



TECHNICAL GUIDE



PHOTOVOLTAIC SOLUTIONS

LEGRAND SUPPORTS YOU ON ALL YOUR PROJECTS

As a company, the **Legrand Group is committed to addressing climate change**, with photovoltaic installations being one of our key solutions to this challenge.

The use of photovoltaics is experiencing rapid global growth, meeting the increasing demand for clean and sustainable energy. Key issues include reducing carbon emissions, achieving energy independence, and driving technological innovation.

In this context, and to better support our clients in their projects, **Legrand offers a range of products dedicated to the protection and distribution of energy generated by photovoltaics.**

In this document, you will find all the **products suitable for your photovoltaic installations** (rooftops, carports, or photovoltaic farms). It also includes a glossary and simplified diagrams to help you understand the photovoltaic sector.

LEGAL INFORMATION

Presentation images do not always include Personal Protective Equipment (PPE) but this is a legal and regulatory obligation that must be scrupulously respected.

In accordance with its continuous improvement policy, Legrand reserves the right to change the specifications and illustrations without notice. All illustrations, descriptions and technical information included in this document are provided as indications and cannot be held against Legrand.

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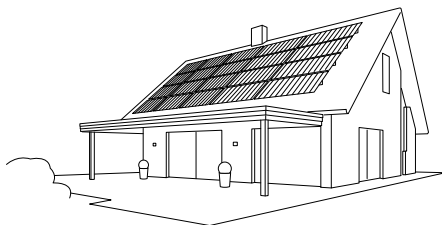
PHOTOVOLTAIC SOLUTIONS

Context

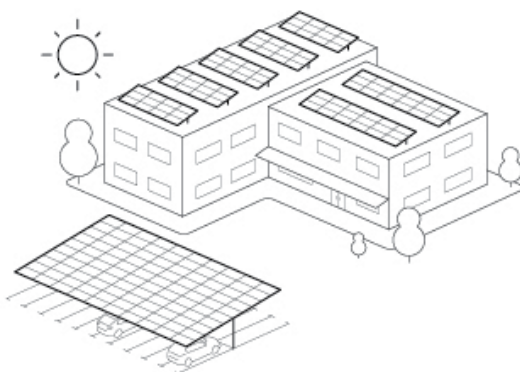
The solarisation of rooftops for individual homes, commercial, industrial, or artisanal buildings, warehouses, non-public hangars, covered parking lots, etc., is expected to evolve in the coming years. The decarbonisation of existing sites and energy efficiency are now major challenges for the environment and energy savings.

In this document, you will find the suitable products for:

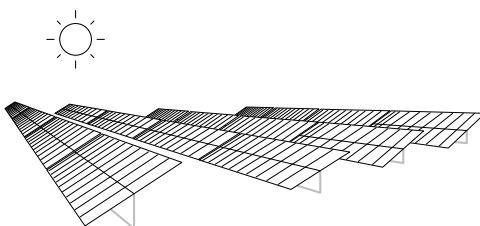
1- Power production for residential use



2- Power production for commercial/canopies solar solutions



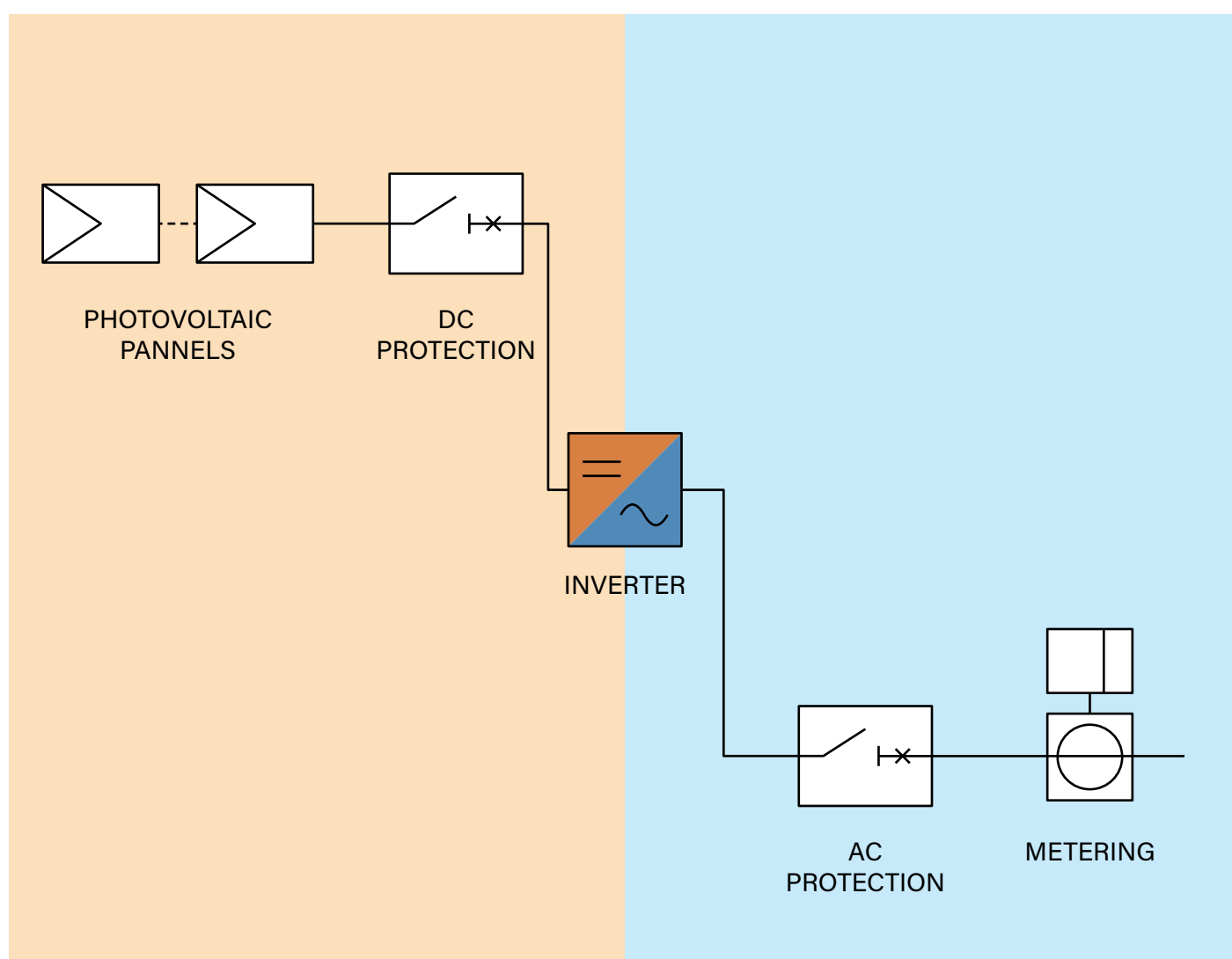
3- Power production for Solar farms



When installing the products, please respect the IEC 60364-8-82 and IEC 60364-7-712 standards

General principle of a photovoltaic installation

The generation of photovoltaic solar energy is based on the transformation of the direct current (DC) into alternating current (AC). This conversation is possible by using devices adapted to the electrical intensity and voltage at each stage of the circuit.



CALCULATION RULES

Definition and sizing of electrical protection on the DC side

According to IEC 60364-7-712 standards :

CALCULATION RULES FOR PV STRING PROTECTION

Values to consider for selecting fuse cartridges:

$$U_e \geq U_{oc\ STC} \times N \times 1.2$$

$$I_n > 1.5 \times I_{sc\ mod}$$

$$I_n < 2.4 \times I_{sc\ mod}$$

where :

$I_{sc\ mod}$: short-circuit current of a PV module under standard test conditions

CALCULATION RULES FOR ISOLATING AND DISCONNECTING A GROUP OF PV STRINGS

Characteristics of the isolator:

$$U_e \geq U_{oc\ STC} \times N \times 1.2$$

$$I_n > 1.25 \times I_{sc\ STC} \times N_{ch}$$

$$I_n < 2.4 \times I_{sc\ STC} \times N_{ch}$$

where:

$U_{oc\ max}$: Maximum open-circuit voltage of a PV module

N : number of PV modules in the string

$I_{sc\ STC}$: short-circuit current of a PV module under standard test conditions

N_{ch} : number of strings in the group

Definition and sizing of electrical protection on the AC side

Inverters must be protected on the AC output side by a circuit breaker.

The sizing of this circuit breaker depends on:

- the nominal output current of the inverter
- the internal ambient temperature of the enclosure
- the surrounding equipment
- the presumed short-circuit current at the circuit breaker installation point

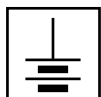
SYMBOLS



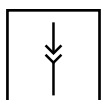
AC
Alternating current



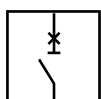
DC
Direct current



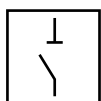
BATTERY
Device that stores electrical energy in chemical form and converts it into electricity when needed. In photovoltaic systems, it stores excess solar energy for use when sunlight is not available.



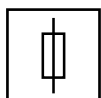
CONNECTORS
Connectors for PV installation cables. Allow safe wiring of PV modules in series and parallel.



CIRCUIT BREAKER
Protection against damage caused by excessive current.



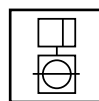
DISCONNECTOR
Mechanical switching device which provides, in the open position, an isolating distance in accordance with specified requirements.



FUSE
Protection that interrupts the electrical current in the circuit in case of a fault.



INVERTER
Electrical energy converter that transforms direct current into alternating current.



METERING
Set of equipment for measuring the electrical energy consumed and/or produced by an installation.



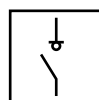
OVERCURRENT PROTECTION
Fuses or circuit breaker.



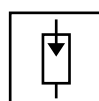
PHOTOVOLTAIC PANNEL
Device that can generate electricity when exposed to solar radiation.



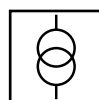
POWER CONVERTER
Electrical energy converter that can adjust voltage and frequency levels to meet the specific needs of a device or electrical system.



SWITCH DISCONNECTOR
Switch which, in the open position, satisfies the isolating requirements specified for a disconnecter.



SURGE PROTECTING DEVICE
Device designed to limit temporary overvoltages of atmospheric origin.



TRANSFORMER
Device that transforms an AC voltage and current system into another voltage and current system for the purpose of transmitting electrical power.



CURRENT TRANSFORMER
A current transformer (CT) is defined as an instrument transformer.



DEFINITIONS

AGRIPV (AGRIVOLTAISM)

Combination of agriculture and photovoltaic production on the same field, allowing simultaneous agricultural cultivation and solar energy generation, optimising land use.

BUILDING-INTEGRATED

PV panels replace the roof covering and directly ensure its waterproofing.

NON-BUILDING-INTEGRATED

PV panels do not replace the roof covering and are placed on top of the roof. However, they must also ensure waterproofing.

CENTRAL OR STRING INVERTER

An inverter designed to convert the direct current from multiple strings (series-connected PV module chains) into alternating current.

INVERTER

Electrical energy converter that transforms the direct current produced by solar panels into alternating current compatible and synchronised with the public electricity distribution grid in the case of grid connection. In this case, the device must comply with DIN VDE 0126-1-1 standards.

JUNCTION BOX

The junction box regroups the electrical connections between the solar panels and the rest of the system.

FRAME

Outer part of the modules or panels that protects the modules themselves and mainly to secure them.

PV* STRING

A string is composed of any number of modules or panels electrically connected in series to obtain the required voltage for a PV* group.

PV* CELL

A semiconductor electronic component that generates an electric current when exposed to light. A panel is composed of cells.

PV* FIELD | SOLAR FARMS | GROUND-MOUNTED SOLAR POWER STATION

Exploitation of several hectares producing electricity from sunlight through a large number of photovoltaic solar panels.

PV* MODULES OR SOLAR PANELS

The result of assembling PV cells and a protective coating, called a frame. They are designed to capture solar energy and convert it into electricity.

GRID CONNECTION

Connecting a photovoltaic installation to the public electricity grid to inject the surplus or the entirety of the production, most often for resale.

SELF-CONSUMPTION

Consuming energy produced by a renewable energy production solution (solar, wind, geothermal, etc.) of which one is the producer.

INJECTION

When a PV* installation is connected to the public grid, the PV* production is injected into the grid either entirely for total resale or only the surplus for a self-consumption installation with or without surplus resale.

ORIENTATION

The position of a photovoltaic/solar panel relative to the reference directions north, south, east, and west.

SOLAR IRRADIATION

Also called "solar irradiance".

Amount of solar energy received by a given surface, commonly expressed in kWh/m².

TILT

The measurable angle between the plane of the PV module and the horizontal plane.

**PV: photovoltaic*



kW

The kilowatt is the unit of measurement for nominal electrical power. $1000 \text{ W} = 1 \text{ kW} = 0.001 \text{ MW}$.

kWp

Kilowatt peak (kWp) represents a power of 1000 W that a solar panel can produce under ideal conditions. This allows the comparison of the efficiency levels between panels and sizing the installation.

kVA

Kilovolt-ampere (kVA) measures the apparent electrical power, which is the maximum value that the meter can support.

kWh

Kilowatt hour (kWh) measures the actual amount of energy produced and consumed. It is the unit of measurement used on your energy bill.

INSTALLATION POWER

kWp (kilowatt-peak) refers to the installed power of a photovoltaic system. In contrast, kWh (kilowatt-hour) measures the energy actually produced or consumed over a given period.

NOMINAL POWER

The maximum power measured under standard test conditions used to classify photovoltaic modules.

PEAK POWER

The power delivered by panels under optimal production conditions. It is measured in Wp (Watt-peak).

SHADING

Shadows that can disrupt the operation of your solar panels.

SHADING FOR PARKING

A parking shelter made of metal or wood. Solar panels are mounted on the shading using an integration system, then connected to each other and to inverters.

MAIN PROTECTIVE DEVICE

Connection device ensuring coordinated control, overload protection, and short-circuit protection

MC4 CONNECTOR

MC stands for Multi-Contact. MC4 connectors are certified IP67 and correspond to protection class II. MC3 connectors are certified IP65 and correspond to protection class II.

SDFI (Switching Device For Islanding)

Connection device for transitioning to disconnected mode from the distribution network, so called "islanded mode" or "backup mode", in which case the installation is operated from local production and/or storage



SRCS

Connection device for the reference conductor of the combined system to the SDFI.

MPP OR MPPT (Maximum Power Point Tracker)

Allows tracking the maximum power point of a non-linear electrical generator such as a photovoltaic generator. The "MPPT" also refers to a component of the inverter that optimizes the use of irradiation by adjusting its load to the characteristics of the PV generator based on actual sunlight.

PHOTOVOLTAIC SHELTER

Structure specifically designed to ensure the safety and optimisation of photovoltaic installations. It generally shelters inverters and AC and DC protection boards, usually installed outdoors and to the north to ensure natural ventilation to cool the inverters, therefore to improve production efficiency. It defines a technical area to limit access only to authorized personnel.

PURCHASE TARIFF

The rate at which the grid operator buys the electricity produced by photovoltaic producers. This rate varies according to the technical specifications of the installation (building integration, power).

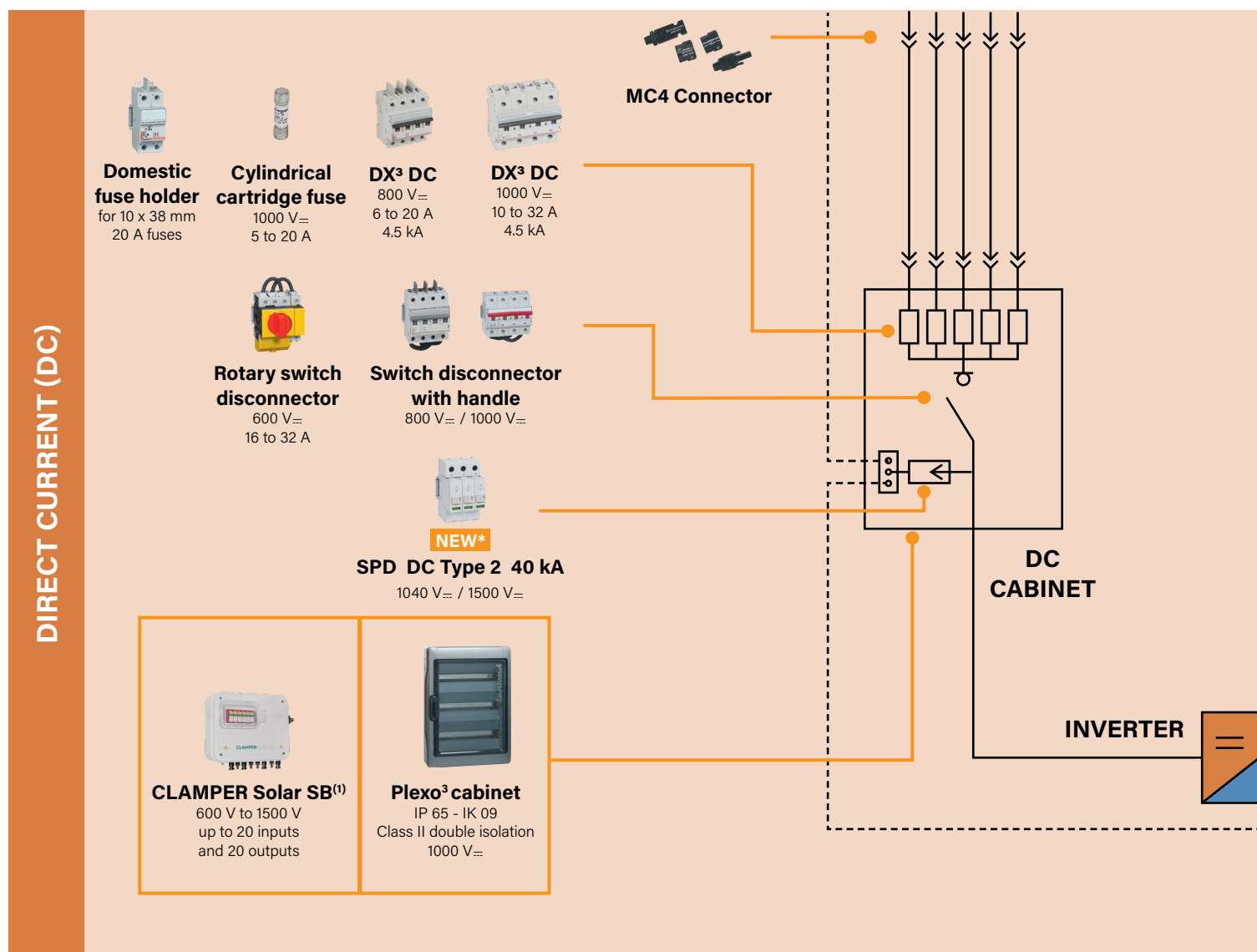
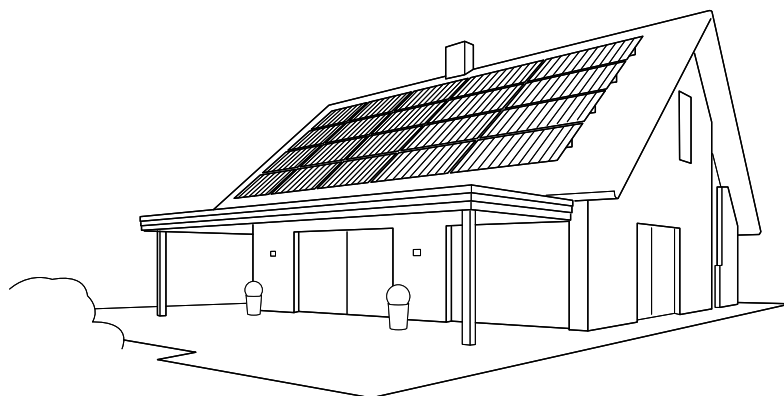
WITHDRAWAL OR CONSUMPTION

Electricity withdrawal corresponds to the consumption of electricity by consumers or storage means during the charging period.

**PV: photovoltaic*

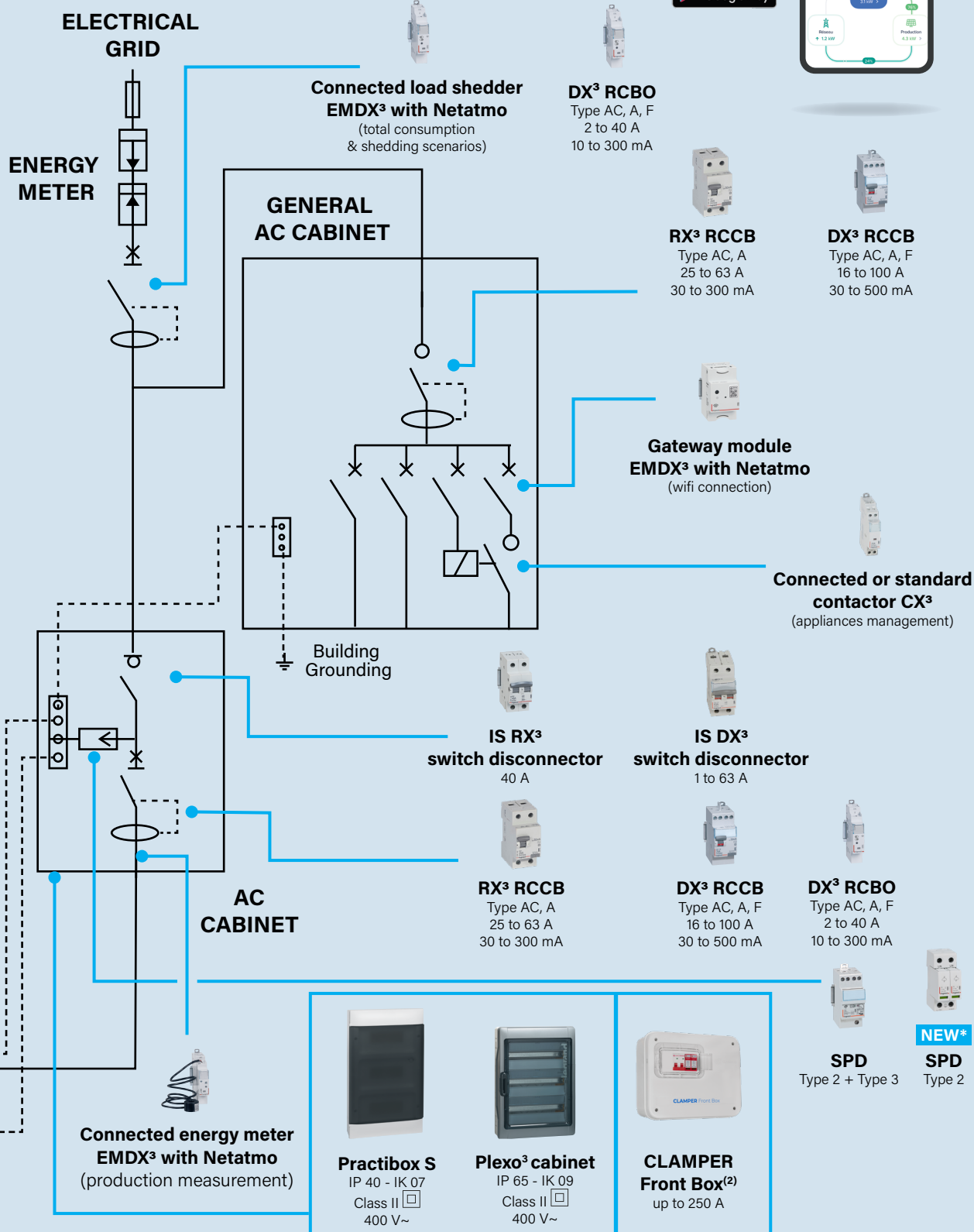
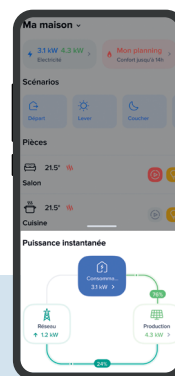
RESIDENTIAL

ON-GRID SELF-CONSUMPTION



⁽¹⁾ CLAMPER Solar SB is a pre-wired solution, which differs from the Plexo³ cabinet. CLAMPER Solar SB is fully equipped while Plexo³ is empty.

Illustrative diagrams: the depicted products serve as examples and may not accurately represent their actual installation or technical specifications. Adaptations to the associated power ratings are required.

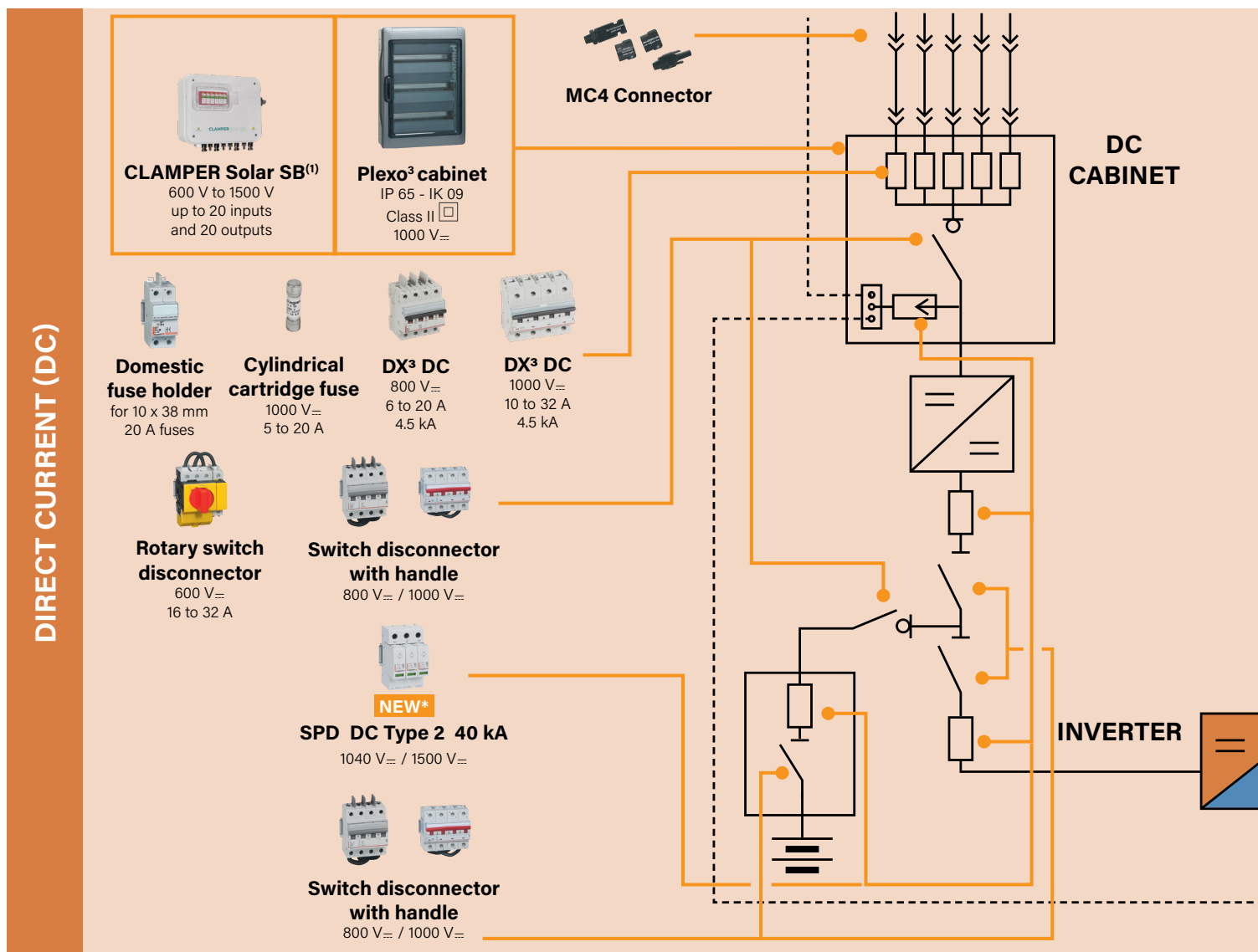
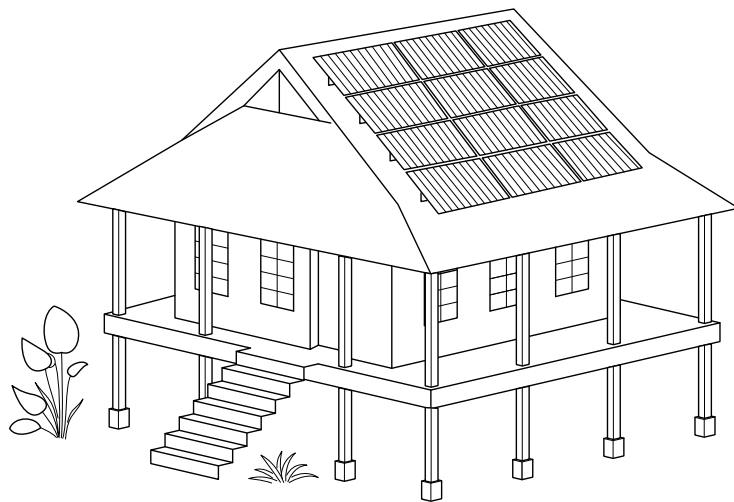


⁽²⁾ CLAMPER Front Box is a pre-wired solution, which differs from the Plexo³ and Practibox S cabinets. CLAMPER Front Box is fully equipped while others are empty.

*available in 2025

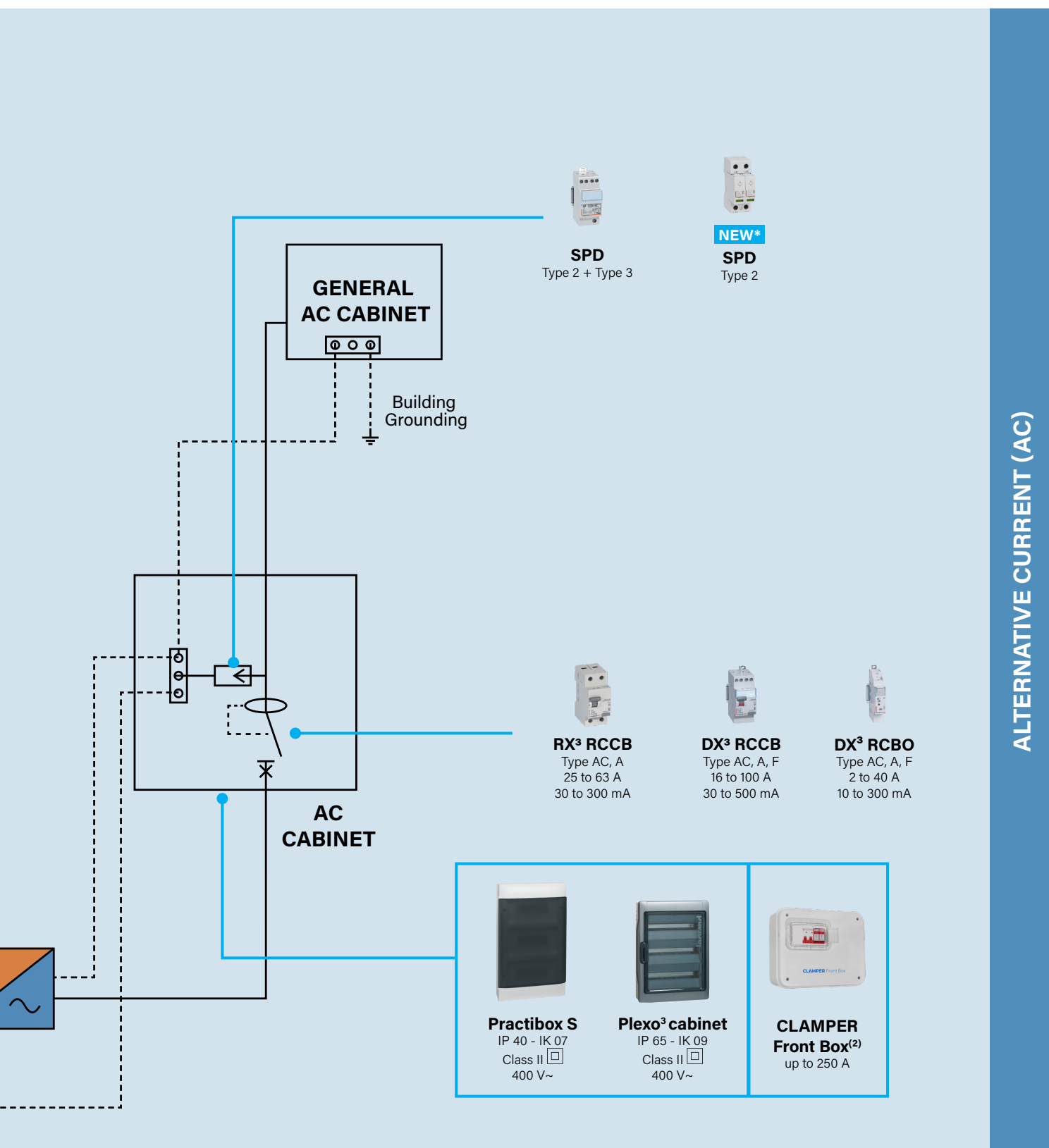
RESIDENTIAL

OFF-GRID SELF-CONSUMPTION WITH BATTERY



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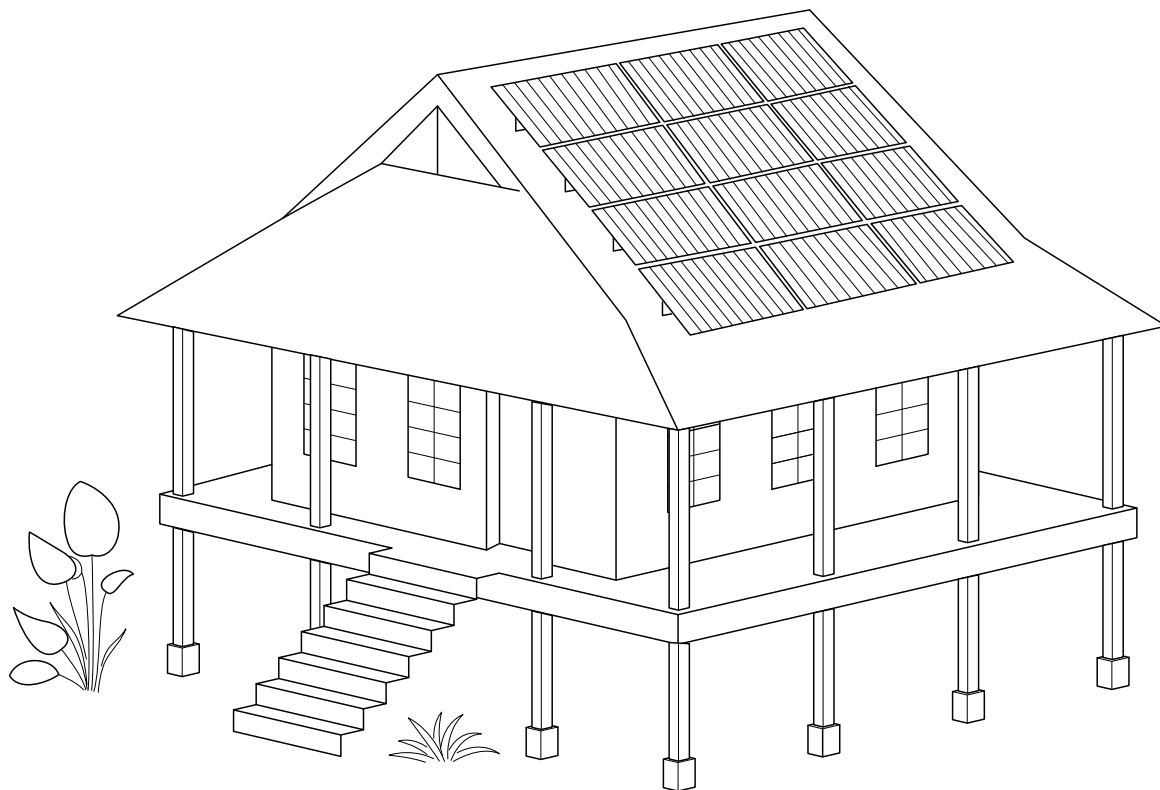


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RESIDENTIAL

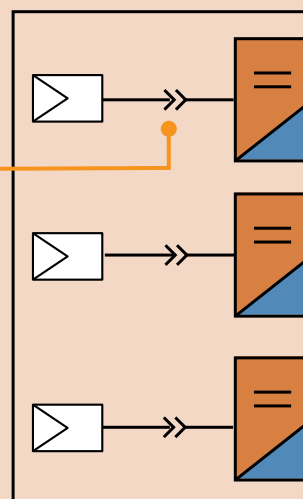
OFF-GRID SELF-CONSUMPTION WITH CENTRALISED BATTERY



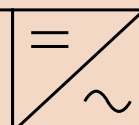
DIRECT CURRENT (DC)



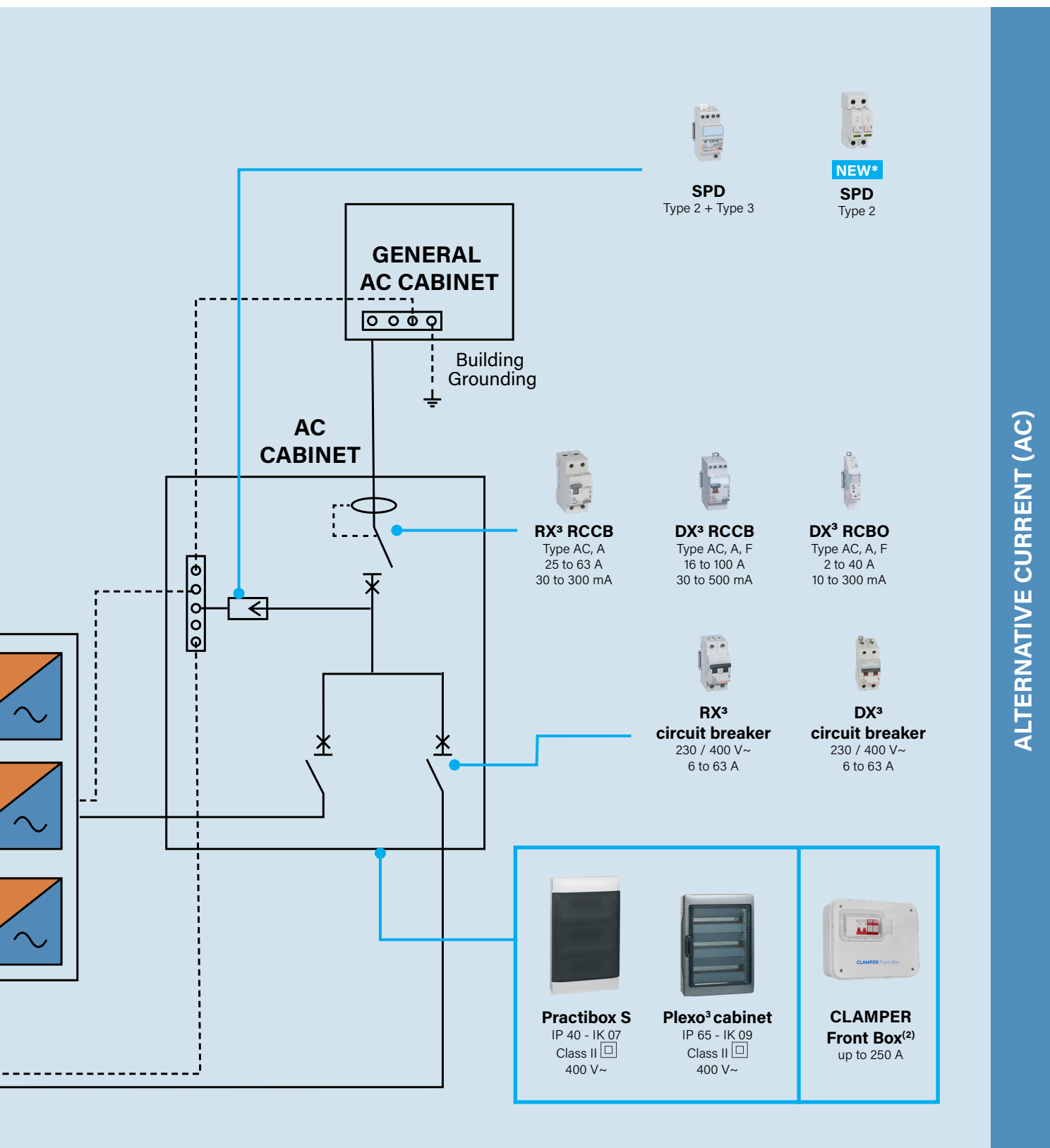
MICROINVERTERS



BATTERY ENCLOSURE WITH DC/AC CONVERTER



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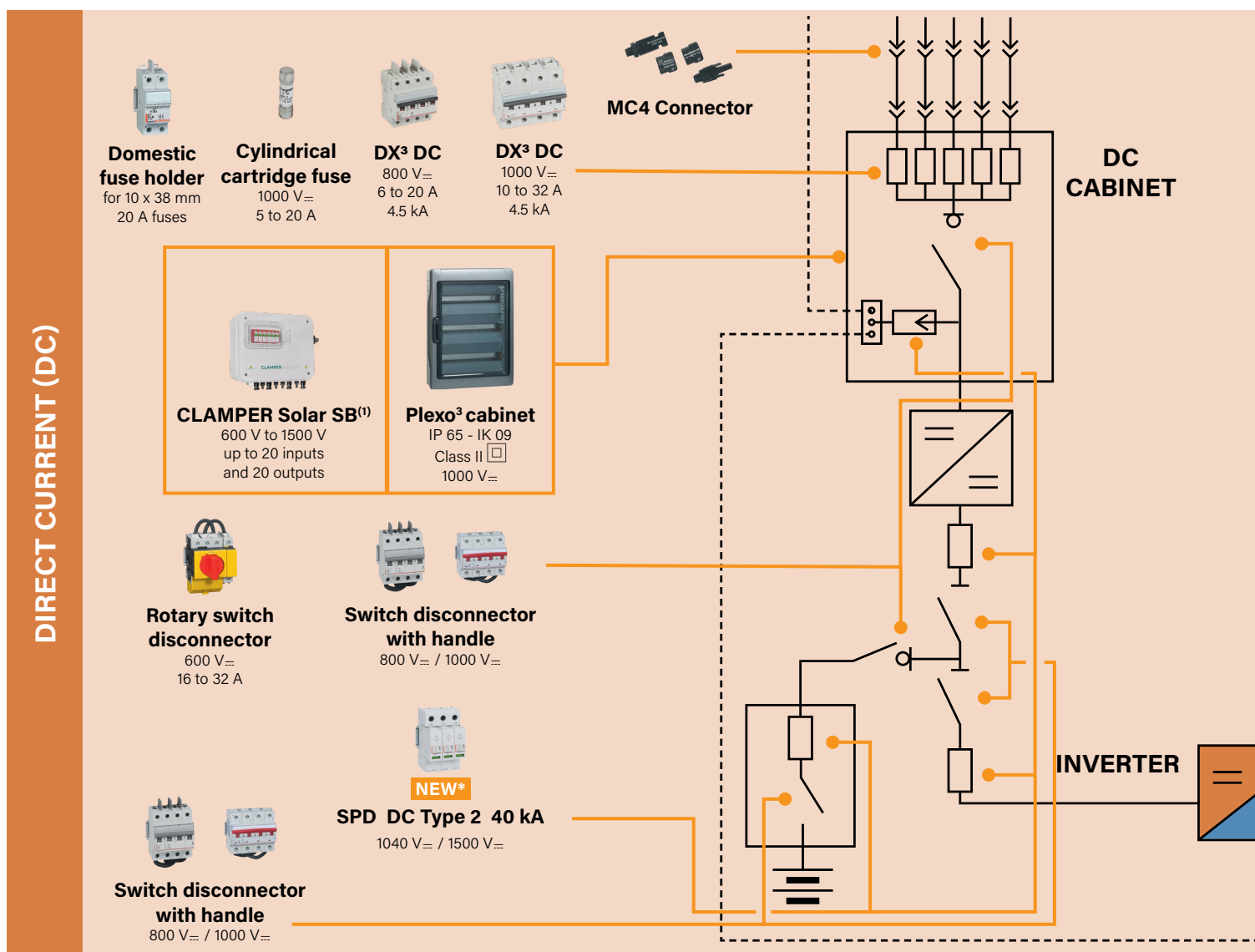
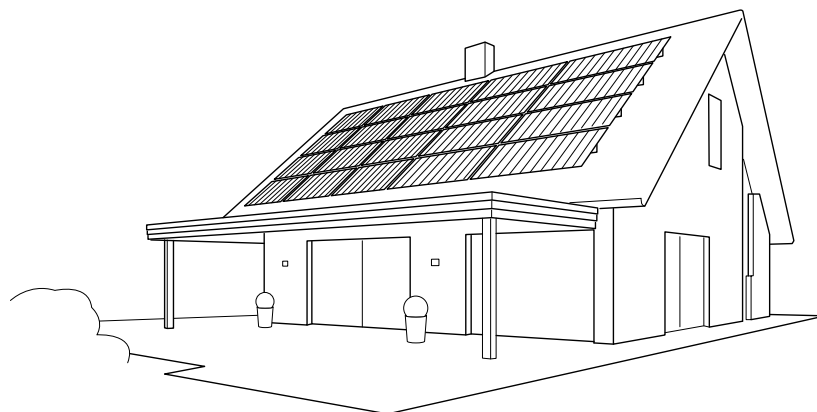
ALTERNATIVE CURRENT (AC)

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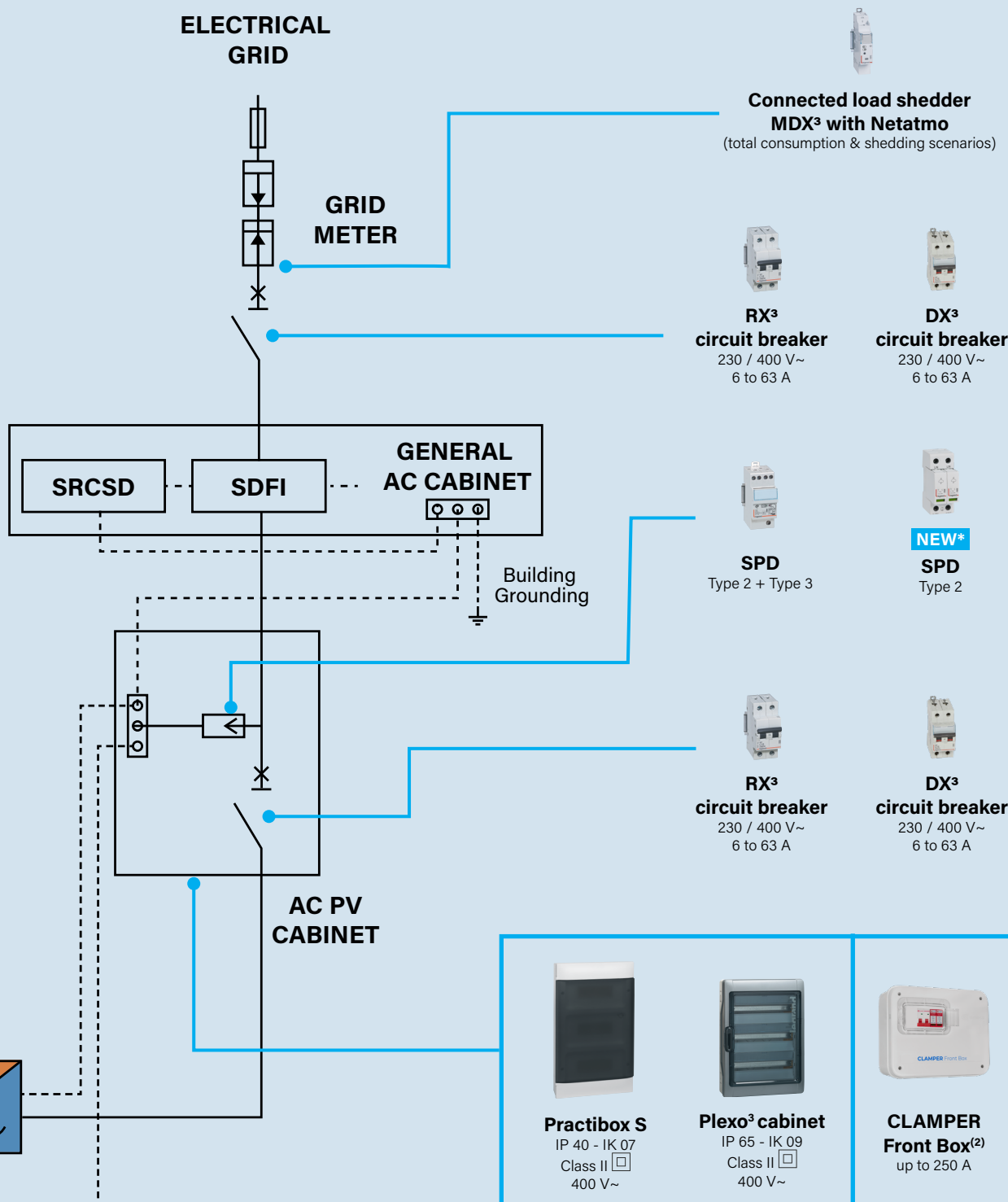
RESIDENTIAL

ALTERNATIVE SELF-CONSUMPTION WITH BATTERY



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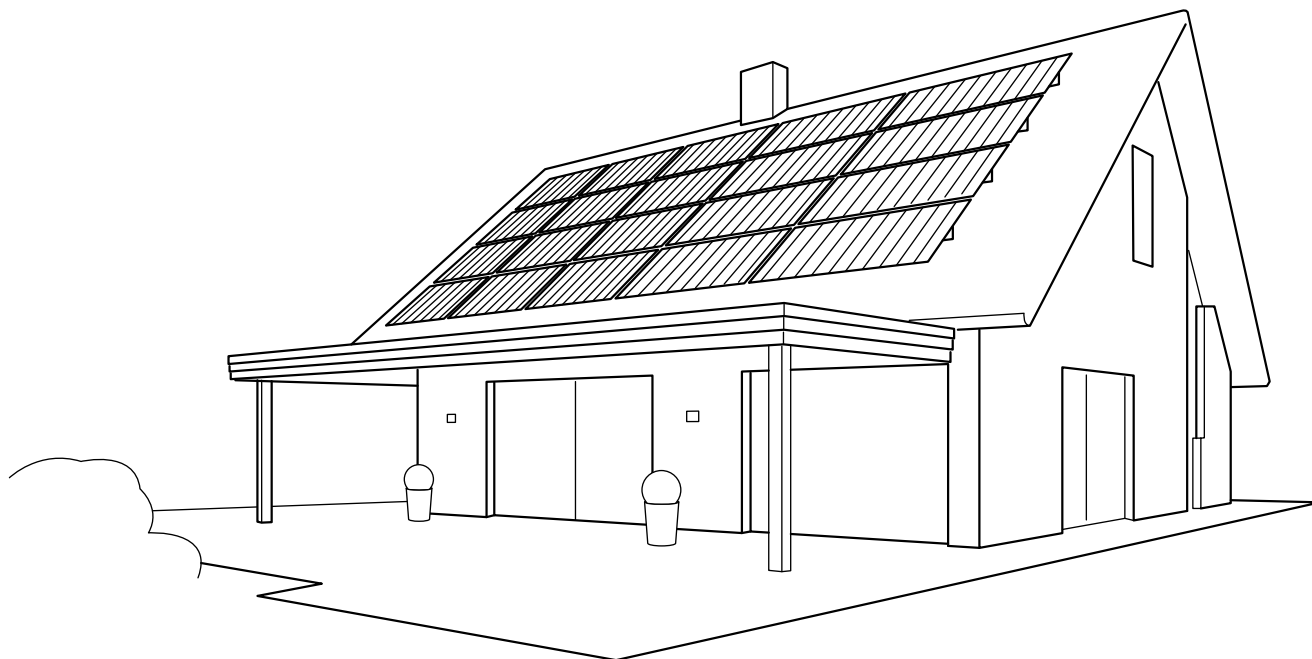
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RESIDENTIAL

ALTERNATIVE SELF-CONSUMPTION WITH CENTRALISED BATTERY

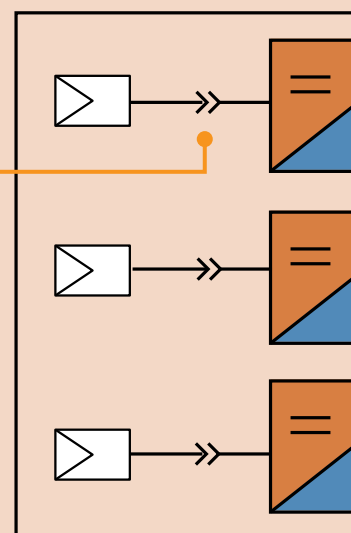


DIRECT CURRENT (DC)

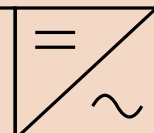


MC4 Connector

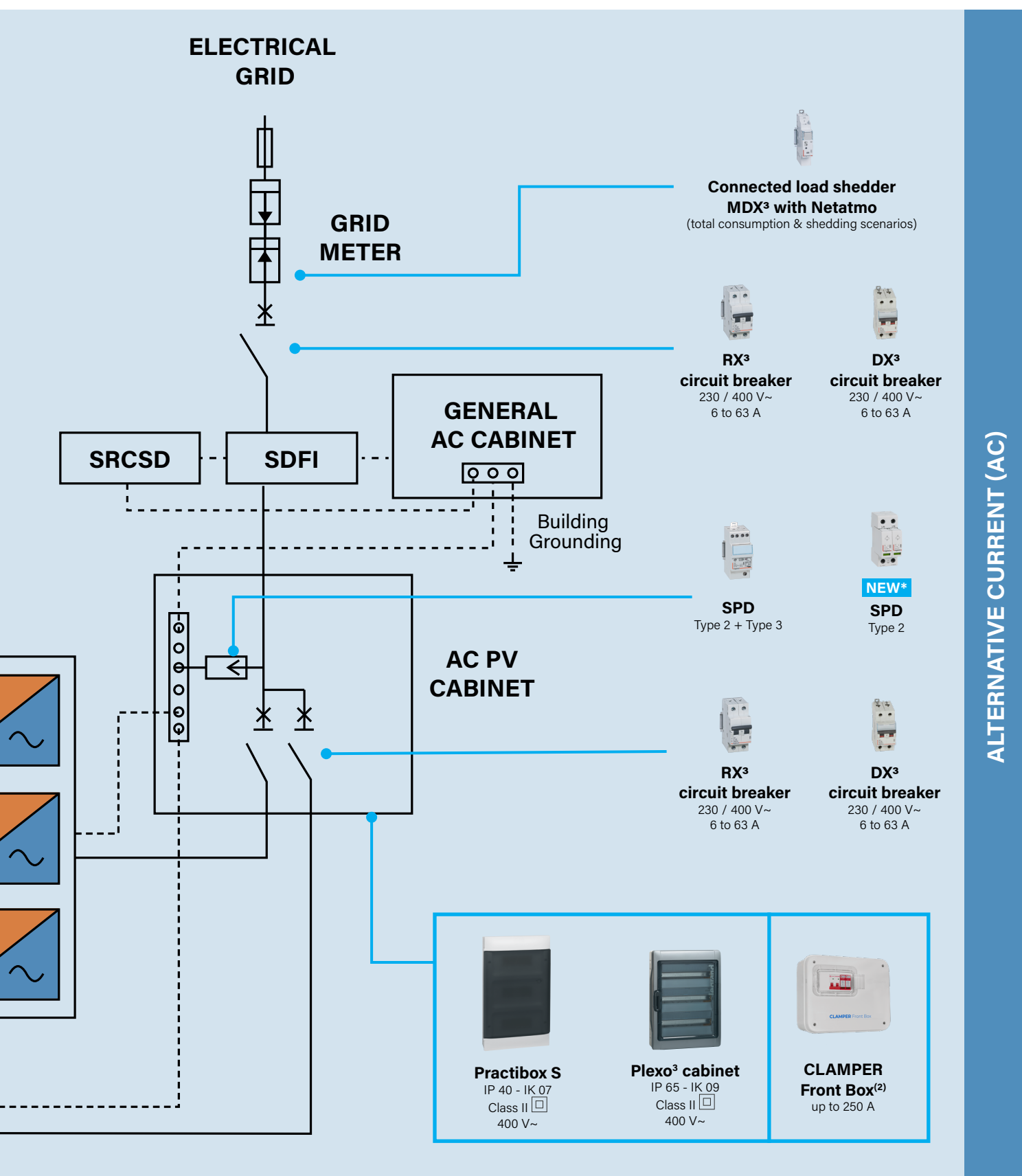
MICROINVERTERS



BATTERY ENCLOSURE WITH DC/AC CONVERTER



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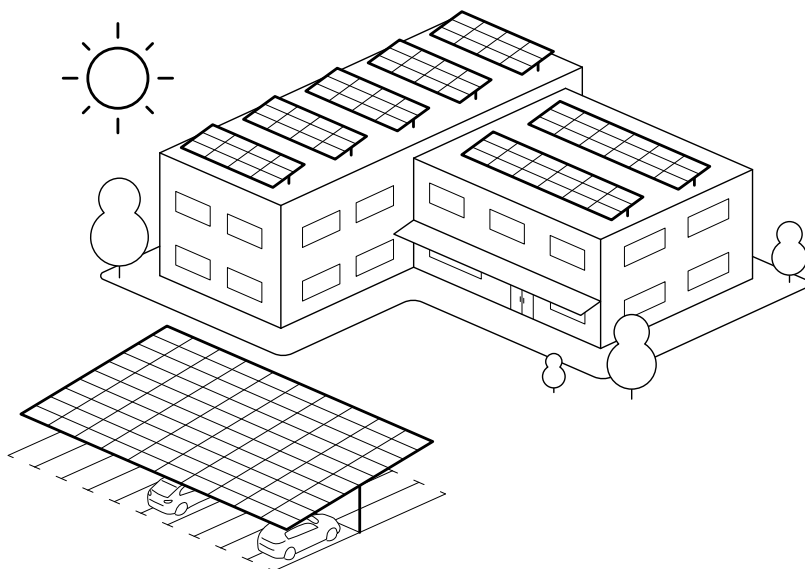
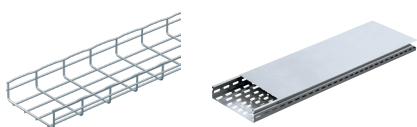
*available in 2025

COMMERCIAL/CANOPIES SOLAR SOLUTIONS

ON-GRID SELF-CONSUMPTION

INSTALLATION WITH A CENTRAL INVERTER

Cable trays are present throughout the installation.



DIRECT CURRENT (DC)

Domestic fuse holder
for 10 x 38 mm
20 A fuses

Cylindrical cartridge fuse
1000 V_~
5 to 20 A

DX³ DC
800 V_~
6 to 20 A
4.5 kA

DX³ DC
1000 V_~
10 to 32 A
4.5 kA

NEW*
SPD CLAMPER Solar
Type 1 + Type 2 Iimp 10 kA
1500 V_~

NEW*
SPD DC
Type 2 I_{max} 40 kA
1040 V_~ / 1500 V_~

CLAMPER Solar SB⁽¹⁾
600 V to 1500 V
up to 20 inputs
and 20 outputs

Marina cabinet
IP 66
1000 V_~

Plexo³ cabinet
IP 65 - IK 09
Class II
1000 V_~

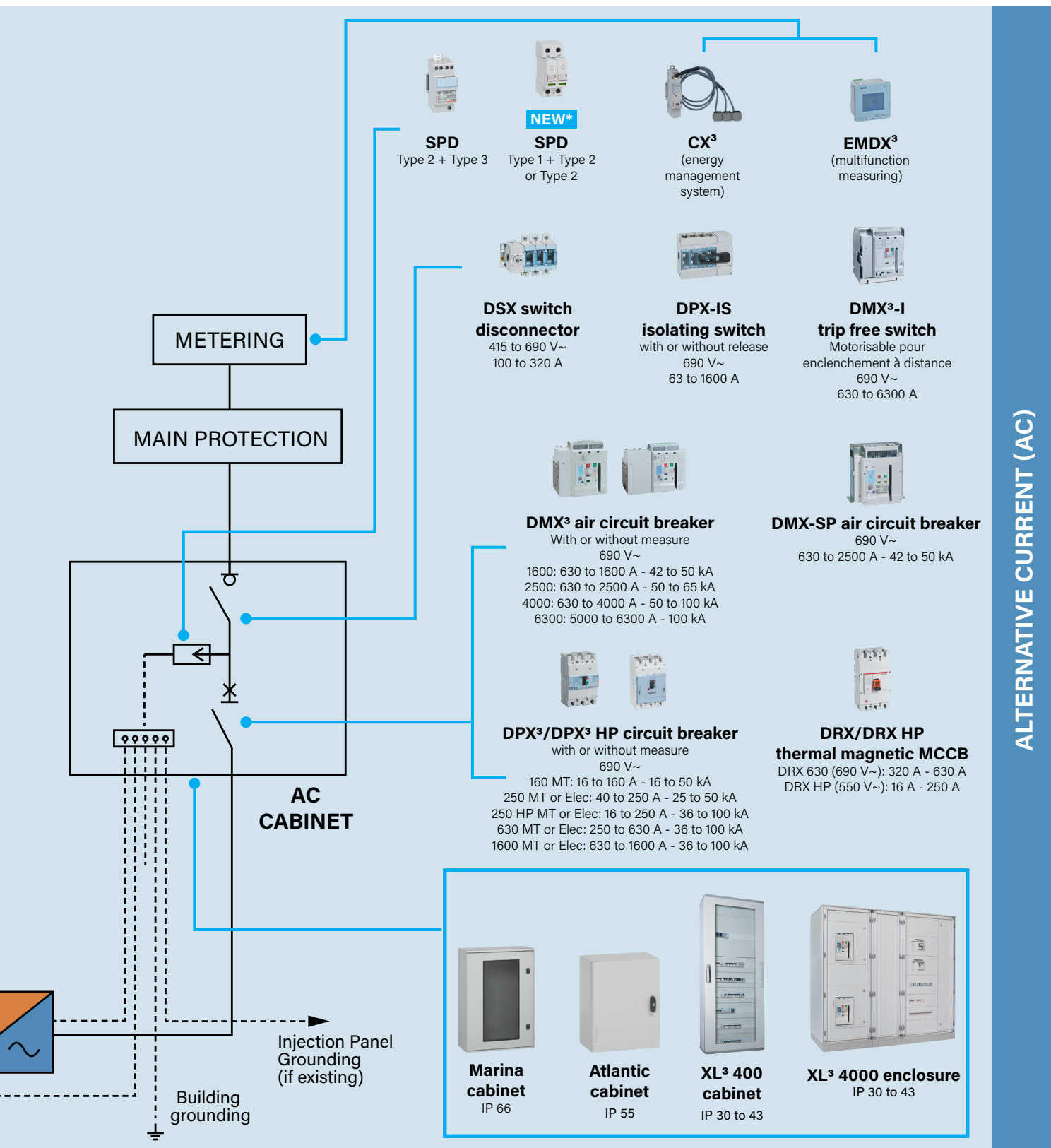
MC4 Connector

DC CABINET

INVERTER

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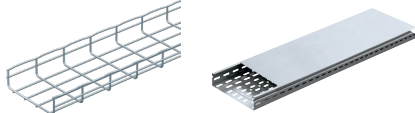
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COMMERCIAL/CANOPIES SOLAR SOLUTIONS

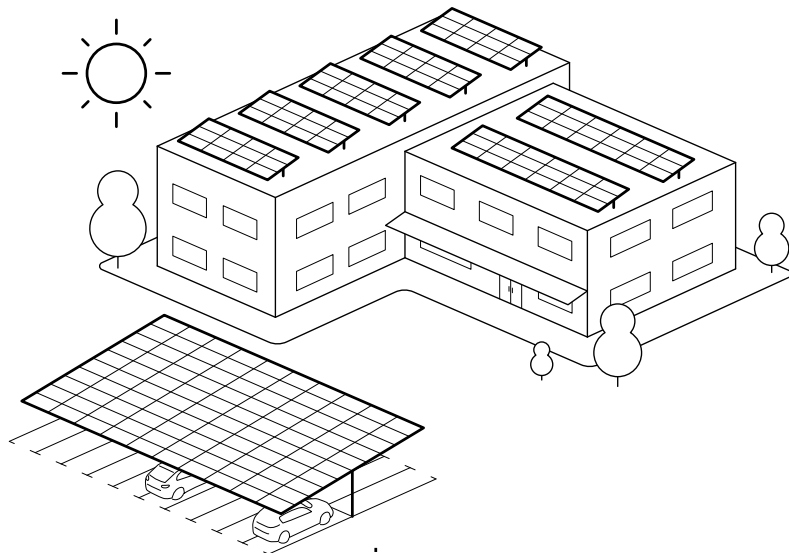
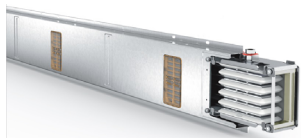
ON-GRID SELF-CONSUMPTION

INSTALLATION WITH A STRING INVERTER

Cable trays are present throughout the installation.



XCP and XCM busbar ranges are present throughout the installation from AC cabinet to LV side of CRT.



DIRECT CURRENT (DC)

Domestic fuse holder
for 10 x 38 mm
20 A fuses



Cylindrical cartridge fuse
1000 V_{DC}
5 to 20 A



DX³ DC
800 V_{DC}
6 to 20 A
4.5 kA



DX³ DC
1000 V_{DC}
10 to 32 A
4.5 kA



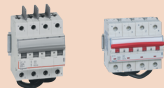
MC4 Connector



Rotary switch disconnecter
600 V_{DC}
16 to 32 A



Switch disconnecter with handle
800 V_{DC} / 1000 V_{DC}



NEW*
SPD CLAMPER Solar
Type 1 + Type 2 Iimp 10 kA
1500 V_{DC}



NEW*
SPD DC
Type 2 I_{max} 40 kA
1040 V_{DC} / 1500 V_{DC}



CLAMPER Solar SB⁽¹⁾
600 V to 1500 V
up to 20 inputs
and 20 outputs



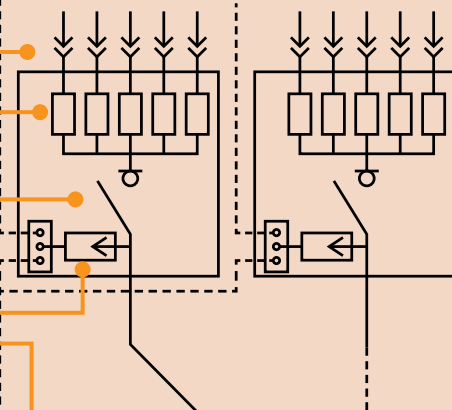
Marina cabinet
IP 66
1000 V_{DC}



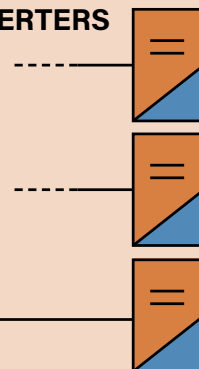
Plexo³ cabinet
IP 65 - IK 09
Class II
1000 V_{DC}



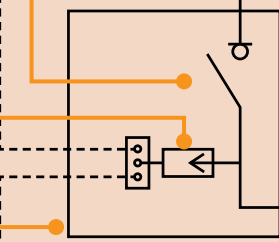
GROUP TERMINAL BLOCKS



INVERTERS

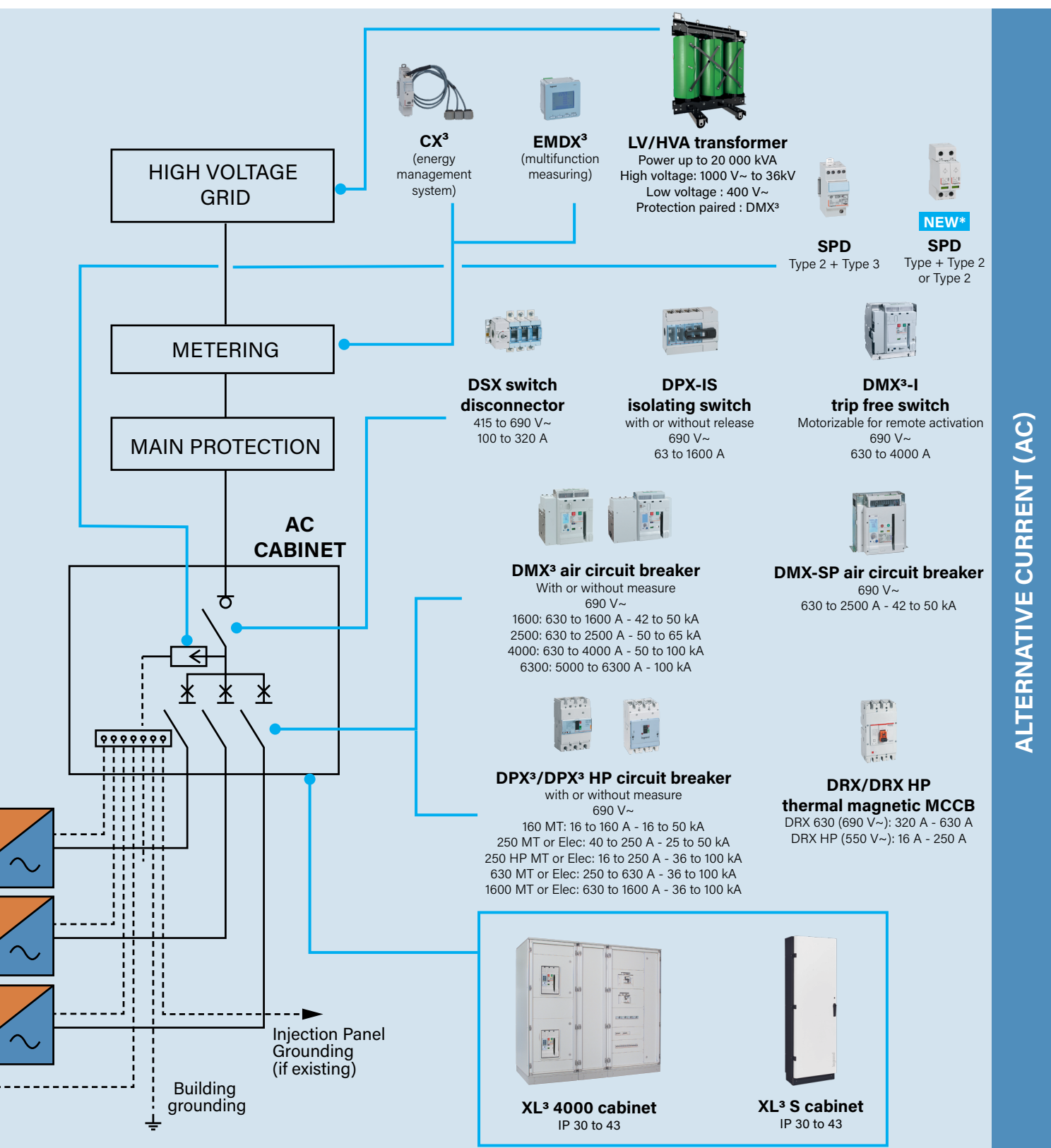


DC CABINET



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ALTERNATIVE CURRENT (AC)

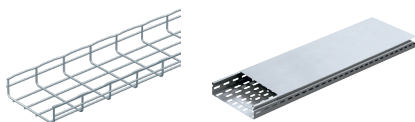
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SOLAR FARMS

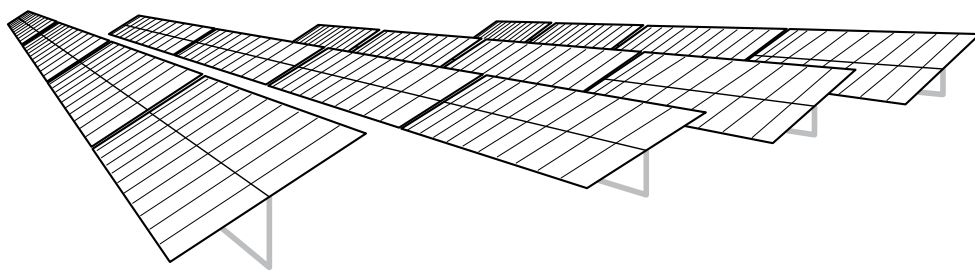
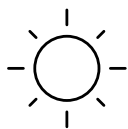
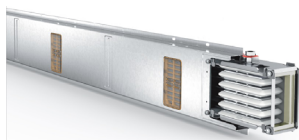
ON-GRID - 400 V~

INSTALLATION WITH A CENTRAL INVERTER

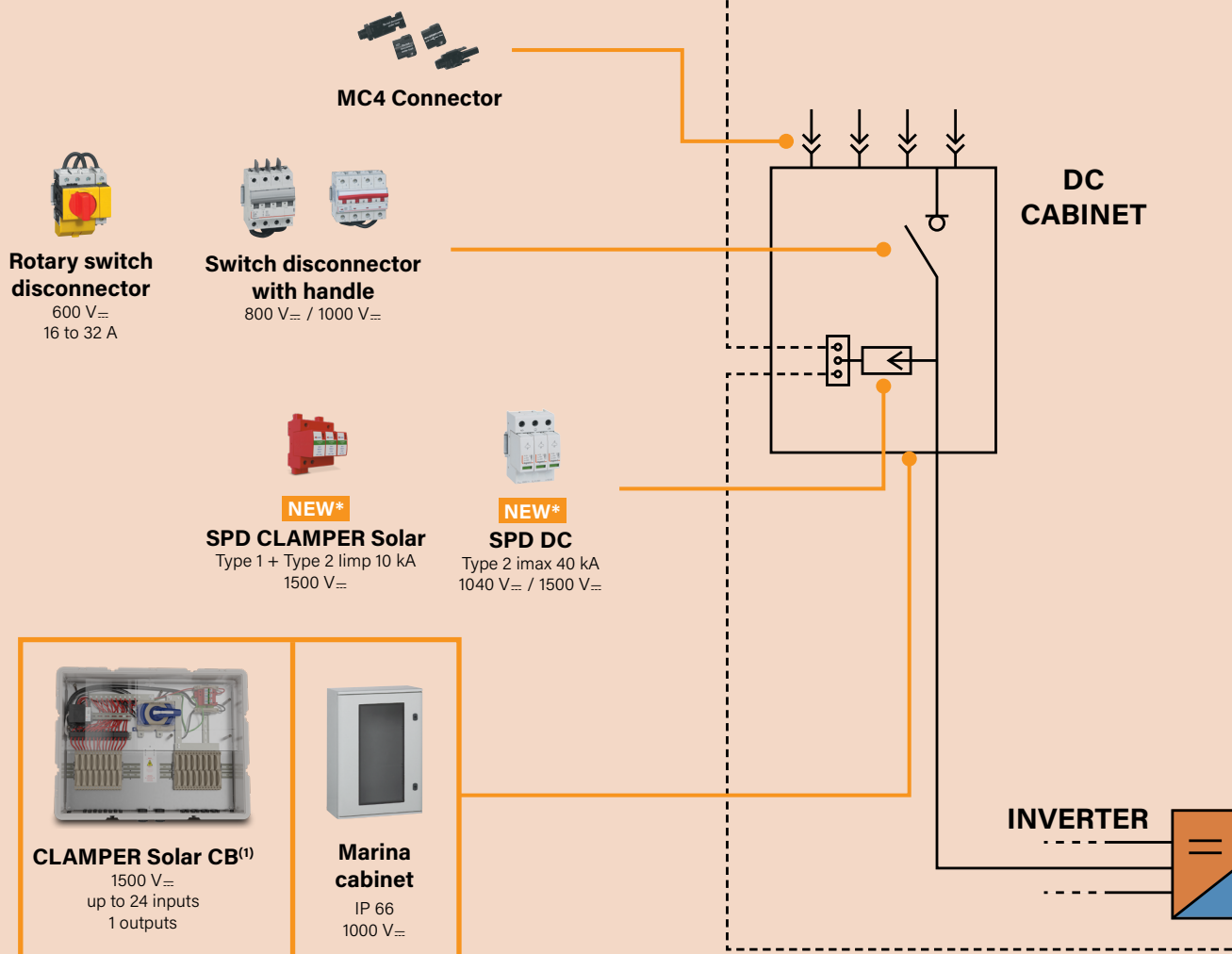
Cable trays are present throughout the installation.



XCP and XCM busbar ranges are present throughout the installation from LV main switchboard to LV side of CRT.

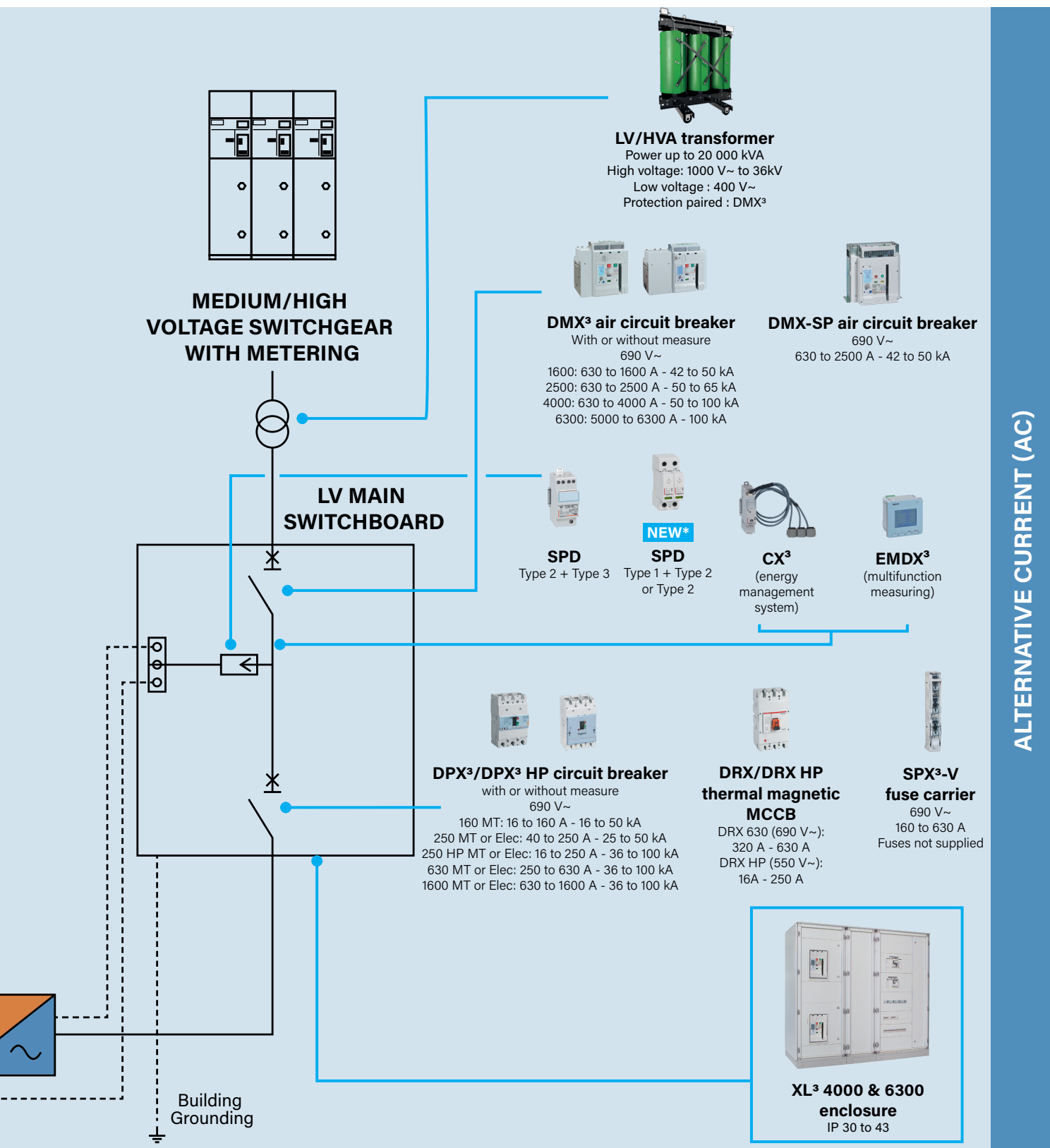


DIRECT CURRENT (DC)



⁽¹⁾ CLAMPER Solar CB is a pre-wired solution, which differs from the Marina cabinet. CLAMPER Solar CB is fully equipped while Marina is empty.

Illustrative diagrams: the depicted products serve as examples and may not accurately represent their actual installation or technical specifications. Adaptations to the associated power ratings are required.



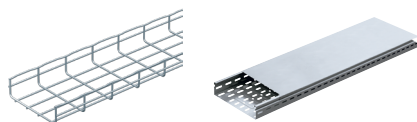
*available in 2025 | **available in 2026

SOLAR FARMS

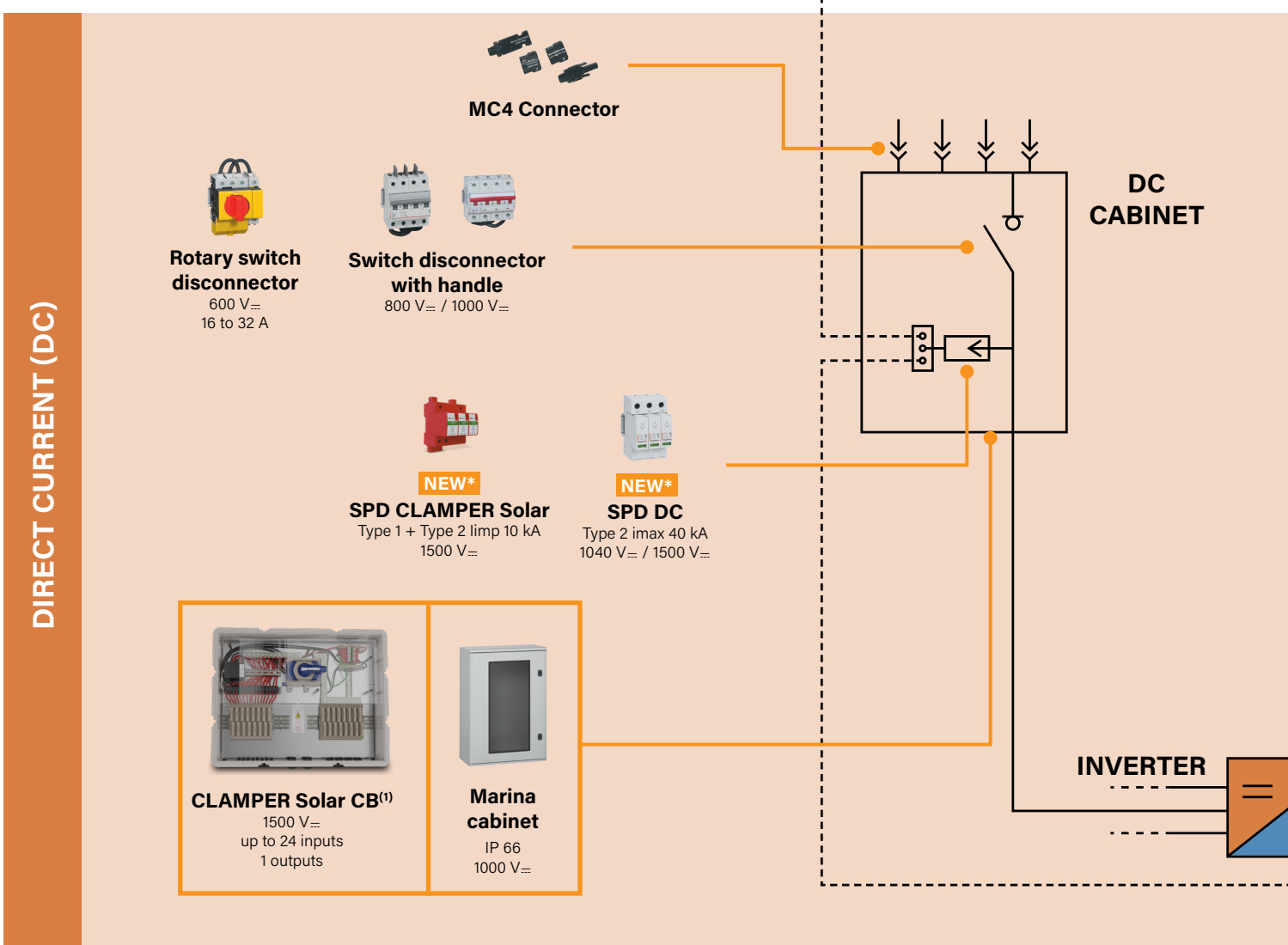
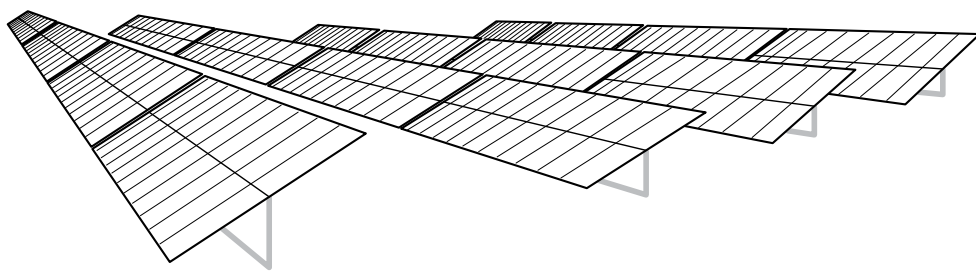
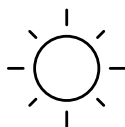
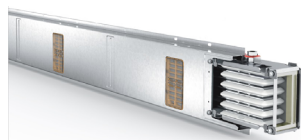
ON-GRID - 800 V~

INSTALLATION WITH A CENTRAL INVERTER

Cable trays are present throughout the installation.

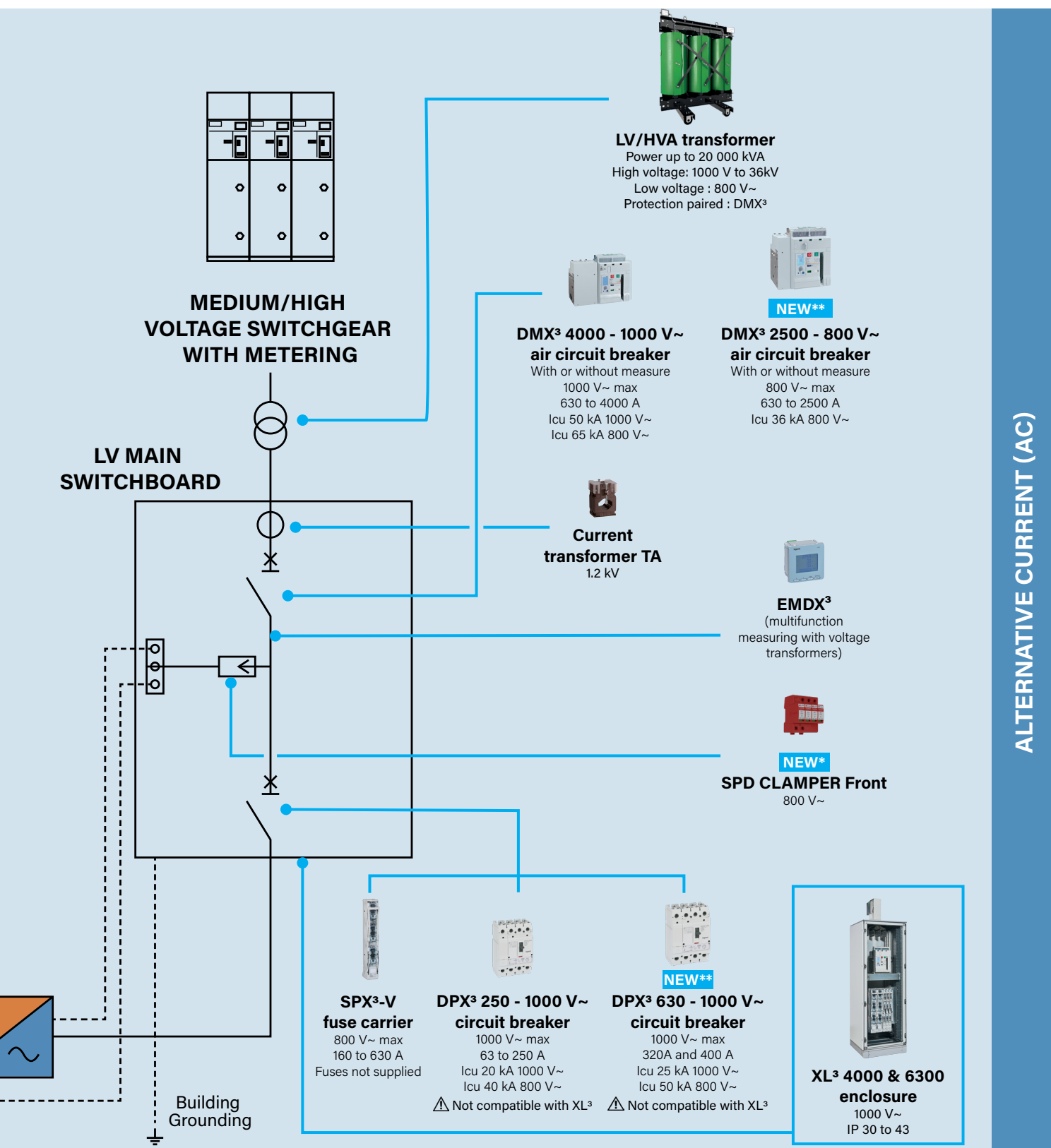


XCP and XCM busbar ranges are present throughout the installation from LV main switchboard to LV side of CRT.



⁽¹⁾ CLAMPER Solar CB is a pre-wired solution, which differs from the Marina cabinet. CLAMPER Solar CB is fully equipped while Marina is empty.

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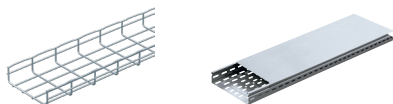
*available in 2025 | **available in 2026

SOLAR FARMS

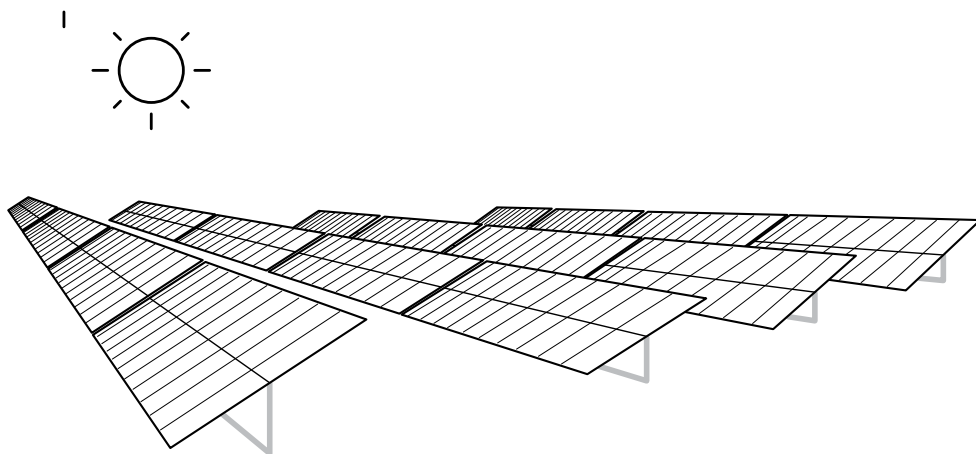
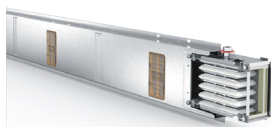
ON-GRID - 400 V~

INSTALLATION WITH A STRING INVERTER

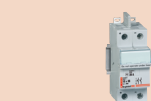
Cable trays are present throughout the installation.



XCP and XCM busbar ranges are present throughout the installation from LV main switchboard to LV side of CRT.



DIRECT CURRENT (DC)



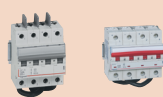
Domestic fuse holder
for 10 x 38 mm 20 A fuses



Cylindrical cartridge fuse
1000 V~
5 to 20 A



Rotary switch disconnecter
600 V~
16 to 32 A



Switch disconnecter with handle
800 V~ / 1000 V~



NEW*
SPD CLAMPER Solar
Type 1 + Type 2 Iimp 10 kA
1500 V~

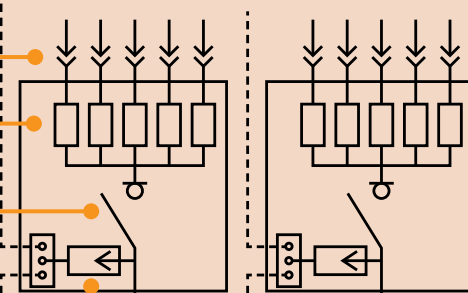


NEW*
SPD
Type 2 I_{max} 40 kA
1040 V~ / 1500 V~

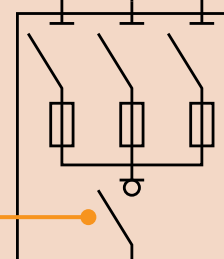


MC4 Connector

GROUP TERMINAL BLOCK

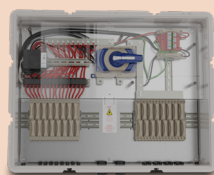


JUNCTION BOX



INVERTERS

DC CABINET



CLAMPER Solar CB⁽¹⁾
1500 V~
up to 24 inputs
1 outputs

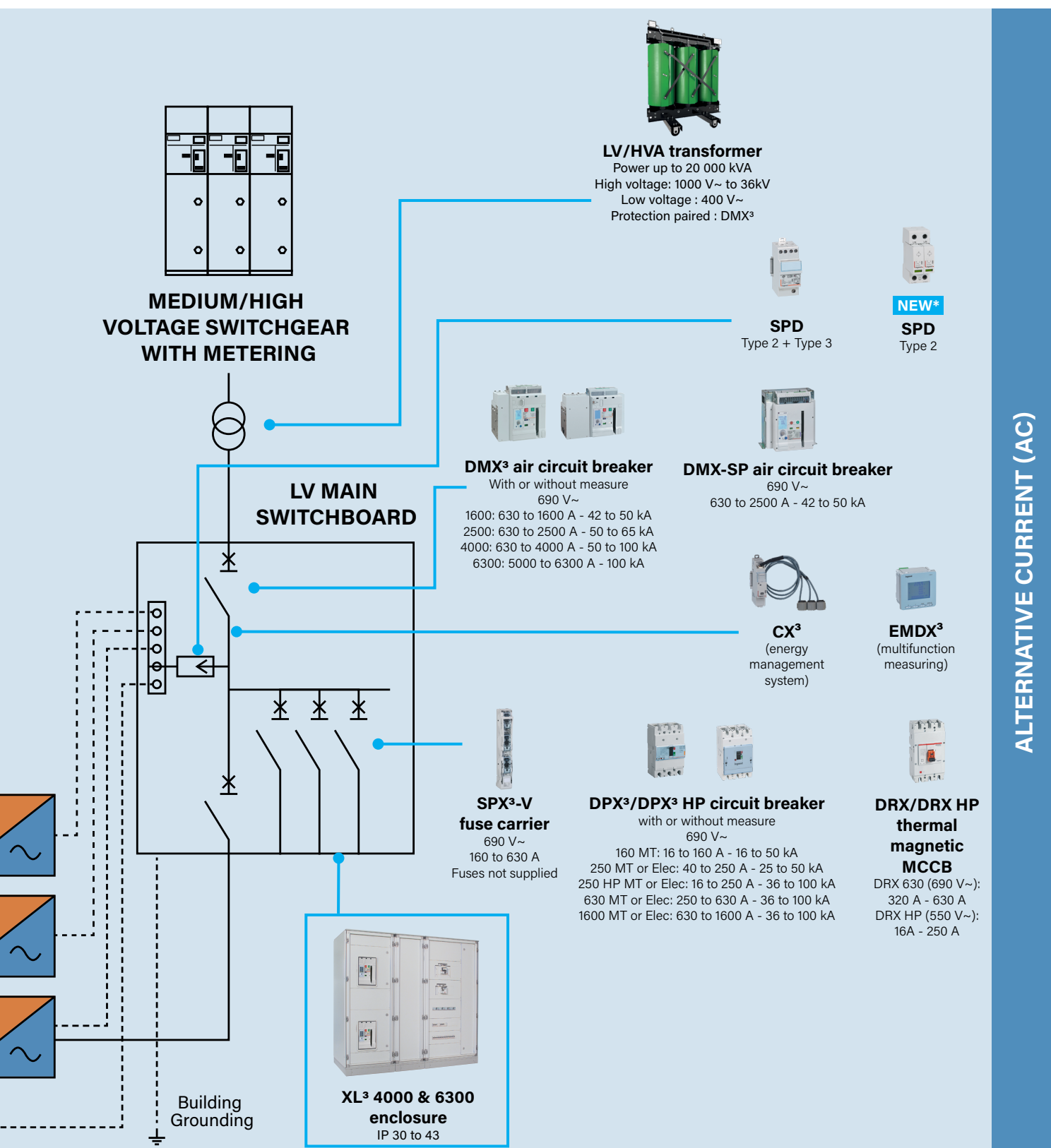


Marina cabinet
IP 66
1000 V~

⁽¹⁾ CLAMPER Solar CB is a pre-wired solution, which differs from the Marina cabinet.

CLAMPER Solar CB is fully equipped while Marina is empty. CLAMPER Solar CB can be applied on group terminal block, junction box and DC cabinet.

Illustrative diagrams: the depicted products serve as examples and may not accurately represent their actual installation or technical specifications. Adaptations to the associated power ratings are required.



ALTERNATIVE CURRENT (AC)

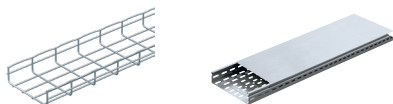
*available in 2025 | **available in 2026

SOLAR FARMS

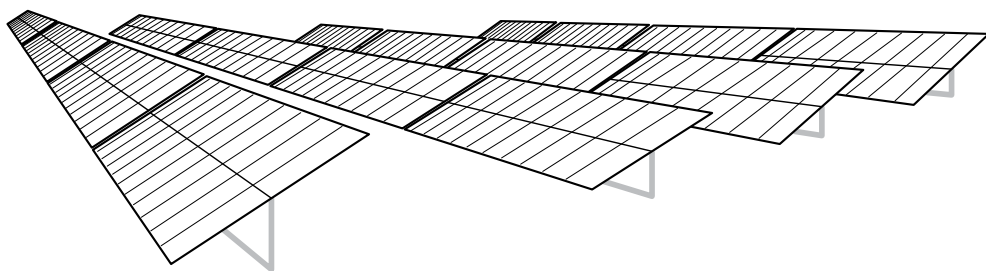
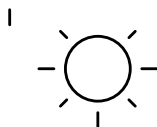
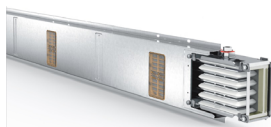
ON-GRID - 800 V~

INSTALLATION WITH A STRING INVERTER

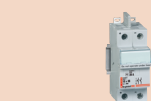
Cable trays are present throughout the installation.



XCP and XCM busbar ranges are present throughout the installation from LV main switchboard to LV side of CRT.



DIRECT CURRENT (DC)



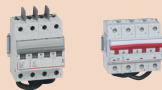
Domestic fuse holder
for 10 x 38 mm 20 A fuses



Cylindrical cartridge fuse
1000 V~
5 to 20 A



Rotary switch disconnecter
600 V~
16 to 32 A



Switch disconnecter with handle
800 V~ / 1000 V~



NEW*
SPD CLAMPER Solar
Type 1 + Type 2 Iimp 10 kA
1500 V~

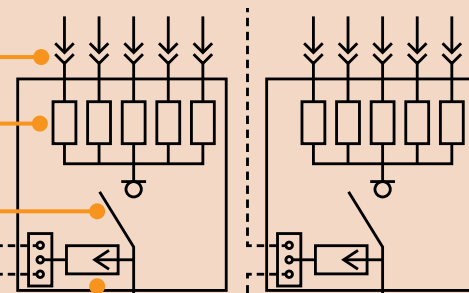


NEW*
SPD
Type 2 I_{max} 40 kA
1040 V~ / 1500 V~

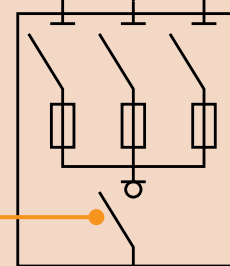


MC4 Connector

GROUP TERMINAL BLOCK

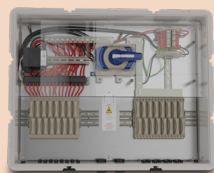


JUNCTION BOX



INVERTERS

DC CABINET



CLAMPER Solar CB⁽¹⁾
1500 V~
up to 24 inputs
1 outputs

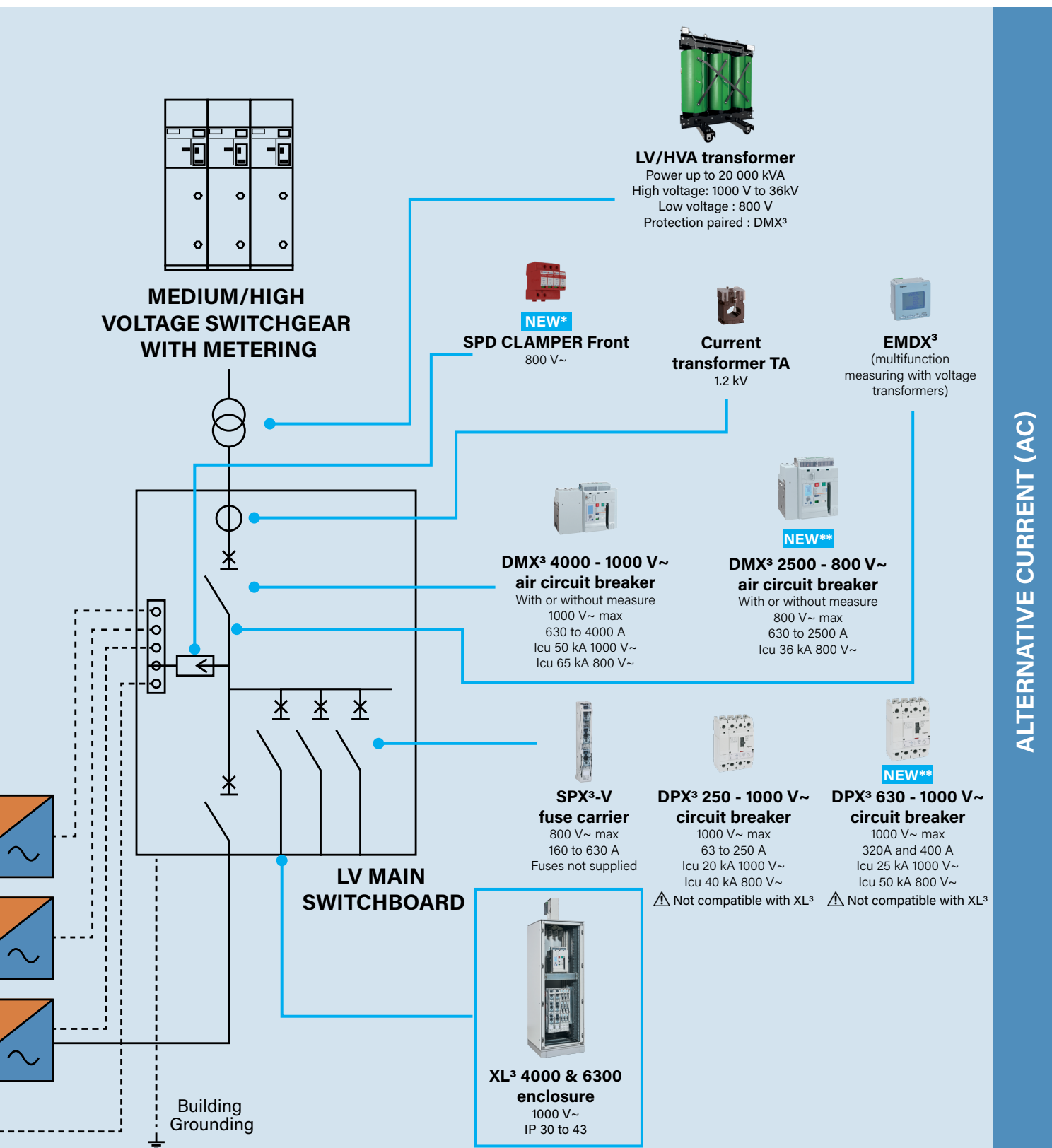


Marina cabinet
IP 66
1000 V~

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**World Headquarters
and International Department**
87045 Limoges Cedex - France
Tel: +33(0)5 55 06 87 87

