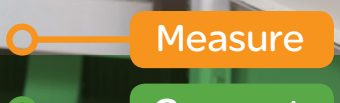
EcoStruxure™ Power

For commercial & Industrial Buildings

Smart Panels
Assembly Guide



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Dear customer,

Here is the new edition of Smart Panels switchboard assembly and installation guide.

Smart Panels make live in the same switchboard components of power and communication with their own circuits.

It is essential to comply with installation and implementation best practices, to avoid any risk of shut-down or malfunction due to insufficient distances between devices, temperature rise or electromagnetic compatibility, for example.

It is intended for use by panel builders in the factory and on-site and also by design engineers to integrate design rules, in compliance with IEC standards 61439-1&2. These rules are essential because the communication architecture must be defined very early in the design phase.

After a short introduction to the examples which will be used as a framework for this guide, the basic installation rules will be presented, then it will deal with auxiliary power supplies and low-power communication circuits in more depth.

The objective of the document is to focus on the installation and testing of networked equipment, limiting the scope to low-voltage distribution on non-critical small to medium-sized buildings (LVDP and final switchboard). Two scenarios will be covered: connecting to an MV/LV transformer and a switchboard directly connected to a low-voltage network. Only two types of neutral systems will be considered, TNS and TNC.

Important instructions

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it.

The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.
Failure to follow these instructions will result in death, serious injury, equipment damage, or permanent loss of data.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **can result in** death or serious injury.
Failure to follow these instructions can result in death, serious injury, equipment damage, or permanent loss of data.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **can result in** minor or moderate injury.
Failure to follow these instructions can result in injury or equipment damage.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol shall not be used with this signal word.

Please note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, operation and installation of electrical equipment, and has received safety training to recognize and avoid the hazards involved.

Before you Begin

Electrical monitoring and control equipment and related software are used in a variety of the buildings. The type or model of electrical monitoring and control equipment suitable for each application will vary depending on factors such as the system dependability level, unusual conditions and government regulations etc.

Only the user can be aware of all the conditions and factors present during setup, operation and maintenance of the solution. Therefore, only the user can determine the electrical monitoring and control equipment and the related safeties and interlocks which can be properly used. When selecting electrical monitoring and control equipment and related software for a particular application, the user should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual also provides much useful information.

Ensure that appropriate safeties and mechanical/electrical interlocks protection have been installed and are operational before placing the equipment into service. All mechanical/electrical interlocks and safeties protection must be coordinated with the related equipment and software programming.

Start up and test

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and grounds, except those grounds installed according to local regulations (according to the National Electrical Code in the U.S.A., for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Perform all start-up tests recommended by the manufacturer.

Operation and adjustments

The following precautions are from the NEMA Standards Publication ICS 7.1-195 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

Safety pre-cautions

The following safety messages apply to installation, configuration and operation of SmartStruxure Building Operation, Power Monotoring Expert and Power Manager sofware connected to Smart Panels.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Do not use the software to control time-critical functions because communication delays can occur between the time a control is initiated and when that action is applied.
- Do not use the software to control remote equipment without securing it with an authorized access level, and without including a status object to provide feedback about the status of the control operation.

Failure to follow these instructions can result in death or serious injury.

⚠ WARNING

INACCURATE DATA RESULTS

- Do not incorrectly configure the software, as this can lead to inaccurate reports and/or data results.
- Do not base your maintenance or service actions solely on messages and information displayed by the software.
- Do not rely solely on software messages and reports to determine if the system is functioning correctly or meeting all applicable standards and requirements.
- Consider the implications of unanticipated transmission delays or failures of communications links.

Failure to follow these instructions can result in death, serious injury, equipment damage, or permanent loss of data.

NOTICE

LOSS OF DATA

- Be sure to activate product and component licenses prior to the expiry of the trial license.
- Ensure that you activate sufficient licenses for the servers and devices in your system.
- Backup or archive any SQL Server database data before adjusting any database memory options.
- Only personnel with advanced knowledge of SQL Server databases should make database parameter changes.

Failure to follow these instructions can result in loss of data.

NOTICE

UNAUTHORIZED OR UNINTENDED ACCESS TO CUSTOMER DATA

- Personnel setting up third-party authentication of the software must be aware that links to data are not secure.
- Do not setup access links to sensitive or secure data.

Failure to follow these instructions can result in unauthorized or unintended access to sensitive or secure customer data.

NOTICE

NETWORK INOPERABILITY

Do not make unauthorized changes in the network configuration.

Failure to follow these instructions can result in an unstable or unusable network.

This document is intended to describe how to select and configure the Smart panels system.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

- Only qualified personnel familiar with low and medium voltage equipment are to perform work described in this set of instructions. Workers should understand the hazards involved in working with or near low and medium voltage circuits.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power before working on or inside equipment.
- Use a properly rated voltage sensing device to confirm that the power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of back feeding.
- Handle this equipment carefully and install, operate, and maintain it correctly in order for it to function properly. Neglecting fundamental installation and maintenance requirements may lead to personal injury, as well as damage to electrical equipment or other property.
- Beware of potential hazards, wear personal protective equipment and take adequate safety precautions.
- Do not make any modifications to the equipment or operate the system with the interlocks removed. Contact your local field sales representative for additional instruction if the equipment does not function as described in this manual.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors and covers before turning on power to this equipment.
- All instructions in this manual are written with the assumption that the customer has taken these measures before performing maintenance or testing.

Failure to follow these instructions will result in death or serious injury.

Introduction

Grouping most of the electrical protection, command and metering components, the switchboards are now significant sources of data locally displayed and sent via communication networks.

Smart Panels use reliable, simple to install and use displays, and Ethernet and Modbus interfaces on the communication system.

Information is transmitted through the most efficient networks, to monitoring and control systems or on-line energy management services.

Structured into successive stages based on the chronological order of switchboard assembly, this guide focuses on all the best practices to apply when installing and testing Smart Panels communication system. For more information on how to mount the switchboard and the busbars, please refer to the Installation Guide (ref. DESW043EN).

Before starting the mounting phases, ensure that the communication architecture constraints have been integrated in the design of the switchboard.

As for all switchboards, IEC 61439-1&2 standard applies to Smart Panels and particularly dielectric tests.

At the end of each chapter, a quality control check list allows to check, step by step, the installation quality level.

Energy and Asset management has never been simpler

Connect your panel in three steps.

1 Measure

Embedded and stand-alone metering & control capabilities.

2 Connect

> Integrated communication interfaces.

> Ready to connect to energy management platforms.

3 Act

> Data-driven energy efficiency actions.

> Real time monitoring and control.

> Access to energy and site information through on-line services.

Tested, Validated, Documented Smart Panels architecture

Smart Panels have been certified via Schneider Electric's "TVDA" quality process

- Tested in performance labs by experts, in the most common configuration
- Validated full functional compatibility of devices
- Documented, with user guide, predefined CAD panel designs & wiring diagrams

Smart Panels overview

Smart Panels are key components of energy and asset management in buildings.

You can only manage what you measure and see. Schneider Electric Smart Panels form the basis of a simple solution for understanding how a building functions in terms of its energy consumption asset tracking and technical performance.

Smart Panels are the first step in creating an energy and asset management strategy. Combined with Schneider Electric Energy Management Services, they form a complete solution for real energy savings.

Smart Panels are based on the Ethernet network. Ethernet is widely used in domestic and industrial applications, allowing easy, transparent access to electrical devices from any location.

Purpose

The purpose of this guide is to give advice and recommendations on how to design and assemble SmartPanel switchboards. It is initially dedicated to panel builders, but can be used by anyone in need.

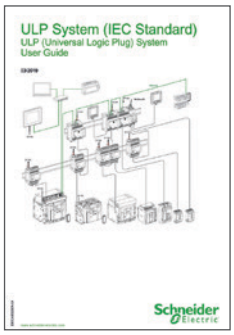
This guide supplements the other Smart Panels design and construction guides and documentation:

> 1. The Design & Select guide

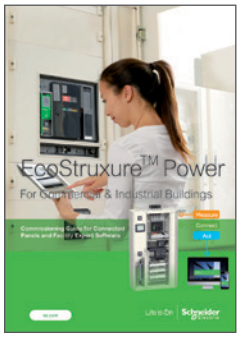
> 2. ULP guide

> 3. The commissioning guide

Design and Selection guide



ULP guide



Commissioning guide

Scope of this guide

The recommendations given in this document are suitable for Small and mid-size non-critical buildings, that is to say with:

- Area above 10 000 m^2
- Voltage 400 V/380 V
- Icc 42 kA
- TNS neutral system.

The reference switchboard of this guide is the Prisma switchboard. By analogy, the rules and recommendations here given can be applied to universal enclosures.

Reference architectures are:

- Switchboard > 630 A
- Switchboard ⩽ 630 A.

Summary - Interactive catalogue

I present

I install

I check

This guide contains clickable links for:
- page redirection towards table of contents or chapters,
- links to open web pages of the Schneider Electric site,
- links for videos.

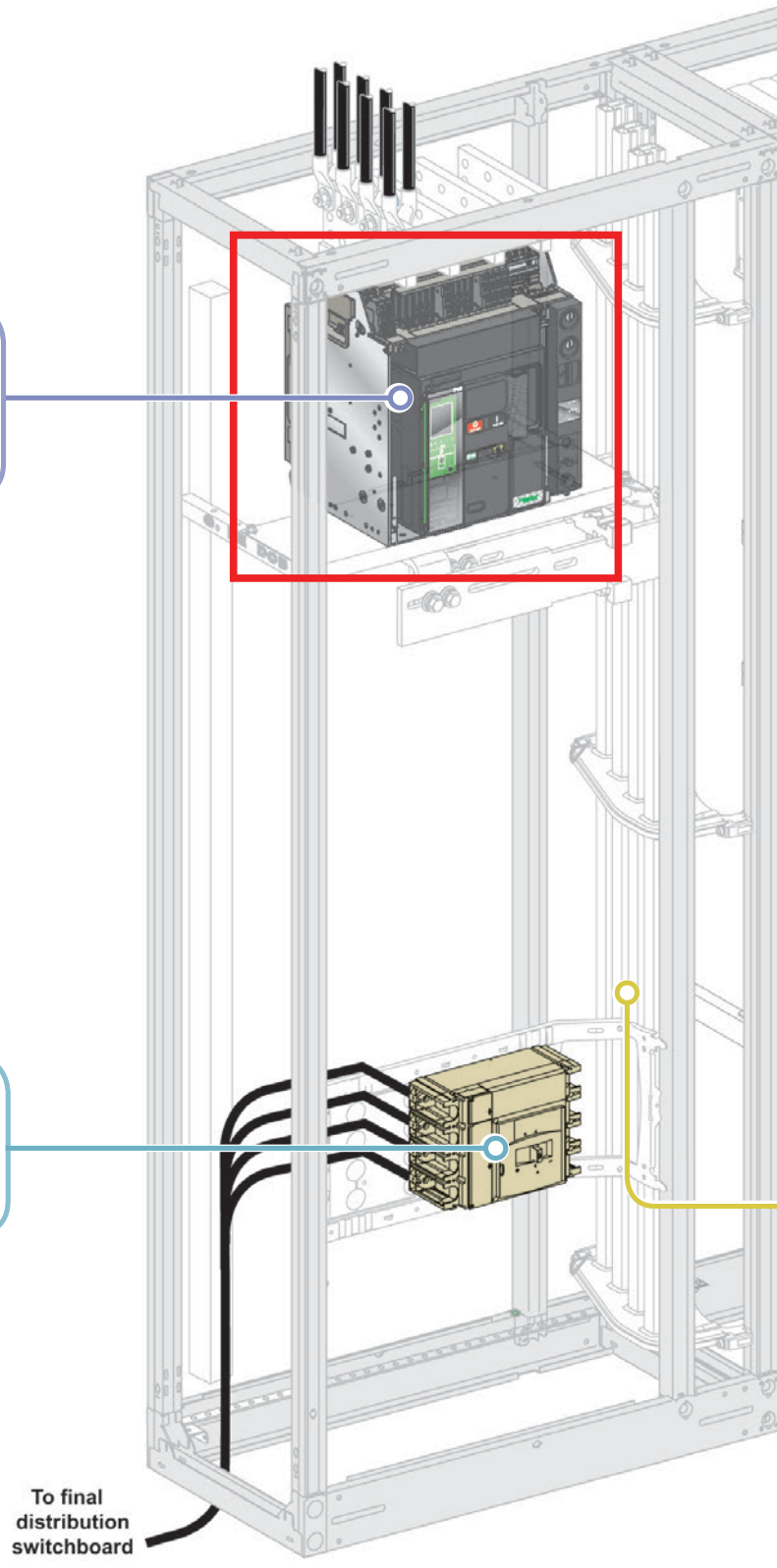
1.1. Non-connected switchboard > 630 A

MasterPact MTZ main switchboard

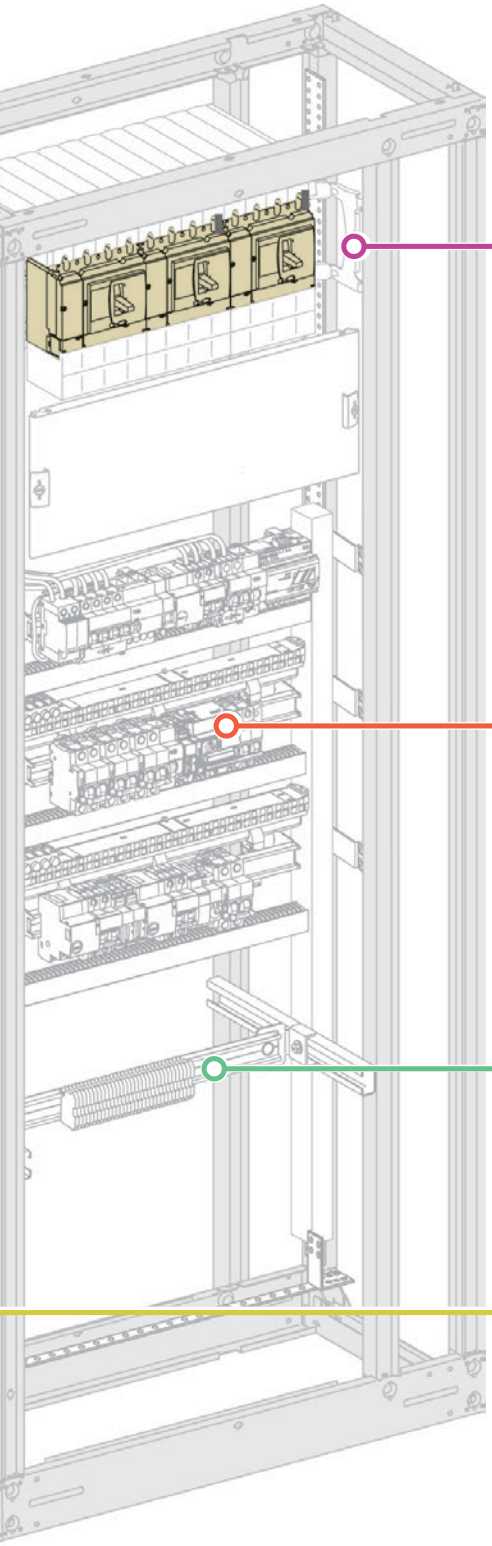
At the switchboard head, the withdrawable MasterPact MTZ circuit breaker protects the building's entire electrical distribution system.

ComPact NSX 400 A circuit breaker

The final distribution circuits are protected by the ComPact NSX circuit breaker, rated 400 A.



SUMMARY



ComPact NSX 100 A outgoing circuit breaker

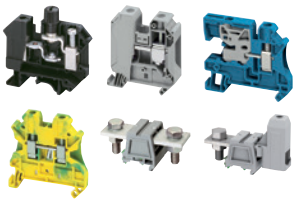
While the final switchboard is protected by the ComPact NSX 400 A (see previous page), the main loads have their own individual protection, thanks to three ComPact NSX outgoing lines.

Final switchboard

The Acti9 range circuit breakers protect the terminal loads.

Terminal connection blocks

The Linergy terminal blocks and busbars are designed to provide the rapid and reliable connection performances that you would expect from a high-quality installation.



Linergy LGY busbar

The Linergy LGY busbar powers the switchboard.

SUMMARY

1.2. Connected switchboard > 630 A

Ethernet interface embedded on the MTZ

The Ethernet interface eIFE is available for MTZ withdrawable circuit breakers, and provides a direct connection to the Ethernet network.

FDM128 local interface

Please refer to the Enerlin'X catalogue.
The FDM128 has a wide but shallow screen. The anti-reflection graphic screen is backlit for easy reading, even in a dark environment or at unusual viewing angles.

Micrologic X

Micrologic 5/6 X releases (Energy and Maintenance) can be fitted on all Masterpact MTZ, regardless of their performance level. They come with an embedded screen, as well as Bluetooth and NFC wireless communication protocol.
They include the basic LSI protection (MicroLogic 5), which can be supplemented by Ground G protection (MicroLogic 6), and can be customised with Digital Modules.
They also come with measurement, alarm and communication functions.

Ethernet switch

Ethernet switch, 5 copper ports.
Communication port protocols: Ethernet TCP/IP.
Ethernet port: 10BASE-T/100BASE-TX-5.
Max. number of connected switches: unlimited.

24 V DC power supply

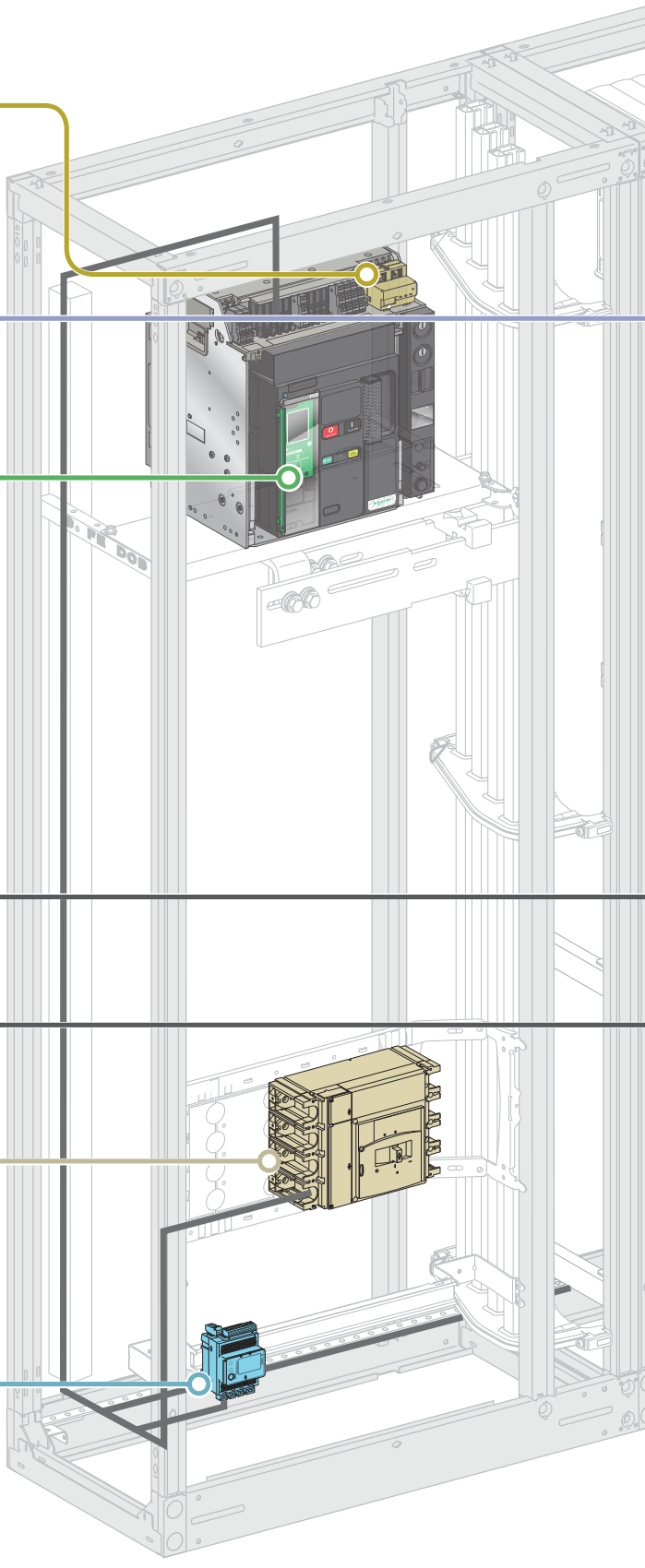
A 24 V DC power supply is required for a networked installation, whatever the MicroLogic types installed in the switchboard.
The requisite specifications are:
- output voltage 24 V DC +/-5 %
- ripple: +/-1 %
- overvoltage category: OVC IV - as specified by standard IEC 60947-1.

MicroLogic NSX100 at 630 A

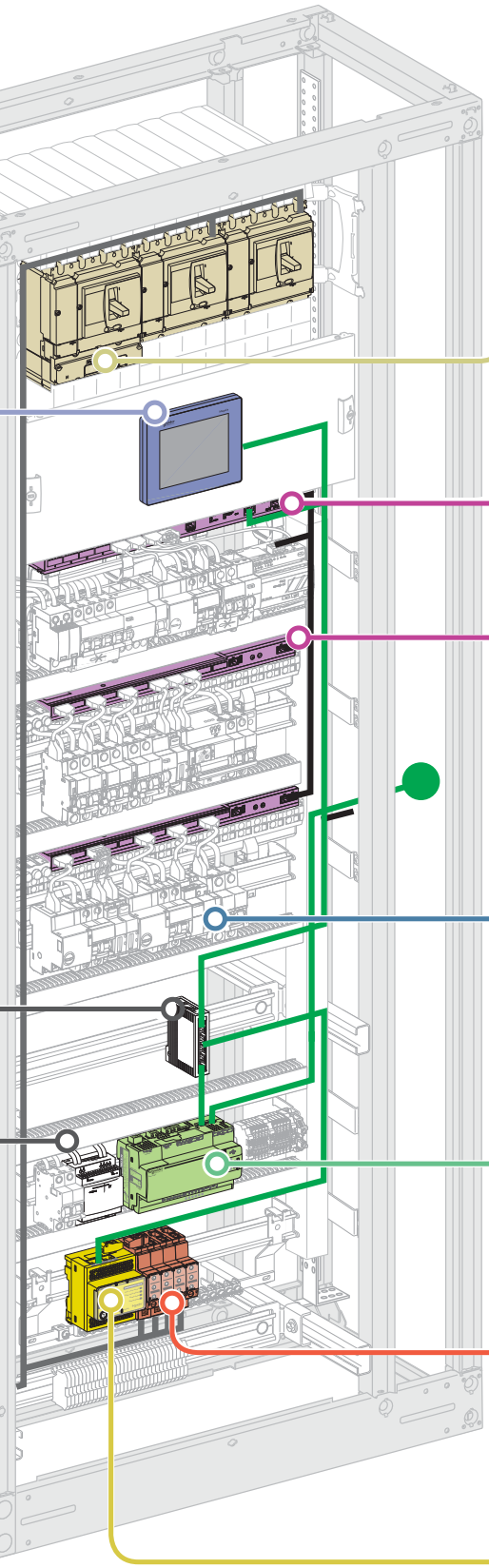
MicroLogic 5 / 6 A (Ammeter)
or E (Energy) releases can be fitted on all ComPact NSX100 at 630 with performance B/F/H/N/S/L/R/HB1/HB2. They come with a display.
They include the basic LSI protection (MicroLogic 5), which can be supplemented by Ground G protection (MicroLogic 6).
They also come with measurement, alarm and communication functions.

Inputs/outputs module interface

The I/O (Input/Output) module for LV circuit breakers is part of the ULP system, and offers pre-defined or configurable functions and applications, to ensure requirements can be met precisely.
Two IO modules can be connected to the same ULP network.



SUMMARY



Modbus
Ethernet network
ULP port

PowerTag Energy 250-630A

PowerTag M250/M630 are modules for ComPact NSX, INS/INV and for TeSys GV5/GV6/GV7. They measure electrical quantities for 3P or 3P+N networks.

For a ComPact NSX, these modules are fitted directly downstream of the circuit breaker or the Vigi extension.

Smartlink SI B

The Smartlink SI B is an interface used for collecting data from the Smartlink Modbus and transmitting them over the Ethernet network, as well as concentrating the wireless sensors: PowerTag.

Smartlink Modbus

The Smartlink Modbus is used for transferring data from Acti**9** range devices via a Modbus serial connection.

PowerTag Energy 63A

PowerTag wireless energy sensors are measuring electrical quantities.

They are designed to fit directly on the Acti**9** or Multi9 range devices up to 63 A.

Com'X energy server

Com'X is the data concentrator for the building's switchboards. It brings together the electrical information, but also gas and temperature information, and provides configurable inputs/outputs. Finally, it sends real-time alerts to Facility Expert Software / Application, plus the building's other energy data.

IFM Modbus interface module

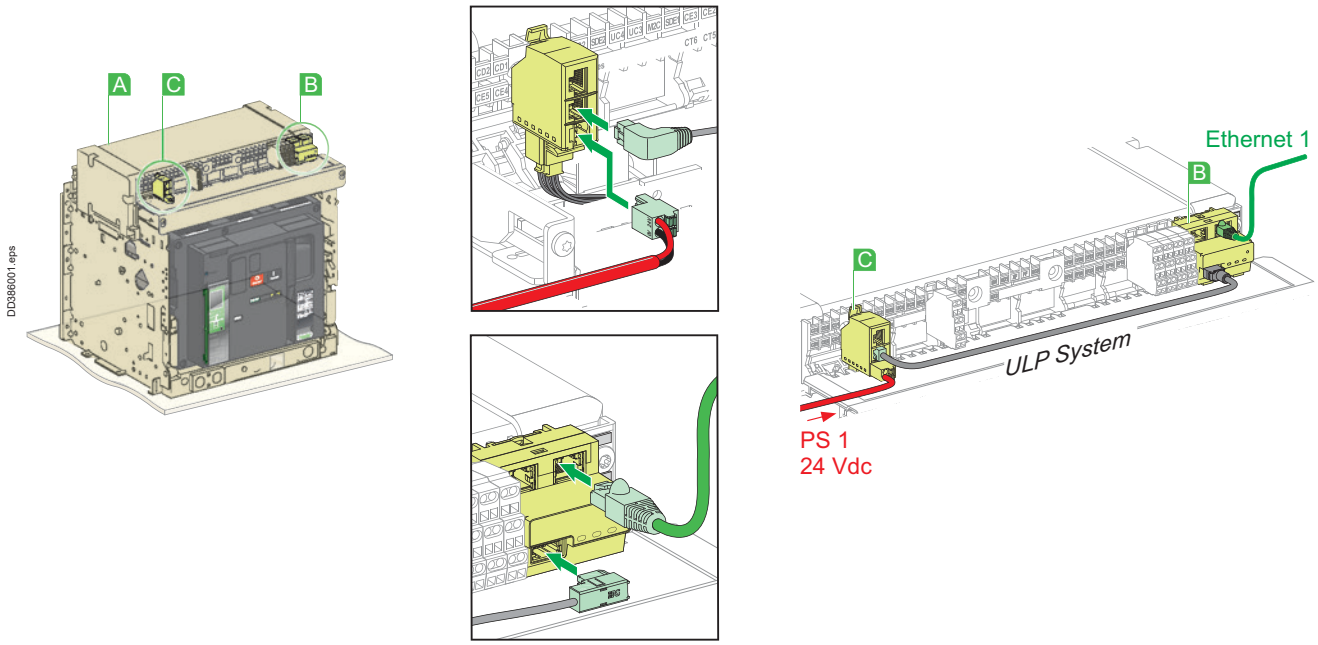
The main function of the IFM Modbus communication interface is to convert the ULP protocol into Modbus serial. This enables transmission of the circuit breaker's settings, such as voltage, current, power factors, energies and powers.

Ethernet IFE interface

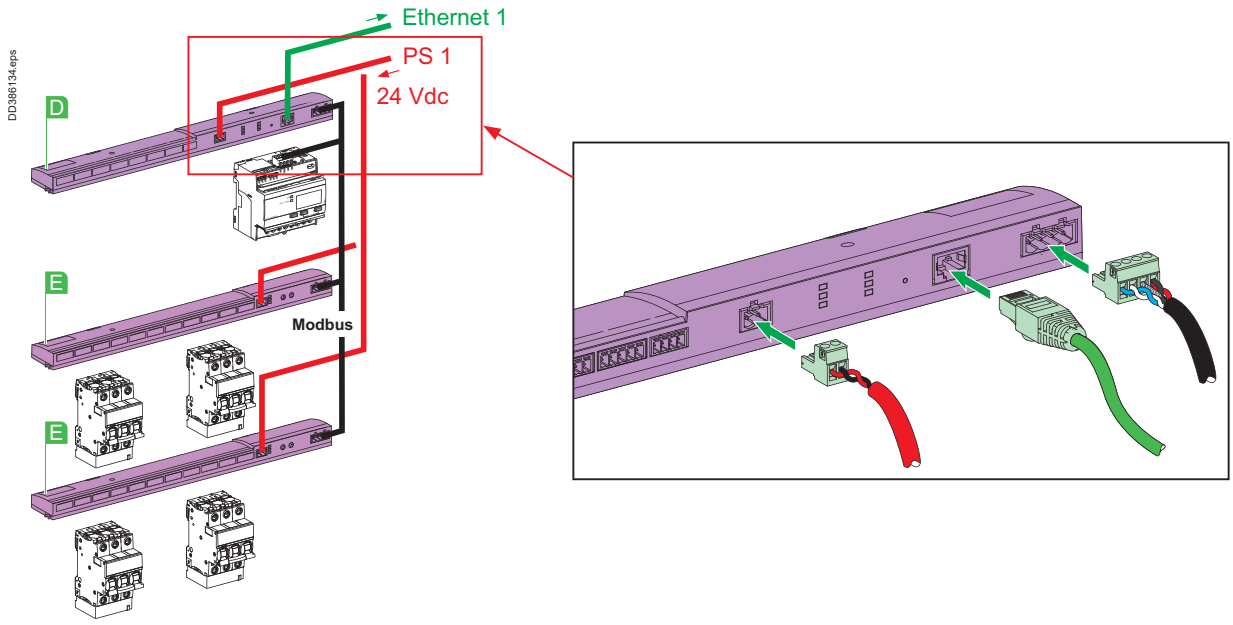
The Ethernet IFE interface for LV circuit breakers enables compatible devices (e.g. a MasterPact NT/NW/MTZ or a ComPact NSX) to be connected and accessible on the Ethernet network.

SUMMARY

1.3. Auxiliary and low-power circuits



Head circuit breaker functional unit

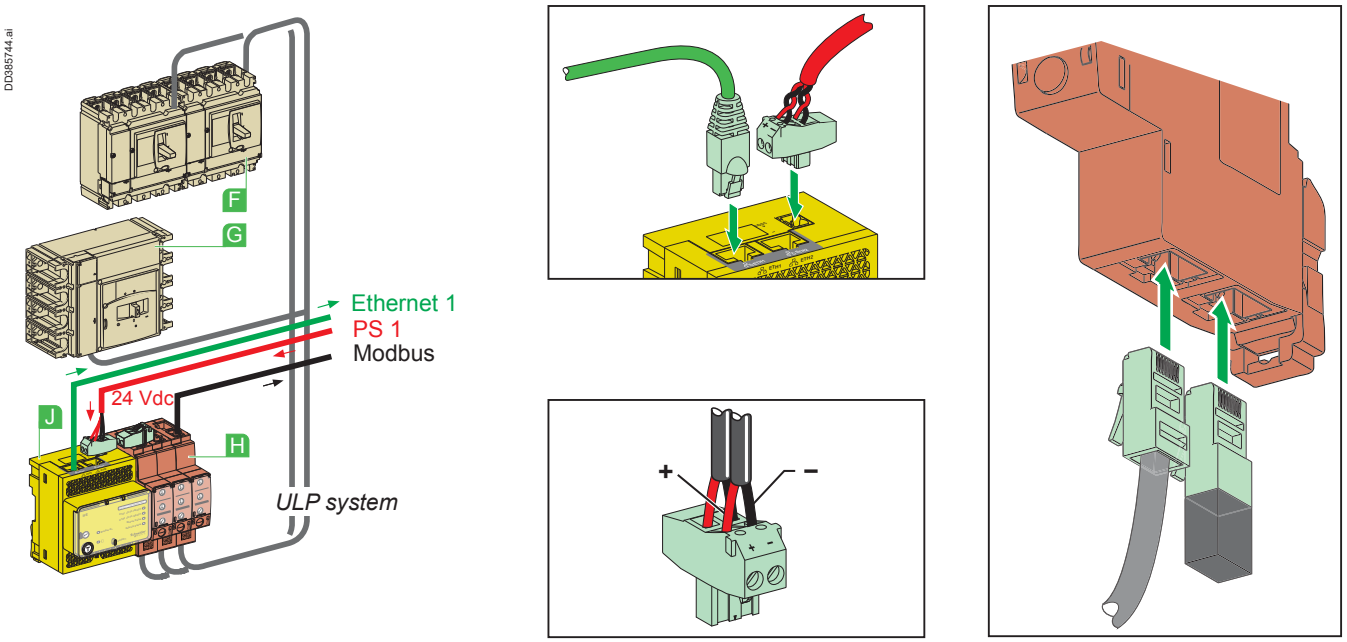


Final distribution functional unit

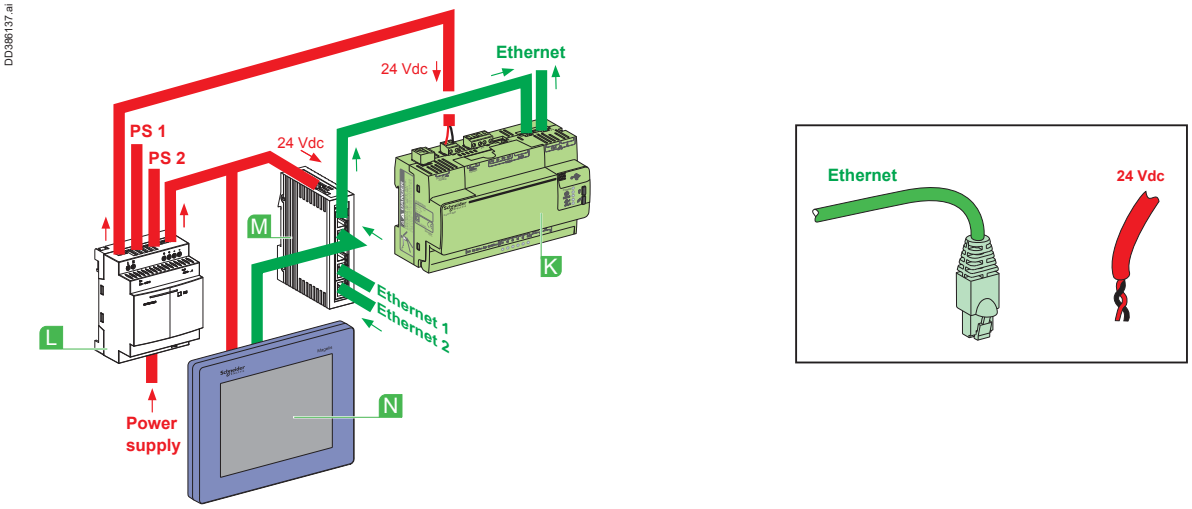
A MasterPact MTZ circuit breaker
B eIFE
C ULP port
D Acti**9** Smartlink SI B
E Acti**9** Smartlink Modbus

Modbus
Ethernet network
ULP system
24 V DC Power supply

SUMMARY



Secondary circuit breakers functional unit



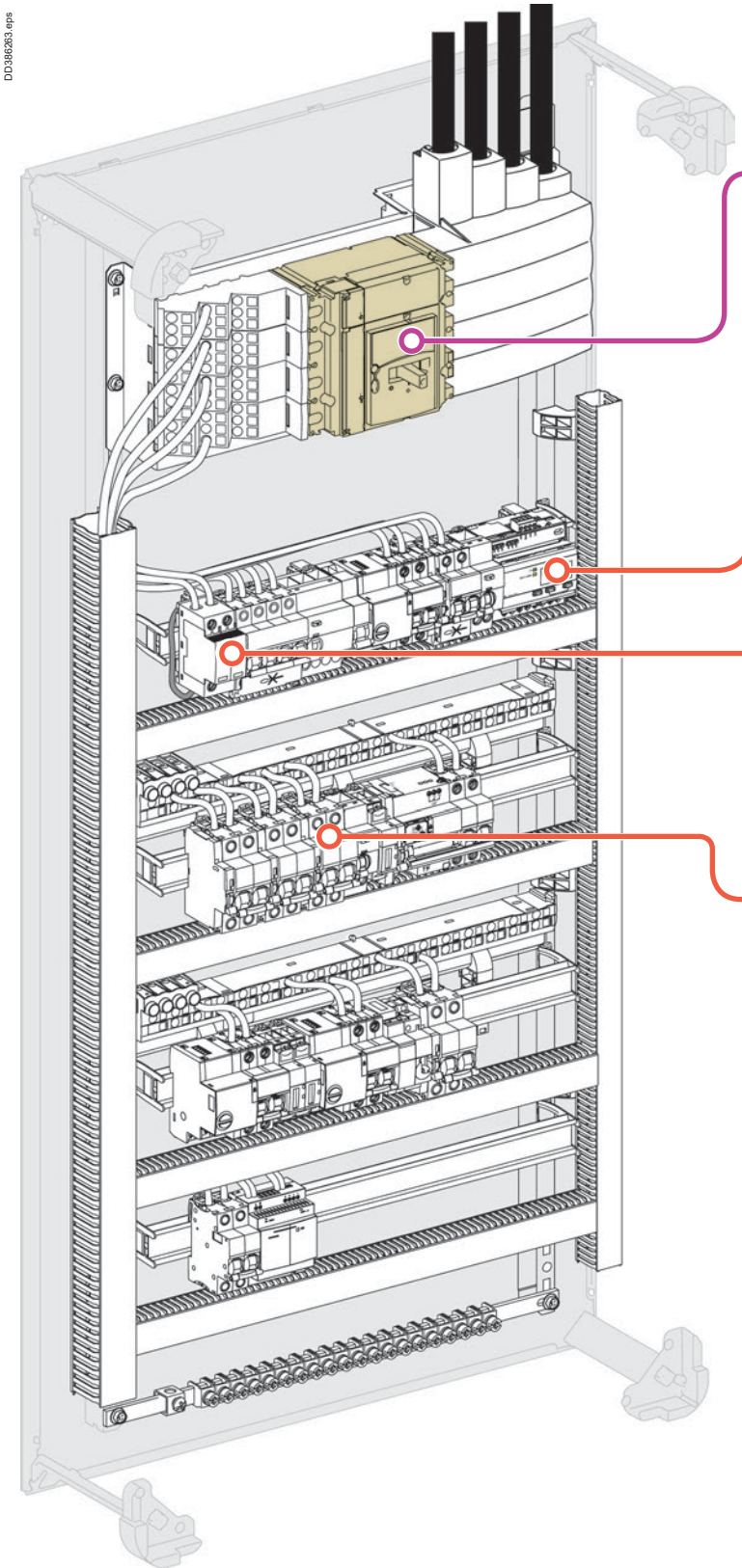
Data server and display

- F ComPact NSX250 circuit breaker
- G ComPact NSX630 circuit breaker
- H Modbus IFM interface
- J Ethernet IFE interface
- K Com'X 510 Energy server
- L 24 V DC power supply
- M Ethernet switch
- N Switchboard FDM128 local display unit

- Modbus
- Ethernet network
- ULP system
- 24 V DC Power supply

SUMMARY

2.1. Non-connected switchboard ⩽ 630 A



ComPact NSX TMD 160 A circuit breaker

The ComPact NSX TMD is a non-connected magneto-thermic circuit breaker, used here to protect the final distribution circuit breakers.
Should you wish to feed back measurement data relating to this circuit breaker, it will need to be coupled to an independent energy meter.

iEM 3250 energy meter

Acti9 range three-phase energy meter, mountable on DIN rail.

The iEM3250 meter provides a comprehensive view of both energy consumption and generation on-site, as well as measuring active and reactive energy transmitted and received.

Acti9 iQuick surge protection device

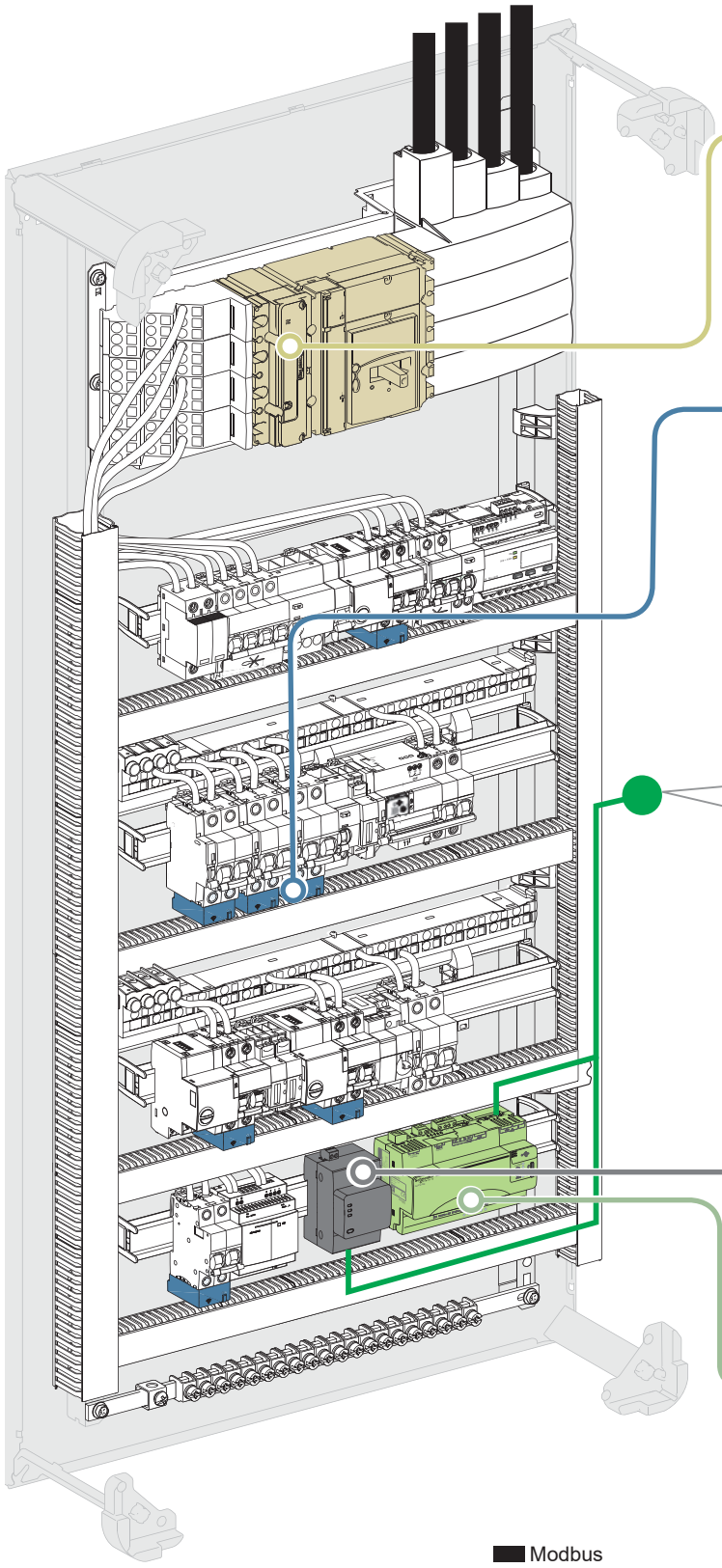
Surge protection device for protecting the switchboard against peaks up to 25 kA.

Acti9 circuit breakers for the final distribution

Acti9 range circuit breakers protect the terminal loads.

SUMMARY

2.2. Connected switchboard ⩽ 630 A



PowerTag Energy 250-630A

PowerTag M250/M630 are modules for ComPact NSX, INS and INV. They measure electrical quantities for 3P or 3P+N networks, and feed back this information via radio to a Smartlink SI.

For a ComPact NSX, these modules are fitted directly downstream of the circuit breaker or Vigi extension.

PowerTag Energy 63A

PowerTag wireless energy sensors are measuring electrical quantities.

They are design to fit directly on the Acti **9** or Multi 9 range devices up to 63 A.

RJ45 socket

The switchboard's external RJ45 socket enables safe connection point, without having to open the doors. Configuration, supervision and control of the devices can be carried out in this way.

PowerTag Link

PowerTag Link is the data concentrator for the PowerTags, used to transmit data via an Ethernet connection to the com'X or building supervision system (EMS/BMS).

It comes with embedded web pages used for configuring the PowerTags and alarms, as well as real-time display of the measured quantities. This configuration can also be obtained with EcoStruxure Power Commision .

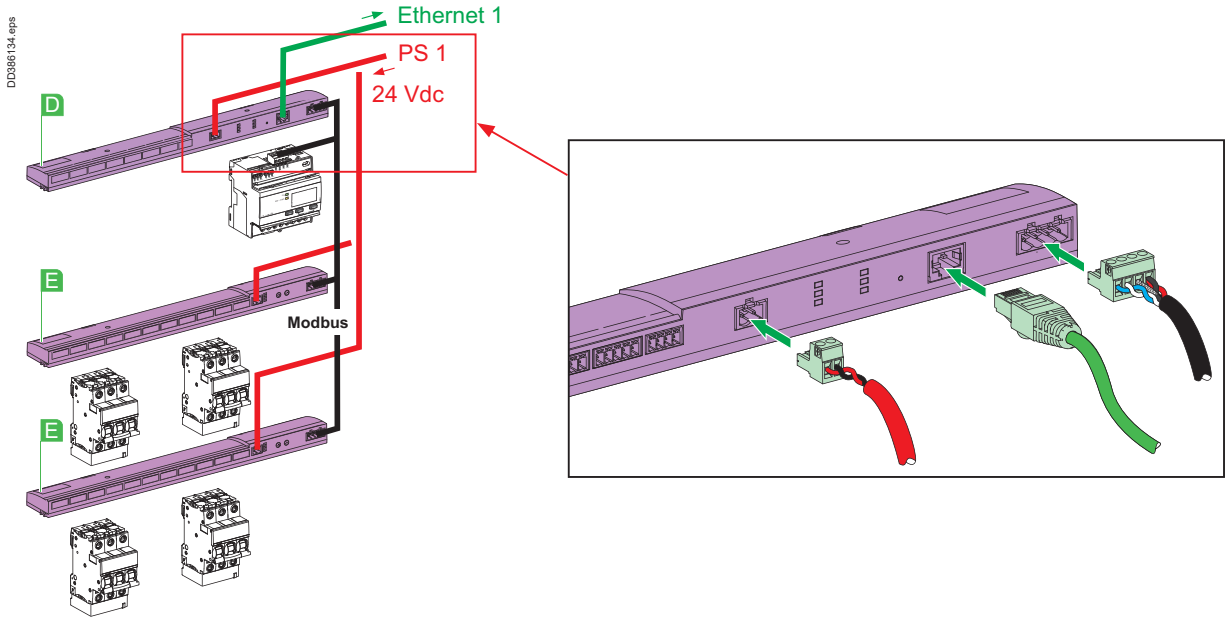
Com'X energy server

Com'X is the data concentrator for the building's switchboards. It brings together the electrical information, but also gas and temperature information, and provides configurable inputs/outputs. Finally, it sends real-time alerts to Facility Expert Software / Application, plus the building's other energy data.

Modbus
Ethernet network

SUMMARY

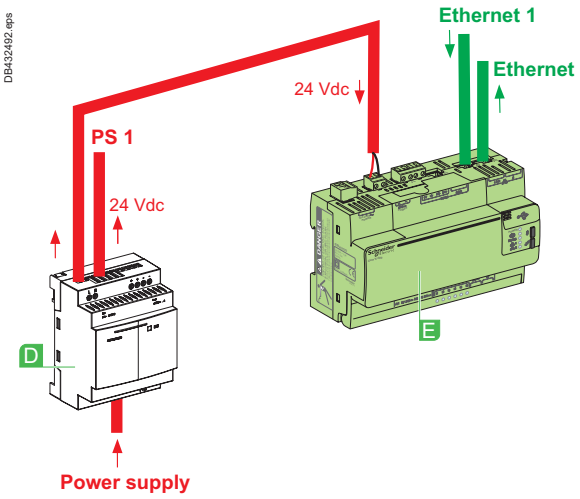
2.3. Auxiliary and low-power circuits

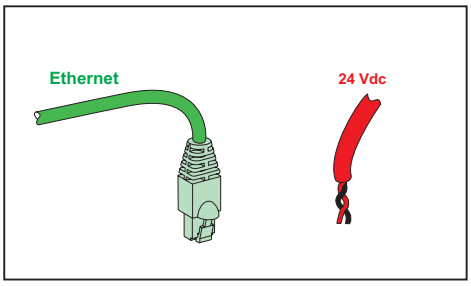


Distribution functional unit

D Smartlink SI B	Ethernet network
E Smartlink ModBus	220 V AC power supply

SUMMARY





Data server

D 24 V DC power supply

E Com'X510: energy server

Modbus

Ethernet network

24 V DC Power supply

SUMMARY

3.1. Positioning

3.1.1. Positioning rules

Standards **Good practice**

IEC 61439-1 Table 6

1 Define the layout of devices in the column based on constraints related to:
- the entry and exit points of the customer's wires (from the top, the bottom of the column or other specific configuration) and the position of the main busbars in order to have the shortest possible connections,
- the routing of prefabricated wires or connections at the input and output of the switchboard,
- the space required for the device to work correctly (volume of device, safety perimeter, connection pads, radius of curvature of wires, control units, etc.),
- the accessibility of the various control units and connection zones (side, rear, etc.) of devices,
- heat dissipation of devices that contributes to increasing the internal temperature of the column,
- the mutual thermal and electromagnetic influence between the main busbars and the devices,
- the maintenance or upgrade of the system (for example, enable the opening of the motorised control of a circuit breaker).

The resulting layout of the switchgear should also be studied to optimise connection zones, busbars, enclosure sizes, etc.

IEC 60480

2 Place devices with a high heat dissipation in the upper part of the switchboard to:
- avoid heating the entire switchgear installed in the column,
- maintain the performance of devices of lower power placed at the bottom to keep derating to a minimum,
- enable greater legibility of the electric layout.

Tip

To maintain the internal temperature of the switchboard within the operating limits of most devices (< 70 °C), a forced ventilation of cubicles may be necessary, to limit temperature derating, in order to optimise the volume of copper and reduce the cost.

3 Several devices with a high heat dissipation may be installed in the same column if:
- the maximum internal temperature is observed (below the manufacturer's recommendations),
- the capacity of the busbars to convey the rated current is observed (see derating tables),
- the expected performance of each device is reached (see derating tables).

IEC 61439-1 Table 6

4 Comply with the temperature rise limits recommended by standard IEC 61439-1.

SUMMARY

Standards Good practice

IEC 61439-1
Table 6

5 To avoid serious malfunctions, do not install devices that are sensitive to temperature rises (e.g., control/command devices) near devices with high heat dissipation.

It is recommended to separate the switchboard into two zones (high-power devices and low-power devices) to improve the efficiency of the installation.

Installing the communicating devices at the bottom of the switchboard is recommended (see example given below).

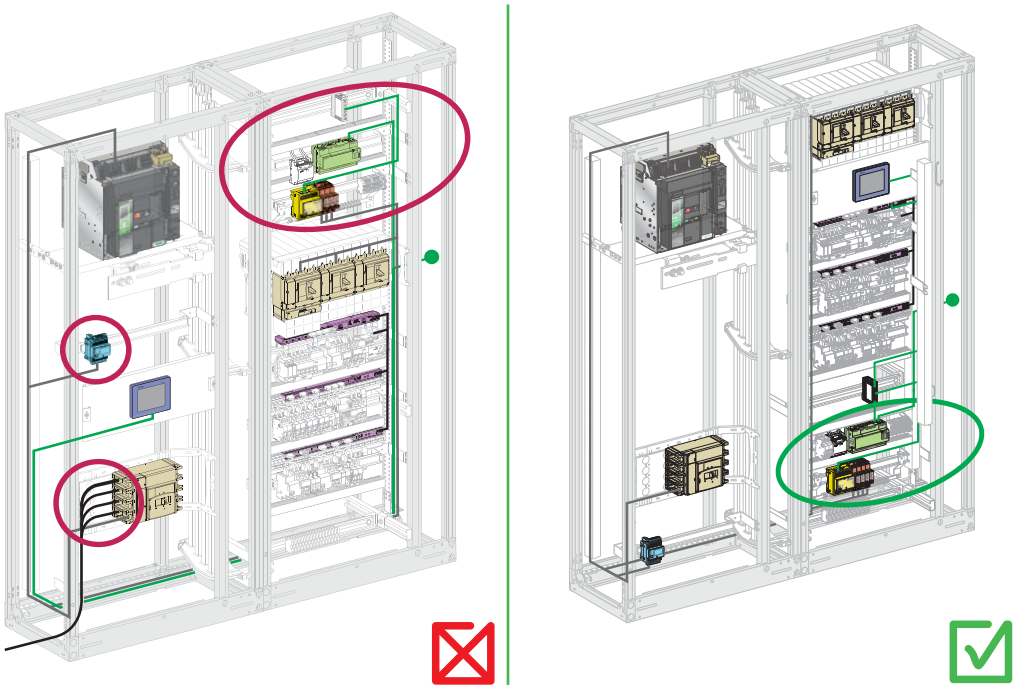
Tip

For the electromagnetic compatibility of the switchboard, the use of shielding sheets for all communicating devices is recommended.

Tip

Use separate routings for power cables and communication cables is recommended.

Example



IEC 61439-1
IEC 60947-x

6 Keep within the safety perimeter defined by the manufacturer for each device and make sure they are working properly:
- minimum distance between two devices,
- minimum distance of the device from surrounding components (frame, plate, etc.),
- minimum distance from powered live busbars.

Tip

For electrical panels with a high operating voltage of 690 V, you may have to install additional barriers to reduce the risk of sparking in case of a short-circuit.

SUMMARY

Standards Good practice

Tip

The safety perimeter may be reduced by adding a cover, terminal cover, barrier, etc.

7 The safety perimeter is usually stated by the manufacturer in the device technical manual or the catalogues.

8 The safety perimeter is a zone where it is forbidden to:
- route wires other than those intended for the connection of the device itself,
- install other devices.

9 Connect the devices with care.
In particular:
- do not strip insulated flexible busbars and connection cables too much, to avoid all risk of sparking between phases in the event of a short-circuit,
- position the lugs correctly on the connection pads,
- if necessary, install barriers, terminal covers or insulating sleeves between each phase.

Sleeves used for marking wires do not act as insulators.

IEC 61439-1 § 8.5.5

10 Position measurement devices requiring a visual inspection at a height comprised between 0.2 m and 2.2 m from the ground. Their exact position must be determined in consultation with the switchboard user.

Example

SUMMARY

3.2. Circuit breaker equipped with communicating MicroLogic protection

3.2.1. General information on the ULP bus

The ULP system is used to improve the functions of the ComPact NSX, ComPact NS, MasterPact NT/NW and MasterPact MTZ circuit breakers. It transforms them into metering and supervision devices, which reinforces energy efficiency and can:

- Optimise energy consumption by zone or application, according to load peaks or priority zones.
- Improving electrical device management.

This is based on intelligent modular units, known as IMUs. These modular units are defined as the assembly comprising the circuit breaker, its internal communication components (e.g. the MicroLogic release) and external ULP modules (an IO module, for example), connected to a communication interface, which will vary according to the circuit breaker type (in the case of the MTZ, this interface will be eIFE).

Note: the ULP system in the switchboard should be designed in accordance with the recommendations of the ULP System User Guide (ref. DOCA0093FR), in particular taking into account the compatibility of the hardware and firmware of the ULP modules, the ULP system connection and power supply rules and the architectures recommended by Schneider Electric.

3.2.2. Connecting the MasterPact MTZ circuit breaker to the ULP system

Here we present the MasterPact MTZ connection to the ULP bus. For the other circuit breaker ranges, please refer to the ULP guide.

Presentation

Use the RJ45 male/male ULP lead to connect the MasterPact MTZ circuit breakers to the ULP system. The circuit breaker should be equipped with a ULP port module.

ULP port module

Depending on the circuit breaker type, the ULP port module is supplied:

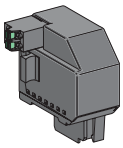
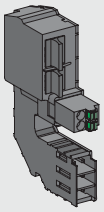
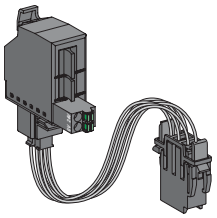
- as standard (on MasterPact MTZ2/MTZ3 withdrawable circuit breakers)
- as an option (on MasterPact MTZ1/MTZ2/MTZ3 fixed circuit breakers and MasterPact MTZ1 withdrawable circuit breakers). It is then fitted with the circuit breaker's terminal blocks.

The ULP port module:

- powers the MicroLogic X release,
- includes the ULP line termination,
- enables connection to external ULP modules, such as IO or IFE interface modules.

On MasterPact MRZ withdrawable circuit breakers with optional EIFE interface, the ULP port module:

- powers the EIFE interface,
- connects the EIFE interface to the other IMU modules (e.g. IO module).

Illustration	Description	Reference
 DB421311.eps	ULP port module for MasterPact MTZ1 fixed circuit breaker	LV850063SP
	ULP port module for MasterPact MTZ2/MTZ3 fixed circuit breaker	LV850061SP
 DB421312.eps	ULP port module for MasterPact MTZ1 withdrawable circuit breaker	LV850064SP
 DB421313.eps	ULP port module for MasterPact MTZ2/MTZ3 withdrawable circuit breaker	LV850062SP

SUMMARY

3.2.3. Connecting the ComPact NSX circuit breaker to the ULP system

Here we present the ComPact NSX connection to the ULP bus.
For the other circuit breaker ranges, please refer to the ULP guide.

Presentation

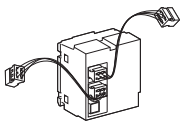
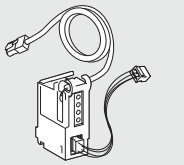
The minimum equipment requirements for the circuit breaker are a networked MicroLogic or a BSCM (Breaker Status Command Module).

Use the NSX shielded cable to connect the ComPact NSX circuit breakers to the ULP system (IFM or IFE).

The ComPact NSX ULP system receives a 24 V DC power supply via the IFM or IFE.

ULP port module

For more details on all the configurations, consult the ULP guide or the ComPact NSX user manual.

Illustration	Description	Reference
 DB430844.ai	BSCM (Breaker Status command module)	LV434205
 DB430845.ai	NSX shielded cable	L = 0.35 mm LV434200 L = 1.3 mm LV434201 L = 3 m LV434202

3.2.4. ULP line termination

The ULP modules at the end of the ULP line receive a ULP line termination (reference TRV00880) on the ULP's unused RJ45 connector.

Example of ULP line termination on the IFE interface:

DB111445.ai 

Place the ULPs equipped with an internal ULP line termination on the end of the ULP line, i.e.:
- BSCM or MicroLogic 5 or 6 release for ComPact NSX circuit breakers,
- ULP BCM for ComPact NS or MasterPact NT/NM circuit breakers,
- ULP port module for MasterPact MTZ circuit breakers.

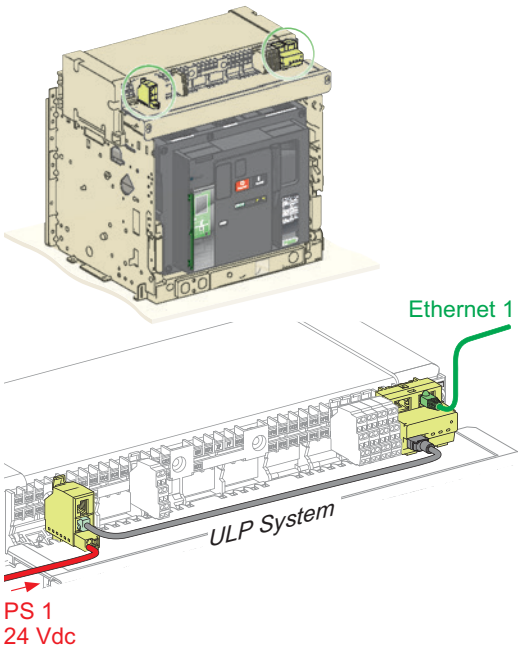
Note: in an architecture comprising an EIFE interface connected to a ULP port module, the ULP port module marks the end of the ULP line.

SUMMARY

3.2.5. Connecting the MTZ to the Ethernet

For more details on connecting other circuit breakers, please refer to the ULP System User Guide (ref. DOCA0093FR) available on the Schneider Electric website.

DD386133.eps



DB430817.eps

SUMMARY

DD086014.eps

IFMV2_Image.eps

3.2.6. Communication interface for circuit breakers equipped with communicating MicroLogic protection

IFM: Modbus communication interface

Modbus addresses

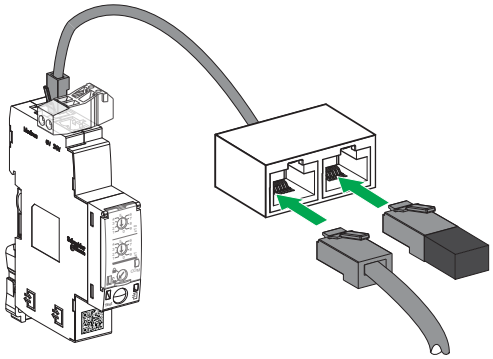
Modbus addresses should be set with the two rotary switches (X1 and X10 symbols). The X10 symbol refers to the tens and the X1 symbol to the units.To set the Modbus address to 4, proceed as follows:

IFM rotary switch:

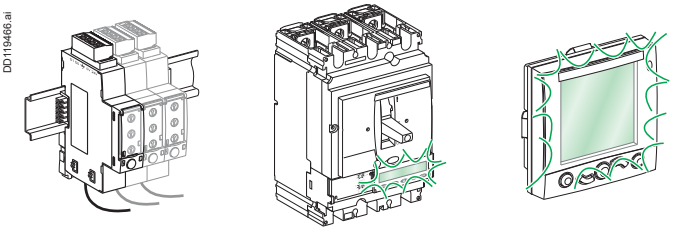
- set the X10 switch to 0
- set the X1 switch to 4
- turn the padlock switch to the unlocked position.

Verify the connection between the IFM and the circuit breaker: press the test button on the IFM and visually check that the associated MicroLogic trip unit flashes simultaneously (ON: 1s/OFF: 1s):

DB430830.ai



DD119466.ai



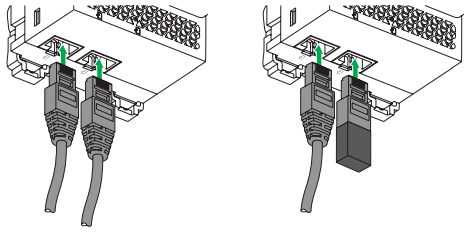
Note: if an FDM121 is used, its screen also flashes.

DB418935_68.eps

IFE: Ethernet communication interface

In this application the IFE is used both as an interface (Incomer FU) and as a gateway (Feeder FU). This difference does not affect their installation in the switchboard or wiring to other devices. In particular, the IFMs may be stacked on the IFE using dedicated connectors, thereby saving on cables and space inside the switchboard (schematic opposite). In this case, the IFE is the network Modbus master and the IFMs are the slaves; their addresses are configured using rotary selectors as explained above. Thanks to this stacking system, the modbus addresses become the only modbus settings requiring configuration: the serial line settings are automatically detected by the stacked devices.

DB417263.eps



References available for IFE:

IFE: Ethernet interface & Gateway

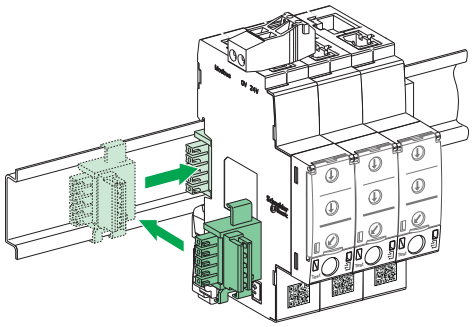
Ref: LV434011 for Modbus to Ethernet

IFE: Ethernet interface

Ref: LV434010

for circuit breakers (does not act as a gateway)

DB430828.ai



ULP Connection

All connection configurations require the circuit breaker ULP cord. An insulated ComPact NSX cord is mandatory for system voltages greaterthan 480 V. If the second ULP RJ45 connector is not used, it should be closed with a ULP terminator.

Check the connection between the IFE, IO module application and circuit breaker using the "ULP test button". Press the test button on the IFE and visually check that the IFE, IO module application and associated MicroLogic trip unit flash simultaneously (ON: 1 ms/OFF: 1 ms).

SUMMARY

EIFE: Ethernet communication interface embedded in the withdrawable MasterPact MTZ

In this application the EIFE is used to connect MasterPact MTZ on Ethernet. It retreives the data through the embeded ULP port. The EIFE allows to get the position of the craddle (craddle management).

Ref: LV851001 for MasterPact MTZ with Craddle management.

3.2.7. Specifications of Ethernet communication interfaces

Ethernet Connection

The IFE / EIFE has two Ethernet ports, E1 and E2.

Ethernet cabling

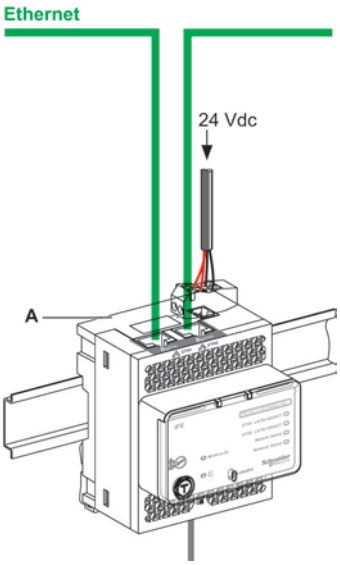
100 base T - 2*RJ45 - E1 and E2.

Ethernet 1 and Ethernet 2 ports act as a non-manageable switch.

Note: IFE / EIFE does not support redundant Ethernet protocol (RSTP, MRP, Hyper Ring, etc.). IFE / EIFE provides an Ethernet daisy chain connection.

If a daisy chain loop is requested, an Ethernet loop manager should be used.

Note: Be careful with ULP and Ethernet connections as both use RJ45 connectors. The ULP system supplies 24 V DC power to all connected devices. Incorrect connection can cause serious damage.



SUMMARY

DD386016.eps

3.2.8. Inputs/outputs module

The IO module provides predefined applications for circuit breaker management. It is an Input/Output interface for ComPact and MasterPact circuit breakers.

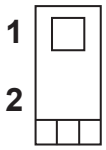
PB115793.eps

IO Module Identification Setting

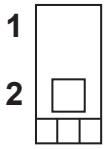
Two IO modules can be used for the same breaker connected to a ULP system (IO Module 1 or IO Module 2).

When 2 IO modules are connected in the same ULP network, the 2 IO modules are differentiated by the position of the dip switches located on the bottom of the IO module.

Dip switch in position 1 for IO module 1 (factory setting).



Dip switch in position 2 for IO module 2.



SUMMARY

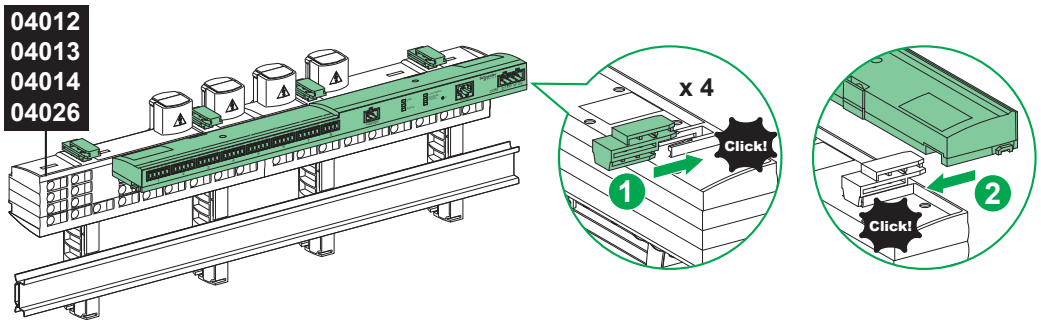
3.3. Smartlink communication system

The Smartlink range offers different types of products: Smartlink SI B, PowerTag Link and Smartlink Modbus.

Smartlink SI B and Modbus communicate with the MCBs from the Acti9 and Multi9 ranges via connector Ti24, which connects their communication channels to the circuit breakers.

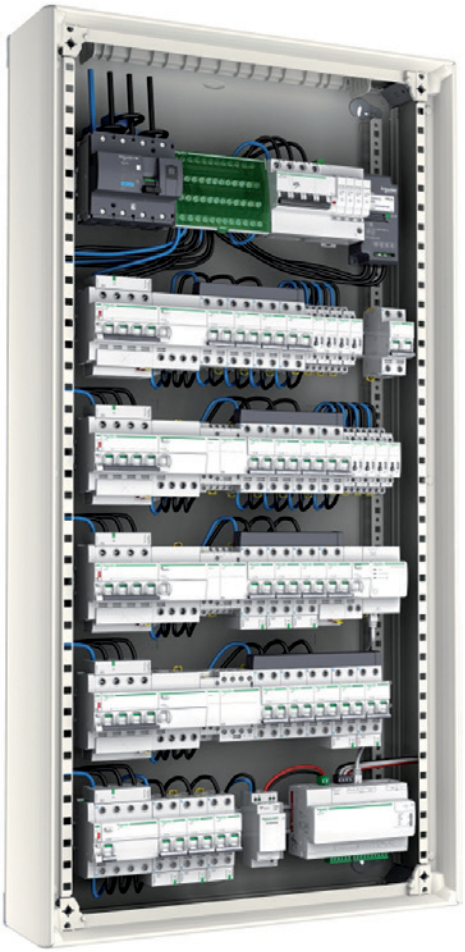
3.3.1. Smartlink SI B and Modbus with Linergy FM

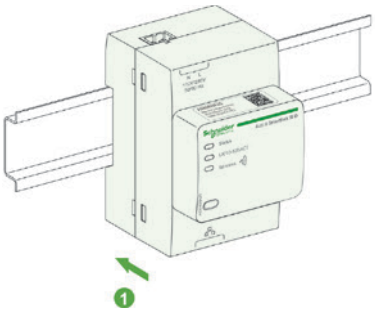
DD119461.ai

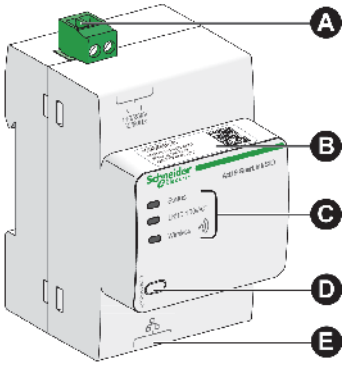


3.3.2. PowerTag Link

DB430827.eps







A Power supply connector 230 V AC
B Default IPv4 address
C Communication status indicators
D Reset button
E RJ45 Ethernet connection

Installation with Linergy FH PowerTag Link and Com'X.

SUMMARY

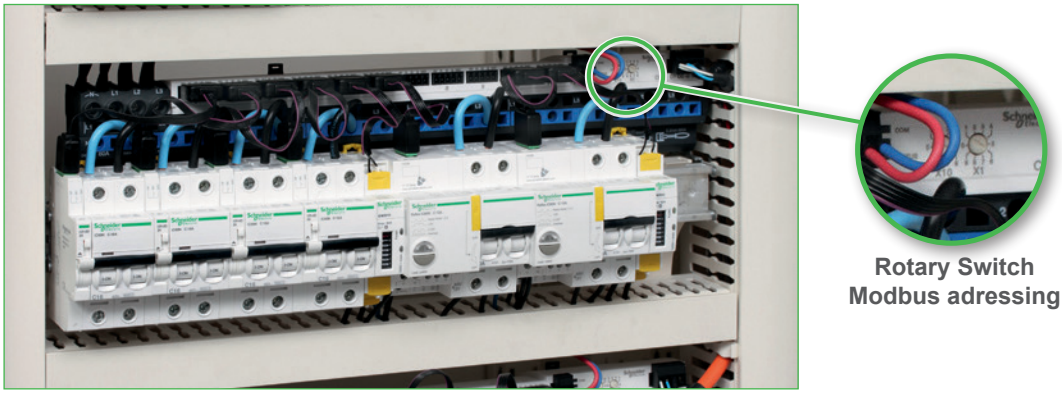
3.3.3. Smartlink Modbus

Ti24 connector
11 input/output channels
- Pin 1: 0 V
- Pin 2: I1 Input 1
- Pin 3: I2 Input 2
- Pin 4: Q Output
- Pin 5: +24 V DC

Modbus slave cabling
RS485 Modbus
- Pin 1: D1 Modbus
- Pin 2: D0 Modbus
- Pin 3: shielding
- Pin 4: common/0 V

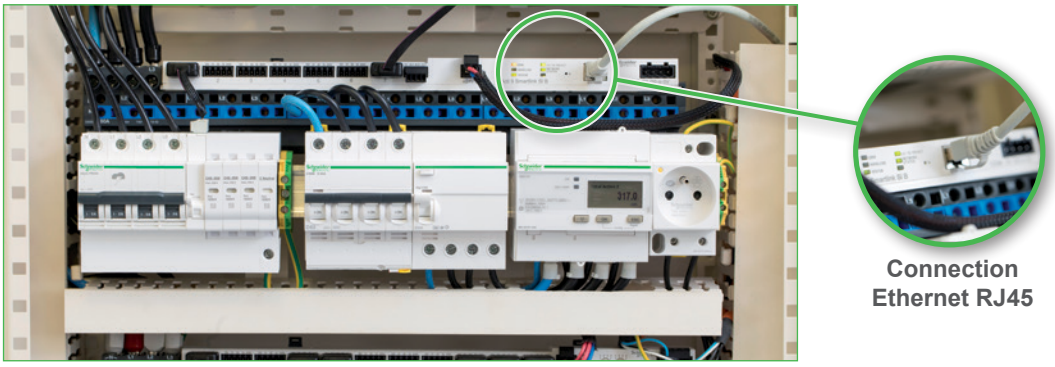
Modbus slave addressing with rotary switch
(Modbus address should be unique).

PB113841_158.eps



Rotary Switch Modbus adressing

DB430824.eps



Connection Ethernet RJ45

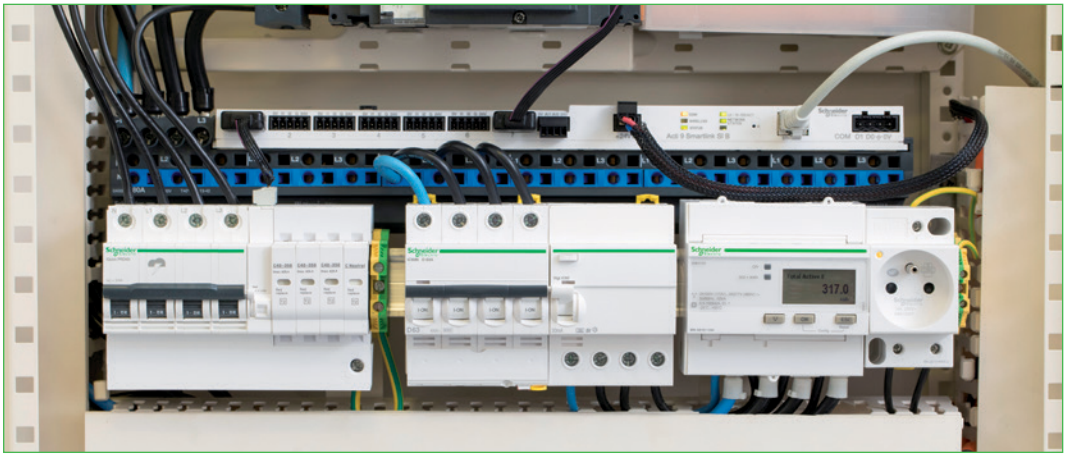
3.3.4. Smartlink SI B

Ti24 connector
7 input/output channels
- Pin 1: 0 V
- Pin 2: I1 Input 1
- Pin 3: I2 Input 2
- Pin 4: Q Output
- Pin 5: +24 V DC

Ethernet Cabling
100 base T - 1* RJ45
Wireless Concentrator
Power tag
Until 20 PowerTag

Modbus master cabling
RS485 Modbus
- Pin 1: D1 Modbus
- Pin 2: D0 Modbus
- Pin 3: shielding
- Pin 4: common/0 V

DD386013.eps



SUMMARY

3.4. PowerTag system

The PowerTag can be installed upstream or downstream of a protection device, and is simple and intuitive to set up: simply feed the cable wires through the sensor and connect it to the terminals of the protection device in the circuit breaker.

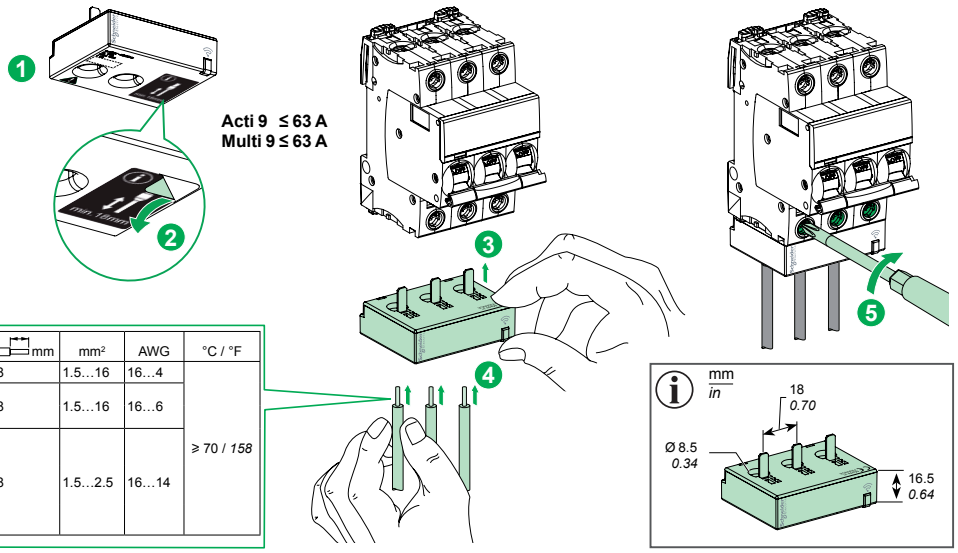
3.4.1. PowerTag Energy Monoconnect 63 A installation

Two rules should be scrupulously followed:

- Consider aligning the neutrals on the PowerTag and circuit breaker: on the PowerTag, neutral is indicated on the front by the letter N.
- Strip an 18 mm section of the wires before screwing them into the circuit breaker.

For more information, please refer to the installation manual, available on the Schneider Electric site.

DD119462.ai



	mm	mm²	AWG	°C / °F
	18	1.5…16	16…4	⩾ 70 / 158
	18	1.5…16	16…6	
	18	1.5…2.5	16…14	

DB430816.eps

A9MEM1521.eps

SUMMARY

3.4.2. PowerTag PhaseNeutral 63A Installation

PowerTag for Acti9 and Multi9 PhaseNeutral offers:

- "Single-terminal" circuit breakers,
- RCDs and switches at pitch of 9 mm between phase and neutral,
- rating less than or equal to 63 A.

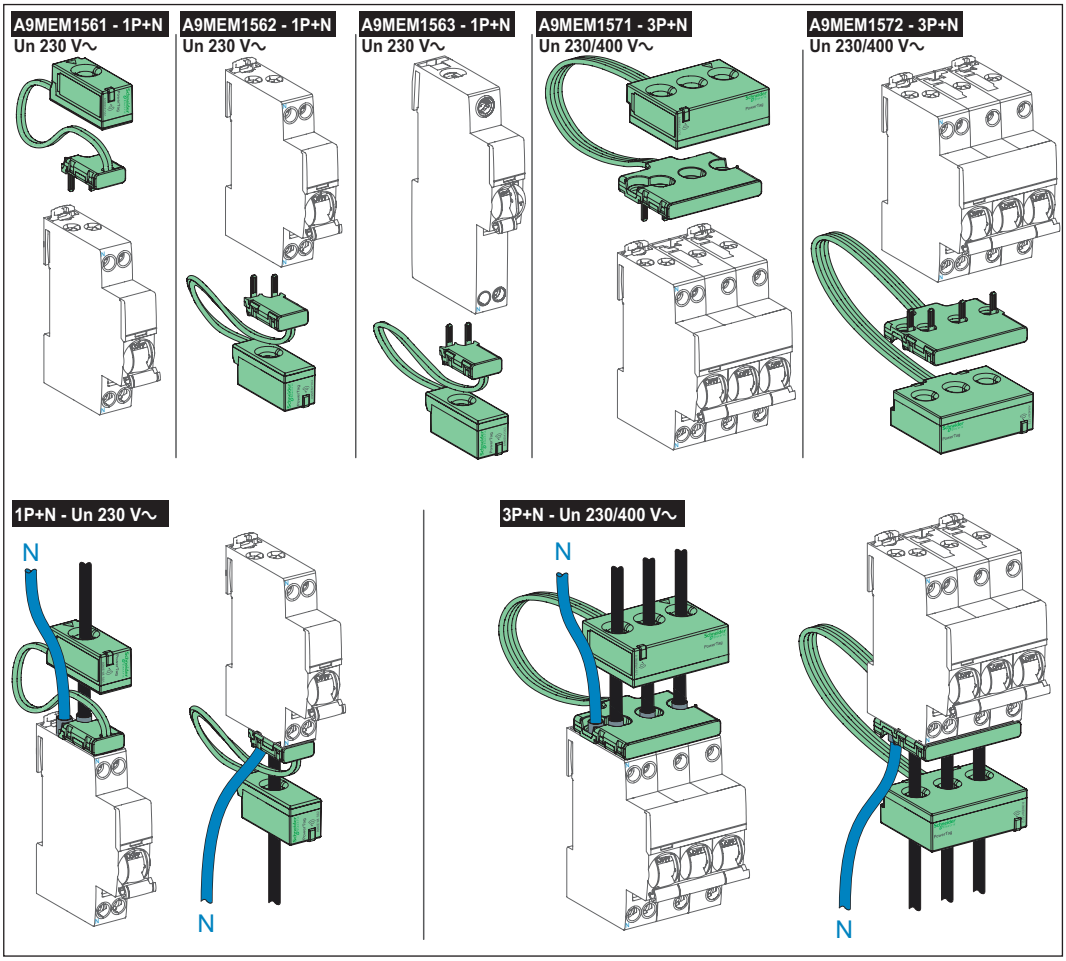
Designed to fit the following devices: DT40, iDPN, C40, i DPN Vigi.

For additional information and the list of Schneider Electric compatible devices and concentrators.

PowerTagPhase.eps

PowerTag PhaseNeutral 63A Installation

DB436338.eps



SUMMARY

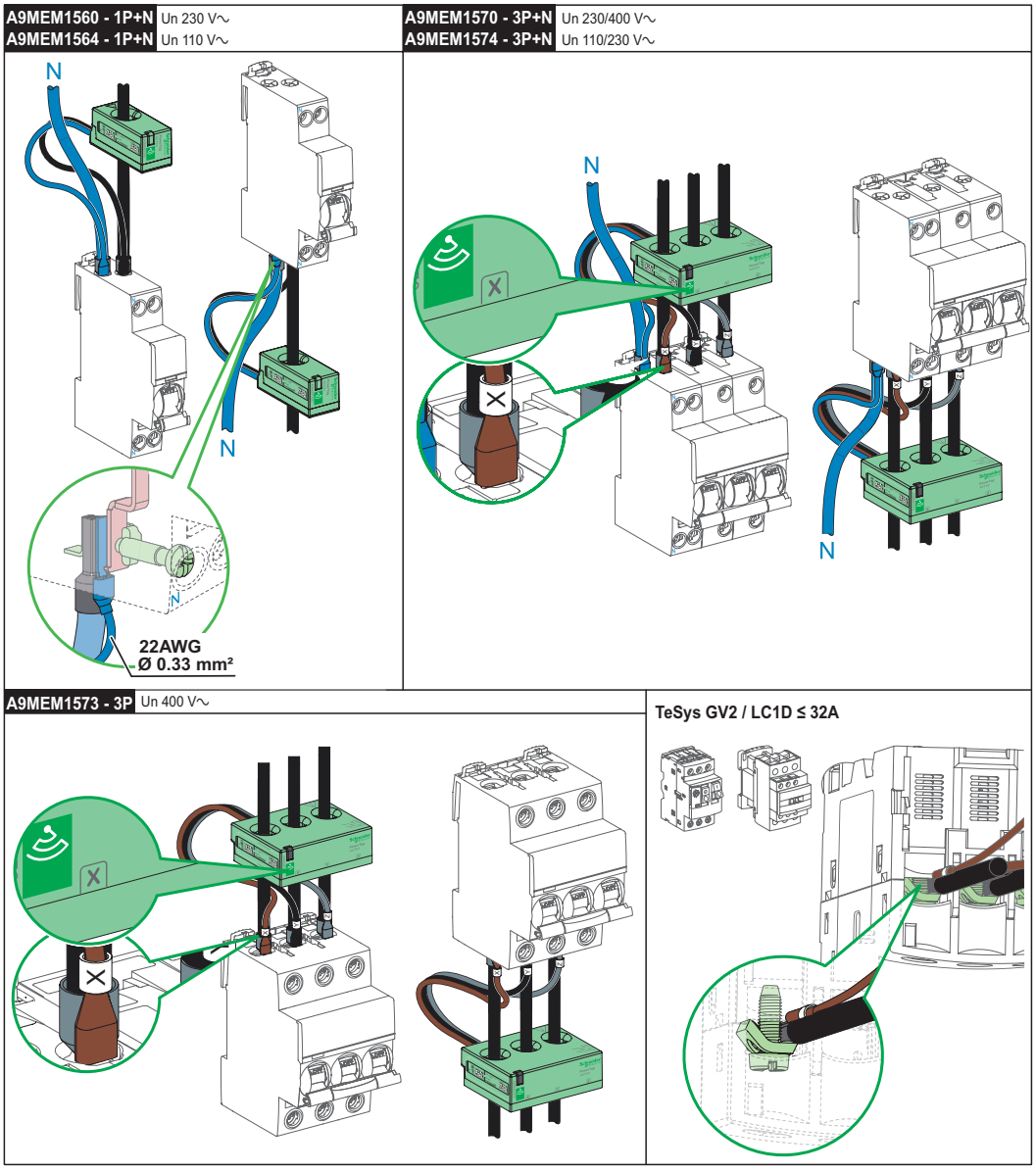
3.4.3. PowerTag Flex 63A Installation

PowerTag Flex for other devices and specific installations, rating less than or equal to 63 A.
Designed to fit the following devices: Vigi iDT40, Vigi iC40, Vigi iC60, iC60 double terminal, iID double terminal.
For additional information and the list of Schneider Electric compatible devices and concentrators.

Powertag Flex.eps

PowerTag Flex 63A Installation

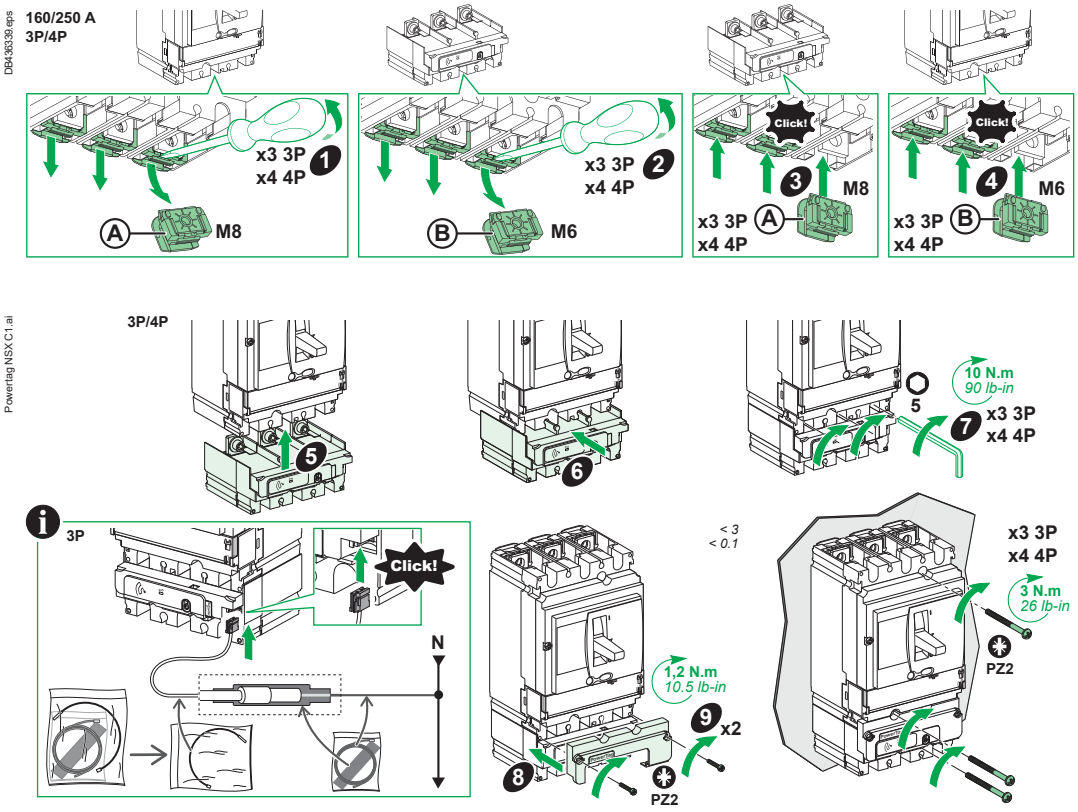
DB429468.eps



SUMMARY

3.4.4. Connecting PowerTag Monoconnect 250/630 A

PowerTag M250 (ComPact NSX100/160/250, TeSys GV5/GV7)

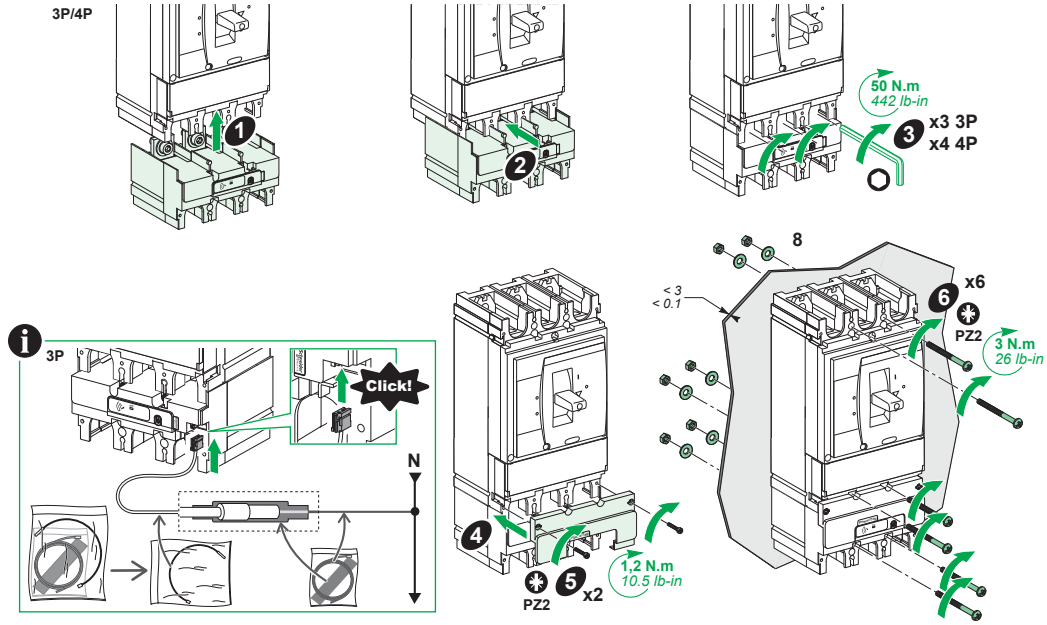


Always fitted downstream of the circuit breaker.

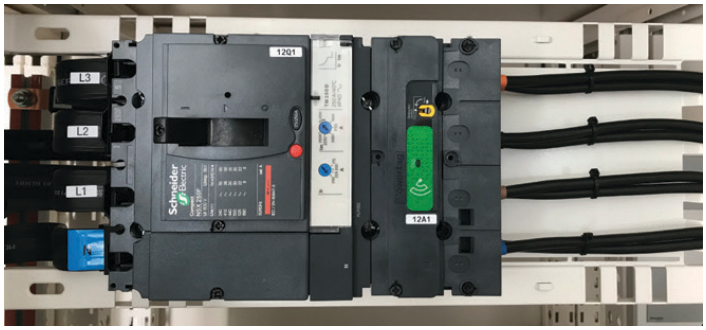
SUMMARY

PowerTag M630 (ComPact NSX400/630, TeSys GV6)

Powertag NSX C2.ai



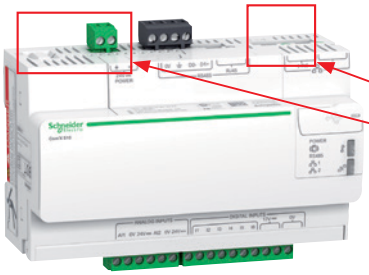
DB430835.eps



SUMMARY

3.5. Com'X

PB114327_60_1.eps



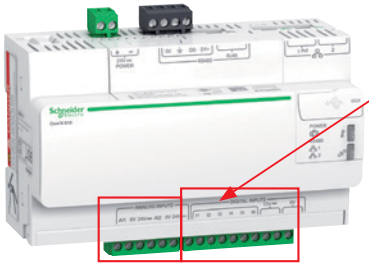
Wiring of Power Supply:

- Power Over Ethernet (PoE).

No external power supply required, easiest installation.

- 24 V DC (+15 %, -20 %).

PB114327_60_1.eps



Digital and analog inputs

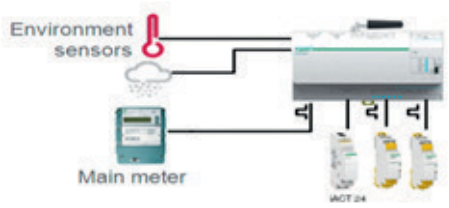
No additional I/O block required.

- 6 digital Inputs

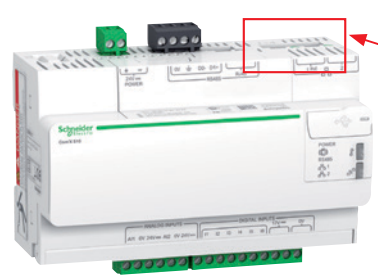
WAGES and pulse meters can be connected directly to Com'X for simple architecture:

- ☐ With LED indication of status and pulse reception
- DI can be powered directly by Com'X: one 12 Vdc power output available for pulse metering contact or status reading.
- 2 analog inputs:
- ☐ Accuracy 1% for PT100 or PT1000 or 0.5% for 0-10 V and 4-20 mA
- ☐ AI can be powered directly by Com'X: one 24 V DC power supply output available for sensors.

DB418236_1.eps



PB114327_60_1.eps



Ethernet Port

2 Ethernet ports can be configured:

- ☐ As a switch: one IP address for both E1 and E2 ports
- ☐ As separate interface: E2 data acquisition and E1 data publication.

DB418237_1.ai

PB112044-50R.eps

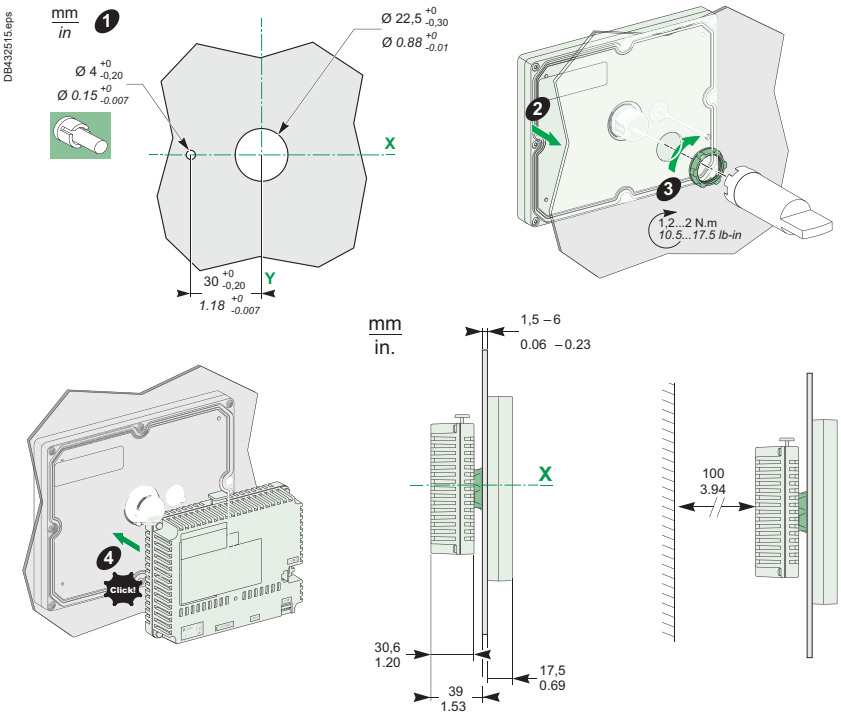
Wifi module

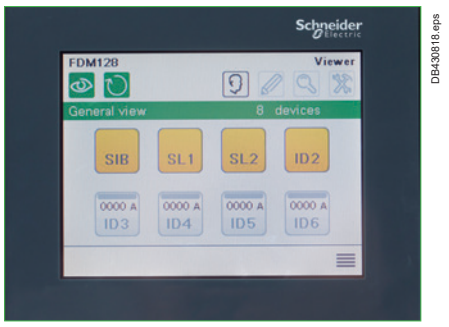
Using this Wifi module as an access point to the Com'X web pages.

SUMMARY

3.6. Local display: FDM128

The FDM128 is mounted on a door or panel, at chest height, approx. 1.65 m.





3.7. Auxiliary power supply and Ethernet switch

24 V DC auxiliary power supply devices and Ethernet switch are key components in digitized switchboards to ensure the availability of communication network and monitoring/ control functions.

Ethernet switch

In the Hypermarket application two switches are used to connect all communicating devices and displays of the electrical installation.

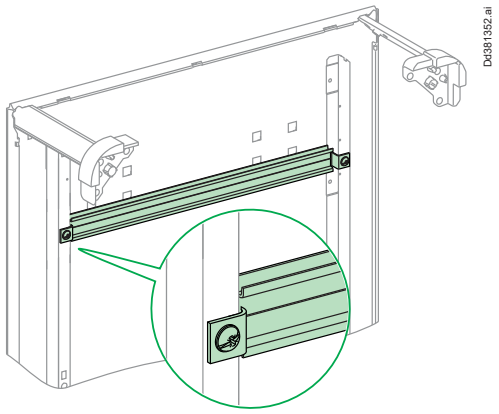
The Ethernet switches used are non-manageable.
Ref: TCS ECU 053FN0.

The daisy chain topology for the Ethernet communication network allows to optimize the number of switches.

To increase the availability of the communication, a star topology is recommended: one single IFE device communication loss does not impact the other devices. But the cost of the installation increase too.

Auxiliary power supply 24 V DC

The section 4.2 in the Appendix chapter gives the general selection and installation recommendations for the auxiliary 24 V DC power supply system.



Reference: 04227

SUMMARY

3.8. Installing the surge protection device

3.8.1. General information

First of all, the current standards define three surge protection device categories for low-voltage electrical installations:

Type 1: they are capable of carrying a very high lightning current, generally from the earth to the energy distribution network. They are actually installed in the main switchboard if the building is equipped with a lightning rod.

Type 2: these are surge protection devices designed to carry the currents generated by indirect lightning strikes and causing overvoltages induced or conducted in the energy distribution network. They are installed in the main distribution switchboard.

Type 3: these are surge protection devices installed in addition to Type 2, and are designed to reduce overvoltages on the terminals of sensitive devices. Their current carrying capacity is very limited. Consequently, they cannot be used alone.

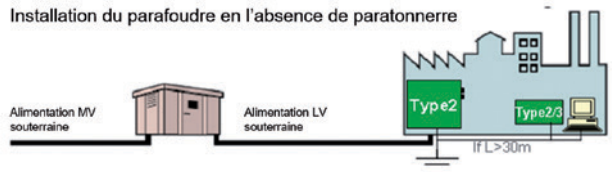
How to choose surge protection devices, and where to install them

Lightning protection must be understood as a whole system. Depending on the application scenario (big industrial sites, data centres, hospitals…), a risk analysis method may be required to ensure the right choice is made for optimum protection (lightning rod, surge protection device).

In other scenarios (residential, offices, buildings not sensitive to industrial risks), it is easier to adopt the following protection principle:

Install a type 2 surge protection device in the electrical installation's head switchboard. Then, determine the distance separating this surge protection device from the devices to be protected. If this distance exceeds 10 metres, an additional surge protection device (Type 2 or Type 3) should be installed near the devices.

DB430808.eps



If the building is equipped with a surge protection device, you need to install a Type 1 surge protection device at the installation head. There are surge protection devices combining Type 1 and Type 2 in the same housing.

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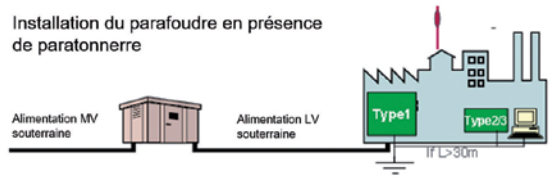


What about surge protection device sizing?

The sizing of Type 2 surge protection devices depends primarily on the exposure zone (moderate, medium, high): There are various carrying capacities for each of these categories (Imax = 20, 40, 65 kA (8/20)).

For Type 1 surge protection devices, the minimum carrying capacity is Iimp = 12.5 kA (10/350) per branch. Higher values may be required by the risk analysis, if this needs to be performed.

How to choose the protection devices associated with the surge protection devices

Finally, the protection arrangement associated with the surge protection device (circuit breaker or fuse) will be chosen according to the short-circuit current at the installation point. In other words, for a room switchboard, you need to choose a protection device with Isc < 6 kA.

For office applications, Isc is generally < 20 kA.

The manufacturers should provide the coordination table between surge protection device and associated protection device. Increasingly, surge protection devices already come with this protection device built into the housing.

SUMMARY

3.8.2. Positioning rules

Standards Theory

1 Recommendation: In Smart Panels, Surge Protection device is highly recommended

Direct lightning to electrical distribution or indirect to the trees, ground or building parts generates a surge which the energy is great and can have dramatic consequences if Surge Protection is not installed in Smart Panels.

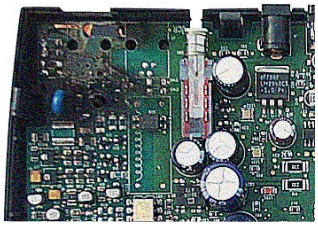
Surges are hardly observable and transient, they have multiple consequences on electronic equipment and installations.
In many cases, surges cause malfunctions and damages: it is a stop of operation, loss of data or interrupted manufacturing process. The users have difficulties to investigate the causes.

Example

2 What are the consequences if Surge Protection is not installed in Smart Panels?

- Surge can damage electronic components, even vaporize conductors.
- There are no superposition of noise on analog signals that generate false indications (e.g. wrong temperature)
- Possibility of data loss or change in memories
- Lower transmission speed due to repetitions
- System reset, etc.

Example



3 What are the devices in Smart Panels sensitive to surges?

Smart Panels devices has integrated MOV surge protection.

This protection prevents devices only against industrial surges and cannot withstand atmospheric surges.

Following devices of Smart Panels shall be protected by SPD - minimum Type 1+2, Iimp = 12.5 kA in incoming switchboard and Type 2, Imax = 20 kA in secondary distribution boards:

- Recloses, remote control mechanisms,
- Smart programmable relays,
- Power supplies,
- WEB servers,
- I/O application modules, etc.

Example

SUMMARY

3.8.3. Installation

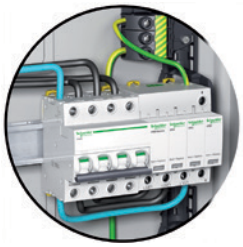
Standards Good practice

1 Back-up protection

According to IEC 61643-11 it is required SPD overcurrent protection to be installed upstream, e.g.: circuit breaker or fuse, internal or external.

Example

Integrated back-up protection

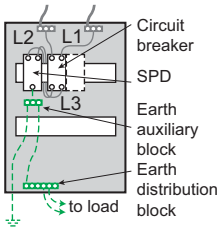


External back-up protection

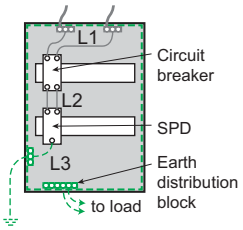
1 bis Proper installation of SPD with backup protection:

- Connections of a SPD to the loads should be as short as possible in order to reduce the value of the voltage protection level (installed Up) on the terminals of the protected equipment.
- The total length of SPD connections to the network and the earth terminal block should not exceed 50 cm.

Example



How to connect a SPD in plastic enclosure



How to connect a SPD in metallic enclosure

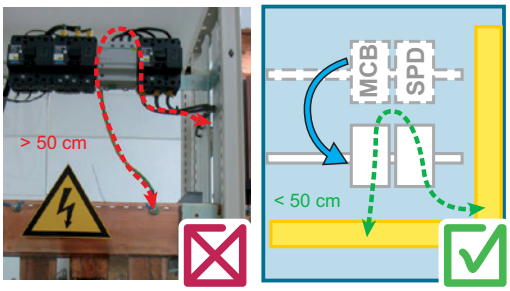
2 Installation in "convenient or free space" place

Equipment installation design should be done in accordance to installation rules: cables length shall be less than 50 cm.

Standard IEC 60364 recommends the following cable cross sections at the installation head:

- 4 mm² (Cu) for Type 2 surge protection device connections.
- 16 mm² (Cu) for Type 1 surge protection. device connections.

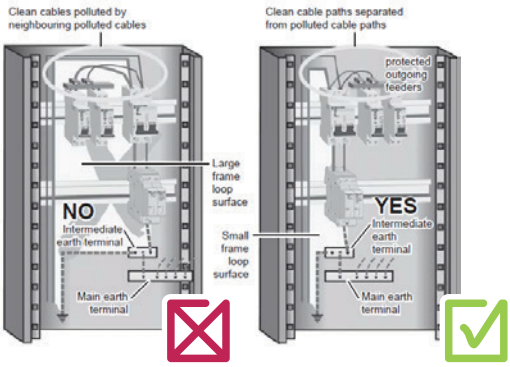
Example



3 Reduce of magnetic field impact

The incoming feeder phase, neutral and protection (PE) conductors should run one beside another in order to reduce the loop surface.
The incoming conductors of the SPD should be remote from the protected outgoing conductors to avoid polluting them by coupling.
The cables should be pinned against the metallic parts of the enclosure (if any) in order to minimize the surface of the frame loop and hence benefit from a shielding effect against EM disturbances.

Example



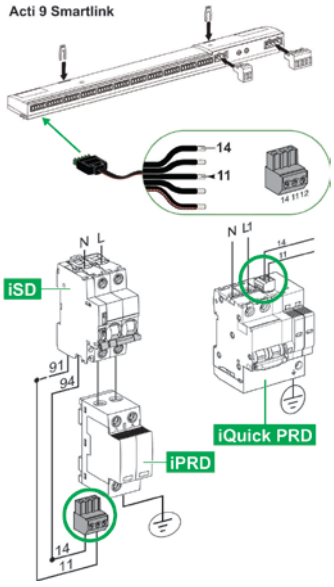
SUMMARY

Standards Good practice

4 Surge protection device status remote monitoring

Monitoring SPD with Smartlink important to verify status of cartridge and backup protection, connecting to OF auxiliary contact.

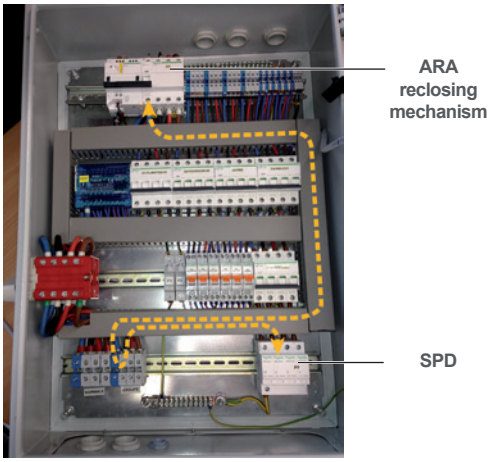
- iPRD / iPRF1 connection(stand alone SPD)
- iQuick PRD connection (SPD with integrated protection)



5 Coordination between SPD and "smart devices"

In order to direct all surge current to SPD but not to internal surge protection of “smart devices” it is recommended to keep **up to 1.5 m cable distance.**

Example

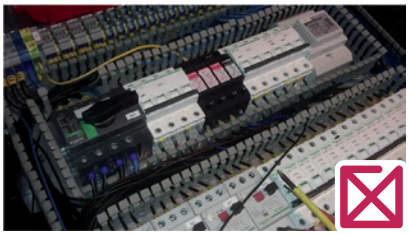


Power distribution board of telecom Base Transceiver Station

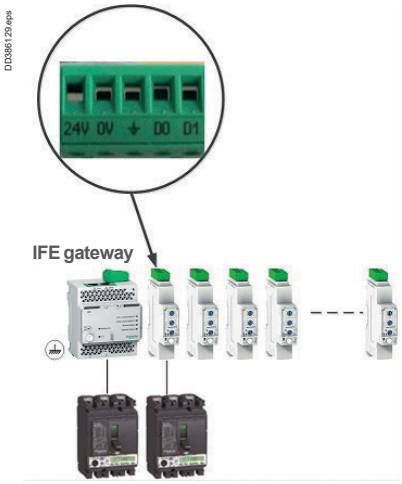
6 Mix of brands – no verification of coordination

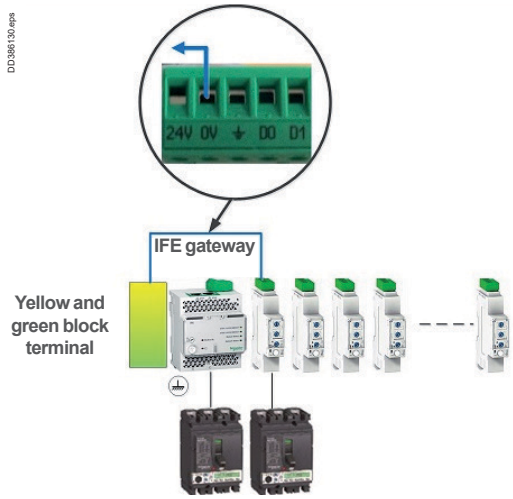
Use of known brand SPD:
Coordination with backup protection (MCB) shall be tested and validated in laboratory
> use coordinated SPD and protection,
see page 38.

Example



SUMMARY





4.1. 24 V power supply

No Modbus device, such as a Smartlink serial line with 0 V neutral potential, should be connected to the IFM.
It's recommended not to exceed 8 Modbus slaves for one Modbus master. This will ensure a better response time (IFE+ or Acti**9** Smartlink Ethernet). To optimise the communication system, stack the IFMs on the IFEs (enhanced performance and behaviour in terms of EMC).

The voltage range of the device should be 24 V DC +/- 10 %. The overvoltage category (OVC) of the 24 V power supply mains input should be compatible with the installation network connection point.
The ULP modules have built-in current protection of 3 A, with Isc = 20 A. The 24 V DC external power supply should be able to protect the ULP module with Isc limited to no more than 20 A.
It is recommended to use star topology to limit EMC disturbances.
The connection between the power supply and the terminal block (+/-) should be as short as possible. In case of a serial topology, connect the last device to the power supply with an additional cable.
All IFE and IO modules should have a direct connection with the power supply, and cannot be powered by ULP. If several stacked IFMs are not mounted on an IFE, only one of the IFMs should be connected to the power supply.
BSCM + MicroLogic NSX or BCM MasterPact are powered directly via one of the two ULP RJ45 ports on IFE/IFM or the IO modules.
Up to 2 IO modules can be used on a ULP bus.
MasterPact MicroLogic should be powered by a dedicated AD power supply (see parts list for more details).

If no IFM is used, the 0 V should be connected to a protective earth terminal block in the power supply. No other devices should have a 0 V connected to earth.

The IFM 0 V is only connected to a protective earth terminal block at one point (first IFM in stack) on the Modbus line. No other devices should have a 0 V connected to earth.

SUMMARY

The number of power supply segments is limited to 3, with a maximum nominal current of 5 A. 0 V, D0 and D1 are divided between the Modbus lines. For more information, please consult the ULP guide.

In case of a floating power supply without IFM, the number of NSX MicroLogics is limited by the earth leakage currents as follows:

Example: If ComPact NSX MicroLogics are used on 690 V AC, the maximum number of NSX authorised on the whole power supply system will be: 500 µA/54 = 9 (500 µA is the normative leakage current set by the electrical authorities for this field of application).

Ue - VLN/ULL	Earth leakage current - (ComPact NSX)
66/115	9
127/220	17
230/400	31
347/600	47
400/690	54
/ 1000	
Vac	µA rms

4.2. Nominal consumption of products

24 V DC power supply devices	W	mA
IFE, EIFE	2.88	120
IFM	0.72	30
FDM121	0.72	30
I/O module	3.96	165
MasterPact BCM ULP	1.56	65
MicroLogic 5, 6 NSX	1.32	55
NSX BSCM ULP	0.36	15
MicroLogic E, P, H, MasterPact	2.4	100
MicroLogic E, P, H, MasterPact MC2 or MC6	4.8	200
1 IO module input	0.12	5
1 IO module output	2.4	100
Smartlink Modbus	0.84	35
Smartlink SI B	2.64	110
OF/SD24, iOF/SD24	0.24	10
iACT24, iATL24	0.36	15
Reflex iC60, RCA iC60	0.36	15
1 iEM2010 pulse meter	0.12	5
2 iEM2010 pulse meters	0.12	5
FDM128	6.84	285
COM'X 24 V DC	5.2	

220 V power supply device	W	mA
PowerTag Link	5	45

Reference	W	A
ABL8MEM24003	7.20	0.3
ABL8MEM24006	14.4	0.6
ABL8MEM24012	28.8	1.2
ABL8RPS24030	72	3
ABL8RPS24050	120	5
ABL8RPS24100	240	10

SUMMARY

5.1. Introduction

Standards **Theory**

1 Cables should be prepared using tools or machines in good working condition that are correctly calibrated. They should be connected according to trade practice to avoid potential temperature rise that may cause serious damage.

> See the "Connections" section in this chapter.

2 Toroids are mounted on cables to detect leakage currents. They transmit a signal that is proportional to the current measured to the related receiver.

Toroids are fragile components. They should be installed in the switchboard according to professional good practice.

Tip

The circuit of the current measuring devices are generally realized with a wiring section u 2.5 mm^2.

Cables reinforced insulation are used to reduce mechanical damage.

SUMMARY

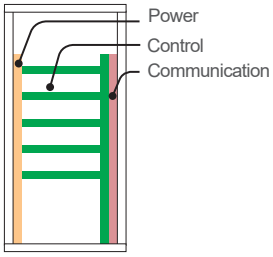
5.2. Routing cables

5.2.1. General circulation rules

Standards **Good practice**

Tip

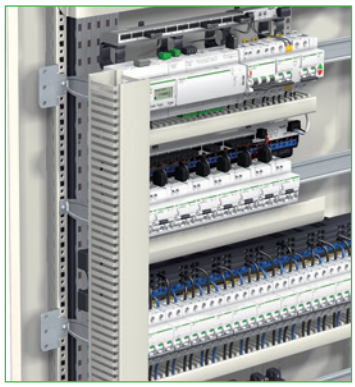
The cable run in the enclosure should be organised as illustrated in the diagram below, in "ladder" form, ensuring the low-power cables (cross section ≤ 6 mm²) and power cables (cross section > 6 mm²) are separated.



1. Use separate routings for auxiliary circuit and low power cables (cross-section ≤ 6 mm²) and power cables (cross-section > 6 mm²).

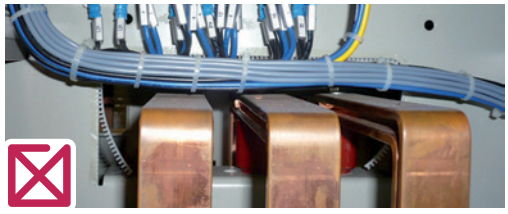
   Moreover, given their sensitivity to electromagnetic disturbance, it is preferable to separate control/monitoring cables from communication cables.

Example



2. It's recommended not to route cables between or too close to power busbars to limit risks:
   - of a temperature rise in the cable,
   - damage to the insulator,
   - electromagnetic disturbance.

Example



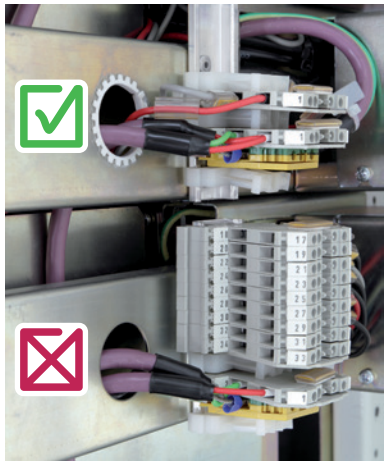
The cables are routed too close to the power busbars.

3. The deterioration of the insulating sleeve of a conductor will result in the deterioration of its dielectric characteristics and increases the risk of sparking and therefore of a short-circuit.

   Limit risks of damage or cutting of the insulating sleeve:
   - do not route cables on parts with sharp edges.
   - protect cables that are routed through a hole in a sheet with grommets, cable glands, gaskets, plastic rings, etc.

   In the specific case of a cable routed in a form sheet, make sure that the degree of protection is IP2X. Use a membrane gland plate to do this.

Example



A plastic ring is used to protect cables from the hole in the sheet.

IEC 61439-1

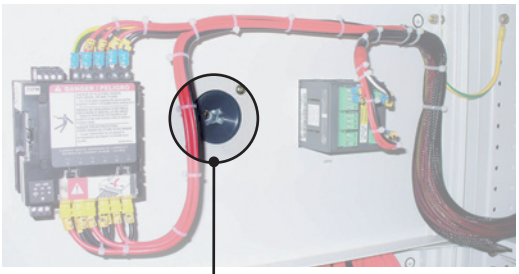
SUMMARY

5.2.2. General cable routing rules

Standards **Good practice**

4 It's recommended not to route the cables:
- in the device safety perimeter, e.g., installation of ducts above the circuit breaker gas evacuation areas,
- close to moving parts (handle, reset button, mechanical interlocking, rotary handle, etc.) where there is a risk of blocking the cable.

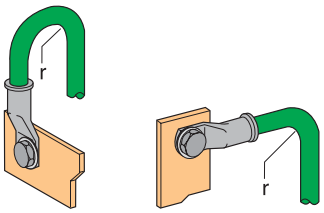
Example



The cables are routed too close to the rotary handle.

5 Comply with the permissible radius of curvature for each type of cable.

Notably:
- provide for sufficient space for connecting the cables, with a minimum radius of curvature (6 to 8 times the external diameter of the cables),



- no use of tools to bend the cable.

An abnormal temperature rise in the conductors could result if this recommendation is not respected.

Tip

The values of the permissible curvature radii are given by the cable suppliers.

They depend on the type:
- of core (copper or aluminium),
- of insulator.

SUMMARY

5.2.3. Cable routing in ducts

Standards

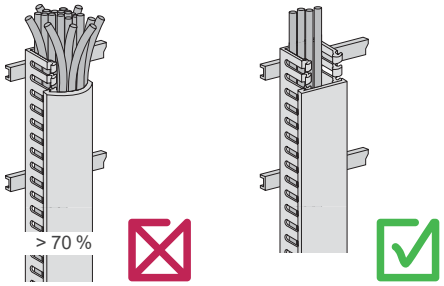
Good practice

Tip

There are trunkings in halogen-free materials that do not generate toxic or corrosive gases in case of combustion.

1. Choose trunkings adapted to the cross-section and the number of cables that they are to hold.
   Provide for a reserve for future extensions.
   The final fill rate should not exceed 70 %.

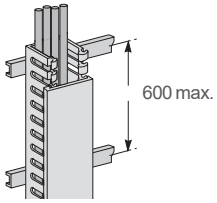
Example



2. Never install a trunking in contact with or between power busbar conductors.

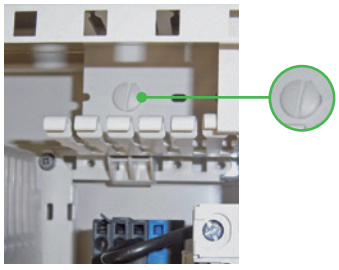
3. Define the number of fastening points of a trunking based on its mechanical characteristics and the fill rate. The trunking should be straight after fastening.
   At any event, the centre distance between fastening points should not be more than 600 mm.

Example



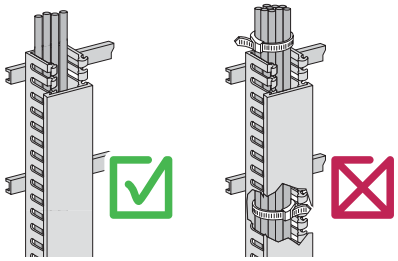
4. Fasten the trunking using rivets or plastic screws to reduce the risk of damaging the cables.

Example



5. It's recommended not to tie cables inside the trunkings to facilitate heat dissipation.
   Never stretch a wiring cable to limit risks of disconnecting the cable. As a rule, there should always be some slack between the duct outlet and the connection point.

Example



SUMMARY

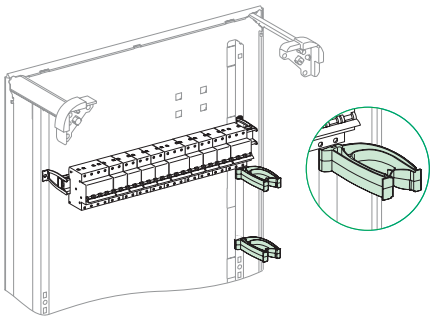
5.2.4. Wiring in grommets

Standards **Good practice**

1. Cable straps are used to ensure faster installation, and facilitate the modification of operations and maintenance.
   Choose the size of the straps based on the number of cables that they are to hold.
   The final fill rate should not exceed 70 %.

2. Lock the straps on a modular rail or vertical mounting plate.
   Fit a sufficiently large number of straps to ensure that cables are properly held in place: 1 strap approximately every 8 cm.
   Nota: It's recommended not to tie cables running inside the straps to facilitate heat dissipation.

Example
In Schneider Electric enclosures, the possibility of installing horizontal and vertical straps optimise cable running and make it easier to read.



SUMMARY

5.2.5. Using cable clips

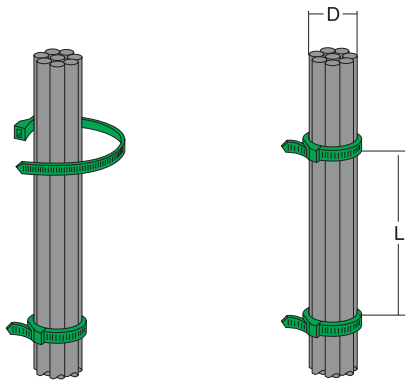
Standards **Good practice**

1 Choose ties that are adapted to the strand to be made. They should:
- be mechanically resistant enough to keep the cables fastened in case of a short-circuit,
- be of a length that is adapted to the strand circumference,
- be wide enough not to damage the cable insulating sleeve.

2 Fit a sufficiently large number of ties to ensure that cables are properly held in place.

Centre distance recommended according to strand diameter:

Diameter D of strand	Distance L between ties	
(in mm)	Mini (in mm)	Maxi (in mm)
< 20	60	120
Between 20 and 30	70	140
Between 31 and 45	90	180
Between 46 and 75	125	200



SUMMARY

5.2.6. Tightening clips

Standards **Good practice**

1. Never run a strand in contact with or between power busbar conductors to avoid temperature rise and damage to insulators.

2. If the cables of the strand don't meet the class 2 requirements, fasten the strand on insulation supports. If they are metal supports, insert an insulating wedge between the strand and each metal support.

   If cables meet the class 2 requirements you may fasten them directly on metal supports.

3. Strands should be run flush with doors, panels, swivelling front panels or panels that hold the switchgear in such a way as to reduce the risks of damaging or pinching the cables to a minimum.

   The strand is protected mechanically by:
   - a tubular plastic sleeve,
   - a braided polyester sleeve,
   - a spiral bearing.

   Follow the recommendations below to mount the strand:
   - make sure that the strand allows the movement of the moving part without any risk of damage to the cables.
   - make sure that the cables are not subject to twisting or pulling. If necessary divide the strand to limit mechanical stresses.
   - comply with the permissible radius of curvature.
   - fasten the strand firmly on the fixed part (framework) as well as on the moving part (door, faceplate, panel, etc.).

Example

SUMMARY

5.2.7. Routing between columns

Standards **Good practice**

1 There are two possible scenarios depending on the switchboard configuration:

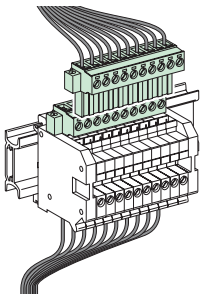
- limited number of columns and cables to connect: it is preferable to connect the cables directly to the switchgear concerned. In this case, you have to protect conductors against risks of deterioration (strand protected by a polyester sleeve, cable tray or trunking),
- large number of columns and cables to connect: use terminal blocks to facilitate the installation and connection on site (faster and more reliable laying) and any maintenance operations.

In both cases:

- identify the cables with marks that are consistent with those of the switchboard to facilitate subsequent operations.

Example

Schneider Electric provides terminal blocks to be mounted on modular rails. They make it possible to connect cables of auxiliary circuits between two columns.



This type of terminal block can be disconnected. It enables fast connection and disconnection during maintenance.

2 For voltage collector power supply, choose an appropriate cable cross-section that will limit voltage drops (usually 6 mm^2).

SUMMARY

5.3. Communicating circuits

5.3.1. General rules

Standards **Good practice**

1 The earthing mesh inside a switchboard is an essential parameter. All metal structures will be interconnected with an electric contact.

☛ Be careful of the various protective coatings, which are generally insulating.

CEM NF EN 61000-6-4

2 The communication switchgear installed should meet the requirements of the relevant immunity and emission standards.

☛ The wiring rules that follow are general ones. They do not replace the wiring guidelines given by the switchgear and controlgear manufacturer.

Example

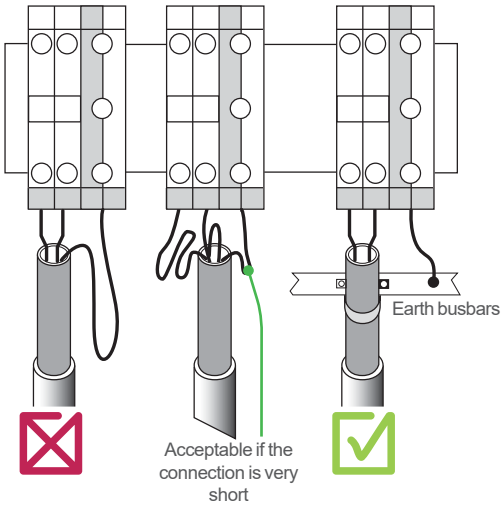
Sensitivity of the various cable families

Family	Cables	Type of signal	EMC behaviour
1	Analogue	Power supply and measurement circuits of analogue sensors	Sensitive signals
2	Digital and Telecom	Digital circuits and data bus	These signals are sensitive. They are also disruptive for family 1
3	Relay	Dry-contact circuits with risks of re-priming	These signals are disruptive for families 1 and 2
4	Power supply	Power supply and power circuits	These signals are disruptive

Remark: a shielded cable is neither disruptive nor sensitive.

3 Use shielded cables or double shielded strands to protect circuits against radiated parasites. The metal armour must be earthed correctly. All free conductors in a cable (except for the analogue cable) must be systematically earthed at both ends.

Example



Earthing terminals with metal fastening system with modular rail.

SUMMARY

5.3.2. Wiring rules

Standards **Good practice**

1 General wiring recommendations

- Do not bend or damage the cables.
- Minimum bending radius:
  10 x cable diameter.
- Avoid sharp angles of paths or passages of the cable.
- The connection of the shield of the cable should be as short as possible.
- Several shields can be connected together.
- Make a physical mark at the end of each cable.
- Identify the logical name and the address of each device.

Wiring should be in accordance with the following colours:

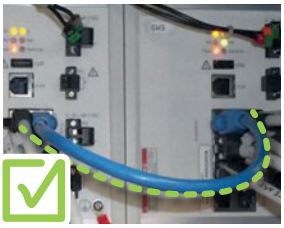
Wire type		Wire colour
AC Power		Black
Neutral		Light blue (RAL 5024)
Control wire	24 V DC	Dark blue (RAL 5013)
	0 V DC	Gray (RAL 7001)
	24 V AC	Red
	0 V AC	Ivory (RAL 1015)
Earth		Green/Yellow

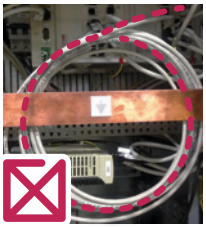
2

Adjust the cable length to actual requirements. Cables should be as short as possible by avoiding the creation of loops that generate parasites currents resulting from magnetic fields.

Cables should be stripped as close as possible to the connection point.

Example





3

Avoid all earth loops: they are very sensitive to power magnetic fields.

Example

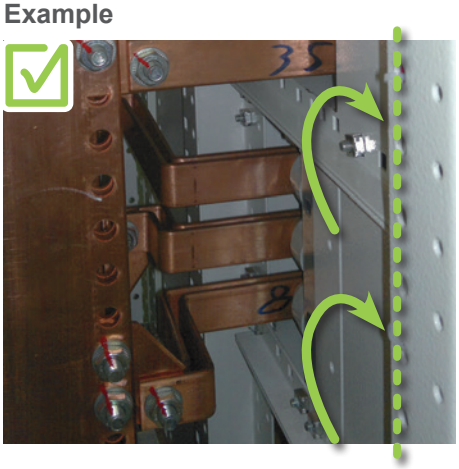
SUMMARY

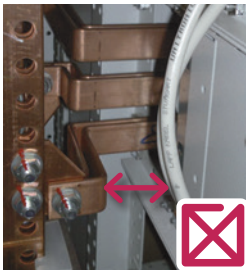
Standards Good practice

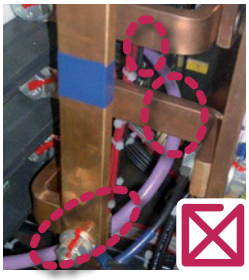
4 Never position communication cables close to busbars or power cables.
- Use a flexible metal tubing.

① Metallic tubing
- Secure the communication cable inside the metallic profile when possible, or stick it on metallic parts.

Example





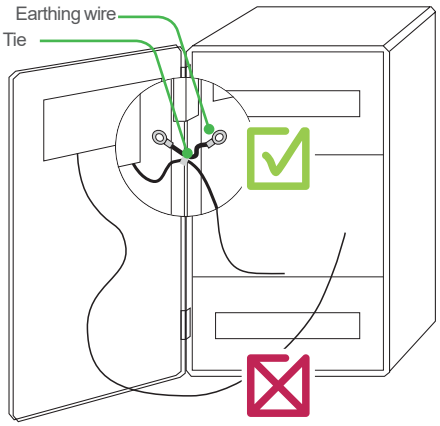


5 The presence of many earth structures in switchboards provides optimum protection. When routing to moving parts (doors, front plate), route the communication cable close to a hinge or earthing wire.

Example

Protective effect inside a switchboard:
- all the cables should be flattened against earthing structures,
- plastic cabling ducts can be used because they are installed on DIN rails connected to the switchboard earth.

Cables should be routed close to assembly points (hinges) or be doubled by an earthing wire.



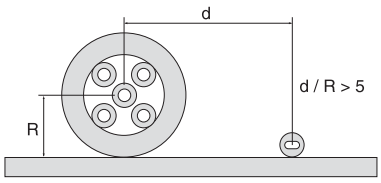
SUMMARY

Standards Good practice

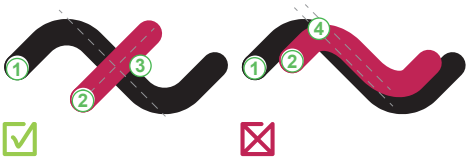
6 Divide the cables into three separate groups (power, command and communication) to let them be routed in separate paths. The routing of wires of groups 2 and 3 is tolerated in the same ducts. However, they should not be mixed in the same sheath or tightened into a single strand.

Example

To maintain the protective effect, we advise that you observe a ratio of the distance (d) between cables to the radius (R) of the largest cable of over 5.

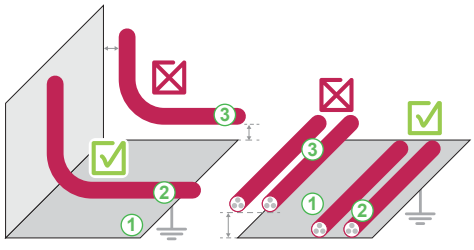


7 When communication cables have to cross over power cables (e.g. when drawer space is small), the angle between the two types of cables should be as close as possible to 90°.



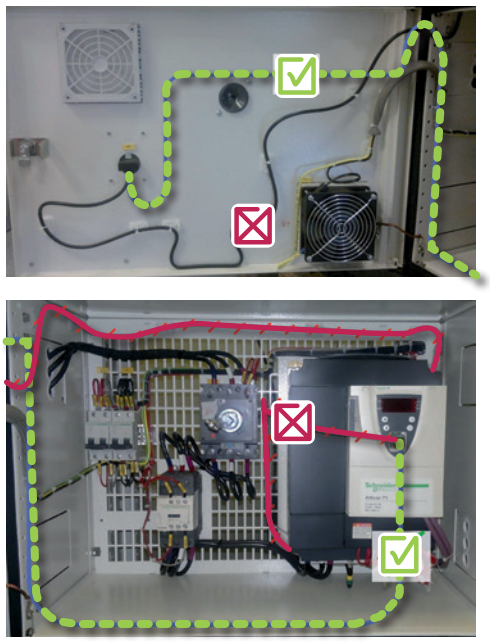
① Power cable
② Communication cable
③ Right angle
④ Parallel cable routing (NOK)

8 It's recommended for a communication cable to be as closed as possible to an earthed plane, i.e. on the steel plates of cubicles.



① Earthed metal plane
② Communication cable laid on the metal parts
③ Communication cable far from the metal parts (NOK)

Example



SUMMARY

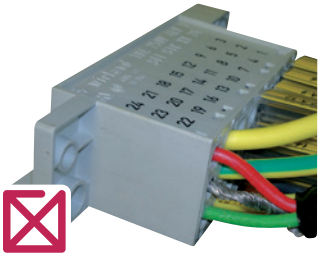
5.3.3. Screen continuity

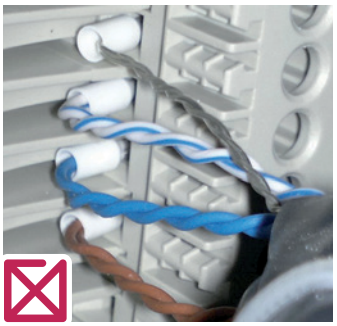
Standards **Good practice**

1. It's recommended not to use the connector pins to ensure screen continuity and "pig tails" (very poor efficiency at high frequency).

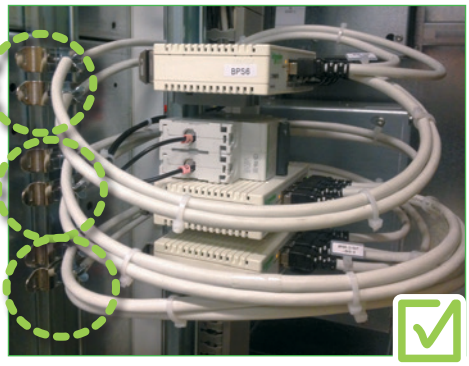
   Connect the cable screens directly on the metal plate:
   - to reduce the common impedance,
   - to divert disturbances directly to earth (outside the products).

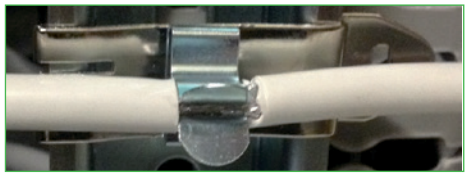
Example





2. For RS485 communication networks, it is recommended to use an earthing clip on the DIN rail.

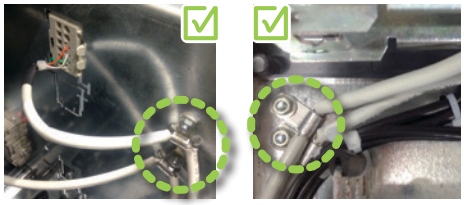




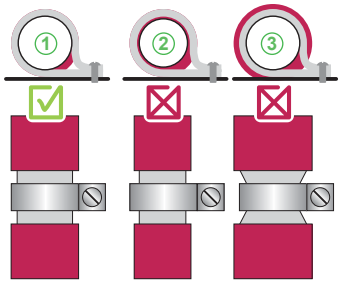
SUMMARY

Standards Good practice

3 360° steel earthing clamp (it's recommended not to use aluminium clamps).

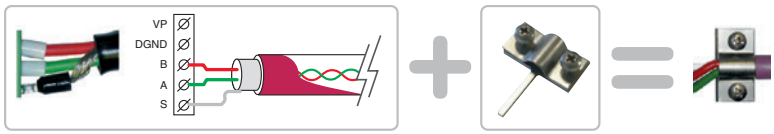


Clamp diameter shall be adapted to the cable screen diameter.



① Clamp adapted to screen diameter
② Clamp too large
③ Clamp too small.

4 Device with an open style connector



Add a heat shrink tubing at the screen cable end (to contain braid metallic particles).

5 Modbus tap earthing and bonding

Never let the tap isolated. Use an universal DIN rail fixing system.

SUMMARY

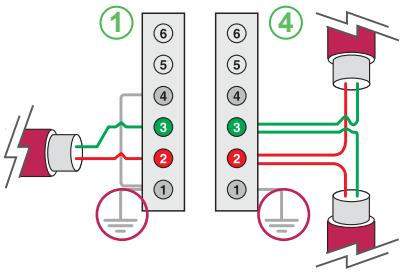
5.3.4. Connection and grounding

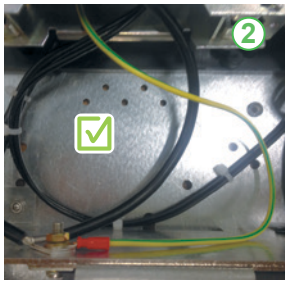
Standards **Good practice**

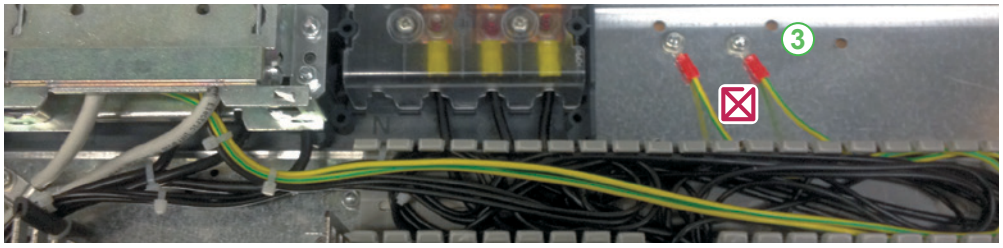
1 Electrical continuity

The electrical continuity between the drawer frame and the cubicle structure shall be obtained using the connector pins.

The connection length should be as short as possible.



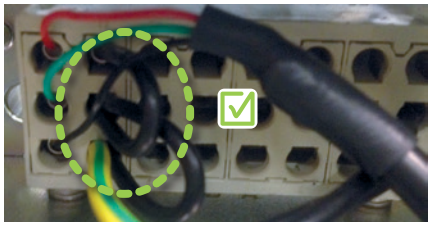


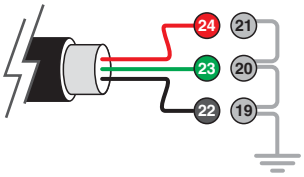


① Internal FU connector
② Connector earthing
③ Earthing connection too long
④ External FU connector
⑤ Earthing by a earth terminal DIN rail mounted.

2 Electromagnetic barrier

Connect together all the "earthing" contacts of the removable connector (= electromagnetic barrier) to the drawer earth.





SUMMARY

5.3.5. Wiring of Ethernet network

Standards **Good practice**

Tip

Types:
- FTP (Foil Twisted Pair): to forbid, risk of breakage if bended.
- STP (Shielded Twisted Pair): suitable.
- SFTP (Shielded Foil Twisted Pair): recommended.

1

Although there are 4 twisted pairs of wires, 10 Base-T / 100 Base-T Ethernet uses only 2 pairs: White/Orange (pins 1 & 2) and White/Green (pins 3 & 6).

As a minimum, an Ethernet line cable should be screened (overall braided screen) and screened also by a foil (SF/UTP).

There are different Ethernet topologies, they can be used separately or mixed.

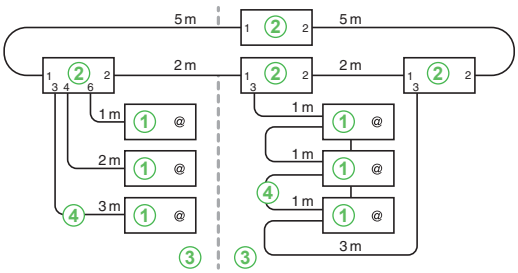
Rules	Standard Ethernet
Maximum number of devices per network	No limits
Transmission rate	10/100 Mbit/s and 1 Gbit/s
Maximum length	Twisted pair 100 m - Multi-mode Fibre optic: 2 km - Mono-mode Fibre optic > 2 km
Cable type	Depends on the transmission rate

2

It is highly recommended to attach a communications wiring diagram in addition to the electrical wiring diagram.

Data to show in this diagram:
- network name and number of each link,
- name, address and location of the equipment,
- identify used ports for each switch,
- all the elements of the architecture (routers, switches, by-pass switch, etc.),
- cable length.

Example

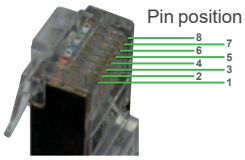


① Name of devices
② Names of the slaves
③ Name of the Network, number and location
④ Name of the Link, number and location

3

Detailed view of a good wiring

Use straight cable through connection in accordance with TIA/ EIA- 568- B (T568B) for the number of pins, number of pairs and color coding.



Pin N°	Pair N°	Color
1	1	White/ Orange
2	1	Orange
3	2	White/Green
4 & 5	3	
6	2	Green
7 & 8	4	

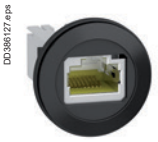
SUMMARY

Standards Good practice

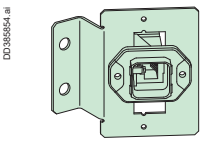
4 Reference XB5PRJ45 can be used as an RJ45 interface installed on the switchboard.

Reference LGY4230 can be used to connect switchboards or as an RJ45 interface in Prisma, with a plastic cable gland to provide IP protection for the switchboard.

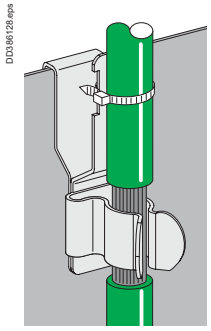
It is recommended to install a clip (stainless steel) before the switch, since a clip does not cause any deviation in the disruptions toward the housing.



XB5PRJ45 metal



LGY4230 metal



SUMMARY

5.3.6. Particular rules for Modbus RTU

Standards **Good practice**

1 This chapter is dedicated to general rules on cable lengths, shielding, path and preparation to comply with EMC and communication specifications.

The Modbus RTU protocol (a.k.a. Modbus SL) is based on a Master-Slave concept.

In the standard Modbus system, all the devices are connected to a main 3 wires cable. Two wires form a balanced twisted pair, on which bi-directional data are transmitted.

The Modbus topology is a main cable with devices connected directly (daisy chaining) or by short derivation cables.

The main cable, a.k.a. "Bus", should be connected at its two extremities with Line Terminations.

Generally speaking, the sum of all the derivation lengths should be lower than the length of the bus.

The "Common" circuit should be connected directly to protective ground, preferably at one point only for the entire bus. In general, this point is chosen either on the master device or on the polarization device.

A Modbus Serial Cable should be shielded. The shield should be connected to protective ground at both ends.

Rules	Standard Modbus RTU	Smart Panels
Maximum number of devices per bus	32 (without repeater)	8
Bus Speed	1200 bps to 115.2 Kbps	19.2 Kbps
Maximum bus length	1300 m (without repeaters) and depending on the transmission rate	1000 m
Maximum length of the sum of the derivations	Depends on the transmission rate	40 m
Cable type	TIA / EIA - 485 Standard	Ditto standard
Location of the terminations	Line termination at the 2 extremities of the bus (R or RC)	Line termination at the 2 extremities of the bus (Only R = 120 Ω)
Location of the polarization	The polarization is given by only one equipment at the beginning of the bus (in general: the master)	Ditto standard

SUMMARY

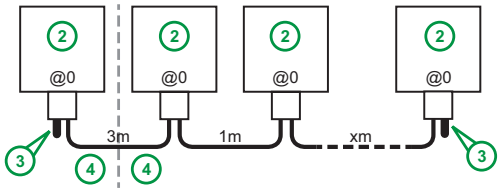
Standards Good practice

2 It is strongly recommended to attach a communication cables diagram to the electrical wiring chart.

Mandatory data for this diagram:

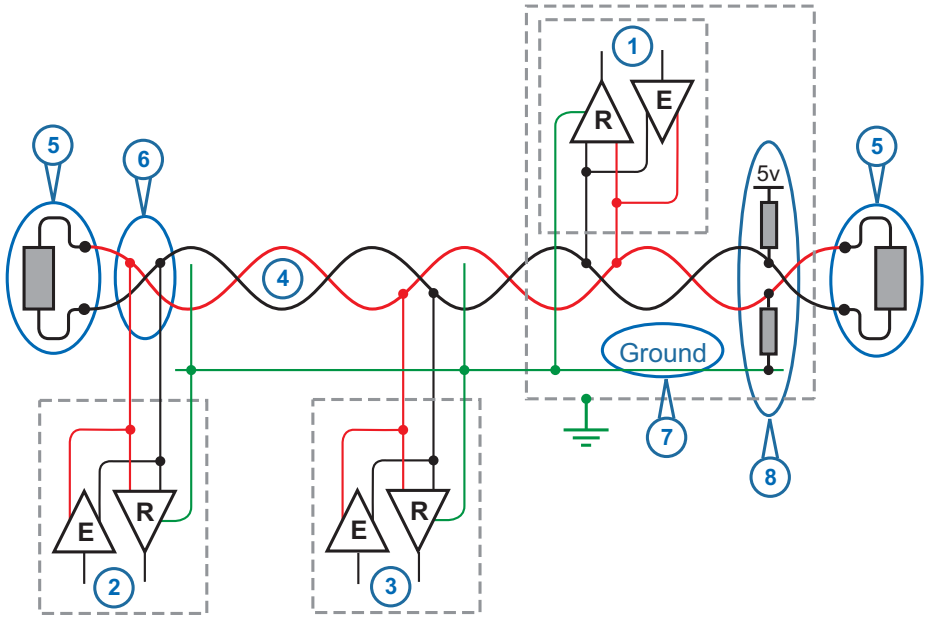
- name, address and location of equipment,
- all the elements in the architecture (copper and fibre optic repeaters, coupling, bridges)
- line termination,
- cable length.

Example



① Name of master
② Names of slaves
③ Line termination
④ Name of bus, number and location

3 Detailed view of a good wiring



① Master
② Slave 1
③ Slave n
④ Balanced twisted pair
⑤ Line termination at the 2 extremities of the bus
⑥ Length of the main line > sum of slaves derivation lines
⑦ Ground signal to reference all the devices
⑧ Polarity resistor (generally integrated in the master)

SUMMARY

Standards Good practice

4 General wiring recommendations

- Do not bend or damage the cables
- Minimum bending radius: 10 x cable diameter (about 75 mm in diameter)
- Avoid sharp angles of paths or passages of the cable
- The connection of the shield of the cable should be as short as possible
- Several shields can be connected together
- Make a physical mark at the end of each cable
- Identify the logical name and the logical address of each device
- Wiring should be in accordance with the following colours:

Wire type	Wire colour
AC POWER	BLACK
NEUTRAL	LIGHT BLUE (RAL 5024)
24 V DC control wire	DARK BLUE (RAL 5013)
0 V DC control wire	GRAY (RAL 7001)
24 V AC control wire	RED
0 V AC control wire	IVORY (RAL 1015)
Ground	GREEN / YELLOW

Example

SUMMARY

DB430821.eps

6.1. Project creation

EcoStruxure Power Commision configuration software saves all electrical assets of the building with contextualization of loads. Users can sort electrical assets by electrical switchboard and locate them inside the building.

The following section details the EcoStruxure Power Commision features (project creation after device discovery, check operation of circuit breaker, firmware upgrade maintenance operation).

> see How to create a project with EcoStruxure Power Commision

"Refresh" updates all settings related to the connected device.
"Write to Project" allows the user to apply the settings from the device to the project.
"Write to Device" allows the user to send the parameters to the connected device.
"Refresh" is a global operation for the full set of device parameters, while "Write to Device" and "Write to Project " are used for partial operations, depending on the section involved (for instance, only Protection can be read from or written to the device. During the first connection, the full set of parameters is read from the device.

6.2. Device discovery

6.2.1. Advanced project creation

EcoStruxure Power Commision software allows you to create a project by device discovery. Device discovery enables you to discover the devices in the network. It also provides an option to generate and save the report for the devices discovered in the network in PDF format. Connect your laptop to the local Ethernet network of the Smart Panels and click the Discovery button.

> see How to discover electrical devices directly connected to Ethernet with EcoStruxure Power Commision

> see How to discover electrical devices connected through Modbus gateways with EcoStruxure Power Commision

> see How to discover PowerTag sensors with EcoStruxure Power Commision

EcoStruxure Power Commision software offers two different displays for the electrical installation:
- General view: shows the electrical topology of the installation.
- Communication view: shows the communication network architecture.

First, define the location and panel name for each discovered device,
> see EcoStruxure Power Commision Device general view. This step is not mandatory but improves the display of the electrical installation.
Then, go to the communication view > see EcoStruxure Power Commision Device communication view.

6.2.2. Communication test report

EcoStruxure Power Commision software provides an easily accessible communication test report to demonstrate that communication links, device hardware settings and cabling have been correctly installed. This can be used to confirm communication setting conformity in the inspection report on the building of the electrical panel.
This test report feature is available without an Internet connection.
From your project, click on "Create Report" and launch "Communication Test and Report".
Finally, run the test and if required generate the report to save it locally to your computer:

> see How to create a communication test report with EcoStruxure Power Commision

SUMMARY

6.3. Check Firmware versions

To check the consistency of the system baseline follow the detailed steps in the video:

> see How to check devices firmware baseline with EcoStruxure Power Commision

6.4. LV circuit breaker system

The IFE and IO Module can be configured and tested using EcoStruxure Power Commision or via webpages embedded in the IFE device. The IFE and IO Module devices should be connected with correct addressing to operate effectively. The following steps are for the configuration with EcoStruxure Power Commision for a MTZ circuit breaker.

6.4.1. MTZ configuration

From the EcoStruxure Power Commision project, connect to an IFE device:
> 1. Select the desired circuit breaker and the attached IFE component to connect to.
> 2. Click on "Connect to Device".

> see How to configure MasterPact MTZ with EcoStruxure Power Commision

6.4.2. Input Output assignment

The IO Module provides predefined applications (Cradle management, Breaker operation, Load Control, etc.) and allows the user to customize some inputs and/or outputs. To do this, the user should first assign the selected inputs/outputs s/he wishes to use in EcoStruxure Power Commision .

> see How to assign Input of IO module application with EcoStruxure Power Commision

The IO module of the HVAC is used for the cradle application (predefined application 1). The digital input 4 is assigned to a piece of contact information showing the availability status of the MV/LV Power at the hypermarket transformer station. A temperature sensor which monitors the outside ambient air temperature is added to the Analog input of the IO module.

Note: A second IO module can be added to the circuit breaker communication system. In this case, predefined application 9 should be used to add user-defined applications (door contact information, fuse health, etc.).

6.5. Acti9 Smartlink system

The Acti**9** Smartlink can be configured and tested using EcoStruxure Power Commision . Smartlink devices should be connected with correct addressing to operate effectively.

6.5.1. Wired configuration

The following steps show the configuration with EcoStruxure Power Commision .

> see How to configure Acti**9** Smartlink OF/SD accessories with EcoStruxure Power Commision

6.5.2. Wireless configuration

PowerTag wireless sensors are configured with EcoStruxure Power Commision software.

> see How to pair PowerTag sensor with Acti**9** Smartlink with EcoStruxure Power Commision

EcoStruxure Power Commision software provides a locating function: click the "Locate" button in front of the PowerTag to start the LED blinking and identify the correct PowerTag.

SUMMARY

6.6. Communication system test

Quality control check list

Note: the list of control points presented is not exhaustive.

It lists the minimum checks required and may be completed depending on the organisation in the workshop and/or recurrences of defects encountered.

Minimum checks required	Control points	Control resources	Self-control
☑	> Modbus addressing	> Installation guide	☐
☑	> Device connection	> Test button on ULP	☐
☑	> Earthing continuity	> Installation guide	☐
☑	> Communication of devices	> Internet browser	☐

Objectives

- Verify access to each communication devices
- Verify the global health of the system
- Provide a test report

SUMMARY

6.7. What does the standard IEC 61439-1 say about quality inspections ?

Routine verification

Routine verification is designed to detect materials and manufacturing defects and to ensure that the manufactured assembly is working properly. It is performed on each assembly.

Panel builders should determine whether routine is carried out during and/or after manufacturing.

If necessary, the routine verification should ensure that design verification is available.

Verification comprises two categories below:

① "Construction" verifications (see sections 11.2 to 11.8 of the standard)

1. Degree of protection of enclosures
2. Clearances and creepage distances
3. Protection against electric shock and integrity of protective circuits
4. Incorporation of built-in components
5. Internal electrical circuits and connections
6. Terminals for external conductors
7. Mechanical operation

② "Performance" verifications (see sections 11.9 to 11.10 of the standard)

1. Dielectric properties
2. Wiring, operational performance and function

What is the risk if the quality inspection is not conducted (during and/or after manufacturing)?

- Quality organisation does not comply with standard
- Customer not satisfied
- Hazardous installation
- Negative impact on the image of the panelbuilder and manufacturer
- Higher costs of intervention
- Operating loss (break in service continuity)
- Financial loss

SUMMARY

6.8. Quality organisation recommended by Schneider Electric

Organise quality checks

Organise quality checks (self-checks) throughout the switchboard assembly and installation process, from acceptance of components until the delivery of the switchboard (see quality control check list opposite).

Benefits

- Increased accountability of operators
- Improved traceability
- Optimisation of installation rules
  E.g. busbar tightening should be checked at the end of manufacturing (involves the dismounting of sheets, resulting in a significant loss of time).

Conduct a final quality inspection

In a secured area dedicated for this purpose (in particular during electrical checks).

Note: the final quality inspection should be performed by qualified and authorised personnel.

Documents required for the final inspection

- Check lists of quality checks (self-checks) conducted throughout the switchboard assembly and installation process
- Final inspection report
  (See example provided in the guide on page 69)
  Note: to be completed depending on the customer's specifications and requirements.
- Other useful documents: notification of non-compliance, check list of missing components, quality measurements
- Manufacturing file
- Switchgear guide
- Technical documentation

> To find out more about the final quality inspection, see the "Quality inspection guide" written by our experts.

SUMMARY

6.9. Check list of checks to be made during the final quality inspection

Make sure that self-checks have been performed throughout the assembly and installation process or validated (e.g. by the line controller).

Control points	Control resources	Final control
Compliance checks		
> Identification & column numbers > Type > Dimensions > Compliance of front panel, block diagram > Handling devices	> Assembly drawing file > Customer specifications	☑
Visual checks		
> Paint (colour, homogeneity, finishing) > No scratches and deformations	> Visual inspection	☑
Frame, structure		
> Functioning of doors, swivelling front panels > Locks (type, functioning) > IP degree of protection	> Operating test > Specifications, visual inspection > Visual Inspection, technical guide	☑
Switchgear		
> Position > Fastening > Characteristics: nominal range, breaking capacity > Identification and marking > Safety perimeter > Mechanical operation > Mechanical indication (test position, connected, etc.) > Plugging-in and withdrawing procedure > Striker pin > Accessibility of switchgear > Ability to connect on terminals or pads > Accessibility for connection > Locking, foolproofing	> Visual inspection > Visual inspection > Specifications, visual inspection > Specifications, visual inspection > Technical guide > Operating test > Operating test > Operating test > Operating test > Visual inspection > Visual inspection > Visual inspection > Visual inspection	☑
Busbars		
> Busbar cross-section > Coating and internal arc device > Busbar support (fastening device and number) > Marking > Compliance of joint blocks	> Technical guide > Customer drawings and specifications file > Technical guide > Customer drawings and specifications file > Technical guide	☑
Cables & flexible busbars		
> Cross-section and characteristics of conductors > Compliance of installation mode (fastening, sharp edges, etc.) > Auxiliary Power separation > EMC protection	> Technical guide > Technical guide > Assembly and installation guide and communication guide > Assembly and installation guide and communication guide	☑
Connection		
> Compliance and quality of bolted connections (e.g. covering and fastener type) > Torque and marking > Crimping quality	> Technical guide	☑
Protection of persons		
> Earth busbar (cross-section and fastening) > Earthing braids > Forms > Bonding continuity > IP of measuring devices (fastened on doors) > Blanking shutters > Terminal guards and covers > Fastening of protective barriers	> Technical guide and assembly technical guide	☑
Safety distances		
> Clearance > Creepage distances	> Assembly and installation guide and visual inspection > Installation and assembly guide	☑
Dielectric check (power circuit)		
> Devices which don't withstand voltage of the dielectric check should be disconnected before the test.	> Insulation tester	☑

SUMMARY

I check

Control points	Control resources	Final control
Insulation check (power circuit)		
	> Megohmmeter	☑
Electrical compliance		
> Phase order > Voltages, control polarities > Distribution of polarities (inter-column connections)	> Phasing test > Electric tests, voltmeter > Electric tests, voltmeter	☑
Functional tests: > Operating sequence (controls and signalling) > Checking of source transfer > Electrical and mechanical inter-locking > Checking of opening/closing orders of units > Trip tests (defects) > Information report (OF-SDE-SD) > Signalling (indicator lights, etc.) > Injection on protection and measurements (values, etc.)	> Test consoles, injection test bench, etc.	
Measurement and protection: > Protection tests (fault tripping, etc.) > Injection on measuring devices (Pa, PWH, etc.) > CT winding direction	> Electric tests	
Device settings (circuit monitors, protections, etc.)	> Technical documentation	
Automation and communication: > Equipment addressing > Network tests (read/write) > Verification of PLC inputs/outputs > Validation of the PLC (according to functional specifications)	> Customer specifications	
Cleaning and preparation of columns		
> Functioning of doors, swivelling front panels > Locks (type, functioning) > IP degree of protection		
Documentation related to switchboard		
> Switchboard building drawings > Installation and maintenance documents > Switchgear guides > List of shortages		
Packaging		
> Compliance of the package Packing list > Compliance of packaging	> Packing list > Compliance of packaging Contract terms	

Objectives

- Avoid having to repeat the process from the beginning
- Meet the customer's specifications to the letter
- Provide a product of high quality, without defect, from the design phase to delivery

SUMMARY

6.10. Model form "Routine verification - Testing report"

Manufacturer of the assembly: .....
Address: .....
Original Manufacturer: .....

Routine verification - checking report

Customer: .....
Project: .....
.....
Switchboard identification: .....
.....
Equipment: .....
Quantity: .....
Drawing No: .....

Report No: .....
Customer ref.: .....
.....
Project ref.: .....
.....
Rev. Index: .....

Checking program

Routine verification checks are carried out in compliance with the Std. IEC 61439-2

1. Construction		Done
a. degree of protection of enclosures	V	
b. clearances and creepage distances	V	
c. protection against electric shock and integrity of protective circuits	V & T	
if electrical control indicate meter reference Ohm Value		.....
d. incorporation of built-in components	V	
e. internal electrical circuits and connections	V & T	
f. terminals for external conductors	V	
g. mechanical operation	T	

V: visual
T: test

2. Performance		
a. dielectric properties	T	

Meter Ref. .....

Circuits		Main circuits	Auxiliaries
Rated insulation voltage Ui	V		
Dielectric check voltage	V		

Option: up to 250 A, dielectric check can be replaced by insulating checks under 500 V: .....

Circuit		Main circuits	Auxiliaries
Applied voltage			
Insulation value			

b. wiring, operational performance and function	T	

Comments:

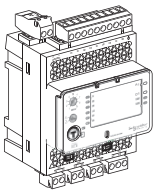
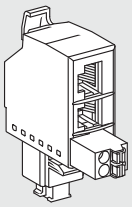
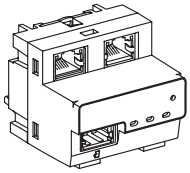
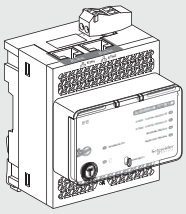
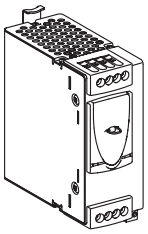
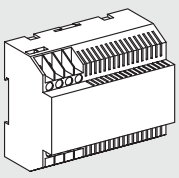
Having passed the above checks, the LV switchgear assembly under consideration is in compliance with the Std. IEC 61439-2 (IEC/EN 61439-2).

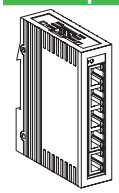
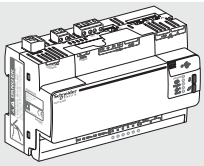
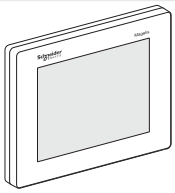
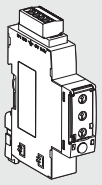
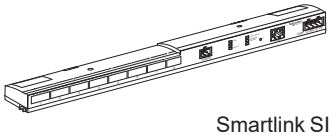
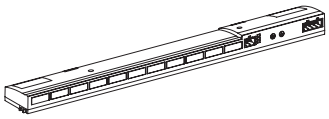
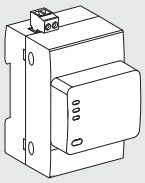
.....
.....

Customer representative	**Quality inspector**	**Quality manager**
.....	.....	.....
Date	**Date**	**Visa** .....
Visa	**Visa**	.....

SUMMARY

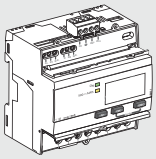
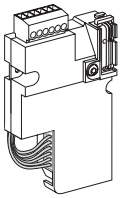
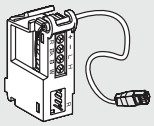
Bill of materials and software

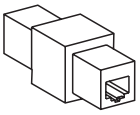
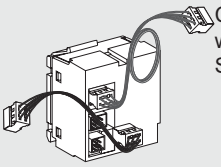
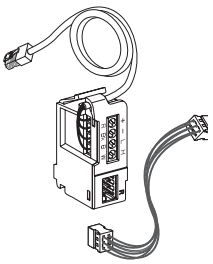
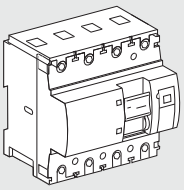
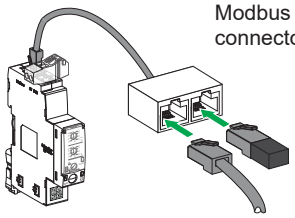
Description		Reference
	I/O application module	**LV434063**
	ULP port	**LV850061SP**
		LV850062SP
	EIFE	**LV851001**
	IFE, EIFE Ethernet interface for LV breaker	**LV434001**
	Ethernet interface for LV breakers and gateway	**LV434002**
	Power supply	**ABL8MEM24003**
		ABL8MEM24006
		ABL8MEM24012
		ABL8MEM24030
		ABL8MEM24050
		ABL8RPS24100
		ABL8RPS24200
	Power MicroLogic	**AD54440**
		AD54441
		AD54442
		AD54443
		AD54444
		AD54445

Description		Reference
	Ethernet Switch	**TCSESU053FN0**
		TCSESU083FN0
	Com'X: Energy server	**EBX**
	Switchboard front display module FDM128	**LV434128**
	IFM V2	**LV434000**
	IS	**NVE85393-04**
	Stacker (set of 10)	**TRV00217**
	Smartlink SI B	**A9XMZA08**
	Smartlink Modbus	**A9XMSB11**
	PowerTag Link	**A9XMWA20**

SUMMARY

Bill of materials and software

Description		Reference
	IEM3150	**A9MEM3150**
	Communicating device with BCM (Breaker Control Module)	**33106**
	Internal terminal block	**33119**
	ULP cord, shielded cable L = 0.35 m	**LV434195**
	L = 1.3 m	**LV434196**
	L = 3 m	**LV434197**
	Ethernet cable RJ45: ■ 10-100 mb ■ Length 100 m max ■ RJ45 cable, Category 6 SFTP, recommended L = 1 m	**VDIP184546010**
	L = 0.5 m	**VDIP184546005**
	Modbus cable: ■ shielded twisted pair ■ RS485 standard + Power Supply ■ a roll of RS485 cable, 4 wires (2 x RS485 + 2 power supply) with a length of 60 m	**50965**
	10 ULP line terminators	**TRV00880**
	ULP cable, shielded cable L = 0.3 m	**TRV00803**
	L = 0.6 m	**TRV00806**
	L = 1 m	**TRV00810**
	L = 2 m	**TRV00820**
	L = 3 m	**TRV00830**
	L = 5 m	**TRV00850**

Description		Reference
	5 RJ45 connectors female/female	**TRV00870**
	Communicating device with BSCM (Breaker Status & Control Module)	**LV434205**
	NSX cord shielded cable L = 0.35 m	**LV434200**
	L = 1.3 m	**LV434201**
	L = 3 m	**LV434202**
	NG125 10 A	**18649**
	Modbus T connector L = 0.3 m	**VW3A8306TF03**
	L = 1 m	**VW3A8306TF10**

SUMMARY

Bill of materials and software

Accessories for Acti 9 Smartlink			
USB cable link/Modbus	for Acti**9** Smartlink test	1	**A9XCATM1**
Prefabricated cables 2 connectors	Short: 100 mm	6	**A9XCAS06**
	Medium: 160 mm	6	**A9XCAM06**
	Long: 870 mm	6	**A9XCAL06**
Prefabricated cables 1 connector	Long: 870 mm	6	**A9XCAU06**
Connectors	5-pin connectors (Ti24)	12	**A9XC2412**
Mounting kit	DIN rail (4 feet, 4 straps, 4 adapters)	1	**A9XMFA04**
	Linergy FM 200 A (4 adapters)	1	**A9XM2B04**
Spare parts	Lock for Linergy FM 80 A (2 clips)	1	**A9XMLA02**

Catalog numbers

PowerTag M250/M630


LV434020


LV434021


LV434022


LV434023

PowerTag M250/M630

Type	Cat. no.	Connection adapter for plug-in base
M250 3P	**LV434020**	**LV429306**
M250 3P+N	**LV434021**	**LV429307**
M630 3P	**LV434022**	**LV432584**
M630 3P+N	**LV434023**	**LV432585**

For additional information and the list of Schneider Electric compatible devices and concentrators, refer to the selection guide CA908058.


A9MEM1520


A9MEM1521


A9MEM1540


A9MEM1522


A9MEM1543


A9MEM1541


A9MEM1542

PowerTag A9 M63

PowerTag for Acti9 and Multi9 Monoconnect offers: "Single-terminal" circuit breakers, RCDs and switches with 18 mm pitch between phase and neutral, rating less than or equal to 63 A.

Type	Mounting	Short description	Cat. no.
1P+wire	Top or bottom	PowerTag A9 M63 1PW	**A9MEM1520**
1P+N	Top	PowerTag A9 M63 1PN T	**A9MEM1521**
	Bottom	PowerTag A9 M63 1PN B	**A9MEM1522**
3P	Top or bottom	PowerTag A9 M63 3P	**A9MEM1540**
		PowerTag A9 M63 3P 230V LL	**A9MEM1543** (1)
3P+N	Top	PowerTag A9 M63 3PN T	**A9MEM1541**
	Bottom	PowerTag A9 M63 3PN B	**A9MEM1542**

Designed to fit the following devices: iC60, Reflex iC60, DT60, iID.

For additional information and the list of Schneider Electric compatible devices and concentrators, refer to the selection guide CA908058.

(1) Not compatible with Smartlink SI D (A9XMWA20) and Smartlink SI B (A9XMZA08).

SUMMARY

PowerTag A9 P63

PowerTag for Acti9 and Multi9 PhaseNeutral offers: "Single-terminal" circuit breakers, RCDs and switches at pitch of 9 mm between phase and neutral, rating less than or equal to 63 A.

PowerTag A9 P63

Type	Mounting	Short description	Cat. no.
1P+N	Top	PowerTag A9 P63 1PN T	**A9MEM1561**
1P+N	Bottom	PowerTag A9 P63 1PN B	**A9MEM1562**
1P+N RCBO	Bottom	PowerTag A9 P63 1PN B for RCBO	**A9MEM1563**
3P+N	Top	PowerTag A9 P63 3PN T	**A9MEM1571**
3P+N	Bottom	PowerTag A9 P63 3PN B	**A9MEM1572**

Designed to fit the following devices: DT40, iDPN, C40, i DPN Vigi.

For additional information and the list of Schneider Electric compatible devices and concentrators, refer to the selection guide CA908058.


A9MEM1561


A9MEM1562


A9MEM1563


A9MEM1571


A9MEM1572

PowerTag A9 F63

PowerTag Flex for other devices and specific installations, rating less than or equal to 63 A.

PowerTag A9 F63

Type	Mounting	Short description	Cat. no.
1P+N	Top or bottom	PowerTag A9 F63 1PN	**A9MEM1560**
1P+N	Top or bottom	PowerTag A9 F63 1PN 110V	**A9MEM1564** (1)
3P	Top or bottom	PowerTag A9 F63 3P	**A9MEM1573** (1)
3P+N	Top or bottom	PowerTag A9 F63 3PN	**A9MEM1570**
3P+N	Top or bottom	PowerTag A9 F63 3PN 110/230V	**A9MEM1574** (1)

Designed to fit the following devices: Vigi iDT40, Vigi iC40, Vigi iC60, iC60 double terminal, iID double terminal.

For additional information and the list of Schneider Electric compatible devices and concentrators, refer to the selection guide CA908058.

(1) Not compatible with Acti9 PowerTag Link C (A9XELC10), Acti9 Smartlink SI D (A9XMWA20) and Acti9 Smartlink SI B (A9XMZA08)


A9MEM1560


A9MEM1564


A9MEM1573


A9MEM1570


A9MEM1574

SUMMARY

Appendices

Reference documents

The table below outlines the reference documents that provide further information as required.

Document title	Reference
IFE - Instruction sheet	**HRB49218-01**
IO module - Instruction sheet	**HRB49217-00**
FDM128 - Instruction sheet	**HRB45777-00**
Acti**9** Smartlink Mobus - Instruction sheet	**S1B33423**
Com'X - Instruction sheet	**253537642**
BCM ULP - Instruction sheet	**5100512864A (B)**
IFM - Instruction sheet	**GHD1632301-05**
ULP System	**DOCA0093**
Cyber security Com'X	**7EN52-0360-00**
Cyber security MTZ	**DOCA0122EN**
PowerTag - Instruction sheet	**EAV31628**

Reference version & software configuration tool procurement

To download EcoStruxure Power Commission Software, contact your local Schneider Electric support.

The reference version is available from EcoStruxure Power Commision software.

> see section 5.2.2: "Enerlin'X System Release Note", or from the Schneider Electric Web site:

> **1.** Go to the Schneider Electric home page www.se.com.
> **2.** Go to Product Offer
> **3.** In the Search box, type Enerlin'X System Release Note
> **4.** Download the pdf file to your computer.

SUMMARY

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