Medium Voltage Distribution

RM6 24 kV

Ring Main Unit

Catalogue
2009

Schneider Electric

A new path for achieving your electrical installations

A comprehensive offer

The RM6 range is part of a comprehensive offer of products that are perfectly coordinated to meet all medium and low voltage electrical distribution requirements.
All of these products have been designed to work together: electrical, mechanical and communication compatibility.
The electrical installation is thus both optimised and has improved performance:

- better service continuity,
- increased personnel and equipment safety,
- guaranteed upgradeability,
- efficient monitoring and control.

You therefore have all the advantages at hand in terms of know-how and creativity for achieving optimised, safe, upgradeable and compliant installations.

Tools for facilitating the design and installation

With Schneider Electric, you have a complete range of tools to help you get to know and install the products whilst complying with current standards and good working practices.
These tools, technical sheets and guides, design software, training courses, etc are regularly updated.

Schneider Electric is associating itself with your know-how and your creativity to produce optimised, safe, upgradeable and compliant installations

For a real partnership with you

A universal solution doesn’t exist because each electrical installation is specific.
The variety of combinations on offer allows you to truly customise the technical solutions.
You are able to express your creativity and put your know-how to best advantage when designing, manufacturing and exploiting an electrical installation.

Contents

Applications

The RM6 can be adapted to meet all Medium Voltage power distribution needs, up to 24 kV.

The RM6 is a compact unit combining all MV functional units to enable connection, supply and protection of one or two transformers on an open ring or radial network:

- **by a fuse-switch combination, up to 2000 kVA**
- **by a circuit breaker with protection unit, up to 3000 kVA.**

The switchgear and busbars are enclosed in a gas-tight chamber, filled with SF6 and sealed for life.

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MT55147

MT55148

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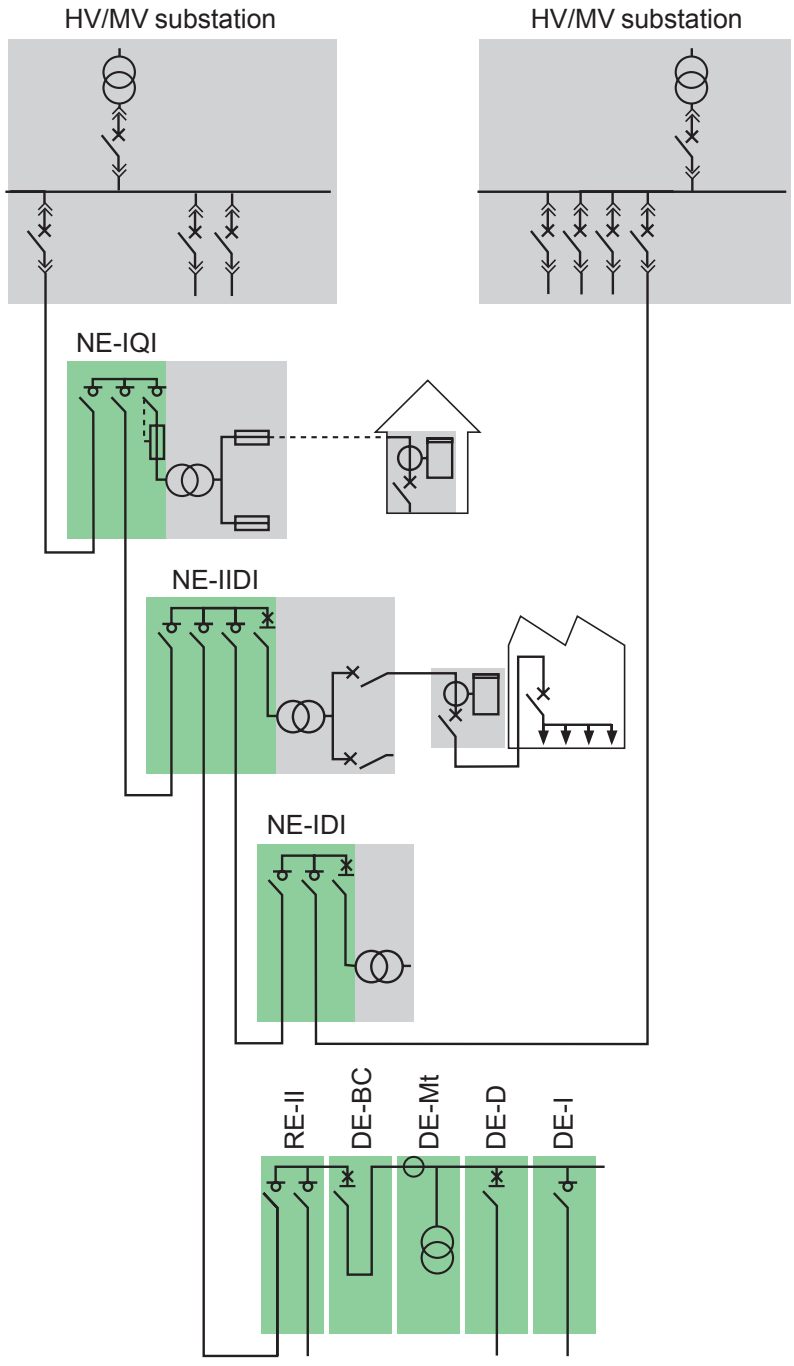


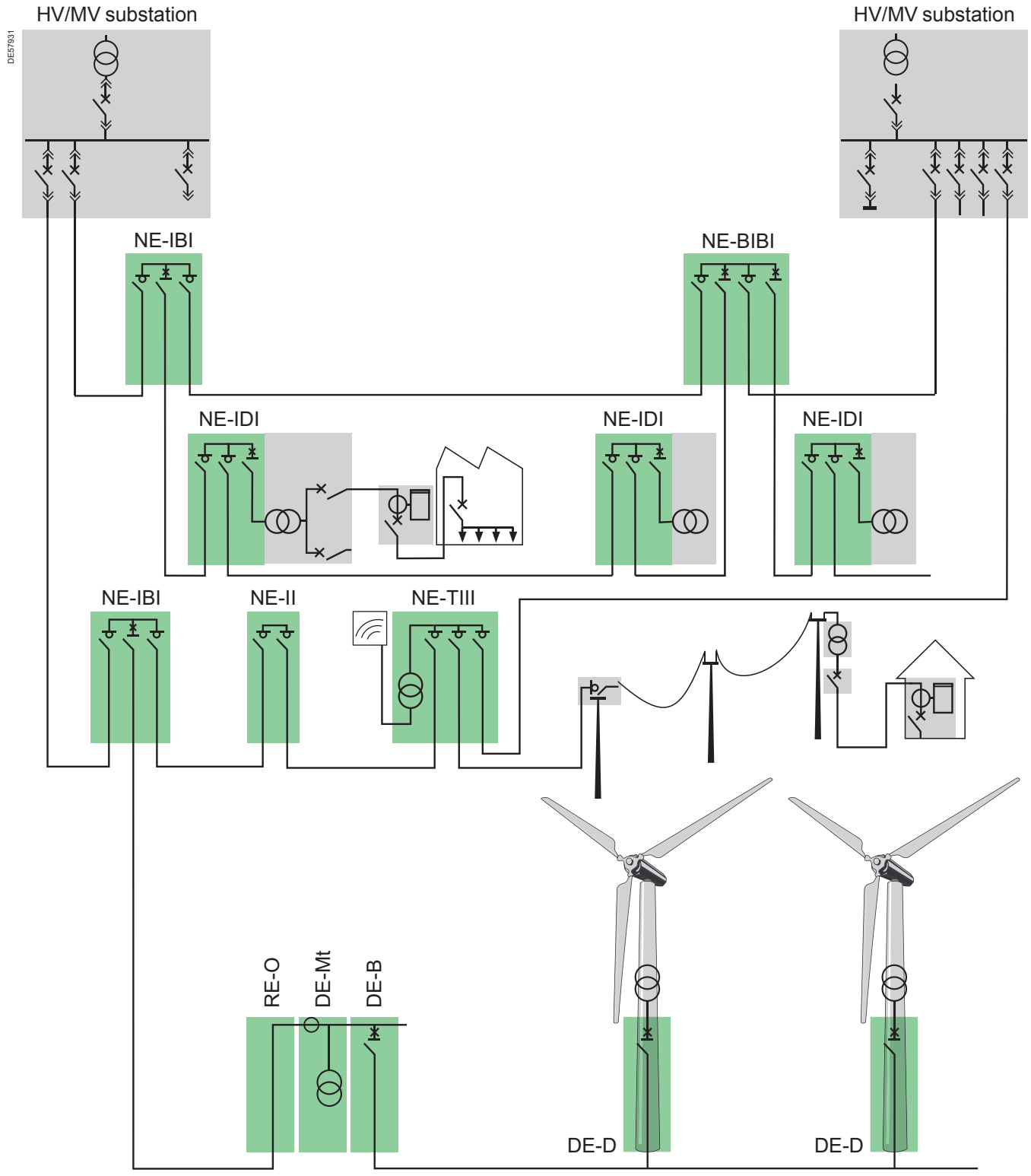
Applications (cont.)

A complete range, enabling you to equip MV network points, and enhance electrical power dependability.

Operating a distribution network sometimes requires switching points in addition to the HV/MV substations, in order to limit the effect of a fault on the network.

The RM6 offers a choice of solutions to make 2, 3 or 4 directional connections

- **with line protection by 630 A circuit breakers**
- **with network switching by switch disconnectors**
- **with integrated power supply telecontrol devices.**



Range advantages

Choosing RM6 offers you the experience of a world leader in the field of Ring Main Units.

The choice for your peace mind

The new RM6 generation benefits from the accumulated experience acquired from the 1,000,000 functional units that equip electrical networks in more than 50 countries in Africa, America, Asia, Europe and Australasia.
With 20 local production units around the world, Schneider Electric offer products can be made available to you in the shortest possible time.

Ring Main Unit, long experience

1983: marketing launch of the first RM6 compact with integrated insulation.
1987: creation of the circuit breaker version, with integrated protection unit needing no auxiliary power supply.
1990: creation of the RM6 1 functional unit.
1994: creation of the Network Point, integrating the RM6 and telecontrol.
1998: creation of the 630 A line protection integrated relay circuit breaker and launch of an RM6 range that is extensible on site.
2007: creation of the MV metering offer and associated functions (metering module, busbar coupling module, cable connection module).

1983

1987

1998

Advantages of a proven design

RM6 switchgear

■ **Ensures personal safety:**
□ internal arc withstand in conformity with IEC 62271-200
□ visible earthing
□ 3 position switchgear for natural interlocking
□ dependable position indicating devices.

■ **Is insensitive to the environment:**
□ stainless steel sealed tank
□ disconnectable, sealed, metallized fuse chambers.

■ **Is of approved quality:**
□ conforms to national and international standards
□ design and production are certified to ISO 9000 (version 2000)
□ benefits from the experience accumulated from 1,000,000 functional units installed world-wide.

■ **Respects the environment:**
□ end-of-life gas recovery possible
□ ISO 14001 approved production site.

■ **Is simple and rapid to install:**
□ front cable connections at the same height
□ easily fixed to the floor with 4 bolts.

■ **Is economical:**
□ from 1 to 4 functional units, integrated within the same metal enclosure for which insulation and breaking take place in SF6 gas
□ lifetime of 30 years.

■ **Has maintenance free live parts:**
□ in conformity with IEC 62271-1, pressure system, sealed for life.

Range advantages (cont.)

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Compact and scalable, the RM6 range covers all of your requirements

Compact

RM6 Medium Voltage switchgear cubicles are perfectly suited for very simple configuration of 1 to 4 functions.

- Choice of **"all in one"** units integrated in a single metal enclosure
- Cubicles insensitive to climatic conditions
- Optimized dimensions
- Quick installation through floor fixing with four bolts and front cable connection.

Extensible

Just as compact and insensitive to climatic conditions **the extensible RM6 is modular to suit your requirements**.

The addition of **functional unit modules**, allows you to build the Medium Voltage switchboard suited to your requirements.

Your organization develops, you build a new building - RM6 adapts with you.

It can be extended on site without handling gases or requiring any special floor preparation **to develop your installation simply and in complete safety**.

Circuit breakers, for greater safety and lower costs

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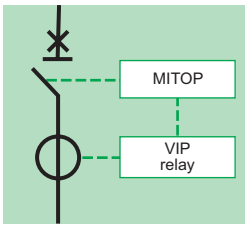

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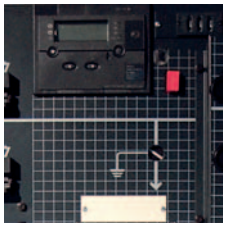

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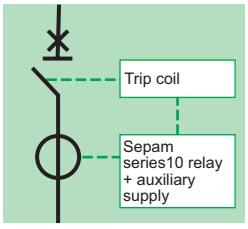


The RM6 range offers 200 A and 630 A circuit breakers to protect both transformers and lines. They are associated with independent protection relays that are self-powered via current sensors or with auxiliary supply protection relays.

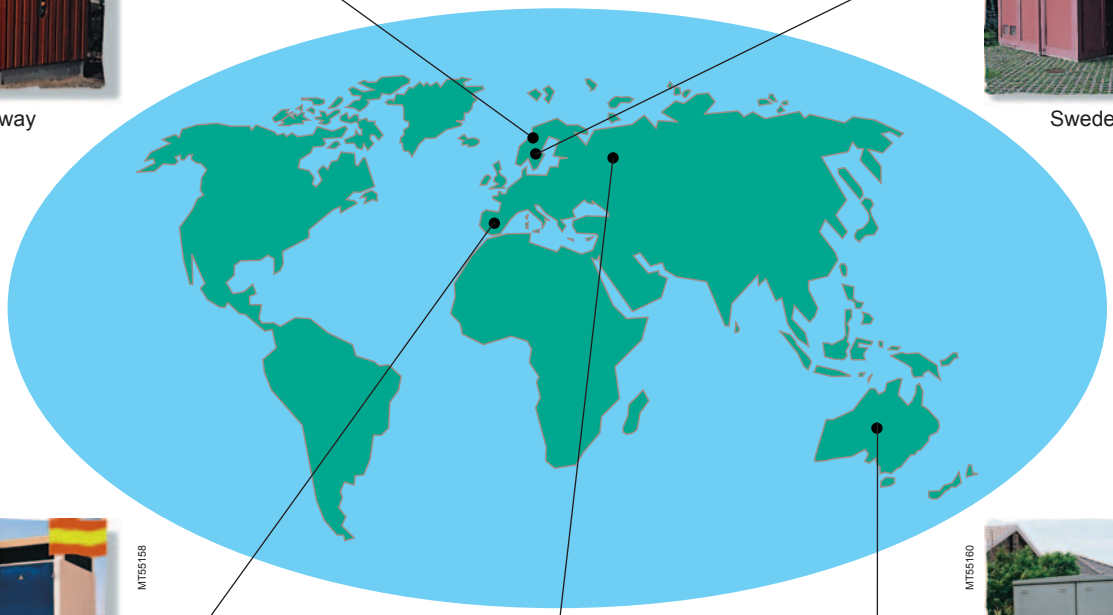
- **Greater operating staff safety and improved continuity of service**
  - increased protection device co-ordination with the source substation, circuit breaker and the LV fuses
  - rated current is normally high, allowing use of a circuit breaker to provide disconnection
  - the isolating system is insensitive to the environment.
- **Simplified switching operations and remote control**
- **Reduction of losses**
  thanks to the low value of RI^2 (the fuse-switches of a 1000 kVA transformer feeder can dissipate 100 W).
- **Reduced maintenance costs**
  no work in progress to replace fuses.

Experience of a world leader

RM6, a world-wide product

Norway

Sweden



Spain

Russia

Australia

Main references

Asia/Middle East
- BSED, Bahrein
- DEWA, Dubaï
- WED, Abu Dhabi
- Tianjin Taifeng Industrial Park, China
- TNB, Malaysia
- China Steel Corporation, Taiwan
- TPC, Taiwan
- SCECO/SEC, Saudi Arabia
- PSB, China

Africa
- Electricité de Mayotte
- EDF Reunion
- Total, Libya
- SONEL, Cameroon
- South Africa

South America/Pacific
- CELESC, Santa Catarina, Brazil
- PETROBRAS, Rio de Janeiro, Brazil
- Guarulhos International Airport
- Sao Paulo, Brazil
- CEMIG, Minas Gerais, Brazil
- EDF, French Guiana
- Tahiti Electricity
- Métro de Mexico, Mexico

Europe
- EDF, France
- Channel tunnel, France
- Iberdrola, Spain
- Compagnie Vaudoise d'électricité SEIC, Switzerland
- Electrabel, Belgium
- Union Fenosa, Spain
- ENHER, Spain
- Oslo Energie, Norway
- STOEN, Poland
- Bayernwerke, Germany
- London Electricity, United Kingdom
- Mosenergo, Russia

Australasia
- Eau et Electricité de Calédonie
- New-Caledonia
- Enercal, New-Caledonia
- United Energy, Australia

Protecting the environment

The Schneider Electric's recycling procedure

The Schneider Electric's recycling procedure for SF6 based products is subject to rigorous management, and allows each device to be traced through to its final destruction documentation.

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Schneider Electric is committed to a long term environmental approach.
As part of this, the RM6 range has been designed to be environmentally friendly, notably in terms of the product's recycleability.
The materials used, both conductors and insulators, are identified and easily separable.
At the end of its life, RM6 can be processed, recycled and its materials recovered in conformity with the draft European regulations on the end-of-life of electronic and electrical products, and in particular without any gas being released to the atmosphere nor any polluting fluids being discharged.

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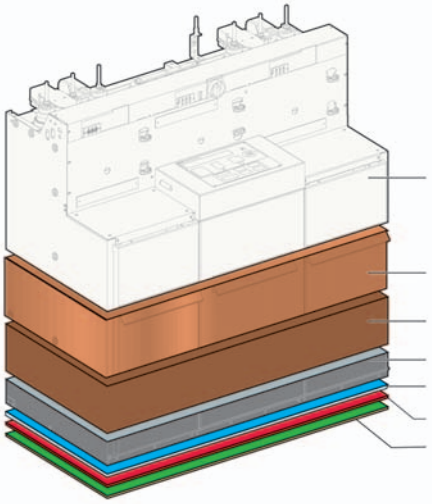

	IDI	IQI
Ferrous metal	78.5%	72.5%
Non-ferrous metal	13.3%	11.3%
Thermohardening	4.7%	11.3%
Thermoplastics	2%	4.1%
Fluids	0.5%	0.4%
Electronic	0.7%	0%
Other	0.4%	0.4%

The environmental management system adopted by Schneider Electric production sites that produce the RM6 have been assessed and judged to be in conformity with requirements in the ISO 14001 standard.

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AFAQ ISO 14001

Quality - Standards

IEC standards

RM6 is designed in accordance with the following standards:

General operation conditions for indoor switchgears

IEC 62271-1 (common specifications for high voltage switchgear and controlgear)
- ■ Ambient temperature: class –25°C indoor
- □ lower than or equal to 40°C without derating
- □ lower than or equal to 35°C on 24 hours average without derating
- □ greater than or equal to –25°C.
- ■ Altitude :
- □ lower than or equal to 1000 m
- □ above 1000 m, and up to 2000 m with directed field connectors
- □ greater than 2000 m: please consult us for specific precaution.

IEC 62271-200 (A.C. metal enclosed switchgear and controlgear for rated voltage above 1 kV and up to 52 kV)
- ■ Switchgear classification: PM class (metallic partitioning)
- ■ Loss of service continuity: LSC2B class for circuit breaker and switch (LSC2A for fuse-switch combinations)
- ■ Internal arc classification: class AF AL up to 20 kA 1 s on request (access restricted to authorized personnel only, for front and lateral access).

Switch disconnectors

IEC 60265-1 (high voltage switches for rated voltage above 1 kV and up to 52 kV)
- ■ Class M1/E3
- □ 100 CO cycles at rated current and 0.7 p.f.
- □ 1000 mechanical opening operations.

Circuit breakers: 200 A feeder or 630 A line protection

IEC 62271-100 (high voltage alternating current circuit breakers)
- ■ Class M1/E2
- □ 2000 mechanical opening operations,
- □ O-3 min.-CO-3 min.-CO cycle at rated short circuit current.

Other applicable standards

- ■ Switch-fuse combinations: IEC 62271-105: alternating current switch-fuse combination
- ■ Earthing switch: IEC 62271-102: alternating current disconnectors and earthing switches
- ■ Electrical relays: IEC 60255.

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AFAQ ISO 9001 VERSION 2000

A major plus point

Schneider Electric has integrated a functional organization into each of its units, the main purpose of which is to check quality and ensure the adherence to standards. This procedure is:
- ■ the same throughout the different departments
- ■ recognized by numerous approved customers and organizations.

Above all, it is our strict application of this functional organization that has enabled us to obtain the recognition of an independent organization, the French Association for Quality Assurance (Association Française pour l'Assurance Qualité, or **(AFAQ)**.

The RM6 design and production quality system has been certified as being in conformity with the requirements of the ISO 9001: 2000 quality assurance model.

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Rigorous, systematic checks

During the manufacture of each RM6, it undergoes systematic routine tests, the aim of which is to check quality and conformity:
- ■ tightness check
- ■ filling pressure check
- ■ opening and closing speed measurement
- ■ operating torque measurement
- ■ partial discharge check
- ■ dielectric check
- ■ conformity with drawings and diagrams.

The quality control department records and signs the results obtained on the **test certificate** for each device.

RM6 switchgear description

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RM6 switchgear comprises 1 to 4 integrated, low dimension functional units.
This self-contained, totally insulated unit comprises:
- a stainless steel, gas-tight metal enclosure, sealed for life, which groups together the live parts, switch-disconnector, earthing switch, fuse switch or the circuit breaker
- one to four cable compartments with interfaces for connection to the network or to the transformer
- a low voltage cabinet
- an electrical operating mechanism cabinet
- a fuse chamber compartment for fused switch-disconnectors or fuse switches.

The performance characteristics obtained by the RM6 meet the definition of a “sealed pressure system” laid down in the IEC recommendations.
The switch-disconnector and the earthing switch offer the operator all necessary usage guarantees:

Tightness
The enclosure is filled with SF6 at a 0.2 bar gauge pressure. It is sealed for life after filling. Its tightness, which is systematically checked at the factory, gives the switchgear an expected lifetime of 30 years. No maintenance of live parts is necessary with the RM6 breaking.

Switch disconnector
Electrical arc extinction is obtained using the SF6 puffer technique.

Circuit breaker
Electrical arc extinction is obtained using the rotating arc technique plus SF6 auto-expansion, allowing breaking of all currents up to the short-circuit current.

PE56813

A range that is extensible on site

When harsh climatic conditions or environmental restrictions make it necessary to use compact switchgear, but the foreseeable evolution of the power distribution network makes it necessary to provide for future changes, RM6 offers a range of extensible switchgear.
The addition of one or more functional units can be carried out by simply adding modules that are connected to each other at busbar level by directed field bushings.
This very simple operation can be carried out on-site:
- without handling any gas
- without any special tooling
- without any particular preparation of the floor.

The only technical limitation to the evolution of an extensible RM6 switchboard is therefore the rated current acceptable by the busbar: 630 A at 40°C.

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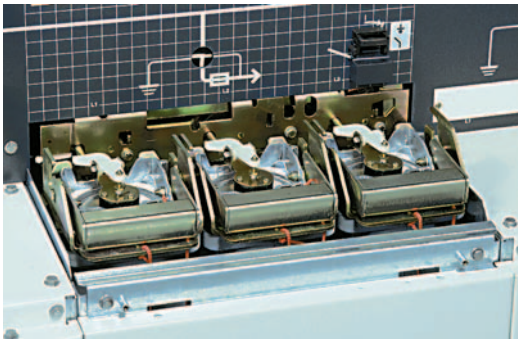

Insensitivity to the environment

Complete insulation

- **A metal enclosure** made of stainless steel, which is unpainted and gas-tight (IP67), contains the live parts of the switchgear and the busbars.
- **Three sealed fuse chambers**, which are disconnectable and metallized on the outside, insulate the fuses from dust, humidity...
- **Metallization of the fuse chambers and directed field terminal connectors** confines the electrical field in the solid insulation.

Taken together, the above elements provide the **RM6 with genuine total insulation** which makes the switchgear completely insensitive to environmental conditions, dust, extreme humidity, temporary soaking.
(IP67: immersion for 30 minutes, as laid down in IEC standard 60529, § 14.2.7).

Safety of people

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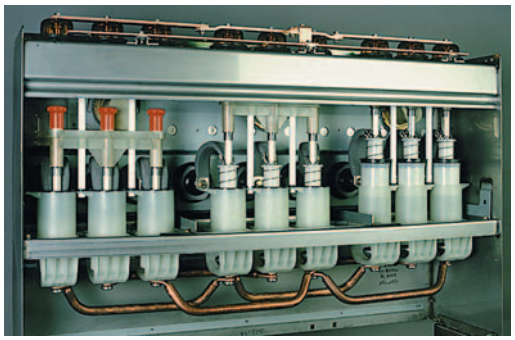

3 stable position switch

Switchgear

Switch-disconnectors and circuit breakers have similar architecture:
■ **a moving contact assembly with 3 stable positions** (closed, open and earthed) moves vertically (see sketch). Its design makes simultaneous closing of the switch or circuit breaker and the earthing switch impossible.
■ **the earthing switch** has a short-circuit making capacity, as required by the standards.
■ the RM6 combines both the **isolating** and interrupting function.
■ the earth collector has the correct dimensions for the network.
■ access to the cable compartment can be interlocked with the earthing switch and/or the switch or circuit breaker.

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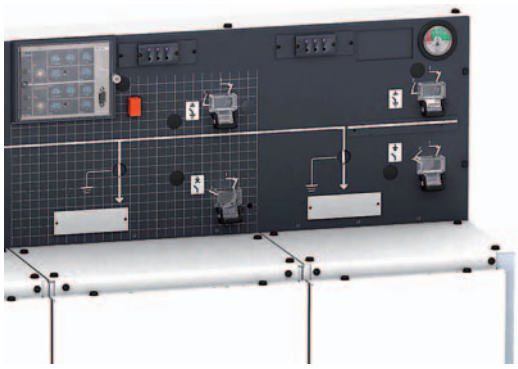

Reliable operating mechanisms

The electrical and mechanical operating mechanisms are located behind a front plate displaying the mimic diagram of the switchgear status (closed, open, earthed):
■ **closing:** the moving contact assembly is manipulated by means of a fast-acting operating mechanism. Outside these manipulations, no energy is stored.
For the circuit breaker and the fuse-switch combination, the opening mechanism is charged in the same movement as the closing of the contacts.
■ **opening:** opening of the switch is carried out using the same fast-acting mechanism, manipulated in the opposite direction.
For the circuit breaker and fuse-switch combination, opening is actuated by:
□ a pushbutton
□ a fault.
■ **earthing:** a specific operating shaft closes and opens the earthing contacts. The hole providing access to the shaft is blocked by a cover which can be opened if the switch or circuit breaker is open, and remains locked when it is closed.
■ **switchgear status indicators:** are placed directly on the moving contact assembly operating shafts. They give a definite indication of the position of the switchgear (attachment A of IEC standard 62271-102).
■ **operating lever:** this is designed with an anti-reflex device which prevents any attempt to immediately reopen the switch-disconnector or the earthing switch after closing.
■ **padlocking facilities:** 1 to 3 padlocks can be used to prevent:
□ access to the switch or circuit breaker operating shaft
□ access to the earthing switch operating shaft
□ operation of the opening pushbutton.

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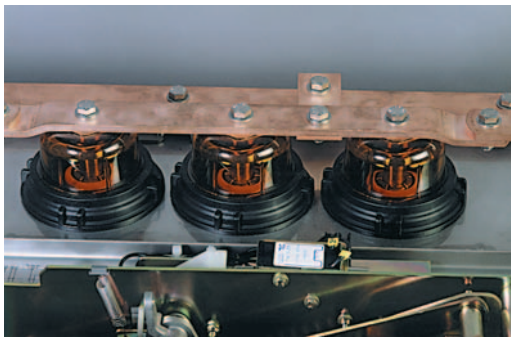

Earthing display

■ **Earthing switch closed position indicators:** these are located on the upper part of the RM6. They can be seen through the transparent earthing covers, when the earthing switch is closed.

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Internal arc withstand

The robust, reliable and environmentally insensitive design of the RM6 makes it highly improbable that a fault will appear inside the switchgear.
Nevertheless, in order to ensure maximum personal safety, the RM6 is designed to withstand an internal arc supplied by a rated short-circuit current for 1 second, without any danger to the operator.
Accidental overpressure due to an internal arc is limited by the opening of the safety valve, at the bottom of the metal enclosure.
The gas is released to the rear or to the bottom of the RM6 without affecting conditions in the front. After type testing carried out for 16 kA 1 s and 20 kA 1 s, the device meets all the criteria of IAC class AF AL, as defined by **IEC 62271-200 standard, appendix A.**

Safety of people (cont.)

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Operating safety

Cable insulation test

In order to test cable insulation or look for faults, it is possible to inject a direct current of up to 42 kVdc for 15 minutes through the cables via the RM6, without disconnecting the connecting devices.
The earthing switch is closed and the moving earthing connection is opened in order to inject the voltage via the “earthing covers”. This system, a built-in feature of the RM6, requires the use of injection fingers (supplied as an option).

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Voltage indicator lamps

A device (supplied as an option) on all functional units makes it possible to check the presence (or absence) of voltage in the cables.
Two types of indicator can be proposed according to network operating habits:
■ a device with built-lamps, of the VPIS type (Voltage Presence Indicating System) complying with standard IEC 61958.

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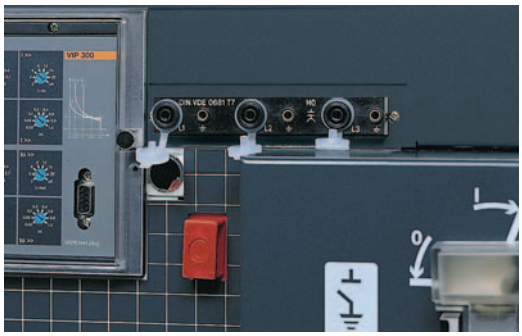

■ or a system with separate luminous modules, of the VDS type (Voltage Detection System) complying with standard IEC 61243-5.

RM6 for marine application

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IACS
INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES LTD.

PE56819

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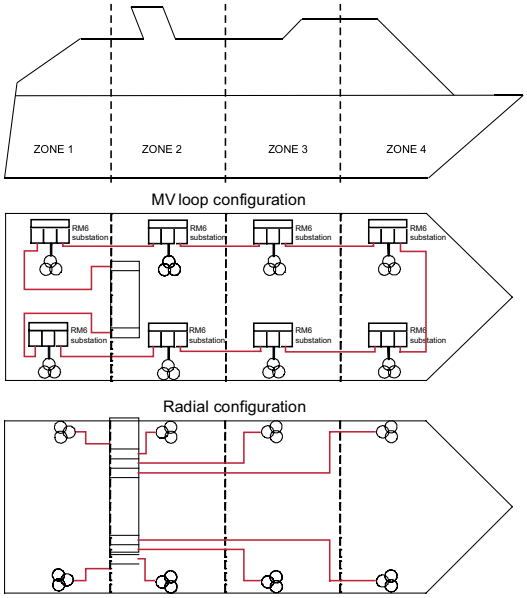

Example of a cruise liner architecture

Safety for personal

■ If RM6 is equipped with special “filter” **LRU** (interna**L** arc **R**eduction **U**nit), internal arc classification is AFLR 20 kA 1 s defined in the standard IEC 62271-200.

Resistance to vibrations

■ Conform to IACS marine standards
■ RM6 has a very low centre of gravity.

Resistance to hash environment

■ Resist to agressive atmosphere.

Some Marine references

■ Aker Yards:
□ NCL Cruise Liner,
□ Genesis 1 & 2.
■ Meyer Werft:
□ Aïda ships,
□ Norvegian Gem,
□ Norvegian Pearl,
□ Pride of Hawaï, Norvegian Jewel,
□ Jewel of the seas…

Benefits of the MV loop adapted to the boat

A MV loop configuration offers significant advantages:

■ main MV switchboard smaller (only two cells to feed a MV loop)
■ length of MV cables reduced (shortening average ratio > 30% for the configuration)
■ the maintainability and availability of the network are also improved.

Actually:

■ a failed cable section on the MV loop can be disconnected
■ an automatic reconfiguration of the MV loop after a fault detection can be achieved.

A wide choice of functions

RM6 range functions

The RM6 range brings together all of the MV functions enabling:

- connection, power supply and protection of transformers on a radial or open-ring network via **200 A circuit breakers** with an independent protection chain or via **combined fuse-switches**
- protection of lines by **a 630 A circuit breaker**
- and now production of **private MV/LV substations** with MV metering.

Network switch

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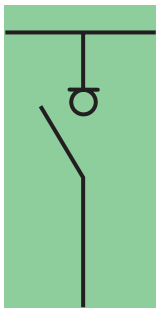

I

Line feeder
630 A circuit breaker

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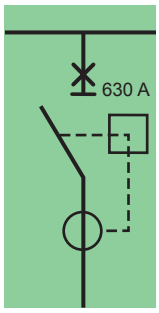

B

Transformer feeder
200 A circuit breaker

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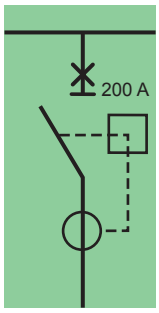

D

Transformer feeder
combined fuse-switch

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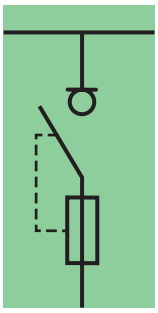

Q

Network coupling
switch

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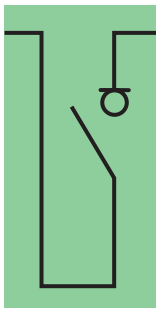

IC

Network coupling
630 A circuit breaker

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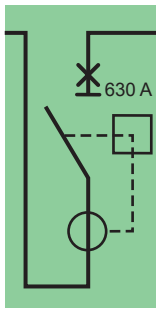

BC

Cable connection

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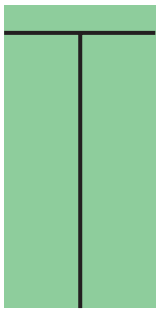

O

MV metering

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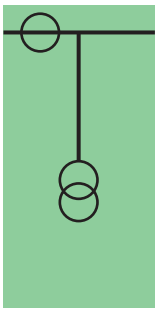


Mt

Device designation

Type of tank	**Multifunction configurations ***				**Unit configurations**
NE: non-extensible **RE**: extensible to the right **LE**: extensible to the left **DE**: extensible module to the right or left (one function)	**I** **B** **D** **Q**	**I**	**I** **B** **D** **Q**	**I**	**I** **B** **D** **Q** **IC** **BC** **O** **Mt**
	no. 4	no. 3	no. 2	no. 1	no. 1
Examples of designations	RM6 NE-DIDI RM6 RE-IDI RM6 NE-IQI				RM6 DE-I RM6 NE-D RM6 DE-Mt

(*) Refer to the table on page 48 for the choice of different combinations

Main characteristics

Electrical characteristics

Rated voltage	**Ur**	kV	**12**	**17.5**	**24**
Insulation level					
Industrial frequency	**Ud**	50 Hz 1 min. (kV rms)	28	38	50
Impulse	**Up**	1.2/50 µs (kV peak)	75	95	125
Tank internal arc withstand		**20 kA 1s**			

Climatic conditions

		°C	**40**	**45**	**50**	**55**	**60**
Busbars 630 A	**Ir**	A	630	575	515	460	425
Busbars 400 A	**Ir**	A	400	400	400	355	
Functions: I, O, B (with bushing type C)		A	630	575	515	460	425
Function D (with bushing type B or C)		A	200	200	200	200	200
Function Q		A	(1)	(2)	(2)	(2)	

(1) depends on fuse selection.
(2) consult us.

Global options

- Manometer or pressure switch
- Additional earth busbar in cable compartment
- Internal arc cable box 20 kA 1 s for I, D or B functions.

Option for operation

Voltage indicator:
- VPIS
- VDS.

Accessories

- Raising plinth
- Set of 3 MV fuses Fusarc CF
- Phase comparator
- Test box for circuit breaker relay (VAP6)
- Additional operating handle.

Additional instructions:
Installation and civil Engineering instructions.

Connectors and adaptaters for RM6

- Connectors for 630 A (1 set = 1 function)
- Connectors for 400 A (1 set = 1 function)
- Connectors for 250 A (1 set = 1 function).

Protection index

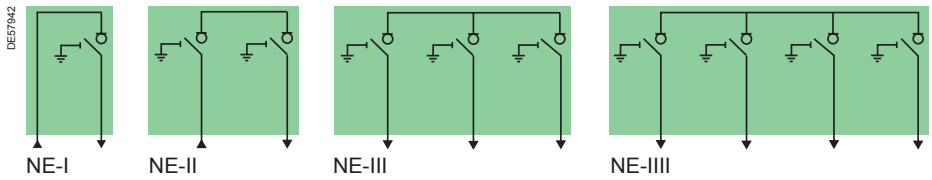
IP3X on front face.

Detailed characteristics for each function

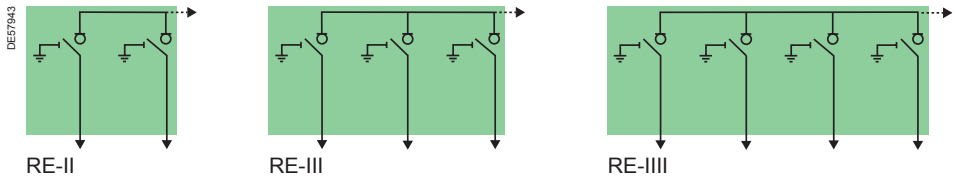
Network points with switch disconnector (I function)

Rated voltage	**Ur**	(kV)	**12**	**17.5**	**24**	**24**	**24**	**24**
Short-time withstand current	**Ik**	(kA rms)	**25**	**21**	**12.5**	**16**	**16**	**20**
	tk	Duration (s)	**1**	**1 or 3**	**1**	**1**	**1**	**1 or 3**
Rated current busbars	**Ir**	(A)	**630**	**630**	**400**	**400**	**630**	**630**
Network switch (I function)								
Rated current		(A)	**630**	**630**	**400**	**400**	**630**	**630**
Breaking capacity (A)	Charging current		630	630	400	400	630	630
	Earth leakage fault		95	95	95	95	95	95
	No-load cable		30	30	30	30	30	30
Making capacity of switch and earthing switches		(kA peak)	62.5	52.5	31.25	40	40	50
Bushing			C	C	B or C	B or C	C	C

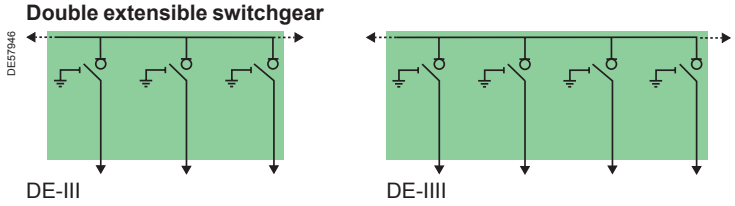
Non-extensible switchgear



Extensible switchgear to the right



Double extensible switchgear



Accessories and options (I function)

Remote operation
Motor mechanism and auxiliary contacts LBSw 2 NO - 2 NC and ESw 1 O/C.

Auxiliary contacts alone
For main switch position indication LBSw 2 NO - 2 NC and ESw 1 O/C
(this option is included in remote operation option).

Front door of cable connection compartment
- Bolted
- Removable with ESw interlocking
- Removable with ESw interlocking and LBSw interlocking.

Self-powered fault passage and load current indicators
- Flair 21D
- Flair 21DT
- Flair 22D
- Amp 21D.

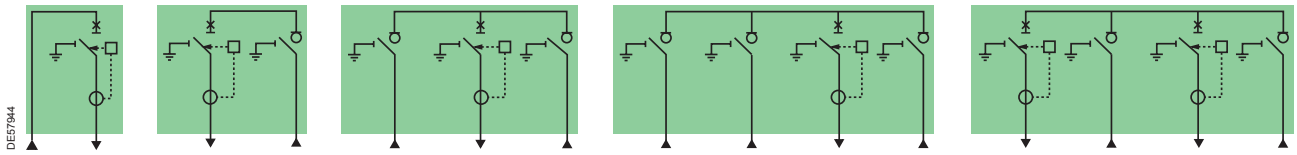
Key locking devices
- Type R1
- Type R2.

Detailed characteristics for each function (cont.)

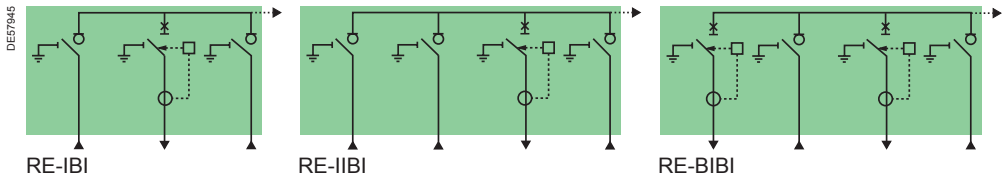
Network points with 630 A circuit breaker (B function)

Rated voltage	**Ur**	(kV)	**12**	**17.5**	**24**	**24**
Short-time withstand current	**Ik**	(kA rms)	**25**	**21**	**16**	**20**
	tk	Duration (s)	**1**	**1 or 3**	**1**	**1 or 3**
Rated current busbars	**Ir**	(A)	**630**	**630**	**630**	**630**
Network switch (I function)						
Rated current		(A)	**630**	**630**	**630**	**630**
Breaking capacity (A)	Charging current		630	630	630	630
	Earth leakage fault		95	95	95	95
	No-load cable		30	30	30	30
Making capacity of switch and earthing switches		(kA peak)	62.5	52.5	40	50
Bushing			C	C	C	C
Line protection feeder (B function)						
Rated current		(A)	**630**	**630**	**630**	**630**
Short-circuit breaking capacity		(kA)	25	21	16	20
Making capacity		(kA peak)	62.5	52.5	40	50
Bushing			C	C	C	C

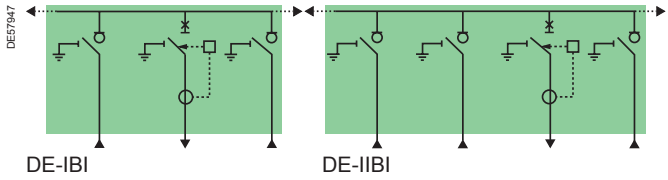
Non-extensible switchgear



Extensible switchgear to the right



Double extensible switchgear



Accessories and options (B function)

Remote operation
Motor mechanism and auxiliary contacts circuit breaker
CB 2 NO - 2 NC and ESw 1 O/C
(including shunt trip coil)

Auxiliary contacts alone
For circuit breaker position indication CB 2 NO - 2 NC and ESw 1 O/C
(this option is included in remote operation option).

Front door of cable connection compartment
- Bolted
- Removable with ESw interlocking
- Removable with ESw interlocking and CB interlocking.

Shunt trip coil for external tripping
- 24 Vdc
- 48/60 Vdc
- 120 Vac
- 110/125 Vdc - 220 Vac
- 220 Vdc/380 Vac.

Undervoltage coil
- 24 Vdc
- 48 Vdc
- 125 Vdc
- 110-230 Vac.

Protection relay for CB transformer protection
(VIP 300 or Sepam series 10)

Forbidden closing under fault 1 NC

Auxiliary contact D or B tripping

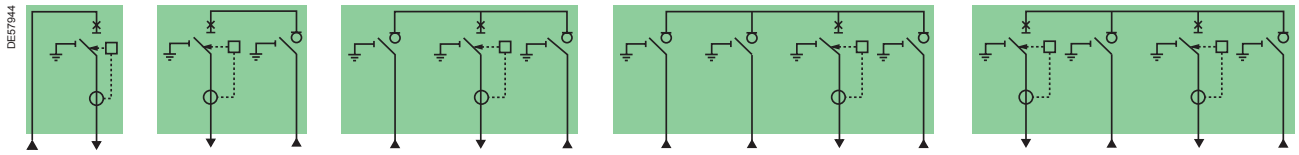
Key locking devices
- Type R1
- Type R2.

Detailed characteristics for each function (cont.)

Transformer feeder 200 A with circuit breaker (D function)

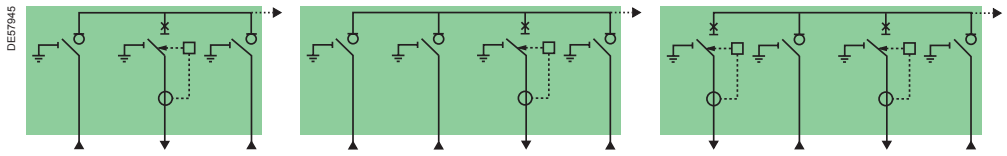
Rated voltage	**Ur**	(kV)	**12**	**17.5**	**24**	**24**	**24**	**24**	**24**
Short-time withstand current	**Ik**	(kA rms)	**25**	**21**	**12.5**	**16**	**12.5**	**16**	**20**
	tk	Duration (s)	**1**	**1 or 3**	**1**	**1**	**1**	**1**	**1 or 3**
Rated current busbars	**Ir**	(A)	**630**	**630**	**400**	**400**	**630**	**630**	**630**
Network switch (I function)									
Rated current		(A)	**630**	**630**	**400**	**400**	**630**	**630**	**630**
Breaking capacity (A)	Charging current		630	630	400	400	630	630	630
	Earth leakage fault		95	95	95	95	95	95	95
	No-load cable		30	30	30	30	30	30	30
Making capacity of switch and earthing switches		(kA peak)	62.5	52.5	31.25	40	31.25	40	50
Bushing			C	C	B or C	B or C	C	C	C
Transformer feeder by circuit breaker (D function)									
Rated current		(A)	**200**	**200**	**200**	**200**	**200**	**200**	**200**
Off-load transformer laking capacity		(A)	16	16	16	16	16	16	16
Short-circuit breaking capacity		(kA)	25	21	12.5	16	12.5	16	20
Making capacity		(kA peak)	62.5	52.5	31.25	40	31.25	40	40
Bushing			C	C	A	B or C	A	B or C	C

Non-extensible switchgear



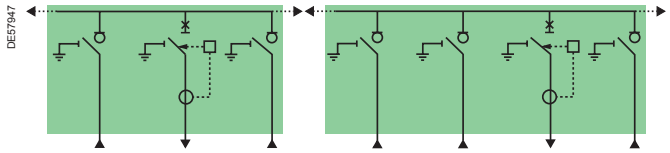
NE-D NE-DI NE-IDI NE-IIDI NE-DIDI

Extensible switchgear to the right



RE-IDI RE-IIDI RE-DIDI

Double extensible switchgear



DE-IDI DE-IIDI

Accessories and options (D function)

Remote operation
Motor mechanism and auxiliary contacts circuit breaker
CB 2 NO - 2 NC and ESw 1 O/C
(including shunt trip coil).

Auxiliary contacts alone
For circuit breaker position indication CB 2 NO - 2 NC and ESw 1 O/C
(this option is included in remote operation option).

Front door of cable connection compartment
- Bolted
- Removable with ESw interlocking
- Removable with ESw interlocking and CB interlocking.

Shunt trip coil for external tripping
- 24 Vdc
- 48/60 Vdc
- 120 Vac
- 110/125 Vdc - 220 Vac
- 220 Vdc/380 Vac.

Undervoltage coil
- 24 Vdc
- 48 Vdc
- 125 Vdc
- 110-230 Vac.

Protection relay for CB transformer protection
(VIP 30, 35, 300 or Sepam series 10)

Forbidden closing under fault 1 NC

Auxiliary contact D or B tripping

Key locking devices
- Type R6
- Type R7
- Type R8.

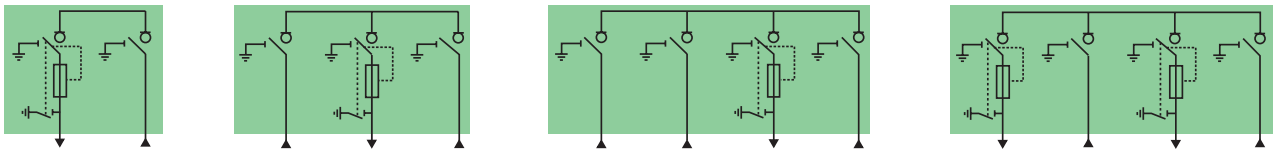
Detailed characteristics for each function (cont.)

Transformer feeder with fuse-switch combinations (Q function)

Rated voltage	**Ur**	(kV)	**12**	**12**	**17.5**	**24**	**24**	**24**	**24**
Rated current busbars	**Ir**	(A)	**630**	**630**	**630**	**400**	**400**	**630**	**630**
Network switch (I function)									
Rated current		(A)	**630**	**630**	**630**	**400**	**400**	**630**	**630**
Breaking capacity (A)	Charging current		630	630	630	400	400	630	630
	Earth leakage fault		95	95	95	95	95	95	95
	No-load cable		30	30	30	30	30	30	30
Short-time withstand current		(kA rms)	**21**	**25**	**21**	**12.5**	**16**	**16**	**20**
	Duration	(s)	**1**	**1**	**1 or 3**	**1**	**1**	**1**	**1 or 3**
Making capacity of switch and earthing switches		(kA peak)	52.5	62.5	52.5	31.25	40	40	50
Bushing			C	C	C	B or C	B or C	C	C
Transformer feeder with fuse-switch protection (Q function)									
Rated current		(A)	**200**	**200**	**200**	**200**	**200**	**200**	**200**
Off-load transformer laking capacity		(A)	16	16	16	16	16	16	16
Short-circuit breaking capacity		(kA)	21	25	21	12.5	16	16	20
Making capacity		(kA peak)	52.5	62.5	52.5	31.25	40	40	50
Bushing			A	A	A	A	A	A	A

Non-extensible switchgear

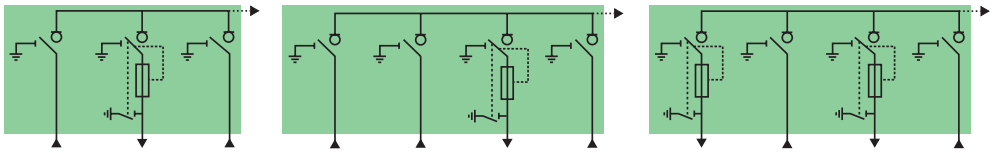
DE57948



NE-QI NE-IQI NE-IIQI NE-QIQI

Extensible switchgear to the right

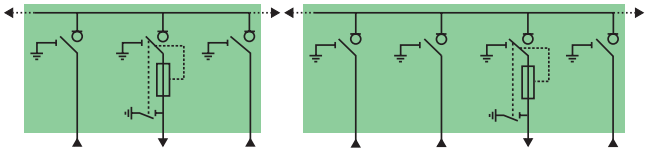
DE57949



RE-IQI RE-IIQI RE-QIQI

Double extensible switchgear

DE57952



DE-IQI DE-IIQI

Accessories and options (Q function)

Auxiliary contacts alone
For fuse-switch combinations position indication LBSw 2 NO - 2 NC (this option is included in remote operation option).

Auxiliary contact for fuses blown

Shunt trip coil for external tripping
- 24 Vdc
- 48/60 Vdc
- 120 Vac
- 110/125 Vdc - 220 Vac
- 220 Vdc/380 Vac.

Undervoltage coil
- 24 Vdc
- 48 Vdc
- 125 Vdc
- 110-230 Vac.

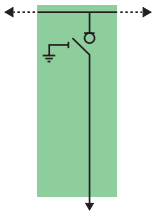
Key locking devices
- Type R6
- Type R7
- Type R8.

Detailed characteristics for each function (cont.)

Extensible modules (DE-I function)

Rated voltage	**Ur**	(kV)	**12**	**17.5**	**24**	**24**	**24**	**24**
Short-time withstand current	**Ik**	(kA rms)	**25**	**21**	**12.5**	**16**	**16**	**20**
	tk	Duration (s)	**1**	**1 or 3**	**1**	**1**	**1**	**1 or 3**
Rated current busbars	**Ir**	(A)	**630**	**630**	**630**	**630**	**630**	**630**
Network switch (DE-I function)								
Rated current		(A)	**630**	**630**	**400**	**400**	**630**	**630**
Breaking capacity (A)	Charging current		630	630	400	400	630	630
	Earth leakage fault		95	95	95	95	95	95
	No-load cable		30	30	30	30	30	30
Making capacity of switch and earthing switches		(kA peak)	62.5	52.5	31.25	40	40	50
Bushing			C	C	B or C	B or C	C	C

DE57950



DE-I

Accessories or options

Remote operation
Motor mechanism and auxiliary contacts
LBSw 2 NO - 2 NC and ESw 1 O/C

Auxiliary contacts alone
For main switch position indication
LBSw 2 NO - 2 NC and ESw 1 O/C
(this option is included in remote operation option).

Front door of cable connection compartment
- Bolted
- Removable with ESw interlocking
- Removable with ESw interlocking and LBSw interlocking.

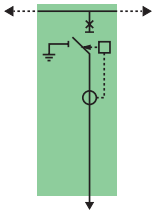
Self-powered fault passage and load current indicators
- Flair 21D
- Flair 21DT
- Flair 22D
- Amp 21D.

Key locking devices
- Type R1
- Type R2.

Network points with 630 A circuit breaker (DE-B function)

Rated voltage	**Ur**	(kV)	**12**	**17.5**	**24**	**24**
Short-time withstand current	**Ik**	(kA rms)	**25**	**21**	**16**	**20**
	tk	Duration (s)	**1**	**1 or 3**	**1**	**1 or 3**
Rated current busbars	**Ir**	(A)	**630**	**630**	**630**	**630**
Network circuit breaker (DE-B function)						
Rated current		(A)	**630**	**630**	**630**	**630**
Short-circuit breaking capacity		(kA)	25	21	16	20
Making capacity		(kA peak)	62.5	52.5	40	40
Bushing			C	C	C	C

DE57951



DE-B

Accessories and options

Remote operation
Motor mechanism and auxiliary contacts circuit breaker CB 2 NO - 2 NC and ESw 1 O/C
(including shunt trip coil).

Auxiliary contacts alone
For circuit breaker position indication
CB 2 NO - 2 NC and ESw 1 O/C
(this option is included in remote operation option).

Front door of cable connection compartment
- Bolted
- Removable with ESw interlocking
- Removable with ESw interlocking and CB interlocking.

Shunt trip coil for external tripping
- 24 Vdc
- 48/60 Vdc
- 120 Vac
- 110/125 Vdc - 220 Vac
- 220 Vdc/380 Vac.

Undervoltage coil
- 24 Vdc
- 48 Vdc
- 125 Vdc
- 110-230 Vac.

Protection relay for CB transformer protection
(VIP 300 or Sepam series 10)

Forbidden closing under fault 1 NC

Auxiliary contact D or B tripping

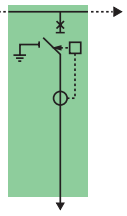
Key locking devices
- Type R1
- Type R2.

Detailed characteristics for each function (cont.)

Transformer feeder 200 A with circuit breaker (DE-D function)

Rated voltage	**Ur**	(kV)	**12**	**17.5**	**24**	**24**	**24**
Short-time withstand current	**Ik**	(kA rms)	**25**	**21**	**12.5**	**16**	**20**
	tk	Duration (s)	**1**	**1 or 3**	**1**	**1**	**1 or 3**
Rated current busbars	**Ir**	(A)	**630**	**630**	**630**	**630**	**630**
200 A circuit breaker (DE-D function)							
Rated current		(A)	**200**	**200**	**200**	**200**	**200**
Off-load transformer laking capacity		(A)	16	16	16	16	16
Short-circuit breaking capacity		(kA)	25	21	12,5	16	20
Making capacity		(kA peak)	62.5	52.5	31.25	40	50
Bushing			C	C	A	B or C	C

DE57961



DE-D

Accessories and options

Remote operation
Motor mechanism and auxiliary contacts circuit breaker CB 2 NO - 2 NC and ESw 1 O/C
(including shunt trip coil).

Auxiliary contacts alone
For circuit breaker position indication
CB 2 NO - 2 NC and ESw 1 O/C
(this option is included in remote operation option).

Front door of cable connection compartment
- Bolted
- Removable with ESw interlocking
- Removable with ESw interlocking and CB interlocking.

Shunt trip coil for external tripping
- 24 Vdc
- 48/60 Vdc
- 120 Vac
- 110/125 Vdc - 220 Vac
- 220 Vdc/380 Vac.

Undervoltage coil
- 24 Vdc
- 48 Vdc
- 125 Vdc
- 110-230 Vac.

Protection relay for CB transformer protection
(VIP 30, 35, 300 or Sepam series 10)

Forbidden closing under fault 1 NC

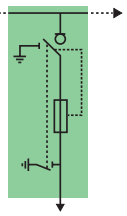
Auxiliary contact D or B tripping

Key locking devices
- Type R6
- Type R7
- Type R8.

Extensible modules (DE-Q function)

Rated voltage	**Ur**	(kV)	**12**	**12**	**17.5**	**24**	**24**	**24**
Rated current busbars	**Ir**	(A)	**630**	**630**	**630**	**630**	**630**	**630**
Fuses (DE-Q function)								
Rated current		(A)	**200**	**200**	**200**	**200**	**200**	**200**
Off-load transformer laking capacity		(A)	16	16	16	16	16	16
Short-circuit breaking capacity		(kA)	21	25	21	12.5	16	20
Making capacity		(kA peak)	52.5	62.5	52.5	31.25	40	50
Bushing			A	A	A	A	A	A

DE57963



DE-Q

Accessories and options

Auxiliary contacts alone
For fuse-switch combinations position indication
LBSw 2 NO - 2 NC
(this option is included in remote operation option)

Auxiliary contact for fuses blown

Shunt trip coil for external tripping
- 24 Vdc
- 48/60 Vdc
- 120 Vac
- 110/125 Vdc - 220 Vac
- 220 Vdc/380 Vac.

Undervoltage coil
- 24 Vdc
- 48 Vdc
- 125 Vdc
- 110-230 Vac.

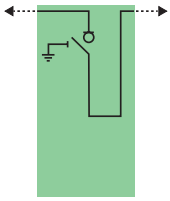
Key locking devices
- Type R6
- Type R7
- Type R8.

Detailed characteristics for each function (cont.)

Bus sectionalizer by load-break switch (DE-IC function)

Rated voltage	**Ur**	(kV)	**12**	**17.5**	**24**	**24**
Short-time withstand current	**Ik**	(kA rms)	**25**	**21**	**16**	**20**
	tk	Duration (s)	**1**	**1 or 3**	**1**	**1 or 3**
Rated current busbars	**Ir**	(A)	**630**	**630**	**630**	**630**
Network switch (DE-IC function)						
Rated current		(A)	**630**	**630**	**630**	**630**
Breaking capacity (A)	Charging current		630	630	630	630
	Earth leakage fault		95	95	95	95
	No-load cable		30	30	30	30
Making capacity of switch and earthing switches		(kA peak)	62.5	52.5	40	50

DE57954



DE-IC

Accessories and options

Remote operation
Motor mechanism and auxiliary contacts
LBSw 2 NO - 2 NC and ESw 1 O/C.

Auxiliary contacts alone
For switch position indication
LBSw 2 NO - 2 NC and ESw 1 O/C
(this option is included in remote operation option).

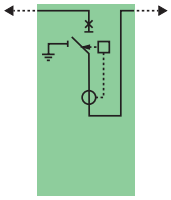
Front door of cable connection compartment
- Bolted
- Removable with ESw interlocking
- Removable with ESw interlocking and LBSw.

Key locking devices
- Type R1
- Type R2.

Bus sectionalizer by 630 A circuit breaker (DE-BC function coupling)

Rated voltage	**Ur**	(kV)	**12**	**17.5**	**24**	**24**
Short-time withstand current	**Ik**	(kA rms)	**25**	**17.5**	**16**	**24**
	tk	Duration (s)	**1**	**1 or 3**	**1**	**1 or 3**
Rated current busbars	**Ir**	(A)	**630**	**630**	**630**	**630**
Bus sectionalizer circuit breaker (DE-BC function coupling)						
Rated current		(A)	**630**	**630**	**630**	**630**
Short-circuit breaking capacity		(kA)	25	21	16	20
Making capacity		(kA peak)	62.5	52.5	40	50

DE57955



DE-BC

Accessories and options

Remote operation
Motor mechanism and auxiliary contacts circuit breaker
CB 2 NO - 2 NC and ESw 1 O/C
(including shunt trip coil).

Auxiliary contacts alone
For circuit breaker position indication
CB 2 NO - 2 NC and ESw 1 O/C
(this option is included in remote operation option).

Front door of cable connection compartment
- Bolted
- Removable with ESw interlocking
- Removable with ESw interlocking and CB interlocking.

Shunt trip coil for external tripping
- 24 Vdc
- 48/60 Vdc
- 120 Vac
- 110/125 Vdc - 220 Vac
- 220 Vdc/380 Vac.

Undervoltage coil
- 24 Vdc
- 48 Vdc
- 125 Vdc
- 110-230 Vac.

Protection relay for CB transformer protection
(VIP 300 or Sepam series 10)

Forbidden closing under fault 1 NC

Auxiliary contact D or B tripping

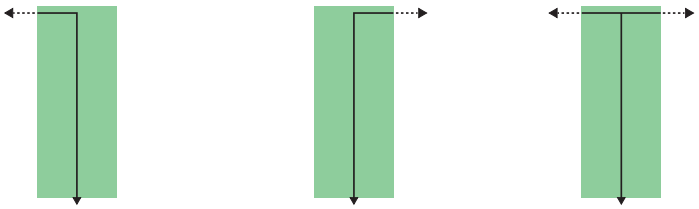
Without earthing switch
- Type R1
- Type R2.

Detailed characteristics for each function (cont.)

Cable connection cubicles LE-O, RE-O, DE-O

Rated voltage	**Ur**	(kV)	**12**	**12**	**17.5**	**17.5**	**24**	**24**	**24**
Rated current busbars	**Ir**	(A)	**630**	**630**	**630**	**630**	**630**	**630**	**630**
Cable connection (O function)									
Rated current		(A)	**200**	**630**	**200**	**630**	**200**	**630**	**630**
Short-circuit breaking capacity		(kA)	25	25	21	21	16	16	20
Short-time withstand current		(kA rms)	**25**	**25**	**21**	**21**	**16**	**16**	**20**
	Duration	(s)	**1**	**1**	**3**	**3**	**1**	**1**	**1 or 3**
Bushing			C	C	C	C	C	C	C

DE57956

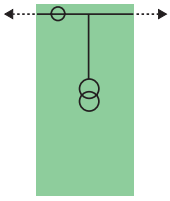


LE-O RE-O DE-O

Metering module DE-Mt

Rated voltage	**Ur**	(kV)	**12**	**17.5**	**24**	**24**
MV metering (DE-Mt function)						
Rated current		(A)	**630**	**630**	**630**	**630**
Short-time withstand current		(kA rms)	**25**	**21**	**16**	**20**
	Duration	(s)	**1**	**1 or 3**	**1**	**1 or 3**
Cubicle internal arc withstand	**16 kA 1s**					

DE57957



DE-Mt

Voltage transformers configuration

Schneider Electric models or DIN 42600 type section 9

2 phase-phase VT, 2 phase-earth VT, 3 TT phase-earth VT

Fitted right or left of the CT's

Optional fuse protection.

Current transformers configuration

Schneider Electric models or DIN 42600 type section 8

2 CT or 3 CT.

Accessories and options

Additional low voltage unit

Door key locking devices

■ Type R7.

Medium Voltage metering

PE56814

The RM6 is boosted by the DE-Mt module

This air-insulated cubicle is fitted with conventional current transformers and voltage transformers enabling invoicing of MV power. It has an internal arc withstand and is integrated in the RM6 unit by a direct connection to the adjacent busbars.

Increased environmental insensitivity

- By eliminating risks related to MV cables (incorrect connection, non-compliance with radius of curvature between two adjacent cubicles, etc.)
- Completely closed module (no opening to the bottom, no ventilation grid)
- Factory tested module.

A clear separation between MV and LV

Everything is done to avoid having to act on the MV compartment. The secondary of CT and VT's are cabled to the customer terminal in an LV compartment.
This LV compartment enables:

- connection to a remote power meter (in another room)

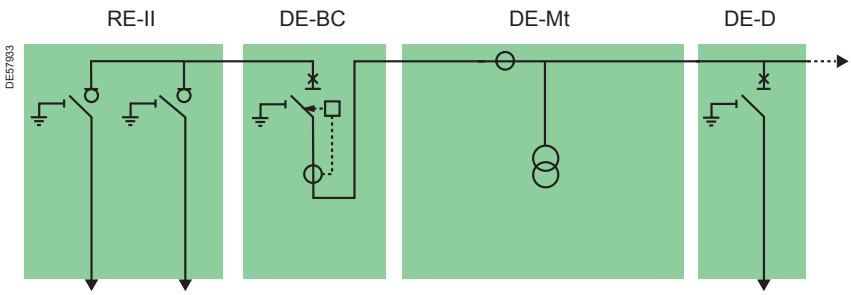
or

- connection to the LV unit mounted on the LV compartment (option).

An LV unit adapted to your requirements

This unit allows the installation of active power meters, a reactive power meter, and all auxiliaries for monitoring current, voltage and consumed power.

PE56815



DE57833

Line and transformer protection by circuit breaker
VIP 300

PE57160

VIP 300

The 630 A circuit breaker has been designed to protect Medium Voltage feeders as near to the fault as possible. The protection unit is identical to that of the 200 A circuit breaker, with a VIP 300 relay adapted to network protection.

VIP 300 self-powered protection relay

VIP 300 protects against phase to phase faults and earth faults. The choice of tripping curves, and the multiplicity of settings enable it to be used with a wide variety of discrimination plans.
VIP 300 is a self-powered relay which obtains its power supply from current sensors. It does not need an auxiliary power supply. It actuates a release.

Description

The operating principle of the protection unit is the same as for the VIP 30 and VIP 35 relays.

Phase protection

Phase protection has two independently adjustable set points:
■ either an IDMT or definite low set point can be selected. The IDMT curves are in conformity with the IEC 60255-3 standard. They are of the inverse, very inverse and extremely inverse type.
■ the high set point is a definite time one.

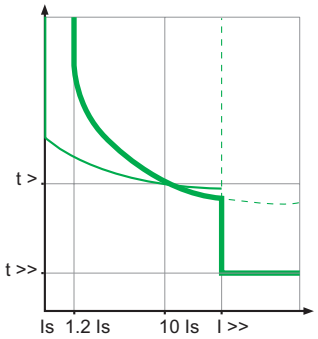
Earth protection

■ Earth fault protection operates with measurement of the residual current carried out using the sum of the secondary currents of the sensors.
■ As with phase protection, earth protection has two independently adjustable set points.

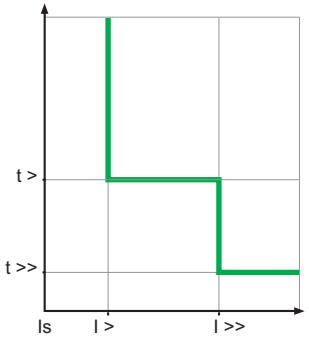
Indication

■ Two indicators show the origin of tripping (phase or earth). They remain in position after the relay power supply is cut off.
■ Two LED indicators (phase and earth) indicate that the low set point has been exceeded and its time delay is in progress.

DE57987



With IDMT low set point

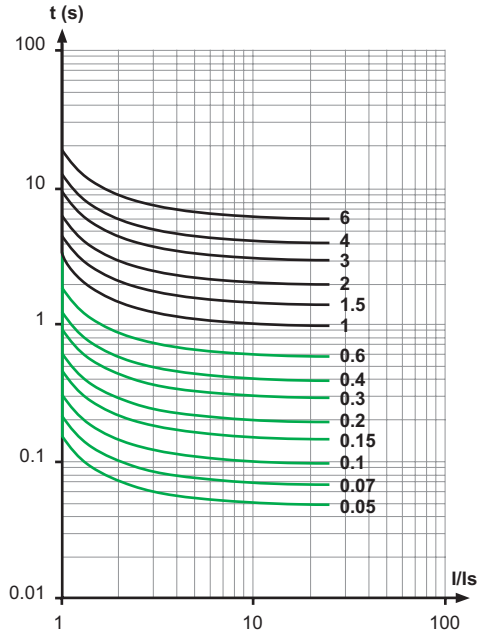


With definite time low set point

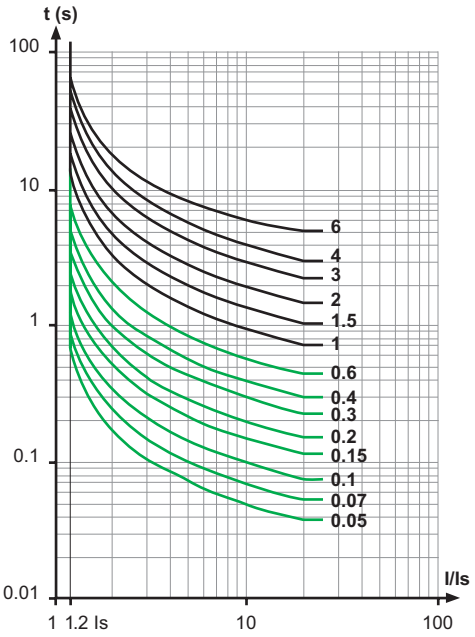
Line and transformer protection by circuit breaker
VIP 300 (cont.)

■ The curves in this chapter indicate the low set IDMT tripping times for time delay settings t > (or to >).
■ The phase protection and earth protection curves are identical.

DE57405

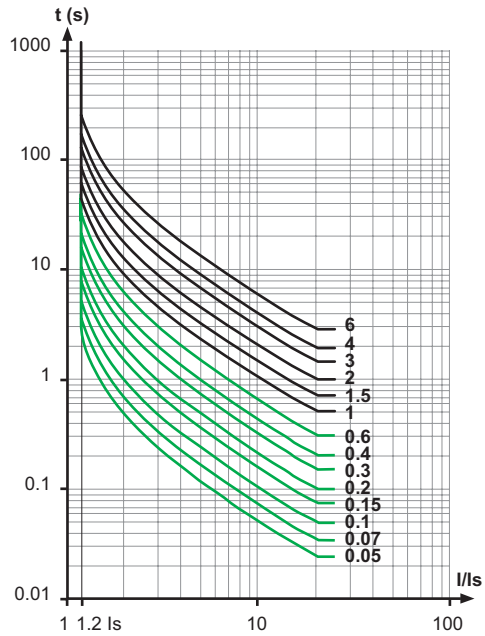


RI curve

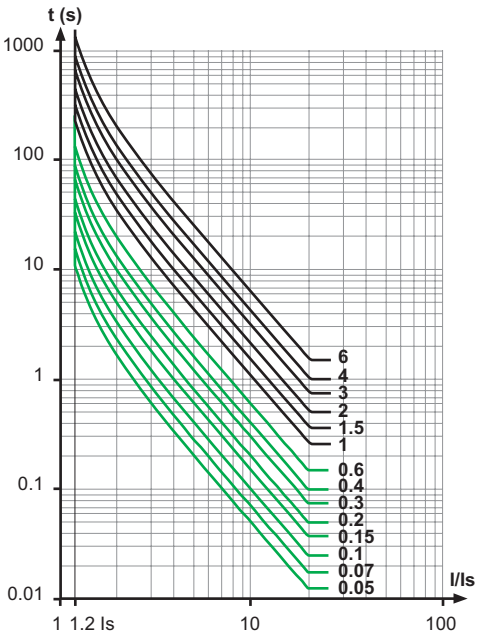


SI curve

DE57406



VI curve



EI curve

Line and transformer protection by circuit breaker
VIP 30, VIP 35

PE57165

VIP 30

PE57159

VIP 35

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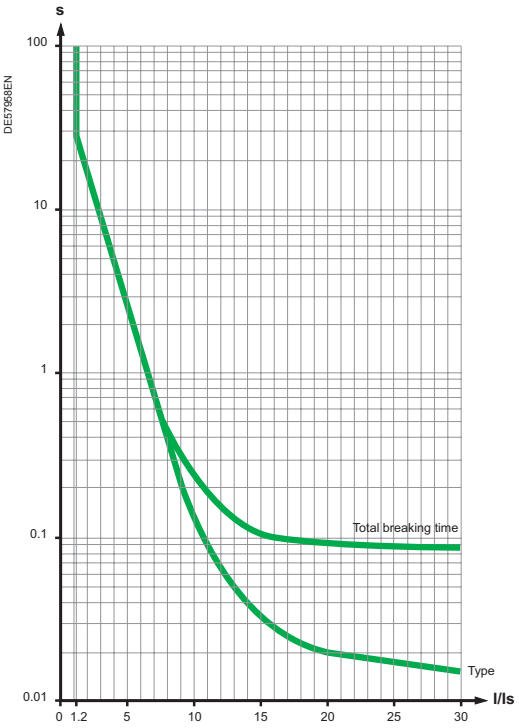

The curve represent the relay intervention time, to which 70 ms must be added to obtain the breaking time.

In contrast to fuses, the circuit breaker has no minimum breaking current, which means that it is particularly well-adapted to transformer protection.

VIP 30 and VIP 35 self-powered protection relays

VIP 30 and VIP 35 are self-powered relays, requiring no auxiliary power supply, which are fed by current sensors, activating a MITOP release.
- VIP 30 protects against phase to phase faults.
- VIP 35 protects against phase to phase faults and earth faults.

Protection system

The protection system operates without an auxiliary power supply, and includes:
- 3 transformers with integrated toroids on the transformer feeder bushings
- 1 VIP 30 or VIP 35 electronic relay
- 1 release
- 1 test connector to check whether the protection unit is operating correctly, using the VAP 6 unit.

Description

- The relays are assembled in a housing, and the front faces are protected a transparent cover. The whole assembly has a degree of protection of IP54.
- Settings are made on the front, using rotary switches.
- The phase operating current is adjusted directly according to the transformer rating and the operating voltage.
- The earth current set point is adjusted according to the network characteristics.

Phase protection

- Phase protection is provided by an IDMT set point which operates as of 1.2 times the operating current (Is). VIP 30 and VIP 35 phase protections are identical.

Earth protection

- Earth fault protection operates with measurement of the residual current carried out using the sum of the secondary currents of the sensors.
- Earth protection operates in definite time: both its set point and time delay are adjustable.

Rated protection current setting selection

Operating voltage (kV)	**Transformer rating** (kVA) 50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3000	**Rated voltage** (kV)
3	10	15	20	25	36	45	55	68	80	140	140	170	200						**12**
3.3	10	15	18	22	28	36	45	56	70	90	140	140	200						
4.2	8	12	15	18	22	28	36	45	56	70	90	140	140	200					
5.5		8	12	15	18	22	28	36	46	55	68	90	140	140	200				
6			10	12	18	20	25	36	46	55	68	80	140	140	200	200			
6.6			10	12	15	18	22	28	36	45	56	70	90	140	140	200			
10				8	10	12	15	20	25	30	37	55	68	80	140	140	170	200	
11					10	12	15	18	22	28	36	45	55	68	90	140	140	170	
13.8					8	10	12	15	18	22	28	36	46	55	68	90	140	140	**24**
15						8	10	15	18	20	25	36	45	55	68	80	140	140	
20							8	10	15	20	25	30	37	45	55	68	80	140	
22							8	10	12	15	18	22	28	36	45	55	68	80	

Line and transformer protection by circuit breaker
Sepam series 10

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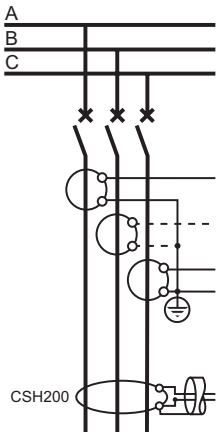
PB103446

DE57975



Sepam series 10 protection relays

■ Protection against phase to phase faults and earth faults, capable to detect the earth faults from 0.2 A.
■ Possibility of communication with Easergy T200 I and remote circuit breaker control.
■ Thermal image overload protection (ANSI 49RMS).
■ Logic discrimination for shorter tripping time.
■ Record of last fault or last five events.

Protection system

The protection system includes:
■ 3 current transformers mounted on the bushings (same as VIP)
■ 1 specially designed homopolar transformer CSH200 for the measurement of residual current (only for high sensitivity models)
■ 1 Sepam series 10 relay
■ 1 trip coil of RM6.

The Sepam series 10 need an auxiliary power supply (not included in RM6).
The Sepam series 10 can be supplied by T200 I.

Simplicity and User-friendliness

■ Easy operation: User-Machine Interface with screen, keys and pictograms. Parameter setting directly on the relay without need of computer.
■ Operating languages: English, Spanish, French, Italian, German, Turkish and Portuguese.

Characteristics

■ 4 logic inputs
■ 7 relay outputs
■ 1 communication port.

Functions		ANSI code	Sepam series 10 B	A
Protections				
Earth-fault protection	Standard	50N/51N	□	□
	High sensitivity		□	□
Phase-overcurrrent protection		50/51	■	■
Thermal overload protection		49RMS	■	■
Phase-overcurrent and earth fault protection cold load pick-up			■	■
Logic discrimination	Blocking send	68	■	■
	Blocking reception			■
External tripping				■
Measurements				
Earth-fault current			■	■
Phase currents			■	■
Peak demand currents			■	■
Control and supervision				
Circuit breaker tripping and lockout		86	■	■
Tripping indication			■	■
Trip-circuit supervision				■
Remote circuit-breaker control				■
Record of last fault			■	
Record of last five events				■
Communication				
Modbus				■
IEC 60870-5-103				■
Inputs / Outputs (Number)				
Earth-fault current inputs			1	1
Phase-current inputs			2 or 3	3
Logic relay outputs			3	7
Logic inputs			-	4
RS 485 communication port			-	1

■ *Function available.*
□ *Function availability depends on the Sepam model.*

Line and transformer protection by circuit breaker

Selection guide for circuit breaker protection

Rated protection current setting selection

Setting values of the Is phase operating current for Sepam series 10

Operating voltage (kV)	Transformer rating (kVA)																		
	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3000	3500
3			19	24	31	38	48	61	77	96	121	154	192	241	308	385	481	577	
3.3				22	28	35	44	55	70	87	110	140	175	219	280	350	437	525	
4.2					22	27	34	43	55	69	87	110	137	172	220	275	344	412	481
5.5						21	26	33	42	52	66	84	105	131	168	210	262	315	367
6						19	24	30	38	48	61	77	96	120	154	192	241	289	337
6.6							22	28	35	44	55	70	87	109	140	175	219	262	306
10									23	29	36	46	58	72	92	115	144	173	202
11									21	26	33	42	52	66	84	105	131	157	184
13.8										21	26	33	42	52	67	84	105	126	146
15										19	24	31	38	48	62	77	96	115	135
20												23	29	36	46	58	72	87	101
22												21	26	33	42	52	66	79	92

Sensors types legend CRa 200/1 CRb 1250/1

VIP 30, 35, 300, Sepam series 10 selection guide

Functions		ANSI code	VIP 30	VIP 35	VIP 300	Sepam series 10 B	Sepam series 10 A
Use							
Line protection					■	■	■
Transformer protection			■	■	■	■	■
Power supply							
Self-powered			■	■	■		
Auxiliary power supply						■	■
Protection							
Instantaneous phase overcurrent protection		50	■	■			
	Setting range		8-80 A 20-200 A	8-80 A 20-200 A			
Phase overcurrent protection		50-51			■	■	■
	Setting range				10-50 A 40-200 A 63-312 A 250-600 A	20-200 A 125-630 A	20-200 A 125-630 A
Earth overcurrent protection		50N-51N		■	■	■	■
	Setting range			10-150 A 25-300 A	1-40 A 4-160 A	20-200 A 125-500 A	20-200 A 125-500 A
	Minimum operating phase current		10 A	10 A	10 A		
Very sensitive earth overcurrent protection		50G-51G				■	■
	Setting range					2-240 A 0.2-24 A	2-240 A 0.2-24 A
Thermal image protection		49RMS				■	■
Cold load pick-up						■	■
Measurements							
Phase currents I1,I2,I3 (RMS)						■	■
Earth current Io						■	■
Phase current maximeter						■	■
Control and signalling							
Logic discrimination	Blocking send	68				■	■
	Blocking reception						■
External tripping							■
Acknowledgement latch		86				■	■
Tripping indication						■	■
Remote circuit breaker control							■
ON position interlocking						■	■
Record of last fault						■	■
Record of last five events							■
Switchgear diagnostic							
Trip-circuit supervision							■
Communication							
Modbus							■
IEC 60870-5-103							■

Transformer protection by fuse-switches

Fuse replacement

IEC recommendations stipulate that when a fuse has blown, **all three fuses must be replaced**.

Ratings for fuses for transformer protection depend, among other points, on the following criteria:

- service voltage
- transformer rating
- thermal dissipation of the fuses
- fuse technology (manufacturer).

Type of fuse may be installed:

- **Fusarc CF type:** according to IEC 60282-1 dimensional standard, with or without striker.

Example (using the selection table below) general case, for protection of a 400 kVA transformer at 10 kV, **Fusarc CF** fuses with a rating of 50 A are chosen.

Correct operation of the RM6 is not guaranteed when using fuses from other manufacturers.

Selection table

(Rating in A, no overload, – 25°C < θ < 40°C)

Fuse type	Operating voltage (kV)	Transformer rating (kVA) 50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	Rated voltage (kV)
Fusarc CF and SIBA (1) (General case, IEC 60282-1 standard, IEC 62271-105 (to replace IEC 60420) and DIN 43625 standard)																		
	3	20	31.5	40	50	50	63	80	100	125 (2)	160 (1) (2)							**12**
	3.3	20	25	40	40	40	63	80	80	125 (2)	125 (2)	160 (1) (2)						
	4.2	20	25	25	40	50	50	63.5	80	80	100	125 (2)	160 (1) (2)					
	5.5	16	20	25	25	40	40	50	63	80	80	100	125 (2)	160 (1) (2)				
	6	16	20	25	25	31.5	40	50	50	63	80	100	125 (2)	160 (1) (2)				
	6.6	10	20	25	25	31.5	40	50	50	63	63	80	100	125 (2)	160 (1) (2)			
	10	10	10	16	20	25	25	31.5	40	50	50	63	80	100	125 (2)			
	11	10	10	16	20	20	25	25	40	40	50	50	63	80	100	125 (2)		
	13.8	10	10	10	16	16	20	25	31.5	40	40	50	50	63	100 (2)			**24**
	15	10	10	10	10	16	20	25	31.5	31.5	40	50	50	63	80	100 (2)		
	20	10	10	10	10	16	16	20	25	25	31.5	40	40	63	63	80	100 (2)	
	22	10	10	10	10	10	16	16	20	25	31.5	40	40	50	63	80	100 (2)	

(1) SIBA type fuses at 160 A/12 kV reference 30-020-13.
(2) In the case of an external trip system (e.g.: overcurrent relay)
A calculation must be carried out to guarantee coordination of fuse-switches – Please consult us.
For any values not included in the table, please consult us.
In the case of an overload beyond 40°C, please consult us.

Fuses dimensions

Fusarc CF

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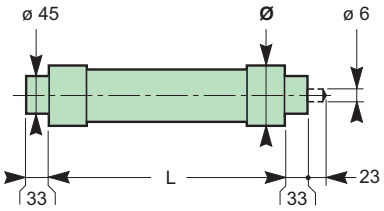


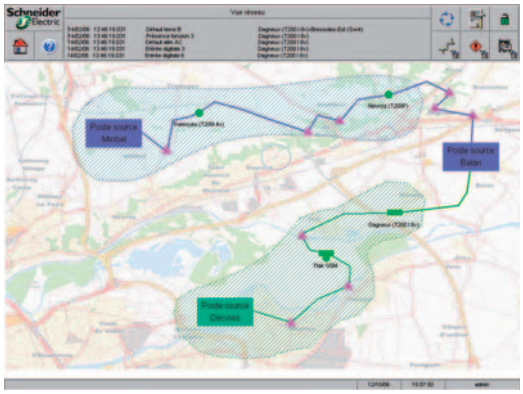
Ur (kV)	Ir (A)	L (mm)	Ø (mm)	Mass (kg)
12	10 to 25	292	50.5	1.2
	31.5 to 40	292	55	1,8
	50 to 100	292	76	3.2
	125	442	86	5
24	10 to 25	442	50.5	1.7
	31.5 to 40	442	55	2.6
	50 to 80	442	76	4.5
	100	442	86	5.7

Architecture and SCADA L500

Continuity of service guaranteed by an overall telecontrol offer

Schneider Electric offers you a complete solution, including:
- the Easergy T200 I telecontrol interface
- MV switchgear that is adapted for telecontrol.

PE56312



L500 network monitor screen

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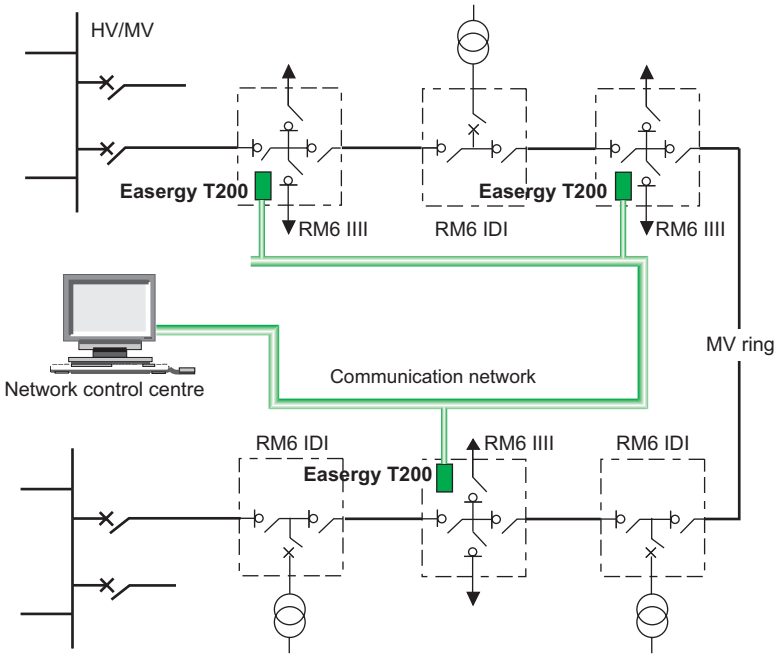

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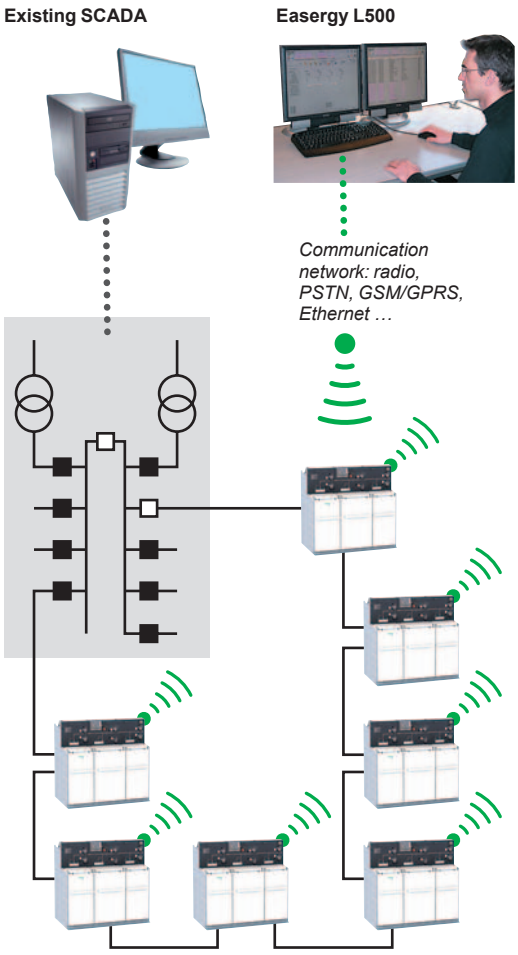


Easergy L500, a low cost solution to immediately improve your SAIDI*

** SAIDI: system average interruption duration index*

Easergy L500 is a SCADA providing all the functions needed to operate the MV network in real time
- Pre-configured with Easergy range products for monitoring and control of MV networks:
  - MV/LV substations equipped with T200 I or Flair 200C
  - overhead LBS equipped with T200 P
  - overhead line equipped with Flite 116/G200
- Broad range of transmission supports: Radio, GSM, GPRS, PSTN, LL, FO.

Advantages
- Simple implementation:
  - one to two weeks only for 20 MV/LV units
  - configuration, training and handling within a few days
- Simple and fast evolutions by operations managers
- Short return on investment
- Service quality and operations rapidly improved.

Easergy T200 I control unit

PE56311

Easergy T200 I: an interface designed for telecontrol of MV networks

Easergy T200 I is a “plug and play” or multifunction interface that integrates all the functional units necessary for remote supervision and control of the RM6:
- acquisition of the different types of information: switch position, fault detectors, current values...
- transmission of switch open/close orders
- exchanges with the control center.

Required particularly during outages in the network, Easergy T200 I is of proven reliability and availability, being able to ensure switchgear operation at any moment. It is simple to set up and to operate.

PE56421

Local information and control

PE56422

Monitoring and control

Functional unit designed for the Medium Voltage network

- Easergy T200 I is designed to be connected directly to the MV switchgear, without requiring a special converter.
- It has a simple front plate for local operation, which allows management of electrical rating mechanisms (local/remote switch) and display of information concerning switchgear status.
- It has an integrated MV network fault current detection system (overcurrent and zero sequence) with detection set points that can be configured channel by channel (current value and fault current duration).

PE56423

Back up power supply

PE56824

Polarized connectors

Medium Voltage switchgear operating guarantee

- Easergy T200 I has undergone severe MV electrical stress withstand tests.
- It is a backed up power supply which guarantees continuity of service for several hours in case of loss of the auxiliary source, and supplies power to the Easergy T200 I and the MV switchgear motor mechanisms.
- **Ready to plug**

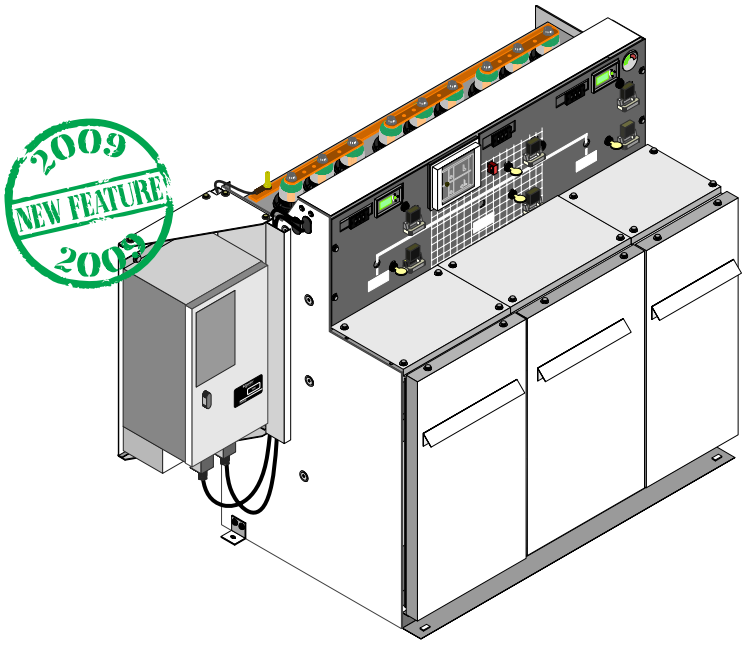
□ Easergy T200 I is delivered with a kit that makes it easy to connect the motor mechanisms and collect measurements.
□ the telecontrol cabinet connectors are polarized to avoid any errors during installation or maintenance interventions.
□ current measurement acquisition sensors are of the split type, to facilitate their installation.
□ works with 24 Vdc and 48 Vdc motor units.

61021N

Split sensors

Automatic transfer system

Because a MV power supply interruption is unacceptable especially in critical applications, an automatic system is required for MV source transfer.



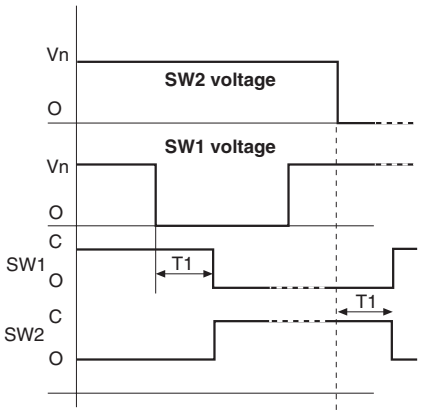
DE57988

DE57986EN

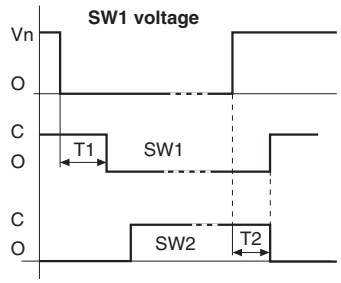
For your peace of mind, RM6 gives automatic control and management of power sources in your Medium Voltage secondary distribution network with a short transfer time (less than 10 seconds), guaranteeing the hi-reliability of your installation.

Automatic control is performed by Easergy T200 I. This T200 I device can also be used for remote control with a wide range of modems and protocols.
By default, the T200 I is provided with the RS232 modem and the Modbus/IP protocol.

MT10013EN



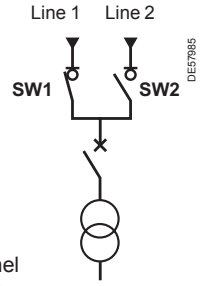
Semi-auto operating mode



Auto-SW1 operating mode

Configurable parameters:
- Operating mode: semi-auto, auto SW1, auto SW2
- T1: 1 to 60 s in 1 s steps
- T2: 10 to 60 s in 1 s steps
- Automation system valid/invalid

Auto changeover switch (ACO 1/2)



DE57985

Changeover between two sources in the distribution network: SW1 and SW2.

Operating modes

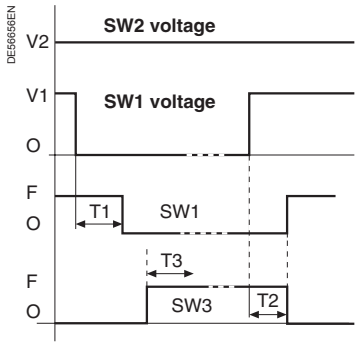
The operating mode is selected from the Easergy T200 I configurator.

Semi-Auto mode, SW1 < > SW2
In the event of a voltage loss on one of the three phases of the active line, automatic control switches to the other channel after a time delay T1: opening of SW1 and then closing of SW2. Automatic control executes no return, except in case of voltage loss on the new active channel.

Semi-Auto mode SW1 > SW2, (SW2 > SW1)
Automatic control executes only one changeover from channel 1 or 2 to the backup channel.

Mode Auto-SW1 or Auto-SW2
After a changeover, return to the priority channel occurs if the MV voltage on that channel is restored.

Automatic transfer system (cont.)



Configurable parameters:
- Operating mode
- Automatic return SW1/SW2
- Automation system on/off
- Delay before switching

T1: 100 ms to 60 s in 100 ms steps
- Delay before return

T2: 5 s to 300 s in 1 s steps
- Interlock delay on voltage loss

T3: 100 ms to 3 s in 100 ms steps
- Motorisation type: command time.

Bus tie coupling (BTA 2/3)

Source changeover between 2 incoming lines (SW1 and SW2) and a busbar coupling switch (SW3).

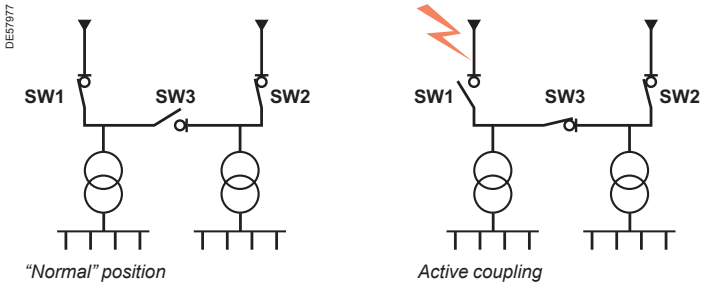
Operating modes

Standard Semi-Auto mode

In the event of a voltage loss on one of the three phases of the SW1 line, following time delay T1, automatic control opens SW1 and then closes SW3.
After closing of SW3, presence of voltage on SW2 is monitored for a period T3.
If the voltage is lost during this period, SW3 opens and the system is locked.
Same logic if the voltage disappears on SW2.

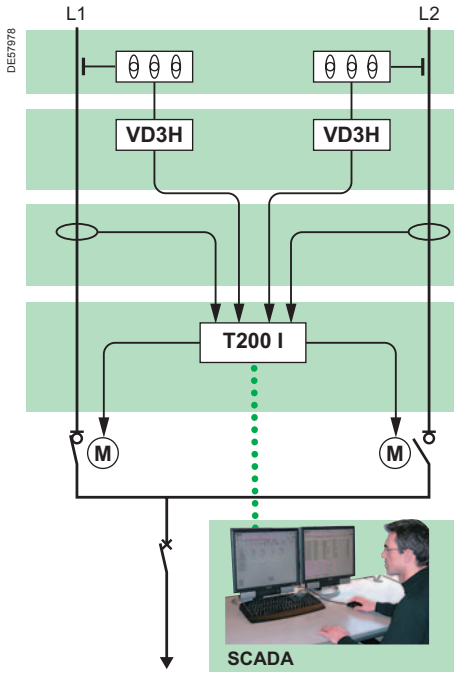
Auto mode

Same sequence as Semi-Auto mode. Then, if the voltage returns normally on SW1 during a time delay T2, the system changes over (opening of SW3 and closing of SW1).
Same logic if the voltage disappears on SW2.



"Normal" position *Active coupling*

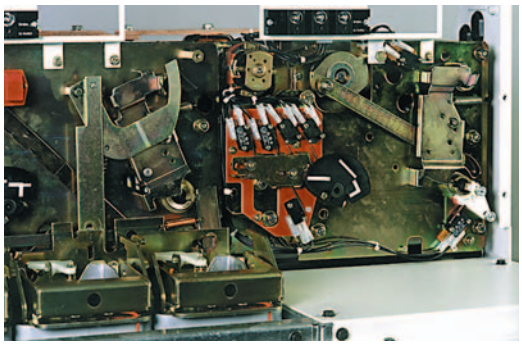
An ATS solution is made of:



SCADA

2 VPIS-VO	Voltage sensor: dedicated version of VPIS with voltage output signal.
2 VD3H	Voltage detector: a relay is activated when a loss of voltage is detected from the VPIS voltage output signal.
2 FPI	Fault Passage Indicator: if a fault current is detected, the Automatic Transfer System is locked in order to avoid closing the healthy line on the fault.
1 T200 I + switch function motorized	From the digital input coming from the VD3H and the FPI information, T200 I takes the decision to switch from one line to the other.
	Communication to SCADA: optionally, communication facilities may be added. *Modems:* PSTN, Radio, GSM/GPRS, Ethernet,… *Protocols:* Modbus, IEC 870-5-101, DNP3,… *Functions:* dual port, remote configuration,…

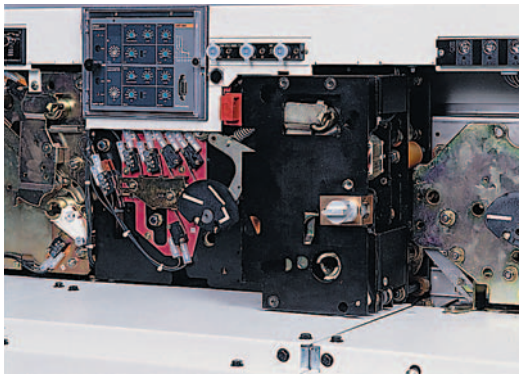
Switch and circuit breaker motorization



Motor mechanism

Switch operating mechanism

■ The switch operating mechanism includes a space that is reserved for the installation of a geared motor. This can be installed at the factory, but it can also the installed on-site, by the customer, without de-energizing the unit, and without dismantling the operating mechanism.
■ An electrical interlocking assembly prohibits any false operations.
Once motorized, the RM6 integrates perfectly into a telecontrol system.



Circuit breaker operating mechanism

■ Circuit breaker protection functional units can be equipped with a geared motor. This can be installed at the factory, but it can also be installed on-site, by the customer, without de-energizing the unit, and without dismantling the operating mechanism.
■ Electrical locking prohibits any false operations, with, as an option, closing after an unacknowledged fault. Once motorized, the RM6 integrates perfectly into a telecontrol system.
This option becomes particularly useful in the context of the protection of a secondary ring, with supervision by a telecontrol system.

Unit applications

Operating mechanism types	CIT		CI1		CI1	
	Switch		Circuit breaker		Fuse switch combination	
Main circuit switch	Closing	Opening	Closing	Opening	Closing	Opening
Manual operating mode	Hand lever	Hand lever	Hand lever	Push button	Hand lever	Push button
Remote control option	Motor	Motor	Motor	Coil	—	Coil
Speed of operation	1 to 2 s	1 to 2 s	11 to 13 s	45 to 75 ms	—	60 to 85 ms
Earthing switch	Closing	Opening	Closing	Opening	Closing	Opening
Manual operating mode	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever	Hand lever

Motor option for switch-units and circuit breakers

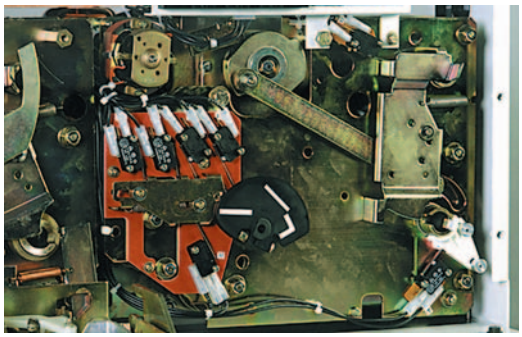
The operating mechanism I, D and B functions may be motorized

		DC						AC (50 Hz)*	
Un power supply	(V)**	24	48	60	110	125	220	120	230
Power	(W)	240							
	(VA)							280	

(*) Please consult us for other frequencies.
(**) At least a 20 A power supply is necessary when starting the motor.

Indication and tripping

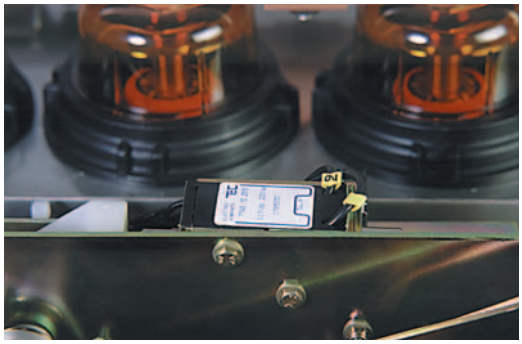
055748B



Auxiliary contacts

■ Each switch or circuit breaker can be fitted with 4 auxiliary contacts with the following positions: 2 NO and 2 NC.
■ The earthing switch (except fuse-switch combination) can be fitted with 1 auxiliary contact with the following position: (opening/closing).
■ Each circuit breaker can receive 1 auxiliary contact for tripping indication (protection by VIP).
■ Each fuse-switch combination can be fitted with 1 blown fuse indication auxiliary contact.

055747



Opening release

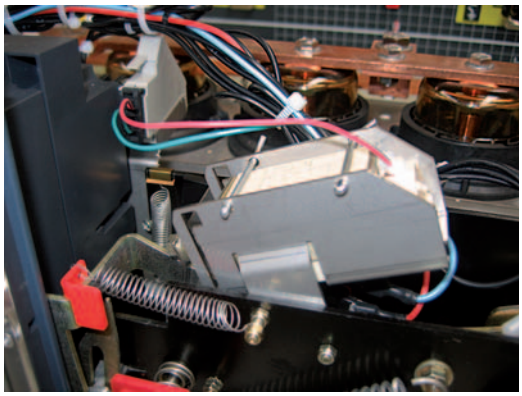
Each circuit breaker or fuse-switch combination can be fitted a switch-on opening release (shunt trip).

Opening release option for each circuit breaker or fuse-switch combination

		DC						**AC** (50 Hz)*	
Un power supply	(V)	24	48	60	110	125	220	120	230
Power	(W)	200	250	250	300	300	300		
	(VA)							400	750
Response time	(ms)	35						35	

(*) Please consult us for other frequencies

PE56424



Undervoltage coil

Available on the circuit breaker function and on the combined fuse-switch, this trip unit causes opening when its supply voltage drops below a value under 35% of its rated voltage.

		DC						**AC** (50 Hz)*	
Un power supply	(V)	24	48	60	110	125	220	120	230
Power									
Excitation	(W or VA)	200 (during 200 ms)						200	
Latched	(W or VA)	4.5						4.5	
Threshold									
Opening		0.35 to 0.7 Un						0.35 to 0.7	
Closing		0.85 Un						0.85	

(*) Please consult us for other frequencies

Fault current and load current indicators

PE56820

Flair 21D and 21 DT

PE56821

Flair 22D

Fault current indicator

RM6 switchboard integrate fault passage indicators, on every switch function:
Flair 21D, Flair 21DT, Flair 22D (*).
These FPI are self-powered by the sensors and comprise a digital display.
They provide:

- earth fault indication,
- phase fault indication,
- load current display (Ampermeter).

(*) RM6 can also be provided with Alpha M or Alpha E (Hortzmann) type short circuit indicators.

PE56822

Amp 21D

Load current indicator

The RM6 can also be provided with an ammeter dedicated to indication of load currents on an MV network, on each switch function:

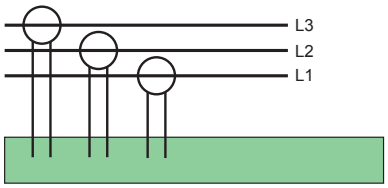
- Amp 21D

This ammeter is specially dedicated to network load monitoring via the digital display of the load current.

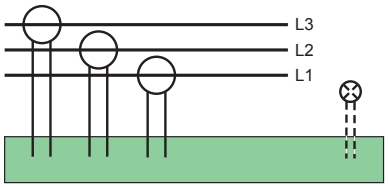
61021N

The installation of all the indicators on site can be facilitated by using the current measurement sensors of the split type, without removing MV cables.

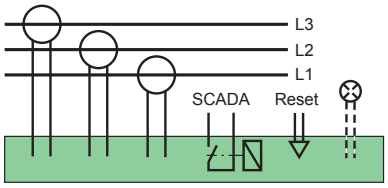
DE57981EN



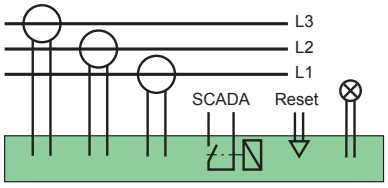
AMP 21D



21D



21DT



22D

Characteristics

	21D	21DT	22D	Amp 21D
Fault detection				
Earth fault	20 to 160 A	20 to 160 A	20 to 160 A	–
Phase fault	200 to 800 A	200 to 800 A	200 to 800 A	–
Reset	■	■	■	–
SCADA interface	–	■	■	–
Display unit				
Display	2 digits	2 digits	4 digits	4 digits
Current resolution	10 A	10 A	1 A	1 A
Accuracy	± 10%	± 10%	± 10%	± 10%
Settings	■	■	■	–
Faulty phase	■	■	■	–
Frequency	–	–	■	■
Peak demand current	–	–	■	■
Load current demand	■	■	■	■
Others				
Dual powered (sensor and battery)	–	–	■	–
External light	■	■	■	–

Flair 21D, 21DT, 22D and Amp 21D operate with a load current more than 3 A.
Due to a lithium battery, Flair 22D can be configurated with no load current (setting display, reset temporisation > 4 h).

PE56823

Voltage presence indicator

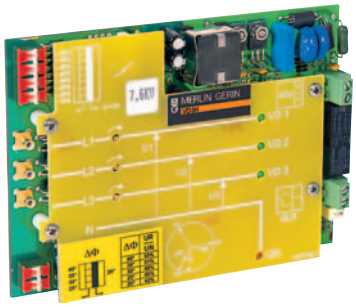
There is a voltage indicator device on network switches, circuit breakers and fuse-switch combinations, which makes it possible to check whether or not there is a voltage across the cables.
Two devices are offered:
- VDS: Voltage Detecting System
- VPIS: Voltage Presence Indication System.

PE56825

Phase concordance unit

This unit is used to check phase concordance.
It can be connected to any voltage indicator lamp device.

058691N



Voltage detection

The system is implemented with a changeover switch VPIS (with voltage output) connected to the VD3H relay.
The VD3H voltage relay can detect phase voltage loss or a phase-to-phase voltage unbalance on a medium-voltage network.
- Phase voltage monitoring

The signals for each voltage (L1, L2, L3) are compared with 2 thresholds.
- Residual voltage monitoring

The phase-to-phase voltage unbalance is obtained by the sum of the three voltages.

The voltage presence signal is delivered by a dry contact. It indicates **voltage presence on the three phases and absence of a UR voltage.**
- Auxiliary voltage: 24, 48, 110 V DC.

Voltage presence relay VD3H

PE56826

Protection relay test

The portable VAP 6 unit is connected to the circuit breaker protection relay:
- injecting an electrical stimulus, two pushbuttons are used to check that the short-circuit and zero sequence fault current protection devices are operating
- an extra pushbutton may be provided to inhibit tripping of the circuit breaker.

PE56806

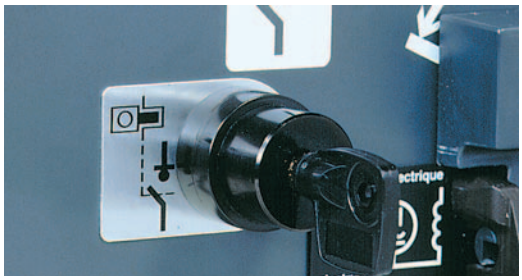
Options for cable compartment

Standard equipment:
- a closing panel
- cable binding
- connection of cable earthing.

Optional equipment:
- panel with hood to display liquid type overcurrent indicators installed around the cables
- deeper panel to enable to adding of a lightning arrester
- interlocking to prohibit access to the connection compartment when the earthing switch is open
- interlocking to prohibit closing of the switch or circuit breaker when the connection compartment panel is open
- compartment base for single-core or three-core cables (compulsory for non-directive field connections)
- internal arc withstand for the cable compartment up to 20 kA 1s.

Key locking

MT55154

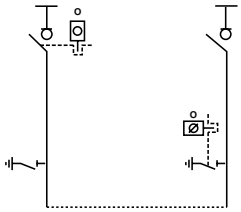


The markings (O, S, and X) are engraved on the keys and the locks.
They are given here only as an aid to understanding of the diagrams.
When the switchgear is locked in the “open” position, the remote control can’t work.

On network switches or 630 A circuit breaker feeder

Type R1 diagram

MT55040

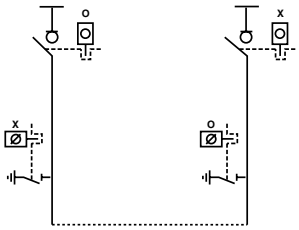


Semi-crossed locking

■ Prohibits the closing of the earthing switch of the downstream switchgear unless the upstream switchgear is locked in the “open” position.

Type R2 diagram

MT55041



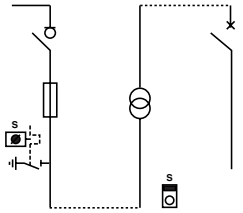
Crossed locking

■ Prohibits closing of the earthing switches unless the upstream and downstream switchgear is locked in the “open” position.

On transformer feeders

Type R7 diagram

MT55042

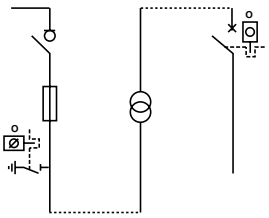


RM6/transformer

■ Prohibits access to the transformer unless the earthing switch has been locked in the “closed” position.

Type R6 diagram

MT55043

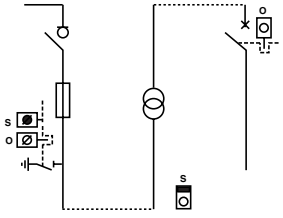


RM6/low voltage

■ Prohibits closing of the earthing switch and access to any protection unit fuses unless the main LV circuit breaker has been locked in the “open” or “disconnected” position.

Type R8 diagram

MT55044

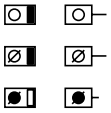


RM6/transformer/low voltage

■ Prohibits closing of the earthing switch and access to any protection unit fuses unless the main LV circuit breaker has been locked in the “open” or “disconnected” position”.

■ Prohibits access to the transformer unless the earthing switch has already been “closed”.

MT55045



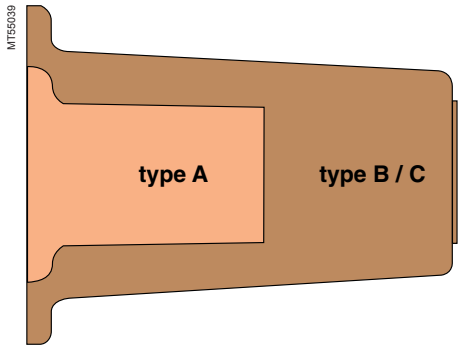
Legend:

no key

free key

captive key

Selecting bushings and connectors



Types of connection interface

General

■ The profiles, contacts and dimensions of the RM6 connection interfaces are defined by the IEC 60137 standard.
■ 100% of the epoxy resin interfaces undergo dielectric testing at power frequency and partial discharge tests.
■ An insulated connector must used in order to guarantee the dielectric performance over time. Schneider Electric recommends using nkt connectors.

Appropriateness for use

The bushings carry the electrical current from the outside to the inside of the enclosure, which is filled with SF6 gas, ensuring insulation between the live conductors and the frame.
There are 3 types of bushing, which are defined by their short-time withstand current:
■ Type A: 200 A: 12.5 kA 1 s and 31.5 kA peak (plug-in)
■ Type B: 400 A: 16 kA 1 s and 40 kA peak (plug-in)
■ Type C: 630 A: 25 kA 1 s, 21 kA 3 s and 62.5 kA peak (disconnectable M16).

How to define the connection interface

The connection interfaces depend on specific criteria, such as:

Installation

■ Current rating of the connected equipment: 200, 400, 630 A
■ Short-time withstand current for 12.5 kA, 16 kA, 25 kA switch and circuit breaker functions
■ For the fuse-switch combination function, as the short-circuit current is limited by the fuse, the connection interface will be of type A (200 A)
■ Minimum phase expansion length
■ Connection type:
□ plug in: multicontact ring
□ disconnectable: bolted.
■ Output position: straight, elbow.

This information must be specified for better definition of the connection interfaces.

Cable

■ Specified voltage:
□ of the cable
□ of the network.
■ Type of conductor:
□ aluminium
□ copper.
■ Cross section in mm^2
■ insulation diameter
■ Cable composition:
□ single-core
□ 3-core.
■ Insulation type:
□ dry
□ paper impregnated (non-draining type).
■ Type of screen
■ Armature.

Connections proposed in the offer

Schneider Electric offers the following *nkt cable connectors in its offer*

Type A bushing

Directed field plug-in connector

Dry single-core cable

Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 17.5 kV	Plug-in	nkt cables GmbH	EASW 12/250 A	25 to 95	Shaped elbow
200 A-95 kV impulse	Plug-in	nkt cables GmbH	EASG 12/250 A	25 to 95	Straight
24 kV	Plug-in	nkt cables GmbH	EASW 20/250 A	25 to 95	Shaped elbow
200 A-125 kV impulse	Plug-in	nkt cables GmbH	EASG 20/250 A	25 to 95	Straight

Type B bushing

Directed field plug-in connector

Dry single-core cable

Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 17.5 kV 400 A-95 kV impulse	Plug-in	nkt cables GmbH	CE 12-400	25 to 300	
24 kV 400 A-125 kV impulse	Plug-in	nkt cables GmbH	CE 24- 400	25 to 300	

Type C bushing

Directed field disconnectable connector

Dry single-core cable

Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 17.5 kV 630 A-95 kV impulse	Disconnectable	nkt cables GmbH	CB 12-630	25 to 300	
24 kV 630 A-125 kV impulse	Disconnectable	nkt cables GmbH	CB 24-630	25 to 300	

Non-directed field disconnectable connector

Dry single and three-core cable

Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 17.5 kV 630 A-95 kV impulse	Disconnectable	nkt cables GmbH	AB 12-630	25 to 300 (+ ATS)	For 3-core cable

Other types of compatible connections

Type A bushing

Directed field plug-in connector

Dry single-core cable

Performance	Connection	Supplier	Reference	Section	Remarks
7.2 to 10 kV	Plug-in	Elastimold	158LR	16 to 120	T-shaped elbow
200 A-95 kV impulse			151SR	16 to 120	Straight, Q function only
		Pirelli	FMCE 250	16 to 95	
7.2 to 24 kV	Plug-in	Elastimold	K158LR	16 to 95	T-shaped elbow
200 A-125 kV impulse			K151SR	25 to 95	Straight, Q function only

Type A/M8 bushing

Non-directed field disconnectable connector (*)

Dry single and three-core cable

Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 17.5 kV	Heat shrinkable	Raychem	EPKT+EAKT+RSRB	16 to 150	
200 A-95 kV impulse	Insulating boots	Kabeldon	KAP70	70 max.	

(*) 520 mm plinth must be used

Type B bushing

Directed field plug-in connector

Dry single-core cable

Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 10 kV	Plug-in	Elastimold	400 LR	70 to 240	Limited to Us = 10 kV
400 A-95 kV impulse					
24 kV	Plug-in	Pirelli	FMCE 400	70 to 300	
400 A-125 kV impulse		Elastimold	K400LR	35 to 240	
		Kabeldon	SOC 630	50 to 300	

Type C bushing

Directed field disconnectable connector

Dry single-core cable

Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 10 kV	Disconnectable	Elastimold	440 TB	70 to 240	
630 A-95 kV impulse					
7.2 to 24 kV	Disconnectable	Pirelli	FMCTs 400	70 to 300	
630 A-125 kV impulse		Elastimold	K400TB	35 to 240	
		Kabeldon	SOC 630	50 to 300	

Non-directed field disconnectable connector

Dry single and three-core cable

Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 17.5 kV	Heat shrinkable	Raychem	EPKT+EAKT+RSRB	16 to 300	
630 A-95 kV impulse		Sigmaform	Q-CAP	16 to 300	
	Insulating boots	Kabeldon	SOC 630	50 to 300	Completed by a kit for three-pole cable
		Pirelli	ELPB12	50 to 300	Limited to 75 kV impulse
	Simplified disconnectable	Raychem	RICS - EPKT	25 to 300	
		Euromold	15TS-NSS	50 to 300	Limited to Us = 12 kV
24 kV	Simplified disconnectable	Raychem	RICS - EPKT	25 to 300	
630 A-125 kV impulse					

Other types of compatible connections (cont.)

Type C bushing (cont.)

Non-directed field disconnectable connector

Single-core cable, paper impregnated, non-draining type

Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 17.5 kV 630 A-95 kV impulse	Disconnectable	Pirelli	FMCp400	95 to 300	
	Insulating boots	Kabeldon	SOC	25 to 300	
		Pirelli	ELPB12	50 to 300	Limited to 75 kV impulse
	Simplified disconnectable	Raychem	RICS - EPKT	25 to 300	
	Heat shrinkable	Raychem	EPKT+EAKT+RSRB	95 to 300	
24 kV 630 A-125 kV impulse	Disconnectable	Pirelli	FMCp 1c	95 to 300	
	Simplified disconnectable	Raychem	RICS - EPKT	25 to 300	

Non-directed field disconnectable connector

Three-core cable, paper impregnated, non-draining type

Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 17.5 kV 630 A-95 kV impulse	Insulating boots	Kabeldon	SOC 630	25 to 300	
		Pirelli	ELPB12	50 to 300	Limited to 75 kV impulse
	Simplified disconnectable	Raychem	RICS - EPKT	25 to 300	
	Heat shrinkable	Raychem	EPKT+EAKT+RSRB	16 to 300	
24 kV 630 A-125 kV impulse	Simplified disconnectable	Raychem	RICS - EPKT	25 to 300	

Connectors with lightning arrestors

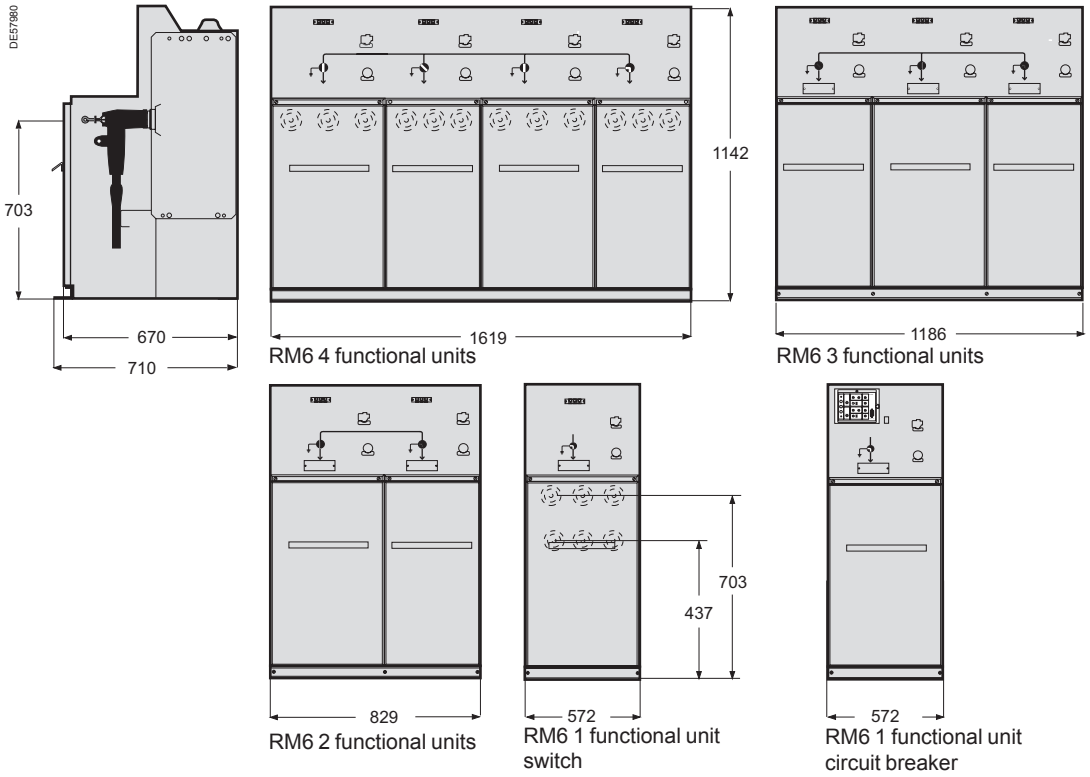
Disconnectable connector

Single-core dry cable and lightning arrestor

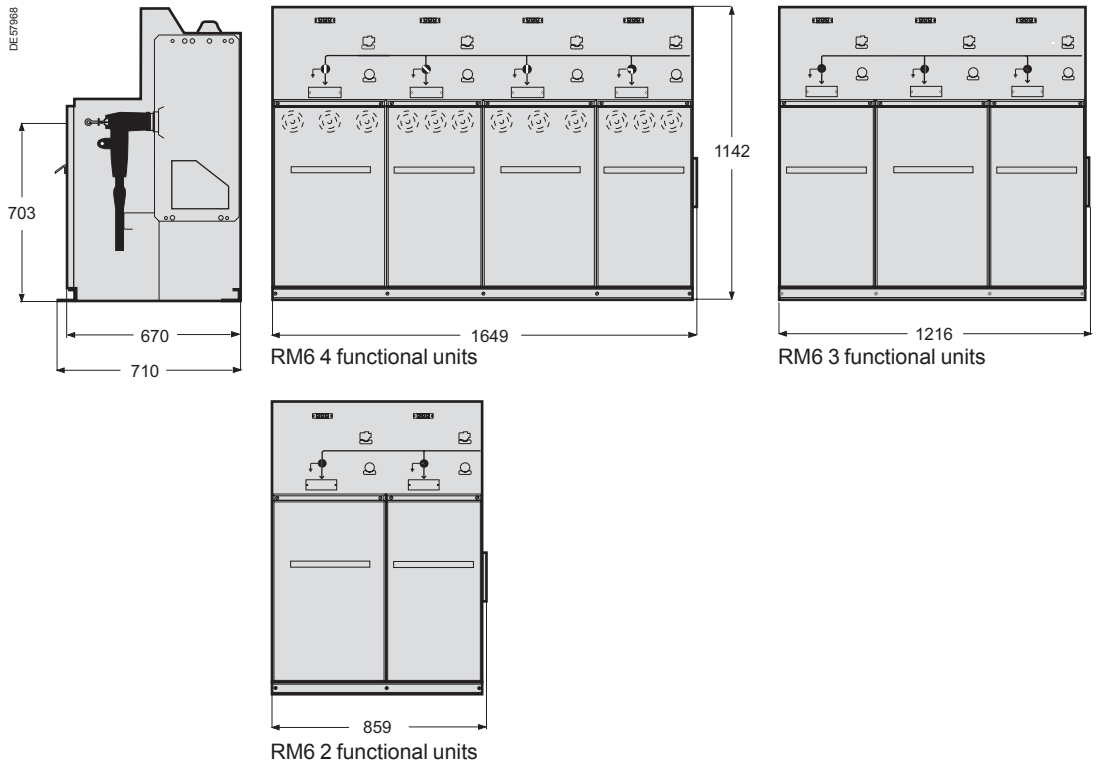
Performance	Connection	Supplier	Reference	Cross section	Remarks
7.2 to 17.5 kV 630 A-95 kV impulse	Disconnectable	nkt cables GmbH	AB 12-630 + ASA12 (5 or 10 kA)	25 to 300	Non-directed field
			CB 24-630 + CSA 24 (5 or 10 kA)	25 to 300	Directed field
24 kV 630 A-125 kV impulse	Disconnectable	nkt cables GmbH	AB 12-630 + ASA12 (5 or 10 kA)	25 to 300	Non-directed field
			CB 24-630 + CSA 24 (5 or 10 kA)	25 to 300	Directed field
7.2 to 17.5 kV 630 A-95 kV impulse	Disconnectable	Raychem	RICS+EPKT RDA 12 or 18	25 to 300	
	Disconnectable	Elastimold	K400TB + K400RTPA + K156SA	35 to 300	Cable box enlarged
24 kV 630 A-125 kV impulse	Disconnectable	Raychem	RICS + EPKT RDA 24	25 to 300	
	Disconnectable	Elastimold	K440TB + K400RTPA + K156SA	35 to 300	Cable box enlarged

Dimensions and installation conditions

Dimensions of non-extensible RM6s

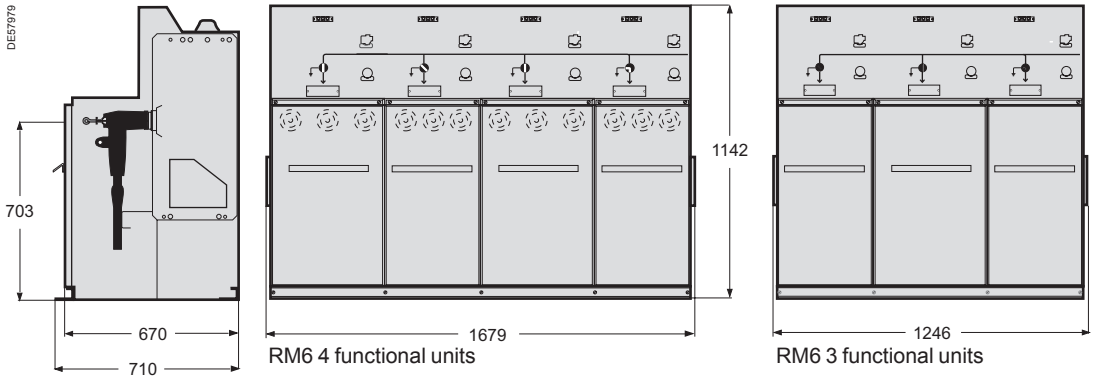


Dimensions of 2, 3 and 4 functions RM6 REs that are extensible on the right

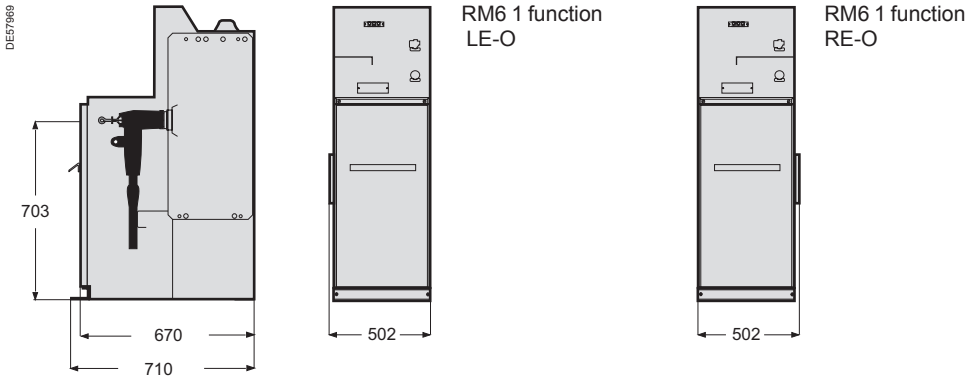


Dimensions and installation conditions (cont.)

Dimensions of the RM6 DE 3 or 4 functions double extensible

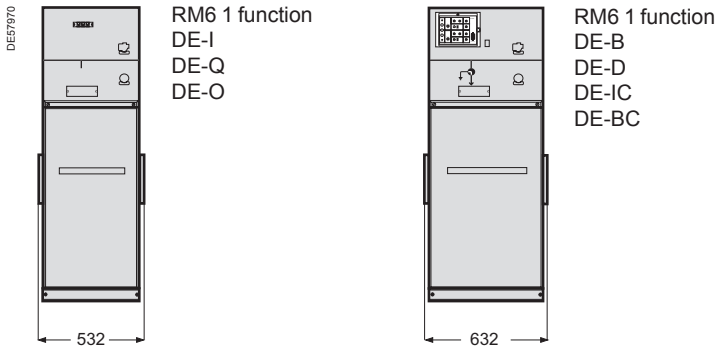


Dimensions of stand-alone RM6 modules cables connections that are extensible

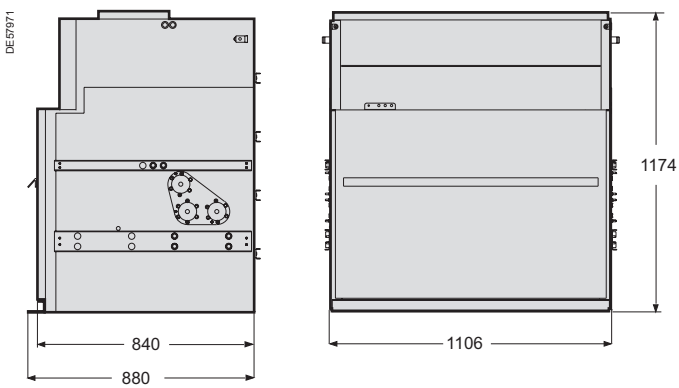


Dimensions of stand-alone RM6 modules that are extensible on both sides

With two bushing protection covers for extensibility

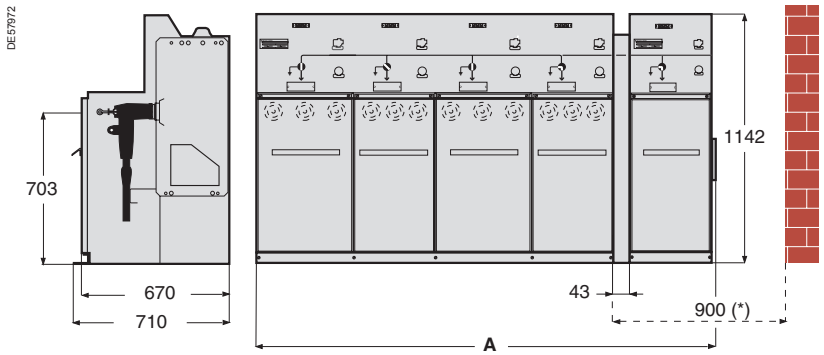


Dimensions of the RM6 metering module



Dimensions and installation conditions (cont.)

Dimensions of RM6 REs with an extension module



- RM6 RE 3 functional units with switch DE module: **A** = 1731 mm
- RM6 RE 4 functional units with switch DE module: **A** = 2164 mm
- RM6 RE 3 functional units with circuit breaker DE module: **A** = 1831 mm
- RM6 RE 4 functional units with circuit breaker DE module: **A** = 2264 mm

(*) Dimensions necessary on the right of the RM6 in order to install an extension

Layout

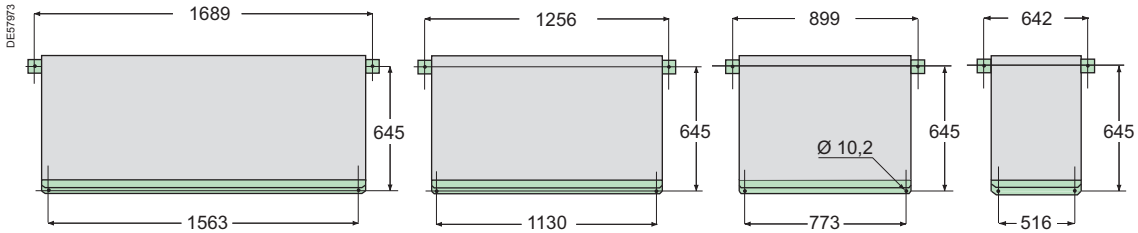
Floor mounting

The RM6 is supported by 2 metal feet with holes for mounting:
- on a flat floor fitted with trenches, passages or ducts
- on concrete footing
- on studs
- on metal rails
- etc.

Additional raising plinth

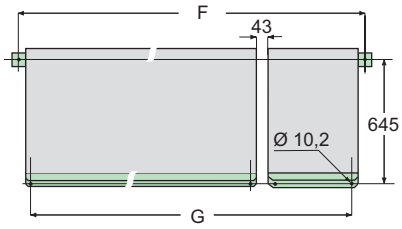
As an option, the RM6 can be fitted with a 260 or 520 mm raising plinth. This addition, which simplifies civil engineering works, results in trenches of a smaller depth, or even in their complete elimination when the bending radius of the cables allows it.
The plinth is mounted directly on the floor.

Non-extensible RM6 (top view)



RM6 4 functional units | RM6 3 functional units | RM6 2 functional units | RM6 1 functional unit

Extensible RM6 (top view)

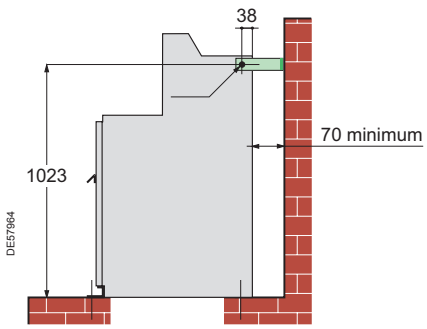


RM6 3 or 4 functional units with extensibility module

RM6 2 functional units with switch or combined switch	**F** = 1414 mm **G** = 1288 mm
RM6 2 functional units with circuit breaker	**F** = 1514 mm **G** = 1388 mm
RM6 3 functional units with switch or combined switch	**F** = 1771 mm **G** = 1645 mm
RM6 3 functional units with circuit breaker	**F** = 1871 mm **G** = 1745 mm
RM6 4 functional units with switch or combined switch	**F** = 2204 mm **G** = 2078 mm
RM6 4 functional units with circuit breaker	**F** = 2304 mm **G** = 2178 mm

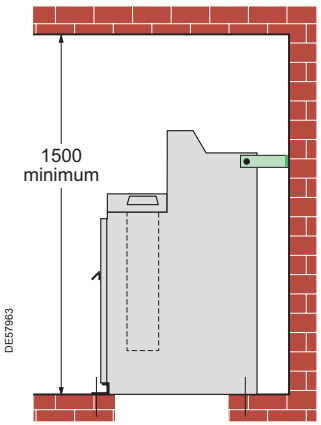
Wall mounting

There are two holes allowing the unit to be fixed on the wall as well as mounted on the floor.



Ceiling clearance

For substations with fuse-holders, provide a minimum ceiling clearance of 1500 mm.

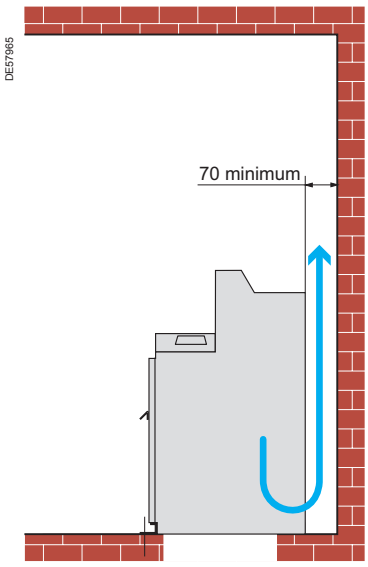


Dimensions and installation conditions (cont.)

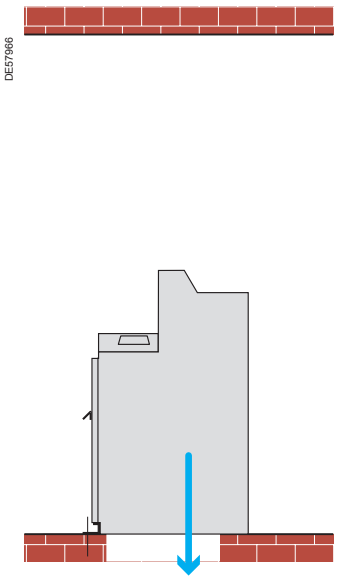
Installation of the substation for internal arc withstand

When there is a requirement for installations with protection against internal arc faults, refer to the following diagrams.

Gas removal to the rear



Gas removal to the bottom

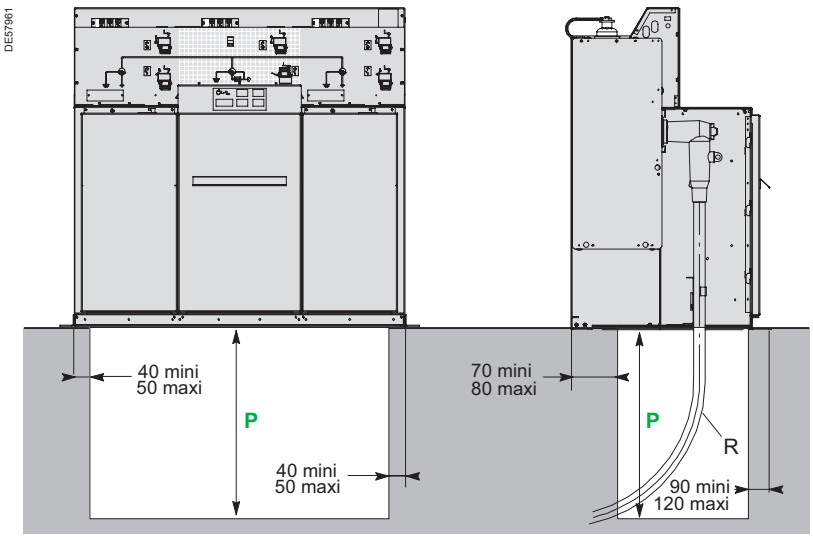


N.B.: *parts for guiding the gases to vent openings and cooling walls are not part of the switchgear supply. These must be adapted to each specific case.*

Civil works

For connection to “network” or “transformer”via circuit breaker

The “network” cables can be run either:
- through trenches, passages, ducts
- through the left or the right side.



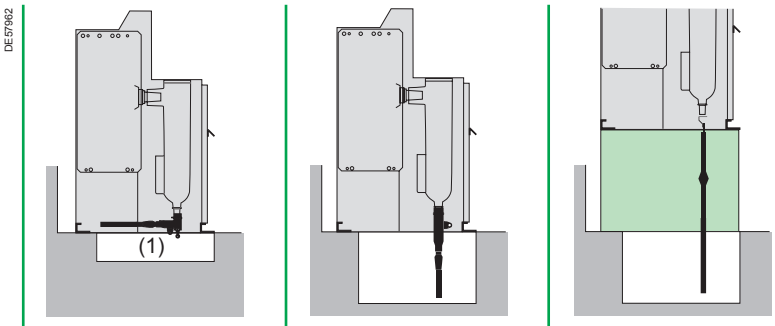
Trench depth P or RM6 without plinth

Note: *trench depths can be reduced and sometimes eliminated by adding a plinth.*

Cable insulation	Cable	Cross-section (mm²)	Bending radius	Cable entry through a trench		Cable entry through a duct	
				P (plug-in)	P (disconnectable)	P (plug-in)	P (disconnectable)
Dry insulation	Single	⩽ 150	500	400		400	
		185 to 300	600	520		520	
	Three	⩽ 150	550	660		660	
		185	650	770		770	
Paper impregnated non-draining type	Single	⩽ 150	500		580		580
		185 to 300	675		800		800
	Three	⩽ 95	635		750		750
		150 to 300	835		970		970

For “transformer” connection via fuse-switch

The cross-sections of “transformer” cables are generally smaller than those of the “network” cables. All the cables are then run through the same space. When straight MV connectors are used, **the depth P** indicated below can be greater than that of the “network” cables.



Cable insulation	Cable	Cross-section (mm²)	Bending radius	Plug-in Elbow connector	Plug-in Straight connector	Disconnectable (2) P
Dry insulation	Single	16 to 35	335	100	520	335
		50 to 70	400	100	520	440
		95 to 120	440	100	550	440
	Three	35	435		520	725
		50 to 70	500		520	800
		95	545		550	860

(1) Leave a clearance of 100 mm
(2) 520 mm plinth must be used

Available functions

Basic unit characteristics

Rated voltage		(kV)	12	12	12	12	17.5	17.5	17.5	17.5	24	24	24	24	24	24	24	24	24	24
Short-time withstand current		(kA rms)	21	21	25	25	21	21	21	21	12.5	12.5	12.5	16	16	16	20	20	20	20
		Duration (s)	1	1	1	1	1	3	1	3	1	1	1	1	1	1	1	3	1	3
Rated current		**(A)**	**200**	**630**	**200**	**630**	**200**	**200**	**630**	**630**	**200**	**400**	**630**	**200**	**400**	**630**	**200**	**200**	**630**	**630**
Extensions	**Functions**																			
NE	**I**					■			■		■	■			■	■			■	
	D		■		■		■				■			■			■			
	B					■			■	■						■			■	
	QI				■		■	■			■			■			■			
	DI				■		■	■			■			■			■			
	BI					■			■	■						■			■	
	II					■			■			■			■	■			■	
	IQI			■		■			■	■		■			■	■			■	■
	IIQI			■		■			■	■		■			■	■			■	■
	QIQI			■		■			■	■		■			■	■			■	■
	IDI					■			■	■		■	■		■	■			■	■
	IIDI					■			■	■		■	■		■	■			■	■
	DIDI					■			■	■		■	■		■	■			■	■
	III					■			■	■		■			■	■			■	■
	IIII					■			■	■		■			■	■			■	■
	IBI					■			■	■						■			■	■
	IIBI					■			■	■						■			■	■
	BIBI					■			■	■						■			■	■
RE	**O**				■	■		■		■				■		■	■		■	
	IQI			■		■			■	■		■			■	■			■	■
	IIQI			■		■			■	■		■			■	■			■	■
	QIQI			■		■			■	■		■			■	■			■	■
	IDI					■			■	■		■	■		■	■			■	■
	IIDI					■			■	■		■	■		■	■			■	■
	DIDI					■			■	■		■	■		■	■			■	■
	II					■				■		■			■	■			■	
	III					■			■	■		■			■	■			■	■
	IIII					■			■	■		■			■	■			■	■
	IBI					■			■	■						■			■	■
	IIBI					■			■	■						■			■	■
	BIBI					■			■	■						■			■	■
LE	**O**				■	■		■		■				■		■	■		■	
DE	**I**					■			■	■		■			■	■			■	■
	BC					■				■						■			■	■
	IC					■				■						■			■	■
	O				■	■		■		■				■		■	■		■	
	Q		■		■		■	■			■			■			■	■		
	D				■		■	■			■			■			■	■		
	B					■			■	■						■			■	■
	Mt					■				■						■			■	■

N.B.: *D and Q functions limited to 200 A*
NE: *non-extensible,* **RE**: *extensible to the right,* **LE**: *extensible to the left,* **DE**: *double extensible.*

Basic unit and options

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.
Green box [X] corresponds to none priced functions.

Basic unit configuration

Quantity [ ]

Configuration (one function per box, fill in from the right)	4th function	3rd function	2nd function	1st function
Example ➡		I	D	I

Option for I, D, B functions

Auxiliary contacts alone
For main switch position indication 2 NO - 2 NC and ESw 1 O/C (this option is included in remote operation option)

Option for I function (Load-Break Switch "LBSw")

Arc short-circuiting device

Front door of cable connection compartment
- Bolted
- Removable with ESw interlocking
- Removable with ESw interlocking and LBSw interlocking

Self-powered fault passage or load current indicators
- Flair 21D
- Flair 21DT
- Flair 22D
- Amp 21D

Short-circuit current setting: 200 A [ ] 400 A [ ] 600 A [ ] 800 A [ ]
Door with window [ ]

Remote operation on I function
Motor mechanism and auxiliary contacts LBSw 2 NO - 2 NC and ESw 1 O/C

50 Hz [ ] 60 Hz [ ] 120 Vac [ ] 220 Vac [ ]
24 Vdc [ ] 48 Vdc [ ] 60 Vdc [ ]
110 Vdc [ ] 125 Vdc [ ] 220 Vdc [ ]

Voltage detection 48 V (VPIS voltage output + VD3H)

Option for D or B function (circuit breaker "C.B.")

Front door of cable connection compartment (only if this option is chosen with I function)
- Bolted
- Removable with ESw interlocking
- Removable with ESw interlocking and C.B. interlocking

Protection relay for lines or transformer protection by circuit breaker (only one type of relay by unit)
- Relay Sepam series 10

Standard [ ] Very sensitive [ ]
Without com. [ ] With communication [ ]

- Relay VIP 30 (over current)
- Relay VIP 35 (over current and earth fault)
- Relay VIP 300 (over current & earth fault/multi curve in accordance with IEC 255-3)

Motor disabled when CB trips

Fault tripping auxiliary contact

Shunt trip coil for external tripping

50 Hz [ ] 60 Hz [ ] 120 Vac [ ] 220 Vac [ ]
24 Vdc [ ] 48 Vdc [ ] 60 Vdc [ ]
110 Vdc [ ] 125 Vdc [ ] 220 Vdc [ ]

Remote operation on D or B function
Motor mechanism and auxiliary contacts C.B. 2 NO - 2 NC and ESw 1 O/C (including shunt trip coil)

50 Hz [ ] 60 Hz [ ] 120 Vac [ ] 220 Vac [ ]
24 Vdc [ ] 48 Vdc [ ] 60 Vdc [ ]
110 Vdc [ ] 125 Vdc [ ] 220 Vdc [ ]

Option for Q function (fuse combination)

Auxiliary contacts alone
For position indication 2 NO - 2 NC

Auxiliary contact for fuses blown

Shunt trip coil for external tripping

50 Hz [ ] 60 Hz [ ] 120 Vac [ ] 220 Vac [ ]
24 Vdc [ ] 48 Vdc [ ] 60 Vdc [ ]
110 Vdc [ ] 125 Vdc [ ] 220 Vdc [ ]

Option for D, B, Q functions

Undervoltage coil

120 Vac [ ] 220 Vac [ ]
24 Vdc [ ] 48 Vdc [ ] 110 Vdc [ ]

Option for operation

Voltage indicator VPIS / VDS

Network service voltage (kV) 10 [ ] 15 [ ]
3 [ ] 4.2 [ ] 6 [ ] 11 [ ] 20 [ ]
3.3 [ ] 5.5 [ ] 6.6 [ ] 13.8 [ ] 22 [ ]

Key locking devices Ronis [ ] Profalux [ ]
- Type R1 (on I and B functions)

On switch or circuit breaker [ ]
On earth switch [ ]

- Type R2 (on I and B functions)
- Type R6 (on Q or D functions)
- Type R7 (on Q or D functions)
- Type R8 (on Q or D functions)

Options and accessories

Only one of the boxes (ticked [X] or filled [ ] by the needed value) have to be considered between each horizontal line.
Green box [X] corresponds to none priced functions.

Specific option for one function

Bushing for I function
- Plug in 400 A type B
- Bolted M16 screw type C (compulsory with 17.5 or 24 kV-630 A)
- Bolted 5/8" ANSI

Bushing for D function
- Plug in 200 A type A (limited to 12.5 kA 1 s)
- Plug in 400 A type B (limited to 16 kA 1 s)
- Bolted M16 screw type C (compulsory with 17.5 or 24 kV-630 A)
- Bushing well ANSI (limited to 12.5 kA 1 s)

Bushing for B function
- Bolted M16 type C
- Bolted 5/8" ANSI

Bushing for Q function
- Plug in 200 A
- Heat shrinkable terminal for fuse chamber

Cable type for I function — Single core [X] — Three-core
- Bottom plate in cable box (compulsory in case of three-core cable)

Cable type for D or B function — Single core [X] — Three-core
- Bottom plate in cable box (compulsory in case of three-core cable)

In and fuse type for Q function — 6 kV [X] — 10 kV [X] — 12/24 kV & 10/100 A
(fuses to be procured separately) — 16 to 100 A [X] — 125 A [X]

Fixation support — Without [X] — With

Global option

Pressure detection — Without [X]

Manometer	Arabic	Scandinavian	Standard
or pressure switch		Scandinavian	Standard

Deep cable box
(enables surge arrestors to be fitted)

Additional earth busbar in cable compartment
(compulsory if earth fault > 6 kA 1 s)

Internal arc cable box 20 kA 1 s for I and D or B functions
(unable to coexist with door with window)

Autotransfer system for I function I (48 Vdc electrical motorization compulsory)

Changeover type			ACO 1/2	BTA 2/3
Communication modem	GSM/GPRS		FSK (radio)	RS485
Protocol			IEC101/104	DNP3/IP
Current measurement sensors + cables	Single core AC 5 m	Single core AC 10 m	Three-core AH 5 m	Three-core AH 10 m
Connection cable to motorization 1		3 m	5 m	10 m
Connection cable to bus tie (only for BTA 2/3)			5 m	10 m
Connection cable to motorization 2		3 m	5 m	10 m

Accessories

Raising plinth — h = 260 mm — h = 520 mm
Set of 3 MV fuses Fusarc CF — Rating (A)
Phase comparator
Test box for circuit breaker relay (VAP 6)
Additional operating handle — Operating handle — Enlarged operating handle
Additional instructions
Installation and civil engineering instructions — French [X] — English [X]

Connectors and adaptaters for RM6

Quantity

Connectors for 630 A (1 set = 1 function)

Directed field disconnectable connector
- CB 24-630 A
- CB 24-630 A with CC-630 A (coupling connection)

Non-directed field disconnectable connector
- AB 15-630 A
- AB 15-630 A with AC 15-630 A (coupling connection)

Connectors for 400 A (1 set = 1 function)

Directed field plug-in connector — CE 24-400 A

Connectors for 250 A (1 set = 1 function)

Elbow connector — EASW 20-250 A
Straight connector — EASG 20-250 A

Notes

Notes

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