

# Data Sheet

## MS Plus

### Measuring System for On-line Partial Discharges Monitoring

Models: MEP-MS2 v02 version with multimode fiber  
MEP-MS3 v02 version with single mode fiber



#### CHARACTERISTICS

- ❖ 4x Channels for partial discharge measurement with 10/12/14 bit of resolution to 100 Msp.
- ❖ 1x Channel for voltage reference measurement with 10/12/14 bit of resolution to 100 Msp (using only 3x PD channels by selection in the front).
- ❖ Capture synchronization by means of optical synchronization input signal of internal synchronization signal.
- ❖ Output of repetition of synchronization optical pulse.
- ❖ Communication 10/100 Fast Ethernet for multimode version and Gigabit Ethernet for single mode version, by RJ45 connection and 2x optical fiber.
- ❖ Selectable power input for 110-220V 50-60Hz and for +12V<sub>DC</sub>.
- ❖ Power output of +12V<sub>DC</sub> filtered to power UHF-HF converter.
- ❖ Protection systems against overvoltages in all channels.
- ❖ Protection fuse for voltage reference channel.
- ❖ External indicators of operation and network connection by optical ports.
- ❖ Handles in the front.
- ❖ Equipment robust and compact.
- ❖ Temperature sensor in the plate and temperature sensor in the housing.

## DESCRIPTION

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

It has functions to configure the armed with synchronization, or by optical fiber synchronization input signal or by forced internal synchronization. The system allows to transmit to the central control PC (CAS) the RAW captured signals of the discharges and the voltage reference.

This system can be controlled from the PC by means of an Ethernet network connection through any of the three available ports (1 electric and 2 optic).

The MS Plus is designed to operate in a dedicated network with an available bandwidth of 100Mbps, and can reach 1000Mbps in its single mode version. It can be installed in series with other MS Plus to make a monitoring with multiple measuring points.

The way to synchronize the measuring system network can be by means of a synchronization system CSS-VR, by a CSS-GPS system or by using its own synchronization function when this MS is placed in the header of the optical fiber synchronization network.

To do PD measurements synchronized with the CSS-GPS or with the synchronization generated internally 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 discharges in the phase resolved PD pattern.

## FRONT PANEL ELEMENTS



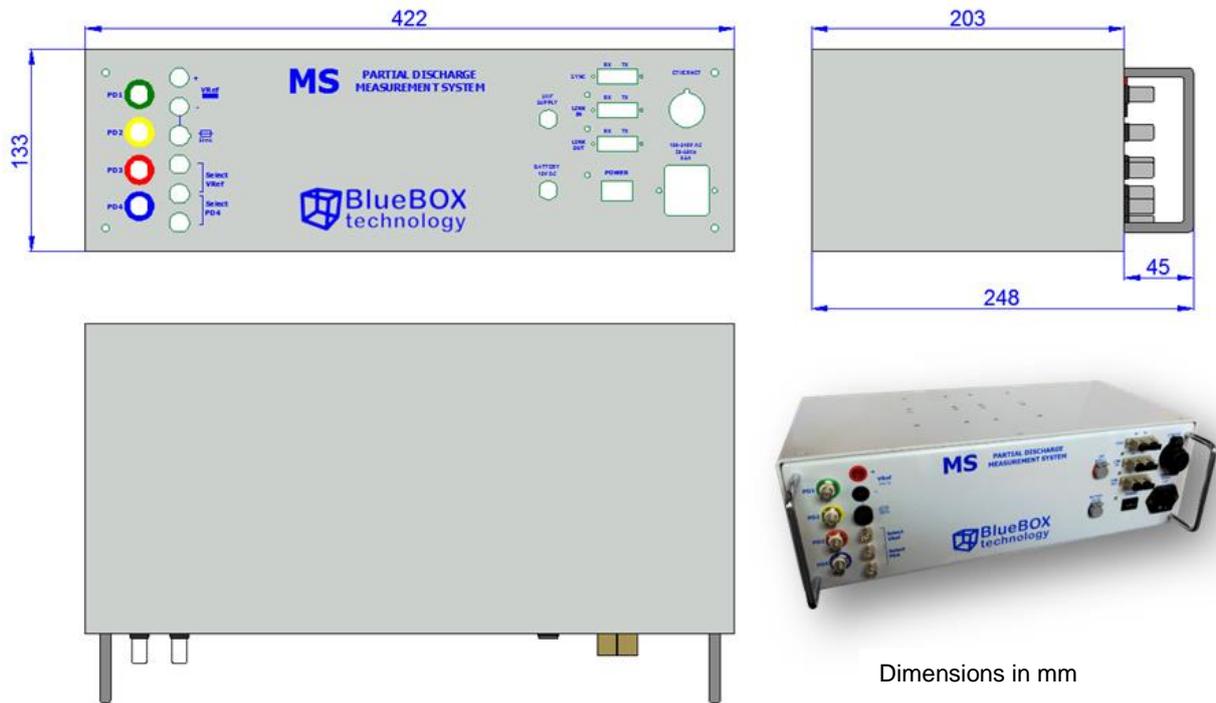
1	4x Channels for partial discharges
2	Channel for voltage reference
3	Fuse holder for voltage reference
4	Function selector for 4th channel DP/VR
5	Output supply of 12V DC for UHF-HF converter
6	Input supply of +12V DC
7	Fiber optic transmitter and receiver for synchronization using SC connector in multimode version or LC connector in single mode version
8	2x Emitter and receiver for fiber optic network link using SC connectors in multimode version or LC connectors in single mode version, and light indicators of linking
9	Selector for power type (AC/DC) and light indicator of operation
10	Network connector by copper cable
11	Input supply of 110-220V <sub>AC</sub> 50-60Hz

## TECHNICAL SPECIFICATIONS

Partial discharges measuring channels	
Input connector	BNC female
Input impedance	50Ω
Coupling	AC
Configurable voltage range	From ±20mV to ±20V
Vertical resolution	10/12/14 bits
Peak Detection Bandwidth	0 - 50 MHz
Sampling rate	100 MS/s
Memory depth	2 MS per channel
Overvoltage protection	Passive and active controlled by software
Analog filters	Enabled by software: - High-pass of 16 kHz - Bandpass of 1 MHz - 35 MHz
Channels for voltage reference measurement	
Input connector	Female banana (red and black)
Input impedance	4,2 kΩ
Coupling	AC
Configurable voltage range	From ±60mV to ±400V
Vertical resolution	10/12/14 bits
Bandwidth	0 – 1MHz
Sampling rate	100 MS/s
Memory depth	2 MS
Overvoltage protection	Fuse 500mA
Trigger function	
Trigger condition	Trigger manual or optical reception of the synchronization signal
Trigger generation	Control ON and OFF of signal of optical synchronization emission by software
System general functions	
Analog power control	Shut down by recorder's software
Positioning reading	Orientation sensors
Housing	
Box dimensions + connectors	422 x 250 x 132 mm
Weight	6,1 kg
IP code	IP52
Temperature ranges	
Storage temperature	From -20°C to 70° C
Operation temperature	From -15°C to 40°C
Temperature sensors	Temperature sensors in plate and in housing
Network control functions	
IP configuration control	Static IP (factory programmed)
Reception of control orders	TCP 1000
Functions of network capture	
Recorders IP configuration	Dynamic IP (editable)
Reception of control orders	TCP 53270 (editable)

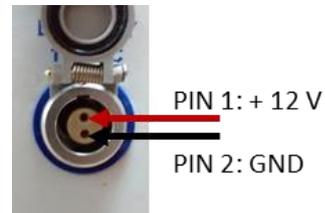
Communication by network cable	
Connector type	RJ-45 IP65
Communication protocol	<ul style="list-style-type: none"> <li>• IEEE 802.3 (Multimode)</li> <li>• IEEE 802.3, 802.3u, 802.3x (Single mode)</li> </ul>
Speed	<ul style="list-style-type: none"> <li>• 10/100 BaseFX (Multimode)</li> <li>• 1000 BaseEX (Single mode)</li> </ul>
Type of cable	RJ-45 8 pin
Communication by optical fiber	
Connector type	<ul style="list-style-type: none"> <li>• SC (Multimode)</li> <li>• LC (Single mode)</li> </ul>
Communication protocol	<ul style="list-style-type: none"> <li>• IEEE 802.3 (Multimode)</li> <li>• IEEE 802.3, 802.3u, 802.3x (Single mode)</li> </ul>
Speed	<ul style="list-style-type: none"> <li>• 10/100 BaseFX (Multimode)</li> <li>• 1000 BaseEX (Single mode)</li> </ul>
Type of fiber	<ul style="list-style-type: none"> <li>• Multimode 50/125 μm, 62,5/125 μm, 100/140 μm 200 μm</li> <li>• Single mode 8-10/125 μm</li> </ul>
Indicators	Link LED in panel
Input of optical fiber synchronization	
Connector type	<ul style="list-style-type: none"> <li>• SC (Multimode)</li> <li>• LC (Single mode)</li> </ul>
Wavelength	<ul style="list-style-type: none"> <li>• 850 nm (Multimodo)</li> <li>• 1310 nm (Single mode)</li> </ul>
Type of fiber	<ul style="list-style-type: none"> <li>• Multimode 50/125 μm, 62,5/125 μm, 100/140 μm 200 μm</li> <li>• Single mode 8-10/125 μm</li> </ul>
Output of repetition of optical fiber synchronization	
Connector type	<ul style="list-style-type: none"> <li>• SC (Multimode)</li> <li>• LC (Single mode)</li> </ul>
Wavelength	<ul style="list-style-type: none"> <li>• 850 nm (Multimodo)</li> <li>• 1310 nm (Single mode)</li> </ul>
Type of fiber	<ul style="list-style-type: none"> <li>• Multimode 50/125 μm, 62,5/125 μm, 100/140 μm 200 μm</li> <li>• Single mode 8-10/125 μm</li> </ul>
Reach	<ul style="list-style-type: none"> <li>• 2,5 km (Multimode)</li> <li>• 20 km (Single mode)</li> </ul>
Optical power	<ul style="list-style-type: none"> <li>• 0,17 mW (for 1m multimode fiber)</li> <li>• 1 mW (total inserted in single mode fiber)</li> </ul>
Pulse distortion (multimode)	< 1 ns
Data rate (single mode)	500 Msps
Return loss (single mode)	12 dB
Total Jitter (single mode)	266 ps
Input supply	
Connector type +12V	G11L0C-P02LPH0-0000
Voltage level +12V	+12V DC
Connector type 110-230V	IEC 13
Voltage level 110-230V	110-240V (50-60Hz) AC
Consumption	<ul style="list-style-type: none"> <li>• 25 W (multimodo)</li> <li>• 30 W (single mode)</li> </ul>
Indicators	LED of power in panel
Output supply UHF-HF converter	
Connector type	G11L0C-P02LPH0-0000
Voltage level	+12V DC

## DIMENSIONS



## OUTPUT SUPPLY FOR UHF-HF CONVERTER

The MS Plus can supply power to the UHF-HF converter designed by DIAEL with its own power. To make the connection with the converter it must be used the proper cable between the connector G11L0C-P02LPH0-0000 of the front panel and the converter.



## POWER CONNECTION

The MS Plus equipment can be powered in two different ways:

### a) Power to 12V DC

To power the MS Plus with 12 Vdc it must be used the connector G11L0C-P02LPH0-0000, using the pins 1 and 2 for +12V and GND respectively. The manufacturer code of the three pieces of the male connector are:

- ODU S21L0C-P02PPL0-520S
- ODU 701.022.117.315.004
- ODU 701.023.202.965.040



### b) Power to 110-240V AC

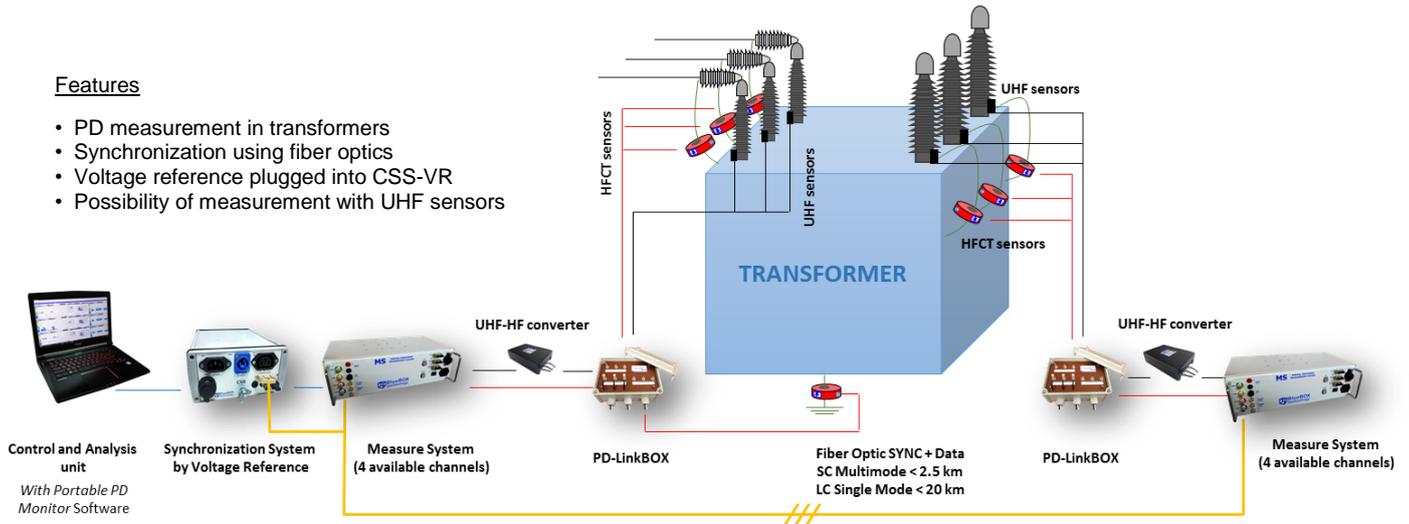
To power the MS Plus with 110-230 Vac it must be used the connector IEC 13.



## MS PLUS IN TRANSFORMERS

### Features

- PD measurement in transformers
- Synchronization using fiber optics
- Voltage reference plugged into CSS-VR
- Possibility of measurement with UHF sensors



### Applications:

Acceptance and predictive maintenance of transformers

- Temporary Monitoring Service (SMT) – Days
- On-Point Monitoring Service (SMP) - Hours

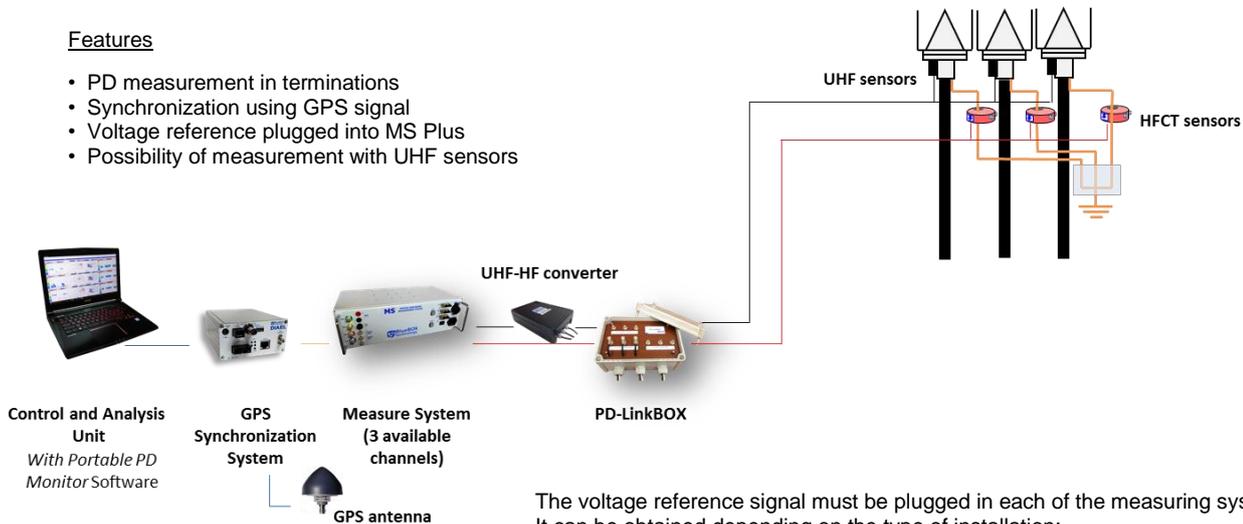
The voltage reference signal must be plugged in each of the measuring system. It can be obtained depending on the type of installation:

- |  |   |
|--|---|
| <p>a) With local generator from the substation:</p> <ul style="list-style-type: none"> <li>• Voltage transformer</li> <li>• Auxiliary services transformer</li> <li>• Clamp Ammeter</li> </ul> | <p>b) With portable generator (generator set) or external generator (ACR generator):</p> <ul style="list-style-type: none"> <li>• Low voltage output from generator</li> <li>• Measuring cuadripole connected to coupling capacitor</li> <li>• Clamp Ammeter</li> </ul> |
|--|---|

## MS PLUS IN TERMINATION SYSTEMS

### Features

- PD measurement in terminations
- Synchronization using GPS signal
- Voltage reference plugged into MS Plus
- Possibility of measurement with UHF sensors



### Applications:

Acceptance and predictive maintenance of terminations

- Temporary Monitoring Service (SMT) – Days
- On-Point Monitoring Service (SMP) - Hours

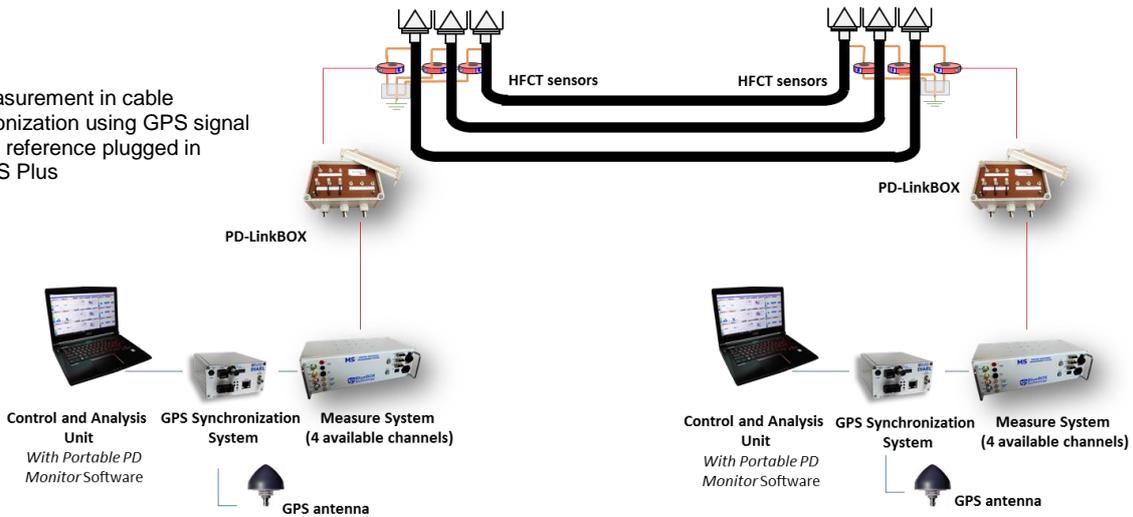
The voltage reference signal must be plugged in each of the measuring system. It can be obtained depending on the type of installation:

- |  |  |
|--|--|
| <p>b) With local generator from the substation:</p> <ul style="list-style-type: none"> <li>• Voltage transformer</li> <li>• Auxiliary services transformer</li> <li>• Clamp Ammeter</li> </ul> | <p>c) With portable generator (generator set) or external generator (ACR generator):</p> <ul style="list-style-type: none"> <li>• Low voltage output from generator</li> <li>• Measuring cuadripole connected to coupling capacitor.</li> <li>• Clamp Ammeter</li> </ul> |
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## MS PLUS IN CABLE SYSTEMS

**Features**

- PD measurement in cable
- Synchronization using GPS signal
- Voltage reference plugged in each MS Plus



**Applications:**

Acceptance and predictive maintenance on cable systems

- Temporary Monitoring Service (SMT) – Days
- On-Point Monitoring Service (SMP) - Hours

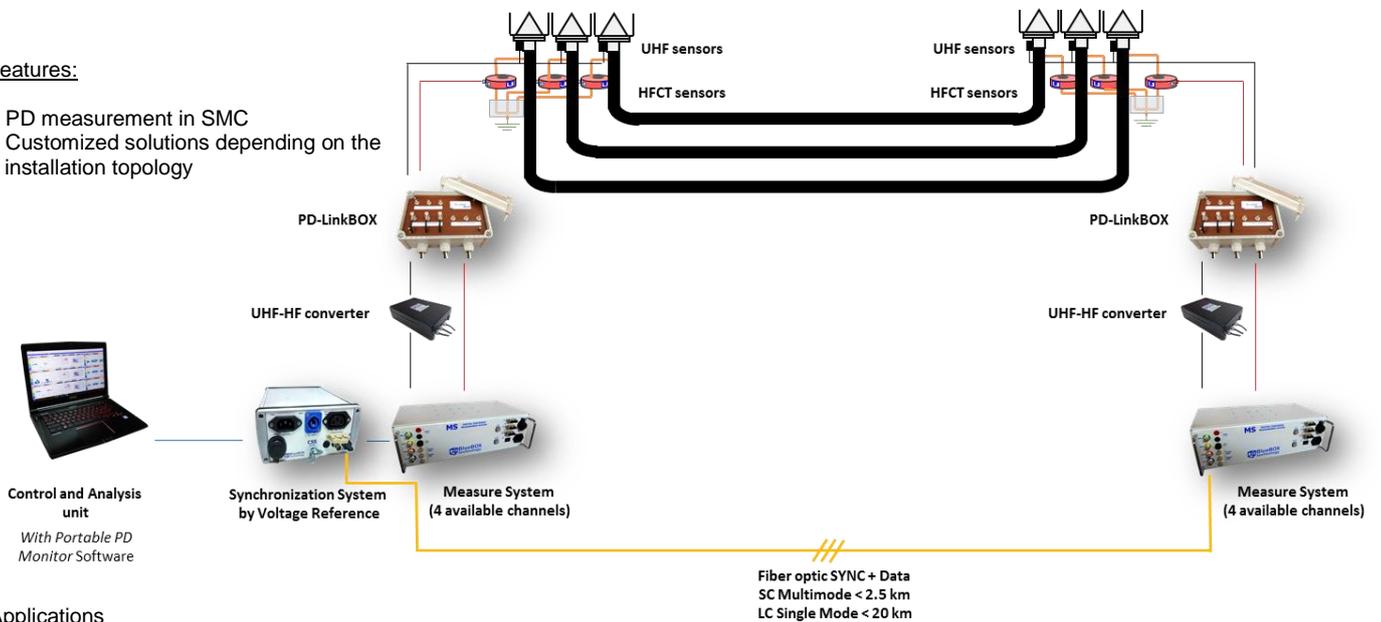
The voltage reference signal must be plugged in each of the measuring system. It can be obtained depending on the type of installation:

- |  |  |
|--|--|
| <p>a) With local generator from the substation:</p> <ul style="list-style-type: none"> <li>• Voltage transformer</li> <li>• Auxiliary services transformer</li> <li>• Clamp Ammeter</li> </ul> | <p>b) With portable generator (generator set) or external generator (ACR generator):</p> <ul style="list-style-type: none"> <li>• Low voltage output from generator</li> <li>• Measuring cuadripole connected to coupling capacitor.</li> <li>• Clamp Ammeter</li> </ul> |
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## MS PLUS IN CONTINUOUS MONITORING SYSTEM

**Features:**

- PD measurement in SMC
- Customized solutions depending on the installation topology



**Applications**

Maintenance and revision of lines

- Continuous monitoring system (SMC) – Months-years

## **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.

To use the connection RJ45 connected to a PC should be taken the necessary precautions so that, there is no electrical hazard to the user. The network connector does not provide sufficient electrical insulation for overvoltages that could get through the measurement channels.

It is advisable to keep the optical fibers connectors, both for communication and synchronization, covered during their storage. The dust accumulation in these connectors could cause failures in the system due to optical signal losses.

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## Contact



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