Medium Voltage Switchgear System

12kV ET1

Removable AC Metal-enclosed Switchgear

EATON

Powering Business Worldwide

Powering business worldwide

Eaton delivers the power inside hundreds of products that are answering the demands of today's fast changing world.

We help our customers worldwide manage the power they need for buildings, aircraft, trucks, cars, machinery and entire businesses. And we do it in a way that consumes fewer resources.

Next generation transportation

Eaton is driving the development of new technologies – from hybrid drivetrains and emission control systems to advanced engine components – that reduce fuel consumption and emissions in trucks and cars.

Higher expectations

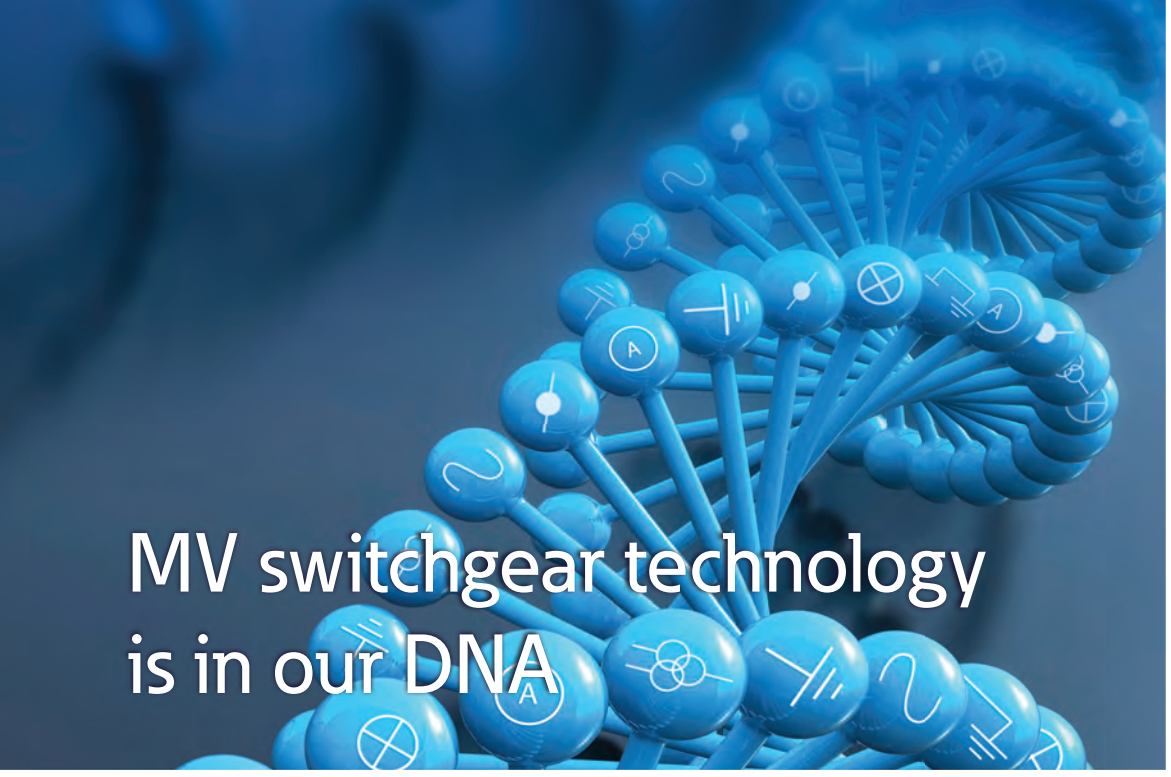
We continue to expand our aerospace solutions and services to meet the needs of new aviation platforms, including the high-flying light jet and very light jet markets.

Building on our strengths

Our hydraulics business combines localised service and support with an innovative portfolio of fluid power solutions to answer the needs of global infrastructure projects, including locks, canals and dams.

Powering Greener Buildings and Businesses

Eaton's Electrical Group is a leading provider of power quality, distribution and control solutions that increase energy efficiency and improve power quality, safety and reliability. Our solutions offer a growing portfolio of "green" products and services, such as energy audits and real-time energy consumption monitoring. Eaton's Uninterruptible Power Supplies (UPS), variable-speed drives and lighting controls help conserve energy and increase efficiency.



MV switchgear technology is in our DNA

Eaton Corporation is a worldwide leader in the design, manufacture, and sale of safe, reliable and high-performance medium voltage power distribution equipment in accordance with IEC, ANSI and GB / DL standards

Complete Global Medium Voltage Switchgear Solutions

Eaton, a premier leader in designing and manufacturing power distribution and protection equipment in the electrical industry, offers a comprehensive range of medium voltage (MV) solutions to meet the needs of virtually every application. From products that feature cutting-edge design that allow for easy access, maintenance and space savings, to arc-resistant products that enhance safety, Eaton's medium voltage solutions provide a variety of products for every need. Additionally, Eaton's global service network provides maximum customer support in all regions of the world.

As one of the few completely vertically integrated and diversified industrial manufacturers in the world, Eaton designs not only MV assemblies, but also the key components that comprise the MV solutions – from steel housing and circuit breaker compartments to vacuum interrupters, circuit breakers, bus systems and fuses.

Eaton's MV heritage, strengthened by acquisitions such as Westinghouse DCBU, Cutler Hammer, MEM and Holec, has resulted in breakthrough MV technologies and numerous international patents over the years.

Part of Eaton's complete electrical PowerChain Solutions – which help businesses minimize risks while realizing greater reliability, cost efficiencies, capital utilization and safety – Eaton's medium voltage equipment meets all applicable standards and certifications such as IEC, NEMA / ANSI, GB / DL, UL, IEEE, KEMA and CSA.

When it comes to medium voltage solutions, you can trust the one name with a long history of proven performance: Eaton.

Eaton's range of SF_6 free switchgear for Medium Voltage

An Eaton Green Solution

12kV ET1

Removable AC Metal-enclosed Switchgear

Overview

12kV ET1 is the indoor metal-clad air insulated medium voltage switchgear. Benefit from Eaton's the new vacuum technology and the mature epoxy-resin insulation technology, it is approved comprehensively through type testing and qualification. The product is mainly applied in the power plants, transformer stations, mining enterprises and high-rise buildings with optimized safety, reliability, cost-effectiveness, and high performance. The 550mm width compact solution better suits the application in projects with restricted spaces such as the commercial real estate, data centers and retrofit.

ET1-12 switchgear comprises a complete range from 1250A up to 4000 A current. The main busbar current can reach 4000A. Adopting the vacuum interrupting technology and the composite insulation technology, the switchgear is the best of its kind in the medium voltage field to replace the environmentally harmful SF6 gas insulation equipment.

It is also produced with fully recyclable materials ensuring that at the end of its life the product can be safely and efficiently recycled – providing a wholly sustainable solution to medium voltage switchgea applications.

Applications

- Infrastructure
- Data centers
- Commercial buildings
- Industries and corporations
- Airports and hospitals

High reliability

- Compact components and optimized electrical field structure guarantee the performance of the overall insulation system
- The epoxy encapsulated circuit breaker and completely insulated and enveloped busbar system enhance service reliability
- Up to 30,000 cycles long-life spring mechanism requires minimal maintenance
- The high-performance circuit breaker can accommodate up to 50 full-capacity circuit-breaking duty
- High-quality brand interrupters with a guaranteed life span of 25 years

Applied standards

- GB3906
- GB/T11022
- DL402
- DL404
- DL593
- IEC62271

Safety for equipment and person

- Metal-clad fully enclosed structure prevents invasion by pollutants and tiny living things.
- Operation only on completely closed-door condition protects the personal safety of operators.
- Reliable and comprehensive interlocking device effectively prevents against wrongful operation for enhanced safety
- The emergency opening device in the front door makes emergency tripping of VCB in closed-door state.
- The quick making earthing switch is used for grounding on the cable side to ensure safety during maintenance.

Easy operation and wide adaptability

- After opening the rear door of switchgear, the cables and current transformers can be installed
- Common electromagnetic transformer is used
- Cable connectors of various common specifications to be used
- Suitable for multiple cables connection of various common specifications (up to 6 cables per phase)
- Panel coupling is simplified in site: no special tools are required and system can be extended on both sides.
- Mimic diagram of primary circuit in front door and the components status are visible for users
- Maintenance may be accommodated for front or rear access.

Environmentally friendly and low energy consumption

- No SF6 gas is used for the circuit breaker and insulation (green and environmentally friendly)
- Powerful maintenance-free design with minimal parts
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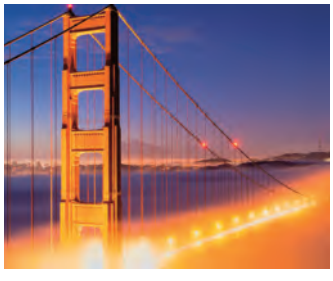
- Highly efficient and energy-saving assembly process to reduce energy consumption during the manufacturing process
- Effective utilization of materials
- The advanced vacuum circuit breaker contact design helps prevent against the heating point to minimize electrode corrosion and to extend the product life.
- The number of electrical contact or interconnection points inside the system is kept at a minimum for lowest energy consumption during operation.
- To discontinue use, no special or required processing procedure is needed.



Basic design

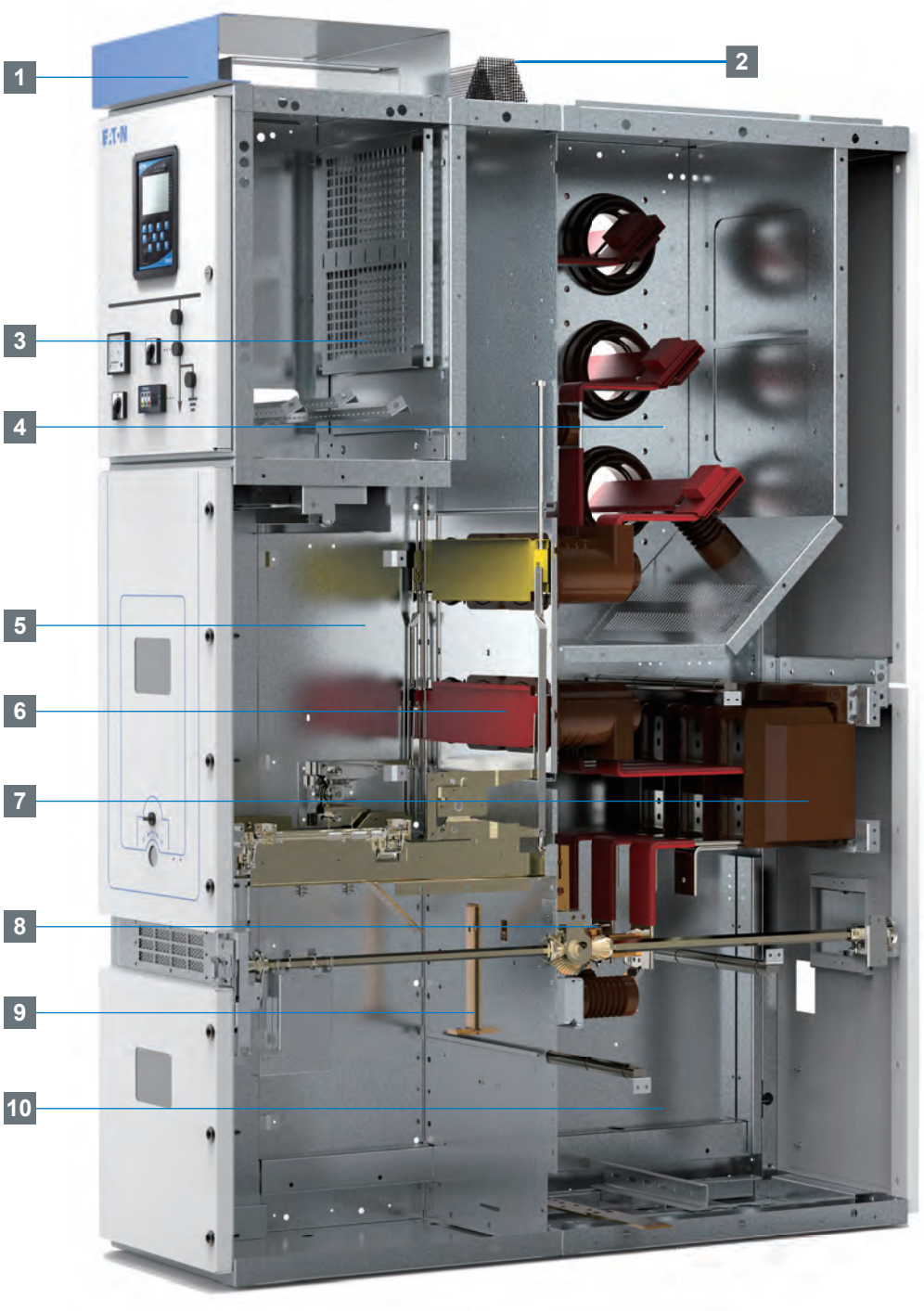
ET1-12 has a modularized structure which consists of the front and the back modules. The module is riveted internally and is known for the outstanding switchgear strength and precision. The interfaces available on both sides of the panel for conveniently expansion of the existing system.

1 Low voltage busbar channel

On top of the panel there's an independent low voltage busbar access that may be opened separately to connect low voltage busbars of adjacent panels which line up.

2 Pressure relief channel

For the three high voltage compartments on top of the panel, there are the respective pressure relief cover plates to help with the emissions of gases generated during internal arcing from above.



Superior safety, reliability and performance

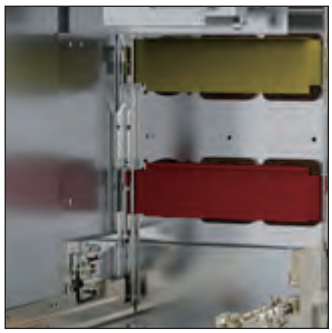
3 Low voltage compartment

The low voltage compartment consists of separate grounded metal partitions. Internally there are the grid board/terminal block/secondary grounding bar to offer sufficient room for secondary control and protection equipment.

4 Busbar compartment

The busbar compartments are separated from one another through grounded metal partition boards and bushings. There are separate pressure relief channels. The whole busbar system is fully insulated to guarantee the insulation level and to minimize the possibility of arc fault. The epoxy resin insulators with large creepage distance (⩾ 240 mm) are used to support the busbar. The bushing is installed on the stainless-steel plate in order to reduce heat generated by the eddy currents from the busbar.

5 Circuit breaker compartme



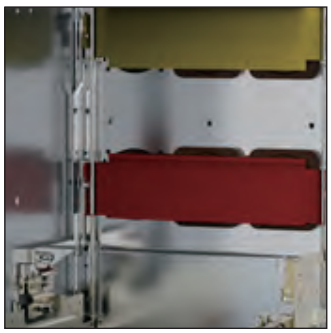
The circuit-breaker compartment is made of grounded metal partition boards. On top of it is the separate pressure relief channel.

Inside the circuit-breaker compartment there are the installed aluminum alloy guide rail and the exclusive grounding conductor to ensure precise coordination between the circuit breaker truck and the primary contacts and reliable grounding during racking-in from the test to service position.

With the compartment door fully closed, the circuit breaker can be closed or opened via the manual button or the operation rod in front of the door.

The circuit breaker truck is mechanically interlocked with the door plate. Only when the circuit breaker is tripped and returns to the test position can the door be opened.

6 Shutters



The earthed metal shutters on the busbar and cable sides can be separately operated. The shutters will automatically open or close as the truck moves in or out.

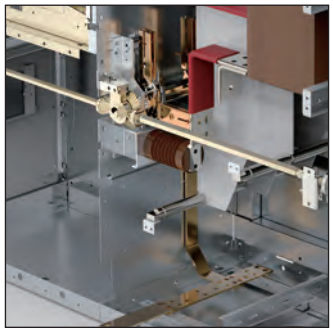
When the circuit breaker is in a test or disconnected position, the shutters close automatically to prevent against approaching or contacting with charged conductors.

When the circuit breaker truck is moved out of the switchgear, a padlock may be added with the shutter closed to ensure that the service personnel do not contact high voltage charged conductors.

7 Current transformer

The switchgear is configured with the standard epoxy resin casting block current transformer.

8 Earthing switch

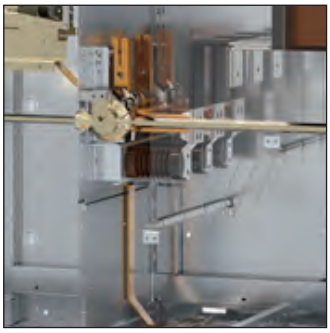


The earthing switch is installed inside the cable compartment in the center of the cabinet. Opening or closing is manipulated from the front side of the switchgear. The status of the earthing switch can be observed directly through the window, and may be displayed on the low voltage door.

There is a mechanical interlock between the earthing switch and the circuit breaker or the contactor truck. Only when the truck is in the test/disconnected position can the earthing switch be turned on or off.

There is also a mechanical interlock between the earthing switch and the cable compartment door to ensure that the cable compartment door can only be opened after the earthing switch is turned to off.

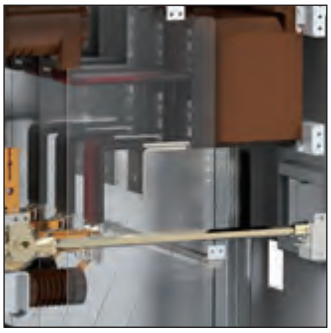
9 Grounding conductor



Each switchgear is configured with a pass-through main earthing busbar. A rectangular copper bar with a suitable cross section is selected according to the short-circuit capacity of the system to ensure simple and effective grounding connection between switchgear and the grounding network at the substation.

The grounding conductors inside the switchgear are distributed inside the cabinet vertically and horizontally and are connected to the earthing switch and the main earthing busbar. The overall grounding system has been validated through the short circuit withstand test.

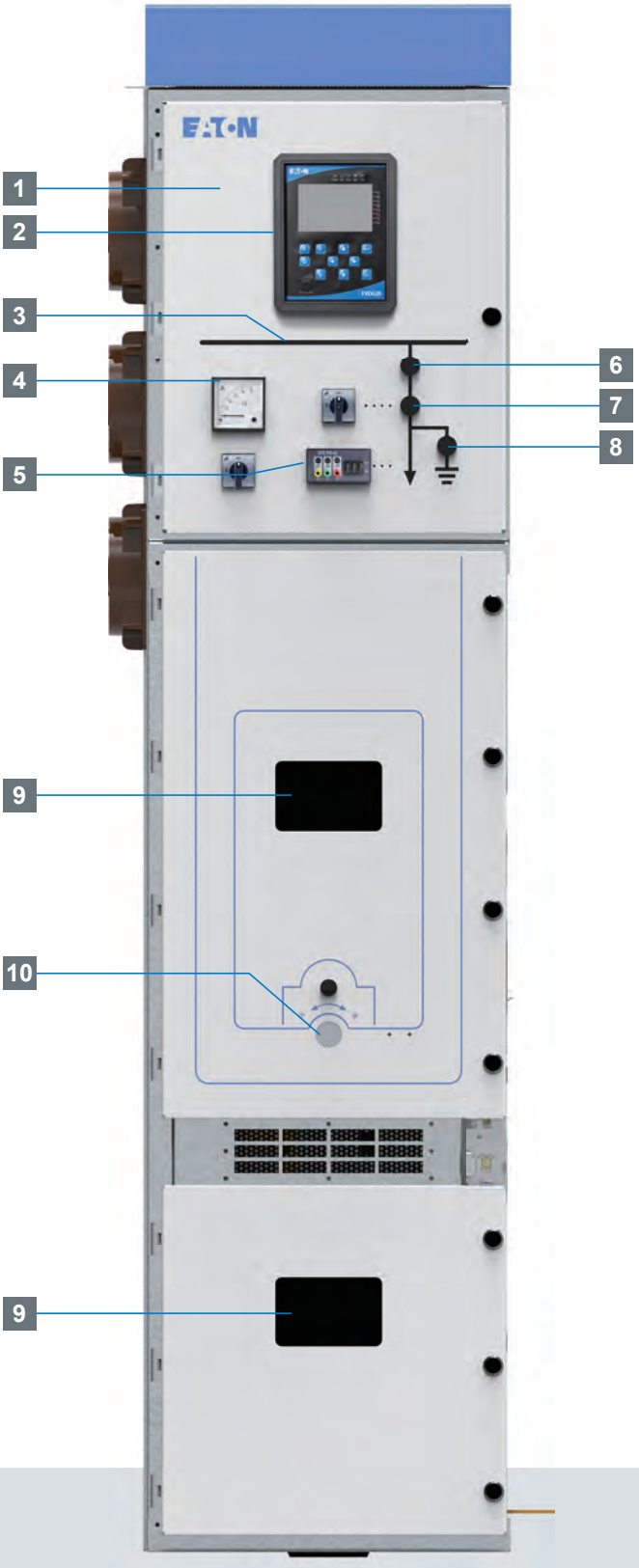
10 Cable compartment



Inside the cable compartment it is possible to install the current transformer, earthing switch, and surge arrester. The cable compartment and the switchgear are designed to accommodate the various ways of incomer and feeder, such as bottom cable in/out, top cable in/out or top bus bar in/out.

The cables can be connected in parallel for at least 2 x 400 mm2 three-core cables at the same time. The terminal height of cable is not below 750 mm, which makes connection convenient.

Control, protection and operating interface



1 Low voltage compartment door

All controls and displays are installed on the door to facilitate operation.
On the door, various types of meters and switches may be installed as required, such as:

- Circuit breaker closing/opening switch
- Circuit breaker status lamp
- Ammeter/Voltmeter and the phase selection switch

2 Protection relay

Eaton brand protection relay may be used as the standard option; customers may also choose protection relays from other suppliers.

3 Mimic diagram

There is a clear circuit mimic diagram on the door of each panel.

4 Ammeter and the phase selection switch

5 Voltage Indicator

The optional three-phase voltage detection and indicator are available for each panel. This voltage indicator is driven by the capacitor voltage divider inside the insulator and is connected to the conductor on the cable side. Operators can see directly if the connected cable is charged.

6 Truck position indicator

Shows that the circuit breaker truck is in the connected/service or test/disconnected position.

7 Circuit breaker status indicator and closing/opening switch

This local circuit breaker opening/closing switch can be used to manipulate the circuit breaker; the closing/opening state is shown on the door.
The optional LED indicates the "charged" state of the spring mechanism.

8 Earthing switch status indicator

Shows that the earthing switch is in the opened/closed state.

9 Viewing windows

The circuit breaker compartment door viewing window provides visual indication of the position of the circuit breaker indicating:

- The status of the breaker
- The status of the spring charged mechanism

The cable compartment door viewing window allows visual indication of:

- The status of the earthing switch
- Inspection of the cable connections

10 Circuit breaker propelling mechanism operation hole

Turn the knob and open the cover plate over the operation hole to insert the handle to racking in/out the truck.

Clear operation panel to facilitate user operation

Safety first design

Eaton applied its experiences and knowledge accumulated over the years in the resin insulation technology, vacuum technology, arc interruption and electrical field control technology to the design and development of products, and has accordingly ensured very high safety and reliability in operation throughout the life span of its equipment. The switchgear is known for the many reliable functional designs to guarantee continuity in power supply and also to protect the safety of operators.

Preventing against internal arc fault

The solid encapsulated monopolar structure of each phase and the fully insulated busbar system guarantee insulation and encapsulation of the overall loop high voltage conductors and keep them isolated from one another to avoid/minimize possible internal arc fault to the greatest extent possible.

Internal arc class: The greatest underlying threat possibly facing operators is the generation of arc inside the switchgear. The metal-clad design of ET1 along with its robust structure enabled its three major compartments to successfully pass the internal arc fault test and meet the GB3906 requirements. The rated value of IAC can reach 40kA-1s.

According to the standard defined protection level of switchgear upon internal arc fault, the ET1 range's approval upon independent third-party testing proves that the IAC class it can offer is **AFLR**。

A = Protection for personnel (authorized personnel only)

F = Protection at the Front of the switchgear

L = Protection at the Lateral (sides) of the switchgear

R = Protection at the Rear of the switchgear

Accessibility of compartments

To guarantee the safety of personnel, access control is enforced for each charged compartment of the switchgear as required by standards:

- Busbar compartment: Tool-based/non-accessible
- Circuit breaker compartment : Interlock controlled
- Cable compartment: Tool-based or optional interlock control

Partition classification

ET1 employs only earthed metal partitions and therefore has the highest level of partition classification of PM.

ET1 switchgear is equipped with automatic earthed metal shutters. Individually operated shutters for both the Line (busbar) and Load (cable) connections can be padlocked in the closed position. When the vacuum circuit breaker is in the test or the disconnect positions, the shutters will automatically close to prevent accidental contact with any live parts.

For testing purposes, special shutter fixtures are used to maintain the shutters in the open position. Colour coded and labelled 'Busbar' and 'Cable', the shutters are easily identified as Open or Closed.

Basic protection against invasion by foreign matters

The standard external protection class of the switchgear design is IP4X. IP41 is an optional configuration. The internal protection class is IP2X. The partition design of the protection class prevents against invasion by foreign matters and reduces the risk of any accident as a result of contact with charged components.

Safety interlocks

For personnel safety ET1 is designed with a series of interlocks to prevent fundamentally against dangerous situations and wrongful operation that might give rise to serious consequences and accordingly protect the operators and the switchgear.

Basic interlocks

- Only when the circuit breaker compartment door is closed can the circuit breaker be moved in or out. Only when the circuit breaker is in the testing/isolated position can the circuit breaker compartment door be opened.
- Only when the circuit breaker is in the opened state, the truck may move from the testing/isolated position to the working position.(mechanical interlock).
- Only when the truck is in a complete testing or working position can the circuit breaker be closed (mechanical interlock). When the truck is in the testing or working position but there is no controlled voltage, the circuit breaker cannot be closed; one can only open it manually (mechanical electrical interlock).
- When the truck is in the working position, the control line plug is locked and hence cannot be pulled out.
- When the earthing switch is off, the truck cannot move from the testing/isolated position to the working position; when the truck is in the working position, the earthing switch cannot be turned off(mechanical interlock).
- When and only when the earthing switch is off, the rear door of the cable compartment may be opened (mechanical interlock). When the rear door is not closed, it is impossible to turn on the earthing switch.

Additional interlocks

- The additional electrical or mechanical lock realizes interlocking between the busbar grounding and the upstream incoming line/downstream outgoing line.
- The additional interlock may be installed onto the truck and/or the earthing switch operation mechanism, such as the latching electromagnet.
- Once the truck moves away, the shutter may be locked with a padlock.
- The operation hole of the earthing switch may be locked by padlock.
- Additional electromagnetic lock may be installed to the door of the cable compartment of the switchgear.

Remote operation

In order to realize further safety requirements, the switchgear may be configured with complete remote operation features. The VCB truck and Earthing switch can be operated via motor no need to access the switch room.

Minimal maintenance and high reliability

Highest class of operational continuity

The class of loss of service continuity of ET1 is LSC2B.

The LSC2B class indicates that system operation can reach maximum continuity When the main switch device is being serviced, there is no need to interrupt corresponding cable connection or the main busbar. Therefore, in the LSC2B switchgear, there have to be at least three compartments to exercise different functions:

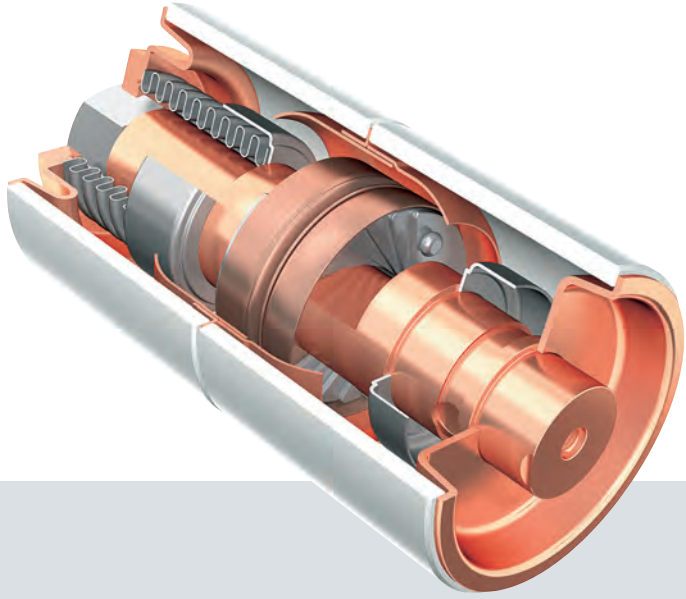
- 1 for the main switch device
- 1 for components connected to one side of the main switch device, such as the feeder loop
- 1 for components connected to the other side of the main switch device, such as the busbar

When the circuit breaker compartment is opened, the cable and the busbar are still in a charged state and the switchgear now can be classified as LSC2B.

Reliable and maintenance-free vacuum switch technology

The reliability and advantages of vacuum switches in the medium voltage field are without a doubt. Eaton's vacuum switch technology has brought about advantageous circuit breakers and contactors for their high performance, long life span, and low energy consumption.

- No servicing is required during the up to 25-year life span of the vacuum interrupter.
- Long operating life span: The circuit breaker can work up to 30,000 times and contactors up to 1,000,000 times.
- Contactor wear is minimal, and mechanical adjustment is not required throughout the operation cycle.



Solid insulation combining resin pouring technology

Epoxy resin is a high-quality insulating material. With more than 50 years of experience in designing and manufacturing pouring resin parts, Eaton was able to design exclusive parts to help optimize distribution of the electrical field with a robust structure and sufficient heat sinking performance.

- High mechanical strength to enhance monopolar durability and mechanical life span
- Avoid impacts from climate conditions and humidity
- Reduce mechanical impacts and vibration
- High heat conductivity
- High resistivity and creepage distance for enhanced insulation and compact design

Fully insulated and fully encapsulated busbar system

The main busbar penetrating through the whole switchgear is completely insulated and isolation between adjacent cabinets is guaranteed by the main busbar compartment. The long-term reliable insulation performance of the main busbar system is accordingly guaranteed. It also helps prevent against spreading between adjacent cabinets in case of failure.

Withdrawable truck design

Main primary components such as the voltage transformer, fuse and lightning arrestor can all be installed on the withdrawable truck to facilitate safe operation while the main busbar is charged and also maintenance.

Highly flexible application

Eaton understands the complexity and variability of actual application and the value of land, and offers various flexible design solutions in order to answer the needs of application to the maximum extent possible.

Adaptation to different climates and environments

- 3500m high-altitude
- Addition of a heater to prevent against condensing risk in a humid environment
- IP41/IP42 cover protection available
- Vibration and tilt test to satisfy special environmental needs
- Galvanized steel sheet or epoxy powder painted cover for enhanced protection against impacts from salty fog in coastal environments

Optional design solutions and configuration

- 7.2kV or 12kV fuse - vacuum contactor used to control and protect the load of the electric motor, capacitor or transformer
- VCB cable in/cable out solution for upstream incomer of transformer, with the top or bottom entry/out
- Option for standard or busbar casing current transformer
- Suitable for cable connectors of various common specifications
- Concurrent connection with multiple cables (up to 6 cables per phase)
- Top entry of primary/secondary cable
- Can accommodate access by cables or the busbar and also mixed access by cables and the busbar
- Fixed or withdraw-able installed voltage transformer
- Busduct between different bus sections or cabinets
- Installed against the wall or back to back

Compact 550 mm solutions of a complete series

ET1-12 550 products inherited the strengths of the ET1 and the E-VAC series of products and further realized the compact design of switchgear to better suit limited space such as commercial real estate and field modification. The products have been comprehensively qualified through type testing with optimized user safety, reliability, cost-effectiveness and high performance.

- New compact design with only 550mm width to save installation room
- Small size VCB as part of E-VAC series, inherited Eaton's high-quality vacuum interrupter and solid encapsulation workmanship
- Same user interface and operation with the ET1 switchgear; free configuration for different rating feeders to form one system is possible

Main components

E-VAC vacuum circuit breaker

Features

- The epoxy resin encapsulated pole unit has excellent insulation performance and can adapt to rough environments
- Use of Eaton's latest vacuum interrupter that has a long life span, low wear and low chop current
- Mature spring mechanism with steady performance, a long life span, and minimal maintenance
- Excellent performance on switching resistance, inductive and capacitive loads with a very low restroke rate
- AC/DC control power supply
- The spring mechanism realizes automatic mechanical and electrical tripping
- Available auxiliary contacts to display the status of the spring charged or not
- Mechanical indicator shows the closed/opened state
- The auxiliary contact shows the closed/opened state
- The auxiliary contact shows the service/test position of VCB
- The auxiliary contact available for remote display
- Mechanical interlock to ensure door-closed operation
- The mechanical interlock ensures the VCB truck racking in or out only when tripped

SL series of contactors

The fused contactor truck may be adopted for motor start and capacitor bank.

Features

- Green and environmentally friendly vacuum interrupter
- The rated current of contactor up to 400A
- The maximum breaking current up to 7.2kV 8.5 kA/12kV 4kA
- Up to 50 kA HRC fuse
- The maximum rated current of the fused-contactor up to 7.2kV 250A/12kV 200A
- The electronic tripper controller allowed to select the control voltage and trip time on site
- Optional mechanical interlock
- Electrical life span up to 300,000 times
- Mechanical operation is possible up to 12kV, 1,000,000/7.2kV, 2,500,000 times, without service or adjustment

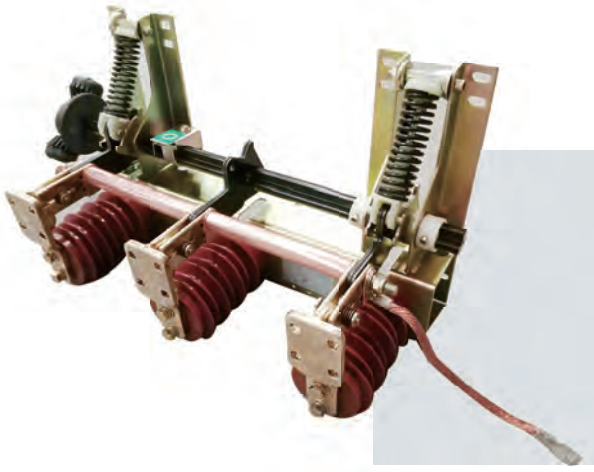
Main components

Busbar

The busbar system consists of a highly-conductive copper row, with a cross section being a standard rounded rectangle.

Features

- Respective busbar compartments are separated by single partition boards
- Fully insulated main busbar penetrates the whole switchgear
- The ventilation of the busbar compartment is directly linked to the pressure relief channel
- For supporting the busbar, the large creepage distance insulators are used
- The pre-drilled copper makes field connection easy
- The rated current of the busbar system reaches 4000A and short-circuit current reaches 50 kA-4s

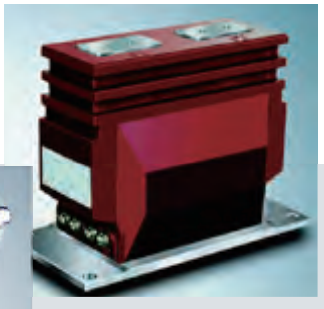


Earthing switch

Both the incomer and feeder can be configured with the cable side earthing switch. There is a mechanical interlock between the earthing switch and the circuit breaker. Only when the circuit breaker is in the opened state and has moved to the "isolated/testing" position can the earthing switch be operated.

Features

- The quick earthing switch passed the fault test
- Front access operation easily with low torque via the bevel gear
- Auxiliary contacts for open/closed positions
- Mechanical indicator for open/closed positions
- Mechanically and/or electrically interlocked with VCB to ensure safety of operators



Current/voltage transformer

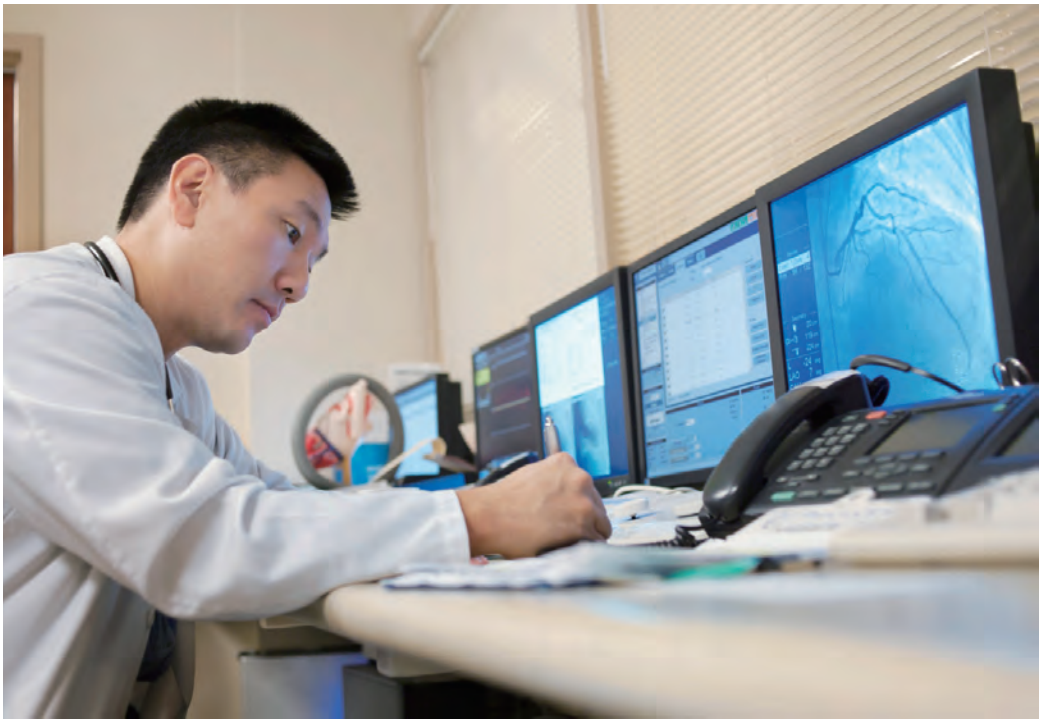
Features

- Configured with smaller epoxy resin molded current transformer
- The external/built-in fuses to protect the transformer
- The type of voltage transformer meets the demand of the compact switchgear

Quality and service warranty

Certifications

- All products have been certified through type-testing performed at a third-party test station
- Related product high-tech certifications



Factory Acceptance Test (FAT)

- The FAT is performed combining test items required by customers
- Field facilities and simulated field environment, testing and measuring test equipment and complete documentation are provided as required
- Customer engineers take part in the whole process as witnesses and sign off for confirmation

Ex-work inspection

- Strict ex-work inspections are performed on each vacuum interrupter, circuit breaker and switch equipment. Upon completion of the overall installation, thorough appearance checks and mechanical functional and electrical tests need to be performed.
- Before being released from the factory, circuit breakers go through standard switchgear coordination tests to ensure product interchangeability and universality.
- Before being released from the factory, circuit breakers go through the run-in test for mechanical operation to ensure steadiness of the performance.
- The ex-work inspection data of all products are archived and traceable.

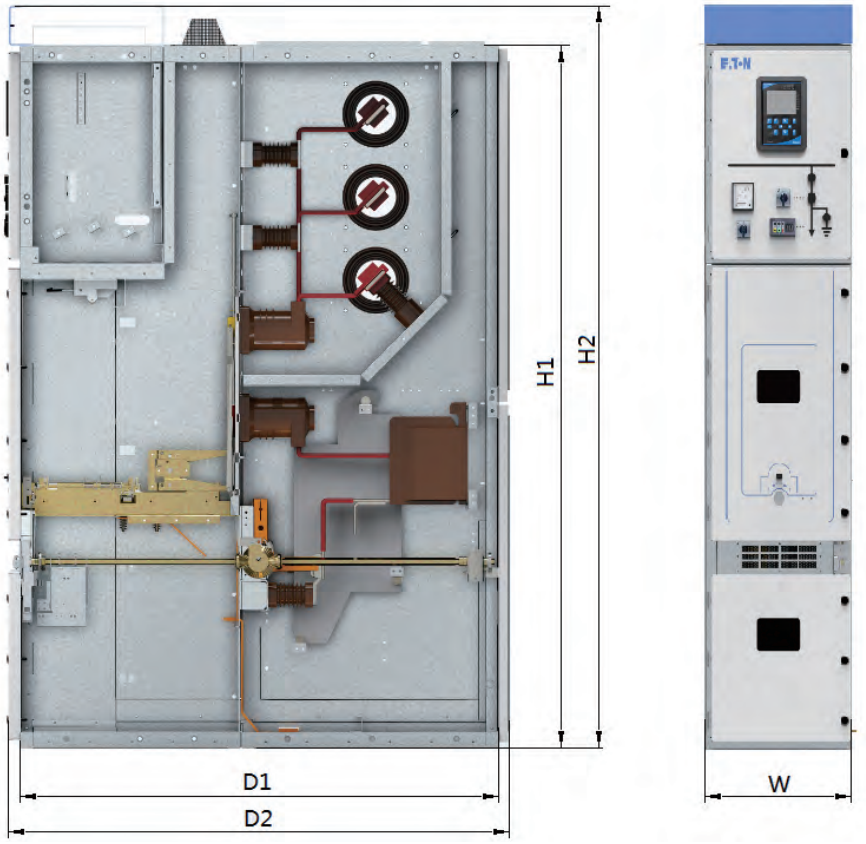
Quality control

- The R&D process is managed through Prolaunch
- The manufacturing facilities follow the globally consistent Eaton quality, environment, and safety system (EQS&EHS) ISO14001 / OHSAS18001 certified
- Both the switchgear and the circuit breaker are tooled to ensure consistency in dimensions
- Quality test from raw material to finished product
  - Automatic three-axis imaging test
  - X-ray testing
  - Loop resistance test
  - Switchgear mechanical property test
  - Pressure tolerance and local release test
  - Mechanical and electrical test

Technical Data

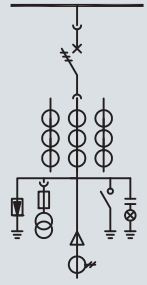
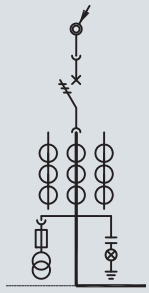
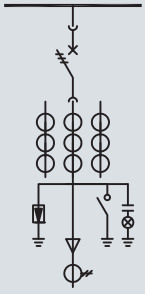
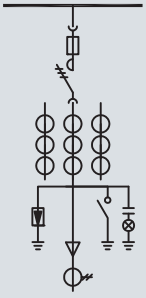
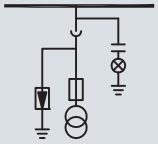
		ET1-12	ET1-12 550	ET1（F-C）-12
System				
Rated voltage	kV	12	12	7.2; 12
Rated Power frequency withstand voltage (1 min)	kV	42	42	32; 42
Rated lightning impulse withstand voltage (BIL)	kV	75*	75	60; 75
Rated frequency	Hz	50	50	50
Busbar system				
Main busbar rated current	A	1250;1600;2000;2500; 3150; 4000	1250;1600;2000;2500; 3150; 4000	1250;1600;2000;2500; 3150; 4000
Branch busbar rated current	A	630;1250;1600;2000; 2500;3150;4000(FC)*	630;1250	Maximum 200 (depending on the fuse)
Short time withstand current	kA/s	25;31.5; 40; 50/4	25;31.5/4	4; 6/4
Rated peak withstand current (peak value)	kA	63; 80; 100; 125	63;80	10; 15
Vacuum Circuit breaker				
Model No.		E-VAC	E-VAC	/
Rated current	A	630; 1250; 1600; 2000; 2500; 3150; 4000(FC)	630;1250	/
Rated short-circuit breaking current	kA	25; 31.5; 40; 50	25; 31.5	*
Rated short-circuit making current (peak value)	kA	63;80;100;125	63;80	*
Short time withstand current	kA/s	25; 31.5; 40;50/4	25;31.5/4	/
Mechanical life	times	30,000/20,000/10,000	30,000	/
SL contactors				
Rated current	A	/	/	400
Rated breaking current	kA	/	/	8.5; 4
Rated short-circuit making current (peak value)	kA	/	/	10.4
Rated short-time withstand current	kA/s	/	/	6/1; 6/4
Withstand current	kA	/	/	15
Electrical life (AC3, AC4)	times	/	/	300,000
Mechanical life	times	/	/	1,000,000**
Enclosure				
Degree of protection		IP4X (IP2X for internal partition)		
Partition class		PM		
Standard color		RAL7035		
		*BIL 95kV can be meet if required; *Add cooling fan while rated current up to 4000A.		*The short-circuit breaking current of F-C depend on fuse with max. 50kA. **The mechanical life bases on electrical latch contactor; The mechanical latch should be replaced every 250,000 times.

Main dimensions



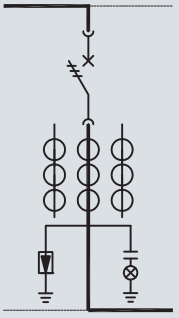
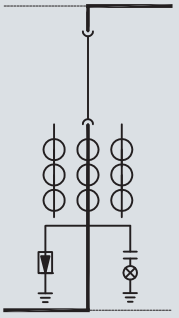
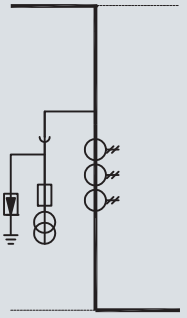
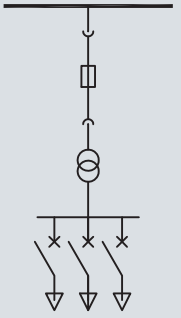
Basic solution		Width W (mm)	Height H1 (mm)	Height H2 (mm)	Depth D1 (mm)	Depth D2 (mm)	Reference weight (kG)
7.2/12kV Contactor							
400A F-C		600	2200	2325	1500	1570	750
12kV 550 VCB panel							
630A	25kA	550	2200	2325	1500	1570	780
1250A	25/31.5kA	550	2200	2325	1500	1570	800
12kV panel							
630A	25/31.5kA	800	2200	2325	1500	1570	850
1250A	25/31.5kA	800	2200	2325	1500	1570	900
1250A	40kA	800	2200	2325	1500	1570	900
1250A	50kA	800	2200	2325	1500	1570	900
1600	31.5/40kA	800	2200	2325	1500	1570	1000
1600/2000A	40/50kA	800	2200	2325	1500	1570	1000
2500A	31.5/40/50kA	1000	2200	2325	1500	1570	1200
2500A	50kA	1000	2200	2325	1500	1570	1200
3150A	31.5/40/50kA	1000	2200	2325	1500	1570	1280
4000A	40/50kA	1000	2200	2325	1500	1570	1450

Basic solution and configuration

		VCB Incomer		Top entry VCB Incomer		VCB Feeder		F-C Feeder		Busbar VT	
											
Primary components	Vacuum circuit-breaker	●	1	●	1	●	1				
	Vacuum contactor							●	1		
	Disconnect truck										
	VT & Arrestor truck									●	1
	VT truck	○	0 or 1	○	0 or 1					○	0 or 1
	Arrestor truck									○	0 or 1
	Metering truck										
	Fuse truck										
	Current transformer	●	3 or 2	●	3 or 2	●	3 or 2	●	3 or 2		
	Voltage transformer	○	1~3	●	1~3					●	2~3
	Surge arrestor	○	0 or 3	○	0 or 3	○	0 or 3	○	0 or 3	●	3
	Earthing switch	○	0 or 1			○	0 or 1	○	0 or 1		
	HRC fuse							●	3		
	PT protection fuse	○	2 or 3	○	2 or 3					●	3
	Ring type CT	○	0 or 1			○	0 or 1	○	0 or 1		
	Voltage Indicator	●	1~2	●	1~2	●	1~2	●	1~2	●	1~2
	Transformer										
LV components	Protection relay	○		○		○		○		○	
	Meter	○		○		○		○			
Entry	Bottom cable entry	●				●		●			
	Top cable entry	○		○		○		○			
	Top busbar entry	○		●		○		○			
Rating	Rated current (A)	630~4000		630~4000		630~4000		<=200A		<=3A	
Dimensions	Width (mm)	550/800(630~1250A) 800(1600~2000A) 1000(2500~4000A)		550/800(630~1250A) 800(1600~2000A) 1000(2500~4000A)		550/800(630~1250A) 800(1600~2000A) 1000(2500~4000A)		600		550 (for withdrawable VTs only; VT's parameter to be confirmed by Eaton due to size limitations) 800/1000 (both VTs and surge arrestor can be installed in truck)	
	Depth D2 (mm)	1500 (Bottom rear cable in/out) 1650(Top rear cable/busbar in/out)		1500		1500 (Bottom rear cable in/out) 1650(Top rear cable/busbar in/out)		1500 (Bottom rear cable in/out) 1650(Top rear cable/busbar in/out)		1500	

Note: ● Required ○ Optional —— Not available

Basic solution and configuration (continued)

		Bus section		Bus riser		Metering		Transformer	
									
Primary components	Vacuum circuit-breaker	●	1						
	Vacuum contactor								
	Disconnect truck			●	1				
	VT & Arrestor truck					●			
	VT truck					○	0 or 1		
	Arrestor truck					○			
	Metering truck					○	0 or 1		
	Fuse truck							●	1
	Current transformer	●	3 or 2	●	3 or 2	●	3 or 2		
	Voltage transformer					●	2~3		
	Surge arrestor	○	0 or 3			●	3		
	Earthing switch								
	HRC fuse							●	3
	PT protection fuse					●	3		
	Ring type CT								
	Voltage Indicator	●	1~2	●	1~2	●	0~1	○	0~1
	Transformer							●	1
LV components	Protection relay	○				○			
	Meter	○				○		○	
Entry	Bottom cable entry								
	Top cable entry								
	Top busbar entry								
Rating	Rated current (A)	630~4000		630~4000		630~4000		<=3A	
Dimensions	Width (mm)	550/800(630~1250A) 800(1600~2000A) 1000(2500~4000A)		550/800(630~1250A) 800(1600~2000A) 1000(2500~4000A)		550 (up to 1250A; Fixed install Surge arrestor; VT's parameter to be confirmed by Eaton due to size limitations) 800 (630~2000A) 1000 (2500~4000A)		800 (for transformer up to 50kVA)	
	Depth D2 (mm)	1500		1500		1500		1500	

General requirements for the installation of switchgear

The location and passageway available for the installation of the switchgear should meet applicable requirements.

The installation foundation for the switchgear usually requires two concrete pouring efforts. The first one is meant to install embedded parts of the switchgear and pave the underlying channel steel. The second concrete pouring effort is for the supplementary level on the ground; the general height is 60 mm. The height of the concrete should be below that of the surface of the channel steel by 3 to 6 mm when the supplementary level of concrete is poured.

The patterns of primary and secondary cable grooves of the switchgear depend on the location and construction conditions of the switchgear to be installed.

The difference per meter on the surface level of the installation foundation of switchgear may not be greater than 1 mm. The difference over the whole length may not exceed 3 mm.

The switchgear is delivered to a specific location according to engineering needs and as shown in the drawings. For a relatively long row of switchgear (with more than 10 units), it is advised to begin with the center while combining the units.

There should be suitable transport tools in the field of installation, such as cranes and forklifts; rollers and crowbars are strictly prohibited.

During installation, the circuit breaker handcart should be removed from inside the switchgear and be placed in another place for proper storage first.

During installation, first calibrate the first unit or ensure that horizontal and vertical requirements are met from the first connecting surface.

The unevenness of switchgear, once installed, may not exceed 2 mm.

Once the first unit is calibrated, install the other units. Pay attention to the side holes and the installed units.

Included documents

- Product Qualification Certificate
- Product Ex-work Inspection Report
- Packing List
- Installation and Operation Instructions
- List of Included Spare Components and Parts and Accessories
- Secondary wiring diagram
- Other relevant materials required by the customer

Ordering information

- It is required to provide the following information when placing an order:
- System wiring diagram, primary solution layout and floor plan
- Basic parameters, including rated voltage, rated current, circuit breaker opening/closing current and control power voltage
- Line access approach and line access cable specification and quantity
- Special requirements for the element model number, specification and quantity (if any)
- For special user environments or requirements, please contact Eaton first.

Spare components and parts and accessories

The accessories of switchgear generally include:

- VCB charging handle
- Opening/closing operating pin
- Racking handle
- Earthing switch operating handle
- Door locking handle
- Trolley
- Specialized tools

Spare components and parts generally include:

- PT protection high-voltage fuse
- Opening coil
- Closing coil
- Voltage Indicator Display

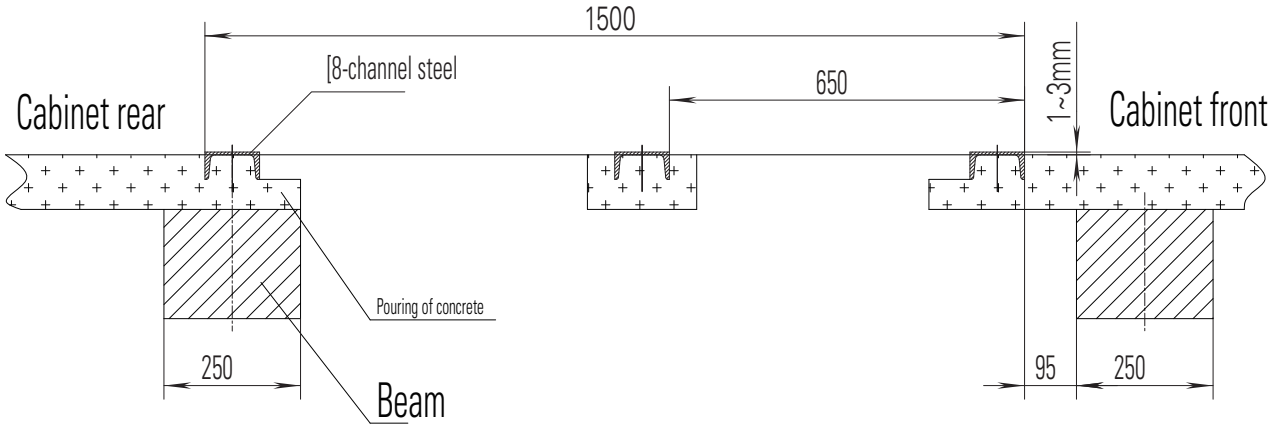
Auxiliary switch

- Indicator
- Transfer switch
- Electromagnetic lock

The list of spare components and parts is eventually based on customer requirements and decided mutually between the supplier and the party with demand.

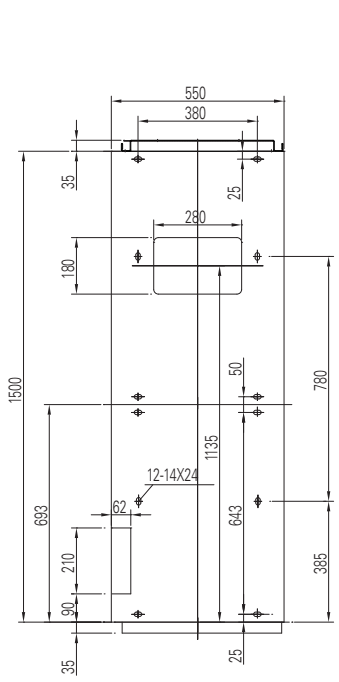
Foundation and floor plan

ET1 installation foundation illustration



1500 deep switchgear installation foundation illustration

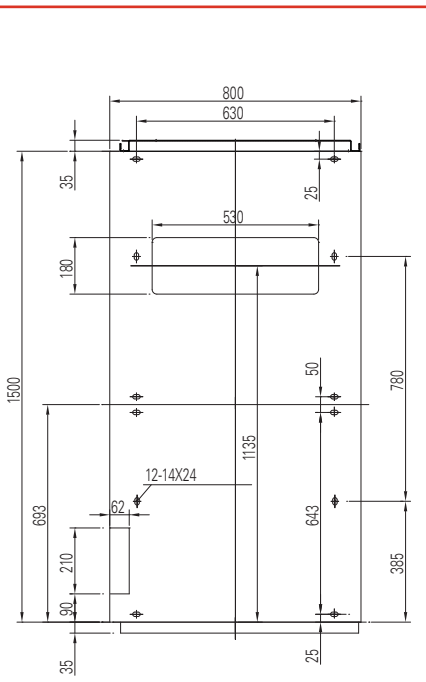
ET1 floor plan



Front

△

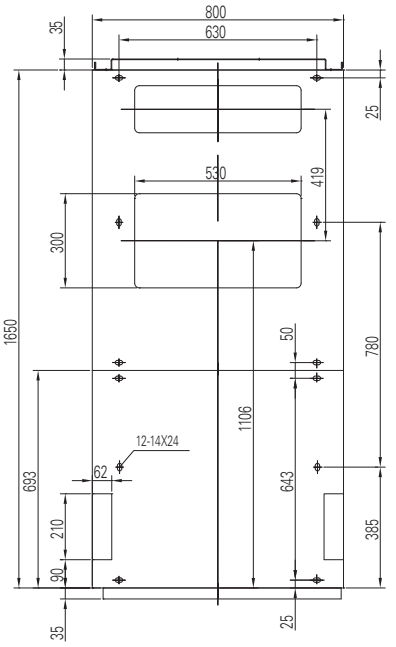
550*1500



Front

△

800*1500



Front

△

800*1650

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Eaton began operation in China more than 20 years ago. Since entering the Chinese market in 1993, Eaton's presence has grown significantly in the country. In 2004, Eaton moved its Asia Pacific headquarters from Hong Kong to Shanghai.

In the Greater China region, Eaton has nearly 9,800 employees, 29 manufacturing bases and 5 R&D centers. Today, we make most products for all of Eaton's distinct business here.

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Printed in China
CHICA2020001A_EN(06-2020)

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