

# Premset

15 kV

Compact modular vacuum switchgear

With Shielded Solid Insulation System



Make the most of your energy



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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.

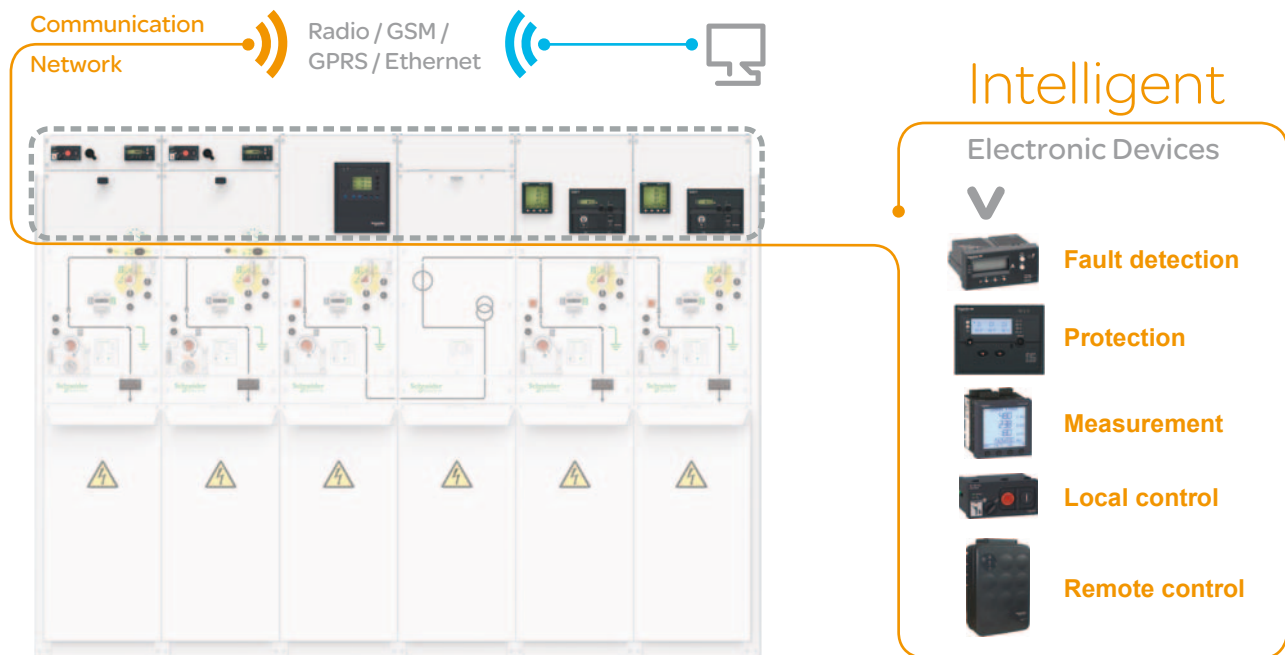
This is precisely what Premset architecture is designed to do, enhancing your installation with such features as:

- **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:

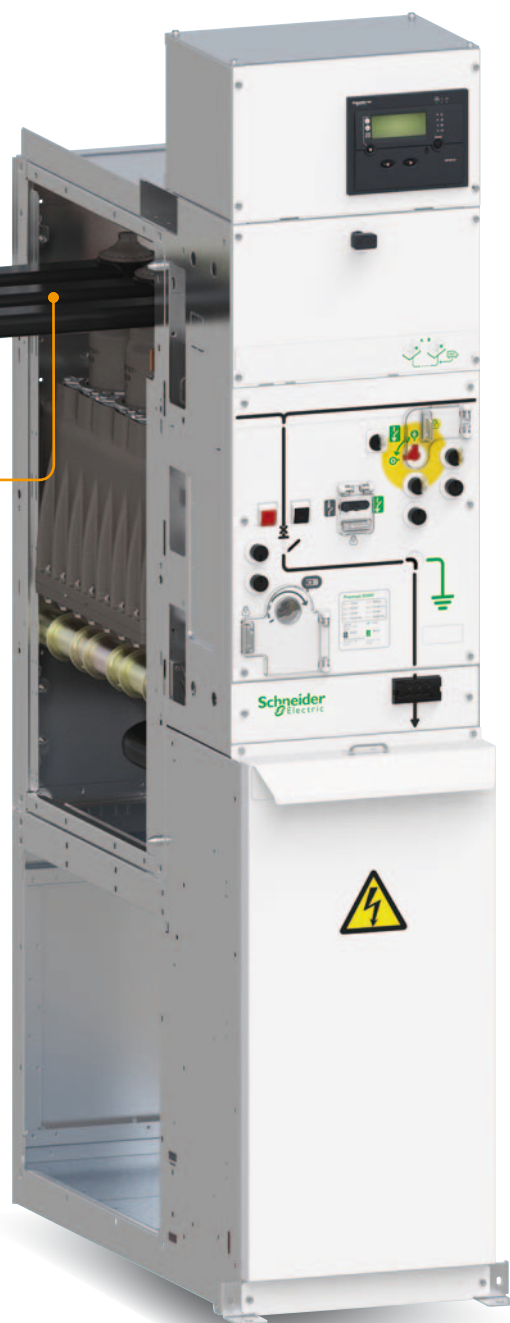
- Reduce the risk of internal arcing
- Eliminate maintenance
- Improve the safety of life and property.



Shielded Solid  
Insulation System  
(2SIS)

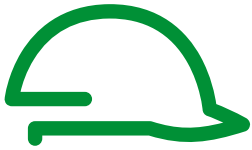


2SIS is applicable for any function such as load break switches or circuit breakers, new compact metering functions, or current and voltage transformers.



# Safety

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

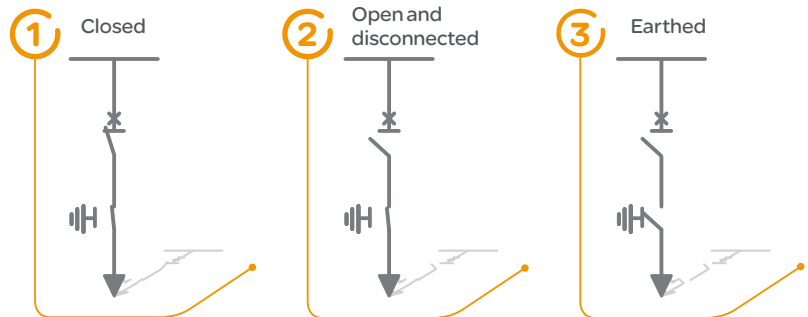


With its 3-in-1 switchgear design, the Premset system's breaking, disconnection, and earthing functions are all integrated into a single disconnecting switch or disconnecting circuit breaker.

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

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
- **No preventive** maintenance and servicing required.



#### Optimized circuit breakers

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.



### 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.

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|                                    |           |
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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

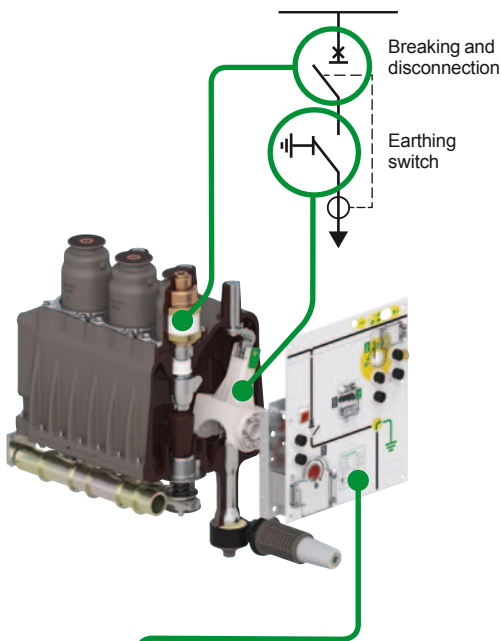
The Premset single line diagram is composed of:

- 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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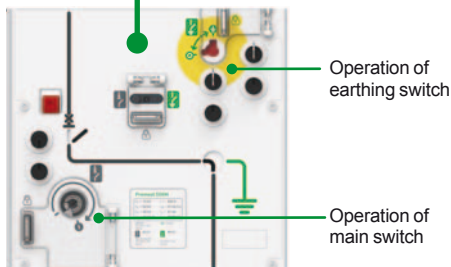
## "3 in 1" integrated core units

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, G06-ES
- Voltage transformers VTM, VTP, VTM-D, VTP-D.

## 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).

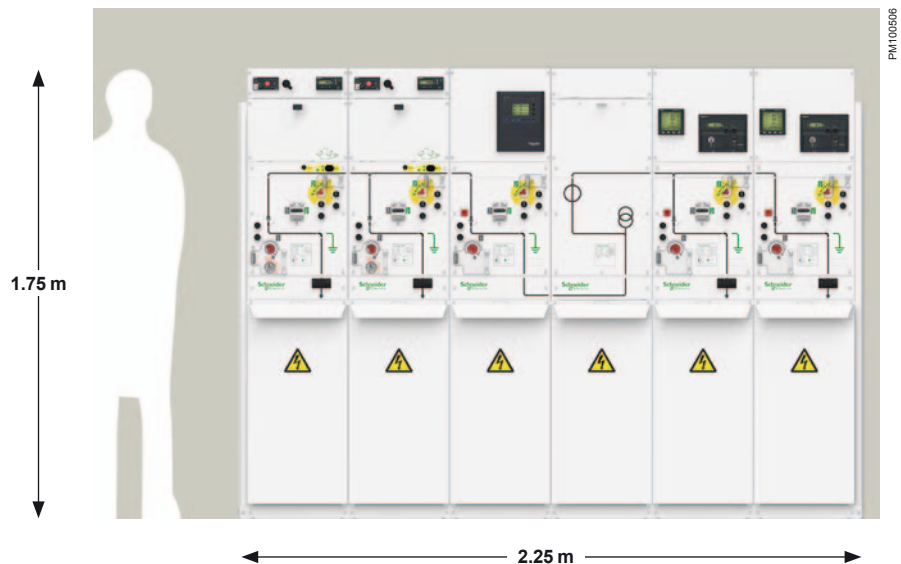
### Built-in self-powered protection, embedding communication

### 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.







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.

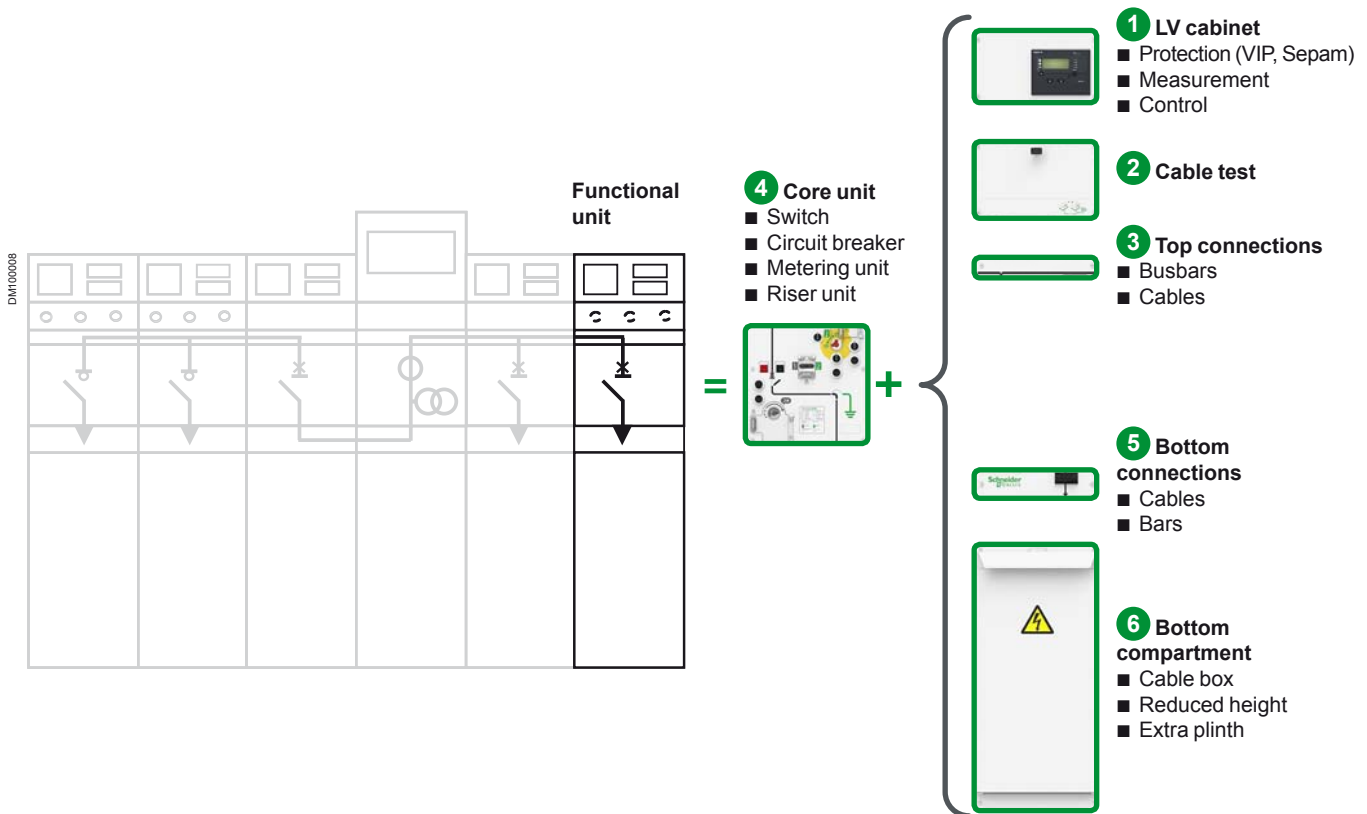
The core units are optimised for each typical application and the assembly forms a totally insulated functional unit insensitive to the environment.

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 deadlines and the possibility of making last minute modifications
- Easy extension and upgrades.

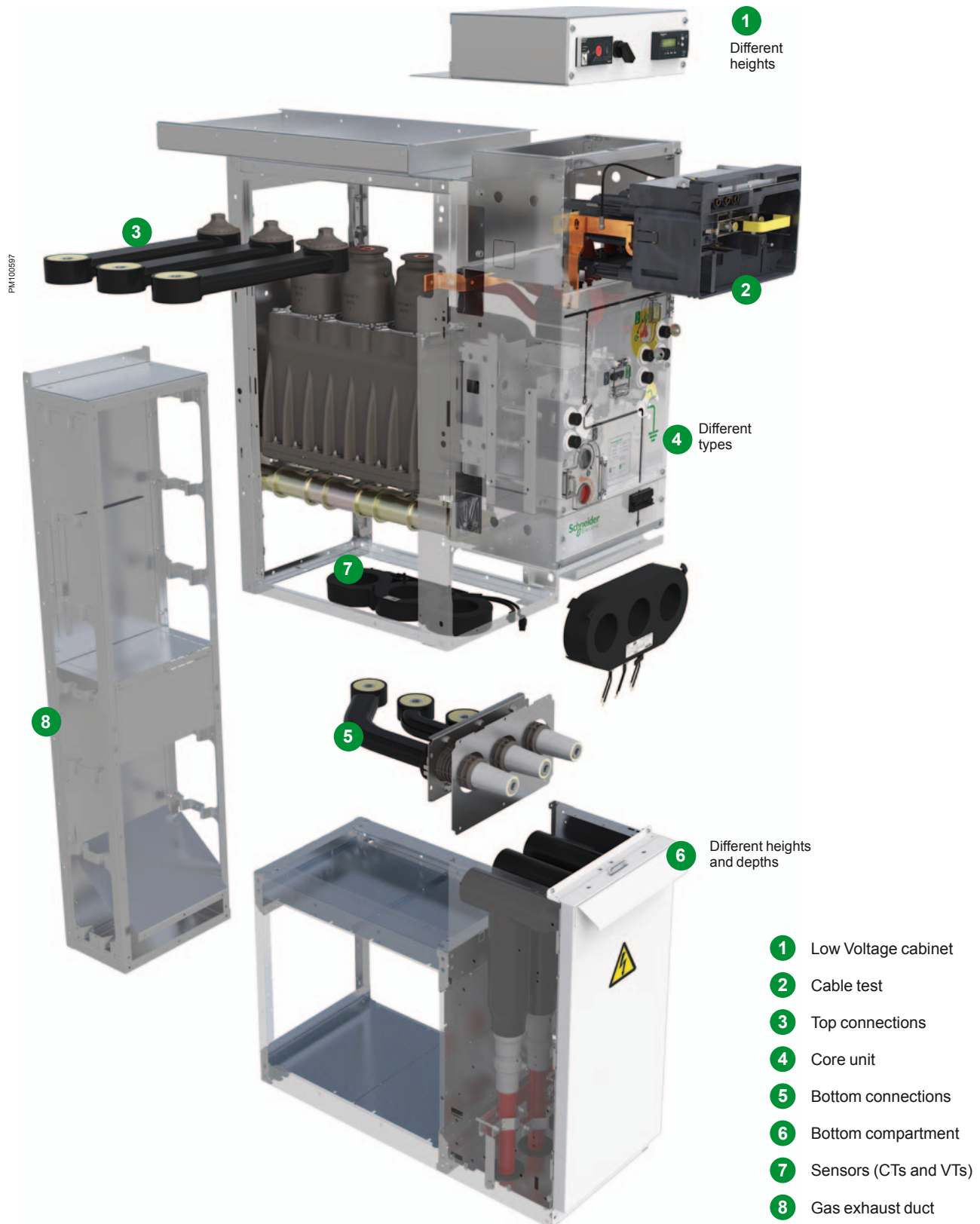
## Switchboard

## Functional unit = An assembly of functional blocks





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



## Unsurpassed safety and reliability with 2SIS Shielded Solid Insulation System

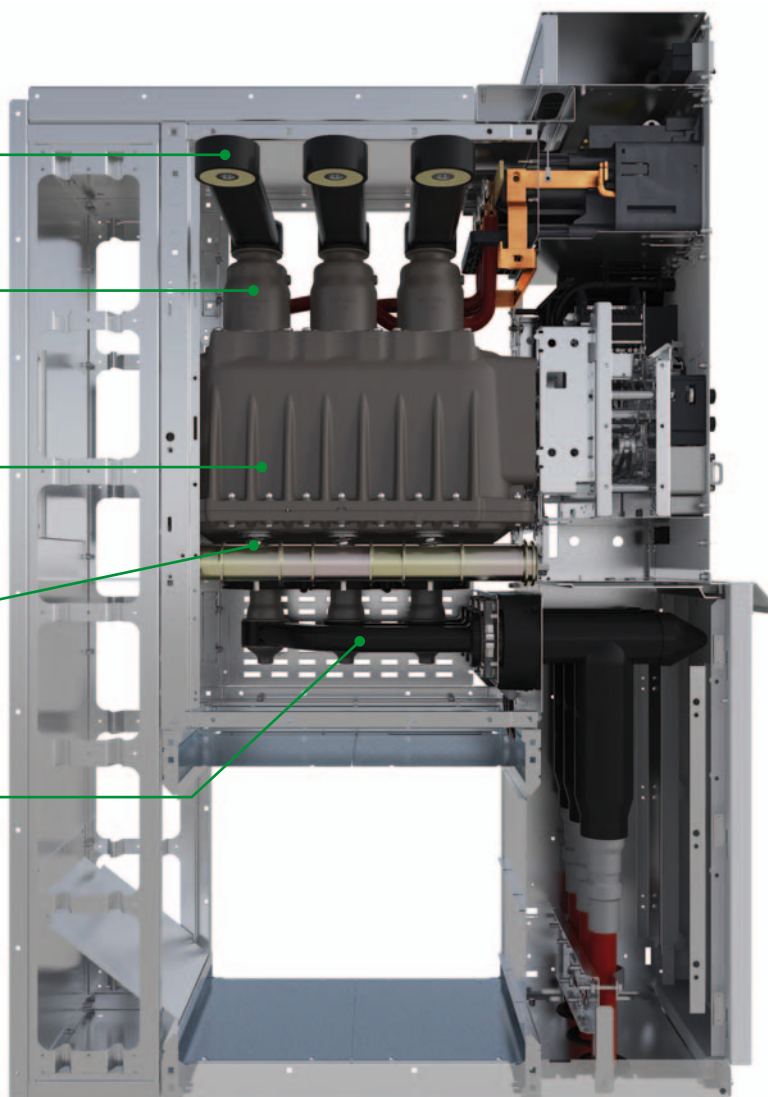
Modular **busbar system** with shielded solid insulation

**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



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## Current and voltage transformers integrated in main functions

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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).

3

### Current transformers located around cables

- Ring-type current transformer for power measurement or metering (ARC6 and ARC7)
- Earth fault toroidal current transformer for high sensitivity earth fault protection (CSH120/200).

4

### Low Power Voltage Transformers located under the core unit or

5

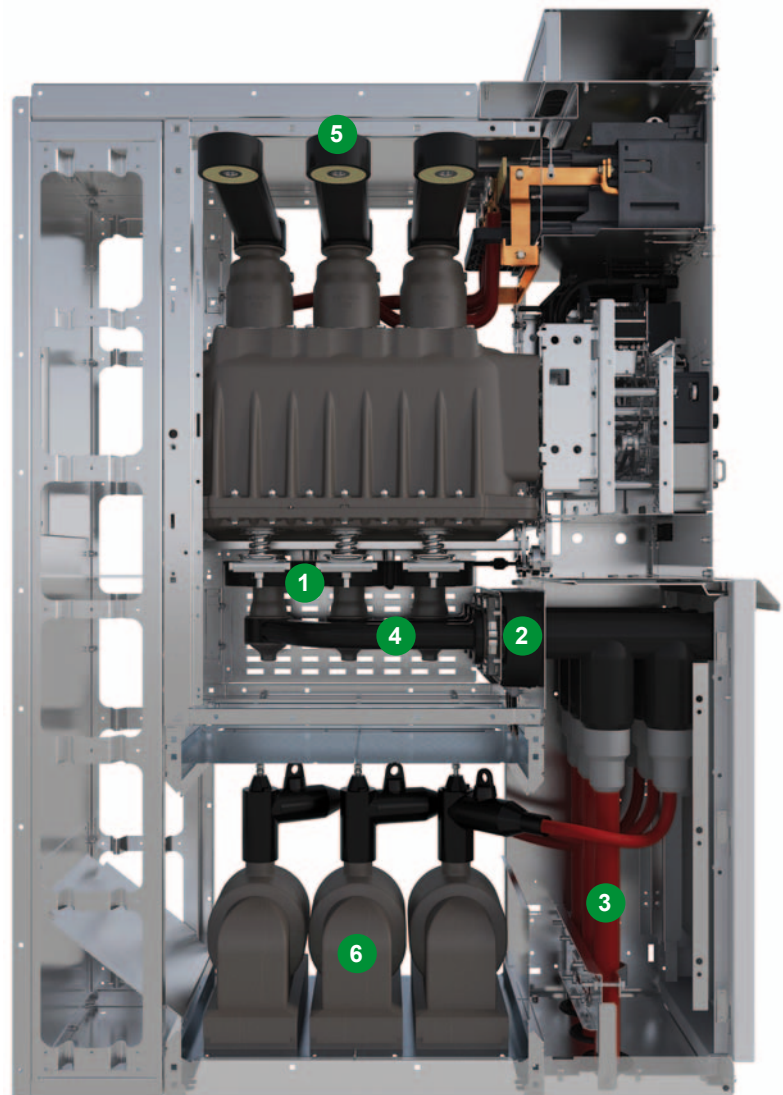
#### in the busbar system

- Low Power Voltage Transformer for protection or measurement (VLPU1).

6

### Voltage transformers located behind the cables

- Phase-to-earth voltage transformers (VRT4).

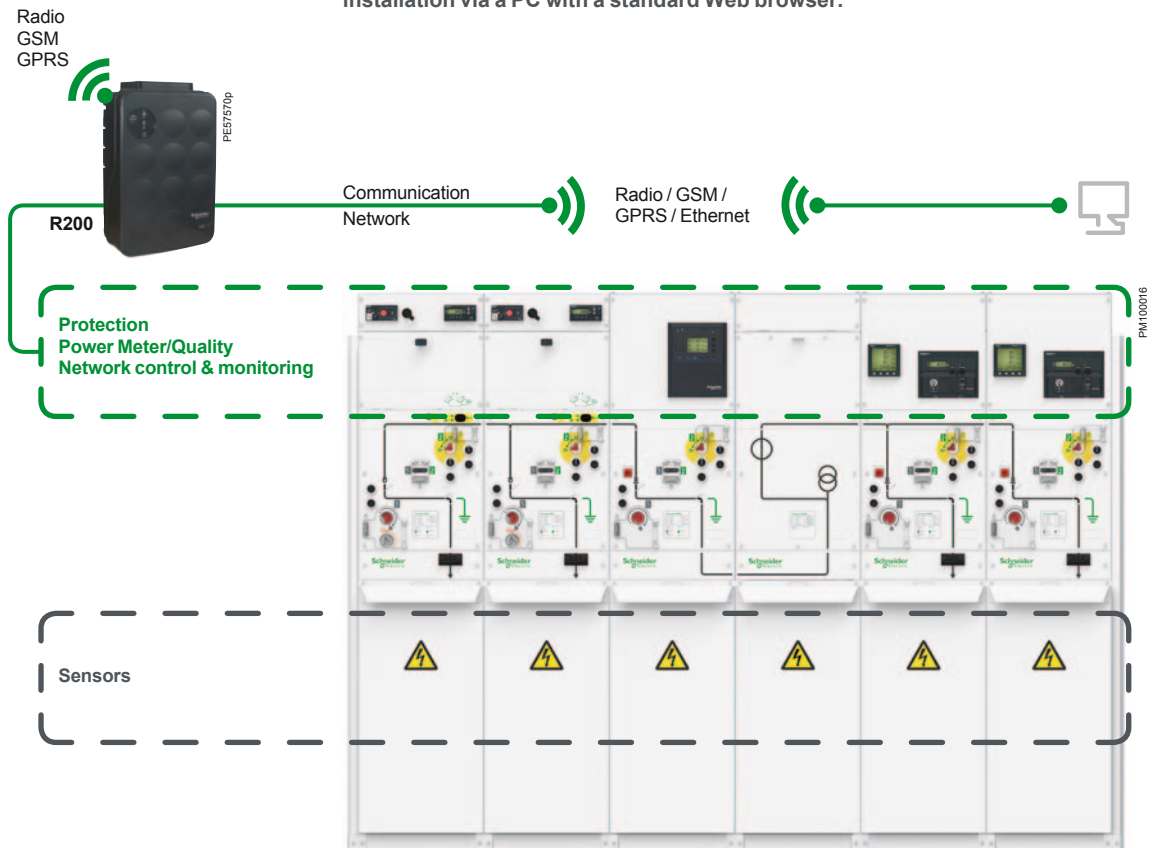


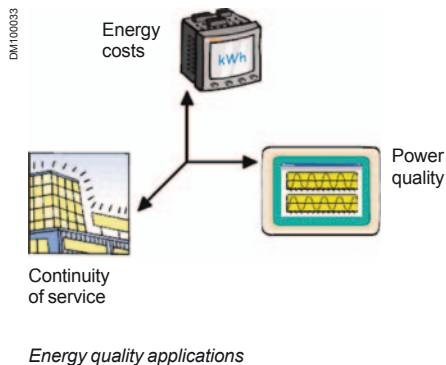
With Premset, intelligence can be added to functional units by integrating protection, control and monitoring IEDs (Intelligent Electrical Devices).

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.





**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 series 20 and series 40**

### 3 - Measurement

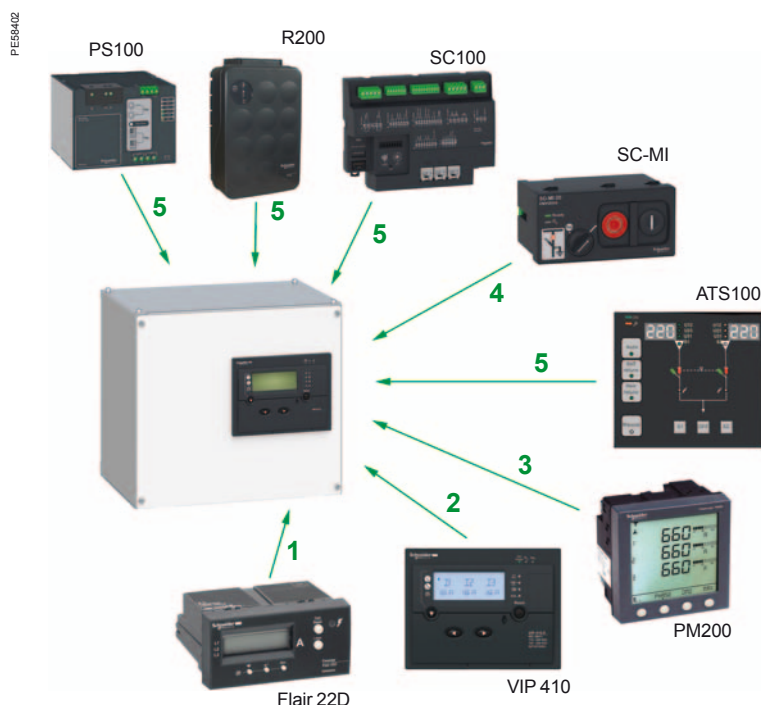
- Ammeter: **AMP21D**
- Power Meter: **PM200**
- Power/Quality Meter: **PM800**

### 4 - Local control

- Motor control: **SC100**
- Control panel: **SC-MI**

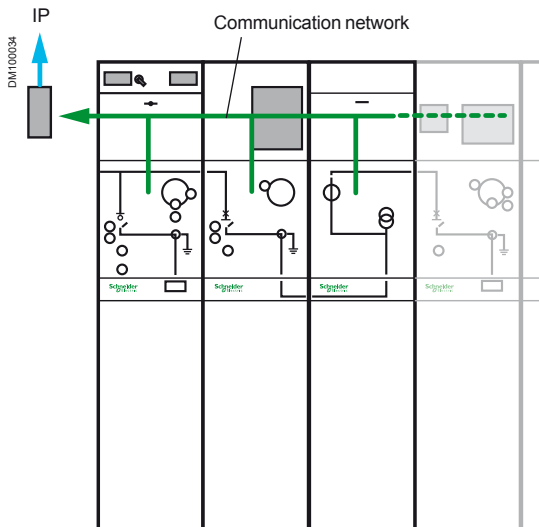
### 5 - Remote control

- Communication
- Local communication network (Field Bus): **SC100**
- Remote communication network (GSM/GPRS/Ethernet/Radio): **R200 (\*)**
- Automatic Transfer System: **ATS100 (\*)**
- Backup power supply: **PS100.**



(\*) Consult us for availability

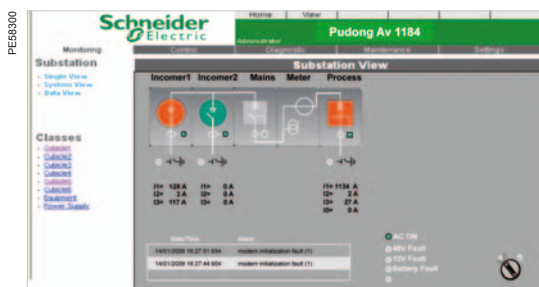




### Distributed architecture for easy installation, operation and scalability

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 Terminal Unit) or SCADA (Supervisory Control And Data Acquisition) system.



### 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.).

### 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.



VIP 400/410



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 and maintenance free
- Fast clearing time, to limit the consequences of internal arcing in the transformer.



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.



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.



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.

### LPCTs for Sepam

Low Power Current Transformers (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.



LPCT

(\*) Consult us for availability





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|                                       |           |
|---------------------------------------|-----------|
| <b>Main applications</b>              | <b>22</b> |
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| <b>Busbar sectionaliser functions</b> | <b>28</b> |
| <b>Protection functions</b>           | <b>30</b> |
| <b>Voltage transformer functions</b>  | <b>31</b> |



### 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.

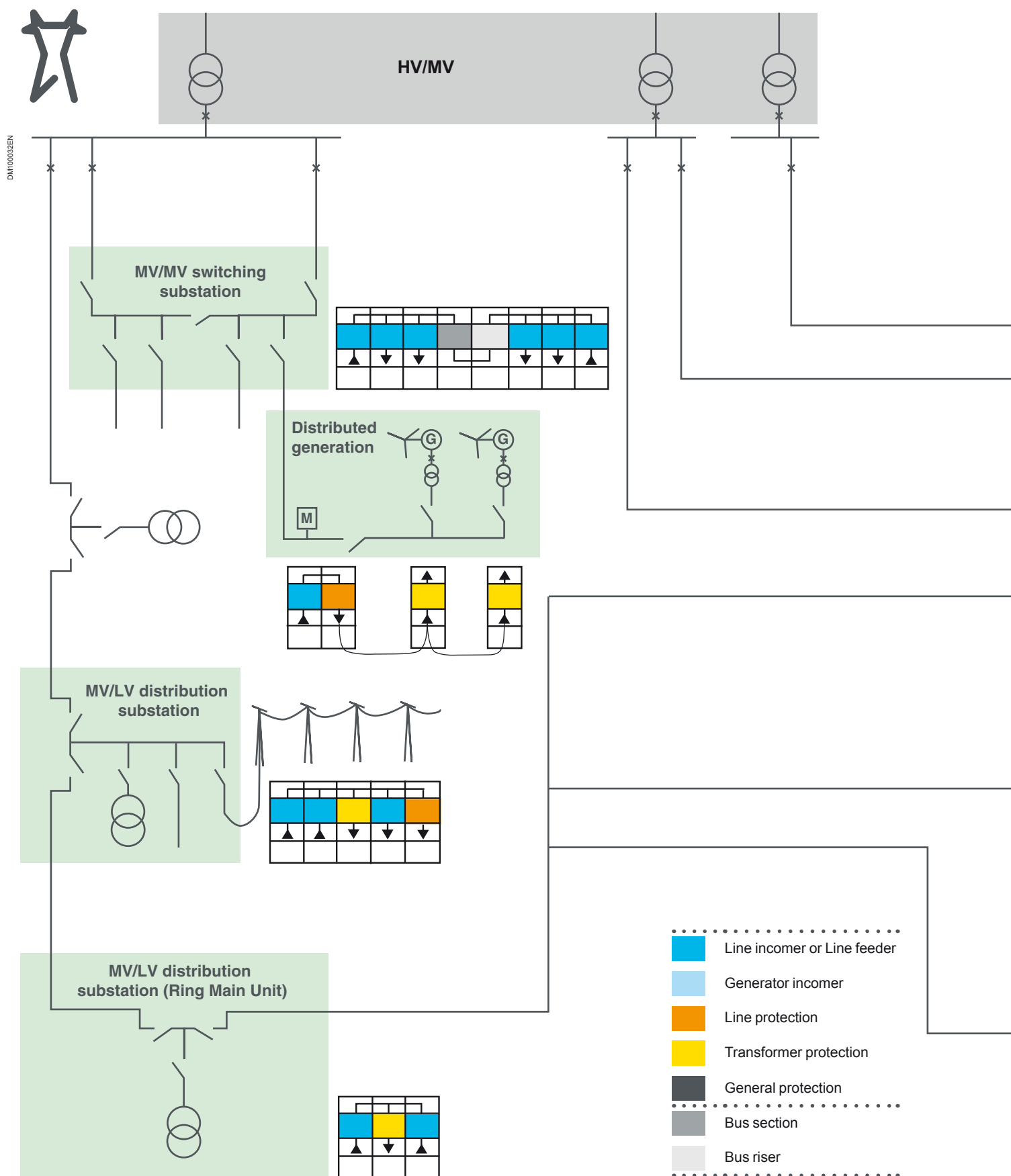
Premset advanced communication possibilities open the way to applications such as:

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

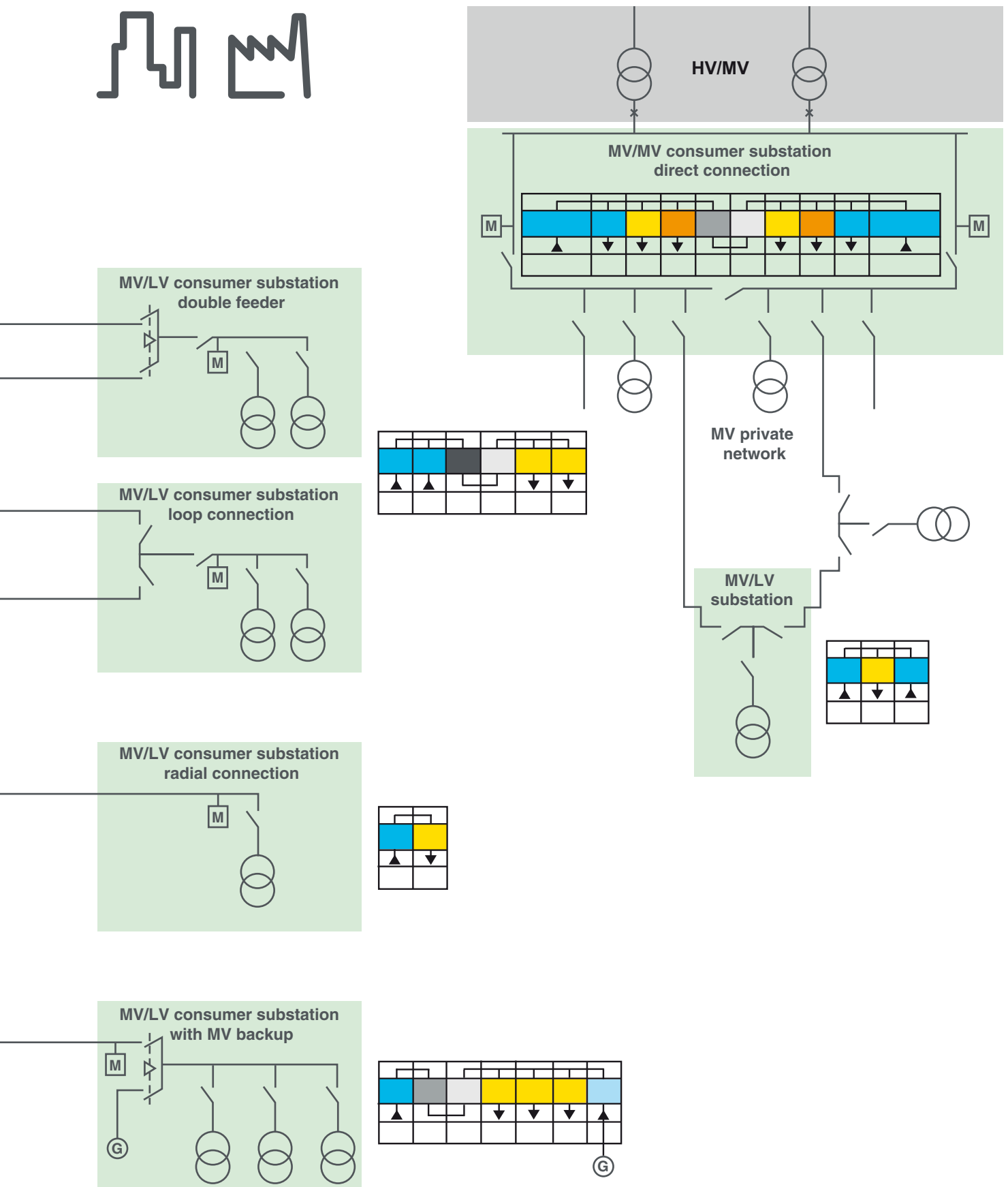


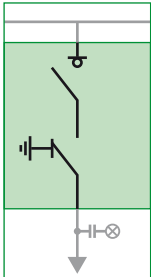
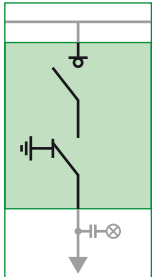
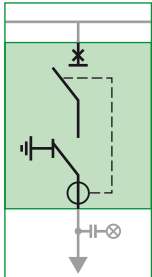
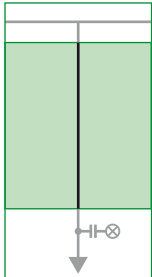
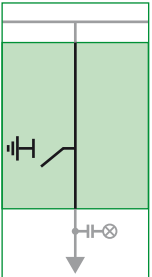


## Distribution network selection chart



## Buildings &amp; Industry selection chart



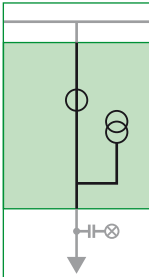
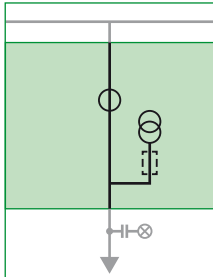
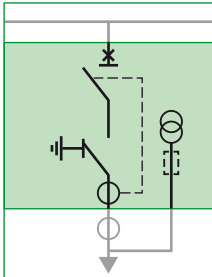
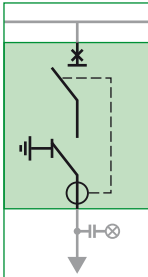
| Function   |                         |    | Line incomer/ Line feeder   |  |   |   |   |
|--|-------------------------|----|---|--|---|---|---|
| Single-line diagram                                      |                         |    |  |     |             |  |  |
| Core unit type   |                         |    | I06T  | I06H (*)   | D06H  | G06   | G06-ES (*)  |
| See details ►  |                         |    | 38  | 39   | 42  | 43  | 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  | Direct connection to busbars with 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 |   |  |   |   |   |
| Phase-to-phase   |                         |    |   |  |   |   |   |
| VDC11  | DIN VTs                 | 49 |   |  |   |   |   |
| VRC2   | Block VTs               | 49 |   |  |   |   |   |
| VRU2 (*)   | Auxiliary power         | 49 |   |  |   |   |   |
| VT protection  |                         |    |   |  |   |   |   |
| Fuses  |                         |    |   |  |   |   |   |

■ Compulsory

(1) Possible only with VIP

□ Optional

(\*) Consult us for availability

| Function   |                         |    | Line incomer/ Line feeder   |  |   | Generator incomer   |
|--|-------------------------|----|---|--|---|---|
| Single-line diagram                                      |                         |    |  |  |  |            |
| Core unit type   |                         |    | M06S  | M06A   | D06H-MA(*)  | D06H  |
| See details ►  |                         |    | Page 44   | 45   | 47  | 42  |
| Core unit  |                         |    | Solid-insulated earth-screened metering unit                                      | Air-insulated metering unit (750 mm wide)  | Air-insulated metering function integrated in D06H incomer (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)   | □ (1)   |
| Auxiliary contacts                                       |                         |    | 70  |  | □   | □   |
| Voltage indication (only one option possible)            |                         |    |   |  |   |   |
| VPI5 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  |                         |    |   | □  | □   |   |

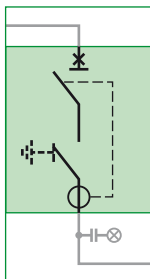
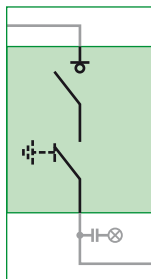
■ Compulsory

□ Optional

(\*) Consult us for availability

(1) 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  |                         |      | <input type="checkbox"/> (2)  | <input type="checkbox"/> (2)  |
| 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   | <input type="checkbox"/>  | <input type="checkbox"/>  |
| Additional opening coil (MX or MN)                       |                         | 70   | <input type="checkbox"/> (1)  |   |
| Auxiliary contacts                                       |                         | 70   | <input type="checkbox"/>  | <input type="checkbox"/>  |
| Voltage indication (only one option possible)            |                         |      |   |   |
| VPIS or VDS  | Voltage indication      | 63   | <input type="checkbox"/>  | <input type="checkbox"/>  |
| VD23   | Voltage relay           | 64   | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 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

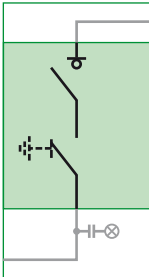
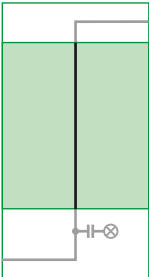
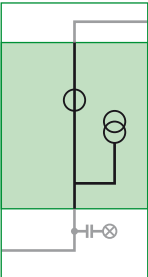
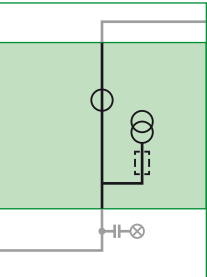
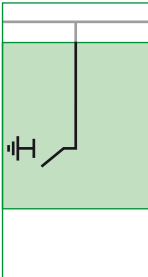
(\*) Consult us for availability

(1) Possible only with VIP

(2) 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 ►   |                         |    | 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   |                         |    | <input type="checkbox"/> (2)  |   |  |   | <input checked="" type="checkbox"/>   |
| Cable testing device  |                         |    | 81  |   |  |   |   |
| Live cable interlock (*)  |                         |    | 65  |   |  |   |   |
| <b>Protection (only one option possible)</b>                    |                         |    |   |   |  |   |   |
| 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 |   |   |  |   |   |
| <b>Fault passage indicator (only one option possible)</b>       |                         |    |   |   |  |   |   |
| Flair 21/22D  | Fault passage indicator | 61 |   |   |  |   |   |
| Flair 23DM(*)   | Fault passage indicator | 61 |   |   |  |   |   |
| <b>Integrated measurement (only one option possible)</b>        |                         |    |   |   |  |   |   |
| AMP21D  | Ammeter                 | 66 |   |   |  |   |   |
| PM200   | Power Meter             | 67 |   |   |  |   |   |
| PM800   | Power/Quality Meter     | 67 |   |   |  |   |   |
| <b>Control</b>  |                         |    |   |   |  |   |   |
| Electrical operation  |                         |    | 70  | <input type="checkbox"/>  |  |   |   |
| Additional opening coil (MX or MN)                              |                         |    | 70  |   |  |   |   |
| Auxiliary contacts  |                         |    | 70  | <input type="checkbox"/>  |  |   | <input type="checkbox"/>  |
| <b>Voltage indication (only one option possible)</b>            |                         |    |   |   |  |   |   |
| VPI5 or VDS   | Voltage indication      | 63 | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/>   | <input type="checkbox"/>  |   |
| VD23  | Voltage relay           | 64 | <input type="checkbox"/>  |   |  |   | <input type="checkbox"/>  |
| <b>Metering current transformers (only one option possible)</b> |                         |    |   |   |  |   |   |
| ARC5  | Ring CTs                | 48 |   |   | <input type="checkbox"/>   |   |   |
| AD12  | DIN CTs                 | 48 |   |   |  | <input type="checkbox"/>  |   |
| ARM3  | Block CTs               | 48 |   |   |  | <input type="checkbox"/>  |   |
| <b>Metering voltage transformers (only one option possible)</b> |                         |    |   |   |  |   |   |
| <b>Phase-to-earth</b>   |                         |    |   |   |  |   |   |
| VRU1  | Screened VTs            | 49 |   |   | <input type="checkbox"/>   |   |   |
| VDF11   | DIN VTs                 | 49 |   |   |  | <input type="checkbox"/>  |   |
| VRQ2  | Block VTs               | 49 |   |   |  | <input type="checkbox"/>  |   |
| <b>Phase-to-phase</b>   |                         |    |   |   |  |   |   |
| VDC11   | DIN VTs                 | 49 |   |   |  | <input type="checkbox"/>  |   |
| VRC2  | Block VTs               | 49 |   |   |  | <input type="checkbox"/>  |   |
| VRU2(*)   | Auxiliary power         | 49 |   |   |  |   |   |
| <b>VT protection</b>  |                         |    |   |   |  |   |   |
| Fuses   |                         |    |   |   |  | <input type="checkbox"/>  |   |

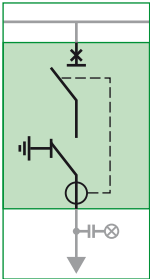
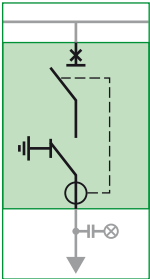
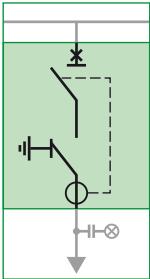
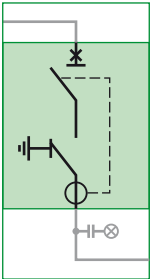
■ Compulsory

□ Optional

(\*) Consult us for availability

(1) Possible only with VIP

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

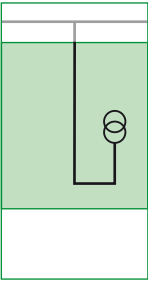
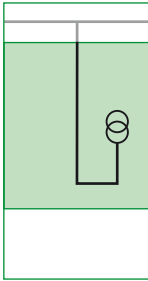
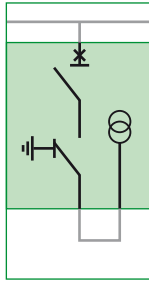
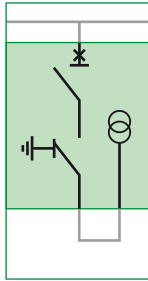
| Function   |                         |    | Line protection   | MV/LV transformer protection   |  | General protection   |
|--|-------------------------|----|---|--|--|--|
|  |                         |    | 100 A   | 200 A  |  |  |
| Single-line diagram                                      |                         |    |              |    |   |   |
| 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                                     |                         |    | ■   | □  | □  | □  |
| Live cable interlock (*)                                 |                         |    | □   | □  | □  | □  |
| 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                                     |                         |    | □   | □  | □  | □  |
| Additional opening coil (MX or MN)                       |                         |    | □ (1)   | □ (1)  | □ (1)  | □ (1)  |
| Auxiliary contacts                                       |                         |    | □   | □  | □  | □  |
| 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

(1) Possible only with VIP

□ Optional

(\*) Consult us for availability

| Function   |                         |    | Voltage transformer   |  |   |   |
|--|-------------------------|----|---|--|---|---|
| Single-line diagram                                      |                         |    |  |  |                    |                        |
| Core unit type   |                         |    | VTM(*)  | VTP(*)   | VTM-D(*)  | VTP-D(*)  |
| See details ►  |                         |    | 46  | 46   | 46  | 46  |
| Core unit  |                         |    | Metering voltage transformer: three 2SIS (2) phase-to-earth VTs                   | Auxiliary power voltage transformer: one 2SIS (2) phase-to-phase VT                | Metering voltage transformer: three 2SIS (2) phase-to-earth VTs, with D01N circuit-breaker protection | Auxiliary power voltage transformer: one 2SIS (2) phase-to-phase VT, with D01N circuit-breaker protection |
| Earthing switch  |                         |    |   |  | ■   | ■   |
| Cable testing device                                     |                         |    |   |  |   |   |
| Live cable interlock (*)                                 |                         |    |   |  |   |   |
| 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) Possible only with VIP  
(2) 2SIS: Shielded Solid Insulation System



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|                                     |           |
|-------------------------------------|-----------|
| <b>Characteristics</b>              | <b>34</b> |
| <b>Standards</b>                    | <b>34</b> |
| <b>Internal arc fault withstand</b> | <b>35</b> |
| <b>Operating conditions</b>         | <b>36</b> |

### Main electrical characteristics

| Voltage  |                |                         |   |    |
|--|----------------|-------------------------|---|----|
| Rated voltage  | <b>Ur</b>      | (kV rms)                | 12  | 15 |
| Rated frequency  | <b>fr</b>      | (Hz)                    | 50/60                                     |    |
| Insulation level                                       |                |                         |   |    |
| Rated short-duration power-frequency withstand voltage |                |                         |   |    |
| Common value <sup>(1)</sup>                            | <b>Ud</b>      | 50/60 Hz 1 min (kV rms) | 42  |    |
| Across the isolating distance                          | <b>Ud</b>      | 50/60 Hz 1 min (kV rms) | 48  |    |
| Rated lightning impulse withstand voltage              |                |                         |   |    |
| Common value <sup>(1)</sup>                            | <b>Up</b>      | 1.2/50 ms (kV peak)     | 95  |    |
| Across the isolating distance                          | <b>Up</b>      | 1.2/50 ms (kV peak)     | 110                                       |    |
| Current  |                |                         |   |    |
| Busbar current   | <b>Ir</b>      | (A rms)                 | 630                                       |    |
| Rated short-time withstand current and duration        | <b>Ik x tk</b> | (kA rms)                | 21 kA x 3 s<br>25 kA x 2 s<br>20 kA x 4 s |    |

(1) To earth and between phases.

### Dimensions

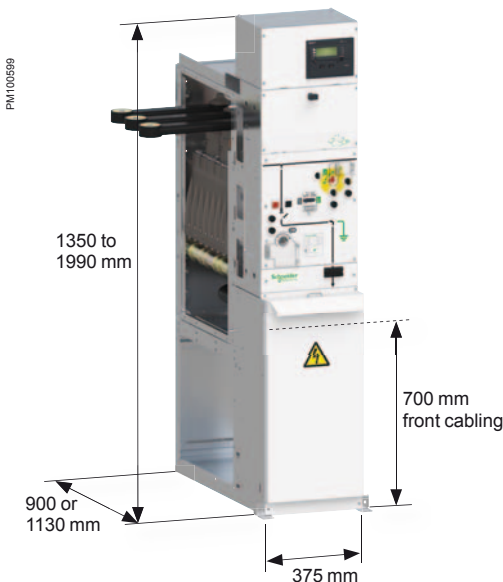
#### Uniform dimensions for the entire system

- 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: 900 mm (1100 mm with internal arc exhausting)
- Height: 1550 to 1990 mm, depending on LV equipment (can be reduced to a minimum of 1350 mm with low-height bottom compartment)
- Cable connections: 700 mm high front-aligned connections (500 mm with low-height bottom compartment).

### IEC standards

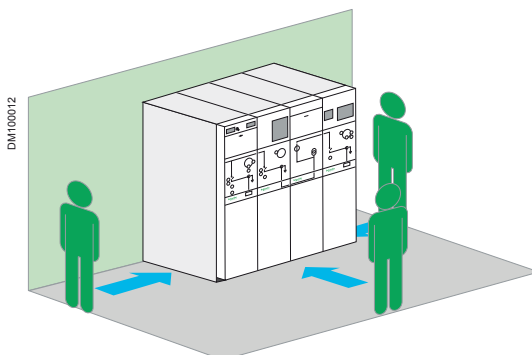
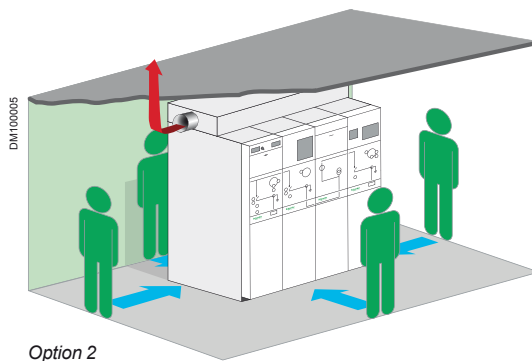
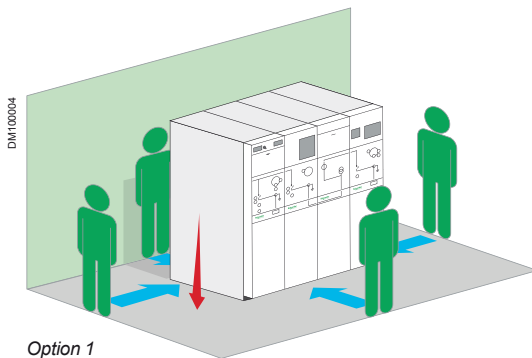
Premset units meet all the following recommendations, standards and specifications:

- 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.



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 50 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.

## 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

Note: this option is limited to 16 kA x 1 s A-FLR when equipped with low-height connection compartment.

- **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.

## Installation against a wall

Premset switchgear can also be installed with its back as close as 100 mm to a wall while maintaining IAC performance of 21 kA x 1 s A-FL (\*).

(\*) 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.

### 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)**, but no maintenance required on core units

### 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.

### Vibrations

- **IEC 60721 > level 3M4 for standard version**
- IACS-E10 for special marine version (\*).

### Seismic withstand (\*)

Standard equipment complies with IEC WG 17C/424 (future IEC 62271-210) and MV qualification requirements:

- Severity (§ 5 table 1):
  - AFloor III, ZPA = 10 m/s<sup>2</sup>, 5% damping.
- Acceptance class (§4 1.1):
  - Class 2 (3).

### Environmental characteristics

|                                     |   |
|-------------------------------------|---|
| <b>Altitude</b>                     | <ul style="list-style-type: none"> <li>■ Up to 3000 m, no particular precautions except screened cable connections</li> <li>■ Over 3000 m, standard precautions: shielded cable connections and 10% dielectric derating every 1000 m</li> </ul>     |
| <b>Temperature (indoor version)</b> | <ul style="list-style-type: none"> <li>■ Storage: from –40°C to +80°C</li> <li>■ Operation: from –25°C to +40°C (normal conditions) IEC 60721 - level 3K6</li> <li>■ Operation: from –40°C to +65°C (consult us for special precautions)</li> </ul> |
| <b>Condensation / humidity</b>      | ■ IEC 60721 > level 3K6 & 3Z7   |
| <b>Chemical / pollution</b>         | ■ IEC 60721 > level 3C2   |
| <b>Dust</b>                         | ■ IEC 60721 > level 3S2   |
| <b>Fire and extinguishability</b>   | ■ Test at 850°C according to IEC 60695-2-10 /-11 /-12   |

### Ring Main Unit version

Made of 2 to 5 functions (except M06A) assembled and tested in factory, delivered ready-to-connect on the network. Please consult us.

### Outdoor version

Consult us for specific outdoor IP54 version.

(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.  
 (3) Class 2: permanent deformations are acceptable provided that the do not impair the functionality of the equipment. The equipment shall properly operate during and after the seismic event and no maintenance is required.

(\*) Consult us for availability



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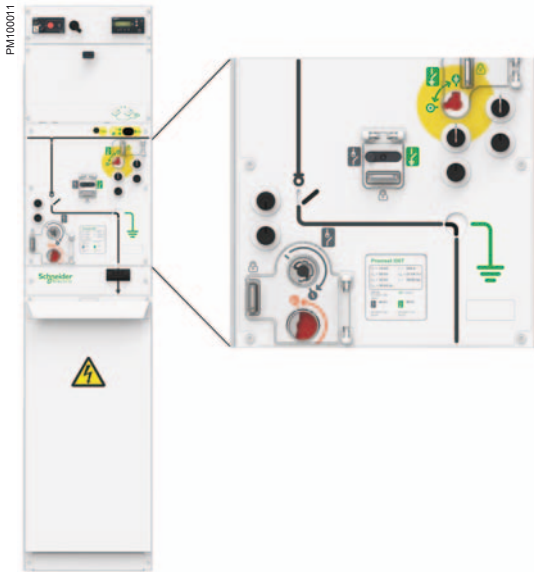
|  |           |
|--|-----------|
| <b>Disconnecting switch</b>  | <b>38</b> |
| I06T - General purpose   |           |
| I06H - Heavy-duty  |           |
| <b>Disconnecting circuit breaker</b>                               | <b>40</b> |
| D01N, D02N - MV/LV transformer protection                          |           |
| D06N - General protection  |           |
| D06H - Heavy-duty line protection                                  |           |
| <b>Busbar sectionaliser</b>  | <b>43</b> |
| G06 - Bus riser  |           |
| G06-ES - Direct incomer  |           |
| ES-B - Busbar earthing switch                                      |           |
| <b>Metering</b>  | <b>44</b> |
| M06S - 2SIS compact metering                                       |           |
| M06A - Air-insulated metering                                      |           |
| VTM, VTP - Voltage transformer                                     |           |
| VTM-D, VTP-D - Voltage transformer with circuit-breaker protection |           |
| <b>Metering and circuit breaker</b>                                | <b>47</b> |
| D06H-MA - Heavy-duty circuit breaker with integrated metering      |           |
| <b>Current and voltage transformers for metering</b>               | <b>48</b> |
| Current transformers (ARC5, AD12, ARM3)                            |           |
| Voltage transformers (VRU1, VDF11, VDC11, VRQ2, VRC2, VRU2)        |           |

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# Disconnecting switch I06T - General purpose

The I06T core unit is a “3 in 1” device combining the functions of a load break switch, disconnecter 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.



## Basic equipment

- 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

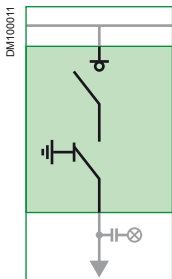
- Optional for main switch.

### Contact visibility

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

## Technical characteristics

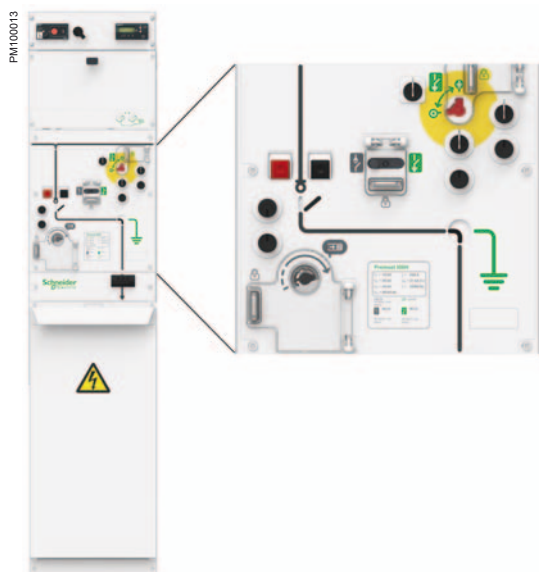
| Rated voltage                                       | Ur                       | (kV)                 | 12   |    |    | 15 |    |
|---|--------------------------|----------------------|------|----|----|----|----|
| Rated current                                       | Ir                       | (A rms)              | 630  |    |    |    |    |
| Rated short-time withstand current and duration     | Ik                       | (kA rms)             | 25   | 25 | 20 | 21 | 21 |
|   | tk                       | (s)                  | 1    | 2  | 4  | 1  | 3  |
| Rated making capacity of main and earthing switches | Icm                      | (kA peak)            | 65   | 65 | 52 | 54 | 54 |
| No-load mechanical endurance of main switch         | M1 class (IEC 62271-103) | Number of operations | 1000 |    |    |    |    |
| Electrical endurance of main switch                 | E3 class (IEC 62271-103) | Number of operations | 100  |    |    |    |    |
| Making capacity endurance of main switch            | E3 class (IEC 62271-103) | Number of operations | 5    |    |    |    |    |
| No-load mechanical endurance of earthing switch     | M0 class (IEC 62271-102) | Number of operations | 1000 |    |    |    |    |
| Making capacity endurance of earthing switch        | E2 class (IEC 62271-102) | Number of operations | 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.



## Basic equipment

- 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.

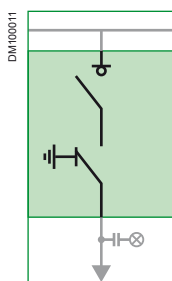
### Operation counter

- 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



| Rated voltage                                       | Ur                          | (kV)                 | 12   |    |    | 15 |    |
|---|-----------------------------|----------------------|------|----|----|----|----|
| Rated current                                       | Ir                          | (A rms)              | 630  |    |    |    |    |
| Rated short-time withstand current and duration     | Ik                          | (kA rms)             | 25   | 25 | 20 | 21 | 21 |
|   | tk                          | (s)                  | 1    | 2  | 4  | 1  | 3  |
| Rated making capacity of main and earthing switches | Icm                         | (kA peak)            | 65   | 65 | 52 | 54 | 54 |
| No-load mechanical endurance of main switch         | M2 class<br>(IEC 62271-103) | Number of operations | 5000 |    |    |    |    |
| Electrical endurance of main switch                 | E3 class<br>(IEC 62271-103) | Number of operations | 100  |    |    |    |    |
| Making capacity endurance of main switch            | E3 class<br>(IEC 62271-103) | Number of operations | 5    |    |    |    |    |
| No-load mechanical endurance of earthing switch     | M0 class<br>(IEC 62271-102) | Number of operations | 1000 |    |    |    |    |
| Making capacity endurance of earthing switch        | E2 class<br>(IEC 62271-102) | Number of operations | 5    |    |    |    |    |

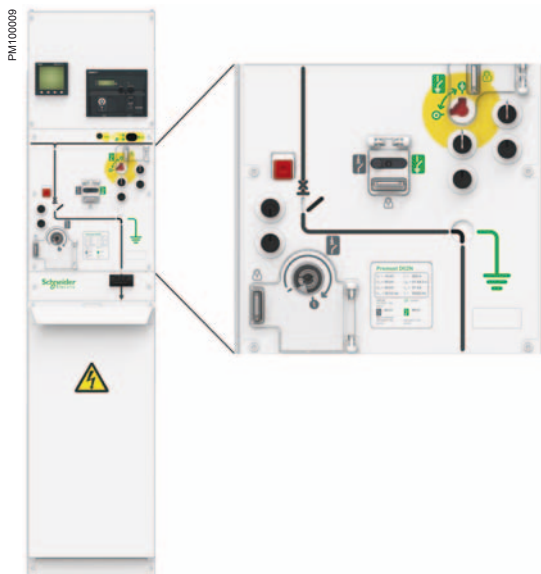
(\*) Consult us for availability

# 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.



### 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

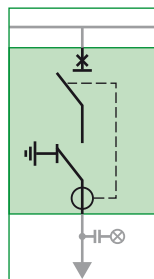
- Optional for circuit breaker.

#### Contact visibility

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

### Technical characteristics

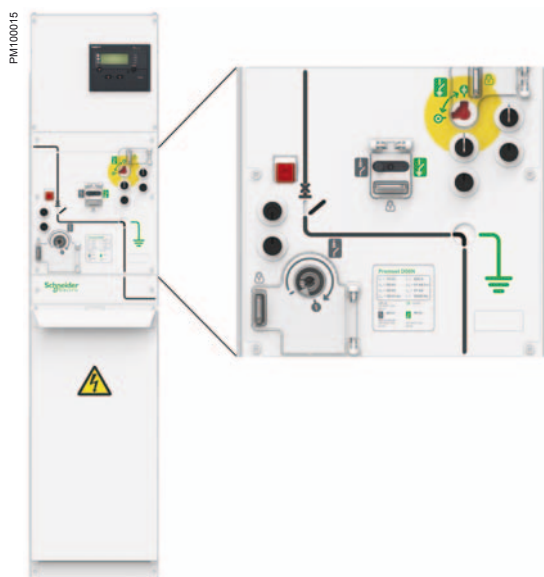
| Rated voltage  | Ur                                   | (kV)                 | 12                                    |    |    | 15 |    |
|--|--------------------------------------|----------------------|---------------------------------------|----|----|----|----|
| Rated current  | I <sub>r</sub>                       | (A rms)              | 100 (D01N) - 200 (D02N)               |    |    |    |    |
| Rated short-time withstand current and duration                | I <sub>k</sub>                       | (kA rms)             | 25                                    | 25 | 20 | 21 | 21 |
|  | t <sub>k</sub>                       | (s)                  | 1                                     | 2  | 4  | 1  | 3  |
| Short-circuit breaking capacity                                | I <sub>sc</sub>                      | (kA rms)             | 25                                    | 25 | 20 | 21 | 21 |
| Rated making capacity of circuit breaker and earthing switches | I <sub>cm</sub>                      | (kA peak)            | 65                                    | 65 | 52 | 54 | 54 |
| No-load mechanical endurance of circuit breaker                | M1 class (IEC 62271-100)             | Number of operations | 2000                                  |    |    |    |    |
| Electrical endurance of circuit breaker                        | E2 class (IEC 62271-100)             | Number of operations | Acc. E2 class, without reclosing duty |    |    |    |    |
| Operating sequence   |                                      |                      | O - 15 s - CO                         |    |    |    |    |
| Maximum number of operations at I <sub>sc</sub>                |                                      |                      | 5                                     |    |    |    |    |
| Total clearing time at I <sub>sc</sub>                         | Fault detection to arc extinguishing | (ms)                 | < 60                                  |    |    |    |    |
| No-load mechanical endurance of earthing switch                | M0 class (IEC 62271-102)             | Number of operations | 1000                                  |    |    |    |    |
| Making capacity endurance of earthing switch                   | E2 class (IEC 62271-102)             | Number of operations | 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, disconnecter 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.



## 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
  - C11 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.

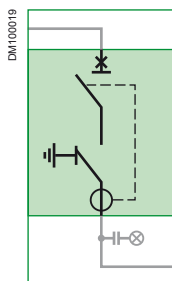
### Operation counter

- 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

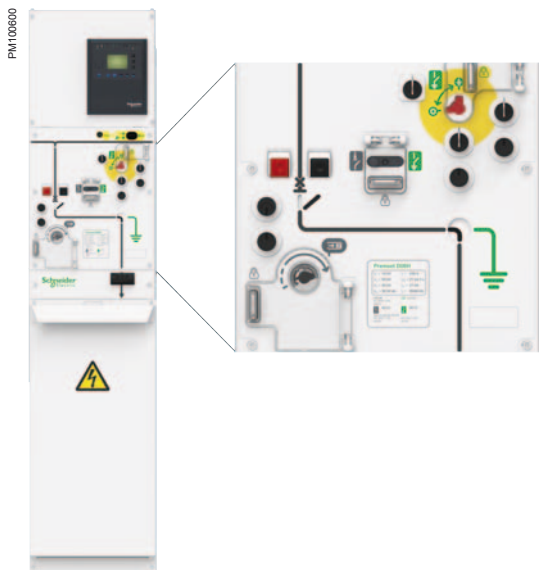


| Rated voltage  | Ur  | (kV)                   | 12                                    |    |    | 15 |    |
|--|---|------------------------|---------------------------------------|----|----|----|----|
| Rated current  | Ir  | (A rms)                | 630                                   |    |    |    |    |
| Rated short-time withstand current and duration                | Ik  | (kA rms)               | 25                                    | 25 | 20 | 21 | 21 |
|  | tk  | (s)                    | 1                                     | 2  | 4  | 1  | 3  |
| Short-circuit breaking capacity                                | Isc                                       | (kA rms)               | 25                                    | 25 | 20 | 21 | 21 |
| Rated making capacity of circuit breaker and earthing switches | Icm                                       | (kA peak)              | 65                                    | 65 | 52 | 54 | 54 |
| 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 operations   | 2000                                  |    |    |    |    |
| Electrical endurance of circuit breaker                        | E2 class (IEC 62271-100)                  | Number of operations   | 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) |                        | < 100                                 |    |    |    |    |
| No-load mechanical endurance of earthing switch                | M0 class (IEC 62271-102)                  | Number of operations   | 1000                                  |    |    |    |    |
| Making capacity endurance of earthing switch                   | E2 class (IEC 62271-102)                  | Number of operations   | 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, disconnecter 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.



## 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

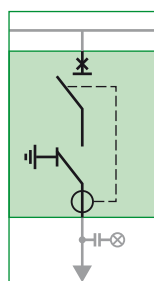
- Optional for circuit breaker.

### Contact visibility

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

## Technical characteristics

| Rated voltage  | Ur                                   | (kV)                   | 12                                 |    |    | 15 |    |
|--|--------------------------------------|------------------------|------------------------------------|----|----|----|----|
| Rated current  | Ir                                   | (A rms)                | 630                                |    |    |    |    |
| Rated short-time withstand current and duration                | Ik                                   | (kA rms)               | 25                                 | 25 | 20 | 21 | 21 |
|  | tk                                   | (s)                    | 1                                  | 2  | 4  | 1  | 3  |
| Short-circuit breaking capacity                                | Isc                                  | (kA rms)               | 25                                 | 25 | 20 | 21 | 21 |
| Rated making capacity of circuit breaker and earthing switches | Icm                                  | (kA peak)              | 65                                 | 65 | 52 | 54 | 54 |
| 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 operations   | 10 000                             |    |    |    |    |
| Electrical endurance of circuit breaker                        | E2 class (IEC 62271-100)             | Number of operations   | 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 |                        | < 100                              |    |    |    |    |
| No-load mechanical endurance of earthing switch                | M0 class (IEC 62271-102)             | Number of operations   | 1000                               |    |    |    |    |
| Making capacity endurance of earthing switch                   | E2 class (IEC 62271-102)             | Number of operations   | 5                                  |    |    |    |    |





# Busbar sectionaliser

## G06 - Bus riser

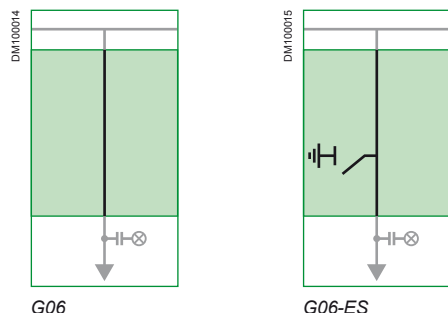
## G06-ES (\*) - Direct incomer

## 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.

■ Depending on the application, it may be associated with an earthing switch.



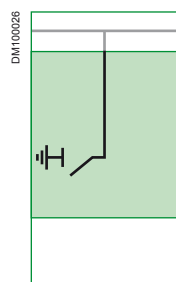
G06

G06-ES

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

■ The busbar system is totally maintenance-free and requires no servicing throughout its life cycle.



### G06, G06-ES (\*)

#### Basic equipment

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

■ Earthing switch (G06-ES (\*))

- 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 (for earthing switch)**

- Standard built-in padlocking facility (shackle diameter < 9 mm)
- Optional keylocking facilities with flat or tubular key types:
  - 1 or 2 keylocks for locking in “cables earthed” position
  - 1 or 2 keylocks for locking in “open” position.

**Auxiliary switches (for earthing switch)**

- 1 optional changeover contact.

**Contact visibility (for earthing switch)**

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

### ES-B (\*)

#### 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 in “cables earthed” position
  - 1 or 2 keylocks for locking in “open” position.

**Auxiliary switches**

- 1 optional changeover contact.

### Technical characteristics (G06 and ES-B)

| Rated voltage                                   | Ur                          | (kV)                 | 12   |    |    | 15 |    |
|---|-----------------------------|----------------------|------|----|----|----|----|
| Rated current                                   | Ir                          | (A rms)              | 630  |    |    |    |    |
| Rated short-time withstand current and duration | Ik                          | (kA rms)             | 25   | 25 | 20 | 21 | 21 |
|   | tk                          | (s)                  | 1    | 2  | 4  | 1  | 3  |
| Rated making capacity                           | Icm                         | (kA peak)            | 65   | 65 | 52 | 54 | 54 |
| No-load mechanical endurance                    | M1 class<br>(IEC 62271-102) | Number of operations | 1000 |    |    |    |    |
| Making capacity endurance                       | E2 class<br>(IEC 62271-102) | Number of operations | 5    |    |    |    |    |

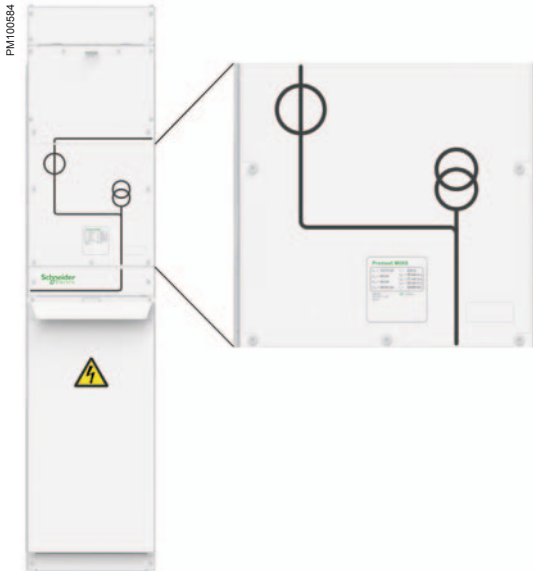
(\*) Consult us for availability

# 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.



### 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)

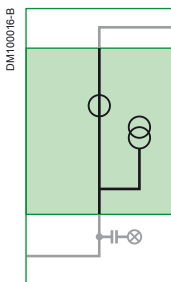
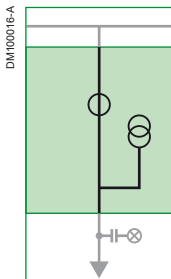
### Accessories

#### 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.

### Technical characteristics

| Rated voltage                                   | Ur | (kV)     | 12  |    |    | 15 |    |
|---|----|----------|-----|----|----|----|----|
| Rated current                                   | Ir | (A rms)  | 630 |    |    |    |    |
| Rated short-time withstand current and duration | Ik | (kA rms) | 25  | 25 | 20 | 21 | 21 |
|   | tk | (s)      | 1   | 2  | 4  | 1  | 3  |





# Metering

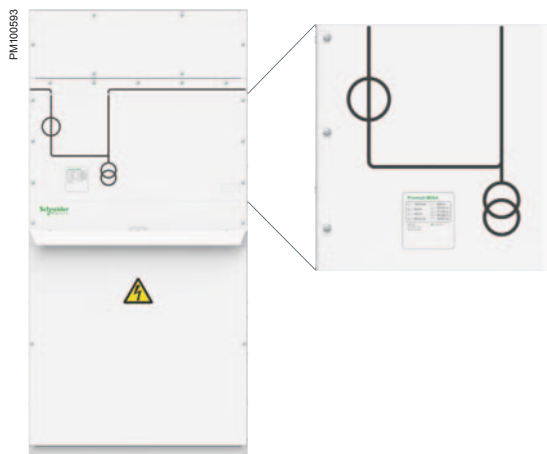
## M06A - Air-insulated metering

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.



### Basic equipment

■ Air-insulated design, composed of:

- bare copper primary circuit, in totally closed IP4X 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

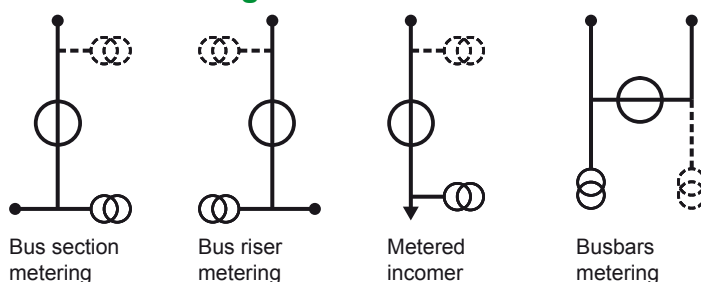
**Locking of front panel**

- 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.

### Technical characteristics

| Rated voltage                                   | Ur              | (kV)     | 12                       |    |    | 15 |    |
|---|-----------------|----------|--------------------------|----|----|----|----|
| Rated current                                   | Ir              | (A rms)  | 630                      |    |    |    |    |
| Rated short-time withstand current and duration | I <sub>tk</sub> | (kA rms) | 25                       | 25 | 20 | 21 | 21 |
|   | tk              | (s)      | 1                        | 2  | 4  | 1  | 3  |
| Internal arc proof, type tested                 |                 |          | IAC cat A-FLR, 21 kA 1 s |    |    |    |    |

### Choice of arrangements



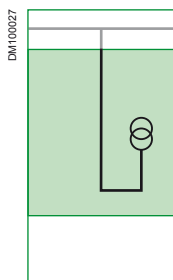
## Metering

### 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.

#### Technical characteristics (VTM, VTP)

| Rated voltage                                   | Ur | (kV)     | 12  |    |    | 15 |    |
|---|----|----------|-----|----|----|----|----|
| Rated current                                   | Ir | (A rms)  | 630 |    |    |    |    |
| Rated short-time withstand current and duration | Ik | (kA rms) | 25  | 25 | 20 | 21 | 21 |
|   | tk | (s)      | 1   | 2  | 4  | 1  | 3  |

#### VTM-D(\*), VTP-D(\*)

#### Voltage transformer units, with circuit-breaker protection

##### Basic equipment

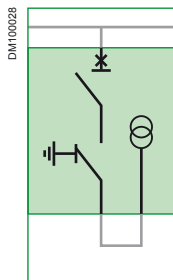
- 2SIS design (Shielded Solid Insulation System), composed of:
  - 100 A disconnecting circuit breaker with associated earthing switch (see D01, page 40)
  - VTM-D unit: three VRU1 phase-to-earth screened voltage transformers, dedicated to power metering (see page 49)
  - VTP-D unit: one VRU2 phase-to-phase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

##### Accessories

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

#### Technical characteristics (VTM-D, VTP-D)

| Rated voltage  | Ur  | (kV)                 | 12            |    |    | 15 |    |
|--|---|----------------------|---------------|----|----|----|----|
| Rated current  | Ir  | (A rms)              | 630           |    |    |    |    |
| Rated short-time withstand current and duration                | Ik  | (kA rms)             | 25            | 25 | 20 | 21 | 21 |
|  | tk  | (s)                  | 1             | 2  | 4  | 1  | 3  |
| Short-circuit breaking capacity                                | Isc                                       | (kA rms)             | 25            | 25 | 20 | 21 | 21 |
| Rated making capacity of circuit breaker and earthing switches | Icm                                       | (kA peak)            | 65            | 65 | 52 | 54 | 54 |
| No-load mechanical endurance of circuit breaker                | M1 class (IEC 62271-100)                  | Number of operations | 1000          |    |    |    |    |
| Electrical endurance of circuit breaker                        | E2 class (IEC 62271-100)                  | Number of operations | 100           |    |    |    |    |
| 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 operations | 1000          |    |    |    |    |
| Making capacity endurance of earthing switch                   | E2 class (IEC 62271-102)                  | Number of operations | 5             |    |    |    |    |

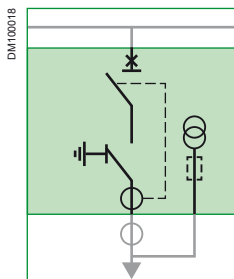


(\*) Consult us for availability

# Metering and circuit breaker D06H-MA(\*) - Heavy-duty circuit breaker with integrated metering

The D06H-MA(\*) dedicated core unit includes an incoming unit with a cable-connected circuit breaker and integrated traditional tariff metering.

- Designed for easy adaptation to any type of conventional block CT or VT
- Double width (750 mm), but compatible with the Premset connection system.



## Basic equipment

Combination of D06H heavy-duty circuit breaker (page 42) and M06A metering unit (page 45).

## D06H circuit breaker

- "3 in 1" core unit integrating circuit breaker, disconnection and earthing functions as well as shielded solid insulation
- **Disconnecting circuit breaker**
  - vacuum disconnecting circuit breaker providing both current 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 and technical characteristics

See page 42

## M06A air-insulated metering unit

- Air-insulated design, composed of:
  - bare copper primary circuit, in totally closed IP4X 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.
- Voltage transformers can be placed upstream or downstream of the current transformers.
- Voltage transformers can be provide with optional fuse protection.

## 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).

(\*) Consult us for availability

# 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 / D06H-MA       |
| ARM3                          | Block     | M06A / D06H-MA       | VRQ2                          | Block     | Phase to earth | M06A / D06H-MA       |
|                               |           |                      | VDC11                         | Block DIN | Phase to phase | M06A / D06H-MA       |
|                               |           |                      | VRC2                          | Block     | Phase to phase | M06A / D06H-MA       |
| 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.



PE93362

### 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 2 s |       |       |       |
| Transformation ratio       | 100/5       | 200/5 | 400/5 | 600/5 |
| Power with cl 0.2S Fs < 5  | 5 VA        |       |       |       |



DES2378

### 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 1 s   |              |              |           |           |           |       |       |
| Transformation ratio                          | 25/5  | 50/5         | 100/5        | 150/5     | 200/5     | 300/5     | 400/5 | 600/5 |
| Transformation ratio<br>(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 |              |           |           |           |       |       |



PE93363

### 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, already used in D06H-MA metering cubicles
- 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 1 s   |              |           |           |           |           |       |       |
| Transformation ratio                          | 25/5  | 50/5         | 100/5     | 150/5     | 200/5     | 300/5     | 400/5 | 600/5 |
| Transformation ratio<br>(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 metering 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.



### 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     |           |              |             |          |             |               |          |

### 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.



VDC11

VDF11

### 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<br>110 V                               | 100 V        | 100 V<br>110 V |  |
| Power and accuracy class | 5 VA to 15 VA cl 0.2<br>5 VA to 50 VA cl 0.5 |              |                |  |

### VDC11 or VDF11

VDF11 phase-to-earth and VDC11 phase-to-phase voltage transformers are used in the **M06A** air-insulated metering unit and **D06H-MA** metered incomer 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.

### 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<br>110/√3 V                         | 100/√3 V     | 100/√3 V<br>110/√3 V | 100/√3 V    | 100/√3 V<br>110/√3 V |
| Power and accuracy class | 5 VA to 10 VA cl 0.2<br>5 VA to 20 VA cl 0.5 |              |                      |             |                      |
| 2nd secondary            | 100/3 V<br>110/3 V                           | 100/3 V      | 100/3 V<br>110/3 V   | 100/3 V     | 100/3 V<br>110/3 V   |
| Power and accuracy class | 30 VA 3P                                     |              |                      |             |                      |



VRQ2

VRC2

### 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<br>110 V                               | 100 V        | 100 V<br>110 V | 100 V       | 100 V<br>110 V |
| Power and accuracy class | 5 VA to 30 VA cl 0.2<br>5 VA to 50 VA cl 0.5 |              |                |             |                |

### VRQ2 or VRC2

VRQ2 phase-to-earth and VRC2 phase-to-phase voltage transformers are used in the **M06A** air-insulated metering unit and **D06H-MA** metered incomer unit.

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

### 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<br>110/√3 V                         | 100/√3 V     | 100/√3 V<br>110/√3 V | 100/√3 V    | 100/√3 V<br>110/√3 V |
| Power and accuracy class | 5 VA to 30 VA cl 0.2<br>5 VA to 50 VA cl 0.5 |              |                      |             |                      |
| 2nd secondary            | 100/3 V<br>110/3 V                           | 100/3 V      | 100/3 V<br>110/3 V   | 100/3 V     | 100/3 V<br>110/3 V   |
| Power and accuracy class | 30 VA 3P                                     |              |                      |             |                      |

# Current and voltage transformers for metering

## Voltage transformers



### 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) |              |              |             |                |

|   |           |
|---|-----------|
| <b>Protection</b>                                 | <b>52</b> |
| Selection guide                                   |           |
| VIP 40 and VIP 45                                 |           |
| VIP 400 and VIP 410                               |           |
| VIP integrated system                             |           |
| Sepam series 20 and series 40                     |           |
| Sensors and actuators                             |           |
| - Current transformers: TLP1, ARU2, CSH120/200    |           |
| - Voltage transformers: VLP1, VRT4                |           |
| <b>Fault passage indicators</b>                   | <b>61</b> |
| Flair 21D, 22D and 23DM                           |           |
| <b>Voltage indicator and relay</b>                | <b>63</b> |
| VPIS and VDS                                      |           |
| VD23 voltage relay                                |           |
| Live cable interlocks                             |           |
| <b>Integrated measurement</b>                     | <b>66</b> |
| AMP21D ammeter                                    |           |
| PM200 series Power Meter                          |           |
| PM800 series Power Meter & Quality Meter          |           |
| Sensors   |           |
| - Current transformers: ARU1, ARC6, ARC7          |           |
| - Voltage transformers: VLP1, VRT4                |           |
| <b>Control</b>                                    | <b>69</b> |
| Local and electrical operation mechanisms         |           |
| Electrical operation auxiliaries: MCH, XF, MX, MN |           |
| Electrical operation auxiliaries: SC100           |           |
| Architecture of feeder automation                 |           |
| Easergy R200 control unit                         |           |
| Automatic Transfer System: ATS100                 |           |
| PS100 high-availability power supply              |           |

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.



VIP 40 and VIP 45



VIP 400 and VIP 410



Sepam series 20 and series 40

## 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 on 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 series 20 and series 40 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: series 20 and series 40
- Standard CTs and trip actuators (see page 59).

(\*) Consult us for availability



## 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  |
| <b>Protection functions</b>                  |   |  |        |                    |             |              |           |
| 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)               |   |  |        |                    |             | ■            | ■         |
| <b>Measurement functions</b>                 |   |  |        |                    |             |              |           |
| Phase current                                |   | ■  | ■      | ■                  | ■           | ■            | ■         |
| Earth current                                |   |  | ■      | ■                  | ■           | ■            | ■         |
| Phase peak demand current                    |   | ■  | ■      | ■                  | ■           | ■            | ■         |
| Load history                                 | Cumulative time                                   |  |        | ■                  | ■           | ■            | ■         |
| <b>Control and monitoring functions</b>      |   |  |        |                    |             |              |           |
| 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 |   |  |        |                    |             | ■            | ■         |
| <b>Power supply</b>                          |   |  |        |                    |             |              |           |
| 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.

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.



## 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:  $I_o >$  (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 ( $I >$ ,  $I_o >$ , to  $>$ ) protected by a lead-sealable cover
- Trip indication powered by dedicated integrated battery with reset by pushbutton or automatically.

### Other features

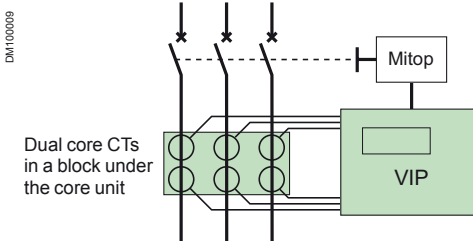
- Complete pre-tested solution that eliminates complicated CT selection
- Complies with MV protection relay standard IEC 60255
- No PC or specific tool required for setting or commissioning
- Maximum setting possibilities consistent with circuit breaker features
- Self-powered by dual core CTs: CUa
-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

### 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).



Dual core CTs: for power and for measurement

- 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.



## 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.

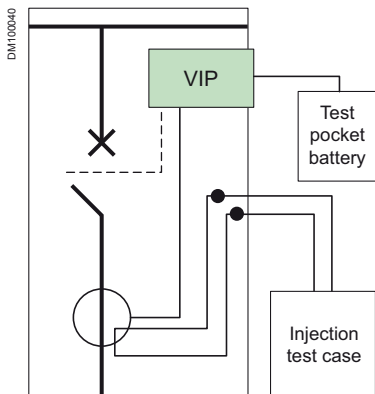
### Primary injection test

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.



Tests of protection system and circuit breaker

(\*) Consult us for availability

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).

## 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.

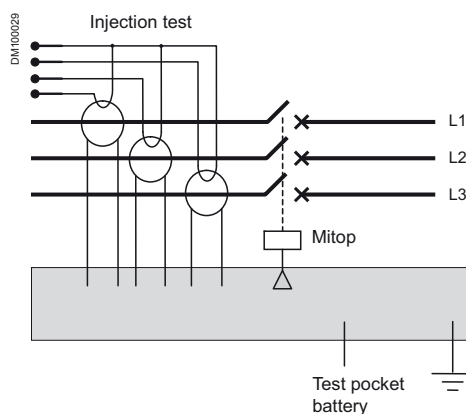
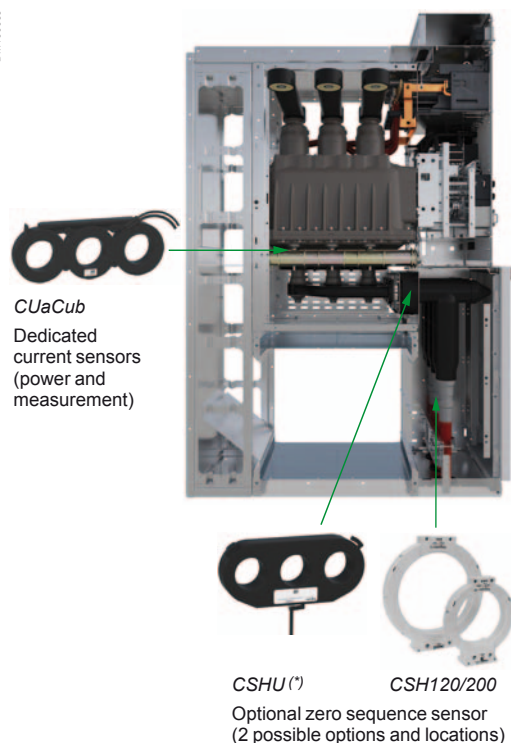
- The protection sensors are located under the core unit, the earth fault sensors around the bushings or on the cables. The connection between all these elements, sensors and the relay is prefabricated and protected against external aggression, providing a higher level of reliability.

### Actuators

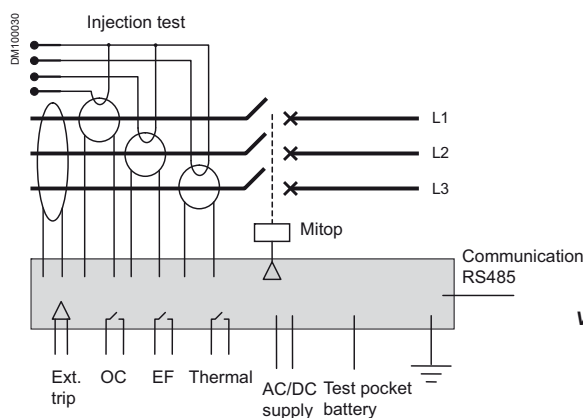
- The actuator is a dedicated low power tripping coil (Mitop) specifically designed to operate with the sensors and the processing unit with minimum energy.

- The integrity of the Mitop circuit is continuously supervised (Trip Circuit Supervision function).

## Connection diagrams



VIP 40, VIP45 & VIP 400



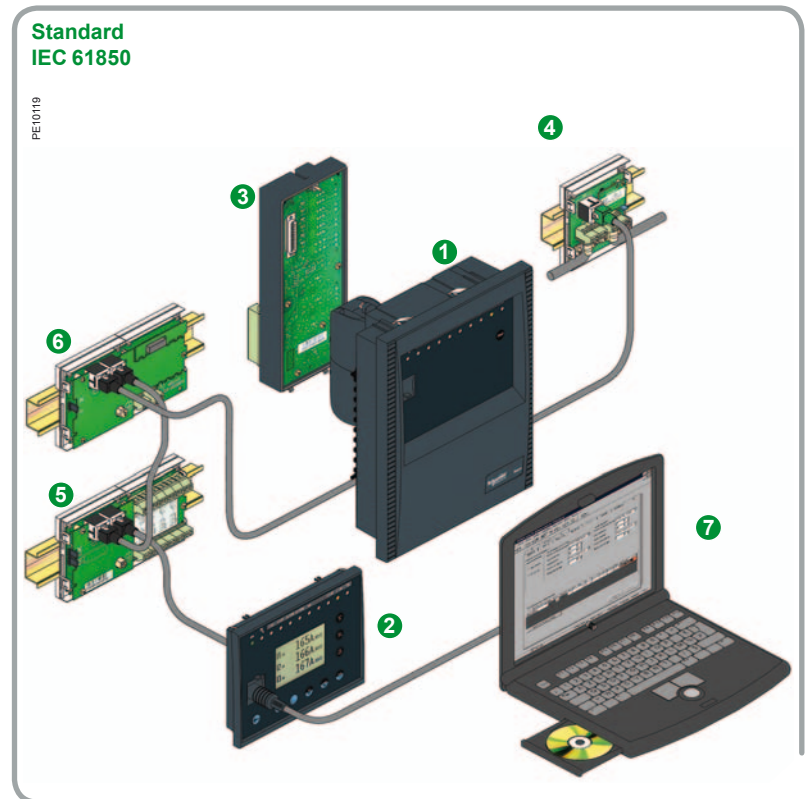
VIP 410

(\*) Consult us for availability

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

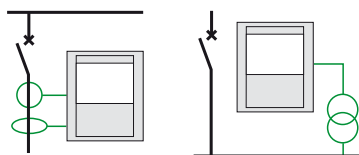
**6 1 analog output**

- 0-10 mA, 4-20 mA or 0-20 mA

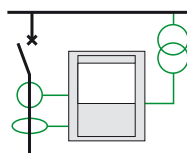
**7 Software tools**

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

### 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     |     |         |                |                |  |  |
| Busbar                 |         |         | B21 | B22     |                |                |  |  |
| Transformer            | T20     | T24     |     |         | T40<br>T50 (4) | T42<br>T52 (4) |  |  |
| Generator              |         |         |     |         | G40            |                |  |  |
| Capacitor              |         |         |     |         |                |                |  |  |
| <b>Characteristics</b> |         |         |     |         |                |                |  |  |
| 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        | 3I + Io |         |     |         | 3I + 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.



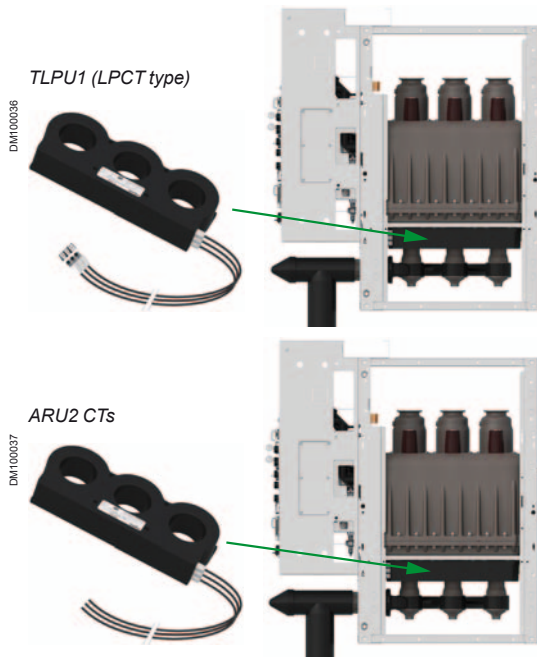
# Protection

## Sensors and actuators for Sepam series 20 and series 40 or third party relays:

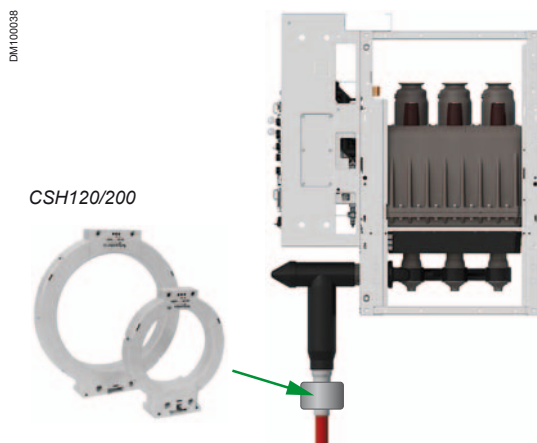
### Current transformers

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.



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



#### 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 - 2 s      |
| Measurement class         | 5P250 - 0.5     |                  |
| Rated primary current     | I1n             | 100 A            |
| Secondary voltage         | Vs              | 22.5 mV at 100 A |
| Extended primary current  | 630 A           |                  |
| Rated burden              | > 2 kΩ          |                  |

#### ARU2

A standard ring type current transformer of the ARU2 type (1A, 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 - 2 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

When the zero sequence CT around the bushings cannot be used, the sensitive earth fault protection will require installation of an earth fault toroidal CT of the CHS120 or CHS200 type around the cables.

# Protection

## Sensors and actuators for Sepam series 20 and series 40 or third party relays:

### Voltage transformers

#### VLPUI (\*)

The VLPUI is a Low Power Voltage Transformer (LPVT). 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.

##### VLPUI 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                             |



#### 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



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.



Flair 21D



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.

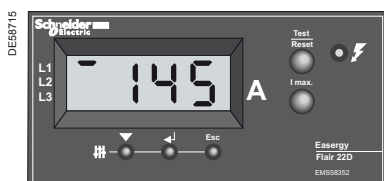
- Fault indication via a red LED on the front panel
- Indication of the faulty phase (earth fault) on LCD display
- Optional remoting of indication to external flashing lamp
- Activation of a contact for retransmission to the SCADA system.

### 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.

(\*) Consult us for availability

## Clear, comprehensive display

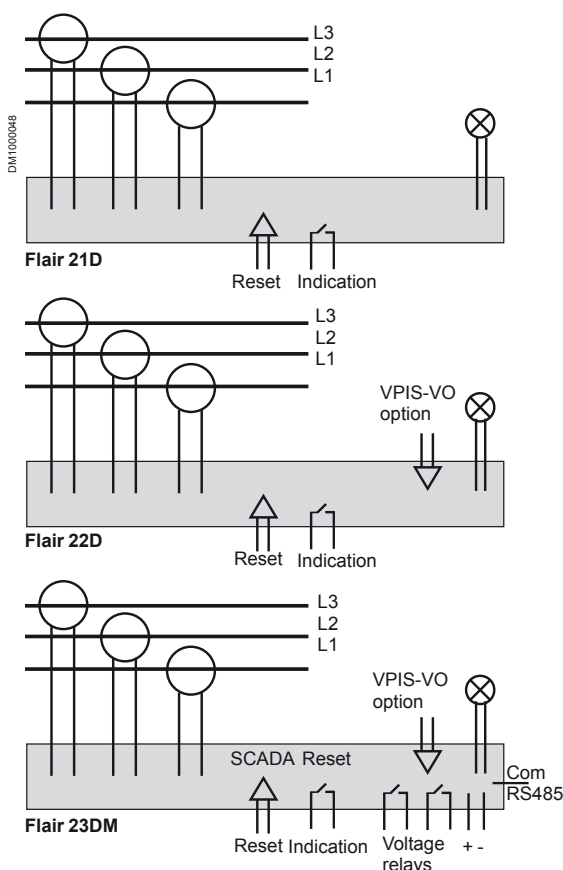


## Sensors

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     |           |                |
|-----------------------|---------------------------|-----------|-----------|----------------|
|                       |                           | 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

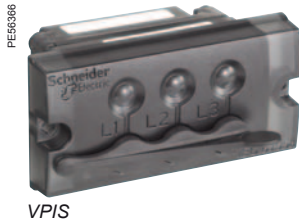
## Characteristics per product

| Model  | Description  |
|--|--|
| <b>Fault passage indicator with single power supply (self-powered)</b>             |  |
| <b>Flair 21D</b>   | Detector with autonomous power supply<br>External indicator lamp output powered by battery (BVP)   |
| <b>Fault passage indicator with dual power supply</b>                              |  |
| <b>Flair 22D</b>   | Detector with autonomous power supply and lithium battery<br>External indicator lamp output powered by the Flair (BVE)<br>Zero sequence CT option (type B setup)<br>Interface with VPIS-VO possible to confirm the fault by voltage absence  |
| <b>Fault passage indicator with dual power supply and voltage presence/absence</b> |  |
| <b>Flair 23DM (*)</b>  | Detector with 24-48 Vdc external and autonomous power supply<br>External indicator lamp output powered by the Flair (BVE)<br>Zero sequence CT option (type B or C setup)<br>Voltage presence and absence detector (same as for VD23)<br>Interface with VPIS-VO needed for the voltage presence |

## Standard applications

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

(\*) Consult us for availability



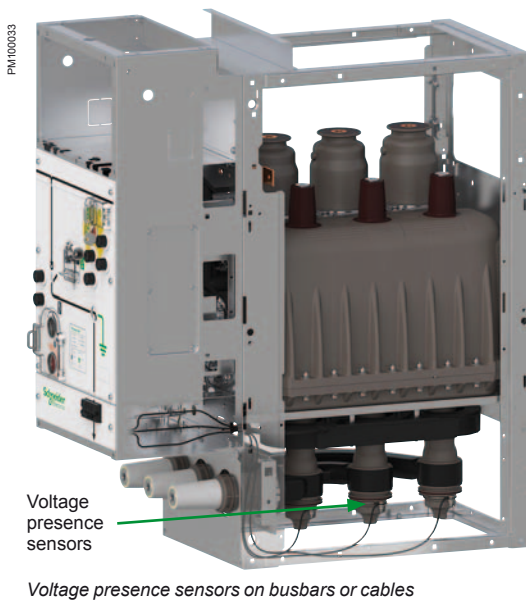
## Voltage presence indicators

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:

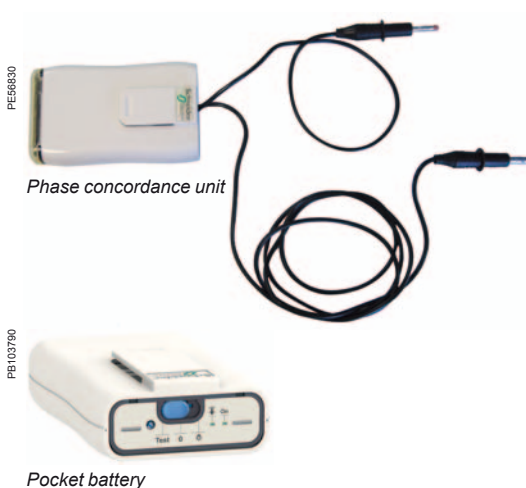
- VPIS: Voltage Presence Indicator System, as defined by standard IEC 62271-206
- VDS: Voltage Detecting System, as defined by standard IEC 61243-5.

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.



## 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.



## Phase concordance unit

This unit is used to check phase concordance.

## 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.

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 (\*)).



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

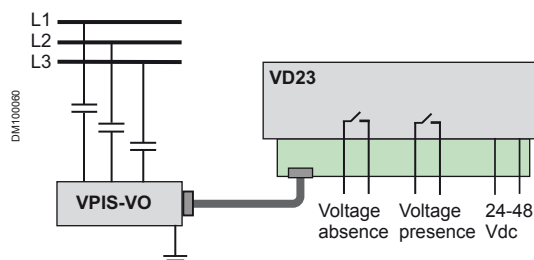
**6 microswitches:**



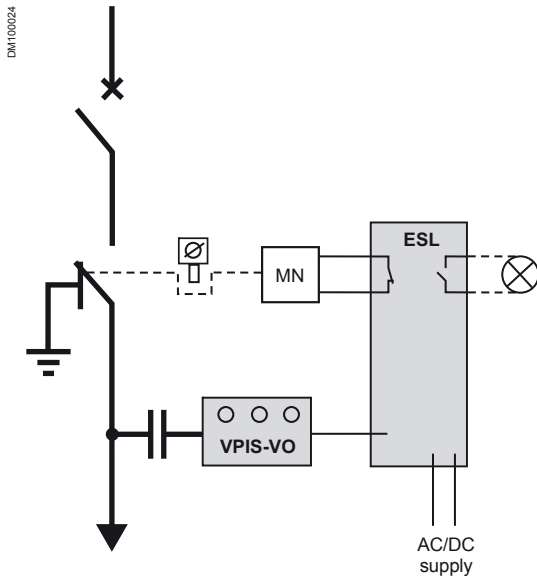
- 1: Ph-N voltage(V) / Ph-Ph voltage(U)
- 2: Direct / inverse action on output relays
- 3: Phase 1 used / not used
- 4: Phase 2 used / not used
- 5: Phase 3 used / not used
- 6: Residual voltage used / not used

## 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.



(\*) Consult us for availability



## 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 earthing switch mechanism, 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 close the earthing switch on 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 earthing switch cannot be closed on earth.
- 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.

(\*) Consult us

■ 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

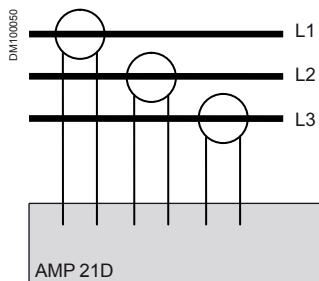
■ Its compact DIN format easily fits in Premset MV cubicles

■ Versatile, it displays phase current and maximum current.



AMP 21D

## Connection diagram



## 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                     |



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.

PE66217



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.

PE66158



### 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.

### 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.

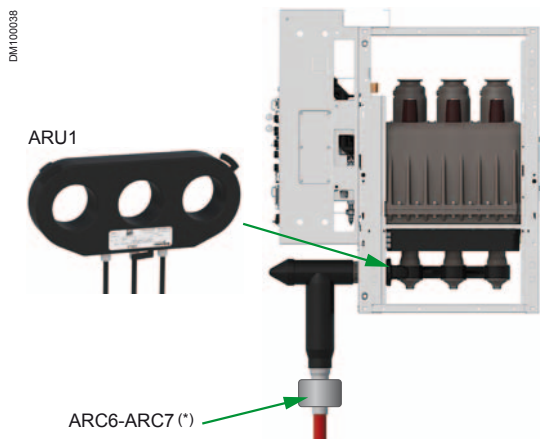
Its large easy-to-read display lets you view the three phases and neutral at the same time.

#### 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.

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.



### 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 2 s   | 25 kA x 2 s   | 25 kA x 2 s   | 25 kA x 2 s   |
| Class                | 0.5           | 0.5           | 0.5           | 0.5           |
| 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 (\*), ARC7 (\*)

ARC6 and ARC7 are ring-type CTs placed around cables. They offer higher accuracy than the ARU1 type presented above. They are not compatible with small cable boxes and can only be installed on single-core screened cables.

##### ARC6-ARC7 characteristics

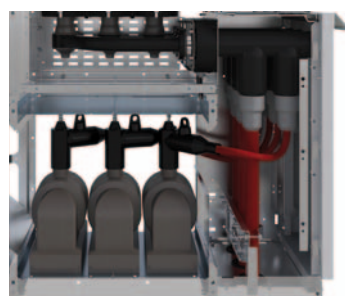
|                      | ARC6        | ARC6 | ARC7 | ARC7 |
|----------------------|-------------|------|------|------|
| Standard             | IEC 60044-1 |      |      |      |
| I <sub>1n</sub> (A)  | 100         | 200  | 400  | 600  |
| I <sub>th</sub> (kA) | 25          | 25   | 25   | 25   |
| t (s)                | 2           | 2    | 2    | 2    |
| Measurement          | 5A          | 5A   | 5A   | RA   |
| Class                | 0.2S        | 0.2S | 0.2S | 0.2S |
| FS                   | 5           | 5    | 5    | 5    |
| Burden               | 5 VA        | 5 VA | 5 VA | 5 VA |

### 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.



VRT4

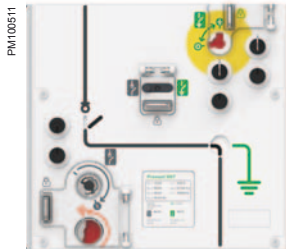
(\*) Consult us for availability



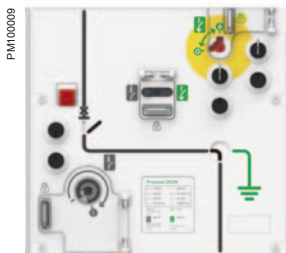
Three operating mechanisms meet all the needs of the various core units of the Premset range.

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

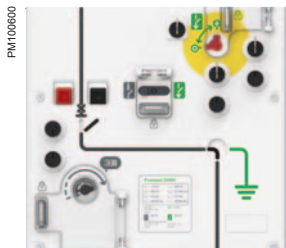
They share the same range of auxiliaries for electrical operation and remote indications.



CIT mechanism in I06T unit



CI1 mechanism in D02N unit



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 without maintenance, servicing or replacement.

**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.

PM100582



MCH motor mechanism

PM100002



XF and MX shunt closing releases

PM100001



Time delay unit for MN undervoltage release

PM100032



Rotary type contacts (OC)

## 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   |

## 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   |

## 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,<br>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<br>(VA or W) | Triggering | 200 (for 200 ms)   |
|                          | Latched    | 4.5  |

## "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                   |
| Utilisation category: |          | 480                       |
| AC12/DC12             |          | 690                       |
|                       | V DC     | 24/48                     |
|                       |          | 125                       |
|                       |          | 250                       |
|                       |          | 10/6 (1)                  |
|                       |          | 10/6 (1)                  |
|                       |          | 3                         |

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

The SC100 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:

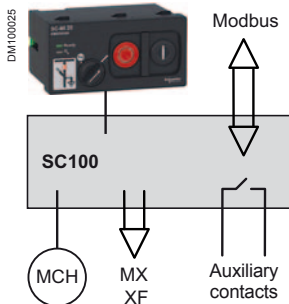
- Electrical interlocking
- Remote control supervision
- Front panel interface for local operation
- Built-in Modbus communication and “Plug and play” design makes the SC100 and the remote control facility:
  - easy to use
  - easy to upgrade.



SC110A



SC-MI control panel



The SC100 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 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 types

|                       | SC100-A | SC100-E | SC110-A (*) | SC110-E (*) |
|-----------------------|---------|---------|-------------|-------------|
| 24-60 Vdc             | ■       |         | ■           |             |
| 110-250 Vdc/Vac       |         | ■       |             | ■           |
| Network communication |         |         | ■           | ■           |

## SC-MI control panels

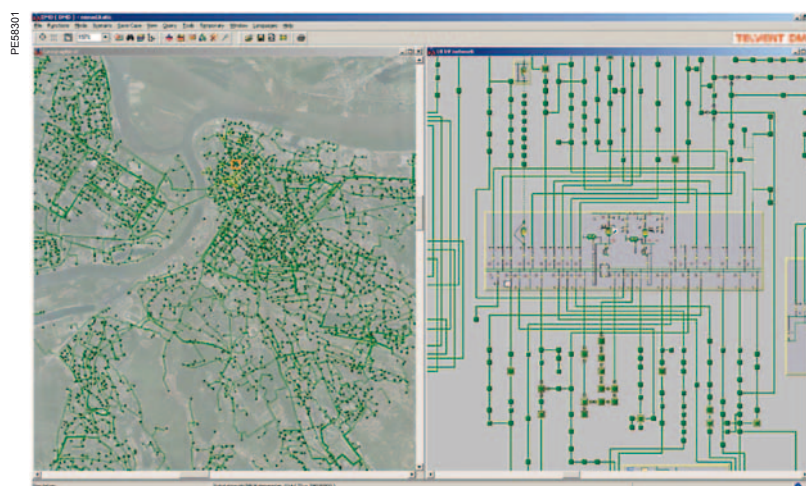
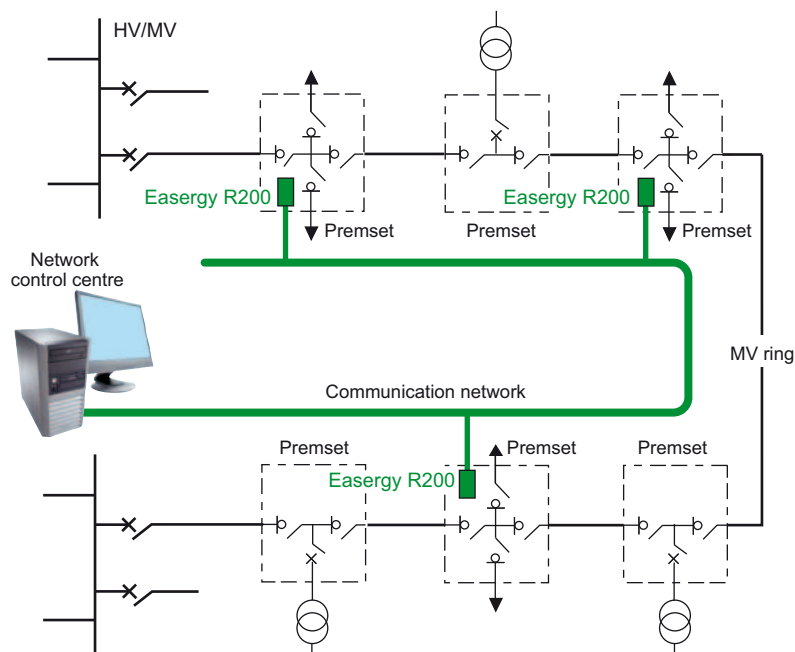
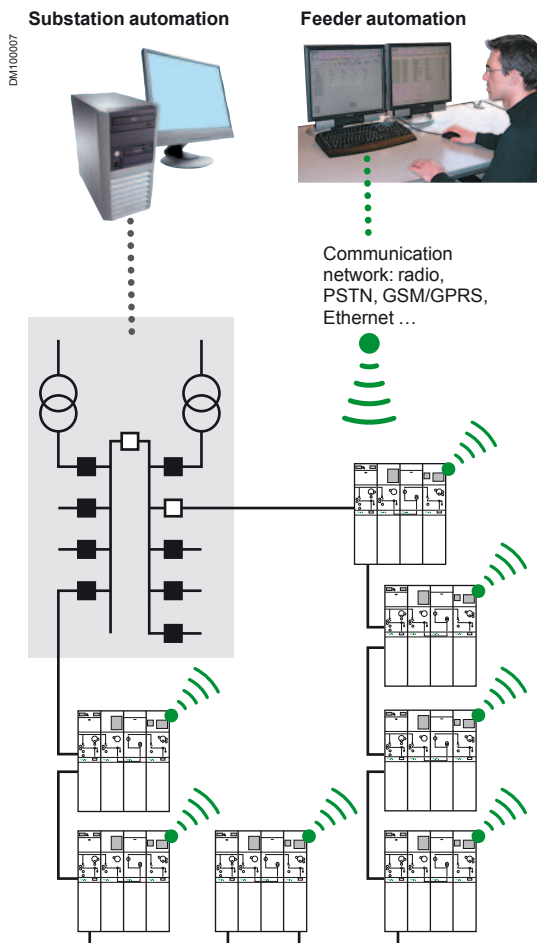
|                     | SC-MI 10 | SC-MI 20 |
|---------------------|----------|----------|
| On/Off pushbuttons  | ■        | ■        |
| Remote/local switch |          | ■        |

(\*) Consult us for availability

### 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.

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 serial interface
- RS232/485 serial interface
- GSM/GPRS 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.

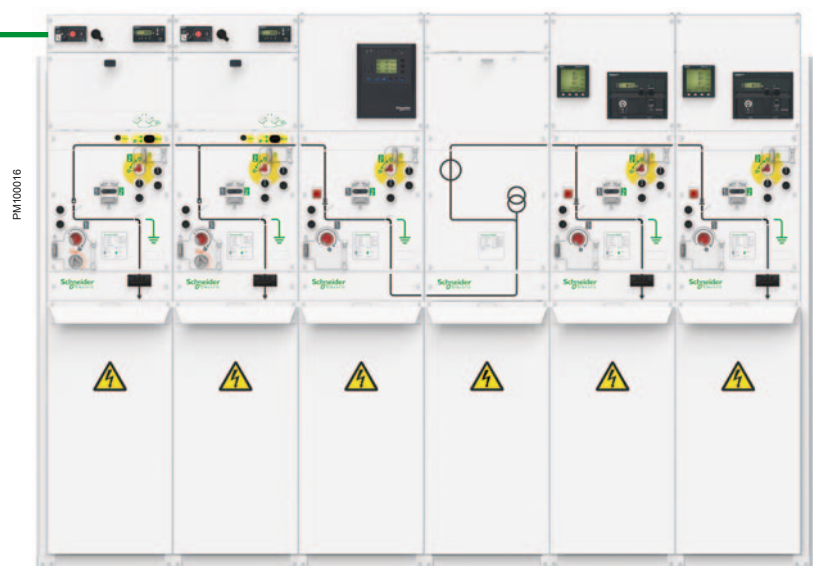
Remote access is possible via GSM, GPRS, Ethernet or PSTN transmission networks and can be implemented in parallel from the remote control centre.

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.



Premset

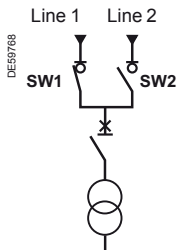


(\*) Consult us for availability



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

The Premset system therefore proposes an automatic source transfer solution.



MV source changeover diagram

### Network ATS (1/2)

Designed to allow changeover between two MV network sources, this solution offers **3 operating modes** (selected via the ATS100 Web server):

#### 1 - Auto SW1 or Auto SW2 mode

In the event of a voltage loss on the distribution line in service (SW1), the ATS changes over to the backup line (SW2) after a configurable time delay (T1) [opening of SW1, closing of SW2].

As soon as voltage returns on the main line (SW1), the ATS changes back to the main line after a time delay (T2).

[opening of SW2, closing of SW1 if the paralleling option is not activated]

[closing of SW1, opening of SW2 if the paralleling option is activated]

#### 2 - Semi-Auto SW1 ↔ SW2

In the event of a voltage loss on the distribution line in service (SW1), the ATS changes over to the backup line (SW2) after a configurable time delay (T1).

[opening of SW1, closing of SW2]

The ATS does not change back to the main line, except in the event of a voltage loss on the backup line [opening of SW2, closing of SW1]

#### 3 - Semi-Auto SW1 → SW2 or Semi-Auto SW2 → SW1

In the event of a voltage loss on the distribution line in service (SW1), the ATS changes over to the backup line (SW2) after an adjustable time delay (T1).

[opening of SW1, closing of SW2].

The ATS maintains the backup line in service (SW2) irrespective of the voltage on the two lines.

### Characteristics

TR: switch response time (< 2 s).

#### ■ Time delay before changeover (T1):

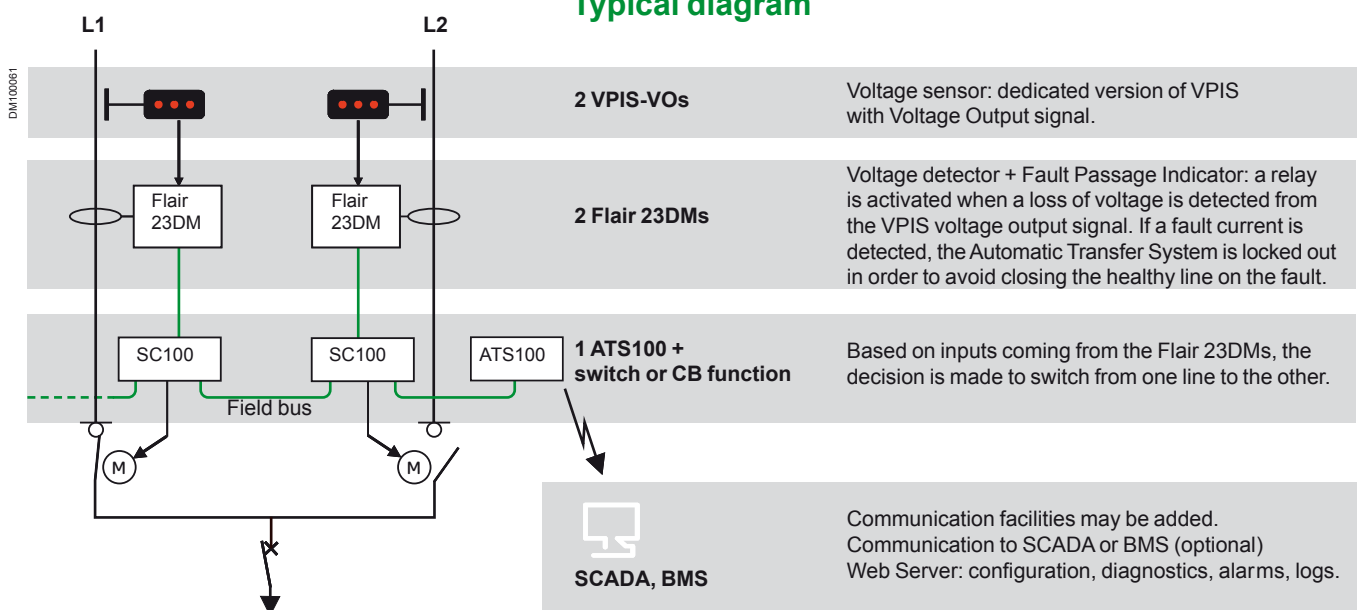
Configurable from 0 s to 200 s in increments of 100 ms (factory setting = 1 s).

This time delay is also used to delay return to the initial line in Semi-Auto mode (SW1 ↔ SW2)

#### ■ Time delay before return to the initial line (T2) (Auto mode only):

Configurable from 0 s to 30 min in increments of 5 s (factory setting = 15 s).

### Typical diagram



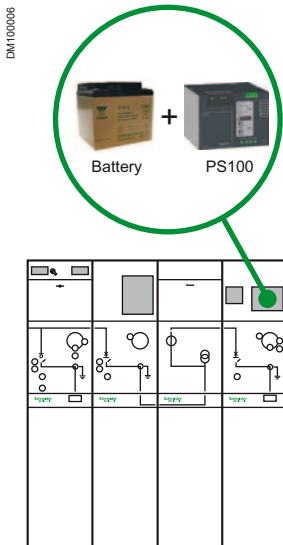
(\*) Consult us for availability

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).



PS100



## 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 availability 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.                |





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|   |           |
|---|-----------|
| <b>Busbar and cable arrangements</b>              | <b>78</b> |
| <b>Cable connections</b>                          | <b>79</b> |
| <b>Network cable testing and diagnosis device</b> | <b>81</b> |

- 2SIS connections with shielded solid insulation, eliminating all electric fields in open air: totally maintenance and servicing free.
- 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.

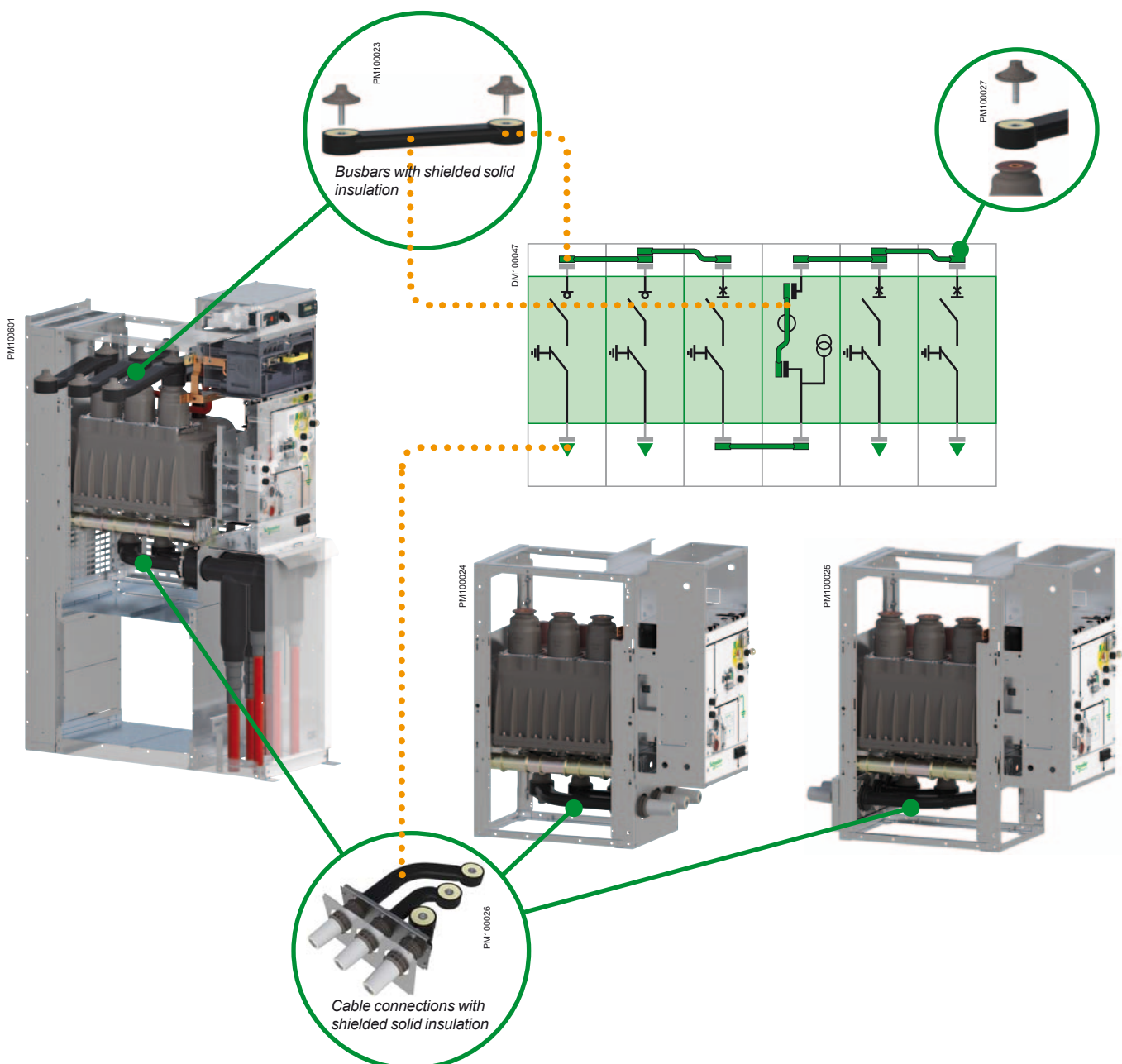
### Universal system of power connections

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.



- 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

D06N



PM10022

## 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.

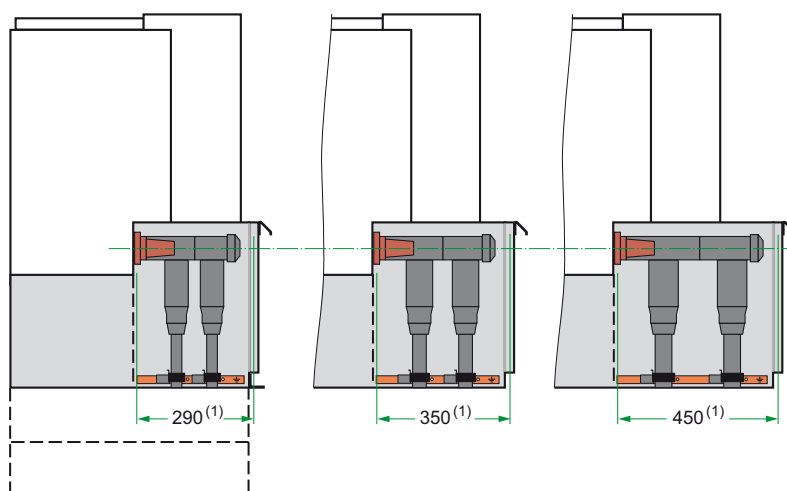
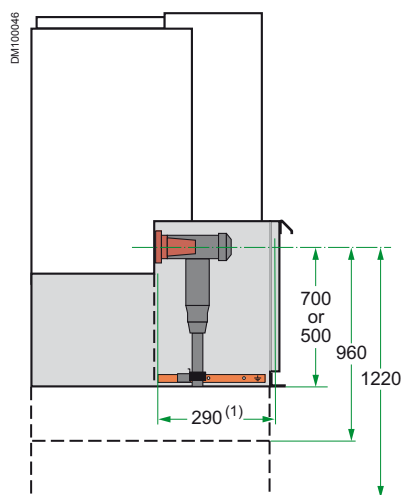
## Cable connections

- **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).



(1) + 10 mm without internal arc performance.

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.

## Compatible cable connections

### Type C bushing

#### Directed field disconnectable connector One cable / phase

| Supplier          | Performance        | Reference   | Cross section (mm <sup>2</sup> ) | Type            |
|-------------------|--------------------|-------------|----------------------------------|-----------------|
| Euromold (Nexans) | Up to 15 kV, 630 A | 400LB       | 25 to 300                        | Elbow connector |
|                   |                    | 400TB       | 35 to 300                        | T connector     |
|                   |                    | 430TB       | 35 to 300                        | T connector     |
|                   |                    | 440TB       | 185 to 630                       | T connector     |
| nkt cables GmbH   | Up to 12 kV, 630 A | CB 12-630   | 25 to 300                        | T connector     |
|                   | Up to 15 kV, 630 A | CB 24-630   | 25 to 300                        | T connector     |
| Suedkabel         | Up to 12 kV, 630 A | SET 12      | 185 to 300                       | Elbow connector |
|                   | Up to 15 kV, 630 A | SET 24      | 95 to 240                        | Elbow connector |
|                   | Up to 12 kV, 630 A | SEHDT 13    | 300 to 500                       | T connector     |
|                   | Up to 15 kV, 630 A | SEHDT 23    | 300 to 630                       | T connector     |
| Tyco              | Up to 15 kV, 630 A | RSTI x6Lxx  | 400 to 630                       | T connector     |
|                   |                    | RSTI L 56xx | 25 to 300                        | T connector     |
| ABB Kabeldon      | Up to 12 kV, 630 A | CSE-A 12630 | 25 to 630                        | T connector     |
|                   | Up to 15 kV, 630 A | CSE-A 24630 | 25 to 630                        | T connector     |
| Prysmian          |                    | FMCTs-400   |                                  | T connector     |
|                   |                    | FMCTs-600   |                                  | T connector     |

#### Directed field disconnectable connector Two cables / phase

| Supplier          | Performance        | Reference                   | Cross section (mm <sup>2</sup> ) | Type               |
|-------------------|--------------------|-----------------------------|----------------------------------|--------------------|
| Euromold (Nexans) | Up to 15 kV, 630 A | 440PB + 400TB/440TB         | 185 to 630                       | Coupling connector |
| nkt cables GmbH   | Up to 12 kV, 630 A | CC 12-630 + CB 12-630       | 25 to 300                        | Coupling connector |
|                   | Up to 15 kV, 630 A | CC 24-630 + CB 24-630       | 25 to 300                        | Coupling connector |
| Suedkabel         | Up to 12 kV, 630 A | SEHDK 13.1                  | 240 to 300                       | Coupling connector |
|                   | Up to 15 kV, 630 A | SEHDK 23.1                  | 150 to 240                       | Coupling connector |
| Tyco              | Up to 15 kV, 630 A | RSTI x6Lxx + RSTI CC L 56xx | 25 to 300                        | Coupling connector |
| ABB Kabeldon      | Up to 12 kV, 630 A | 2 x CSE-A 12-630            | 25 to 630                        | Coupling connector |
|                   | Up to 15 kV, 630 A | 2 x CSE-A 12-630            | 25 to 630                        | Coupling connector |

## Other types of compatible cable connections

### Connectors with lightning arresters

#### Directed field disconnectable connector Surge arrester

| Supplier          | Performance | Reference               | Type           |
|-------------------|-------------|-------------------------|----------------|
| Euromold (Nexans) | Up to 15 kV | 400PB-XSA + 400TB/440TB | Surge arrester |
| nkt cables GmbH   | Up to 12 kV | CSA 12                  | Surge arrester |
|                   | Up to 15 kV | CSA 24                  | Surge arrester |
| Tyco              | Up to 15 kV | RSTI L56SAxxxx          | Surge arrester |
|                   |             | RSTI CC L56SAxxxx       | Surge arrester |

# 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

**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.

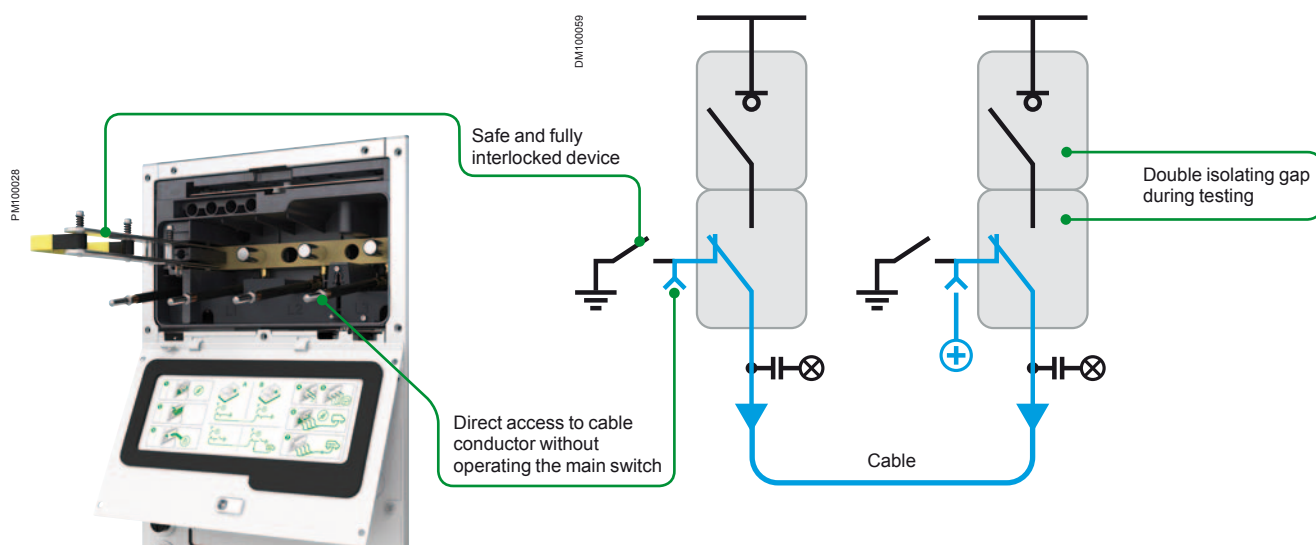
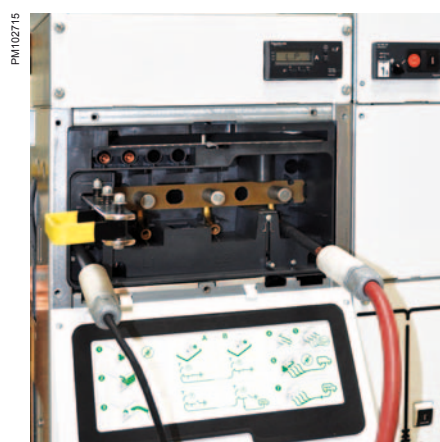
**The cable testing device can be used on both ends of cable to be tested, in order to isolate completely the cable section from the network.**

## 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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|   |           |
|---|-----------|
| <b>Dimensions</b>                             | <b>84</b> |
| <b>Civil engineering &amp; gas exhausting</b> | <b>86</b> |
| <b>VIP tripping curves</b>                    | <b>87</b> |
| VIP 40 and VIP 45 tripping curve              |           |
| VIP 400 and VIP 410 tripping curves           |           |

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## Dimensions

| Function                     | Unit type | Height <sup>(1)</sup><br>(mm) | Width<br>(mm) | Depth <sup>(2)</sup><br>(mm) |
|------------------------------|-----------|-------------------------------|---------------|------------------------------|
| Line incomer/ Line feeder    | I06T      | 1350                          | 375           | 910                          |
|                              | I06H (*)  | 1350                          | 375           | 910                          |
|                              | D06H      | 1350                          | 375           | 910                          |
|                              | G06       | 1350                          | 375           | 910                          |
|                              | M06S      | 1350                          | 375           | 910                          |
|                              | M06A      | 1350                          | 750           | 910                          |
|                              | D06H      | 1350                          | 375           | 910                          |
| Bus section                  | D06H      | 1350                          | 375           | 910                          |
|                              | I06T      | 1350                          | 375           | 910                          |
| Bus riser                    | I06T      | 1350                          | 375           | 910                          |
|                              | G06       | 1350                          | 375           | 910                          |
|                              | M06S      | 1350                          | 375           | 910                          |
|                              | M06A      | 1350                          | 375           | 910                          |
| Line protection              | D06H      | 1350                          | 375           | 910                          |
| MV/LV transformer protection | D01N      | 1350                          | 375           | 910                          |
|                              | D02N      | 1350                          | 375           | 910                          |
| General protection           | D06N      | 1350                          | 375           | 910                          |

(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

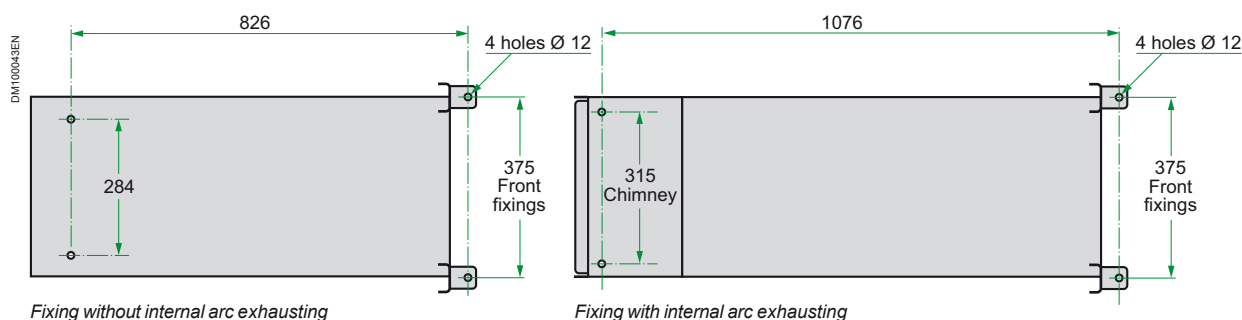
The units are simply bolted together to form the MV switchboard (bolts supplied).  
Busbar connections are made using a torque wrench set to 28 mN.

### To the floor

■ For switchboards comprising up to three units, the four corners of the switchboard must be secured to the floor using:

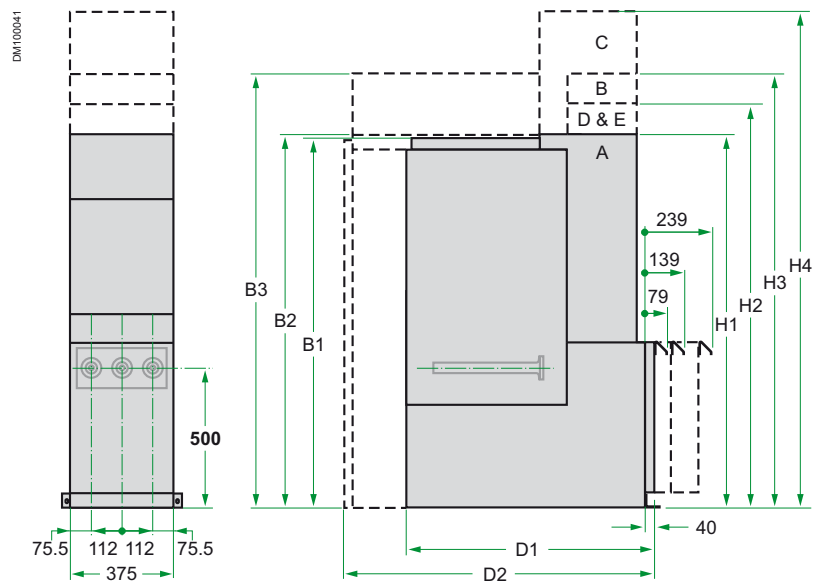
- bolts (not supplied) screwed into nuts set into the floor using a sealing pistol
- threaded rods grouted into the ground

■ For switchboards comprising more than three units, the number and position of fixing points depends on local criteria (earthquake withstand capacities, etc.).



(\*) Consult us for availability

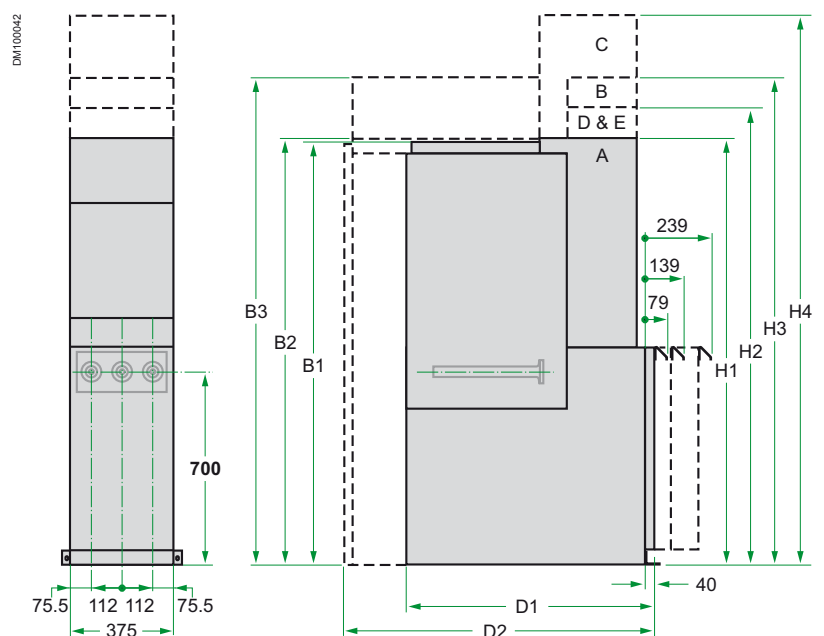
## Cable termination height: 500 mm



|    |   |      |
|----|---|------|
| 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                    | 1574 |
| D1 | Without internal arc exhausting             | 910  |
| D2 | With internal arc exhausting                | 1135 |

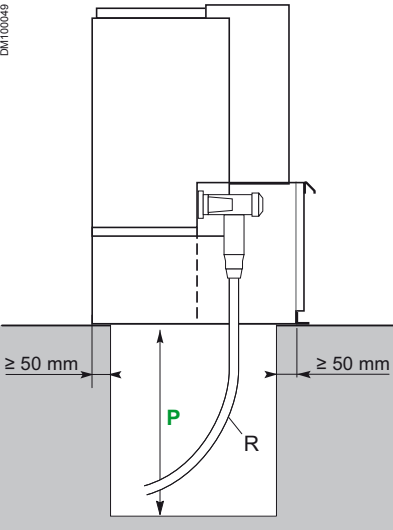
Note: dimensions are the same for bar-connected cubicles.

## 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                    | 1774 |
| D1 | Without internal arc classification         | 910  |
| D2 | With internal arc classification            | 1135 |

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



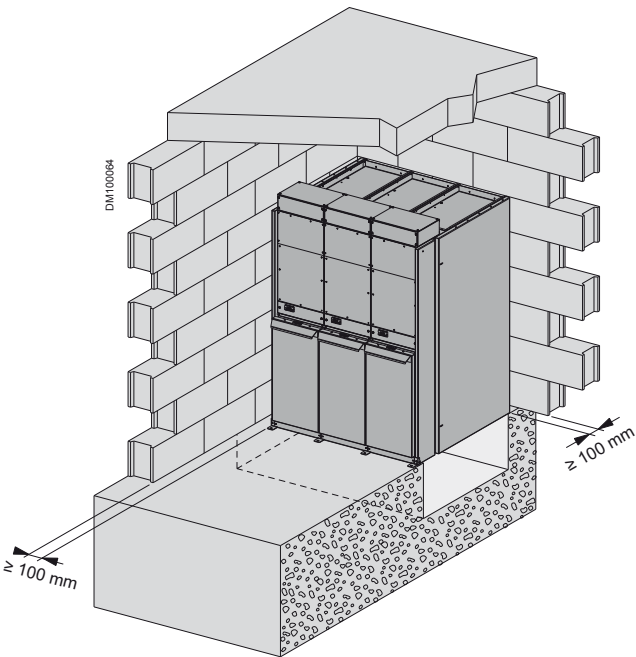
Trench depth P for Premset without plinth

Cable connection and cable trench

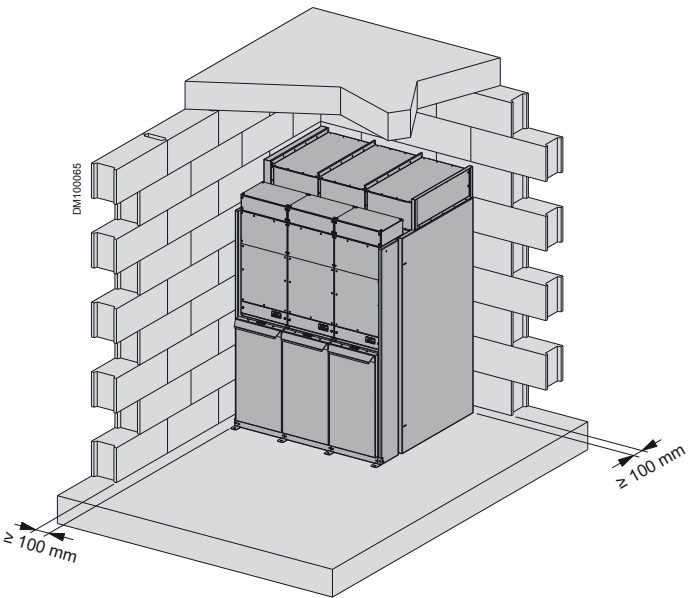
| Cable insulation                    | Cable       | Cross-section (mm <sup>2</sup> ) | Bending radius | Cable trench depth P |
|-------------------------------------|-------------|----------------------------------|----------------|----------------------|
| Dry insulation                      | Single-core | ≤ 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



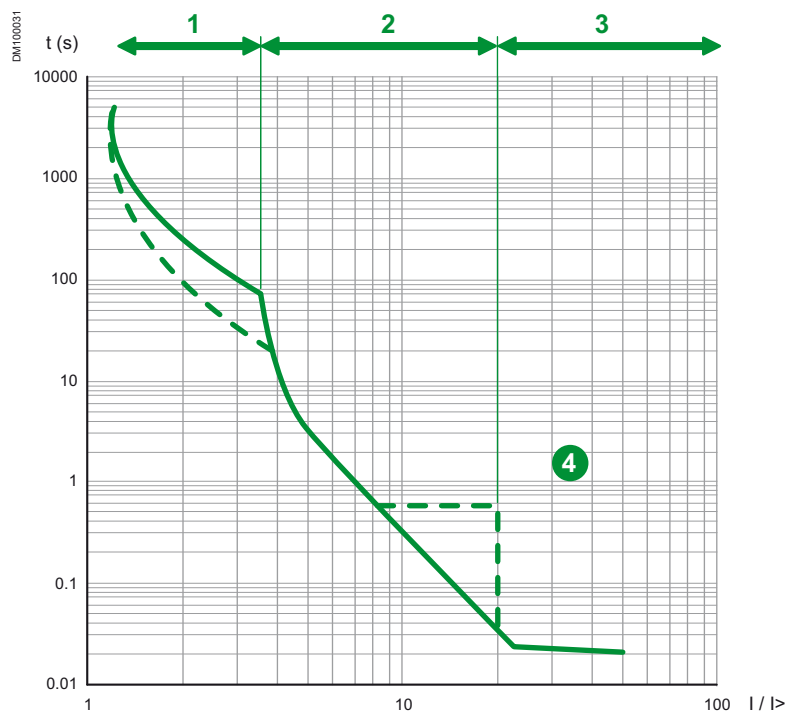
Layout of a top exhaust internal arc switchboard



# VIP tripping curves

## VIP 40 and VIP 45 tripping curve

### Phase overcurrent protection (ANSI 50-51)

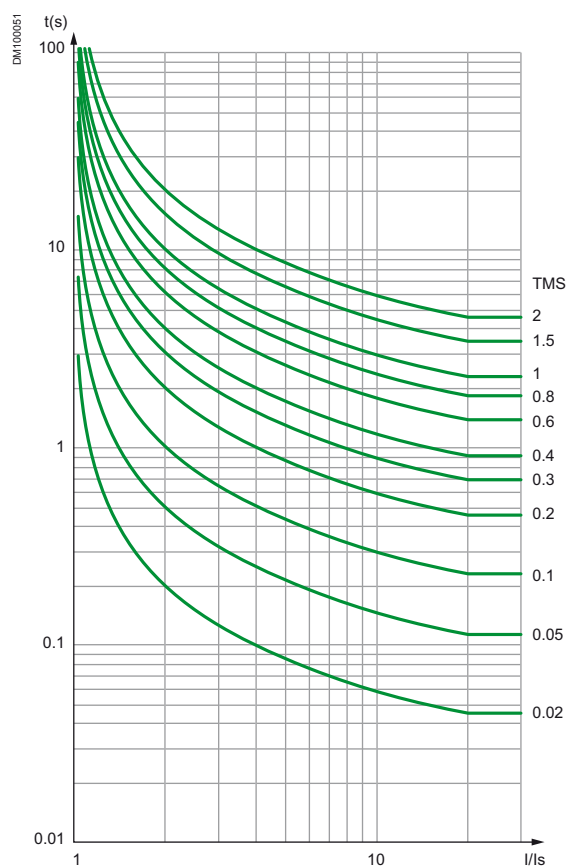


- 1 Overload
- 2 Secondary short-circuit
- 3 Primary short-circuit
- 4 Activation of discrimination with a Low Voltage circuit breaker.

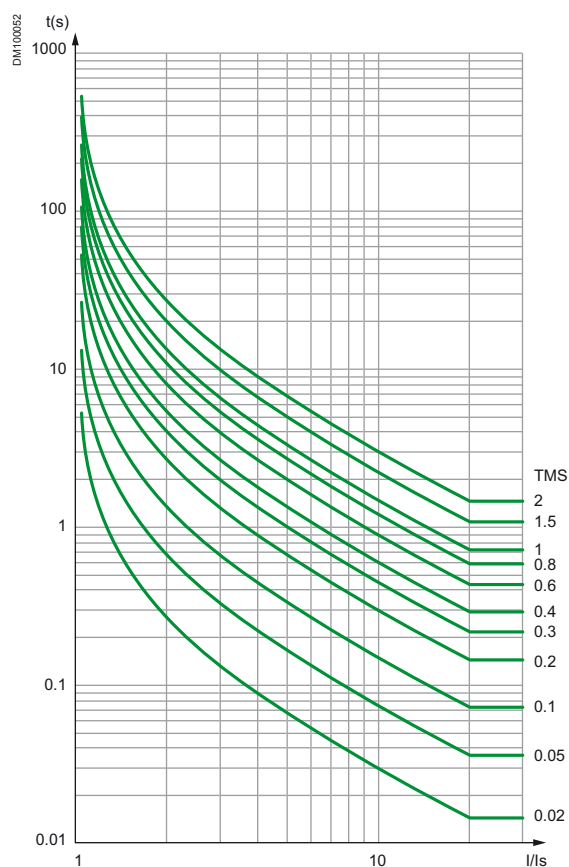
# VIP tripping curves

## VIP 400 and VIP 410 tripping curves

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



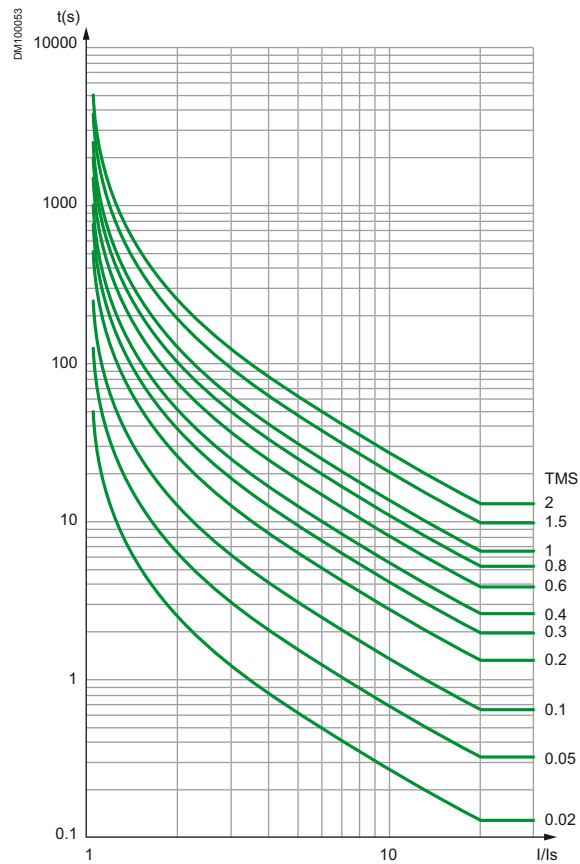
**IEC Very Inverse Time Curve  
(IEC/VIT or IEC/B)**



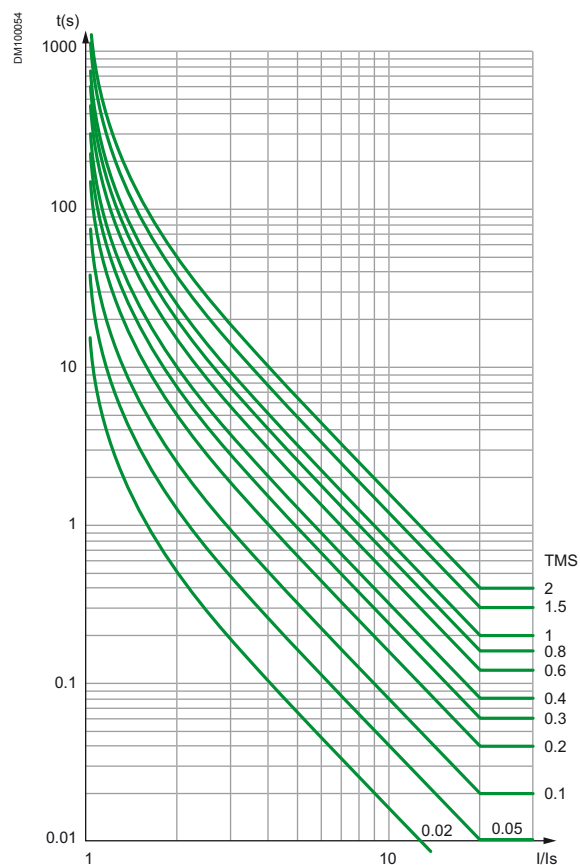
# VIP tripping curves

## VIP 400 and VIP 410 tripping curves

**IEC Long Time Inverse Curve  
(IEC/LTI)**



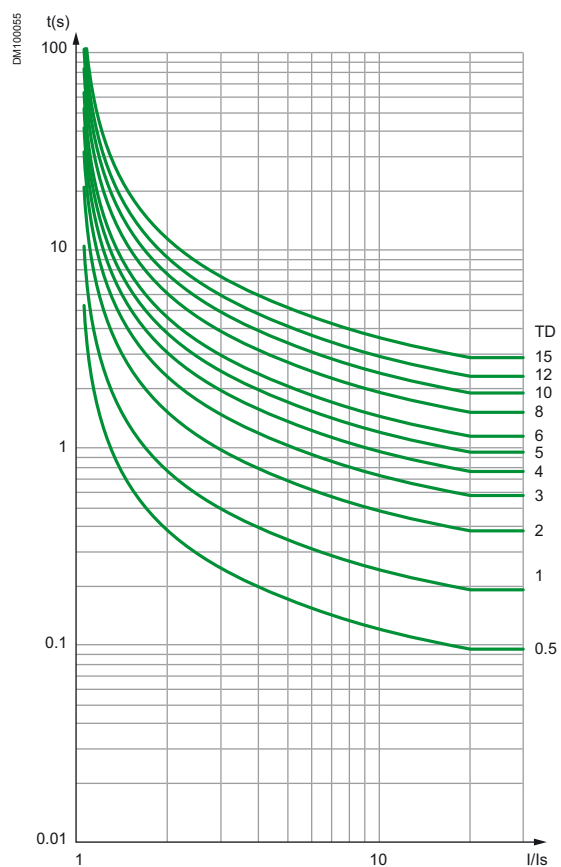
**IEC Extremely Inverse Time Curve  
(IEC/EIT or IEC/C)**



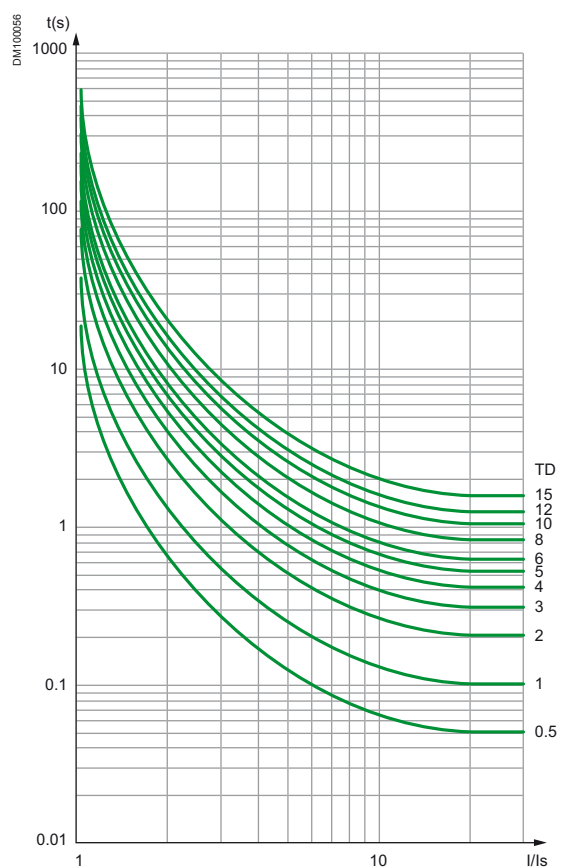
# VIP tripping curves

## 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)

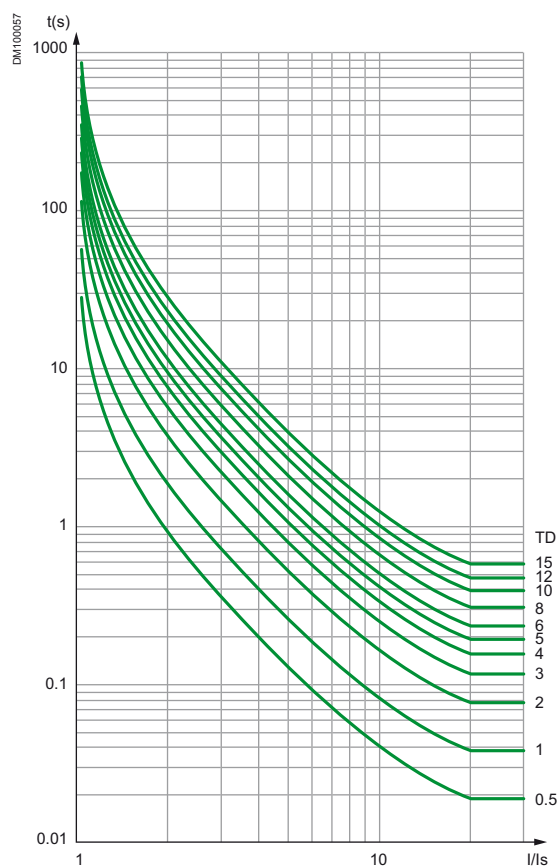




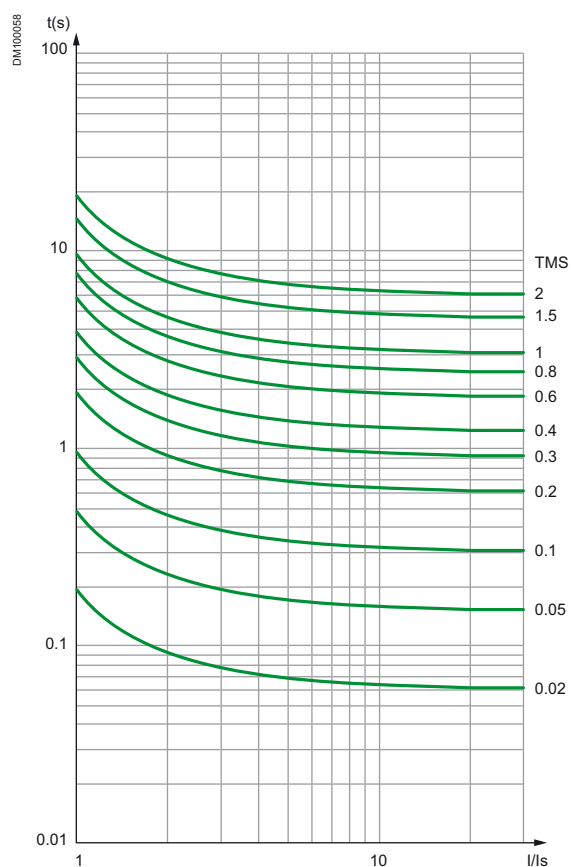
# VIP tripping curves

## VIP 400 and VIP 410 tripping curves

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



### RI Curve












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