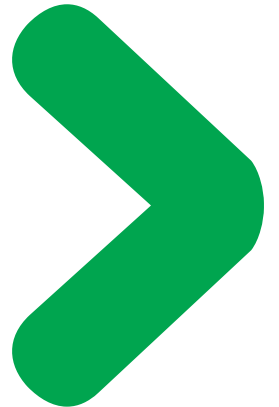


Medium Voltage Distribution

# NEX 17.5 kV

Withdrawable vacuum circuit breaker

Catalogue  
November 2008



## A new path for achieving your electrical installations

A comprehensive offer

The NEX 17.5 range is part of a comprehensive offer of products that are perfectly coordinated to meet all medium and low voltage electrical distribution requirements. All of these products have been designed to work together: electrical, mechanical and communication compatibility.

The electrical installation is thus both optimised and has improved performance:

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

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

Tools for facilitating the design and installation

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

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

For a real partnership with you

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

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|  |           |
|--|-----------|
| <b>Presentation</b>                              | <b>4</b>  |
| Field of application                             | 4         |
| NEX: reliability, simplicity, safety             | 5         |
| Continuity of service and complete safety        | 6         |
| Architecture                                     | 7         |
| <b>NEX 17.5 range</b>                            | <b>8</b>  |
| Description                                      | 8         |
| Technical characteristics                        | 9         |
| Operating conditions                             | 10        |
| Main functions                                   | 11        |
| Protection of people                             | 12        |
| Schneider Electric products inside               | 13        |
| <b>Cubicle description</b>                       | <b>15</b> |
| Functional applications                          | 15        |
| IF Incomer and Feeder                            | 16        |
| ID Incomer Direct to busbar                      | 17        |
| BC Bus Coupler                                   | 18        |
| RF Bus Riser Fixed                               | 19        |
| VT Busbar Voltage Transformer                    | 20        |
| LB-QM Fuse switch feeder                         | 21        |
| LB-IM Load Break switch                          | 22        |
| LB-TM MV/LV transformer unit for auxiliaries     | 23        |
| <b>Protection, monitoring and control</b>        | <b>24</b> |
| Sepam range                                      | 24        |
| Sepam series 20, series 40, series 80, Sepam 100 | 25        |
| Instrument transformers                          | 27        |
| <b>Switchgear</b>                                | <b>29</b> |
| Evolis circuit breaker                           | 29        |
| Description of functions                         | 30        |
| Withdrawable parts                               | 31        |
| LB switch cubicle                                | 34        |
| <b>Installation</b>                              | <b>36</b> |
| Connections                                      | 36        |
| Implementation example                           | 38        |
| <b>Appendix</b>                                  | <b>39</b> |
| Cubicle equipment                                | 39        |

PE56220



For over 45 years, Schneider Electric has provided medium voltage electrical network protection, monitoring and control solutions in the public distribution, industry and building sectors.

### NEX units 12 kV/17.5 kV switchboard

NEX is indoor, metal-enclosed switchgear designed for the MV section of HV/MV and MV/MV substations.

NEX is a medium voltage equipment comprising cubicles with breaking devices, sensors, medium voltage connections and auxiliaries.

#### For all your applications:

- industrial substations,
- infrastructure supply substations.

#### NEX offers you:

- flexible and adapted solutions,
- the experience of a major electrical manufacturer,
- dedicated engineering.

PE56221



PE56222

PE56101



### An enhanced offer with vacuum type switchgear

The NEX 17.5 offer is further enhanced to include a vacuum type circuit breaker (Evolis range).

This switchgear offers you:

- high mechanical and electrical endurance
- a comprehensive range of performance levels
- optimal operating safety
- environmental protection.

PE6024



### Schneider Electric design

NEX design has been achieved thanks to full up to date means such as computer aided design software, synthetic laboratories, simulation of behaviour...

NEX is designed according to the best practices in terms of installation, operation and maintenance:

- **reliability:** the user benefits from the progress provided by expertise developed by Schneider Electric in the area of operating dependability for more than 45 years,
- **simplicity:** little effort is required for local manual operations, icon-illustrated instructions on each front panel make the operating sequence and switching device status very simple to understand,
- **safety:** very comprehensive set of mechanical and electrical interlocks prevents operator errors.

MT20066



### Certification

The type certificate of conformity guarantees that the product:

- has been subjected to type testing according to standardised procedures (ISO/IEC 17025) in approved laboratories by independent organisations,
- is in conformity with recognised international standards.

For NEX, certification has been carried out by EN 45011 approved external organisations, members of the STL (Short-circuit Testing Liaison).

PE40039



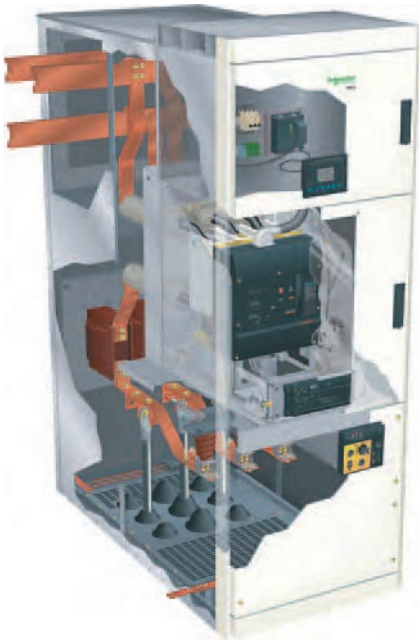
### Conformity with standards

All the different cubicles are in accordance with the latest IEC publications:

- 62271-200 and 60694 relating to construction of medium voltage switchgear and controlgear assemblies,
- 62271-100 relating to construction of medium voltage circuit breakers,
- 62271-102 high voltage alternating current disconnectors and earthing switches.

# Continuity of service and complete safety

PE57121



NEX 17.5 is solidly based on extensive experience acquired throughout the world and provides your networks with a high level of dependability and safety.

NEX 17.5 integrates a host of innovative solutions designed around proven techniques: high performance switchgear, digital protection, monitoring and control systems, enclosures capable of withstanding internal arcing.

From its very conception, NEX 17.5 has taken account of three key user requirements:

## Reliability

- type testing was carried out for each performance level in the NEX 17.5 range.
- the design, manufacturing and testing of NEX 17.5 was carried out according to ISO 9001: 2000 quality standard.
- three-dimensional computer modeling techniques were used to study the electrical fields.

## Simplicity

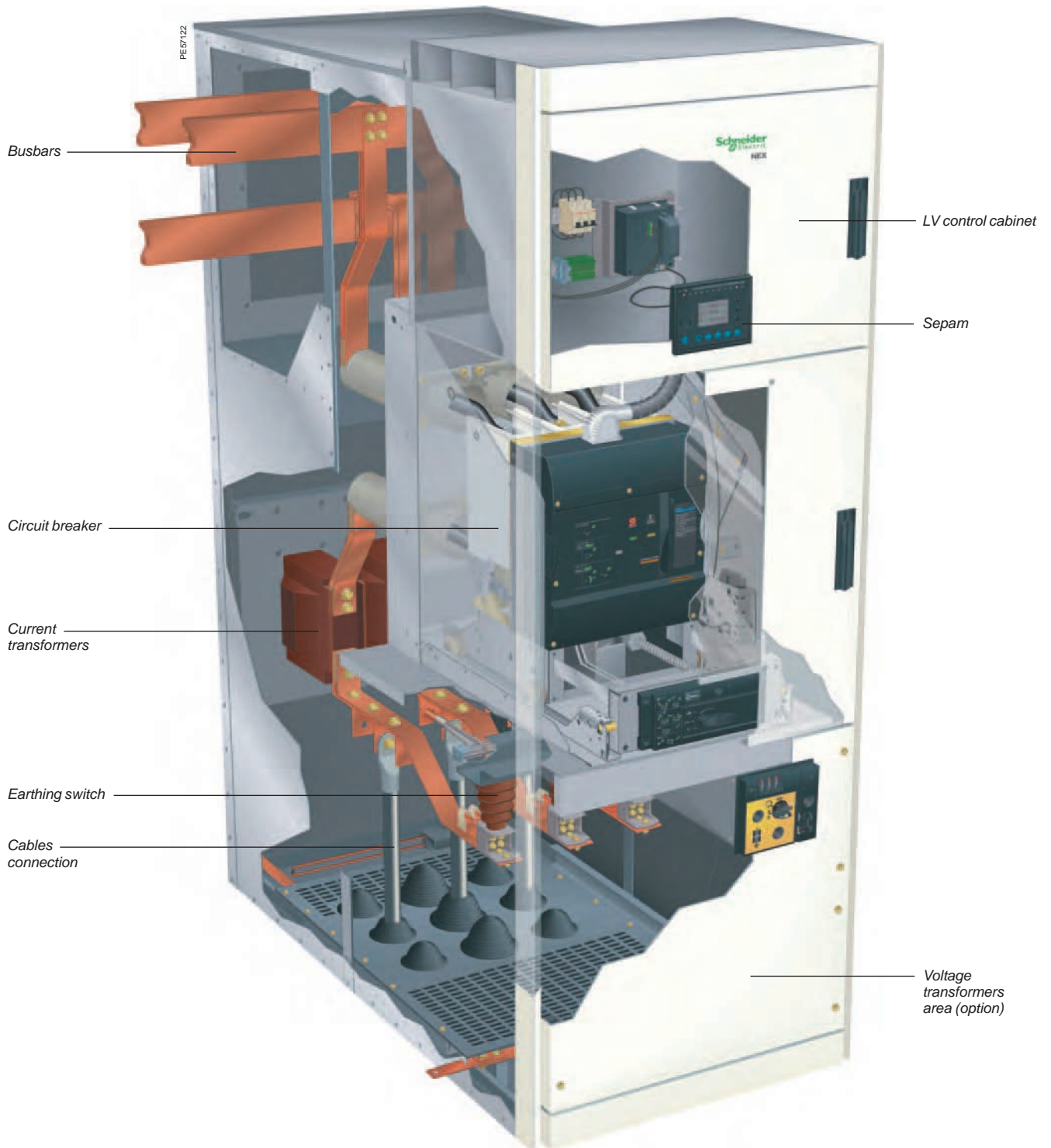
- a user interface which is easily understood by everybody.
- interlocks and padlocks preventing operator errors.
- Sepam-type protection units enabling on-site information retrieval without any additional devices.
- maintenance limited to simple, routine operating checks and cleaning and greasing every 5 to 10 years.
- easy installation due to identical civil engineering dimensions for all cubicles and installation being possible against a wall.

PE63386



## Safety

- operations are all performed from the front, including access to connections and busbars.
- racking in and out is only possible with the door closed.
- the power-on indicator is situated on the front of the functional unit.
- the earthing switch has making capacity.
- one single "anti-reflex" handle is used for all NEX 17.5 operations.
- internal arc withstand developed for all functional units.



### Make up of a NEX 17.5 switchboard

NEX 17.5 switchboards are made up of several interconnected functional units. Power connections are made between functional units within a switchboard via a single busbar.

The electrical continuity of all metal frames is provided by the connection of each functional unit's earthing busbar to the switchboard's main earthing circuit. Low voltage wiring trays are provided in the switchboard above the LV control cabinets.

LV cables can enter the switchboard through the top or bottom of each functional unit.

### Description of a functional unit

A functional unit comprises all equipment in the main and auxiliary circuits which together provide a protection function. Each functional unit combines all the components which are required to fulfil this function:

- the cubicle,
- the protection, monitoring and control system,
- the withdrawable part.

### The cubicle

As defined by IEC standard 62271-200, the functional unit is of LSC2B-PM type (loss of service continuity category). The medium voltage parts are compartmented using metallic partitions (PM class) which are connected to earth and which separate:

- the busbars,
- the withdrawable part (circuit breaker, disconnecter truck or earthing truck),
- MV connections, earthing switch, current sensors and voltage transformers as required.

NEX 17.5 guarantees a high level of protection of people; when a compartment containing a main circuit is open, the other compartments and/or functional units may remain energised.

The low voltage auxiliaries and monitoring unit are in a control cabinet separated from the medium voltage section.

Eight basic cubicle layouts are offered:

- |  |              |
|--|--------------|
| ■ Incomer or Feeder                      | <b>IF</b>    |
| ■ Incomer Direct to busbar               | <b>ID</b>    |
| ■ Bus Coupler                            | <b>BC</b>    |
| ■ Bus Riser                              | <b>RF</b>    |
| ■ Busbar Voltage Transformer             | <b>VT</b>    |
| ■ Fuse switch feeder                     | <b>LB-QM</b> |
| ■ Load Break switch                      | <b>LB-IM</b> |
| ■ MV/LV transformer unit for auxiliaries | <b>LB-TM</b> |

IF and BC cubicles have withdrawable circuit breaker.

### The protection, monitoring and control system

This includes:

- voltage transformers,
- Sepam, protection, monitoring and control unit,
- current sensors, which may be of 3 types:
  - conventional MV current transformers,
  - low voltage toroid type current transformers (max. 1250 A),
  - LPCT (Low Power Current Transducer) MV block type (max. 1250 A),

### The withdrawable part

This includes:

- the circuit breaker, the earthing truck with its closing and opening mechanism, or the disconnecter truck,
- the lever-type propulsion mechanism for racking in-out,
- interlocks to fix the withdrawable part on the fixed part either in service position or disconnected.



PEE7132



## Technical data

| Rated voltage (kV)                                       |                |            | 12   | 17.5 |
|--|----------------|------------|------|------|
| Rated insulation level                                   |                |            |      |      |
| Power frequency withstand voltage<br>50 Hz - 1 min       | (rms kV)       |            | 28   | 38   |
| Lightning impulse withstand voltage<br>1.2/50 $\mu$ s    | (kV peak)      |            | 75   | 95   |
| Nominal current and maximum short time withstand current |                |            |      |      |
| Functionnal unit with circuit breaker                    |                |            |      |      |
| Short time withstand current                             | lth. max       | (kA/3 s)   | 25   | 25   |
|  |                |            | 31.5 | 31.5 |
| Rated current  | In max busbars | (A)        | 2500 | 2500 |
|  |                | (A)        | 630  | 630  |
|  | In CB          | (A)        | 1250 | 1250 |
|  |                | (A)        | 2500 | 2500 |
| Internal arc withstand (option)                          |                |            |      |      |
| IAC-AFLR   |                | (kA/0.5 s) | 25   | 25   |

**IAC (internal arc classification):**  
The metal enclosed switchgear may have different types of accessibility on the various sides of its enclosure. For identify purpose of different sides of the enclosure, the following code shall be used (according to IEC 62271-200 standard).

- A: restricted access to authorized personnel only
- F: access to the front side
- L: access to the lateral side
- R: access to the rear side.

**LSC2B (Loss of service continuity):**  
this category defines the possibility to keep other compartments energised when opening a main circuit compartment.

## Protection index

- IP3X or IP4X for the enclosure,
- IP2X between each compartment.

## Construction

- internal arc withstand (classification IAC): AFLR,
- 3 compartments (classification LSC2B-PM according to IEC 62271-200),
- all the metal surfaces in the panels are corrosion proof,
- panels are produced using hot dipped galvanisation steel sheet in accordance to ISO 3575 or electro zinc coated steel sheet in accordance to ISO 5002,
- busbar: bare for 12 kV and insulated for 17.5 kV.

## Connections

- front and/or rear access,
- conductor entry from below or from top.

PE6236



PE6237



PE6238



## Operating conditions

Normal operating conditions, according to IEC 60694 for indoor switchgear

- ambient air temperature:
  - less than or equal to 40°C,
  - less than or equal to 35°C on average over 24 hours,
  - greater than or equal to -5°C.
- altitude:
  - less than or equal to 1000 m,
  - above 1000 m, a derating coefficient is applied (please consult us).
- atmosphere:
  - no dust, smoke or corrosive or inflammable gas and vapor, or salt (clean industrial air).
- humidity:
  - average relative humidity over a 24 hour period ≤ 95%,
  - average relative humidity over a 1 month period ≤ 90%,
  - average vapor pressure over a 24 hour period ≤ 2.2 kPa,
  - average vapor pressure over a 1 month period ≤ 1.8 kPa.

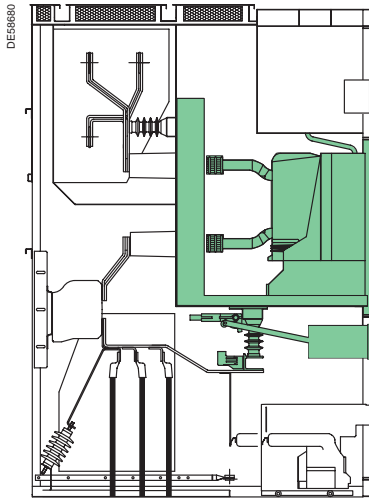
## Storage conditions

In order to retain all of the functional unit's qualities when stored for prolonged periods, we recommend that the equipment is stored in its original packaging, in dry conditions sheltered from the sun and rain at a temperature of between -25°C and +55°C.

## Standards

The NEX 17 range meets the following international standards:

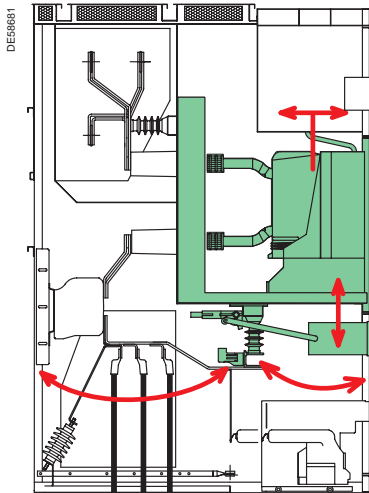
- IEC 62271-1: clauses common to high voltage switchgear
- IEC 62271-100: high voltage alternating current circuit breakers
- IEC 62271-102: alternating current disconnectors and earthing switches
- IEC 62271-103: switches for rated voltages above 1 and less than 52 kV
- IEC 62271-200: metal-enclosed switchgear for alternating current at rated voltages of between 1 and 52 kV
- IEC 60282-2: high voltage fuses
- IEC 60255: measurement relay and protection unit
- IEC 60044-1: current transformers
- IEC 60044-2: voltage transformers
- IEC 60529 : defining the protection indices provided by the enclosures.



## Withdrawable unit and earthing

Composed of:

- withdrawable circuit breaker,
- complete cradle equipped with metallic safety shutters and dedicated bushings,
- earthing switch with making capacity,
- LV connector between LV control cabinet and CB auxiliaries.

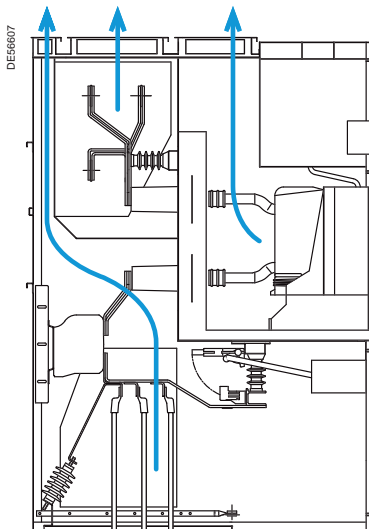


## Interlocking

The cubicle integrates the different interlocking to prevent incorrect operation by the operator.

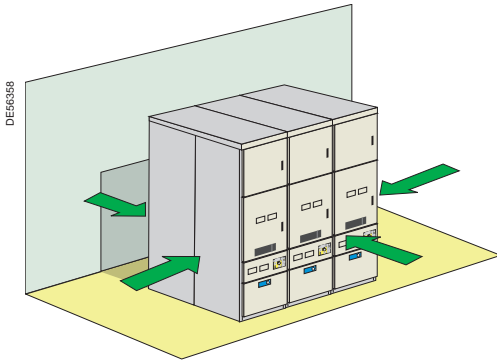
NEX secures operation to:

- access the cable compartment,
- rack in and out,
- operate the earthing switch,
- open the CB door.



## Safety

- General structure that allows gas evacuation through pressure relief flaps.
- Each compartment is designed with a specific chimney for upward gas evacuation.



## Internal arc version

NEX 17.5 is designed to withstand and protect operators in the case of failure due to an internal arc.

NEX 17.5 has been successfully tested using type tests.

Protection against internal arcing is available on 25 kA ratings.

NEX 17.5 proposes one option to install an internal arc switchboard.

- 4-sided internal arc protection

In the case of a NEX 17.5 switchboard installed in the middle of a room, internal arc protection on 4 sides is necessary in order to protect an operator who goes behind the cubicle.

- Installation in a room with ceiling height > 3.6 m

- Internal arcing detection (please consult us)

NEX 17.5 can have 2 systems that can detect internal arcing and switch off the power supply so as to limit the fault duration.

- electromechanical detector

This system employs a secure electromechanical tripping circuit, positioned on the cubicle roof flaps.

This set transmits the information to the Sepam to give the opening order to the circuit breaker located upstream of the fault.

- optic detector (VAMP system).

Internal arcing is detected by optical sensors which will measure the light caused by the initiation of arcing. Based on this information, an electronic module, after processing the information, will give the opening order to the circuit breaker located upstream of the fault.



## Dependable mechanical control devices

All operations are carried out from the front face.

The user is guided through icon-diagrams on each front panel making it easy to understand the operating sequence and device status. Interlocks and padlocks prevent operator errors.

Several additional levels of security also protect operators:

- racking in and out is only possible with the door closed.

- the very extensive set of mechanical and electrical interlocks do not allow operator error. These can be added to by key locks or padlocks according to specific operating procedures. Each selector can be fitted with padlocks.

- all operations are carried out from the front face.

- the voltage present indicator is located on the front face of the functional unit, in the immediate vicinity of the earthing switch control.

PE57128



Voltage transformer with fuse

PE6226



Voltage transformer

## Instrument transformers

### Voltage transformers

- measuring, metering and monitoring devices,
- relays or protective devices,
- auxiliary LV sources for various types of switchgear.

They are in conformity with standard IEC 60044-1.

Schneider Electric has drawn up a list of voltage transformers which are appropriate for use with digital protection devices.

They are installed at the bottom of the functional unit. The energized part is entirely encapsulated in an epoxy resin, which provides both electrical insulation and excellent mechanical strength.

### Current transformers

Conventional current transformers are used to provide power to metering, measuring or control devices. They measure the value of primary current from 10 A to 2500 A. They are in conformity with standard IEC 60044-2.

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

They are installed in the rear part of the functional unit. The energized part is entirely encapsulated in an epoxy resin, which provides both electrical insulation and excellent mechanical strength.

### LPCT low power current transducer

LPCT's are specific current sensors with a direct voltage output of the "Low Power Current Transducer" type, in conformity with standard IEC 60044-8.

LPCT's provide metering and protection functions.

They are defined by:

- the rated primary current
- the extended primary current
- the accuracy limit primary current or the accuracy limit factor.

These have a linear response over a large current range and do not start to saturate until beyond the currents to be broken.

DE52381



LPCT LV toroidal type

PE56228



LPCT MV block type

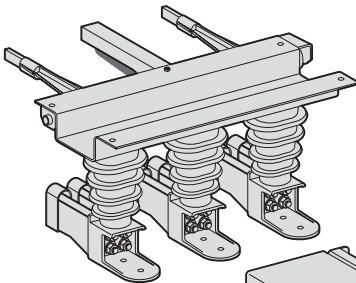
## Earthing switch

An earthing switch is used to earth and short-circuit the cable ends before work is performed on the cable connection compartment.

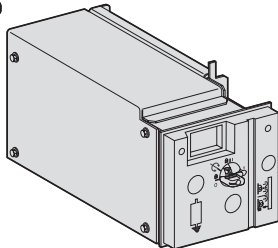
In a VT functional unit, the earthing switch is used to earth the busbar of the switchboard. This switch, with a making capacity, complies with IEC 60271-102 and comprises:

- a fast-acting closing mechanism independent of the operator,
- a locking device which stops it from being operated until the circuit breaker has been opened and withdrawn,
- 3 voltage capacitive dividers incorporated into the insulators which support the terminal plates, and connected to the VPIS mounted on the front plate, to indicate whether the cables are live or not.

DE5223



DE5222



## Voltage Presence Indicator System (VPIS)

The VPIS, combined with the capacitive divider insulators of the power circuit unit, provides an indication by lights of the voltage presence on each phase of the main circuit.

The voltage presence indicator unit is installed on the front of the earthing switch operating mechanism box.

The voltage presence indicator unit covers five voltage ranges, in accordance with standard IEC 61958:

- 1.0 to 1.9 kV
- 2.0 to 3.0 kV
- 3.1 to 5.9 kV
- 6.0 to 8.9 kV
- 9.0 to 17.9 kV.

PE56823



PE57131



### Power monitoring and control power monitoring device

The PowerLogic Power Meter is a cost effective, high performance meter. It can operate as a stand alone device or as part of the power monitoring and control system from Schneider Electric: the PowerLogic system (contact us for more information).

■ **Essential power monitoring:**

- revenue-class; accuracy 0.2% current/voltage,
- on-board memory for energy consumption analysis,
- on-board clock/calendar for time/date stamping.

■ **Application flexibility:**

- separate meter and display modules,
- direct-connect up to 600 V: higher voltages with PTs.

Other devices, such as the PowerLogic Circuit Monitor, are available for MV and LV networks. Main functions include comprehensive power monitoring, power quality analysis and recording and optional input, output control.

PE57130



PE56231



PE56232



### Low voltage Schneider Electric components

Integration of standardised Schneider Electric components in the LV compartment. Example:

- LV circuit breakers cover all ratings from 1 to 100 A,
- push-button,
- rotary switch,
- light signal.

PE57129



### Fuses

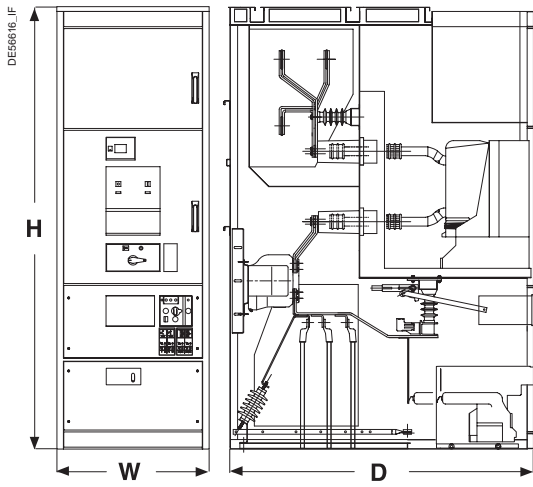
Schneider Electric fuses provide protection to medium voltage distribution devices (from 3 to 36 kV) from both the dynamic and thermal effects of short-circuit currents greater than the fuse's minimum breaking current.

Considering their low cost and their lack of required maintenance, medium voltage fuses are an excellent solution to protect various types of distribution devices: medium voltage current consumers (transformers, motors, capacitors, etc.), public and industrial electrical distribution networks.

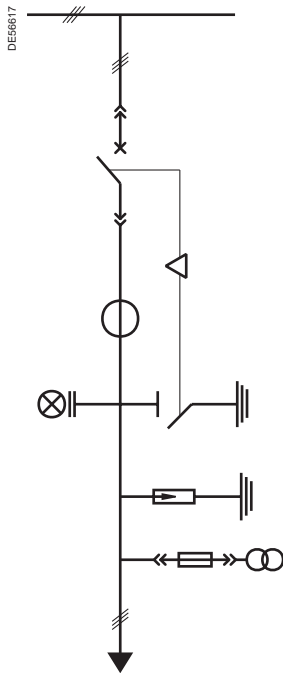
### Presentation

The NEX range comprises 8 functional applications.  
The table below can be used to link requirements to functional units and gives basic information on the general composition of each unit.

| Single line diagram   | Designation                             | Function   | See details page |
|---|---|--|------------------|
| <br>DES66811   | <b>IF</b><br>Incomer and Feeder         | Connection to incomer or feeder lines                      | 16               |
| <br>DES66809   | <b>ID</b><br>Incomer Direct to busbar   | Direct connection of supply to busbar                      | 17               |
| <br>DES66812  | <b>BC</b><br>Bus Coupler                | Coupling of two busbars systems                            | 18               |
| <br>DES66813 | <b>RF</b><br>Bus Riser - Fixed type     | Solid busbar link to be used in association with a BC unit | 19               |
| <br>DES66815 | <b>VT</b><br>Busbar Voltage Transformer | Connection VT to the busbar for metering                   | 20               |
| <br>DES66865 | <b>LB-QM</b><br>Fuse switch             | Connection to transformer                                  | 21               |
| <br>DES66866 | <b>LB-IM</b><br>Load Break switch       | Connection to feeder line                                  | 22               |
| <br>DES66867 | <b>LB-TM</b><br>Auxiliaries transformer | Connection to self contained auxiliary transformer         | 23               |



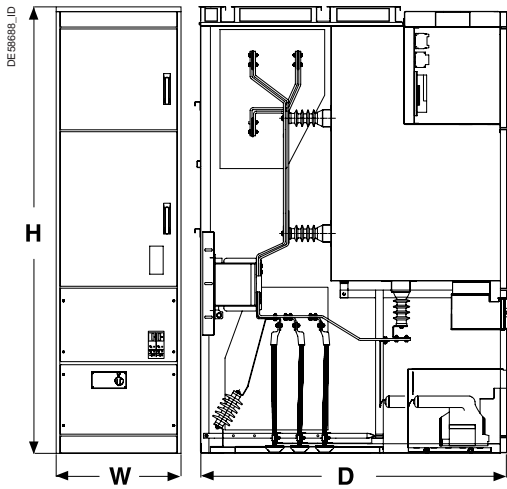
| Rated voltage (kV)  |              | 12           |      |     | 17.5 |     |     |
|---|--------------|--------------|------|-----|------|-----|-----|
| <b>Rated insulation level</b>                                   |              |              |      |     |      |     |     |
| Power frequency withstand voltage<br>50 Hz - 1 min (rms kV)     |              | 28           |      |     | 38   |     |     |
| Lightning impulse withstand voltage<br>1.2/50 $\mu$ s (kV peak) |              | 75           |      |     | 95   |     |     |
| Rated current (A)   | 630          | ■            | ■    | ■   | ■    | ■   | ■   |
|   | 1250         | ■            | ■    | ■   | ■    | ■   | ■   |
|   | 2500         | ■            | ■    | ■   | ■    | ■   | ■   |
| Breaking capacity (kA)  | 25           | ■            | ■    | ■   | ■    | ■   | ■   |
|   | 31.5         | ■            | ■    | ■   | ■    | ■   | ■   |
| Short time<br>withstand current (kA/3 s)                        | 25           | ■            | ■    | ■   | ■    | ■   | ■   |
|   | 31.5         | ■            | ■    | ■   | ■    | ■   | ■   |
| <b>Dimensions (mm)</b>  |              |              |      |     |      |     |     |
| Width (W)   |              | 650          | 650  | 800 | 800  | 900 | 900 |
| Height (H)  |              | 2320         |      |     |      |     |     |
| Depth (D)   | top entry    | 1935 - 2195  |      |     |      |     |     |
|   | bottom entry | basic        | 1595 |     |      |     |     |
|   |              | internal arc | 1780 |     |      |     |     |



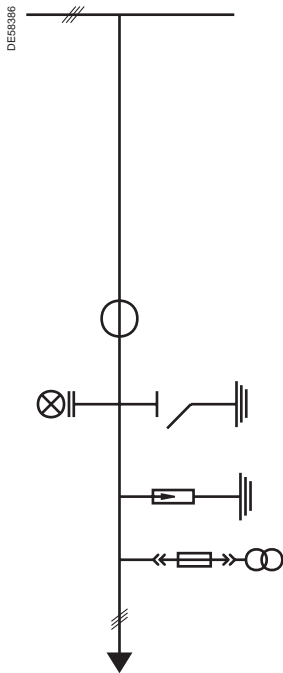
### Functions

- **Low voltage cabinet**
  - standard height
- **Circuit breaker**
  - Evolis range - vacuum technology
- **Voltage transformers**
  - withdrawable with fuses
  - fixed with fuses
  - fixed without fuses
- **Earthing switch**
- **Voltage indication (VPIS)**
- **MV cables connection**
  - bottom entry
  - top entry
- **Current transformers**
  - 3 MV type
  - 6 MV type
  - 3 MV low powered CTs (up to 1250 A)
  - LV toroidal CTs on MV primary bar (up to 1250 A)
- **Surge arresters**
- **Anticondensation heaters**





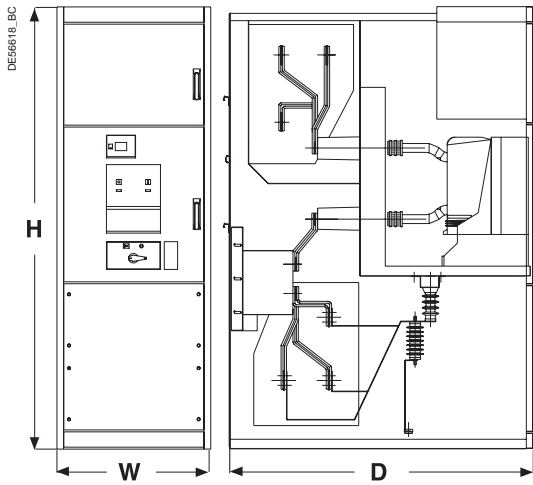
| Rated voltage (kV)  |                        | 12          | 17.5 |     |     |     |
|---|------------------------|-------------|------|-----|-----|-----|
| <b>Rated insulation level</b>                               |                        |             |      |     |     |     |
| Power frequency withstand voltage<br>50 Hz - 1 min (rms kV) |                        | 28          |      |     | 38  |     |
| Lightning impulse withstand voltage<br>1.2/50 μs (kV peak)  |                        | 75          |      |     | 95  |     |
| Rated current (A)   | 1250                   | ■           | ■    |     | ■   | ■   |
|   | 2500                   |             |      | ■   |     | ■   |
| Short time<br>withstand current (kA/3 s)                    | 25                     | ■           |      | ■   | ■   | ■   |
|   | 31.5                   |             | ■    | ■   |     | ■   |
| <b>Dimensions (mm)</b>                                      |                        |             |      |     |     |     |
| Width (W)   |                        | 650         | 800  | 900 | 800 | 800 |
| Height (H)  |                        | 2320        |      |     |     |     |
| Depth (D)   | top entry (consult us) | 1935 - 2195 |      |     |     |     |
|   | bottom entry basic     | 1595        |      |     |     |     |
|   | internal arc           | 1780        |      |     |     |     |



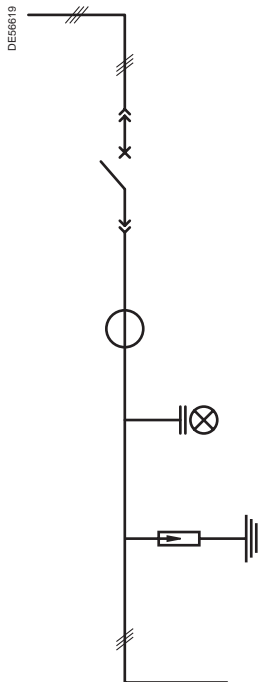
### Functions

- **Low voltage cabinet**
  - standard height
- **Voltage transformers**
  - withdrawable with fuses
  - fixed with fuses
  - fixed without fuses
- **Earthing switch**
- **Voltage indication (VPIS)**
- **MV cables connection**
  - bottom entry
  - top entry (consult us)
- **Current transformers**
  - 3 MV type
  - 6 MV type
  - 3 MV low powered CTs (up to 1250 A)
- **Surge arresters**
- **Anticondensation heaters**

# BC Bus Coupler



| Rated voltage (kV)  |      | 12           | 17.5 |     |     |      |
|---|------|--------------|------|-----|-----|------|
| Rated insulation level                                      |      |              |      |     |     |      |
| Power frequency withstand voltage<br>50 Hz - 1 min (rms kV) |      | 28           | 38   |     |     |      |
| Lightning impulse withstand voltage<br>1.2/50 μs (kV peak)  |      | 75           | 95   |     |     |      |
| Rated current (A)   | 1250 | ■            | ■    |     | ■   |      |
|   | 2500 |              |      | ■   | ■   |      |
| Breaking capacity (kA)                                      | 25   | ■            |      | ■   | ■   |      |
|   | 31.5 |              | ■    | ■   | ■   |      |
| Short time<br>withstand current (kA/3 s)                    | 25   | ■            |      | ■   | ■   |      |
|   | 31.5 |              | ■    | ■   | ■   |      |
| Dimensions (mm)   |      |              |      |     |     |      |
| Width (W)   |      | 650          | 800  | 900 | 800 | 900  |
| Height (H)  |      | 2320         |      |     |     |      |
| Depth (D)   |      | basic        |      |     |     | 1595 |
|   |      | internal arc |      |     |     | 1780 |

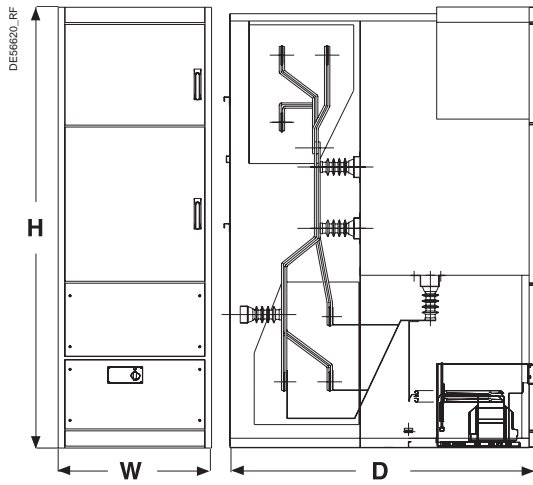


## Functions

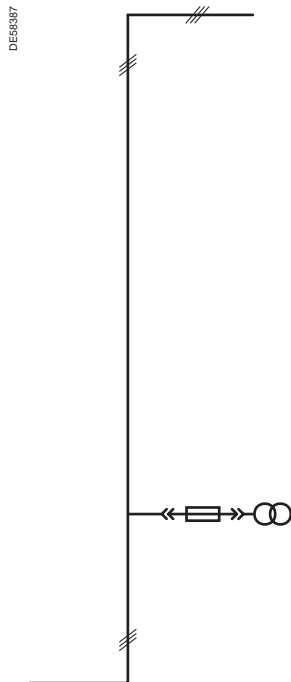
- **Low voltage cabinet**
  - standard height
- **Circuit breaker**
  - Evolis range - vacuum technology
- **Voltage indication (VPIS)**
- **Current transformers**
  - 3 MV type
  - 3 MV low powered CTs (up to 1250 A)
- **Surge arresters**
- **Anticondensation heaters**

# RF

## Bus Riser Fixed



| Rated voltage (kV)  |              |      |     |     |         |
|---|--------------|------|-----|-----|---------|
|   |              |      | 12  |     | 17.5    |
| Rated insulation level                                      |              |      |     |     |         |
| Power frequency withstand voltage<br>50 Hz - 1 min (rms kV) |              | 28   |     |     | 38      |
| Lightning impulse withstand voltage<br>1.2/50 μs (kV peak)  |              | 75   |     |     | 95      |
| Rated current (A)   | 1250         | ■    | ■   |     | ■       |
|   | 2500         |      |     | ■   | ■       |
| Short time<br>withstand current (kA/3 s)                    | 25           | ■    |     | ■   | ■       |
|   | 31.5         |      | ■   | ■   | ■       |
| Dimensions (mm)   |              |      |     |     |         |
| Width (W)   |              | 650  | 800 | 900 | 800 900 |
| Height (H)  |              | 2320 |     |     |         |
| Depth (D)   | basic        | 1595 |     |     |         |
|   | internal arc | 1780 |     |     |         |

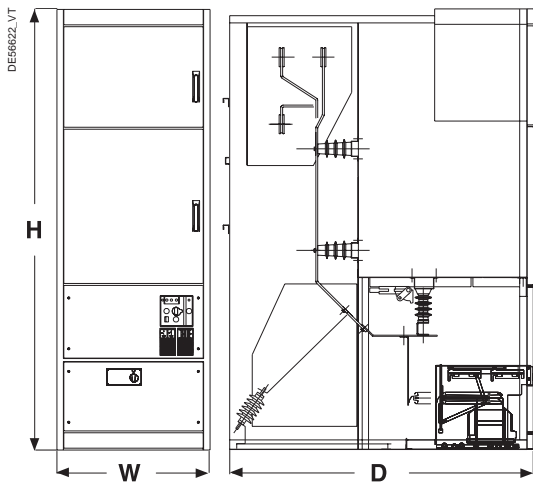


### Functions

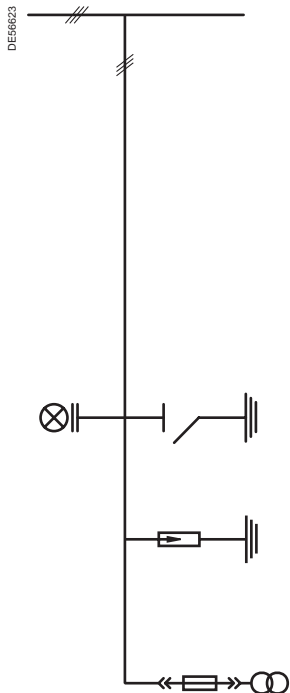
- Low voltage cabinet
  - standard height
- Voltage transformers
  - withdrawable with fuses
  - fixed with fuses
  - fixed without fuses
- Anticondensation heaters
- Voltage indication (VPIS)

# VT

## Busbar Voltage Transformer



| Rated voltage (kV)  |              | 12   | 17.5 |
|---|--------------|------|------|
| <b>Rated insulation level</b>                               |              |      |      |
| Power frequency withstand voltage<br>50 Hz - 1 min (rms kV) |              | 28   | 38   |
| Lightning impulse withstand voltage<br>1.2/50 μs (kV peak)  |              | 75   | 95   |
| Short time<br>withstand current (kA/3 s)                    | 25           | ■    |      |
|   | 31.5         |      | ■    |
| <b>Dimensions (mm)</b>                                      |              |      |      |
| Width (W)   |              | 650  | 800  |
| Height (H)  |              | 2320 |      |
| Depth (D)   | basic        | 1595 |      |
|   | internal arc | 1780 |      |

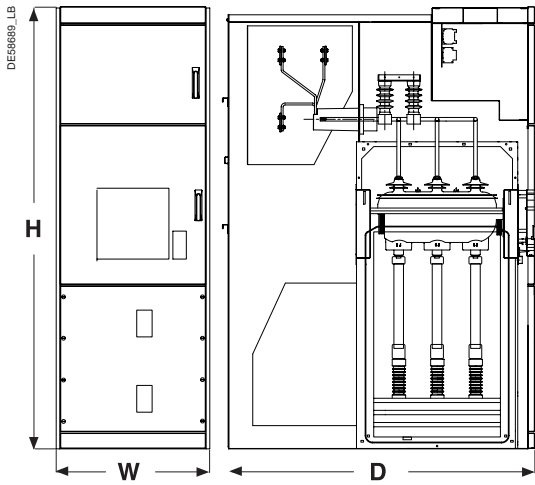


### Functions

- **Low voltage cabinet**
  - standard height
- **Voltage transformers**
  - withdrawable with fuses
  - fixed with fuses
  - fixed without fuses
- **Earthing switch**
- **Voltage indication (VPIS)**
- **Surge arresters**
- **Anticondensation heaters**

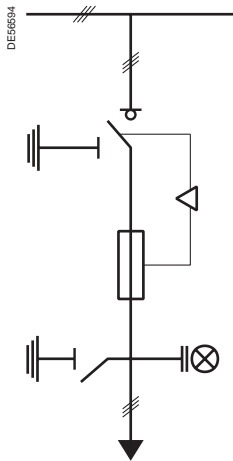
# LB

## QM Fuse switch feeder



| Rated voltage (kV)  |              | 12   | 17.5 |
|---|--------------|------|------|
| <b>Rated insulation level</b>                               |              |      |      |
| Power frequency withstand voltage<br>50 Hz - 1 min (rms kV) |              | 28   | 38   |
| Lightning impulse withstand voltage<br>1.2/50 μs (kV peak)  |              | 75   | 95   |
| Rated current (A)   | 200          | ■    | ■    |
| Breaking capacity (kA)                                      | 25           | ■    | ■    |
| Short time<br>withstand current (1)<br>(kA/1 s)             | 25           | ■    | ■    |
| <b>Dimensions (mm)</b>                                      |              |      |      |
| Width (W)   |              | 800  |      |
| Height (H)  |              | 2320 |      |
| Depth (D)   | basic        | 1595 |      |
|   | internal arc | 1780 |      |

(1) Limited by fuses



### Functions

- **Low voltage cabinet**
  - standard height
- **Switch**
  - SM6 type SF6 technology
- **Earthing switch** (integrated to the switch)
- **Voltage indication (VPIS)**
- **MV cables connection**
  - bottom entry
- **Anticondensation heaters**

### Optional accessories

- **Motor for operating mechanism**
- **Auxiliary contacts**
- **Key-type interlocks**
- **50 W heating element**

LB cubicles including a fuse switch are used to supply power and protect low power transformers.

E.g.: auxiliary service transformers in primary substations.

All operations are carried out from the front face, including access to connections and busbars.

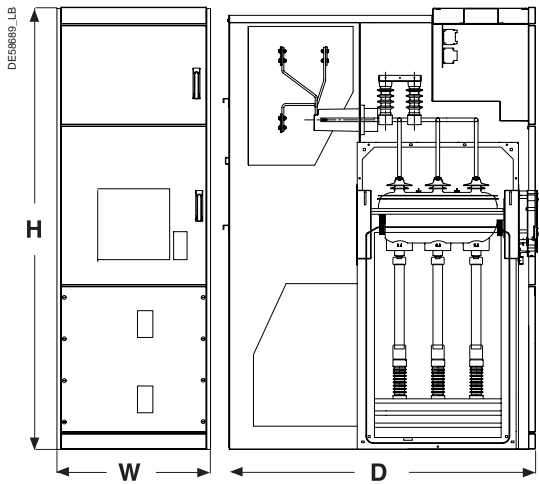
#### All functional interlocks meet recommendations in IEC 62271-200:

- the switch is only possible to close if the earthing switch is open and the connection access panel is in place;
- closing of the earthing switch is only possible if the switch is open;
- opening of the access panel to medium voltage connections and fuses is only possible if the earthing switches upstream and downstream of the fuses are closed;
- the switch is locked in the open position when the access panel is taken off.

The voltage presence indicator is situated on the front face of the functional unit, integrated in the switch's control panel.

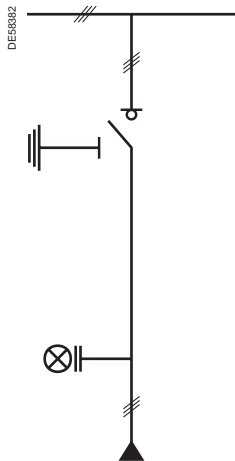
# LB

## IM Load Break switch



| Rated voltage (kV)  |              | 12   | 17.5 |
|---|--------------|------|------|
| <b>Rated insulation level</b>                               |              |      |      |
| Power frequency withstand voltage<br>50 Hz - 1 min (rms kV) |              | 28   | 38   |
| Lightning impulse withstand voltage<br>1.2/50 μs (kV peak)  |              | 75   | 95   |
| Rated current (A)   | 630          | ■    | ■    |
| Breaking capacity (A)                                       | 630          | ■    | ■    |
| Short time<br>withstand current (1)<br>(kA/1 s)             | 25           | ■    | ■    |
| <b>Dimensions (mm)</b>                                      |              |      |      |
| Width (W)   | 800          |      |      |
| Height (H)  | 2320         |      |      |
| Depth (D)   | basic        | 1595 |      |
|   | internal arc | 1780 |      |

(1) Limited by fuses



### Functions

- **Low voltage cabinet**
  - standard height
- **Switch**
  - SM6 type SF6 technology
- **Earthing switch** (integrated to the switch)
- **Voltage presence indicator**
- **MV cables connection**
  - bottom entry
- **CIT operating mechanism**

### Versions

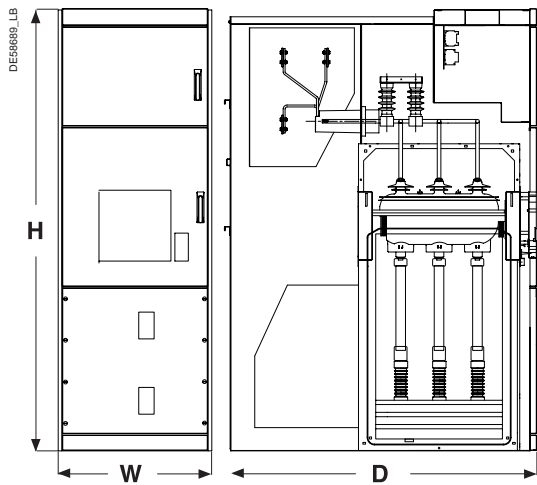
- **CI2 operating mechanism**
- **CI1 operating mechanism**

### Optional accessories

- **Motor for operating mechanism**
- **Auxiliary contacts**
- **Key-type interlocks**
- **50 W heating element**

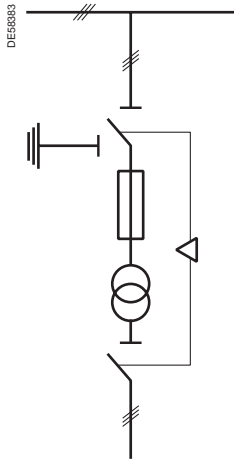
# LB

## TM MV/LV transformer unit for auxiliaries



| Rated voltage (kV)  |              | 12   | 17.5 |
|---|--------------|------|------|
| <b>Rated insulation level</b>                                   |              |      |      |
| Power frequency withstand voltage<br>50 Hz - 1 min (rms kV)     |              | 28   | 38   |
| Lightning impulse withstand voltage<br>1.2/50 $\mu$ s (kV peak) |              | 75   | 95   |
| Rated current (A)   | 50           | ■    | ■    |
| Short time<br>withstand current <sup>(1)</sup> (kA/1 s)         | 25           | ■    | ■    |
| <b>Dimensions (mm)</b>  |              |      |      |
| Width (W)   |              | 800  |      |
| Height (H)  |              | 2320 |      |
| Depth (D)   | basic        | 1595 |      |
|   | internal arc | 1780 |      |

(1) Limited by fuses



### Functions

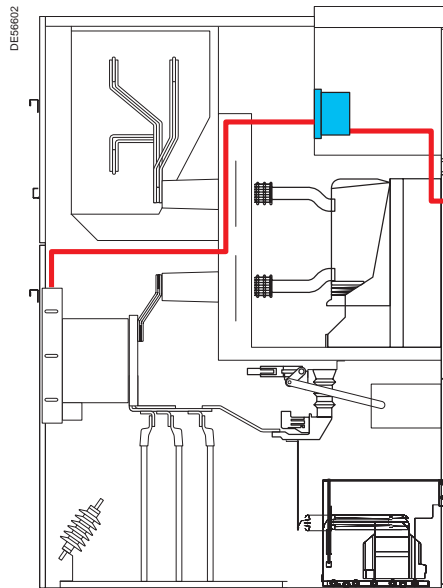
- **Low voltage cabinet**
  - standard height
- **disconnector**
  - SM6 type SF6 technology
- **Earthing switch** (integrated to the disconnector)
- **MV cables connection**
  - bottom entry
- **three-phase busbars**
- **Operating mechanism CS**
- **Two 6.3 A fuses, UTE or DIN type**
- **LV circuit isolating switch**
- **One voltage transformer (phase-to-phase)**

### Optional accessories

- **Mechanical indication system for blown fuses**
- **Auxiliary contacts**
- **Key-type interlocks**
- **50 W heating element**

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

- instrument transformers to measure the necessary electrical values (phase current, residual current, voltages, etc.),
- protection relays, providing functions adapted to the part of the network to be protected,
- metering equipment, to inform operators,
- low voltage relaying, i.e. to provide control of the breaking device and of the withdrawable part,
- various auxiliaries: secondary circuit test units, etc.



PE57021



### Sepam: protection, monitoring and control units

Sepam, is a range of digital monitoring protection and control units. Sepam is at the centre of the protection, monitoring and control system for NEX functional units: all the necessary protection, metering, control, monitoring and signalling functions are carried out by Sepam.

Like the NEX range, the Sepam range is a range of units defined to provide an optimal solution for each application, and includes (eg):

- Sepam S, substation incomer and feeder,
- Sepam B, bussectioning,
- Sepam T, transformer feeder,
- Sepam G, generator feeder.

### Sepam advantages

#### Reliability

- Over 20 years of experience in multi-function digital protection relays.
- Over 150,000 Sepam units in service in more than 90 countries.

#### Quality

- Quality design based on dependability studies and strict definition of environmental constraints: temperature, pollution, EMC, dielectric strength...
- Quality manufacturing based on procurement agreements with suppliers and inspection throughout all manufacturing phases.

#### Simplicity of use

- Ergonomic and intuitive user machine interface (UMI).
- User friendly and powerful PC setting software.

### Protection chain

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

#### A high performance, economical solution

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

#### Easy to order and install

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

#### The power of a multi-functional digital unit

Sepam is more than a simple protection relay, it is truly multi-functional unit notably offering:

- circuit breaker diagnosis functions (switching counter and time, rearming time, cumulated broken A<sup>2</sup>),
- direct circuit breaker control whatever type of release unit,
- remote equipment operation using the modbus communication option.

The Sepam will operate with Low Power Current Transducers (LPCT) as defined by standard IEC 60044-8.



The Sepam range of protection relays is designed for the operation of machines and electrical distribution networks of industrial installations and utility substations at all levels of voltage.

It includes 3 families:

- Sepam series 20, for usual applications.
- Sepam series 40, for demanding applications.
- Sepam series 80, for custom applications.

To cover all needs, from the simplest to the most complete.

## Sepam protection relay

### A range of solutions adapted to your application

- Substation protection (incomers, feeders, busbars)
- Transformer protection
- Motor and generator protection.

### A comprehensive solution, integrating all of the necessary functions for your application

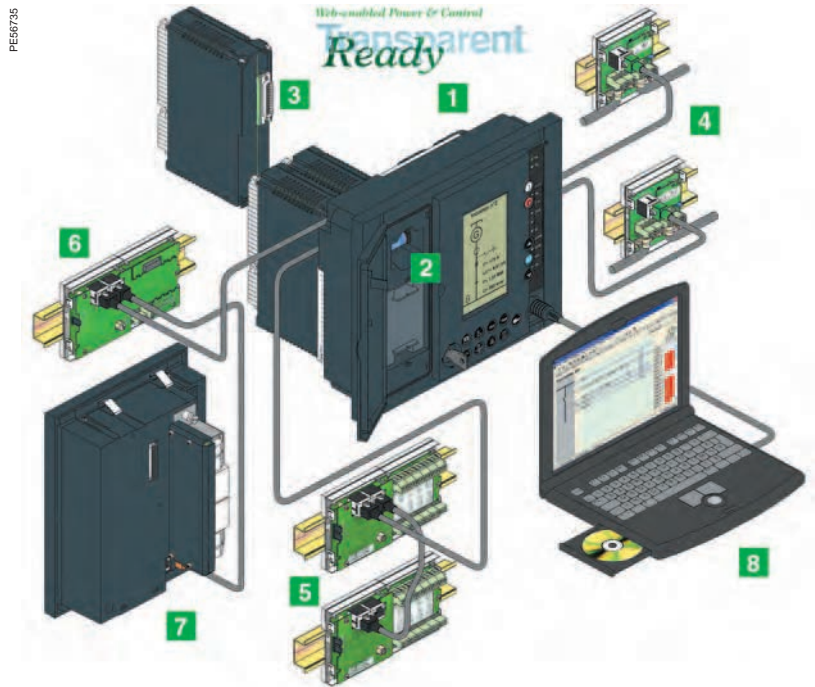
- Effective protection of people and property
- Accurate measurements and detailed diagnosis
- Integral equipment control
- Local or remote indication and operation.

### Flexibility and upgrading capability

To adapt to as many situations as possible, and allow for future installation upgrading, optional modules may be added to Sepam at any time for new functions.

### Sepam series 80 modular architecture

- 1- Base unit, with integrated or remote advanced User Machine Interface.
- 2- Parameter and protection settings saved on removable memory cartridge.
- 3- 42 logic inputs and 23 outputs relays with 3 optional modules providing 14 inputs and 6 outputs.
- 4- 2 independent Modbus communication ports.
  - direct connection to 2-wire RS 485, 4-wire RS 485 and fiber optic networks;
  - connection to Ethernet TCP/IP network via PowerLogic System webserver (Transparent Ready™).
- 5- Processing of data from 16 temperature sensors.
- 6- 1 low level analog output, 0-10 mA, 4-20 mA or 0-20 mA.
- 7- Synchro-check module
- 8- Software tools:
  - Sepam parameter and protection setting and control logic customization;
  - local or remote installation operation;
  - retrieval and display of disturbance recording data.



Sepam 100 MI

Sepam 100 LD

Sepam 100 LA

## Sepam 100 units

Sepam 100 units round off the Sepam range and can be installed either separately or combined with either Sepam series 20, 40 and series 80.

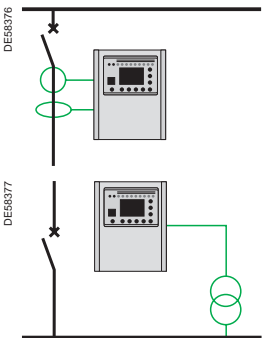
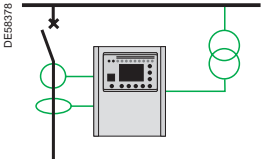
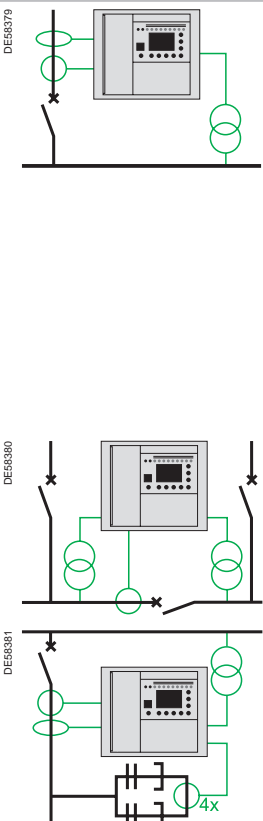
### Sepam 100 has several variants:

Sepam 100 MI, local breaking device control and signalling modules (many different line diagram types are available):

- Sepam 100 LD, high impedance differential protection
- Sepam 100 LA, self-powering protection (back-up protection without auxiliary power supply).

# Sepam series 20, series 40, series 80

## Selection guide

| Sepam   | Protections  |          | Applications |             |           |         |           |
|---|--|----------|--------------|-------------|-----------|---------|-----------|
|   | Basic  | Specific | Substation   | Transformer | Generator | Busbar  | Capacitor |
| <b>Sepam series 20</b>  |  |          |              |             |           |         |           |
| <ul style="list-style-type: none"> <li>■ 10 logic inputs</li> <li>■ 8 relay outputs</li> <li>■ 8 temperature probe inputs</li> <li>■ 1 Modbus communication port</li> </ul>                                        | Current protection                                       |          | S20 (*)      | T20 (*)     |           | S20 (*) |           |
|   | Voltage and frequency protection                         |          |              |             |           | B21 (*) |           |
|   | Loss of mains (ROCOF)                                    |          |              |             |           | B22 (*) |           |
| <b>Sepam series 40</b>  |  |          |              |             |           |         |           |
| <ul style="list-style-type: none"> <li>■ 10 logic inputs</li> <li>■ 8 relay outputs</li> <li>■ 16 temperature probe inputs</li> <li>■ 1 Modbus communication port</li> <li>■ logic equations editor</li> </ul>     | Current, voltage and frequency protection                |          | S40 (*)      | T40 (*)     | G40 (*)   | S40 (*) |           |
|   | Directional earth fault                                  | S41 (*)  |              |             |           |         |           |
|   | Directional earth fault and phase overcurrent            | S42 (*)  | T42 (*)      |             |           |         |           |
| <b>Sepam series 80</b>  |  |          |              |             |           |         |           |
| <ul style="list-style-type: none"> <li>■ 42 logic inputs</li> <li>■ 23 relay outputs</li> <li>■ 16 temperature probe inputs</li> <li>■ 2 Modbus communication port</li> <li>■ logic equations editor</li> </ul>  | Current, voltage and frequency protection                |          | S80          |             |           |         |           |
|   | Directional earth fault                                  | S81      | T81          |             |           |         |           |
|   | Directional earth fault and phase overcurrent            | S82      | T82          | G82         |           |         |           |
|   | Transformer or machine transformer-differential          |          | T87          | G88         |           |         |           |
|   | Machine differential                                     |          |              | G87         |           |         |           |
|   | Voltage and frequency protection for two sets of busbars |          |              |             |           | B83     |           |
|   | Capacitor bank unbalance                                 |          |              |             |           |         | C86       |

(\*) A Medium Voltage application catalogue is available, for all Medium Voltage equipment designers. Purpose :

- to facilitate the production of Medium Voltage switchgear assemblies which include Schneider Electric components
- to specify standard solutions easily

How?

- with specification of the equipment required for each standard application
- and the complete wiring diagram of the Medium Voltage equipment for each application.

## Current transformers

Conventional current transformers are used to provide power to metering, measuring or control devices. They measure the value of primary current from 10 A to 2500 A. They are in conformity with standard IEC 60044-2.

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

They are installed in the rear part of the functional unit. The energized part is entirely encapsulated in an epoxy resin, which provides both electrical insulation and excellent mechanical strength.



DE52387

ARJP1



PE66391

ARJP2



PE66392

ARJP3



PE66393

ARJA1

### For IF (630 A) cubicle

CT types:

IF cubicle can use ARJP1/J, ARJP2/J

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

### For IF - ID - BC (1250 A) cubicle

CT types:

IF/ID/BC cubicle can use ARJP3/J

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

### For IF - ID - BC (2500 A) cubicle

IF3/ID3/BC3 cubicle can use ARJA1/J

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



PE66228

LPCT

## LPCT low power current transducer

LPCT's are specific current sensors with a direct voltage output of the "Low Power Current Transducer" type, in conformity with standard IEC 60044-8.

LPCT's provide metering and protection functions.

They are defined by:

- the rated primary current
- the extended primary current
- the accuracy limit primary current or the accuracy limit factor.

These have a linear response over a large current range and do not start to saturate until beyond the currents to be broken.

### For IF - BC - cubicle up to 1250 A

Transformer CLP1

- Single range primary current for measurement or protection
- Frequency 50-60 Hz

|                       |             |
|-----------------------|-------------|
| I <sub>1n</sub> (A)   | 100 to 1250 |
| I <sub>1th</sub> (kA) | 40          |
| t (s)                 | 1           |
| Accuracy class        | 0.5 - 5P    |

PE57128



Voltage transformer with fuse

### Voltage transformers

- Measuring, metering and monitoring devices
- Relays or protective devices
- Auxiliary LV sources for various types of switchgear.

All these devices are protected and insulated from the MV section.

They are in conformity with standard IEC 60044-1.

Schneider Electric has drawn up a list of voltage transformers which are appropriate for use with digital protection devices.

They are installed at the bottom of the functional unit. The energized part is entirely encapsulated in an epoxy resin, which provides both electrical insulation and excellent mechanical strength.

#### For IF - ID - VT - RF cubicle

##### Fused transformer VRS3/S1

- Phase/earth
- Frequency 50-60 Hz

|                          |        |  |
|--------------------------|--------|--|
| Transformation ratio V/V |        | 3000-13800 / $\sqrt{3}$ :100 - 110-120/ $\sqrt{3}$ |
| Measuring                | cl 0.5 | 30 VA  |
|                          | 1.0    | 50 VA  |

##### Unfused transformer VRQ3/S2

- Phase/earth
- Frequency 50-60 Hz

|                          |        |   |
|--------------------------|--------|---|
| Transformation ratio V/V |        | 3000-15000 / $\sqrt{3}$ :100 - 110/ $\sqrt{3}$ :100-110/3 |
| Measuring                | cl 0.5 | 30-50 VA  |
|                          | cl 1.0 | 75 VA   |
| Protection               | 3P     | 50 VA   |

PE56226



Voltage transformer without fuse

### Zero sequence core balance current transformers (CSH type)

CSH 120 and CSH 200 core balance CT's, provide more sensitive protection by direct measurement of earth fault currents.

Specifically designed for the Sepam range, they can be directly connected to the Sepam "residual current" input.

They are only different in terms of their diameter:

- CSH 120 - 120 mm internal diameter
- CSH 200 - 200 mm internal diameter.

E28678



CSH toroid CT

The reliability and dependability of a cubicle is also assumed by the internal components, producing between them a coherent architecture. This technology provides users with the best guarantee of continuity of service for their installations.

### Evolis vacuum circuit breakers from 1 to 17.5 kV

Evolis circuit breaker is used to protect and control MV public or industrial distribution network.

- Rated voltage 12 kV and 17.5 kV.
- Short circuit breaking capacity up to 31.5 kA.
- Rated normal current from 630 A to 2500 A.
- Axial magnetic field (AMF) breaking technology.
- Withdrawable version.

The Evolis circuit breaker equips cubicles IF and BC at ratings of up to 17.5 kV.

### High electrical endurance

A magnetic field is applied in the axis of the vacuum interrupter contacts. This process maintains the arc in diffused mode even at high current values. It ensures optimal dispersion of the energy over the contact surface and avoids localised temperature rise.

The advantages of this technique are:

- a very compact vacuum interrupter,
- low energy dissipation of the arc in the vacuum interrupters.

Evolis is in conformity with the highest electrical endurance class (IEC 62271-100: class E2).

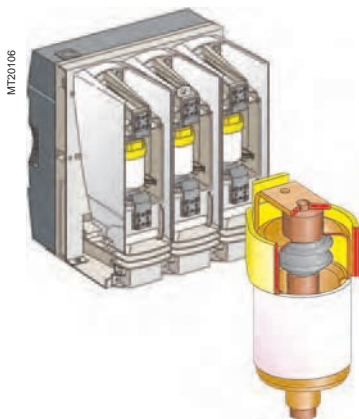
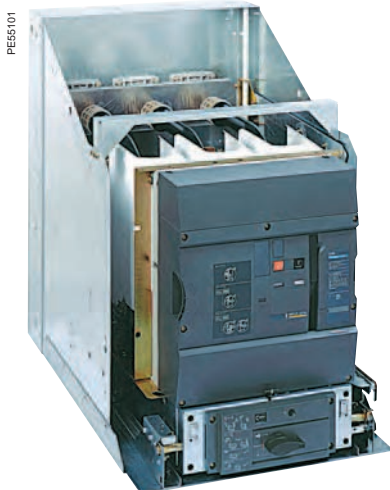
### High mechanical endurance

The magnetic field is generated by a patented outside coil which surrounds the contact area. This solution has many advantages:

- a simplified and therefore reliable vacuum interrupter unit,
- heavy duty contacts which do not distort under repeated switching operations.

This is the first time that a low voltage device control mechanism has been used on a medium voltage circuit breaker. The Masterpact control unit used on Evolis has the advantages of a system which has been proven for over 10 years in hundreds of thousands of installations.

Evolis is in conformity with the most demanding mechanical endurance class (IEC 62271-100: class M2).

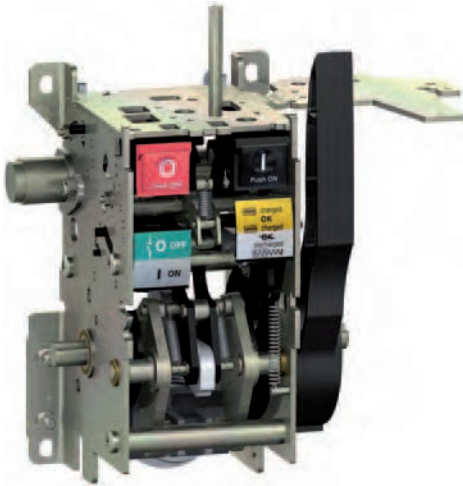


# Description of functions

## P2 stored energy operating mechanism

### Wiring diagram

PE66600



#### Operation of the P2 stored energy operating mechanism

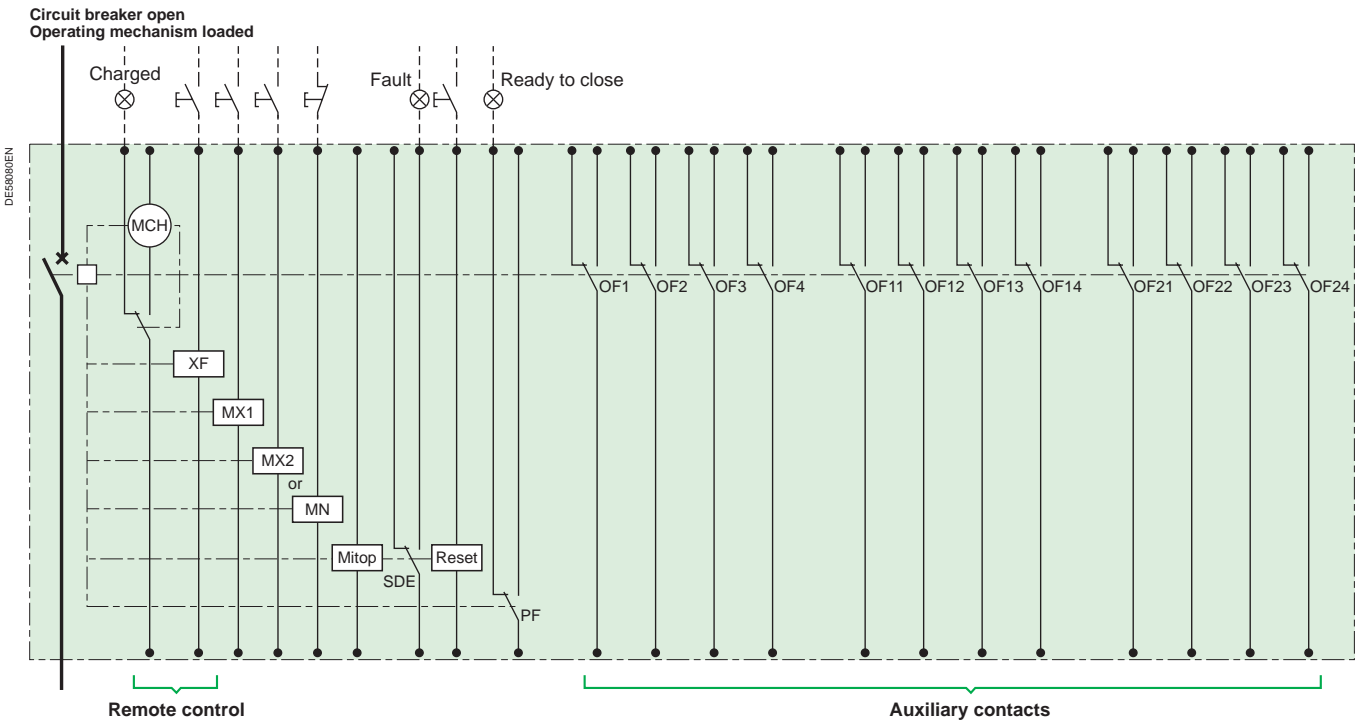
This gives the device an opening and closing speed that is independent of the operator whether the order is electrical or manual.

The electrical control mechanism carries out reclosing cycles and is automatically recharged by a geared motor each time after closing.

#### It consists of:

- the stored energy operating mechanism which stores in springs the energy required to open and close the device
- a gear motor electrical charging device with manual charging by lever (useful on loss of auxiliary supply)
- manual order devices by push buttons on the front panel of the device (accessible in test position)
- an electrical remote closing device containing a release with an antipumping relay
- an electrical opening device containing one or more releases, for example:
  - shunt opening
  - undervoltage
  - Mitop, a low consumption release, used only with the Sepam 100 LA protection relay.
- an operation counter
- a position indication device by mechanical indicator and 3 modules of 4 auxiliary contacts whose availability varies according to the diagram used
- a device for indicating "charged" operating mechanism status by mechanical indicator and electrical contact.

#### Wiring diagram (principle)



# Withdrawable parts

## Description of functions: service trucks

| Electrical characteristics according to IEC 62271-100 |         |        |     |     |     |
|---|---------|--------|-----|-----|-----|
| Ur 17.5 kV  | Isc     | Ir     |     |     |     |
| Cubicle width (mm)                                    |         |        | 650 | 800 | 900 |
| Ud 50 kV 50 Hz, 1 min<br>Up 125 kV peak               | 25 kA   | 630 A  | ■   | ■   |     |
|   |         | 1250 A | ■   | ■   |     |
|   |         | 2500 A |     |     | ■   |
|   | 31.5 kA | 630 A  |     | ■   |     |
|   |         | 1250 A |     | ■   |     |
|   |         | 2500 A |     |     | ■   |

| Additional characteristics according to IEC 62271-100 |                                |         |                               |      |      |
|---|--------------------------------|---------|-------------------------------|------|------|
| Rated values  |                                |         |                               |      |      |
| Voltage   | Ur                             | kV rms  | 12                            | 17.5 | 17.5 |
| Insulation voltage:                                   |                                |         |                               |      |      |
| - power frequency withstand                           | Ud                             | kV rms  | 28                            | 38   | 38   |
| - lightning impulse withstand (1.2/50 µs)             | Up                             | kV peak | 75                            | 95   | 95   |
| Frequency   | fr                             | Hz      | 50-60                         |      |      |
| Short time withstand current                          | Ik/tk                          | kA      | Isc/3 s                       |      |      |
| Peak withstand current                                | Ip                             | kA peak | 2.5 Isc (50 Hz)               |      |      |
|   |                                |         | 2.6 Isc (60 Hz)               |      |      |
| Short circuit making capacity                         |                                | kA peak | 2.5 Isc (50 Hz)               |      |      |
|   |                                |         | 2.6 Isc (60 Hz)               |      |      |
| Other characteristics                                 |                                |         |                               |      |      |
| Operating sequence                                    |                                |         | O-0.3 s-CO-15 s-CO            |      |      |
|   |                                |         | O-0.3 s-CO-3 min-CO           |      |      |
|   |                                |         | O-3 min-CO-3 min-CO           |      |      |
| Operating times                                       | Opening                        | ms      | < 50                          |      |      |
|   | Breaking                       | ms      | < 60                          |      |      |
|   | Closing                        | ms      | < 71                          |      |      |
| Mechanical endurance                                  | Class                          |         | M2                            |      |      |
|   | Number of switching operations |         | 10 000                        |      |      |
| Electrical endurance                                  | Class                          |         | E2                            |      |      |
| Number of switching operations at full Isc value      | 25 kA                          |         | 100                           |      |      |
|   | 31.5 kA                        |         | 50                            |      |      |
| Capacitive current breaking capacity                  | Class                          |         | C1 (for certain applications) |      |      |
| Operating conditions                                  |                                |         | -25°C to +40°C                |      |      |
| Average relative humidity                             | Over 24 h                      |         | < 95%                         |      |      |
|   | Over 1 month                   |         | < 90%                         |      |      |

## Service trucks

### Disconnecting truck

This device allows disconnection of the upstream and downstream circuits in the cubicle. It is installed in the same location as the withdrawable circuit breaker in the cradle.

It includes a device to lock it in the in-service position.

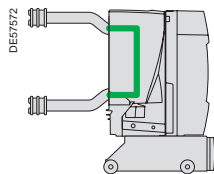
| Electrical characteristics         |    |    |             |      |      |
|------------------------------------|----|----|-------------|------|------|
| Rated voltage                      | Ur | kV | 7.2 to 17.5 |      |      |
| Phase distance                     |    | mm | 145         | 185  | 240  |
| Rated normal current               | Ir | A  | 1250        | 1250 | 2500 |
| Short-time withstand current (3 s) | Ik | kA | 25          | 31.5 | 31.5 |

### Earthing truck

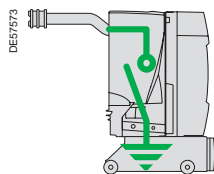
This device is a safety accessory used in place of the withdrawable circuit-breaker in order to earth the busbars.

Possibility of locking by padlocks in the service position.

| Electrical characteristics         |    |         |                                 |      |      |
|------------------------------------|----|---------|---------------------------------|------|------|
| Rated voltage                      | Ur | kV rms  | 12                              | 17.5 | 17.5 |
| Phase distance                     |    | mm      | 145                             | 185  | 240  |
| Short-time withstand current (3 s) | Ik | kA      | 25                              | 31.5 | 31.5 |
| Making capacity                    |    | kA peak | 2.5 Ik (50 Hz) & 2.6 Ik (60 Hz) |      |      |



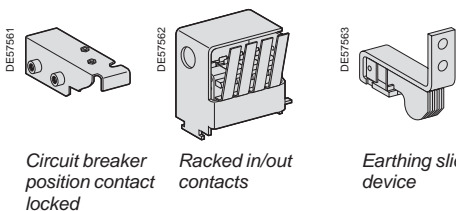
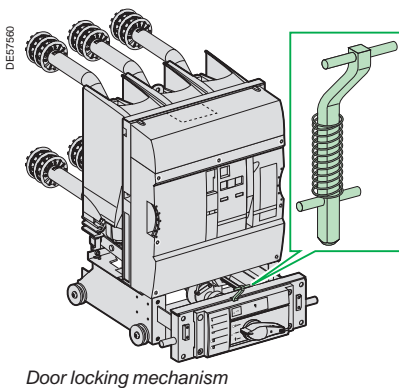
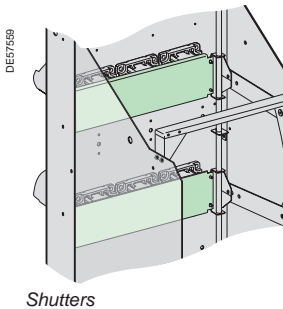
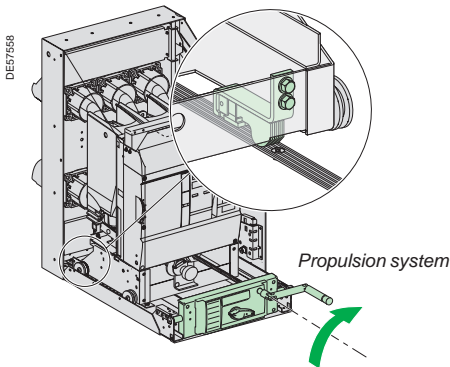
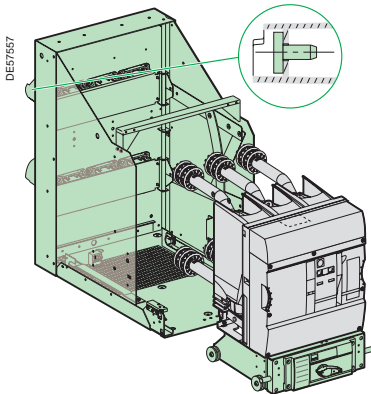
Disconnecting truck



Earthing truck

# Withdrawable parts (cont.)

## Description of functions: racking in

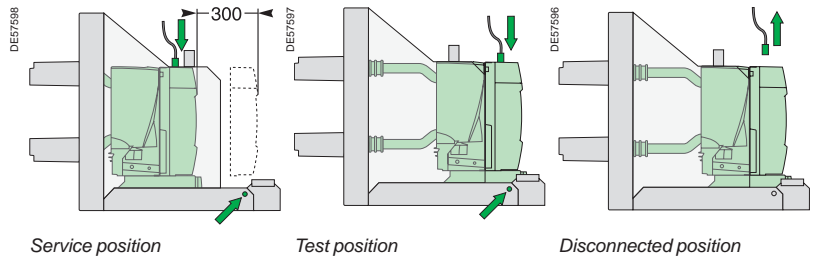


### Composition

- The "racking in" function is carried out by:
- the racking truck supporting the circuit breaker (mobile part)
  - the cradle with bushings (fixed part)
  - LV plug.

### Operation

- The circuit breaker can be placed in 3 stable positions:
- **service position:** circuit breaker racked in and locked in position; LV plugs connected
  - **test position:** circuit breaker racked out and locked in position; LV plug connected
  - **disconnected position:** circuit breaker racked out and locked in position; LV plug disconnected. The circuit breaker can be unlocked and extracted from the cradle.



*Note: the arrows show the "locked positions" for the circuit breaker and the LV plug.*

### Functions

- A drive system combined with a threaded shaft gives easier racking in and out. The racking in mechanism can be operated with the door closed.
  - An interlock stops the user from inserting the lever as long as the racking truck has not been put in the "racked in/out" position.
  - An interlock between the circuit breaker status and the truck gives secure operation: racking in or out is only possible if the circuit breaker is open.
  - An interlock also exists between the LV connector and the truck. It is only possible to rack in if the LV connector is connected.
- The cradle floor has all the fixing holes needed to correctly position the earthing switch control mechanism and power circuit. This makes earthing switch operation reliable and gives interlocking between the circuit breaker and the earthing switch.
- Earthing is automatic as the truck is racked in.
  - Protective shutters stop fingers from touching the racking clusters when the device is extracted (protection index: IP2X).
  - For maintenance operations, it is possible to:
    - padlock the shutters in the closed position
    - unlock the shutter mechanism to access the fixed contacts.
  - A foolproof device enables correct matching of the cradle and circuit breaker rating. This system is mounted on the cradle base and CB truck. The system must be assembled by the panelbuilder.

### Accessories

- One set of auxiliary contacts:
  - 4 circuit breaker racked in/out position contacts
  - 1 contact showing that the circuit breaker is locked in place on the cradle.
- A key locking system (Ronis or Profalux) for the circuit breaker in the racked out position enables increased safety downstream of it during work. This system is associated with an earthing switch mechanism box.
- Locking of the circuit breaker compartment door. This device enables the circuit breaker, full version, to only be operated when the door is closed.



# Withdrawable parts (cont.)


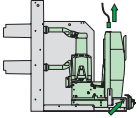
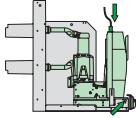
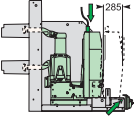
## Extraction

This table describes the safety functions available on NEX 17.5 .

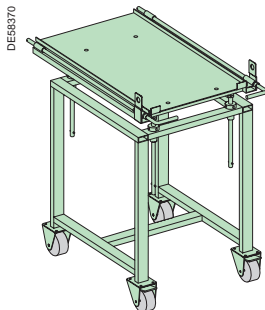
**How to use the table**

Each of the boxes describes the functional status of each circuit breaker position and the associated parts:

- Possible status
- Possible status, operation impossible
- Impossible status

| Parts                |              | Circuit breaker positions   |  |  |   |   |   |  |
|----------------------|--------------|---|--|--|---|---|---|--|
|                      |              |  | Insertion<br>---><br>Extraction<br>---<    |  |  | Racking-in<br>---><br>Racking-out<br>---< |  |  |
|                      |              | Removed   |  | Disconnected   | Test position   |   | Service   |  |
| 1 - Cradle           |              |   | Fool-proof protection (1)<br>Anti-drop (2) |  |   |   |   |  |
|                      |              | No opening shutters   |  |  |   |   |   |  |
|                      |              | Shutters padlocking possible  |  |  |   |   |   |  |
| 2 - LV plug          | Disconnected |   |  | No racking-in  | <input checked="" type="checkbox"/>   | <input checked="" type="checkbox"/>       | <input checked="" type="checkbox"/>   |  |
|                      | Connected    | <input checked="" type="checkbox"/>   | <input checked="" type="checkbox"/>        |  | No unplugging   |   |   |  |
| 3 - Circuit breaker  | Closed       |   | Auto-discharge function (3)                |  | No racking-in   | <input checked="" type="checkbox"/>       | No racking-out  |  |
|                      | Open         |   |  |  |   | No closing                                |   |  |
|                      |              | Open position circuit breaker locking available (3)                               |  |  |   |   |   |  |
| 4 - Switchboard door | Open         |   |  |  | No racking-in   | <input checked="" type="checkbox"/>       | <input checked="" type="checkbox"/>   |  |
|                      | Closed       |   |  |  | No door opening (4)   |   |   |  |
| 5 - Earthing switch  | Open         |   |  |  |   | No earthing switch closing                |   |  |
|                      | Closed       |   |  |  | No racking-in   | <input checked="" type="checkbox"/>       | <input checked="" type="checkbox"/>   |  |

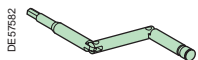
(1) This protection mechanism ensures that the performance levels of the circuit breaker correspond with those of the cradle.  
 (2) Device that prevents the circuit breaker from dropping when extracted from the cradle.  
 The device can be either unlocked manually or when the extraction rig is put in position.  
 (3) Option.  
 (4) Interlocking device to be fitted to the cubicle door. If there is no interlocking, the circuit breaker device should be inhibited.



### Circuit breaker extraction table

Enables the circuit breaker to be taken out of the cubicle and handled during maintenance operations.

- a device using screws and bolts allows the height adjustment up to 250 mm
- a latching device is provided between the extraction table and the cradle.



### Racking handle

This handle enables:

- the withdrawable part to be racked in/out
- the earthing switch to be open/closed.

E7422



### SM6 switch

The three rotating contacts are placed in an enclosure filled with gas to a relative pressure of 0.04 MPa (0.4 bars).

The SF6 filled enclosure is of the "sealed pressure system type". Sealing tightness is always checked in the factory.

#### ■ Safety

- the switch may be in one of three positions: "closed", "open" or "earthed", giving a natural interlocking system that prevents operator error. Moving contact rotation is driven by a fast acting mechanism that is independent of the operator.
- the device combines the breaking and disconnecting functions.
- the earthing switch has a short-circuit making capacity in compliance with standards.

041487R



### Operating mechanism and auxiliaries

#### CI2 double function operating mechanism for QM and IM functions

##### ■ Switch function:

- independent closing in two steps:
  - operating mechanism recharged by a hand lever or motor
  - stored energy released by a push button or trip unit
- independent opening by push button (O) or trip unit.

##### ■ Earthing switch function:

- independent closing by a hand lever.

Operating energy is provided by the compression of a spring which causes the contacts to close or open after the neutral point is passed.

61032N



#### CS operating mechanism for TM unit

##### ■ Switch and earth switch functions

Dependent-operation opening and closing by lever

##### ■ Auxiliary contacts

Disconnecter (1 O + 2 C)

##### ■ Mechanical indications

Fuses blown.

Fuse ratings for NEX 17.5 protection units depend, among other things, on the following criteria:

- service voltage
- transformer rating
- fuse technology (manufacturer).

Different types of fuses with medium loaded striker maybe installed:

- Solefuse fuses as per standard UTE NCF 64.210
  - Fusarc CF fuses as per IEC recommendation 60.282.1 and DIN dimensions 43.625.
- For fuse-switch combination unit, refer only to the selection table and reference list of fuses. For all other type of fuses, consult us.

**Example:** for the protection of a 400 kVA transformer at 22 kV, select either Solefuse fuses rated 16 A or Fusarc CF fuses rated 25 A.

### Fuse selection table

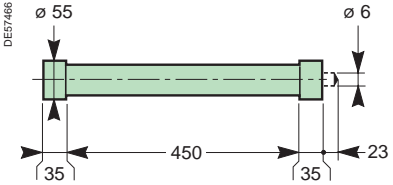
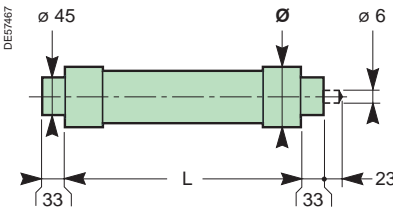
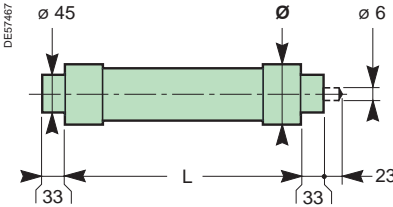
Rating in A - no overload at  $-5^{\circ}\text{C} < t < 40^{\circ}\text{C}$ .

Please consult us for overloads and operation over  $40^{\circ}\text{C}$  for France Transfo oil immersed type transformers.

| Type of fuse   | Service voltage (kV) | Transformer rating (kVA) |     |     |     |     |     |     |      |      |      |      |     |      |      |                    |                    | Rated voltage (kV) |           |
|--|----------------------|--------------------------|-----|-----|-----|-----|-----|-----|------|------|------|------|-----|------|------|--------------------|--------------------|--------------------|-----------|
|  |                      | 25                       | 50  | 100 | 125 | 160 | 200 | 250 | 315  | 400  | 500  | 630  | 800 | 1000 | 1250 | 1600               | 2000               |                    | 2500      |
| <b>Solefuse</b> (UTE NFC standards 13.100, 64.210)                                 |                      |                          |     |     |     |     |     |     |      |      |      |      |     |      |      |                    |                    |                    |           |
| 20   | 6.3                  | 6.3                      | 6.3 | 6.3 | 6.3 | 16  | 16  | 16  | 16   | 43   | 43   | 43   | 43  | 43   | 63   |                    |                    |                    | <b>24</b> |
| <b>Solefuse</b> (general case, UTE NFC standard 13.200)                            |                      |                          |     |     |     |     |     |     |      |      |      |      |     |      |      |                    |                    |                    |           |
| 20   | 6.3                  | 6.3                      | 6.3 | 6.3 | 16  | 16  | 16  | 16  | 31.5 | 31.5 | 31.5 | 43   | 43  | 63   |      |                    |                    |                    | <b>24</b> |
| 22   | 6.3                  | 6.3                      | 6.3 | 6.3 | 16  | 16  | 16  | 16  | 16   | 31.5 | 31.5 | 31.5 | 43  | 63   | 63   |                    |                    |                    |           |
| <b>Fusarc CF and SIBA</b> <sup>(1)</sup> (general case according to IEC 62271-105) |                      |                          |     |     |     |     |     |     |      |      |      |      |     |      |      |                    |                    |                    |           |
| 20   | 6.3                  | 6.3                      | 10  | 10  | 16  | 16  | 25  | 25  | 31.5 | 40   | 40   | 50   | 50  | 63   | 80   | 100 <sup>(1)</sup> | 125 <sup>(1)</sup> | <b>24</b>          |           |
| 22   | 6.3                  | 6.3                      | 10  | 10  | 10  | 16  | 20  | 25  | 25   | 31.5 | 40   | 40   | 50  | 50   | 80   | 80                 | 80                 | 100 <sup>(1)</sup> |           |

(1) = SIBA fuses

### Fuses dimensions

| Solefuse (UTE standards)  |  | Ur (kV)     | Ir (A)    | L (mm) | Ø (mm) | Weight (kg) |
|---|--|-------------|-----------|--------|--------|-------------|
|  |  | <b>17.5</b> | 6.3 to 63 | 450    | 55     | 2           |
| Fusarc CF   |  | Ur (kV)     | Ir (A)    | L (mm) | Ø (mm) | Weight (kg) |
|  |  | <b>17.5</b> | 6.3       | 442    | 50.5   | 1.6         |
|   |  |             | 10        | 442    | 50.5   | 1.6         |
|   |  |             | 16        | 442    | 50.5   | 1.6         |
|   |  |             | 20        | 442    | 50.5   | 1.6         |
|   |  |             | 25        | 442    | 57     | 2.2         |
|   |  |             | 31.5      | 442    | 57     | 2.2         |
|   |  |             | 40        | 442    | 57     | 2.2         |
|   |  |             | 50        | 442    | 78.5   | 4.1         |
|   |  |             | 63        | 442    | 78.5   | 4.1         |
|   |  |             | 80        | 442    | 86     | 5.3         |
| SIBA  |  | Ur (kV)     | Ir (A)    | L (mm) | Ø (mm) | Weight (kg) |
|  |  | <b>17.5</b> | 100       | 442    | 85     | 5.4         |
|   |  |             | 125       | 442    | 85     | 5.4         |

PE56239



## Switchgear resistance to ageing in a substation depends on 3 key factors

### ■ The need for correctly made connections

New cold connecting technologies offer easy installation and favour durability in time. Their design means they can be used in polluted environments with harsh atmospheres.

### ■ The impact of relative humidity

The installing of a heating element is essential in climates with high relative humidities and significant temperature differentials.

### ■ Ventilation control

The dimensions of air vents must be appropriate for the dissipated energy in the substation.

### Cold connected terminals

Schneider Electric's experience has led it to favour this technology wherever possible for optimum durability.

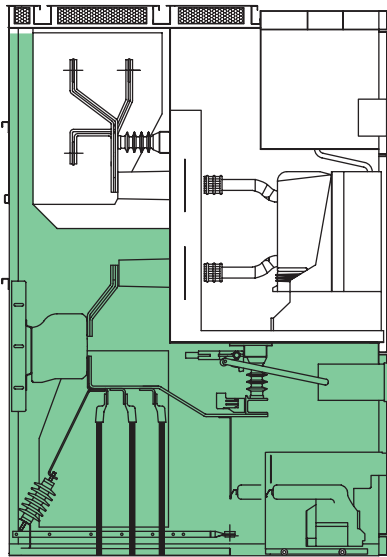
The maximum acceptable cable cross-section for standard assemblies are:

- 630 mm<sup>2</sup> for incomer or feeder cubicles with single-core cables;
- 300 mm<sup>2</sup> for incomer or feeder cubicles with three-core cables;
- 95 mm<sup>2</sup> for transformer protection cubicles with fuses.

Access to the compartment is only possible when the earthing switch is closed.

Tightening torques for cables will be attained using a dynamo wrench set to 50 mN.

DE56862



## Dry, single core cable

### Short end piece, cold connectable

|                               |  |
|-------------------------------|--|
| Performance                   | 3 to 17.5 kV - 400 A - 2500 A  |
| Cross section mm <sup>2</sup> | 50 to 630 mm <sup>2</sup>  |
| Supplier                      | all suppliers of cold connectable terminals:<br>Silec, 3M, Pirelli, Raychem... |
| Number of cables              | 1 to 4 per phase   |
| Comments                      | for greater cross section and number of cables,<br>please consult us           |

## Dry, three core cable

### Short end piece, cold connectable

|                               |  |
|-------------------------------|--|
| Performance                   | 3 to 17.5 kV - 2500 A  |
| Cross section mm <sup>2</sup> | 50 to 300 mm <sup>2</sup>  |
| Supplier                      | all suppliers of cold connectable terminals:<br>Silec, 3M, Pirelli, Raychem... |
| Number of cables              | 1 to 4 per phase   |
| Comments                      | for greater cross section and number of cables,<br>please consult us           |

## Connection possibilities using dry cables ID - IF - LB

### For bottom entry

|                         | IF-630 A | IF-1250 A | IF-2500 A | ID-1250 A | ID-2500 A | LB-IM | LB-QM |
|-------------------------|----------|-----------|-----------|-----------|-----------|-------|-------|
| 1 single core per phase | ■        | ■         | ■         | ■         | ■         | ■     | ■     |
| 2 single core per phase | ■        | ■         | ■         | ■         | ■         | ■     |       |
| 3 single core per phase |          | ■         | ■         | ■         | ■         |       |       |
| 4 single core per phase |          |           | ■         |           | ■         |       | ■     |
| 1 three core per phase  | ■        | ■         | ■         | ■         | ■         | ■     |       |
| 2 three core per phase  | ■        | ■         | ■         | ■         | ■         | ■     |       |
| 3 three core per phase  |          | ■         | ■         | ■         | ■         |       |       |
| 4 three core per phase  |          |           | ■         |           | ■         |       |       |

### For top entry

|                         | IF-630 A | IF-1250 A | IF-2500 A | ID-1250 A | ID-2500 A | LB-IM | LB-QM |
|-------------------------|----------|-----------|-----------|-----------|-----------|-------|-------|
| 1 single core per phase | ■        | ■         | ■         | NA        | NA        | NA    | NA    |
| 2 single core per phase | ■        | ■         | ■         | NA        | NA        | NA    | NA    |
| 3 single core per phase |          | ■         | ■         | NA        | NA        | NA    | NA    |
| 4 single core per phase |          |           | ■         |           | NA        | NA    | NA    |
| 1 three core per phase  | ■        | ■         | ■         | NA        | NA        | NA    | NA    |
| 2 three core per phase  | ■        | ■         | ■         | NA        | NA        | NA    | NA    |
| 3 three core per phase  |          | ■         | ■         | NA        | NA        | NA    | NA    |
| 4 three core per phase  |          |           | ■         |           |           | NA    | NA    |

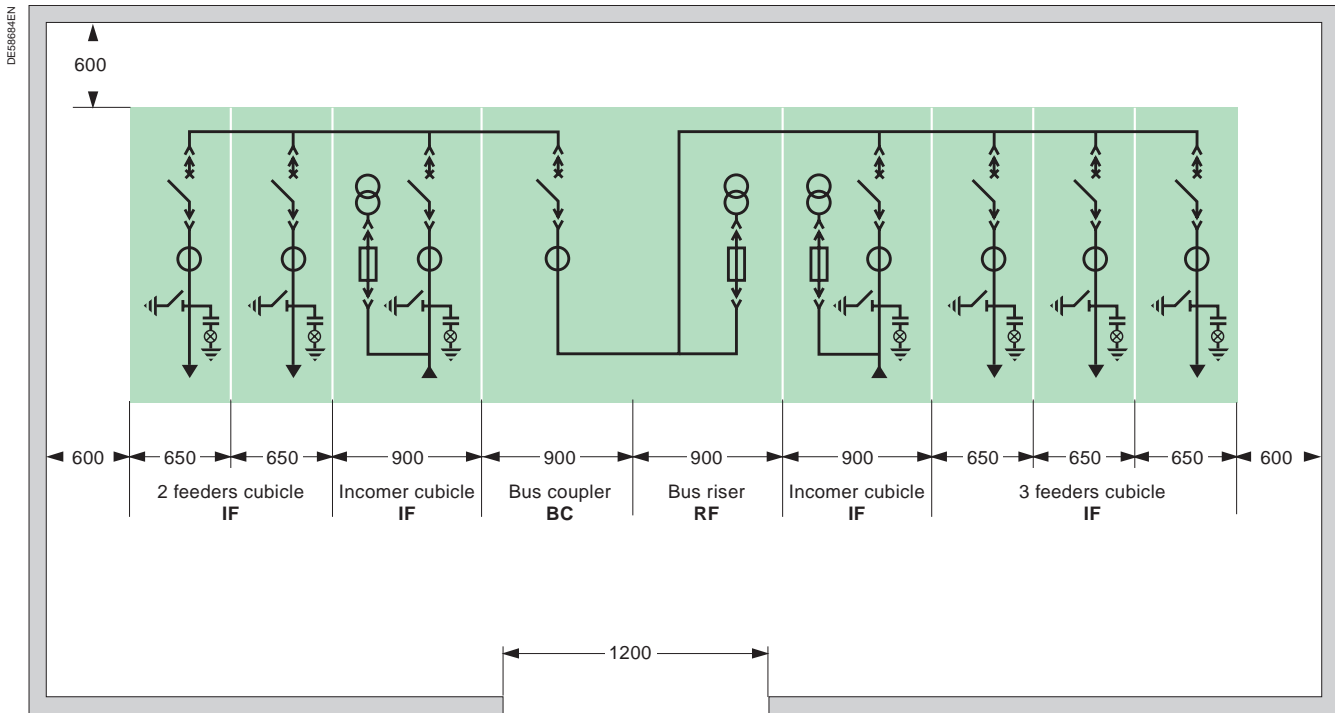
NA = Not Available

## Bottom cable connection

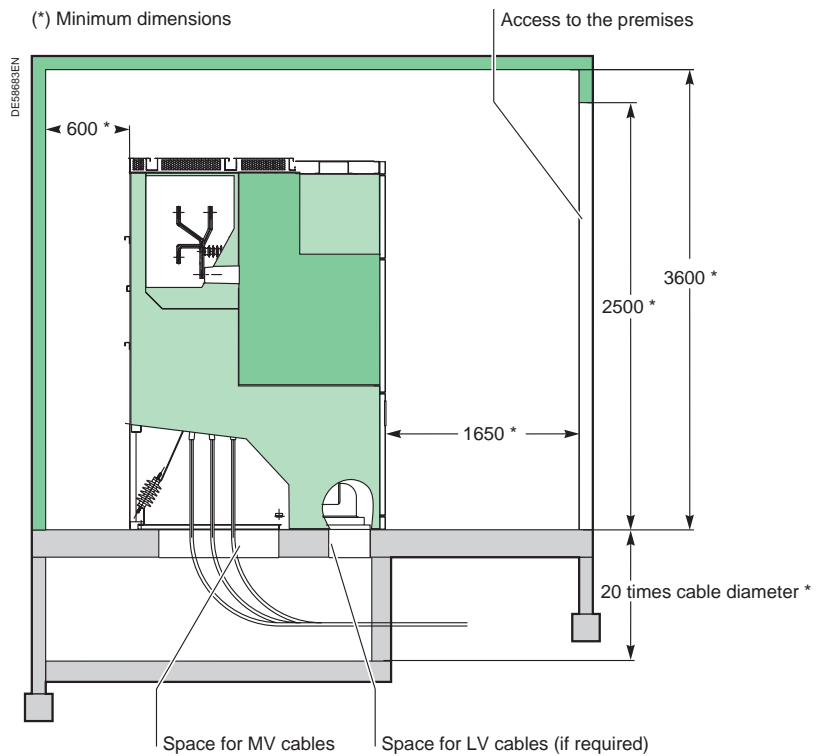
### Cable connection height

| Type of cubicle | Configuration                 | H (mm) |
|-----------------|-------------------------------|--------|
| IF              | 630 to 1250 A    1 set of CTs | 630    |
| IF              | 2500 A                        | 580    |
| LB              |                               | 400    |

## Line up switchboard



## Civil engineering with utility space



Note: for further information, refer to the civil engineering guide, user and instruction manual.

| Equipment  |   | Type of cubicle |    |    |    |    |       |
|--|---|-----------------|----|----|----|----|-------|
|  |   | IF              | ID | BC | RF | VT | LB    |
| <b>Switchgear</b>  |   |                 |    |    |    |    |       |
| Circuit breaker  |   | ■               |    | ■  |    |    |       |
| Switch   |   |                 |    |    |    |    | ■     |
| Disconnecter truck   |   | □               |    | □  |    |    |       |
| Earthing truck   |   | □               |    | □  |    |    |       |
| Fixed connections  |   |                 | ■  |    | ■  |    |       |
| Racking position indication contact for the withdrawable part    | 4 NO + 4 NC                                       | □               |    | □  |    |    |       |
| Padlocking of isolating shutters for withdrawable parts          |   | ■               |    | ■  |    |    |       |
| Voltage presence indicator                                       |   | □               | □  | □  |    | □  | ■     |
| Locking of mechanical racking of the withdrawable part (padlock) |   | ■               |    | ■  |    |    |       |
| Locking of mechanical racking of the withdrawable part (keylock) |   | □               |    | □  |    |    |       |
| Locking of the electromagnetic racking of the withdrawable part  |   | □               |    | □  |    |    |       |
| <b>Earthing switch (SMALT)</b>                                   |   |                 |    |    |    |    |       |
| Earthing switch  |   | □               | □  |    |    | □  | ■     |
| Earthing switch position indication contacts                     | 3 NO + 3 NC                                       | □               | □  |    |    | □  | □ (1) |
| Earthing switch position key locking                             |   | □               | □  |    |    | □  | □     |
| Electromagnetic earthing switch position locking                 |   | □               | □  |    |    | □  |       |
| <b>Transformers</b>  |   |                 |    |    |    |    |       |
| Voltage transformers<br>(1 per phase) phase-earth                | Unfused fixed                                     | □               | □  |    |    | □  |       |
|  | Fused fixed                                       | □               | □  |    | □  | □  |       |
|  | Fused withdrawable                                | □               | □  |    | □  | □  |       |
| Current transformer  | Set of 3 CT's                                     | □               | □  | □  |    |    |       |
|  | Set of 6 CT's                                     | □               | □  |    |    |    |       |
|  | Set of LPCT's                                     | □               |    | □  |    |    |       |
| <b>Cubicle</b>   |   |                 |    |    |    |    |       |
| Protection index enclosure                                       | IP3X  | ■               | ■  | ■  | ■  | ■  | ■     |
|  | IP4X  | □               | □  | □  | □  | □  | □     |
|  | Compartments                                      | ■               | ■  | ■  | ■  | ■  | ■     |
| Anti-arcing protection   | 25 kA - 0.5 s                                     | □               | □  | □  | □  | □  | □     |
|  | Internal arc flap signalling contact (consult us) | □               | □  | □  | □  | □  | □     |
| LV control cabinet key locking                                   |   | □               | □  | □  | □  | □  | □     |
| LV control cabinet lighting                                      |   | □               | □  | □  | □  | □  | □     |
| Anti-condensation heating element                                |   | □               | □  | □  | □  | □  | □     |

■ : basic equipment

□ : option

(1) 1 NO + 1 NC available.

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