HORSTMANN
GERMANY

Instructions for Use

Wega PD

104101-5528V2
EN
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Contents

General notes

Before using this device, carefully read and understand the contents of this document and keep it for future reference.

The content reflects the most accurate information at the date of printing. We reserve the right to make technical changes at any time and without prior notice as necessary in the framework of on-going developments. This release of the document becomes invalid when a new issue of this document is released.

Installation, connection and commissioning of the devices must be carried out by an electrician observing the "Five Safety Rules" according to DIN VDE 0105 (EN 50110).

Important terms

The following defined terms must be understood by the operator of this device. Failure to observe, recognise and act accordingly may impact the safety of the operator and/or the operable life of this device and/or connected devices/equipment.

DANGER

... indicates a hazardous situation which, if not avoided, could lead to death or serious injury.

WARNING

... indicates a hazardous situation which, if not avoided, may lead to death or serious injury.

CAUTION

... indicates a hazardous situation which, if not avoided, may lead to wounds and minor injuries.

NOTICE

... is used for application purposes and does not refer to personal injuries.

CE Declaration of conformity

This device complies with the requirements of all applicable EU directives in the currently valid version.
If required, the CE Declaration of Conformity may be obtained from the following address:

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General safety notes

DANGER

- Only electrically skilled or instructed persons may install the integrated voltage presence indication system Wega PD and use them to detect the presence or absence of voltage.
- When installing the device, the ‘Five Safety Rules‘ of electrical engineering as defined by the standard DIN VDE 0105 (EN 50110) must be observed:
  - Disconnect compeletely
  - Verify that the installation is dead
  - Carry out earthing and short-circuiting
  - Provide protection against all adjacent live parts
- For a reliable and safe ‘voltage present’ indication according to IEC 61243-5 and IEC 62271-213, it must be ensured that the Wega is only used within its rated voltage and frequency and that it has been matched with the entire system.
- The Wega is a part of the entire voltage detecting system (incl. cable and e.g. coupling capacitance), meaning that the system manufacturer or operator is responsible for the correct interpretation and thus the function of the entire voltage detection system.
- The system manufacturer specifies the rated voltage of the switchgear and the permissible nominal or nominal voltage range, which must also be considered for the voltage testing system.
- Verify the absence of voltage at all poles before accessing the high voltage parts.
- The Wega is used to detect and indicate the presence or absence of operating voltage. It is not intended to distinguish between voltage not present (i.e. V < 10 % of nominal voltage) and dead circuit state (i.e. V = 0 V).
- Damaged devices which do not have a guaranteed level of functional efficiency or safety, or which do not have clearly legible labels must not be used.
- The user is obliged to check that the device is in a faultless condition prior to each use.
- Wega may only be used for the purpose for which it has been designed as described in the present Instructions for Use.
- Any warranty claim is void in the case of damages caused by non-observance of this Instructions for Use. Horstmann GmbH is not liable for any consequential damage arising from or relating to this non-observance.
- Only use the integrated voltage detecting systems Wega for indoor applications.

CAUTION

- In the case of adverse lighting conditions the visual display should be either darkened or illuminated additionally.
- Store and transport the integrated voltage detecting system Wega PD in a clean and dry place. All damages are to be avoided.

NOTICE

- When performing cable tests or DC tests on switchgear or cable sections equipped with a Wega, we recommend short-circuiting the measuring sockets with the earth socket if the triple line-to-earth operating voltage is exceeded. The short-circuiting can be done via short laboratory cables (max. 25 cm) or alternatively with the 4-pole Wega short-circuit plug (part no. 51-9904-001).
- With correct C2 design of the Wega and exceeding the triple line-to-earth operating voltage (measuring voltage > 60 V), it can be assumed that internal surge arresters in the Wega will ignite to protect the electronics. The ignition of the surge arresters in cable tests can be prevented by earthing the measuring sockets.

1 Intended use

The Wega is an integrated voltage detecting system. The device determines and displays the operating conditions of the medium-voltage systems according to EN 50110-1.

The Wega complies with the requirements for Voltage Detecting and Indicating Systems (VDIS) in accordance with IEC 62271-213. The voltage detecting systems are capacitively coupled to live parts. Additionally, the Wega is equipped with partial discharge monitoring, which detects increases in partial discharges as an indication of developing insulation faults and transmits this information via a relay for early fault detection.

2 Device description

2.1 Scope of delivery

Complete Wega unit:

- Wega PD voltage detecting system (base type).
- Instructions for Use
- Optional:
  - 1 set of connection leads (prefabrication according to agreement)
  - For any additional accessories, see product catalogue

NOTICE

Requires perfectly coordinated components:

- Coupling capacitor (on the side of the switchgear) either in a bushing or a post-type insulator.
- Connection leads between the Wega and the coupling capacitor.

The switchgear manufacturer or operator is responsible for the proper coordination of the system.

2.2 System structure

The Wega is part of an integrated voltage detecting and indication system in accordance with IEC 62271-213. The drawing below shows the Wega within the complete system.

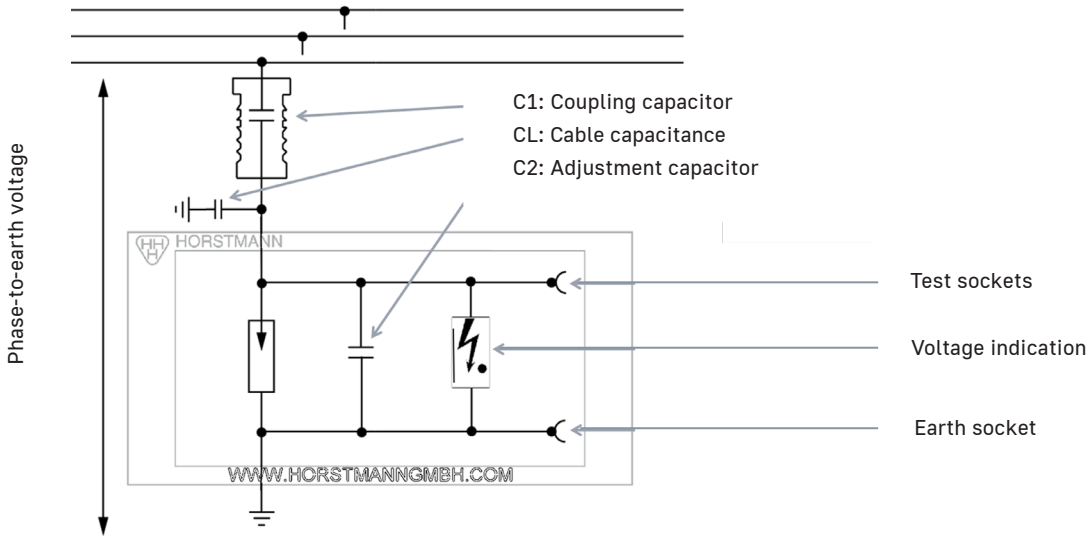

Fig. 2.1: Schematic illustration of the Wega as part of an integrated voltage detecting and indicating system

2.3 Connections and controls

2.3.1 Front view Wega PD

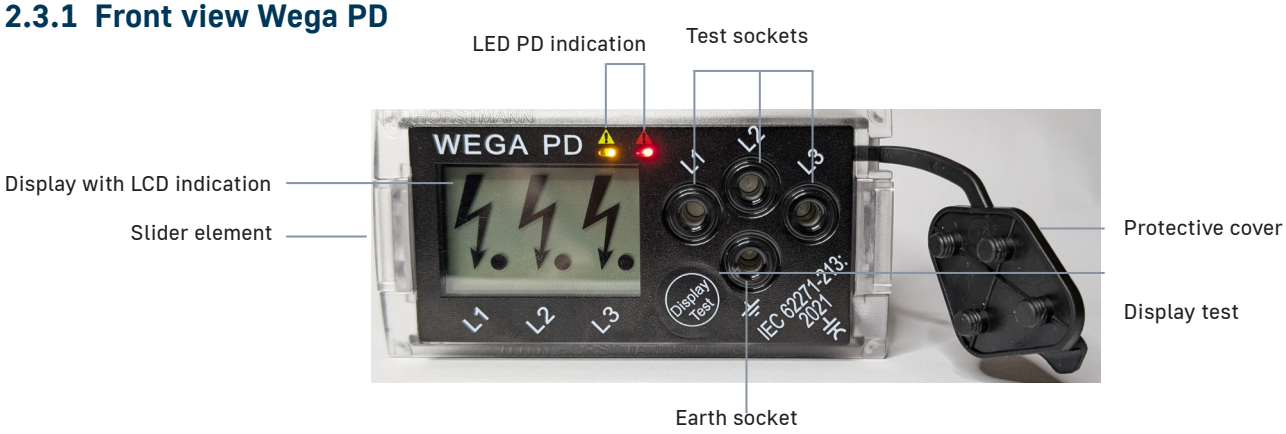

Fig. 2.2: Front view Wega PD with indications and controls

2.3.2 Rear view Wega PD

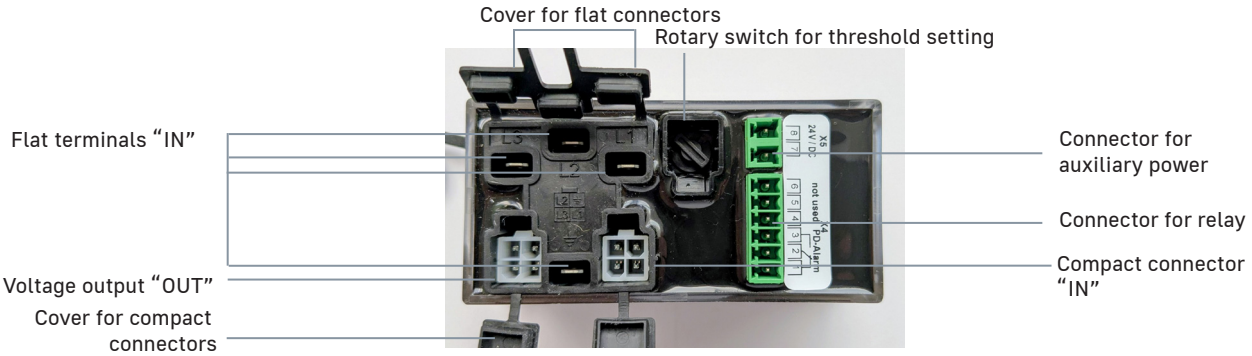

Fig. 2.3: Rear view Wega PD with connections and controls

NOTICE

Close covers of connections that are not required!

- “IN“: Voltage input from a bushing or an insulator.
- „OUT“: Voltage signal for short-circuit indicators such as Sigma or ComPass

2.4 Cut-Out dimensions

The cut-out dimensions $92^{+0.8}$ mm x $45^{+0.6}$ mm in accordance with DIN 61554 apply to all versions of the Wega.

3 Device function

3.1 Functional principle

The Wega determines the status of the switchgear in which it is installed and checks whether voltage is present or not by showing the information on the display.
In addition, a voltage detection, a maintenance test or a phase comparison can be performed with a suitable test instrument (e.g. Horstmann Orion) by connecting it to the test sockets.

WARNING

The Wega is used to detect and indicate the presence or absence of operating voltage. It is not intended to distinguish between voltage not present (i.e. V < 10 % of nominal voltage) and dead circuit state (i.e. V = 0 V).

3.2 Display indication

Indication	Definition
	**Voltage present** Threshold value for voltage presence indication: 0.1 - 0.45 x Vn Installation note: The voltage signal is too low when operating the system at nominal voltage. The cause is usually the selected adjustment capacitor which is too large, or the switchgear is operated at a nominal voltage that is lower than originally intended.
	**Voltage present and passed maintenance test** The current flowing through the display unit meets the current monitoring requirements of IEC 61243-5 (section 5.28) and IEC 62271-213 (section 11.4.2). A maintenance test is not necessary due to the continuous monitoring.
	**Voltage present and integrated maintenance test passed; voltage signal, nonetheless, is too high** Installation note: Voltage signal too high. The cause is usually the selected adjustment capacitor which is too small, an earth fault, the switchgear is operated at a nominal voltage that is higher than originally intended.
	**Voltage not present** When the system is switched off at all poles, all symbols are switched off. Voltage applied < 0.1 x Vn

Tab. 3.1: Displayed symbols

3.3 Functional test

A functional test can be done while the unit is fixed in the installation and is either energised (indication of arrow or arrow and dot symbols) or the unit is de-energised.

3.3.1 Energised state

There are two possibilities to perform the functional test in the energised state:

1. Function test by short-circuiting one of the three testing sockets with the earth socket.
   Displayed symbol (L1, L2, L3) disappears. After the test, the short-circuit bridge must be removed again.
2. Functional test using the “Function tester for Wega”

- Plug in the connecting leads of the function tester to one of the three test sockets and the earth socket of the Wega PD.
- Switch the functional tester.
- The appropriate arrow and dot symbols appear (see Tab. 3.1). The wrench tool symbol is not activated.

3.3.2 De-energised state

For the function test in de-energised state, press the “Display test“ button. All symbols of the LCD display are activated for a short time.

DANGER

- If the specified indication does not appear:

→ The Wega is defect. Do not use this device for the voltage detection!

- Attach the protective cover after the functional test!

3.4 Voltage detection

The Wega is suitable for continuous operation. After installation of the Wega in the switchgear, a continuous voltage detection is performed. The voltage detecting function is powered by the measuring voltage signal.

The voltage state is displayed for each phase via the LCD indication (s. Tab. 3.1).

3.5 Phase comparison

Perform a phase comparison using a phase comparator for LRM systems available as an option in accordance with IEC 62271-215 or IEC 61243-5 (for example, Horstmann Orion). Connect the phase comparator’s connecting leads to one of the three test sockets and the earth socket. The test sockets are accessible once the protective cover has been removed.

- The corresponding indication of the Wega may be weaker or may switch off completely.
- Put on protective cover after phase comparison!

3.6 Partial discharge detection

The Wega 1 PD is capable of detecting partial discharge (PD) which is propagated on the high-voltage mains and which is input to the Wega by the capacitive voltage divider. The sensitivity of the PD detection can be either set manually by a rotary switch or by the 24 hours auto-setting function (see 3.6.2 Threshold settings). Detected PD is indicated by two different LEDs and by one relay with Form C change-over contacts for remote signalling (see 3.6.1 PD indication). For using the PD function the Wega requires auxiliary power which needs specific considerations (see 3.6.3 Auxiliary power supply).

3.6.1 PD indication

When PD is detected, it is indicated as follows:

- The yellow LED flashes if PD amplitude reaches or exceeds the set threshold value within a time interval of 20 ms.
- The red LED flashes if the average value of PD amplitudes within a time interval of 1 minute reaches or exceeds the set threshold value. Additionally, the relay is activated for remote signalling as PD alarm.

If power supply is applied for the first time, the detector will start with an LED blinking sequence, which flashes each LED three times.
This start-up sequence can be used to verify the proper functioning of the Wega after tinstallation.

Please note: In the context of the following relay settings, the voltage parameter ‘V’ (as used in this manual) corresponds to the value labeled as ‘U’ on the device sticker.

The relay has Form C change-over contacts, comprising a common connection (COM - Common), a normally close contact (NC - normally closed) and a normally open contact (NO - normally open). The relay contacts are galvanically isolated from the PD detector and the auxiliary power supply.

Auxiliary power supply	Status PD detector	PD-Alarm relay	LED yellow (U = 0)	LED red (U ≠ 0)
present (Vaux ≠ 0)	No PD present or PD amplitude < threshold	off 	off	off
	PD amplitude ≥ threshold (20 ms)	off 	on	off
	PD amplitude ≥ threshold (1 min)	on 	on	on
not present (Vaux = 0)		off 	off	off

Tab. 3.2: LED and relay indication

The label on Wega shows the relay in its de-energised state.

3.6.2 Threshold settings

The Wega 1 PD can be operated in two different threshold modes, which can be selected by the rotary switch on the rear side of the device. The following options are possible:

Switch position	Mode
0	**24 hours auto-setting function** The Wega 1 PD detects PD for 24 hours and determines the maximum of appearing PD amplitudes. The threshold is set above the maximum amplitude. This mode will be active unless auxiliary power is switched off. After return of auxiliary power, the Wega 1 PD starts with the auto-setting function again. The other positions of the rotary switch will have no effect on the detector during this mode.
1 - F	**Manual threshold setting** The Wega 1 PD starts in this mode immediately after auxiliary power is applied. The position “1” is the lowest threshold level, “F” the highest level.

Tab. 3.3: Threshold settings

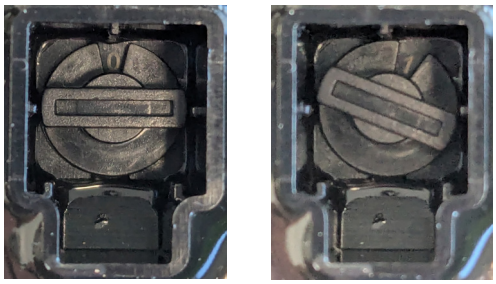

Fig. 3.1: Rotary switch for threshold mode selection

3.6.3 Auxiliary power supply

The auxiliary power supply is needed for PD function only. The voltage detecting function of Wega is powered by the voltage signal to be supervised. Special requirements for the choice of auxiliary power supply must be considered to avoid unwanted PD signaling:

- DC voltage of 24 Vdc ±15%.
- Ripple voltage must not exceed 100 mVpp (peak-to-peak).
- Do not use other devices with internal switched DC/DC or AC/DC converters connected to the same auxiliary power supply rail. Their switching frequencies and ripple voltages may cause interferences.
-

3.7 Detection of a malfunction

If there is a malfunction of the Wega PD, it can be detected by the following:

- After auxiliary power supply is connected to Wega, there is no start-up sequence.
- After auxiliary power supply is connected to Wega, both LEDs ((yellow and red LED on the front side) flash at the same time immediately.

The LCD indication “Voltage present” and “Voltage not present” operates independently of this malfunction.

Fault correction: The auxiliary power supply for the Wega PD must be switched off and switched on again after approx. 10 s. If the malfunction is not corrected following this, the Wega PD must be taken out of operation and replaced.
It is important to ensure that the device is no longer used as a voltage detecting system.

4 Installation

DANGER

Verify that the system is de-energised for installation and disassembly!

4.1 Electrical connection

The connection cables are provided by the respective switchgear manufacturer. The Wega can be connected to the switchgear with a connection cable equipped with flat plugs or compact connectors.

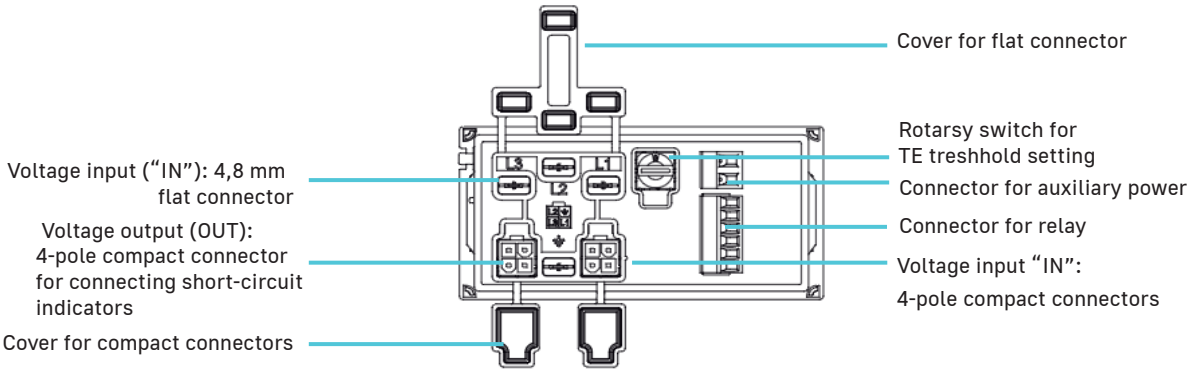

Fig. 4.1: Voltage signal connections

DANGER

- Remove cover from required connectors.
- Keep unused connection closed!
- The flat and the “IN” compact connectors are connected in parallel.

4.1.1 Connecting the flat connectors

The connection to the switchgear is made via 4 flat connectors 4.8 x 0.8 mm
(s. Fig. 4.1: Voltage input (“IN”): 4.8 mm flat connector).

Plug the flat connector receptacles onto the flat connectors (L1, L2, L3 and earth symbol).
Slide the sealing grommets on the cable side into the openings on the device side.

NOTICE

Observe the correct phase assignment for the flat connectors

4.1.2 Connect 4-pole compact connector [Voltage input (IN)]

The connection to the switchgear is made via a 4-pole compact connector (s. Fig. 4.1,: Voltage input (“IN”): 4-pole compact connectors).

CAUTION

Prevent slipping-out by engaging the ratchet mount.

DANGER

The compact connector “OUT” must not be used for the voltage input!

Use the connecting lead sets from the manufacturer for this purpose.
The connecting lead sets are available in different lengths.

4.1.3 Connect 4-pole compact connector [Voltage output (OUT)]

Connection for short-circuit direction and earth fault direction indicators

NOTICE

The voltage signal to the short-circuit and earth-fault indicator (via OUT) has a phase shift of less than 1°. In the cos φ method (used in the short-circuit and earth-fault indicator), the dead angle must be set to at least 3° to prevent false triggering.

4.1.4 Relay connection

6-pin terminal block:

- PD-Alarm: make or break contacts of the PD relay

4.1.5 Auxiliary power supply

The auxiliary power supply must be connected to the 2-pin terminal block.

4.2 Mechanical installation

1. Insert the Wega into the DIN cut-out (92 mm x 45 mm) in the front of the switchgear.
   Note the installation depth.

Connected lead	Minimum installation depth
Flat connectors with single-core cables	50 mm
4-pole compact connectors with single-core leads, angle 0°	85 mm
4-pole compact connectors with single-core leads, angle 90°	53 mm
4-pole compact connectors with coaxial leads	95 mm

Tab. 4.1: Installation depth

2. Press in the slider elements on both sides.

4.3 Disassembly

To disassemble, use a flat-head screwdriver and pull out the slider elements.
The Wega can now be removed from the cut-out.

5 Setup

An adjustment capacitor must be determined prior to commissioning in order to customize the Wega to different switchgear, coupling capacitors, nominal voltages or cable lengths.

5.1 Checking the the LRM interface via measurement techniques

Connect a suitable interface tester for interfaces at the LRM interface L1 in accordance with IEC 62271-215 or IEC 61243-5 (for example, Horstmann Orion).

The interface tester with current measurement function must display the following test result:

- The power from the interface must be equal to or higher than 3.2 µA (50 Hz).
- This test must be repeated with the interfaces for phases L2 and L3.
  If deviations occur during the optical check of the indicator or during checks of the LRM interfaces via measurement techniques, the tuning of the Wega to the switchgear (selection of the adaptation capacitor) must be checked.

5.2 Optical check of the indication

The settings are correct, if:

- the dot symbols are visible on all three phases L1, L2 and L3.

An incorrect setting exists if:

- the dot symbol is not visible.
- the arrow symbol is difficult to see.

5.3 Checking the interface by measurement

Checking the interface by measurement is carried out in the same way as the maintenance test in accordance with IEC 62271-213 or IEC 61243-5. For this purpose, a resistor with a value of 2.0 MOhm is connected to the interface and the current through the resistor is measured using a suitable multimeter. The test is deemed to have been passed if the current from the interface is equal to or greater than 3.2 µA (DC).

5.4 Checking the threshold setting of the partial discharge indicator

During installation or commissioning, the following sequence must be observed:

Step	Activity
1	The auxiliary power supply must be disconnected from the Wega.
2	Select the threshold mode on rotary switch. ▶ “0” = 24 hours threshold auto-setting ▶ “1” – “F”: manual threshold setting
3	Reconnect auxiliary power supply and wait for start-up sequence.
4	If in 24 hours auto-setting mode, wait until next day. The yellow LED may flash continuously but will stop indicating after setting new threshold. Do not change position of rotary switch in this mode. If in manual mode, find position of rotary switch, where yellow LED starts indicating. Then increase switch position until LED stops flashing. If highest position “F” is reached without yellow LED being off, then check all electrical connections including power supply and earth connection and then retry.

Tab. 5.1: Installation sequence

When switching between Automatic Mode (Auto-Learning Cycle, switch position “0”) and Manual Mode (switch position “1” – “F”), note that the device software only checks the current operating mode during startup.

Therefore, after each mode change, a restart by briefly disconnecting the auxiliary power supply is required (see procedure in Tab. 5.1).

NOTICE

Changing the operating mode without disconnecting the auxiliary power supply will result in the change not taking effect.

6 Maintenance

6.1 Servicing

Ensure that the Wega is kept in a clean and dry state. Otherwise, the device is maintenance-free.
The device contains no batteries or any other parts which need to be replaced by the user.

6.2 Maintenance test

The maintenance test on voltage detecting and indicating systems shall be performed in accordance with IEC 62271-213. The interval periods of maintenance tests are defined by the national regulations of the respective places of use, e.g. in Germany the interval period for maintenance test is every 6 years at the latest.

The Wega is equipped with a feature that permanently monitors the current through the indicating unit. Thus, the Wega complies with the requirements regarding the current monitoring in accordance with IEC 62271-213 (section 11.4.2). A maintenance test is not necessary in general due to the permanent monitoring.

NOTICE

As the LCD indication may have a different contrast depending on the viewing angle, the following must be observed: The maintenance test is passed if, when viewed from a perpendicular angle the dot symbol has the same contrast as the corresponding arrow symbol!

7 Disposal

At the end of its service life, the Wega must be disposed of in accordance with the legal regulations of the respective place of use.

8 Technical data

Electrical data	
Nominal voltage	From 1 kV (nominal voltage of the switchgear)
Nominal frequency	50 / 60 Hz
Power supply	The VDIS is powered by the measuring voltage signal
Interface	Test socket for each phase and one earth socket, compliant with LRM
Indication	LCD indication (display) with black symbols for: ▸ Voltage present ▸ Maintenance test passed ▸ Over-voltage
Voltage-limiting predetermined breaking point	90 V ± 20% (The effects of tripping the voltage-limiting predetermined breaking point must be checked against the switchgear's protection concept.)
Operating temperature	-40 °C to +75 °C
Operating time	Suitable for permanent operation
Auxiliary power supply	24 V DC ±15% / Ripple voltage < 100 mVpp
Power consumption	Approx. 1.2 W

Relay characteristics	
Type	32.21-4000, changeover contact, switching capabilities DC 3A/30V 0.35A/110V 0.2A/220V
Contact	Permanent contact
Shock resistance	20 g
Vibration resistance	10 g

Mechanical data	
Cut-out on the system side	$92^{+0.8}$ mm x $45^{+0.6}$ mm
Housing material	Polycarbonate
Measuring and earth socket	LRM system, the distance between the sockets is 14 mm, the socket has an inner diameter of 4 mm
Type of protection	IP54 (applies only with the fitted protective cover for the interface and with closed covers for unused connections on the rear.)

	Total weight	Dimensions (W x H x D) (installation housing for panel cut-out 96 mm x 48 mm in accordance with DIN IEC 61554)	Installation depth (from the front panel incl. place for the cable)
Wega PD	225 g	96 mm x 48 mm x 62 mm	48 mm