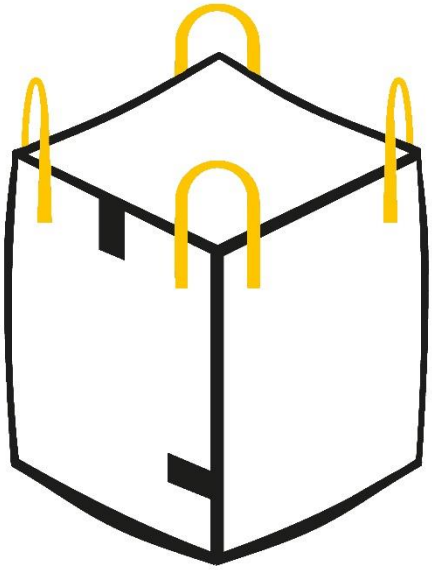
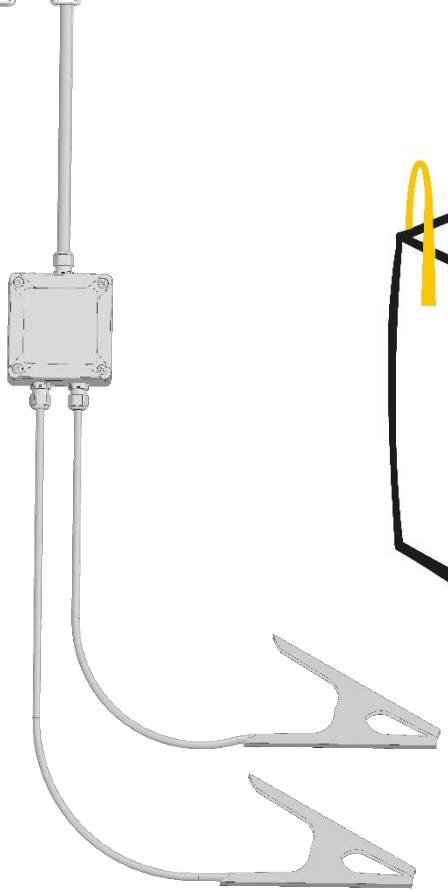
TRUSTED TECHNOLOGY

GROUNDING CONTROL DEVICE EKX-FIBC

Technical Description | English





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1. Danger of dust explosion with bulk solids

Solid bulk materials are frequently handled and stored in flexible big bags. Two physical aspects must be considered during the loading or unloading processes of these bags. Dust will be released due to the movement of the bulk materials. It forms together with the surrounding air an **explosive atmosphere**, outside and inside the bag. The following materials are classified as potentially explosive, for example:

- Flour, starch, rice, sugar, fruits in powder form
- Wood shavings, coconut coir, jute, cellulose
- Coal, soot, ash
- Metals, plastics, resins, rubber, PVC in powder form
- and many more

On the other hand, the collision and separation of the bulk particles during filling and emptying of the bags will lead to the **accumulation of electrostatics**. The uncontrolled discharge can generate a spark and thus ignite the dust cloud. A **dust explosion** will take place.

In order to reduce the risk of a dust explosion, **conductive big bags** must be used. There are two different types of these bags: with woven metal fiber or with woven carbon fiber. These fibers are connected to the grounding tabs of the big bag. From the grounding tabs the electrostatics can be dissipate safely to the earth potential. The disadvantage of using a simple bonding cable for dissipation of electrostatics is that the grounding resistance is not verified. That means, a mechanical damage on the cable, a poor connection of the grounding clamp, damages of the grounding tabs or fibers, or a not connected grounding clamp cannot be detected. To prevent from these dangerous situations, dedicated **grounding control devices** should be used according to the **state of the art**.

Most commonly used carbon fiber big bags are of type C according to IEC EN 61340-4-4, called **FIBC type C**. FIBC means Flexible Intermediate Bulk Container. These FIBC can be recognized by the woven carbon fibers, the carbon grounding tabs and the type C mark on the yellow label. For filling processes into these FIBC type C, TIMM has developed its Grounding Control Device **EKX-FIBC** incorporating a unique measurement principle. It provides a **very high level of safety** in hazardous areas due to its continuous monitoring of the grounding connection and its reliable object recognition of the FIBC, which increases the protection against incorrect handling actions by the operator.

EKX-FIBC

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2. Grounding Control Device EKX-FIBC

2.1. Functionality

The Grounding Control Device EKX-FIBC is used to monitor the filling and emptying process of Flexible Intermediate Bulk Containers FIBC type C **in accordance with IEC EN 61340-4-4**. It has two **special FIBC grounding clamps**, which are clamped to the grounding tabs of the FIBC before the filling or emptying. After connecting the clamps, the Grounding Control Device measures the proper contact, the electrical characteristics of the FIBC and the quality of grounding connection. The safe status is signalized with very **bright green LEDs**. The filling and emptying process can get started now safely. Additionally to the LED signal light, the **control outputs** are activated at the same time so that the safe state is also reported to the process control system. In case of a bad grounding connection or other dangerous situations, the LED switches to red and the control outputs report this state to the control system immediately. The filling or emptying process will be stopped before dangerous electrostatics accumulate.

2.2. Flexible installation with external measuring modules

The Grounding Control Device EKX-FIBC is explosion-proof according to **ATEX 2014/34/EU** and can be installed in **Zone 1 and 21**. For the optimal adaptation to local conditions, three product variants are available, which enables flexible system structure solutions.

- EKX-FIBC with **integrated measuring electronics in the main enclosure** to mount the device directly at the corresponding filling or emptying station of FIBCs.
- EKX-FIBC with an **external measuring module**: The main enclosure can be mounted at a distance of more than 20 m to the filling or emptying station, e.g. near to the power supply or the control rooms for process control. The connection between main enclosure and measuring module is made with an intrinsically safe cable. The measuring module at the FIBC station generates the measuring signal and transmits the measurement result back to the main unit. The measuring module contains the two grounding clamps for connecting to the FIBC.
- EKX-FIBC with **two external measuring modules**: In this variant, two measuring modules, each with two grounding clamps, are available for the monitoring of two neighboring FIBC stations.

EKX-FIBC with integrated measuring electronics

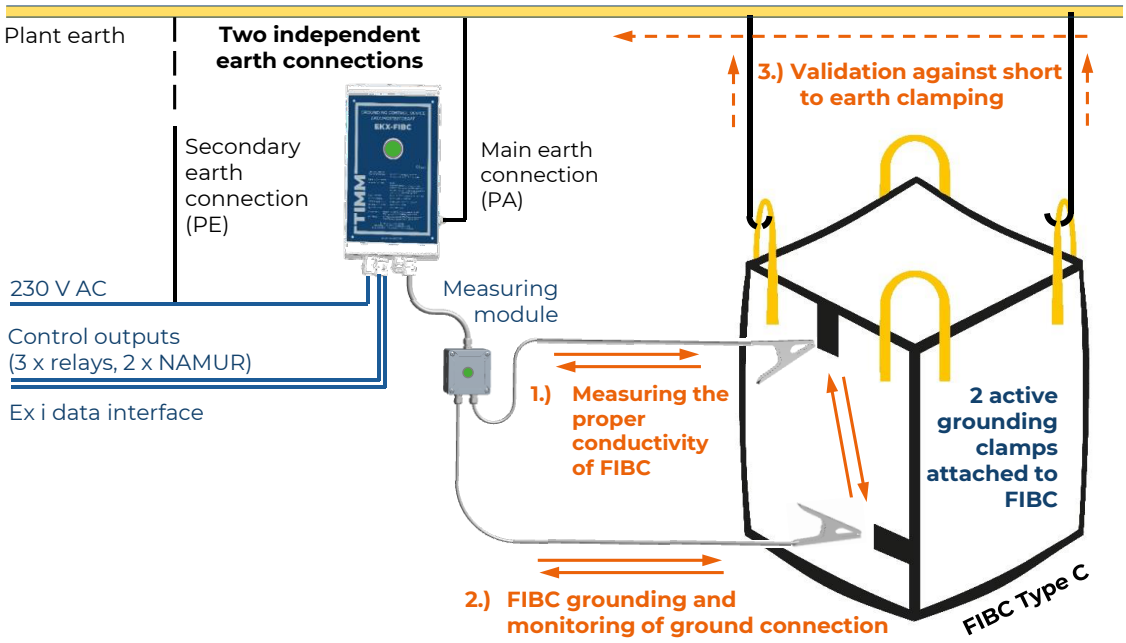
EKX-FIBC with an external measuring module

EKX-FIBC with two external measuring modules

2.3. Active 2-clamp measurement with object recognition

The TIMM measurement principle for grounding and recognition of FIBC is based on a new measurement method for this application. It is characterized by **two active grounding clamps**, an intrinsically safe measuring signal for the measurement of extremely high resistances of up to 10^8 ohms, an aware separation of the measuring signal from the influences of the earth potential, **adjustable limit values** as well as a **high robustness against disturbing influences** by advanced PLL phase regulation. The FIBC type C is plausibly detected by its electrical characteristics and safely grounded. The digital measurement technology allows extensive **diagnostic options**, a diagnostic memory and the transmission of status information via a **data interface**.

The main advantages of this measurement principle are the **reliable object recognition** and the proof of a safe **grounding connection**. An unauthorized release, e.g. caused by the connection of the grounding clamp to the bag hanger or other parts of the filling frame, by FIBC with too high grounding resistance, by influences of moisture, by the hand of the operator, mechanical disturbances (movement of the FIBC) or electrical interferences, is reliably avoided compared to conventional measurement with only one active grounding clamp. The measurements shown in the following schematic diagram are all realized by the two active clamps.



Active clamp measuring principle of EKX-FIBC for reliable object detection and grounding

2.4. Intelligent explosion protection

All devices developed by TIMM follow the **Intelligent Explosion Protection Concept (IEPC)**. This is based on the combination of the types of protection suitable for the application, the use of modern measurement methods and advanced safety functions as well as a user-friendly operation concept. The aim here is to implement the **highest safety level** in hazardous areas by means of device functions and the design of the device.

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IEPC Intelligent Explosion Protection Concept

HIGHEST LEVEL OF SAFETY
in hazardous areas

LEADING TECHNOLOGY
in monitoring, diagnostics, and configuration

EASY TO OPERATE
by ability to open housing in hazardous areas

The Grounding Control Device EKX-FIBC was designed with the types of protection: **intrinsic safety**, **increased safety** and **powder filling**. With this special combination of ignition protection types, the device can be easily opened for commissioning, service and configuration purposes on site. In gas hazardous areas, this is allowed in the Ex zone with power supply being active.

2.5. Special device features

The clearly visible main **LED signal light on the device** and a **second signal light on the measuring module** make it easy to overlook the correct grounding at the place, where the FIBC is handled. This allows individual FIBC grounding solutions to be set up.

LED Indicator on the main enclosure

LED Indicator on measuring module MBX

EKX-FIBC has extensive **diagnostic options** and can be configured for special applications. Diagnostic and configuration functions can be made intuitively on site with the **OLED displays** in the enclosure and a rotary switch with confirmation button. The **data interface** makes it possible to transfer the diagnostic information in the higher-level process control.

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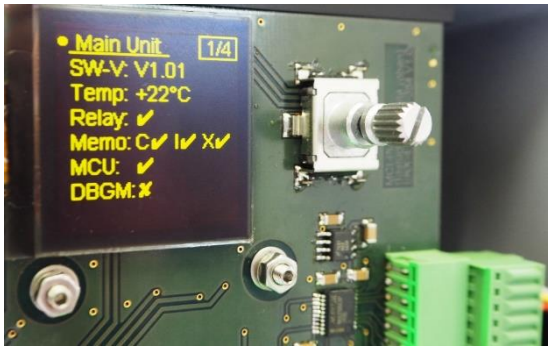


OLED Display and rotary switch for operating the menu (inside the main enclosure)

The grounding cables and grounding clamps are subject to daily use or may be mechanically damaged by improper handling. Grounding cables and clamps are the only wearing parts of the Grounding Control Device EKX-FIBC. To make their replacement as easy as possible, they are designed with intrinsically safe **quick-release couplings** on the measuring module.

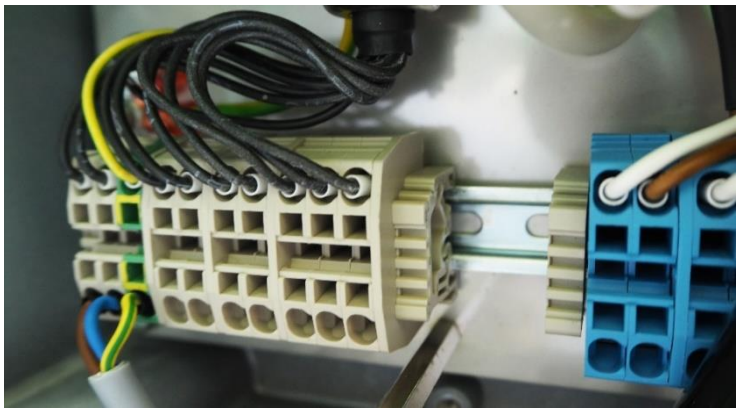
Quick-release couplings for grounding cables and clamps

The correct grounding contact to the FIBC is essential for the safe dissipation of electrostatic charges. **Special FIBC grounding clamps** with gold-plated contacts ensure a secure hold and good contact, even when the FIBC is moved during filling or emptying.

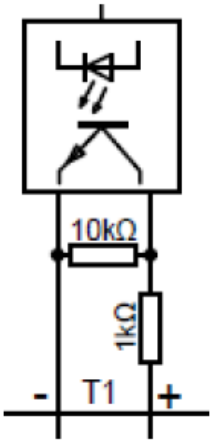
2 active FIBC grounding clamps

Grounding clamp on the FIBC carbon grounding tab

The filling of the FIBCs should only be possible if the correct grounding is proven. This can be achieved by integrating the grounding control device EKX-FIBC into the **process control system**. It has 2 self-monitoring, potential-free **relay outputs** as well as two intrinsically safe NAMUR-compatible **signal outputs**.



Ex e and Ex i connection compartment in main enclosure



NAMUR-compatible Ex i signal output

2.6. Technical data | Preliminary technical specification

The Grounding Control Device EKX-FIBC is currently in the certification process for **ATEX** and **functional safety** according to EN 61508. The device will be launched in July 2019.

General operating data

Device category according to ATEX Directive 2014/34 / EU: II 2 GD

Type of protection: Ex eb q [ib] IIB T4 Gb / Ex tb [ib] IIIC T80 ° C Db

Protection of enclosure: IP65

Power supply (in type of protection "Increased safety" Ex eb): 230 V AC ± 10%, 50 Hz, approx. 10 VA

Ambient operating temperature: -25 ° C to +60 ° C

Dimensions & Weight: 306 mm, 190 mm, 110 mm (H, W, D); app. 4,5 kg (without measuring module)

Contact release outputs in type of protection "Increased safety" Ex eb

Maximum values: 250 V AC, 3 A, 100 VA

► 2 release outputs: potential-free NO contacts, internally monitored

► 1 additional output: potential-free change-over contacts, not monitored

Electronic output in type of protection "intrinsic safety" Ex ib

Maximum values: Ui = 20 V, Ii = 20 mA, Pi = 400 mW

► 2 NAMUR-compatible transistor outputs for signaling the filling release

Data Interface in type of protection "intrinsic safety" Ex ib / RS485

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3. About TIMM

TIMM is a leading developer and manufacturer of high-quality safety technology "Made in Germany" for electronic measuring and control technology since 1963. Thanks to the Intelligent Explosion Protection Concept (IEPC), our products guarantee the highest level of safety for people, the environment and operation plant.

All TIMM products are developed and produced at our facility in Glinde near Hamburg. With the support from more than 40 sales partners of ours, we work for our customers worldwide.

Since 2018, we have been developing an intelligent access control system for wind energy plants for our new Renewable Energies business unit. TIMM's existing expertise in explosion-proof areas will be combined with future-oriented requirements from the wind industry.

4. Contact

Would you like to contact us regarding quotations, sales or technical advices? Our team is available for you under the following contact details.

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Further information about TIMM and our products can be found online. Visit us!

Homepage **www.timm-technology.de**
YouTube https://www.youtube.com/channel/UCvuDv6ztAPueF2r_fcPxwRg

5. Your Feedback

Your opinion is very valuable to us!

You have suggestions for improvement, suggestions, criticism or praise for us? We look forward to sharing your opinion with us. Only in this way can we constantly improve our customer service.

Our marketing department welcomes your feedback:

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