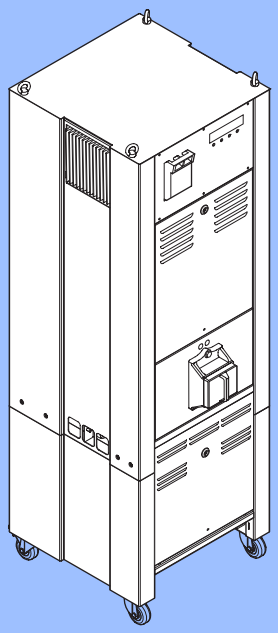
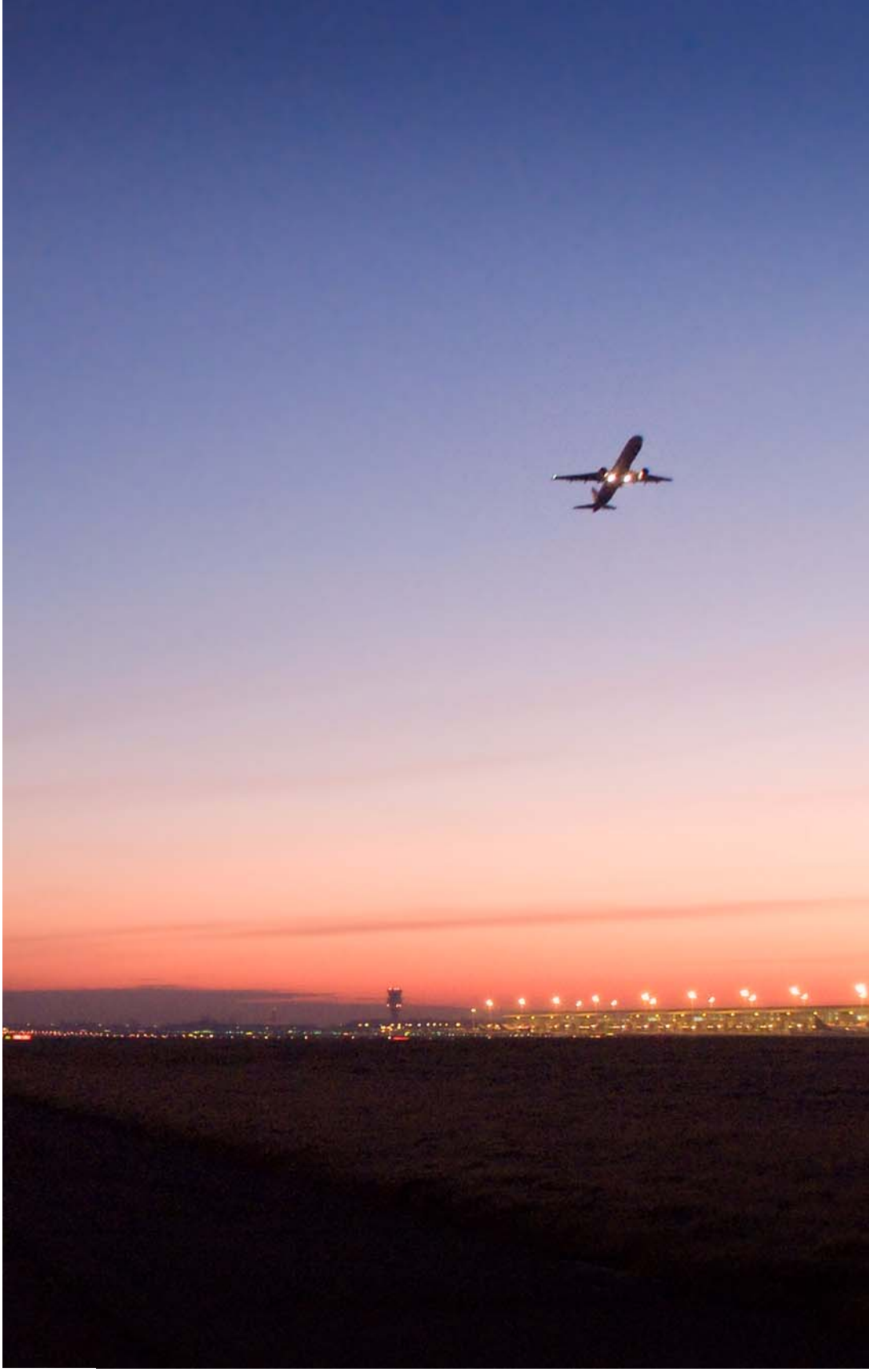




Installation manual

Microprocessor controlled constant current regulator
Type MCR³ 2.5 kVA to 30kVA

AM.07.360e Edition 2.0

ADB
Airfield Solutions

ADB	Address: Leuvensesteenweg 585, B-1930 Zaventem, Belgium Tel.: +32 2 722 17 11, Fax: +32 2 722 17 64 Email: info.adb@adb-air.com Internet: www.adb-airfieldsolutions.com

ADB
Airfield Solutions

Table of contents

7. Technical data

1 About this manual

The manual shows the information necessary to:
- install

the MCR^3 2.5 to 30 kVA.
- 2.5 to 12.5 kVA: small cabinet;
- 15 to 30 kVA: big cabinet;

If in the manual the term equipment is used, this refers to both the small and the big cabinet.

1.1 How to work with the manual

1. Familiarize yourself with the structure and content.
2. Carry out the actions completely and in the given sequence.

1.2 Record of changes

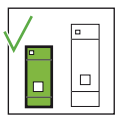
Edition	Editor	Check	Date	Description
1.0				New
2.0	MR	KBL, VHE, AHU, WEW	12/2010	Restructuring and adaptation after midlife update2

1.3 Icons used in the manual

For all WARNING symbols, see the chapter 2.

CAUTION
Can cause damage to the equipment.

NOTE
Gives further information.



Small cabinet: represents applicability only to the 2.5 to 12.5 kVA version

Represents applicability only to the 15 to 30 kVA version.

1.4 Abbreviations and terms

Table: 1.1 Terms and abbreviations

Term or abbreviation	Description
AC	Alternating Current
AGLAS	Airfield Ground Lighting Automation System
AWG	American Wire Gauge
Binary notation	All data in the digital circuits is treated using “1” and “0”. Thus, all decimal notations are transcripted into binary notations.
CCL	Current Control Logic
CS	Circuit Selector
CSM	Circuit Selector Module
DC	Direct Current
EFD	Earth Fault Detection
EMC	Electro Magnetic Compatibility
Equipment	Both small cabinet and big cabinet, if the information is the same
FAA	Federal Aviation Administration
Hexadecimal notation	This is a way to write numbers in base 16 notation, instead of the standard base 10 notation. In the manual, it is used for bits and addresses, because it identifies better the active data address or data lines (16 or 8-bit large).
HV	High Voltage.
ICAO	International Civil Aviation Organisation
ILCMS	Individual Lamp Control and Monitoring System
LA	Lightning arrestor
LFD	Lamp Fault Detection
LMC	Local Master Controller
MCR^3	Microprocessor Controlled Constant Current Regulator, third generation
MW	Multiwire
PC	Personal Computer
PCB	Printed Circuit Board
PCMCIA	Personal Computer Memory Card International Association
PVO	A type of guidance sign with fluorescent lamps.
PE	Protective Earth

Term or abbreviation	Description
PSL	Power Supply Logic
RMS	Root Mean Square
SCO	Series CutOut
TBM	Thyristor Block Module
UI	User Interface

2 Safety

Read all warnings carefully. Failure to do so may result in personal injury, death, or property damage.

2.1 Use

To use the equipment safely:

- Refer to the International Standard IEC 61820, *Electrical installation for lighting and beaconing of aerodromes - Constant current series circuits for aeronautical ground lighting - System design and installation requirements*, and to the International Standard IEC 61821, *Electrical installations for lighting and beaconing of aerodromes - Maintenance of aeronautical ground lighting circuits* for instructions on safety precautions.
- Observe all safety regulations. To avoid injuries, always remove power prior to making any wire connections and touching any live part. Refer to the International Standards IEC 61820 and IEC 61821.
- In addition for a parallel power supply also take into account the International Standard IEC 60598 (for class I equipment).
- Read and become familiar with the general safety instructions provided in this chapter before you install, operate, maintain or repair the equipment.
- Read and carefully follow the instructions given throughout this manual before installing, operating, maintaining, or repairing the equipment.
- Store this manual within easy reach of personnel installing, operating, maintaining or repairing the equipment.
- Follow all applicable safety procedures required by your company, industry standards, and government or other regulatory agencies.
- Obtain and read Material Safety Data Sheets (MSDS) for all materials used.

2.2 Safety symbols

Become familiar with the safety symbols presented in this chapter. These symbols will alert you to safety hazards and conditions that may result in personal injury, death, or property and equipment damage.

WARNING 1: Failure to observe this warning may result in personal injury, death, or equipment damage.

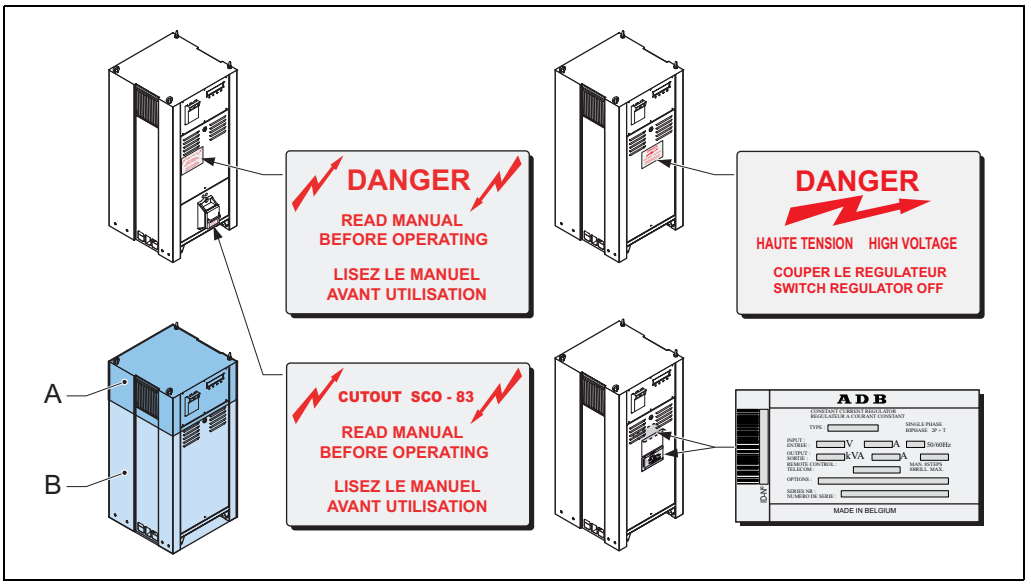
WARNING 2: Risk of electrical shock. Failure to observe this warning may result in personal injury, death, or equipment damage.

WARNING 3: Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage.

WARNING 4: Wear personal protective equipment. Failure to observe may result in serious injury.

WARNING 5: Do not touch. Failure to observe this warning may result in personal injury, death, or equipment damage.

2.3 Signs on the equipment



A Low-voltage compartment B High-voltage compartment

The signs on the equipment are part of the safety provisions. Do not cover or remove the signs. The signs must be present and legible during the entire life of the equipment.

2.4 Qualified personnel

The term qualified personnel is defined here as individual who thoroughly understand the equipment and its safe operation, maintenance, and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations and have been trained to safely install, operate, maintain, and repair the equipment. It is the responsibility of the company operating the equipment to see that its personnel meet these requirements.

2.5 Liability

WARNING
Use of the equipment in ways other than described in the catalogue leaflet and the manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in the manual.

ADB cannot be held responsible for injuries or damages resulting from non-standard, unintended applications of its equipment. The equipment is designed and intended only for the purpose described in the manual. Uses not described in the manual are considered unintended uses an may result in serious personal injury, death or property damage.

Unintended uses may result from taking the following actions:

- Making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine ADB replacement parts or accessories.
- Failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards if not in contradiction with the general rules.
- Using materials or auxiliary equipment that are inappropriate or incompatible with your ADB equipment.
- Allowing unqualified personnel to perform any task.

2.6 Installation

Read the installation section of all system component manuals before installing your equipment. A thorough understanding of system components and their requirements will help you install the equipment safely and efficiently.

WARNING
Failure to follow these safety procedures can result in personal injury or death.

- Allow only qualified personnel to install ADB and auxiliary equipment. Use only approved equipment. Using unapproved equipment in an approved system may void agency approvals and will void the warranty.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- Follow all instructions for installing components and accessories.
- Install all electrical connections to local code provided they are not in contradiction with the general rules.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current and voltage demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment and animals (e.g. rodents).
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility (power products), and cover removal (power products).
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning.

2.7 Operation

Only qualified personnel, physically capable of operating the equipment and with no impairments in their judgment or reaction times, should operate this equipment.

Read all system component manuals before operating the equipment. A thorough understanding of system components and their operation will help you operate the equipment safely and efficiently.

- Before starting this equipment, check all safety interlocks and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the equipment if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks or locked-out electrical disconnects or pneumatic valves.
- Never operate equipment with a known malfunction.
- Do not attempt to operate or service electrical equipment if standing water is present.
- Use the equipment only in the environments for which it is rated. Do not operate the equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.
- Never touch exposed electrical connections on equipment while the power is ON. Make sure the exposed electrical connections are proven to be dead.

2.8 Action in the event of an equipment malfunction

Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.

1. Disconnect and lock out electrical power.
2. Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.

2.9 Maintenance and repair

Allow only qualified personnel to perform maintenance, troubleshooting, and repair tasks. Only persons who are properly trained and familiar with ADB equipment are permitted to service the equipment.

- Always use safety devices when working on the equipment.
- Follow the recommended maintenance procedures in your equipment manuals.
- Do not service or adjust any equipment unless another person trained in first aid and Cardio Pulmonary Resuscitation (CPR) is present.
- Connect all disconnected equipment ground cables and wires after servicing equipment. Ground all conductive equipment.
- Use only approved ADB replacement parts. Using unapproved parts or making unapproved modifications to equipment may void agency approvals, impair specified performance and create safety hazards.
- Check interlock systems periodically to ensure their effectiveness.
- Do not attempt to service electrical equipment if standing water is present. Use caution when servicing electrical equipment in a high-humidity environment.
- Use tools with insulated handles when working with electrical equipment.

2.10 CE certification

The equipment is CE certified. It means that the product complies with the essential requirements concerning safety and hygiene. The directives that have been taken into consideration in the design are available on written request to ADB.

2.11 Guarantee

ADB guarantees that the performance of the equipment described in this manual, when sold by ADB or its licensed representatives, meets the corresponding requirements of FAA and IEC.

The contractual warranty period applies for a period of 12 months after installation and at the latest for a period of 24 monts after ex-works delivery. Any defect in design, material or workmanship, which may occur during proper and normal use over this period will be repaired or replaced by ADB free of charge, ex. works.

The warranty does not cover consumables and/or operational failure resulting from improper maintenance or installation. Other damages caused by pavement maintenance equipment, snow ploughs or aircraft arresting gear hooks are not considered as a result of proper use and are beyond the scope of the warranty.

The warranty does not cover natural wear and tear or damage arising after delivery owing to faulty or negligent handling, excessive strain, unsuitable materials for operation, deficient civil engineering work, unsuitable soil conditions, and such chemical, electrochemical or electrical influences as were not assumed at the time of the conclusion of the contract.

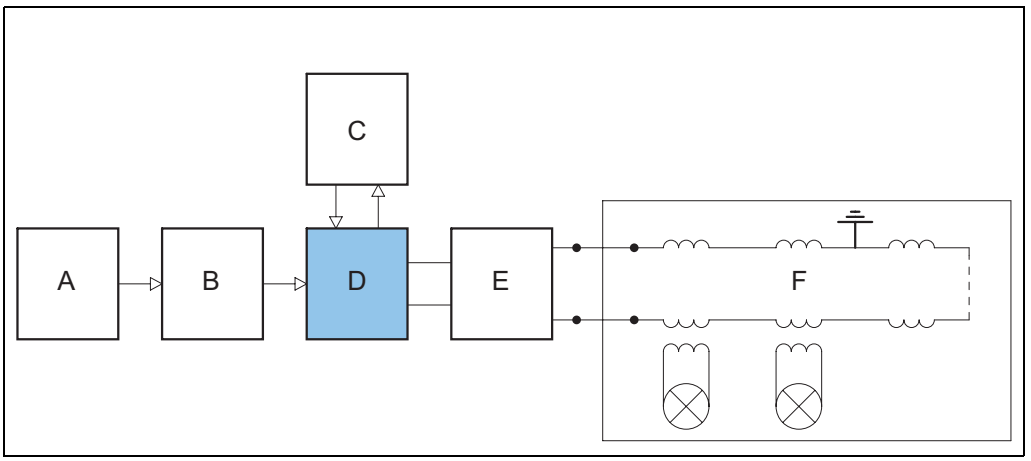
All liability for consequences of any inexpert alterations or repairs carried out by the purchaser or a third party shall be waived. ADB shall in no event be liable to the purchaser for any further claims, particularly claims for damages not affecting the goods themselves.

The above constitutes the limits of the liabilities of ADB in connection with the equipment covered by this manual.

Also refer to the document ‘General Conditions for Deliveries and Services by ADB’.

3 Description

3.1 Series circuit system overview



A Input power supply
B Input disconnection device
C Remote control system
D Equipment
E Output disconnection device
F Series circuit

The equipment is a microprocessor-controlled constant current regulator.

3.2 Intended use

The equipment is designed to supply airport lighting series circuits at different intensity levels. Any other or additional use will be considered not to be in conformity with the purpose.

Do not operate the equipment outside the limits of the specifications or outside the specified ambient conditions.

3.3 Non linear loads

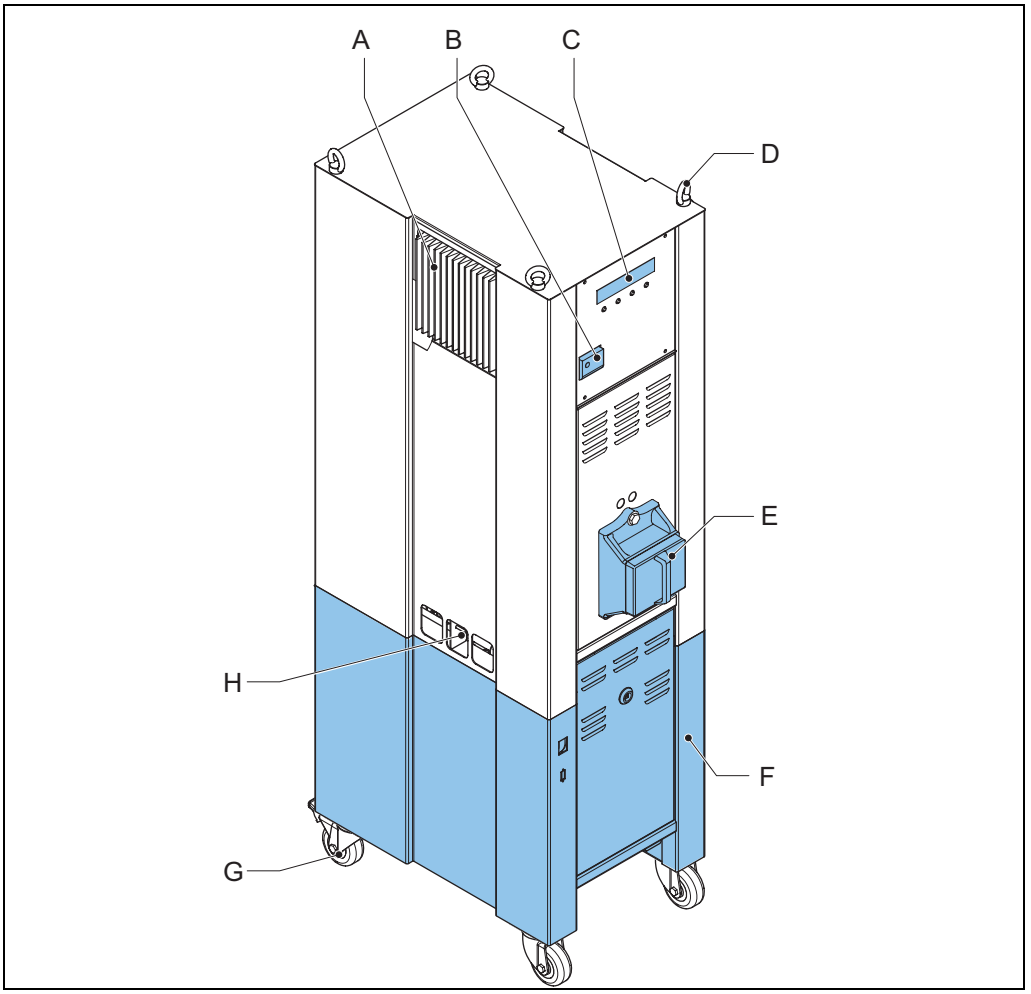
The equipment is fully compliant with several standards. See § 7.2.

Note
Non linear loads may negatively influence the correct operation of the equipment.

Examples:
- PVO loads are limited to 30 percent of the total load.
- It is recommended to switch blocks via ILCMS on a lower brightness step.

3.4 Lay-out of the equipment cabinets

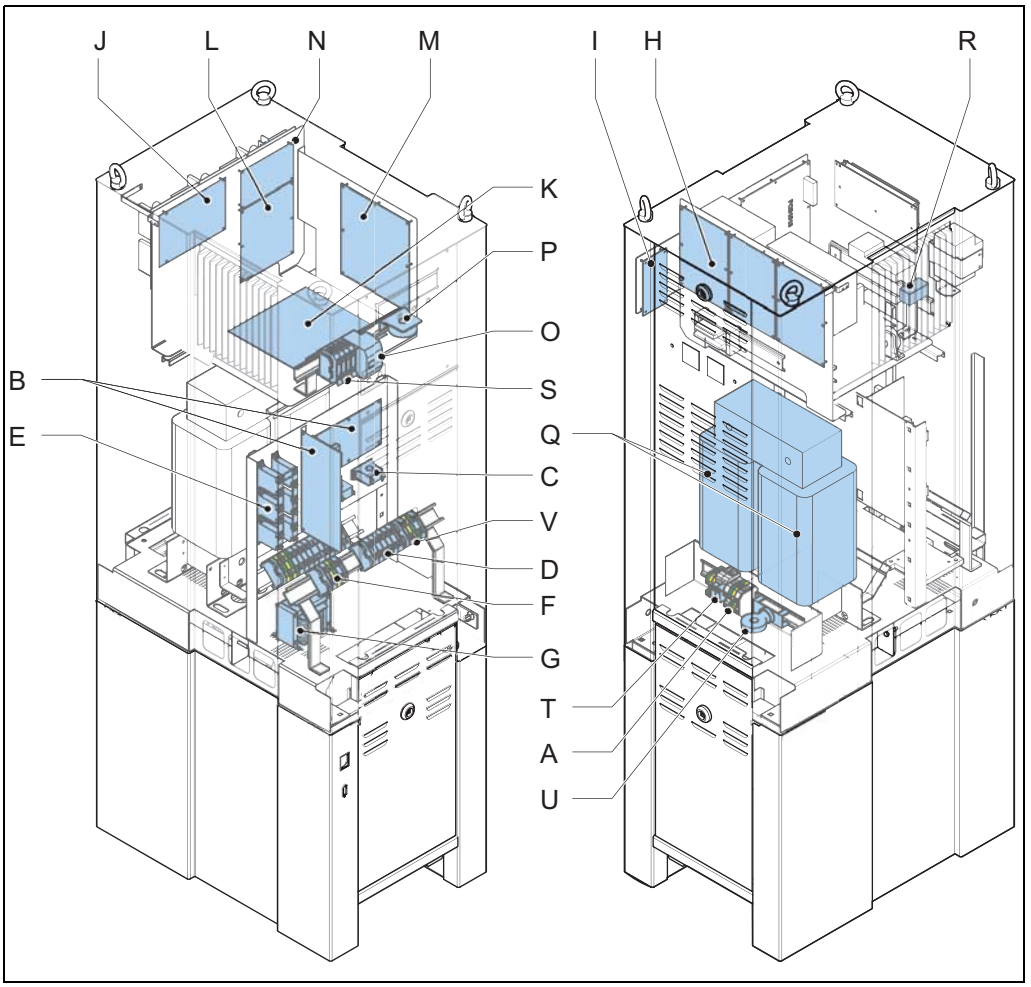
3.4.1 Outside - small cabinet: 2.5 to 10 kVa



Main items

A Thyristor heatsink
B Fused input switch
C User interface
D Lifting lugs (option)
E Series CutOut (SCO) (option)
F CS cabinet (option)
G Wheels (option)
H Ground stud M6

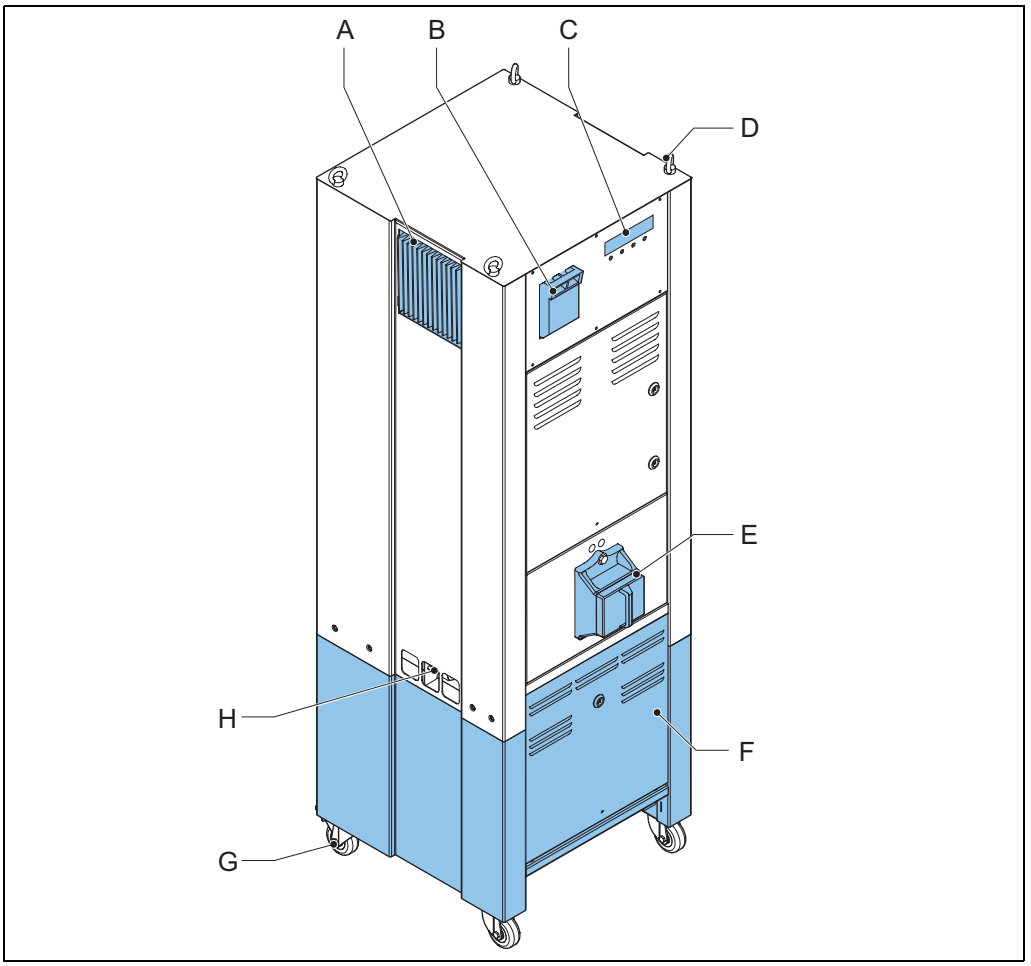
3.4.2 Inside - small cabinet: 2.5 to 10 kVa



Main items

A Input terminals (X1)
B Earth Fault Detection module (EFD) (option)
C Output measurement transformers (TI2, TI3)
D Tap (S6 to S1)
E Lightning arrestors (LA1, LA2)
F Output terminals (X2)
G Series choke (L1)
H Multiwire control (option)
I J-Bus logic (option)
J Thyristor Block Module (TBM)
K Power Supply Logic (PSL)
L Current Control Logic (CCL)
M Local Master Controller (LMC)
N Lamp Fault Detection (LFD) (option)
O Main contactor (K1)
P Input measurement transformer (TI1)
Q Output power transformer (T1)
R Thyristor (THP1)
S Fuses (F2, F3)
T Over Voltage Protection (OVP)
U Common mode choke
V Output terminals when you use a CSM

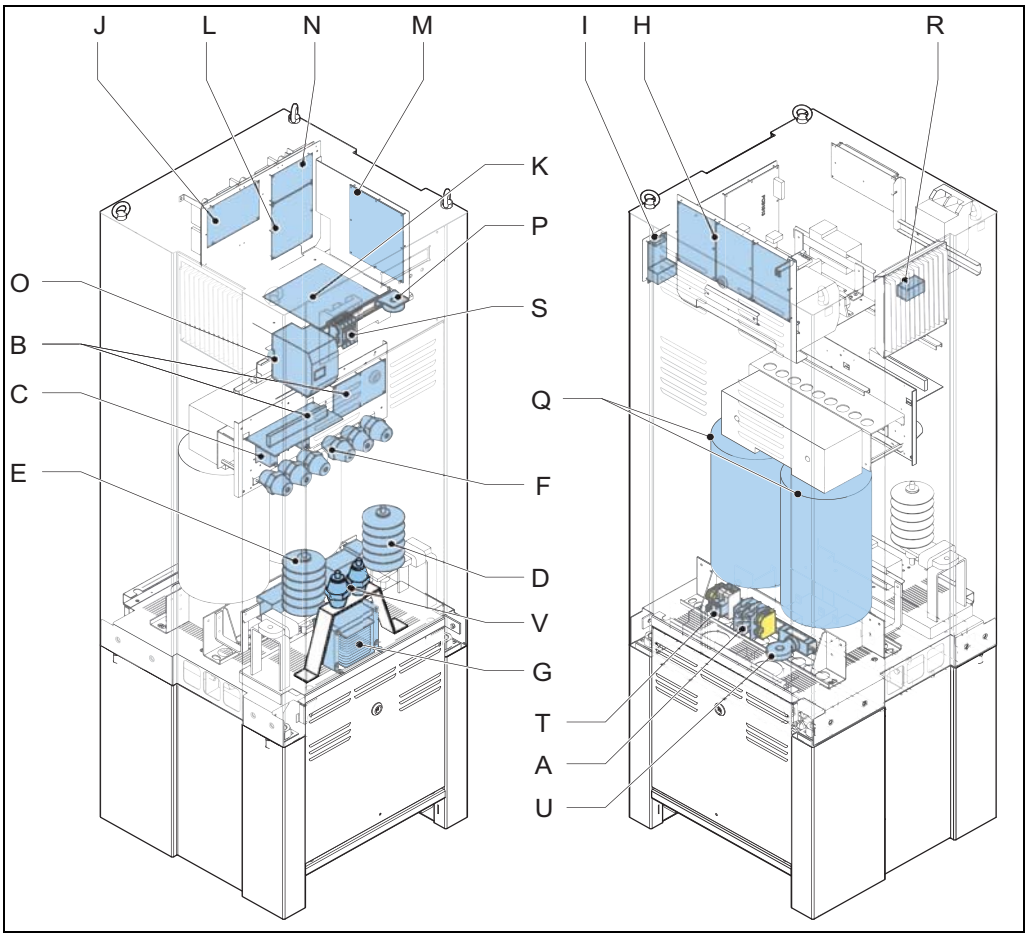
3.4.3 Outside - big cabinet 15 to 30 kVa



Main items

A Thyristor heatsink
B Fused input switch
C User interface
D Lifting lugs (option)
E Series CutOut (SCO) (option)
F CS cabinet (option)
G Wheels (option)
H Ground stud M6

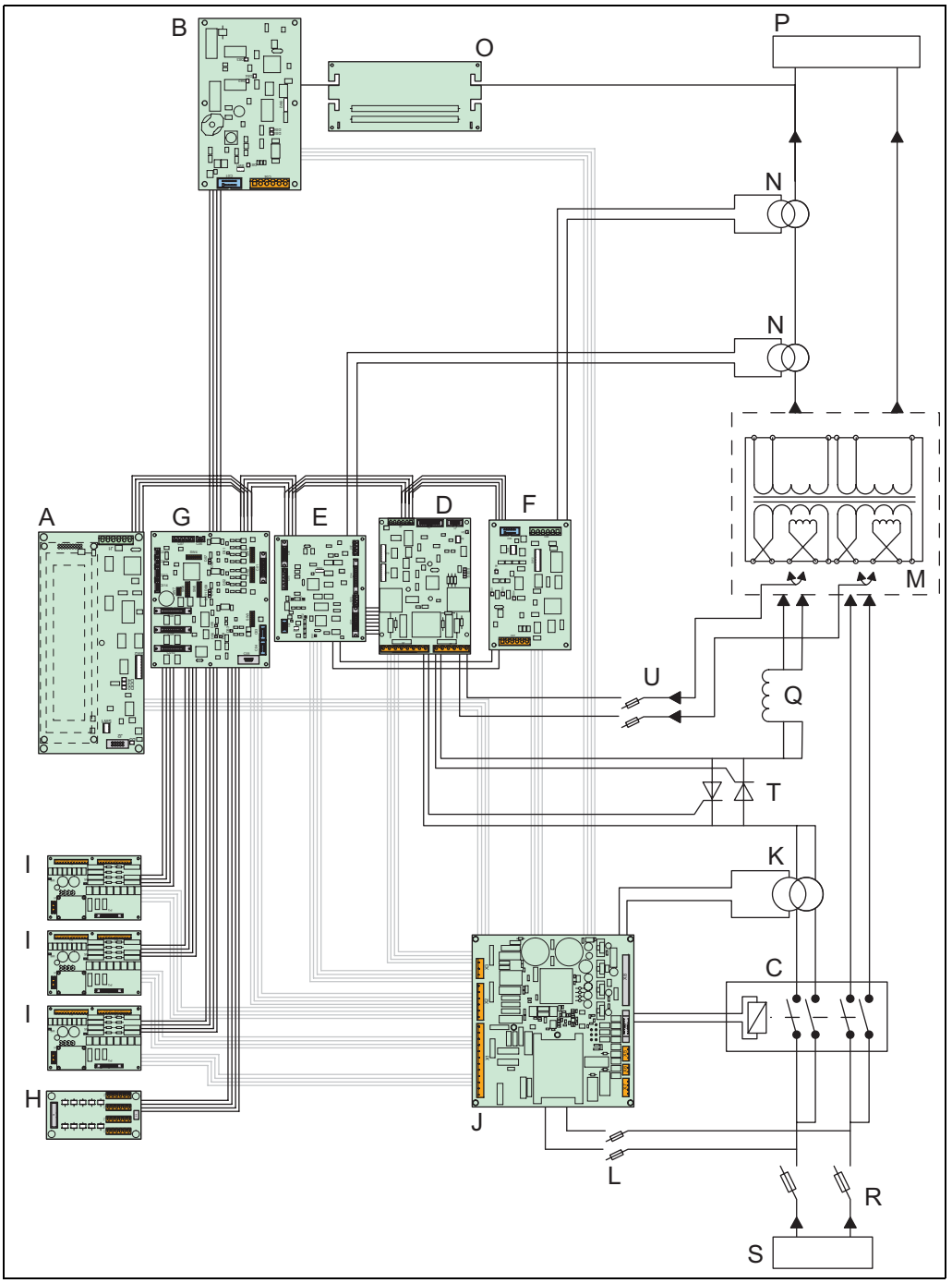
3.4.4 Inside - big cabinet 15 to 30 kVa



Main items

A Input terminals (X1)
B Earth Fault Detection module (EFD) (option)
C Output measurement transformers (TI2, TI3)
D Lightning arrestors (LA1, LA2)
E Output terminals (X2)
F Tap (S6 to S1)
G Series choke (L1)
H Multiwire control (option)
I J-Bus logic (option)
J Thyristor Block Module (TBM)
K Power Supply Logic (PSL)
L Current Control Logic (CCL)
M Local Master Controller (LMC)
N Lamp Fault Detection (LFD) (option)
O Main contactor (K1)
P Input measurement transformer (TI1)
Q Output power transformer (T1)
R Thyristor (THP1)
S Fuses (F2, F3, F4)
T Over Voltage Protection (OVP)
U Common mode choke
V Output terminals when you use a CSM

3.4.5 Overview of component connections



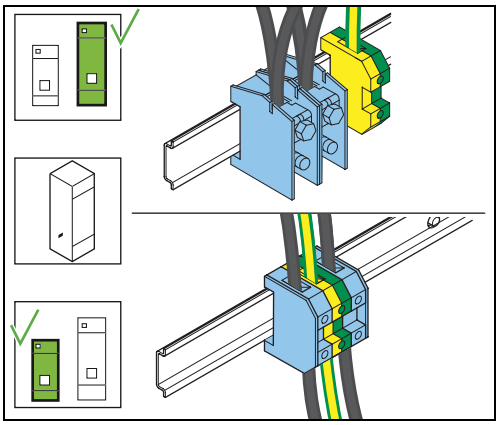
A	UI logic	L	Fuse (F2)
B	EFD (option)	M	Output power transformer (T1)
C	Main contactor (K1)	N	Output measurement transformer (TI2, TI3)
D	TBM	O	EFD resistors (option)
E	CCL	P	Output terminals (X2)
F	LFD (option)	Q	Series choke (L1)
G	LMC	R	Fused input switch (F1)
H	J-Bus interface (option)	S	Input terminals (X1)
I	Multiwire logic (option)	T	Thyristors (THP1)
J	PSL	U	Fuse (F3)
K	Input measurement transformer (TI1)		

3.5 Components

3.5.1 Power input

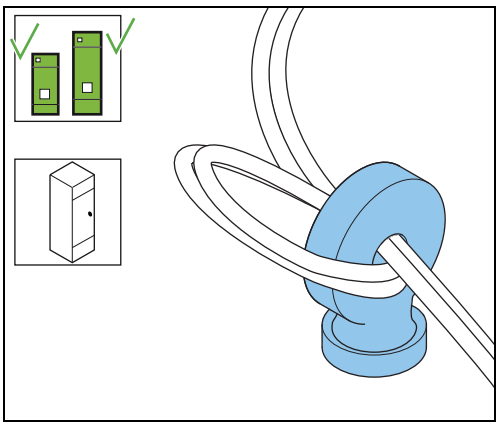
Input terminals (X1)

The input terminals connect the power input cables to the regulator. The size of these terminals depends on the input current rating of the regulator:



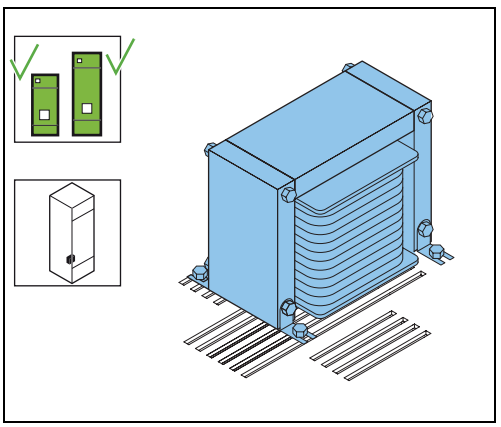
Common mode choke

The common mode choke blocks the high-frequency common-mode currents from the power circuitry.



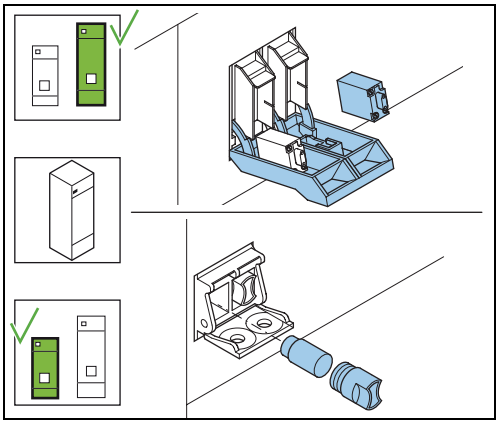
Series choke (L1)

The series choke limits the current rise time of the thyristors, the output transformer, and the current loop. The series choke also limits the harmonics on the current waveform.



Fused input switch (F1)

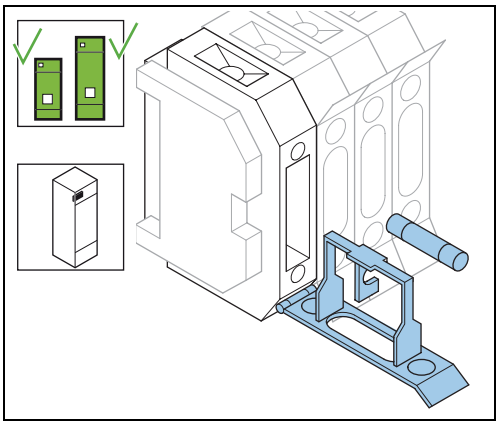
The fused input switch disconnects the equipment from the mains power supply.



Fuses (F2, F3)

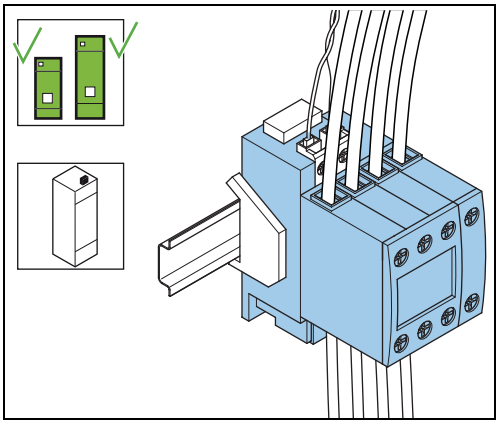
The fuses F2 and F3 protect the wiring of the equipment from overcurrent:

- F2 protects the low current mains wiring;
- F3 protects the wiring to measure the primary voltage of the power transformer;



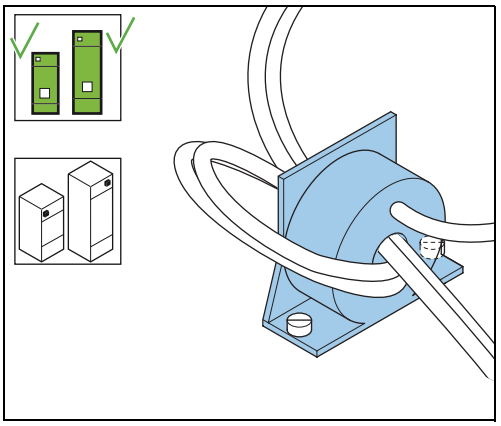
Main contactor (K1)

The main contactor interrupts the maximum input current. It also provides a positive interruption of the input power circuitry on both supply lines.



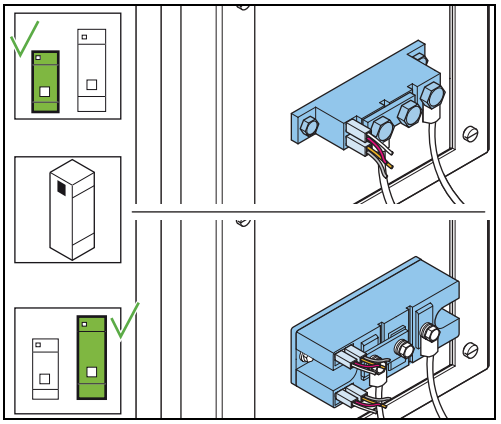
Input measurement transformer (TI1)

The input measurement transformer enables the equipment to measure the input current accurately.



Thyristors (THP1)

The thyristors use phase control as a closed loop regulation system to obtain the required output current.

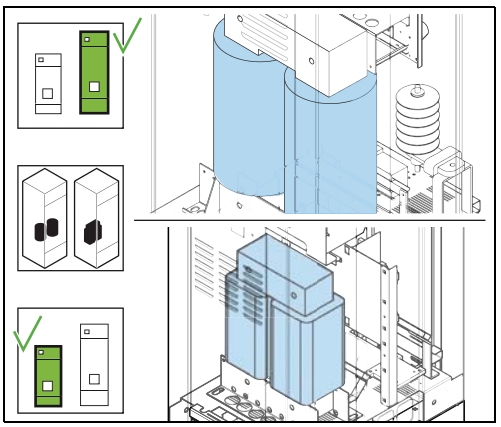


3.5.2 Power output

Output power transformer (T1)

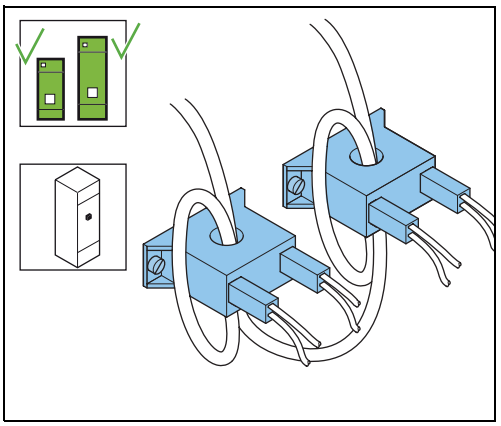
The transformer has a set of primary and secondary taps. The primary taps can adapt to the typical input voltages of 220, 240, 380, 400 or 416 V - 50 or 60 Hz. The secondary taps allow the equpment to adapt to the actual load with a set of steps: 2/8, 4/8, 6/8, 7/8, and 8/8.
The following exceptions apply:

- 25 and 30 kVA: only the primary taps 380, 400 or 416 V - 50 or 60 Hz.
- 25 and 30 kVA: 6.6 and 20 A power transformers.
- 2.5 kVA: only the secondary taps 8/8 and 4/8.



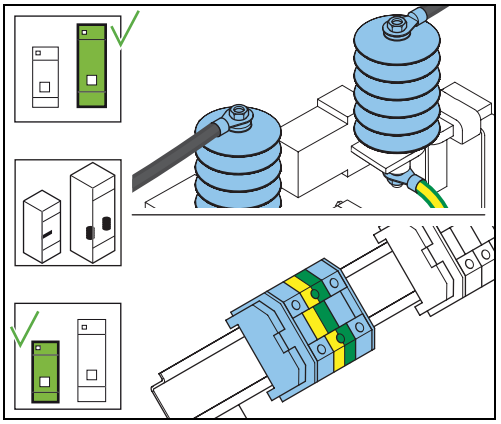
Output measurement transformer (TI2, TI3)

The output measurement transformer enables the equipment to measure the output current accurately.



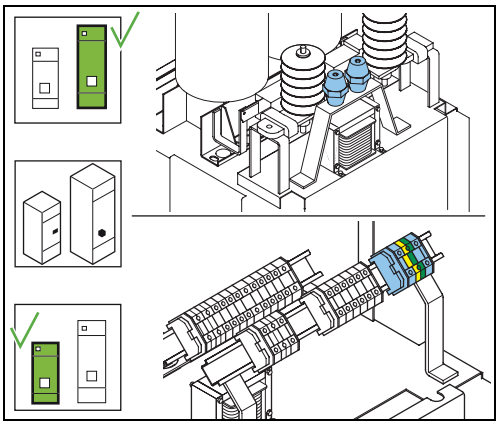
Output terminals (X2)

The output terminals connect the equipment to the series circuit.



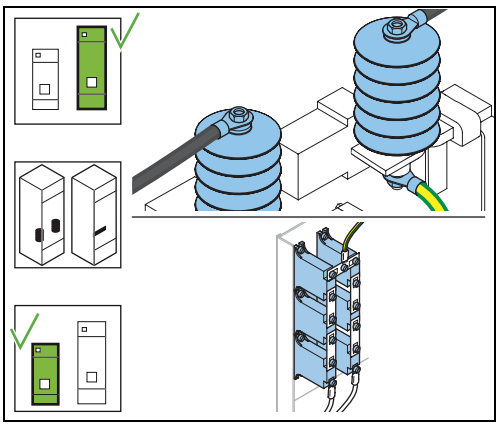
Output terminals when you use a CSM

The output terminals connect the equipment to the series circuit.



Lightning arrestors (LA1, LA2)

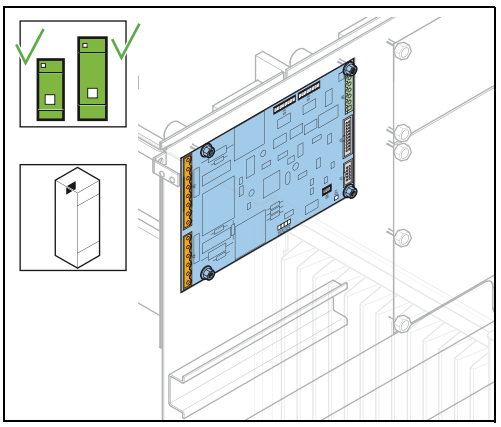
The output terminals connect the equipment to the series circuit. The output terminals are also used as lighting arrestors.



3.5.3 Printed Circuit Boards (PCBs)

Thyristor Block Module (TBM)

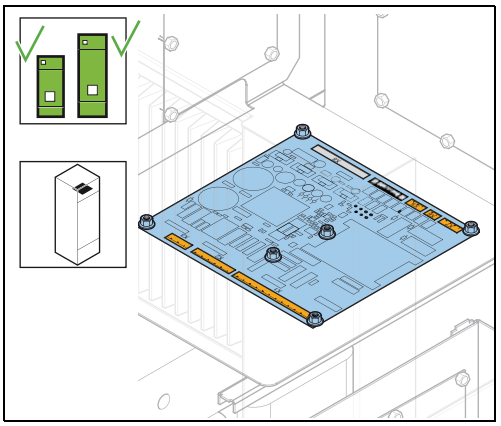
The TBM is the interface between the CCL and the thyristor gates. The TBM PCB controls the thyristor gates to obtain the required conduction angle. The TBM also provides fast overcurrent protection and asymmetric output voltage monitoring.



Power supply Logic (PSL)

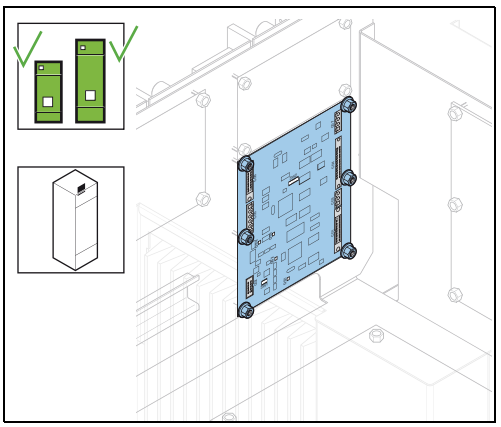
The PSL supplies power to the other modules in +12 / +5 / -12 V.
If the power supply to the PSL is interrupted, its signal (Power Good) goes low in less than 20 ms. The PSL maintains the DC voltages for about two seconds after a power failure, which leaves sufficient time for the CCL to prepare a fast restart without the loss of control data.

The PSL also provides 230 V AC for the internal 230 V AC components of the equipment. The input lines have supplementary filters to reduce the conducted emission of the equipment.



Current Control Logic (CCL)

The CCL compares the actual output current and the received brightness step request. The CCL calculates the optimal conduction angle. The CCL checks the tolerance of the output current, the overcurrent, or open circuit condition and produces the back-indication signals. In addition, the CCL also monitors the output circuit and the input parameters.
The CCL module also controls the back-indication signals ON and REG.ERR.



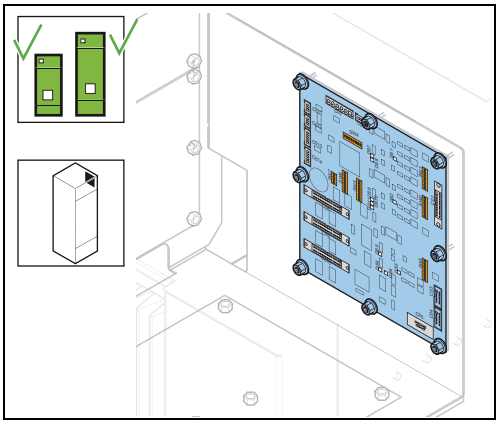
Back-indication signals ON and REG.ERR

The equipment can send basic back-indication signals to a monitoring system. These signals indicate to the monitoring system if the equipment is ON or OFF.
These signals must have simple, potential free contacts. The maximum contact load is:

- AC - 110 V - 2 A - 220 VA;
- DC - 110 V - 2 A - 60 VA.

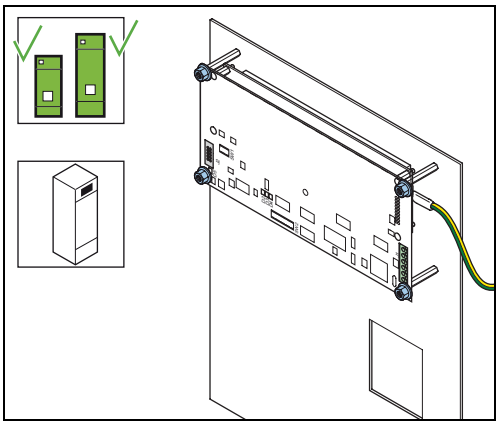
Local Master Controller (LMC)

The LMC communicates with the other modules as a master via a local bus. The LMC processes and distributes the messages it receives from the other modules. Each slave has a control line to request transmission of data to the LMC.
The local bus connection uses the RS485 protocol to send isolated signals over two wires.



User Interface (UI)

The user interface allows you to operate the equipment, view the status and the parameters. You can change some in Local Mode.



3.6 Working principle

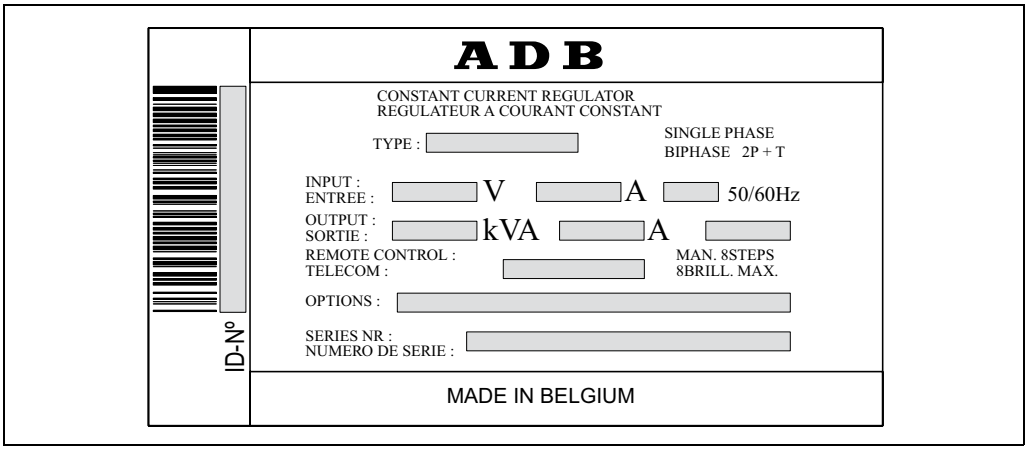
The equipment varies the output voltage to the series circuit to keep the output current constant. The conduction angle of the thyristor changes to vary the output voltage.

The sequence:
- The equipment receives a step request from a local or remote control.
- The CCL requests the contactor to close.
- The contactor closes.
- The CCL sends a request to the TBM to start firing the thyristors.
- The TBM fires the thyristor gates.
- The CCL compares the request with the actual output and adjusts the firing request to the TBM, if necessary.
- The produced RMS voltage is fed into a power transformer.
- The power transformer transforms the voltage to the required output voltage.

This process will be maintained until no output is anymore demanded or if any of the safety features are triggered. The equipment stops immediately when triggered by a safety feature. The safety can only be reset at the TBM.

3.7 Nameplate

Each equipment has a standard nameplate:



3.8 Options

Remote control

The equipment can be controlled remotely with Multiwire, J-Bus, or a combination of the above. The system automatically detects which communication method is available.

Multiwire

Each equipment has a maximum of three multiwire PCBs connected to the LMC:
- MW1;
- MW2;
- MW3 (for CS only)

A multiwire PCB has 8 input and 8 output signals. The terminals handle the incoming and outgoing signals between the equipment and the remote control system.

The multiwire interface provides control and back-indication signals for basic remote control functions between the equipment and a remote control system.
The number of multiwire PCBs in the equipment determines the maximum number of available terminals.

Note
It is necessary to configure a specific signal only to one terminal.

J-Bus

J-Bus can be either a single or a dual databus:
- With a single databus, the equipment has only one communication channel.
- With a dual databus, the equipment has two redundant separate communications channels: Bus A and Bus B. They should take different routes to avoid a communication failure if one cable is interrupted.

Series CutOut (SCO)

The optional SCO acts as an output disconnection device between the equipment and the series circuit. The SCO also isolates the series circuit from the equipment during maintenance or testing operations. The cover can be locked with a key to prevent unauthorized access.

Earth Fault Detection (EFD)

The EFD shows the insulation resistance of the series circuit on the user interface. This value is only an indication. To find out a more accurate value, use a specific measurement tool (Megger).The EFD measures the insulation resistance between the series circuit and the earth. The EFD module works when the equipment is connected to the mains supply, even if no output current is present.
You can set two alarm levels, Level 1 and Level 2, for the measured values. Both alarm levels can be set to any value between 20 kOhm and 250 MOhm. However, Level 1 must always be higher than Level 2.
Working principle: A high-voltage resistor applies a stable, current-limited voltage of 500 V DC between the series circuit and the ground or cable screen.

Lamp Fault Detection (LFD)

The LFD shows the number of defective light fittings on the UI.
The operation of the LFD is based on the change in the output waveforms when a series transformer saturates as a consequence of the lamp having blown at the secondary side.
The LFD can be used together with a CS. It is then possible to calibrate the LFD module for two or more different circuit combinations.
The accuracy for a calibrated LFD level is one light fitting with a margin of +/- 3 light fittings.

The LFD provides correct measurements only if these conditions apply:
- All lamp transformers are of the same type and rating;
- Reactive and capacitive loads are low;
- The cable capacitance towards ground is less than 1µF and is equally distributed in the series loop.
- No non-linear lights, such as guidance signs, BRITE, serial-to-parallel adapts or poor contacts at primary or secondary lamp transformers.

Circuit selector (CS)

With a CS you can connect several (up to eight) series circuits to a single equipment.
The CS has two modes:
- Simultaneous: the equipment can connect to a number of the available circuits at the same time;
- Alternate: the equipment can connect to only one circuit at a time.

The interface board converts the logic control signals (12 V DC) that come from the CCL PCB into coil control voltages. If the equipment has a multiwire interface, the multiwire PCB MW3 serves as the remote control and back-indication interface for circuit selection.
The fuses F4 protect the power supply to the auxiliary transformer that feeds the CS logic. These fuses are located close to the main fuse F1 and are accessible after removing the user interface panel.

An auxiliary transformer T1 is used to adapt the input voltage to the contactor coil voltage level.

The type of high-voltage contactors (K1-K8) depends on the cabinet size. The number of contactors depends on the number of circuits and can be from two to eight.
For the big cabinet the HV-circuit connects directly to the HV contactor terminals. For the small cabinet there are separate connection terminals for the circuit connection.
The coil voltage of the HV contactors is standardized to 230 V 50/60 Hz.

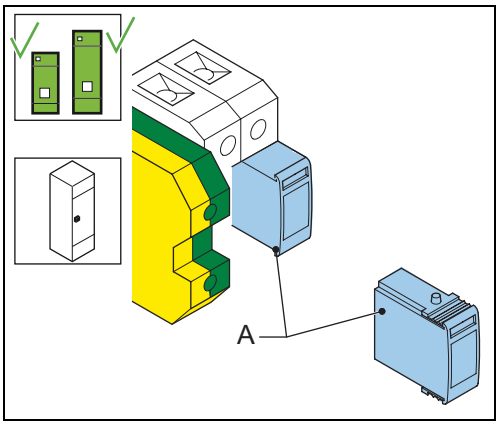
Hour counters

Measure the number of hours the equipment is ON, or the number of hours the equipment is ON and produces output current that is higher than a set value.
If the equipment has a CS, each circuit has its own hour counter.

Overvoltage protection (MOV1A and MOV1B)

The overvoltage protection module protects the input circuit from incoming voltage transients or peaks. The status of the modules is monitored.

The overvoltage protection modules have indicators. These indicators become red when the protection is activated.



4 Inspection and transport

4.1 Inspect equipment on delivery

Each equipment comes in a crate.

1. Check if the crate is not damaged.
2. If the crate is damaged, tell the carrier immediately.
3. Unpack the crates. See § 4.3.
4. Check if the equipment corresponds to your order.
5. Check the equipment for damage.
6. If the equipment is damaged or does not correspond to your order, tell the carrier immediately.

4.2 How to transport the crate

CAUTION

- **The maximum weight of the equipment is approximately 380 kg.**
- **Keep the crate in a vertical position at all times.**
- **Do not let the crate tilt or fall.**
- **The centre of gravity of the crate is not the same as the physical centre of the crate.**

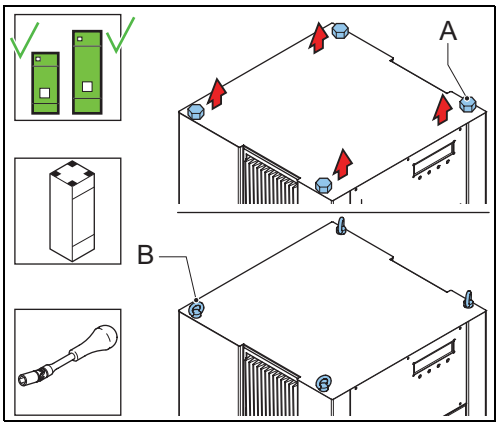
4.3 Unpack at installation area and transport equipment

CAUTION

- **Always use lifting lugs (option) and adequate hoisting cables to lift the load.**
- **Do not let the load swing without control.**

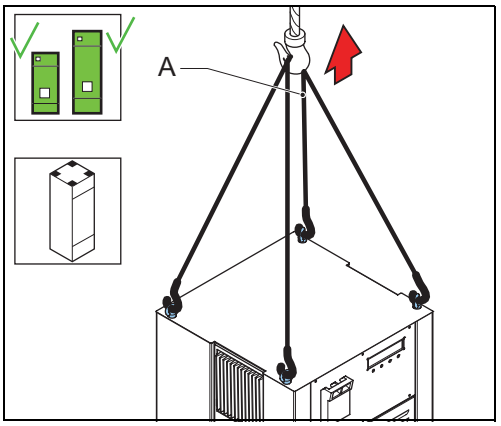
Prepare

1. Make sure that the equipment is at the installation area.
2. Remove the cover and side panels of the crate.
3. Remove the bolts (A).
4. Install the lifting lugs (B).



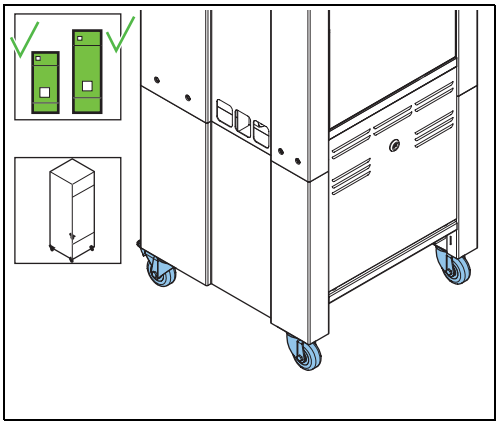
Lift

1. Secure a chain or a rope (A) to the lifting lugs.
2. Slightly lift the equipment. *The cables tighten.*
3. Carefully move the equipment to the applicable location.



Equipment with wheels (option)

1. Push the equipment to the applicable location.



5 Pre-installation

5.1 How to pre-install - general procedure

1. Prepare the substation for the equipments. See § 5.2.
2. Plan a power supply for each equipment. See § 5.3.
3. Plan the cables and the lay-out of the cables. See § 5.4.

5.2 Prepare substation

5.2.1 Prepare

WARNING
Make sure that the supply voltage of the equipment is in accordance with the local supply voltage.

1. Make sure that the substation complies with the general substation specifications. See § 5.2.2.
2. Make sure that sufficient heat dissipation is present. See § 5.2.3.
3. Make sure that sufficient ventilation is present. See § 5.2.4.
4. Make sure that the substation layout meets the minimum specifications. See § 5.2.5.
5. Install an external fuse. See § 5.2.6.
6. Make sure that the circuit breakers are of the correct type. See § 5.2.7.
7. Install the separate disconnection devices. See § 5.2.8.

5.2.2 Substation specifications

- For details on the substation specifications below, see ICAO Aerodome Design Manual, Part 5 Electrical Systems, DOC 9157-AN/901.

Table: 5.1 Substation specifications

Item	Description
Shelter	- Clean and dry; - Lockable; - Fireproof; - Separate construction with reinforced concrete floors and walls; - Adequate drainage; - Sufficient room and lighting for personnel to do maintenance work.
Location	- Reasonable distance from the control tower to allow applicable cable lengths; - Leaves limitation surfaces free; - Accessible in all weather conditions; - Minimum interference with aircraft traffic.
Ventilation	Good ventilation to prevent the equipment to become overheated.
Electrical connections	- Sufficient number of conduits and cable entrance accesses; - Sufficient power to supply all equipments; - Access to the required power supply, remote control and series circuit cabling; - Ground network; - External fuse and an electrical distribution cabinet; - Disconnection devices for the input and output current.

5.2.3 Provide heat dissipation

The equipment meets the FAA AC150/5345-10F standard for equipment efficiency.

Table: 5.2 Indicative values for heat dissipation

Equipment [kVA]	Heat dissipation [W]
2.5	250
4	400
5	500
7	750
10	900
15	1200
20	1400
25	1750
30	1800

1. Make sure that the heat dissipation efficiency is better than 90% for an equipment less than 30kVA and at least 92% for a 30kVA equipment.

Note
The necessary heat dissipation also depends on the input voltage range and on the ambient conditions.

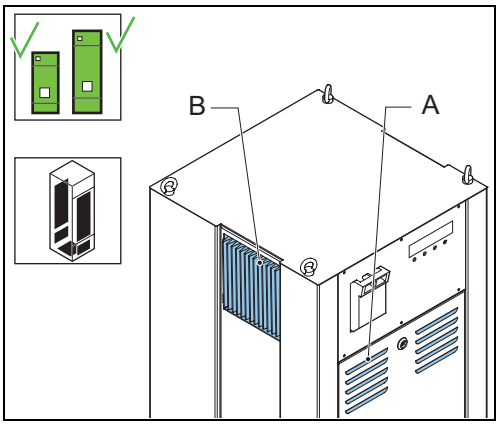
5.2.4 Ventilation

1. Make sure that you do not block the ventilation grids (A) on the sides and bottom of the equipment.

CAUTION
If there is not enough air-flow, the components of the equipment become too hot.

2. Handle the heatsink for the thyristors (B) with care.

WARNING
The heatsink for the thyristors becomes hot when the equipment is in operation.



5.2.5 Substation layout

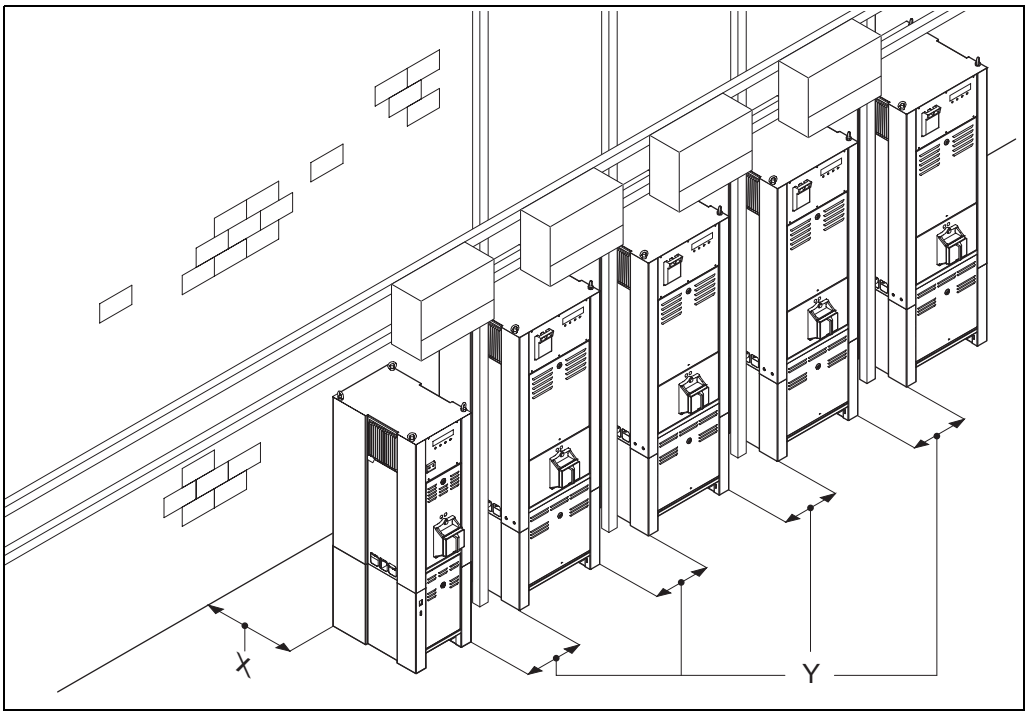


Table: 5.3 Clearance specifications

Clearance specification	Distance [mm]
Between the rear of the machine and the wall, X	Approximately 500
Between two machines (side by side), Y	Minimum 50

5.2.6 External fuse

- Install the external fuse, type gL/gG. For the specification, see the table below.

Table: 5.4 External fuse specifications

Equipment type [kVA]	Equipment type voltage [V]	External fuse [A]
2.5	208 to 240	25
	380 to 416	25
4	208 to 240	35
	380 to 416	25
5	208 to 240	50
	380 to 416	25
7.5	208 to 240	63
	380 to 416	35
10	208 to 240	80
	380 to 416	50
15	208 to 240	100
	380 to 416	63
20	208 to 240	125
	380 to 416	80
25	380 to 416	100
30	380 to 416	125

5.2.7 Circuit breakers

- If you use circuit breakers, make sure they are of the type D, or an equivalent type. *This means that the magnetic trip current must be from 10 up to 14 times higher than the nominal current.*
- If you install more than one circuit breaker close to each other, make sure to take into account the thermal derating to maintain the selectivity.

5.2.8 Disconnection devices

- Install a separate disconnection device for the input and output power, according to these standards:
  - FAA: AC 150/5345-10F and L829;
  - IEC: IEC 61822.

5.3 Install power supply

- Install a power supply for each equipment. See the table in § 5.4.4.

5.4 Plan cables and lay-out of cables

5.4.1 Procedure

1. Plan the layout of the cables. See § 5.4.2.
2. Plan the cable slack. See § 5.4.3.
3. Plan the power supply cables and earthing cables. See § 5.4.4.
4. Plan the remote control cables (option). See § 5.4.5.
5. Plan the cables for the series circuit. See § 5.4.6.
6. Install the cables for the substation. See § 5.4.7.

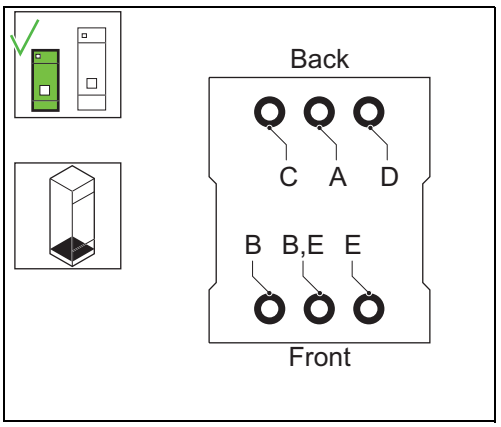
5.4.2 Plan layout of cables

Plan routing

- Keep power cables and remote control cables separated from each other.
- Plan the routing of the cables. *The small and big cabinets have different cable layouts.*

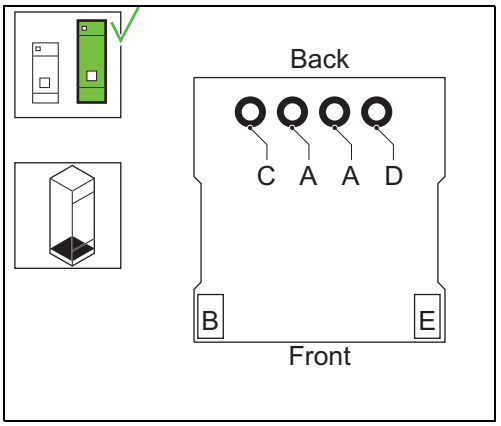
Small cabinet

1. Plan the placement of the different cables:
   - A: power input supply cables
   - B: power output supply cables from output terminals
   - C: power output supply cables from a CS (option)
   - D: remote control cables
   - E: power output supply cables from an SCO (option)



Big cabinet

1. Plan the placement of the different cables:
   - A: power input supply cables
   - B: power output supply cables from output terminals
   - C: power output supply cables from a CS (option)
   - D: remote control cables
   - E: power output supply cables from an SCO (option)



5.4.3 Cable slack

- Leave enough slack for the cables. See the table below. *This makes it easier to connect the equipment later.*

Table: 5.5 Cable slack for the different cable types

Cabinet type	Cable slack [mm]
Big cabinet without CS:	
Chassis protective earth:	1000
High voltage:	1500
Power supply:	1000
Remote control:	2000
Big cabinet with CS:	
Chassis protective earth:	1500
High voltage:	1500
Power supply:	5000
Remote control:	2500
Small cabinet without CS:	
Chassis protective earth:	1000
High voltage:	1500
Power supply:	1000
Remote control:	2000
Small cabinet with CS:	
Chassis protective earth:	1500
High voltage:	1500
Power supply:	5000
Remote control:	2000

5.4.4 Power supply cables and earthing cables

- Make sure the wire sections for the power supply and the earthing wire apply to the equipment. See tables 5.6 and 5.7.

Table: 5.6 Input supply voltages for equipments supplied with 208 to 240 V

Output power [kVA]	Fuse in fused input switch [A]	Input current				Section supply wire [mm^2]	Section earthing wire [mm^2]
		208 V	220 V	230 V	240 V		
2.5	20	15	14	13	13	4	4
4	25	24	22	21	21	6	6
5	35	30	28	27	26	10	10
7.5	50	45	42	40	39	16	16
10	63	59	56	54	51	25	16
15	100	84	80	76	73	35	16
20	125	112	106	102	97	50	25

Table: 5.7 Input supply voltages for equipments supplied with 380 to 416 V

Output power [kVA]	Fuse in fused input switch [A]	Input current (max.)			Section supply wire [mm^2]	Section earthing wire [mm^2]
		380 V	400 V	416 V		
2.5	20	8	8	7	4	4
4	20	13	12	12	4	4
5	20	16	15	15	4	4
7.5	25	24	23	22	6	6
10	35	32	31	30	10	10
15	50	46	44	42	16	16
20	80	62	58	56	25	16
25	80	77	73	70	35	16
30	100	90	86	83	50	25

Table: 5.8 Output voltages

Rated powers [kVA]	2.5	4	5	7.5	10	15	20	25	30
Max. RMS output voltage [V]	378	606	757	1136	1515	2272	3030	3788	4545

Table: 5.9 Power input terminal sizes

Input current rating of the regulator	Terminal size [mm^2]
Up to 50 A	16
Up to 100 A	35
Above 100 A	70

5.4.5 Cables to remote control interface

WARNING
Only earth the remote control cable at one location. Only earth the local bus connection at the first equipment cabinet. Only earth the remote control bus at the tower level.

Multiwire cables (option)

- Plan screened cables with the screen connected to the ground at only one end.
- Plan the signal wires:
  - Plan one paired wire for the signal and the other wire of that pair as a return. Bundle all returns to the same terminal to minimize the voltage drop.
  - Do not combine the remote control and back-indication signals in one cable, except when these signals do not require more than low-level isolation. The latter is the case if the remote control and back-indication signals use one common energy source.
- Calculate the wire sections. Take into account these items:
  - The tolerances of the power supply;
  - The maximum permitted voltage drop on the line. This is the minimum available power supply voltage minus the minimum required voltage for the load. The coils of the relays have a resistance of 1700 Ohm;
  - The typical resistance;
  - The required load current in each line;
  - The number of signals that may exist at the same time.

Table: 5.10 Recommended multiwire cables

Type	Number of conductors	Diameter [mm]
JE-LiYCY with armouring type R, B, Q or Z	number of signals + return(s)	0.5
TWAVB	number of signals + return(s)	0.8

Table: 5.11 Wire sections and cable lengths for multiwire cables

Diameter [mm]	Typical resistance at 55 °C [Ohm/m]	Power supply tolerance [%]	Maximum cable length 48 V DC [km]	Maximum cable length 24 V DC [km]
0.5	0.1	-5	3	0.65
		-10	1.7	-
0.8	0.04	-5	7.5	1.5
		-10	4	-

J-Bus cables (option)

- For a Tx+/Tx- and Rx+/Rx- connection plan a twisted-pairs cable.
- Provide screened (armoured) data cable according to the selected protocol:
  - RS485 (2 wire communication).
  - RS422 (4 wire communication).
  - One cable for a single J-bus, two cables for a dual J-Bus.

Table: 5.12 Wire sections for J-Bus cables

Cable type	Number of wires	Diameter [mm]
JE-LiYCY (with armouring type R, B, Q or Z)	2 or 3 pairs twisted	0.5
TWAVB	4 or 6 x 0.8mm (0 V wire)	0.8

Ideally, the maximum length of a J-Bus cable is 1200 m.

CAUTION
Do not mix J-bus A and J-bus B signals in one pair.

5.4.6 Cables for series circuit

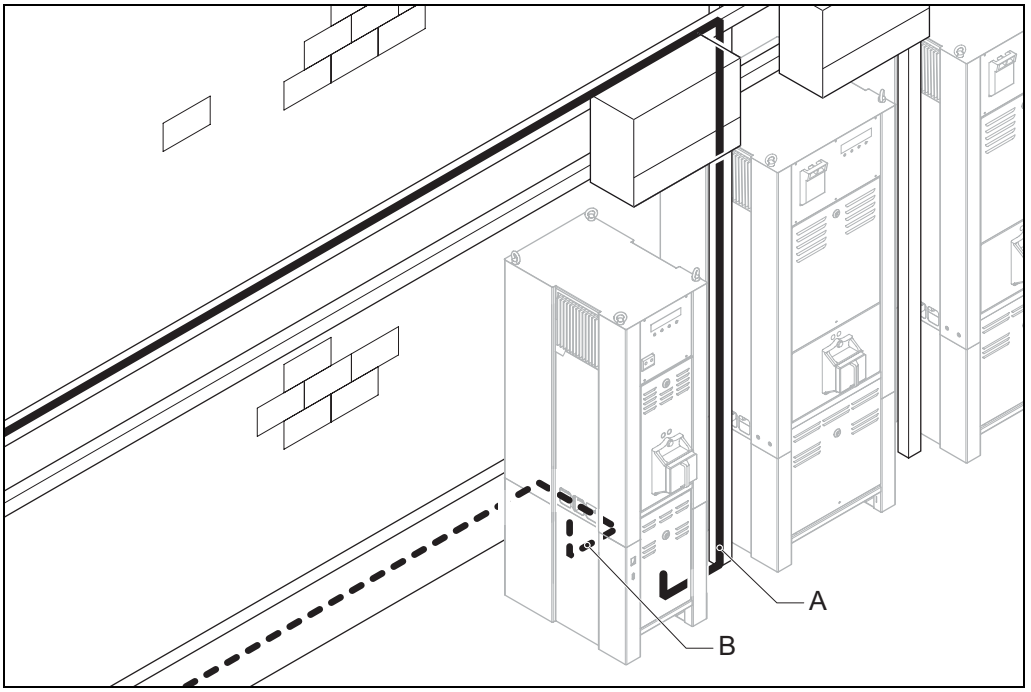
- Make sure the cables meet the specifications. See the table below.

Table: 5.13 Series circuit cable specifications

Type	Description
Conductor	Stranded, copper single-conductor with a 8.3 mm^2 cross-section.
Insulation	Cross-linked polyethylene, ethylene-propylene-rubber, or buna-rubber.
Jacket	Chlorosulfonated polyethylene, polyvinyl chloride, polyethylene, or heavy duty neoprene jacketed.
Shield type	Metal-tape shielding between the insulation and the jacket or between the jacket and a non-metallic covering.

5.4.7 Install cables for substation

- Install the required cabling at the substation for each planned equipment. See also the figure below.
- Keep power cables and remote control cables separated from each other.



A Cables come through the ceiling.
B Cables come through a false room under the substation.

6 Installation

WARNING
Always wear protective gloves and shoes when you do work on the equipment or the series circuit.

WARNING
Make sure that the power is OFF when you install the equipment.

6.1 Main installation procedure

1. Check the pre-installation. See § 6.2.
2. Check the required tools. See § 6.3.
3. Transport the cabinet to the correct location. See § 4.2.
4. Unpack the equpment. See § 4.3.
5. Install the equipment. See § 6.4.
6. Make sure that the panels are removed. See § 6.5.
7. Install the electrical connections:
   - Switch off the power supply. See § 6.6.
   - Route the cables. See § 6.7.
   - Install additional earthing. See § 6.8.
   - Connect the power input supply. See § 6.9.
   - Connect the output to the series circuit. See § 6.10.
   - Connect the back-indication signals ON and REG.ERR. See § 6.11.
8. Install the remote control connections. See § 6.12.
9. Install the panels. See § 6.13.

6.2 Check pre-installation

Table: 6.1 Check list to check pre-installation

Checked	Item
	The substation meets the general requirements.
	The cables have been installed according to an applicable layout.
	All the cables have enough slack to connect to the equipment.
	All the cables meet the specifications.
	For each equipment there is a power supply cable available.
	For each equipment there is a remote control cable available.
	For each equipment there is a series circuit cable available.

6.3 Required tools

Safety

- Protective gloves;
- Protective shoes.

Meters

- True RMS Multimeter;
- Isolating measurement transformer;

CAUTION
The output voltage of the 30 kVA / 6.6 A equipment can reach approximately 4600 V at full load.

- Insulation tester "Megger" 5000 V or 10000 V;
- AC True RMS measurement device, scale 10 and 30 A.

CAUTION
The current regulation is +/- 1%. To make an acceptable readjustment of the output current, the precision of the meter should be better than 0.5% for the adjusted value.

Tools

- A standard electrical and mechanical tool kit;·
- Screwdrivers with protection up to 1000 V;
- A spanner set (socket spanners);·
- Allen key 8 mm.

Cables

- Earth wire;
- Feeder cable.

6.4 Install

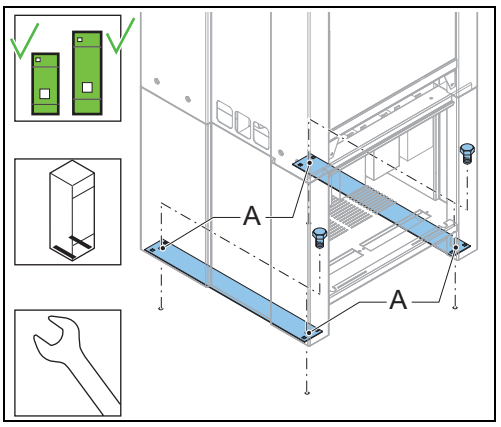
6.4.1 Inspection

1. Carry out a general inspection. See § 4.1.
2. Remove all the panels of the equipment. See § 6.5.
3. Examine if the inner side of the equipment is not damaged.
4. Examine the transformers for displacement or bending.
5. If you see damage, displacement or bending, tell the carrier immediately.

6.4.2 Attach equipment to floor

The procedure applies to an equipment without wheels only.

1. Attach the equipment to the floor. Install bolts in the slots (A).



6.5 Remove panels

The panels of the equipment can be removed for installation or maintenance procedures.

CAUTION

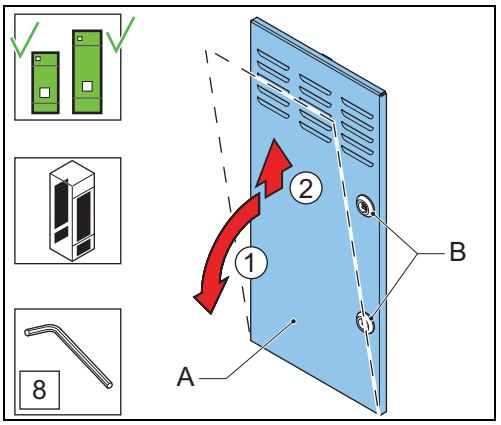
- **Do not operate the equipment with any of the panels removed.**
- **Do not mix panels from different equipments.**
- **Always connect the earthing wires before you install the panels.**

6.5.1 Front and rear panel

Remove panel

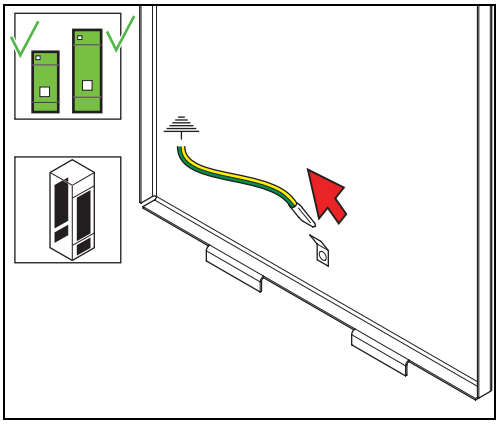
1. Open the locks (B). *Use an Allen key 8 mm*.
2. Remove the panel (A).

Note
The front panel is a hinged panel. The front panel stays attached to the equipment.



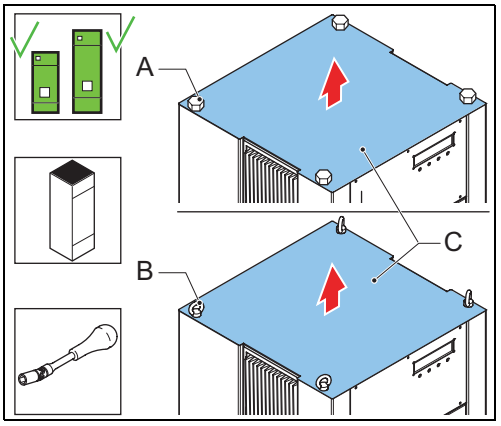
Disconnect wires

1. Disconnect the green/yellow earthing wires. *The wires have a fast-on connector.*



6.5.2 Top panel

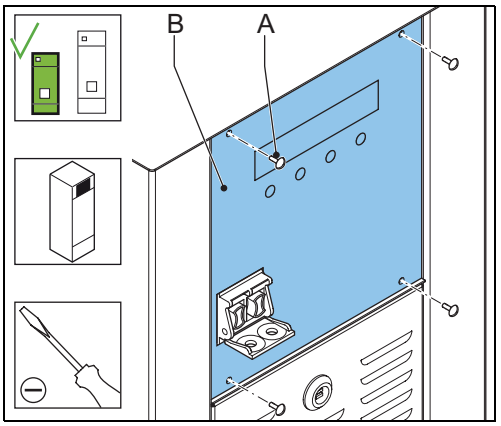
1. Remove the bolts (A) or the optional lifting lugs (B).
2. Remove the panel (C).



6.5.3 UI panel: small cabinet

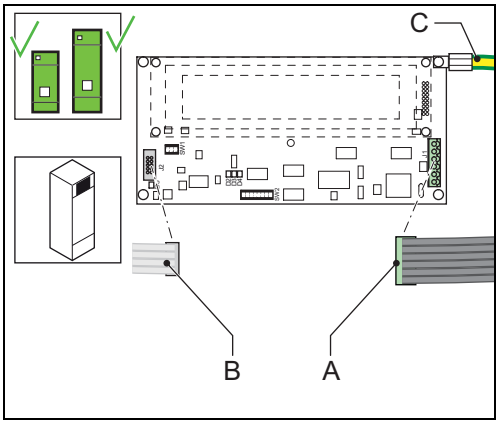
Remove panel

1. Remove the screws (A).
2. Remove the panel (B).



Disconnect wires

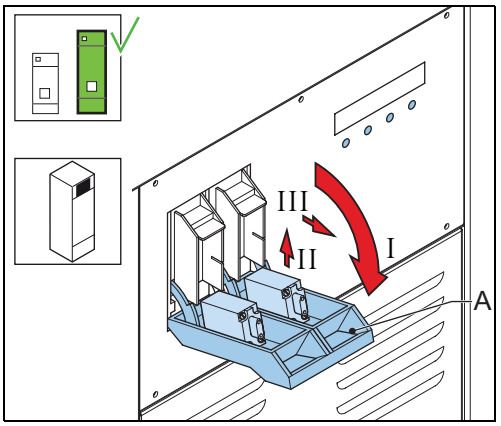
1. Disconnect the power cable from connector J1 (A).
2. Disconnect the local bus cable from connector J2 (B)
3. Disconnect the earthing wire (C).



6.5.4 UI panel: big cabinet

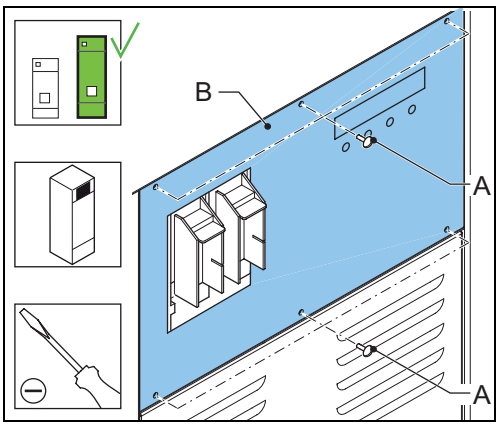
Remove fused input switch and complete handle (A)

1. Open the handle (I).
2. Move up the handle (II).
3. Pull and remove the handle (III).



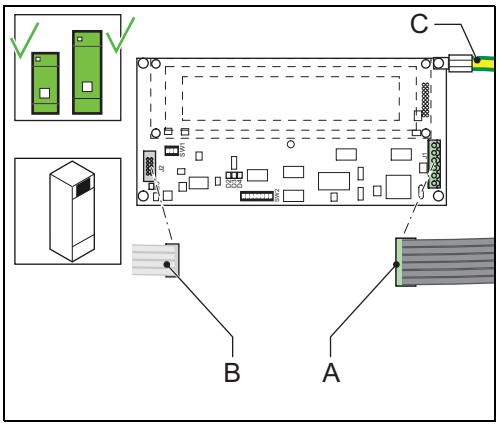
Remove panel

1. Loosen the screws (A).
2. Remove the panel (B).



Disconnect wires

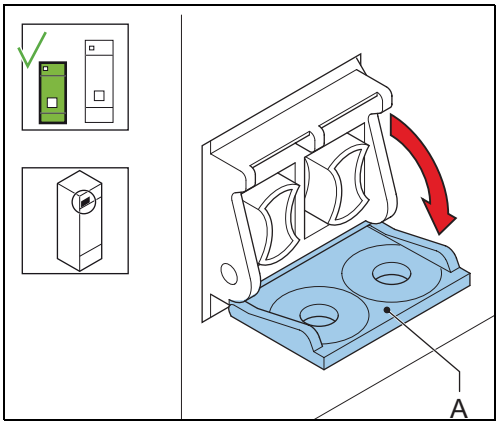
1. Disconnect the power cable from connector J1 (A).
2. Disconnect the local bus cable from connector J2 (B)
3. Disconnect the earthing wire (C).



6.6 Switch OFF power supply

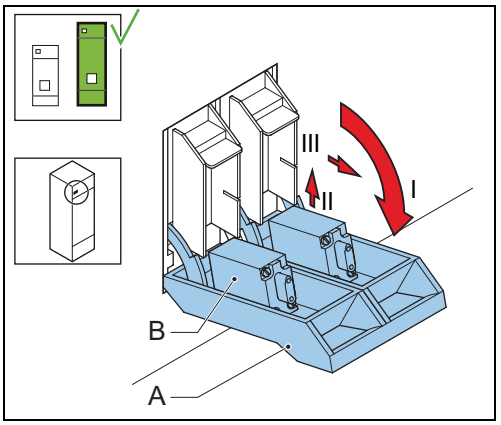
Small cabinet

1. Switch OFF the fused input switch (A).
2. Switch OFF the main power supply at the disconnection device.
3. Open the main switch on the main distribution board.
4. Disconnect the equipment from the series circuit.



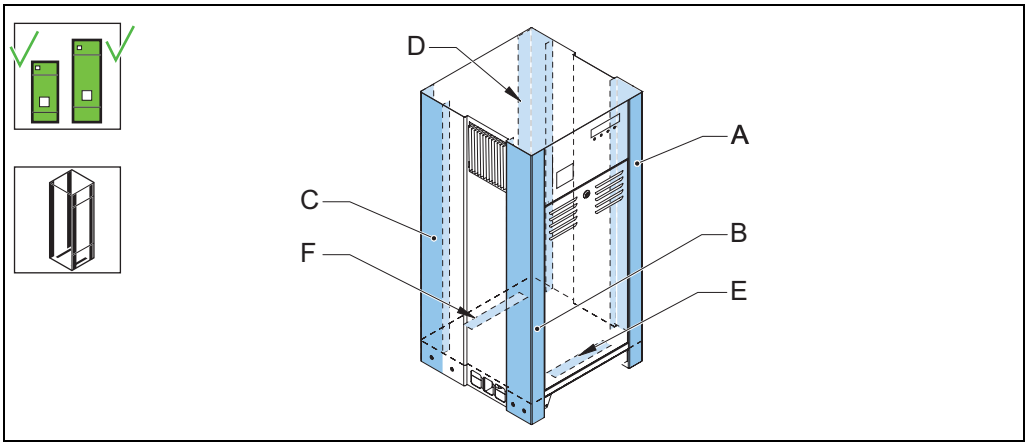
Big cabinet

1. Switch OFF the fused input switch (A).
2. Switch OFF the main power supply at the disconnection device.
3. Open the main switch on the main distribution board.
4. Disconnect the equipment from the series circuit.



6.7 Route cables

Overview



A Shaft A
B Shaft B
C Shaft C
D Shaft D
E Front cable entries
F Rear cable entries

Route cables

CAUTION

- **Keep the power cables separated from other cables.**
- **Do not let the series circuit cables touch the transformer winding. The transformer winding becomes extremely hot during operation.**

1. Use gland plates and correctly sized glands to route the cabling.
2. Tie the cables to the shaft walls with a cable tie.
3. Route the cables. See the tables below.

Table: 6.2 Routing for power input cables

Cabinet size	Route through
Small	Rear cable entries (F).
Big	Rear cable entries (F).

Table: 6.3 Routing for power output cables

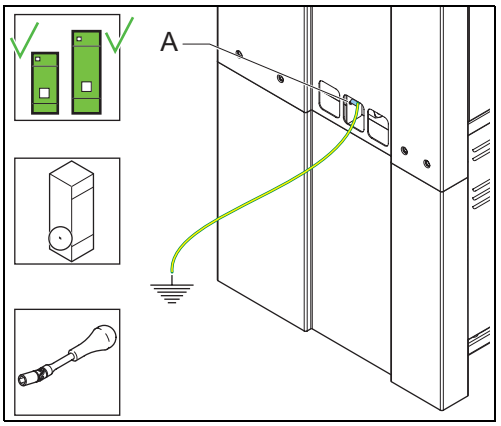
Output type	Route through
Output terminal	Front cable entries (E).
SCO (option)	Front cable entries (E).
CS (option)	Rear gland plate and shaft C.

Table: 6.4 Routing for remote control cables

Cabinet size	Route through
All	Rear cable entries and shaft D.

6.8 Install additional earthing

1. Connect an earthing wire to the M6 earthing stud (A). *Use an earthing wire with a cross-section of at least 16 mm². The wire must be as short as possible.*
2. Connect the earthing wire to the earthing network of the substation.



6.9 Connect power input supply

Strip cables

1. Strip the input supply cables and earthing wires. See the tables below.

Table: 6.5 Input supply cables earthing wires for equipments 208 / 220 / 230 / 240 V

Output power [kVA]	Section supply cable [mm^2]	Strip length supply cable [mm]	Section ground wire [mm^2]	Strip length earthing wire [mm]
2.5	4	16	4	16
4	6	16	6	16
5	10	16	10	16
7.5	16	16	16	16
10	25	22	16	18
15	35	22	16	18
20	50	22	25	18

Table: 6.6 Input supply cables and earthing wires for equipments 380 / 400 / 415 V

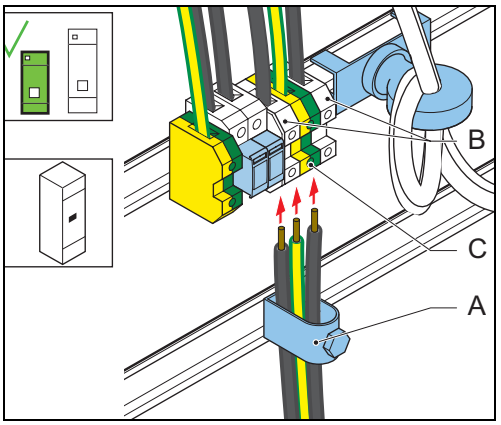
Output power [kVA]	Section supply cable [mm^2]	Strip length supply cable [mm]	Section earthing wire [mm^2]	Strip length earthing wire [mm]
2.5	4	16	4	16
4	4	16	4	16
5	4	16	4	16
7.5	6	16	6	16
10	10	16	10	16
15	16	18	16	18
20	25	22	16	18
25	35	22	16	18
30	50	22	25	18

Connect: wire sections up to 35 mm^2

The connection is based on screw terminals.

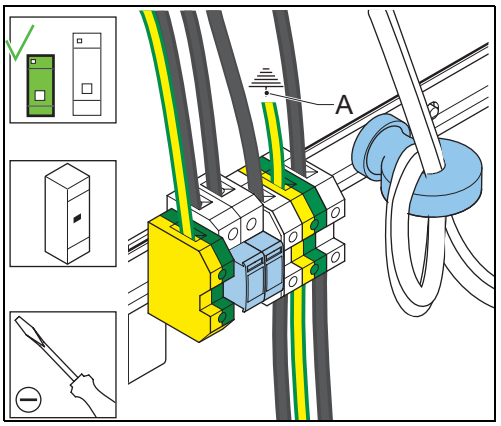
Connect - 1

1. Put the cables through the stress-relief clamp (A)
2. Connect the input supply cables to the terminals (B).
3. Connect the earthing wire to the terminal (C).
4. Tighten the screw of the stress-relief clamp.



Connect - 2

1. Connect the earthing wire to the earthing network (A) of the substation.

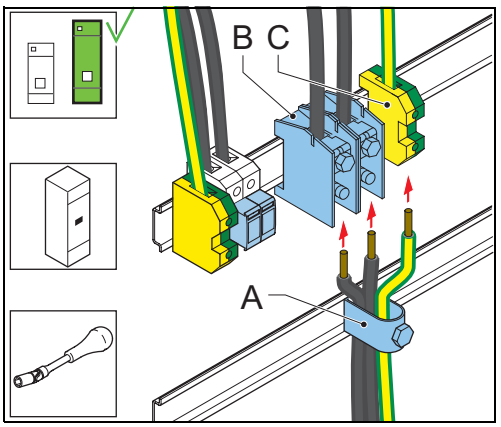


Connect: wire sections above 35 mm^2

The connection is based on 70 mm^2 bolt terminals.

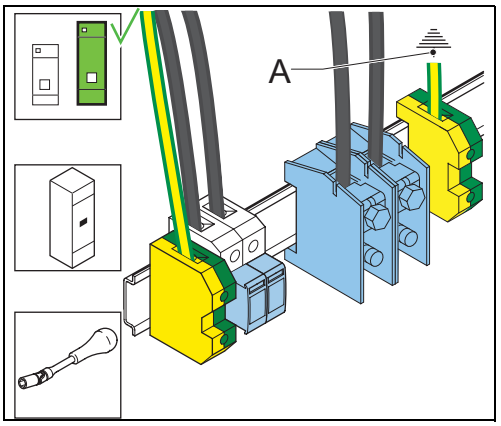
Connect - 1

1. Put the cables through the stress-relief clamp (A)
2. Connect the power cables to the terminals (B). *Use a 13 mm socket spanner.*
3. Connect the earthing wire to the terminal (C).
4. Tighten the screw of the stress-relief clamp.



Connect - 2

1. Connect the earthing wire to the earthing network (A) of the substation.



6.10 Connect output to series circuit

CAUTION
If the series circuit cable is screened, you must connect the screen to an earthing network either inside or outside the equipment.

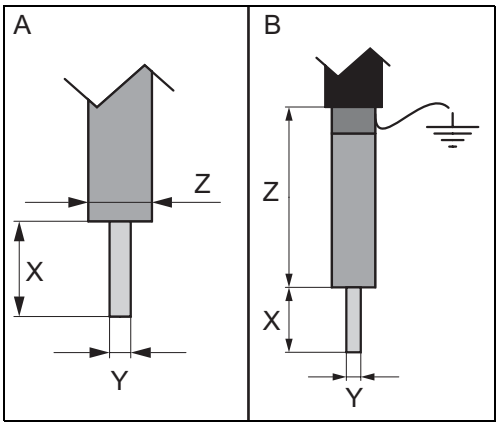
The procedures show how to connect the integrated output connections:
- Standard, small cabinet. See § 6.10.1.
- Standard, big cabinet. See § 6.10.2.
- With CS (option), small cabinet. See § 6.10.3.
- With CS (option), big cabinet. See § 6.10.4.
- With built-in SCO (option). See § 6.10.5.

If the output connection is not integrated in the equipment, see the dedicated installation manuals:
- AGLAS Master;
- External SCO.

6.10.1 Standard, small cabinet

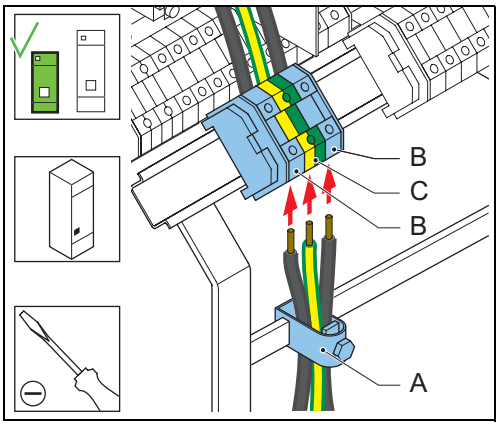
Strip cables

1. Strip the cables at the end.
   - A: unscreened cables
     - X: 16 mm;
     - ∅ Y: less than or equal to 7 mm;
     - ∅ Z: less than or equal to 12 mm.
   - B: screened cables
     - X: 14 mm;
     - ∅ Y: less than or equal to 14 mm;
     - Z: less than or equal to 50 mm.



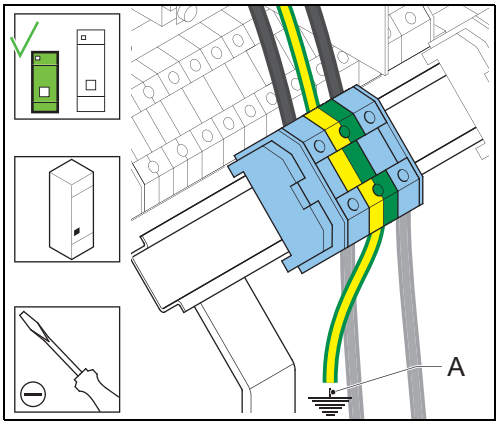
Connect - 1

1. Lead the series circuit cables and the earthing cable through the stress relief clamps (A).
2. Install the the series circuit cables in the connectors (B), labeled OUT 1 and OUT 2.
3. Install the the earthing wire in the connector (C), labeled GRND.
4. Make sure the cables are connected.
5. Tighten the screws of the stress relief clamps.



Connect - 2

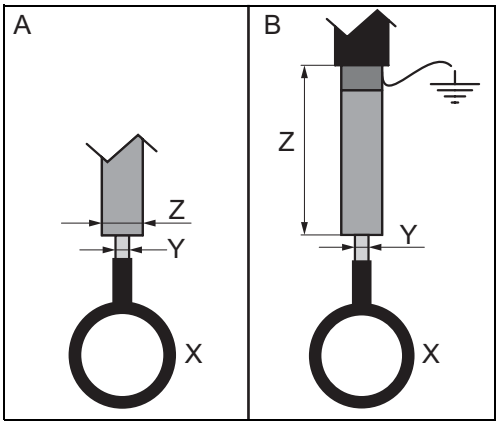
1. Connect the earthing wire to the earthing network (A) of the substation.



6.10.2 Standard, big cabinet

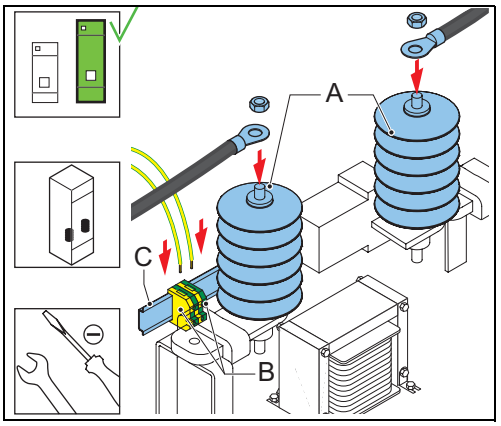
Strip cables

1. Strip the cables at the end.
   - A: unscreened cables
     - X: M10;
     - ∅ Y: less than or equal to 7 mm;
     - ∅ Z: less than or equal to 12 mm.
   - B: screened cables
     - X: M10;
     - ∅ Y: less than or equal to 7 mm;
     - Z: 100 mm.



Connect

1. Connect the series circuit cables to the lightning arrestors (A).
2. Connect the earthing wire to the earthing terminal (B).
3. Connect the earthing wire to the earthing network of the substation.
4. With cable ties, tighten the cables to the rail (C).

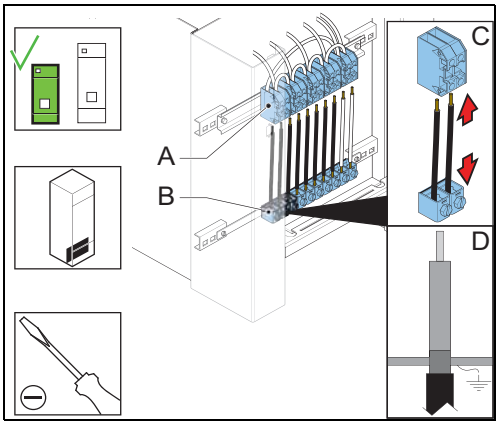


6.10.3 With Circuit Selector (CS) (option), small cabinet

The number of terminals available for series circuit connections depends on your order.

CAUTION
Make sure you connect all terminals. If you do not want to use all terminals, put the free terminals into short-circuit.

1. Strip the cables at the end. *In the case of a screened cable, remove the outer sheet of the cable between the terminals and the earthing bar.*
2. Connect the two cables for each series circuit to the corresponding output terminals (A).
3. Connect the cables to the earthing bar (B). *Use earthing clamps.*
   - Screened cable (C): connect the screen to the earthing bar;
   - Unscreened cable (D): connect the cable to the earthing bar for stress relief.

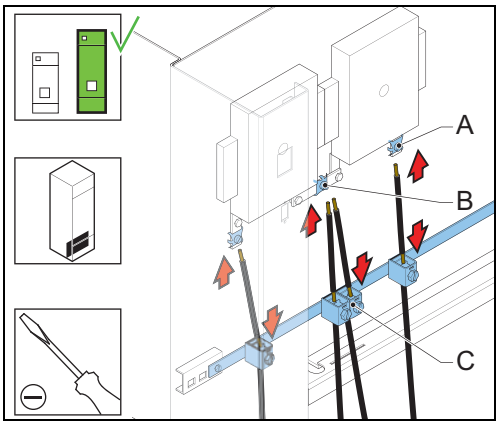


6.10.4 With Circuit Selector (CS) (option), big cabinet

The number of terminals available for series circuit connections depends on your order.

CAUTION
Make sure you connect all terminals. If you do not want to use all terminals, put the free terminals into short-circuit.

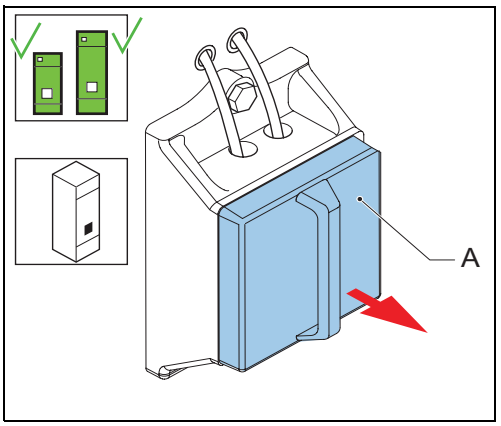
1. Strip the cables at the end. In the case of a screened cable, remove the outer sheet of the cable between the terminals and the earthing bar.
2. Connect the two cables for each series circuit directly to the corresponding HV-contactors (A).
3. Between two circuits, connect one cable from each circuit to the same terminal (B).
4. Connect the cables to the earthing bar (C). *Use earthing clamps.*
   - Screened cable: connect the screen to the earthing bar;
   - Unscreened cable: connect the cable to the earthing bar for stress relief.



6.10.5 With built-on Series CutOut (SCO), small cabinet (option)

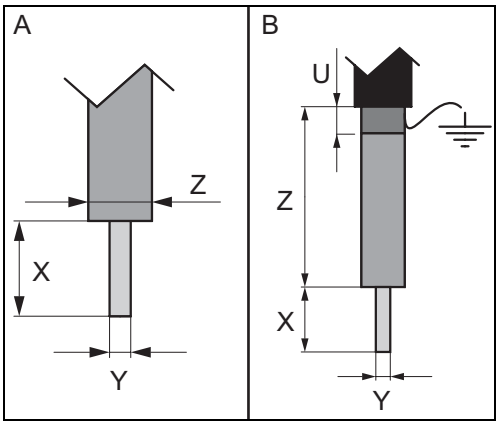
Remove cover

1. Remove the cover (A) of the SCO.



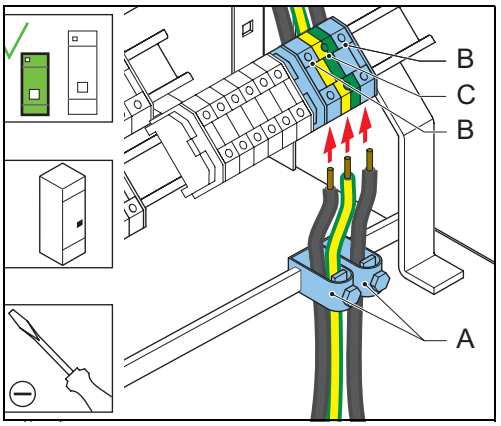
Strip cables

1. Strip the cables at the end.
   - A: unscreened cables
     - X: 14 mm;
     - ∅ Y: less than or equal to 7 mm;
     - ∅ Z: less than or equal to 12 mm.
   - B: screened cables
     - X: 14 mm;
     - ∅ Y: less than or equal to 7 mm;
     - Z: 29 mm;
     - U: 10 mm;



Connect

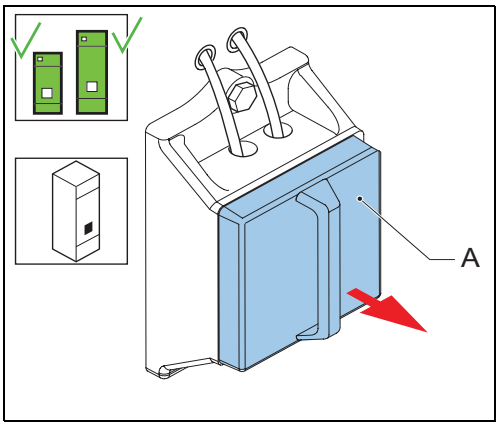
1. Put the output cablies through the stress relief clamps (A).
2. Connect the output cables to the to the terminals labeled OUT3 and OUT4 (B).
3. If you use a screened cable, connect the screen to the GRND (C).
4. Tighten the screw of the stress relief clamp.



6.10.6 With built-on Series CutOut (SCO), big cabinet (option)

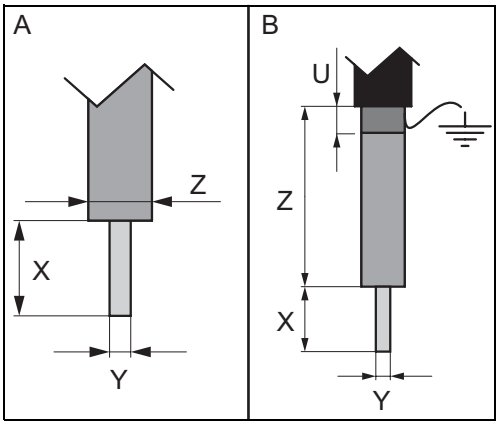
Remove cover

1. Remove the cover (A) of the SCO.



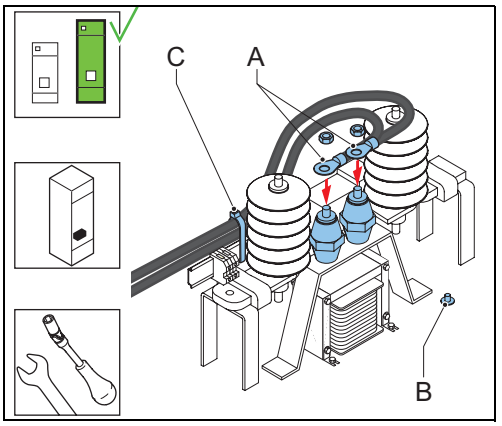
Strip cables

1. Strip the cables at the end.
   - A: unscreened cables
     - X: 14 mm;
     - ∅ Y: less than or equal to 7 mm;
     - ∅ Z: less than or equal to 12 mm.
   - B: screened cables
     - X: 14 mm;
     - ∅ Y: less than or equal to 7 mm;
     - Z: 29 mm;
     - U: 10 mm;



Connect

1. Connect the output cables to the red connectors (A).
2. If you use a screened cable, connect the screen to an earthing ponit at the bottom (B). *Use a 6 mm socket wrench*.
3. Connect the output cables tightly to the rail (C).



6.11 Connect back-indication signals ON and REG.ERR

Cable specifications

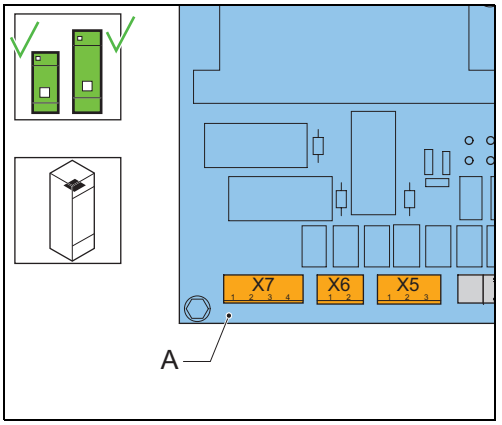
- Screened cable.
- The cross-section of the cable must be applicable to the load of this terminal block.
- The insulation level must be is applicable to the operation voltage level of the load.

The signals must have simple, potential free contacts. The maximum contact load is:
- AC - 110 V - 2 A - 220 VA;
- DC - 110 V - 2 A - 60 VA.

Connect the cables

1. Connect the cables to the connector X7 of the PSL (A).

Terminal	Description
1	ON
2	COMMON (for contacts to terminal 1, 3 and 4)
3	REG.ERR./NC (normally closed contact)
4	REG.ERR./NO (normally open contact)



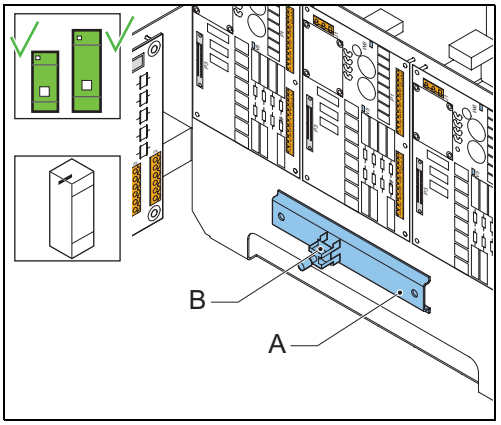
2. Connect the screen of the cable to the earth at both ends to limit high-frequency disturbance.
3. Connect the cables to your monitoring system.

6.12 Connect remote control cables

6.12.1 Earth remote control cabling

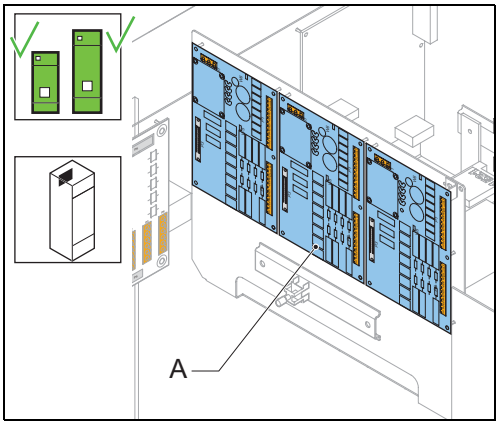
Carry out the procedure when an earthing feeder is present in the remote control cable harness.

1. Attach the cable harness to the earthing and stress relief bar (A). *Use the clamp (B) provided with the equipment.*
   - The earthing bar also works as a stress relieve system.
   - If you do not use the earthing clamp, connect the screen to any other earthing point on the multiwire or J-Bus PCB.



6.12.2 Connect multiwire cables (option)

1. Connect the cables for the control and back-indication signals to P1 (output) and P2 (input). *To connect the individual wires to the WAGO connectors, use the specific tool delivered with the equipment.*
2. Make sure the multiwire cable is earthed. See § 6.12.1.



6.12.3 Connect J-Bus cables (option)

Connect

1. Connect the wires. See § 7.6.
   - Connect for a four wire connection (RS422) to the pair Tx+/Tx- and the pair Rx+/Rx-;
   - Connect for a two wire connection (RS485) to the pair Tx+/Tx-.

2. Make sure the J-Bus cable is earthed in the tower only, not in the equipment cabinet.

6.13 Install panels

1. Install the panels in reverse order of removal. See § 6.5:
   - Front and rear panels;
   - Top panel;
   - UI panel.

7 Technical data

7.1 Technical characteristics

Table: 7.1 Technical characteristics

Item	2.5 to 10 kVa	15 to 30 kVA
Rated powers [kVA]	2.5 / 4 / 5 / 7.5 / 10	15 / 20 / 25 / 30
Rated input voltage [V] [1] [2]	FAA: 220 / 230 / 240 / 380 / 400 (± 15%) IEC: 230/ 400 (± 15%)	
Rated frequencies [Hz]	50 / 60 (± 7.5%)	

Current regulation limits	Current regulation is guaranteed under the following conditions (±1.5%):
	- A minimum of 30% of lamp transformers with an open circuit in their secondary side. This is for a range from half-load to full-load.
	- For nominal input voltage:
	  - IEC: ± 10%
	  - FAA: + 10% / -5%
	
	Operation from -5% to -15% (FAA) or from -10% to -15% (IEC) of nominal input voltage with full load can cause output current to be too low at the maximum brightness step.
	
	Operation at +15% of the nominal input voltage is restricted to a maximum period of 1 hour. This helps to prevent that components become overheated or overstressed.	

Output current [A]	6.6	
Remote control and monitoring	Multiwire, single or dual wire industrial field bus (J-Bus), or the two combined	
Net weight [kg][3] Maximum 2.5 kVA 4 kVA 5 kVA 7.5 kVA 10 kVA 15 kVA 20 kVA 25 kVA 30 kVA crate CS cabinet (option)	 380 57 103 120 123 155 40 50	 380 220 235 250 303 50 15

1) 25 and 30 kVA, only for 380/ 400/ 415 V.
2) Some readjustments are possible in the ranges 220 - 240 V and 380 - 415 (420 V). For readjustments, contact ADB.
3) The net weights depend on the chosen configuration.

7.2 Applicable standards

The equipment is in accordance with these standards:

Table: 7.2 Applicable standards

Standard	Description
ICAO	Aerodrome Design Manual, Part 5 paragraphs 3.2.1.4/5/6
FAA	AC 150/5345-10F and L829
IEC	IEC 61822

7.3 ElectroMagnetic Compatibility (EMC)

The equipment is designed to operate in an industrial electro-magnetic environment. The regulator complies with IEC 61822, in accordance with IEC 61000-6-4 and IEC 6-6-2 (generic standard for industrial environment). The equipment is, with adapted test levels, in accordance with IEC/TS61000-6-5, G (substation environment, location G).

7.4 Ambient conditions

The equipment is air-cooled without fans. Thus, the equipment must have a good airflow, especially if they operate near the maximum temperature.

Table: 7.3 Ambient conditions

Item	Description
Temperature	From -20 up to +55 °C
Altitude	From 0 (sea level) up to 1000 meter
Relative humidity	From 10% up to 95% RH without condensation

7.5 Dimensions

The small cabinet (A) and the big cabinet (B):

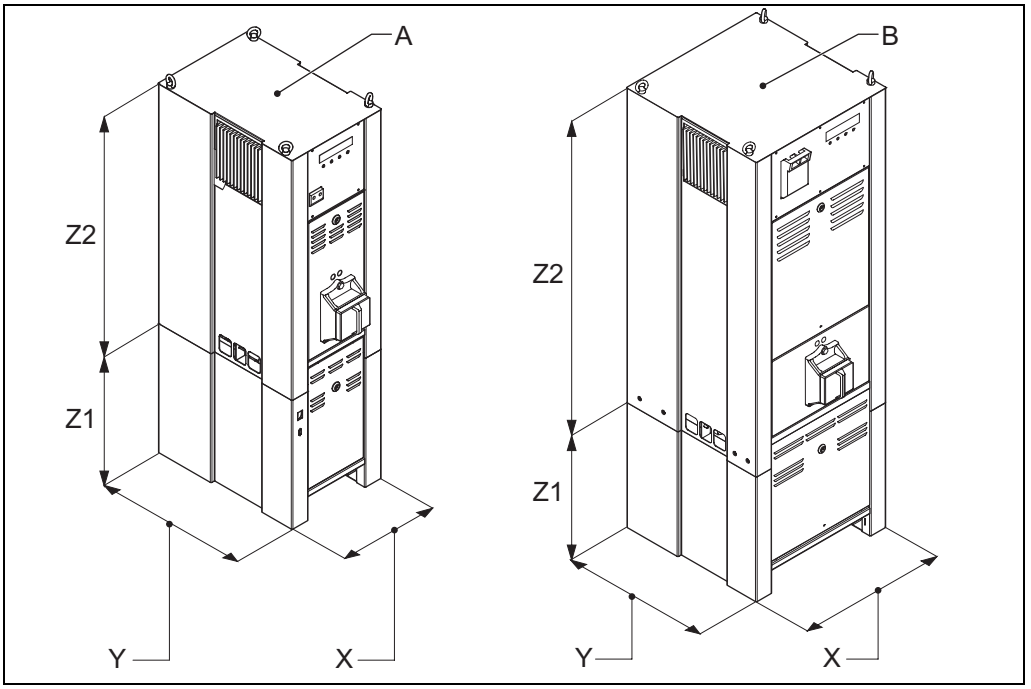
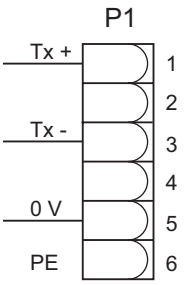
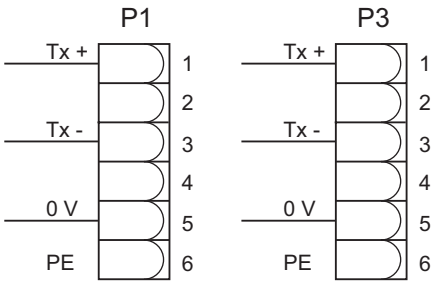
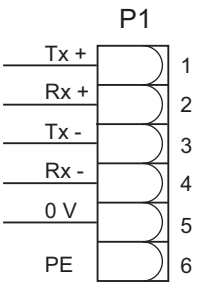
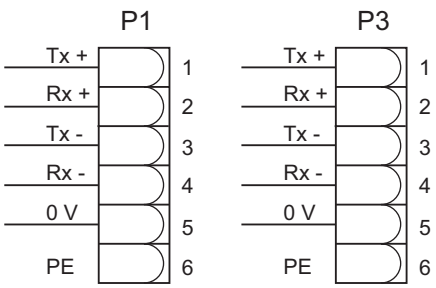


Table: 7.4 Dimensions

Item	A - 2.5 to 10 kVa	B - 15 to 30 kVA
X [mm]	400	600
Y [mm]	600	600
Z1 [mm]	500	500
Z2 [mm]	930	1280
Dimensions with options [mm] Wheels Lifting lugs CS Bolts M12	 Height + 100 Height + 50 Height + 500 Height + 15	

7.6 J-Bus PCB: Slave connections

The figures show the wire connections for the slave side. The connections for the master side depend on the used hardware.

J-bus type	Single J-bus: Bus A P1	Dual J-bus: Bus A P1 and Bus B P3
Two wire RS485		
Four wire RS422		

- Tx+ an Tx- connections: first pair of the cable;
- Rx+ an Rx- connections: second pair of the cable (RS422);
- O V connections: second pair of the cable (RS485) or third pair of the cable (RS422).

Registered office:

ADB Headquarters
Leuvensesteenweg 585
B-1930 Zaventem
Belgium
www.adb-airfieldsolutions.com
Tel: +32 (2) 722.17.11
Fax: +32 (2) 722.17.64

Other addresses:

ADB Airfield Solutions LLC
977 Gahanna Parkway
Columbus, OH 43230
USA
Tel: +1 (614) 861 1304
Fax: +1 (614) 864 2069

ADB Airfield Solutions Ltd.
5500 North Service Road, Suite 1108
Burlington, Ontario L7L 6W6
Canada
Tel: +1 (905) 331 6887
Fax: +1 (905) 331 9389

ADB Airfield Technologies Ltd.
01A Unit, 9F, LSH Plaza
8, Wangjing Jie
Chaoyang District
Beijing 100102
P.R. China
Tel: +86 10 8476 0106
Fax: +86 10 8476 0090

ADB Airfield Solutions GmbH & Co. KG
Von-der-Tannstr. 31
90439 Nürnberg
Germany
Tel: +49 (911) 9239 1287
Fax: +49 (911) 285 25 82

ADB Airfield Solutions, Ltd.
2nd Floor, 3 Rivonia Village
Cnr Mutual Road and Rivonia Boulevard
South
Rivonia 2128
South Africa
Tel: +27 (0) 11 602 8983
Fax: +27 (0) 11 602 8988

ADB
Tour Pleyel
149 - 153 Boulevard Anatole France
93200 Saint-Denis
France
Tel: +33 (0) 1 48 13 36 30
Fax: +33 (0) 1 48 13 36 35

ADB
Asia Pacific Regional HQ
Unit C-9.3.1, Level 9, Block C
Mines Waterfront Business Park
No. 3, Jalan Tasik
The Mines Resort City
43300 Seri Kembangan Selangor
Malaysia
Tel: +603 8941 4868
Fax: +603 8942 4869

ADB Airfield Solutions Netherlands
Prinses Beatrixlaan 614
Office D3.14
2595 BM Den Haag
The Netherlands
Tel: +31 (0)70 304 3611
Fax: +31 (0)70 333 8094

ADB
Dubai Silicon Oasis
Wing D - Office D-309
P.O. Box 341218
United Arab Emirates
Tel: +971 4372 4970
Fax: +971 4372 4975

ADB
Unit 44 Business Innovation Centre
Binley Business Park
Harry Weston Road
Coventry
CV3 2TX
United Kingdom
Tel: +44(0) 2476 430050
Fax: +44(0) 2476 430051

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