



MV Switchgear for  
Distribution Network Solutions

## ga / gae630

Fully gas-insulated compact (RMU) and  
modular system

Up to 24 kV 20 kA 630 A

IEC Standards

Reliable innovation. Personal solutions.

[www.ormazabal.com](http://www.ormazabal.com)

## CONTENTS

<b>INTRODUCTION</b>	<b>1</b>
Preface	1
Your Electrical Network	2
Your Business and DNS Applications	2
Our Product Map (SSS & DNS)	3
<b>MAIN FEATURES</b>	<b>4</b>
Safety	4
Reliability	4
Efficiency	5
Sustainability	5
Continuous innovation	5
<b>TECHNICAL DETAILS</b>	<b>6</b>
Family	6
Technical data	7
Constructive structure	8
<b>DESIGN CHARACTERISTICS</b>	<b>9</b>
Key components	9
Main compartments	10
Protection & Automation	12
Smart Grids	13
<b>TYPE OF MODULES</b>	<b>14</b>
Other components and accessories	36
Indicators	36
Integrated voltage indication system IVDS	36
Integrated voltage detecting system IVDS	36
Cable connections	36
HRC Fuses	37
Spare parts and auxiliaries	38
<b>HANDLING, INSTALLATION AND AFTER SALES</b>	<b>39</b>
Handling	39
Inside buildings	39
Inside prefabricated transformer substations	40
Inside containerised substations	40
Inside wind turbines	40
Commissioning and After Sales	41
Recycling and end-of-life	41

The quality of the products designed, manufactured and installed by **Ormazabal** is backed by the implementation and certification of a quality management system, based on international standard ISO 9001:2008.

Our commitment to the environment is reaffirmed with the implementation and certification of an environmental management system as laid down in international standard ISO 14001 and OHSAS 18001 related to health & safety. Now it seems it is related to environmental things. The text should be written more clearly.

In view of the constant evolution in standards and design, the characteristics of the elements contained in this catalogue are subject to change without prior notification.

These characteristics, as well as the availability of components, are subject to confirmation by **Ormazabal**.



# Introduction

## Preface

Getting its DNA from decades of experience in research, design, development, manufacture and installation of Medium Voltage (MV) apparatus and switchgear, **Ormazabal** is now one of the world's biggest suppliers of MV gas-insulated switchgear (GIS). Today around 1,300,000 **Ormazabal** MV functional units have been installed in the electrical networks of over 100 electrical utilities and 600 wind farms in more than 110 countries.

The first **ga**, then called **ga-24**, was launched in 1985 as the most robust and compact ring main unit (RMU) range for secondary distribution networks up to 24 kV. It was upgraded in 1992 for a wider range and better electrical characteristics and begun to be known as the **ga** system. Nowadays **ga** is still considered to be one of the most widely used RMUs in electrical distribution worldwide and a well known symbol of the German design and technology in the sector.

Based on our customers' demands, the modular version of **ga** (then called GE) was designed and developed in 1993 to provide flexible solutions to the electrical networks and transformer distribution substations. In 2001 this modular system was upgraded to a fully gas-insulated extensible switchgear system and begun to be known as **gae**.

Since then both **ga** and **gae630** systems have been continuously evolving every year into a more extended and more ecological range with higher ratings to respond to the changes in the design parameters of the electrical network. Also both systems have already been integrated into several smart-grid applications. Today more than 600,000 **ga** and **gae630** system functional units have been installed in more than 80 countries.

The **ga** and **gae630** system provides you with reliable and efficient distribution network solutions (DNS) for all kinds of MV installations from electrical utilities to infrastructures, from leisure facilities to industrial installations, and from wind farms to PV plants.

**Ormazabal** is the leading provider of customized solutions to electrical utilities, to electrical end users as well as applications of renewable energy systems based on its own technology.

We encourage the **development of the electrical sector** towards the challenges of the future energy needs. We cooperate with the world's leading local, regional and global companies in the electrical sector with a strong commitment to **innovation towards personal safety, network reliability, energy efficiency, and sustainability.**

Our highly qualified and focused team of innovation-motivated professionals have developed our own products and solutions during our consolidated history of over a century, always establishing a close relationship with our customers aimed at achieving mutual long-term benefits.

**Velatia** is a family-run, industrial, technological and global group which operates in the areas of electrical networks, electronics and communication networks as well as in the consulting, security and aviation sectors, where security, efficiency and reliability are valued.

**Grupo Ormazabal** is now called **Velatia**. We have combined our forces to transform ourselves into a stronger group. Made up of companies with more than a hundred years of experience and committed to innovation in order to meet the present and future needs of our customers. Wherever they may be.

The solutions of the companies in **Velatia** seek to make the world a more and better connected, more sustainable, smarter, better connected, safer, more humane place.



Sofia metro  
(Bulgaria)



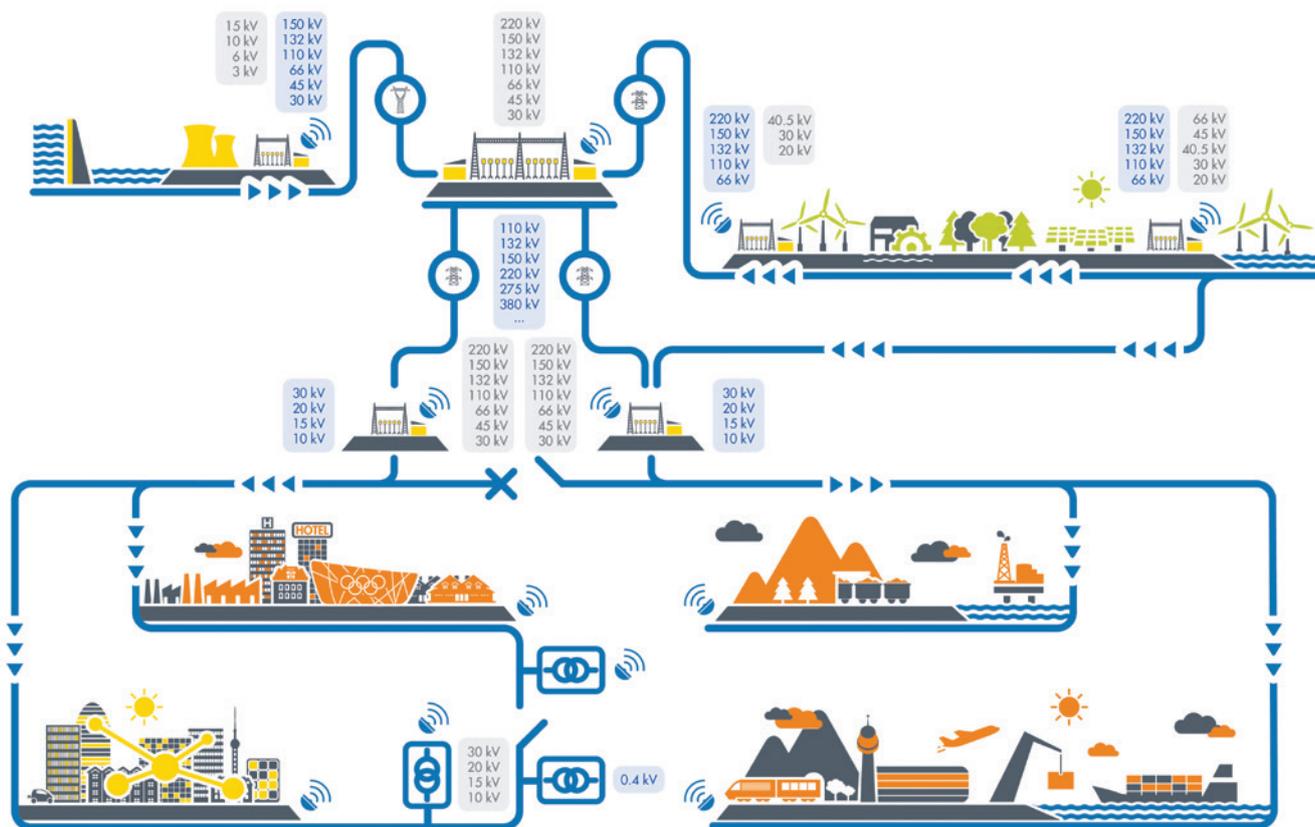
Wind farm application  
(Denmark)



Deutsche Bahn  
(Germany)

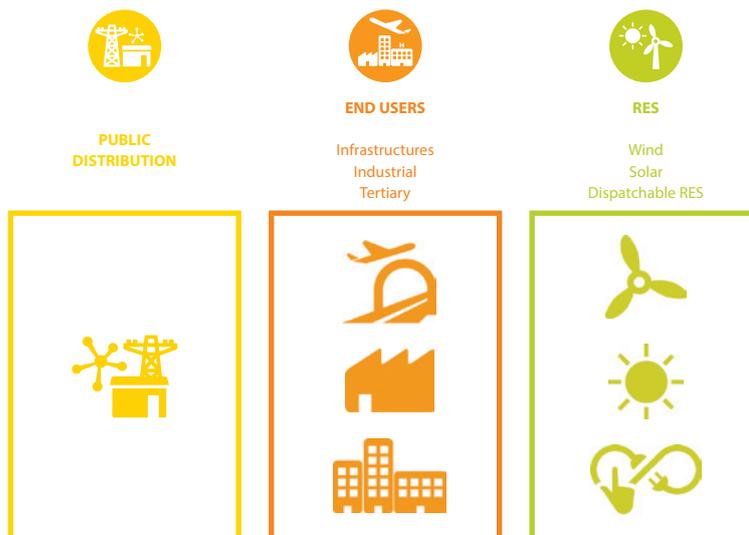
## Your Electrical Network

"Your dedicated partner for a reliable and intelligent electrical network"



## Your Business and DNS Applications

Close relationship with our customers and the profound knowledge of the electrical business are the keys to success that enable us to offer **Distribution Network Solutions (DNS)** based on high added value products and services adapted to the needs of the electrical utilities, electrical energy end users and renewable energies.



## Our Product Map (SSS & DNS)

We believe that **excellence** does not lie solely in offering **effective products and services**, but also in the ability to respond to **individual requirements and demands**.

We provide our clients with personalised projects for efficient energy management via **Primary and Secondary Distribution equipment and solutions**.

### Our Business Lines

- SSS** Substation Solution for primary distribution
- DNS** Distribution Network Solutions for secondary distribution

### Our products for your segment

<b>SSS</b>	cpg.1	cpg.0	gae1250kmax	amc	cibor nvl.cibor	transforma Power transformers	ormaccontainer	Prefabricated substations

<b>DNS</b>	cgm.3	gae	ga	cgmcosmos [IEC - ANSI/IEEE]	cgmcosmos [HN]	ea	
	ekorsys family			transforma Distribution transformers			
	Protection, automation and control			Oil	Conventional	Non-conventional	
	CURRENT® family		Low voltage board		transforma.tpc	transforma.fine	Extended range solutions
	Advanced metering, sensing & analytics, monitoring and communications			Biodegradable dielectric liquid	organic		
	Concrete prefabricated transformer substations (TS)			Metallic prefabricated TS	CEADS	Switching nodes	
	Underground	Walk-in	Compact				
	Concrete enclosure for transformer substations (TS)			Metallic enclosure for TS	Photovoltaic substation	Mobile substation	
	Underground	Walk-in	Modular				

# Main features

## Safety

Protection for people, the environment and your electrical installations.

Special attention paid to the **personal safety** of the operators and the general public, even **under fault conditions**.

### Internal arc

Both **ga** and **gae630** systems have been designed to withstand the effects of an internal arc according to IEC 62271-200:

- IAC AFL class:  
20 kA 1 s

### Arc-fault proof

The HV and connection compartments comply with arc-fault protection requirements according to IEC 62271-200 Appendix A "Arc-fault protection" criteria 1 to 5.

The internal arc classification IAC A FL is always present for the sealed gas tank & cable compartment

In the **ga-c** system version (h= 1050 mm) it is not possible to fit a metal cooling stretch arrangement into the plinth. Instead, a metal cooling stretch arrangement can be provided as part of the substation building, in the lower dividing wall towards the transformer room.

A rear absorber channel is optionally available on request, which enables the installation of the switchgear in connection with metal absorbers on a closed floor. By means of this option, the pressure values inside the switchgear room can be reduced by approximately 60% and it is passive & maintenance free.

## Hermetically sealed

Operational safety is assured by the hermetically sealed encapsulation of the primary components which makes them impervious to ambient influences, such as dirt, humidity, insects, etc. The actuating parts are designed for low maintenance, and accessible from outside the MV compartment.

## Interlocks

**ga** and **gae630** systems have mechanical interlocks as **standard** in accordance with IEC 62271-200 to enable safe and reliable service.

Interlocks prevent unsafe operations:

- It makes it impossible to close the switch-disconnector and the earthing switch at the same time
- It permits the opening of the access cover to the MV cables when the earthing switch is closed

Optional locks, anti reversing interlocks, key interlocks and electrical locks based on customers' characteristics are available.



## Reliability

Help to maintain the uninterrupted supply of your electrical network

### Sealed for life insulation

Insulation inside a stainless steel gas tank provides long service life (minimum 30 years) and absence of the maintenance of live parts.

### Suitable for any environment

Extensive climatic independence.

### Use of screened cable connectors

Resistance to harsh conditions (humidity, salinity, dust, pollution...).

### 100% routine tested

The switch panel or switchgear product test is naturally included in the different tests in accordance with IEC 62271 as well as the testing of customer-specific devices.

For example:

- Functional tests of the devices,
- Rated short-duration power frequency withstand voltage test 50 kV / 1 min.
- Test of all auxiliary devices such as auxiliary switches, shunt trip release remote control drives protective devices (relays), measuring tools
- Functional test of capacitive measuring device
- Functional test of the short-circuit indicator (if present)

## Efficiency

High added value features that make your task easier.

### Modularity

**ga** and **gae630** systems incorporate modular cubicles as well as block-type compact structures. Modular cubicles and extensible-type blocks can be connected in between them. This offers customers flexible diagram configurations, easy extension and minimal side occupation. Additionally, this equipment is adaptable to the future evolution of the electrical network.

### Extensibility and replaceability

The connecting set allows effortless mechanical and electrical connection between two cubicles without gas handling and provides an option of future extensibility.

### Smart Grid ready

**ga** and **gae630** systems have already been integrated into several Smart Grid applications.

**Ormazabal** supplies complete Medium Voltage installations that include protection, control, automation and advanced meter management (AMM) functions according to the most demanding needs of the intelligent networks.

## Ergonomics

the following user-friendly features are present in the **ga** and **gae630**:

- Front access to install MV cables and fuses
- Easy connection and testing cables
- Optimal interface with operators
- Simple operation of driving mechanisms
- Small size and light weight
- Conventional replaceable ring CTs around cable bushings

## Sustainability

Continuous efforts in gas emission reduction.

Commitment to the environment

- End-of-life management
  - Recycling options
- Use of highly recyclable material
- Minimum use of SF<sub>6</sub>
- No use of SF<sub>6</sub> during installations
- Continuous investigations towards reducing environmental footprint
  - Constant research on investment in alternative materials



## Continuous innovation

Help to maintain the uninterrupted supply of your electrical network

A focused team of professionals dedicated to innovation leads to a constant offer of new developments and upgrades, such as:

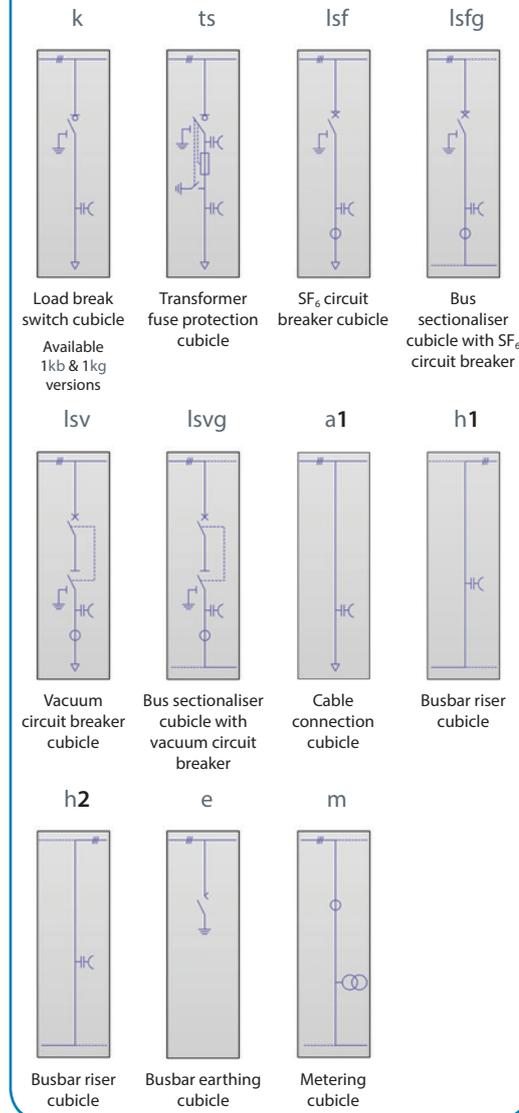
- New modules for 20 kA 4 s
- Adaptation of Smart Grid demands of utilities
- New metering cubicles
- Voltage and current sensors
- Preventive cable fault diagnosis
- Partial discharge (PD) detection for network diagnosis



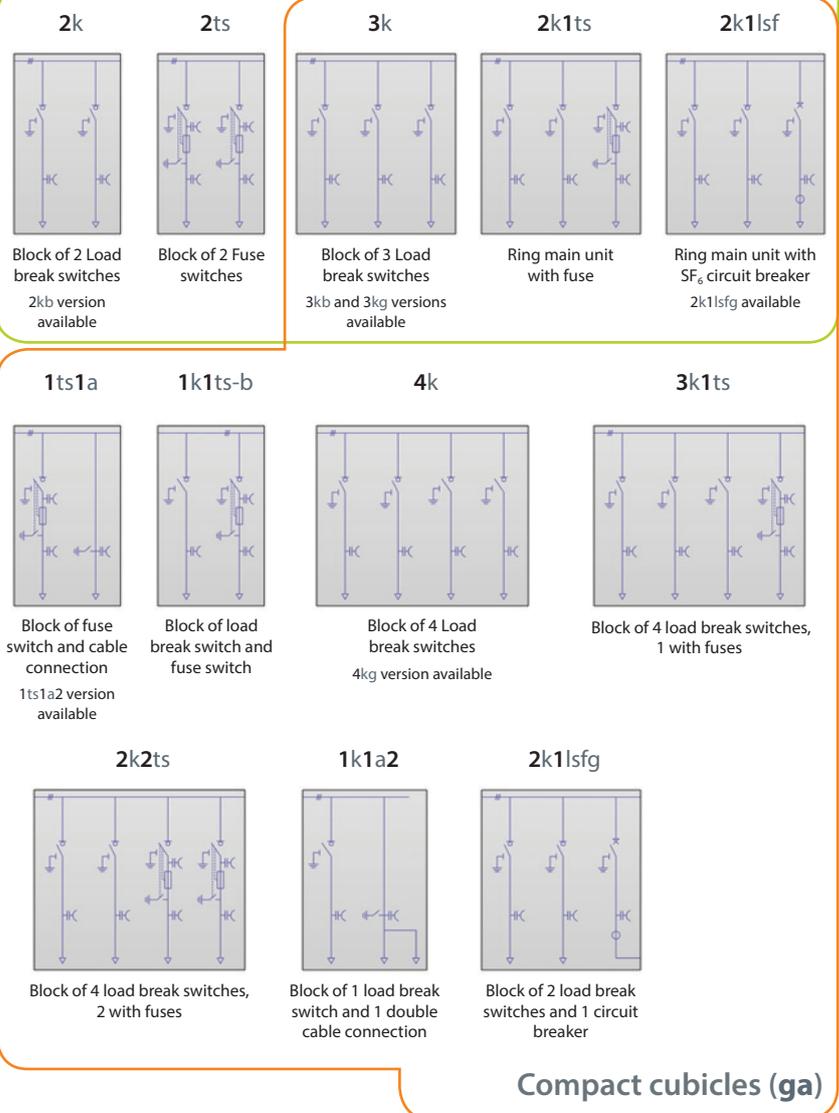
# Technical details

## Family

### Modular cubicles (gae630)



### Extensible blocks (gae630)



### Compact cubicles (ga)

### Applicable electrical standards

IEC	
IEC 60265-1 / 62271-103	Switches for rated voltages above 1 kV up to and including 52 kV
IEC 60282-1	High-voltage fuses - Part 1: Current-limiting fuses
IEC 60529	Degrees of protection provided by enclosures
IEC 61243-5	Voltage detecting systems (VDS)
IEC 62271-1	Common characteristics for high-voltage switchgear and controlgear standards
IEC 62271-100	High-voltage alternating current circuit-breakers
IEC 62271-102	Alternating current disconnectors and earthing switches
IEC 62271-105	High-voltage alternating current switch-fuse combinations
IEC 62271-200	Alternating current metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
IEC 62271-303	Use and handling of sulphur hexafluoride (SF <sub>6</sub> )
DIN EN ISO 9001	
DIN ISO 14001	
OHSAS 18001	

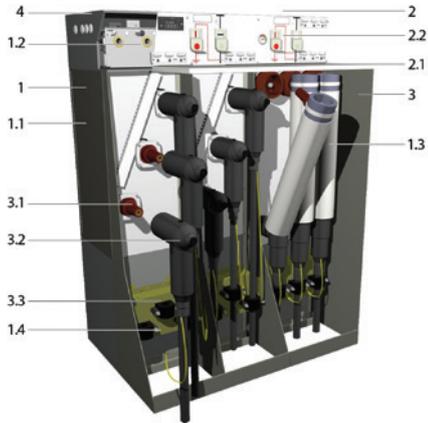
26. BlmSchV 1996, part 1 no. 66 dated 20.12.1996

## Technical data

Electrical characteristics				IEC						
Rated voltage	U <sub>r</sub>	[kV]	7.2	12	17.5	24				
Rated frequency	f <sub>r</sub>	[Hz]	50 / 60							
Rated normal current	I <sub>r</sub>									
Busbars and cubicle interconnection		[A]	630							
Feeder		[A]	630							
Output to transformer		[A]	200							
<b>Rated short-time withstand current</b>										
With t <sub>k</sub> = 1 s	I <sub>k</sub>	[kA]	20 <sup>(1)</sup> / 25 <sup>(2)</sup>							
With t <sub>k</sub> = 3 s	I <sub>k</sub>	[kA]	20							
Peak value	I <sub>p</sub>	[kA]	50 <sup>(1)</sup> / 63 <sup>(2)</sup>							
<b>Rated insulation level</b>										
Rated power-frequency withstand voltage [1 min]	U <sub>d</sub>	[kV]	20	28	38	50				
Rated lightning impulse withstand voltage	U <sub>p</sub>	[kV]	60	75	95	125				
Internal arc classification according to IEC 62271-200	IAC	AFL	20 kA 1 s - 25 kA <sup>(2)</sup> 1 s							
Degree of protection: Gas tank			IP65							
Degree of protection: External enclosure			IP44 / IP3XD							
Colour of equipment	RAL		Grey 7035							
Loss of service continuity category	LSC		LSC2A							
Partition class			PM							
<small>(1) Type tests done at 21 kA (2) Optional</small>										
			k	k motor	ts	ts motor	Isf	Isf motor	Isv	Isv motor
<b>Tripping coils</b>										
Internal insulation	[kV]	2								
<b>Tripping coil (opening)</b>										
Rated voltage	[V]	-	24 / 48 / 60 / 110 / 220 Vdc 110 / 230 Vac							
Max. consumption	[W] / [VA]	-	<265 / 652		<75 / 71		<50 / 50			
<b>Tripping coil (closing)</b>										
Rated voltage	[V]	-					*			
Max. consumption	[W] / [VA]	-					<80 / 130			
<b>Undervoltage coil</b>										
Rated voltage	[V]	-					*		*	
Max. consumption	[W]	-					<40 / 40			
<b>Motorised units</b>										
Rated voltage	[V]	-	*	-	*	-	*	-	*	
Motor operation time	[s]	-	<8	-	<8	-	<8	-	<6	
Peak current	[A]	-	<12	-	<13	-	<13	-	<12	
<b>Indicating contacts</b>										
Switch   Earthing			4NO + 4NC / 3NO + 3NC			3NO + 3NC		3NO + 3NC / 2NO + 2NC		
Circuit breaker			-			4NO + 4NC		10NO + 10NC		
<b>Service conditions</b>				<b>IEC</b>						
Type of switchgear				Indoor						
<b>Ambient temperature</b>										
Minimum   Maximum				-5 °C*   +40 °C*						
Maximum average ambient temperature, measured over a 24-hour period				+40 °C*						
<b>Relative humidity</b>										
Maximum average relative humidity, measured over a 24-hour period				<95 %						
<b>Overpressure</b>										
Maximum average overpressure, measured over a 24-hour period   1-month period				130 kPa for all models except Isf 150 kPa						
Maximum height above sea level				1000m*						
<small>* Consult availability and other values</small>										

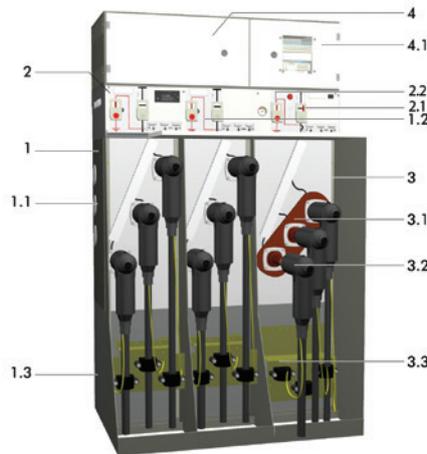
## Constructive structure

### ga / gae630-2k1ts



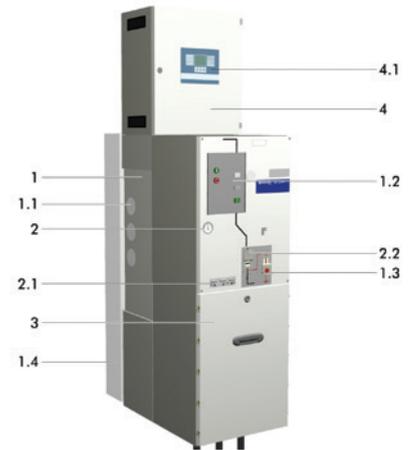
- 1 Gas tank
  - 1.1 Busbar connection (side bushings)
  - 1.2 Switch-disconnector
  - 1.3 HRC fuses
  - 1.4 Gas relief duct
- 2 Mimic and driving mechanism
  - 2.1 Voltage indicator
  - 2.2 Switching device indicator
- 3 Cable compartment
  - 3.1 Cable bushings
  - 3.2 Cable connectors
  - 3.3 Cable clamps
- 4 Control box

### ga / gae-2k1sf



- 1 Gas tank
  - 1.1 Busbar connection (side bushings)
  - 1.2 Switch disconnector
  - 1.3 Gas relief duct
- 2 Mimic and driving mechanism
  - 2.1 Voltage indicator
  - 2.2 Switching device indicator
- 3 Cable compartment
  - 3.1 Cable bushings
  - 3.2 Cable connectors
  - 3.3 Cable clamps
- 4 Control box
  - 4.1 Protection relay

### gae630-lsv



- 1 Gas tank
  - 1.1 Busbar connection (side bushings)
  - 1.2 Circuit breaker
  - 1.3 Switch disconnector
  - 1.4 Gas relief duct
- 2 Mimic and driving mechanism
  - 2.1 Voltage indicator
  - 2.2 Switching device indicator
- 3 Cable compartment
- 4 Control box
  - 4.1 Protection relay

# Design characteristics

## Key components

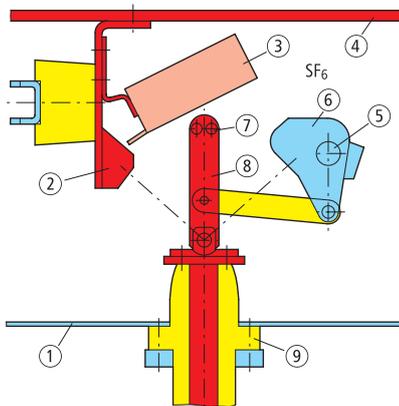
### Load break switch (LBS)

High duty load break switch which is the multi blade arc divider type designed and developed by **Ormazabal**.

The three-position switch includes the functions of load break switch, disconnecter and earthing switch in a single unit.

Features:

- 3 position switch-disconnector: Open - Close - Earth
- Operator independent operation
- Switch category
  - Mechanical endurance:
  - 1000 (manual or motor)
  - Electrical endurance certification: E3
- Earthing switch category:
- Mechanical endurance:
  - 1000 (manual)
  - Electrical endurance certification: E2



1. Front gas tank
2. Fixed contact, On
3. Arc quenching coil
4. Busbar
5. Drive shaft
6. Earthing contact
7. Special contact rivets
8. Blade contact
9. Bushing

### Connecting set

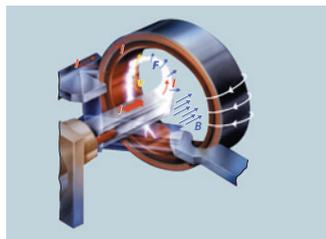
It is very simple to extend the **ga** and **gae630** system modular and extensible switchgear and combine it with any other modular **gaes**. Due to their uniform design and dimensions, all **ga** and **gae630** system switchgear can be connected to each other both mechanically and electrically by means of the screened busbar connecting sets, similar to ormaLINK.

### Rotating arc circuit breaker (CB)

A rotating arc circuit breaker (CB) can be described as a CB which generates a magnetic field for driving the arc.

During the breaking process, initially the arc introduces a current into the coil. Then the coil generates a magnetic field and the arc starts to rotate due to forces of the magnetic field. Finally the arc extinguishes by cooling down and totally dissipates when passing to the zero position of the sine function.

**Ormazabal** has been producing rotating arc type CBs for more than 10 years.



- I= Current
- B= Magnetic field generated by current I in the arc quenching coil
- F= Force exerted on the current-carrying switching arc
- v= Speed vector of the switching arc

### Vacuum circuit breaker (VCB)

All lsv type modular cubicles under **gae630** system incorporate a compact three-pole circuit breaker with vacuum breaking technology thanks to the axial magnetic field type vacuum interrupter (VI). Two massive copper contacts, one fixed and the other moving, inside the VI's ceramic body form the main connection parts of the VCB circuit.

During the switching off, an arc occurs in the vacuum contact chamber from the moment the fixed and moving contacts are separated. Once the quenching distance is reached, the arc is quenched on the zero crossing to break the current.

All VCBs are designed, developed and manufactured by **Ormazabal** and certified in accordance with IEC 62271-100 standard, including extended electrical endurance (class E2) with a rapid reclosing cycle and hence low maintenance during its whole service life.

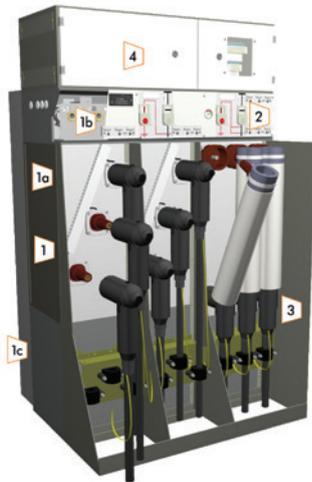
Features:

- Mechanical endurance
  - M2: 10 000 operations
- Operating sequence with reclosing
  - O-0.3 s-CO-15 s-CO
  - O-0.3 s-CO-3 min-CO
- Associated with switch-disconnector ensures across isolating distance

## Main compartments

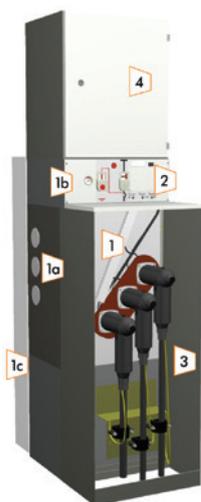
The **ga** and **gae630** systems include a structure divided into independent compartments:

### ga compact cubicles



1. Gas tank
  - a) Busbar
  - b) Switching and breaking devices
  - c) Pressure relief duct
2. Driving mechanism and operator interface for switch disconnecter and earthing switch
3. Cable Compartment
4. Control box

### gae630 modular cubicles



1. Gas tank
  - a) Busbar
  - b) Switching and breaking devices
  - c) Pressure relief duct (optional)
2. Driving mechanism and operator interface for switch disconnecter and earthing switch
3. Cable Compartment
4. Control box

## Gas tank

### The MV compartment

This is a gas-tight welded tank made from stainless steel, which houses all the live parts including the busbars. The incoming and outgoing power feeders, as well as the connection of the fuses is made through cast-resin bushings that are individually tested for maintenance of the maximally admissible partial discharge values ( $TE < 2pC$ ). Each MV compartment is equipped with a bursting membrane.

Busbars are also located in the MV compartment. The busbars of the individual sections or blocks of panels are linked to one another via special bushings including controlled silicone insulation and coupling pieces.

### Gas leakage indication

Each gas tank has a pressure display for verification of the gas overpressure within, allowing its functional safety to be inspected.

To control the functional safety, each gas tank is equipped with a pressure indicator.



### Pressure switch monitor

For remote monitoring each gas tank can be equipped with a pressure switch. The bottom switching point corresponds to the transition to the red measuring range on the gas leakage indicator.

## Driving mechanism

### Drives

The sturdy drives, operated by spring or stored energy mechanisms, of the load break and earthing switches, and rotating arc circuit breakers (CBs) are located above the HV compartment. The spring operated drives are low maintenance components and the tripping mechanism of the stored energy operated drives of transformer and CB panels should be operated at least once every 10 years.

### Operation

The mechanisms must be operated via the external drive shafts that are included in the mimic diagram. They include operating lever, 1 per load-break switch or circuit-breaker, 1 per earthing switch and if available 1 per disconnecter. Conventional operability is ensured due to the clearly structured mimic diagram and the easy-to-operate rotary handles.

### Front panel

Front panel with

- Mimic diagram
- Switch position indication
- Operator surface for the actuators
- Capacitive voltage indicators
- Gas leakage indication
- Short-circuit indicators (Optional)
- Padlocking facility (Optional)
- Drive sealed against dust, sand and insects
- Housing IP44

## Base

### Cable compartment

These are generally provided, and are always arc-fault resistant. They are separated from one panel to the next by sheet steel intermediate walls. Inspections or work can be carried out in this way although the cable connection zone of the neighbouring panel is live. The front covers are interlocked against the corresponding earthing switch. Optional surge arrester and deep front covers for different connector suppliers. If required, an anti-reverse interlock can also be made available. This prevents the corresponding load break switch from being switched onto a live busbar when the termination zone is open (front cover removed). The mechanism can be operated only with the front cover in place and the latch closed. The earthing switch at the cable outgoing is not incorporated in this interlock and is switchable even when the terminal zone is open (necessary for cable testing).

Deeper front covers are available to allow for double cable connection systems. Vacuum circuit breakers can be equipped up to 4 cables per phase (A2 Version).

### Cable fixing irons

The cable fixing irons consist of galvanised folded sheet-metal parts. They are adjustable in height and in depth thanks to a special screw construction, so that all common terminations used for the switchgear and the cables can be fixed without using further cable clamps.

### Cable compartment

Features:

- Up to two connectors per phase.
- Optional surge arrester and deep front covers for different types of connectors
- Effortless connections (screw-in)
- Suitable bushing height for 3-core / big size cables
- Outer-cone bushing plug-in type terminal
- Expansion of gases in case of Internal Arc to the cable trench
- Optional: Chimney for additional safety for people and buildings

### Cable clamps

#### Size I

Clamping area 26 to 38 mm for cables, e.g.

- 12 kV: 35 mm<sup>2</sup> – 240 mm<sup>2</sup>
- 24 kV: 25 mm<sup>2</sup> – 185 mm<sup>2</sup>

#### Size II

Clamping area 36 to 52 mm for cables, e.g.

- 12 kV: > 300 mm<sup>2</sup>
- 24 kV: > 240 mm<sup>2</sup>

The precise cable diameter should be matched to the clamping area.

## Control box

The control box, placed in the upper part of the cubicle and independent of the MV compartments, is defined for installing protection relays, as well as metering and control devices.

Features:

- Independent compartment from MV area
- Ready for installing protection relays, control and metering equipment
- Factory assembled and tested according to customer needs
- Standard and compact design for installing **Ormazabal's** protection relays and automation units
- High adaptation capabilities for other manufacturers' protection relays, control and metering units as well as customers' provided equipment
- Customized size and design

Attachable control boxes can be supplied optionally, for the location of signalling elements and the activation of motorised functions.



## Protection & Automation

All commercially available protection relays can be installed on the circuit breaker panels of both **ga** and **gae630** system switchgear.

The variants cover basic transformer protection relays to more sophisticated combined protection and control systems, as well as typical relays needing external power to self-supplied protection relays.

For transformer operated protection relays, low energy trips 0.5 and 0.1 Ws are available. In this context special relay- transformer combinations are tested.

Common protocols and interfaces such as, Profibus DP, Modbus, IEC 60870-5-103, IEC 60870-5-104, IEC 60870-5-101 and IEC 61850 can be provided with the corresponding relays. Installation in normally on control box of the related switchgear. Optionally the protection relays can also be installed on the corresponding cover.

If data is provided, it is also possible to configure the parameters for the protection relays in accordance with customer's requirements

For protection applications, encapsulated low-voltage toroidal core current transformers (CTs) according to IEC60044-1 are installed around the extended cone bushings. In some cases, it is possible to mount these ring CTs in the cable compartment or in the cable trench.

Depends on technical characteristics and customers' requests, **ga** and **gae630** type switchgear can be equipped with protection relays of market approved international and local brands. To maintain the quality of the service, all these integration shall be made in our factory following to 100% routine tests before dispatch.



### ekorsys family

**Ormazabal** supplies complete Medium Voltage installations that include protection, control and automation functions.

**Ormazabal**, has a wide portfolio of applications and services to respond to the needs of the distribution network.

#### Protection

- Supply to Medium Voltage customers
  - **ekor.rpg**  
3 x 50 / 51 + 50N / 51N + 50Ns / 51Ns
- Protection of switching substations and industrial customers
  - **ekor.rps**  
3 x 50 / 51 + 50N / 51N + 50Ns / 51Ns+67+49+81+27+59N...+ control
  - **ekor.rpgci**  
3 x 50 / 51 + 50N / 51N + 50Ns / 51Ns + integrated control
- Generator set protection unit
  - **ekor.upg**
- Substation protection
  - **ekor.rps-tcp:**  
3 x 50 / 51 + 50N / 51N + 50Ns / 51Ns +67+49+81+27+59N+50BF... + control

#### Automation and remote control

- Remote control
  - **ekor.uct, ekor.ccp, ekor.rci**
- Automatic transfer
  - **ekor.stp, ekor.ccp, ekor.rtk**
- Fault detection
  - **ekor.rci**

#### Advanced Meter Management and communication

- **ekor.gid**

#### Dispatching centre

#### Software

- **ekor.soft**

➔ For further information, please refer to **Ormazabal** or visit [www.ormazabal.com](http://www.ormazabal.com)

## Smart Grids

The aim of the intelligent networks or Smart Grids leads to generate and share electrical energy in a more efficient, reliable, cleaner and safer way.

In the value chain of the Smart Grids it converges and coexists the sectors of the electrical energy, telecommunications and information and communications technology.

**Ormazabal** collaborates in innovative projects and provides solutions and products focused on improving the energy distribution efficiency in a continuous changing environment as driver and dynamic factor for Smart Grids.

Smart Grids are considered to be an optimized version of the electricity grid capable of providing the transition to a safer, more reliable, efficient and sustainable energy system.

**Ormazabal** provides high efficient solutions to the smartization of current urban electric networks. From the accommodation all **generation** and **storage** options, up to enabling the **integration** of greater quantity of **renewable sources** and a growing number of **electric vehicles**, **managing** the intermittent nature of their **patterns**, and **minimizing** the **environmental impact** of building up additional grid capacity.

Our milestones:

Our technology allows the **integration** of new users in the network.

- Our innovative solutions **drive the efficiency** of the network operation
- Our experienced products **reinforce the safety** of the grid, the control and quality of supply
- We focus on **optimizing the plan of investments** for the electrical network improvement
- We work for the **improvement of the market working** and the customer service
- Our objective is the **promotion of the consumer participation** in the energy management

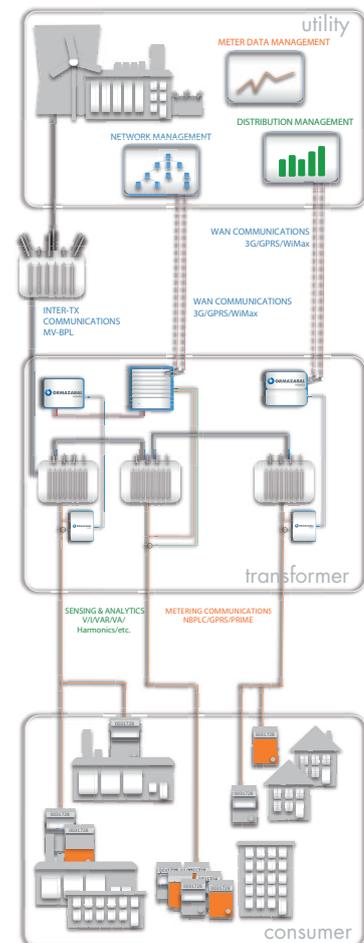
### References

- Iberdrola Star project. Spain (Castellón, Bilbao...)
- Endesa project. Spain (Malaga)
- Gas Natural Fenosa project. Spain (Madrid)
- RedNA project (E.ON, Spain): Smart faults location
- GRID4EU project: advanced Smart Grid solutions for Europe
- Sinerdis project (EDF, France)



## Advance metering & Sensing

**Ormazabal** communication, sensing and advanced metering solutions give utilities the tools that they need to enhance their distribution grid through increased connectivity and analytics. By combining hardware designed to support two-way communications connectivity with powerful software that analyses data from the distribution grid.



# Type of modules

## k type ga and gae630

### Load break switch (LBS) cubicle(s)

Modular and extensible feeder cubicle(s), equipped with a three-position switch-disconnector (close, open, earth)

Electrical characteristics			IEC			
Rated voltage	$U_r$	[kV]	7.2	12	17.5	24
Rated frequency	$f_r$	[Hz]	50 / 60			
<b>Rated current</b>						
General busbar and cubicle interconnection	$I_r$	[A]	630			
Feeder	$I_r$	[A]	630			
<b>Rated short-duration power frequency withstand voltage (1 min)</b>						
Phase-to-earth and between phases	$U_d$	[kV]	20	28	38	50
Across isolating distance	$U_d$	[kV]	23	32	45	60
<b>Rated lightning impulse withstand voltage</b>						
Phase-to-earth and between phases	$U_p$	[kV]	60	75	95	125
Across isolating distance	$U_p$	[kV]	70	85	110	145
Internal arc classification	IAC		IAC AFL 20 kA 1 s			
<b>Switch-disconnector</b>			<b>IEC 62271-103</b>			
<b>Rated short-time withstand current</b>						
Value $t_k=1$ s	$I_k$	[kA]	20 <sup>(1)</sup>			
Peak value	$I_p$	[kA]	50 <sup>(1)</sup>			
Mainly active load-breaking current	$I_1$	[A]	630			
Cable charging-breaking current	$I_{4a}$	[A]	50			
Closed-loop breaking current	$I_{2a}$	[A]	630			
Earth fault breaking current	$I_{6a}$	[A]	160			
Cable- & line-charging breaking current under earth fault conditions	$I_{6b}$	[A]	100			
Main switch making capacity (peak value)	$I_{ma}$	[kA]	50			
<b>Switch category</b>						
Mechanical endurance			1000x (M1)			
Cycles of operations (Short-circuit making current)- class			E3			
<b>Earthing Switch</b>			<b>IEC 62271-102</b>			
<b>Rated short-time withstand current (earthing circuit)</b>						
Value $t_k=1$ s	$I_k$	[kA]	20			
Peak value	$I_p$	[kA]	50			
Earthing switch making capacity (peak value)	$I_{ma}$	[kA]	50			
<b>Earthing Switch Category</b>						
Mechanical endurance (manual)			1000x			
Cycles of operations (Short-circuit making current)- class			E2			

<sup>(1)</sup> 1 s and 3 s

## Applications

Incoming and outgoing feeder panel to connect MV cables to ring networks.

## Configuration

### Cubicle

- Internal arc IAC AFL
  - 20 kA 1 s
- 400 mm height cubicle

### Gas tank

- Stainless steel tank

### Gas pressure indicator:

- Manometer
- Pressure switch with aux. contacts

### Cable bushings:

- Diagonal / horizontal
- Capacitive voltage tap
- Capacitive voltage indicator with cont. 3 ph. permanent indication

## Driving mechanism

- Actuating levers
- Aux. contact modules for LBS max 4 NO / 4 NC for ES max 3 NO / 3 NC
- Lockable driving mechanisms
- k-type manual mechanisms
- k Motor type motorized mechanism
- Short circuit (s/c) indicator
- Earth fault (e/f) indicator
- Combined s/c and e/f indicator

### Additional interlocks:

- Standard IEC interlocks
- Anti-reverse interlock
- Electrical interlocks
- Key interlocks

### Cable compartment

- Screw-type IEC bushings
- Open bottom
- Cable clamps
- Cover for one standard / two reduced cable connector(s)
- Deep front cover
- Extra deep front cover

### Pressure relief duct

- In the cable cellar, open panel bottom
- Arc fault proof cable compartment
- Additional base (h: 400 mm) with pressure absorber channel
- Rear absorber channel for installation on closed floor

### Control box

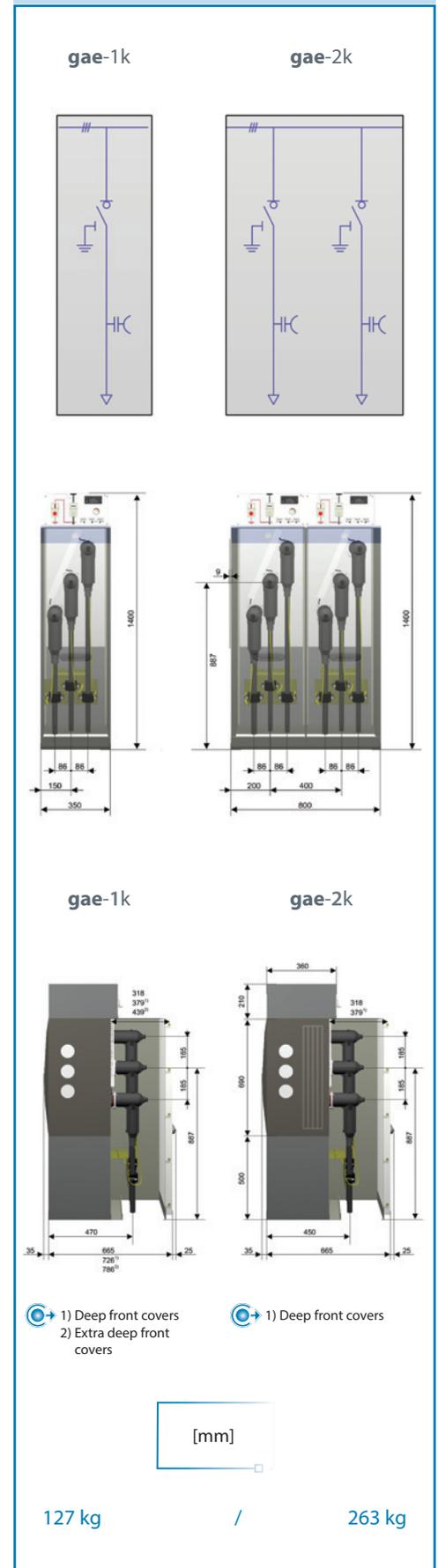
- Without control box
- 300 mm height
- 600 mm height
- 900 mm height

## Options

1kb / 2kb: Horizontal bushings

- Standard equipment
- Optional equipment

## Dimensions



## ts-type ga and gae630

### Transformer protection cubicle(s) with fuse load break switch

Modular and extensible fuse protection cubicle(s), equipped with a three-position switch-disconnector (close, open, earth) in series with HRC type limiting fuses.

Electrical characteristics		IEC			
Rated voltage	$U_r$ [kV]	7.2	12	17.5	24
Rated frequency	$f_r$ [Hz]	50 / 60			
<b>Rated current</b>					
General busbar and cubicle interconnection	$I_r$ [A]	630			
Output to transformer	[A]	200			
<b>Rated short-duration power frequency withstand voltage (1 min)</b>					
Phase-to-earth and between phases	$U_d$ [kV]	20	28	38	50
Across isolating distance	$U_d$ [kV]	23	32	45	60
<b>Rated lightning impulse withstand voltage</b>					
Phase-to-earth and between phases	$U_p$ [kV]	60	75	95	125
Across isolating distance	$U_p$ [kV]	70	85	110	145
Internal arc classification	IAC	IAC AFL 20 kA			
<b>Switch-disconnector</b>		<b>IEC 62271-105</b>			
<b>Rated short-time withstand current (main circuit)</b>					
Value $t_s=1$ s <sup>(1)</sup>	$I_k$ [kA]	20			
Peak value <sup>(1)</sup>	$I_p$ [kA]	50			
Mainly active load-breaking current	$I_l$ [A]	200			
Rated transfer current	$I_t$ [kA]	1900		1500	
<b>Switch category</b>					
Mechanical endurance		1000-M1			
Cycles of operations (Short-circuit making current)- class		E3			
<b>First Earthing switch<sup>(2)</sup></b>		<b>IEC 62271-102</b>			
<b>Rated short-time withstand current (earthing circuit)</b>					
Value $t_s=1$ s	$I_k$ [kA]	20			
Peak value	$I_p$ [kA]	50			
Earthing switch making capacity (peak value)	$I_{ma}$ [kA]	50			
<b>Earthing Switch Category</b>					
Mechanical endurance (manual)		1000x			
Cycles of operations (Short-circuit making current)- class		E2			

<sup>(1)</sup> Values limited by the fuse    <sup>(2)</sup> Please consult for the technical values of the 2nd earthing switch

## Applications

The fuse protection cubicle for protecting distribution transformers and auxiliary service transformers

## Configuration

### Cubicle

- Internal arc IAC AFL
  - 20 kA 1 s
- 1400 mm height cubicle

### Gas tank

- Stainless steel tank

### Gas pressure indicator:

- Manometer
- Pressure switch with aux. contacts

### Cable bushings:

- Horizontal
- Capacitive voltage tap after fuses
- Capacitive voltage tap before fuses
- Capacitive voltage indicator with cont. 3 ph. permanent indication

### Side connection:

- Two side extensibility

## Driving mechanism

- Actuating levers
- ts-type manual mechanism
- Aux. switch for LBS: max. 4 NO / 4 NC
- Aux. switch for ES: max. 3 NO / 3 NC
- Shunt trip release (AC / DC)
- ts Motor-type motorised mechanism
- Lockable mechanisms

### Additional interlocks:

- Standard IEC interlocks
- Anti-reverse interlock
- Electrical interlocks
- Key interlocks

### Cable compartment

- 3 pole vertical fuse base enclosure
- 3 ph. sliding surface sealing end
- TR cable (up to max. 240 mm<sup>2</sup> Cu / 185 mm<sup>2</sup> Al)
- Open bottom
- Cable clamps

### Pressure relief duct

- In the cable cellar, open panel bottom
- Arc fault proof cable compartment
- Rear absorber channel for installation on closed floor (Total panel depth: 1150 mm)

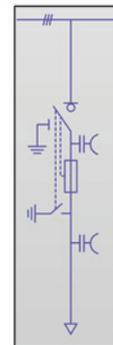
### Control box

- Without control box
- 300 mm height
- 600 mm height
- 900 mm height

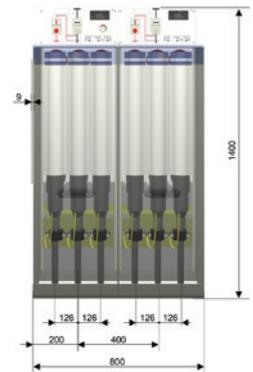
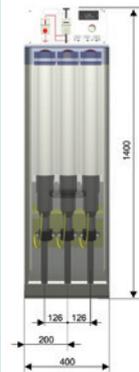
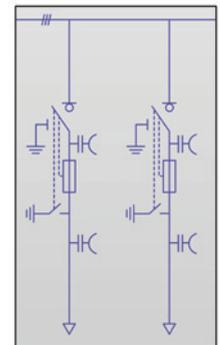
- Standard equipment
- Optional equipment

## Dimensions

gae-1ts



gae-2ts



[mm]

150 kg

/

310 kg

## Isf-type gae630

### SF<sub>6</sub> circuit breaker cubicle and bus sectionaliser cubicle SF<sub>6</sub> circuit breaker

Modular and extensible CB protection cubicle, equipped with a three-position rotating-arc-type CB (close, open, earth)

Electrical characteristics			IEC			
Rated voltage	U <sub>r</sub>	[kV]	7.2	12	17.5	24
Rated frequency	f <sub>r</sub>	[Hz]	50 / 60			
<b>Rated current</b>						
General busbar and cubicle interconnection	I <sub>r</sub>	[A]	630			
Feeder	I <sub>r</sub>	[A]	250 - 630			
<b>Rated short-duration power frequency withstand voltage (1 min)</b>						
Phase-to-earth and between phases	U <sub>d</sub>	[kV]	20	28	38	50
Across isolating distance	U <sub>d</sub>	[kV]	23	32	45	60
<b>Rated lightning impulse withstand voltage</b>						
Phase-to-earth and between phases	U <sub>p</sub>	[kV]	60	75	95	125
Across isolating distance	U <sub>p</sub>	[kV]	70	85	110	145
Internal arc classification	IAC		IAC AFL 20 kA 1 s <sup>(1)</sup>			
<b>Circuit-breaker</b>			<b>IEC 62271-100</b>			
<b>Rated short-time withstand current (main circuit)</b>						
Value t <sub>α</sub> = 1 s	I <sub>k</sub>	[kA]	20 <sup>(1)</sup>		16 <sup>(1)</sup>	
Peak value	I <sub>p</sub>	[kA]	50 <sup>(1)</sup>		40 <sup>(1)</sup>	
<b>Rated breaking capacity and making capacity</b>						
Mainly active current rated breaking capacity	I <sub>i</sub>	[A]	630			
Short-circuit breaking capacity	I <sub>sc</sub>	[kA]	20		16	
Main switch making capacity (peak value)	I <sub>ma</sub>	[kA]	50		40	
Rated cable-charging breaking current	I <sub>c</sub>	[A]	50			
<b>Rated operating sequence</b>						
Without reclosing			O - 3 min - CO - 3 min - CO			
<b>Circuit-breaker category</b>						
Mechanical endurance (operations-class)			2000x M1			
Electrical endurance (class)			E2			
<b>Earthing Switch</b>			<b>IEC 62271-102</b>			
<b>Rated short-time withstand current (earthing circuit)</b>						
Value t <sub>α</sub> = 1 s	I <sub>k</sub>	[kA]	20		16	
Peak value	I <sub>p</sub>	[kA]	50		40	
Main switch making capacity (peak value)	I <sub>ma</sub>	[kA]	50		40	
<b>Earthing Switch Category</b>						
Mechanical endurance			1000x			
Cycles of operations (Short-circuit making current)- class			E2			

<sup>(1)</sup> 1 s and 3 s

## Applications

General and transformer protection as well as connection or disconnection operations for feeder cables.

## Configuration

### Cubicle

- Internal arc IAC AFL 20 kA 1 s
- 1400 mm height cubicle

### Gas tank

- Stainless steel tank

### Gas pressure indicator:

- Manometer
- Pressure switch with aux. contacts

### Side connection:

- Two side extensibility

## Driving mechanism

- Actuating levers
- Isf-type manual mechanism
- Aux. switch for CB: max. 4 NO / 4 NC
- Aux. switch for ES: max. 3 NO / 3 NC
- Shunt trip release (AC / DC)
- Emergency manual "OFF" switch, push on type
- Isf Motor-type motorised mechanism
- Lockable mechanisms
- Capacitive voltage indicator with cont. 3 ph. permanent indication
- Transformer trip release 0.1Ws
- Undervoltage release (non delayed)

### Additional interlocks:

- Standard IEC interlocks
- Anti-reverse interlock
- Key interlocks
- Pad locks

### Cable compartment

- Screw-type IEC bushings
- Aux. current transformer (CT)
- 3 ph. toroidal core type current transformer, (optionally calibrated) installed around DIN bushings
- Open bottom
- Cable clamps
- Cover for one standard / two reduced cable connector(s)
- Deep front cover

### Pressure relief duct

- In the cable cellar, open panel bottom
- Arc fault proof cable compartment
- Rear absorber channel for installation on closed floor (Total panel depth: 1119 mm)

### Control box

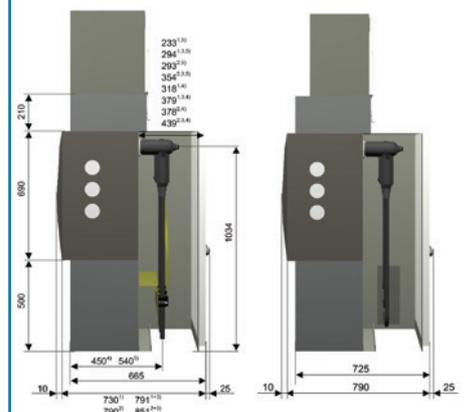
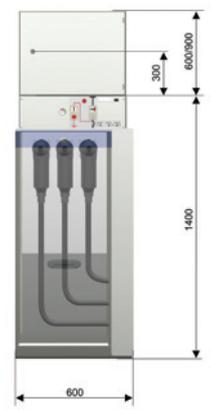
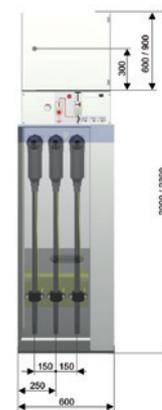
- Protection relay (acc. to agreement/client's spec.)
- Without control box
- 600 mm height
- 900 mm height
- Assembly of control box acc. to agreement/client's spec.

- Standard equipment
- Optional equipment

## Dimensions

**gae-1lsf**

**gae-1lsfg**



- 1) Standard connection compartment
- 2) Deep connection compartment
- 3) Deep front cover
- 4) Short bushings
- 5) Long bushings

[mm]

225 kg

/

255 kg

## lsv-type gae630

### Vacuum circuit breaker (VCB) cubicle and bus sectionaliser cubicle with vacuum breaker

Modular and extensible CB protection cubicle, equipped with a 3-phase vacuum circuit breaker (VCB) in series with a three-position disconnecter and earthing switch (close, open, earth)

Electrical characteristics			IEC			
Rated voltage	$U_r$	[kV]	7.2	12	17.5	24
Rated frequency	$f_r$	[Hz]	50 / 60			
<b>Rated current</b>						
General busbar and cubicle interconnection	$I_r$	[A]	630			
Feeder	$I_r$	[A]	630			
<b>Rated short-duration power frequency withstand voltage</b>						
Phase-to-earth and between phases	$U_d$	[kV]	20	28	38	50
Across isolating distance	$U_d$	[kV]	23	32	45	60
<b>Rated lightning impulse withstand voltage</b>						
Phase-to-earth and between phases	$U_p$	[kV]	60	75	95	125
Across isolating distance	$U_p$	[kV]	70	85	110	145
Internal arc classification	IAC		IAC AFL 20 KA1 s			
<b>Circuit-breaker</b>			<b>IEC 62271-100</b>			
<b>Rated short-time withstand current (main circuit)</b>						
Value $t_k=1$ s	$I_k$	[kA]	20 <sup>(1)</sup>			
Peak value	$I_p$	[kA]	50 <sup>(1)</sup>			
<b>Rated breaking capacity and making capacity</b>						
Mainly active current rated breaking capacity	$I_b$	[A]	630			
Short-circuit breaking capacity	$I_{sc}$	[kA]	20 <sup>(1)</sup>			
Main switch making capacity (peak value)	$I_{ma}$	[kA]	50 <sup>(1)</sup>			
<b>Rated cable-charging breaking current</b>		[A]	50			
<b>Rated operating sequence</b>						
Without reclosing			O - 0.3 s - CO - 15 s - CO			
With reclosing			O - 3 min - CO - 15 s - CO			
<b>Circuit-breaker category</b>						
Mechanical endurance (operations-class)			10 000x			
Electrical endurance (class)			E2			
<b>Switch-disconnector</b>			<b>IEC 62271-102</b>			
<b>Rated short-time withstand current (main circuit)</b>						
Value $t_k=1$ s	$I_k$	[kA]	20 <sup>(1)</sup>			
Peak value	$I_p$	[kA]	50 <sup>(1)</sup>			
<b>Switch-disconnector Category</b>						
Mechanical endurance			10 000			
<b>Earthing Switch</b>			<b>IEC 62271-102</b>			
<b>Rated short-time withstand current (earthing circuit)</b>						
Value $t_k=1$ s	$I_k$	[kA]	20			
Peak value	$I_p$	[kA]	50			
<b>Main switch making capacity (peak value)</b>		$I_{ma}$	50			
<b>Earthing Switch Category</b>						
Mechanical endurance			1000x			
Cycles of operations (Short-circuit making current)- class			E2			

<sup>(1)</sup> 1 s and 3 s

## Applications

General and transformer protection as well as connection or disconnection operations for feeder cables.

## Configuration

### Cubicle

- Internal arc IAC AFL
  - 20 kA 1 s
- 1400 mm height cubicle

### Gas tank

- Stainless steel tank

### Gas pressure indicator:

- Manometer
- Pressure switch with aux. contacts

### Side connection:

- Two side extensibility

## Driving mechanism

- Actuating spring charging lever
- lsv-type manual mechanism
- Aux. switch for CB: max. 10 NO/ 10 NC
- Aux. switch for DS: max. 3 NO/ 3 NC
- Aux. switch for ES: max. 3 NO/ 3 NC
- lsv Motor-type motorised mechanism with anti pumping relay
- Under voltage release (non delayed)
- Fleeting contact for breaker tripping signal
- Lockable mechanisms
- Motor drive for disconnector
- Motor drive for earthing switch
- Trip element ON (standard)
- 2. Trip element OFF
- 3. Trip element OFF
- Transformer operated trip 0.5 or 0.1 Ws
- Signalling switch "mech. ON-push-button activated"

### Additional interlocks:

- Anti-reverse interlock
- Electrical closing lock-out
- Pad locks

### Cable compartment

- Screw-type IEC bushings
- Cable clamps
- 3 ph. toroidal core type current transformer, (optionally calibrated) installed around DIN bushings
- Aux. current transformer (CT)
- Arc-fault resistant cable compartment
- Capacitive voltage indicator with cont. 3 ph. permanent indication

### Pressure relief duct

- Rear absorber channel for installation on closed floor (Total panel depth: 1150 mm)

### Control box

- Other voltage indicators
- Other metering and automation components
- 600 mm height
- 900 mm height
- Protection relay acc. to agreement
- Assembly of control box acc. to agreement/client's spec

## Options

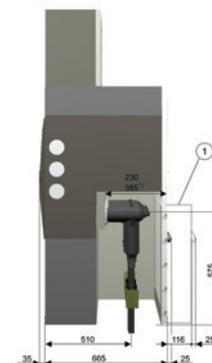
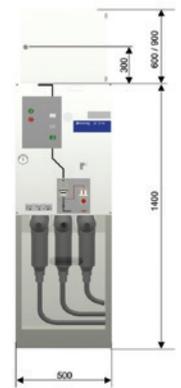
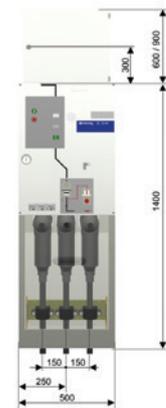
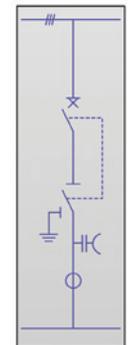
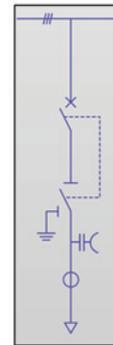
- A lighting arrester instead of a connecting plug

- Standard equipment
- Optional equipment

## Dimensions

gae-1lsv

gae-1lsvg



1) Deep front cover  
Possible for multipart connection according to the type of plug-in connection required

[mm]

330 kg

/

330 kg

## 1a1-1h1-1h2-1e types gae630

### 1a1 Cable connection cubicle

Three pole busbars inside gas tank without switch.

### 1h1 Bus riser cubicle

Bus riser for Isfg and 1kg cubicles.

Three pole busbars inside gas tank without switch.

### 1h2 Busbar rise cubicle

Bus riser for lsvg cubicles.

Three pole busbars without switch.

### 1e Busbar earthing cubicle

Three pole earthing switch for busbar earthing.

## Applications

Cable rising panel for direct cable connections in rigid ring network without any interruption.

Busbar rising panel for bus sectionalising and bus coupling functions in substations.

Busbar earthing panel for earthing connection to busbar during testing and maintenance.

## Configuration

### Cubicle

- Internal arc IAC AFL
  - 20 kA 1 s
- 1400 mm height cubicle

### Gas tank

- Stainless steel tank

### Gas pressure indicator:

- Manometer
- Pressure switch with aux. contacts

### Cable bushings:

- Horizontal
- Diagonal
- Capacitive voltage indicator with cont. 3 ph. permanent indication

### Side connection:

- Two side extensibility
- One side extensibility

Electrical characteristics			IEC			
Rated voltage	$U_r$	[kV]	7.2	12	17.5	24
Rated frequency	$f_r$	[Hz]	50 / 60		50 / 60	
<b>Rated current</b>						
General busbar and cubicle interconnection	$I_r$	[A]	630			
Feeder	$I_r$	[A]	630			
<b>Rated short-duration power frequency withstand voltage (1 min)</b>						
Phase-to-earth and between phases	$U_d$	[kV]	20	28	38	50
<b>Rated lightning impulse withstand voltage</b>						
Phase-to-earth and between phases	$U_p$	[kV]	60	75	95	125
Internal arc classification	IAC		AFL 20 kA 1 s			
<b>Earthing Switch [Optional]</b>			<b>IEC 62271-102</b>			
<b>Rated short-time withstand current (main circuit)</b>						
Value $t_s=1$ s	$I_k$	[kA]	20			
Peak value	$I_p$	[kA]	50			
Earthing switch making capacity (peak value)	$I_{ma}$	[kA]	50			
<b>Earthing Switch Category</b>						
Mechanical endurance			1000x			
Cycles of operations (Short-circuit making current)- class			E2			

## Dimensions

### Driving mechanism

- Actuating levers
- k-type manual mechanism
- Aux. switch for ES:  
max. 3 NO / 3 NC
- Lockable mechanisms
- Capacitive voltage indicator with  
cont. 3 ph. permanent indication

### Additional interlocks:

- Standard IEC interlocks
- Anti-reverse interlock
- Electromagnetic interlocks
- Key interlocks

### Cable compartment

- Screw-type DIN bushings
- Open bottom
- Cable clamps
- Cover for one standard /  
two reduced cable connector(s)

### Pressure relief duct

- In the cable cellar, open panel  
bottom
- Arc fault proof cable  
compartment
- Rear absorber channel for  
installation on closed floor  
(Total panel depth: 1150 mm)
- Intermediate frame B= 50 mm  
for bus sectionaliser panel

### Control box

- Without control box
- 600 mm height
- 900 mm height

### Protection relay acc. to agreement

- Assembly of control box acc.  
to agreement/client's spec



## m-type gae630

### Metering cubicle

Air insulated modular metering cubicle, equipped with current and / or voltage transformers.

Electrical characteristics			IEC			
Rated voltage	$U_r$	[kV]	7.2	12	17.5	24
Rated frequency	$f_r$	[Hz]	50 / 60			
<b>Rated current</b>						
General busbar and cubicle interconnection	$I_r$	[A]	630			
<b>Rated short-duration power frequency withstand voltage (1 min)</b>						
Phase-to-earth and between phases	$U_d$	[kV]	20	28	38	50
<b>Rated lightning impulse withstand voltage</b>						
Phase-to-earth and between phases	$U_p$	[kV]	60	75	95	125
Internal arc classification	IAC		IAC AFL 20 kA 1 s			
Rated short-time withstand current Value $t_k=3$ s	$I_r$	[kA]	20 <sup>(1)</sup>			

<sup>(1)</sup> 1 s and 3 s

### Applications

Voltage and current metering transformer housing, enabling communication with the main busbar of the transformer substation, via busbars or dry cables.

## Configuration

### Cubicle

- IAC AFL 20 kA 1 s
- Rear absorber channel for installation on closed floor (Total panel depth: 1150 mm)
- Lockable front covers, utility lock mechanism
- Heater
- Narrow band support CT or VT in acc. with DIN EN 42600 Part 8 or 9, IEC 60044.1 or .2
- Front covers with / without hinges
  - Right  Left
- Fixed ball point for earthing connection and short circuiting device behind and in front of CTs
  - D= 20 mm M 12
  - D= 25 mm M 16

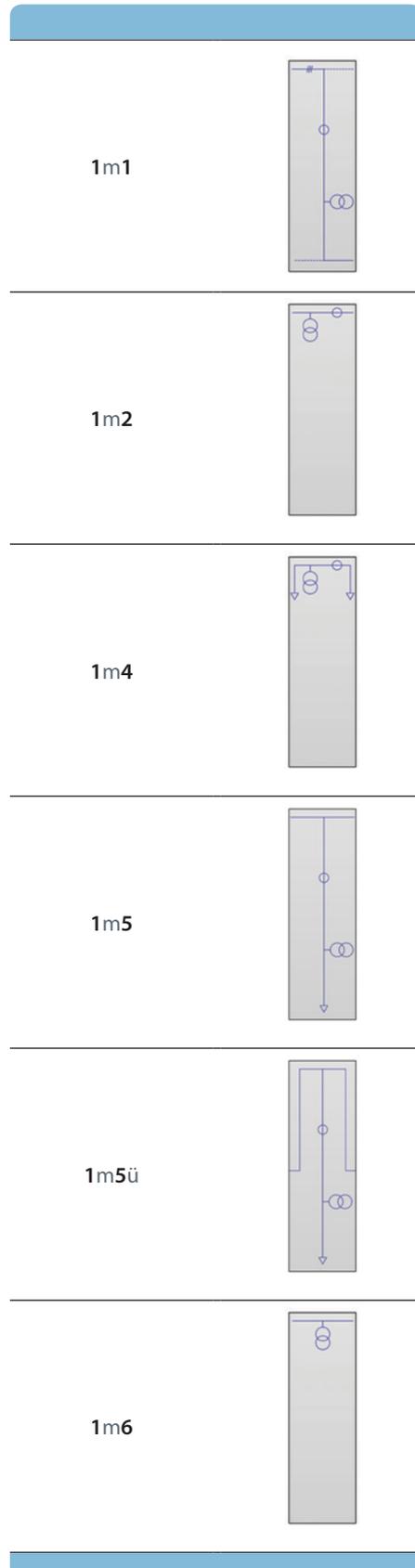
### Metering transformers

- Installed CTs Ratings:  
Quantity:
- Installed VTs Ratings:  
Quantity:
- Other components:
- kWhm:

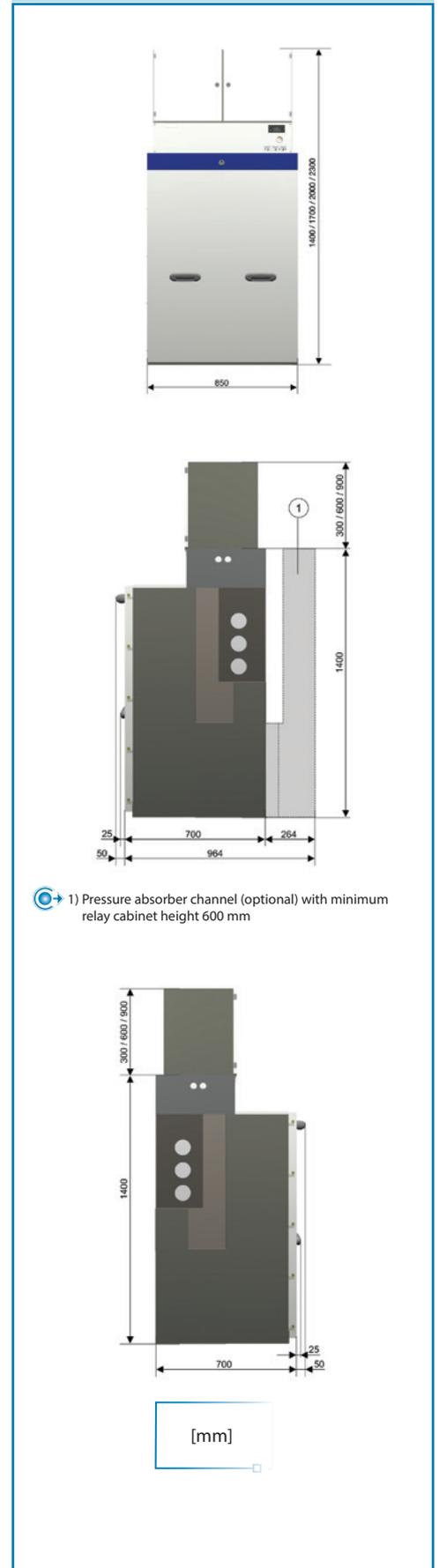
### Control box

- Other metering and automation components
- 210 mm height
- 300 mm height
- 600 mm height
- 900 mm height
- Assembly of control box acc. to agreement/client's spec

## Options



## Dimensions



- Standard equipment
- Optional equipment

## 1ts1a - 1k1ts-b type ga

### Fuse switch and cable connection compact cubicle and Load break switch and fuse switch compact cubicle

Compact panel with one cable feeder function with a three-position switch disconnecter and one fuse protection function with a three-position switch disconnecter and HRC fuses, housed in a single gas tank.

Compact cubicle with one fuse protection function with a three-position switch disconnecter and HRC fuses, and one cable connection function with earthing switch housed in a single gas tank.

Electrical characteristics			1k and 1a		1ts	
Rated voltage*	$U_r$	[kV]	12	24	12	24
Rated frequency	$f_r$	[Hz]	50 / 60			
<b>Rated current</b>						
General busbar and cubicle interconnection	$I_r$	[A]	630			
Feeder	$I_r$	[A]	630			-
Output to transformer	$I_r$	[A]	-			200
<b>Rated short-duration power frequency withstand voltage (1 min)</b>						
Phase-to-earth and between phases	$U_d$	[kV]	28	50	28	50
Across isolating distance	$U_d$	[kV]	32	60	32	60
<b>Rated lightning impulse withstand voltage</b>						
Phase-to-earth and between phases	$U_p$	[kV]	75	125	75	125
Across isolating distance	$U_p$	[kV]	85	145	85	145
Internal arc classification	IAC		IAC AFL 20 kA 1 s			
<b>Switch-disconnector (for k and ts)</b>			IEC 62271-103		IEC 62271-105	
<b>Rated short-time withstand current (main circuit)</b>						
Value $t_k=1$ s	$I_k$	[kA]	20 <sup>(1)</sup>			
Value $t_k=3$ s	$I_k$	[kA]	50 <sup>(1)</sup>			
Mainly active current rated breaking capacity	$I_b$	[A]	630			200
Rated transfer current	$I_t$	[kA]	-		1900	1500
Cable charging-breaking current	$I_{4a}$	[A]	50			-
Closed-loop breaking current	$I_{2a}$	[A]	630			-
Earth fault breaking current	$I_{6a}$	[A]	160			-
Cable- & line-charging breaking current under earth fault conditions	$I_{6b}$	[A]	100			-
Main switch making capacity (peak value)	$I_{ma}$	[kA]	50 <sup>(1)</sup>			-
<b>Switch category</b>						
Mechanical endurance			1000x (M1)			
Cycles of operations (Short-circuit making current)- class			E3			
<b>Earthing Switch (for k, ts and a)</b>			IEC 62271-102			
<b>Rated short-time withstand current (earthing circuit)</b>						
Value $t_k=1$ s	$I_k$	[kA]	20			
Value $t_k=3$ s	$I_k$	[kA]	50			
Earthing switch making capacity (peak value)	$I_{ma}$	[kA]	50			
<b>Earthing Switch Category</b>						
Mechanical endurance (manual)			1000x			
Cycles of operations (Short-circuit making current)- class			E2			

\* Also available 7.2 and 17.5 kV on request <sup>(1)</sup> 1 s and 3 s

## Applications

Input and output of the MV cables and transformer protection at the end of the line and radial cable distribution applications.

## Configuration

### Cubicle

- Internal arc IAC AFL
  - 20 kA 1s
- 1400 mm height cubicle
- 1050 mm height cubicle

### Gas tank

- Stainless steel tank

### Gas pressure indicator:

- Manometer
- Pressure switch with aux. contacts
- Density monitor with aux. contacts

### Cable bushings:

- Horizontal
- Capacitive voltage tap
- Capacitive voltage tap after fuses
- Capacitive voltage tap before fuses

### Driving mechanism

- Actuating levers
- k-type manual mechanism
- ts-type manual mechanism
- Aux. switch for LBS: max. 3 NO/ 3 NC
- Aux. switch for ES: max. 2 NO/ 2 NC
- Shunt trip release ( AC / DC )
- Aux. switch for trip indication
- k-Motor type motorised mechanism
- ts-Motor type motorised mechanism
- Lockable mechanisms
- Capacitive voltage indicator with cont. 3 ph. permanent indication

### Additional interlocks:

- Standard IEC interlocks
- Anti-reverse interlock
- Electrical interlocks
- Key interlocks
- Pad locks

- Standard equipment
- Optional equipment

### Cable compartment

- 3 pole vertical fuse base enclosure
- Fuse adapters for 292 mm long fuses
- 3 ph. sliding surface sealing end for
- TR cable (up to max. 240 mm<sup>2</sup> Cu / 185 mm<sup>2</sup> Al)
- Screw-type DIN bushings for cable connections
- Open bottom
- Vermin-proof option
- Cable clamps
- Cover for one standard / two reduced cable connector(s)

### Pressure relief duct

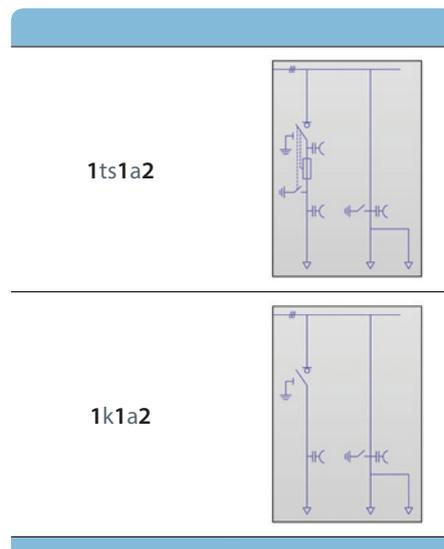
- In the cable cellar, open panel bottom
- Arc fault proof cable compartment
- Additional base (h: 400 mm) with pressure absorber channel
- Rear absorber channel for installation on closed floor (Total panel depth: 1119 mm)

### Control box

- Without control box
- 300 mm height
- 600 mm height
- 900 mm height

### Options

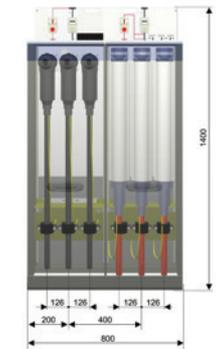
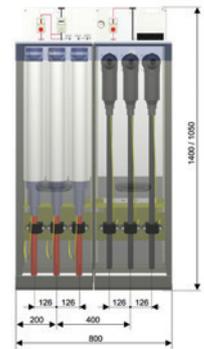
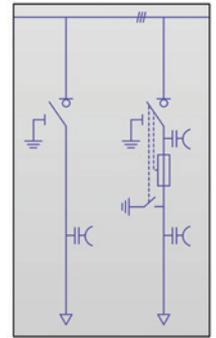
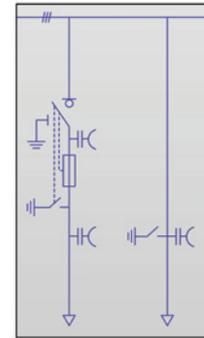
One transformer feeder panel and one cable connection panel with two sets of connection bushings



## Dimensions

**ga-1ts1a1**

**ga-1k1ts-b**



➡ 1) Deep front cover in a1 cubicle

➡ 1) Deep front cover in k1 cubicle

[mm]

236 kg

/

236 kg

## 2k1ts-type ga and gae630

### Ring Main Unit (RMU) with fuse protection

Compact three-position RMU coming in non-extensible (**ga**) and extensible (**gae**) versions, equipped with two cable feeder with a three-position switch-disconnector and a transformer protection feeder with a three-position switch-disconnector in series with 3 nos. HRC-type limiting fuses.

Electrical characteristics			2k		1ts	
Rated voltage*	$U_r$	[kV]	12	24	12	24
Rated frequency	$f_r$	[Hz]	50 / 60			
<b>Rated current</b>						
General busbar and cubicle interconnection	$I_r$	[A]	630			
Feeder	$I_r$	[A]	630			-
Output to transformer	$I_r$	[A]	-			200
<b>Rated short-duration power frequency withstand voltage (1 min)</b>						
Phase-to-earth and between phases	$U_d$	[kV]	28	50	38	50
Across isolating distance	$U_d$	[kV]	32	60	32	60
<b>Rated lightning impulse withstand voltage</b>						
Phase-to-earth and between phases	$U_p$	[kV]	75	125	75	125
Across isolating distance	$U_p$	[kV]	85	145	85	145
Internal arc classification	IAC		IAC AFL 20 kA 1 s			
<b>Switch-disconnector (for k and ts)</b>			<b>IEC 62271-103</b>			
<b>Rated short-time withstand current (main circuit)</b>						
Value $t_{\Sigma} = 1$ s	$I_k$	[kA]	20 <sup>(1)</sup>			
Peak value	$I_p$	[kA]	50 <sup>(1)</sup>			
Mainly active load-breaking current	$I_l$	[A]	630			200
Rated transfer current	$I_t$	[kA]	-		1900	1500
Cable charging-breaking current	$I_{4a}$	[A]	50			-
Closed-loop breaking current	$I_{2a}$	[A]	630			-
Earth fault breaking current	$I_{6a}$	[A]	160			-
Cable- & line-charging breaking current under earth fault conditions	$I_{6b}$	[A]	100			-
Main switch making capacity (peak value)	$I_{ma}$	[kA]	50 <sup>(1)</sup>			-
<b>Switch category</b>						
Mechanical endurance			1000x (M1)		1000-M1	
Cycles of operations (Short-circuit making current)- class			E3			
<b>Earthing Switch (for k, ts)</b>			<b>IEC 62271-102</b>			
<b>Rated short-time withstand current (earthing circuit)</b>						
Value $t_{\Sigma} = 1$ s	$I_k$	[kA]	20			
Peak value	$I_p$	[kA]	50			
Earthing switch making capacity (peak value)	$I_{ma}$	[kA]	50			
<b>Earthing Switch Category</b>						
Mechanical endurance (manual)			1000x			
Cycles of operations (Short-circuit making current)- class			E2			

\* Also available 7.2 and 17.5 kV on request <sup>(1)</sup> 1 s and 3 s

## Applications

MV Electrical distribution in open and close ring networks.

## Configuration

### Cubicle

- Internal arc IAC AFL
  - 20 kA 1s
- 1400 mm height cubicle
- 1050 mm height cubicle

### Gas tank

- Stainless steel tank

### Gas pressure indicator:

- Manometer
- Pressure switch with aux. contacts
- Density monitor with aux. contacts

### Cable bushings:

- Horizontal
- Diagonal
- Capacitive voltage tap
- Capacitive voltage tap after fuses
- Capacitive voltage tap before fuses

### Side connection:

- Non-extensible
- Right extensibility

### Type of side connection:

- Female bushing
  - Right

### Driving mechanism

- Actuating levers
- k-type manual mechanism
- ts-type manual mechanism
- Aux. switch for LBS: max. 3 NO/ 3 NC
- Aux. switch for ES: max. 2 NO/ 2 NC
- Shunt trip release ( AC / DC )
- Aux. switch for trip indication
- k-Motor-type motorised mechanism
- ts Motor-type motorised mechanism
- Lockable mechanisms
- Capacitive voltage indicator with cont. 3 ph. permanent indication

### Additional interlocks:

- Standard IEC interlocks
- Anti-reverse interlock
- Electrical interlocks
- Key interlocks
- Pad locks

### Cable compartment

- 3 pole vertical fuse base enclosure
- Fuse adapters for 292 mm long fuses
- 3 ph. sliding surface sealing end for TR cable (up to max. 240 mm<sup>2</sup> Cu / 185 mm<sup>2</sup> Al)
- Screw-type DIN bushings for cable connections
- Open bottom
- Vermin-proof option
- Cable clamps
- Cover for one standard
- Two reduced cable connector(s)
- Deep front cover (depth + 61 mm)
- Extra deep front cover (depth + 150 mm)

### Pressure relief duct

- In the cable cellar, open panel bottom
- Arc fault proof cable compartment
- Rear absorber channel for installation on closed floor (Total panel depth: 1119 mm)

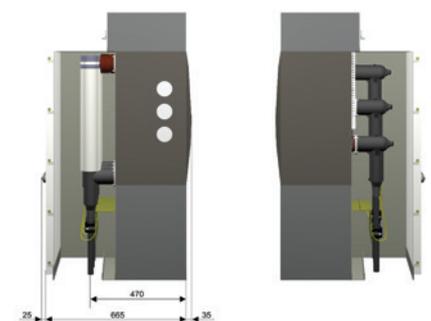
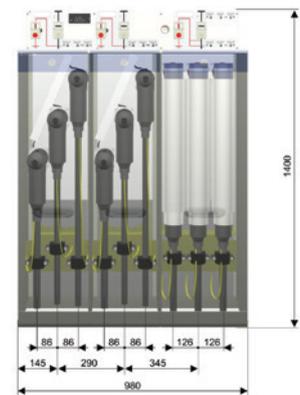
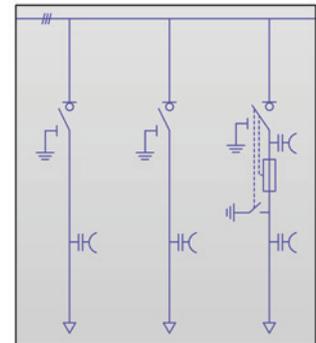
### Control box

- Without control box
- 300 mm height
- 600 mm height
- 900 mm height

- Standard equipment
- Optional equipment

## Dimensions

### ga / gae-2k1ts



[mm]

298 kg

## 2k1sf and 2k1sf(g) type ga and gae630

### Ring Main Unit (RMU) with circuit breaker protection

Compact RMU coming in non-extensible (ga) and extensible (gae) versions, equipped with two cable feeder with a three-position switch-disconnector and a transformer protection feeder with three-position rotating arc type CB.

Electrical characteristics			2k		1sf	
Rated voltage*	$U_r$	[kV]	12	24	12	24
Rated frequency	$f_r$	[Hz]	50 / 60			
<b>Rated current</b>						
General busbar and cubicle interconnection	$I_r$	[A]	630			
Feeder	$I_r$	[A]	630		250 - 630	
<b>Rated short-duration power frequency withstand voltage (1 min)</b>						
Phase-to-earth and between phases	$U_d$	[kV]	28	50	28	50
Across isolating distance	$U_d$	[kV]	32	60	32	60
<b>Rated lightning impulse withstand voltage</b>						
Phase-to-earth and between phases	$U_p$	[kV]	75	125	95	125
Across isolating distance	$U_p$	[kV]	85	145	110	145
<b>Internal arc classification</b>			IAC AFL 20 kA 1 s			
<b>Switch-disconnector (for k)</b>			IEC 62271-103			
<b>Rated short-time withstand current (main circuit)</b>						
Value $t_k=1$ s	$I_k$	[kA]	20 <sup>(1)</sup>			
Peak value	$I_p$	[kA]	20 <sup>(1)</sup>			
Mainly active load-breaking current	$I_l$	[A]	630			
Cable charging-breaking current	$I_{ca}$	[A]	50			
Closed-loop breaking current	$I_{2a}$	[A]	630			
Earth fault breaking current	$I_{ea}$	[A]	160			
Cable- & line-charging breaking current under earth fault conditions	$I_{cb}$	[A]	100			
Main switch making capacity (peak value)	$I_{ma}$	[kA]	50 <sup>(1)</sup>			
<b>Switch category</b>						
Mechanical endurance			1000x (M1)			
Cycles of operations class			E3/E1			
<b>Circuit-breaker (for Isf)</b>			IEC 62271-100			
<b>Rated short-time withstand current (main circuit)</b>						
Value $t_k=1$ s	$I_k$	[kA]	20		20	16
Peak value	$I_p$	[kA]	50		50 / 40	
<b>Rated breaking capacity and making capacity</b>						
Mainly active current rated breaking capacity	$I_l$	[A]	250/630			
Short-circuit breaking capacity	$I_{sc}$	[kA]	20		16	
Main switch making capacity (peak value)	$I_{ma}$	[kA]	50		40	
Rated cable-charging breaking current	$I_c$	[A]	50			
<b>Rated operating sequence</b>						
Without reclosing			O - 3 min - CO - 3 min - CO			
<b>Circuit-breaker category</b>						
Mechanical endurance (operations-class)			2000x M1			
Electrical endurance (class)			E2			
<b>Earthing Switch (for k, Isf)</b>			IEC 62271-102			
<b>Rated short-time withstand current (earthing circuit)</b>						
Value $t_k=1$ s	$I_k$	[kA]	20		20	16
Peak value	$I_p$	[kA]	50		50	40
Earthing switch making capacity (peak value)	$I_{ma}$	[kA]	50		50	40
<b>Earthing Switch Category</b>						
Mechanical endurance (manual)			1000x			
Cycles of operations class			E2			

\* Also available 7.2 and 17.5 kV on request <sup>(1)</sup> 1 s and 3 s

## Applications

MV Electrical distribution in open and close ring networks.

## Configuration

### Cubicle

- Internal arc IAC AFL
  - 16 kA 1s  20 kA 1s
- 1400 mm height cubicle
- 1050 mm height cubicle

### Gas tank

- Stainless steel tank

### Gas pressure indicator:

- Manometer
- Pressure switch with aux. contacts
- Density monitor with aux. contacts

### Cable bushings:

- Horizontal
- Diagonal
- Capacitive voltage tap

### Side connection:

- Non-extensible
- Right extensibility

### Type of side connection:

- Female bushing
  - Right

### Driving mechanism

- Actuating levers
- k-type manual mechanisms
- Isf-type manual mechanism
- Aux. switch for lbs and Isf: max. 3 NO / 3 NC
- Aux. switch for ES: max. 2 NO / 2 NC
- Shunt trip release (AC / DC)
- Aux. switch for trip indication
- k-Motor-type motorised mechanism
- Isf-Motor type motorised mechanism
- Lockable mechanisms
- Capacitive voltage indicator with cont. 3 ph. permanent indication
- Transformer trip release 0.1 Ws
- Undervoltage release (non delayed)

### Additional interlocks:

- Standard IEC interlocks
- Anti-reverse interlock
- Electrical interlocks
- Key interlocks
- Pad locks

- Standard equipment
- Optional equipment

### Cable compartment

- 3 pole vertical fuse base enclosure
- Fuse adapters for 292 mm long fuses
- 3 ph. sliding surface sealing end for TR cable (up to max. 240 mm<sup>2</sup> Cu / 185 mm<sup>2</sup> Al)
- Screw-type DIN bushings for cable connections
- Open bottom
- Vermin-proof option
- Cable clamps
- Cover for one standard / two reduced cable connector(s)
- Deep front cover (depth + 61 mm)
- Extra deep front cover (depth + 150 mm)

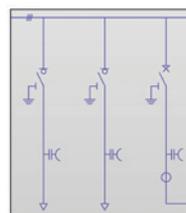
### Pressure relief duct

- In the cable cellar, open panel bottom
- Arc fault proof cable compartment
- Rear absorber channel for installation on closed floor (Total panel depth: 1119 mm)

### Control box

- Protection relay (acc. to agreement/client's spec.)
- Without control box
- 300 mm height
- 350 mm height
- 600 mm height
- 900 mm height
- Assembly of control box acc. to agreement/client's spec.

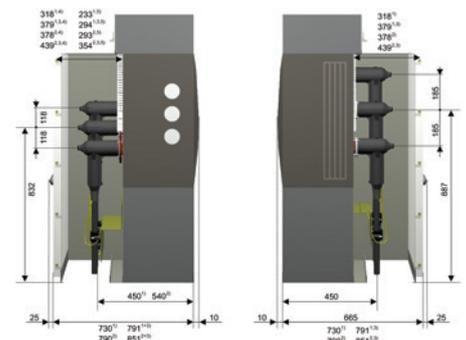
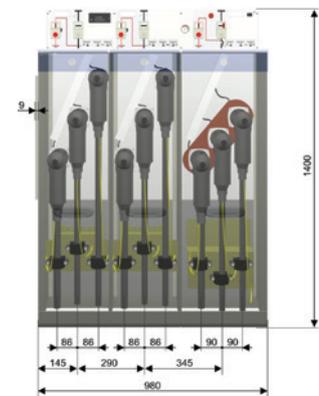
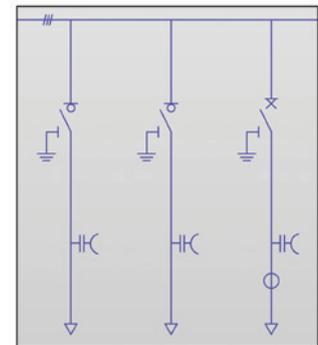
### Options



2k1lsfg

## Dimensions

ga / gae-2k1lsf



- ➡ 1) Standard connection compartment
- ➡ 2) Deep connection compartment
- ➡ 3) Deep front cover
- ➡ 4) Short bushing Isf cubicle
- ➡ 5) Long bushing Isf cubicle

[mm]

355 kg

## 3k and 4k type ga and gae630

### Compact block of 3 and 4 load break switches (LBS)

Compact three- and four-cubicle feeder cubicles, equipped with a three-position switch-disconnector (close, open, earth).

Electrical characteristics			k	
Rated voltage*	$U_r$	[kV]	12	24
Rated frequency	$f_r$	[Hz]	50 / 60	
<b>Rated current</b>				
General busbar and cubicle interconnection	$I_r$	[A]	630	
Feeder	$I_r$	[A]	630	
<b>Rated short-duration power frequency withstand voltage (1 min)</b>				
Phase-to-earth and between phases	$U_d$	[kV]	28	50
Across isolating distance	$U_d$	[kV]	32	60
<b>Rated lightning impulse withstand voltage</b>				
Phase-to-earth and between phases	$U_p$	[kV]	75	125
Across isolating distance	$U_p$	[kV]	85	145
Internal arc classification	IAC		IAC AFL 20 kA 1 s	
<b>Switch-disconnector</b>			<b>IEC 62271-103</b>	
<b>Rated short-time withstand current (main circuit)</b>				
Value $t=1$ s	$I_k$	[kA]	20 <sup>(1)</sup>	
Peak value	$I_p$	[kA]	50 <sup>(1)</sup>	
Mainly active load-breaking current	$I_l$	[A]	630	
Cable charging-breaking current	$I_{4a}$	[A]	50	
Closed-loop breaking current	$I_{2a}$	[A]	630	
Earth fault breaking current	$I_{6a}$	[A]	160	
Cable- & line-charging breaking current under earth fault conditions	$I_{6b}$	[A]	100	
Main switch making capacity (peak value)	$I_{ma}$	[kA]	50 <sup>(1)</sup>	
<b>Switch category</b>				
Mechanical endurance			1000x (M1)	
Cycles of operations (Short-circuit making current)- class			E3	
<b>Earthing Switch</b>			<b>IEC 62271-102</b>	
<b>Rated short-time withstand current (earthing circuit)</b>				
Value $t=1$ s	$I_k$	[kA]	20	
Peak value	$I_p$	[kA]	50	
Earthing switch making capacity (peak value)	$I_{ma}$	[kA]	50	
<b>Earthing Switch Category</b>				
Mechanical endurance (manual)			1000x	
Cycles of operations (Short-circuit making current)- class			E2	

\* Also available 7.2 and 17.5 kV on request <sup>(1)</sup> 1 s and 3 s

## Applications

Input and output of the MV cables, enabling connections with other transformer/switching substations.

## Configuration

### Cubicle

- Internal arc IAC AFL
  - 16 kA 1 s  20 kA 1 s
- 1400 mm height cubicle
- 1050 mm height cubicle

### Gas tank

- Stainless steel tank

### Gas pressure indicator:

- Manometer
- Pressure switch with aux. contacts
- Density monitor with aux. contacts

### Cable bushings:

- Diagonal
- Horizontal
- Capacitive voltage tap

### Driving mechanism

- Actuating levers
- k-type manual mechanisms
- Aux. switch for LBS: max. 4 NO / 4 NC
- Aux. switch for ES: max. 3 NO / 3 NC
- k-Motor-type motorised mechanism
- Lockable mechanisms
- Capacitive voltage indicator with cont. 3 ph. permanent indication
- Short circuit (s/c) indicator
- Earth fault (e/f) indicator
- Combined s/c and e/f indicator

### Additional interlocks:

- Standard IEC interlocks
- Anti-reverse interlock
- Electrical interlocks
- Key interlocks
- Pad locks

- Standard equipment
- Optional equipment

### Cable compartment

- Screw-type IEC bushings
- Open bottom
- Vermin-proof option
- Phase separation
- Cable clamps
- Cover for one standard
- Two reduced cable connector(s)
- Deep front cover (depth + 61 mm)
- Extra deep front cover (depth + 121 mm)

### Pressure relief duct

- In the cable cellar, open panel bottom
- Arc fault proof cable compartment
- Additional base (h: 400 mm) with pressure absorber channel
- Rear absorber channel for installation on closed floor (Total panel depth: 1119 mm)

### Control box

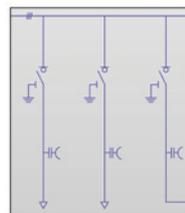
- Without control box
- 300 mm height
- 600 mm height
- 900 mm height

## Options

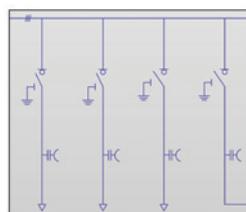
3kb and 4kb

With horizontal bushings

3kg



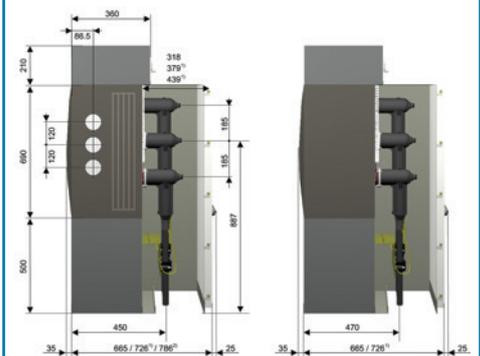
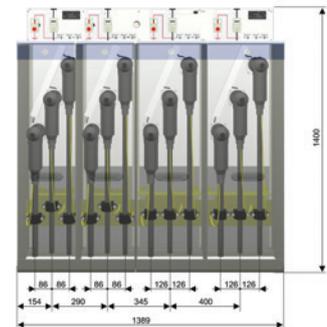
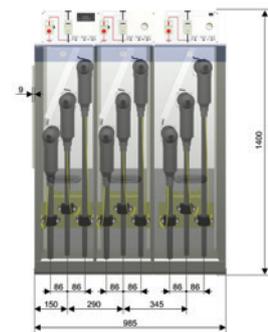
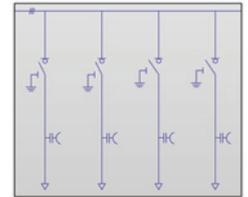
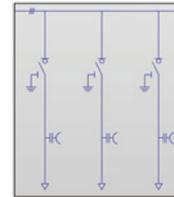
4kg



## Dimensions

ga / gae-3k

ga / gae-4k



- 1) Deep front cover
- 2) Extra deep front cover (cubicle 1+2)

[mm]

300 kg

325 kg

## 2k2ts and 3k1ts type ga

### 4 position Ring Main Unit (RMUs) with fuse protection

#### 2k2ts

Compact RMU coming in non-extensible versions, equipped with two cable feeder with a three-position switch-disconnector and two transformer protection feeders with a three-position switch-disconnector in series with 3 nos. HRC-type limiting fuses

#### 3k1ts

Compact RMU coming in non-extensible versions, equipped with three cable feeder with a three-position switch-disconnector and a transformer protection feeders with a three-position switch-disconnector in series with 3 nos. HRC-type limiting fuses

Electrical characteristics			k		ts	
Rated voltage*	$U_r$	[kV]	12	24	12	24
Rated frequency	$f_r$	[Hz]	50 / 60			
<b>Rated current</b>						
General busbar and cubicle interconnection	$I_r$	[A]	630			
Feeder	$I_r$	[A]	630			-
Output to transformer	$I_r$	[A]				200
<b>Rated short-duration power frequency withstand voltage (1 min)</b>						
Phase-to-earth and between phases	$U_d$	[kV]	28	50	28	50
Across isolating distance	$U_d$	[kV]	32	60	32	60
<b>Rated lightning impulse withstand voltage</b>						
Phase-to-earth and between phases	$U_p$	[kV]	75	125	95	125
Across isolating distance	$U_p$	[kV]	85	145	85	145
Internal arc classification	IAC		IAC AFL 20 kA 1 s			
<b>Switch-disconnector (for k and ts)</b>			IEC 62271-103		IEC 62271-105	
<b>Rated short-time withstand current (main circuit)</b>						
Value $t=1$ s	$I_k$	[kA]	20 <sup>(1)</sup>			
Peak value	$I_p$	[kA]	50 <sup>(1)</sup>			
Mainly active load-breaking current	$I_l$	[A]	630			200
Rated transfer current	$I_l$	[kA]				200
Cable charging-breaking current	$I_{4a}$	[A]	50			-
Closed-loop breaking current	$I_{2a}$	[A]	630			-
Earth fault breaking current	$I_{6a}$	[A]	160			-
Cable- & line-charging breaking current under earth fault conditions	$I_{6b}$	[A]	100			-
Main switch making capacity (peak value)	$I_{ma}$	[kA]	50 <sup>(1)</sup>			-
<b>Switch category</b>						
Mechanical endurance			1000x (M1)		1.000-M1	
Cycles of operations (Short-circuit making current)- class			E3			
<b>Earthing Switch (for k, ts)</b>			IEC 62271-102			
<b>Rated short-time withstand current (earthing circuit)</b>						
Value $t=1$ s	$I_k$	[kA]	20			
Peak value	$I_p$	[kA]	50			
Earthing switch making capacity (peak value)	$I_{ma}$	[kA]	50			
<b>Earthing Switch Category</b>						
Mechanical endurance (manual)			1000x			
Cycles of operations (Short-circuit making current)- class			E2			

\* Also available 7.2 and 17.5 kV on request <sup>(1)</sup> 1 s and 3 s

## Applications

MV Electrical distribution in open and close ring networks.

## Configuration

### Cubicle

- Internal arc IAC AFL
  - 20 kA 1 s
- 1400 mm height cubicle
- 1050 mm height cubicle

### Gas tank

- Stainless steel tank

### Gas pressure indicator:

- Manometer
- Pressure switch with aux. contacts
- Density monitor with aux. contacts

### Cable bushings:

- Horizontal
- Diagonal
- Capacitive voltage tap
- Capacitive voltage tap after fuses
- Capacitive voltage tap before fuses

### Driving mechanism

- Actuating levers
- k-type manual mechanisms
- ts-type manual mechanism
- Aux. switch for LBS:  
max. 3 NO / 3 NC
- Aux. switch for ES:  
max. 2 NO / 2 NC
- Shunt trip release (AC / DC)
- Aux. switch for trip indication
- k-Motor-type motorised mechanism
- ts Motor-type motorised mechanism
- Lockable mechanisms
- Capacitive voltage indicator with cont. 3 ph. permanent indication

### Additional interlocks:

- Standard IEC interlocks
- Anti-reverse interlock
- Electrical interlocks
- Key interlocks
- Pad locks

- Standard equipment
- Optional equipment

### Cable compartment

- 3 pole vertical fuse base enclosure
- Fuse adapters for 292 mm long fuses
- 3 ph. sliding surface sealing end for TR cable (up to max. 240 mm<sup>2</sup> Cu / 185 mm<sup>2</sup> Al)
- Screw-type DIN bushings for cable connections
- Open bottom
- Vermin-proof option
- Cable clamps
- Cover for one standard
- Two reduced cable connector(s)
- Deep front cover (depth + 61 mm)
- Extra deep front cover (depth + 150 mm)

### Pressure relief duct

- In the cable cellar, open panel bottom
- Arc fault proof cable compartment
- Rear absorber channel for installation on closed floor (Total panel depth: 1119 mm)

### Control box

- Without control box
- 300 mm height
- 600 mm height
- 900 mm height

## Options

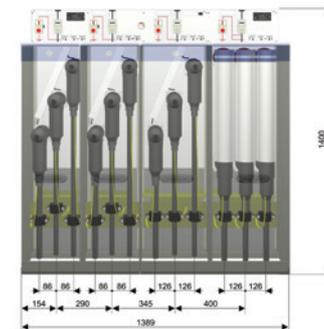
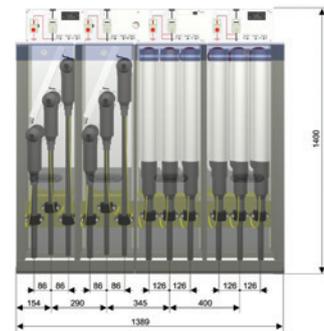
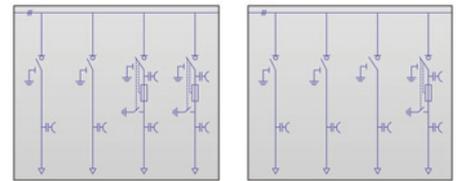
### ga-2kb2ts and ga-3kb1ts

kb cable feeder with horizontal bushings

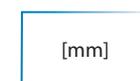
## Dimensions

ga / gae-2k2ts

ga / gae-3k1ts



1) Deep front cover in k cubicle



299 kg

/

366 kg

## Other components and accessories

### Indicators

To check for electrical isolation or to perform a voltage test in accordance with IEC 61243-5, each switch panel can be equipped with the following voltage indicating systems:

#### Measuring devices for phase comparison or interface testing

In connection with the voltage indicating systems, for the phase comparison or interface testing the use of the following measuring devices is possible:

Brand	Phase-comparison	Interface testing
Horstmann	-	Measuring module HO-M with ammeter device Fluke-type 87 or Matrix-type Mx55 (II to IV)
Horstmann	Type: ORION 3.0	Type: ORION 3.0
ELSIC	Type: HO-PV	
Pfisterer	Type: EPV	Type: Euro test-HO
Jordan	-	Type: KSP-HR
Kries	Type: CAP phase	Type: CAP phase



### Integrated voltage indication system IVDS

#### System CAPDIS, Kries:

CAPDIS is a capacitive voltage indicator with a three-phase continuous display and permanent self monitoring.

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

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.

### Integrated voltage detecting system IVDS

#### System WEGA, Co. Horstmann

The integrated voltage detecting system WEGA complies with the requirements for capacitive voltage detecting systems of VDE 0682-415 (IEC 61243-5). It is a three-phase testing system, with which the voltage condition of a medium voltage line is displayed.

On the front plate are the LCD display, the display test button and the three-phase LRM interface. A shroud that is secured against loss protects the sleeves from dust and corrosion. On the rear side are connections for the measuring signals and auxiliary voltage.

For the display of arrows and point symbols in the Display, no auxiliary power is required, it is fed from the measuring signal. Even when the auxiliary voltage fails these display functions remain active. For the additional functions (relay control, display lighting and active zero readout) an auxiliary voltage is necessary.



### Short-circuit/earth fault indicators

All ring cable panels can optionally be equipped with a three phase short-circuit (s/c) or earth fault (e/f) indicator, or other indicators that can provide the combination of the both signals. All commercially available s/c and e/f indicators can be installed on the load break panels of both **ga** and **gae630** system switchgear.

## Cable connections

### Cable connectors

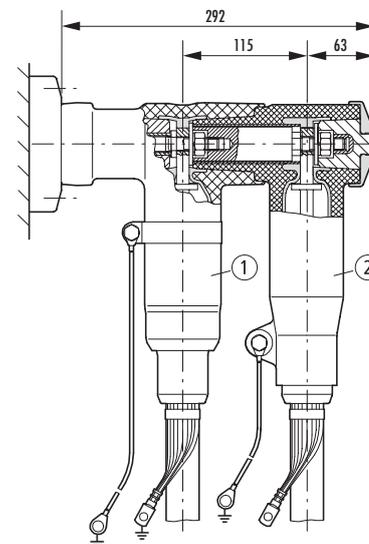
In **ga** and **gae630** system panel, T-connectors are to be used at the discretion of the operator in cable/connection panels or circuit-breaker panels. To be connected to bushings acc. to DIN EN 50181 connection type C (630 A) with outside taper and screw contact (M16).

During the installation of the cable connectors, the installation instructions of the manufacturer must be strictly followed.

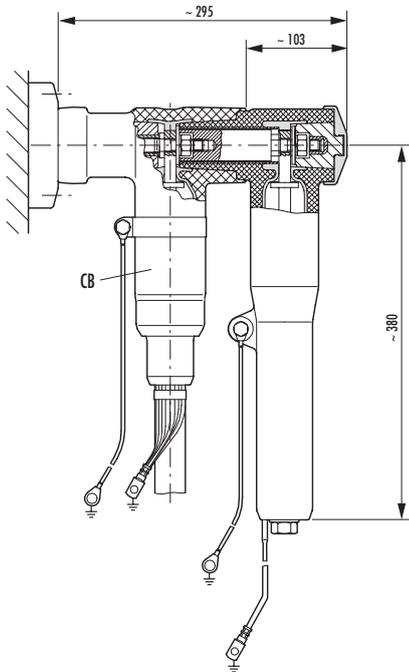
Depending on the mounting depth of the cable connection compartments, deep front covers or deep cable connection compartments may be necessary. Further connection possibilities are also available on request.

### Cable connectors (for lbs panels type k and for rotating arc CB panel type lsf)

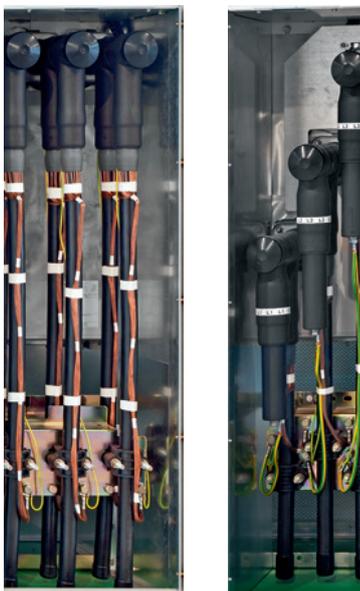
Normally T-connectors are used for connecting single phase or trifurcated three phase cables to the load break switches (k and a) panels as well as the rotating arc type circuit breakers (lsf). It is also possible to connect more than one cable per phase however it is only possible by using reduced (asymmetric T) type cable connectors in the standard version without exceeding the maximum standard installation depth of 318 mm. An example of this application can be seen below:



Similarly a surge arrester per phase can also be installed together with the T connector in the standard version without exceeding the maximum standard installation depth of 318 mm as can be seen below.



For applications of double cable connectors or cable connector plus surge arrester configurations exceeding the installation depth of 318 mm, special cable connection compartments with deeper front covers should be requested and mentioned during the ordering stage.



### Cable connectors (for fused LBS panels type ts)

As mentioned earlier, there is no need for separate cable connectors for ts-type fused load break switch panels in any of the **ga** and **gae630** system. In these fuse transformer protection panels, the functionality of the lower fuse holder is additionally designed as a slide-on cable termination suitable for Cu cables from 25 to 240 mm<sup>2</sup> diameter, and for Al cables from 25 to 185 mm<sup>2</sup> diameter.

### Cable connectors (for VCB panels type lsv)

Typical T-connectors are being used for connecting single phase or trifurcated three phase cables to the VCB panels (lsv). It is also possible to connect more than one cable per phase (up to two cables per phase) however it is only possible by means of deeper cable compartment covers because the standard cable installation depth of lsv-type panels is just 230 mm.



### HRC Fuses

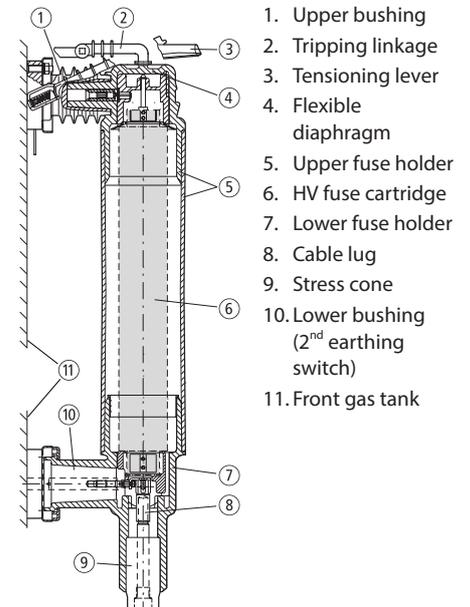
#### Fuse base and transformer cable connection

The fuse base on both the **ga** and **gae630** systems panels is designed as a plug-in system. All components are coupled to the current paths outside the gas tank via cast resin bushings. The plug-in system consists of the upper and lower fuse holder. The plug parts made of silicon rubber are of track-proof and arc-root free design. In its functionality the lower fuse holder is additionally designed as a slide-on cable termination. Application range for Cu cable from 25 to 240 mm<sup>2</sup>, for Al

cable from 25 to 185 mm<sup>2</sup>. Through the earthing switch located in the gas tank the HRC-fuse cartridges can be earthed on both sides. The fuse base is only accessible with the earthing switches inserted. Actual dimension of fuse: 442 mm, with extension adapter fuses with an actual dimension of 292 mm can also be installed.

#### Fuse selection

Only HRC backup fuses corresponding to current selection table no. 12248573 are used in accordance with DIN 43625 to 88 mm diameter, for the protection of distributor transformers 6/10/15/ 20 kV. Other HRC-fuses can only be used after consultation!



Transformer outgoing panel, front cover opened.

With fuse holders and transformer cable sealing end.

## Spare parts and auxiliaries

### Metal enclosure

#### Phase separation option

The phase separation PS in the cable connection compartments of the SF<sub>6</sub>-insulated switchgear of types **ga** and **gae630** is an option for increasing personal and switchgear protection as well as network availability.

- Panel bottom closed
- Pressure relief via rear pressure absorber channel into the switchgear room

As such the front covers of cable panel type **k** and circuit-breaker panel type **lsf** are provided on the inner side with phase isolating plates. They form according to the installation of the front cover one-phase metal partitioning between the screened cable connection compartments.

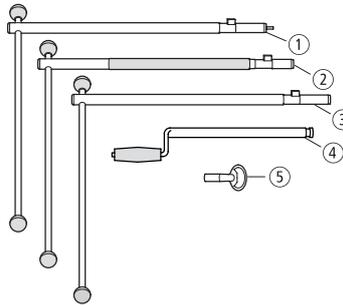
As a result the effects of a potential arc fault in the cable connection zone are considerably reduced. For earth fault compensated networks, the fault current will be limited to a one-phase earth fault current. Front covers with phase separation are can be exchanged subsequently. Details on request.

#### Additional base option

For special installation conditions such as in switchgear rooms without raised floors or tower substations, **Ormazabal** offers an optional 400 mm additional base with rear pressure absorber channel.

The medium-voltage cables can be fitted from behind or from the side via pressure-proof cable glands in the additional base, depending on the version. The additional bases can be delivered with diverse **ga** and **gae630** panel combinations. Details on request.

### Operating levers



#### Operating levers, keys for fasteners

1. Operating lever (optional) for the load-break switch actuating shaft with motor operator (for manual switching e.g. in case of loss of supply voltage)
2. Operating lever for the earthing switch (optional red shaft)
3. Operating lever for the load-break switch (optional plain shaft)
4. Charging handle for vacuum circuit-breakers
5. Key for the fastener on the front cover (controls the anti-reverse interlock)

### Connecting

#### Coupling and bolt connection kits

##### Busbar coupling kit with double gasket



Display: 1 Phase

##### Busbar end cover with single gasket



Display: 1 Phase

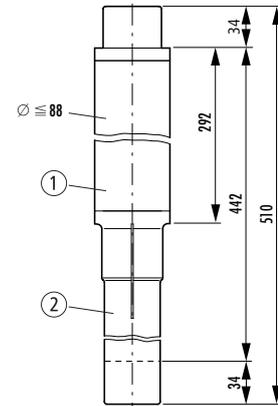
##### Parts for bolt connection of panels



Display: 1 Set

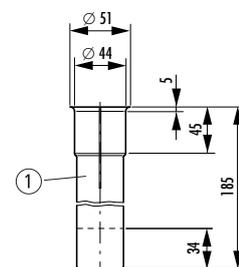
### Fuse adapter

The transformer outgoing panels are designed for fuses with the dimension "e" = 442 mm. To be able to install fuses also with the dimension "e" = 292 mm there is an adapter.



#### Fuse cartridge with adapter

1. Fuse cartridge 12 kV "e" = 292 mm
2. Adapter



1. Adapter

# Handling, installation and after sales

## Handling

- Reduced size and weight make easier handling and installation tasks
- Safe cubicle delivery: Upright position on a pallet, wrapped in protective cardboard cover

### Handling methods:

- Lifting: Forklift truck or hand-operated pallet jack (alternative methods: rollers or rods underneath)
- Raising: Sling & lifting beams

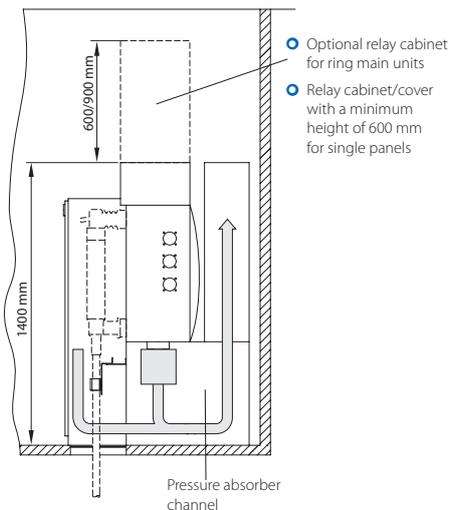


- Ergonomic design for easy cubicle connection and floor fastening



## Inside buildings

- Easy handling with pallet jack (go through standard doors and elevators)
- Small dimensions: minimum switchgear room occupation
- Operation, extensibility, and removal in reduced space
- No gas manipulation at site



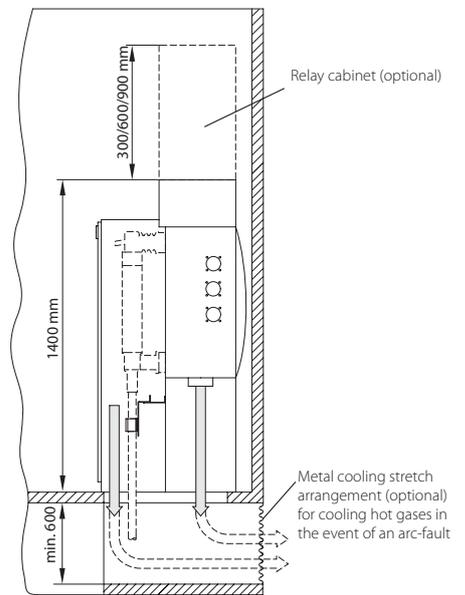
Please see the corresponding operating instructions for **ga** and **gae630** switchgear for further details. Detailed installation plans on request.

### Minimal switchgear height **ga** and **gae630** with pressure absorber channel

- **gae630** single panels: Switchgear height 2000 mm with 600 mm relay box or cover
- **ga** and **gae630** 2-panel/3-panel and **ga** 4-panel blocks without further single panels: Switchgear height 1400 mm

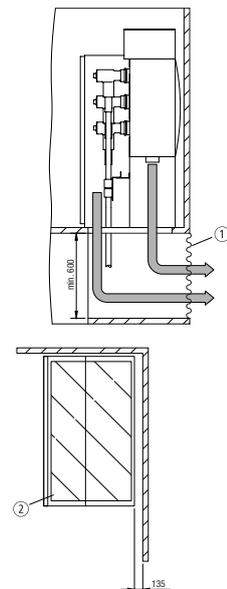
The construction of the building and the switchgear room must withstand the expected mechanical loads and the internal pressure caused by a short-circuit arc. Appropriate calculations for these purposes are recommended.

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



## Installation **ga** and **ga-c**

- Without metal cooling stretch arrangement within pedestal
- Bottom open

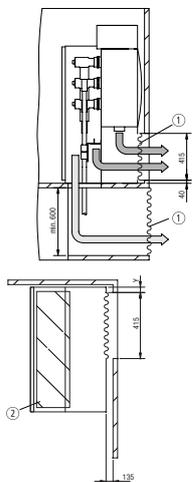


Pressure relief only into cable cellar/cable trench.

1. Metal cooling stretch arrangement to cool down hot gases generated in case of an internal arc fault.
2. Cable trench/cable cellar

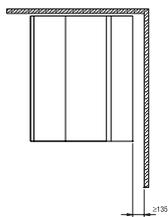
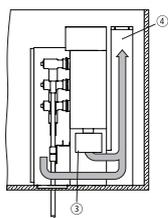
## Installation ga

- With metal cooling stretch arrangement within pedestal
- Bottom open



Pressure relief via metal cooling stretch arrangement into the room behind.  
(Optionally also in the cable trench)

- Dimension Y= 30 mm for 3-panel-units
- Dimension Y= 395 mm for 4-panel units
- 3. Metal cooling stretch arrangement to cool down hot gases generated in case of an internal arc fault
- 4. Cable trench/cable cellar
- With rear absorber channel and metal absorber
- Bottom closed



Pressure relief via rear absorber channel.

1. Metal absorber
2. Rear absorber channel

## Inside prefabricated transformer substations

- Turnkey solutions
- Possibility of on-site installation of cubicles
- Wide range of transformer substation: Walk-in, kiosk, underground, etc.
- Availability of having an operational transformer substation in a short time



## Inside wind turbines

- Over 15 years of experience in wind energy



## Inside containerised substations

- Turnkey solutions
- Availability of having an operational substation in a short time
- Ideal solution for remote locations



## Commissioning and After Sales

### Services



Technical assistance



FAT



Pick-up & delivery



Supervision & installation



Commissioning



Training



Warranty



Inspection & maintenance



Spare part



Repair



Retrofitting



Recycling



Engineering



Procurement



EPCM

## Recycling and end-of-life

The **Ormazabal** production centres have introduced the corresponding environmental management systems, conforming to the requirements of the international ISO 14001 standard and endorsed by the Environmental Management Certificate.

**ga** and **gae630** system cubicles have been designed and manufactured in accordance with the requirements of international standard IEC 62271-200.

By design, and depending on the models, they have a sealed compartment with SF<sub>6</sub> which allows full operation of the equipment throughout its service life, estimated at 30 years (IEC 62271-200).

At the end of the product life cycle, the SF<sub>6</sub> gas content must not be released into the atmosphere. It is recovered and treated for reuse, in accordance with the instructions given in standards IEC 62271-303, IEC 60480 and the CIGRE 117 guide. **Ormazabal** will provide the additional information required to carry out this task correctly, out of respect for the safety of individuals and that of the environment.





 **ORMAZABAL**  
velatia

[www.ormazabal.com](http://www.ormazabal.com)