

Data Sheet

MS Pico

Portable Measuring System for Partial Discharge Monitoring

Model: MSP-PIC-v01



CHARACTERISTICS

- ❖ 3x Channels for partial discharge measurement with 14 bit hardware resolution.
- ❖ 1x Channel for voltage reference measurement with 14 bit hardware resolution.
- ❖ 125 MS/s sampling resolution.
- ❖ 60 MHz analog bandwidth.
- ❖ Capture synchronization by means of electrical synchronization input signal or using independent mode.
- ❖ Communication using USB 3.0 SuperSpeed to carry out PD acquisition in 3 minutes
- ❖ Powered with laptop by USB 3.0 + USB-power cable or using AC adaptor.
- ❖ External protection modules against overvoltage in all channels.
- ❖ Equipment light and compact.

DESCRIPTION

The partial discharge measuring equipment MS Pico is capable to do the capture of partial discharge signals and voltage reference signals.

The system allows to configure capture acquisition and to transmit to the control PC the RAW captured signals of the discharge and the voltage reference. It has also functions to generate sine wave signal in order to use and artificial voltage reference during acquisition.

The MS Pico can be controlled from the PC by means of an USB 3.0 connection, to transfer the signals sampled at 125 MS/s or 62.5 MS/s. All the data is processed and interpreted using the BlueBox software *Portable PD Monitoring System*.

Synchronized acquisition can be done using CSS-GPS module. Partial discharge captured with GPS synchronization are compatible with other products like MS Plus Portable to be analyzed together with localization tool of BlueBOX software.

To do PD measurements synchronized with the CSS-GPS or with the independent mode, it is necessary that at least exist the analysis of one synchronized voltage reference channel to obtain the frequency parameters and offset that allow to place the discharge in the phase resolved PD pattern. To do this, the voltage reference can be obtained using a current probe (Pico model TA326).

FRONT AND REAR PANEL ELEMENTS



1	PD1 Partial discharge channel
2	PD2 Partial discharge channel
3	PD3 Partial discharge channel
4	VR Voltage reference channel
5	Ext Input trigger channel
6	Gen Signal generator
7	Ground screw connection
8	USB 3.0 communication and power port
9	5 V _{DC} power supply input

DIMENSIONS



Dimensions in mm

TECHNICAL SPECIFICATIONS

Partial discharge measuring channels	
Input connector	BNC female
Input impedance	1M Ω
Coupling	AC
Configurable voltage range	From ± 10 mV to ± 20 V
Vertical resolution	14 bits
Bandwidth	0 - 60 MHz
Sampling rate	125 MS/s or 62.5 MS/s
Memory depth	32 MS per channel
Voltage reference measurement channel	
Input connector	BNC female
Input impedance	1M Ω
Coupling	AC
Configurable voltage range	From ± 10 mV to ± 20 V
Vertical resolution	14 bits
Bandwidth	0 - 60 MHz
Sampling rate	100 kS/s
Memory depth	32 MS per channel
External protection module for PD channels	
Overvoltage protection	90 V (DC+AC peak)
Analog filter	High-pass of 16 kHz
Impedance adaptation	50 Ω
External protection module for VR channel	
Overvoltage protection	90 V (DC+AC peak)
Analog filter	Low-pass of 16 kHz
Impedance adaptation	50 Ω
External trigger input	
Input connector	BNC female
Input impedance	1M Ω
Coupling	DC
Trigger types	Edge, pulse width, dropout, interval, logic
Threshold range	± 5 V DC coupled
Threshold range accuracy	$\pm 1\%$ on full scale
Sensitivity	200 mV peak to peak
Overvoltage protection	± 100 V (DC+AC peak)

Function generator	
Output connector	BNC female
Output impedance	50 Ω
Output signal	Sine
Signal frequency	0.025 Hz to 20 MHz
Frequency resolution	< 0.025 Hz
Output voltage	± 2 V
Amplitude flatness	< 1.5 dB to 20 MHz, typical
DC accuracy	$\pm 1\%$ of full scale
Input supply	
Power requirements	Powered by USB 3.0 + second DC power connection obtained from AC adaptor or USB power cable supplied.
Consumption	6W
General	
PC connectivity and requirements	USB 3.0 SuperSpeed (USB 2.0 compatible with slower performance)
Box dimensions + connectors	190 x 170 x 40 mm
Weight	< 0.5 kg
Storage temperature	From -20°C to 60° C
Operation temperature	From 0 to 40 °C, 15 to 30 °C for quoted accuracy after 1 hour warm-up
Humidity range	Operating: 5 to 80 %RH non-condensing
Environment	Up to 2000 m altitude and EN61010 pollution degree 2
Safety approvals	Designed to EN 61010-1:2010
EMC approvals	Tested to EN61326-1:2013 and FCC Part 15 Subpart B
Environmental approvals	RoHS and WEEE compliant

PROTECTION MODULES

Each of the MS Pico equipment includes a set of protections for the measurement channels composed of four units. There are two types: one for the channels PD1 PD2 and PD3 (marked as PD) and another for the reference measurement channel VR (also marked as VR). The PD protection includes inside a high-pass filter of 16 kHz and the VR protection a low-pass filter of 40 kHz. Both offer protection against overvoltage up to 90 V (DC + AC peak).

Each of these modules is inserted directly into the channels using the male BNC connection. The cable from the measurement sensors is connected to the female BNC end.



POWER CONNECTION

MS Pico equipment can be powered with 5 V_{DC} in two different ways:

- | | |
|-----------------|------------------|
| <u>Option 1</u> | USB-power cable. |
| <u>Option 2</u> | AC adapter. |



VOLTAGE REFERENCE ACQUISITION

The measurement equipment MS Pico needs to take reference voltage measurement on channel VR to be able to perform the identification of physical phenomena of partial discharge. Three different options to do it are presented below:

- Low voltage reference signal from installation:
This low voltage AC signal must be obtained from the installation using a low voltage signal that not exceed 90 V peak (for example from measuring transformer in substation). It is necessary to use an auxiliary transformer that provides galvanic isolation between the low voltage connection of the installation and the Ms Pico equipment.
- Using current sensor supplied with MS Pico:
Signal can be obtained installing Rogowski sensor over HV cable or over grounding cable where PD sensors are installed.
- Using the function generator output:
In the case of not being able to use any of the first two options, there is the possibility of using the signal generator output of the MS Pico during short measurements. To do this, the output of the function generator is connected to the VR channel input using a BNC cable.



Note: It is important for cases a) and b) to use the VR protection module.

SOFTWARE

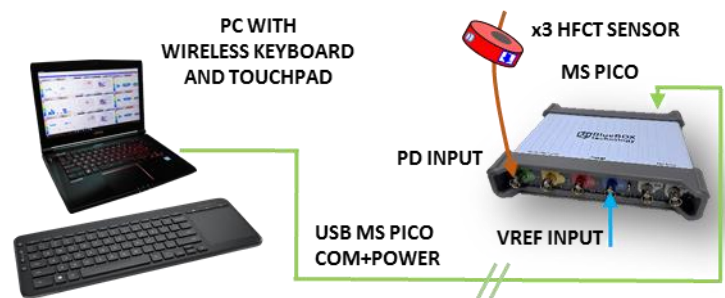
The measurement equipment MS Pico uses the control software provided by DIAEL to be functional. The computer employed to monitoring must satisfy the minimum requirements, which are detailed in the user manual of the software *Portable PD Monitor*. In order to reach the maximum measurement speed it is recommended to acquire a laptop with the highest performance available.

MODES OF OPERATION

a) Independent measurement

The system takes partial discharge captures using its own time reference.

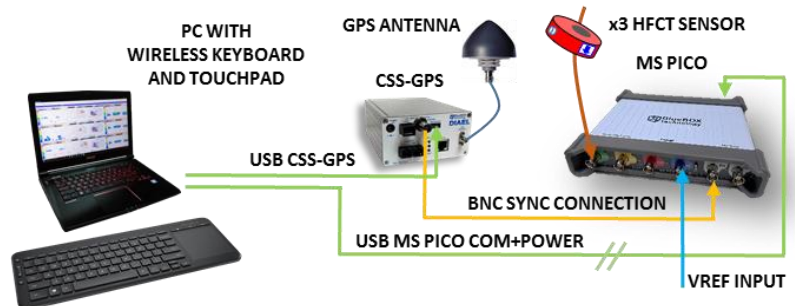
The voltage reference signal can be obtained using one of the three methods described previously.



b) GPS synchronization measurement

The system takes partial discharge captures using GPS time reference. It is useful for synchronized measurements in time between different measuring equipment.

The voltage reference signal can be obtained using one of the three methods described previously.



GENERIC SOLUTION

A unique and optimized solution consisting of an MS Pico and 3 high frequency current transformers (HFCT) sensors. This solution allows a single operator to diagnose the insulation condition of cables, substations, power transformers and generators.

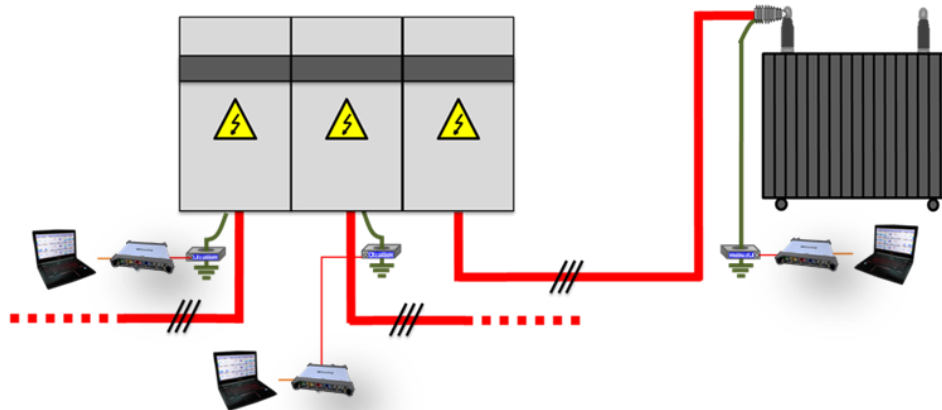
Components

- 1 x MS Pico
- 3 x HFCT Sensor
- 1 x Pulse Calibrator
- 1 x Control Unit (Laptop)
- 1 x Software License

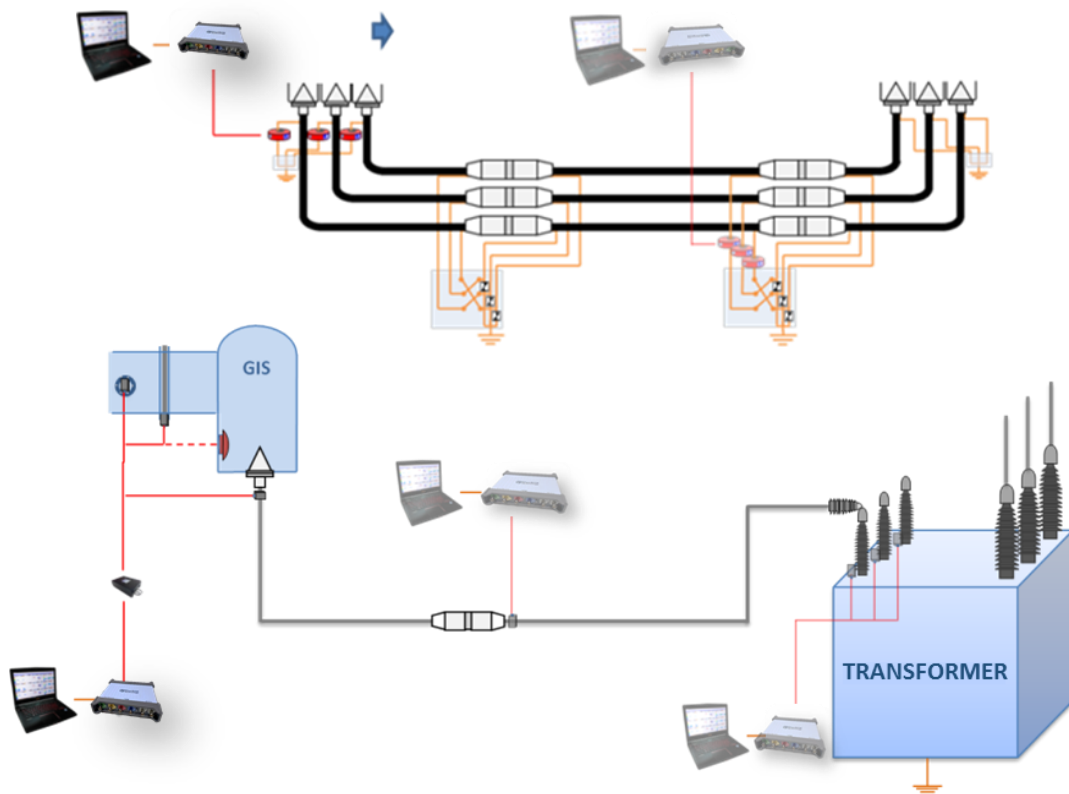


APPLICATION EXAMPLES

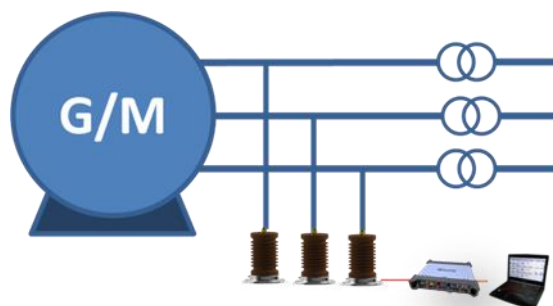
a) PD measuring in medium voltage grids



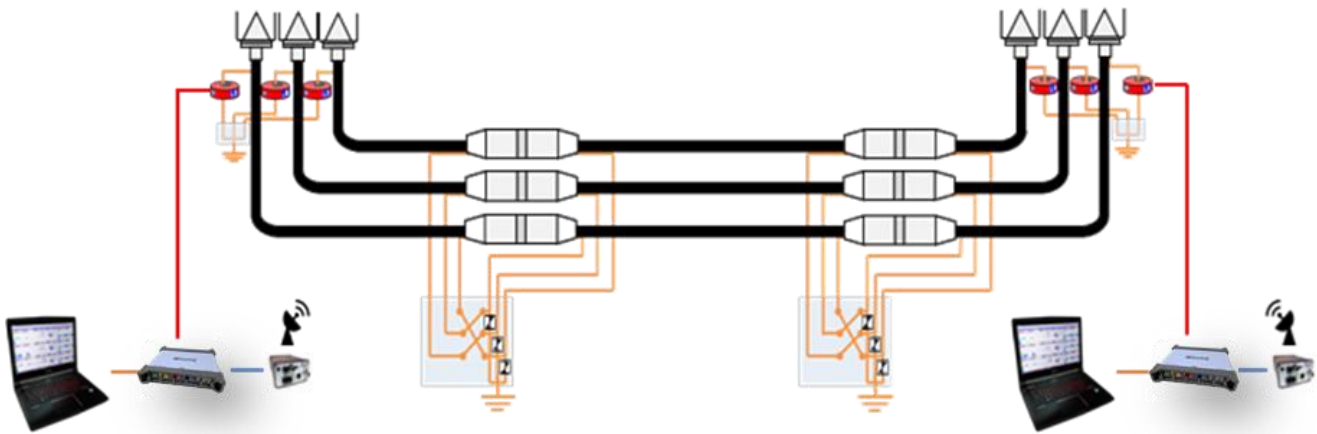
b) PD measuring in high voltage grids



c) PD measuring in motors and generators



d) PD GPS synchronized measuring



SAFETY RECOMMENDATIONS

For any handling of the equipment, be sure to connect the equipment ground to the general ground before making any other connection. To do any type of interconnection between elements it is mandatory the use of insulated gloves, specific for the proper voltage.



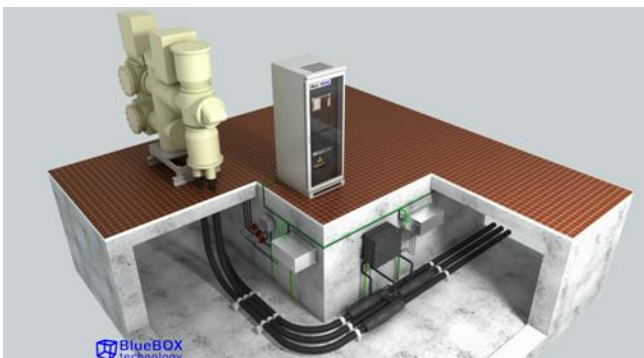
Due to the USB connection with the control PC computer, and due to the loss of galvanic isolation, it is necessary to use a wireless keyboard to prevent electrical hazard to the user while installed sensor are connected to MS Pico.

Always use the protection modules included with the MS Pico equipment kit for measurements, otherwise it can result in permanent damage to the equipment.

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