mediumVOLTAGE

ORMAZABAL
velatia

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

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Reliable innovation. Personal solutions.

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Contents

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 9001:2015.
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 over 1.590.000 **Ormazabal** medium voltage 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 **gae**630 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 700.000 **ga** and **gae**630 system functional units have been installed in more than 80 countries.

The **ga** and **gae**630 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.

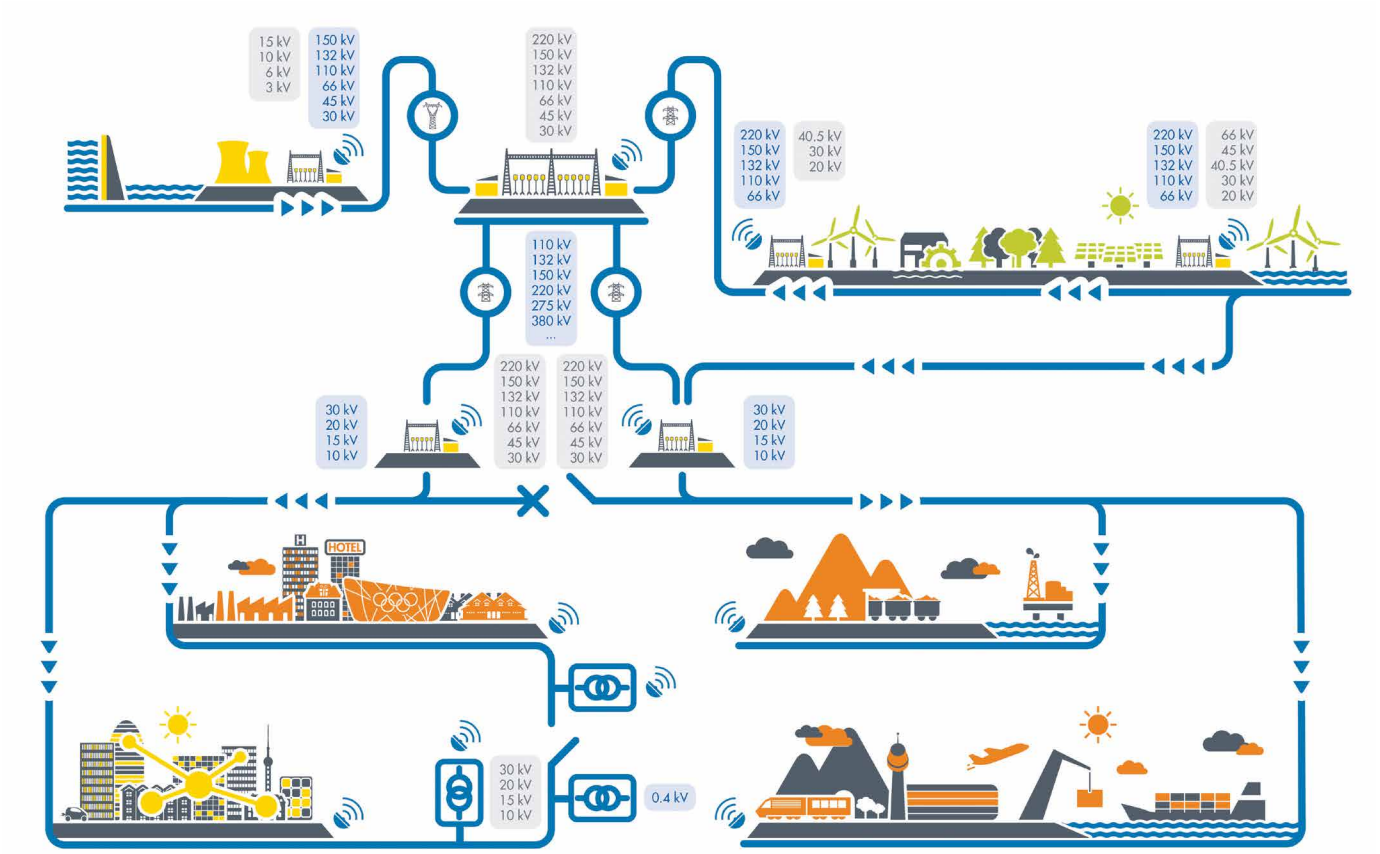
Velatia is a family-run, industrial, technological and global group which operates in the areas of electrical networks, electronics and communication networks as well as in the consulting, security and aviation sectors, where security, efficiency and reliability are valued.

Our customer orientation has led to the development of our extensive network of factories in Spain, France, Germany, Poland, Brazil and China, helping to meet our customers' needs in more than 50 countries.

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

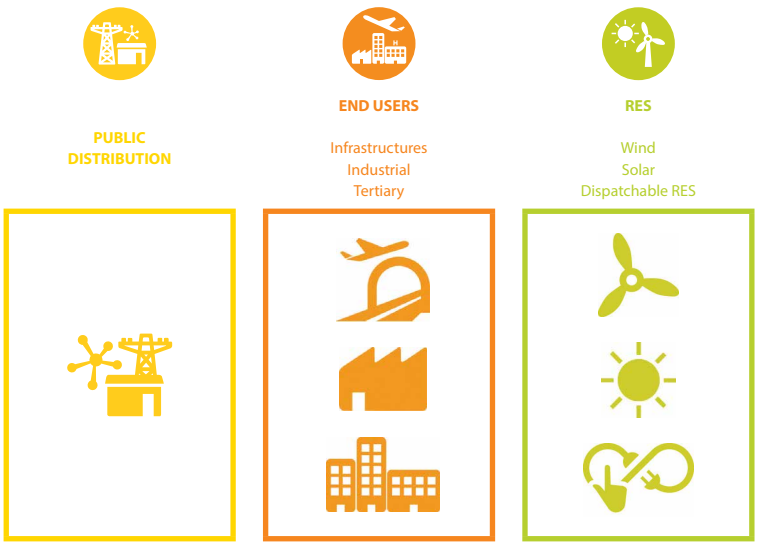
Your Electrical Network

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



Your Business

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



Main features

Safety

Protection for people, the environment and your electrical installations.

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

Internal arc

Both **ga** and **gae**630 systems have been designed to withstand the effects of an internal arc according to IEC 62271-200:

- **IAC AFL (R)** 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 AFL(R) 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 **gae**630 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-reverse 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.

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

100% routine tested

The switch panel or switchgear undergo 100% routine 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 devices
- Functional test of the short-circuit indicator (if present)

Efficiency

High added value features that make your task easier.

Modularity

ga and **gae**630 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 **gae**630 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 **gae**630:

- 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_6
- No use of SF_6 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

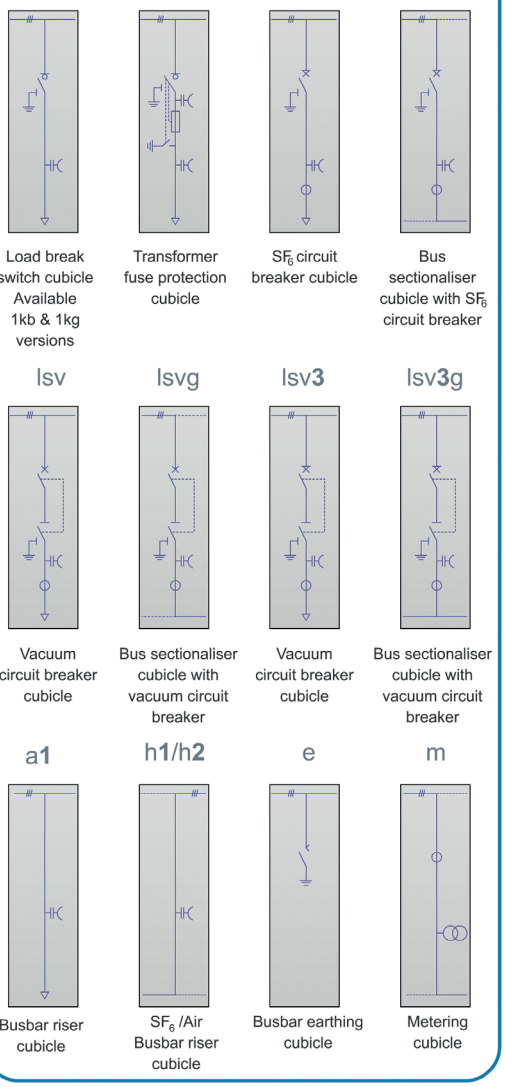
A focused team of professionals dedicated to innovation leads to a constant offer of new developments and upgrades, such as:

- New modules for 20 kA 1 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

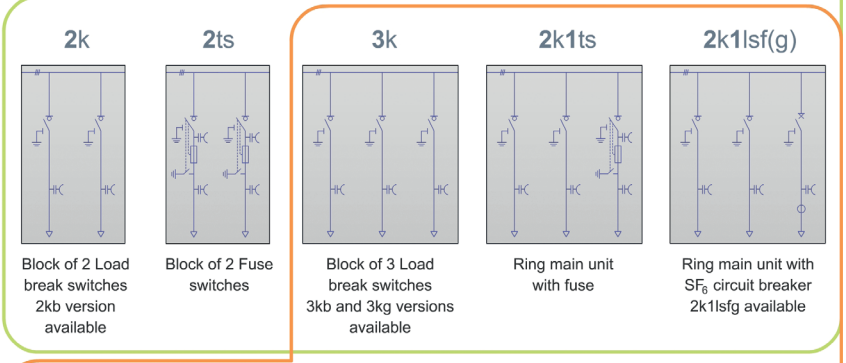
Technical details

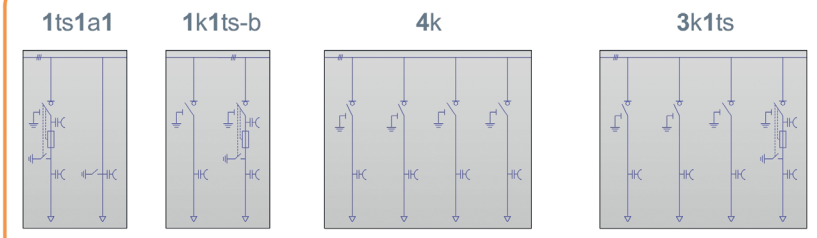
Family

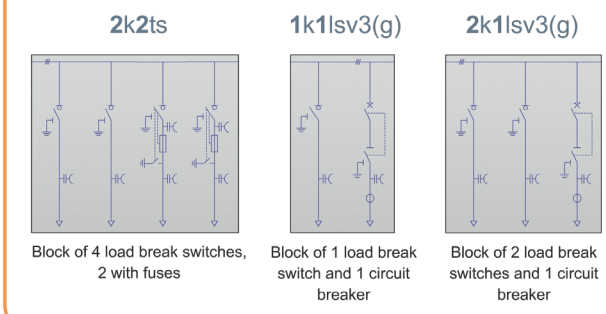
Modular cubicles (**gae**630)



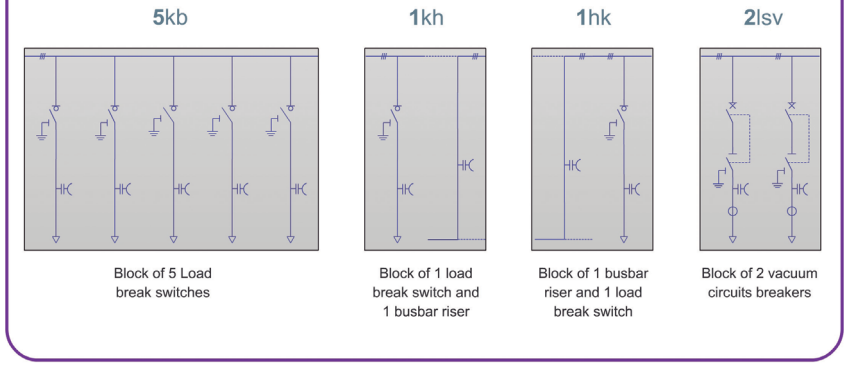
Extensible blocks (**gae**630)







Compact cubicles (**ga**)



(*) Additional 12 kV functions for GB standard

Applicable electrical standards

IEC 60282-1	High-voltage fuses - Part 1: Current-limiting fuses
IEC 60529	Degrees of protection provided by enclosures
IEC 62271-213	Voltage detecting systems (VDS)
IEC 62271-1	Common characteristics for high-voltage switchgear and controlgear
IEC 62271-100	High-voltage alternating current circuit-breakers
IEC 62271-102	Alternating current disconnectors and earthing switches
IEC 62271-103	Switches for rated voltages above 1 kV up to and including 52 kV
IEC 62271-105	High-voltage alternating current switch-fuse combinations
IEC 62271-200	AC metal-enclosed switchgear and controlgear (up to 52 kV)
IEC 62271-4	Use and handling of sulphur hexafluoride (SF_6)

Technical data

Electrical characteristics			IEC			
Rated voltage	U_r	[kV]	**7.2**	**12**	**17.5**	**24**
Rated frequency	f_r	[Hz]	50 / 60			
Rated normal current	I_r					
Busbars and cubicle interconnection		[A]	630			
Feeder		[A]	630			
Output to transformer		[A]	200			
Rated short-time withstand current						
With t_k= 1 s	I_k	[kA]	20[1]			
With t_k= 3 s	I_k	[kA]	20			
Peak value	I_p	[kA]	50[1]			
Rated insulation level						
Rated power-frequency withstand voltage [1 min]	U_d	[kV]	20	28	38	50
Rated lightning impulse withstand voltage	U_p	[kV]	60	75	95	125
Internal arc classification according to IEC 62271-200	IAC	AFL	20 kA 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			

[1] Type tests done at 21 kA

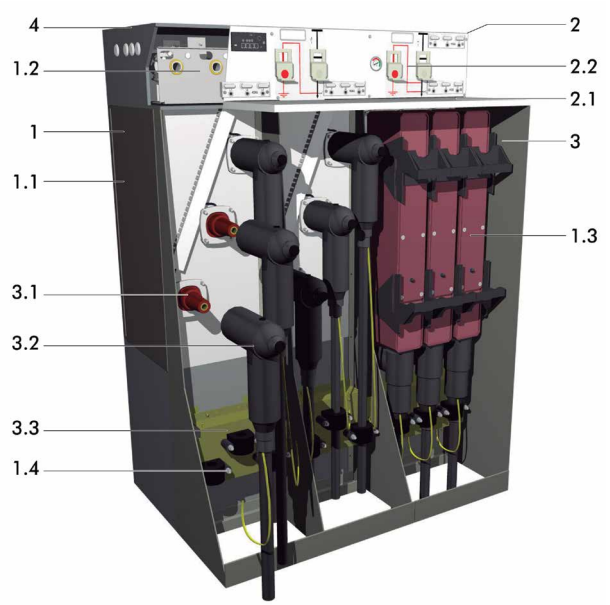
		k	k **motor**	ts	ts **motor**	lsf	lsf **motor**	lsv	lsv **motor**
Tripping coils									
Internal insulation	[kV]	2							
Tripping coil (opening)									
Rated voltage	[V]	–		24 / 48 / 60 / 110 / 220 Vdc 110 / 230 Vac					
Max. consumption	[W] / [VA]	–		<265 / 652		<75 / 71		<50 / 50	
Tripping coil (closing)									
Rated voltage	[V]	–				–		*	
Max. consumption	[W] / [VA]	–				–		<80 / 130	
Undervoltage coil									
Rated voltage	[V]	–				–		*	*
Max. consumption	[W]	–				–		<40 / 40	
Motorised units									
Rated voltage	[V]	–	*	–	*	–	*	–	*
Motor operation time	[s]	–	<8	–	<8	–	<8	–	<6
Peak current	[A]	–	<12	–	<13	–	<13	–	<12
Indicating contacts									
Switch | Earthing		4NO + 4NC / 3NO + 3NC				3NO + 3NC		3NO + 3NC / 2NO + 2NC	
Circuit breaker		–				4NO + 4NC		10NO + 10NC	

Service conditions	IEC
Type of switchgear	Indoor
Ambient temperature	
Minimum | Maximum	-5 °C* | +-40 °C*
Maximum average ambient temperature, measured over a 24-hour period	+40 °C*
Relative humidity	
Maximum average relative humidity, measured over a 24-hour period	<95 %
Overpressure	
Maximum average overpressure, measured over a 24-hour period | 1-month period	130 kPa for all models except lsf 150 kPa
Maximum height above sea level	1000m*

* Consult availability and other values

Constructive structure

ga / gae630-2k1ts



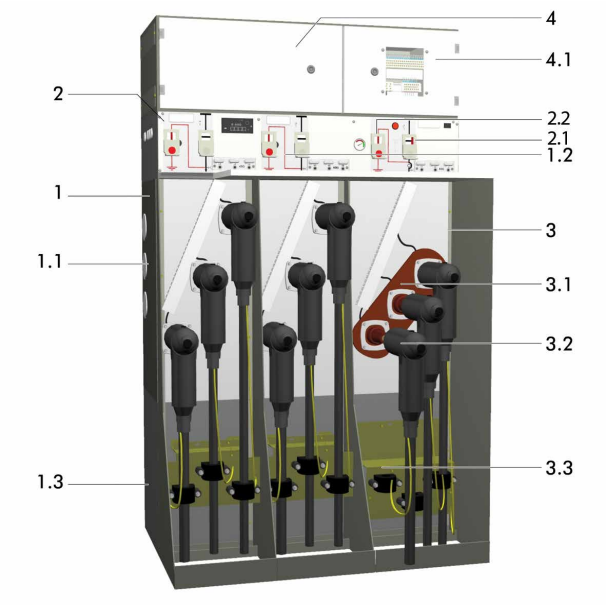
1 Gas tank
- 1.1 Busbar connection (side bushings)
- 1.2 Switch-disconnector
- 1.3 HRC fuses
- 1.4 Gas relief duct

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-2k1lsf



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

gae630-1lsv

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
3. Cable compartment
4. Control box

RAV (3G) Driving mechanism

Optionally

VTs on top for busbar voltage measurement.

VTs on cable compartment for the outgoing voltage measurement

Design characteristics

Key components

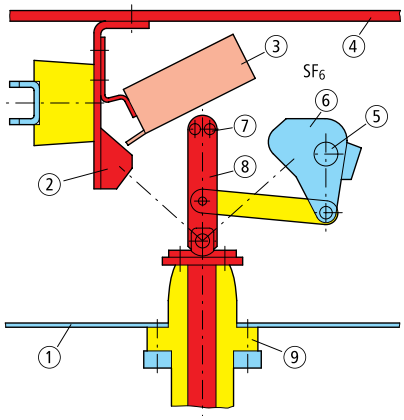
Load break switch (LBS)

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, disconnector 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

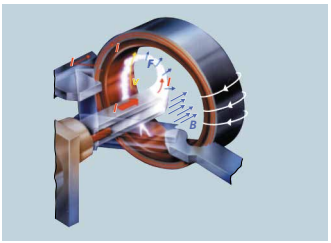
It is very simple to extend the **ga** and **gae**630 system modular and extensible switchgear and combine it with any other modular **gae**. Due to their uniform design and dimensions, all **ga** and **gae**630 system switchgear can be connected to each other both mechanically and electrically by means of the screened busbar connecting sets.

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 20 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 **Isv** type modular cubicles under **gae**630 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 **gae**630 systems include a structure divided into independent compartments:

ga compact cubicles

gae630 modular cubicles

Gas tank

The MV compartment

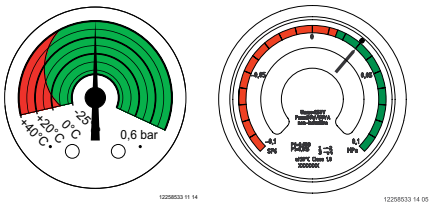
This is a gas-tight welded tank made from stainless steel, which houses all the live parts including the busbars. The incoming and outgoing power feeders, as well as the connection of the fuses is made through cast-resin bushings that are individually tested for maintenance of the maximally admissible 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.



Density switch monitor

For remote monitoring each gas tank can be equipped with a density switch. The bottom switching point corresponds to the transition to the red measuring range on the gas leakage indicator. As an option, the density switch can be configurated with a warning switching point.

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 disconnector. 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 arrestor 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.

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 arrestor 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

- Clamping range from 26 to 52 mm.

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 and automation

ekorsys family

Ormazabal supplies complete medium-voltage installations that include protection, control and automation functions.

Ormazabal has a wide range of applications and services to meet distribution network requirements.

Protection

- Supply to medium-voltage customers
  - **ekor**.rpg
  - **ekor**.rpt
  - **ekor**.rpa series 020
  - **ekor**.rpa series 030
- Protection of switching substations industrial customers and substations
  - **ekor**.rpa series 100
  - **ekor**.rpa series 200

Automation and remote control

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

Dispatching centre

Software

- **ekor**.soft
- **ekor**.soft-xml

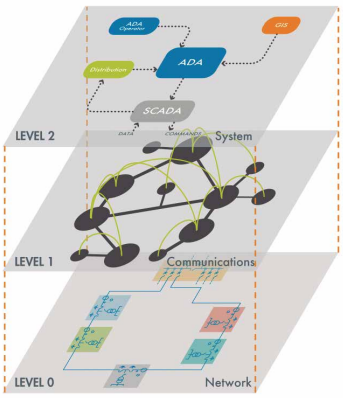
For further information on **ekor** product family, please ask your **Ormazabal** contact person or visit www.ormazabal.com

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 also provides high efficient solutions to the smartization of current urban electric networks, including:

- Adaptation to all energy generation and storage options
- Enabling the integration of greater quantity of renewable sources and a growing number of electric vehicles
- Managing the intermittent nature of their patterns
- Minimizing the environmental impact of additional grid capacity build-up



Type of modules

k type **ga** and **gae**630

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			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Feeder	I_r	[A]	630			
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	20	28	38	50
Across isolating distance	U_d	[kV]	23	32	45	60
Rated lightning impulse withstand voltage						
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		AFL(R) 20 kA 1 s			
Switch-disconnector			**IEC 62271-103**			
Rated short-time withstand current						
Value t_k= 1 s	I_k	[kA]	20[(1)]			
Peak value	I_p	[kA]	50			
Mainly active load-breaking current	I_1	[A]	630			
Cable charging-breaking current	I_{cc}	[A]	60			
Closed-loop breaking current	I_{loop}	[A]	630			
Earth fault breaking current	I_{ef1}	[A]	160			
Cable- & line-charging breaking current under earth fault conditions	I_{ef2}	[A]	100			
Main switch making capacity (peak value)	I_{ma}	[kA]	50			
Switch category						
Mechanical endurance			1000x (M1)			
Cycles of operations (Short-circuit making current)- class			E3			
Earthing Switch			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
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			
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)			
Cycles of operations (Short-circuit making current)- class			E2			

(1) 1 s and 3 s

Applications

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

Configuration

Cubicle

- ☐ IAC AFL(R) 20 kA 1 s
- ■ 1400 mm height cubicle

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density 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
- ☐ Additional base (h: 400 mm) with pressure absorber channel
- ☐ Rear absorber channel for installation on closed floor

Control box

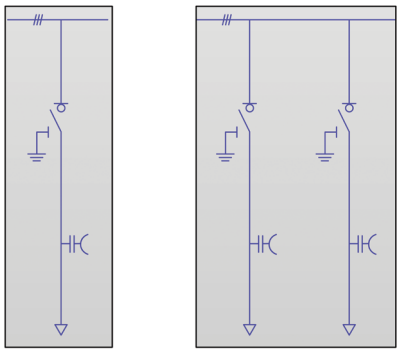
- ■ Without control box
- ☐ 300 mm height
- ☐ 600 mm height
- ☐ 900 mm height

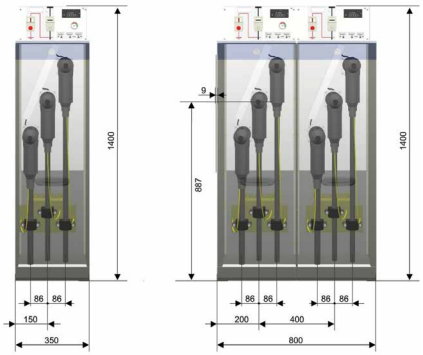
Options

1kb / 2kb: Horizontal bushings

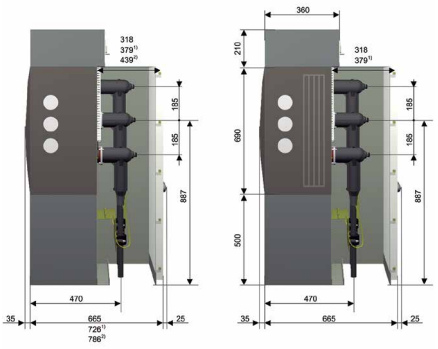
Dimensions

gae-1k **gae**-2k





gae-1k **gae**-2k



1) Deep front covers
2) Extra deep front covers

1) Deep front covers

[mm]

127 kg / 263 kg

■ Standard equipment
☐ Optional equipment

ts-type **ga** and **gae**630

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			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Output to transformer		[A]	200			
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	20	28	38	50
Across isolating distance	U_d	[kV]	23	32	45	60
Rated lightning impulse withstand voltage						
Phase-to-earth and between phases	U_p	[kV]	60	75	95	125
Across isolating distance Exhaust gases downwars into the cable trench	U_p	[kV]	70	85	110	145
Internal arc classification	IAC		AFL(R) 20 kA 1 s			
Switch-disconnector			**IEC 62271-105**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]			
Peak value	I_p	[kA]	50			
Mainly active load-breaking current	I_1	[A]	200			
Rated transfer current	I_t	[kA]	1900		1100	
Switch category						
Mechanical endurance			1000x (M1)[2]			
Earthing switch			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]			
Peak value	I_p	[kA]	50[1]			
Earthing switch making capacity (peak value)	I_{ma}	[kA]	50[1]			
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)[2]			
Cycles of operations (Short-circuit making current)- class			E2			
Earthing switch after the fuse			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	2.5			
Earthing switch making capacity (peak value)	I_{ma}	[kA]	6.3			
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)[2]			
Cycles of operations (Short-circuit making current)- class			E2			

[1] 1 s and 3 s (optional) before the fuse. Otherwise this value will be limited by the HRC fuse [2] Higher values up to 3000x on request

Applications

Fuse protection cubicle for protecting distribution transformers and auxiliary service transformers.

Configuration

Cubicle

- ☐ IAC AFL(R) 20 kA 1 s
- ■ 1400 mm height cubicle

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density switch with aux. contacts

Cable bushings:

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

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
- ■ type-A bushing for standard connector
- ■ TR cable (up to 150 mm 2 depending on connector type)
- ■ Open bottom
- ☐ Cable clamps

Pressure relief duct

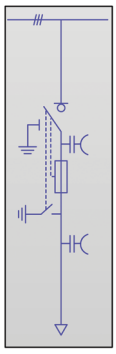
- ■ In the cable cellar, open panel bottom
- ☐ Rear absorber channel for installation on closed floor (Total panel depth: 1150 mm)

Control box

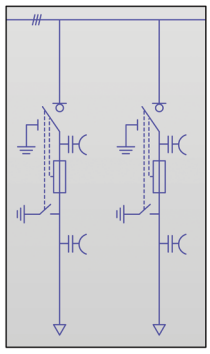
- ■ Without control box
- ☐ 300 mm height
- ☐ 600 mm height
- ☐ 900 mm height

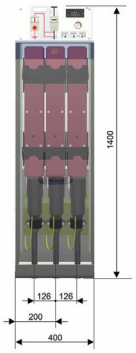
Dimensions

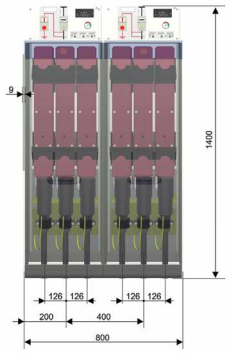
gae-1ts



gae-2ts







[mm]

150 kg / 310 kg

■ Standard equipment
☐ Optional equipment

Isf-**type gae**630

SF_6 circuit breaker cubicle and bus sectionalizer cubicle SF_6 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_r	[kV]	**7.2**	**12**	**17.5**	**24**
Rated frequency	f_r	[Hz]	**50 / 60**			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Feeder	I_r	[A]	250 - 630			
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	20	28	38	50
Across isolating distance	U_d	[kV]	23	32	45	60
Rated lightning impulse withstand voltage						
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		AFL(R) 20 kA 1 s			
Circuit-breaker			**IEC 62271-100**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[(1)]		16[(1)]	
Peak value	I_p	[kA]	50		40	
Rated breaking capacity and making capacity						
Mainly active current rated breaking capacity	I_1	[A]	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			
Rated operating sequence						
Without reclosing			O - 3 min - CO - 3 min - CO			
Circuit-breaker category						
Mechanical endurance (operations-class)			2000x (M1)			
Electrical endurance (class)			E2			
Earthing Switch			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	20		16	
Peak value	I_p	[kA]	50		40	
Main switch making capacity (peak value)	I_{ma}	[kA]	50		40	
Earthing Switch Category						
Mechanical endurance			1000x (M0)			
Cycles of operations (Short-circuit making current)- class			E2			

(1) 1 s and 3 s

Applications

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

Configuration

Cubicle

- ☐ IAC AFL (R) 20 kA 1 s
- ■ 1400 mm height cubicle

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density switch with aux. contacts

Driving mechanism

- ■ Actuating levers
- ■ lsf-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
- ☐ lsf Motor-type motorised
  mechanism
- ■ Lockable mechanisms
- ■ Capacitive voltage indicator with
  cont. 3 ph. permanent indication
- ☐ Low energy trip release at 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
- ☐ Rear absorber channel for
  installation on closed floor
  (Total depth: 1119 mm)

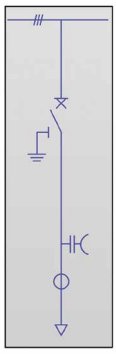
Control box

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

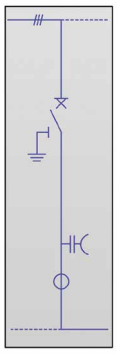
■ Standard equipment
☐ Optional equipment

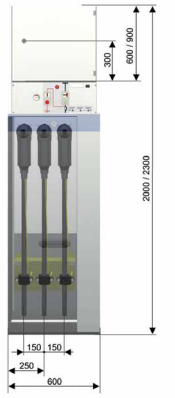
Dimensions

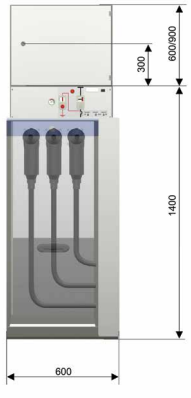
gae-1lsf

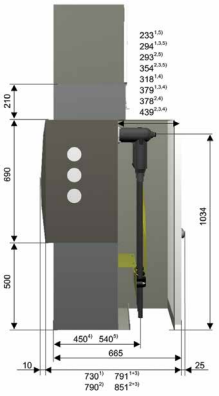


gae-1lsfg









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

[mm]

225 kg / 255 kg

Isv-type **gae**630

Vacuum circuit breaker (VCB) cubicle and bus sectionalizer cubicle with vacuum breaker

Modular and extensible CB protection cubicle, equipped with a vacuum circuit breaker (VCB) in series with a three-position disconnector 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			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Feeder	I_r	[A]	630			
Rated short-duration power frequency withstand voltage						
Phase-to-earth and between phases	U_d	[kV]	20	28	38	50
Across isolating distance	U_d	[kV]	23	32	45	60
Rated lightning impulse withstand voltage						
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		AFL(R) 20 kA 1 s			
Circuit-breaker			**IEC 62271-100**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[(1)]			
Peak value	I_p	[kA]	50			
Rated breaking capacity and making capacity						
Mainly active current rated breaking capacity	I_1	[A]	630			
Short-circuit breaking capacity	I_{sc}	[kA]	20			
Main switch making capacity (peak value)	I_{ma}	[kA]	50			
Rated cable-charging breaking current	I_c	[A]	50			
Rated operating sequence						
Without reclosing			O - 0.3 s - CO - 15 s - CO			
With reclosing			O - 3 min - CO - 15 s - CO			
Circuit-breaker category						
Mechanical endurance (operations-class)			10 000x (M2)			
Electrical endurance (class)			E2			
Switch-disconnector			**IEC 62271-102**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[(1)]			
Peak value	I_p	[kA]	50			
Switch-disconnector Category						
Mechanical endurance			2000x (M1)			
Earthing Switch			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	20[(1)]			
Peak value	I_p	[kA]	50			
Main switch making capacity (peak value)	I_{ma}	[kA]	50			
Earthing Switch Category						
Mechanical endurance			1000x (M0)			
Cycles of operations (Short-circuit making current)- class			E2			

[(1)] 1 s and 3 s

Applications

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

Configuration

Cubicle

- ☐ IAC AFL(R) 20 kA 1 s
- ■ 1400 mm height cubicle

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density switch with aux. contacts

Driving mechanism

- ■ Actuating spring charging lever
- ■ lsv-type manual mechanism
- ■ Aux. switch for CB: max. 9 NO/ 9 NC
- ☐ Aux. switch for DS: max. 4 NO/ 4 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
- ☐ Trip element ON (standard)
- ■ 1. Trip element OFF
- ☐ 2. Trip element OFF
- ☐ Low energy trip release at 0.5 or 0.1 Ws
- ☐ Signalling switch "mech. ON-push-button activated"

Additional interlocks:

- ■ Standard IEC 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)
- ■ Capacitive voltage indicator with cont. 3 ph. permanent indication
- ☐ VTs on cable compartment for outgoing voltage measurement

Pressure relief duct

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

Control box

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

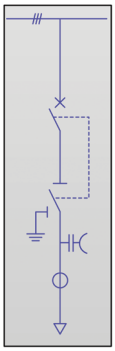
Options

- ☐ Cable connector acc. to agreement/client's spec
- ☐ Surge arrester acc. to agreement/client's spec
- ☐ Double cable connector
- ☐ VTs on top for busbar voltage measurement

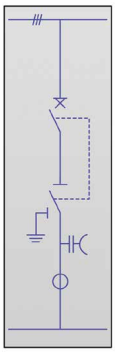
■ Standard equipment
☐ Optional equipment

Dimensions

gae-1lsv



gae-1lsvg



[mm]

330 kg

Isv3-**type gae**630

Vacuum circuit breaker (VCB) cubicle and bus sectionalizer cubicle with vacuum breaker

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

Electrical characteristics			**IEC**			
Rated voltage	U_r	[kV]	**7.2**	**12**	**17.5**	**24**
Rated frequency	f_r	[Hz]	**50 / 60**			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Feeder	I_r	[A]	250 - 630			
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	20	28	38	50
Across isolating distance	U_d	[kV]	23	32	45	60
Rated lightning impulse withstand voltage						
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		AFL(R) 20 kA 1 s			
Circuit-breaker			**IEC 62271-100**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[(1)]			
Peak value	I_p	[kA]	50			
Rated breaking capacity and making capacity						
Mainly active current rated breaking capacity	I_1	[A]	630			
Short-circuit breaking capacity	I_{sc}	[kA]	20			
Main switch making capacity (peak value)	I_{ma}	[kA]	50			
Rated cable-charging breaking current	I_c	[A]	50			
Rated operating sequence						
Without reclosing			O - 3 min - CO - 3 min - CO			
Circuit-breaker category						
Mechanical endurance (operations-class)			2000x (M1)			
Electrical endurance (class)			E2			
Switch-disconnector			**IEC 62271-102**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[(1)]			
Peak value	I_p	[kA]	50[(1)]			
Switch-disconnector Category						
Mechanical endurance			10 000x (M2)			
Earthing Switch			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	20			
Peak value	I_p	[kA]	50			
Main switch making capacity (peak value)	I_{ma}	[kA]	50			
Earthing Switch Category						
Mechanical endurance			1000x (M0)			
Cycles of operations (Short-circuit making current)- class			E2			

[(1)] 1 s and 3 s

Applications

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

Configuration

Cubicle

- ☐ IAC AFL(R) 20 kA 1 s
- ■ 1400 mm height cubicle

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density switch with aux. contacts

Side connection:

- ■ Two side extensibility

Driving mechanism

- ■ Actuating levers
- ■ Isv3-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
- ☐ Isv3 Motor-type motorised
  mechanism
- ■ Lockable mechanisms
- ☐ Capacitive voltage indicator with
  cont. 3 ph. permanent indication
- ☐ Low energy 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
- ☐ Rear absorber channel for
  installation on closed floor
  (Total panel depth: 1119 mm)

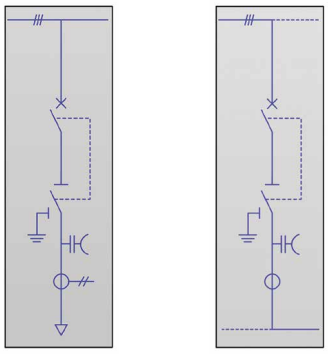
Control box

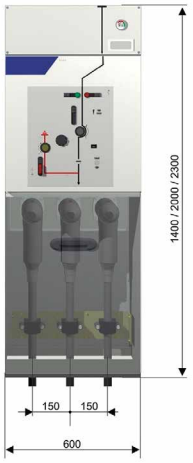
- ☐ Protection relay (acc. to
  agreement/client's spec.)
- ■ Without control box
- ☐ 300 mm height
- ☐ 600 mm height
- ☐ 900 mm height
- ☐ Assembly of control box acc.
  to agreement/client's spec.

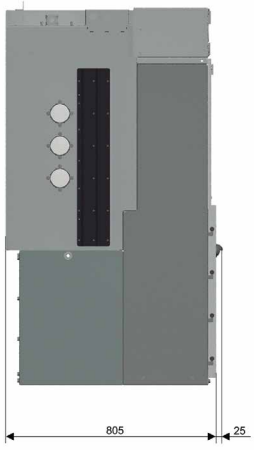
■ Standard equipment
☐ Optional equipment

Dimensions

gae-1Isv3 **gae**-1Isv3g







[mm]

225 kg

1a1-1h1-1h2-1e types **gae**630

1a1 Cable connection cubicle

Three pole busbars inside gas tank without switch.

1h1 Busbar riser cubicle

Bus riser for lsfg and **1**kg cubicles.

Three pole busbars inside gas tank without switch.

1h2 Busbar riser 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 sectionalizing and bus coupling functions in substations.

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

Configuration

Cubicle

- ☐ IAC AFL(R) 20 kA 1 s
- ■ 1400 mm height cubicle

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density 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	
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Feeder	I_r	[A]	630			
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	20	28	38	50
Rated lightning impulse withstand voltage						
Phase-to-earth and between phases	U_p	[kV]	60	75	95	125
Internal arc classification	IAC		AFL (R) 20 kA 1 s			
Earthing Switch [Optional]			**IEC 62271-102**			
Rated short-time withstand current (main circuit)						
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			
Earthing Switch Category						
Mechanical endurance			1000x (M0)			
Cycles of operations (Short-circuit making current)- class			E2			

Driving mechanism

- ■ Actuating levers
- □ 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)

Control box

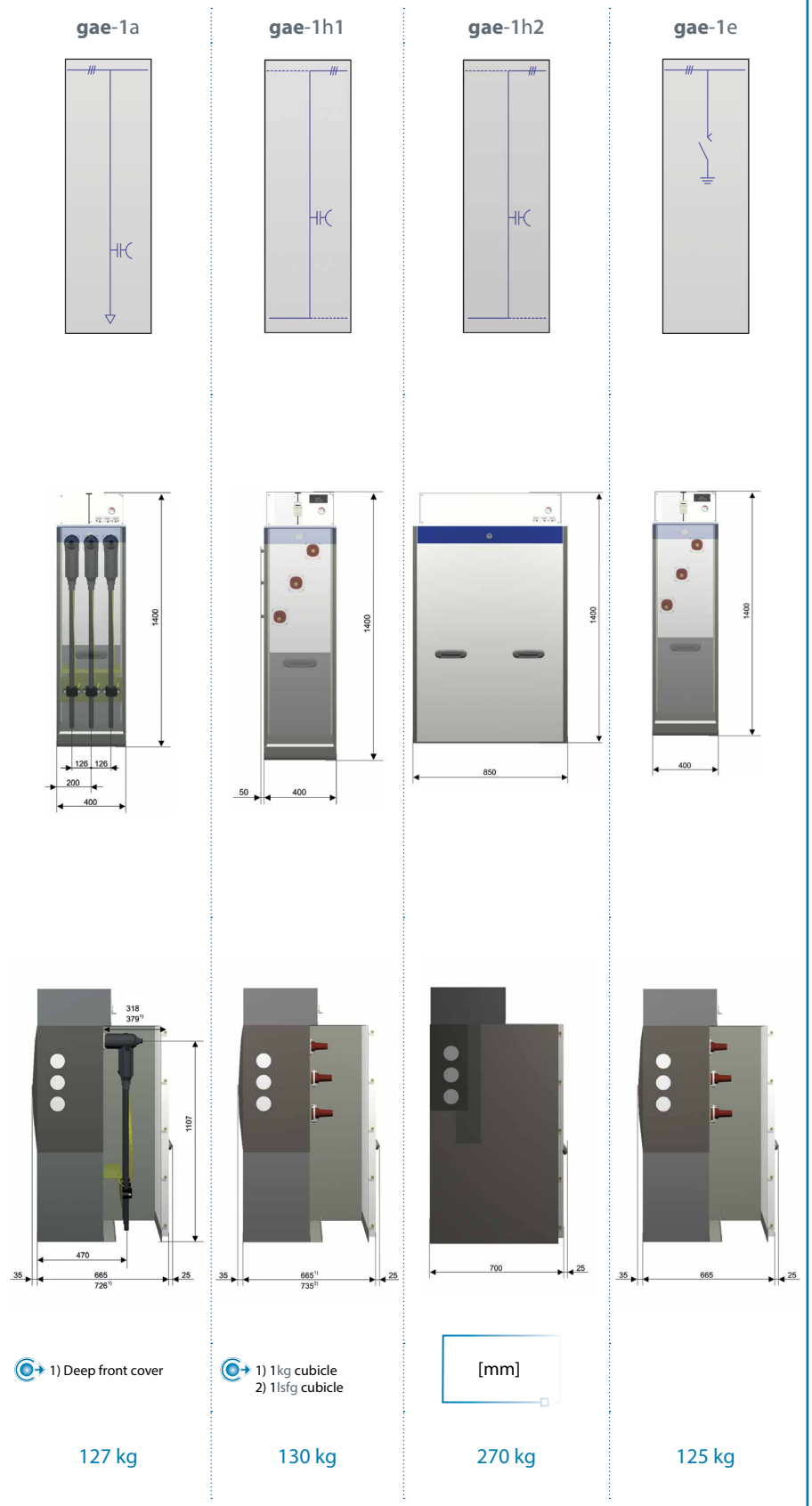
- ■ Without control box
- □ 300 mm height
- □ 600 mm height
- □ 900 mm height

Protection relay acc. to agreement

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

■ Standard equipment
□ Optional equipment

Dimensions



1) Deep front cover

1) 1kg cubicle
2) 1lsfg cubicle

[mm]

127 kg | 130 kg | 270 kg | 125 kg

m-**type gae**630

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			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	20	28	38	50
Rated lightning impulse withstand voltage						
Phase-to-earth and between phases	U_p	[kV]	60	75	95	125
Internal arc classification	IAC		AFL(R) 20 kA 1 s			
Rated short-time withstand current Value t_k= 1 s	I_r	[kA]	20[1]			

[1] 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(R) 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

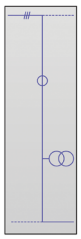
Metering transformers

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

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

1m**1**	
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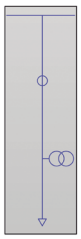
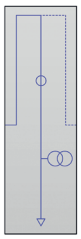
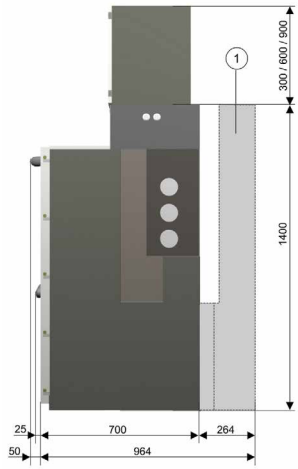
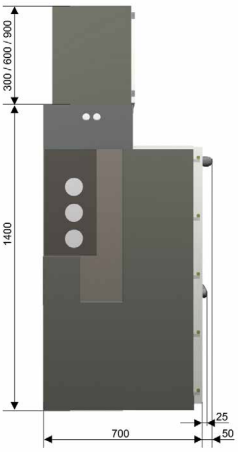
1m**4**	
1m**5**	
1m**5**ü	
1m**6**	

Dimensions



1) Pressure absorber channel (optional) with minimum relay cabinet height 600 mm



[mm]

■ 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 disconnector and one fuse protection function with a three-position switch disconnector and HRC fuses, housed in a single gas tank.

Compact cubicle with one fuse protection function with a three-position switch disconnector 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			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Feeder	I_r	[A]	630		-	
Output to transformer	I_r	[A]	-		200	
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	28	50	28	50
Across isolating distance	U_d	[kV]	32	60	32	60
Rated lightning impulse withstand voltage						
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		AFL(R) 20 kA 1 s			
Switch-disconnector (for k and ts)			**IEC 62271-103**		**IEC 62271-105**	
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20			
Value t_k= 3 s	I_k	[kA]	20			
Mainly active current rated breaking capacity	I_1	[A]	630		200	
Rated transfer current	I_{transf}	[kA]	-		1900	1500
Cable charging-breaking current	I_{4a}	[A]	50		-	
Closed-loop breaking current	I_{loop}	[A]	630		-	
Earth fault breaking current	I_{ef1}	[A]	160		-	
Cable- & line-charging breaking current under earth fault conditions	I_{ef2}	[A]	100		-	
Main switch making capacity (peak value)	I_{ma}	[kA]	50		-	
Switch category						
Mechanical endurance			1000x (M1)			
Cycles of operations - class			E3			
Earthing Switch (for k, ts and a)			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	20			
Value t_k= 3 s	I_k	[kA]	20			
Earthing switch making capacity (peak value)	I_{ma}	[kA]	50			
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)			
Cycles of operations (Short-circuit making current)- class			E2			
Earthing switch after the fuse (for ts)			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	2.5			
Earthing switch making capacity (peak value)	I_{ma}	[kA]	6.3			
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)[2]			
Cycles of operations (Short-circuit making current)- class			E2			

* Also available 7.2 and 17.5 kV on request

Applications

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

Configuration

Cubicle

- ☐ IAC AFL(R) 20 kA 1 s
- ■ 1400 mm height cubicle
- ☐ 1050 mm height cubicle (**ga**-c)

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density switch 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. 4 NO/ 4 NC
- ☐ Aux. switch for ES: max. 3 NO/ 3 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
- ■ Type-A bushings
- ☐ 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)

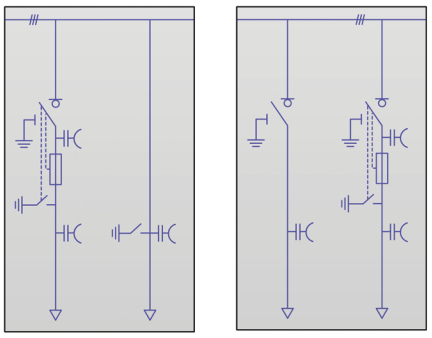
Control box

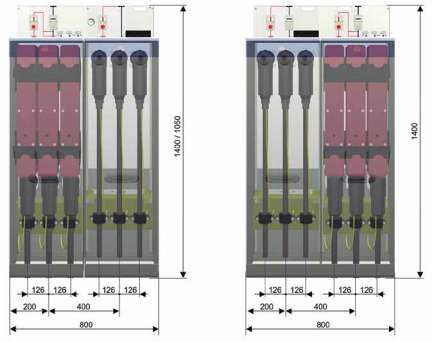
- ■ Without control box
- ☐ 300 mm height
- ☐ 600 mm height
- ☐ 900 mm height

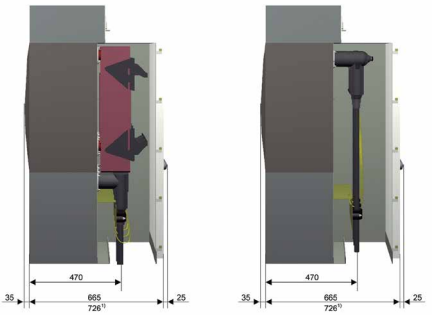
■ Standard equipment
☐ Optional equipment

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 **gae**630

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			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Feeder	I_r	[A]	630		-	
Output to transformer	I_r	[A]	-		200	
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	28	50	38	50
Across isolating distance	U_d	[kV]	32	60	32	60
Rated lightning impulse withstand voltage						
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		AFL(R) 20 kA 1 s			
Switch-disconnector (for k and ts)			**IEC 62271-103**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]			
Peak value	I_p	[kA]	50			
Mainly active load-breaking current	I_{load}	[A]	630		200	
Rated transfer current	I_{transf}	[kA]	-		1900	1100
Cable charging-breaking current	I_{cc}	[A]	50		-	
Closed-loop breaking current	I_{loop}	[A]	630		-	
Earth fault breaking current	I_{ef1}	[A]	160		-	
Cable- & line-charging breaking current under earth fault conditions	I_{ef2}	[A]	100		-	
Main switch making capacity (peak value)	I_{ma}	[kA]	50		-	
Switch category						
Mechanical endurance			1000x (M1)			
Cycles of operations (Short-circuit making current)- class			E3			
Earthing Switch (for k, ts)			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]			
Peak value	I_p	[kA]	50			
Earthing switch making capacity (peak value)	I_{ma}	[kA]	50			
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)			
Cycles of operations (Short-circuit making current)- class			E2			
Earthing switch after the fuse (for ts)			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	2.5			
Earthing switch making capacity (peak value)	I_{ma}	[kA]	6.3			
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)[2]			
Cycles of operations (Short-circuit making current)- class			E2			

* Also available 7.2 and 17.5 kV on request [1] 1 s and 3 s

Applications

MV electrical distribution in open and close ring networks.

Configuration

Cubicle

- ☐ IAC AFL(R) 20 kA 1 s
- ■ 1400 mm height cubicle
- ☐ 1050 mm height cubicle (**ga**-c)

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density switch with aux. contacts

Cable bushings:

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

Type of side connection:

- ☐ Female bushing
  - ☐ Right

Driving mechanism

- ■ Actuating levers
- ■ k-type manual mechanism
- ■ 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)
- ☐ 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
- ■ Type-A bushing for ts
- ☐ 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
- ☐ Rear absorber channel for installation on closed floor (Total depth: 1119 mm)

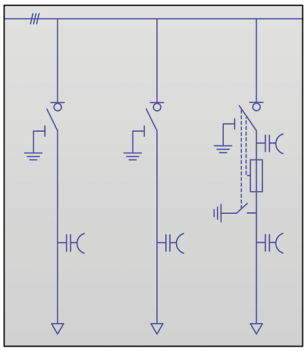
Control box

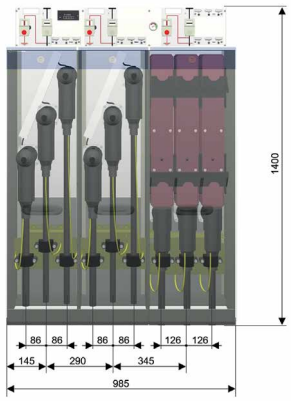
- ■ Without control box
- ☐ 300 mm height
- ☐ 600 mm height
- ☐ 900 mm height

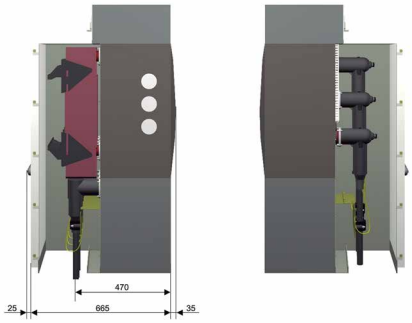
■ Standard equipment
☐ Optional equipment

Dimensions

ga / gae-2k1ts







[mm]

298 kg

2k1lsf(g) type **ga** and **gae**630

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		1lsf	
Rated voltage*	U_r	[kV]	**12**	**24**	**12**	**24**
Rated frequency	f_r	[Hz]	50 / 60			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Feeder	I_r	[A]	630		250 - 630	
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	28	50	28	50
Across isolating distance	U_d	[kV]	32	60	32	60
Rated lightning impulse withstand voltage						
Phase-to-earth and between phases	U_p	[kV]	75	125	95	125
Across isolating distance	U_p	[kV]	85	145	110	145
Internal arc classification	IAC		AFL(R) 20 kA 1 s			
Switch-disconnector (for k)			**IEC 62271-103**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]			
Peak value	I_p	[kA]	50			
Mainly active load-breaking current	I_{load}	[A]	630			
Cable charging-breaking current	I_{cc}	[A]	50			
Closed-loop breaking current	I_{loop}	[A]	630			
Earth fault breaking current	I_{ef1}	[A]	160			
Cable- & line-charging breaking current under earth fault conditions	I_{ef2}	[A]	100			
Main switch making capacity (peak value)	I_{ma}	[kA]	50			
Switch category						
Mechanical endurance			1000x (M1)			
Cycles of operations class			E3/E1			
Circuit-breaker (for lsf)			**IEC 62271-100**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]		20[1]	16[1]
Peak value	I_p	[kA]	50		50 / 40	
Rated breaking capacity and making capacity						
Mainly active current rated breaking capacity	I_{load}	[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_{cc}	[A]	50			
Rated operating sequence						
Without reclosing			O - 3 min - CO - 3 min - CO			
Circuit-breaker category						
Mechanical endurance (operations-class)			2000x (M1)			
Electrical endurance (class)			E2			
Earthing Switch (for k, lsf)			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]		20[1]	16[1]
Peak value	I_p	[kA]	50		50	40
Earthing switch making capacity (peak value)	I_{ma}	[kA]	50		50	40
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)			
Cycles of operations class			E2			

* Also available 7.2 and 17.5 kV on request [1] 1 s and 3 s

Applications

MV electrical distribution in open and close ring networks.

Configuration

Cubicle

- ☐ Internal arc IAC AFL (R)
  ☐ 16 kA 1s ☐ 20 kA 1s
- ■ 1400 mm height cubicle
- ☐ 1050 mm height cubicle (**ga**-c)

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density switch 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
- ■ lsf-type manual mechanism
- ☐ Aux. switch for lbs and lsf: max. 4 NO / 4 NC
- ☐ Aux. switch for ES: max. 3 NO / 3 NC
- ☐ Shunt trip release (AC / DC)
- ☐ Aux. switch for trip indication
- ☐ k-Motor-type motorised mechanism
- ☐ lsf-Motor type motorised mechanism
- ☐ Lockable mechanisms
- ☐ Capacitive voltage indicator with cont. 3 ph. permanent indication
- ☐ Low energy trip release at 0.1 Ws
- ☐ Undervoltage release (non delayed)

Additional interlocks:

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

Cable compartment

- ■ 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

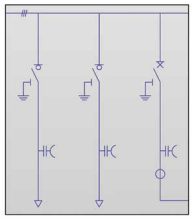
- ■ In the cable cellar, open panel bottom
- ☐ Rear absorber channel for installation on closed floor (Total panel depth: 1119 mm)

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

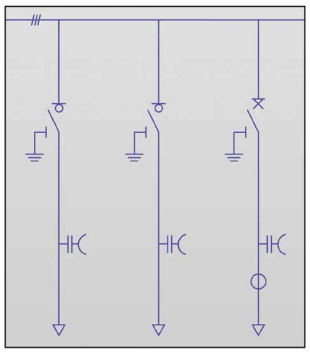
2k1lsfg

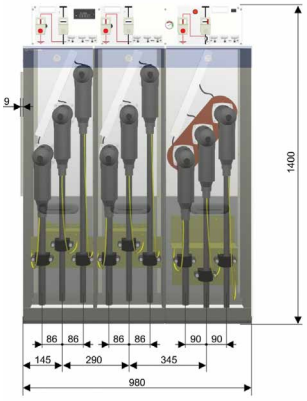


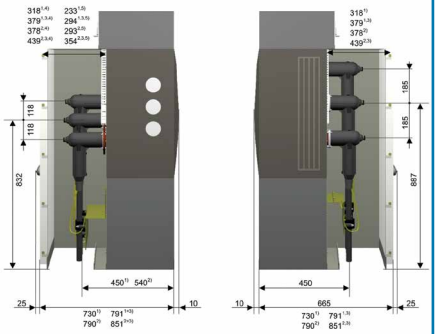
■ Standard equipment
☐ Optional equipment

Dimensions

ga / **gae**-2k1lsf







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

[mm]

355 kg

1k1lsv3 (g) and 2k1lsv3 (g)

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		1lsv3	
Rated voltage*	U_r	[kV]	**12**	**24**	**12**	**24**
Rated frequency	f_r	[Hz]	50 / 60			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Feeder	I_r	[A]	630		250 - 630	
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	28	50	28	50
Across isolating distance	U_d	[kV]	32	60	32	60
Rated lightning impulse withstand voltage						
Phase-to-earth and between phases	U_p	[kV]	75	125	95	125
Across isolating distance	U_p	[kV]	85	145	110	145
Internal arc classification	IAC		AFL (R) 20 kA 1 s			
Switch-disconnector (for k)			**IEC 62271-103**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]			
Peak value	I_p	[kA]	50			
Mainly active load-breaking current	I_{load}	[A]	630			
Cable charging-breaking current	I_{cc}	[A]	50			
Closed-loop breaking current	I_{loop}	[A]	630			
Earth fault breaking current	I_{ef1}	[A]	160			
Cable- & line-charging breaking current under earth fault conditions	I_{ef2}	[A]	100			
Main switch making capacity (peak value)	I_{ma}	[kA]	50			
Switch category						
Mechanical endurance			1000x (M1)			
Cycles of operations class			E3			
Circuit-breaker (for lsv3)			**IEC 62271-100**			
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]			
Peak value	I_p	[kA]	50			
Rated breaking capacity and making capacity						
Mainly active current rated breaking capacity	I_{load}	[A]	250/630			
Short-circuit breaking capacity	I_{sc}	[kA]	20			
Main switch making capacity (peak value)	I_{ma}	[kA]	50			
Rated cable-charging breaking current	I_{cc}	[A]	50			
Rated operating sequence						
Without reclosing			O - 3 min - CO - 3 min - CO			
Circuit-breaker category						
Mechanical endurance (operations-class)			2000x (M1)			
Electrical endurance (class)			E2			
Earthing Switch (for k, lsv3)			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]			
Peak value	I_p	[kA]	50			
Earthing switch making capacity (peak value)	I_{ma}	[kA]	50			
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)			
Cycles of operations class			E2			

* Also available 7.2 and 17.5 kV on request [1] 1 s and 3 s

Applications

MV electrical distribution in open and close ring networks.

Configuration

Cubicle

- ☐ IAC AFL(R) 20 kA 1 s
- ■ 1400 mm height cubicle
- ☐ 1050 mm height cubicle (**ga**-c)

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density switch with aux. contacts

Cable bushings:

- ☐ Horizontal
- ■ Diagonal
- ■ Capacitive voltage tap

Side connection:

- ■ Non-extensible

Driving mechanism

- ■ Actuating levers
- ■ k-type manual mechanisms
- ■ lsv3-type manual mechanism
- ☐ Aux. switch for lbs: max. 3 NO / 3 NC
- ☐ Aux. switch for ES: max. 3 NO / 3 NC
- ☐ Shunt trip release (AC / DC)
- ☐ Aux. switch for trip indication
- ☐ k-Motor-type motorised mechanism
- ☐ lsv3-Motor type motorised mechanism
- ☐ Lockable mechanisms
- ☐ Capacitive voltage indicator with cont. 3 ph. permanent indication
- ☐ Low energy trip release 0.1 Ws
- ☐ Undervoltage release (non delayed)

Additional interlocks:

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

Cable compartment

- ■ 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

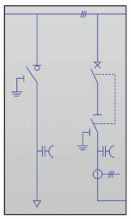
- ■ In the cable cellar, open panel bottom
- ■ Arc fault proof cable compartment
- ☐ Rear absorber channel for installation on closed floor (Total panel depth: 1119 mm)

Control box

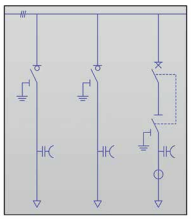
- ☐ Protection relay (acc. to agreement/client's spec.)
- ☐ Without control box
- ☐ 300 mm height
- ☐ 350 mm height
- ☐ 600 mm height
- ☐ 900 mm height
- ☐ Assembly of control box acc. to agreement/client's spec.

Options

1k1lsv3g



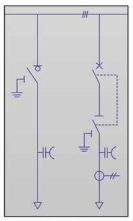
2k1lsv3g



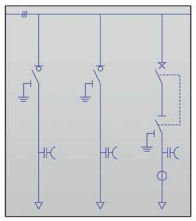
■ Standard equipment
☐ Optional equipment

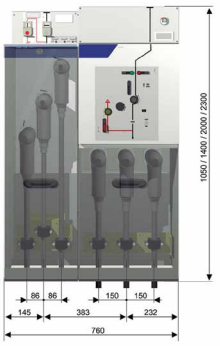
Dimensions

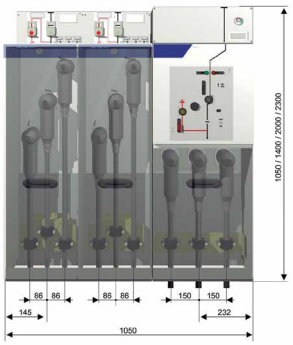
ga-1k1lsv3



ga-2k1lsv3







[mm]

3k and 4k type **ga** and **gae**630

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	
Rated current				
General busbar and cubicle interconnection	I_r	[A]	630	
Feeder	I_r	[A]	630	
Rated short-duration power frequency withstand voltage (1 min)				
Phase-to-earth and between phases	U_d	[kV]	28	50
Across isolating distance	U_d	[kV]	32	60
Rated lightning impulse withstand voltage				
Phase-to-earth and between phases	U_p	[kV]	75	125
Across isolating distance	U_p	[kV]	85	145
Internal arc classification	IAC		AFL(R) 20 kA 1 s	
Switch-disconnector			**IEC 62271-103**	
Rated short-time withstand current (main circuit)				
Value t_k= 1 s	I_k	[kA]	20(1)	
Peak value	I_p	[kA]	50	
Mainly active load-breaking current	I_{load}	[A]	630	
Cable charging-breaking current	I_{cc}	[A]	60	
Closed-loop breaking current	I_{loop}	[A]	630	
Earth fault breaking current	I_{ef1}	[A]	160	
Cable- & line-charging breaking current under earth fault conditions	I_{ef2}	[A]	100	
Main switch making capacity (peak value)	I_{ma}	[kA]	50(1)	
Switch category				
Mechanical endurance			1000x (M1)	
Cycles of operations (Short-circuit making current)- class			E3	
Earthing Switch			**IEC 62271-102**	
Rated short-time withstand current (earthing circuit)				
Value t_k= 1 s	I_k	[kA]	20(1)	
Peak value	I_p	[kA]	50	
Earthing switch making capacity (peak value)	I_{ma}	[kA]	50	
Earthing Switch Category				
Mechanical endurance (manual)			1000x (M0)	
Cycles of operations (Short-circuit making current)- class			E2	

* Also available 7.2 and 17.5 kV on request (1) 1 s and 3 s

Applications

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

Configuration

Cubicle

- ☐ IAC AFL(R) 20 kA 1 s
- ■ 1400 mm height cubicle
- ☐ 1050 mm height cubicle (**ga**-c)

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density switch 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

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
- ☐ Additional base (h: 400 mm) with
  pressure absorber channel
- ☐ Rear absorber channel for
  installation on closed floor
  (Total depth: 1119 mm)

Control box

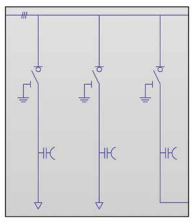
- ■ Without control box
- ☐ 300 mm height
- ☐ 600 mm height
- ☐ 900 mm height

Options

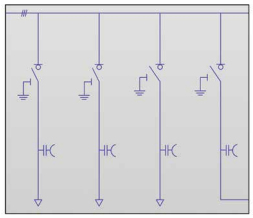
3kb and 4kb

With horizontal bushings

3kg



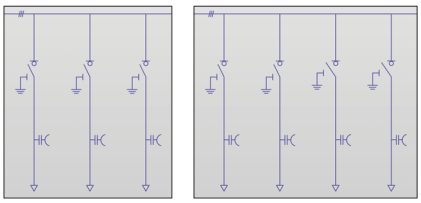
4kg

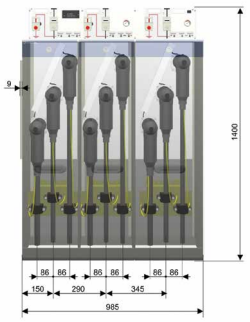


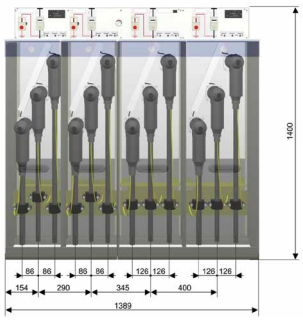
■ Standard equipment
☐ Optional equipment

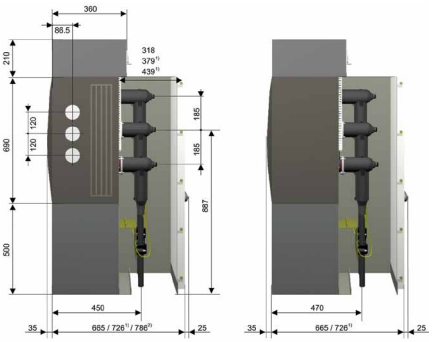
Dimensions

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			
Rated current						
General busbar and cubicle interconnection	I_r	[A]	630			
Feeder	I_r	[A]	630		-	
Output to transformer	I_r	[A]	-		200	
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth and between phases	U_d	[kV]	28	50	28	50
Across isolating distance	U_d	[kV]	32	60	32	60
Rated lightning impulse withstand voltage						
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		AFL(R) 20 kA 1 s			
Switch-disconnector (for k and ts)			**IEC 62271-103**		**IEC 62271-105**	
Rated short-time withstand current (main circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]			
Peak value	I_p	[kA]	50			
Mainly active load-breaking current	I_{load}	[A]	630		200	
Rated transfer current	I_{transf}	[A]	-		1900	1100
Cable charging-breaking current	I_{cc}	[A]	60		-	
Closed-loop breaking current	I_{loop}	[A]	630		-	
Earth fault breaking current	I_{ef1}	[A]	160		-	
Cable- & line-charging breaking current under earth fault conditions	I_{ef2}	[A]	100		-	
Main switch making capacity (peak value)	I_{ma}	[kA]	50		-	
Switch category						
Mechanical endurance			1000x (M1)			
Cycles of operations (Short-circuit making current)- class			E3			
Earthing Switch (for k, ts)			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	20[1]			
Peak value	I_p	[kA]	50			
Earthing switch making capacity (peak value)	I_{ma}	[kA]	50			
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)			
Cycles of operations (Short-circuit making current)- class			E2			
Earthing switch after the fuse (for ts)			**IEC 62271-102**			
Rated short-time withstand current (earthing circuit)						
Value t_k= 1 s	I_k	[kA]	2.5			
Earthing switch making capacity (peak value)	I_{ma}	[kA]	6.3			
Earthing Switch Category						
Mechanical endurance (manual)			1000x (M0)[2]			
Cycles of operations (Short-circuit making current)- class			E2			

* Also available 7.2 and 17.5 kV on request [1] 1 s and 3 s

Applications

MV electrical distribution in open and close ring networks.

Configuration

Cubicle

- ☐ IAC AFL(R) 20 kA 1 s
- ■ 1400 mm height cubicle
- ☐ 1050 mm height cubicle (**ga**-c)

Gas tank

- ■ Stainless steel tank

Gas pressure indicator:

- ■ Manometer
- ☐ Density switch with aux. contacts

Cable bushings:

- ■ Diagonal
- ■ 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. 4 NO / 4 NC
- ☐ Aux. switch for ES: max. 3 NO / 3 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
- ☐ Type-A bushing for ts
- ■ 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
- ☐ Rear absorber channel for installation on closed floor (Total depth: 1119 mm)

Control box

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

Options

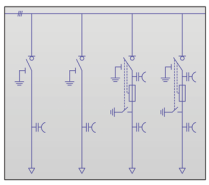
ga-2kb2ts and **ga**-3kb1ts

kb cable feeder with horizontal bushings

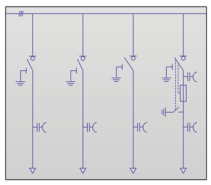
■ Standard equipment
☐ Optional equipment

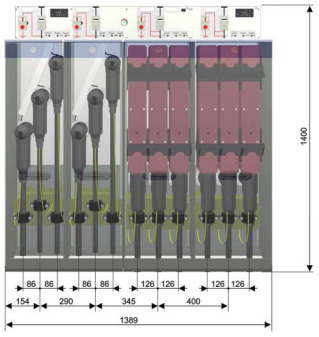
Dimensions

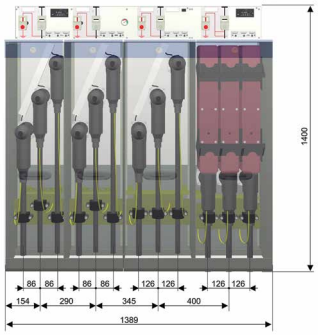
ga / **gae**-2k2ts

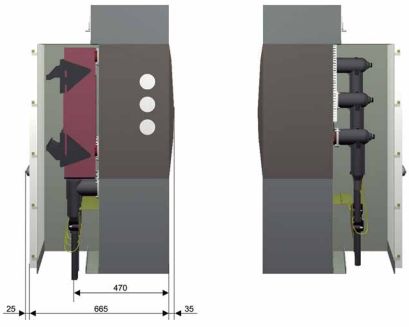


ga / **gae**-3k1ts









[mm]

399 kg / 366 kg

Other components and accessories

Indicators

To check for electrical isolation or to perform a voltage test in accordance with IEC 62271-213, 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 phase comparison or interface testing, the devices must comply with the following standards: IEC62271-213 or IEC61243-5 (outdated)

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 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 requirements according to IEC 62271-213 and is suitable for phase testing using an LRM phase comparator. A captive shroud protects the test sockets against dirt, dust and moisture.

System WEGA, Horstmann

The integrated voltage detecting system WEGA complies with the requirements for capacitive voltage detecting systems of IEC 62271-213. 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 **gae**630 system switchgear.

Cable connections

Cable connectors

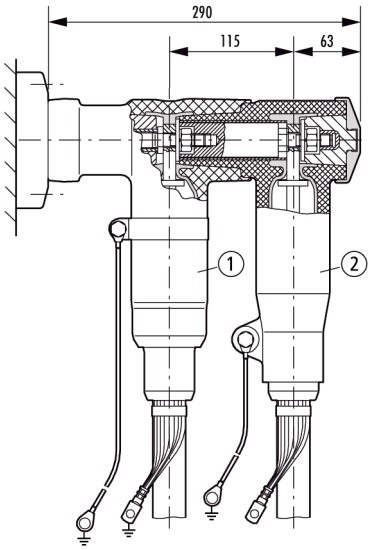
In **ga** and **gae**630 system panel, T-connectors are to be used at the discretion of the operator in cable/connection panels or circuit-breaker panels. To be connected to bushings acc. to DIN EN 50181 connection type C (630 A) with outside taper and screw contact (M16).

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

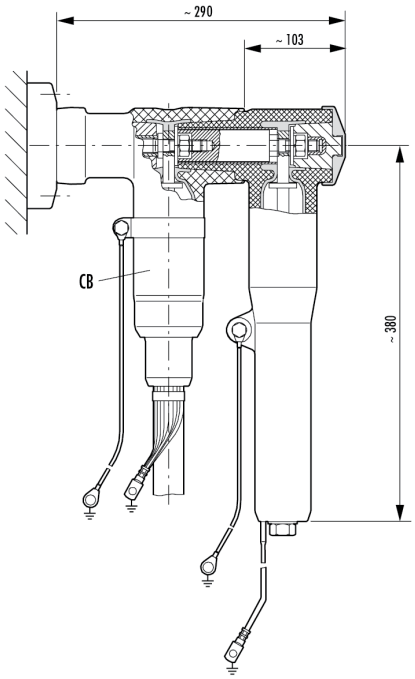
Depending on the mounting depth of the cable connection compartments, deep front covers or deep cable connection compartments may be necessary. Further connection possibilities are also available on request.

Cable connectors (for 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)

For **ga** and **gae**630 -ts type switchgears, type-A connectors are to be used at the discretion of the operator to be connected to bushings according to DIN EN 50181 connection type-A (250 A) with outside taper.

Cable connectors (for VCB panels type lsv)

Common T-cable connectors are used for connecting single phase or trifurcated three-phase cables. Cable cross-sections up to 630 mm^2 can be connected. Double cable connections per phase can only be made with an extended cable compartment cover, as the compartment depth is just 265 mm.

HRC Fuses

Fuse base and transformer cable connection

The fuse base on both the **ga** and **gae**630 systems panels is designed as a solid insulating housing outside the gastank. The housing is made of Epoxy resin, which makes it track-proof and arc root-free. 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 fuses corresponding to **ga**/ **gae**630 selection table in accordance to DIN 43625 may be used, up to a diameter of 88 mm. Other HRC-fuses can only be used after consultation!

Spare parts and auxiliaries

Metal enclosure

Phase separation option

The phase separation PS in the cable connection compartments of the SF_6-insulated switchgear of types **ga** and **gae**630 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.

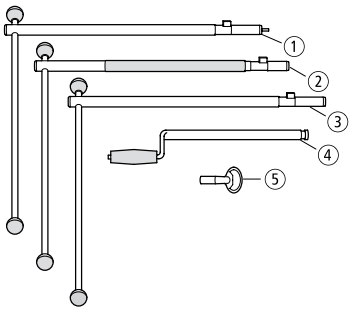
As a result the effects of a potential arc fault in the cable connection zone are considerably reduced. For earth fault compensated networks, the fault current will be limited to a one-phase earth fault current. Front covers with phase separation can be exchanged subsequently. Details on request.

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 **gae**630 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)

Coupling and bolt connection kits

Busbar coupling kit with double gasket

Display: 1 Phase

Busbar end cover with single gasket

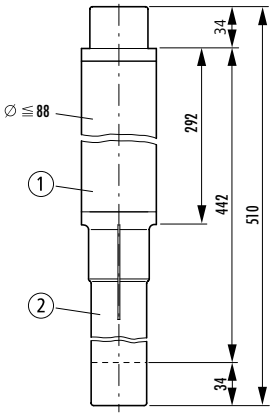
Display: 1 Phase

Parts for bolt connection of panels

Display: 1 Set

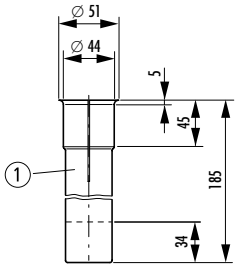
Fuse adapter

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
- Raising: Sling & lifting beams

- Ergonomic design for easy cubicle connection and floor fastening

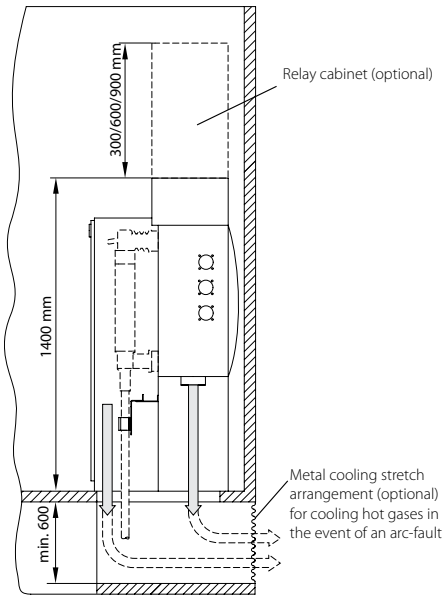
Inside buildings

- 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 **gae**630 switchgear for further details. Detailed installation plans on request.

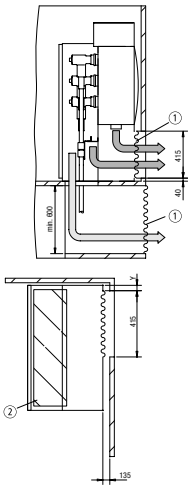
Pressure relief systems

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



Installation **ga** and **gae**630

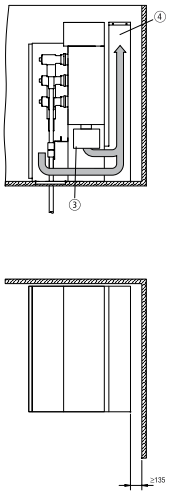
- With metal cooling stretch arrangement within pedestal
- Bottom open



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

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

- With rear absorber channel and metal absorber
- Bottom closed

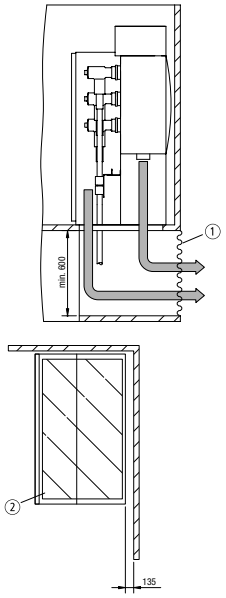


Pressure relief via rear absorber channel.

3. Metal absorber
4. Rear absorber channel

Installation ga and ga-c

- Without metal cooling stretch arrangement within pedestal
- Bottom open



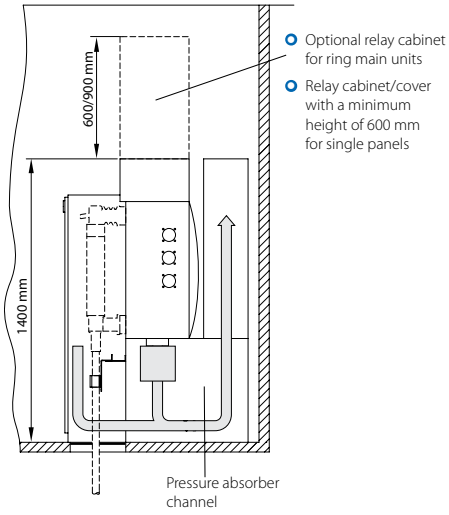
Pressure relief only into cable cellar/cable trench.

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

Switchgear height considerations

Minimal switchgear height **ga** and **gae**630 with pressure absorber channel

- **gae**630 single panels: Switchgear height 2000 mm with 600 mm relay box or cover
- **ga** and **gae**630 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.

Inside prefabricated transformer substations

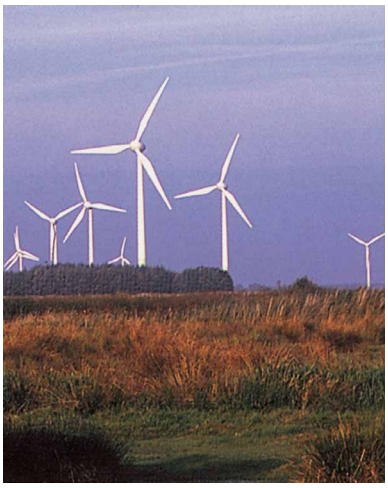
- Turnkey solutions
- Possibility of on-site installation of cubicles
- Wide range of transformer substation: Walk-in, kiosk, underground, etc.
- Possibility of having an operational substation in a short period of time

Inside containerised substations

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

Inside wind turbines

- Over 20 years of experience in wind energy



Commissioning and After Sales

Services

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 **gae**630 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_6 which allows full operation of the equipment throughout its service life, estimated at minimum 30 years (IEC 62271-200).

At the end of the product life cycle, the SF_6 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 62271-4, 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.

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