Modular Industrial DC Charger System

Gutor Modular DC Charger

Installation Manual

08/2022 Version 2

https://www.gutor.com

Schneider Electric

Legal Information

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Safety Information

Read these instructions carefully and look at the equipment to become familiar with it before trying to install, operate, service or maintain it. The following safety messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

IMPORTANT: Save the safety information for future reference.

The addition of this symbol to a “Danger” or “Warning” safety message 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 with 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 or serious injury.

⚠WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

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

⚠CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could 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.

Failure to follow these instructions can result in equipment damage.

Please Note

Electrical equipment should only be installed, operated, serviced, and maintained 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, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Safety Precautions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow safe electrical work practices. See NFPA 70E or CSA Z462, or according to your local standards and regulations.
- Always use appropriate personal protective equipment (PPE).
- All safety information must be read, understood and followed.
- Only qualified personnel are allowed to install, operate and perform maintenance on the system.
- Isolate all power supplies (including the battery) before working on or inside the system.
- Always use a properly rated voltage sensing device to check for hazardous voltage between all terminals, including the protective earth (PE).
- Reinstall all parts and protective covers before turning on any AC power supply or connecting a DC power source to the system.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Always wait 5 minutes after turning off the system and isolating all the power supplies (including the battery) before removing any parts or protective covers. The system contains DC capacitors with long discharge time.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The system must be connected to protective earth (PE). Always connect the system to protective earth (PE) before connecting any power supply.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Battery circuit breakers must be installed according to the specifications and requirements as defined by Schneider Electric.
- Battery maintenance must only be performed by qualified personnel knowledgeable of batteries and the required precautions.
- Always disconnect the charge source before you connect or disconnect the battery to the terminals.
- Never open, alter or damage batteries. This can release toxic electrolytes that are harmful to the skin and eyes.
- Never dispose of batteries in a fire as they can explode.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

When replacing batteries, always replace with the same type and number of batteries or battery packs.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Never drill or cut holes in or near the system.

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

⚠WARNING

HAZARDOUS VAPORS

Fire inside the system can produce hazardous vapors that should not be inhaled.

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

⚠CAUTION

UNINTENDED EQUIPMENT OPERATION

Never connect the system output to regenerative loads, for example, photovoltaic systems or speed drives.

Failure to follow these instructions can result in injury or equipment damage.

NOTICE

SYSTEM OVERHEATING

Always be aware of the space requirements around the system for ventilation and operation.

Never cover the product’s ventilation openings when the system is in operation.

Failure to follow these instructions can result in equipment damage.

NOTICE

Always recycle and dispose of any waste in accordance with local regulations and rules.

Safety Precautions for Installation

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read all instructions in the *Installation Manual* before installing or working on the system.
- Only install the system after all construction work has been completed and the installation location has been cleaned.
- The system must be installed according to the specifications and requirements as defined by Schneider Electric. It concerns in particular the external and internal protections (upstream breakers, battery breakers, cabling, etc.) and environmental requirements. No responsibility is assumed by Schneider Electric if these requirements are not respected.
- After the system has been electrically wired, do not start up the system. Start-up must only be performed by Schneider Electric.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The system must be installed according to local and national regulations. Install the system according to:

- IEC 60364 (including 60364–4–41- protection against electric shock, 60364–4–42 - protection against thermal effect, and 60364–4–43 - protection against overcurrent), or
- NEC NFPA 70, or
- Canadian Electrical Code (C22.1, Part 1)

depending on which one of the standards apply in your local area.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The system must be installed:

- In a restricted access area
- In an indoor environment that is temperature controlled, free of conductive contaminants and humidity
- Directly on a leveled, solid and non-combustible surface that can support the weight of the system

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The system is not designed for and must not be installed in the following unusual operating environments:

- Damaging fumes
- Explosive mixtures of dust or gases, corrosive gases, or conductive or radiant heat from other sources
- Moisture, abrasive dust, steam or in an excessively damp environment
- Fungus, insects, vermin
- Salt-laden air or contaminated cooling refrigerant
- Pollution degree higher than 2 according to IEC 60664-1
- Exposure to abnormal vibrations, shocks, and tilting
- Exposure to direct sunlight, heat sources, or strong electromagnetic fields

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Never make mechanical changes to the system, including removal of cabinet parts or drilling/cutting of holes that are not described in the *Installation Manual*.

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

NOTICE

DISCHARGED BATTERIES

If the system remains de-energized for a long period, it is recommended that you energize the system for a period of 24 hours at least once every month to avoid irreversible damage to the batteries.

Failure to follow these instructions can result in equipment damage.

General Information

This manual provides information about Gutor Modular systems.

In this manual “the system” refers to the complete system and “the cabinet” refers to the mechanical frame of the system.

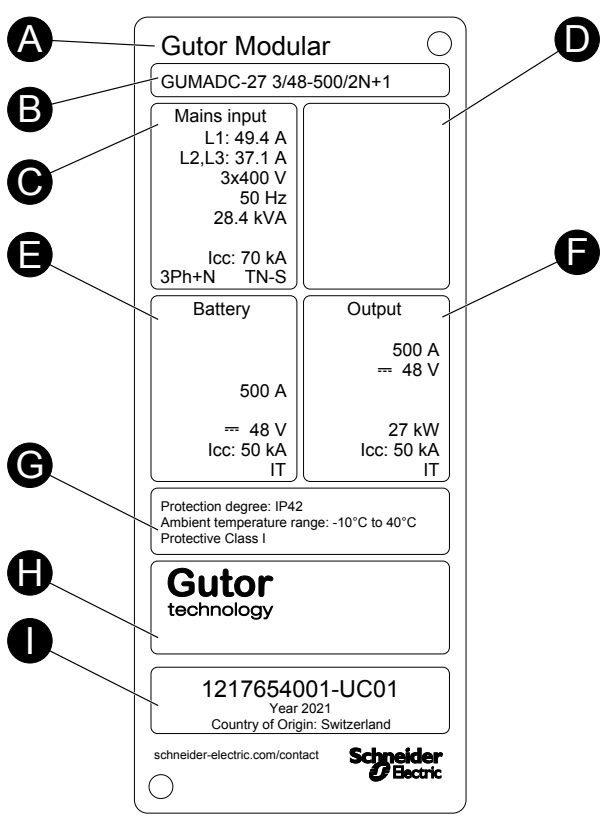
The customer specific documents *Single Line Diagram*, *Technical Data*, and *Drawings* are often referred to. It is required that you are familiar with the configuration of the system before installing, operating or performing maintenance on the system.

Any breaker or switch mentioned in this manual can be a switch-disconnector, fuse switch-disconnector or circuit breaker. Please see the *Single Line Diagram* for type used in your system.

The standard reference designators for parts are mentioned and might be different. For the actual reference designator refer to the *Drawings*.

All images are only for illustration. The shown examples might differ from the actual system.

Rating Plate



(A) System type

(B) System type designation

(C) Mains input values

(D) (Not used)

(E) Battery values

(F) Output values

(G) Protection degree and ambient temperature range

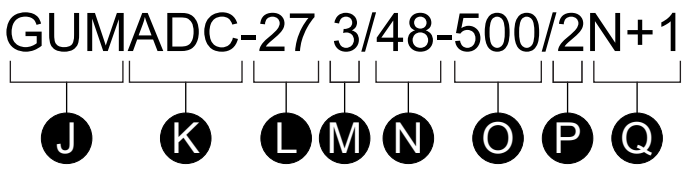
(H) Place for certification/conformity mark (e.g. CE, EAC, UL)

(I) Unique identifier and manufacturing information:

- Gutor project number
- System serial number
- Transport unit number
- Year of manufacturing
- Country of origin / Country of manufacturing

System Type Designation

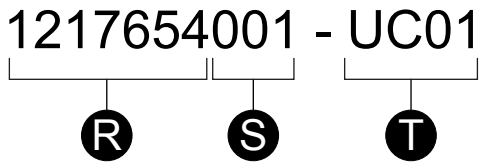
The top section **(B)** of the rating plate contains the system type designation. The system type designation contains information about the system configuration.



Position	Description	Options
(J)	**Gu**tor **M**odular	Always GUM for all Gutor Modular systems
(K)	System type	**ADC** – Rectifier system, **A**C to **DC**
(L)	Maximum output power [kW]	Based on customer specification
(M)	Input phases	**1** – Single phase input **3** – Three phase input
(N)	Nominal output voltage [V]	24, 48, 60, 110/125, 220 V DC
(O)	Maximum output current [A]	Based on customer specification
(P)	Number of system inputs	**None** – One input **2** – Two inputs, also called dual input
(Q)	Module configuration	**None** – No redundancy, also called **N + 0** **N + 1** – One redundant module **N + x** – Customized number of redundant modules, selected number will be shown. For example, N + 3. **N + N** – Fully redundant

Unique Identifier

The bottom section **(I)** on the rating plate contains the unique identifier. The unique identifier is built up of sections to make it possible to identify the cabinet.



Position	Name	Description
(R)	Gutor project number	A unique number for each project.
(S)	System serial number	Indicates a specific system number in the project.
(T)	Transport unit number	The number indicates a transport unit. A system may consist of multiple transport units that can be separated for transportation.

System Installation Location

⚠WARNING

HAZARD OF FIRE

The system must be installed directly on a leveled, solid and non-combustible surface that can support the weight of the system.

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

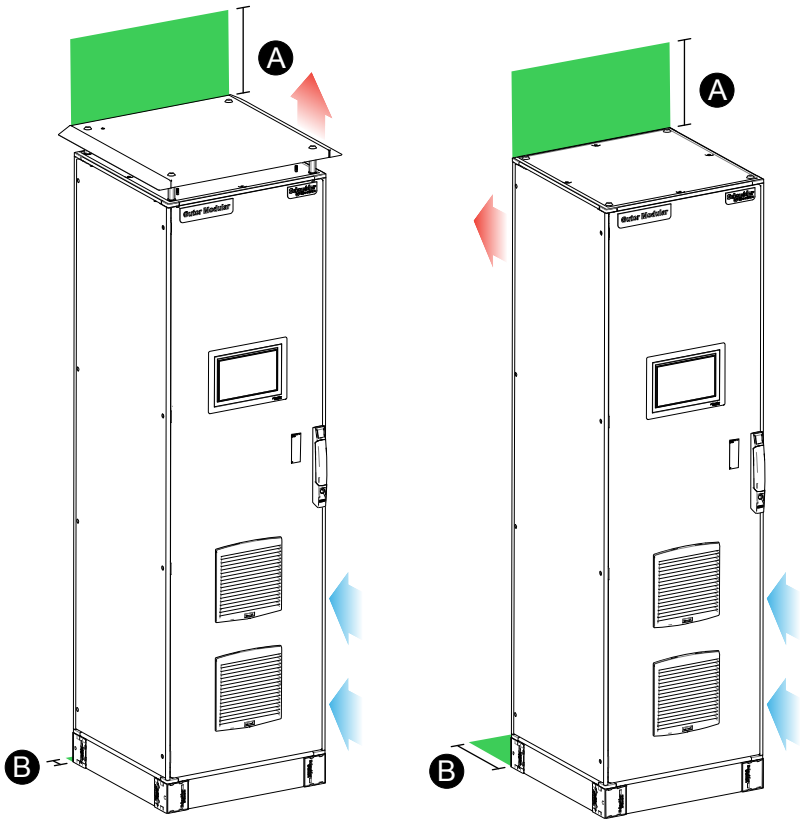
Before starting the installation read the complete chapter and consider the systems location, space and environment requirements.

System Space Requirements

The system has minimum clearances requirements from the top **(A)** and from the back **(B)**, for airflow and to be able to transport the system. The minimum clearances depends on where the air outlet is located.

It is possible to place systems side by side. It is recommended to not have any direct contact between the side walls.

IMPORTANT: Always make sure that there is enough space for the warm air to dissipate.



Position	Minimum Clearances	
	Top Air Outlet	Back Air Outlet
(A)[1]	300 mm (12 in)	300 mm (12 in)
(B)	20 mm (0.8 in)[2]	100 mm (4 in)

Environment and Ventilation

NOTICE

SYSTEM OVERHEATING

Always be aware of the space requirements around the system for ventilation and operation.

Never cover the product's ventilation openings when the system is in operation.

Failure to follow these instructions can result in equipment damage.

For sufficient ventilation make sure that the system placement follows the minimum clearances. Make sure that the system environment is within the specifications. For information about the environment specifications, see the *Technical Data*.

The necessary quantity of air cooling per hour from the cooling system depends on:

- The size and number of systems
- The specified ambient temperature
- The temperature of the incoming cold air from the cooling system

IP Protection

The IP protection with the cabinet door open is always IP 20.

With the cabinet door closed, the options for the system IP rating are:

- IP 20 (default). Includes grid in the cabinet top and ventilation grids without air filters in the door.
- IP 42. Includes rain roof, grid in the cabinet top and ventilation grids without air filters in the door.

  NOTE: Other system IP ratings might be available depending on customer needs.

1. If the system has a rain roof, the minimum clearances is measured from the rain roof and not the cabinet roof.
2. No direct contact with wall. The rain roof extends about 20 mm (0.8 in) from the back of the system.

Transport the Cabinet

⚠WARNING

UNINTENDED TRANSPORTATION OF HEAVY OBJECT

Never transport the cabinet with any modules or batteries installed.

Always follow the instructions for the selected recommended transport option.

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

There are two recommended ways to transport the cabinet to the final installation site:

- Transport the Cabinet with a Forklift or Pallet Truck, page 14
- Lift the Cabinet with Lifting Eye Bolts, page 18

Transport the Cabinet with a Forklift or Pallet Truck

⚠WARNING

TIP OVER HAZARD

- Only use forklifts and pallet trucks rated for the weight of the cabinet.
- Always make sure that the center of gravity is as close to the middle of the forks as possible.
- Always make sure that the forks protrude on the other side of the system and that the frame fully rests on the forks.
- Fasten the cabinet to the forklift or pallet truck.

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

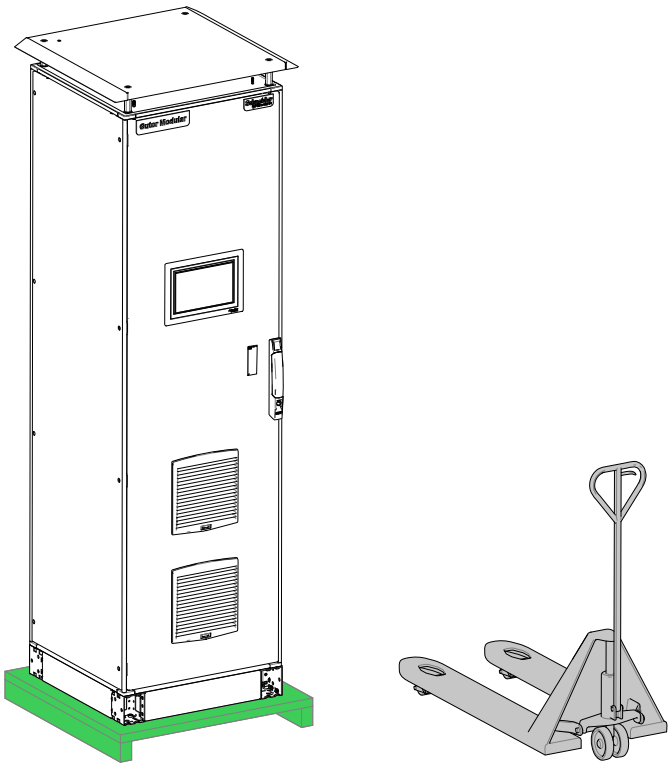
The transportation options depend on the width and depth of the cabinet:

- For cabinets where both the width and depth are 600 mm (23.6 in) or less, the system must be moved while on the pallet.
- For cabinets where either the width or the depth is at least 800 mm (31.5 in) or more, the system can be moved either with or without the pallet.

Transport the Cabinet on the Pallet

The cabinet can be moved to the final installation location while on the pallet.

NOTE: All systems can be moved while on a pallet. Systems with both width and depth less than 600 mm (23.6 in) can only be moved while on the pallet.

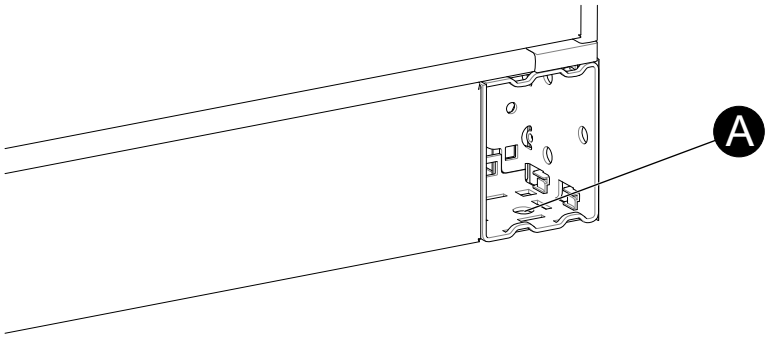


Remove the Pallet

To transport the cabinet without the pallet or to lift the system of the pallet, the pallet screws need to be removed. The cabinet is secured to the pallet with 4 screws, one at each corner of the plinth **(A)**. To remove the pallet from the system:

IMPORTANT: Only systems where either the width or the depth is at least 800 mm (31.5 in) can be moved without a pallet. Systems with a width and depth of 600 mm can only be lifted of the pallet.

1. Unscrew and remove the screws at each plinth corner **(A)**.

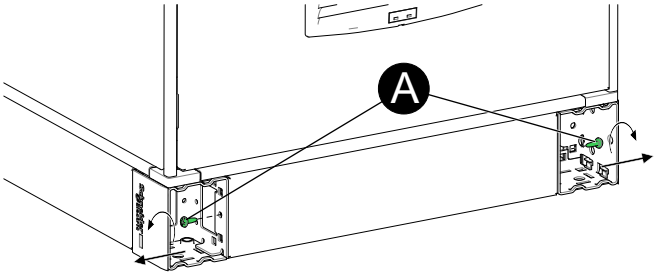


2. Make sure nothing else attaches the system to the pallet.

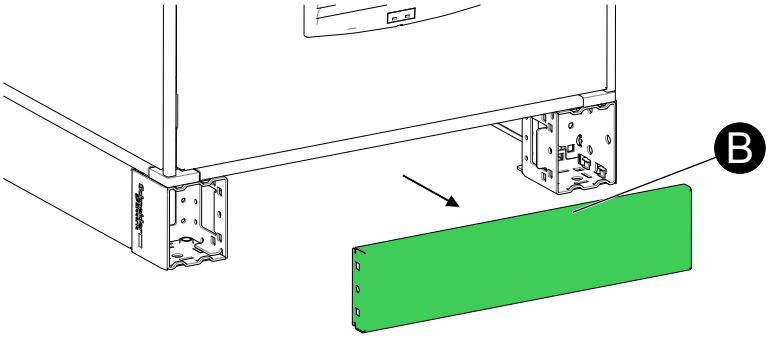
Remove the Plinth Panels

To be able to lift the system two plinth panels needs to be removed. Decide if the front and back panels or both side panels should be removed. It is recommended to select either the width or depth depending on what is largest.

1. Remove the two screws **(A)** in the plinth corners.



2. Remove the plinth panel **(B)**.



3. Remove the opposite panel in the same way.

   NOTE: Remember to attach the panels after the system has been fastened to the floor.

Transport the Cabinet without the Pallet or Lift the System Off the Pallet

⚠WARNING

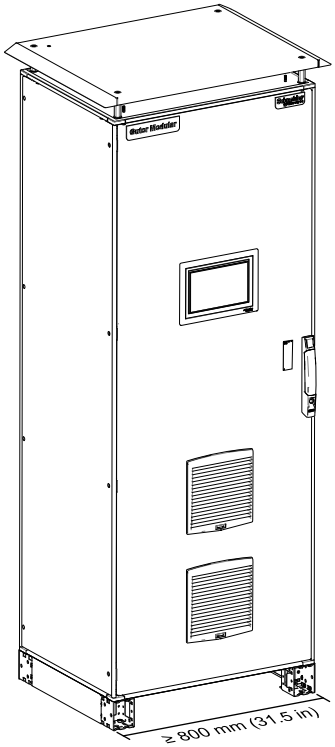
TIP OVER HAZARD

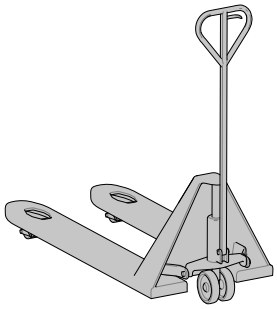
When transporting a cabinet without a pallet:

- Only move cabinets with a width or depth equal to or larger than 800 mm (31.5 in) with a pallet truck or forklift.
- Forklifts can only be used to lift a cabinet straight up if both the depth and width are less than 800 mm (31.5 in), so that the pallet can be removed from under it.

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

The system can now be lifted of the pallet or moved to the final installation place if either the width or depth is equal to or larger than 800 mm (31.5 in).





Lift the Cabinet with Lifting Eye Bolts

Before lifting the system, the pallet needs to be removed and if the system has a rain roof this also needs to be removed. Then the lifting eyes can be attached.

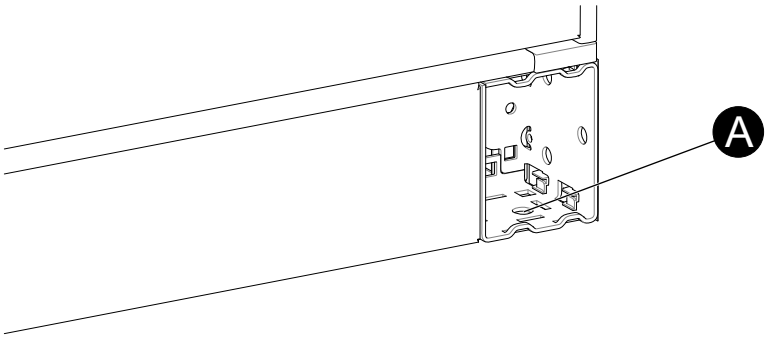
NOTE: The lifting eye bolts are typically delivered in a plastic bag placed under the rain roof on top of the system or inside the cabinet.

Remove the Pallet

To transport the cabinet without the pallet or to lift the system of the pallet, the pallet screws need to be removed. The cabinet is secured to the pallet with 4 screws, one at each corner of the plinth **(A)**. To remove the pallet from the system:

IMPORTANT: Only systems where either the width or the depth is at least 800 mm (31.5 in) can be moved without a pallet. Systems with a width and depth of 600 mm can only be lifted of the pallet.

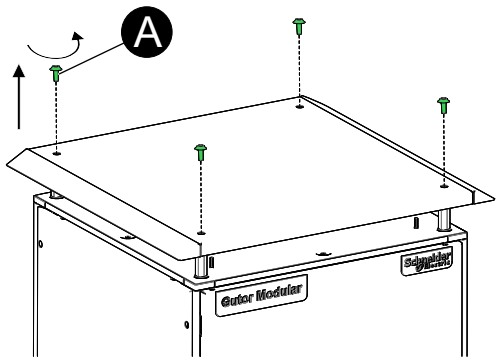
1. Unscrew and remove the screws at each plinth corner **(A)**.



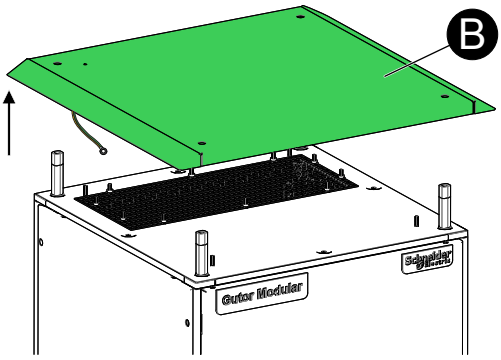
2. Make sure nothing else attaches the system to the pallet.

Remove the Rain Roof

1. Detach the rain roof earthing cable from the cabinet roof.
2. Unscrew and remove the screws **(A)** in the roof.

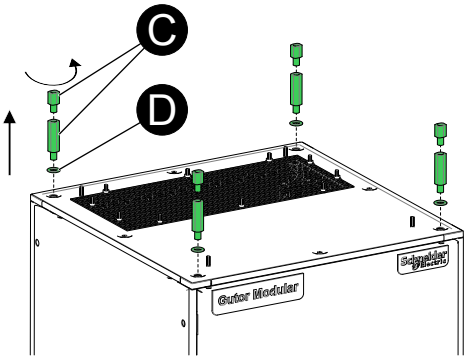


3. Lift off and remove the roof **(B)**.



4. Unscrew and remove the distant bolts **(C)** and washer **(D)**.

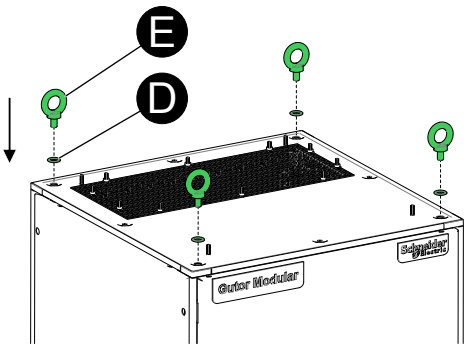
   NOTE: The same washers **(D)** are used for the lifting eye bolts.



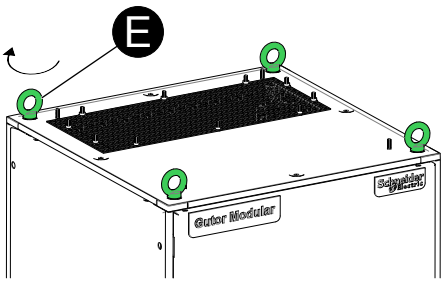
Attach the Lifting Eye Bolts

1. **Only for systems without rain roof:** Remove the cabinet roof screws and washers.
2. Attach the lifting eye bolts **(E)**. Use the washers **(D)** from the distant bolts or cabinet roof screws.

   NOTE: The lifting eye bolts are typically delivered in a plastic bag placed under the rain roof on top of the system or inside the cabinet.



3. Tighten the lifting eye bolts **(E)** to a torque of 10 Nm (88.5 lbf-in).



4. Make sure that lifting eye bolts **(E)** are attached to all lifting locations.

Lift the System and Lifting Options

⚠WARNING

RISK OF HEAVY OBJECTS FALLING

- Only use lifting equipment rated for the weight of the cabinet.
- Never lift the system with any modules or batteries installed.
- All locations for the lifting eye bolts must be used.
- Always make sure the lifting eye bolts are tightened correctly.
- For transport units heavier than 580 kg (1279 lbs) the lifting eye bolts must be strained perpendicularly.
- Maximum system weight that can be lifted is 750 kg (1653 lbs).

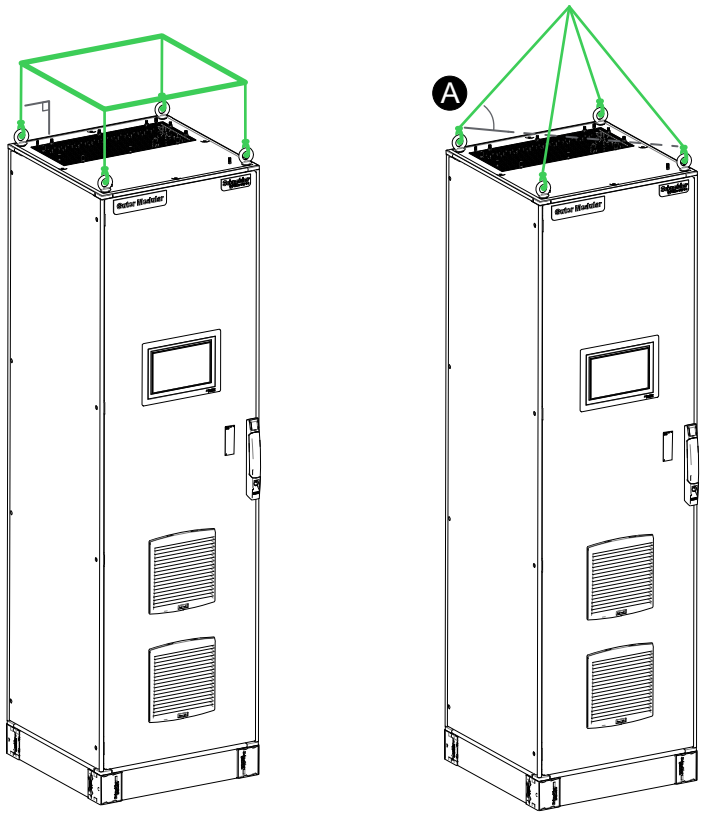
Failure to follow these instructions can result in death, serious injury, or equipment damage.

After the lifting eye bolts have been attached, lift the cabinet to the installation location.

For cabinets that weigh more than 580 kg (1279 lbs) and less than 750 kg (1653 lbs):
Always use a lifting traverse that strains the lifting eye bolts perpendicular (90°) to the top of the system.

For cabinets that weigh 580 kg (1279 lbs) or less:
It is recommended to strain the lifting eye bolts perpendicular (90°) to the top of the system. The lifting eye bolts can also be strained at an angle. The minimum allowed angle depends on the system weight, see table.

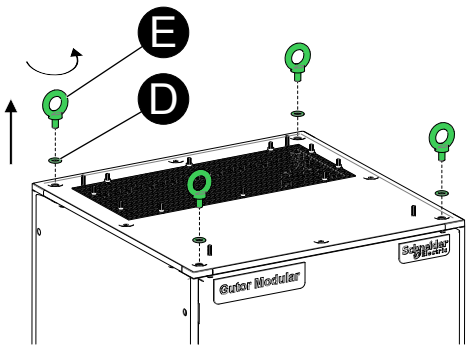
System weight:	≤ 750 kg (1653 lbs)	≤ 580 kg (1279 lbs)	≤ 415 kg (914 lbs)	≤ 240 kg (529 lbs)
(A) Minimum strain angle:	90°	67.5°	60°	45°



Remove Lifting Eye Bolts

1. Unscrew and remove the lifting eye bolts **(E)** and washers.

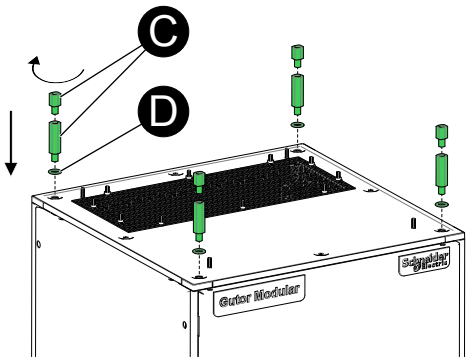
   NOTE: The same washers **(D)** are used for the distance bolts or cabinet roof screws.



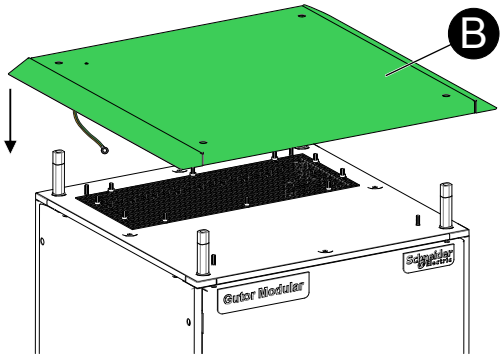
2. **Only for systems without rain roof:** Attach and tighten the cabinet roof screws and washers.

Attach the Rain Roof

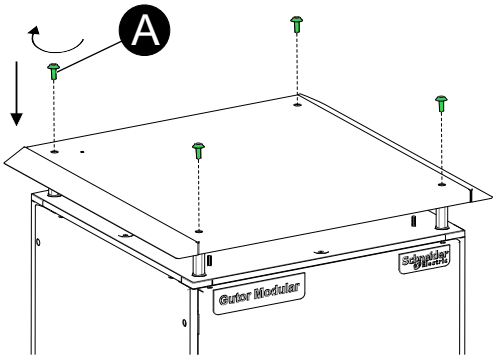
1. Attach and tighten the distant bolts **(C)** and washer **(D)**.



2. Place the roof **(B)** on top of the distance bolts.



3. Attach and tighten the screws **(A)** in the roof.



4. Attach the earthing cable that connects the rain roof and cabinet roof.

Fasten the Cabinet to the Floor

⚠WARNING

TIP OVER HAZARD

Always fasten the system to the floor. The system has a high center of gravity.

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

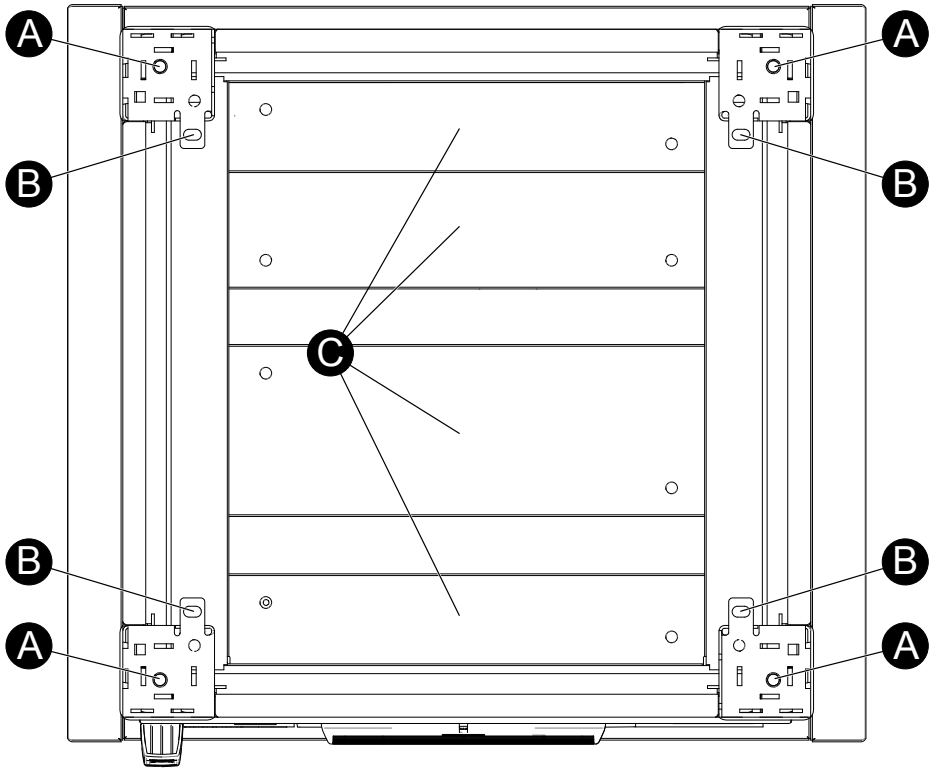
Each system has a plinth at the bottom of the cabinet with the height of 100 mm. The plinth needs to be fastened to the floor at the installation site. At each corner of the plinth there are two different locations where it can be fastened.

For dimensions and details of the plinth, see the *Drawings*.

- The location **(A)** is accessed from outside the cabinet by removing a cover on the plinth.
- The location **(B)** is accessed from inside the cabinet by removing the bottom gland plates **(C)**.

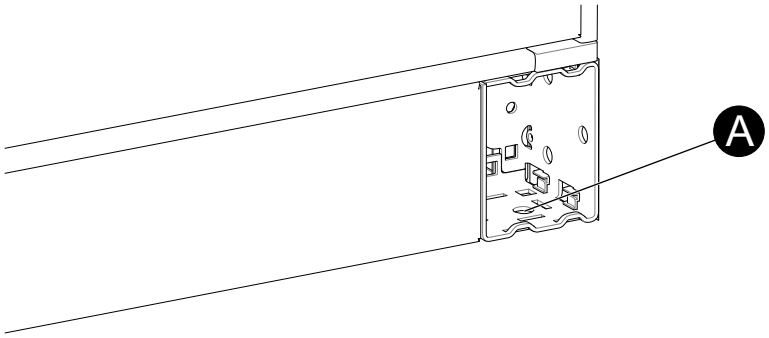
  IMPORTANT: Always fasten the cabinet to the floor before connecting any cables.

  NOTE: It is only necessary to fasten one of the locations at each corner.



Fasten the Cabinet to the Floor Using Outside Access

1. Fasten each corner of the plinth to the floor at the location **(A)**.



Fasten the Cabinet to the Floor Using Inside Access

⚠⚠DANGER

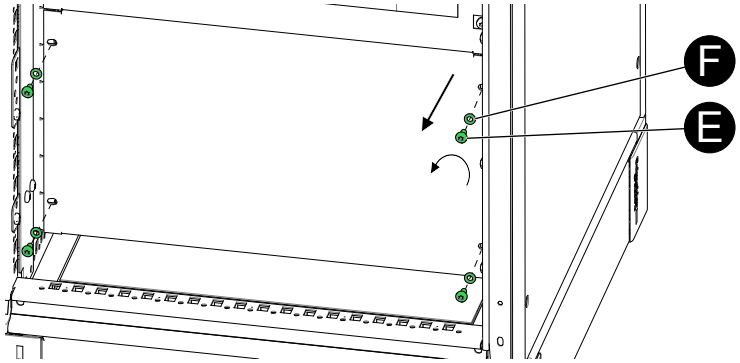
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Make sure that the input power supply and any batteries have not yet been connected.
- Before working inside the cabinet always use a properly rated voltage sensing device to check for hazardous voltage between all terminals, including the protective earth (PE).

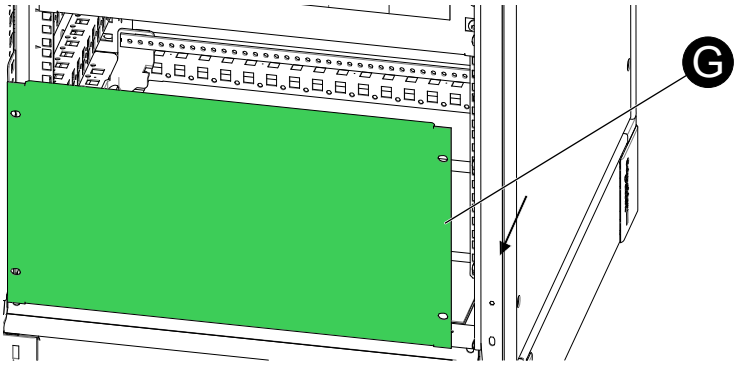
Failure to follow these instructions will result in death or serious injury.

1. Remove the screws **(E)** and washers **(F)** attaching the cover plates at the bottom.

   NOTE: Depending on the system configuration it might be necessary to remove more than one cover for access.

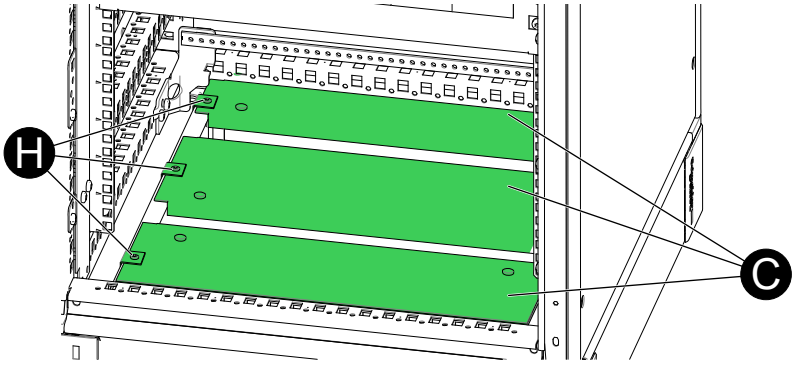


2. Remove the cover plate **(G)**.

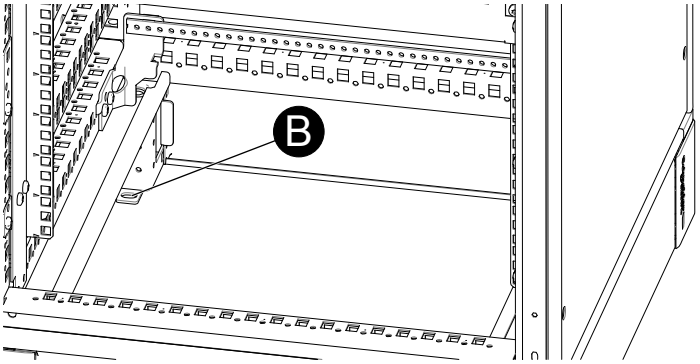


3. Unscrew and remove the clips **(H)** on both sides of the gland plates **(C)**. Then remove the gland plates **(C)**.

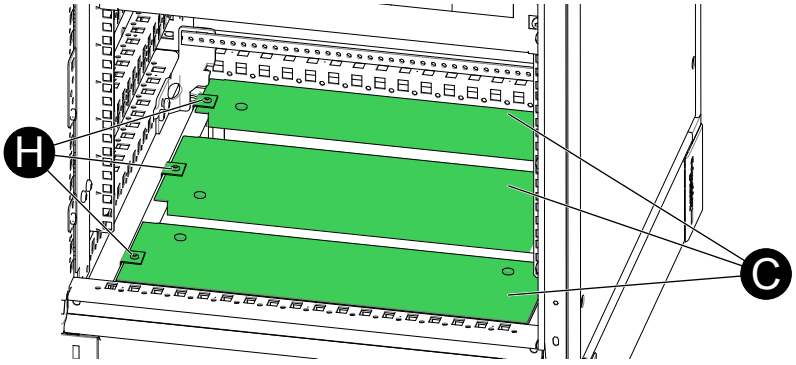
   NOTE: Depending on the system configuration the number and position of the gland plates **(C)** might be different. For more information see the *Drawings*.



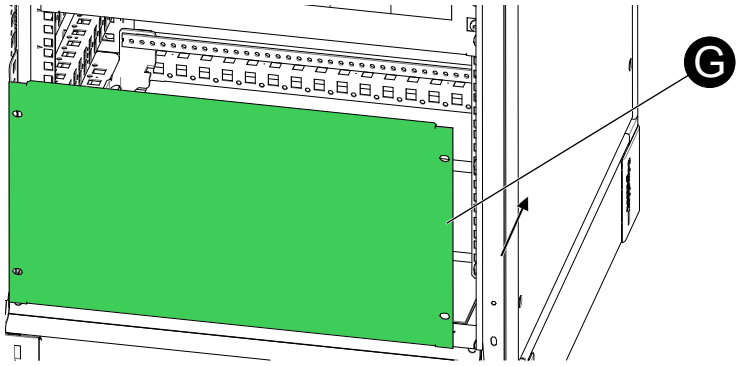
4. Fasten each corner of the plinth to the floor at the location **(B)**.



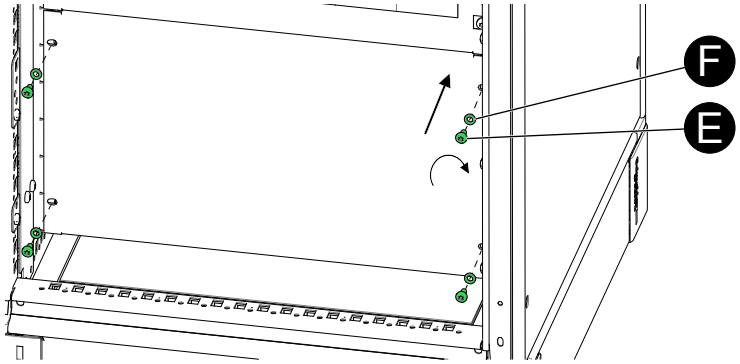
5. Place the gland plates **(C)** and attach the clips **(H)** on both sides of the gland plates **(C)**. Tighten the screws in the clips **(H)** to a torque of 2.5 Nm (22.12 lbf-in).



6. Attach the cover plate **(G)**.



7. Attach and tighten the screws **(E)** and washers **(F)**.

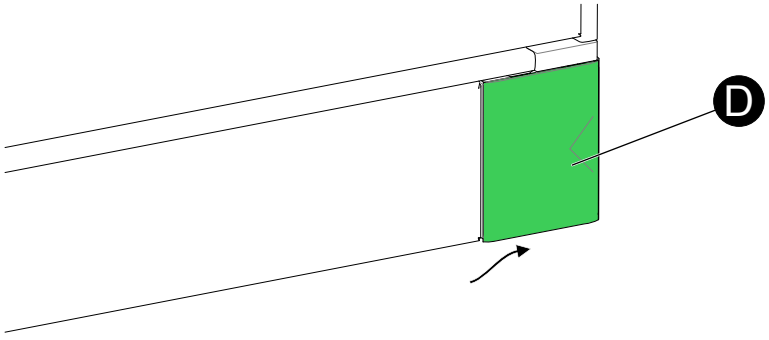


Attach Plinth Corner Covers

If any plinth panels were removed during transportation of the system, make sure they are attached again before attaching the plinth corner covers.

NOTE: The corner covers are typically delivered in a plastic bag placed under the rain roof on top of the system or inside the cabinet.

1. Attach the covers **(D)** on each plinth corner. Carefully slide and push it into place.



Cable Entry

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

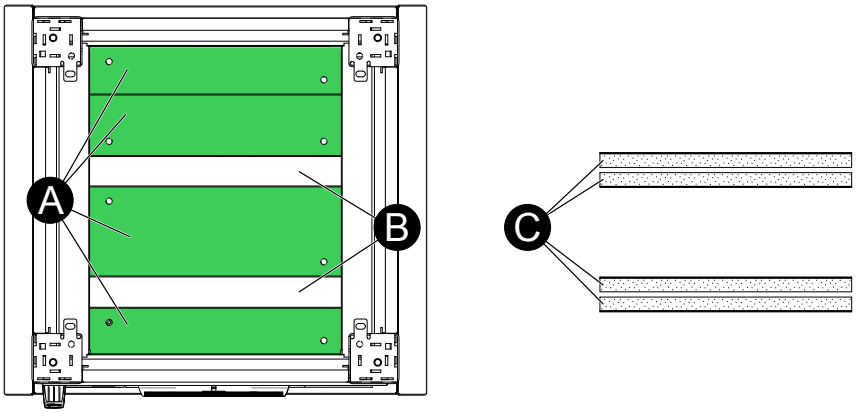
Never drill or cut holes in or near the system.

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

Bottom Gland Plates

The positions of the bottom gland plates **(A)** and the cable entry slots **(B)** depends on the system design. For more information see the *Drawings*.

Foam strips **(C)** are placed on the sides of the cable entry slots to help prevent particles and dust from entering the cabinet. The cables are then pulled in between the foam strips that seals around them.



Attach Foam Strips in Cable Entries

Two foam strips **(C)** are needed for each cable entry slot **(B)**.

NOTE: The foam strips are typically delivered in a plastic bag placed under the rain roof on top of the system or inside the cabinet.

1. Remove the adhesive tape on the back side of the foam strip **(C)**.
2. Place the foam strip **(C)** in the cable entry slot **(B)** so that the tape attaches to one side of the glad plate **(A)**.
3. Repeat until all cable entry slots **(B)** are covered on both sides with foam strips **(C)**.

Check External Protection

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Check that all the external protections (MCCBs, MCBs, fuses) are sized according to the specifications in the *Technical Data*.

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

NOTE: Minimum protection ratings are specified in the *Technical Data*. Higher protection ratings might be required to comply with local and/or national electrical codes.

Before wiring the protective earth (PE), incoming cables and batteries it is important to ensure that all breakers used for these cables are sized correctly.

Connect the Protective Earth (PE) and Power Cables

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

All wiring must comply with all applicable local and/or national electrical codes.

Wiring may only be done by an authorized electrician.

Always check the rating plate for details.

For AC wiring pay attention to the voltage, frequency and if applicable the phase rotation.

For DC wiring pay attention to the polarity.

Check that the cables and connections are according to the *Drawings*.

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

⚠⚠DANGER

HIGH LEAKAGE CURRENT

The system must be connected to protective earth. Always connect the system to protective earth before connecting any power supply.

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

Before connecting any power cables to the terminals, all cabinets must be connected to the protective earth. High leakage currents are present when the system is connected to the mains supplies.

The type of terminals depends on the system rating, configuration and customer specifications. There are three standard types:

- Push in terminals
- Bolt terminals and an earth bolt terminal (connected to the internal earth bar) or an earth bar
- Copper bars and an earth bolt terminal (connected to the internal earth bar) or an earth bar

Push In Terminals

To connect a cable to a push in terminal no tool is required.

NOTE: Only use flat screwdrivers if a cable needs to be removed from a push in terminal. Apply pressure carefully to release the cable.

Torque Table for Terminals

Terminal Type	Bolt Size	Torque Range [Nm]	Torque Range [lb-ft]
Bolt Terminal	M6	3–6 Nm	2.2–4.4 lb-ft
	M8	6–12 Nm	4.4–8.9 lb-ft
	M10	10–20 Nm	7.4–15 lb-ft
	M12	14–31 Nm	10–23 lb-ft
	M16	30–60 Nm	22–44 lb-ft
Copper Bar	M12	30–40 Nm	22–30 lb-ft
	M16	40–60 Nm	30–44 lb-ft
Earth bar	M8	8–12 Nm	5.9–8.9 lb-ft

Recommended Power Cable Dimensions

For the power cables sizes it is recommended to follow the table below based on IEC/EN 60950–1 COMPIL:2013. The table only lists recommended minimum size. Always follow applicable local and/or national electrical codes.

NOTE: For the rated current see the rating plate of the system for the different power cables.

NOTE: Consider the length of the cable, especially for DC power cables. A larger cross-section might be required for long cables due to the voltage drop.

Rated current [A]	Minimum conductor sizes	
	Nominal cross-sectional area mm^2	AWG or kcmil [cross-sectional area in mm^2][3]
Up to and including 25	2,5	12 [3]
Over 25 up to and including 32	4	10 [5]
Over 32 up to and including 40	6	8 [8]
Over 40 up to and including 63	10	6 [13]
Over 63 up to and including 80	16	4 [21]
Over 80 up to and including 100	25	2 [33]
Over 100 up to and including 125	35	1 [42]
Over 125 up to and including 160	50	0 [53]
Over 160 up to and including 190	70	000 [85]
Over 190 up to and including 230	95	0000 [107]
Over 230 up to and including 260	120	250 kcmil [126]
Over 260 up to and including 300	150	300 kcmil [152]
Over 300 up to and including 340	185	400 kcmil [202]

3. AWG and kcmil sizes are provided for information only. The associated cross-sectional areas, in square brackets, have been rounded to show significant figures only.

Rated current [A]	Minimum conductor sizes	
	Nominal cross-sectional area mm²	AWG or kcmil [cross-sectional area in mm²][4]
Over 340 up to and including 400	240	500 kcmil [253]
Over 400 up to and including 460	300	600 kcmil [304]

4. AWG and kcmil sizes are provided for information only. The associated cross-sectional areas, in square brackets, have been rounded to show significant figures only.

External Connections

Depending on the configuration and options selected, different external connections might be available.

Battery Temperature Sensor

The battery temperature sensor can either be connected at the controller or in the terminal section.

In systems with internal batteries the temperature sensor is already installed in the factory and connected to the controller.

For external batteries the temperature sensor must be connected at the terminal section to a terminal, for the reference designator and more details see the *Drawings*.

NOTE: After the batteries are installed the position of the temperature sensor should be checked. It is recommended to place the temperature sensor close to a battery cell in the middle of the battery bank.

External Battery Breaker

If an external battery breaker is used the signal from it must be wired to the terminal in the terminal section. The terminal is connected to the controller.

For details about how to wire the external battery breaker signal see the *Drawings*.

Emergency Power Off

⚠⚠DANGER

ENERGIZED BY EXTERNAL POWER SOURCES

When emergency power off (EPO) is activated, the rectifier modules no longer supply the load. The load and system are still energized by the batteries (unless the battery breaker is also tripped by the EPO).

Hazardous voltages are still present at some circuits, terminals and switches even when the EPO is activated (unless disconnected from the upstream supply with a separate EPO).

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

According to UPS safety standard IEC 62040-1, a UPS with an emergency switch device should be able to prevent further supply of the load.

The emergency switching device interrupts the load via a terminal to an externally connected switching device.

- **EPO in a Gutor Modular DC Charger with internal battery:** The EPO will switch off the modules and trip the internal battery breaker.
- **EPO in a Gutor Modular DC Charger with external battery:** The EPO will switch off the modules. The disconnection of the external batteries needs to be handled by the customer.

  NOTE: Optionally, with external batteries the internal battery breaker (if installed) can be selected to trip if the EPO is activated.

EPO Connection

The EPO has an internal 24 V DC power supply. It is wired to two terminals on the controller (NO), if the circuit is closed the EPO signal is sent to the controller and the modules turn off. For more information see the *Drawings*.

Relay Connections on Controller

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Only connect safety extra low voltage (SELV) to relays on the controller.

Never mix safety extra low voltage (SELV) and other voltages.

Relay circuits to the controller must be protected with fuse/MCB ≤ 2A.

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

On the controller 3 potential-free change-over (CO) relays are available. If more relays are needed optional ADBUS cards with 4 additional relays can be used.

NOTE: The terminals for the controller relays are located in the terminal section at the bottom.

Maximum contact ratings:	Minimum contact ratings:
250 V AC / 6 A AC, 60 W 30 V DC, 180 W 300 V DC, 40 W	12 V DC

Relay	Pin	Description
Relay K1	X800:1	Common alarm
	X800:2	Normally closed (NC)
	X800:3	Normally open (NO)
Relay K2	X800:4	Battery operation
	X800:5	Normally closed (NC)
	X800:6	Normally open (NO)
Relay K3	X800:7	EPO signal active (or optionally battery end of discharge)
	X800:8	Normally closed (NC)
	X800:9	Normally open (NO)

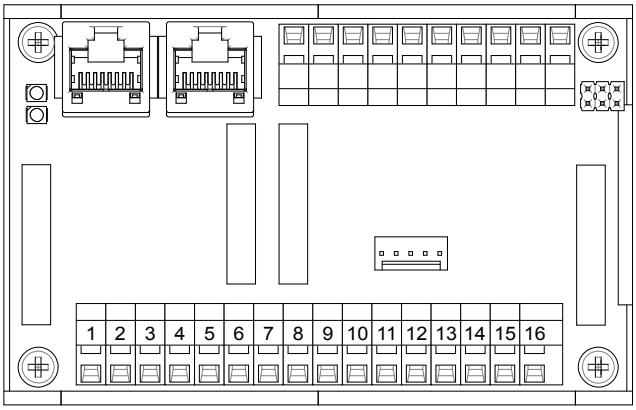
Relay Connections on ADBUS Input/Output Card

By default, 3 relays are available on the controller. If more relays are needed additional cards can be used.

Each input/output card have 4 potential-free change-over (CO) relays. Multiple cards can be used if needed.

NOTE: If multiple input/output cards are used, each card must have a unique address. The address is set using jumpers.

Maximum contact ratings:	Minimum contact ratings:
250 V AC / 6 A AC, 60 W 30 V DC, 180 W 300 V DC, 40 W	12 V DC



X1

Relay	Pin	Description
Relay K1	X1:1	Common
	X1:2	Normally closed (NC)
	X1:3	Normally open (NO)
	X1:4	—
Relay K2	X1:5	Common
	X1:6	Normally closed (NC)
	X1:7	Normally open (NO)
	X1:8	—
Relay K3	X1:9	Common
	X1:10	Normally closed (NC)
	X1:11	Normally open (NO)
	X1:12	—
Relay K4	X1:13	Common
	X1:14	Normally closed (NC)
	X1:15	Normally open (NO)
	X1:16	—

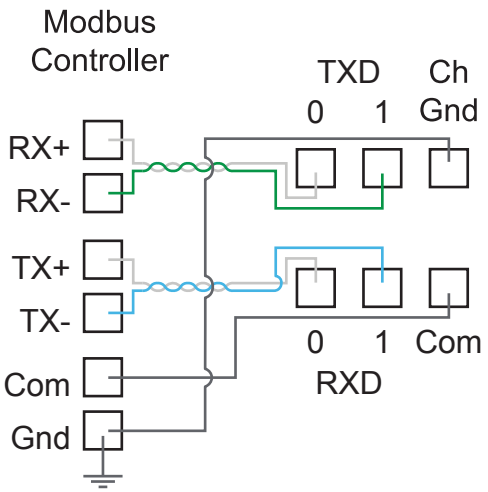
Modbus Wiring Diagrams

The Modbus wiring for the NMC in a Gutor system is done with a 4-wire configuration.

IMPORTANT: Always follow local wiring codes.

NOTE: It is recommended to use 150 Ohm resistors at each end of the Modbus bus cable if the cable is over 300 m (1000 feet) using 19200 as baud rate or over 600 m (2000 feet) using 9600 as baud rate.

4-Wire Configuration



NOTE: Use shielded twisted pair cables.

Install Batteries

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

When working on batteries always use:

- Eye protection
- Protective rubber gloves
- Protective rubber apron
- Protective rubber boots
- Insulated tools

When working on batteries:

- Always disconnect the charging source
- Always remove from earth if inadvertently earthed
- Always remove watches, rings, or other metal objects
- Never place tools or metal objects on top of batteries

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

The battery bank can either be internal or external. An internal battery bank is only possible in certain system designs. Due to cabinet and system design limitations, only certain batteries can be used for the internal battery bank.

For larger or higher rated systems an external battery rack or cabinet must be used.

During the battery installation:

- Start placing the cells from the bottom, to avoid a high center of gravity in the cabinet or the rack.
- Interconnect all the batteries with the provided cables and copper bars according to the *Drawings*.

  IMPORTANT: Pay attention to the polarity!
- Make sure that any external battery breaker is correctly sized.
- Check the polarity on the cable and breaker terminal before connecting.

DC Module Coding

⚠⚠DANGER

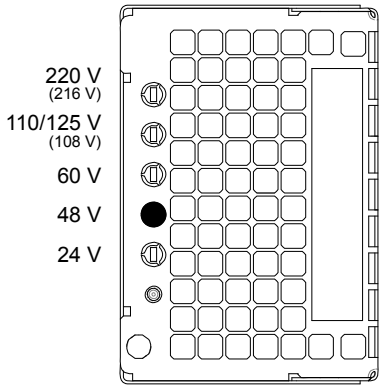
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Never modify or change the coding on a module.

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

Each module is coded for a specific voltage. On the back of the module there are five circles that indicate the different DC voltages. The position of the hole indicates the voltage DC voltage of the module. The hole on the module will correspond to a pin in the back of the rack in the system.

As an example, a 48 V DC module is shown:



Insert the Modules in the Cabinet

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Never install a damaged module.

Check that blind covers are installed in all empty slots in the module racks.

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

⚠CAUTION

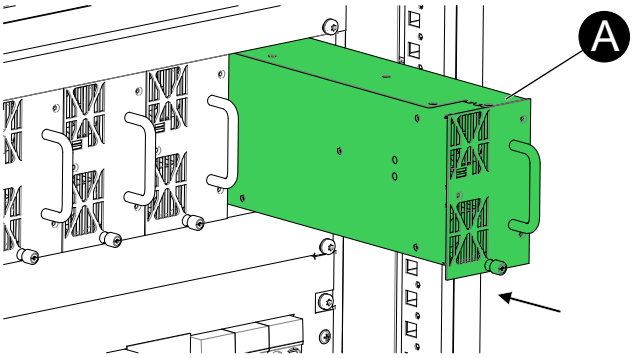
UNINTENDED OPERATION

Never attempt to insert a module of a different rating into a rack coded for another rating.

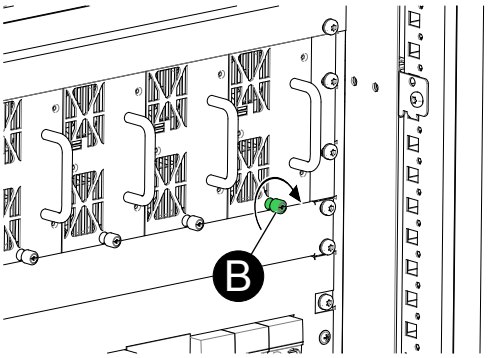
Check that the rating of the module is according to the system rating plate.

Failure to follow these instructions can result in injury or equipment damage.

1. Carefully insert the module **(A)** with both hands in an empty slot starting from the left, with the screw at the bottom.



2. Make sure that the module is fully inserted and that the module front is flush to the protective covers.
3. Tighten the screw **(B)** at the bottom by hand.



4. Repeat for the remaining modules. There should be no empty slots between the modules.
5. Check that blinds covers are firmly installed in all empty slots to the right in the module rack(s). If necessary, tighten the screws on the blind covers.

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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