

Products for Railway Networks

You will find what
you are looking for





Head office in Heiligenhaus

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 own 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 facility for safety material.

Our company has been certified according to DIN EN ISO 9001 since 1996.



In-house manufacturing



Component testing



High voltage laboratory



The safe and reliable transport of passengers and goods is the primary concern of railway network operators. In order to achieve this, not only the trains, but also the tracks need to be monitored and maintained.

Horstmann offers products and system solutions for the rapid location of faults in the event of short-circuits or lightning strikes, as well as for continuous monitoring of railway electrical systems.

In the event of disturbances or outages fault finding is often laborious and time-consuming. It is necessary to drive or walk along the entire electrified section in order to find the fault location.

Horstmann fault indicators divide the electrified sections into sub-sections. In the event of a fault, all fault information is sent to the control room, clearly indicating the exact fault location. This permits maintenance staff to go straight to the fault location and quickly implement the necessary measures. This saves time and money and ensures customer satisfaction for all rail passengers.

When there are no faults, monitoring provides the railway network operator with a full overview of the most important network parameters at all times.

Horstmann also offers products which allow work to safely be carried out on the tracks. These include voltage detection systems for determining that there is no voltage present in overhead line systems which provide power to the overhead contact lines.

Horstmann products are precisely adjusted to the requirements of railway networks and designed for use with the typical frequencies.

- Smart Navigator 2.0 Rail – Quick location of faults in overhead line systems and on catenary masts
- Pole Master Rail – Long-distance communication of reports of faults in overhead line systems to a central location
- BO-A 2.0 – Determining voltage presence or absence in overhead line systems of electrified railways
- BO-A AC/DC – Focus: Determining the absence of voltage for DC and AC applications with residual voltage
- Polaris – Electrified sections with autotransformers, monitoring of return currents
- Wega 2 R1 and Wega 1R1 – Determining voltage presence or absence in switchgears for powering railways
- Earthing and short-circuiting device – For safe working in switchgears

Smart Navigator 2.0 Rail

Directional overhead faulted circuit indicator with monitoring



Smart Navigator 2.0 Rail

Pole Master Rail

Product features

- Intelligent fault detection – reduces outage times
- Overhead line monitoring – data for the evaluation of the network condition
- Innovative installation – on live conductors and from the ground
- Remote maintenance – configuration and updates from the control room

Intelligent fault detection

The proven overcurrent detection algorithm detects fault currents reliably under a wide range of network situations. Individual parameter settings tailor the system perfectly for all locations in your overhead line network, eliminating false tripping.

The Smart Navigator 2.0 Rail can be quickly and easily mounted in overhead line systems. Typical mounting locations are longitudinal and transverse disconnects, catenary lines, amplifier lines, bypass lines and feeder lines in autotransformer systems.

Fault messages containing information about short-circuits and fault current direction help to clearly identify problem situations. Every fault is signalled to the control room within one minute.

Energy management

Pole-mounted units with solar panels are used to ensure supply and control room communication. Alternatively, these can be powered from a DC or AC auxiliary power supply.

The high battery capacity of the Smart Navigators guarantees a service life of >10 years, and any load current extends the service life.

Clamp

Thanks to the innovative clamping mechanism, unintentional detaching from the overhead line due to environmental influences is impossible.

With a hot stick, the Smart Navigator 2.0 Rail can be mounted on an overhead line up to 12 meters high, even under live conditions. Likewise, it also can be uninstalled again without any problems.



Service

Smart Navigators 2.0 Rail are successfully used worldwide, on all continents, to detect and remotely report network faults. Therefore, the Smart Navigator 2.0 Rail is tailored to the country-specific radio approvals and the different frequency ranges of the network operators.

We are happy to support you with the connection to your server solution for the control room and the design of the network-specific tripping characteristics.

Implement your individual projects together with us:
+49 2056 976 0.

Remote signalling and monitoring

Thanks to remote signalling, the complex, high quality and diverse sensor technology enables clear monitoring and thus direct insight into your overhead line network.

Remote maintenance such as software updates or configuration adjustments can be performed via the GSM / LTE connection.

Technical data	Smart Navigator 2.0 Rail
Trip current	10 – 1.200 A (adjustable)
Current measurement accuracy	±2 A (0 – 10 A) 3 % (10 – 600 A)
Indication	Ultra-bright high power LEDs (red, green, yellow), indication for maintenance purposes only. Deactivated in normal operation, as there is a risk of confusion with signalling and control systems
Directional indication	Is supported
Reset	Automatic time reset (1 minute)
Power supply	Smart Navigator 2.0 Rail: Lithium cells, replaceable, shelf life >10 years Pole Master Rail: ▪ Solar supply (12 V DC) ▪ Up to 8 weeks buffer time using integrated backup battery (depending on dial-up interval)
Max. permissible voltage	7.2 – 46 kV / 16.7 Hz
Withstand current	800 A at <50 °C ambient temperature, 25 kA / 3 s
Temperature measurement range	–40 to +80 °C, ±5 °C for conductor rope
Remote signal	▪ Fault detection ▪ Fault current direction ▪ Data such as temperature, signal field strength and battery status
Server	▪ Cloud solution for fast system integration: iHost Cloud ▪ Connection to the control room: iHost Solo or iHost Pro ▪ Functionality monitoring
Communication	Smart Navigator 2.0 Rail: ▪ Local: 868 MHz short-range radio (50 m) Pole Master Rail: ▪ WAN: 4G-LTE modem (2G fallback) ▪ WAN: 4G-LTE CAT M1 Modem ▪ Local: 868 MHz short-range radio (50 m)
Cable diameter range	≤33 mm
Adjacent conductor immunity	No influence by adjacent conductors with a horizontal distance of >250 mm from the indicator
Coupling	One Pole Master Rail with up to four Smart Navigator 2.0 Rail
Housing	UV resistant reinforced plastic, IP65
Dimensions	223 x 131 mm (H x W)
Weight	Approx. 1.0 kg
Temperature range	–40 to +85 °C

Equipment set	Accessories	Page
1 Smart Navigator 2.0 Rail	Order No. 44-1200-001	Bird guard for Pole Master Rail
1 Pole Master Rail	Order No. 44-1200-101	USB-Transmitter
		Magnet (Test/Reset)
		Installation Tool
		Hot Stick

Installation tool and extension stick

For Smart Navigator 2.0 Rail installations and removals on overhead line systems.

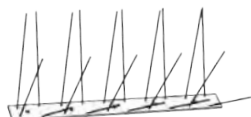


Installationstool

	Order no.
Installation tool for Smart Navigator 2.0 Rail	49-6006-005
Extension stick with universal end fitting, designed for work under voltage with telescopic rods according to IEC 62193 and ASTM 1826. (extended length: 6.43 m, retracted length: 1.63 m) Rated voltage: 123 kV (only when extended)	65-0305-001



Extension stick with universal end fitting



	Order no.
Bird guard for Pole Master Rail	44-9900-001



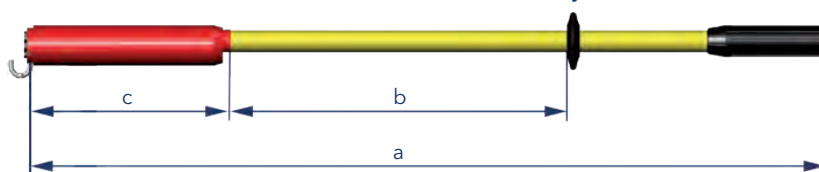
	Order no.
USB-Transmitter	28-5000-001



	Order no.
Magnet (Test / Reset)	49-6001-002

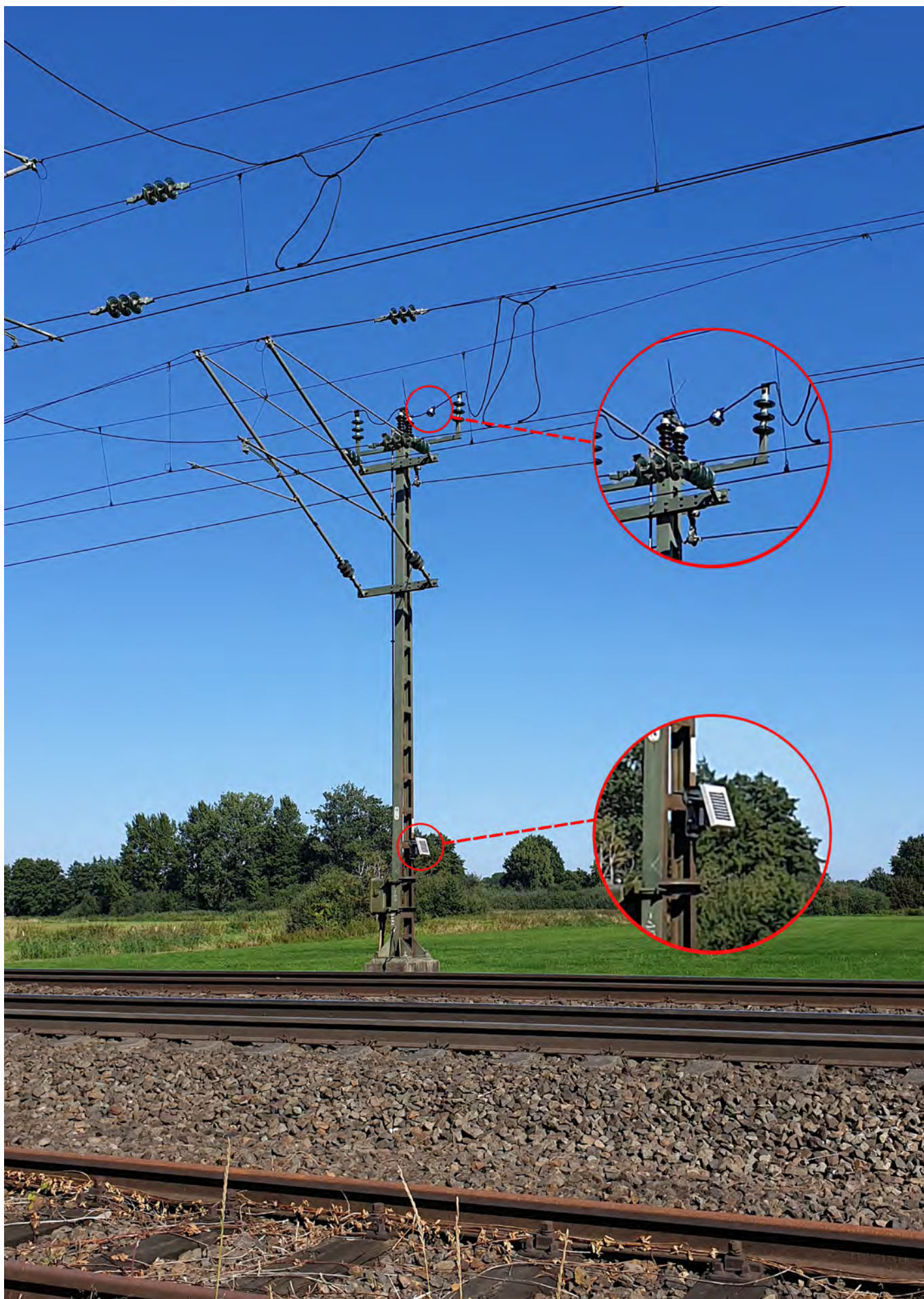
Hot Stick with hook

For Smart Navigator 2.0 Rail installations and removals on overhead line systems.



Hot stick with hook (according to DIN VDE V 0681-1)

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	1,310	65-0301-003
1–52	2,000	900	310	65-0301-004





BO-A 2.0

Product features

- Bright LED's and loud acoustic signals - Excellent perception under all environmental conditions.
- Extension or plug-in system – quick and easy to use
- Self-testing when switched on - Increased safety
- Light weight – easy handling and transportation
- Use even in precipitation 
- Automatic frequency detection - Warning when used in networks of a different frequency
- Signal colour storage bag – safe transport
- Backpack carrying belts and hand carrying belts – comfortable transport
- Highest reliability and user comfort
- Shockproof and no battery replacement necessary - maintenance-free with long operating life

The BO-A 2.0 is a voltage detector for medium voltage overhead line systems of electrified railways, substations and electrical indoor installations.

It is designed to detect the absence or presence of voltage during maintenance work for example.

The voltage detector BO-A 2.0 is suitable for use in 16.7/50/60 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. DIN VDE 0681-6, depending on the version. The voltage detector is ready for the global market.

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with intervals of not more than 6 years.

Technical data	BO-A 2.0
Use	In dry and wet conditions
Indication	'Ready-to-operate': green LED (after passed self-test) 'Voltage present': red LED and acoustical signal 'Voltage not present': green LED and no acoustical signal
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	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 (Other voltages and frequencies on request)
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 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 insul	>520 mm (Insulating sticks or a telescopic stick can be assembled by a plug-in adapter)
Operating temperature	-25 to +70 °C, climatic class N and W

Nominal voltage [kV]/ Nominal frequency [Hz]	Total length [mm] ±50 mm	Insertion depth [mm]	Handling	Version	Order no
15 kV/16,7 Hz	max. 5.400	1.790	Plug-in adapter/Telescopic stick	▪ VDE-Version ▪ DB-Approval	50-1510-202
15 kV/16,7 Hz	max. 5.400	1.790	Plug-in adapter/Telescopic stick	▪ IEC-Version ▪ Automatic self-activation	50-1512-002
15 kV/16,7 Hz	4.700	1.790	Insulating sticks (pluggable)	▪ VDE-Version ▪ DB-Approval	50-1510-002
11 kV/16,7 Hz	4.700	1.790	Insulating sticks (pluggable)	▪ 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,
- Handling (telescopic pole/plug-in adapter, universal adapter/telescopic pole, plug-in insulating pole),
- Optional: Automatic self-activation when connected to energized overhead lines.

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



Green LED: *Stand-by state and Voltage not present*
Red LED: *Voltage present*
Black button: Acoustical indicator

Accessories	Page
Plug-in adapter/Telescopic stick	12
Universal adapter/Telescopic stick	12
Insulating sticks (pluggable)	12
Storage bag, orange, with silver reflective strips	12
Storage bag, yellow, with silver reflective strips	12

BO-A 2.0 indication and control panel

BO-A AC/DC

The new DC multifunction voltage detector for overhead line systems of electrified railways



BO-A AC/DC

Product features

- One device for DC and AC voltage networks
- Bright LEDs and loud acoustic signals - Excellent perception in all environmental conditions
- Telescope and plug-in system - quick and easy to use
- Integrated self-test and AC/DC residual voltage indicator - Maximum safety
- DC $\pm$ polarity indicator
- Low weight – easy handling and transport
- Use even in precipitation ☔
- Automatic frequency detection - warning when used in networks of a different frequency
- No hazard when touching the ground contact - Increased personal protection

The voltage detector BO-A AC/DC is a two-pole test equipment for overhead line systems of electrified railways and other typical voltage applications. It provides clear evidence of the presence or the absence of the operating voltage.

The BO-A AC/DC tester is suitable for use in DC and AC voltage networks.

When the BO-A AC/DC is connected to a live line, an optical and acoustical signal is activated.

A DC or AC voltage network is detected and indicated automatically.

The BO-A AC/DC is designed and tested according to IEC 61243-1, -2 and DIN VDE 0681-6.

The voltage detector is ready for the global market.

According to the German accident prevention standard DGUV Regulation 3 (Table 1c), the device is subject to maintenance tests with intervals of not more than 6 years.



- | | |
|------------------|--|
| Yellow LED: | Residual voltage indication |
| Green LED: | Stand-by state and Voltage not present |
| Red LED: | Voltage present |
| Blue Pushbutton: | On/Off-Pushbutton |
| Red/blue LED: | Polarity indication |

BO-A AC/DC indication and control panel

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 $\pm 75V$ DC $\pm$ polarity indicator: detecting DC voltage polarity: red or blue flashing LED
Period of „Stand-by state“	65 s $\pm$ 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 $\pm 10\%$ 16,7–60 Hz
Properties of the insulating stick	Passed test as insulating element for leakage current at $1.2 \times V_r$ 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 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

Accessories	Page
Telescopic pole/Plug-in adapter	12
Telescopic pole/Universal adapter	12
Insulating sticks (pluggable)	12
Earthing bridge	12
Storage bag, orange, with silver reflective strips	12
Storage bag, orange, with silver reflective strips	12

Transportation and storage bag for BO-A 2.0 and BO-A AC/DC



Product	Dimensions [mm]			Order no.
	L	H	D	
Transportation bag black	1.130	340	100	52-0104-105
Storage bag reflector foil orange	1.130	340	100	52-0104-106
Storage bag reflector foil yellow	1.130	340	100	52-0104-107
Cordura bag black, Horstmann logo in yellow	1.210	300	100	52-0104-018
Cordura bag black, Horstmann logo in blue	1.210	300	100	52-0104-019



Storage bag incl. BO-A 2.0 with pluggable insulating poles (example)



Cordura bag with yellow Horstmann logo

Catch hook and catch fork for BO-A 2.0 and BO-A AC/DC



Product	Order no.
Catch hook, screw-on type, for hooking into the overhead line (left)	52-0307-010
Catch fork, screw-on type, for contacting or contacting the overhead line from below (right)	52-0307-011

Telescopic insulating stick/Plug-in system



Product	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

Earthing bridge



For	Order no.
BO-A AC/DC	52-0108-052





Polaris



Single-phase current sensor

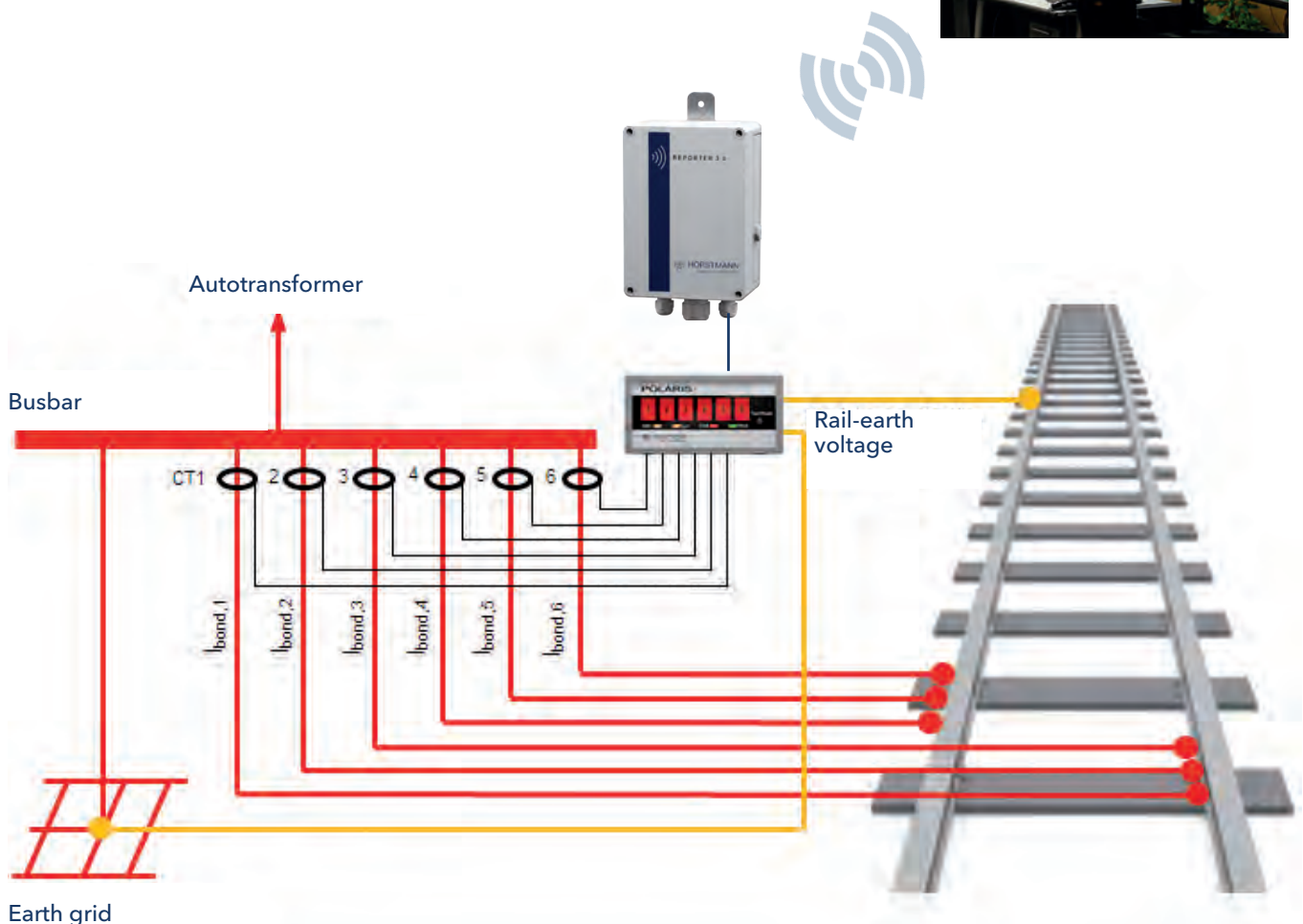
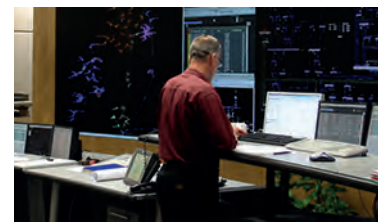
Product features

- Monitoring of lines in the reverse current system of electrical railway supply
- Monitoring the earth potential
- Relay for remote signal

The Polaris performs a continuous monitoring of parallel connecting cables in 2 x 25 kV railway systems, which typically carry the return current.

If the connection of one of these cables deteriorates, it will be detected and selectively displayed. In addition, any undesired increase of the earth potential is detected and displayed.

The above events are remotely reported to the control centre. This means that railway asset management can direct the service team to the fault location.



Technical data	Polaris
Measurement sensors	0 – 630 A
tl>> response delay	500 ms/1000 ms/5 s/10 s (adjustable)
Threshold inequality	30 %, 40 %, 50 %, 60 % (adjustable)
Trip current earth potential	50 V AC $\pm$ 2 V
Accuracy	$\pm$ 5 %
Amount of channels	2 – 6 (adjustable)
Indication	6 red LEDs/1 per channel 2 yellow LEDs IMB> (unbalanced return current) and VE> (shift in earth potential) 1 red LED ERR (device error) 1 green LED PWR (power supply)
Remote signal	2 relay contacts, changeover contact
Remote contact	Potential-free permanent contact Contact capacity: 230 V AC/1 A/62.5 VA; 220 V DC/1 A/60 VA
Test / Reset	Manual
Power supply	External auxiliary supply 24 V +10 %/–20 %, 200 mA max.
Housing	Polycarbonate
Dimensions	96 x 48 x 96 mm (W x H x D) for installation housing
Temperature range	–30 to +70 °C

Equipment set	Order no.	Accessories	Order no.
1 Polaris	99-0000-220	Assembly bracket Z-shape	53-0101-004
2 – 6 single-phase current sensors (depending on application)	49-6024-013	Assembly bracket U-shape	53-0101-005

Wega 2 R1 | Wega 1 R1

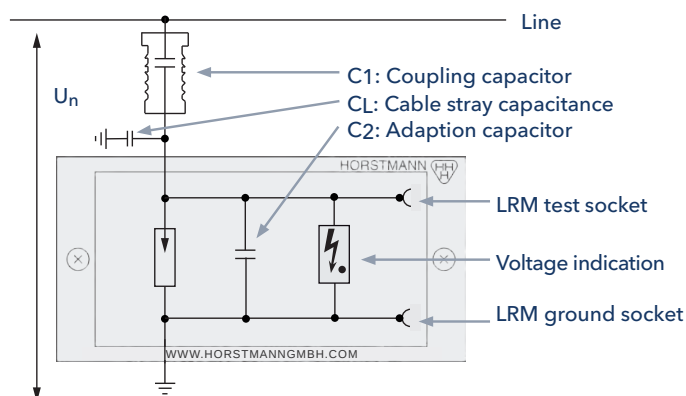
Integrated voltage detecting system for railway networks



Wega 2 R1



Wega 1 R1



Principle of an integrated voltage detecting system

Product features

- Designed according to IEC 62271-213 (VDE 0682-415)
- Use in single-sided grounded single-phase network
Wega 2 R1: 15 kV/16,7 Hz and 25 kV/50 Hz-60 Hz
Wega 1 R1: 15 kV/16,7 Hz and 25 kV/50 Hz-60 Hz
- Operation with capacitive high-voltage insulator
- Wega 2 R1: Remote signalling with relay contacts
- Integrated maintenance test: Maintenance-free
- Overvoltage indication
- Front accessible LRM interface: Fully featured according to IEC 62271-213 and IEC 61243-5
- Fully potted electronics: High functional reliability

Wega 2 R1 and Wega 1 R1 are single-phase voltage detecting systems, which indicate the following operating voltage states:



Voltage present

Threshold values for voltage presence indication:
 $0.17 - 0.78 \times U_n$



Voltage present

Integrated maintenance test passed



Voltage present

Integrated maintenance test passed

Voltage signal too high (overvoltage indication)



Voltage not present

Wega 2 R1 and Wega 1 R1 determine the absence of voltage in railway networks.

For connection, either shielded or unshielded cables with flat connectors or system connectors can be used.

The front accessible built-in display-test function enables the Wega a varification of the LCD-display in the built-in and voltage-free state.

In addition to the LCD display the Wega 2 R1 also comprises two LED displays (red "voltage present" and green "Voltage not present").

Via independent relay contacts the voltage status of the switchgear can be reported remotely.

Technical data	Wega 2 R1	Wega 1 R1I
Nominal frequency	16.7/50/60 Hz	
Interface	1 LRM measuring sockets 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 ▪ LED indication, U=0 and U≠0 and auxiliary power present	▪ LCD display with arrow, dot and wrench tool
Remote signal	Relay contacts, alternating contact	–
Power supply	▪ LCD display: fed by measuring voltage ▪ Relay via 24–230 V AC/DC power supply	▪ LCD display: fed by measuring voltage
Temperature range	–25 to +65 °C	
Housing	Polycarbonate, IP54	
Dmension	96 x 48 x 52 mm (L x H x D), cut-out on system side: 92 ^{+0,8} x 45 ^{+0,6} mm	

Equipment set			
1 display unit			
Wega 2 R1, 16.7 Hz	Order no.	51-2251-102	
Wega 2 R1, 50 Hz/60 Hz	Order no.	51-2251-302	
Wega 1 R1, 16,7 Hz	Order no.	51-1255-004	
Wega 1 R1, 50 Hz/60 Hz	Order no.	51-1255-003	

Earthing and short-circuiting devices

Single-pole without connecting elements



Product features

- Designed according to IEC 61230 (VDE 0683-1 or -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 connecting element can be used for the earthing cables.

Other versions and combinations on request

Single-pole earthing and short-circuiting cable

Cross section of copper conductor [mm ²]	Rated values I _r [kA]/tr = 1 s	Cable length [mm ²]	Order no.	Accessories	Page
25	4.9	800	61-0101-015	Phase connecting elements	17
25	4.9	2,000	61-0101-003	Earth connecting elements	17
25	4.9	2,500	61-0101-016	Hot sticks	see main catalogue
35	6.9	2,000	61-0102-003	Earthing sticks	see main catalogue
35	6.9	3,000	61-0102-009	Wall holders	see main catalogue
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		

Other cable lengths available on request

Line clamps with bayonet fitting



Connection to					Order no.			
Ball pin Ø [mm]	T-connection bolt [mm]	Round conductor [mm]	Flat conductor [mm]	Rated values I _r [kA]/tr = 1 s	Universal compact clamp	Universal phase clamp	Universal phase clamp	Ball tong
20	–	–	–	18.7	–	–	–	64-0103-001
25	–	–	–	29.7	–	–	–	64-0103-002
20	15	4–15	0–25	13.8	64-0101-001	–	–	–
20	–	10–20	0–22	13.8	–	64-0102-001	–	–
25	15	10–25	0–28	23.7	–	64-0102-002	–	–
20/25	15	10–25	0–28	18.7/23.7	–	–	64-0102-003	–
25/30	15	10–30	0–28	23.7	–	–	64-0102-004	–

Earth connecting elements



Earth clamp with T-handle

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



Earth clamp with wing bolt

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



Earth clamp with bayonet connector

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



Earthing terminal

Cable cross section [mm²]	Rated values I _r [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 hole

Cable cross section [mm²]	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

Cable cross section [mm²]	Thread	Rated values I _r [kA]/tr = 1 s	Order no.
50	M12	9.9	64-0203-001
70	M12	13.8	64-0203-002
95	M12	18.7	64-0203-003



Cable lug with captive wing bolt

Cable cross section [mm²]	Thread	Rated values I _r [kA]/tr = 1 s	Order no.
50	M12	9.9	64-0204-001
70	M12	13.8	64-0204-002
95	M12	18.7	64-0204-003

Further clamps and connecting points are in the main catalogue.

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