Medium Voltage Distribution
Catalogue | 2013

Premset

15 kV
Compact modular vacuum switchgear

With Shielded Solid Insulation System

Make the most of your energy

Schneider Electric

General contents

Medium Voltage Distribution
Premset 15 kV
Compact modular
vacuum switchgear

Innovation for MV distribution

Efficiency

Reliability

Safety

Flexibility

Efficiency

Smart grid and advanced management solutions across your network

The electricity market is changing. Every day, end-users' expectations increase and suppliers worldwide gain a greater awareness of energy's environmental impact. Meanwhile, overall consumption is steadily growing. But as this reliance on electricity grows globally, the ways in which we produce, distribute, and use energy must also evolve. The solution will involve not only smarter demand, but also smarter supply and a smarter grid.

Intelligent, smart grid-ready solutions

To meet these challenges, we need to enhance our electrical distribution networks with intelligent, smart grid-ready solutions that bring a new level of efficiency through advanced monitoring and control.

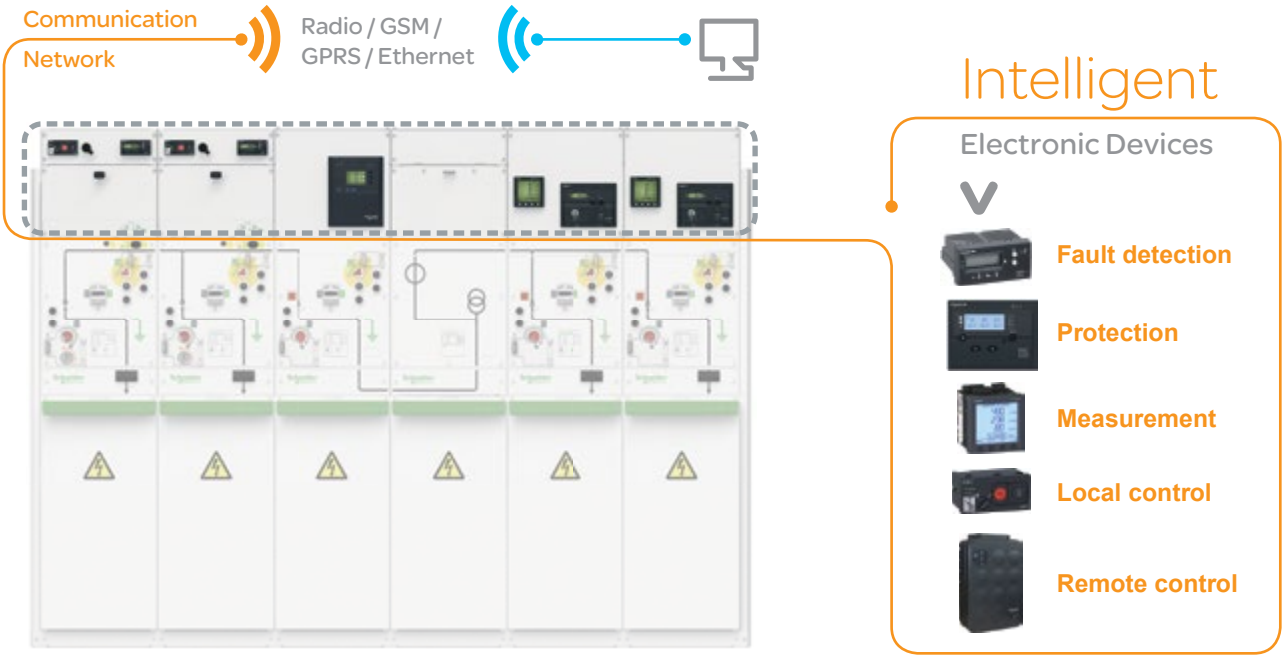
This is precisely what Premset architecture is designed to do, enhancing your installation with such features as:

- **Feeder automation**, with switchgear including built-in communication and local intelligence
- **Load management**, with integrated smart metering
- **Asset management**, with advanced switchgear and transformer monitoring
- **Automatic Transfer System**, with integrated source transfer solution to reduce power supply interruption.

Architecture with distributed intelligence

The intelligent electronic devices (IEDs) used in Premset solutions allow easy integration, based on a standard communications protocol, with a plug-and-play scanning system for easy configuration.

All this adds up to a flexible system with integrated Web technology, pre-engineered and pre-tested, which you can easily upgrade as necessary. With Premset architecture, you can easily build a smarter MV distribution system.



Reliability

Long-lasting performance with the Shielded Solid Insulation System (2SIS)

In addition to its impressive ability to maintain optimal performance in any environment, the Shielded Solid Insulation System also combines robustness with a flexible and modular design, allowing its functional blocks to be used in any combination.

Extending protection to the entire switchgear assembly

Premset switchgear is the first global product to offer shielded solid insulation throughout.

The system is applicable for all network functions, including:

- Load break switches or circuit breakers
- Integrated metering units
- Current and voltage transformers.

Enhanced safety, reduced internal arcing risk

Shielded solid insulation extends equipment service life, resulting in a lower total cost of ownership (TCO).

And, with no part of the main circuit exposed to free air, you also:

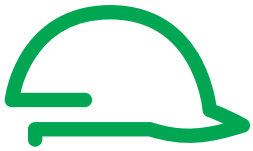
- Reduce the risk of internal arcing
- Eliminate maintenance
- Improve the safety of life and property.

Shielded Solid Insulation System (2SIS)

2SIS is applicable for any function such as load break switches or circuit breakers, new compact meteringfunctions, or current and voltage transformers.

Safety

An intuitive 3-in-1 architecture for breaking, disconnection, and earthing

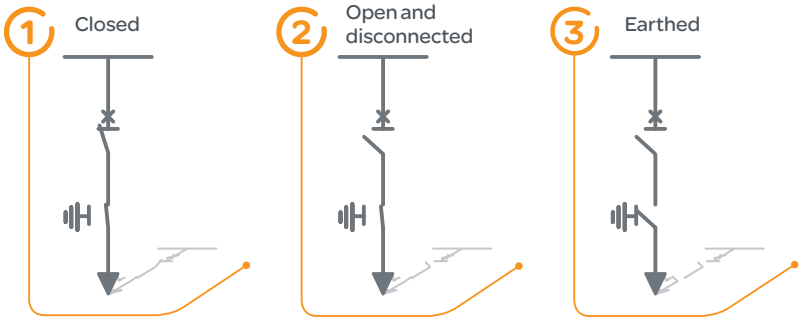


With its 3-in-1 switchgear design, the Premset system's breaking, disconnection, and earthing functions are all integrated into a single disconnecting switch or disconnecting circuit breaker.

There are also only three possible operating positions: closed, open and disconnected, and earthed.

3

position scheme



Simple and user-friendly operation

The Premset 3-in-1 system has proven itself to be the most reliable and end-user friendly MV switchgear system, providing:

- Earthing in a single operation
- Intuitive mimic diagram and operation
- Direct downstream earthing
- Positively driven built-in interlocks
- Easy front access to cable test injection points.

Intuitive operation reduces worker risk

With only two operations from line to earth – one to open and disconnect, and one to earth – the Premset range optimises operating safety, keeping all aspects as simple as possible.

Additionally, standard built-in safety interlocking between the main and earthing functions is keyless and positively driven, making every interaction with the unit safe and easy.

The safest MV switchgear in its class

This three-position scheme provides an integrated cable test feature, implemented by dedicated earthed rods, accessible from the front, without needing to enter the cable box or dismantle cable terminations.

Flexibility

A compact and modular design for all functions

Premset is a range of functional switchgear, with the added advantages of a simplified and modular architecture. The end result is a system that is easy to choose, easy to use, and cost effective, facilitating both installation and modifications.

Fast, stress-free installation, upgrading, and maintenance

Because the range uses the same design for every configuration, customising the switchgear to your needs is easier than ever before. And with its standardised dimensions, reduced footprint, and simple front power connections, time and money spent installing Premset switchgear is greatly reduced.

Modular combination

Optimized circuit breakers

Every aspect of the system is designed with the intention of making installation and adaptations as seamless as possible, including:

- **Straightforward** assembly with identical busbar and cable connections for the entire range
- **Easy-to-install** patented universal flat power connection system
- **Easy cabling** since all cable connections are at a height of 700 mm
- Associated with innovative maintenance program for your total peace of mind

Upgrading is easy, using the same auxiliaries, accessories and monitoring devices for the entire range. 'Plug and play' design also allows on-site additions without any special training, tools, or adjustments.

Lastly, end-of-life management is easier, because SF6-free design eliminates worries about future regulations, greatly reducing labour and administrative considerations.

Premset Maintenance & Service program:

Reduction of total cost of ownership and easy budget control
- Optimized maintenance program according to the installation environment and operation conditions
- Total budget control through services agreement

Improved availability & "best in class" life time of equipment
- Preventive maintenance adapted to local operation conditions will ensure extended life time of the equipment
- Specific predictive maintenance program, linked with the high technology design of Premset, will help to know and act before any serious failure occurs (diagnostic of metallic painting, diagnostic of ageing & circuit breaker...)

These programs will contribute to the reduction of down time and critical loss and to the improved safety & security

Peace of mind due to our reactivity commitment
- Through our services agreement, we assure a total peace of mind: even a failure occurs, our Field Services Engineers will go on site within the defined time in the agreement to fix the issue and change parts if needed.

3 ways

that total cost of ownership (TCO) is reduced:

1. **Up to 30%**
   The increase in life expectancy due to the absence of pressurised gases.
2. **Trouble-free installation**
   With a reduction of up to 50% in footprint.
   (Circuit breaker is up to two times smaller than existing Air Insulated Switchgears.)
3. **Easy cabling**
   All cables connections are aligned in front at a height of 700 mm. Extended possibilities of cable entry arrangements: bottom-front, bottom-rear, top-rear etc.

Contents

Presentation

PM100595

Shielded Solid Insulation System

Shielded Solid Insulation System

The entire main circuit is solid insulated with epoxy or EPDM, eliminating all live parts in free air:
- Insensitive to harsh environments (humidity, dust, pollution, etc.)
- Drastic reduction of risk of phase-to-phase faults.

The solid insulation is shielded, i.e. its surface is at earth potential everywhere (no electrical field in free air):
- System is “accidentally touchable” in accordance with PA class of IEC 62271-201
- No need for regular cleaning of the insulation surface
- Extended life expectancy.

All functions with shielded solid insulation have a longer life expectancy, including the M06S compact metering unit.

Innovative single line diagram, new arrangement of main functions

The Premset single line diagram is composed of:
- **Disconnecting load break switch or disconnecting circuit breaker using vacuum interrupters**
- **Earthing switch within sealed tank with air at atmospheric pressure**
  - MV cables can be directly earthed, via fault-making earthing switch, without the contribution of any other device
  - the arrangement of two devices in series provides double isolation between busbars and cables
  - the system does not contain SF6 and is RoHS compliant, for your total peace of mind regarding end of life treatment and environmental concerns.

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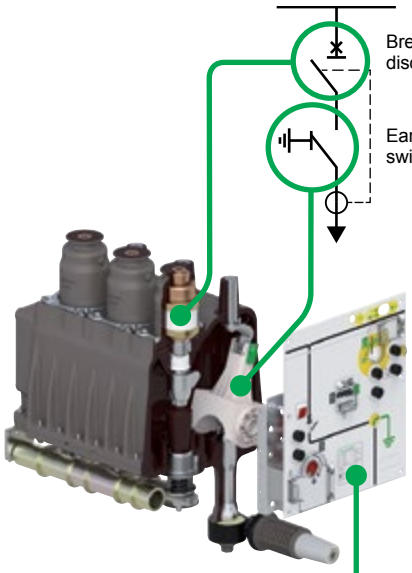

“3 in 1” integrated core units

All the necessary functions: breaking, disconnection and earthing, are embedded in a single device:
- Simple operation, with just 3 positions for all units: connected – opened & disconnected – earthed
- Intuitive mimic diagram, with two clear and reliable indicators (in accordance with IEC 62271-102)
- All safety interlocks between functions are built-in as standard, positively driven, failsafe and without keys.

This applies to all types of circuit breakers and load-break switches.

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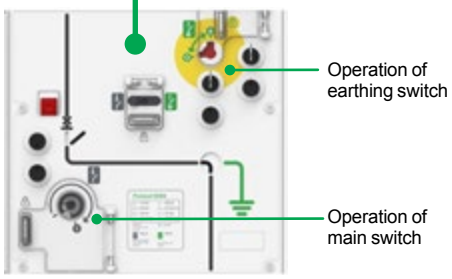


Consistent range of switches and circuit breakers to suit any application

The range of core units is composed of 2 switches and 4 circuit breakers:
- I06T: simple load-break switch for cable incomers or feeders
- I06H: fast closing switch for transfer between multiple sources
- D01N and D02N: fast clearing circuit breakers for fuseless MV/LV transformer overcurrent protection
- D06N: simple circuit breaker for general protection
- D06H: O-CO heavy duty circuit breaker with reclosing capacity for line protection.

Modular system architecture, simplifying installation and upgrading

The entire range of core units is optimised for dedicated applications, sharing:
- Same dimensions and footprint, 375 mm width in particular
- Same auxiliaries such as electrical operation devices, accessories and options
- Same easy operation and possibility of installation against a wall
- Extensive cable entry possibilities including bottom-front, bottom-rear, top-rear, etc.
- Same cable connections with type C bushings, 700 mm high.

The latter is applicable as well to other units, such as:
- Compact metering M06S with shielded solid insulation
- Direct incomers G06
- Voltage transformers VTM, VTP, VTM-D, VTP-D.

Presentation

Innovative auxiliary features

Live cable interlock:
- Electrical interlock to prevent the earthing of live cables.

Cable test device, interlocked with earthing switch, simplifying cable testing and diagnosis:
- Cable testing without accessing cable box or dismantling cable connections
- Test device connection from the front of the switchboard, while cables remain earthed
- Failsafe interlocks with earthed star point.

Circuit breaker testing with dedicated device for primary injection:
- Primary test current injection without disconnecting CTs or modifying relay settings.

New controller for source changeover.

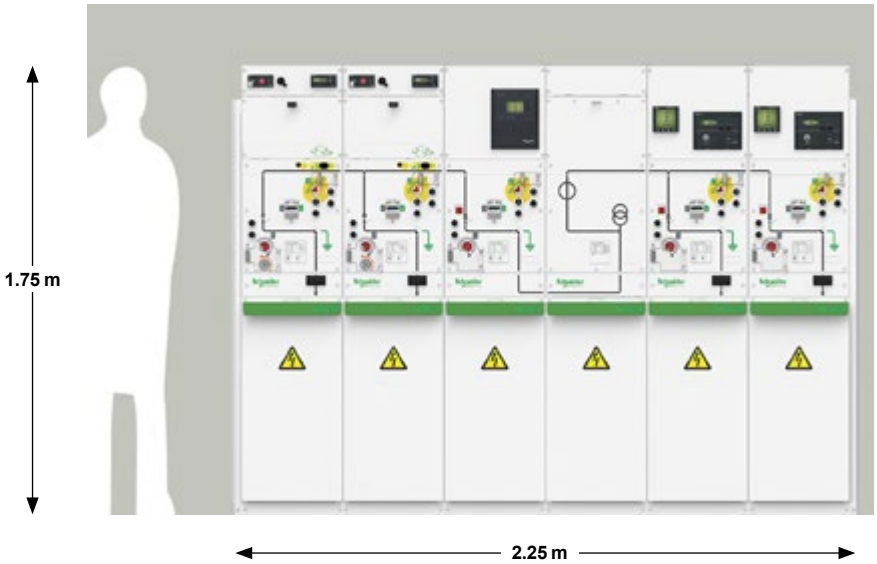
Ready for smart grids

D06H heavy duty circuit breaker:
- Dedicated to line management (with reclosing capacity and O-CO cycle)
- Very small footprint (375 mm width).

Built-in self-powered protection, embedding communication

Integrated metering and power measurement functions:
- Compact metering unit with 375 mm width and shielded solid insulation
- Integration of power measurement in feeders without additional space.

Feeder automation features:
- Modular architecture for scalable solutions (distributed intelligence)
- Linked by field bus using standard RJ45 Modbus protocol
- Easy to integrate in SCADA systems via multiple protocols (IEC 61850)
- Embedded web interface.



Architecture and components

Premset switchboards are made up of functional units, each representing a type-tested assembly composed of a basic core unit and other functional blocks designed to work together in any combination.

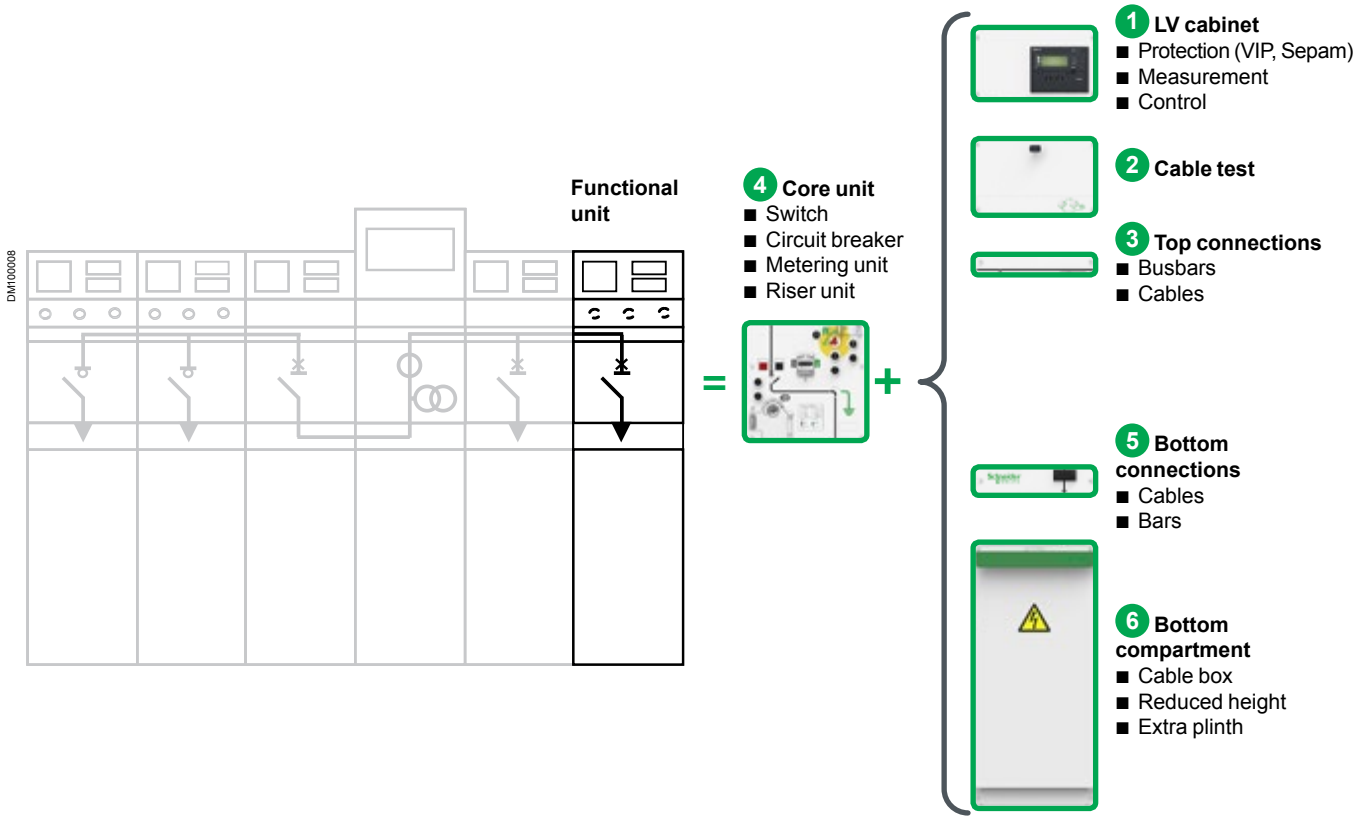
The core units are optimised for each typical application and the assembly forms a totally insulated functional unit insensitive to the environment.

This Premset medium voltage system makes it possible to meet most of your application needs.

- Flexibility and simplicity in the design of functional units for any application
- Safety and reliability of type-test assemblies
- Space savings
- Freedom from environmental constraints
- Shorter delivery and the possibility of making last minute modifications
- Easy extension and upgrades.

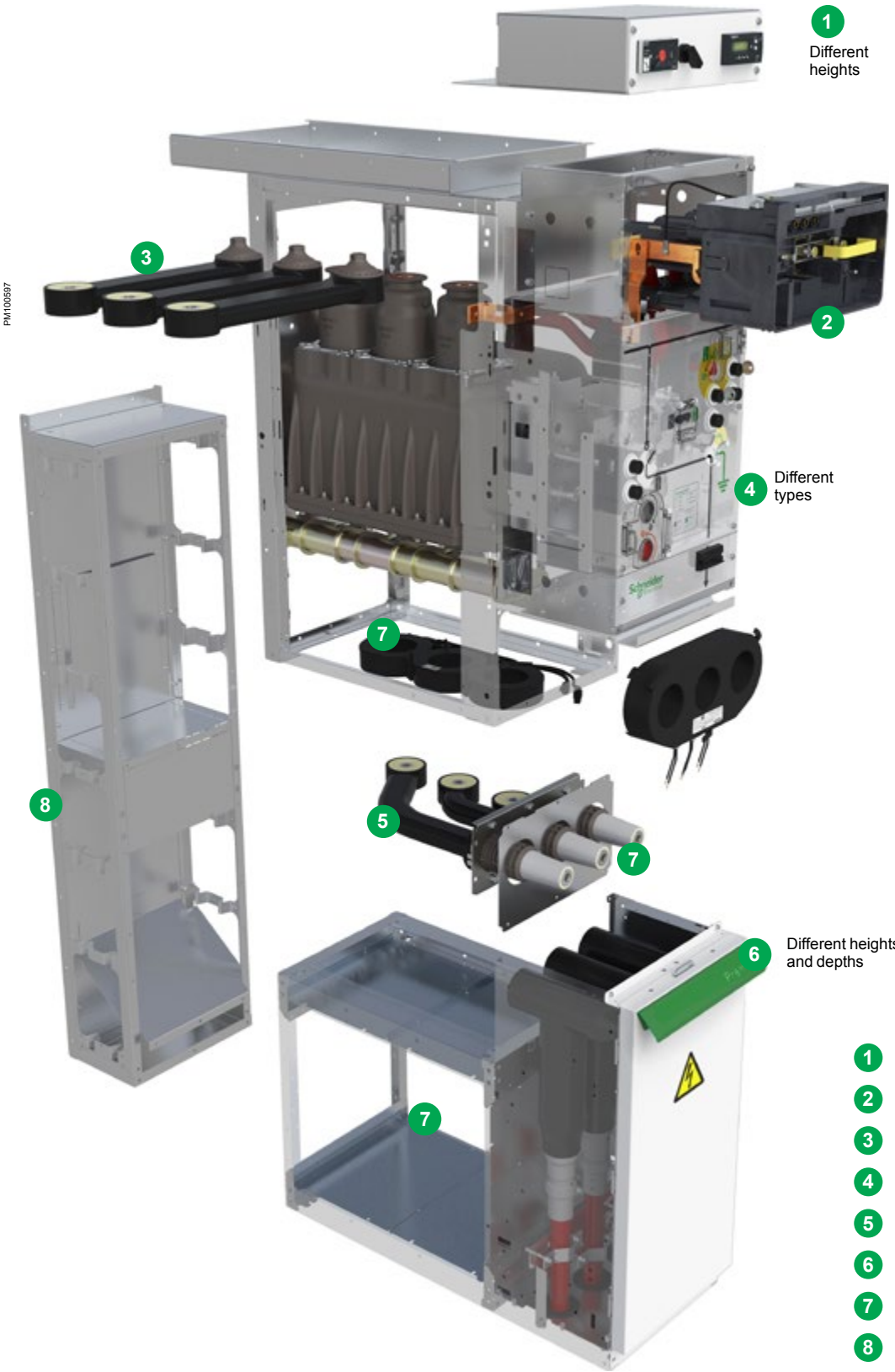
Switchboard

Functional unit = An assembly of functional blocks



Architecture and components

Unsurpassed simplicity with mix-and-match modular architecture based on functional blocks



1. Low Voltage cabinet
2. Cable test
3. Top connections
4. Core unit
5. Bottom connections
6. Bottom compartment
7. Sensors (CTs and VTs)
8. Gas exhaust duct

Architecture and components

Unsurpassed safety and reliability with 2SIS Shielded Solid Insulation System

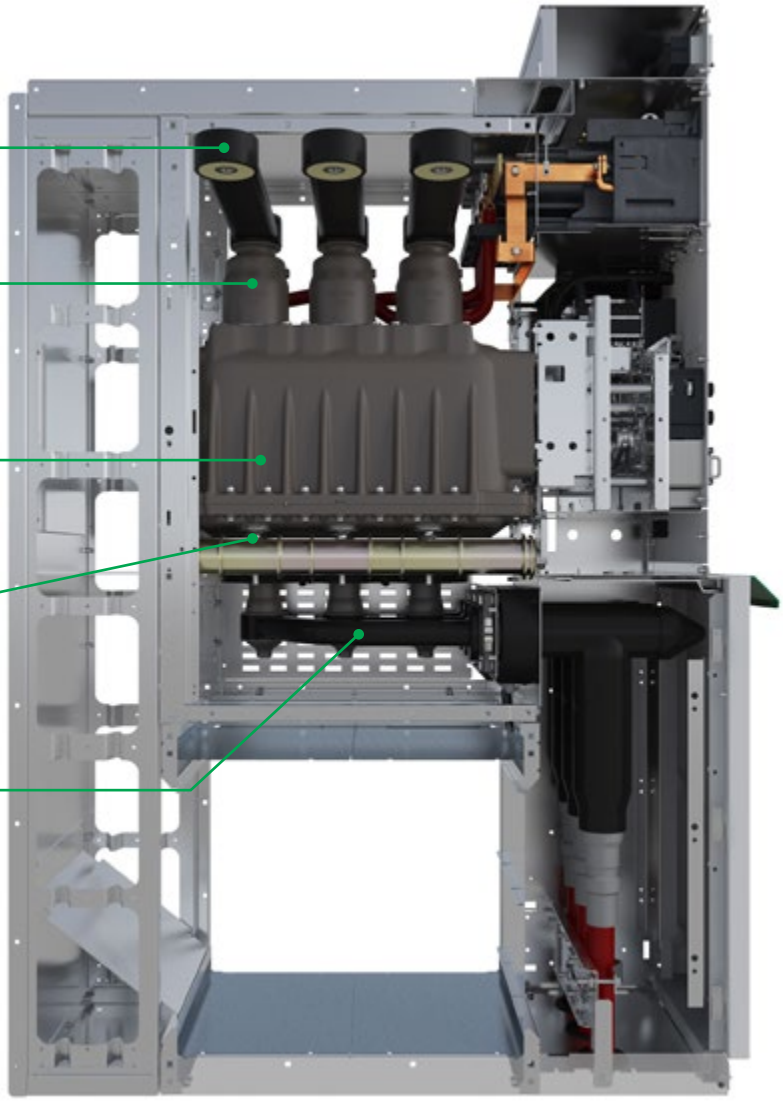
Modular **busbar system** with shielded solid insulation

Vacuum bottles with shielded solid insulation for breaking and disconnection

Integrated air-insulated earthing switch enclosed in tank with shielded solid insulation

Built-in voltage and current **sensors** for optimised protection and control, available in versions with shielded solid insulation where required

Front aligned cable **connections** with shielded solid insulation, designed for easy clamping



PM100598

Architecture and components

Current and voltage transformers integrated in main functions

1

Current transformers located under the core unit
- Dedicated current transformer for VIP integrated self-powered protection (CuaCUb)
- Low power current transformer for Sepam or any conventional relay (TLPU1)
- 1 A ring-type current transformer for Sepam or any conventional relay (ARU2).

2

Current transformers located around bushings
- Zero sequence current transformer for VIP high sensitivity earth fault protection (CSHU)
- Measurement current transformer for fault passage indication and power measurement (ARU1)
- Zero sequence current sensors (CTR2200).

3

Current transformers located around cables
- Ring-type current transformer for power measurement or metering (ARC6)
- Earth fault toroidal current transformer for high sensitivity earth fault protection (CSH120/200)
- Zero sequence currents sensors (MF1).

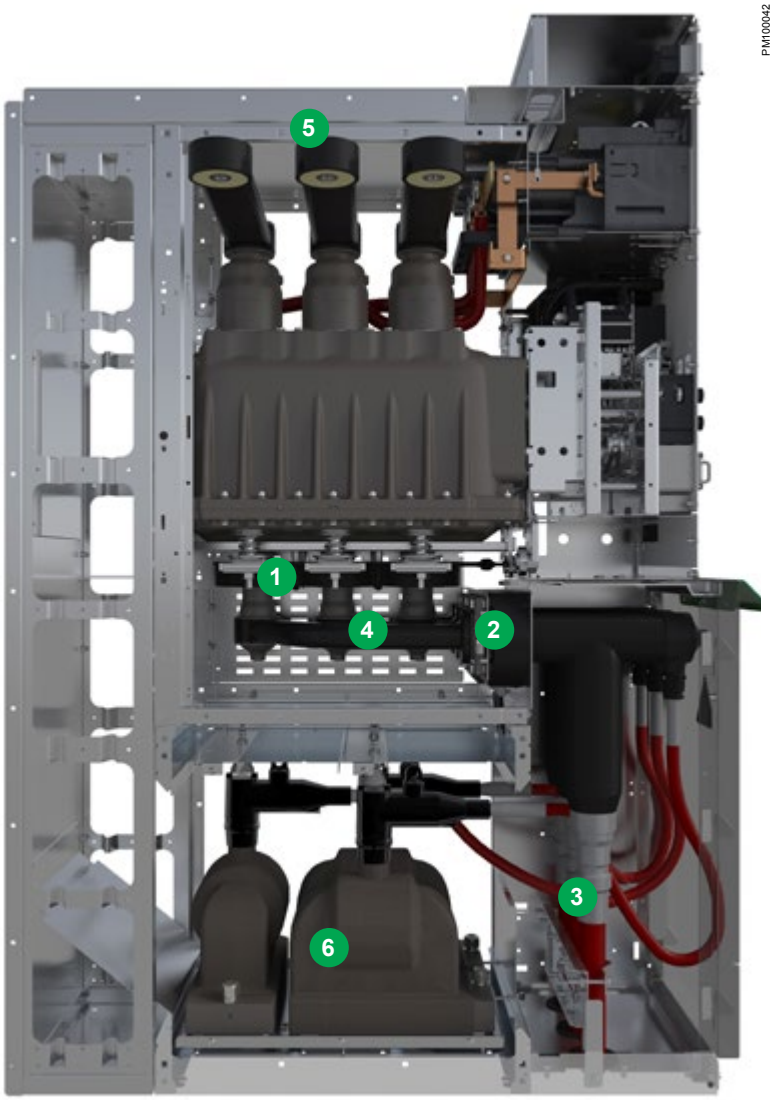
4

Low Power Voltage Transformers located under the core unit or

5 **in the busbar system**
- Low Power Voltage Transformer for protection or measurement (VLPU1).

6

Voltage transformers located behind the cables
- Phase-to-earth voltage transformers (VRT4).



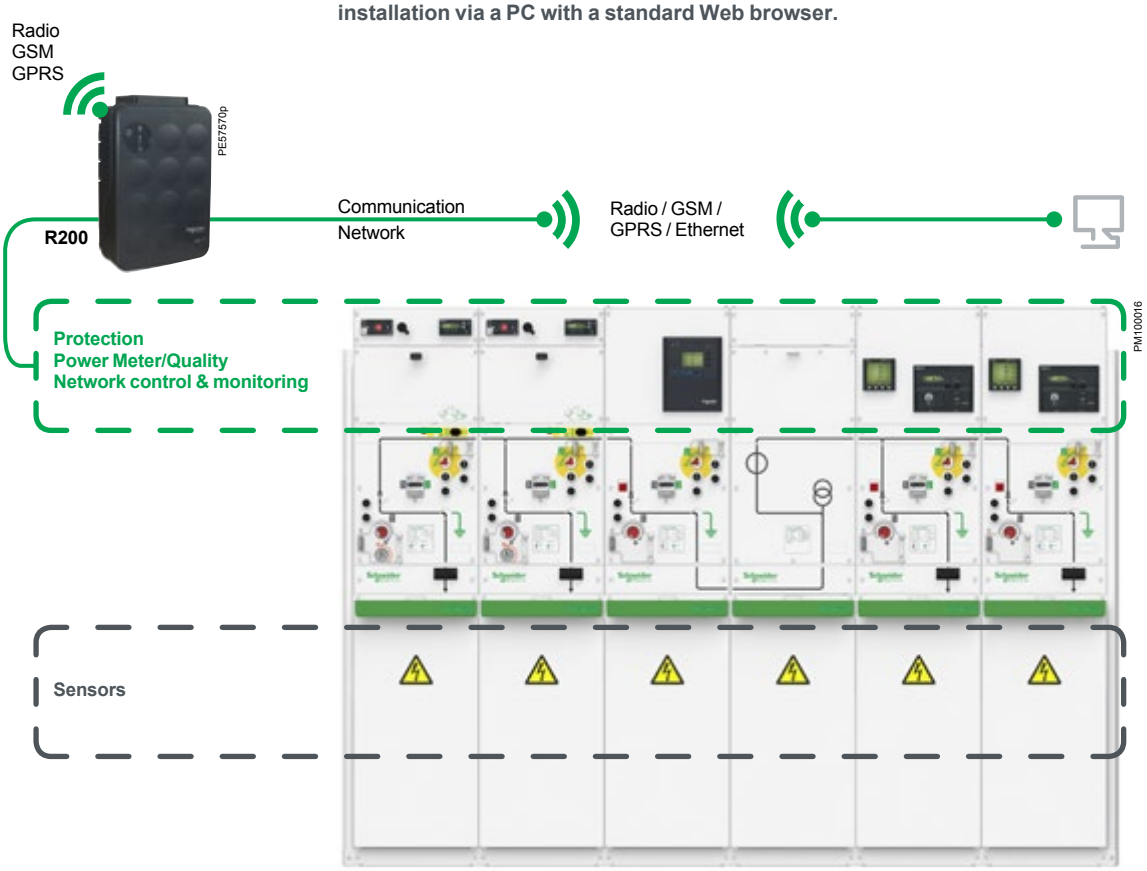
PM100042

Distributed intelligence

With Premset, intelligence can be added to functional units by integrating protection, control and monitoring IEDs (Intelligent Electrical Devices).

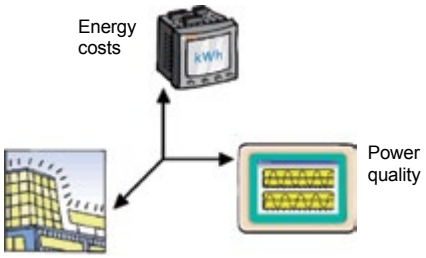
The IEDs have dedicated locations and cabling and are daisy-chained throughout the various functional units using RJ45 connectors and Modbus protocol.

A gateway can be used to connect the IEDs to supervision systems via Ethernet, TCP-IP and/or radio-frequency communication. Premset is Web-enabled to let you access information on your electrical installation via a PC with a standard Web browser.



Distributed intelligence

DM100033



Energy quality applications

Premset switchboards are designed to integrate distributed intelligence for feeder automation, protection and energy quality applications.

1 - Fault detection
- Fault Passage Indicators: **Flair 21D/22D, Flair 23DM**
- Voltage indicators: **VPIS, VDS**
- Voltage relay: **VD23**

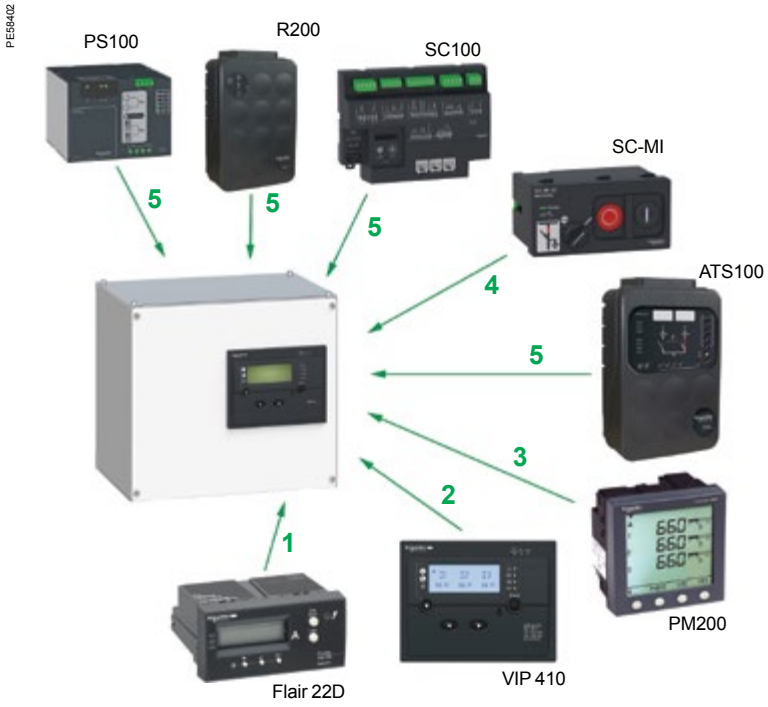
2 - Protection
- Self-powered: **VIP 40 and VIP 45, VIP 400 and VIP 410**
- Auxiliary powered: **Sepam and Micom ranges**

3 - Measurement
- Ammeter: **AMP21D**
- Power Meter: **PM200**
- Power/Quality Meter: **PM800**

4 - Local control
- Motor control: SC100
- Control panel: SC-MI

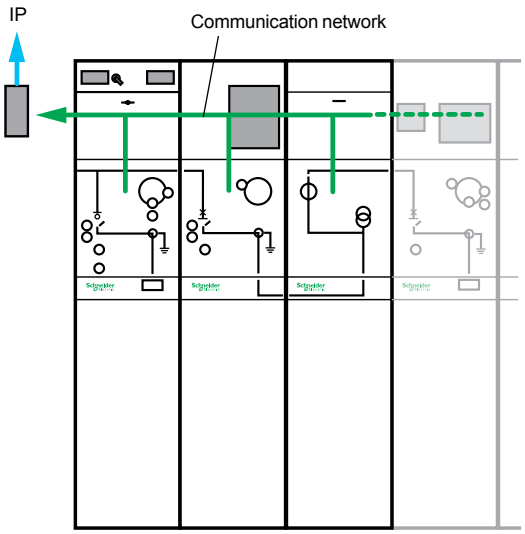
5 - Remote control
- Embedded intelligent devices
- Switch controller for local communication network: **SC100**
- Switch controller for remote communication network : **SC110**
- Remote communication network (GSM/GPRS/Ethernet/Radio): **R200**
- Automatic Transfer System: **ATS100**
- Backup power supply: **PS100**.

PE58402



Distributed intelligence

DM100034

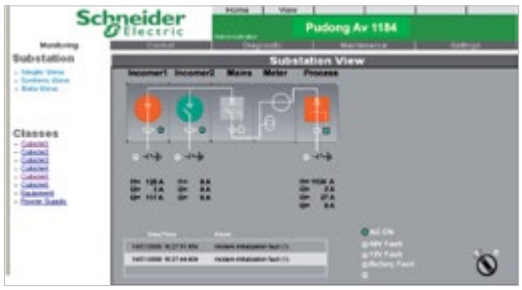


Distributed architecture for easy installation, operation and scalability

The IEDs (Intelligent Electrical Devices) used in the Premset system have been designed **to optimise substation performance and compactness**.
They can be used to build a robust distributed architecture suited to harsh environments.

- **Modular architecture** for scalable solutions from local control up to complex feeder automation, optimising cost and performance by letting you choose only what you need
- Each IED is **fully integrated in a functional unit** with a dedicated location and cabling
- **Pre-engineered, pre-tested and cost effective**, the system includes the necessary sensors, switchgear interfaces, power supplies, communication solutions and HMIs
- **Easy integration** based on field bus communication between IEDs with a plug and play system that scans and configures the system
- The field bus uses standard RJ45 Modbus protocol open to third-part devices
- Each IED has a compatible XML description file based on CIM (Common Information Model) / IEC 61850 standard. This allows easy configuration to communicate with any RTU (Remote Teminal Unit) or SCADA (Supervisory Control And Data Acquisition) system.

PE58300



Ready for smart grids

In the 80s and 90s, RTUs (Remote Terminal Units) were mainly used in feeder automation applications to improve energy availability and reduce the number and duration of outages. Today RTUs have evolved to integrate functions such as automatic meter reading and load management.

Ready for the future, the Premset system R200 RTU has downloadable firmware to keep pace with these and other evolving possibilities of smart grids.

Web technology

Premset integrates Web technologies so that access to information on your electrical installation is as easy as opening a Web page.

All you need is a standard Web browser and a PC connected via:

- Your local area network
- A pluggable connection to the Premset switchboard
- A mobile network access (3G, GPRS, etc.).

PM100576

VIP 400/410

VIP self-powered protection relay for higher MV network availability

VIP relays are self-powered while Sepam relays require an auxiliary power supply. Self-powered protection relays increase the availability of the MV network and are perfectly suited to most applications.

- Insensitive to voltage drop due to faults
- Not dependent on UPS systems
- Less dependent on the external environment (EMC, LV overvoltages) because they require no external connections.

In addition, the VIP 410 offers enhanced sensitivity to low earth-fault currents and provides additional diagnostics with time-stamped logs thanks to a dual power supply and a communication port.

PM100573

VIP 40/45

Circuit breaker for improved MV/LV transformer protection

With the VIP 40/45, Premset circuit breakers provide MV/LV transformers superior protection compared to traditional MV switch-fuse solutions - at an equivalent lifetime cost. The main advantages are:

- Better discrimination with other MV and LV protection devices
- Improved protection performance for inrush current, overloads, low magnitude phase-faults and earth-faults
- Greater harsh climate withstand.
- Fast clearing time, to limit the consequences of internal arcing in the transformer.

Distributed intelligence

PE57785

Flair FPI

Auto-adapting Fault Passage Indicator with remote communication for higher power network availability

The Flair range offers cost-effective auto-adapting fault passage indicators (FPI) that can be fully integrated in the cubicle.
In addition to the Flair 21D /22D self-powered FPIs, the range includes the Flair 23DM , a powerful IED with a communication port.

- The Flair 23DM is linked to the voltage presence indication system (VPIS) to confirm faults by undervoltage instead of current measurement, thereby avoiding transient faults
- The Flair 23DM provides an integrated output voltage relay for automatic transfer switch (ATS100) or other applications
- Phase fault and standard earth fault detection are maintained even if the power supply is lost. The auxiliary power supply is only needed for communication and the voltage presence relay
- The communication port provides the current values, records diagnostic information (voltage drops, transient fault indications) and makes it possible to modify settings remotely.

PE88030

Sepam

Sepam protection and control units

Sepam series 20 and series 40 digital protection relays take full advantage of Schneider Electric's experience in electrical network protection to meet your needs.

- Effective protection of life and property
- Accurate measurements and detailed diagnostics
- Integral equipment control
- Local or remote indication and operation

The Sepam range complies with IEC 61850.

PM100592

PS100

Backup power supply for MV/LV substations

Backup power supplies (UPSs or batteries) are now common in industrial and commercial premises. However, they often represent a weak link in the power supply chain and their failure can have serious consequences.
Given the harsh environment and critical nature of substations, the Premset system includes the PS100, a dedicated solution with a high insulation level designed to provide 24 hours of backup power to electronic devices.

Maintenance is easy with:

- Just one battery to replace
- End-of-life alarm possible via Modbus communication.

VLPU1 (*) voltage sensors (LPVTs) for load management

Traditional voltage sensors are used for protection and tariff metering. With the advent of smart grids, there is a growing need for voltage sensors in MV substations for load management applications.

Traditional VTs are not suitable because of their size, certain ferroresonance problems that can appear and above all the necessity of disconnecting them for cable or cubicle power frequency tests.

Low Power Voltage Transformers (LPVT) provide a compact and cost-effective protection and measurement solution without the drawbacks of traditional VTs. They offer a wide operating range, avoiding the difficulty of choosing the right VT. For all these reasons, the VLPU1 (LPVT type) sensors are the ideal solution for Premset switchboards.

PM100587

LPCT

LPCTs for Sepam

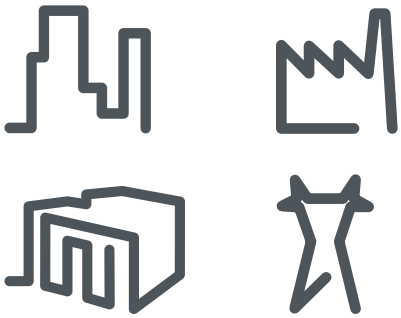
Low Power Current Transfomers (LPCT) use optimised technology that offers a number of advantages in Premset cubicles.

- Simpler selection: a single sensor can be used for both measurement and protection over the entire range of operating currents
- Easy and safe installation: the LPCT output is plugged directly into the Sepam relay with no risk of overvoltage when disconnecting
- Flexibility of use: easy adaptation to changes in power levels and/or protection settings during MV system design or service life
- High accuracy up to the short-time circuit current with low saturation
- Compact design: small size and weight allows easy integration in Premset cubicles.

(*) Consult us for availability

Contents

Main applications



Why Premset?

Premset switchboards are modular and insensitive to harsh environments.

For these reasons, they offer the highest reliability and efficiency for a wide range of applications.

Typical applications

Premset applications can be found in all Medium Voltage secondary distribution substations.

Buildings and industry

- MV/MV consumer substation direct connection
- MV/LV consumer substation double feeder
- MV/LV consumer substation loop connection
- MV/LV consumer substation radial connection
- MV/LV consumer substation with MV backup
- MV private network
- MV/LV substation.

Distribution networks

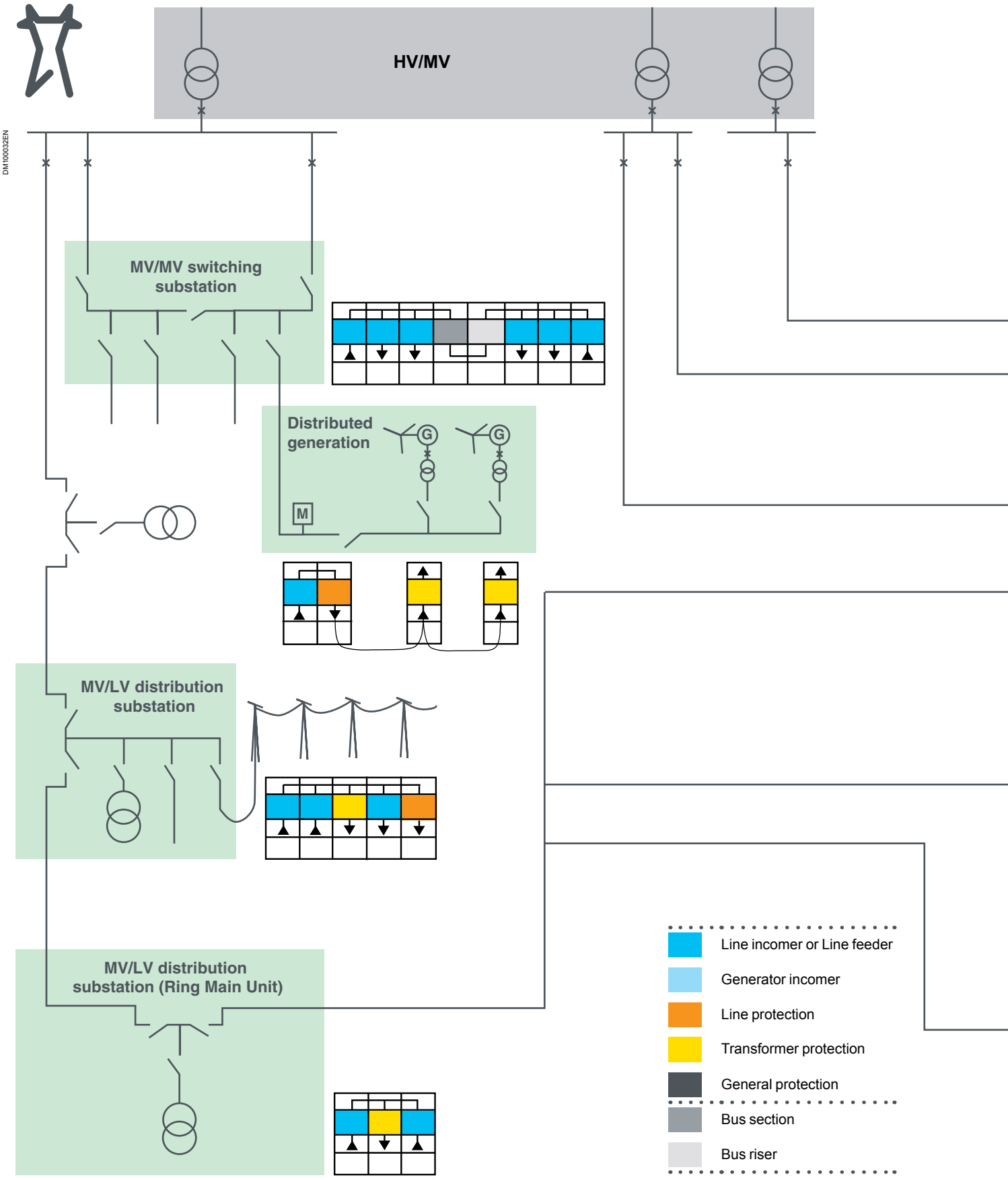
- MV/MV switching substation
- MV/LV distribution substation
- MV/LV Ring Main Unit
- MV distributed generation.

Premset advanced communication possibilities open the way to applications such as:

- Local control up to complex feeder automation
- MV Automatic Transfer System (ATS)
- RTU with new Smart Grid functions for load management.

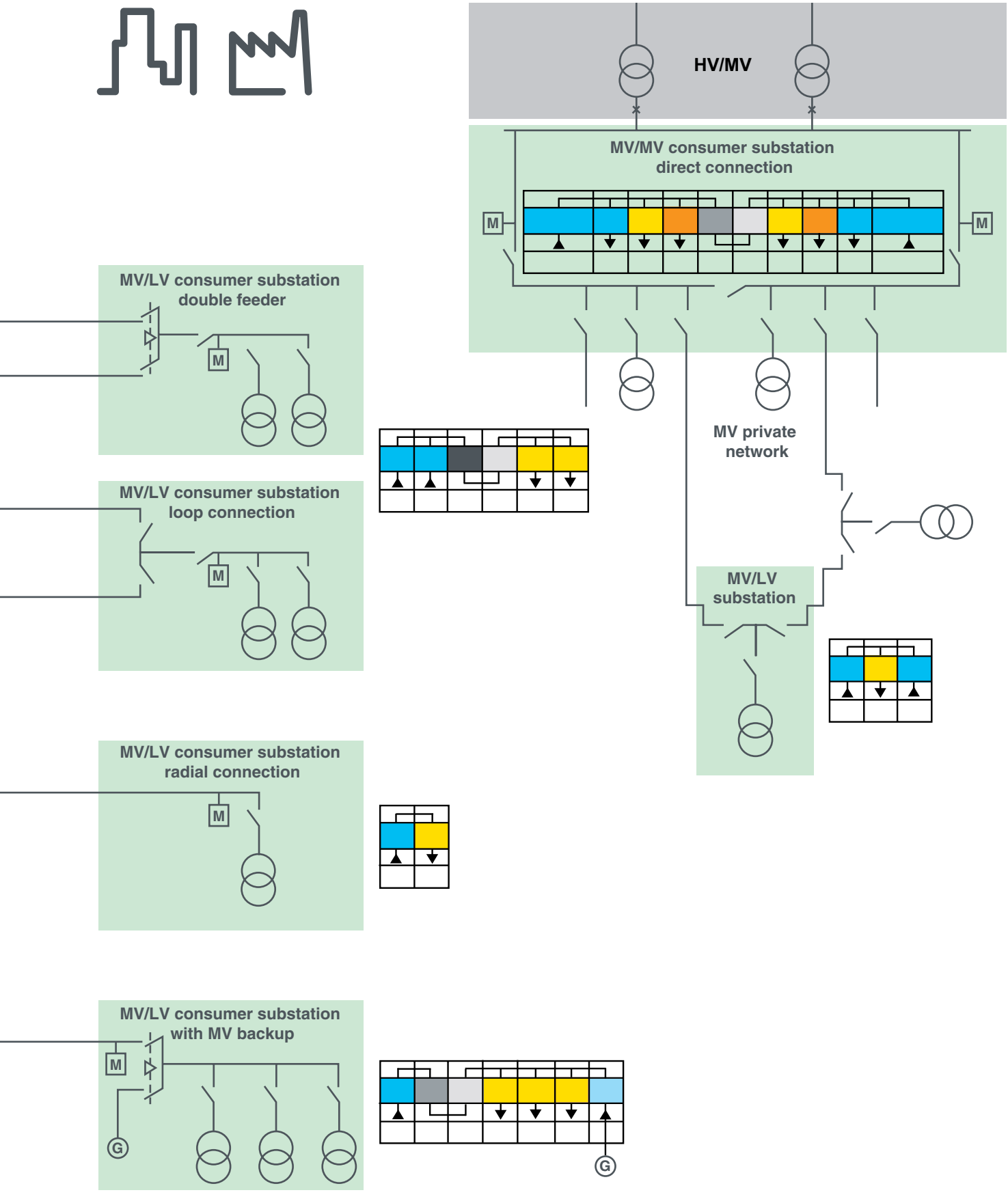
Main applications

Distribution network selection chart

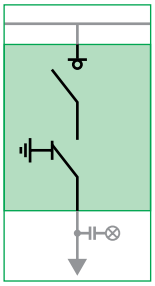
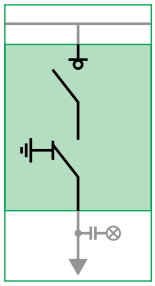
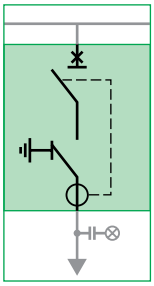
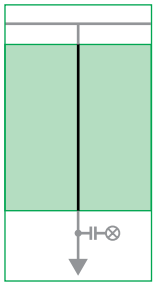


Main applications

Buildings & Industry selection chart



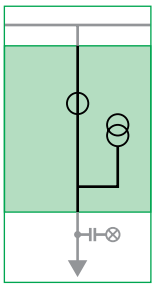
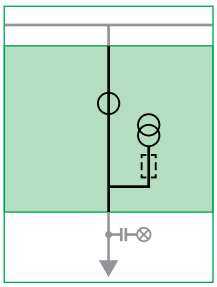
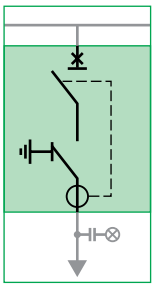
Incomer and feeder functions

Function			Line incomer/ Line feeder			
Single-line diagram						
Core unit type			**I06T**	**I06H**	**D06H**	**G06**
See details ▶		*Page*	*38*	*39*	*42*	*43*
Core unit			Disconnecting switch with lever-operated mechanism and integrated earthing switch	Disconnecting switch with stored-energy OCO mechanism and integrated earthing switch	Disconnecting circuit breaker with stored-energy OCO mechanism and integrated earthing switch	Direct connection to busbars
Earthing switch			□ (*)	■	□ (*)	
Cable testing device		*81*	■	■	■	
Live cable interlock (*)		*65*	□	□	□	
Protection (only one option possible)						
VIP 40/45	Self-powered	*54*				
VIP 400	Self-powered	*55*			□	
VIP 410	Dual powered	*55*			□	
Sepam 20	Auxiliary powered	*57*			□	
Sepam 40	Auxiliary powered	*57*			□	
Fault passage indicator (only one option possible)						
Flair 21/22D	Fault passage indicator	*61*	□	□		□
Flair 23DM	Fault passage indicator	*61*	□	□		□
Integrated measurement (only one option possible)						
AMP21D	Ammeter	*66*	□	□		□
PM200	Power Meter	*67*	□	□	□	□
PM800	Power/Quality Meter	*67*	□	□	□	□
Control						
Electrical operation		*70*	□	□	□	
Additional opening coil (MX or MN)		*70*		□	□ (1)	
Auxiliary contacts		*70*	□	□	□	
Voltage indication (only one option possible)						
VPIS or VDS	Voltage indication	*63*	□	□	□	□
VD23	Voltage relay	*64*	□	□	□	
Metering current transformers (only one option possible)						
ARC5	Ring CTs	*48*				
AD12	DIN CTs	*48*				
ARM3	Block CTs	*48*				
Metering voltage transformers (only one option possible)						
Phase-to-earth						
VRU1	Screened VTs	*49*				
VDF11	DIN VTs	*49*				
VRQ2	Block VTs	*49*				
VRT4	Screened VTs	*60*	□	□	□	□
Phase-to-phase						
VDC11	DIN VTs	*49*				
VRC2	Block VTs	*49*				
VRU2	Auxiliary power	*49*				
VT protection						
Fuses						

■ Compulsory
□ Optional
(*) Core units without earthing switch: consult us for availability

(1) Possible only with VIP

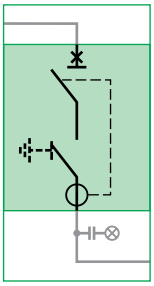
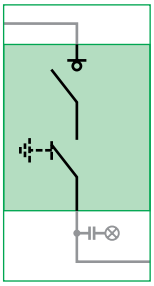
Incomer and feeder functions

Function			Line incomer/ Line feeder		Generator incomer
Single-line diagram					
Core unit type			**M06S**	**M06A**	**D06H**
See details ▶		*Page*	*44*	*45*	*42*
Core unit			Solid-insulated earth-screened metering unit	Air-insulated metering unit (750 mm wide)	Disconnecting circuit breaker with stored-energy OCO mechanism and integrated earthing switch
Earthing switch					□ (*)
Cable testing device		*81*			■
Live cable interlock (*)		*65*			□
Protection (only one option possible)					
VIP 40/45	Self-powered	*54*			
VIP 400	Self-powered	*55*			□
VIP 410	Dual powered	*55*			□
Sepam 20	Auxiliary powered	*57*			□
Sepam 40	Auxiliary powered	*57*			□
Fault passage indicator (only one option possible)					
Flair 21/22D	Fault passage indicator	*61*			
Flair 23DM	Fault passage indicator	*61*			
Integrated measurement (only one option possible)					
AMP21D	Ammeter	*66*			
PM200	Power Meter	*67*			□
PM800	Power/Quality Meter	*67*			□
Control					
Electrical operation		*70*			□
Additional opening coil (MX or MN)		*70*			□ (1)
Auxiliary contacts		*70*			□
Voltage indication (only one option possible)					
VPIS or VDS	Voltage indication	*63*	□	□	□
VD23	Voltage relay	*64*			□
Metering current transformers (only one option possible)					
ARC5	Ring CTs	*48*	□		
AD12	DIN CTs	*48*		□	
ARM3	Block CTs	*48*		□	
Metering voltage transformers (only one option possible)					
Phase-to-earth					
VRU1	Screened VTs	*49*	□		
VDF11	DIN VTs	*49*		□	
VRQ2	Block VTs	*49*		□	
VRT4	Screened VTs	*60*			□
Phase-to-phase					
VDC11	DIN VTs	*49*		□	
VRC2	Block VTs	*49*		□	
VRU2	Auxiliary power	*49*			
VT protection					
Fuses				□	

■ Compulsory
□ Optional
(*) Consult us for availability

(1) Possible only with VIP

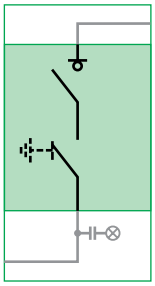
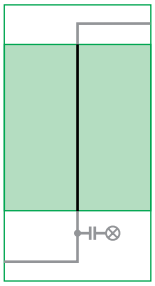
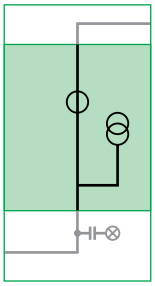
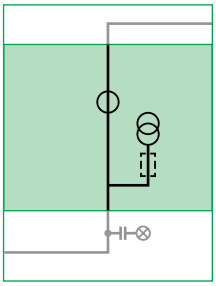
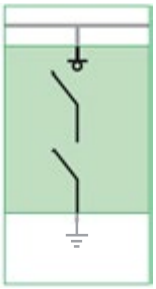
Busbar sectionaliser functions
(Bus section + Bus riser)

Function			Bus section	
Single-line diagram				
Core unit type			**D06H**	**I06T**
See details ▶		*Page*	*42*	*38*
Core unit			Disconnecting circuit breaker with stored-energy OCO mechanism and integrated earthing switch	Disconnecting switch with lever-operated mechanism and integrated earthing switch
Earthing switch			□ (1)	□ (*)
Cable testing device		*81*		
Live cable interlock (*)		*65*		
Protection (only one option possible)				
VIP 40/45	Self-powered	*54*		
VIP 400	Self-powered	*55*	□	
VIP 410	Dual powered	*55*	□	
Sepam 20	Auxiliary powered	*57*	□	
Sepam 40	Auxiliary powered	*57*	□	
Fault passage indicator (only one option possible)				
Flair 21/22D	Fault passage indicator	*61*		
Flair 23DM	Fault passage indicator	*61*		
Integrated measurement (only one option possible)				
AMP21D	Ammeter	*66*		
PM200	Power Meter	*67*		
PM800	Power/Quality Meter	*67*		
Control				
Electrical operation		*70*	□	□
Additional opening coil (MX or MN)		*70*	□	
Auxiliary contacts		*70*	□	□
Voltage indication (only one option possible)				
VPIS or VDS	Voltage indication	*63*	□	□
VD23	Voltage relay	*64*	□	□
Metering current transformers (only one option possible)				
ARC5	Ring CTs	*48*		
AD12	DIN CTs	*48*		
ARM3	Block CTs	*48*		
Metering voltage transformers (only one option possible)				
Phase-to-earth				
VRU1	Screened VTs	*49*		
VDF11	DIN VTs	*49*		
VRQ2	Block VTs	*49*		
Phase-to-phase				
VDC11	DIN VTs	*49*		
VRC2	Block VTs	*49*		
VRU2	Auxiliary power	*49*		
VT protection				
Fuses				

■ Compulsory
□ Optional
(*) Consult us for availability

(1) Core units without earthing switch: consult us for availability

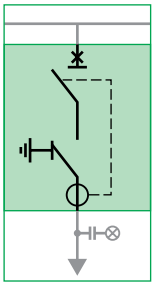
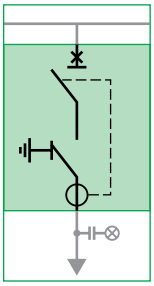
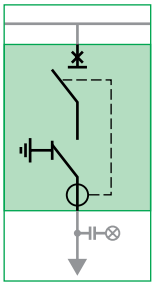
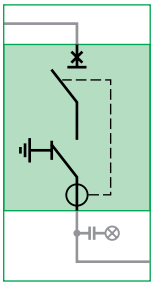
Busbar sectionaliser functions
(Bus section + Bus riser)

Function			+ Bus riser				Busbar earthing
Single-line diagram							
Core unit type			**I06T**	**G06**	**M06S**	**M06A**	**ES-B**
See details ▶		*Page*	*38*	*43*	*44*	*45*	*43*
Core unit			Disconnecting switch with lever-operated mechanism and integrated earthing switch	Direct riser to busbar	Solid-insulated earth-screened metering unit	Air-insulated metering unit (750 mm wide)	Earthing switch for busbar earthing
Earthing switch			□ (1)				
Cable testing device		*81*					
Live cable interlock (*)		*65*					
Protection (only one option possible)							
VIP 40/45	Self-powered	*54*					
VIP 400	Self-powered	*55*					
VIP 410	Dual powered	*55*					
Sepam 20	Auxiliary powered	*57*					
Sepam 40	Auxiliary powered	*57*					
Fault passage indicator (only one option possible)							
Flair 21/22D	Fault passage indicator	*61*					
Flair 23DM	Fault passage indicator	*61*					
Integrated measurement (only one option possible)							
AMP21D	Ammeter	*66*					
PM200	Power Meter	*67*					
PM800	Power/Quality Meter	*67*					
Control							
Electrical operation		*70*	□				
Additional opening coil (MX or MN)		*70*					
Auxiliary contacts		*70*	□				□
Voltage indication (only one option possible)							
VPIS or VDS	Voltage indication	*63*	□	□	□	□	
VD23	Voltage relay	*64*	□				
Metering current transformers (only one option possible)							
ARC5	Ring CTs	*48*			□		
AD12	DIN CTs	*48*				□	
ARM3	Block CTs	*48*				□	
Metering voltage transformers (only one option possible)							
Phase-to-earth							
VRU1	Screened VTs	*49*			□		
VDF11	DIN VTs	*49*				□	
VRQ2	Block VTs	*49*				□	
Phase-to-phase							
VDC11	DIN VTs	*49*				□	
VRC2	Block VTs	*49*				□	
VRU2	Auxiliary power	*49*					
VT protection							
Fuses						□	

■ Compulsory
□ Optional
(*) Consult us for availability

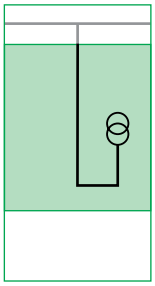
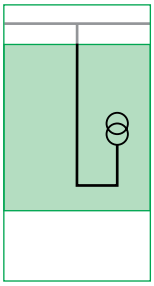
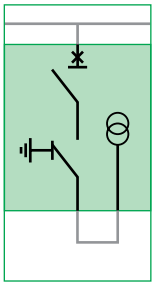
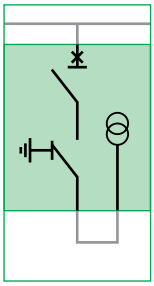
(1) Core units without earthing switch: consult us for availability

Protection functions

Function			Line protection	MV/LV transformer protection 100 A	MV/LV transformer protection 200 A	General protection
Single-line diagram						
Core unit type			**D06H**	**D01N**	**D02N**	**D06N**
See details ▶		*Page*	*42*	*40*	*40*	*41*
Core unit			Disconnecting circuit breaker with stored-energy OCO mechanism and integrated earthing switch	Disconnecting circuit breaker with latching mechanism and integrated earthing switch	Disconnecting circuit breaker with latching mechanism and integrated earthing switch	Disconnecting circuit breaker with latching mechanism and integrated earthing switch
Earthing switch			■	■	■	■
Cable testing device		*81*	■	□	□	□
Live cable interlock (*)		*65*	□	□	□	
Protection (only one option possible)						
VIP 40/45	Self-powered	*54*		□	□	
VIP 400	Self-powered	*55*	□	□	□	□
VIP 410	Dual powered	*55*	□	□	□	□
Sepam 20	Auxiliary powered	*57*	□	□	□	□
Sepam 40	Auxiliary powered	*57*	□			□
Fault passage indicator (only one option possible)						
Flair 21/22D	Fault passage indicator	*61*				
Flair 23DM	Fault passage indicator	*61*				
Integrated measurement (only one option possible)						
AMP21D	Ammeter	*66*				
PM200	Power Meter	*67*	□	□	□	□
PM800	Power/Quality Meter	*67*	□	□	□	□
Control						
Electrical operation		*70*	□	□	□	□
Additional opening coil (MX or MN)		*70*	□	□	□	□
Auxiliary contacts		*70*	□	□	□	□
Voltage indication (only one option possible)						
VPIS or VDS	Voltage indication	*63*	□	□	□	□
VD23	Voltage relay	*64*	□	□	□	□
Metering current transformers (only one option possible)						
ARC5	Ring CTs	*48*				
AD12	DIN CTs	*48*				
ARM3	Block CTs	*48*				
Metering voltage transformers (only one option possible)						
Phase-to-earth						
VRU1	Screened VTs	*49*				
VDF11	DIN VTs	*49*				
VRQ2	Block VTs	*49*				
Phase-to-phase						
VDC11	DIN VTs	*49*				
VRC2	Block VTs	*49*				
VRU2	Auxiliary power	*49*				
VT protection						
Fuses						

■ Compulsory
□ Optional
(*) Consult us for availability

Voltage transformer functions

Function			Voltage transformer			
Single-line diagram						
Core unit type			**VTM**	**VTP**	**VTM-D**	**VTP-D**
See details ▶		*Page*	*46*	*46*	*46*	*46*
Core unit			Metering voltage transformer: three 2SIS (1) phase-to-earth VTs	Auxiliary power voltage transformer: one 2SIS (1) phase-to-phase VT	Metering voltage transformer: three 2SIS (1) phase-to-earth VTs, with D01N circuit-breaker protection	Auxiliary power voltage transformer: one 2SIS (1) phase-to-phase VT, with D01N circuit-breaker protection
Earthing switch					■	■
Cable testing device		*81*				
Live cable interlock (*)		*65*				
Protection (only one option possible)						
VIP 40/45	Self-powered	*54*			■	■
VIP 400	Self-powered	*55*				
VIP 410	Dual powered	*55*				
Sepam 20	Auxiliary powered	*57*				
Sepam 40	Auxiliary powered	*57*				
Fault passage indicator (only one option possible)						
Flair 21/22D	Fault passage indicator	*61*				
Flair 23DM	Fault passage indicator	*61*				
Integrated measurement (only one option possible)						
AMP21D	Ammeter	*66*				
PM200	Power Meter	*67*				
PM800	Power/Quality Meter	*67*				
Control						
Electrical operation		*70*			□	□
Additional opening coil (MX or MN)		*70*			□	□
Auxiliary contacts		*70*			□	□
Voltage indication (only one option possible)						
VPIS or VDS	Voltage indication	*63*				
VD23	Voltage relay	*64*				
Metering current transformers (only one option possible)						
ARC5	Ring CTs	*48*				
AD12	DIN CTs	*48*				
ARM3	Block CTs	*48*				
Metering voltage transformers (only one option possible)						
Phase-to-earth						
VRU1	Screened VTs	*49*	■		■	
VDF11	DIN VTs	*49*				
VRQ2	Block VTs	*49*				
Phase-to-phase						
VDC11	DIN VTs	*49*				
VRC2	Block VTs	*49*				
VRU2	Auxiliary power	*49*		■		■
VT protection						
Fuses						

■ Compulsory
□ Optional
(*) Consult us for availability

(1) 2SIS: Shielded Solid Insulation System

Contents

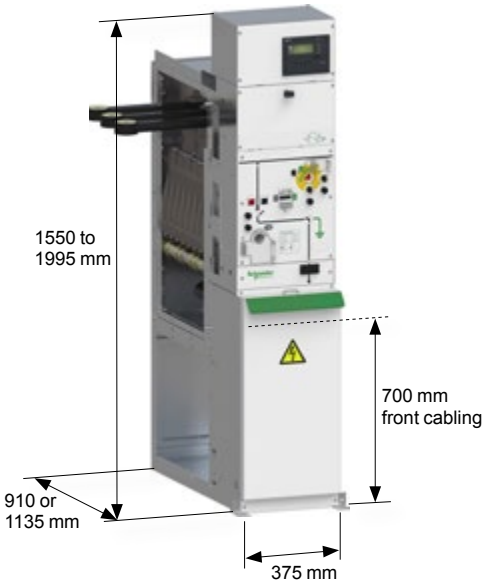
Characteristics
Standards

Main electrical characteristics

Voltage						
Rated voltage	**Ur**	(kV rms)	**7.2**	**12**		**15**
Rated frequency	**f**	(Hz)	50/60			
Insulation level						
Rated short-duration power-frequency withstand voltage						
Common value *(1)*	**Ud**	50/60 Hz 1 min (kV rms)	42			
Across the isolating distance	**Ud**	50/60 Hz 1 min (kV rms)	48			
Rated lightning impulse withstand voltage						
Common value *(1)*	**Up**	1.2/50 ms (kV peak)	**60**	**75**	**95 (*)**	**95**
Across the isolating distance	**Up**	1.2/50 ms (kV peak)	**70**	**85**	**110 (*)**	**110**
Current						
Busbar current	**Ir**	(A rms)	630			
Rated short-time withstand current & duration	**Ik x tk**	(kA rms)	20 kA x 4s 21 kA x 3s 25 kA x 3s			

* Please, consult us
(1) To earth and between phases.

PM100599



Dimensions

Uniform dimensions for the entire system

- Width: 375 mm for all switch, circuit breaker and metering units with shielded solid insulation
- Air-insulated metering units and metering incomer: 750 mm wide, but still fully compatible with the rest of the system
- Depth: 910 mm (1135 mm with internal arc exhausting) *(2)*
- Height: 1550 to 1995 mm, depending on LV equipment.
With low height bottom compartment (500 mm) it can be reduced to a minimum of 1350 mm
- Cable connections: 700 mm high front-aligned connections (500 mm with low-height bottom compartment).

(2) For front cable connection.

IEC standards

Premset units meet all the following recommendations, standards and specifications:

- IEC 62271-1: High-voltage switchgear and controlgear -
Part 1: Common specifications
- IEC 62271-200: High-voltage switchgear and controlgear -
Part 200: A.C. metal-enclosed switchgear and controlgear for rated voltage above 1 kV and up to and including 52 kV
- IEC 62271-103 (replaces IEC 60265-1):
Switches for rated voltages above 1 kV and less than 52 kV
- IEC 62271-100: High-voltage switchgear and controlgear -
Part 100: High-voltage alternating current circuit breakers
- IEC 62271-102: High-voltage switchgear and controlgear -
Part 102: High-voltage alternating current disconnectors and earthing switches
- IEC 62271-206 (replaces IEC 61958): High-voltage prefabricated switchgear and controlgear assemblies - Voltage presence indicating systems
- IEC 60529: Degrees of protection provided by enclosures (IP Code)
- IEC 60044-8: Instrument transformers - Part 8: Low Power Current Transducers
- IEC 60044-1: Instrument transformers - Part 1: Current transformers
- IEC 60044-2: Instrument transformers - Part 2: Voltage transformers
- IEC 60255: Electrical relays.

Internal arc fault withstand

Standard IEC 62271-200 defines internal arc classifications to characterise the performance level for protection of persons against effects of internal arcing fault. It also clarifies the testing procedure and acceptance criteria.

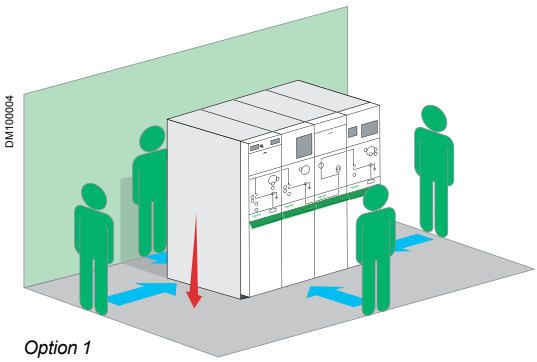
The aim of this classification is to show that an operator situated around the switchboard would be protected against the effects of an internal fault.

Drastically reduced risk of internal fault

Premset shielded solid insulation technology provides phase-per-phase insulation and screening, and thereby drastically reducing the risk of an internal fault.
The probability of an internal arcing fault is extremely low because phase-to-phase clearances in free air are eliminated.
In any case, the internal arc withstand of Premset has been tested in every compartment in accordance with the edition 2 of the IEC 62271-200 standard, both for standard and arc-control versions.

Standard version qualified for neutral networks with arc extinction coil earthing system

The effect of low phase-to-earth internal faults has been type-tested for the standard version of Premset.
Premset is IAC qualified for earth fault current of 100 A (IAe). It has successfully passed all the tests in every compartment, in accordance with the latest edition of the IEC 62271-200 standard (edition 2). This demonstrates the ability of standard Premset to withstand internal arcing for tuned (Petersen coil) neutral networks without any specific precautions.



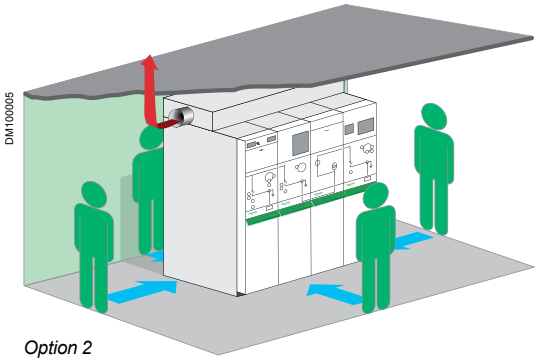
Option 1

Arc-control version, 21 kA x 1 s class A-FLR (*) Four-sided internal arc protection

The effect of high internal faults, up to 21 kA, has been type-tested on a special version of Premset designed for arc control with two options for gas exhausting.
Premset has successfully passed all the type tests of standard IEC 62271-200 (5 acceptance criteria).
The thermal and mechanical forces that an internal arc can produce are perfectly absorbed by the enclosure. An operator situated around the Premset switchboard during an internal fault will not be exposed to the effects of arcing.
Operators are safe, whatever the installation layout:
- Access to all four sides when not installed against a wall
- Front or lateral access when installed against a rear wall.

Two gas exhausting options

- **Option 1:** 21 kA x 1 s A-FLR (*), bottom exhausting in 400 x 600 mm minimum trench for installation in rooms with low ceilings
- **Option 2:** 21 kA x 1 s A-FLR (*), top exhausting into a top tunnel for installation in rooms with total height > 2 m and/or when the use of the trench for exhausting is not possible.



Option 2

Installation against a wall

For detailed civil engineering information, please refer to page 86.

Note: When 500 mm LCA is selected, 16kA/1s IAC is max reached

(*) IAC (internal arc classification): classification code refers to different types of accessibility according to standard IEC 62271-200.
A: access restricted to authorised personnel only
F: access to the front side
L: access to the lateral side
R: access to the rear side.

Operating conditions

Partition class and loss of service continuity category

■ Partition class of compartments accessible for maintenance (i.e. cable box, voltage transformer compartment, etc.): **PM** (1)
■ Loss of service continuity category: **LSC2A** (2)

Protection index

■ All external faces of the switchgear: **IP3X**
■ Between compartments: IP2X
■ Main circuit and all HV parts: IP67 (except M06A metering cubicles).

Mechanical impact strength

■ **IK07** for standard version.

Flooding

■ **Service continuity ensured for 3 days** of flooding for all functions (except air insulated metering M06A)
■ After flooding, accessories, auxiliaries and relays may require maintenance or replacement.

Environmental characteristics

Altitude	■ Up to 3000 m, no particular precautions except screened cable connections ■ Over 3000 m, standard precautions: shielded cable connections and 10% dielectric derating every 1000 m
Temperature (indoor version)	■ Storage : from – 40°C° to + 80 C° ■ Operation: from – 15°C to + 40°C (*) (normal conditions) IEC 60721 - level 3K6 ■ Operation: from – 40°C to + 65°C (consult us for special precautions)
Condensation / humidity	■ IEC 60721 > level 3K6 & 3Z7
Chemical / pollution	■ IEC 60721 > level 3C2
Dust	■ IEC 60721 > level 3S2
Fire and extinguishability	■ Test at 850°C according to IEC 60695-2-10 /-11 /-12

(*) For -25°C please consult us

Outdoor version

Consult us for specific outdoor IP54 version.

Specific version

Cable in and out in 1 single cubicle with cable entries from the bottom.

(1) PM class according to IEC 62271-200: metallic partitioning between compartments.
(2) LSC2A (loss of service continuity) according to IEC 62271-200: this category offers the possibility of keeping other compartments energised when opening a main circuit compartment.

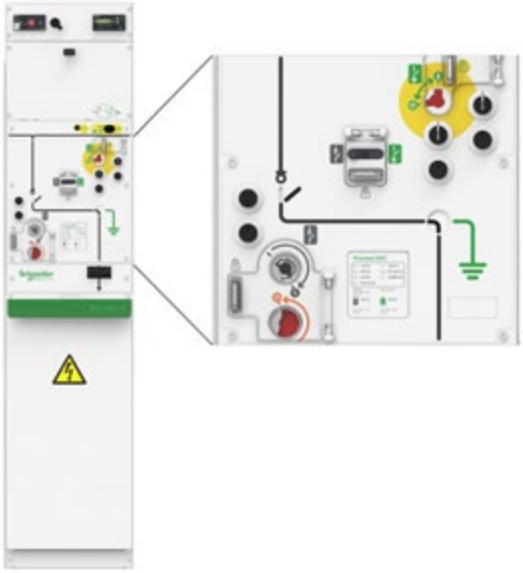
Contents

Disconnecting switch
IO6T - General purpose

The IO6T core unit is a "3 in 1" device combining the functions of a load break switch, disconnector and associated earthing switch. It can be used in various functional units.

- **3 positions (closed, open & disconnected, earthed) with direct earthing of cables**
- **Intuitive operation and clear mimic panel indications**
- **Built-in failsafe interlocks between main switch and earthing switch.**

PM100011



Basic equipment

■ '3 in 1" core unit integrating load breaking, disconnection and earthing functions as well as shielded solid insulation.

■ **Main switch**
□ vacuum disconnecting load-break switch providing both load breaking and disconnection functions
□ anti-reflex lever-operated mechanism (CIT type), independent of operator action.

■ **Earthing switch**
□ combined with the main switch
□ full failsafe interlocking with the main switch
□ air technology in sealed-for-life tank at atmospheric pressure
□ anti-reflex lever-operated mechanism, independent of operator action.

■ Totally SF6-free solution based on vacuum and air breaking technologies.

Accessories

Locking
■ Standard built-in padlocking facility for main switch, earthing switch and interlock (shackle diameter < 9 mm)
■ Optional keylocking facilities with flat or tubular key types:
□ 1 or 2 keylocks for main switch in "open & disconnected" position
□ 1 or 2 keylocks for earthing switch in "cables earthed" position
□ 1 or 2 keylocks for earthing switch in "line" position.

Interlocking
■ Standard built-in interlock between main switch and earthing switch
■ Optional interlock between cable box door and earthing switch (prevents opening of the door unless the earthing switch is in "cables earthed" position)
■ Optional interlock between main switch and cable box door (prevents closing of the main switch when the door is open).

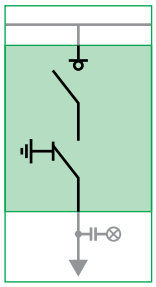
Auxiliary switches
■ For main switch:
□ standard: 2 changeover contacts (1 for units with electrical operation)
□ optional: up to 2 additional blocks of 4 changeover contacts.
■ For earthing switch:
□ optional: 1 changeover contact.

Operation counter
■ Optional for main switch.

Contact visibility
■ Optional windows allow direct visual check to ensure that earthing switch main contacts are effectively in earthed position.

Technical characteristics

DM100011



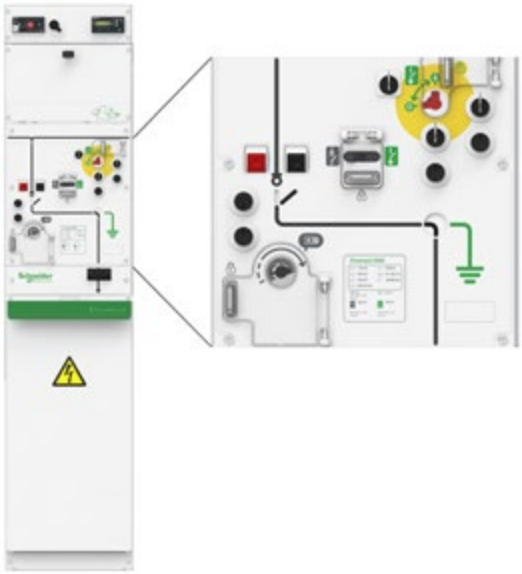
Rated voltage	Ur	(kV)	7.2		12		15	
Rated current	Ir	(Arms)	630					
Rated short-time withstand current and duration	Ik	(kArms)	20	21	21	25	25	25
	tk	(s)	4	1	3	1	2	3
Short-circuit breaking capacity	Isc	(kArms)	20	21	21	25	25	25
Rated making capacity of circuit breaker and earhing switches	Icm	(kApeak)	52	54	54	65	65	65
No-load mechanical endurance of main switch	M1 class (IEC 62271-103)	Number of cycles	1000					
Electrical endurance of main switch	E3 class (IEC 62271-103)	Number of cycles	100					
Making capacity endurance of main switch	E3 class (IEC 62271-103)	Number of cycles	5					
No-load mechanical endurance of earthing switch	M0 class (IEC 62271-102)	Number of cycles	1000					
Making capacity endurance of earthing switch	E2 class (IEC 62271-102)	Number of cycles	5					

Disconnecting switch
I06H - Heavy-duty

The I06H core unit is a "3 in 1" device combining the functions of a load break switch, disconnector and associated earthing switch. It is designed for heavy duty or multiple incomers:

- **3 positions (closed, open & disconnected, earthed) with direct earthing of cables**
- **Intuitive operation and clear mimic panel indications**
- **Built-in failsafe interlocks between main switch and earthing switch.**

PM100013



Basic equipment

■ "3 in 1" core unit integrating load breaking, disconnection and earthing functions as well as shielded solid insulation.

■ **Main switch**
□ vacuum disconnecting load-break switch providing both load breaking and disconnection functions
□ pushbutton-operated stored energy mechanism (O-CO type), independent of operator action.

■ **Earthing switch**
□ combined with the main switch
□ full failsafe interlocking with the main switch
□ air technology in sealed-for-life tank at atmospheric pressure
□ anti-reflex lever-operated mechanism, independent of operator action.

■ Totally SF6-free solution based on vacuum and air breaking technologies.

Accessories

Locking
■ Standard built-in padlocking facility for main switch, earthing switch and interlock (shackle diameter < 9 mm)
■ Optional keylocking facilities with flat or tubular key types:
□ 1 or 2 keylocks for main switch in "open & disconnected" position
□ 1 or 2 keylocks for earthing switch in "cables earthed" position
□ 1 or 2 keylocks for earthing switch in "line" position.

Interlocking
■ Standard built-in interlock between main switch and earthing switch
■ Optional interlock between cable box door and earthing switch (prevents opening of the door unless the earthing switch is in "cables earthed" position)
■ Optional interlock between main switch and cable box door (prevents closing of the main switch when the door is open).

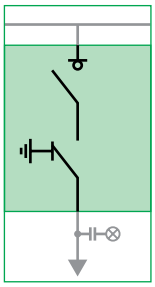
Auxiliary switches
■ For main switch:
□ standard: 2 changeover contacts (1 for units with electrical operation)
□ optional: up to 2 additional blocks of 4 changeover contacts.
■ For earthing switch:
□ optional: 1 changeover contact.

Operation counter
■ Optional for main switch.

Contact visibility
■ Optional windows allow direct visual check to ensure that earthing switch main contacts are effectively in earthed position.

Technical characteristics

DM100011



Rated voltage	Ur	(kV)	7.2		12		15	
Rated current	Ir	(Arms)	630					
Rated short-time withstand current and duration	Ik	(kArms)	20	21	21	25	25	25
	tk	(s)	4	1	3	1	2	3
Short-circuit breaking capacity	Isc	(kArms)	20	21	21	25	25	25
Rated making capacity of circuit breaker and earhing switches	Icm	(kApeak)	52	54	54	65	65	65
No-load mechanical endurance of main switch	M2 class (IEC 62271-103)	Number of cycles	5000					
Electrical endurance of main switch	E3 class (IEC 62271-103)	Number of cycles	100					
Making capacity endurance of main switch	E3 class (IEC 62271-103)	Number of cycles	5					
No-load mechanical endurance of earthing switch	M0 class (IEC 62271-102)	Number of cycles	1000					
Making capacity endurance of earthing switch	E2 class (IEC 62271-102)	Number of cycles	5					

Disconnecting circuit breaker
D01N, D02N - MV/LV transformer protection

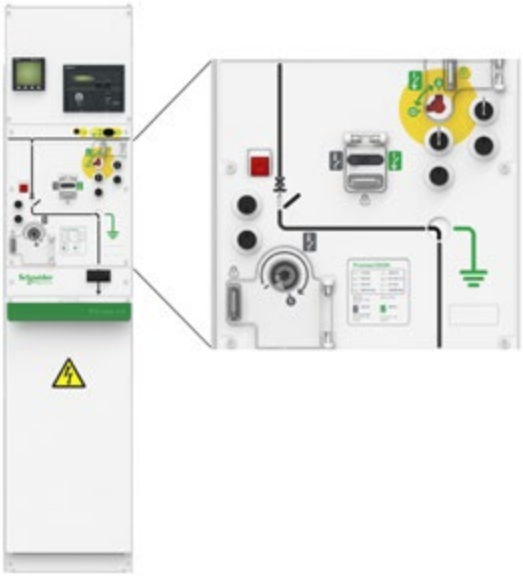
The D01N and D02N core units are a "3 in 1" devices combining the functions of a 100 A or 200 A circuit breaker, disconnector and associated earthing switch. They are dedicated to MV/LV transformer protection.

■ 3 positions (closed, open & disconnected, earthed)

■ Intuitive operation and clear mimic panel indications

■ Built-in failsafe interlocks between circuit breaker and earthing switch.

PM100009



Basic equipment

■ "3 in 1" core unit integrating breaking, disconnection and earthing functions as well as shielded solid insulation

■ **Disconnecting circuit breaker**
□ vacuum disconnecting circuit breaker providing both breaking and disconnection functions
□ CI1 type operating mechanism featuring pushbutton opening and antireflex lever-operated closing, both independent of operator action
□ designed to work with VIP 40 and VIP 45 relays for optimum protection of MV/LV transformers.

■ **Earthing switch**
□ combined with the circuit breaker
□ full failsafe interlocking with the circuit breaker
□ air technology in sealed-for-life tank at atmospheric pressure
□ anti-reflex lever-operated mechanism, independent of operator action.

■ Totally SF6-free solution based on vacuum and air breaking technologies.

Accessories

Locking
■ Standard built-in padlocking facility for circuit breaker, earthing switch and interlock (shackle diameter < 9 mm)
■ Optional keylocking facilities with flat or tubular key types:
□ 1 or 2 keylocks for main switch in "open & disconnected" position
□ 1 or 2 keylocks for earthing switch in "cables earthed" position
□ 1 or 2 keylocks for earthing switch in "line" position.

Interlocking
■ Standard built-in interlock between circuit breaker and earthing switch
■ Optional interlock between cable box door and earthing switch (prevents opening of the door unless the earthing switch is in "cables earthed" position)
■ Optional interlock between circuit breaker and cable box door (prevents closing of the circuit breaker when the door is open).

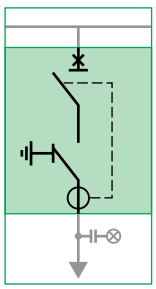
Auxiliary switches
■ For circuit breaker:
□ standard: 2 changeover contacts for contact position (1 for units with electrical operation) and 1 NO contact for trip indication (VIP relay only)
□ optional: up to 2 additional blocks of 4 changeover contacts.
■ For earthing switch:
□ optional: 1 changeover contact.

Operation counter
■ Optional for circuit breaker.

Contact visibility
■ Optional windows allow direct visual check to ensure that earthing switch main contacts are effectively in earthed position.

Technical characteristics

DM100013



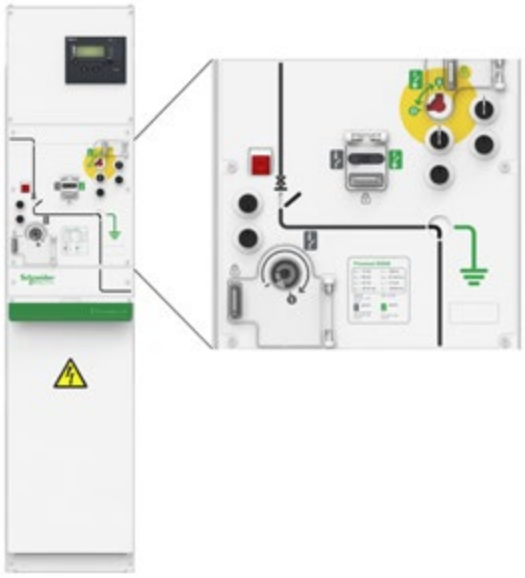
Rated voltage	Ur	(kV)	7.2		12		15	
Rated current	Ir	(Arms)	630					
Rated short-time withstand current and duration	Ik	(kArms)	20	21	21	25	25	25
	tk	(s)	4	1	3	1	2	3
Short-circuit breaking capacity	Isc	(kArms)	20	21	21	25	25	25
Rated making capacity of circuit breaker and earhing switches	Icm	(kApeak)	52	54	54	65	65	65
No-load mechanical endurance of circuit breaker	M1 class (IEC 62271-100)	Number of cycles	2000					
Electrical endurance of circuit breaker	E2 class (IEC 62271-100)	Number of cycles	Acc. E2 class, without reclosing duty					
Operating sequence			CO - 15 s - CO					
Maximum number of operations at Isc			30					
Total clearing time at Isc	Fault detection to arc extinguishing	(ms)	< 60					
No-load mechanical endurance of earthing switch	M0 class (IEC 62271-102)	Number of cycles	1000					
Making capacity endurance of earthing switch	E2 class (IEC 62271-102)	Number of cycles	5					

Disconnecting circuit breaker
D06N - General protection

The D06N core unit is a "3 in 1" device combining the functions of a standard duty 630 A circuit breaker, disconnector and associated earthing switch. It is dedicated to general protection of installations:

- **3 positions (closed, open & disconnected, earthed) with direct earthing of cables**
- **Intuitive operation and clear mimic panel indications**
- **Built-in failsafe interlocks between circuit breaker and earthing switch.**

PM100015



Basic equipment

- "3 in 1" core unit integrating breaking, disconnection and earthing functions as well as shielded solid insulation

Disconnecting circuit breaker
- vacuum disconnecting circuit breaker providing both breaking and disconnection functions
- CI1 type operating mechanism featuring pushbutton opening and antireflex lever-operated closing, both independent of operator action.

Earthing switch
- combined with the circuit breaker
- full failsafe interlocking with the circuit breaker
- air technology in sealed-for-life tank at atmospheric pressure
- anti-reflex lever-operated mechanism, independent of operator action

- Totally SF6-free solution based on vacuum and air breaking technologies.

Accessories

Locking
- Standard built-in padlocking facility for circuit breaker, earthing switch and interlock (shackle diameter < 9 mm)
- Optional keylocking facilities with flat or tubular key types:
- 1 or 2 keylocks for circuit breaker in "open & disconnected" position
- 1 or 2 keylocks for earthing switch in "cables earthed" position
- 1 or 2 keylocks for earthing switch in "line" position.

Interlocking
- Standard built-in interlock between circuit breaker and earthing switch
- Optional interlock between cable box door and earthing switch (prevents opening of the door unless the earthing switch is in "cables earthed" position)
- Optional interlock between circuit breaker and cable box door (prevents closing of the circuit breaker when the door is open).

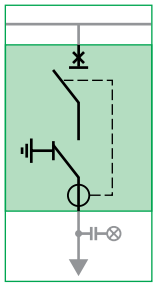
Auxiliary switches
- For circuit breaker:
- standard: 2 changeover contacts for contact position (1 for units with electrical operation) and 1 NO contact for trip indication (VIP relay only)
- optional: up to 2 additional blocks of 4 changeover contacts.
- For earthing switch:
- optional: 1 changeover contact.

Operation counter
- Optional for circuit breaker.

Contact visibility
- Optional windows allow direct visual check to ensure that earthing switch main contacts are effectively in earthed position.

Technical characteristics

DM100013



Rated voltage	Ur	(kV)	7.2		12		15	
Rated current	Ir	(Arms)	630					
Rated short-time withstand current and duration	Ik	(kArms)	20	21	21	25	25	25
	tk	(s)	4	1	3	1	2	3
Short-circuit breaking capacity	Isc	(kArms)	20	21	21	25	25	25
Rated making capacity of circuit breaker and earhing switches	Icm	(kApeak)	52	54	54	65	65	65
Capacitive breaking capacity	(IEC 62271-100)	Capacitive break class	CC1 / LC1					
No-load mechanical endurance of circuit breaker	M1 class (IEC 62271-100)	Number of cycles	2000					
Electrical endurance of circuit breaker	E2 class (IEC 62271-100)	Number of cycles	Acc. E2 class, without reclosing duty					
Operating sequence			CO - 15 s - CO					
Maximum number of operations at Isc			30					
Total clearing time at Isc	Fault detection to arc extinguishing	(ms)	< 100					
No-load mechanical endurance of earthing switch	M0 class (IEC 62271-102)	Number of cycles	1000					
Making capacity endurance of earthing switch	E2 class (IEC 62271-102)	Number of cycles	5					

Disconnecting circuit breaker
D06H - Heavy-duty line protection

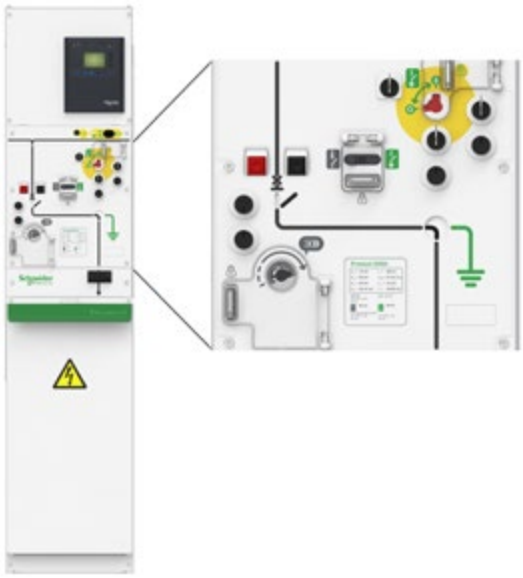
The D06H core unit is a "3 in 1" device combining the functions of a heavy-duty 630 A circuit breaker, disconnector and associated earthing switch. It is dedicated to protection of incoming lines or feeders, thanks to extended mechanical endurance and fast auto-reclosing.

■ 3 positions (closed, open & disconnected, earthed) with direct earthing of cables

■ Intuitive operation and clear mimic panel indications

■ Built-in failsafe interlocks between circuit breaker and earthing switch.

PM100600



Basic equipment

■ "3 in 1" core unit integrating breaking, disconnection and earthing functions as well as shielded solid insulation

■ **Disconnecting circuit breaker**
□ vacuum disconnecting circuit breaker providing both breaking and disconnection functions
□ stored energy type operating mechanism (O-CO) with pushbutton opening and closing and spring charging using a lever
□ heavy-duty operating cycle (O-0.3 s-CO-15 s-CO).

■ **Earthing switch**
□ combined with the circuit breaker
□ full failsafe interlocking with the circuit breaker
□ air technology in sealed-for-life tank at atmospheric pressure
□ anti-reflex lever-operated mechanism, independent of operator action.

■ Totally SF6-free solution based on vacuum and air breaking technologies.

Accessories

Locking
■ Standard built-in padlocking facility for circuit breaker, earthing switch and interlock (shackle diameter < 9 mm)
■ Optional keylocking facilities with flat or tubular key types:
□ 1 or 2 keylocks for circuit breaker in "open & disconnected" position
□ 1 or 2 keylocks for earthing switch in "cables earthed" position
□ 1 or 2 keylocks for earthing switch in "line" position.

Interlocking
■ Standard built-in interlock between circuit breaker and earthing switch
■ Optional interlock between cable box door and earthing switch (prevents opening of the door unless the earthing switch is in "cables earthed" position)
■ Optional interlock between circuit breaker and cable box door (prevents closing of the circuit breaker when the door is open).

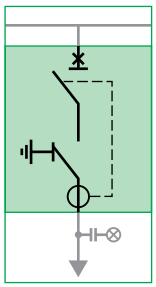
Auxiliary switches
■ For circuit breaker:
□ standard: 2 changeover contacts for contact position (1 for units with electrical operation) and 1 NO contact for trip indication (VIP relay only)
□ optional: up to 2 additional blocks of 4 changeover contacts.
■ For earthing switch:
□ optional: 1 changeover contact.

Operation counter
■ Optional for circuit breaker.

Contact visibility
■ Optional windows allow direct visual check to ensure that earthing switch main contacts are effectively in earthed position.

Technical characteristics

DM100013

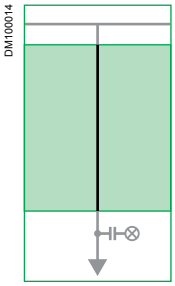


Rated voltage	Ur	(kV)	7.2		12		15	
Rated current	Ir	(Arms)	630					
Rated short-time withstand current and duration	Ik	(kArms)	20	21	21	25	25	25
	tk	(s)	4	1	3	1	2	3
Short-circuit breaking capacity	Isc	(kArms)	20	21	21	25	25	25
Rated making capacity of circuit breaker and earhing switches	Icm	(kApeak)	52	54	54	65	65	65
Capacitive breaking capacity	(IEC 62271-100)	Capacitive break class	CC2 / LC2					
No-load mechanical endurance of circuit breaker	M2 class (IEC 62271-100)	Number of cycles	10 000					
Electrical endurance of circuit breaker	E2 class (IEC 62271-100)	Number of cycles	Acc. E2 class, with reclosing duty					
Operating sequence			O - 0.3 s - CO -15 s - CO					
Maximum number of operations at 100% Isc			50					
Total clearing time at Isc	Fault detection to arc extinguishing	(ms)	< 100					
No-load mechanical endurance of earthing switch	M0 class (IEC 62271-102)	Number of cycles	1000					
Making capacity endurance of earthing switch	E2 class (IEC 62271-102)	Number of cycles	5					

Busbar sectionaliser
G06 - Bus riser
ES-B - Busbar earthing switch

The G06 core unit is a simple 630 A bus riser.

■ It can be used in various functional units: direct cable incomers, bus risers, bus sections, auxiliary voltage units, etc.



G06

G06

Basic equipment

■ Bus section (with optional earthing switch) with shielded solid insulation, designed for easy integration in various Premset functional units

ES-B

The ES-B core unit is dedicated to busbar earthing:

■ The main application is coupled busbars (2 incomers + 1 bus coupler system) but it can also be used for any application requiring busbar earthing prior to accessing the busbars

Basic equipment

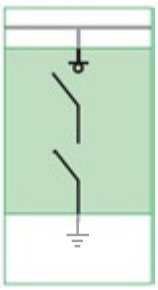
■ Earthing switch with shielded solid insulation, directly connected to the busbar system. Based on the same earthing switch device used in other core units for cable-side earthing.

■ **Earthing switch**
□ air technology in sealed-for-life tank at atmospheric pressure for a totally SF6-free solution
□ anti-reflex lever-operated mechanism, independent of operator action.

Accessories

Locking
■ Standard built-in padlocking facility (shackle diameter < 9 mm)
■ Optional keylocking facilities with flat or tubular key types:
□ 1 or 2 keylocks for locking the ES-B fonction in “open” position.

Auxiliary switches
■ 1 optional changeover contact.



Technical characteristics (GO6 and ES-B)

Rated voltage	Ur	(kV)	7.2		12		15	
Rated current	Ir	(Arms)	630					
Rated short-time withstand current and duration	Ik	(kArms)	20	21	21	25	25	25
	tk	(s)	4	1	3	1	2	3
Short-circuit breaking capacity	Isc	(kArms)	20	21	21	25	25	25
Rated making capacity of circuit breaker and earhing switches	Icm	(kApeak)	52	54	54	65	65	65
No-load mechanical endurance	M1 class (IEC 62271-102)	Number of cycles	1000					
Making capacity endurance	E2 class (IEC 62271-102)	Number of cycles	5					

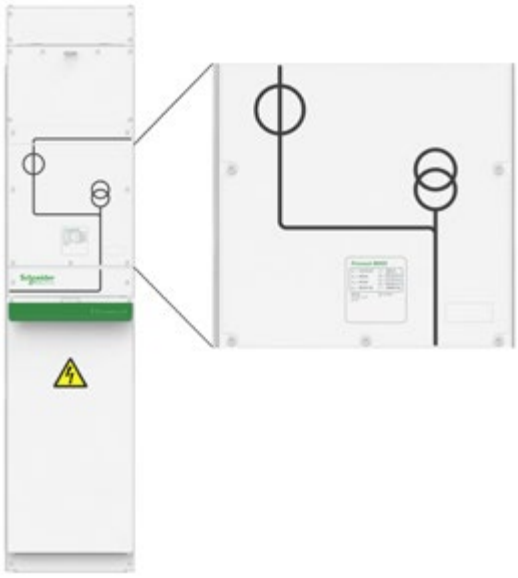
Metering
M06S - 2SIS compact metering

The M06S core unit is a compact metering unit, insensitive to harsh environments thanks to 2SIS design.

■ A cost-effective alternative to traditional air-insulated metering units

■ Fully compatible with the Premset system, the M06S core unit can be used in a wide range of applications requiring metering.

PM100584



Basic equipment

■ 2SIS design (Shielded Solid Insulation System), composed of:
□ bus riser with shielded solid insulation (see G06, page 43)
□ 3 ring-type current transformers with shielded solid insulation
□ 3 phase-to-earth voltage transformers with shielded solid insulation, located in front compartment to provide easy access for maintenance and easy disconnection for commissioning.

■ The M06S metering core unit is fully compatible with the Premset system: same dimensions as the other core units (375 mm wide) and fully compatible with busbar or cable connections

■ Featuring compact and modular design, the M06S metering unit can be used in a wide range of applications requiring tariff metering, including metered incomers, feeders and risers.

Current and voltage transformers

The M06S integrates 3 current transformers and 3 voltage transformers, all with shielded solid insulation and compatible with digital meters.

■ Current transformers: ring-type ARC5 (see page 48)

■ Voltage transformers: phase-to-earth VRU1 (see page 49)

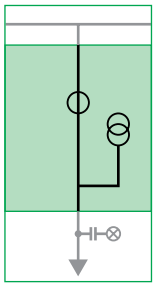
Accessories

Locking of front panel

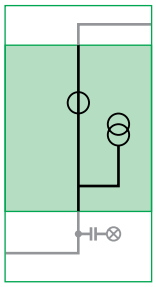
■ Standard built-in padlocking facility (shackle diameter < 9 mm)

■ Optional keylocking facilities with flat or tubular key types:
□ 1 keylock to prevent access to the voltage transformers.

DM100016-A



DM100016-B



Technical characteristics

Rated voltage	Ur	(kV)	7.2		12		15	
Rated current	Ir	(Arms)	630					
Rated short-time withstand current and duration	Ik	(kArms)	20	21	21	25	25	25
	tk	(s)	4	1	3	1	2	3
Short-circuit breaking capacity	Isc	(kArms)	20	21	21	25	25	25
Rated making capacity of circuit breaker and earhing switches	Icm	(kApeak)	52	54	54	65	65	65

PM100579

Metering
M06A - Air-insulated metering

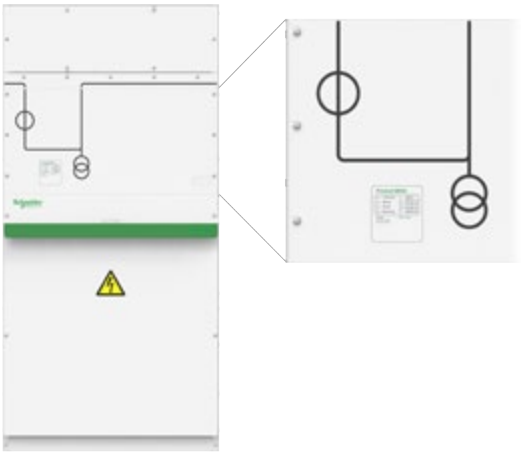
The M06A core unit is a traditional air-insulated metering unit.

■ Designed for easy adaptation to any type of conventional block CT or VT

■ Compatible with the Premset connection system.

The M06A is twice the width (750 mm) of the equivalent M06S 2SIS solution.

PM100593



Basic equipment

■ Air-insulated design, composed of:
□ bare copper primary circuit, in totally closed IP3X metal housing
□ low-voltage cabinet
□ 2 or 3 block-type current transformers
□ 2 or 3 phase-to-earth or phase-to-phase block-type voltage transformers.

■ The M06A metering core unit is fully compatible with the Premset system, thanks to its flat interfaces for downstream and upstream connections.

■ Voltage transformers can be connected upstream or downstream of the current transformers and associated with optional fuse protection

■ Wide choice of arrangements, addressing a wide range of applications requiring tariff metering including metered incomers, feeders and risers (see below).

Current and voltage transformers

■ Block-type current transformers (see page 48):
□ DIN 42600 t8 standard dimensions (AD12)
□ Schneider Electric type (ARM3).

■ Voltage transformers (see page 49)
□ DIN 42600 t9 standard dimensions (phase-to-earth VDF11 and phase-to-phase VDC11)
□ Schneider Electric type (phase-to-earth VRQ2 and phase-to-phase VRC2).

■ Optional fuses for voltage transformers: length 360 mm, diameter 45 mm.

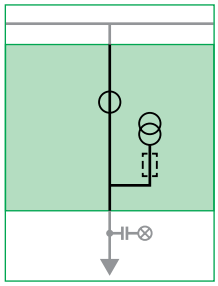
Accessories

Locking of front panel

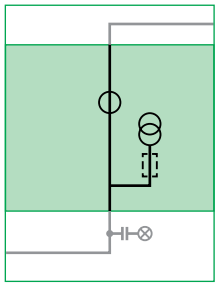
■ Standard built-in padlocking and sealing facility (shackle diameter < 9 mm)

■ Optional keylocking facilities with flat or tubular key types:
□ 1 keylock to prevent access to the sensor compartment.

DM100017-A



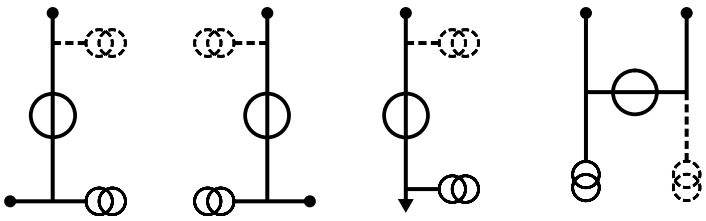
DM100017-B



Technical characteristics

Rated voltage	Ur	(kV)	7.2		12		15	
Rated current	Ir	(Arms)	630					
Rated short-time withstand current and duration	Ik	(kArms)	20	21	21	25	25	25
	tk	(s)	4	1	3	1	2	3
Short-circuit breaking capacity	Isc	(kArms)	20	21	21	25	25	25
Rated making capacity of circuit breaker and earhing switches	Icm	(kApeak)	52	54	54	65	65	65
Internal arc proof, type tested			IAC cat A-FLR, 21 kA 1 s					

Choice of arrangements



Bus riser metering | Bus riser metering | Metered feeder / incomer | Busbars metering

Metering
VTM, VTP - Voltage transformer
VTM-D, VTP-D - Voltage transformer with circuit-breaker protection

The VTM and VTP core units are voltage transformer units, directly connected to the busbars and dedicated to power supply or metering.

They are compact and insensitive to harsh environments thanks to 2SIS design.

VTM, VTP
Voltage transformer units

Basic equipment

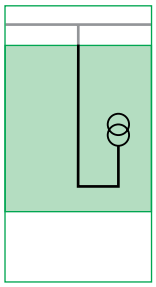
■ 2SIS design (Shielded Solid Insulation System), composed of:
□ bus riser with shielded solid insulation (see G06, page 43)
□ VTM unit: three VRU1 phase-to-earth screened voltage transformers dedicated to power metering (see page 49)
□ VTP unit: one VRU2 phase-to-phase screened voltage transformer dedicated to auxiliary power supply (see page 50)

■ The VTM and VTP core units are fully compatible with the Premset system: same dimensions as the other core units (375 mm wide) and fully compatible with busbar connections.

Accessories

Locking of front panel
■ Standard built-in padlocking and sealing facility (shackle diameter < 9 mm)
■ Optional keylocking facility with flat or tubular key types:
□ 1 keylock to prevent access to the voltage transformers.

DM100027



Technical characteristics (VTM, VTP)

Rated voltage	Ur	(kV)	7.2		12		15	
Rated current	Ir	(Arms)	630					
Rated short-time withstand current and duration	Ik	(kArms)	20	21	21	25	25	25
	tk	(s)	4	1	3	1	2	3
Short-circuit breaking capacity	Isc	(kArms)	20	21	21	25	25	25
Rated making capacity of circuit breaker and earhing switches	Icm	(kApeak)	52	54	54	65	65	65

VTM-D, VTP-D
Voltage transformer units, with circuit-breaker protection

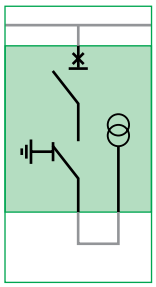
Basic equipment

■ 2SIS design (Shielded Solid Insulation System), composed of:
□ 100 A disconnecting circuit breaker with associated earthing switch (see D01, page 40)
□ VTM-D unit: three VRU1 phase-to-earth screened voltage transformers, dedicated to power metering (see page 49)
□ VTP-D unit: one VRU2 phase-to-phase screened voltage transformer, dedicated to auxiliary power supply (see page 50).

Accessories

Please refer to accessories and auxiliaries of D01N core unit, page 40.

DM100028



Technical characteristics (VTM-D, VTP-D)

Rated voltage	Ur	(kV)	7.2		12		15	
Rated current	Ir	(A rms)	100					
Rated short-time withstand current and duration	Ik	(kA rms)	20	21	21	25	25	25
	tk	(s)	4	1	3	1	2	3
Short-circuit breaking capacity	Isc	(kA rms)	20	21	21	25	25	25
Rated making capacity of circuit breaker and earthing switches	Icm	(kA peak)	52	54	54	65	65	65
No-load mechanical endurance of circuit breaker	M1 class (IEC 62271-100)	Number of cycles	1000					
Electrical endurance of circuit breaker	E2 class (IEC 62271-100)	Number of cycles	Acc. E2 class, without reclosing duty					
Operating sequence			O - 15 s - CO					
Maximum number of operations at Isc			5					
Total clearing time at Isc	Fault detection to arc extinguishing	(ms)	< 60					
No-load mechanical endurance of earthing switch	M0 class (IEC 62271-102)	Number of cycles	1000					
Making capacity endurance of earthing switch	E2 class (IEC 62271-102)	Number of cycles	5					

Current and voltage transformers for metering
Current transformers

Summary of current and voltage transformers for metering

Metering current transformers			Metering voltage transformers			
	Type	Functional unit type		Type		Functional unit type
ARC5	Ring	M06S	VRU1	Screened	Phase to earth	M06S / VTM / VTM-D
AD12	Block DIN	M06A	VDF11	Block DIN	Phase to earth	M06A
ARM3	Block	M06A	VRQ2	Block	Phase to earth	M06A
			VDC11	Block DIN	Phase to phase	M06A
			VRC2	Block	Phase to phase	M06A
			Auxiliary power supply			
			VRU2	Screened	Phase to phase	VTP / VTP-D

Three different types of current transformers are used for tariff metering on Premset switchboards.

They are all designed for easy installation and a long trouble-free service life.

Compliance with standard IEC 60044-1 and 50/60 Hz frequency for all current transformers.

PE58382

ARC5

The ARC5 is a ring-type current transformer used in the **M06S** 2SIS metering core unit.

- Compact dimensions for easy installation on a Premset bus riser
- Cost-effective compared to standard MV CT block or DIN solutions.

ARC5 characteristics

Rated & insulation voltage	0.72 / 3 kV			
Thermal withstand	25 kA x 3 s			
Transformation ratio	100/5	200/5	400/5	600/5
Power with cl 0.2S Fs < 5	5 VA			

DE52378

AD12

The AD12 is a DIN type medium voltage current transformer used in the **M06A** air-insulated metering core unit.

- Widely used type of current transformer with overall dimensions in accordance with DIN 42600 Teil 8 standard 12 kV size
- High accuracy over the entire measurement range.

AD12 characteristics

Rated & insulation voltage	17.5 & 38/95 kV (1 min power frequency withstand / lightning impulse withstand)							
Thermal withstand	25 kA x 3 s							
Transformation ratio	25/5	50/5	100/5	150/5	200/5	300/5	400/5	600/5
Transformation ratio (2 secondary wirings)	25-50/5	50-100/5	100-200/5	150-300/5	200-400/5	300-600/5		
Power with cl 0.2S Fs < 5	2.5 VA	2.5 to 10 VA	2.5 to 15 VA					
Power with cl 0.2 Fs < 5	2.5 VA	2.5 to 10 VA	2.5 to 15 VA					
Power with cl 0.5 Fs < 10	2.5 to 5 VA	2.5 to 15 VA						

PE58383

ARM3

The ARM3 is a block type medium voltage current transformer used in the **M06A** air-insulated metering core unit.

- Standard type of current transformer for Schneider Electric applications.
- High accuracy over the entire measurement range.

ARM3 characteristics

Rated & insulation voltage	17.5 & 38/95 kV (1 min power frequency withstand / lightning impulse withstand)							
Thermal withstand	25 kA x 3 s							
Transformation ratio	25/5	50/5	100/5	150/5	200/5	300/5	400/5	600/5
Transformation ratio (2 secondary wirings)	25-50/5	50-100/5	100-200/5	150-300/5	200-400/5	300-600/5		
Power with cl 0.2S Fs < 5	2.5 to 10 VA	2.5 to 15 VA						
Power with cl 0.2 Fs < 5	2.5 to 10 VA	2.5 to 15 VA						
Power with cl 0.5 Fs < 10	2.5 to 15 VA							

cl: accuracy class
Fs: Safety factor

Current and voltage transformers for metering
Voltage transformers

Different types of voltage transformers are used for tariff metering on Premset switchboards.

They are all designed for easy installation and a long trouble-free service life.

Compliance with standard IEC 60044-1 and 50/60 Hz frequency for all voltage transformers.

PE58411

VRU1

The VRU1 is a phase-to-earth screened voltage transformer used in 2SIS **M06S** and **VTM** and **VTM-D** metering core units.

- Compact dimensions and design for easy installation in Premset core units
- Easy front access for disconnection for commissioning or replacement
- 2SIS design for insensitivity to harsh environments.

VRU1 characteristics

Voltages	7.2-20-60 kV		7.2-32-60 kV	12-28-75 kV		12-42-75 kV	17.5-38-95 kV	
Primary	6/√3 kV	6.6/√3 kV	6/√3 kV	10/√3 kV	11/√3 kV	10/√3 kV	13.8/√3 kV	15/√3 kV
1st secondary	100/√3 V	110/√3 V	100/√3 V	100/√3 V	110/√3 V	100/√3 V	110/√3 V	100/√3 V
Power and accuracy class	10 VA cl 0.2							
2nd secondary	100/3 V	110/3 V	100/3 V	100/3 V	110/3 V	100/3 V	110/3 V	100/3 V
Power and accuracy class	30 VA 3P							

PE58446 PE58399

VDC11 *VDF11*

VDC11 or VDF11

VDF11 phase-to-earth and VDC11 phase-to-phase voltage transformers are used in the **M06A** air-insulated metering unit.

- Widely used type of voltage transformer with overall dimensions in accordance with DIN 42600 Teil 9 standard 12 kV size
- Easy to adapt to local practices or specifications.

VDC11 characteristics

Voltages	7.2-20-60 kV	7.2-32-60 kV	12-28-75 kV	
Primary	3 to 6.6 kV	6 kV	6 to 11 kV	
Secondary	100 V 110 V	100 V	100 V 110 V	
Power and accuracy class	5 VA to 15 VA cl 0.2 5 VA to 50 VA cl 0.5			

VDF11 characteristics

Voltages	7.2-20-60 kV	7.2-32-60 kV	12-28-75 kV	12-42-75 kV	17.5-38-95 kV
Primary	3/√3 to 6.6/√3 kV	6/√3 kV	6/√3 to 11/√3 kV	10/√3 kV	10/√3 to 15/√3 kV
1st secondary	100/√3 V 110/√3 V	100/√3 V	100/√3 V 110/√3 V	100/√3 V	100/√3 V 110/√3 V
Power and accuracy class	5 VA to 10 VA cl 0.2 5 VA to 20 VA cl 0.5				
2nd secondary	100/3 V 110/3 V	100/3 V	100/3 V 110/3 V	100/3 V	100/3 V 110/3 V
Power and accuracy class	30 VA 3P				

PE58408 PE59403

VRQ2 *VRC2*

VRQ2 or VRC2

VRQ2 phase-to-earth and VRC2 phase-to-phase voltage transformers are used in the **M06A** air-insulated metering unit.

- Standard type of voltage transformer for Schneider Electric applications, VRQ2 or VRC2 already used in SM6 and RM6 metering cubicles.

VRC2 characteristics

Voltages	7.2-20-60 kV	7.2-32-60 kV	12-28-75 kV	12-42-75 kV	17.5-38-95 kV
Primary	3 to 6.6 kV	6 kV	6 to 11 kV	10 kV	10 to 15 kV
Secondary	100 V 110 V	100 V	100 V 110 V	100 V	100 V 110 V
Power and accuracy class	5 VA to 30 VA cl 0.2 5 VA to 50 VA cl 0.5				

VRQ2 characteristics

Voltages	7.2-20-60 kV	7.2-32-60 kV	12-28-75 kV	12-42-75 kV	17.5-38-95 kV
Primary	3/√3 to 6.6/√3 kV	6/√3 kV	6/√3 to 11/√3 kV	10/√3 kV	10/√3 to 15/√3 kV
1st secondary	100/√3 V 110/√3 V	100/√3 V	100/√3 V 110/√3 V	100/√3 V	100/√3 V 110/√3 V
Power and accuracy class	5 VA to 30 VA cl 0.2 5 VA to 50 VA cl 0.5				
2nd secondary	100/3 V 110/3 V	100/3 V	100/3 V 110/3 V	100/3 V	100/3 V 110/3 V
Power and accuracy class	30 VA 3P				

Current and voltage transformers for metering
Voltage transformers

PE58412

VRU2 for auxiliary power supply

The VRU2 is a phase-to-phase screened voltage transformer.
It is used in **VTP** and **VTP-D** auxiliary power supply functions.

- Compact dimensions and screened design for easy installation in Premset core units, insensitivity to harsh environments
- Designed to withstand power frequency tests (no need for disconnection during commissioning)
- Power: 300 VA continuous, 500 VA for 1 minute.

VRU2 characteristics

Voltages	7.2-20-60 kV	7.2-32-60 kV	12-28-75 kV	12-42-75 kV	17.5-38-95 kV
Primary	6 and 6.6 kV	6 kV	10 and 11 kV	10 kV	13.8 and 15 kV
Secondary	230 V				
Accuracy class	cl 3 (for 30 VA)				

Contents

Protection
Selection guide

Premset functional units including a circuit breaker core unit (D01N, D02N, D06N, D06H) can be equipped for protection with:

- **A VIP 40, VIP 45, VIP 400 or VIP 410 relay, integrated in an optimised functional block to form a protection system dedicated to the application**
- **An external Sepam series 20 or series 40 relay or other compatible relay.**

PM100573

VIP 40 and VIP 45

PM100576

VIP 400 and VIP 410

PE88030

Sepam range

PM102898

MiCOM range

VIP self-powered integrated protection

Optimised performance for Premset

- Integrated protection relay
  - complete engineered and pre-tested protection system: dedicated CT and low power actuator (Mitop)
  - savings on space and cabling time
- Self-powered protection
- Optimised for Premset: core unit switchgear and protection designed to work together in an optimum manner:
  - optimisation of the breaking time
- Simple protection, easy to implement
- Perfectly adapted to dedicated applications.

VIP 40 and VIP 45: designed for D01N and D02N transformer protection circuit breakers

- MV/LV 100 A (D01N) or 200 A (D02N) transformer protection
- Dedicated protection curve to protect against overloads, short-circuits and earth faults with straight-forward settings
- Fast clearing time or transformer short-circuits (< 60 ms): no fuse needed.

VIP 400 and VIP 410: designed for D06N and D06H general protection circuit breakers

- Substation protection (incomers, feeders, bus risers) using D06N (standard duty) or D06H (heavy duty) 630 A circuit breakers
- MV/LV transformer protection instead of VIP 40 and VIP 45 if more functions are required
- DT (Definite Time) and standard IDMT (Inverse Definite Minimum Time) tripping curves
- Switchgear diagnostics
- Multi-language display
- VIP 410 includes a dual supply (self-powered plus auxiliary) for communication and high sensitivity earth fault protection.

High sensitivity sensors

A VIP integrated protection system is composed of sensors, a processing unit and an actuator, designed together to provide the highest level of reliability and sensitivity from 0.2 A to 20 In for VIP 400 and VIP 410 and 5 A to 20 In for VIP 40 and VIP 45 (see page 56).

Sepam range protection

Protection relays of the Sepam range are also available and have the following characteristics:

- External auxiliary power
- Open range
- From basic to more sophisticated protection
- Standard CTs and trip actuators (see page 59).

MiCOM range

MiCOM protection provides the user with a choice of cost-optimised solutions for specific protection
requirements within the distribution network. The MiCOM relay series offers comprehensive protective
function solutions for all power supply systems as well as for various functional and hardware project stages.

Protection
Selection guide

Quick selection table

		VIP series				Sepam series	
		Integrated self-powered protection optimised for Premset				General	
		Transformer protection		General protection			
		VIP 40	VIP 45	VIP 400	VIP 410	Sepam 20	Sepam 40
Protection functions							
Phase overcurrent (ANSI 50-51)		■	■	■	■	■	■
Earth fault phase (ANSI 51N)	Standard (sum of current method)		■	■	■	■	■
	High sensitivity (earth fault CTs)				■	■	■
Thermal overload (ANSI 49)				■	■	■	■
Cold load pick-up					■	■	■
Other protection functions (1)						■	■
Measurement functions							
Phase current		■	■	■	■	■	■
Earth current			■	■	■	■	■
Phase peak demand current		■	■	■	■	■	■
Load history	Cumulative time			■	■	■	■
Control and monitoring functions							
Trip indication	Local (with origin of the fault)	■	■	■	■	■	■
	Remote (one contact)	■	■	■	■	■	■
	Output relays				■ (2)	■	■
Trip circuit supervision (ANSI 74TC)		■	■	■	■	■	■
Time-tagged events	Local on display (5 last trips)			■	■	■	■
	Remote, via communication				■	■	■
External tripping input					■	■	■
Overcurrent and breaking profile	Number of phase and earth trips (3)			■	■	■	■
Serial communication port	Modbus RS485				■	■	■
Digital inputs/outputs for control functions						■	■
Power supply							
Type of supply	Self-powered or auxiliary	Self	Self	Self	Dual (4)	Auxiliary	Auxiliary
	Minimum 3 phase load currents to activate the VIP	4 A	4 A	7 A (5)	–		

(1) See Sepam user guide.

(2) Signalling relays: (use of output relays may be change):
O1 = phase fault (I>, I>>, I>>>)
O2 = earth fault (Io>, Io>>)
O3 = thermal overload alarm.

(3) The number of trips is displayed in 4 levels:
For D01 and D02: < 200 A, < 2 kA, < 8 kA, > 8 kA
For D06 and D06H: < 630 A, < 10 kA, < 20 kA, > 20 kA.

(4) The protection is self-powered. Auxiliary power is used only for communication and high sensitivity earth fault protection.

(5) 14 A with 630 A CBs.

(*) Consult us for availability

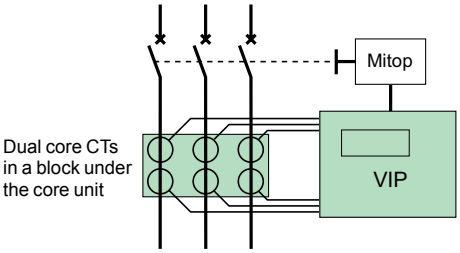
Protection
VIP 40 and VIP 45

Schneider Electric recommends circuit breakers for transformer protection instead of fuses. They offer the following advantages:

- **Easy to set**
- **Better discrimination with other MV and LV protection devices**
- **Improved protection performance for inrush currents, overloads, low magnitude phase faults and earth faults**
- **Greater harsh climate withstand**
- **Reduced maintenance and spare parts**
- **Availability of additional functions such as measurement, diagnostics and remote monitoring**

And with the recent development of low cost circuit breakers and self-powered relays, life time costs are now equivalent to those of traditional MV switch fuse solutions.

PM100574



DM100009

Dual core CTs: for power and for measurement

Application

- Entry level MV/LV transformer protection
- Dependent-time phase overcurrent tripping curve dedicated to MV/LV transformer protection
- Definite-time earth fault protection
- Phase current and peak demand current measurement.

Main features

Self-powered operation

- Energised by the CTs: no auxiliary power needed.

Complete pre-tested protection system

- Functional block ready to be integrated.

Designed for Premset to protect transformers

- Designed for D02N 200 A and D01N 100 A circuit breakers to replace fuse-switch solutions
- Setting is as simple as fuse selection
- Maximum setting possibilities consistent with circuit breaker characteristics.

Phase overcurrent protection

- Tripping curve optimised for MV/LV transformer protection
- Protection against overloads and secondary and primary short-circuits
- Second harmonic restraint filtering
- Only one setting (I>)
- Discrimination with LV circuit breakers or LV fuses
- Compliant with TFL (Time Fuse Link) operating criteria.

Earth fault protection

- Definite-time tripping curve
- Settings: Io> (phase current sum method) and to>
- Second harmonic restraint element.

Measurement

- Load current on each phase
- Peak demand current.

Front panel and settings

- Current measurements displayed on a 3 digit LCD
- Settings with 3 dials (I>, Io>, to>) protected by a lead-sealable cover
- Trip indication powered by dedicated integrated battery with reset by pushbutton or automatically.

Other features

- Complete pre-tested solution that eliminates complicated CT selection
- Complies with MV protection relay standard IEC 60255
- No PC or specific tool required for setting or commissioning
- Maximum setting possibilities consistent with circuit breaker features
- Self-powered by dual core CTs: CUa
- Environment: -40°C / +70°C.

Primary injection test

- A primary injection circuit may be permanently installed (option) through the CTs, inside the Premset cubicle, to test the physical integrity of the complete protection system including the CTs
- The test is carried out without disconnecting the CTs and the VIP 40 and VIP 45 displays the injected current during testing
- If required, a temporary VIP 40 and VIP 45 test mode can be activated to test the tripping of the circuit breaker by pressing a test pushbutton.

Test with the Pocket Battery module

- This accessory can be connected on the VIP 40 and VIP 45 front plate to energise the relay to carry out a quick test even when the relay is not powered (the temporary “VIP 40/45 test mode” can be activated for the circuit breaker).

Protection
VIP 400 and VIP 410

■ **VIP 400 is a self-powered relay energised by the CTs; it does not require an auxiliary power supply to operate**

■ **VIP 410 is a dual powered relay offering self-powered functions and additional functions powered by an AC or DC auxiliary supply.**

PM100580

Applications

■ MV distribution substation incomer or feeder protection relay
■ MV/LV transformer protection.

VIP 410 ready for smart grids

Dual supply for communication with:

■ DMS and RTUs
■ Remote alarming
■ Time stamped events
■ Measurements of current, load history, overcurrent and breaking profile.

Dedicated to intelligent MV loops with automation:

■ Remote configuration
■ Setting groups selectable according to the configuration of the MV loop
■ Remote asset management
■ Plug and play system with Easergy RTUs (R200) to integrate all protocols (IEC 60870-104, DNP3, IEC 61850) and remote Web pages.

Main features

VIP 400: Self-powered protection relay

This version is energised by the current transformers (CTs). It does not require an auxiliary power supply to operate.
■ Overcurrent and earth fault protection
■ Thermal overload protection
■ Current measurement functions.

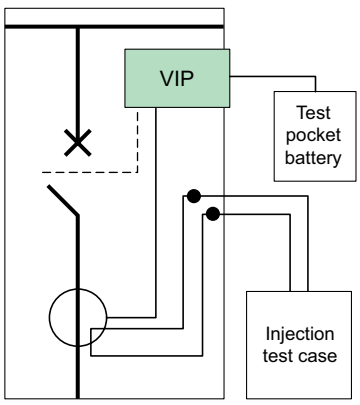
VIP 410: Dual powered protection relay

■ Offers the same self-powered functions as the VIP 400
■ In addition, the VIP 410 has an AC or DC auxiliary supply to power certain additional functions that cannot be self-powered:
□ sensitive earth fault protection
□ external tripping input
□ cold load pick-up
□ communication (Modbus RS485 port)
□ signalling
■ If the auxiliary power fails during an MV short-circuit, the protection functions are maintained.

Other features

■ Designed for Premset D02N 200 A and D06N 630 A circuit breakers
■ Complete pre-tested solution that eliminates complicated CT selection
■ Complies with MV protection relay standard IEC 60255
■ No PC or specific tool required for setting or commissioning
■ Self-powered by dual core CTs
■ Environment: -40°C / +70°C.

DM100040



Tests of protection system and circuit breaker

Primary injection test

A primary injection circuit may be permanently installed (option) through the CTs, inside the Premset cubicle, to test the physical integrity of the complete protection system including the CTs.
■ The test is carried out without disconnecting the CTs and the VIP relay displays the injected current during testing
■ If required, a temporary VIP test mode can be activated to test the tripping of the circuit breaker by pressing a test pushbutton.

Test with the Pocket Battery module

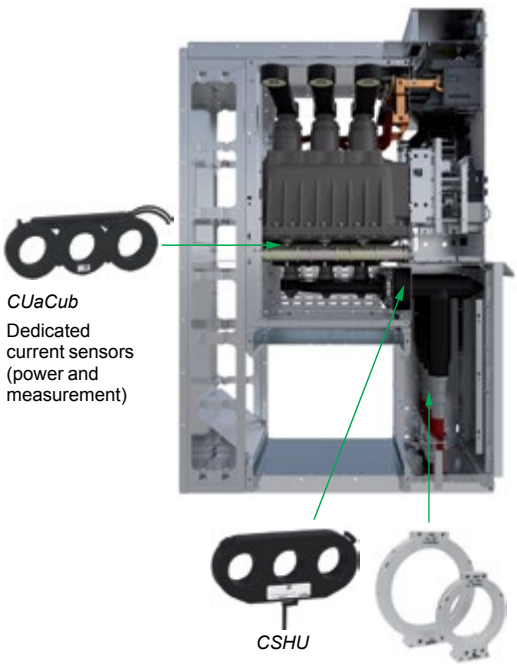
■ This accessory can be connected on the VIP relay front plate to energise the relay to carry out a quick test even though the relay is not powered. This module also makes it possible to test the circuit breaker.

Protection
VIP integrated system

The VIP series is an integrated protection system:

- **Dedicated sensors located under the core unit provide protection and measurement outputs**
- **Optional additional earth fault sensors are available**
- **Actuators are low power tripping coils (Mitop).**

DM100035



CUaCub
Dedicated current sensors (power and measurement)

CSHU
for VIP 410 only

CSH120/200
Optional zero sequence sensor (2 possible options and locations)

High sensitivity sensors

VIP integrated protection system

The VIP integrated protection system is composed of sensors, a processing unit and an actuator, designed together to provide the highest level of reliability and sensitivity from 0.2 A to 20 In for VIP 400 and VIP 410 and 5 A to 20 In for VIP 40 and VIP 45.

Sensors

The sensors are made up of one block of three CTs with rated and insulation voltages of 0.72 kV / 3 kV - 1 min, providing both measurement and power outputs.

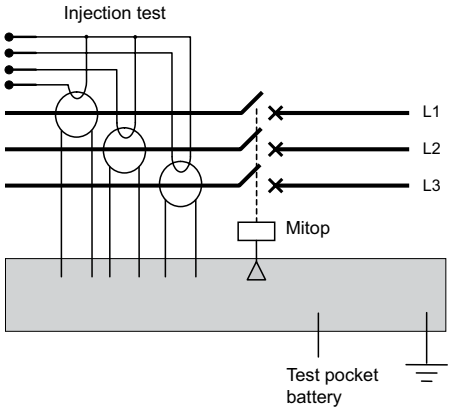
- The measurement sensor is based on Low Power Current Transformer (LPCT) technology as defined by standard IEC 60044-8, ensuring excellent accuracy:
  - 5P30 for protection
  - class 1 for measurement.
- The power supply winding ensures calibrated self-powering of the relay even for currents of just a few Amperes
  - e.g. 7 A is sufficient for operation of the VIP 400 with a 200 A circuit breaker, up to its saturation level
  - e.g. 4 A is for operation of the VIP 40 up to its saturation level.
- Optionally, the VIP 410 can be associated with an earth fault current transformer (a single zero-sequence CT) dedicated to sensitive earth fault protection with a low threshold down to 0.2 A.
- The protection sensors are located under the core unit, the earth fault sensors around the bushings or on the cables. The connection between all these elements, sensors and the relay is prefabricated and protected against external aggression, providing a higher level of reliability.

Actuators

- The actuator is a dedicated low power tripping coil (Mitop) specifically designed to operate with the sensors and the processing unit with minimum energy.
- The integrity of the Mitop circuit is continuously supervised (Trip Circuit Supervision function).

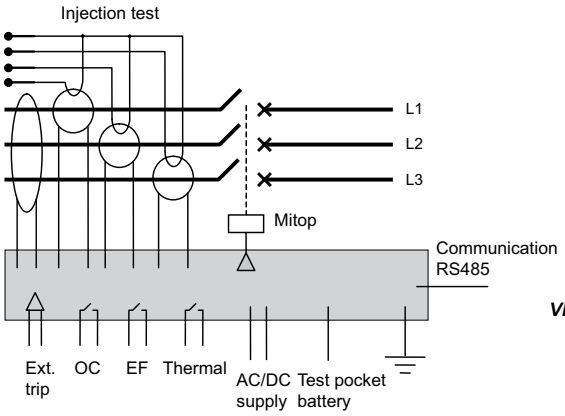
Connection diagrams

DM100029



VIP 40, VIP45 & VIP 400

DM100030



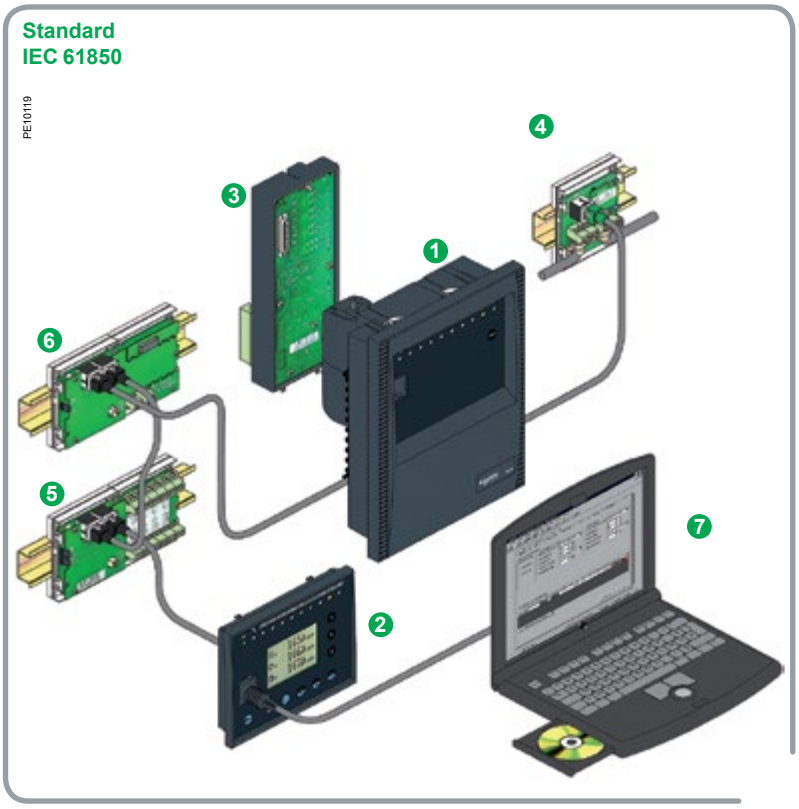
VIP 410

Protection
Sepam series 20 and series 40

Sepam series 20 and series 40 are families of digital current and voltage protection relays for MV public and industrial distribution networks:

- **Sepam series 20 for standard applications**
- **Sepam series 40 for demanding applications.**

Series 20 and series 40 relays and optional modules



1 Base unit, with various types of User Machine Interfaces (UMI)
- Basic UMI
- Advanced UMI with graphical LCD screen

2 Remote advanced UMI

3 10 logic inputs and 8 output relays
- 4 outputs on the base unit + 1 optional module providing 10 inputs and 4 outputs

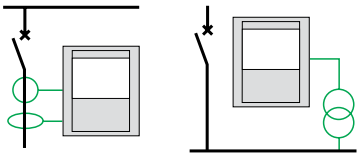
4 Communication port
- Connection to 1 or 2 S-LAN and/or E-LAN networks
- Modbus, Modbus TCP/IP, IEC 60870-5-103, DNP3 and IEC 61850 communication protocols
- RS485 (2 or 4 wire) or fibre optic network

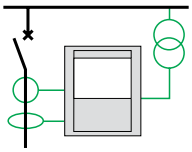
5 Temperature data from 8 or 16 sensors
- Pt100, Ni100 or Ni120

6 1 analog output
- 0-10 mA, 4-20 mA or 0-20 mA

7 Software tools
- Sepam parameter and protection settings and control function customisation
- Recovery and display of disturbance recording data
- Local or remote operation via an E-LAN

Protection
Sepam series 20 and series 40





		Series 20				Series 40				
Protections										
Current		■	■			■	■	■	■	■
Voltage				■	■	■	■	■		■
Frequency				■	■	■	■	■		■
Specifics			Breaker failure		Disconnection by rate of change of frequency		Directional earth fault	Directional earth fault and phase overcurrent	Directional earth fault	
Applications										
Substation		**S20**	**S24**			**S40** **S50** (3)	**S41** **S51** (3)	**S42** **S52** (3)	**S43** **S53** (3)	**S44** **S54** (3)
Busbar				**B21**	**B22**					
Transformer		**T20**	**T24**			**T40** **T50** (4)		**T42** **T52** (4)		
Generator						**G40**				
Capacitor										
Characteristics										
Logic inputs		0 to 10		0 to 10		0 to 10				
Logic outputs		4 to 8		4 to 8		4 to 8				
Temperature sensors		0 to 8		0 to 8		0 to 16				
Channel	Current	3 I + Io				3 I + Io				
	Voltage			3V + Vo		3V, 2U + Vo				
	LPCT (1)	■				■				
Communication ports		1 to 2		1 to 2		1 to 2				
IEC61850 Protocol		■		■		■				
	Redundancy					■				
Control	Matrix (2)	■		■		■				
	Logic equation editor					■				
Other	Backup battery					48 hours				

(1) LPCT: low-power current transformer complying with standard IEC 60044-8.
(2) Control matrix for simple assignment of information from the protection, control and monitoring functions.
(3) S5X applications are identical to S4X applications with the following additional functions:
- Earth fault and phase overcurrent cold load pick-up
- Broken wire detection
- Fault locator.

(4) T5X applications are identical to T4X applications with the following additional functions:
- Earth fault and phase overcurrent cold load pick-up
- Broken wire detection.

Protection
Sensors and actuators for Sepam series 20 and series 40 or third party relays: Current transformers

The Sepam series 20 and series 40 includes sensors and actuators.

- **Sensors can be:**
  - **TLPU1 standard LPCT sensors placed under the core unit**
  - **ARU2 current transformers.**
- **Actuators are additional shunt trip coils**
- **50/60 Hz frequency for all sensors.**

TLPU1 (LPCT type)

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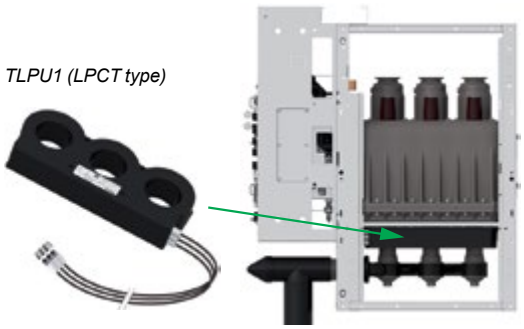
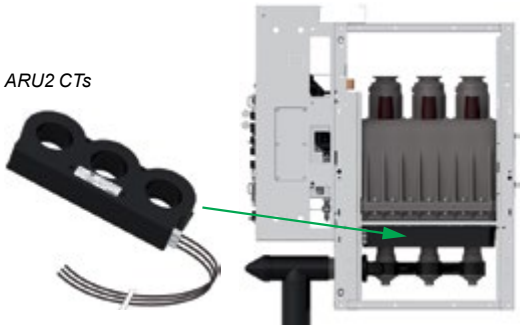


ARU2 CTs

DM100037



Sensitive earth fault protection may require CSH sensors to be installed around the cables.

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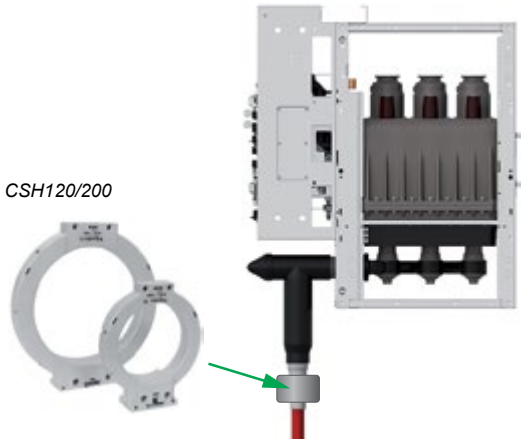
CSH120/200



TLPU1 (LPCT)

A standard Low Power Current Transformer (LPCT) of the TLPU1 type can be located under the core unit. LPCTs provide a precise and stable voltage output over a single large range.

TLPU1 characteristics

LPCT standard		IEC 60044-8
Rated voltage	Ur	0.72 kV
Insulation voltage	Ud	3kV - 1 min
Thermal withstand current	Ith (kA) - t(s)	25 kA - 3 s
Measurement class		5P250 - 0.5
Rated primary current	I1n	100 A
Secondary voltage	Vs	22.5 mV at 100 A
Rated burden		> 2 kΩ

ARU2

A standard ring type current transformer of the ARU2 type (1 A, 5P20 class) can be located under the core unit.

ARU2 characteristics

CT standard		IEC 60044-1	
Rated voltage	Ur	0.72 kV	
Insulation voltage	Ud	3 kV - 1 min	
Thermal withstand current	Ith (kA) - t(s)	25 kA - 3 s	
Transformation ratio		100/1	200/1 - 400/1 - 600/1
Rated burden		1.5 VA	2.5 VA
Protection class		5P-20	

CSH120/200

- For Sepam or third party protection relays, if the sensitive earth fault protection is required, an earth fault toroidal CT of the CSH120 or CSH200 type around the cables should be installed.

Protection
Sensors and actuators for Sepam series 20 and series 40 or third party relays: Voltage transformers

VLPU1 (*)

The VLPU1 is a Low Power Voltage Transformer.
Resistive divisor technology is used, ensuring small size, a wide range of ratings in a single device and avoiding ferroresonance problems. Provided with a flat interface, fully compatible with the connection system, the sensor can be located under the core unit or anywhere in the busbar system and does not need to be disconnected during commissioning and cable tests. It does not require any fuse protection.

VLPU1 characteristics

LPVT voltage transformer	IEC 60044-7
Earth screened	■
Phase-to-earth	■
Insulation level	17.5-42-95 kV
Operating voltage	$3/\sqrt{3}$ to $15/\sqrt{3}$ kV
Ratio	$10/\sqrt{3}$ / $1.625/\sqrt{3}$ V
Accuracy class	1 - 3P
Rated burden	> 4 MΩ

PE58413

VRT4

The VRT4 is a phase-to-earth screened voltage transformer, placed behind the cables. Totally insensitive to harsh atmosphere effects, it does not require any fuse protection. A flexible connection to the front T-type cable plugs can be easily disconnected for commissioning tests.

VRT4 characteristics

Standard	IEC 60044-2							
Voltages	7.2-20-60 kV		7.2-32-60 kV	12-28-75 kV		12-42-75 kV	17.5-38-95 kV	
Primary	$6/\sqrt{3}$ kV	$6.6/\sqrt{3}$ kV	$6/\sqrt{3}$ kV	$10/\sqrt{3}$ kV	$11/\sqrt{3}$ kV	$10/\sqrt{3}$ kV	$13.8/\sqrt{3}$ kV	$15/\sqrt{3}$ kV
1st secondary	$100/\sqrt{3}$ V	$110/\sqrt{3}$ V	$100/\sqrt{3}$ V	$100/\sqrt{3}$ V	$110/\sqrt{3}$ V	$100/\sqrt{3}$ V	$110/\sqrt{3}$ V	$100/\sqrt{3}$ V
Power and accuracy class	10 VA cl 0.2							
2nd secondary	100/3 V	110/3 V	100/3 V	100/3 V	110/3 V	100/3 V	110/3 V	100/3 V
Power and accuracy class	30 VA 3P							

(*) Consult us for availability

Fault passage indicators
Flair 21D, 22D and 23DM

Flair 21D, 22D, 23DM is a family of DIN format fault passage indicators. They are small in size, self-powered and adapt automatically to the network.

These devices use cutting-edge technology to detect earth faults on underground MV networks with isolated, resistor-earthed or directly earthed neutral and overcurrents on all networks.

- **Self-powered, the fault current passage detection and indication system operates continuously**
- **Adjustment-free, they are immediately operational (numerous manual adjustments are however possible)**
- **Compact, their DIN format easily fits in MV cubicles**
- **Smart, they offer an ammeter/digital maximeter function**
- **Comprehensive, the Flair 23DM version incorporates a highly sophisticated voltage presence/absence relay function with RJ45 Modbus communication.**

PE57783

Flair 21D

PE57784

Flair 22D

- **Earth fault sensitivity as low as 5 A**
- **Display of settings and faulty phase**
- **Automatic reset**

Applications and main features

The Flair range increases your power availability by providing indicators suitable for fault locating and MV network load management.

- Indication of phase-phase and phase-earth faults
- Display of settings
- Indication of the faulty phase
- Display of the load current including peak demand and frequency
- Fault passage indication and voltage detection combination (Flair 23DM)
- RJ45 communication (Flair 23DM only).

These fault passage indicators are reliable and easy to use.

- Automatic setting on the site
- Fault indication with LED or outdoor lamp
- 15-year battery life for Flair 22D
- More accurate fault detection if Flair 22D or 23DM is connected to voltage presence indication system (VPIS) voltage output
- Can be factory-mounted in Premset cubicles or added on the site
- Easy on-site addition without removing MV cables using split-type current sensor.

Fault detection functions

Overcurrent detection

- Automatic mode for adjustment-free calibration of detection thresholds
- Manual mode for special override settings:
  - Flair 21D: 4 detection thresholds from 200 A to 800 A, in 200 A increments, selectable via microswitches
  - Flair 22D and Flair 23DM: 8 detection thresholds from 100 A to 800 A, in 50 A increments, configurable via the front panel keypad.
- Fault acknowledge time:
  - Flair 21D: 40 ms
  - Flair 22D and Flair 23DM (configurable via the front panel keypad)
    - Type A from 40 to 100 ms in 20 ms increments
    - Type B from 100 to 300 ms in 50 ms increments.

Earth fault detection

The detector checks the 3 phases for current variations (di/dt).
A time delay of 70 s is applied for fault confirmation by the upstream protective device.

- Automatic mode for adjustment-free calibration of detection thresholds
- Manual mode for special override settings:
  - Flair 21D: 6 detection thresholds from 40 to 160 A, via microswitches
  - Flair 22D and Flair 23DM (configurable via the front panel keypad):
    - Type A from 20 to 200 A, in 10 A increments
    - Type B from 5 to 30 A in 5 A increments and 30 to 200 A in 10 A.
- Inrush function: prevents unnecessary detection in the event of load switch-on. Incorporates a 3 s time delay for fault filtering at network power up. The Inrush function can be disabled via configuration on Flair 22D and 23DM.

Fault indication function

Signalling

As soon as a fault is confirmed, the indication device is activated.

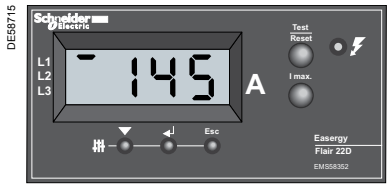
- Fault indication via a red LED on the front panel
- Indication of the faulty phase (earth fault) on LCD display
- Optional remoting of indication to external flashing lamp
- Activation of a contact for retransmission to the SCADA system.

Indication reset

- Automatic reset upon load current recovery (configurable time delay on Flair 22D and Flair 23DM)
- Manual reset via front panel button
- Reset via external Reset input
- Reset by time delay: fixed (4 hr) for Flair 21D and adjustable using front panel keypad (2 hr to 16 hr) for Flair 22D and Flair 23DM.

Fault passage indicators
Flair 21D, 22D and 23DM

Clear, comprehensive display

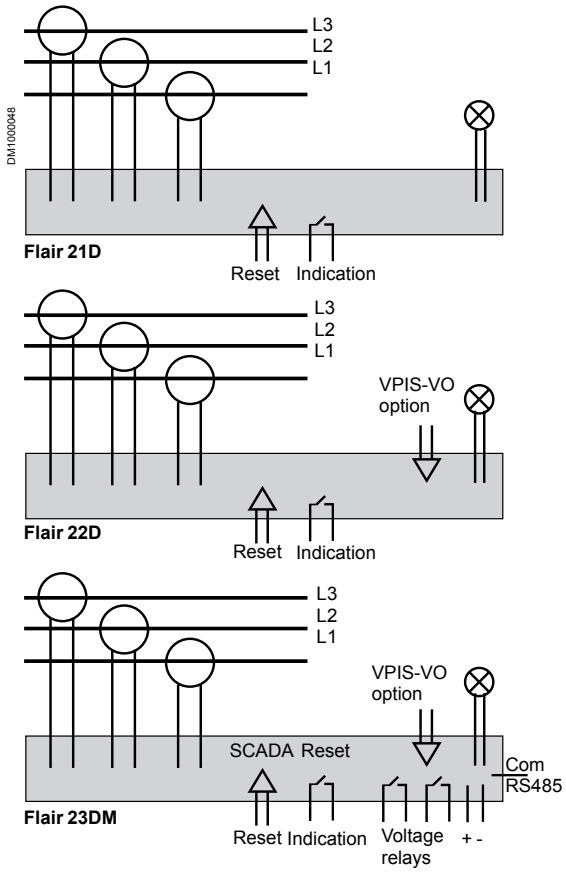


Sensors

The Flair 21D, 22D, 23DM range uses an integrated detection system composed of indicators and dedicated CTs.

Integrated sensors are normally placed around the bushings. Split CTs can be placed around cables for retrofit purposes.

Connection diagrams



Display principle

- The load current is displayed continuously
- When a fault is detected, the faulty phase is indicated
- Use the buttons on the front panel to scroll through settings and measurements.

Selection table

		Flair 21D	Flair 22D	Flair 23DM
Power supply	Self-powered	■	■	■
	Dual-powered		■ (1)	■
Detection	Overcurrent	■	■	■
	Earth-fault	■	■	■
Display (4 digit LCD)	Ammeter	■	■	■
	Maximeter	■	■	■
Options	SCADA interface (relay)	■	■	■
	External lamp	■	■	■
	External reset		■	■
	Extended setting (keypad)		■	■
Communication	2-voltage output relays			■
	Serial communication port			■

(1) By lithium battery

Characteristics per product

Model	Description
Fault passage indicator with single power supply (self-powered)	
Flair 21D	Detector with autonomous power supply
	External indicator lamp output powered by battery (BVP)
Fault passage indicator with dual power supply	
Flair 22D	Detector with autonomous power supply and lithium battery
	External indicator lamp output powered by the Flair (BVE)
	Interface with VPIS-VO possible to confirm the fault by voltage absence
Fault passage indicator with dual power supply and voltage presence/absence	
Flair 23DM	Detector with 24-48 Vdc external and autonomous power supply
	External indicator lamp output powered by the Flair (BVE)
	Voltage presence and absence detector (same as for VD23)
	Interface with VPIS-VO needed for the voltage presence

Standard applications

Flair 21D	Maintenance-free, adjustment-free fault detector
Flair 22D	Fault detector for networks with very low load current (< 2 A) with possibility of manual adjustments.
Flair 23DM	Adapted to Feeder Automation. Forwarding of current measurement, fault passage indication and voltage outage information to the SCADA via a serial communication port. Combination fault passage indicator and voltage detector, ideal for use with an Automatic Transfer System.

Voltage indicator and relay
VPIS and VDS

PE56366

VPIS

Voltage presence indicators

A voltage presence indicating device can be integrated in all the functional units, either on the cable or busbar side. It can be used to check whether or not a voltage is present across the cables.

Two devices are available:

- VPIS: Voltage Presence Indicator System, as defined by standard IEC 62271-206
- VDS: Voltage Detecting System, as defined by standard IEC 61243-5.

The VPIS can be fitted with a voltage output (VPIS-VO) dedicated to various voltage detection applications such as automatic transfer switches, voltage absence or presence contacts, live-cable earthing switch lockout, etc.

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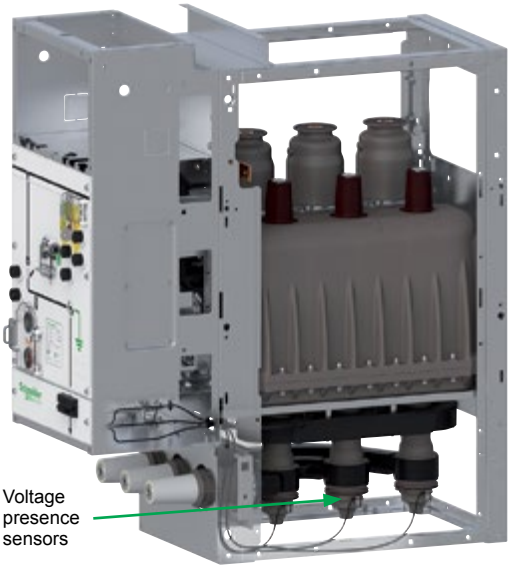
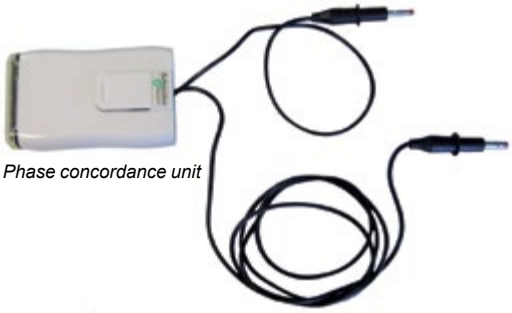


Voltage presence sensors on busbars or cables

Voltage sensors

A voltage sensor is integrated in all the functional units. It provides a signal with an accuracy of 5% to the VPIS through a 30 pF capacitive divider.
The sensor is integrated in the tightening cap used to secure the busbar or cable connections. The voltage can be detected either on the cable side or the busbar side.

PE56830



Phase concordance unit

Phase concordance unit

This unit is used to check phase concordance.

PB103790

Pocket battery

Pocket battery for VIP

This unit is used to power the VIP 40, VIP 45, VIP 400 and VIP 410 units, making it possible to operate and test the protection system.
It can also be used to power Schneider Electric LV circuit breakers.

Voltage indicator and relay
VD23 voltage relay

The VD23 is a voltage detecting system for automatic transfer system or interlock applications.

- **Various combinations:**
  - **presence or absence voltage relay**
  - **zero sequence voltage relay**
  - **phase-to-neutral or phase-to-phase voltage**
  - **phase selection.**
- **Easy to install:**
  - **compact 96 x 48 mm DIN format**
  - **terminal connection for VPIS-VO**
  - **no need for HV transformer**
  - **hot installation**
  - **auto-adaptation of nominal voltage.**
- **Optional communication port and fault detector (Flair 23DM).**

PE57787

VD23

Features

The VD23 is a compact voltage relay for 3 kV to 36 kV, 50/60 Hz medium voltage networks. It is associated with a capacitive divider and a VPIS-VO.

- 2 output relays based on 2 functional modes:
  - R1 = Voltage presence (typically used for automatic transfer switching)
  - R2 = Voltage absence (typically used for interlocking of earthing switch).
- Thresholds can be set as a percent of phase-to-neutral voltage (V), phase-to-phase voltage (U) or residual voltage (VO)
- All combinations of voltage conditions are possible:
  - 3 phases and residual: V1+V2+V3+VO
  - 3 phases: V1+V2+V3 or U12+U13+U23
  - single phase: Vo, V1, V2, V3, U12, U13 or U23
- Output is a tripping order via two output relays with a normal or inverse active position
- Signalling and tripping outputs may be set with a delay.

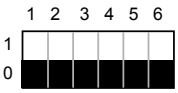
Display principle

- Voltage value (% of Un) of L1, L2 and L3 shown on the display
- Voltage presence/absence indication via LED
- Settings by front pushbuttons and LCD
  - thresholds, delays and smart parameters
  - display of all settings on LCD.
- Auto-adaptation of the nominal system voltage
- Check on voltage status.

Advanced settings

All the combinations can be set with microswitches on the rear of the device. The use of two relays provides safety backup operation for each combination

6 microswitches:

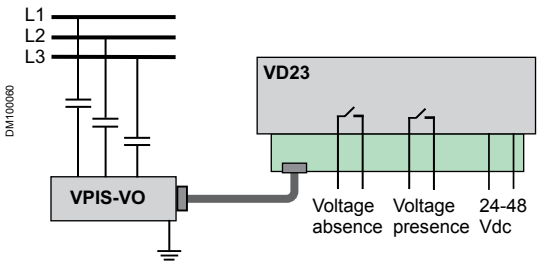


1: Ph-N voltage(V) / Ph-Ph voltage(U)
2: Direct / inverse action on output relays
3: Phase 1 used / not used
4: Phase 2 used / not used
5: Phase 3 used / not used
6: Residual voltage used / not used

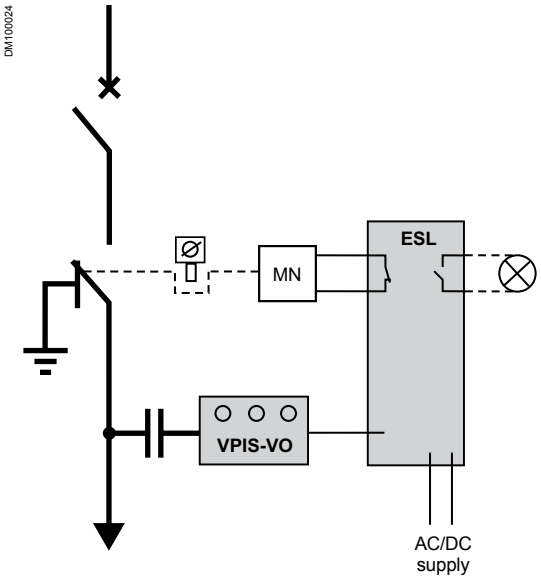
Wiring (with VPIS-VO)

All the combinations can be set with microswitches on the rear of the device. The use of two relays provides safety backup operation for each combination.

DM100060



Live cable interlock



Functions

The “live cable interlock” function is an electrical interlock preventing the operator from closing the earthing switch on live cables.
Even if all the earthing switches integrated in Premset core units have full making capacity performance, it may be useful to avoid creating intempestive faults by inadvertently earthing live cables.

Principle

The system is composed of:
■ A mechanical locking assembly acting directly on the line / earth selector, including an override key that can be used to bypass the locking device
■ An undervoltage coil for failsafe operation of the mechanical lockout system (see MN, page 70)
■ A dedicated electronic auxiliary-powered voltage relay (ESL) fitted with an auxiliary contact for remote indication of “locked” position
■ A VPIS indicator on the cable side, with a voltage output (VPIS-VO), to detect and send the voltage signal to the relay.

Operation

■ Normal case : the system is powered by auxiliary power. It is then impossible to move the selector from “line” to “earth”, as long as voltage is detected on the cable by the VPIS.
■ In case of auxiliary power loss, cables live or not, a failsafe features blocks the system so the selector cannot be operated.
Override is possible only by unlocking the system with key or when auxiliary power is restored.

Technical data

■ Auxiliary power:
□ 24-48 VDC: ESL100 A
□ 110-220 VAC / 110-250 VDC: ESL100 E
■ Key types:
□ tubular
□ flat.
■ Undervoltage coil: see MN, page 70.

Integrated measurement
AMP 21D ammeter

■ Traditionally, three analogue dial-type ammeters were installed on MV feeders with a costly and bulky TC to power them . These devices had poor accuracy (cl. 1.5) and no maximeters to provide feedback on the maximum load

■ Now, with the AMP 21D digital ammeter, all feeders can be equipped with small TCs that provide accurate measurements and a maximeter function, all at a lower price

■ The AMP 21D is self-powered to display currents continuously

■ Its compact DIN format easily fits in Premset MV cubicles

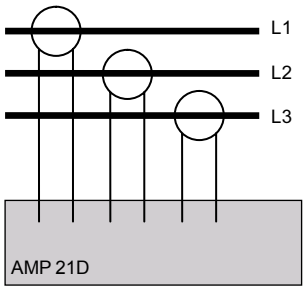
■ Versatile, it displays phase current and maximum current.

PE57786

AMP 21D

Connection diagram

DM100050



Functions

The Easergy Amp 21D is an ammeter dedicated to the display of the load current on Medium Voltage networks.
It is particularly suited to network load management applications.
■ Display of the 3 phase currents: I1 , I2 , I3 (range: 3 A to 800 A)
■ Display of the 3 phase current maximums: M1, M2 , M3 (range: 3 A to 800 A).

Display principle

■ Load currents are displayed by default, with continuous scrolling of L1, then L2, then L3.
■ The maximeter is displayed by pressing a dedicated pushbutton, with continuous scrolling of maximum currents M1, then M2, then M3.
■ The maximums are reset by pressing a combination of two pushbuttons.

Design

Small enclosure
■ DIN format: 93 x 45 mm
■ Secured, extraction-proof mounting
■ Terminal connections.

Technical data

Application		
Frequency		50 Hz and 60 Hz
Load current	Minimum current	3 A
Measurement		
Range	Phase current	3 to 800 A
	Accuracy (I < 630 A)	±3%, ±2 A
Reset of maximeter	Manual from device	Yes
Power supply		
Self powered	From the current sensors	I load > 3 A
Battery		No
Auxiliary supply		No
Display		
	Display	4 digits LCD
	Current per phase	Yes (resolution 1 A)
	Maximeter current per phase	Yes
Sensors		
	Phase CTs	3 ring or split core CT
Other		
	Test	Yes

Integrated measurement
PM200 series Power Meter
PM800 series Power Meter & Quality Meter

The PowerLogic PM200 series help you:

- **Reduce energy costs**
- **Improve power quality**
- **Improve continuity of service for optimal management of your electrical installation and higher productivity.**

PE86217

PM200 series Power Meter

Applications and main features

The PowerLogic **Power Meter series 200 is perfectly suited to sub-billing and cost allocation**. It offers all the measurement capabilities required to monitor an electrical installation in a compact 96 x 96 mm unit.

With its large display, you can monitor all three phases at the same time.
The anti-glare-display features large 11 mm high characters and powerful back lighting for easy reading even under extreme lighting conditions and viewing angles.

The Power Meter series 200 is available in **three versions**:
- PM200, basic version
- PM200P, basic version plus two pulse outputs for energy metering
- PM210, basic version plus an RS485 port for Modbus communication.

Characteristics
- Requires only 50 mm behind the mounting surface
- Fault passage indication and volts
- Large backlit display with integrated bar charts
- Intuitive use
- Power and current demand
- Energy class 1 as defined by IEC 62053-21
- Auxiliary supply for PM devices are 110 to 240 Vac and 110 Vdc.

The PowerLogic PM800 series is designed to:

- **Improve power system reliability and reduce downtime by helping you monitor, troubleshoot and prevent power quality issues (the PM870 includes sag and swell detection and configurable waveform capture)**
- **Measure and manage non-electrical utilities using up to five different channels for optimal management of your electrical installation and higher productivity.**

PE86158

PM800 series Power & Quality Meter

Applications and main features

The PowerLogic Power Meter series 800 is perfectly suited to:
- Sub-billing, cost allocation and utility bill verification
- Remote monitoring of an electrical installation
- Mid-range power quality analysis and energy management
- Utility contract optimisation and load preservation.

The PM800 offers all the high performances measurement capabilities needed to monitor an electrical installation in a compact 96 x 96 mm unit.
Its large easy-to-read display lets you view the three phases and neutral at the same time.

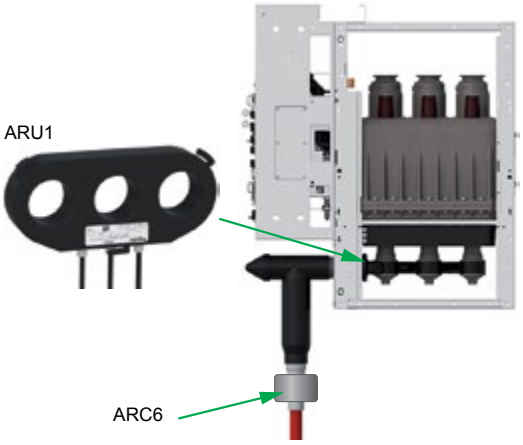
Characteristics
- Large, anti-glare display with white back-light
- Summary screens with multiple values
- Custom alarming with time stamping
- Individual harmonic magnitudes and angles and waveform capture (PM850 and 870)
- Voltage and current disturbance (sags and swells) detection and configurable waveform capture (PM870)
- Extensive and non-volatile on-board memory
- IEC 62053-22 class 0.5S for real energy ensures accurate energy measurement for sub-billing and cost allocation
- Trend curves and short-term forecasting (PM850 and PM870)
- Five channels for WAGES (water, air, gas, electricity, steam) metering capability on all models (a single channel can aggregate pulses from multiple inputs)
- Modular and upgradeable
- Optional remote display (as far as 10 m from the metering unit)
- Optional Ethernet communication port offers Modbus TCP/IP protocol, e-mail on alarm, web server and Ethernet-to-serial gateway
- Auxiliary supply for PM devices are 110 to 240 Vac and 110 Vdc.

Integrated measurement
Sensors for PM 200, PM800 or third party power monitors

Dedicated current and voltage transformers are available for measurements. They are designed to be integrated in Premset core functions to avoid extra cubicles.

They are fully compatible with the PM Power Meter series, but can also be used with third party devices.

DM100038



Current transformers

ARU1

The ARU1 is a block comprising three ring-type current transformers used on the phases of all the switchgear units: **I06, D01N / D02N, D06N and D06H.**

ARU1 characteristics

Standard	IEC 60044-1			
Rated voltage	0.72 kV			
Insulation voltage	3 kV - 1 min			
Transformation ratio	100/1	200/1	400/1	600/1
Thermal withstand	25 kA x 3 s	25 kA x 3 s	25 kA x 3 s	25 kA x 3 s
Class	0.5 s	0.5 s	0.5 s	0.5 s
Power with cl 0.5 s	2.5 VA cl 0.5	2.5 VA cl 0.5	2.5 VA cl 0.5	2.5 VA cl 0.5

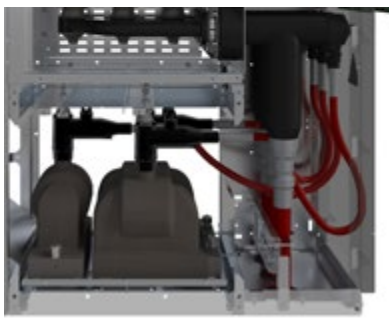
ARC6 (*)

ARC6 is a ring-type CTs placed around cables. It offers higher accuracy than the ARU1 type presented above. It is not compatible with small cable boxes and can only be installed on single-core screened cables.

ARC6

	ARC6					
Standard	IEC 60044-1					
Transformation Ratio	100/5	150/5	200/5	300/5	400/5	600/5
Ith (kA)	25	25	25	25	25	25
t (s)	3	3	3	3	3	3
Measurement						
Class	0.2S	0.2S	0.2S	0.2S	0.2S	0.2S
Power	5VA	5VA	5VA	15VA	15VA	15VA
Protection						
Class	5P	5P	5P	5P	5P	5P
Power	1 VA	2.5 VA	2.5 VA	5 VA	7.5 VA	10 VA

PM100042



VRT4

Voltage transformers

VLPU1 (*), VRT4

The voltage sensors used for protection (VLPU1 or VRT4) can also be used for power measurement.
The entire PowerLogic PM range is fully compatible with them.
See page 60 for their description and technical characteristics.

(*) Consult us for availability

Control
Local and electrical operation mechanisms

Three operating mechanisms meet all the needs of the various core units of the Premset range.

They provide trouble-free and user-friendly operation over the entire life of your switchgear.

They share the same range of auxiliaries for electrical operation and remote indications.

PM100511

CIT mechanism in I06T unit

PM100009

CI1 mechanism in D02N unit

PM100600

OCO mechanism in D06H unit

A rational range of operating mechanisms

Three operating mechanisms have been designed together with the core units to optimise performance and ensure user-friendly operation.

They are totally integrated within the core units and will operate over the total life expectancy of the switchgear.

Periodic checkup of the mechanism can be done to ensure the performance depending on the environmental conditions.

All three mechanisms share the same features:
- Intuitive operation principles
- Positive indications and easy-to-read mimic diagrams
- Range of auxiliaries including motor-mechanism, opening coils (MX, MN), closing coils (XF) and auxiliary switches
- Range of accessories including padlocking and keylock devices
- Earthing switch mechanism, fully and safely interlocked with the main device.

Three mechanisms

- **Lever type (CIT):** lever-operated for closing and opening
- **Latching type (CI1):** lever-operated for closing, pushbutton-operated for opening and fast tripping by coil or actuator (Mitop)
- **Stored energy type (OCO):** pushbutton-operated for closing and opening, lever-operated for mechanical energy charging, fast tripping by coil or actuator (Mitop). Can be closed by a coil (XF) and can operate an OCO cycle without recharging.

A rational range of electrical control auxiliaries

All functional units of a Premset switchboard can be electrically operated using the same auxiliary components:
- Motor mechanism: MCH
- Opening coil: shunt trip release MX
- Opening coil: undervoltage release MN
- Closing coil: XF.

They are easy to add to a core unit without special tooling or training. This makes it possible for installers to make last-minute modifications on-site.

Main characteristics

Mechanisms	**CIT**		**CI1**		**OCO**	
Core units	**I06T**		**D01N, D02N, D06N**		**I06H, D06H**	
Operation	Manual	Electrical	Manual	Electrical	Manual	Electrical
Opening	Lever	MCH	Push button	MX	Push button	MX
Closing	Lever	MCH	Lever	MCH	Push button	XF
Charging	When closing	When closing	When closing	When closing	Lever	MCH
Additional opening by coil (1)	No		MX2 or MN		MX2 or MN	

(1) Possible only with VIP tripping relays, because used by Sepam or other external relays as an actuator.
Please note that VIP 410 and Sepam relays include an "external tripping input" function.

Control
Electrical operation auxiliaries
MCH, XF, MX, MN

PM100582

MCH motor mechanism

Motor mechanism (MCH)

The MCH electrical motor mechanism is used to charge the main springs that store the operating energy for the core unit mechanism.
- On the CIT mechanism, it allows electrical opening and closing of the core unit.
- On the CI1 mechanism, it allows electrical charging and closing of the core unit.
- On the OCO mechanism, it allows electrical charging of the core unit.

The motor mechanism is equipped with a “spring charged” limit switch that stops spring charging when the springs are fully charged. This contact is also used to indicate the “spring charged” status.

MCH characteristics

Power supply	24-30 V DC, 48-60 V AC/DC, 100-130 V DC, 110-130 V AC, 200-250 V DC, 220-240 V AC
Threshold	0.85 to 1.1 Un
Consumption (VA or W)	180
Motor overcurrent	2 to 3 In for 0.1 s
Charging time	6 s maximum
Operating rate	3 cycles maximum per minute

PM100002

XF and MX shunt closing releases

Shunt closing release (XF) and opening release (MX)

XF shunt closing release

This release, dedicated to the OCO mechanism, allows electrical closing as soon as the springs are charged.

MX shunt trip release

This release, dedicated to the CI1 or OCO mechanisms, allows electrical opening of the core unit. It can lock the unit in open position as long as the remote order is maintained.

XF and MX characteristics

Power supply		24-30 V DC, 48-60 V AC/DC, 100-130 V DC, 110-130 V AC, 200-250 V DC, 220-240 V AC
Threshold	XF	0.85 to 1.1 Un
	MX	0.7 to 1.1 Un
Consumption (VA or W)	Triggering	200 (for 200 ms)
	Latched	4

PM100001

Time delay unit for MN undervoltage release

Undervoltage release (MN)

This release allows the electrical opening of the core unit in the event of an undervoltage. It can be used also for positive opening and locking in case of an emergency caused by a voltage drop, loss of auxiliary power, etc. It can be associated with a time delay unit.

MN characteristics

Power supply		24-30 V DC, 48-60 V AC/DC, 100-130 V DC, 110-130 V AC, 200-250 V DC, 220-240 V AC
Threshold	Opening	0.35 to 0.7 Un
	Closing	0.85 Un
Consumption (VA or W)	Triggering	200 (for 200 ms)
	Latched	4.5

PM100032

Rotary type contacts (OC)

“On/Off” auxiliary position contacts

These auxiliary contacts indicate the “open” or “closed” position of the circuit breaker.
- Rotary type changeover contacts directly controlled by the circuit breaker mechanism.
- Indication contacts are proposed:
  - for standard relaying applications
  - for low level control applications with PLCs or electronic circuits.

This version is compatible with Sepam series 20, series 40 and series 80 units.

Characteristics

Breaking capacity (A)	Standard		Minimum load: 100 mA/24 V
Cos φ: 0.3	V AC	240/380	10/6 (1)
Utilisation category: AC12/DC12		480	10/6 (1)
		690	6
	V DC	24/48	10/6 (1)
		125	10/6 (1)
		250	3

(1) Standard contacts: 10 A
Optional contacts: 6 A (temperature derating)

Control
Electrical operation auxiliaries SC100 and SC110

The SC100 and SC110 is an intelligent electronic device designed to control and monitor all the components involved in the remote control of core units.
It integrates all the necessary functions for trouble-free remote control:

- **Electrical interlocking**
- **Remote control supervision**
- **Front panel interface for local operation**
- **Built-in Modbus communication and "Plug and play" design makes the SC100 and SC110 and the remote control facility:**
  - **easy to use**
  - **easy to upgrade.**

PM100043

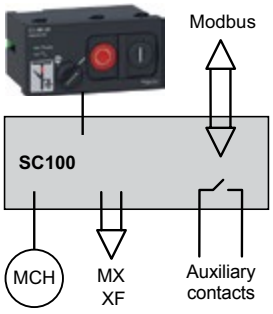
3 RJ45 Modbus plugs

SC110A

PM100038

SC-MI control panel

DM100025



The SC100 and SC110 is installed in the Low Voltage cabinet of the functional unit. It controls and monitors all the devices needed for electrical operation: MCH, MX, XF, auxiliary contacts.

SC100 universal intelligent controller

SC100 and SC110 is a compact device with digital inputs and outputs to monitor all the components associated with the electrical operation of the core unit: MCH, MX, XF, auxiliary contacts.
It can be associated with a control panel (SC-MI) and wireless remote control options.

Switchgear control functions

- Coil and motor operation
- Information on core unit status: main switch, earthing switch, lever insertion, etc.
- Built-in electrical interlocks: anti-pumping and anti-reflex functions
- External interlocking feature
- Lockout of electrical operation after tripping (option)
- Modbus communication for remote control via data transmission.

Switchgear monitoring

- Diagnosis information: motor consumption, etc.
- Core unit auxiliary contacts status
- Logging of time-stamped events
- Modbus communication for remote indication of monitoring information.

SC100 - SC110 types

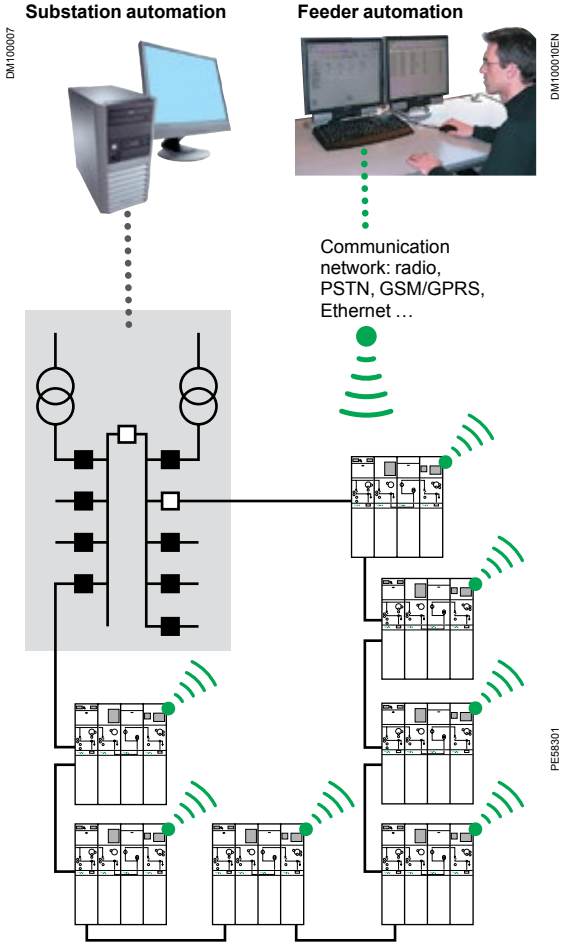
	SC100-A	SC100-E	SC110-A	SC110-E
24-60 Vdc	■		■	
110-250 Vdc/Vac		■		■
Network communication			■	■

SC-MI control panels

	SC-MI 10	SC-MI 20
On/Off pushbuttons	■	■
Remote/local switch		■

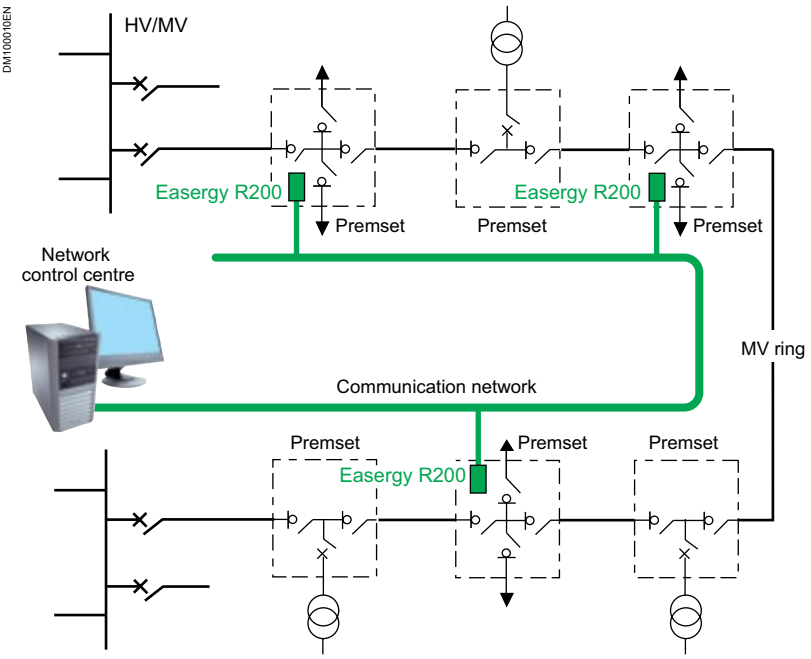
(*) Consult us for availability

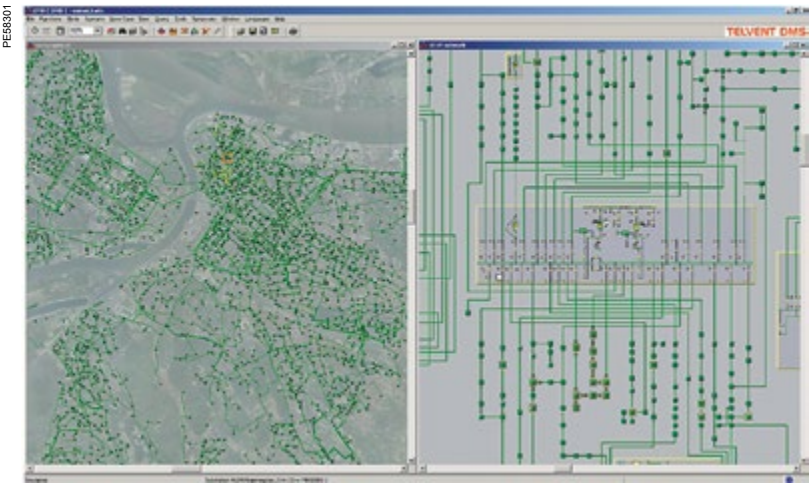
Control
Architecture of feeder automation



Continuity of service guaranteed by an overall telecontrol solution

Schneider Electric offers you a complete solution, including:
- The Easergy R200 telecontrol interface
- Premset switchgear that can be easily adapted for telecontrol
- The SCADA and DMS system.





Telvent DMS system

Premset range, more than ready

Premset switchgear is perfectly suited to telecontrol thanks to options such as:
- LV control cabinet including an R200 RTU
- Motorised operating mechanism
- Auxiliary fault and position indication contacts
- Current sensors for fault detection.

Control
Easergy R200 control unit

Built-in solutions for protecting, monitoring and controlling your installation.

Energy availability

- **Measurement**
- **Remote fault detection**
- **Remote control and protection devices.**

Easy to use

- **Compact design with built-in devices - no engineering required**
- **Scalable with "just enough" dedicated solutions from monitoring to remote control**
- **Robust devices designed for harsh environments**
- **Easy and safe plug and play connection**
- **Open to standard protocols, ensuring easy SCADA connection.**

Easergy R200: an interface designed for telecontrol of MV networks

Easergy R200 is a Remote Terminal Unit (RTU) intended for typical remote management applications in the Energy industry and for MV infrastructures in general.

The Easergy R200 "plug and play" RTU integrates all the functional units necessary for remote supervision and control of an MV switchboard cubicle:
- Transmission of switch open/close orders
- Exchanges with the control centre.

Easergy R200 is of proven reliability and availability, ready to ensure switchgear operation at any time. It is simple to set up and to operate.

Communication

Easergy R200 can manage both "serial type" and IP protocols.
It is thus possible to mix serial and IP transmission media in a given application.

Communication possibilities are continuously evolving to keep pace with your needs:
- IEC 870-5-101 and IEC 870-5-104 protocols
- DNP3 serial and TCP protocols
- Modbus serial and TCP protocols
- Other proprietary protocols.

An extensive choice of integrated modems and interfaces:
- RS232/485 serial interface
- GSM/GPRS modem
- 3G Modem
- Voice modem (PSTN)
- FSK radio modem
- FFSK radio modem
- Ethernet port.

Easergy R200 incorporates a Web data server in HTML page form for data configuration and monitoring. All that is needed to log on is a PC with a Web browser.

Remote access is possible via GSM, GPRS, Ethernet or PSTN transmission networks and can be implemented in parallel from the remote control centre.

Thanks to this remote access and its capability to send e-mails and SMSs, the R200 offers you a cost-effective solution to monitor your MV substation without a SCADA system.

The embedded Web server allows local monitoring of the substation.

R200

Premset

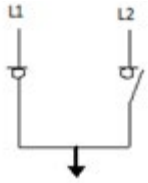
(*) Consult us for availability

Control
Automatic Transfer System: ATS100

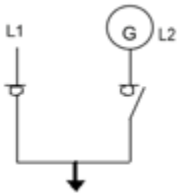
An MV power supply interruption is unacceptable, especially in critical applications.

The Premset system therefore proposes an automatic source transfer solution.

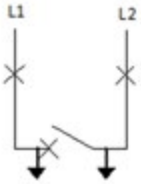
ATS100



ATS100-ACO: *2 line incomers*



ATS100-GEN: *1 line and 1 generator incomers*



ATS100-BTA : *2 line incomers with bus tie*

Source transfer

The ATS100 drives automatic transfer from the normal MV source to the back-up source in order to keep supplying the MV substation in case of failure of the normal source. ATS100 can drive either Load Break Switch or Circuit Breaker.
There are 3 types of ATS100 depending of single line diagram and sources:
ATS100-ACO : 2 line incomers

L1 and L2 can be either normal or backup source. Upon loss of Normal source, Backup source will automatically supply the substation. When Normal source recover there are 3 possibilities depending of the configuration :
- Self-return : The Normal source will automatically supply the substation
- No-return : Only a manual operation will be possible for Normal to supply again the substation.
- Auto-return : The Normal source will automatically supply the substation only in case of loss of the back-up sources: **ATS100-GEN** (*)**:** 1 line and 1 generator incomers

L1 and L2 can be either Line or Generator source. Only the Line can be the Normal source. Upon loss of it, Generator source will automatically be started and the supply the substation. When Line source recover there are 3 possibilities depending of the configuration :
- Self-return : The Line source will automatically supply the substation and generator will be shut down
- No-return : Only a manual operation will be possible for Line to supply again the substation.
- Auto-return : The Line source will automatically supply the substation only in case of loss of the generator sources: **ATS100-BTA** : 2 line incomers with bus tie

Normal situation is L1 and L2 closed and Bus Tie open. In case of loss of one of the lines, the bus tie is automatically closed to recover the supply of the substation. When both lines are back, depending of the configuration, the Normal situation is automatically recovered or not.

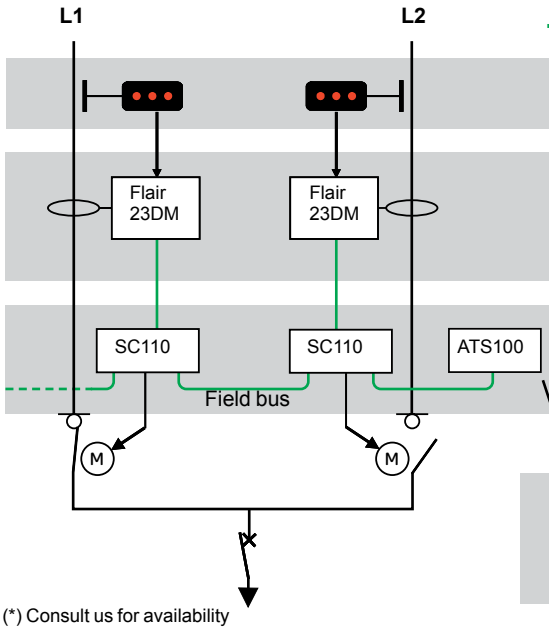
Characteristics

- Switch response time : < 3s
- Parallel coupling : configurable to avoid black-out when restoring normal situation
- Load shedding : configurable to adapt load to the capacity of the generator or to restart loads in sequence after black-out.
- Time delay before changing source : configurable up to 120s
- Time delay before recovering normal situation : configurable up to 30mn
- Remote communication : Ethernet, GSM, GPRS, or 3G communication with
  IEC 870-5-101 and IEC 870-5-104 protocols
  DNP3 serial and TCP protocols
  Modbus serial and TCP protocols

- WebServer : Easergy ATS100 incorporates a Web data server in HTML page form for data configuration and monitoring. All that is needed to log on is a PC with a Web browser.

Typical diagram

DM100061



2 VPIS-VOs	Voltage sensor: dedicated version of VPIS with Voltage Output signal.
2 Flair 23DMs	Voltage detector + Fault Passage Indicator: a relay is activated when a loss of voltage is detected from the VPIS voltage output signal. If a fault current is detected, the Automatic Transfer System is locked out in order to avoid closing the healthy line on the fault.
1 ATS100 + switch or CB function	Based on inputs coming from the Flair 23DMs, the decision is made to switch from one line to the other.
SCADA, BMS	Communication facilities may be added. Communication to SCADA or BMS (optional) Web Server: configuration, diagnostics, alarms, logs.

(*) Consult us for availability

Control
PS100 high-availability power supply

Backup solution for MV switchgear power needs in the event of micro outages and power interruptions.

- **Easy maintenance with only one battery**
- **Remote battery monitoring**
- **High level of insulation to protect the electronic devices in harsh MV environments**
- **End-of-life alarm possible via Modbus communication**
- **Compliant with standards IEC 60 255-5 (10 kV level).**

PM100592

PS100

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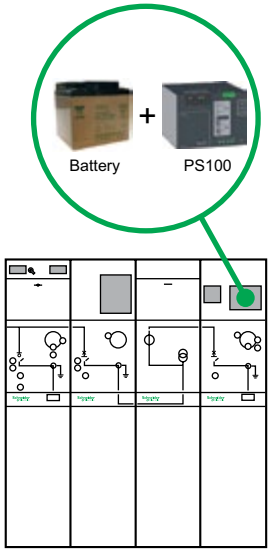


PS100 backup power supply for MV substations

Applications

The power supply unit supplies backup operating power for:
- MV switchgear motor mechanisms and circuit breaker coils
- Transmission equipment (e.g. radio)
- Control units such as RTU (R200) or Automatic Transfer System (ATS100)
- Protection relays, Fault Passage Indicators and others electronic devices.

High availabilty power supply

A battery ensures uninterrupted operation of the whole substation in the event of loss of the main supply. The backup power supply unit:
- Includes a regulated and temperature-compensated charger
- Stops the battery before deep discharge
- Carries out a battery check every 12 hours
- Measures battery ageing
- Forwards monitoring information via a Modbus communication port and output relays.

PS100 benefits

Only one battery

Traditional backup power supplies require a set of 2 or 4 batteries to produce 24 V or 48 V, with complicated replacement and adjustment of the battery pack.

The PS100 needs only one battery, simplifying replacement.

The battery is a standard sealed lead-acid 12 V battery with a 10-year service. It can be purchased easily, anywhere in the world.

Improved availability of MV substations

The PS100 is designed to ride through power network interruptions of up to 48 hours. It is associated with a battery selected to meet the required backup time.

For example, a 38 Ah battery provides 12 hours of backup time to a Premset switchboard including 4 Sepam units.

The PS100 protects and optimises the battery with state-of-the-art monitoring. A Modbus communication port forwards monitoring data to allow optimised maintenance operations.

Additional energy backup

The PS100 stops supplying power and reserves an “additional energy backup” to restart the installation after an extended power interruption.

The “additional energy backup” can be enabled with a local pushbutton to provide energy for restarting the protection relays and operating the MV switchgear.

Withstands severe substation environments

The PS100 includes 10 kV insulation, electronic protection against overvoltage and overloads, and automatic restart after a fault.

Main features

- DIN rail mounting for easy integration in any LV cabinet
- 2 power supply outputs:
  - 12 Vdc - 18 W continuous - 100 W 20 s (for modem, radio, RTU, etc.)
  - 48 Vdc or 24 Vdc - 300 W /1 minute (for switchgear operating mechanism motors) and 90 W / continuous for protection relays, electronic devices, etc.
- RJ45 Modbus communication port
- 2 output relays (AC supply ON, Battery ON)
- Diagnosis with LEDs
- 1 sealed lead-acid 12 V battery with a 10-year service life (from 7 Ah to 40 Ah)
- Power supply paralleling available with a 2nd PS100
- -40°C to +70°C operating temperature.

Range

PS100-48V	48 Vdc power supply and battery charger
PS100-24V	24 Vdc power supply and battery charger
Bat24AH	24 Ah long life battery
Bat38AH	38 Ah long life battery.

Contents

Busbar and cable arrangements

■ **2SIS connections with shielded solid insulation, eliminating all electric fields in open air. Periodic checkup of the mechanism can be done to ensure the performance depending on the environmental conditions.**

■ **Flat and smooth interface between connections, allowing flexibility and misalignment in any direction: easier floor installation.**

■ **Only one cable connection set, used everywhere: many possibilities for cable entry arrangements.**

Universal system of power connections

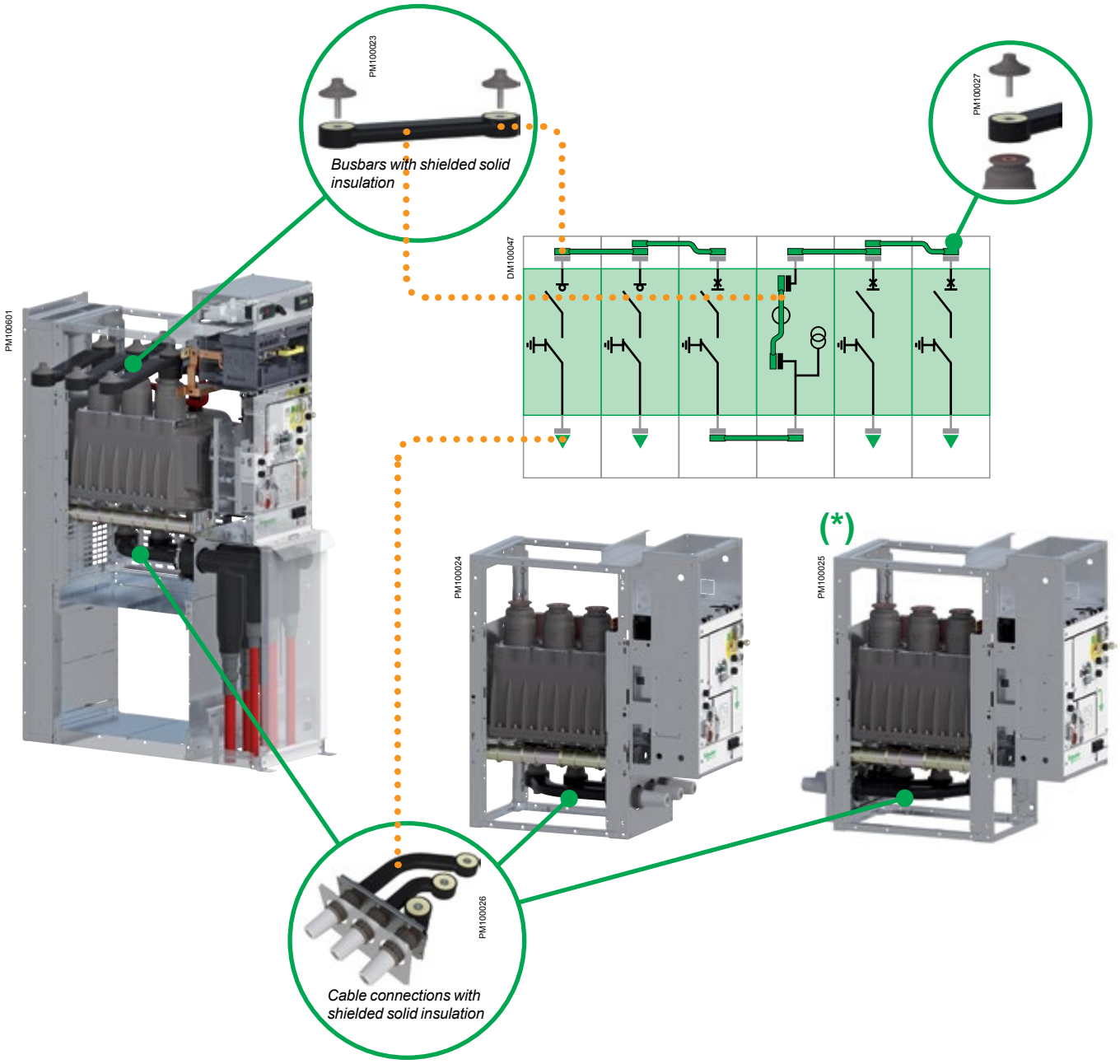
The Premset system is based on a set of common elements, used throughout the system:

■ 2 types of bar elements, used to make up the busbar system as well as risers and downstream connections between cubicles.

■ One set of 3 connections for cables, used in various directions: front, rear, bottom, top…

The connection interface between these elements is always the same (Schneider Electric patented design), allowing a wide variety of arrangements.

For example, the set of cable connections can be fitted in different directions to implement various cable entry arrangements: front bottom, top rear, bottom rear, direct connection to busbars, cable in cable out, etc.



(*) Rear bottom cable option

Cable connections

■ **Only one type of bushing to simplify installation, but various arrangements of connections to fit any application.**

■ **Large choice of cable box and bottom compartment dimensions.**

LV cabinet

Cable test

Top connection

Core unit

Bottom connection

Bottom compartment

D06H

Bottom compartment

The bottom compartment is the lower part of Premset cubicles. It has been designed separately from the rest of the cubicle to offer different versions.
It comes in two different heights to match the space required for cable bending and switchgear installation:

■ Standard height, for cable connections at a height of 700 mm.

■ Low-height version for cable connections at a height of 500 mm, allowing installation of switchgear in rooms with low ceilings (total height of switchgear as low as 1350 mm, depending on LV cabinet dimensions).

■ For higher installations, raising plinths can be fitted as accessories, with two different heights.

Cable connections

■ **Cable boxes** are available in 3 different depths to meet the needs of various types of installations: number of cables, type of connections, bending radius of cables, surge arresters.
Cable boxes can be interlocked with main and earthing switches (see core unit pages) and can be fitted with two transparent windows (not compatible with internal arc performance).

■ **Cable bushings** are standardised “type C”, M16 screw type bushings as defined by standard IEC 60137, in order to simplify the choice and installation of connections.

■ **Cable connections** are always horizontally aligned, 700 or 500 mm high depending on height of the bottom compartment (please refer to dimension drawings in the technical appendix).

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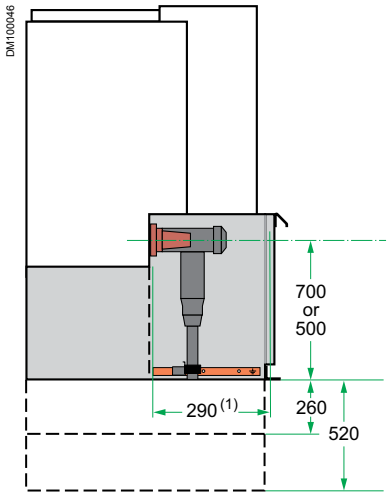
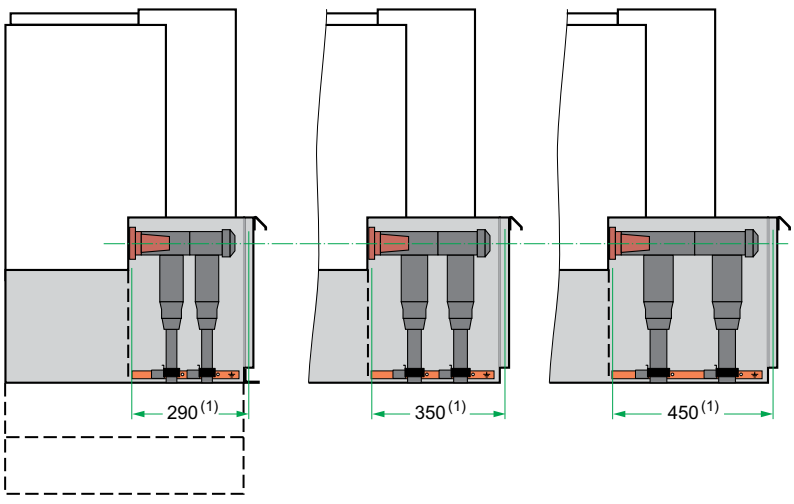


As an option, 2 raising plinths are available (260 and 520 mm dimensions)



(1) + 10 mm without internal arc performance.

Cable connections

Compatible cable connections

Here are some examples of compatible cable connections. As the Premset system is designed with shielded solid insulation, we strongly recommend using directed field cable connectors for better reliability and longer life expectancy.

Supplier	Performance	Reference	1 cable/ phase	1 cable/ phase + Surge Arrester	1 cable/ phase + VRT4	cable/ phase + Surge Arrester + VRT4	2 cables / phase (1)	Cross section (mm^2)	Type
Euromold (Nexans)	Up to 15 kV, 630 A	400LB	x					25 to 300	Elbow connector
		400TB	x		x			35 to 300	T connector
		430TB	x					35 to 300	T connector
		440TB	x		x			185 to 630	T connector
		400TB / 440TB + 440PB-XSA		x		X (*)			Surge Arrestor
		430TB + 300SA		x					Surge Arrestor
NKT Cables GmbH	Up to 12 kV, 630 A	CB12-630	x					25 to 300	T connector
		CB12-630 + CSA12		x					T connector
		CB12-630 + CC12-630					x		Surge Arrestor
	Up to 15 kV, 630 A	CB24-630	x					25 to 300	Surge Arrestor
		CB24-630 + CSA24		x					Coupling Connector
		CB24-630 + CC24-630					x	25 to 300	Coupling Connector
Suedkabel	Up to 12 kV, 630 A	SET 12	x					185 to 300	Elbow connector
		SEHDT 13			x			300 to 500	T connector
		SET B + SEHDK 13.1					x	240 to 300	Coupling Connector
	Up to 15 kV, 630 A	SET 24	x					95 to 240	Elbow connector
		SEHDT 23			x			300 to 630	T connector
		SET B + SEHDK 23.1					x	150 to 240	Coupling Connector
Tyco	Up to 15 kV, 630 A	RSTI x6Lxx	x					400 to 630	T connector
		RSTI L56xx	x					25 to 300	T connector
		RSTI L56SAxxxx		x					T connector
		RSTI L56xx + RSTI-C-L56SAxxxx		x					Surge Arrestor
		RSTI x6Lxx + RSTI CC L56xx					x	25 to 300	Coupling Connector
ABB Kabeldon	Up to 12 kV, 630 A	CSE-A 12630	x					25 to 630	T connector
		2xCSE-A 12-630					x	25 to 630	Coupling Connector
	Up to 15 kV, 630 A	CSE-A 24630	x					25 to 630	T connector
		2xCSE-A 12-630					x	25 to 630	Coupling Connector
Prysmian		FMCTs-400	x		X (*)				T connector

(1) For 2 cables /phase + surge arrester, please consult us

(*): Not compatible with IAC

Please note that the dielectric performance of cable box is reduced down to 75kV BIL when using unscreened connections

Network cable testing and diagnosis device

Premset offers an original primary circuit arrangement allowing direct access to cable conductors without operating the main switches or dismantling the cables connections.

Combined with a dedicated cable test device, it provides maximum operator safety during cable testing and diagnosis.

Cable testing and cable diagnosis

Medium voltage cable testing is a demanding task that leaves no room for error

- Work is carried out on the main circuit with a high-voltage test bench
- Earthing is removed during testing
- Access to the main circuit for test connections may require access to the cable box and dismantling of cable termination insulation
- Procedures must be followed strictly to ensure the safety of personnel
- Cable connections must be properly reassembled to restore full insulation

Safe and easy cable access with Premset

PM102715

Premset switchboards can be fitted with a dedicated cable testing device that greatly increases safety during cable testing

- Cable testing can be carried out without accessing the cable box (cables remain connected) and without touching the cable terminations
- The test device can be connected from the front of the switchboard, prior to removing the earth link, in total safety
- Earth link removal is the last operation to be carried out, using a special earthing bar disconnection system, without any operation of the main switching device or main earthing switch
- Earth link removal featuring full failsafe interlocking, i.e. the earth link can be opened only if the main earthing switch is closed (cable earthed) and the main earthing switch can be opened only if the earthing link is closed
- Test bench connections are delivered separately. They can also be adapted locally to any specific test set.

The cable testing device can be used on both ends of cable to be tested, in order to isolate completely the cable section from the network.

Technical characteristics

Cable testing device can be used for various testing and diagnosis purposes:

- DC tests up to 36 kV DC x 15 min
- Very low frequency testing from 0.1 Hz up to 20 kV x 30 min (sinusoidal signal), and 28 kV x 30 min for $\cos^2$ signal.
- 50/60 Hz dielectric tests up to 14 kV x 1 min
- Tan Delta diagnosis: power dissipation 18 kV.

Performance characteristics have been validated in accordance with standard IEC 62271-200, edition 2.

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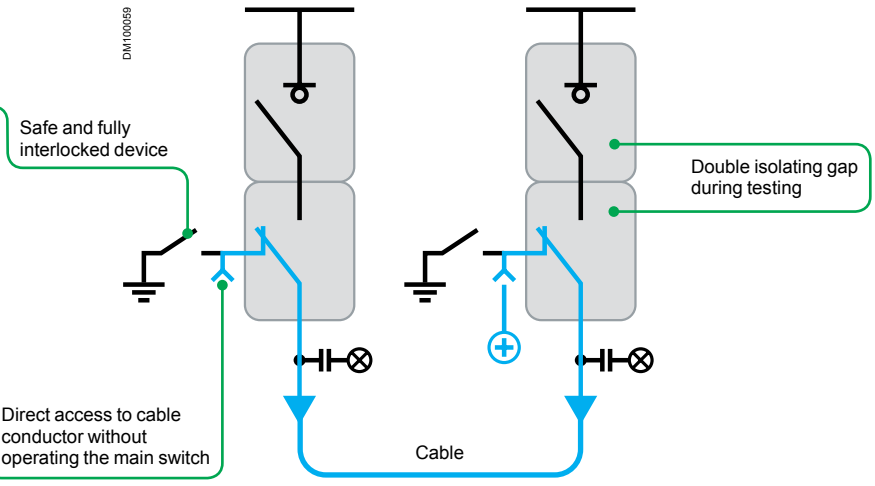


Dimensions

Dimensions

Unit type	Height (1) (mm)	Width (mm)	Depth (2) (mm)	Weight (kg)
I06T	1350	375	910	200
I06H	1350	375	910	200
D06H	1350	375	910	200
G06	1350	375	910	100
M06S	1350	375	910	200
M06A	1350	750	910	350
D01N	1350	375	910	200
D02N	1350	375	910	200
D06N	1350	375	910	200
VTM	1350	375	910	150
VTP	1350	375	910	150
VTM-D	1350	375	910	250
VTP-D	1350	750	910	250

(1) Minimum height with low voltage cabinet A, cable termination height 500 mm and no cable testing device.
(2) Without internal arc exhausting.

Floor preparation

Units may be installed on ordinary concrete floors, with or without trenches depending on the type and cross-section of cables.
Required civil works are identical for all units.

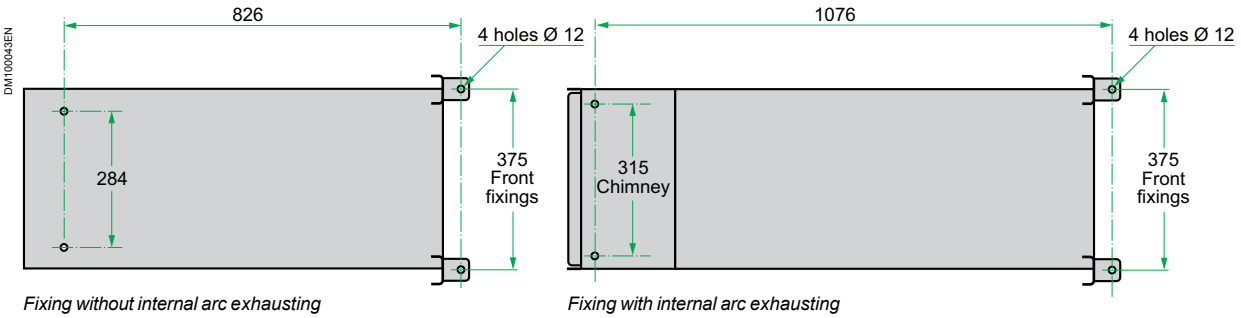
Fixing of units

With each other

The units are simply bolted together to form the MV switchboard (bolts supplied).

To the floor

■ For switchboards comprising up to three units, the four corners of the switchboard must be secured to the floor using:
□ bolts (not supplied) screwed into nuts set into the floor using a sealing pistol
□ threaded rods grouted into the ground
■ For switchboards comprising more than three units, the number and position of fixing points depends on local criteria (earthquake withstand capacities, etc.).

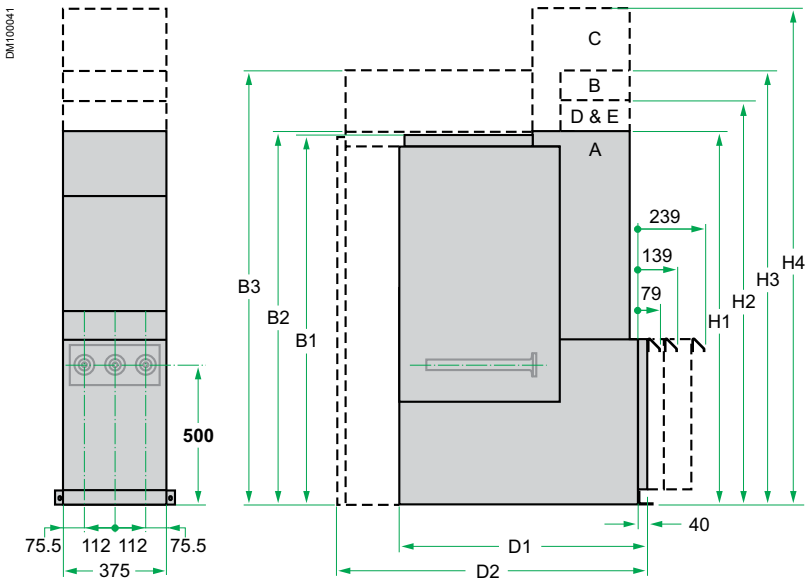


Fixing without internal arc exhausting

Fixing with internal arc exhausting

Dimensions

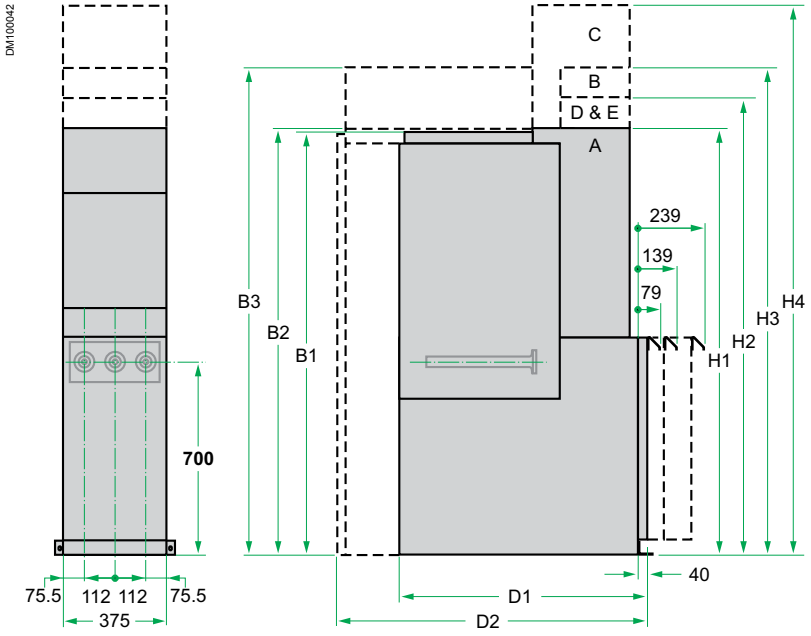
Cable termination height: 500 mm



H1	LV cabinet A (when no cable testing device)	1350
H2	LV cabinet D & E	1461
H3	LV cabinet B	1573
H4	LV cabinet C	1795
B1	Non internal arc	1336
B2	Internal arc bottom exhaust	1349
B3	Internal arc top exhaust	1664
D1	Without internal arc exhausting	910
D2	With internal arc exhausting	1135

Note: dimensions are the same for bar-connected cubicles.

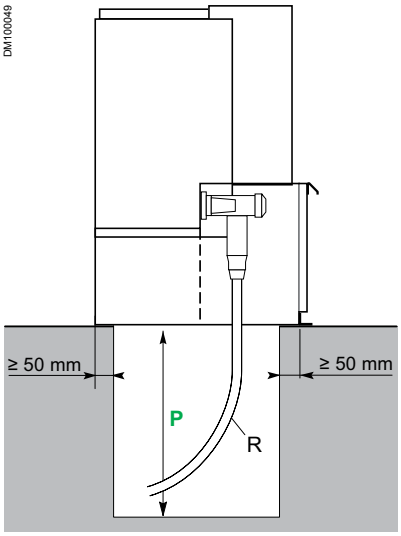
Cable termination height: 700 mm



H1	LV cabinet A (when no cable testing device)	1550
H2	LV cabinet D & E	1661
H3	LV cabinet B	1773
H4	LV cabinet C	1995
B1	Non internal arc	1536
B2	Internal arc bottom exhaust	1549
B3	Internal arc top exhaust	1864
D1	Without internal arc classification	910
D2	With internal arc classification	1135

Note: dimensions are the same for bar-connected cubicles.

Civil engineering & gas exhausting



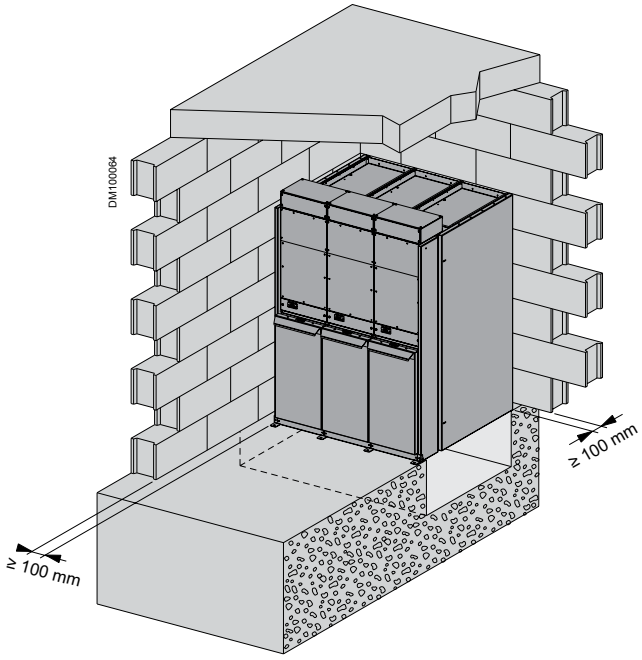
Trench depth **P** for Premset without plinth

Cable connection and cable trench

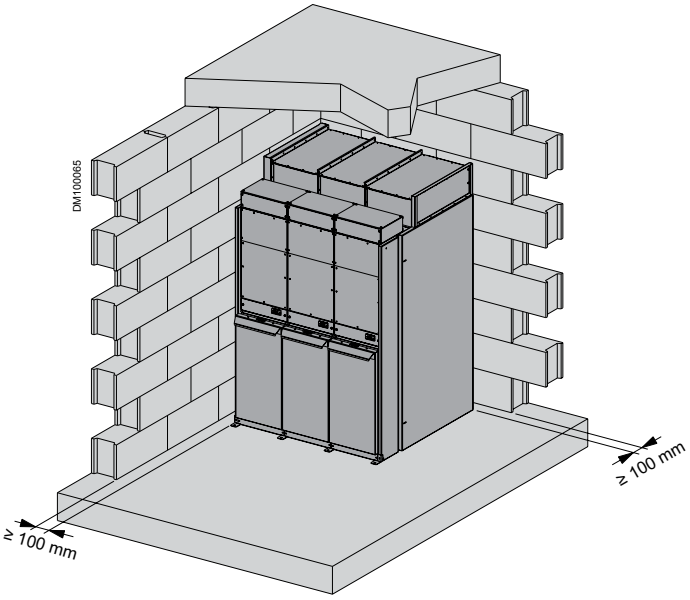
Cable insulation	Cable	Cross-section (mm^2)	Bending radius	Cable trench depth P
Dry insulation	Single-core	≤ 150	500	400
		185 to 300	600	520
	Three-core	≤ 150	550	660
		185	650	770
Paper impregnated non-draining type	Single-core	≤ 150	500	580
		185 to 300	675	800
	Three-core	≤ 95	635	750
		150 to 300	835	970

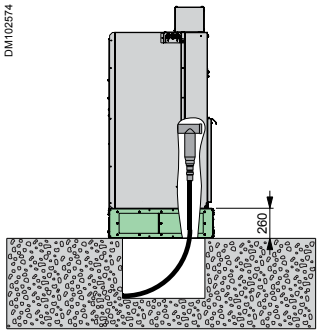
Note: *trench depths can be reduced and sometimes eliminated by adding a plinth.*

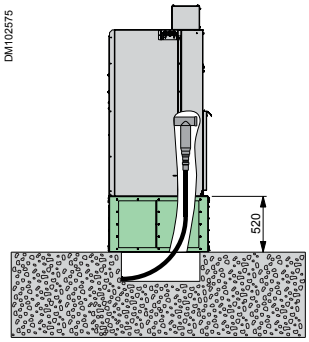
Layout of a bottom exhaust internal arc switchboard

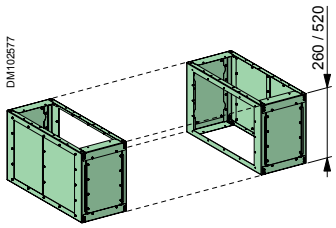


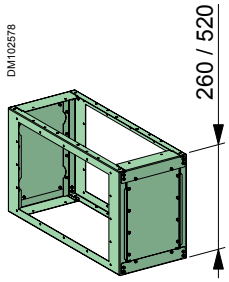
Layout of a top exhaust internal arc switchboard

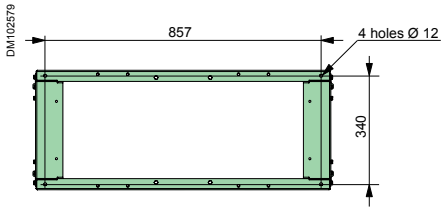










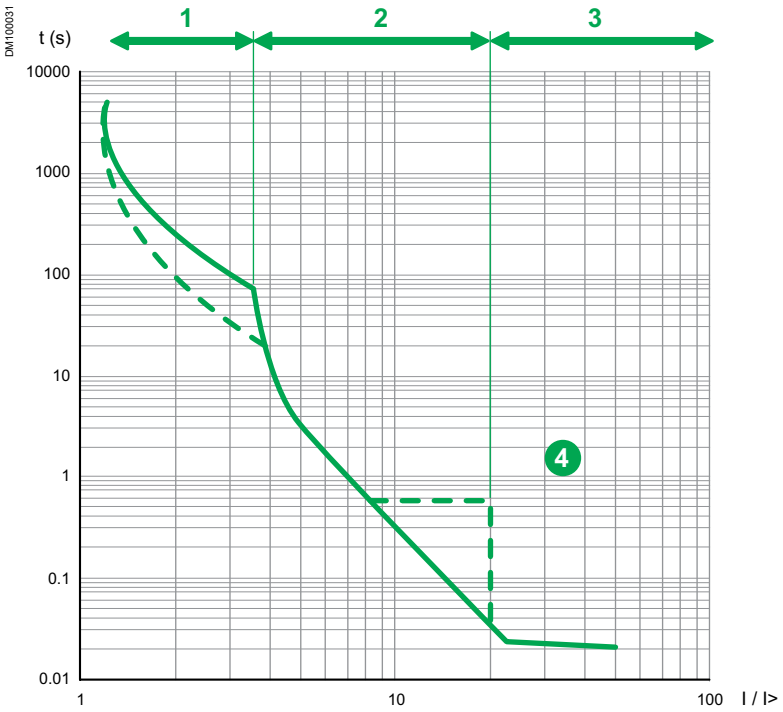


Additional raising plinths

If the trench depth is too small to take in account the proper bending of cables, the switchboard can be fitted with optional raising plinth.
These plinths exist in two different heights, 260mm or 520mm, which moreover can be stacked together in order to reach a total height of 780mm.
The cell is to be assembled on the plinth prior to fix the whole on the floor.

VIP tripping curves
VIP 40 and VIP 45 tripping curve

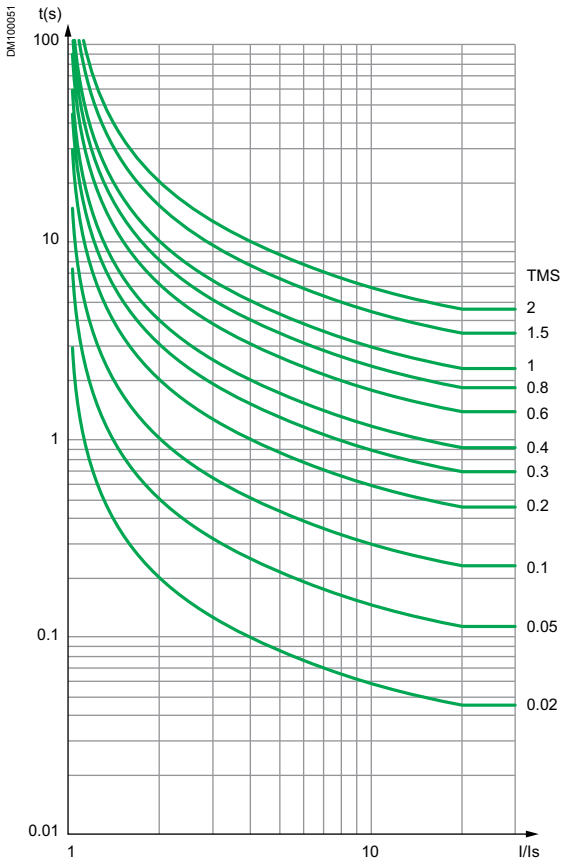
Phase overcurrent protection (ANSI 50-51)



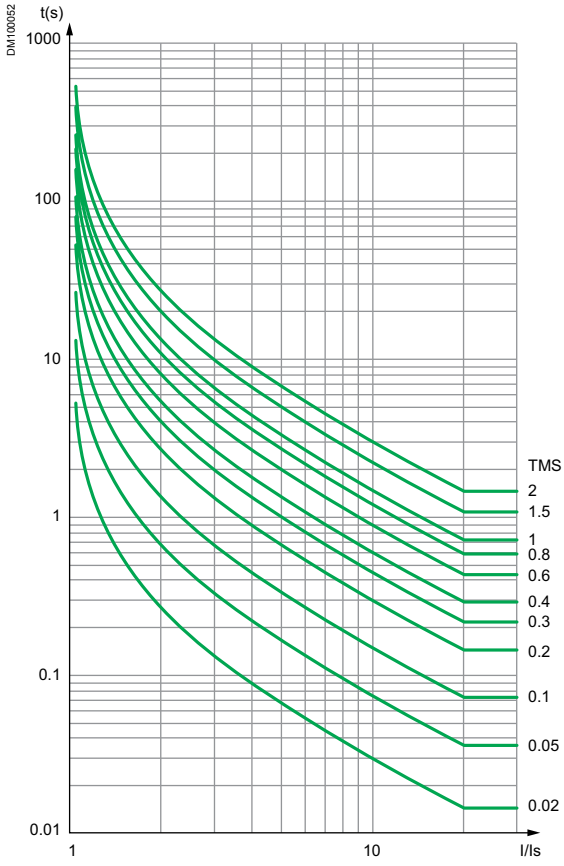
1 Overload
2 Secondary short-circuit
3 Primary short-circuit
4 Activation of discrimination with a Low Voltage circuit breaker.

VIP tripping curves
VIP 400 and VIP 410 tripping curves

IEC Standard Inverse Time Curve (IEC/SIT or IEC/A)

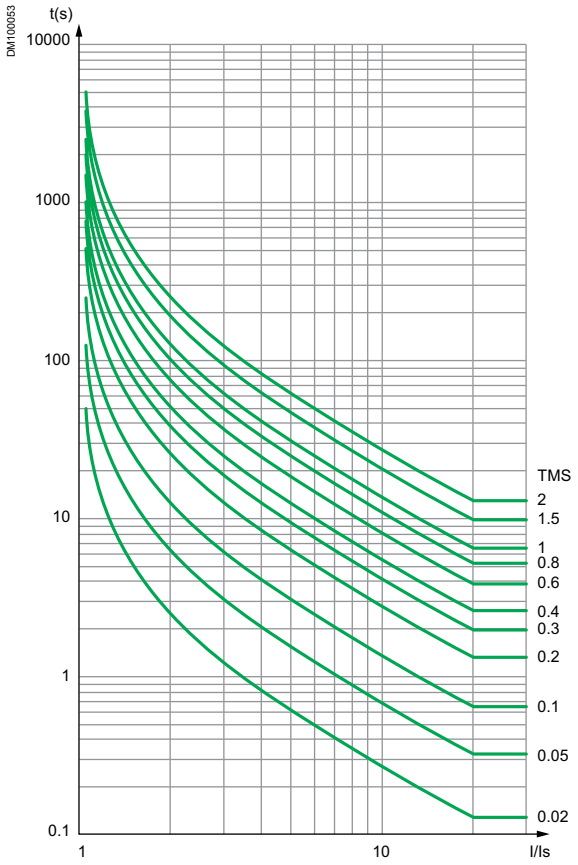


IEC Very Inverse Time Curve (IEC/VIT or IEC/B)

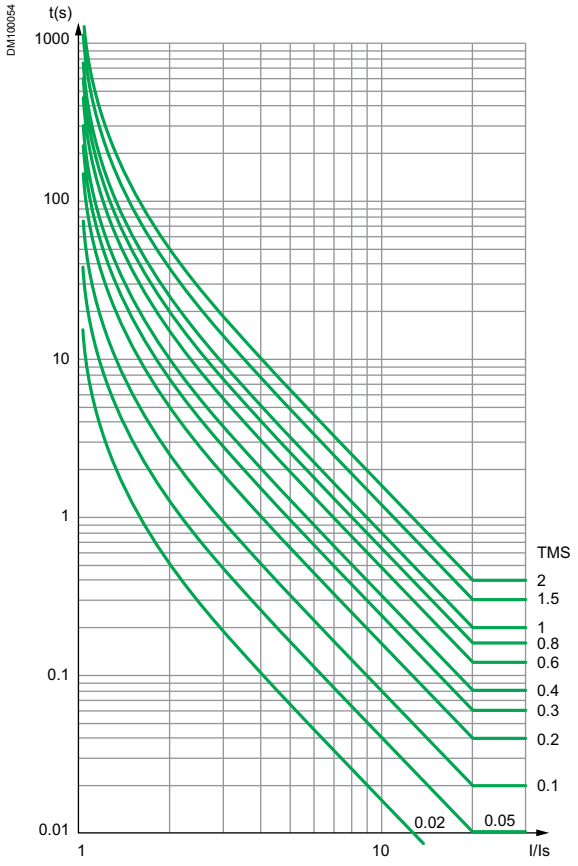


VIP tripping curves
VIP 400 and VIP 410 tripping curves

IEC Long Time Inverse Curve (IEC/LTI)

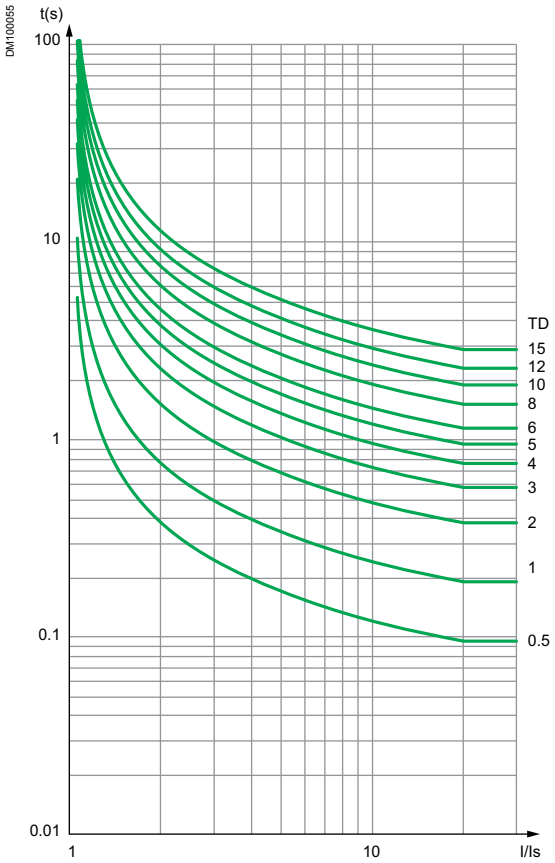


IEC Extremely Inverse Time Curve (IEC/EIT or IEC/C)

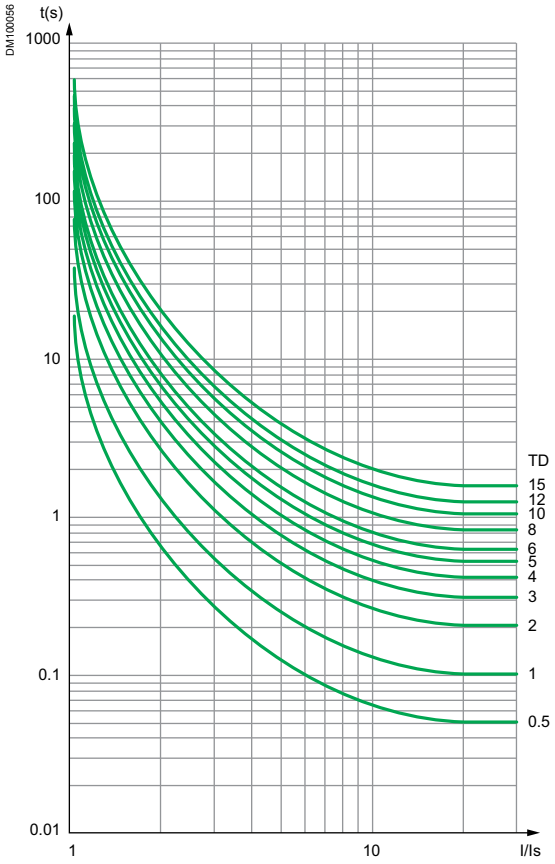


VIP tripping curves
VIP 400 and VIP 410 tripping curves

IEEE Moderately Inverse Curve (IEEE/MI or IEC/D)

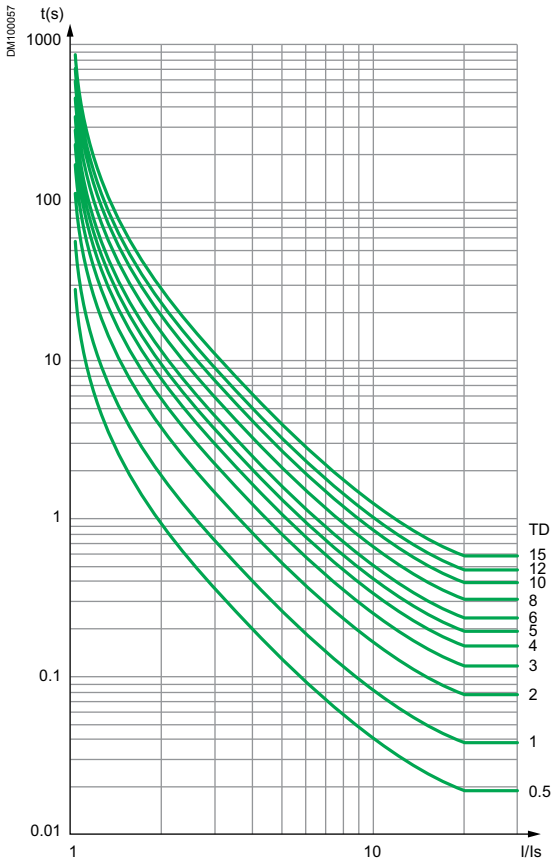


IEEE Very Inverse Curve (IEEE/VI or IEC/E)

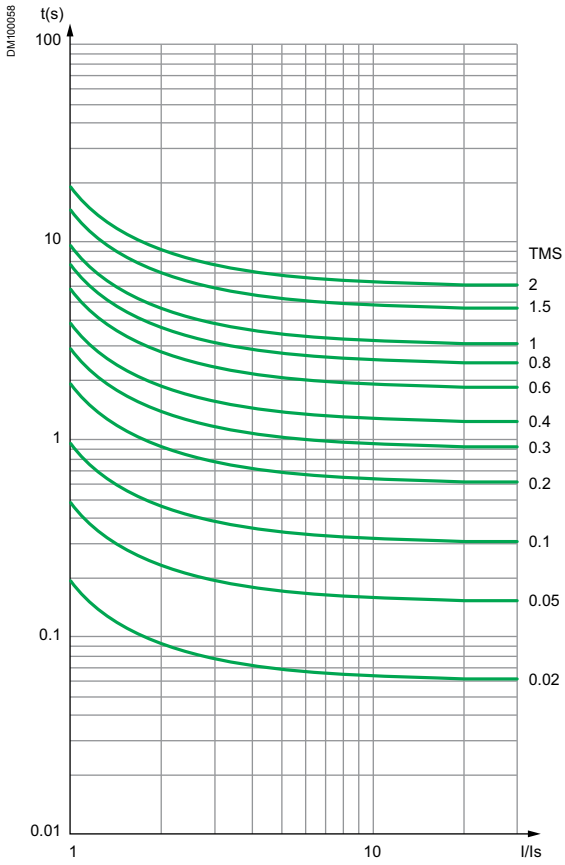


VIP tripping curves
VIP 400 and VIP 410 tripping curves

IEEE Extremely Inverse Curve (IEEE/EI or IEC/F)



RI Curve



Notes

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