Technical Description

Grounding Control Device

EKX-4 LT
Grounding Control Device
EKX-4 LT and Accessories

For use in gas and combustible dust hazardous areas of zones 1 and 21 according to EAC Standards TR CU 012/2011 for a temperature range of -55 °C up to +50 °C.

The explosion-proof grounding control device EKX-4 LT ensures the controlled discharge of electrostatics occurring during filling processes of petrochemical, chemical or other products. It is characterised by ease of installation, convenient operation, highest functional safety and a user-friendly state-of-the-art explosion protection concept designed by Timm Elektronik.

To prevent from static-caused ignitions, the electrostatic charge has to be dissipated safely. The grounding control device EKX-4 provides and monitors the required connection continously. Therefor it is installed firmly connected to the ground reference potential of the filling station (ground connection).

An additional housing with a self-regulating integrated heating in combination with our special cold-resistant silicone cable ensures an application at a temperature range of minus 55 °C up to plus 50 °C.

Before starting any filling process, the tanker, railcar or container must be grounded by attaching the grounding cable. As soon as the grounding control device detects a sufficient conductive connection, it will switch the control outputs and the indicator lamp to ‘filling release’.

If the proper grounding connection breaks, the device will switch immediately to the ‘no release’ state.

The EKX-4 LT is also available as 2-pole version for applications without a measurable impedance against ground reference potential, like containers or barrels on an isolated pallet. In this special case, the measuring loop is established.

1 Functional Principle

Electrostatic charges can arise by filling of certain fluids, granulate materials or other products to road tank trucks, railway tank wagons, containers etc. An exceptional hazardous situation will be present, if these electrostatics happen with inflammable products or within an explosive gas or dust atmosphere.

Controlled grounding of a tanker with the grounding control device EKX-4 LT
through the 2-pole cable and clamp connection.

2 Special Features

2.1 Compliance to the EAC standards
The Grounding Control Device EKX-4 LT was specially designed for application in cold ambient and fully complies with the EAC Standards for use in gas and combustible dust hazardous areas.

2.2 Intelligent Explosion Protection
Timm Elektronik’s special explosion protection concept combines protection by intrinsic safety, increased safety, powder filling and protection by enclosure. With this combination of protection types, the grounding control device can be opened in gas hazardous areas for configuration. Opening the outer housing is just possible at ambient temperatures of above -30 °C. Below this temperature, the power supply of the device must be permanently turned on and the outer housing must be closed.

2.3 Proven Factory Settings
Every unit is delivered pre-configured and ready-for-use right after installation. The factory settings of the object recognition result from long standing experiences and are suitable to all standard grounding applications.

2.4 Configurability
Many functions of the grounding control device can be configured in order to cover the wide range of possible electrostatic applications. This includes setting the object to be grounded, e.g. road tank truck or railway tank wagon, adjusting the limit values of object recognition, the type of release signal at the electronic output and the cable compensation function. Thus, the device can get adjusted easily during installation and operation according to the local requirements at site of operation.

2.5 Object Recognition
With the setting ‘tank truck’, the grounding control device can distinguish between correct grounding and faulty operation, e.g. attaching the grounding clamp to the filling frame. ‘Filling release’ will only be given with proper grounding connection. This protection against false operation increases operational safety and ensures explosion prevention by compulsive grounding.

2.6 Functional Safety
The grounding control device performs several internal monitoring functions like a plausibility check of the device configuration, internal self-tests of all safety related functions, an automatic calibration of the measuring circuit electronics and tests of the relay reliability of the release outputs before every switching. The conductivity of the grounding connection is monitored permanently during operation. The unit’s design and the selection of its component parts under aspects of explosion prevention and protection assure exceptional equipment reliability and functional safety.
2.7 Ease of Commissioning, No need for Maintenance and High Durability
With the factory settings and the easy-to-open enclosure, the grounding control device is installed, electrically connected and ready for operation within short time. Except from visual inspections, the device is maintenance-free. The electronic works reliably and requires no readjustment of the switching thresholds. The housing is extra coated for high resistance against chemicals and other environmental influences. With the integrated connection terminals, broken grounding cables can be replaced on site quickly.

2.8 Bright Signal Light
The EKX-4 has a multicolor signal light that is clearly visible even in bright environments. It is mounted considerably raised at the front of the enclosure and can be recognized sidewise, also with the additional housing. The signal light indicates the operational state of the device as large display. With opened enclosure, the signal light’s six LEDs are used as detail display for indicating measured data, limit values and error diagnostics.

2.9 Cable Compensation
Every grounding cable has a parasitic capacitance against ground potential. Without compensating this cable capacitance, the device may issue a release signal accidentally during connecting the cable to the object to be grounded. The cable compensation function of the grounding control device EKX-4 LT prevents from these fault releases by enabling a very high accuracy of the object recognition measurements. Besides, increased lengths of grounding cables are possible with active cable compensation.

2.10 Supervision of Interfering Voltages
Separate source voltages result in unregulated stray currents and have to be suspend from hazardous areas. Furthermore, they can interfere the functioning of grounding control devices. The device EKX-4 LT monitors the level of interfering voltages at the filling station and indicates as soon as the permitted level for its correct functioning is exceeded. Simple grounding control devices may interfere with stray currents and lead to an ungrounded ‘release’ state.

2.11 Control outputs
The EKX-4 LT comes like the EKX-4 with four control outputs:

- **2 Contact Release Outputs**
- **1 Electronic Release Output**
- **1 Auxiliary Output**

The release outputs can be connected directly to the control system of the filling station, e.g. PLC. Thus, automated filling processes can be released, or interrupted when proper grounding is not ensured. The contact release outputs are redundant, monitored by return signal and tested by the device prior to every release switching. Due to a mechanical link inside the relays, any malfunction of the contacts will be detected reliably. The electronic output can be configured to a static or a dynamic signal. By using the dynamic oscillating signal together with a suitable evaluation electronic at the PLC, failures at the transmission lines can be recognized. The auxiliary output is intended for not safety related control functions, e.g. external indicator lights.

2.12 Made in Germany
Timm Elektronik is an independent manufacturer of electronic equipment for control and measuring applications in hazardous areas. All our products are engineered and produced at our site in Glinde, Germany near Hamburg. More than fifty years of experience, co-operations with German universities and best qualified employees ensure the high quality of our products and substantiated technical advices by our sales engineers. With our very flexible production system we can provide best service to our customers, even at unanticipated project situations.
3 Accessories

Timm Elektronik provides a variety of accessories for its grounding control devices EKX-4 LT.

3.1 Grounding Clamps

The grounding clamp EZ1 is very durable made of stainless steel V2A. The spring action is limited in such way that for a safe contacting of the clamp no strong force is needed. The clamp is covered by an insulated shelf and designed with a special metal sheet. This ensures the release will only be given when the clamp is properly attached. An accidental contact to the object to be grounded will not result in ‘filling release’. The insulation cover of nitrile rubber is handy, heat resistant and steady against mineral oil products.

![Grounding clamp EZ1 connected to a grounding](image)

The following models of the Grounding Clamp are available:

<table>
<thead>
<tr>
<th>Variation</th>
<th>Description</th>
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<tbody>
<tr>
<td>EZ1-1pol</td>
<td>Standard clamp for the grounding control device EKX-4 LT.</td>
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<tr>
<td>EZ1-Dorn</td>
<td>Grounding clamp with a brass pin that can be used as plug-in break-away connection for devices EKX-4 LT.</td>
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3.2 Grounding Socket, Grounding Plug and Break-away Coupling

**Grounding Socket TW700BU**

The grounding socket TW700BU is used for road tankers having a 10mm thick grounding pin. It is impact and oil resistant. The combination of grounding socket TW700BU and clamp EZ1-Dorn works as a break-away coupling for EKX-4 LT.

**Grounding Plug TW700ST**

The break-away coupling can be delivered with 1 m cable at the grounding clamp too, e.g. for pull relief of the plug-in connection.

![Plug-in connection made of socket TW700BU and plug TW700ST with 1 m cable at the clamp](image)

3.3 Grounding Cable

The grounding cable is available as straight silicone cable. Grounding clamp or socket are mounted to the cable. The cable is oil resistant. The cold-resistant straight cable features silicone outer sheath and conductor insulators. It is for applications with ambient temperatures up to -55 °C.

![Cold-resistant silicone cable with clamp](image)

3.4 Testing equipment

The testing equipment is intended to verify the functioning of installed grounding control devices. By using the rotary switch,
the preset thresholds (short-circuit to ground, lower and upper limit of road tankers, limit of railcars) can be checked. For this purpose, the grounding clamp can easily get attached to the metal plate at the front. Both models of grounding control device EKX-4 LT can be tested with this equipment.

4 International approval

The Grounding Control Device EKX-4 LT is approved for use in potentially explosive atmospheres according to the customs union standard between Russia, Belarus, Kazakhstan, Armenia and Kyrgyzstan (EACU). The EKX-4 LT is an extension of the EKX-4 approved according to European and Chinese standards, as well as wherever these standards are valid.

Eurasian Economic Union
TR CU 012/2011
(Certificate TC RU C-DE.GB08.V.02301)
5 Technical Specifications

5.1 Operating Data

Type of protection according to EAC Standard TR ZU 012/2011

1Ex e q [ib] IIIC T4 Gb X
Ex t [ibD] IIIC T80°C Db

Protection of enclosure
IP65

Power supply
- Type of protection 'Increased Safety' Ex e
- 230 V AC ± 10 %, 50 Hz, about 75 VA

Ambient temperature range
-55 °C to +60 °C

Dimensions
305 mm, 440 mm, 185 mm (L, W, H)

Weight
12 kg

5.2 Measuring Circuit

For connection of the grounding cable. The measuring circuit is grounded.

Type of protection
'Intrinsic Safety' Ex ib / ibD

Maximum cable length
50 m (Ex related specification, please observe functional limitations)

Maximum values
Uo = 6.7 V, Io = 68 mA,
Po = 114 mW

5.3 Control Outputs

Contact Outputs
- Type of protection 'Increased safety’ Ex e
- Maximum values: 250 V AC, 3 A, 100 VA

► 2 Release Contacts (K1, K2)
2 potential-free closing contacts, internally monitored

► 1 Auxilliary Contact (K3)
Potential-free change-over contact, not monitored

Electronic Output (T1)
- Type of protection 'Intrinsic safety’ EX ib
- NAMUR-compatible transistor output signaling 'Filling Release'

- Maximum values:
  Ui = 20 V, li = 20 mA, Pi = 400 mW
  Ci negligibly small
  Li negligibly small

- Internal resistance:
  1 kOhm or 11 kOhm

- Modulation: 10 Hz, duty factor 1:1
6 Connection Diagram (EKX-4 LT)

Grounding test unit type EKX-4

Carrier board with measurement module (protection by intrinsic safety)

Supply module (protection by powder filling)

Relay control

Auxiliary

Display

Microcontroller

Instrument circuit

KLE1

KLE2

KLE3

KLE4

L, N, PE: Power supply 230V (±10%) 50Hz, ca. 80VA
1 - 2: Potential-free relays - contacts 1: N/O (internally monitored output)
3 - 4: Potential-free relays - contacts 2: N/O (internally monitored output)
5 - 7: Potential-free relays - contacts 3 (auxiliary relay)
Contact rating (terminal 1-7): max. 250VAC, 3A, 100VA
8 - 9: Potential-free Ex-transistor output, NAMUR-compatible
Maximum values: U=20V, I=20mA, P=400mW
10: Grounding cable connection terminal No. 10
11: Grounding cable compensation terminal No. 11
Use only cables with a wire diameter of 0.5 - 2.5 mm² (AWG 20 to 12)

Cable and cable glands:
KLE1: (M20) Power supply cable diameter 7-13mm
KLE2: (M20) Contact outputs cable diameter 7-13mm
KLE3: (M16) NAMUR transistor output cable diameter 4.5-10mm
KLE4: (M20) Grounding cable diameter 7-13mm
7 Contact Us

For technical consulting or distribution, our sales team will be available for you under the following contact data:

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