Assembly instructions
GAE1250 1HT-/-1HT/6/
GAE1250kMAX 1HT-/-1HT/6/

SF₆-insulated bus riser panel
in modular extensible design, up to 24 kV,
1250 A rated current busbar
# Assembly instructions

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1  Relay cabinet lateral opening
2  Sealing end side bushing
3  Screw plug
4  Pedestal opening for optional earthing bus
5  Intermediate frame
2 General

2.1 Liability and warranty
All information and notes concerning operation and maintenance of the bus riser panel are provided under due consideration of our present experience and to the best of our knowledge. These instructions describe the standard design of the bus riser panel.

The technical information and data in these assembly instructions reflect the situation at the time of going to print. 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 assembly instructions or incorrect repairs.

Genuine Ormazabal spare parts are specifically designed for and tested on Ormazabal bus riser panels.

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

The installation and use of products from other manufacturers may have a negative effect on specific design characteristics of the bus riser panel and degrade personal safety or place the bus riser 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 unauthorised conversions and changes to the bus riser panels are prohibited for safety reasons and cause the exclusion of any liability by Ormazabal for any damage resulting from this.

2.2 Management system
The management system introduced and applied to Ormazabal Anlagentechnik GmbH in Krefeld fulfils the requirements of the following standards:

► ISO 9001 (quality management system)
► ISO 14001 (environmental protection management system)
► OHSAS 18001 (occupational health and safety management system)

2.3 Service information
Ormazabal Anlagentechnik GmbH customer service is available to provide technical information on Ormazabal products.
3 Safety regulations

3.1 Intended use
The GAE1250(kMAX) 1HT-/-1HT/6/ bus riser panels are prefabricated, type-tested, metal-enclosed indoor switchgear for accessible switchgear rooms. They can be used for an operating voltage of up to 24 kV.

Bus riser panels are used in:
- transformer substations
- hub substations
- combined heat and power plants
- industrial plants
- consumer’s installations
- wind turbine generators

Using bus riser panels:
- overhead lines and cables
- transformers
- motors
- generators
- choke coils

are switched.

The 1HT-/-1HT panels are used as busbar riser panels.

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

These assembly instructions must be read carefully and strictly observed before installing and commissioning the bus riser panel.

Every person involved in the installation, commissioning, operation, maintenance and repair of the unit must have read and understood these assembly 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 with knowledge of these assembly instructions can operating errors be avoided and trouble-free operation guaranteed.

The general safety and accident-prevention instructions issued by the legislator and any potential regulations of the insurer, which may differ from country to country, must be strictly observed when operating and servicing the bus riser panel.

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

Also observe the operating instructions and special manufacturer’s instructions for the secondary technology components used.

3.2 Explanation of symbols and instructions
Observe these instructions and exercise extreme care in such cases. Hand out all instructions on health and safety also to all persons who are involved in work on the equipment. Besides the instructions in these assembly instructions, you must also comply with the generally valid safety and accident prevention instructions (e.g. DIN EN 50110, VDE 0105 Part 100, BGV A3).

Health and safety symbol

You will find these symbols with all health and safety instructions in these assembly 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.

Cautionary instruction

In these assembly 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 bus riser panel.

NOTE!
Notes contain important additional information.
3.3 General safety instructions

The bus riser panel is designed and manufactured to the latest technical standards and with due consideration of all safety instructions.

However, dangers for persons and property may arise from these bus riser 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. Therefore each person involved in the installation, commissioning, operation or servicing of the bus riser panel must have read and understood these instructions.

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

Before commissioning the bus riser 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 persons within the danger zone around the bus riser panel must be warned and asked to leave this area. Any objects positioned on the floor must in no case hinder accessibility of the operating elements.

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

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

Modifications to the bus riser panel must strictly be coordinated with Ormazabal and should only be performed under the supervision of expert personnel.

Experts are persons who, due to their professional education and experience, have sufficient knowledge in the field of electro technology and are acquainted with the relevant accident prevention instructions (BGV A3), guidelines and the generally accepted technical rules and regulations (e.g. VDE regulations, IEC-standards, DIN standards).

3.3.2 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 bus riser panel with faulty safety features is not allowed.

3.3.3 Auxiliary device for operation, maintenance and repair
If any auxiliary devices (tools or similar) are required for operation, maintenance or repair of the bus riser 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 bus riser panel is not permissible.

3.3.4 Statutory health and safety instructions
Apart from these notes on prevention of accidents and the notes attached to the bus riser panel the locally valid accident prevention instructions must also be observed.
4 Transport and installation

4.1 Safety instructions for transport

⚠️ Lifting tackle must only be used at points intended for this purpose.
⚠️ Ropes, chains or other lifting tackle must be fitted with safety hooks.
⚠️ Do not use any torn or worn ropes.
⚠️ Ropes and chains must not be knotted.
⚠️ Ropes and chains must not touch any sharp edges.
⚠️ Use only ropes and chains of sufficient loading capacity (for weight of circuit-breaker panel see chapter 11 “Technical data”, Tab. 11.1).
⚠️ Use only lifting gear of sufficient loading capacity (for weight of circuit-breaker panel see chapter 11 “Technical data”, Tab. 11.1).
⚠️ Do not lift loads over persons.

4.2 Transport and unloading

The circuit-breaker panel is delivered packed upright on a pallet. It is fastened to the pallet with tightening straps (Figure 4.1).

For transportation or intermediate storage, please always use the original packaging and secure the circuit-breaker panel with straps in the same way as for delivery.

When attaching the tightening straps make sure to attach these as shown in the Figure 4.1, as otherwise the circuit-breaker panel may be damaged.

⚠️ During transport, comply with the warning and safety instructions on the circuit-breaker panel and its packaging.

⚠️ When unloading, observe the safety instructions (see chapter 4.1) 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).
4.3 Arrival and unpacking of goods

- The goods must be checked immediately upon 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 bus riser panel is then no longer secured. Due to its design, the centre of gravity of the bus riser panel is higher than the middle of the switch panel.

- The bus riser panel must only be attached using the transportation mounts provided.

Transportation mounts, each with three anchorage points, are attached to both sides of the bus riser panel.

- For transportation with a chain or rope anchor, the anchorage point must be chosen so that the panel is held in its centre of gravity position (Figure 4.2). For this type of attachment, only use transport lifting beams. Otherwise there is a risk of damage.

- In case of unsecured handling of the bus riser panel there is a risk of the panel tipping over! Particular attention is to be paid to this issue when transporting the bus riser panel to its place of installation. It is not allowed to use levers to transport the bus riser panel to its final position. This action could cause damage to the enclosure.

Figure 4.2 Transport

Check the bus riser panel delivery for correctness and completeness. The serial numbers on the delivery note and on the rating plate of the bus riser panel (Figure 4.3) must match.

Figure 4.3 Rating plate (exemplary sample)
4.4 **Storage**

The switch 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 and VDE 0670 part 1000, ambient temperature class "minus 5 indoor".

### 4.5 Key to type references of the bus riser panel

The principle used for the type identifiers is explained in Figure 4.4 and Figure 4.5, based on the example of the bus riser panel.

<table>
<thead>
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<th>1</th>
<th>Type: gas-insulated, extensible</th>
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<tr>
<td>2</td>
<td>Series: 1250 A</td>
</tr>
<tr>
<td>3</td>
<td>Switch panel type: 1HT- = busbar riser panel with disconnector</td>
</tr>
<tr>
<td>4</td>
<td>Switch panel width 6 = 600 mm</td>
</tr>
<tr>
<td>5</td>
<td>Rated voltage: 12 = 12 kV 24 = 25 kV</td>
</tr>
<tr>
<td>6</td>
<td>Rated current of the busbar: 1250 = 1250 A</td>
</tr>
<tr>
<td>7</td>
<td>Rated short-time withstand current: 16 = 16 kA 20 = 20 kA</td>
</tr>
<tr>
<td>8</td>
<td>Rated short-time withstand current seconds: 1 = 1 s 3 = 3 s</td>
</tr>
</tbody>
</table>

**Figure 4.4  Key to type references of the switchgear**
4.6 Installation and assembly

To install the bus riser panel, follow the installation plans shown in chapter 3.6.1. In order to assure secure standing of the panel use all fastening holes provided.

<table>
<thead>
<tr>
<th>For GAE1250kMAX switchgear, the following minimum ceiling heights must be adhered to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>► Ceiling height 200 mm over switchgear GAE1250kMAX without pressure absorber channel</td>
</tr>
<tr>
<td>► Ceiling height 600 mm over switchgear GAE1250kMAX with pressure absorber channel</td>
</tr>
</tbody>
</table>

In the case of installation on concrete with a strength of ≥ 25 N/mm², we recommend the following fastening material:

► Fischer plastic dowels of type S12
► Wood screw DIN 571-10x80-St
► Washer DIN 125 A10

Remove front cover and cable fixing irons, if applicable, inside the cable connection compartment in order to gain access to the fastening holes (see chapter 8).

To simplify assembly of the modular switchgear GAE, we recommend the following lateral wall distances when attaching from left to right:

► distance from left wall at least 100 mm
► distance from right wall at least 300 mm

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

A prerequisite for stress-free assembly of the bus riser panel is a flat and even floor surface that is free of foreign bodies. Observe 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.

To ease the assembly work on the installation of several GAE1250(kMAX) panels, we recommend the usage of a metal chassis.

The fastening material is not included in the items supplied.

To fasten the metering 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
4.7 Planning of installation

4.7.1 Floor fastening measurements

Figure 4.6 and Figure 4.7 show the floor fastening and floor opening measurements.

Figure 4.6  GAE1250(kMAX) 1HT-/6/ with pressure relief in the cable trench/raised floor
(all dimensions are nominal dimensions [mm])

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>GAE1250(kMAX) -1LSVG</td>
</tr>
<tr>
<td>2</td>
<td>GAE1250(kMAX) 1HT-</td>
</tr>
<tr>
<td>3</td>
<td>Fastening holes Ø 12</td>
</tr>
<tr>
<td>4</td>
<td>Floor contact area</td>
</tr>
<tr>
<td>5</td>
<td>Floor opening</td>
</tr>
</tbody>
</table>
Figure 4.7  GAE1250(kMAX) 1HT/-6/ with pressure relief via the pressure absorber channel on rear (all dimensions are nominal dimensions [mm])

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GAE1250(kMAX) -1LSVG</td>
</tr>
<tr>
<td>2</td>
<td>GAE1250(kMAX) 1HT-</td>
</tr>
<tr>
<td>3</td>
<td>Fastening holes Ø 12</td>
</tr>
<tr>
<td>4</td>
<td>Floor contact area</td>
</tr>
<tr>
<td>5</td>
<td>Outgoing earthing</td>
</tr>
</tbody>
</table>

GAE1250 1HT/-1HT/6/  
GAE1250kMAX 1HT/-1HT/6/
4.7.2 Dimensions

Figure 4.8 Dimensions of GAE120(kMAX) 1HT/-6/ (all dimensions are nominal dimensions [mm])

Figure 4.9 Dimensions of GAE1250(kMAX) -1LSVG/6/ (all dimensions are nominal dimensions [mm])
4.7.3 Possible installations

Possible installations for bus riser panel in accessible switchgear rooms.

⚠️ During installation make sure not to damage the burst protection in the bottom of the gas tank (Figure 4.10). This diaphragm opens in the case of an internal arc fault. The emerging gases must be discharged as shown in Figure 4.10.

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)
- as of 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.

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 services at the sales department of OrmaZabal GmbH.

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 bottom. 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.

Figure 4.10 Possible installations
(all dimensions are nominal dimensions [mm])
4.8 Installation of the supply line for the auxiliary and control circuits

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, left or right, (loop cable) is laid through openings in the related side wall of the relay cabinet (Figure 4.11).

Figure 4.11 Relay cabinets flush at the front

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 (Figure 4.12).

Figure 4.12 Relay cabinets offset

The ventilation grilles of the bus riser panel must not be removed.
4.9 Attachments

The auxiliary switches for the disconnector and earthing switch are behind the control panel cover on the right-hand side of the panel (Figure 4.13).

Figure 4.14 shows the connection diagram (standard design) of the auxiliary switch.

For additional relevant information on the wiring of the bus riser panel, please refer to the enclosed circuit documentation.

Should additional auxiliary circuits be laid from the cable connection compartment or the operating room in the relay cabinet, proceed as follows:

1. Disassembling the control panel cover. Unclamp the 4 fastening screws and lift the cover (Figure 4.15) out of the bus riser panel.

2. Remove bottom plates for the relay cabinet. To do so, unclamp both screws of both bottom plates on the front edge, lift the plate slightly and remove it from the relay cabinet.

3. Assembly of the bottom plate and control panel cover is performed in reverse order.

* The density monitor is also available with 2 changeover contacts (2 switching points)
5 Technical description

5.1 Bus riser panel

The bus riser panel is a quality product manufactured to the requirements of DIN ISO 9001. It can be used for a rated voltage of up to 24 kV and a rated normal current up to 1250 A and has the following features:

► metal-enclosed
► maintenance free
► Type-tested
► extensible via side busbar connection.

Connection is made on the right-hand side through the bushings fitted to the side of SF6-insulated panels of series GAE(kMAX)1250 (see assembly instructions "Panel screw connection for extensible GAE1250 panels", article number 12258706).

Transfer is made on the left-hand side via a three-phase busbar to a busbar sectionaliser panel GAE1250(kMAX)-1LSVG (see chapter 6.1, "Attachment of GAE1250(kMAX) 1HT- to GAE1250(kMAX) -1LSVG").

The GAE bus riser panel comprises the gas tank, the three-position switch (disconnector and earthing switch), the busbars and the cable connection compartment.

During production, a functional module, comprising a three-position switch and switch drive mechanism is assembled as a pre-tested unit on the front wall of the tank and is subsequently gas-tightly welded to the stainless steel tank.

Sulphur hexfluoride (SF6) is used as the insulation medium.

The bus riser panel contains a sealed pressure system acc. to IEC.

The operating and indication elements of the bus riser panel are clearly arranged on the panel cover (see system overview, Figure 1.1).

The elements for disconnectors and earthing switches are located on the control panel cover. All symbols of relevance for the earthing circuit appear in red, whereas the symbols for the main current path are printed in black.

The bus riser panel can optionally be equipped with a switchable or non-switchable voltage transformer.

5.2 Gas tank

The gas tank is made of stainless steel. Guarantee of the safe functioning of the switchgear for many years requires optimal processing of all mechanical components as well as the leak tightness of the tank.

The gas-tight welded tank is checked for leak tightness according to IEC 62271-200 (permissible leak rate $10^{-7}$ mbar x l/s).

The gas tank includes the three-position switch. The bushings of the busbars are located on the side of the tank and are connected inside the tank via copper busbars. The three-position switch connects the cable bushings to the busbar.

The connection of the sectionaliser busbars occurs via cast resin bushings with outside taper according to DIN 47636 part 1 and 3.

The bushings are individually tested for compliance with the maximum permissible partial discharged value.

Bushings, sealing flange for actuating shaft and bursting plate are sealed towards the tank by means of sealing rings. The switching shaft of the three-position switch is inserted into the tank with a double pair of radial seals.

After the evacuation process, the tank of each bus riser panel is filled with dry SF6 gas according to IEC 60376. The addition of $\text{Al}_2\text{O}_3$ absorbs the smallest quantities of humidity and continuously regenerates the SF6.
5.3 Gas leakage indicator

The gas leakage indicator occurs via an aneroid diaphragm pressure gauge, which is connected to the tank via a check valve. The aneroid pressure gauge is corrosion-resistant.

The indication range (Figure 5.1) is divided into two measuring ranges.

![Gas leakage indicator]

Figure 5.1 Gas leakage indicator

- Red: NOT ready for switching!
- Green: ready for switching

Before each switching procedure, the gas filling in the tank must be checked via the gas leakage indicator.

5.4 Density monitor or pressure switch (option)

For remote monitoring, the switchgear can optionally be equipped with a density monitor or pressure switch, which works as a break contact in the auxiliary circuit.

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

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

5.5 Three-position switch

The disconnector and earthing switch is a three-position switch. Its schematic design is shown in Figure 5.2.

![Three-position switch]

Figure 5.2 Three-position switch

The technical design of the three-position switch is simple and reliable. The switching positions ON-OFF-EARTHED can be switched with only one switching element (pair of switching blades).

Each pair of blades is stored on a support and connected to the switching shaft via a coupling bar. The connection of the fixed device contacts for the busbar occurs via copper supports. The pair of switching blades for each phase slides on according to the switch position on the corresponding contact.

To guarantee a long lifetime of the switching elements, the blades and contact elements are made of burnout and wear-resistant material.
5.6 Three-position switch drive

The functions disconnector ON/OFF are operated by means of a switching lever via a robust mechanism.

The earthing switch ON function occurs via a spring drive, which is tensioned when switching the earthing switch function to OFF.

The drive is borne on a U-shaped drive carrier. The robust drive is equipped with both disconnector and earthing switch actuating shafts.

Both actuating shafts are hollow shafts with integrated blade inhibitors. These inhibitors prevent the blades from swinging through to the opposing contact of the three-position switch when switching the disconnector or earthing switch OFF. They are unlocked when the switching lever is inserted into the actuating shafts.

The function and arrangement of the actuating shafts is shown on the mimic diagram.

The transfer of the rotary movement of the actuating shafts occurs via toggle links and the operating lever on the switching shaft.

The switch position indicator is controlled by the operating lever.

All parts of the drive at risk of corrosion are galvanically zinc coated.

5.7 Panel interlock

The bus riser panel is equipped as standard with the following interlocks:

► Earthing switch for front cover (front cover interlock)
► Optional voltage transformer disconnector is secured with front cover interlock
► Disconnector for earthing switch
► Optional - electromechanical interlock between disconnector of the 1HT- panel and circuit-breaker of the bus sectionaliser panel -1LSVG

Figure 5.3 Front cover interlock

The front cover interlock (Figure 5.3) ensures that the front cover can only be removed for earthing switches that are inserted. For deactivated earthing switches, a bolt is inserted from the inside into a recess on the front cover and locks them.

Figure 5.4 Disconnector/earthing switch drive without disconnector motor drive

1 Electromechanical interlock
2 Actuating shaft disconnector
3 Actuating shaft for earthing switch
4 Anti-reverse interlock
5 Activation via fastener
6 Switch position indicator plate
The interlock between the disconnector and the earthing switch is effected by the switch position indicator (Figure 5.4). This closes the plug-in opening on the corresponding switching shaft for the switching lever.

An anti-reverse interlock (Figure 5.4) can additionally be delivered if required.

This prevents the disconnector from being switched ON when the front cover has been removed. The anti-reverse interlock is switched on and off with the fastener key.

When the fastener is open, the plug-in opening for the switching lever on the disconnector’s switching shaft is closed off by a plate.

5.8 Voltage transformer

Plug-in, metal-enclosed, single-pole voltage transformer in acc. with IEC 60044-2 and VDE 0414 Part 2 are flanged on directly above the gas tank in the bus riser panels.

They are optionally switched as busbars or outgoing voltage transformers. A series connected disconnector or earthing switch under SF$_6$ is optionally available (standard fitting with outgoing voltage transformers). This disconnector or earthing switch is operated via a drive device, which is installed behind the interlocked front cover of the cable connection area. The drive device can be provided with a padlock or sealing.

The voltage transformers are optionally equipped with verified or calibrated measuring cores.

If there is no voltage transformer disconnector fitted, the voltage transformers must be removed in order to carry out cable and transformer tests on the bus riser panel (see chapter 10.5.1).

5.9 Capacitive voltage detecting system

To check for electrical isolation, a capacitive coupling unit (voltage indication ledge, Figure 5.6), which is wired to the switch panel, is integrated in the control panel cover. It is an HR system according to VDE 0682, part 415 and IEC 61243-5.

The voltage indication ledge consists of a insulated housing with all electronic assembly parts encapsulated.

The test sockets integrated into the voltage indication ledge make it possible to connect commercially available HR voltage testers.

The coupling part must be subjected to a requalification test at regular intervals (approx. every 6 years). This test must be performed under operating voltage and by using appropriate testing equipment or adapters.

Captive shrouds protect the test sockets from dirt, dust and moisture (Figure 5.6). For voltage testing they must be swivelled by 90°.
The test must be performed using a suitable voltage tester (Tab. 5.1) (Figure 5.4).

<table>
<thead>
<tr>
<th>Voltage tester</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfisterer</td>
<td>DSA-2</td>
</tr>
<tr>
<td>Horstmann</td>
<td>HO-ST-1</td>
</tr>
<tr>
<td>ELSIC</td>
<td>HO-SA</td>
</tr>
<tr>
<td>Jordan</td>
<td>DSP-HR</td>
</tr>
<tr>
<td>Dehn</td>
<td>DEHN cap/P-HR</td>
</tr>
<tr>
<td>EMG</td>
<td>CSA</td>
</tr>
</tbody>
</table>

Tab. 5.1 Voltage tester

With a flashing indicator these units indicate that voltage is applied to the testing point of the bushing.

⚠️ During the tests for electrical isolation, all phases (L1, L2, L3) must always be checked!

To check for electrical isolation, see chapter 9.3.

It can optionally be supplied with a capacitive voltage indicator with three-phase continuous display and permanent self monitoring.

![Capacitive voltage indicator with three-phase continuous display](image)

This device indicates that voltage is present at the capacitive insulating support test point using the display of warning signs on the integrated Display.

No additional voltage indication devices or repeat tests are necessary.

In addition, the device has an integrated three-phase measuring point. This device is calibrated in accordance with LR requirements according to VDE 0682 part 415 and IEC 61243-5 and is suitable for phase testing using an LR phase comparator.

A captive shroud protects the test sockets against dirt, dust and moisture.

### Display explanation

<table>
<thead>
<tr>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>no display</td>
<td>$U &lt; 10% U_N$, no voltage present</td>
</tr>
<tr>
<td>half lightning</td>
<td>$10% \times U_N \leq U \leq 45% \times U_N$,</td>
</tr>
<tr>
<td>arrow</td>
<td>i.e. voltage present</td>
</tr>
<tr>
<td>full lightning</td>
<td>nominal voltage present</td>
</tr>
</tbody>
</table>

Tab. 5.2 $U_N = \text{nominal voltage}$

---

**Assembly instructions**

**GAE1250 1HT/-1HT/6**

**GAE1250kMAX 1HT/-1HT/6**
# 6 Assembly kits

## 6.1 Panel screw connection assembly kit GAE1250(kMAX) 1HT- to GAE1250(kMAX) -1LSVG

All parts must be checked for correctness and completeness prior to assembly. It must be ensured that all parts are assembled in a clean and perfect condition.

The assembly kit consists of the following assembly parts (Figure 6.1 to Figure 6.3):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sectionaliser busbar L1, L2, L3, 636 mm long</td>
</tr>
<tr>
<td></td>
<td>3 pieces</td>
</tr>
<tr>
<td>1</td>
<td>Earthing cable lug</td>
</tr>
<tr>
<td>2</td>
<td>Earth cable</td>
</tr>
<tr>
<td>3</td>
<td>Washer DIN125-A6,4</td>
</tr>
<tr>
<td>4</td>
<td>Screw DIN933-M6</td>
</tr>
<tr>
<td>5</td>
<td>Hat nut DIN986-M6</td>
</tr>
<tr>
<td>6</td>
<td>Washer DIN125-A10,5</td>
</tr>
<tr>
<td>7</td>
<td>Spring lock ring DIN128-10</td>
</tr>
<tr>
<td>8</td>
<td>Screw DIN933-M10</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
Assembly instructions

GAE1250 1HT/-1HT/6/
GAE1250kMAX 1HT/-1HT/6/

Panel screw connection assembly kit
GAE1250(kMAX) 1HT- to GAE1250(kMAX) -1LSVG

<table>
<thead>
<tr>
<th>Number</th>
<th>Item Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nut DIN 934-M12</td>
<td>6 pieces</td>
</tr>
<tr>
<td>2</td>
<td>Conical spring washer DIN 6796-12</td>
<td>6 pieces</td>
</tr>
<tr>
<td>3</td>
<td>Thread bolt M12/M16</td>
<td>6 pieces</td>
</tr>
<tr>
<td>4</td>
<td>Adapter</td>
<td>6 pieces</td>
</tr>
<tr>
<td>5</td>
<td>Contact shell</td>
<td>12 pieces</td>
</tr>
<tr>
<td>6</td>
<td>End adapter</td>
<td>6 pieces</td>
</tr>
<tr>
<td>7</td>
<td>Threaded insert</td>
<td>6 pieces</td>
</tr>
<tr>
<td>8</td>
<td>Cover flap</td>
<td>6 pieces</td>
</tr>
<tr>
<td>9</td>
<td>Cable tie</td>
<td>6 pieces</td>
</tr>
<tr>
<td>10</td>
<td>Polishing pad</td>
<td>1 pieces</td>
</tr>
<tr>
<td>11</td>
<td>Cloth, lint-free</td>
<td>1 pieces</td>
</tr>
<tr>
<td>12</td>
<td>Assembling paste</td>
<td>1 pieces</td>
</tr>
<tr>
<td>13</td>
<td>Plastic brush</td>
<td>1 pieces</td>
</tr>
<tr>
<td>14</td>
<td>Disposal gloves</td>
<td>1 pair</td>
</tr>
<tr>
<td>15</td>
<td>Edge protection profile (not shown)</td>
<td>200 mm</td>
</tr>
</tbody>
</table>

Figure 6.3  Panel screw connection assembly kit
6.2 Earthing bus assembly kit (optional)

All parts must be checked for correctness and completeness prior to assembly. It must be ensured that all parts are assembled in a clean and perfect condition.

The assembly kit consists of the following assembly parts (Figure 6.4 to Figure 6.5):

<table>
<thead>
<tr>
<th></th>
<th>Part Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Earthing bus connection kit</td>
<td>1 pieces</td>
</tr>
<tr>
<td>2</td>
<td>Bushing grommet</td>
<td>2 pieces</td>
</tr>
<tr>
<td>3</td>
<td>Hexagon screw DIN 933 M10x30</td>
<td>2 pieces</td>
</tr>
<tr>
<td>4</td>
<td>Conical spring washer DIN6796-10</td>
<td>4 pieces</td>
</tr>
<tr>
<td>5</td>
<td>Nut DIN 934-M10</td>
<td>2 pieces</td>
</tr>
</tbody>
</table>

![Figure 6.4 Earthing bus assembly kit](image1)

![Figure 6.5 Earthing bus assembly kit](image2)
6.3 Assembly tools

In addition to the specified assembly components and auxiliary devices, you need the following tools (Figure 6.6):

- 1/4” ratchet
- 1/4” socket SW 8 mm
- 1/4” socket SW 10 mm
- 3/8” ratchet
- 3/8” socket SW 10 mm
- 3/8” socket SW 13 mm
- 3/8” socket SW 17 mm
- 3/8” socket SW 19 mm (long)
- Torque wrench (1 to 50) Nm
- Hex wrench size 5
- Hex wrench size 10
- Ring spanner SW 8 mm
- Ring spanner SW 10 mm
- Ring spanner SW 17 mm
- Open-ended spanner SW 17 mm
- Open-ended spanner SW 19 mm
- Combination pliers
- Standard screwdriver size 8

Figure 6.6 Assembly tools
7 Assembly

7.1 Attaching GAE1250(kMAX) 1HT- to GAE1250(kMAX) -1LSVG

1) Place the bus riser panel next to the GAE1250(kMAX) bus sectionaliser panel at a distance of approx. 0.3 m (Figure 7.1). During installation pay attention to the notes chapter 4 “Transport and installation”.

2) On the left side of the intermediate frame, remove the 12 screws with spring lock rings and keep them for later on in the assembly.

► Before mounting the bus riser panel onto the bus sectionaliser panel, ensure that the screw plug and the sealing end are mounted on the lateral bushings on the right side of the bus sectionaliser panel and on the left side of the bus riser panel (Figure 7.2).

As standard, the attachment to a row of GAE1250(kMAX) panels is to the right. If the attachment of the bus riser panel is to the left, assembly steps listed in this chapter must be carried out as a mirror image.

► When expanding a GAE1250(kMAX) row of panels with a bus riser panel, the busbar line for the switchgear must be isolated and the related safety measures (VDE 0105 part 100, BGV A3) taken.
Assembly
Attaching GAE1250(kMAX) 1HT- to GAE1250(kMAX) -1LSVG

Assembly instructions
GAE1250 1HT/-1HT/6/
GAE1250kMAX 1HT/-1HT/6/

Figure 7.3  Remove front cover, fasten the panel

3) Place the bus riser panel next to the bus sectionaliser panel, remove the front cover and fasten the panel via the floor opening (see chapter 4.7.1).

Figure 7.4  Remove front cover

4) Remove the front cover (Figure 7.4) of the GAE1250(kMAX) bus sectionaliser panel, in order to access the screw connections of the cable connection compartment.

5) Remove the control panel cover of the GAE1250(kMAX) bus sectionaliser panel, in order to access the screw connections of the cable connection compartment. To do so, unclamp the four screws (Figure 7.4) and lift the bus sectionaliser panel cover.
Assembly
Attaching GAE1250(kMAX) 1HT- to GAE1250(kMAX) -1LSVG

6) Connect the cable connection compartment and the relay cabinet of the bus sectionaliser panel to the intermediate frame. To do so, insert and screw the screws and spring lock rings removed in assembly step 2 into the corresponding connection points (Figure 7.5).

7) For assembly of the sectionaliser busbars, perform the assembly step of chapter 7.1.1, “Assembly of the sectionaliser busbars”. Then proceed with work step 8 in this chapter.

Prior to assembly of the control panel and front cover, check that there are no foreign parts (tools etc.) inside the switchgear. If items remain inside the switchgear, this can lead to serious malfunctions.

8) The assembly of the front cover and the control panel cover on the bus sectionaliser panel occurs in reverse order to assembly steps 4 and 5.

9) The front covers on the bus riser panel are assembled in the reverse order, as described in chapter 8.3.

Figure 7.5  Remove front cover

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bus sectionaliser panel GAE1250(kMAX) -1LSVG</td>
</tr>
<tr>
<td>2</td>
<td>Intermediate frame</td>
</tr>
<tr>
<td>3</td>
<td>Screw DIN 912 M6 x 10</td>
</tr>
<tr>
<td>4</td>
<td>Spring lock ring DIN 7980-6</td>
</tr>
<tr>
<td>5</td>
<td>Bus riser panel GAE1250(kMAX) 1HT-</td>
</tr>
</tbody>
</table>

12258533 06 28
7.1.1 Assembly of the sectionaliser busbars

⚠️ For assembly of the sectionaliser busbars, the busbar line of the switchgear must be isolated and the related safety measures (VDE 0105 Part 100, BGV A3) taken.

⚠️ The sectionaliser busbars are to be assembled with great care, as the black conductive layer on the sectionaliser busbars must not be damaged in any way.

As standard, the attachment to a row of GAE1250(kMAX) panels is to the right. If the attachment of the bus riser panel is to the left, assembly steps listed in this chapter must be carried out as a mirror image.

1) To protect the sectionaliser busbars from damage, attach an edge protection profile to the side wall opening on both side walls of the bus sectionaliser panel and bus riser panel (Figure 7.6).

Figure 7.6 Pre-assembly of sectionaliser busbars

Figure 7.7 Attach edge protection profile
Assembly
Attaching GAE1250(kMAX) 1HT- to 
GAE1250(kMAX) -1LSVG

For pre-assembly, perform assembly steps 2 and 3 for all three sectionaliser busbars L1, L2 and L3.

2) Rub a thin layer of assembling paste simultaneously on the contact shells and end adapter in the areas marked with "A" (Figure 7.8). Lay the contact shells on top of each other and press them with adapter completely through the greased busbar opening until the middle of the adapter. Align the contact shells so that the bores align with the receptacle direction for the thread bolt.

3) Clean the busbars in the area marked "B" (Figure 7.8), at the same time rub a thin layer of assembling paste on and insert until the middle of the end adapter.

The black conductive layer of the busbar must be overlaid by the end adapter.

Finally, carefully place the sectionaliser busbars with the pre-assembled end adapters to the side for later on in the assembly.

Due to reasons of space, perform assembly step 4 initially only for phases L1 and L3.

4) Screw thread bolts M12/M16 up to the stop in the female connector of the bus sectionaliser panel and the bus riser panel and tighten to a torque of 10 Nm (Figure 7.9).

Figure 7.8 Mount contact shells

Figure 7.9 Screw in the thread bolts
Figure 7.10  Assembly of end adapter on female connector in bus sectionaliser panel (L1)

5) Rub a thin layer of assembling paste simultaneously on the contact shells and end adapter in the areas marked with "A" (Figure 7.10). Lay the contact shells on top of each other and press them with adapter completely through the greased busbar opening until the middle of the adapter. Align the contact shells so that the bores align with the receptacle direction for the thread bolt.

6) Attach an end adapter to Phase 1 in bus sectionaliser panel, as shown in Figure 7.9. To do so, clean the end adapter and female connector in the area marked "B" and simultaneously apply a layer of assembling paste. Press the end adapter onto the female connector.

Figure 7.11  Assembly of end adapter on female connector in bus riser panel (L3)

7) Rub a thin layer of assembling paste simultaneously on the contact shells and end adapter in the areas marked with "A" (Figure 7.11). Lay the contact shells on top of each other and press them with adapter completely through the greased busbar opening until the middle of the adapter. Align the contact shells so that the bores align with the receptacle direction for the thread bolt.

8) Attach an end adapter to Phase 3 in the bus riser panel, as shown in Figure 7.11. To do so, clean the end adapter and female connector in the area marked "B" and simultaneously apply a layer of assembling paste (Figure 7.11). Press the end adapter onto the female connector.
Attaching GAE1250(kMAX) 1HT- to GAE1250(kMAX) -1LSVG

**Figure 7.12 Assembly of the end adapter**

9) Unplug the pre-assembled sectionaliser busbar of the bus riser panel from the openings of the cable connection compartment of the bus riser and bus sectionaliser panel. Then insert at a slight angle (see Figure 7.12) in the pre-assembled end adapter on the bus sectionaliser panel. Plug in the end adapter that is pre-assembled on the right-hand side of the sectionaliser busbar to the female connector of the bus riser panel.

- GAE1250(kMAX) -1LSVG
- Female connector
- GAE1250(kMAX) 1HT-
- Sectionaliser busbar
- End adapter
- End adapter

Only perform assembly step 10 for Phase L1.

**Figure 7.13 Assembly of the end adapter**

10) Unplug the pre-assembled sectionaliser busbar of the bus sectionaliser riser panel from the openings of the cable connection compartment of the bus sectionaliser and bus riser panel. Then insert at a slight angle (see Figure 7.13) in the pre-assembled end adapter on the bus riser panel. Plug in the end adapter that is pre-assembled on the left-hand side of the sectionaliser busbar to the female connector of the bus sectionaliser panel.

- GAE1250(kMAX) -1LSVG
- Female connector
- GAE1250(kMAX) 1HT-
- Sectionaliser busbar
- End adapter
- End adapter

Only perform assembly step 11 for Phase L3.
Figure 7.14  Assembly of the end adapter

11) Screw the thread bolts into the bus sectionaliser panel and bus riser panel with conical spring washer and nut SW 19 mm (torque 50 Nm).

12) In the bus sectionaliser panel and bus riser panel on Phase L2, screw thread bolts M12/M16 up to the stop in the female connector and tighten to a torque of 10 Nm (Figure 7.9).

13) Rub a thin layer of assembling paste simultaneously on the contact shells and end adapter in the areas marked with "A" (Figure 7.15). Lay the contact shells on top of each other and press them with adapter completely through the greased busbar opening until the middle of the adapter. Align the contact shells so that the bores align with the receptacle direction for the thread bolt.

Figure 7.15  Assembly of end adapter on female connector in bus sectionaliser panel (L2)

14) Attach an end adapter to Phase L2 in bus sectionaliser panel, as shown in Figure 7.15. To do so, clean the end adapter and female connector in the area marked "B" and simultaneously apply a layer of assembling paste (Figure 7.15). Press the end adapter onto the female connector.

15) Unplug the pre-assembled sectionaliser busbar of the bus riser panel from the openings of the cable connection compartment of the bus riser and bus sectionaliser panel. Then insert at a slight angle (see Figure 7.12) in the pre-assembled end adapter on the bus sectionaliser panel. Plug in the end adapter that is pre-assembled on the right-hand side of the sectionaliser busbar to the female connector of the bus riser panel.

16) Screw the thread bolts on Phase L2 into the bus sectionaliser panel and bus riser panel with conical spring washer and nut SW 19 mm, see Figure 7.14 (torque 50 Nm).
Perform assembly steps 17 to 20 for all phases in the bus sectionaliser panel and bus riser panel.

17) To do so, clean the end adapter and threaded insert in the area marked "D" (Figure 7.16) and simultaneously apply a layer of assembling paste. Insert a threaded insert together with a clean cable tie (for ventilation) into the adapter and tighten slightly on the thread bolt. Remove the cable tie. Unclamp the threaded insert by 1½ turns. Tighten the threaded insert, torque: 30 Nm.

18) Press the cover cap onto the end adapter.
19) Earth all end adapters with earthing lines, earthing cable lugs, screws M6, washers and hat nuts M6 on the earthing section of the respective panel (Figure 7.17).

20) Clean the inserted sectionaliser busbars and end adapters of adhesive assembling paste with a cloth.

21) Remove the edge protection profile used in assembly step 1.

For assembly of the control panel and front covers on the bus sectionaliser panel and bus riser panel, please proceed with assembly steps 9 and 10 in chapter 7.1.

Figure 7.17

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hat nut DIN 986-M6</td>
</tr>
<tr>
<td>2</td>
<td>Screw DIN 933-M6</td>
</tr>
<tr>
<td>3</td>
<td>Washer DIN 125-A6,4</td>
</tr>
<tr>
<td>4</td>
<td>Earth cable</td>
</tr>
<tr>
<td>5</td>
<td>Adapter</td>
</tr>
<tr>
<td>6</td>
<td>Screw DIN 933-M10</td>
</tr>
<tr>
<td>7</td>
<td>Spring lock ring DIN 128-10</td>
</tr>
<tr>
<td>8</td>
<td>Washer DIN 125-A10,5</td>
</tr>
<tr>
<td>9</td>
<td>Earthing cable lug</td>
</tr>
</tbody>
</table>
7.2 Assembly of earthing busbar
GAE1250(kMAX) -1LSVG to GAE1250(kMAX) 1HT- (optional)

1) Remove the front covers of the bus sectionaliser panel and bus riser panel, in order to access the pre-assembled earthing buses (Figure 7.18).

2) Clean earthing buses at the points for the screws of soiling and layers of oxide using the polishing pad. Remove residue from polishing using a lint-free, dry cloth.

3) Insert a guiding sleeve into the opening on the right-hand side wall of the bus sectionaliser panel (Figure 7.18).

4) Insert a guiding sleeve into the opening on the left-hand side wall of the bus riser panel (Figure 7.18).

5) Insert earthing buses through the opening in the side wall (Figure 7.18).

6) Evenly smear a thin layer of assembling paste on the points on the earthing buses for the screws.

7) Align the earthing bus and screw it in accordingly Figure 7.18.

8) Close the front cover.

For assembly work on an existing GAE1250(kMAX) row of panels, the busbar line for the switchgear must be isolated and the related safety measures (VDE 0105 part 100, BGV A5) taken.

The positions on the earthing buses for the screws must be un-damaged, clean and free of oxide.
8 Operation

8.1 Switching accessories

For operation of the bus riser panel the following accessories are needed:

1) Switching lever for earthing switch (red shaft) (only in conjunction with 2-lever drive).
2) Switching lever for disconnector (bare shaft) (optional for disconnector and earthing switch (only in conjunction with 1 lever drive)).
3) Key for front cover fastener (controls the anti-reverse interlock).

The switching levers used to switch the bus riser panel are fitted with a non-positive lock, 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.

Never leave the switching lever plugged in the actuating shaft since the switching interlock of the panel is damaged by switching the other actuating shaft.

8.2 Padlocking facility

The bus riser panel is fitted with padlocking facilities as standard (Figure 8.2). 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 end position by means of an integrated stop, so that also the adjacent padlocking facility can be opened.

To ensure that switching operations are always fully performed, shifting links are attached to the switch operations. They have the effect that the switching levers can only be removed in the respective end position.

In the description of the switching operations in chapter 8.3 and chapter 8.4, the interlock inhibitors are not shown, for the purpose of a clearer presentation of switch position indicators and actuating shafts.
8.3 Delivery condition of the bus riser panel

On delivery, the bus riser panel is in the following state:

- Figure 8.3: Fastener closed (anti-reverse interlock optional)

- Figure 8.4: Disconnector switched off and interlocked by switching interlock, earthing switch on

In the switching state described, the front cover can be removed as the bolt of the front cover interlock (see chapter 5.7, panel interlocks) is removed from the front cover.

Remove the front cover:

- Before removing the front cover, the respective panel must be switched off and earthed (see chapter 8.4.3).
- Open the fastener. To do so, turn the fastener anti-clockwise with the fastener key to the end stop.
- Lift the front cover up to the end stop (Figure 8.5/1).
- Pull the front cover off to the front (Figure 8.5/2).
8.4 Switching the bus riser panel

8.4.1 Inspection activities and safety instructions

► Before switching the bus riser panel check the gas leakage indicator. In case of a red indication the bus riser panel must not be switched! In such a case inform the customer service.

► During each switching process (connection to or disconnection from the mains) the function of the capacitive voltage detecting system must be checked, if a de-energised state is detected (see chapter 8.3). Always check all phases L1, L2, L3!

Prior to switching the circuit-breaker, the front cover must be fitted. The fastener must be closed with the fastener key. To do so, turn the fastener clockwise with the fastener key to the end stop (Figure 8.9).

![Fastener actuator](image)

The disconnector and earthing switches are mechanically locked with each other. If the earthing switch is switched to ON, the plug-in opening on the switching shaft of the disconnector is closed by a locking plate.

The switching state of the disconnector and earthing switch can be read off the switch position indicators in the mimic diagram of the circuit-breaker panel (Figure 8.10).

![Switching states](image)

If the switching procedure includes safety disconnection and earthing/short-circuiting, the integral voltage detecting systems and suitable voltage testers should in any case be used in compliance with VDE 0105 part 100.
8.4.2 Switching on the bus riser panel

Prior to switching on, check the gas pressure of the bus riser panel. Ensure that the front cover is correctly inserted and interlocked (see chapter 8.4.1).

The bus riser panel may only be switched in the switched off state. This must be guaranteed via the electro-mechanical interlock in the direction of the incoming circuit-breaker panel.

To switch the bus riser panel on, please proceed as follows:

1) Switch off the earthing switch. Hold the switching lever (red shaft) depressed to the end stop against spring pressure and turn it anti-clockwise (Figure 8.12).

2) Switch the disconnector ON. Hold the switching lever (blank shaft) depressed to the end stop against spring pressure and turn it clockwise (Figure 8.14).

Prior to switching on, check the gas pressure of the bus riser panel. Ensure that the front cover is correctly inserted and interlocked (see chapter 8.4.1).

Check the electrical isolation of the switchgear with the capacity voltage testing system (see chapter 9.3).

Check the electrical isolation of the switchgear with the capacity voltage testing system (see chapter 9.3).
8.4.3 Switching off the bus riser panel

To switch the bus riser panel off, please proceed as follows:

Prior to switching off, check the gas pressure of the bus riser panel. Ensure that the front cover is correctly inserted and interlocked (see chapter 8.4.1).

The bus riser panel may only be switched in the switched off state. This must be guaranteed via the electro-mechanical interlock in the direction of the incoming circuit-breaker panel.

Check the electrical isolation of the switchgear with the capacity voltage testing system (see chapter 9.3).

Switch the disconnector OFF

3) Switch the disconnector switch OFF. Hold the switching lever (blank shaft) depressed to the end stop against spring pressure and turn it anti-clockwise (Figure 8.17).

Switch on earthing switch

Prior to switching off, check the gas pressure of the bus riser panel. Ensure that the front cover is correctly inserted and interlocked (see chapter 8.4.1).

The bus riser panel may only be switched in the switched off state. This must be guaranteed via the electro-mechanical interlock in the direction of the incoming circuit-breaker panel.

Check the electrical isolation of the switchgear with the capacity voltage testing system (see chapter 9.3).
**Operation**

Switching the bus riser panel

4) Switch on the earthing switch. Hold the switching lever (red shaft) depressed to the end stop against spring pressure and turn it clockwise (Figure 8.19).

![]()**Check the electrical isolation of the switchgear with the capacity voltage testing system (see chapter 9.3).**

![Switch position with deactivated disconnector and activated earthing switch.](image)

**8.4.4 Switching the voltage transformer disconnector**

The optional drive for the voltage transformer disconnector is located behind the front cover of the cable connection compartment (see Figure 8.21).

The voltage transformer disconnector is designed as a two-position switch. The switch positions ON and OFF/ EARTHED are switchable.

► Before switching the voltage transformer disconnector, the bus riser panel must be switched OFF and earthed (see chapter 8.4).

![]()**Check the electrical isolation of the switchgear with the capacity voltage testing system (see chapter 9.3).**

► Unlock the front cover with the fastener key and remove it (see chapter 8.3).
**Switching the bus riser panel**

**Figure 8.23**  Switch the voltage transformer disconnector **ON**

1) Switch the voltage transformer disconnector **ON**. Remove the locking bolt up to the end stop. Put the actuating lever into switch position **ON**. Finally, engage the locking bolt (Figure 8.23).

**Figure 8.24**  Switch position with activated voltage transformer disconnector

**Risk of crushing**

► Do not tighten the locking bolt during switching.

**Figure 8.25**  Switch position with activated voltage transformer disconnector

**Figure 8.26**  Switching the voltage transformer disconnector **OFF/earthed**

1) Switching the voltage transformer disconnector **OFF/earthed**. Remove the locking bolt up to the end stop. Put the actuating lever into switch position **ON/EARTHED**. Finally, engage the locking bolt (Figure 8.24).

**Risk of crushing**

► Do not tighten the locking bolt during switching.
Operation
Switching the bus riser panel

Figure 8.27  Switching position for deactivated/earthed voltage transformer disconnector
9 Commissioning

9.1 Inspection activities and safety instructions

To commission the busbar riser panel, correct function is to be ensured by inspecting the following points:

► Please compare the data on the rating plate and the data on the delivery paperwork with the order documentation.
► Check the secondary equipment in accordance with the information in the circuit documentation for the related switchgear configuration.
► Check all screwed connections (cable connections, operational earthing, panel screw connections) for correct seating (torque) and proper fastening.
► In case of an installed density monitor, check the reading on the indicator via the remote indicator when the voltage supply is switched on.
► Check the available operating pressure on the gas leakage indicator pressure gauge (the pointer must be in the green sector).

9.2 Switching the bus riser panel (manual)

The switch panel is delivered with closed front cover in earthed circuit state (see chapter 8.3).

The following operating sequences are to be followed.

SWITCHING ON
► Switch off the earthing switch.
► Switch the disconnector ON.

SWITCH OFF
► Switch off circuit-breaker.
► Move interlock operating lever.

9.3 Verifying the safe isolation from supply

Before disconnecting an operating bus riser panel from and connecting a bus riser panel to the mains supply net, the panel must be checked for an isolated state.

The test is performed using the following procedure:
► With the bus riser panel switched on, open the shrouds of the capacitive measuring points.
► Insert a voltage tester (see Tab. 5.1, chapter 5.9) in the three measuring sockets.

The voltage testers must flash.
► Switch the circuit-breaker to OFF.
► Switch the disconnector to OFF.
► Isolate also the second cable end.
► Switch the earthing switch to ON.

The outgoing cable is now electrically isolated. The voltage testers must not flash!
► Upon completion of the test, remove the voltage testers and close the shrouds again.
9.4 Phase comparison

- A phase comparison between two outgoings can be performed at the insulated test sockets (Figure 9.1).
- Phase comparator, e.g., manuf. Horstmann: type ORION, manuf. Pfisterer: type EPV, manuf. ELSIC: type HO-PV).
- The correct function of the phase comparison device must be checked in compliance with the instructions of the manufacturer.

Figure 9.1 Phase comparison
10  Maintenance

10.1  General

Maintenance is used to ensure continuing trouble-free operation and the longest possible service lifetime of the switching device and the equipment integrated. It covers the following areas, which are closely related according to DIN 31051:

- **Inspection:** Determination of the actual state
- **Maintenance:** Measures to preserve the nominal state (ensuring trouble-free function)
- **Repair:** Measures to restore the nominal state.

10.2  Inspection

Prior to inspection, electrically isolate and secure the operating range in accordance with the "safety rules" specified by DIN VDE/IEC.

The switchgear should be inspected, depending on operating conditions and local conditions, as per BGV A3 approximately every four years.

In exceptional operating conditions (these also include harsh climatic conditions) and/or heavy pollution (including heavy soiling and aggressive air), inspection may be required at significantly shorter intervals.

Inspection includes:

- The service pressure of the SF₆ gas tank must be checked for pressure loss. As long as the pointer in the gas leakage indicator is in the green sector the pressure is sufficient.
- Check switchgear and switching devices for anything unusual, soiling and the result of environmental effects.
- Perform several no-load switching operations.
- Determine the subsequent measures (maintenance, service) taking into account the number of operating cycles and the core-balance limit.

10.3  Maintenance

The gas tank of the bus riser panel is welded gas-tight and all components inside are maintenance-free.

The SF₆ gas is resistant to ageing and is not consumed during the switching operations.

Under normal conditions, refilling of the SF₆ gas during the lifetime of the switchgear is not necessary.

10.4  Cleaning the bus riser panel

Even though the bus riser panel can be regarded as maintenance-free in normal conditions indoors, in case of heavy soiling and aggressive air (deviations from the indoor conditions acc. to DIN/EN 60694), cleaning or additional measures are recommended.

Cleaning is performed using the following procedure:

- Switch on earthing switch
- Open the fasteners and remove the front covers (if required).

Carefully clean the surfaces, especially the surfaces of insulating materials. Clean off strongly adhering soiling, e.g. greasy soiling, using a fluff-free cloth soaked in a household cleaning agent, then wipe off with clean water and dry.

- Before starting cleaning work, the bus riser panel must be isolated.
- As a measure to avoid impermissible switching processes the supply voltage must be switched off.
- It is not allowed to use aggressive solvents!
## 10.5 Voltage transformer

### 10.5.1 Voltage transformer assembly

1) If present, release/earth the optional voltage transformer disconnector (see chapter 8.4.4). The optional drive for the voltage transformer disconnector is located behind the front cover of the cable connection compartment (Figure 10.1).

2) Open relay cabinet door. Turn the fastener clockwise with the key to the end stop. Then open the doors to the front.

3) Disassemble bottom plates for the relay cabinet. To do so, unclamp the 4 screw connections (SW 8 mm) (Figure 10.2/1) and remove the plate from the panel (Figure 10.2/2).

4) Remove cable connections. To do so, all cable connections must be unclamped on the terminal strip of the relay cabinet.

5) Remove the screw connections (SW 13 mm) of the relay cabinet (Figure 10.2/3).

6) Lift the relay cabinet upwards from the panel and set it down on the rear wall of the relay cabinet e.g. on a provided lift carriage.

**Figure 10.1 Voltage transformer disconnector drive**

1 Voltage transformer disconnector
2 Locking bolt
3 Actuating lever

**Figure 10.2 Disassemble the bottom plate**

1 Contact washer M8
2 Taptite screw M5x12

► Before starting assembly work all the switchgear must be electrically isolated.

► Electrical isolation is to be ensured by a voltage test on all switch panels.

For switchgear that are not accessible from the rear, it is necessary to disassemble the relay cabinet of the bus riser panel.
7) Unclamp the plug connector of the voltage transformer. Fold the lever on coupling housing up and pull the plug out of the coupling housing.

8) Disassemble the fastening screws of the voltage transformer. To do so, unclamp and unscrew the four fastening screws SW 13 mm on the voltage transformer using a socket.

9) Unclamp the voltage transformer. To remove the voltage transformer, the clamped connection made of silicone compound and cone socket must be undone with a tyre lever (Figure 10.3).

10) Lift the voltage transformer off the switch panel with the help of a crane. The transport mounts may vary according to the manufacturer of the voltage transformer.

---

[Figure 10.3] Unclamp the plug connector, fastening screws

[Figure 10.4] Unclamp and lift the voltage transformer
10.5.2 Voltage transformer assembly

1) Remove foreign particles from the cone and contact bolt of the voltage transformer and finally, clean any deposit build-up with a lint-free cloth.

2) Apply a full, thin and even layer of assembling paste on the sliding surface of the cone and contact bolt (order no. 12201700) (see Figure 10.5).

3) Insert the voltage transformer into the respective receptacle of the bus riser panel with the help of a crane (see Figure 10.6).

4) Insert the four fastening screws SW 13 mm into the screw connection points and tighten crosswise evenly (torque: 20 Nm).

5) Perform work steps 1-7 of chapter 10.5.1 in reverse order.

Before starting assembly work all the switchgear must be electrically isolated.

Electrical isolation is to be ensured by a voltage test on all switch panels.
10.6 Return of switchgear

For Ormazabal switch panels an operating time of many years is assumed. The "sealed pressure system" according to IEC does not require refilling of the SF₆ gas over the entire operating time. Due to the high reliability of the bus riser panels arc faults are almost completely ruled out.

When handling failed or disused switch panels, the national health and safety guidelines must be observed.

This switch panel contains the fluorinated greenhouse gas SF₆, which is covered by the Kyoto Protocol and has a global warming potential of (GWP) 22200. SF₆ must be recovered and cannot be released into the atmosphere.

For further information on the use and handling of SF₆, please refer to IEC 62271-303: High-voltage switchgear and control gear – Part 303 Use and handling of sulphur hexafluoride (SF₆), to be observed.

All materials of the switch panel should be recycled.

As a competent partner Ormazabal offers you the return of your switch panel after the expiration of the above mentioned operating time. Here all necessary guidelines will be observed. The costs involved depend on the legal requirements applicable at the time of return.
# 11 Technical data

## 11.1 General data

<table>
<thead>
<tr>
<th>Insulating gas</th>
<th>SF$_6$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated density of insulating gas</td>
<td>7.9 kg/m$^3$</td>
</tr>
<tr>
<td>Rated filling pressure of insulating gas at 20 °C and 101.3 kPa</td>
<td>130 kPa (30 kPa overpressure)</td>
</tr>
<tr>
<td>Minimum service pressure of insulating gas at 20 °C and 101.3 kPa</td>
<td>105 kPa</td>
</tr>
<tr>
<td>SF$_6$ filling capacity at 20 °C and 101.3 kPa</td>
<td>1.61 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient temperature T</th>
<th>with secondary equipment</th>
<th>– 5 to + 40 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean peak value of the 24-h average</td>
<td>+ 35 °C</td>
</tr>
<tr>
<td></td>
<td>with reduced rated currents</td>
<td>above + 40 °C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>measured over 24 h</td>
<td>maximum 95 %</td>
</tr>
<tr>
<td></td>
<td>measured over 1 month</td>
<td>maximum 90 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enclosure of HV compartment</th>
<th>sealed pressure system acc. to IEC, IP67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure of the drive housing</td>
<td>IP3XD</td>
</tr>
<tr>
<td>Enclosure of cable connection compartment</td>
<td>IP44</td>
</tr>
<tr>
<td>Internal arc classification according to VDE 0671 Part 200 or IEC 62271-200</td>
<td>IAC AFL 20 kA 1 s (GAE1250)</td>
</tr>
<tr>
<td></td>
<td>IAC AFL 25 kA 1 s (GAE1250kMAX)</td>
</tr>
<tr>
<td>Coloration of equipment</td>
<td>RAL 7035 (light grey)</td>
</tr>
<tr>
<td>Loss of service continuity category</td>
<td>LSC 2A</td>
</tr>
<tr>
<td>Partition class</td>
<td>PM</td>
</tr>
</tbody>
</table>

| Weight 1) | Approx. 270 kg (approx. 360 kg with absorption channel) |

1) The exact weight is dependent on the order-related secondary equipment (configuration of the relay cabinet etc.)

---

Tab. 11.1 General data
### 11.2 Rating data switch panel GAE1250 1HT/-HT/6/

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Uᵣ</th>
<th>7.2 kV</th>
<th>12 kV</th>
<th>17.5 kV</th>
<th>24 kV&lt;sup&gt;1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated insulation level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Rated short-duration power-frequency withstand voltage</td>
<td>Uₜ</td>
<td>20 kV</td>
<td>28 kV</td>
<td>38 kV</td>
<td>50 kV</td>
</tr>
<tr>
<td>• Rated lightening impulse voltage</td>
<td>Uₚ</td>
<td>60 kV</td>
<td>75 kV</td>
<td>95 kV</td>
<td>125 kV</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>fᵣ</td>
<td>50 (60) Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated normal current busbar</td>
<td>Iᵣ</td>
<td>1250 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated normal current outgoing (optional)</td>
<td>Iᵣ</td>
<td>1250 (630) A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short-time withstand current 1 s (3 s)</td>
<td>Iₛ</td>
<td>20 kA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>Iₛ</td>
<td>50 kA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Increased rated voltage (25 kV) on request

Tab. 11.2 Rating data switch panel GAE1250 1HT/-HT/6/

### 11.3 Rating data switch panel GAE1250kMAX 1HT/-HT/6/

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Uᵣ</th>
<th>7.2 kV</th>
<th>12 kV</th>
<th>17.5 kV</th>
<th>24 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated insulation level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Rated short-duration power-frequency withstand voltage</td>
<td>Uₜ</td>
<td>20 kV</td>
<td>28 kV</td>
<td>38 kV</td>
<td>50 kV</td>
</tr>
<tr>
<td>• Rated lightening impulse voltage</td>
<td>Uₚ</td>
<td>60 kV</td>
<td>75 kV</td>
<td>95 kV</td>
<td>125 kV</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>fᵣ</td>
<td>50 Hz&lt;sup&gt;1)&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated normal current busbar</td>
<td>Iᵣ</td>
<td>1250 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated normal current outgoing (optional)</td>
<td>Iᵣ</td>
<td>1250 (630) A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short-time withstand current 1 s</td>
<td>Iₛ</td>
<td>25 kA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>Iₛ</td>
<td>63 kA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) 60 Hz on request

Tab. 11.3 Rating data switch panel GAE1250kMAX 1HT/-HT/6/
## 11.4 Rating data, disconnector/earthing switch GAE1250

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>UR</th>
<th>7.2 kV</th>
<th>12 kV</th>
<th>17.5 kV</th>
<th>24 kV 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching device</td>
<td>–</td>
<td>Disconnector</td>
<td>Earthing switch</td>
<td>Disconnector</td>
<td>Earthing switch</td>
</tr>
<tr>
<td>Rated normal current (optional)</td>
<td>I_r</td>
<td>1250 (630) A</td>
<td>–</td>
<td>1250 (630) A</td>
<td>–</td>
</tr>
<tr>
<td>Rated short-time withstand current 1 s (3 s)</td>
<td>I_k</td>
<td>20 kA</td>
<td>20 kA</td>
<td>20 kA</td>
<td>20 kA</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>I_p</td>
<td>50 kA</td>
<td>50 kA</td>
<td>50 kA</td>
<td>50 kA</td>
</tr>
<tr>
<td>Rated short-circuit making current</td>
<td>I_ma</td>
<td>–</td>
<td>50 kA</td>
<td>–</td>
<td>50 kA</td>
</tr>
<tr>
<td>Number of short circuits made</td>
<td>n</td>
<td>–</td>
<td>5</td>
<td>–</td>
<td>5</td>
</tr>
<tr>
<td>Mechanical operating cycles</td>
<td>n</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Class</td>
<td>–</td>
<td>M1</td>
<td>E2</td>
<td>M1</td>
<td>E2</td>
</tr>
</tbody>
</table>

1) Increased rated voltage (25 kV) on request

### Tab. 11.4 Rating data, disconnector/earthing switch GAE1250

## 11.5 Rating data, disconnector/earthing switch GAE1250kMAX

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>UR</th>
<th>7.2 kV</th>
<th>12 kV</th>
<th>17.5 kV</th>
<th>24 kV 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching device</td>
<td>–</td>
<td>Disconnector</td>
<td>Earthing switch</td>
<td>Disconnector</td>
<td>Earthing switch</td>
</tr>
<tr>
<td>Rated normal current (optional)</td>
<td>I_r</td>
<td>1250 (630) A</td>
<td>–</td>
<td>1250 (630) A</td>
<td>–</td>
</tr>
<tr>
<td>Rated short-time withstand current 1 s (3 s)</td>
<td>I_k</td>
<td>25 kA</td>
<td>25 kA</td>
<td>25 kA</td>
<td>25 kA</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>I_p</td>
<td>63 kA</td>
<td>63 kA</td>
<td>63 kA</td>
<td>63 kA</td>
</tr>
<tr>
<td>Rated short-circuit making current</td>
<td>I_ma</td>
<td>–</td>
<td>63 kA</td>
<td>–</td>
<td>63 kA</td>
</tr>
<tr>
<td>Number of short circuits made</td>
<td>n</td>
<td>–</td>
<td>5</td>
<td>–</td>
<td>5</td>
</tr>
<tr>
<td>Mechanical operating cycles</td>
<td>n</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Class</td>
<td>–</td>
<td>M1</td>
<td>E2</td>
<td>M1</td>
<td>E2</td>
</tr>
</tbody>
</table>

1) Increased rated voltage (25 kV) on request

### Tab. 11.5 Rating data, disconnector/earthing switch GAE1250kMAX

## 11.6 Tightening torques

The following table values only apply if no other tightening torques are specified in the documents.

<table>
<thead>
<tr>
<th>Thread nominal diameter</th>
<th>Screw joints strength class 8.8</th>
<th>Welded thread bolt</th>
</tr>
</thead>
<tbody>
<tr>
<td>M5</td>
<td>6 Nm</td>
<td>–</td>
</tr>
<tr>
<td>M6</td>
<td>10 Nm</td>
<td>6 Nm</td>
</tr>
<tr>
<td>M8</td>
<td>25 Nm</td>
<td>14.5 Nm</td>
</tr>
<tr>
<td>M10</td>
<td>49 Nm</td>
<td>–</td>
</tr>
<tr>
<td>M12</td>
<td>86 Nm</td>
<td>–</td>
</tr>
</tbody>
</table>

### Tab. 11.6 Tightening torques
11.7 Materials

<table>
<thead>
<tr>
<th>Metals</th>
<th>Steel, copper, aluminium, zinc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic materials</td>
<td>PA, PE, PC, NBR, Q, EP, (PF/MF), BIIR, laminated fabric</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Aluminium oxide, lubricants, SF₆ gas, oils, greases</td>
</tr>
</tbody>
</table>

Tab. 11.7 Materials

11.8 Solenoid data (electromechanical interlock)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>24 V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal power</td>
<td>14 W</td>
</tr>
<tr>
<td>Duty factor</td>
<td>100 %</td>
</tr>
</tbody>
</table>

Tab. 11.8 Solenoid

11.9 Regulations and standards

The bus riser panel complies with the following standards and publications:

IEC 60265-1
IEC 60529
IEC 61243-5
IEC 62271-1
IEC 62271-102
IEC 62271-200
IEC/TR 62271-303
DIN EN ISO 9001
12 Accessories

► Article no. 12258706
    Assembly instructions for panel screw connection
    GAE1250

► Article no. 12263623
    Earthing bus assembly kit
    GAE1250 -1HT/1LSV(G)- (optional)

► Article no. 12258213
    Earthing bus accessory assembly kit

► Article no. 12261812
    Sectionaliser busbar assembly kit
    GAE1250 -1HT/1LSV(G)-