

PFISTERER

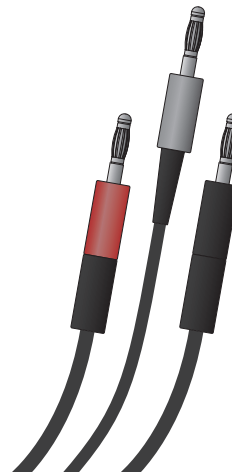
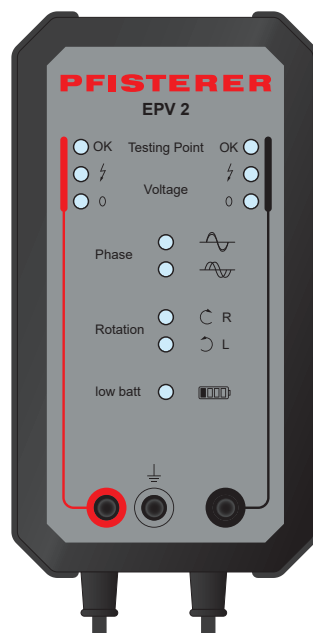
040 210 020

OPERATING INSTRUCTIONS

EPV 2

Electronic Phase Comparator / Voltage Indicator

827 189 011 Var. xxxxx



THE POWER CONNECTION



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1 General Information

The electronic phase comparator EPV 2 detects the phase angle between two energised, capacitively sensed voltages on encapsulated switchgear with the same rated voltage and frequency.

The detection of the phase angle and the voltage indication take place at measuring points integrated into the encapsulated switchgear exclusively in accordance with IEC 62271-213 *Voltage detecting and indicating system* VDIS.

In addition, the EPV 2 can be used to determine the phase rotation of the switchgear.

Phase comparators and voltage indicators are used to ensure the safety of the user and protection of the system. There is a risk of fatal injury even if only one of the points in these instructions is disregarded. Furthermore, the system availability is endangered and all warranty claims will be void.

1.1 Information about the Operating Instructions

These operating instructions describe the safe and proper use of the described product. The safety information and instructions must be observed in addition to the locally applicable accident prevention regulations relating to the area of application of the product and general safety rules.

Carefully read through the operating instructions, especially the section on safety and the relevant safety information, before starting any work on the product. It is vital that what is read has also been understood. The operating instructions is a constituent part of the product. It must be kept accessible at all times in the immediate vicinity of the product (control room, etc.).

1.2 Operating Instructions Contents

Every person who is commissioned to perform work on or with the product must have read and understood the operating instructions before working on/with the product. This requirement applies even if the person has already worked with such a product or a similar product or has been trained by the manufacturer. Knowledge of the contents of the operating instructions is one of the requirements for protecting personnel from hazards as well as for preventing errors, thus ensuring the product is used in a safe and trouble-free manner. The operator is advised to have the staff confirm that they have familiarized themselves with the contents of these operating instructions.

1.3 Copyright protection

The operating instructions are confidential. It is intended solely for persons who work on and with the product.

All contents, text, drawings, images and other representations are protected under copyright law and are subject to other intellectual property rights. Any misuse is punishable by law.

Disclosure to third parties, including making copies of any type or form - even of extracts - as well as the use and/or communication of the contents without written permission from the manufacturer is prohibited. Any infringements shall be subject to claims for compensation. We reserve the right to assert further claims.

We reserve the right to exercise any of our intellectual property rights.

1.4 Liability and warranty

All information and data contained in these operating instructions were compiled under consideration of the applicable regulations, the technological state of the art and our long-standing expertise and experience.

The operating instructions are to be kept in the immediate vicinity of the product (e.g. control room), accessible to all persons who work on or with the product at all times.

The operating instructions are to be read carefully before starting work on and with the product. The manufacturer shall accept no liability for any damage or malfunctions resulting from failure to observe the operating instructions.

The text and images contained in the instructions do not necessarily correspond to the scope of delivery. The illustrations are not to scale. Due to the fact that special versions or additional options may have been ordered or innovative technical modifications may have been made, the actual scope of delivery can differ from the explanations and illustrations described in these instructions. Please direct any queries to the manufacturer.

We reserve the right to make technical modifications to the product within the framework of improving performance characteristics and further development.

1.5 Warranty

The terms and conditions of warranty are defined in the purchase agreement and the general terms and conditions of the manufacturer.

On return of defective parts or inspection on site, the manufacturer shall ultimately make a decision on the validity of a warranty claim.

1.6 Spare Parts

Only use genuine spare parts of the manufacturer.

The use of unapproved spare parts voids all claims concerning service, compensation for damages and liability against the manufacturer or its agents, dealers or representatives.

2 Safety

At the time of its development and manufacture, the product was constructed according to currently applicable, accepted codes of engineering practice and is safe to operate. Nevertheless, the product can pose dangers if it is not used by professionally trained personnel or is used improperly or in a manner deemed not for its intended purpose.

2.1 Intended Use

The phase comparator EPV 2 may only be used for checking for phase balance on capacitively sensed voltages at the measuring points of a VDIS as per IEC 62271 as well as on LRM systems as per IEC 61243-5. A suitable adapter is required for use in HR systems (see Table 11-1).

Phase comparators may only be used by specialists or trained persons.
Note: See section 2.6.



Any other than the intended use of the product is prohibited and is deemed as not for its intended purpose.
Any claims against the manufacturer and/or his authorized representatives for damage resulting from use of the product not for its intended purpose shall not be accepted.
The operator shall be solely liable for any damage resulting from use of the product other than its intended purpose.

Operational reliability/safety can only be ensured if the product is used as intended.

The product may only be used when the environment temperature is within the range from **-25 °C to 55 °C**.

2.2 Changes and Modifications to the Product

To avoid hazards and to ensure optimum performance, no changes, additions or modifications may be made to the product that have not been expressly approved by the manufacturer.



Do not affix any stickers or other foreign components!
These could trigger arcing.

2.3 Responsibility of the operating company

The product may only be used in a technically perfect and operationally reliable condition. The information given in the operating instructions must be followed in its entirety and without restrictions!

In addition to the safety precautions and instructions specified in these operating instructions, the locally applicable accident prevention regulations relating to the area of use of the product and general safety regulations as well as the applicable environmental protection regulations must be observed and followed.

The operating company and personnel authorized by the operating company shall be responsible for fault-free operation of the product and for clear definitions of the responsibilities for operation and repair of the product.

II

2.4 Hazards posed by the product

The state-of-the-art design and configuration of the product correspond to the latest technological developments.

The product is safe when used for its intended purpose. Nevertheless, a certain degree of residual risk remains!



Danger - electrical current!

Electrical energy can cause serious injuries. Damage to the insulation or individual components may result in the danger of death by electrical current.

Observe the following points before starting work on electrical systems:

- 1 Disconnect completely.
- 2 Secure against re-connection.
- 3 Verify absence of operating voltage.
- 4 Carry out earthing and short-circuiting.
- 5 Provide protection against adjacent live parts.

2.5 Work safety

Personal injury and material damage while working with and on the product can be avoided by following the safety precautions and instructions specified in these operating instructions.

Failure to comply with these instructions can result in personal injury and damage to or destruction of the product.

Any liability and compensation claims against the manufacturer or his authorized representative resulting from non-compliance with the safety precautions and instructions specified in this operating instructions as well as the accident prevention regulations applicable to the area of application of the product and the general safety regulations shall not be accepted.

2.6 Requirements for the personnel

Technical personnel are persons who, on the basis of their technical training, knowledge and experience as well as knowledge of the applicable regulations, can assess the tasks assigned to them and recognize potential hazards.

The responsibilities for working on and with the product (operation, repair) must be clearly defined and complied with to avoid any ambiguous division of responsibilities in terms of safety.

Only persons who can be entrusted to work reliably are permitted to work on and with the product. All working methods that impair the safety of persons, the environment or of the product are prohibited.

Persons under the influence of drugs, alcohol or medication that impedes their reactions must not work on or with the product.

The local age and job-specific regulations applicable at the place of use of the product must be taken into account with regard to personnel selection. Such specialists or trained persons are defined in EN 50110-1:2004 or VDE 0105-100 as well as other regulations.

The personnel must immediately report a to the operator any changes to the product that impair safety.

3 Transportation / Storage



Phase comparators must be handled with great care and correspondingly protected to prevent soiling and damage.

3.1 Scope of supply

Check the scope of supply for completeness. Contact the manufacturer immediately if parts are missing. Reference is made to the terms and conditions of purchase and delivery.

On delivery of the product, any damage as a result of defective packaging or that has been incurred during transportation must be reported immediately to the shipping company, the insurer and the supplier. Ensure that damage is reduced and that further damage is avoided.

3.2 Packaging

The main packaging materials are wood, cardboard and plastic (film, foam). If no corresponding agreement has been made with regard to its return, the packaging material will remain with the customer.

Environmentally acceptable disposal in accordance with the applicable waste disposal regulations must be ensured. If necessary have a waste disposal company dispose of the packaging material.

3.3 Transport

Transport operating rods in dry condition, and do not subject them to direct sunlight for a prolonged period.

Suitable bags or cases must be used for transportation.

3.4 Storage

- The EPV 2 must be stored and transported in a dry condition.
- The temperature range must also be complied with during storage and transport (see section 4).
- The EPV 2 must not be exposed to direct sunlight for long periods of time.
- Remove discharged batteries from the device (for replacing the batteries, see section 10).

3.5 Cleaning

- All components are to be cleaned with a lint-free damp cloth. Solvents or aggressive cleaning agents must not be used.

3.6 Disposal

If no return or disposal agreement has been made, consign disassembled components after proper disassembly for recycling as follows:

- Scrap metal parts.
- Recycle plastic elements.
- Sort and dispose of remaining components according to material type.



Lubricants and other additives are subject to special waste treatment and may only be disposed of by specialist waste disposal companies!

III

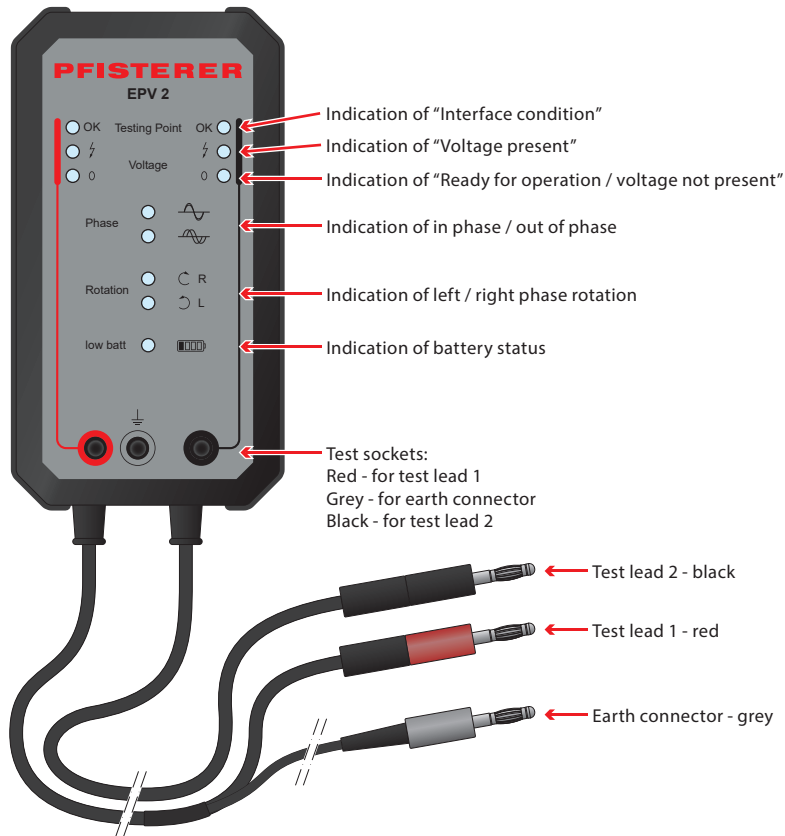
IV

4 Technical data

Description	Values
Rated frequency	16.7 to 60 Hz
Operating temperature	-25 to 55 °C
Protection class	IP54
Power supply	4 × 1.5 V AA
Indication and detection range	Class A "out of phase" at $\pm 30^\circ$ to 330° "in phase" at -10° to $+10^\circ$

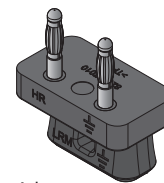
Table 4-1

5 Parts and Labels



5.1 Contents

- 1 × phase comparator / voltage indicator, including permanently affixed test leads and 4 AA 1.5 V alkaline batteries
- 2 × adapters (HR → LRM)
- 1 × storage case



Adapter

6 Application Rules

6.1 Area of Application

The electronic phase comparator EPV 2 detects the phase angle between two energised, capacitively sensed voltages on encapsulated switchgear with the same rated voltage and frequency.

The detection of the phase angle and the voltage indication take place at measuring points integrated into the encapsulated switchgear exclusively in accordance with IEC 62271-213 *Voltage detecting and indicating system* VDIS.

In addition, the EPV 2 can be used to determine the phase rotation of the switchgear.

Phase comparators and voltage indicators are used to ensure the safety of the user and protection of the system. There is a risk of fatal injury even if only one of the points in these instructions is disregarded. Furthermore, the system availability is endangered and all warranty claims will be void.

6.2 Using the EPV 2

The EPV 2 may only be used by experts or trained persons.

Note: The definition of an expert or trained person can be found, for instance, in EN 50110-1 *Operation of electrical installations*.

The EPV 2 may only be used on capacitively sensed measuring points in an LRM system. A suitable adapter is required for use in an HR system (see section 10 Accessories and Spare Parts).

6.3 Standards

The design of the EPV 2 complies with the standard EN IEC 62271-215:2023.

6.4 Safety Information

The shielded test leads may not be shortened. If the shielded test leads are extended, interference signals may impair the functioning of the EPV 2. The EPV 2 may not be connected to energised low-voltage or high-voltage parts. Failure to heed this information could lead to life-threatening injuries!

VI

7 Start-up and Function Test



Before use, the phase comparator must be inspected for obvious damage and soiling. Defective phase comparators must not be used.

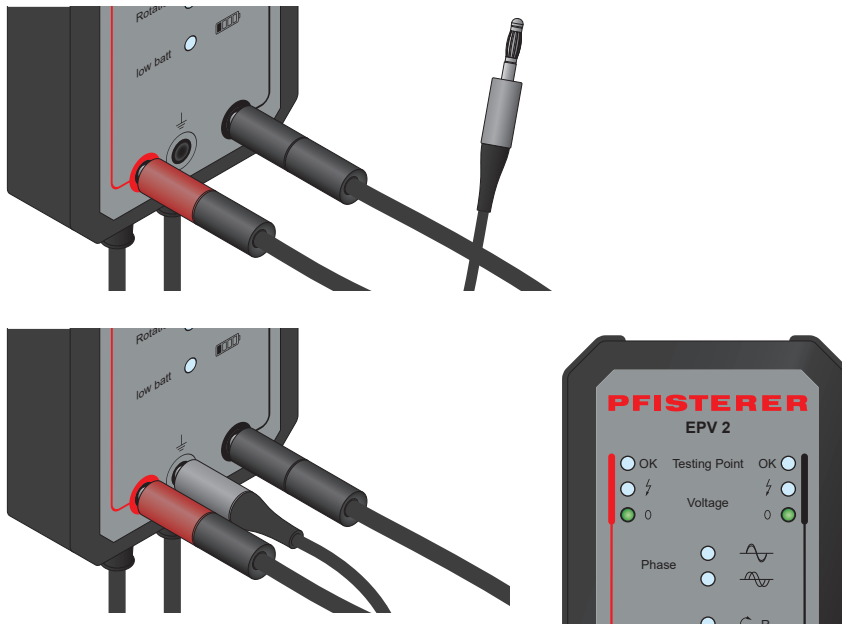
7.1 Self-test

The EPV 2 carries out a comprehensive function check of the device upon start-up.

For this purpose, connect the two red / black test connectors to the associated test sockets of the EPV 2.

Then connect the grey earth connector to the middle test socket.

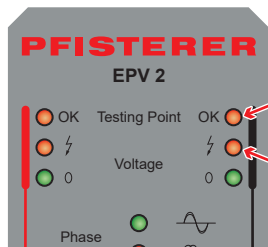
Once the two green LEDs light up, the self-test is concluded and the EPV 2 is ready for operation.



VII

Application

All LEDs are shown lit up here for illustration purposes (unrealistic appearance).



8 Application

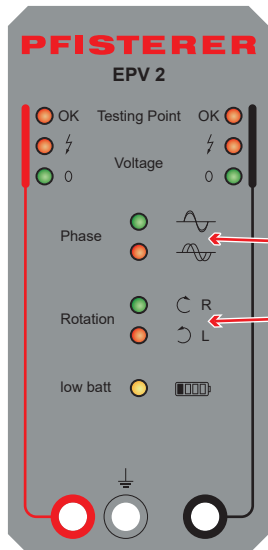
8.1 Voltage Testing and Interface Condition

The EPV 2 can be used to determine the absence of operating voltage as well as the interface condition at measuring points as per IEC 62271-213 as well as HR or LRM systems as per IEC 61243-5.

The check is performed as follows:

- Insert the grey connector of the earth lead into the earth socket of the interface.
- Insert the red connector into the voltage tap of the interface to be checked.
- **Interface condition:** If both LEDs light up red, the interface conditions as per IEC 62271-213 are met. The voltage at the interface is ≥ 6.4 V. If both or one of the two LEDs do not light up, the interface condition(s) is/are not met.
- **Voltage present:** If both LEDs light up red, there is a voltage in the system. The voltage at the interface is > 5 V. The green LEDs below go out.

For performing the check on HR systems as per 61243-5, the adapter HR \rightarrow LRM (see section 11) must be connected between the system and the test connectors.



8.2 Phase Comparison

For phase comparison at measuring points as per 62271-213 or on LRM systems as per 61243-5, the grey connector of the earth lead must be inserted into the earth socket of the interface.

Insert the red connector into the voltage tap (phase L1) of the interface of the first system to be checked and the black connector of the test lead into the voltage tap (phase L1) of the interface of the second system.

A phase comparison can only be performed on energised systems.

- **Phase comparison:** If the green LED lights up, both systems are "in phase". If the red LED flashes, the systems are "out of phase".
- **Phase rotation indication:** For checking the phase rotation, see section 8.3 Phase Rotation Indication.

The procedure must be repeated with phases L2 and L3.

For performing the check on HR systems as per 61243-5, the adapter HR \rightarrow LRM (see section 11) must be connected between the system and the test connectors.

The phase balance is correctly indicated when the different input voltages lie within 5 – 30 V and the frequency is within 16 – 69 Hz.

8.3 Phase Rotation Indication

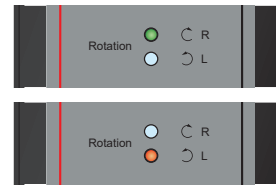
The phase comparator EPV 2 can also be used for determining the **phase rotation** of a system.

To do this, insert the two test connectors into the voltage taps of the interface to be tested, red connector in L1 / black connector in L2.

If the green LED lights up, the field is rotating to the right (clockwise).

If the red LED lights up, the field is rotating to the left (anti-clockwise).

This indication plays no role in a phase comparison.



8.4 Switching Off

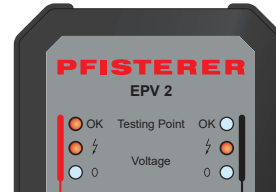
After completing a phase comparison, the EPV 2 can be switched off manually. Do this by briefly touching the earth connector (grey) to the earth socket.

If the device is not switched off manually, the EPV 2 will remain ready for operation for about 2 minutes and then switch off automatically.

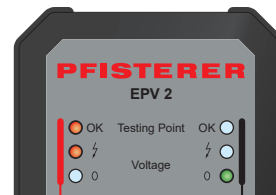


8.5 Troubleshooting

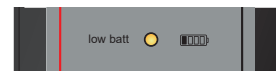
Voltage is present on the right system, but the interface signal as per IEC EN 62271-213 is too weak (see section 8.1). The interface must be checked. Phase comparison is possible, see section 8.2.



No voltage is present on the right system (see section 8.1). Phase comparison is not possible.



If this LED lights up, the batteries are low. Operation is still possible, but the batteries should be replaced as soon as possible.



9 Routine Inspection

The EPV 2 must undergo routine inspection at regular intervals. It is the responsibility of the user to establish a maintenance schedule while taking into account the operating conditions. The interval is defined in the national regulations. The applicable regulation in Germany is BGV A3, which states that a retest interval of 6 years may not be exceeded.

The period between routine inspections **must not exceed 6 years**.

It is recommended that the routine inspection be carried out by PFISTERER Kontaktsysteme or by a repair workshop approved by PFISTERER.

Delivery address for customers in Germany:

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Bereich Instandhaltungsprüfung
Bahnhofstraße 30
89547 Gerstetten-Gussenstadt
Germany

E-mail address: service-whp@pfisterer.com

10 Replacing the Batteries



Any modification of or tampering with the EPV 2 beyond replacing the batteries is not permitted. Inoperative or damaged EPV 2 units are to be withdrawn from further use.

10.1 Type of battery

Batteries should only be changed in a dry and clean environment. The battery compartment is located on the back side of the device. The indicated battery polarity must be precisely complied with.

Required battery type: AA 1.5 volt alkaline battery.
The device requires 4 batteries.

Under normal operating conditions, it is not necessary to replace this type of battery between the routine inspections (6 years).

IX

X

Replacing the Batteries | Accessories and Spare Parts

11 Accessories and Spare Parts

Description	Article number
HR Adapter → LRM two-pole	827 217 010
HR Adapter → LRM single-pole	827 217 003
HR Adapter → LRM 6.3 mm with jack plug	827 217 004
AA 1.5 V alkaline battery	619 435 004
Storage case	364 889 002

Table 11-1

XI





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