Online Partial Discharge Monitoring Systems by Megger

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PD by Megger®
Power Diagnostix Systems

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What is the Megger Grid Performance Solutions (GPS) Division?

Megger´s strategy “From selling portable test devices to asset monitoring systems”

Megger Business Divisons

Cable Division	Substation Division	Motor Division	LVI/ GET Division	GPS Division
• Cable fault location • Cable testing and diagnosis	• Relay protection • Transformers • Circuit breakers	• Static insul. test. • Dynamic testing	• Insulation resist. testing • LV testing • Battery testing	• PD testing and monitoring • Smart Grid monitoring and analytics • Asset Performance Management Solutions
Production sites				
Baunach Radeburg	*Dover, Danderyd Valley Forge, Dallas*	*Baker (Fort Collins, Dover)*	*Dover Danderyd*	*Power Diagnostix (Aachen) Megger Grid Analytics IPS (partnership)*

Most recent acquisitions

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Power Diagnostix Systems GmbH, Aachen, Germany

- Acquired by the Megger Group in 2019
- Specialist in Partial Discharge Testing and Monitoring solutions for all kinds of assets throughout their whole life cycle
- From factory acceptance testing, through permanent online PD monitoring, to specialized testing services on cables, transformers, rotating machines, GIS, AIS.

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2 Online PD Monitoring hardware platforms

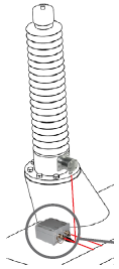
- **ICM*monitor***
- **GIS*monitor***

Both available as

- portable units for online PD spot testing and temporary monitoring
- permanently installed online PD monitoring systems

ICM*monitor portable*
4 or 8 multiplexed channels

HF (IEC, VHF)



Transformers
Rotating machines

UHF

Transformers
Cable terminations

VHF (HFCT)

Cable terminations
Transformers

VHF (TEV)

Switchgear

Acoustic

Transformers
Switchgear

IPD by Megger®
Power Diagnostix Systems

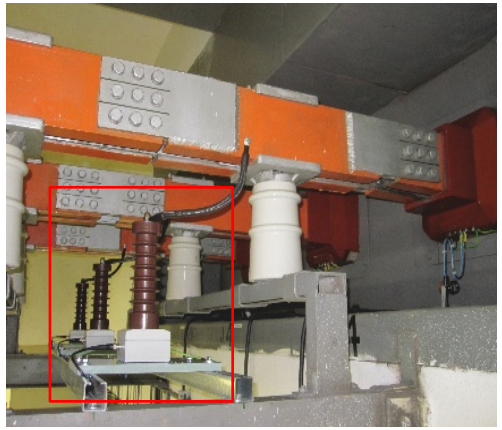
2 online PD monitoring approaches for rotating machines:

1. Temporary (periodical) online monitoring with portable monitoring device on preinstalled coupling capacitors (CC)

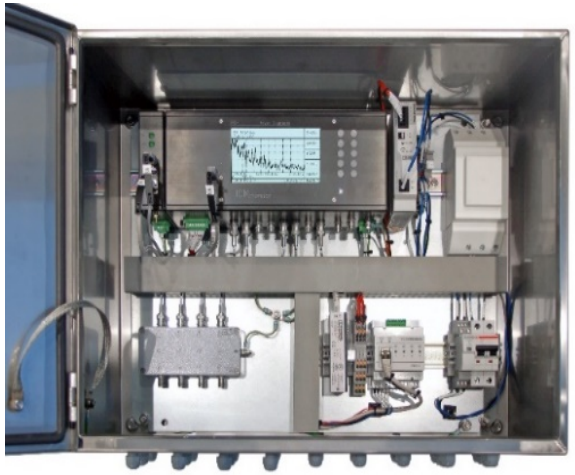
Example of preinstalled CC on motor terminals

ICM*monitor portable*
Portable version of 4/8/12 channel monitoring device. Usable for various online monitoring applications as well as offline testing in combination with CC and notebook/software. Optional remote access via LAN or external LTE router.

2. Permanently installed monitoring system with remote access and alarming

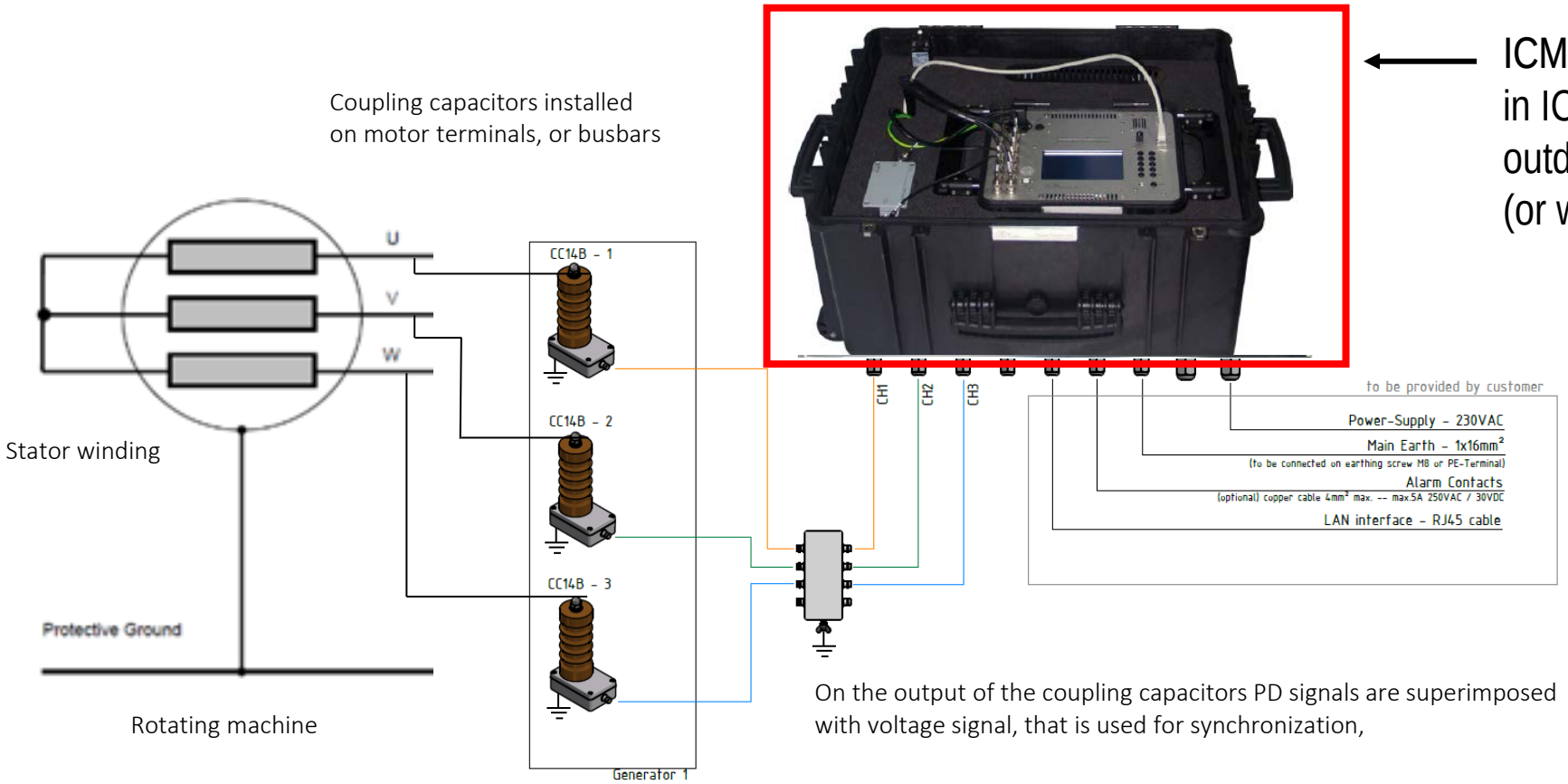


Example of preinstalled CC on generator busbar



ICM*monitor*
Permanently installed monitoring system with 4 /12 channels (multiplexed) in a wall mounted cabinet with integrated mobile webserver, analogue gating, circuit breaker, overvoltage protection, dry contacts, LAN interface.

Online PD monitoring on Rotating Machines



ICM*monitor portable*
in ICM*outlander*
outdoor IP65 enclosure
(or without it)

On the output of the coupling capacitors PD signals are superimposed with voltage signal, that is used for synchronization,

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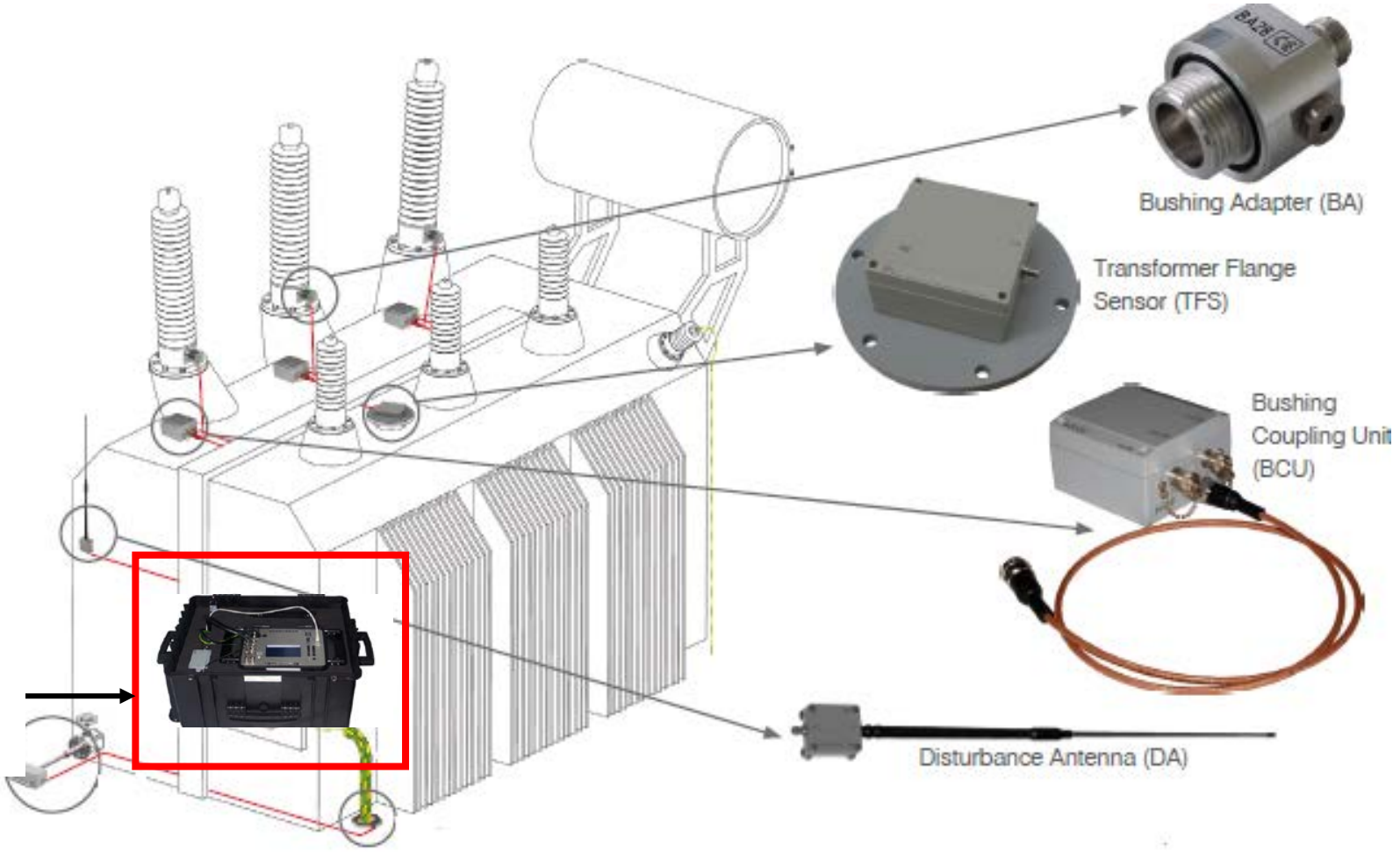
Online PD monitoring on Power Transformers

ICM*monitor portable* in ICM*outlander* outdoor IP65 enclosure



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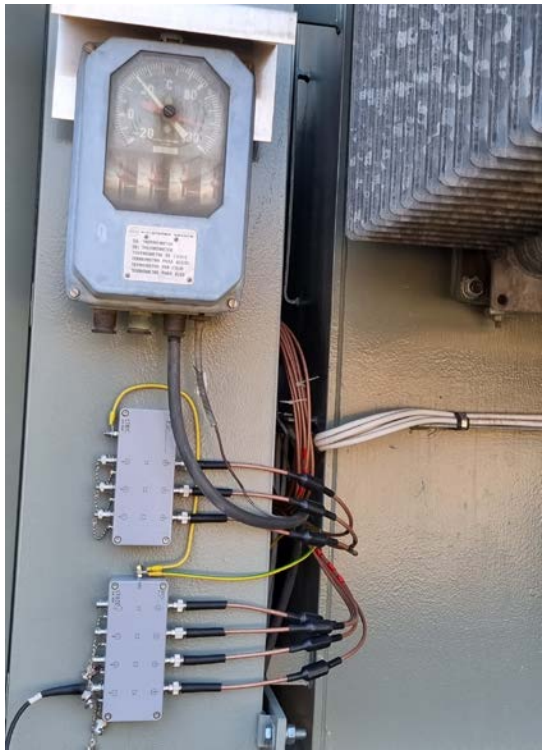
Example of preinstalled coupling devices for online PD spot testing/ monitoring on an aged 110/6kV power transformer showing increased H_2 DGA values.

Bushing adapters and bushing coupling units on HV bushings

Bushing adapters and bushing coupling unit on HV neutral



Coupling termination boxes with synchronization and PD signal outputs

Online PD spot testing/ monitoring with ICM*system,* or ICM*monitor portable*, or ICMmonitor

ICM*monitor*
for permanent installation

General features (portable and stationary):

- 4, 8, or 12 (only 12” version) multiplexed channels
- Spectrum analyzer and analog gating (denoising) on board
- Built in Monitoring Webserver with preinstalled webinterface software for local and remote access without the need of a desktop software
- Autoscan, trending and alarming functions
- Optional AUX Inputs for monitoring of additional parameters (temp., load, etc.)
- Optional IEC61850 hardware converter
- Relay outputs for alarm forwarding

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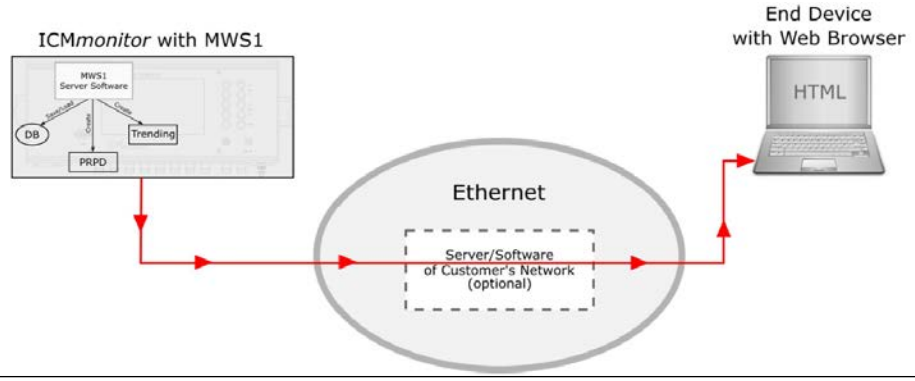
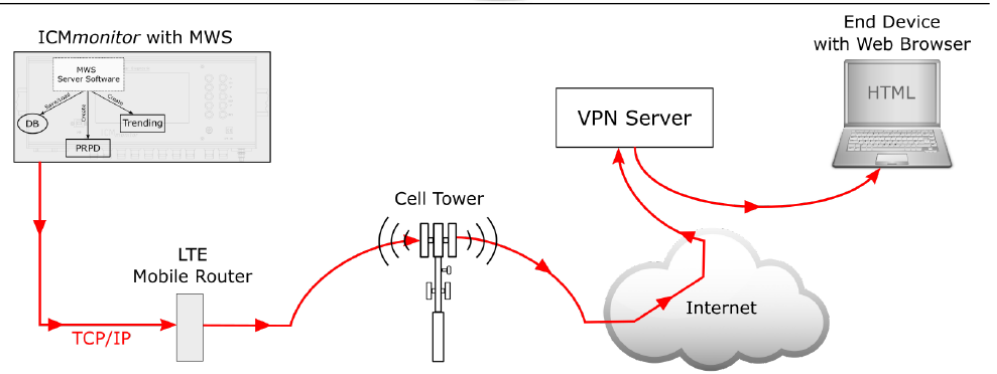
MWS Monitoring Web Server

- Industrial PC built into ICMmonitor
- Web interface software runs on MWS and is accessible through web browser (locally, or remotely)
- Connection either through LAN or GSM (LTE router)





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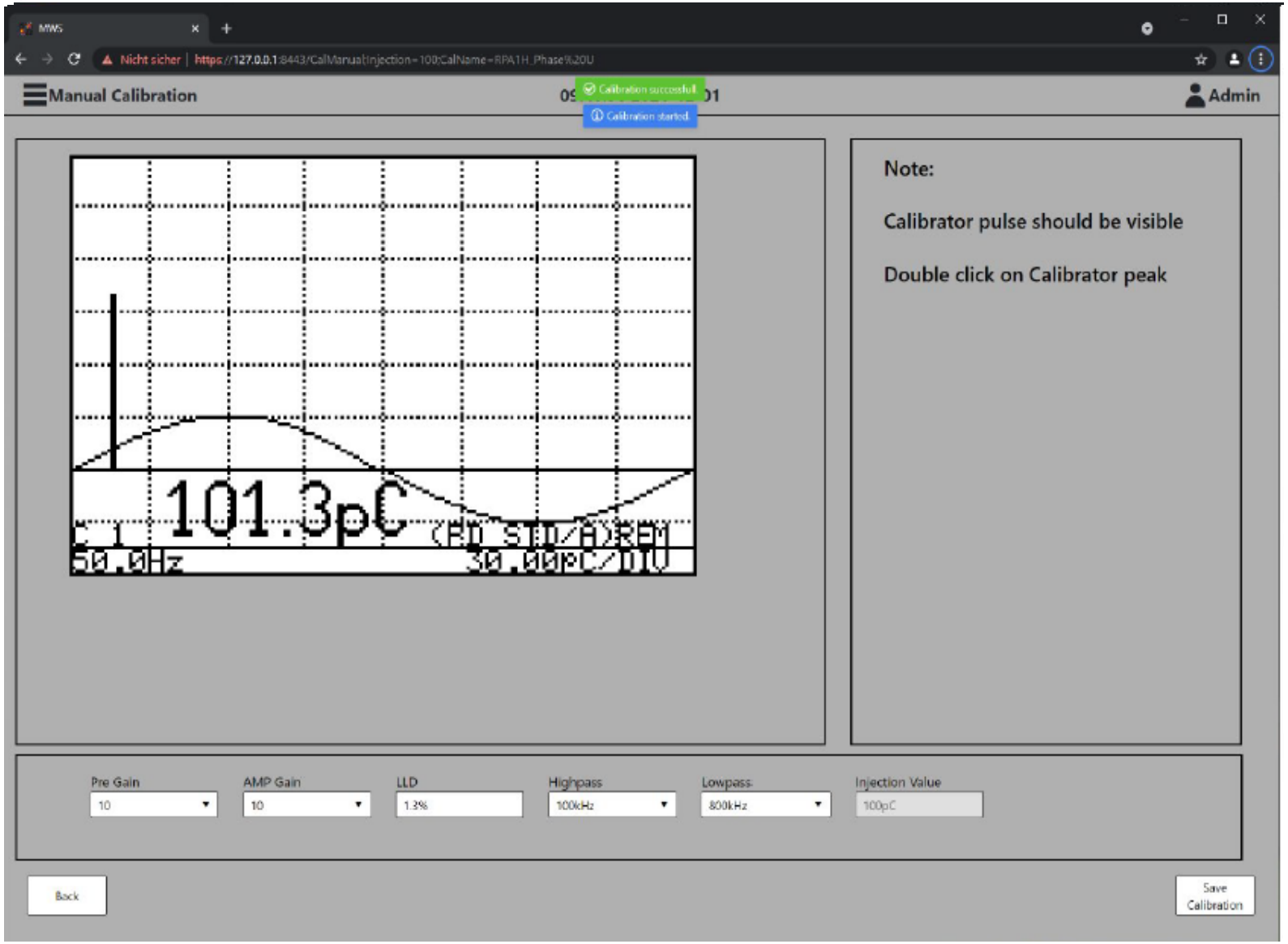
MWS Monitoring Webserver
Webinterface



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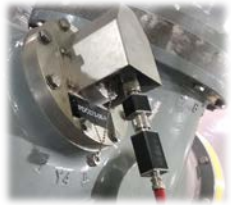
GIS*monitor portable plus*
up to 40 simultaneous channels

UHF

VHF

HFCT

TEV



GIS

Transformers
Cable terminations

Cable terminations

Switchgear

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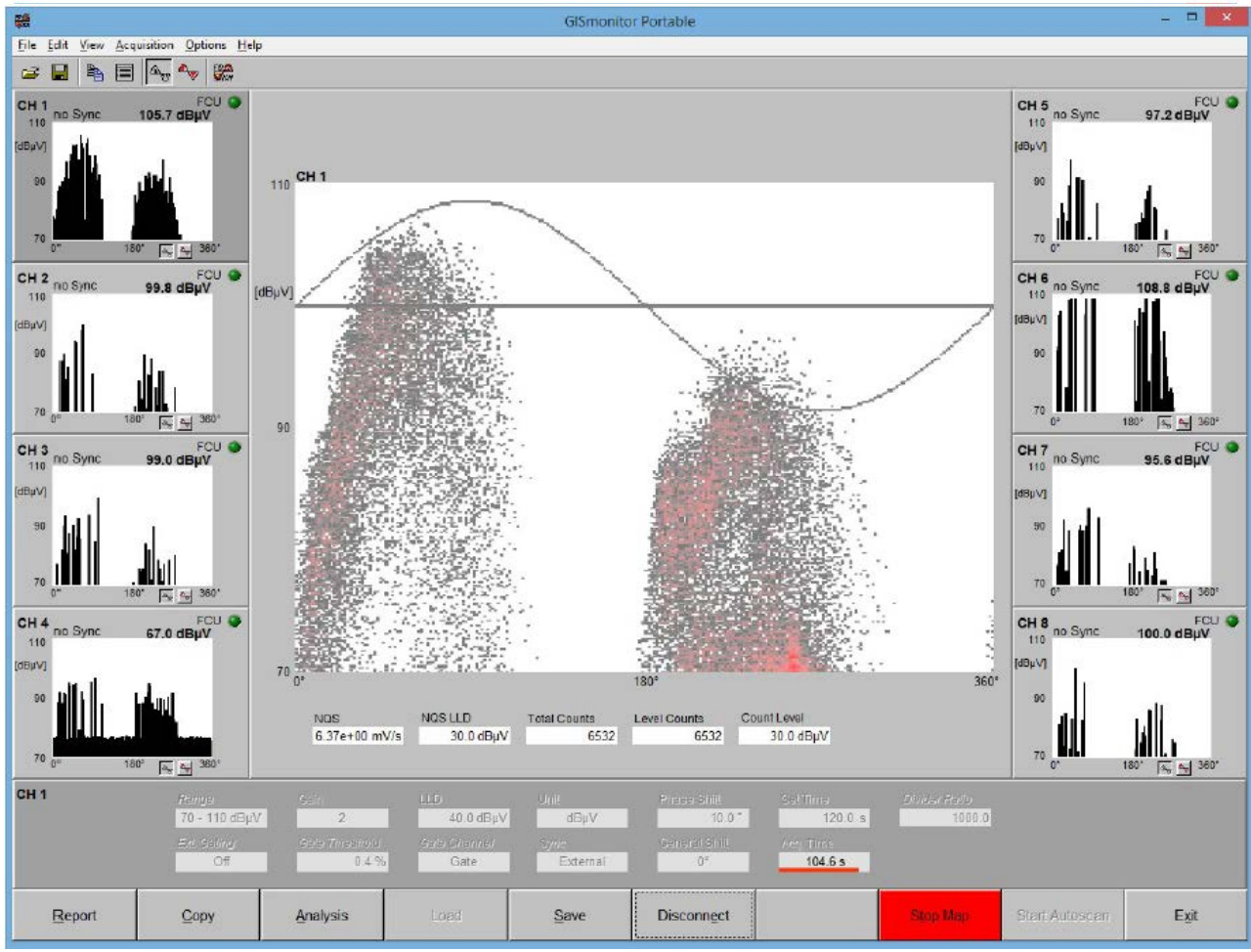
Power Diagnostix Systems

GIS*monitor portable*
8 to 40 simultaneous channels

Features:

- Simultaneous, continuous PD acquisition on all channels
- Intuitive desktop software with 4 main windows: Overview; Live analysis; Historic analysis; Event list
- Optionaly with integrated monitoring server for temporary monitoring, data storage and remote access without a laptop left on site
- Special test panels used for GIS commissioning (standardized test solution by major OEMs):
  - Sensitivity check panel
  - HV test panel



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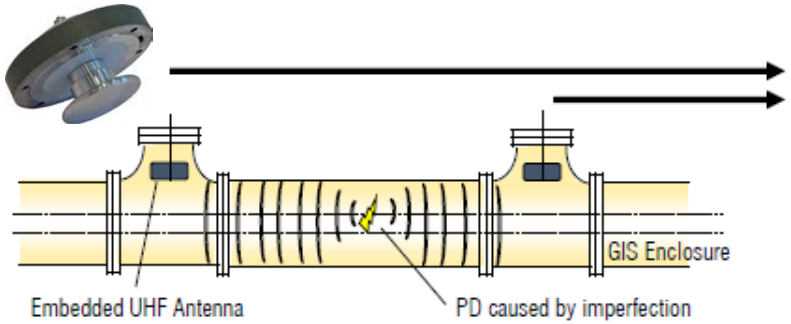
GIS*monitor*
Permanent online PD monitoring of GIS substations



Pre-Processing Units

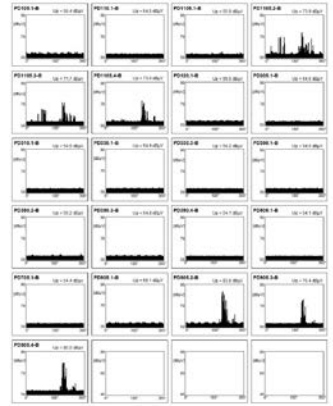
Coaxial Cables

Signal transferred to Acquisition Cabinets (PDMARs)

Fiber Optics

Data transferred to Control Cabinet (PDMCR)

- Unique signal pre-processing concept =>
  - Centralized acquisition rack with up to 120 channels in 1 rack
  - Signal cable length up to 80 meters without signal loss
  - Logarithmic scale for wide input range
- Continuous simultaneous recording of PRPD on all channels
  - in case of PD event continuous full time pre-event history available on all channels
  - comparison of sensors and phases gives pre-location of PD source
- Multiple redundancies integrated (ring network; RAID HD setup, plus separate backup disk; duplicate server power supply)
- More than 20.000 channels installed worldwide



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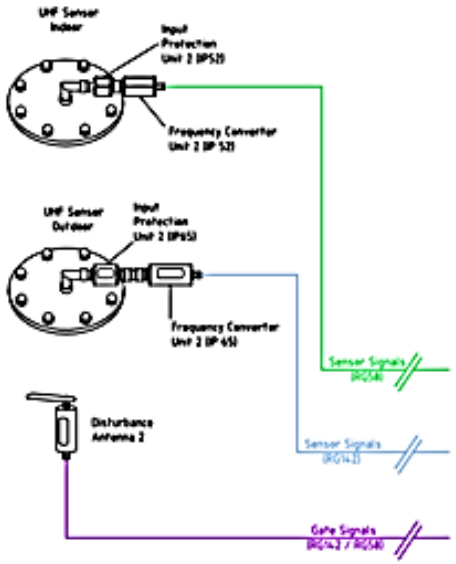
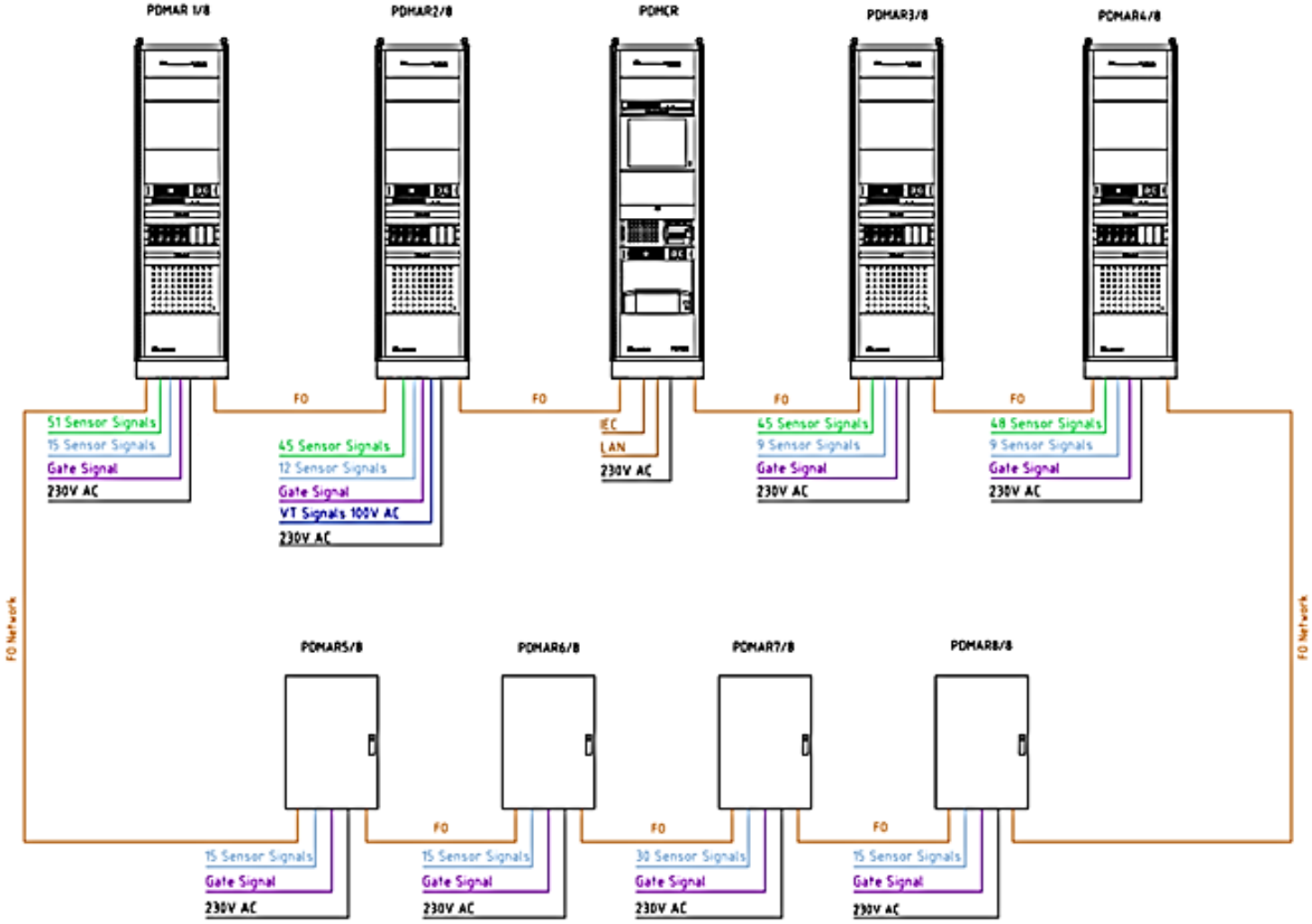
GIS*monitor* – system architecture





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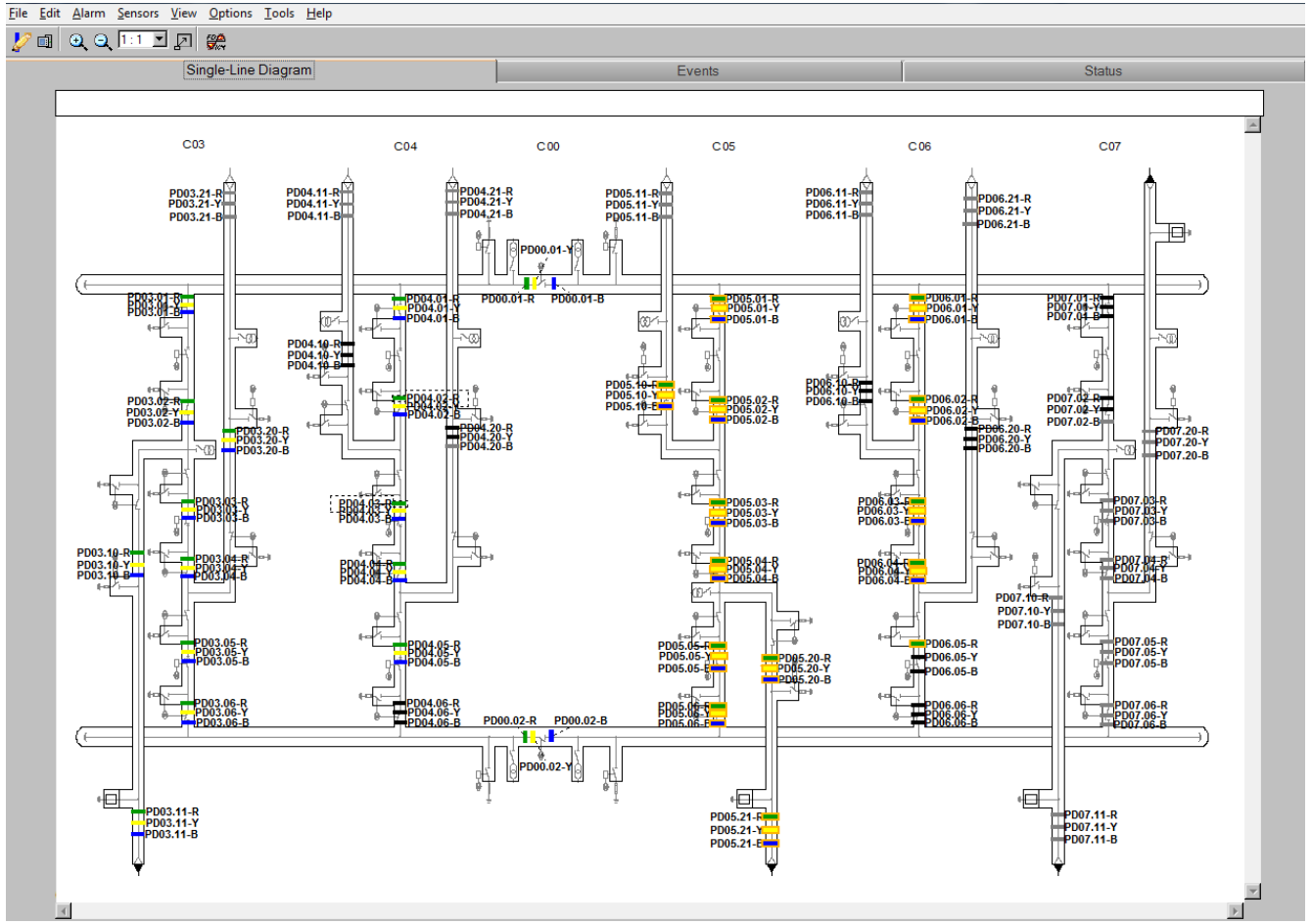
GIS*monitor*- control software impressions



- Customized GIS layout with individual sensor labeling and positioning
- Direct overview about PD activity in GIS and PDMS status

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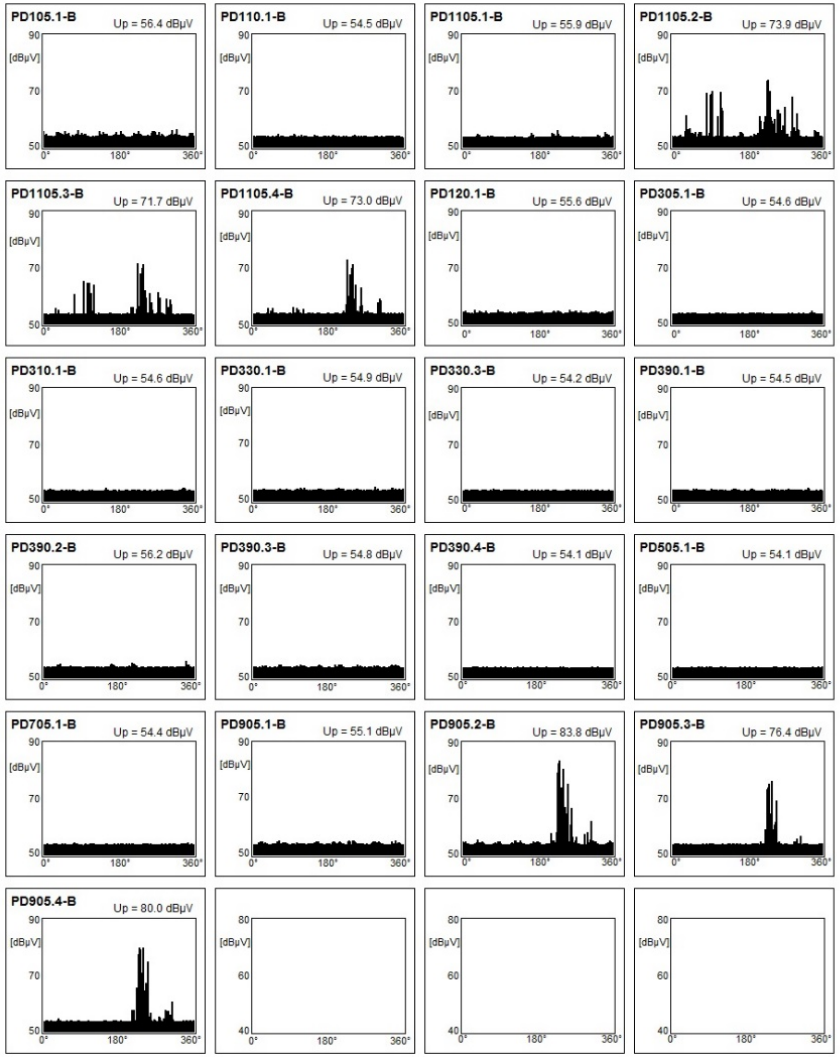
GIS*monitor*- control software impressions



- Live mode for manual operation of software
- Scope view providing instant feedback for up to 24 measurement channels in parallel
- Deeper analysis of PD signals by recording of PRPD
- Gating / LLD / phase shift

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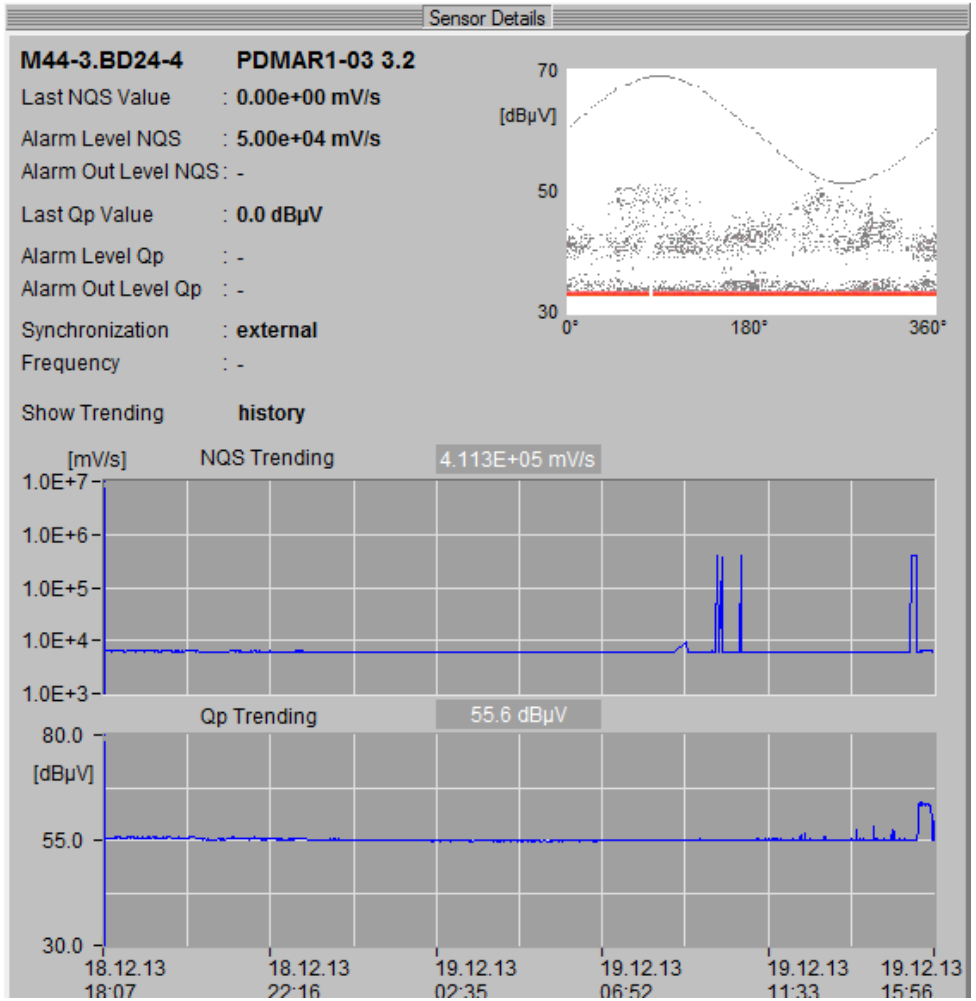
GIS*monitor*- control software impressions



- Detailed data of all sensors
- Current and past measurement data over the lifetime of the system
- Details of alarm configuration and alarm status
- Synchronization

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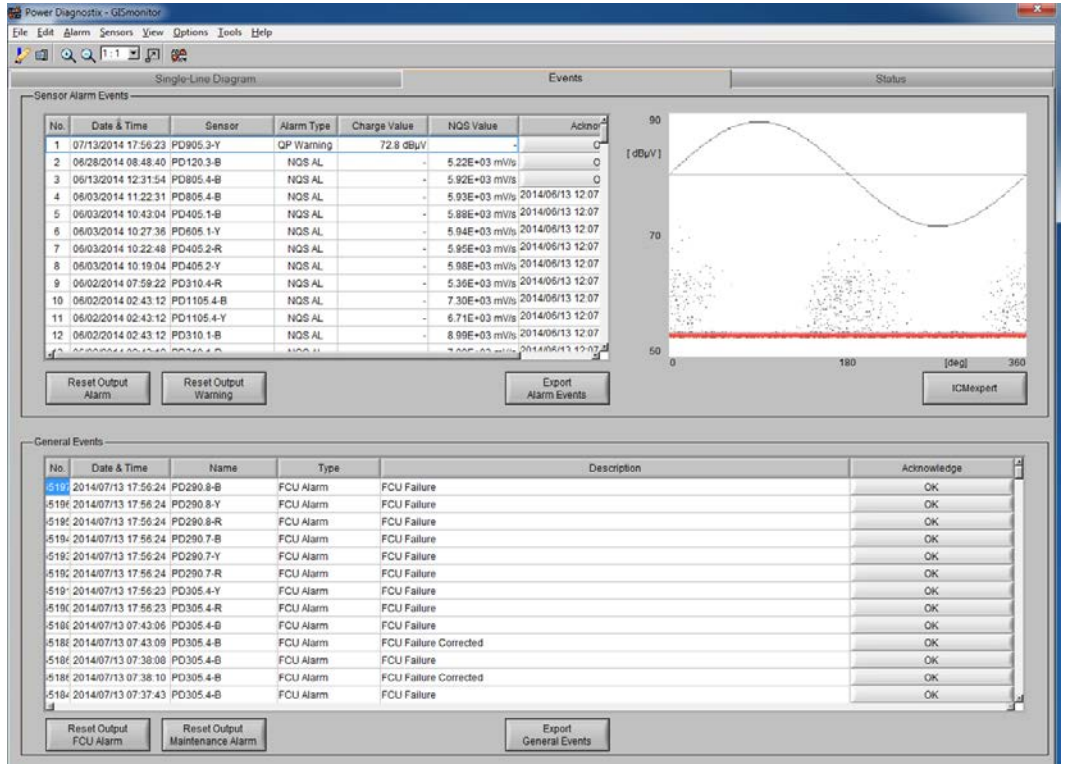
GIS*monitor*- control software impressions



- Detailed alarm event list
  - Date & Time stamp for each entry
  - PRPD for each suspicious measurement
- Detailed general events list
  - Status changes
  - System alarms
  - Detailed logging

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GIS*monitor* – more than 20.000 channels installed worldwide

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GIS*monitor* – performance cetificates

ABB

PERFORMANCE CERTIFICATE

We herewith certify that the Partial Discharge Monitoring System of type GISmonitor and its related accessories and software products have been commissioned and installed successfully at the substation as mentioned below. The system is in service since then and is working properly.

Name of Utility:	DOMNESTI
Name of Substation:	DOMNESTI 400kV
Location of Substation:	Domnesti, Romania
GIS Rated Voltage:	400 kV
Type of GIS:	ABB ELK-3/420
Type of PDM System:	GIS*monitor*
No. of Sensors:	54
Year of Installation:	2019
Installation:	passed
Cigre Sensitivity Test:	passed
Commissioning:	passed
Software test:	passed
Functional test:	passed

29.06.2020
Date, Stamp & Signature

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PERFORMANCE CERTIFICATE

We herewith certify that the partial discharge monitoring system of type GIS*monitor* and all its related accessories and software products have been commissioned and installed successfully at the substation as mentioned below. The system is in service since then and is working properly.

Name of Utility:	Saudi Electricity Company (SEC)
Name of Substation:	AS SAFA 380/132 kV BSP (#9014)
GIS Rated Voltage:	380 kV
Type of GIS:	ELK-03/420
Manufacturer of PDM System:	Power Diagnostix
Type of PDM System:	GIS*monitor*
No. of Channels:	248
Year of Installation:	2015
Installation:	passed
Cigre Sensitivity Test:	passed
Commissioning:	passed
Software test:	passed
Functional test:	passed

Yasser
Stamp & Signature (End User)

Yasser

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If you are interested in more detailed information on any of the presented applications and solutions, don´t hesitate to contact us.

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Thanks for your attention

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