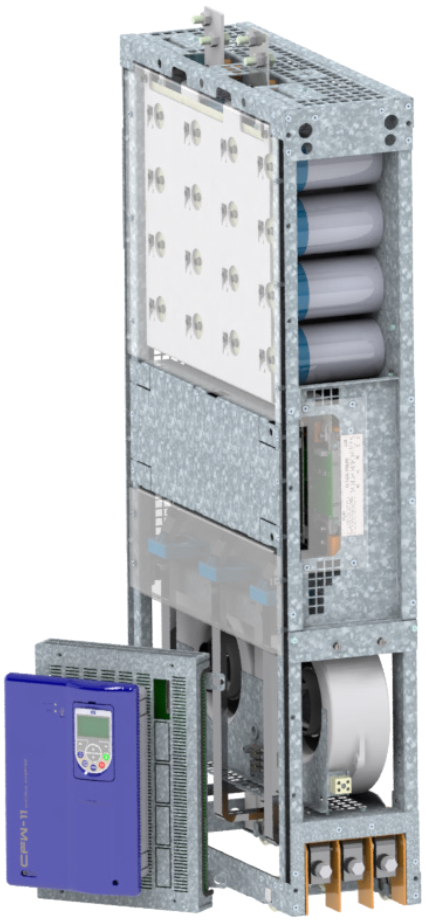
Frequency Inverter

CFW11M G2

User's Manual



User's Manual

Series: CFW-11M G2

Language: English

Document: 10005517349 / 02

Models: 634...3012 A/380...480 V
496...2356 A/500...600 V
439...2085 A/660...690 V

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Summary of Reviews

The table below describes all revisions made to this manual.

Version	Review	Description
-	R00	First edition
-	R01	Addition of the TÜV certificate, addition of the conducted and radiated emission levels, review of the applicable standards and general corrections
-	R02	Updating of section 3.3 and general revision

1 SAFETY INSTRUCTIONS

This manual contains the necessary information for the correct use of the CFW-11M G2 frequency inverter.

Only trained and qualified personnel should attempt to install, start-up, and troubleshoot this type of equipment.

1.1 SAFETY NOTICES IN THE MANUAL

The following safety warnings are used in this manual:

DANGER!
The procedures recommended in this warning have the purpose of protecting the user against dead, serious injuries and considerable material damage.

DANGER!
Les procédures concernées par cet avertissement sont destinées à protéger l'utilisateur contre des dangers mortels, des blessures et des détériorations matérielles importantes.

ATTENTION!
The procedures recommended in this warning have the purpose of avoiding material damage.

NOTE!
The text intents to supply important information for the correct understanding and good operation of the product.

1.2 SAFETY WARNINGS ON THE PRODUCT

The following symbols are attacheds to the product as safety warnings:

High voltages present.

Components sensitive to electrostatic discharges. Do not touch them.

Mandatory connection to the protection earth (PE).

Connection of the shield to the ground.

Hot surface.

1.3 PRELIMINARY RECOMMENDATIONS

DANGER!
Only qualified personnel, familiar with the CFW-11M G2 frequency inverter and related equipment must plan or perform the installation, start-up, operation and maintenance of this equipment.
Such personnel must follow the safety instructions described in this manual and/or defined by local standards.
Failure to comply with the safety instructions may cause risk of death and/or equipment damage.

DANGER!
Seulement personnes avec la qualification adéquate et familiarisation avec le CFW-11 et équipements associés doivent planifiquer ou implementer l'installation, mise en marche, operation et entretien de cet équipement.
Cettes personnes doivent suivre toutes les instructions de sécurités indiquées dans ce manuel, et/ou définies par normes locales.
L'inobservance des instructions de sécurité peut résulter en risque de vie et/ou dommages de cet équipement.

NOTE!
For the purposes of this manual, qualified personnel are those trained and able to:
1. Install, ground, power up and operate the CFW-11M G2 according to this manual and the legal safety procedures in force.
2. Use the protective equipment according to the standards.
3. Give first aid.

DANGER!
Always disconnect the main power supply before touching any electrical component associated to the inverter.
Several components can remain charged with high voltages or remain in movement (fans) even after the AC power is disconnected or switched off.
Wait for at least ten minutes so as to ensure the full discharge of the capacitors.
Always connect the equipment frame to the protection earth (PE) at the suitable connection point.

DANGER!
Débranchez toujours l'alimentation principale avant d'entrer en contact avec un appareil électrique associé au variateur.
Plusieurs composants peuvent rester chargés à un potentiel électrique élevé et/ou être en movement (ventilateurs), même après la déconnexion ou la coupure de l'alimentation en courant alternatif.
Attendez au moins 10 minutes que les condensateurs se déchargent complètement.
Raccordez toujours la masse de l'appareil à une terre protectrice (PE).

ATTENTION!
Electronic boards have components sensitive to electrostatic discharges. Do not touch directly on components or connectors. If necessary, touch the grounded metallic frame before or use an adequate grounded wrist strap.

Do not perform any withstand voltage test!
If necessary, consult WEG.

NOTE!
Frequency inverter may interfere with other electronic equipment. In order to reduce these effects, take the precautions recommended in the Chapter 3 INSTALLATION AND CONNECTION on page 3-1 in order to minimize those effects.

NOTE!
Read the user manual completely before installing or operating the inverter.

DANGER!
Crushing hazard
In order to ensure safety in load lifting applications, electric and/or mechanical devices must be installed outside the inverter for protection against accidental fall of load.

DANGER!
This product was not designed to be used as a safety element. Additional measures must be taken so as to avoid material and personal damages.
The product was manufactured under strict quality control, however, if installed in systems where its failure causes risks of material or personal damages, additional external safety devices must ensure a safety condition in case of a product failure, preventing accidents.

DANGER!
Risque d'écrasement
Afin d'assurer la sécurité dans les applications de levage de charges, les équipements électriques et/ou mécaniques doivent être installés hors du variateur pour éviter une chute accidentelle des charges.

DANGER!
Ce produit n'est pas conçu pour être utilisé comme un élément de sécurité. Des précautions supplémentaires doivent être prises afin d'éviter des dommages matériels ou corporels.
Ce produit a été fabriqué sous un contrôle de qualité conséquent, mais s'il est installé sur des systèmes où son dysfonctionnement entraîne des risques de dommages matériels ou corporels, alors des dispositifs de sécurité externes supplémentaires doivent assurer des conditions de sécurité en cas de défaillance du produit, afin d'éviter des accidents.

ATTENTION!
When in operation, electric energy systems – such as transformers, converters, motors and cables – generate electromagnetic fields (EMF), posing a risk to people with pacemakers or implants who stay in close proximity to them. Therefore, those people must stay at least 2 meters away from such equipment.

2 GENERAL INFORMATION

2.1 ABOUT THE MANUAL

This manual exposes how to install, to start-up in V/f (scalar) mode, the main characteristics and shows how to troubleshoot the most common problems of the CFW-11M G2 inverter series.

It is also possible to operate the CFW-11M G2 in the following control modes VVW, Sensorless Vector and Vector with Encoder. For further details on the inverter operation with other control modes, refer to the programming manual.

ATTENTION!
The operation of this equipment requires installation instructions and detailed operation provided in the user manual, programming manual and manuals/guides for kits and accessories. The user's manual and the parameters quick reference are supplied in a hard copy together with the inverter. The user guides are also provided in a hard copy along with the kit/accessories. The other manuals are available at **www.weg.net**. A printed copy of the files available on WEG's website can be requested at your local WEG dealer.

For information on other functions, accessories and operating conditions, refer to the following manuals:

- Programming manual, with a detailed description of the parameters and advanced functions of the CFW-11.
- Incremental encoder interface module manual.
- I/O expansion module manual.
- RS232/RS485 Serial communication manual.
- CANopen Slave communication manual.
- Anybus-CC communication manual.

2.2 TERMS AND DEFINITIONS USED IN THE MANUAL

Normal Duty (ND): the duty cycle that defines the steady state current value I_{nom}-ND and an overload of 110 % during 1 minute. It is selected by programming P0298 (Application) = 0 (Normal Duty (ND)). It must be used for driving motors that are not subject in that application to high torques with respect to their rated torque, when operating at constant speed, during start, acceleration or deceleration.

I_{nom-ND}: corrente nominal do inversor para uso com regime de sobrecarga normal (ND = Normal Duty).
Overload: 1.1 x I_{nom-ND}/ 1 minute.

Heavy Duty (HD): the duty cycle that defines the steady state current value I_{nom}-HD and an overload of 150 % during 1 minute. It is selected by programming P0298 (Application) = 1 (Heavy Duty (HD)). It must be used for driving motors that are subject in that application to high torques with respect to their rated torque, when operating at constant speed, during start, acceleration or deceleration.

I_{nom-HD}: inverter rated current for use with heavy duty cycle (HD = Heavy Duty).
Overload: 1.5 x I_{nom-HD} / 1 minute.

Current Imbalance (%):

$$\text{Unbalance at power unit X - phase Y} = \left| \frac{I_{YX} - I_{YAVG}}{I_{YAVG}} \right| .100$$

$$I_{YAVG} = \frac{I_{Y1} + I_{Y2} + \cdots + I_{YN}}{N}$$

Where:

N = number of the power units.

I_{YN} = current of phase Y (U, V or W) of the power unit N (P0815 to P0829).

I_{YAVG} = average current of phase Y.

Rectifier: input circuit of the inverters which converts the AC input voltage into DC. Formed by thyristors or power diodes.

Pre-Charge Circuit: it charges the DC link capacitors with a limited current, thus avoiding higher current peaks when powering the inverter.

DC link: inverter intermediate circuit; DC voltage obtained from the rectification of the AC input voltage or from an external power supply. It feeds the inverter output IGBTs bridge.

DC+: Positive terminal of the DC Link.

DC-: Negative terminal of the DC Link.

U, V, W Arms: set of two IGBTs forming the inverter output phases U, V, and W.

IGBT: insulated Gate Bipolar Transistor, basic component of the output inverters. They work as an electronic switch in the saturated (closed switch) and cut-off (open switch) modes.

Braking IGBT: It works as a switch to turn on the braking resistors. It is controlled by the DC link level.

PTC: resistor whose resistance value in ohms increases proportionally to the temperature; used as temperature sensor on motors.

NTC: resistor which resistance value in ohms decreases proportionally to the temperature increase; used as a temperature sensor in power modules.

HMI: Human-Machine Interface; it is the device that allows the control of the motor, the visualization and the modification of the inverter parameters; it's also known as keypad. The CFW-11M G2 HMI presents keys for commanding the motor, navigation keys and a graphic LCD display.

FLASH Memory: nonvolatile memory that can be electrically written and erased.

RAM memory: random access memory.

USB: Universal Serial Bus; serial communication protocol conceived to work according to the plug-and-play concept.

PE: Protective earth.

RFI Filter: radio Frequency Interference Filter; filter to reduce interference in the radio frequency band.

PWM: Pulse Width Modulation; a pulsed voltage that feeds the motor.

Switching Frequency: switching frequency of the IGBTs of the inverter bridge, normally expressed in kHz. Also known as carrier frequency.

General Enable: when activated, it accelerates the motor via acceleration ramp. When deactivated, this function immediately blocks the PWM pulses. The general enable function can be controlled through a digital input programmed for this function or via serial communication.

Run/Stop: inverter function that when activated (Run) accelerates the motor with the acceleration ramp until reaching the speed reference, and when deactivated (Stop) decelerates the motor with the deceleration ramp down to stop. It can be commanded through a digital input programmed for that function or via serial communication. The HMI I (Run) and O (Stop) keys operate in a similar way.

Heatsink: piece of metal designed to dissipate heat generated by power semiconductors.

UP11 G2: power Unit of the CFW-11M G2.

UC11 G2: control Unit of the CFW-11M G2

PLC: programmable logic controller.

Amp, A: ampere.

°C: degrees celsius.

AC: alternate current.

DC: direct current.

CFM: cubic feet per minute; a flow measurement unit.

cm: centimeter.

ft: foot.

hp: horse power = 746 Watts; unit of power, usually used to indicate mechanical power of electric motors.

Hz: hertz.

in: inch.

kg: kilogram = 1000 grams.

kHz: kilohertz = 1000 Hertz.

l/min: liters per minute.

lb: pound.

m: meter.

mA: milliampere = 0.001 ampere.

min: minute.

mm: millimeter.

ms: millisecond = 0.001 second.

Nm: Newton meter; torque measurement unit.

rms: root mean square; effective value.

rpm: revolutions per minute; unit of rotation.

s: second.

V: volts.

Ω: ohms.

2.3 ABOUT THE CFW-11M G2

The CFW-11M G2 inverters are the second generation of the CFW-11M inverters. The main differences in relation to the previous generation are the following:

- Smaller. The CFW-11M G2 is shorter and slimmer than the CFW-11M, allowing the installation of 3 UP11 G2 in panels featuring 800 mm wide and 2000 mm high columns.
- More modern. State-of-the-art components increased the inverter power.

The CFW11 G2 is a high-performance product which enables speed and torque control of three-phase induction motors. The main characteristic of this product is the "Vectrue" technology, which provides the following advantages:

- High compactness and power density.
- Scalar control (V/f), VVW or vector control programmable in the same product.
- The vector control can be programmed as “sensorless” (which means standard motors, without requiring encoder) or as “vector control” with encoder on the motor.
- The “sensorless” vector control allows high torque and fast response, even at very low speeds or at the start.
- The “vector with encoder” control allows high speed precision for the whole speed range (even with a standstill motor).
- "Optimal Braking" function for vector control, allowing the controlled braking of the motor, eliminating the use of braking resistor in some applications.
- "Self-Tuning" function for vector control: It allows the automatic setting of control parameters and regulators based on the identification (also automatic) of the motor parameters and load.

The CFW-11M G2 inverters present a modular structure, with configurations from one to five power units (UP11 G2), one control unit (UC11 G2) and wiring cables. The modular assembly increases the reliability of the inverter and simplifies its maintenance. There is a single control unit (UC11 G2) which can control up to 5 UP11s G2.

The UP11s and UC11 G2 are supplied trough a power supply of +24 Vdc. Figure 2.1 on page 2-5 shows a general diagram of the inverter, considering the configuration with three UP11s connected in parallel.

The control of the power units is done by the UC11 G2 control unit. The control unit contains the control rack of the CFW-11 line and the ICUP board. This board sends signals to all UP11 G2 (PWM, control signals, etc.), and it receives signals from them (current, voltage feedback, etc.).

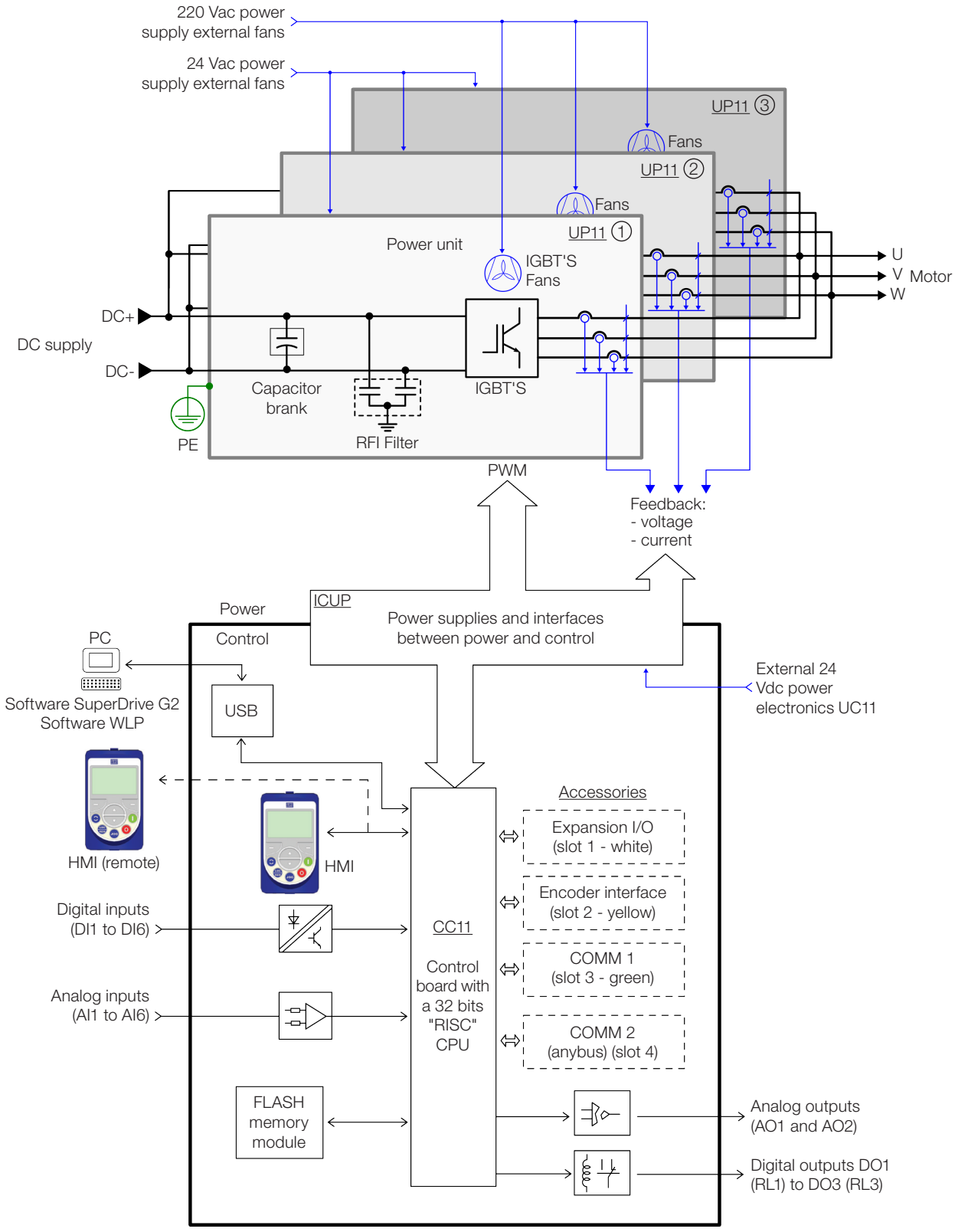

Figure 2.1: *Block diagram for the CFW-11M G2*

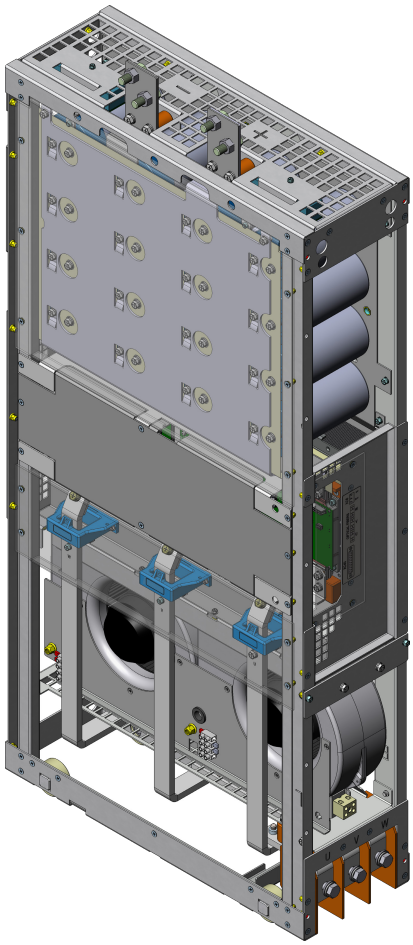

Figure 2.2: *Power Unit (UP11)*

Figure 2.3: *Control Unit (UC11)*

NOTE!
Several additional items are necessary for mounting the complete drive, such as input rectifier, fuses in the DC supply of each power unit UP11, external pre-charge circuit and an input reactor with a minimum impedance of 3 % in case of a 6 pulse rectifier.

NOTE!
The inclusion of a current transformer (CT) in the drive for the output short-circuit to the ground protection is not necessary because each UP11 has its own internal protection.

2.4 IDENTIFICATION LABEL FOR THE UC11 G2

The UC11 nameplate is located on the control rack.

Figure 2.4: *Nameplate of the UC11*

Figure 2.5: *Nameplate location*

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2.5 IDENTIFICATION LABEL FOR THE UP11 G2

The nameplate is located on the front of the UP11 G2.

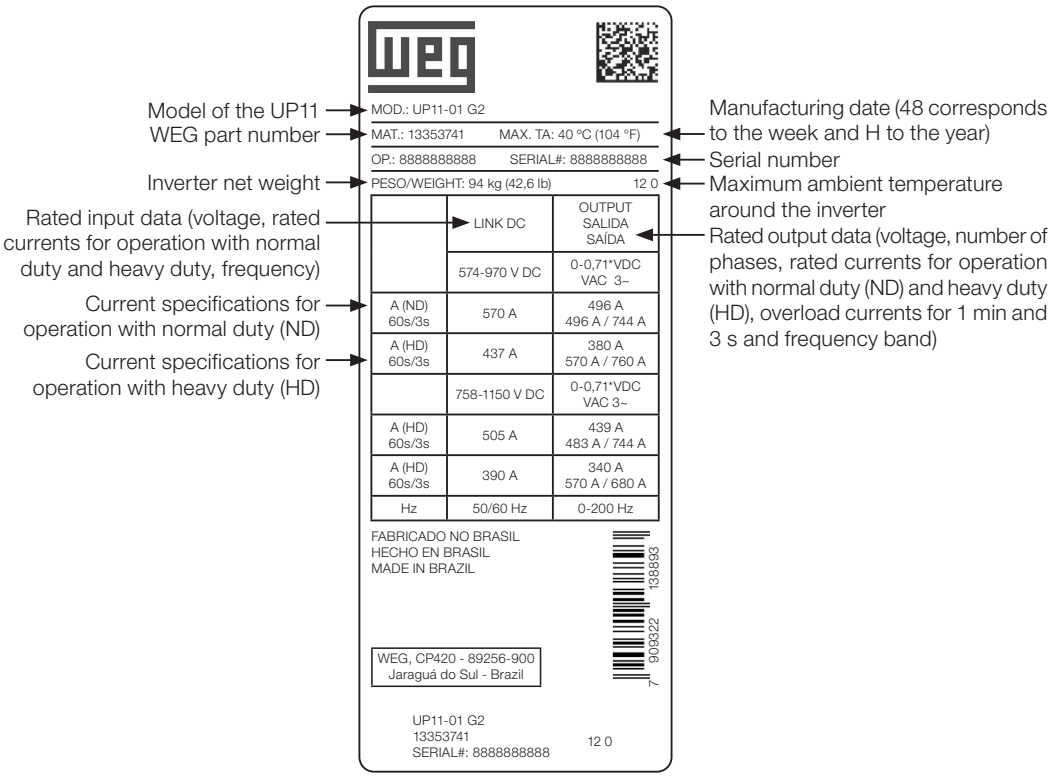


Figure 2.6: *UP11 G2 nameplate*

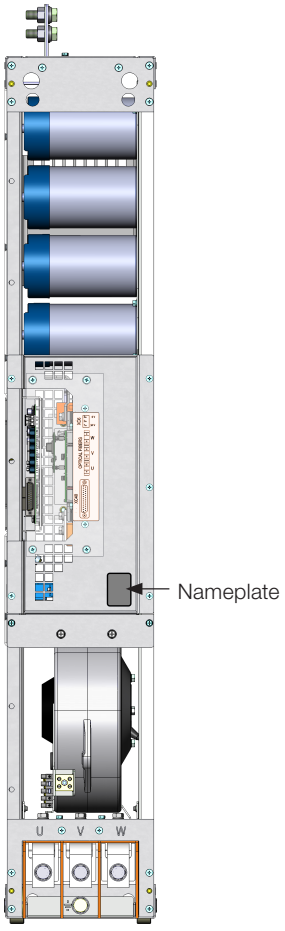


Figure 2.7: *Location of the Nameplates*

2.6 HOW TO SPECIFY THE MODEL OF THE CFW-11M G2 (SMART CODE)

In order to specify the model of the CFW-11M G2, replace the smart code values with the desired rated supply voltage and rated output current in the respective fields for operation under normal duty (ND), as shown in the example of Table 2.1 on page 2-9.

Table 2.1: *Smart code*

		Inverter Model						Available Options				
		See the list of models in Chapter 8 TECHNICAL SPECIFICATIONS on page 8-1, which also contains the technical specifications of the inverters						See Chapter 7 ACCESSORIES on page 7-1 for further details on the optional items				
Example	**BR**	**CFW11MG2**	**0634**	**T**	**4 (*)**	**S**	**_ _**	**_ _**	**_ _**	**_ _**	**_ _**	**Z**
Field denomination	Market identification (sets the language of the manual and factory settings)	WEG frequency inverter - series 11	Rated output current for use under normal duty (ND)	Number of output phases	Rated output voltage	Optional items	Braking	Safety stop	Special hardware	Special software	Final coding indicator digit
Possible options	2 characters			T = Three-phase	4 = 380...480 V 5 = 500...600 V 6 = 660...690 V	S = standard product O = Product with optional item	Blank = standard (no internal dynamic braking) RB = regenerative braking	Y = with safety stop	Blank = standard H1 = special hardware #1	Blank = standard S1 = special software #1	

E.g.: CFW11MG21205T4OYZ corresponds to a CFW-11M G2 three-phase inverter of 1205 A, with input supply voltage from 380 V to 480 V, with optional safety stop. The options for the inverter rated current under normal duty (ND) are in Table 3.2 on page 2-10, according to the inverter rated output voltage.

Table 3.2: *Rated currents under normal duty (ND)*

380-480 V	500-600 V	660-690 V
0634 = 634 A	0496 = 496 A	0439 = 439 A
1205 = 1205 A	0942 = 942 A	0834 = 834 A
1807 = 1807 A	1414 = 1414 A	1251 = 1251 A
2409 = 2409 A	1885 = 1885 A	1668 = 1668 A
3012 = 3012 A	2356 = 2356 A	2085 = 2085 A

2.7 RECEIPT AND STORAGE

The power units of the CFW-11M G2 are supplied in a wooden box.

The control units of the CFW-11M G2 are supplied in a cardboard box.

There is an identification label affixed to the outside of the package, the same as the one fixed on the inverter.

In order to open the package:

1. Remove the front cover of the package.
2. Remove the styrofoam protection.

Check if:

1. The nameplates correspond to the models purchased.
2. There were any damages during transportation.

Report any damage immediately to the carrier.

If the products are not immediately installed , store them in a clean and dry location (temperature between –25 °C and 60 °C), with a cover to prevent the ingress of dust.

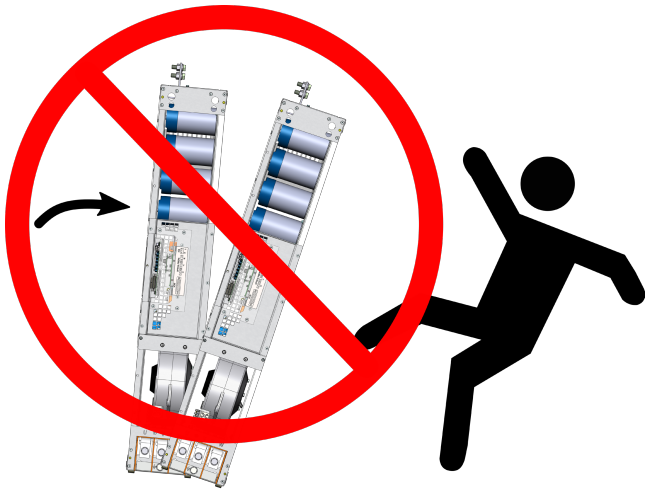


Figure 2.8: *Do not tilt the power units*

3 INSTALLATION AND CONNECTION

This chapter provides information on installing and wiring the CFW-11M G2. The instructions and guidelines listed in this manual shall be followed to guarantee personnel and equipment safety, as well as the proper operation of the inverter.

3.1 MECHANICAL INSTALLATION

The power units must be installed in the drive panel appropriately, allowing easy extraction and reinstallation in case of maintenance. The mounting must be such to avoid damage during the panel transportation.

3.1.1 Environment Conditions

Avoid:

- Direct exposure to sunlight, rain, high humidity, or sea-air.
- Inflammable or corrosive liquids or gases.
- Excessive vibration.
- Dust, metal particles or oil suspended in the air.

Environment conditions for the operation of the inverter:

- Ambient temperature: 0 °C to 45 °C (32 °F to 113 °F) - rated conditions (measured around the inverter). From 45 °C to 55 °C (113 °F to 131 °F) - 2 % of current derating for each Celsius degree above 45 °C (113 °F).
- Altitude: up to 1000 m (3.300 ft) above sea level – rated conditions.
- From 1000 m to 4000 m (3.300 ft to 13.200 ft) – 1% of current derating for each 100 m (330 ft) above 1000 m (3.300 ft) of altitude.
- From 2000 m to 4000 m (6.600 ft to 13.200 ft) - maximum voltage (480 V for models 380...480 V and 690 V for models 500...690 V) derating of 1.1 % for each 100 m (330 ft) above 2000 m (6.600 ft).
- Maximum altitude of up to 4000 m (13.200 ft).
- Air relative humidity: 5 % to 95 % non-condensing.
- Pollution degree: 2 (according to EN50178 and UL508C), with non-conductive pollution. Condensation must not cause conduction of the accumulated residues.

3.1.2 List of Components

For panel mounting of the CFW11M G2, it is necessary: a control set (UC11 G2), UP11 G2 power units and a cable set to connect the UC11 G2 to the UP11 G2. Table 3.1 on page 3-1, Table 3.2 on page 3-2 and Table 3.3 on page 3-2 present the list of components of the CFW-11M G2 inverter.

Table 3.1: *List of Components - Drives CFW-11M G2 380 - 480 V*

Qty. UP11-02 G2	Rated Current [A]		Qty. UC11 G2	Qty. Cable Set 2.5 m	Qty. Cable Set 3.0 m	Qty. Cable Set 3.6 m
	ND	HD				
1	634	515	1	1	-	-
2	1205	979	1	2	-	-
3	1807	1468	1	-	1	2
4	2409	1957	1	2	1	1
5	3012	2446	1	-	3	2

Table 3.2: List of Components - Drives CFW-11M G2 500 - 600 V

Qty. UP11-02 G2	Rated Current [A]		Qty. UC11 G2	Qty. Cable Set 2.5 m	Qty. Cable Set 3.0 m	Qty. Cable Set 3.6 m
	ND	HD				
1	496	380	1	1	-	-
2	942	722	1	2	-	-
3	1414	1083	1	-	1	2
4	1885	1444	1	2	1	1
5	2356	1805	1	-	3	2

Table 3.3: Lista de componentes acionamentos CFW-11M G2 660 - 690 V

Qty. UP11-02 G2	Rated Current [A]		Qty. UC11 G2	Qty. Cable Set 2.5 m	Qty. Cable Set 3.0 m	Qty. Cable Set 3.6 m
	ND	HD				
1	439	340	1	1	-	-
2	834	646	1	2	-	-
3	1251	969	1	-	1	2
4	1668	1292	1	2	1	1
5	2085	1615	1	-	3	2

Table 3.4: Cable set items

WEG Item	Cable Set
13555095	2.5 m Cables
13555150	3.0 m Cables
13555151	3.6 m Cables

The other components of the drive are under the responsibility of the panel builder. Among those components, we may point out the input rectifier, power busbar, pre-charge circuit, panel fans, protection fuses, input reactance, etc.

3.1.3 Lifting

Figure 3.1 on page 3-3 shows the position of the lifting lugs.

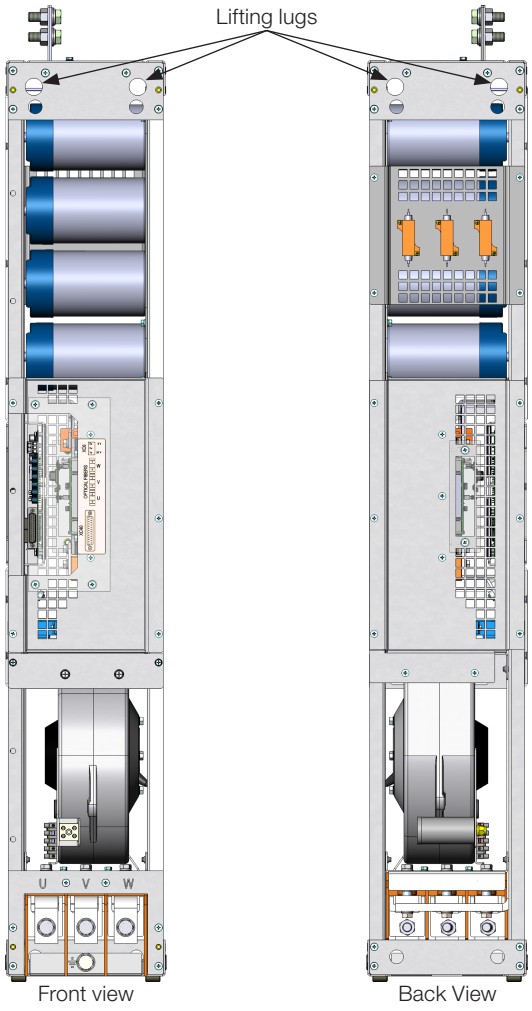


Figure 3.1: *UP11 G2 lifting lugs*

3.1.4 Panel Ventilation

The efficiency of the panel ventilation depends on the equipment installed inside the panel, such as fans, air inlets and filters. The internal fan of the UP11 is not enough to cool the entire panel.

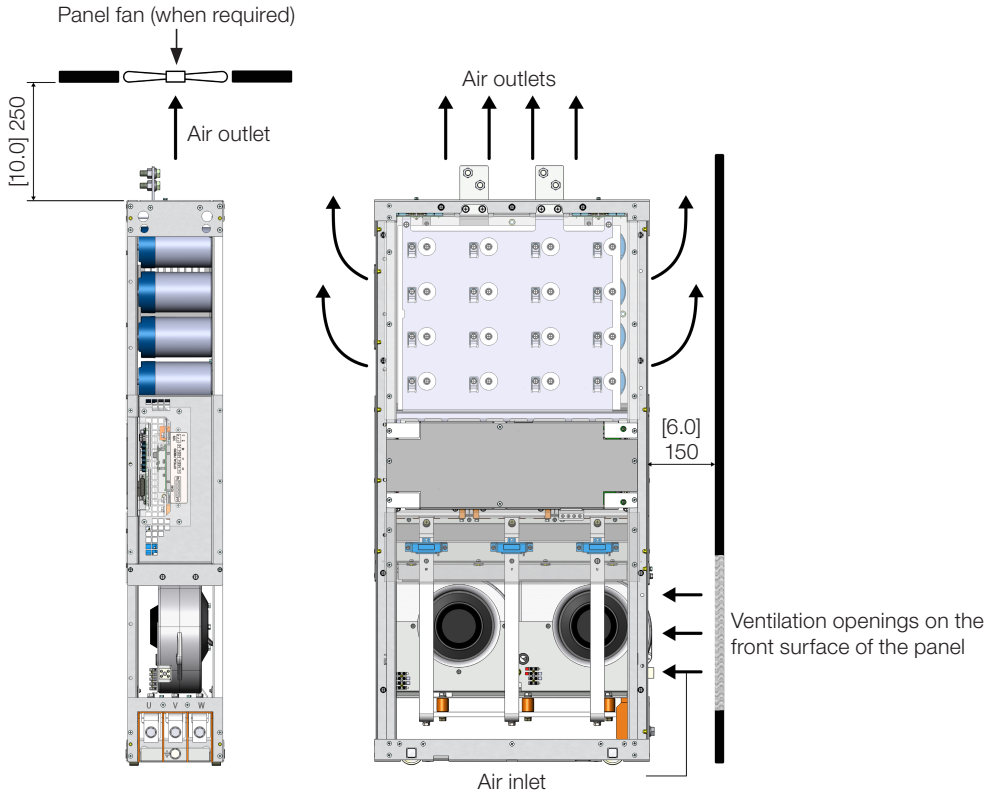


Figure 3.2: *Clearances for ventilation in mm [in]*

The total air flow of the fans of the power unit is 1150 m^3/h (320 l/s; 677 CFM).

3.1.5 Panel Mounting of the UP11 G2

To install the UP11 G2 in panels, the following mounting accessories are necessary:

- Rack 2 G2 allows the mounting of 1 or 2 modules side by side in 600 mm wide panels.
- Rack 3 G2 allows the mounting of 1, 2 or 3 modules side by side in 800 mm wide panels.

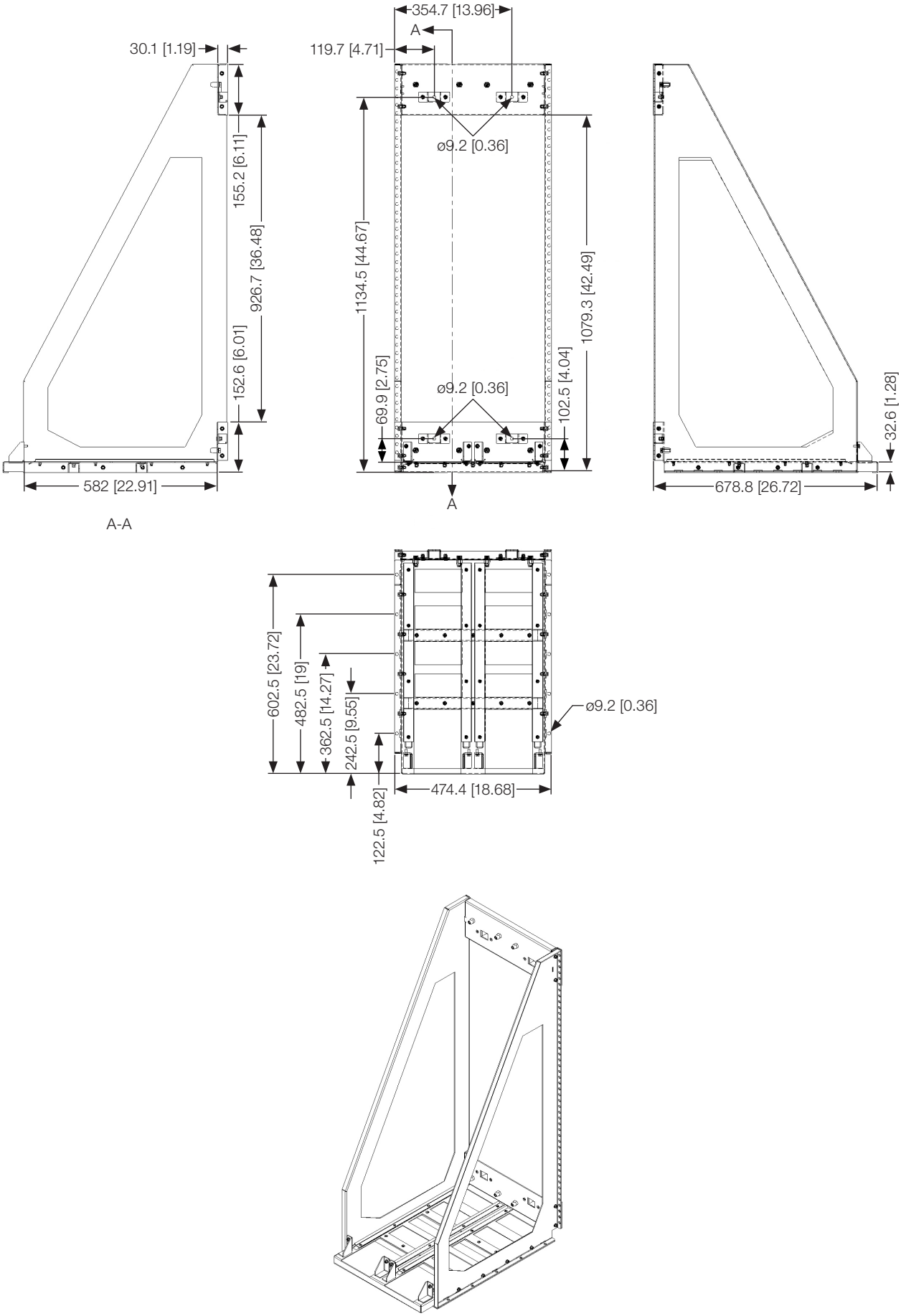


Figure 3.3: *Dimensions of Rack 2 G2 in mm [in]*

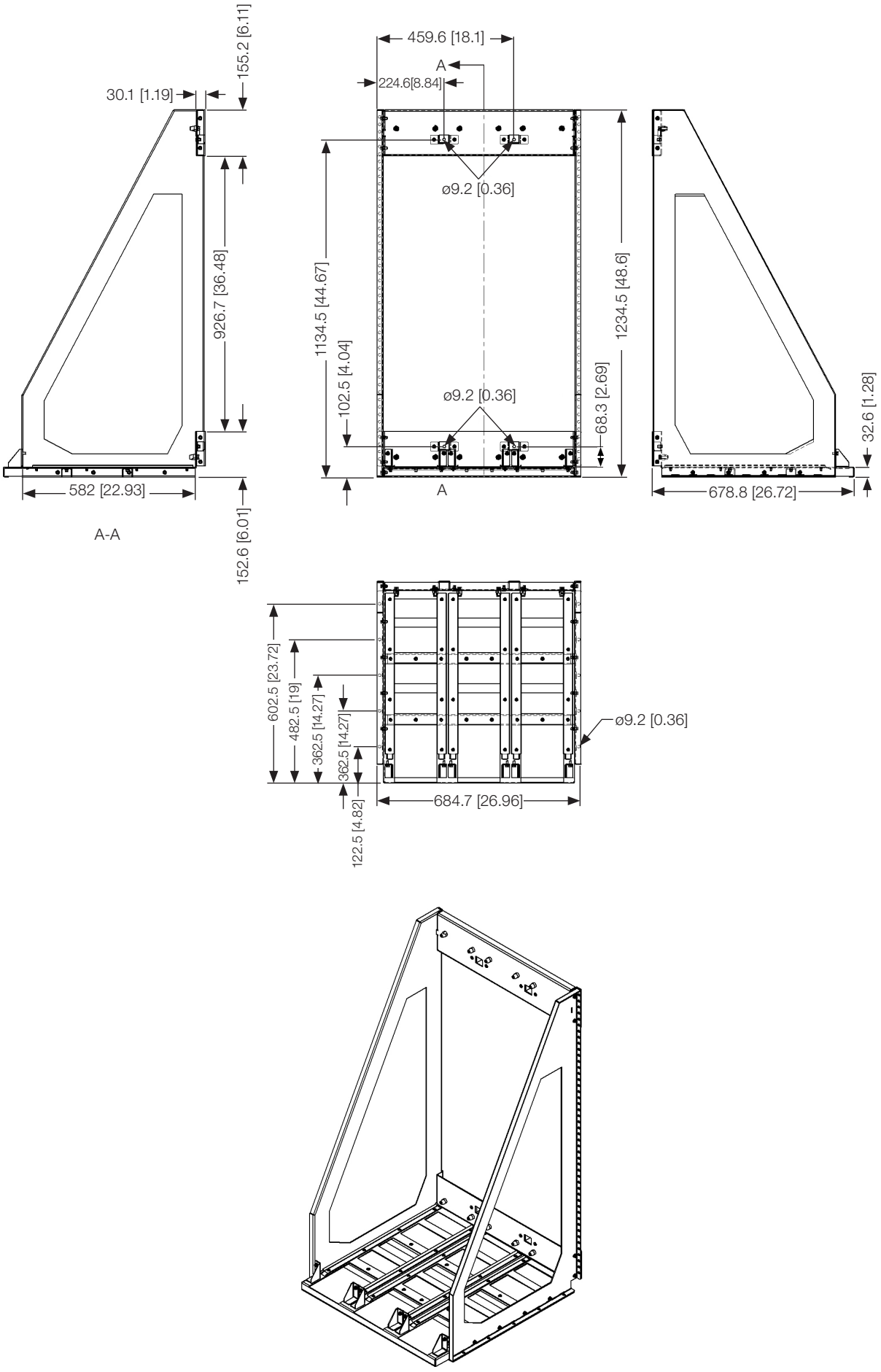


Figure 3.4: *Dimensions of Rack 3 G2 in mm [in]*

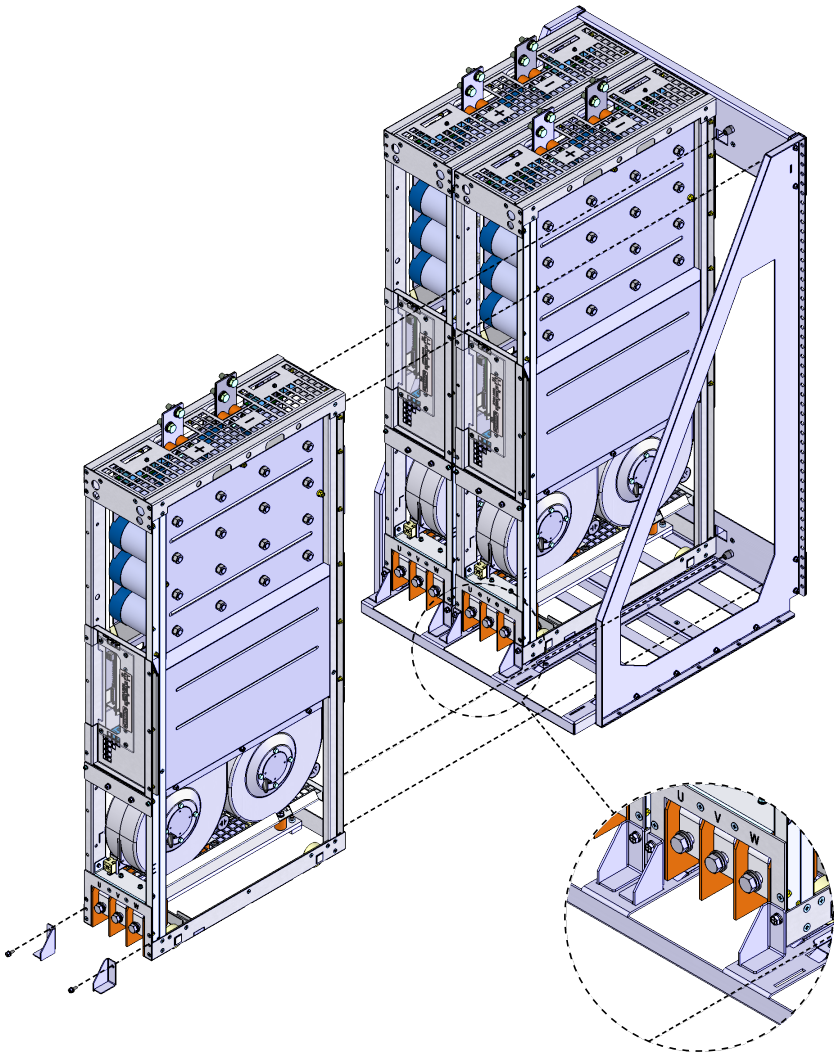
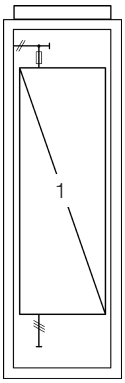


Figure 3.5: *Insertion of the power modules into Rack 3 G2*

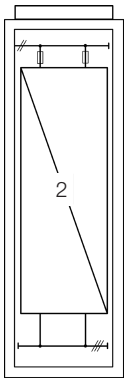
3.1.6 Panel

According to the quantity of UP11 G2 of the drive, minimum dimensions are necessary for the panels. Figure 3.6 on page 3-7, Figure 3.7 on page 3-8, Figure 3.8 on page 3-8 and Figure 3.10 on page 3-8 present the minimum dimensions of the panel according to the quantity of UP11 G2.



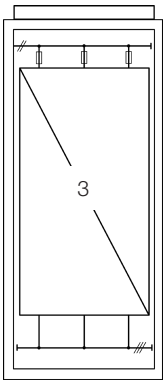
Panel Width	At least 600 mm
Panel Height	At least 2000 mm
Panel Depth	At least 800 mm
Weight Capacity	118 kg

Figure 3.6: *Data of the panel for drive with 1 UP11 G2*



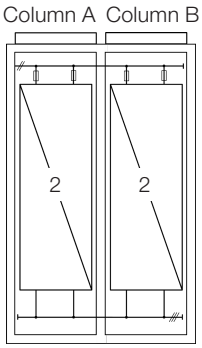
Panel Width	At least 600 mm
Panel Height	At least 2000 mm
Panel Depth	At least 800 mm
Weight Capacity	212 kg

Figure 3.7: *Data of the panel for drive with 2 UP11 G2*



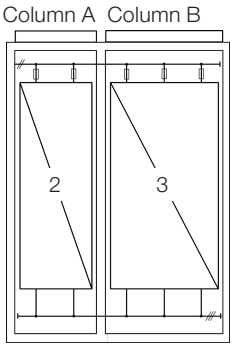
Panel Width	At least 800 mm
Panel Height	At least 2000 mm
Panel Depth	At least 800 mm
Weight Capacity	310 kg

Figure 3.8: *Data of the panel for drive with 3 UP11 G2*



Panel Width	At least 600 mm (Column A) + 600 mm (Column B)
Panel Height	At least 2000 mm
Panel Depth	At least 800 mm
Weight Capacity	212 kg (Column A) + 212 kg (Column B)

Figure 3.9: *Data of the panel for drive with 4 UP11 G2*



Panel Width	At least 600 mm (Column A) + 800 mm (Column B)
Panel Height	At least 2000 mm
Panel Depth	At least 800 mm
Weight Capacity	212 kg (Column A) + 310 kg (Column B)

Figure 3.10: *Data of the panel for drive with 5 UP11 G2*

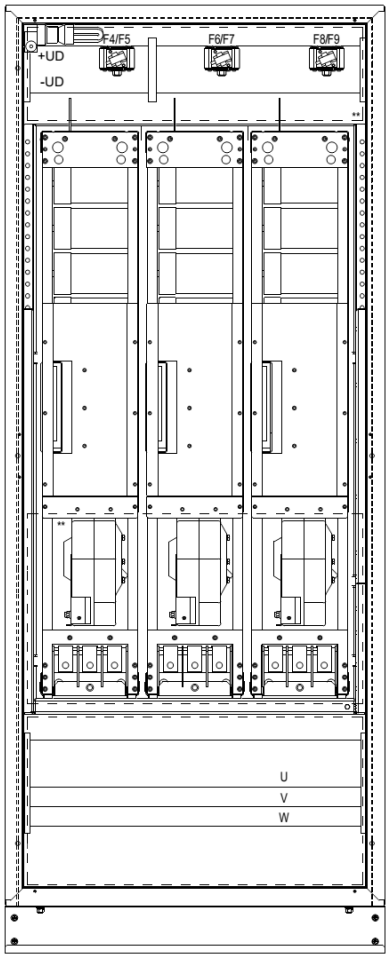


Figure 3.11: *Column with 3 UP11 G2 installed*

Mounting of the UC11 at the panel door: Control rack with flange mounting and IPS1 module mounted at the bottom part of the door. The control rack is secured with four M3 screws (tightening torque: 0.5 Nm).

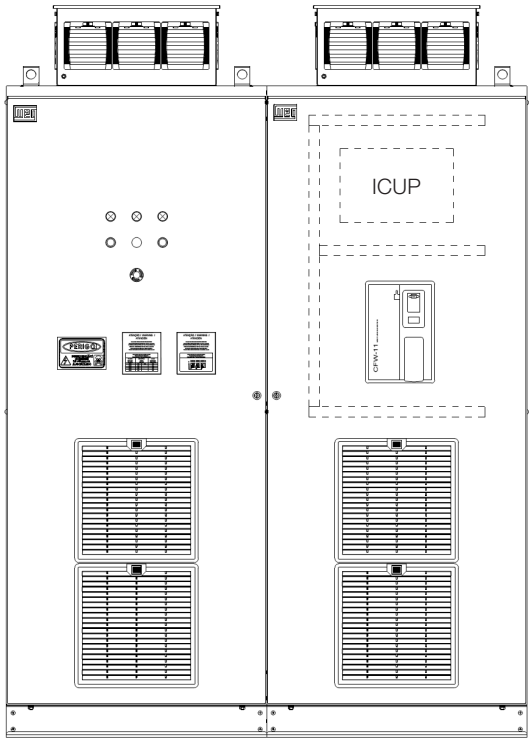


Figure 3.12: *Example of mounting of the control rack in the panel*

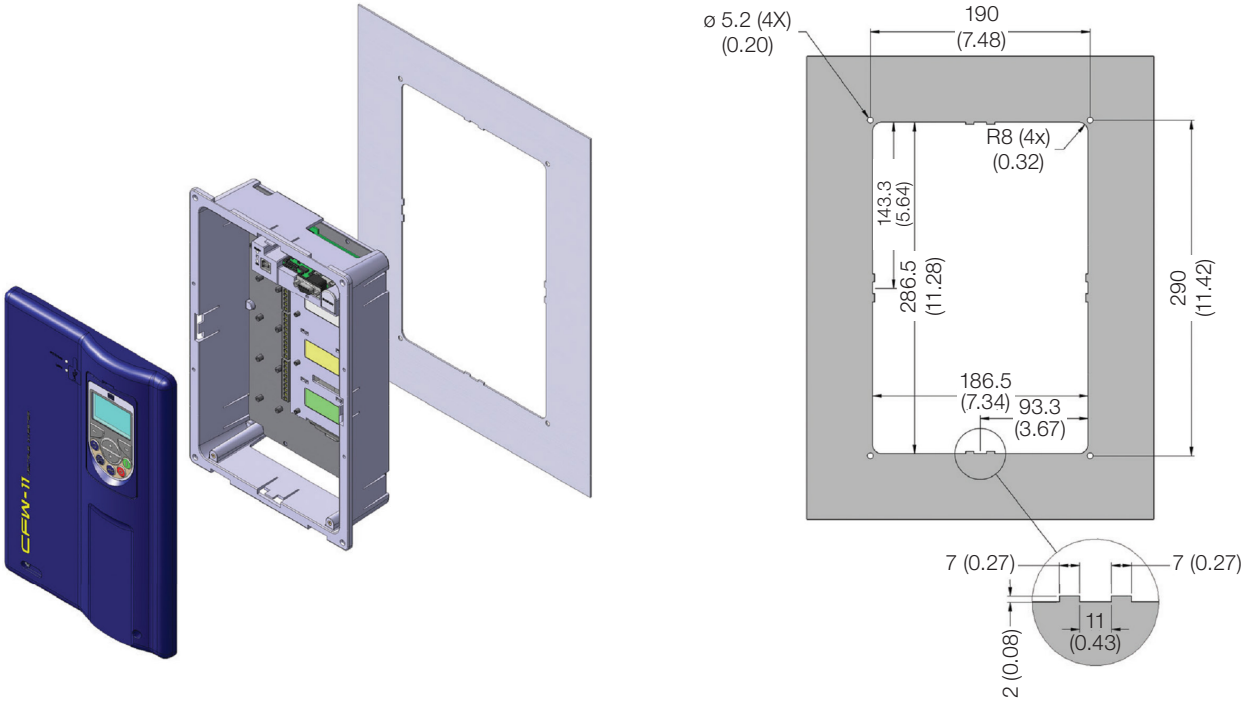


Figure 3.13: *Mounting of the control rack and necessary slots mm (in)*

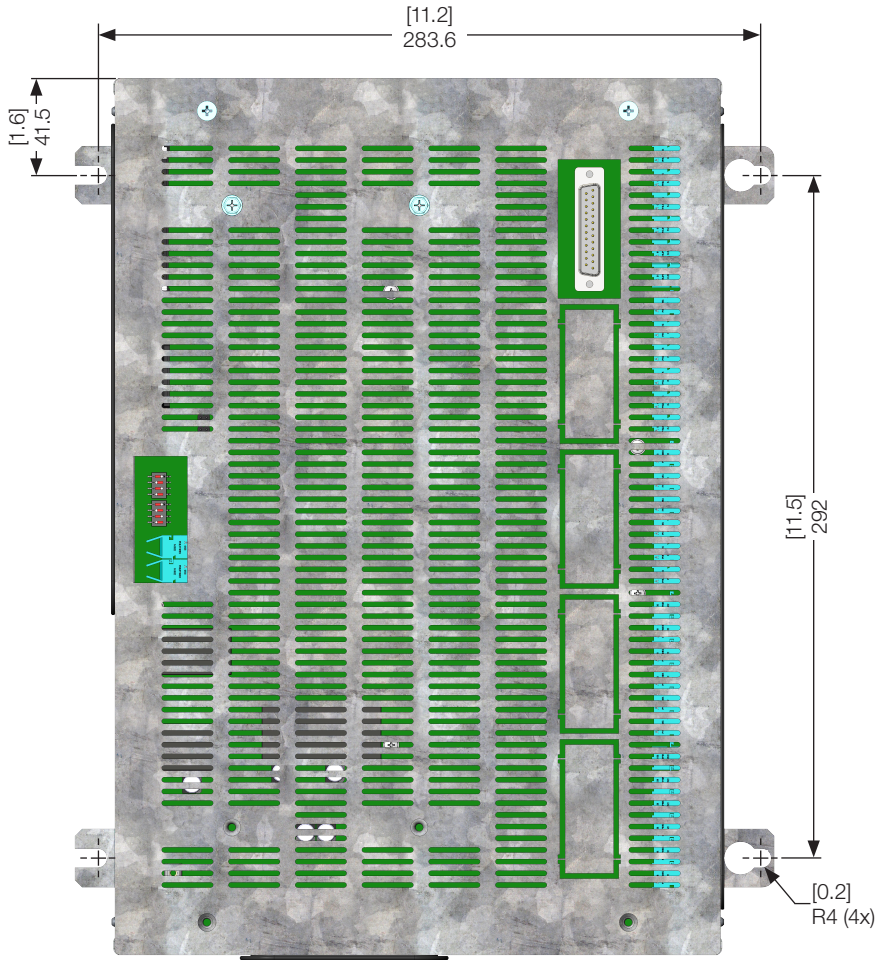


Figure 3.14: *Mounting of the base of the ICUP1 module (mm)*

The shield of the ICUP board is mounted with four screws M6 (recommended torque: 8.5 N.m).

3.2 ELECTRICAL INSTALLATION

DANGER!
The following information is merely a guide for proper installation. Comply with applicable local regulations for electrical installations.

DANGER!
Les informations suivantes constituent uniquement un guide pour une installation correcte. Respectez les réglementations locales en vigueur pour les installations électriques.

DANGER!
Make sure the AC power supply is disconnected before starting the installation.

DANGER!
Vérifiez que l'alimentation secteur CA est débranchée avant de commencer l'installation.

ATTENTION!
The CFW-11M G2 can be connected in circuits with symmetrical short circuit capability up to 100000 A_{rms} (480 V/690 V maximum).

ATTENTION!
Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with applicable local codes.

3.2.1 Input Rectifier

It is necessary to use a rectifier to generate DC voltage for the power supply of the UP11 G2. The rectifier may be an Active Front End (AFE) or a diode bridge rectifier with 6, 12, 18 pulses or more.

The following items contain general directions on the sizing of a 6-pulse rectifier. For further information on multipulse rectifiers or AFE solution, contact WEG.

3.2.1.1 Sizing

The main rectifier bridge is selected to comply with the nominal power of the drive. The heat dissipation caused by losses at the rectifier bridge should be taken into account for the sizing of the heatsink, as well as in the heating up of the panel internal air.

ATTENTION!
The diodes reverse voltage must be ≥ 2200 V.

3.2.1.2 Line Reactor

The diode rectifier plus the capacitor bank of the UP11 G2 drain from the electric grid a current with non-sinusoidal wave shape containing harmonics of the fundamental frequency. Those harmonic currents flowing on the impedances of the power supply line cause harmonic voltage drops, distorting the supply voltage of the inverter itself and other loads connected to this line. These harmonic current and voltage distortions may increase the electrical losses in the installation, overheating components (cables, transformers, capacitor banks, motors, etc.), as well as a lowering power factor.

The harmonic input currents depend on the impedance values that are present in the rectifier input/output circuit. The addition of a line reactor and/or DC bus choke reduces the current harmonic content, providing the following advantages:

- Increased input power factor.
- Reduced RMS input current.
- Reduced power supply voltage distortion.
- Increased life of the DC Link capacitors.

To determine the line reactor needed to obtain the desired voltage drop, use equation below:

$$L_{line} = \frac{\text{Voltage Drop [\%] x Line Voltage [V]}}{\sqrt{3} \times 2\pi \times \text{Line Freq [Hz]} \times \text{Rated Cur . [A]}}$$

ATTENTION!
It is recommended a line reactance of at least 3 % on the input of the 6-pulse diode rectifier.

3.2.1.3 Pre-Charge

The resistors of the pre-charge circuit must be sized according to the following criteria:

- Maximum voltage.
- Maximum energy.
- Power overload capacity of the resistors during the pre-charge period (energy dissipation capacity).

Table 3.5: *Dimensioning of the pre-charge*

Peak Current During the Pre-charge (A)		$0.82.(V_{line}/R)$
Energy Stored in the Capacitor Bank (J)	UP11-02 G2	$N.0.012.V_{line}^2$
	UP11-01 G2	$N.0.006.V_{line}^2$
Duration of the Pre-charge (s)	UP11-02 G2	0.031.N.R
	UP11-01 G2	0.015.N.R

Where R is the ohmic value of the resistor used on each phase and N the number of power units.

Example:

At a drive composed by three power units, whose line voltage at the input of the rectifier was 690 Vrms (UP11-01 G2), the obtained values would be the following:

- Energy stored in the capacitor bank: 3.0,006.6902 = 8569.8 J.
- Using three 10 Ω resistors (one per phase), each resistor must withstand 2856.6 J.
- The resistor manufacturer is able to inform the power supported by the component.
- The peak current during the pre-charge would be 56.6 A and the length of the pre-charge would be 0.45 s.

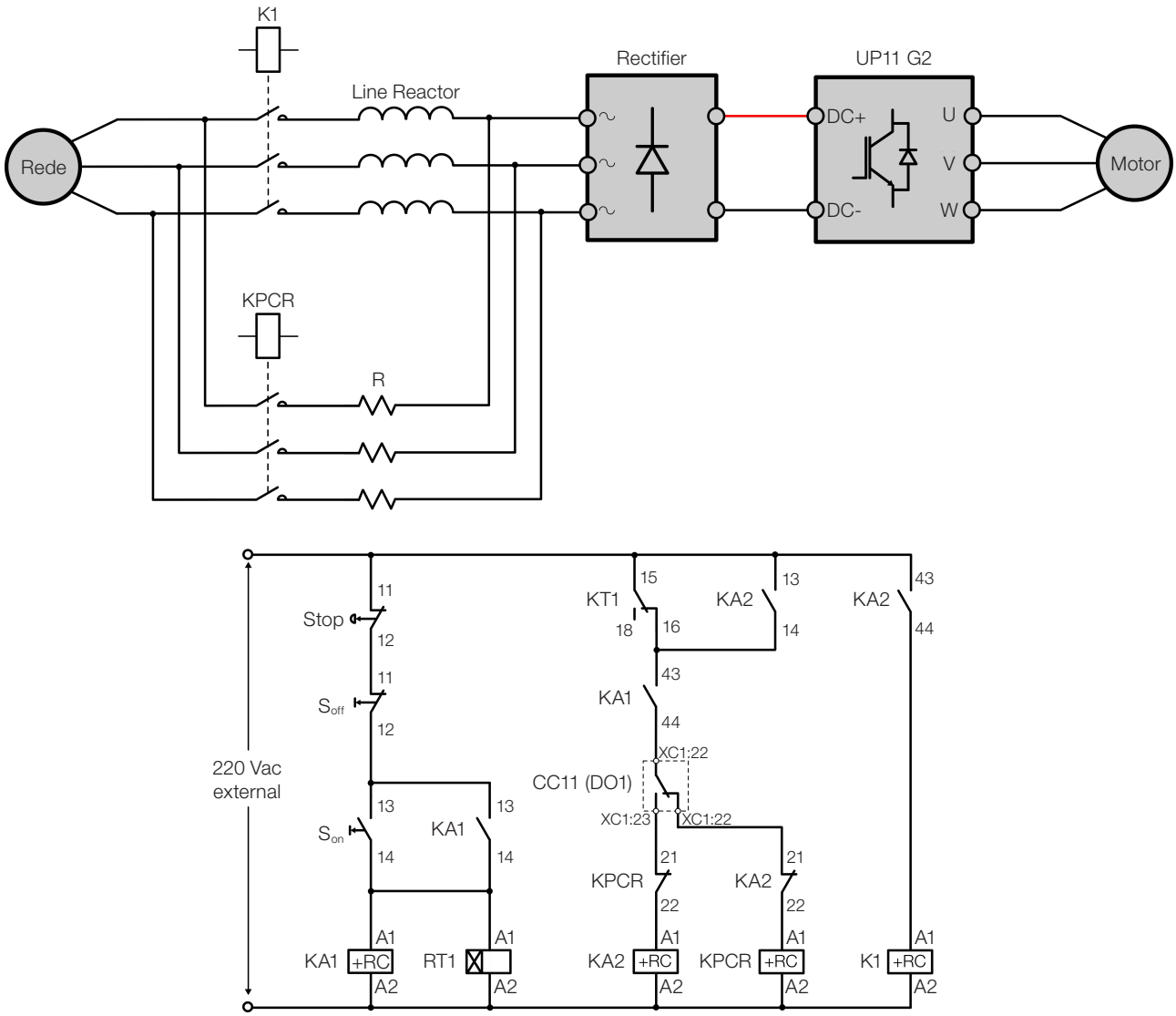


Figure 3.15: *Pre-charge circuit example*

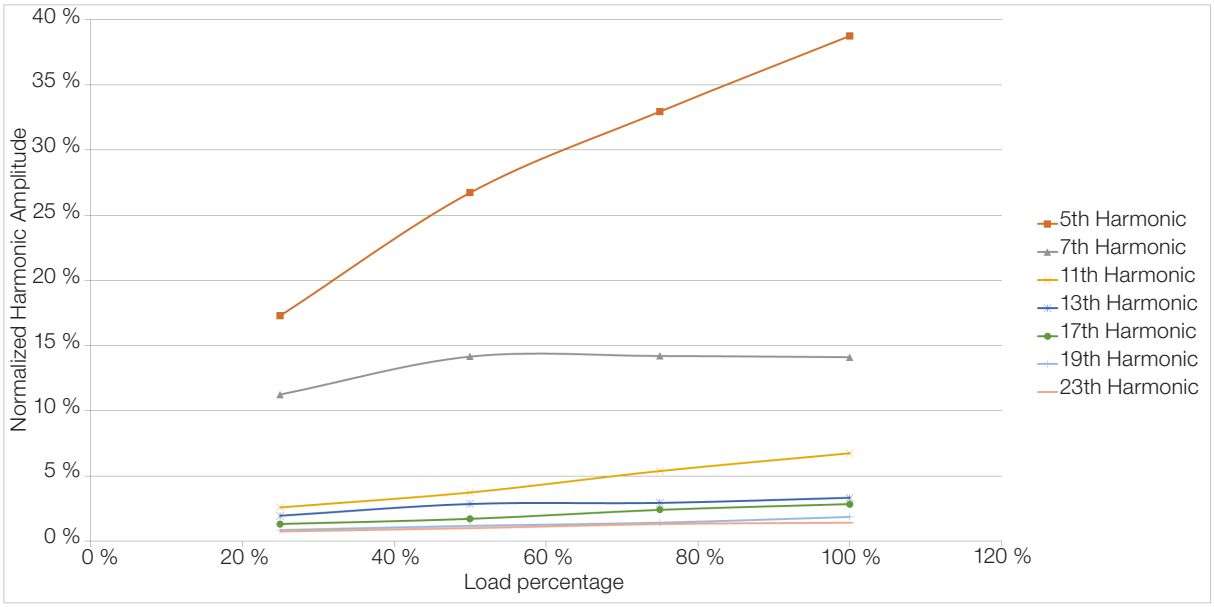
The CFW-11M G2 input rectifier can be supplied through a contactor or a motorized circuit breaker (represented by K1), whose command must be interlocked with the pre-charge contactor K(PCR) command. The Figure 3.15 on page 3-13 presents an example of the recommended pre-charge circuit for the CFW-11M G2 inverter, with simplified power and command diagrams. The digital relay output DO1 of the CC11 board must be configured with the “Pre-Charge OK” function (P0275 = 25). This relay must be used to command the pre-charge contactor and the main contactor (motorized circuit breaker). Furthermore, the pre-charge length must be timed for the protection of the auxiliary circuit (resistors, rectifier bridge). This function is carried out by a timer with a normally-closed on-delay contact, represented in Figure 3.15 on page 3-13 by RT1.

3.2.1.4 Harmonics of the 6-Pulse Rectifier

Table 3.6 on page 3-14, Figure 3.16 on page 3-14 and Figure 3.17 on page 3-14 show the typical values of the harmonic content of the currents, Power Factor (PF) and THD (I) on the power supply, considering the 6-pulse rectifier.

Table 3.6: *Individual harmonics, Power Factor and THD (I) typical for rated load in the output, 6-pulse rectifier*

Harmonic Order	I (%)	FP	THD(I)
1	100.0 %	0,89	42 %
5	38.7 %		
7	14.1 %		
11	6.7 %		
13	3.3 %		
17	2.9 %		
19	1.9 %		
23	1.4 %		



Note: Amplitude of the normalized harmonics as a function of the fundamental with 100 % of load. 6-pulse rectifier.

Figure 3.16: *Typical values of the harmonics of the input current with variation of the output power*

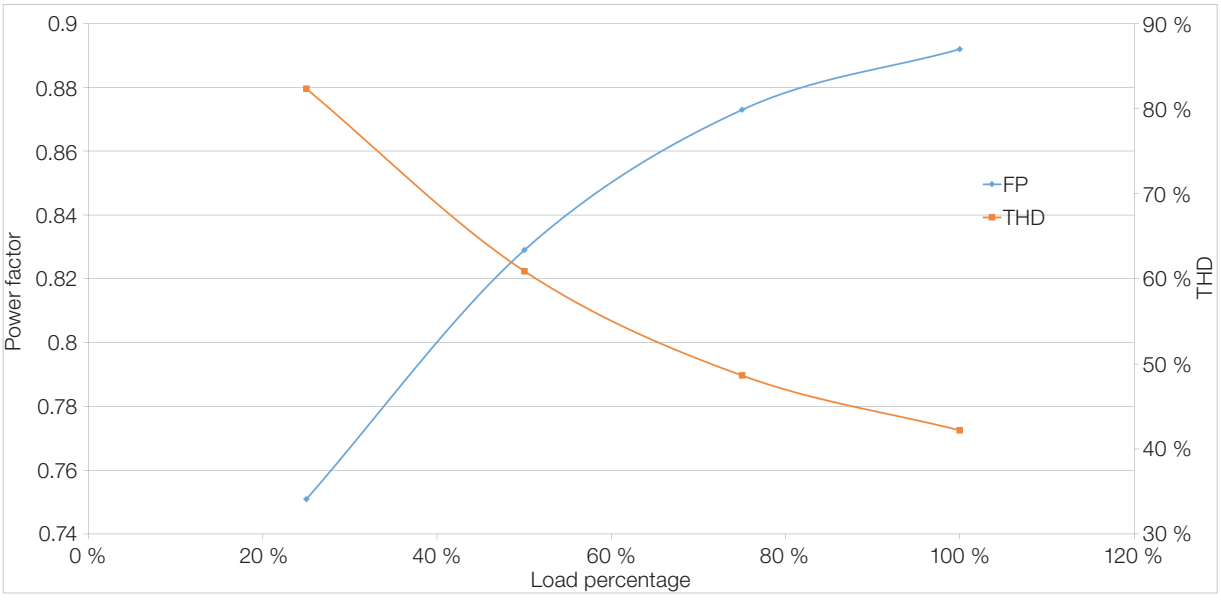


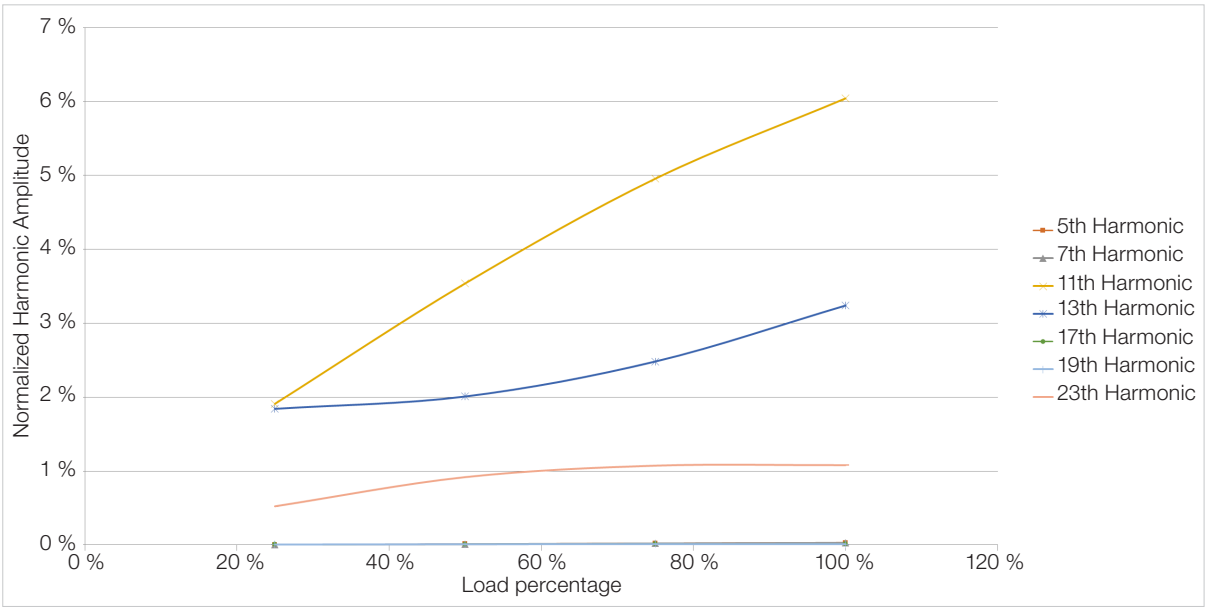
Figure 3.17: *Power Factor (FP) and THD(I) with variation of the output power 6-pulse rectifier*

3.2.1.5 Harmonics of the 12-Pulse Rectifier

Table 3.7 on page 3-15, Figure 3.18 on page 3-15 and Figure 3.19 on page 3-15 show the typical values of the harmonic content of the currents, Power Factor and THD (I) on the power supply, considering the 12-pulse rectifier.

Table 3.7: *Individual harmonics, Power Factor and THD (I) typical for rated load in the output, 12-pulse rectifier*

Harmonic Order	I (%)	FP	THD(I)
1	100.0 %	0,96	7,1 %
5	0.0 %		
7	0.0 %		
11	6.0 %		
13	3.2 %		
17	0.0 %		
19	0.0 %		
23	1.1 %		



Note: Amplitude of the normalized harmonics as a function of the fundamental with 100 % of load. 12-pulse rectifier.

Figure 3.18: *Typical values of the harmonics of the input current with variation of the output power*

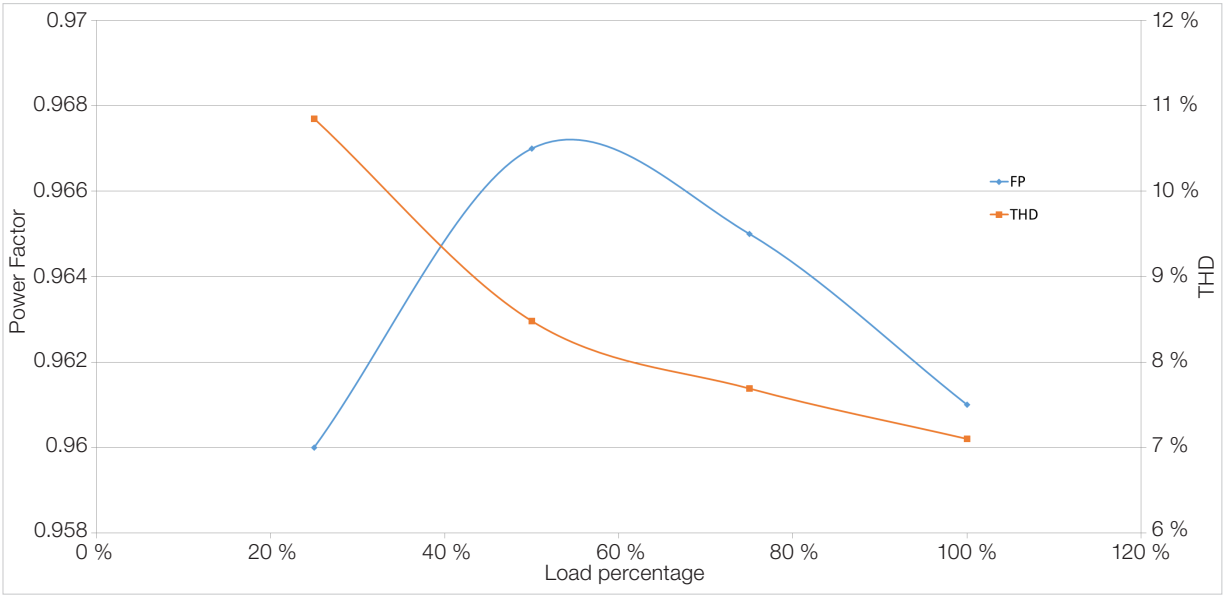


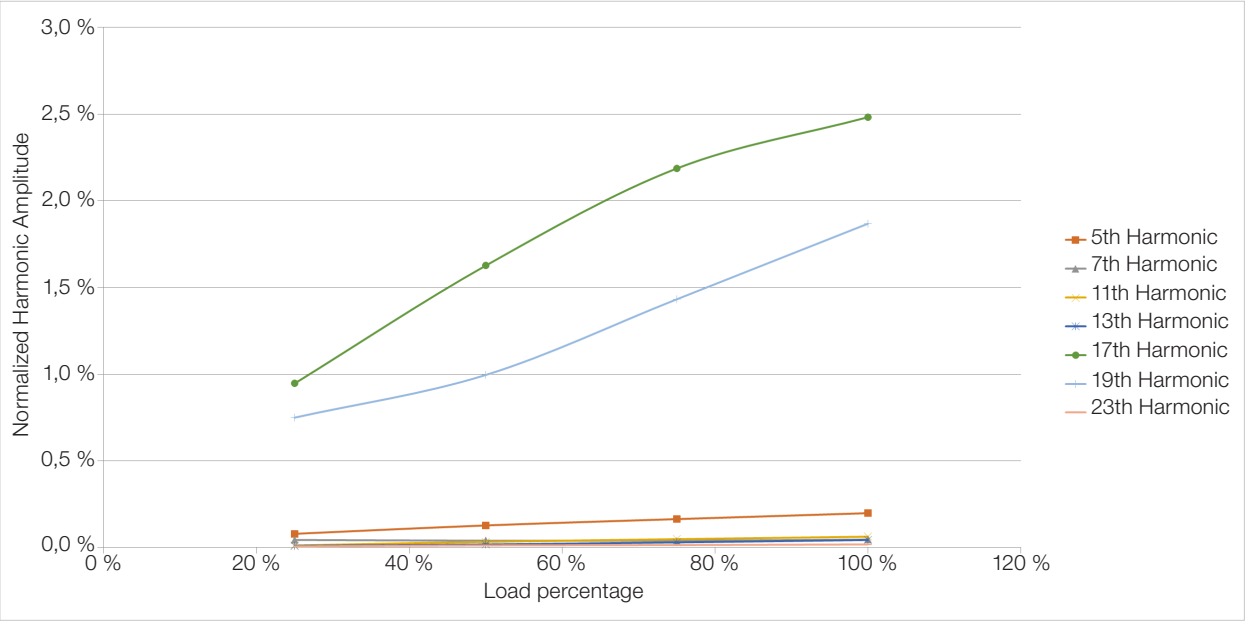
Figure 3.19: *Power Factor (FP) and THD (I) with variation of the output power. 12-pulse rectifier*

3.2.1.6 Harmonics of the 18-Pulse Rectifier

Table 3.8 on page 3-16, Figure 3.20 on page 3-16 and Figure 3.21 on page 3-16 show the typical values of the harmonic content of the currents, Power Factor and THD (I) on the power supply, considering the 18-pulse rectifier.

Table 3.8: *Individual harmonics, Power Factor and THD (I) typical for rated load in the output, 18-pulse rectifier*

Harmonic Order	I (%)	FP	THD(I)
1	100.0 %	0.97	3.2 %
5	0.2 %		
7	0.0 %		
11	0.1 %		
13	0.0 %		
17	2.5 %		
19	1.9 %		
23	0.0 %		



Note: Amplitude of the normalized harmonics as a function of the fundamental with 100 % of load. 18-pulse rectifier.

Figure 3.20: *Typical values of the harmonics of the input current with variation of the output power*

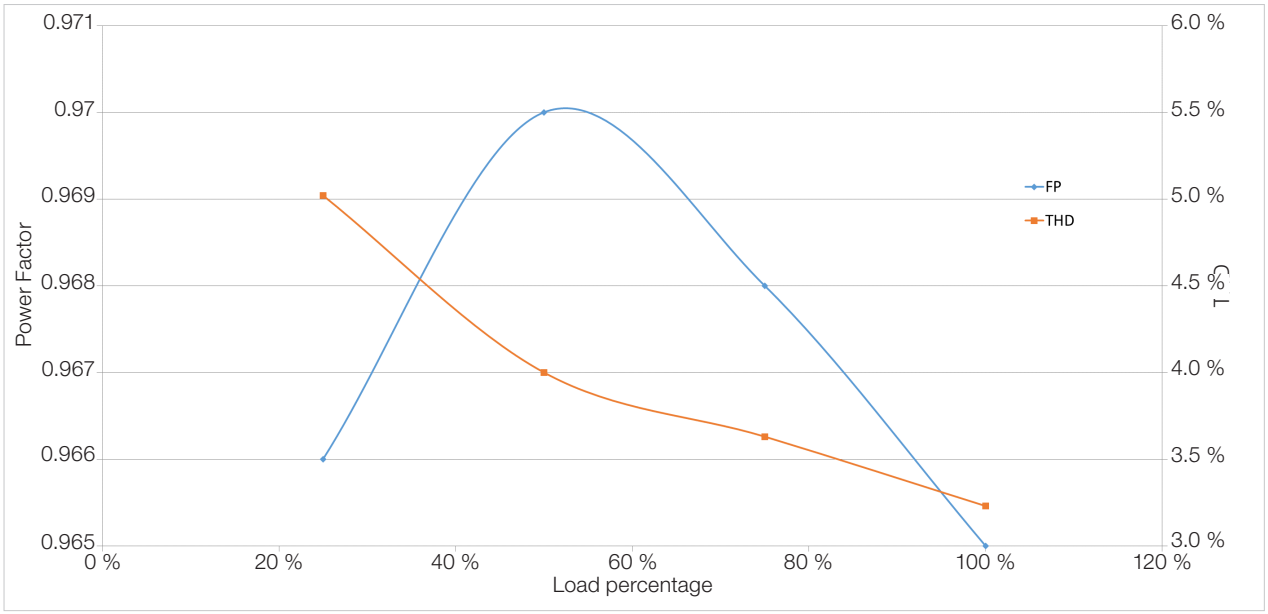


Figure 3.21: *Power Factor (FP) and THD (I) with variation of the output power 18-pulse rectifier*

NOTE!
The harmonics shown in Item 3.2.1.4 Harmonics of the 6-Pulse Rectifier on page 3-14, Item 3.2.1.5 Harmonics of the 12-Pulse Rectifier on page 3-15 and Item 3.2.1.6 Harmonics of the 18-Pulse Rectifier on page 3-16 are typical values and may vary according to the application. The data shown are valid for the following condition:
- Short circuit current of the transformer of 100000 symmetric Arms.
- Line reactance of 3 %.

3.2.2 Busbars

The panel busbars must be sized according to the rectifier output current and the drive output current. It is recommended to use copper busbars. In case it is necessary to use aluminum busbars, it is necessary to clean the contacts and use anti-oxidant compound. If the compound is not used, any copper and aluminum joint will undergo accelerated corrosion.

3.2.3 Fuses

It is recommended to use proper fuses for operation in direct current on the DC power supply of the UP11 G2. The maximum voltage on the DC link on the UP11-01 G2 is 1200 Vdc, on the UP11-02 G2 is 800 Vdc (tripping level of the IGBTs for overvoltage). Fuses used in AC lines can be used, but the specified AC voltage must be derated. To obtain the derating factor, refer to the fuse manufacturer.

Examples of fuses:

- UP11-01 G2: PC73UD13C630TF (Mersen).

- UP11-02 G2: PC73UD12C900TF (Mersen).

3.2.4 General Wiring Diagram

Figure 3.22 on page 3-18 shows the general diagram for an inverter with five power units (UP11). It shows the connections between the Control Unit UC11 and the UPs (XC40 DB25 connectors and optical fibers), power connections of the UPs (DC+, DC-, U, V, W and GND), and auxiliary power supply connections of the cooling (220 V), of the UP11 (24 Vdc) and UC11 (24 Vdc). For a reduced number of UP11, connect them in increasing order (1, 2, 3, etc.), leaving the last positions without connection.

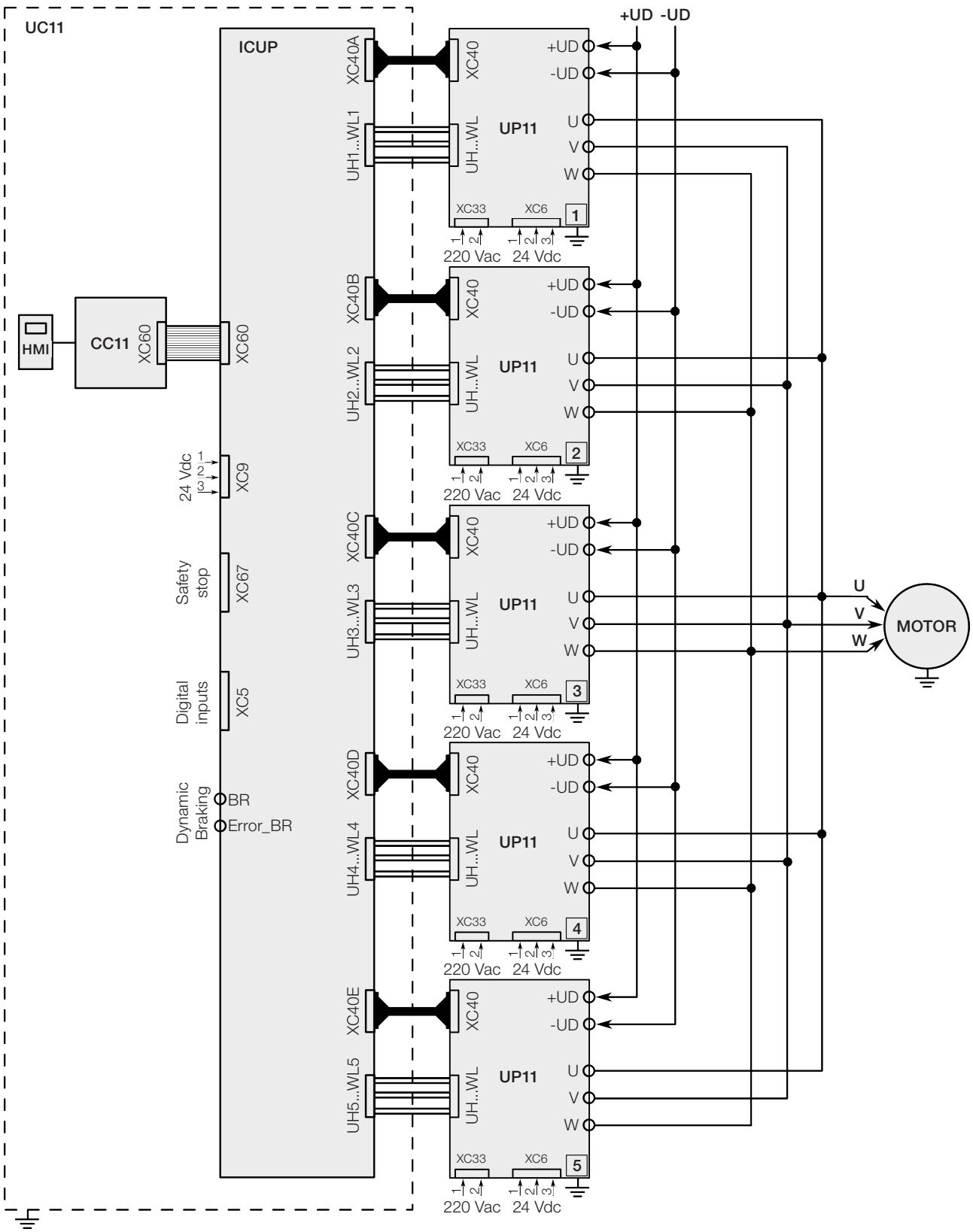


Figure 3.22: *General wiring diagram*

3.2.5 Power Connections

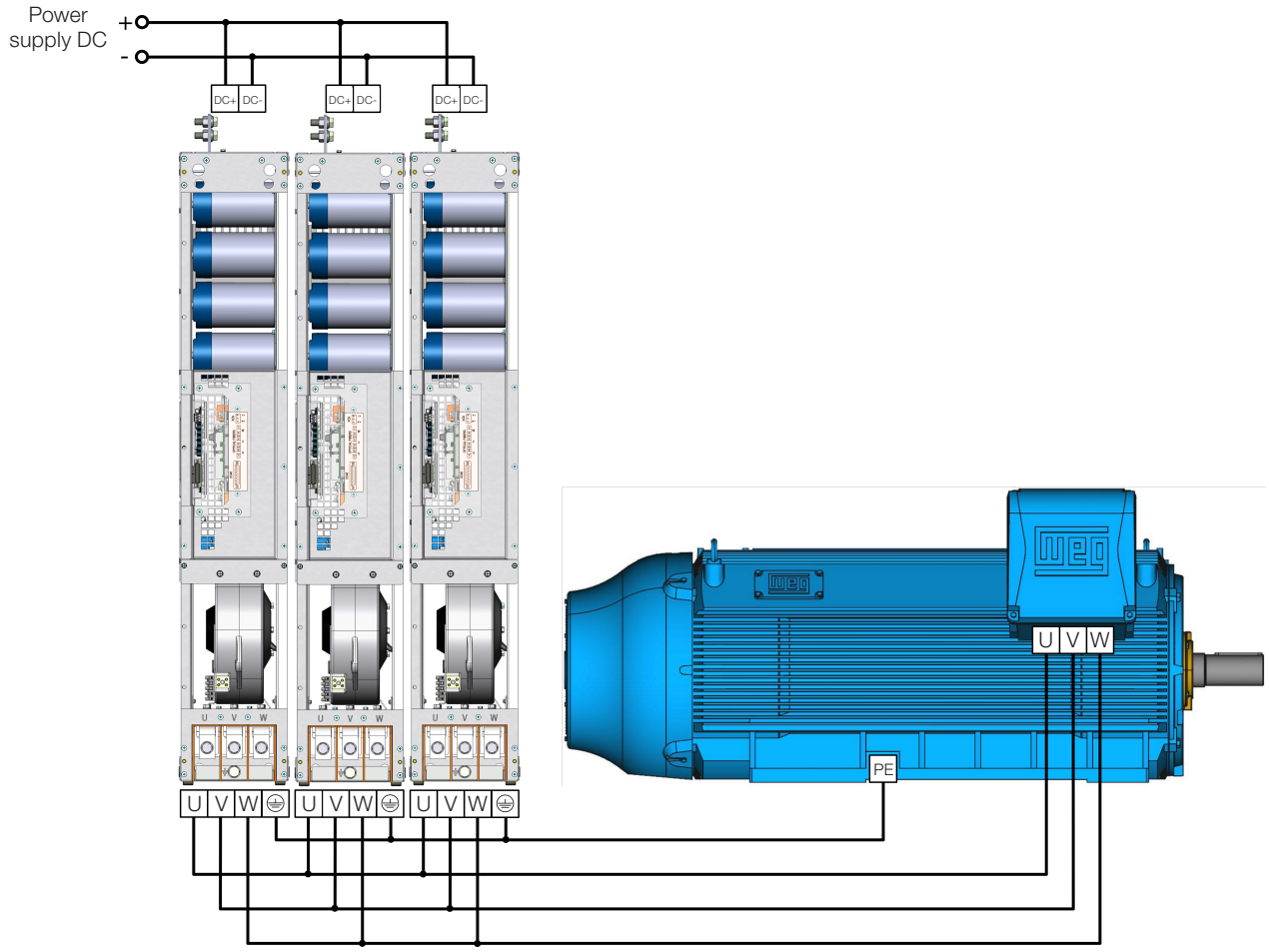


Figure 3.23: *Power and grounding connections*

ATTENTION!
The protective earth of the motor must be connected to the panel ground.

The fastening of the DC+ and DC- connections of the UP11 G2 is done with 4 screws M12X35 (tightening torque: 60 N.m); refer to the Figure 3.24 on page 3-20.

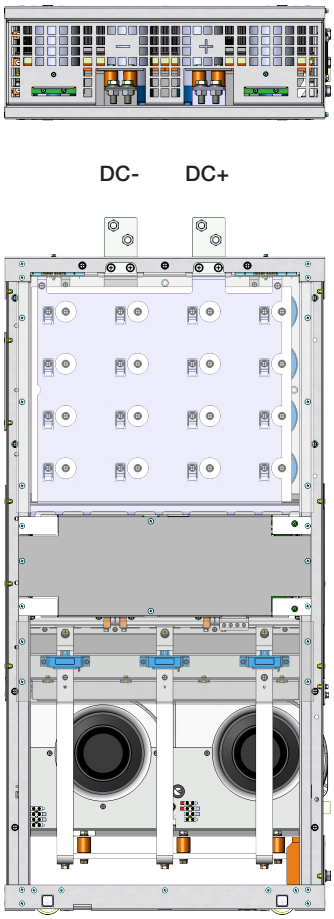


Figure 3.24: *DC power supply terminals*

DC+: DC Link positive terminal.

DC-: DC Link negative terminal.

The U, V and W connections are made through 3 screws M12X45 (tightening torque: 60 N.m, see Figure 3.25 on page 3-21).

The screw used to fasten the grounding cable of the UP11 G2 is M12X25 (tightening torque: 60 N.m).

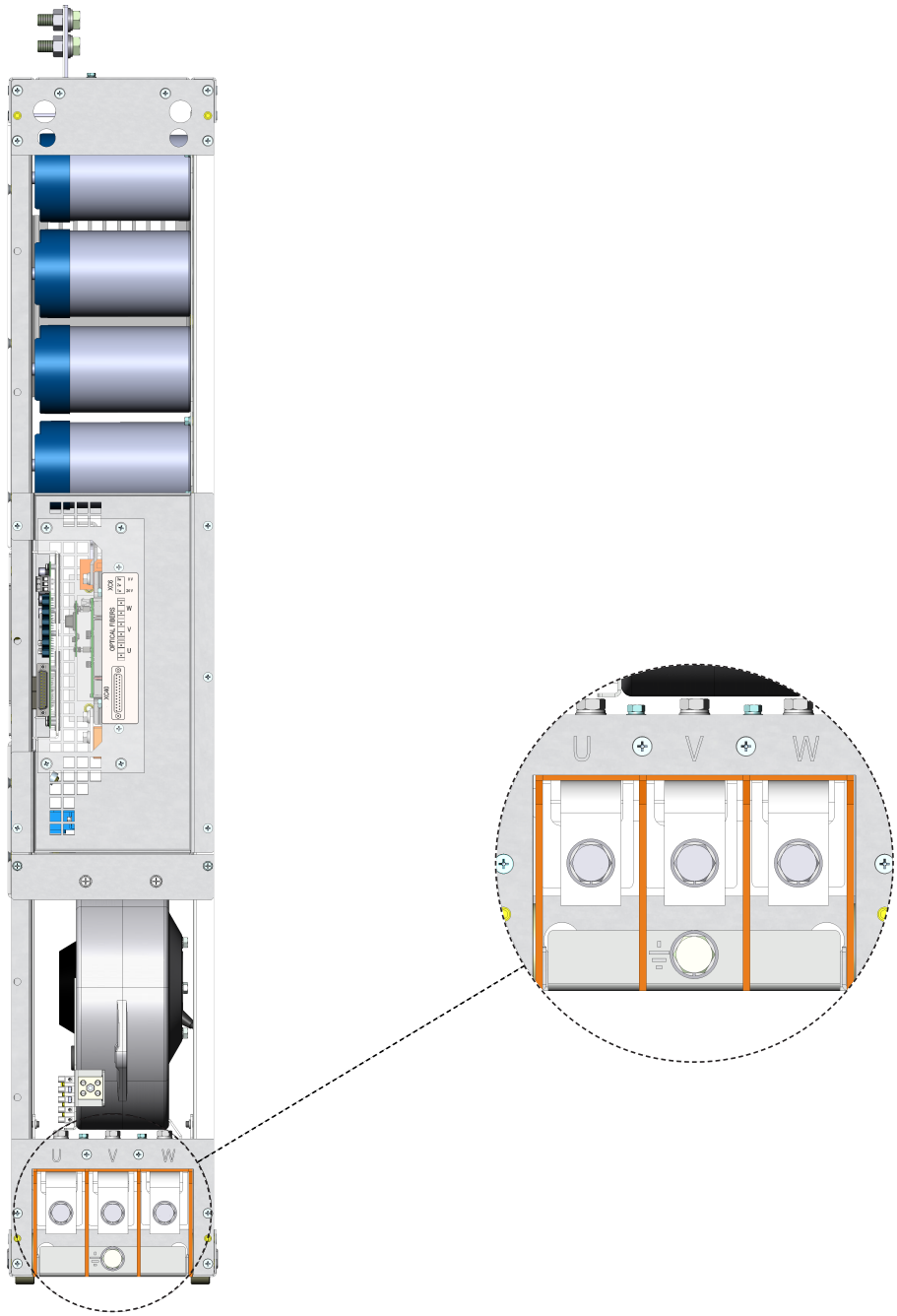


Figure 3.25: *U, V, W and grounding terminals*

U, V and W: Motor connection.

⏚: Grounding connection.

For a better current distribution between the UP11, it is recommended that their output connections be interconnected through a single paralleling busbar. The length of the cables between the UP11 and the paralleling busbar must be as short as possible.

ATTENTION!
The output cables U, V and W of all paralleled UP11 must have the same length.

ATTENTION!
The motor cables must be distributed as evenly as possible on the connection to the paralleling busbar, as in the example shown in Figure 3.26 on page 3-22. Distance "L" must be kept constant.

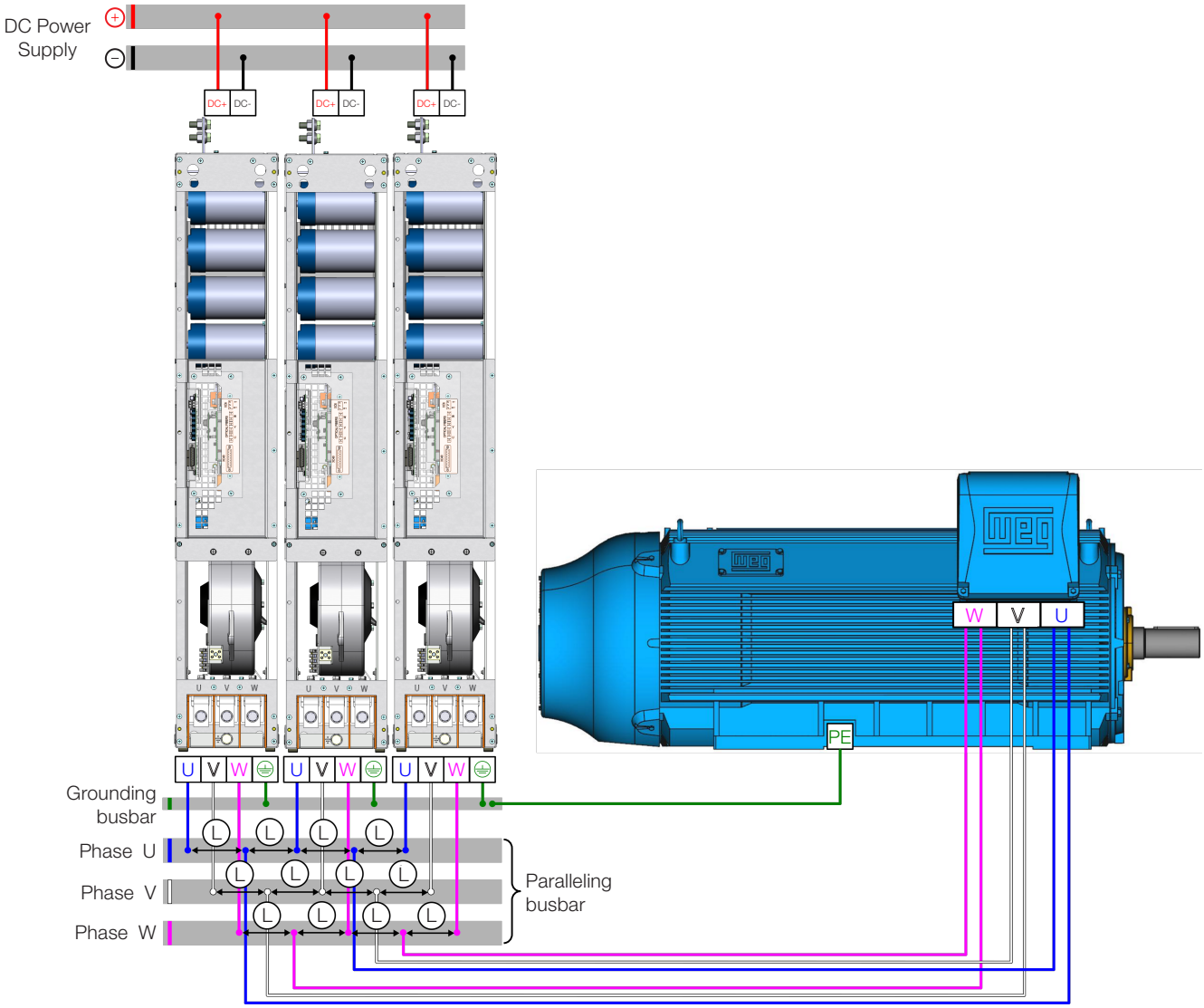


Figure 3.26: *Recommended distribution for the motor cables*

3.2.6 Input Connections

DANGER!
Provide a disconnect device for the input power supply of the inverter.
This device shall disconnect the input power supply for the inverter when needed (for instance, during servicing).

DANGER!
Montez un dispositif de coupure sur l'alimentation du variateur.
Ce composant déconnecte l'alimentation du variateur si cela est nécessaire (ex. pendant l'entretien et la maintenance).

ATTENTION!
A contactor or another device that frequently disconnects and reapplies the AC supply to the inverter, in order to start and stop the motor, may cause damage to the inverter power section. The drive is designed to use control signals for starting and stopping the motor. If used for that purpose, the input device must not exceed one operation per minute; otherwise, the inverter may be damaged.

ATTENTION!
The supply voltage must not exceed the inverter rated values (see Table 8.1 on page 8-2).

The interconnection between the DC Link and each UP11 G2 can be done with flat braided cables according to the Figure 3.27 on page 3-23, example, sized to withstand the DC Link current, according to the Table 8.1 on page 8-2. The Figure 3.28 on page 3-23 shows an example of flexible braid used by WEG, using a fuse on DC+ and another on DC-.

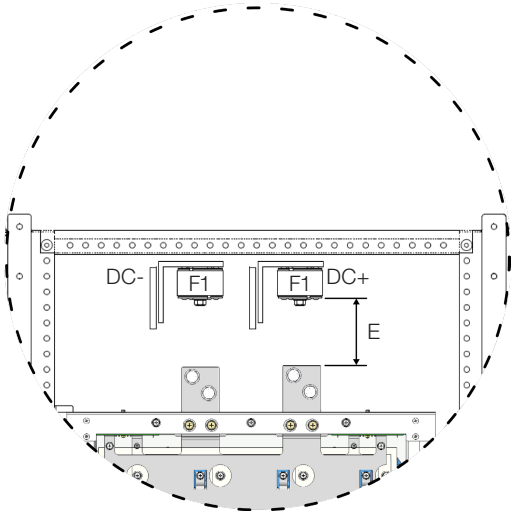


Figure 3.27: *Side view of the connections of the flexible braids and fuses*

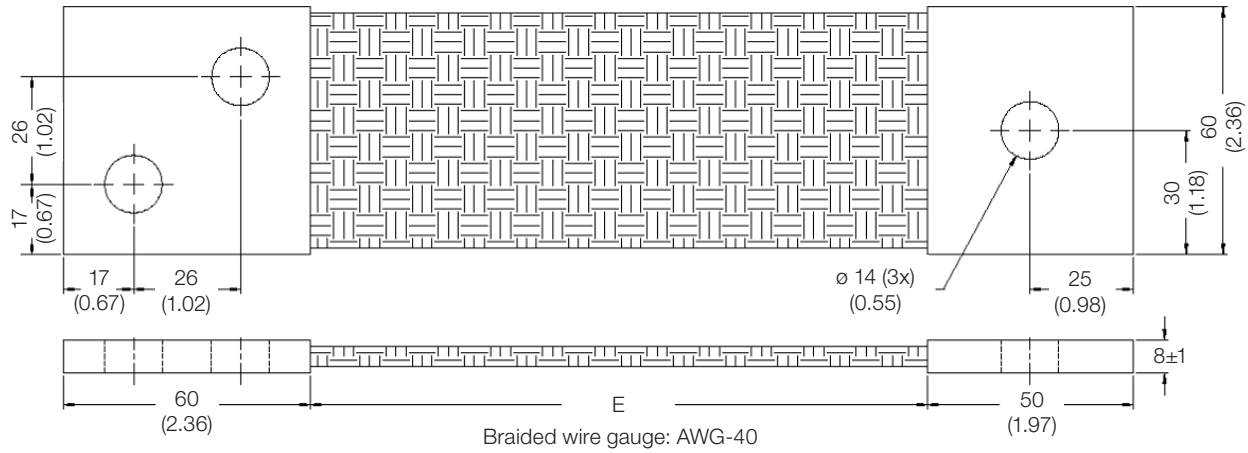


Figure 3.28: *Example of flat braided cable – mm (in)*

NOTE!
It is important that all the flexible braids have the same length (defined by dimension “E”), which will depend on the panel construction.

3.2.7 Output Connections

ATTENTION!
The inverter has an electronic motor overload protection that must be adjusted according to the driven motor. When several motors are connected to the same inverter, install individual overload relays for each motor.

ATTENTION!
The motor overload protection available on the CFW-11M G2 complies with IEC609047-4-2 and UL508C, notice the information below:
- Trip current equal to 1.25 times the motor rated current (P0401) set on the "Oriented Start-up" menu.
- The maximum value of parameter P0398 (Motor Service Factor) is 1.15.
- Parameters P0156, P0157 and P0158 (overload current at 100 %, 50 % and 5 % of the rated speed, respectively) are automatically set when parameters P0401 (motor rated current) and/or P0406 (motor cooling) are set on the "Oriented Start-up" menu. If parameters P0156, P0157 and P0158 are manually set, the maximum value allowed is 1.05 x P0401.

ATTENTION!
If a disconnect switch or a contactor is installed between the inverter and the motor, never operate it with a spinning motor or with voltage at the inverter output.

Use two parallel cables with the gauge indicated in Table 3.8 on page 3-16 to interconnect connections U, V and W of the UP11 with the paralleling busbar (motor connection).

Table 3.9: *Connection cables U, V and W*

Current (A)	Voltage (V)	Duty	Minimum Cable Cross Section (mm²)
634	380-480	ND	(2X) 300
515		HD	(2X) 185
496	500-600	ND	(2X) 185
380		HD	(2X) 120
439	660-690	ND	(2X) 150
340		HD	(2X) 120

ATTENTION!
Cables U, V and W of all phases of all paralleled UP11 must have the same length so as to prevent current imbalance.

The characteristics of the cable used to connect the motor to the inverter, as well as its routing, are extremely important to avoid electromagnetic interference in other equipment and not to affect the life cycle of windings and bearings of the controlled motors.

Recommendations for motor cables:

Unshielded Cables:

- They can be used when it is not necessary to comply with the European electromagnetic compatibility directive (2014/30/EU).
- Keep motor cables away from other cables (signal cables, sensor cables, control cables, etc.), according to Table 3.9 on page 3-24.
- The emission of the cables can be reduced by installing them within a metallic conduit, which must be grounded at least at both ends.
- Connect a fourth cable between the motor ground and the inverter ground.

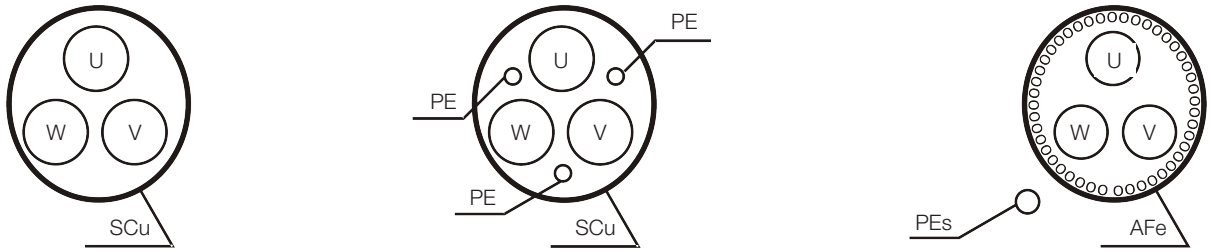
NOTE!
The magnetic field created by the current circulation in these cables may induce currents in nearby metal parts, heating them, and cause additional electrical losses. Therefore, keep the three cables (U, V, W) always together.

Shielded Cables:

- They are mandatory when it is necessary to comply with the electromagnetic compatibility directive (89/336/EEC), as defined by EN 61800-3 “Adjustable Speed Electrical Power Drive Systems”. It mainly acts reducing the electromagnetic radiation disturbance produced by the motor cables in the radio frequency band.
- Regarding the installation types and details, follow the recommendations of IEC 60034-25 “Guide For Design and Performance of Cage Induction Motors Specifically Designed For Converter Supply”; see summary in Figure 3.29 on page 3-25. Refer to the standard for further details and occasional changes related to the new revisions.
- Keep motor cables away from other cables (signal cables, sensor cables, control cables, etc.), according to Table 3.10 on page 3-25.
- The grounding system must be well interconnected among the several installation locations such as the grounding points of the motor and the inverter. Voltage difference or impedance between the several points may cause the circulation of parasite currents among the equipments connected to the ground, resulting in electromagnetic interference problems.

Table 3.10: *Minimum separation distance between motor cables and all other cables*

Cable Length	Minimum Separation Distance
≤ 30 m (100 ft)	≥ 10 cm (3.94 in)
> 30 m (100 ft)	≥ 25 cm (9.84 in)



Symmetrical shielded cables: three concentric conductors with or without a ground conductor, symmetrically manufactured, with an external shield of copper or aluminum.

Note:
(1) SCu = copper or aluminum external shield.
(2) AFe = galvanized steel or iron.
(3) PE = ground conductor.
(4) Cable shielding must be grounded at both ends (inverter and motor). Use 360° connections for low impedance to high frequencies.
(5) For using the shield as a protective ground, it must have at least 50 % of the power cables conductivity. Otherwise, add an external ground conductor and use the shield as an EMC protection.
(6) Shielding conductivity at high frequencies must be at least 10 % of the phase power cable conductivity.

Figure 3.29: *Motor connection cables recommended by IEC 60034-25*

3.2.8 Grounding Connections

DANGER!
Do not share the grounding wiring with other equipment that operate with high currents (e.g. high power motors, soldering machines, etc.).

DANGER!
Ne pas partager le câblage de mise à la terre avec d’autres équipements opérant avec des intensités élevées (par ex: moteurs haute puissance, postes de soudure, etc.).

ATTENTION!
The neutral conductor of the network must be solidly grounded; however, this conductor must not be used to ground the inverter.

DANGER!
The inverter must be obligatorily connected to a protective ground (PE).
Observe the following:
- Connect the grounding points of the inverter to a specific grounding rod, or specific grounding point or to the general grounding point (resistance ≤ 10 Ω).
- Use a minimum cable gauge for connection to the ground as indicated in Table 3.11 on page 3-26. If local standards require different gauges, they must be observed.
- For compatibility with IEC 61800-5-1 standard, use at least one copper cable of 10 mm² to connect the inverter to the protective earth, since the leakage current is higher than 3.5 mA AC.

DANGER!
Le variateur doit être raccordé à une terre de protection (PE).
Observer les règles suivantes:
- Connectez la masse du variateur à une barre collectrice de terre en un seul point ou à un point commun de raccordement à la terre (impédance ≤ 10 Ω).
- Utilisez la section minimale de raccordement à la terre indiquée dans les Table 3.11 on page 3-26. Se conformer aux à la règlementation locale et/ou aux codes de l'électricité si une autre épaisseur de fil est nécessaire.
- Pour assurer la conformité avec la norme CEI 61800-5-1, connecter le variateur à la terre grâce à un câble en cuivre à un conducteur ayant une épaisseur de fil minimale de 10 mm², étant donné que le courant de fuite est supérieur à 3,5 mA C.A.

Use the cables with the gauge indicated in Table 3.11 on page 3-26 to ground the UP11 power units.

Table 3.11: *Grounding cables*

Current (A)	Voltage (V)	Duty	Minimum Cable Cross Section (mm²)
634	380-480	ND	300
515		HD	185
496	500-600	ND	185
380		HD	120
439	660-690	ND	150
340		HD	120

3.2.9 IT Networks

NOTE!
The ground-fault protection (F074) is intended for IGBT protection and may not be activated when inverter output is shorted to ground, when fed by IT networks.
External insulation monitoring devices should be used for system fault monitoring.

3.2.10 Terminals Recommended for Power Cables

Cable Gauge [mm²]	Screw	Manufacturer	Lug Terminal, Code	Crimping Tool, Code	Number of Crimps
120	M12	Hollingsworth	RM120-12	Hydraulic tool H6-500	1
		Burndy (FCI)	YA28L	Tool without die: MY29-3 or Y644 or Y81 Tool+die: Y35 or Y750 / U29RT	
150		Hollingsworth	RM150-12	Hydraulic tool H6-500	
		Burndy (FCI)	YA30L	Tool without die: Y644 or Y81 Tool+die: Y35 or Y750 / U30RT	
185		Hollingsworth	RM185-12	Hydraulic tool H6-500	
		Burndy (FCI)	YA31L	Tool without die: Y644 or Y81 Tool+die: Y35 or Y750 / U31RT	
300		Hollingsworth	RM300-12	Hydraulic tool H6-500	
		Burndy (FCI)	YA36L2	Tool without die: Y644 or Y81 Tool+die: Y35 or Y750 / U36RT	

(a) Cables with size in mm2

Wire Size [AWG/ kcmil]	Stud Size	Manufacturer	Ring Lug, P/N	Crimping Tool P/N	Number of Crimps
4/0	M12	Hollingsworth	R4012	Hydraulic Crimp Tool H6-500	1
		Burndy (FCI)	YA28L	Dieless tool: MY29-3 or Y644 or Y81 Tool+die: Y35 or Y750 / U29RT	
300		Hollingsworth	R 30012	Hydraulic Crimp Tool H6-500	
		Burndy (FCI)	YA30L	Dieless tool: Y644 or Y81 Tool+die: Y35 or Y750 / U30RT	
350		Hollingsworth	R 35012	Hydraulic Crimp Tool H6-500	
		Burndy (FCI)	YA31L	Dieless tool: Y644 or Y81 Tool+die: Y35 or Y750 / U31RT	
600		Hollingsworth	RM300-12	Hydraulic Crimp Tool H6-500	
		Burndy (FCI)	YA36L2	Dieless tool: Y644 or Y81 Tool+die: Y35 or Y750 / U36RT	

(b) Cables with size in AWG

Table 3.12: *(a) and (b) Recommended cable terminals for power connections*

3.2.11 Dynamic Braking

The braking torque obtained by the application of frequency inverters without dynamic braking resistors varies from 10 % to 35 % of the motor rated torque.

Braking resistors shall be used to obtain higher braking torques. In this case, the regenerated energy in excess is dissipated in a resistor mounted outside the inverter.

This kind of braking is used in cases where short deceleration times are desired or when high-inertia loads are driven.

The “Optimal Braking” feature may be used with the vector control mode, which eliminates in most cases the need of an external braking resistor.

ATTENTION!
For the CFW-11M G2, use the DBW-04 braking module only. For further information, refer to the manual of the accessory.

3.2.12 Control Connections

3.2.12.1 UP11 G2 Connections

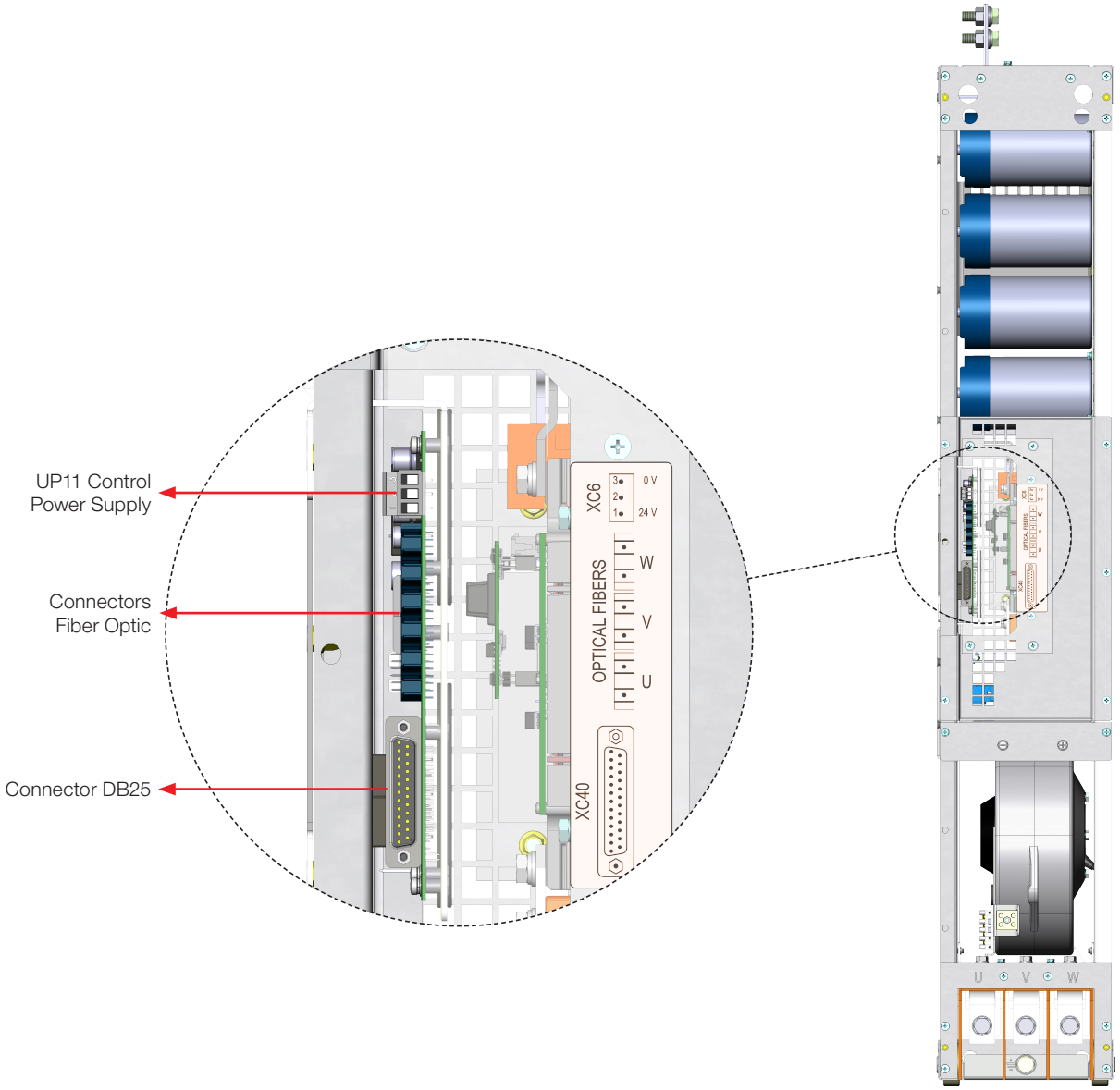


Figure 3.30: *Control cable connection points on the UP11 G2*

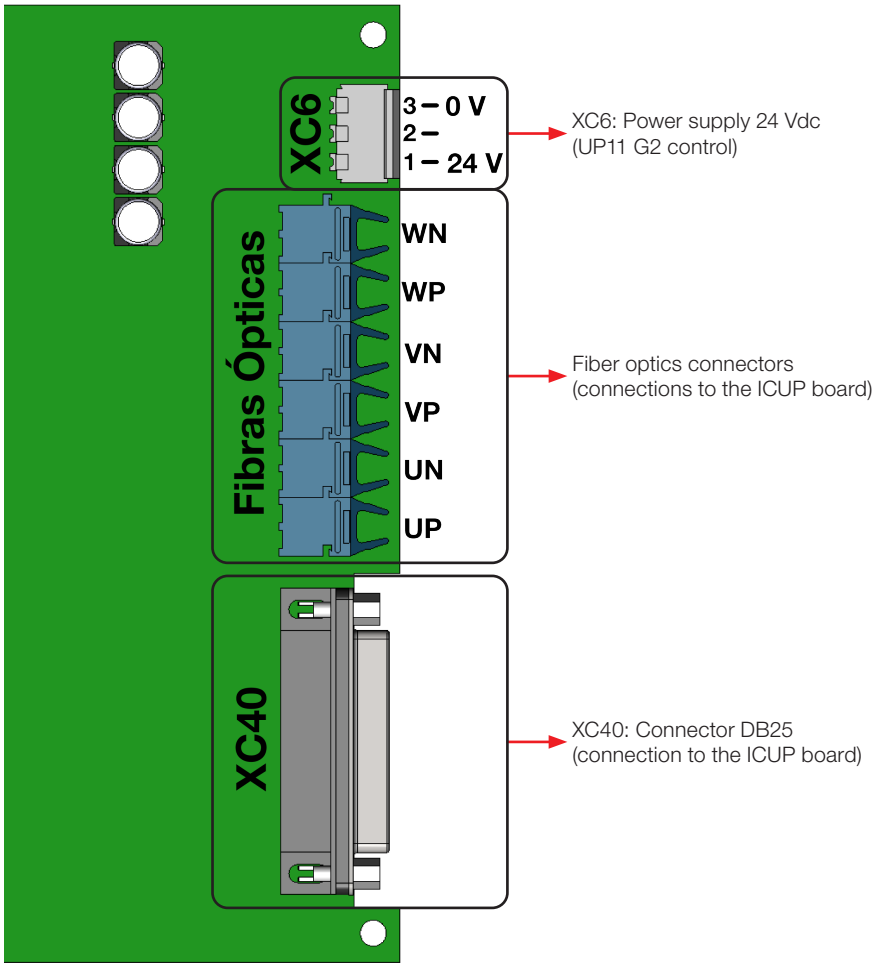


Figure 3.31: *Identification of the control connections of the UP11 G2*

The electronics of the UP11 G2 is powered via connector XC6, located on the IUP board; it is described in Figure 3.12 on page 3-9.

Table 3.13: *Description of connector XC6*

XC6		Function	Specifications
1	+24 Vdc	Positive pole of the +24 Vdc power supply	24 Vdc power supply (± 3 %) Consumption: 750 mA per UP11 G2
2	NC	Not connected	
3	GND	0 V reference for the +24 Vdc power supply	

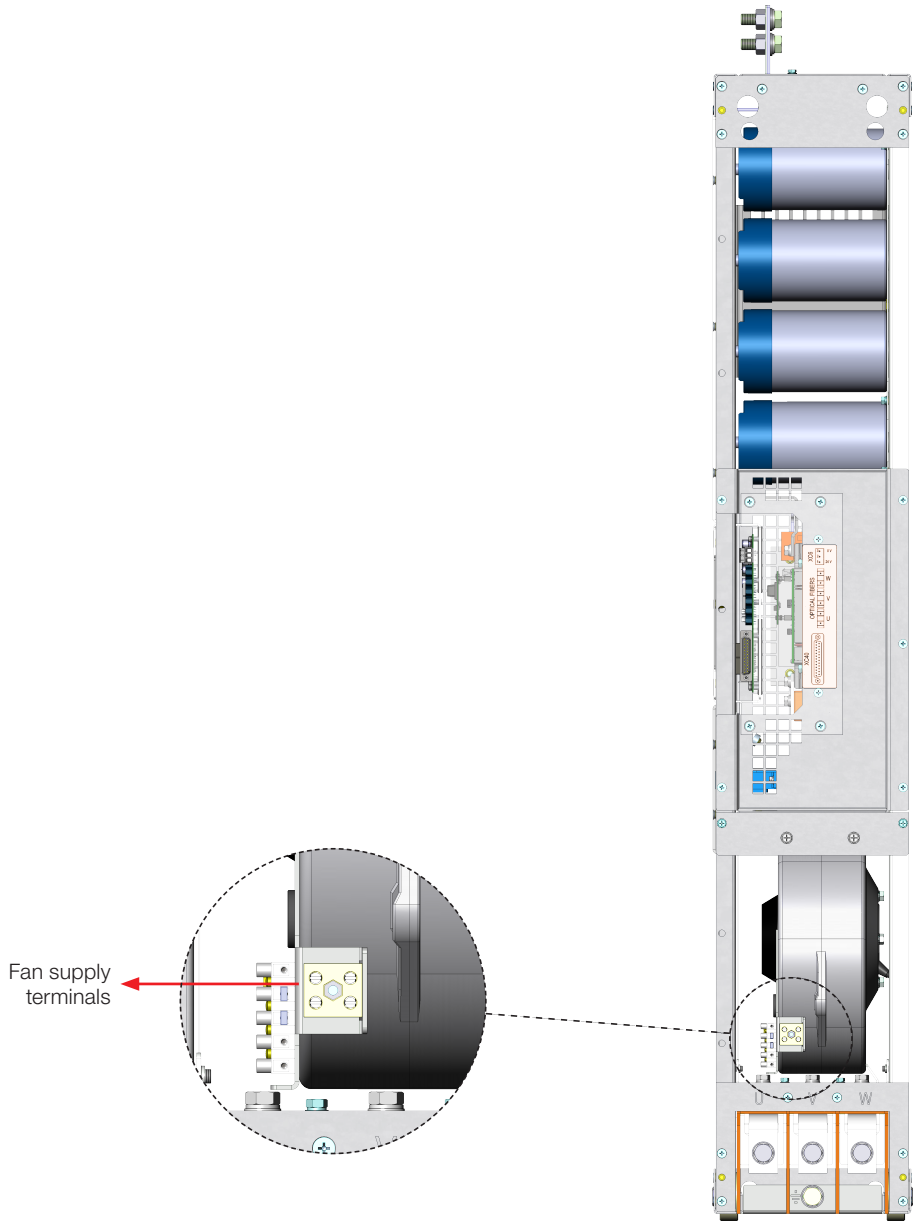


Figure 3.32: *Fan supply terminals*

Table 3.14: *Specification of the fan power supply of the fans*

Voltage	Frequency	Current
220 Vac	50 / 60 Hz	3.8 Aca

3.2.12.2 UC11 G2 Connections

DIM1 and DIM2 digital inputs located on the ICUP board (Table 3.13 on page 3-29) can be programmed via parameters P0832 and P0833 respectively.

Table 3.15: *Function of the signals on the connector XC5*

Connector XC5		Factory Default Function	Specifications
1	DIM1	DIM1 isolated digital input, programmable in (P0832). Refer to the programming manual	High level ≥ 18 V Low level ≤ 3 V Maximum input voltage: 30 V Input current: 11 mA @ 24 Vdc
2	DIM2	DIM2 isolated digital input, programmable in (P0833). Refer to the programming manual	
3	COM	Common point of the digital inputs of the ICUP1 board	
4	+24 V	24 Vdc power supply	Isolated 24 Vdc ± 8 % power supply Capacity: 600 mA **Note 1:** This power supply may be used for feeding the ICUP board digital inputs DIM1 (ISOL) and DIM2 (ISOL) **Note 2:** This power supply is isolated from the 24 Vdc input used to power ICUP **Note 3:** This is the same power supply available on the CC11 board
5	GND_24	0 V reference for the 24 Vdc power supply	

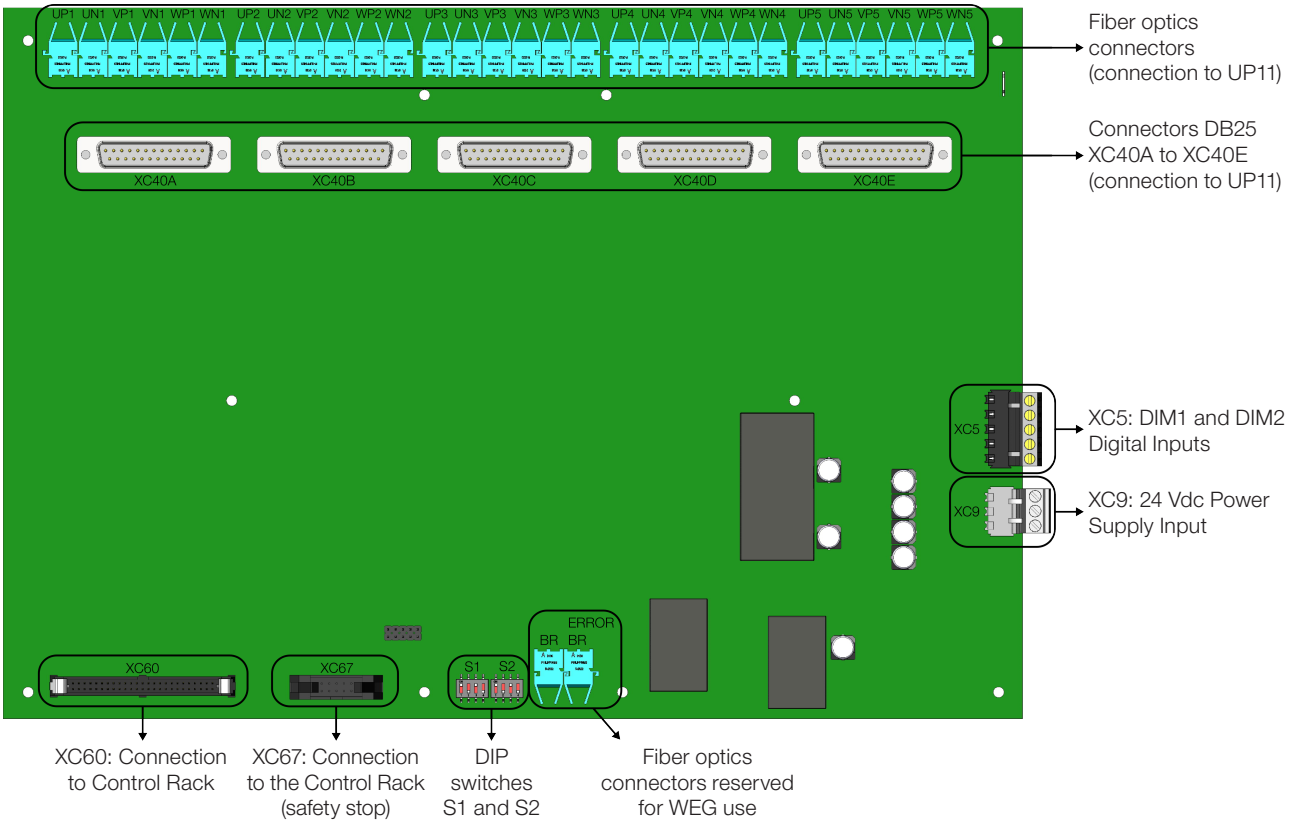


Figure 3.33: *ICUP board connection points*

The control rack is powered via connector XC9, located on the ICUP board; it is described in Table 3.14 on page 3-30.

Table 3.16: *Description of connector XC9*

XC9		Function	Specifications
1	+24 Vdc	Positive pole of the +24 Vdc power supply	24 Vdc power supply (± 3 %) Consumption: 1.25 A
2	NC	Not connected	
3	GND	0 V reference for the +24 Vdc power supply	

DIP switches S1 and S2, Figure 3.34 on page 3-32, have the function, respectively, to select the level of the inverter alternate supply voltage and the number of UP11 connected.

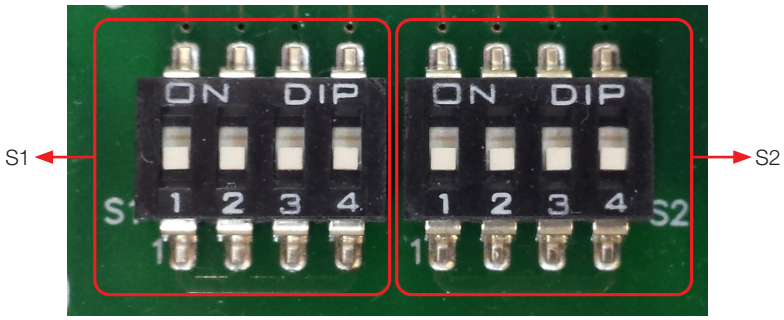


Figure 3.34: DIP switches S1 and S2 detail

3

Table 3.17: DIP switch S1:1 - S1:3 configuration

S1:3	S1:2	S1:1	Alternate Supply Voltage
ON	OFF	ON	380 - 480 V
ON	OFF	OFF	500 - 690 V

Table 3.18: DIP switch S1:4 configuration

S1:4	Operating Mode
OFF	Normal
ON	Reduced Power

The operating mode with reduced power is detailed in Section 5.7 OPERATION WITH A REDUCED NUMBER OF POWER UNITS on page 5-10.

Table 3.19: DIP switch S2 configuration

S2:4	S2:3	S2:2	S2:1	Number of UP11 Connected
OFF	OFF	OFF	OFF	1
OFF	OFF	OFF	ON	2
OFF	OFF	ON	ON	3
OFF	ON	ON	ON	4
ON	ON	ON	ON	5

The grounding of the UP11 plus UC11 must be done according to the diagram shown in Figure 3.35 on page 3-33.

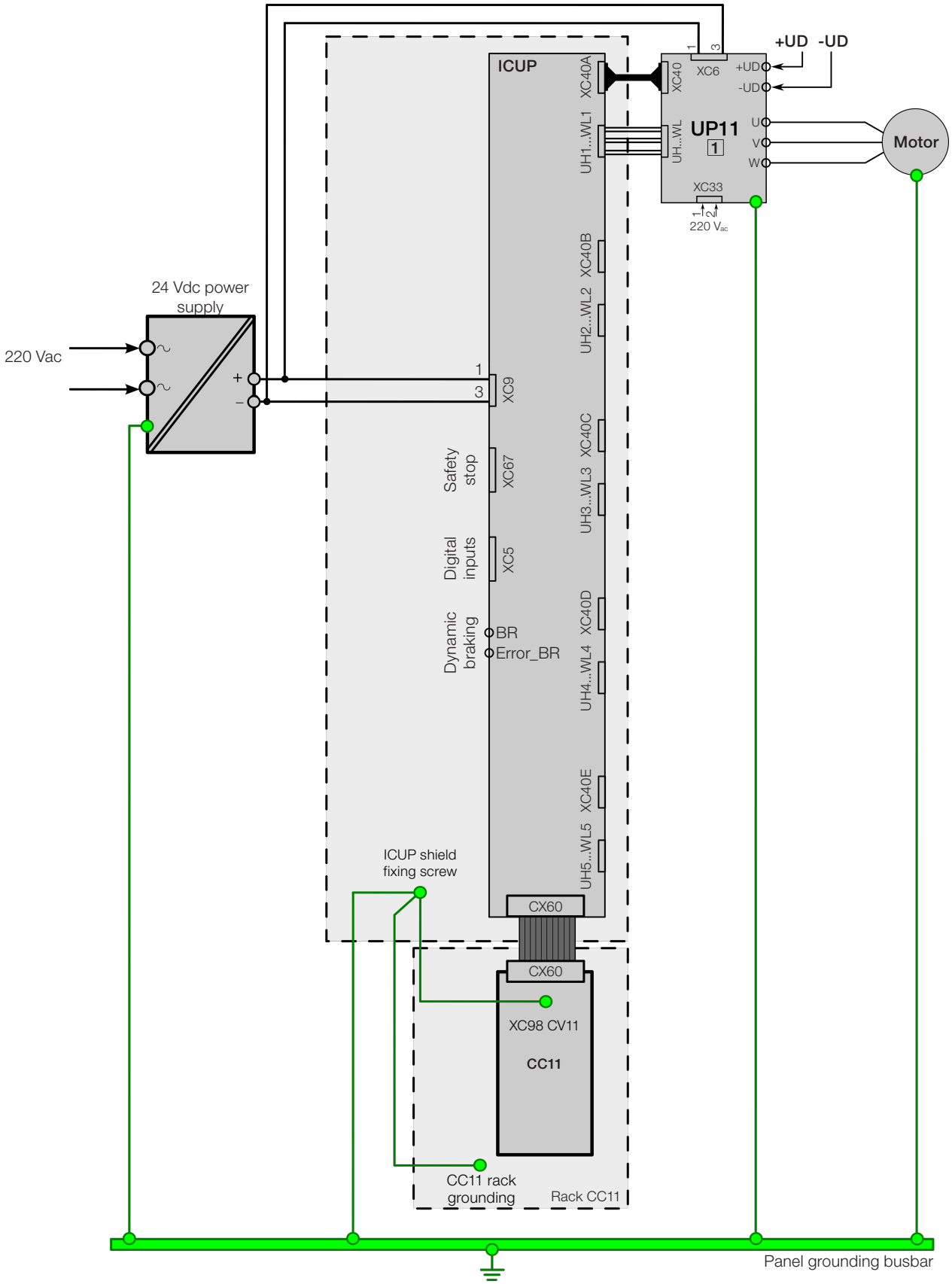


Figure 3.35: *Grounding diagram of the UP11 plus UC11, in case of only one UP11*

The screws to fasten the ICUP shield to the panel must ensure the electrical contact between the shield and the panel for grounding.

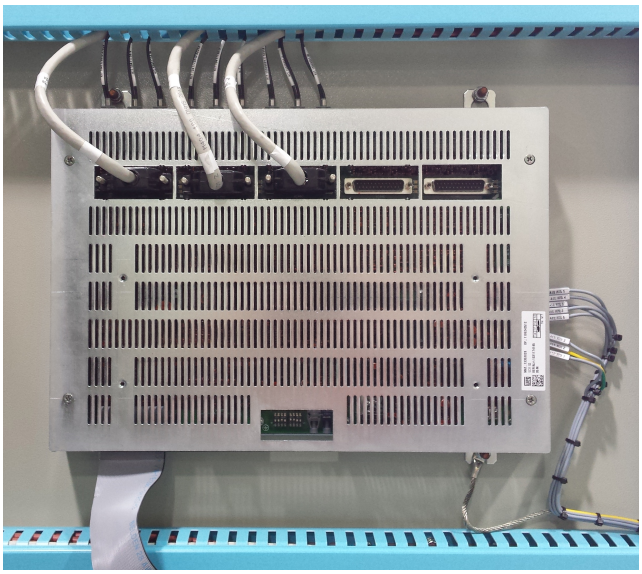


Figure 3.36: *ICUP shield fastened to the panel*

The control rack must be grounded using a flat flexible braid with minimum width of 5 mm and minimum cross section of 3 mm² with standard FASTON terminal 6.35 mm (E.g.: TYCO 735075-0 and 180363-2) and lug terminal M4; see Figure 3.37 on page 3-34.

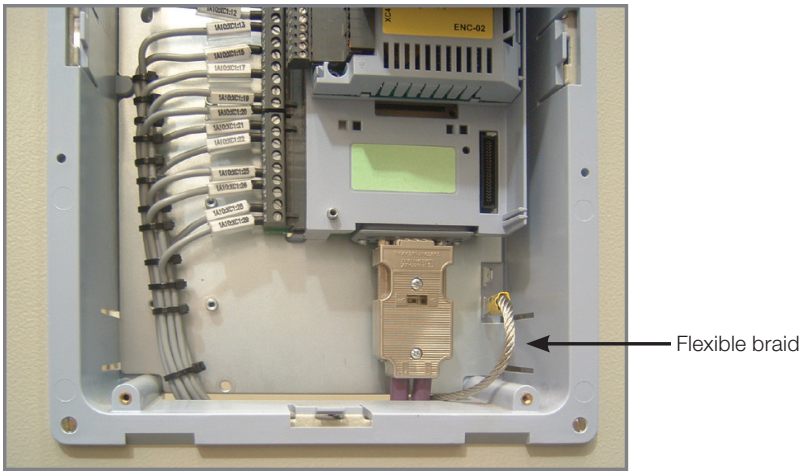


Figure 3.37: *Control rack grounding*

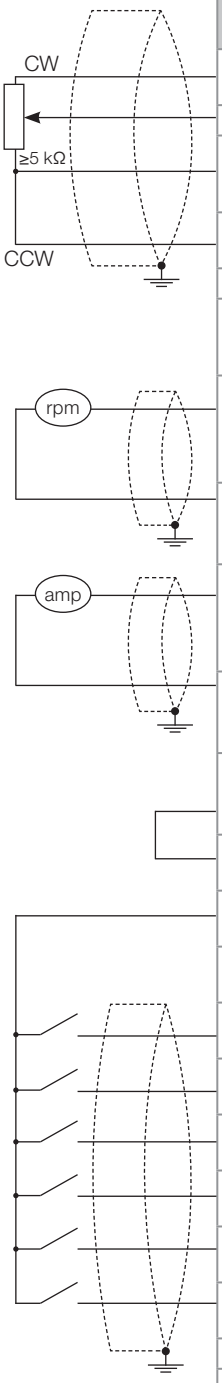
The panel door must be grounded with a braided ground strap.

Figure 3.38: *Panel door grounding*

3.2.12.3 CC11 Connections

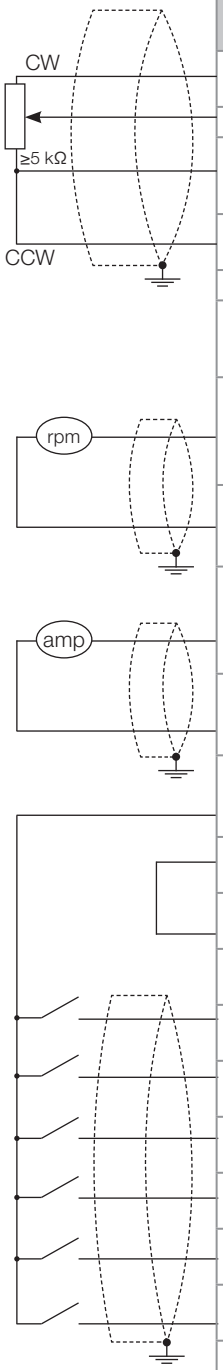
The control connections (analog inputs/outputs, digital inputs/outputs), must be made at the CC11 control board terminal strip XC1.

Functions and typical connections are presented in Figure 3.39 on page 3-35 and Figure 3.40 on page 3-36.



XC1 Terminal Strip		Factory Setting Function	Specifications
1	REF+	Positive reference for potentiometer	Output voltage: +5.4 V, ±5 % Maximum output current: 2 mA
2	AI1+	Analog input # 1: speed reference (remote)	Differential Resolution: 12 bits Signal: 0 to 10 V (RIN = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (RIN = 500 Ω) Maximum voltage: ±30 V
3	AI1-		
4	REF-	Negative reference for potentiometer	Output voltage: -4.7 V, ±5 % Maximum output current: 2 mA
5	AI2+	Analog input # 2: no function	Differential Resolution: 11 bits + signal Signal: 0 to ±10 V (RIN = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (RIN = 500 Ω) Maximum voltage: ±30 V
6	AI2-		
7	AO1	Analog output # 1: speed	Galvanic isolation Resolution: 11 bits Signal: 0 to 10 V (RL ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (RL ≤ 500 Ω) Protected against short-circuit
8	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of DGND *
9	AO2	Analog output # 2: motor current	Galvanic isolation Resolution: 11 bits Signal: 0 to 10 V (RL ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (RL ≤ 500 Ω) Protected against short-circuit
10	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of DGND *
11	DGND*	Reference (0 V) for the 24 Vdc power supply	Connected to the ground (frame) through an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of AGND (24 V)
12	COM	Common point of the digital inputs	
13	24 Vdc	24 Vdc power supply	24 Vdc power supply, ±8 % Capacity: 500 mA
14	COM	Common point of the digital inputs	
15	DI1	Digital input # 1: Start/Stop	6 isolated digital inputs High level ≥ 18 V Low level ≤ 3 V Input voltage ≤ 30 V Input current: 11 mA @ 24 Vdc
16	DI2	Digital input # 2: direction of rotation (remote)	
17	DI3	Digital input # 3: no function	
18	DI4	Digital input # 4: no function	
19	DI5	Digital input # 5: Jog (remote)	
20	DI6	Digital input # 6: 2nd ramp	
21	NF1	Digital output #1 DO1 (RL1): no fault	Contact rating: Maximum voltage: 240 Vac Maximum current: 1 A NC - normally closed contact C - common NO - normally open contact
22	C1		
23	NA1		
24	NF2	Digital output #2 DO2 (RL2): N > NX - speed > P0288	
25	C2		
26	NA2		
27	NF3	Digital output #3 DO3 (RL3): N* > NX - speed reference > P0288	
28	C3		
29	NA3		

Figure 3.39: *Signals of connector XC1 - Digital inputs as active high*



XC1 Terminal Strip		Factory Setting Function	Specifications
1	REF+	Positive reference for potentiometer	Output voltage: +5.4 V, ±5 % Maximum output current: 2 mA
2	AI1+	Analog input # 1: speed reference (remote)	Differential Resolution: 12 bits Signal: 0 to 10 V (RIN = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (RIN = 500 Ω) Maximum voltage: ±30 V
3	AI1-		
4	REF-	Negative reference for potentiometer	Output voltage: -4.7 V, ±5 % Maximum output current: 2 mA
5	AI2+	Analog input # 2: no function	Differential Resolution: 11 bits + signal Signal: 0 to ±10 V (RIN = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (RIN = 500 Ω) Maximum voltage: ±30 V
6	AI2-		
7	AO1	Analog output # 1: speed	Galvanic isolation Resolution: 11 bits Signal: 0 to 10 V (RL ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (RL ≤ 500 Ω) Protected against short-circuit
8	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of DGND *
9	AO2	Analog output # 2: motor current	Galvanic isolation Resolution: 11 bits. Signal: 0 to 10 V (RL ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (RL ≤ 500 Ω). Protected against short-circuit.
10	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of DGND *
11	DGND*	Reference (0 V) for the 24 Vdc power supply	Connected to the ground (frame) through an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of AGND (24 V)
12	COM	Common point of the digital inputs	
13	24 Vdc	24 Vdc power supply	24 Vdc power supply, ±8 % Capacity: 500 mA
14	COM	Common point of the digital inputs	
15	DI1	Digital input # 1: Start/Stop	6 isolated digital inputs High level ≥ 18 V Low level ≤ 3 V Input voltage ≤ 30 V Input current: 11 mA @ 24 Vdc
16	DI2	Digital input # 2: direction of rotation (remote)	
17	DI3	Digital input # 3: no function	
18	DI4	Digital input # 4: no function	
19	DI5	Digital input # 5: Jog (remote)	
20	DI6	Digital input # 6: 2nd ramp	
21	NF1	Digital output #1 DO1 (RL1): no fault	Contact rating: Maximum voltage: 240 Vac Maximum current: 1 A NC - normally closed contact C - common NO - normally open contact
22	C1		
23	NA1		
24	NF2	Digital output #2 DO2 (RL2): N > NX - speed > P0288	
25	C2		
26	NA2		
27	NF3	Digital output #3 DO3 (RL3): N* > NX - speed reference > P0288	
28	C3		
29	NA3		

Figure 3.40: *Signals of connector XC1 - Digital inputs as active low*

NOTE!
In order to use the digital inputs as active low, it is necessary to remove the jumper between XC1: 11 and 12 and change it to XC1:12 and 13.

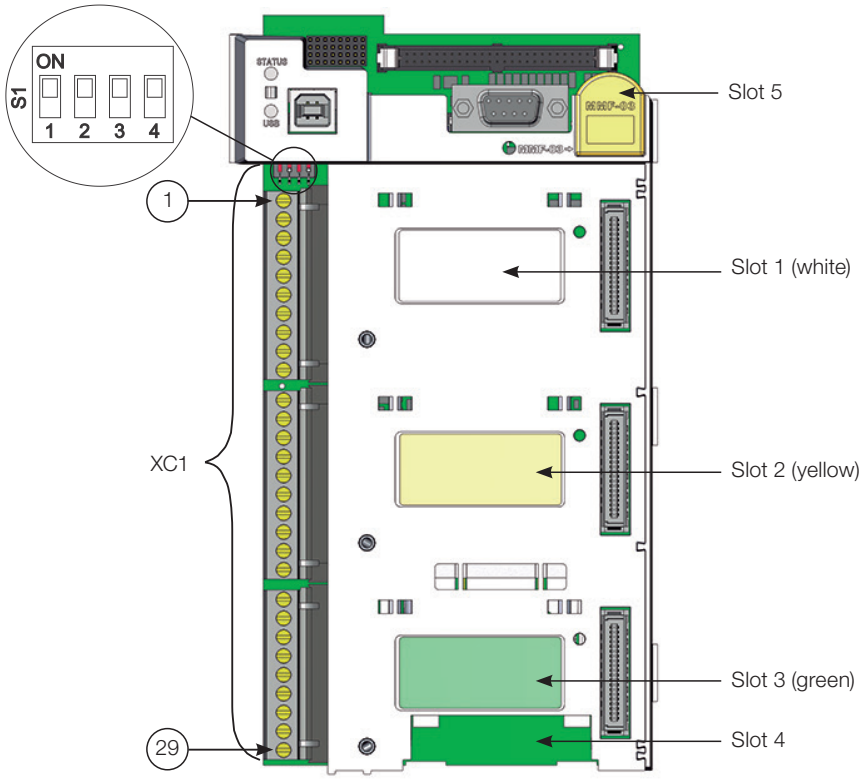


Figure 3.41: *Connector XC1 and switches to select the signal type of the analog inputs and outputs*

As the factory setting, the analog inputs and outputs are adjusted to operate in the 0 to 10 V range, but they can be changed by using the S1 DIP-switch.

Table 3.20: *Configurations of the switches to select the signal type of the analog inputs and outputs*

Signal	Factory Setting Function	DIP-Switch	Selection	Factory Setting
AI1	Speed Reference (remote)	S1.4	OFF: 0 to 10 V (factory setting) ON: 4 to 20 mA / 0 to 20 mA	OFF
AI2	No function	S1.3	OFF: 0 to ±10 V (factory setting) ON: 4 to 20 mA / 0 to 20 mA	OFF
AO1	Speed	S1.1	OFF: 4 to 20 mA / 0 to 20 mA ON: 0 to 10 V (factory setting)	ON
AO2	Motor Current	S1.2	OFF: 4 to 20 mA / 0 to 20 mA ON: 0 to 10 V (factory setting)	ON

Parameters related to the analog inputs and outputs (AI1, AI2, AO1, and AO2) must be programmed according to the DIP-switches settings and desired values.

Follow instructions below for the proper installation of the control wiring:

1. Wire gauge: 0.5 mm² (20 AWG) to 1.5 mm² (14 AWG).

2. Maximum tightening torque: 0.5 N.m (4.50 lbf.in).

3. Use shielded cables for the connections at XC1 and run the cables separated from the remaining circuits (power, 110 V/220 Vac control, etc.), as presented in Table 3.20 on page 3-37. If control cables must cross other cables, it must be done perpendicularly among them, keeping a minimum of 5 cm (1.9 in) distance at the crossing point.

Table 3.21: *Minimum separation distances between wiring*

Wiring Length	Minimum Separation Distance
≤ 30 m (100 ft)	≥ 10 cm (3.94 in)
> 30 m (100 ft)	≥ 25 cm (9.84 in)

The correct connection of the cable shield is shown in Figure 3.43 on page 3-38.

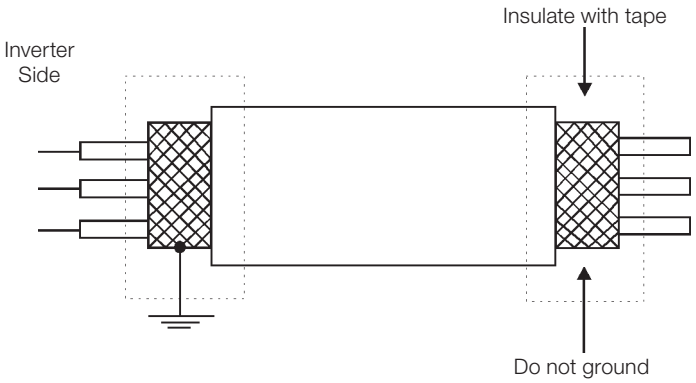


Figure 3.42: *Conexão da blindagem*

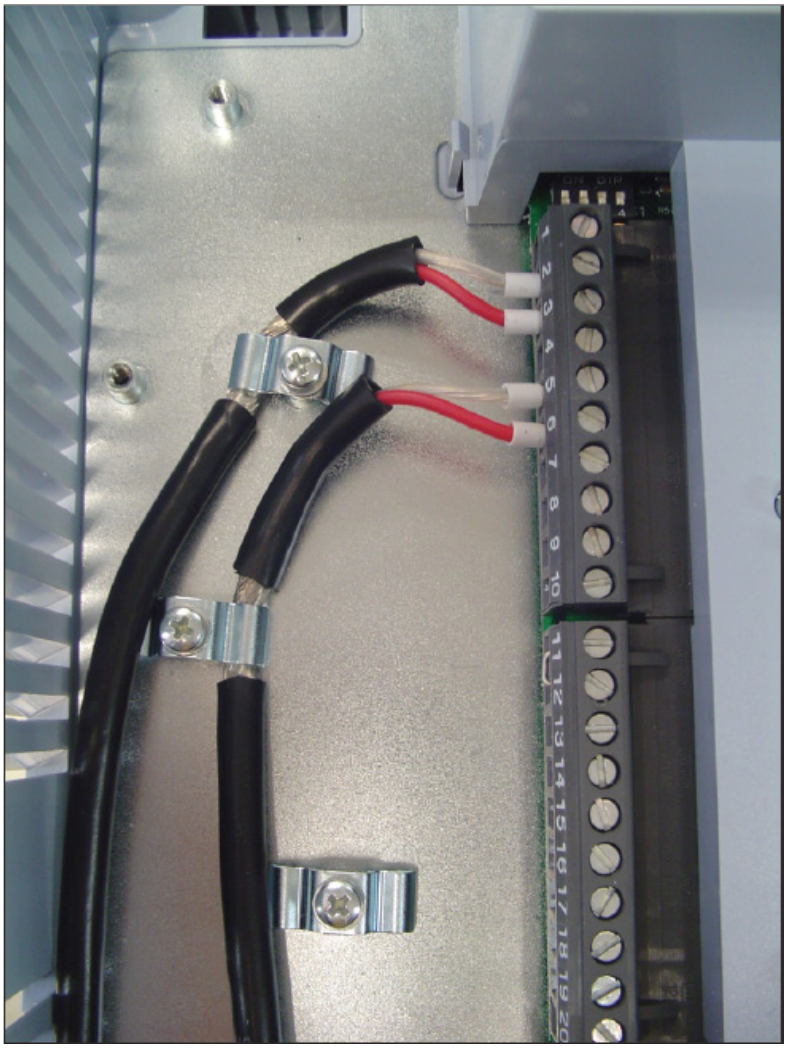


Figure 3.43: *Example of shield connection for the control wiring*

4. Relays, contactors, solenoids or coils of electromechanical brakes installed close to the inverter may eventually create interferences in the control circuit. To eliminate this effect, RC suppressors (with AC power supply) or free-wheel diodes (with DC power supply) shall be connected in parallel to the coils of these devices.

3.2.12.4 Typical Control Connections

Control connection 1 - Run/Stop function controlled from the keypad (Local Mode).

With this control connection it is possible to run the inverter in local mode with the factory default settings. This operation mode is recommended for first-time users, since no additional control connections are required.

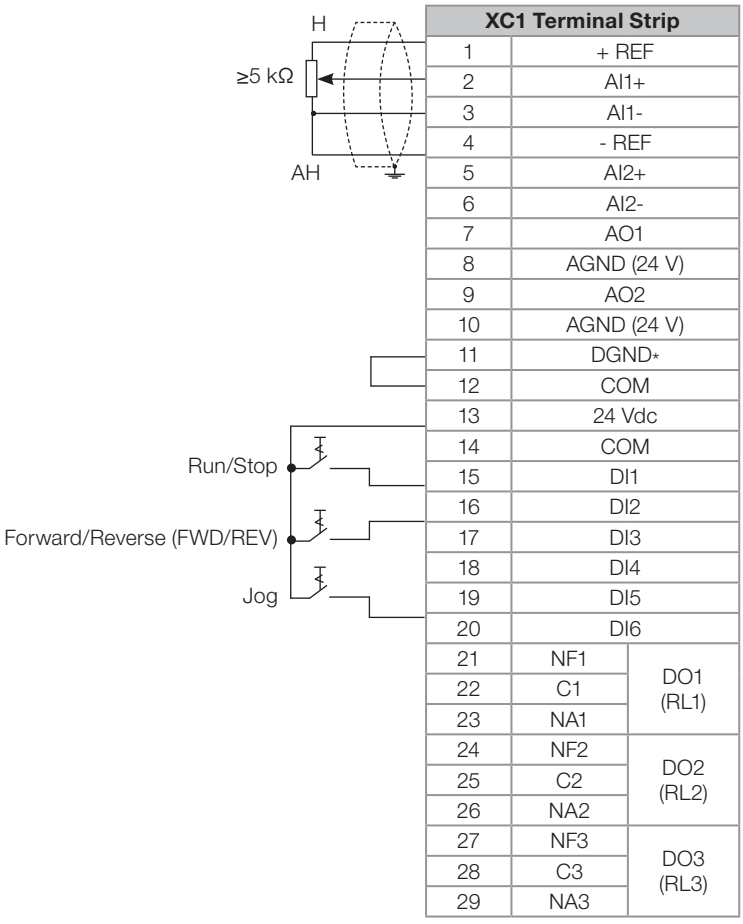
For the start-up in this operation mode, please follow instructions listed in Chapter 5 FIRST TIME POWER-UP AND START-UP on page 5-1.

Control connection 2 - Wire Run/Stop function (Remote Mode).

This wiring example is valid only for the default factory settings and if the inverter is set to remote mode.

With the factory default settings, the selection of the operation mode (local/remote) is performed through the HMI key LOC REM to remote mode (local mode is default).

Set P0220 = 3 to change the default setting of operator key LOC REM to remote mode.



XC1 Terminal Strip		
1	+ REF	
2	AI1+	
3	AI1-	
4	- REF	
5	AI2+	
6	AI2-	
7	AO1	
8	AGND (24 V)	
9	AO2	
10	AGND (24 V)	
11	DGND*	
12	COM	
13	24 Vdc	
14	COM	
15	DI1	
16	DI2	
17	DI3	
18	DI4	
19	DI5	
20	DI6	
21	NF1	DO1 (RL1)
22	C1	
23	NA1	
24	NF2	DO2 (RL2)
25	C2	
26	NA2	
27	NF3	DO3 (RL3)
28	C3	
29	NA3	

Figure 3.44: *XC1 wiring for Control Connection #2*

Control connection 3 - Wire Run/Stop function.

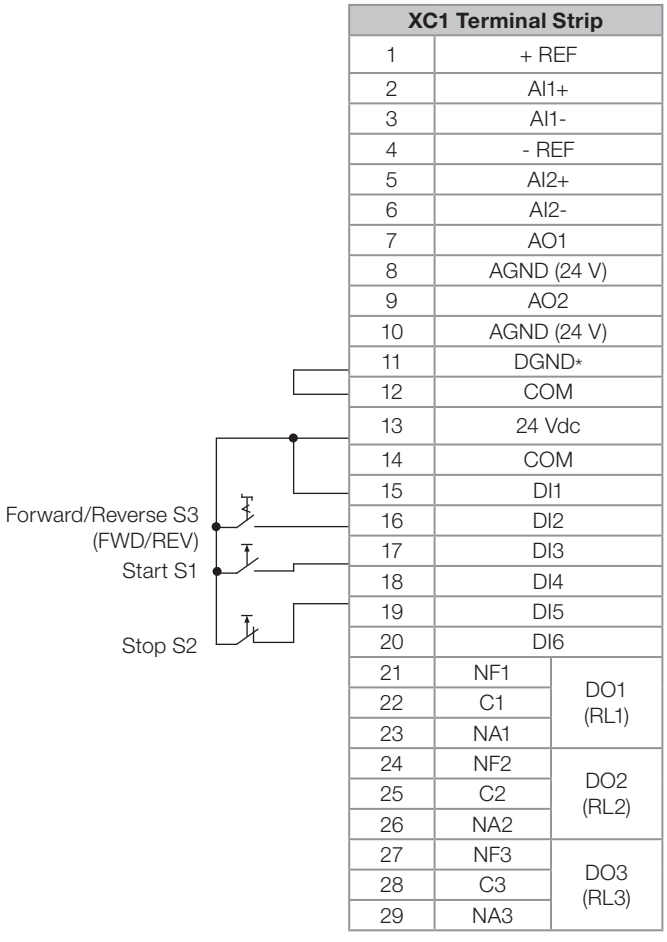
Enabling the Run/Stop function with 3-wire control.

Parameters to be set:

- Set DI3 to START.
- P0265 = 6.
- Set DI4 to STOP.
- P0266 = 7.
- Set P0224 = 1 (DIx) for 3-wire control in Local mode.
- Set P0227 = 1 (DIx) for 3-wire control in Remote mode.
- Set the Forward/Reverse selection by using digital input # 2 (DI2).
- Set P0223 = 4 for Local Mode or P0226 = 4 for Remote Mode.

S1 and S2 are Start (NO contact) and Stop (NC contact) pushbuttons respectively.

The speed reference can be provided through the analog input (as in control connection # 2), through the keypad (as in control connection # 1) or through other available source.



XC1 Terminal Strip		
1	+ REF	
2	AI1+	
3	AI1-	
4	- REF	
5	AI2+	
6	AI2-	
7	AO1	
8	AGND (24 V)	
9	AO2	
10	AGND (24 V)	
11	DGND*	
12	COM	
13	24 Vdc	
14	COM	
15	DI1	
16	DI2	
17	DI3	
18	DI4	
19	DI5	
20	DI6	
21	NF1	DO1 (RL1)
22	C1	
23	NA1	
24	NF2	DO2 (RL2)
25	C2	
26	NA2	
27	NF3	DO3 (RL3)
28	C3	
29	NA3	

Figure 3.45: *XC1 wiring for control connection # 3*

Control connection 4 - Forward/Reverse.

Enabling the Forward/Reverse function.

Parameters to be set:

- Set DI3 to Forward run.
- P0265 = 4.
- Set DI4 to Reverse run.
- P0266 = 5.

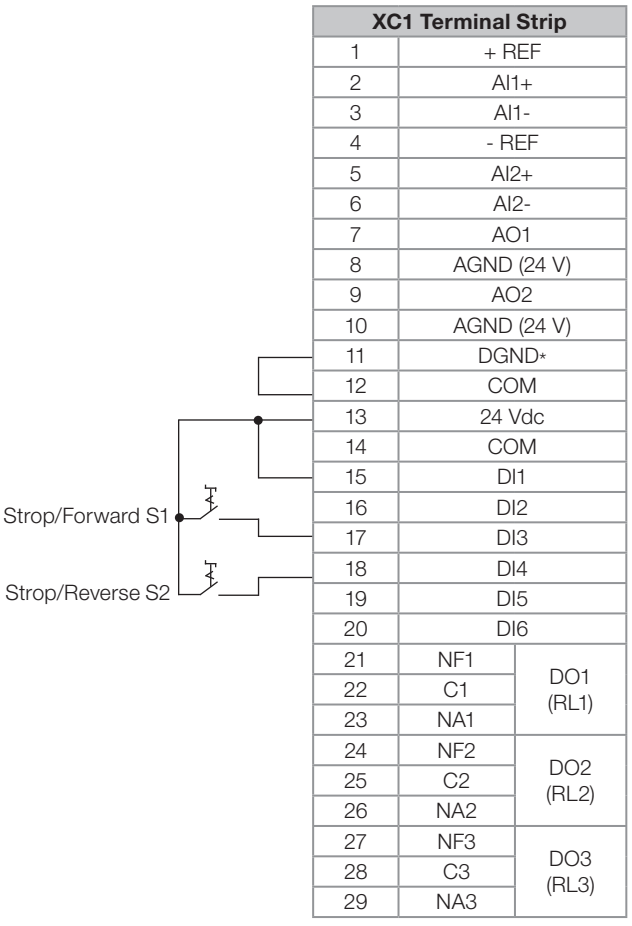
When the Forward/Reverse function is set, it will be active either in Local or Remote mode.

At the same time, the HMI keys O and I will remain always inactive (even if P0224 = 0 or P0227 = 0).

The direction of rotation is determined by the Forward run and Reverse run inputs.

Clockwise direction for Forward run and counterclockwise for Reverse run.

The speed reference can be provided by any source (as in the control connection # 3).



XC1 Terminal Strip		
1	+ REF	
2	AI1+	
3	AI1-	
4	- REF	
5	AI2+	
6	AI2-	
7	AO1	
8	AGND (24 V)	
9	AO2	
10	AGND (24 V)	
11	DGND*	
12	COM	
13	24 Vdc	
14	COM	
15	DI1	
16	DI2	
17	DI3	
18	DI4	
19	DI5	
20	DI6	
21	NF1	DO1 (RL1)
22	C1	
23	NA1	
24	NF2	DO2 (RL2)
25	C2	
26	NA2	
27	NF3	DO3 (RL3)
28	C3	
29	NA3	

Figure 3.46: *XC1 wiring for control connection # 4*

3.3 SAFETY STOP FUNCTION

The CFW11WG2...O...Y... inverters have the SRBXX board that implements the STO (Safe Torque Off) Safety Stop function. For detailed information, refer to the Safety Stop Function Installation, Configuration and Operation Guide.

3.4 INSTALLATIONS ACCORDING TO THE EUROPEAN ELECTROMAGNETIC COMPATIBILITY DIRECTIVE

The CFW-11M G2 inverters, when correctly installed, meet the requirements of the EMC Directive 2014/30/EU.

The CFW-11M G2 inverter series has been designed only for industrial applications. Therefore, the emission limits of harmonic currents defined by the standards IEC/EN 61000-3-2 and IEC/EN 61000-3-12 are not applicable.

3.4.1 Conformal Installation

For conformal installation use:

- Standard CFW-11M G2 inverter for emission levels according to IEC/EN61800-3 “Adjustable Speed Electrical Power Drive Systems”, category C4.
- Shielded output cables (motor cables) with the shield connected at both ends, motor and inverter, with low-impedance connection for high frequency. Keep the separation from the other cables according to Table 3.20 on page 3-37.
- Shielded control cables, keeping the separation distance from other cables according to Item 3.2.12.3 CC11 Connections on page 3-35.
- Grounding of the inverter according to instructions of Item 3.2.8 Grounding Connections on page 3-25.

3.4.2 Definition of the Standards

IEC/EN 61800-3: “Adjustable Speed Electrical Power Drives Systems”.

Environments:

First Environment: includes residential premises. It also includes establishments directly connected without intermediate transformer to a low-voltage power supply network which supplies buildings used for residential purposes.

Example: houses, apartments, commercial installations, or offices located in residential buildings.

Second Environment: includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes.

Example: industrial area, technical area of any building supplied by a dedicated transformer.

Categories:

Category C1: inverters with a voltage rating less than 1000 V and intended for use in the First Environment.

Category C2: inverters with a voltage rating less than 1000 V, intended for use in the First Environment, not provided with a plug connector or a movable installations, and installed and commissioned by a professional.

Note: a professional is a person or organization familiar with the installation and/or commissioning of inverters, including the EMC aspects.

Category C3: inverters with a voltage rating less than 1000 V and intended for use in the Second Environment only (not designed for use in the First Environment).

Category C4: inverters with a voltage rating equal to or greater than 1000 V, or with a current rating equal to or greater than 400 Amps, or intended for use in complex systems in the Second Environment.

3.4.3 Emission and Immunity Levels Met

Table 3.22: Emission and immunity levels met

EMC Phenomenon	Basic Standard	Level
Emission		
Mains Terminal Disturbance Voltage Frequency Range: 150 kHz to 30 MHz	IEC/EN61800-3	Refer to Table 3.23 on page 3-43
Electromagnetic Radiation Disturbance Frequency Range: 30 kHz to 1 GHz		
Immunity:		
Electrostatic Discharge (ESD)	IEC/EN61000-4-2	4 kV for contact discharge and 8 kV for air discharge
Fast Transient-Burst	IEC/EN61000-4-4	2 kV / 5 kHz (coupling capacitor) power input cables 1 kV / 5 kHz control cables, and remote keypad cables 2 kV / 5 kHz (coupling capacitor) motor output cables
Conducted Radio-Frequency Common Mode	IEC/EN61000-4-6	0.15 to 80 MHz; 10 V; 80 % AM (1 kHz) Motor cables, control cables, and remote keypad cables
Surges	IEC/EN61000-4-5	1.2/50 µs, 8/20 µs 1 kV line-to-line coupling 2 kV line-to-ground coupling
Radio-Frequency Electromagnetic Field	IEC/EN61000-4-3	80 to 1000 MHz 10 V/m 80 % AM (1 kHz)

Table 3.23: Conducted and radiated emission levels

Inverter Model	Conducted Emission - Maximum Length Motor Cable	Radiated Emission
	Category C3	Category
CFW11M 0634 T 4	100 m	C4
CFW11M 1205 T 4	100 m	C4
CFW11M 1807 T 4	100 m	C4
CFW11M 2409 T 4	100 m	C4
CFW11M 3012 T 4	100 m	C4
CFW11M 0496 T 6	100 m	C4
CFW11M 0942 T 6	100 m	C4
CFW11M 1414 T 6	100 m	C4
CFW11M 1885 T 6	100 m	C4
CFW11M 2356 T 6	100 m	C4
CFW11M 0496 T 6	100 m	C4
CFW11M 0942 T 6	100 m	C4
CFW11M 1414 T 6	100 m	C4
CFW11M 1885 T 6	100 m	C4
CFW11M 2356 T 6	100 m	C4

4 HMI

This chapter contains the following information:

- HMI keys and functions.
- Indications on the display.
- Parameter structure.

4.1 INTEGRAL KEYPAD - HMI-CFW11M G2

The integral keypad can be used to operate and program (view/edit all parameters) of the CFW-11 inverter. The inverter keypad navigation is similar to the one used in cell phones and the parameters can be accessed in numerical order or through groups (Menu).

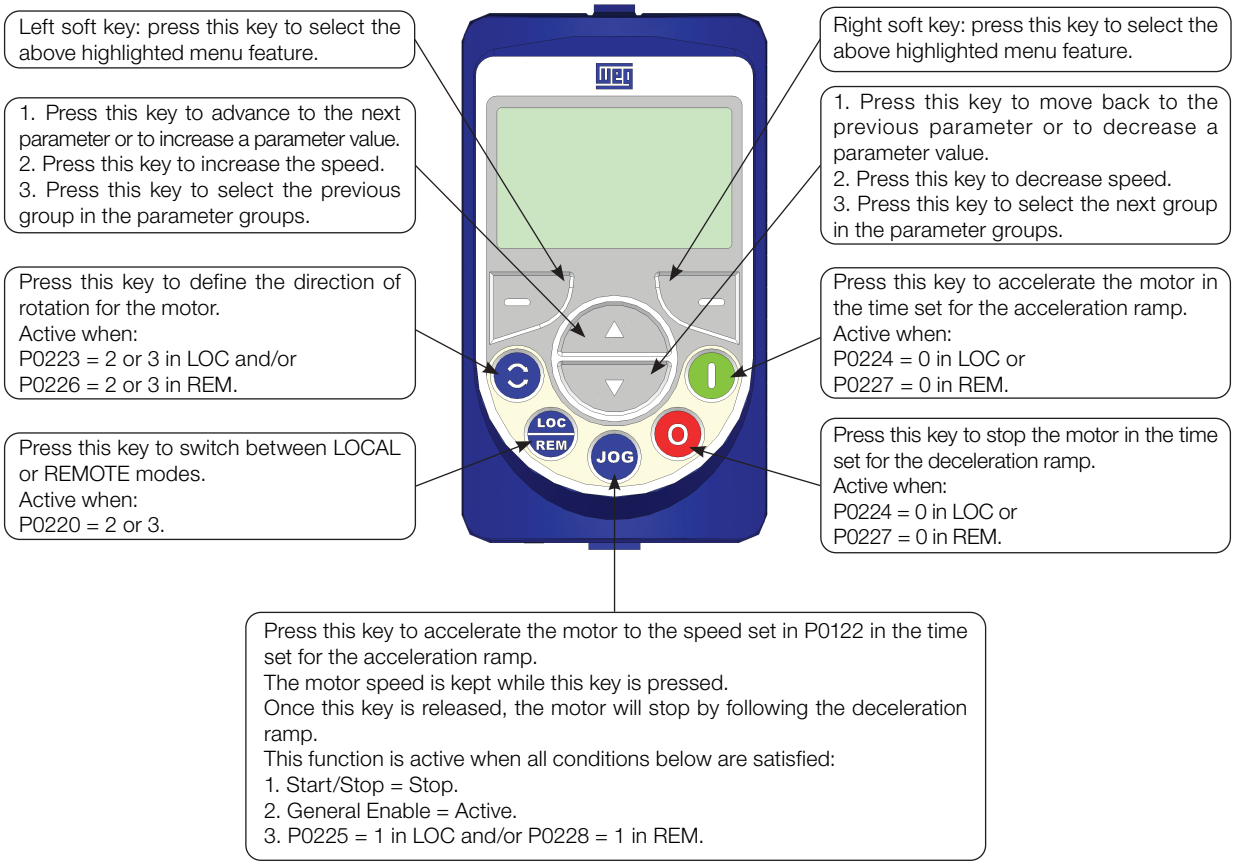


Figure 4.1: *HMI Keys*

Battery:

> **NOTE!**
> The battery is necessary only to keep the internal clock operation when the inverter stays without power. If the battery is completely discharged or if it is not installed in the keypad, the displayed clock time will be invalid and an alarm condition "A181 - Invalid clock time", will be indicated whenever the AC power is applied to the inverter.

The life expectation of the battery is of approximately 10 years. Replace the battery, when necessary, by a CR2032 battery.

1

Cover for battery access

2

Press the cover and rotate it counterclockwise

3

Remove the cover

4

Remove the battery with the help of a screwdriver positioned in the right side

5

HMI without the battery

6

Install the new battery positioning it first at the left side

7

Press the battery for its insertion

8

Put the cover back and rotate it clockwise

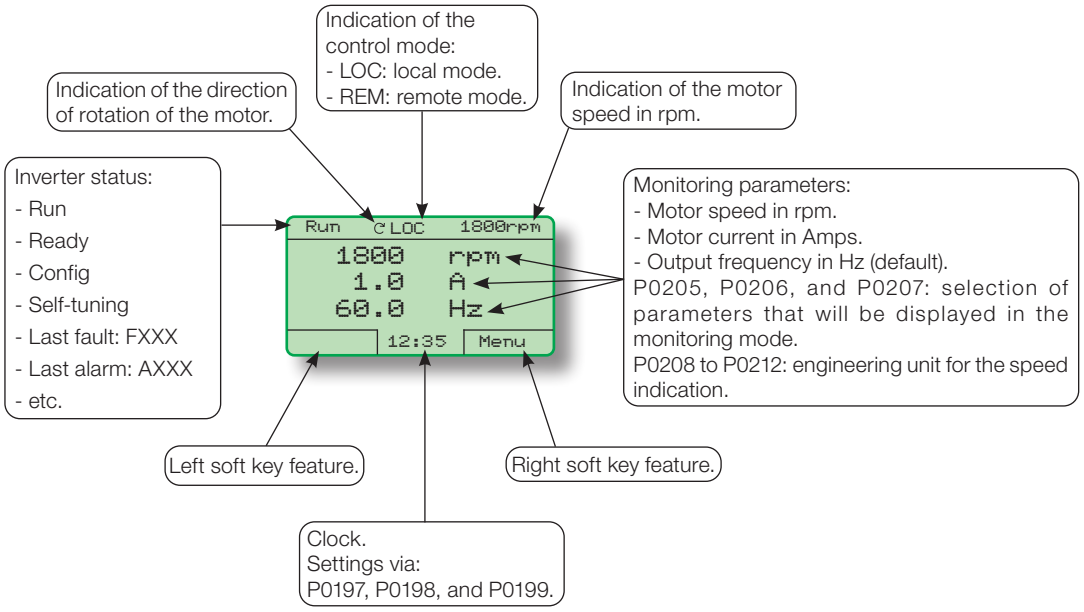
Figure 4.2: *HMI battery replacement*

NOTE!
At the end of the battery useful life, please do not discard batteries in your waste container, but use a battery disposal site.

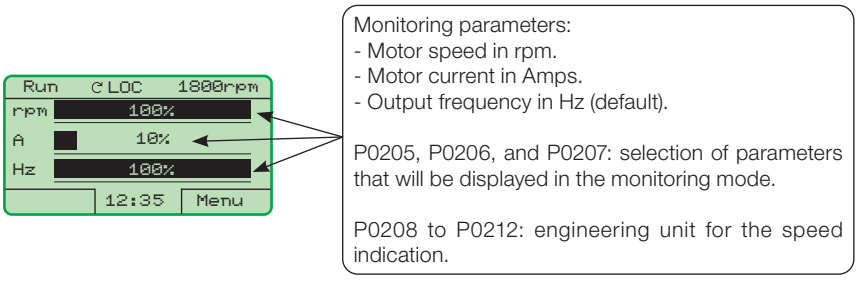
Installation:

The keypad can be installed or removed from the inverter with or without AC power applied to the inverter.

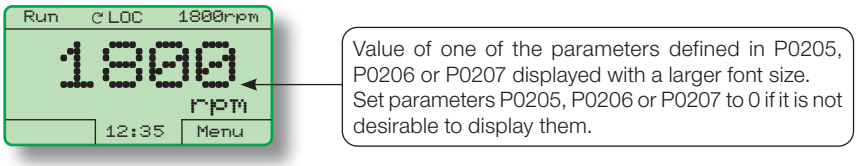
Whenever the inverter is energized, the display goes to the monitoring mode. For the factory setting, a screen similar to Figure 4.3 on page 4-3 (a) will be shown. By setting proper parameters, other variables can be shown in the monitoring mode or the content of the parameters can be presented as bar graphs or larger characters as shown in Figure 4.3 on page 4-3 (b) and (c).



(a) Monitoring screen with the factory default settings



(b) Example of a monitoring screen with bar ghaphs



(c) Example of a monitoring screen displaying a parameter with a larger font size

Figure 4.3: *(a) to (c) Keypad monitoring modes*

4.2 PARAMETER STRUCTURE

When the right soft key ("MENU") is pressed in the monitoring mode, the display shows the first 4 groups of parameters. An example of how the groups of parameters are organized is presented in Table 4.1 on page 4-4. The number and name of the groups may change depending on the firmware version used. For further details on the existent groups for the firmware version used, please refer to the programming manual.

Table 4.1: *Parameter groups*

Level 0	Level 1		Level 2		Level 3	
Monitoring	00	ALL PARAMETERS				
	01	PARAMETER GROUPS	20	Ramps		
			21	Speed Reference		
			22	Speed Limits		
			23	V/f Control		
			24	Adjustable V/F Curve		
			25	VVW Control		
			26	V/f Current Limit		
			27	V/f DC Link Limit		
			28	Dynamic Braking		
			29	Vector Control	90	Speed Regulator
					91	Current Regulator
					92	Flux Regulator
					93	I/F Control
					94	Self-Tuning
					95	Torque Curr. Lim.
					96	DC Link Regulator
			30	HMI		
			31	Local Command		
			32	Remote Command		
			33	3-Wire Command		
			34	Forward/Reverse Command		
			35	Stop Logic		
			36	Multispeed		
			37	Electronic Potent.		
			38	Analog Inputs		
			39	Analog Outputs		
			40	Digital Inputs		
			41	Digital Outputs		
			42	Inverter Data		
			43	Motor Data		
			44	FlyStart/RideThru		
			45	Protections		
			46	PID Controller		
			47	DC Braking		
			48	Skip Speed		
			49	Communication	110	Local/Rem Config.
					111	Status/Commands
					112	CANopen/DeviceNet
					113	RS232/485 Serial
					114	Anybus
					115	Profibus DP
			50	SoftPLC		
			51	PLC		
			52	Trace Function		
	02	ORIENTED START-UP				
	03	CHANGED PARAM.				
	04	BASIC APPLICATION				
	05	SELF-TUNING				
	06	BACKUP PARAMETERS				
	07	I/O CONFIGURATION	38	Analog Inputs		
			39	Analog Outputs		
			40	Digital Inputs		
			41	Digital Outputs		
	08	FAULT HISTORY				
	09	READ ONLY PARAMETERS				

5 FIRST TIME POWER-UP AND START-UP

This chapter explains:

- Check and prepare the inverter before power-up.
- Power-up the inverter and check the result.
- Set the inverter for the operation in the V/f mode based on the power supply and motor information by using the Oriented Start-up routine and the Basic Application group.

NOTE!
For a detailed description of the VVW or Vector control modes and for other available functions, please refer to the CFW-11 programming manual.

5.1 PREPARE FOR START-UP

The inverter must have already been installed according to Chapter 3 INSTALLATION AND CONNECTION on page 3-1. If the drive project is different from the typical drives suggested, the steps below may also be followed.

DANGER!
Always disconnect the main power supply before performing any inverter connection.

DANGER!
Débranchez toujours l'alimentation principale avant d'effectuer une connexion sur le variateur.

1. Configure DIP switch S1 located on the ICUP board, according to the rated voltage of the UP11 G2 used on the drive, Table 3.15 on page 3-31.
2. Configure the number of UP11 G2 connected in parallel through the DIP switch S2 located on the ICUP board, according to Table 3.17 on page 3-32.
3. Check if the power, grounding and control connections are correct and firm.
4. Remove all the material rests from the inverter or panel interior.
5. Verify the motor connections and if the motor voltage and current are within the inverter rated value.
6. Energize the control (supply +24 Vdc).
7. Close the panel doors.
8. The HMI must indicate undervoltage with the electronics energized and the power units de-energized. Parameter P0004 (Voltage on the DC Link) will indicate approximately 15 Vdc.
9. Measure the line voltage making sure it is inside the permitted range according to Chapter 8 TECHNICAL SPECIFICATIONS on page 8-1.
10. Verify if the automatic hardware identification recognized the current of the CFW-11M G2 inverter properly, parameter P0295. The inverter current must be compatible with the number of power units installed.
11. Set parameter P0296 according to the rated voltage of the input line.

12. Mechanically uncouple the motor from the load.
    If the motor cannot be uncoupled, make sure that the chosen direction of rotation (forward or reverse) will not result in personnel injury and/or equipment damage.

13. Command the drive, perform the DC link pre-charge and close the main contactor/circuit breaker.

14. Check the success of the energization.

15. The display must show the standard monitoring screen (Figure 4.3 on page 4-3 (a)), the status LED must turn on and remain on in green.

5.2 START-UP

The start-up in the V/f mode is simply explained in three steps, using the programming facilities with the existing parameter groups **Oriented Start-Up** and **Basic Application**.

Sequence:

5

1. Set the password to change parameters.

2. Execute the **Oriented Start-up** routine.

3. Set the parameters of the **Basic Application** group.

5.2.1 Password Setting in P0000

Step	Action/Result	Display Indication
1	■ Monitoring mode ■ Press **"Menu"** (rigth soft key)	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 15:45 Menu
2	■ Group **"00 ALL PARAMETERS"** is already selected ■ Press **"Select"**	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETERS GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 15:45 Select
3	■ Parameter **"Access to Parameters P0000: 0"** is already selected ■ Press **"Select"**	Ready LOC 0rpm Acess to Parameters P0000: 0 Speed Reference P0001: 90 rpm Return 15:45 Select
4	■ To set the password, press the Up Arrow until number **5** is displayed in the keypad	Ready LOC 0rpm P0000 Acess to Parameters 0 Return 15:45 Save

Step	Action/Result	Display Indication
5	■ When number **5** is displayed in the keypad, press **"Save"**	Ready LOC 0rpm P0000 Acess to Parameters 5 Return 15:45 Save
6	■ If the setting has been properly performed, the keypad should display **"Access to Parameters P0000: 5"** ■ Press **"Return"** (left soft key)	Ready LOC 0rpm Acess to Parameters P0000: 5 Speed Reference P0001: 90 rpm Return 15:45 Select
7	■ Press **"Return"**	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETERS GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 15:45 Select
8	■ The display returns to the monitoring mode	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 15:45 Menu

Figure 5.1: *Steps for allowing parameters modification via P0000*

5.2.2 Oriented Start-up

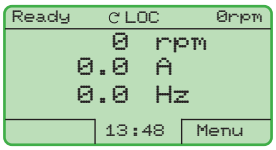
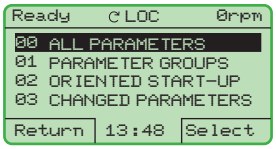
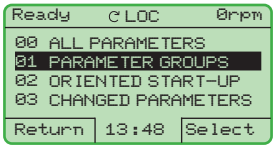
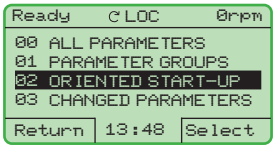
There is a group of parameters named ”Oriented Start-up” that makes the inverter settings easier. Inside this group, there is a parameter – P0317 – that shall be set to enter into the Oriented Start-up routine.

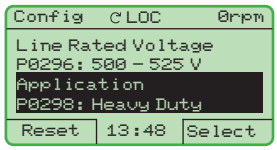
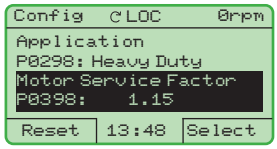
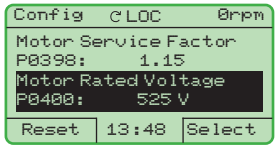
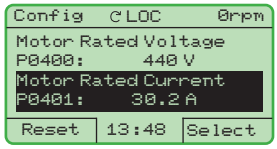
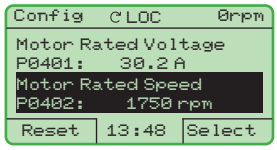
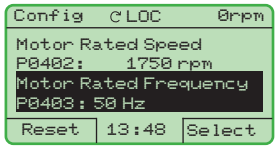
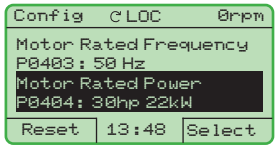
The Oriented Start-up routine allows you to quickly set up the inverter for operation with the line and motor used. This routine prompts you for the most commonly used parameters in a logic sequence.

In order to enter into the Oriented Start-up routine, follow the steps presented in Figure 5.2 on page 5-4, first modifying parameter P0317 to 1 and then, setting all remaining parameters as they are prompted in the display.

The use of the Oriented Start-up routine for setting the inverter parameters may lead to the automatic modification of other internal parameters and/or variables of the inverter

During the Oriented Start-up routine, the message “Config” will be displayed at the left top corner of the keypad.

Step	Action/Result	Display Indication
1	- Monitoring mode - Press **"Menu"** (right soft key)	
2	- Group **"00 ALL PARAMETERS"** has been already selected	
3	- Group **"01 PARAMETER GROUPS"** is selected	
4	- Group **"02 ORIENTED START-UP"** is then selected - Press **"Select"**	
5	- Parameter **"Oriented Start-Up P0317: No"** has been already selected - Press **"Select"**	
6	- The value of **"P0317 = [000] No"** is displayed	
7	- The parameter value is modified to **"P0317 = [001] Yes"** - Press **"Save"**	

Step	Action/Result	Display Indication
11	- If needed, change the value of P0298 according to the inverter application. To do so, press **"Select"**. This modification will affect P0156, P0157, P0158, P0401, P0404 and P0410 (this last one only if P0202 = 0, 1, or 2 - V/f control). The time and the activation level of the overload protection will be affected as well	
12	- If needed, change the value of P0398 according to the motor service factor To do so, press **"Select"** This modification will affect the current value and the activation time of the motor overload function	
13	- If needed, change the value of P0400 according to the motor rated voltage To do so, press **"Select"** This modification adjusts the output voltage by a factor x = P0400/P0296	
14	- If needed, change the value of P0401 according to the motor rated current. To do so, press **"Select"**. This modification will affect P0156, P0157, P0158, and P0410	
15	- If needed, set P0402 according to the motor rated speed. To do so, press **"Select"**. This modification affects P0122 to P0131, P0133, P0134, P0135, P0182, P0208, P0288, and P0289	
16	- If needed, set P0403 according to the motor rated frequency. To do so, press **"Select"**. This modification affects P0402	
17	- If needed, change the value of P0404 according to the motor rated power To do so, press **"Select"** This modification affects P0410	

5

Step	Action/Result	Display Indication
8	- At this point the Oriented Start-up routine starts and the **"Config"** status is displayed at the top left corner of the keypad - The parameter "Language P0201: English" is already selected - If needed, change the language by pressing **"Select"**. Then, press ▲ or ▼ to scroll through the available options and press **"Save"** to select a different language	Config LOC 0rpm Language P0201: English Type of Control P0202: V/F 60 HZ Reset 13:48 Select
9	- If needed, change the value of P0202 according to the type of control. To do so, press **"Select"** - The settings listed here are valid only for P0202 = 0 (V/f 60 Hz) or P0202 = 1 (V/f 50 Hz). For other options (Adjustable V/f, VVW, or Vector modes), please refer to the programming manualulte o manual de programação	Config LOC 0rpm Language P0201: English Type of Control P0202: V/F 60 HZ Reset 13:48 Select
10	- If needed, change the value of P0296 according to the line rated voltage To do so, press **"Select"** This modification will affect P0151, P0153, P0185, P0321, P0322, P0323, and P0400	Config LOC 0rpm Type of Control P0202: V/F 50 HZ Line Rated Voltage P0296: 500 – 525 V Reset 13:48 Select

Step	Action/Result	Display Indication
18	- This parameter will only be visible if the encoder board ENC1 is installed in the inverter - If there is an encoder connected to the motor, set P0405 according to the encoder pulses number. To do so, press **"Select"**	Config LOC 0rpm Motor Rated Power P0404: 30 hp 22 kW Encoder Pulses Number P0405: 1024 ppr Reset 13:48 Select
19	- If needed, set P0406 according to the motor ventilation. To do so, press **"Select"** - To complete the Oriented Start-up routine, press **"Reset"** (left soft key) or O	Config LOC 0rpm Encoder Pulses Number P0405: 1024 ppr Motor Ventilation P0406: Self-vent. Reset 13:48 Select
20	- After few seconds, the display returns to the monitoring mode	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 13:48 Menu

Figure 5.2: *Oriented start-up*

5.2.3 Setting of the Basic Application Parameters

After running the Oriented Start-up routine and properly setting the parameters, the inverter is ready to operate in the V/f mode.

The inverter has a series of other parameters that allow its adaptation to different applications. This manual contains some basic parameters whose setting is necessary in most cases. In order to simplify this task, there is a group called Basic Application. To set the parameters contained in the Basic Application group, follow the sequence of Figure 5.6 on page 5-11. For further details, refer to the programming manual of the CFW-11.

After the setting of those parameters, the start-up in the V/f mode will be completed.

Step	Action/Result	Display Indication
1	- Monitoring mode - Press **"Menu"** (right soft key)	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 13:48 Menu
2	- Group **"00 ALL PARAMETERS"** has been already selected	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
3	- Group **"01 PARAMETER GROUPS"** is then selected	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
4	- Group **"02 ORIENTED START-UP"** is then selected	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
5	- Group **"03 CHANGED PARAMETERS"** is selected	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 15:45 Select
6	- Group **"04 BASIC APPLICATION"** is selected - Press **"Select"**	Ready LOC 0rpm 01 PARAMETERS GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS 04 BASIC APPLICATION Return 15:45 Select
7	- Parameter **"Acceleration Time P0100: 20.0 s"** has been already selected - If needed, set P0100 according to the desired acceleration time. To do so, press **"Select"** - Proceed similarly until all parameters of group **"04 BASIC APPLICATION"** have been set. When finished, press "Return" (left soft key)	Ready LOC 0rpm Acceleration Time P0100: 20.0 s Deceleration Time P0101: 20.0 s Return 15:45 Select
8	- Press **"Return"**	Ready LOC 0rpm 01 PARAMETERS GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS 04 BASIC APPLICATION Return 15:45 Select
9	- The display returns to the monitoring mode and the inverter is ready to run	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 15:45 Menu

Figure 5.3: *Setting of the basic application parameters*

Table 5.1: Parameters comprised in the basic application group

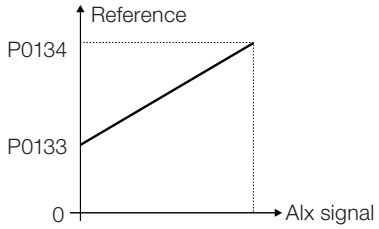
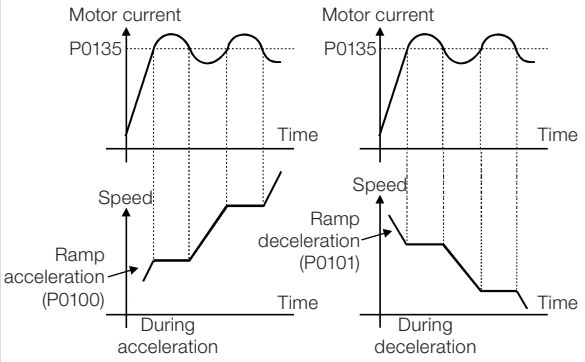
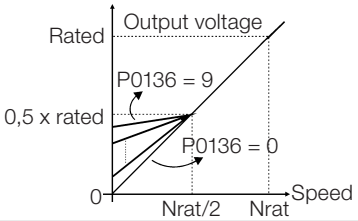
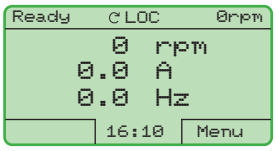
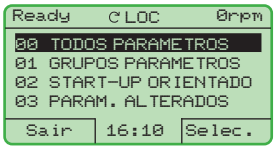
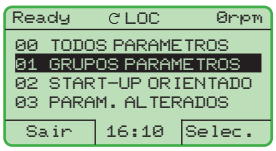
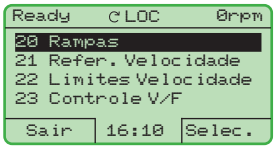
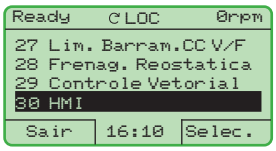
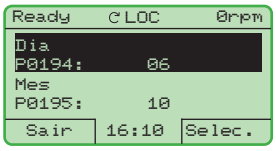
Parameter	Name	Description	Setting Range	Factory Setting	User Setting
P0100	Acceleration time	- Defines the time to linearly accelerate from 0 up to the maximum speed (P0134) - If set to 0.0 s, it means no acceleration ramp	0.0 to 999.0 s	20.0 s	
P0101	Deceleration time	- Defines the time to linearly decelerate from the maximum speed (P0134) up to 0 - If set to 0.0 s, it means no deceleration ramp	0.0 to 999.0 s	20.0 s	
P0133	Minimum speed	- Defines the minimum and maximum values of the speed reference when the drive is enabled - These values are valid for any reference source	0 to 18000 rpm	90 rpm (60 Hz motor) 75 rpm (50 Hz motor)	
P0134	Maximum speed	 0.....10 V 0.....20 mA 4 mA .....20 mA 10 V.....0 20 mA .....0 20 mA .....4 mA		1800 rpm (60 Hz motor) 1500 rpm (50 Hz motor)	
P0135	Max. output current	- Avoids motor stall under torque overload condition during the acceleration or deceleration - The factory default setting is for "Ramp Hold": if the motor current exceeds the value set at P0135 during the acceleration or deceleration, the motor speed will not be increased (acceleration) or decreased (deceleration) anymore. When the motor current reaches a value below the programmed in P0135, the motor speed is again increased or decreased - Other options for the current limitation are available. Refer to the CFW-11 programming manual 	0.2 x I_{nom-HD} a 2 x I_{nom-HD}	1.5 x I_{nom-HD}	
P0136	Manual torque Boost	- Operates in low speeds, modifying the output voltage x frequency curve to keep the torque constant - Compensates the voltage drop at the motor stator resistance. This function operates in low speeds increasing the inverter output voltage to keep the torque constant in the V/f mode - The optimal setting is the smallest value of P0136 that allows the motor to start satisfactorily. An excessive value will considerably increase the motor current in low speeds, and may result in a fault (F048, F051, F071, F072, F078 or F183) or alarm (A046, A047, A050 or A110) condition 	0 to 9	1	

Table 5.2: Main read only parameters

Parameter	Description	Setting Range
P0001	Speed Reference	0 to 18000 rpm
P0002	Motor Speed	0 to 18000 rpm
P0003	Motor Current	0.0 to 4500.0 A
P0004	DC Link Voltage (Ud)	0 to 2000 V
P0005	Motor Frequency	0.0 to 300.0 Hz
P0006	VFD Status	0 = Ready 1 = Run 2 = Undervoltage 3 = Fault 4 = Self-tuning 5 = Configuration 6 = DC-Braking 7 = STO
P0007	Motor Voltage	0 to 2000 V
P0009	Motor Torque	-1000.0 to 1000.0 %
P0010	Output Power	0.0 to 6553.5 kW
P0012	DI8 to DI1 Status	0000h to 00FFh
P0013	DO5 to DO1 Status	0000h to 001Fh
P0018	AI1 Value	-100.00 to 100.00 %
P0019	AI2 Value	-100.00 to 100.00 %
P0020	AI3 Value	-100.00 to 100.00 %
P0021	AI4 Value	-100.00 to 100.00 %
P0023	Software Version	0.00 to 655.35
P0027	Accessories Config. 1	Hexadecimal code representing the identified accessories. Refer to Chapter 7 ACCESSORIES on page 7-1
P0028	Accessories Config. 2	
P0029	Power Hardware Config.	Hexadecimal code according to the available models and option kits. Refer to the programming manual for a complete code list
P0030	IGBTs Temperature U	-20.0 to 150.0 °C (-4 °F to 302 °F)
P0031	IGBTs Temperature V	-20.0 to 150.0 °C (-4 °F to 302 °F)
P0032	IGBTs Temperature W	-20.0 to 150.0 °C (-4 °F to 302 °F)
P0033	Rectifier Temperature	-20.0 to 150.0 °C (-4 °F to 302 °F)
P0034	Internal Air Temp.	-20.0 to 150.0 °C (-4 °F to 302 °F)
P0036	Fan Heatsink Speed	0 to 15000 rpm
P0037	Motor Overload Status	0 to 100 %
P0038	Encoder Speed	0 to 65535 rpm
P0040	PID Process Variable	0.0 to 100.0 %
P0041	PID Setpoint Value	0.0 to 100.0 %
P0042	Time Powered	0 to 65535h
P0043	Time Enabled	0.0 to 6553.5h
P0044	kWh Output Energy	0 to 65535 kWh
P0045	Fan Enabled Time	0 to 65535h
P0048	Present Alarm	0 to 999
P0049	Present Fault	0 to 999
P0050	Last Fault	0 to 999
P0051	Last Fault Day/Month	00/00 to 31/12
P0052	Last Fault Year	00 to 99
P0053	Last Fault Time	00:00 to 23:59
P0054	Second Fault	0 to 999
P0055	Second Fault Day/Month	00/00 to 31/12
P0056	Second Fault Year	00 to 99
P0057	Second Fault Time	00:00 to 23:59
P0058	Third Fault	0 to 999
P0059	Third Fault Day/Month	00/00 to 31/12
P0060	Third Fault Year	00 to 99
P0061	Third Fault Time	00:00 to 23:59
P0062	Fourth Fault	0 to 999
P0063	Fourth Fault Day/Month	00/00 to 31/12
P0064	Fourth Fault Year	00 to 99
P0065	Fourth Fault Time	00:00 to 23:59
P0066	Fifth Fault	0 to 999
P0067	Fifth Fault Day/Month	00/00 to 31/12
P0068	Fifth Fault Year	00 to 99
P0069	Fifth Fault Time	00:00 to 23:59
P0070	Sixth Fault	0 to 999
P0071	Sixth Fault Day/Month	00/00 to 31/12
P0072	Sixth Fault Year	00 to 99
P0073	Sixth Fault Time	00:00 to 23:59
P0074	Seventh Fault	0 to 999
P0075	Seventh Fault Day/Month	00/00 to 31/12
P0076	Seventh Fault Year	00 to 99
P0077	Seventh Fault Time	00:00 to 23:59
P0078	Eighth Fault	0 to 999
P0079	Eighth Fault Day/Month	00/00 to 31/12
P0080	Eighth Fault Year	00 to 99
P0081	Eighth Fault Time	00:00 to 23:59
P0082	Ninth Fault	0 to 999
P0083	Ninth Fault Day/Month	00/00 to 31/12
P0084	Ninth Fault Year	00 to 99
P0085	Ninth Fault Time	00:00 to 23:59
P0086	Tenth Fault	0 to 999
P0087	Tenth Fault Day/Month	00/00 to 31/12
P0088	Tenth Fault Year	00 to 99
P0089	Tenth Fault Time	00:00 to 23:59
P0090	Current At Last Fault	0.0 to 4000.0 A
P0091	DC Link At Last Fault	0 to 2000 V
P0092	Speed At Last Fault	0 to 18000 rpm
P0093	Reference Last Fault	0 to 18000 rpm
P0094	Frequency Last Fault	0.0 to 300.0 Hz
P0095	Motor Volt. Last Fault	0 to 2000 V
P0096	DIx Status Last Fault	0000h to 00FFh
P0097	DOx Status Last Fault	0000h to 001Fh
P0800	Phase U Book 1 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0801	Phase V Book 1 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0802	Phase W Book 1 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0803	Phase U Book 2 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0804	Phase V Book 2 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0805	Phase W Book 2 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0806	Phase U Book 3 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0807	Phase V Book 3 Temoer	-20 to 150 °C (-4 °F to 302 °F)
P0808	Phase W Book 3 Temoer	-20 to 150 °C (-4 °F to 302 °F)
P0809	Phase U Book 4 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0810	Phase V Book 4 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0811	Phase W Book 4 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0812	Phase U Book 5 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0813	Phase V Book 5 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0814	Phase W Book 5 Temper	-20 to 150 °C (-4 °F to 302 °F)
P0815	Phase U Book 1 Current	-1000 to 1000 A
P0816	Phase V Book 1 Current	-1000 to 1000 A
P0817	Phase W Book 1 Current	-1000 to 1000 A
P0818	Phase U Book 2 Current	-1000 to 1000 A
P0819	Phase V Book 2 Current	-1000 to 1000 A
P0820	Phase W Book 2 Current	-1000 to 1000 A
P0821	Phase U Book 3 Current	-1000 to 1000 A
P0822	Phase V Book 3 Current	-1000 to 1000 A
P0823	Phase W Book 3 Current	-1000 to 1000 A
P0824	Phase U Book 4 Current	-1000 to 1000 A
P0825	Phase V Book 4 Current	-1000 to 1000 A
P0826	Phase W Book 4 Current	-1000 to 1000 A
P0827	Phase U Book 5 Current	-1000 to 1000 A
P0828	Phase V Book 5 Current	-1000 to 1000 A
P0829	Phase W Book 5 Current	-1000 to 1000 A

5.3 SETTING DATE AND TIME

Step	Action/Result	Display Indication
1	Monitoring mode - Press **"Menu"** (right soft key)	
2	- Group **"00 ALL PARAMETERS"** is already selected	
3	- Group **"01 PARAMETER GROUPS"** is selected - Press **"Select"**	
4	- A new list of groups is displayed and group **"20 Ramps"** is selected - Press until you reach group **"30 HMI"**	
5	- Group **"30 HMI"** is selected - Press **"Select"**	
6	- Parameter **"Day P0194"** is already selected - If needed, set P0194 according to the actual day To do so, press **"Select"** and then, or to change P0194 value - Follow the same steps to set parameters **"Month P0195"** to **"Seconds P0199"**	

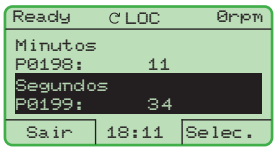
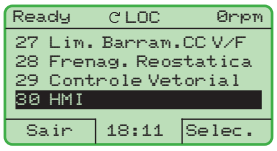
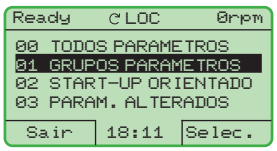
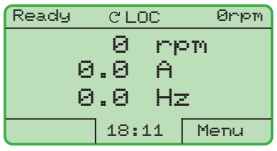
Step	Action/Result	Display Indication
7	- Once the setting of P0199 is over, the Real Time Clock is now updated - Press **"Return"** (left soft key)	
8	- Press **"Return"**	
9	- Press **"Return"**	
10	- The display is back to the monitoring mode	

Figure 5.4: *Date and time setting*

5.4 LOCKING OF PARAMETER MODIFICATION

In case you want to prevent unauthorized people from changing parameters, just change the content of P0000 to a value different from 5. Follow basically the same procedure presented in Item 5.2.1 Password Setting in P0000 on page 5-2.

5.5 HOW TO CONNECT A PC

NOTE!

- Always use standard host/device shielded USB cable. Cables without shield may cause communication errors.
- Recommended cables: Samtec:
  USBC-AM-MB-B-B-S-1 (1 meter).
  USBC-AM-MB-B-B-S-2 (2 meters).
  USBC-AM-MB-B-B-S-3 (3 meters).
- The USB connection is galvanically isolated from the mains power supply and from other high voltages internal to the inverter. However, the USB connection is not isolated from the Protective Ground (PE). Use an isolated notebook for the USB connection or a desktop connected to the same Protective Ground (PE) of the inverter.

Install the SuperDrive G2 software to control motor speed, view, or edit inverter parameters through a personal computer (PC).

Basic procedures for transferring data from the PC to the inverter:

1. Install the SuperDrive G2 software on the PC.
2. Connect the PC to the inverter via USB cable.
3. Start the SuperDrive G2.
4. Select “Open” and the files stored on the PC are shown.
5. Select the proper file.
6. Use the function "Write Parameters to the Drive".

All parameters are now transferred to the inverter.

For further details and other functions related to the SuperDrive G2, refer to the Manual of the SuperDrive.

5.6 FLASH MEMORY MODULE

Location according to Figure 5.5 on page 5-9.

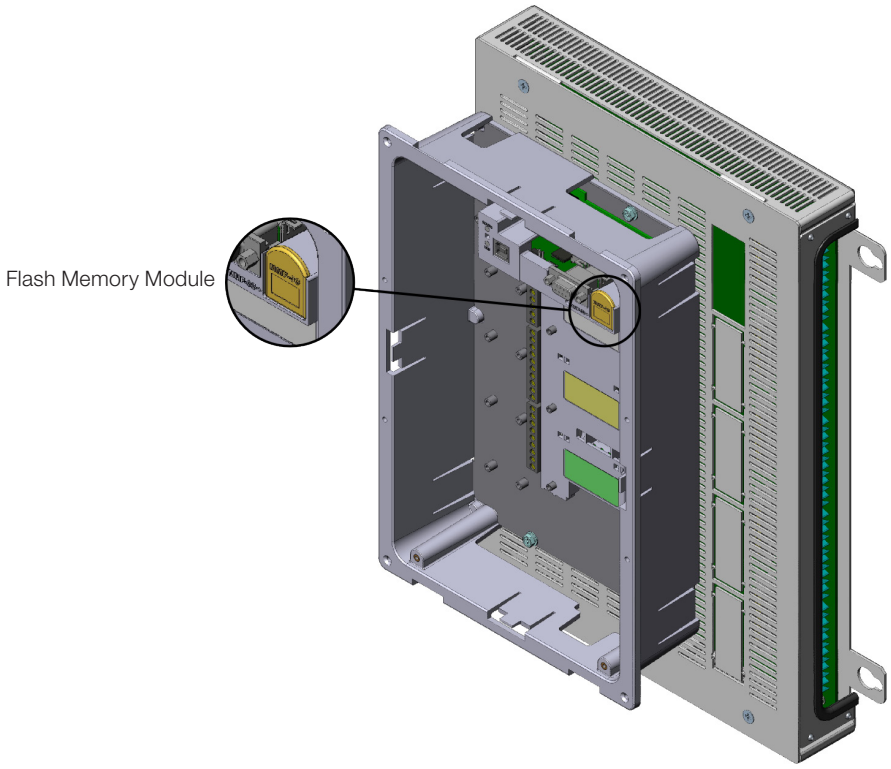


Figure 5.5: *Detail of location of the flash memory module*

Features:

- Store a copy of the inverter parameters.
- Transfer parameters stored in the FLASH memory to the inverter.
- Transfer firmware stored in the FLASH memory to the inverter.
- Store programs created by the SoftPLC.

Whenever the inverter is powered up, this program is transferred to the RAM memory located in the inverter control board and executed.

Refer to the CFW-11 programming manual and to SoftPLC manual for further details.

ATTENTION!
Before installing or removing the FLASH memory module, disconnect the inverter power supply and wait for the complete discharge of the capacitors.

5.7 OPERATION WITH A REDUCED NUMBER OF POWER UNITS

The CFW-11M G2 can operate with a reduced number of UP11 and reduced power for a short time. That operating mote is called "Reduced Power Mode". It may be applied to critical processes in which you do not want to stop a whole machine when one UP11 fails, enabling the operation with reduced power until you have a UP11 for replacement.

The general scheme of a drive with 5 UP11 is shown in Figure 3.22 on page 3-18. The reduced power mode works as a drive of up to 2 UP11.

Assuming that in the drive of Figure 3.22 on page 3-18, composed of 5 UP11, the UP11 number4 fails. In order to reestablish the drive operation with reduced power (Reduced Power Mode), you must follow the steps below:

1. Disconnect the power supply from the drive.
2. Identify the defective UP11 (in this case, number 4).
3. Disconnect the power and control of the UP11 number 4, according to Figure 5.7 on page 5-12.
4. Move the control connections on the ICUP board, as shown in Figure 5.7 on page 5-12. Connect the control cables of UP11 number 5 to position 4 of the ICUP board. Thus, UP11 5 becomes UP11 4.
5. Configure the new number of UP11 through DIP switch S2 located on the ICUP board, according to Table 3.17 on page 3-32.
6. Change DIP switch S1:4 to ON; thus, it will be informed to the control that the CFW-11M G2 drive is operating with a reduced number of UP11.

ATTENTION!
It is recommended that the drive operate short of one UP11 at most.

7. Reconnect only the power supply of the drive control.
8. Alarm A420 will be indicated (Reduced Power Mode), informing that the CFW-11M G2 is operating in the reduced power mode.
9. Check if parameters P0295 (Rat. Curr. ND/HD Inv.) and P0296 (Rated Line Voltage) are according to the voltage and the number of connected UP11.
10. Set the following control parameters:
11. P0169: Maximum Torque Current +.
12. P0170: Maximum Torque Current -.
13. Parameters P0169 and P0170 must be set so that the maximum torque current will not exceed the maximum inverter current. The values of those parameters are referenced to the motor rated current, as you can see in Item 11.8.6 - Torque Current Limit of the CFW-11 programming manual.

14. Connect the drive power source.

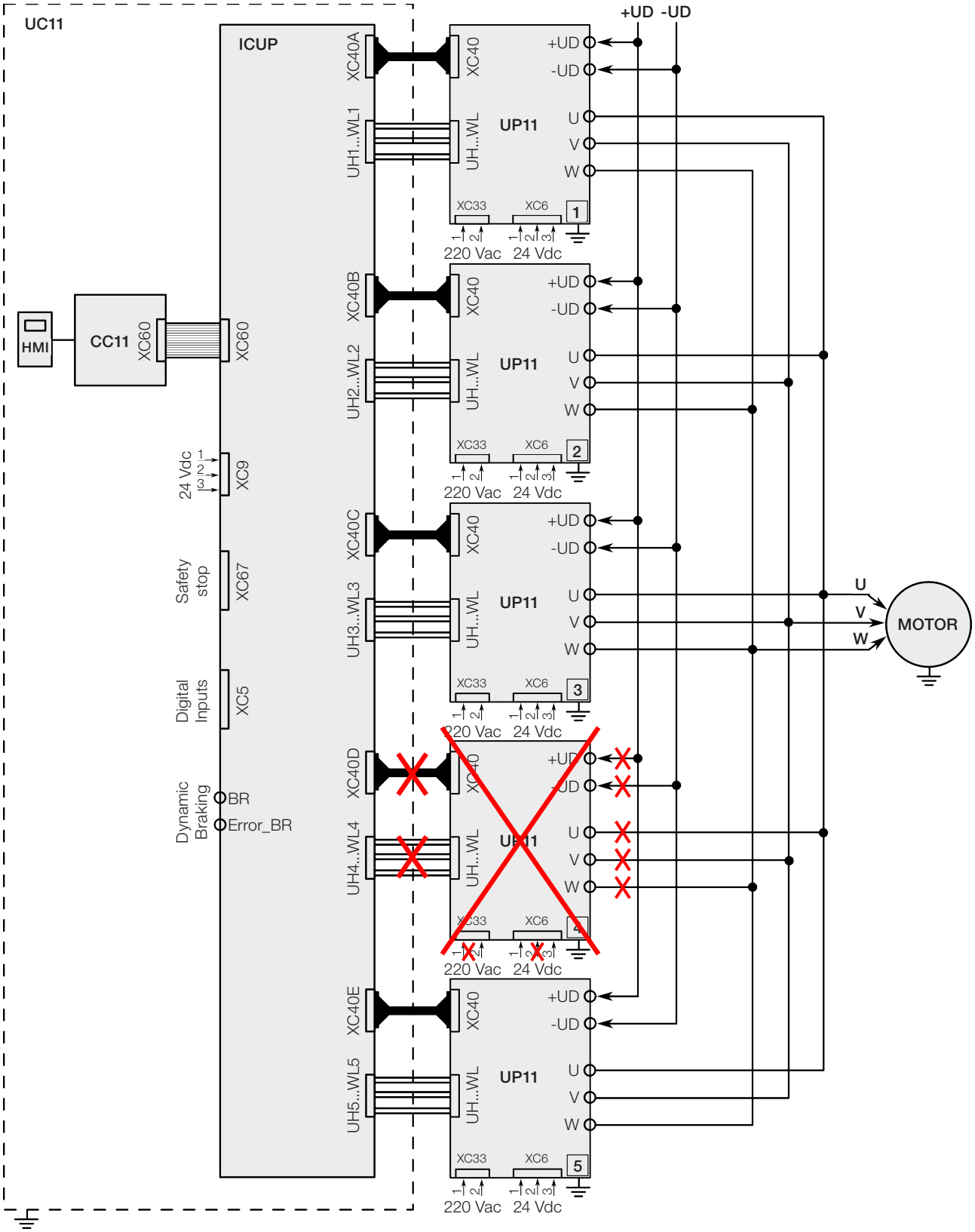


Figure 5.6: *Disconnection of the power and control cables of UP11 number 4*

ATTENTION!
The execution of self-tuning when the inverter is operating in the Reduced Power Mode is not permitted.

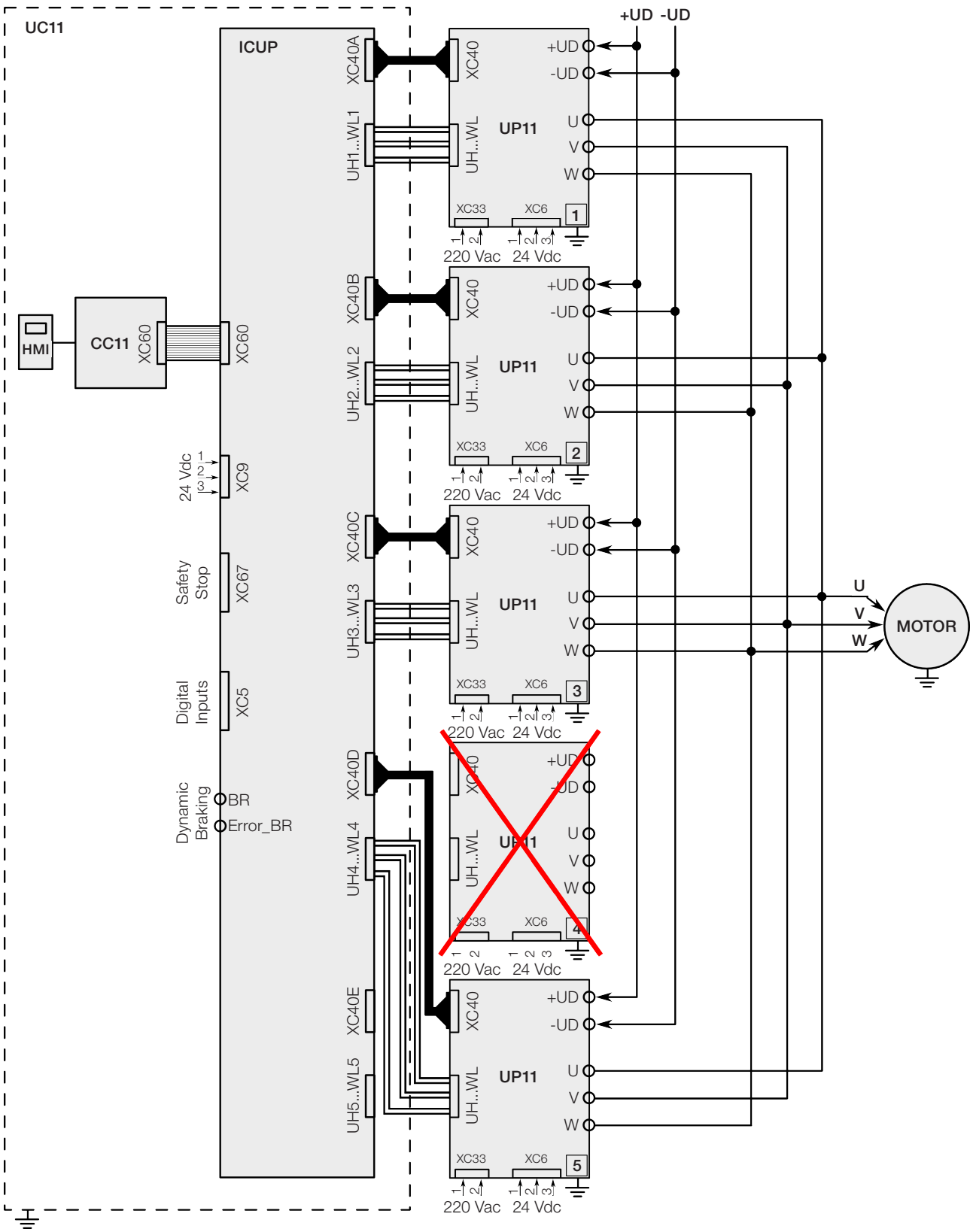


Figure 5.7: Moving the control connections on the ICUP board

6 TROUBLESHOOTING AND MAINTENANCE

This chapter presents:

- The list of all faults and alarms.
- Most probable causes for each fault and alarm.
- The list of the most common problems and corrective actions.
- Instructions for periodical inspections of the product and preventive maintenance.

6.1 OPERATION OF THE FAULTS

When a fault is detected ("FAULT" (FXXX)):

- The PWM pulses are blocked.
- The keypad displays the "FAULT" code and description.
- The “STATUS” LED flashes red.
- The output relay set to "NO FAULT" opens.
- Some control circuitry data is saved in the EEPROM memory:
  - Keypad and EP (Electronic Pot) speed references, in case the function "Reference backup" is enabled in P0120.
  - The "FAULT" or alarm potentiometer code that occurred (shifts the last nine previous faults and alarms).
  - The state of the motor overload function integrator.
  - The state of the operating hours counter (P0043) and the powered-up hours counter (P0042).
- Reset the inverter to return the drive to a "READY" condition in the event of a "FAULT". The following reset options are available:
  - Removing the power supply and reapplying it (power-on reset).
  - Pressing the operator key O (manual reset).
  - Through the "Reset" soft key.
  - Automatically by setting P0340 (auto-reset).
  - Through a digital input: DIx = 20 (P0263 to P0270).
  - When an alarm situation ("ALARM" (AXXX)) is detected:
- The keypad displays the "ALARM" code and description.
- The "STATUS" LED changes to yellow.
- The PWM pulses are not blocked (the inverter is still operating).

6.2 FAULTS, ALARMS AND POSSIBLE CAUSES

Table 6.1: *Faults, alarms and possible causes*

Fault/Alarm	Description	Possible Causes
F020: 24Vdc Power Supply Undervoltage	Undervoltage on the 24Vdc power supply that feeds the control.	■ Voltage on the power supply below 22.8 Vdc.
F021: DC Link Undervoltage	DC Link undervoltage condition occurred.	■ Supply voltage too low, producing voltage on the DC link below the minimum value (read value in parameter P0004): – Ud < 385 V - Supply voltage 380 V (P0296 = 1). – Ud < 405 V – Supply voltage 400-415 V (P0296 = 2). – Ud < 446 V – Supply voltage 440-460 V (P0296 = 3). – Ud < 487 V - Supply voltage 480 V (P0296 = 4). – Ud < 530 V – Supply voltage 500-525 V (P0296 = 5). – Ud < 580 V – Supply voltage 550-575 V (P0296 = 6). – Ud < 605 V - Supply voltage 600 V (P0296 = 7). – Ud < 696 V – Supply voltage 660-690 V (P0296 = 8). ■ Phase loss in the input. ■ Fault in the pre-charge circuit. ■ Parameter P0296 was set to a value above of the power supply rated voltage.
F022: DC Link Overvoltage	DC Link overvoltage condition occurred.	■ Supply voltage too high, producing voltage on the DC link above the maximum value: – Ud > 800 V - Models 380 - 480 V (P0296 = 1, 2, 3 and 4). – Ud > 1000 V - Models 500-600 V (P0296 = 5, 6 and 7). – Ud > 1200 V - Models 660-690 V (P0296 = 8). ■ Driven load inertia too high or deceleration ramp too fast. ■ Setting of P0151 or P0153 or P0185 too high.
F030: (1) Power Module U Fault	Desaturation of IGBT occured in Power Module U.	■ Short circuit between phases U and V or U and W of the motor.
F034: (1) Power Module V Fault	Desaturation of IGBT occured in Power Module V.	■ Short circuit between phases V and U or V and W of the motor.
F038: (1) Power Module W Fault	Desaturation of IGBT occured in Power Module W.	■ Short circuit between phases W and U or W and V of the motor.
A046: High Load on the Motor	Load is too high for the used motor **Note:** It may be disabled by setting P0348 = 0 or 2.	■ Setting of P0156, P0157 and P0158 too low for the motor. ■ Overload on the motor shaft.
A047: IGBTs Overload Alarm	An IGBTs overload alarm occurred. **Note:** It may be disabled by setting P0350 = 0 or 2.	■ Inverter output current is too high.
F048: IGBTs Overload Fault	An IGBTs overload fault occurred.	■ Inverter output current is too high.
F067: Encoder /Motor Wiring Is Inverted	Fault related to the phase relation of the encoder signals, if P0202 = 4 and P0408 = 2, 3 or 4. **Note:** - This error can only occur during self-tuning. - This fault cannot be reset. - In this case, de-energize the inverter, solve the problem and then energize it.	■ U, V, W wiring to the motor is inverted. ■ Encoder channels A and B are inverted. ■ Error in the encoder assembly position.
F070: Overcurrent/ Short circuit	Overcurrent or short circuit in the output, DC link or braking resistor.	■ Short circuit between two motor phases. ■ Short circuit of the connecting cables of the dynamic braking. ■ IGBT modules short circuited.
F071: Output Overcurrent	The inverter output current was too high for too long.	■ Load inertia too high or acceleration ramp too fast. ■ Setting of P0135, P0169, P0170, P0171 and P0172 too high.
F072: Motor Overload	Motor overload fault. **Note:** - It can be disabled by setting P0348 = 0 or 3.	■ Setting of P156, P157 and P158 too low for the motor. ■ Load on the motor shaft is too high.

Fault/Alarm	Description	Possible Causes
F074: Ground Fault	A ground fault occured either in the cable between the inverter and the motor or in the motor itself. **Note:** It may be disabled by setting P0343 = 0.	■ Short circuit to the ground in one or more output phases. ■ Motor cable capacitance too high, causing current peaks in the output. (4)
F076: Motor Current Imbalance	Motor current imbalance fault. **Note:** - It may be disabled by setting P0342 = 0.	■ Loose connection or broken wiring between the motor and inverter connection. ■ Vector control with wrong orientation. ■ Vector control with encoder, encoder wiring or encoder motor connection inverted.
F077: DB Resistor Overload	The dynamic braking resistor overload protection operated.	■ Excessive load inertia or desacceleration time too short. ■ Motor shaft load is excessive. ■ Values of P0154 and P0155 programmed incorrectly.
F078: Motor Overtemperature	Fault related to PTC temperature sensor installed on the motor. **Note:** - It can be disabled by setting P0351 = 0 or 3. - It is necessary to program analog input and output for PTC function.	■ Load on the motor shaft is too high. ■ Load cycle is too high (high number of starts and stops per minute). ■ High ambient temperature around the motor. ■ Loose connection or short-circuit (resistance < 60 Ω) in the wiring connected to the motor termistor. ■ Motor thermistor not installed. ■ Motor shaft locked.
F079: Encoder Signal Fault	Lack of encoder signals.	■ Broken wiring between motor encoder and option kit for encoder interface. ■ Encoder is defective.
F080: CPU Watchdog	Watchdog fault on the microcontroller.	■ Electric noise.
F082: Copy Function Fault	Fault while copying parameters.	■ Attempt to copy parameters from the HMI to the inverter with incompatible software versions.
F084: Auto-diagnosis Fault	Auto-diagnosis fault.	■ Defect on the inverter internal circuits.
A088: Communication Lost	Indicates a problem between the keypad and control board communication.	■ Loose keypad cable connection. ■ Electrical noise in the installation.
A090: External Alarm	External alarm via DI. **Note:** - It is necessary to program DI for "without external alarm".	■ Wiring in the DI1 to DI8 inputs open (programmed for "without external alarm").
F091: External Fault	External fault via DI. **Note:** - It is necessary to program DI for "without external fault".	■ Wiring in the DI1 to DI8 inputs open (programmed for "without external fault").
F099: Invalid Current Offset	Current measurement circuit is measuring a wrong value for null current.	■ Defect on the inverter internal circuits.
A110: High Motor Temperature	Alarm related to PTC temperature sensor installed on the motor. **Note:** - It can be disabled by setting P0351 = 0 or 2. - It is necessary to program analog input and output for PTC function.	■ Excessive load at the motor shaft. ■ Excessive duty cycle (too many starts / stops per minute). ■ Surrounding air temperature too high. ■ Loose connection or short-circuit (resistance < 100 Ω) in the wiring connected to the motor termistor. ■ Motor termistor is not installed. ■ Blocked motor shaft.
A128: Timeout for Serial Communicationt	It indicates that the inverter stopped receiving valid telegrams within a certain period. **Note:** - It can be disabled by setting P0314 = 0.0 s.	■ Check the wiring and grounding installation. ■ Make sure the inverter has sent a new message within the time interval set at P0314.
A129: Anybus Offline	Alarm that indicates interruption in the Anybus-CC communication.	■ PLC went to the idle status. ■ Programming error. Number of I/O words programmed on the slave differs from the setting on the master. ■ Loss of communication with the master (broken cable, connector disconnected, etc.).
A130: Anybus Access Error	Alarm that indicates error of access to the Anybus-CC communication module.	■ Anybus-CC module defective, not recognized or incorrectly installed. ■ Conflict with WEG optional board.
A133: CAN Not Powered	Alarm of power supply missing on the CAN controller.	■ Broken or loose cable. ■ Power supply is off.

Fault/Alarm	Description	Possible Causes
A134: Bus Off	Inverter CAN interface has entered into the bus-off state.	■ Incorrect communication baud-rate. ■ Two nodes configured with the same address in the network. ■ Wrong cable connection (inverted signals).
A135: CANopen Communication Error	Alarm that indicates communication error.	■ Communication problems. ■ Wrong master configuration/settings. ■ Incorrect configuration of the communication objects.
A136: Idle Master	Network master has entered into the idle state.	■ PLC in IDLE mode. ■ Bit of the PLC command register set to zero (0).
A137: DNet Connection Time out	I/O connection timeout - DeviceNet communication alarm.	■ One or more allocated I/O connections went to the timeout status.
A138: (2) Profibus DP Interface in Clear Mode	It indicates that the inverter received the command from the DP Profibus network master to go into Clear mode.	■ Verify the network master status, making sure it is in execution mode (Run). ■ Refer to the Profibus DP communication manual for more information.
A139: (2) Offline Profibus DP Interface	It indicates interruption in the communication between the DP Profibus network master and the inverter.	■ Check if the network master is correctly configured and operating properly. ■ Check the network installation in general – cabling, grounding. ■ For further information, refer to the Profibus DP communication manual.
A140: (2) Profibus DP Module Access Error	It indicates error in the access to the data of the DP Profibus communication module.	■ Check if the DP profibus module is correctly fitted in slot 3. ■ For further information, refer to the Profibus DP communication manual.
F150: Motor Overspeed	Overspeed Fault. Enabled when the real speed exceeds the value of P0134 x (100 % + P0132) for more than 20 ms.	■ Incorrect setting of P0161 and/or P0162.
F151: FLASH Memory Module Fault	Fault on the Flash Memory Module (MMF-01).	■ Flash memory module defective. ■ Check the connection of the FLASH memory module.
A152: Internal Air High Temperature	Air temperature alarm high internal temperature measured above 75 ºC (167 °F). **Note:** - It can be disabled by setting P0353 = 1 or 3.	■ High ambient temperature around the inverter (> 40 °C (104 °F)). ■ High temperature inside the cabinet (> 40 °C (104 °F)).
F153: Internal Air Overtemperature	Failure of the internal air temperature measured temperature above 80 ºC (176 °F).	
A156: Undertemperature	Only 1 sensor indicates temperature below -30 ºC (-22 °F).	■ Surrounding air temperature ≤ -30 °C (-22 °F).
F156: Undertemperature	Undertemperature fault (below -30 °C (-22 °F)) in he IGBTs or rectifier measured by the temperature sensors.	■ Surrounding air temperature ≤ -30 °C (-22 °F).
F160: Safety Stop Relay	Safety Stop relay fault.	■ It was only applied +24 Vdc to one STO input (STO1 or STO2). ■ One of the relays is defective.
F161: Timeout PLC11 CFW-11	Refer to the programming manual of the PLC11-01 module available on **www.weg.net**.	
A162: Incompatible PLC Firmware		
A163: Break Detect AI1	It indicates that AI1 current reference (4-20 mA or 20-4 mA) is out of the range from 4 to 20 mA.	■ Cable of AI1 broken. ■ Poor contact on the signal connection on the terminals.
A164: Break Detect AI2	It indicates that AI2 current reference (4-20 mA or 20-4 mA) is out of the range from 4 to 20 mA.	■ Cable of AI2 broken. ■ Poor contact on the signal connection on the terminals.
A165: Break Detect AI2	It indicates that AI3 current reference (4-20 mA or 20-4 mA) is out of the range from 4 to 20 mA.	■ Cable of AI3 broken. ■ Poor contact on the signal connection on the terminals.
A166: Break Detect AI2	It indicates that AI4 current reference (4-20 mA or 20-4 mA) is out of the range from 4 to 20 mA.	■ Cable of AI4 broken. ■ Poor contact on the signal connection on the terminals.
A177: Fan Replacement	Alarm to replace the fan (P0045 > 50000 hours). **Note:** - It may be disabled by setting P0354 = 0.	■ Maximum number of hours of operation of the heatsink fan exceeded.
A181: Invalid Clock Value	Invalid clock value alarm.	■ Necessary to set the date and time in P0194 to P0199. ■ HMI battery low, defective or not installed.

Fault/Alarm	Description	Possible Causes
F182: Pulse Feedback Fault	Fault in the output pulse feedback.	■ Defect on the internal circuits of the inverter.
F183: IGBTs Overload +Temperature	Overtemperature related to IGBT overload protection.	■ High ambient temperature around the inverter. ■ Operation in frequency < 10Hz with overload.
F186: (3) Sensor 1 Temperature Fault	Temperature fault in sensor 1.	■ High temperature on the motor.
F187: (3) Sensor 2 Temperature Fault	Temperature fault in sensor 2.	■ High temperature on the motor.
F188: (3) Sensor 3 Temperature Fault	Temperature fault in sensor 3.	■ High temperature on the motor.
F189: (3) Sensor 4 Temperature Fault	Temperature fault in sensor 4.	■ High temperature on the motor.
F190: (3) Sensor 5 Temperature Fault	Temperature fault in sensor 5.	■ High temperature on the motor.
A191: (3) Sensor 1 Temperature Alarm	Temperature alarm in sensor 1.	■ High temperature on the motor. ■ Problem in the wiring that connects the IOE-01 Module (02 or 03) to the sensor.
A192: (3) Sensor 2 Temperature Alarm	Temperature alarm in sensor 2.	■ High temperature on the motor. ■ Problem in the wiring that connects the IOE-01 Module (02 or 03) to the sensor.
A193: (3) Sensor 3 Temperature Alarm	Temperature alarm in sensor 3.	■ High temperature on the motor. ■ Problem in the wiring that connects the IOE-01 Module (02 or 03) to the sensor.
A194: (3) Sensor 4 Temperature Alarm	Temperature alarm in sensor 4.	■ High temperature on the motor. ■ Problem in the wiring that connects the IOE-01 Module (02 or 03) to the sensor.
A195: (3) Sensor 5 Temperature Alarm	Temperature alarm in sensor 5.	■ High temperature on the motor. ■ Problem in the wiring that connects the IOE-01 Module (02 or 03) to the sensor.
A196: (3) Sensor 1 Cable Alarm	Sensor 1 cable alarm.	■ Short circuited temperature sensor.
A197: (3) Sensor 2 Cable Alarm	Sensor 2 cable alarm.	■ Short circuited temperature sensor.
A198: (3) Sensor 3 Cable Alarm	Sensor 3 cable alarm.	■ Short circuited temperature sensor.
A199: (3) Sensor 4 Cable Alarm	Sensor 4 cable alarm..	■ Short circuited temperature sensor.
A200: (3) Sensor 5 Cable Alarm	Sensor 5 cable alarm.	■ Short circuited temperature sensor.
F228: Serial Communication Timeout	■ Refer to the RS-232/RS-485 Serial communication manual.	
F229: Anybus Offline	■ Refer to the Anybus-CC communication manual.	
F230: Anybus Access Error		
F233: CAN Bus Power Failure	■ Refer to the CANopen communication manual and/or refer to the DeviceNet communication manual.	
F234: Bus Off		
F235: CANopen Communication Error	■ Refer to the CANopen communication manual.	
F236: Master in Idle	■ Refer to the DeviceNet communication manual.	
F237: DeviceNet Connection Timeout		
F238: (2) Profibus DP Interface in Clear Mode	■ It indicates that the inverter received the command from the DP Profibus network master to go into Clear mode.	■ Check the network master status, ensuring it is in the Run mode. ■ The fault indication will occur if P0313 = 5. ■ For further information, refer to the Profibus DP communication manual.

Fault/Alarm	Description	Possible Causes
F239: (2) Offline Profibus DP Interface	■ It indicates interruption in the communication between the DP Profibus network master and the inverter.	■ Check if the network master is correctly configured and operating properly. ■ Check the network installation in general – cabling, grounding. ■ The fault indication will occur if P0313 = 5. ■ For further information, refer to the Profibus DP communication manual.
F240: (2) Profibus DP Module Access Error	■ It indicates error in the access to the data of the Profibus DP communication module.	■ Check if the DP Profibus Module is correctly fitted in slot 3. ■ The fault indication will occur if P0313 = 5. ■ For further information, refer to the Profibus DP communication manual.
A300: High Temperature IGBT U B1	Alarm of high temperature measured on the temperature sensor (NTC) of the IGBT of phase U of book 1. Measured temperature above 110 ºC (230 °F).	■ High ambient temperature (> 45 °C (113 °F)) and high output current. ■ Blocked or defective fan. ■ Fins of the book heatsink too dirty, hindering the air flow.
F301: Overtemperature IGBT U B1	Fault of overtemperature measured on the temperature sensor (NTC) of the IGBT of phase U of book 1. Measured temperature above 115 ºC (239 °F).	
A303: High Temperature IGBT V B1	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase V of book 1. Measured temperature above 110 ºC (230 °F).	
F304: Overtemperature IGBT V B1	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase V of book 1. Measured temperature above 115 ºC (239 °F).	
A306: High Temperature IGBT W B1	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase W of book 1. Measured temperature above 110 ºC (230 °F).	
F307: Overtemperature IGBT W B1	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase W of book 1. Measured temperature above 115 ºC (239 °F).	
A309: High Temperature IGBT U B2	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase U of book 2. Measured temperature above 110 ºC (230 °F).	
F310: Overtemperature IGBT U B2	Fault of overtemperature measured on the temperature sensor (NTC) of the IGBT of phase U of book 2. Measured temperature above 115 ºC (239 °F).	
A312: High Temperature IGBT V B2	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase V of book 2. Measured temperature above 110 ºC (230 °F).	
F313: Overtemperature IGBT V B2	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase V of book 2. Measured temperature above 115 ºC (239 °F).	
A315: High Temperature IGBT W B2	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase W of book 2. Measured temperature above 110 ºC (230 °F).	
F316: Overtemperature IGBT W B2	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase W of book 2. Measured temperature above 115 ºC (239 °F).	
A318: High Temperature IGBT U B3	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase U of book 3. Measured temperature above 110 ºC (230 °F).	
F319: Overtemperature IGBT U B3	Fault of overtemperature measured on the temperature sensor (NTC) of the IGBT of phase U of book 3. Measured temperature above 115 ºC (239 °F).	

Fault/Alarm	Description	Possible Causes
A321: High Temperature IGBT V B3	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase V of book 3. Measured temperature above 110 ºC (230 °F).	■ High ambient temperature (> 45 °C (113 °F)) and high output current. ■ Blocked or defective fan. ■ Fins of the book heatsink too dirty, hindering the air flow.
F322: Overtemperature IGBT V B3	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase V of book 3. Measured temperature above 115 ºC (239 °F).	
A324: High Temperature IGBT W B3	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase W of book 3. Measured temperature above 110 ºC (230 °F).	
F325: Overtemperature IGBT W B3	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase W of book 3. Measured temperature above 115 ºC (239 °F).	
A327: High Temperature IGBT U B4	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase U of book 4. Measured temperature above 110 ºC (230 °F).	
F328: Overtemperature IGBT U B4	Fault of overtemperature measured on the temperature sensor (NTC) of the IGBT of phase U of book 4. Measured temperature above 115 ºC (239 °F).	
A330: High Temperature IGBT V B4	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase V of book 4. Measured temperature above 110 ºC (230 °F).	
F331: Overtemperature IGBT V B4	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase V of book 4. Measured temperature above 115 ºC (239 °F).	
A333: High Temperature IGBT W B4	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase W of book 4. Measured temperature above 110 ºC (230 °F).	
F334: Overtemperature IGBT W B4	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase W of book 4. Measured temperature above 115 ºC (239 °F).	
A336: High Temperature IGBT U B5	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase U of book 5. Measured temperature above 110 ºC (230 °F).	
F337: Overtemperature IGBT U B5	Fault of overtemperature measured on the temperature sensor (NTC) of the IGBT of phase U of book 5. Measured temperature above 115 ºC (239 °F).	
A339: High Temperature IGBT V B5	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase V of book 5. Measured temperature above 110 ºC (230 °F).	
F340: Overtemperature IGBT V B5	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase V of book 5. Measured temperature above 115 ºC (239 °F).	
A342: High Temperature IGBT W B5	Alarm of high temperature measured on the temperature sensor (NTC) of IGBT of phase W of book 5. Measured temperature above 110 ºC (230 °F).	
F343: IGBT Overtemperature W B5	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase W of book 5. Measured temperature above 115 ºC (239 °F).	

Fault/Alarm	Description	Possible Causes
A345: High Load IGBT U B1	Alarm of overload on the IGBT of phase U of book 1.	■ High current in the inverter output (refer to Figure 8.1 on page 8-3).
F346: Overload on IGBT U B1	Fault of overload on the IGBT of phase U of book 1.	
A348: High Load IGBT V B1	Alarm of overload on the IGBT of phase V of book 1.	
F349: Overload on IGBT V B1	Fault of overload on the IGBT of phase V of book 1.	
A351: High Load IGBT W B1	Alarm of overload on the IGBT of phase W of book 1.	
F352: Overload on IGBT W B1	Fault of overload on the IGBT of phase W of book 1.	
A354: High Load IGBT U B2	Overload alarm on IGBT of phase U of book 2.	
F355: Overload on IGBT U B2	Fault of overload on the IGBT of phase U of book 2.	
A357: High Load IGBT V B2	Alarm of overload on the IGBT of phase V of book 2.	
F358: Overload on IGBT V B2	Fault of overload on the IGBT of phase V of book 2.	
A360: High Load IGBT W B2	Alarm of overload on the IGBT of phase W of book 2.	
F361: Overload on IGBT W B2	Fault of overload on the IGBT of phase W of book 2.	
A363: High Load IGBT U B3	Alarm of overload on the IGBT of phase U of book 3.	
F364: Overload on IGBT U B3	Fault of overload on the IGBT of phase U of book 3.	
A366: High Load IGBT V B3	Alarm of overload on the IGBT of phase V of book 3.	
F367: Overload on IGBT V B3	Fault of overload on the IGBT of phase V of book 3.	
A369: High Load IGBT W B3	Alarm of overload on the IGBT of phase W of book 3.	
F370: Overload on IGBT W B3	Fault of overload on the IGBT of phase W of book 3.	
A372: High Load IGBT U B4	Alarm of overload on the IGBT of phase U of book 4.	
F373: Overload on IGBT U B4	Fault of overload on the IGBT of phase U of book 4.	■ High current in the inverter output (refer to Figure 8.1 on page 8-3).
A375: High Load IGBT V B4	Alarm of overload on the IGBT of phase V of book 4.	
F376: Overload on IGBT V B4	Fault of overload on the IGBT of phase V of book 4.	
A378: High Load IGBT W B4	Alarm of overload on the IGBT of phase W of book 4.	
F379: Overload on IGBT W B4	Fault of overload on the IGBT of phase W of book 4.	
A381: High Load IGBT U B5	Alarm of overload on the IGBT of phase U of book 5.	
F382: Overload on IGBT U B5	Fault of overload on the IGBT of phase U of book 5.	
A384: High Load IGBT V B5	Alarm of overload on the IGBT of phase V of book 5.	
F385: Overload on IGBT V B5	Fault of overload on the IGBT of phase V of book 5.	
A387: High Load IGBT W B5	Alarm of overload on the IGBT of phase W of book 5.	
F388: Overload on IGBT W B5	Fault of overload on the IGBT of phase W of book 5.	

Fault/Alarm	Description	Possible Causes
A390: Current Imbalance Phase U B1	Alarm of current imbalance of phase U book 1. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	■ Poor electrical connection between the DC link and the power unit. ■ Poor electrical connection between the power unit output and the motor. **Note:** In case of quick accelerations and brakes, this alarm may be momentarily indicated, disappearing after some seconds. This does not indicate a malfunction on the inverter. In case this alarm persists when the motor in operating at constant speed, it is an indication of abnormal current distribution between the power units.
A391: Current Imbalance Phase V B1	Alarm of current imbalance of phase V book 1. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A392: Current Imbalance Phase W B1	Alarm of current imbalance of phase W book 1. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A393: Current Imbalance Phase U B2	Alarm of current imbalance of phase U book 2. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A394: Current Imbalance Phase V B2	Alarm of current imbalance of phase V book 2. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A395: Current Imbalance Phase W B2	Alarm of current imbalance of phase W book 2. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A396: Current Imbalance Phase U B3	Alarm of current imbalance of phase U book 3. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A397: Current Imbalance Phase V B3	Alarm of current imbalance of phase V book 3. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A398: Current Imbalance Phase W B3	Alarm of current imbalance of phase W book 3. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A399: Current Imbalance Phase U B4	Alarm of current imbalance of phase U book 4. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A400: Current Imbalance Phase V B4	Alarm of current imbalance of phase V book 4. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A401: Current Imbalance Phase W B4	Alarm of current imbalance of phase W book 4. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	

Fault/Alarm	Description	Possible Causes
A402: Current Imbalance Phase U B5	Alarm of current imbalance of phase U book 5. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	■ Poor electrical connection between the DC link and the power unit. ■ Poor electrical connection between the power unit output and the motor. **Note:** In case of quick accelerations and brakes, this alarm may be momentarily indicated, disappearing after some seconds. This does not indicate a malfunction on the inverter. In case this alarm persists when the motor in operating at constant speed, it is an indication of abnormal current distribution between the power units.
A403: Current Imbalance Phase V B5	Alarm of current imbalance of phase V book 5. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
A404: Current Imbalance Phase W B5	Alarm of current imbalance of phase W book 5. It indicates an imbalance of 20 % in the current distribution between this phase and the smallest current of the same phase in another book, only when the current in this phase is higher than 75 % of its rated value.	
F406: Overtemperature on the Braking Module	This fault/alarm is linked to the configuration of parameters P0832 and P0833. - Function of input DIM 1. - Function of input DIM 2.	■ Fault on the cooling of the braking module. ■ Load inertia too high or deceleration ramp too fast. ■ Load on the motor shaft is too high.
F408: Fault on the Cooling System		■ Fault on pumps (drives with water cooling). ■ Fault on the panel ventilation.
F410: External Fault		■ Input DIM1 or DIM2 open.
F412: Overtemperature on the Rectifier		■ Ambient temperature around the rectifier (>45 °C (113 °F)) and output current too high. ■ Cooling problem on the rectifier. ■ Rectifier heatsink too dirty.
F414: Fault on the External Rectifier		■ Undervoltage or phase loss in the rectifier input.
A415: High temperature on the Rectifier		■ High ambient temperature around the rectifier and high output current. ■ Rectifier heatsink too dirty.
A700: (5) HMI Disconnected	Alarm or Fault linked to the disconnection of the HMI.	■ RTC function block was enabled in the SoftPLC application and the HMI is disconnected from the inverter.
F701: (5) HMI Disconnected		
A702: (5) Inverter Disabled	Alarm indicates the General Enable command is Disabled.	■ The SoftPLC Run/Stop command is equal to Run or a movement block has been enable while the inverter is general disabled.
A704: (5) Two Movements Enabled	Two movements have been enabled.	■ It occurs when two or more movement blocks are simultaneously enabled.
A706: (5) Speed Reference Not Programmed for SoftPLC	Speed reference not programmed for SoftPLC.	■ It occurs when a movement block has been enabled and the speed reference has not been configured for SoftPLC (check P0221 and P0222).

Models in which it may occur:

(1) In case of the CFW11M G2, the HMI does not indicated in which UP11 G2 the fault occurred. LEDs on the ICUP board indicate which UP11 caused the fault, Figure 6.1 on page 6-10. When the reset is executed, the LEDs turn off and turn back on if the fault persists.

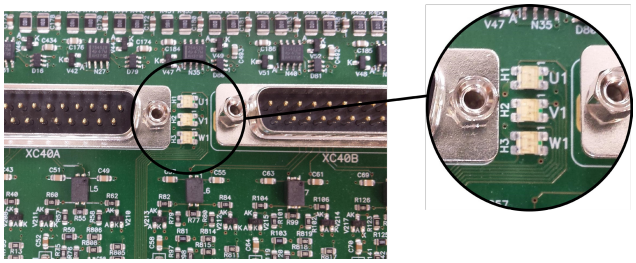


Figure 6.1: *LEDs that indicate fault on the arms of the power units (desaturation)*

(2) With Profibus DP module connected to slot 3 (XC43).
(3) With IOE-01 (02 or 03) module connected to slot 1 (XC41).
(4) Very long motor cables (longer than 100 meters) present a high parasite capacitance against the ground. The circulation of parasite currents through those capacitances may cause the ground fault circuit activation and thus disabling the inverter with F074, immediately after the inverter enabling.
(5) All the models with a SoftPLC applicative

NOTE!
The range from P0750 to P0799 is destined to the SoftPLC applicative user faults and alarms.

6.3 SOLUTIONS FOR THE MOST FREQUENT PROBLEMS

Table 6.2: *Solutions for the most frequent problems*

Problem	Point to be Verifid	Corrective Action
Motor does not start	Incorrect wiring	1. Check all power and control connections. For instance, the digital inputs set to Start/Stop, General Enable, or no external error must be connected to the 24 Vdc or to DGND* terminals (refer to Figure 3.39 on page 3-35 and Figure 3.40 on page 3-36)
	Analog reference (if used)	1. Check if the external signal is properly connected 2. Check the status of the control potentiometer (if used)
	Incorrect settings	1. Check if the parameters have correct values for the application
	Fault	1. Check whether the inverter is disabled due to a fault condition 2. Make sure that the terminals XC1:13 and XC1:11 are not shorted (short-circuit at the 24 Vdc power supply)
	Stalled motor	1. Decrease the motor overload 2. Increase P0136, P0137 (V/f), or P0169/P0170 (vector control)
Motor speed oscillates	Loose connections	1. Stop the inverter, turn off the power supply, check and tighten all the power connections 2. Check all the internal connections of the inverter
	Defective speed reference potentiometer	1. Replace potentiometer
	Oscillation of the external analog reference	1. Identify the cause of the oscillation. If it is caused by electrical noise, use shielded cables or separate them from the power and control wiring
	Incorrect settings (vector control)	1. Check parameters P0410, P0412, P0161, P0162, P0175 and P0176 2. Refer to the Programming Manual
Motor speed too high or too low	Incorrect settings (reference limits)	1. Check if the content of P0133 (minimum speed) and P0134 (maximum speed) are according to the motor and application
	Control signal from the analog reference (if used)	1. Check the level of the reference control signal 2. Check the programming (gains and offset) in P0232 to P0249
	Motor nameplate	1. Check if the motor is according to the application requirements
Motor does not reach the rated speed, or motor speed starts oscillating around the rated speed (Vector Control)	Settings	1. Check P0410
Display is off	Keypad connections	1. Check the inverter keypad connection
	IPS1 24 Vdc power supply voltage	1. Check the connections of the control 24 Vdc power supply 2. Check if the power supply limits are according to Table 3.14 on page 3-30
Low motor speed and P0009 = P0169 or P0170 (motor operating with torque limitation), for P0202 = 4 - vector with encoder	Encoder signals are inverted or power connections are inverted	1. Check the signals A-$\overline{A}$, B-$\overline{B}$ refer to the incremental encoder interface manual. If signals are properly wired, invert two of the output phases. For instance U and V

6.4 INFORMATION NECESSARY FOR CONTACTING TECHNICAL SUPPORT

NOTE!
For technical support and servicing, it is important to have the following information in hand:
- Inverter model.
- Serial number, manufacturing date and hardware revision indicated on the nameplate of the product (see Chapter 2 GENERAL INFORMATION on page 2-1).
- Installed software version (see P0023).
- Application data and inverter settings.

6.5 PREVENTIVE MAINTENANCE

DANGER!
- Always turn off the main power supply before touching any electrical component associated to the inverter.
- High voltages may still be present even after disconnecting the power supply.
- To prevent electric shock, wait at least 10 minutes after turning off the input power for the complete discharge of the power capacitors.
- Always connect the equipment frame to the protective ground (PE). Use the adequate connection terminal at the inverter.

DANGER!
- Débranchez toujours l'alimentation principale avant d'entrer en contact avec un appareil électrique associé au variateur.
- Des tensions élevées peuvent encore être présentes, même après déconnexion de l'alimentation.
- Pour éviter les risques d'électrocution, attendre au moins 10 minutes après avoir coupé l'alimentation d'entrée pour que les condensateurs de puissance soient totalement déchargées.
- Raccordez toujours la masse de l'appareil à une terre protectrice (PE). Utiliser la borne de connexion adéquate du variateur.

ATTENTION!
The electronic boards have electrostatic discharge sensitive components.
Do not touch the components or connectors directly. If necessary, first touch the grounded metallic frame or wear a ground strap.

Do not perform any withstand voltage test!
If necessary, consult WEG.

The inverters require low maintenance when properly installed and operated Table 6.3 on page 6-12 presents the main procedures and time intervals for preventive maintenance. Table 6.4 on page 6-13 contains the recommended inspections to be performed every 6 months after the start-up.

Table 6.3: *Preventive maintenance*

Maintenance	Interval	Instructions
Keypad battery replacement	Every 10 years	See Chapter 4 HMI on page 4-1
Fan replacement	After 50.000 hours of operation (1)	Fan replacement procedure indicated in Figure 6.2 on page 6-13

(1) The inverters are programmed at the factory for automatic control of the fans (P0352 = 2) so that they only start when the temperature of the heatsink increases. Therefore, the number of operating hours of the fans will depend on the operating conditions (motor current, output frequency, temperature of the cooling air, etc.). The inverter records in parameter P0045 the number of hours that the fan remained ON. When the fan reaches 50.000 hours of operation, the HMI display will show alarm A177.

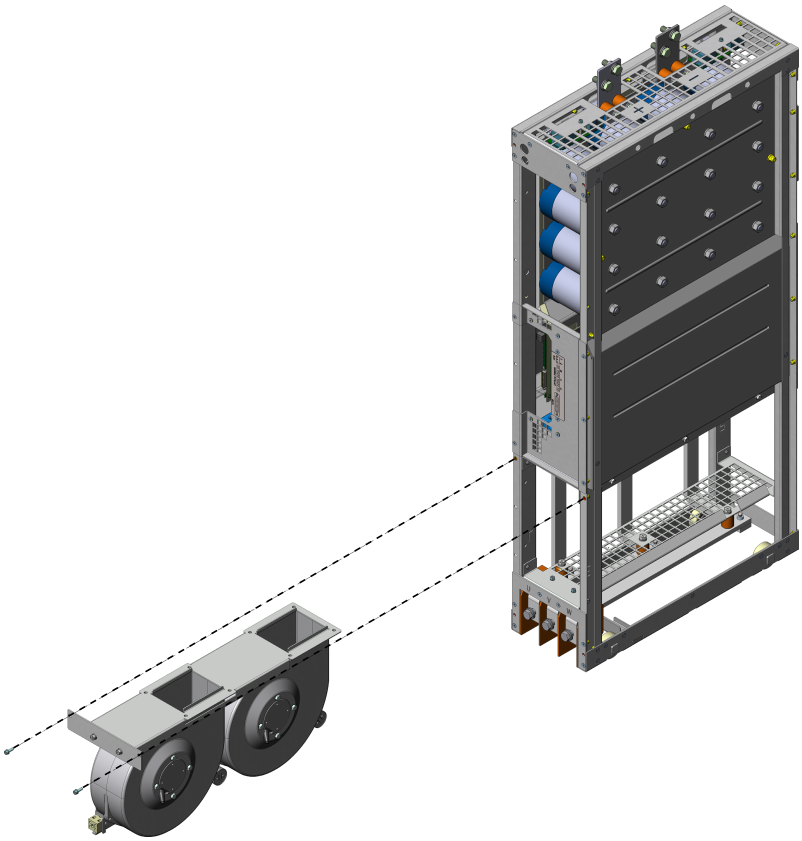


Figure 6.2: *Fan replacement*

Table 6.4: *Recommended periodic inspections - every 6 months*

Component Part	Problem	Corrective Action
Terminals, connectors	Loose Screws	Tighten
	Loose Connectors	
Fans/Cooling system	Dirt on the fans	Cleaning
	Abnormal acoustic noise	Replace fan Refer to Figure 6.2 on page 6-13. Check fan connections
	Blocked fan	
	Abnormal vibration	
	Dust in the cabinet air filter	Cleaning or replacement
Printed circuit boards	Accumulation of dust, oil, humidity, etc.	Cleaning
	Smell	Replacement
Power module/Power connections	Accumulation of dust, oil, humidity, etc.	Cleaning
	Loose connection screws	Tighten
Power resistors	Discoloration	Replace
	Smell	
Heatsink	Dust accumulation	Clean
	Dirt	

6.5.1 Cleaning Instructions

When it is necessary to clean the inverter, follow the instructions below:

Ventilation system:

1. Disconnect the power supply of the inverter and wait for 10 minutes.
2. Remove the dust from the cooling air inlet by using a soft brush or a flannel.
3. Remove the dust from the heatsink fins and from the fan blades by using compressed air.

Electronic boards:

1. Disconnect the power supply of the inverter and wait for 10 minutes.
2. Remove the dust from the electronic board by using an anti-static brush or an ion air gun (Charges Burtes Ion Gun - reference A6030-6DESCO).
3. If necessary, remove the boards from the inverter.
4. Always use grounding strap.

7 ACCESSORIES

This chapter presents:

- The accessories that may be incorporated to the inverters.
- The installation, operation and programming details of the accessories are presented in the respective manuals and are not included in this chapter.

7.1 SAFETY STOP FUNCTION

Inverters with the following codification CFW11MG2...O...Y.... Refer to Section 3.3 SAFETY STOP FUNCTION on page 3-42.

7.2 ACCESSORIES

The accessories are installed on the inverters easy and quickly using the “Plug and Play” concept. When an accessory is connected to the slots, the control circuit identifies the model and informs the code of the accessory connected in P0027 or P0028. The accessory must be installed with the inverter power supply disconnected.

Part number and model of each available accessory are presented in Table 7.1 on page 7-1. The accessories can be ordered separately and will be shipped in individual packages containing the components and the manual with detailed instructions for the product installation, operation, and programming.

ATTENTION!
Only one module at a time can be fitted into each slot (1, 2, 3, 4 or 5).

Table 7.1: *Accessory models*

WEG Item (material number)	Name	Description	Slot	Identification Parameters	
				P0027	P0028
Control accessories to install in Slots 1, 2 and 3					
11008162	IOA-01	IOA Module: 1 analog 14-bit input in voltage and current; 2 digital inputs; 2 analog 14-bit outputs in voltage and current; 2 open collector digital outputs	1	FD--	----
11008099	IOB-01	IOB Module: 2 isolated analog inputs in voltage and current; 2 digital inputs; 2 isolated analog outputs in voltage and current (same output programming as the standard CFW-11); 2 open-collector digital outputs	1	FA--	----
11126674	IOC-01	Module with 8 digital inputs and 4 digital relay outputs (use with SoftPLC)	1	C1	----
11126730	IOC-02	Module with 8 digital inputs and 8 NPN open-collector digital outputs (use with SoftPLC)	1	C5	----
11820111	IOC-03	IOC module with 8 digital inputs and 7 PNP open-collector digital outputs	1	C6	----
11126732	IOE-01	Input module for 5 PTC sensors	1	25--	----
11126735	IOE-02	Input module for 5 PT100 sensors	1	23--	----
11126750	IOE-03	Input module for 5 KTY84 sensors	1	27--	----
11008100	ENC-01	Incremental encoder module, 5 to 12 Vdc, 100 kHz, with repeater of the encoder signals	2	--C2	----
11008101	ENC-02	Incremental encoder module, 5 to 12 Vdc, 100 kHz	2	--C2	----
11008102	RS485-01	RS-485 serial communication module (Modbus)	3	----	CE--
11008103	RS232-01	RS-232C serial communication module (Modbus)	3	----	CC--
11008104	RS232-02	RS-232C serial communication module with switches to program the microcontroller flash memory	3	----	CC--
11008105	CAN/RS485-01	CAN and RS-485 interface module (CANopen / DeviceNet / Modbus)	3	----	CA--
11008106	CAN-01	CAN interface module (CANopen / DeviceNet)	3	----	CD--
11045488	PROFIBUS DP-01	Profibus DP communication module	3	----	C9
11008911	PLC11-01	PLC module	1, 2 and 3	----	--xx[(1)(3)]
11094251	PLC11-02	PLC module	1, 2 and 3	----	--xx[(1)(3)]

WEG Item (material number)	Name	Description	Slot	Identification Parameters	
				P0027	P0028
Anybus-CC accessories to install in Slot 4					
11008158	DEVICENET-05	DeviceNet interface module	4	----	--xx[2][3]
10933688	ETHERNET/IP-05	EtherNet/IP interface module	4	----	--xx[2][3]
11550476	MODBUSTCP-05	Modbus TCP interface module	4	----	--xx[2][3]
11550548	PROFINETIP-05	PROFINET IO interface module	4	----	--xx[2][3]
11008107	PROFDP-05	Profibus DP interface module	4	----	--xx[2][3]
11008161	RS485-05	RS-485 interface module (passive) (Modbus)	4	----	--xx[2][3]
11008160	RS232-05	RS-232 interface module (passive) (Modbus)	4	----	--xx[2][3]
Flash memory module to install in Slot 5 - Included in Standard Models					
11719952	MMF-03	Flash memory module	5	----	--xx[3]
Stand-alone HMI, Blank Cover, and Frame for Remote Mounted HMI					
11008913	HMI-01	Stand-alone HMI [4]	HMI	-	-
11010521	RHMIF-01	Remote HMI frame kit (IP56)	-	-	-
11010298	HMID-01	Blank cover for the HMI slot	HMI	-	-
10950192	HMI CAB-RS-1M	Serial cable for remote HMI 1 m	-	-	-
10951226	HMI CAB-RS-2M	Serial cable for remote HMI 2 m	-	-	-
10951223	HMI CAB-RS-3M	Serial cable for remote HMI 3 m	-	-	-
Others					
10960846	CONRA-01	Control rack (containing the CC11 control board)	-	-	-
10960847	CCS-01	Control cable shielding kit (supplied with the product)	-	-	-
13555095	Cabos Fibra/Sinal 2,5 m	Signal and Fiber optic cables set CFW11M G2 - 2.5 m	-	-	-
13555150	Cabos Fibra/Sinal 3,0 m	Signal and Fiber optic cables set CFW11M G2 - 3.0 m	-	-	-
13555151	Cabos Fibra/Sinal 3,6 m	Signal and Fiber optic cables set CFW11M G2 - 3.6 m	-	-	-
13353317	RACK G2 2	Rack to assemble 2 UP11 G2 units in panel [5]	-	-	-
13353316	RACK G2 3	Rack to assemble 3 UP11 G2 units in panel [5]	-	-	-
13166838	DBW040250D5069SZ	DBW04 dynamic braking module	-	-	-

(1) Refer to the PLC module manual.
(2) Refer to the Anybus-CC communication manual.
(3) Refer to the programming manual.
(4) Use DB-9 pin, male-to-female, straight-through cable (serial mouse extension type) for connecting the keypad to the inverter or Null-Modem standard cable. Maximum cable length: 3 m (9.8 ft).
Examples:
- Mouse extension cable - 1.80 m (6 ft); Manufacturer: Clone.
- Belkin pro series DB9 serial extension cable 5 m; Manufacturer: Belkin.
- Cables Unlimited PCM195006 cable, 6 ft DB9 m/f; Manufacturer: Cables Unlimited
(5) Refer to the rack mounting guide.

8 TECHNICAL SPECIFICATIONS

This chapter describes the technical specifications (electrical and mechanical) of the CFW-11M G2.

8.1 POWER DATA

Power supply:

- Voltage tolerance: -15 % to +10 %.
- Maximum rated line voltage: 480 V for models with DC power supply of 436...750 Vdc, 600 V for models with DC power supply of 574...970 Vdc and 690 V for models with DC power supply of 758...1150 Vdc, for altitude up to 2000 m. For higher altitudes, the rated line voltage derating will be 1.1 % for each 100 m above 2000 m – maximum altitude: 4000 m.
- Frequency: 50/60 Hz (48 Hz to 62 Hz).
- Phase imbalance: ≤ 3 % of the rated phase-to-phase input voltage.
- Overvoltages according to Category III (EN 61010/UL 508C).
- Transient voltages according to Category III.
- Maximum of 12 connections per hour (1 every 5 minutes).
- Typical efficiency: ≥ 98 %.

NOTE!
In the power supply data presented, it is assumed that the inverter is powered by a diode bridge.

Table 8.1: Inverter technical specifications for rated switching frequencies

Model	Power Supply [Vdc]	Nº. of UP11	Normal Duty (ND)							Heavy Duty (HD)						
			Rated Output Current [Arms]	Overload Current (2) [Arms]		Switching Frequency [kHz]	Maximum Motor (3) [CV/kW]	Rated Input Current [Adc]	Dissipated Power (4) [kW]	Rated Output Current [Arms]	Overload Current (2) [Arms]		Switching Frequency [kHz]	Maximum Motor (3) [CV/kW]	Rated Input Current [Adc]	Dissipated Power (4) [kW]
				1 min	3 s						1 min	3 s				
CFW11M G2 0634 T 4	436...750	1	634	697	951	2.0	550/400	729	4.4	515	773	1030	2.0	450/330	592	3.5
CFW11M G2 1205 T 4		2	1205	1325	1807	2.0	1000/750	1385	8.7	979	1468	1957	2.0	800/600	1125	6.9
CFW11M G2 1807 T 4		3	1807	1988	2710	2.0	1500/1100	2078	13.1	1468	2202	2936	2.0	1200/900	1688	10.4
CFW11M G2 2409 T 4		4	2409	2650	3614	2.0	2000/1500	2771	17.5	1957	2936	3914	2.0	1600/1200	2251	13.8
CFW11M G2 3012 T 4		5	3012	3313	4517	2.0	2500/1850	3463	21.8	2446	3669	4893	2.0	2000/1500	2813	17.3
CFW11M G2 0496 T 6	574...970	1	496	546	744	2.0	550/400	570	5.8	380	570	760	2.0	400/300	437	4.6
CFW11M G2 0942 T 6		2	942	1037	1414	2.0	1000/750	1084	11.7	722	1083	1444	2.0	800/600	830	9.2
CFW11M G2 1414 T 6		3	1414	1555	2120	2.0	1500/1100	1626	17.5	1083	1625	2166	2.0	1200/920	1245	13.8
CFW11M G2 1885 T 6		4	1885	2073	2827	2.0	2000/1500	2168	23.4	1444	2166	2888	2.0	1500/1200	1661	18.4
CFW11M G2 2356 T 6		5	2356	2592	3534	2.0	2500/1850	2709	29.2	1805	2708	3610	2.0	1900/1500	2076	23.0
CFW11M G2 0496 T 6	758...1150	1	439	483	659	2.0	600/440	505	5.9	340	510	680	2.0	400/300	391	4.7
CFW11M G2 0942 T 6		2	834	918	1251	2.0	1100/800	959	11.8	646	969	1292	2.0	800/600	743	9.5
CFW11M G2 1414 T 6		3	1251	1376	1877	2.0	1500/1100	1439	17.7	969	1454	1938	2.0	1250/920	1114	14.2
CFW11M G2 1885 T 6		4	1668	1835	2502	2.0	2200/1600	1918	23.6	1292	1938	2584	2.0	1600/1200	1486	19.0
CFW11M G2 2356 T 6		5	2085	2294	3128	2.0	2800/2000	2398	29.5	1615	2423	3230	2.0	2000/1500	1857	23.7

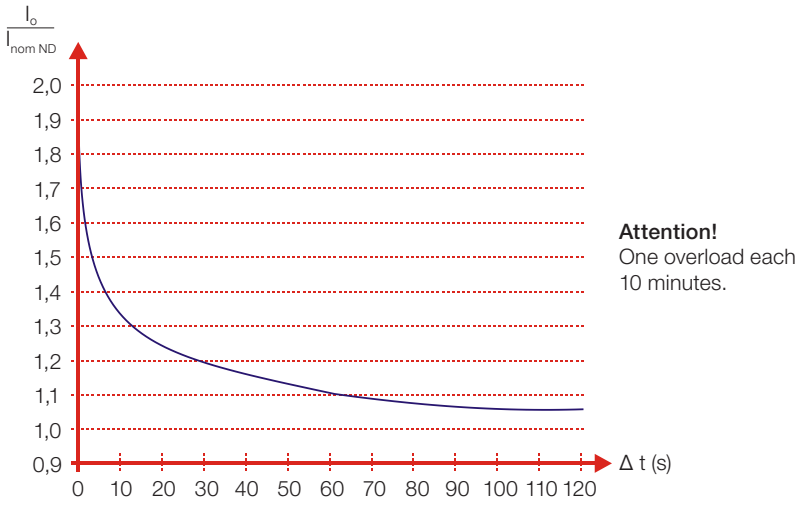
Note:

(1) Steady state rated current in the following conditions:

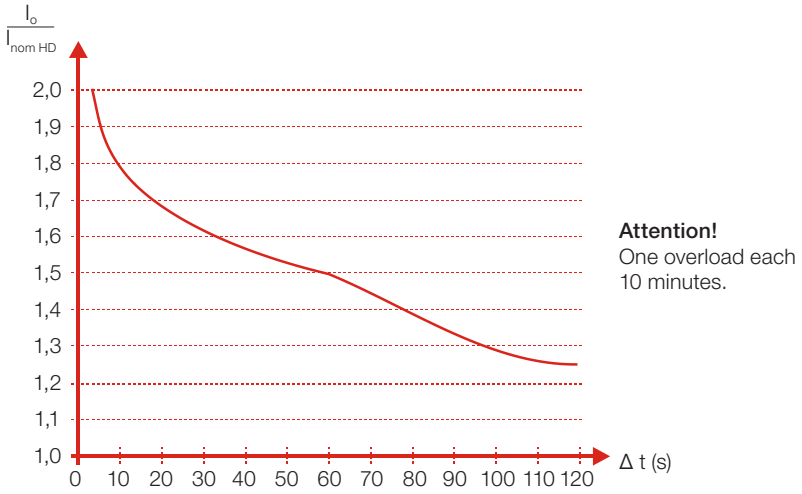
- Indicated switching frequency. It is not possible to use the CFW-11M G2 inverter with switching frequency of 2.5 kHz, 5 kHz and 10 kHz.
- Ambient temperature around the inverter as specified in Chapter 3 INSTALLATION AND CONNECTION on page 3-1. For higher temperatures, limited to 55 ° C, the output current must be derated by 2 % for each ° C above the maximum temperature specified.
- Air relative humidity: 5 % to 95 % non-condensing.
- Altitude: 1000 m. Above 1000 m up to 4000 m, the output current must be derated by 1% for each 100 m above 1000 m.

- Environment with pollution degree 2 (as per EN50178 and UL508C).
- For operation of the inverter in steady state with output frequencies between 0 and 10 Hz, derate the rated output current by 35 %.

(2) One overload every 10 minutes.Table 8.1 on page 8-2 presents only two points of the overload curve (actuation time of 1 min and 3 s). The complete overload curves of the IGBTs for Normal Duty (ND) and Heavy Duty (HD) are presented in Figure 8.1 on page 8-3. Depending on the inverter operating conditions, such as ambient temperature around the inverter and output frequency, the maximum operating time of the inverter with overload may be shorter.



(a) IGBTs overload curve for the Normal Duty (ND) cycle



(b) IGBTs overload curve for the Heavy Duty (HD) cycle

Figure 8.1: *(a) and (b) IGBT overload curves for ND and HD use*

(3) The motor powers are reference values; they are specified for WEG motors with 4 poles, 440 V for models with DC power supply 436...750 Vdc; 575 V for models with DC power supply of 574...970 Vdc and 690 V for models with DC power supply of 758...1150 Vdc. The proper sizing must be done according to the rated current of the motors used.

(4) All dissipated powers obtained using the maximum input voltage, rated current (ND or HD), maximum output voltage and switching frequency of 2.0 kHz. All indicated losses are for the worst case.

8.2 ELECTRONICS/GENERAL DATA

Table 8.2: General data regarding the inverter control and electronics

Control	**Method**	■ Voltage source ■ Control types: - V/f (scalar) - VVW: Voltage vector control - Vector control with encoder - Sensorless vector control (without encoder) - Vector control with encoder for permanent magnet motors (PMSM) ■ PWM SVM (Space Vector Modulation) ■ Current, flux and speed regulators in software (totally digital) ■ Execution rate: - Current regulators: 0.25 ms (switching frequency = 2 kHz) - Flux regulator: 0.5 ms (switching frequency = 2 kHz) - Speed regulator / speed measurement: 1.2 ms
	Output Frequency	■ 0 to 3.4 x motor rated frequency (P0403). This rated frequency is adjustable from 0 Hz to 300 Hz in the scalar mode and from 30 Hz to 120 Hz in the vector mode ■ Output frequency limit as a function of the switching frequency: - De 125 Hz (switching frequency = 1.25 kHz) - De 200 Hz (switching frequency = 2 kHz)
Performance	**Speed Control**	**V/f (Scalar):** ■ Regulation (with slip compensation): 1 % of the rated speed ■ Speed variation range: 1:20 **VVW:** ■ Regulation: 1 % of the rated speed ■ Speed variation range: 1:30 **Sensorless (P0202 = 3 induction motor):** ■ Regulation: 0.5 % of the rated speed ■ Speed variation range: 1:100 **Vector with Encoder (P0202 = 4 induction motor or P0202 = 6 permanent magnet):** ■ Regulation: - ±0.01 % of the rated speed with analog 14-bit input (IOA) - ±0.01 % of the rated speed with digital reference (keypad, serial, Fieldbus, Electronic Potentiometer, multispeed) - ±0.05 % of the rated speed with a 12-bits analog input (CC11) - Speed variation range: 1:1000
	Torque Control	■ Range: 10 to 180 %, regulation: ±5 % of rated torque (P0202 = 4, 6 or 7) ■ Range: 20 to 180 %, regulation: ±10 % of the rated torque (P0202 = 3, above 3 Hz)
Inputs (CC11 board)	**Analog**	■ 2 isolated differential inputs; resolution of AI1: 12 bits, resolution of AI2: 11bits + signal, (0 to 10) V, (0 to 20) mA or (4 to 20) mA, impedance: 400 kΩ for (0 to 10) V, 500 Ω for (0 to 20) mA or (4 to 20) mA, programmable functions
	Digital	■ 6 isolated digital inputs, 24 Vdc, programmable functions
Outputs (CC11 board)	**Analog**	■ 2 isolated outputs, (0 to 10) V, Rl ≥ 10 kΩ (maximum load), 0 to 20 mA / 4 to 20 mA (Rl ≤ 500 Ω) resolution: 11 bits, programmable functions
	Relay	■ 3 relay outputs with NA/NF (NO/NC), 240 Vac, 1 A, programmable functions
Safety	**Protection**	■ Output overcurrent/short-circuit ■ Under/overvoltage ■ Phase loss ■ Overtemperature ■ Braking resistor overload ■ IGBTs overload ■ Motor overload ■ External fault / alarm ■ CPU or memory fault ■ Output phase-ground short-circuit
Integral keypad (HMI)	**Standard keypad**	■ 9 operator keys: Start/Stop, Up arrow, Down arrow, Direction of rotation, Jog, Local/Remote, Right soft key and Left soft key ■ Graphical LCD display ■ View/edition of parameters ■ Indication accuracy: - Current: 5% of the rated current - Speed resolution: 1rpm ■ Possibility of remote mounting
Enclosure	**IP00**	■ Standard
PC Connection for Inverter Programming	**USB Connector**	■ Standard USB Rev. 2.0 (basic speed) ■ Type B (device) USB plug ■ Interconnection cable: standard host/device shielded USB cable

8.2.1 Codes and Standards

Safety Standards	■ UL 61800-5-1 – Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal and Energy ■ IEC/EN 61800-5-1 - Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal and Energy
Electromagnetic Compatibility Standards (EMC)	■ IEC/EN 61800-3 - Adjustable speed electrical power drive systems - Part 3: EMC product standard including specific test methods ■ IEC/EN 61000-4-2 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 2: Electrostatic discharge immunity test ■ IEC/EN 61000-4-3 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio-frequency, electromagnetic field immunity test ■ IEC/EN 61000-4-4 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 4: Electrical fast transient/burst immunity test ■ IEC/EN 61000-4-5 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 5: Surge immunity test ■ IEC/EN 61000-4-6 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 6: Immunity to conducted disturbances, induced by radio-frequency fields
Machine Safety Standards (1)	■ EN ISO 13849-1:2015 - Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design ■ EN 62061:2005+A1:2013+AC:2010+A2:2015 / IEC 62061:2005+A1:2012+A2:2015* - Safety of machinery – Functional safety of safety-related electrical, electronic and programmable control systems ■ EN 61800-3:2004+A1:2012 / IEC 61800-3:2004+AMD1:2011* - Adjustable speed electrical power drive systems Part 3: EMC requirements and specific test methods ■ EN 60204-1:2006+A1:2009+AC:2010 - Safety of machinery – Electrical equipment of machines Part 1: General requirements ■ EN 61800-5-2:2007 / IEC 61800-5-2:2007 - Adjustable speed electrical power drive systems Part 5: Safety Requirements / Section 2: Functional ■ IEC/EN 61508 Parts 1-7:2010 - Functional safety of electrical/electronic/programmable electronic safety-related systems
Mechanical Construction Standards	■ IEC/EN 60529 - Degrees of protection provided by enclosures (IP code) ■ UL 50 - Enclosures for electrical equipment

(1) These standards only apply to inverters with safety stop.

8.3 MECHANICAL DATA

The UP11 G2 module has a total mass of 94 Kg. Its dimensions are shown in Figure 8.2 on page 8-6.

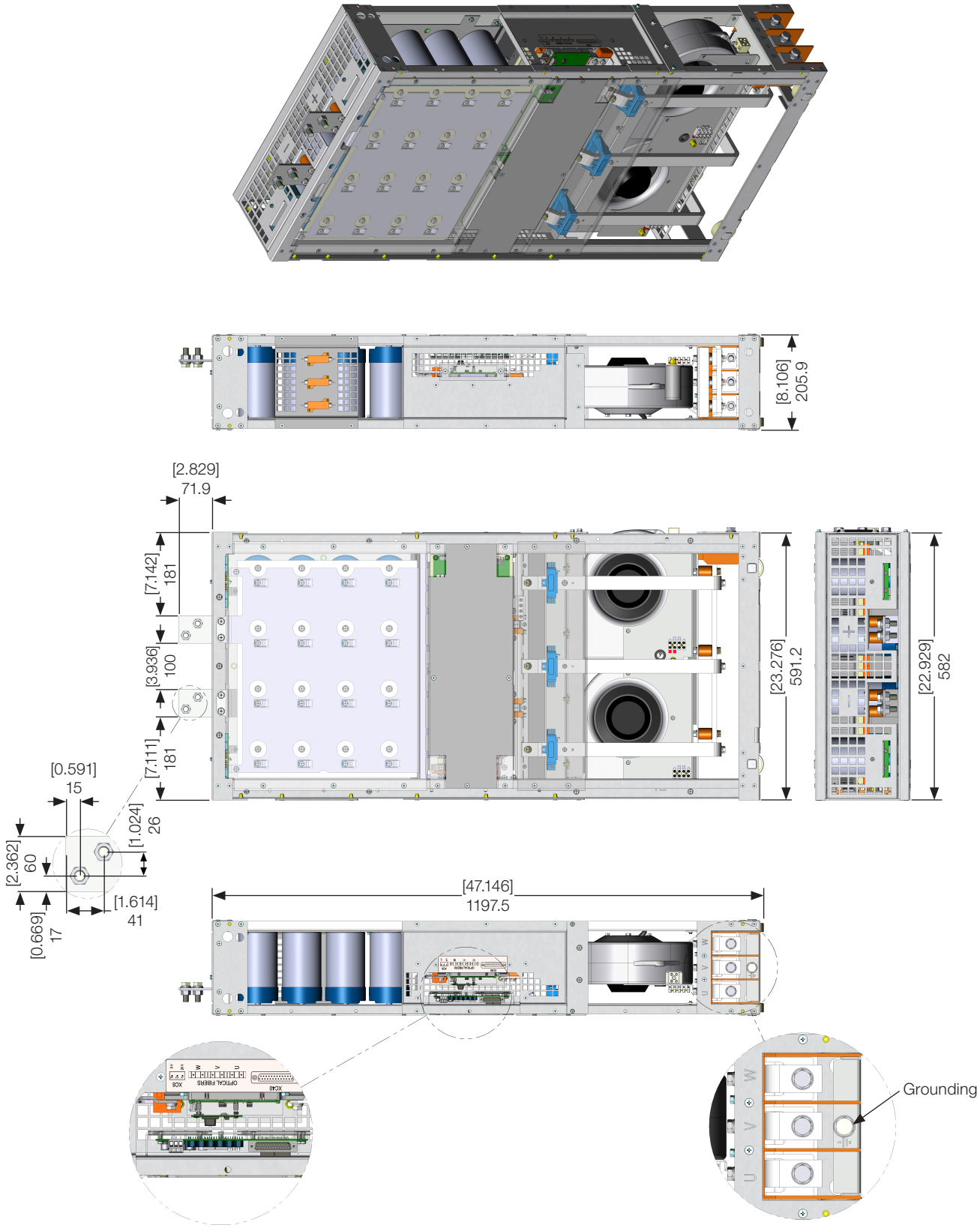


Figure 8.2: *Mechanical dimensions in mm [in]*

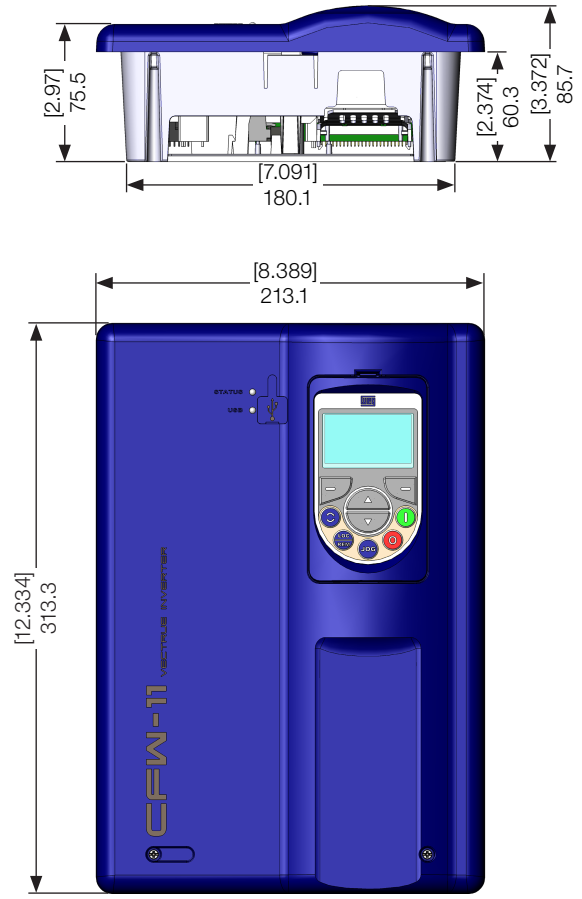


Figure 8.3: *Control rack dimensions in mm [in]*

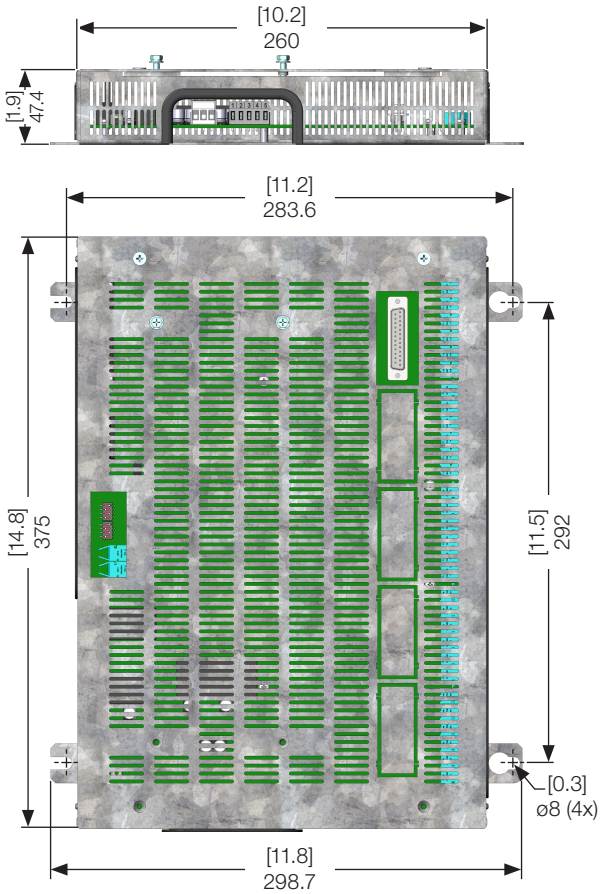


Figure 8.4: *Dimensions of the ICUP board metal enclosure in mm [in]*