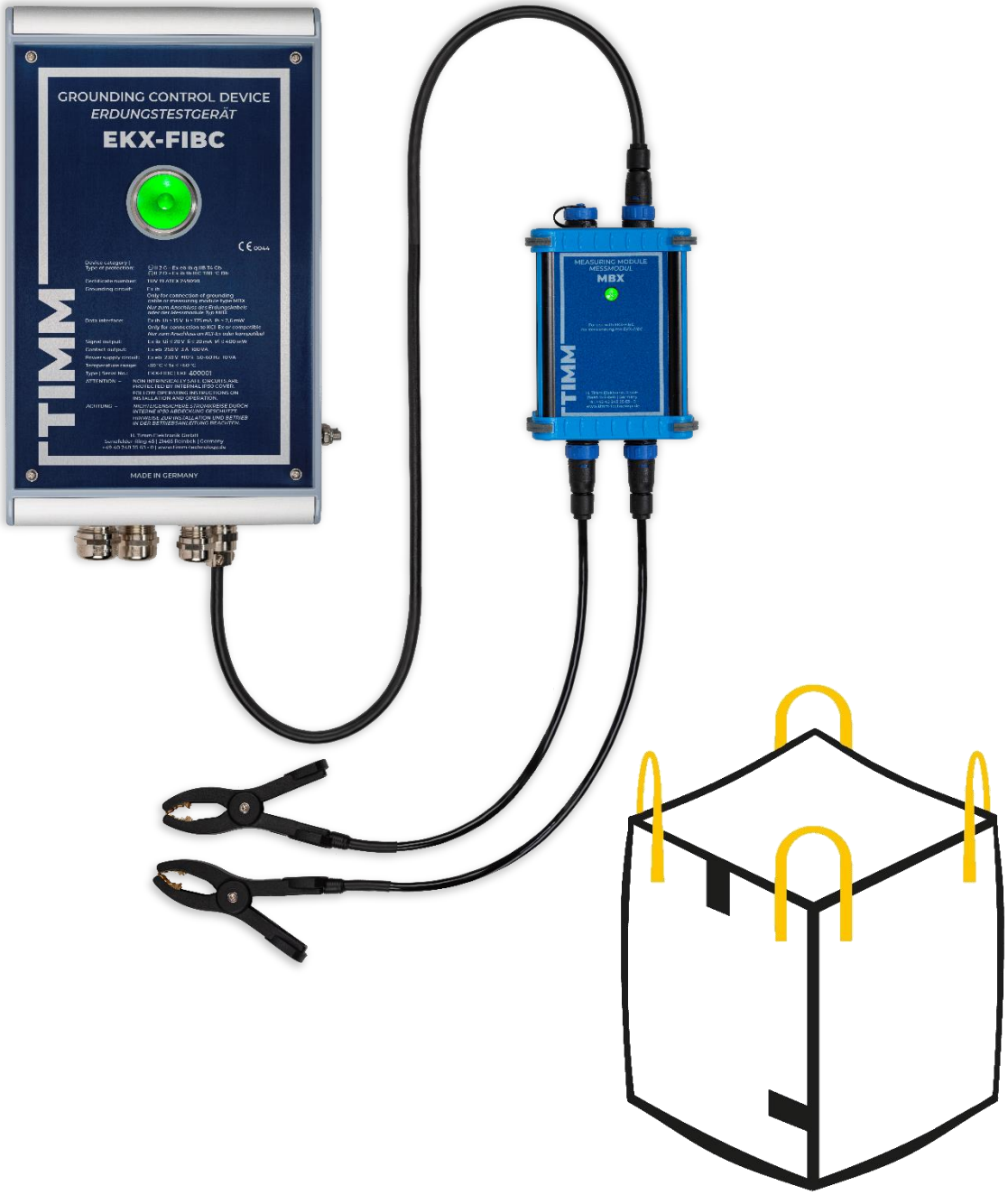
GROUNDING CONTROL DEVICE EKX-FIBC

TECHNICAL DESCRIPTION | ENGLISH



Content

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, coke, soot, ashes
- 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 exclude this potential hazard, **grounding control devices** should be used that correspond to the current **state of the art** and continuously monitor the **quality of the grounding connection**.

Most commonly carbon fiber big bags of type C according to **EN IEC 61340-4-4** are used, just called **FIBC type C** for short, where FIBC means flexible intermediate bulk container. These FIBC can be recognized by the woven carbon fibers, the carbon grounding tabs and the type C marking on a yellow label. For filling processes into these FIBC type C, TIMM has developed its Grounding Control Device **EKX-FIBC** incorporating a unique 5-fold measuring principle.

This provides a **highest level of safety** in hazardous areas due to its continuous monitoring of the bonding connection and its reliable object recognition of the FIBC, which increases the protection against incorrect handling actions by the operator.

2. Grounding Control Device EKX-FIBC

2.1. Compliance to latest European Standards

The grounding control device fully complies with the latest editions of the European standards **EN 60079-0 ff.** for equipment intended to be used in potentially explosive atmospheres, and is **ATEX-certified** according to **directive 2014/34/EU**. It is approved as **device of category II 2 GD** for use in gas hazardous areas of **zones 1 and 2** as well as in dust hazardous areas of **zones 21 and 22.** As a result, it complies with all relevant operating and working regulations and can be used within the scope of filling and emptying **big bags type C** according to **EN IEC 61340-4-4**.

2.2. Functionality

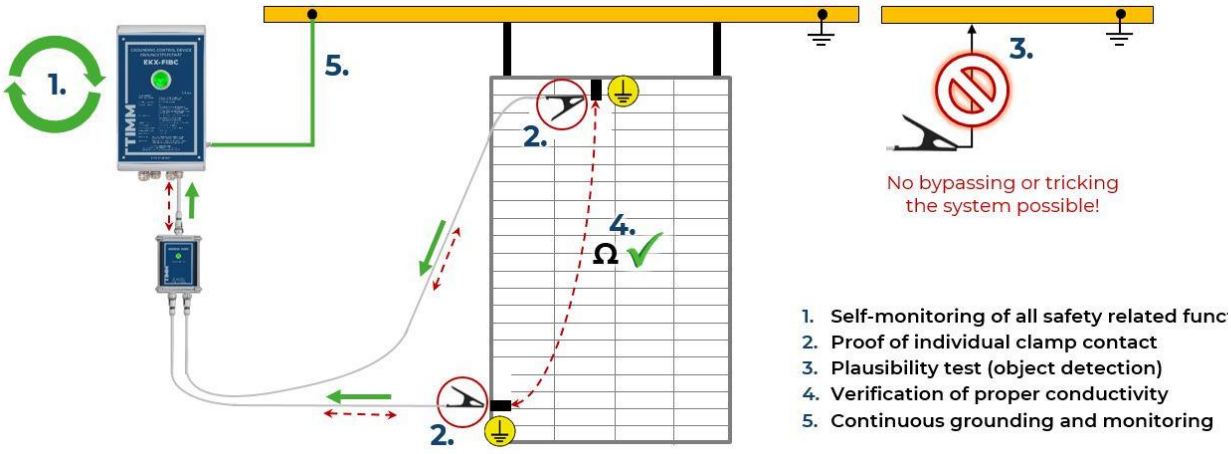
The Grounding Control Device EKX-FIBC has two **special FIBC grounding clamps**, which are clamped to the grounding tabs of the FIBC before filling or emptying. After connecting the clamps, the Grounding Control Device measures the proper contact, the electrical characteristics of the FIBC and the quality of grounding connection. The safe status is signalized with very **bright green LEDs** at the main device and the optional measurement module. This clarifies the user that he can start the filling or emptying process. 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.

2.3. TIMM 5-check measuring principle

The unique **5-check measuring principle** by TIMM for the recognition and grounding of FIBC is based on a 5-fold measurement method that is new 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 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 measuring principle are a **reliable object recognition** and the proof of a **safe grounding connection**.

2.4. Unique object recognition of FIBC type C

With the 5-check-measuring principle, a FIBC type C can be plausibly detected by its electrical characteristics and safely grounded. In order to do so, the **quality of the clamp contact** is checked and the electrical characteristics are being compared with **preset values**. Only if both values are plausible and within the limits, a filling release is given. The main advantages of this measuring principle are a **reliable object recognition** and the proof of a **safe grounding connection**. All measurements are done within a **closed measuring circuit** what makes them robust **against disturbing influences.** An unauthorized release, for example caused by manipulation of the device or improper use, is thus avoided much more effectively than with conventional measurement with only one grounding clamp against earth potential. The measurements shown in the following schematic diagram are all realized by the two active clamps.



5-check measuring principle of EKX-FIBC for reliable object detection and grounding

2.5. Easy commissioning and maintenance

Due to the preconfigured factory settings and the easy-to-open housing, the device is mounted in the shortest possible time on site, electrically connected and ready for use. If required, the digital measuring technology can be adapted to specific conditions on site via the integrated **OLED display**. Except for visual inspections, the device is basically maintenance-free. The electronic circuit works reliably for years and requires no readjustment. A special coating of the housing ensures a high resistance to chemicals and environmental influences. Cables damaged by mechanical effects can be exchanged quickly and easily via the connection terminals integrated in the main housing and the **quick couplings** at the optional measuring module.

2.6. Flexible installation with external measuring modules

For the optimal adaptation to local conditions, three product variants are available, which enable 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

2.7. Accessories

Measuring module

Connection cable (10 m | 20 m)

Clamps with cables

Clamp hanger

Measuring module hanger

Testing equipment

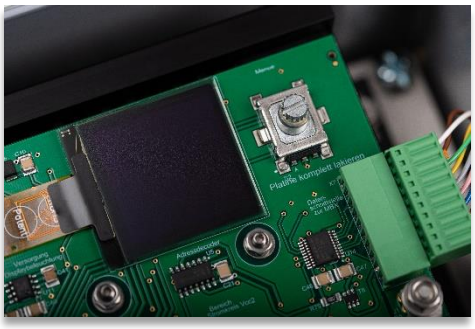
2.8. Special device features

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.



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 with measuring module

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**.

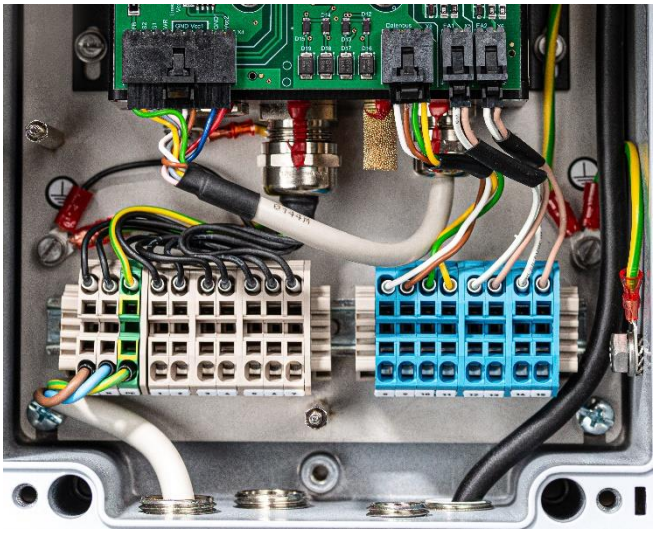
Therefore, the EKX-FIBC is equipped with **five control outputs**:

- 2 potential free, internally monitored NO contacts
- 1 potential free changeover contacts
- 2 NAMUR-compatible, electrical transistor outputs

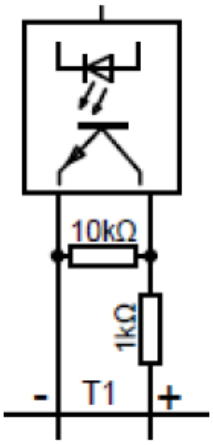
The control outputs can be wired into the process control system to automatically start filling or emptying processes or interrupt them if dangerous situations occur.

The contact enable outputs are built redundant, are internally monitored and undergo a self-test before each operation. Forced operation of the contacts within the relays can reliably detect malfunction of the signal outputs and thus potential safety risks. The NAMUR-compatible electronic enable outputs can be configured with static or dynamic output signals. By using the dynamic oscillating enable signal in conjunction with a suitable signal evaluation, failures of the external signal transmission paths (cable break, faulty connection) can also be detected. The combination of the two output types, NO and electrical contacts, offers flexible connection and integration options in existing and planned systems and processes.

The changeover contact can be used for not safety relevant control functions like external indicators (e.g. lamps, warning lights, sirens).

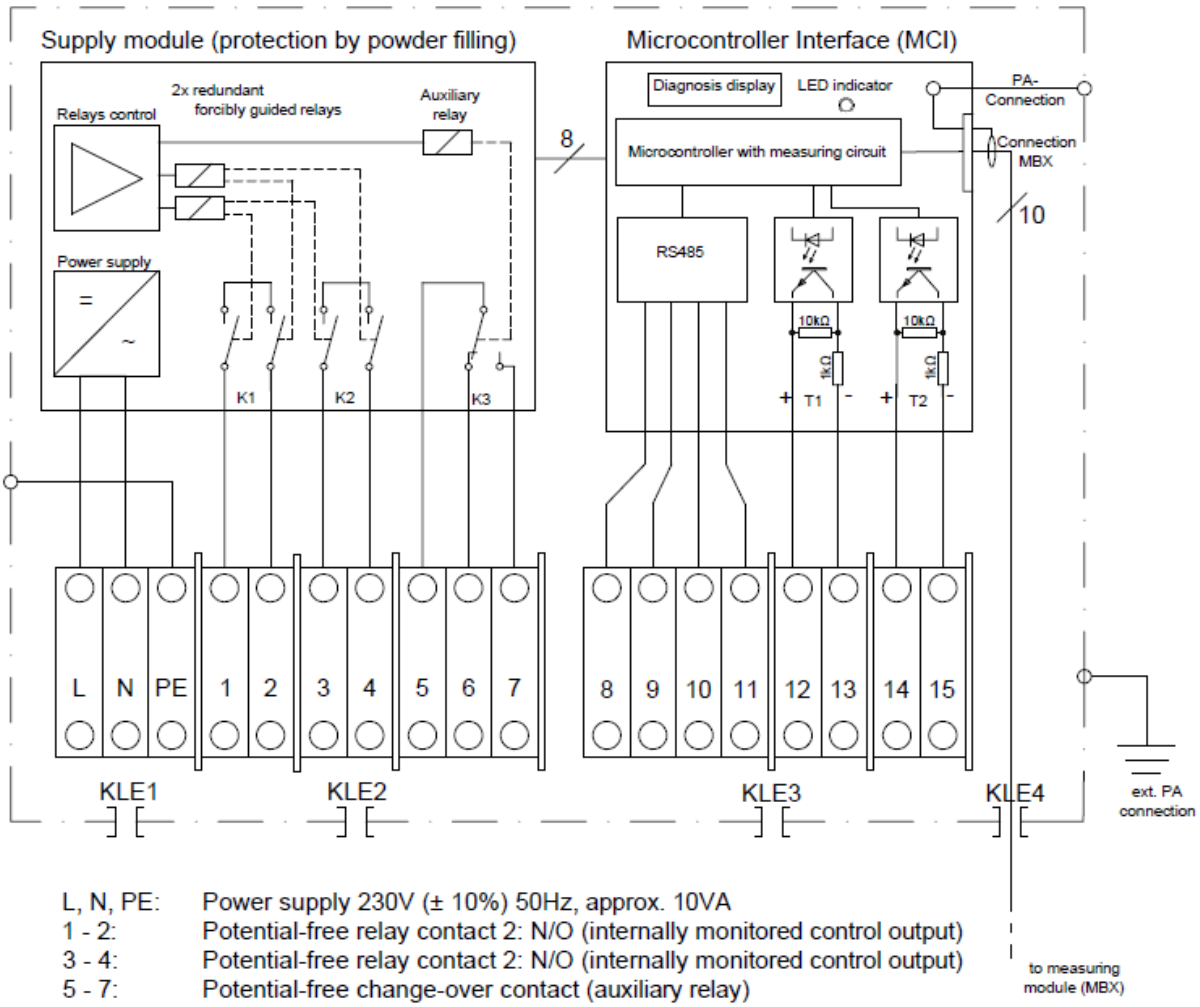


Ex e and Ex i connection terminals in main enclosure



NAMUR-compatible Ex i signal output

2.9. Electrical wiring diagram



L, N, PE:	Power supply 230V (± 10%) 50Hz, approx. 10VA
1 - 2:	Potential-free relay contact 2: N/O (internally monitored control output)
3 - 4:	Potential-free relay contact 2: N/O (internally monitored control output)
5 - 7:	Potential-free change-over contact (auxiliary relay)
	Contact rating (terminals 1-7): max. 250VAC, 3A, 100VA
8-11:	Ex ib data bus for connection to KCIEx
	Maximum values: Ui ≥15V, Ii ≥175mA, Pi ≥ 2.6W
12 - 13:	Potential-free Ex-i transistor output, NAMUR-compatible
14 -15:	Potential-free Ex-i transistor output, NAMUR-compatible
	Maximum values: Ui ≥20V, Ii ≥20mA, Pi ≥400mW
	Only use 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 7-12mm
KLE2	(M20) Contact outputs cable diameter 7-12mm
KLE3	(M16) Namur transistor output cable diameter 4.5-10mm
KLE4	(M20) Connection cable to measuring module (MBX) with 2x earthing clamps

2.10. Technical specifications

General operating data

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

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

EU-Type Examination Certificate: TÜV 19 ATEX 249098

IECEx certificate: IECEx TUN 19.0020

Protection of enclosure: IP65

Power supply: 230 V AC ± 10%, 50-60 Hz, about 10 VA (in type of protection "increased safety" Ex eb)

Ambient operating temperature: -30 °C to +60 °C

Dimensions: 306 mm, 190 mm, 110 mm (H, W, D)

Weight: about 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 outputs 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

The Grounding Control Device EKX-FIBC is currently in the certification process for **functional safety** according to EN 61508.

3. Intelligent explosion protection

All devices developed by TIMM follow the **Intelligent Explosion Protection Concept (IEPC)**, which 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.

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 has been designed with the types of protection **intrinsic safety**, **increased safety** and **powder filling** as well as **protection by enclosure**. 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.

4. 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 ex-proof products grant the highest level of safety for people, the environment and operation plants.

All TIMM products are developed and produced at our new facility in Reinbek 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.

5. 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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YouTube https://www.youtube.com/channel/UCvuDv6ztAPueF2r_fcPxwRg

6. 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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