

MARINE GROUNDING SYSTEM SEK-3

Technical Description | English



MARINE GROUNDING SYSTEM
SCHIFFSERDUNGSSYSTEM
SEK-3

CE 0044

TIMM

Device category: II 2 G
 Type of protection: Ex eb Ib q [Ib] IIB T4 Cb
 Certificate number: PTB 17 ATEX 2024
 IECEx PTB 17.0036
 Clamp circuits: Ex Ib IIB Uo ≤ 11,2 V Io ≤ 475 mA Po ≤ 1,34 W
 Grounding circuit: Ex eb IIB Umax = 1 V Imax = 25 A
 Only for connection of marine grounding cable
Nur zum Anschluss des Schiffserdungskabels
 Signal output: Ex Ib IIB Ui ≤ 20 V Ii ≤ 20 mA Pi ≤ 400 mW
 Ci, Li negligibly small
 Ci, Li vernachlässigbar klein
 Contact output: Ex eb IIB Umax = 250 V
 Imax ≤ 3 A Pmax = 100 VA
 Power supply: Ex eb IIB 50 % 50 - 60 Hz 15 VA
 Temperature range: -40 °C ≤ Ta ≤ +60 °C
 Type | Serial No.: SEK-3 |

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MADE IN GERMANY

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1. General Information

To be certified for use in gas hazardous areas of zone 1 according to European ATEX Directive 2014/34/EU.

The explosion-proof Marine Grounding System SEK-3 ensures the safe and monitored equalization of a voltage difference between ship and shore that occurs during filling processes of petrochemical, chemical or other products.

To prevent such unregulated current flow, different guidelines for tank ships and terminals specify to insulate the ship from the shore electrically. Typically, non-conductive flanges are used to insulate ships from the shore, to take the physical effect into consideration. However, there are still risks of a conductive connection might be created by mistake or by chance, e.g. at gangways, with metal ropes and tools. This risk consists in total operating time of the terminal and over a variety of

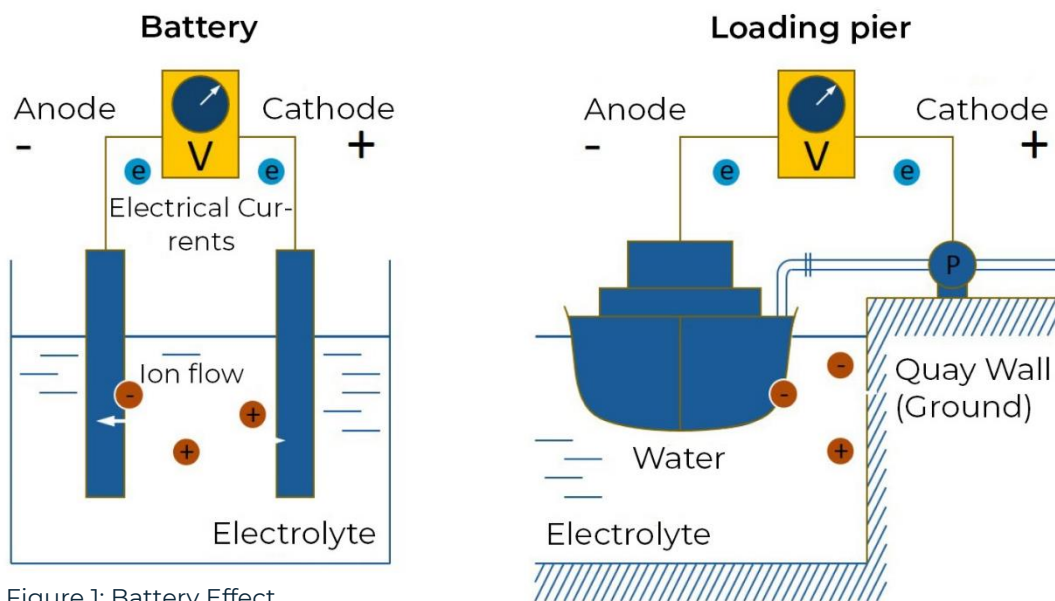


Figure 1: Battery Effect

2. Functional Principle

The danger of equalization currents between vessels and loading bay occurs by electro-chemical processes, independently of the filling. The ship, the metal construction of the loading bay and the water as electrolyte in between form a galvanic cell (see Figure 1). Between the electrodes of this cell a voltage difference exists. Any conductive connection between the electrodes will lead to an indefinite electrical current flow. A current flow can cause hotspots at connection points and build sparks while disconnecting inductive elements. These sparks could cause a fatal ignition in hazardous areas. The effect of a voltage difference takes place as soon as the ship has been docked, and not only during loading and unloading

ship loading processes. Regarding this aspect, insulating by means of flanges as the only safety procedure establishes no sufficient safety conditions. A high-conductive and monitored voltage equalization bonding line such as a marine grounding system is recommended. The Marine Grounding System is an effective risk reduction and explosion protection method in addition to the flange insulating. The SEK-3 Marine Grounding System ensures a higher level of safety at the ship and shore.

3. Application

The Marine Grounding System is attached to the ship, using the special SKS-4A Marine Grounding Clamp, directly after the vessel has been docked and before any loading equipment is mounted. The potential difference between ship and shore will be reduced by the conductive bonding line. As long as safe conditions are detected, the signal light at the marine grounding system shows status “green” (see Figure 2). The impact of errors in handling and operating with metal equipment on board or on the loading bay will not create a hazardous situation.

In case of an unintended loosening of the clamp or any change of the electrical conditions between ship and shore apart from safe specification, the SEK-3 Marine Grounding System will immediately interrupt the bonding connection. Any remaining or induced voltage difference at the cable will be dissipated securely inside the system and kept away from the connection point at the ship. As long as safe conditions are not detected, the signal light at the marine grounding system shows status “red”.

Before and during contacting the Marine Grounding Clamp, the connection to the voltage equalization inside the control system remains interrupted. This ensures that the electrical conductive bonding line connection between ship and shore is released, when a proper mechanical an electrical contracting is monitored.

Another monitoring function of the SEK-3 Marine Grounding System ensures the recognition of active voltage sources around (e.g. an active cathodic corrosion protection system). The monitored voltage of the object itself and more monitoring functions of internal control functions display failure status and activate external alarm signals in case of any fault

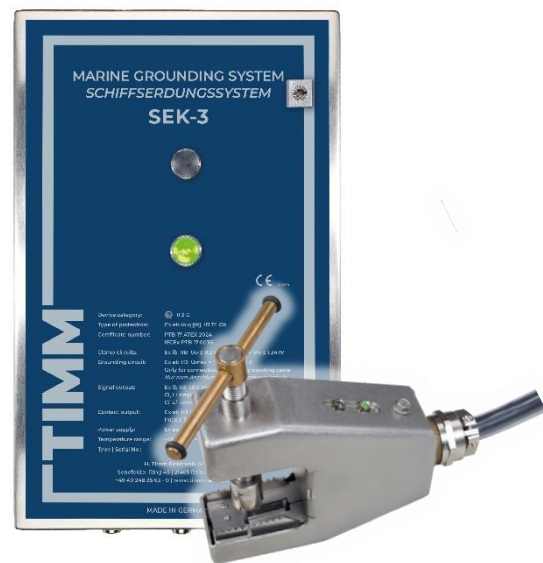


Figure 2: Clear visible signal lights

4. Adequacy of the Marine Grounding System

Conventional Grounding Control Devices or simple voltage-equalization bonding lines are not suitable for the described case. Using an electrical conductive connection between ship and shore without monitoring functions can be dangerous and should not be considered.

The internal contacts of the Marine Grounding System are engineered for extra high current-voltage-resistance. If the limit will be exceeded, the connection will be automatically interrupted. The Marine Grounding System has a compulsive interruption system of the voltage equalization line that comes in operation, when the clamp is connected incorrectly or before pull off (e.g. loosening by force).



Figure 3: Tank farm with ship loading and unloading area

Grounding Control Devices, which ensures the controlled discharge of electrostatics occurring during filling processes to road trucks or railway tank wagons, come up with a high-ohmic bonding line and clamp contact. While an effective voltage equalization between ship and shore takes place in m Ω range, for discharging electrostatics $10^6 \Omega$ are sufficient. In contrast to the Marine Grounding System SEK-3, a Grounding Control Device is in a conductive state during attaching.

5. Special features of the Marine Grounding System

5.1. Compliance to European standard

The Marine Grounding System type SEK-3 is designed in full compliance to the newest editions of European **ATEX and EMC standards**. It is approved as electrical device of **category II 2 G** for use in hazardous areas of **zone 1**.

5.2. Intelligent Explosion Protection

Timm's **intelligent explosion protection concept (IEPC)** combines protection by intrinsic safety, increased safety and powder filling. With this combination of protection types, the Marine Grounding System can be opened in gas hazardous areas for configuration and to see the System Information Display. The construction and selection of the components under the aspect of explosion protection increases the reliability of the SEK-3.

5.3. Special Marine Grounding Clamp

The SEK-3 Marine Grounding System includes the completely newly developed SKS-4A Marine Grounding Clamp. It is made of high sturdy stainless steel. The fastening handle design allows to attach the clamp with low force (see Figure 4).

The limit switch evaluation of the flexible clamping jaws and the contact resistance measurement enables the safe detection of proper clamp attachment. The design of the clamp guarantees a very reliable electrical and mechanical connection. When the clamp is tightened and a proper connection is detected, the Marine Grounding System indicates this at its front and by electronic outputs. To improve usability, the SEK-3 features a special grounding clamp with additional status LEDs. The operator at the attachment point gets informed directly whether the clamp is attached properly or in need for retightening. This is also important in particular to the large distance between the installed Marine Grounding System and

the contact patch for the grounding clamp at the ship.



Figure 4: Connected Marine Grounding Clamp

5.4. High-conductive Marine Grounding Cable

A safe voltage equalization and measure line between ship and shore is ensured by a very low-ohmic, multi-wire Marine Grounding Cable. The Cable is available up to a length of 30 meters.

5.5. Bright signal lights at the device front

Two clearly visible signal lights at the front of the SEK-3 housing indicate the operational status widely. The signal lights stand out of the housing front, so that they are still clearly visible by a view from side and from a high distance range.

5.6. Monitoring functions | System information display

The control device implements several intern and extern monitoring and measuring functions that enable a safe and effective operation. The intern monitoring reviews the correct functions of safety relevant circuit areas. The evaluation of extern signals is also subject to consequent plausibility checks. The low-ohmic bonding line is permanent monitored during operation. Detailed status information is available inside the housing at a system information display (see Figure 5), that enables

an effective diagnosis, e.g. for error diagnosis.



Figure 5: System-Info insight the housing

5.7. Control and Signal Outputs

For integration of the Marine Grounding System to the automatic control system of the filling, the SEK-3 comes with voltage-free contact outputs and electronic signal outputs in accordance to the NAMUR-standard:

- 1 contact release output
- 1 electronic release output
- 2 configurable switch contact outputs
- 1 configurable electronic output
- 1 alarm contact output

Filling release is given by a voltage-free and internally monitored contact output or by an intrinsically safe electronic output. By integration of the Marine Grounding System to the automatic control system of the filling, a compulsory use of the Grounding System is enabled. Two configurable changing contacts, one configurable electronic output and one additional alarm contact are available. The configurable contacts can be set to indicate different operating states for evaluation at the control room. The alarm contact signals potentially unsafe situations, e.g. overvoltage or overcurrent at the bonding line, internal failures as well as a deactivated marine grounding to warn immediately and to prevent from using the system when safe conditions cannot be assured.

5.8. Area of application

The type of explosion protection makes the Marine Grounding System applicable to installations in **zone 1** areas with **gas group IIB** for filling even pure Ethanol. Furthermore, with its extended temperature range from **-40 °C up to +60 °C**, the SEK-3 provides reliable operation under extreme climate conditions.

6. Technical Specifications

6.1. Operating data

- EU-Type-Examination Certificate No.
PTB 17 ATEX 2024
- Device category according to 2014/34/EU
II 2 G
- IECEx Certificate
PTB 17.0036
- Type of protection
Ex eb ib q [ib] IIB T4 Gb (SEK-3)
Ex eb ib IIB T4 Gb (SKS-4A)
- Protection of enclosure
IP65
- Power supply
In type of protection „increased safety“ Ex eb IIB
110, 120, 220, 230 V \pm 10 %, 50-60 Hz approx. 15 VA ▶
- Ambient temperature range
-40 °C to +60 °C
- Dimensions
650 mm, 380 mm, 245 mm (H,W,D)
- Weight
Approx. 25 kg (without cable)

6.2. Equipotential bonding circuit

- Type of protection “increased safety ”
Ex eb IIB

Only for connection of the cable of the associated Grounding Clamp SKS-4A.

- Maximum operating values:
 $U_{max} = 1 \text{ V}$, $I_{max} = 25 \text{ A}$
- Maximum cable length:
 $L_{max} = 50 \text{ m}$ (Ex-specification, functional limitations must be observed)

6.3. Grounding clamp circuits

- Type of protection
„intrinsic safety“ Ex ib IIB

Only for connection of the cable of the associated Grounding Clamp SKS-4A

- Maximum values
 $U_o = 11.2 \text{ V}$, $I_o = 475 \text{ mA}$,
 $P_o = 1.34 \text{ W}$, $L_o = 1 \text{ mH}$, $C_o = 2.7 \mu\text{F}$

6.4. Control and output circuits

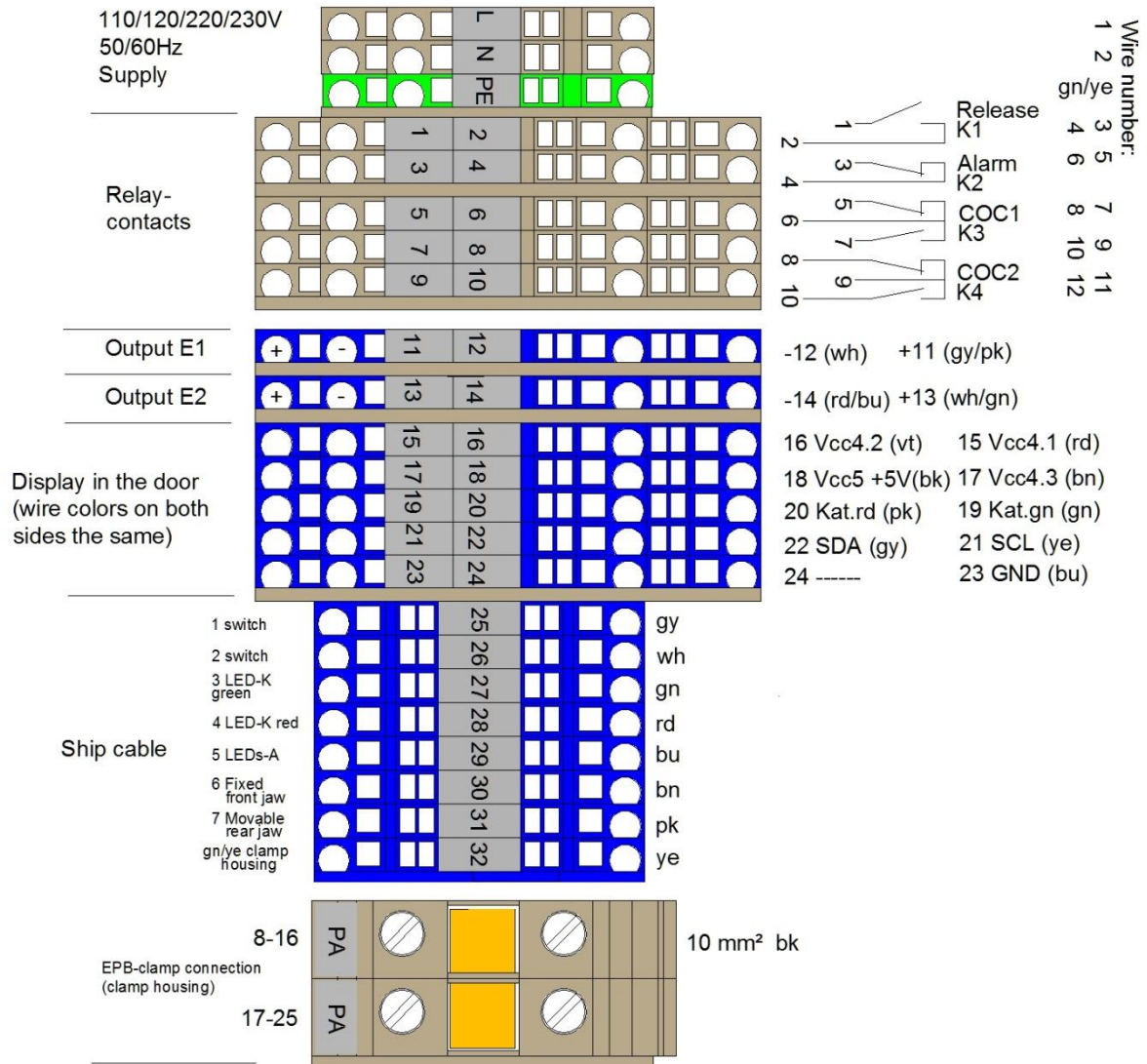
Contact output

- Type of protection „increased safety“
Ex eb IIB
- Maximum values:
250 V AC, 3 A, 100 VA
 - ▶ 1 filling release contact, voltage-free closing contact (N/O contact)
 - ▶ 1 alarm output, voltage-free opening contact (N/C contact)
 - ▶ 2 additional signal contacts, 2 voltage-free switch-over contacts

Electronical outputs

- Type of protection “ intrinsic safety”
Ex ib IIB
- NAMUR- compatible transistor output
- Maximum values: $U_i = 20 \text{ V}$, $I_i = 20 \text{ mA}$, $P_i = 400 \text{ mW}$, C_i and L_i negligibly small

7. Connecting diagram



8. International Approvals

The SEK-3 Marine Grounding System is approved for use in hazardous area of **zone 1** according to European Explosion Prevention Directive 2014/34/EU (**ATEX**) and the international **IECEx** certification scheme.



Europe (EU + EFTA)
EU-Type-Examination-Certificate
PTB 17 ATEX 2024



Australia | Oceania
Certificate IECEx PTB 17.0036

9. Contact us

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