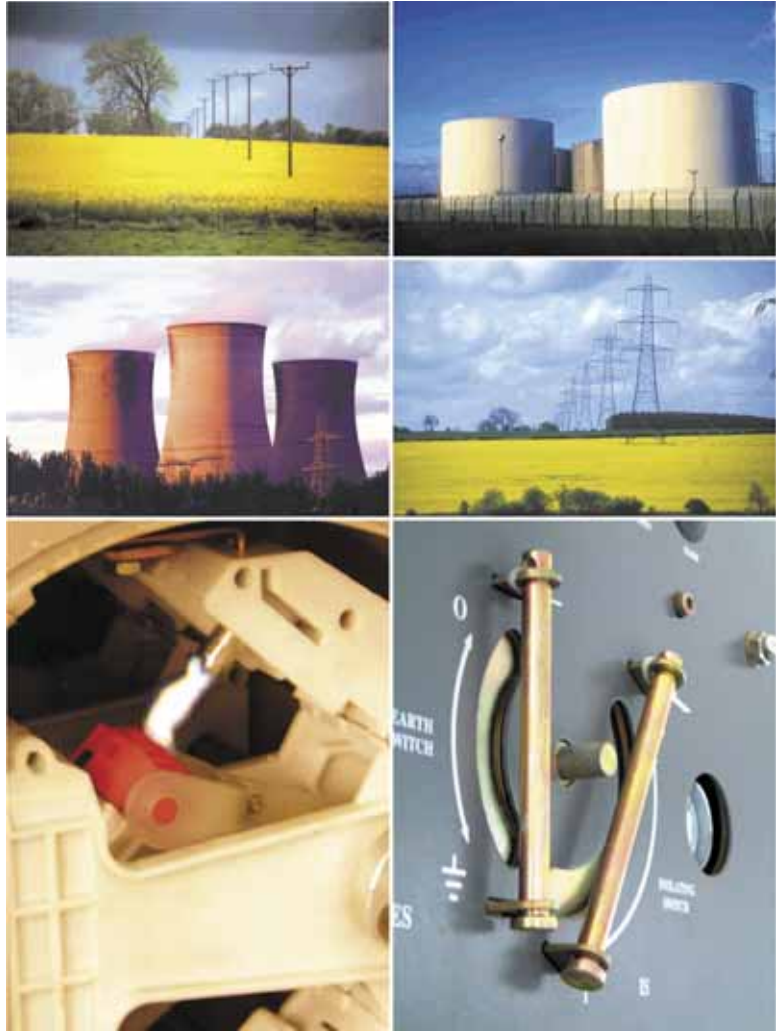


# Sf<sub>6</sub> Load Break Switch



12~24 kV  
Type GLBS SF<sub>6</sub> Load Break Switch  
Type LCA-G Metal Enclosed Switchgear

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**LKE**  
Medium  
Voltage  
Systems



FM 73638

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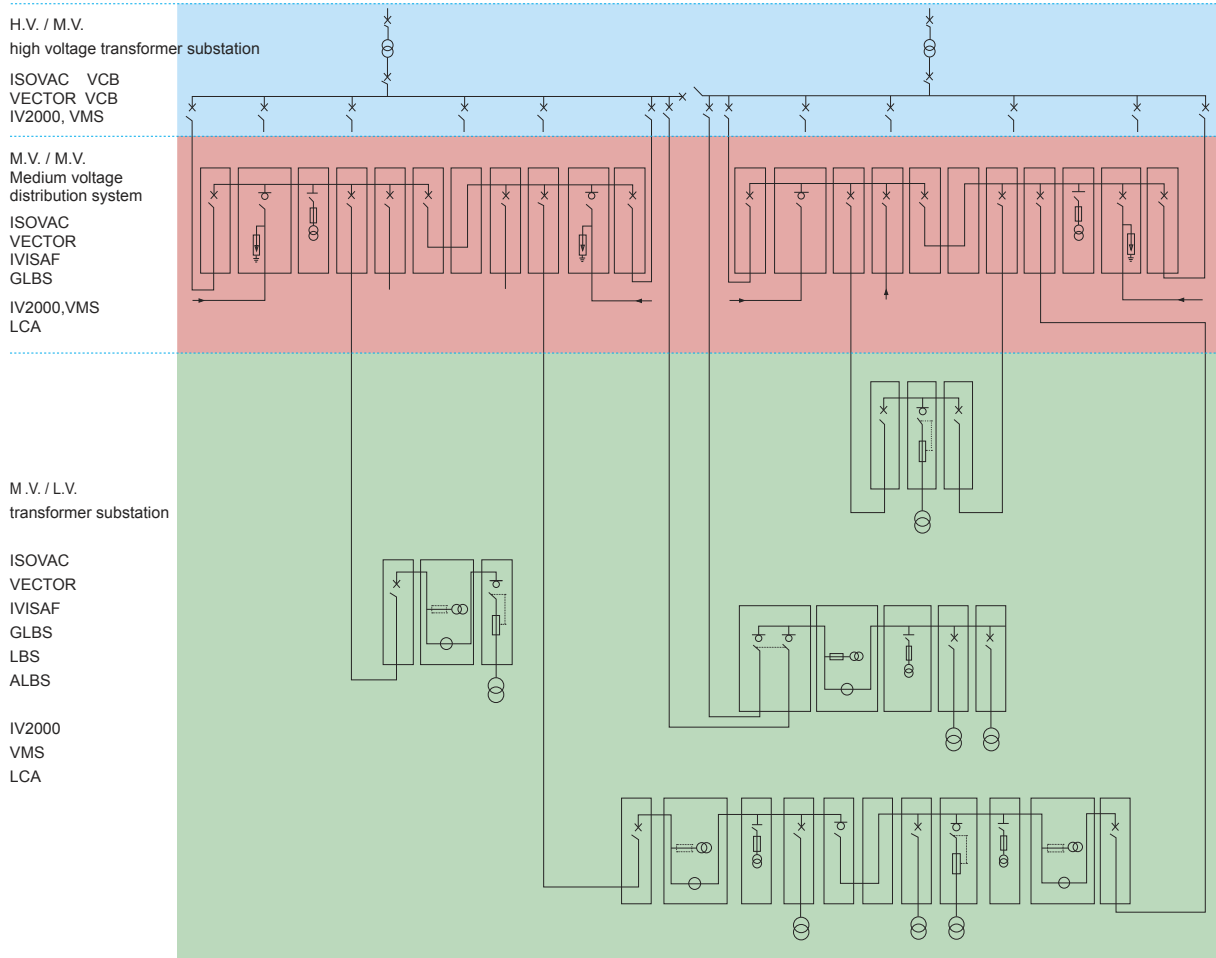
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## H.V. / M.V. power distribution system



LKE's medium voltage switchgear may be applied to the following sections of the power distribution network:

- LKE's ISOVAC series vacuum circuit breakers are suitable for application on the secondary side of the H.V. / M.V. transformer system.
- LKE's circuit breakers, vacuum load break switches and SF<sub>6</sub> load break switches are suitable for applications on the M.V. / M.V. power distribution system and ring main system.
- LKE's SF<sub>6</sub> load break switches and air load break switches are suitable for applications within M.V. / L.V. transformer substations.



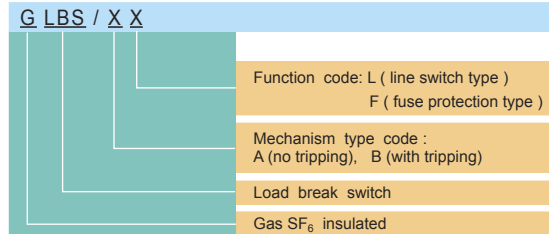
Type LCA-G top section

Type LCA-G ring main unit (RMU)



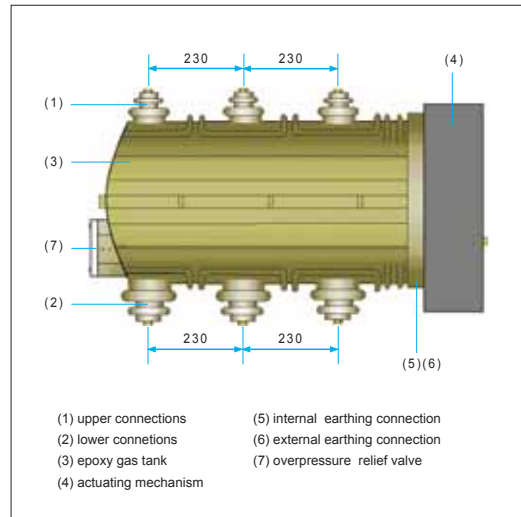
## Profile of GLBS load break switch

### Product code



Example: GLBS/AL, GLBS/BL, GLBS/BF

The **GLBS** is a SF<sub>6</sub> load break switch which relies on the chemical properties of SF<sub>6</sub> for insulation and arc quenching. SF<sub>6</sub> has proven its reliability and advantages in electrical power equipment for a long time. As an inert, electro-negative and non-inflammable gas with many physical and chemical advantage, it has been used for many years in circuit breakers on high-voltage systems and medium-voltage systems such as load-break switches and circuit breakers.



View of GLBS

The **GLBS** is a 12~24 kV medium voltage load break switch is designed for applications within indoor or outdoor medium voltage switchgear panels. It consists of a three position rotary switch mechanism mounted and sealed within an epoxy gas tank charged with SF<sub>6</sub> gas.

### The GLBS has the following features:

- High load breaking capacity (transfer current or maximum breaking capacity of 2600A).
- Large creepage distances and superior insulation properties.
- Arc proof and tested for internal arcing.
- Maintenance free or low maintenance requirements
- Compact dimensions.
- Rugged design ensures long mechanical and electrical life.
- Low gas pressure system requiring less than 1kg of SF<sub>6</sub> per switch.

### GLBS compliance with:

- IEC 129 (earthing switch)
- IEC265 (load break switch)
- IEC 420 (load break switch + fuses)



GLBS type load break switch (front view)



GLBS type load break switch (rear view)



## Technical parameters of the GLBS

### ■ GLBS/AL, GLBS/BL has the following parameters

table-1

Item		Unit	IEC standards				
Rated Voltage		kV	7.2	12	15	17.5	24
Withstand voltage to earth and between poles		kV	20	28	36	38	50
Withstand voltage across isolating distance		kV	28	32	45	45	60
Impulse withstand voltage to earth and between poles		kV	60	75	95	95	125
Impulse withstand voltage across isolating distance		kV	70	85	110	110	145
Rated frequency		Hz	50/60				
Rated current		A	630				
Rated short -time current (I <sub>k</sub> )	t <sub>k</sub> =1s systems	kA(max.)	25				
	t <sub>k</sub> =3s systems ( choice)	kA	20				
Making capacity		kA(max.)	50				
Electrical endurance		times	500				
Mechanical endurance		times	5000				
Temperature	panel including : auxilliary instruments and relays	°C	-40~70				
	panel excluding : auxilliary instruments and relays	°C	-5~55				
Rated SF <sub>6</sub> gas pressure (20 °C)		kPa	≥ 10				

### ■ GLBS/BF has the following parameters

table-2

Item		Unit	IEC standards				
Rated Voltage		kV	7.2	12	15	17.5	24
Withstand voltage to earth and between poles		kV	20	28	36	38	50
Withstand voltage across isolating distance		kV	28	32	45	45	60
Impulse withstand voltage to earth and between poles		kV	60	75	95	95	125
Impulse withstand voltage across isolating distance		kV	70	85	110	110	145
Rated frequency		Hz	50/60				
Rated current		A	630				
Rated short -time current (I <sub>k</sub> )	t <sub>k</sub> =1s systems	kA(max.)	25				
	t <sub>k</sub> =3s systems ( choice)	kA	20				
Making capacity		kA(max.)	50				
Max. breaking capacity (transfer current)		A	2600				
Rated short-circuit breaking current (fuses)		kA	31.5				
Electrical endurance		times	500				
Mechanical endurance		times	5000				
Temperature	panel including : auxilliary instruments and relays	°C	-40~70				
	panel excluding : auxilliary instruments and relays	°C	-5~55				
Rated SF <sub>6</sub> gas pressure (20 °C)		kPa	≥ 10				



## Epoxy gas tank

The epoxy gas tank of the **GLBS** is a permanently sealed system where the integrity of the seal is effective for 25 years in conformance with IEC298. Without additional maintenance or re-charging the gas tank depressurises at less than 10<sup>-10</sup> MPa/s or an annual rate of depressurisation of less than 0.01%. The switch does not require gas refilling within its service life.

The opening of the tank is sealed by a stainless steel lid bolted to the front of the tank. A specially designed “O” ring completes the seal and ensures the integrity of the gas tank.

A pressure relief valve is located at the rear of the gas tank. This feature allows for pressure relief if an arc fault occurs within the gas tank.



Copper conductors of the incoming and outgoing terminals and the earthing conductors are embedded within the epoxy material of the gas tank during moulding.



interior and side view of the gas tank

The design of the epoxy gas tank ensures that creepage distances are at 480mm or more, providing adequate insulation for systems with rated voltages of up to 24 kV.

An internal U-shaped copper wire rings the interior of the epoxy tank. The wire is positioned in the space between the fixed and moving contacts of the switch. This wire is connected to the earthing terminal of the switch. It ensures no leakage of current over the interior surface of the gas tank when the main contacts are in open position.

Internal U-shaped earthing copper wire connection which is positioned between the fixed contacts and moving contacts.



the interior of the epoxy gas tank



internal earthing connection



earthing connection terminal



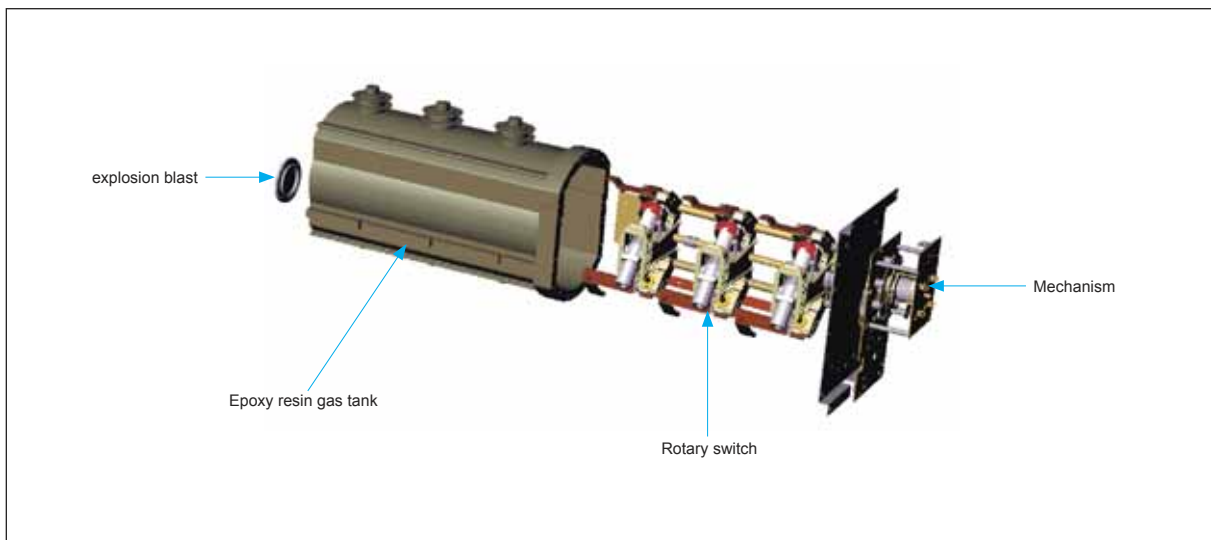
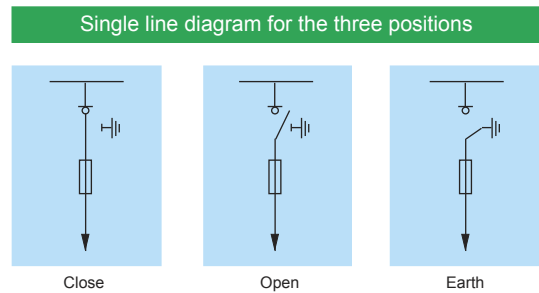
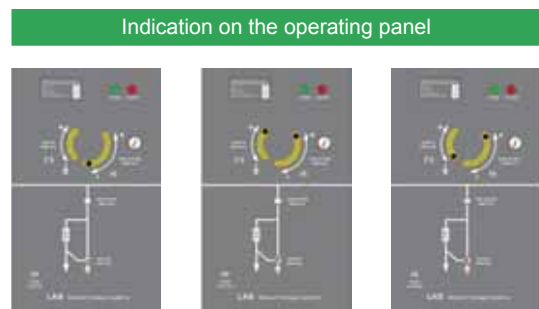
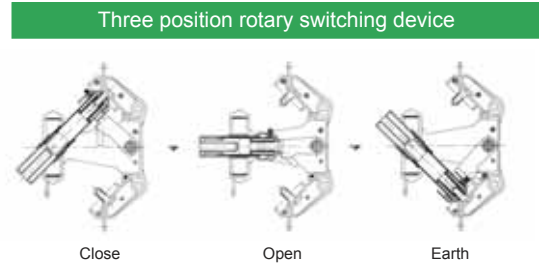
### Three position rotary switching device

The switching system of **GLBS** consists of a three phase, three position load-breaking and fault-making rotary switching device, the three positions being “close”, “open” and “earth”.

This rotary switching device is mounted within the epoxy gas tank and the tank is charged with SF<sub>6</sub> gas to the pressure of 0.03Mpa which allows the switch to break loads of up to 2600A at 12 kV or 1300A at 24kV. The rotary switching mechanism is also capable of a breaking capacity of 630A at 12 kV under normal atmospheric conditions, ie, without SF<sub>6</sub>.

The design of the three position rotary switch also meets insulation requirements for a 12 kV load break switch under normal atmospheric conditions as long as it remains mounted within the epoxy gas tank.

The three phases of the switch are actuated in unison by one main shaft. The shaft (within the gas tank) is coupled to the spring charged actuating mechanism (outside the gas tank) via an air tight bearing/coupling system.







## Actuating mechanism

**GLBS** is actuated by one of two types of spring charged drive mechanism. The two types of mechanism, designated A type and B type, are as follows :

A type mechanism can be operated manually or driven by a motor system to energise the charging spring for closing and opening operations. When not in operation, the spring remains in a de-energised state. This mechanism is not capable of instantaneous tripping and hence may not be fitted with a shunt trip coil.

B type mechanism can be operated manually or driven by a motor system to energise the charging spring for closing and opening operations. Upon closing, the opening spring remains energised for instantaneous tripping operations. This mechanism may be fitted with a shunt trip coil, Under-voltage tripping coil or HRC fuses with striking pin.

Motorisation is optional and if it is required, it should be indicated in the ordering information.

### The actuating mechanism of GLBS



A type mechanism

B type mechanism

### Mechanism is located at front of switch



### ■ Interlock system

The **GLBS** actuating mechanism is linked with the external earth switch as well as the panel door of the **LCA-G** so as to provide safety inter-locks which ensures that the operator may only access the panel when the system is isolated and earthed. The interlock system is in-built and comes with every **GLBS**.

The interlock system is a standard feature of the **GLBS**.

The access door of the LCA panel is linked by interlock with the GLBS so that it may only be opened when the switch is isolated and earthed







## Operating the GLBS

### ■ Operation

All operating positions and instructions are at the front of the unit. The **GLBS** switches are of the single break, fault make, load break type with three positions, "OPEN", "CLOSE" and "EARTH".

### ■ Operational sequence

To put the **GLBS** into operation, the operator must firstly close the panel door, secondly open the earth switch then finally closing the load break switch.

To terminate operation of the **GLBS** and access the service compartment, the operator should first open the load break switch, secondly close the earth switch before opening the panel door.

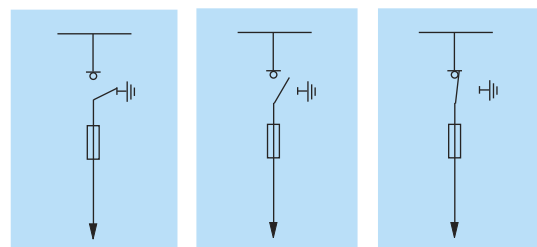
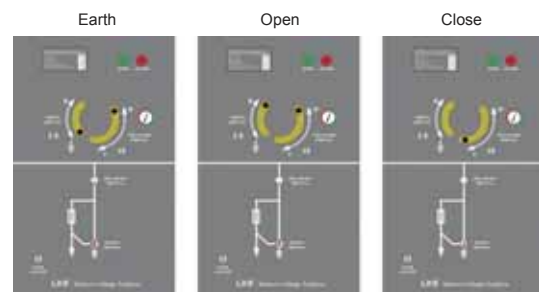
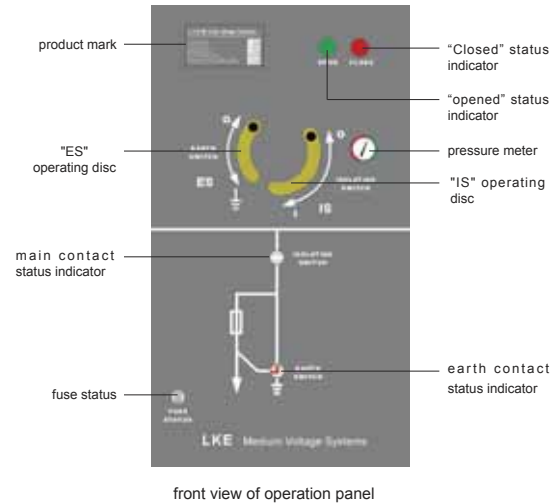
### ■ Resetting the switch

In instances when the type B mechanism is tripped by fuses or solenoid, the main contact status indicator would show that the main contacts are opened. However the operator should still proceed to reset the mechanism as if to manually open it by returning the "IS" operating disc to open position before proceeding to re-close the load break switch or to open the earth switch.

When the **GLBS** is tripped by fuses, the operator should proceed to replace the blown fuses before re-closing the switch.

### ■ Safety shutters to prevent mal-operation

Interlocking safety shutters are designed to cover the respective operating discs so as to prevent attempts to operate against the standard sequence. When the shutter covers the operating disc, the hole into which the operating handle must be inserted is blocked, thus excluding the possibility of forceful mal-operation.



earth switch closed  
load break switch  
opened

Shutter covers "IS" operating disc to prevent operating the load break switch

earth switch opened  
load break switch  
opened

Both shutters opened both "ES" and "IS" can be operated

earth switch opened  
load break switch  
closed

Shutter covers "ES" operating disc to prevent operating earth switch



## Accessories

### ■ Shunt trip coil (optional)

The shunt trip coil is applicable only on B type operating mechanisms (BL,BF). It allows for remote opening operation of the **GLBS** by the operator, or automatic tripping under the control of an over-current relay.

#### ● Technical description

table-3

Rated voltage	V	220 / 110 AC / DC
Frequency	Hz	50 / 60
Rated current	A	1.5
Stroke	mm	25

shunt trip



### ■ Auxilliary contacts (Optional)

Both the A type and the B type operating mechanism of the **GLBS** may be fitted with auxilliary contacts.

closed position/open position each have the following set of contacts: 1NO+1NC

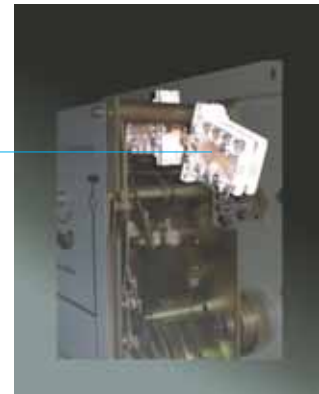
Earth position has the following set of contacts: 1NO+1NC

#### ● Technical description

table-4

Rated voltage	V	220 AC / DC
Max. current	A	10
Closing capacity	A	25
AC-3 breaking capacity	A	5

auxilliary contacts



### ■ Motor-driven closing operation (Optional)

**GLBS** may be closed via a motor-drive.

#### ● Technical description

table-5

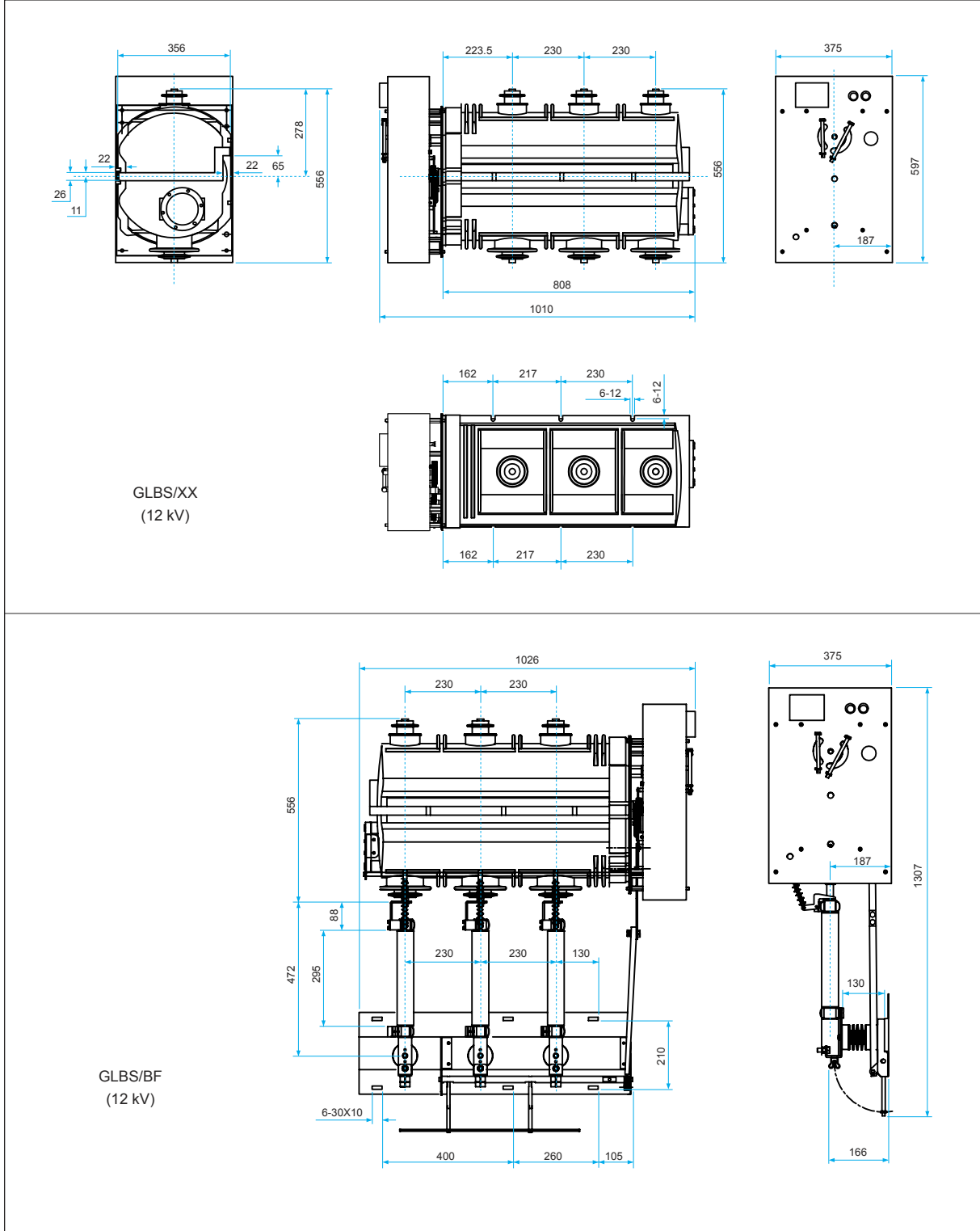
Rated voltage	V	220/110 AC/DC
Rated current	A	1.3/2.6
Frequency	Hz	50
Rated power	W	200
Torque	N.m	100
Time needed to charge	s	3.6
Max. operations	--	S2 / 1 min

motor and gear drive



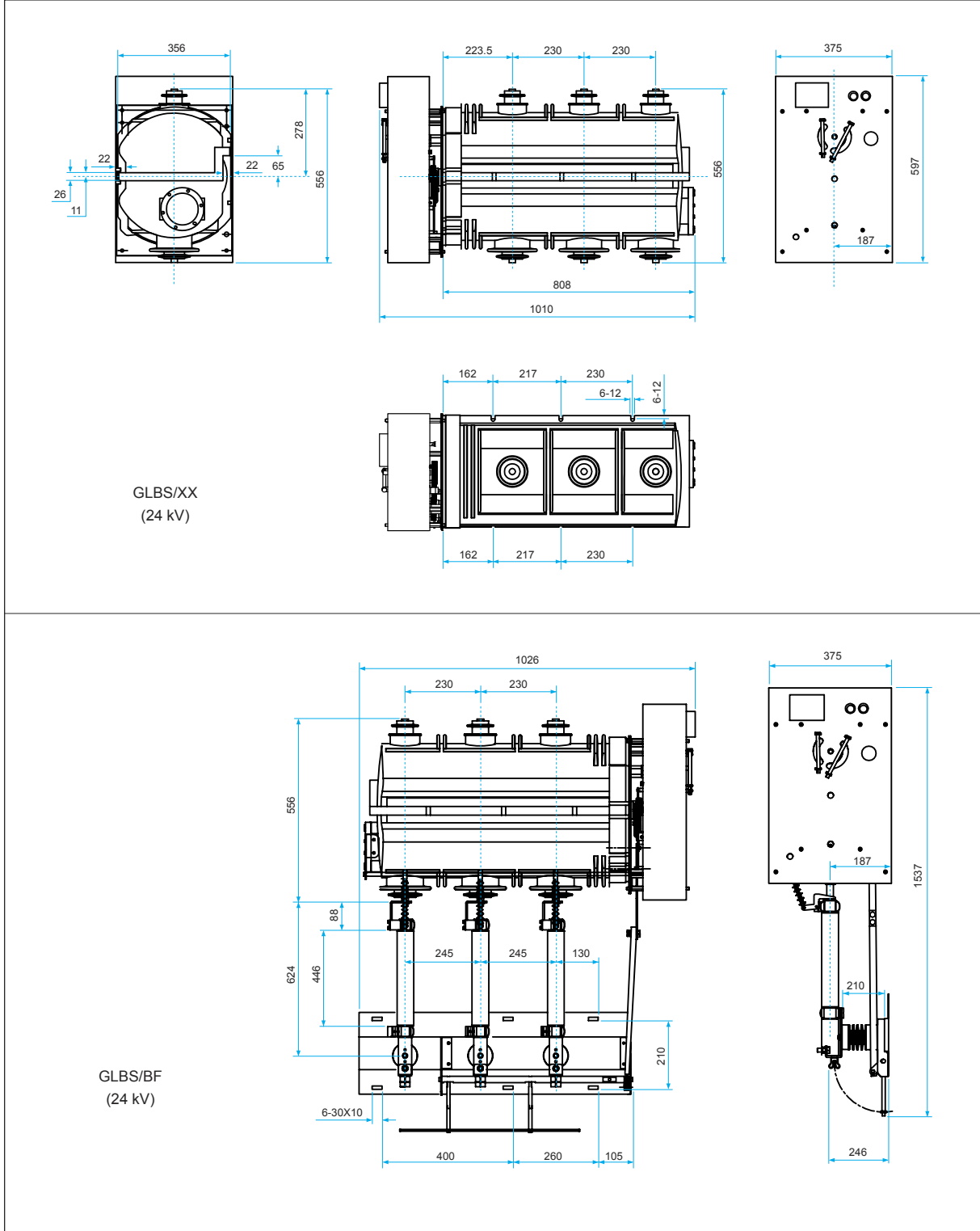


### General dimensions (mm)



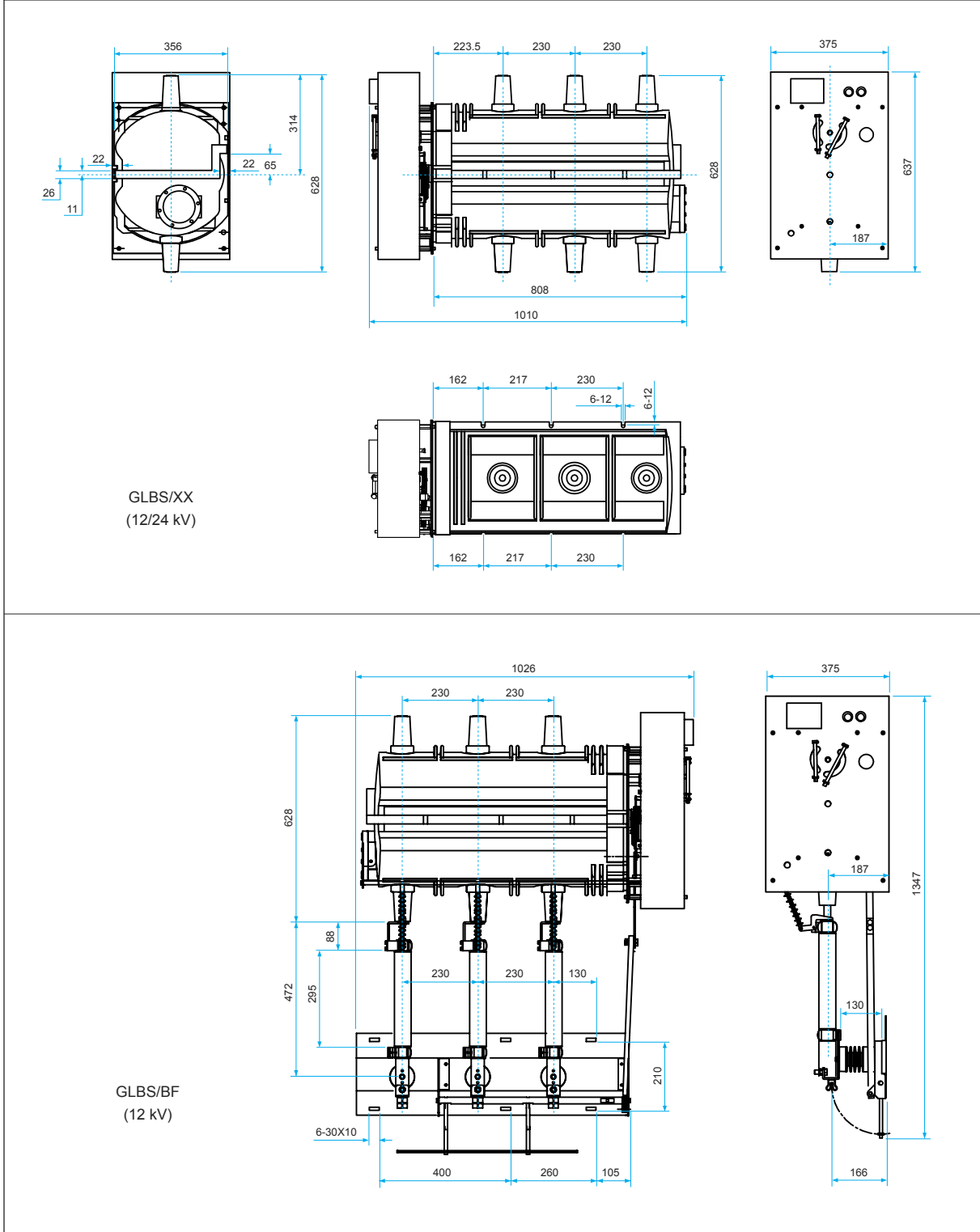


### General dimensions (mm)





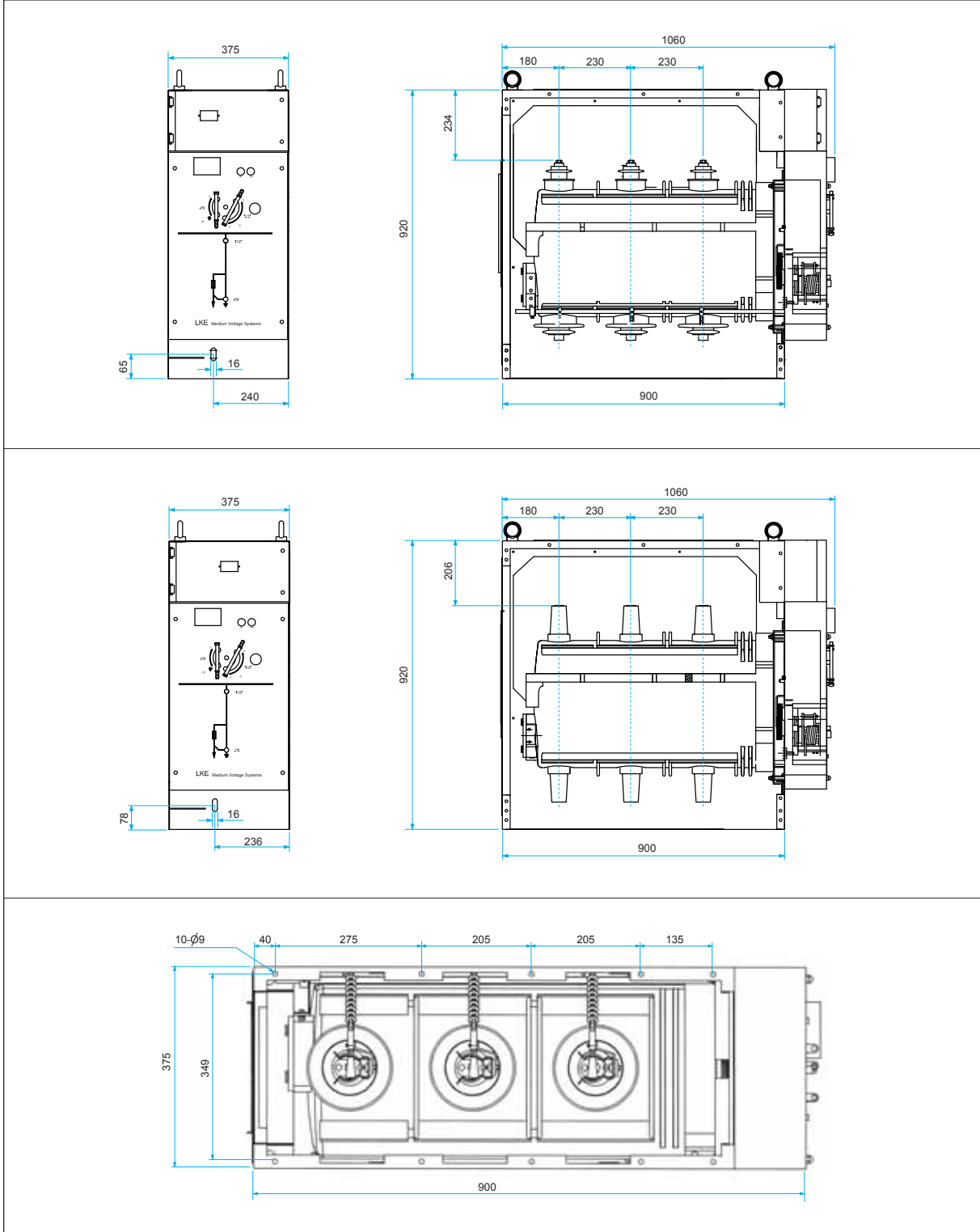
### General dimensions (mm)





### General dimensions (mm)

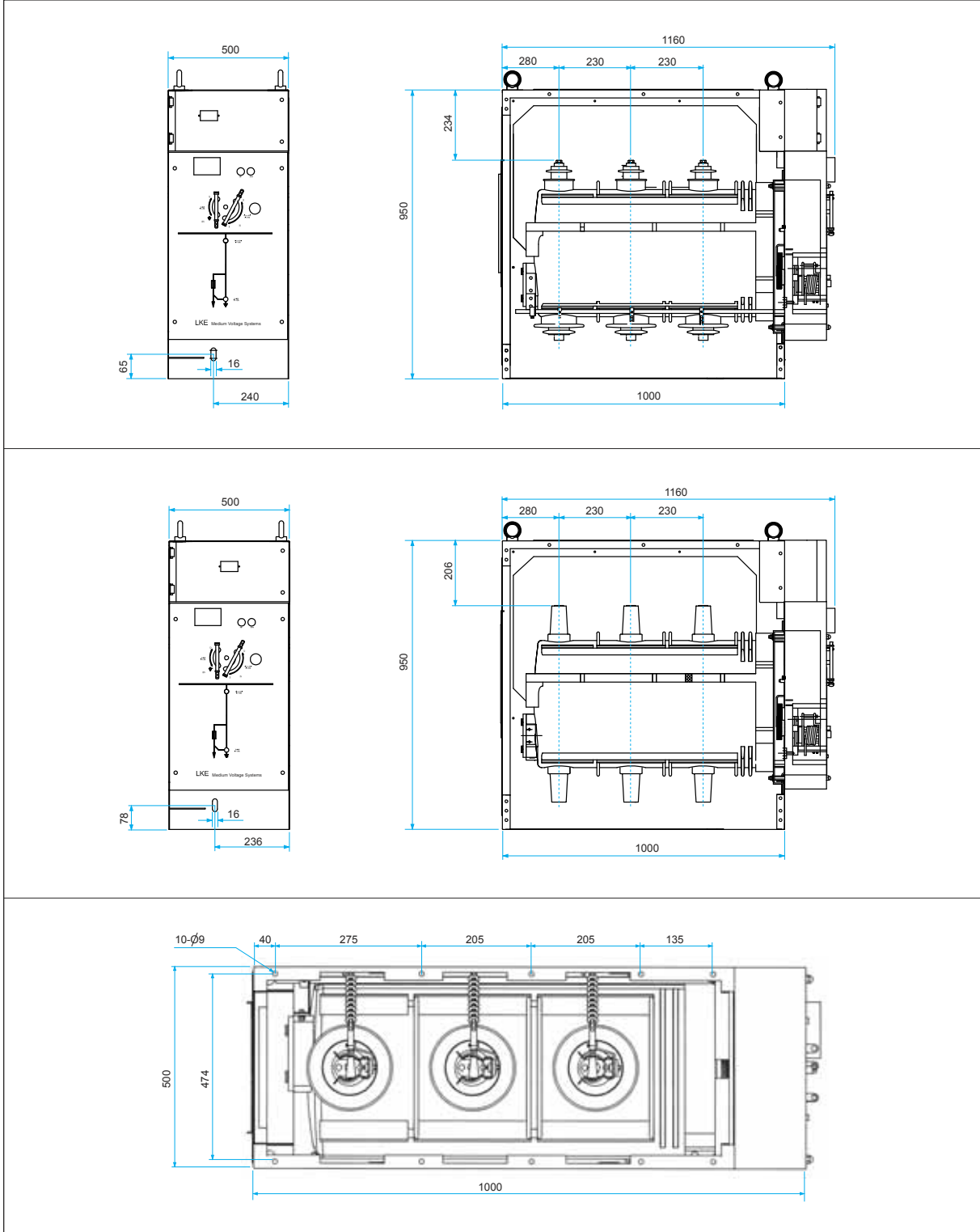
#### LCA-G top section (12 kV)





### General dimensions (mm)

#### LCA-G top section (24 kV)







## Profile of LCA-G switchgear

### Product code for the LCA:

L C A-A/G/V	
VLBS within	
GLBS within	
ALBS within	
Air insulated panel	
Compartmentalized panel	
LBS switch board	

The **LCA-G** switchgear is a modular system consisting of extensible panels.

They are ideal for applications where space limitations are severe.

Their compact dimensions make them ideal for applications within prefabricated mobile or underground substations. The modular system makes “**LCA-G**” the ideal solution in retro-fit or system expansion projects.

The reduced dimensions and weight of the cubicles allows for ease of handling and prompt installation.

Its safe and reliable design allows for a wide range of applications:

- Prefabricated outdoor substations and RMUs
- Industrial switchboard systems for M.V. power distribution
- As isolating devices in primary stations.
- Protection of downstream devices.

### LKE'S LCA-G was type-tested in compliance with the following standards:

- IEC 298

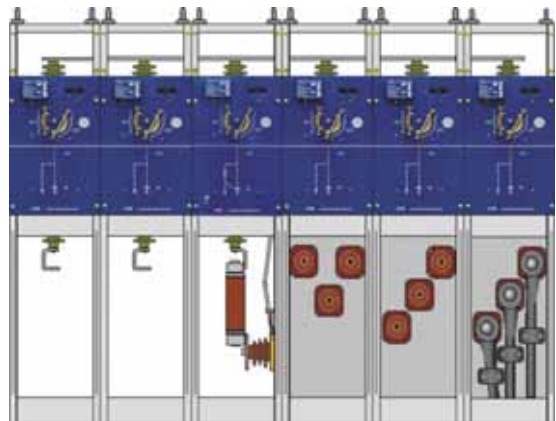
### LCA-G panel



IEC 12 kV

IEC 24 kV

### Cable of pass in and out lines



extensible cubicles with various means of connection



outdoor RMU with the LCA-G within



## Normal operating conditions

### Ambient conditions

- Ambient temperature: -40 °C to +70 °C.
- Relative humidity: daily average of less than 95% and monthly average of less than 90%.
- Height above sea level of less than 1000 m.
- Earthquake intensity less than 8 degree.
- Environment: no frequent violent vibration.

### Special operating conditions

The degree of protection of the **LCA-G** switch panel can be upgraded to IP 56. The **LCA-G** may also incorporate a temperature regulating module for extreme weather conditions.

### Use in areas with altitude of more than 1000 m above sea level

The equipment's dielectric properties are influenced by its altitude. The insulation is influenced by air density, moisture content, etc. When the **LCA-G** is located in altitudes above 1000m, the following method is suggested for derating the insulation level.

#### Altitude correction

The insulation considerations of the switch depend on the extent to which the isolating distances are influenced by weather conditions. The dielectric strength of insulation is influenced by the properties of the surrounding air (air density, moisture content, etc.)

With increasing height above sea level the density of the air and hence its dielectric strength diminishes. This fact must be taken into account in considering the application of the switch.

#### Correction procedure

Method 1: Knowing the altitude H of the site, find the corresponding altitude factor k from Table 7. The impulse test voltage or the power-frequency test voltage (Table 6) corresponding to the rated voltage of the equipment is then divided by the altitude factor. The test voltages thus obtained are then valid for testing in high-voltage laboratories at altitudes of less than 1000 m above sea level, and determines the design of the insulation.

Method 2: Having found the altitude factor, divide the rated voltage of the network in question by this value. The result is the new rated voltage, which determines the choice of the equipment to be installed.

LCA-G modular switchgear



LCA-G ring main unit (RMU)

- Insulation for 1 kV <math>U\_m</math> <math>< 52</math> kV

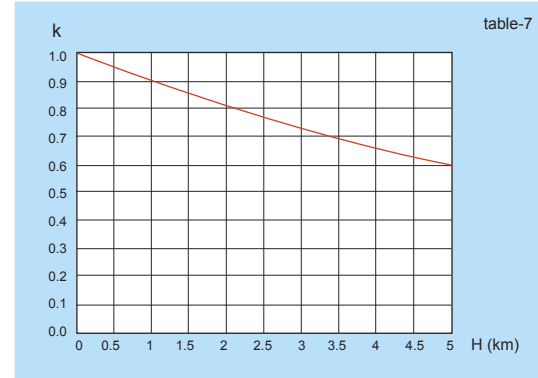
table-6

Max. voltage for apparatus $U_m$ (r.m.s)	Nominal lightning impulse withstand voltage $U_{IB}$ (peak)	Nominal power frequency withstand voltage $U_{rw}$ (r.m.s)
kV	kV	kV
3.6	40	10
7.2	60	20
12*	75	28
17.5*	95	38
24*	125	50
36	170	70

\* \*\* -- According to with voltage level of the LCA-G

- Curve for determining altitude factor k in relation to altitude H

table-7





## Technical parameters of the LCA-G

### ■ LCA-G1~ G18 has the following parameters

table-8

Item		Unit	IEC standards				
Rated Voltage		kV	7.2	12	15	17.5	24
Withstand voltage to earth and between poles		kV	20	28	36	38	50
Withstand voltage across isolating distance		kV	28	32	45	45	60
Impulse withstand voltage to earth and between poles		kV	60	75	95	95	125
Impulse withstand voltage across isolating distance		kV	70	85	110	110	145
Rated frequency		Hz	50/60				
Rated current		A	630				
Rated short -time current (I <sub>k</sub> )	t <sub>k</sub> =1s systems	kA(max.)	25				
	t <sub>k</sub> =3s systems ( choice)	kA	20				
Making capacity		kA(max.)	50				
Electrical endurance		times	500				
Mechanical endurance		times	5000				
Temperature	panel including : auxilliary instruments and relays	°C	-40~70				
	panel excluding : auxilliary instruments and relays	°C	-5~55				
Rated SF <sub>6</sub> gas pressure (20 °C)		kPa	≥ 10				

### ■ LCA-G19~ G24 has the following parameters

table-9

Item		Unit	IEC standards				
Rated Voltage		kV	7.2	12	15	17.5	24
Withstand voltage to earth and between poles		kV	20	28	36	38	50
Withstand voltage across isolating distance		kV	28	32	45	45	60
Impulse withstand voltage to earth and between poles		kV	60	75	95	95	125
Impulse withstand voltage across isolating distance		kV	70	85	110	110	145
Rated frequency		Hz	50/60				
Rated current		A	630				
Rated short -time current (I <sub>k</sub> )	t <sub>k</sub> =1s systems	kA(max.)	25				
	t <sub>k</sub> =3s systems ( choice)	kA	20				
Making capacity		kA(max.)	50				
Max. breaking capacity (transfer current)		A	2600				
Rated short-circuit breaking current (fuses)		kA	31.5				
Electrical endurance		times	500				
Mechanical endurance		times	5000				
Temperature	panel including : auxilliary instruments and relays	°C	-40~70				
	panel excluding : auxilliary instruments and relays	°C	-5~55				
Rated SF <sub>6</sub> gas pressure (20 °C)		kPa	≥ 10				



## Panel layout

### ■ Frame

The design of the panel complies with IEC 298. The materials used are Al-Zn-coated or epoxy powder coated sheet steels, with a thickness of 2.5mm~3.0mm (the thickness of door and cover is 3.0mm). The steel frame section is assembled into a strong unit with bolts. The low-voltage compartment, switch compartment, busbar compartment and cable compartment are totally enclosed by sheet steel.

Each module have their own independent over-pressure relief vents. There are no welded joints in the frame. A special clamping jig is used during assembly to ensure high degree of precision. Each functional unit has its own separate door with lock and hinges on it (the distance between hinges doesn't exceed 400mm).

The frames present a firm and beautiful appearance. The protection degree of the enclosure with closed door reaches IP 4X.

### ■ Surface Treatment

The doors and end cover are epoxy powder coated, and other steel structures are made of Al-Zn-coated sheet steel. The advantage is a high degree of corrosion resistance.

### ■ Bus - bar compartment

The bus-bar compartment is located in the upper rear section of the panel. The busbar system consists of high-quality electrolytic copper which meets IEC694 standard.

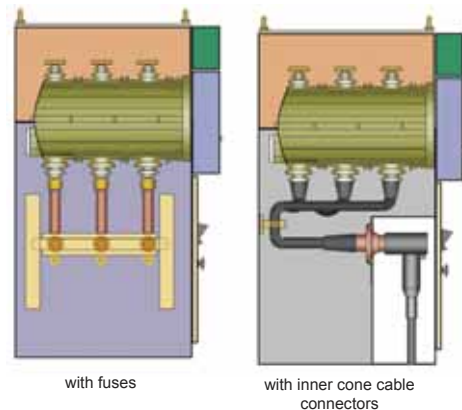
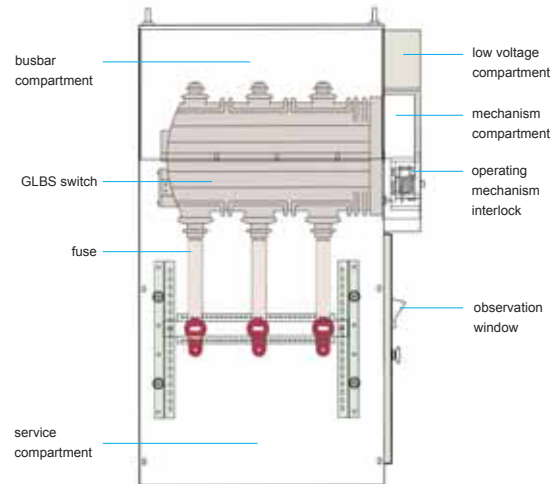
The busbar with copper bars (of upto 5X50) is mounted on each phase, and is capable of carrying a load current of 630A max.. During short-circuit fault, the busbar system can withstand peak currents of upto 25kA, short-time currents of up to 20kA/3s. It is suitable for applications under severe climate conditions.

The material of the busbars conforms to IEC431.

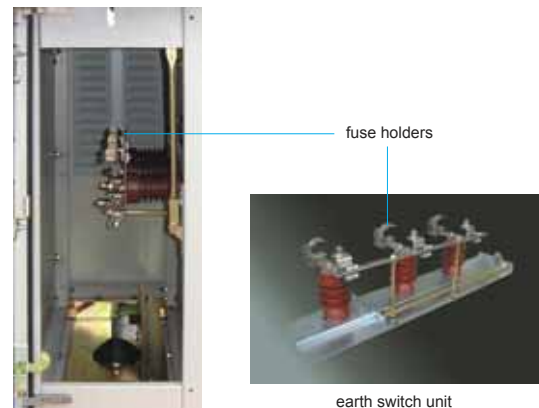
The busbars have round edges (R=2mm). Holes in the busbar are punched before leaving the factory. The joints are silver-plated. The bolts of the busbar are made of high tensile strength stainless steel. The busbar coupling is mounted easily, flexible and firm. The system of mounting the busbars conform to IEC298.

The earthing busbar is 30X5mm<sup>2</sup>, which can carry a current of 630A, 25kA/1s. Holes on the earthing busbar are punched before leaving the factory.

LCA-G panel structure drawing



LCA-G panel external earth switch unit





## Panel layout

### ■ Load break switch compartment

The three position load break switch is located beneath the bus bar compartment.

### ■ Operating mechanisms and interlock

The operating mechanism with interlock mechanism is located at the front of the panel for ease of service.

### ■ Service compartment

About 70% of the space in the cubicle of **LCA-G** load break switch panel is taken up by the service compartment, within which cable connections are located.

The surge/lighting arrestor, CT, external earth-switch system are also located within this compartment. The standard design includes both the inspection window and a door access interlock system.

### ■ Low voltage compartment

The low voltage compartment is located at the upper front section of the panel. This can be equipped with a digital processor controlled, programmable protection relay with a communication interface, which can be used for a comprehensive automation of the substation.

The protection relay not only protects, but can also display, and record data as well as send alarms from the sub-station to the main control center. It has a backup RS232 or RS485 serial interface for communication with the monitoring system.

The following indicating and control devices are optional on the panel of the low-voltage compartment:

- Functional unit control switch
- Local/remote selection switch
- Test terminals of relay circuits used to check the protective relays. When testing the relays, a special joint is provided to short the CT secondary circuit and open the PT secondary circuit.
- Signal indication: breaking or making, operation position and test position of the GLBS, status of earthing switch.
- voltage indicator. These indicators are connected with a capacitive layer in the cable compartment.
- Different types of measurement meters

#### Auxiliary wiring

Cross-section: current circuit  $>2.5\text{mm}^2$   
voltage circuit  $>1.5\text{mm}^2$

Insulation grade: 2000V

Connection method: fixed at the block terminal

Enough terminals are prepared; 25% terminals and some connection strips are reserved.



internal view of service compartment for line units



internal view of service compartment for transformer protection units



## Internal arcing capacity

### ■ Arc-proof structure

Internal arcing within the **LCA-G** cubicle is much reduced by the insulation provided by the SF<sub>6</sub> gas tank made of epoxy resin which provides an effective segregation of the main terminals from external factors which cause arc-faults such as pollution, condensation, small rodents etc.

**LCA-G's** effective panel layout and the design of the three position switch prevents mal-operation or improper operating sequences.

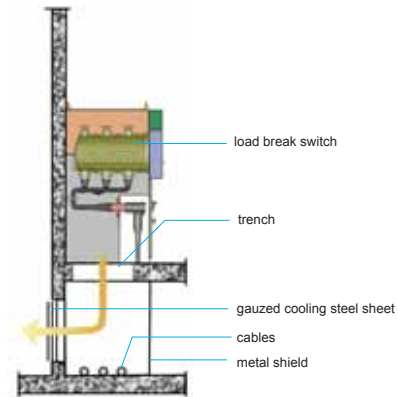
If the arc-fault occurs on the cabling (within the service compartment) the resulting increase in pressure is released via the rear or the base of the panel.

In the rare case when the fault occurs within the SF<sub>6</sub> gas tank, the SF<sub>6</sub> will limit the energy released by the fault to a third of what it would have been in air. The pressure relief valve located at the rear of the gas tank allows for depressurisation. The released gas will be channelled into the service compartment and from there, out of the panel.

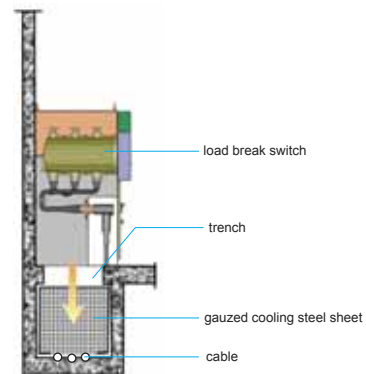
Effective pressure control ensures the safety of the operator and other personnel near the panel during an arc-fault.

The depressurisation system is a "fix and forget" system requiring virtually no maintenance. If the panel could be installed against a wall with a pressure window, the safety of operators and the building can be further enhanced.

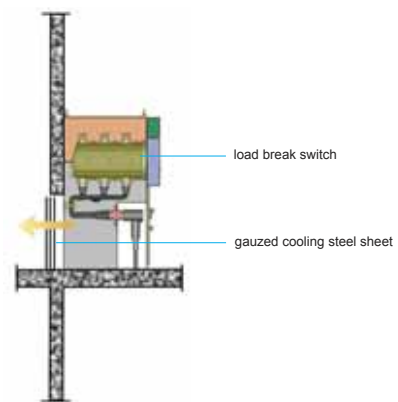
### LCA-G panel pressure relief system



a downward pressure release into cable trench (as arrows illustrate)



a downward release into cable trench (as arrows illustrate)



backward release into transformer room (as arrows illustrate)

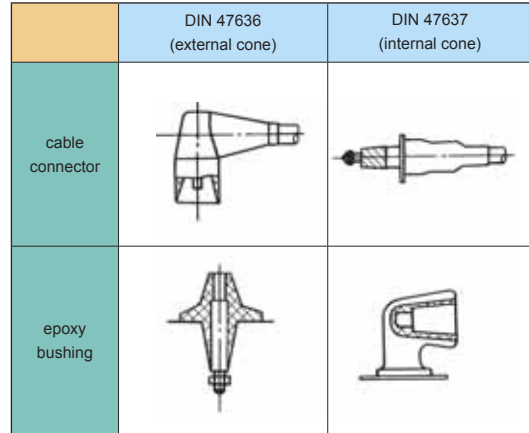


## Cable accessories

The **GLBS** is designed to be compatible with cable connections that conform with the following standards:

- ANSI 368-1977
- DIN 47636/47637

Right: Cable connectors conforming with DIN 47636/47637.



- **Electrical properties of cable connections (according to ANSI and DIN)**

table-10

Voltage	(ANSI / DIN) kV
Rated value	15 / 12
Max. Between phases	14.4 / 12
Withstand Voltage (1min)	42
DC withstand voltage (15min)	42
Impulse voltage (peak)	95

- **Cable connection for transform protection panel (with fuses)**

table-11

Current	(ANSI / DIN)
Rated value	200 / 250 A
Short-time value	10kA / 0.2s, 3.5kA / 3s

- **Cable connections for ring main units and line switching panel**

table-12

Current	(ANSI/DIN)
Rated value	400 / 600 / 630 A
Short-time value	50kA / 0.3s, 27kA / 4s

- **Other accessories with the available with cable connectors:**

- Surge arrestors
- Short circuit/earth fault mdilator
- Cable clamps



cable connections for the LCA-G using internal cone type connectors



cable connectors with surge arrestors



cable clamps





## Selecting fuses for transformer protection

When fuses are used with the GLBS, when any one fuse blows, a striking pin extends from the fuse to strike the trigger which opens all three phases of the switch. This solution relies on fuses as the primary overcurrent and short circuit protection device and is commonly used to protect downstream equipment such as transformers. Due to the inverse time/current characteristics of the fuse, it has the advantage over circuit breakers of being capable of instantaneous response of less than 10 ms with a breaking capacity of up to 50 kA.

### Rated current of the fuse

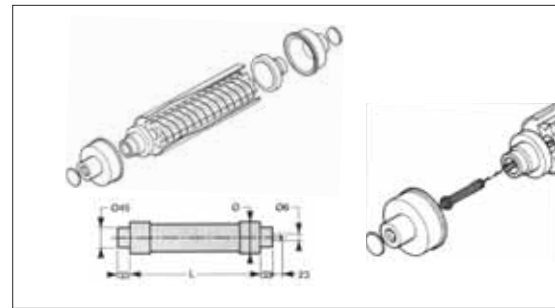
Applying the above solution to protect capacitors and transformers (Table 15) one must include provision for inrush currents. In capacitor installations the rated current of the fuse link must be at least 1.6 times the capacitor current rating. This has been found to take account of possible network harmonics and elevated voltage.

When selecting fuse links for protecting high-voltage motors, attention must be paid to the motors' starting current and starting time. The frequency of starting must also be considered if this is so high that the fuses cannot cool down in between.

When selecting fuse links it should be remembered that these are available with rated voltage and currents graded for fuse-bases of different size.

### Current-limiting capacity of the fuse

The max. current that a fuse will let through depends on its rated current and on the prospective short-circuit current. The fuse's melting characteristics must be stated by the manufacturer for the range of breaking currents, see DIN VDE 0670 Part 4. For each rated current one can read off the peak value of the let-through current to which the fuse limits a symmetrical short-circuit. Plotted on the horizontal axis are the r.m.s. symmetrical short-circuit current occurring when a fuse is shunted out. At a symmetrical short-circuit current of 40kA, for example, with a 16A link the let-through current is only 3kA as against a prospective impulse short-circuit current of about 100kA with full asymmetry. This current limitation effectively protects the installation against damage due to thermal and dynamic stresses.

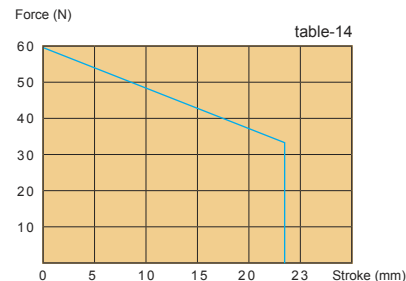


### Fuse parameters

table-13

Rated Voltage	Rated current	Length	Diameter	Weight
kV	A	mm	mm	kg
7.2	125	292	86	3.3
12	6.3-20	292	50.5	1.2
	25-40	292	57	1.5
	50-100	292	78.5	2.8
	125	442	86	4.6
24	6.3-20	442	50.5	1.6
	25-40	442	57	2.2
	50-63	442	78.5	4.1
	80-100	442	86	5.3

### Stroke/Force of striking pin of fuse



### Permissible protection of transformers on the medium-voltage side

table-15

Rated voltage (kV)	Transformer rating (kVA)																
	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500
Medium-voltage fuses / N (A)																	
3	25	25	40	40	63	63	63	100	100	100	160	200	200	250	315		
5	16	25	25	25	40	40	63	63	63	100	100	100	160	200	200	250	315
6	16	16	25	25	25	40	40	63	63	63	100	100	100	160	200	200	250
10	10	16	16	16	25	25	25	40	40	63	63	63	80	100	100	160	200
12	10	16	16	16	16	25	25	25	40	40	63	63	80	100	100	160	160
15	10	10	16	16	16	16	25	25	25	40	40	63	63	80	80	100	125
20	10	10	10	16	16	16	16	25	25	25	40	40	63	80	80	100	100
24	10	10	10	10	16	16	16	16	25	25	25	40	40	63	80	80	100
30	10	10	10	10	10	16	16	16	16	25	25	25	40	40	40	2X40	2X40
36	10	10	10	10	10	10	16	16	16	16	25	25	25	40	40	2X40	2X40

■ --Range where by fuses & GLBS can be effectively applied.



## Selecting fuses for transformer protection

### ■ Discrimination between fuse and switch

The shunting of any one fuse triggers the tripping action of the switch. In some instances the contacts of the switch may open before the remaining two fuses blow. In these instances the mechanical response time  $T_{mr}$  of the switch is faster than the time taken for the remaining fuses to break the current, and the arc-quenching action occurs on the contacts of the switch instead of in the unblown fuses (This is also known as transfer current). (During type tests in laboratories this is simulated by using one fuse and two copper tubes in place of fuses on the other two poles.) The maximum breaking capacity of the load break switch must be considered under such circumstances because when the current exceeds this max. breaking capacity the current breaking function must be transferred from the switch to the fuse to prevent damage to the switch.

Hence when selecting a suitable fuse for the GLBS, the following procedure is recommended:

Using the mechanical response time of the switch  $T_{mr}$ , derive the corresponding current value from the time/current curve,  $f$ , of the intended fuse. This derived current value,  $I_d$  represents the current that would be broken by the fuse at time  $T_{mr}$ . In diagram-2,  $I_d$  is less than the max. breaking capacity of the switch,  $I_{mbc}$ . This implies that at  $T_{mr}$ , when the contacts open, the current that the switch has to break is within the capacity of the switch, and given this fuse configuration, if current exceeds the breaking capacity of the switch, the fuse would break before the contacts open. ( $T_f < T_{mr}$ )

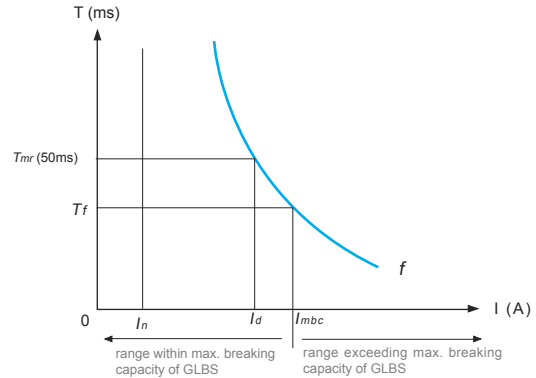
In diagram-2 however,  $I_d$  exceeds the max. breaking capacity of the switch, it is not recommended that the particular fuse be used with the switch because the switch might be called upon to break a current exceeding its breaking capacity.

### ■ In combination with overcurrent relays

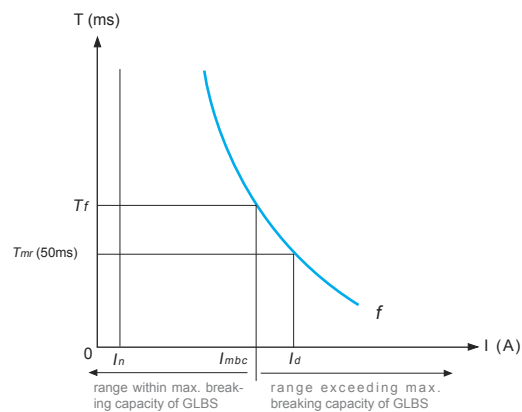
The GLBS may be used with fuses and overcurrent relays for protecting down stream devices. This is a highly effective solution because fuses are less responsive at low levels of overcurrent, especially when fuse ratings are deliberately set at 1.6 times above rated current of the system to avoid nuisance tripping. By incorporating overcurrent relays to the system, overcurrent levels upto the max. breaking capacity of the switch,  $I_{mbc}$  will be broken by the switch. Overcurrent levels above  $I_{mbc}$  will be broken by the fuse.

Diagram-3 illustrates this:

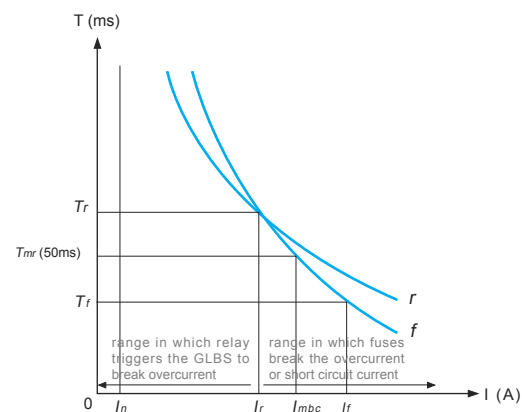
Curve  $r$  represents the time/current characteristics of the switch when it is tripped by the overcurrent relay.  $I_r$  represents the current level below which the switch will carry out the current breaking function. Above  $I_r$ , current breaking is executed by the fuse (for example, when current is at  $I_f$ ). It is therefore important to ensure that  $I_r$  does not exceed  $I_{mbc}$ . Hence the point of intersection between Curve  $r$  and Curve  $f$  should derive a current level less than or equal to  $I_{mbc}$ .



1--In the above instance  $I_d$  is less than  $I_{mbc}$ , implying that fuse is compatible.



2--In the above instance  $I_d$  exceeds  $I_{mbc}$ , implying that the fuse is not compatible.

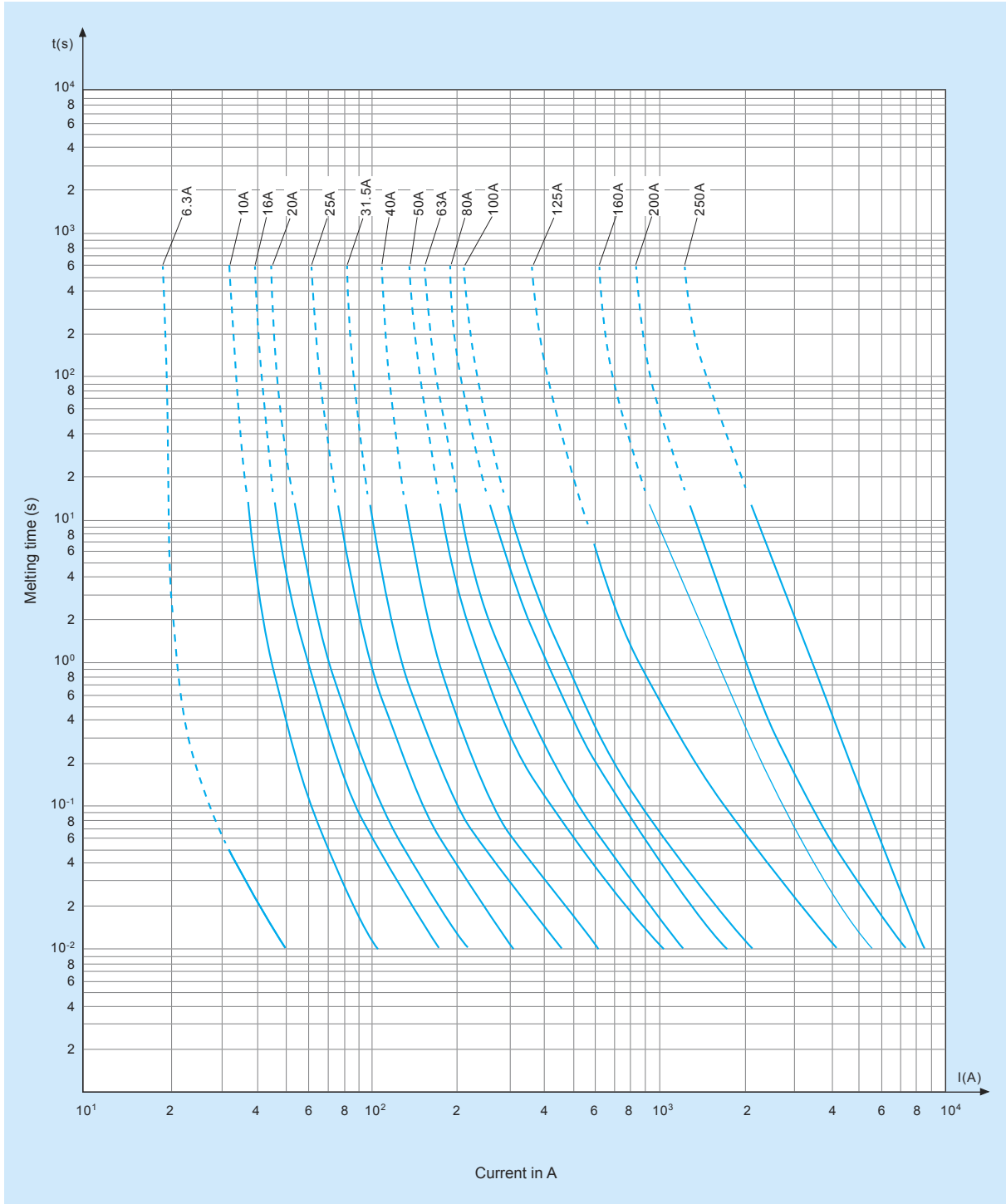


3--In the above instance  $I_r < I_{mbc}$ , implying that the switch can break all levels of  $I$  when  $I < I_r$ . All levels of  $I$  when  $I > I_r$ , such as  $I_f$ , will be broken by the fuse.



## Fuse time-current curves

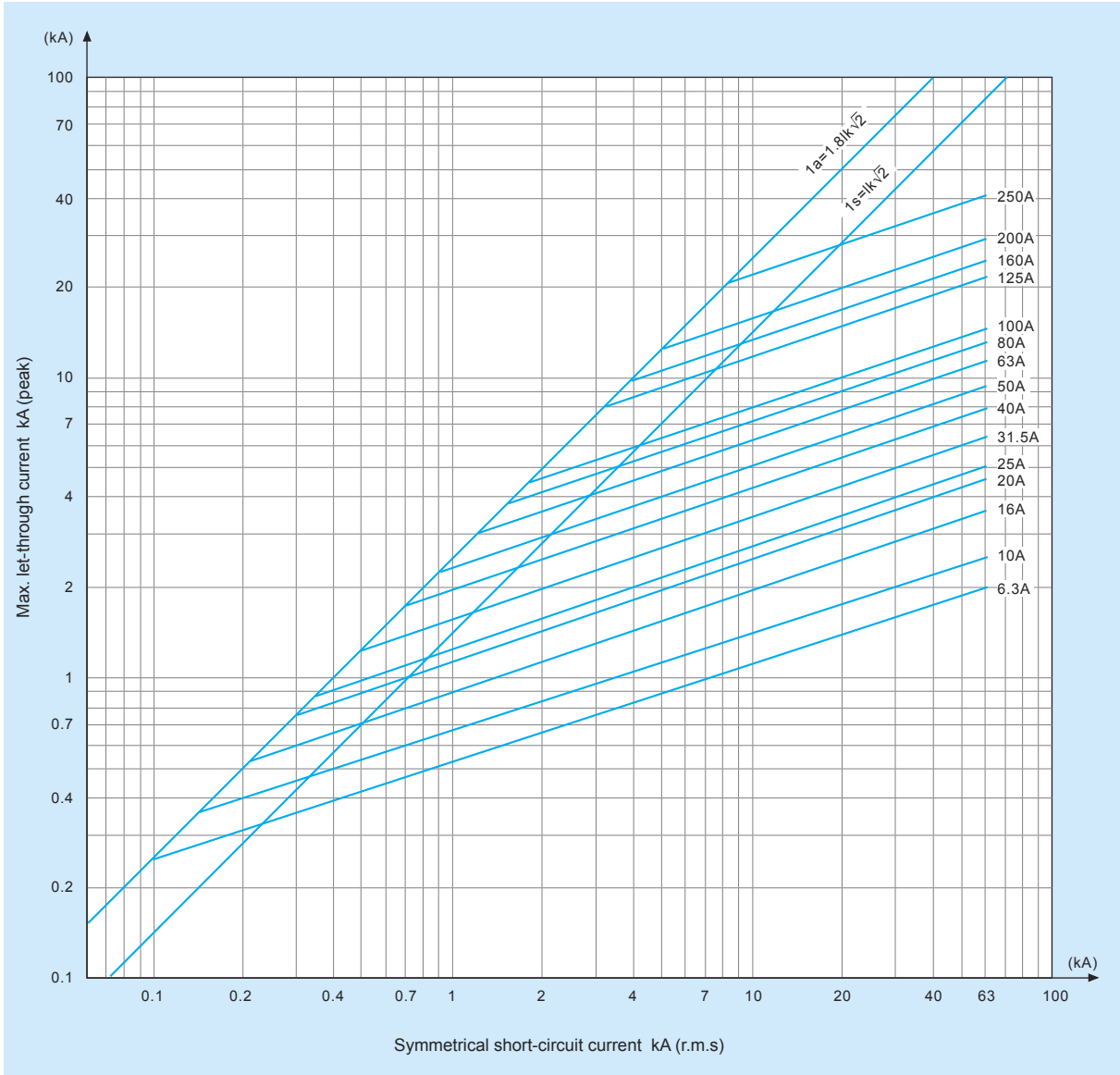
3.6, 7.2, 12 and 24 kV





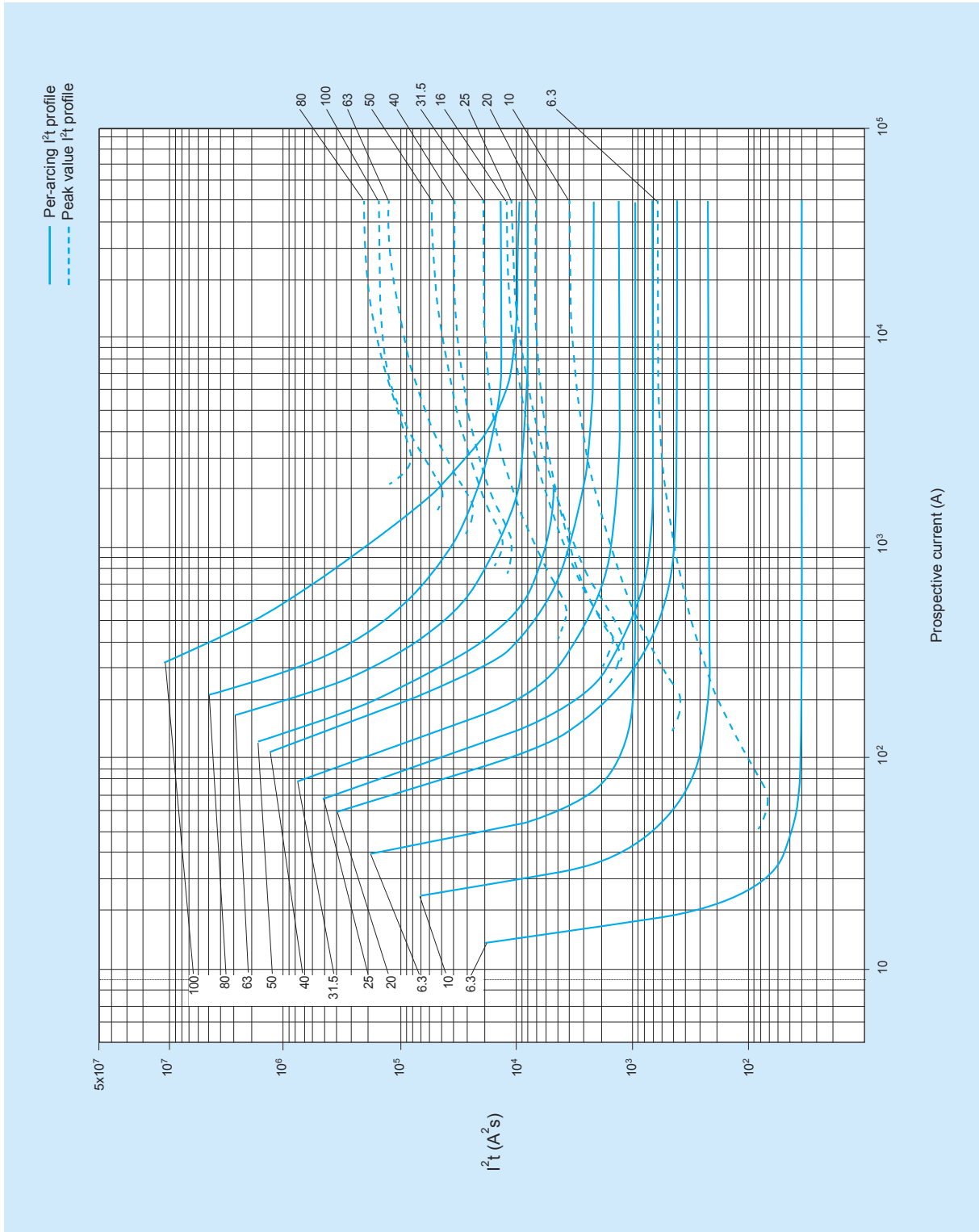
## Fuse current-limiting curves

Let-through current as a function of short-circuit current



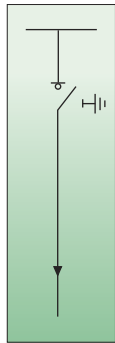


## Fuse short-circuit withstand strength ( $I^2t$ )





## Layout of standard panels



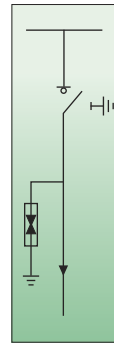
Line switch section LCA-G1	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window

### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



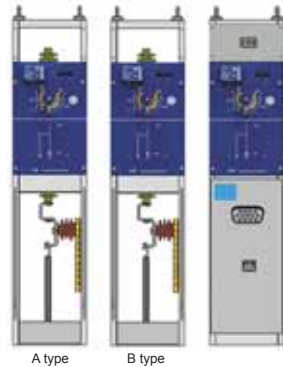
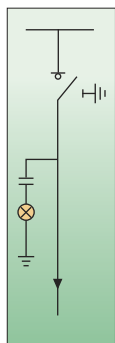
Line switch section LCA-G2	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- voltage indicator

### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



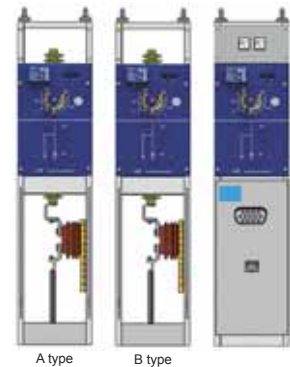
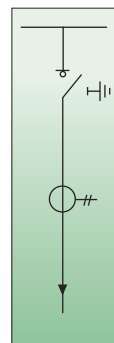
Line switch section LCA-G3	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- voltage indicator

### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



Line switch section LCA-G4	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- current transformer

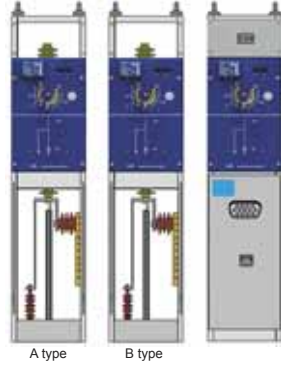
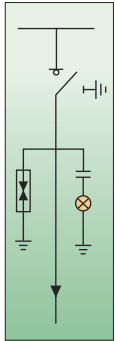
### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

\* --- base depth  
 \*\* -- absolute depth



## Layout of standard panels



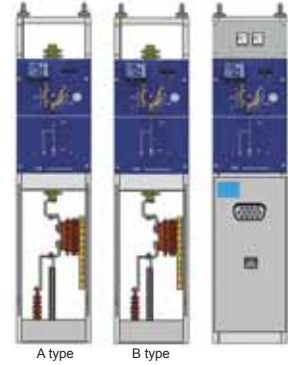
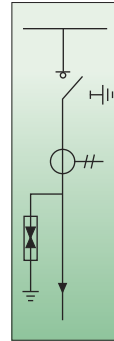
Line switch section LCA-G5	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- surge arrester
- voltage indicator

### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



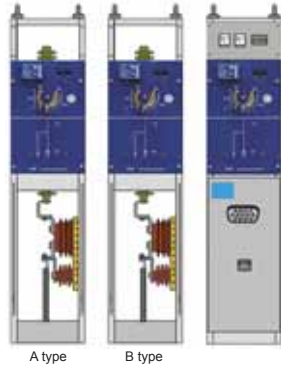
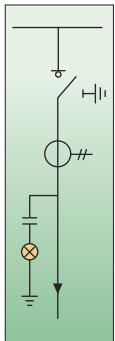
Line switch section LCA-G6	
Rated voltage (kV)	H X W X D (mm)
12	1700X375X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- surge arrester
- current transformer

### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



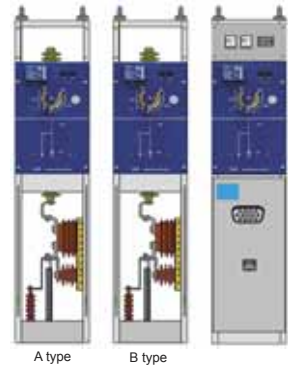
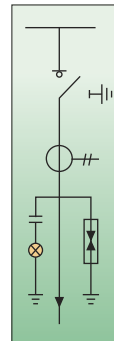
Line switch section LCA-G7	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- voltage indicator
- current transformer

### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



Line switch section LCA-G8	
Rated voltage (kV)	H X W X D (mm)
12	1700X500X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- surge arrester
- voltage indicator
- current transformer

### Optional fittings:

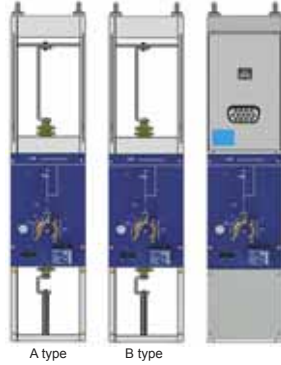
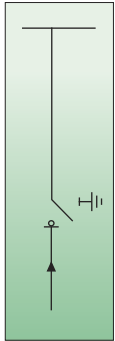
- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

\* --- base depth  
\*\* - absolute depth





### Layout of standard panels



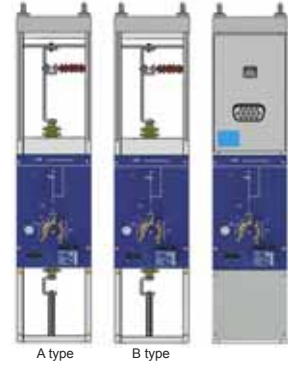
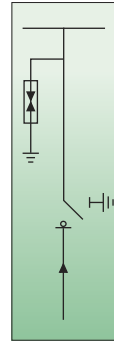
Line switch section LCA-G9	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window

**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



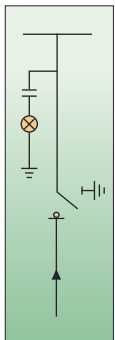
Line switch section LCA-G10	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- voltage indicator

**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



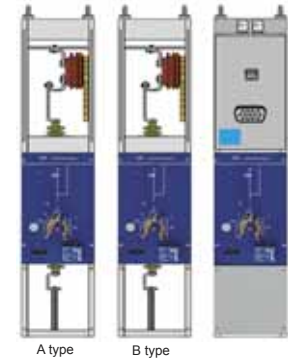
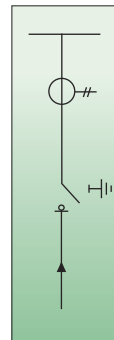
Line switch section LCA-G11	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- voltage indicator

**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



Line switch section LCA-G12	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- current transformer

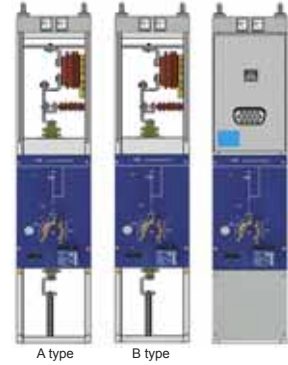
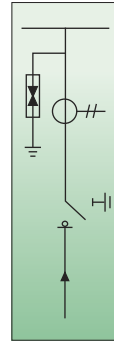
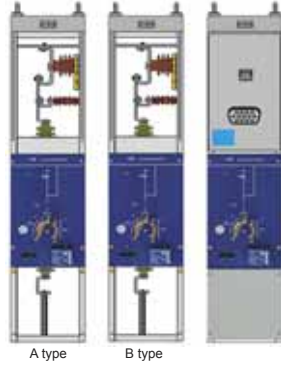
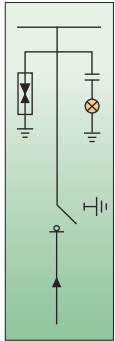
**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

\* -- base depth  
 \*\* -- absolute depth



## Layout of standard panels



Line switch section LCA-G13	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

Line switch section LCA-G14	
Rated voltage (kV)	H X W X D (mm)
12	1700X375X900*(1060)**
24	2000X500X1000

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- surge arrester
- voltage indicator

**Optional fittings:**

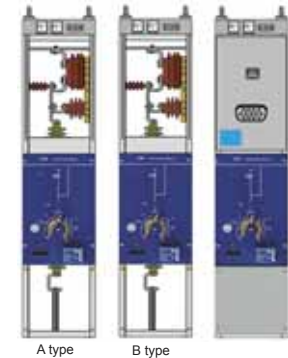
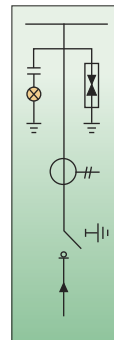
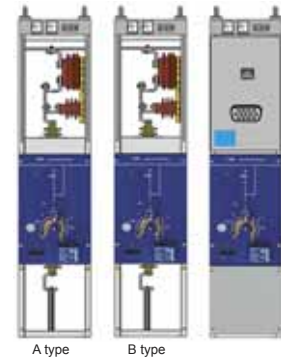
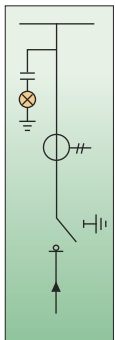
- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- surge arrester
- current transformer

**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



Line switch section LCA-G15	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

Line switch section LCA-G16	
Rated voltage (kV)	H X W X D (mm)
12	1700X500X900*(1060)**
24	2000X500X1000

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- voltage indicator
- current transformer

**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window
- surge arrester
- voltage indicator
- current transformer

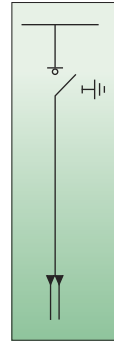
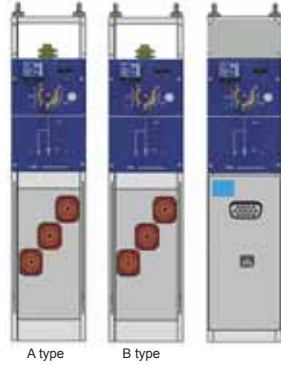
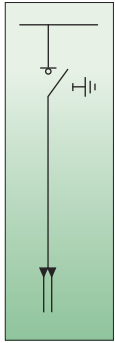
**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

\* --- base depth  
 \*\* -- absolute depth



### Layout of standard panels



Line switch section LCA-G17	
Rated voltage (kV)	H X W X D (mm)
12	1700X375X900*(1060)**
24	2000X500X1000

Line switch section LCA-G18	
Rated voltage (kV)	H X W X D (mm)
12	1500/1700X375X900*(1060)**
24	2000X500X1000

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window

**Optional fittings:**

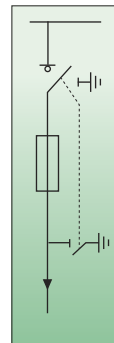
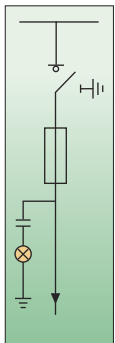
- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- door lock
- cable mounting rack
- observation window

**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



Transformer/downstream device protection section LCA-G19	
Rated voltage (kV)	H X W X D (mm)
12	1700X375X900*(1060)**
24	2000X500X1000

Transformer/downstream device protection section LCA-G20	
Rated voltage (kV)	H X W X D (mm)
12	1700X375X900*(1060)**
24	2000X500X1000

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- fuses
- door lock
- cable mounting rack
- observation window

**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

**Standard fittings:**

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- fuses
- door lock
- cable mounting rack
- observation window

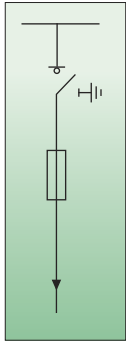
**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

\* --- base depth  
 \*\* -- absolute depth



## Layout of standard panels



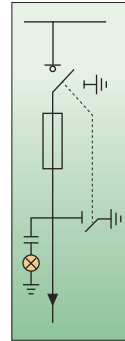
Transformer/downstream device protection section LCA-G21	
Rated voltage (kV)	H X W X D (mm)
12	1700X375X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- fuses
- door lock
- cable mounting rack
- observation window

### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



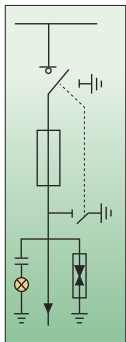
Transformer/downstream device protection section LCA-G22	
Rated voltage (kV)	H X W X D (mm)
12	1700X375X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- fuses
- door lock
- cable mounting rack
- observation window
- voltage indicator

### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



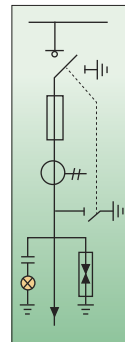
Transformer/downstream device protection section LCA-G23	
Rated voltage (kV)	H X W X D (mm)
12	1700X500X900*(1060)**
24kV	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- fuses
- door lock
- cable mounting rack
- observation window
- voltage indicator

### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack



Transformer/downstream device protection section LCA-G24	
Rated voltage (kV)	H X W X D (mm)
12	1700X500X900*(1060)**
24	2000X500X1000

### Standard fittings:

- GLBS AL or BF configuration
- safely interlocks between switch and panel locks
- fuses
- door lock
- cable mounting rack
- observation window
- surge arrester
- voltage indicator
- current transformer

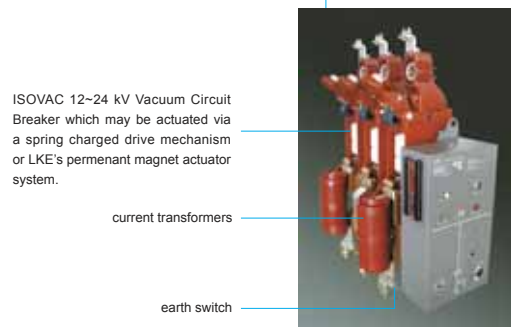
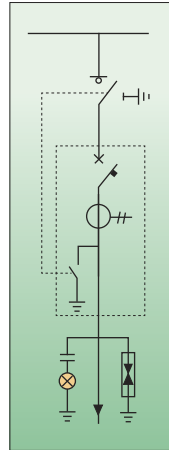
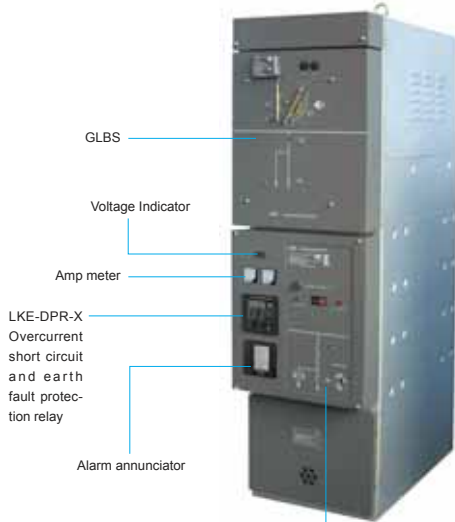
### Optional fittings:

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

\* --- base depth  
 \*\* -- absolute depth



**Layout of standard panels (with vacuum circuit breaker)**



Transformer/downstream device protection section	
Rated voltage (kV)	H X W X D (mm)
12	2000X550X900*(1060)**
24	2000X550X940*(1100)**

**Standard fittings:**

- GLBS AL or BF configuration
- ISOVAC vacuum circuit breaker
- safely interlocks between switch and panel locks
- fuses
- door lock
- cable mounting rack
- observation window
- voltage indicator
- current fault protection relay
- surge arrestors
- amp meter
- alarm annunciator

**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

\* --- base depth  
\*\* -- absolute depth

Circuit breaker unit suitable for protection of transformer or other downstream devices

**Electrical features**

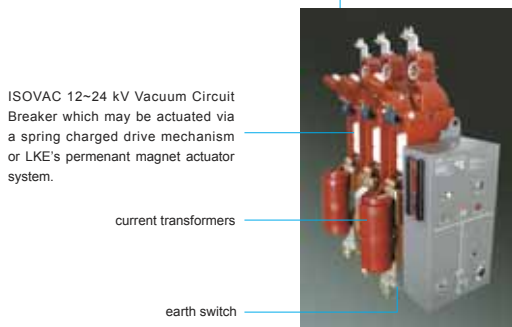
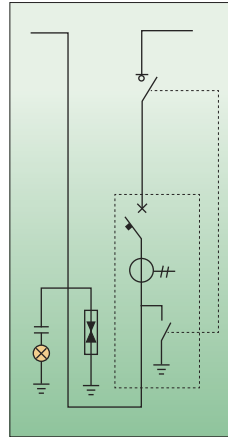
table-16

Rated voltage	kV	12	17.5	24
Dielectric withstand voltage to earth and between phases (50 Hz 1min) and isolating distance	kV	42/48	38	50
Impulse withstand voltage to earth, between phases and isolating distance	kV	75/85	95	125
Rated current	A	630	400~630	400~630
Short time current	kA	20X3s	12.5...20X1s	12.5...20X1s
Making capacity	kA	50	31.5...50	31.5...50
Internal arc withstand current (0.5 s)*	kA	12.5...16	12.5...16	12.5...16
Breaking capacity	kA	20~31.5	20~31.5	20~31.5

\* \* \* -- Request information from LKE for higher capacity.



**Layout of standard panels (with vacuum circuit breaker)**



ISOVAC 12-24 kV Vacuum Circuit Breaker which may be actuated via a spring charged drive mechanism or LKE's permanent magnet actuator system.

Circuit breaker panel with bus riser suitable for sectionalising

Transformer/downstream device protection section	
Rated voltage (kV)	H X W X D (mm)
12	2000X550X900*(1060)**
24	2000X550X940*(1100)**

**Standard fittings:**

- GLBS AL or BF configuration
- ISOVAC vacuum circuit breaker
- safely interlocks between switch and panel locks
- fuses
- door lock
- cable mounting rack
- voltage indicator
- current fault protection relay
- surge arrestors
- amp meter
- alarm annunciator

**Optional fittings:**

- auxiliary contacts/shunt trip
- IS / ES position locks
- Interlocks for main and backup units
- internal illumination
- heater
- motor and gear drive
- general accessories and mounting rack

\* --- base depth  
\*\* -- absolute depth

**Electrical features**

table-17

Rated voltage	kV	12	17.5	24
Dielectric withstand voltage to earth and between phases (50 Hz 1min) and isolating distance	kV	42/48	38	50
Impulse withstand voltage to earth, between phases and isolating distance.	kV	75/85	95	125
Rated current	A	630	400-630	400-630
Short time current	kA	20X3s	12.5...20X1s	12.5...20X1s
Making capacity	kA	50	31.5...50	31.5...50
Internal arc withstand current (0.5 s)*	kA	12.5...16	12.5...16	12.5...16
Breaking capacity	kA	20~31.5	20~31.5	20~31.5

\* \* \* -- Request information from LKE for higher capacity.

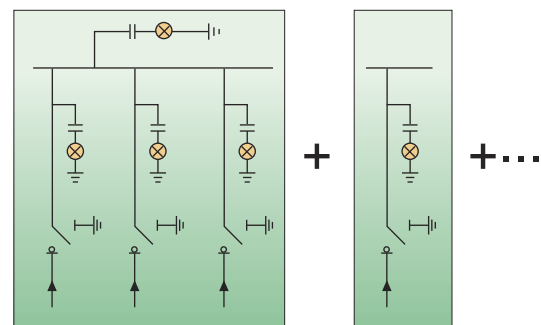
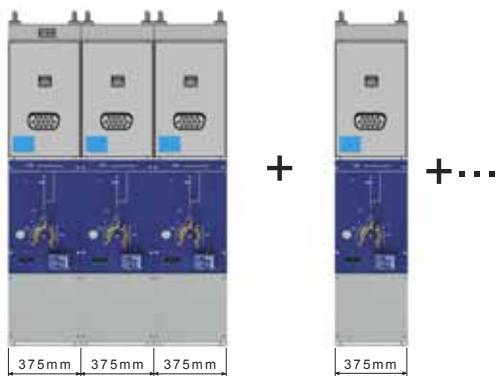
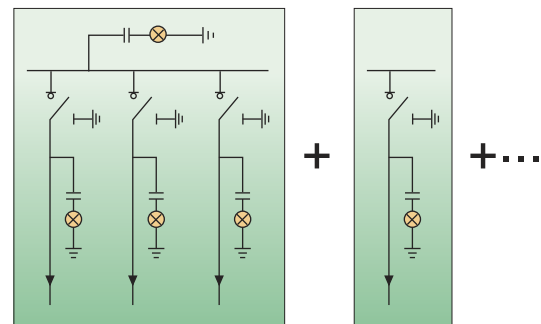
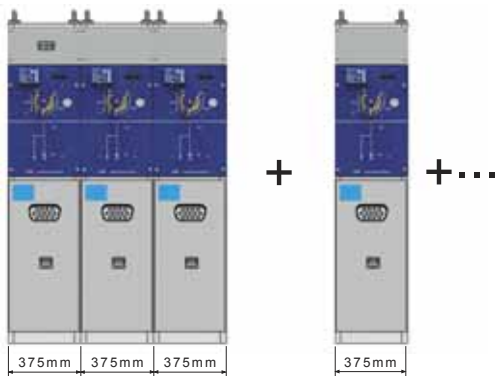
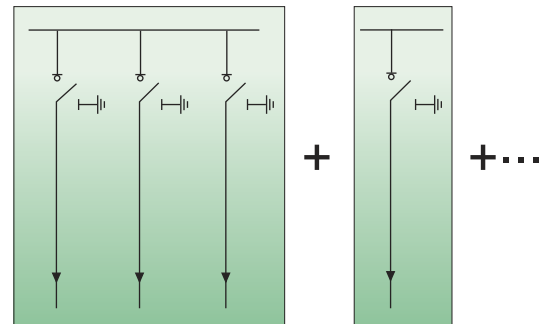
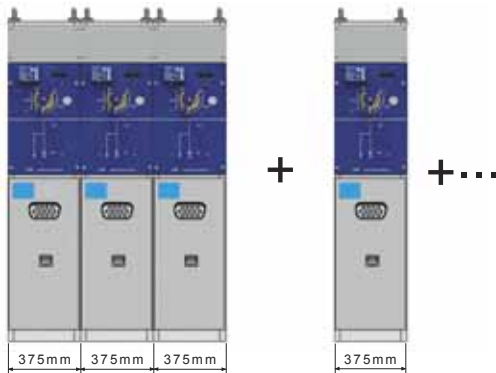


## APEXE outdoor RMU system using GLBS

LKE's APEXE is an outdoor RMU system which uses the **GLBS** and **LCA-G**. The **GLBS** is relatively compact even though it relies on air as an insulation medium because it has been spatially optimised. The smallest modular increase for each additional panel unit is 375mm in width. The system is 1500mm or 1700mm or 1900mm high and has a depth of no more than 1200mm.



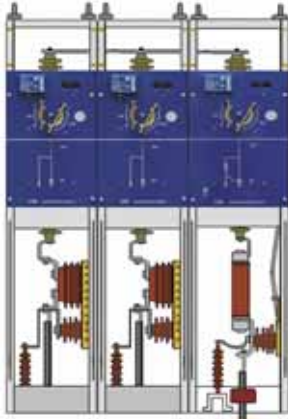
APEXE 4 panel RMU in an outdoor enclosure with the dimensions of 1600X1500X1200 (WXHXD)mm





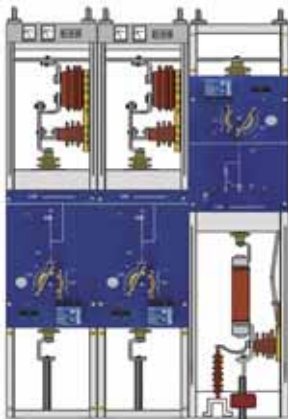
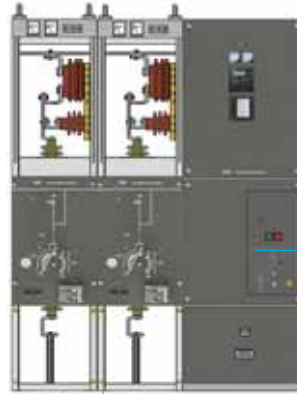


**RMU combination schemes**



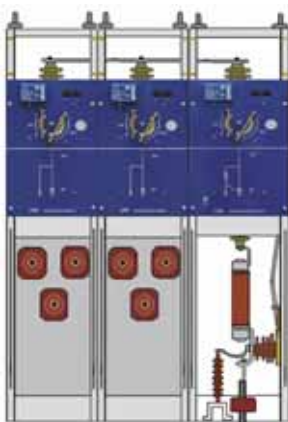
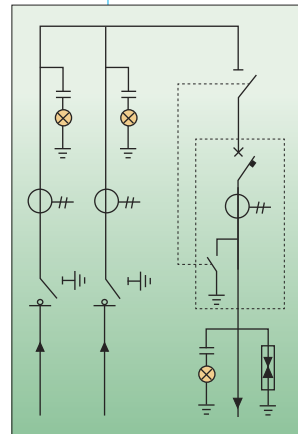
2L+1T RMU Scheme whereby the service compartment of the line units are on the incoming end of the load break switch.

Schemes G1 to G8 for line units and schemes G19 to G24 for transformer protection units.



2L+1T Scheme whereby the service compartments of the line units are on the outgoing side of the load break switch.

Schemes G9 to G16 for line units and schemes G19 to G24 for transformer protection units.



2L+1T Scheme using internal cone cable connections for the line units.

Schemes G17 to G18 for line units and schemes G19 to G24 for transformer protection units.

2L+1T Scheme where the transformer protection unit consists of the ISOVAC (integrated spatially optimised vacuum circuit breaker), the circuit breaker includes its own air insulated isolator switch on the incoming end as well as current transformers and earth switch on the outgoing end downstream of the vacuum interrupter.



The ISOVAC VCB with isolator switch in open position (above picture).





## Transportation and handling

### ■ Transportation (give an example)

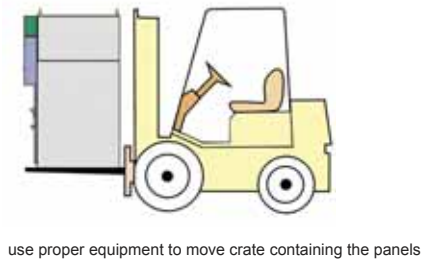
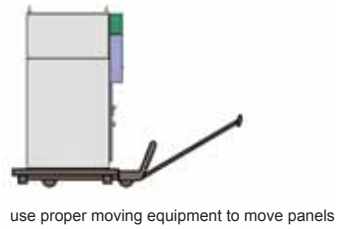
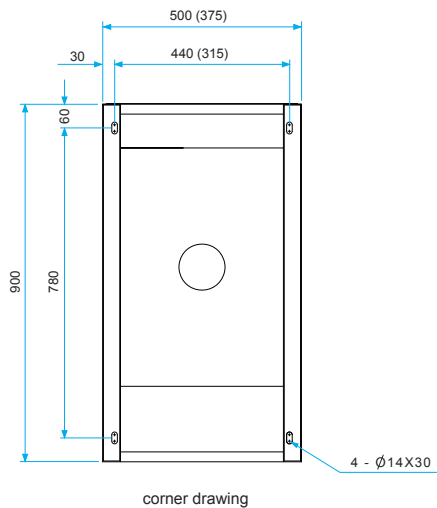
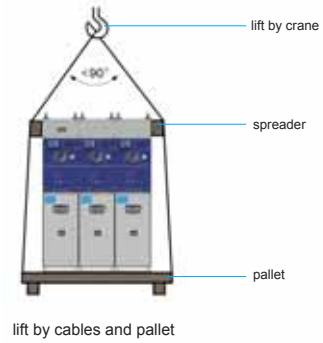
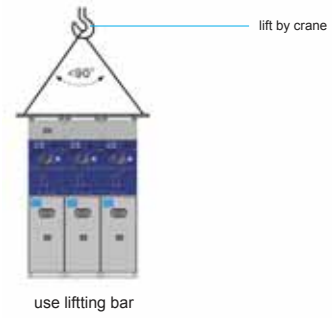
- Lift
- Flat truck
- Use proper moving equipment

### ■ Packaging

Below table illustrates various switchgear packaging examples.

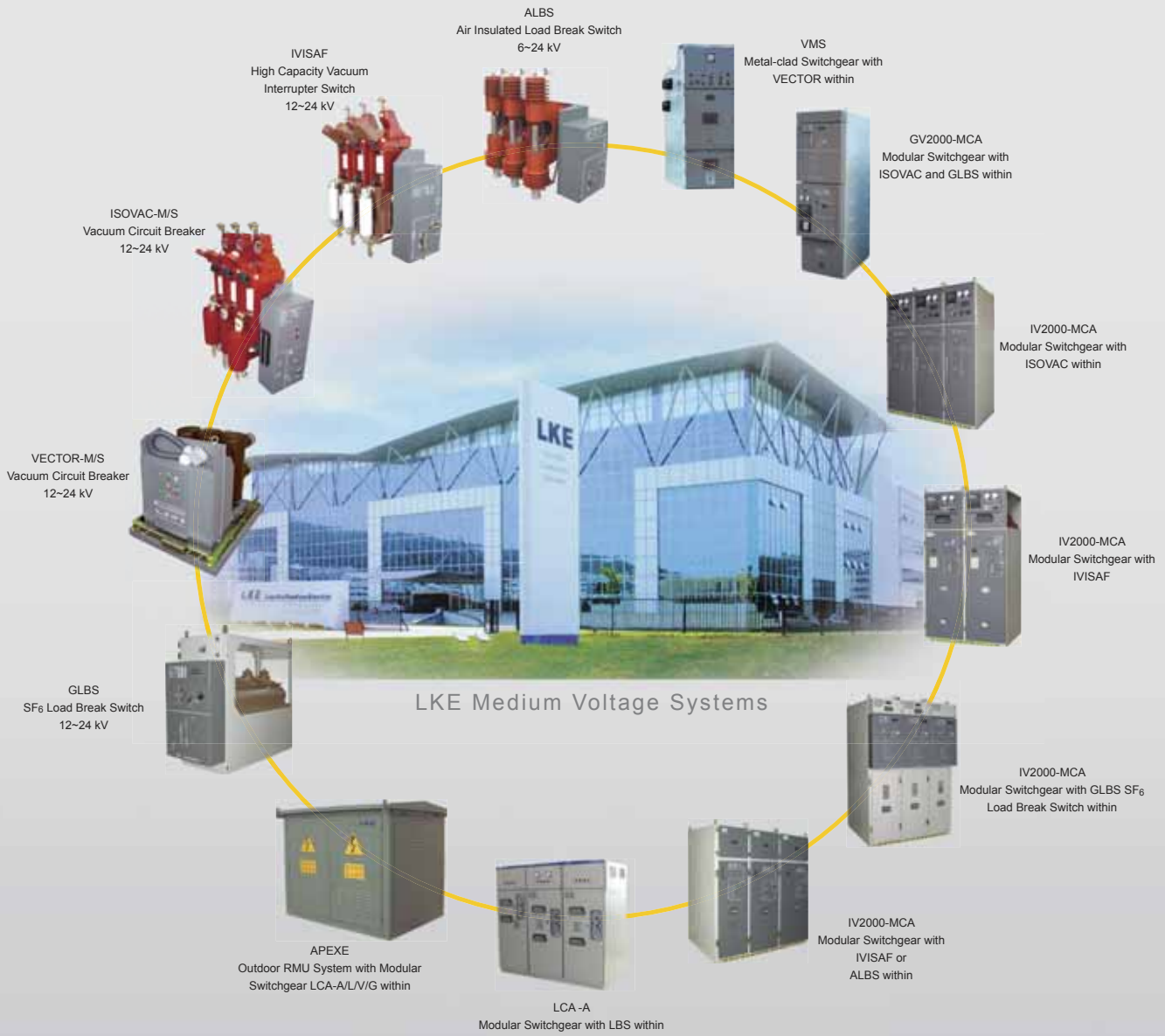
table-18

Means of transportation	Packaging examples
Via railway or road delivery	Packaging: Open type with switchgear secured on pallet and covered by waterproof material.
Via sea freight	Packaging: Secured upon standard pallets for sea freight and sealed in waterproof material with extra drying agents within.
Via air freight	Packaging: Open type Secured on pallet and covered by waterproof material.



## LKE Medium Voltage Products

LKE's 12~24 kV load break switches, circuit breakers and complete switchgears for indoor and outdoor applications are products of the LKE Medium Voltage Components Division.



1.0  
0.9  
0.8  
0.7  
0.6  
0.5  
0.4  
0.3  
0.2  
0.1  
0.0