

Safety Equipment

Design of Phase Comparators

Phase Comparators

Phase comparators in accordance with EN/IEC 61481 (DIN VDE 0682 Part 431) are designed for testing in-phase conditions of three-phase systems.

Only electrically skilled or instructed persons are allowed to test in-phase conditions.

Phase comparators have to be tested for correct operation immediately before and after use.

Phase comparators without self-testing element have to be tested for correct operation by making contact with a part of the installation connected to operating voltage.

Testing in-phase conditions by means of a phase comparator is considered live working.

Phase comparators may only be used for the nominal voltage / nominal voltage range as indicated on the rating plate. The user may be at risk if the phase comparator is used for voltages other than indicated on the rating plate (incorrect indication, electric shock, arcing).

Phase comparators labelled "For indoor and outdoor installations" must not be used in wet weather conditions.

Phase comparators labelled "Also suitable for use in wet weather conditions" may be used in all weather conditions such as rain, snow, fog and dew.

Phase comparators in accordance with IEC/EN 61481 (VDE 0682 Part 431) are only suitable to a limited extent for use in factory assembled (type tested) installations.

Due to the restricted space in these installations, flashover may occur when inserting the test prod into the installation. The user of the phase comparator or the operator of the switchgear installation must contact the manufacturer of the type-tested installation to find out whether the phase comparator may be used in the installation.

Design of phase comparators

Phase comparators in accordance with IEC/EN 61481 (VDE 0682 Part 431) can be designed as **two-pole devices** (resistive phase comparators) or as **single-pole devices** (capacitive phase comparators).

The design of single-pole phase comparators is similar to that of capacitive voltage detectors. The functional principle of single-pole phase comparators is based on a microprocessor controlled electronic storage system.

Classified as complete devices, PHV and PHV I phase comparators are tested as a complete unit.

Single-pole phase comparators consist of a handle with hand guard, insulating element, indicator and test prod with test electrode. Two-pole phase comparators additionally have a connecting cable.

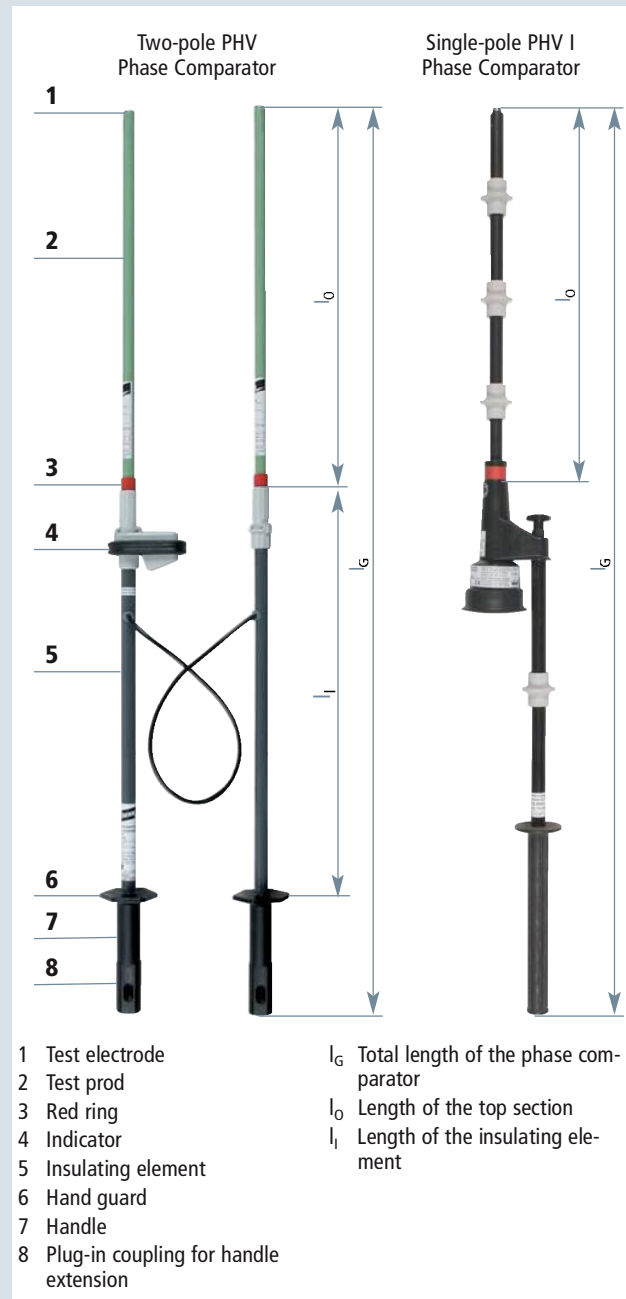
The **insulating element** is the section of a phase comparator between the hand guard and the red ring. It ensures that the user maintains an adequate safety distance for safe operation.

The **test prod** with contact electrode above the red ring allows to reach remote parts of the installation and to eliminate the influence of interference fields.

The **hand guard** provides a visible barrier between the handle and the insulating element and prevents the user from making contact with the insulating element.

The **red ring** indicates the end of the insulating element in the direction of the test electrode. This provides the user with a visible limit of contact with live parts in the installation. The insulating element situated between the red ring and the hand guard must not contact live parts, however, it may contact earthed parts.

The **test electrode** is the part of the phase comparator that is used to make contact with the part of the installation to be tested.



Storage Bags and Transport Cases

Sheet metal or plastic case
 Artificial leather or canvas bag

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Two-pole PHV Phase Comparator

Nominal voltages up to 36 kV / 50 Hz



Easy and safe testing

- Easy to use
- User-friendly
- Cost-effective/space-saving transport



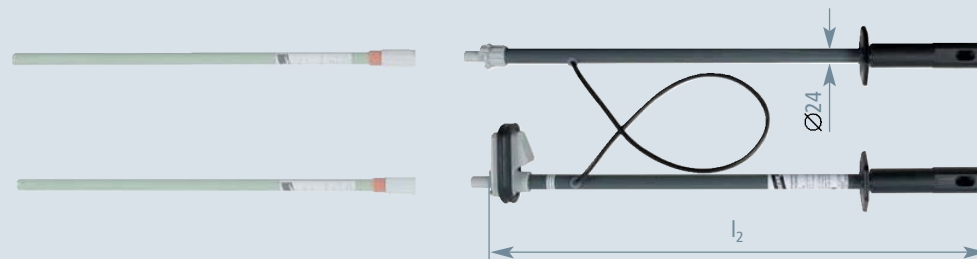
Two-pole PHV phase comparator with a pair of green test prods (15 ... 24 kV) used in a 20 kV switchgear installation

General Information:

Standard	EN/IEC 61481 (DIN VDE 0682 Part 431)
Temperature range	- 25 °C ... + 55 °C, climatic category N
Use	Not suitable for use in wet weather conditions
Material (test electrode)	Copper alloy/gal Sn
For	Indoor and outdoor installations
Material (test prod)	Glass-fibre reinforced epoxy resin tube
Material (indicator)	Plastic, fully insulated
Material (insulating stick)	Glass-fibre reinforced epoxy resin tube
Connecting cable	Flexible copper cable, plastic-insulated



PHV Test Unit



The two-pole PHV phase comparator consists of a test unit and two test prods which are attached to the test unit (to be ordered separately). To avoid confusion, the test prods have different colours according to the nominal voltage.

Type	PHV 3 36 STK
Part No.	759 300
Nominal voltage (U_N)	3 ... 36 kV
Colour	Grey
Length (test unit) (l_2)	750 mm
Length (connecting cable)	800 mm

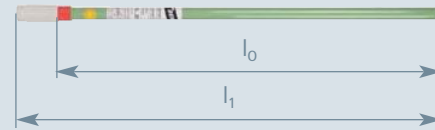
Other connecting cable lengths as well as versions for other nominal voltages and for special switchgear installations are available on request.

Safety Equipment

Two-pole PHV Phase Comparator

Phase Comparators

Straight Test Prods

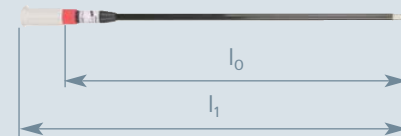


Note: Two tests prods are required for a test unit.

Type	PS 3 3.6 PHV	PS 5 7.2 PHV	PS 10 12 PHV	PS 10 17.5 PHV	PS 15 24 PHV	PS 25 36 PHV
Part No.	759 603	759 605	759 610	759 615	759 620	759 630
Nominal voltage (U_N)	3 ... 3.6 kV	5 ... 7.2 kV	10 ... 12 kV	10 ... 17.5 kV	15 ... 24 kV	25 ... 36 kV
Colour	Grey	White	Yellow	Grey	Green	Grey
Length (test prod) (l_1)	381 mm	681 mm	681 mm	681 mm	681 mm	681 mm
Insertion depth (l_0)	316 mm	616 mm	616 mm	616 mm	616 mm	616 mm
Diameter	20 mm	20 mm	20 mm	20 mm	20 mm	20 mm

Test Prods (Ø11 mm)

For type-tested, factory assembled switchgear installations with limited access (e.g. Mipak)

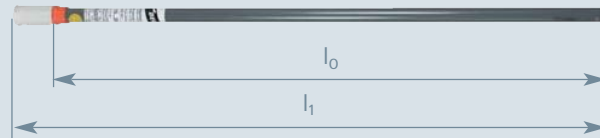


Note: Two tests prods are required for a test unit.

Type	PS 10 12 PHV D11	PS 20 24 PHV D11
Part No.	759 111	759 121
Nominal voltage (U_N)	10 ... 12 kV	20 ... 24 kV
Colour	Black	Black
Length (test prod) (l_1)	415 mm	585 mm
Insertion depth (l_0)	330 mm	520 mm
Diameter	11 mm	11 mm

Long Test Prods

For type-tested, factory assembled switchgear installations with remotely situated series-connected contacts (e.g. Driescher D600)

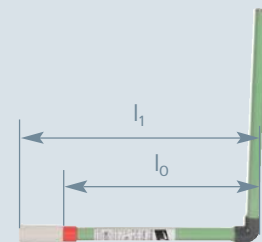


Note: Two tests prods are required for a test unit.

Type	PS 15 24 PHV L880
Part No.	759 621
Nominal voltage (U_N)	15 ... 24 kV
Colour	Grey
Length (test prod) (l_1)	880 mm
Insertion depth (l_0)	820 mm
Diameter	20 mm

90° angled Test Prods

For type-tested, factory assembled switchgear installations with limited access and contacts situated in a vertical plane (e.g. Alstom)



Note: Two tests prods are required for a test unit.

Type	PS 3 3.6 PHV W90	PS 5 7.2 PHV W90	PS 10 12 PHV W90	PS 15 24 PHV W90	PS 25 36 PHV W90
Part No.	759 604	759 608	759 611	759 622	759 633
Nominal voltage (U_N)	3 ... 3.6 kV	5 ... 7.2 kV	10 ... 12 kV	15 ... 24 kV	25 ... 36 kV
Colour	Grey	White	Yellow	Green	Grey
Length (test prod) (l_1)	359 mm	359 mm	359 mm	359 mm	359 mm
Insertion depth (l_0)	274 mm	274 mm	274 mm	274 mm	274 mm
Diameter	20 mm	20 mm	20 mm	20 mm	20 mm

Single-pole PHV I Phase Comparator

Safety Equipment

Nominal voltages up to 36 kV / 50 Hz

Phase Comparators



Single-pole PHV I phase comparator used in a switchgear installation

Safe testing

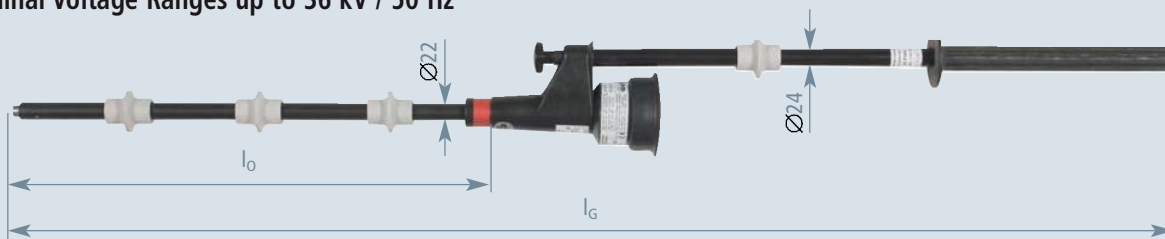
- Reliable indication



General Information:

Standard	EN/IEC 61481 (DIN VDE 0682 Part 431)
Temperature range	- 25 °C ... + 55 °C, climatic category N
Use	Suitable for use in wet weather conditions
For	Indoor and outdoor installations
Material (test prod)	Plastic
Material (indicator)	Plastic, fully insulated
Material (insulating stick)	Glass-fibre reinforced polyester tube

Nominal Voltage Ranges up to 36 kV / 50 Hz



Type	PHV1 6 12	PHV1 12 24	PHV1 24 36
Part No.	759 606	759 612	759 624
Nominal voltage (U _N)	6 ... 12 kV	12 ... 24 kV	24 ... 36 kV
Total length (l _G)	1400 mm	1600 mm	1600 mm
Insertion depth (l ₀)	575 mm	775 mm	775 mm

Nominal Voltage Ranges up to 36 kV / 50 Hz, switchable via Selector Ring



Type	PHV1 U 6 36
Part No.	759 616
Nominal voltage (U _N)	6 ... 12 / 12 ... 24 / 24 ... 36 kV
Total length (l _G)	1600 mm
Insertion depth (l ₀)	775 mm