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## Contents

1. Regulations and provisions 4
   1.1 Remarks on these instructions 4
   1.2 Terms and symbols used 4
   1.3 Use in the line with the intended purpose 4
   1.4 Applied standards 5
   1.5 Safety provisions 6
   1.6 Disposal after the end of service life 6

2. Overview of variants GMA double busbar 7
   2.1 Design of GMA double busbar panels 7
   2.2 Cable feeder panels with one circuit-breaker 8
   2.3 Combination cable feeder / bus coupler 9
   2.4 Bus coupler 9
   2.5 Bus section coupler 9

3. Operation 10
   3.1 Operator interfaces for manual operation 10
   3.2 Interlocking 16
   3.3 Important guidelines for switching operations 17
   3.4 Operation 17
   3.5 Standard switching operations 18
   3.6 Earthing the busbar 23
   3.7 Earthing the current conductors between main and opposite panels 25

4. Operating the voltage transformer disconnecting device 26
   4.1 Take off the cable compartment cover 26
   4.2 Disconnecting device for voltage transformers 26

5. Cable testing 27
1 Regulations and provisions

1.1 Remarks on these instructions

These Technical Instructions are a supplement to the Operating Instructions GMA (AGS 531 521-01) and describe the operation of panels used in GMA double busbar installations. The following chapters of these Operating Instructions apply also for this supplement without restriction:

- Ch. 2: Technical Data
- Ch. 4: Insulating gas, monitoring
- Ch. 5: Voltage detecting systems
- Ch. 10: Maintenance
- Ch. 11: Annex

These instructions are an integral part of the product and must be stored so that they are at any time readily accessible for and can be used by persons who are to work on the switchgear. If the switchgear is sold to new owners, they must receive this document along with the switchgear.

The following additional documents must be observed for this switchgear:

- Purchase contract with the agreements on the configuration of the switchgear and with legal details
- The appropriate installation specific circuit diagrams / documentation
- Operating Instructions GMA AGS 531 521-01
- Installation Instructions GMA AGS 531 526-01
- The operating instructions of the devices installed in the switchgear (e.g. IVIS, devices in low-voltage cabinet)
- The installation instructions of the high voltage cable connection system provided by the manufacturer of this system
- The switchgear configuration document “GMA”
- The Technical Instructions “Use and handling of insulating gas” for GMA (can be requested as required)

Since our products are constantly improved, changes concerning images, technical data and standards are reserved.

1.2 Terms and symbols used

These technical instructions use certain symbols which warn about danger or provide important information which must be complied with to avoid danger to personnel and damage to equipment:

**Warning!**

This warning symbol indicates dangerous electrical voltage. Contact with voltage may result in fatal injury!

**Warning!**

This warning symbol indicates danger of injury. Observe all instructions that are labelled with this sign to avoid death or serious injury.

**Important!**

This notice symbol is used for information which is important to avoid damage.

1.3 Use in the line with the intended purpose

Medium-voltage gas-insulated switchgear type GMA are exclusively intended for switching and distributing electrical power. They must only be used in the scope of the specified standards and the appropriate installation specific technical data. Any other use constitutes improper use and may result in dangers and damage.

Disclaimer of liability

The manufacturer shall not be held responsible for damage which occurs if

- instructions in this manual are not complied with
- the switchgear is not operated according to its intended use (see above),
- the switchgear is installed, connected or operated improperly,
- accessories or spare parts are used which have not been approved by the manufacturer,
- the switchgear is modified without the approval of the manufacturer, or if inadmissible parts are attached.

No liability is accepted for parts provided by customers, e.g. current transformers.
1.4 Applied standards

Switchgear type GMA meet the following standards and regulations:

<table>
<thead>
<tr>
<th>Designation</th>
<th>IEC-Standard</th>
<th>EN-Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switchgear</td>
<td>IEC 62271-200</td>
<td>EN 62271-200</td>
</tr>
<tr>
<td></td>
<td>IEC 60694</td>
<td>EN 60694</td>
</tr>
<tr>
<td>Internal Arc Classification (IAC)</td>
<td>IEC 62271-200</td>
<td>EN 62271-200</td>
</tr>
<tr>
<td>Circuit-breaker</td>
<td>IEC 62271-100</td>
<td>EN 62271-100</td>
</tr>
<tr>
<td>Earthing switch</td>
<td>IEC 62271-102</td>
<td>EN 62271-102</td>
</tr>
<tr>
<td>Disconnector</td>
<td>IEC 62271-102</td>
<td>EN 62271-102</td>
</tr>
<tr>
<td>Current transformer</td>
<td>IEC 60044-1</td>
<td>EN 60044-1</td>
</tr>
<tr>
<td>Voltage transformer</td>
<td>IEC 60044-2</td>
<td>EN 60044-2</td>
</tr>
<tr>
<td>Voltage detecting systems</td>
<td>IEC 61243-5</td>
<td>EN 61243-5</td>
</tr>
<tr>
<td>Protection against accidental contact, foreign objects, water</td>
<td>IEC 60529</td>
<td>EN 60529</td>
</tr>
<tr>
<td>Installation</td>
<td>IEC 61936-1</td>
<td>HD 637 S1</td>
</tr>
<tr>
<td>Operation of electrical installations</td>
<td>-</td>
<td>EN 50110</td>
</tr>
<tr>
<td>Insulating gas sulphur hexafluoride (SF₆)</td>
<td>IEC 60376</td>
<td>EN 60376</td>
</tr>
</tbody>
</table>

Environmental and operating conditions

GMA is an indoor switchgear and may only be operated under normal operating conditions according to specifications of IEC 60694.

Operation under conditions deviating from these is only admissible upon consultation with and approved by the switchgear manufacturer.

<table>
<thead>
<tr>
<th>Ambient conditions (acc. to IEC 60694)</th>
<th>&quot;minus 5 indoor&quot; ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>-5 / 40 ¹</td>
</tr>
<tr>
<td>Ambient temperature min./max.</td>
<td>°C</td>
</tr>
<tr>
<td>Average value within 24 hours</td>
<td>°C</td>
</tr>
<tr>
<td>Average rel. air humidity 24 h/1 month</td>
<td>%</td>
</tr>
<tr>
<td>Max. installation altitude above sea level</td>
<td>m</td>
</tr>
</tbody>
</table>

¹) Higher values upon request

Degrees of protection (acc. to IEC 60529)

- Main electrical circuits: IP 65
- Operating mechanisms: IP 2X ²
- Low-voltage cabinet: IP 3X ³
- Cable cabinet: IP 3X

²) option IP 5X
³) option IP 52
1.5 Safety provisions

Works described in these instructions may only be performed by fully skilled and well experienced electricians. They must have sound knowledge about switchgear type GMA and all relevant safety provisions.

Relevant standards and regulations:

Comply with:
- the locally applicable health and safety, operating and work instructions
- Installation 1):
  IEC 61936-1 / HD 637 S1
- Operation of electrical installations 1):
  EN 50110-1

1) Comply with the national standards which are valid in the country of installation.

Read these instructions carefully before you work on the switchgear, and perform the work as described. Only perform such work if you have understood the instructions. Do not perform any work on the switchgear which is not described here.

Important!
Operating reliability and service life depend on correct operation.

Before performing work on the panel, make sure to comply with the following instructions:

Warning!
Before starting work on the high-voltage components, de-energize the system, verify it for zero voltage and earth the system according to the applicable safety rules according to EN 50110-1.

Warning!
After removal of covers, operator safety acc. to IEC 62271-200 may be restricted. De-energize the appropriate part of the switchgear before starting work.

Warning!
Before performing work on operating mechanisms, switch off the supply voltage and prevent it from reclosing.

Warning!
Risk of injury when working on operating mechanisms. Discharge the mechanism’s energy storage by performing the necessary
- OFF-ON-OFF operating sequence at the circuit-breaker
- closing operation at the make-proof earthing switch.

1.6 Disposal after the end of service life

The following documents can be provided on request for the disposal of series GMA switchgear at the end of their service lives:
- Technical Instruction “Use and handling of insulating gas SF₆”
- Material and recycling data sheet

Disposal at the end of service life is performed as a service by the manufacturer’s Service Center which is subject to a fee.
2 Overview of variants GMA double busbar

2.1 Design of GMA double busbar panels

Figure 2.1 Cable feeder panel with one circuit-breaker

1 Main panel with busbar system 1
2 Opposite panel with busbar system 2
3 Current conductor system connecting both panels
4 Cable connection
5 Bushings for busbar coupling (busbar coupling tank)
6 Operator interface of the opposite panel (manual operation)
7 Adjustable cable support
8 Earthing conductor
9 Cable compartment cover
10 Operator interface of the main panel (Manual Operation)
11 Control device for electrical operation
12 Voltage detecting system at the cable connection
13 Pressure gauge (temperature compensated)
14 Low-voltage cabinet
15 Cable duct for low-voltage cabling between the panels
Description of the panels

Double busbar panels of type GMA always consist of two single panels in a "back-to-back configuration" with a main panel and an opposite panel.

The following panel variants for GMA double busbar installations are available:

- Cable feeder panel with one circuit-breaker
- Combination cable feeder / bus coupler with 2 circuit-breakers
- Bus coupler
- Bus section coupler

Main and opposite panels are connected by a current conductor system with a single-phase insulation. The current conductors are plugged to the outer-cone bushings according to EN 50181, type C, which are implemented into the panels.

Important!
The phase sequence in opposite panels is from left to right L3 - L2 - L1, determined by the different design compared to main panels!

In opposite panels phases L1 and L3 are always changed between the disconnector and busbar system 2. As a result the phase sequence of busbar 2 is L1 - L2 - L3 regarded from the panel front to the back which is the same phase sequence of the main panels.

Thus single panels or modules can be attached to the left or the right of main panels as well as of opposite panels to extend the switchgear with single busbar panels.

Optional features:
- Opposite panels can be equipped with an additional earthing switch. In this way the terminals of the current conductor system connecting both panels can be earthed in both panels.
- The combination cable feeder / bus coupler can be equipped with voltage transformers at the feeder side. The voltage transformers including a disconnecting device are installed in opposite panels behind the cable compartment cover.
- Additionally voltage transformers can be installed for busbar measurement (see Installation Instructions, chapter 5.1).

2.2 Cable feeder panels with one circuit-breaker

Main panel with busbar 1:
- Disconnector
- Circuit-breaker
- Earthing switch
- Toroidal-core current transformer
- Coupling capacitor
- Outer-cone cable bushing according to EN 50181, type C, for max. triple cable connection or double cable connection with surge arrester

Opposite panel with busbar 2:
- Disconnector
- Earthing switch (option)

Figure 2.2
Cable feeder panel with one circuit-breaker.
Main panel (left) with BB1: Disconnector, circuit-breaker, earthing switch
Opposite panel (right) with BB2: Disconnector, earthing switch (option)
2.3 Combination cable feeder / bus coupler

Main panel with busbar 1:
– Disconnector
– Circuit-breaker
– Earthing switch
– Toroidal-core current transformer
– Coupling capacitor
– Outer-cone cable bushing according to EN 50181, type C, for max. triple cable connection or double cable connection with surge arrester

Opposite panel with busbar 2:
– Disconnector
– Circuit-breaker
– Earthing switch
– Voltage transformer with disconnecting device (option)

2.4 Bus coupler

Main panel with busbar 1:
– Disconnector
– Circuit-breaker
– Earthing switch

Opposite panel with busbar 2:
– Disconnector
– Earthing switch

2.5 Bus section coupler

The bus section coupler panels for "back-to-back configuration" are identical to those for single busbar installations because there is no link between the busbars.
3.1 Operator interfaces for manual operation

The following figures show the two operator interfaces of a double bus-bar panel together belonging to the main panel and to the opposite panel.

3.1.1 Cable feeder panel with one circuit-breaker

---

**Main panel:**
1. Nameplate
2. Opening for operation of the disconnector
3. Position indicator of the disconnector
4. Position indicator of the energy storage CHARGED/DISCHARGED
5. Position indicator circuit-breaker
6. Push button circuit-breaker OFF
7. Push button circuit-breaker ON
8. Counter for number of operations
9. Opening for hand crank to charge the energy storage of the circuit-breaker
10. Interlocking slide for cable compartment cover
11. Position indicator of the earthing switch
12. Electrical position indicator of the disconnector in the opposite panel
13. Opening for operation of the earthing switch
14. Mechanical interlocking of the openings for disconnector/earthing switch operation (slide)
15. Busbar 2
16. Busbar 1
17. Mechanical lock to prevent operation

**Opposite panel:**
18. Position indicator of the disconnector
19. Mechanical interlocking of the openings for disconnector operation (slide)
20. Opening for operation of the disconnector
21. Diagram of the switching devices in the main panel

---

**Figure 3.1**
Operator interfaces for cable feeder panels with one circuit-breaker
Main panel (top) with busbar 1:
- Disconnector, circuit-breaker, earthing switch
Opposite panel (bottom) with busbar 2:
- Disconnector
Cable feeder panel with additional earthing switch

As an option the opposite panel can be delivered with an additional earthing switch on customer request. In this way both outer-cone bushings for the current conductors, which connect main and opposite panel, can be earthed separately.

Compared to Fig. 3.1 the following additional elements have been added:

Main panel:
22 Electrical position indicator of the earthing switch in the opposite panel

Opposite panel:
23 Position indicator of the earthing switch
24 Opening for operation of the earthing switch

Figure 3.2
Operator interfaces for cable feeder panels with one circuit-breaker
Main panel (top) with busbar 1: Disconnector, circuit-breaker, earthing switch
Opposite panel (bottom) with busbar 2: Disconnector, earthing switch (option)
3.1.2 Combination cable feeder / bus coupler

The combination cable feeder / bus coupler is equipped with circuit-breaker, disconnector and earthing switch in the main panel as well as in the opposite panel.

Main panel:
1 Nameplate
2 Opening for operation of the disconnector
3 Position indicator of the disconnector
4 Position indicator of the energy storage CHARGED/DISCHARGED
5 Position indicator circuit-breaker
6 Push button circuit-breaker OFF
7 Push button circuit-breaker ON
8 Counter for number of operations
9 Opening for hand crank to charge the energy storage of the circuit-breaker
10 Interlocking slide for cable compartment cover
11 Electrical position indicator circuit-breaker in the opposite panel
12 Position indicator of the earthing switch
13 Electrical position indicator of the disconnector in the opposite panel
14 Electrical position indicator of the earthing switch in the opposite panel
15 Opening for operation of the earthing switch
16 Mechanical interlocking of the openings for disconnector/earthing switch operation (slide)
17 Busbar 2
18 Busbar 1
19 Mechanical lock to prevent operation

Opposite panel:
20 Position indicator of the energy storage CHARGED/DISCHARGED
21 Position indicator circuit-breaker
22 Push button circuit-breaker OFF
23 Push button circuit-breaker ON
24 Counter for number of operations
25 Position indicator of the disconnector
26 Position indicator of the earthing switch
27 Opening for operation of the earthing switch
28 Mechanical interlocking of the openings for disconnector/earthing switch operation (slide)
29 Opening for operation of the disconnector
30 Diagram of the switching devices in the main panel
31 Interlocking slide for cable compartment cover

Figure 3.3
Operator interfaces for combination cable feeder / bus coupler
Main panel (top) with busbar 1:
Disconnector, circuit-breaker, earthing switch
Opposite panel (bottom) with busbar 2:
Disconnector, circuit-breaker, earthing switch
Variant without electrical position indicators

The operator interface of the main panel is not equipped with an electrical position indication of the switching devices in the opposite panel.

The operator interface matches Fig. 3.3 with one modification:

Main panel:
31 Diagrams of the switching devices in the opposite panel instead of electrical position indicators.

Figure 3.4
Operator interfaces for combination cable feeder / bus coupler
Main panel (top) with busbar 1:
Disconnected, circuit-breaker, earthing switch
Opposite panel (bottom) with busbar 2:
Disconnected, circuit-breaker, earthing switch
3.1.3 Bus coupler

The bus coupler connects or disconnects the busbar systems 1 and 2. The position of the switching devices in the opposite panel is displayed on the operator interface of the main panel by electrical position indicators.

![Diagram of the bus coupler](image)

**Main panel:**
1. Nameplate
2. Opening for operation of the disconnector
3. Position indicator of the disconnector
4. Position indicator of the energy storage CHARGED/DISCHARGED
5. Position indicator circuit-breaker
6. Push button circuit-breaker OFF
7. Push button circuit-breaker ON
8. Counter for number of operations
9. Opening for hand crank to charge the energy storage of the circuit-breaker
10. Position indicator of the earthing switch
11. Electrical position indicator of the disconnector in the opposite panel
12. Electrical position indicator of the earthing switch in the opposite panel
13. Opening for operation of the earthing switch
14. Mechanical interlocking of the openings for disconnector/earthing switch operation (slide)
15. Busbar 2
16. Busbar 1
17. Mechanical lock to prevent operation

**Opposite panel:**
18. Position indicator of the disconnector
19. Position indicator of the earthing switch
20. Opening for operation of the earthing switch
21. Mechanical interlocking of the openings for disconnector/earthing switch operation (slide)
22. Opening for operation of the disconnector
23. Diagram of the switching devices in the main panel

**Figure 3.5**
Operator interfaces for double busbar bus coupler
Main panel (top) with busbar 1:
- Disconnector, circuit-breaker, earthing switch
Opposite panel (bottom) with busbar 2:
- Disconnector, earthing switch
3.1.4 Bus section coupler

The design is the same as of bus section couplers in single busbar installations. There is an operator interface for busbar system 1 and an operator interface for busbar system 2.

Figure 3.6
Operator interfaces for bus section coupler of busbar system 1
Circuit-breaker panel on the left with disconnector, circuit-breaker and earthing switch
Riser panel on the right with disconnector and earthing switch

Figure 3.7
Operator interfaces for bus section coupler of busbar system 2
Circuit-breaker panel on the left with disconnector, circuit-breaker and earthing switch
Riser panel on the right with disconnector and earthing switch
### 3.2 Interlocking

#### Table for mechanical interlocking within a panel:

<table>
<thead>
<tr>
<th>Switching device</th>
<th>Position</th>
<th>Interlocking condition towards</th>
<th>Circuit-breaker</th>
<th>Disconnector</th>
<th>Earthing switch</th>
<th>Cable compartment cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit-breaker</td>
<td>“ON”</td>
<td>-</td>
<td>not interlocked in cable feeder panels with one circuit-breaker</td>
<td>not interlocked if disconnector “OFF”</td>
<td>interlocked if earthing switch “ON”</td>
<td>not interlocked if earthing switch “OFF”</td>
</tr>
<tr>
<td></td>
<td>“OFF”</td>
<td>-</td>
<td>interlocked if earthing switch “ON”</td>
<td>not interlocked if disconnector “OFF”</td>
<td>not interlocked if earthing switch “ON”</td>
<td>interlocked if earthing switch “OFF”</td>
</tr>
<tr>
<td>Disconnector</td>
<td>“ON”</td>
<td>not interlocked</td>
<td>-</td>
<td>interlocked</td>
<td>-</td>
<td>interlocked if earthing switch “OFF”</td>
</tr>
<tr>
<td></td>
<td>“OFF”</td>
<td>not interlocked</td>
<td>-</td>
<td>not interlocked</td>
<td>-</td>
<td>interlocked if earthing switch “OFF”</td>
</tr>
<tr>
<td>Earthing switch</td>
<td>“ON”</td>
<td>not interlocked</td>
<td>interlocked</td>
<td>-</td>
<td>not interlocked</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>“OFF”</td>
<td>not interlocked</td>
<td>not interlocked</td>
<td>-</td>
<td>interlocked</td>
<td>-</td>
</tr>
<tr>
<td>Cable compartment cover</td>
<td>taken off</td>
<td>not interlocked</td>
<td>interlocked</td>
<td>interlocked</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>inserted</td>
<td>-</td>
<td>-</td>
<td>interlocked if disconnector “OFF”</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

**Additional interlocking:**

For the interlocking in main panels and opposite panels of double busbar installations applies the following information in the Operating Instructions AGS 531 521-01:

- **Mechanical locks to prevent manual operation**
  - by cylinder lock, chapter 6.2.2 (option)
  - by padlock, chapter 6.2.3 (option)
- **Electromagnetic interlocking:**
  This kind of interlocking can be implemented according to customer request.

**Important!**

Comply with the purchase contract and the installation specific documentation and circuit diagrams.

**Important!**

If no blocking coils to prevent maloperation are used, mechanical locking by cylindrical locks or padlocks is mandatory (see chapters 6.2.2 and 6.2.3).
3.3 Important guidelines for switching operations

See Operating Instructions GMA
AGS 531 521-01, chapter 6.3.

3.4 Operation

**Warning!**

Danger of serious injury due to mistake in identifying the position of the busbar!
The busbar in main panels is named busbar 1 (BB1) and the busbar in opposite panels is named busbar 2 (BB2).
During operation a clear labelling of busbar 1 and busbar 2 is mandatory.

Electrical position indicators:
The electrical position indicators installed in main panels show the position of the switching devices in the opposite panels.
The electrical position indicators provide the following information:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![ ]</td>
<td>Horizontal bar: Switching device OFF</td>
</tr>
<tr>
<td>![ ]</td>
<td>Vertical bar: Switching device ON</td>
</tr>
<tr>
<td>![ ]</td>
<td>Bar 45°: Switching device not in end position or supply voltage of indicator is down</td>
</tr>
</tbody>
</table>

**Electrical operation:**
GMA double busbar panels can be operated by a control device installed in the low-voltage cabinet of the main panel, depending on the degree of motorization of the switching devices.

**Important!**

Comply with the installation specific documentation describing the remote control of the switching devices.

**Manual operation:**
The switching devices are operated manually at the operator interfaces of the specific panel.
The switching devices of main panels are operated at the installation’s main operating front. The switching devices in opposite panels are operated at the opposite front.
The operation of the different switching devices - circuit-breaker - disconnector - earthing switch are described in the Operating Instructions GMA.

**Important!**

Comply with chapter 6.4 “Switching - Circuit-breaker panel” of the Operating Instructions AGS 531 521-01.
3.5 Standard switching operations

**Warning!**

Comply with all relevant safety provisions during switching operations.

3.5.1 Switching the feeder panel

**Cable feeder panel with one circuit-breaker**

Initial condition is feeder EARTHED:

- **Main panel with BB1:**
  - Circuit-breaker: OFF
  - Disconnector BB1: OFF
  - Earthing switch: ON
- **Opposite panel with BB2:**
  - Disconnector BB2: OFF

Connect feeder to BB2

(Fig. 3.9 shows the final condition):

1. Switch earthing switch (A) OFF
2. Switch disconnector BB2 (B) ON (at opposite panel)
3. Switch circuit-breaker (C) ON

The feeder is earthed by carrying out the operations vice versa (Fig. 3.8 shows the final condition).

**Definition of terms:**

BB1 (= busbar 1) is used to designate switching devices in main panels.
BB2 (= busbar 2) is used to designate switching devices in opposite panels.

**Important!**

The switching operations are always pictured pointing at the position indicators of the operator interfaces in the main panels.

Connect feeder to BB1

(Fig. 3.10 shows the final condition):

1. Switch earthing switch (A) OFF
2. Switch disconnector BB1 (D) ON (at the main panel)
3. Switch circuit-breaker (C) ON

The feeder is earthed by carrying out the operations vice versa (Fig. 3.8 shows the final condition).
Combination cable feeder / bus coupler

Initial condition is feeder EARTHED:

Main panel with BB1:
- Circuit-breaker BB1: OFF
- Disconnector BB1: OFF
- Earthing switch BB1: ON

Opposite panel with BB2:
- Circuit-breaker BB2: OFF
- Disconnector BB2: OFF
- Earthing switch BB2: OFF

Connect feeder to BB2
(Fig. 3.12 shows the final condition):
1. Switch earthing switch BB1 (A) OFF
2. Switch disconnector BB2 (B) ON
3. Switch circuit-breaker BB2 (C) ON

The feeder is earthed by carrying out the operations vice versa (Fig. 3.11 shows the final condition).

Connect feeder to BB1
(Fig. 3.13 shows the final condition):
1. Switch earthing switch BB1 (A) OFF
2. Switch disconnector BB1 (D) ON
3. Switch circuit-breaker BB1 (E) ON

The feeder is earthed by carrying out the operations vice versa (Fig. 3.8 shows the final condition)
3.5.2 Bus transfer of the feeder without interruption

**Important!**

*Bus coupler has to be switched on.*

The following description refers to feeder panels with one circuit-breaker.

The bus transfer from busbar 1 to busbar 2 is described.

Initial condition is feeder connected to BB1:

Main panel with BB1:
- Circuit-breaker: ON
- Disconnector BB1: ON
- Earthing switch: OFF

Opposite panel with BB2:
- Disconnector BB2: OFF

Bus transfer without interruption to busbar 2 (Fig. 3.15 shows the final condition):
1. Switch disconnector BB2 (A) ON.
   Feeder connected to BB1 and BB2.
2. Switch disconnector BB1 (B) OFF.
   Feeder connected to BB2.

The bus transfer from busbar 2 to busbar 1 is realized by carrying out the operations vice versa (Fig. 3.14 shows the final condition).

Figure 3.14
Feeder connected to BB1

Figure 3.15
Feeder connected to BB2
3.5.3 Switching the bus coupler on

**Bus coupler panels**

Initial condition is bus coupler OFF:

Main panel with BB1:
- Circuit-breaker: OFF
- Disconnector BB1: OFF
- Earthing switch BB1: OFF

Opposite panel with BB2:
- Disconnector BB2: OFF
- Earthing switch BB2: OFF

Switching the bus coupler on (Fig. 3.17 shows the final condition):
1. Switch disconnectors BB1 (A) and BB2 (B) ON.
2. Switch circuit-breaker (C) ON.

Switching the bus coupler off:

**Important!**
*For switching the bus coupler off, at least one disconnector in each panel belonging to the relevant busbar sections has to be in position OFF.*

The bus coupler is switched off by carrying out the operations vice versa:
1. Switch circuit-breaker OFF.
2. Switch disconnectors BB1 and BB2 OFF.
Initial condition is combination cable feeder / bus coupler OFF:

Main panel with BB1:
- Circuit-breaker BB1: OFF
- Disconnector BB1: OFF
- Earthing switch BB1: OFF

Opposite panel with BB2:
- Circuit-breaker BB2: OFF
- Disconnector BB2: OFF
- Earthing switch BB2: OFF

Switching the combination cable feeder / bus coupler on (Fig. 3.19 shows the final condition):
1. Switch disconnector BB2 (A) ON.
2. Switch circuit-breaker BB2 (B) ON.
3. Switch disconnector BB1 (C) ON.
4. Switch circuit-breaker BB1 (D) ON.

Feeder is connected to BB2 and BB1. The bus coupler is ON.

Important!
For switching the bus coupler off, at least one disconnector in each panel belonging to the relevant busbar sections has to be in position OFF.

The combination cable feeder / bus coupler is switched off by carrying out the operations vice versa (Fig. 3.18 shows the final condition):
1. Switch circuit-breaker BB1 and BB2 OFF.
2. Switch disconnector BB1 and BB2 OFF.

3.5.4 Connect busbar sections with the bus section coupler

See Operating Instructions GMA AGS 531 521-01, chapter 6.7.
3.6 Earthing the busbar

**Warning!**
Comply with all relevant safety provisions.

**Important!**
The disconnectors at the busbar sections to be earthed have to be in position “OFF”.

**Important!**
The switching operations are always pictured pointing at the position indicators of the operator interfaces in the main panels.

3.6.1 Earthing the busbar via the feeder and its circuit-breaker

See Operating Instructions AGS 531 521-01, chapter 6.7, with the following supplement:
Chapter 3.5.1 describes the connection of the feeder to busbar 1 or 2 with earthing accessories attached to the cable terminals.
Fig. 3.20 shows the busbar 1 which has been earthed via the feeder.

![Figure 3.20]
Busbar earthed via the feeder and its circuit-breaker

3.6.2 Earthing a busbar section by the bus section coupler

See Operating Instructions AGSC 531 521-01, chapter 6.7.
3.6.3 Earthing a busbar section by the bus coupler

Initial condition is bus coupler OFF:

Main panel with BB1:
- Circuit-breaker: OFF
- Disconnector BB1: OFF
- Earthing switch BB1: OFF

Opposite panel with BB2:
- Disconnector BB2: OFF
- Earthing switch BB2: OFF

Earthing BB1 (Fig. 3.22 shows the final condition):
1. Switch disconnector BB1 (A) ON.
2. Switch circuit-breaker (B) ON.
3. Switch earthing switch BB2 (C) ON.

BB1 is unearthed by carrying out the operations vice versa.

Earthing BB2 (Fig. 3.23 shows the final condition):
1. Switch disconnector BB2 (D) ON.
2. Switch earthing switch BB1 (E) ON.

BB2 is unearthed by carrying out the operations vice versa.

3.6.4 Earthing a busbar section by the combination cable feeder / bus coupler

Earthing BB1 (see also Fig. 3.22):
1. Switch disconnector BB1 ON.
2. Switch circuit-breaker BB1 ON.
3. Switch earthing switch BB2 ON.

Earthing BB2:
1. Switch disconnector BB2 ON.
2. Switch circuit-breaker BB2 ON.
3. Switch earthing switch BB1 ON.

The busbar section is unearthed by carrying out the operations vice versa.
3.7 Earthing the current conductors between main and opposite panels

In the following the earthing of the single-phase, solid-insulated current conductors which connect main and opposite panels is described.

3.7.1 Combination cable feeder / bus coupler:

The current conductors are earthed automatically
- by earthing the feeder (see Fig. 3.11).
- by earthing a busbar section (see chapter 3.6.3).

3.7.2 Feeder panels with one circuit-breaker:

Initial condition is feeder EARTHED (see also chapter 3.5.1)

Main panel with BB1:
- Circuit-breaker: OFF
- Disconnector BB1: OFF
- Earthing switch: ON

Opposite panel with BB2:
- Disconnector BB2: OFF

Earthing the current conductors (Fig. 3.25 shows the final condition):
- Switch circuit-breaker (A) ON

The current conductors are un-earthed by carrying out the operations vice versa.

As an option the opposite panel can be delivered with an additional earthing switch. In this way the terminals on both sides of the current conductors which connect main and opposite panels can be earthed separately (see chapter 3.1.1).
4 Operating the voltage transformer disconnecting device

4.1 Take off the cable compartment cover

Voltage transformer and disconnecting device are installed in the opposite panel behind the cable compartment cover:

1. Earthing switch “ON”
2. Unlock the cable compartment cover by moving the interlocking slide upwards.
3. Lift the cable compartment cover and take it off.

4.2 Disconnecting device for voltage transformers

Operate the disconnecting device:

1. De-energize the cable feeder. Switch the circuit-breaker and disconnector “OFF”.
2. Earth the cable feeder. Switch the earthing switch “ON”.
3. Take off the cable compartment cover (see chapter 4.1).
4. Insert the lever for the disconnecting device (2) into the opening.
5. Pull the locking pin (1).
6. Turn the lever (2) quickly to “ON” or “OFF” till mechanical stop (approx. 95°).
7. If end position is reached, the locking pin must latch again.
8. Take off lever after switching operation has been completed.
9. Insert the cable compartment cover and engage the interlocking.
10. Switch the earthing switch “OFF”.

Important!

Observe the phase sequence of the voltage transformers.
The phase sequence is from left to right L3 - L2 - L1.

Figure 4.1
Take off the cable compartment cover
1 Earth the panel
2 Move interlocking slide upwards
3 Lift the cable compartment cover and take it off

Figure 4.2
Disconnecting device for voltage transformers. Observe the phase sequence of the voltage transformers!

Figure 4.3
Disconnecting device and opening for lever.
1: Locking pin
2: Lever
5 Cable testing

See Operating Instructions
AGS 531 521-01, chapter 9,
regarding the following supplement:

**Important!**

In item 8 the earthing switch is switched off and all switching devices of the panel are in the necessary position for cable testing. In case the opposite panel of a combination cable feeder / bus coupler (Fig. 5.1) is equipped with an additional earthing switch, this earthing switch has to be switched OFF additionally!

![Fig. 5.1](image)

**Fig. 5.1**
Combination cable feeder / bus coupler: Position of the switching devices during cable testing.
1. Test transformer
2. High-voltage cable