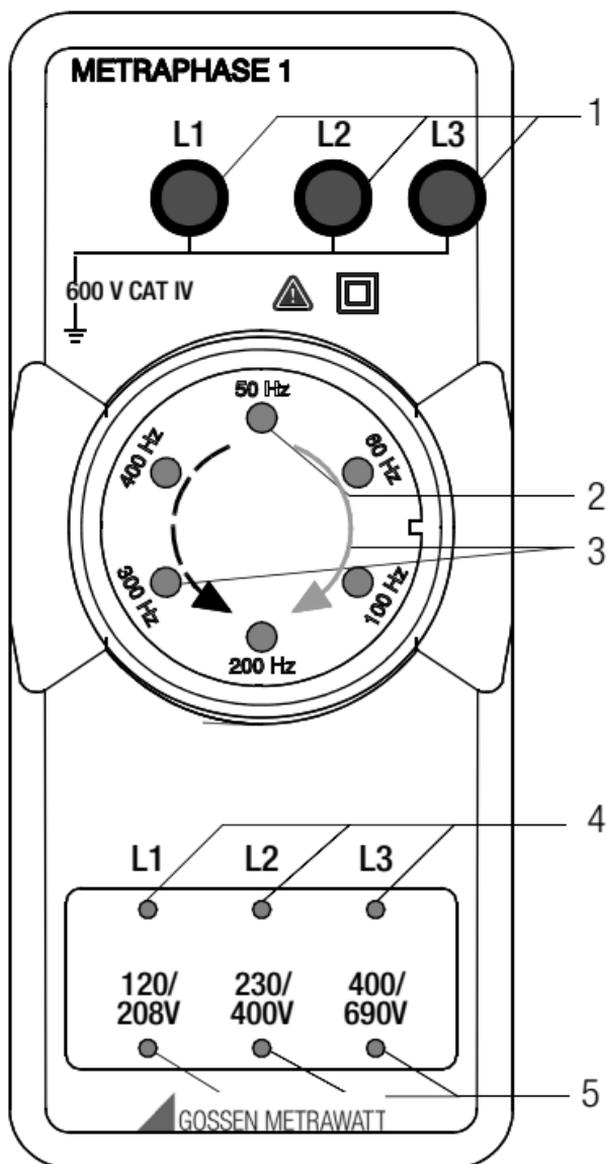


METRAPHASE 1

Phase Sequence Indicator

3-348-991-15
13/9.20



- (1) Connector sockets for phases L1 ... L3
- (2) **Rotary LEDs** for displaying frequency and phase sequence
- (3) **Phase sequence and frequency**
Green arrow: Clockwise rotation, LEDs light up green and rotate clockwise
Momentary frequency: Indicated by LED which briefly lights up red
Dashed red arrow: Counterclockwise rotation, LEDs light up red and rotate counterclockwise
Momentary frequency: Indicated by LED which briefly lights up green
- (4) **Phase LEDs**, indicate voltage at L1 ... L3
- (5) **Voltage value LEDs**, indicate line-to-line voltage value

Meanings of Symbols on the Device



Warning concerning a point of danger
(attention: observe documentation)



Ground



Continuous, doubled or reinforced
insulation

CAT IV **Maximum allowable voltage** between the
connector sockets (1) and ground it is
600 V category IV.



EU conformity marking



This device may not be disposed of with house-
hold trash. Further information regarding the
WEEE mark can be accessed on the Internet at
www.gossenmetrawatt.com by entering the
search term "WEEE".

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1 Safety Instructions

Observe this documentation, in particular all included safety information, in order to protect yourself and others from injury, and to prevent damage to the instrument.

- Carefully and completely read and adhere to these operating instructions.
This document can also be accessed at <http://www.gossenmetrawatt.com>. Retain this document for future reference.
- Tests may only be performed by a qualified electrician, or under the supervision and direction of a qualified electrician. The user must be instructed by a qualified electrician concerning performance and evaluation of the tests.
- Wear suitable and appropriate personal protective equipment (PPE) whenever working with the instrument.
- Only use accessories which are included with the instrument or listed as optional accessories.
- Carefully and completely read and adhere to the product documentation for accessories. Retain these documents for future reference.
- The instrument may only be operated by persons who are capable of recognizing contact hazards and taking the appropriate safety precautions. Contact hazards exist anywhere, where voltages of greater than 30 V RMS may occur.
- Do not work alone when performing measurements which involve contact hazards. Be certain that a second person is present.
- If the device doesn't function flawlessly, remove it from operation and secure it against inadvertent use.
- The device may only be used as long as it's in good working order.
Inspect the housing before use. Pay particular attention to any possible cracks and the insulation around the sockets.
Damaged components must be replaced immediately.
- Accessories and cables may only be used as long as they're fully intact.
Inspect all cables and accessories before use. Pay particular attention to damaged housings, interrupted insulation or kinked cables.
Damaged components must be replaced immediately.
- Do not use the instrument after long periods of storage under unfavorable conditions (e.g. humidity, dust or extreme temperature).
- Do not use the instrument after extraordinary stressing due to transport.
- Use the instrument only within the specified ambient conditions.
- Use the instrument only in accordance with the specified protection class (IP code).

- The instrument must not be exposed to direct sunlight.
- The instrument and the included accessories may only be used for the measurements described here and in the operating instructions for the instrument.
- Only use the instrument and the accessories within the specified measuring category.
- Do not perform any measurements in electrical circuits with corona discharge (high-voltage).
- Do not use the instrument if the battery compartment cover has been removed. Touch contact with dangerous voltage is otherwise possible.

2 Applications

2.1 Intended Use / Use for Intended Purpose

The instrument is a phase sequence indicator with electronic rotary dial, frequency display and nominal line voltage display.



Note!

It's not a voltmeter in the usual sense of the word – it only indicates voltage within the specified ranges.

Safety of the operator, as well as that of the instrument, is only assured when it's used for its intended purpose.

2.2 Use for Other than Intended Purpose

Use of the instrument for any purposes other than those described in these operating instructions is contrary to use for intended purpose.

2.3 Liability and Guarantee

Gossen Metrawatt GmbH assumes no liability for property damage, personal injury or consequential damage resulting from improper or incorrect use of the product, in particular due to failure to observe the product documentation. Furthermore, all guarantee claims are rendered null and void in such cases.

2.4 Opening the Instrument / Repairs

The instrument may only be opened by authorized, trained personnel in order to ensure flawless, safe operation and to assure that the guarantee isn't rendered null and void. Even original replacement parts may only be installed by authorized, trained personnel.

Unauthorized modifications to the instrument are prohibited.

If it can be ascertained that the instrument has been opened by unauthorized personnel, no guarantee claims can be honored by the manufacturer with regard to personal safety, measuring accuracy, compliance with applicable safety measures or any consequential damages.

3 Initial Startup

Batteries

The phase sequence indicator is shipped ready to use with four AA batteries. Before initial startup, be sure to read section 7.1, "Battery".

Battery Test

If none of the LEDs light up after applying voltage, or if they're very dim, the batteries need to be replaced.

Switching the Instrument On Automatically

The instrument is switched on automatically when a voltage of at least 100 V is applied to 2 measuring sockets.

Automatic Shutdown

The instrument is switched off automatically when voltage is no longer applied. Battery service life is extended in this way.

4 Operation



Attention!

Measurements per DIN EN 61010-031 may only be performed in environments in accordance with measuring categories III and IV with the **safety cap** attached to the test probe at the end of the measurement cable.



Note!

In order to establish contact inside 4 mm sockets, the **safety caps** have to be removed by prying open the snap fastener with a pointed object (e.g. the other test probe).



Note!

The phase sequence indicator does not include any fuses!

4.1 Voltage Display

Voltage is displayed by means of 3 red LEDs (5) which are allocated to the respective nominal line voltages. The highest voltage which occurs within the circuit between two phases is always detected.

Voltage is displayed for nominal voltages 120 V/208 V, 230 V/400 V and 400 V/690 V.

Missing or Unconnected Phase

If one of the phases isn't connected to the phase sequence indicator, or if it isn't included in the wiring, its potential is too small relative to the artificial neutral point. The corresponding phase LED does not light up in this case. However, the voltage value LED lights up in accordance with line-to-line voltage.

Special case: If the phase is missing at the L1 connector socket, the voltage value LED indicates the next lower voltage because in this case the instrument no longer has an internal reference point.



Attention!

The L1 socket on the METRAPHASE 1 must always be contacted first in order to prevent erroneous measurements.

4.2 3-Pole Connection

Symmetrical Clockwise Rotation

If symmetrical clockwise rotation is measured, phase LEDs L1, L2 and L3 are continuously lit up and an illuminated green spot (rotary LED) rotates in the clockwise direction around the display loop (approx. 30 RPM).

Symmetrical Counterclockwise Rotation

In the case of symmetrical counterclockwise rotation, phase LEDs L1 through L3 light up as well, but color and direction of the rotating spot are changed: it rotates in the counterclockwise direction and lights up red.

Frequency Display

In the case of clockwise rotation, the LED assigned to the momentary frequency briefly lights up red, as soon as the illuminated rotating spot passes its position. In the case of counterclockwise rotation, the corresponding LED lights up green.

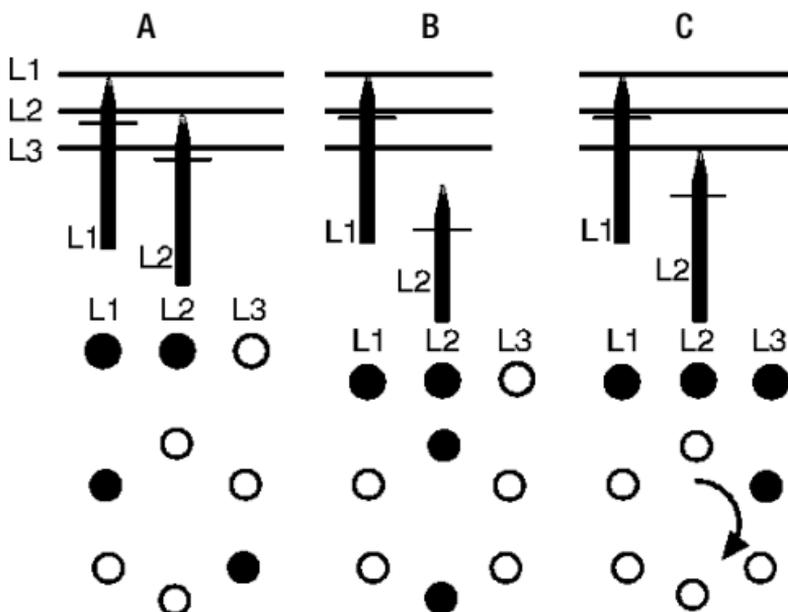
Instrument Sockets Connected to N or PE

If one of the sockets is connected to N or PE, the LED for the incorrectly connected phase doesn't light up. Phase sequence indication is the same as for clockwise or counterclockwise rotation.

Incorrect Wiring

If wiring has not been completed correctly, e.g. 2 x L1, indefinite displays can be expected.

4.3 2-Pole Connection



Phase sequence can also be determined with just 2 connector cables if line frequency is 50 or 60 Hz:

- 1 Contact phase L1 first via connector socket L1 and then connect phase L2 via connector socket L2 (see figure A).
Phase LEDs L1 and L2, as well as the corresponding voltage value LED, light up red. The two LEDs for 100 and 400 Hz also light up. This indicates that the instrument has synchronized itself to phases L1 and L2.
- 2 Disconnect socket L2 from phase L2 (see figure B).
The two LEDs for 50 and 200 Hz light up during this standby mode.
- 3 Now connect phase L3 via the L2 socket (see figure C).
Phase LEDs L1 and L3 light up red. L2 is generated internally. Phase sequence and line voltage value can be read from the display.



Note!

Changing from L2 to L3 must be completed within approximately two seconds. If this duration is exceeded, the instrument is no longer able to maintain synchronization with the mains. The 60, 100, 300 and 400 Hz LEDs light up simultaneously to indicate that this is the case. The 100 and 400 Hz LEDs then light up, in order to indicate that 2-pole measurement has been restarted. The same display sequence is used in the event that the same phase is contacted again erroneously instead of changing from one phase to the other.

5 Characteristic Values, Phase Sequence Indicator

Line Frequency

Nominal Frequency	Display Range	Tolerance Range	Display
50 Hz ¹	49.4 ... 50.7 Hz	49.2 ... 50.9 Hz	50 Hz – LED active
—	51.1 ... 57.9 Hz	50.9 ... 58.1 Hz	50 Hz and 60 Hz – LED active
60 Hz	58.3 ... 61.0 Hz	58.1 ... 61.2 Hz	60 Hz – LED active
—	61.4 ... 97.3 Hz	61.2 ... 97.5 Hz	60 Hz and 100 Hz – LED active
100 Hz	97.7 ... 102.8 Hz	97.5 ... 103 Hz	100 Hz – LED active
—	103.2 ... 195 Hz	103 ... 195.2 Hz	100 Hz and 200 Hz – LED active
200 Hz	195.4 ... 205.6 Hz	195.2 ... 205.8 Hz	200 Hz – LED active
—	206 ... 298.6 Hz	205.8 ... 298.8 Hz	200 Hz and 300 Hz – LED active
300 Hz	299 ... 303.4 Hz	298.8 ... 303.6 Hz	300 Hz – LED active
—	303.8 ... 395.3 Hz	303.6 ... 395.5 Hz	300 Hz and 400 Hz – LED active
400 Hz ¹	395.7 ... 405.8 Hz	395.5 ... 406 Hz	400 Hz – LED active

¹ < 50 Hz/> 400 Hz – both LEDs active

Overall frequency range 15 ... 410 Hz

Overall voltage range 100 ... 690 V

Line Voltage, 3 Phases ~

Nominal Line Voltage, LED Display	Corresponding L-L Voltage	Corresponding L-N Voltage
120/208V	180 ... 300 V	104 ... 173 V
230/400V	360 ... 470 V	208 ... 271 V
400/690V	530 ... 800 V	306 ... 462 V

Phase Sequence

Direction	Phase Sequence	Phase LEDs	Rotary LEDs
Clockwise	L1 - L2 - L3	L1, L2, L3 light up	Green LED rotates clockwise
Counterclockwise	L3 - L2 - L1	L1, L2, L3 light up	Red LED rotates counterclockwise
Asymmetrical rotary field	Lx - N/PE - Lx	Connection to N/PE, doesn't light up	Green or red LED rotates clockwise or counterclockwise depending on connection
One missing phase	Lx - X - Lx	Missing phase doesn't light up but the other 2 do	—

Reference Conditions

Ambient temperature	+23 °C ±2 K
Relative humidity	40 ... 60%
Battery voltage	4.5 V ±0.25 V
Line voltage	230/400 V ±0.5%
Line Frequency	50 Hz ±0.1 Hz
Line voltage waveform	Sine, deviation between TRMS and rectified value < 1%

Ambient Conditions

Storage temperature	-25 °C ... +75 °C
Operating temperature	-10 °C ... +50 °C
Relative humidity:	Max. 75% no condensation allowed
Elevation	To 2000 m

Power Supply

Batteries	4 ea. AA, IEC LR6 alkaline manganese
Battery voltage	4 V ... 6 V
Service life	Approx. 100 hours

Electrical Safety

Protection category	II per DIN EN 61010-1
Measuring category	IV
Operating voltage	600 V
Pollution degree	2
Test voltage	5.55 kV

Electromagnetic Compatibility

Interference emission	DIN EN 61326-1, class B
Interference immunity	DIN EN 61326-1

Mechanical Design

Protection	IP 40 per DIN VDE 0470, part 1 / DIN EN 60529 Table Excerpt Regarding Significance of IP Codes
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IP XY (1 st digit X)	Protection against foreign object ingress	IP XY (2 nd digit Y)	Protection against ingress by water
4	≥ 1.0 mm Ø	0	Not protected

Dimensions	84 x 195 x 35 mm
Weight	Approx. 0.3 kg with batteries, without rubber holster

Relevant Standards

The battery tester has been manufactured and tested in accordance with the following safety regulations:

DIN EN 61010-1/ VDE 0411-1	Safety requirements for electrical equipment for measurement, control and laboratory use
DIN EN 61557-7/ VDE 0413, part 7	Phase sequence indicators
DIN EN 60529 VDE 0470, part 1	Test instruments and test procedures Degrees of protection provided by enclosures (IP code)

6 CE Declaration

The instrument fulfills all requirements of applicable EU directives and national regulations. We confirm this with the CE mark.

The relevant declaration of conformity can be obtained from Gossen Metrawatt GmbH.

7 Maintenance

7.1 Battery

Make sure that no battery leakage has occurred before initial start-up, and after long periods of storage. This inspection should be repeated at regular intervals.

If battery leakage has occurred, carefully and completely clean the electrolyte from the instrument with a damp cloth and replace the batteries before using the instrument.

If none of the LEDs light up after applying voltage, or if they're very dim, the batteries need to be replaced.

The instrument requires four 1.5 V batteries in accordance with IEC or four equivalent rechargeable batteries.

Replacing the Batteries



Attention!

When the instrument is opened, voltage conducting parts may be exposed.

Disconnect the instrument from the measuring circuit and the device under test before opening the instrument in order to replace the batteries.



Attention!

Only the included (rechargeable) batteries or those specified in the technical data (see section 5 on page 11) may be inserted and used.

Set the instrument face down onto a suitable working surface, loosen the two screws at the back and lift off the housing base, beginning at the position where the screws are located. The housing top and housing base are held together with the help of snap hooks on the opposite side. Replace the batteries in the battery compartment with four new batteries.

Set the housing base back into place. Start on the side with the snap hooks and make sure they snap into place correctly.

Secure the housing base with the two screws.

Please dispose of depleted batteries in accordance with environmental protection regulations, e.g. at a designated collection point (see section 7.3 on page 14).

7.2 Housing

No special maintenance is required for the housing. Keep outside surfaces clean. Use a slightly dampened cloth for cleaning.

Avoid the use of cleansers, abrasives or solvents.

7.3 Returns and Environmentally Sound Disposal

The **instrument** is a category 9 product (monitoring and control instrument) in accordance with ElektroG (German electrical and electronic device law). This device is subject to the WEEE directive. We also draw attention to the fact that in this regard, the current status can be found on the Internet at www.gossenmetrawatt.com by entering the search term WEEE.

We identify our electrical and electronic devices in accordance with WEEE 2012/19EU and ElektroG using the symbol shown at the right per DIN EN 50419.



These devices may not be disposed of with household trash. Please contact our service department regarding the return of old devices.

If the **batteries** or **rechargeable batteries** used in your instrument or accessory product are depleted, they must be disposed of properly in accordance with valid national regulations.

Batteries may contain pollutants and heavy metals such as lead (Pb), cadmium (Cd) and mercury (Hg).

The symbol at the right indicates that batteries must not be disposed of with household trash, and must be brought to a designated collection point.



Pb Cd Hg

8 Accessories (not included)

VARIO Plug Adapter Set (article no. Z500A)



Three self-retaining test probes with touch protection for the connection of measurement cables with 4 mm banana plugs, or with touch protected plugs for sockets with an opening of 3.5 mm to 12 mm, e.g. CEE or Perilex sockets etc.

For example, the test probes also fit the square PE jacks on Perilex sockets. Maximum permissible operating voltage: 600 V per DIN EN 61010.

9 Repair and Replacement Parts Service Calibration Center and Rental Instrument Service

If required please contact:

GMC-I Service GmbH
Service Center
Beuthener Str. 41
D-90471 Nürnberg, Germany
Phone: +49-911-817718-0
Fax: +49-911-817718-253
e-mail service@gossenmetrawatt.com
www.gmci-service.com

This address is only valid in Germany.
Please contact our representatives or subsidiaries for
service in other countries.

10 Product Support

If required please contact:

Gossen Metrawatt GmbH
Product Support Hotline
Phone: +49 911-8602-0
Fax: +49 911 8602-709
e-mail: support@gossenmetrawatt.com

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