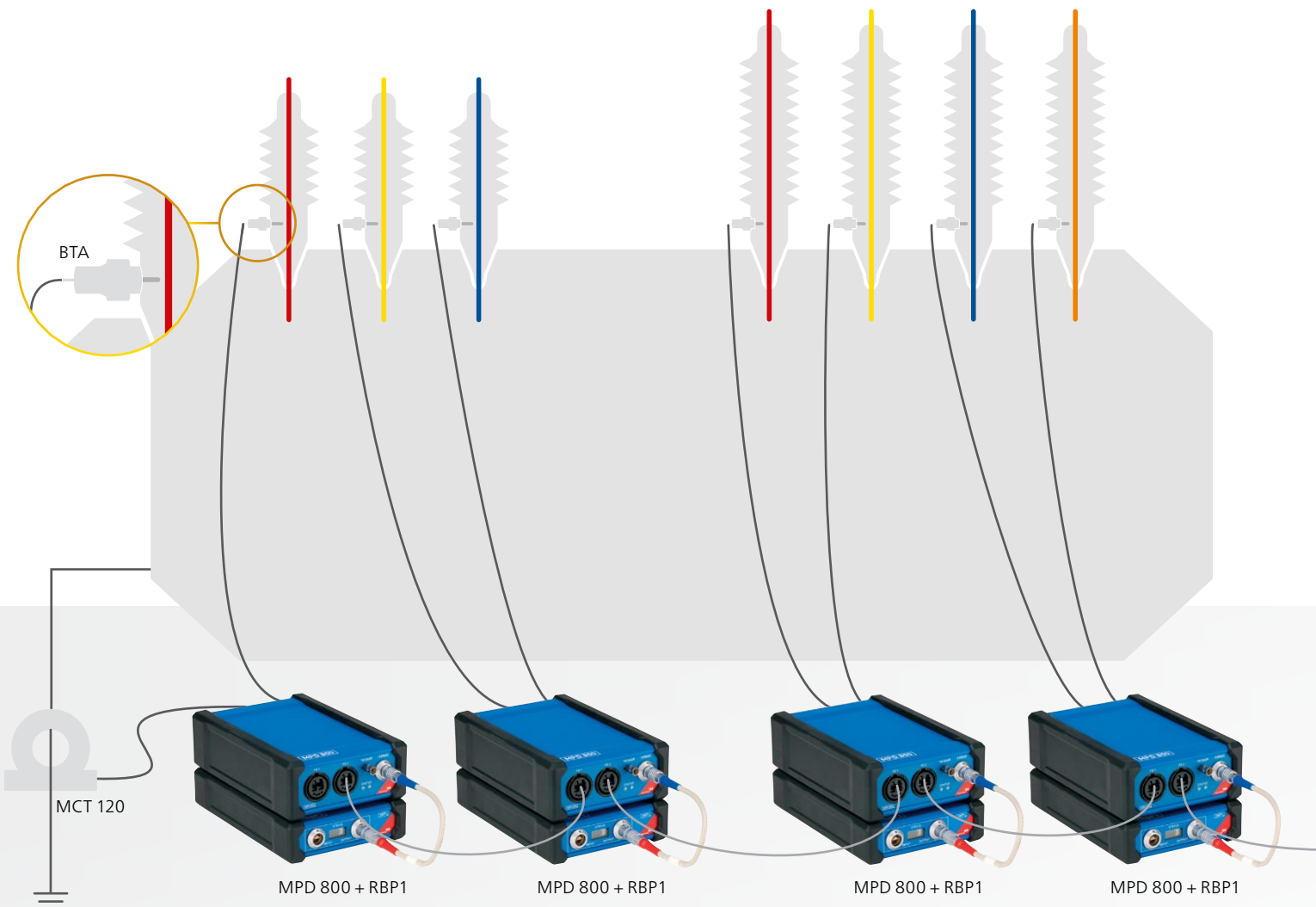
## Which parts of power transformers can be tested?

- ✓ Bushings
- ✓ CTs
- ✓ Tap changer
- ✓ Winding
- ✓ Core Leads

When measuring and analyzing partial discharge (PD) activity in power transformers, the particular tests and test set-ups are determined by the type of transformer and depend on the standards according to which the measurements are performed.

Depending on the type of bushings used, MPD 800 is connected either to the capacitive tap of the bushings or to an external coupling capacitor. PD is measured either in  $\mu\text{V}$  (according to IEEE standards) or in pC (according to the IEC 60270 standard).

PD measurements on power transformers are performed during factory acceptance, on-site commissioning and routine testing in order to detect critical defects in the insulation and assess potential risks.



## Your benefits for PD testing on power transformers

### Standards-compliant measurements

MPD 800 ensures standards-compliant measurements – with just the click of a button, all parameters based on a specific standard can be automatically set and added to a report.

### Simultaneous testing

MPD 800 supports you in the simultaneous measurement and analysis of charge ( $Q_{IEC}$ ) and Radio Interference Voltage (RIV) values, for example during factory acceptance testing.

### Powerful separation tools

Advanced filtering options (3PARD and 3FREQ) help you to reliably distinguish between harmful PD and external noise and to separate multiple PD sources.

### Two input channels

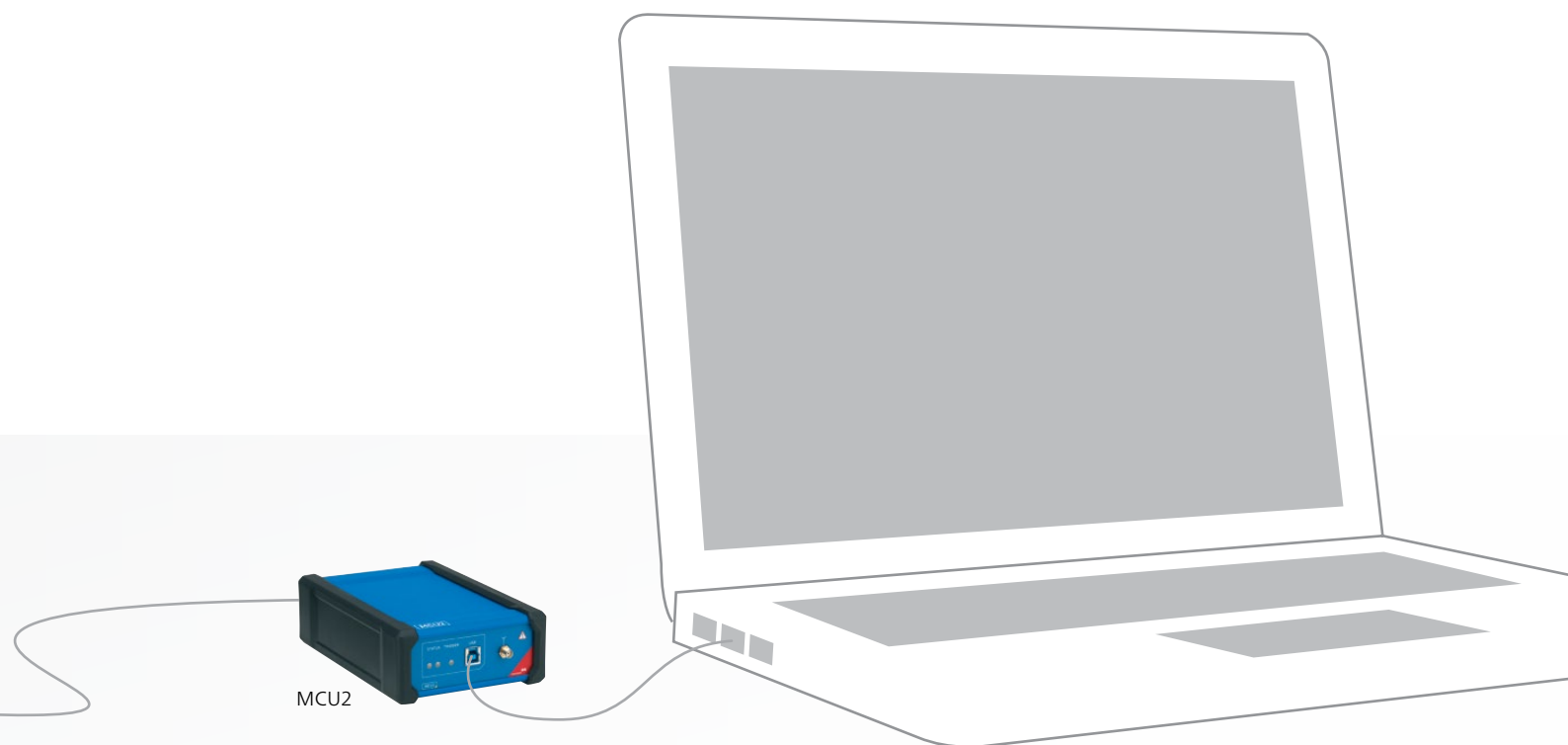
MPD 800 has two PD input channels to enable synchronous, multi-channel measurements using one device, and to allow real-time gating of the current measurement in order to suppress surrounding noise.

### PD trigger functionality

By drawing a trigger-window, pulses can be displayed in the PD scope for detailed pulse shape analysis and for triggering acoustic PD localization with PDL 650 via the optical output of MPD 800.

### UHF measurements (available 2021)

To further verify the signal source, PD can be additionally measured inside the tank of liquid-insulated transformers using ultra-high frequency sensors.



# Partial discharge measurements on rotating machines

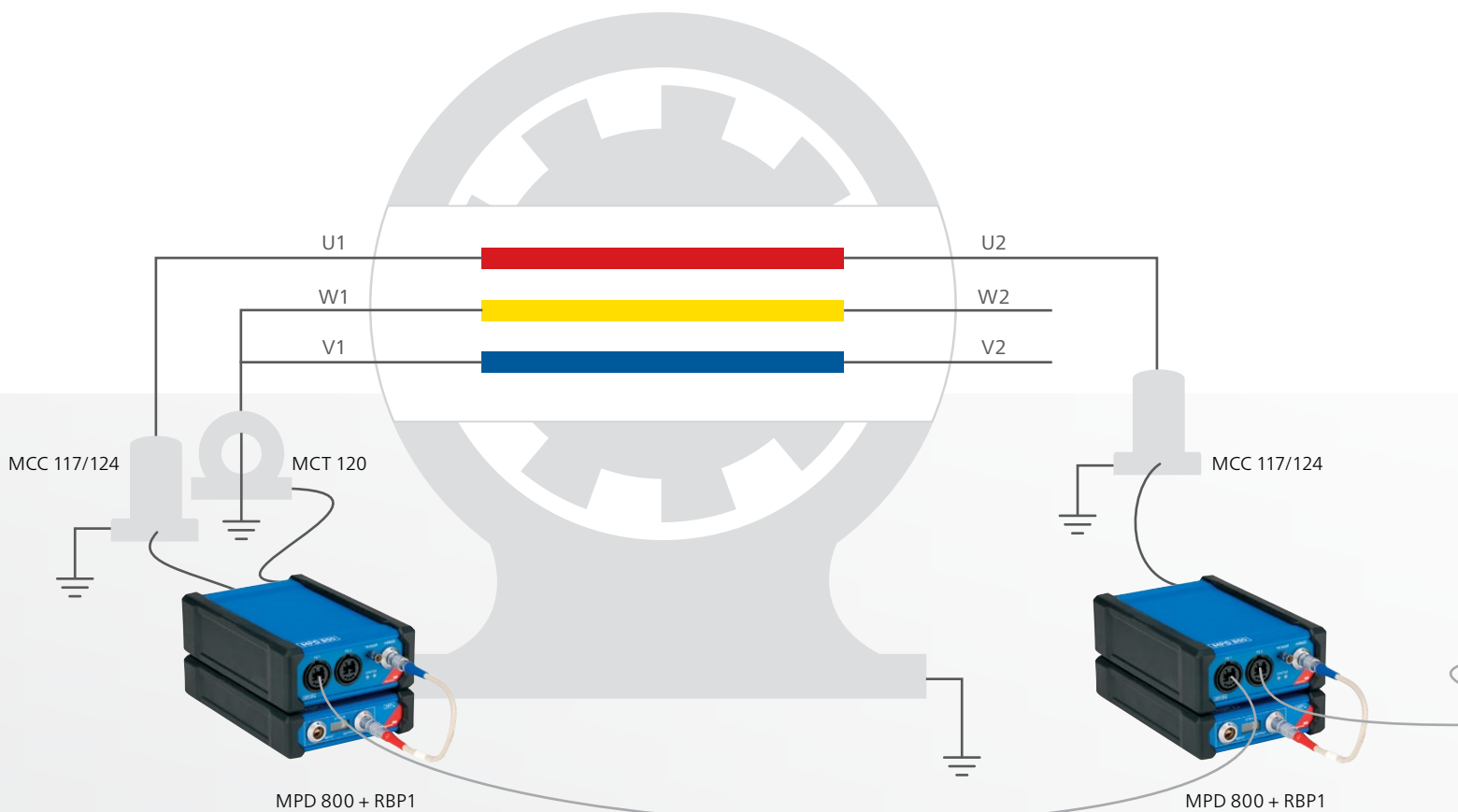
## Which machine parts can be tested?

- ✓ Stator
- ✓ End Winding
- ✓ Busbar
- Core
- Magnet
- Rotor

Partial discharge (PD) testing on rotating electrical machines is performed according to international standards, either off-line when the machine is taken out of service and energized with a high-voltage source or on-line when the machine is in service.

Depending on whether the star point is accessible, a single-phase measurement can be done. Otherwise a three-phase measurement in combination with source separation techniques enables you to identify PD activity in a specific phase.

Off-line PD measurements on rotating machines are performed during factory acceptance, on-site commissioning and routine maintenance testing to detect critical defects in the insulation and assess potential risks. On-line PD measurements can also be performed on large generators when in service using permanently installed coupling capacitors.



## Your benefits for PD testing on rotating machines

### Standards-compliant measurements

MPD 800 ensures standards-compliant measurements – with just the click of a button, all parameters based on a specific standard can be automatically set.

### Two input channels

MPD 800 has two PD input channels to enable synchronous, multi-channel measurements using one device, and to allow real-time gating of the current measurement to suppress surrounding noise.

### Powerful separation tools

Advanced filtering options (3PARD and 3FREQ) help you to reliably distinguish between harmful PD and external noise and to separate multiple PD sources.

### Create user profiles

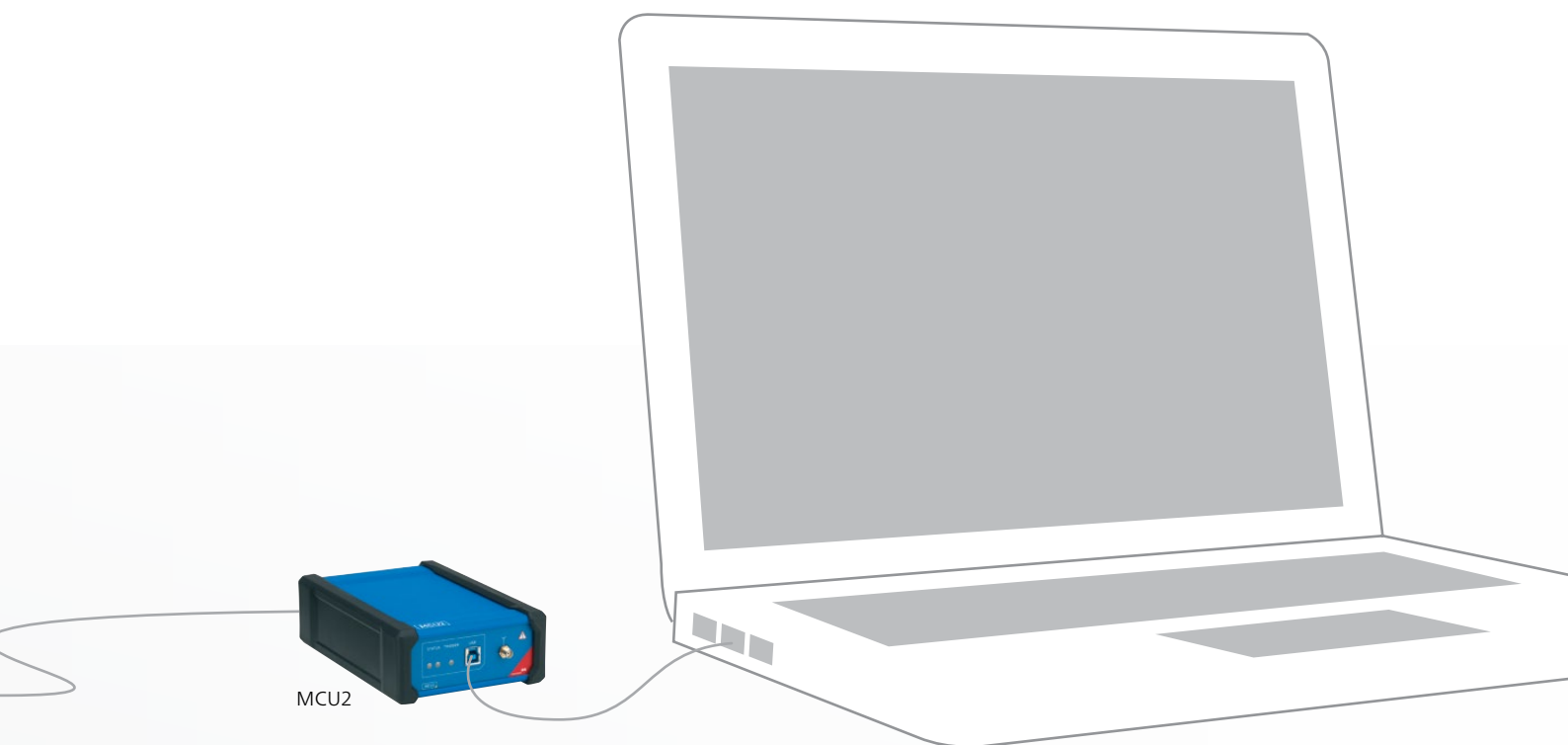
For different types of PD tests on rotating machines, you can set up specific measurement or user profiles with the required test parameters according to international standards.

### Flexible user interface

The flexible MPD software allows you to configure measurements, select only the analysis tools you need and to determine how data should be displayed.

### Record and replay PD measurements

Live data sets can be recorded and replayed later for analysis. You can focus on specific segments of the data set and include these in reports.



# Partial discharge measurements on power cables

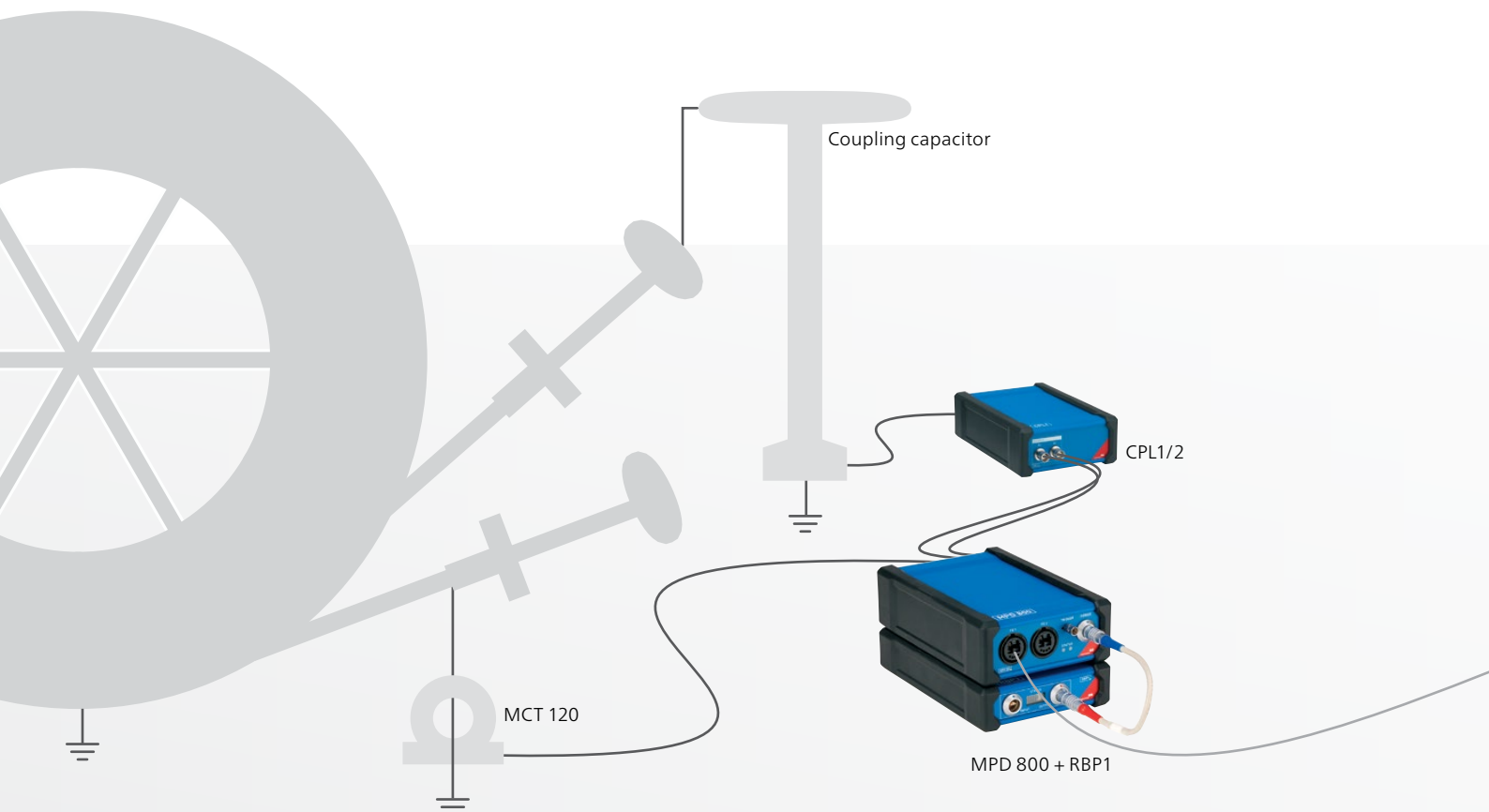
## Which parts of power cables can be tested?

- ✓ Main conductor
- ✓ Terminations
- ✓ Joints
- Sheath
- Shielding

Partial discharge (PD) testing on medium- and high-voltage cables starts in the factory as this it clearly reveals manufacturing-related insulation defects. During factory testing, the test voltage is increased according the relevant international standard, while the PD signals are decoupled within the coupling capacitor path.

A test voltage is applied that is higher than the normal operating voltage of the power cable and the PD measurement is made. The goal of the test is to determine whether the cable insulation is free from PD before it is put into service.

PD testing is also important during site acceptance testing of installed cable systems at their joints and terminations. Regular in-service PD testing can also be performed on-line to assess the dielectric condition of the cable system as it ages.





## Your benefits for PD testing on power cables

### Standards-compliant measurements and negative superposition suppression

MPD 800 ensures standards-compliant measurements – with just the click of a button, all parameters based on a specific standard can be automatically set, and can be manually adjusted to on-site conditions (noise).

### Two input channels

MPD 800 has two PD input channels to enable synchronous, multi-channel measurements using one device, and to allow real-time gating of the current measurement to suppress surrounding noise.

### High sensitivity for locating defects

Advanced broadband PD localization filters, multi-channel time domain reflectometry (TDR), a wide localization range (> 130  $\mu$ s) as well as statistical (sTDR) localization techniques allow you to quickly locate defects along entire lengths of cables.

### Create user profiles

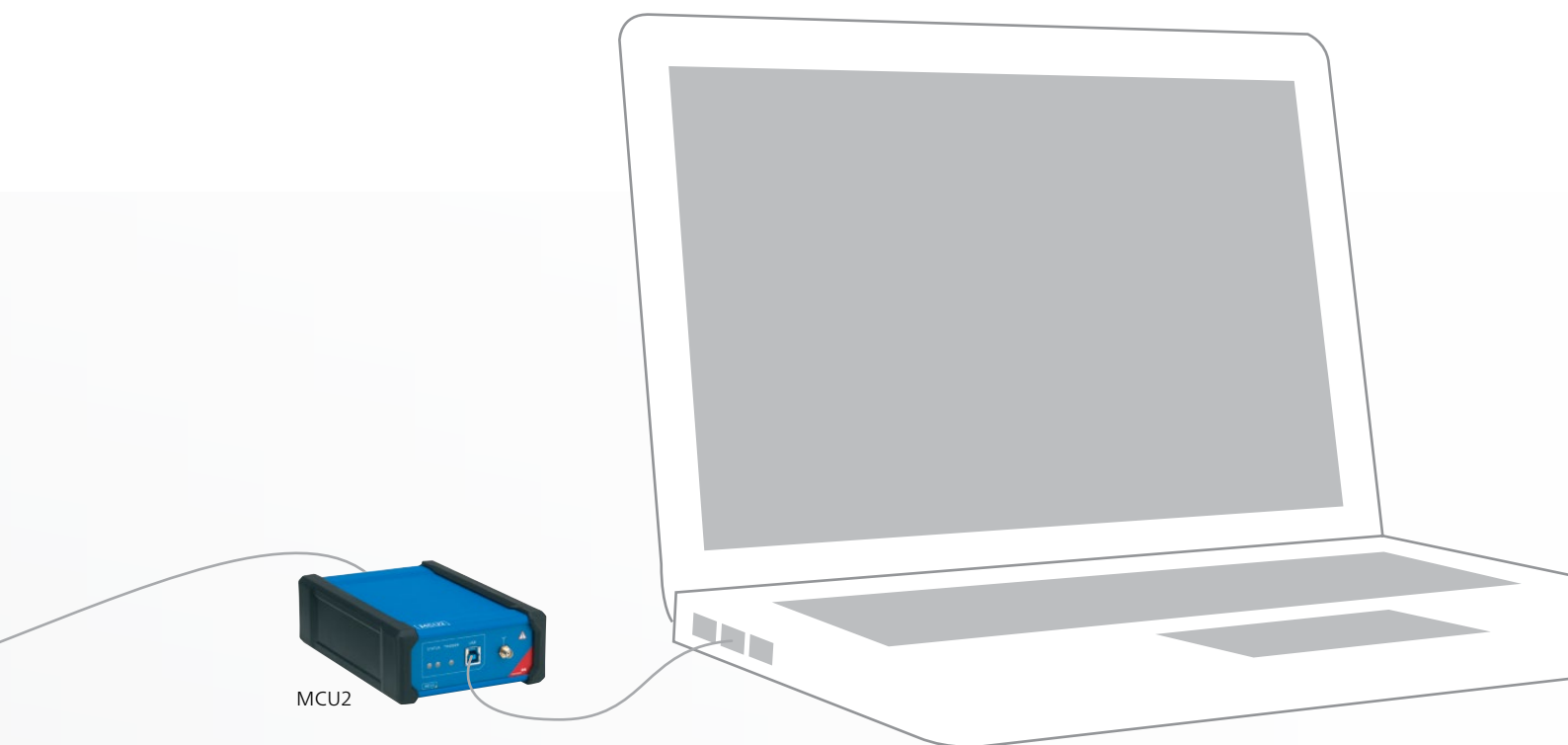
For different types of PD tests on power cables, you can set up specific measurement or user profiles with the required test parameters according to international standards.

### Synchronous multi-channel measurements

Synchronous multi-channel measurements at the terminations and joints ensure a more complete assessment of the insulation system and reliable localization of defects along the entire cable length for on-site testing.

### Powerful separation tools

An advanced 3PARD filtering option helps you to reliably distinguish between harmful PD and external noise and to separate multiple PD sources on site.



# Partial discharge measurements on other high-voltage components

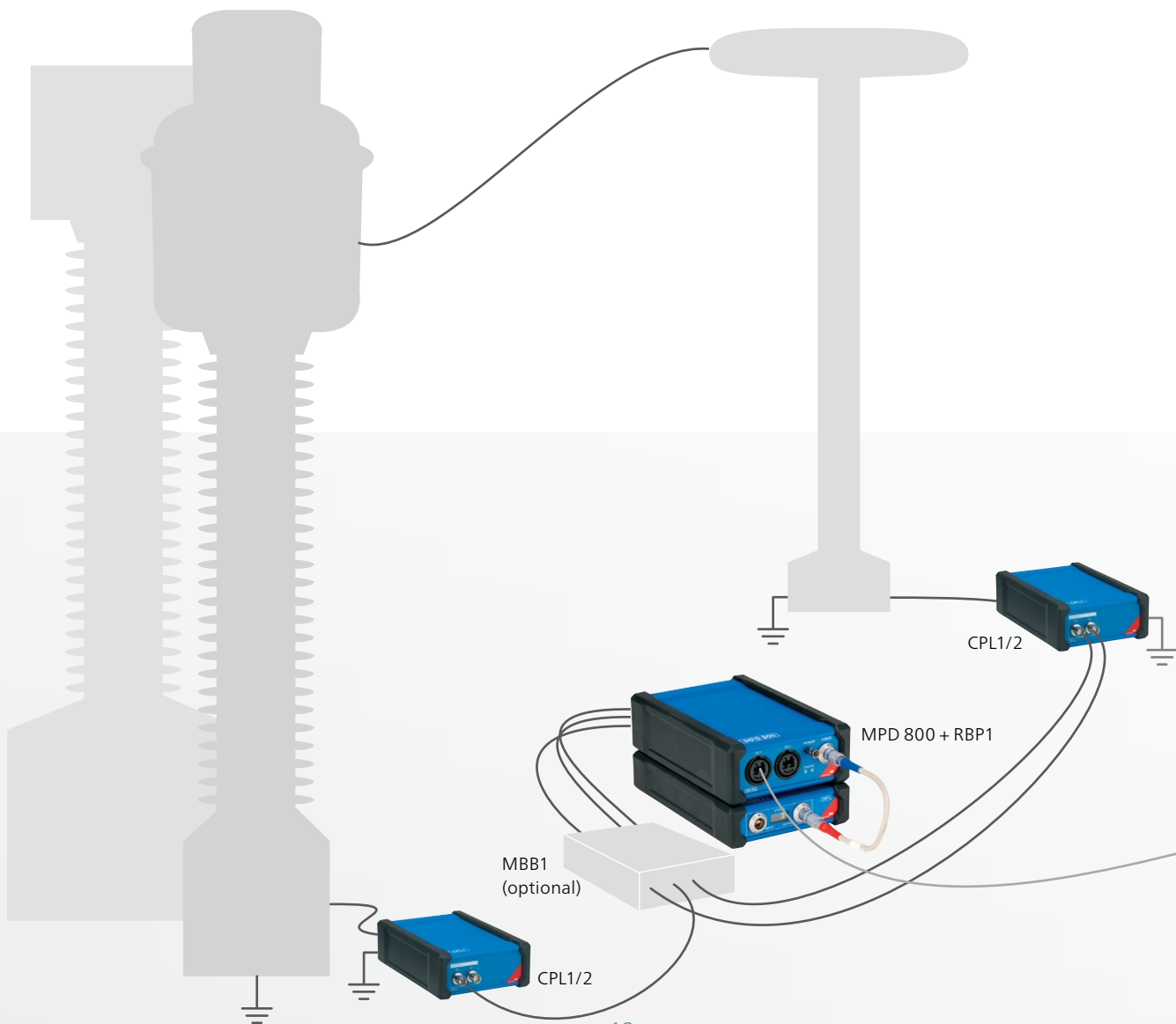
## Which component parts can be tested?

- ✓ Windings
- ✓ Voltage/Current divider
- ✓ Capacitors
- ✓ Compensation reactor

Partial discharge (PD) testing is essential for high-voltage components used in many electrical assets, such as electrical insulators, bushings, converters and capacitors. It is important to determine whether they meet specific design and operational requirements.

Off-line single-phase PD measurements are performed on these components in a test lab with an external voltage source according to international standards. In many cases, a test voltage is applied that is higher than the normal operating voltage. Also the PD measurement is made while other machines run in the factory, creating disturbances which influence the PD testing.

These types of measurements are performed on a pass-fail basis during the development of high-voltage components as well as quality control during factory acceptance tests.



## Your benefits for PD testing on high-voltage components

### Standards-compliant measurements

MPD 800 ensures standards-compliant measurements – with just the click of a button, all parameters based on a specific standard can be automatically set.

### Record and replay PD measurements

Live PD datasets can be recorded and replayed later for analysis and PD data comparison. You can focus on specific segments of the PD dataset and include these in reports.

### Powerful separation tools

The advanced 3FREQ filtering option helps you to reliably distinguish between harmful PD and external noise for more reliable analysis. Additional noise filtering can be achieved with our MBB1 balanced measurement bridge.

### HVDC testing

New features focussed on HVDC standards compliant PD testing will be available soon.

### Flexible user interface

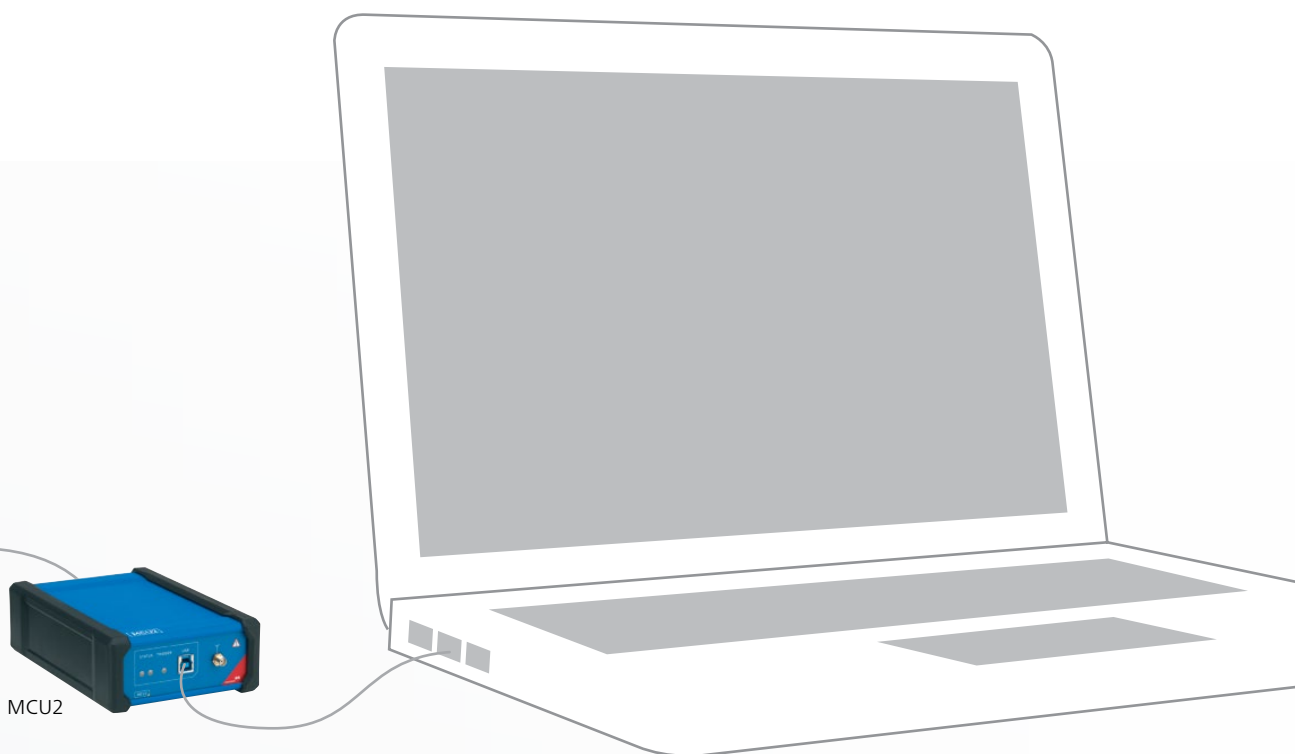
The flexible MPD software allows you to configure measurements, select only the analysis tools you need and to determine how data should be displayed.

### Create user profiles







For different types of PD tests on high-voltage components, you can set up specific measurement or user profiles with the required test parameters according to international standards.

### Customized reporting

You can select the measurement parameters and images to include and how they are displayed in automatically generated reports.









# Extend your MPD 800 system depending on your application area and

	 Power transformer testing	 Rotating machine testing	 Power cable testing	 Instrument transformer testing	 High-voltage GIS testing	 Medium-voltage GIS testing	Other high-voltage component testing
<b>MPD System</b>							
MPD 800	■	■	■	■	■	■	■
RBP1	■	■	■	■	■	■	■
Fiber-optic cables	■	■	■	■	■	■	■
MCU2	■	■	■	■	■	■	■
<b>Calibration</b>							
CAL 542	<input type="checkbox"/> (Type C)	<input type="checkbox"/> (Type D)	<input type="checkbox"/> (Type A or B)	<input type="checkbox"/> (Type B)	<input type="checkbox"/> (Type A or B)	<input type="checkbox"/> (Type B)	<input type="checkbox"/> (Type B)
RIV1	<input type="checkbox"/>	-	-	<input type="checkbox"/>	-	-	<input type="checkbox"/>
<b>Sensors</b>							
CPL1 / CPL2 *	■	■	■	■	■	■	■
MCC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BTA	<input type="checkbox"/>	-	-	-	-	-	<input type="checkbox"/>
PDL 650	<input type="checkbox"/>	-	-	-	-	-	-
MBB1	-	-	-	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>
MCT 120	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Extensions</b>							
MPD 800 (for multi-channel measurements)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UHF 800 (for UHF measurements)	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	-	-

\* Required either for tests with coupling capacitors larger than 2 nF, when the MPD is installed in the test object path, or when breakdowns of the test objects are expected during testing.

# testing requirements

	 <b>Power transformer testing</b>	 <b>Rotating machine testing</b>	 <b>Power cable testing</b>	 <b>Instrument transformer testing</b>	 <b>High-voltage GIS testing</b>	 <b>Medium-voltage GIS testing</b>	<b>Other high-voltage component testing</b>
<b>UHF System</b>							
UHF 800	■	-	■	-	■	-	-
RBP1	■	-	■	-	■	-	-
Fiber-optic cables	■	-	■	-	■	-	-
MCU2	■	-	■	-	■	-	-
<b>Impulse Generator</b>							
UPG 620	□	-	□	-	□	-	-
<b>Sensors</b>							
UVS 610	□	-	-	-	-	-	-
UHT1	□	-	-	-	-	-	-
UCS1	-	-	□	-	-	-	-

■ included   □ compatible and optional accessory   - not compatible

We create customer value through ...

## — Quality —

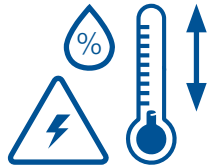
You can rely



on the highest  
safety and security  
standards

Superior reliability  
through up to

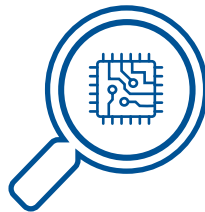
72



hours burn-in tests before delivery

100%

routine testing of all  
test set components



ISO 9001  
TÜV & EMAS  
ISO 4001  
OHSAS 18001

Compliance with  
international standards



## — Innovation —



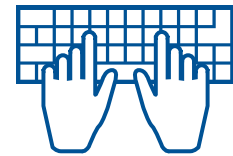
... a product portfolio geared  
to my needs

More than

200

developers

keep our solutions up-to-date



More than

15%

of our annual sales gets reinvested  
in research and development



Save up to

70%

testing time through templates,  
and automation



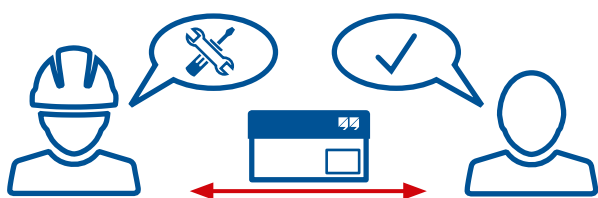
— Support —



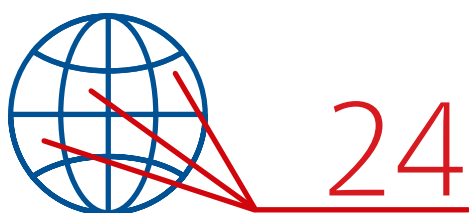
Professional technical support at any time



Loaner devices help to reduce downtime



Cost-effective and straight-forward repair and calibration



offices worldwide for local contact and support

— Knowledge —

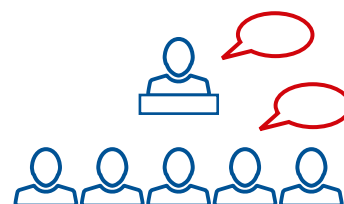
More than

300

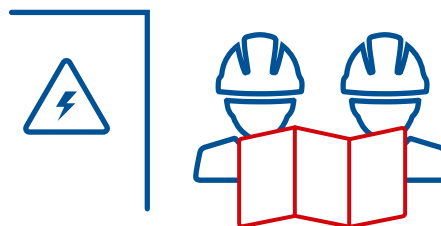


Academy and numerous hands-on trainings per year

Frequent OMICRON hosted user meetings, seminars and conferences



to thousands of technical papers and application notes



Extensive expertise in consulting, testing and diagnostics

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 160 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 more information about MPD 800:

- MPD 800 Technical Data
- MPD 800 Ordering Information
- MPD 800 Upgrade Information for MPD 600 Users

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