

Product catalogue 2024

Product catalogue

PASSION FOR PERFECTION



Dipl.-Ing. H. Horstmann GmbH
Humboldtstraße 2 - 10
42579 Heiligenhaus
Germany

T +49 2056 976 0

info@horstmannmbh.com
www.horstmannmbh.com

All rights reserved to make technical changes.
101101-0000/1000/0924






**Short-circuit and
earth fault indicators**

Remote monitoring

**Voltage detectors
and detecting systems**

Earthing devices













Substation accessories








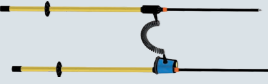




| | | |
|---|--|-------|
| About us | | |
| | Company profile | 8 |
| Short-circuit and earth fault indicators | | |
| | General information | 9 |
| | Product matrix Short-circuit indicators | 10 |
| | Product matrix Earth fault indicators | 11 |
| | Product matrix Short-circuit indicators and Earth fault indicators | 12-13 |
| | Product matrix Fault direction indicators | 14-15 |
| Mechanical indicators | | |
|  | Rotor indicator | 16 |
|  | Fluid indicator | 17 |
| Short-circuit indicators | | |
|  | Opto F 3.0 | 18-19 |
|  | Sigma 2.0 | 20-21 |
|  | Alpha M Alpha E | 22 |
| Earth fault indicators | | |
|  | Earth 4.0 | 23 |
|  | Earth Zero Earth Zero Flag | 24-25 |
| Short-circuit and earth fault indicators | | |
|  | Opto F+E 3.0 | 26-27 |
|  | Sigma F+E 2.0 Sigma F+E 3 2.0 | 28-29 |
|  | Sigma L Sigma F+E L Sigma F+E 3 L | 30-31 |
|  | ComPass A | 32-33 |
|  | ComPass A 2.0 | 34-35 |






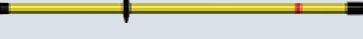

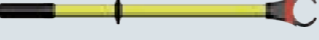



The contents, performance characteristics and diagrams listed in this catalogue are not always applicable in the form described in the specific application or may change due to further developments of the products. The textual content and illustrations have been processed with the greatest care. Nevertheless, errors cannot be completely excluded. The desired performance characteristics are only binding if they are expressly agreed upon when the contract is concluded. Delivery possibilities and technical changes reserved.

The names, trade names and descriptions of goods etc. given in this catalogue are subject to the guidelines of the respective manufacturer. Dipl.-Ing. H. Horstmann GmbH does not assume any obligation to keep this catalogue up to date.

| | | |
|---|--|---------|
| Directional fault indicators | | |
| | Device options / System composition | 36 |
| | Project planning | 37 |
|  | Sigma D Sigma D+ Sigma D++ | 38-39 |
|  | Sigma DM | 40-41 |
|  | ComPass B | 42-43 |
|  | ComPass B 2.0 ComPass Bs 2.0 | 44-45 |
|  | ComPass D | 46-47 |
| Accessories | | |
|  | Phase current transformers | 48-49 |
|  | Single-phase current sensors | 50 |
|  | Summation current transformers | 51 |
|  | Summation current sensors | 51 |
| | Product matrix Capacitive and resistive voltage signal | 52-53 |
|  | Voltage sensors | 54-56 |
|  | Accessories | 58 - 59 |
| Special indicators | | |
|  | Application (low-voltage monitoring) | 60-61 |
|  | Trip Flag | 62 |
| Overhead faulted circuit indicators | | |
| | Product matrix Overhead faulted circuit indicator | 63 |
|  | Navigator LM Navigator LM HV | 64-65 |
|  | Navigator LED+Flag | 66-67 |
|  | Smart Navigator 2.0 Smart Navigator 2.0 HV | 68-69 |

| | | |
|---|--|---------|
|  | Accessories | 70 |
| Remote monitoring | | |
| | General information | 71 |
|  | iHost | 72-75 |
|  | Reporter 3.0 | 76 - 77 |
|  | Reporter 4.0 | 78 - 79 |
| | Product matrix Remote monitoring | 80 |
| Voltage detectors and voltage detecting systems | | |
| | General information | 82 |
| Integrated voltage detecting systems | | |
| | Product matrix Integrated voltage detecting systems (VDIS) | 83 |
|  | Wega 1 | 84 - 85 |
|  | Wega 1 V | 86 - 87 |
|  | Wega 2 | 88 - 89 |
|  | Wega 2 V | 90 - 91 |
|  | Wega 1 LV | 92 |
|  | Wega T1 | 93 |
| Voltage detecting and voltage indication systems | | |
|  | Orion 3.1 Orion M1 | 94 - 95 |
|  | HR-ST LRM-ST | 96 |

| Voltage detectors | | |
|---|---|-----------|
| | Product matrix Voltage detectors Phase comparators | 98 - 99 |
|  | FL-I | 100 |
|  | Comet BL-I Comet BL-A | 101 |
|  | Comet BK-I Comet BK-A | 102 |
|  | Comet BS-I Comet BS-A | 103 |
|  | BO-A 2.0 | 104 - 105 |
|  | BO-A AC/DC | 106- 107 |
| Phase comparators | | |
|  | Compare 2.0 | 108 |
|  | PG II | 109 |
| | Accessories | 110 |
| | Maintenance test | 111 |
| Earthing devices and accessories | | |
| | General information | 112 - 113 |
| Earthing and short-circuiting devices | | |
|  | Three-phase device with ball tongs | 114 |
|  | Three-phase device with universal compact clamp or universal line clamp | 115 |
|  | Single-phase device without connection elements | 116 |
|  | Short-circuiting bars | 117 |

| Connection points and clamps | | |
|---|--|-----------|
|  | Line connection points | 118 |
|  | Line clamps | 119 |
|  | Earth connection points | 120 |
|  | Earth clamps Earth connecting elements | 121 - 122 |
| Devices for installations | | |
|  | Earthing sticks | 123 |
|  | Hot sticks | 124 |
|  | Operating rods | 125 |
|  | Fuse tongs | 126 |
| Accessories | | |
| | General information | 127 |
|  | Fuse testing devices | 128 |
|  | Wall holders | 129 |
|  | Accessories | 130 |
| Technical appendix | | |
| | Dimension drawings | 132 - 134 |
| | Order inquiry | 136 - 137 |
| | Index | 138 - 139 |
| | Terms of delivery | 140 |



Dipl.-Ing. H. Horstmann GmbH is a medium-sized company based in Heiligenhaus near Düsseldorf (Germany). The company was founded in 1946 by Heinrich Horstmann. Since that time it has been a successful family-owned company. Due to its long experience and the ongoing expansion activities in research and development as well as in production facilities Dipl.-Ing. H. Horstmann GmbH is today recognized as the leading manufacturer in medium voltage technology for:

- ▶ Short-circuit and earth fault indicators
- ▶ Solutions for remote monitoring
- ▶ Voltage detectors and voltage detecting systems
- ▶ Earthing devices and accessories

The worldwide distribution is covered by both our own highly qualified sales force and trade agents.

Our products meet the highest quality requirements and are developed and manufactured in our production facilities in Germany. In order to respond to these demands, we have a very high vertical depth of production (e. g. own SMD assembly lines) as well as an own research and development department with state-of-the-art testing and measuring equipment. Besides the electronics manufacturing, we have also a mechanical production facilities.

Since 1996 our company has been certified according to DIN EN ISO 9001.



Manufacturing



Component testing



High voltage laboratory

Short-circuit and earth fault indicators

General information

Horstmann offers a comprehensive range of short-circuit and earth fault indicators, which are characterised by extremely high reliability, top quality and state-of-the-art-functions.

There are different products and system solutions for medium voltage underground cable and overhead line networks with and without directional fault indication. They are suitable for radial, open ring and closed ring networks as well as for networks with a distributed generation. The following applies for all applications:

If a fault occurs:

- ▶ Quick identification of the fault location, immediate local indication and communication to SCADA
- ▶ Targeted de-energising/switching
- ▶ Quick supply restoration

This means: utilities can minimise the time and effort in searching for faults and benefit from high availability of energy supply. This helps them save costs and optimise their earnings.

With continuous monitoring:

- ▶ High transparency: Provision of high accuracy measurements from the distribution network
- ▶ Transmission of simple station reports like door contact, temperature alarm and status of the intelligent substation
- ▶ Simple upgrading of existing medium-voltage switchgear with retrofit solutions

With this, utilities will always have an overview of the situation in the network as well as be able to create predictive maintenance programs.

The product series for cable networks:

The Sigma series provides short-circuit and earth fault indicators for networks with a low-impedance neutral earthing.

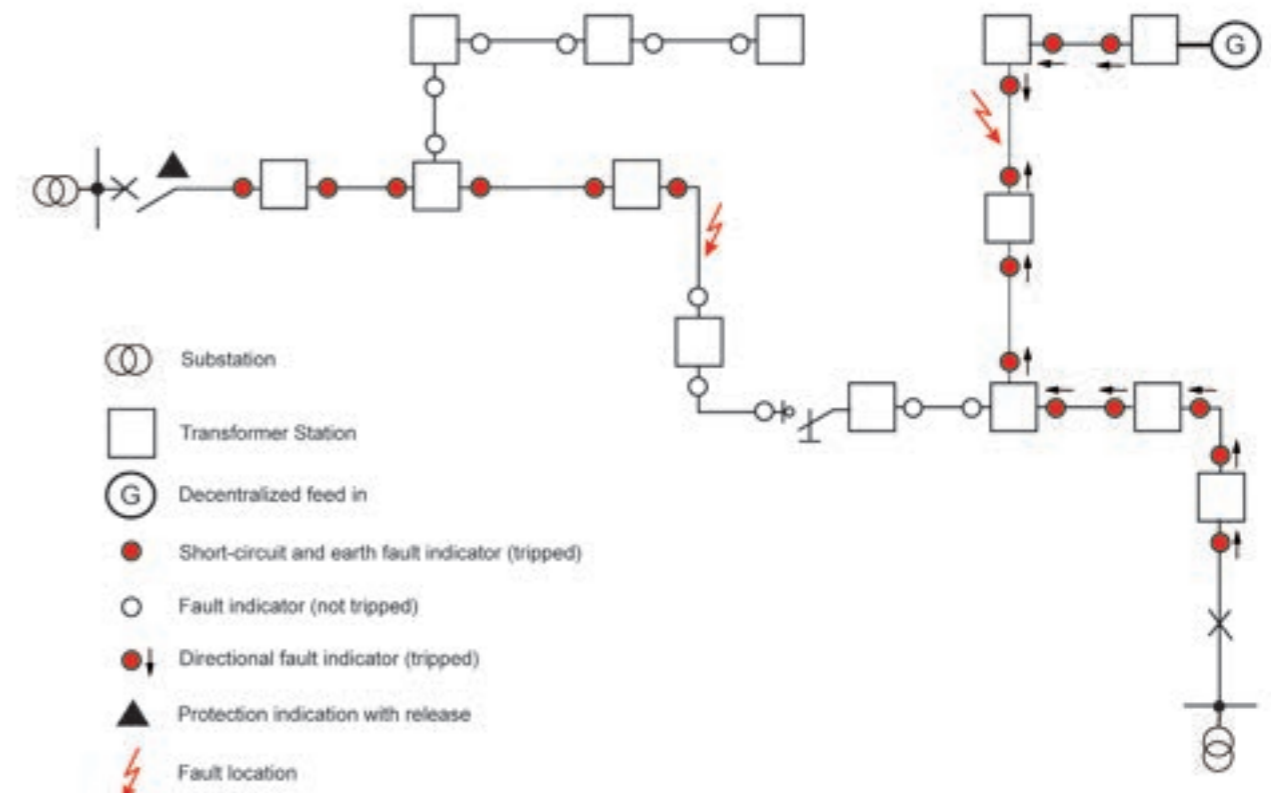
The Sigma D series provides directional short-circuit and earth fault indicators for networks with a low-impedance resonant and isolated networks (Sigma D+ and Sigma D++) and neutral earthing with distributed energy generation.

The ComPass B series is for applications requiring highly accurate network monitoring in combination with directional fault indication. ComPass Bs 2.0 is used for applications where remote switching is required.

The diagram below shows two types of faults:

Left: A permanent fault that leads to line de-energisation when the circuit-breaker in the substation is opened. The short-circuit and earth fault indicators have tripped between substation and towards the fault location.

Right: A transient fault which does not lead to network de-energisation. The circuit-breaker remains closed. The short-circuit and earth fault indicators point from two directions to the fault location.



Product matrix

Short-circuit indicators



| Function | Rotor indicator | Fluid indicator | Opto F 3.0 | Sigma 2.0 / Sigma 2.0 AC/DC | Alpha M / Alpha E |
|--|---------------------------------|---------------------------------------|--|--|---------------------------|
| Short-circuit indication / earth short-circuit indication | ■ | ■ | ■ | ■ | ■ |
| Earth fault indication | — | — | — | — | — |
| Directional indication | — | — | — | — | — |
| Monitoring | — | — | — | — | — |
| Control function and programmable logic | — | — | — | — | — |
| Neutral system | | | | | |
| Low-impedance earthed / short-term low-impedance earthed | ■ | ■ | ■ | ■ | ■ |
| Isolated earthed | — | — | — | — | — |
| Resonant earthed (with Petersen coil) | — | — | — | — | — |
| Short-circuit trip current values | | | | | |
| I>> Short-circuit trip current / earth short-circuit trip current | 150—2,000 A (fixed settings) | 400, 600, 1,000 A (fixed settings) | 400, 600, 800 or 1,000 A | 200, 300, 400, 600, 800, 1,000, 2,000 A, self-adjustment | 400, 600, 800, 1,000 A |
| tI>> Response delay | 100 ms | 200 ms | 40, 60, 80, 100, 200, 300 or 500 ms | 40, 80 ms | 100 ms |
| Earth fault detection methods | | | | | |
| IE> Earth fault trip current | — | — | — | — | — |
| IEP> Active residual current cos φ | — | — | — | — | — |
| IEQ> Reactive current sin φ | — | — | — | — | — |
| IET> Transient earth fault method | — | — | — | — | — |
| VNE> Neutral point displacement voltage (permanent earth fault) | — | — | — | — | — |
| IE> Pulse (stroke) | — | — | — | — | — |
| Response delay | — | — | — | — | — |
| Reset | | | | | |
| Manual/ Remote | ■/— | — | ■/■ | ■/■ | M: ■/— E: ■/■ |
| Automatic time reset | — | ■ | ■ | ■ | — ■ |
| Current- / voltage- / auxiliary supply restoration | — | — | —/■/■ | — AC/DC: —/—/■ | — |
| Test | | | | | |
| Manual/ Remote | — | — | ■/■ | ■/■ | ■/— |
| Communication | | | | | |
| Relay contacts | on request | on request | 1 | 1 | 1 |
| Ethernet/ IEC 60870-5-104 | — | — | — | — | — |
| RS485 / Modbus-RTU | — | — | — | — | — |
| USB port | — | — | — | — | — |
| Parameter setting | | | | | |
| Manual / remote / software via USB | — | — | ■/—/— | ■/—/— | ■/—/— |
| Power supply | | | | | |
| Long-life lithium cell / capacitor | —/— | —/— | ■/— | ■/— AC/DC: —/■ | ■ (E)/— |
| CT powered | ■ | ■ | — | ■ — | ■ |
| External auxiliary supply [V AC/DC] | — | — | 24—60 V AC, 12—110 V DC | — 24—230 | — |
| Number of current transformers (CT) / current sensor (S) | | | | | |
| Phase current / summation current | — | — | 3/— (CT) | 3/— (S) | 3/— (CT) |
| Voltage coupling | | | | | |
| Capacitive / resistive | — | — | — | — | — |

Product matrix

Earth fault indicator



| Function | Earth 4.0 | Earth Zero | Earth Zero Flag |
|--|------------------|-------------------|-------------------|
| Short-circuit indication / earth short-circuit indication | — | — | — |
| Earth fault indication | ■ | ■ | ■ |
| Directional indication | — | — | — |
| Monitoring | — | — | — |
| Control function and programmable logic | — | — | — |
| Neutral system | | | |
| Low-impedance earthed / short-term low-impedance earthed | ■ | ■ | ■ |
| Isolated earthed | ■ | ■ | ■ |
| Resonant earthed (with Petersen coil) | — | — | — |
| Short-circuit trip current values | | | |
| I>> Short-circuit trip current / earth short-circuit trip current | — | — | — |
| tI>> Response delay | — | — | — |
| Earth fault detection methods | | | |
| IE> Earth fault trip current | 25, 50, 60, 80 A | 25, 50, 75, 100 A | 25, 50, 75, 100 A |
| IEP> Active residual current cos φ | — | — | — |
| IEQ> Reactive current sin φ | — | — | — |
| IET> Transient earth fault method | — | — | — |
| VNE> Neutral point displacement voltage (permanent earth fault) | — | — | — |
| IE> Pulse (stroke) | — | — | — |
| Response delay | 80, 160 ms | 80, 160 ms | 80, 160 ms |
| Reset | | | |
| Manual/ Remote | ■/■ | ■/— | ■/— |
| Automatic time reset | ■ | ■ | ■ |
| Current- / voltage- / auxiliary supply restoration | —/■/— | —/■/— | —/■/— |
| Test | | | |
| Manual/ Remote | ■/■ | ■/— | ■/— |
| Communication | | | |
| Relay contacts | 3 | 1 | 1 |
| Ethernet/ IEC 60870-5-104 | — | — | — |
| RS485 / Modbus-RTU | — | — | — |
| USB port | — | — | — |
| Parameter setting | | | |
| Manual / remote / software via USB | ■/—/— | ■/—/— | ■/—/— |
| Power supply | | | |
| Long-life lithium cell / capacitor | ■/— | ■/— | ■/— |
| CT powered | ■ | ■ | ■ |
| External auxiliary supply [V AC/DC] | — | — | — |
| Number of current transformers (CT) / current sensor (S) | | | |
| Phase current / summation current | —/1 (CT) | —/1 (CT) | —/1 (CT) |
| Voltage coupling | | | |
| Capacitive / resistive | — | — | — |

Product matrix

Short-circuit and earth fault indicator



| Function | Opto F+E 3.0 | Sigma F+E 2.0 / Sigma F+E 2.0 AC/DC | Sigma F+E 3.0 / Sigma F+E 3.0 AC/DC | Sigma L/ Sigma F+E L/ Sigma F+E 3 L |
|---|---|--|--|--|
| Short-circuit indication / earth short-circuit indication | ■ | ■ | ■ | |
| Earth fault indication | ■ | — | ■ | |
| Directional indication | — | — | — | |
| Monitoring | — | — | — | |
| Control function and programmable logic | — | — | — | |
| Neutral system | | | | |
| Low-impedance earthed / short-term low-impedance earthed | ■ | ■ | ■ | |
| Isolated earthed | — | — | ■ | |
| Resonant earthed (with Petersen coil) | — | — | — | |
| Short-circuit trip current values | | | | |
| I>> Short-circuit trip current / earth short-circuit trip current | 400, 600, 800 or 1,000 A | 200, 300, 400, 600, 800, 1,000, 2,000 A, self-adjustment | 200, 300, 400, 600, 800, 1,000, 2,000 A, self-adjustment | |
| tl>> Response delay | 40, 60, 80, 100, 200, 300 or 500 ms | 40, 80 ms | 40, 80, 200, 300 ms | |
| Earth fault detection methods | | | | |
| IE> Earth fault trip current | 10, 20, 40 or 80 A and 40, 80, 120 or 160 A | — | 20, 40, 60, 80, 100, 120 or 160 A | |
| IEP> Active residual current cos φ | — | — | — | |
| IEQ> Reactive current sin φ | — | — | — | |
| IET> Transient earth fault method | — | — | — | |
| VNE> Neutral point displacement voltage (permanent earth fault) | — | — | — | |
| IE> Pulse (stroke) | — | — | — | |
| Response delay | 60, 100 or 200 ms | — | 60, 80, 200 or 300 ms | |
| Reset | | | | |
| Manual/ Remote | ■/■ | ■/■ | ■/■ | |
| Automatic time reset | ■ | ■ | ■ | |
| Current- / voltage- / auxiliary supply restoration | -/■/■ | — | AC/DC: -/■/■ ■/■/■ | AC/DC: ■/■/■ |
| Test | | | | |
| Manual/ Remote | ■/■ | ■/■ | ■/■ | |
| Communication | | | | |
| Relay contacts | 2 | 1 | 3 | |
| Ethernet/ IEC 60870-5-104 | — | — | — | |
| RS485 / Modbus-RTU | — | — | — | |
| USB port | — | — | — | |
| Parameter setting | | | | |
| Manual / remote / software via USB | ■/■/■ | ■/■/■ | ■/■/■ | |
| Power supply | | | | |
| Long-life lithium cell / capacitor | ■/■ | ■/■ | AC/DC: -/■ ■/■ | AC/DC: -/■ |
| CT powered | — | ■ | — | — |
| External auxiliary supply [V AC/DC] | 24–60 V AC, 12–110 V DC | — | 24–230 | — 24–230 |
| Number of current transformers (CT) / current sensor (S) | | | | |
| Phase current / summation current | 3/1 (CT) | 3/— (S) | 3/— (S) | |
| Voltage coupling | | | | |
| Capacitive / resistive | — | — | — | |

Product matrix

Short-circuit and earth fault indicator



| Function | ComPass A | ComPass A 2.0 |
|---|------------|-----------------------------|
| Short-circuit indication / earth short-circuit indication | ■ | ■ |
| Earth fault indication | ■ | ■ |
| Directional indication | — | — |
| Monitoring | ■ | ■ |
| Control function and programmable logic | — | — |
| Neutral system | | |
| Low-impedance earthed / short-term low-impedance earthed | ■ | ■ |
| Isolated earthed | ■ | ■ |
| Resonant earthed (with Petersen coil) | — | — |
| Short-circuit trip current values | | |
| I>> Short-circuit trip current / earth short-circuit trip current | 20–2,000 A | 10–2,000 A, self-adjustment |
| tl>> Response delay | 40 ms–60 s | 20 ms–60 s |
| Earth fault detection methods | | |
| IE> Earth fault trip current | 20–1,000 A | 10–1,000 A |
| IEP> Active residual current cos φ | — | — |
| IEQ> Reactive current sin φ | — | — |
| IET> Transient earth fault method | — | — |
| VNE> Neutral point displacement voltage (permanent earth fault) | — | — |
| IE> Pulse (stroke) | — | 1–200 A |
| Response delay | 40 ms–60 s | 40 ms–60 s |
| Reset | | |
| Manual/ Remote | ■/■ | ■/■ |
| Automatic time reset | ■ | ■ |
| Current- / voltage- / auxiliary supply restoration | ■/■/■ | ■/■/■ |
| Test | | |
| Manual/ Remote | ■/■ | ■/■ |
| Communication | | |
| Relay contacts | 4 | 4 |
| Ethernet/ IEC 60870-5-104 | — | — |
| RS485 / Modbus-RTU | ■ | ■ |
| USB port | — | ■ |
| Parameter setting | | |
| Manual / remote / software via USB | ■/■/■ | ■/■/■ |
| Power supply | | |
| Long-life lithium cell / capacitor | ■/■ | ■/■ |
| CT powered | — | — |
| External auxiliary supply [V AC/DC] | 24–230 | 24–230 |
| Number of current transformers (CT) / current sensor (S) | | |
| Phase current / summation current | 3/— (S) | 3/— (S) |
| Voltage coupling | | |
| Capacitive / resistive | — | — |

Product matrix

Directional fault indicators



| Function | Sigma D | Sigma D+ | Sigma D++ | Sigma DM |
|---|--|--|--|--|
| Short-circuit indication / earth short-circuit indication | ■ | ■ | ■ | ■ |
| Earth fault indication | ■ | ■ | ■ | ■ |
| Directional indication | ■ | ■ | ■ | ■ |
| Monitoring | — | — | — | ■ |
| Control function and programmable logic | — | — | — | — |
| Neutral system | | | | |
| Low-impedance earthed / short-term low-impedance earthed | ■ | ■ | ■ | ■ |
| Isolated earthed | ■ | ■ | ■ | ■ |
| Resonant earthed (with Petersen coil) | — | ■ | ■ | ■ |
| Short-circuit trip current values | | | | |
| I>> Short-circuit trip current / earth short-circuit trip current | DIP: 200, 300, 400, 600, 800, 2,000 A, self-adjustment SW: 50–2,000 A | DIP: 200, 300, 400, 600, 800, 2,000 A, self-adjustment SW: 50–2,000 A | DIP: 200, 300, 400, 600, 800, 2,000 A, self-adjustment SW: 50–2,000 A | DIP: 400, 800, 1,000, 2,000 A, self-adjustment SW: 50–2,000 A |
| tI>> Response delay | DIP: 40, 80 ms, SW: 40 ms–60 s | DIP: 40, 80 ms, SW: 40 ms–60 s | DIP: 40, 80 ms, SW: 40 ms–60 s | DIP: 40, 80 ms, SW: 40 ms–60 s |
| Earth fault detection methods | | | | |
| IE> Earth fault trip current | DIP: off, 20, 40, 60, 80, 100, 120, 160 A SW: 20–1,000 A | DIP: off, 20, 40, 60, 80, 100, 120, 160 A SW: 20–1,000 A | DIP: off, 20, 40, 60, 80, 100, 120, 160 A SW: 20–1,000 A | SW: 20–1,000 A |
| IEP> Active residual current cos φ | — | 5–200 A | 5–200 A | 1–200 A |
| IEQ> Reactive current sin φ | — | 5–200 A | 5–200 A | 1–200 A |
| IET> Transient earth fault method | — | 10–100 A | 10–500 A | 10–500 A |
| VNE> Neutral point displacement voltage (permanent earth fault) | — | — | — | 1–100% |
| IE> Pulse (stroke) | — | 1–100 A | 1–100 A | 1–100 A |
| Response delay | DIP: 80, 160 ms, SW: 40 ms–60 s | DIP: 80, 160 ms, SW: 40 ms–60 s | DIP: 80, 160 ms, SW: 40 ms–60 s | SW: 40 ms–60 s |
| Reset | | | | |
| Manual/ Remote | ■/■ | ■/■ | ■/■ | ■/■ |
| Automatic time reset | ■ | ■ | ■ | ■ |
| Current- / voltage- / auxiliary supply restoration | ■/■/— | ■/■/— | ■/■/— | ■/■/— |
| Test | | | | |
| Manual/ Remote | ■/■ | ■/■ | ■/■ | ■/■ |
| Communication | | | | |
| Relay contacts | 4 | 4 | 4 | — |
| Ethernet/ IEC 60870-5-104 | — | — | — | — |
| RS485 / Modbus-RTU | — | — | — | ■ |
| USB port | ■ | ■ | ■ | ■ |
| Parameter setting | | | | |
| Manual / remote / software via USB | ■/—/■ | ■/—/■ | ■/—/■ | ■/—/■ |
| Power supply | | | | |
| Long-life lithium cell / capacitor | ■/— | ■/— | ■/— | ■/— |
| CT powered | ■ | ■ (from 3A) | ■ (not IET>) | ■ (not IET>) |
| External auxiliary supply [V AC/DC] | — | 24–60V DC/ 24V AC | 24–230 (for IET>) | 24–230 (for IET>) |
| Number of current transformers (CT) / current sensor (S) | | | | |
| Phase current / summation current | 3/— (S) | 3/1, opt. 3/— (S) | 3/—, opt. 3/1 (S) | 3/— (S) |
| Voltage coupling | | | | |
| Capacitive / resistive | ■/— | ■/— | ■/— | ■/— |

Product matrix

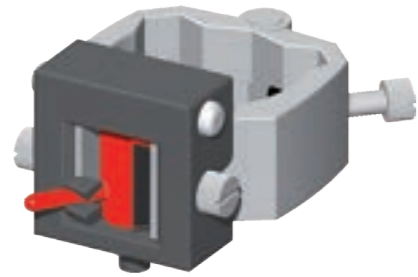
Directional fault indicators



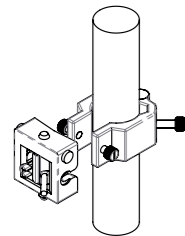
| Function | ComPass B | ComPass B 2.0 | ComPass Bs 2.0 | ComPass D |
|---|--------------------------------|-----------------------------|----------------------------|----------------------------|
| Short-circuit indication / earth short-circuit indication | ■ | ■ | ■ | ■ |
| Earth fault indication | ■ | ■ | ■ | ■ |
| Directional indication | ■ | ■ | ■ | ■ |
| Monitoring | ■ | ■ | ■ | ■ |
| Control function and programmable logic | — | — | 1 switchgear | 2 switchgears |
| Neutral system | | | | |
| Low-impedance earthed / short-term low-impedance earthed | ■ | ■ | ■ | ■ |
| Isolated earthed | ■ | ■ | ■ | ■ |
| Resonant earthed (with Petersen coil) | ■ | ■ | ■ | ■ |
| Short-circuit trip current values | | | | |
| I>> Short-circuit trip current / earth short-circuit trip current | 50–2,000 A | 10–2,000 A, self-adjustment | 10–2,000 A self-adjustment | 10–2,000 A self-adjustment |
| tI>> Response delay | 40 ms–60 s | 20 ms–60 s | 20 ms–60 s | 20 ms–60 s |
| Earth fault detection methods | | | | |
| IE> Earth fault trip current | 20–1,000 A | 10–1,000 A | 10–1,000 A | 10–1,000 A |
| IEP> Active residual current cos φ | 1–200 A | 1–200 A | 1–200 A | 1–200 A |
| IEQ> Reactive current sin φ | 1–200 A | 1–200 A | 1–200 A | 1–200 A |
| IET> Transient earth fault method | — | 10–500 A | 10–500 A | 10–500 A |
| VNE> Neutral point displacement voltage (permanent earth fault) | 0–100% | 1–100% | 1–100% | 1–100% |
| IE> Pulse (stroke) | — | 1–200 A | 1–200 A | 1–200 A |
| Response delay | 40 ms–60 s | 40 ms–60 s | 40 ms–60 s | 40 ms–60 s |
| Reset | | | | |
| Manual/ Remote | ■/■ | ■/■ | ■/■ | ■/■ |
| Automatic time reset | ■ | ■ | ■ | ■ |
| Current- / voltage- / auxiliary supply restoration | ■/■/■ | ■/■/■ | ■/■/■ | ■/■/■ |
| Test | | | | |
| Manual/ Remote | ■/■ | ■/■ | ■/■ | ■/■ |
| Communication | | | | |
| Relay contacts | 4 | 4 | 4 | 4 |
| Ethernet/ IEC 60870-5-104 | — | — | — | ■ |
| RS485 / Modbus-RTU | ■ | ■ | ■ | — |
| USB port | — | ■ | ■ | ■ |
| Parameter setting | | | | |
| Manual / remote / software via USB | ■/■/— | ■/■/■ | ■/■/■ | ■/■/■ |
| Power supply | | | | |
| Long-life lithium cell / capacitor | ■/— | ■/— | ■/— | ■/— |
| CT powered | — | — | — | — |
| External auxiliary supply [V AC/DC] | 24–230 | 24–230 | 24–230 | 24 |
| Number of current transformers (CT) / current sensor (S) | | | | |
| Phase current / summation current | 2/1, opt. 3/— for IE> 10 A (S) | 3/—, opt. 3/1 or 2/1 (S) | 3/—, opt. 3/1 or 2/1 (S) | 3/— |
| Voltage coupling | | | | |
| Capacitive / resistive | ■/— | ■/■ | ■/■ | ■/■ |

Rotor indicator

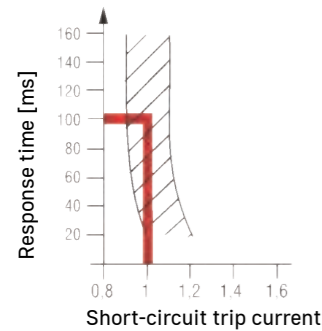
Short-circuit indicator



Rotor indicator



Installation



Response characteristic

| I_{min} [A] | for \varnothing [mm] | Order no. | Accessories | Page |
|---------------|------------------------|---------------------------|-------------|------|
| 150 | 8–16 | 20-0101-001 ¹⁾ | Hot stick | 124 |
| 200 | 16–20 | 20-0102-001 | | |
| 200 | 20–30 | 20-0103-001 | | |
| 200 | 30–40 | 20-0104-001 | | |
| 200 | 40–50 | 20-0105-001 | | |
| 300 | 50–60 | 20-0106-001 | | |
| 300 | 60–80 | 20-0108-001 | | |
| I_{min} [A] | for \varnothing [mm] | Order no. | | |
| 150 | 20 x 4–25 x 6 | 20-0122-001 ¹⁾ | | |
| 150 | 25 x 4–30 x 6 | 20-0123-001 ¹⁾ | | |
| 200 | 30 x 4–40 x 10 | 20-0120-001 ¹⁾ | | |
| 300 | 45 x 4–60 x 12 | 20-0121-001 ¹⁾ | | |

¹⁾ Screws for fixing the conductor made of steel
 Combined rotor / fluid short-circuit indicators are available on request.
 Product matrix on page 10
 Dimension drawing see on page 132 ff. | M1

PRODUCT FEATURES

- ▶ Mechanical design
- ▶ Installation on cables or busbars
- ▶ Fault indication by pivoted rotor
- ▶ Retrofit ready

YOUR ADVANTAGES

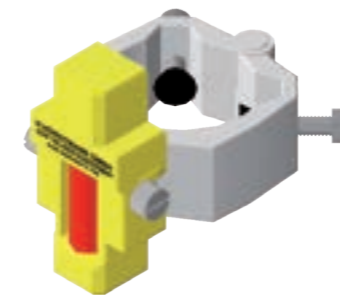
- ▶ Universal use
- ▶ Reliable fault detection during re-energising
- ▶ Maintenance-free, no battery

The rotor indicator is a mechanical short-circuit indicator. It is designed to detect short-circuit currents in medium voltage distribution networks. The indicator is tripped by a magnetic field strength "H" which is induced by trip values $I_{>>}$. The pivoted rotor with reset pin uses a two-colour indication to inform the user of the state of the Rotor Indicator. "Black" means that the indicator has not been tripped whereas "red" indicates that the indicator has been tripped.

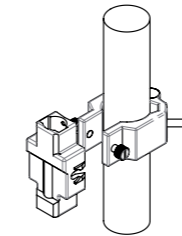
| Technical data | Rotor indicator |
|-------------------------------------|---|
| Short-circuit indicator | ■ |
| Earth fault detection method | Earth short-circuit |
| $I_{>>}$ Short-circuit trip current | 150–2,000 A (factory setting) |
| $t_{l>>}$ Response delay | 100 ms at rated trip value |
| Accuracy | ±10 % |
| Reset | Manual reset with hot stick |
| Material | Housing and fixing screws made from polyamide, Yoke made from ferromagnetic steel |
| Temperature range | -40 to +85 °C |

Fluid indicator

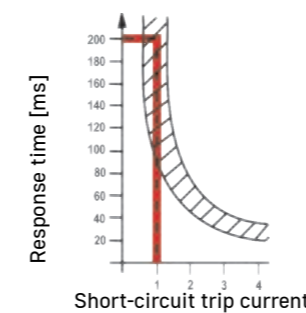
Short-circuit indicator



Fluid indicator



Installation



Response characteristic

| I_{min} [A] | for \varnothing [mm] | Order no. |
|---------------|------------------------|---------------------------|
| 400 | 8–16 | 20-0401-000 ¹⁾ |
| 400 | 16–20 | 20-0402-000 |
| 400 | 20–30 | 20-0403-000 |
| 400 | 30–40 | 20-0404-000 |
| 600 | 40–50 | 20-0405-000 |
| 600 | 50–60 | 20-0406-000 |
| 1,000 | 60–80 | 20-0408-000 |
| I_{min} [A] | for \varnothing [mm] | Order no. |
| 400 | 30 x 4–40 x 10 | 20-0420-000 ¹⁾ |
| 400 | 20 x 4–25 x 6 | 20-0422-000 ¹⁾ |
| 400 | 25 x 4–30 x 6 | 20-0423-000 ¹⁾ |
| 600 | 45 x 4–60 x 12 | 20-0421-000 ¹⁾ |
| I_{min} [A] | for \varnothing [mm] | Order no. |
| 400 | 30 x 4–40 x 15 | 20-0410-000 ¹⁾ |

¹⁾ Screws for fixing the conductor made of steel
 Combined rotor / fluid short-circuit indicators are available on request.
 Product matrix on page 10
 Dimension drawing see on page 132 ff. | M2

PRODUCT FEATURES

- ▶ Mechanical design
- ▶ Installation on cables or busbars
- ▶ Fault indication by fluid with red coloured particles
- ▶ Retrofit ready

YOUR ADVANTAGES

- ▶ Universal use
- ▶ Automatic reset
- ▶ Maintenance-free, no battery

The fluid indicator is a mechanical short-circuit indicator which is designed to detect short-circuit currents in medium voltage distribution networks.

The indicator is tripped by a magnetic field strength "H" which is induced by trip values $I_{>>}$. When a short-circuit occurs, the mixer is pulled up by the magnetic field stirring up red particles in the fluid. The indication resets automatically after six to eight hours once the red particles have set to the bottom of the mixer.

| Technical data | Fluid indicator |
|-------------------------------------|---|
| Short-circuit indicator | ■ |
| Earth fault detection method | Earth short-circuit |
| $I_{>>}$ Short-circuit trip current | 400, 600, 1,000 A (factory setting) |
| $t_{l>>}$ Response delay | 200 ms at rated trip value (100 ms are available on request) |
| Accuracy | ±20 % |
| Reset | Automatic reset by time after approx. 6–8 h |
| Material | Housing and fixing screws made from polyamide, Yoke made from ferromagnetic steel |
| Temperature range | -40 °C bis +85 °C |

Opto F 3.0

Short-circuit indicator



Opto F 3.0, plug-in housing



Opto F 3.0, Surface mount housing

PRODUCT FEATURES

- ▶ Fibre optic cables for electrical isolation between indicator and current transformers
- ▶ High-intensity LED indication
- ▶ Single and double flash mode for operation in radial and ring networks
- ▶ Remote indication via relay contact
- ▶ Current transformer retrofit ready

YOUR ADVANTAGES

- ▶ Installation on bare cables and busbars/copper conductors
- ▶ New fault detection within reset time

The Opto F 3.0 is a short-circuit indicator. It is designed to detect, display and remotely indicate short-circuit currents in medium voltage distribution networks. The indicator unit can be used in all medium voltage switchgear installations. Fibre optic cables provide electrical isolation between the current transformers, mounted on cable/busbar, and the display unit when transferring signals.

The current transformers (CT) have an integrated trip threshold detection capability. When the pre-set trip current is reached or exceeded, light pulses will be emitted. A fibre optic cable is used to transmit these light pulses from the CT to the Opto. Phase-selectively operated red LEDs start flashing.

After the first tripping incident (e. g. in radial systems) the LEDs begin a phase-selective flash rhythm of: flash / pause / flash.

A second tripping (e. g. ring operated network with auto-reclosing) is indicated by flashing LEDs of the fault-affected phases in a flash-flash / pause / flash-flash rhythm.

| Technical data | Opto F 3.0 |
|--------------------------------|---|
| Short-circuit indicator | ■ |
| Earth fault detection method | Earth short-circuit |
| I>> short-circuit trip current | 400, 600, 800, 1,000 A ¹⁾ (adjustable at the CT) |
| tl>> response delay | 40, 60, 80, 100, 200, 300, 500 ms (adjustable at the display unit) |
| Accuracy | ±15 % (determined by current transformer) |
| Indication | Phase-selective short-circuit: 3 red LEDs, flashing period 2 s, double flash sequence 0.3 s with flashing period 3 s Optional: external signal lamp |
| Remote signal / communication | 1 relay contact |
| Remote contact | Potential-free permanent or momentary contact Contact capacity: 380 V AC / 5 A / 1250 VA max.; 220 V DC / 5 A / 150 W max. |
| Reset | <ul style="list-style-type: none"> ▶ By button ▶ Automatic time reset: 1, 2, 4 or 8 h ▶ Restoration of auxiliary supply ≥10 s (activated via DIP switch) ▶ Remote reset |
| Power supply | |
| Internal power supply | Long-life lithium cell, active flashing time >1,000 h, shelf life ≥20 years |
| External auxiliary supply | 12–110 V DC ±10 % or 24–60 V AC (±10 %), 50–60 Hz (optional) |
| Optional accessories | Transformer with cable for top-hat rail or screw mounting (115–230 V AC / 24–48 V AC) |
| Temperature range | -30 to +70 °C |

| Equipment set | Page | Order no. | Accessories | Page |
|-----------------------------------|------|-------------|-------------------------------------|------|
| 1 Display unit | | | External signal lamp | 58 |
| Opto F 3.0, plug-in housing | | 33-0513-001 | Transformer for top-hat rail | 59 |
| Opto F 3.0, surface mount housing | | 33-0613-001 | Cutting tool for fibre optic cables | 59 |
| 3 Single-phase current sensors | 48 | | Optical testing unit | 59 |
| 3 Fibre optic cables | 59 | | Disassembly clip | 59 |
| | | | Spring clip | 59 |

¹⁾ Further trip currents on request.

Dimension drawing see on page 132 ff. | M3

Sigma 2.0

Short-circuit indicator



Sigma 2.0



Sigma 2.0 AC/DC

PRODUCT FEATURES

- ▶ Short-circuit indicator for all medium voltage networks
- ▶ Phase-selective fault indication
- ▶ Trip current values: load-dependent self-adjustment or fixed values
- ▶ Single and double flash mode for operation in radial and ring networks
- ▶ With auxiliary supply and back-up capacitor available in AC/DC version

YOUR ADVANTAGES

- ▶ No false trips due to higher harmonics
- ▶ Highly visible LED fault indication
- ▶ Retrofit ready for short-circuit and earth fault indicators with monitoring/control and fault direction function

The Sigma 2.0 is a phase-selective short-circuit indicator. It is designed to detect, display and remotely indicate short-circuits in medium voltage distribution networks.

The current is measured via three Single-phase current sensors. By using the new sensors retrofit to more advanced indicator series is possible at any time – without changing the sensors.

There are two response criteria for short-circuit detection, fixed response value with response delay or auto-adjustment based on load current.

If the current for the selected response criterion – fixed value or self-adjustment – is exceeded, the fault-affected phase will be indicated by a bright flashing LED and remote contact will be activated. A double flashing LED signals a second fault that has occurred within the reset time, e. g. by an automatic reclose attempt and the remote contact will be reactivated.

For testing and commissioning purposes, the trip current values can be reduced to 10 A without changing the DIP switch settings.

Sigma 2.0 AC/DC

This version can be connected to auxiliary supply. If the auxiliary power drops out in the event of a fault, the LED indicator can operate using a back-up capacitor for up to 8 hours.

| Technical data | Sigma 2.0 |
|--------------------------------|--|
| Short-circuit indicator | ■ |
| Earth fault detection method | Earth short-circuit |
| I>> short-circuit trip current | 200, 300, 400, 600, 800, 1,000, 2,000 A Self-adjustment to load current (IL = load current): IL < 100 A → I>> = 400 A, IL > 100 A → I>> = 4 x IL |
| tI>> response delay | 40, 80 ms |
| Accuracy | 5 % (0–630 A) 10 % (>630 A) |
| Indication | 3 red LEDs: 3 x short-circuit (L1, L2, L3) |
| Remote signal / communication | 1 potential-free relay contact |
| Remote contact | Potential-free permanent or momentary contact Contact capacity: 230 V AC / 1 A / 62.5 VA max.; 220 V DC / 1 A / 60 W max. |
| Reset | ▶ By button ▶ Automatic time reset: 1, 2, 4 or 8 h ▶ Remote reset |
| Power supply | |
| CT powered | ■ |
| Internal power supply | Long-life lithium cell, active flashing time >900 h, shelf life ≥20 years AC/DC version: back-up capacitor, max. 8 h |
| External auxiliary supply | AC/DC version: 24–230 V AC/DC |
| Housing | Polycarbonate, IP40 |
| Temperature range | –30 °C to +70 °C |

| Equipment set | Page | Order no. | Accessories | Page |
|--------------------------------|------|-------------|---------------------------------|------|
| 1 Display unit | | | Connection to remote monitoring | 71 |
| Sigma 2.0 | | 37-1111-101 | Wall-mounted housing | 58 |
| Sigma 2.0 AC/DC | | 37-1121-101 | External signal lamp | 58 |
| 3 Single-phase current sensors | 54 | | Disassembly clip | 59 |
| | | | Spring clip | 59 |

Dimension drawing see on page 132 ff. | M3

Alpha M | Alpha E

Short-circuit indicator



Alpha M



Alpha E

PRODUCT FEATURES

- ▶ Adjustable trip currents
- ▶ Flag-type indication (black / red)
- ▶ Remote signal

YOUR ADVANTAGES

- ▶ Maintenance-free, no battery (Alpha M)
- ▶ Remote reset (Alpha E)

The Alpha is designed to detect, display and remotely indicate short-circuit faults in medium voltage distribution networks.

The indication is tripped by a short-circuit current and remains active until the device is reset.

If a new device is connected to the CTs that are already installed in the switchgear, the Alpha must be factory-calibrated to match the existing CTs.

| Technical data | Alpha M | Alpha E |
|--------------------------------|--|--|
| Short-circuit indicator | ■ | ■ |
| Earth fault detection method | Earth short-circuit | |
| I>> short-circuit trip current | 400, 600, 800, 1,000 A | |
| tl>> response delay | 100 ms, no tripping <20 ms | |
| Accuracy | ±15 % | |
| Indication | 3 display elements (black / red), bi-stable type, for L1, L2, L3 | |
| Remote signal / communication | 1 relay contact | |
| Remote contact | Potential-free permanent and momentary contact (>100 ms) Contact capacity: 230 V AC / 1 A / 62.5 VA max.; 220 V DC / 1 A / 60 A max. | |
| Reset | ▶ Via rotary knob | ▶ By button ▶ Remote reset: 12–60 V AC/DC ±10 % ▶ Automatic time reset: 2 or 4 h |
| Power supply | | |
| CT powered | ■ | ■ |
| Internal power supply | — | Long-life lithium cell, shelf life ≥20 years |
| Housing | Polycarbonate, IP40 | |
| Temperature range | -30 °C to +70 °C | |

| Equipment set | Page | Order no. | Accessories | Page |
|--------------------------------|------|-------------|----------------------|------|
| 1 Display unit | | | Wall-mounted housing | 64 |
| Alpha M | | 30-1815-001 | External signal lamp | 64 |
| Alpha E | | 30-1715-001 | Disassembly clip | 65 |
| 3 Single-phase current sensors | 50 | | Spring clip | 65 |

Dimension drawing see on page 132 ff. | M3/M5

Earth 4.0

Earth fault indicator



Earth 4.0

PRODUCT FEATURES

- ▶ Indication of earth fault currents by LED and mechanical flag
- ▶ Remote indication, test and reset via relay contacts
- ▶ Battery status indication and remote indication via relay contact

YOUR ADVANTAGES

- ▶ Connection to remote monitoring
- ▶ Early warning of battery end-of-life

The Earth 4.0 is an earth fault indicator. It is designed to detect, locally indicate and remotely report earth fault currents in medium voltage distribution networks. A wired earth fault current transformer monitors the summation current of all three conductors. The electronics of the display unit evaluates the measurements. When the fault sensitivity threshold is exceeded, a red LED will start flashing and a mechanical flag becomes visible. In addition to that, the remote indication contacts are energised. A system-specific external signal lamp is optionally available.

| Technical data | Earth 4.0 |
|--------------------------------|--|
| Short-circuit indicator | ■ |
| Earth fault detection method | 25, 50, 60, 80 A ¹⁾ |
| I>> short-circuit trip current | 80, 160 ms ¹⁾ |
| tl>> response delay | ±10 % |
| Accuracy | ▶ 1 red LED, flash rate 2 s ▶ 1 yellow LED (battery status), flash rate 2 s ▶ Mechanical flag |
| Indication | ▶ 2 relay contacts (change over) for earth fault indication ▶ 1 relay contact (change over) for battery status indication |
| Remote signal / communication | Potential-free permanent and momentary contact (1 s) Contact capacity: 230 V AC / 1 A / 62.5 VA max.; 220 V DC / 1 A / 60 A max. |
| Remote contact | ▶ By button ▶ Remote contact ▶ Automatic time reset: 1, 2, 4 or 8 h ▶ Voltage restoration (220–240 V AC, ≥10%) |
| Power supply | |
| CT powered | ■ |
| Internal power supply | Long-life lithium cell, shelf life ≥20 years, total flashing time ≥1,200 h |
| Housing | Polycarbonate, IP40 |
| Temperature range | -30 °C to +70 °C |

| Equipment set | Page | Order no. | Accessories | Page |
|---------------------------------|------|-------------|----------------------|------|
| 1 Display unit Earth 4.0 | | 32-0504-XXX | External signal lamp | 58 |
| 1 Summation current transformer | 51 | | | |

¹⁾ Further trip currents and / or response delays on request.

Dimension drawing see on page 132 ff. | M7

Earth Zero | Earth Zero Flag

Earth fault indicator



Earth Zero, plug-in housing



Earth Zero, surface mount housing



Earth Zero Flag, plug-in housing



Earth Zero Flag, surface mount housing

PRODUCT FEATURES

- ▶ Indication of earth fault currents by LED and mechanical flag
- ▶ Remote indication
- ▶ Optional: External signal lamp

YOUR ADVANTAGES

- ▶ LED for fast and clear indication
- ▶ Connection to remote monitoring
- ▶ Fault detection without opening / entering the substation in combination with the external signal lamp

The Earth Zero is an earth fault indicator. It is designed to detect, locally indicate and remotely report earth fault currents in medium voltage distribution networks. A wired earth fault current transformer monitors the summation current of all three conductors. The electronics of the display unit evaluates the measurements.

When the fault sensitivity threshold is exceeded, a red LED will start flashing and a mechanical flag becomes visible (Earth Zero Flag). A system-specific external signal lamp is optionally available.

| Technical data | Earth Zero | Earth Zero Flag |
|-------------------------------|--|---|
| Earth fault indicator | ■ | ■ |
| IE> earth fault trip current | 25, 50, 75, 100 A ¹⁾ | |
| tIE> response delay | 80, 160 ms ¹⁾ | |
| Accuracy | ±15 % | |
| Indication | 1 red LED, flash rate 2 s | 1 red LED, flash rate 2 s + mechanical flag |
| Remote signal / communication | 1 relay contact and input for external signal lamp | |
| Remote contact | Potential-free permanent and momentary contact (1 s) Contact capacity: 230 V AC / 1 A / 62.5 VA max.; 220 V DC / 1 A / 60 A max. | |
| Reset | <ul style="list-style-type: none"> ▶ By button ▶ Automatic time reset: 2, 4 or 8 h ▶ Voltage restoration (110 – 240 V AC) | |
| Power supply | | |
| CT powered | ■ | |
| Internal power supply | Long-life lithium cell, shelf life ≥20 years, total flashing time ≥1,200 h (>500 h when using the external signal lamp) | |
| Housing | Polycarbonate, IP40 (plug-in housing), IP65 (surface mount housing) | |
| Temperature range | -30 °C to +70 °C | |

| Equipment set | Page | Order no. | Accessories | Page |
|--|------|-------------|----------------------|------|
| 1 Display unit | | | External signal lamp | 58 |
| Earth Zero, Plug-in housing | | 32-0513-001 | | |
| Earth Zero, Surface mount housing | | 32-0503-001 | | |
| Earth Zero Flag, Plug-in housing | 58 | 32-0512-002 | | |
| Earth Zero Flag, Surface mount housing | | 32-0502-002 | | |
| 1 Summation current transformer | 51 | | | |

¹⁾ Further trip currents and / or response delays on request.

Dimension drawing see on page 132 ff. | M6/M7

Opto F+E 3.0

Short-circuit and earth fault indicator



Opto F+E 3.0, Plug-in housing



Opto F+E 3.0, Surface mount housing

PRODUCT FEATURES

- ▶ Fibre optic cables for electrical isolation between indicator and current transformers
- ▶ High-intensity LED indication
- ▶ Single and double flash mode for operation in radial and ring networks
- ▶ Remote indication via relay contact
- ▶ Current transformer retrofit ready

YOUR ADVANTAGES

- ▶ Installation on bare cables and busbars
- ▶ New fault detection within reset time

The Opto F+E 3.0 device is a combined short-circuit and earth fault indicator. It is designed to detect, display and remotely indicate short-circuit currents and earth faults in medium voltage distribution networks. The indicator unit can be used in all medium voltage switchgear installations. Fibre optic cables provide electrical isolation between the current transformers, mounted on cable/busbar, and the display unit when transferring signals. Due to its measuring principle, the earth fault indication is suitable for low-impedance or solidly earthed neutral networks as well as for radial or open ring networks.

The current transformers (CT) have an integrated trip threshold detection capability. When the pre-set trip current is reached or exceeded, light pulses will be emitted. A fibre optic cable is used to transmit these light pulses from the CT to the Opto. Phase-selectively operated red LEDs start flashing.

After the first tripping incident (e. g. in radial systems) the LEDs begin a phase-selective flash rhythm of: flash / pause / flash.

A second tripping (e. g. ring operated network with auto-reclosing) is indicated by flashing LEDs of the fault-affected phases in a flash-flash / pause / flash-flash rhythm.

| Technical data | Opto F+E 3.0 |
|--------------------------------|---|
| Short-circuit indicator | ■ |
| Earth fault indicator | ■ |
| Earth fault detection method | Earth short-circuit |
| I>> short-circuit trip current | 400, 600, 800, 1,000 A ¹⁾ (adjustable at the CT) |
| tI>> response delay | 40, 60, 80, 100, 200, 300, 500 ms (adjustable at the display unit) |
| I>E> earth fault trip current | 10, 20, 40, 80 A or 40, 80, 120, 160 A (adjustable at the CT) |
| tI>E> response delay | 60, 100 or 200 ms (adjustable at the display unit) |
| Accuracy | ±15 % (determined by current transformer) |
| Indication | Phase-selective short-circuit: 3 red LEDs, flashing period 2 s, double flash sequence 0.3 s with flashing period 3 s Optional: external signal lamp |
| Remote signal / communication | 1 relay contact |
| Remote contact | Potential-free permanent or momentary contact Contact capacity: 380 V AC / 5 A / 1250 VA max.; 220 V DC / 5 A / 150 W max. |
| Reset | <ul style="list-style-type: none"> ▶ By button ▶ Automatic time reset: 1, 2, 4 or 8 h ▶ Restoration of auxiliary supply ≥10 s (activated via DIP switch) ▶ Remote reset |
| Power supply | |
| Internal Power supply | Long-life lithium cell, active flashing time >1,000 h, shelf life ≥20 years |
| External auxiliary supply | 12–110 V DC ±10 % or 24–60 V AC (±10 %), 50–60 Hz (optional) |
| Accessories | Transformer with cable for top-hat rail or screw mounting (115 - 230 V AC / 24 - 48 V AC) |
| Housing | Polycarbonate, IP40 (Plug-in housing), IP65 (Surface mount housing) |
| Temperature range | -30 °C to +70 °C |

| Equipment set | Page | Order no. | Accessories | Page |
|-------------------------------------|------|-------------|---|------|
| 1 Display unit | | | External signal lamp | 58 |
| Opto F+E 3.0, Plug-in housing | | 36-0323-001 | Transformer with cable for top-hat rail | 59 |
| Opto F+E 3.0, Surface mount housing | | 36-0313-001 | Cutting tool for fibre optic cables | 59 |
| 3 Single-phase current sensors | 48 | | Optical testing unit | 59 |
| 1 Summation current transformer | 51 | | Disassembly clip | 59 |
| 4 Fibre optic cables | 59 | | Spring clip | 59 |

¹⁾ Further trip currents and / or response delays on request.

Dimension drawing see on page 132 ff. | M3/M7

Sigma F+E 2.0 | Sigma F+E 3 2.0

Short-circuit and earth fault indicator



Sigma F+E 2.0



Sigma F+E 2.0 AC/DC



Sigma F+E 3 2.0



Sigma F+E 3 2.0 AC/DC

PRODUCT FEATURES

- ▶ Short-circuit and earth fault detection from 3 Single-phase current sensors
- ▶ Phase-selective fault indication
- ▶ Trip current values: load-dependent self-adjustment or fixed values
- ▶ Single and double flash mode for operation in radial and ring networks
- ▶ With auxiliary supply and back-up capacitor available in AC/DC version

YOUR ADVANTAGES

- ▶ No false trips due to higher harmonics
- ▶ Highly visible LED fault indication
- ▶ Detection of high-impedance earth faults
- ▶ Clear fault type indication via LED (Sigma F+E 3 2.0)
- ▶ Retrofit ready for earth fault and short-circuit indicators with monitoring/control and fault direction function

Sigma F+E 2.0 and Sigma F+E 3 2.0 are combined short-circuit and earth fault indicators. Due to the measuring principle the earth fault indication is suitable for networks with low-impedance, solid and isolated neutral earthing..

The current is measured via three Single-phase current sensors. This allows phase-selective fault detection and indication.

There are two response criteria for short-circuit detection, fixed response values with response delay or auto-adjustment based on load current.

If the current for the selected response criterion – fixed value or self-adjustment – is exceeded, the fault-affected phase will be indicated by a bright flashing LED and remote contact will be activated. A double flashing LED signals a second fault that has occurred within the reset time, e. g. by an automatic reclose attempt and the remote contact will be reactivated.

For testing and commissioning purposes, the trip current values can be reduced to 10 A without changing the DIP switch settings.

Sigma F+E 3 2.0

The red LED I>> signals a short-circuit, the yellow LED I_{E>} signals an earth fault. The L1, L2 and L3 indication fields display the fault-affected phase. In addition, phase-selective (L1, L2, L3) or group-selective (I>>, I_{E>}, I>> and I_{E>}) remote signalling is possible.

Sigma F+E 2.0 AC/DC and Sigma F+E 3 2.0 AC/DC

These versions can be connected to auxiliary supply. If the auxiliary power drops out in the event of a fault, the LED indicator can operate using a back-up capacitor for up to 8 hours.

| Technical data | Sigma F+E 2.0 | Sigma F+E 3 2.0 |
|---|--|---|
| Short-circuit indicator | ■ | ■ |
| Earth fault indicator | ■ | ■ |
| Earth fault detection method | Earth short-circuit | |
| I>> short-circuit trip current | 200, 300, 400, 600, 800, 1,000, 2,000 A Self-adjustment to load current (I _L =load current): I _L < 100 A → I>> = 400 A, I _L > 100 A → I>> = 4 x I _L | |
| tI>> response delay | 40 ms, 80 ms | 40, 80, 200, 300 ms |
| I _{E>} earth fault trip current | 20, 40, 60, 80, 100, 120, 160 A | |
| tI _{E>} response delay | 80, 160 ms | 60, 80, 200, 300 ms |
| Accuracy | ±5 % (0–630 A) ±10 % (>630 A) | |
| Indication | 3 red phase-selective LEDs: short-circuit 2 or 3 phases (L1, L2, L3) and earth fault 1 phase | LED indication 3 red phase-selective LEDs L1, L2, L3 1 red LED short-circuit I>> 1 yellow LED earth fault I _{E>} |
| Remote signal / communication | 2 potential-free relay contact | 3 potential-free relay contact |
| Remote contact | Potential-free permanent or momentary contact Contact capacity: 230 V AC / 1 A / 62.5 VA max.; 220 V DC / 1 A / 60 W max. | |
| Reset | <ul style="list-style-type: none"> ▶ By button ▶ Automatic time reset: 1, 2, 4 or 8 h ▶ Remote reset | <ul style="list-style-type: none"> ▶ By button ▶ Remote reset ▶ Automatic time reset: 2, 4, 8 or 24 h ▶ Current restoration |
| Power supply | <ul style="list-style-type: none"> CT powered ■ Internal power supply Long-life lithium cell, active flashing time >900 h, shelf life ≥20 years AC/DC version: back-up capacitor, max. 8 h External auxiliary supply AC/DC version: 24–230 V AC/DC | |
| Housing | Polycarbonate, IP40 | |
| Temperature range | –30 °C to +70 °C | |

| Equipment set | Page | Order no. | Accessories | Page |
|--------------------------------|------|-------------|---------------------------------|------|
| 1 Display unit | | | Connection to remote monitoring | 71 |
| Sigma F+E 2.0 | | 37-2111-101 | Wall-mounted housing | 58 |
| Sigma F+E 2.0 AC/DC | | 37-2121-101 | External signal lamp | 58 |
| Sigma F+E 3 2.0 | | 37-5113-101 | Disassembly clip | 59 |
| Sigma F+E 3 2.0 AC/DC | | 37-5123-101 | Spring clip | 59 |
| 3 Single-phase current sensors | 50 | | | |

Dimension drawing see on page 132 ff | M3

Sigma L

Short-circuit and earth fault indicator with communication via LoRaWAN



Sigma L

PRODUCT FEATURES

- ▶ Detection of short circuits and earth faults using only three Single-phase current sensors
- ▶ Phase-selective fault indication
- ▶ Short circuit: load-dependent self-adjustment or fixed trip current thresholds
- ▶ Single and double flash modes for radial and ring networks with auxiliary power connection and back-up capacitor for fault indication
- ▶ Remote data transmission via LoRaWAN radio module
- ▶ Available in three versions:
 - ▶ Sigma L
 - ▶ Sigma F+E L
 - ▶ Sigma F+E 3 L

YOUR ADVANTAGES

- ▶ Cost-effective data transmission solution
- ▶ Secure communication within a public radio network
- ▶ Highly visible LED fault indication
- ▶ Detection of low-impedance earth faults
- ▶ Transformer-powered supply for local fault indication

The distinctive feature of the Sigma L series is the capability for remote data transmission over the 868 MHz radio frequency using the LoRaWAN protocol. In the event of a fault, data transmission is secured for 1 minute after the loss of auxiliary power, ensuring secure data transfer to the LoRaWAN gateway.

The current measurement of the Sigma 2.0 L series is performed using three Single-phase current sensors. This allows for phase-selective fault detection and indication. For short-circuit detection, you can choose between two criteria – fixed trip current thresholds with response delay or self-adjustment based on the load current.

If the current exceeds the selected response criterion – either the fixed thresholds or self-adjustment – the LED of the corresponding phase will blink, and the remote signalling contact will be activated.

If a second tripping occurs within the reset time, such as due to an automatic reclosing, this will be indicated by a double-flashing display, and the remote signalling contact will be reactivated. For testing and commissioning purposes, the current response values can be reduced to 10 A without changing the DIP switch settings. In two variants, separate earth fault detection for low-impedance or solidly earthed medium-voltage networks is available.

Sigma L

Short-circuit indicator, whereby the display fields L1, L2 and L3 indicate the fault phase-selectively.

Sigma F+E L

Short-circuit and earth fault indicator, whereby the display fields L1, L2 and L3 display the fault phase-selectively. The earth fault is calculated separately and displayed as a single-phase fault.

Sigma F+E 3 L

The red LED I>> signals the short circuit, the yellow LED IE> the earth fault, whereby the display fields L1, L2 and L3 display the fault phase-selectively.

The Sigma F+E 3 L also has phase-selective (L1, L2, L3) or group-selective (I>>, IE>, I>> and IE>) remote signalling via LoRaWAN.

| Technical data | Sigma L | Sigma F+E L | Sigma F+E 3 L |
|-----------------------------------|---|---|--|
| Short-circuit indicator | ■ | ■ | ■ |
| Earth fault indicator | ■ | ■ | ■ |
| Earth fault detection method | Earth short-circuit | | |
| I>> short-circuit trip current | 200, 300, 400, 600, 800, 1,000, 2,000 A Self-adjustment to load current : $I_B < 100 \text{ A} \rightarrow I_{>>} = 400 \text{ A}$, $I_B > 100 \text{ A} \rightarrow I_{>>} = 4 \times I_B$ | | |
| tI>> response delay | 40 ms, 80 ms | 40 ms, 80 ms | 40, 80, 200, 300 ms |
| IE> earth fault trip current | 20, 40, 60, 80, 100, 120, 160 A | | |
| tIE> response delay | 40, 80 ms | | |
| Accuracy | ±5 % (0 – 630 A) ±10 % (>630 A) | | |
| Indication | 3 red LEDs: Short circuit: 2 or 3 phases (L1, L2, L3) | 3 red LEDs: Short circuit: 2 or 3 phases (L1, L2, L3) | 3 red LEDs: Short circuit: 2 or 3 phases (L1, L2, L3) |
| Reset | <ul style="list-style-type: none"> ▶ By button ▶ Automatic time reset: 1,2, 4 or 8 h | | <ul style="list-style-type: none"> ▶ By button ▶ Automatic time reset: 2, 4, 8 or 24 h ▶ Auxiliary voltage supply |
| Power supply | <ul style="list-style-type: none"> CT powered Internal power supply External auxiliary supply | | |
| | <ul style="list-style-type: none"> Back-up capacitor: max. 8 hours after loss of auxiliary power 24 – 230 V AC/DC | | |
| Remote signalling / Communication | Radio frequency: 868 MHz with LoRaWAN protocol | | |
| Housing | Polycarbonate, Front IP40, Terminals IP20 | | |
| Temperature range | -30 °C to +70 °C | | |

| Equipment set | Page | Order no. | Accessories | Page |
|---|------|-------------|----------------------|------|
| 1 Display unit | | | Wall-mounted housing | 58 |
| Sigma L | | 37-1321-101 | Disassembly clip | 59 |
| Sigma F+E L | | 37-2321-101 | Spring clip | 59 |
| Sigma F+E 3 L | | 37-5323-101 | | |
| Antenna (required for all three device variants) | | 28-7910-018 | | |
| 3 Single-phase current sensors | 50 | | | |

Dimension drawing see on page 132 ff | M3

ComPass A

Short-circuit and earth fault indicator



ComPass A

PRODUCT FEATURES

- ▶ Short-circuit and earth fault detection by 3 Single-phase current sensors
- ▶ LED and OLED display: for good visibility
- ▶ Monitoring of current (I) and frequency (f)
- ▶ Remote indication via RS485 / Modbus interface and 4 freely configurable relay contacts

YOUR ADVANTAGES

- ▶ Network load visible on site
- ▶ Remote signalling of analogue values

The ComPass A device is a combined short-circuit and earth fault indicator for medium voltage distribution networks with solidly or low-impedance earthed neutral system.

The device indicates all measuring results and parameter settings on a menu-controlled display. Via Modbus protocol the device can be parameterised and reports the fault events.

When the previously set trip values are exceeded, the red LED will start flashing. By operating the rocker switch short-circuits or earth faults will be displayed in plain text format. The device saves the last 20 events along with date, time, and information on fault currents.

| Technical data | ComPass A |
|-------------------------------------|---|
| Short-circuit indicator | ■ |
| Earth fault indicator | ■ |
| Earth fault detection method | Earth short-circuit |
| Measured values / indication | <ul style="list-style-type: none"> ▶ Phase currents I_1, I_2, I_3, I_E with phase angle ▶ Operating current, I_1, I_2, I_3, I_E \varnothing15 min, I_1, I_2, I_3 max. 24 h / 7 days / 365 days ▶ Maximum demand indicator I max. LR (last reset) I_1, I_2, I_3 ▶ Frequency f |
| $I_{>>}$ short-circuit trip current | 10–2,000 A (1-A-steps) |
| $t_{I>>}$ response delay | 40 ms–60 s (10-ms-steps) |
| $I_{E>}$ earth fault trip current | 20–1,000 A (low impedance / rigidly earthed network) |
| $t_{I_{E>}}$ response delay | 40 ms–60 s |
| Measurement accuracy phase currents | <ul style="list-style-type: none"> ±3 % (0–630 A, resolution 1 A) ±5 % (630–1,500 A) ±10 % (1,500–2,000 A) |
| Indication | LED status display (multicolour) OLED display (multicolour) |
| Remote signal / communication | 4 potential-free relay contacts, freely configurable RS485 / Modbus interface |
| Remote contact | 4 potential-free permanent or momentary contacts (1 s), NC or NO Contact capacity: 230 V AC / 1 A / 62.5 VA max.; 220 V DC / 1 A / 60 W max. |
| Reset | <ul style="list-style-type: none"> ▶ By rocker switch ▶ Automatic time reset: 1 min–24 h ▶ Remote reset ▶ Via RS485 / Modbus interface ▶ Current restoration |
| Power supply | |
| External auxiliary supply | 24 V–230 V AC / DC (±10 %) |
| Internal power supply | Long-life lithium cell, active flashing time >1,000 h, >1,000 display activations, shelf life \geq 20 years |
| Housing | Polycarbonate, IP40 |
| Temperature range | -30 °C to +70 °C |

| Equipment set | Page | Order no. | Accessories | Page |
|--------------------------------|------|-------------|---------------------------------|------|
| 1 Display unit ComPass A | | 38-0102-001 | Connection to remote monitoring | 71 |
| 3 Single-phase current sensors | 50 | | Wall-mounted housing | 58 |
| | | | External signal lamp | 58 |
| | | | Disassembly clip | 59 |
| | | | Spring clip | 59 |

Dimension drawing see on page 132 ff | M3

ComPass A 2.0

Short-circuit and earth fault indicator



ComPass A 2.0

PRODUCT FEATURES

- ▶ Short-circuit and earth fault indicator suitable for two earth fault detection methods
- ▶ Short-circuit and earth fault detection from three single-phase current sensors
- ▶ LED and OLED display: for good visibility
- ▶ High-precision current measurement to 0.5 %
- ▶ Monitoring of current (I), temperature (T) and frequency (f)
- ▶ PT100 temperature sensor for equipment monitoring
- ▶ Limit monitoring: I, T
- ▶ Compass Explorer Software: Commissioning and parameterisation via front accessible USB port
- ▶ Pulse detection for resonant earthed networks

YOUR ADVANTAGES

- ▶ Fast commissioning and parameterisation
- ▶ Retrofit ready for earth and short-circuit indicators with fault direction, monitoring and control function

The ComPass A 2.0 is suitable for use in substations with a remote control connection of the electrical power distribution in a medium-voltage network. Trip current values and pre-fault current values are logged with time stamp.

In addition to the short-circuit and earth fault function, the ComPass A 2.0 measures the temperature, for example of a transformer or the transformer station with the PT100 sensor.

The ComPass A 2.0 provides the collected information, measured values and their limits, for transmission to the control room. Phase selectivity and type of faults (earth fault or short-circuit) are also shown in the OLED display.

| Technical data | ComPass A 2.0 |
|--|---|
| Short-circuit indicator | ■ |
| Earth fault indicator | ■ |
| Earth fault detection method | Earth short-circuit, Pulse detection |
| Measured values / indication | <ul style="list-style-type: none"> ▶ Operating current, I1, I2, I3, all average values adjustable (1–60 min), I1, I2, I3 max. 24 h / 7 days / 365 days, maximum demand indicator I_{max}. LR (last reset), T_{min}. LR, T_{max}. LR ▶ Frequency f ▶ Temperature T |
| I>> short-circuit trip current | 10 – 2,000 A, Self-adjustment (200–2,000 A) |
| tI>> response delay | 20 ms – 60 s |
| I< earth short-circuit trip current | 10 – 1,000 A |
| tI< response delay | 40 ms – 60 s |
| ΔI<> Response values for pulse localisation (clock stroke) | 1 – 200 A |
| Limit monitoring | |
| I> overload current | 5–1,500 A; tI> response delay: 40 ms – 60 s |
| T< / T<< / T> / T>> temperature | –40 °C to +85 °C |
| Measurement accuracy phase currents | Up to 0.5 % / 0.5 A closed sensor type, ≤1 % / 0.5 A split-core sensor type |
| Indication | LED status display (multicolour) OLED display (multilingual) |
| Remote signal / communication | 4 potential-free relay contacts, freely configurable RS485 / Modbus interface |
| Parameter setting | USB port with ComPass Explorer Software |
| Remote contact | 4 potential-free permanent or momentary contacts, bistable, NC or NO Contact capacity: 230 V AC / 1 A / 62.5 VA max.; 220 V DC / 1 A / 60 W max. |
| Binary inputs | 2, potential-free, 1 s < t < 5 s, freely programmable <ul style="list-style-type: none"> ▶ By rocker switch ▶ Automatic time reset: 1 min – 24 h ▶ Remote reset ▶ Via RS485 / Modbus interface ▶ Current restoration ▶ Restoration of auxiliary supply ▶ ComPass Explorer Software |
| Reset | |
| Power supply | |
| External auxiliary supply | 24 – 230 V AC/DC (±10 %) |
| Internal power supply | Long-life lithium cell, active flashing time >1,000 h, >1,000 display activations, shelf life ≥20 years |
| Housing | Polycarbonate, IP50 |
| Temperature range | –30 °C to +70 °C |

| Equipment set | Page | Order no. | Accessories | Page |
|--------------------------------|------|-------------|---------------------------------|------|
| 1 Display unit ComPass A 2.0 | | 38-0102-001 | Connection to remote monitoring | 71 |
| 3 Single-phase current sensors | 50 | | Wall-mounted housing | 58 |
| | | | External signal lamp | 58 |
| | | | Disassembly clip | 59 |
| | | | Spring clip | 59 |

Dimension drawing see on page 132 ff | M3

Accessories

for directional fault indicators Sigma and ComPass series

| Voltage signal | | |
|--|---|--|
| HR jack module | Gas-/solid insulated switchgear | Air-insulated switchgear |
| | | |
| <div style="display: flex; justify-content: space-around;"> <div> <p>HR interface cable Page 54</p> </div> <div> <p>Wega with HR interface cable Page 93</p> </div> </div> | <p>Integrated voltage detecting system Wega series Page 84</p> | <div style="display: flex; justify-content: space-around;"> <div> <p>Interface cable Page 54</p> </div> <div> <p>Wega with interface cable Page 54</p> </div> </div> |
| + | | |
| Current signal | | |
| | | |
| Split-core Single-phase current transformers for retrofit and new installations Page 50 | Closed Single-phase current transformers for new installations Page 50 | |
| + | | |
| Directional short-circuit and earth fault indicators | | |
| | | |
| Sigma D series Page 38/39 | ComPass B series/ ComPass D Page 42 - 47 | |
| [+] | | |
| Resistive voltage signal | | |
| <p>Optional supplement Page 56</p> | | |

Project planning

for directional fault indicators Sigma and ComPass series

| Company | <input type="text"/> | Contact partner | <input type="text"/> | Phone | <input type="text"/> |
|---|--|--|--|---|-----------------------------|
| Project | <input type="text"/> | | | | |
| Network informationen | | | | | |
| Operating voltage V _{Nom} | <input type="text"/> kV | Neutral point treatment | <input type="text"/> | | |
| Switchgear | | | | | |
| Manufacturer | <input type="text"/> | Type | <input type="text"/> | Year of construction | <input type="text"/> |
| <input type="checkbox"/> Gas-insulated/solid insulated <input type="checkbox"/> C1 capacity <input type="text"/> pF or panel type <input type="text"/> | | | <input type="checkbox"/> Air insulated <input type="checkbox"/> C1 capacity <input type="text"/> pF or sensor Type <input type="text"/> | | |
| Cable length from panel to Wega <input type="text"/> m | | | Cable length from sensor to Wega <input type="text"/> m | | |
| Capacity voltage signal | | | | | |
| System solution - Wega | | System solution - Wega to HR interface | | Direct connection - capacitive post insulator | |
| <input type="checkbox"/> Wega 1 <input type="checkbox"/> Wega 1 V | <input type="checkbox"/> Wega 2 <input type="checkbox"/> Wega 2 V | <input type="checkbox"/> Wega 1 V <input type="checkbox"/> Wega 2 V | <input type="checkbox"/> Interface cable for capacitive post insulator | | |
| Cable length between voltage signal and Sigma / ComPass <input type="text"/> m | | | | | |
| Resistive voltage signal | | | | | |
| <input type="checkbox"/> Yes | | | | | <input type="checkbox"/> No |
| Gas- / solid insulated switchgear | | | Air-insulated Switchgear | | |
| <input type="checkbox"/> RDP1-24/RDP1-36 <input type="checkbox"/> RDP2-24/RDP2-36 | <input type="checkbox"/> RDP3-24/RDP3-36 <input type="checkbox"/> RDP4-24 | <input type="checkbox"/> RDP5-24/RDP5-36 <input type="checkbox"/> RDG3-24 | <input type="checkbox"/> RDM3-24 | | |
| Directional fault indicator | | | | | |
| Monitoring and control function | | Standard | | Monitoring | |
| <input type="checkbox"/> ComPass Bs 2.0 / ComPass D | | <input type="checkbox"/> Sigma D <input type="checkbox"/> Sigma D ⁺¹ <input type="checkbox"/> Sigma D ⁺⁺ <input type="checkbox"/> Sigma DM | | <input type="checkbox"/> ComPass B <input type="checkbox"/> ComPass B 2.0 | |
| Current signal | | | | | |
| <input type="checkbox"/> Single-phase current sensor for retrofit on insulated cables | | | <input type="checkbox"/> Single-phase current sensors for new installations on bushings | | |
| Cable length between Sigma / ComPass and current signal <input type="text"/> m | | | | | |
| Your comments | | | | | |
| <input type="text"/> | | | | | |

¹⁾ We recommend the use of an additional summation current sensor for the transient earth fault method.

Sigma D | Sigma D+ | Sigma D++

Short-circuit and earth fault direction indicator



Sigma D



Sigma D+



Sigma D++

PRODUCT FEATURES

- ▶ CT powered directional short-circuit and directional earth fault indicator for all distribution networks / neutral point treatments
- ▶ Earth fault detection with up to five different earth fault detection methods, also in combination
- ▶ Fully automatic voltage calibration
- ▶ Easy and flexible parameter setting via DIP switch or USB port
- ▶ Event memory for fault evaluation
- ▶ Multicolour LED status display
- ▶ Remote signalling via freely programmable relays
- ▶ Sigma Explorer Software: Commissioning and parameterisation via front accessible USB port

Special features of Sigma D+

- ▶ For the transient earth fault method with the Sigma D+ a summation current sensor is mandatory, auxiliary supply is optional.

Special features of Sigma D++

- ▶ Only 3 Single-phase current sensors needed for all earth fault detection methods
- ▶ Wide-range power supply 24 to 230 V AC/DC

For the transient earth fault method only three Single-phase current sensors are needed, but auxiliary supply is mandatory. The connection of a summation current sensor is optional. For all other fault detection methods, no auxiliary power is required if the operating current is >5 A.

YOUR ADVANTAGES

- ▶ Immediate detection of fault direction
- ▶ No auxiliary supply required (Sigma D & D+)
- ▶ Fast commissioning and parameterisation
- ▶ Monitoring on site with USB port and Sigma Explorer

The Sigma D series are combined directional short-circuit and directional earth fault indicators for medium voltage distribution networks. The devices are current sensor powered. The voltage information will be taken from an integrated voltage detecting system (Wega series), from an HR interface or capacitive post insulators.

The Sigma D+ and Sigma D++ provide additional earth fault detection methods for compensated and isolated neutral networks.

The variants differ in regard of the transient earth fault method.

| Technical data | Sigma D | Sigma D+ | Sigma D++ |
|--|---|---|--|
| Directional short-circuit indicator | ■ | ■ | ■ |
| Directional earth fault indicator | ■ | ■ | ■ |
| Earth fault detection methods | Earth short-circuit | Continuous earth fault, earth short circuit, cos φ and sin φ method, pulse detection, transient earth fault | |
| I>> short-circuit trip current | ▶ DIP: 200, 300, 400, 600, 800, 2,000 A, Self-adjustment (200–2,000 A) ▶ SW: 50–2,000 A (1-A-steps) | | |
| tI>> response delay | DIP: 40, 80 ms; SW: 40 ms–60 s | | |
| IE> earth fault trip current | DIP: off, 20, 40, 60, 80, 100, 120, 160 A; SW: 10–1,000 A (1-A-steps) | | |
| tIE> response delay | DIP: 80, 160 ms; SW: 40 ms–60 s | | |
| IE> Transient method, trip current | – | 10–100 A | 10–500 A |
| IEP> Active current cos φ trip current | – | 2–200 A | – |
| tIEP> response delay | – | 2–200 A | – |
| IEQ> Reactive current sin φ trip current | – | 40 ms–60 s | – |
| tIEQ> response delay | – | 1–100 A | – |
| Measurement accuracy phase currents | 3 % (0–630 A, resolution 1 A) 5 % (630–1,500 A) 10 % (1,500–2,000 A) | | |
| Indication | ▶ 3 red LEDs phase-selective L1, L2, L3 ▶ 1 red LED short-circuit I>> ▶ 1 yellow LED earth short-circuit IE> ▶ LED, fault direction arrows red / green | | |
| Remote signal / communication | 4 potential-free relay contacts, freely configurable | | |
| Parameterisation | ▶ USB 2.0 interface, connection to Sigma Explorer Software ▶ Via DIP switches on the device | | |
| Remote contact | 4 Potential-free permanent or momentary contacts (1 s), NC or NO Contact capacity: 230 V AC / 1 A / 62,5 VA max.; 220 V DC / 1 A / 60 W max. | | |
| Voltage calibration | Manual / automatic ▶ By button ▶ Remote reset ▶ Automatic time reset: DIP: 2, 4, 8, 24 h; SW: 1 min–24 h ▶ Current restoration ▶ Voltage restoration | | |
| Reset | | | |
| Power supply | | | |
| CT powered | ■ | ■ | ■ |
| Internal power supply | Long-life lithium cell, shelf life ≥20 years | | |
| External auxiliary supply | – | Optional: 24-60V DC 24V AC | 24–230 V AC/DC (optional) required for transient method |
| Summation current sensor | – | Required for transient method | Optional |
| Housing | Polycarbonate, IP40 | | |
| Temperature range | –30 °C to +70 °C | | |

| Equipment set | Page | Order no. | Accessories | Page |
|--|------|-------------|---------------------------------|------|
| 1 Display unit Sigma D | | 37-6000-001 | Installation system | 59 |
| 3 Single-phase current sensors | 50 | | Connection to remote monitoring | 71 |
| 1 Voltage signal | 54 | | Wall-mounted housing | 58 |
| Equipment set | Page | Order no. | External signal lamp | 58 |
| 1 Display unit Sigma D+ | | 37-6100-001 | Disassembly clip | 59 |
| 3 Single-phase current sensors | 50 | | Spring clip | 59 |
| 1 Summation current sensor (required for transient method) | 51 | | | |
| 1 Voltage signal | 54 | | | |
| Equipment set | Page | Order no. | | |
| 1 Display unit Sigma D++ | | 37-6200-001 | | |
| 3 Single-phase current sensors ¹⁾ | 50 | | | |
| 1 Voltage signal | 54 | | | |

¹⁾ Combination with summation current sensor possible: 2+1
Project planning on page 37

Dimension drawing see on page 132 ff | M3

Short-circuit and earth fault direction indicator



Sigma Dm

PRODUCT FEATURES

- ▶ Short-circuit and earth fault direction indicators for all networks and neutral point treatments
- ▶ Remote signalling via RS485 with Modbus RTU
- ▶ Requires only three phase current sensors for all earth fault location methods
- ▶ Earth fault detection with up to six different earth fault detection methods, can also be combined
- ▶ Independent, fully automatic voltage calibration
- ▶ Simple and flexible parameterisation via DIP switch or USB port
- ▶ Event memory for error evaluation
- ▶ LED status display, multicolour
- ▶ Sigma Explorer software: Commissioning, parameterisation and reading out the event memory via the front USB port
- ▶ Wide-range power supply 24 V to 230 V AC/DC

YOUR ADVANTAGES

- ▶ Immediate fault direction detection
- ▶ Availability of measured values and error messages in the control room via RS485/Modbus RTU and on site via USB port with Sigma Explorer software
- ▶ Fast commissioning and parameterisation

The Sigma Dm is a directional short-circuit and earth fault indicator with clear fault direction indication. Equipped with an RS485 interface for transmitting measured values and error messages via the Modbus RTU protocol.

Suitable closed current sensors are available for every gas- and solid-insulated medium-voltage system for installation via the cone in the cable panels. It is also possible to retrofit divisible current sensors around the medium-voltage cable, even in air-insulated systems. The phase voltage and the reference signal for fault direction indication are provided via the voltage detecting system Wega. The voltage signal is automatically adjusted to the switchgear over 24 hours or can be adjusted manually using buttons or the Sigma Explorer configuration software. Operational readiness is indicated by the status LED.

Sigma Dm provides 6 earth fault location detection for all neutral point treatments such as resonant earthing, isolated neutral point, low-resistance or temporarily low-resistance earthing, which can also be used in combination. Earth fault detection methods such as pulse detection are supported. Two digital inputs are freely configurable and, in addition to the test/reset function, can also detect status information such as switch positions.

Except for the transient earth fault method, no auxiliary voltage is required for fault detection if the load current is >5 A.

| Technical data | Sigma Dm |
|---|---|
| Short-circuit indicator | ■ |
| Earth fault indicator | ■ |
| Earth fault detection method | Continuous earth fault, earth short circuit, $\cos \varphi$ and $\sin \varphi$ method, pulse detection, transient earth fault |
| Measured values | <ul style="list-style-type: none"> ▶ Phase currents I1, I2, I3, IE with phase angle ▶ Phase-to-earth voltage V1, V2, V3, VNE and phase-to-phase voltage V12, V23, V31, VNE ▶ Power P, Q, S and power factor $\cos \varphi$ (P1,2,3, Q1,2,3, S1,2,3, $\cos \varphi_{1,2,3}$) ▶ Network frequency f |
| Indication | <ul style="list-style-type: none"> ▶ 3 red LEDs phase-selective L1, L2, L3 ▶ 1 red LED short-circuit I>> ▶ 1 yellow LED earth short-circuit IE> ▶ LED, fault direction arrows red / green |
| I>> short-circuit trip current | DIP: 400, 800, 1,000, 2,000 A, Self-adjustment SW: 10 - 2,000 A |
| tI>> Response delay | 50–2,000 A |
| IE> earth fault trip current | 10 - 1,000 A |
| tIE> response delay | 40 ms–60 s DIP: On/Off |
| IEQ> Reactive current $\sin \varphi$ trip current | 1 – 200 A tIEP> / tIQP> Response delay: 40 ms–60 s |
| VNE> Response values continuous earth fault | 0–100 % tVNE> Response delay: 40 ms–60 s |
| V> Overvoltage trip values | 100 %–200 % |
| V< Undervoltage trip values | 0 %–100 % |
| Measurement accuracy phase currents | 3 % (0–630 A, resolution 1 A) 5 % (630–1,500 A) 10 % (1,500–2,000 A) |
| Remote signal / communication | RS485- / Modbus interface |
| Reset | <ul style="list-style-type: none"> ▶ Remote reset ▶ Automatic time reset: 1 min - 24 h ▶ Via RS485 / Modbus interface ▶ Power recovery ▶ Voltage recovery ▶ Auxiliary voltage recovery |
| Power supply | |
| Internal power supply | 24 - 230 V AC/DC (for IET> RS485/Modbus RTU) |
| External auxiliary supply | Long-life lithium cell, >1,000 h total flashing time of the LED, >1,000 activations of the display |
| Housing | Polycarbonate, IP40 |
| Temperature range | -30 °C to +70 °C |

| Equipment set | Page | Order no. | Accessories | Page |
|--------------------------------|------|-------------|---------------------------------|------|
| 1 Display unit Sigma Dm | | 37-6250-001 | Connection to remote monitoring | 71 |
| 3 Single-phase current sensors | 50 | | Wall-mounted housing | 58 |
| Voltage coupling | 54 | | Disassembly clip | 59 |
| | | | Spring clip | 59 |

Dimension drawing see on page 132 ff | M3

ComPass B

Directional fault indicator with monitoring



ComPass B

PRODUCT FEATURES

- ▶ Directional short-circuit and earth fault detection for all distribution networks / neutral point treatments
- ▶ LED and OLED display: for good visibility
- ▶ Monitoring of V, I, f
- ▶ Load monitoring and load flow direction monitoring P, Q, S, cos φ, E
- ▶ Voltage monitoring V<, V>
- ▶ Active energy to load flow direction A↑ or B↓
- ▶ Multilingual OLED display, additional multicolour LED
- ▶ Remote indication using RS485 / Modbus interface and four freely configurable relay contacts
- ▶ User friendly, simple and intuitive operation, easy-to-read display

YOUR ADVANTAGES

- ▶ Fast fault location determination
- ▶ Immediate detection of voltage limit violations
- ▶ Measured values available for control room and on site

The ComPass B combines the functions of a directional short-circuit and directional earth fault indicator in one unit for medium voltage distribution networks. The voltage information will be taken from the integrated voltage detecting system, either Wega 1, Wega 2, Wega 1 V or Wega 2 V. Optional the voltage information can be taken from the HR interface or capacitive post insulators.

| Technical data | ComPass B |
|--|---|
| Short-circuit indicator | ■ |
| Earth fault indicator | ■ |
| Earth fault detection method | Earth short-circuit, cos φ, sin φ, pulse detection, transient earth fault |
| Measured values / indication | <ul style="list-style-type: none"> ▶ Phase currents I1, I2, I3, IE with phase angle ▶ Phase-to-earth voltage V1, V2, V3, VNE and phase-to-phase voltage V12, V23, V31, VNE ▶ Load flow direction A↑ or B↓ ▶ S, P, Q and cos φ (S 1,2,3, P 1,2,3, Q 1,2,3, cos φ 1,2,3) ▶ Effective energy (E1A, E2A, E3A, EA, E1B, E2B, E3B, EB) ▶ Operating current, I1, I2, I3, IE ø15 min, I1, I2, I3 max. 24 h / 7 days / 365 days ▶ Maximum demand indicator I max. LR (last reset) I1, I2, I3 ▶ Frequency f |
| I>> short-circuit trip current | 50–2,000 A |
| tI>> response delay | 40 ms–60 s |
| tIE> earth fault trip current | 20–1,000 A (low-impedance / solidly earthed network) 5–200 A (isolated / compensated network) |
| tIE> response delay | 40 ms–60 s |
| I _{EP} > active current cos φ / I _{EQ} > reactive current sin φ | 1–200 A tI _{EP} > / tI _{QP} > response delay: 40 ms–60 s |
| VNE> permanent earth fault values | 0–100 % tVNE> response delay: 40 ms–60 s |
| V> Overvoltage trip values | 100 %–200 % |
| V< Undervoltage trip values | 0 %–100 % |
| Measurement accuracy phase currents | 3 % (0–630 A, resolution 1 A) 5 % (630–1,500 A) 10 % (1,500–2,000 A) |
| Indication | LED status display (multicolour) OLED display (multicolour) |
| Remote signal / communication | 4 potential-free relay contacts, freely configurable RS485 / Modbus interface |
| Remote contact | 4 potential-free permanent or momentary contacts (1 s), NC or NO Contact capacity: 230 V AC / 1 A / 62.5 VA max.; 220 V DC / 1 A / 60 W max. |
| Reset | <ul style="list-style-type: none"> ▶ By rocker switch ▶ Remote reset ▶ Automatic time reset: 1 min–24 h ▶ Via RS485 / Modbus interface ▶ Current restoration ▶ Voltage restoration ▶ Restoration of auxiliary supply |
| Power supply | |
| External auxiliary supply | 24 V–230 V AC / DC (±10 %) |
| Internal power supply | Long-life lithium cell, active flashing time >1,000 h, >1,000 display activations, shelf life ≥20 years |
| Housing | Polycarbonate, IP40 |
| Temperature range | –30 °C to +70 °C |

| Equipment set | Page | Order no. | Accessories | Page |
|--------------------------------|------|-------------|---------------------------------|------|
| 1 Display unit ComPass B | | 38-4102-001 | Installation system | 59 |
| 3 Single-phase current sensors | 50 | | Connection to remote monitoring | 71 |
| 1 Voltage signal | 54 | | Wall-mounted housing | 58 |
| | | | External signal lamp | 58 |
| | | | Disassembly clip | 59 |
| | | | Spring clip | 59 |

Dimension drawing see on page 132 ff | M3

ComPass B 2.0 | ComPass Bs 2.0



Directional fault indicator with monitoring and control function



ComPass B 2.0

PRODUCT FEATURES

- ▶ Clear fault indication and reading on-site: 2 directional arrow LEDs (A, B) and high contrast OLED display
- ▶ High-precision current and voltage measurement to 0.5 %
- ▶ Monitoring of the parameters voltage (V), current (I), load flow direction (A↑ or B↓), power factor (cos φ), power (P, Q, S), energy (E), temperature (T) and frequency (f)
- ▶ Suitable for all types of networks/neutral point treatments
- ▶ Earth fault detection with 6 different earth fault detection methods, also in combination
- ▶ Voltage monitoring with connection to capacitive and resistive (ohmic) sensors in one indicator
- ▶ Limit monitoring: V, I, P, Q, T
- ▶ ComPass Explorer Software: Commissioning and parameterisation via front accessible USB port



ComPass Bs 2.0

Additional features of the Control ComPass BS 2.0:

- ▶ Control ComPass Bs 2.0 for remote controlling of a load-break switch or circuit-breaker
- ▶ Free assignment of six binary inputs for the collection and transmission of relevant switchgear / station data
- ▶ Freely programmable logic for flexible definition of switchgear conditions

YOUR ADVANTAGES

- ▶ Immediate detection of fault direction
- ▶ Immediate detection of limit violations
- ▶ Measured values available on site and for SCADA
- ▶ Only ComPass BS: Remote switching
- ▶ Automatic self-calibration of the capacitive voltage inputs, optionally with temperature compensation

The ComPass B 2.0 is suitable for use in substations with a remote control connection of the electrical power distribution in a medium voltage network. In addition to the short-circuit and earth fault function, ComPass B 2.0 supplies the collected measured values of current, voltage and power from the station for transmission to the control room. The PT-100 sensor measures the temperature of the transformer or the transformer station. For all measured values limits can be defined, which can also be transmitted to the control room.

The voltage coupling/measurement is done via the capacitive VDIS* system and/or via resistive (ohmic) voltage sensors. With the simultaneous measurement, the voltage measurement of the VDIS system can be automatically calibrated with the resistive voltage measurement. Up to four ComPass B can be connected to one set of resistive voltage sensors.

In addition to the functions of the ComPass B 2.0, the ComPass Bs 2.0 offers a control function for switching a load-break switch or circuit-breaker. A free assignment of six binary inputs in combination with a freely programmable logic (PLC functionality) enables the user to define the switching conditions in a flexible manner. Random information, such as the SF6 gas disruption or HV tripped fuse, can be captured via the binary inputs.

* VDIS according to IEC62271-213, current standard as of 08/2023

| Technical data | ComPass B 2.0 | ComPass Bs 2.0 |
|---|---|--|
| Short-circuit indicator | ■ | ■ |
| Earth fault indicator | ■ | ■ |
| Earth fault detection method | Permanent, earth short-circuit, transient, cos φ, sin φ, Pulse location | |
| Remote control | - | 2 Switching elements |
| Control system /freely programmable logic | - | ■ |
| Measured values / indication | <ul style="list-style-type: none"> ▶ Phase currents I₁, I₂, I₃, I_E with phase angle ▶ Phase-to-earth voltage V₁, V₂, V₃, V_{NE} and phase-to-phase voltage V₁₂, V₂₃, V₃₁, V_{NE} with phase angle ▶ Load flow direction A↑ or B↓ ▶ P, Q, S and cos φ (power factor) (P_{1,2,3}, Q_{1,2,3}, S_{1,2,3}, cos φ_{1,2,3} via RS485) ▶ Amount of active energy, separate for load flow direction A↑ or B↓, additionally per phase ▶ Operating current, I₁, I₂, I₃, I_E, S, P, Q, V₁₂, V₂₃, V₃₁, all average values adjustable (1–60 min), I₁, I₂, I₃ max. 24 h / 7 days / 365 days, maximum demand indicator I_{max}. LR, V_{12max}. LR, V_{23max}. LR, V_{31max}. LR, S_{max}. LR, P_{max}. LR, Q_{max}. LR, T_{min} LR, T_{max}. LR (last reset) ▶ Power frequency f ▶ Temperature T | |
| I>> short-circuit trip current | 10 – 2,000 A, Self-adjustment (200–2,000 A) | tI>> response delay: 40 ms–60 s |
| IES> / IES>> earth short-circuit trip current | 10 – 1,000 A | tIES> / tIES>> Response delay: 40 ms – 60 s |
| IET> transient method | 1 – 500 A | |
| IEP> active current cos φ | 1 – 200 A | tIEP> / tIEQ> Response delay: 40 ms–60 s |
| IEQ> reactive current sin φ | 1 – 200 A | |
| VNE> permanent earth fault values | 1–100 % | tVNE> Response delay: 40 ms–60 s |
| Limit monitoring | | |
| I> overload current | 5–1,500 A | tI> Response delay: 40 ms–60 s |
| V> overvoltage | 100–200 % | tV> Response delay: 40 ms–60 s |
| V< undervoltage | 1–100 % | tV< Response delay: 40 ms–60 s |
| P> / P>> / +P> / -P> active power | 1–30,000 kW | tP> / tP>> / +tP> / -tP> Response delay: 40 ms–60 s |
| Q> / Q>> / +Q> / -Q> reactive power | 1–30,000 kW | tQ> / tQ>> / +tQ> / -tQ> Response delay: 40 ms–60 s |
| T< / T<< / T> / T>> temperature | -40 °C to +85 °C | |
| Measurement accuracy phase currents | Up to 0.5 % / 0.5 A closed sensor type, 1 % / 0.5 A split-core sensor type | |
| Measurement accuracy voltages | Up to 0.5 % in the range of 80–120 % / V _{nom} (resistive) | |
| Indication | <ul style="list-style-type: none"> ▶ LED status display (multicolour) ▶ OLED display (multicolour) | |
| Remote signal / communication | <ul style="list-style-type: none"> ▶ 4 potential-free relay contacts, freely configurable ▶ RS485 / Modbus interface | |
| Parameter setting | USB port with ComPass Explorer Software | |
| Remote contact | 4 permanent or momentary contacts, bistable, NC or NO Contact capacity: 230 V AC / 1 A / 62.5 VA max.; 220 V DC / 1 A / 60 W max. | 4 permanent or momentary contacts, monostable, NC or NO Contact capacity: 250 V AC / 6 A; 30 V DC / 6 A, resistive load |
| Binary inputs | 2, potential-free, 1 s < t < 5 s, freely programmable | 6, freely programmable, max. 30 V DC |
| Reset | <ul style="list-style-type: none"> ▶ By rocker switch ▶ Remote reset ▶ Automatic time reset: 1 min – 24 h ▶ Via RS485 / Modbus interface ▶ Current restoration ▶ Voltage restoration ▶ Restoration of auxiliary supply ▶ ComPass Explorer Software | |
| Power supply | | |
| External auxiliary supply | 24–230 V AC/DC (±10 %) | |
| Internal Power supply | Long-life lithium cell, active flashing time >1,000 h, >1,000 display activations | |
| Housing | Polycarbonate, IP50 | |
| Temperature range | -30 °C to +70 °C | |

| Equipment set | Page | Order no. | Accessories | Page |
|--|------|-------------|---------------------------------|------|
| 1 Display unit | | | Installation system | 59 |
| ComPass B 2.0 | | 38-4150-001 | Connection to remote monitoring | 71 |
| ComPass Bs 2.0 | | 38-4153-001 | Temperature sensor PT100 | 59 |
| 3 Single-phase current sensors ¹⁾ | 50 | | Wall-mounted housing | 58 |
| 1 Voltage signal | 54 | | External signal lamp | 58 |
| | | | Disassembly clip | 59 |
| | | | Spring clip | 59 |

¹⁾ Combination with summation current sensor possible: 2+1 or 3+1
Project planning on page 37, Product matrix on page 10-14

Dimension drawing see on page 132 ff | M3

ComPass D

Directional fault indicator with monitoring and control function via IEC 60870-5-104



ComPass D

PRODUCT FEATURES

- ▶ Remote control option for 2 switching elements
- ▶ Communication via Ethernet with IEC 60870-5-104 protocol
- ▶ Clear fault indication and reading on-site: 2 directional arrow LEDs (A, B) and high contrast OLED display
- ▶ High-precision current and voltage measurement to 0.5 %
- ▶ Monitoring of the parameters voltage (V), current (I), load flow direction (A↑ or B↓), power factor (cos φ), power (P, Q, S), energy (E), temperature (T) and frequency (f)
- ▶ Suitable for all types of networks/neutral point treatments
- ▶ Earth fault detection with 6 different earth fault detection methods, also in combination
- ▶ Voltage monitoring with connection to capacitive and resistive (ohmic) sensors in one indicator
- ▶ Limit monitoring: V, I, P, Q, T
- ▶ Commissioning via USB connection with support for ComPass Explorer and ScadaDataConfigurator software
- ▶ Freely assignable binary inputs for recording and transmitting relevant status information from the system/station
- ▶ Freely programmable logic for defining the switching conditions

YOUR ADVANTAGES

- ▶ Fast fault direction detection
- ▶ High-precision current and voltage monitoring
- ▶ Detection of threshold violations
- ▶ Availability of measured values in the control room and on-site
- ▶ Remotely controllable from the control room via IEC 60870-5-104 protocol
- ▶ Automatic self-calibration of capacitive voltage inputs, optionally with temperature compensation

The ComPass D is suitable for use in substations with a remote control connection of the electrical power distribution in a medium voltage network. In addition to the short-circuit and earth fault functions, the ComPass D collects highly accurate measured values for current, voltage and power from the substation and makes them available for transmission to the control room. The PT-100 sensor measures the temperature, for example of the transformer or the transformer station. For all measured values limits can be defined, which can also be transmitted to the control room.

The voltage coupling/measurement is done via the capacitive VDIS* system and/or via resistive (ohmic) voltage sensors. Up to five ComPass D can be connected to a set of resistive voltage sensors.

The ComPass D offers a control function for switching a load-break switch or circuit-breaker. A free assignment of six binary inputs in combination with a freely programmable logic (PLC functionality) enables the user to define the switching conditions in a flexible manner. Random information, such as the SF6 gas disruption or HV tripped fuse, can be captured via the binary inputs.

* VDIS according to IEC62271-213, current standard as of 08/2023

| Technical data | ComPass D | |
|---|---|---|
| Short-circuit indicator | ■ | |
| Earth fault indicator | ■ | |
| Earth fault detection method | Permanent, earth short-circuit, transient, cos φ, sin φ, Pulse location | |
| Measured values / indication | <ul style="list-style-type: none"> ▶ Phase currents I₁, I₂, I₃, I_E with phase angle ▶ Phase-to-earth voltage V₁, V₂, V₃, V_{NE} and phase-to-phase voltage V₁₂, V₂₃, V₃₁, V_{NE} with phase angle ▶ Load flow direction A↑ or B↓ ▶ P, Q, S and cos φ (power factor) (P_{1,2,3}, Q_{1,2,3}, S_{1,2,3}, cos φ_{1,2,3} via RS485) ▶ Amount of active energy, separate for load flow direction A↑ or B↓, additionally per phase ▶ Operating current, I₁, I₂, I₃, I_E, S, P, Q, U₁₂, U₂₃, U₃₁, all average values adjustable (1–60 min), I₁, I₂, I₃ max. 24 h / 7 days / 365 days, maximum demand indicator I_{max} LR, V_{12max} LR, V_{23max} LR, V_{31max} LR, S_{max} LR, P_{max} LR, Q_{max} LR, T_{min} LR, T_{max} LR (last reset) ▶ Power frequency f ▶ Temperature T | |
| I>> short-circuit trip current | DIP: 400, 800, 1,000, 2,000 A, Self-adjustment: 10 - 2,000 A | |
| IES> / IES>> earth short-circuit trip current | 10 – 1,000 A | tIES> / tIES>> Response delay: 40 ms – 60 s |
| IET> transient method | 10 – 500 A | |
| IEP> active current cos φ | – 200 A tIEP> / tIEQ> Response delay: 40 ms – 60 s | |
| I EQ> reactive current sin φ | 1 – 200 A | |
| VNE> permanent earth fault values | 1–100 % | tVNE> Response delay: 40 ms – 60 s |
| Limit monitoring | | |
| I> overload current | 5–1.500 A | tI> Response delay: 40 ms – 60 s |
| V> overvoltage | 100–200 % | tV> Response delay: 40 ms – 60 s |
| V< undervoltage | 1–100 % | tV< Response delay: 40 ms – 60 s |
| P> / P>> / +P> / -P> active power | 1–30,000 kW | tP> / tP>> / +tP> / -tP> Response delay: 40 ms – 60 s |
| Q> / Q>> / +Q> / -Q> reactive power | 1–30,000 kW | tQ> / tQ>> / +tQ> / -tQ> Response delay: 40 ms – 60 s |
| T< / T<< / T> / T>> temperature | –40 °C to +85 °C | |
| Measurement accuracy phase currents | Up to 0.5 % / 0.5 A closed sensor type, 1 % / 0.5 A split-core sensor type | |
| Measurement accuracy voltages | Up to 0.5 % in the range of 80 – 120 % / V _{nom} (resistive) | |
| Indication | <ul style="list-style-type: none"> ▶ LED status display (multicolour) ▶ OLED display (multicolour) | |
| Remote signal / communication | <ul style="list-style-type: none"> ▶ 4 potential-free relay contacts, freely configurable ▶ Ethernet / IEC 607-5-104 | |
| Parameter setting | USB port with ComPass Explorer Software | |
| Remote contact | 4 permanent or momentary contacts, bistable, NC or NO Contact capacity: 250 V AC/6 A; 30 V DC/6 A | |
| Binary inputs | 6, freely programmable, max. 30 V DC | |
| Reset | <ul style="list-style-type: none"> ▶ By rocker switch ▶ Remote reset ▶ Automatic time reset: 1 min – 24 h ▶ Via Ethernet with IEC 60870-5-104 protocol ▶ Current restoration ▶ Voltage restoration ▶ Restoration of auxiliary supply ▶ ComPass Explorer Software | |
| Power supply | | |
| External auxiliary supply | 24 V AC/DC | |
| Internal Power supply | Long-life lithium cell, service lifetime ≥20 years, >900 h total flashing time | |
| Housing | Polycarbonate, IP50 | |
| Temperature range | –30 °C to +70 °C | |

| Equipment set | Page | Order no. | Accessories | Page |
|--|------|-------------|---------------------------------|------|
| 1 Display unit | | | Installation system | 59 |
| ComPass D | | 38-5110-201 | Connection to remote monitoring | 71 |
| 3 Single-phase current sensors ¹⁾ | 50 | | Wall-mounted housing | 58 |
| 1 Voltage signal | 54 | | External signal lamp | 58 |
| | | | Disassembly clip | 59 |
| | | | Spring clip | 59 |

¹⁾ Combination with summation current sensor possible: 2+1 or 3+1
Project planning on page 37, Product matrix on page 10-14

Dimension drawing see on page 132 ff | M3

Phase current transformers

For installation on bushings and pole plates

for Alpha M, Alpha E

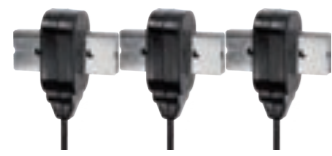


ABB
SafeRing, SafeLink, RGC,
SafePlus
Order no.
3 x 49-6012-009



ABB
SafeRing, RGC,
SafePlus
Order no.
1 x 49-6012-015



Driescher
MINEX, G.I.S.E.L.A.
Order no.
3 x 49-6012-007



EATON/Holec
SVS
Order no.
1 x 49-6010-032



EATON/Holec
XIRIA
Order no.
1 x 49-6010-048



Ormazabal
GA/GAE, GE
Order no.
3 x 49-6010-011



Schneider Electric
RM6
Order no.
3 x 49-6010-044



Schneider Electric
FBA, GLA, GMA
Order no.
3 x 49-6010-030



Schneider Electric
FBX
Order no.
3 x 49-6012-005



Siemens
8DJ, 8DH, SIMOSEC
Order no.
3 x 49-6010-052



Siemens
8DJH module transformer
Order no.
3 x 49-6010-060

For installation on insulated cables

for Alpha M, Alpha E



| Conductor Ø [mm] | Cable length [m] | Order no. |
|------------------|------------------|-------------|
| 15 – 52 | 3.00 | 49-6011-040 |
| 15 – 52 | 6.00 | 49-6011-043 |

For installation on cables and busbars

for Opto F 3.0, Opto F+E 3.0



| Trip currents ¹⁾ [A] | Conductor Ø [mm] | Order no. |
|---------------------------------|------------------|-------------|
| 400, 600, 800 or 1,000 | 22 – 42 | 49-0101-202 |

¹⁾ adjustable



| Trip currents ¹⁾ [A] | Conductor Ø [mm] | Order no. |
|---------------------------------|------------------|-------------|
| 400, 600, 800 or 1,000 | 40 – 60 | 49-0101-203 |

¹⁾ adjustable



| Trip currents ¹⁾ [A] | Conductor Ø [mm] | Order no. |
|---------------------------------|------------------|-------------|
| 400, 600, 800 or 1,000 | 20 x 4 – 40 x 10 | 49-0101-206 |


¹⁾ adjustable

Single-phase current sensors

For new installations on bushing with Ø 84 mm for Sigma 2.0 series, Sigma D series ComPass series




ABB
SafeLink, SafePlus, SafeRing
Order no.
3 x 49-6025-000 | Ø 79,5 mm
3 x 49-6025-301 | Ø 84 mm



Schneider Electric
RM6, RMAirSet
Order no. 3 x 49-6025-615



Driescher
MINEX, MINEX C, G.I.S.E.L.A
Order no. 3 x 49-6025-601¹⁾



Schneider Electric
FBX
Order no. 1 x 49-6025-622



EATON
XIRIA
Order no.
3 x 49-6025-000 | Ø 79,5 mm
3 x 49-6025-301 | Ø 84 mm



Siemens
8DJH24 (module transformer),
Field width 310 mm
Order no. 1 x 49-6025-630



Lucy Electrics
AegisPlus
Order no. 3 x 49-6025-601



Siemens
8DJH24, 8DJH36, NX-Plus C
Field width 430 mm
Order no. 3 x 49-6025-611



Ormazabal
GA/GAE + GE
Order no.
3 x 49-6025-311

For screened connectors only. Insulation level: 0.72 / 3 kV.
¹⁾ Without retaining plates. Order no. with retaining plates on request

For mounting on bushings for SF6-free compact switchgears for Sigma 2.0 series, Sigma D series



Siemens
8DJH24 blueGIS
(module transformer)
Order no. 49-6025-630





ABB
SafePlus Air/AirPlus 12/24kV
Order no. 3 x 49-6025-301




Schneider Electric
RM AirSeT24
Order no. 49-6025-623



Ormazabal
cgm.zero24
Order no. 3 x 49-6025-316


Single-phase current sensors | Summation current transformers

CSOR | For installation on insulated conductors up to 12kV/√3 for Sigma 2.0 series, Sigma D series, ComPass series




| Conductor Ø [mm] | Cable length [m] | Order no. |
|------------------|------------------|------------------|
| 15–45 | 3.00 | V49-6024-010-042 |

For installation on insulated cables for retrofitting for Sigma 2.0 series, Sigma D series, ComPass series




| Conductor Ø [mm] | Cable length [m] | Order no. |
|---------------------|------------------|-------------|
| 15–55 | 3.00 | 49-6024-001 |
| 15–65 | 3.00 | 49-6024-010 |
| 15–78 (for 1,250 A) | 3.00 | 49-6024-130 |

For installation on shielded and earthed medium-voltage cables for Sigma plus



| Conductor Ø [mm] | Cable length [m] | Order no. |
|------------------|------------------|-------------|
| 40 – 115 | 3,00 | 49-6013-016 |

for Earth 4.0, Earth Zero, Earth Zero Flag



| Conductor Ø [mm] | Cable length [m] | Order no. |
|------------------|------------------|-------------|
| up to 130 mm | 3,00 | 49-6013-029 |

For installation on insulated medium-voltage cables for Opto F+E 3.0




| Trip currents ¹⁾ [A] | Conductor Ø [mm] | Order no. |
|---------------------------------|------------------|-------------|
| (10), (20), 40 or 80 | up to 115 | 49-6014-007 |
| 40, 80, 120 or 160 | up to 115 | 49-6014-009 |

¹⁾ adjustable

Summation current sensor

Summation current sensor, splittable for Sigma D+, Sigma D++, ComPass B series



| Conductor Ø [mm] | Cable length [m] | Order no. |
|------------------|------------------|-------------|
| 220–250 | 4,00 | 49-6023-020 |

Product matrix

Capacitive and resistive voltage signal



| Function | C1A2-24 | C11x | RDP series | RDG3-24 | RDM3-24 |
|--|---------|------|------------|---------|---------|
| Capacitive voltage signal | ■ | ■ | — | — | — |
| Resistive voltage signal | — | — | ■ | ■ | ■ |
| Voltage indication | — | — | — | — | — |
| Voltage measurement | — | — | ■ | ■ | ■ |
| Connection | | | | | |
| Connection to Sigma D series | ■ | ■ | — | — | — |
| Connection to ComPass B | ■ | ■ | — | — | — |
| Connection to ComPass B 2.0 series | ■ | ■ | ■ | ■ | ■ |
| Purpose | | | | | |
| New installation | — | ■ | ■ | ■ | ■ |
| Retrofit | ■ | ■ | ■ | ■ | ■ |
| Gas- / solid insulated switchgear | — | — | ■ | ■ | — |
| Air-insulated switchgear | ■ | ■ | — | — | ■ |
| Features | | | | | |
| Maintenance-free voltage detecting system | — | — | — | — | — |
| Relay contacts for remote monitoring | — | — | — | — | — |
| Voltage indication in combination with HR interface | — | — | — | — | — |
| Voltage indication in combination with post insulator | — | — | — | — | — |
| Direct connection from HR interface to directional fault indicator | — | — | — | — | — |
| Direct connection from post insulator to directional fault indicator | — | — | — | — | — |
| Capacitive interface integrated in switchgear | — | — | — | — | — |
| High-precision voltage measurement | — | — | ■ | ■ | ■ |
| Installation on T connector set | — | — | ■ | — | — |
| Installation on A cone | — | — | — | ■ | — |
| Connection to Wega possible | ■ | ■ | — | — | — |
| Voltage calibration necessary | ■ | ■ | — | — | — |

Product matrix

Capacitive and resistive voltage signal



| Function | Wega with interface cable | Interface cable for post insulator |
|--|---------------------------|------------------------------------|
| Capacitive voltage signal | ■ | ■ |
| Resistive voltage signal | — | — |
| Voltage indication | ■ | — |
| Voltage measurement | — | ■ |
| Connection | | |
| Connection to Sigma D series | ■ | ■ |
| Connection to ComPass B | ■ | ■ |
| Connection to ComPass B 2.0 series | ■ | ■ |
| Purpose | | |
| New installation | — | — |
| Retrofit | ■ | ■ |
| Gas- / solid insulated switchgear | ■ | — |
| Air-insulated switchgear | ■ | ■ |
| Features | | |
| Maintenance-free voltage detecting system | ■ | — |
| Relay contacts for remote monitoring | — | — |
| Voltage indication in combination with HR interface | ■ | — |
| Voltage indication in combination with post insulator | ■ | — |
| Direct connection from HR interface to directional fault indicator | — | — |
| Direct connection from post insulator to directional fault indicator | — | ■ |
| Capacitive interface integrated in switchgear | ■ | ■ |
| High-precision voltage measurement | — | — |
| Installation on T connector set | — | — |
| Installation on A cone | — | — |
| Connection to Wega possible | — | — |
| Voltage calibration necessary | ■ | ■ |

Capacitive voltage coupling

for Wega series in air-insulated switchgears



| C1A2-24 | Cable length [m] | Rated voltage [kV] | Order no. set |
|--|------------------|--------------------|-------------------------------------|
| For installation on cable terminations ¹⁾ | | | |
| Driescher: LDTM-12/24 | | | V38-9100-061-001 (without Wega) |
| Driescher: TSL-20 | | | |
| Driescher: TSL-G20 | | | |
| Calor Emag: C2-20 | 4,5 | 12, 24 | V38-9100-061-002 (Set incl. Wega 1) |
| Calor Emag: C3-10/20 | | | |
| F&G: Concordia-Sprecher 12 | | | |
| F&G: EA20 | | | V38-9100-061-003 (Set incl. Wega 2) |
| Leukhardt: 10 kV | | | |

1) Further types of switchgear on request.
Wega series as well as set of connection cables see page 88



| C11x | Voltage [kV] | Order no. |
|---------|--------------|-----------------|
| C111-12 | max. 12 | 3 x 48-0101-002 |
| C112-24 | max. 24 | 3 x 48-0101-003 |
| C113-36 | max. 36 | 3 x 48-0101-004 |

Wega 1 V for capacitive support C11x (see page 86)



| Equipment set | Order no. |
|---------------------------------------|-------------|
| 1 integrated voltage detecting system | |
| Wega 1 V | 51-1900-108 |
| 3 Coaxial cable | |
| 3.000 mm | 49-6003-201 |
| 5.000 mm | 49-6003-213 |
| 6.000 mm | 49-6003-210 |
| 7.500 mm | 49-6003-215 |
| 10.000 mm | 49-6003-212 |
| 1 Earth connection cable | 49-0511-016 |

Further cable lengths on request.

Measuring cable sets between capacitive support C11x and Sigma D, Sigma D+, Sigma D++, ComPass B 2.0, ComPass Bs 2.0



| Capacitive support | Nominal voltage | Input Indicator | Cable length | Order no. |
|--------------------|-----------------|-----------------|--------------|-------------|
| C111-12 (PSA 10) | 10 kV | AMP | 8.000 mm | 49-0509-245 |
| C112-24 (PSA 20) | 20 kV | AMP | 4.000 mm | 49-0509-246 |

Further capacitive values and cable lengths on request.

Measuring cable sets between capacitive support C11x and ComPass B



| Capacitive support | Nominal voltage | Input Indicator | Cable length | Order no. |
|--------------------|-----------------|--------------------|--------------|-------------|
| C111-12 (PSA 10) | 10 kV | 4-pole series plug | 2.000 mm | 49-0509-061 |
| C112-24 (PSA 20) | 20 kV | 4-pole series plug | 2.000 mm | 49-0509-062 |

Further capacitive values and cable lengths on request.

Resistive voltage sensors for high-precision voltage measurements

for ComPass B 2.0 series

with shielded 2 pole cable with connector, connecting terminal resistor and termination resistor

For gas-insulated switchgears



| RDP2.1-24 | Cable length [m] | Voltage [kV] | Order no. set |
|--|------------------|--------------|---------------|
| For T connector set ¹⁾ | | | |
| Suitable for MS connectors | | | |
| Nkt cables: CB-12, CC-12, CB-24, CC-24 | | | |
| Raychem: RSTI-58xx, RSTI-CC-58xx | | | |
| Nexans: 430TB, 430PB, K430TB, K430PB | 3,70 | 12, 24 | 38-9100-131 |
| Südkabel: SET12, SET24, SEHDT 13.1, SEHDT23.1, SAT12, SAT24, SEHDK23.1, MUT23, MUT23.1, AD23.1SP | | | |
| Cellpack: CTS 630A, CTSK630A | | | |



| RDP1-24 | Cable length [m] | Voltage [kV] | Order no. set |
|-----------------------------------|------------------|--------------|---------------|
| For T connector set ¹⁾ | | | |
| Nexans: (K)400TB | | | |
| Cellpack: CTS-S | 3,70 | 12, 24 | 38-9100-013 |
| Südkabel: SEHDT 13, SEHDT 23 | | | |



| RDP2-24 | Cable length [m] | Voltage [kV] | Order no. set |
|-----------------------------------|------------------|--------------|---------------|
| For T connector set ¹⁾ | | | |
| NKT: CB-24, CC-24 | | | |
| Raychem: RSTI-58xx, RSTI-CC-58xx | 3,70 | 12, 24 | 38-9100-017 |



| RDP3-24 | Cable length [m] | Voltage [kV] | Order no. set |
|---|------------------|--------------|---------------|
| For T connector set ¹⁾ | | | |
| Nexans: (K)430TB-630A, (K)300 PB-630A | | | |
| Südkabel: SET24, SEHDT23.1, SAT24, SEHDK23.1, SAK24, MUT23, MUT23.1, AD23.1SP | 3,70 | 12, 24 | 38-9100-018 |



| RDP4-24 | Cable length [m] | Voltage [kV] | Order no. set |
|-----------------------------------|------------------|--------------|---------------|
| For T connector set ¹⁾ | | | |
| Cellpack: CTS630A, CTKS630A | 3,70 | 12, 24 | 38-9100-019 |



| RDP5-24 | Cable length [m] | Voltage [kV] | Order no. set |
|---|------------------|--------------|---------------|
| For T connector set ¹⁾ | | | |
| Nexans: (K)480TB-630A, (K)800PB-630A, (K)484TB-630A, (K)804PB-630A, (K)489TB-630A, (K)809PB-630A, 800SA | 3,70 | 12, 24 | 38-9100-021 |

¹⁾ Further connector sets on request.



| RDG3-24 | Cable length [m] | Voltage [kV] | Order no. set |
|-----------------------------------|------------------|--------------|---------------|
| Sensors with adapters for A cones | 6,00 | 12, 24 | 38-9100-026 |



| RDP1-36 | Cable length [m] | Voltage [kV] | Order no. set |
|--|------------------|--------------|----------------|
| For T-connector ¹⁾ Nexans Südkabel M400TB, SEHDT 33 | 6 | 36 | 3x 38-9100-122 |



| RDP2-36 | Cable length [m] | Voltage [kV] | Order no. set |
|---|------------------|--------------|----------------|
| For T-connector ¹⁾ NKT cables CB36-630, CC36-630 TE/ Raychem RSTI x95x, RSTI-CC x95 TE/ Raychem RSTI 68xx, RSTI-CC 68xx | 6 | 36 | 3x 38-9100-127 |



| RDP3-36 | Cable length [m] | Voltage [kV] | Order no. set |
|---|------------------|--------------|----------------|
| For T-connector ¹⁾ Südkabel SET36, SDEHDK36 SEHDK36 MUT33 | 6 | 36 | 3x 38-9100-127 |



| RDP5-36 | Cable length [m] | Voltage [kV] | Order no. set |
|---|------------------|--------------|----------------|
| For T-connector ¹⁾ Nexans M480TB, M800PB M484TB, M804PB M484TB, M809PB 800SA | 6 | 36 | 3x 38-9100-122 |



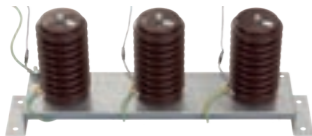
| Connection cable | Cable length ¹⁾ [m] | Order no. |
|--|--------------------------------|-------------|
| For the provision of voltage information from ComPass B / BS 2.0 to ComPass B / BS 2.0 | 1,00 | 49-0509-311 |

¹⁾ Further cable lengths on request.

For air-insulated switchgears



| RDM3-24 | Cable length [m] | Voltage [kV] | Order no. set |
|--|------------------|--------------|---------------|
| For different switchgear manufacturers | 6,00 | 12, 24 | 38-9100-050 |



| RDM3-24 | Cable length [m] | Voltage [kV] | Order no. set |
|---|------------------|--------------|---------------|
| For different switchgear manufacturers, with retaining plate for installation on cable brackets | 6,00 | 12, 24 | 38-9100-051 |

For short-circuit and earth fault indicators and integrated voltage detecting systems

WALL-MOUNTED HOUSING

for the installation of short-circuit and earth fault indicators as well as integrated voltage detecting systems outside the switchgear



| Product information |
|---|
| W x H x D 125 x 75 x 125 mm |
| Order no. 49-9001-001 bottom cable entry 49-9001-002 rear cable entry |



| Product information |
|--|
| W x H x D 125 x 175 x 125 |
| Order no. 49-9001-017 incl. earthing bar |



| Product information |
|-------------------------------|
| W x H x D 125 x 75 x 75 mm |
| Order no. 49-9001-006 |



| Product information |
|---|
| W x H x D 290 x 74 x 200 mm |
| Order no. V49-9001-007-001 incl. earthing bar |

EXTERNAL SIGNAL LAMP

for installation outside the switchgear



| ESL2-B, 3 LEDs, red | Order no. |
|--|-------------|
| 5 m connection cable, with battery, for permanent contact | 49-0813-102 |
| 10 m connection cable, with battery, for permanent contact | 49-0813-103 |
| 15 m connection cable, with battery, for permanent contact | 49-0813-104 |



| ESL2.1-B, 3 LEDs, bicolour red/green | Order no. |
|--|-------------|
| 5 m connection cable, with battery, for permanent contact | 49-0816-102 |
| 10 m connection cable, with battery, for permanent contact | 49-0816-103 |
| 15 m connection cable, with battery, for permanent contact | 49-0816-104 |



| ESL 1 LED, bicolour red/green | Order no. |
|---|-------------|
| 2 m connection cable, with battery, without fibre optic cable | 49-0704-001 |

| Technical data | |
|-----------------------------------|--|
| Display | 3 ultra-bright LEDs, colour red or red/green, 5 mm lens diameter |
| Flashing frequency | 30 flashes per minute, On-time > 30 ms |
| Internal device supply | Integrated Lithium battery, expected life > 20 years, Potential free contact; Min. flashing time: 1,200 h |
| Protection class, DIN EN 61140 | SELV, protection class III |
| Degree of protection DIN EN 60529 | IP 65 |
| Impact resistance EN 62262 | IK06 |
| Housing material | Polycarbonate, UV and weather resistant |
| Dimensions | 83 x 81 x 51 mm (H x W x D) |
| Available cable lengths | 5 m, 10 m, 15 m, other lengths on request |
| Mounting material | The fixing material is included in the delivery. Cylinder head screw M5x45 DIN84, steel, washer, nut M5, stainless A2 (slotted) Optional: Cross screw 5x60 mm, drive: PH2 with 8 mm dowel (can be ordered with separate part number) |

Installation system

for Sigma D series and ComPass series



| | Order no. |
|---|-------------|
| Tablet for parameter setting during installation or monitoring, incl. cover, pencil, power supply and USB cable | 49-6022-010 |

Temperature sensor PT100 (2-conductor)



| | Order no. |
|-------------------|-----------------------------|
| Temperature range | -50 °C to +180 °C |
| Dimension | 6 x 50 mm |
| Cable length | 10 m (silicone, 2 ferrules) |
| Protection degree | IP65 |

Fibre optic cables



| | Order no. |
|--|-------------|
| Fibre optic cables 3 m (Standard length for Single-phase current sensors) | 49-0602-009 |
| Fibre optic cables 4 m (Standard length for summation current transformer) | 49-0602-001 |
| Fibre optic cables 1,8 m (Standard length for external signal lamp) | 49-6007-206 |

Accessories for Opto series



| | Order no. |
|-------------------------------------|-------------|
| Cutting tool for fibre optic cables | 49-0109-003 |



| | Order no. |
|---|-------------|
| Transformer with cable for top-hat rail mounting (115 V – 230 V AC / 24 V – 48 V AC) | 49-0921-002 |



| | Order no. |
|---|-------------|
| Optical testing unit to excite the indicator for connection to the fibre optic cable plug | 49-0109-002 |

Accessories Plug-in housing



| | Order no. |
|------------------|-------------|
| Disassembly clip | 49-9090-029 |



| | Order no. |
|--|-------------|
| Spring clip suitable for front plate thickness 2 mm (standard) | 49-9090-018 |
| Spring clip suitable for front plate thickness 3 mm | 49-9090-019 |
| Spring clip suitable for front plate thickness 4 mm (Eaton standard) | 49-9090-028 |

Applications

Load flow monitoring in the low-voltage grid using an Interface box



PRODUCT FEATURES

The Interface box can be used to adapt voltages from different voltage levels to the Wega input of short-circuit indicators.

- ▶ 3x 100V or 3x 110V: Secondary voltage signal from medium-voltage transformer
- ▶ 400/230V: Direct connection in the low voltage

The voltage signals from the interface box can be provided to the following devices:

- ▶ ComPass B 2.0

Depending on the device functions, only measured values corresponding to the device accuracies and transmission functions can be further processed:

- ▶ High-precision current and voltage measurements with 1% using ComPass B series devices
- ▶ Highly accurate voltage measurements with 1% using ComPass B 2.0 device
- ▶ Current measurement range up to 1,250 A possible

YOUR ADVANTAGES

- ▶ A system also for low voltage with 400/230V
- ▶ A system for special applications in medium voltage with 100 V / $\sqrt{3}$
- ▶ Measured value availability in the control room and on site
- ▶ Remote transmission options via RS485/Modbus
- ▶ Provision of measured values: V, I, f, T, S, P, Q, E in medium and low voltage
- ▶ Switching function of 2 switching elements
- ▶ Short-circuit and earth fault direction detection in the medium voltage
- ▶ The device functions can be found on the corresponding device pages



| Equipment set | Page | Order no. | Accessories | Page |
|--------------------------------|------|-------------|---------------------------------|------|
| Interface box | | 49-6021-001 | Installation system | 59 |
| ComPass B | | 38-4102-001 | Connection to remote monitoring | 71 |
| 3 Single-phase current sensors | 50 | | External signal lamp | 58 |
| 1 Voltage signal | 54 | | Temperature sensor PT100 | 59 |
| | | | Wall-mounted housing | 58 |
| | | | Disassembly clip | 59 |
| | | | Spring clip | 59 |

Trip Flag

Trip indicator relay for trip display



Trip Flag

PRODUCT FEATURES

- ▶ Suitable for connection to CT powered protection relays in medium voltage switchgears
 - ▶ 2 drop indicators (black/red)
 - ▶ OC relay trip: Overcurrent relay trip
- ▶ ETFS trip: External trip forced switch
- ▶ Controllable via electrical impulse output
- ▶ 2 changeover contacts per relay, self-holding
- ▶ Test / reset function for indicator and relay contacts via rotary knob

The Trip Flag is a drop indicator relay for two independent indications. It is suitable for the trip display of CT powered protection devices with electrical impulse output.

In addition to the display, output relays are activated. Each output has 2 changeover contacts. The output contacts and the display are latching and are reset manually via a rotary knob.

The Trip Flag is suitable for protection devices from Woodward (WIC1, WIB1, WIP1).

For devices of other manufacturers the electrical impulse of the outputs of the protection relays needs to be 24 V DC and $E \geq 0.01 \text{ Ws}$.

| Technical data | |
|-------------------|---|
| Indication | 2 trip displays (black / red) |
| Remote signal | 2 changeover contacts per trip display |
| Remote contact | Potential-free contacts, bistable Contact capacity: 230 V AC / 1 A / 62.5 VA max.; 220 V DC / 1 A / 60 W max. |
| Input signal | Electrical impulse, 24 V DC $\geq 0.01 \text{ Ws}$ |
| Test / Reset | Manually via rotary knob |
| Housing | Polycarbonate, IP40 front panel, IP20 terminals |
| Temperature range | -30 °C to +70 °C |

| Equipment set | Page | Order no. | Accessories | Page |
|--------------------------|------|-------------|----------------------|------|
| 1 Display unit Trip Flag | | 49-9010-001 | Wall-mounted housing | 58 |
| | | | Disassembly clip | 59 |
| | | | Spring clip | 59 |

Dimension drawing see on page 132 ff | M5

Product matrix

Overhead faulted circuit indicators



| Function | Navigator LM | Navigator LM HV | Navigator LED + Flag | Smart Navigator 2.0 | Smart Navigator 2.0 HV | Smart Navigator 2.0 LC + Pole Master |
|------------------------------------|----------------|-----------------|----------------------|---------------------|------------------------|--------------------------------------|
| Short-circuit indication | ■ | ■ | ■ | ■ | ■ | ■ |
| Directional indication | — | — | — | ■ (red/green) | ■ (red/green) | ■ (red/green) |
| Self-adjustment/ fixed settings | ■/■* | ■/■* | ■/■* | ■/■* | ■/■* | ■/■* |
| Monitoring | — | — | — | ■ | ■ | ■ |
| Recloser mode | ■ | ■ | ■ | ■ | ■ | ■ |
| Rated voltage | ≤46kV | ≤161kV | ≤46kV | ≤69kV | ≤161kV | ≤69kV |
| Withstand current | 25kA/3s | 40kA/1s | 31,5kA/3s | 40kA/1s | 40kA/1s | 40kA/1s |
| Trip settings | | | | | | |
| I>> short-circuit trip current | 200–1.000 A | 200–1.000 A | 50–1.000 A | 20–1.200 A | 20–1.200 A | 7–1.200 A |
| tI>> response delay | 100 ms | 100 ms | 100 ms | 100 ms | 100 ms | 100 ms |
| Reset | | | | | | |
| Manual | ■ | ■ | ■ | ■ | ■ | ■ |
| Remote | — | — | — | ■ | ■ | ■ |
| Automatic time reset | ■ | ■ | ■ | ■ | ■ | ■ |
| Current restoration | ■ | ■ | ■ | ■ | ■ | ■ |
| Voltage restoration | ■ | ■ | ■ | ■ | ■ | ■ |
| Test | | | | | | |
| Via magnet | ■ | ■ | ■ | ■ | ■ | ■ |
| Remote | — | — | — | ■ | ■ | ■ |
| Communication | | | | | | |
| LTE CAT-M1, 4G, 450 MHz | — | — | — | ■ | ■ | ■ |
| Parameter setting | | | | | | |
| Local | — | — | — | ■ | ■ | ■ |
| Remote | — | — | — | ■ | ■ | ■ |
| Monitoring | | | | | | |
| Conductor temperature | — | — | — | ■ | ■ | ■ |
| Conductor | | | | | | |
| Diameter | 8–29 mm | 13–36 mm | 8–29 mm | ≤33 mm | ≤33 mm | ≤33 mm |
| Power supply | | | | | | |
| Long-life lithium cell, shelf life | ≥20 years | ≥20 years | ≥20 years | ≥10 years | ≥10 years | ≥10 years |
| Battery status indication | ■ | ■ | ■ | ■ | ■ | ■ |
| Mechanic | | | | | | |
| Weight | 470 g | 470 g | 425 g | 1 kg | 1 kg | 1,0 kg / 2,8 kg |
| Degree of protection IP65 | — | — | — | — | — | ■ |
| Degree of protection IP68 | ■ | ■ | ■ | ■ | ■ | — |
| Temperature range | -40°C to +85°C | -40°C to +85°C | -40°C to +85°C | -40°C to +85°C | -40°C to +85°C | -40°C to +85°C |

* Fixed trip current values only with Navigator PM

Navigator LM | Navigator LM HV

Overhead faulted circuit indicator



Navigator LM



Navigator LM HV

PRODUCT FEATURES

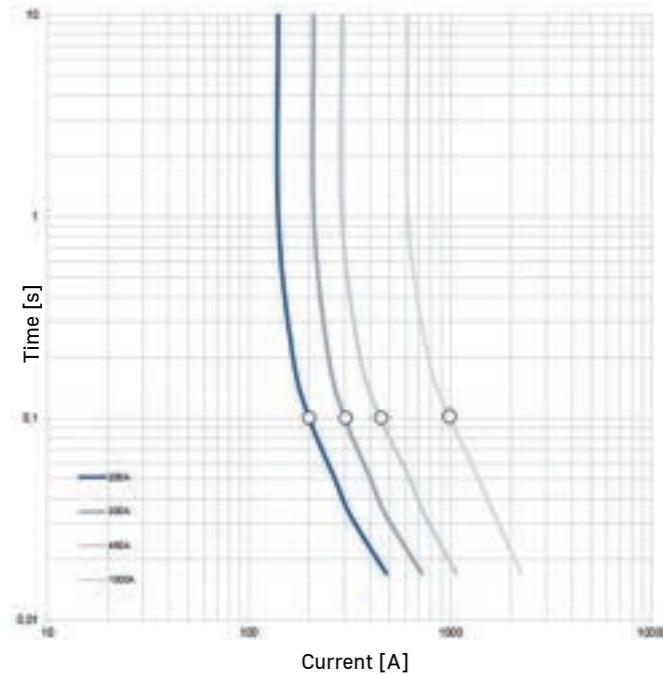
- ▶ LED indication with 360 degrees of visibility
- ▶ Double-flashing mode upon detection of a second fault
- ▶ Battery status indication
- ▶ Reset depending on type: manual, current restoration, voltage restoration
- ▶ Mounting on live overhead lines possible
- ▶ Navigator-LM HV: permissible voltage ≤ 161 kV

The Navigator fault passage indicator is an electronic device which is designed for medium voltage utility overhead lines.

The indicator is provided with a self-adjusting load-dependent control of the trip current level. This function allows the indicator to continuously sample the load current on overhead lines and automatically set a corresponding trip value for fault detection as a function of the load current. The maximum load current sampled by the indicator, is kept in a memory for a period of at least 72 hours. Thus, the indicator is most favourably adapted to the network to be monitored, even if low load is currently present.

The indicator is provided with a built-in battery control. When the battery capacity decreases from a total indicating time of 500 hours to a residual time of 50 hours, the yellow LED of the display starts flashing for a period of 6 months.

The Navigator LM differentiates between two subsequent short-circuit detections. Upon the detection of a first short-circuit, the LED indicator light starts flashing at equal rates. The detection of a second short-circuit (e. g. after ARC) switches the LED to double flashing mode.



Current / time characteristic

| | | | | |
|---------------------------|------|-----|-----|-------|
| Load current [A] | 0-50 | 78 | 100 | 170 |
| Response value [A]/100 ms | 200 | 300 | 450 | 1,000 |

| Technical data | Navigator LM Navigator LM HV | | | |
|--|---|---------------------------|--|---------------------------|
| | Version A | Version B | Version C | Version E |
| I>> Short-circuit trip current | ≥ 200 A / ≥ 100 ms, load-dependent self-adjustment (see current/time characteristic curve) | | | |
| Accuracy | ± 10 % at 20 °C | | | |
| Self-adjustment | ≥ 30 A load current | | | |
| Trip factor | 4-6 x load current (see current/time characteristic curve) | | | |
| Adjustment delay | 60 s Load current flow duration | | | |
| Peak load memory | 72 h | | | |
| Indicators (short circuit / earth fault) | <ul style="list-style-type: none"> ▶ 4 red LEDs (>5,000 mcd or 7,000 mLm per LED) ▶ 2 yellow LEDs (>5,000 mcd or 7,000 mLm per LED) | | | |
| Visibility | >50 m / day, >150 m / night, 360 degrees of visibility | | | |
| Flash rate | 30 flashes per minute, total indication time >500 h | | | |
| Reset | Version A | Version B | Version C | Version E |
| Manual | Via magnet | Via magnet | Via magnet | Via magnet |
| Automatic time reset | 4 h ± 10 % (2 or 8 h) | 4 h ± 10 % (2 or 8 h) | 4 h ± 10 % (2 or 8 h) | 4 h ± 10 % (2 or 8 h) |
| Current restoration | load current >3 A | — | Red LEDs turn off, yellow LEDs turn off after manual or time reset | — |
| Voltage restoration | — | — | — | ≥ 5 kV line voltage |
| Power supply | Replaceable lithium batteries, service life ≥ 20 years | | | |
| Battery check | 1 yellow LED, flash rate: 6 per minute, 0,5 years | | | |
| Max. permissible voltage | Navigator LM: ≤ 46 kV / 50 Hz or 60 Hz Navigator LM HV: ≤ 161 kV / 50 Hz or 60 Hz | | | |
| Withstand current | Navigator LM: 25 kA / 3 s Navigator LM HV: 40 kA / 1 s | | | |
| Cable diameter range | Navigator LM: 8-29 mm Navigator LM HV: 13-36 mm | | | |
| Housing | UV resistant glass-fibre reinforced plastic, IP68 Clamping yoke: stainless steel | | | |
| Temperature range | -40 °C to +85 °C (IEEE 495: -40 °C to +85 °C) | | | |

| Order no. | | | | | | |
|------------------|--------------|---|---|--|---------------------------|------------------------------------|
| 41 | — | 2 | 1 | 01 | — | 1 1 1 |
| Navigator series | Navigator LM | Flashing frequency | Line diameter | Reset | Response value | Automatic time reset |
| 41 | 2 | 0=Single flashing 1=Single and double flashing | 01=8-29 mm (LM-Version) 08=13-36 mm (HV-Version) | 1=Version A 2=Version B 3=Version C 5=Version E | 1=200 A/100 ms (50/60 Hz) | 0=2 h 1=4 h (Standard) 2=8 h |

Navigator PM (without self-adjustment with fixed response values) and other special types on request

Product matrix see on Page 63

Dimension drawing see on page 132 ff | M8

| Accessories | Page |
|---------------------|------|
| Hot stick with hook | 70 |
| Installations tool | 70 |
| Magnet (Test/Reset) | 70 |

Navigator LED + Flag

Overhead faulted circuit indicator



Navigator LED + Flag

PRODUCT FEATURES

- ▶ 72 hour peak load memory
- ▶ 4 hours LED automatic reset
- ▶ 1, 2 or 7 days flag automatic reset
- ▶ Self diagnostic battery circuit
- ▶ Replaceable lithium cells
- ▶ 360 degrees visibility
- ▶ Manual test and reset
- ▶ Automatic inrush restraint
- ▶ Microprocessor controlled

The Navigator LED + Flag is a faulted circuit indicator for power distribution overhead lines. The faulted circuit indication is visualised by a large red flag in combination with LEDs.

The Navigator LED + Flag has a load tracking characteristic. This means it constantly monitors the load current magnitude on the line and automatically adjusts its trip current level for a fault. The highest current sensed for at least 60 seconds will establish a trip point (~4 times load) in memory and holds this value for 72 hours. If the load current reaches or exceeds the stored load current level at any time, a new trip point is registered and the memory time of 72 hours starts again. If load current does not meet or exceed the established level for 72 hours, the Navigator LED + Flag will sense and re-establish a new lower trip point. When a fault current exceeds the trip point, the indicator activates the red flag and high intensity red LEDs will also flash. The LEDs are reset by current, time or manually whichever comes first. The red flag is reset by either time or manually, giving both an indication on permanent as well as on momentary faults. The reset times for the LED and Flag can be selected independently to combine the advantages of a blinking indicator (better visibility) at night and a mechanical flag for difficult to reach rural applications.

| Technical data | Navigator LED + Flag | | |
|--|---|--|--|
| | Version A | Version B | Version E |
| Trip current | ≥50 A / ≥100 ms | | |
| Accuracy | ±10 % at 20 °C ±20 % at -30 to +70 °C | | |
| Self-adjustment | ≥20 A load current | | |
| Trip factor | 4 x load current | | |
| Adjustment delay | 60 s | | |
| Peak load memory | 72 h | | |
| Indication (short-circuit / earth fault) | <ul style="list-style-type: none"> ▶ Mechanical flag ▶ 3 red LEDs for fault indication ▶ 1 yellow LED for low-battery indication | | |
| Visibility | >50 m / day, >150 m / night, 360 degrees of visibility | | |
| Flash rate | 30 flashes per minute, total indication time >1,500 h | | |
| Reset | Version A | Version B | Version E |
| Manual | ■ | ■ | ■ |
| Automatic time reset | ▶ LED: 4 h ▶ Flag: 4 h, 1, 2, 3 or 7 days | ▶ LED: 4 h ▶ Flag: 4 h, 1, 2, 3 or 7 days | ▶ LED: 4 h ▶ Flag: 4 h, 1, 2, 3 or 7 days |
| Current restoration load current >3 A | ■ | - | - |
| Voltage restoration line voltage ≥5 kV | - | - | ■ |
| Power supply | Lithium battery, replaceable, shelf life ≥20 years | | |
| Battery check | 1 yellow LED, flash rate: 6 per minute (only while flag is reset) | | |
| Max. permissible voltage | ≤46 kV / 50 Hz or 60 Hz | | |
| Withstand current | 25 kA / 1 s | | |
| Cable diameter range | 4-29 mm 8-29 mm | | |
| EMC | IEC 61000-4-2 (ESD), IEC 61000-4-3 (HF) | | |
| Housing | UV resistant glass-fibre reinforced plastic, IP68 Clamping yoke: stainless steel | | |
| Temperature range | -30 to +70 °C (IEEE 495: -40 to +85 °C) | | |

Product matrix see on Page 63

Dimension drawing see on page 27ff | M8

| Order no. | | | | | | | | |
|------------------|---|--------------------|---|------------------------|--|---|--|--|
| 41 | — | 3 | 2 | 01 | — | 1 2 1 | | |
| Navigator series | | Navigator LED+Flag | | Flashing frequency | Line diameter | Reset | Trip current | Automatic time reset |
| 41 | | 3 | | 1 = 60 Hz 2 = 50 Hz | 01 = 8-29 mm (LM-Version) 04 = 4-29 mm (HV-Version) | 1 = Version A 2 = Version B 5 = Version E | 0 = 100 A / 200 ms 1 = 100 A / 100 ms 2 = 200 A / 200 ms (60 Hz) 2 = 200 A / 100 ms (50 Hz) 6 = 50 A / 200 ms (60 Hz) 6 = 50 A / 100 ms (50 Hz) | 1 = 4 h 5 = 3 days 6 = 1 day 7 = 7 days 8 = 2 days |

| Accessories | Page |
|---------------------------------|------|
| Hot stick with hook | 74 |
| Hot stick for installation tool | 74 |
| Installations tool | 74 |
| Magnet (Test/Reset) | 74 |

Smart Navigator 2.0

Self-powered overhead line sensor | smart faulted circuit indicator



PRODUCT FEATURES

- ▶ Quick fault detection – locally and in the control room at the same time
- ▶ Remote monitoring of measured values – high-precision current measurements, load flow direction and conductor temperature
- ▶ Embedded WAN communication – no box on the pole required – quick and easy installation saves costs
- ▶ Remote configuration and updates via iHost or locally via USB transmitter
- ▶ High availability of the medium voltage overhead lines – reduces outage times

The Smart Navigator 2.0 is the ideal solution for monitoring overhead line networks. It recognises and reports faults, voltage drops, overloads and other faults in the grid and reports them remotely without delay. It enables faster fault localisation, optimum utilisation of grid capacity and therefore improved supply quality.

The Smart Navigator 2.0 is easy to install, configure and maintain. The indicator is a self-powered sensor, which harvests its power supply from the overhead line. Power is stored in a rechargeable lithium cell for periods with low or no load current. It is compatible with various communication technologies and can be maintained remotely via a web or mobile application.

One set is required for each overhead line section to be monitored. The set consists of a master and two satellites. The satellites report all measured values and fault information to the master, which communicates with the control room via iHost.

| Accessories | Page |
|-----------------------|------|
| Connection to iHost | 72 |
| Hot stick with hook | 70 |
| USB transmitter | 70 |
| Magnet (Test / Reset) | 70 |

| Technical data | Smart Navigator 2.0 | Smart Navigator 2.0 HV |
|--|--|------------------------|
| I>> Short-circuit trip current | 7 – 1,200 A (Self-adjustment) or fixed trip up to 2,000 A | |
| Self-adjustment | ≥2 A Load current | |
| Trip factor | 4 x Load current | |
| Peak load memory | 72 h | |
| Current measurement accuracy | ±2 A (0–10 A) 3 % (10–600 A) 10 % (600–10,000 A) | |
| Indicators (short circuit / earth fault) | Ultra-bright high power LEDs | |
| Visibility | >50 m / day, >150 m / night, 360 degrees of visibility | |
| Flash rate | 30 flashes per minute | |
| Reset | | |
| Manual | Local by magnet or via USB transmitter, Remote optional | |
| Remote reset | Via iHost | |
| Automatic time reset | Can be parameterised | |
| Current restoration | >3 A Load current | |
| Voltage restoration | >5 kV line voltage | |
| Power supply | ▶ Power inductively from line current (>5 A) ▶ Internal rechargeable back-up-battery | |
| Power distribution line voltage | ≤69 kV (L–L) | ≤161 kV (L–L) |
| Withstand current | 600 A continuous, 40 kA / 1 s | |
| Event reporting | ▶ Fault detection ▶ Loss of current or voltage ▶ Fault current magnitude and duration | |
| Remote monitoring | Load current monitoring (max / min / average) Voltage presence or absence (E-field based detection) | |
| Communication | WAN: 2G/4G, 4G LTE CAT-M1, 450 MHz LTE 1 SIM card format 2ff TLS encryption Local: 868 MHz short-range radio | |
| SCADA | ▶ DNP3 from Master to iHost ▶ iHost supports DNP3, 104, 101 and other protocols ▶ iHost acts as data concentrator, fleet and connection manager | |
| Configuration and firmware | ▶ Remotely (re)configurable settings over the air ▶ Supports firmware updates over the air ▶ Remote interface from SCADA / iHost or with USB transmitter on site | |
| Cable diameter range | Up to 33 mm | |
| Housing | UV resistant polycarbonate, IP68 | |
| Temperature range | –40 °C to +85 °C | |

Variants with extended operating ranges and functions are available on request.

Dimension drawing see on page 132 ff | M9

| Order no. | | | | |
|---------------------|--|---|-----|--|
| 44 – | 10 | 1 | 0 – | 1 00 |
| Navigator 2.0 44 | Hardware 10 = 2,4–69 kV –20 °C–+60 °C Rechargeable battery 11 = 2,4–69 kV –40 °C–+85 °C Rechargeable battery 12 = 2,4–69 kV –40 °C–+85 °C Non-rechargeable battery 20 = 69–161 kV –20 °C–+60 °C Rechargeable battery 21 = 69–161 kV –40 °C–+85 °C Rechargeable battery 41 = 9–161 kV 1200A max –40 °C–+85 °C Rechargeable battery | Function 1 = Without fault direction detection 3 = With fault direction detection | 0 | Cellular 0 = without modem (satellite) 1 = 4G Cat-1 (EU), 2G 3 = 4G Cat-M1 450MHz 5 = 4G Cat-M1 (WW), 2G |
| | | | | Variants 00 = Standard settings |

Accessories

For overhead line faulted circuit indicators



| Commissioning and testing | Order no. |
|---------------------------|-------------|
| Magnet (Test/Reset) | 49-6001-002 |



| Installations tools | Order no. |
|--|-------------|
| To install and remove the Navigator series | 49-6006-004 |
| To install and remove Smart Navigator 2.0 & LC | 49-6006-005 |
| To install and remove Smart Navigator 2.0 HV | 49-6006-006 |



| | Order no. |
|--|-------------|
| Telescopic stick with universal gear coupling (length extended: 6.43 m, length retracted: 1.63 m) Rated voltage: 123 kV (only when fully extended) | 65-0305-001 |

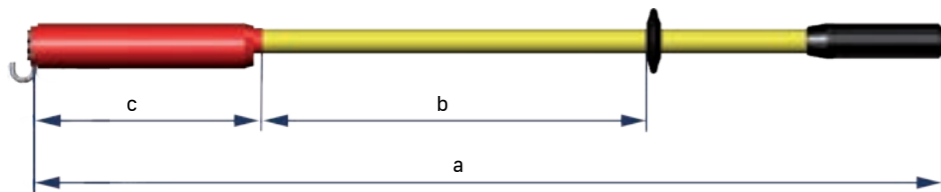
| | |
|---|-------------|
| Telescopic stick with universal gear coupling (length extended approx. 12m, length retracted approx. 1.8m) Rated voltage: 132 kV (only when fully extended) | 65-0305-004 |
|---|-------------|



| | Order no. |
|---|-------------|
| USB-Transmitter for Smart Navigator 2.0 | 28-5000-001 |
| USB-Transmitter for Smart Navigator 2.0 (915 MHz) | 28-5000-002 |
| USB-Transmitter for Smart Navigator 2.0 (923 MHz) | 28-5000-006 |

Hot stick with hook

for overhead faulted circuit indicator installations and removals



Hot stick with hook

| Nominal voltage range [kV] | Dimensions [mm] | | | Order no. |
|----------------------------|-----------------|-----|-----|-------------|
| | a | b | c | |
| 1–24 | 1,200 | 500 | 310 | 65-0301-001 |
| 1–36 | 2,000 | 900 | 310 | 65-0301-002 |
| 1–36 | 3,000 | 900 | 310 | 65-0301-003 |
| 1–52 | 2,000 | 900 | 310 | 65-0301-004 |

Remote monitoring

General information



Energy supply grids are becoming more and more complex. One major reason for this is the growing number of decentralised feeding lines originating from renewable energy sources. This trend is expected to continue, as evidenced by the discussions about intelligent substations and smart grids. Additional decentralised energy generation systems, such as fuel cells or battery stations, could be integrated into the grids in future.

Challenges faced by network operators:

- ▶ Increasing network complexity
- ▶ Ensuring consistently high availability of energy supply
- ▶ Increasing competitive pressure

In addition, the bonus / penalty regulations arising from SAIDI metrics create a high incentive for the reduction of power outage durations.

Horstmann solution

Remote monitoring solutions with direct reports of short-circuit and earth fault indicators installed in the network to a control room or directly to field service staff via their mobile devices.

- ▶ Specific coordination of service teams
- ▶ Minimisation of power outage periods
- ▶ Continuous overview of the most important network parameters

Horstmann's product range includes different remote monitoring solutions (radio-based) for underground cable and overhead lines in a medium voltage network. Leading this innovative approach is the iHost system (see page 82) which collects data from short-circuit and earth fault indicators in the field, evaluates it and provides utilities with information about network performance and irregularities.



OUR PRODUCT AT THE CUTTING EDGE

As grids become increasingly complex and heterogeneous, greater demands are placed on the availability of electricity networks. The increasing use of renewable energy sources and the desire for decentralisation play important roles in this development.

Horstmann solution

Information based network monitoring – the iHost system reduces power outage times thanks to quicker availability of information.

The iHost system collects data from devices such as from the short-circuit and earth fault indicators in the field (e.g. of the Compass series), evaluates the data in a data concentrator and shares it with the control room systems and / or mobile terminals. Fault information and exceeded limits can also be send by e-mail and SMS.

YOUR ADVANTAGES

- ▶ Short-circuit alarms directly in the control room
- ▶ Transparency on the web through evaluation of archived monitoring data
- ▶ Remote management and maintenance of field devices

iHost Cloud

For smaller scale projects or pilot schemes iHost Cloud is the best choice. Quick and easy implementation works without software installation. Handling is very user-friendly – all you need is a web-enabled device, your user name and password. Customised notifications in case of a fault or alarms are possible via SMS and e-mail.



iHost

Data concentrator for short-circuit and earth fault indicators

- ▶ Bundles and processes all data received from remote field devices
- ▶ Provides data access at any time in various ways and devices

Central management of all field devices

- ▶ Grid monitoring: system overview, data analysis, function check
- ▶ Configuration and firmware updates

Data on demand

- ▶ Customised visualisation of data and alarms
- ▶ Individual notifications, generated automatically

Embedded database

- ▶ Grid data available from day one of installation
- ▶ Flexible data provision for asset management, planning, engineers and further user

Full control over your own data with on-premise installation

- ▶ Data to be stored in Horstmann cloud
- ▶ On premise installation with SCADA connection over IEC 60870-5-101 / -104 or DNP3 serial / IP
- ▶ The same user interface in all variants simplifies the transition and reduces the familiarisation period

| Features | iHost Cloud |
|-------------------------------|---|
| Hardware / Server arrangement | High availability cluster Software as a service |
| Operating system (OS) | Cloud service / data centre |
| Visualisation | Web browser |
| Suitable Horstmann RTUs | Smart Navigator 2.0 Reporter 3.0 Reporter 4.0 |
| Communication | SIM card with public APN. Available on request or use your own. |
| iHost licence type | Annually per RTU |
| RTU count | 1 – 1,000 |
| Limits of users / user roles | 50 / 3 |
| Maps | Yes |
| Notifications | Yes (e-mail / SMS) |
| Historian | Yes |
| Data access API | Yes |
| SCADA protocols | n/a |
| Simultaneous SCADA channels | n/a |

| iHost Cloud | Order no. | Accessories | Page |
|----------------------|-------------|---------------------|------|
| 1 Licence | | Smart Navigator 2.0 | 68 |
| Cloud per RTU / year | 79-1010-000 | Reporter 3.0 | 76 |
| 1 SIM card | | Reporter 4.0 | 78 |
| Cloud SIM-M* | 79-1041-000 | | |
| Cloud SIM-L** | 79-1042-000 | | |

* SIM-M: 2G, 3G, 4G, 20 MB Data volume / month / SIM card.

** SIM-L: 2G, 3G, 4G, 4G LTE-M, 5G 50 MB Data volume / month / SIM card..

iHost Solo | Pro

Remote monitoring software for SCADA

With iHost Solo and iHost Pro all measured values as well as fault information are transferred directly to your SCADA. All data is stored in iHost. Installed in your premises these solutions provide you multiple options regarding the use, analysis and visualisation of data.

iHOST SOLO

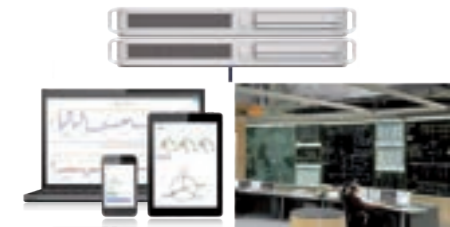
iHost Solo is designed for medium-sized distribution networks. All data is stored exclusively on the customer's server and backed up.



iHost Solo

iHOST PRO

iHost Pro is the ideal solution for high system availability requirements. Two servers ensure this through parallel and synchronised operation.



iHost Pro

| Features | iHost Solo | | | iHost Pro |
|-------------------------------|--|-----------------------------------|--|--|
| | Software | Software/Hardware | Software/Hardware/101 | |
| Hardware / Server arrangement | Single installation of the iHost software on a customer supplied, pre-installed and virtual server | Single server, Horstmann supplied | Single server, Horstmann supplied with serial interface | Single installation of the iHost software on a customer supplied, pre-installed and virtual server |
| Operating system (OS) | Microsoft Windows Server BS | | | |
| Visualisation | Web browser and SCADA | | | |
| Suitable Horstmann RTUs | Smart Navigator 2.0 Reporter 3.0 Reporter 4.0 | | | |
| Communication | Customer supplied SIM with private APN | | | |
| iHost licence type | One-time licence fees | | | Annual licence fees |
| RTU count | 100 / 500 / 1,000 | | | 2,000 / 3,500 / 5,000 |
| Limits of users / user roles | 50 / 10 | | | Unlimited / 50 |
| Maps | Yes (option) | | | |
| Notifications | Yes (e-mail / SMS) | | | |
| Historian | Yes | | | |
| Data access API | Yes | | | |
| SCADA protocols | IEC60870-5-101 ¹⁾ IEC60870-5-104 DNP3 (serial) ¹⁾ DNP3 (IP) | IEC60870-5-104 DNP3 (IP) | IEC60870-5-101 IEC60870-5-104 DNP3 (serial) DNP3 (IP) | IEC60870-5-101 ¹⁾ IEC60870-5-104 DNP3 (serial) ¹⁾ DNP3 (IP) |
| Simultaneous SCADA channels | 2 | | | 10 |

¹⁾ Customers server hardware must contain serial interface.

| iHost Solo Software | Accessories | Page |
|---|---------------------|------|
| 1 licence | Smart Navigator 2.0 | 68 |
| Solo 100 (SW) | Reporter 3.0 | 76 |
| Solo 500 (SW) | Reporter 4.0 | 78 |
| Solo 1000 (SW) | | |
| 1 software installation package (remote VPN access) | | |
| 1 technical support for 12 months | | |
| iHost Solo Software / Hardware | | |
| 1 licence | | |
| Solo 100 (SW/HW) | | |
| Solo 500 (SW/HW) | | |
| Solo 1000 (SW/HW) | | |
| 1 software installation package (remote VPN access) | | |
| 1 technical support for 12 months | | |
| iHost Solo Software / Hardware / 101 | | |
| 1 licence | | |
| Solo 100 (SW/HW/101) | | |
| Solo 500 (SW/HW/101) | | |
| Solo 1000 (SW/HW/101) | | |
| 1 software installation package (remote VPN access) | | |
| 1 technical support for 12 months | | |
| iHost Pro | | |
| 1 licence | | |
| Pro 2000 | | |
| Pro 3500 | | |
| Pro 5000 | | |
| 1 software installation package (remote VPN access) | | |
| 1 technical support for 12 months | | |



Detailed information you will receive from our sales staff or by e-mail via iHost@horstmannmbh.com

Reporter 3.0

Remote monitoring to iHost



Reporter 3.0

PRODUCT FEATURES

- ▶ Recording and forwarding of digital statuses, such as those generated by short-circuit or earth fault indicators, door contacts, etc.
- ▶ Transmission via bidirectional data connection to iHost
- ▶ Internal battery supply/ no auxiliary supply necessary

The Reporter 3.0 is used for the remote signalling of short-circuits, earth faults and additional status reports (door contact, temperature sensor etc.) from a medium-voltage network that are reported by short-circuit and earth fault indicators. The received reports are transferred to iHost through a bidirectional data connection. The Reporter 3.0 is housed in robust, weatherproof housing for wall mounting and can be configured using Windows-based PC software and iHost.

Reported short-circuits and earth faults are securely sent to SCADA via the iHost system and can be retrieved by any web-enabled device at any time. Notifications can also be received by e-mail and / or SMS.

- Fault indicator with relay contact
- Door contact
- Temperature sensor
- ...



| Technical data | Reporter 3.0 |
|---------------------|---|
| Special features | <ul style="list-style-type: none"> ▶ Routine call ▶ Automatic date and time synchronisation ▶ Transmission of signal field strength ▶ Temperature sensor ▶ Fault and status notification via SMS and / or e-mail |
| Inputs | <ul style="list-style-type: none"> ▶ 16 digital inputs for potential-free relay contacts ▶ 2 analogue inputs (4–20 mA) |
| Communication | Bidirectional data connection to iHost |
| Indication (inside) | Control LEDs for data reception / connection |
| Power supply | Replaceable long-life lithium cell 7–10 years, min. 1,000 calls |
| Mobile network | 4G / 2G |
| Housing | Glass fibre reinforced polycarbonate, IP66 |
| Installation | Wall mounting |
| Temperature range | -30 °C to +70 °C |

| Equipment set | Order no. | Accessories | Page |
|--------------------------------------|-------------|--------------------------------------|-------|
| 1 Remote monitoring box Reporter 3.0 | 28-7330-022 | Fault indicators with relay contacts | 26-47 |
| 1 iHost solution | | | |
| iHost Cloud | | | |
| iHost Solo | | | |
| iHost Pro | | | |

Product matrix on page 80

Dimension drawing see on page 132 ff | M10

Reporter 4.0

Remote monitoring to iHost



Reporter 4.0

PRODUCT FEATURES

- ▶ Detection and forwarding of digital states as generated e.g. by short-circuit or earth fault indicators, door contacts etc.
- ▶ Transfer via bidirectional data connection to iHost
- ▶ Auxiliary supply necessary

The Reporter 4.0 is used for the remote signalling of short-circuits, earth faults and additional status reports from a medium-voltage network. The information is transferred by ComPass B or ComPass B 2.0 in particular. Voltage, current, load flow direction, power factor, power, energy and frequency are also measured and monitored.

The received reports are transferred to iHost through a bidirectional data connection. The Reporter 4.0 is housed in robust, weatherproof housing for wall mounting and can be configured using Windows-based PC software and iHost.

Reported short-circuits and earth faults are securely sent to SCADA via the iHost system and can be retrieved by any web-enabled device at any time. Notifications can also be received by e-mail and / or SMS.



| Technical data | Reporter 4.0 |
|---------------------------|---|
| Special features | <ul style="list-style-type: none"> ▶ Routine call ▶ Automatic date and time synchronisation ▶ Transmission of signal field strength ▶ Temperature sensor ▶ Fault and status notification via SMS and / or e-mail |
| Inputs | <ul style="list-style-type: none"> ▶ 16 digital inputs (hardware) ▶ 8 analogue inputs (4–20 mA) (hardware) ▶ 63 Modbus (digital) – 47 if hardware inputs are used ▶ 68 Modbus (analogue) – 60 if hardware inputs are used |
| Interfaces | Modbus |
| Communication | <ul style="list-style-type: none"> ▶ Bidirectional data connection to iHost ▶ Detection and forwarding of analogue measurement values, such as voltage, current etc. |
| Indication | Control LEDs for data reception / connection / fault indicators |
| Power supply | |
| Internal Power supply | Back-up battery, max. 24 h |
| External auxiliary supply | 100–240 V AC (50–60 Hz) |
| Mobile network | 4G / 2G |
| Housing | Glass fibre reinforced polyester, IP66 |
| Montage | Wall mounting |
| Temperature range | -20 °C to +65 °C |

| Equipment set | Order no. | Accessories | Page |
|---|---------------------------|----------------------|------|
| 1 Remote monitoring box Reporter 3.0 | | ComPass B | 42 |
| Reporter 4.0 for ComPass B | On request | ComPass B 2.0 series | 44 |
| Reporter 4.0 for ComPass B 2.0 and ComPass Bs 2.0 | 28-7503-002 ¹⁾ | | |
| 1 iHost solution | | | |
| iHost Cloud | | | |
| iHost Solo | | | |
| iHost Pro | | | |

¹⁾ Further variants on request.

Dimension drawing see on page 132 ff | M10

Product matrix

Remote monitoring



| Function | Reporter 3.0 | Reporter 4.0 |
|--|-------------------------------------|---|
| SCADA | | |
| iHost | ■ | ■ |
| Data source | | |
| Short-circuit and earth fault indicator | ■ | ■ |
| Information | | |
| Short-circuit and earth fault indication | ■ | ■ |
| Monitoring | — | ■ |
| Communication | | |
| Inputs | | |
| Analogue | 2 (4–20 mA) | 8 (4–20 mA) |
| Digital | 16 | 16 |
| Modbus | — | 47 Modbus (digital) 60 Modbus (analogue) |
| Interfaces / Protocol | — | RS-485 / Modbus-RTU |
| Mobile network | 4G / 2G | 4G / 2G |
| Power supply | | |
| External auxiliary supply | — | ■ (100–240 V AC) |
| Back-up battery (rechargeable) | — | ■ |
| Long-life lithium cell | ■ | — |
| Housing | | |
| Material | Glas fibre reinforced Polycarbonate | Glas fibre reinforced polyester |
| Degree of protection | IP66 | IP66 |
| Dimensions (W x H x D) | 136 x 245 x 88 mm | 291 x 362 x 186 mm |
| Cable ducts | 3 | 4 |
| Lock | Screws | Padlock |
| Mounting | Wall | Wall |
| Temperature range | -30 °C to +70 °C | -20 °C to +65 °C |

Voltage detectors and voltage detecting systems

General information



Is the system live or not? This is an elementary question, but it is vital to have a definite answer when service or maintenance staff are working on switchgears, power lines and electrical systems. In so doing, it is absolutely imperative to ensure that devices are only used for their approved nominal voltage and nominal frequency.

Voltage detectors and phase comparators

- ▶ For indoor and outdoor checks
- ▶ Visual and audible signals
- ▶ Highest safety thanks to self-test feature on selected models

Capacitive voltage detecting systems

Capacitive voltage detection systems (VDIS = Voltage Detecting and Indicating System) can be categorised into groups. In the case of plug-in systems, a portable indicating device (e.g. LRM-ST) is connected via an interface (e.g. LRM sockets) to the permanently installed part of the VDIS system (e.g. socket module).

In contrast, the integrated systems (type Wega) are permanently installed or can be retrofitted. They comprise the permanent voltage indication and are equipped with either an LRM interface or a measurement point for phase comparison. Thanks to the additional feature of a permanently supervised interface conditions displayed, no extra maintenance tests are required for these devices.

The Orion series: Orion 3.1 and M1 are portable testing devices that allow technicians to carry out on-site voltage detection, phase comparison and interface checks.

Product matrix

Integrated voltage detecting systems



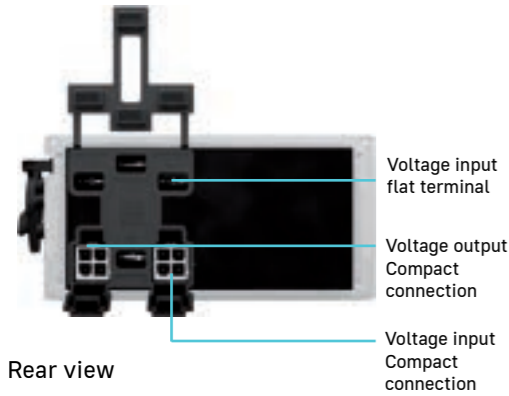
| Function | Wega 1 | Wega 1 V | Wega 2 | Wega 2 V | Wega 1 LV | Wega T1 |
|---|-----------|-----------|-----------|-----------|-----------|---------------------------|
| VDIS according to IEC 62271-213 | ■ | ■ | ■ | ■ | — | — |
| Capacitive voltage coupling for ComPass B series and Sigma D series | ■ | ■ | ■ | ■ | ■ | Connection to transformer |
| Overvoltage indication | ■ | ■ | ■ | ■ | — | ■ |
| Integrated permanent maintenance test | ■ | ■ | ■ | ■ | ■ | ■ |
| Integrated display test (without auxiliary supply) | ■ | ■ | ■ | ■ | ■ | ■ |
| Fully enclosed electronics | ■ | ■ | ■ | ■ | ■ | ■ |
| Adjustable C2 capacity | — | ■ | — | ■ | — | Vario variant |
| Assembly set for retrofit | — | ■ | — | — | — | ■ |
| Nominal voltage / nominal frequency | | | | | | |
| Nominal voltage of switchgear | from 1 kV | from 1 kV | from 1 kV | from 1 kV | 400-700 V | from 1 kV |
| Nominal frequency 50 Hz / 60 Hz | ■ | ■ | ■ | ■ | 50 Hz | ■ |
| Display | | | | | | |
| LCD display / LED indication | ■ / — | ■ / — | ■ / ■ | ■ / ■ | ■ / — | ■ / — |
| Display powered by measured voltage | ■ | ■ | ■ | ■ | ■ | ■ |
| LCD symbols | | | | | | |
| Voltage present | ■ | ■ | ■ | ■ | ■ | ■ |
| Threshold value: 0.1 — 0.45 x Vnom | ■ | ■ | ■ | ■ | ■ | ■ |
| Interface | | | | | | |
| Front accessible, fully featured LRM interface, also in compliance with LRM system according to IEC 61243-5 | ■ | ■ | ■ | ■ | ■ | Test point |
| Communication | | | | | | |
| Relay contacts | — | — | ■ | ■ | — | — |
| Connections | | | | | | |
| Flat connector | ■ | ■ | ■ | — | ■ | ■ |
| System connector (AMP) | ■ | ■ | ■ | ■ | ■ | Vario variant |
| Power supply | | | | | | |
| External auxiliary supply | — | — | ■ | ■ | — | — |

Wega 1

Integrated voltage detecting system



Front view

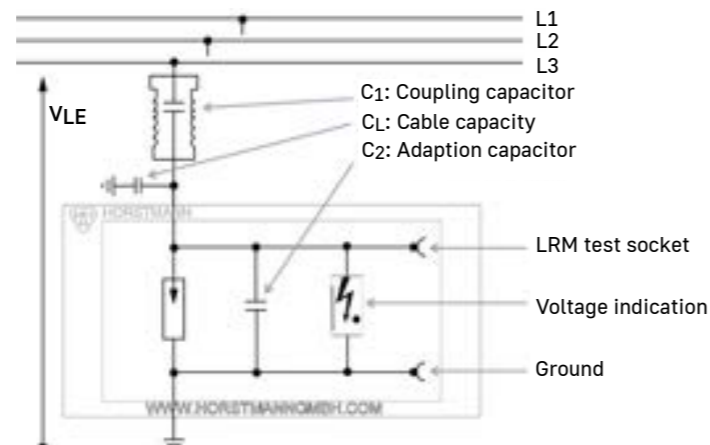


Rear view

Voltage input flat terminal
Voltage output Compact connection
Voltage input Compact connection

PRODUCT FEATURES

- ▶ According to the current IEC 62271-213:2021 standard
- ▶ Tool-free assembly and disassembly: saves time
- ▶ Integrated maintenance test: maintenance-free
- ▶ Retrofit ready: capacitive connection to ComPass B and Sigma D series
- ▶ Fully encapsulated electronics: high functional reliability
- ▶ Extended temperature range from -40°C to +75°C: increased application possibilities
- ▶ High display contrast: improved readability
- ▶ Overvoltage display: phase-selective
- ▶ LRM interface on the front: fully compliant with IEC 62271-213:2021



Principle of an integrated voltage detecting system

Wega 1 is a three-phase voltage detecting system that indicates subsequent medium voltage conditions:

- Voltage present
Threshold values for voltage presence indication: $0.1 - 0.45 \times V_{nom}$
- Voltage present
Integrated maintenance test passed
- Voltage present
Integrated maintenance test passed
Voltage signal too high (overvoltage indication)
- Voltage not present

The built-in display test function at the front enables verification of the display of the installed and de-energised unit. For connection, either shielded or unshielded cables with flat connectors or system connectors (AMP) can be used.

| Technical data | Wega 1 |
|-------------------|--|
| Nominal voltage | 1–52 kV (nominal voltage of switchgear, further values on request) |
| Nominal frequency | 50–60 Hz |
| Interface | <ul style="list-style-type: none"> ▶ 3 LRM measuring sockets (one per phase) and 1 earth socket ▶ LRM system, 14 mm distance between sockets, with captive anti-dust cap |
| Indication | LCD display with arrow, dot and wrench tool |
| Power supply | <ul style="list-style-type: none"> ▶ No auxiliary supply needed ▶ LCD display: fed by measuring voltage |
| Input/ Output | Input: flat terminal or compact connection (AMP) Output: compact connection (AMP) |
| Housing | Polycarbonate, IP54 |
| Temperature range | -40 °C to +75 °C |

| Switchgear | Switchgear panel | Voltage range | Order no. |
|---------------------|---------------------------------------|---------------|------------------|
| SafeRing / SafePlus | Cable / transformer / circuit breaker | 10–24 kV | V51-1800-120-400 |

| Switchgear | Switchgear panel | Voltage range | Order no. |
|-----------------|---------------------------------------|---------------|-------------|
| Minex / Minex-C | Cable / transformer / circuit breaker | 10–20 kV | 51-1800-148 |

| Switchgear | Switchgear panel | Voltage range | Order no. |
|------------|---------------------------------------|---------------|-------------|
| XIRIA | Cable / transformer / circuit breaker | 10.0–17.5 kV | 51-1800-125 |
| XIRIA | Cable / transformer / circuit breaker | 13.8–24.0 kV | 51-1800-129 |

| Switchgear | Switchgear panel | Voltage range | Order no. |
|------------|------------------|---------------|-------------|
| Aegis Plus | Circuit breaker | 10–24 kV | 51-1800-131 |
| Aegis Plus | Switch | 10–24 kV | 51-1800-121 |

| Switchgear | Switchgear panel | Voltage range | Order no. |
|------------|----------------------|---------------|-------------|
| ga / gae | Cable | 10–20 kV | 51-1800-121 |
| ga / gae | Transformer | 10–20 kV | 51-1800-101 |
| ga / gae | Circuit breaker 630 | 10–20 kV | 51-1800-129 |
| ga / gae | Circuit breaker 1250 | 10–20 kV | 51-1800-131 |
| ga / gae | Metering | 10–20 kV | 51-1800-133 |

| Switchgear | Switchgear panel | Voltage range | Order no. |
|------------|--------------------|---------------|-------------|
| FBX | C, C1, T1, R, RE | 10–24 kV | 51-1800-122 |
| FBX | T2, CB | 10–24 kV | 51-1800-132 |
| RM6 | Cable/ transformer | 10–20 kV | 51-1800-125 |

| Switchgear | Switchgear panel | Voltage range | Order no. |
|------------|--------------------------------|---------------|-------------|
| 8DJH | Cable / Transformer / Metering | 10–21.5 kV | 51-1800-142 |

Required connecting cable between Wega and directional fault indicator

| Switchgear | Output Wega / Input indicator | Indicator | Cable length | Order no. |
|--|-------------------------------|----------------------------------|--------------|-------------|
| ABB Eaton Lucy Electric Ormazabal Schneider Siemens | AMP / AMP | Sigma D and ComPass B 2.0 series | 300 mm | 49-0509-180 |
| ABB Eaton Lucy Electric Ormazabal Schneider (RM6) Siemens | AMP / 4-pole connector | ComPass B | 300 mm | 49-0509-007 |
| Driescher | AMP / AMP | Sigma D and ComPass B 2.0 series | 1,300 mm | 49-0509-188 |
| Driescher | AMP / 4-pole connector | ComPass B | 1,300 mm | 49-0509-024 |

Further switchgear types, manufacturer, voltage ranges and cable lengths on request.

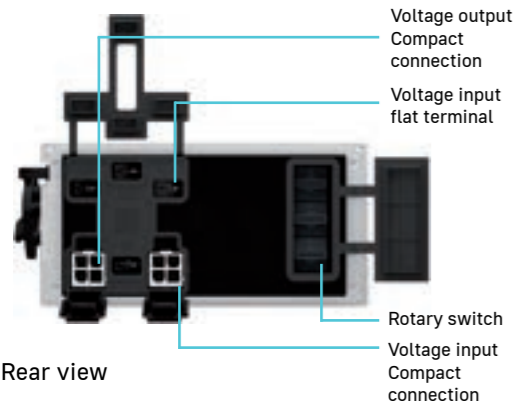
Dimension drawing see on page 132 ff | M12

Wega 1 V

Integrated voltage detecting system



Front view



Rear view

PRODUCT FEATURES

- ▶ According to the current IEC 62271-213:2021 standard
- ▶ Tool-free assembly and disassembly: saves time
- ▶ Integrated maintenance test: maintenance-free
- ▶ Retrofit ready: capacitive connection to ComPass B and Sigma D series
- ▶ Fully encapsulated electronics: high functional reliability
- ▶ Extended temperature range from -40°C to +75°C: increased application possibilities
- ▶ High display contrast: improved readability
- ▶ Phase-selective rotary switches: quick and easy commissioning
- ▶ LRM interface on the front: fully compliant with IEC 62271-213:2021

Wega 1 V is a three-phase voltage detecting system that indicates subsequent medium voltage conditions:

- Voltage present
Threshold values for voltage presence indication: 0.1 – 0.45 x Vnom
- Voltage present
Integrated maintenance test passed
- Voltage present
Integrated maintenance test passed
Voltage signal too high (overvoltage indication)
- Voltage not present

The built-in display test function on the front allows the display to be tested when installed and de-energised.

Shielded or unshielded cables with compact connections (AMP) can be connected to the fault direction indicator. Fifteen different C2 settings can be made in a user-friendly manner via phase-selective rotary switches. The correct C2 setting is shown on the display (arrow and dot symbol without overvoltage indicator).

| Technical data | Wega 1 V |
|-------------------|--|
| Nominal voltage | 1–52 kV (nominal voltage of switchgear, further values on request) |
| Nominal frequency | 50–60 Hz |
| Interface | <ul style="list-style-type: none"> ▶ 3 LRM measuring sockets (one per phase) and 1 earth socket ▶ LRM system, 14 mm distance between sockets, with captive anti-dust cap |
| Indication | LCD display with arrow, dot and wrench tool |
| Power supply | <ul style="list-style-type: none"> ▶ No auxiliary supply needed ▶ LCD display: fed by measuring voltage |
| Input/ Output | Input: flat terminal or compact connection (AMP) Output: compact connection (AMP) |
| Housing | Polycarbonate, IP54 |
| Temperature range | -40 °C to +75 °C |

For retrofit projects, the following Wega 1 V variants can be connected directly to the C1 decoupler:

| Switchgear | Voltage range | Order no. |
|---|---------------|-------------|
| ABB SafeRing/SafePlus; Driescher Minex, PSA10, PSA20; Ormazabal GAE; Schneider FBX, RM6, SM6; Siemens 8DJH, 8DA/DB (Innenkonus S2, S3, S4 & Poltragplatte), NX Plus | 10 kV | 51-1900-151 |

| Switchgear | Voltage range | Order no. |
|---|---------------|-------------|
| ABB SafeRing/SafePlus; Driescher Minex, PSA10, PSA20; Ormazabal GAE; Schneider FBX, RM6, SM6; Siemens 8DJH, 8DA/DB (Inner cone S2, S3, S4 & Pole mounting plate), NX Plus | 20 kV | 51-1900-152 |

Universal solution for new installations and retrofit – Wega 1 V

| Capacitor cube | Adjustable capacities | Input or output | Order no. |
|----------------|---|-------------------------------|-------------|
| Low-Range | 0, 100, 220, 320, 470, 570, 690, 790, 820, 920, 1040, 1140, 1290, 1390, 1510, 1610 pF | 4 x Flat connector 2 x AMP | 51-1900-101 |
| Mid-Range | 0, 1,5, 3,3, 4,8, 6,8, 8,3, 10,1, 11,6, 15,0, 16,5, 18,3, 19,8, 21,8, 23,3, 25,1, 26,6 nF | 4 x Flat connector 2 x AMP | 51-1900-102 |
| High-Range | 0, 22, 33, 55, 68, 90, 101, 123, 68, 90, 101, 123, 136, 158, 169, 191 nF | 4 x Flat connector 2 x AMP | 51-1900-103 |

Further Vario variants on request.

Required connecting cable between Wega and directional fault indicator

| Switchgear | Output Wega / Input indicator | Indicator | Cable length | Order no. |
|--|-------------------------------|----------------------------------|--------------|-------------|
| ABB Eaton Lucy Electric Ormazabal Schneider Siemens | AMP / AMP | Sigma D and ComPass B 2.0 series | 300 mm | 49-0509-180 |
| ABB Eaton Lucy Electric Ormazabal Schneider (RM6) Siemens | AMP / 4-pole connector | ComPass B | 300 mm | 49-0509-007 |
| Driescher | AMP / AMP | Sigma D and ComPass B 2.0 series | 1,300 mm | 49-0509-188 |
| Driescher | AMP / 4-pole connector | ComPass B | 1,300 mm | 49-0509-024 |

Further voltage ranges and cable lengths of the connecting cables on request.

Dimension drawing see on page 132 ff | M12

Wega 1 V to HR interfaces | Retrofit of HR socket modules



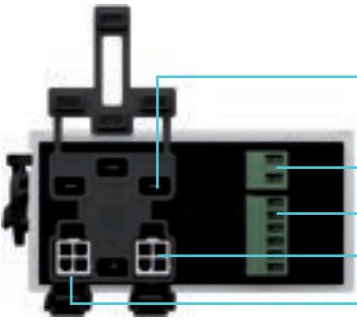
| Equipment set | Order no. |
|--|-------------|
| 1 Wega mounting kit incl. housing, magnet, connecting cables | |
| 300 mm Cable | 51-1550-900 |
| 500 mm Cable | 51-1550-901 |

Further cable lengths on request.

Integrated voltage detecting system



Front view



Rear view

- Voltage input flat terminal
- Auxiliary power supply
- Relay contacts
- Voltage input Compact connection
- Voltage output Compact connection

PRODUCT FEATURES

- ▶ According to the current IEC 62271-213:2021 standard
- ▶ Tool-free assembly and disassembly: saves time
- ▶ Integrated maintenance test: maintenance-free
- ▶ Retrofit ready: capacitive connection to ComPass B and Sigma D series
- ▶ Fully encapsulated electronics: high functional reliability
- ▶ Extended temperature range from -40°C to +75°C: increased application possibilities
- ▶ High display contrast: improved readability
- ▶ Overvoltage display: phase-selective
- ▶ LRM interface on the front: fully compliant with IEC 62271-213:2021

Wega 2 is a three-phase voltage detecting system that indicates subsequent medium voltage conditions:

- Voltage present
Threshold values for voltage presence indication: 0.1 – 0.45 x Vnom
- Voltage present
Integrated maintenance test passed
- Voltage present
Integrated maintenance test passed
Voltage signal too high (overvoltage indication)
- Voltage not present

The display test function built into the front allows the display to be tested when installed and de-energised.

Shielded or unshielded cables with compact connections can be connected to the fault direction indicator. Fifteen different C2 settings can be made in a user-friendly manner via phase-selective rotary switches. The correct C2 setting is shown on the display (arrow and dot symbol without overvoltage indicator).

| Technical data | Wega 2 |
|-------------------|--|
| Nominal voltage | 1–52 kV (nominal voltage of switchgear, further values on request) |
| Nominal frequency | 50–60 Hz |
| Interface | <ul style="list-style-type: none"> ▶ 3 LRM measuring sockets (one per phase) and 1 earth socket ▶ LRM system, 14 mm distance between sockets, with captive anti-dust cap |
| Indication | <ul style="list-style-type: none"> ▶ LCD display with arrow, dot and wrench tool ▶ LED display, U=0 and U≠0 |
| Remote signalling | 2 alternating relay contacts |
| Power supply | <ul style="list-style-type: none"> ▶ LCD display: fed by measuring voltage ▶ Relay and LEDs via 24–230 V AC/DC power supply |
| Input/ Output | Input: flat terminal or compact connection (AMP) Output: compact connection (AMP) |
| Housing | Polycarbonate, IP54 |
| Temperature range | -40 °C to +75 °C |

The following variants are only for new installations.

| ABB | | | |
|---------------------|---------------------------------------|---------------|-------------|
| Switchgear | Switchgear panel | Voltage range | Order no. |
| SafeRing / SafePlus | Cable / Transformer / Circuit breaker | 10–24 kV | 51-2800-105 |
| Driescher | | | |
| Switchgear | Switchgear panel | Voltage range | Order no. |
| Minex / Minex-C | Cable / Transformer / Circuit breaker | 10–20 kV | 51-2800-143 |
| Eaton | | | |
| Switchgear | Switchgear panel | Voltage range | Order no. |
| XIRIA | Cable / Transformer / Circuit breaker | 10,0–17,5 kV | 51-2800-116 |
| XIRIA | Cable / Transformer / Circuit breaker | 13.8–24,0 kV | 51-2800-119 |
| Ormazabal | | | |
| Switchgear | Switchgear panel | Voltage range | Order no. |
| ga / gae | Cable | 10–20 kV | 51-2800-115 |
| ga / gae | Transformer | 10–20 kV | 51-2800-106 |
| ga / gae | Circuit breaker 630 | 10–20 kV | 51-2800-119 |
| ga / gae | Circuit breaker 1250 | 10–20 kV | 51-2800-134 |
| Schneider | | | |
| Switchgear | Switchgear panel | Voltage range | Order no. |
| FBX | C, C1, T1, R, RE | 10–24 kV | 51-2800-136 |
| FBX | T2, CB | 10–24 kV | 51-2800-139 |
| RM6 | Cable / Transformer | 10–20 kV | 51-2800-116 |
| Siemens | | | |
| Switchgear | Switchgear panel | Voltage range | Order no. |
| 8DJH | Cable / Transformer / Metering | 10-21,5 kV | 51-2800-124 |

Required connecting cable between Wega and directional fault indicator

| Switchgear | Output Wega / Input indicator | Indicator | Cable length | Order no. |
|-----------------|-------------------------------|----------------------------------|--------------|-------------|
| ABB | | | | |
| Eaton | | | | |
| Lucy Electric | AMP / AMP | Sigma D and ComPass B 2.0 series | 300 mm | 49-0509-180 |
| Ormazabal | | | | |
| Schneider | | | | |
| Siemens | | | | |
| ABB | | | | |
| Eaton | | | | |
| Lucy Electric | AMP / 4-pole connector | ComPass B | 300 mm | 49-0509-007 |
| Ormazabal | | | | |
| Schneider (RM6) | | | | |
| Siemens | | | | |
| Driescher | AMP / AMP | Sigma D and ComPass B 2.0 series | 1,300 mm | 49-0509-188 |
| Driescher | AMP / 4-pole connector | ComPass B | 1,300 mm | 49-0509-024 |

Further voltage ranges and cable lengths of the connecting cables on request.

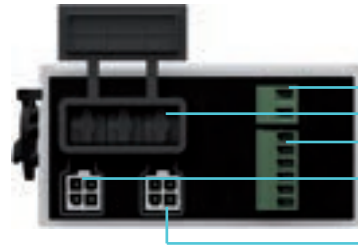
Dimension drawing see on page 132ff | M13

Wega 2 V

Integrated voltage detecting system



Front view



Rear view

- Auxiliary power supply
- Rotary switch
- Relay contacts
- Voltage output Compact connection
- Voltage input Compact connection

PRODUCT FEATURES

- ▶ According to the current IEC 62271-213:2021 standard
- ▶ Tool-free assembly and disassembly: saves time
- ▶ Integrated maintenance test: maintenance-free
- ▶ Retrofit ready: capacitive connection to ComPass B and Sigma D series
- ▶ Fully encapsulated electronics: high functional reliability
- ▶ Extended temperature range from -40°C to +75°C: increased application possibilities
- ▶ High display contrast: improved readability
- ▶ Phase-selective rotary switches: quick and easy commissioning
- ▶ Two independently current-carrying relay contacts: secure remote signalling and locking options
- ▶ LRM interface on the front: fully compliant with IEC 62271-213:2021

Wega 2 V is a three-phase voltage detecting system that indicates subsequent medium voltage conditions:

- Voltage present
Threshold values for voltage presence indication: 0.1 – 0.45 x V_{nom}
- Voltage present
Integrated maintenance test passed
- Voltage present
Integrated maintenance test passed
Voltage signal too high (overvoltage indication)
- Voltage not present

The built-in display test function on the front allows the display to be tested when installed and de-energised. Shielded or unshielded cables with compact connections can be connected to the fault direction indicator. Fifteen different C2 settings can be made in a user-friendly manner via phase-selective rotary switches. The correct C2 setting is shown on the display (arrow and dot symbol without overvoltage indicator).

The voltage status of the system panel can be signalled remotely or used for interlocking purposes via two independent relay contacts. The additional LEDs (green: V = 0 and red: V ≠ 0) provide information about the relay switch positions.

| Technical data | Wega 2 V |
|-------------------|--|
| Nominal voltage | 1 – 52 kV (nominal voltage of switchgear, further values on request) |
| Nominal frequency | 50 – 60 Hz |
| Interface | <ul style="list-style-type: none"> ▶ 3 LRM measuring sockets (one per phase) and 1 earth socket ▶ LRM system, 14 mm distance between sockets, with captive anti-dust cap |
| Indication | <ul style="list-style-type: none"> ▶ LCD display with arrow, dot and wrench tool ▶ LED display, U=0 and U≠0 |
| Remote signalling | 2 alternating relay contacts |
| Power supply | <ul style="list-style-type: none"> ▶ LCD display: fed by measuring voltage ▶ Relay and LEDs via 24 – 230 V AC/DC power supply |
| Input/ Output | Input: compact connection (AMP) Output: compact connection (AMP) |
| Housing | Polycarbonate, IP54 |
| Temperature range | -40 °C to +75 °C |

Universal solution for new installations and retrofit – Wega 2 V

| Capacitor cube | Adjustable capacities | Input or output | Order no. |
|----------------|---|-------------------------------|-------------|
| Low-Range | 0, 100, 220, 320, 470, 570, 690, 790, 820, 920, 1040, 1140, 1290, 1390, 1510, 1610 pF | 4 x Flat connector 2 x AMP | 51-2900-101 |
| Mid-Range | 0, 1,5, 3,3, 4,8, 6,8, 8,3, 10,1, 11,6, 15,0, 16,5, 18,3, 19,8, 21,8, 23,3, 25,1, 26,6 nF | 4 x Flat connector 2 x AMP | 51-2900-102 |
| High-Range | 0, 22, 33, 55, 68, 90, 101, 123, 68, 90, 101, 123, 136, 158, 169, 191 nF | 4 x Flat connector 2 x AMP | 51-2900-103 |

Further Vario variants on request.

| Switchgear | Switchgear panel | Voltage range | Input or output | Order no. |
|------------|---------------------------------------|----------------|----------------------|-------------|
| XIRIA | Cable / Transformer / Circuit breaker | 10,0 – 17,5 kV | Flat connector / AMP | 51-2250-116 |
| XIRIA | Cable / Transformer / Circuit breaker | 13,8 – 24,0 kV | Flat connector / AMP | 51-2250-119 |

Required connecting cable between Wega and directional fault indicator

| Switchgear | Output Wega / Input indicator | Indicator | Cable length | Order no. |
|--|-------------------------------|----------------------------------|--------------|-------------|
| ABB Eaton Lucy Electric Ormazabal Schneider Siemens | AMP / AMP | Sigma D and ComPass B 2.0 series | 300 mm | 49-0509-180 |
| ABB Eaton Lucy Electric Ormazabal Schneider (RM6) Siemens | AMP / 4-pole connector | ComPass B | 300 mm | 49-0509-007 |
| Driescher | AMP / AMP | Sigma D and ComPass B 2.0 series | 1,300 mm | 49-0509-188 |
| Driescher | AMP / 4-pole connector | ComPass B | 1,300 mm | 49-0509-024 |

Further voltage ranges and cable lengths of the connecting cables on request.

Dimension drawing see on page 132 ff | M13

Accessories



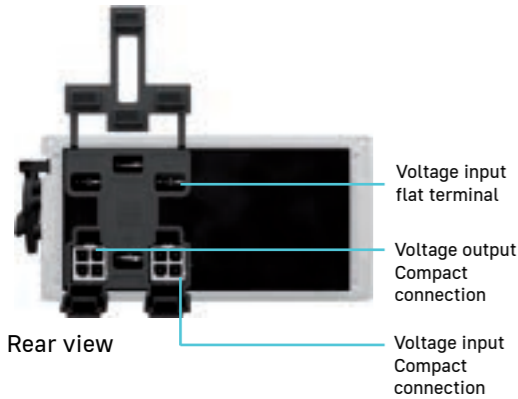
| | Order no. |
|--|-------------|
| AMP flat plug adapter cable set Enables the C1 decoupling to be connected to a Wega 2 V via a flat plug | 49-5090-110 |

Wega 1 LV

Integrated voltage detecting system for low-voltage applications



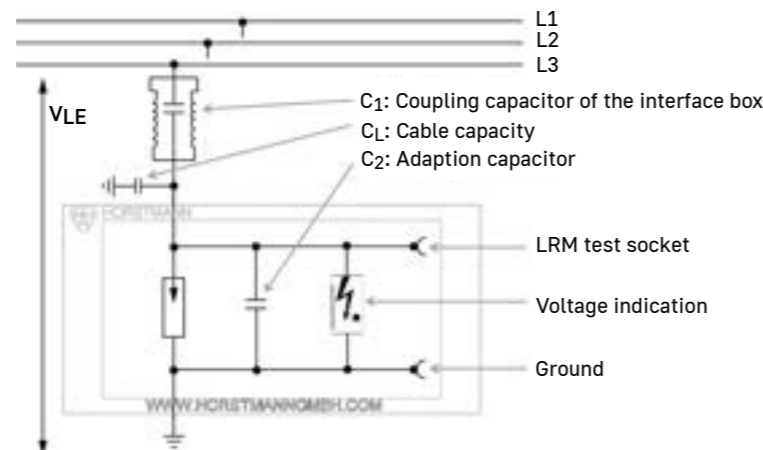
Front view



Rear view

PRODUCT FEATURES

- ▶ According to the current IEC 62271-213:2021 standard
- ▶ Tool-free assembly and disassembly: saves time
- ▶ Integrated maintenance test: maintenance-free
- ▶ Retrofit ready: capacitive connection to ComPass B and Sigma D series
- ▶ Fully encapsulated electronics: high functional reliability
- ▶ Extended temperature range from -40°C to +75°C: increased application possibilities
- ▶ High display contrast: improved readability
- ▶ Overvoltage display: phase-selective
- ▶ LRM interface on the front: fully compliant with IEC 62271-213:2021



Principle of an integrated voltage detecting system for low-voltage applications

Wega 1 LV is a three-phase voltage detecting system that indicates low-voltage conditions:

| | |
|--|--|
| | Voltage present Threshold value for voltage presence indication: 50 V |
| | Voltage present Integrated maintenance test passed |
| | Voltage not present |

The Wega 1 LV is an integrated voltage indication system. The device is used to determine and display the operating status of three-phase low-voltage systems (without neutral conductor) in accordance with IEC 62271-213. The Wega 1 LV is based on the requirements for voltage detection and indication systems (VDIS) in accordance with IEC 62271-213, with the exception that IEC 62271-213 applies to rated voltages greater than 1 kV and that the Wega 1 LV has been designed accordingly for low voltage. The Wega 1 LV may only be operated as a complete system in combination with the interface box included in the set and the corresponding connection cable. The display test function built into the front of the device enables the display to be tested in the installed and de-energised state.

Dimension drawing see on page 27ff | M13

| Technical data | Wega 1 LV |
|-------------------|--|
| Nominal voltage | 400 – 700 V (nominal voltage of switchgear, further values on request) |
| Nominal frequency | 50 Hz |
| Interface | <ul style="list-style-type: none"> ▶ 3 LRM measuring sockets (one per phase) and 1 earth socket ▶ LRM system, 14 mm distance between sockets, with captive anti-dust cap |
| Indication | LCD display with arrow, dot and wrench tool |
| Power supply | <ul style="list-style-type: none"> ▶ No auxiliary supply needed ▶ LCD display: fed by measuring voltage |
| Input/ Output | Input: flat terminal or compact connection (AMP) Output: compact connection (AMP) |
| Housing | Polycarbonate, IP54 |
| Temperature range | -40 °C to +75 °C |

Wega T1

For insulated medium-voltage transformers

PRODUCT FEATURES

- ▶ Voltage display system, designed according to IEC 62271-213:2021 and IEC 61243-5
- ▶ Continuous LCD indication: 3-phase
- ▶ Suitable for Euromold elbow connectors (K) 158 LR, (K) 152 SR and M 400 LR / G as well as Pfisterer MSCE 250 A with capacitive test points
- ▶ Integrated maintenance test: maintenance-free

The Wega T1 is a 3-phase voltage detector for insulated medium voltage transformers safe for touching. It is installed in a surface mount housing for applications in new and existing transformer stations. Besides conventional medium voltage transformers, these types are in particular ideally suited for insulated medium voltage transformers, or in transformer stations / buildings with more than one transformer.

The built-in display test function at the front enables verification of the display of the installed and de-energised unit.

The test points are not suitable for an LRM phase comparator due to the weak capacitive coupling which is associated with the specific application of the devices.

Wega T1 is a three-phase voltage detecting system that indicates subsequent medium voltage conditions:

- Voltage present
Threshold values for voltage presence indication: 0.1 – 0.45 x Vnom
- Voltage present
Integrated maintenance test passed
- Voltage present
Integrated maintenance test passed
Voltage signal too high (overvoltage indication)
- Voltage not present



Front view



Example of installation

| Technical data | Wega T1 |
|-------------------|---|
| Nominal voltage | 1 – 52 kV (nominal voltage of transformer, further values on request) |
| Nominal frequency | 50 – 60 Hz |
| Interface | Test points (1 per phase) and one earth socket, with captive anti-dust cap |
| Indication | LCD display with arrow, dot and wrench tool |
| Power supply | <ul style="list-style-type: none"> ▶ No auxiliary supply needed ▶ LCD display: fed by measuring voltage |
| Housing | Polycarbonate, IP54 |
| Temperature range | -25 °C to +65 °C |

| Euromold | Connector type | Voltage range | Order nr.* |
|----------|--------------------------------------|---------------|------------------|
| | (K) 152 SR / (K) 158 LR / M 400 LR/G | 6 – 12 kV | V51-1251-001-301 |
| | (K) 152 SR / (K) 158 LR / M 400 LR/G | 10 – 20 kV | V51-1251-001-302 |
| | (K) 152 SR / (K) 158 LR / M 400 LR/G | 20 – 36 kV | V51-1251-001-303 |

| Connector type | Voltage range | Order nr.* |
|------------------------------|---------------|------------------|
| Cellpack CGS 250 A | 10 – 15 kV | |
| Cellpack CWS 250 A | 16 – 24 kV | |
| Nexans/Euromold (K)200LR/G/V | 6 – 10 kV | |
| Nexans/Euromold (K)200SR/G/V | 10 – 15 kV | V51-1252-001-001 |
| TE/Raychem RSES-VD-525x | 15 – 24 kV | |
| TE/Raychem RSSS-VD-525x | 8 – 15 kV | |
| | 12 – 24 kV | |

* Incl. wall-mounted housing, coaxial cable and earthing cable

Dimension drawing see on page 132 ff | M14

www.horstmannmbh.com | info@horstmannmbh.com

Orion 3.1 | Orion M1

Combined voltage detecting and indicating systems



Orion 3.1



Orion M1

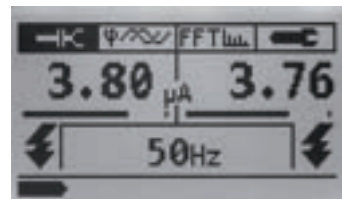
PRODUCT FEATURES

- ▶ Designed according to IEC 61243-5 (VDE 0682-415)
- ▶ Voltage detector
- ▶ Phase comparator
- ▶ Interface detector
- ▶ Phase-sequence indicator with status RGB LED
- ▶ Orion M1 with additional functions
 - ▶ Voltage harmonics and interface current measurement
 - ▶ Phase angle measurement
 - ▶ LCD display
 - ▶ Measured data storage, readable
 - ▶ Data transmission via USB interface

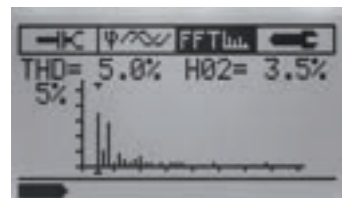
Orion 3.1 and Orion M1 are testing and indication devices for voltage detecting, phase comparison and coupling part maintenance testing according to IEC 61243-5. They are used at LRM and HR interfaces in medium voltage switchgears.

The Orion M1 features a large LCD display with backlight. It allows easy reading of the measured values, e. g. interface current, phase angle and voltage harmonics (according to EN 50160). The integrated USB interface is used to retrieve the stored data results for further evaluation.

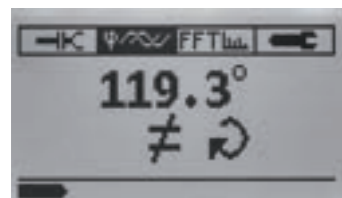
Besides the information on the next maintenance test and the indication of the battery status, the Orion M1 device provides the user with menu language options (German/English) and option of setting the power frequency (16.7Hz / 50Hz / 60Hz).



Indication capacitive interface



Indication harmonic waves



Indication phase comparison

Capacitive interface

- ▶ Precise current measurement in μA (2 x CH)
- ▶ Voltage testing symbols for both channels
- ▶ Maintenance tests
- ▶ Phase-sequence indication
- ▶ Frequency setting and battery status

Voltage accuracy

- ▶ FFT (Fast Fourier Transformation)
- ▶ Total harmonic distortion (THD) [%]
- ▶ Up to the 40th harmonic [%]
- ▶ Bar graph for voltage harmonics [%]

Phase characteristics

- ▶ Phase angle difference
- ▶ Phase balance / phase unbalance symbol
- ▶ Phase-sequence indication

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with minimum intervals of at least 6 years.

| Technical data | Orion 3.1 | Orion M1 |
|------------------------------|---|---|
| Nominal frequency | 50 or 60 Hz | 16.7, 50, 60 Hz (adjustable) |
| Current measurement | — | Measuring range 1: 0–5 μA ($\pm 2\%$) Measuring range 2: 0–25 μA ($\pm 2\%$) |
| Phase angle measurement | — | Measuring range: -180° to $+180^\circ$ ($\pm 1^\circ$) |
| Harmonic voltage measurement | — | Bar graph: 0–5 % / 0–10 % THD: 0–100 % ($\pm 1\%$) Harmonic (2–40): 0–100 % ($\pm 1\%$) |
| Indication | RGB-LEDs | RGB LEDs LCD display |
| Power supply | <ul style="list-style-type: none"> ▶ 4 mignon cells; replaceable ▶ 6 years of service life, 1,000 operating cycles/year | |
| Temperature range | -25 to +55 °C | -25 to +55 °C, below -15 °C LED indication only |



| Orion 3.1 | Nominal frequency | Order no. |
|---|-------------------|-------------|
| 1 indication unit incl. plastic case, set of measuring cables, 2 HR / LRM adapter | 50 Hz | 51-0206-101 |



| Orion M1 | Nominal frequency | Order no. |
|--|-------------------|-------------|
| 1 indication unit incl. plastic case, set of measuring cables, 2 HR / LRM adapter, USB cable, CD with application software | 16,7, 50, 60 Hz | 51-0206-201 |

Dimension drawing see on page 132 ff | M17

Accessories



| LR-LRM adapter |
|-----------------------|
| Order no. 52-0206-002 |



| Weva adapter Orion, 104 mm |
|-----------------------------|
| Order no. 10 kV 52-0206-004 |
| Order no. 20 kV 52-0206-005 |



| Weva adapter Orion, 130 mm |
|-----------------------------|
| Order no. 10 kV 52-0206-014 |
| Order no. 20 kV 52-0206-024 |



| Special adapter (HR / IVIS) |
|--|
| Set consists of 2 x red and 2 x black adapters Cable length approx. 0.1 m |
| Order no. 52-0206-017 |



| Magnetic holder |
|--------------------------|
| Part of the Orion M1 set |
| Order no. 49-6001-010 |

Voltage indicator for capacitive measuring points



LRM-ST

PRODUCT FEATURES

- ▶ LRM-ST: Voltage indicator for low-resistance modified systems, according to IEC 62271-213 und IEC 61243-5
- ▶ HR-ST: Voltage indicator for high-resistance systems, according to IEC 61243-5
- ▶ No battery supply - Low maintenance
- ▶ Fully encapsulated electronics - High functional reliability under all environmental conditions
- ▶ Gold-plated contacts - Long service life
- ▶ Voltage display via flashing LED
- ▶ Also suitable for permanent operation on socket modules



HR-ST

LRM-ST und HR-ST type voltage indicators are portable parts of a voltage detecting system with capacitive single-pole coupling to live parts.

The LRM/ HR function tester allows testing of the display and the overall function of the device.

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with minimum intervals of at least 6 years.



Function tester HR/ LRM-ST



Example of application
Note: Our proven socket modules (BuMo 2.0) are available on request for switchgear manufacturers

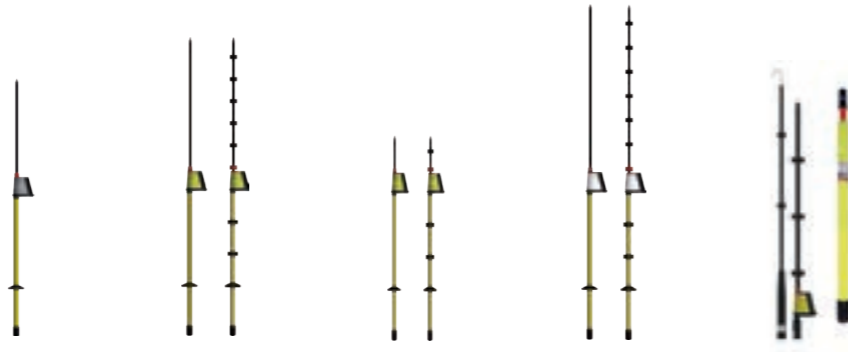
| Technical data | LRM-ST | HR-ST |
|------------------------|-----------------------------------|----------------------|
| Response voltage V_t | 4–5 V | 70–90 V |
| Nominal frequency | 50 Hz | |
| Input impedance | 2.0–2.4 M Ω | 36.0–43.2 M Ω |
| Flash frequency | ≥1 Hz upon trip voltage | |
| Circuit | Sealed in cast resin, water-proof | |
| Housing | Polycarbonate, IP 54 | |
| Temperature range | –25 °C to +55 °C | |

| Equipment set | Order no. | Accessories | Order no. |
|---------------|-------------|-----------------|-------------|
| LRM-ST | 51-0205-011 | Function tester | 52-0211-007 |
| HR-ST | 51-0205-010 | | |

Dimension drawing see on page 27ff | M15/ M16

Product matrix

Voltage detectors



| Function | FL-I | Comet BL-I / Comet BL-A | Comet BK-I / Comet BK-A | Comet BS-I / Comet BS-A | BO-A 2.0 |
|--|-------------|-------------------------|-------------------------|-------------------------|-------------|
| Environmental conditions | | | | | |
| Indoor* | ■ | BL-I: ■ | BK-I: ■ | BS-I: ■ | ■ |
| Indoor and outdoor** | — | BL-A: ■ | BK-A: ■ | BS-A: ■ | ■ |
| Signalling | | | | | |
| Visual | ■ | ■ | ■ | ■ | ■ |
| Visual and audible | — | ■ | ■ | ■ | ■ |
| Further functions | | | | | |
| Self-test | — | ■ | ■ | ■ | ■ |
| Test principle: capacitive / resistive | ■ / — | ■ / — | ■ / — | ■ / — | ■ / — |
| Voltage detection for Overhead lines | — | — | — | — | ■ |
| AC / DC | ■ / — | ■ / — | ■ / — | ■ / — | ■ / — |
| Nominal voltage [kV]*** | | | | | |
| 0.1–3 | — | — | — | — | — |
| 5 | — | ■ | — | — | — |
| 6 | ■ | — | — | — | — |
| 10 | ■ | ■ | — | — | — |
| 11 | — | ■ | — | — | ■ |
| 15 | — | — | — | — | ■ |
| 20 | ■ | ■ | — | — | — |
| 25 | — | — | — | — | ■ |
| 30 | — | ■ | — | — | — |
| 5–10 | — | ■ | — | ■ | — |
| 6–10 | — | ■ | ■ | — | — |
| 10–20 | — | ■ | ■ | ■ | — |
| 20–30 | — | ■ | — | ■ | — |
| 20–36 | — | — | — | — | — |
| Voltage range selectable | — | — | — | ■ | — |
| Technical data | | | | | |
| Length [mm]**** | 1,270–1,370 | 1,270–1,570 | 900–955 | 1,570 | 1,111–4,700 |
| Weight [g]**** | 700–1,000 | 700–1,000 | 750–850 | 850–1,000 | 3,340 |

Product matrix

Voltage detectors / Phase comparators



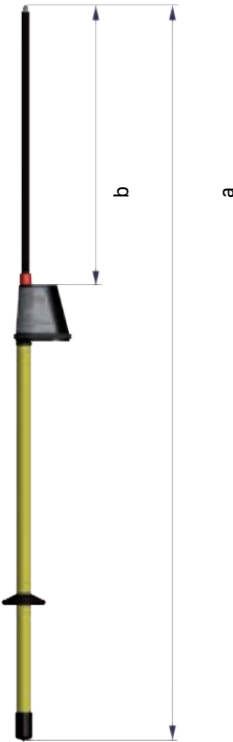
| Function | BO-A AC / DC | Compare 2.0 | PG II |
|--|--------------|-------------|-------------|
| Environmental conditions | | | |
| Indoor* | ■ | ■ | ■ |
| Indoor and outdoor** | ■ | ■ | — |
| Signalling | | | |
| Visual | ■ | ■ | ■ |
| Visual and audible | ■ | — | — |
| Further functions | | | |
| Self-test | ■ | ■ | — |
| Test principle: capacitive / resistive | — / ■ | ■ / — | — / ■ |
| Voltage detection for Overhead lines | ■ | ■ | ■ |
| AC / DC | ■ / ■ | ■ / — | ■ / — |
| Nominal voltage [kV]*** | | | |
| 0.1–3 | ■ | — | — |
| 5 | — | — | ■ |
| 6 | — | — | ■ |
| 10 | — | — | ■ |
| 11 | — | — | — |
| 15 | — | — | — |
| 20 | — | — | ■ |
| 25 | — | — | — |
| 30 | — | — | ■ |
| 5–10 | — | ■ | — |
| 6–10 | — | — | — |
| 10–20 | — | ■ | — |
| 20–30 | — | — | ■ |
| 20–36 | — | ■ | — |
| Voltage range selectable | — | ■ | — |
| Technical data | | | |
| Length [mm]**** | 1,100–4,700 | 1,420 | 1,220–1,420 |
| Weight [g]**** | 3,800–4,060 | 900 | 1,600 |

* Can be used outside, but not under wet conditions!

** Can be used under wet conditions.

*** Other voltage ranges on request.

**** Length and weight vary depending on the version.



FL-I with indication unit

PRODUCT FEATURES

- ▶ Designed according to IEC 61243-1 (VDE 0682-411), Category S
- ▶ Indoor type 🏠
- ▶ Visual voltage indication 👁️
- ▶ No battery

The FL-I device is a voltage detector for testing the voltage on one pole. This device is designed to detect operating voltages clearly indicating either the “voltage present” or “voltage not present” state. This device does not have a built-in power source (battery) and thus no self-test function.

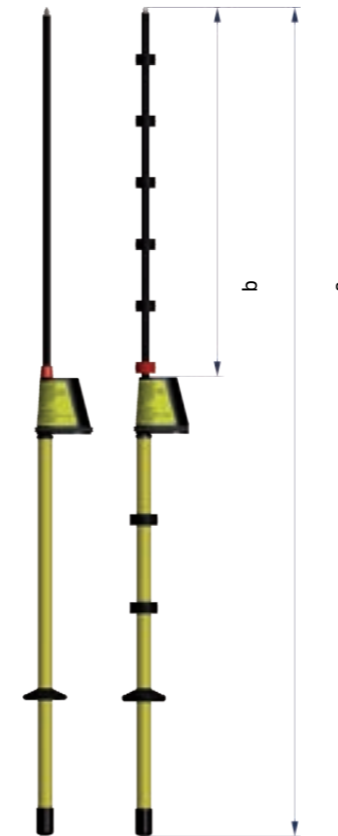
For transportation purposes, the insulating element can be removed from the display unit with the contact electrode.

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with minimum intervals of at least 6 years.

| Technical data | FL-I |
|-----------------------|---------------------------------------|
| Application | In dry conditions, normally indoors |
| Indication | 3 red LEDs |
| Nominal frequency | 50 Hz (optional 60 Hz) |
| Operating temperature | -25 to +70 °C, climatic class N and W |

| Nennspannung [kV] | Gesamtlänge a [mm] | Eintauchtiefe b [mm] | Art.-Nr. |
|-------------------|--------------------|----------------------|-------------|
| 6 | 1.270 | 463 | 50-1201-001 |
| 10 | 1.270 | 463 | 50-1201-002 |
| 20 | 1.370 | 563 | 50-1201-003 |

| Accessories | Page |
|------------------|------|
| Extension rod | 110 |
| Contact tip | 110 |
| Storage bag/case | 110 |



Comet BL-I | Comet BL-A with indication unit

PRODUCT FEATURES

- ▶ Designed according to IEC 61243-1 (VDE 0682-411), category S
- ▶ Comet BL-I: indoor type 🏠
- ▶ Comet BL-A: outdoor type 🏠🌧️
- ▶ Voltage indication visual 👁️ or visual 👁️ and audible 🔊
- ▶ Built-in self-test

The Comet BL-I / BL-A devices are capacitive voltage detectors for testing the voltage on one pole. They are intended for the detection of operating voltages clearly indicating either the “voltage present” or “voltage not present” state.

The voltage detectors are provided with a built-in self-test facility which checks the function of the circuit including the contact electrode (comprehensive self-test function) before each use.

For transportation purposes, the insulating element can be removed from the display with the contact electrode.

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with minimum intervals of at least 6 years.

| Technical data | Comet BL-I | Comet BL-A |
|-----------------------|--|---|
| Application | In dry conditions, normally indoors | In dry and wet conditions, either indoors or outdoors |
| Indication | Visual: 1 red LED / 1 green LED Visual and audible: 1 red LED / 1 green LED / 1 buzzer | |
| Nominal voltage | 50 Hz (optional 60 Hz) | |
| Power supply | 2 lithium cells, battery service life: 6 years based on 10 ready-to-operate cycles per day for a total of 230 work days per year | |
| Operating temperature | -25 to +70 °C, climatic class N and W | |

| Nominal voltage [kV] | Total length a [mm] | Insertion depth b [mm] | Order no. | | | |
|----------------------|---------------------|------------------------|--------------|----------------|----------------|------------------|
| | | | Comet BL-I 🏠 | Comet BL-I 👁️🔊 | Comet BL-A 🏠🌧️ | Comet BL-A 👁️🔊🌧️ |
| 5 | 1,270 | 462 | 50-0901-011 | 50-0903-008 | 50-1001-009 | 50-1003-009 |
| 10 | 1,270 | 462 | 50-0901-012 | 50-0903-009 | 50-1001-010 | 50-1003-010 |
| 20 | 1,420 | 612 | 50-0901-013 | 50-0903-010 | 50-1001-011 | 50-1003-011 |
| 6–10 | 1,420 | 612 | 50-0901-014 | 50-0903-011 | 50-1001-012 | 50-1003-012 |
| 10–20 | 1,570 | 762 | 50-0901-015 | 50-0903-012 | 50-1001-013 | 50-1003-013 |
| 20–30 | 1,570 | 762 | 50-0901-022 | 50-0903-018 | 50-1001-015 | 50-1003-018 |

| Accessories | Page |
|----------------------|------|
| Extension rod | 110 |
| Contact tip | 110 |
| Double prong adapter | 110 |
| Storage bag/case | 110 |

Comet BK-I | Comet BK-A

Voltage detector with self-test



PRODUCT FEATURES

- ▶ Designed according to IEC 61243-1 (VDE 0682-411), category S
- ▶ Comet BK-I: indoor type 🏠
- ▶ Comet BK-A: outdoor type 🏠 ☔
- ▶ Voltage indication visual 👁️ or visual 👁️ and audible 🔊
- ▶ Shortened design
- ▶ Built-in self-test

The Comet BK-I / BK-A devices are capacitive voltage detectors for testing the voltage on one pole in short version. They are intended for the detection of operating voltages clearly indicating either the "voltage present" or "voltage not present" state.

The voltage detectors are provided with a built-in self-test facility which checks the function of the circuit including the contact electrode (comprehensive self-test function) before each use.

For transportation purposes, the insulating element can be removed from the display with the contact electrode.

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with minimum intervals of at least 6 years.



Comet BK-I | Comet BK-A with indication unit

| Technical data | Comet BK-I | Comet BK-A |
|-----------------------|---|---|
| Application | In dry conditions, normally indoors | In dry and wet conditions, either indoors or outdoors |
| Indication | <ul style="list-style-type: none"> ▶ Visual: 1 red LED / 1 green LED ▶ Visual and audible: 1 red LED / 1 green LED / 1 buzzer | |
| Nominal voltage | 50 Hz (optional 60 Hz) | |
| Power supply | 2 lithium cells, battery service life: 6 years based on 10 ready-to-operate cycles per day for a total of 230 work days per year | |
| Operating temperature | -25 to +70 °C, climatic class N and W | |

| Nominal voltage [kV] | Total length a [mm] | Insertion depth b [mm] | Order no. | | | |
|----------------------|---------------------|------------------------|--------------|----------------|-------------|-----------------------|
| | | | Comet BK-I 🏠 | Comet BK-A 🏠 ☔ | Visual 👁️ | Visual & Audible 👁️ 🔊 |
| 6-10 | 900 | 110 | 50-1301-001 | 50-1401-001 | 50-1303-001 | 50-1403-001 |
| 10-20 | 950 | 210 | 50-1301-002 | 50-1401-002 | 50-1303-002 | 50-1403-002 |

| Accessories | Page |
|----------------------|------|
| Extension rod | 110 |
| Contact tip | 110 |
| Double prong adapter | 110 |
| Storage bag/case | 110 |

Comet BS-I | Comet BS-A

Voltage detector with self-test, voltage range selector



PRODUCT FEATURES

- ▶ Designed according to IEC 61243-1 (VDE 0682-411), category S
- ▶ Voltage detector for nominal voltages from 5–30 kV, switchable
- ▶ Comet BS-I: indoor type 🏠
- ▶ Comet BS-A: outdoor type 🏠 ☔
- ▶ Voltage indication visual 👁️ or visual 👁️ and audible 🔊
- ▶ Built-in self-test

Comet BS-I / BS-A devices are switchable single-pole voltage detectors. They are designed to detect operating voltages clearly indicating the "voltage present" or "voltage not present" state.

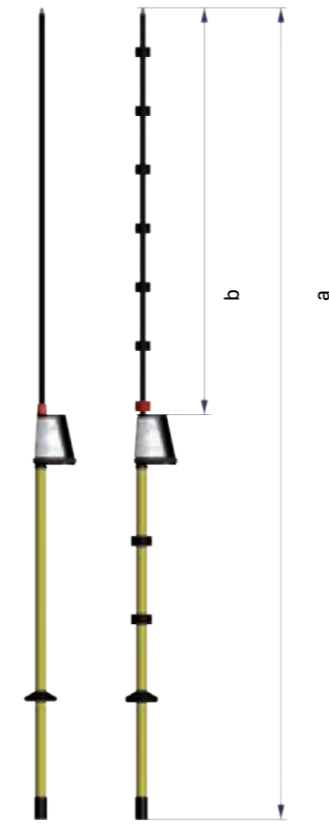
The voltage detectors are provided with a built-in self-test facility which checks the function of the circuit including the contact electrode (comprehensive self-test function) before each use.

The turning knob is used to select between three nominal voltage ranges:

- 0: OFF
- 1: 5–10 kV
- 2: 10–20 kV
- 3: 20–30 kV

For transportation purposes, the insulating element can be removed from the display unit with the contact electrode.

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with minimum intervals of at least 6 years.



Comet 2.0 BS-I | Comet 2.0 BS-A with indication unit

| Technical data | Comet BS-I | Comet BS-A |
|-----------------------|---|---|
| Application | In dry conditions, normally indoors | In dry and wet conditions, either indoors or outdoors |
| Indication | <ul style="list-style-type: none"> Visual: 1 red LED / 1 green LED Visual and audible: 1 red LED / 1 green LED / 1 buzzer | |
| Nominal voltage | 50 Hz (optional 60 Hz) | |
| Power supply | 2 lithium cells, battery service life: 6 years based on 10 ready-to-operate cycles per day for a total of 230 work days per year | |
| Operating temperature | -25 to +70 °C, climatic class N and W | |

| Nominal voltage [kV] | Total length a [mm] | Insertion depth b [mm] | Order no. | | | |
|----------------------|---------------------|------------------------|--------------|----------------|-------------|-----------------------|
| | | | Comet BL-I 🏠 | Comet BL-A 🏠 ☔ | Visual 👁️ | Visual & Audible 👁️ 🔊 |
| 5-30 | 1,570 | 758 | 50-0921-001 | 50-1021-001 | 50-0923-001 | 50-1023-001 |

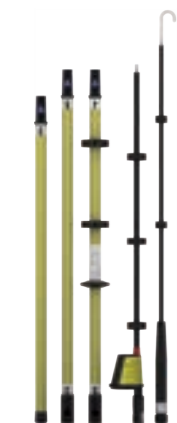
| Accessories | Page |
|----------------------|------|
| Extension rod | 110 |
| Contact tip | 110 |
| Double prong adapter | 110 |
| Storage bag/case | 110 |

BO-A 2.0

For railway overhead contact lines



BO-A 2.0 plug-in adapter, telescopic rod | Display



BO-A 2.0 with insulating rods (plug-in)

PRODUCT FEATURES

- ▶ VDE version — according to DIN VDE 0681-6
IEC version — based on IEC 61243-1 category S
- ▶ Pluggable system — minimal setup
- ▶ Integrated self-test — greater safety
- ▶ Light weight — easy handling and transportation
- ▶ Length of 4.7 m — voltage detection from the ground
- ▶ Use even in precipitation
- ▶ Storage bag - safe transport

The BO-A 2.0 is a voltage detector for medium voltage railway overhead contact lines. It is designed to detect the absence or presence of voltage during maintenance work for example. The voltage detector BO-A 2.0 is developed for 16.7 Hz, 50 Hz and 60 Hz networks. If the voltage detector BO-A 2.0 is used in a network with a deviating frequency, a visual and audible signal is activated. In this case the network situation must be verified.

The BO-A 2.0 is designed according to IEC 61243-1 resp. VDE 0681-6, depending on the version. The voltage detector is ready for the world-wide market.

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with minimum intervals of at least 6 years.

| Technical data | BO-A 2.0 |
|-------------------------------------|---|
| Application | In dry and wet conditions |
| Indication | “Ready-to-operate state”: green LED (after passed self-test) “Voltage present”: red LED and audible signal “Voltage not present”: green LED and no audible signal |
| Period of “Stand-by state” | 65 s ±15 s |
| Type of indication | According to group III IEC 61243-1 |
| Nominal voltage / nominal frequency | VDE version: 11 kV / 16.7 Hz or 15 kV / 16.7 Hz IEC version: 15 kV / 16.7 Hz, 25 kV / 50 Hz or 25 kV / 60 Hz |
| Properties of the insulating rod | Passed test as insulating element for leakage current at 1.2 x Vr for 1 min |
| Power supply | Lithium cells, battery service life: 6 years based on 10 ready-to-operate cycles per day for a total of 230 work days per year |
| Transportation length | <1,111 mm |
| Minimum length insulating element | >520 mm |
| Operating temperature | -25 to +70 °C, climatic class N and W |

| Nominal voltage [kV]/ nominal frequency [Hz] | Total length a [mm] | Insertion depth b [mm] | Handhabe | Ausführung | Order no. |
|--|---------------------|------------------------|----------------------------------|--|-------------|
| 15 kV / 16.7 Hz | max. 5,400 | 1,790 | Telescopic rod / plug-in adapter | ▶ VDE version ▶ DB approval | 50-1510-202 |
| 15 kV / 16.7 Hz | max. 5,400 | 1,790 | Telescopic rod / plug-in adapter | ▶ IEC version ▶ Automatic self-activation | 50-1512-002 |
| 15 kV / 16.7 Hz | 4,700 | 1,790 | Insulating rods (plug-in) | ▶ VDE version ▶ DB approval | 50-1510-002 |
| 11 kV / 16.7 Hz | 4,700 | 1,790 | Insulating rods (plug-in) | ▶ VDE version ▶ Automatic self-activation | 50-1510-301 |

Further versions are available depending on the following parameters:

- ▶ Nominal voltage (11 kV, 15 kV, 25 kV),
- ▶ Rated frequency (16.7 Hz, 50 Hz, 60 Hz),
- ▶ Version according to IEC 61243-1 or VDE 0681-6,
- ▶ Handle (telescopic rod/plug-in adapter, universal adapter/telescopic rod, plug-in insulating rod),
- ▶ Optional: Automatic self-activation when connected to live overhead lines.

Simply let us know which version is suitable for your application.

| Accessories | Order no. |
|--|-------------|
| Transportation bag ¹⁾ , reflection orange | 52-0104-106 |
| Transportation bag ¹⁾ , reflection yellow | 52-0104-107 |

¹⁾ Dimensions: 1,130 x 340 x 100 mm (L x H x D)



Transportation bag with BO-A 2.0



Pluggable system BO-A 2.0



Transport of one and two storage bags

BO-A AC/DC

DC voltage detector for overhead lines of electric railways



BO-A AC/DC plug-in adapter telescopic rod | Display



BO-A AC/DC with insulating rods (plug-in)

PRODUCT FEATURES

- ▶ Simple plug-in and telescopic system - quick and easy ready for use
- ▶ Integrated self-test + AC / DC residual voltage indicator - maximum safety
- ▶ Low weight - easy handling and transport
- ▶ Bright LEDs and loud acoustic signals - good visibility in all environmental conditions
- ▶ Shock-resistant and no battery replacement necessary - maintenance-free with long service life
- ▶ DC polarity indicator
- ▶ Can also be used in precipitation
- ▶ Up to max. 4.7 m in length - voltage test from the ground
- ▶ Magnetic earthing contact

The BO-A AC/DC mobile voltage detector is used to determine the absence of voltage on overhead lines. It recognises dangerous DC and AC residual voltages and thus increases user safety.

The BO-A AC/DC is a two-pole voltage tester for overhead lines on trams and electric buses, for example.

If the BO-A AC/DC is applied to a live conductor, an optical and acoustic signal is activated. A DC or AC voltage network is automatically recognised and indicated.

The BO-A AC/DC is designed and tested in accordance with the IEC 61243-1, -2 and DIN VDE 0681-6 standards. It can therefore be used worldwide.

In accordance with DGUV Regulation 3 (Table 1c), the device is subject to the periodic test prescribed every 6 years.

| Technical data | BO-A AC/DC |
|-------------------------------------|--|
| Use | ▶ DC and AC voltage networks from 100 V to 3,000 V ▶ Use in dry and wet conditions |
| Indication | 'Stand-by': green LED (after successful self-test) 'Voltage present': red LED and acoustical signal for DC with static polarity indication (blue/red) for AC without polarity indication 'Voltage not present': green LED, no acoustical signal AC/DC residual voltage indicator: yellow flashing LED for: AC residual voltage detection from 50 V RMS or DC residual voltage detection from ±75V DC +_ polarity indicator: detecting DC voltage polarity: red or blue flashing LED |
| Period of „Stand-by state“ | 65 s ±15 s (Automatic self-activation optionally available) |
| Type of indication | According to group III IEC 61243-1 |
| Nominal voltage / nominal frequency | The following three standard versions are available: ▶ Un = 100 V – 300 V ▶ Un = 300 V – 900 V ▶ Un = 1000 V – 3000 V See imprint on type plate, tolerance ± 10 % 16.7 – 60 Hz |
| Properties of the insulating stick | Passed test as insulating element for leakage current at 1.2 x Vr for 1 min |
| Power supply | Replaceable lithium cells, 6 years at approx. 10 ready cycles / day and 230 days / year |
| Transportation length | <1,100 mm (incl. hook) |
| Minimum length insulating element | >520 mm |
| Operating temperature | –25 °C to +65 °C |

| Nominal voltage [kV] Nominal frequency [Hz] | Total length [mm] ±50 mm | BO-A AC/DC version | Order no. |
|---|-----------------------------|------------------------------------|-------------|
| 100–300 V (AC) / 50 Hz or DC | 4,700 | Telescopic pole /Plug adapter | 50-1600-202 |
| 300–900 V (AC) / 50 Hz or DC | 4,700 | Telescopic pole /Plug adapter | 50-1600-203 |
| 1000–3000 V (AC) / 50 Hz or DC | 4,700 | Telescopic pole /Plug adapter | 50-1600-204 |
| 100–300 V (AC) / 50 Hz or DC | 4,700 | Telescopic pole /Universal adapter | 50-1600-102 |
| 300–900 V (AC) / 50 Hz or DC | 4,700 | Telescopic pole /Universal adapter | 50-1600-103 |
| 1000–3000 V (AC) / 50 Hz or DC | 4,700 | Telescopic pole /Universal adapter | 50-1600-104 |
| 100–300 V (AC) / 50 Hz or DC | 4,700 | Insulating sticks (pluggable) | 50-1600-002 |
| 300–900 V (AC) / 50 Hz or DC | 4,700 | Insulating sticks (pluggable) | 50-1600-003 |
| 1000–3000 V (AC) / 50 Hz or DC | 4,700 | Insulating sticks (pluggable) | 50-1600-004 |
| 1500 V DC (without residual and polarity display) | 4,700 | Telescopic pole /Plug adapter | 50-1504-002 |

Telescopic pole/Plug-in system

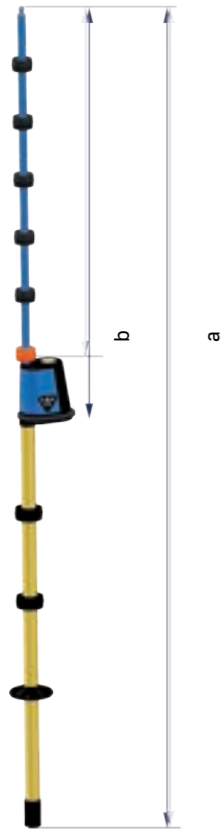


| | Order no. |
|---|-------------|
| Plug-in adapter/ telescopic insulating stick according to IEC 62193 and ASTM 1826 | 52-0108-051 |
| Universal adapter/ telescopic insulating stick according to IEC 62193 and ASTM 1826 | 65-0305-001 |
| Insulating stick (pluggable) | 52-0108-008 |

| Accessories | Page |
|-------------------------------------|------|
| Earthing bridge | 110 |
| Storage bag | 110 |
| Double prong adapter and catch fork | 110 |

Compare 2.0

Phase comparator, single-pole



PRODUCT FEATURES

- ▶ Designed according to IEC 61481 (VDE 0682-431)
- ▶ Single-pole, capacitive phase comparator
- ▶ Detection of correct phase relationship and incorrect phase relationship between two live conductors
- ▶ For indoor and outdoor applications 🏠 ⚡
- ▶ Visual indication 👁️
- ▶ Built-in self-test function

The phase comparator Compare 2.0 is a single-pole, capacitive phase comparator for voltages from 5–36 kV. The device detects “correct phase relationship” or “incorrect phase relationship” conditions between two live conductors of a medium voltage distribution network.

Confirming to IEC 61481 Class B, “incorrect phase relationship” appears at a phase angle between 60° and 300°.

Four bright LEDs indicate various operational conditions.

The turning knob is used to select between three voltage ranges:

- 1: 5–10 kV
- 2: 10–20 kV
- 3: 20–36 kV

The phase comparison is realised by contacting the conductors one after the other.

In medium voltage networks with decentralised renewable energy feed-ins, measurement interruptions may occur. In such cases repeat the phase comparison. It is impossible to get a wrong indication.

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with minimum intervals of at least 6 years.

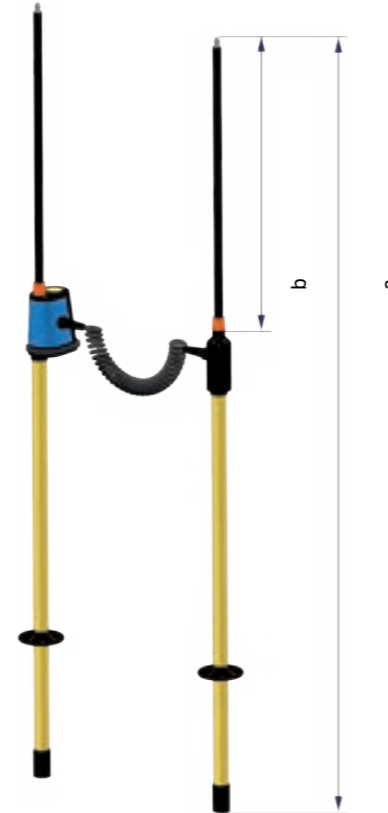
Compare 2.0 with indication unit

| Technical data | Compare 2.0 |
|-----------------------|--|
| Application | In dry and wet conditions, either indoors or outdoors |
| Indication | Visual: 1 white LED / 1 blue LED / 1 green LED / 1 red LED |
| Nominal frequency | 50 Hz |
| Power supply | 2 lithium cells, battery service life: 6 years based on 10 ready-to-operate cycles per day for a total of 230 work days per year |
| Operating class | B (indication of phase unbalance in the range of 60°–300°) |
| Operating temperature | -25 to +70 °C, climatic class N and W |

| Nominal voltage [kV] | Total length a [mm] | Insertion depth b [mm] | Order no. | Accessories | Page |
|----------------------|---------------------|------------------------|-------------|-------------|------|
| 5–36 | 1,420 | 635 | 51-0104-001 | Storage bag | 110 |

PG II

Phase comparator, two-pole



PRODUCT FEATURES

- ▶ Designed according to IEC 61481 (VDE 0682-431)
- ▶ Two-pole phase comparator
- ▶ Detection of correct phase relationship and incorrect phase relationship of two live conductors
- ▶ Indoor type 🏠
- ▶ Visual indication 👁️

PG II two-pole testing devices detect phase balance between two live conductors of a medium voltage distribution network.

The device consists of an operating stick with contact electrode and an indication unit (part A) as well as an operating stick with contact electrode (part B) to tap a comparative phase.

The insulated stick can be removed from the indication unit with the contact electrode.

Contact electrode A is directly connected with the contact electrode B using a helix cable suitable for high voltages.

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with minimum intervals of at least 6 years.

PG II with indication unit

| Technical data | PG II |
|---|--|
| Application | In dry conditions, normally indoors |
| Indication | Visual: 3 red LEDs |
| Nominal frequency | 50 Hz (optional 60 Hz) |
| Maximum operating period with the pole connected to voltage | 60 s |
| Connection cable | 1 m |
| Operational class | B (indication of phase unbalance in the range of 60°–300°) |
| Operating temperature | -25 to +70 °C, climatic class N and W |

| Nominal voltage [kV] | Total length a [mm] | Insertion depth b [mm] | Order no. | Accessories | Seite |
|----------------------|---------------------|------------------------|-------------|-------------|-------|
| 5 | 1,220 | 413 | 51-0102-001 | Storage bag | 110 |
| 6 | 1,220 | 413 | 51-0102-002 | Contact tip | 110 |
| 10 | 1,220 | 413 | 51-0102-003 | | |
| 20 | 1,320 | 513 | 51-0102-004 | | |
| 30 | 1,420 | 613 | 51-0102-005 | | |
| 5–10 | 1,220 | 413 | 51-0102-010 | | |
| 10–12 | 1,220 | 413 | 51-0102-006 | | |
| 15–24 | 1,320 | 513 | 51-0102-012 | | |

Accessories

for voltage detectors and phase comparators

Transportation bag



| For products | Dimensions [mm] | | Order no. |
|--|-----------------|-----|-------------|
| | L | H | |
| FL-I, Comet BL-I / BL-A / BK-I / BK-A, Compare 2.0 | 900 | 200 | 52-0104-101 |
| TP-I, Comet BS-I, Comet BS-A | 1,080 | 220 | 52-0104-102 |

Universal plastic case



| For products | Dimensions [mm] | | | Order no. |
|--|-----------------|-----|-----|-------------|
| | L | H | D | |
| FL-I, TP-I, Comet series, Compare 2.0, PG II | 1,030 | 240 | 100 | 52-0102-001 |

Extension rod

For extending the handle



| For products | Length [mm] | Order no. |
|--|-------------|-------------|
| FL-I, Comet series, Compare 2.0, PG II | 500 | 52-0108-013 |
| FL-I, Comet series, Compare 2.0, PG II | 1,000 | 52-0108-014 |

Contact tip

The tip provides improved penetration into oxide or paint layers



| For products | Order no. |
|--|-------------|
| FL-I, Comet series, PG II, Compare 2.0 | 52-0306-002 |

Extension rod with contact electrode

For extending the insertion depth. It is not allowed to use the extension with contact electrode when it is wet.



| For Products | Length [mm] | Effective Länge engh | Order no. |
|--------------|-------------|----------------------|-------------|
| Comet Series | 890 | 820 | 52-0106-015 |

Double prong adapter, Catch hook and Earthing bridge

The double prong adapter is designed to make it easier to contact overhead lines, while the catch hook is designed to hook the voltage detector onto overhead lines.



| | Order no. |
|--|-------------|
| Catch hook, screw-on, for attaching to the overhead line (left) | 52-0307-010 |
| Double prong adapter, screw-on, for contacting or connecting to the overhead line from below (right) | 52-0307-011 |



| Earthing bridge for | Order no. |
|---------------------|-------------|
| BO-A AC/DC | 52-0108-052 |

Maintenance test

Voltage measuring devices

As per German accident prevention regulations for electrical installations and equipment (DGUV Regulation 3) of Employers Liability Insurance Association, voltage detectors, phase comparators and pluggable capacitive voltage detecting systems are subject to maintenance tests at intervals not exceeding 6 years. Dipl.-Ing. H. Horstmann GmbH offers this maintenance testing for all new but also for some older devices of own production.

Regardless of the duty to perform maintenance testing, the following rule is mandatory for devices and equipment including voltage detectors: The user is responsible for the safe and proper condition of the devices. Prior to each use, the user must verify devices and equipment are suitable for proper function as well as checking for externally visible damages and defects. Integrated capacitive voltage testing devices of the Wega series including Wega 1, Wega 1 V, Wega 2, Wega 2 V and Wega T1 with self-test facility, are not subject to maintenance tests.

Maintenance test on devices belonging to the AC and FGB series are no longer carried out. In exchange, we offer corresponding new devices.

| | Testing requirements according to | Remark | Age ≤14 years Order no. | Age ≥14 years and ≤24 years Order no. |
|---|--|------------|----------------------------|---|
| Voltage detectors with capacitive coupling a) | | | | |
| BL-I, BL-A | DIN EN 61243-1 / VDE 0682 part 411 | a), b), c) | 79-0102-004 | 79-0102-006 |
| BK-I, BK-A, BS-I, BS-A | DIN EN 61243-1 / VDE 0682 part 411 | a), b), c) | 79-0102-004 | 79-0102-007 |
| BO-A 2.0 | DIN VDE 0681 part 6 | a), b), c) | 79-0114-001 | 79-0114-005 |
| BO-A AC/DC | DIN VDE 0682 part 6 | a), b), c) | 79-0114-001 | 79-0114-005 |
| FL-I | DIN EN 61243-1 / VDE 0682 part 411 | a), b) | 79-0110-001 | 79-0110-005 |
| Phase comparators with capacitive coupling | | | | |
| PG | DIN EN 61481 / VDE 0682 part 431 | | 79-0105-000 | — |
| PG II | DIN EN 61481 / VDE 0682 part 431 | a), b), c) | 79-0105-001 | 79-0105-005 |
| Compare 2.0 | DIN EN 61481 / VDE 0682 part 431 | a), b), c) | 79-0112-001 | 79-0112-005 |
| Interface detectors, voltage detectors, phase comparators, measurement modules | | | | |
| Orion 3.1 | DIN EN 61243-5 / VDE 0682 part 415 | c) | 79-0107-002 | 79-0107-005 |
| Orion M1 | DIN EN 61243-5 / VDE 0682 part 415 | c) | 79-0107-003 | 79-0107-006 |
| Capacitive continuous voltage indicators, pluggable a) | | | | |
| HR-ST, LRM-ST | DIN EN 61243-5 / VDE 0682 part 415 | d) | — | — |
| Coupling parts of pluggable capacitive voltage detecting systems | | | | |
| HR- or LRM interface (Alternatively: HR or LRM jack modules) | DIN EN 61243-5 / VDE 0682 part 415 (latest and newer devices) | e) | — | — |

- All devices, which are sent to us by our customers, must be sent complete, including operating sticks and extension elements.
- We perform maintenance test only on the condition that the devices are not older than 24 years and in a technically acceptable condition. For devices with an age >14 and ≤24 years, an extended maintenance test will be performed, including electronics replacement.
- For all battery-operated devices, the battery replacement is mandatory during maintenance test (included in the price).
- Due to the disproportionately high testing expenditure, we do not carry out maintenance tests, but we offer "old" versus "new". Here we grant a special discount of 20 % on the new price if the old devices are sent back.
- Can be carried out on own initiative with the Orion 3.1, M1. Orion 3.1 conclude a good / bad condition. Further quantitative measurements can be carried out using Orion M1 well as appropriate digital multimeters.

In order to avoid any delay in processing order, we kindly ask you to either attach a copy of your order letter to your consignment, or send us your order letter in due time.



Earthing and short-circuiting devices with a reduced earth wire cross-section can be used in all networks without direct star point earthing (see IEC 61230 or VDE 0683-100). For networks with direct neutral earthing short-circuiting and earthing cable cross-sections must be the same.

Lengths of earthing and short-circuit cables have to fit to the switchgear and the distances between the connection points (min 1.2 times of the distance). If the cables are too long (>1.5 times of the distance) they must be fixed with an insulating cable to prevent damages and injuries in case of a short-circuit.

Current and time rating for earthing equipment

When selecting the required cable cross section, the maximum short-circuit current of the switchgear installation must be taken into account.

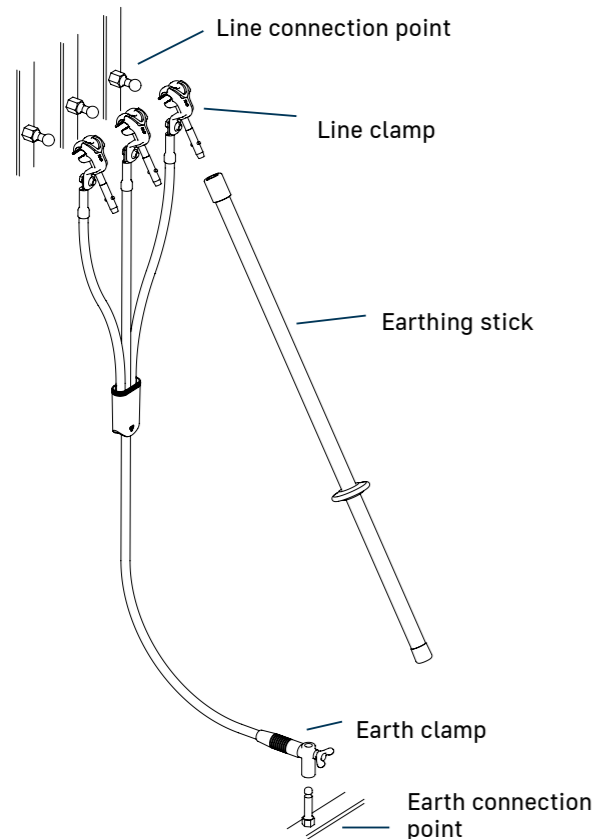
Earthing and short-circuiting devices and their components must be dimensioned in accordance with the short-circuit current rating (I_r), the short-circuit time rating (t_r) and the corresponding peak factor.

Earthing and short-circuiting devices can be connected in parallel to increase the rated currents. The requirements of VDE 0105-100 must be observed:

- ▶ Same cable length
- ▶ Same cable cross-sections
- ▶ Same connecting parts and connectors
- ▶ Installation of the devices close together with parallel routing of the cables
- ▶ 75 % of the permissible current carrying capacity must be assumed for each cable

Type testing refers basically to a rated time $t_r = 0.5$ s.

| Cable cross section [mm ²] | Short-circuit time $t_r = 0.5$ s | | Short-circuit time $t_r = 1.0$ s | |
|--|----------------------------------|-------------|----------------------------------|-------------|
| | Rated current I_r [kA] | Peak factor | Rated current I_r [kA] | Peak factor |
| 16 | 4.5 | 2.5 | 3.2 | 3.5 |
| 25 | 7.0 | 2.5 | 4.9 | 3.5 |
| 35 | 10.0 | 2.5 | 6.9 | 3.5 |
| 50 | 14.0 | 2.5 | 9.9 | 3.5 |
| 70 | 19.5 | 2.5 | 13.8 | 3.5 |
| 95 | 26.5 | 2.5 | 18.7 | 3.5 |
| 120 | 33.5 | 2.5 | 23.7 | 3.5 |
| 150 | 42.0 | 2.5 | 29.6 | 3.5 |



As a full-range supplier of medium voltage equipment, Horstmann offers a comprehensive and high-quality range of portable devices:

- ▶ for temporary earthing or
- ▶ earthing and short-circuiting of disconnected or isolated switchgear

This will prevent the occurrence of dangerous voltages or electric arcs if a system is re-closed accidentally or from coupling currents from adjacent systems.

The flexible Horstmann product range has a solution for almost every requirement.

Customised design in accordance with:

- ▶ Length of the cable
- ▶ Type of neutral earthing (whether or not solidly earthed)
- ▶ Rated short-circuit time
- ▶ Rated short-circuit current
- ▶ Rated short-circuit peak factor
- ▶ Required phase and earth connecting points

Earthing and short-circuiting devices

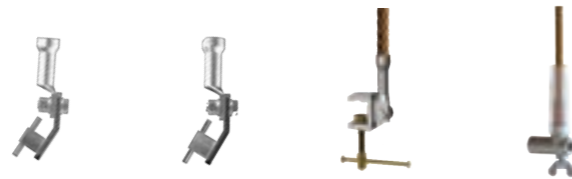
Three-phase device with ball tongs



Line cables with ball tong

PRODUCT FEATURES

- ▶ Designed according to IEC 61230 (VDE 0683-100)
- ▶ Cables assembled from highly flexible copper conductors (with transparent insulation)
- ▶ Moulded transparent connection piece allows permanent visual inspection
- ▶ Connection elements for phase cable:
 - ▶ Up to 70 mm² cross-section: 3 ball tongs 64-0103-001
 - ▶ From 70 mm² cross-section: 3 ball tongs 64-0103-002
- ▶ Connection elements for earth cable: M12 wing nut, M16 wing nut, earth clamp or earthing terminal
- ▶ Dimensions:
 - Distance between centre line of cable lug hole and entry of the connection piece:
 - Phase cable: 600 mm / 550 mm / 600 mm
 - Earth cable: 1,500 mm



| Connection to: Fixed ball point Ø [mm] | Cable cross section, phase / earth cable [mm ²] | Rated values I _r [kA]/tr=1 s | Order no. of kit | | | |
|--|---|--|------------------|--------------|-------------|-------------------|
| | | | Wing nut M12 | Wing nut M16 | Earth clamp | Earthing terminal |
| 20 | 50 / 50 | 9.9 | 60-0108-002 | — | 60-0101-001 | 60-0107-001 |
| 20 | 70 / 35 | 13.8 | 60-0108-004 | — | 60-0101-003 | 60-0107-003 |
| 20 | 70 / 70 | 13.8 | 60-0108-003 | 60-0209-013 | 60-0101-002 | 60-0107-002 |
| 25 | 95 / 35 | 18.7 | 60-0208-002 | 60-0209-004 | 60-0201-001 | 60-0207-002 |
| 25 | 95 / 95 | 18.7 | 60-0208-001 | 60-0209-001 | 60-0202-001 | 60-0207-001 |
| 25 | 120 / 50 | 23.7 | 60-0208-003 | 60-0209-010 | 60-0201-002 | 60-0207-003 |
| 25 | 120 / 120 | 23.7 | — | 60-0209-002 | 60-0202-002 | — |

Further earthing and short-circuiting devices with other cable lengths and fittings for line or earth cable ends are available on request.

| Accessories | Page |
|-----------------|------|
| Earthing sticks | 123 |
| Hot stick | 124 |
| Wall holders | 129 |

Earthing and short-circuiting devices

Three-phase device with universal compact clamp or universal line clamp



Line cables with universal line clamp

PRODUCT FEATURES

- ▶ Designed according to IEC 61230 (VDE 0683-100)
- ▶ Cables assembled from highly flexible copper conductors (with transparent insulation)
- ▶ Moulded transparent connection piece allows permanent visual inspection
- ▶ Connection elements for phase cable:
 - ▶ Up to 70 mm² cross-section: 3 x universal compact clamps 64-0101-001
 - ▶ From 70 mm² cross-section: 3 x universal line clamps 64-0102-002
- ▶ Connection elements for earth cable: M12 wing nut, M16 wing nut, earth clamp or earthing terminal
- ▶ Dimensions:
 - Distance between centre line of cable lug hole and entry of the connection piece:
 - Phase cable: 600 mm / 550 mm / 600 mm
 - Earth cable: 1,500 mm



| Connection to: | | | | | | Order no. of kit | | | |
|--|---------------------------|-------------------------|------------------------|---|--|------------------|--------------|-------------|-------------------|
| Connection to: Fixed ball point Ø [mm] | T-connection bolt [mm] | Round conductor [mm] | Flat conductor [mm] | Cable cross section, phase / earth cable [mm ²] | Rated values I _r [kA]/tr=1 s | Wing nut M12 | Wing nut M16 | Earth clamp | Earthing terminal |
| 20 | 15 | 4–15 | 0–25 | 50 / 50 | 9.9 | 60-0308-001 | — | 60-0301-001 | 60-0307-001 |
| 20 | 15 | 4–15 | 0–25 | 70 / 35 | 13.8 | 60-0308-003 | — | 60-0301-003 | 60-0307-003 |
| 20 | 15 | 4–15 | 0–25 | 70 / 70 | 13.8 | 60-0308-002 | — | 60-0301-002 | 60-0307-002 |
| 25 | 15 | 10–25 | 0–28 | 95 / 35 | 18.7 | 60-0508-002 | — | 60-0501-001 | 60-0507-002 |
| 25 | 15 | 10–25 | 0–28 | 95 / 95 | 18.7 | 60-0508-001 | 60-0509-001 | 60-0502-001 | 60-0507-001 |
| 25 | 15 | 10–25 | 0–28 | 120 / 50 | 23.7 | 60-0508-003 | — | 60-0501-002 | 60-0507-003 |
| 25 | 15 | 10–25 | 0–28 | 120 / 120 | 23.7 | — | 60-0509-002 | 60-0502-002 | — |

Further Earthing and short-circuiting devices with other cable lengths and fittings for line or earth cable ends are available on request.

| Accessories | Page |
|-----------------|------|
| Earthing sticks | 123 |
| Hot stick | 124 |
| Wall holders | 129 |

Single-phase device without connection elements



PRODUCT FEATURES

- ▶ Designed according to IEC 61230 (VDE 0683-100)
- ▶ Cables assembled from highly flexible copper conductors (with transparent insulation)
- ▶ Cable lug on each cable end

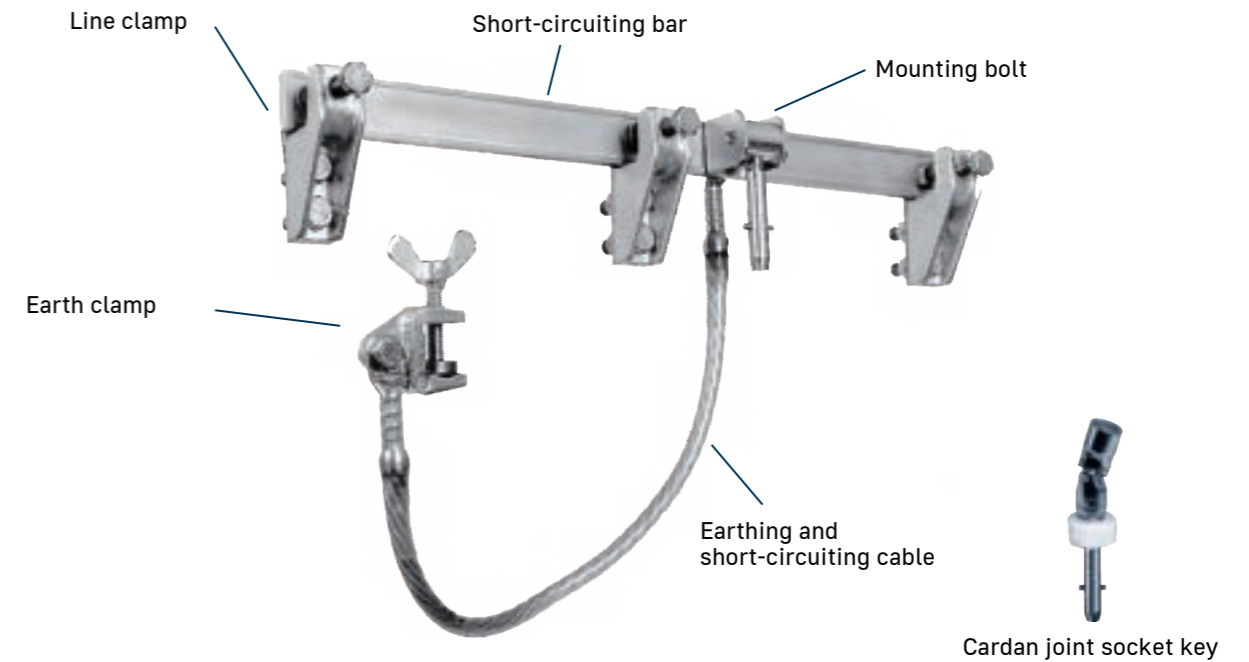
Each cable lug is provided with a 13 mm diameter hole. Any type of line or phase clamp can be used for the earthing cables.

Single-phase earthing and short-circuiting cable

| Cross section of copper conductor [mm ²] | Rated values I _r [kA]/tr=1 s | Cable length [mm] | Order no. |
|--|---|-------------------|-------------|
| 25 | 4.9 | 800 | 61-0101-015 |
| 25 | 4.9 | 2,000 | 61-0101-003 |
| 25 | 4.9 | 2,500 | 61-0101-016 |
| 35 | 6.9 | 2,000 | 61-0102-003 |
| 35 | 6.9 | 3,000 | 61-0102-009 |
| 50 | 9.9 | 1,200 | 61-0103-001 |
| 50 | 9.9 | 1,500 | 61-0103-002 |
| 50 | 9.9 | 2,000 | 61-0103-003 |
| 70 | 13.8 | 800 | 61-0104-018 |
| 70 | 13.8 | 1,200 | 61-0104-001 |
| 70 | 13.8 | 1,500 | 61-0104-002 |
| 70 | 13.8 | 2,000 | 61-0104-003 |
| 95 | 18.7 | 1,200 | 61-0105-001 |
| 95 | 18.7 | 1,500 | 61-0105-002 |
| 95 | 18.7 | 3,000 | 61-0105-009 |
| 95 | 18.7 | 4,000 | 61-0105-008 |
| 95 | 18.7 | 5,000 | 61-0105-010 |
| 120 | 23.7 | 1,000 | 61-0106-012 |
| 120 | 23.7 | 1,200 | 61-0106-001 |
| 120 | 23.7 | 1,500 | 61-0106-002 |
| 120 | 23.7 | 2,000 | 61-0106-003 |
| 120 | 23.7 | 3,000 | 61-0106-006 |
| 150 | 29.6 | 1,200 | 61-0107-001 |
| 150 | 29.6 | 1,500 | 61-0107-002 |
| 150 | 29.6 | 2,000 | 61-0107-003 |
| 150 | 29.6 | 2,500 | 61-0107-009 |
| 150 | 29.6 | 3,000 | 61-0107-006 |

Further cable lengths available on request.

Short-circuiting bars



Short-circuiting bar with accessories

| Equipment set | Rail length [mm] | Rated values I _r [kA]/tr=1 s ¹⁾ | Phase distance of line clamps [mm] | Order no. | Page |
|---|------------------|---|------------------------------------|-------------|------|
| 1 short-circuiting bar, with mounting bolt | 560 | 45.9 | 210 | 62-0101-050 | |
| 40 x 10 | 640 | 45.9 | 250 | 62-0101-051 | |
| 60 x 8 | 560 | 55.9 | 210 | 62-0101-054 | |
| 60 x 8 | 1,000 | 55.9 | 450 | 62-0101-057 | |
| 3 clamping pieces, for short-circuiting bar | Bolts | Material | | | |
| 40 x 10 | M12, AF19 | GTW | | 62-0103-001 | |
| 60 x 8 | M12, AF19 | GK-ALSI 10 MG | | 62-0103-003 | |
| 1 earthing and short-circuiting cable | | | | | 116 |
| 1 earth clamps | | | | | 121 |

¹⁾ The type test of the short-circuiting bars is carried out with a rated time tr = 1 s.

| Accessories | Order no. | Page |
|-------------------------|-------------|------|
| Cardan joint socket key | 67-0301-001 | |
| Earthing sticks | | 123 |

Line connection points

Fixed ball points are suitable for phase connection points and busbars

Fixed ball point with female thread

Material of straight ball pin: E-Cu, tinned

Material of angle ball pin: CuCr, tinned



| Ø [mm] | Thread | Rated values I _r [kA]/tr=1 s | Order no. |
|--------|--------|--|-------------|
| 20 | M10 | 18.7 | 63-0101-002 |
| 20 | M12 | 18.7 | 63-0101-001 |
| 25 | M12 | 23.7 | 63-0101-003 |
| 25 | M16 | 29.6 | 63-0101-004 |



| Ø [mm] | Thread | Rated values I _r [kA]/tr=1 s | Order no. |
|--------|--------|--|-------------|
| 20 | M12 | 13.8 | 63-0103-001 |
| 25 | M12 | 23.7 | 63-0103-002 |
| 25 | M16 | 29.6 | 63-0103-003 |

Ball point with steel grub screw

Material of straight ball pin: E-Cu, tinned

Material of angle ball pin: CuCr, tinned



| Ø [mm] | Thread | Rated values I _r [kA]/tr=1 s | Order no. |
|--------|----------|--|-------------|
| 20 | M10 x 30 | 18.7 | 63-0102-002 |
| 20 | M12 x 30 | 18.7 | 63-0102-001 |
| 25 | M12 x 30 | 23.7 | 63-0102-003 |
| 25 | M16 x 45 | 29.6 | 63-0102-004 |



| Ø [mm] | Thread | Rated values I _r [kA]/tr=1 s | Order no. |
|--------|----------|--|-------------|
| 20 | M12 x 30 | 13.8 | 63-0104-001 |
| 25 | M12 x 30 | 23.7 | 63-0104-002 |
| 25 | M16 x 45 | 29.6 | 63-0104-003 |

T-connection bolts

Material: E-Cu, tinned



| Ø [mm] | Thread | Rated values I _r [kA]/tr=1 s | Order no. |
|--------|----------|--|-------------|
| 15 | M12 | 13.8 | 63-0106-001 |
| 15 | M12 x 30 | 13.8 | 63-0106-002 |

Line clamps

Line clamps with bayonet fitting

Material of universal compact clamp: CuCr, tinned

Material of universal line clamp: brass, tinned

Material of ball tongs: brass, zinc-plated



| Ball pin Ø [mm] | Connection to | | | | Rated values I _r [kA]/tr=1 s | Order no. | | | Ball tong |
|--------------------|---------------------------|-------------------------|------------------------|-------------------------|--|-------------------------|----------------------|----------------------|-------------|
| | T-connection bolt [mm] | Round conductor [mm] | Flat conductor [mm] | | | Universal compact clamp | Universal line clamp | Universal line clamp | |
| 20 | — | — | — | — | 18.7 | — | — | — | 64-0103-001 |
| 25 | — | — | — | — | 29.7 | — | — | — | 64-0103-002 |
| 20 | 15 | 4–15 | ≤25 | 13.8 | 64-0101-001 | — | — | — | — |
| 20 | — | 10–20 | ≤22 | 13.8 | — | 64-0102-001 | — | — | — |
| 25 | 15 | 10–25 | ≤28 | 23.7 ¹⁾ | — | — | — | 64-0102-002 | — |
| 20/25 | 15 | 10–25 | ≤28 | 18.7/23.7 ¹⁾ | — | — | — | 64-0102-003 | — |
| 25/30 | 15 | 10–30 | ≤28 | 23.7 | — | — | — | 64-0102-004 | — |

¹⁾The rated value for the T-connection bolt is always 13.8 kA.

Line clamps with hexagon spindle

Material: brass, zinc-plated



| Ø [mm] | Bemessungswert I _r [kA]/tr=1 s | Order no. |
|--------|--|-------------|
| 20 | 18.7 | 64-0103-005 |
| 25 | 23.7 | 64-0103-006 |

Earth connection bolts with ring groove for earthing terminal

Material: brass, tinned



With steel pin

| Fixing in switchgears [mm] | Rated values Ir [kA]/tr=1 s | Order no. |
|----------------------------|-----------------------------|-------------|
| M12x25 | 18.7 | 63-0201-007 |
| M12x40 | 18.7 | 63-0201-006 |



With female thread

| Fixing in switchgears [mm] | Rated values Ir [kA]/tr=1 s | Order no. |
|----------------------------|-----------------------------|-------------|
| M12 | 18.7 | 63-0201-003 |

Earthing weld nut for cable lug with captive wing nut or with 13 mm diameter hole

Material: steel, zinc-plated



| Fixing in switchgears [mm] | Rated values Ir [kA]/tr=1 s | Order no. |
|----------------------------|-----------------------------|-------------|
| M12 x 30 | 18.7 | 63-0204-001 |

Earthing screw for cable lug with captive wing nut

Material: brass, zinc-plated



| Fixing point for earthing device [mm ²] | Spanner size | Rated values Ir [kA]/tr=1 s | Order no. |
|---|--------------|-----------------------------|-------------|
| M12x60 | 32 | 13.8 | 63-0205-001 |
| M16x70 | 32 | 18.7 | 63-0205-002 |

Earthing screw adapter for cable lug with captive wing nut

Material: brass, zinc-plated



| Thread [mm ²] | Spanner size | Rated values Ir [kA]/tr=1 s | Order no. |
|---------------------------|--------------|-----------------------------|-------------|
| M12 to M16 | 32 | 18.7 | 63-0205-003 |

Earthing nut for cable lug with captive wing bolt

Material: brass, zinc-plated



| Female thread [mm ²] | Bolt thread [mm ²] | Spanner size | Rated values Ir [kA]/tr=1 s | Order no. |
|----------------------------------|--------------------------------|--------------|-----------------------------|-------------|
| M12 | M12x25 | 32 | 9.9 | 63-0206-001 |
| M12 | M16x30 | 32 | 9.9 | 63-0206-003 |
| M16 | M12x25 | 32 | 9.9 | 63-0206-002 |

Earth clamp for flat conductors

Material: CuNi, zinc-plated



With T-handle

| Clamping range [mm] | Rated values Ir [kA]/tr=1 s | Order no. |
|---------------------|-----------------------------|-------------|
| 23 | 18.7 | 64-0201-001 |
| 38 | 29.6 | 64-0201-002 |



With wing bolt

| Clamping range [mm] | Rated values Ir [kA]/tr=1 s | Order no. |
|---------------------|-----------------------------|-------------|
| 23 | 18.7 | 64-0201-003 |
| 38 | 29.6 | 64-0201-004 |



With bayonet connector

| Clamping range [mm] | Rated values Ir [kA]/tr=1 s | Order no. |
|---------------------|-----------------------------|-------------|
| 23 | 18.7 | 64-0201-005 |
| 38 | 29.6 | 64-0201-006 |

Universal earth clamp with handle

Material: brass, tinned



| Connection to: | | | | Rated values Ir [kA]/tr=1 s | Order no. |
|-------------------------|---------------------|------------------------|---------------------|-----------------------------|-------------|
| Fixed ball point Ø [mm] | Round conductor mm] | T-connection bolt [mm] | Flat conductor [mm] | | |
| 25 | 10–25 | 15 | ≤28 | 23.7 ¹⁾ | 64-0102-007 |
| 20/25 | 10–25 | 15 | ≤28 | 18.7/23.7 ¹⁾ | 64-0102-016 |
| 25/30 | 10–25 | 15 | ≤28 | 23.7 ¹⁾ | 64-0102-012 |

1) The rated value for the T-connection bolt is always 13.8 kA.

Earthing terminal

Material: brass, zinc-plated / E-Cu



| Cable cross section [mm ²] | Rated values Ir [kA]/tr=1 s | Order no. |
|--|-----------------------------|-------------|
| 50 | 9.9 | 64-0202-003 |
| 70 | 13.8 | 64-0202-004 |
| 95 | 18.7 | 64-0202-005 |

Cable lug with 13 mm Ø hole

Material: E-Cu, tinned



| Cable cross section [mm ²] | Rated values I _r [kA]/tr=1 s | Order no. |
|--|---|-------------|
| 50 | 9.9 | 64-0205-003 |
| 70 | 13.8 | 64-0205-004 |
| 95 | 18.7 | 64-0205-005 |

Cable lug with captive wing nut

Material: E-Cu, tinned



| Cable cross section [mm ²] | Thread | Rated values I _r [kA]/tr=1 s | Order no. |
|--|--------|---|-------------|
| 120 | M12 | 23.7 | 64-0213-001 |
| 150 | M16 | 29.6 | 64-0213-002 |

Cable lug with captive wing bolt

Material: E-Cu, tinned



| Cable cross section [mm ²] | Thread | Rated values I _r [kA]/tr=1 s | Order no. |
|--|--------|---|-------------|
| 120 | M12 | 23.7 | 64-0214-001 |
| 150 | M16 | 29.6 | 64-0214-002 |

PRODUCT FEATURES

- ▶ Designed according to VDE 0683-100 (IEC 61230)
- ▶ Material: fibreglass reinforced epoxy resin tube
- ▶ Types: bayonet or hexagonal fitting
- ▶ Application for indoor installations

The insulating element of the earthing stick must be of adequate dimension to avoid inadmissible high leakage currents. The minimum length of the insulating element is 500 mm.



Indoor application earthing stick

| Dimensions [mm] | | Order no. | |
|-----------------|-------|-----------------|-----------------|
| a ¹⁾ | b | Bayonet fitting | Hexagon fitting |
| 1,117 | 717 | 66-0101-001 | 66-0201-001 |
| 1,517 | 917 | 66-0101-002 | 66-0201-002 |
| 2,017 | 1,217 | 66-0101-003 | 66-0201-003 |

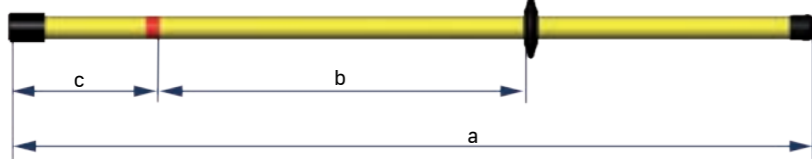
¹⁾ Dimensions apply to earthing sticks with bayonet fitting. Earthing sticks with hexagonal fitting are 12 mm longer.

Hot sticks

Manual operation of live parts

PRODUCT FEATURES

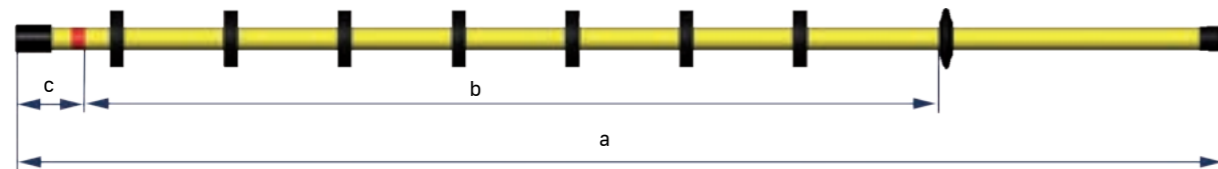
- ▶ Designed according to DIN VDE 0681-1
- ▶ Material: fibreglass reinforced epoxy resin tube
- ▶ Types: bayonet or hexagonal fitting
- ▶ Application for indoor 🏠 or outdoor installation 🌳



Indoor application hot stick

| Nominal voltage range [kV] | Dimensions [mm] | | | Order no. | |
|----------------------------|-----------------|-----|-----------------|-----------------|-----------------|
| | a ¹⁾ | b | c ¹⁾ | Bayonet fitting | Hexagon fitting |
| 1–24 | 1,117 | 500 | 217 | 65-0101-001 | 65-0201-001 |
| 1–36 | 1,217 | 525 | 242 | 65-0101-002 | 65-0201-002 |
| 1–52 | 1,517 | 720 | 197 | 65-0101-003 | 65-0201-003 |
| 1–72.5 | 2,017 | 905 | 312 | 65-0101-004 | 65-0201-004 |

1) Dimensions apply to hot stick with bayonet head. Hot stick with hexagon fitting are 12 mm longer.

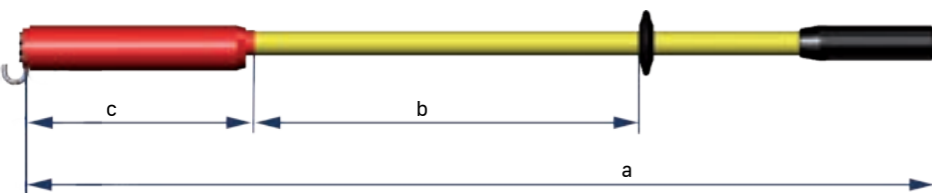


Outdoor application hot stick

| Nominal voltage range [kV] | Dimensions [mm] | | | Order no. Bayonet fitting |
|----------------------------|-----------------|-------|-----|------------------------------|
| | a | b | c | |
| 1–36 | 1,707 | 1,200 | 107 | 65-0102-001 |
| 1–72.5 | 2,317 | 1,600 | 117 | 65-0102-002 |

With hook for applications in dry weather conditions 🏠

The hook serves to mount and dismount elbow connectors and for overhead faulted circuit indicator installations and removals



Hot stick with hook

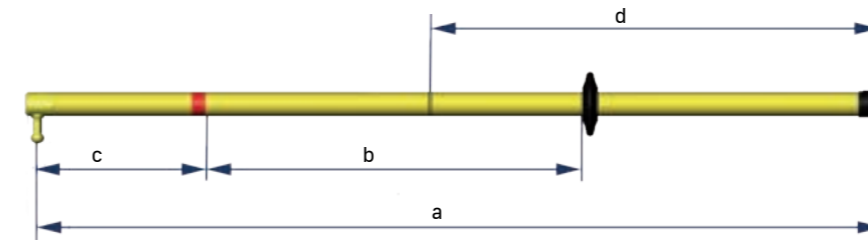
| Nominal voltage range [kV] | Dimensions [mm] | | | Order no. |
|----------------------------|-----------------|-----|-----|-------------|
| | a | b | c | |
| 1–24 | 1,200 | 500 | 310 | 65-0301-001 |
| 1–36 | 2,000 | 900 | 310 | 65-0301-002 |
| 1–36 | 3,000 | 900 | 310 | 65-0301-003 |
| 1–52 | 2,000 | 900 | 310 | 65-0301-004 |

Operating rods

Used to switch on and off switches with ring eyes

PRODUCT FEATURES

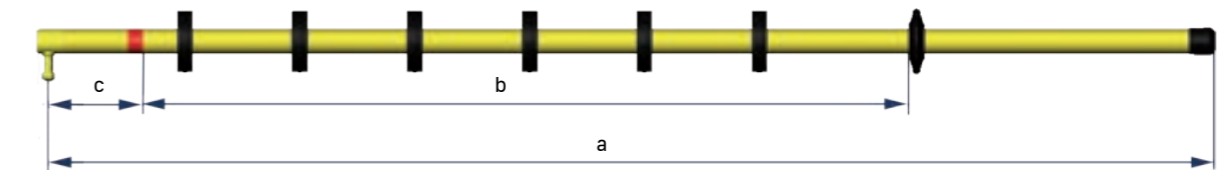
- ▶ Designed according to VDE 0681-2 (DIN 57681-2)
- ▶ Material: fibreglass reinforced epoxy resin tube
- ▶ One-part and two-part pluggable design
- ▶ Application for indoor 🏠 or outdoor installation 🌳



Indoor application operating rod

| Nominal voltage range [kV] | Dimensions [mm] | | | | Order no. | |
|----------------------------|-----------------|-----|-----|-----------------|-------------|-------------|
| | a | b | c | d ¹⁾ | One-part | Two-part |
| 1–24 | 1,120 | 505 | 215 | 600 | 65-0401-001 | 65-0403-001 |
| 1–36 | 1,220 | 525 | 245 | — | 65-0401-002 | — |
| 1–52 | 1,520 | 720 | 200 | 800 | 65-0401-003 | 65-0403-003 |
| 1–72.5 | 2,020 | 900 | 320 | 1,050 | 65-0401-004 | 65-0403-004 |

1) Dimensions only for two-part operating rods.



Outdoor application operating rod

| Nennspannungsbereich [kV] | Dimensions [mm] | | | Order no. |
|---------------------------|-----------------|-------|-----|-------------|
| | a | b | c | |
| 1–24 | 1,520 | 1,000 | 120 | 65-0402-001 |
| 1–36 | 1,720 | 1,200 | 120 | 65-0402-002 |
| 1–52 | 2,180 | 1,400 | 180 | 65-0402-003 |
| 1–72.5 | 2,320 | 1,600 | 120 | 65-0402-004 |

Switch hook with bayonet fitting

Suitable for all hot sticks (bayonet fitting according to DIN 48087)



Order no.
67-0301-003

Hexagonal adapter for earthing rod

Suitable for all operating rods (bayonet corresponds to DIN 48087)



Order no.
67-0301-007

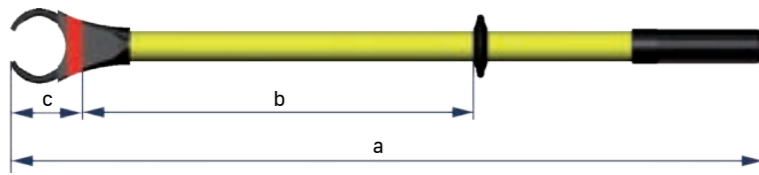
Fuse tongs

For gripping and replacing high-voltage fuses

PRODUCT FEATURES

- ▶ According to DIN VDE 0681-3

The fuse tongs are guided over the fuses from the front, thus requiring little spaces to the side. They are ideally suited for use in narrow installations. The clamps are fixed and released by turning the handle.



Fuse tong type K

| Nominal voltage range [kV] | Dimensions [mm] | | | Clamping range [mm] | Order no. |
|----------------------------|-----------------|-----|-----------------|---------------------|-------------|
| | a | b | c ¹⁾ | | |
| 1–36 | 1,010 | 530 | 85 | 50–90 | 65-0502-002 |

1) In closed position.

Tools for fuses

Material: Special brass



| Total length [mm] | Order no. |
|-------------------|-------------|
| 305 | 65-0504-004 |
| 385 | 65-0504-001 |

Substation accessories



Station accessories are not only part of safety-relevant equipment, they play a crucial role in the safe, efficient, and reliable operation of local network and medium-voltage installations. Regardless of whether you are cleaning the system from dirt or moisture as part of maintenance or performing a functional test: To be able to work safely and without danger, you need the appropriate equipment.

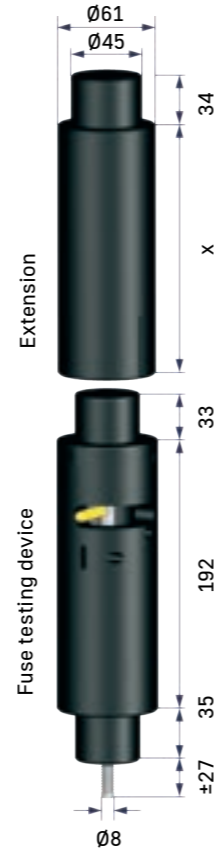
Our range includes, among others, the following accessories for your medium-voltage system:

- ▶ Fuse testing devices
- ▶ Wall holders
- ▶ Warning signs
- ▶ Safety helmets
- ▶ Fire extinguishers and gloves

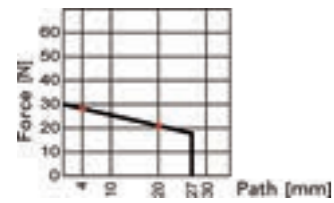
You can find additional accessories such as grounding rods, operating rods, switching rods, fuse tongs, or fixed points and connection terminals in the chapter "Earthing devices" on page 112ff.

PRODUCT FEATURES

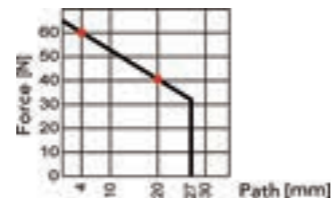
The mechanical HPS fuse testing device is designed to control the trip function of load break switches. After winding up the timer the striker pin is reset and the testing device is inserted into the fuse cartridge of the switch to be checked. After about 150 s ±20 % the test fuse is operated whereupon the striker fires out. The size of the fuse corresponds to that of HH fuses with 6 kV nominal voltage. Extension pieces are available for the adaptation to other voltage levels.



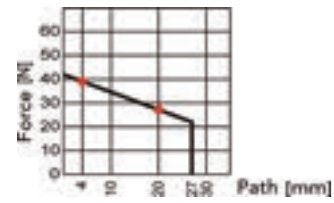
Fuse testing device and extension



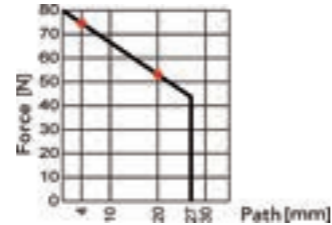
| Rated release force 30 N | |
|--------------------------|---------------------|
| Free stroke | |
| 4 mm [N] | 28.2 |
| 20 mm [N] | 20.8 |
| Energy [J] | 0.39 |
| Order no. | 49-6015-007 (white) |



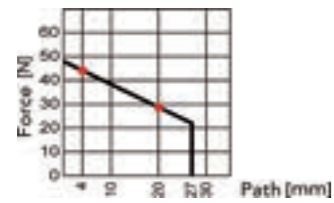
| Rated release force 65 N | |
|--------------------------|----------------------|
| Free stroke | |
| 4 mm [N] | 60.1 |
| 20 mm [N] | 40.6 |
| Energy [J] | 0.81 |
| Order no. | 49-6015-005 (yellow) |



| Rated release force 42 N | |
|--------------------------|---------------------|
| Free stroke | |
| 4 mm [N] | 39.0 |
| 20 mm [N] | 27.2 |
| Energy [J] | 0.53 |
| Order no. | 49-6015-001 (black) |



| Rated release force 80 N | |
|--------------------------|----------------------|
| Free stroke | |
| 4 mm [N] | 74.7 |
| 20 mm [N] | 53.3 |
| Energy [J] | 1.02 |
| Order no. | 49-6015-008 (silver) |



| Rated release force 48 N | |
|--------------------------|---------------------|
| Free stroke | |
| 4 mm [N] | 44.1 |
| 20 mm [N] | 28.7 |
| Energy [J] | 0.58 |
| Order no. | 49-6015-006 (black) |

| Accessories | Vn [kV] | Order no. |
|-------------|---------|-------------|
| Extension | | |
| 100 mm | 12.0 | 49-6015-003 |
| 175 mm | 17.5 | 49-6015-004 |
| 250 mm | 24.0 | 49-6015-002 |
| Bag | | 52-0102-003 |

For safety material

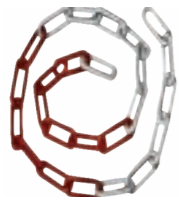


| Order no. | 67-0101-001 | 67-0101-002 | 67-0101-006 | 67-0101-007 | 67-0101-014 | 67-0101-015 |
|---------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Earthing and short-circuiting devices | ■ | — | — | — | — | — |
| Earthing sticks | ■ | ■ | ■ | — | — | — |
| Hot sticks | ■ | ■ | ■ | — | — | — |
| Operating rods | ■ | ■ | ■ | — | — | — |
| Fuse tongs | — | — | — | ■ | ■ | — |
| HH fuses | — | — | — | — | ■ | ■ |

For voltage detectors



| Order no. | 52-0105-001 | 52-0105-002 |
|-------------------|-------------|-------------|
| FL-I | ■ | ■ |
| TP-I | ■ | ■ |
| Comet BK-I / BK-A | ■ | ■ |
| Comet BL-I / BL-A | ■ | ■ |
| Comet BS-I / BS-A | ■ | ■ |



Plastic chain

Red / white with nylon links

Order no.
67-0202-001



Safety helmet

Without face shield
Order no. 67-0202-002

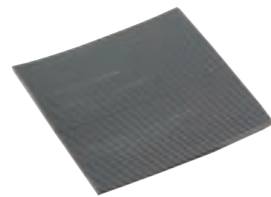
With face shield
Order no. 67-0202-003



High-grade protective helmet

Without face shield
Order no. 67-0202-012

With face shield
Order no. 67-0202-013



Rubber insulating matting

Up to 50 kV, max. 1 m wide,
4 mm thick, 10 m long
(delivered as a roll)

Order no.
67-0202-004



Insulating protective barrier

- ▶ According to VDE 0682-552
- ▶ PVC hard DIN 16927
- ▶ Colour: Red
- ▶ Plate thickness: <30 kV,
6 mm
- ▶ Special insulation
resistance: 1015 Ω cm
- ▶ Surface resistivity: 1011 Ω

Order no.: On request



Protective gloves

For electricians, 1,000 V
according to VDE 0680-1 with
certification stamp, length: 350
mm, thickness: 0.7 mm

Order no.
67-0202-005



Handheld fire extinguisher

Filled with 5 kg of carbon di-
oxide, with snow pipe and wall
holder

Order no.
67-0202-007



LED work lamp

Incl. wall-mounting charge
station with charge status
display, flashing and emergen-
cy light function

Order no.
67-0202-010

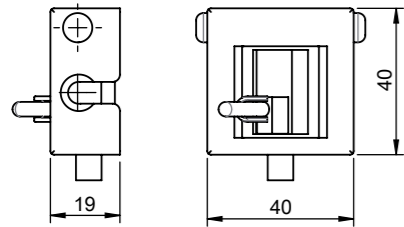


Insulating protective barriers are intended for short-term use in electrical indoor switchgears exceeding voltage ratings from 1 kV bis 30 kV AC. These devices may be used in factory-built, type-tested switchgears only in compliance with the switchgear manufacturer's instructions.

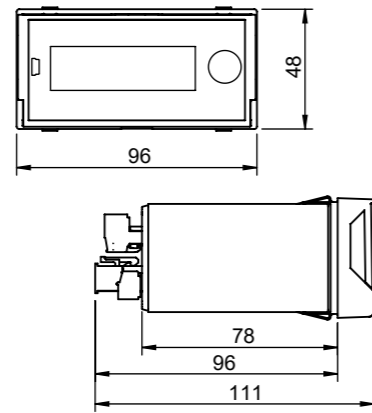
Insulating protective barriers are designed for partial protection against direct touching. These components do not protect against reclosure and must not touch live parts when installed.

Dimension drawings

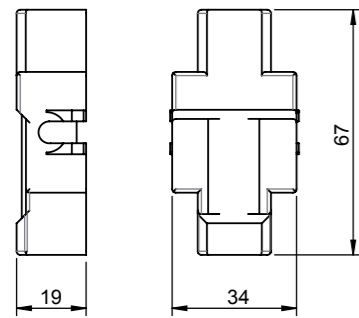
The products marked with * are available in the ePLAN-data Portal with the circuit diagram and terminal assignment.



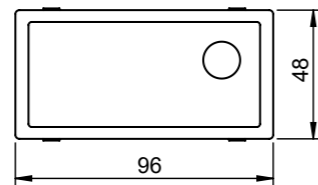
M1: Rotor indicator



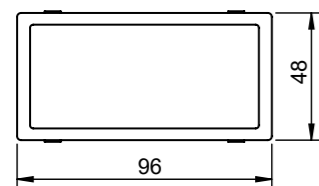
M4: ComPass A 2.0*, ComPass B 2.0*, ComPass Bs 2.0*, ComPass D



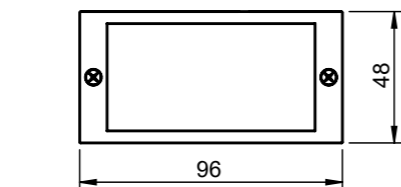
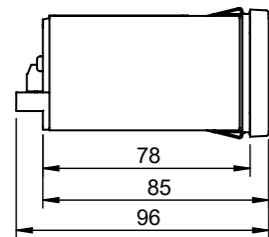
M2: Fluid indicator



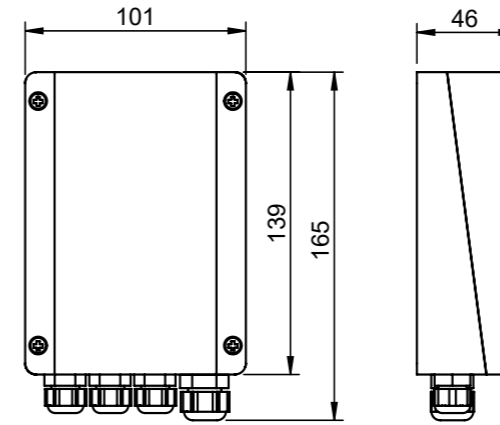
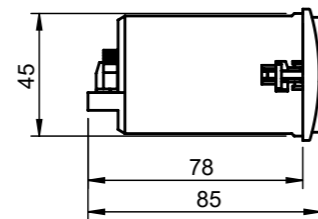
M5: Alpha M, Trip Flag



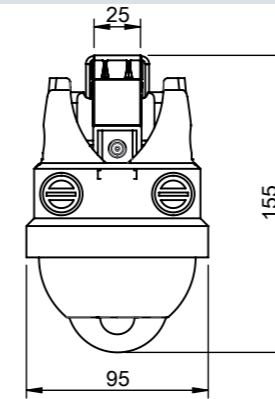
M3: Alpha E, ComPass A, ComPass B*, Opto series, Sigma series*



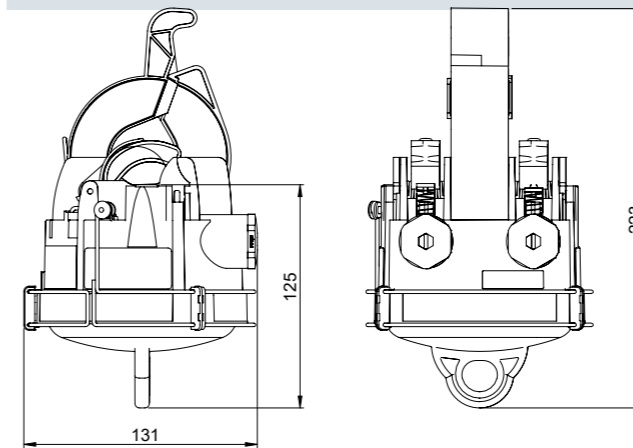
M6: Earth series (surface mount housing)



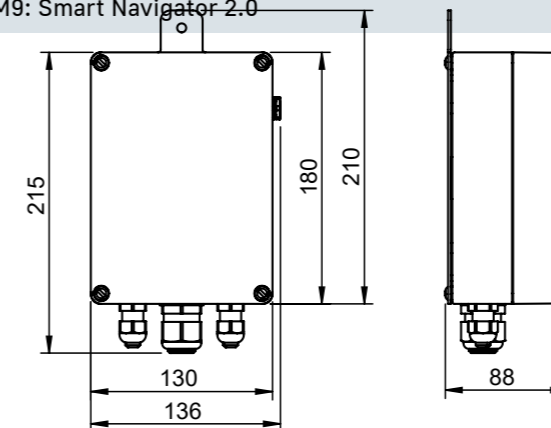
M7: Earth series, Opto series (Surface mount housing)



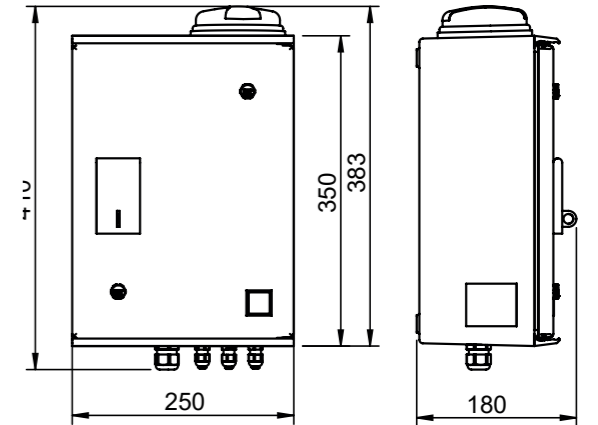
M8: Navigator series



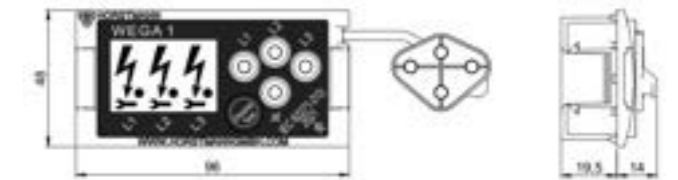
M9: Smart Navigator 2.0



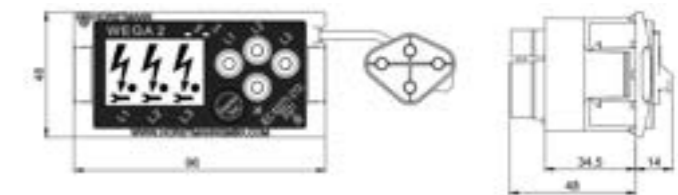
M10: Reporter 3.0



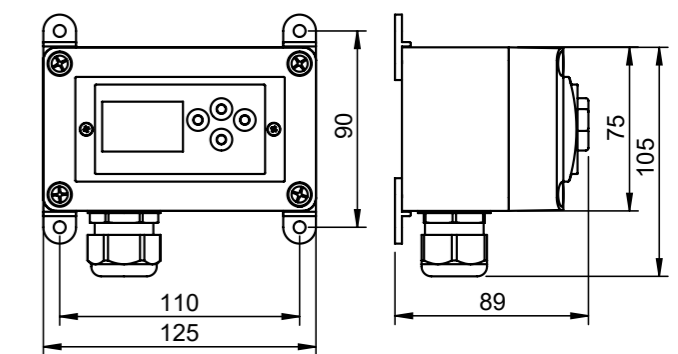
M11: Reporter 4.0



M12: Wega 1 / Wega 1 V

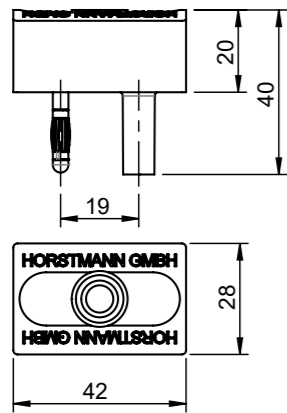


M13: Wega 2 / Wega 2 V

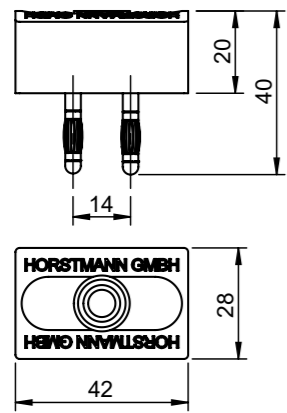


M14: Wega T1

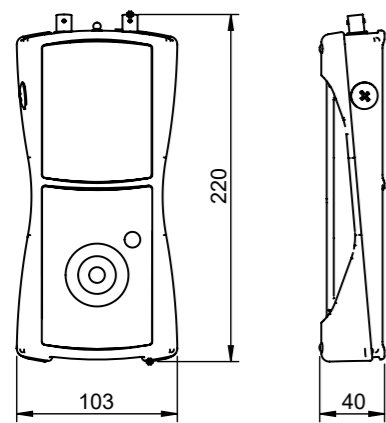
Dimension drawings



M15: HR-ST



M16: LRM-ST



M17: Orion 3.1, Orion M1

Order | inquiry

| | | | |
|------------|--|--------------|--|
| Order no.: | | Inquiry no.: | |
|------------|--|--------------|--|

| Order no. | Article description | Quantity | Delivery date |
|-----------|---------------------|----------|---------------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| | | |
|--------------------------|-------------------|--|
| | Company: | |
| | Contact person: | |
| | Department: | |
| | Street: | |
| | Postcode / Place: | |
| Stamp / Date / Signature | Phone | |

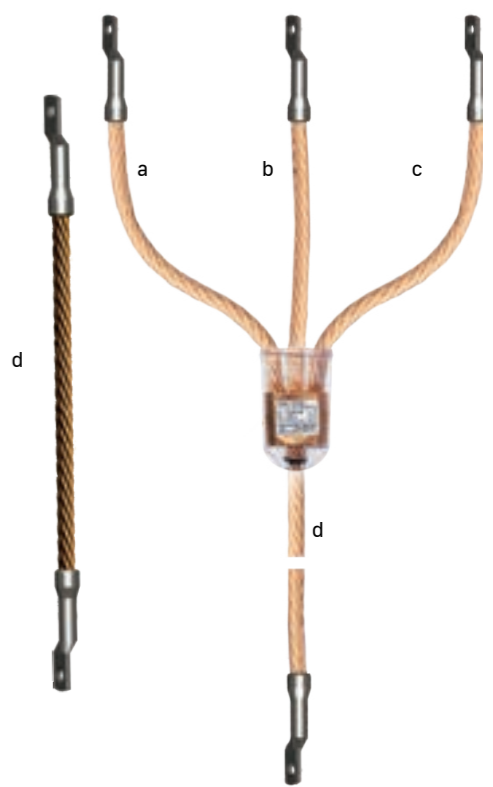
An order is made exclusively by the terms and conditions of Dipl.-Ing. H. Horstmann GmbH.

Order | inquiry

Earthing and short-circuiting devices

| | | | |
|-----------|--|-------------|--|
| Order no. | | Inquiry no. | |
|-----------|--|-------------|--|

| | |
|---|--|
| Short-circuiting cable (a / b / c) | |
| Cable cross section (mm ²): | |
| Length a: | |
| Length b: | |
| Length c: | |
| Mounting: | |
| | |
| Earthing cable (d) | |
| Cable cross section (mm ²): | |
| Length d: | |
| | |
| Mounting (see page 121 / 122): | |
| | |
| | |
| | |
| Quantity: | |
| Date of delivery: | |



Lengths of earthing and short-circuit cables have to fit to the switchgear and the distances between the connection points (min 1.2 times of the distance). If the cables are too long (>1.5 times of the distance) they must be fixed with an insulating cable to prevent damages and injuries in case of a short-circuit.

| | | |
|--------------------------|-------------------|--|
| | Company: | |
| | Contact person: | |
| | Department: | |
| | Street: | |
| | Postcode / Place: | |
| Stamp / Date / Signature | Phone | |

An order is made exclusively by the terms and conditions of Dipl.-Ing. H. Horstmann GmbH.

Index

A

- Accessories
 - Directional fault indicators 58-59
 - Integrated voltage detecting systems 58
 - Overhead faulted circuit indicators 70
 - Short-circuit and earth fault indicators 58
 - Short-circuit indicators 58
 - Voltage detectors and phase comparators 137
- Alpha E 26
- Alpha M 26

B

- BO-A 2.0 104–105
- BO-A AC/DC 106–107

C

- Capacitive voltage signal 84
- Comet BK-A 102
- Comet BK-I 102
- Comet BL-A 101
- Comet BL-I 101
- Comet BS-A 103
- Comet BS-I 103
- Company profile 8
- Compare 2.0 108
- ComPass A 32
- ComPass A 2.0 34
- ComPass B 42
- ComPass B 2.0 44
- ComPass BS 2.0 44
- ComPass D 46
- CSOR 51

D

- Dimension drawings 132
- Directional fault indicators
 - Product matrix 14-15
 - Project planning 37

E

- Earth 4.0 27
- Earth clamps
 - Earth clamp 121
 - Earthing terminal 121
 - Cable lug 122
 - Universal earth clamp with handle 121
- Earth fault indicator 23–25
- Earth connection points 120
 - Earth connection bolts 120
 - Earthing nut 120
 - Earthing screw 120
 - Earthing screw adapter 120
 - Earthing weld nut 120
- Earthing sticks 123

- Earthing and short-circuiting devices 112–113
 - Single-phase device without connection elements 116
 - Three-phase device with ball tongs 114
 - Three-phase device with universal line clamp 115
 - External signal lamp 58
- Earthing sticks 123
- Earth Zero 24
- Earth Zero Flag 24

F

- FL-I 104
- Fluid indicator 17
- Function tester LRM- /HR-ST 96
- Fuse testing devices 128
- Fuse tongs 126

H

- Hot stick with hook 70 | 124
- HR interface cable 54
- HR-ST 96

I

- iHost
 - iHost Cloud 72
 - iHost Pro 74–75
 - iHost Solo 74–75
- Interface cable 54

L

- Line clamps
 - Line clamps with bayonet fitting 119
 - Line clamps with hexagon spindle 119
- Line connection points
 - Ball point with steel grub screw 118
 - Fixed ball point with female thread 118
- T-connection bolts 118
- LRM-ST 96

M

- Maintenance test 111

N

- Navigator LM 64
- Navigator LM HV 64

O

- Operating rods 125
- Opto F+E 3.0 26
- Opto F 3.0 18
- Orion 3.1 94
- Orion M1 94
- Overhead faulted circuit indicators
 - Accessories 70
 - Product matrix 63

P

- PG II 109
- Line clamps 119
- Phase comparators 108
- Phase current transformers 48

R

- Remote monitoring 71
- Reporter 3.0 76
- Reporter 4.0 78
- Rotor indicator 16

S

- Short-circuit and earth fault indicators
 - Accessories 58
 - General information 9
 - Phase current transformers 48
 - Product matrix 12
 - Selection scheme 2436
 - Single-phase current sensors 50
- Short-circuit indicators 18-22
- Sigma 2.0 20
- Sigma D 38
- Sigma D+ 38
- Sigma D++ 38
- Sigma Dm 40
- Sigma F+E 2.0 28
- Sigma F+E 3 2.0 28
- Sigma L 30
- Sigma F+E L 30
- Sigma F+E 3 L 30
- Smart Navigator 2.0 68
- Smart Navigator 2.0 HV 64
- Summation current sensors 51
- Summation current transformer 51

T

- Trip Flag 68

V

- Voltage detecting systems
 - General information 82
 - Integrated voltage detecting systems 84-90
 - Product matrix 83
 - Voltage detectors 94
 - Accessories 95
- Voltage sensors 54
- Capacitive voltage coupling 54
- Resistive voltage sensors 55
- Voltage signal 54

W

- Wall holders 129
- Wega 1 84
- Wega 1 V 86
- Wega 2 88
- Wega 2 V 90
- Wega 1 LV 91
- Wega T1 92

General terms of delivery

All contracts are based on the “General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry” (“Grüne Lieferbedingungen” – GL) of the ZVEI in its relevant version at a time, as well as on the following special condition:

PRICE SETTINGS

All prices are valid for delivery “Ex works Heiligenhaus (or Körperich)” (EXW Heiligenhaus (or Körperich) Incoterms 2010), excluding packing.

- ▶ Metal surcharges
Information on any necessary metal surcharges on request.

Product range :

Please note: In both our catalogues and the corresponding price lists you will only find a selection of our product range. In addition, a large number of customer-specific solutions and configurations are possible – please contact us if you cannot find the product you are looking for!

Catalogues / leaflets / instructions for use::

For our customers and interested parties, we also have the current editions of catalogues and leaflets available on our website: <http://www.horstmannmbh.com>

Exclusively for our customers we also offer the possibility to download the latest instructions for use of all current devices as PDF files via a password-protected access.

If you need further, special documents or have any questions, please do not hesitate to contact us.

We will be glad to help you!