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TRUSTED TECHNOLOGY

BEST PRACTICE FOR GROUNDING OF BIG BAGS IN HAZARDOUS AREAS
FULFILLING OPERATOR RESPONSIBILITY WITH OBJECT DETECTION

What are your responsibilities as an operator? How can you address these challenges with legal certainty?

Operator responsibility as risk factor

Operator responsibility is a key issue in any business. Operators are required to take every reasonable action to protect their employees and the environment. Non-compliance with operator obligations can lead to severe punishments.[1] In order to create an appropriate working environment and to implement all regulation correctly, operators have to establish clear rules and to ensure that they are complied with.

In manufacturing industries, occupational and operational safety of employees is one of the key issues that any operator faces. International laws, such as the European directives 2009/104/EC and 98/24/EC, regulate the protection of employees when handling potentially combustible materials.

These directives have to be transformed into national legislation by EU member states. In Germany, these include in particular the Industrial Safety Regulation (BetrSichV) and the Hazardous Substances Regulation (GefStoffV).

Basic operator obligations

These laws require the employer in principle to carry out a risk assessment and to select the necessary protective measures[2] according to the current safety standards. In general, technical safety measures have priority over organizational and personal protective measures. When working in potentially explosive environments, the operator is required to prepare an explosion protection document as part of the risk assessment.

This contains e. g. the identified hazards, a zone classification depending on the degree of danger, and an explosion protection concept which identifies the resulting safety precautions.[3] Basic requirements for the work equipment demand, amongst others, that:[4]

- Work equipment is provided with the required safety equipment.
- Installation or replacement of parts and maintenance work can be performed as far as possible without dismantling the safety equipment.
- Protective devices cannot be bypassed or rendered ineffective.
- Safety systems in potentially explosive areas comply with Directive 2014/34/EU (ATEX).

However, the operator's duties do not end with the initial commissioning of the system. Rather, starting from this point, the complex control and documentation of these processes and their adherence begins. With regard to protection and safety equipment, it is the responsibility of the operator to ensure that they are functional in the day-to-day operation and cannot be easily manipulated nor circumvented.[5]

The difference between theory and practice

What at first glance seems easy and sensible often causes problems in practice. The biggest problem that arises for the operator or the authorized person is the constant monitoring of the intended use and the integrity of protective devices. Ignorance, lack of safety thinking and non-compliance of regulation often lead to the circumvention of safety measures and protective devices - a danger for the workers, the environment and not least for the operator. Especially in explosive hazardous areas, the highest level of safety and the constant use and verifiability of safety equipment must be provided to avoid these risks.

The problems of conventional grounding systems for big bags

There is often a lot of catching up to do in the field of electrostatic grounding of big bags in explosion hazardous areas.

1| Cf.: www.tuv.com/media/germany/10_industrialservices/download si05/Betreiberverantwortung_TUV-Rheinland.pdf
2| Cf.: §4 BetrSichV
3| Cf.: §6 GefStoffV
4| Cf.: §9 BetrSichV
5| Cf.: §6 BetrSichV

Driven by underestimation of dusts' explosion hazards, unsupervised grounding solutions with simple clamps and cables are installed in the workplace as a protective measure. An automated monitoring of correct use and the integrity of the ground connection is not given in this application.

Another grounding variant are conventional grounding monitoring devices. These continuously measure compliance with the maximum resistance of $10^8 \Omega$[6] in the discharge connection and, in the event of danger, can interrupt the work process via their electronic control outputs and simultaneously trigger a safety notification. In the most common application, one clamp is connected to the FIBC bag and a second clamp leads to the designated grounding point of the facility via a grounding cable. Within this grounding loop, the maximum resistance is then measured and continuously monitored.

But this very type of measurement is the weak point of the system. On the one hand, the wide grounding loop makes it very susceptible to external influences. On the other hand, and much more problematic, is that these devices only check compliance with the maximum resistance. This means in practice: If the grounding clamp is connected to an object or point on the system the grounding resistance of which is within the required limits, the device will give filling release without a proper grounding connection of the big bag. As a result, the two most important questions remain unsolved:

- Is the device used as intended and is it not being bypassed?
- Is the device functional and can it perform its task when used as intended?

The problems of conventional grounding systems for big bags

These two problems can only be solved with state-of-the-art equipment as required by law. These offer two particular advantages over conventional ground monitoring systems:

1. An object detection for detecting a big bag based on its electrical characteristics
2. Self-monitoring of all safety-related device functions

Object detection is already a recognized standard in the grounding of tank trucks. These devices check different electrical properties of the connected object via an intrinsically safe measuring signal in a closed measuring and grounding circuit. The values determined are then compared with the stored limit values in the context of a plausibility check and filling permission is only given if the values match. This offers the decisive advantage that the device can no longer be bypassed simply by clamping the grounding clamp elsewhere, for example to the filling platform.

A self-monitoring function of the device should also ensure that all safety-related functions are intact and the device is functioning properly. In the event of malfunction, this should be automatically detected and signaled to the user. An internal diagnostic function and display helps to identify and correct the error. In order to meet the legal requirements, maintenance work and the replacement of wearing parts (grounding clamps, cables) should be possible at best without dismantling the device.[7] Savings in workload and the associated costs are positive side effects.

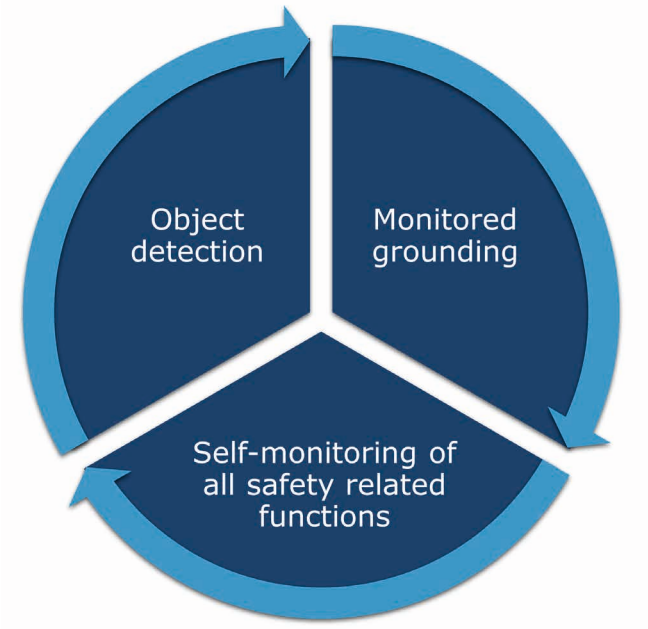


Figure 1: The three factors of a state-of-the-art big bag grounding system

TIMM EKX-FIBC – Best practice for the supervised grounding of big bags

One solution to the problems of conventional grounding systems is the TIMM Grounding Control Device EKX-FIBC. It combines the legal regulations and best practice requirements of the operators in one product and therefore reflects the current state of the art.

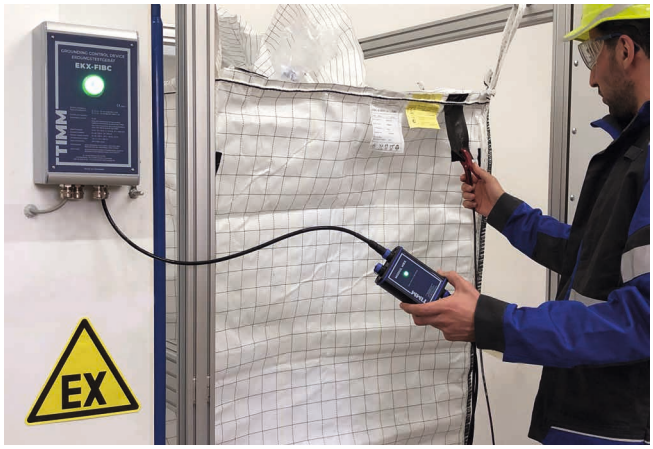
It can be used in hazardous areas 1/21 and 2/22 and complies with all internationally relevant standards. Thanks to the unique 2-clamp measuring principle with an intrinsically safe and independent measuring and grounding circuit, an object detection for big bags has been realized, that detects operating errors or manipulations.

6| Cf.: DIN EN IEC 61340-4-4 (para.: 7.3.1)

7| Cf.: §9 BetrSichV

For this purpose, both clamps are connected to the grounding points of the big bag by the operator. The device checks the electrical properties of the bag and dissipates the static charge via both clamps to ground potential. A filling release via the NAMUR and switching outputs is only given if the electrical properties of the object are plausible and the earth connection complies with the legal limit values. The advantage of connecting two clamps is that grounding and object detection run in a closed measuring and grounding circuit protected against external influences. Thus, a more accurate and reliable measurement and safe grounding via both clamps is possible. In the event of danger, the work process is stopped by the device and danger is indicated by a red LED light on the device.

The permanent self-monitoring of all safety-related functions in conjunction with the integrated self-diagnostic system ensures the integrity of the system and helps to find a fast and efficient solution to a malfunction.



Summary of the main points

1. The operator has to ensure the safety of his employees, the plant and the environment to the best of his knowledge and belief.
2. Legal rules provide a framework that should be strictly observed in order to prevent accidents and legal punishment.
3. The laws demand state-of-the-art safety equipment, especially to:
   a. Avoid incorrect operation and manipulation.
   b. Ensure readiness and functionality of the device.
4. The intended use of conventional grounding systems can only be ensured by personal inspection.
5. Grounding with object recognition in conjunction with permanent self-monitoring is a state-of-the-art technology in big bag grounding and should therefore be taken into consideration by operators focusing both on safety and efficiency.

For further questions on safety in hazardous areas or regarding modern grounding control devices, you are welcome to contact our sales department at **+49 40 248 35 63 - 0** or **info@timm-technology.de**. We look forward to helping you.