Frequency Inverter

CFW11W G2

User's Manual

User's Manual

Series: CFW11W G2

Language: English

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Models: 780...3705 A/500...690 V

Publication Date: 03/2022

Summary of Reviews

The table below describes all revisions made to this manual.

Revision	Description	Chapter
-	R00	First edition
-	R01	Coolant's inhibitor concentration change, preventive maintenance review and general corrections
-	R02	General review

1 SAFETY INSTRUCTIONS

This manual contains the information necessary for the correct use of the CFW11W G2 frequency inverter.

It was developed to be used by people with proper technical qualification or training to operate this kind of equipment.

1.1 SAFETY NOTICES IN THE MANUAL

The following safety notices are used in this manual:

DANGER!
Failure to comply with the procedures recommended in this warning may lead to death, serious injuries and considerable material damages.

ATTENTION!
Failure to comply with the procedures recommended in this warning may lead to material damages.

NOTE!
The text provides important information for the full understanding and proper operation of the product.

1.2 SAFETY WARNINGS ON THE PRODUCT

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

High voltages present.

Components sensitive to electrostatic discharges. Do not touch them.

Mandatory connection to the protective earth (PE).

Connection of the shield to the ground.

Hot surface.

1

1.3 PRELIMINARY RECOMMENDATIONS

DANGER!
Only qualified personnel, familiar with the CFW-11W 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.

NOTE!
For the purpose of this manual, qualified personnel are people trained so as to be able to:
1. Install, ground, power up and operate the CFW-11W 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 general power supply before touching any electrical component linked to the inverter.
Many components may remain charged with high voltages and/or moving parts (fans) even after the AC power supply input is disconnected or turned off.
Wait for at least ten minutes in order to guarantee the full discharge of the capacitors.
Always connect the equipment frame to the protective earth (PE) at the proper terminal.

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

Do not execute any applied potential test on the inverter!
If necessary, contact WEG.

NOTE!
Frequency inverters may interfere in other electronic devices. Observe the recommendations of Chapter 3 INSTALLATION AND CONNECTION on page 3-1 in order to minimize those effects.

NOTE!
Read this manual completely before installing or operating this inverter.

ATTENTION!
The operation of this equipment requires detailed installation and operation instructions provided in the user's manual and manuals/guides for kits and accessories. Only the user's manual is supplied in print. The other manuals can be obtained on WEG website - **www.weg.net**. A printed copy of this information may be requested through your local WEG representative.

2 GENERAL INFORMATION

2.1 ABOUT THE MANUAL

This manual contains information for the proper installation and start-up in the V/f (scalar) control mode, the main technical data and how to troubleshoot the most usual problems of the CFW11W G2 inverters.

It is also possible to operate the CFW11W G2 in the VVW, Vector Sensorless Vector and Vector with Encoder control modes. For further details about the start-up and other control modes, refer to the programming manual.

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

- Programming manual with detailed description of the parameters and advanced functions of the CFW11 inverter.
- Manual of the interface modules for incremental encoder.
- Manual of the I/O expansion modules.
- RS-232/RS-485 serial communication manual.
- CANopen slave communication manual.
- Anybus-CC communication manual.

Those manuals are available on WEG website - **www.weg.net**.

2.2 TERMS AND DEFINITIONS USED IN THE MANUAL

Normal Duty (ND): operating duty of the inverter that defines the maximum current values for continuous operation I_{nom-ND} and overload of 110 % for one minute. It is selected by programming P0298 (Application) = 0 (Normal Duty (ND)). It should be used to drive motors which are not subject, in the application, to high torques in relation to its rated torque, when operating in steady state, at the start, at the acceleration or deceleration.

I_{nom-ND}: inverter rated current for operation under normal duty (ND). Overload: 1.1 x I_{nom-ND}/ 1 minute.

Heavy Duty (HD): operating duty of the inverter that defines the maximum current values for continuous operation I_{nom-HD} and overload of 150 % for one minute. It is selected by programming P0298 (Application) = 1 (Heavy Duty (HD)). It should be used to drive motors which are subject, in the application, to high overload torques in relation to its rated torque, when operating at constant speed, at the start, at the acceleration or at the deceleration.

I_{nom-HD}: inverter rated current for operation under heavy duty (HD). 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. Composed of thyristors or power diodes.

Pre-Charge Circuit: it loads the capacitors of the DC link with limited current, avoiding high current peaks at the inverter energization.

DC Link: intermediate circuit of the inverters; voltage in direct current obtained by rectifying the alternate supply voltage or through an external power supply; it supplies the output inverter bridge of the inverters composed of IGBTs.

DC+: positive terminal of the DC Link.

DC-: negative terminal of the DC Link.

Arm U, V and W: 2-IGBT set of 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 whose resistance value in ohms decreases proportionally to the temperature increase; used as temperature sensor on power packs.

HMI: Human-Machine Interface; device which allows controlling the motor, viewing and changing the inverter parameters. The HMI of the CFW11W G2 has keys to control 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; pulsed voltage generated by the output inverter which feeds the motor.

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

General Enable: function of the inverter that, when enabled, accelerates the motor by acceleration ramp. When disabled, the PWM pulses will be immediately blocked. It may be controlled by a digital input programmed for this function or via serial.

Run/Stop: function of the inverter that, when enabled (run), accelerates the motor by acceleration ramp up to the reference speed, and, when disabled (stop), decelerates the motor by deceleration ramp until full stop, when the PWM pulses are then blocked. It may be controlled by a digital input programmed for this function or via serial. The HMI I (Run) and O (Stop) keys operate in a similar way.

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

UP11W G2: power Unit of the CFW11W G2.

UC11 G2: control Unit of the CFW11W G2.

PLC: programmable logic controller.

Amp, A: ampere.

°C: degrees Celsius.

AC: alternating current.

DC: direct current.

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

cm: centimeter.

CV: Brazilian unit of power = 736 Watts; usually used to indicate mechanical power of electric motors.

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 CFW11W G2

CFW11W G2 inverters are the second generation of CFW11W inverters. The main differences in relation to the previous generation are the following:

- Smaller. CFW-11M G2 is shorter, slimmer and less deep than the CFW11W, allowing the installation of 3 UP11W G2 in panels featuring 800 mm wide, 2000 mm high and 800 mm deep columns.
- More modern. State-of-the-art components increased the inverter power.

The CFW11W G2 is a high-performance, water-cooled 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.
- Programmable Vector, Scalar (V/f) or VVW control on 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 enables high precision in the drive throughout the speed range (even stopped 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 CFW11W G2 inverters present a modular design, with configurations from one to five power units (UP11W 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 UP11Ws G2.

These inverters are water-cooled, being more compact than other inverters.

The UP11Ws and UC11 G2 are supplied by 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 UP11Ws 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 CFW11 line and the ICUP board. This board sends signals to all UP11Ws G2 (PWM, control signals, etc.), and receives signals from them (current, voltage feedback, etc.).

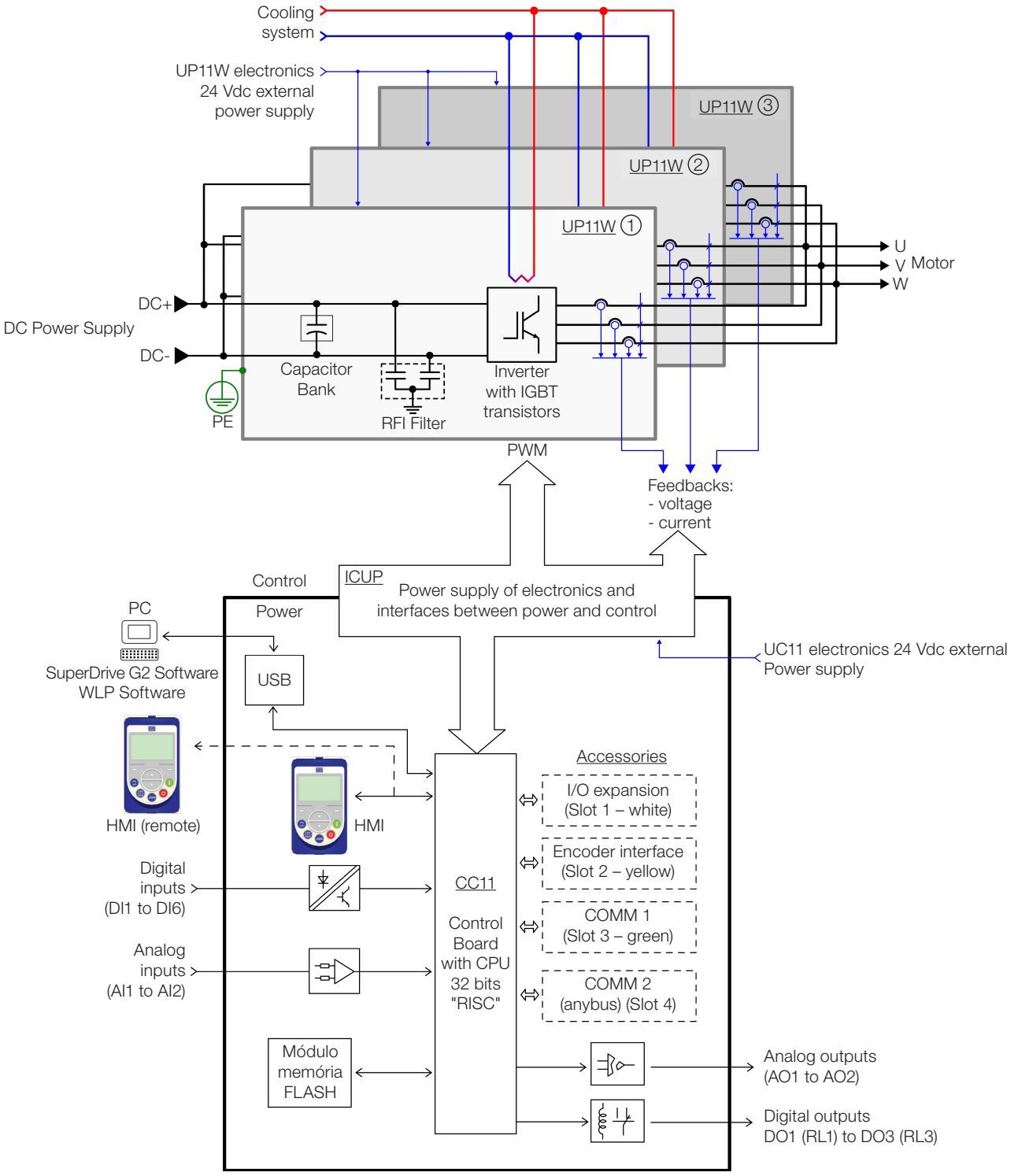


Figure 2.1: *General diagram of the inverter*

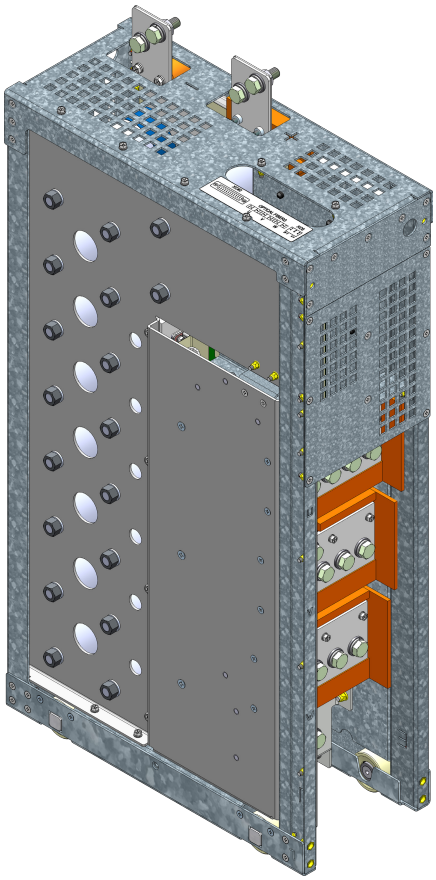


Figure 2.2: *Power unit (UP11W G2)*

Figure 2.3: *Control unit (UC11 G2)*

NOTE!
To assemble the complete drive, several additional items are necessary, such as input rectifier, fuses on the DC power supply of each UP11W power unit, external pre-charge circuit and input reactance with minimum input impedance of 3 % when it is a 6-pulse rectifier.

NOTE!
It is not necessary to include a current transformer (CT) in the drive for protection against short circuit to the ground in the output, since each UP11W G2 has its own internal protection.

2.4 UC11 G2 NAMEPLATE

The UC11 G2 nameplate is located on the control rack.

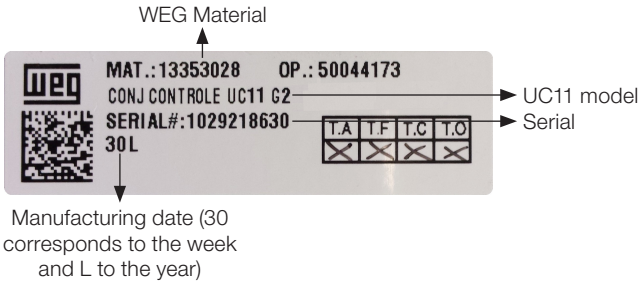


Figure 2.4: *Nameplate of the UC11 G2*

Figure 2.5: *Nameplate location*

2.5 UP11W G2 NAMEPLATE

The nameplate is located on the front of the UP11W G2.

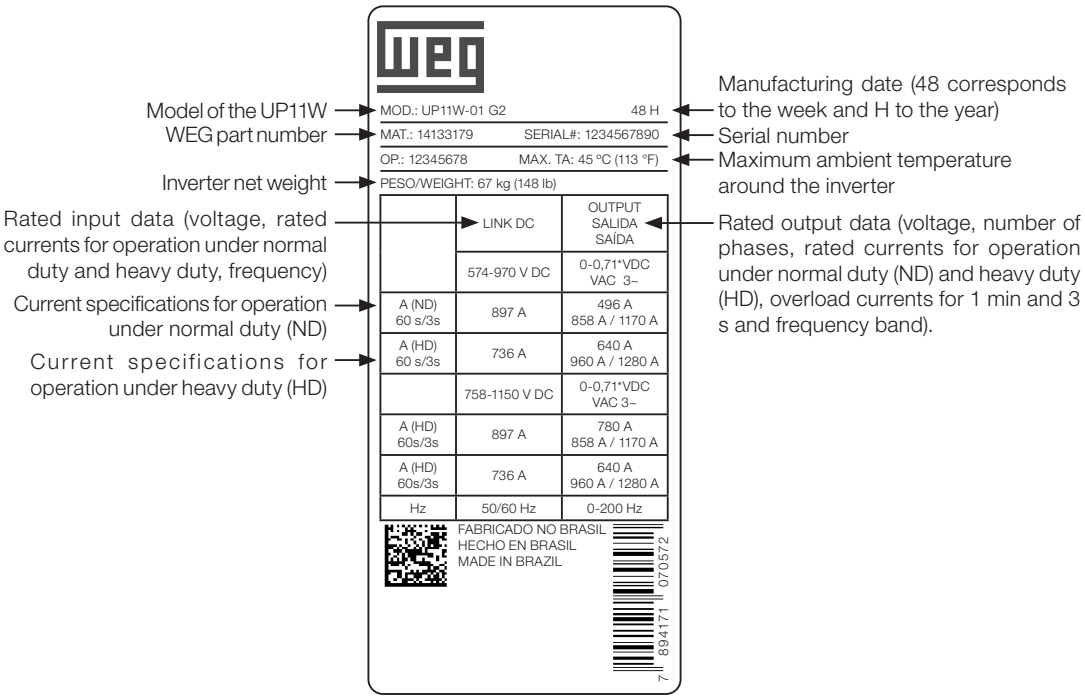


Figure 2.6: *UP11W G2 nameplate*

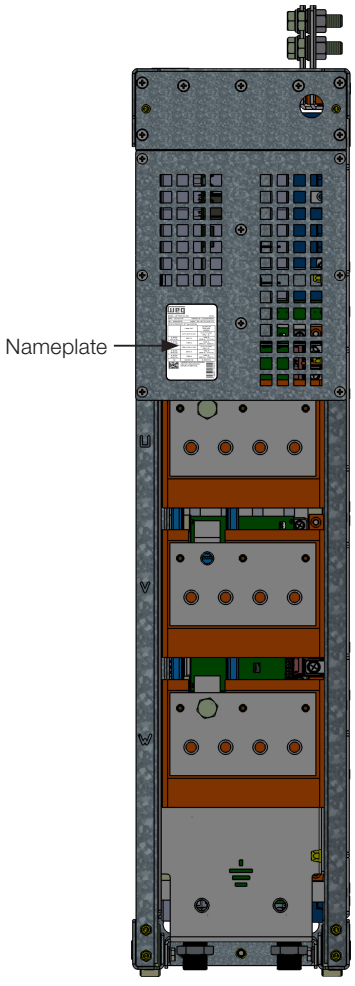


Figure 2.7: *Location of the nameplates*

2.6 HOW TO SPECIFY THE MODEL OF THE CFW11W G2 (SMART CODE)

In order to specify the model of the CFW11W G2, it is necessary to 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 See the list of models in Chapter 8 TECHNICAL DATA on page 8-1, which also contains the technical data of the inverters					Optional Items See Chapter 7 OPTIONAL ITEMS AND ACCESSORIES on page 7-1 for further details on the optional items				
Example	**BR**	**CFW11W G2**	**0780**	**T**	**6 (*)**	**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	6 = 500...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.: CFW11W G21482T6OYZ corresponds to a CFW11W G2 three-phase inverter of 1482 A, with input supply voltage from 500 V to 690 V, with optional safety stop. The options for the inverter rated current under normal duty (ND) are in Table 2.2 on page 2-10, according to the inverter rated output voltage.

Table 2.2: *Rated currents under normal duty (ND)*

500-690 V
0780 = 780 A
1482 = 1482 A
2223 = 2223 A
2964 = 2964 A
3705 = 3705 A

2.7 RECEIPT AND STORAGE

The power units of the CFW11W G2 are supplied in a wooden box.

The control units of the CFW11W G2 are supplied in a cardboard box.

There is an identification label affixed to the outside of the package, identical to the label affixed to the side of 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 ºC and 60 ºC), with a cover to prevent the ingress of dust.

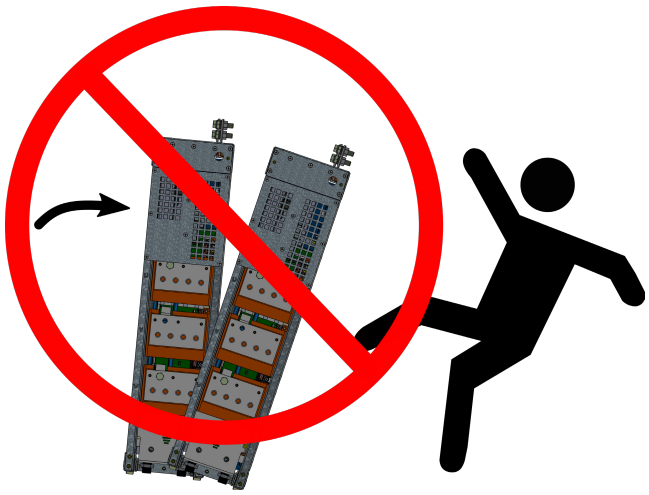


Figure 2.8: *Do not tilt the power units*

3 INSTALLATION AND CONNECTION

This chapter describes the electrical and mechanical installation procedures for the CFW11W G2. The directions and suggestions must be observed so as to ensure the safety of people and equipment, and 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 and high humidity.
- Inflammable or corrosive liquids or gases.
- Dust, metal particles or oil suspended in the air.

Environment conditions permitted for operation:

- 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) - 0.5 % of current derating for each Celsius degree above 45 °C (113 °F).
- Coolant input temperature: 0 °C to 45 °C (32 °F to 113 °F) according to the coolant used. From 45 °C to 55 °C (113 °F to 131 °F) – 1 % of current derating for each Celsius degree above 45 °C (113 °F).
- Coolant flow: 20 l/min.
- Maximum altitude: up to 1000 m (3.300 ft) – rated conditions.
- From 1000 m to 4000 m (3.300 ft to 13.200 ft) – 1 % of current derating for each 100 m above 1000 m of altitude.
- From 2000 m to 4000 m (6.600 ft to 13.200 ft) - maximum voltage (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 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 Part List

For the panel mounting of the CFW11W G2, it is necessary: control set, UP11W G2 power units and cable sets to connect the UC11 G2 to the UP11W G2. Table 3.1 on page 3-1 contains the part list of the CFW11W G2 inverter.

Table 3.1: *Part list - CFW-11W G2 500 - 690 V Drives*

Qty. UP11W-01 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	780	640	1	1	-	-
2	1482	1216	1	2	-	-
3	2223	1824	1	-	1	2
4	2964	2432	1	2	1	1
5	3705	3040	1	-	3	2

Table 3.2: Cable set items

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

The panel builder must provide the other parts of the drive. Among those parts are the rectifier, power busbar, pre-charge circuit, panel fans, protection fuses and input reactance.

3.1.3 Lifting

Figure 3.1 on page 3-2 shows the position of the lifting lugs.

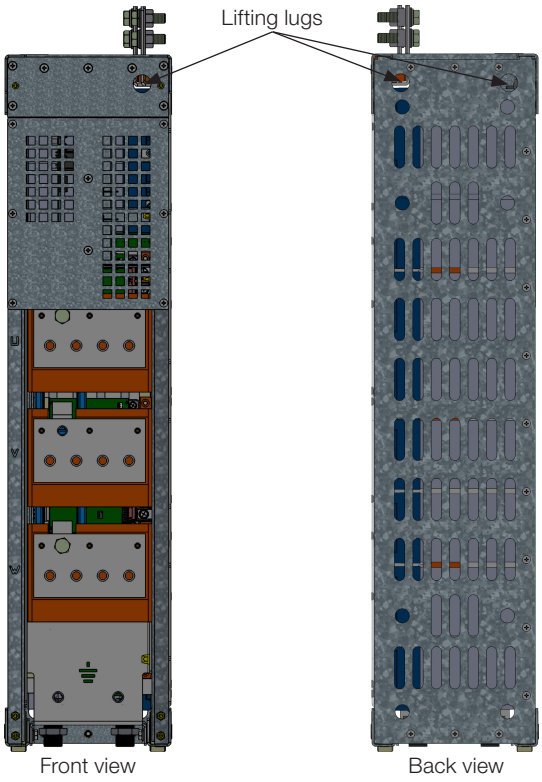


Figure 3.1: UP11W G2 lifting lugs

3.1.4 Panel Mounting of the UP11W G2

In order to install the UP11W 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.

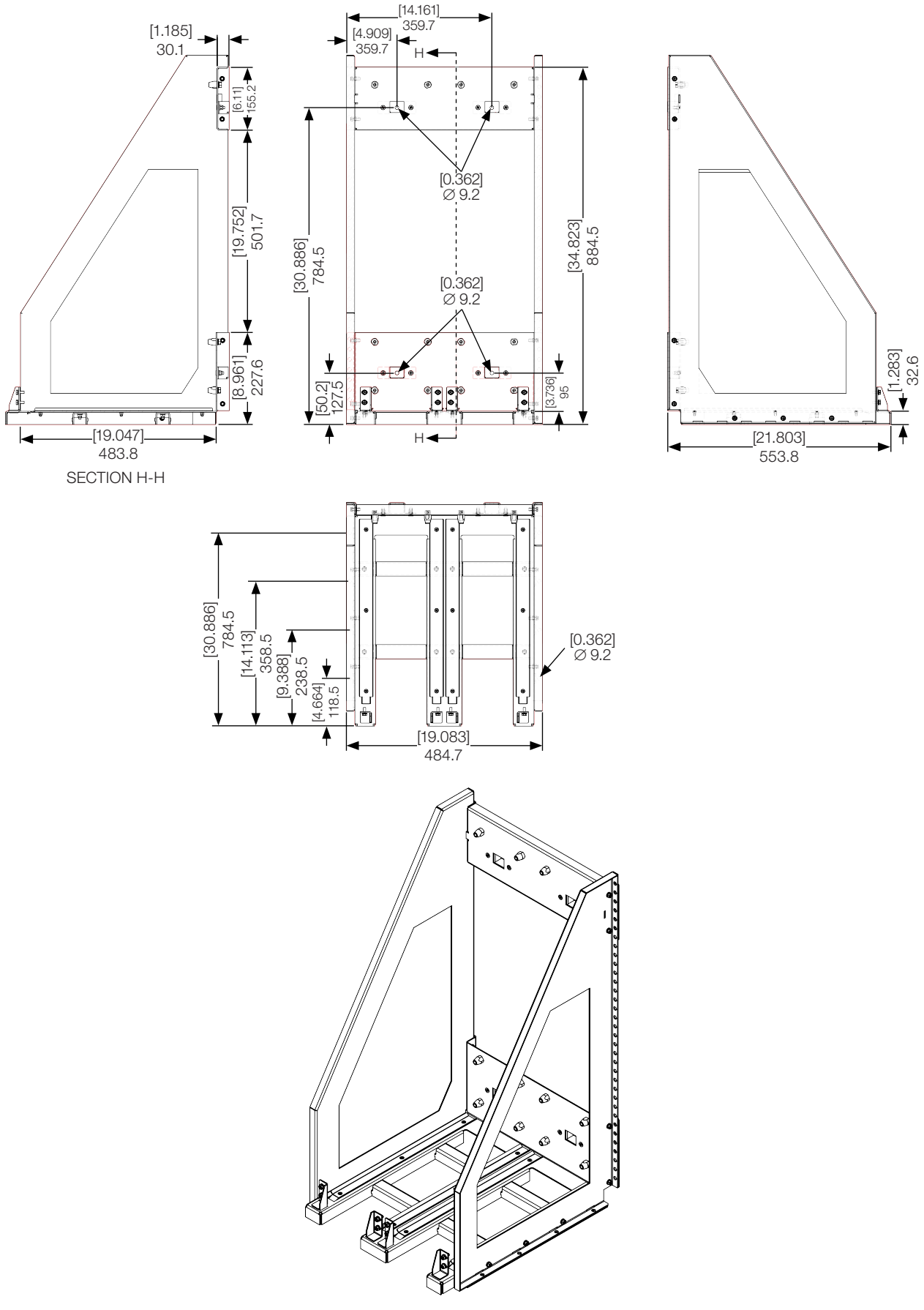
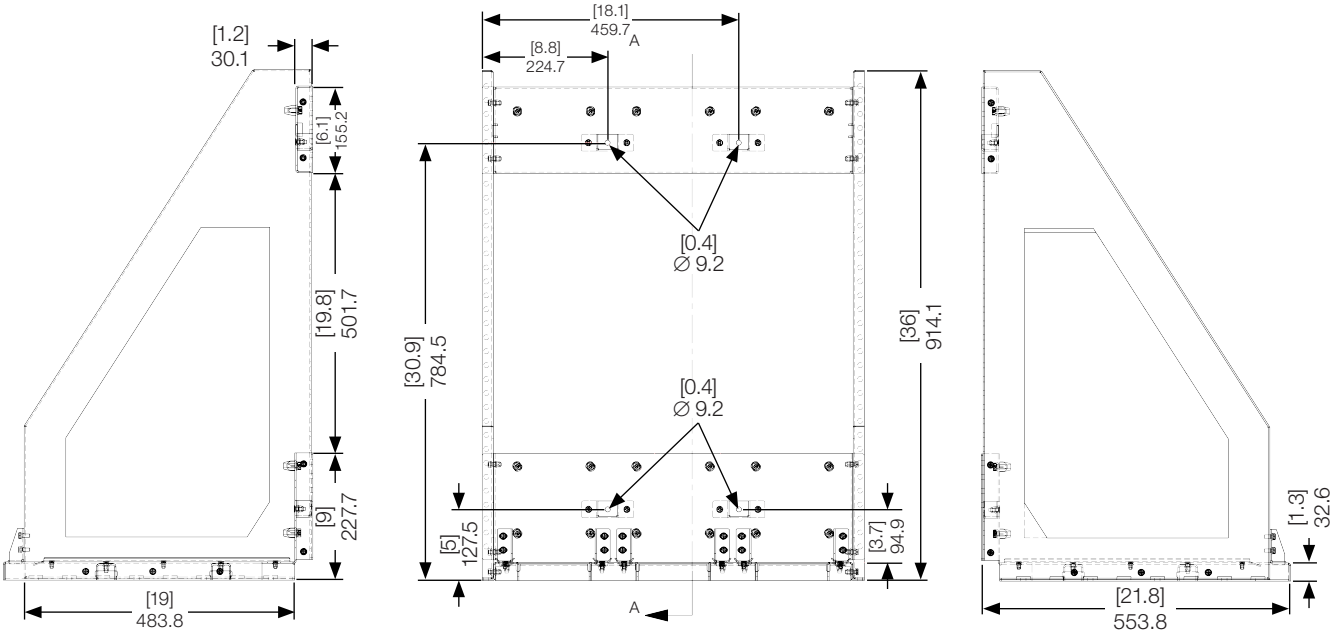
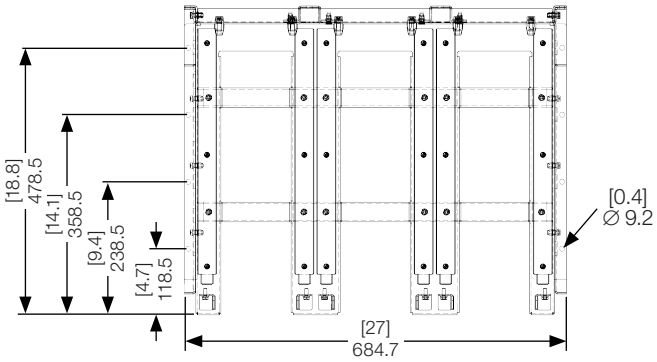


Figure 3.2: *Dimensions of Rack 2 G2 in (mm) [in]*





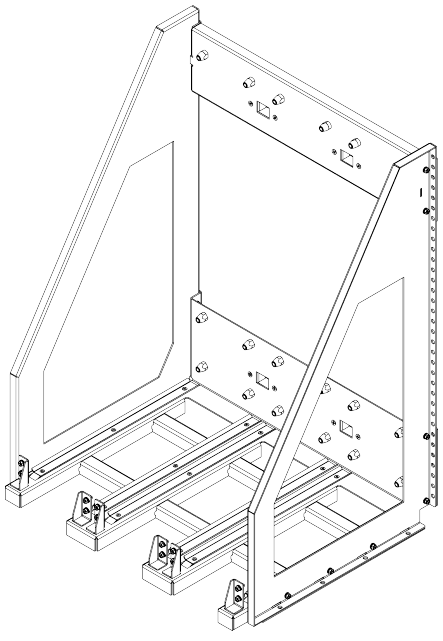


Figure 3.3: *Dimensions of Rack 3 G2 in mm [in]*

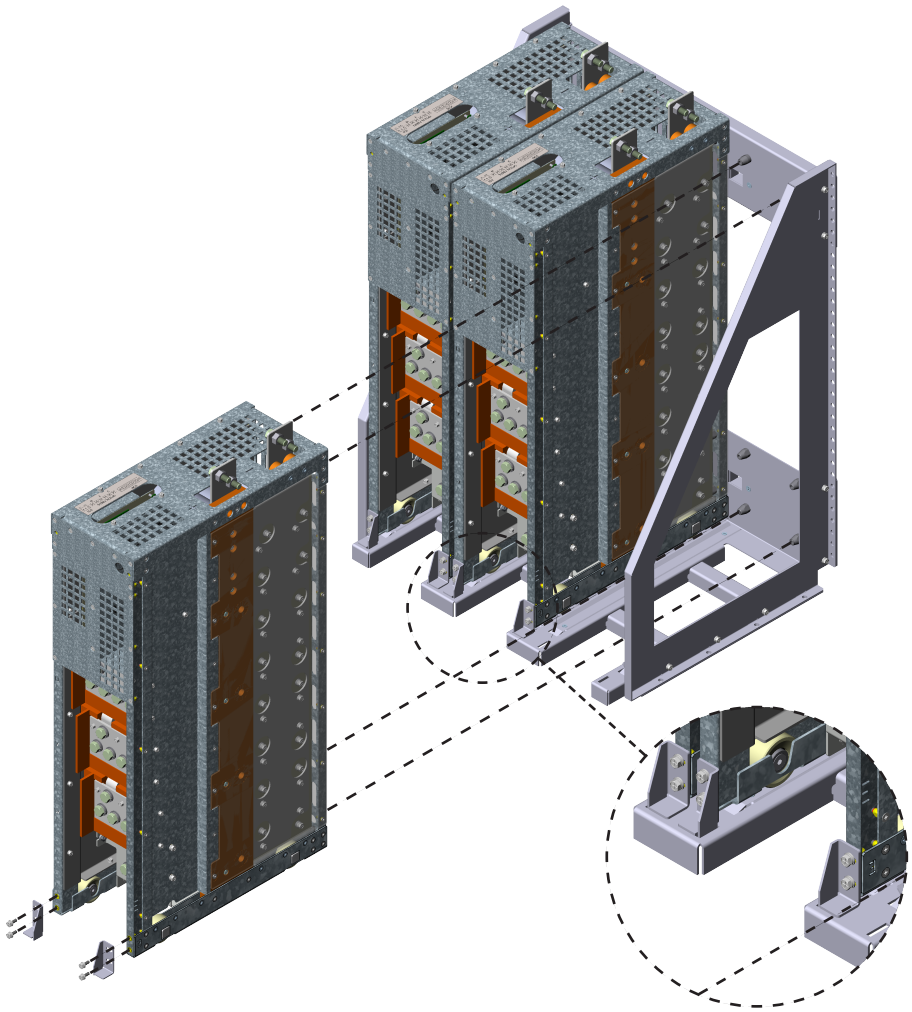
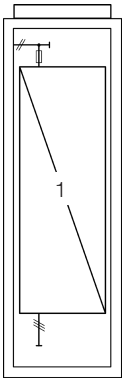


Figure 3.4: *Insertion of the power modules into Rack 3 G2*

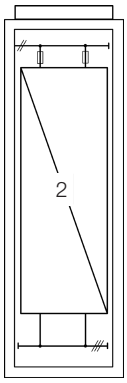
3.1.5 Panel

The minimum panel dimensions are subject to the quantity of UP11Ws G2 of the drive. Figure 3.5 on page 3-5, Figure 3.6 on page 3-6, Figure 3.7 on page 3-6, Figure 3.8 on page 3-6 and Figure 3.9 on page 3-6 contain the minimum dimensions of the panel according to the quantity of UP11Ws G2.



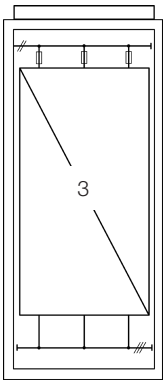
Panel Width	At least 600 mm
Panel Height	At least 2000 mm
Panel Depth	At least 600 mm
Weight Capacity	89 kg

Figure 3.5: *Panel data for a drive with 1 UP11W G2*



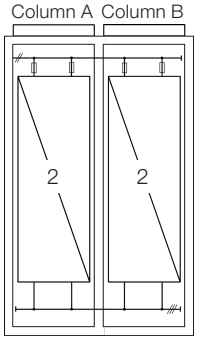
Panel Width	At least 600 mm
Panel Height	At least 2000 mm
Panel Depth	At least 600 mm
Weight Capacity	156 kg

Figure 3.6: *Panel data for a drive with 2 UP11W G2*



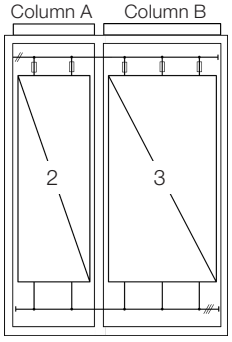
Panel Width	At least 800 mm
Panel Height	At least 2000 mm
Panel Depth	At least 600 mm
Weight Capacity	227 kg

Figure 3.7: *Panel data for a drive with 3 UP11W G2*



Panel Width	At least 600 mm (Column A) + 600 mm (Column B)
Panel Height	At least 2000 mm
Panel Depth	At least 600 mm
Weight Capacity	156 kg (Column A) + 156 kg (Column B)

Figure 3.8: *Panel data for a drive with 4 UP11W G2*



Panel Width	At least 600 mm (Column A) + 800 mm (Column B)
Panel Height	At least 2000 mm
Panel Depth	At least 600 mm
Weight Capacity	156 kg (Column A) + 227 kg (Column B)

Figure 3.9: *Panel data for a drive with 5 UP11W G2*

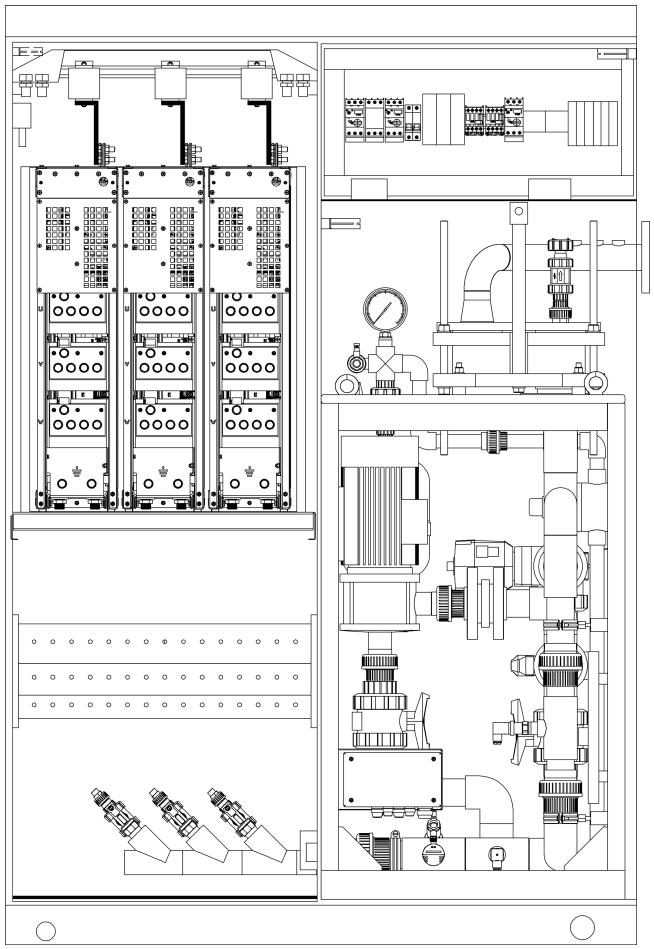


Figure 3.10: *Column with 3 UP11W G2 installed*

Mounting of the UC11 G2 on the panel door: control rack with flange mount and ICUP board shield mounted inside the door. The control rack is mounted with four screws M3 (recommended torque: 0.5 N.m).

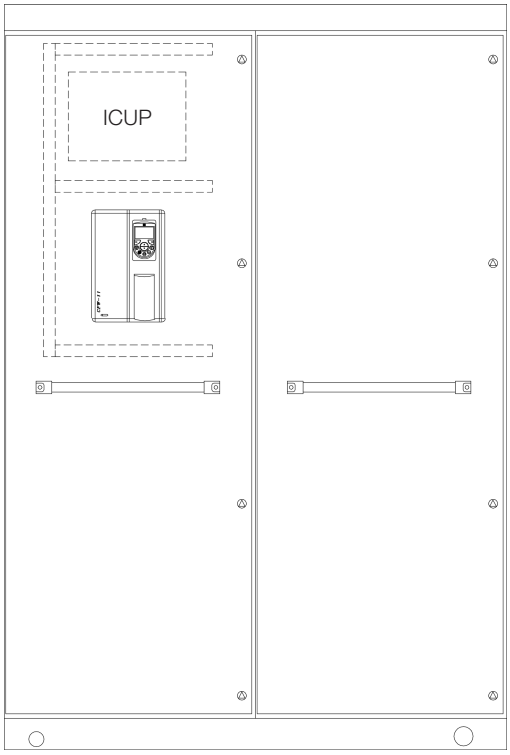


Figure 3.11: *Example of mounting of the control rack in the panel*

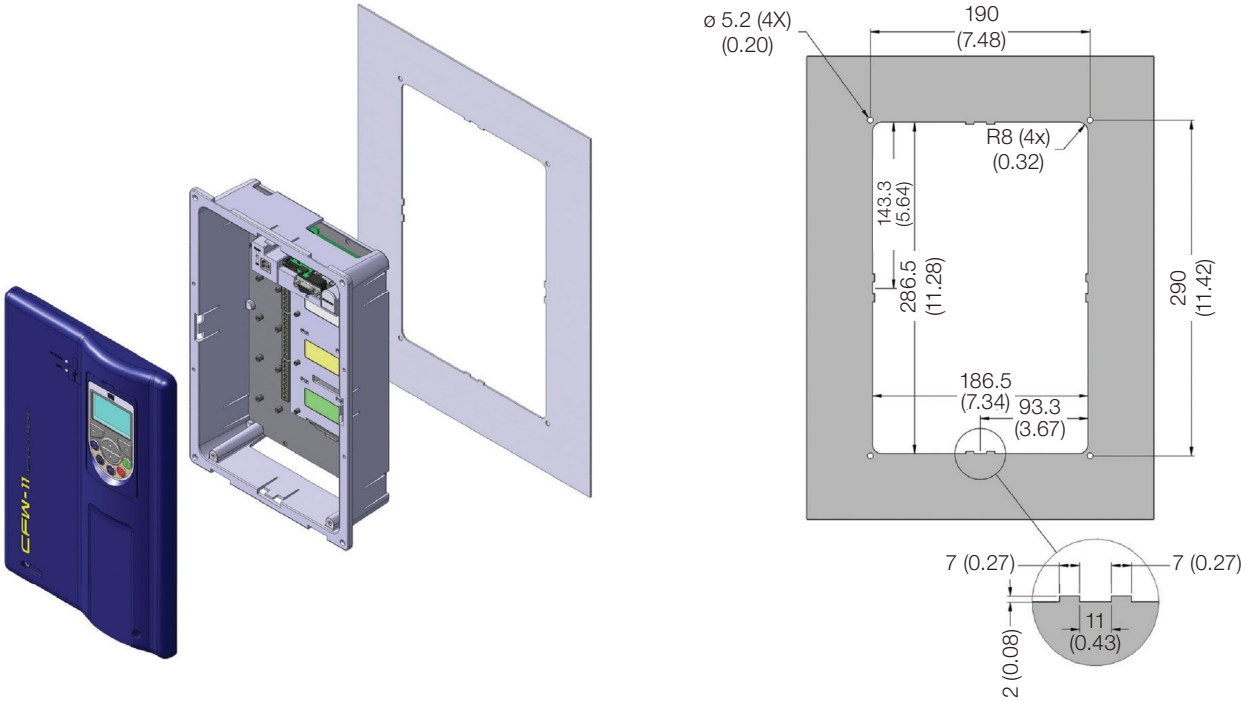


Figure 3.12: *Mounting of the control rack and necessary slots in mm (in)*

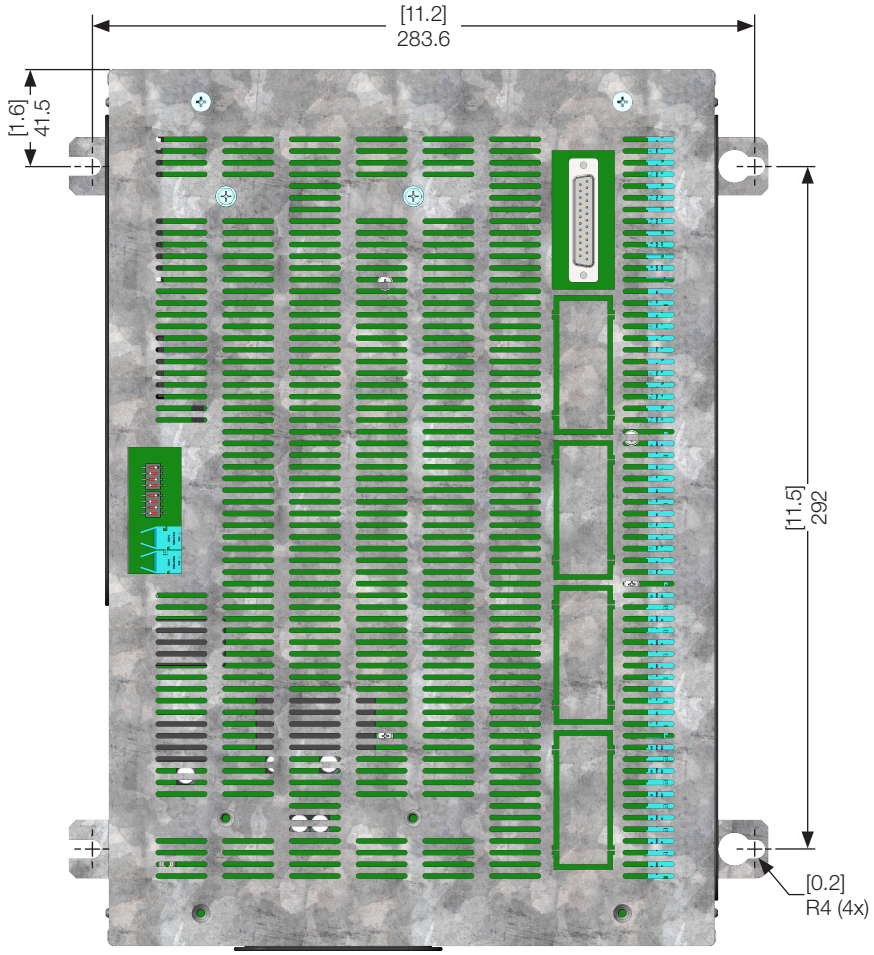


Figure 3.13: *Mounting of the base of the ICUP1 module in mm (in)*

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

3.1.6 Cooling System

Figure 3.14 on page 3-9 shows the details of the coolant inlet and outlet.

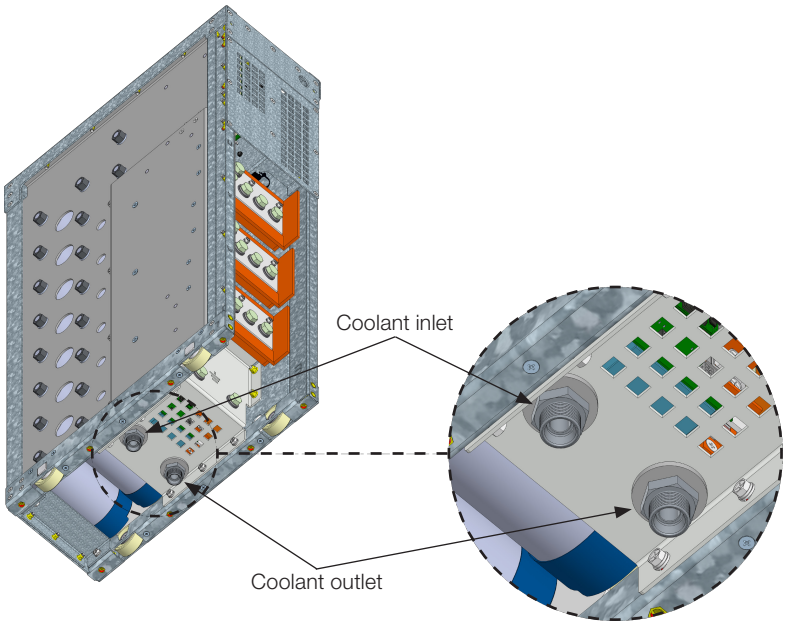


Figure 3.14: *Detail of the coolant inlet and outlet*

Table 3.3 on page 3-9 contains detailed specifications of the UP11W G2 cooling system.

Table 3.3: *Cooling system specifications*

Coolant Inlet Temperature	From 0 °C to 45 °C (32 °F to 113 °F) according to the coolant; see Table 3.7 on page 3-12. From 45 °C to 55 °C (113 °F to 131 °F) with output current derating
Fluid Temperature Increase (1)	6 °C (43 °F)
Coolant Flow	20 l/min
Maximum Flow Allowed	30 l/min
Maximum System Pressure in Relation to the Atmosphere	6 bar (600 kPa)
Load Loss on the Inverter Heatsink (1)	0,84 bar (84 kPa)
Coolant Inlet and Outlet Fittings Used on the Inverter	Stainless steel bulkhead fitting for 16 mm tube, M24X1.5 thread and 24° taper (DIN 3861/ ISO 8434-1). According to Figure 3.15 on page 3-9

Note:

1. Considering the 20 l/min flow and the composition of 88,5 % of water, 10 % de glycol and 1,5 % of inhibitor CorteC VpCI-649 in the coolant.

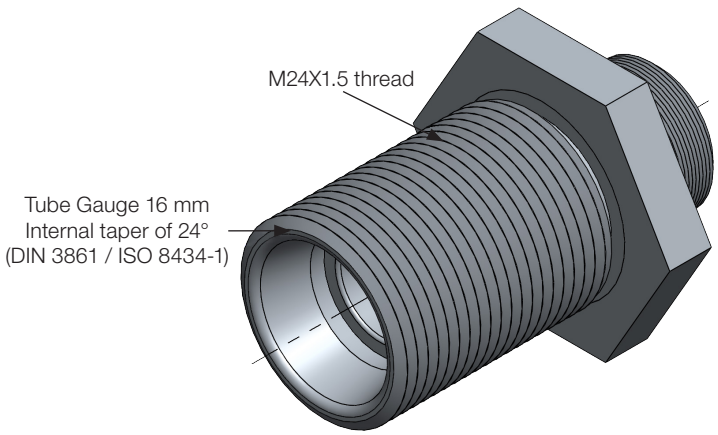


Figure 3.15: *Details of the hydraulic connection on the product*

ATTENTION!
It is recommended the use of stainless steel hydraulic connections in the application cooling system.

Figure 3.16 on page 3-10 shows a simplified diagram of a closed cooling system for the UP11W G2.

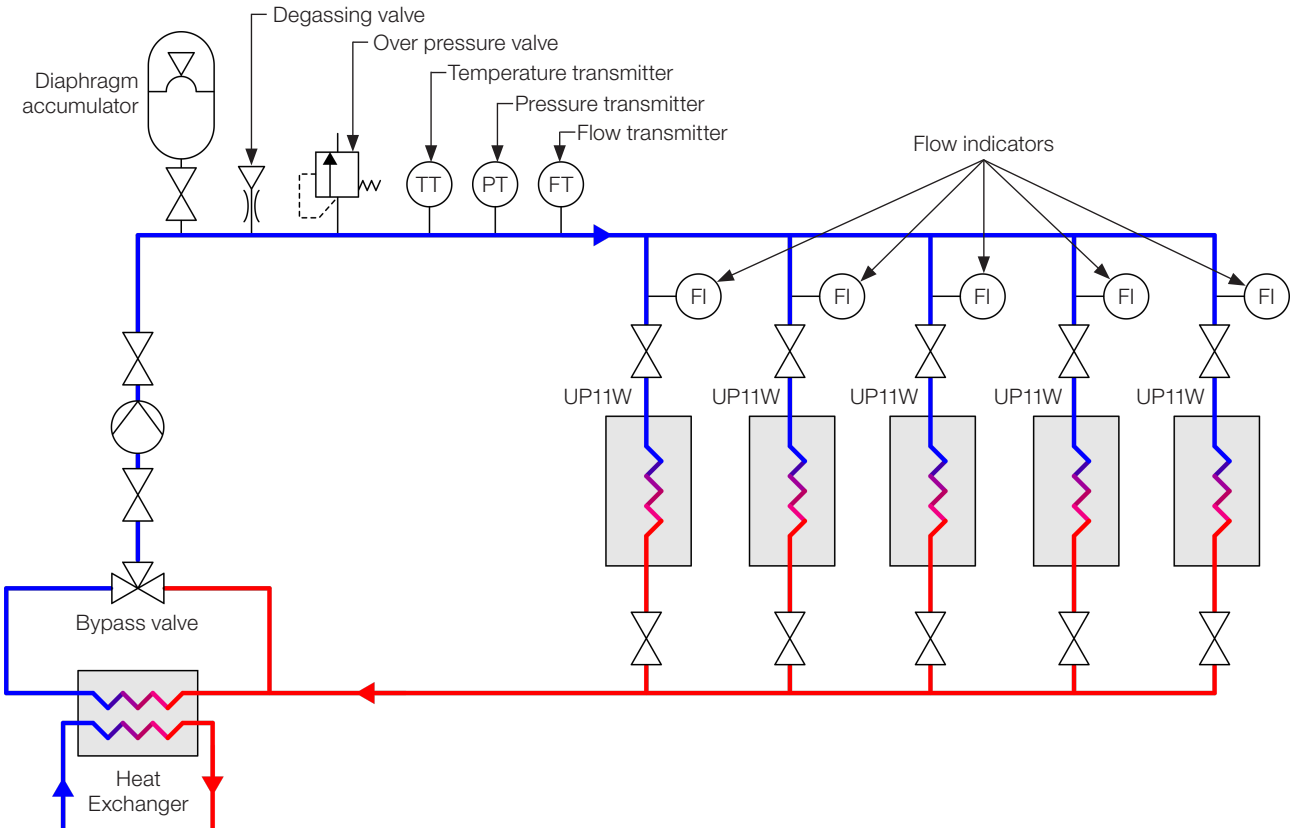


Figure 3.16: *Simplified example of a closed cooling system*

The bypass valve is necessary for the temperature control and protection against condensation. The diaphragm accumulator ensures a quite constant pressure in the cooling system even when great variations occur in the coolant temperature. The pump provides the continuous coolant flow; it is recommended that such pump be made of stainless steel. The acceptable differential pressure in the cooling circuit in relation to the atmosphere must not exceed 6 bar. That must be guaranteed by the over pressure valve.

ATTENTION!
The hoses that connect the cooling system to the UP11W G2 must not conduct electricity.

ATTENTION!
The acceptable differential pressure in the cooling circuit in relation to the atmosphere must not exceed 6 bar.

ATTENTION!
The cooling of the UP11Ws G2 must not be connected in series in the circuit of the cooling system.

NOTA!
WEG RSW cooling system can be used for cooling the CFW11W G2. For further information, refer to the RSW user's manual.

The water used in the coolant must meet the specifications of Table 3.4 on page 3-11. The coolant must not contain any organic sediments or active chemical agents. The coolant is composed of demineralized water, corrosion inhibitor and ethylene glycol.

Table 3.4: *Water specification*

Characteristic	Unit	Value
pH		6 - 8
Hardness	°dH	< 10
Conductivity	µS/cm	< 10
Chlorine	mg/l	< 10
Iron	mg/l	< 0.1
Maximum particle size	µm	< 300

ATTENTION!
Do not use sea or tap water in the coolant.

The specifications of the inverter output current informed in chapter 8 are for coolant temperature from 10 to 45 °C (50 °F to 113 °F), and the composition according to Table 3.5 on page 3-11.

Table 3.5: *Coolant composition for temperature from 10 to 45 °C (50 °F to 113 °F)*

Component	Proportion
Demineralized water	88.5 %
Ethylene glycol	10 %
Inhibitor CorteC VpCI-649	1.5 %

For the inverter operation at temperatures below 10 °C (50 °F), the concentration of ethylene glycol in the coolant must be increased. The increase of the percentage of ethylene glycol reduces the coolant specific heat and the system heat exchange capacity. Therefore, if the inverter operates with more ethylene glycol than the specification of Table 3.5 on page 3-11 and coolant temperature of 45 °C (113 °F), the output current must be derated. As the ethylene glycol concentration is normally increased in order to reduce the coolant freezing point, the coolant temperature reduction can compensate the current derating. Table 3.6 on page 3-11 shows the maximum percentage of the output current as a function of the ethylene glycol concentration and the coolant temperature.

Table 3.6: *Maximum percentage of the output current as a function of the ethylene glycol concentration and the coolant temperature*

		Glycol Concentration				
		10 %	20 %	30 %	40 %	50 %
Coolant Temperature	37 °C (99 °F)	100 %	100 %	100 %	100 %	100 %
	39 °C (102 °F)	100 %	100 %	100 %	100 %	98 %
	41 °C (106 °F)	100 %	100 %	100 %	98 %	96 %
	43 °C (109 °F)	100 %	100 %	98 %	96 %	94 %
	45 °C (113 °F)	100 %	98 %	96 %	94 %	92 %
	47 °C (117 °F)	98 %	96 %	94 %	92 %	90 %
	49 °C (120 °F)	96 %	94 %	92 %	90 %	88 %
	51 °C (124 °F)	94 %	92 %	90 %	88 %	86 %
	53 °C (128 °F)	92 %	90 %	88 %	86 %	84 %
	55 °C (131 °F)	90 %	88 %	86 %	84 %	82 %

ATTENTION!
In order to prevent corrosion, always add 1.5 % of the inhibitor CorteC VpCI-649 to the coolant.

Condensation may occur when the incoming water temperature is too lower than the ambient temperature. The water temperature to avoid condensation varies according to the air relative humidity and ambient temperature.

The temperature at which the water vapor contained in the air turns into liquid as small water drops is known as "dew point".

Table 3.7 on page 3-12 shows the dew point in relation to the air relative humidity and to ambient temperature for an atmospheric pressure of 1 atm. If the water temperature is lower than the presented value, condensation may occur.

Table 3.7: *Dew point in relation to the air relative humidity and ambient temperature*

		Air Relative Humidity									
		5 %	**10 %**	**20 %**	**30 %**	**40 %**	**50 %**	**60 %**	**70 %**	**80 %**	**90 %**
Ambient Temperature	**10 °C (50 °F)**	<0	<0	<0	<0	<0	0.1	2.6	4.8	6.7	8.4
	20 °C (68 °F)	<0	<0	<0	1.9	6	9.3	12	14.4	16.4	18.3
	25 °C (77 °F)	<0	<0	0.5	6.2	10.5	13.8	16.7	19.1	21.3	23.2
	30 °C (86 °F)	<0	<0	4.6	10.5	14.9	18.4	21.4	23.9	26.2	28.2
	35 °C (95 °F)	<0	<0	8.7	14.8	19.4	23	26.1	28.7	31	33.1
	40 °C (104 °F)	<0	2.6	12.7	19.1	23.8	27.6	30.7	33.5	35.9	38
	45 °C (113 °F)	<0	6.3	16.8	23.4	28.2	32.1	35.4	38.2	40.7	43

ATTENTION!
The water temperature must always be higher or equal to the dew point.

3.2 ELECTRICAL INSTALLATION

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

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

ATTENTION!
The CFW11W G2 can be connected to circuits with short-circuit capacity of up to 100000 symmetric Arms.

ATTENTION!
The short-circuit protection of the inverter does not provide short-circuit protection for the feeder circuit. The short-circuit protection of the feeder circuit must be provided in accordance with the applicable local regulations.

3.2.1 Input Rectifier

It is necessary to use a rectifier to generate DC voltage for the power supply of the UP11W G2. The rectifier may be an Active Front End (AFE), diode rectifier of 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, contact WEG.

3.2.1.1 Sizing

The main rectifier bridge is sized according to the drive rated power. The heat dissipation caused by the losses on the rectifier bridge must be taken into account both in the sizing of the bridge heatsink and in the heating of the air inside the panel.

ATTENTION!
It is recommended that the diodes of the bridge have a reverse voltage ≥ 2200 V.

3.2.1.2 Line Reactance

The diode rectifier plus the capacitor bank of the UP11W G2 drain from the power grid a current with non-sinusoidal wave shape containing harmonics of the fundamental frequency. Those harmonic currents flowing on the impedances of the power line cause harmonic voltage drops, distorting the supply voltage of the inverter itself or of other consumers. As an effect of those current and voltage harmonic distortions, we may have an increase in the electrical losses on the installations with the overheating of its components (cables, transformers, capacitor banks, motors, etc.), as well as a low power factor.

The input current harmonics depend on the values of the impedances present on the rectifier input/output circuit. The addition of a line reactance reduces the current harmonic content, providing the following advantages:

- Increase of the power factor on the inverter input.
- Reduction of the effective input current.
- Reduction of the voltage distortion on the supply line.
- Increase of the useful life of the DC link capacitors.

For the calculation of the line reactance necessary to obtain the desired percentage voltage drop, use:

$$L_{line} = \frac{\text{Voltage drop [\%]} \cdot \text{Line voltage [V]}}{\sqrt{3}.2 \cdot \pi \cdot \text{Line Freq [Hz]} \cdot I_{\text{Rated Cur}} \cdot \text{[A]}.100}$$

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 3.8: *Sizing of the pre-charge*

Peak Current During the Pre-charge (A)	0.82 x (V_{line}/R)
Energy Stored in the Capacitor Bank (J)	N x 0.007. V_{line}^2
Pre-Charge Duration	0.017 x N x R

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

E.g.:

In a drive composed of three power units, whose line voltage on the rectifier input is 690 Vrms (UP11W-01 G2), the obtained values would be:

- Energy stored in the capacitor bank: 3x0,007x6902 = 9998.1 J.
- Using three 10 Ω resistors (one per phase), each resistor must withstand 3332.7 J.
- The manufacturer of the resistor can inform the energy the component withstands.
- The peak current during the pre-charge would be 56.6 A and the pre-charge duration would be 0.51 s.

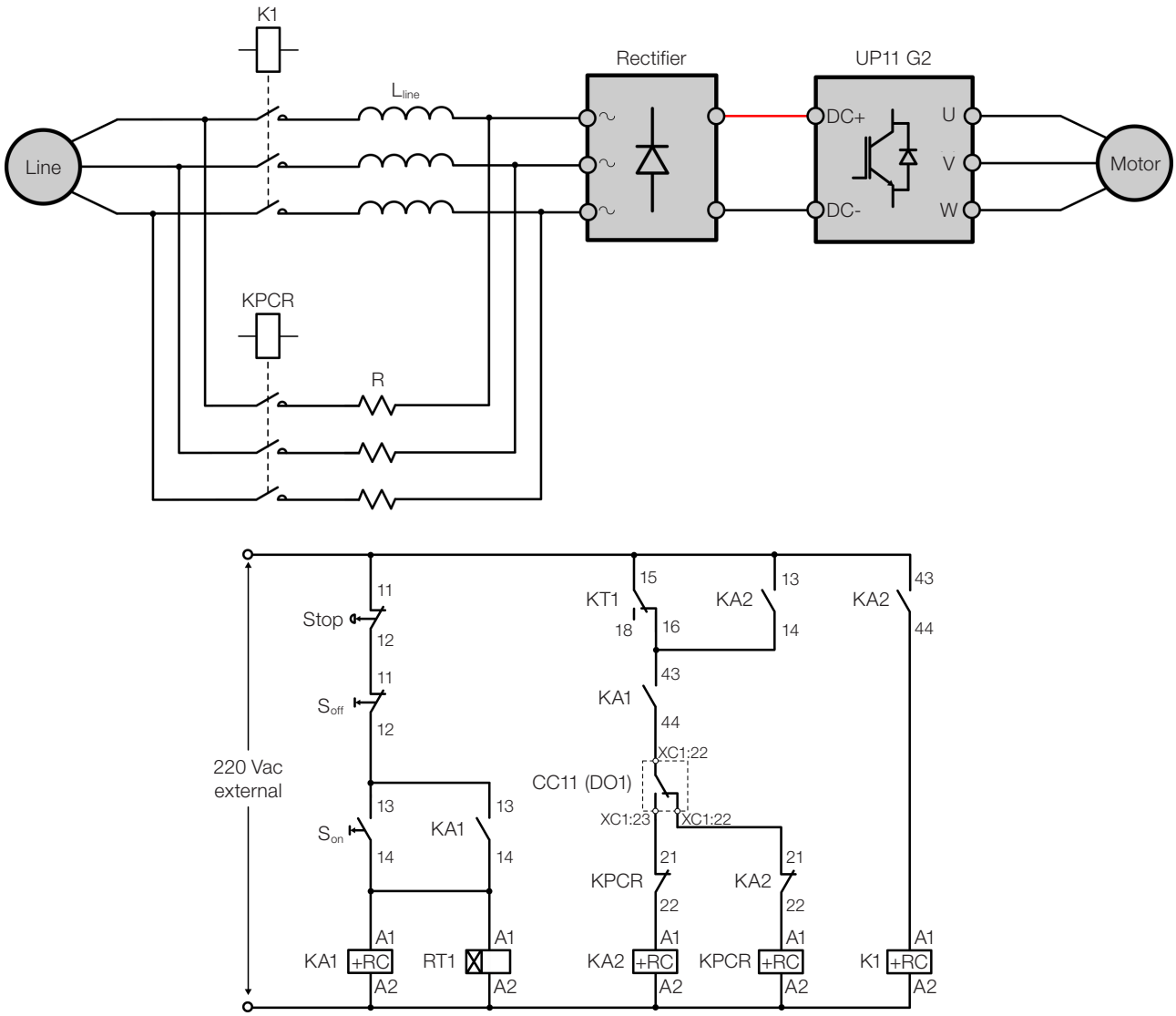


Figure 3.17: *Example of a pre-charge activation circuit*

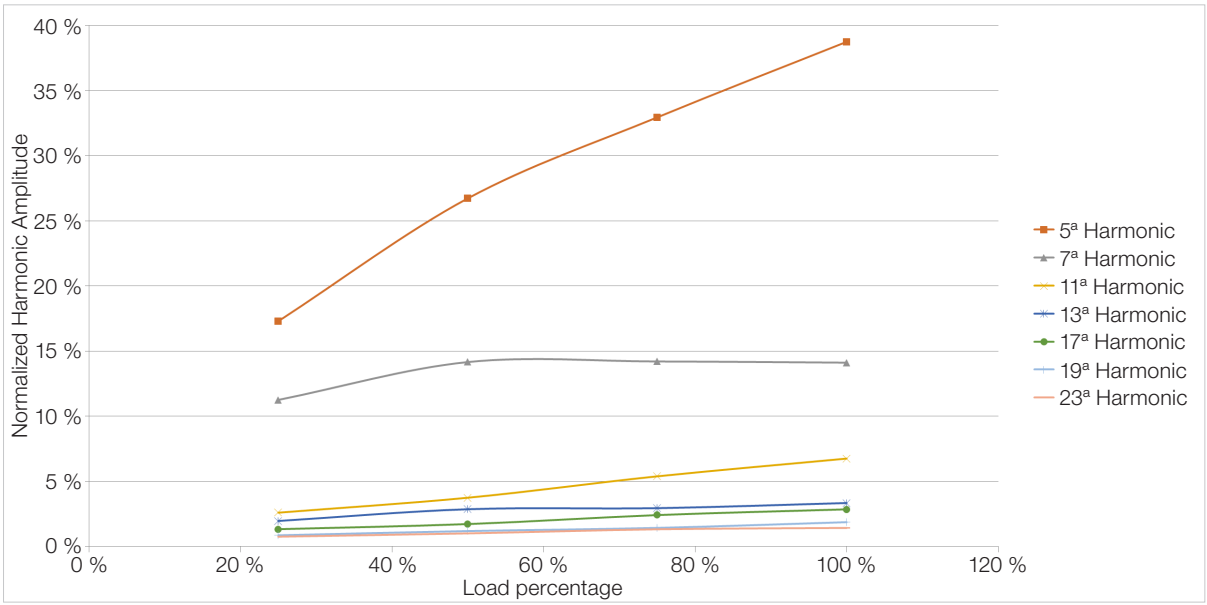
The Input Rectifier of the CFW-11W G2 can be supplied via contactor or motorized circuit breaker (represented by K1), and its command must be interlocked with the command of the KPCR pre-charge contactor. Figure 3.17 on page 3-15 shows an example of a pre-charge circuit recommended for the CFW-11W G2 inverter, with the simplified power and control 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). In addition, the duration of the pre-charge must be timed to protect the components of the auxiliary circuit (resistors, contactor). This function is performed by a timing relay with on-delay, represented in Figure 3.17 on page 3-15 by RT1.

3.2.1.4 Harmonics of the 6-Pulse Rectifier

Table 3.4 on page 3-11, Figure 3.18 on page 3-16 and Figure 3.19 on page 3-16 show typical harmonic content values of the currents, Power Factor and THD(I) on the power line, considering the 6-pulse rectifier.

Table 3.9: *Typical individual harmonics, Power Factor and THD (I) 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 3.18: *Typical input current harmonic values with variation of the output power*

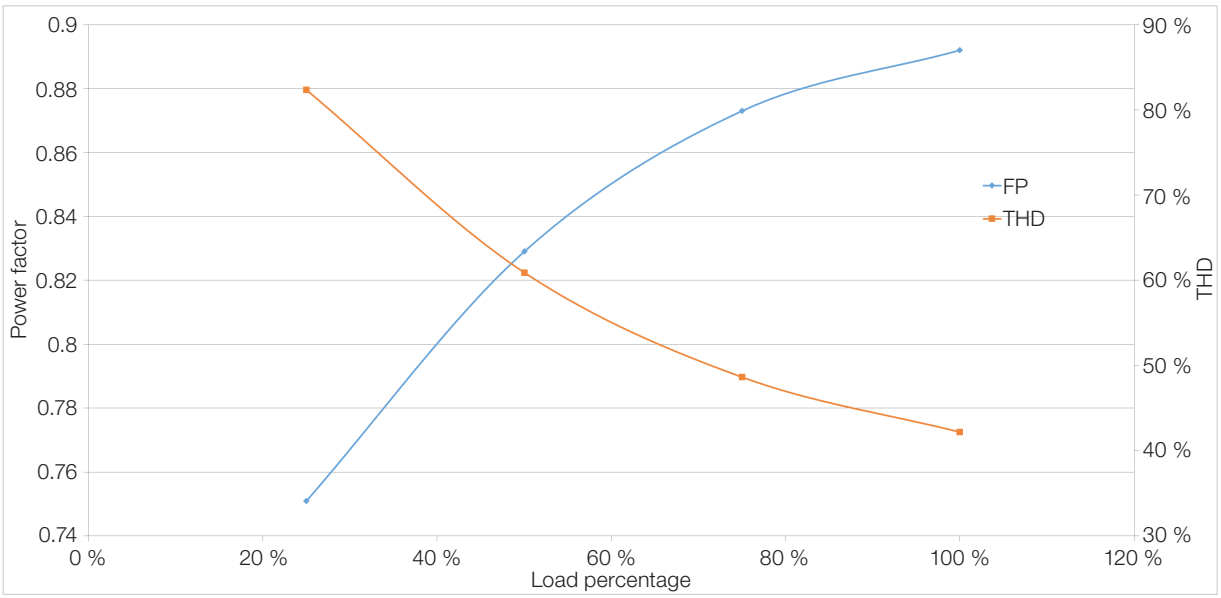


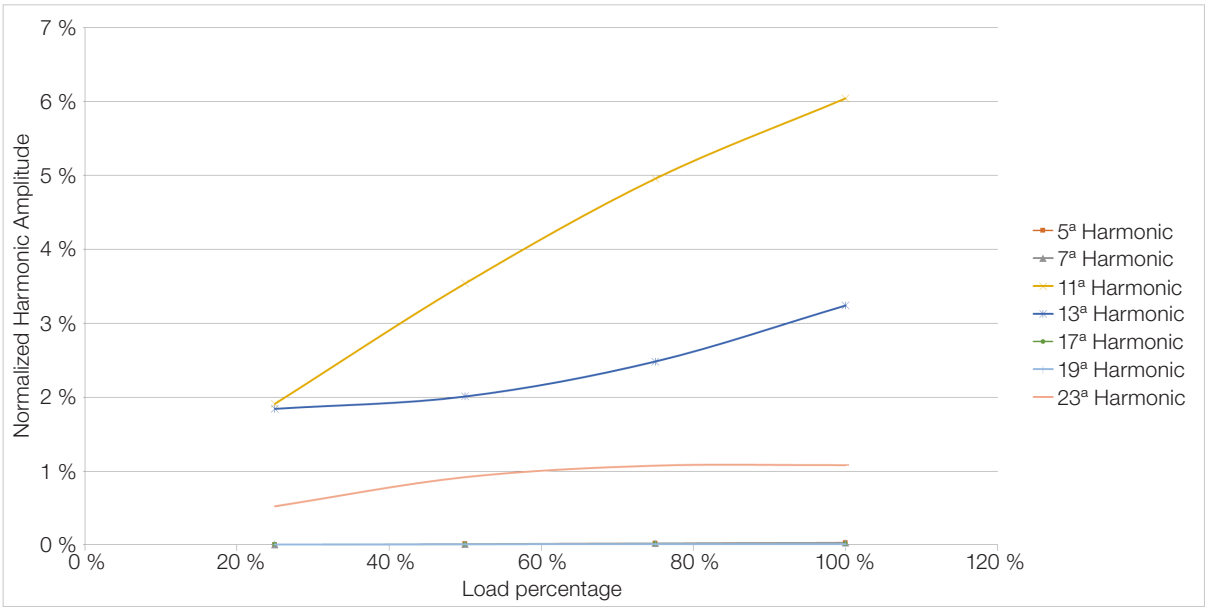
Figure 3.19: *Power Factor (PF) and THD (I) with variation of the output power. 6-pulse rectifier*

3.2.1.5 Harmonics of the 12-Pulse Rectifier

Table 3.11 on page 3-18, Figure 3.20 on page 3-17 and Figure 3.21 on page 3-17 show the typical harmonic content values of the currents, Power Factor and THD(I) on the power line, considering the 12-pulse rectifier.

Table 3.10: *Typical individual harmonics, Power Factor and THD (I) 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 3.20: *Typical input current harmonic values with variation of the output power*

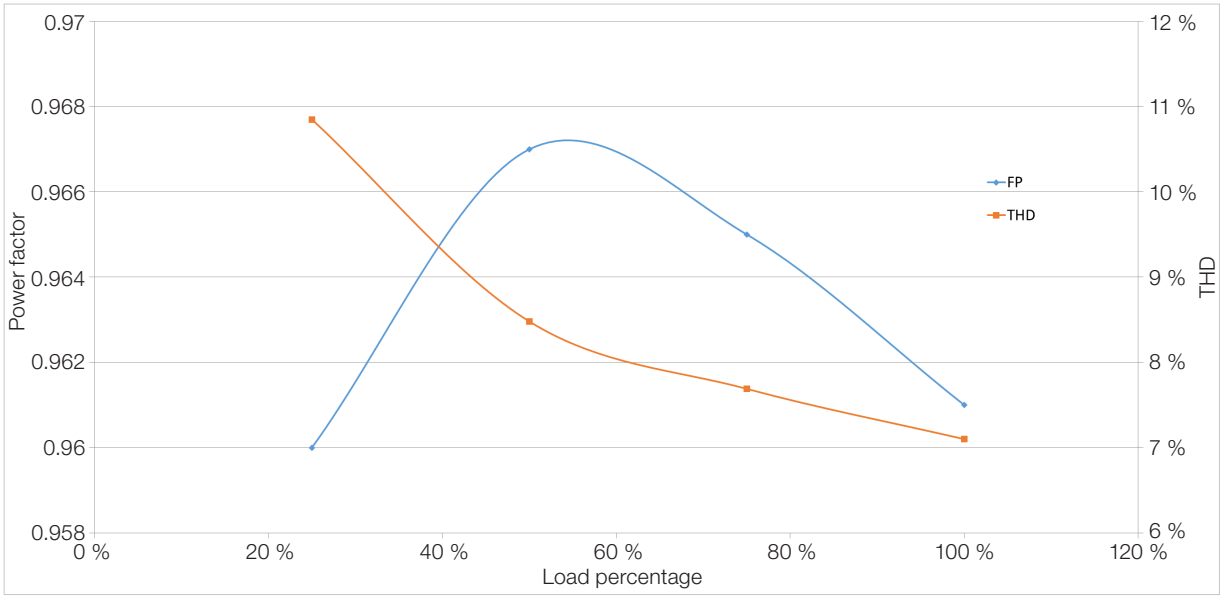


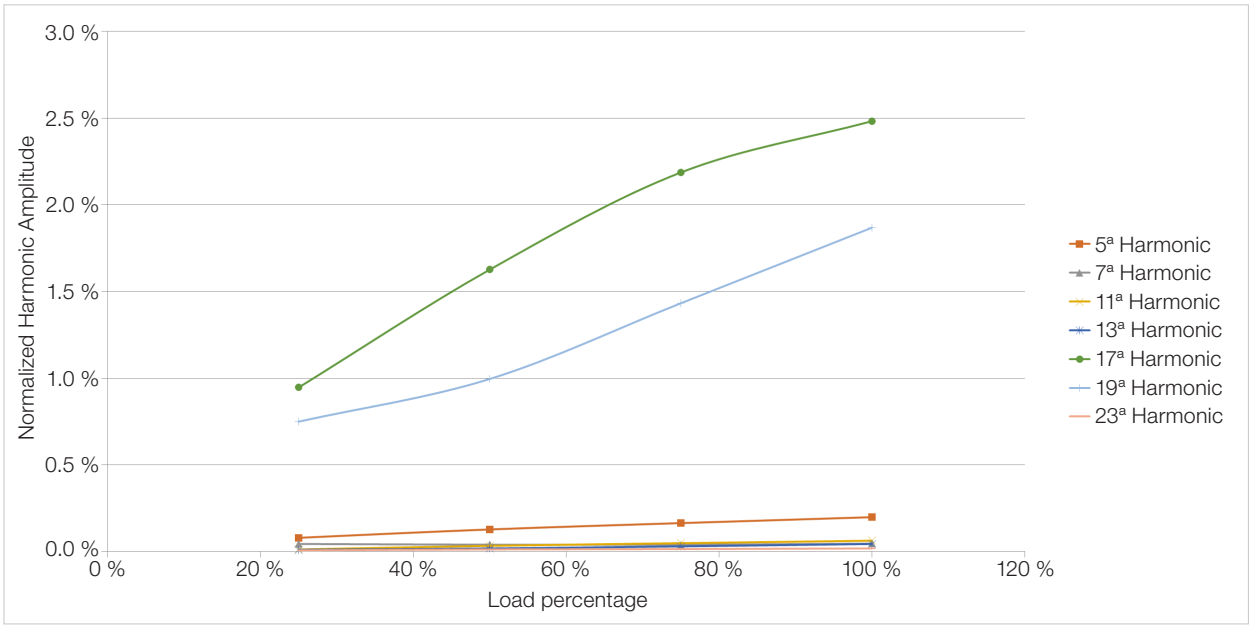
Figure 3.21: *Power Factor (PF) and THD (I) with variation of the output power. 12-pulse rectifier*

3.2.1.6 Harmonics of the 18-Pulse Rectifier

Table 3.7 on page 3-12, Figure 3.22 on page 3-18 and Figure 3.23 on page 3-18 show the typical harmonic content values of the currents, Power Factor and THD(I) on the power line, considering the 18-pulse rectifier.

Table 3.11: *Typical individual harmonics, Power Factor and THD(I) 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 3.22: *Typical input current harmonic values with variation of the output power*

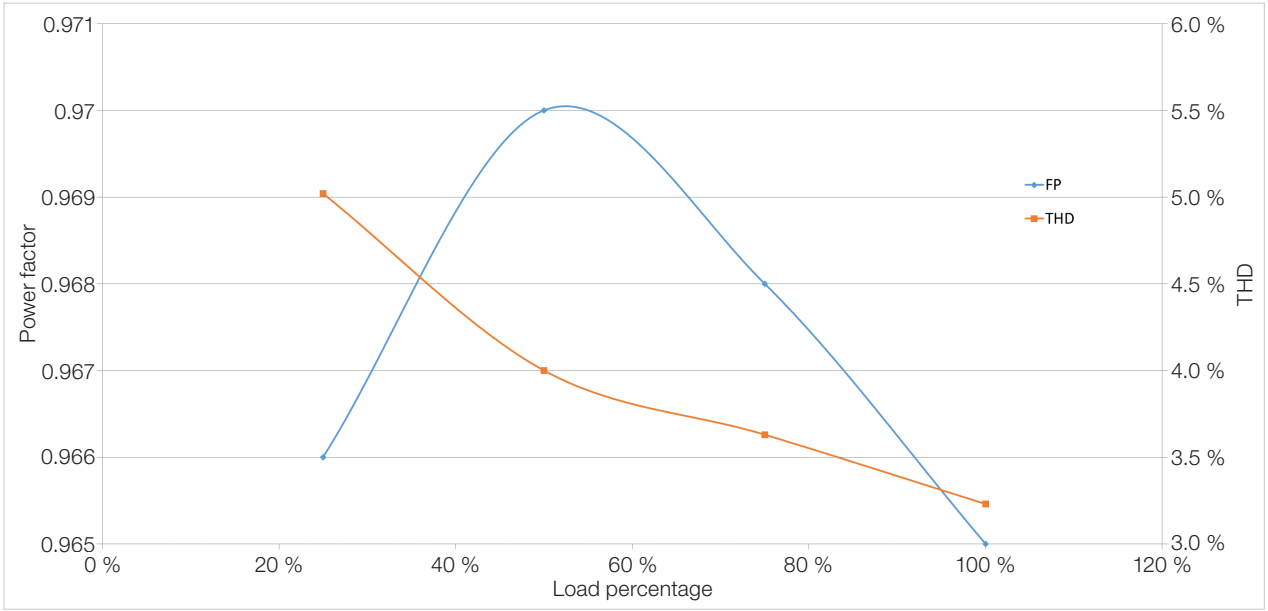


Figure 3.23: *Power Factor (PF) and THD (I) with variation of the output power. 18-pulse rectifier*

NOTE!
The harmonics shown in Item 3.2.1.4 Harmonics of the 6-Pulse Rectifier on page 3-16, Item 3.2.1.5 Harmonics of the 12-Pulse Rectifier on page 3-17 and Item 3.2.1.6 Harmonics of the 18-Pulse Rectifier on page 3-18 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: 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 UP11W G2. The maximum voltage on the DC link on the UP11W-01 G2 is 1200 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.

Fuse examples:

- UP11W-01 G2: PC73UD12C900TF (Mersen).

3.2.4 General Wiring Diagram

Figure 3.24 on page 3-20 shows the general diagram for an inverter with five Power Units (UP11W G2). It shows the connections between the Control Unit UC11 and the PUs (Connectors DB25 XC40 and Fiber Optics), power connections of the PUs (DC+, DC-, U, V, W and GND), and auxiliary power supply connections of the UP11W G2 (24 Vdc) and UC11 G2 (24 Vdc). For a reduced number of UP11W G2, connect them in increasing order (1, 2, 3, etc.), leaving the last positions without connection.

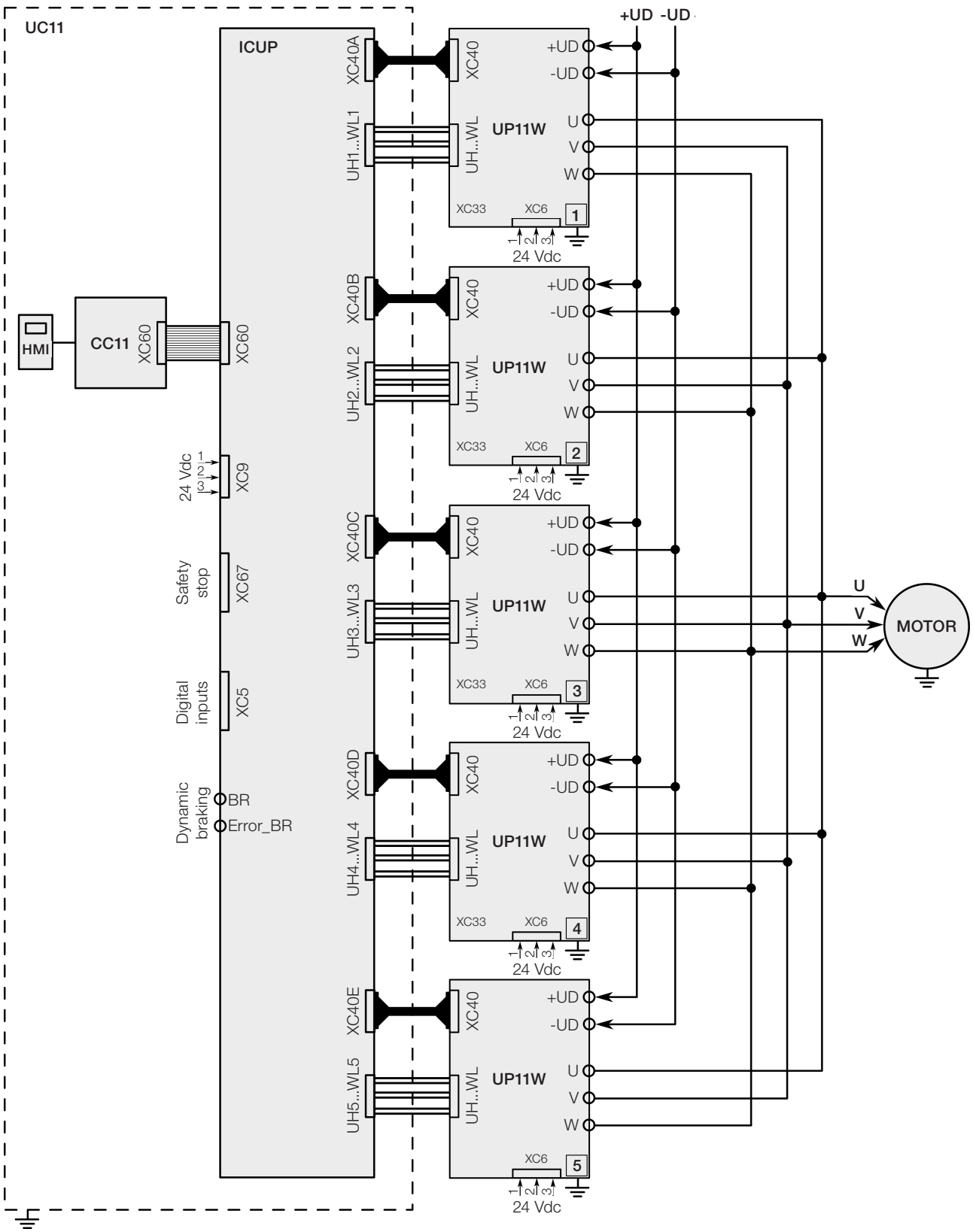


Figure 3.24: General wiring diagram

3.2.5 Power Connections

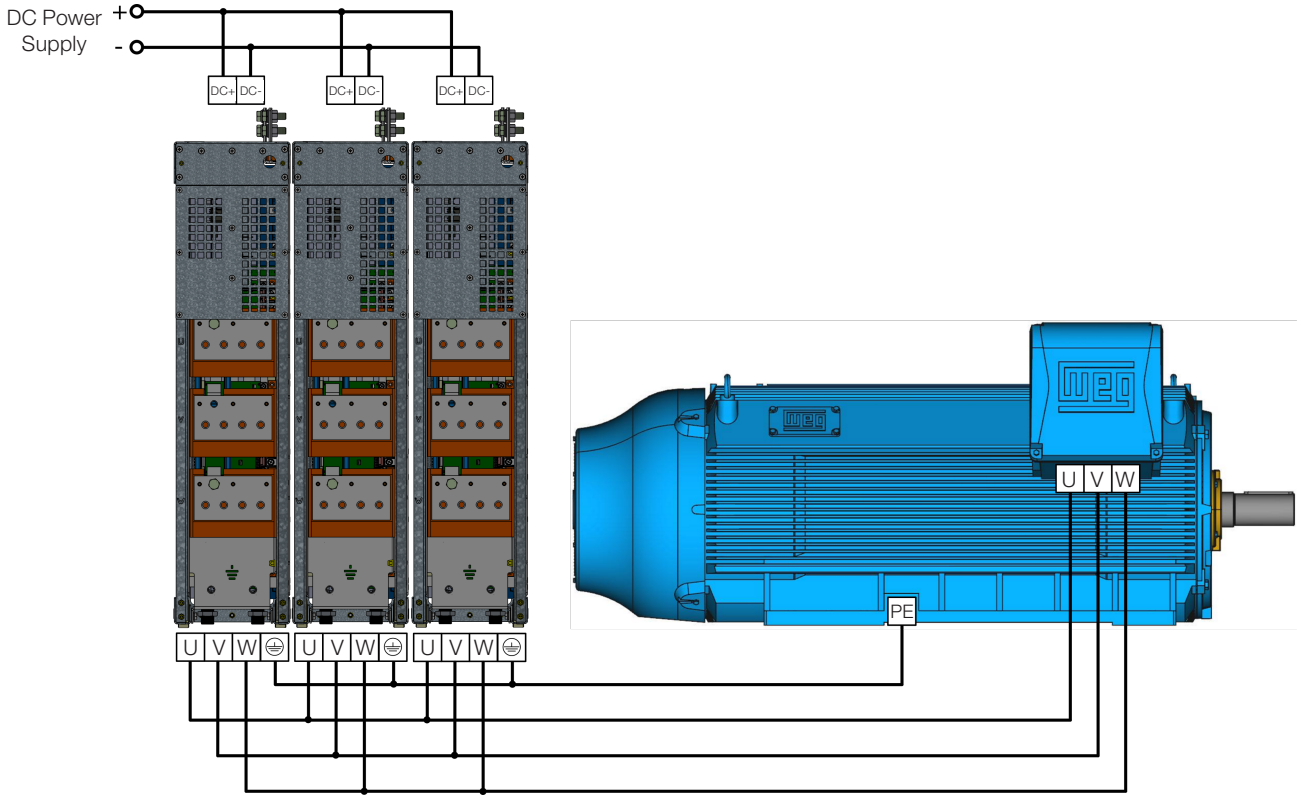


Figure 3.25: *Power and grounding connections*

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

The fastening of the DC+ and DC- connections of the UP11W G2 is done with 4 screws M12X35 (recommended torque: 60 N.m); see Figure 3.26 on page 3-22.

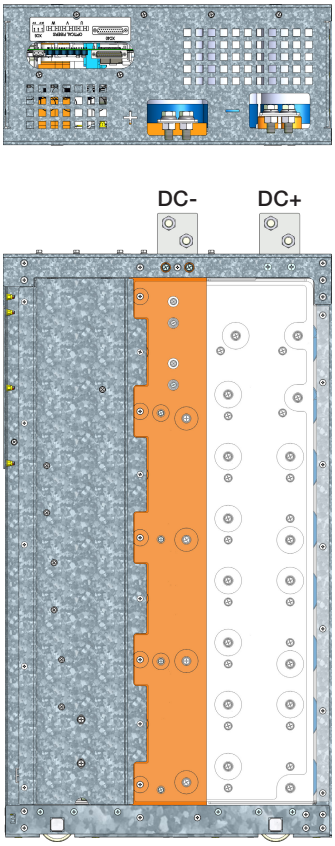


Figure 3.26: *DC power supply terminals*

DC+: Positive pole of the DC power supply.

DC-: Negative pole of the DC power supply.

The U, V and W connections are made through 12 screws M12X25 (recommended torque: 60 N.m; see Figure 3.27 on page 3-23).

Two screws M12X25 (recommended torque: 60 N.m) are used to fasten the grounding cable of the UP11W G2.

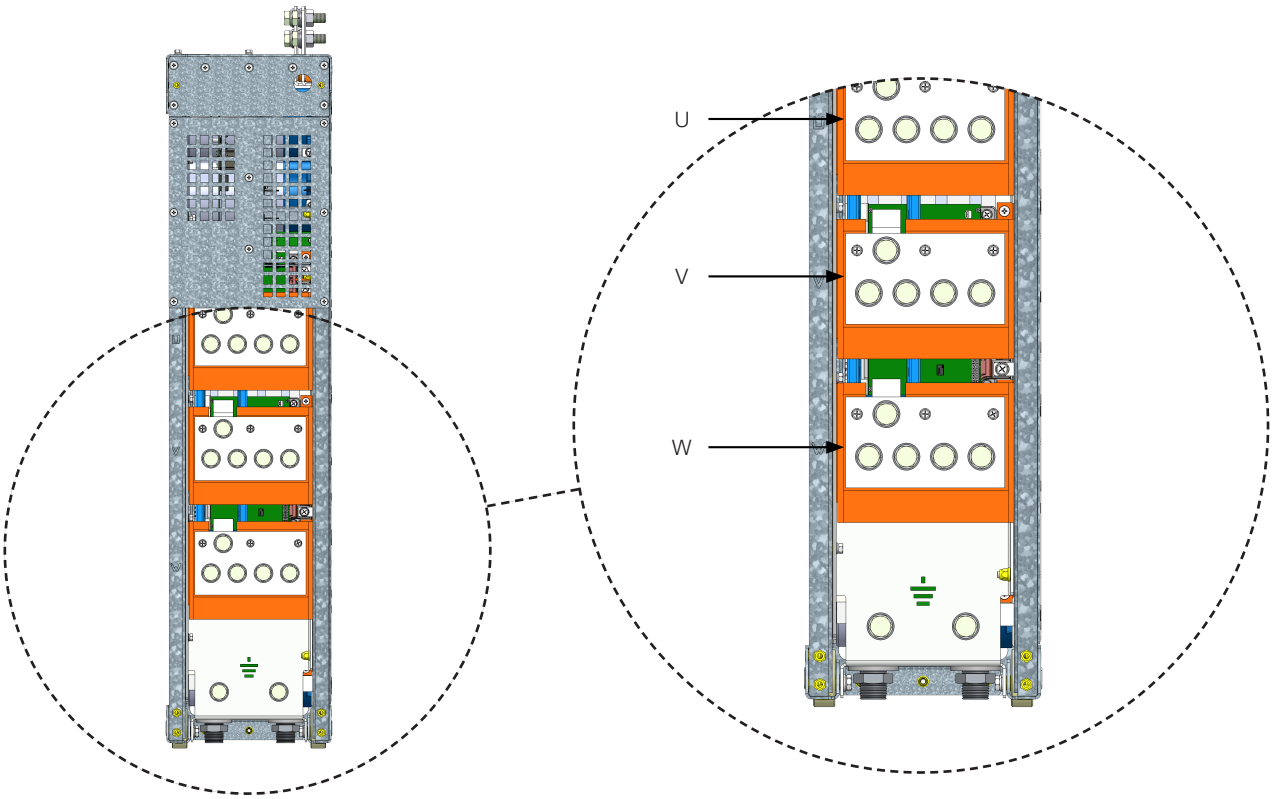


Figure 3.27: *U, V, W and grounding terminals*

U, V and W: connections to the motor.

⏚: Grounding cable connection.

For a better current distribution between the UP11W G2, it is recommended that their output connections be interconnected through a single paralleling busbar. The length of the cables between the UP11W G2 and the paralleling busbar must be as short as possible.

ATTENTION!
The output cables U, V and W of the UP11W G2 must have the same length.

ATTENTION!
The motor cables must be distributed as evenly as possible in the connection to the paralleling busbar, as in the example shown in Figure 3.28 on page 3-24. Distance "L" must be kept constant.

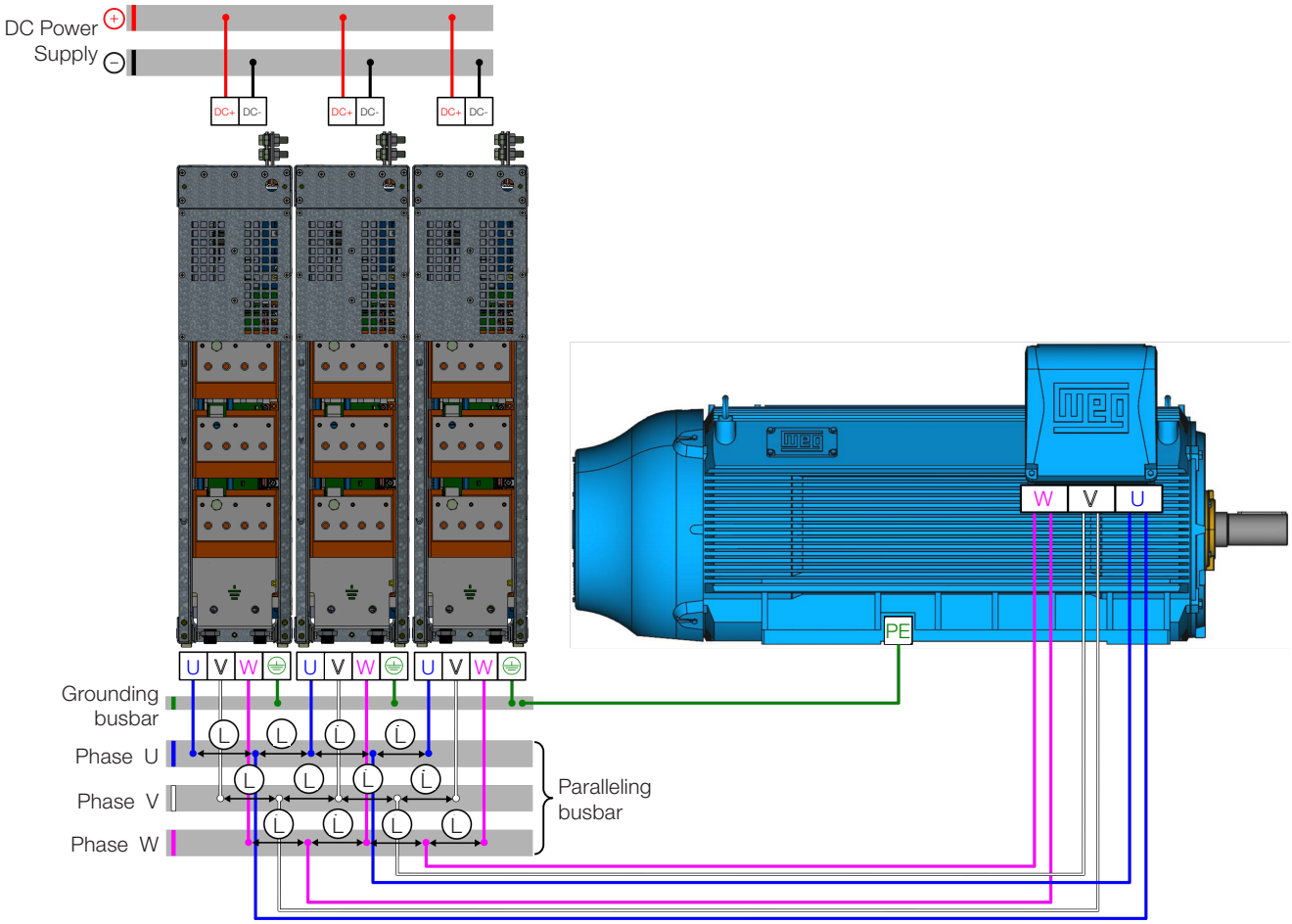


Figure 3.28: *Recommended distribution for the motor cables*

3.2.6 Input Connections

DANGER!
Provide a disconnector device for the inverter power supply. This device must cut off the inverter power supply whenever necessary (during maintenance for instance).

ATTENTION!
Using a contactor or another device that disconnects the inverter power supply to often start and stop the motor may damage the inverter power supply circuit. The inverter is designed to use control signals to start and stop the motor. If used, the device on the input cannot exceed one operation every five minutes or 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 UP11W G2 can be made with flexible braids as in the example of Figure 3.29 on page 3-25, sized to withstand the DC link current, according to Table 8.1 on page 8-2. Figure 3.30 on page 3-25 shows an example of flexible braid used by WEG, using a fuse on DC+ and another on DC-.

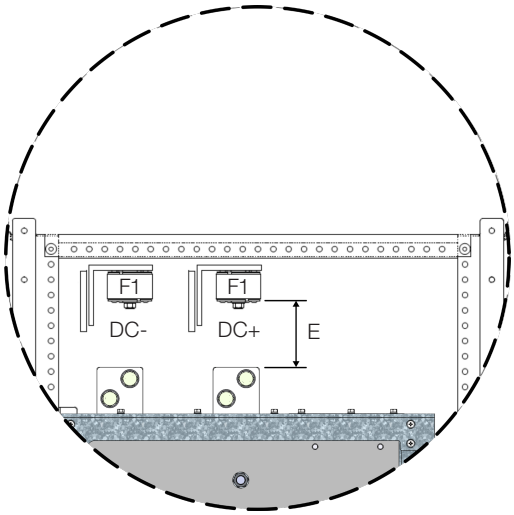


Figure 3.29: *Side view of the connections of the flexible braids and fuses*

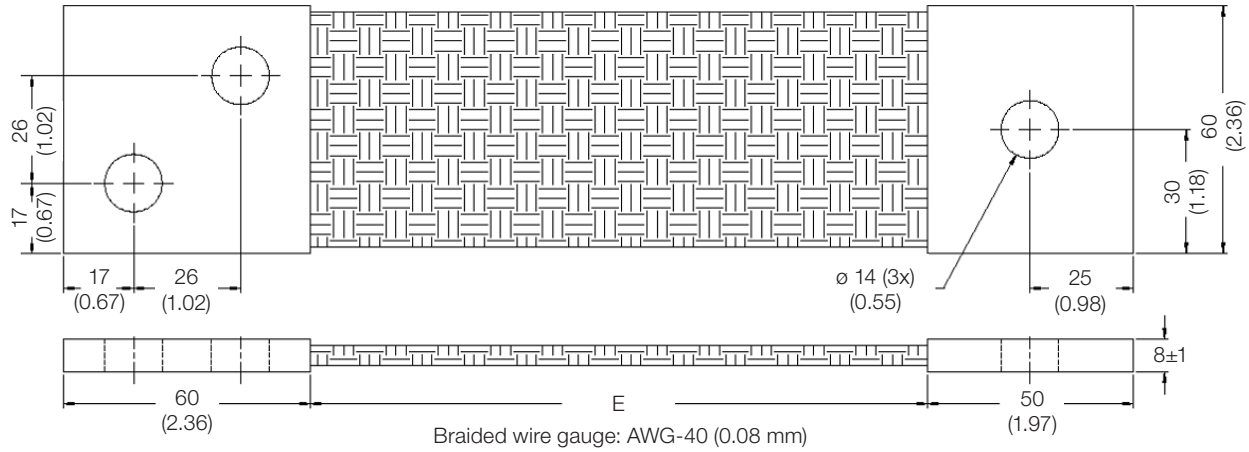


Figure 3.30: *Example of flexible braid in mm (in)*

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 set according to the 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-11W G2 complies with IEC609047-4-2 and UL508C; see 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 switch-disconnector or a contactor are installed on the motor power supply, never operate them with the motor spinning or with voltage in the inverter output.

Use four cables in parallel with the gauge indicated in Table 3.7 on page 3-12 to interconnect connections U, V and W of the UP11W with the paralleling busbar (motor power supply).

Table 3.12: *Connection cables U, V and W*

Current (A)	Voltage (V)	Steady-state	Minimum Cable Cross Section (mm²)
780	500-690	ND	(4X) 120
640		HD	(4X) 95

ATTENTION!
Cables U, V and W of all phases of all UP11W G2 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 interconnection and 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.

Instructions for the motor cables:

Cables without Shield:

- They can be used when it is not necessary to comply with the European electromagnetic compatibility directive (89/336/EEC).
- Keep motor cables away from other cables (signal cables, sensor cables, control cables, etc.), according to Table 3.8 on page 3-14.
- The emission of the cables can be reduced by installing them within a metal 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 flow on those cables may induce currents on metal parts nearby, heating them up and causing additional electric losses. Therefore, keep the cables of phases U, V and W always together.

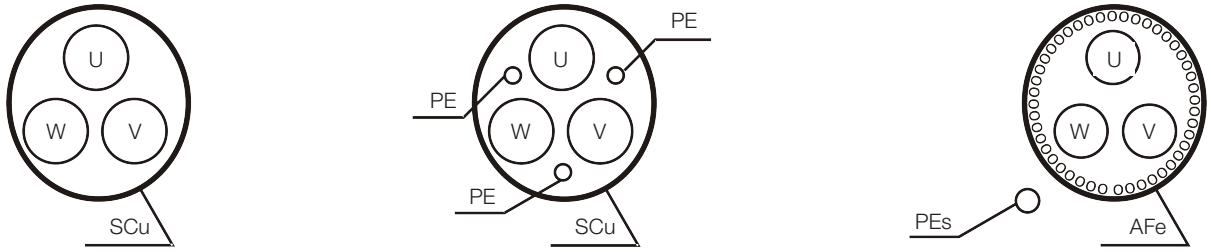
Shielded Cables:

- 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 3.31 on page 3-27. 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 3.13 on page 3-27.

- The grounding system must present a good interconnection between the different locations of the installation, such as between the motor and of the inverter grounding points. Voltage or impedance differences between the different points may cause the flow of eddy currents between the devices connected to the ground, leading to problems of electromagnetic interference.

Table 3.13: *Minimum separation distance between the motor cables and the others*

Wiring Length	Minimum Separation Distance
≤ 30 m	≥ 10 cm
> 30 m	≥ 25 cm



Symmetric shielded cables: three concentric conductors with or without ground conductors built symmetrically with a copper or aluminum external shield.

Note.:
(1) SCu = copper or aluminum external shield.
(2) AFe = galvanized iron or steel.
(3) PE = ground conductor.
(4) The cable shield must be grounded on both sides, inverter and motor. 360° connections must be made for a low impedance for high frequencies.
(5) For the shield to act as protective earth, it must have at least 50 % of the conductivity of the phase conductors. Otherwise, use an additional ground conductor outside the shielded cable; the shield will then be used as EMC protection.
(6) The conductivity of the shield for high frequencies must be at least 10 % of the conductivity of the phase conductors.

Figure 3.31: *Cables recommended by IEC 60034-25 to connect the motor*

3.2.8 Grounding Connections

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

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

DANGER!
The inverter must be connected to a protective earth (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 3.14 on page 3-28. 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.

Use two cables in parallel with the gauge indicated in Table 3.14 on page 3-28 to ground the UP11W power units.

Table 3.14: *Grounding cables*

Current (A)	Voltage (V)	Steady-State	Minimum Cable Cross Section (mm²)
780	500-690	ND	(2X) 120
640		HD	(2X) 95

3.2.9 IT Networks

NOTE!
The protection against ground fault (F074) is intended to the IGBT protection and cannot be activated when the inverter output is in short circuit with the ground, when supplied by IT networks.
External insulation monitoring devices must be used for system fault tracking.

3.2.10 Terminals Recommended for Power Cables

Table 3.15: *Terminals recommended for power cables*

Cable Gauge [mm²]	Screw	Manufacturer	Lug Terminal, Code	Crimping Tool, Code	Number of Crimps
95	M12	Hollingsworth	RM95-12	Hydraulic tool H6-500	1
		Tyco	XCT 95-12	UNIPRESS 6/120 +COF+CHARG Item TE: 2107475-2	
120		Hollingsworth	RM120-12	Hydraulic tool H6-500	
		Burndy (FCI)	YA28L	Tool without die: MY29-3 or Y644 or Y81 Tool+die: Y35 or Y750 / U29RT	
		Tyco	XCT 120-12	UNIPRESS 6/120 +COF+CHARG Item TE: 2107475-2	

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.

In order to obtain higher braking torques, use resistors for dynamic braking. 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.

For vector control mode, it is possible to use the "Optimal Braking", often eliminating the need for dynamic braking.

ATTENTION!
For the CFW-11W 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 UP11W G2 Connections

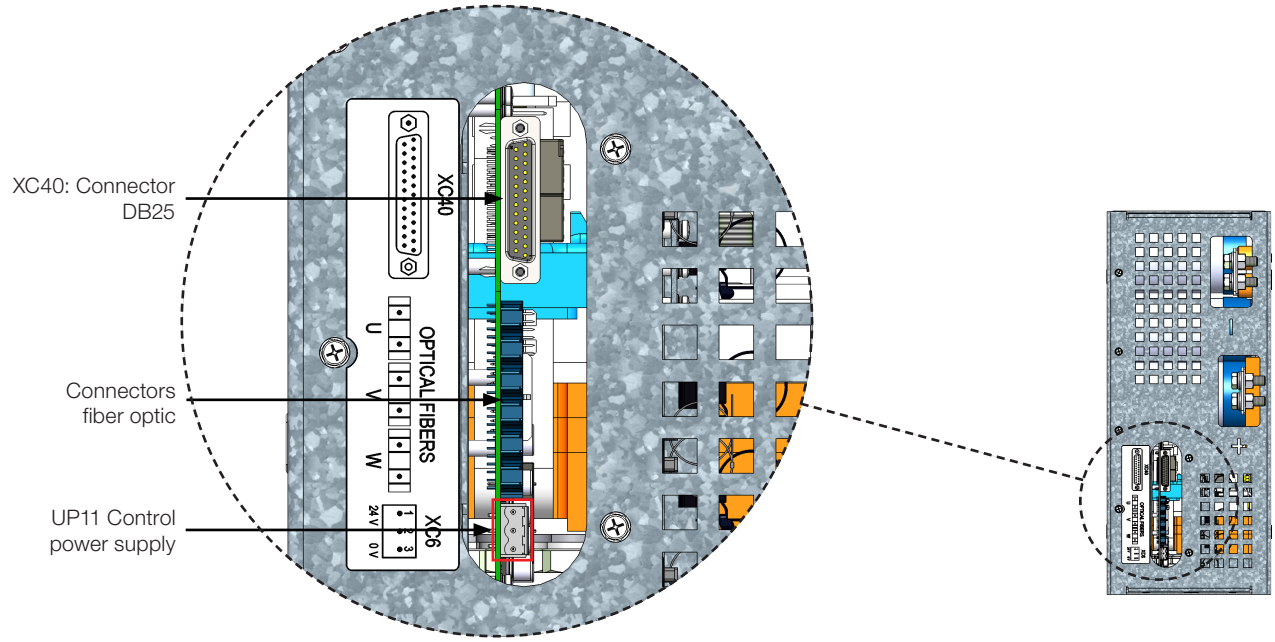


Figure 3.32: Control cable connection points on the UP11W G2

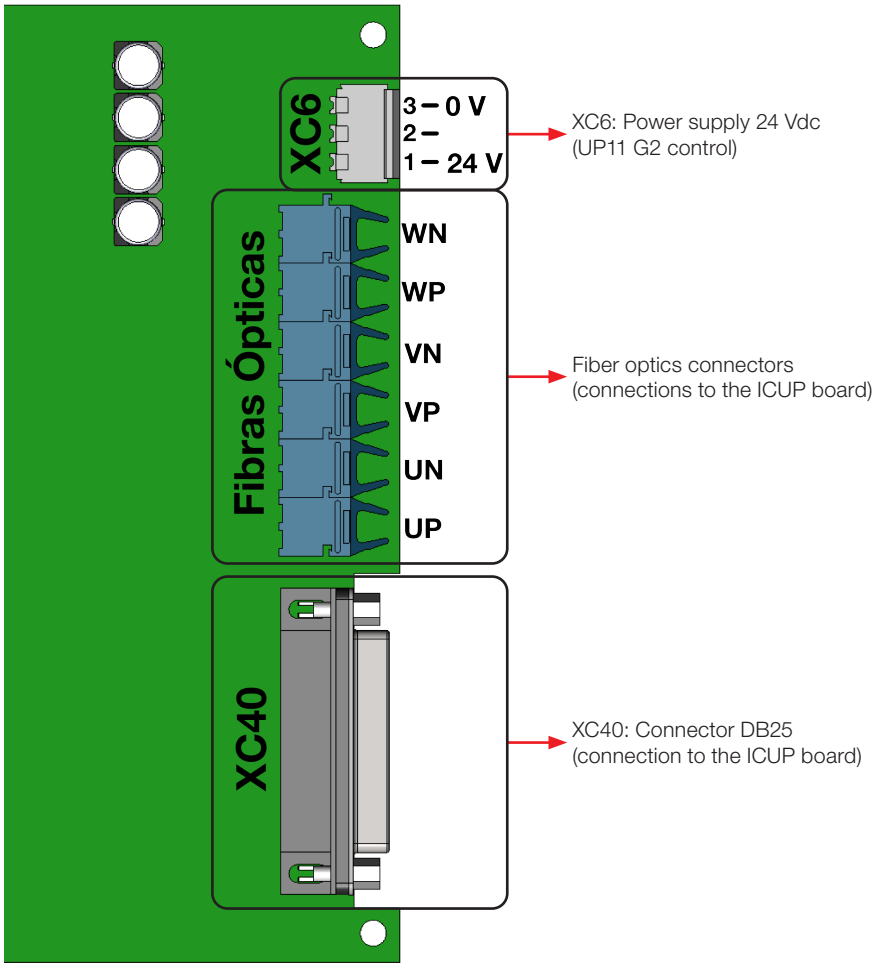


Figure 3.33: Identification of the control connections of the UP11W G2

The electronics of the UP11W G2 is powered via connector XC6, located on the IUP board; it is described in Table 3.16 on page 3-30.

Table 3.16: *Description of connector XC6*

XC6		Function	Specifications
1	+24 Vcc	Positive pole of the +24 Vdc power supply	24 Vdc power supply(± 3 %) Consumption: 750 mA per UP11W G2
2	NC	Not connected	
3	GND	Reference of the +24 Vdc power supply	

3.2.12.2 UC11 G2 Connections

DIM1 and DIM2 digital inputs located on the ICUP1 board (Table 3.17 on page 3-30) can be programmed via parameters P0832 and P0833 respectively.

Table 3.17: *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 power supply 24 Vdc ± 8 % Capacity: 600 mA **Note 1:** This power supply can be used to power DIM1 (ISOL) and DIM2 (ISOL) digital inputs of the ICUP1 board **Note 2:** This power supply is isolated from the 24 Vdc input used to power ICUP1 **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	

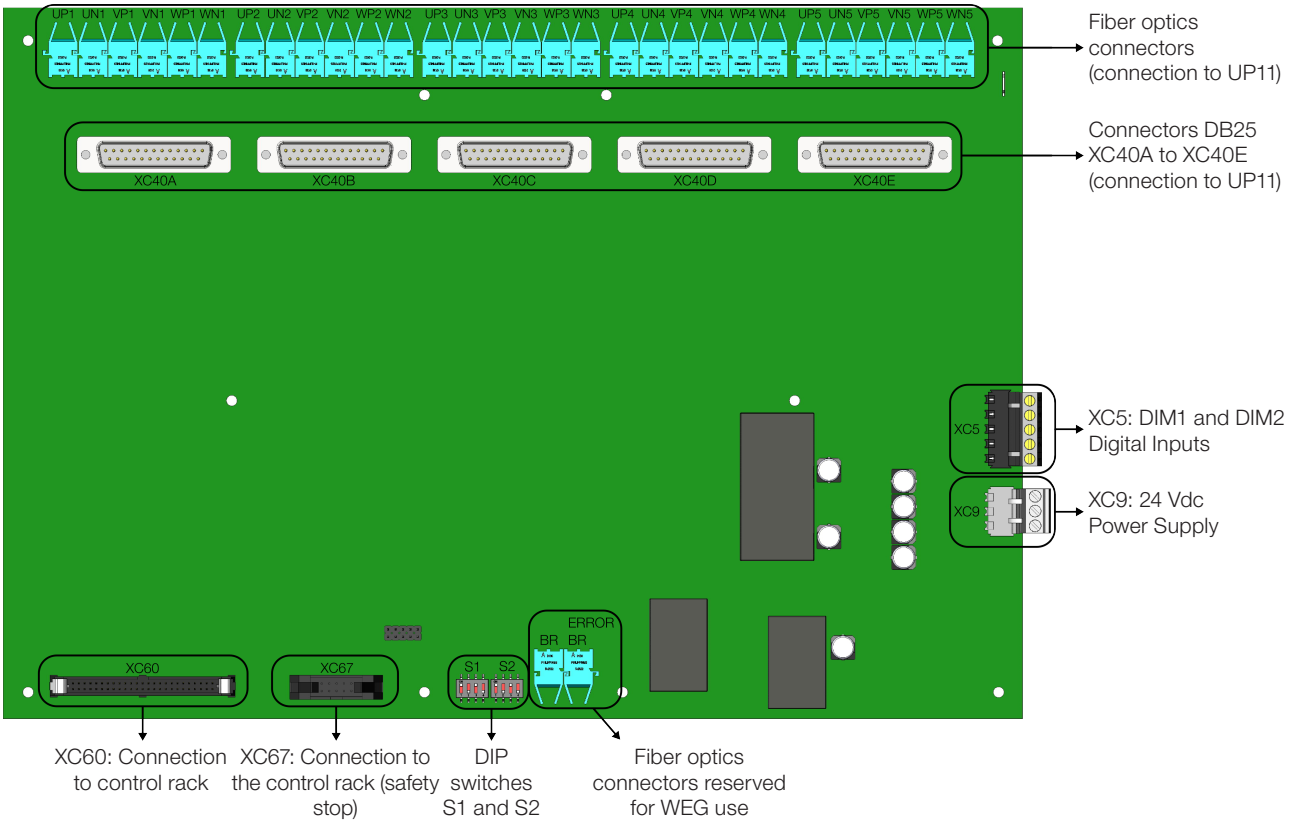


Figure 3.34: *ICUP board connection points*

The control rack is powered via connector XC9, located on the ICUP board; it is described in Table 3.18 on page 3-31.

Table 3.18: *Description of connector XC9*

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

DIP switches S1 and S2, Figure 3.35 on page 3-31, have the function, respectively, to select the level of the inverter alternating supply voltage and the number of UP11W G2 connected.

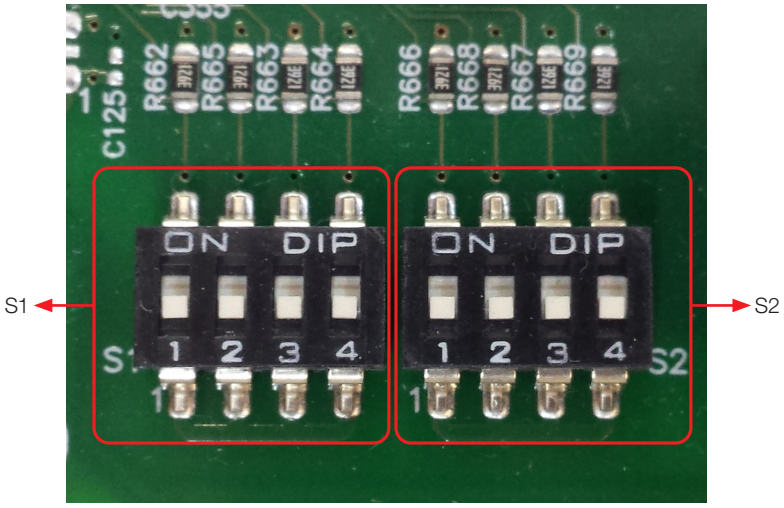


Figure 3.35: *Detail of DIP switches S1 and S2*

Table 3.19: *DIP switch S1:1 - S1:3 configuration*

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

Table 3.20: *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 5-11.

Table 3.21: *DIP switch S2 configuration*

S2:4	S2:3	S2:2	S2:1	Number of UP11W 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 UP11W plus UC11 must be done according to the diagram shown in Figure 3.31 on page 3-27.

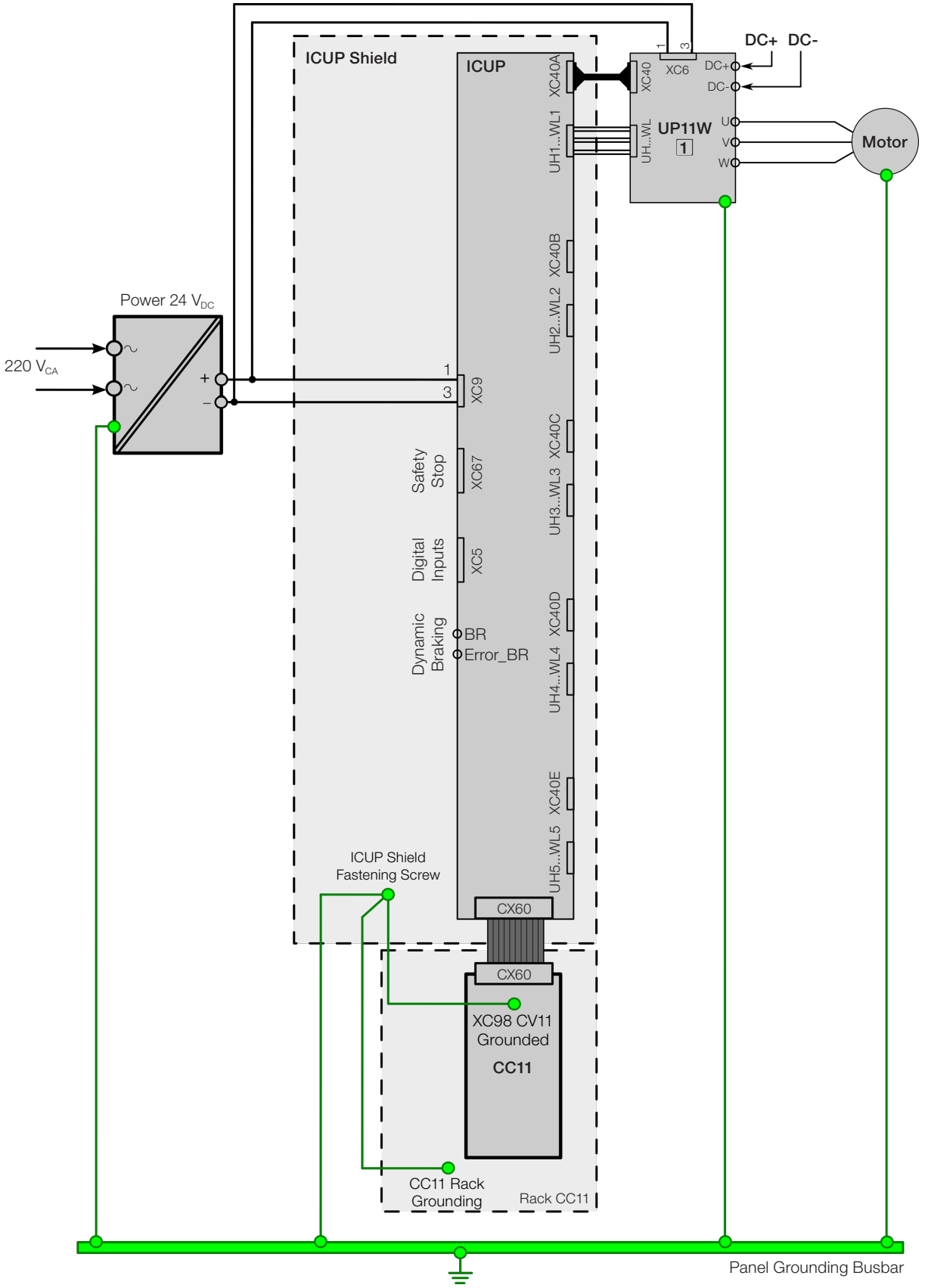


Figure 3.36: *Grounding diagram of the UP11W G2 plus UC11, in case of only one UP11W G2*

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

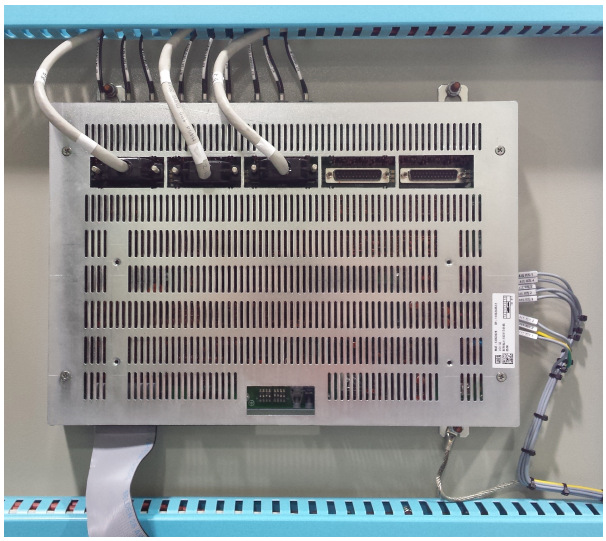


Figure 3.37: *ICUP shield fastened to the panel*

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 3.38 on page 3-33.

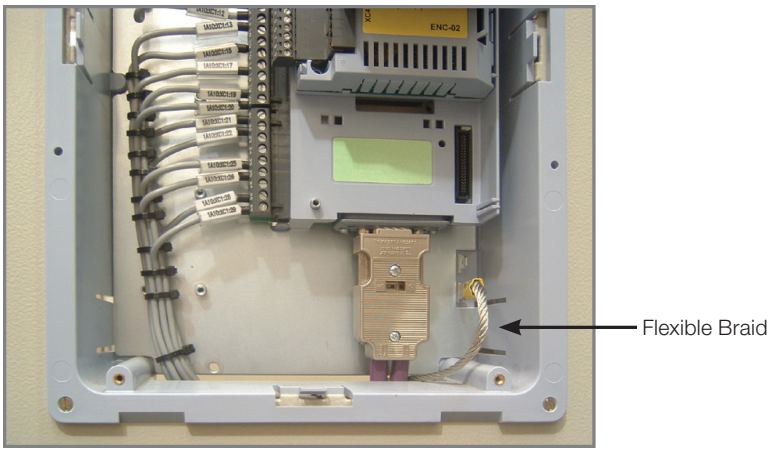


Figure 3.38: *Control rack grounding*

The panel door must be grounded with flexible braid.

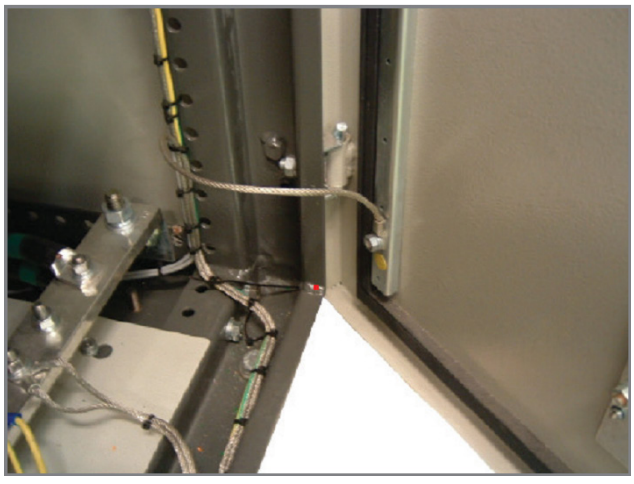
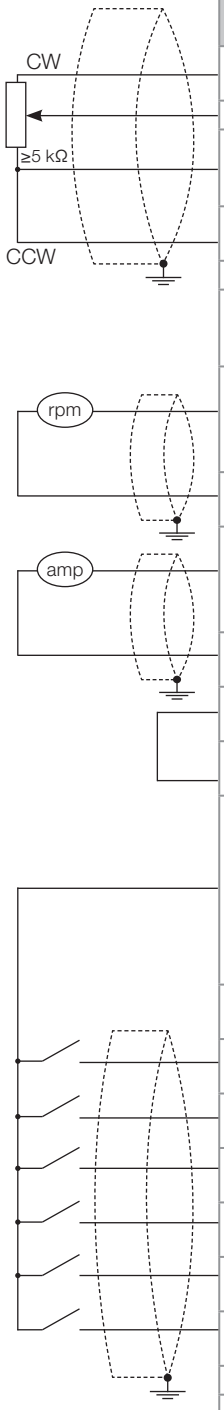


Figure 3.39: *Grounding of the panel door*

3.2.12.3 CC11 Connections

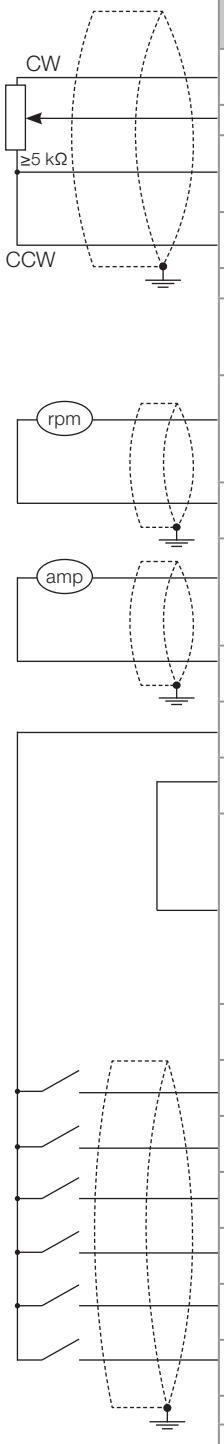
The control connections (analog inputs/outputs, digital inputs/outputs) must be done to connector XC1 of the CC11 Control Electronic Board.

The typical connections and functions are shown in Figure 3.40 on page 3-34 and Figure 3.41 on page 3-35.



XC1 Terminal Strip		Factory Default 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 (R_{IN} = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (R_{IN} = 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 (R_{IN}= 400 kΩ) / 0 to 20 mA / 4 to 20 mA (R_{IN} = 500 Ω) Maximum voltage: ±30 V
6	AI2-		
7	AO1	Analog output #1: Speed	Galvanic Isolation Resolution: 11 bits Signal: 0 to 10 V (R_L ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (R_L ≤ 500 Ω) Protected against short-circuit
8	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor
9	AO2	Analog output #2: Motor current	Galvanic isolation Resolution: 11 bits Signal: 0 to 10 V (R_L ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (R_L ≤ 500 Ω) Protected against short-circuit
10	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor
11	DGND*	Reference (0 V) for the 24 Vdc power supply	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor
12	COM	Common point of the digital inputs	
13	24 Vcc	24 Vdc power supply	24 Vdc power supply, ±8 % Capacity: 500 mA **Note:** in the models with the 24 Vdc external control power supply (CFW11XXXXXOW) the terminal 13 of XC1 becomes an input, i.e., the user must connect a 24 Vdc power supply for the inverter (refer to the Item 7.1.2 Safety Stop Function on page 7-2, for more details). Inall the other models this terminal is an output, i.e., the user has a 24 Vdc power supply available there
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 > N_X 25 C2 - Speed > P0288	
25	C2		
26	NA2		
27	NF3	Digital output #3 DO3 (RL3): N* > N_X - Speed reference > P0288	
28	C3		
29	NA3		

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



XC1 Terminal Strip		Factory Default 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 impedance: 940 Ω resistor in parallel with a 22 nF capacitor
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 impedance: 940 Ω resistor in parallel with a 22 nF capacitor
11	DGND*	Reference (0 V) for the 24 Vdc power supply	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor
12	COM	Common point of the digital inputs	
13	24 Vcc	24 Vdc power supply	24 Vdc power supply, ±8 % Capacity: 500 mA **Note:** in the models with the 24 Vdc external control power supply (CFW11XXXXXOW) the terminal 13 of XC1 becomes an input, i.e., the user must connect a 24 Vdc power supply for the inverter (refer to the Item 7.1.2 Safety Stop Function on page 7-2, for more details). Inall the other models this terminal is an output, i.e., the user has a 24 Vdc power supply available there
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: 2nf 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 25 C2 - Speed > P0288	
25	C2		
26	NA2		
27	NF3	Digital output #3 DO3 (RL3): N* > NX - Speed reference > P0288	
28	C3		
29	NA3		

Figure 3.41: *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.

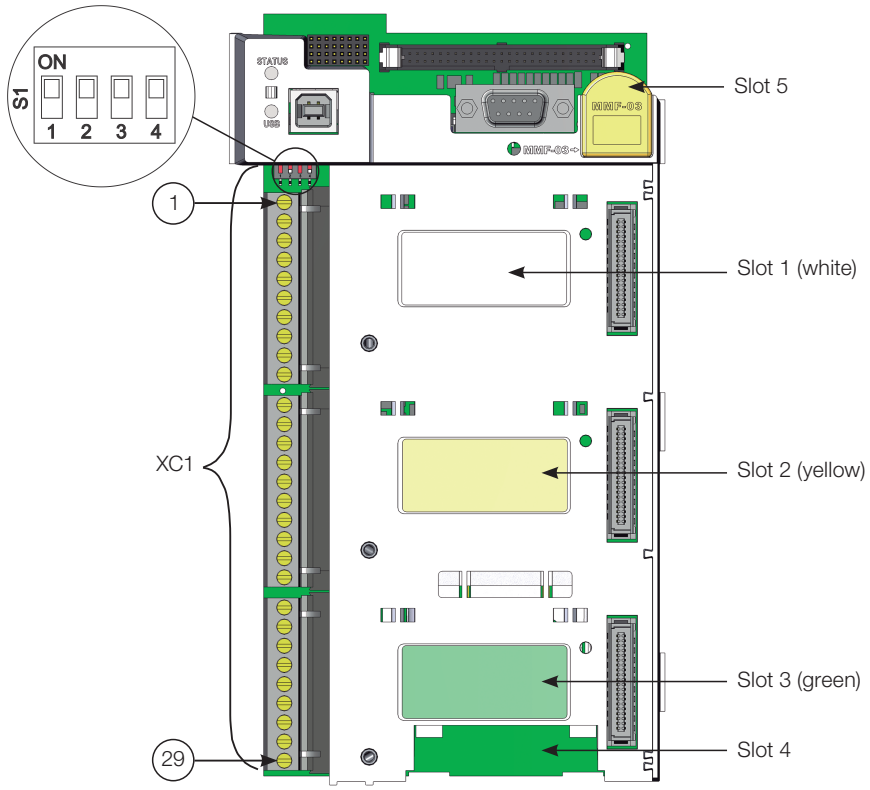


Figure 3.42: *Connector XC1 and switches to select the signal type of the analog inputs and outputs*

As factory standard, the analog inputs and outputs are selected within the range from 0 to 10 V, and they can be changed using switch S1.

Table 3.22: *Configurations of the switches to select the signal type of the analog inputs and outputs*

Signal	Factory Default Function	Setting Element	Selection	Factory Setting
AI1	Speed Reference (remote)	S1.4	OFF: 0 to 10 V (factory default) ON: 4 to 20 mA / 0 to 20 mA	OFF
AI2	Not Used	S1.3	OFF: 0 to ±10 V (factory default) 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 default)	ON
AO2	Motor Current	S1.2	OFF: 4 to 20 mA / 0 to 20 mA ON: 0 to 10 V (factory default)	ON

The parameters related to AI1, AI2, AO1 and AO2 must also be set according to the selection of the switches and desired values.

For the correct connection of the control, use:

1. Gauge of the cables: 0.5 mm² (20 AWG) to 1.5 mm² (14 AWG).

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

3. Wiring on XC1 must be done with shielded cables separated from the other wiring (power, control in 110 V / 220 Vac, etc.), according to Table 3.23 on page 3-36. If those cables must cross other cables, it must be done perpendicularly, keeping the minimum separation distance of 5 cm at the crossing point.

Table 3.23: *Wiring separation distance*

Wiring Length	Minimum Separation Distance
≤ 30 m	≥ 10 cm
> 30 m	≥ 25 cm

The correct connection of the cable shield is shown in Figure 3.44 on page 3-37.

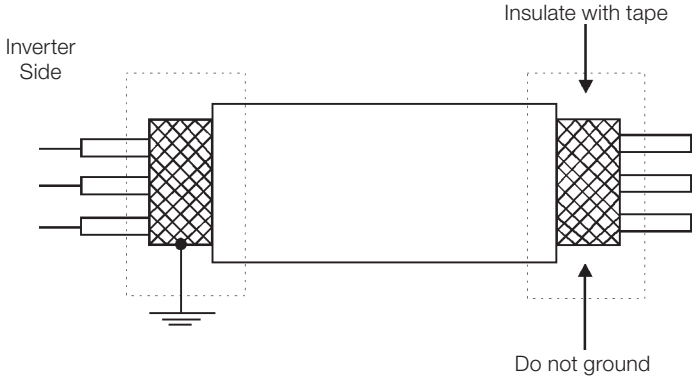


Figure 3.43: *Connection of the shield*

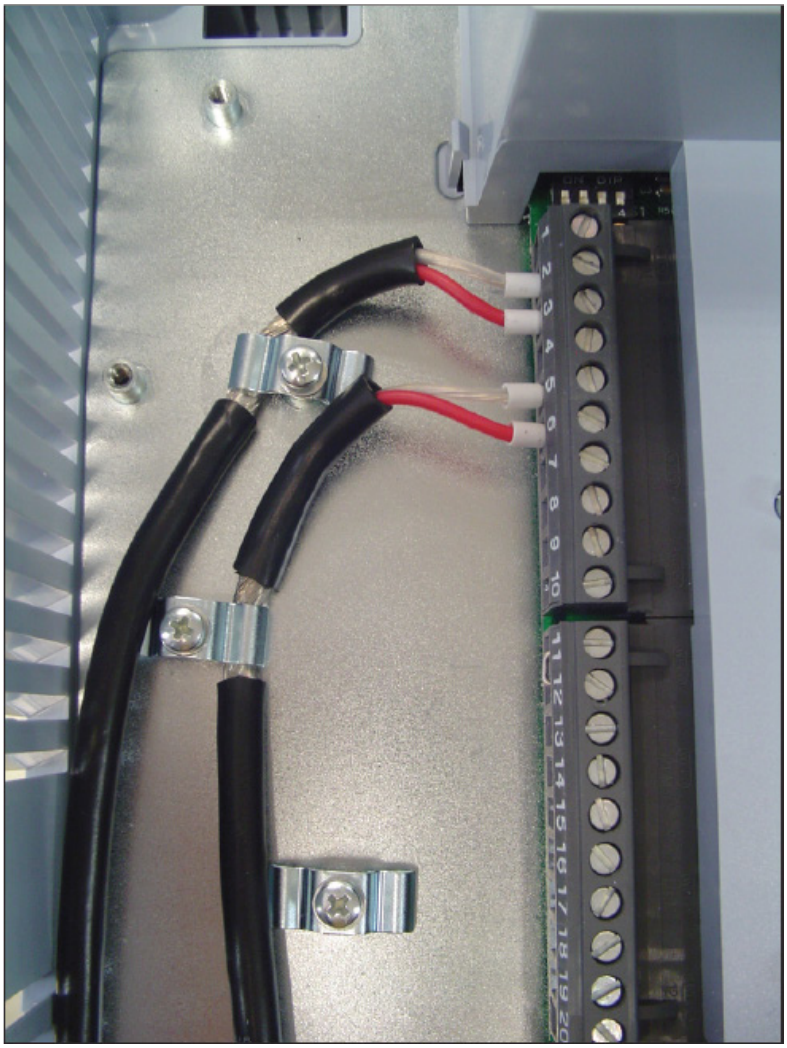


Figure 3.44: *Example of connection of the control cable shield*

4. Relays, contactors, solenoids or electromechanical braking coils installed close to the inverters may generate interference in the control circuit. To eliminate this effect, RC suppressors must be connected in parallel to the coils of those devices in case of AC power supply, and freewheel diodes in case of DC power supply.

3.2.12.4 Typical Drives

Drive 1 - Run/Stop function with control via HMI (Local Mode).

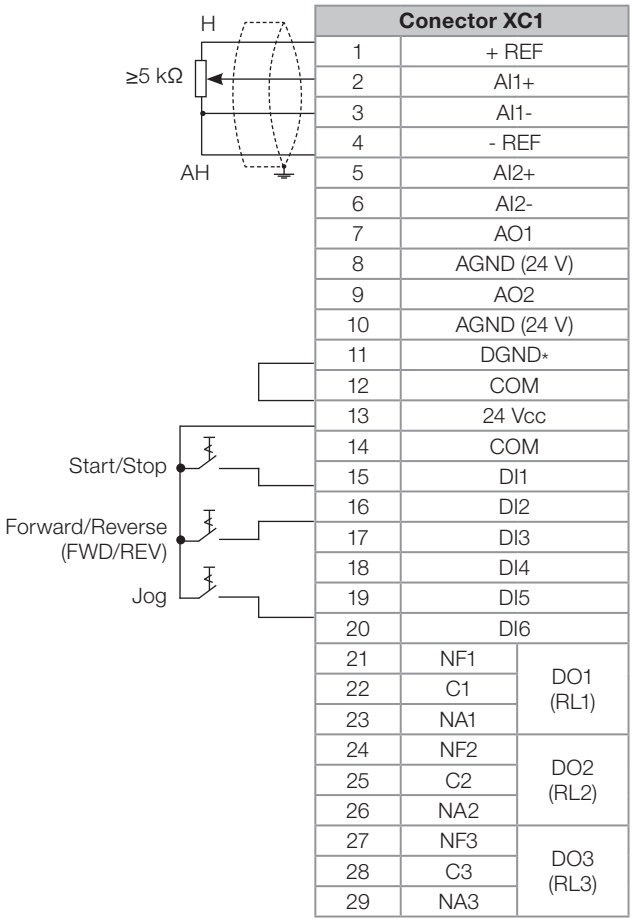
With the factory default programming, it is possible to operate the inverter in the local mode. This operating mode is recommended for users that are using the inverter for the first time, as a form of learning.

In order to perform the start-up in this operating mode, refer to Chapter 5 ENERGIZATION AND START-UP on page 5-1.

Drive 2 - Run/Stop function with two-wire control (Remote Mode).

Valid for factory default setting and inverter operating in the remote mode. In the factory default, the selection of the operating mode (local/remote) is done by the key LOC REM (default local).

In order to change the default setting of the key LOC REM to remote, set P0220 = 3.



Conector XC1		
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 Vcc	
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: *Connections in XC1 for Drive 2*

Drive 3 - Run/Stop function with three-wire control.

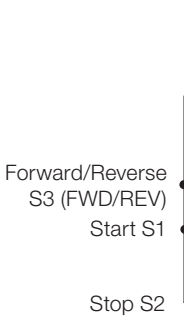
Enabling of the Run/Stop function with three-wire control.

Parameters to be set:

- Program DI3 to START.
- P0265 = 6.
- Program DI4 to STOP.
- P0266 = 7.
- Program P0224 = 1 (DIx) in case you wish the 3-wire control in Local mode.
- Program P0227 = 1 (DIx) in case you wish the 3-wire control in Remote mode.
- Program the Direction of Rotation via DI2.
- Program P0223 = 4 for Local Mode or P0226 = 4 for Remote Mode.

S1 and S2 are, respectively, ON (NO contact) and OFF (NC contact) pushbuttons.

The speed reference can be via AI analog input (as in Drive 2), via HMI (as in Drive 1) or another source.



Conector XC1		
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 Vcc	
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: *Connections in XC1 for Drive 3*

Drive 4 - Forward/Reverse.

Enabling of the Forward/Reverse function.

Parameters to be set:

- Program DI3 to FORWARD.
- P0265 = 4.
- Program DI4 to REVERSE.
- P0266 = 5.

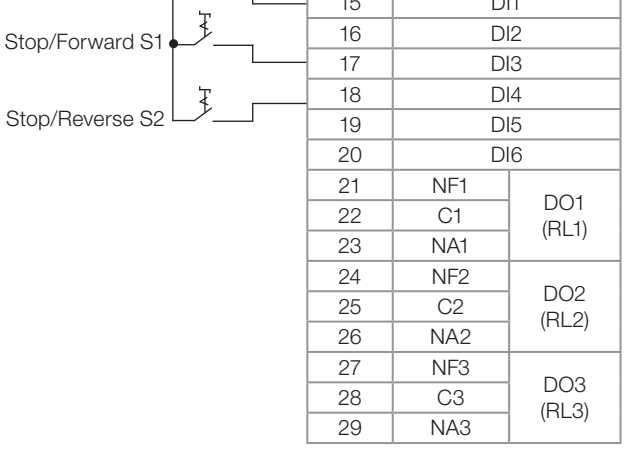
When the Forward/Reverse function is programmed, it will be enabled, both in local and remote mode.

At the same time the keys O and I are always disabled (even if P0224 = 0 or P0227 = 0).

The direction of rotation is defined by the forward and reverse inputs.

Clockwise rotation for forward and counterclockwise for reverse.

The speed reference can come from any source (like in Drive 3).



Conector XC1		
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 3.47: *Connections in XC1 for Drive 4*

3.3 SAFETY STOP FUNCTION

The CFW11W G2...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-11W G2 inverters, when correctly installed, meet the requirements of the EMC Directive 2014/30/EU.

The CFW-11W G2 inverters were developed for professional applications only. Therefore, the limits for emission of harmonic currents established by the IEC/EN 61000-3-2 and IEC/EN 61000-3-12 standards are not applicable.

3.4.1 Conformal Installation

For conformal installation, use:

- Standard CFW-11W 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 3-31.
- Shielded control cables, keeping the separation distance from other cables according to Item 3.2.12.3 CC11 Connections on page 3-34.
- Grounding of the inverter according to instructions of Items Item 3.2.8 Grounding Connections on page 3-27 and Item 3.2.12.2 UC11 G2 Connections on page 3-30.

3.4.2 Definition of the Standards

IEC/EN 61800-3: "Adjustable Speed Electrical Power Drives Systems"

Environments:

First Environment: environments that include residential premises, as well as establishments directly connected without intermediate transformers to the low voltage power line which supplies installations used for residential purposes.

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

Second Environment: environments that include all the buildings other than those directly connected to the low voltage power line which supplies buildings used for domestic purposes.

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

Categories:

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

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

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

Category C3: inverters with voltage ratings below 1000 V developed for application in the "Second Environment" and not designed for application in the "First Environment".

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

3.4.3 Emission and Immunity Levels Met

Table 3.24: *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	See Table 3.25 on page 3-42
Electromagnetic Radiation Disturbance Frequency Range: 30 kHz to 1 GHz		
Immunity:		
Electrostatic Discharge (ESD)	IEC/EN61000-4-2	4 kV discharge per contact and 8 kV discharge through the air
Fast Transient-Burst	IEC/EN61000-4-4	2 kV/5 kHz (coupling capacitor) input cables 1 kV/5 kHz control cables 2 kV/5 kHz (coupling capacitor) motor cables
Conducted Radio-Frequency Common Mode	IEC/EN61000-4-6	0.15 to 80 Mhz; 10 V; 80 % AM (1 kHz) Motor and control 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 3.25: *Conducted and radiated emission levels*

Inverter Model	Conducted Emission - Maximum Length Motor Cable	Radiated Emission
	Category C3	Category
CFW11W 0780 T 6	100 m	C4
CFW11W 1482 T 6	100 m	C4
CFW11W 2223 T 6	100 m	C4
CFW11W 2964 T 6	100 m	C4
CFW11W 3705 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 HMI-CFW11W G2 HUMAN MACHINE INTERFACE

Using the HMI, it is possible to command the inverter, and to view and set all parameters. It presents a navigation method similar to that used in cell phones, with the option to access the parameters sequentially or by means of groups (Menu).

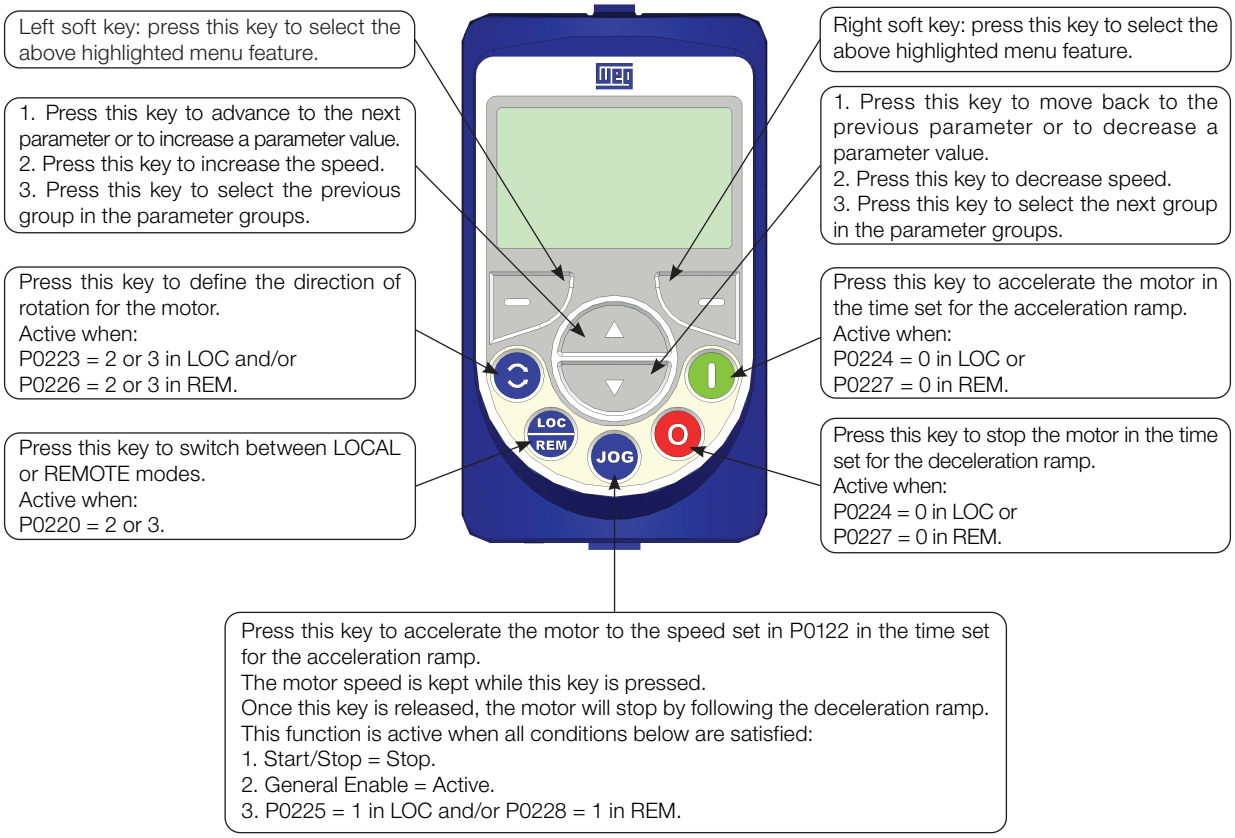


Figure 4.1: *HMI keys*

Battery:

> **NOTE!**
> The battery is only necessary to maintain operation of the internal clock when the inverter is de-energized. In case the battery is low, or not installed on the HMI, the clock time becomes incorrect and alarm A181 – "Clock with invalid value" will be indicated every time the inverter is turned on.

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

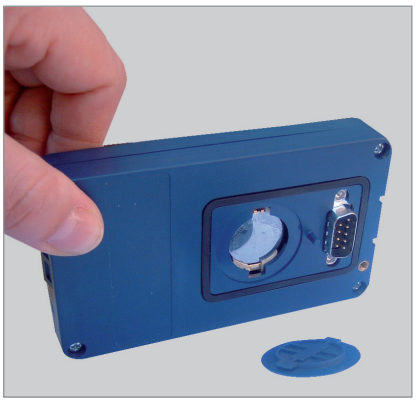
1

Cover for baterry 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

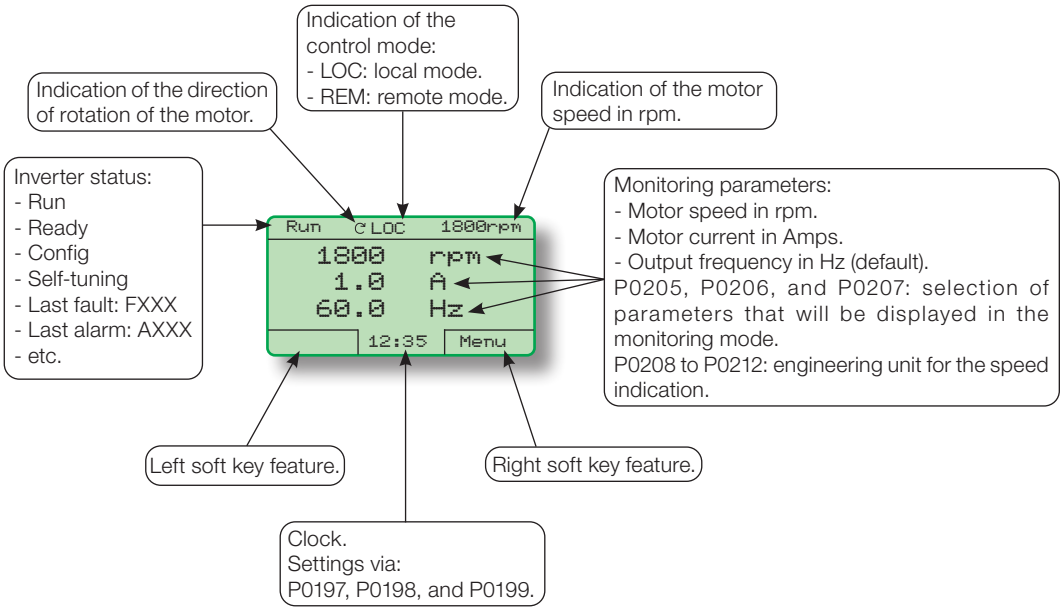
Figure 4.2: *Replacement of the HMI battery*

NOTE!
At the end of the battery useful life, do not dispose it in common garbage, but in a proper place for batteries.

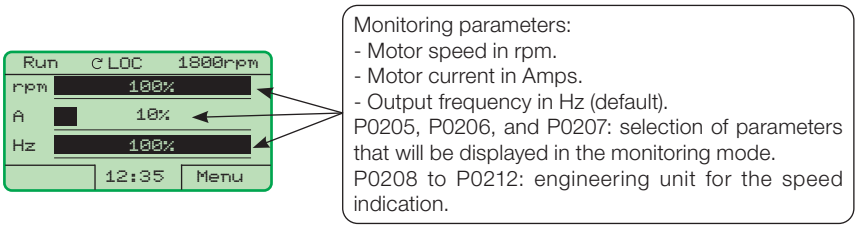
Installation:

The HMI can be installed or removed with the inverter energized or not.

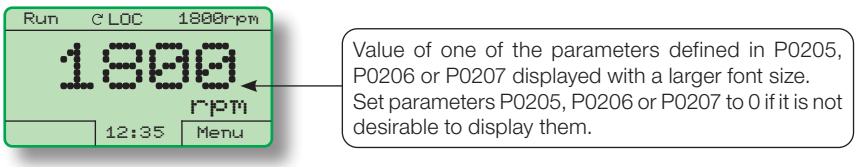
Whenever the inverter is energized, the display goes to the monitoring mode. For the factory setting, a screen similar to Figure 4.3 on page 4-3 (a) will be shown. By setting proper parameters, other variables can be shown in the monitoring mode or the content of the parameters can be presented as bar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

4.2 PARAMETER STRUCTURE

When the right soft key is pressed in the monitoring mode ("MENU"), the first four parameter groups are shown on the display. The parameter group structure is shown in Table 4.1 on page 4-4. For further details on the existing groups in the software version in use, 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	Adj. V/F Curve		
			25	VVW Control		
			26	V/f Current Limit V/f		
			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	Zero Speed 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 Regulator		
			47	DC braking		
			48	Skip Speed		
			49	Communication	110	Local/Rem Config.
					111	Status/Commands
					112	CANopen/DeviceNet
					113	Serial RS232/485
					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	READING PARAMETERS				

5 ENERGIZATION AND START-UP

This chapter explains:

- How to check and prepare the inverter before energization.
- How to energize and check the success of the energization.
- How to program the inverter for operation in the V/f mode using the Oriented Start-up routine and the Basic Application group.

NOTE!
In order to program the inverter in Vector or VVW mode and other existing functions, refer to the Programming Manual of the CFW-11.

5.1 PREPARATION AND ENERGIZATION

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

DANGER!
Always disconnect the general power supply before making any connections.

1. Configure DIP switch S1 located on the ICUP board, according to the rated voltage of the UP11W G2 used on the drive, Table 3.25 on page 3-42.
2. Configure the number of UP11W G2 connected in parallel through the DIP switch S2 located on the ICUP board, according to Table 3.17 on page 3-30.
3. Check if the power, grounding and control connections are correct and firm.
4. Remove all the materials left behind from the installation work from inside the inverter or drive.
5. Verify the motor connections and if the motor voltage and current are within the inverter rated value.
6. Make a pressure test on the Cooling System to check for leaks.
7. Turn on the Cooling System and set the flow and the incoming water temperature to the values of Table 3.8 on page 3-14.
8. Keep the water flowing for five minutes and check for leaks on the hydraulic connections.
9. Energize the control (supply +24 Vdc).
10. Close the panel doors.
11. 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.
12. Measure the voltage of the line and verify if it is within the allowed range, according to Chapter 8 TECHNICAL DATA on page 8-1.
13. Verify if the automatic hardware identification recognized the current of the CFW-11W G2 inverter properly, parameter P0295. The inverter current must be compatible with the number of power units installed.
14. Set parameter P0296 according to the rated voltage of the input line.

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

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

17. Check the success of the energization.

18. 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:

1. Set the password to change parameters.

2. Execution of the **Oriented Start-Up** routine.

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

5.2.1 Password Setting in P0000

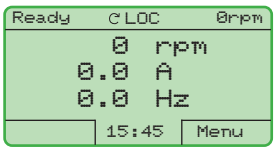
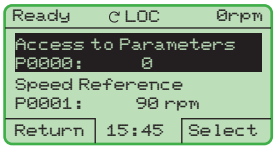
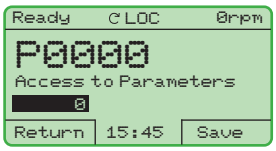
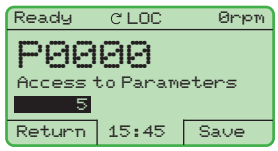
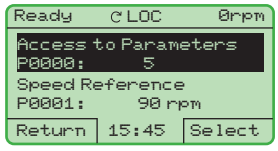
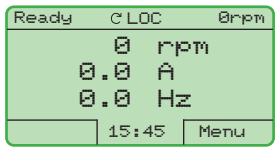
Step	Action/Result	Display Indication
1	- Monitoring mode - Press **"Menu"** (rigth soft key)	
2	- Group **"00 ALL PARAMETERS"** is already selected - Press **"Select"**	
3	- Parameter **"Access to Parameters P0000: 0"** is already selected - Press **"Select"**	
4	- To set the password, press the Up Arrow until number **5** is displayed in the keypad	
5	- When number **5** is displayed in the keypad, press **"Save"**	
6	- If the setting has been properly performed, the keypad should display **"Access to Parameters P0000: 5"** - Press **"Return"** (left soft key)	
7	- Press **"Return"**	
8	- The display returns to the monitoring mode	

Figure 5.1: *Sequence for allowing parameter change via P0000*

5.2.2 Oriented Start-up

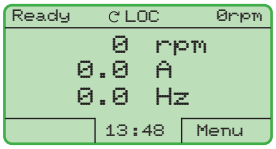
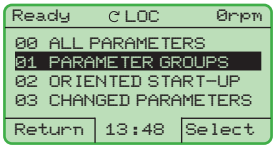
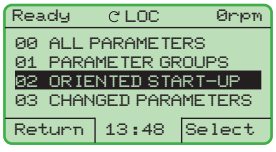
In order to simplify the setting of the inverter, there is a parameter group called Oriented Start-Up. Within this group is parameter P0317, which can be used to access the Oriented Start-Up.

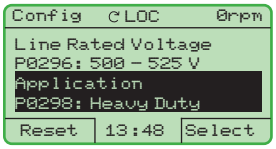
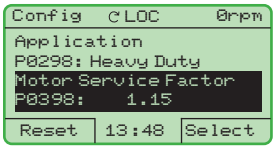
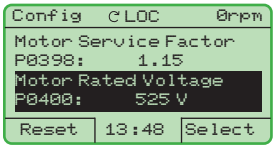
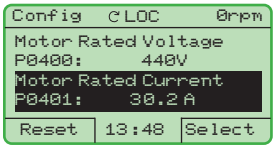
The Oriented Start-up routine shows on the HMI the main parameters in a logical sequence, so that their setting, according to the operating conditions, prepares the inverter for operation according to the supply voltage and motor used.

In order to enter an Oriented Start-up routine, follow the sequence presented in Figure 5.2 on page 5-4, first changing P0317 = 1, and then setting the other parameters as they are displayed on the HMI.

The setting of the parameters presented in this operating mode automatically changes the content of other inverter parameters and/or internal variables.

During the Oriented Start-Up routine the "Config" (Configuration) status will be indicated on the top left part of the HMI.

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"**	

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	

Step	Action/Result	Display Indication
5	- Parameter **"Oriented Start-Up P0317: No"** has been already selected - Press **"Select"**	Ready ↻LOC 0rpm Oriented Start-Up P0317: No Return 13:48 Select
6	- The value of **"P0317 = [000] No"** is displayed	Ready ↻LOC 0rpm P0317 Oriented Start-up [000] No Return 13:48 Save
7	- The parameter value is modified to **"P0317 = [001] Yes"** - Press **"Save"**	Ready ↻LOC 0rpm P0317 Oriented Start-up [001] Yes Return 13:48 Save
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 manual	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
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	Config ↻LOC 0rpm Motor Rated Current P0401: 30.2 A Motor Rated Speed P0402: 1750 rpm Reset 13:48 Select
16	- If needed, set P0403 according to the motor rated frequency. To do so, press **"Select"**. This modification affects P0402	Config ↻LOC 0rpm Motor Rated Speed P0402: 1750 rpm Motor Rated Frequency P0403: 50 Hz Reset 13:48 Select
17	- If needed, change the value of P0404 according to the motor rated power To do so, press **"Select"** This modification affects P0410	Config ↻LOC 0rpm Motor Rated Frequency P0403: 50 Hz Motor Rated Power P0404: 30hp 22kW Reset 13:48 Select
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: 30hp 22kW 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 the Oriented Start-up routine is executed and the parameters are correctly set, the inverter is ready for operation 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 5.3 on page 5-5. For further details, refer to the programming manual of the CFW-11.

After setting 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

Step	Action/Result	Display Indication
6	- Group **"04 BASIC APPLICATION"** is selected - Press **"Select"**	Ready LOC 0rpm 01 PARAMETER 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: 20.0s Deceleration Time P0101: 20.0s Return 15:45 Select
8	- Press **"Return"**	Ready LOC 0rpm 01 PARAMETER 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 contained in the basic application group

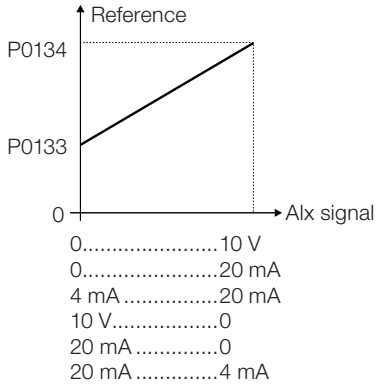
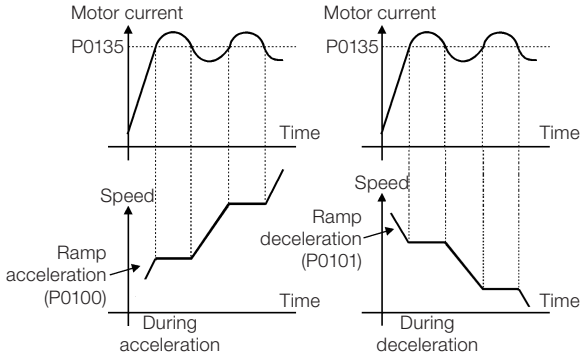
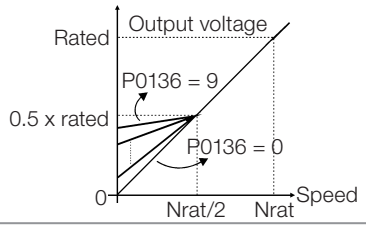
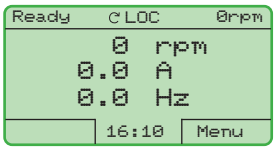
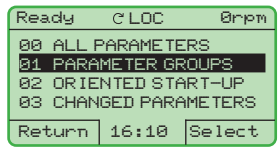
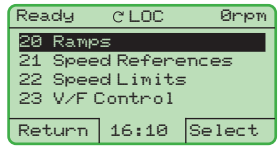
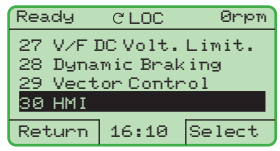
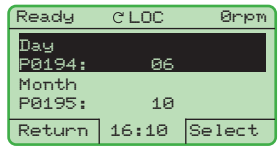
Parameter	Name	Description	Setting Range	Factory Setting
P0100	Acceleration time	- Defines the time to linearly accelerate from 0 up to the maximum speed (P0134) - If set to 0.0 s, it means no acceleration ramp	0.0 to 999.0 s	20.0 s
P0101	Deceleration time	- Defines the time to linearly decelerate from 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			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} to 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 reading 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 OPTIONAL ITEMS AND 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 DATE AND TIME SETTING

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"**	

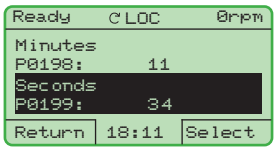
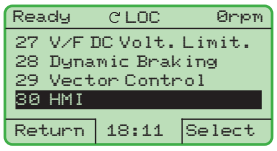
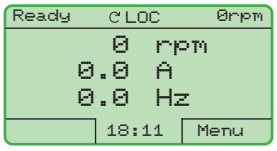
Step	Action/Result	Display Indication
7	- Once the setting of P0199 is over, the Real Time Clock is now updated - Press **"Return"** (left soft key)	
8	- Press **"Return"**	
9	- Press **"Return"**	
10	- The display is back to the monitoring mode	

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.
- Example of 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 electric line and other high voltages inside the inverter. However, it is not isolated from the protective earth (PE). Use an isolated laptop for connection to the USB connector or desktop with connection to the same protective earth as the inverter protective earth.

To control the motor speed via PC or to view and program the inverter via PC, it is necessary to install the SuperDrive G2 software on the PC.

Basic procedure to transfer 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 5.6 on page 5-12.

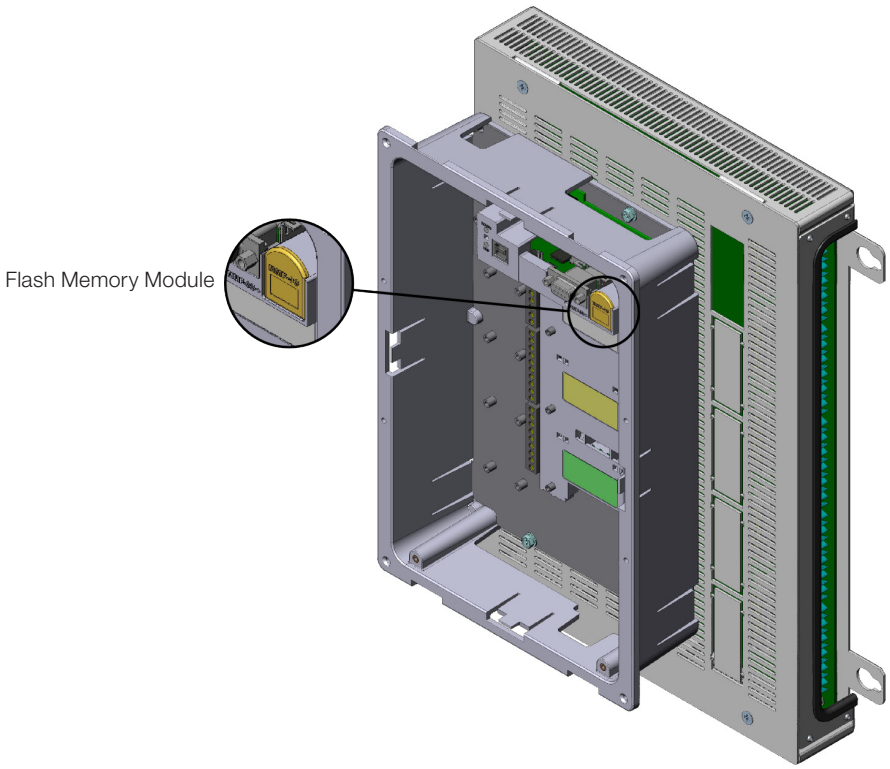


Figure 5.5: *Detail of location of the FLASH memory module*

Functions:

- It stores an image of the inverter parameters.
- It allows transferring parameters stored in the FLASH memory module to the inverter.
- It allows transferring firmware stored in the FLASH memory module to the inverter.
- It stores the program generated by the SoftPLC.

Whenever the inverter is energized, it transfers this program to the RAM, located on the inverter control board, and it executes the program.

For further details, refer to the Programming Manual and SoftPLC manual of the CFW-11.

ATTENTION!
To connect or disconnect the flash memory module, first turn off the inverter and wait for the discharge of the capacitors.

5.7 OPERATION WITH A REDUCED NUMBER OF POWER UNITS

The CFW11W G2 can operate with a reduced number of UP11W G2 and reduced power for a short time. That operating mode is called "Reduced Power Mode". It may be applied to critical processes in which you do not want a whole machine to stop when one UP11W G2 fails, enabling the operation with reduced power until you have a UP11W G2 for replacement.

The general scheme of a drive with 5 UP11W is shown in Figure 3.24 on page 3-20. The reduced power mode works as a drive of up to 2 UP11W.

Assuming that in the drive of Figure 3.24 on page 3-20, composed of 5 UP11W G2, the UP11W G2 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 UP11W G2 (in this case, number 4).
3. Disconnect the power and control of the UP11W G2 number 4, according to Figure 5.7 on page 5-13.
4. Move the control connections on the ICUP board, as shown in Figure 5.7 on page 5-13. Connect the control cables of UP11W number 5 to position 4 of the ICUP board. Thus, UP11W G2 5 becomes UP11W G2 4.
5. Configure the new number of UP11 through DIP switch S2 located on the ICUP board, according to Table 3.7 on page 3-12.
6. Change DIP switch S1:4 to ON; thus, it will be informed to the control that the CFW-11W G2 drive is operating with a reduced number of UP11W G2.

ATTENTION!
It is recommended that the drive operate short of one UP11W G2 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-11W 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 UP11W G2.
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 CFW11 programming manual.
14. Connect the drive power source.

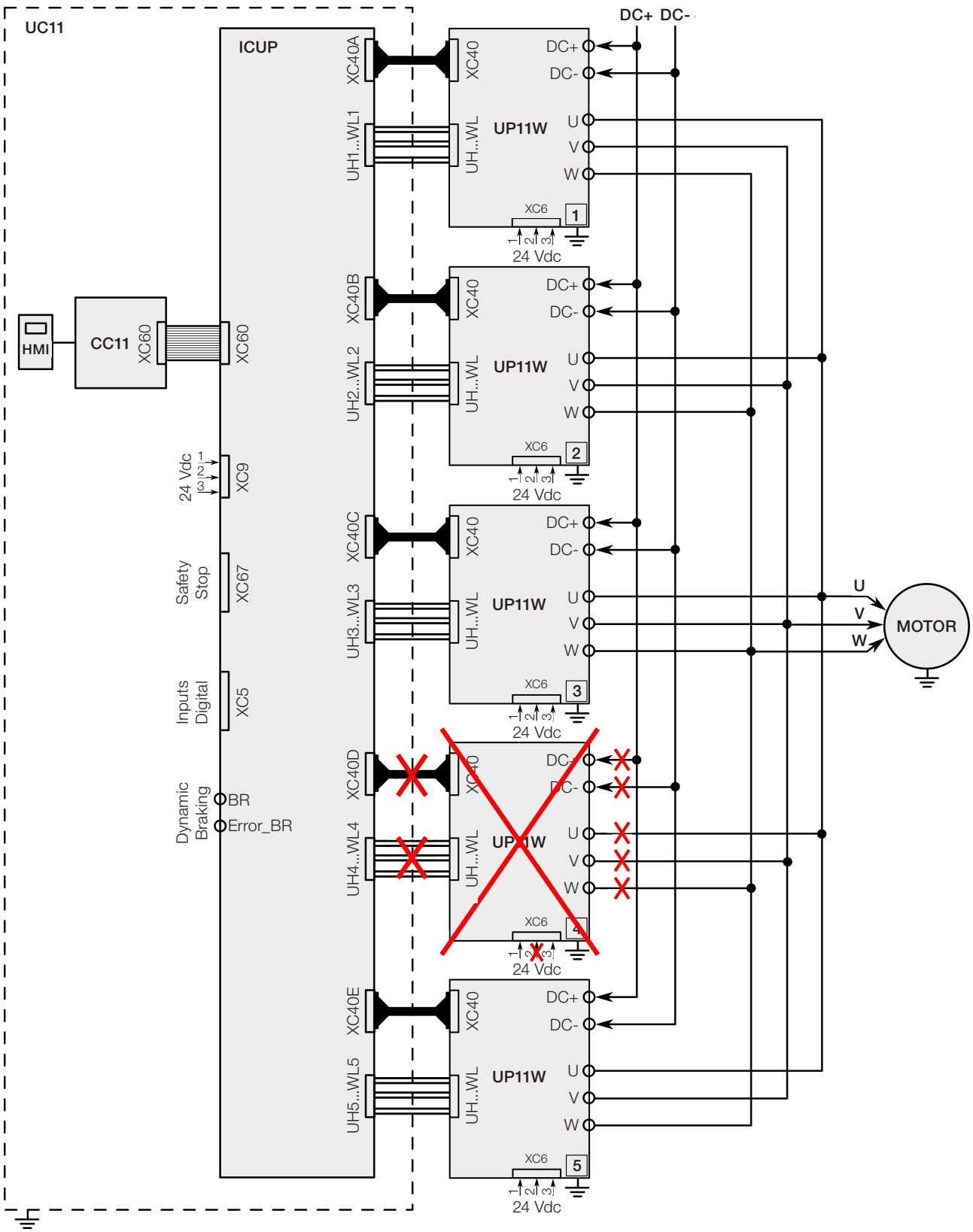


Figure 5.6: Disconnection of the power and control cables of UP11W number 4

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

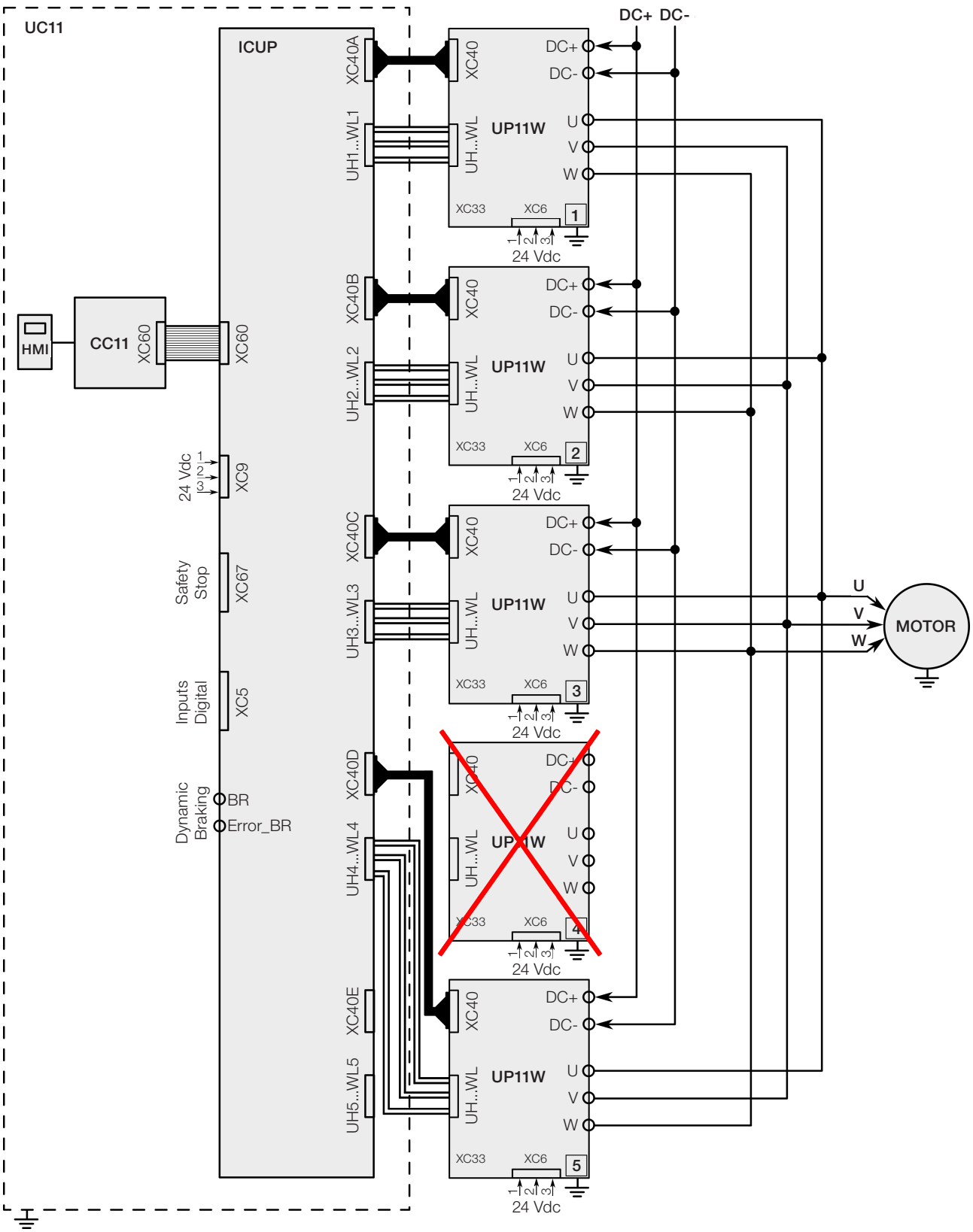


Figure 5.7: Moving the control connections on the ICUP board

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 (FXXX) is identified, what occurs is:

- Locking of the PWM pulses.
- Indication on the display of the fault description and code.
- The "STATUS" LED flashes red.
- The relay programmed for "NO FAULTS" is turned off.
- Saving of some data on the EEPROM of the control circuit:
  - Speed reference via HMI and E.P. (Electronic Potentiometer), in case the "Reference backup" function in P0120 is enabled.
  - The fault or alarm code occurred (it moves the nine previous faults).
  - The status of the integrator of the motor overload function.
  - The status of the hours enabled (P0043) and energized (P0042) counter.
- For the inverter to return to normal operation right after the occurrence of a fault, it is necessary to reset it, which can be done as follows:
  - Switching off the power supply, and switching it back on (power-on reset).
  - Pressing the O (manual reset) key.
  - Via soft key "Reset".
  - Automatically by means of the P0340 setting (auto-reset).
  - Via digital input: DIx = 20 (P0263 to P0270).

When an alarm (AXXX) is identified, what occurs is:

- Indication on the display of the alarm description and code.
- The "STATUS" LED becomes yellow.
- The inverter remains in operation, without blocking the PWM pulses.

6.2 ALARMS, FAULTS AND POSSIBLE CAUSES

Table 6.1: Alarms, faults and possible causes

Fault/Alarm	Description	Possible Causes
F020: 24 Vdc Power Supply Undervoltage	Undervoltage on the 24 Vdc power supply that feeds the control.	■ Voltage on the power supply below 22.8 Vdc.
F021: DC Link Undervoltage	Undervoltage on the intermediate circuit.	■ Supply voltage too low, producing voltage on the DC link below the minimum value (read value in parameter P0004): – Ud < 530 V – Supply voltage 500-525 V (P0296 = 5). – Ud < 696 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 on the pre-charge circuit. ■ Parameter P0296 selected for use above the rated line voltage.
F022: DC Link Overvoltage	Overvoltage on the intermediate circuit.	■ Supply voltage too high, producing voltage on the DC link above the maximum value: – 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) Arm U Fault	Desaturation on the IGBTs of arm U.	■ Short circuit between phases U and V or U and W of the motor.
F034: (1) Arm V Fault	Desaturation on the IGBTs of arm V.	■ Short circuit between phases V and U or V and W of the motor.
F038: (1) Arm W Fault	Desaturation on the IGBTs of arm W.	■ Short circuit between phases W and U or W and V of the motor.
A046: High Load on the Motor	Motor overload alarm. **Note:** - It can 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: Overload on the IGBTs	IGBT overload alarm. **Note:** - It may be disabled by setting P0350 = 0 or 2.	■ High current in the inverter output.
F048: Overload on the IGBTs	IGBT overload fault	■ Current in the inverter output too high.
F067: Encoder /Motor Wiring Is Inverted	Fault linked 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.
F071: Overcurrent in the Output	Output overcurrent fault.	■ Load inertia too high or acceleration ramp too fast. ■ Setting of P0135 or 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.
F074: Ground Fault	Ground overcurrent fault. **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 Unbalance	Motor current imbalance fault. **Note:** - It may be disabled by setting P0342 = 0.	■ Poor contact or interrupted wiring in the connection between the inverter and the motor. ■ Vector control with orientation loss. ■ Vector control with encoder, wiring of the encoder or connection to the motor inverted.

Fault/Alarm	Description	Possible Causes
F077: Overload on the Braking Resistor	Overload on the dynamic braking resistor fault.	■ Load inertia too high or deceleration ramp too fast. ■ Load on the motor shaft is too high. ■ Values of P0154 and P0155 programmed incorrectly.
F078: Motor Overtemperature	Fault related to PTC temperature sensor installed on the motor. **Note:** - It may 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. ■ Poor contact or short circuit (resistance <60 Ω) on the wiring connected to the motor thermistor. ■ Motor thermistor not installed. ■ Motor shaft locked.
F079: Encoder Signals Fault	Encoder signals missing fault.	■ Wiring between encoder and encoder interface accessory interrupted. ■ Encoder is defective.
F080: CPU Fault (Watchdog)	Watchdog fault on the microcontroller.	■ Electric noise.
F082: Copy Function Fault	Fault in the copy of parameters.	■ Attempt to copy parameters from the HMI to the inverter with incompatible software versions.
F084: Self-Diagnose Fault	Self-Diagnose Fault.	■ Defect on the inverter internal circuits.
A088: Communication Lost	Communication fault of the HMI with the control board.	■ Poor contact on the HMI cable. ■ Electric noise on 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 presents a value out of the standards for zero 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.	■ Overload on the motor shaft. ■ Load cycle too high (high number of starts and stops per minute). ■ High ambient temperature around the inverter. ■ Motor thermistor not installed. ■ Motor shaft locked.
A128: Serial Communication Timeout	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 installation of cables and grounding. ■ Make sure the master sent a new telegram in a period of time shorter than the setting in P0314.
A129: Anybus Offline	Alarm that indicates interruption in the Anybus-CC communication.	■ PLC went to the Idle state. ■ Programming error. Number of I/O words programmed on the slave is different 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: Without CAN Supply	Alarm of power supply missing on the CAN controller.	■ Broken or disconnected cable. ■ Power supply turned off.
A134: Bus Off	CAN peripheral of the inverter went to the bus off status.	■ Incorrect baud rate. ■ Two slaves on the network with the same address. Error in the cable assembly (inverted signals).
A135: CANopen Communication Error	Alarm that indicates communication error.	■ Communication problems. Incorrect programming of the master. ■ Incorrect configuration of the communication objects.
A136: Master in Idle	Network master went to the idle state.	■ PLC switch in the idle position. ■ Bit of the PLC command register in zero (0).
A137: DNet Connection Time out	Alarm of timeout on the DeviceNet I/O connections.	■ One or more allocated I/O connections went to the timeout status.

Fault/Alarm	Description	Possible Causes
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.	■ Check the network master status, ensuring it is in the run mode. ■ For further information, refer to the Profibus DP communication manual.
A139: (2) Profibus DP Interface Offline	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. ■ Flash memory module not well fitted.
A152: High Internal Air Temperature	High internal air temperature alarm. Measured temperature above 75 °C (167 °F). **Note:** - It can be disabled by setting P0353 = 1 or	■ High ambient temperature around the inverter (> 45 °C (113 °F)). ■ High temperature inside the panel (> 45 °C (113 °F)).
F153: Overtemp. Internal Air	Internal air overtemperature fault. Measured temperature above 80 °C (176 °F).	
A156: Undertemperature	Only one sensor indicates temperature below -30 °C.	■ Ambient temperature around the inverter ≤ -30 °C (-22 °F).
F156: Undertemperature	Undertemperature fault measured on the IGBT temperature sensors (-22 °F).	■ Ambient temperature around the inverter ≤ -30 °C (-22 °F).
F160: Safety Stop Relay	Fault on the Safety Stop relays.	■ One of the relays is defective or without the +24 Vdc voltage on the coil.
F161: PLC11 CFW-11 Timeout	Refer to the programming manual of the PLC11-01 module available on **www.weg.net**.	
A162: Incompatible PLC Firmware		
A163: Broken Wire 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: Broken Wire 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: Broken Wire AI3	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: Broken Wire AI4	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.
A181: Clock with Invalid Value	Alarm of clock with wrong time.	■ Necessary to set the date and time in P0194 to P0199 ■ HMI battery low, defective or not installed.
F182: Pulse Feedback Fault	Fault in the output pulse feedback.	■ Defect on the internal circuits of the inverter.
F183: Overload IGBTs+Temperature	Overtemperature related to IGBT overload protection.	■ High ambient temperature around the inverter. Operation in frequency < 10 Hz with overload.
F186: (3) Temperature Fault Sensor 1	Temperature fault in sensor 1.	■ High temperature on the motor.
F187: (3) Temperature Fault Sensor 2	Temperature fault in sensor 2.	■ High temperature on the motor.
F188: (3) Temperature Fault Sensor 3	Temperature fault in sensor 3.	■ High temperature on the motor.
F189: (3) Temperature Fault Sensor 4	Temperature fault in sensor 4.	■ High temperature on the motor.
F190: (3) Temperature Fault Sensor 5	Temperature fault in sensor 5.	■ High temperature on the motor.

Fault/Alarm	Description	Possible Causes
A191: (3) Temperature Alarm Sensor 1	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) Temperature Alarm Sensor 2	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) Temperature Alarm Sensor 3	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) Temperature Alarm Sensor 4	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) Temperature Alarm Sensor 5	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) Cable Sensor 1 Alarm	Broken cable alarm in sensor 1.	■ Short circuited temperature sensor.
A197: (3) Cable Sensor 2 Alarm	Broken cable alarm in sensor 2.	■ Short circuited temperature sensor.
A198: (3) Cable Sensor 3 Alarm	Broken cable alarm in sensor 3.	■ Short circuited temperature sensor.
A199: (3) Cable Sensor 4 Alarm	Broken cable alarm in sensor 4.	■ Short circuited temperature sensor.
A200: (3) Cable Sensor 5 Alarm	Broken cable alarm in sensor 5.	■ 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: Without CAN Supply	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 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.
F239: (2) Profibus Offline	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 Interf. 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.

Fault/Alarm	Description	Possible Causes
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 °C (230 °F).	■ High coolant temperature (> 45 °C (113 °F) see Item 3.1.6 Cooling System on page 3-9) and high output current. ■ Coolant flow < 20l/min or clogged tubing. ■ UP11W heatsink or system heat exchanger rust inside due to coolant out of the specifications (see Item 3.1.3 Lifting on page 3-2). ■ Fault in the pumps.
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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (239 °F).	
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 °C (230 °F).	
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 °C (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 °C (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 °C (239 °F).	

Fault/Alarm	Description	Possible Causes
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 °C (230 °F).	■ High coolant temperature (> 45 °C (113 °F) see Item 3.1.6 Cooling System on page 3-9) and high output current. ■ Coolant flow < 20l/min or clogged tubing. ■ UP11W heatsink or system heat exchanger rust inside due to coolant out of the specifications (see Item 3.1.3 Lifting on page 3-2). ■ Fault in the pumps.
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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (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 °C (230 °F).	
F343: Overtemperature IGBT W B5	Fault of overtemperature measured on the temperature sensor (NTC) of IGBT of phase W of book 5. Measured temperature above 115 °C (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 (see Table 8.1 on page 8-2).
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	Alarm of overload on the 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.	
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 unbalance 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 is operating at constant speed, it is an indication of abnormal current distribution between the power units.
A391: Current unbalance 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 unbalance 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 unbalance 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 unbalance 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 unbalance 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 unbalance 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 unbalance 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 unbalance 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 unbalance 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 unbalance 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 unbalance 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 unbalance 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 is operating at constant speed, it is an indication of abnormal current distribution between the power units.
A403: Current unbalance 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 unbalance 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		■ Pump fault. ■ Fault on the panel ventilation.
F410: External Fault		■ Input DIM1 or DIM2 open. Check the drive used in the application.
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 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.	■ Run/Stop command of the SoftPLC application or the movement block was enabled with the inverter in general disabled.
A704: (5) Two Movements Enabled	Two movements enabled.	■ It occurs when two or more movement blocks are simultaneously enabled.
A706: (5) Reference Not Set for SoftPLC	Reference not set for SoftPLC.	■ It occurs when a movement block is enabled and the speed reference is not configured for SoftPLC (check P0221 and P0222).

Models in which it may occur:
(1) In the case of the CFW11W G2, the HMI does not indicated in which UP11W G2 the fault occurred. LEDs on the ICUP board indicate which UP11W 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.

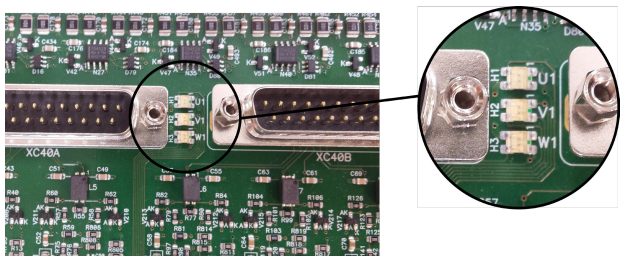


Figure 6.1: *LEDs that indicate fault on the arms of the power units (desaturation)*

(2) With Profibus DP module connected to slot 3 (XC43).
(3) With IOE-01 (02 or 03) module connected to slot 1 (XC41).
(4) Motor connecting cable too long, over 100-meter long, will present a high stray capacitance to the ground. The circulation of eddy currents in these capacitances may cause the activation of the ground fault circuit and, consequently, blocking due to F074 immediately after the inverter is enabled.
(5) All models with SoftPLC application.

NOTE!
The range from P0750 to P0799 is intended for user's Faults and Alarms of the SoftPLC application.

6.3 TROUBLESHOOTING THE MOST COMMON PROBLEMS

Table 6.2: *Troubleshooting the most common problems*

Problem	Point to be Checked	Corrective Action
Motor will not spin	Wrong wiring	1. Check all the power and control connections. For example, the DIx digital inputs programmed as run/stop, general enable or without external fault must be connected to 24 Vdc or DGND* (see Figure 3.40 on page 3-34 and Figure 3.42 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)
	Wrong programming	1. Check if the parameters have correct values for the application
	Fault	1. Check if the inverter is not locked due to a fault condition 2. Check if there is a short circuit between terminals XC12:13 and 11 (short circuit in the 24 Vdc power supply)
	Motor stall	1. Reduce motor overload 2. Increase P0136, P0137 (V/f) or P0169/P0170 (vector control)
Motor speed varies (fluctuates)	Loose connections	1. Lock inverter, disconnect power supply and tighten all connections 2. Check the tightening of all internal connections of the inverter
	Reference potentiometer is defective	1. Replace potentiometer
	Variation in the external analog reference	1. Identify the reason for the variation. If the reason is electric noise, use shielded cables or move the cable away from the power or control wiring
	Parameters poorly set (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	Wrong programming (reference limits)	1. Check if the content of P0133 (minimum speed) and P0134 (maximum speed) are according to the motor and application
	Control signal of 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 data	1. Check if the motor is according to the application requirements
Motor will not reach the rated speed or the speed starts oscillating when close to the rated speed (Vector Control)	Programming	1. Check P0410
Display off	HMI connections	1. Check the HMI connections outside the inverter
	ICUP supply voltage of 24 Vdc	1. Check the connections of the control 24 Vdc power supply 2. Check if the power supply limits are according to Table 3.21 on page 3-31
Low motor speed and P0009 = P0169 or P0170 (motor in torque limitation), for P0202 = 4 - vector with encoder	Inverted encoder signals or inverted power connections	1. Check the signals A-$\overline{A}$, B-$\overline{B}$, see the interface manual for incremental encoder. If the signals are correct, change the connection of the two output phases For example U and V

6.4 INFORMATION TO CONTACT TECHNICAL SUPPORT

NOTE!

For technical support or queries, it is important to have the following data at 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 and programming data.

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.
- Wait at least 10 minutes for the complete discharge of the power capacitors.
- Always connect the equipment frame to the protective earth (PE) at the proper terminal.

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

Do not execute any applied potential test on the inverter!
If necessary, contact WEG.

When installed in proper environment and operating conditions, the inverters require little maintenance. Table 6.3 on page 6-12 presents the main procedures and time intervals for preventive maintenance. Table 6.4 on page 6-12 contains the recommended inspections to be performed every 6 months after the start-up.

Table 6.3: *Preventive maintenance*

Maintenance	Interval	Instructions
HMI battery replacement	Every 10 years	See Chapter 4 HMI on page 4-1
Cleaning the cooling system and changing the coolant	Every 5 years	Contact WEG
Monthly inspection	Once a month	Open the panel and check for leaks. If present, it must be corrected
Refill 1.5 % of Inhibitor CorteC VpCI-649	Once a year	Contact WEG

The following refrigeration system parameters must be registered annually:

- Measure the ethylene glycol concentration using a refractometer. If the concentration is below the recommended level, ethylene glycol must be replaced in the system.
- Measure the pH of the solution. The pH of the solution should be between 8.2 ... 10. If the pH is outside this range, a complete fluid change must be made.

Table 6.4: *Periodic inspections every six months*

Component	Anomalies	Corrective Action
Terminals, connectors	Loose Screws	Tighten
	Loose Connectors	
Printed circuit boards	Buildup of dust, oil, moisture, etc.	Cleaning
	Smell	Replace
Power module/Power connections	Buildup of dust, oil, moisture, etc.	Cleaning
	Loose connection screws	Tighten
Power resistors	Discoloration	Replace
	Smell	

6

6.5.1 Cleaning Instructions

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

Electronic boards:

1. Disconnect the power supply of the inverter and wait for 10 minutes.
2. Remove the dust accumulated on the boards using an anti-static brush or ion compressed air gun (Example: Charges Burtes Ion Gun (non-nuclear) reference A6030-6DESCO).
3. If necessary, remove the boards from the inverter.
4. Always wear a grounding strap.

7 OPTIONAL ITEMS AND 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 OPTIONAL ITEMS

7.1.1 Connections of the Cooling System with Quick Couplings

Inverters with the following coding: CFW11W G2...O...QC...

This optional item is used when you want the coolant inlet and outlet fittings to be quick couplings with check valve. Figure 7.1 on page 7-1 shows a UP11W G2 with quick couplings installed.

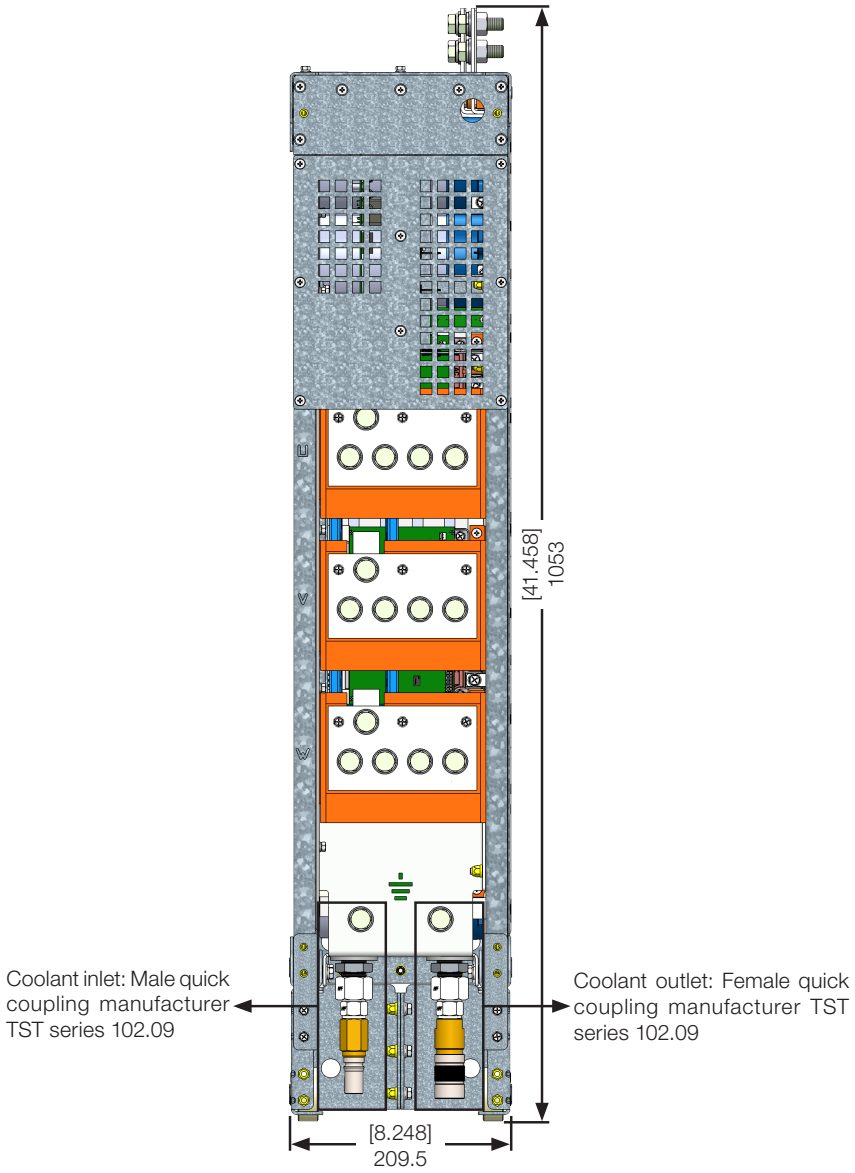


Figure 7.1: *UP11W with the coolant inlet and outlet fittings of the quick coupling type. Dimensions in mm [in]*

ATTENTION!
The UP11W G2 becomes 120 mm higher with the quick couplings in the coolant inlet and outlet fittings.

ATTENTION!
The addition of quick couplings increases de pressure drop in the UP11W G2 by 1,55 bar. Considering the 20 l/min flow and the composition of 88,5 % of water, 10 % de glycol and 1,5 % of inhibitor CorteC VpCI-649 in the coolant.

7.1.2 Safety Stop Function

Inverters with the following coding CFW11W G2...O...Y.... See the Section 3.3 SAFETY STOP FUNCTION on page 3-41.

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.

The code and models available of each accessory are presented in Table 7.1 on page 7-2. They may be ordered separately and will be shipped in individual packages containing the components and the manuals with detailed instructions for the product installation, operation and programming.

ATTENTION!
Only one module can be used at a time in 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)

WEG Item (Material Number)	Name	Description	Slot	Identification Parameters	
				P0027	P0028
11094251	PLC11-02	PLC module	1, 2 and 3	----	--xx (1)(3)
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)
Separate HMI, Blind Cover and Frame for External HMI					
11008913	HMI-01	Separate HMI (4)	HMI	-	-
11010521	RHMIF-01	Frame kit for HMI (degree of protection IP56)	-	-	-
11010298	HMID-01	Blind cover for 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	Shield kit for control cables (supplied with the product)	-	-	-
13555095	Signal/Fiber Cables 2.5 m	Signal and Fiber cable set CFW11W G2 - 2.5 m	-	-	-
13555150	Signal/Fiber Cables 3.0 m	Signal and Fiber cable set CFW11W G2 - 3.0 m	-	-	-
13555151	Signal/Fiber Cables 3.6 m	Signal and Fiber cable set CFW11W G2 - 3.6 m	-	-	-
14235116	RACK G2 2 UP11W	Rack to assemble 2 UP11W G2 units in panel (5)	-	-	-
14235117	RACK G2 3 UP11W	Rack to assemble 3 UP11W 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 cable to connect the HMI to the inverter with D-Sub9 (DB-9) male and female connectors with pin to pin connection (market standard mouse extension) or Null-Modem type. Maximum length 3 m.
Examples:
- Mouse extension cable - 1.80 m; 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 DATA

This chapter contains the technical data (electrical and mechanical) of the CFW11W G2.

8.1 POWER DATA

Power supply:

- The maximum rated line voltage of 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-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!
The power supply data assumes that the inverter is fed by a diode rectifier bridge.

Table 8.1: Inverter technical data for rated switching frequencies

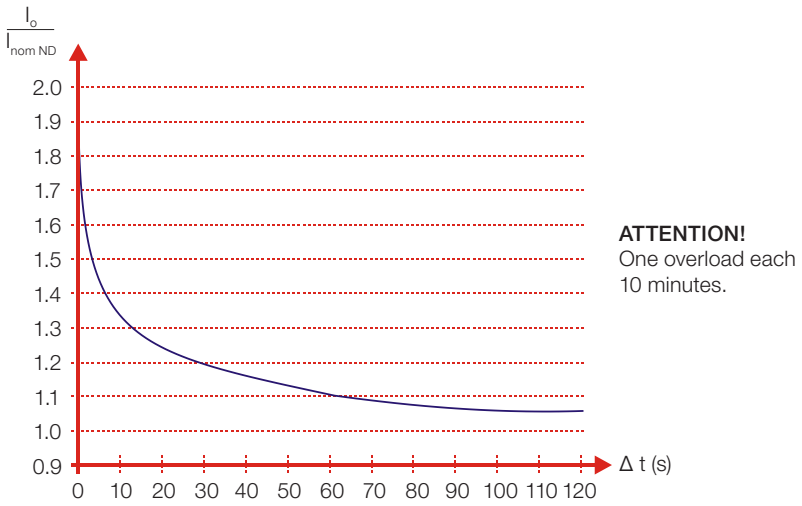
Model			CFW11W G2 0780 T 6	CFW11W G2 1482 T 6	CFW11W G2 2223 T 6	CFW11W G2 2964 T 6	CFW11W G2 3705 T 6
Power Supply [V_{dc}]			574...1150				
Nº of UP11			1	2	3	4	5
Normal Duty (ND)	Rated Output Current [Arms]		780	1482	2223	2964	3705
	Overload Current [Arms]	1 min	858	1630	2445	3260	4076
		3 s	1170	2223	3335	4446	5558
	Switching Frequency [kHz]		2	2	2	2	2
	Maximum Motor [cv/kW]		1000/750	2000/1500	3000/2250	4000/3000	5000/3750
	Rated Input Current [Adc]		897	1704	2556	3409	4261
	Dissipated Power [kW]	For the Coolant	10,5	21.0	31.5	42.0	52.5
		For the Air	0,2	0.4	0.6	0.8	1.0
Heavy Duty (HD)	Rated Output Current [Arms]		640	1216	1824	2432	3040
	Overload Current [Arms]	1 min	960	1824	2736	3648	4560
		3 s	1280	2432	3648	4864	6080
	Switching Frequency [kHz]		2	2	2	2	2
	Maximum Motor [cv/kW]		800/600	1500/1100	2200/1600	3000/2200	3800/2800
	Rated Input Current [Adc]		736	1398	2098	2797	3496
	Dissipated Power [kW]	For the Coolant	8.7	17.4	26.1	34.8	43.5
		For the Air	0.2	0.4	0.6	0.8	1.0

Note:

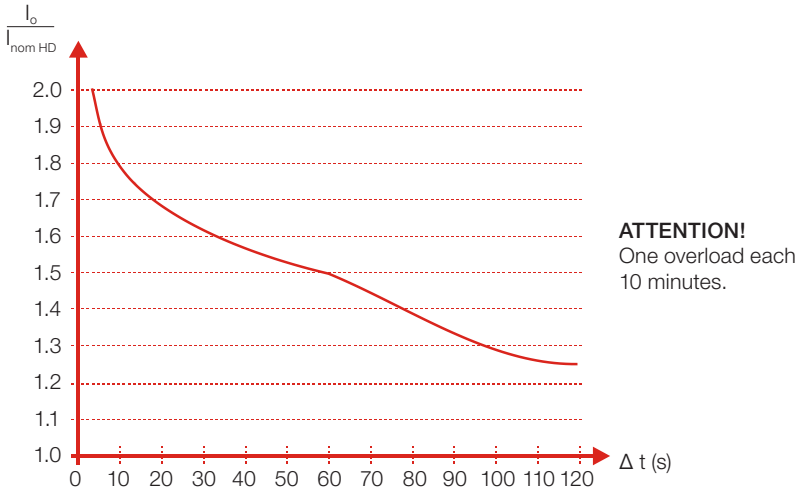
(1) Steady state rated current in the following conditions:

- Indicated switching frequency. It is not possible to use the CFW11W 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 0,5 % for each ° C above the maximum temperature specified.
- Coolant input temperature 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 1 % for each ° C above the maximum temperature specified.
- Coolant flow as specified in Chapter 3 INSTALLATION AND CONNECTION on page 3-1.
- 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



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

Figure 8.1: *(a) and (b) Overload curves of the IGBTs for operation under normal duty (ND) and operation under heavy duty (HD)*

(3) The motor power are just reference values; they are specified for WEG 4-pole 690 V motors 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**	■ Imposed voltage ■ Control types: - V/f (scalar) - VVW: Voltage vector control - Vector control with encoder - Sensorless vector control (without encoder) - Vector 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: - 125 Hz (switching frequency = 1.25 kHz) - 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 analog input 12 bits (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 by differential amplifier; resolution of the AI1:12 bits, resolution of the 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 insulated digital inputs, 24 Vdc, programmable functions
Outputs (CC11 board)	**Analog**	■ 2 isolated outputs, (0 to 10) V, RL ≥ 10 kΩ (max. load), 0 to 20 mA / 4 to 20 mA, (RL ≤ 500 Ω) resolution: 11 bits, programmable functions
	Relay	■ 3 relays with NO/NC contacts, 240 Vac, 1 A, programmable functions
Safety	**Protection**	■ Overcurrent/short circuit in the output ■ Under/overvoltage in the power ■ Phase loss ■ Overtemperature ■ Overload on the braking resistor ■ Overload on the IGBTs ■ Motor overload ■ External fault / alarm ■ Fault on the CPU or memory ■ Phase-ground short circuit in the output
Human Machine Interface HMI	**Standard HMI**	■ 9 keys: Run/Stop, Increment, Decrement, Direction of Rotation, Jog, Local/Remote, right soft key and left Soft key ■ Graphic LCD display ■ It enables to access/change all the parameters ■ Precision of the indications: - Current: 5 % of the rated current - Speed resolution: 1rpm ■ Option of external mounting
Degree of Protection	**IP00**	■ Default
USB Connector for Programming	**USB Connector**	■ Standard USB Rev. 2.0 (basic speed) ■ USB plug type B "device" ■ Interconnecting cable: standard host/device shielded USB cable

8.2.1 Codes and Standards Met

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 UP11W G2 module has a total mass of 67 Kg. Its dimensions are shown in Figure 8.2 on page 8-6.

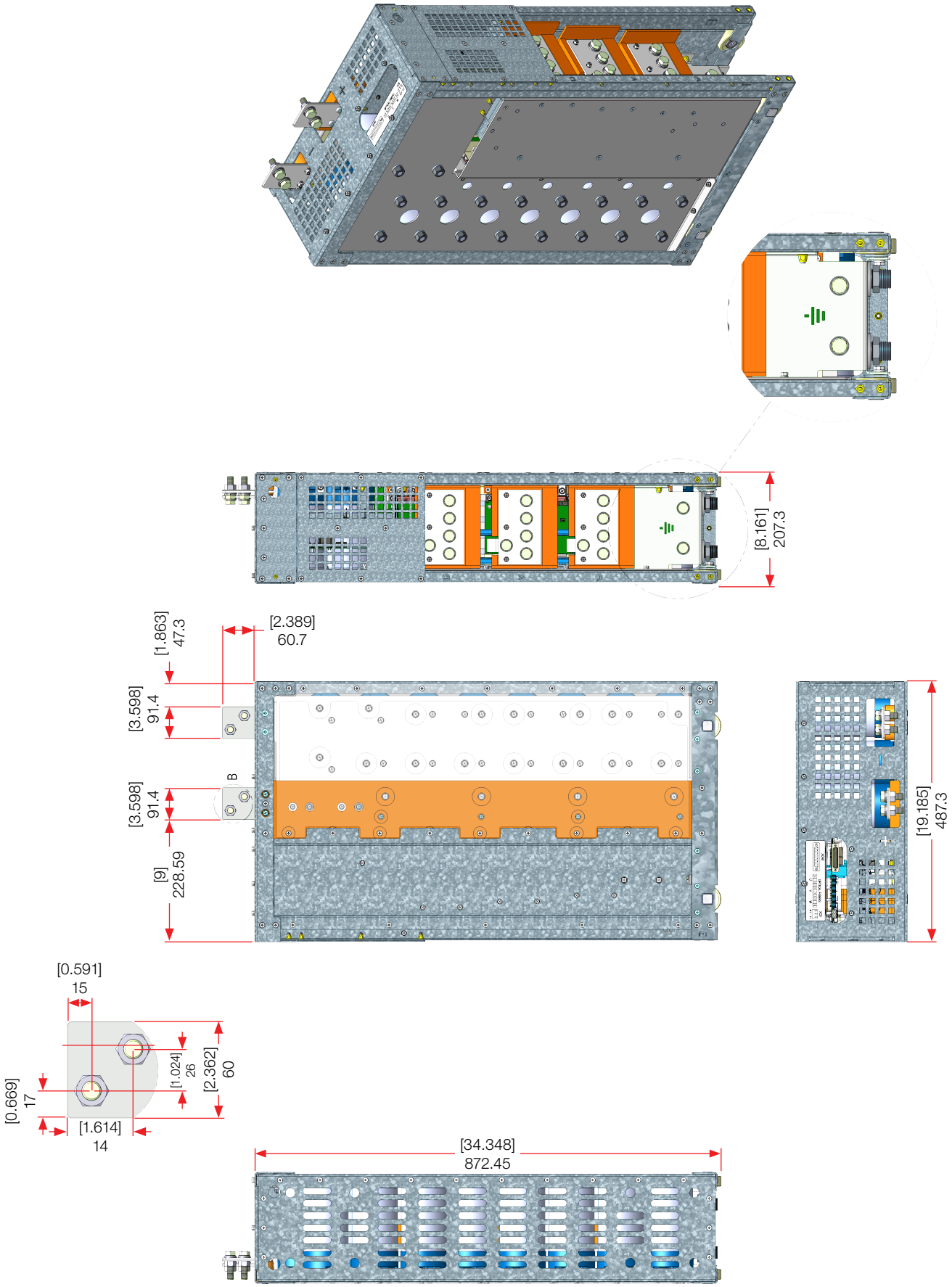


Figure 8.2: *Mechanical dimensions of the UP11W G2 in mm [in]*

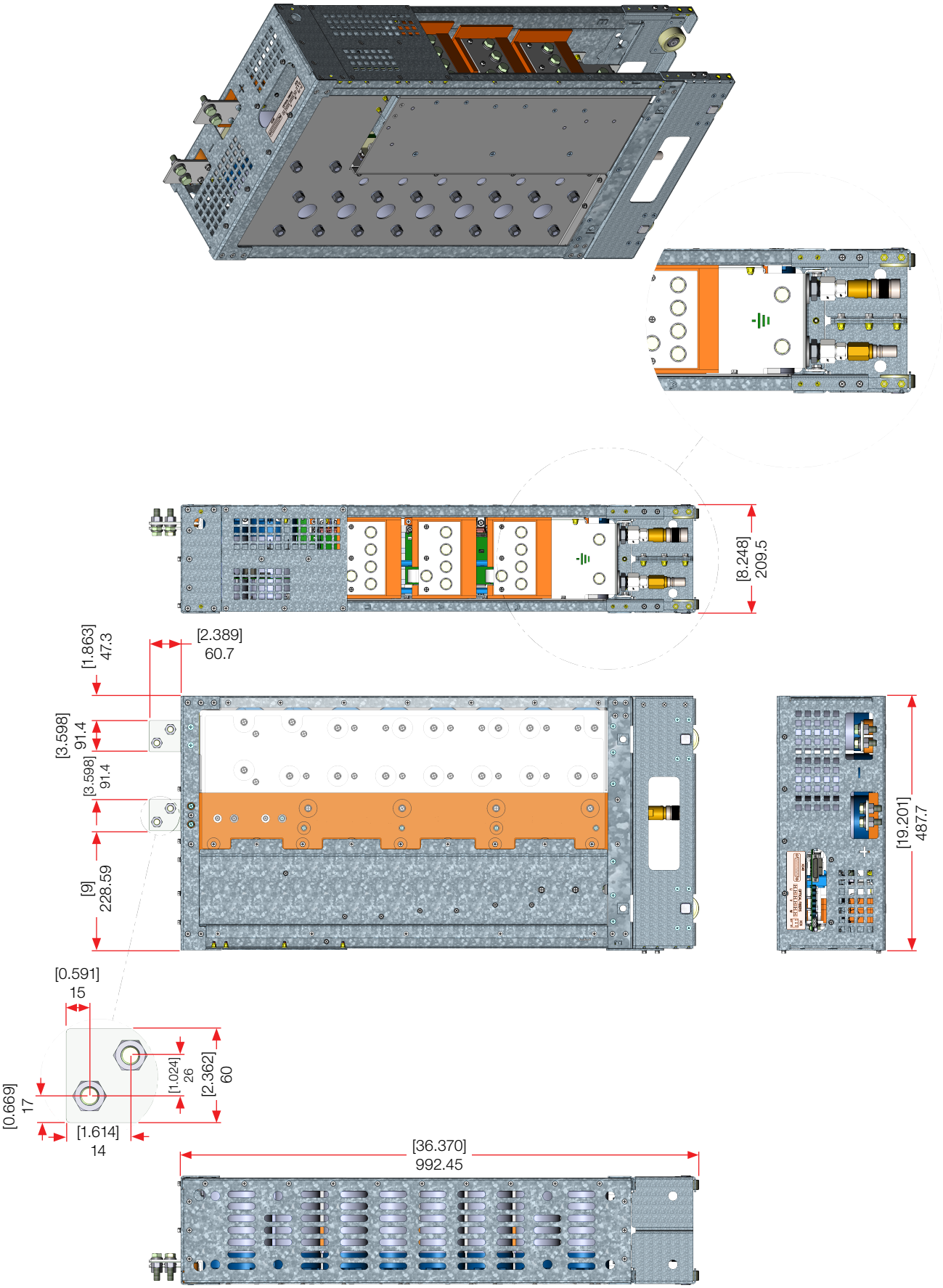


Figure 8.3: *Mechanical dimensions of the UP11W G2 with quick couplings in the hydraulic fittings in mm [in]*

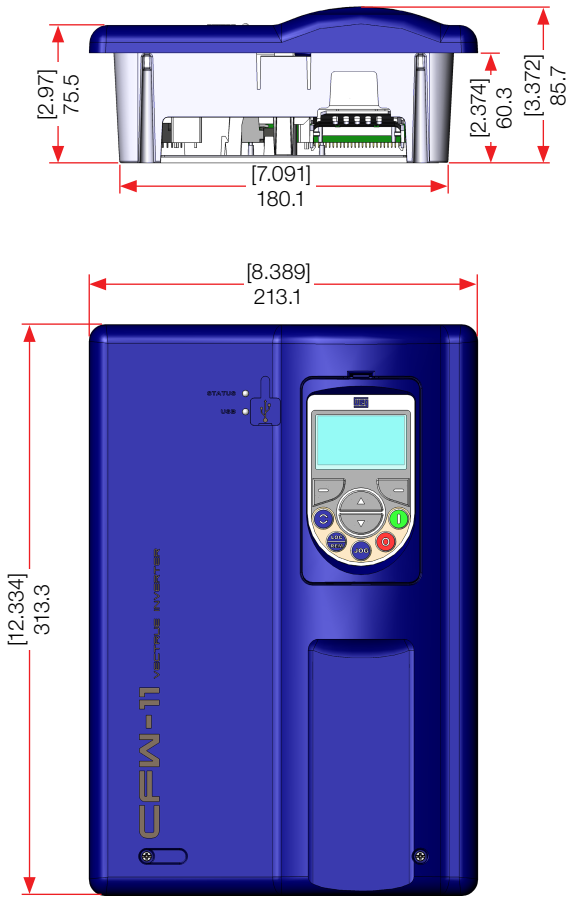


Figure 8.4: *Dimensions of the control rack mm [in]*

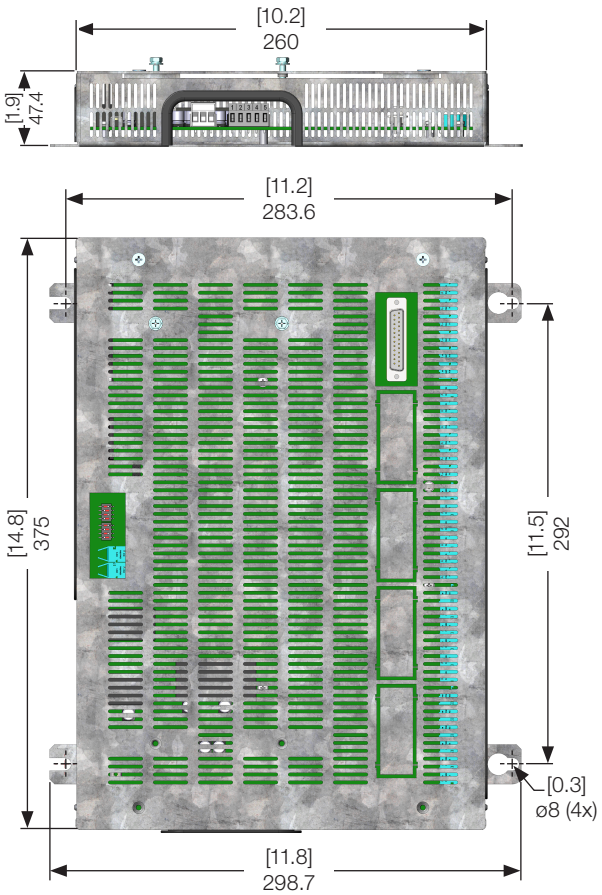


Figure 8.5: *Dimensions of the ICUP board metal enclosure in mm [in]*