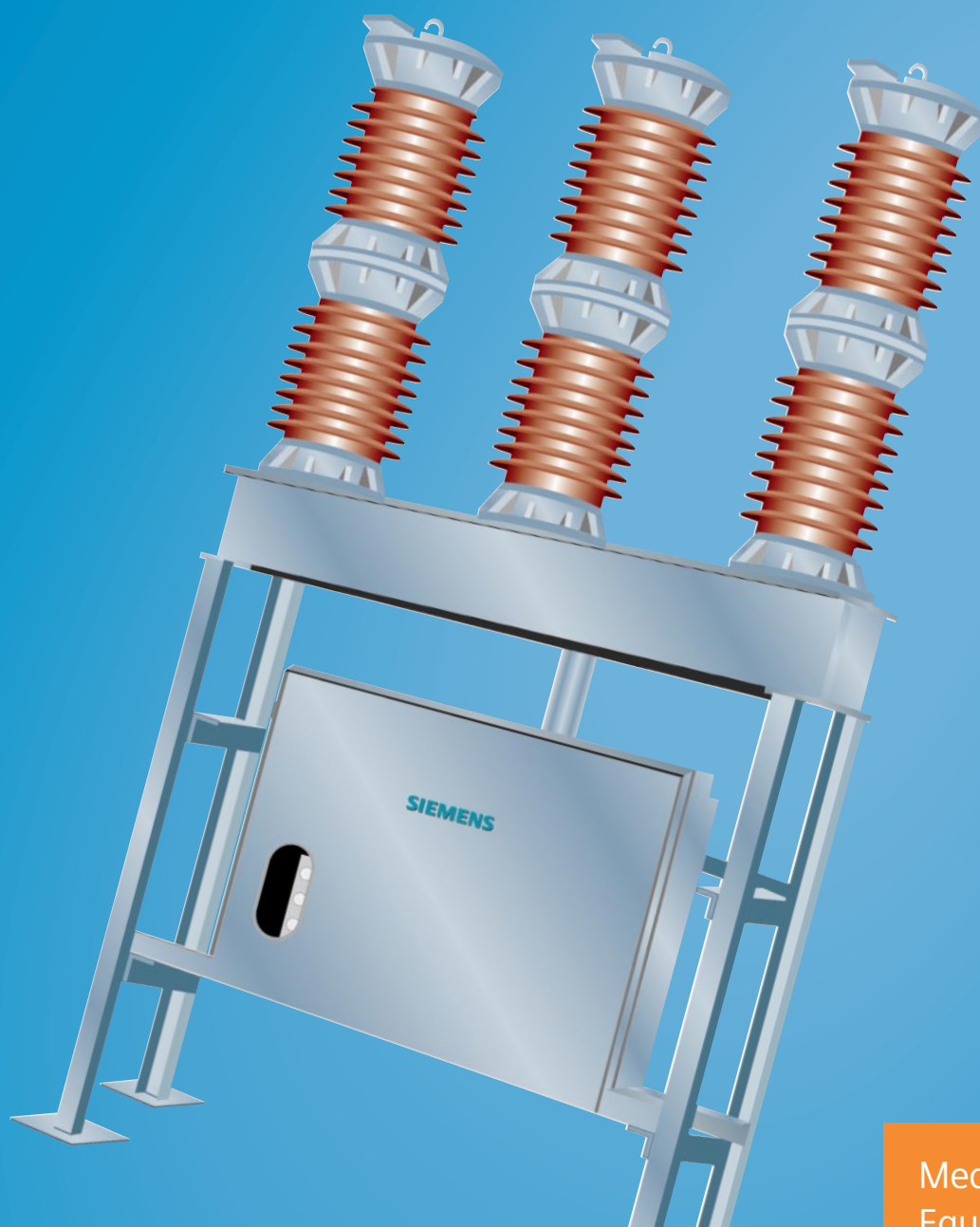




**3AG01 / 3AF01**  
**Outdoor Vacuum Circuit-Breakers**  
**up to 40.5 kV**

Medium-Voltage  
Equipment

Catalog HG 11.41  
2002

**SIEMENS**



|                            |   |
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## Introduction

The Siemens outdoor vacuum circuit-breaker types 3AG01/3AF01 are structure-mounted, easy-to-install outdoor vacuum circuit-breaker for use in 12/36/40.5 kV systems. They are a porcelain-clad, three-pole circuit-breakers fitted with reliable and well-proven vacuum interrupters from Siemens. Adequate phase clearances and heights have been provided to meet the standard safety requirements. They are suitable for direct connection to overhead lines.

The design of 3AG01/3AF01 incorporates a minimum number of moving parts and a simple assembly which ensures a long electrical and mechanical service life. It has all the advantages inherent to the use of vacuum interrupters like low drive and arc energy, light weight, shock-proof performance and many more.

## Typical uses

Transformer substations and switching substations operated by:

- Automobile industry
- Cement industry
- Chemical industry
- Electrochemical plants
- Iron and steel works
- Lignite open-cast mines
- Mining industry
- Petrochemical plants
- Petroleum industry
- Pipeline installations
- Power supply utilities
- Rolling mills
- Distribution network
- Shipbuilding industry
- Textile, paper and food industries

## Features

- Fully type-tested
- Conforms to IEC standards
- High electrical and mechanical service life
- No fire hazard
- Suitable for auto-reclosing duty
- Negligible maintenance
- High reliability
- Perfect harmony between vacuum interrupter and operating mechanism



**3AG01**

Maximum ratings  
12 kV/25 kA/1600 A



**3AF01**

Maximum ratings  
40.5 kV/31.5 kA/2000 A

# Technical Data

| Type                                             | 3AG0144                          | 3AF0143                                   | 3AF0144                                   | 3AF0153                                   | 3AF0154                                   |
|--------------------------------------------------|----------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| Rated voltage, frequency                         | 12 kV, 50 or 60 Hz               | 36 kV <sup>1)</sup> , 50 or 60 Hz         | 36 kV <sup>1)</sup> , 50 or 60 Hz         | 36 kV <sup>1)</sup> , 50 or 60 Hz         | 36 kV <sup>1)</sup> , 50 or 60 Hz         |
| Rated current                                    | 1600 A                           | 1600 A                                    | 2000 A                                    | 1600 A                                    | 2000 A                                    |
| Rated power-frequency withstand voltage          | 28 kV                            | 70 kV                                     | 70 kV                                     | 70 kV                                     | 70 kV                                     |
| Rated lightning impulse withstand voltage (peak) | 75 kV                            | 170 kV <sup>2)</sup>                      | 170 kV <sup>2)</sup>                      | 170 kV <sup>2)</sup>                      | 170 kV <sup>2)</sup>                      |
| Rated short-circuit breaking current             | 25 kA                            | 25 kA <sup>1)</sup>                       | 25 kA <sup>1)</sup>                       | 31.5 kA <sup>1)</sup>                     | 31.5 kA <sup>1)</sup>                     |
| Rated short-circuit making current (peak)        | 63 kA                            | 62.5 kA                                   | 62.5 kA                                   | 80 kA                                     | 80 kA                                     |
| Rated short-time withstand current               | 25 kA, 3 s                       | 25 kA, 3 s                                | 25 kA, 3 s                                | 31.5 kA, 3 s                              | 31.5 kA, 3 s                              |
| Rated operating sequence                         | O-0.3 s-CO-3 min-CO              | O-0.3 s-CO-3 min-CO<br>O-0.3 s-CO-15 s-CO | O-0.3 s-CO-3 min-CO<br>O-0.3 s-CO-15 s-CO | O-0.3 s-CO-3 min-CO<br>O-0.3 s-CO-15 s-CO | O-0.3 s-CO-3 min-CO<br>O-0.3 s-CO-15 s-CO |
| Service conditions                               | - 25 °C to + 55 °C <sup>3)</sup> | - 25 °C to + 55 °C <sup>3)</sup>          | - 25 °C to + 55 °C <sup>3)</sup>          | - 25 °C to + 55 °C <sup>3)</sup>          | - 25 °C to + 55 °C <sup>3)</sup>          |
| Degree of protection                             | IP 55                            | IP 55                                     | IP 55                                     | IP 55                                     | IP 55                                     |
| Approx. total weight                             | 515 kg                           | 880 kg                                    | 880 kg                                    | 880 kg                                    | 880 kg                                    |

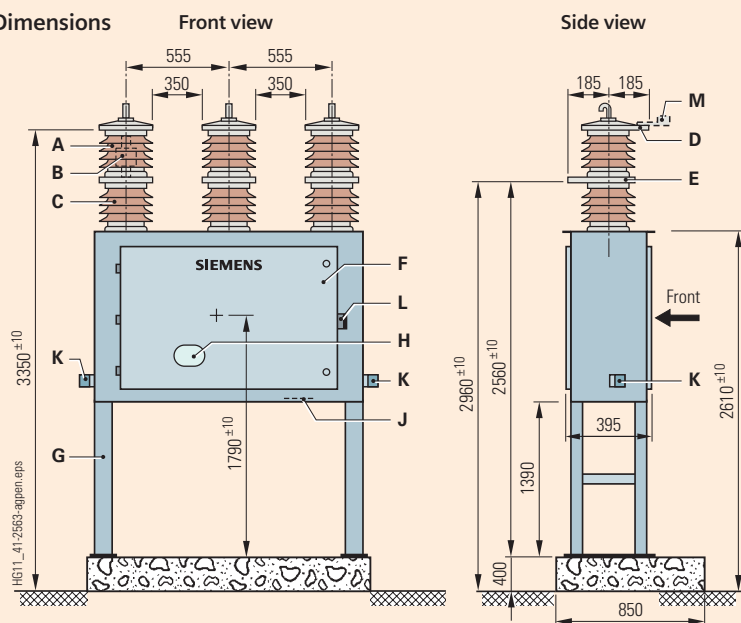
Notes: 1) 40.5 kV, 31.5 kA, 4 s on request.

2) Higher withstand voltages on request.

3) - 40 °C on request.

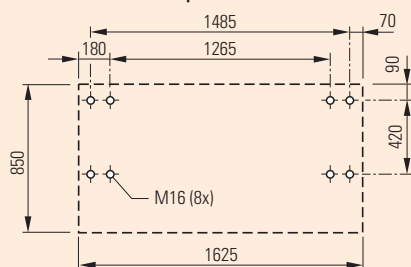
## 3AG01

### Dimensions

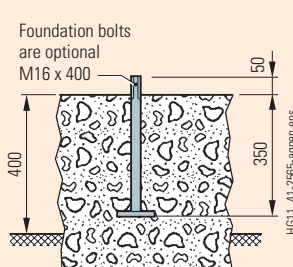


| Item | Description                                                                                           |
|------|-------------------------------------------------------------------------------------------------------|
| A    | Interrupter assembly                                                                                  |
| B    | Vacuum interrupter                                                                                    |
| C    | Support insulator                                                                                     |
| D    | Top terminal                                                                                          |
| E    | Bottom terminal                                                                                       |
| F    | Operating mechanism housing                                                                           |
| G    | Steel structure                                                                                       |
| H    | Plexiglass for mechanical indications (ON-OFF indicator, spring charged indicator, operation counter) |
| J    | Gland plate for control cable                                                                         |
| K    | Earthing terminal                                                                                     |
| L    | Facility for padlock                                                                                  |
| M    | Terminal connector (optional)                                                                         |

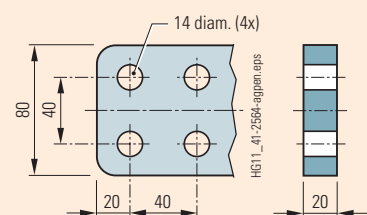
### Foundation plan



### Foundation detail



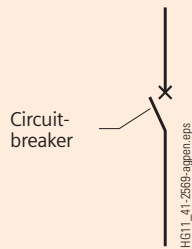
### Top/bottom terminal aluminium (D,E)



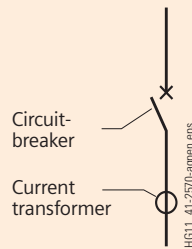
Note: Extended structure for mounting instrument transformers can be provided as an option.

## Product range

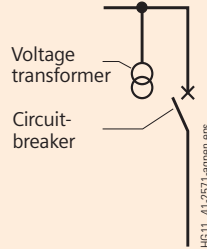
Circuit-breaker



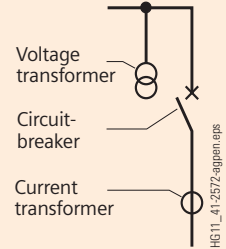
Circuit-breaker with current transformer



Circuit-breaker with voltage transformer

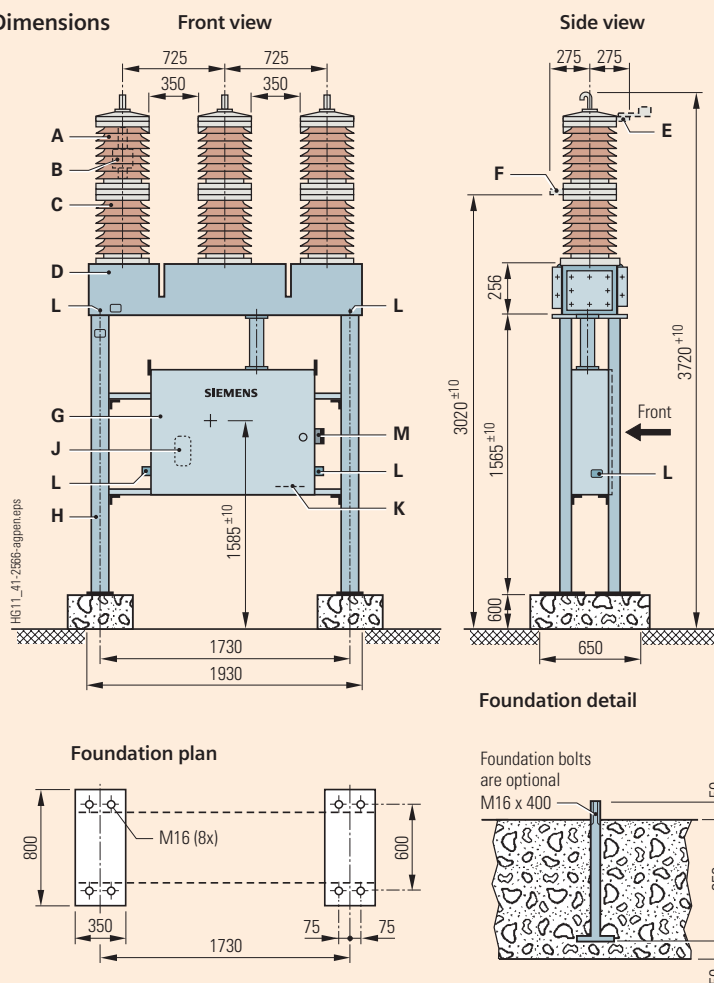


Circuit-breaker with current transformer and voltage transformer



## 3AF01

## Dimensions



| Item | Description                                                                                           |
|------|-------------------------------------------------------------------------------------------------------|
| A    | Interrupter assembly                                                                                  |
| B    | Vacuum interrupter                                                                                    |
| C    | Support insulator                                                                                     |
| D    | Base frame                                                                                            |
| E    | Top terminal                                                                                          |
| F    | Bottom terminal                                                                                       |
| G    | Operating mechanism housing                                                                           |
| H    | Steel structure                                                                                       |
| J    | Plexiglass for mechanical indications (ON-OFF indicator, spring charged indicator, operation counter) |
| K    | Gland plate for control cable                                                                         |
| L    | Earthing terminal                                                                                     |
| M    | Facility for padlock                                                                                  |

Note: Extended structure for mounting instrument transformers can be provided as an option.

## Secondary Equipment

### Operation, accessories

#### Operating mechanism

The well-proven operating mechanism of indoor vacuum circuit-breakers 3AG01/3AF01 have been incorporated in the outdoor vacuum circuit-breaker. They are equipped with a motor spring stored-energy operating mechanism. The motor can be operated either by AC or DC standard supply voltages.

#### Features

- Integrated mechanical breaker position indication CLOSED/OPEN, spring charged indication and mechanical counter
- Unambiguous assignment of actuating openings and control elements to corresponding breaker position indications
- All switching operations are from front including cable termination
- Ergonomically favorable height of all control elements from ground

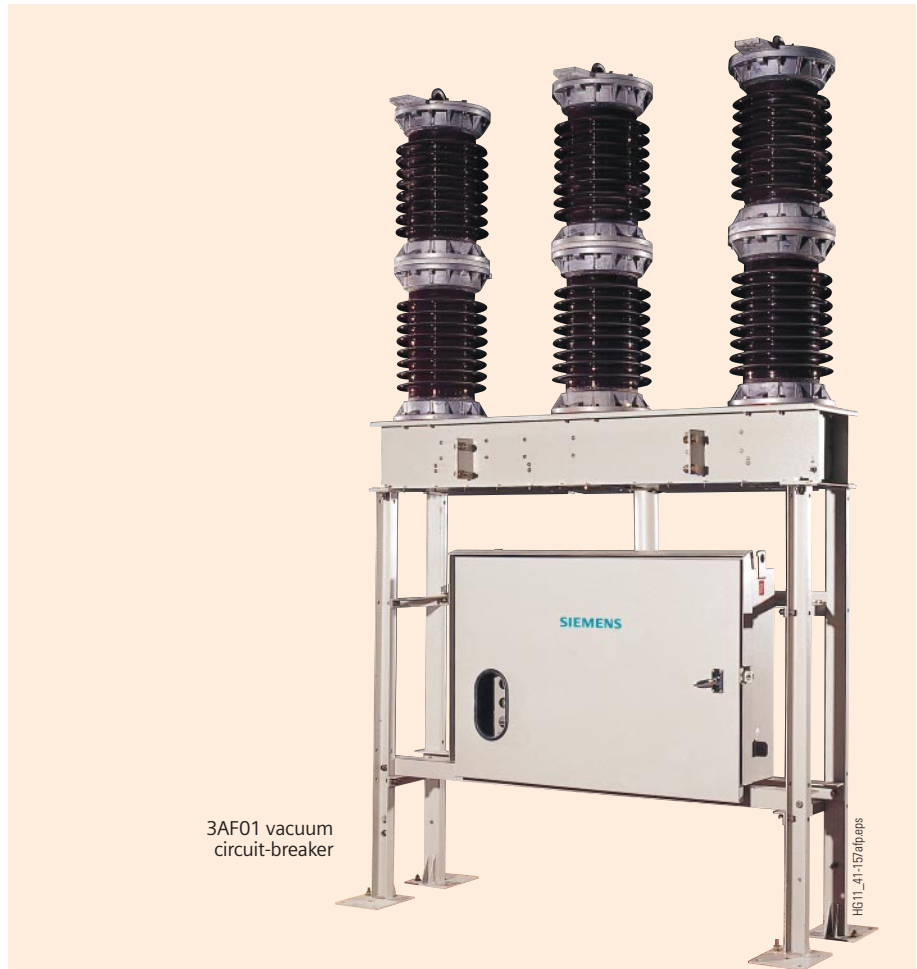
#### Instrument transformers

On client's requirement the breakers can be supplied with an extended structure for mounting outdoor current and voltage transformers on the incoming and outgoing supply sides, respectively.

#### Accessories

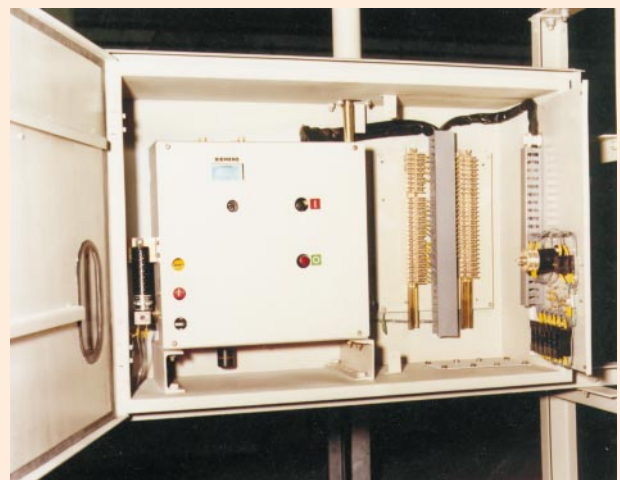
The following accessories can be provided:

- Auxiliary switch (5 NO+5 NC or 11 NO+11 NC)
- Closing solenoid (AC/DC voltages)
- Tripping solenoid (AC/DC voltages)



3AF01 vacuum circuit-breaker

Operating mechanism chamber of 3AF01



Emergency manual spring charging in the event of loss of control supply

## Construction

### General description

#### Suitability

Siemens outdoor vacuum circuit-breakers are designed to handle all switching duties that occur in primary distribution systems including rapid auto-reclosing. The breakers are extremely reliable in service, require minimum maintenance and have a long service life due to the use of vacuum interrupters. They can be used in all kinds of environments by virtue of their small size and weight, low vibration operation and they are unaffected by temperature or fire risks.

#### Construction

The vacuum interrupter is mounted in a porcelain insulator to form an interrupter assembly. For a cross-sectional view of a typical interrupter assembly of 36 kV, see below. Three such assemblies along with the bottom insulators are mounted on a baseframe which has a common operating shaft. This assembly is mounted on a steel structure, intended to locate the power terminals at a safe distance above the ground. The structure also encloses the operating mechanism. All the control and actuating devices are installed in this mechanism housing. The circuit-breaker can be either operated electrically from a remote control room or locally by hand. The necessary mechanical indicating devices for ON/OFF indication, spring charged indication and operation counter are provided in the mechanism housing. Also mounted in the mechanism housing are the special cage clamp type terminal blocks for control cables when required.

#### Arc quenching principle

When the contacts separate, the current to be interrupted initiates a metal-vapour arc discharge. Current continues flowing through the metal-vapour plasma until the next current zero. The arc is then extinguished and the conductive metal vapour condenses on the metal surfaces within a few microseconds. As a result, the dielectric strength between the contacts builds up very rapidly.

The contacts are so designed that the self generated axial field causes the arc to remain diffuse even at high currents. This keeps the stress on the contact surfaces uniform and any local melting is avoided when interrupting large currents.

The use of special copper chromium contacts ensures that the chopping current is less than 5 A.

### Maintenance, tests

#### Maintenance

The Siemens outdoor vacuum circuit-breakers are practically maintenance-free and need minimum attention of operating personnel. Maintenance is confined to merely cleaning and lubricating of the operating mechanism. Change of vacuum interrupter is not foreseen throughout the normal life of a circuit-breaker in a distribution system. Vacuum interrupters are designed for 30,000 operations at rated current. Necessary mechanical arrangement is also provided to check the presence of vacuum as a precommissioning and in service check.

#### Tests/Standards

Siemens outdoor vacuum circuit-breakers 3AG01/3AF01 have been fully type tested and conform to the latest IEC/IS standards.

#### Seismic capacity

The outdoor vacuum circuit-breakers are designed in accordance with internationally accepted requirements. Specific confirmations on request.

#### Notes

If not stated otherwise on the individual pages of this catalog, we reserve the right to include modifications, especially regarding dimensions and weights.

Drawings and photographs are not binding.

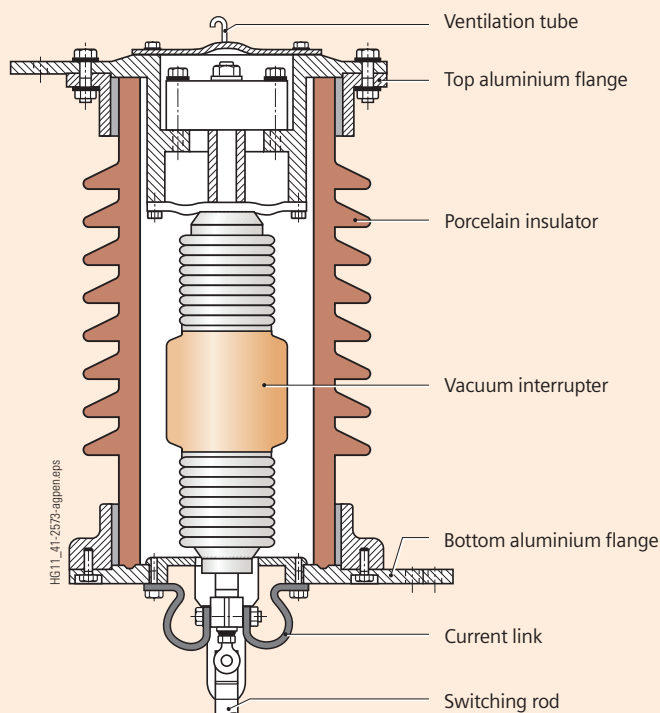
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If not stated otherwise, all dimensions in this catalog are given in mm.

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Technical contents:

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Typical cross-sectional view  
of a 36 kV/40.5 kV pole

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