UniGearZS2

DISTRIBUTION SOLUTIONS

UniGear ZS2

Medium-voltage air-insulated switchgear up to 36 kV

The electrical characteristics of the switchboard can vary for ambient conditions other than those described in the previous section and also if a higher degree of protection is used.

— 01 Circuit-breaker compartment

Degrees of protection
The degrees of protection of the switchgear conform with IEC 60529 Standards.

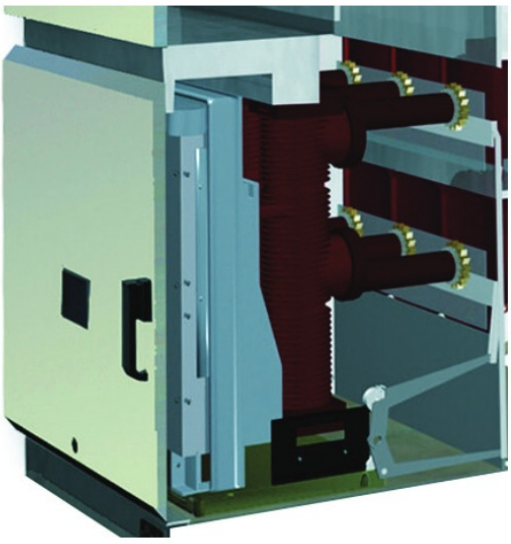
UniGear ZS2 switchgear is normally supplied with the following standard degrees of protection:
- IP4X for the enclosure
- IP2X for the partition between compartments

On request, the external housing can be supplied with a higher degree of protection; in this case please contact your ABB sales representative.

Color of the external surfaces
RAL7035 - light grey (front doors)
Other colors available on request

Electrical characteristics

Rated voltage kV	[kV]	36
Rated insulation voltage	[kV]	36
Rated power frequency withstand voltage	kV 1min	70
Rated lightning impulse withstand voltage	kV	170
Rated frequency	Hz	50-60
Rated short time withstand current	kA 3	...31.5
Peak current	kA	...80
Internal arc withstand current	kA 1 s	...31.5
Main busbars rated current	A	1250
		1600
		2000
		2500
		3150
Branch connections rated current	A	1250
		1600
		2000
Branch connection rated current with forced ventilation with fan	A	2500
Branch connection rated current with forced ventilation with fans (available only with VD4 vacuum Circuit Breaker)	A	3150



Control of the earthing switch is from the front of the switchgear with manual operation.
The position of the earthing switch can be seen from the front of the switchgear by means of a mechanical coupled indicator.

Earthing busbar
The earthing busbar is made of electrolytic copper and it runs longitudinally throughout the switchgear, thereby guaranteeing maximum personnel and installation safety.

Insulating bushings and shutters
The insulating bushings in the circuit-breaker compartment contain the contacts for connection of the circuit-breaker with the busbar compartment and cable compartment respectively.

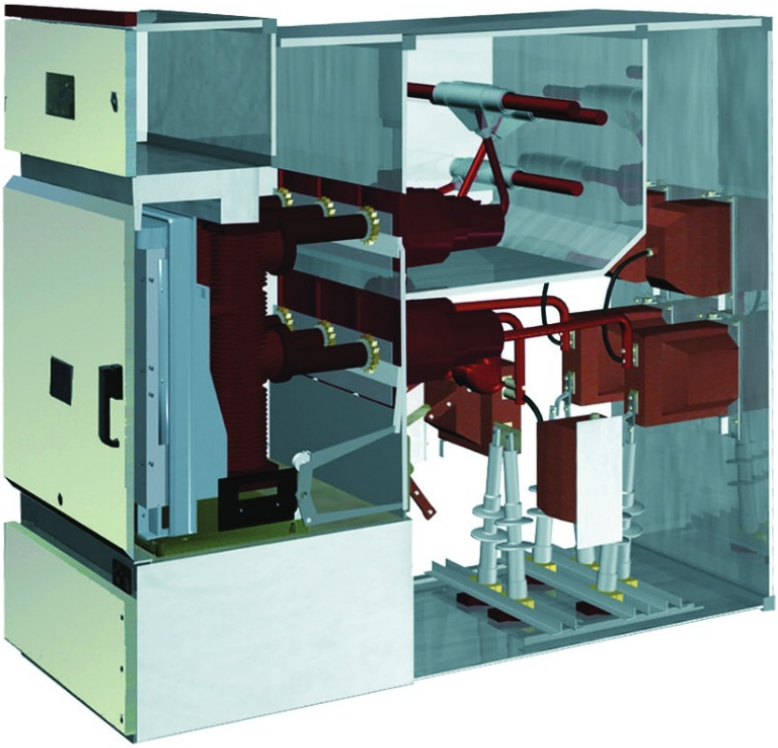
The insulating bushings are of single-pole type and are made of epoxy resin. The shutters are metallic and are activated automatically during movement of the circuit-breaker from the racked-out position to the operation position and vice versa.

Cables
Single core cables up to a maximum of four per phase can be used depending on the rated voltage, the unit dimensions and the cable cross section (please refer to page 44).
The switchgear can be wall-mounted as the cables are easily accessible from the front.

Gas exhaust duct
The gas exhaust duct is positioned above the switchgear and runs along its whole length.
Each power compartment is fitted with a flap on its top surface. The pressure generated by the fault makes it open, allowing the gas to pass into the duct.

Evacuation from the room of the hot gases and incandescent particles produced by the internal arc must normally be carried out. The UniGear ZS2 switchgear can be fitted with a complete range of solutions to satisfy all requirements, either in the case where evacuation is possible directly at the end of the switchgear, or when solutions from the rear are requested.
Please contact your ABB sales representative for more information.

Busbar applications
Each switchgear unit can optionally be fitted with an accessory busbar application:
- current or voltage transformers for busbar measurements
- top entry duct to make interconnections between different sections of switchgear



— 01 Single level section view

— 01

UniGear ZS2
Vacuum circuit-breaker

UniGear ZS2 switchgear can be fitted with the widest range of apparatus available on the market today, and of these the vacuum circuit-breaker now occupies a position of prime importance in all sectors of primary distribution.

— 01 VD4

— 02 VD4

— 03 VD4 circuit-breaker

Vacuum circuit-breakers cover the whole range of switchgear parameters and therefore the whole range of applications. In standard version circuit breakers are withdrawable cassette type.

In case of need floor truck type circuit breakers also can be provided as an option. Many years of experience gained in developing and using vacuum interrupters is today reflected in the range of ABB circuit-breakers, which stand out for their exceptional electrical and mechanical characteristics, extremely long life, low maintenance, compactness and the use of highly innovative construction techniques. ABB develops and produces a complete range of interrupters for use in circuit-breakers and contactors and for all medium voltage applications.

VD4 circuit-breaker
The VD4 medium voltage circuit-breaker interrupters use the vacuum to extinguish the electric arc and as the insulating medium. Thanks to the unequalled properties of vacuum and the breaking technique used, current interruption takes place without arc chopping and without over voltages. Restoration of the dielectric properties following interruption is extremely rapid.

The VD4 circuit-breakers are used in electrical distribution for control and protection of cables, overhead lines, transformer and distribution substations, motors, transformers, generators and capacitor banks.

Poles
The VD4 medium voltage circuit-breakers use vacuum interrupters embedded in poles. Embedding the interrupter in the pole makes the circuit-breaker particularly sturdy and protects the interrupter itself against shocks, deposits of dust and humidity.

The vacuum interrupter houses the contacts and provides the interruption chamber.

ABB circuit-breakers use the most advanced vacuum breaking techniques: with radial magnetic flow for circuit- breakers with medium-low performance and with axial magnetic flow for those with high breaking capacity. Both techniques guarantee even distribution of the arc roots over the whole surface of the contacts, allowing optimum performance at all current values.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— 02


— 03

UniGear ZS2
Gas circuit-breaker

UniGear ZS2 switchgear can be fitted either with vacuum circuit-breakers or with SF6 circuit-breakers.

The ABB vacuum and gas series of circuit-breakers are mechanically interchangeable and the same switchgear unit can therefore take either type of apparatus. Only ABB can offer apparatus representing both techniques for the whole range of applications, voltage levels (36 kV), rated current (1250...2500 A) and breaking capacity (16...31.5 kA). This makes it possible to specify the optimum solution for the installation characteristics and the feeders to be switched and protected.
ABB's long practical experience shows that the two types of circuit-breakers are equally valid and complementary.

The HD4 medium voltage circuit-breakers use sulphur hexafluoride gas (SF6) to extinguish the electric arc and as the insulating medium.
Thanks to the excellent properties of SF6 gas, interruption of the currents takes place without arc chopping and over voltages. There is no restriking phenomenon after interruption and the dielectric properties following interruption are recovered extremely rapidly.
Circuit-breakers are available for all electric power distribution applications. They are particularly recommended for use on capacitor banks, motors, transformers insulated in oil and in installations where components which are particularly sensitive to dielectric and dynamic stresses are installed (for example, old cables or transformers).

Poles
The HD4 circuit-breaker poles use the autopuffer breaking system, combining the compression and self-blast techniques in a single solution.
The autopuffer system is the most innovative technique in the field of gas circuit-breakers and originates from high voltage apparatus.
The combination of the compression and self-blast techniques allows the best performance to be obtained at all current values. Both techniques are always present, but whereas the former operates optimally in switching low currents, the latter acts effectively during operation at higher current values. The autopuffer technique allows the use of a smaller quantity of gas than that required by circuit-breakers based on other techniques. For the same reason, the gas pressure is also considerably reduced. The autopuffer technique guarantees the insulating withstand voltage and the breaking capacity up to 30% of the rated value, even with zero relative pressure.

SF6 gas pressure level monitoring is not necessary, since the circuit-breaker poles are sealed-for-life pressure systems and are maintenance-free. They are fitted with a pressure control device for checking that the characteristics are not altered due to transport or incorrect operations.

Operating mechanism
The HD4 circuit-breaker is fitted with a mechanical stored energy operating mechanism. This is free-tripping and therefore allows opening and closing operations independent of the operator.
The operating mechanism spring system can be recharged either manually or by means of a geared motor. The operating mechanism is of the same type for the whole series and has a standardized range of accessories and spare parts. All the accessory components can easily be replaced by means of plug-socket connectors.
Opening and the closing of the apparatus can be carried out by pushbuttons on the front of the operating mechanism or by electric releases (shunt closing, shunt opening and undervoltage).
The circuit-breakers are always fitted with an anti-pumping device to eliminate the possibility of simultaneous opening and closing commands, closing commands with springs discharged or with the main contacts not yet in their run-end position.

Truck
The poles and operating mechanism are fixed onto a metal support and handling truck.
The truck is provided with a wheel system which makes the operations for racking the apparatus out of and into the switchgear unit possible with the door closed. The truck allows effective earthing of the circuit-breaker by means of the metallic structure of the switchgear unit.

Apparatus-operator interface
The front panel of the circuit-breaker provides the user interface. It features the following equipment:
- ON pushbutton
- OFF pushbutton
- Operation counter
- Indicator of the circuit-breaker open and closed state
- Indicator of the charged and discharged state of the operating mechanism springs
- Manual charging device for the operating mechanism springs
- Override selector of the undervoltage release (optional)
- LED gas pressure indicator (optional)

Standards
IEC 62271-100 for the circuit-breaker
IEC 60376 for the SF6 gas

UniGear ZS2
Service trucks

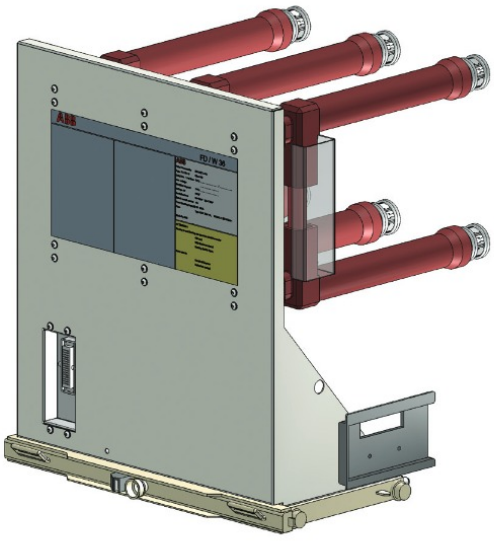
The UniGear ZS2 range is equipped with all the service trucks needed to complete the switchgear and required for service and maintenance operations.
The trucks are divided into five different types:
- Earthing without making capacity
- Power cable test
- Isolation without making capacity
- Fused without making capacity
- Shutter test

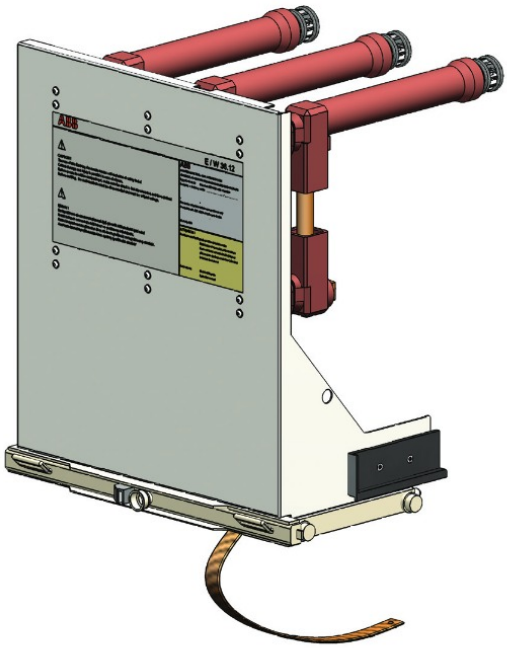
Earthing truck without making capacity
These trucks carry out the same function as the earthing switches without making capacity. They therefore have no capacity to earth live circuits in fault conditions.
They are used to ensure an additional fixed earth, as is required by some installation service and maintenance procedures, as a further safety guarantee for personnel.
The use of these trucks anticipates removal of the apparatus from the switchgear (circuit-breaker) and its replacement with the truck.

This truck is available in two versions:
- Earthing of the main busbar system
- Earthing of the power cables

The earthing truck of the main busbars, during the racking-in phase, only lifts the top shutter and earths the contacts connected to the top branch connections (and therefore to the main busbar system) by means of the switchgear structure. The earthing truck of the power cables, during the racking-in phase, only activates the bottom shutter and earths the contacts connected to the bottom branch connections (and therefore to the power cables) by means of the switchgear structure. These trucks can also be used in the bus-tie unit. In this case, they earth one of the two sides of the main busbar system.

Power cable test truck
These trucks allow the insulation tests on the power cables to be carried out without accessing the feeder compartment or disconnecting the cables from the switchgear. The use of these trucks anticipates removal of the apparatus from the switchgear (circuit-breaker) and its replacement with the truck.
The truck, during the racking-in phase, only activates the bottom shutter and, by means of the connectors it is fitted with, allows connection of the test apparatus cables.
This truck can only be used in the incoming/outgoing feeders with the door open.





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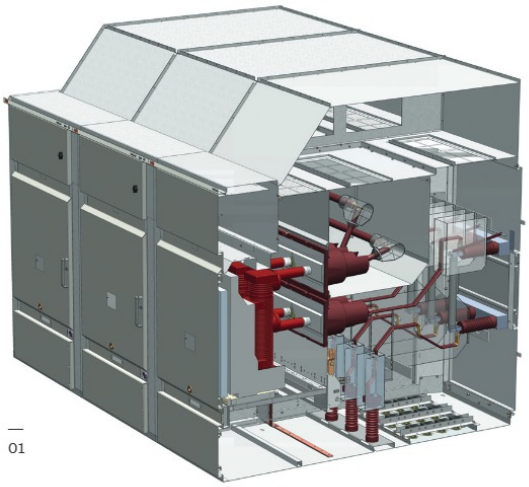
01 Fused Switch (Circuit Breaker) feeder

Isolating truck without making capacity
The isolating truck allows the top switchgear contacts to be connected directly to the bottom ones. Connection is made safe by using the poles to insulate the connection busbars from the external environment.
In the incoming/outgoing feeder units it connects the main busbar system to the power cables, whereas in the bus-tie, to the two sides of the busbar system. This truck has its application in UniGear ZS2 switchgear for making incoming/ outgoing feeders without a circuit-breaker in radial networks, for making cable connections between two items of switchgear placed in front of each other, in making interconnection units and in creating the bus-tie riser configuration with double insulation (in this case, both the units are made up of bus-ties, the former fitted with a circuit breaker and the latter with an isolating truck).

Fused truck without making capacity
The fused truck can be used to protect small power transformers up to 250 kVA with 10 A fuses. It is developed to provide cost effective and technically best possible solution for small transformers. It is developed and tested according to IEC 62271 with M0 class. Fuse breaking capacity of apparatus is 40 kA. The fused truck needs to be electrically interlocked with downstream LV circuit breaker to protect racking in/out while the down stream circuit breaker is on.

Shutter test truck
These truck allow the shutter tests on the shutter to be carried out without accessing the feeder compartment. The use of these trucks anticipates removal of the apparatus from the switchgear (circuit-breaker) and its replacement with the truck. The truck, during the racking-in phase, activates the upper and bottom shutter. This truck can be used in the incoming/outgoing feeders with the door closed.

Fused Switch (Circuit Breaker) feeder
Fused switch (circuit breaker feeder) can be used with fuses up to 200A to protect transformers and lines. This solution gives LSC2B solution for transformers protection also with a fuse blown indication. Vacuum or SF6 circuit breaker is used to switch the line also to trip the feeder with fuse blown contact. This solution is available only with 1200 mm width cubicle.



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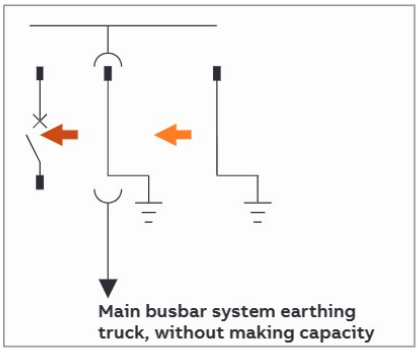

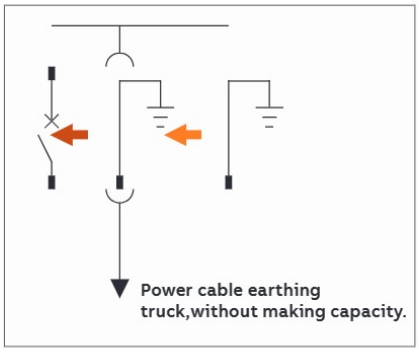

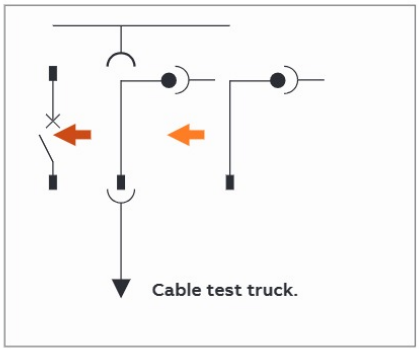

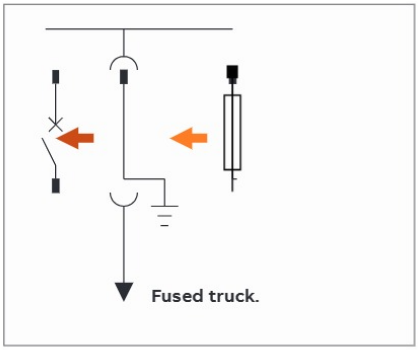

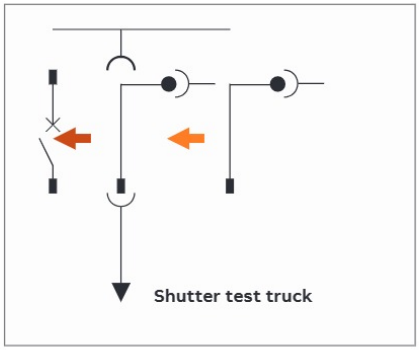

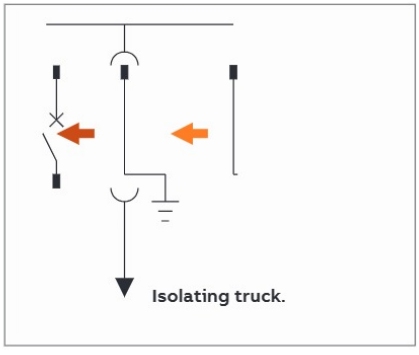

UniGear ZS2
Instrument transformers

— 01 Toroidal current transformer

— 02 1250 A

— 03 2500 A

Block type current transformers
The block type current transformers are epoxy resin insulated and used to supply the measurement devices and protection instruments. These transformers can have a wound core or a bushing bar with one or more cores, with performance and accuracy classes suitable for the installation requirements.
They conform to the IEC 61869-2 standards.
Their dimensions are in accordance with the DIN 42600 narrow type standard, in the medium and long size versions up to 3150 A.
The current transformers can also be provided with a capacitive socket for connection to voltage signaling devices.
The current transformers are normally fitted on the load side of the apparatus compartment for measurement of the phase currents of the switchgear unit. Fitting on the supply side of the apparatus compartment is also possible (busbar applications) for measuring the busbar currents or for realizing particular protection schemes.

Ring core current transformers
The toroidal transformers are of the epoxy resin insulated type and are used to supply measurement and protection devices.
These transformers can feature either a closed or openable core. They can be used both for measuring phase currents or for detecting the earth fault current.

They conform with the IEC 61869-2 standards.

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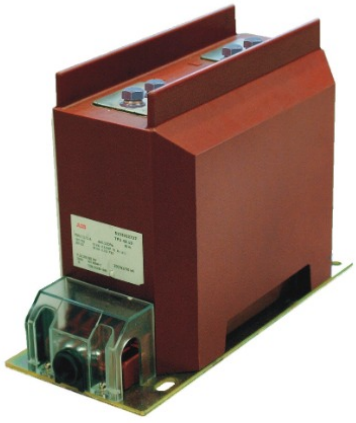

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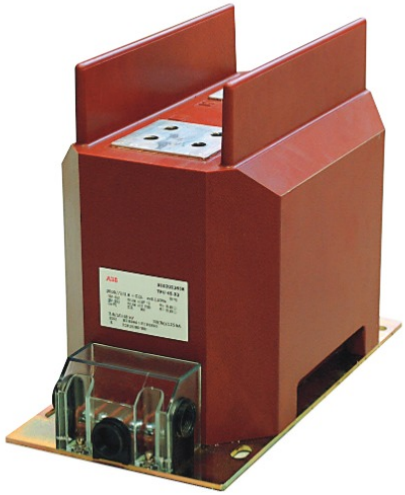

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01 Single-pole VTs with fuse

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02 Single pole VTs

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03 Double-pole VTs

Voltage transformers
The voltage transformers are of the epoxy resin insulated type and are used to supply measurement and protection devices.
They are available for fixed assembly or for installation on removable and withdrawable trucks.
They conform with the IEC 61869-3 Standards.
Their dimensions are in accordance with the DIN 42600 Narrow type Standard.
These transformers can have one or two poles, with performance and precision classes suited to the functional requirements of the instruments connected to them.
When they are installed on removable or withdrawable trucks they are fitted with medium voltage protection fuses.

The withdrawable trucks also allow replacement of the fuses with the switchgear in service. Truck racking-out with the door closed automatically operates closure of a metallic segregation shutter between the live parts of the switchgear and the instrument compartment.
Fixed voltage transformers can be installed directly on the main busbar system (busbar applications).
Withdrawable type voltage transformers can be installed in to the cable compartments of incoming/outgoing feeders for power cable side voltage measuring.

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01 Relion protection and control product family

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02 The REA system is a fast and flexible arc fault protection system for air-insulated low voltage and medium-voltage switchgear.

Product offering
The recommended products for arc fault protection is the arc fault protection system REA 101 with its extension units REA 103, REA 105 and REA 107 and protection and control relays from ABB's Relion® product family.

REA system
The REA system is a fast and flexible arc fault protection system for switchgears. This type of fast and selective arc fault protection system is a natural constituent of modern switchgear panels, and a safety and security investment for older switchgear panels, to protect human lives and prevent or reduce material damage. The REA system can be described as the fastest operating arc fault protection system in ABB's product portfolio, with trip command time in less than 2.5 ms.

Relion 615 series and 620 series
The Relion® product family offers integrated arc fault protection in its widest range of products for the protection, control, measurement and supervision of power systems for IEC and ANSI applications.

The Relion 615 and 620 series offer integrated three channel arc fault protection – to protect human lives and prevent or reduce material damage of protected switchgear – for power distribution in utility and industrial applications. The arc fault protection function operates with high-speed outputs with operation times down to 4 ms.

For more information, please refer to the following documentation:
- Arc Fault Protection REA 101 main module Product Guide
- Arc Fault Protection REA 103 extension module Product Guide
- Arc Fault Protection REA 105 extension module Product Guide
- Arc Fault Protection REA 107 extension module Product Guide
- Feeder Protection and Control REF615 Product Guide
- Motor Protection and Control REM615 Product Guide
- Transformer Protection and Control RET615 Product Guide
- Voltage Protection and Control REU615 Product Guide
- Capacitor Bank Protection and Control REV615 Product Guide
- Feeder Protection and Control REF620 Product Guide
- Motor protection and control REM620 Product Guide
- Transformer Protection and Control RET620 Product Guide

Relion Interactive Selection Guide
The Relion Interactive Selection Guide (ISG) helps you select the protection relay type that is the most suitable for your application. It also provides links to relevant documentation online. The Relion ISG is available at http://abb.relionisg.com

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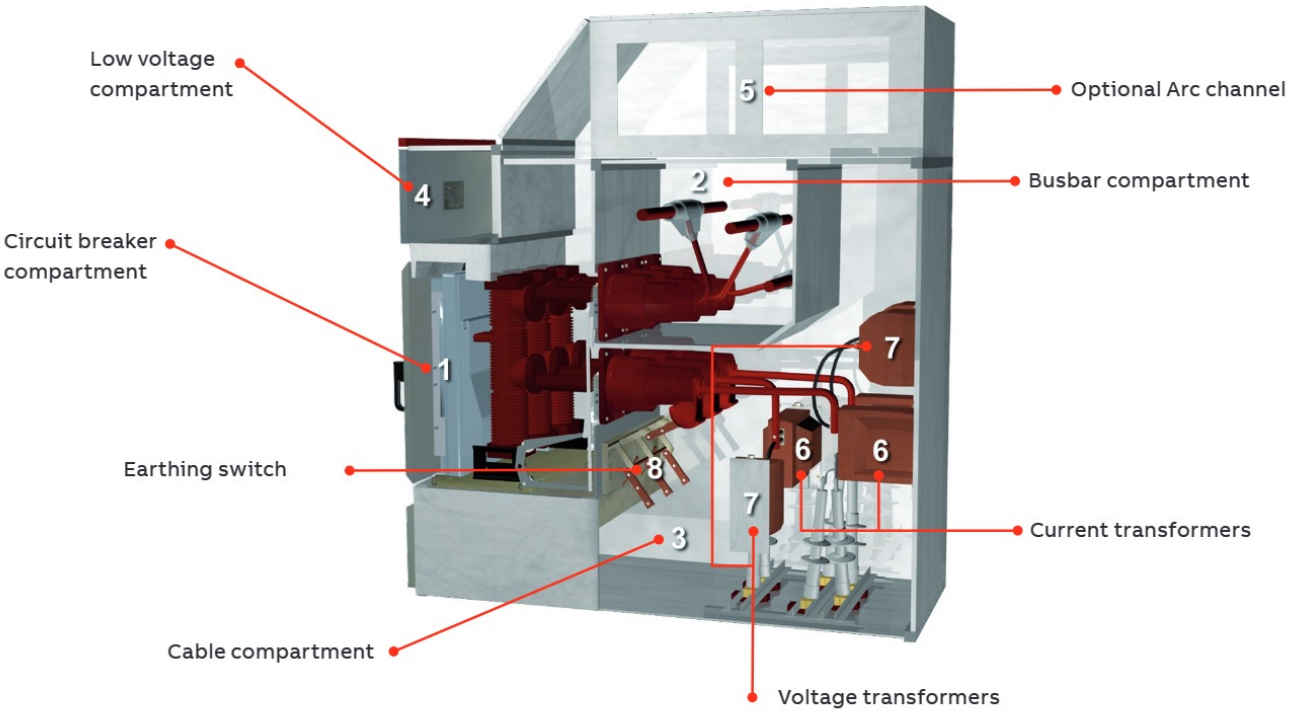
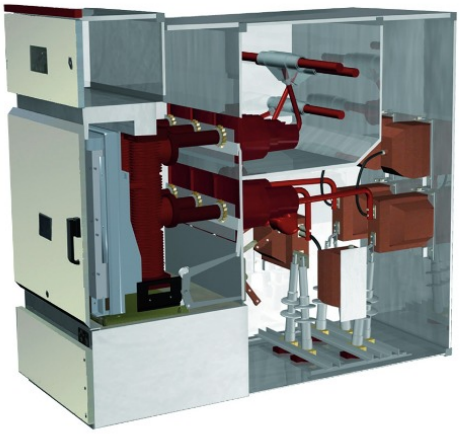
Unit compartments





The completed assembly of arc vent duct for middle panel with flap channel (total height of the switchgear is 2662 mm)

UniGear ZS2 Digital

The digital solution takes full advantage of well-proven components: current and voltage sensors, protection and control relays with IEC 61850 digital communication to ensure a reliable and efficient electrical network.
UniGear ZS2 Digital benefits
Safe and reliable
• Increased equipment reliability and safety in your substation
• Extended communication supervision functionality
Intelligent and ready for the future
• Implement changes easily as requirements change
• Flexibility towards varying load flows
• Late customizations and changes possible
Simple and efficient
• Minimized lifetime costs
• Saves space in your switchgear room by reducing switchgear footprint
• 30 % quicker delivery time from order to switchgear operation

Lower environmental impact
• Lowers energy consumption up to 250 MWh** which represents saving of 13 000 EUR
• Saves up 150 tons of CO2**, that is equal to emissions produced by mid-size European car driven for 1 250 000 km
Global solution
• Available for projects according to IEC standards

UniGear ZS2 Digital
represents an advanced switchgear solution as it meets important requirements of the future:
• Unprecedented flexibility
• Increased process efficiency
• Lower cost of operation
• Maximized integration
• Reliability and safety

With UniGear Digital you avoid many of the practical challenges you face in today's complex applications, you simply have less to worry about in your electrical network.

Specification
- Rated voltage up to 36 kV
- Rated feeder current from 1 250 A up to 2500 A
- Busbars up to 2500 A
- 31.5 kA 3 sec short-circuit current
- IAC classification: AFLR (31.5 kA / 1 s)
- LSC2B-PM

* compared to a conventional UniGear ZS2

** compared to typical substation with 14 switchgear panels of UniGear ZS2

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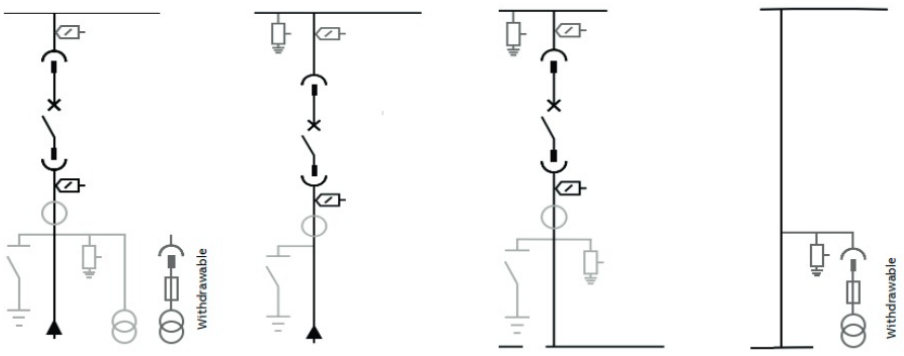
Single line diagram of typical units

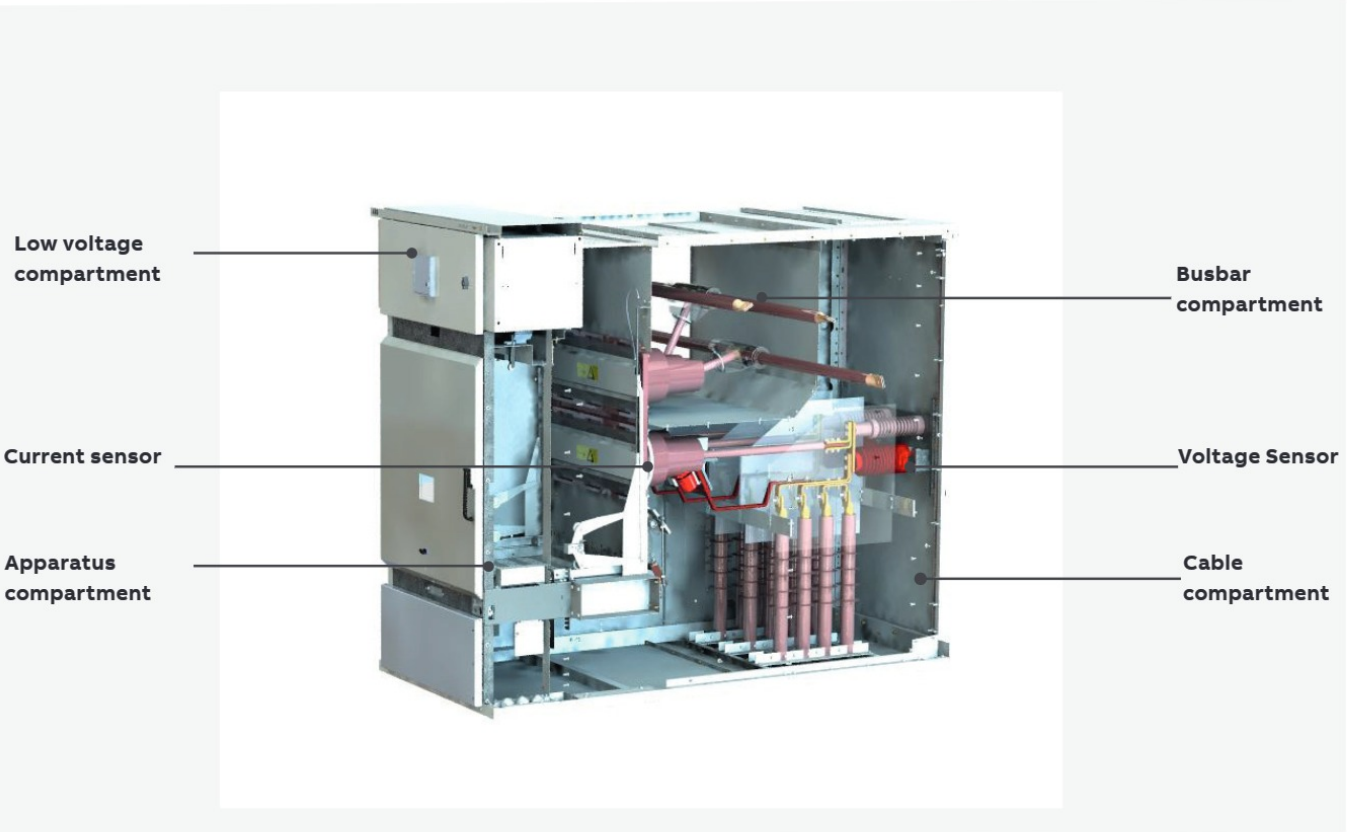


IF - Incoming/outgoing feeder

OFM - Outgoing with BB measurement

BT - Bus-tie

R - Riser



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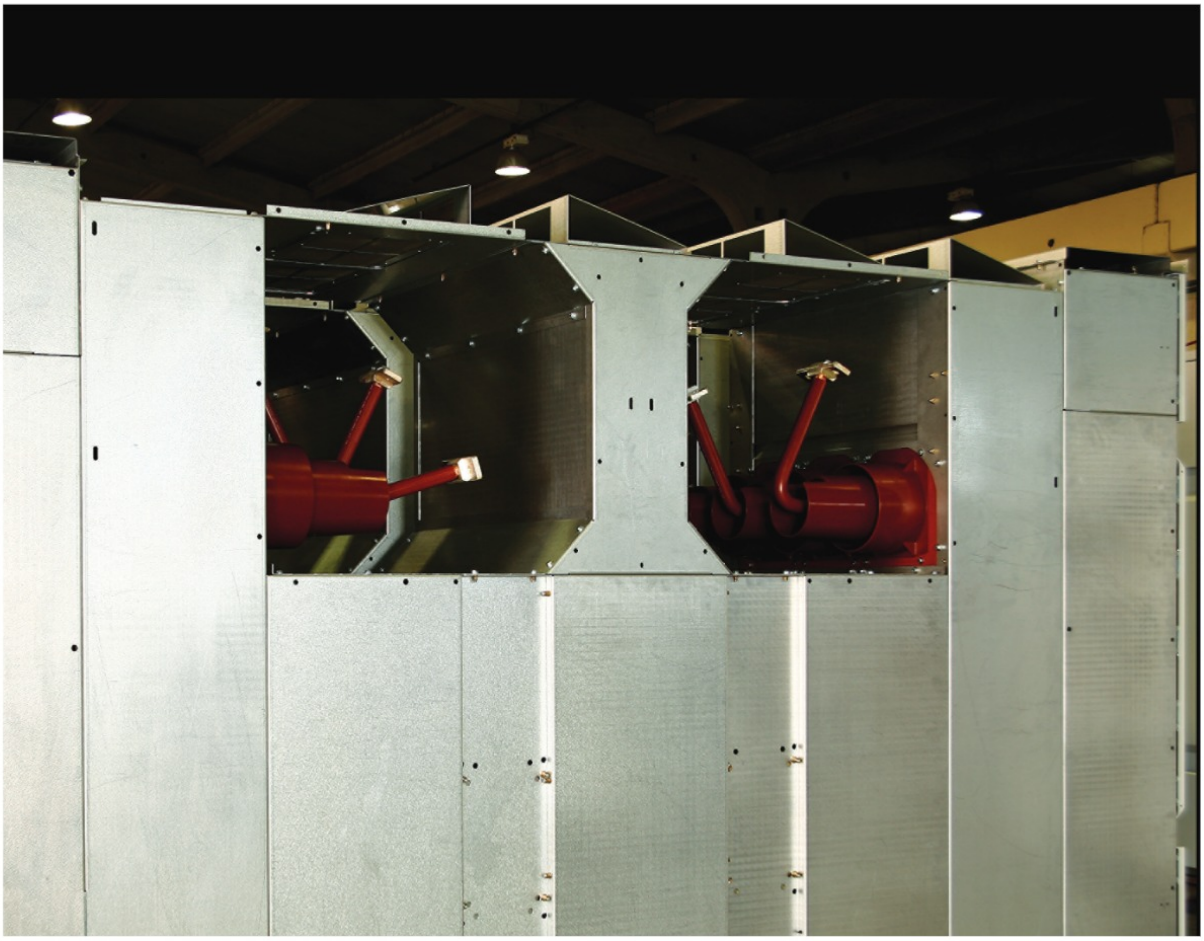
... 36 kV - ... 31.5 kA

Depth (mm)		3820				3820				
Height (mm)		2310				2310				
Height with gas exhaust duct (mm)		2662				2662				
Width (mm)		1000				1200				
Rated current (A)		1250	1600	2000	2500*	1250	1600	2000	2500*	3150*
DIF	Incoming/outgoing feeder with measurements									
DBT	Bus-tie									
DM	Measurements									
DBTL	Longitudinal bus-tie	(1)	(1)	(1)	(1)					
DRL	Longitudinal riser	(1)	(1)	(1)	(1)					
DRML	Longitudinal riser with measurements	(1)	(1)	(1)	(1)					

(1) Two pieces units are required to complete the configuration.

* 2500A and 3150A ratings are available with forced cooling fans only



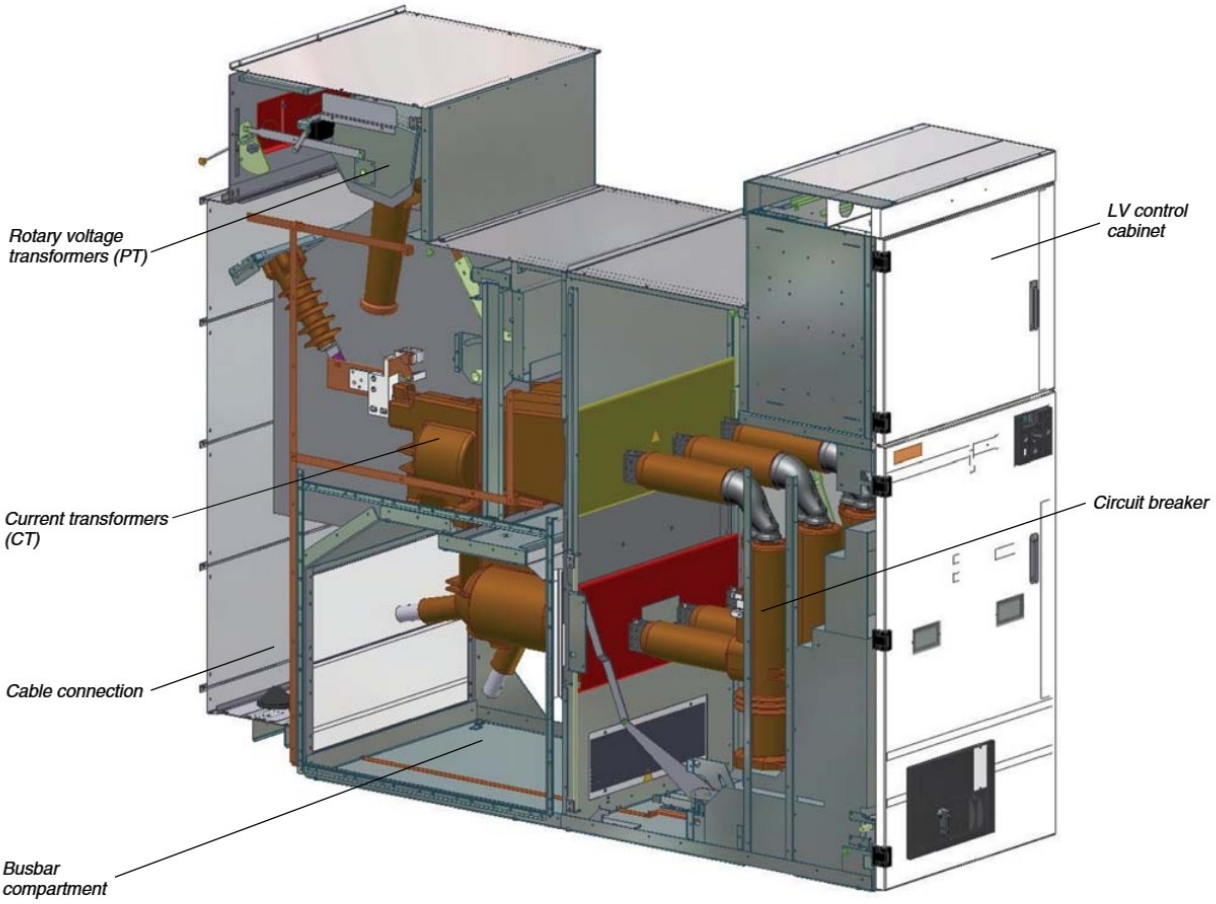
UniGear F400

Medium voltage switchgear

F400

Withdrawable circuit breaker
1 to 40.5 kV

Description



Technical characteristics


PE40329

The values below are given for normal operating conditions as defined in IEC 62271-200 and IEC 62271-1.

Technical characteristics of the F400 range

Basic cubicle										
Rated voltage (kV)	Ur	kV rms	36	36	36	36	36	36	40.5	40.5
Rated frequency	fr	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Normal rated current	Ir	A rms	1250		1250		1250		1250	1250
				2500		2500		2500		
Insulation rated voltage										
Industrial frequency withstand rated voltage (50 Hz - 1 min)	Ud	kV rms	70	70	70	70	70	70	95	95
Lightning impulse withstand voltage (1.2/50 µs)	Up	kV peak	170	170	170	170	170	170	185	185
Permissible rated short-time withstand current (1)	Ik	kA rms 3s	25	25					25	
					31.5	31.5				31.5
							40	40		
Electrodynamic rated withstand	Ip	kA peak	62.5	62.5					62.5	
					79	79				79
							100	100		
Internal arc withstand	kA/1 s		25	25	25	25	25	25	25	25
	kA/0.5 s		31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
	kA/0.15 s		40	40	40	40	40	40	40	40
Standard protection index	coating		IP3X	IP3X	IP3X	IP3X	IP3X	IP3X	IP3X	IP3X
	LV control cabinet		IP4X	IP4X	IP4X	IP4X	IP4X	IP4X	IP4X	IP4X
	between compartments		IP2X	IP2X	IP2X	IP2X	IP2X	IP2X	IP2X	IP2X
Circuit breaker										
Type of circuit breaker	SF1		SF1						SF1	
	SF2			SF2	SF2	SF2	SF2	SF2		SF2
Rated short-circuit cut-off current	Isc		25	25					25	
					31.5	31.5				31.5
							40	40		
Electrodynamic rated withstand	Ip	kA peak	62.5	62.5					62.5	
					79	79				79
							100	100		
Busbars										
Maximum normal rated current	Ir	A rms	1250		1250		1250		1250	1250
			2500	2500	2500	2500	2500	2500		

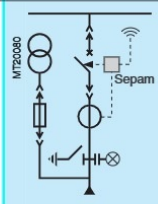
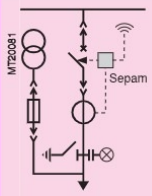
(1) For functional units equipped with circuit breakers, the breaking capacity is equal to the short time withstand current.
In all cases, the device peak making capacity in kA is equal to 2.5 times the rms short time withstand current.

Choice of functional units

The F400 range comprises **11 functional applications**.
The table below can be used to link requirements to functional units and gives information on the general composition of each unit.

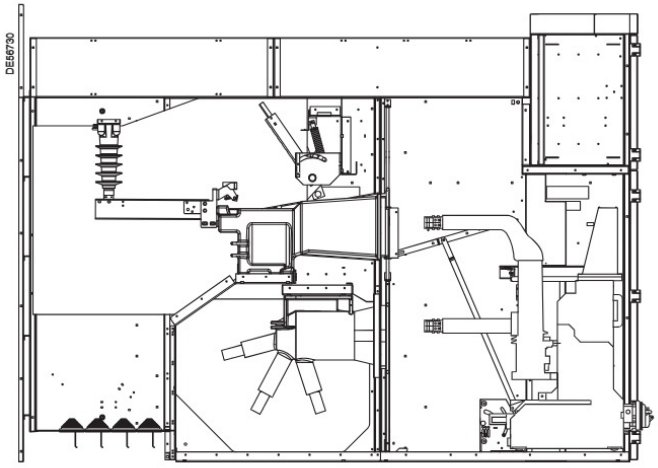
Selection:

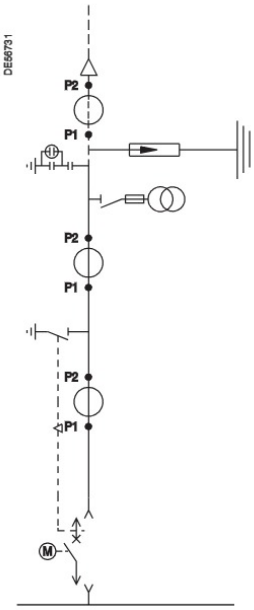
You want to supply power to a transformer.
You have selected a **transformer feeder/breaker**.
The corresponding **functional unit** will therefore be a **TF-B**, comprising an **AD cubicle** fitted with a withdrawable **circuit breaker** and a **transformer Sepam**.

Function	**Incomer** (1)			**Feeder**	
	Line	Transformer	Generator	Line	Transformer
Functional unit	**LI-B**	**TI-B**	**GI-B**	**LF-B**	**TF-B**
Cubicle	AD6	AD6	AD6	AD6	AD6
Device	Circuit breaker	Circuit breaker	Circuit breaker	Circuit breaker	Circuit breaker
Sepam protection relays	Substation application	Transformer application	Generator application	Substation application	Transformer application
F400 single-line diagrams					

(1) The direct incomer (functional unit without a circuit breaker, fitted with a fixed busbar bridge) is produced using an RD6 cubicle.

Feeders and incomers
AD6





Functions

■ **Cubicle**
□ standard LSC2B PM,
□ IAC AFLR LSC2B PM (option).

■ **LV control cabinet**

■ **Withdrawable part**
□ SF1 and SF2 1250 A circuit breakers,
□ SF2 2500 A circuit breaker,
□ disconnector unit.

■ **Voltage transformers (phase/earth)**
□ withdrawable with fuses,
□ fixed.

■ **Earthing switch**
□ making capacity.

■ **Voltage indicator**
□ VPIS.

■ **Cable connection (from the bottom, rear access)**
□ single-pole (1 to 4 cables),
□ three-pole (1 to 4 cables).

■ **Current transformers**

No. of windings	Functional CTs	Conventional DIN format CT	LV toroid type CT
3 maximum	■		
⩾ 3	■	■	
	■		■
	■		

■ **Anti-condensation heating element**

■ **Lightning arrester (option)**

■ **Incomer from the top (adaptation)**
□ cables,
□ busbars.

Sepam series 20, series 40, series 80

The Sepam range of protection relays is designed to operate machines and electrical distribution networks in industrial installations and in energy distributors' substations at all voltage levels. It consists of three groups of products:
- *Sepam series 20, for usual applications,*
- *Sepam series 40, for demanding applications,*
- *Sepam series 80, for customized applications.*

To satisfy all requirements, from the simplest to the most comprehensive.

PE56170

Sepam series 20, series 40 and series 80

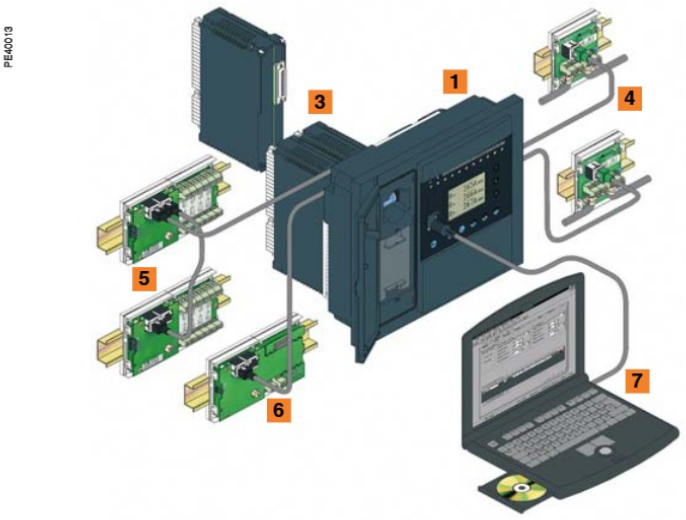
Sepam multi-function protection relays

A range of solutions to suit your application
- Substation protection (incomers, feeders and busbars),
- Transformer protection,
- Motor and generator protection.

All the functions your application requires
- Effective protection of people and property,
- Accurate measurements and detailed diagnosis,
- Integral equipment control,
- Local or remote indication and operation.

Flexibility and upgradeability
To ensure that the facility is suitable for use in as many situations as possible and to enable it to be upgraded in the future, Sepam's functions can be enhanced at any time by adding optional modules.

PE40013



Sepam series 80 modular architecture

1- Base unit, with integrated or remote advanced man-machine interface.

2- Parameters and settings saved on removable memory cartridge.

3- 42 logic inputs and 23 relay outputs with 3 optional modules providing 14 inputs and 6 outputs.

4- 2 independent Modbus communication ports.
- *direct connection to 2-wire RS 485, 4-wire RS 485 or fiber optic networks,*
- *connection to Ethernet TCP/IP network via PowerLogic System Webserver (Transparent Ready™).*

5- Processing of data from 16 temperature sensors.

6- One 0-10 mA, 4-20 mA or 0-20 mA low level analog output.

7- Software tool:
- *Sepam parameter and protection setting and control logic customization,*
- *local or remote operation of the facility,*
- *retrieval and display of oscillography records.*

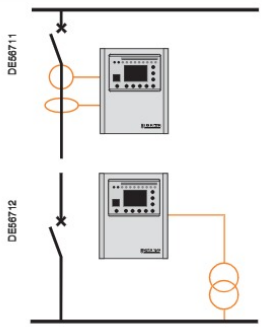
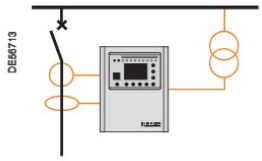
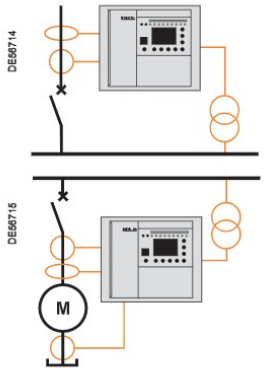
Simplicity

Easy of installation
- Easy-to-install remote modules common to all Sepams.

Implementation assistance
- Predefined functions implemented by simple parameter setting,
- Powerful, user-friendly PC configuration software.

Intuitive use
- Clear graphic LCD display of all data required for local operation and diagnosis of the installation,
- The working language can be customized to be understood by all users.

Sepam series 20, series 40, series 80
Selection guide

Sepam		Protection		Functional units and applications				
		Basic	Specific	SS-B, BS-B, LF-B, LI-B		TI-B, TF-B	MF-B	GI-B
				Substation	Busbar	Transfo.	Motor	Generator
Sepam series 20								
■ 10 logic inputs ■ 8 relay outputs ■ 8 temperature sensor inputs ■ 1 Modbus communication port		Current protection		S20		T20	M20	
		Voltage and frequency protection			B21			
			Frequency-derived		B22			
Sepam series 40								
■ 10 logic inputs ■ 8 relay outputs ■ 16 temperature sensor inputs ■ 1 Modbus communication port ■ logic equations editor		Current, voltage and frequency protection		S40		T40		G40
			Directional earth	S41			M41	
			Directional earth and phase	S42		T42		
Sepam series 80								
■ 42 logic inputs ■ 23 relay outputs ■ 16 temperature sensor inputs ■ 2 Modbus communication ports ■ logic equations editor		Current, voltage and frequency protection		S80				
			Directional earth	S81		T81	M81	
			Directional earth and phase	S82		T82		G82
			Transformer of group assembly differential			T87	M88	G88
			Machine Differential				M87	G87

Monitoring and control equipment

PE56229

Power metering unit

PowerLogic Power Meters combine in one very compact box all the measurements required for monitoring an electrical installation.

Applications

- Local measurements,
- Sub-metering, cost allocation,
- Remote monitoring of the electrical installation.

Other devices, such as the PowerLogic Circuit Monitor, are available for use on MV and LV networks. The main functions provided are energy management, analysis of the quality of the energy and data recording.

PE56230

PE56231

PE56232

Low voltage components

Integration of standard Merlin Gerin and Telemecanique components in the low voltage compartment.

Examples

- 1 to 100 A low voltage circuit breakers,
- Pushbuttons,
- Rotary switches,
- Indicator lights,
- Photoelectric sensors.

Instrument transformers

Conventional current transformers are used to provide power to measuring, metering or monitoring devices. They measure primary currents from 50 A to 2500 A.

Schneider Electric has drawn up a list of preferred current transformers which are appropriate for use with digital protection devices to make it easier to determine accuracy characteristics.

The live parts of the dry-insulated current transformers are integrated into a resin enclosure. These compact transformers have excellent electrical and mechanical characteristics and are fully protected against fire hazards.

Conventional current transformers provide power to the “current” circuits of the measuring instruments and/or protection devices.

Functional current transformers

F400 cubicles are fitted with functional current transformers.
These transformers are integrated into the power bushings on which the fixed rack-in contacts are mounted.
The current transformers have one, two or three 1 or 5 A secondary windings (1).
The transformation ratios can be changed in the LV control cabinet.

PE85032

Functional current transformer

Technical characteristics

Type	Ratio (A/A)	Measurement VA cl 0.5	Protection VA 5P20	Ith max					
				25 kA/1 s	25 kA/3 s	31.5 kA/1 s	31.5 kA/3 s	40 kA/1 s	40 kA/3 s
TCF4/N2	50-100/5-5	10-20	5-10	■	■	■	■	■	
	100-200/5-5	15-30	5-10	■	■	■	■	■	
	200-400/5-5	15-30	5-10	■	■	■	■	■	
	300-600/5-5	15-30	5-10	■	■	■	■	■	■
	400-800/5-5	15-30	5-10	■	■	■	■	■	■
	600-1200/5-5	15-30	5-10	■	■	■	■	■	■
TCF4G/N2	1500/5-5	15	5	■	■	■	■	■	■
	2000/5-5	15	5	■	■	■	■	■	■
	2500/5-5	15	5	■	■	■	■	■	■

(1) For all other characteristics, please contact us.

PE60206

DIN format current transformer

DIN format current transformers

F400 cubicles are fitted with DIN format current transformers when the installation requires additional secondary windings (>3).
The current transformers have one, two or three 1 to 5 A secondary windings (1).
The transformation ratios can be changed in the LV control cabinet.

Technical characteristics

Type	Ratio (A/A)	Measurement VA cl 0.5	Protection VA 5P20	Ith max					
				25 kA/1 s	25 kA/3 s	31.5 kA/1 s	31.5 kA/3 s	40 kA/1 s	40 kA/3 s
ARM9T/N2	50-100/5-5	10-20	5-10	■	■	■	■	■	
	100-200/5-5	15-30	5-10	■	■	■	■	■	
	200-400/5-5	15-30	5-10	■	■	■	■	■	
	300-600/5-5	15-30	5-10	■	■	■	■	■	■
	400-800/5-5	15-30	5-10	■	■	■	■	■	■
	600-1200/5-5	15-30	5-10	■	■	■	■	■	■
	1500/5-5	15	5	■	■	■	■	■	■
	2000/5-5	15	5	■	■	■	■	■	■
	2500/5-5	15	5	■	■	■	■	■	■

(1) For all other characteristics, please contact us.

PE40325

ARL4 current transformer

LV toroid type current transformers

F400 cubicles can be fitted with low voltage toroid type current transformers.
F400 cubicles are fitted with LV toroid type current transformers when the installation requires additional secondary windings (>3).
AOPC, ARL4 and ARL5 toroid current transformers are installed in the cable compartment. The toroid accepts the secondary windings; the cable is the primary winding.
The transformers have a primary current of 50 to 2500 A and a secondary current of 1 to 5 A.
The type of AOPC, ARL4 and ARL5 current transformer selected depends on the number of medium voltage cables installed in the F400 cubicle.

Type of connection pads (for reference only)				
Rated voltage	**Rated current**	**Short-circuit current**	**Max. number of cables by phase(2)**	**Max. number of CTs by phase**
kV	**A**	**kA**	**size**	**and type**
12-36	1250/1600	31.5	2	2 x AOPC
12-36	2000	31.5	3	2 x ARL4
12-36	2500	31.5	4	2 x ARL5

(2) Cable section for size 3 connection pads: 150 to 630 mm².

E28678

CSH homopolar toroid

CSH type homopolar toroid

CSH 120 and CSH 200 homopolar toroids provide more sensitive protection by measuring earth fault currents directly.
They are specifically designed for the Sepam range and can be connected directly to the “residual current” of the Sepam devices.
They differ only in their diameter:
- CSH 120 - internal diameter 120 mm,
- CSH 200 - internal diameter 200 mm.

Instrument transformers (continued)

The voltage transformers supply:
- the measuring, metering or monitoring instruments,
- the relays or safety devices.

They are installed in the cable connection compartment in the case of incomer/feeder cubicles and in the busbar compartment in the case of bussectioning and bus riser cubicles.
The live parts of the dry-insulated voltage transformers are integrated into a resin enclosure. These compact transformers have excellent electrical and mechanical characteristics and are fully protected against fire hazards.

PE56034

Rotary voltage transformer

Rotary voltage transformers

F400 cubicles are fitted with rotary voltage transformers.
The three phase/earth voltage transformers are disconnectable devices.
Each one is protected by a fuse incorporated into the transformer primary winding.
They are operated simultaneously from the rear of the cubicle.
When the voltage transformers are in the "isolated", position, the following operations can be performed with the cubicle powered on:
- a fuse can be replaced by opening a safety flap,
- transformers can be accessed by installing a padlockable separator.

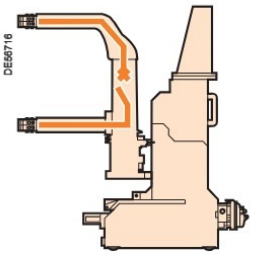
Type of VT	Ratio			1st secondary winding (VA - class)	2nd secondary winding (VA - class)	Flow
	Primary voltage	1st secondary winding voltage	2nd secondary winding voltage			
VRP4n/S1	30000 / √3	100 / √3		50-100 VA cl. 0.5		
				150 VA cl. 1		
	33000 / √3	110 / √3		50-100 VA cl. 0.5		
				150 VA cl. 1		
	34500 / √3	115 / √3		50-100 VA cl. 0.5		
				150 VA cl. 1		
	35000 / √3	110 / √3		50-100 VA cl. 0.5		
				150 VA cl. 1		
VRP4n/S2	20000 / √3	100 / √3	100 / √3	50-100 VA cl. 0.5	100 VA 3P	not simultaneous
				150 VA cl. 1	100 VA 3P	not simultaneous
				50 VA cl. 0.5	50 VA cl. 0.5/3P	simultaneous
				75 VA cl. 1	75 VA cl. 1/3P	simultaneous
	22000 / √3	110 / √3	110 / √3	50-100 VA cl. 0.5	100 VA 3P	not simultaneous
				150 VA cl. 1	100 VA 3P	not simultaneous
				50 VA cl. 0.5	50 VA cl. 0.5/3P	simultaneous
				75 VA cl. 1	75 VA cl. 1/3P	simultaneous
	30000 / √3	100 / √3	100 / √3	50-100 VA cl. 0.5	100 VA 3P	not simultaneous
				150 VA cl. 1	100 VA 3P	not simultaneous
				50 VA cl. 0.5	50 VA cl. 0.5/3P	simultaneous
				75 VA cl. 1	75 VA cl. 1/3P	simultaneous
	33000 / √3	110 / √3	110 / √3	50-100 VA cl. 0.5	100 VA 3P	not simultaneous
				150 VA cl. 1	100 VA 3P	not simultaneous
				50 VA cl. 0.5	50 VA cl. 0.5/3P	simultaneous
				75 VA cl. 1	75 VA cl. 1/3P	simultaneous
	34500 / √3	115 / √3	115 / √3	50-100 VA cl. 0.5	100 VA 3P	not simultaneous
				150 VA cl. 1	100 VA 3P	not simultaneous
				50 VA cl. 0.5	50 VA cl. 0.5/3P	simultaneous
				75 VA cl. 1	75 VA cl. 1/3P	simultaneous
	35000 / √3	110 / √3	110 / √3	50-100 VA cl. 0.5	100 VA 3P	not simultaneous
				150 VA cl. 1	100 VA 3P	not simultaneous
				50 VA cl. 0.5	50 VA cl. 0.5/3P	simultaneous
				75 VA cl. 1	75 VA cl. 1/3P	simultaneous

Withdrawable parts

They include:
- the circuit breaker with its opening and closing mechanism, the disconnector unit or the earthing unit,
- the racking in/out handle propulsion mechanism,
- interlocks for fixing the withdrawable part firmly to the fixed part.

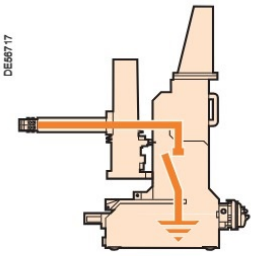
F400 SF1 or SF2 circuit breakers use sulphur hexafluoride (SF6) for insulation and breaking.
The live parts are housed in a sealed pressure system type insulating enclosure in compliance with IEC 62271-100.

The devices used to equip the F400 range of functional units have outstanding features:
- long service life,
- maintenance-free live parts,
- high electrical endurance,
- very low overvoltage,
- dependability,
- environmental insensitivity,
- breaking capacity and dielectric strength maintained at atmospheric pressure,
- low filling pressure.



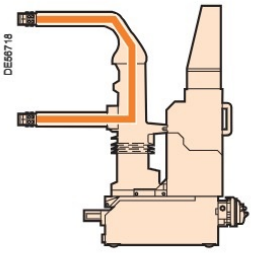
Circuit breaker

A circuit breaker is a safety device used to operate and protect electrical distribution networks. It is fitted in the F400 cubicle to protect all the downstream components in the event of a short-circuit.



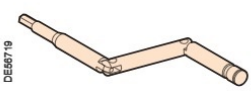
Earthing unit

The earthing unit is a safety feature used to earth the cubicle busbar. It is installed in place of the circuit breaker and provides many locking possibilities.



Disconnector unit

The disconnector unit enables the upper and lower part of the cubicle to be short-circuited. It is installed in place of the circuit breaker and provides the same locking possibilities.



Racking handle

This handle is used to:
- rack the withdrawable part in/out,
- open/close the earthing switch.

SF circuit breakers

PE50184

SF range

SF circuit breakers work on the basis of the “puffer” type principle in SF6, which is used as a breaking and insulating gas.
Each of the three poles is independent and has a sealed pressure system type insulating enclosure in compliance with IEC 62271-1.
Each pole forms a gas-tight unit filled with SF6 at a low relative pressure of 0.25 to 0.35 MPa (2.5 to 3.5 bar) depending on the performance level required.
An optional pressure switch on each pole operates an alarm in the event of a pressure drop.
SF6 circuit breakers are actuated by a GMH energy accumulation control.

PE50183

SF6, the ideal breaking gas for circuit breakers

The sulphur hexafluoride (SF6) provides the insulation and breaking functions in SF circuit breakers.
The live parts are housed in an insulating enclosure which is sealed for life, as specified in IEC 62271-100.

The switchgear used in the F400 cubicles therefore has the following characteristics:
- long service life,
- maintenance-free live parts,
- high electrical endurance,
- very low overvoltage,
- dependability,
- environmental insensitivity,
- possibility of continuous monitoring of the status of the circuit breaker.

PE55037

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Puffer: operating principle

The main contacts and arcing contacts are initially closed (fig. 1).

Pre-compression (fig. 2)

When the contacts begin to open, the piston compresses the SF6 gas slightly in the compression chamber.

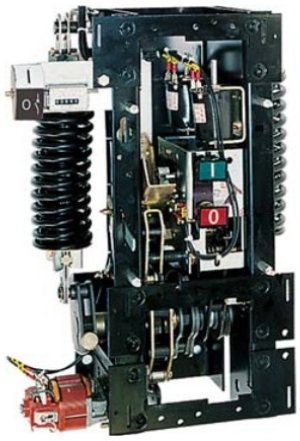
Arcing period (fig. 3)

The arc appears between the arcing contacts. The piston continues its movement. A small quantity of gas, directed by the insulating nozzle, is injected across the arc. For low current breaking, the arc is cooled by forced convection.
However, for high current breaking, thermal expansion causes the hot gases to move towards the cooler parts of the unit.
The distance between the two arcing contacts then becomes sufficient for the current to be broken permanently when it first reaches the zero point, due to the dielectric properties of the SF6.

Sweeping overtravel (fig. 4)

The moving parts finish their movement and the injection of cold gas continues until the contacts are completely open.

GMH operating mechanism



SF circuit breakers are actuated by the GMH operating mechanism which ensures that the closing and opening speed of the breaking device is not operator-dependent.

The circuit breakers are fitted with a GMH electrical operating mechanism. They are used for remote operation and to ensure a fast resetting cycle.

The GMH electrical operating mechanism includes:

- ■ an energy accumulation mechanism that stores, in the springs, the energy required to close and open the breaker,
- ■ a manual lever-operated resetting device,
- ■ an electrical motor-operated resetting device that automatically resets the control as soon as the breaker closes (time ⩽ 15 s),
- ■ a mechanical opening and closing device operated by two pushbuttons on the front panel,
- ■ an electrical closing device including:
- □ a closing release for remote control with an anti-pumping relay,
- ■ an electrical opening device including one or more opening releases that may be one of the following types:
- □ power on,
- □ undervoltage,
- □ a low consumption mitop(1),
- ■ an operation counter,
- ■ an optional reset control indication contact,
- ■ a resetting limit switch contact,
- ■ a black/white mechanical “open-closed” position indicator,
- ■ a multi-pin connector to isolate auxiliary circuits in the “racked out” position.

Auxiliary contacts

The GMH operating mechanism is fitted with a block of 14 auxiliary contacts including:

- ■ 1 changeover contact for the electrical control,
- ■ 1 changeover contact for indication,
- ■ 1 contact for the power-on release.

The number of available contacts depends on the composition of the control and on the options selected (see table below).

(1) Mitop: release with its own optional current used in combination with the Sepam 100 LA protection relay.

Rated current	10 A	
Breaking capacity	AC	10 A at 220 V (cos φ ⩾ 0.3)
	DC	1.5 A at 110 or 220 V (L/R ⩽ 0.01 s)

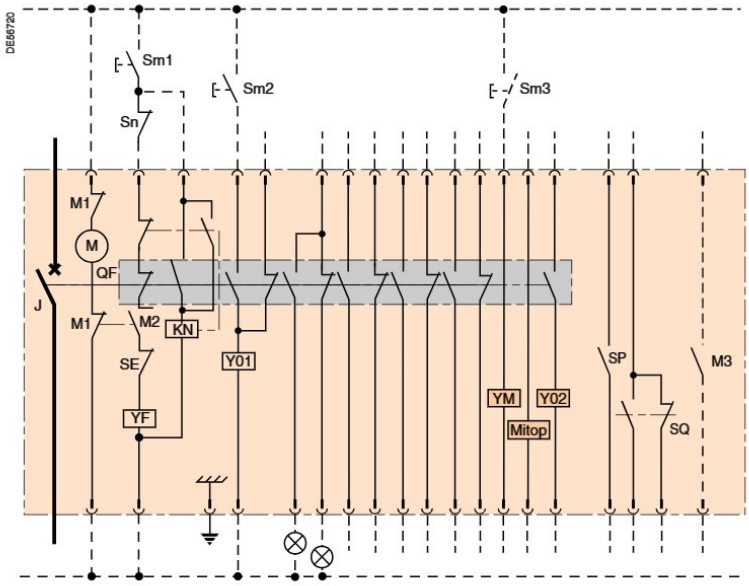
GMH operating mechanism characteristics

Types of auxiliaries				Spring charging motor	Closing release	Opening release			Available contacts		
						Power on		Undervoltage	Mitop	C/O	O/C	Changeover
						single	dual					
Power supply	voltage	AC (V)	50 Hz	50 to 55 - 100 to 140 - 220 to 250 - 380								
			60 Hz	110 to 127 - 200 to 250								
		DC (V)		24 to 33 - 48 to 60 - 110 to 136 - 220 to 260								
Consumption		AC (VA)		700	120	120	240	400/100(2)				
		DC (W)		570	70	70	140	100/10(2)				
Possibility of combining auxiliaries and quantities				■ 1	■ 1	■ 1		■ 1		3	4	1
			or	■ 1	■ 1	■ 1				3	4	1
			or	■ 1	■ 1	■ 2				3	3	1
			or	■ 1	■ 1		■ 1	■ 1		3	3	1
			or	■ 1	■ 1		■ 1			3	3	1
			or	■ 1	■ 1			■ 1		3	5	1
			or	■ 1	■ 1	■ 1			■ 1	3	4	1
			or	■ 1	■ 1		■ 1		■ 1	3	3	1

(2) Pick-up/latched consumption.

GMH operating mechanism
Auxiliaries diagram

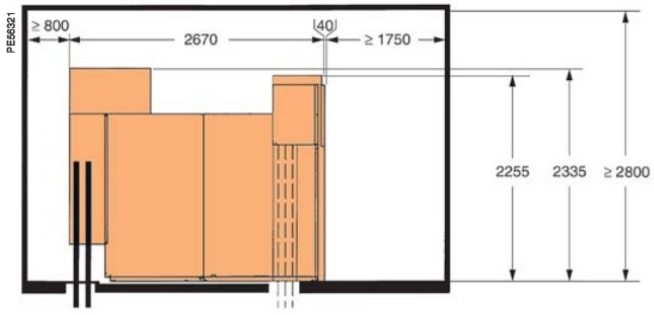
GMH circuit breaker operating mechanism

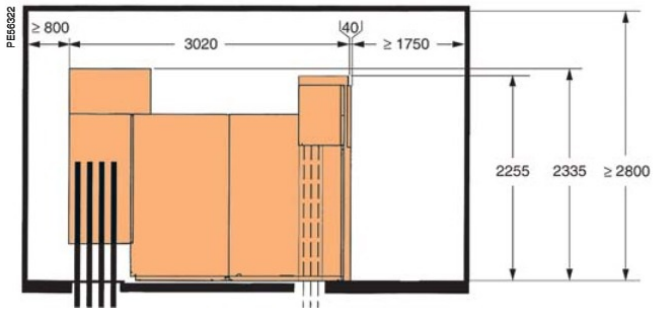


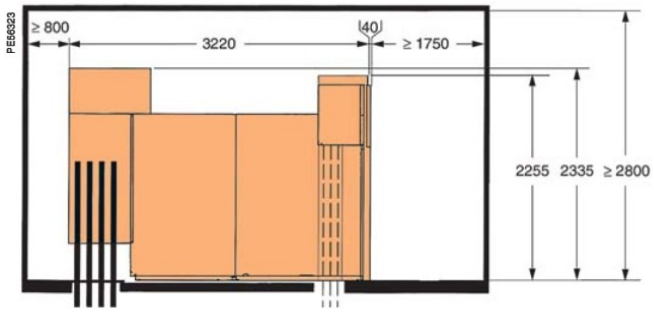
J	Circuit breaker
M	Spring charging motor
YF	Closing release
M1-M2	End of charging contact
QF	Auxiliary circuit breaker contacts
KN	Anti-pumping relay
SE	Latched release contact
Y01-Y02	“Shunt” opening releases
YM	Undervoltage opening release
“Mitop”	“Mitop” opening release (with its own current)
M3	Operating mechanism charged contact
SP	Pressure switch contact
SQ	Device ready-to-operate contact
Sm1	Closing pushbutton (external)
Sm2	Opening pushbutton for shunt releases (external)
Sm3	Opening pushbutton for undervoltage releases (external)
Sn	Closing disabling contact (external)

Dimensions

Type	Un (kV)	In (A)	No. of cables	Additional DIN format CT	Width	Depth	Height without PT control cabinet	Height with PT control cabinet	Mass without VT	Mass with VT
AD6/RD6	36	1250	2		900	2670	2255	2335	1095	1320
			4		900	3020	2255	2335	1095	1320
			2 or 4		1100	3020	2255	2335	1340	1610
				■	1100	3220	2255	2335	1610	1835
		2500	4		1100	3020	2255	2335	1560	1790
				■	1100	3220	2255	2335	1790	2015
	40.5	1250	2 or 4		1100	3020	2255	2335	1340	1610
				■	1100	3220	2255	2335	1610	1835
CL6	36	1250			900	3020	2255	2335	940	1160
					1100	3020	2255	2335	1150	1420
		2500			1100	3020	2255	2335	1150	1420
	40.5	1250			1100	3020	2255	2335	1150	1420
GL6	36	1250			1100	3020	2255	2335	740	970
		2500			1100	3020	2255	2335	740	970
	40.5	1250			1100	3020	2255	2335	740	970
TT6	36				900	2670		2335		1200
					1100	2670		2335		1140
	40.5	1250			1100	2670		2335		1140
LB6	36	1250			1100	2670	2255		930	
		2500			1100	2670	2255		930	
	40.5	1250			1100	2670	2255		930	







UniGearZS1

DISTRIBUTION SOLUTIONS

UniGear ZS1

Medium-voltage air-insulated switchgear up to 24 kV

Standards
The switchgear and main apparatus contained in it comply with the following Standards:

- IEC 62271-1 for general purposes
- IEC 62271-200 for the switchgear
- IEC 62271-102 for the earthing switch
- IEC 62271-100 for the circuit-breakers
- IEC 60071-2 for the insulation coordination
- IEC 62271-106 for the contactors
- IEC 62271-103 for the switch-disconnectors
- IEC 60529 for degree of protections

Colour of the external surfaces
RAL7035 - ligh grey (front doors and side sheets).
Other colours are available on request.

Degrees of protection
The degrees of protection of the switchgear conform with IEC 60529 Standards.
UniGear ZS1 switchgear is normally supplied with the following standard degrees of protection:

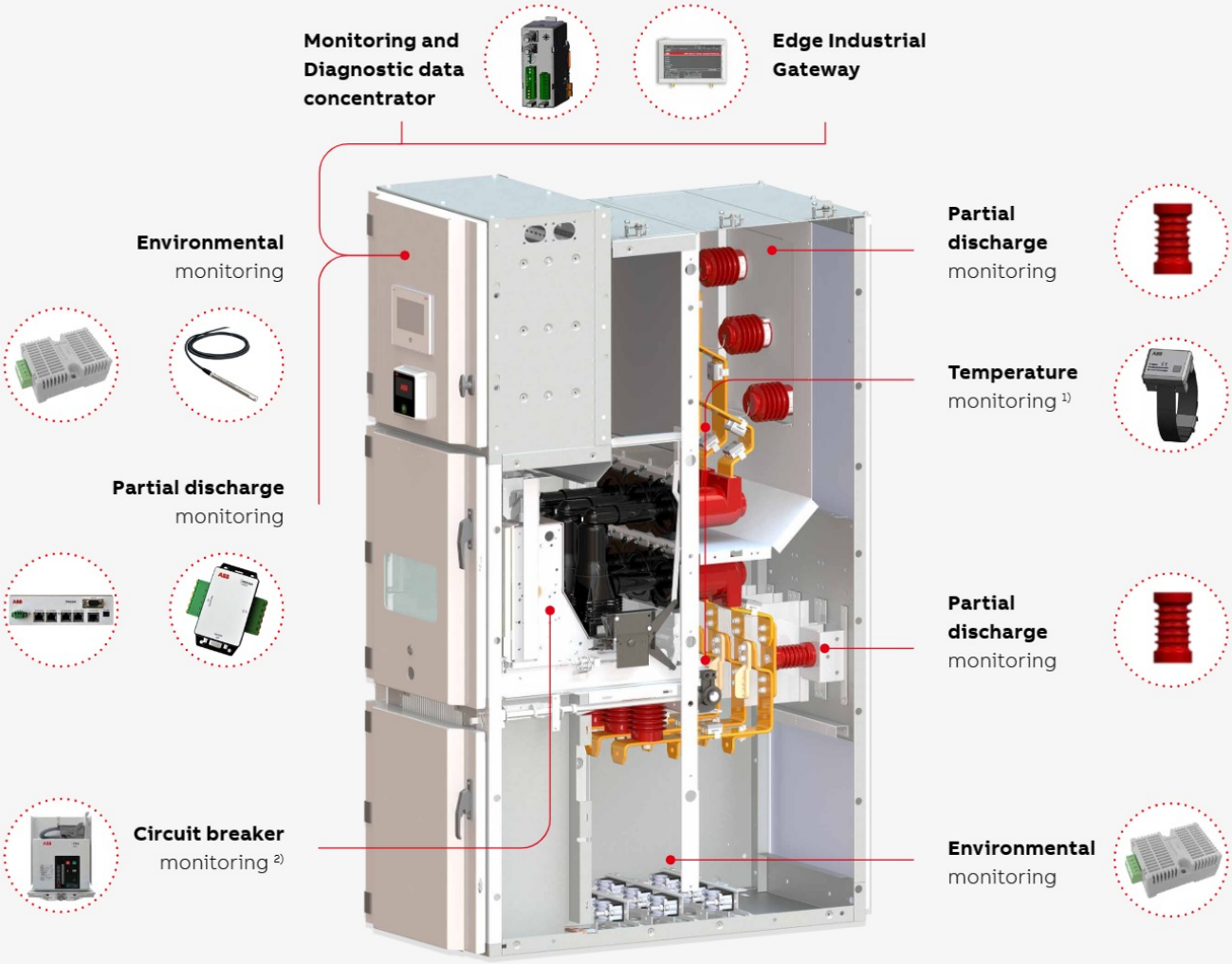
- IP4X for the enclosure
- IP2X for the partition between compartments

On request, the external housing can be supplied with a higher degree of protection; in this case please contact your ABB sales representative.
The electrical characteristics of the switchboard can vary for ambient conditions other than those described in the previous section and also if a higher degree of protection is used.

Electrical characteristics					
Rated voltage	[kV]	7.2	12	17.5	24
Rated insulation voltage	[kV]	7.2	12	17.5	24
Rated power frequency withstand voltage	[kV / 1min]	20	28	38*	50
Rated lightning impulse withstand voltage	[kV]	60	75	95	125
Rated frequency	[Hz]	50 / 60	50 / 60	50 / 60	50 / 60
Rated short time withstand current	[kA / 3 s]	...50	...50	...50	...31.5
Rated short time withstand current	[kA / 1 s]	63	63	63	
Peak current	[kA]	...164	...164	...164	...80
Internal arc withstand current	[kA / 1 s]	...50	...50	...50	...31.5
Internal arc withstand current	[kA / 0.5 s]	63	63	63	
Main busbar rated current	[A]	...4 000	...4 000	...4 000	...3 150
Circuit-breaker rated current	[A]	630	630	630	630
		1 250	1 250	1 250	1 250
		1 600	1 600	1 600	1 600
		2 000	2 000	2 000	2 000
		2 500	2 500	2 500	2 300
		3 150	3 150	3 150	2 500
Circuit-breaker rated current with forced ventilation	[A]	3 600	3 600	3 600	2 500
		4 000	4 000	4 000	3 150

GB/DL version is available with higher request in dielectric characteristics (42 kV) and short time withstand current (4 s)
The values indicated are valid for both vacuum and SF6 circuit-breaker
For panel with contactor the rated current value is 400 A
CSA version is available up to 27.6 kV
1 250 A - 40 kA available at 650 mm panel
* 42 kV (63 kA version)

UniGear ZS1
Monitoring and Diagnostics



Note: The picture shows various options, while actual implementation depends on the selected features

1) Rear access to panel needed for temperature monitoring of circuit breaker / panel connection

2) Monitoring of mechanical condition of VD4 circuit breaker through Relion® protection relay function
Advanced circuit breaker condition monitoring available with VD4 evo

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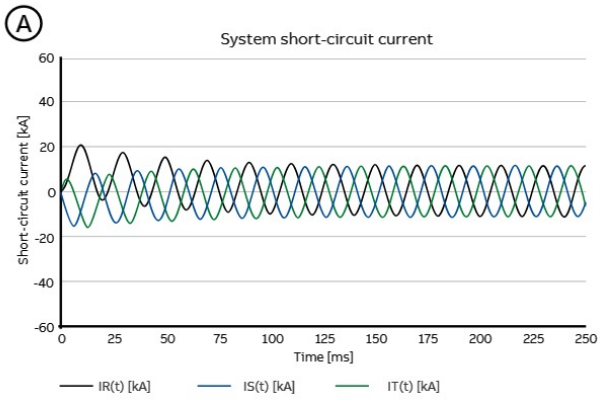
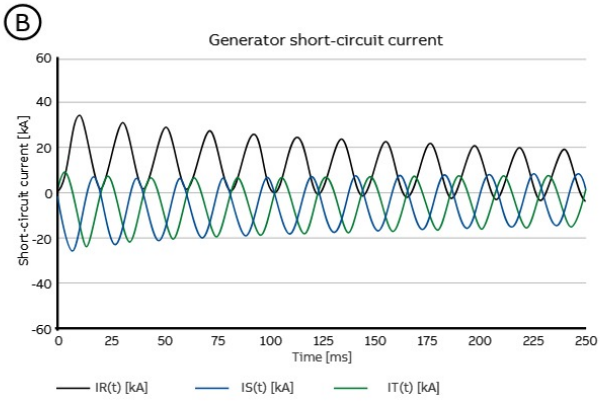
The challenge to protect the grid as well as the generator against failures makes generator circuit-breakers essential. Each generator has specific technical characteristics. A suitability analysis of the generator circuit-breaker application is indispensable.

The system-fed fault (A) and the generator-fed fault (B) of a grid need to be reliably interrupted by the generator circuit-breaker.



Failure location A: System-fed fault
Fast decaying DC component



Failure location B: Generator-fed fault
Slowly decaying and raised DC component results in delayed current zero

Electrical characteristics according to IEC 62271-200 and IEC/IEEE 62271-37-013

Switchgear		UniGear ZS1 with VD4G-25	UniGear ZS1 with VD4G-40	UniGear ZS1 with VD4G-50	UniGear ZS1 with VD4G-63
Rated voltage	[kV]		15*		
Maximum service voltage	[kV]		15		
Test voltage (50/60 Hz)	[kV / 1 min]		38		
Impulse withstand voltage	[kV]		95		
Rated frequency	[Hz]		50 / 60		
Rated short-time withstand current		25 kA / 3 s	40 kA / 3 s	50 kA / 3 s	63 kA / 1 s
Symmetrical short-circuit current Iscg Class G1	[kA]	16	25	50	50
Symmetrical short-circuit current Iscg Class G2	[kA]	16	25	37	37
Peak withstand current	[kA]	68.5	115	137	173
Internal arc withstand current		25 kA / 1 s	40 kA / 1 s	50 kA / 1 s	63 kA / 0.5 s
Rated current of the main busbars	[A]	...4 000	...4 000	...4 000	...4 000
Feeders rated current with natural ventilation	[A]	1 250	1 250		
	[A]		1 600		
	[A]		2 000		
	[A]		3 150	3 150	3 150
Feeders rated current with forced ventilation	[A]		4 000	4 000	4 000

UniGear ZS1 panel with VD4G circuit-breaker can be coupled with standard UniGear ZS1 panel with VD4/P circuit-breaker

* Contact ABB for higher values

Truck
The poles and operating mechanism are fixed onto a metal support and handling truck.
The truck is provided with a wheel system which makes the operations for racking the apparatus out of and into the switchgear unit possible with the door closed.
The truck allows effective earthing of the circuit-breaker by means of the metallic structure of the switchgear unit.

Apparatus-operator interface
The front panel of the circuit-breaker provides the userinterface. It features the following equipment:

- ON pushbutton
- OFF pushbutton
- Operation counter
- Indicator of the circuit-breaker open and closed state
- Indicator of the charged and discharged state of the operating mechanism springs
- Manual charging device for the operating mechanism springs
- Override selector of the undervoltage release (optional)
- LED gas pressure indicator (optional)

HD4-HXA circuit-breaker for high unidirectional components

The range of HD4 circuit-breakers is extended by the HD4-HXA version.
This series of circuit-breakers maintains all the features
described in this chapter, but is notable for its ability to switch loads with strong unidirectional components.
For breaking capacities of 40 kA or lower, HD4-HXA circuit-breakers are able to switch loads with unidirectional components IDC = 100%, up to service voltage 13.8 kV; at 50 kA the unidirectional component percentage IDC is reduced to 50%.
They can be used in all installations affected by strong unidirectional components, but their natural field of application is found in switching and protecting transformers of the auxiliary circuits in power generating stations.

Standards
- IEC 62271-100 for the circuit-breaker
- IEC 60376 for the SF6 gas

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HD4 circuit-breaker

Fuses
ConVac/P is fitted with medium voltage fuses to protect the users and devices downstream the fuses. Fuse coordination with ABB fuses is tested in damage class C according IEC 62271-106 Standard.
ConVac/P fuse-holder is suitable to accept, for each phase, one single body DIN type fuse, or BS type fuse (to be defined at order stage), with average dimensions and striker according DIN 43625 Standard. Fuses shall be according IEC 60282-1 with maximum cartdrige length 442 mm or BS 2692 (1975) with maximum cartridge length L=454 mm.
ABB fuses type CMF-BS cannot be installed on ConVac/P contactors.

ConVac electrical characteristics		7.2 kV
Rated voltage	[kV]	7.2
Rated insulation voltage	[kV]	7.2
Rated power frequency withstand voltage	[kV / 1 min]	20 (32) (3)
Rated lightning impulse withstand voltage	[kV]	60
Rated frequency	[Hz]	50 / 60
Rated short-time withstand current (1)	[kA]	6 (50)
Internal arc withstand current (2)	[kA / 1s]	...50
Maximum contactor rated current without fuses	[A]	400
Maximum contactor rated current with fuses	[A]	250

(1) Limited by the fuses
(2) The internal arc withstand values are guaranteed in the compartments on the supply side of the fuses (busbars and apparatus) by the structure of the switchgear and on the load side (feeder) by the limiting properties of the fuses
(3) Available on request

—
ConVac

The following fuses can be applied:

- DIN type with a length of 192, 292 and 442 mm
- BS type with a length of 235, 305, 410, 454 and 553 mm

The fuse-holder frames are fitted with a device for automatic opening when even just one fuse blows.

This same device does not allow contactor closing when even a single fuse is missing. The ABB range of fuses for transformer protection is called CEF, whereas CMF is for motors and capacitors.

Standards

- IEC 62271-106 for the contactor
- IEC 60282-1 for the fuses

Contactor		VSC7/P	VSC12/P
Rated voltage	[kV]	7.2	12
Rated insulation voltage	[kV]	7.2	12
Rated power frequency withstand voltage	[kV / 1 min]	20 (3)	28 (3)
Rated lightning impulse withstand voltage	[kV]	60	75
Rated frequency	[Hz]	50 / 60	50 / 60
Rated short-time withstand current	[kA](1)	...50	...50
Peak current	[kA]	...125	...125
Internal arc withstand current (2)	[kA / 1s]	...50	...50
Maximum rated current of the contactor	[A]	400	400

(1) Limited by the fuses
(2) The internal arc withstand values are guaranteed in the compartments on the supply side of the fuses (busbars and apparatus) by the structure of the switchgear and on the load side (feeder) by the limiting properties of the fuses
(3) VSC7/PG for 32 kV power frequency withstand voltage and VSC12/PG for 42 kV power frequency withstand voltage are available on request in a dedicated panel

Maximum performances of the contactor with fuses		7.2 kV	12 kV
Motors	[kW]	1 800	3 000
Transformers	[kVA]	2 500	2 500
Capacitors	[kVAR]	1 800	3 000

—
V-Contact VSC contactor

Rated voltage	[kV]	12	17.5	24
Rated insulation voltage	[kV]	12	17.5	24
Rated power frequency withstand voltage (1)	[kV / 1 min]	28	38	50
Rated lightning impulse withstand voltage	[kV]	75	95	125
Rated frequency	[Hz]	50/60	50/60	50/60

(1) GB/DL version is available with higher request in dielectric characteristics

NALF switch-disconnector unit with fuses				
Rated short-time withstand current of switch-disconnector (1)	**[kA / 1 s]**	**...25**	**...25**	**...25**
Peak current	**[kA]**	**...63**	**...63**	**...63**
Maximum rated current of the fuses	**[A]**	**100**	**63**	**63**
Internal arc withstand current (2)	**[kA / 1 s]**	**...25**	**...25**	**...25**

(1) Limited by the fuses
(2) The internal arc withstand values are guaranteed in the compartment on the supply side of the fuses (busbars) by the structure of the switchgear and on the load side (cables) by the limiting properties of the fuses

Selection table of the fuses for protection transformers

Transformer rated voltage [kV]	**Transformer rated output [kVA]**																	**Fuse rated voltage [kV]**
	25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	
	CEF Fuse-link In [A]																	
3	16	25	25	40	40	50	63	80	100	125								
5	10	16	25	25	25	40	40	50	63	80	100	125						3.6/7.2
6	6	16	16	25	25	25	40	40	50	63	80	100	125					
10	6	10	16	16	16	20	20	25	31.5	40	50	63	80	100	125			12
12	6	6	10	16	16	16	20	20	25	40	40	50	63	80	100	125		
15	6	6	10	10	16	16	16	20	20	25	40	40	50	63	80	100	125	17.5
20	6	6	6	10	10	16	16	16	20	20	25	31.5	40	50	63	80		24
24	6	6	6	6	10	10	16	16	16	20	20	25	40	40	50	63	80	

The table was calculated according to standards IEC 60787 and IEC 62271-105 (for operating voltages up to 24 kV).
The following transformer work conditions were assumed:
- Maximum long-lasting overload – 150%
- Magnetizing inrush current – 12×In during 100 ms
- Transformer short-circuit voltage according to IEC 60076-5
- Standard ambient working conditions of fuses

The table above details the rated current of a particular fuse link for a given line voltage and transformer rating. For different criteria, the fuse selection must be recalculated. The given limits of the rated current of fuse are not mandatory for use in the NALF disconnector / NAL without fuse tripping system. Rated current values of the corresponding fuses for these applications are given in the ABB catalogue “FUSES”.

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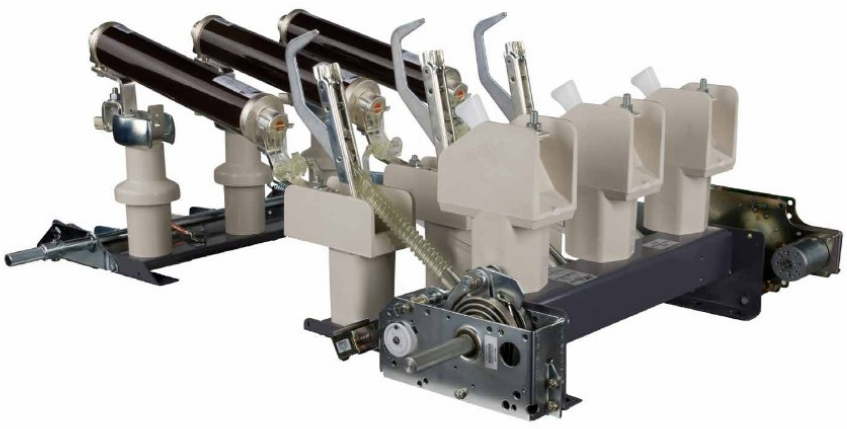
NALF switch-disconnector



UniGear ZS1
Ultra Fast Earthing Switch

The Ultra-Fast Earthing Switch (UFES) is an innovative design of an active arc protection device which effectively mitigates the severe mechanical and thermal impacts caused by internal arc faults.

The UFES is a combination of devices consisting of an electronic unit and the corresponding primary switching elements which initiate a three-phase earthing in the event of an arc fault. With operating times of less than 4 ms after detection UFES clears an internal arc fault almost immediately after it arises. Thus arc impacts are reduced to an absolute minimum and safety standards raised to a whole new level.

The UFES is available to fulfil a variety of applications in the UniGear ZS1 switchgear e.g.:

- Busbar installation with top-housing box
- Cable compartment installation

Unbeatable advantages in case of an arc fault event:

- Drastic reduction of repair costs: no damages on the switchgear equipment to be expected. No exchange of the faulty panel.
- Greatly increased system availability: after inspection and elimination of the fault reason the switchgear can be taken into service again within shortest possible time.
- Greatly increased operator safety for human mal-operation under maintenance conditions
- Minimized secondary effects like light/sound emission or the release of toxic gases
- Solution for pressure sensitive environment with limited pressure relief options

Electrical maximum characteristics in UniGear ZS1				
Rated insulation voltage (rms) (1)	[kV]	12	17.5	24
Rated power frequency withstand voltage (rms)	[kV]	28	38	50
Rated lightning impulse withstand voltage (peak)	[kV]	75	95	125
Rated frequency	[Hz]	50 / 60	50 / 60	50 / 60
Rated short-time withstand current (rms) (1)	[kA]	50	50	31.5
Rated short-circuit making current	[kA]	125	125	80
Rated duration of short-circuit	[s]	3	3	3

(1) GB/DL version is available with higher request in dielectric characteristics (42 kV) and short-time withstand current (4 s)

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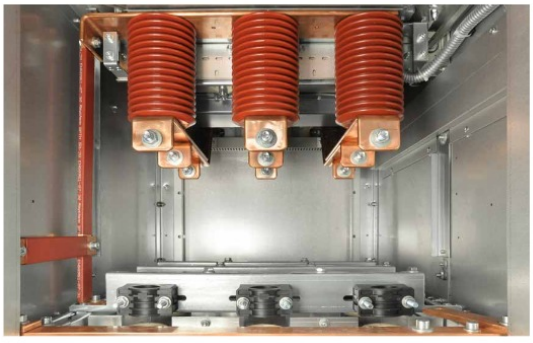
UFES kit; Primary switching element installed in the cable compartment



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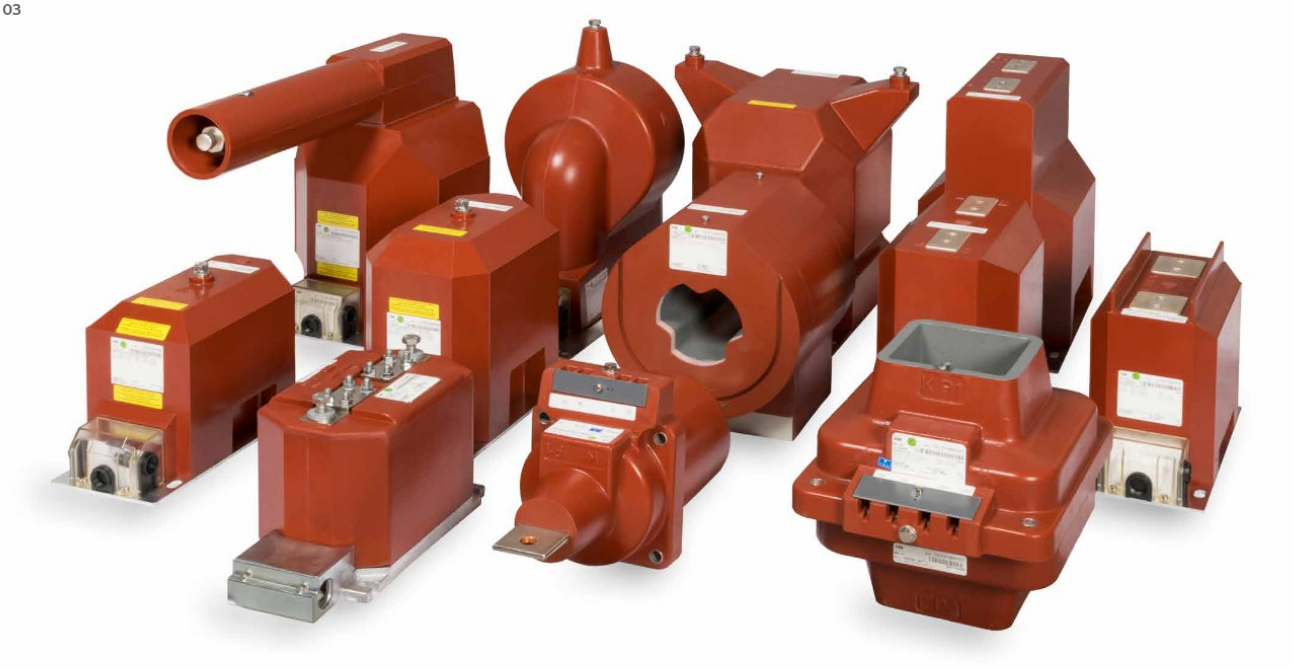

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Designation and sizes

Voltage level	Designation	Diameter over insulation	Conductor size [mm²]			
[kV]		[mm]	7.2 kV	12 kV	17.5 kV	24 kV
1 - 7.2	SOT 101	10.5 - 15	10 - 35	-	-	-
1 - 7.2	SOT 102	12.9 - 25.8	50 - 150	-	-	-
1 - 7.2	SOT 103	21.4 - 34.9	185 - 300	-	-	-
12 - 17.5	SOT 241 A	11 - 15	-	10 - 35	-	-
12 - 17.5	SOT 241	15 - 28	-	50 - 185	50 – 150	-
12 - 17.5	SOT 242	24 - 39	-	240 - 500	185 - 300	-
24	-	-	-	-	-	-
12 - 17.5	SOT 242 B	38 - 54	-	630 (*)	630 (*)	-
24	SOT 241 A	11 - 15	-	-	-	10
24	SOT 241	15 - 28	-	-	-	25 - 120
24	SOT 242	24 - 39	-	-	-	150 - 400
24	SOT 242 B	38 - 54	-	-	-	500 - 630 (*)

(*) Can be mounted on cables with 800 and 1000 mm² by using silicone rubber tape 2342 as top seal

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02 The REA system is a fast and flexible arc fault protection system for air-insulated low voltage and medium-voltage switchgear.

Product offering
The recommended products for arc fault protection is the arc fault protection system REA 101 with its extension units REA 103, REA 105 and REA 107 and protection and control relays from ABB's Relion® product family.

REA system
The REA system is a fast and flexible arc fault protection system for switchgears. This type of fast and selective arc fault protection system is a natural constituent of modern switchgear panels, and a safety and security investment for older switchgear panels, to protect human lives and prevent or reduce material damage. The REA system can be described as the fastest operating arc fault protection system in ABB's product portfolio, with trip command time in less than 2.5 ms.

Relion 615 series and 620 series
The Relion® product family offers integrated arc fault protection in its widest range of products for the protection, control, measurement and supervision of power systems for IEC and ANSI applications.
The Relion 615 and 620 series offer integrated three channel arc fault protection – to protect human lives and prevent or reduce material damage of protected switchgear – for power distribution in utility and industrial applications. The arc fault protection function operates with high-speed outputs with operation times down to 4 ms.

Relion 640
REX640 protection relays are equipped with arc flash sensor card, that supports either loop or lens sensors or a combination thereof, and includes supervision of the sensors . By using suitable sensor combinations for different bays, a selective arc flash protection scheme can be build up for the complete switchgear.

For more information, please refer to the following documentation:
- Arc Fault Protection REA 101 main module Product Guide
- Arc Fault Protection REA 103 extension module Product Guide
- Arc Fault Protection REA 105 extension module Product Guide
- Arc Fault Protection REA 107 extension module Product Guide
- Feeder Protection and Control REF615 Product Guide
- Motor Protection and Control REM615 Product Guide
- Transformer Protection and Control RET615 Product Guide
- Voltage Protection and Control REU615 Product Guide
- Capacitor Bank Protection and Control REV615 Product Guide
- Feeder Protection and Control REF620 Product Guide
- Motor protection and control REM620 Product Guide
- Transformer Protection and Control RET620 Product Guide
- Multiapplication Protection and Control REX640 Product Guide

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UniGear McSet

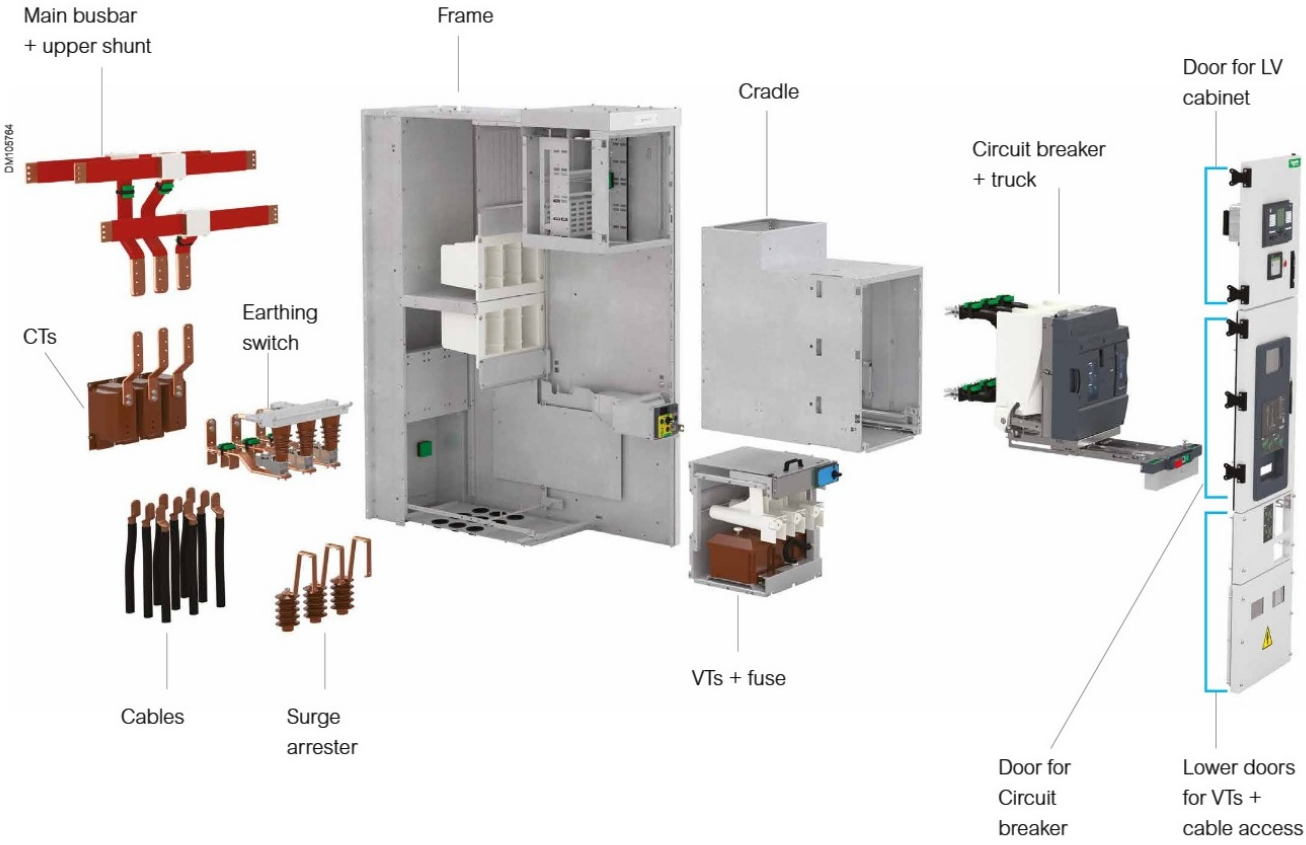
MCset

Air insulated switchgear up to 24 kV

Middle rolling circuit breaker

Medium Voltage Distribution

Description



Enable nearby control, ensure safety and uptime

All the Schneider Electric protection, metering and control devices can be connected to our Substation monitoring device.

The HMI can be installed anywhere within the substation to allow local control and monitoring, independant of any external systems.

The monitoring information and control functions can be scaled to the needs of each customer.

Optionally, the Magelis control and monitoring functions can be mirrored on a tablet through Wifi connection thanks to our Vijeo Design Air application. The technician can operate remotely the switchgear, while keeping visual contact with it.

Technical characteristics

Normal operating conditions according to IEC 62271-200 and IEC 62271-1

Rated voltage							
		Ur	(kV)	7.2	12	17.5	24
Rated insulation level							
Power frequency withstand voltage 50 Hz - 1 min		Ud	(rms kV)	20	28	38	50
Lightning impulse withstand voltage 1.2/50 µs		Up	(kV peak)	60	75	95	125
Rated normal current and maximum short time withstand current (1)							
Functional unit with circuit breaker							
Short time withstand current	Ik max.	Ik/tk	(kA/3 s)	25	25	25	25
				31.5	31.5	31.5	31.5
				40	40	40	
				50 (6)	50 (6)		
Rated current	Ir max. busbar	Ir	(A)	4 000	4 000	4 000	2 500 (7)
Rated current	Ir CB	Ir	(A)	630	630	630	630
				1 250	1 250	1 250	1 250
				2 500	2 500	2 500	2 500
				3 150	3 150	3 150	
				4 000 (2)	4 000 (2)	4 000 (2)	
Functional unit with fuse-contactor (3)							
Short time withstand current (prospective value) (9)	Ik max.		(kA)	50 (4)	50 (4) (5)		
Rated current	Ir max.		(A)	250	200 (5)		
Functional unit with switch-fuse combination (DI cubicle) (8)							
Rated current according to the fuses installed, see documentation							
Rated current	Ir max. ≤		(A)	200	200	200	200
Degree of protection							
IP3X IP4X IPX1 IPX2							

(1) For functional units equipped with circuit breakers or fuse-contactors, the breaking capacity is equal to the short time withstand current. In all cases, the device peak making capacity is equal to 2.5 times the short time withstand current.
(2) With fan for forced cooling.
(3) Lightning impulse dielectric withstand voltage = 60 kV peak.
(4) Limited by fuses (prospective value).
(5) With Rollarc contactor. (only SF6)
(6) Limited to 1 s for In circuit breaker: 1250 A.
(7) For higher performance, consult us.
(8) According to IEC 62271-105, combinations do not have a rated short time withstand current.
(9) In accordance with IEC 62271-106.

IAC (Internal Arc Classification)

The metal enclosed switchgear may have different types of accessibility on the various sides of its enclosure.

For identification purposes concerning the different sides of the enclosure, the following code shall be used (according to the IEC 62271-200 standard):

- **A**: Restricted access to authorized personnel only. Sides of the enclosure which meet the criteria of the internal arc test
- **F**: Front side
- **L**: lateral side
- **R**: Rear side

Functional overview

Choice of functional units

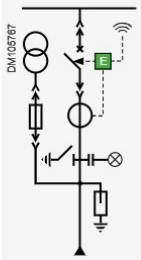
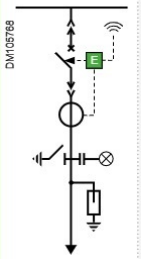
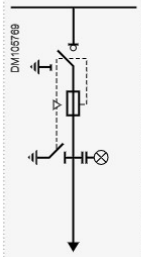
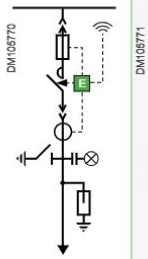
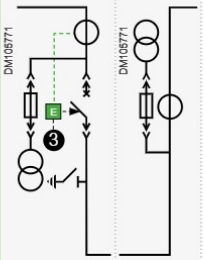
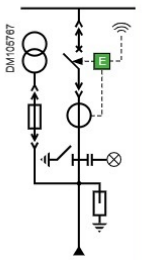
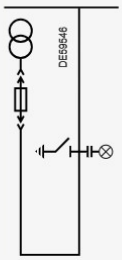
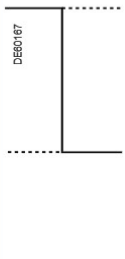
MCset has a comprehensive range of functions to suit all requirements for many applications.

The table below can be used to link requirements to functional units and gives basic information on the general composition of each unit.

Selection guide

For example:
You want to supply power to a transformer:
The chosen solution is a **transformer feeder/breaker.**
The corresponding functional unit will therefore a **AD cubicle**.
The main functions of the equipment are shown below.

Additional functions are available upon request to answer specific requirements.

Function	Incomer ❶	Feeder			Bus sectioning			Metering and busbar earthing	Motorpact transition ❷
	Line / Transformer / Generator	Line / Transformer / Motor / Capacitor	Transformer	Motor / Capacitor	Switchboard		Substation		Motor control
Cubicle	AD 1-2-3-4	AD 1-2-3-4	DI 2 DI 4	AD1C	CL 1-2-3-4	GL 1-2-3-4	AD 1-2-3-4	TT 1-2-4	
Device	Circuit breaker	Circuit breaker	Fuse-switch	Fuse contactor	Circuit breaker		Circuit breaker		
Single line diagrams									

E Easergy relay

❶ The direct incomer (functional unit without circuit breaker, equipped with a fixed busbar bridge) is produced using cubicles AD1-2-3 for U up to 17.5 kV. For the 24 kV version, the direct incomer is produced using a specific cubicle: RD4.

❷ Transition cubicle for MCC application (Motorpact).

❸ VTs or earthing switch, both can not be installed in the same time.

Functional overview

AD type cubicles - Incomer or feeder

MV devices

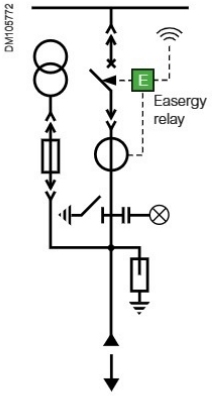
1. Busbars for cubicle interconnection
2. Main switching device
3. MV connections by cables accessible from the front face
4. Earthing switch
5. Current sensors
6. Voltage Transformers (optionally equipped with withdrawable fuses)

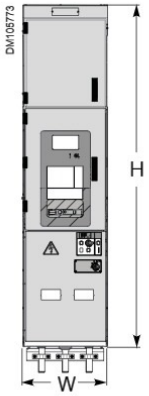
Note: For feeder function, no need of the VT device

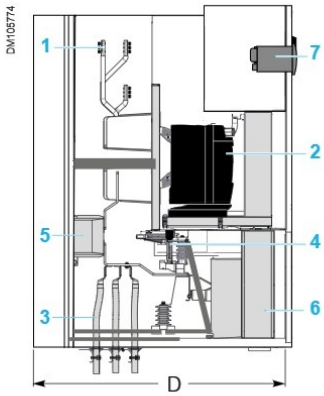
LV control cabinet

7. Low voltage auxiliaries and the protection, monitoring and control unit are in a control cabinet which is separated from the medium voltage part

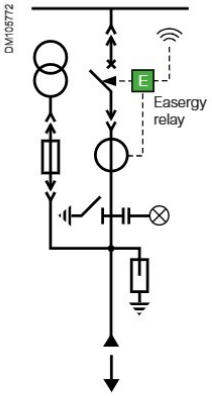
AD1, AD2, AD3

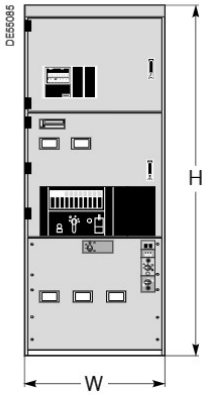


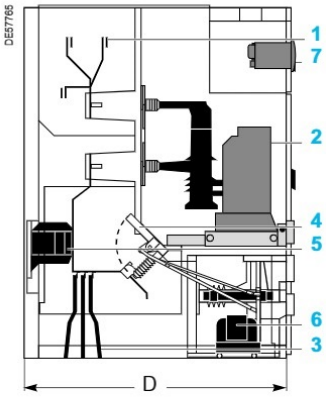




AD4







Functional overview

AD type cubicles - Incomer or feeder

		AD1						AD2					AD3												AD4
Rated voltage (kV)		7.2			12			7.2		12	17.5		7.2				12				17,5				24
Breaking capacity (kA)		25	31.5	50 (1)	25	31.5	50 (1)	40	50	40	25	31.5	25	31.5	40	50	25	31.5	40	50	25	31.5	40	50	31.5
Rated current (A)																									
EasyPact EXE circuit breaker	630	●	●		●	●					●	●													
	1 250	●	●		●	●					●	●													
	2 500												●	●			●	●			●	●			
Evolis circuit breaker **(For MARINE appl. ONLY)**	630	●	●		●	●					●	●													
	1 250	●	●		●	●					●	●													
	2 500												●	●			●	●			●	●			
CTV1 contactor	200			●																					
LF circuit breaker	630	●	●		●	●		●		●	●	●													●
	1 250	●	●		●	●		●		●	●	●				●				●			●		●
	2 500												●	●	●	●	●	●	●	●	●	●	●		●
	3 150												●	●	●	●	●	●	●	●	●	●	●		
	4 000												●	●	●	●	●	●	●	●	●	●	●		
Rollarc contactor	200			●			●																		
	250			●																					
Short-circuit making current Ip (peak value kA)	50 Hz	63	79		63	79		100	125	100	63	79	63	79	100	125	63	79	100	125	63	79	100	125	
	60 Hz	65	82		65	82		104	130	104	65	82	65	82	104	130	65	82	104	130	65	82	104	130	79
Dimensions (mm)	H	2 300						2 300					2 300												2 325
	W	570						700					900												900
	D (2)	1 550						1 550					1 550												1 750
Weight (kg) (4)		850						1 000					1 300												1 100

(1) Fault current limited by fuses: prospective current value in accordance with IEC 62271-106.

(2) Overall + 175 mm for 4-sided internal arcing protected switchboards, for 3150 A, for 4000 A or 2 sets of CT's.

(3) With fan.

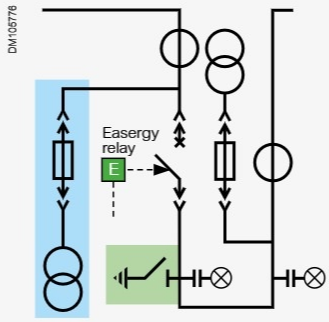
(4) Fully equipped cubicle.

(5) Consult us for 60 Hz.

Functional overview

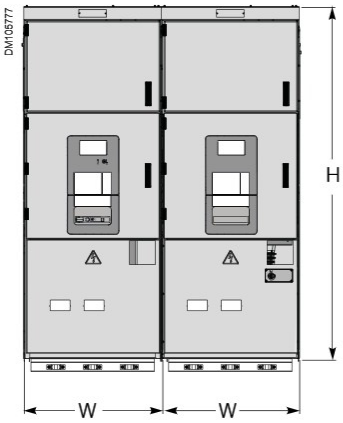
CL - GL type cubicles / Line-up bussectioning

The bussectioning functional unit comprises 2 cubicles mounted side by side (one cubicle equipped with a circuit breaker, the other with a busbar return).

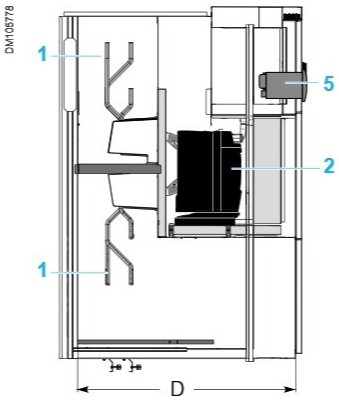


Option for customer to choose:

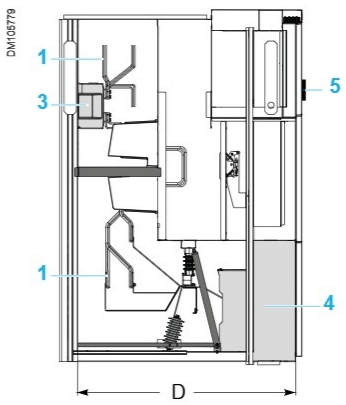
- VTs (blue) OR Earthing switch (green)

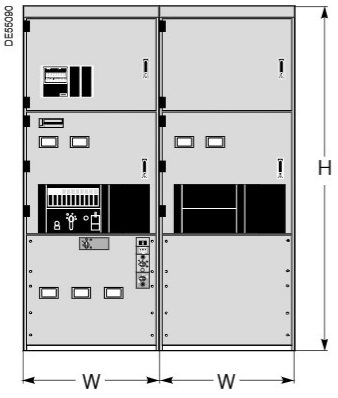


CL1, CL2, CL3

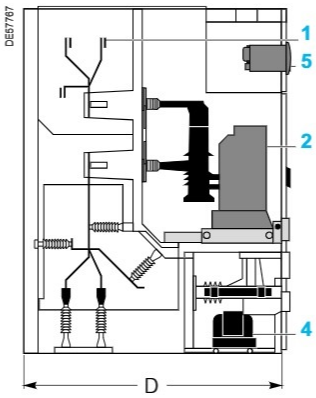


GL1, GL2, GL3

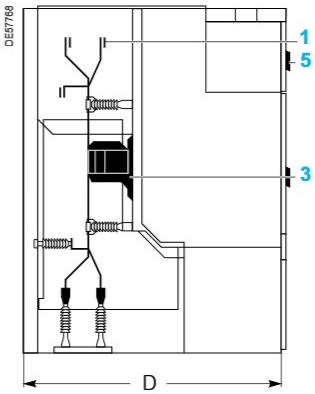




CL4



GL4



MV devices

1. Busbars to connect the bussectioning functional unit with other switchboard functional units
2. Main switching device
3. Current sensors
4. Voltage Transformers (optionally equipped with withdrawable fuses)

LV control cabinet

5. Low voltage auxiliaries and the protection, monitoring and control units are in one control cabinet which is separated from the medium voltage part

Functional overview

CL - GL type cubicles / Line-up bussectioning

		CL1+GL1						CL2+GL2					CL3+GL3												GL4
Rated voltage (kV)		7.2			12			7.2		12		17.5	7.2				12				17,5				24
Breaking capacity (kA)		25	31.5	50 (1)	25	31.5	50 (1)	40	50	40	25	31.5	25	31.5	40	50	25	31.5	40	50	25	31.5	40	50	31.5
Rated current (A)																									
EasyPact EXE circuit breaker	630	●	●		●	●		●		●	●	●													
	1 250	●	●		●	●		●		●	●	●											●		
	2 500												●	●	●		●	●	●		●	●	●		
Evolis circuit breaker **(For MARINE appl. ONLY)**	630	●	●		●	●		●		●	●	●													
	1 250	●	●		●	●		●		●	●	●											●		
	2 500												●	●	●		●	●	●		●	●	●		
CTV1 contactor	200			●																					
LF circuit breaker	630	●	●		●	●		●		●	●	●													●
	1 250	●	●		●	●		●		●	●	●											●		●
	2 500												●	●	●	●	●	●	●	●	●	●	●		●
	3 150													●	●	●		●	●	●	●	●	●		
	4 000															●				●			●		
Rollarc contactor	200			●			●																		
	250			●																					
Short-circuit making current Ip (peak value kA)	50 Hz	63	79		63	79		100	125	100	63	79	63	79	100	125	63	79	100	125	63	79	100	125	
	60 Hz	65	82		65	82		104	130	104	65	82	65	82	104	130	65	82	104	130	65	82	104	130	79
Dimensions (mm)	H (6)	2300						2300					2300												2 325
	W	2* 570						2* 700					2* 900												2*900
	D (2)	1 550						1 550					1 550												1 750
Weight (kg) (4)		1 200						1 400					1 800												1 800

(1) Overall + 175 mm for 4-sided internal arcing protected switchboards.

(2) Overall + 500 mm for upstream CT's.

(3) With fan.

(4) Fully equipped cubicle.

(5) Consult us for 60 Hz.

(6) + 400 mm for tunnel

Safety and protection of persons and property

PM100695

Safety and protection of persons and property

The devices used to equip the MCset range of functional units have outstanding features:

- Long service life
- Maintenance-free live parts
- High electrical endurance
- Operating safety
- Insensitivity to the environment

PM106461

The withdrawable parts

- the circuit breaker, the contactor, the disconnector truck or the earthing truck
- the lever-type propulsion mechanism for racking in-out
- interlocks to fix the withdrawable parts onto the fixed part

The live parts are housed in an insulating enclosure in the sealed pressure system in compliance with IEC 62271-100.

Circuit breaker

A circuit breaker is a safety device enabling switching and protection of electrical distribution networks. Installed in the MCset cubicle, it protects all components situated downstream during a short-circuit.

- Vacuum breaking: **EasyPact EXE/ Evolis (Marine)**
- Breaking in SF6: **LF**

PM106697

Contactor

The contactor is a motor control and protection device.

- Vacuum breaking: **CTV1**
- Breaking in SF6: **Rollarc**

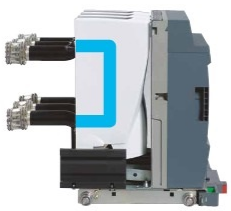
All accidental overpressure would be limited by the safety disk opening.

PM106696

Earthing truck

The earthing truck is a safety feature which allows the cubicle busbar to be earthed. It is installed instead of the circuit breaker and has the same interlock possibilities.

PM105381



Disconnector truck

The disconnector truck enables the upper and lower part of the cubicle to be short-circuited. It is installed instead of the circuit breaker and has the same interlock possibilities.

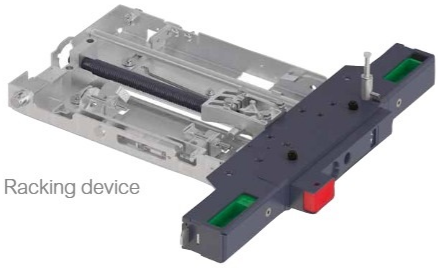
EasyPact EXE circuit breaker

General characteristics

PM106400

PM106412

PM106402



Racking device

EasyPact EXE is our latest range of state of the art vacuum circuit breaker. Its design is the result of more than 40 years of Schneider Electric experience in switching devices. Its wide geographical deployment makes it a key component of PIX Easy equipment.

It has been designed to suit particularly applications such as: Infrastructure, commercial and Industrial Buildings, Industrial plants Distribution sub-stations.

The materials used to manufacture this circuit breaker have been selected and designed to operate 10 000 cycles.

Mechanism

The operating mechanism gives the device an opening and closing speed that is independent of the operator whether the order is electrical or manual. It carries out reclosing cycles and it is automatically recharged by a geared motor after each closing.

Vacuum interrupter

This component is the heart of the circuit breaker. The very carefull Schneider Electric own design allows to break the rated short-circuit current and this is achieved by:

- Choosing materials that are specifically selected for this application (metals and ceramics)
- Choosing an appropriate assembly process (vacuum, high temperature brazing)
- The use of a "getter" material to absorb the residual gas inside the enclosure

Racking device

The racking device moves the circuit breaker from the disconnected position to the service position and vice versa.

A motorized version of the truck allows to remotely rack in and rack out the circuit breaker.

This feature greatly enhances the safety operation of the switchboards.

EasyPact EXE racking device has a robust interlocking system with the switchgear door, the LV plug, the circuit-breaker and the earthing switch.

The materials used to manufacture EasyPact EXE racking trolley sub-assemblies have been selected and designed to operate 2 000 cycles under the conditions defined by the IEC standard.

According to IEC 62271-100			
Rated voltage	Ur	kV	12
			17.5
Rated frequency	fr	Hz	50/60
Rated short duration power frequency withstand voltage	Ud	kV	28
			38
Rated lightning impulse withstand voltage	Up	kV	75
			95
Rated short-circuit breaking current	Isc	kA	20
			25
			31.5
Rated duration of short-circuit	tk	s	3

EasyPact EXE circuit breaker

Remote control indication auxiliaries

PM106429

Rotary type
contacts (OC)

Position contacts (OC)

EasyPact EXE is equipped with one block of four position contacts as standard, and the Panel Builder may add one or two additional blocks of four contacts. The maximum number of position contacts is twelve.

Characteristics				
Standard delivery	1 (1 block of 4 contacts)			
Maximum quantity	3 (3 blocks of 4 contacts)			
Breaking capacity (A)	Standard			Min. load: 100 mA/24 V
Cos φ: 0.3		V AC	240/380	10/6
		V DC	24/48	10/6 *
			125	10/6
			250	3

*** standard contacts: 10A; optional contacts: 6A (temperature derating)**

PM106430

"Ready to close"
PF contact

«Ready to close» contact (PF)

A «ready to close» contact (PF) indicates that the circuit breaker is ready to close in the following conditions:

- The circuit breaker contacts are open
- The operating mechanism closing spring is charged
- The opening pushbutton is not activated (by a keylock or manually)
- The opening shunt release is not energized
- The undervoltage release, if present, is energized

EasyPact EXE is always equipped with 1 «ready to close» contact (PF) for remote control.

Characteristics				
Standard delivery	1			
Maximum quantity	1			
Breaking capacity (A)	Standard			Min. load: 100 mA/24 V
Cos φ: 0.3		V AC	240/380	5
		V DC	24/48	3
			125	0.3
			250	0.15

PM106431

Operation counter
(CDM)

Operation counter (CDM)

An operation counter counts the number of operating cycles (close-open) that the device has carried out.

EasyPact EXE is always delivered with an operation counter showing the number of close-open cycles that have been performed for the factory routine test (usually 50).

Voltage Transformers for MCset

E28679

VRQ3

For cubicles AD1, CL1, GL1, TT1, AD2, CL2, GL2, AD3, CL3, GL3

Transformer VRQ3n/S2

- Phase-earth
- Frequency 50-60 Hz

Primary voltage (kV)	3/√3	3.3/√3	5.5/√3	6/√3	6.6/√3	10/√3	11/√3	13.8/√3	15/√3
1st secondary voltage (V)	100/√3	110/√3	110/√3	100/√3	110/√3	100/√3	110/√3	110/√3	100/√3
2nd secondary voltage (V)	100/√3	110/√3	110/√3	100/√3	110/√3	100/√3	110/√3	110/√3	100/√3
1st secondary accuracy class (VA)	30-50 VA cl.0.5								
2nd secondary accuracy class (VA)	50 VA cl.0.5								

E28680

VRC1/S1F

For cubicles AD2, CL2, GL2, TT2, AD3, CL3, GL3

Transformer VRC1/S1F

- Phase-phase
- Frequency 50-60 Hz

Primary voltage (kV)	3.3	5.5	6,6	11	13.8	15
Secondary voltage (V)	110	110	110	110	110	100
Accuracy class (VA)	75 VA cl.0.5					

M720104

VRCR

For contactor cubicle AD1

This transformer provides power to the coil in order to keep the magnetic circuit of the contactor closed.

Transformer VRCR/S1

- Phase-phase
- Frequency 50-60 Hz

Primary voltage (kV)	3.3	5.5	6.6
Secondary voltage (V)	110	110	110
Accuracy class (VA)	50 VA cl.0.5		

E74401

VRQ1

For AD4, RD4, CL4, GL4, TT4 cubicles

Transformer VRQ1N/S2

- Phase-earth
- Frequency 50-60 Hz

Primary voltage (kV)	20/√3	22/√3
1st secondary voltage (V)	100/√3	110/√3
2nd secondary voltage (V)	100/√3	110/√3
1st secondary accuracy class (VA)	50 VA cl.0.5 100 VA cl.1	
2nd secondary accuracy class (VA)	50 VA cl.3P	

Current transformers for MCset

Conventional current transformers

Conventional current transformers are used to provide power to metering, measuring or control devices. They measure the value of primary current from 10 A to 4 000 A.

Schneider Electric has drawn up a list of current transformers which are appropriate for use with digital protection devices in order to make it easier to determine accuracy characteristics. This list is available in the selection guide.

MCset 1/2/3 up to 17.5 Kv				
Schneider Electric CT				
ARJP1 /N2J(AD1)	ARJP2/N2J	ARJP3/N2J	ARJA1/N2J	ARO1a/N3

Other manufactures qualified by Schneider Electric with type test	
Up to 2 500 A (DIN Type)	ALCE (Turkey)
	TRAFINDO (Indonesia)
	NPT (India)
> 2 500 A	ALCE (Turkey)

MCset 4 up to 24 Kv			
Schneider Electric CT			
ARJP1 /N2J(AD1)	ARJP2/N2J	ARJP3/N2J	ARJA1/N2J

E28676

ARJP1, 2 or 3

For cubicle AD1 contactor

Transformer ARJP1/N2J

- Single primary current, double secondary current for measurement or protection
- Frequency 50-60 Hz

I1n (A)		10	20	30	50	75	100	150	200	250
Ith (kA)		1.2	2.4	3.6	6	10	10	10	10	10
t (s)		1	1	1	1	1	1	1	1	1
Measuring*	cl.0.5					15 VA				
Protection*	5P20					2.5 VA				

Current transformers for MCset

For cubicles AD1-CL1-GL1-AD2-CL2-GL2-AD4-RD4-CL4-GL4

Transformer ARJP2/N2J

- Double primary current, double secondary current for measurement or protection
- Frequency 50-60 Hz

I1n (A)		50-100	75-150	100-200	150-300	200-400	250-500	600	750
Ith (kA)		40	40	31.5-40	40	40	40	50	50
t (s)		1	1	1	1	1	1	1	1
Measuring*	cl.0.5			5-10VA	10-20 VA	7.5-15VA	10-20 VA	20VA	20VA
Protection*	5P20	2.5-5VA	2.5-5VA	2.5-5VA	2.5-5VA	5-10VA	5-10VA	7.5VA	7.5VA

For cubicles AD1-CL1-GL1-AD2-CL2-GL2-AD4-RD4-CL4-GL4

Transformer ARJP3/N2J

- Single primary current, double secondary current for measurement or protection
- Frequency 50-60 Hz

I1n (A)		1 000	1 250
Ith (kA)		50	50
t (s)		1	1
Measuring*	cl.0.5	30 VA	30 VA
Protection*	5P20	10 VA	10 VA

* The secondary current for measuring and protection can be of 1 A or 5 A.

For cubicles AD3-CL3-GL3-AD4-RD4-CL4-GL4

Transformer ARJA1/N2J

- Single primary current, double secondary current for measurement or protection
- Frequency 50-60 Hz

E74399

ARJA1

I1n (A)		1500	2000	2500
Ith (kA)		50	50	50
t (s)		1	1	1
measuring*	cl.0.5	30 VA	30 VA	30 VA
protection*	5P20	15 VA	15 VA	15 VA

For cubicles AD3-CL3-GL3

Transformer ARO1a/N3

- Single primary current, triple secondary current for measurement or protection
- Frequency 50-60 Hz

E74400

ARO1

I1n (A)		3150
Ith (kA)		50
t (s)		1
Measuring*	cl.0.5	30 VA
Protection*	5P20	7.5 VA

* The secondary current for measuring and protection can be of 1 A or 5 A.

Protection, monitoring & control

Easergy Sepam protection system

PM109624

Each functional unit can be equipped with a comprehensive protection, monitoring and control system comprising:

- Instrument transformers to measure the necessary electrical values (phase current, residual current, voltages, etc.)
- Protection relays, providing functions adapted to the part of the network to be protected
- Metering equipment, to inform operators
- Low voltage relaying, to provide control of the breaking device and of the withdrawable part
- Various auxiliaries: secondary circuit test units, etc.

Easergy Sepam: protection digital relays

Easergy Sepam is a range of digital monitoring protection and control units.

Easergy Sepam is the centre of the protection, monitoring and control system functional units: all the necessary protection, metering, control, monitoring and signalling functions are carried out by Easergy Sepam.

The Easergy Sepam range is a range of units defined to provide an optimal solution for each application, and includes (e.g.):

- Easergy Sepam S, substation incomer and feeder
- Easergy Sepam B, bus sectioning
- Easergy Sepam T, transformer feeder
- Easergy Sepam M, motor feeder
- Easergy Sepam G, generator feeder
- Easergy Sepam C, capacitor feeder

The Easergy Sepam range consists of the Easergy Sepam series 20, series 40, series 60 and series 80, a range of modular protection relays to adapt precisely to your needs.

Protection chain

The Easergy Sepam protection units combined with innovative current sensors, provide a comprehensive measurement, protection and energy management chain.*

A high-performance, economical solution

The modular Easergy Sepam offer provides a cost-effective solution tailored to every requirement.

Easy to order and install

All the components of the protection chain are referenced and can be delivered very quickly.

The power of a multi-functional digital unit

Easergy Sepam is more than a simple protection relay; it is a truly multi-functional unit offering, in particular:

- Circuit-breaker diagnosis functions (switching counter and time, rearming time, cumulated broken A2)
- Direct circuit-breaker control, whatever the type of release unit
- Remote equipment operation using the communication option

(*) Please check in the Sepam catalogue the sensor to use with each Sepam version.