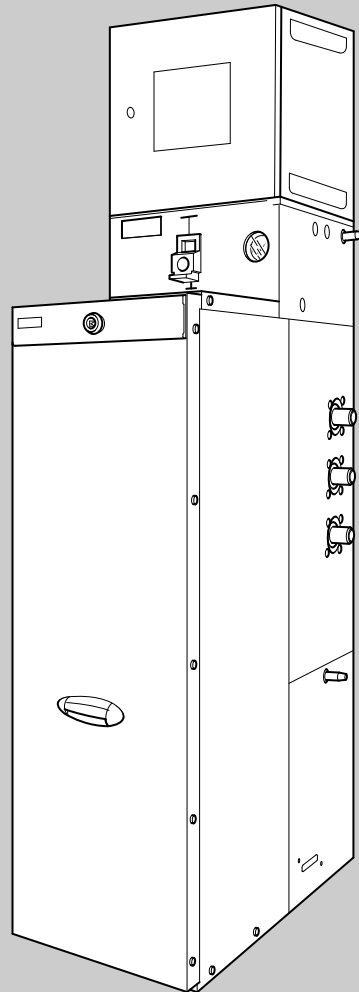


# SF<sub>6</sub>-insulated, extensible busbar earthing panel

Type GAE1250 -1E-/4/ for accessible switchgear rooms  
for rated voltages of up to 24 kV

## OPERATING INSTRUCTIONS





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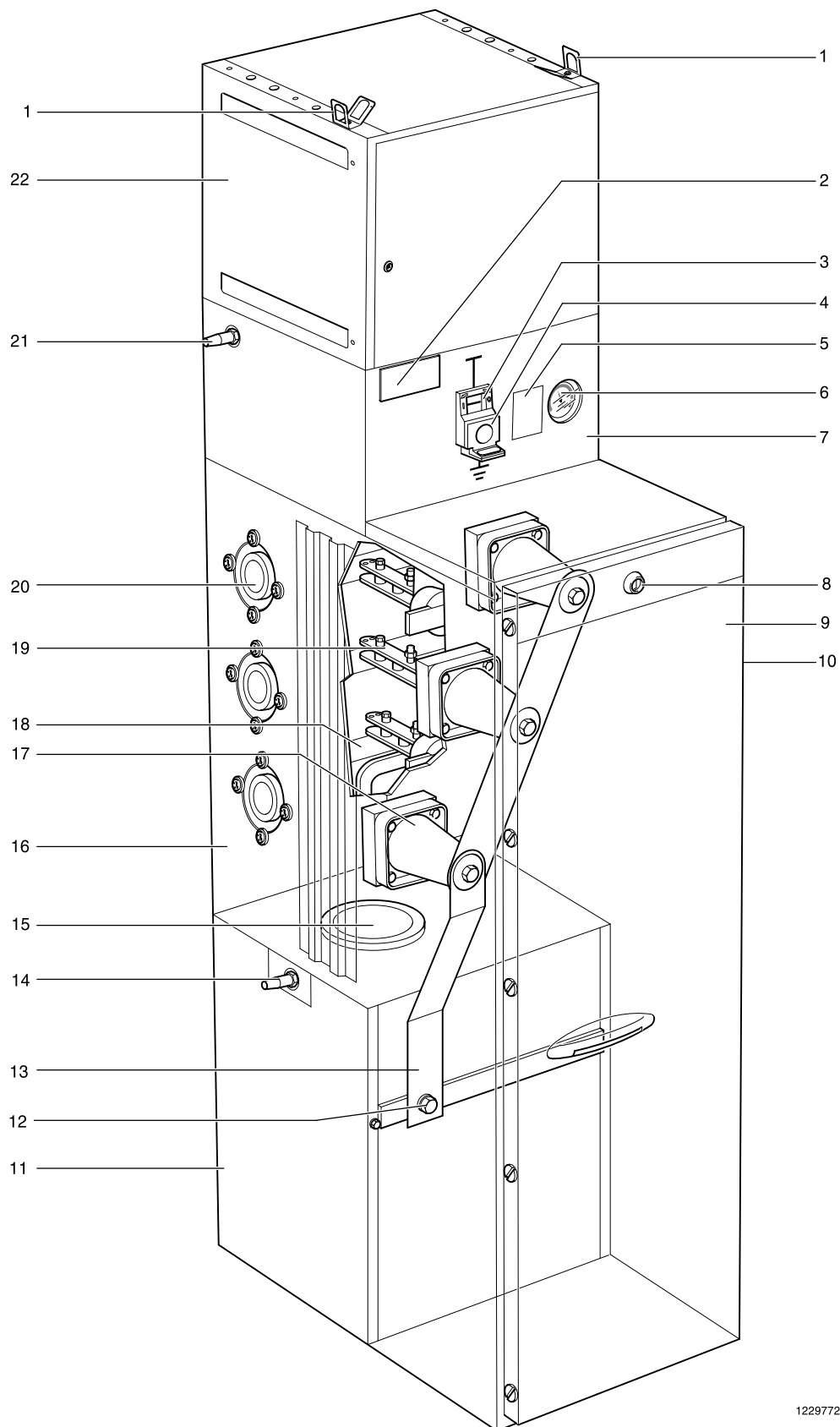
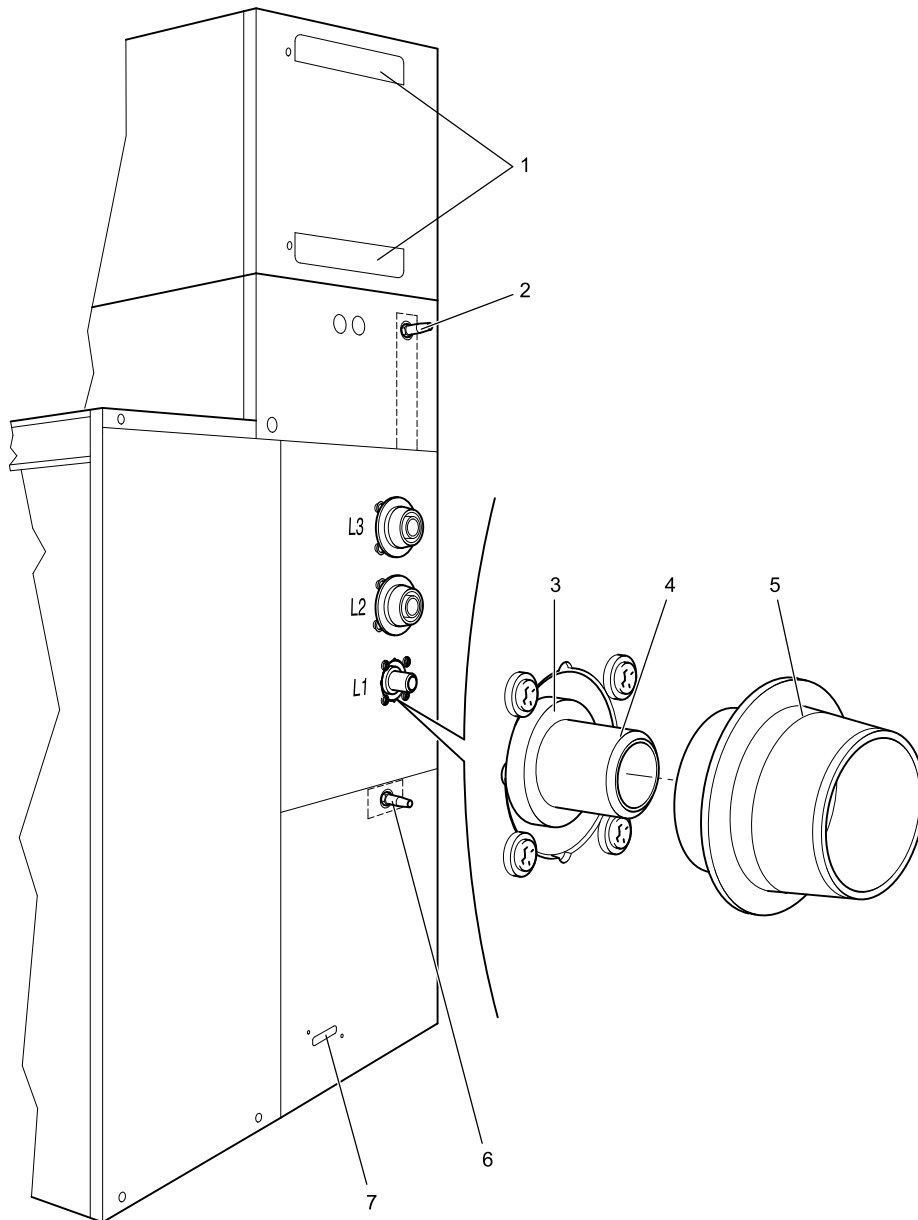


Fig. 1

12297721 00 03

### **System overview**

- 1 Transport bracket
- 2 Panel designation
- 3 Earthing switch position indicator
- 4 Padlocking facility for earthing switch
- 5 Rating plate
- 6 Gas leakage indicator
- 7 Front panel
- 8 Fastener
- 9 Cable connection compartment
- 10 Front cover
- 11 Pedestal
- 12 System earthing
- 13 Copper busbar
- 14 Bottom panel screw connection
- 15 Bursting plate
- 16 SF<sub>6</sub>-gas tank
- 17 Bushing
- 18 Busbars
- 19 Switching blade
- 20 Lateral bushing (busbar)
- 21 Top panel screw connection
- 22 Relay cabinet

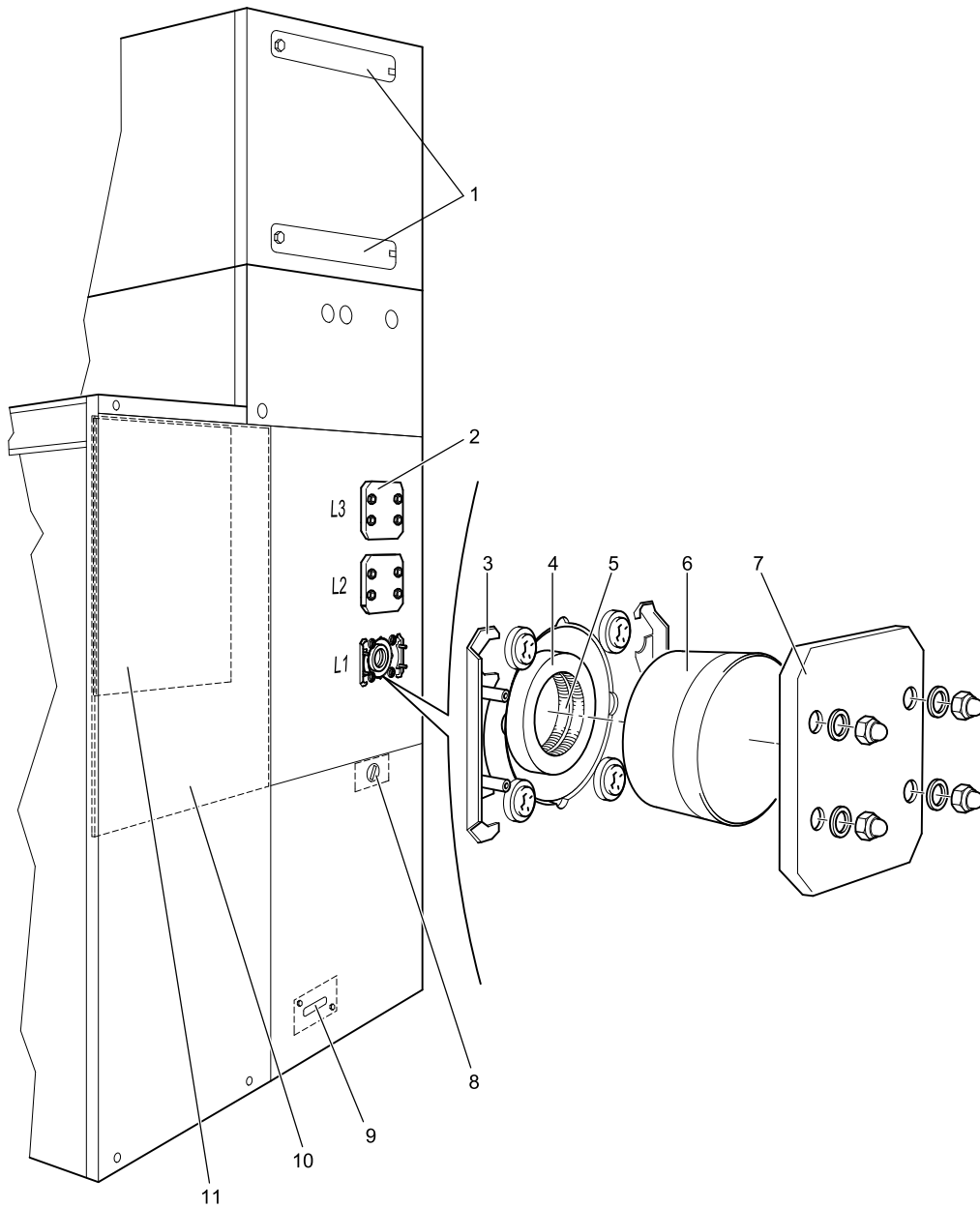


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Fig. 2

Assembly components for panel screw connection

- 1 Lateral opening, relay cabinet
- 2 Top panel screw connection (guide pin)
- 3 Bushing with contact springs
- 4 Contact tube
- 5 Double sealing
- 6 Bottom panel screw connection (guide pin)
- 7 Base opening for optional earthing busbar



12297721 00 02

Fig. 3

Installation components for earthing panel if it is an end panel in the complete switchgear

- |   |                               |    |                              |
|---|-------------------------------|----|------------------------------|
| 1 | Closing plates, relay cabinet | 9  | Base closing plate           |
| 2 | Sealing end lateral bushing   | 10 | Stiffening plate             |
| 3 | Clamping sheet                | 11 | Arc proofed protection sheet |
| 4 | Busbar bushing (inside taper) |    |                              |
| 5 | Contact springs               |    |                              |
| 6 | Single seal                   |    |                              |
| 7 | Cover                         |    |                              |
| 8 | Screw plug                    |    |                              |

# 1 General

## 1.1 Liability and warranty

All information and notes concerning operation and maintenance of the earthing panel are provided under due consideration of our present experience and to the best of our knowledge. These instructions describe the standard earthing panel.

All technical information and data contained in these operating instructions are up to date at the day of printing. We reserve the right for technical changes in the course of further development without changing these instructions.

Therefore, no claims can be made based on the information and descriptions in these instructions.

We will not assume liability for damage or malfunctions resulting from operating errors, failure to observe these operating instructions or incorrect repairs.

Genuine spare parts from Ormazabal have been specially designed and tested for Ormazabal earthing panels.

It is highly recommended to purchase spare parts and accessories only from Ormazabal. We would like to make explicitly clear, that any spare parts and accessories not supplied by us require the approval by Ormazabal.

The installation and use of products from other manufacturers may have a negative effect on specific design characteristics of the earthing panel and degrade personal safety or place the earthing panel or other property at risk.

For damage resulting from the use of spare parts and accessories not approved by Ormazabal any liability by Ormazabal is excluded.

Any unauthorized conversions and changes to the earthing panels are prohibited for safety reasons and cause the exclusion of any liability by Ormazabal for any damage resulting from this.

## 1.2 Service information

The customer service of Ormazabal Anlagentechnik GmbH is available to provide technical information on Ormazabal products.



## 2 Safety regulations

### 2.1 Intended use

The SF<sub>6</sub>-insulated earthing panel of the GAE type is a prefabricated, type approved, metal encapsulated interior switching panel for accessible switchgear rooms. As standard the earthing panel can be extended with switchgear panels of the GAE type on both sides.

The earthing panel can be used with alternating current of up to 1250 A (rated normal current) at rated operational voltages of up to 24 kV.

Earthing panels are used for e. g.:

- Power grids
- industrial plants
- consumer's installations
- wind turbine generators etc.

The earthing panel must only be serviced and repaired by authorised persons, who have been instructed or trained accordingly.

These operating instructions must be read carefully and strictly observed before installing and commissioning the earthing panel.

Every person involved in the installation, commissioning, operation, maintenance and repair of the unit must have read and understood these operating instructions, especially the chapter on safety and any other safety instructions.

We recommend that the user/owner obtains written confirmation of compliance with this requirement.

Only the exact knowledge of these operating instructions helps to avoid operating errors and ensures trouble-free operation.

The general safety and accident prevention regulations issued by the authorities and any regulations from the insurer, which may vary from country to country, must be strictly observed when operating and servicing the earthing panel.

These operating instructions are part of the earthing panel. When passing on the earthing panel (relocation, selling or similar) the operating instructions must also be handed over.

Also observe the operating instructions and the manufacturer's information for used components of secondary technology.

### 2.2 Explanation of symbols and notes

Observe these instructions and exercise extreme care in such cases. Hand out all notes on health and safety also to all persons who are involved in work on the equipment. Besides the notes in these operating instructions you must also comply with the generally valid safety and accident prevention instructions (e. g. DIN EN 50110, VDE 105 part 100, BGV A3).



#### Health and safety symbols

You will find these symbols with all health and safety instructions in these operating instructions in which reference is made to hazards for personnel.



#### Warning about risk of electric voltage

This special health and safety symbol warns against dangers due the risk of electric voltage.

#### Attention!

#### Cautionary instruction

In these operating instructions this instruction appears at all points where particular care is required to comply with directives, regulations, instructions and the correct work sequence, and to avoid damage to the earthing panel.

## 2.3 General health and safety instructions

The earthing panels from Ormazabal are designed on the basis of the latest technical standard and under due consideration of all relevant safety instructions.

However, dangers for people and property may arise from these earthing panels if they are used incorrectly by untrained personnel or for purposes they are not intended for, if they are manipulated or if the safety regulations are disregarded. Each person involved in the installation, commissioning, operation or servicing of the earthing panels must therefore have read and understood these instructions.

### 2.3.1 Operation

When operating the earthing panel the responsibilities must be clearly specified and complied with, so that no unclear competences regarding safety will arise.

Before commissioning the earthing panel and after maintenance work or modifications, it must be inspected by suitably qualified personnel to ensure it is in safe and correct working order.

Before commissioning, all personnel in the danger zone around the earthing panel must be warned and asked to leave this area. There must not be any objects blocking the access to the controls.

The user must operate the earthing panel only in correct working order.

Any changes that degrade safety must be reported immediately to the supervisor.

Changes to the earthing panel are only permitted in coordination with Ormazabal and under the supervision of expert personnel.

Specialist personnel are persons who, due to their professional training and experience, have sufficient knowledge in the field of electrical technology and are familiar with the applicable health and safety regulations (BGV A3), directives and the generally accepted technical rules and regulations (e. g. VDE-regulations, IEC-standards, DIN standards).

### 2.3.2 Safety features

Safety features must not be altered, dismantled or rendered ineffective. Unprotected parts of the system can cause fatal injuries.

All safety installations, e. g. shrouds, must always be fully functional and correctly in place.

Operation of the earthing panel with faulty safety features is not allowed.

### 2.3.3 Auxiliary device for operation, maintenance and repair

If any auxiliary devices (tools or similar) are required for operation, maintenance or repair of the earthing panel, these must be in safe condition and should be used in a safe way.

Any unnecessary or hazardous use of auxiliary devices of any kind on the earthing panel is not permissible.

### 2.3.4 Statutory health and safety instructions

Apart from these notes on prevention of accidents and the notes attached to the earthing panel the locally valid accident prevention instructions must also be observed.

### 3 Transport and installation

#### 3.1 Safety notes for transport



1. Lifting tackle must only be used at points intended for this purpose.
2. Ropes, chains or other lifting tackle must be fitted with safety hooks.
3. Do not use any torn or worn ropes.
4. Ropes and chains must not be knotted.
5. Ropes and chains must not touch any sharp edges.
6. Use only ropes and chains of sufficient load bearing capacity. (for weight of the GAE-earthing panel see Table 1.)
7. Use only lifting gear of sufficient loading capacity. (for weight of the GAE-earthing panel see Table 1.)
8. Do not lift loads over persons.

#### 3.2 Transport and unloading

The panel is delivered packed upright on a pallet. It is strapped to the pallet with tightening straps (Fig. 4).

For transportation or intermediate storage you should always use the original packaging and secure the earthing panel with tightening straps (tightening belts), in the same way as for delivery.

When attaching the tightening straps make sure to attach these as shown in Fig. 4, as otherwise the cable connection compartment may be damaged.

Weight of the earthing panel

Type	Weight	Accessories
GAE1250 -1E-/4/	approx. 148 kg	5 kg
GAE1250 -1E-/4/ with pressure absorber channel	approx. 238 kg	5 kg

Table 1



During transport comply with the warning and safety notes on earthing panel and packaging!



When unloading observe the safety instructions (See chap. 3.1) and the applicable accident prevention regulations.



Unloading is only allowed to be performed by experienced persons who are fully familiar with the lifting gear. Observe the permissible hoisting weight of lifting tackle and lifting gear (forklift truck, crane).

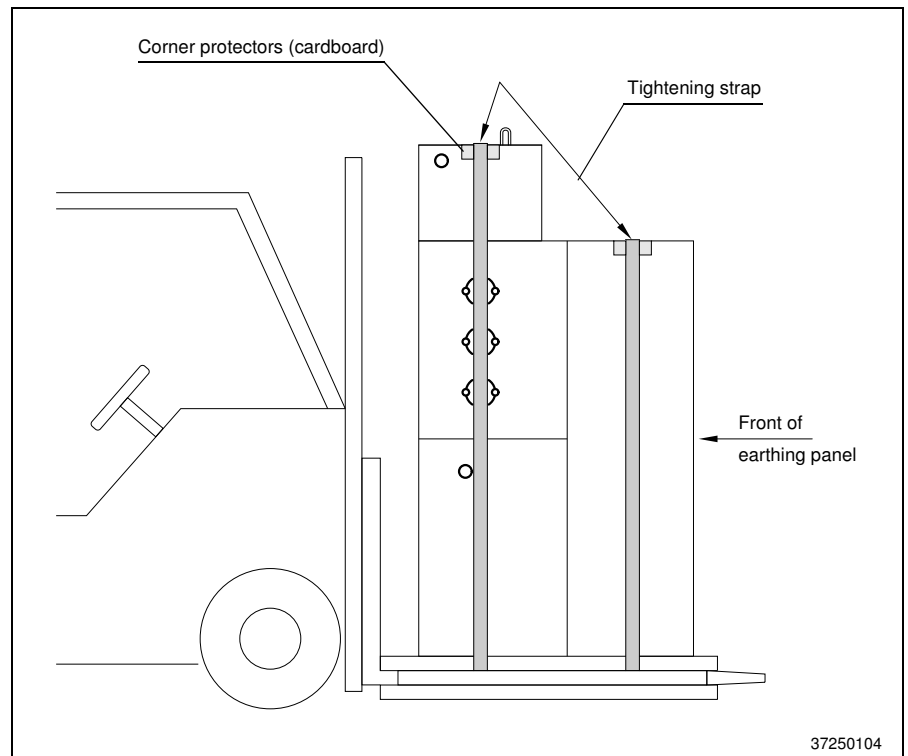


Fig. 4

### 3.3 Arrival and unpacking

#### Attention!

- The goods must be checked immediately on receipt!
- Any complaints have to be stated on the freight document and countersigned by the driver!
- In case of complaints please contact your distributor:  
www.ormazabal.com.

Remove the tightening straps - the earthing panel is now unsecured. Due to the design of the earthing panel the centre of gravity is located in the middle of the unit.



The earthing panel may only be attached using the transport brackets provided. The transport bracket screw connections (Fig. 5) must be checked for tightness before lifting (tightening torques see chapter 8, Table 5).



In case of unsecured handling of the earthing panel there is a risk of the panel tipping over!

Particular attention is to be paid to this issue when transporting the earthing panel to its place of installation. It not allowed to use levers to transport the earthing panel to its final position. This action could cause damage to the enclosure.

The earthing panel must be transported with a 2-rope lifting tackle to avoid damage (Fig. 5).

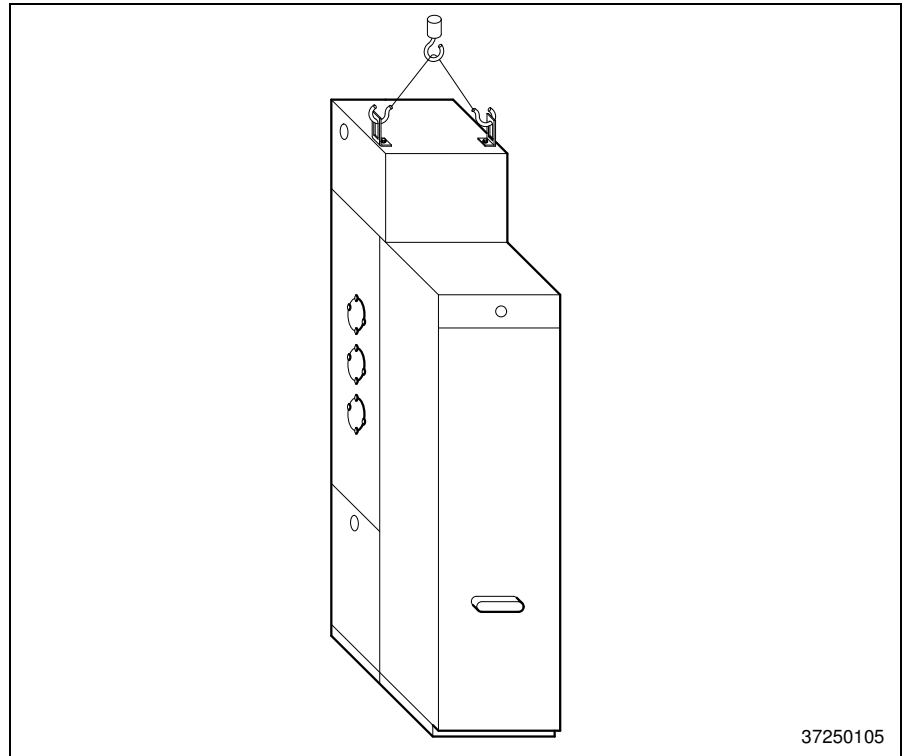


Fig. 5

When using lifting tackle, use tackle with 2 ropes with a rope length of at least 500 mm.

Shorter rope lengths can lead to damage to the earthing panel!

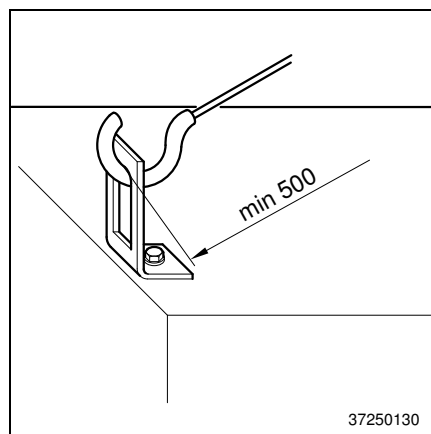


Fig. 6

For particularly narrow transport passages (e.g. tower stations) the cable connection compartment can be disassembled.

In such case contact the customer service of Ormazabal.

After transporting the earthing panel to the place of installation remove the transport brackets (Fig. 6) and close the fastening threads of the brackets with the hexagon screws.

For a possible later transport of the earthing panel store the transport brackets in a suitable place.

In order to ensure a tight fit of the screws in case of a later installation of the transport brackets, the screws must be tightened with a torque according to chapter 8, Table 5.

Check the delivery for completeness.

The serial number on the delivery note must conform with the serial number mentioned on the rating plate (Fig. 7) of the earthing panel.

### 3.4 Storage

The earthing panel is packed ready for transport and storage in the factory. It is only to be stored in dry, clean rooms and is to be protected against excessive soiling.

The environmental conditions must comply with IEC 62271-1 / DIN EN 62271-1 (VDE 0671-1), ambient temperature class "minus 5 indoor".

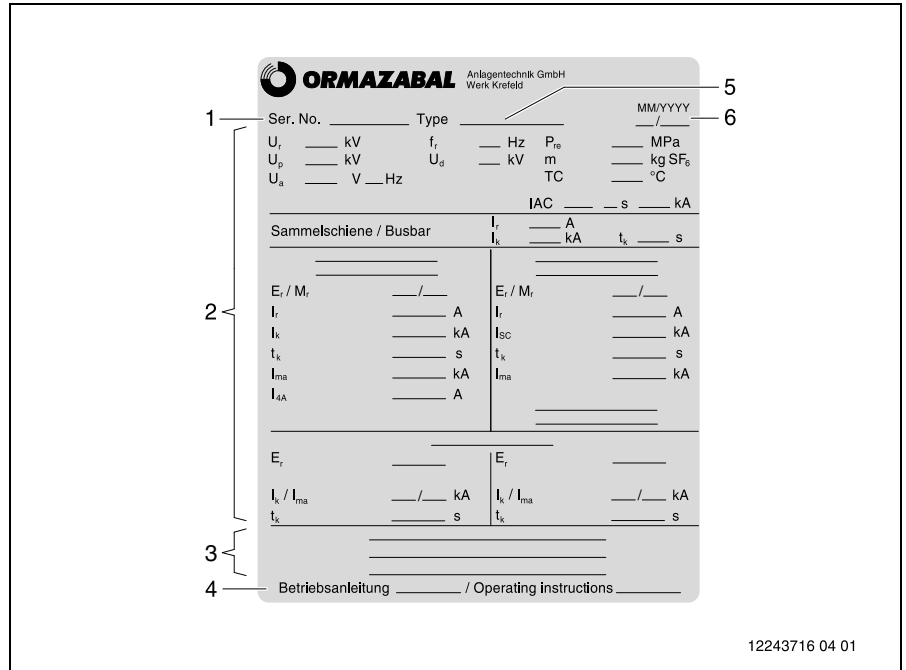


Fig. 7 Rating plate (example)

- 1 Serial number
- 2 Technical data
- 3 Standards applied
- 4 Document numbers of the corresponding operating instructions (German/English)
- 5 Type of unit
- 6 Manufacturing date: month/year

### 3.5 Installation and assembly

For installation of the earthing panel follow the illustrated installation plan. In order to assure secure standing of the earthing panel use all fastening holes provided.

The depth of the individual panel types of GAE family vary.

In order to ensure all possible block/panel combinations (excluding GAE1250 1LSV panels) can be installed, the foundation projection must be drawn at a distance of 135 mm from the wall!

In the case of the installation of GAE1250 1LSV panels, a minimum distance of 205 mm is necessary.

#### Note!

If it is assured that with any system extension **no** GAE 1LSF panels, GAE1250 1LSV panels, GAE metering panels are installed, the distance from the wall can be reduced to 100 mm.

To ease the assembly of the modular switchgear GAE, we recommend the following distances from side walls on installation from left to right:

- Distance from left wall at least 100 mm
- right wall distance at least 300 mm.

When installing from right to left the lateral wall distances are reversed.



The area for the floor opening must not be reduced in size, so that, in case of an arc incident, the hot gases can be safely discharged.

A straight and level floor surface is a prerequisite for the stress-free installation of the earthing panel. Pay attention to the information in DIN 43661. In particular the tolerance on the evenness (maximum 1 mm over a measured length of 1 m) and the tolerance on the straightness (maximum 1 mm per metre and maximum 2 mm over the entire length of the foundation rail) are to be observed.

#### Note!

To ease the assembly work on the installation of several GAE panels, we recommend the usage of a metal chassis.

The fastening material is not part of the delivery.

To fastening the earthing panel to a raised floor, we recommend the following fastening material:

- Hexagon screw M10 (minimum M8, strength class 5.6)  
DIN EN ISO 4017
- Washers DIN EN ISO 7093 (switch panel side)
- Washers  
DIN EN ISO 7089/7090 (raised floor side) or tapered washers for fastening to U-sections
- Spring lock ring DIN 127 / DIN 128
- Hexagon nut M10 DIN EN ISO 4032

In the case of installation on concrete with a strength of  $B \geq 25 \text{ N/mm}^2$ , we recommend the following fastening material:

- Fischer plastic dowels of type S12
- Wood screw 10x80 St DIN 571

To make the fastening holes accessible for installation, remove the front covers of the cable connection compartment (See chap. 5).

#### Attention!

To attach on GAE630 panels, follow the assembly instructions "Panel installation for extensible GAE630 panels", article no. 12244002.

To attach on GAE1250 panels, follow the assembly instructions "Panel installation for extensible GAE1250 panels", article no. 12258706.

As standard the earthing panels are fitted with protective caps against soiling on the side bushings. The side wall sealing ends are to be fitted in accordance with the assembly instructions stated above.

**3.6 Planning of installation**

**3.6.1 Floor fastening measurements**

Fig. 10 shows the floor fastening and floor opening dimensions for pressure relief in the cable trench/raised floor.

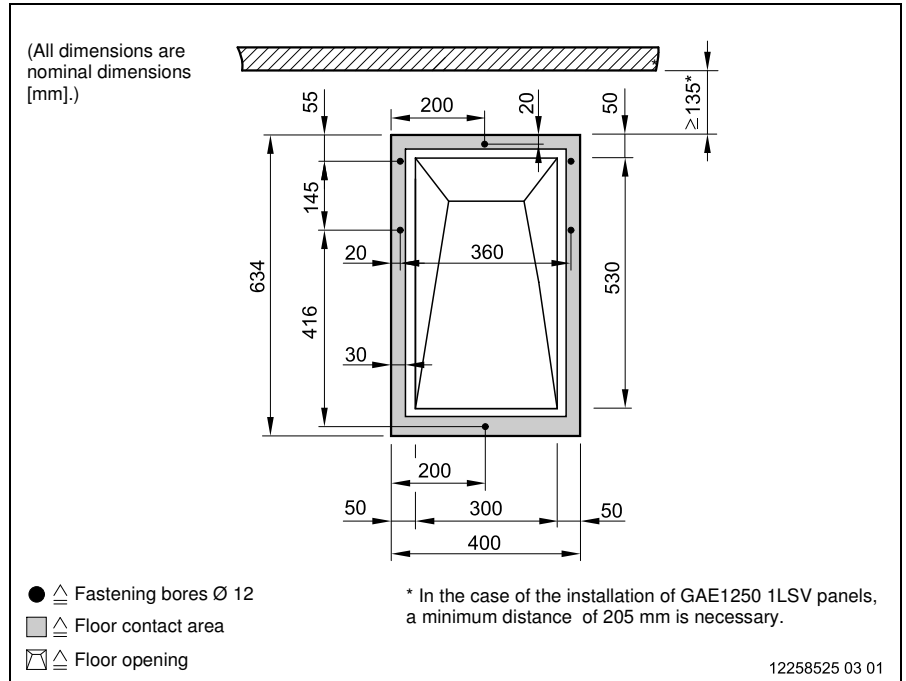


Fig. 8

Fig. 9 shows the floor fastening and floor opening dimensions for pressure relief via rear pressure absorber channel into the switchgear room.

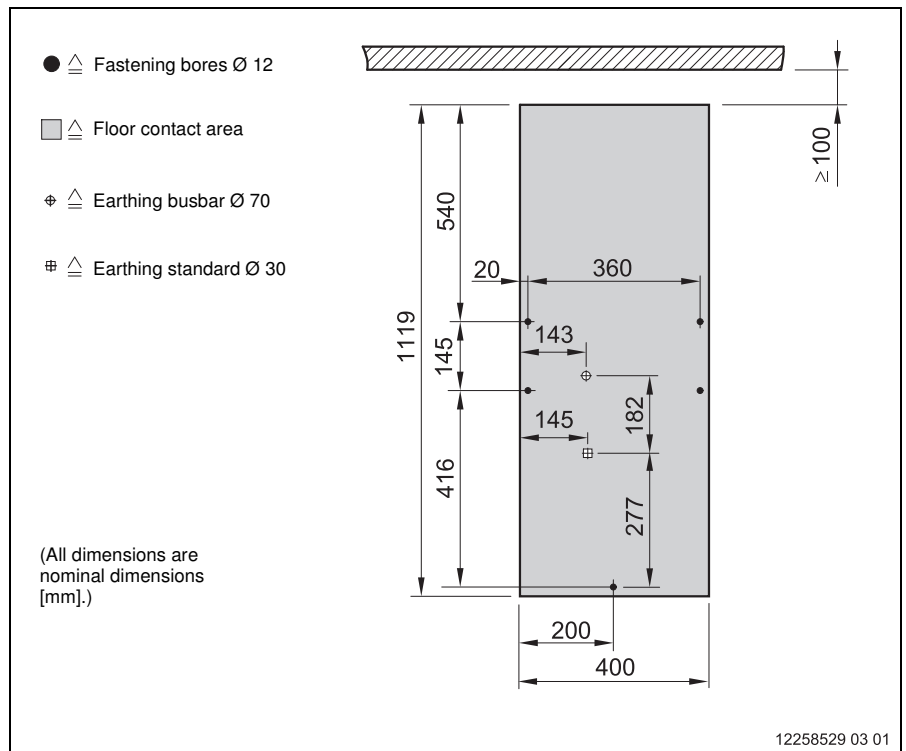


Fig. 9

### 3.6.2 Dimensions

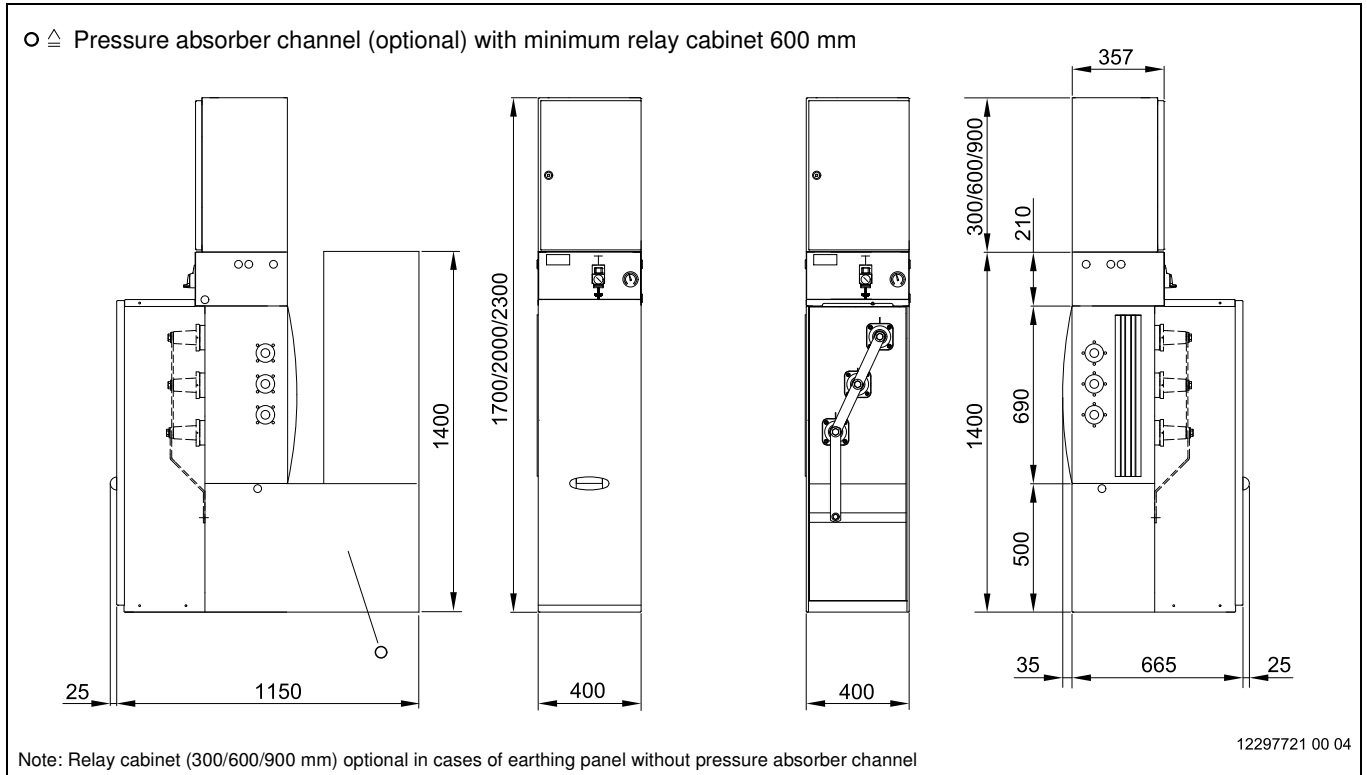


Fig. 10 Earthing panel GAE1250 -1E-/4/



### 3.6.3 Possible installations

#### Installation possibility for earthing panel in accessible switchgear rooms

**Attention!**

During installation make sure not to damage the bursting plate in the bottom of the gas tank (Fig. 11).

This diaphragm opens in case of an internal arc fault. The gases emerging must be discharged as shown in Fig. 11.

As shown in Fig. 11 the cable trench must have a defined minimum cross section. For the optional pressure relief of the cable trench the following rule of thumb must be applied:

- up to 3 panels: 1 metal cooling stretch arrangement (400 x 600 mm)
- from 4 panels: 1 second metal cooling stretch arrangement of the same size.

The metal cooling stretch arrangement provided by the customer must be arranged in a way that the cable trench is evenly divided.

In order to enhance the stability the rear wall of the earthing panel can be fastened with two steel angles (not included in the scope of delivery). For this purpose use the screw connections from the transport device.

Please ask for our assistance in the planning and installation of the station.

The construction of the building and the switchgear room must withstand the expected mechanical loads and the internal pressure caused by a short-circuit arc. Appropriate calculations for these purposes are recommended.

Switchgear related pressure calculations can be requested as part of the services provided by the sales department at Ormazabal GmbH.

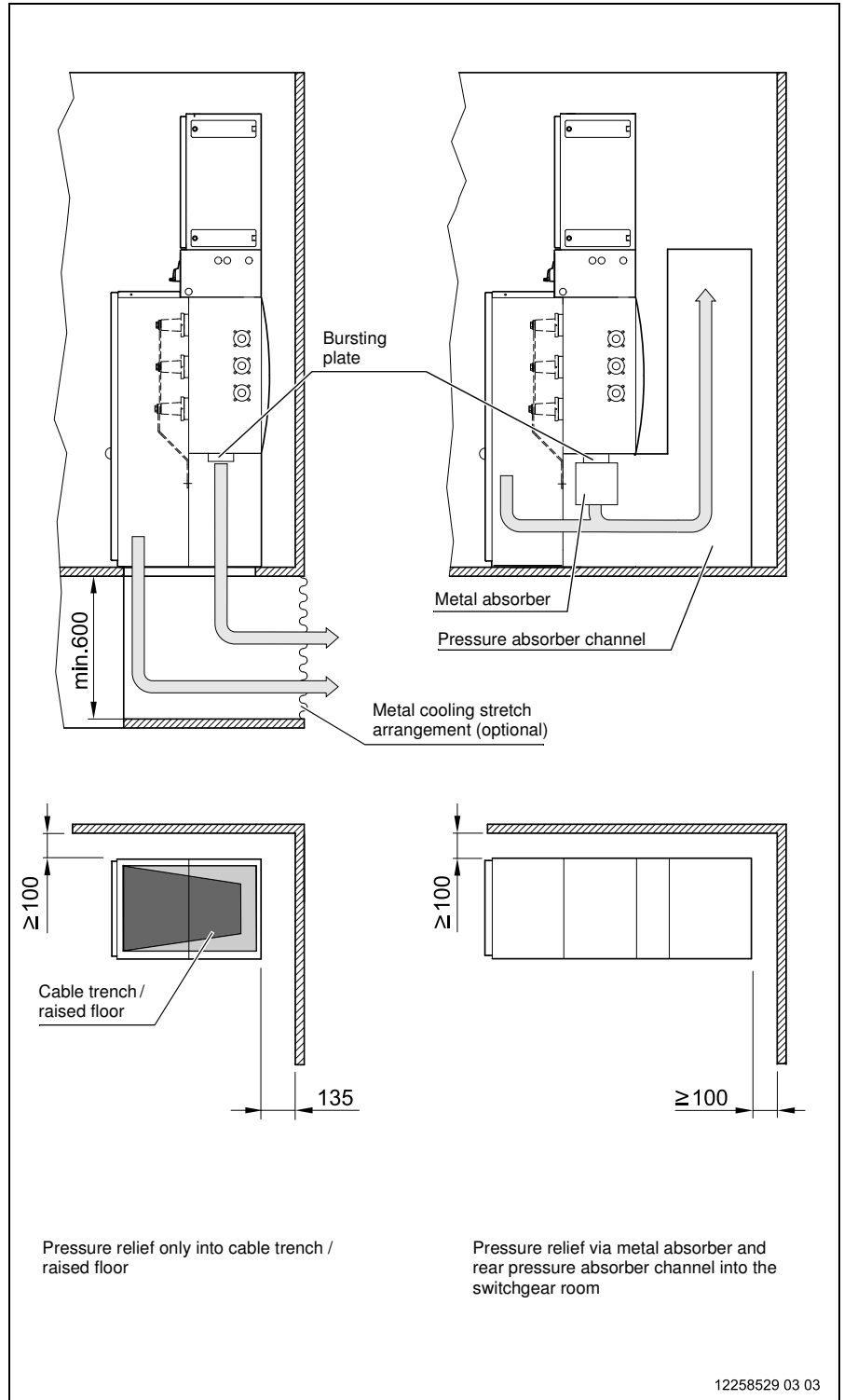


Fig. 11

Rear pressure absorber channels are available on request. In combination with metal absorbers these absorber channels allow an installation of the Ring Main Unit on closed panel base.

The pressure relief takes place towards the top on the back side. This version also meets the standard: internal arc classification IAC AFL 20 kA 1 s.

### 3.7 Laying the supply line for the auxiliary and control circuits

#### 3.7.1 Laying the supply line for supply voltage

When routing the supply line for the supply voltage for the auxiliary and control circuits the following installation work must be performed:



When working with the drive open, never reach into the drive during a switching process. You may be seriously injured.

- Unscrew the hexagon screws (2x) from the covering sheet.
- Remove all combi-Torx screws (4x) in the top part of the front plate.
- Pull the front panel a few millimetres forward (Fig. 12-1).
- Lift the covering sheet up from behind the front panel (Fig. 12-2).
- Pull the covering sheet out of the clip-on clamps (Fig. 12-3).

The side wall of the cover frame is fitted with flexible plugs, which enable a cable inlet protected against dust and moisture. For adaptation to the cable diameter use the separating lines on the plugs.

On earthing panels that are extended with other GAE panel types, the plugs must be removed from the cover frame and pedestals so that the joint depth for the double sealing is achieved.

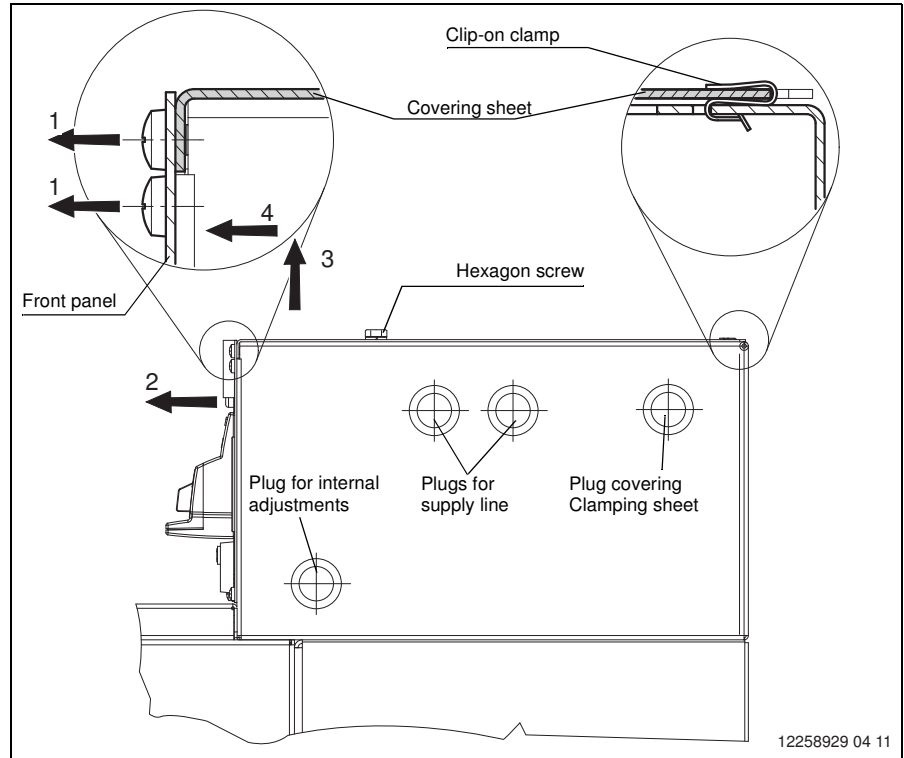


Fig. 12

#### Attention!

Additional GAE panels are installed and end panels are fitted as per the related assembly instructions "Panel installation for extensible GAE630 panels", article no. 12244002 respectively "Panel installation for extensible GAE1250 panels", article no. 12258706.

Assembly of cover plate and front panel is performed in reverse order.

### 3.7.2 Laying the supply line for supply voltage with optional relay cabinet

There are openings for laying the supply line for the auxiliary and control circuits in the roof of the relay cabinet.

Flexible plugs are fitted in these openings, which provide a cable bushing protected against dust and moisture. For adaptation to the cable diameter use the separating lines on the plugs.

The supply line from a neighbouring panel on the left or right (loop cable) is laid through openings in the related side wall on the relay cabinet (Fig. 13).

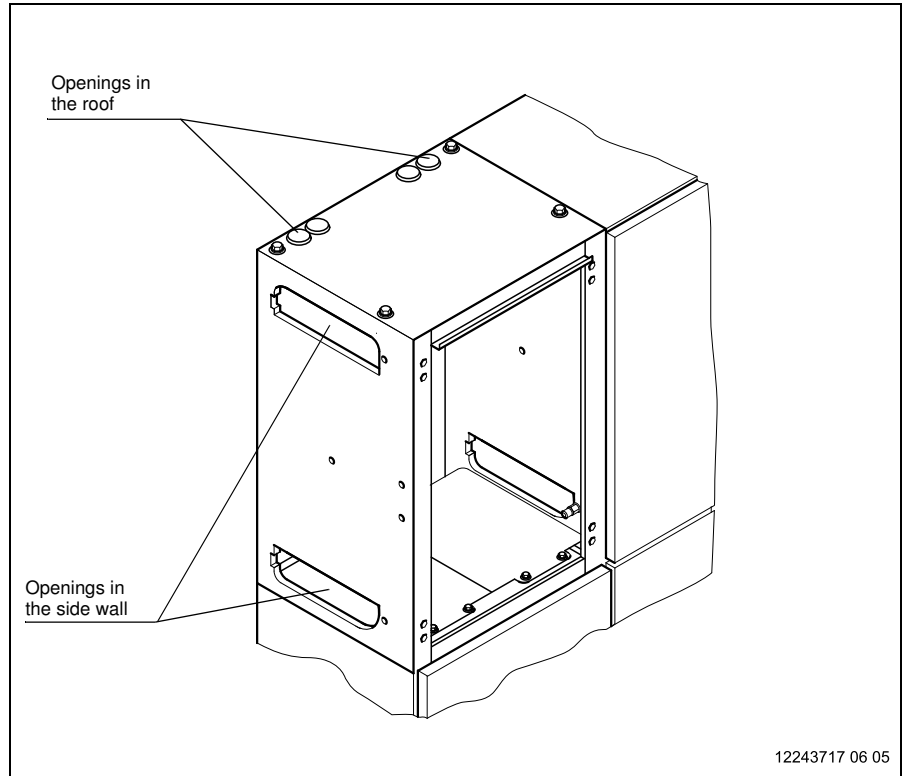


Fig. 13 Relay cabinet flush at the back plate

If the relay cabinet on the neighbouring panel is fitted offset, the cable can be laid through the openings in the roof of the relay cabinet (Fig. 14).

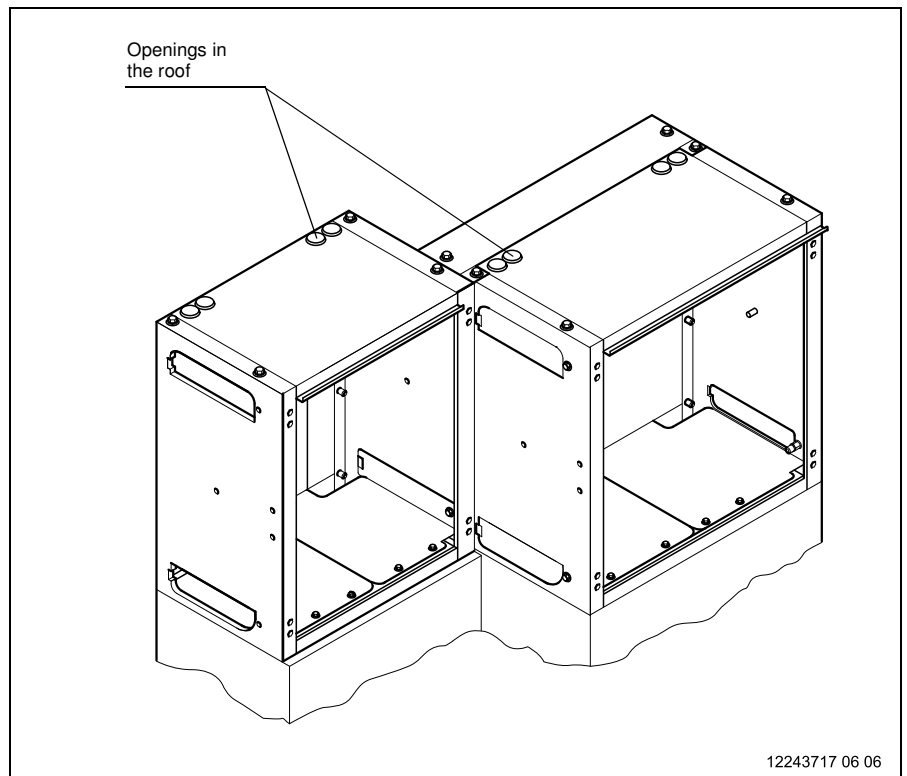


Fig. 14 Relay cabinet offset

**3.7.3 Terminal connection diagrams for the individual extension groups**

Fig. 15 shows the arrangement of auxiliary switches for the earthing switch on the drive carrier.

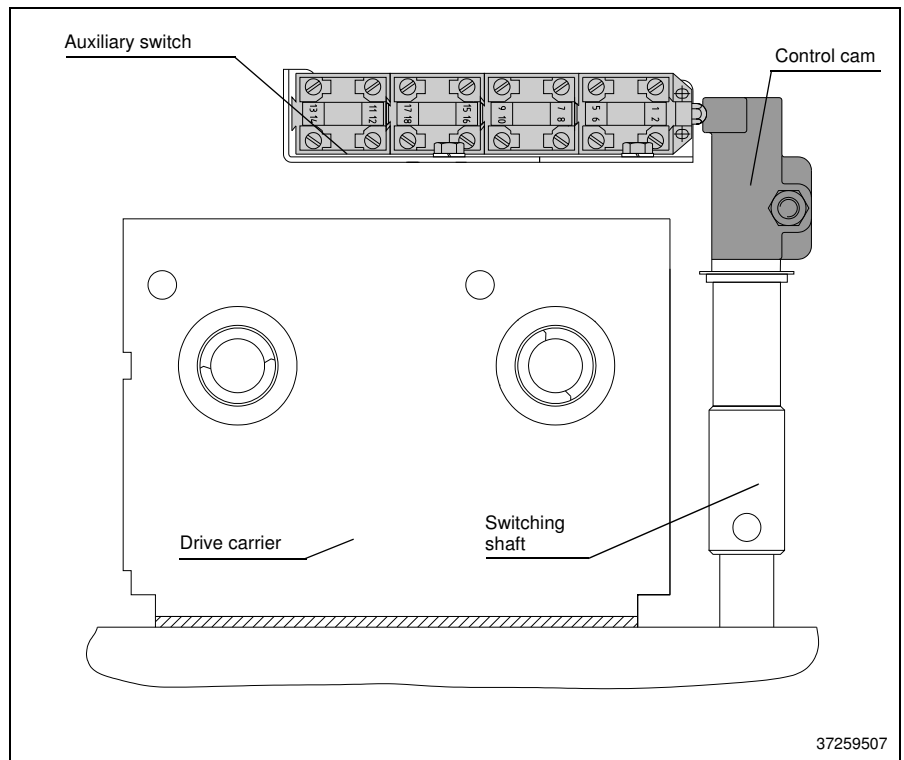


Fig. 15

Fig. 16 shows the connection diagram for the auxiliary switch.

Additional information of relevance for the wiring of the earthing panel can be found in the enclosed circuitry documentation.

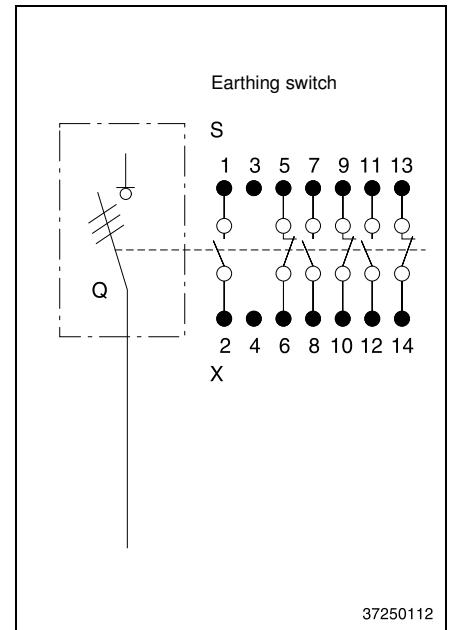


Fig. 16

### 3.8 Earthing

The earthing of the earthing panel must be in accordance with DIN VDE 0141/101.

The earthing panel is fitted with an earthing bus, which stretches over the entire width of the panel (Fig. 17).

As a measure to ensure an electrically conductive connection of the metal enclosure, earthing bus and enclosure are bolted with contact washers. This makes sure that, in case of a ground leak or a double ground leak, the fault currents are safely discharged to the earth connection.

The earthing bus is equipped with a screw joint (M12) for the connection of an earthing line to establish earthing of the unit.

For extension with GAE1250 panels it is possible to fit an optional earthing busbar over the total width of the system as an (Fig. 18).

This is installed in accordance with the assembly instructions "Panel installation for extensible GAE1250 panels", article no. 12258706".

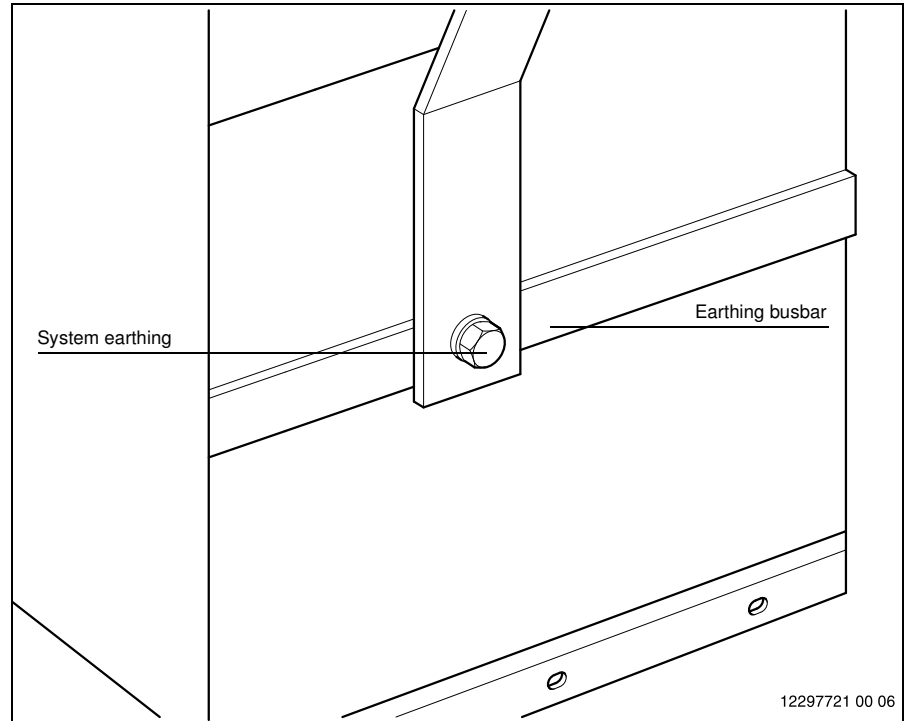


Fig. 17

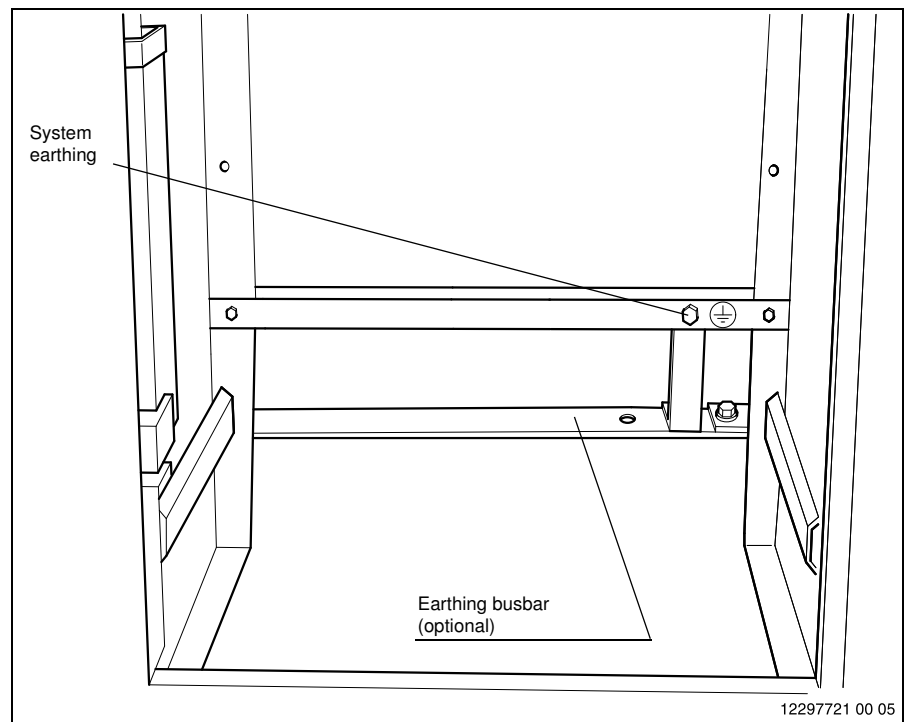


Fig. 18

## 4 Technical description

### 4.1 Description of the earthing panel

The SF<sub>6</sub>-insulated earthing panel type GAE is characterised by the following features.

Primary switching devices and busbar are installed in a common gas tank. Sulphur hexafluoride (SF<sub>6</sub>) is used as an extinguishing medium. The earthing panel can be used up to a rated voltage of 24 kV with a rated current of 1250 A.

The earthing panel is:

- metal-enclosed,
- almost low maintenance,
- suitable for severe climatic conditions,
- type-tested,
- extensible.

The earthing panel complies with the specifications of the applicable standards and regulations as well as the statutory regulations. During manufacturing the earthing panels are subjected to the quality guidelines of ISO 9001.

The earthing switch consists of the following core components:

- maintenance-free spring drive
- no additional insulating distance generator required because the break distance is not bridged by the insulating substance
- SF<sub>6</sub> as insulating gas.

The system components, such as drive mechanism housing with drives, cable connection compartment and pedestal are attached to the gas tank in modular mode (see Fig. 1).

For an enhanced personnel protection the earthing panel can be executed in an arcfault resistant design. In this case both the outside walls and the cover of the cable connection compartment and the front covers are reinforced.

The gas tank is reinforced with burn-out protection sheets as a protection against internal faults.

In case of an internal fault the pressure increase inside the gas tank is limited by the bursting plate (in the bottom of the gas tank). The burst protection, a clamped metal foil of low mass, opens at a gas overpressure of 200 kPa. The opening created by the pressed out metal foil controls the directed pressure relief of the hot gases into the compartment under the SF<sub>6</sub> gas tank and from there into the cable trench/ raised floor or via a rear pressure absorber channel into the switchgear room (see Fig. 11).

The front cover provides a pressure-proof seal for the cable connection zone. It is plugged onto panhead rivets on the lateral field walls, then pushed vertically down and thereby locked in the cable connection compartment.

All active parts are located in the gas tank filled with SF<sub>6</sub>-insulating gas. The supply or discharge of energy is routed through cast resin bushings in accordance with DIN 47636 (see chapter "Technical data").

For an extension of the earthing panel with panels or block modules of the GAE series must be attached to the cast resin bushings on both sides using a contact tube.

All control and indicator elements of the earthing panel are clearly arranged on the front panel. Switch position indicators and actuating shafts are integrated in the mimic diagram. The front panel is provided with a padlocking facility and panel nameplate as standard.

#### 4.2 Earthing panel extension

The earthing panel of type GAE1250 -1E- can be extended on both sides with all panels/block modules in the GAE series. The design of the complete switchgear is oriented to the customer's requirements. The busbars of the complete switchgear are phase separated and arranged vertically above each other in the gas tank. The busbars of the panels to be attached are connected by means of contact bolts, which are inserted with double seals into the lateral bushings. The contact tube connects the contact springs in the lateral bushings on two panels that in turn are connected electrically to the busbars in the gas tank (Fig. 19). The silicone double seal around the contact tube is responsible for controlling the electric fields. The inner surfaces of the double sealing are conductive and at medium voltage, the outer surfaces are at earth potential.

The greasing of the double sealing surfaces with assembling paste prevents seizing. The double sealing can also be removed without damage years later.

The busbar termination in the side wall on the end panel is made using a sealing end per phase.

The single seal made of silicone is responsible for controlling the electric fields (Fig. 20 and Fig. 3). The inner surfaces of the single sealing are conductive and at medium voltage, the outer surfaces are at earth potential. The necessary contact pressure for the single sealing is provided by a stainless steel cover that is fastened to the fastening plates fitted to the bushing fittings using lock nuts.

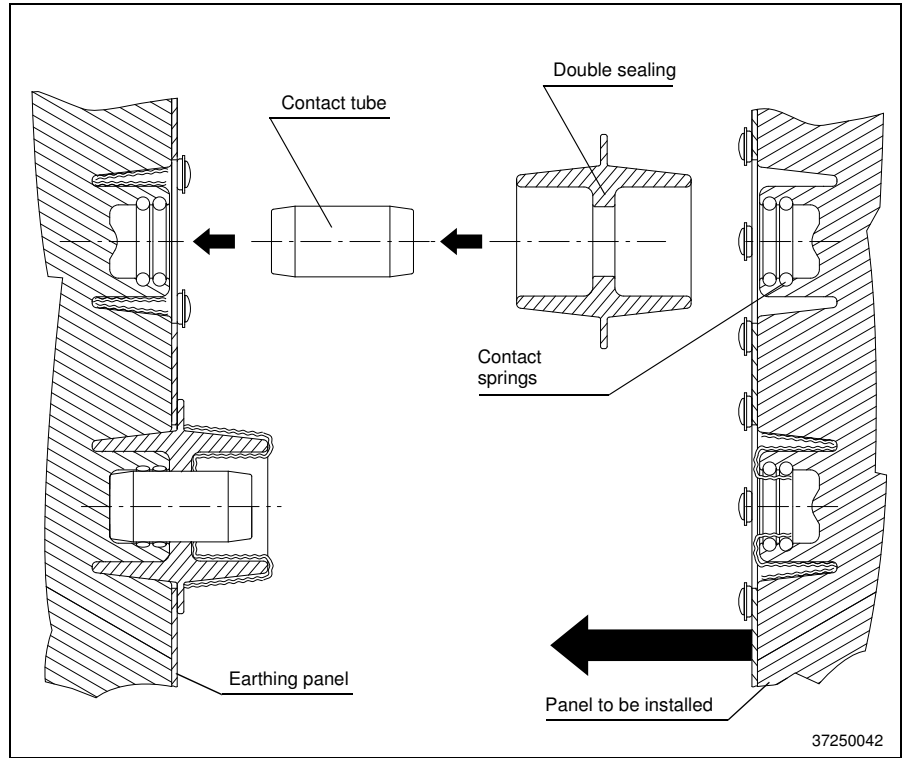


Fig. 19

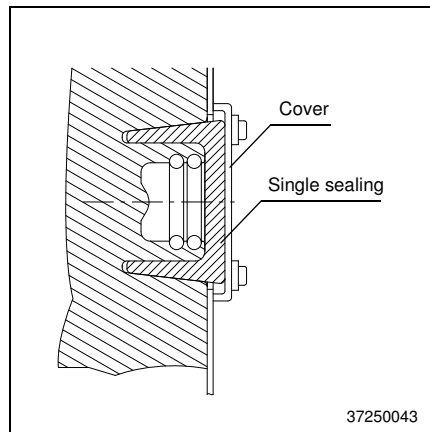


Fig. 20

In the end panel, on the exterior side of the panel in the pedestal (bottom panel screw connection) (Fig. 21 and Fig. 3) instead of the guide pin a screw plug is fitted to ensure the arc-fault resistance of the cable connection compartment.

The external side walls of the cable connection compartment in end panels must be secured with stiffening plates and arc proofed protection sheets.

For the installation of two panels/modules the right panel side of the unit has a pin guide. This feature has the following functions:

- Secure installation of two panels/modules side by side
- Absorption of external forces to protect the outer busbar
- Fixing the busbar connection

The pin guide is arranged on the top and underside of the gas tank. The panels/modules to be attached are always pushed onto the guide pins during installation. Before the contact tubes for the outer busbars connect the bushings for the panel to be attached, the panel to be attached is pushed into the panel-side pin receptacle (Fig. 21). Using a sleeve and tension screw the panel/module to be attached is pulled alternately at the top and bottom panel screw connection against the mating panel during which process the outer busbar connection engages with the three phases (Fig. 22). The joint dimension for the busbar/panel screw connection is achieved when the pin guide on the panel to be attached is against the spacer collar on the guide pin (pay attention to tightening torque).

#### Attention!

To install the extensible panels/modules, proceed in accordance with the assembly instructions: "Panel installation for extensible GAE630 panels", article no. 12244002 respectively "Panel installation for extensible GAE1250 panels", article no. 12258706.

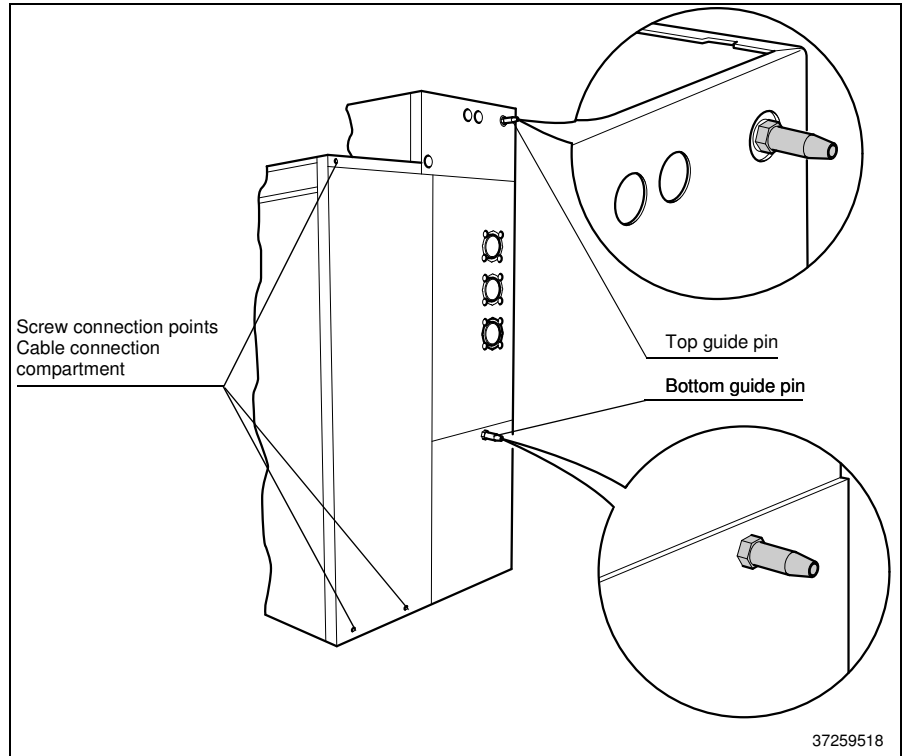


Fig. 21

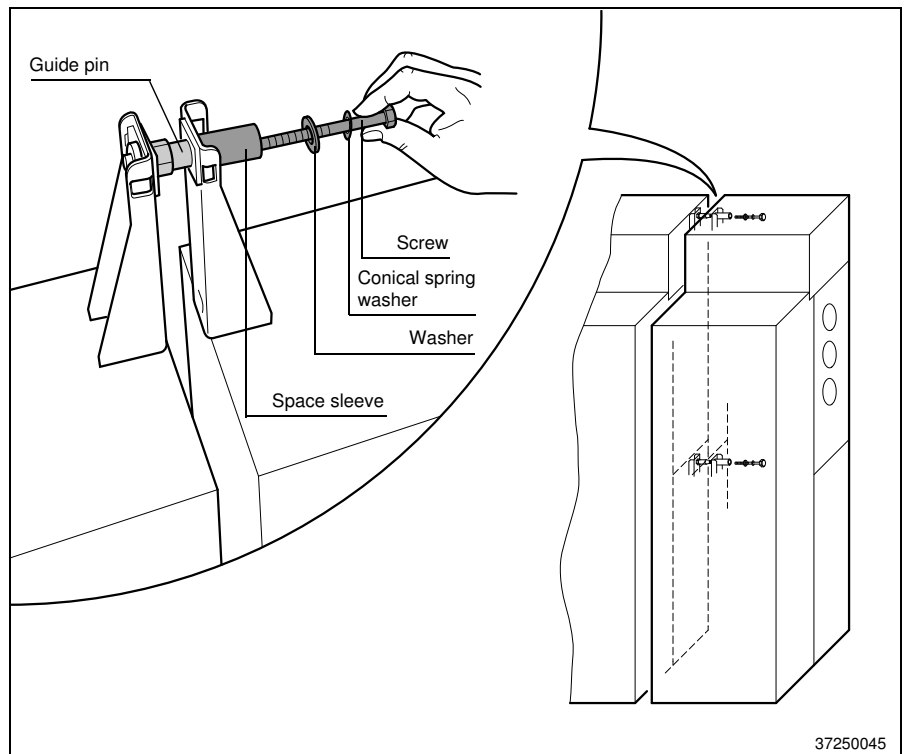


Fig. 22



### 4.3 Earthing panel versions

The earthing panel is available as a 1400 mm high version for accessible switchgear rooms.

The markings on the panel designation have the following meanings:

1	=	single panel
E	=	Earthing panel with drive without trip-free release
-	=	Extendable on the right or left

The pedestal for the earthing panel is closed at the rear as standard. In case of an arc fault the hot gases are discharged into the cable cellar or into the cable trench. The cable trench must have a pressure relief opening (see Fig. 11).

The earthing panel can be extended by panels or block modules of the GAE series on both sides. The extendibility to a complete switchgear is determined by the job specification issued by the customer.

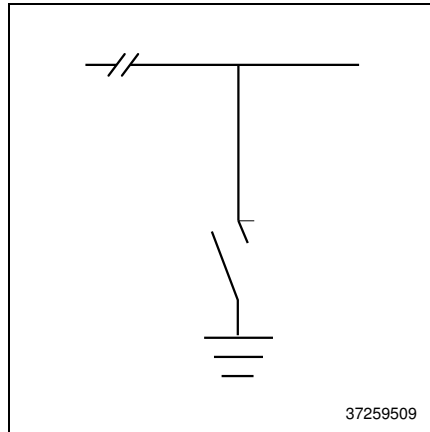


Fig. 23 GAE -1E-

#### 4.4 Drive mechanism

The electrical drive switches the earthing switch to the ON and OFF position.

All parts of the drive susceptible to corrosion are galvanically zinc coated.

For the earthing panels a spring drive (electrical drive) with a pressure spring is used. The drive is installed on a U-shaped drive carrier; the actuating shaft for the earthing switch is mounted on the right in plain bearings in the webs of the drive carrier.

The actuating shaft is a hollow shaft with integrated blade inhibitor that prevents the switching blade swinging when switching off.

The interlock is unlocked when the switching lever is inserted (against spring pressure) into the actuating shaft. The transfer of the rotary movement of the actuating shaft to the switching shaft vertically arranged in the gas tank is accomplished by a toggle link.

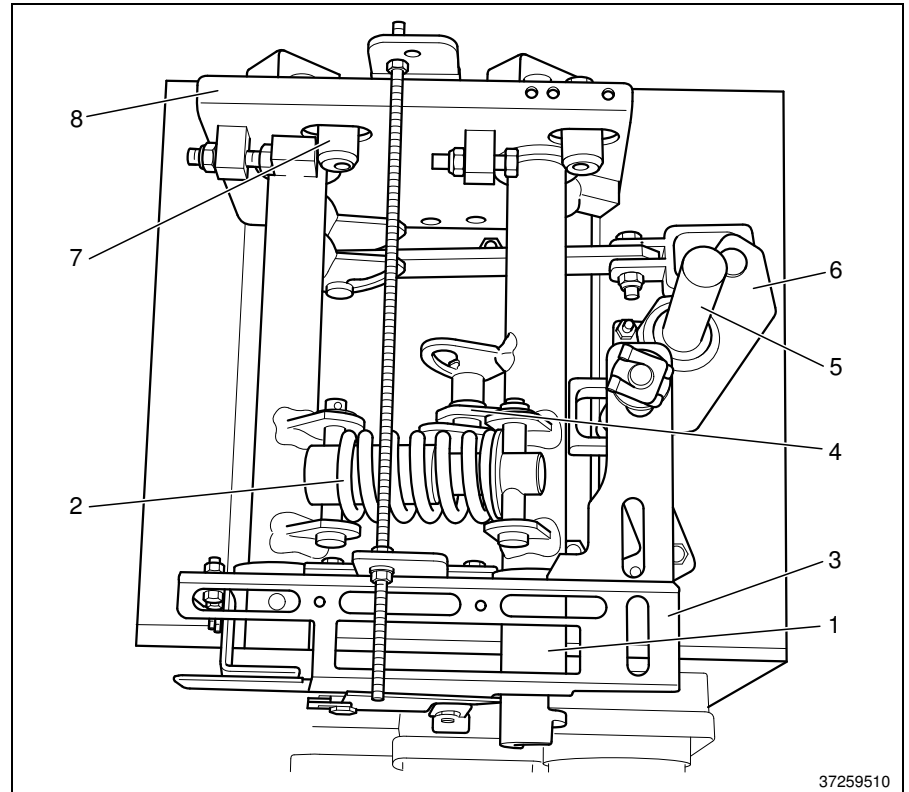


Fig. 24

- 1 Earthing switch - actuating shaft
- 2 Compression spring for earthing switch
- 3 Switch position indicator - slide
- 4 Toggle link for earthing switch
- 5 Switching shaft
- 6 Operating lever
- 7 Blade inhibitor for earthing switch
- 8 Drive carrier

#### 4.5 Gas tank

After the evacuation process each earthing panel is filled with dry SF<sub>6</sub>-gas, in accordance with IEC 60376. The additional adding of AL<sub>2</sub>O<sub>3</sub> absorbs smallest moisture quantities and permanently regenerates the SF<sub>6</sub>. The performance of a leak test according to IEC 62271-200 is proof that the permissible leak rate (10<sup>-7</sup> mbar l/s) of the hermetically welded tank is not exceeded.

#### 4.6 Gas leakage indicator

The gas pressure is indicated by a barometric cell type pressure gauge, connected to the tank via a non-return valve. The pressure gauge is corrosion-resistant against normal environmental influences. The indication range (Fig. 25) is divided into two measuring ranges.

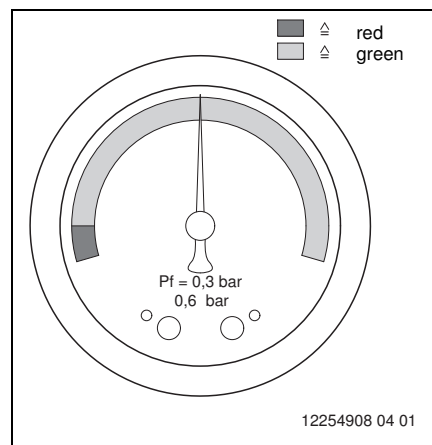



Fig. 25

	Red: Not ready for switching!
	Green: Ready for switching

Before each switching process the gas leakage indicator and therefore the gas filling inside the tank must be checked.

#### 4.6.1 Pressure switch (optional)

For remote monitoring the switchgear can optionally be equipped with a pressure switch, which works as a normally closed contact in the auxiliary circuit.

The bottom switching point of the pressure switch is 106 kPa abs. If the pressure in the gas tank drops to 106 kPa abs., the pressure switch will report this pressure drop.

The bottom switching point of the pressure switch corresponds with the transition to the red measuring range on the scale of the gas leakage indicator. The pressure switch is fastened to the non-return valve, together with the gas leakage indicator.

## 5 Operation

### 5.1 Switching accessories

For operation of the earthing panel the following accessories are needed:

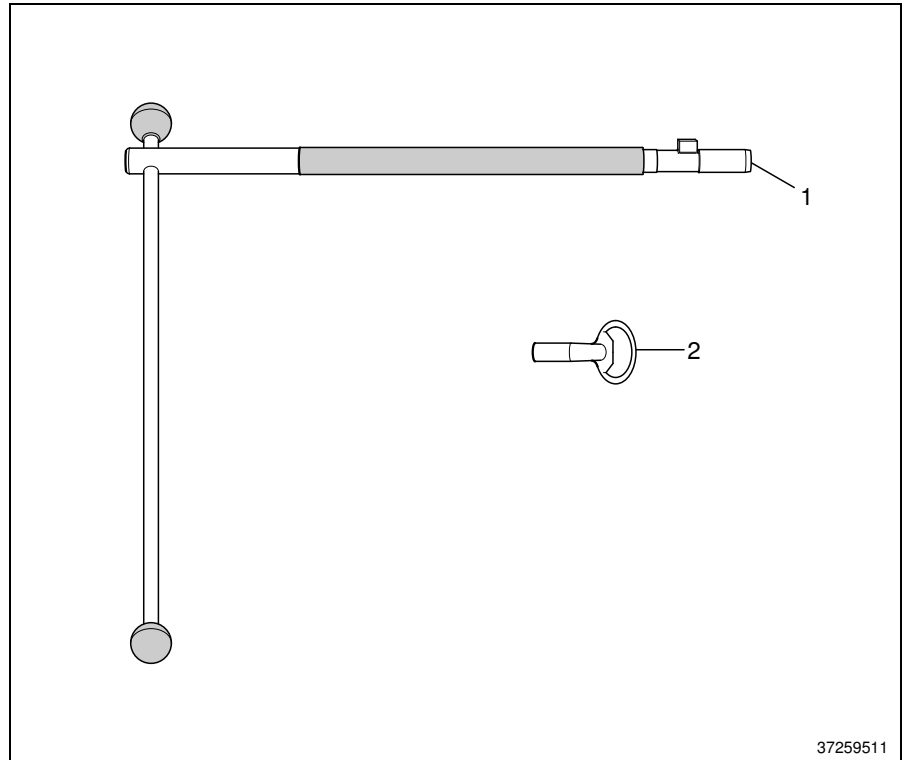
- 1 Switching lever for earthing switch (red shaft).
- 2 Key for front cover fastener (controls the anti-reverse interlock).

The switching levers used to switch the earthing panel are fitted with a torque reducing safety feature, which avoids damage to the drives.

When trying to continue a switching operation in a switch position (ON/OFF) by application of force, the knob of the switching lever will bend.

**Attention!**

Never leave the switching lever plugged in the actuating shaft.



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Fig. 26

### 5.2 Padlocking facility

The earthing panel is fitted with a padlocking facility as standard (Fig. 27). The padlocking facility is opened by pressing the thumb against the locking resistance of the locking cover in clockwise direction. The padlocking facility stops in the end position by means of an integrated stop. The access to the actuating shafts can be secured with a maximum of three locks.

**Note!**

In the description of the switching operations in chapters 5.3 and 5.4 the padlocking facility is not shown, for the purpose of a clearer representation of switch position indicator and actuating shaft.

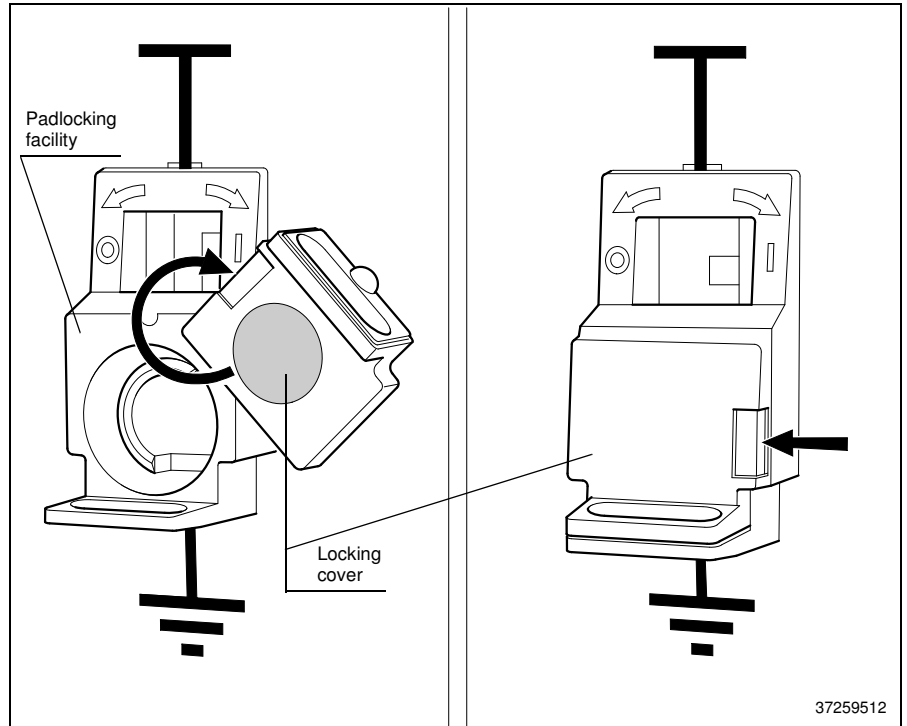


Fig. 27

### 5.3 As delivered state of the earthing panel

Upon delivery the earthing panel is in the following switch position:



Before removing the front cover switch on the earthing switch (See chap. 5.4).

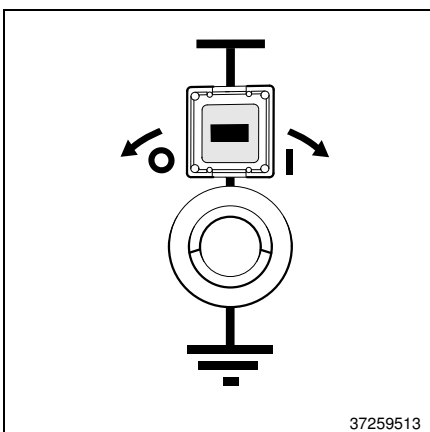


Fig. 28

Earthing switch switched off

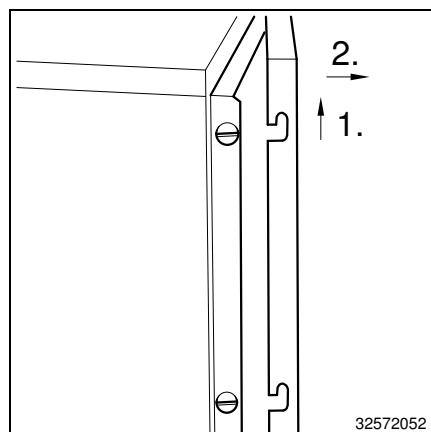



Fig. 29 Front cover

Remove the front cover.

- Lift the front cover up against the stop (Fig. 29/1)
- Pull the front cover off to the front (Fig. 29/2).

### 5.4 Switching

 Before switching the earthing panel check the gas leakage indicator.

In case of a red indication the earthing panel must not be switched! In such a case inform the customer service of Ormazabal.

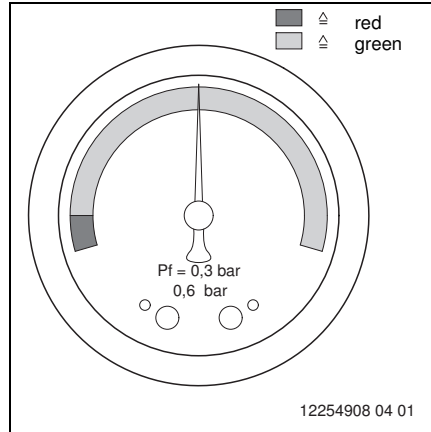


Fig. 30  
Gas overpressure correct - panel may be switched.

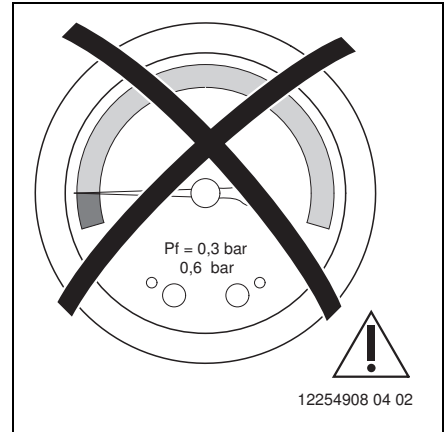



Fig. 31  
 Gas overpressure **not** correct – panel must **not** be switched.

Before switching the earthing switch the fastener must be closed with the fastener key (Fig. 32).

The circuit state of earthing switch can be read from the indicating device in the mimic diagram of the panel (Fig. 33).

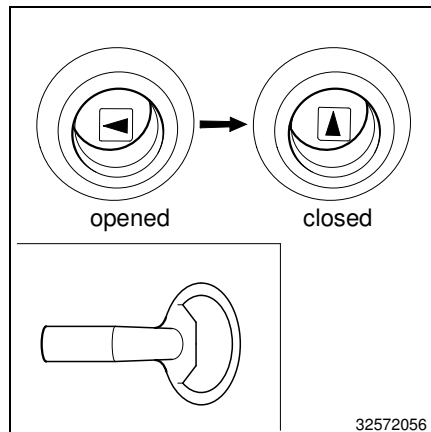


Fig. 32

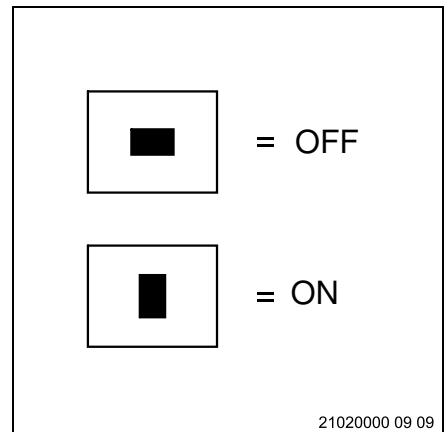


Fig. 33

#### 5.4.1 Switching on earthing panel

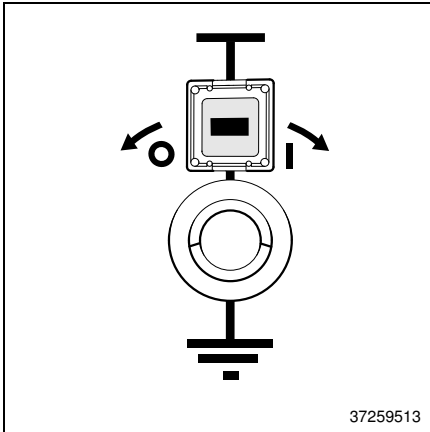


Fig. 34

**1** Switch position with deactivated earthing switch.

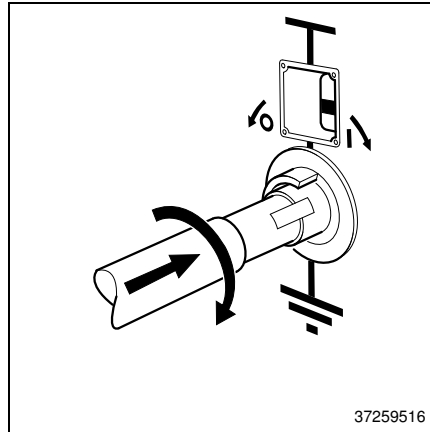


Fig. 35

**2** Switch on the earthing switch. Hold the switching lever (red shaft) depressed to the end stop against spring pressure and turn it clockwise.

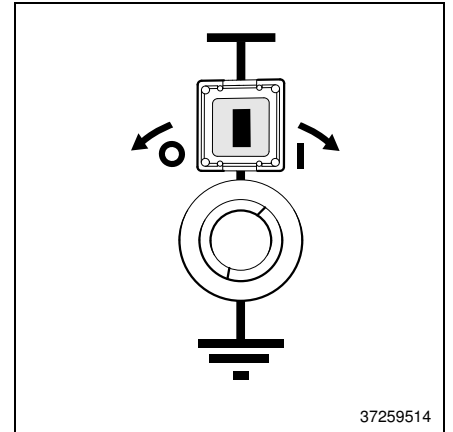


Fig. 36

**3** Switch position with activated earthing switch.

#### 5.4.2 Switching off earthing panel

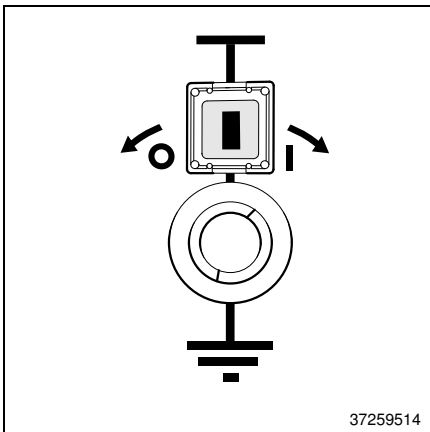


Fig. 37

**1** Switch position with activated earthing switch.

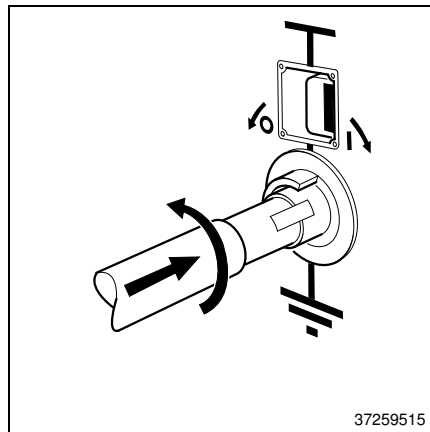


Fig. 38

**2** Switch off the earthing switch. Hold the switching lever (red shaft) depressed to the end stop against spring pressure and turn it anti-clockwise.

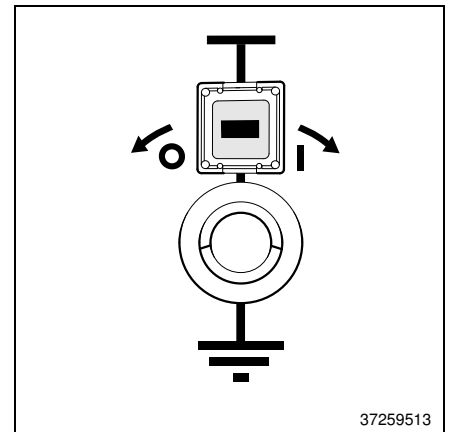


Fig. 39

**3** Switch position with deactivated earthing switch.

## 6 Commissioning

For commissioning the correct function of the earthing panel must be assured by testing the following points:

- Please compare the data of rating plate, delivery note and order documents.
- Check the wiring of the secondary equipment by following the specifications in the circuit documentation provided for the respective equipment configuration.
- Check all screwed connections (cable connections, equipment joints, system earthing) for tight fit (torque) and proper fastening.
- Check the available operating pressure on the gas pressure gauge (the pointer must be in the green sector).
- In case of an installed gas leakage indicator check the reading on the indicator via the remote indicator when the voltage supply is switched on.
- Check the function of the switch after installing the earthing panel.



When installing an earthing panel as end panel make sure that the sealing ends are correctly fitted to the lateral bushings and that the bottom screw connection point is closed with the screw plug. Please observe the assembly instructions "Panel installation for extensible GAE630 panels", article no. 12244002 respectively "Panel installation for extensible GAE1250 panels", article no. 12258706.

### Note!

We recommend during commissioning on site, after completion of the assembly, to perform a power frequency voltage withstand test as per IEC 62271-200 / DIN EN 62271-200 (VDE 0671-200) section 7.105.

### Note!

The earthing panel is delivered with front panels closed in the switched off state (See chap. 5.3).

The indication states of the switch position indicator are to be checked mechanically and with the supply voltage.

For this purpose, as described above, switch the drive and check the mechanical and electrical switch position.



## 7 Maintenance



Maintenance, repair work and subsequent modifications must only be performed by skilled personnel and in compliance with the operating instructions, the accident prevention instructions and rules from the German official labour association.

### 7.1 Inspection

Depending on the operating and local conditions an inspection of the earthing panel should be performed every 4 years in order to check the condition of the cable panel.

In case of operation under severe environmental conditions (temperature, dirt, gases) shorter inspection intervals may be necessary.

The operating pressure of the SF<sub>6</sub>-gas tank should be checked for pressure loss during this process. As long as the pointer in the gas leakage indicator is in the green sector the pressure is sufficient.

The earthing panel should be subjected to a general visual examination. Check the earthing panel for any peculiarities such as dirt deposits or changes caused by other environmental influences.

### 7.2 Maintenance

The drives and the switches themselves are maintenance free.

The gas tank is welded gas-tight and all components inside are maintenance-free.

The SF<sub>6</sub> gas is resistant to ageing and is not consumed during the switching operations.

Under normal conditions the SF<sub>6</sub>-gas does not need to be refilled during the lifetime of the earthing panel.

### 7.3 Cleaning

#### Attention!

Before starting cleaning work the earthing panel must be switched on.

- Switch earthing switch to ON position.
- Open the fasteners and remove the front cover (if required).

Carefully clean off all dirty surfaces, especially the surfaces of insulating materials. Clean off strongly adhesive, e. g. greasy, dirt with a lint-free cloth soaked in a commercial detergent, then wipe off with clear water and dry.

#### Attention!

Do not use any aggressive solvents!

### 7.4 Return of switchgear

For Ormazabal switchgear at least a 30-year operating time is assumed. The "sealed pressure system" acc. to IEC does not require refilling of the SF<sub>6</sub>-gas over the entire operating time. Due to the high reliability of the switchgear arc faults are almost completely ruled out. The handling and implementation of safety measures for switchgear, that has failed or has been taken out of operation because of such incidents, is described in the brochure SF<sub>6</sub>-systems, issued by the liability association for precision engineering and electrical engineering.

In 1993 the plant in Krefeld was certified acc. to DIN EN ISO 9001 for its quality system and in 1998 acc. to DIN EN ISO 14001 for its environment management system. As a competent partner Ormazabal offers you the return of your switchgear after the expiration of the above mentioned operating time. The costs involved depend on the legal requirements applicable at the time of return.

This switchgear contains the fluorinated greenhouse gas SF<sub>6</sub> covered by the Kyoto Protocol and with a global warming potential (GWP) 22200. SF<sub>6</sub> shall be recovered and not released into the atmosphere.

For further information on use and handling of SF<sub>6</sub> please refer to IEC 62271-303: High-voltage switchgear and controlgear – Part 303 Use and handling of sulphur hexafluoride (SF<sub>6</sub>).

All other materials of this switchgear should also be recycled.

## 8 Technical data

### 8.1 General data

Rated filling pressure of the insulating gas at 20 °C and 101,3 kPa	130 kPa (30 kPa overpressure)
Insulating gas	SF <sub>6</sub>
SF <sub>6</sub> -filling weight at 20 °C and 101,3 kPa	0,7 kg
Rated density of the insulating gas	7,9 kg/m <sup>3</sup>
Ambient temperature	-5...+40 °C *
Relative humidity	maximum 95% (indoor conditions)
Enclosure of HV compartment	sealed pressure system acc. to IEC, IP 65/IP4X
Enclosure of the drive housing	IP 44
Enclosure of connection compartment	IP 44
Internal arc classification according to VDE 0671 part 200 or IEC 62271-200	IAC AFL 20 kA 1 s for HV compartment and connection compartment
Coloration of equipment	RAL 7035 (light grey)
Loss of service continuity category	LSC 2A
Partition class	PM
Weight	approx. 148 kg (approx. 238 kg with pressure absorber channel)
Rated filling pressure of the insulating gas at 20 °C and 101,3 kPa	130 kPa (30 kPa overpressure)
Insulating gas	SF <sub>6</sub>

Table 2

\* when using a pressure switch (optional) the operating conditions comply with class minus 5 interior

### 8.2 Ratings

		Panel / earthing switch
Rated frequency	f <sub>r</sub>	50/60 Hz
Rated voltage	U <sub>r</sub>	12/24 kV
Rated normal current busbar	I <sub>r</sub>	1250 A
Rated short-duration power-frequency withstand voltage 1 min	U <sub>d</sub>	50 kV
Rated lightning impulse withstand voltage	U <sub>w</sub>	125 kV
Rated lightning impulse withstand voltage of the isolating distance	U <sub>p</sub>	145 kV
Rated peak withstand current	I <sub>p</sub>	50/40 kA
Rated short-time withstand current 1 s, optional 3 s	I <sub>K</sub>	20/16 kA
Rated short-circuit making current	I <sub>ma</sub>	50/40 kA
Number of switching events under rated short-circuit making current	n	5
Number of mechanical operating cycles	n	1000
Class	-	E2

Table 3

### 8.3 Pressure switch \*(optional)

Pressure range	60-400 hPa
Lower switch point	60 hPa
Hysteresis	20-30 hPa
Switching duty	250 V / 1A

\*when using the pressure switch (optional) the operating conditions comply with class minus 5 indoor.

Table 4

## 8.4 Tightening torques

Thread nominal diameter	Screw joints strength class 8.8	Welded stud
M5	6 Nm	-
M6	10 Nm	5,9 Nm
M8	25 Nm	14.7 / -0.2 Nm
M10	49 Nm	-
M12	86 Nm	-

**Note!**

The table values do not apply for tightening torques specially mentioned in the documents!

Table 5

## 8.5 Switching forces with manual operation

Drive type	Switch position	Torque actuating shaft (Nm)	Force to be applied (N) (manual)
Electrical drive	Making / breaking	55	130

Table 6

## 8.6 Materials

Materials used in the earthing panel:

Metals	Steel, copper, aluminium, zinc
Plastic materials	PC, PA, EPDM, NBR, EP, POM, Q, PPS (PF/MF, PBT, GFK-optional)
Miscellaneous	Aluminium oxide, lubricants, SF <sub>6</sub> -gas

Table 7

## 8.7 Regulations and standards

The earthing panel complies with the following standards or publications:

IEC 60529

IEC 61243-5

IEC 62271-1

IEC 62271-102

IEC 62271-200

IEC 62271-303

DIN EN ISO 9001

BlmSchV Federal Gazette 1996, part 1 no. 66 dated 20.12.1996

# 9 Accessories

## 9.1 Assembly components

Order no. 12238777	Assembly kit end panel GAE630
Order no. 12261688	Assembly kit end panel GAE1250
Order no. 12238779	Extension kit end panel
Order no. 12262315	Assembly kit panel screw connection GAE630 / GAE630
Order no. 12261690	Assembly kit panel screw connection GAE1250 / GAE1250



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