Regenerative Frequency Converter

CFW-11 RB

User Manual

User Manual

Series: CFW-11 RB

Language: English

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Models: 142...211 A / 220...230 V

105...760 A / 380...480 V

53...472 A / 500...690 V

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Summary of Reviews

The table below describes the revisions made to this manual.

Version	Review	Description
-	R00	First edition
-	R01	General review
-	R02	General review

1 SAFETY INSTRUCTIONS

This manual provides information for the proper installation and operation of the regenerative frequency converter CFW-11 RB.

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

1.1 SAFETY WARNINGS IN THE MANUAL

The following safety warnings are used in this manual:

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

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

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

1.2 SAFETY WARNINGS IN THE PRODUCT

The following symbols are attached to the product and require special attention:


High voltages are present.


Components sensitive to electrostatic discharge.
Do not touch them.


Mandatory connection to the protective ground (PE).


Connection of the shield to the ground.


Hot surface.

1.3 PRELIMINARY RECOMMENDATIONS

DANGER!
Only qualified personnel familiar with the CFW-11 RB regenerative frequency converter and associated equipment should plan or implement the installation, start-up and subsequent maintenance of this equipment.
These personnel must follow all the safety instructions included in this Manual and/or defined by local regulations.
Failure to comply with these instructions may result in death, serious injury and equipment damage.

NOTE!
For the purposes of this manual, qualified personnel are those trained and able to:
1. Install, ground, power-up and operate the CFW-11 RB according to this manual and the effective legal safety procedures.
2. Use protection equipment according to the established regulations.
3. Provide first aid.

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

DANGER!
Always disconnect the main power supply before touching any electrical component associated to the converter.
Several components can remain charged with high voltages and/or in movement (fans) even after the AC power supply is disconnected or switched off.
Wait at least 10 minutes to assure a total discharge of the capacitors.
Always connect the equipment frame to the protective earth (PE) at the suitable connection point.

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

Do not execute any applied potential test on the CFW-11 RB!
If necessary, contact WEG.

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

NOTE!
Read this manual completely before installing or operating the converter.

ATTENTION!
The operation of this equipment requires installation instructions and detailed operation provided in the user manual, programming manual and manuals/guides for kits and accessories. The user manual and the parameters quick reference are supplied in a hard copy together with the converter. The user guides are also provided in a hard copy along with the accessories. The other manuals are they available for download on the website: **www.weg.net**.

2 GENERAL INSTRUCTIONS

2.1 ABOUT THE MANUAL

This manual presents how to install, to start-up, the main characteristics and how to troubleshoot the most common problems of the CFW-11 RB converter series.

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

- Programming Manual, with a detailed description of the parameters and advanced functions of the CFW-11 RB.
- I/O Expansion Module Manual.

These manuals are available for download on the website: **www.weg.net**.

2.2 TERMS AND DEFINITIONS USED IN THE MANUAL

Regenerative Frequency Converter: three-phase switching frequency converter “boost type” (amplifier) that converts the AC voltage from the power supply to a DC voltage (DC Link). It has the capability of absorbing the energy of the power supply (AC) or to recover the energy back to the power supply, being used as a DC voltage source to supply voltage to several output inverter.

Output Inverter: frequency inverter fed by the DC Link bus bar supplied by the regenerative converter. It is responsible for the motor control.

Normal Duty Cycle (ND): converter duty cycle that defines the maximum continuous operation current (Inom-ND) and overload current conditions (110 % for 1 minute). The ND cycle is selected by setting P0298 (Application) = 0 (Normal Duty (ND)). The inverter overload conditions are reflected in the regenerative converter.

$I_{nom\text{-}ND}$: converter rated current for use with the normal duty (ND) cycle. Overload: 1.1 x $I_{nom\text{-}ND}$ / 1 minute.

Heavy Duty Cycle (HD): converter duty cycle that defines the maximum continuous operation current (Inom-HD) and overload current conditions (150 % for 1 minute). The HD cycle is selected by setting P0298 (Application) = 1 (Heavy Duty (HD)). The inverter overload conditions are reflected in the regenerative converter.

$I_{nom\text{-}HD}$: converter rated current for use with the heavy duty (HD) cycle.
Overload: 1.5 x $I_{nom\text{-}HD}$ / 1 minute.

Pre-charge Circuit: charges the DC Link capacitors with limited current, which avoids higher peak currents at the converter power-up.

Link DC: converter intermediate circuit; DC voltage obtained from the AC input voltage rectification or from an external power supply; feeds the output IGBTs converter bridge.

Power Modules U, V, and W: set of two IGBTs of the regenerative converter input phases U, V, and W.

IGBT: Insulated Gate Bipolar Transistor; basic component of the power modules U, V and W. The IGBT works as an electronic switch in the saturated (closed switch) and cut-off (open switch) modes.

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

HMI: Human Machine Interface: it is a device that allows the visualization and modification of the converter parameters. The CFW-11 RB HMI presents keys for the regenerative converter control, navigation keys and a graphic LCD display.

Flash Memory: non-volatile memory that can be electronically written and erased.

Ram Memory: Random Access Memory (volatile).

USB: Universal Serial Bus; is a serial bus standard that allows devices to be connected using the ”Plug and Play” concept.

PE: Protective Earth.

RFI Filter: Radio-Frequency Interference Filter for interference reduction in the Radio-Frequency range.

PWM: Pulse Width Modulation; pulsed voltage at the input of the regenerative converter.

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

General Enable: when activated, the converter controls the voltage at the DC Link. When deactivated, this function immediately blocks the PWM pulses. The General Enable function may be controlled through a digital input set to this function.

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

Amp, A: ampères.

°C: celsius degree.

°F: Fahrenheit degree.

AC: alternated current.

DC: direct current.

CFM: Cubic Feet per Minute; unit of flow.

cm: centimeter.

ft: foot.

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

Hz: hertz.

in: inch.

kg: kilogram = 1000 grams.

kHz: kilohertz = 1000 Hertz.

l/s: liters per second.

lb: pound.

m: meter.

mA: miliampère = 0.001 Ampère.

min: minute.

mm: millimeter.

ms: millisecond = 0.001 seconds.

N.m.: newton meter; unit of torque.

rms: root mean square; effective value.

rpm: revolutions per minute; unit of speed.

s: second.

V: volts.

Ω: ohms.

2.3 ABOUT THE CFW-11 RB

The regenerative frequency converter is a bidirectional three-phase boost type AC/DC converter that generates higher DC voltage than the line peak voltage. These converter are commonly known as AFE (Active Front End) drives. The CFW-11 RB line utilizes the “RB” sulfix which states for Regenerative Braking because it has the natural capacity of allowing the energy to flow from the converter to the power supply when the motor is braking. The DC voltage generated by the regenerative converter is used to feed other converter power units that are controlling three-phase motors.

The CFW-11 RB regenerative converter is a high performance product that allows three-phase power supply rectification with the following advantages:

- Low input current harmonic distortion.
- Capacity of recovering energy back to the power supply (regeneration) allowing high braking torque levels.

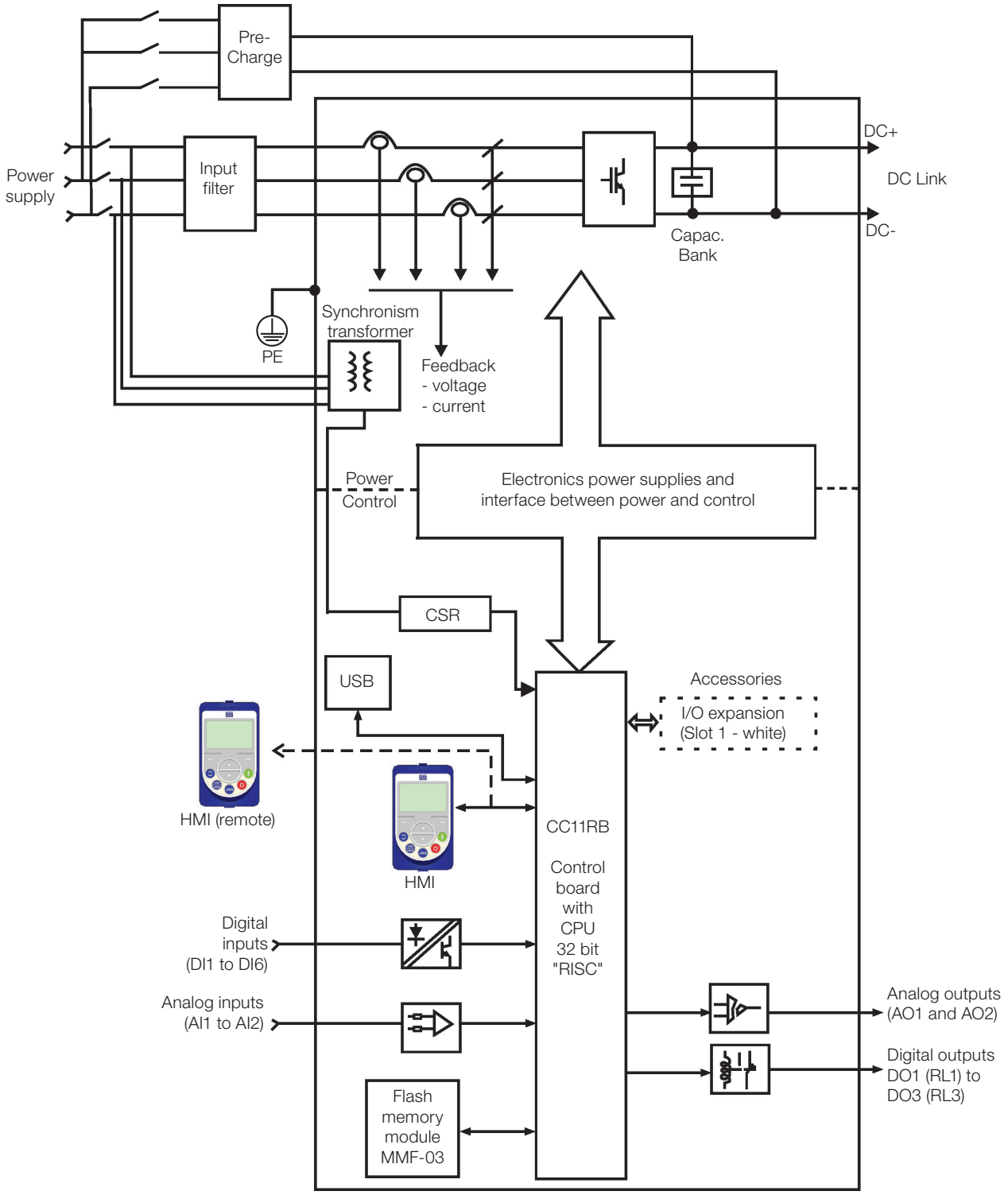
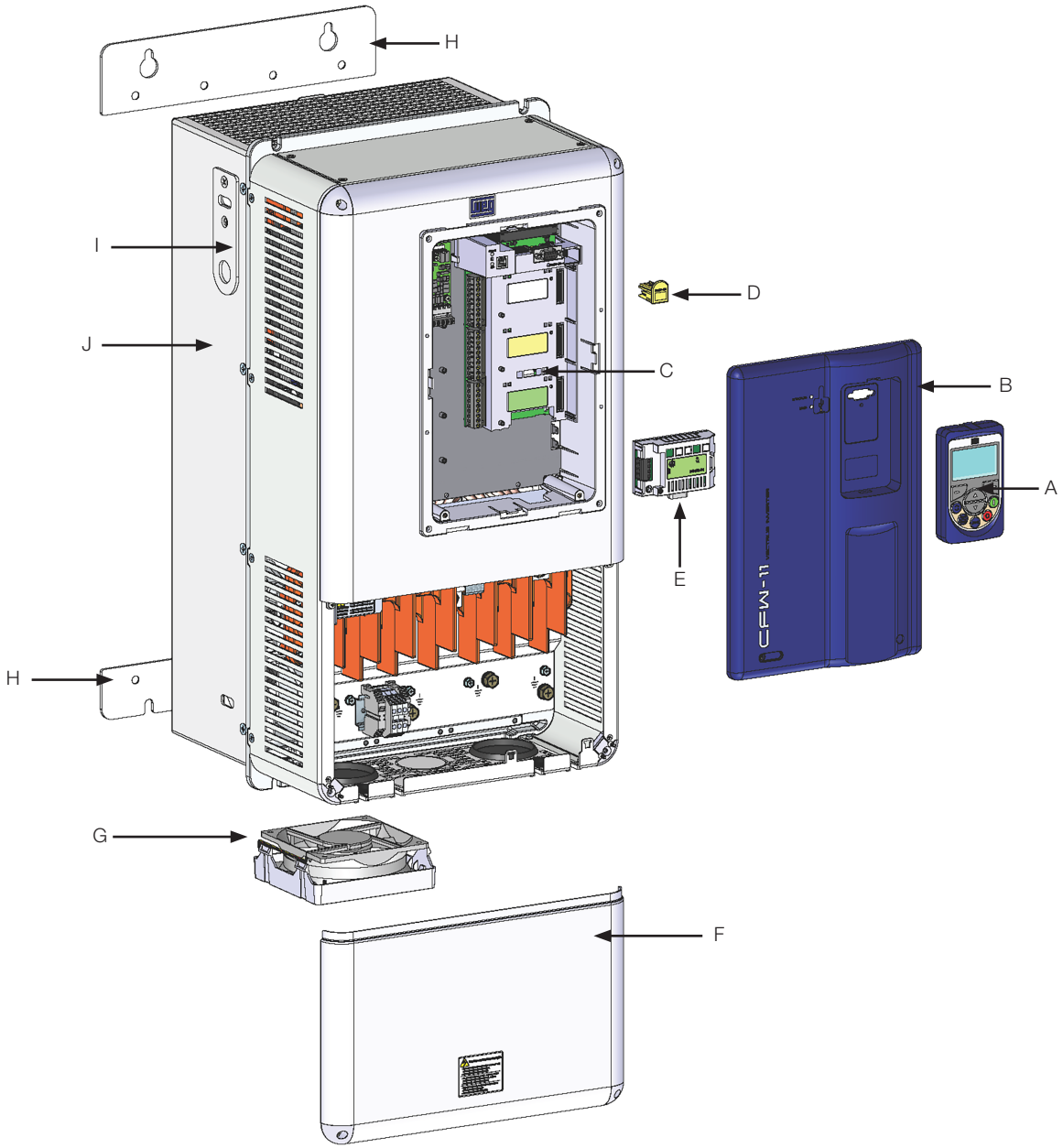


Figure 2.1: *CFW-11 RB block diagram*

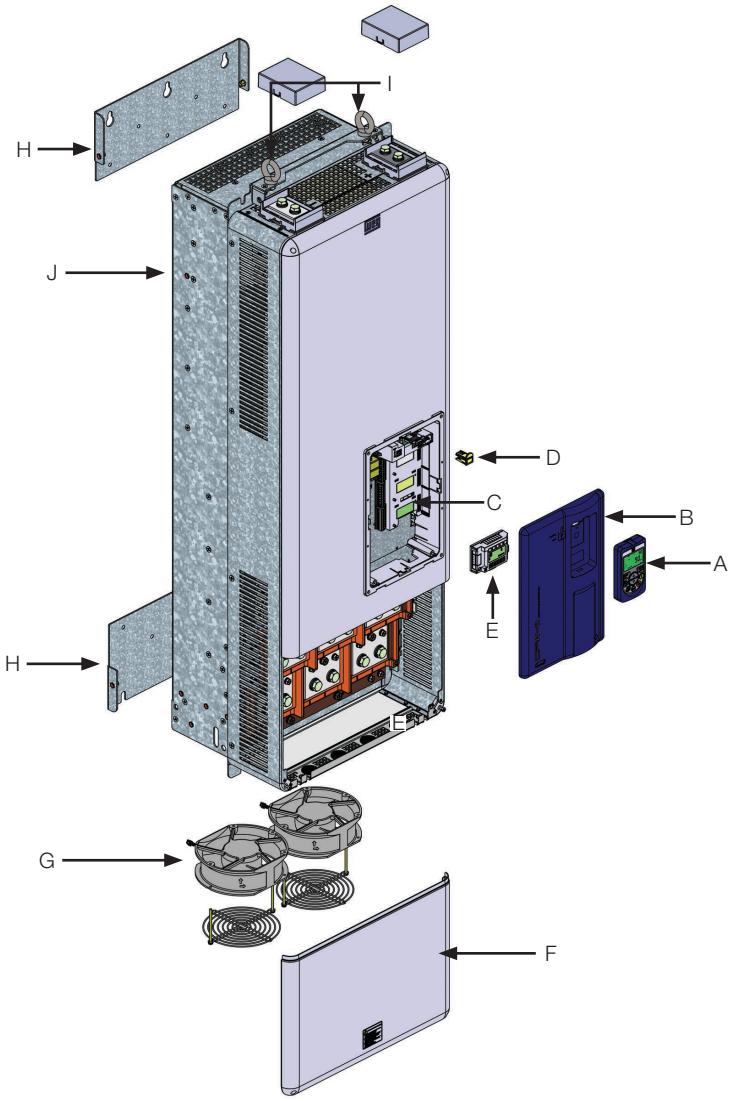
NOTE!
Additional itens are need for the assembly of the complete unit, such as output inverter, DC fuses in the DC link bus bar connection, external pre-charge circuit and filter.

NOTE!
It is not necessary to add a current transformer (CT) for output short circuit protection to the ground since each CFW-11 RB module has its own internal protection.



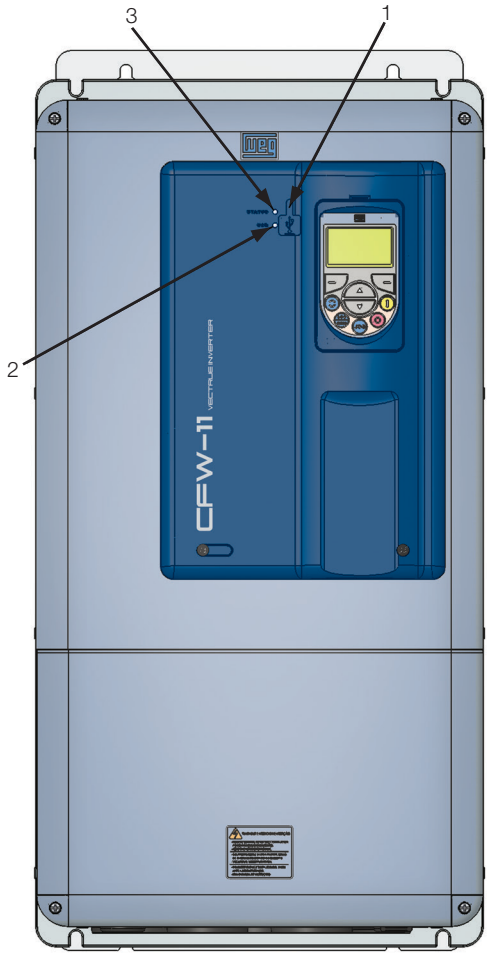
A - Keypad (HMI)
B - Control rack cover
C - CC11 control board
D - Flash memory module MMF-03
E - Control accessory module (refer to the Section 7.2 ACCESSORIES on page 7-2)
F - Bottom front cover
G - Heatsink fan
H - Mounting supports (for through the wall mounting)
I - Hoisting eye
J - Rear part of the converter (external part for flange mounting)

Figure 2.2: *Main components of the CFW-11 RB - frame size E*



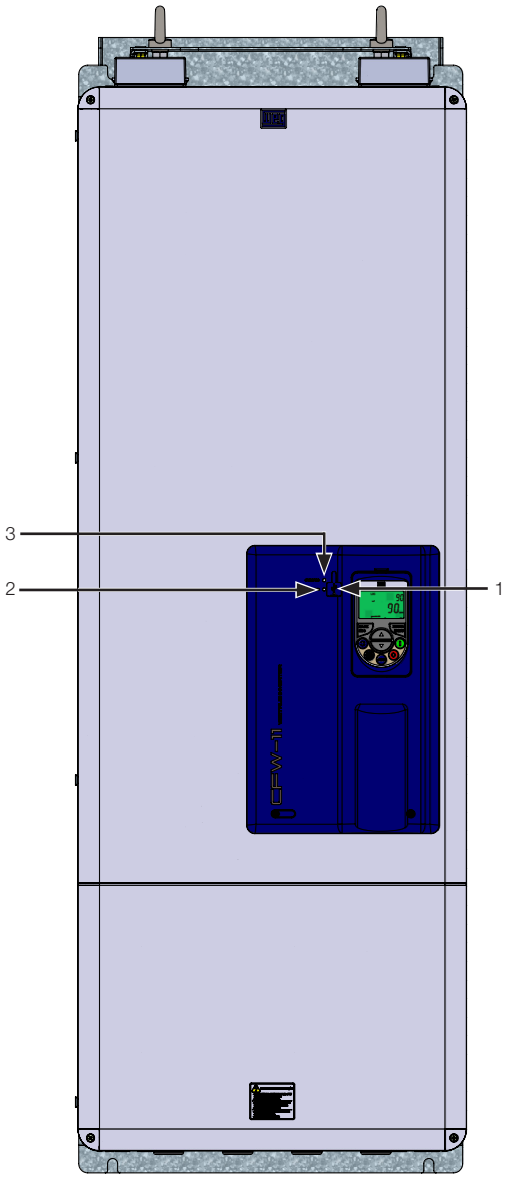
A - Keypad (HMI)
B - Control rack cover
C - CC11 control board
D - Flash memory module MMF-03
E - Control accessory module
F - Bottom front cover
G - Heatsink fan
H - Mounting supports (for surface mounting)
I - Eyebolt
J - Rear part of the converter (external part for flange mounting)

Figure 2.3: *Main components of the CFW-11 RB - frame sizes F and G*



1 - USB connector
2 - USB led
    Off: without USB connection
    On/blinking: USB communication active
3 - Status led
    Green: normal operation without fault or alarm
    Yellow: in the alarm condition
    Blinking red: in the fault condition

Figure 2.4: *leds and USB connector*

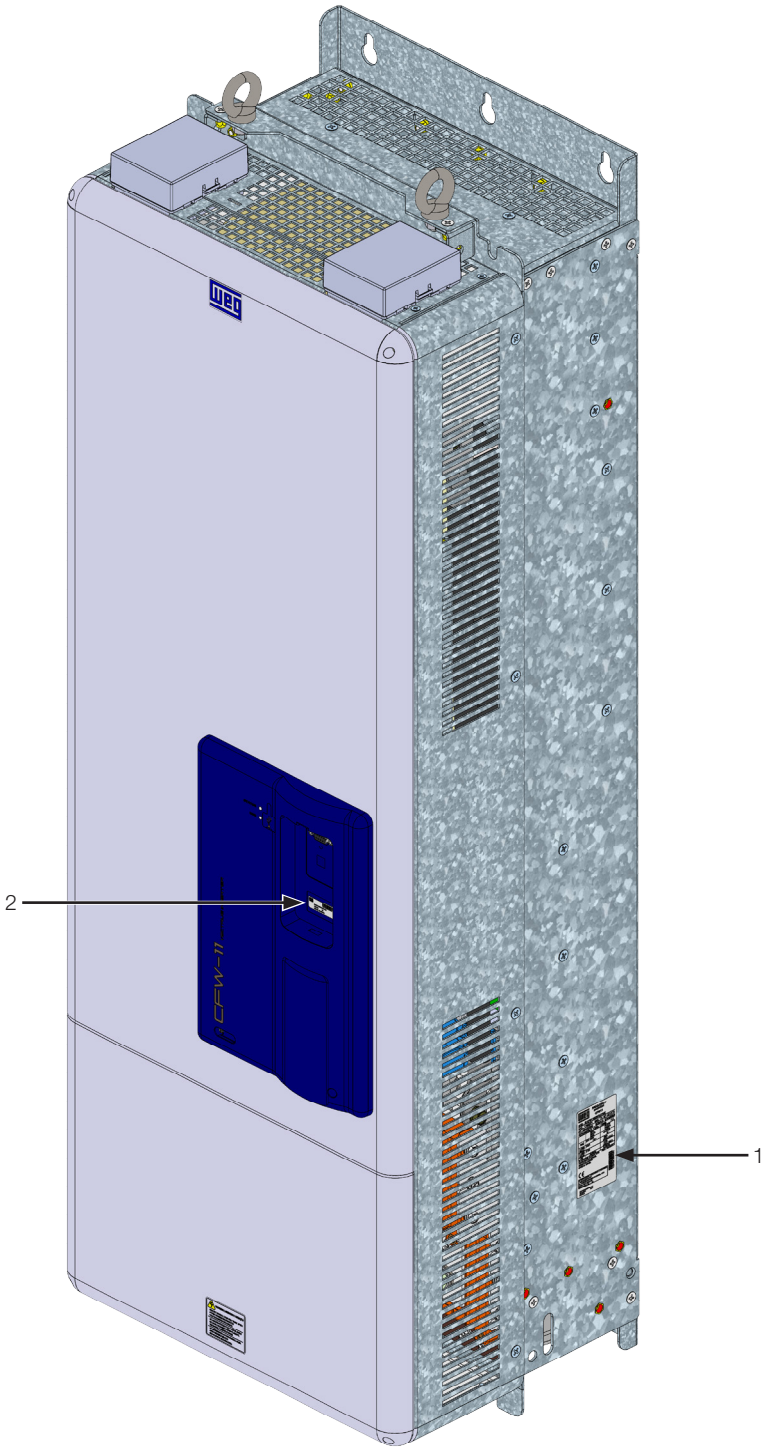


1 - USB connector
2 - USB led
    Off: without USB connection
    On/blinking: USB communication active
3 - Status led
    Green: normal operation without fault or alarm
    Yellow: in the alarm condition
    Blinking red: in the fault condition

Figure 2.5: *leds and USB connector*

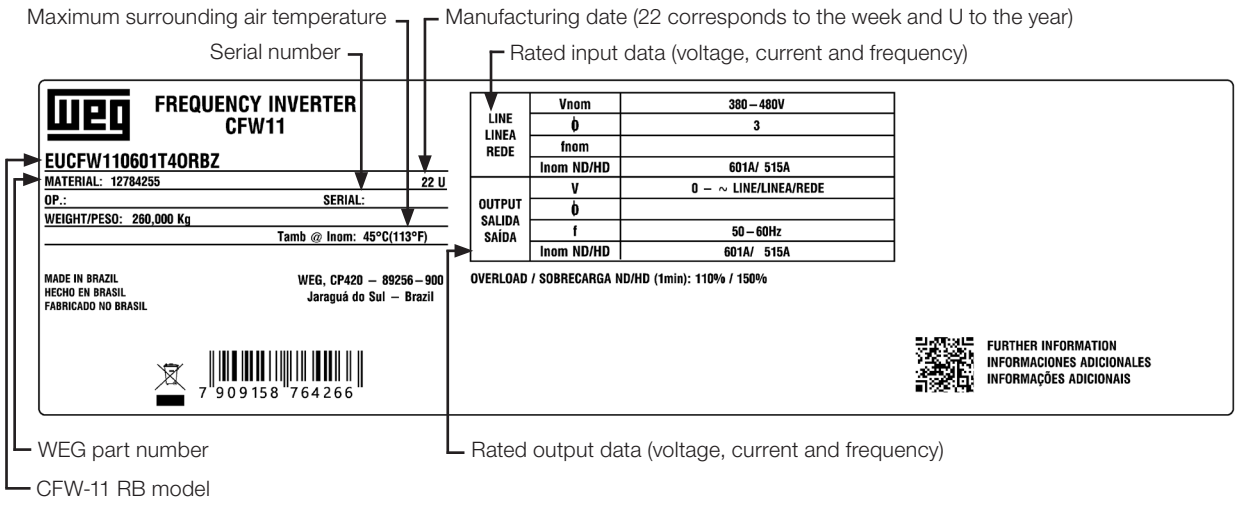
2.4 IDENTIFICATION LABELS FOR THE CFW-11 RB

There are two identification labels, one complete nameplate is affixed at the side of the converter and a simplified label is located under the keypad. The label under the keypad allows the identification of the most important characteristics of the converter even if they are mounted side-by-side.



1 - Nameplate affixed to the side of the heatsink
2 - Nameplate under the keypad

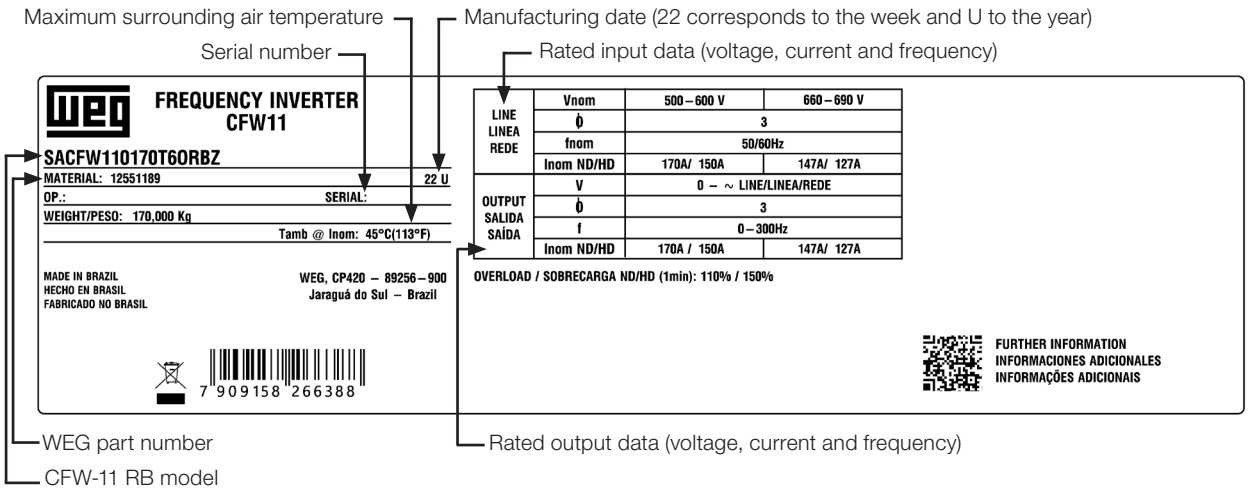
Figure 2.6: *Location of the identification labels*



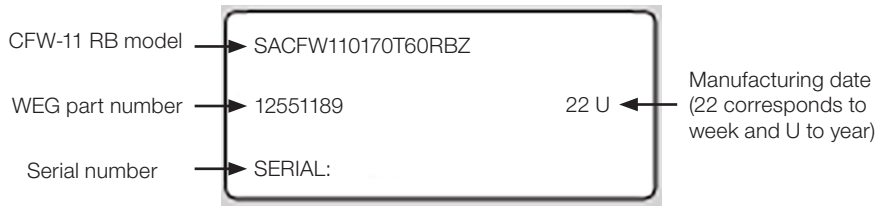
(a) Nameplate affixed at the side of the converter

(b) Label located under the keypad

Figure 2.7: *(a) and (b) - Identification labels for 220...230 V and 380...480 V models*



(a) Nameplate affixed to the side of the converter



(b) Nameplate located under the keypad

Figure 2.8: *(a) and (b) - Identification labels for 500...690 V models*

2.5 CFW-11 RB MODEL SPECIFICATION (SMART CODE)

In order to specify the CFW-11 RB, it is necessary to fill in the desired voltage and current values in the respective fields for the nominal supply voltage and the rated input current for normal duty (ND) cycle in the smart code according to the example on Table 2.1 on page 2-11.

Table 2.1: *Smart code*

	Converter Model							Available Option Kits				
	Refer to Chapter 8 TECHNICAL SPECIFICATIONS on page 8-1 for the CFW-11 RB list of models and for the complete technical specifications							Refer to the Chapter 7 OPTION KITS AND ACCESSORIES on page 7-1 for more details on the options				
Example	**BR**	**CFW11**	**0370**	**T**	**4**	**O**	**RB**	**_ _**	**_ _**	**_ _**	**Z**
Field description	Market identification (defines the manual language and the factory settings)	WEG 11 frequency converter series	Rated current for Normal Duty (ND) cycle	Number of power phases	Power supply voltage	Option kit	Braking	External 24 Vdc control power supply	Special hardware	Special software	Character that identifies the end of the code
Available options	2 characteres		Possible options presented in Table 2.2 on page 2-12	**T** = threephase	**2** = 220...230 V **4** = 380...480 V **6** = 660...690 V	**O** = product with option kit	**RB** = Regenerative Braking	Blank = standard (not available) **W** = with external 24 Vdc control power supply	Blank = standard **H1**= special hardware n°1	Blank = standard **S1** = special software n°1	

Table 2.2: Nominal currents at normal duty cycle (ND)

T2	T4	T6	
220...230 V	380...480 V	500...600 V	660...690 V
0142 = 142 A	0105 = 105 A	0053 = 53 A	0053 = 46 A
0180 = 180 A	0142 = 142 A	0063 = 63 A	0063 = 54 A
0211 = 211 A	0180 = 180 A	0080 = 80 A	0080 = 73 A
	0211 = 211 A	0107 = 107 A	0107 = 100 A
	0242 = 242 A	0125 = 125 A	0125 = 108 A
	0312 = 312 A	0150 = 150 A	0150 = 130 A
	0370 = 370 A	0170 = 170 A	0170 = 147 A
	0477 = 477 A	0216 = 216 A	0216 = 195 A
	0515 = 515 A	0289 = 289 A	0289 = 259 A
	0601 = 601 A	0315 = 315 A	0315 = 259 A
	0720 = 720 A	0365 = 365 A	0365 = 312 A
	0760 = 760 A	0435 = 435 A	0435 = 365 A
		0472 = 472 A	0472 = 427 A

2.6 RECEIVING AND STORAGE

The CFW-11 RB converters from the frame sizes E, F and G models are supplied packed in wooden boxes.

There is an identification label affixed to the outside of the package, identical to the one affixed to the side of the converter CFW-11 RB.

To open the package:

1. Remove the package front cover.

2. Take out the polystyrene foam protection.

Verify whether:

1. The CFW-11 RB nameplate corresponds to the purchased model.

2. Any damage occurred during transportation.

If any problems are detected, contact the carrier immediately.

If the CFW-11 RB is not installed soon, store it in a clean and dry location (temperature between -25 °C and 60 °C (-13 °F and 140 °F)), with a cover to prevent dust accumulation inside it.

ATTENTION!
When the converter is stored for a long period, it becomes necessary to perform the capacitor reforming. Verify the procedure on Section 6.5 PREVENTIVE MAINTENANCE on page 6-4 .

3 INSTALLATION AND CONNECTION

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

3.1 MECHANICAL INSTALLATION

3.1.1 Installation Environment

NOTE!
The converter is designed for indoor use only.

Avoid:

- Direct exposure to sunlight, rain, high humidity, or sea-air.
- Inflammable or corrosive gases or liquids.
- Excessive vibration.
- Dust, metallic particles, and oil mist.

Permissible environmental conditions for the converter operation:

- Temperature (standard conditions (surrounding the converter), no frost allowed):

  - 10 ºC to 45 ºC (14 ºF to 113 ºF) for frame sizes E, F and G (except 720T4 and 760T4 models).

  - 10 ºC to 40 ºC (14 ºF to 104 ºF) for frame size G (only 720T4 and 760T4 models).

- From 40 ºC to 45 ºC (104 ºF to 113 ºF) for frame size G (only 760T4 model): 1 % of current derating for each Celsius degree above maximum temperature as specified in item above.

  From 40 ºC to 45 ºC (104 ºF to 113 ºF) for frame size G: (only 720T4 model): 2 % of current derating for each Celsius degree above maximum temperature as specified in item above.

  From 45 ºC to 55 ºC (113 ºF to 131 ºF) for frame sizes E, F and G: apply 2 % of current derating for each Celsius degree above maximum temperature as specified in item above.

- Altitude: up to 1000 m (3.300 ft) above sea level - standard conditions (no derating required).

  From 1000 m to 4000 m (3.300 ft to 13.200 ft) above sea level - 1 % of current derating for each 100 m (330 ft) above 1000 m (3.300 ft) altitude.

  From 2000 m to 4000 m (6.600 ft to 13.200 ft) above sea level - reduction of maximum voltage (230 V for 220...230 V models, 480 V for 380...480 V models, 600 for 500...600 V models and 690 for 660...690 V models) of 1.1 % for each 100 m (330 ft) above 2000 m (6.600 ft).

- Humidity: from 5 % to 95 % non-condensing.

- Pollution degree: 2 (according to EN50178 and UL508C) with non-conductive pollution. Condensation shall not originate conduction through the accumulated residues.

3.1.2 Mounting Considerations

Consult the converter weight at Table 8.1 on page 8-2 to Table 8.4 on page 8-5.

Mount the converter in the upright position on a flat and vertical surface.

External dimensions and fixing holes position according to Figure 3.1 on page 3-3 and Figure 3.2 on page 3-4. Refer to Section 8.3 MECHANICAL DATA on page 8-8, for more details.

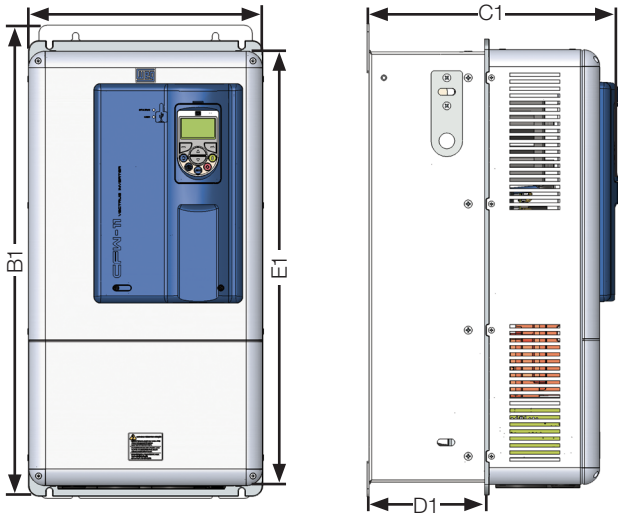
First, mark the mounting points and drill the mouting holes. Then, position the converter and firmly tighten the screws in all four corners to secure the converter.

Minimum mounting clearances requirements for proper cooling air circulation are specified in Figure 3.3 on page 3-5 and Figure 3.4 on page 3-6 .

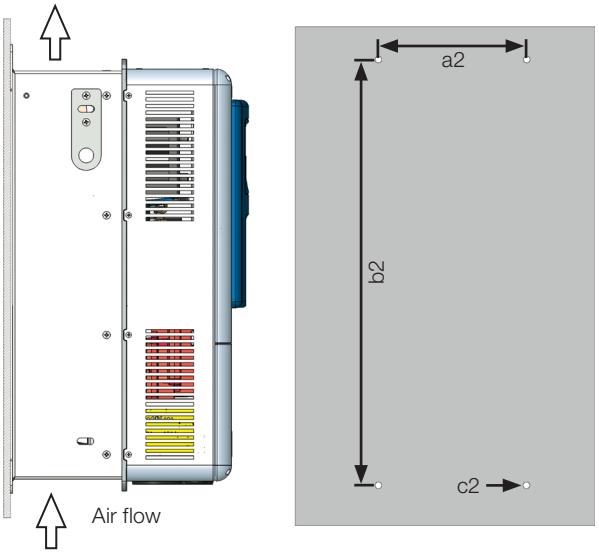
Do not install heat sensitive components right above the converter.

ATTENTION!
When arranging two or more converters vertically, respect the minimum clearance A + B (Figure 3.3 on page 3-5 and Figure 3.4 on page 3-6) and provide an air deflecting plate so that the heat rising up from the bottom converter does not affect the top converter.

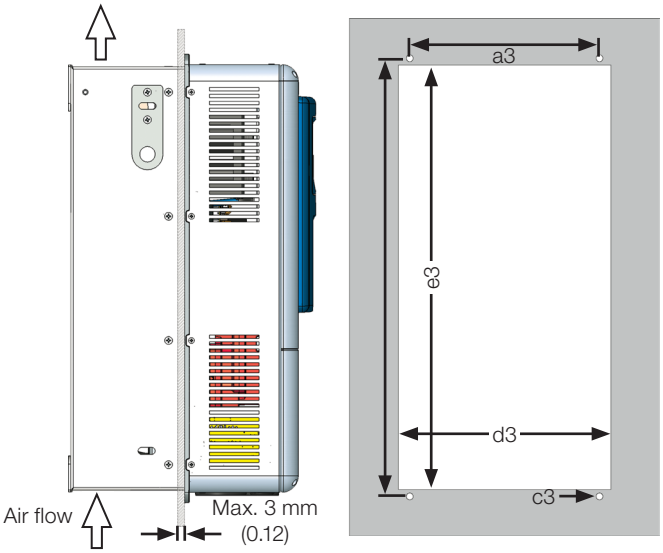
ATTENTION!
Provide conduit for physical separation of the signal, control, and power conductors (refer to Section 3.2 ELECTRICAL INSTALLATION on page 3-12).



(a) External dimension



(b) Surface mounting

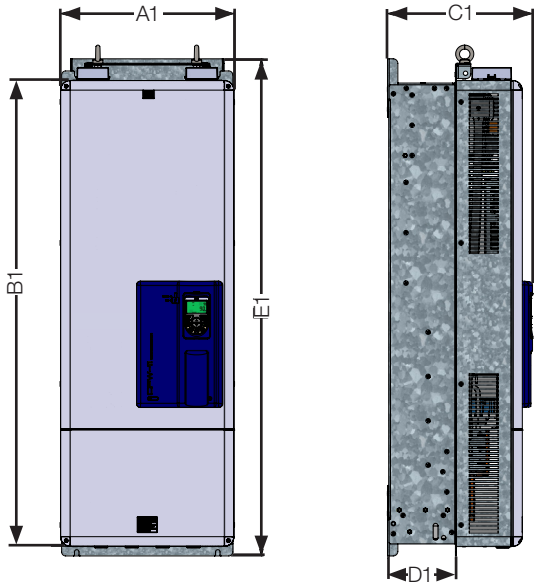


(c) Flange mounting

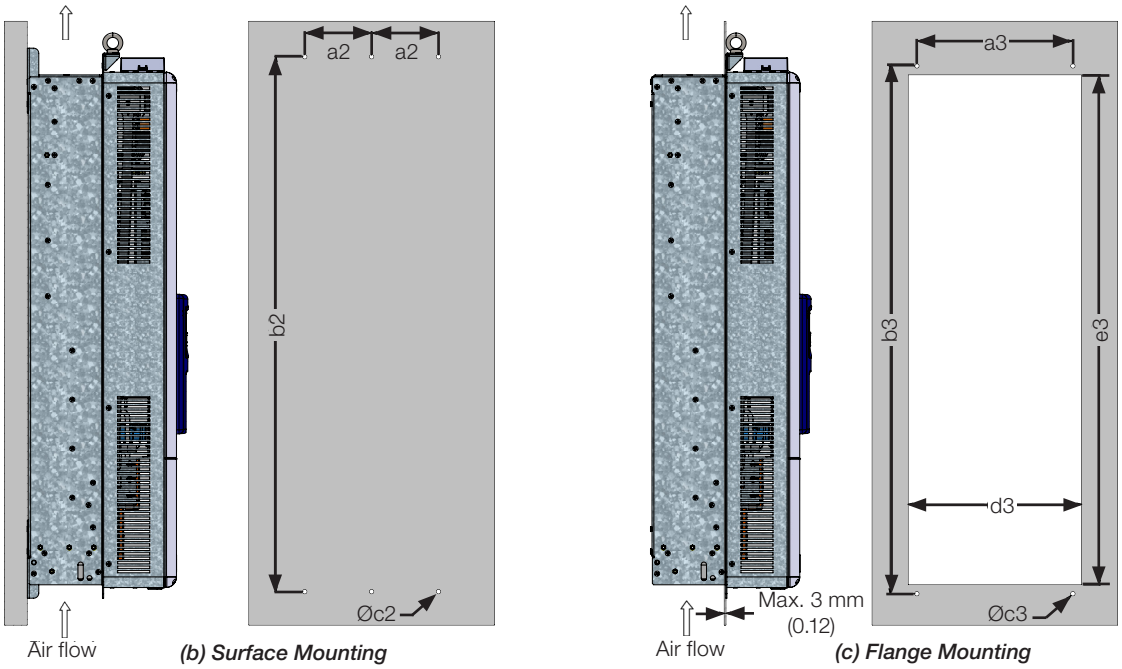
Model	A1	B1	C1	D1	E1	a2	b2	c2	a3	b3	c3	d3	e3	Torque (*)
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	M	mm (in)	mm (in)	M	mm (in)	mm (in)	N.m (ibf.in)
Frame Size E	335 (13.2)	375 (26.6)	358 (14.1)	168 (6.6)	620 (24.4)	200 (7.8)	650 (25.6)	M8	275 (10.8)	635 (25)	M8	315 (24.21)	615 (24.21)	20.0 (177.0)

Tolerance for dimensions d3 and e3: +1.0 mm (+0.039 in).
Tolerance for the other dimensions: ±1.0 mm (+0.039 in).
(*) Recommended torque for the converter mounting (valid for c2 and c3).

Figure 3.1: *(a) to (c) - Mechanical installation details - mm (in) - frame size E*



(a) External dimension



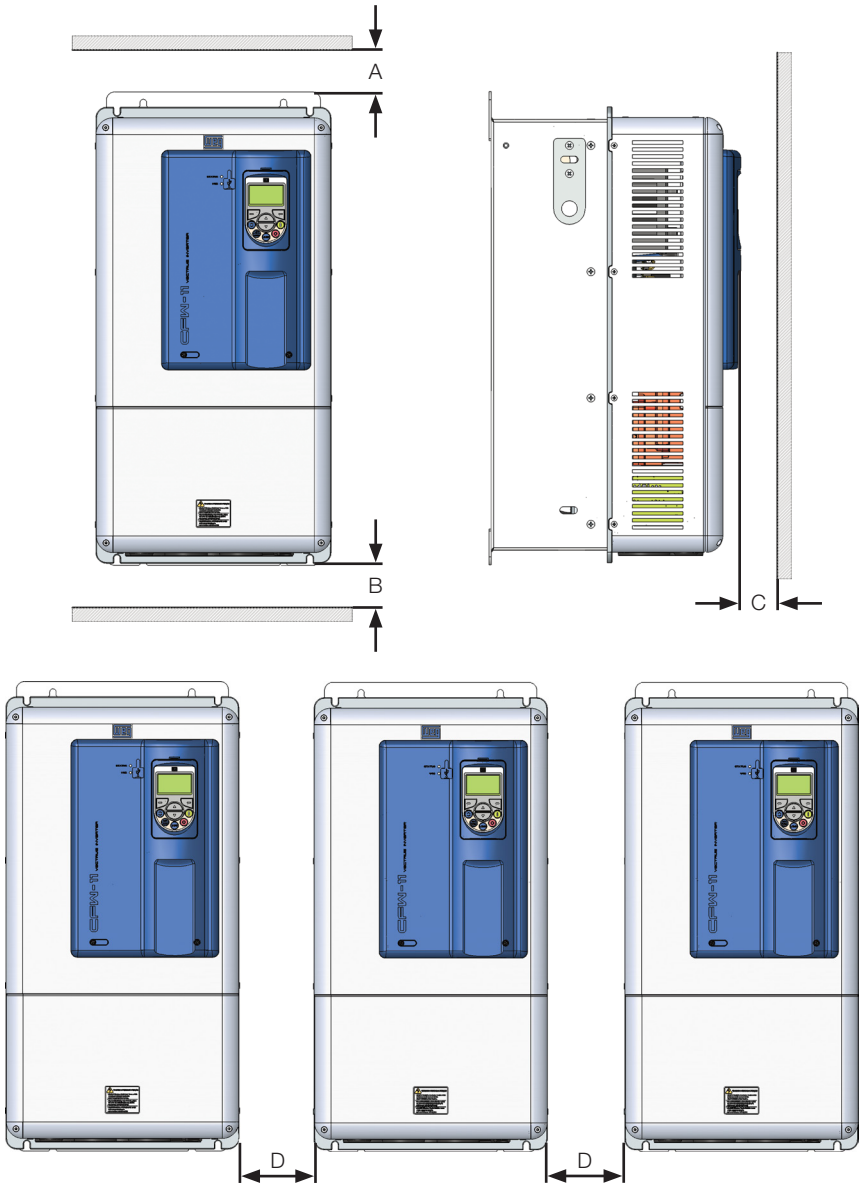
(b) Surface Mounting

(c) Flange Mounting

Model	A1	B1	C1	D1	E1	a2	b2	c2	a3	b3	c3	d3	e3
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	M	mm (in)	mm (in)	M	mm (in)	mm (in)
Frame Size F	430 (16.93)	1156 (45.51)	360 (14.17)	169 (6.65)	1234 (48.58)	150 (5.91)	1200 (47.24)	M10	350 (13.78)	1185 (46.65)	M10	391 (15.39)	1146 (45.12)
Frame Size G	535 (21.06)	1190 (46.85)	426 (16.77)	202 (7.95)	1264 (49.76)	200 (7.87)	1225 (48.23)	M10	400 (15.75)	1220 (48.03)	M10	495 (19.49)	1182 (46.53)

Tolerance for dimensions d3 and e3: +1.0 mm (+0.039 in).
Tolerance for the other dimensions: ±1.0 mm (±0.039 in).

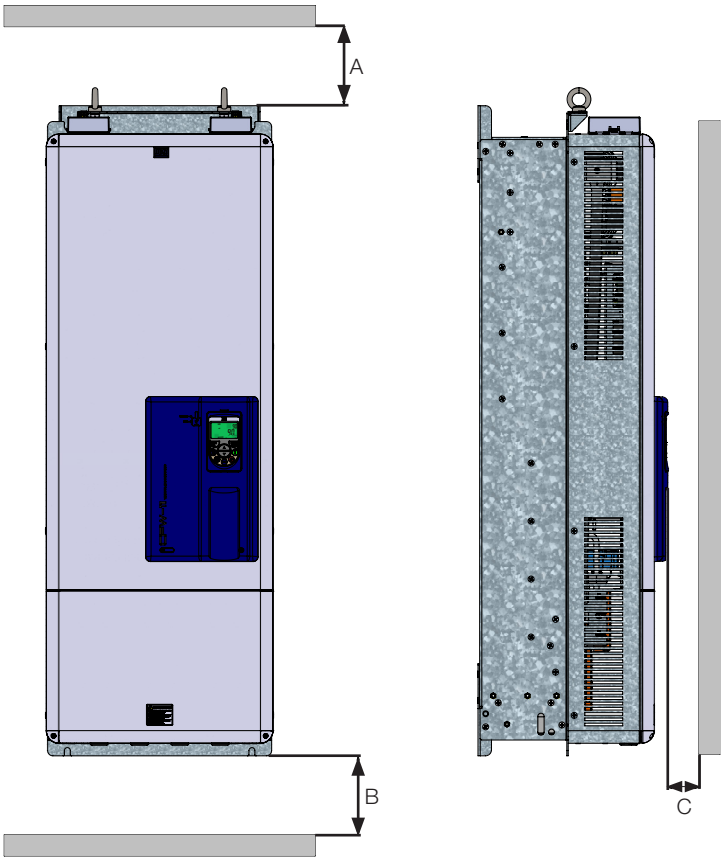
Figure 3.2: *(a) to (c) - Mechanical installation details - frame sizes F and G*

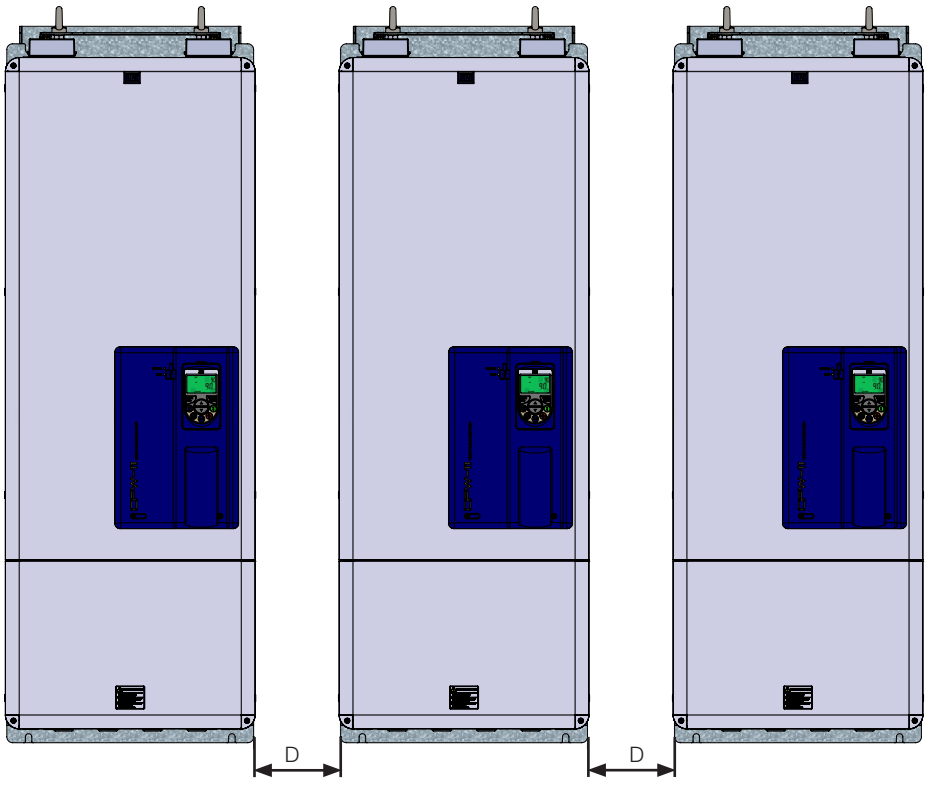


Model	A mm (in)	B mm (in)	C mm (in)	D mm (in)
Frame Size E	150 (5.91)	250 (9.84)	20 (0.78)	80 (3.15)

Tolerance: ±1.0 mm (±0.039 in).

Figure 3.3: *Free spaces around converter for ventilation - frame size E*





	A	B	C	D
Modelo	**mm (in)**	**mm (in)**	**mm (in)**	**mm (in)**
Frames Sizes F and G	150 (5.91)	250 (9.84)	20 (0.78)	80 (3.15)

Tolerance: ±1.0 mm (±0.039 in).

Figure 3.4: *Free spaces around converter for ventilation - frames sizes F and G*

3.1.3 Cabinet Mounting

There are two possibilities for mounting the converter: surface mounting or flange mounting (the heatsink is mounted outside the cabinet and the cooling air of the power module is kept outside the enclosure). The following information shall be considered in these cases:

Surface Assembly:

- Provide adequate exhaustion so that the internal cabinet temperature is kept within the allowable operating range of the converter.
- The power dissipated by the converter at its rated condition, as specified in Table 8.1 on page 8-2 to Table 8.4 on page 8-5 "Dissipated power in Watts - Surface mounting".
- The cooling air flow requirements, as shown in Table 3.1 on page 3-7.
- The position and diameter of the mounting holes, according to Figure 3.1 on page 3-3 and Figure 3.2 on page 3-4.

Flange Assembly:

Frame Size E:

- The power specified in Table 8.1 on page 8-2 to Table 8.4 on page 8-5 "Dissipated power in Watts - flange mounting" will be dissipated inside the cabinet. The remaining losses (power module) will be dissipated through the vents.
- The converter securing supports (position H of Figure 2.2 on page 2-5) and the hoisting eyes (position I of Figure 2.2 on page 2-5) must be removed and repositioned according to the Figure 3.5 on page 3-8 and Figure 3.6 on page 3-8.
- The portion of the converter that is located outside the cabinet is rated IP54. Provide an adequate gasket for the cabinet opening to ensure that the enclosure rating is maintained. Example: silicone gasket.
- Mounting surface opening dimensions and position/diameter of the mounting holes, as shown in Figure 3.1 on page 3-3

Frame Sizes F and G:

ATTENTION!
The part of the converter that stays outside the cabinet is rated IP20.

- The power specified in Table 8.1 on page 8-2 to Table 8.4 on page 8-5 under “Dissipated power in Watts - Flange mounting” will be dissipated inside the cabinet. The other losses (power modules) will be dissipated at the external ventilation duct.
- The converter mounting supports and the hoisting eyes must be removed. Refer to the Figure 2.3 on page 2-6, positions H and I.
- Dimensions of the flange-mounting opening and the diameters of the securing holes must be according to the Figure 3.2 on page 3-4.

Table 3.1: *Minimum required cabinet cooling air flow*

Frame Size	CFM	l/s	m³/min
E	265	125	7,5
F	460	217	13
G	680	321	19,3

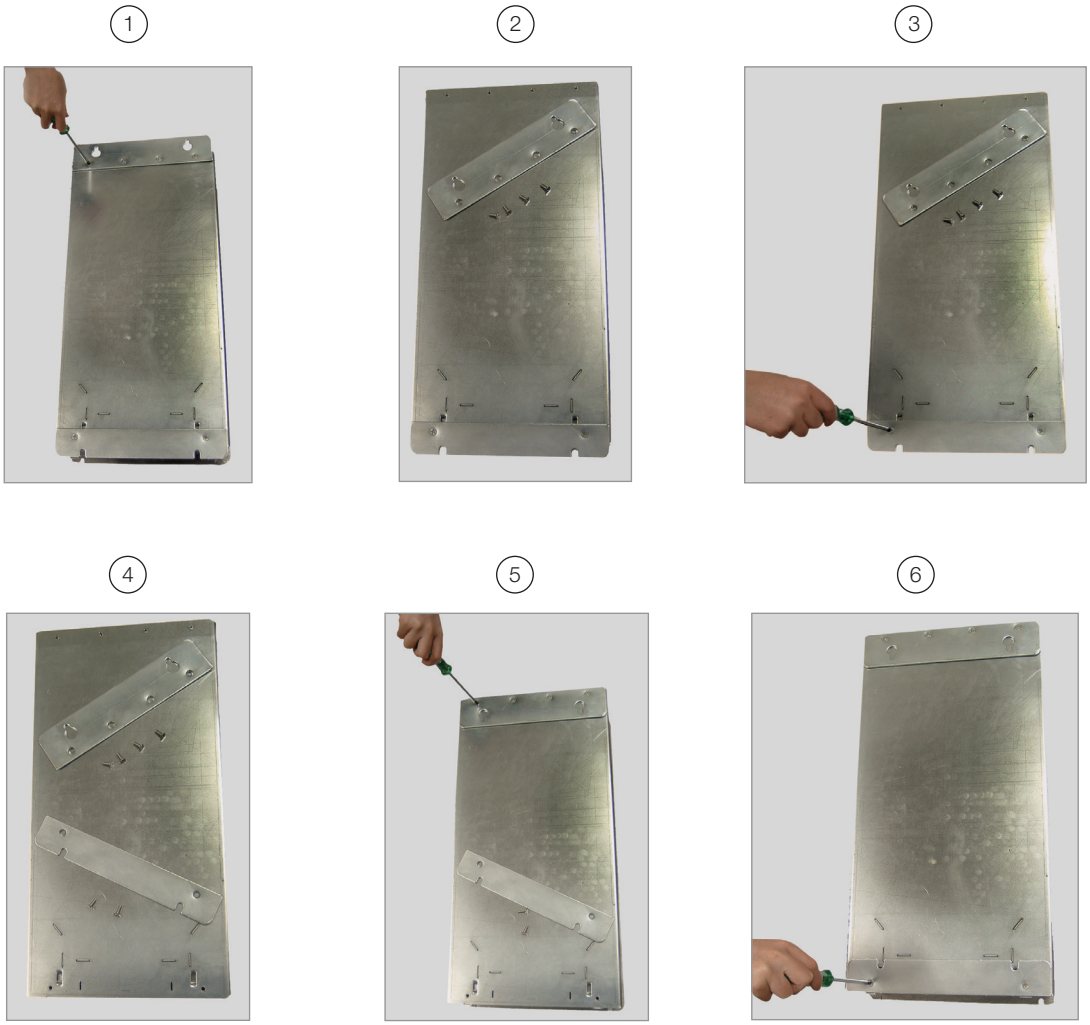


Figure 3.5: Repositioning the mounting supports - frame size E

3.1.4 Installation of the Converter Hoisting Eyes - Frame Size E

Two hoisting eyes for the converter lifting, which are mounted at the converter sides (rear part), are supplied. By inverting their position, as shown in Figure 3.6 on page 3-8, two points for hoisting the converter, which are very useful during the mechanical installation of the converter, are obtained.

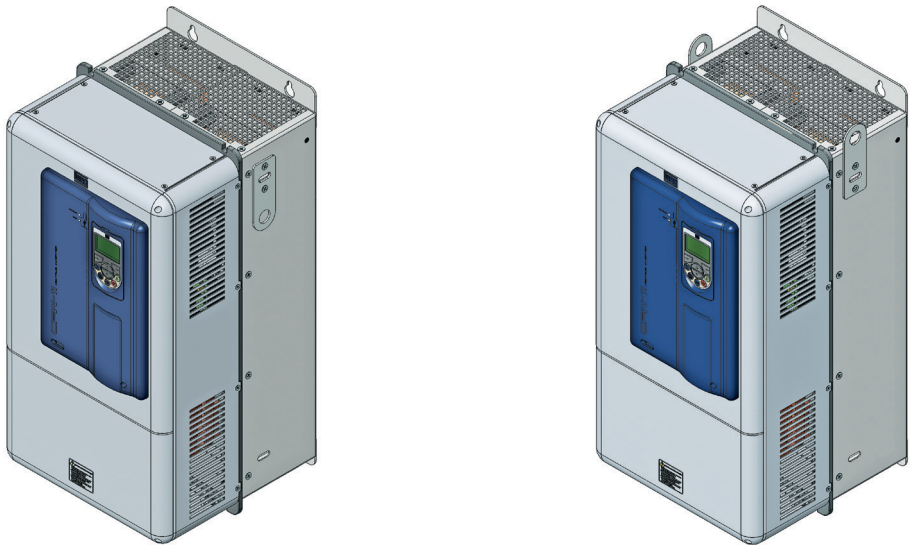


Figure 3.6: Installation of the converter hoisting eyes frame size E

3.1.5 Access to the Control and Power Terminal Strips

Frame Size E:

It is necessary to remove the keypad (HMI) and the control rack cover in order to get access to the control terminal strip (see Figure 3.7 on page 3-9). In order to get access to the power terminal strip, remove the bottom front cover (see Figure 3.8 on page 3-9).

Figure 3.7: *HMI and control rack cover removal - frame size E*

Figure 3.8: *Bottom front cover removal - frame size E*

Frame Sizes F and G:

In order to get access to the control terminals, it is necessary to remove the HMI and the control rack cover, as showed in Figure 3.9 on page 3-10.

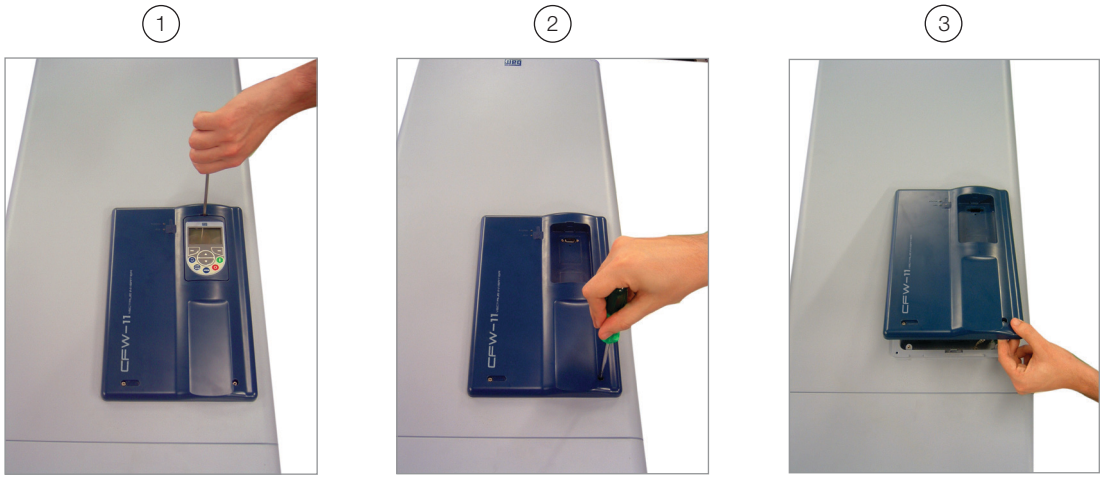


Figure 3.9: *Removal of the HMI and the control rack cover - frame sizes F and G*

In order to get access to the power terminals, it is necessary to remove the bottom front cover, as shown in Figure 3.10 on page 3-10.

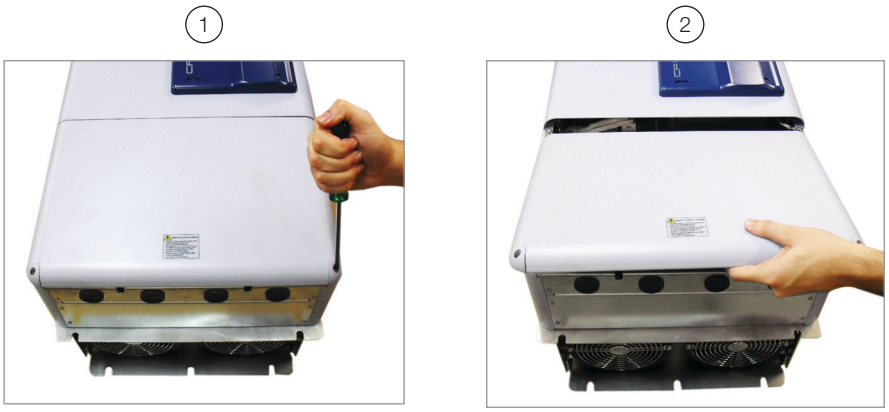


Figure 3.10: *Removal of the bottom front cover to access the power terminals - frame sizes F and G*

In order to connect the power cables (line and motor), remove the bottom plate, as shown in Figure 3.11 on page 3-10. In this case the protection degree of the converter bottom part will be reduced.

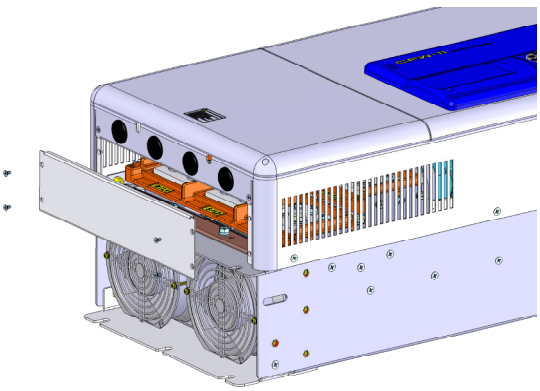


Figure 3.11: *Removal of the bottom plate, to access the power terminals - frame sizes F and G*

3.1.6 Removal of the Cable Passage Plate - Frame Size E

When it is not necessary neither IP20 nor Nema1 protection degree, the cable passage plate may be removed in order to make the converter electric installation easier. Remove the four M4 screws, according to the procedure presented in Figure 3.12 on page 3-11.

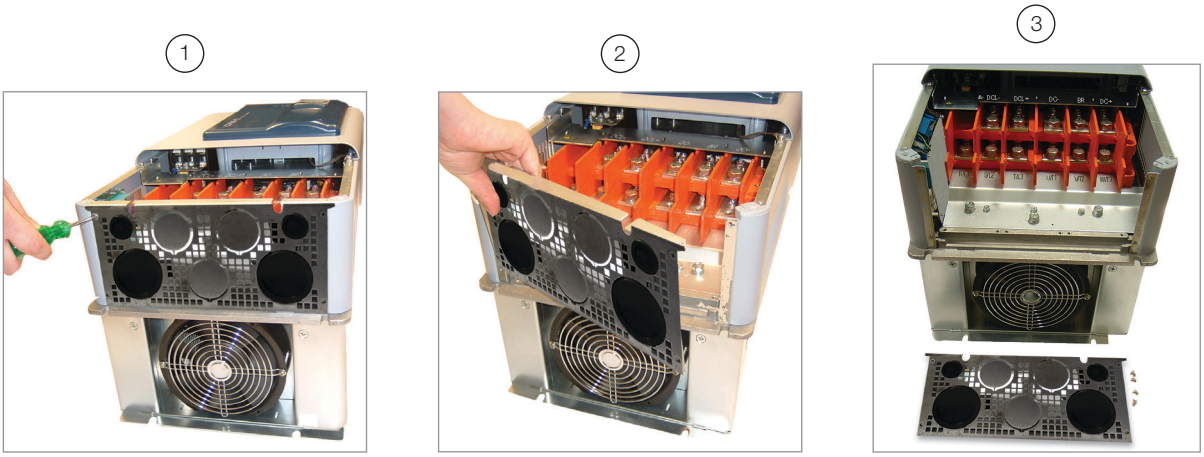


Figure 3.12: *Removal of the cable passage plate - frame size E*

3.1.7 HMI Installation at the Cabinet Door or Command Panel (Remote HMI)

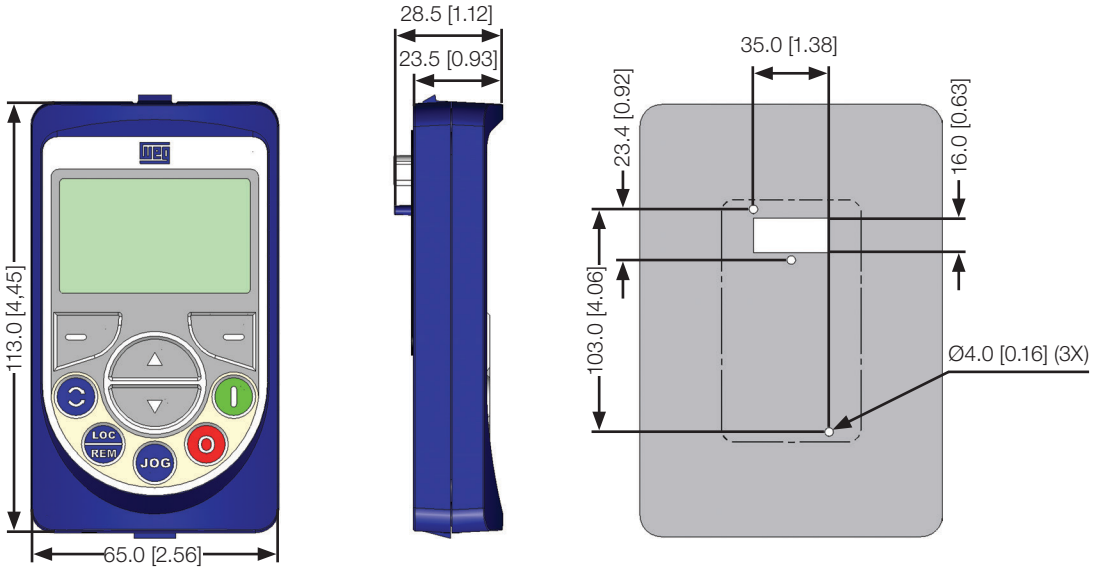


Figure 3.13: *Data for the HMI installation at the cabinet door or command panel – mm [in]*

The keypad frame accessory can also be used to fix the HMI as mentioned in the Table 7.1 on page 7-3.

3.2 ELECTRICAL INSTALLATION

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

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

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

3.2.1 Identification of the Power and Grounding Terminals

U/T1, V/T2, W/T3: AC power supply.

DC-: this is the negative potential terminal in the DC Link circuit.

DC+: this is the positive potential terminal in the DC Link circuit.

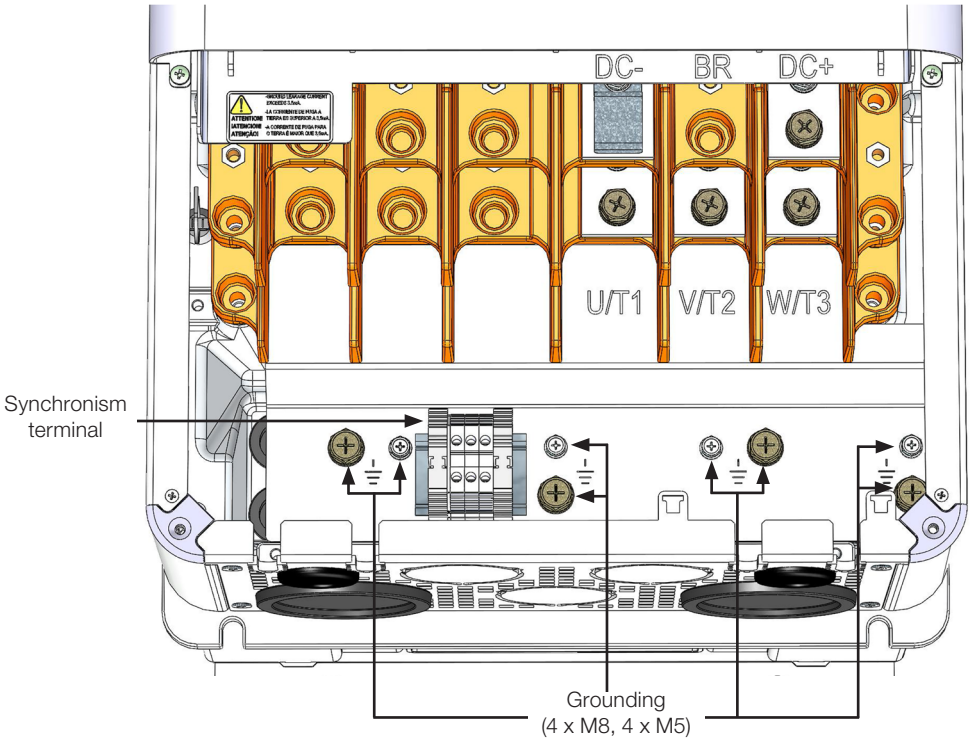
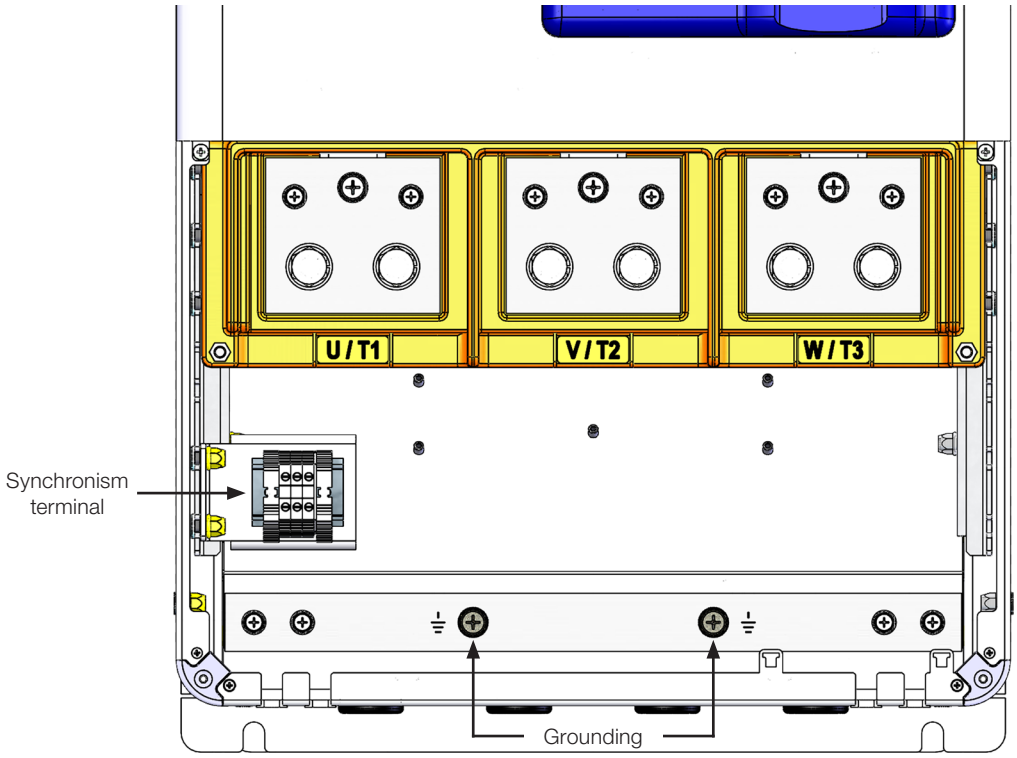
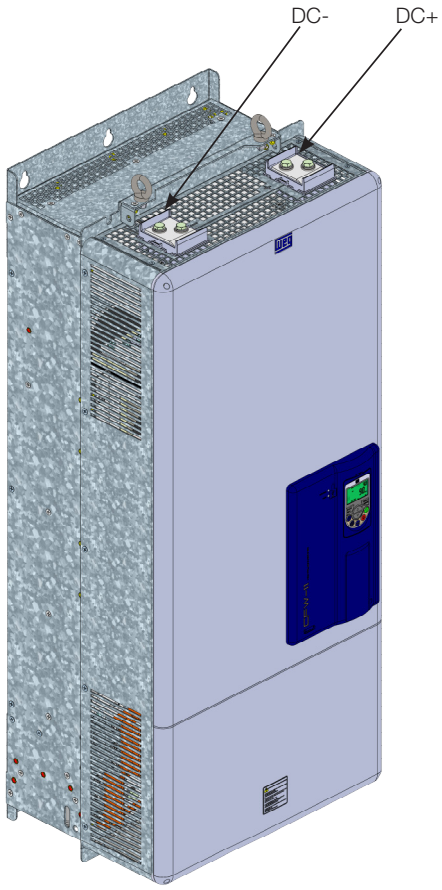


Figure 3.14: *Grounding, synchronism and power terminals of frame size E models*

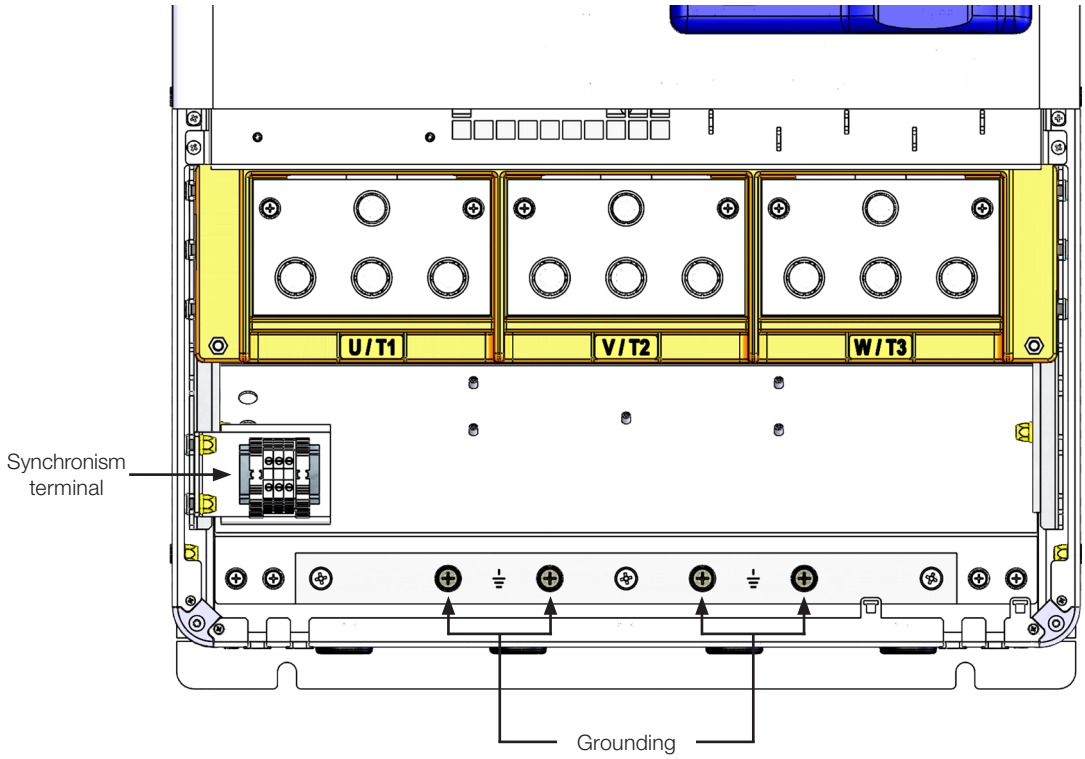


(a) Terminals for AC power supply

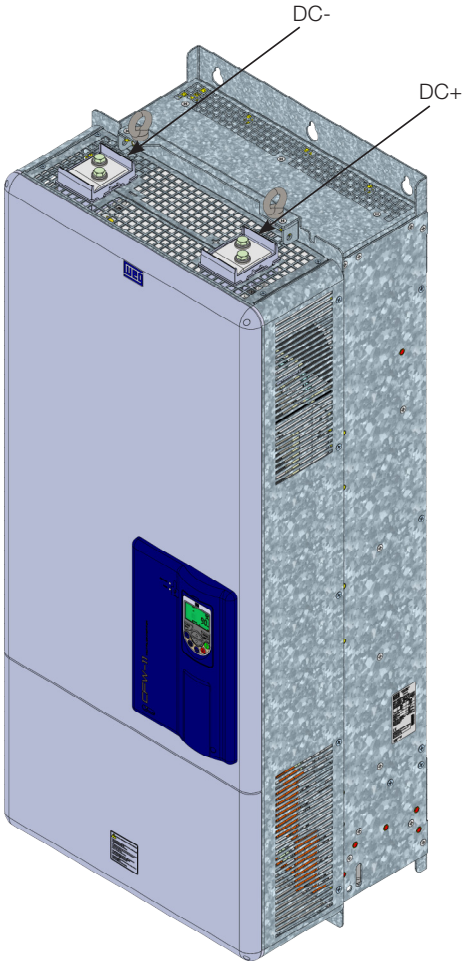


(b) Terminals for output inverter conection

Figure 3.15: *(a) and (b) - Grounding, synchronism and power terminals of frame size F models*



(a) Terminals for AC power supply



(b) Terminals for output inverter conection

Figure 3.16: *(a) and (b) - Grounding, synchronism and power terminals of frame size G models*

3.2.2 Pre-charge Circuit

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).

NOTE!
- The pre-charge resistor is sized considering that the CFW-11 RB is feeding a CFW-11 DC inverter of the same current value.
- In case the CFW-11 RB is not feeding an inverter of the same current value, contact WEG.
- In case the CFW-11 RB is feeding other converter, WEG must be consulted.

The characteristics of the resistors must be obtained with their manufacturer.

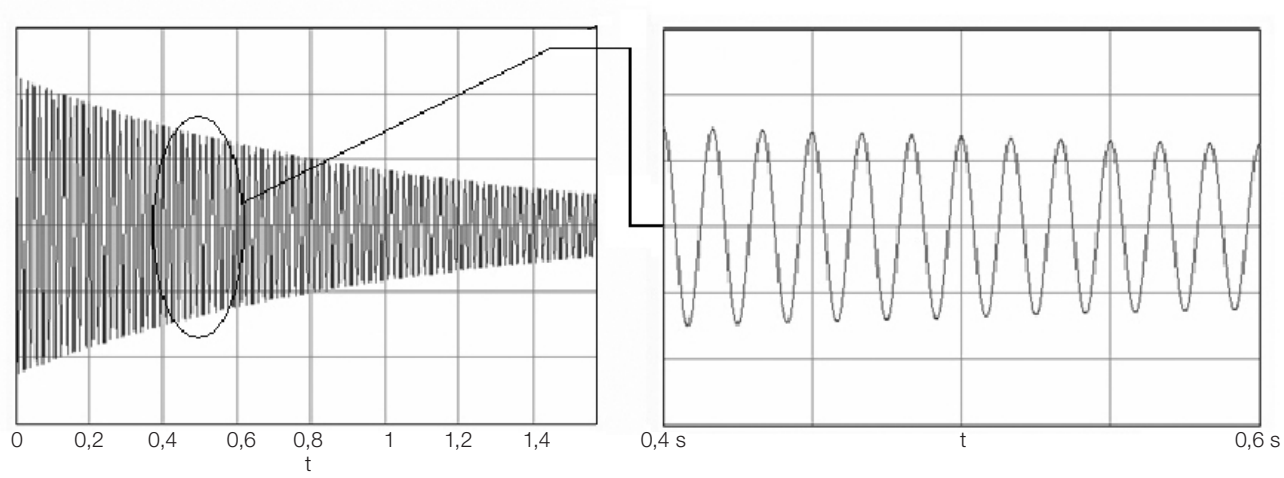


Figure 3.17: *Current during the pre-charge*

Table 3.2: *Sizing of the pre-charge*

Peak current during the pre-charge (A)	$0,83 \cdot (V_{line}/R)$
Energy stored in the capacitor bank (J)	$k_E \cdot V_{line}^2$
Pre-charge duration (s)	$k_T \cdot R$

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

Table 3.3: Values of the constants for sizing the pre-charge

Model	k_E	k_T
CFW110142T2O...RB...	0.0030	0.0180
CFW110180T2O...RB...	0.0053	0.0315
CFW110211T2O...RB...	0.0053	0.0315
CFW110105T4O...RB...	0.0030	0.0180
CFW110142T4O...RB...	0.0030	0.0180
CFW110180T4O...RB...	0.0053	0.0315
CFW110211T4O...RB...	0.0053	0.0315
CFW110242T4O...RB...	0.0094	0.0564
CFW110312T4O...RB...	0.0118	0.0705
CFW110370T4O...RB...	0.0141	0.0846
CFW110477T4O...RB...	0.0188	0.1128
CFW110515T4O...RB...	0.0235	0.1410
CFW110601T4O...RB...	0.0235	0.1410
CFW110720T4O...RB...	0.0329	0.1974
CFW110760T4O...RB...	0.0329	0.1974
CFW110053T6O...RB...	0.0010	0.0060
CFW110063T6O...RB...	0.0010	0.0060
CFW110079T6O...RB...	0.0015	0.0090
CFW110107T6O...RB...	0.0020	0.0120
CFW110125T6O...RB...	0.0025	0.0150
CFW110150T6O...RB...	0.0025	0.0150
CFW110170T6O...RB...	0.0063	0.0376
CFW110216T6O...RB...	0.0063	0.0376
CFW110289T6O...RB...	0.0078	0.0470
CFW110315T6O...RB...	0.0094	0.0564
CFW110365T6O...RB...	0.0125	0.0752
CFW110435T6O...RB...	0.0125	0.0752
CFW110472T6O...RB...	0.0125	0.0752

Example:

In a drive composed of a BRCFW110601T4ORBZ as regenerative converter and a BRCFW110601T4ODCZ as output inverter, whose line voltage in the converter input is 380 VRMS, the obtained values would be the following:

- For this model, the kE value is 0.024. Thus, the energy stored in the in capacitor bank is: $0.024.(380)^2 = 3466$ J.
- Using three 10 Ω resistors (one per phase), each resistor must withstand 1155 J.
- The manufacturer of the resistor can inform the energy the component withstands.
- The peak current during the pre-charge is 0.83. (380) /10 = 31.54 A.
- For this model, the kT value is 0.141. Thus, the duration of the pre-charge is 0.141x10 = 1.41 s.

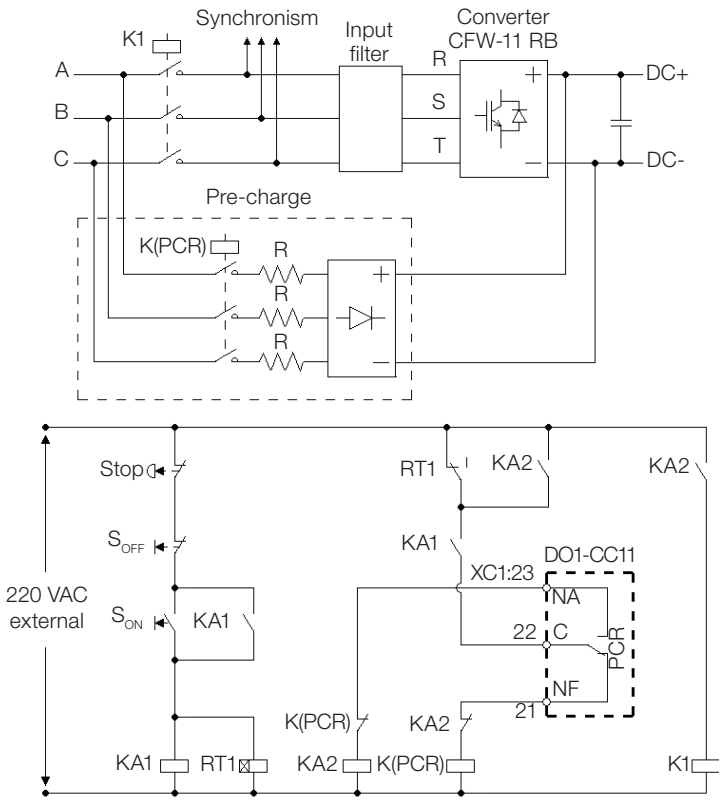


Figure 3.18: *Pre-charge circuit example*

A contactor or a motorized circuit breaker can be installed at the input of the CFW-11 RB (represented by K1) and its command must be interlocked with the pre-charge contactor K(PCR) command. Figure 3.18 on page 3-17 presents an example of the recommended pre-charge circuit for the CFW-11 RB converter with simplified power and command diagrams. There is already a digital output (D01) configured as “Pre-charge OK” function in the CC11 RB board. This digital output must be used to command the pre-charge contactor and the main contactor (motorized circuit breaker). Furthermore, the pre-charge timing must be set for the protection of the auxiliary circuit (resistors, rectifier bridge). This function is carried out by a timer relay with a normally-closed on-delay contact, represented as RT1 in the figure Figure 3.18 on page 3-17.

3.2.3 Power/Grounding Wiring and Fuses

ATTENTION!
Use proper cable lugs for the power and grounding connection cables.

ATTENTION!
Sensitive equipment such as PLCs, temperature controllers, and thermal couples shall be kept at a minimum distance of 0.25 m (9.84 in) from the converter and from the cables that connect the converter to the motor.

DANGER!
Wrong cable connection:
- Check all the connections before powering up the converter.
- When replacing an existing converter by a CFW-11 RB, check if the installation and wiring is according to the instructions listed in this manual.

ATTENTION!
Residual Current Device (RCD):
- When installing an RCD to guard against electrical shock, only devices with a trip current of 300 mA should be used on the supply side of the converter.

NOTE!
The wire gauges listed in Table 3.4 on page 3-18 to Table 3.6 on page 3-22 are orientative values. Installation conditions and the maximum permitted voltage drop must be considered for the proper wiring sizing.

Input fuses:

- The fuse to be used in the input must be of the UR type (Ultra-Fast).
- In order to meet UL requirements, use class J fuses at the converter supply with a current not higher than the values of Table 3.4 on page 3-18 to Table 3.6 on page 3-22.
- Optionally, slow blow fuses can be used at the input. They must be sized for 1.2 x the converter rated input current. In this case, the installation is protected against short-circuit, but not the converter input rectifier. This may result in major damage to the converter in the event of an internal component failure.

Table 3.4: *Recommended Wire size/ Fuses - use only copper wire [75 °C (167 °F)] - 220...230 V supply voltage*

Model	Frame Size	Power Terminals			Overload class	Wire Size			WEG Recommended Fuses			
		Terminals	Bolt (wrench/screw head type)	Recommended Torque N.m (lbf.in)		mm²	AWG	Terminals	Type NH aR Knife Contact		Type NH aR Flush End	
									In [A]	Model	In [A]	Model
CFW110142T2O...RB...	E	U/T1,V/T2,W/T3, DC+,DC-	M8 (hexagonal phillips screw)	15 (132.75)	HD	50	1/0	Ring tongue	250	FNH00-250K-A	-	-
					ND	70	2/0					
		⏚(PE)	M5 and M8 (hexagonal phillips screw))	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ND	35	2					
CFW110180T2O...RB...		U/T1,V/T2,W/T3, DC+,DC-	M10 (hexagonal screw)	30 (265.5)	HD	70 (2 x 25)	2/0 (2 x 4)	Ring tongue	350	FNH1-350K-A	450	FNH3FEM-450Y-A
					ND	120 (2 x 35)	4/0 (2 x 2)					
		⏚(PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ND	50	1					
CFW110211T2O...RB...		U/T1,V/T2,W/T3, DC+,DC-	M10 (parafuso sextavado)	30 (265.5)	HD	120 (2 x 35)	4/0 (2 x 2)	Ring tongue	400	FNH1-400K-A	450	FNH3FEM-450Y-A
					ND	150 (2 x 50)	300 (2 x 1)					
		⏚(PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ND	70	2/0					

Table 3.5: Recommended Wire size/ Fuses - use only copper wire [75 ºC (167 °F)] - 380...480 V supply voltage

Model	Frame Size	Power Terminals			Overload class	Wire Size			WEG Recommended Fuses			
		Terminals	Bolt (wrench/ screw head type)	Recommended Torque N.m (lbf.in)		mm²	AWG	Terminals	Type NH aR Knife Contact		Type NH aR Flush End	
									In [A]	Model	In [A]	Model
CFW110105T4O...RB...	E	U/T1,V/T2,W/T3, DC+,DC-	M8 (hexagonal phillips screw)	15 (132.75)	HD	35	2	Ring tongue	160	FNH00-160K-A	-	-
					ND	50	1					
		⏚ (PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ND	25	4					
CFW110142T4O...RB...		U/T1,V/T2,W/T3, DC+,DC-	M8 (hexagonal phillips screw)	15 (132.75)	HD	50	1/0	Ring tongue	250	FNH00-250K-A	-	-
					ND	70	2/0					
		⏚ (PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ND	35	2					
CFW110180T4O...RB...		U/T1,V/T2,W/T3, DC+,DC-	M10 (hexagonal screw)	30 (265.5)	HD	70 (2 x 25)	2/0 (2 x 4)	Ring tongue	350	FNH1-350K-A	450	FNH3FEM-450Y-A
					ND	120 (2 x 35)	4/0 (2 x 2)					
		⏚ (PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ND	50	1					
CFW110211T4O...RB...		U/T1,V/T2,W/T3, DC+,DC-	M10 (hexagonal screw)	30 (265.5)	HD	120 (2 x 35)	4/0 (2 x 2)	Ring tongue	400	FNH1-400K-A	450	FNH3FEM-450Y-A
					ND	150 (2 x 50)	300 (2 x 1)					
		⏚ (PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ND	70	2/0					

Model	Frame Size	Power Terminals			Overload class	Wire Size		Terminals	WEG Recommended Fuses			
		Terminals	Bolt (wrench/ screw head type)	Recommended Torque N.m (lbf.in)		mm²	AWG		Type NH aR Knife Contact		Type NH aR Flush End	
									In [A]	Model	In [A]	Model
CFW110242T4O...RB...	F	U/T1, V/T2, W/T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	2 x 50	2 x 1/0	Ring tongue	450	FNH2-450K-A	450	FNH3FEM-450Y-A
					ND	2 x 70	2 x 1/0					
		DC+,DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	50	1/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	70	1/0					
CFW110312T4O...RB...		U/T1, V/T2, W/T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	2 x 70	2 x 1/0	Ring tongue	630	FNH2-630K-A	450	FNH3FEM-450Y-A
					ND	2 x 95	2 x 4/0					
		DC+,DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	50	1/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	120	4/0					
CFW110370T4O...RB...		U/T1, V/T2, W/T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	2 x 120	2 x 4/0	Ring tongue	710	FNH2-710K-A	500	FNH3FEM-500Y-A
					ND	2 x 120	2 x 4/0					
		DC+,DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	50	1/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	120	4/0					
CFW110477T4O...RB...		U/T1, V/T2, W/T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	2 x 120	2 x 4/0	Ring tongue	900	FNH3-900K-A	630	FNH3FEM-630Y-A
					ND	2 x 185	2 x 350					
		DC+,DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	50	1/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	185	350					

Model	Frame Size	Power Terminals			Overload class	Wire Size			WEG Recommended Fuses			
		Terminals	Bolt (wrench/ screw head type)	Recommended Torque N.m (lbf.in)		mm²	AWG	Terminals	Type NH aR Knife Contact		Type NH aR Flush End	
									In [A]	Model	In [A]	Model
CFW110515T4O...RB...	G	U/T1, V/T2, W/T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	3 x 120	3 x 4/0	Ring tongue	1000	FNH3-1000K-A	700	FNH3FEM-700Y-A
					ND	3 x 120	3 x 4/0					
		DC+,DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	120	4/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	120	4/0					
CFW110601T4O...RB...		U/T1, V/T2, W/T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	3 x 120	3 x 4/0	Ring tongue	2 x 630 (1)	FNH2-630K-A	800	FNH3FEM-800Y-A
					ND	3 x 150	3 x 300					
		DC+,DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	120	4/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	150	300					
CFW110720T4O...RB...		U/T1, V/T2, W/T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	3 x 120	3 x 4/0	Ring tongue	2 x 710 (1)	FNH2-710K-A	900	FNH3FEM-900Y-A
					ND	3 x 185	3 x 350					
		DC+,DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	120	4/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	185	350					
CFW110760T4O...RB...		U/T1, V/T2, W/T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	3 x 150	3 x 300	Ring tongue	2 x 710 (1)	FNH2-710K-A	900	FNH3FEM-900Y-A
					ND	3 x 185	3 x 500					
		DC+,DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	120	4/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ND	185	500					

(1) For this application, the fuses cannot be mounted on FSW and RFW switch-disconnectors; only on individual BNH mounting bases.

Table 3.6: Recommended Wire size/ Fuses - use only copper wire [75 °C (167 °F)] - 500...690 V supply voltage

Model	Frame Size	Power Terminals			Overload class	Wire Size			WEG Recommended Fuses			
		Terminals	Bolt (wrench/ screw head type)	Recommended Torque N.m (lbf.in)		mm²	AWG	Terminals	Type NH aR Knife Contact		Type NH aR Flush End	
									In [A]	Model	In [A]	Model
CFW110053T6O...RB...	E	U/T1,V/T2,W/T3, DC+,DC-	M8 (hexagonal screw)	15 (132.75)	HD	10	6	Ring tongue	80	FNH00-80K-A	-	-
					ND	25	4					
		⏚(PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ ND	25	4					
CFW110063T6O...RB...		U/T1,V/T2,W/T3, DC+,DC-	M8 (hexagonal screw	15 (132.75)	HD	25	5	Ring tongue	100	FNH00-100K-A	-	-
					ND	35	2					
		⏚(PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ ND	25	4					
CFW110080T6O...RB...		U/T1,V/T2,W/T3, DC+,DC-	M8 (hexagonal screw)	15 (132.75)	HD	25	3	Ring tongue	125	FNH00-125K-A	-	-
					ND	35	2					
		⏚(PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ ND	25	4					
CFW110107T6O...RB...		U/T1,V/T2,W/T3, DC+,DC-	M8 (hexagonal screw)	15 (132.75)	HD	50	1	Ring tongue	160	FNH00-160K-A	-	-
					ND	50	1					
		⏚(PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ ND	35	2					
CFW110125T6O...RB...		U/T1,V/T2,W/T3, DC+,DC-	M8 (hexagonal screw)	15 (132.75)	HD	50	1	Ring tongue	200	FNH00-200K-A	450	FNH3FEM-450Y-A
					ND	50	1/0					
		⏚(PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ ND	35	2					
CFW110150T6O...RB...		U/T1,V/T2,W/T3, DC+,DC-	M8 (hexagonal screw)	15 (132.75)	HD	50	1/0	Ring tongue	250	FNH00-250K-A	450	FNH3FEM-450Y-A
					ND	70	2/0					
		⏚(PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ ND	50	1					

Model	Frame Size	Power Terminals			Overload class	Wire Size			WEG Recommended Fuses			
		Terminals	Bolt (wrench/ screw head type)	Recommended Torque N.m (lbf.in)		mm²	AWG	Terminals	Type NH aR Knife Contact		Type NH aR Flush End	
									In [A]	Model	In [A]	Model
CFW110170T6O...RB...	F	U/T1, V/T2, W/ T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	70	2/0	Ring tongue	350	FNH1-350K-A	450	FNH3FEM-450Y-A
					ND	120 (2 x 35)	4/0 (2 x 2)					
		DC+, DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	50	1/0					
		⏚ (PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	50	1					
CFW110216T6O...RB...		U/T1, V/T2, W/ T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	120 (2 x 35)	4/0 (2 x 2)	Ring tongue	400	FNH1-400K-A	450	FNH3FEM-450Y-A
					ND	150 (2 x 50)	300 (2 x 1)					
		DC+, DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	50	1/0					
		⏚ (PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	70	2/0					
CFW110289T6O...RB...		U/T1, V/T2, W/ T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	2 x 70	2 x 2/0	Ring tongue	630	FNH2-630K-A	450	FNH3FEM-450Y-A
					ND	2 x 70	2 x 2/0					
		DC+, DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	50	1/0					
		⏚ (PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	70	2/0					

Model	Frame Size	Power Terminals			Overload class	Wire Size			WEG Recommended Fuses			
		Terminals	Bolt (wrench/ screw head type)	Recommended Torque N.m (lbf.in)		mm²	AWG	Terminals	Type NH aR Knife Contact		Type NH aR Flush End	
									In [A]	Model	In [A]	Model
CFW110315T6O...RB...	G	U/T1, V/T2, W/ T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	2 x 70	2 x 2/0	Ring tongue	630	FNH2-630K-A	450	FNH3FEM-450Y-A
					ND	2 x 120	2 x 4/0					
		DC+, DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	120	4/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	120	4/0					
CFW110365T6O...RB...		U/T1, V/T2, W/ T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	2 x 120	2 x 4/0	Ring tongue	710	FNH2-630K-A	500	FNH3FEM-500Y-A
					ND	2 x 120	2 x 4/0					
		DC+, DC-	M8 (parafuso sextavado phillips)	10 (88.5)	HD/ ND	120	4/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	120	4/0					
CFW110435T6O...RB...		U/T1, V/T2, W/ T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	2 x 120	2 x 4/0	Ring tongue	800	FNH3-800K-A	630	FNH3FEM-630Y-A
					ND	2 x 150	2 x 300					
		DC+, DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	120	4/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	150	300					
CFW110472T6O...RB...		U/T1, V/T2, W/ T3	M12 (hexagonal phillips screw)	60 (531.00)	HD	3 x 70	3 x 2/0	Ring tongue	900	FNH3-900K-A	700	FNH3FEM-700Y-A
					ND	3 x 120	3 x 4/0					
		DC+, DC-	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	120	4/0					
		⏚(PE)	M8 (hexagonal phillips screw)	10 (88.5)	HD/ ND	150	300					

3.2.4 Power Connections

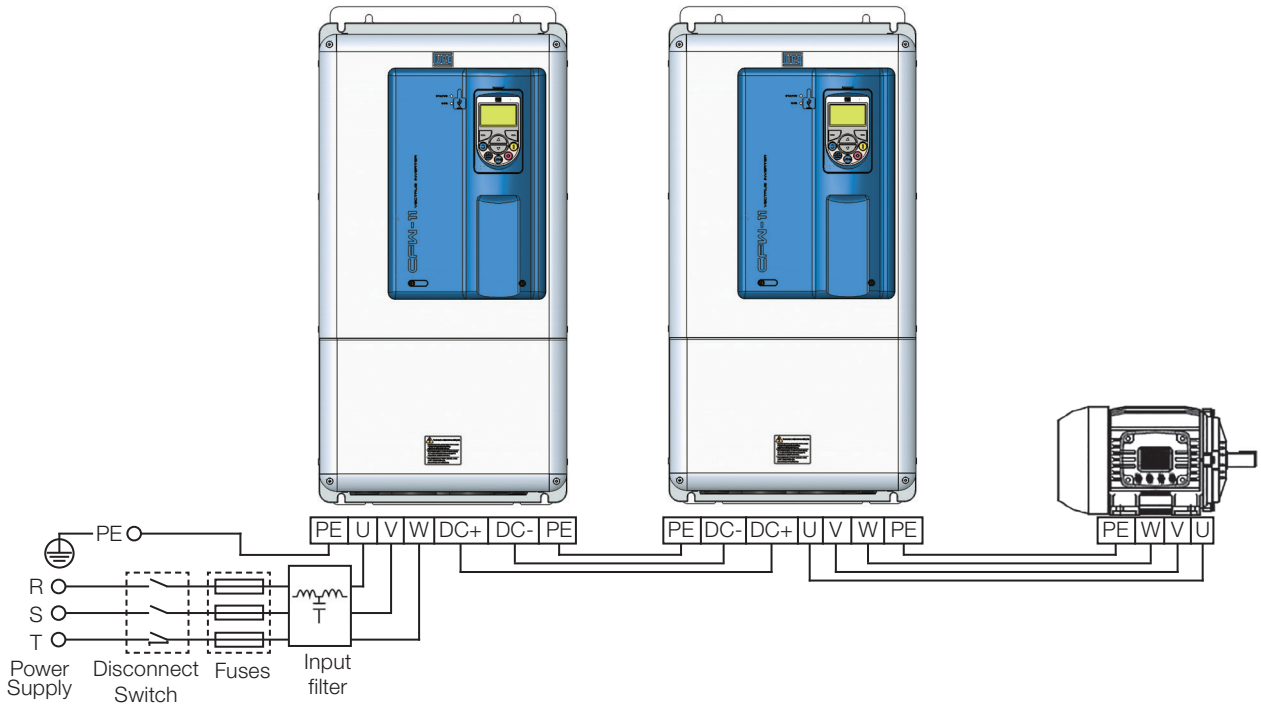


Figure 3.19: *Power and grounding connections - frame size E*

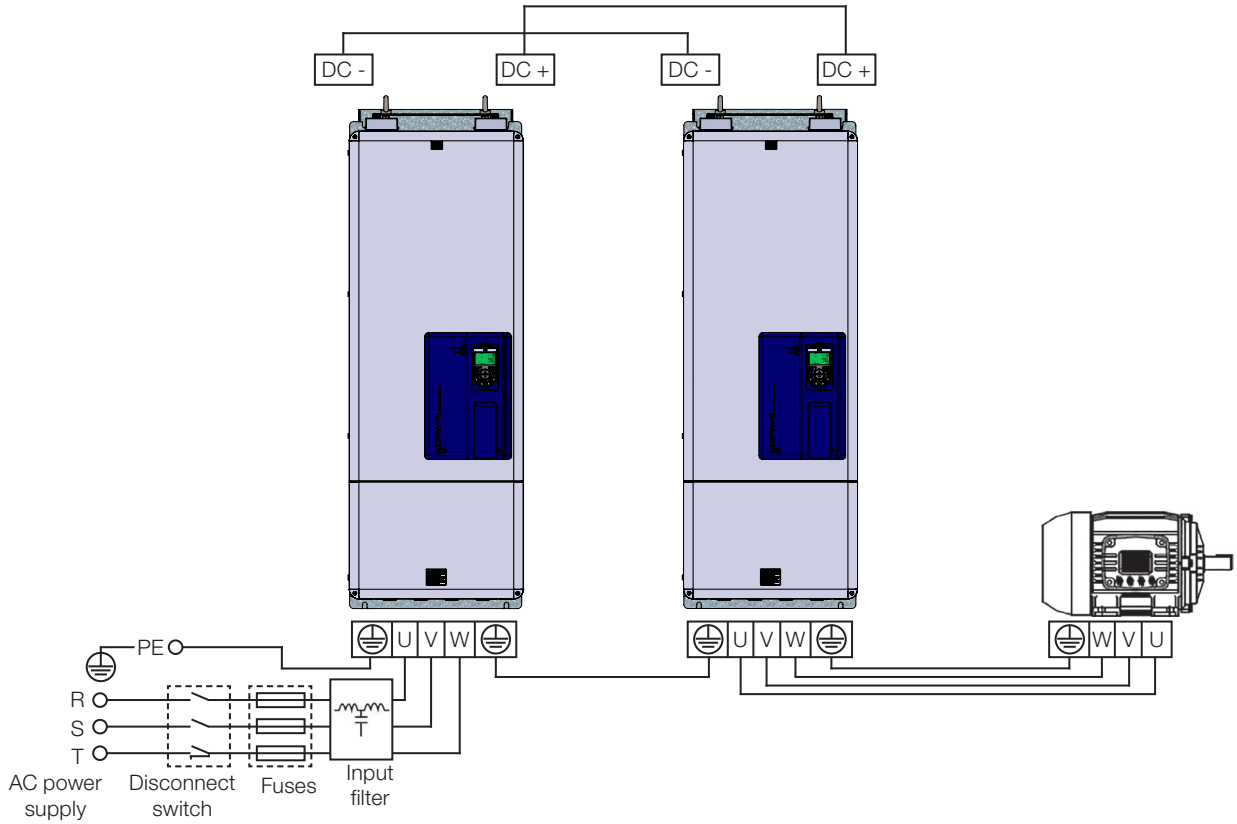


Figure 3.20: *Power and grounding connections - frame sizes F and G*

3.2.4.1 Input Connections

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

ATTENTION!
The power supply that feeds the converter shall have a grounded neutral.

NOTE!
The input power supply voltage shall be compatible with the converter rated voltage.

NOTE!
Power factor correction capacitors are not needed at the converter input (U, V, W).

3.2.5 Grounding Connections

DANGER!
Do not share the grounding wiring with other equipment that operate with high currents (e.g. high power motors, soldering machines, etc.). When installing several converters, follow the procedures presented in Figure 3.21 on page 3-27 for the grounding connection.

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

DANGER!
The converter must be obligatorily connected to a protective ground (PE).
Observe the following:
- Use a minimum wire gauge for ground connection equal to the indicated in Table 3.4 on page 3-18 a Table 3.6 on page 3-22. Conform to local regulations and/or electrical codes in case a different wire gauge is required.
- Connect the converter grounding connections to a ground bus bar, to a single ground point, or to a common grounding point (impedance ≤ 10 Ω).
- To comply with IEC 61800-5-1 standard, connect the converter to the ground by using a single conductor copper cable with a minimum wire gauge of 10 mm2, since the leakage current is greater than 3.5 mA CA.

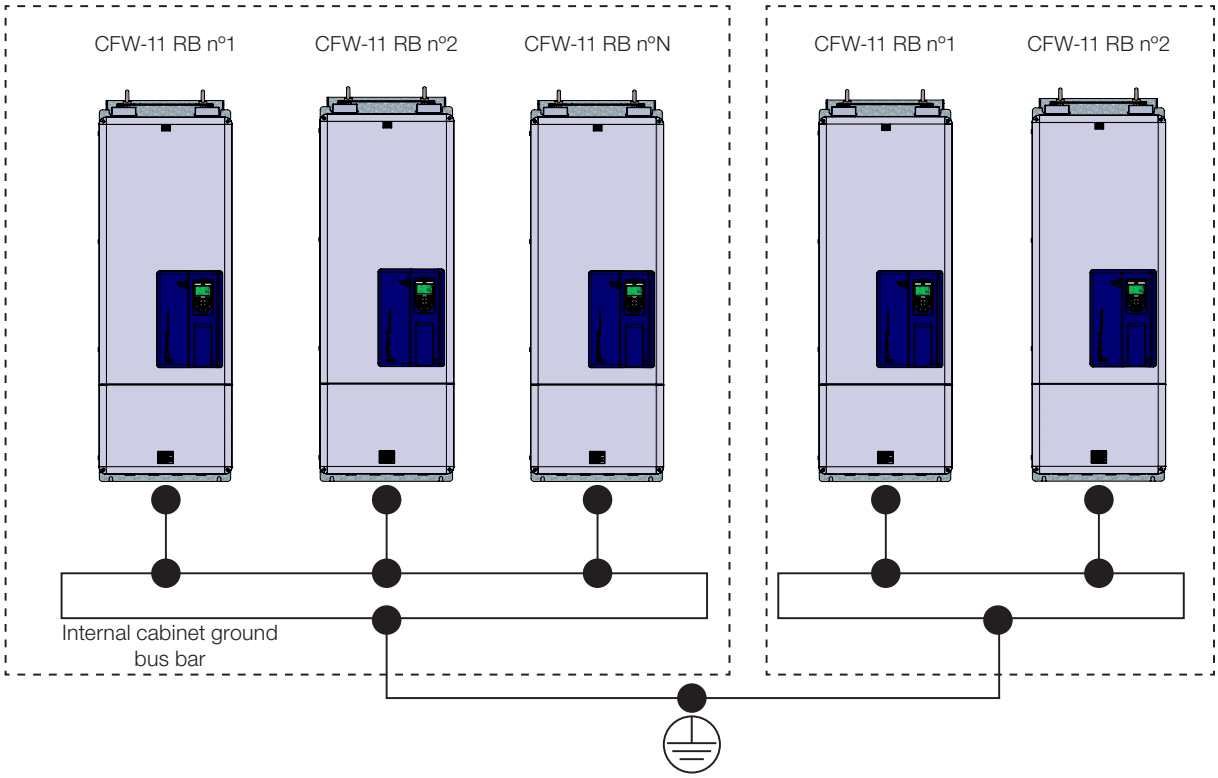


Figure 3.21: Grounding connections with multiple converters

3.2.6 Input Filter

3.2.6.1 Basic Definitions

The proper operation of the regenerative converter demands the use of a three-phase reactance between the input and the power supply. This three-phase reactance is known as L_{BOOST} (boost reactor). It is used an additional LC filter between the L_{BOOST} and the power supply in order to eliminate the high frequency currents flow generated by the IGBTs switching to the power supply. In this manual, the components connected between the power supply and the regenerative converter are identified as filters.

The input filter is the connection of two three-phase inductances (L1 and L2) between the power supply and the U, V and W terminals of the regenerative converter. Among these inductance is a branch with capacitors and damping resistors.

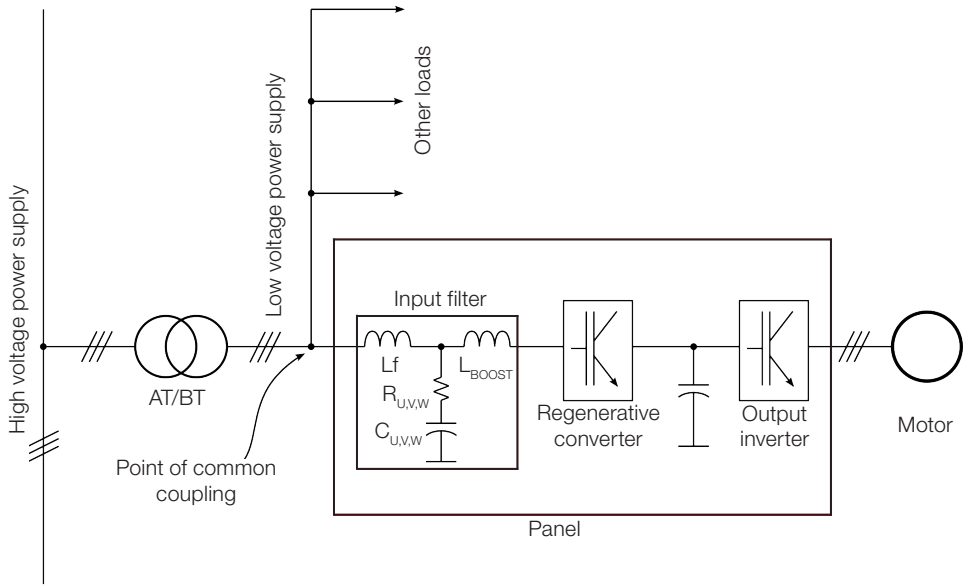


Figure 3.22: Filter simplified connection diagram

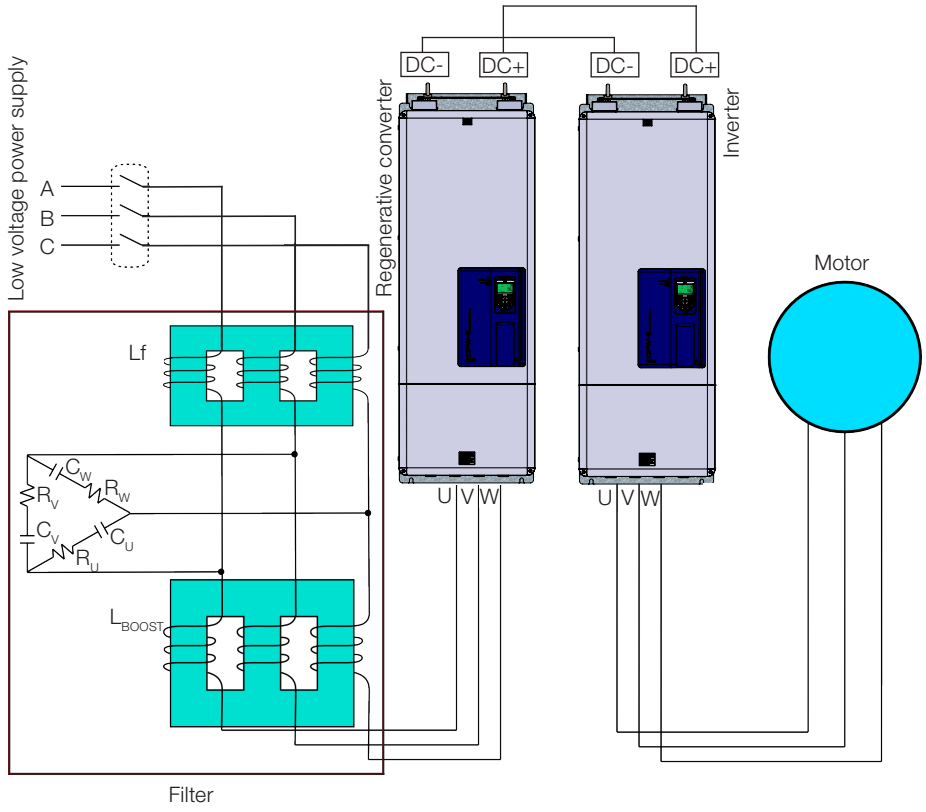


Figure 3.23: Simplified connection drawing of the filter 2

3.2.6.2 How to Specify the Filter Model

WEG has input filters ready to be used with each of its regenerative converters. In order to specify the input filter model, replace the voltage and current values in the respective rated supply voltage and rated input current fields of the smart code as in the example of Table 3.7 on page 3-28.

Table 3.7: Smart code of the input filters

Exemplo	WLCL	0242	T	4
Field denomination	LCL WEG Filter	Filter rated current	Number of phases	Rated voltage
Possible options		Check Table 3.8 on page 3-28	T= three-phase	2 = 220...230V 4 = 380...480V 5 = 500...600V 6 = 660...690V

Table 3.8: Rated currents of the input filters

220...230 V	380...480 V	500...600 V	660...690 V
0142 = 142 A	0105 = 105 A	0053 = 53 A	0046 = 46 A
0180 = 180 A	0142 = 142 A	0063 = 63 A	0054 = 54 A
0211 = 211 A	0180 = 180 A	0080 = 80 A	0073 = 73 A
	0211 = 211 A	0107 = 107 A	0100 = 100 A
	0242 = 242 A	0125 = 125 A	0108 = 108 A
	0312 = 312 A	0150 = 150 A	0130 = 130 A
	0370 = 370 A	0170 = 170 A	0147 = 147 A
	0477 = 477 A	0216 = 216 A	0195 = 195 A
	0515 = 515 A	0289 = 289 A	0259 = 259 A
	0601 = 601 A	0315 = 315 A	0312 = 312 A
	0720 = 720 A	0365 = 365 A	0365 = 365 A
	0760 = 760 A	0435 = 435 A	0427 = 427 A
		0472 = 472 A	

3.2.7 Synchronism

The CFW-11 RB monitors the line voltage (A, B and C) at the converter input with two transformers and asynchronism board. These signals are used for the regenerative converter control. In order to execute this monitoring, it is necessary to connect the power line to points 1, 2 and 3 of the synchronism terminal, as shown in Figure 3.24 on page 3-29.

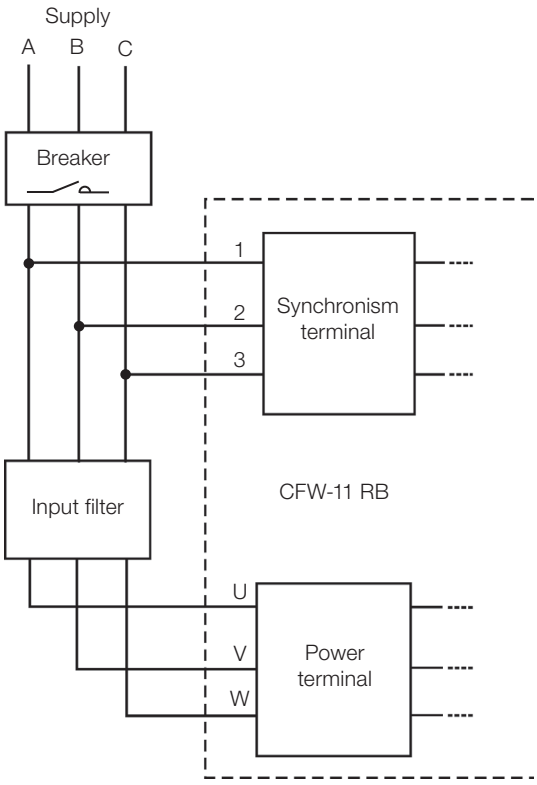
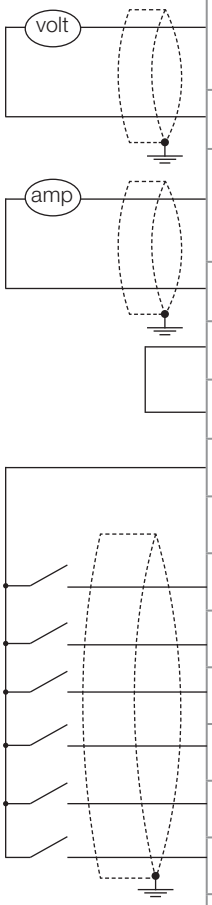


Figure 3.24: *Synchronism connection diagram*

Frames F and G have fuses inside the product to protect the synchronism circuit. Frame E does not have such fuses, which can be added outside the product. Example: Fuses manufacturer Ferraz Shawmut model FR14GG69V4.

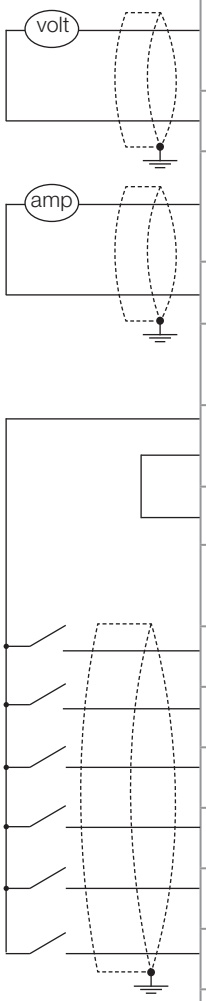
3.2.8 Control Connections

The control connections (analog inputs/outputs, and digital inputs/outputs) must be made at the electronic control board CC11 RB terminal strip XC1.
Functions and typical connections are presented at Figure 3.25 on page 3-31.



XC1 Connector		Factory Default Function	Specifications
7	AO1	Analog output 1: DC Link voltage	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: AC 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*	24 Vdc power supply	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor
12	COM	Digital inputs common point connection	
13	24 Vcc	24 Vdc power supply	24 Vdc power supply, ±8 % Capacity: 500 mA
14	COM	Digital inputs common point connection	
15	DI1	Digital input 1: General enable	6 isolated digital inputs High level ≥ 18 V Low level ≤ 3 V Maximum input voltage = 30 V Input current: 11 mA @ 24 Vdc
16	DI2	Digital input 2: No function	
17	DI3	Digital input 3: No function	
18	DI4	Digital input 4: No function	
19	DI5	Digital input 5: No function	
20	DI6	Digital input 6: No function	
21	NF1	Digital output 1 DO1 (RL1): Pre-charge OK	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): RUN	
25	C2		
26	NA2		
27	NF3	Digital output 3 DO3 (RL3): No fault	
28	C3		
29	NA3		

a) Digital inputs as active high



XC1 Connector		Factory Default Function	Specifications
7	AO1	Analog output 1: DC Link voltage	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: AC Current	Galvanic Isolation Resolution: 11 bits. Signal: 0 to 10 V (R_L ≥ 10 kΩ) / 0 to 20 mA / 4 a 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	Digital inputs common point connection	
13	24 Vcc	24 Vdc power supply	24 Vdc power supply, ±8 %. Capacity: 500 mA
14	COM	Digital inputs common point connection	
15	DI1	Digital input 1: General enable	6 isolated digital inputs High level ≥ 18 V Low level ≤ 3 V Maximum input voltage = 30 V Input current: 11 mA @ 24 Vdc
16	DI2	Digital input 2: No function	
17	DI3	Digital input 3: No function	
18	DI4	Digital input 4: No function	
19	DI5	Digital input 5: No function	
20	DI6	Digital input 6: No function	
21	NF1	Digital output 1 DO1 (RL1): Pre-charge OK	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): RUN	
25	C2		
26	NA2		
27	NF3	Digital output 3 DO3 (RL3): No fault	
28	C3		
29	NA3		

b) Digital inputs as active low

Figure 3.25: *(a) and (b) XC1 connector signals*

NOTE!
Remove the jumper between XC1:11 and 12 and install it between XC1:12 and 13 to use the digital inputs as active low.

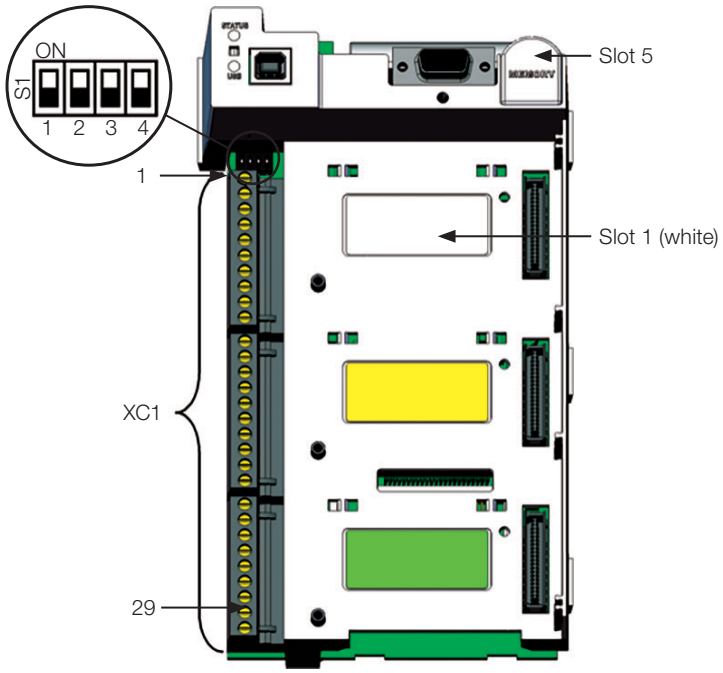


Figure 3.26: *Connector XC1 and DIP-switches for selecting the signal type of the analog inputs and outputs*

The analog inputs and outputs are factory set to operate from 0 to 10 V; this setting may be changed by using DIP-switch S1.

Table 3.9: *DIP-switches configuration for selecting the signal type of the analog outputs*

Signal	Factory Default Function	DIP-Switch	Selection	Factory Setting
AO1	DC Link Voltage	S1.1	OFF: 4 to 20 mA / 0 to 20 mA ON: 0 to 10 V (factory setting)	ON
AO2	Input current	S1.2	OFF: 4 to 20 mA / 0 to 20 mA ON: 0 to 10 V (factory setting)	ON

Parameters related to the analog outputs (AO1 and AO2) shall also be programmed according to the DIP-switches settings and desired values.

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

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

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

3. Use shielded cables for the XC1 connections and run the cables separated from the remaining circuits (power, 110 V / 220 Vac control, etc.) as presented in Table 3.10 on page 3-32. If control wiring must cross other cables (power cables for instance), make it cross perpendicular to the wiring and provide a minimum separation of 5 cm (1.9 in) at the crossing point.

Table 3.10: *Minimum separation distances between wiring*

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

4. The proper connection of the cable shield is shown in Figure 3.27 on page 3-33. Figure 3.28 on page 3-33 shows how to connect the cable shield to the ground.

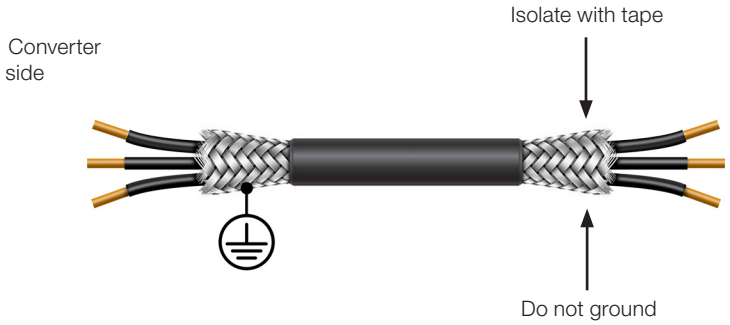


Figure 3.27: *Shield connection*

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

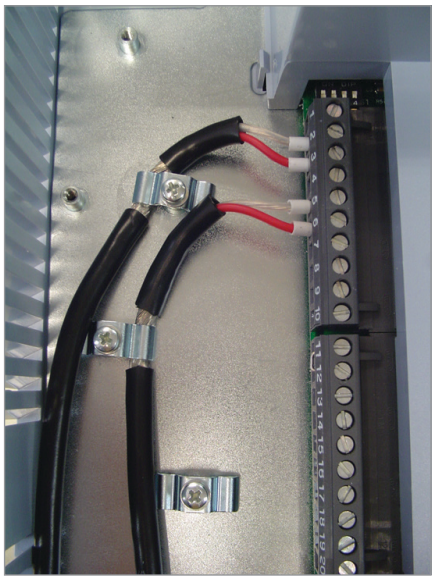


Figure 3.28: *Example of shield connection for the control wiring and synchronism*

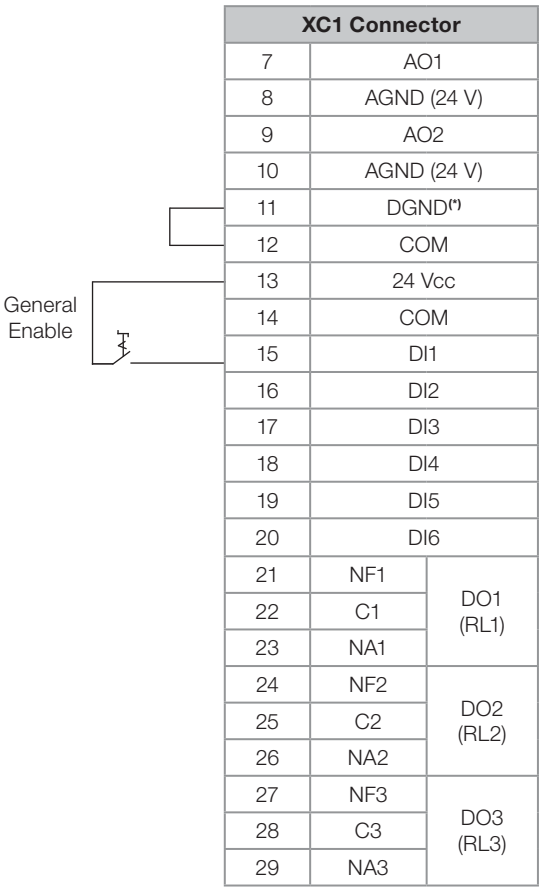
3.2.9 Typical Control Connection

Control connection 1 - Control via Keypad (HMI) with General Enable function.

The factory default settings allows the converter to operate in local mode. This operation mode is recommended for first-time users due to its easiness of implementation.

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

DI1 is already set to General Enable as factory default (P0263 = 2).



XC1 Connector		
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 3.29: *XC1 wiring for control connection 1*

3.3 INSTALLATION ACCORDING TO THE EUROPEAN DIRECTIVE OF ELECTROMAGNETIC COMPATIBILITY

The CFW-11 RB converters, when properly installed, meet the requirements of the electromagnetic compatibility directive “EMC Directive 2004 / 108 / EC”.

3.3.1 Conformal Installation

For the conformal installation use:

1. Input filter and RFI in order to comply with the conducted emission levels C3 categorie.

2. Shielded control cables, keeping them separate from the other cables as described at Item 3.2.8 Control Connections on page 3-30.

3. Converter grounding according to the instructions at Item 3.2.5 Grounding Connections on page 3-26.

4. Instruction for conformal installations applicable to converters controlling motors.

3.3.2 Standard Definitions

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

- **Environment:**

First Environment: includes domestic premises. It also includes establishments directly connected without intermediate transformer to a low-voltage power supply network which supplies buildings used for domestic purposes.
Exemplo: houses, apartments, commercial installations, or offices located in residential buildings.

Second Environment: includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes.
Example: industrial area, technical area of any building supplied by a dedicated transformer.

- **Categories:**

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

Category C2: converters with a voltage rating less than 1000 V, intended for use in the First Environment, not provided with a plug connector or a movable installations, and installed and commissioned by a professional.
Note: a professional is a person or organization familiar with the installation and/or commissioning of converters, including the EMC aspects.

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

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

EN 55011: "Threshold values and measuring methods for radio interference from industrial, scientific and medical (ISM) high-frequency equipment".

Class B: equipment intended for use in the low-voltage power supply network (residential, commercial, and light-industrial environments).

Class A1: equipment intended for use in the low-voltage power supply network. Restricted distribution.
Nota: quando forem usados em redes públicas deverão ser instalados e colocados em funcionamento por profissional.

Class A2: equipment intended for use in industrial environments.

3.3.3 Emission and Immunity Levels

Table 3.11 on page 3-36 shows the emission and immunity levels for the complete drive (AFW-11 RB) formed by the input filter, CFW-11 RB and CFW-11 DC.

Table 3.11: *Emission and immunity levels*

EMC Phenomenon	Basic Standard	Level
Emission:		
Mains Terminal Disturbance Voltage Frequency Range: 150 kHz to 30 MHz)	IEC/EN61800-3	- Without external filter: C4 Category - With external filter: C2 or C3 Category
Eletromagmetic Radiation Disturbance Frequency Range: 30 kHz to 1 GHz)		
Immunity:		
Electrostatic Discharge (ESD)	IEC/EN61000-4-2	4 kV for contact discharge and 8 kV for air discharge
Fast Transient-Burst	IEC/EN61000-4-4	2 kV/5 kHz (coupling capacitor) power input cables 1 kV/5 kHz control cables, and remote keypad cables 2 kV/5 kHz (coupling capacitor) motor output cables
Conduced Radio-Frequency Common Mode	IEC/EN61000-4-6	0.15 to 80 MHz; 10 V; 80 % AM (1 kHz) Control cables and remote keypad cables
Surge Immunity	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 a 1000 MHz 10 V/m 80 % AM (1 kHz)

3.3.4 RFI Filters

To be used only if necessary to comply with conducted emission levels Category C3 daccording to IEC/EN61800-3. The models bellow are from the manufacturer Epcos.

Table 3.12: Conducted and radiated emission levels and further information

Converter Model (with built-in RFI filter)	External RFI Filter Part Number (manufacturer Epcos)
CFW110142T2O...RB...	B84143B0150S020
CFW110180T2O...RB...	B84143B0180S020 (1)
CFW110211T2O...RB...	B84143B0250S020 (2)
CFW110105T4O...RB...	B84143B0150S020
CFW110142T4O...RB...	B84143B0150S020
CFW110180T4O...RB...	B84143B0180S020 (1)
CFW110211T4O...RB...	B84143B0250S020 (2)
CFW110242T4O...RB...	B84143-B0250-S020
CFW110312T4O...RB...	B84143-B0320-S020
CFW110370T4O...RB...	B84143-B0400-S020
CFW110477T4O...RB...	B84143-B0600-S020
CFW110515T4O...RB...	B84143-B0600-S020
CFW110601T4O...RB...	B84143-B0600-S020
CFW110720T4O...RB...	B84143-B1000-S020
CFW110760T4O...RB...	B84143-B1000-S020
CFW110053T6O...RB...	B84143B180S081
CFW110063T6O...RB...	B84143B180S081
CFW110080T6O...RB...	B84143B180S081
CFW110107T6O...RB...	B84143B180S081
CFW110125T6O...RB...	B84143B180S081
CFW110150T6O...RB...	B84143B180S081
CFW110170T6O...RB...	B84143B0320S21
CFW110216T6O...RB...	B84143B0320S21
CFW110289T6O...RB...	B84143B0320S21
CFW110315T6O...RB...	B84143B0320S21
CFW110365T6O...RB...	B84143B0320S21
CFW110435T6O...RB...	B84143B0320S21
CFW110472T6O...RB...	B84143B0320S21

(1) For converter/filter surrounding air temperature higher than 40 °C (104 °F) and continuous output current higher than 172 Arms, it'srequired to use B84143B0250S020 filter.
(2) For converter/filter surrounding air temperature of 40 °C (104 °F) and HD applications (heavy duty cycle, output current < 180 Arms), it's possible to use B84143B0180S020 filter.

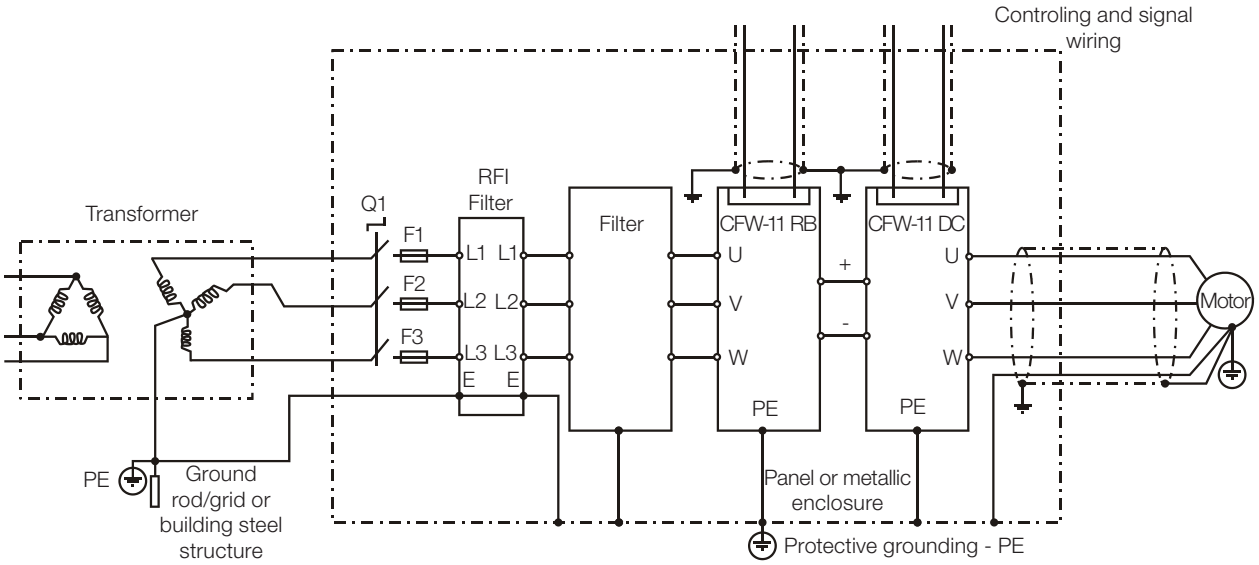


Figure 3.30: *External RFI filter connections*

Use only listed filters in lines with solid grounded neutral point. Do not use RFI filtes in IT networks, lines not grounded or grounded via a high impedance.

Take the usual precautions for EMC filters installation: do not cross the filter input cables with the output cables, mount the filter on a metallic plate assuring the biggest possible contact surface between the filter and the plate, connect this plate to the ground via cordage.

4 HMI

This chapter describes:

- The operator keys and their functions.
- The indications on the display.
- Parameters organization.

4.1 INTEGRAL KEYPAD - HMI - CFW-11 RB

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

Figure 4.1: *Keypad keys*

Battery:

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

The battery life expectancy is of approximately 10 years. When necessary, replace the battery by another of the CR2032 type.

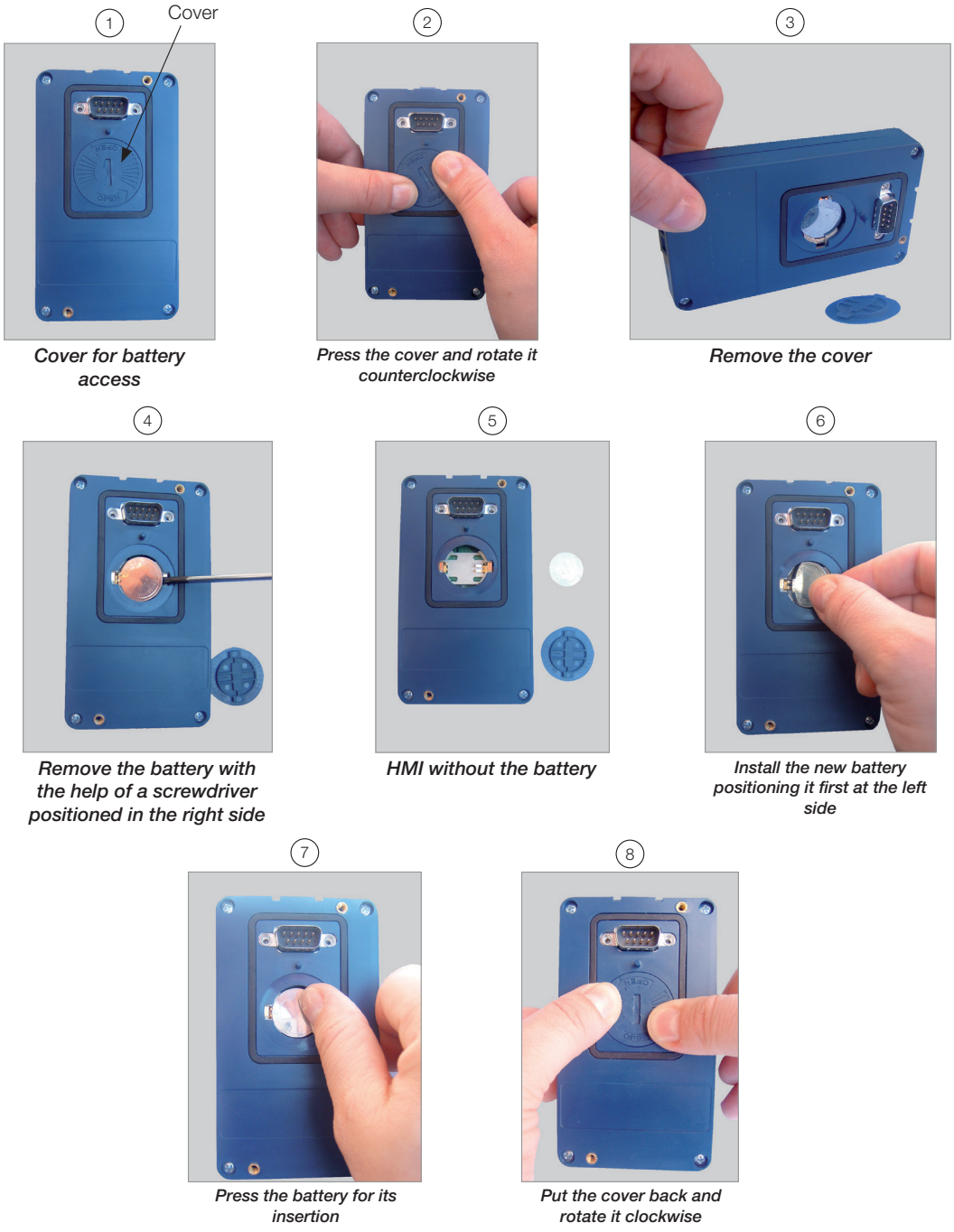
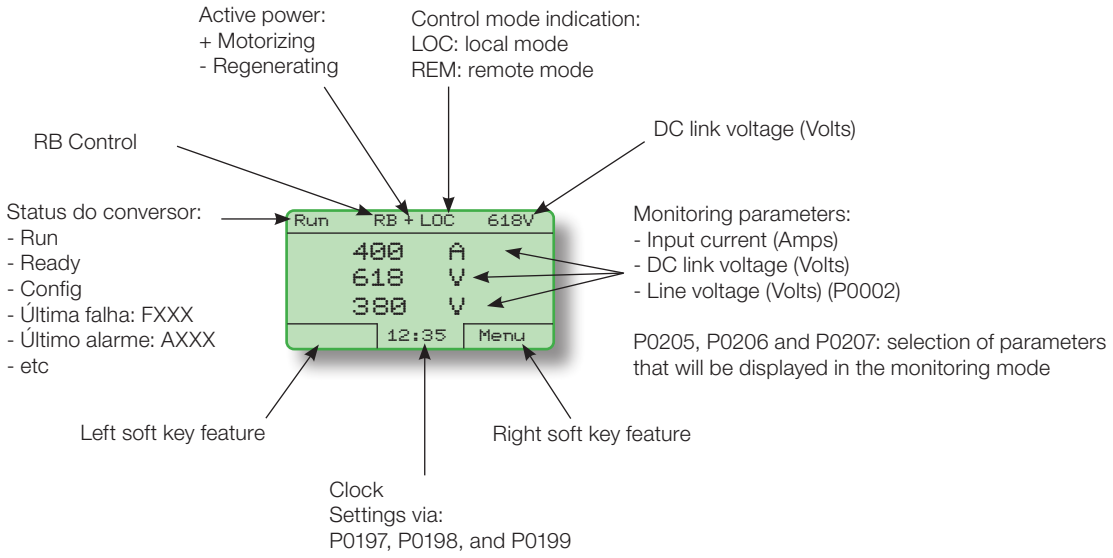


Figure 4.2: *HMI battery replacement*

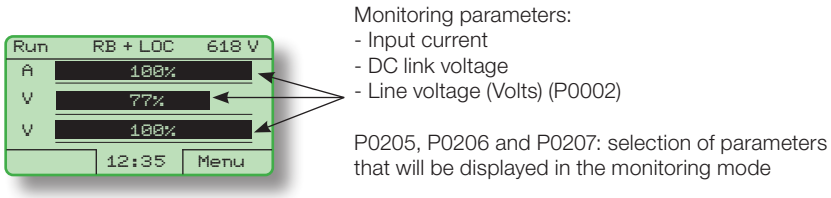
NOTE!
At the end of the battery useful life, please do not discard batteries in your waste container, but use a battery disposal site.

- The HMI can be installed or removed from the converter with or without AC power applied to the converter.
- The HMI supplied with the product can also be used for remote command of the converter. In this case, use a cable with male and female D-Sub9 (DB-9) connectors wired pin to pin (mouse extension type) or a market standard Null-Modem cable. Maximum cable length: 10 m (33 ft). It is recommended the use of the M3 x 5.8 standoffs supplied with the product. Recommended torque: 0.5 N.m (4.5 lbf.in).

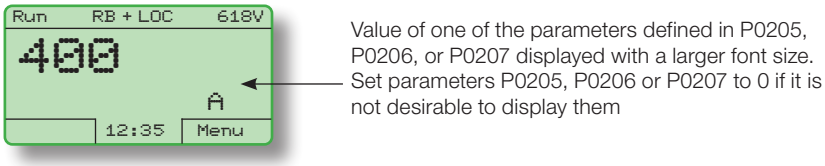
When power is applied to the converter, the display automatically enters the monitoring mode. Figure 4.3 on page 4-3 (a) presents the monitoring screen displayed for the factory default settings. By properly setting specific converter parameters, other variables can be displayed in the monitoring mode or the value of a parameter can be displayed using bar graphs or with larger characters as presented in Figure 4.3 on page 4-3 (b) and (c).



(a) Monitoring screen with 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*

4.2 PARAMETERS ORGANIZATION

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

Table 4.1: *CFW-11 RB parameters organization*

Level 0	Level 1	Level 2	Level 3
Monitoring	00 All Parameters		
	01 Parameter Groups	20 DC Link Voltage	
		21 Control	90 Current Regulator
			91 Reactive Regulator
			92 Current Limiting
			93 DC Link Regulator
		22 HMI	
		24 Analog Outputs	
		25 Digital Inputs	
		26 Digital Outputs	
		27 Converter Data	
		28 Protections	
	02 Oriented Start-up		
	03 Changed Parameters		
	04 Backup Parameters		
	05 I/O Configuration	24 Analog Outputs	
		25 Digital Inputs	
		26 Digital Outputs	
	06 Fault History		
	07 Read Only Parameters		

5 FIRST TIME POWER-UP AND START-UP

This chapter describes how to:

- Check and prepare the converter before power-up.
- Power-up the converter and check the result.

5.1 PREPARATIONS FOR THE START-UP

The converter shall have been already installed according to the recommendations listed in Chapter 3 INSTALLATION AND CONNECTION on page 3-1. The following recommendations are applicable even if the application design is different from the suggested control connections.

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

5.1.1 Procedures for the First Time Power-up/Start-up

1. Verify all the panel connections.

2. Search for short-circuits at the input, DC Link, etc.

3. Make sure all the cables are correctly connected between the control and power units.

4. Verify the condition of all the fuses.

5. Inspect all the ground connections (panel, the door where the control is installed, etc.).

6. Remove all the material rests from the converter or panel interior.

7. Close the converter or panel covers.

8. Measure the line voltage making sure it is inside the permitted range.

9. Command the drive, perform the DC link pre-charge and close the main contactor/circuit breaker keeping the converters always connected to the DC link with the PWM pulses disabled.

10. Verify the proper operation of the fans. The fan control configuration is done via software through the parameter P0352 (refer to the CFW-11 RB programming manual). The power units do not have internal fans at the electronics, only at the heatsinks. At the factory default the fans stay on for a while during the energization and then they are switched off. They will only be switched on again if the heatsink temperature reaches 70 °C (158 °F), and off if the temperature drops below 60 °C (140 °F).

11. Observe the existence of faults/alarms. In case that a fault or alarm occurs, verify the possible causes and solve the problem.

12. Enable the converter PWM pulses via DI.

13. Verify if the DC link voltage at P0004 presents a value close to P0151.

14. Disable the converter.

15. Verify if the temperature reading parameters of the installed power units, P0800 to P0814 according to the case, indicate values close to the ambient temperature.

16. Follow the start-up routine of the output inverter according to the instructions described at the specific manual.

5.2 START-UP

The start-up procedure is described in three simple steps by using the existing parameter groups, **Oriented Start-up** routine and the **Basic Application** group.

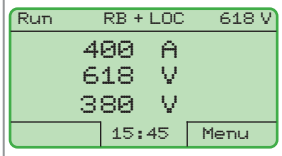
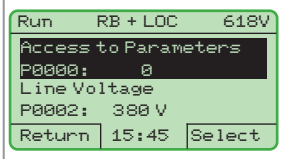
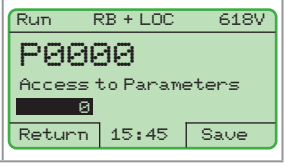
Steps:

1. Set the password for parameter modification.

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

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

5.2.1 Password Setting in P0000

Step	Action/Result	Display Indication
1	■ Monitoring Mode ■ Press **"Menu"** (right soft key)	
2	■ Group **"00 ALL PARAMETERS"** is already selected ■ Press **"Select"**	
3	■ Parameter **"Access to Parameters P0000: 0"** is already selected ■ Pressione **"Select"**	
4	■ To set the password, press the Up Arrow  until number **5** is displayed in the keypad	

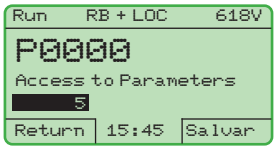
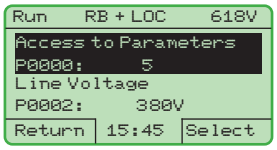
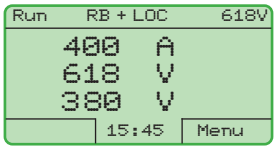
Step	Action/Result	Display Indication
5	■ When number **5** is displayed in the keypad, press **"Save"**	
6	■ If the setting has been properly performed, the keypad should display **"Access to Parameters P0000: 5"** ■ Press **"Return"** (left soft key)	
7	■ Press **"Return"**	
8	■ The display returns to the Monitoring Mode	

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

5.2.2 Oriented Start-Up

There is a group of parameters named "Oriented Start-up" that makes the converter settings easier. Within this group there is a parameter P0317, through which it is possible to enter the Oriented Start-Up routine.

The Oriented Start-Up routine presents the main parameters on the HMI in a logical sequence, so that their setting, according to the operation conditions, prepares the converter for the operation with the used line and motor.

In order to enter into the Oriented Start-up routine, follow the steps presented in Figure 5.2 on page 5-3, first modifying parameter P0317 to 1 and then, setting all remaining parameters as they are prompted in the display.

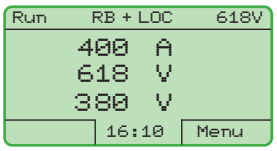
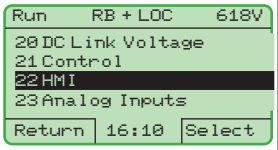
The use of the Oriented Start-up routine for setting the converter parameters may lead to the automatic modification of other internal parameters and/or variables of the converter.

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

Step	Action/Result	Display Indication
1	■ Monitoring Mode ■ Press **"Menu"** (right soft key)	Ready RB + LOC 618V 0 A 618 V 380 V 13:48 Menu
2	■ Group **"00 ALL PARAMETERS"** is already selected	Ready RB + LOC 618V 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
3	■ Group **"01 PARAMETER GROUPS"** is selected	Ready RB + LOC 618V 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 ■ Press **"Select"**	Ready RB + LOC 618V 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
5	■ Parameter **"Oriented Start-Up P0317: No"** is already selected ■ Press **"Select"**	Ready RB + LOC 618V Oriented Start-Up P0317: No Return 13:48 Select
6	■ The value of **"P0317 = [000] No"** is displayed	Ready RB + LOC 618V P0317 Oriented Start-up [000] No Return 13:48 Save
7	■ The parameter value is modified to **"P0317 = [001] Yes"** ■ Press **"Save"**	Ready RB + LOC 618V 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 RB + LOC 618V Language P0201: English DI1 Function P0263: General Enable Reset 13:48 Select
9	■ If needed, change the value of P0263 according to the application. To do so, press **"Select"** ■ It is necessary to have one DI set to General Enable in order the regenerative converter can be enabled	Config RB + LOC 618V DI1 Function P0263: General Enable Line Rated Voltage P0296: 440 – 460V Reset 13:48 Select
10	■ If needed, change the value of P0296 according to the line voltage. To do so, press **"Select"**. This change will affect P0151	Config RB + LOC 618V DI1 Function P0263: General Enable Line Rated Voltage P0296: 440 – 460 V Reset 13:48 Select
11	■ If needed, change the value of P0298 according to the application. To do so, press **"Select"**. The time and the activation level of the IGBT's overload protection will be affected as well ■ To complete the Oriented Start-Up routine, press **"Reset"** (left soft key)	Config RB + LOC 618V Switching Frequency P0297: 2.5 kHz Application P0298: Normal Duty (ND) Reset 13:48 Select
12	■ After few seconds, the display returns to the Monitoring Mode	Ready RB + LOC 618V 0 A 618 V 380 V 13:48 Menu

Figure 5.2: Oriented Start-up

5.3 SETTING DATE AND TIME

Step	Action/Result	Display Indication
1	■ Monitoring Mode ■ Press **"Menu"** ("right soft key")	
2	■ Group **"00 ALL PARAMETERS"** is already selected 	
3	■ Group "01 PARAMETER GROUPS" is selected ■ Press **"Select"** 	
4	■ A new list of groups is displayed and group **"20 DC Link Voltage"** is selected ■ Press  until you reach group **"22 HMI"**	
5	■ Group **"22 HMI"** is selected ■ Press **"Select"**	

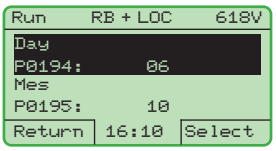
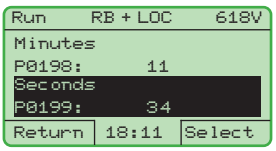
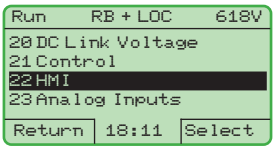
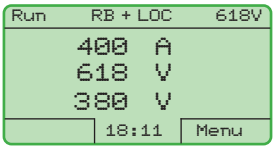
Step	Action/Result	Display Indication
6	■ Parameter "Day P0194" is already selected ■ If needed, set P0194 according to the actual day. To do so, press "Select" and then  or  to change P0194 value ■ Follow the same steps to set parameters **"Month P0195"** to **"Seconds P0199"**	
7	■ Once the setting 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 returns to the Monitoring Mode	

Figure 5.3: *Setting date and time*

5.4 BLOCKING PARAMETERS MODIFICATION

To prevent unauthorized or unintended parameters modification, parameter P0000 should be set to a value different from 5. Follow the same procedures described in Item 5.2.1 Password Setting in P0000 on page 5-2 . Refer to P0200 at the programming manual to know how to change the password.

5.5 HOW TO CONNECT TO A PC

NOTE!
Always use a standard host/device shielded USB cable. Unshielded cables may lead to communication errors.

- Recommended cables: Samtec:
  USBC-AM-MB-B-B-S-1 (1 meter) (39.36 in).
  USBC-AM-MB-B-B-S-2 (2 meter) (78.73 in).
  USBC-AM-MB-B-B-S-3 (3 meter) (118.10 in).
- The USB connection is galvanically isolated from the mains power supply and from other high voltages internal to he converter. However, the USB connection is not isolated from the Protective Ground (PE). Use an isolated notebook for the USB connection or a desktop connected to the same Protective Ground (PE) of the converter.

5.6 FLASH MEMORY MODULE

Features:

- Stores a copy of the converter parameters.
- Transfers the parameters stored in the flash memory to the converter.
- Transfers the firmware stored in the flash memory to the converter.

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

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

ATTENTION!
Before installing or removing the flash memory module, first disconnect the converter power supply and wait for the complete discharge of the capacitors and then disconnect the + 24 V control voltage.

6 TROUBLESHOOTING AND MAINTENANCE

This chapter presents the following:

- Lists all faults and alarms that may occur.
- Indicates the possible causes of each fault and alarm.
- Lists most frequent problems and corrective actions.
- Presents instructions for periodic inspections and preventive maintenance in the equipment.

6.1 OPERATION OF THE FAULTS AND ALARMS

When a fault is detected fault (FXXX):

- The PWM pulses are blocked.
- The keypad displays the fault code and description.
- The "Status" Led starts flashing red.
- The output relay set to "No Fault" opens.
- Some control circuitry data is saved in the EEPROM memory:

  - The fault or alarm code that occurred (shifts the last nine previous faults and alarms).

  - The state of the operating hours counter (P0043) and the powered-up hours counter (P0042).

Reset the converter to return the drive to a “Ready” condition in the event of a fault. The following reset options are available:

- Removing the power supply and reapplying it (power-on reset).
- Pressing the operator key (manual reset).
- Through the "Reset" soft key.
- Automatically by setting P0340 (auto-reset).
- Through a digital input: DIx = 20 (P0263 to P0270).

When an alarm situation ("Alarm" (AXXX)) is detected:

- The keypad displays the alarm code and description.
- The "Status" Led changes to yellow.
- The PWM pulses are not blocked (the converter is still operating).

6.2 FAULTS, ALARMS, AND POSSIBLE CAUSES

Table 6.1: *Faults, alarms and possible causes*

Fault/Alarm	Description	Possible Causes
F006 Imbalance or Input Phase Loss	Phase missing in the input power supply or wrong phase sequency.	■ CSR11 board connections. ■ Synchronism transformer connections. ■ Power supply connections.
F021 DC Link Undervoltage	DC Link undervoltage condition occurred.	■ The input voltage is too low and the DC Link voltage dropped below the minimum permitted value (monitor the value at Parameter P0004): Ud < 223 V - For a 200 / 240 V input voltage (P0296 = 0). Ud < 385 V - For a 380 V input voltage (P0296 = 1). Ud < 405 V - For a 400 / 415 V input voltage (P0296 = 2). Ud < 446 V - For a 440 / 460 V input voltage (P0296 = 3). Ud < 487 V - For a 480 V input voltage (P0296 = 4). Ud < 530 V - For a 500 / 525 V input voltage (P0296 = 5). Ud < 580 V - For a 550 / 575 V input voltage (P0296 = 6). Ud < 605 V - For a 600 V input voltage (P0296 = 7). Ud < 696 V - For a 660 / 690 V input voltage (P0296 = 8). ■ Phase loss in the input power supply. ■ Pre-charge circuit failure. ■ Parameter P0296 was set to a value above of the power supply rated voltage.
F022 DC Link Overvoltage	DC Link overvoltage condition occurred.	■ The input voltage is too high and the DC Link voltage surpassed the maximum permitted value: Ud > 400 V - For 220 / 230 V input models (P0296 = 0). Ud > 800 V - For 380 / 480 V input models (P0296 = 1, 2, 3 or 4). Ud > 1000 V - For 500 / 600 V input models (P0296 = 5, 6 or 7). Ud > 1200 V - For 660 / 690 V input models (P0296 = 8). ■ Iner tia of the driven-load is too high or deceleration time is too short. ■ Setting of P0151 too high.
F030 Power Module U Fault	Desaturation of IGBT occured in Power Module U.	■ Short-circuit between motor phases U and V or U and W.
F034 Power Module V Fault	Desaturation of IGBT occured in Power Module V.	■ Short-circuit between motor phases V and U or V and W.
F038 Power Module W Fault	Desaturation of IGBT occured in Power Module W.	■ Short-circuit between motor phases W and U or W and V.
A047 IGBT Overload Alarm	A IGBT overload alarm occurred.	■ Converter input current is too high.
F048 IGBT Overload Fault	A IGBT overload fault occurred.	■ Converter input current is too high.
A050 IGBT High Temperature U	A high temperature alarm was detected by the NTC temperature sensors located on the IGBTs. **Note:** It may be disabled by setting P0353 = 2 or 3.	■ Surrounding air temperature is too high (> 40 °C or 45 °C (104 °F or 113 °F) depending on the converter model - refer to Section 3.1 MECHANICAL INSTALLATION on page 3-1) and output current is too high. ■ Blocked or defective fan. ■ Very dirty heatsink.
F051 IGBT Overtemperature U	Overtemperature fault on the IGBTs of phase U.	
A053 High Temperature on IGBTs V	Alarm of high temperature measured at the temperature sensors (NTC) of the IGBTs. **Note:** It can be disabled by setting P0353 = 2 or 3.	
F054 Overtemperature on IGBTs V	Overtemperature fault on the IGBTs of phase V.	
A056 High Temperature on IGBTs W	Alarm of high temperature measured at the temperature sensors (NTC) of the IGBTs. **Note:** It can be disabled by setting P0353 = 2 or 3.	
F057 Overtemperature on IGBTs W	Overtemperature fault on the IGBTs of phase W.	
F071 Input Overcurrent	Input overcurrent fault.	■ Input reactance too low. ■ Setting of P0169 and P0170 too high.

Fault/Alarm	Description	Possible Causes
F074 Ground Fault	A ground fault occured. **Note:** It may be disabled by setting P0343 = 0.	■ +UD or -UD short-circuit to ground.
F080 CPU Watchdog	Microcontroller watchdog fault.	■ Electrical noise.
F082 Copy Function Fault	Fault while copying parameters.	■ An attempt to copy the keypad parameters to an converter with a different firmware version.
F084 Auto-diagnosis Fault	Auto-diagnosis Fault.	■ Defect in the converter internal circuitry.
A088 HMI Communication Lost	Indicates a problem with the keypad and control board communication.	■ Loose keypad cable connection. ■ Electrical noise in the installation.
A090 External Alarm	External alarm via digital input. **Note:** It is required to set a digital input to "No external alarm".	■ Wiring was not connected to the digital input (DI1 to DI8) set to “No external alarm”).
F091 External Fault	External fault via digital input. **Note:** It is required to set a digital input to “No external fault”.	■ Wiring was not connected to the digital input (DI1 to DI8) set to “No external fault”.
F099 Invalid Current Offset	Current measurement circuit is measuring a wrong value for null current.	■ Defect in the converter internal circuitry.
F101 Invalid Voltage Offset	Offset calculation error when reading the input voltage (synchronism).	■ Main contactor closed before the pre-charge is complete. ■ CPU has reset and the main contactor did not open.
A105 Reactive Injection in the Power Supply	Alarm for the reactive current injection in the power supply.	■ Voltage power supply much higher than the rated voltage. ■ P0180 too low.
F151 Flash Memory Module Fault	Flash Memory Module fault (MMF-01).	■ Defective flash memory module. ■ Check the connection of the flash memory module.
A152 Internal Air High Temperature	Alarm indicating that the internal air temperature is too high. **Note:** It may be disabled by setting P0353 = 1 or 3.	■ Surrounding air temperature too high (> 40 °C or 50 °C (104 °F or 122°F) according to the model - refer to Section 3.1 MECHANICAL INSTALLATION on page 3-1) and excessive output current. ■ Blocked or defective fan. ■ Fins of the book heatsink too dirty, impairing the air flow.
F153 Internal Air Overtemperature	Internal air overtemperature fault.	
A155 Undertemperature	Only one sensor indicates temperature below -30°C.	■ Surrounding air temperature ≤ -30 °C (-22 °F).
F156 Undertemperature	Undertemperature fault below -30 °C (-22 °F) in the IGBTs or rectifier measured by the temperature sensors.	■ Surrounding air temperature ≤ -30 °C (-22 °F). ■ Defective internal circuitry of the power modules (supply, cables).
F174 Left Fan Speed Fault	Fault on the heatsink left fan speed.	■ Dirt on the blades and rolling bearings of the fan. ■ Defective fan. ■ Defective fan power supply connection.
F175 Center Fan Speed Fault	Fault on the heatsink center fan speed.	
F176 Right Fan Speed Fault	Fault on the heatsink right fan speed.	
A177 Fan Replacement	Fan replacement alarm (P0045 > 50000 hours). **Note:** This function may be disabled by setting P0354 = 0.	■ Maximum number of operating hours for the heatsink fan has been reached.
A178 Fan Speed Alarm	Alarm on the heatsink fan speed.	■ Dirt on the blades and rolling bearings of the fan. ■ Defective fan. ■ Defective fan power supply connection.
F179 Heatsink Fan Speed Fault	Fan speed is under the minimum limit.	■ The fan is dirt or blocked.
A181 Invalid Clock Value.	Invalid clock value alarm.	■ It is necessary to set date and time at parameters P0194 to P0199. ■ Keypad battery is discharged, defective, or not installed.
F182 Pulse Feedback Fault	Pulse feedback fault.	■ Defective converter internal circuitry.

Fault/Alarm	Description	Possible Causes
F183 IGBT Overload + Temperature.	Overtemperature related to the IGBTs overload protection.	■ Surrounding air temperature too high. ■ Operation with overload.

6.3 SOLUTIONS FOR THE MOST FREQUENT PROBLEMS

Table 6.2: *Solutions for the most frequent problems*

Problem	Point to be Verified	Corrective Action
DC Link does not reach the value set in P0151	Incorrect wiring connection	1. Check all power and control connections. For instance, the digital inputs set to start/stop, general enable, or no external fault shall be connected to the 24 Vdc or to DGND* terminals (refer to Figure 3.25 on page 3-31)
	Incorrect settings	1. Check if parameters are properly set for the application
	Fault	1. Check if the converter is not blocked due to a fault condition 2. Check if terminals XC1:13 and XC1:11 are not shorted (short-circuit at the 24 Vdc power supply)
Off display	Keypad connections	1. Check the external keypad connections
	Open power supply fuse(s)	1. Replace fuses
	24 Vdc power supply voltage	1. Check if the 24 Vds control voltage is proper connected and turned on

6.4 INFORMATION FOR CONTACTING TECHNICAL SUPPORT

NOTE!
For technical support and servicing, it is important to have the following information in hand:
- Converter model.
- Serial number, manufacturing date, and hardware revision that are listed in the product nameplate (refer to Section 2.5 CFW-11 RB MODEL SPECIFICATION (SMART CODE) on page 2-11).
- Installed software version (check parameter P0023).
- Application data and converter settings.

6.5 PREVENTIVE MAINTENANCE

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

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

Do not execute any applied potential test on the CFW11 RB!
If needed, consult WEG.

The converter require low maintenance when properly installed and operated. Table 6.3 on page 6-5 presents main procedures and time intervals for preventive maintenance. Table 6.4 on page 6-5 provides recommended periodic inspections to be performed every 6 months after converter start-up.

Table 6.3: Preventive maintenance

Maintenance		Interval	Instructions
Fan replacement		After 50000 operating hours (1)	Replacement procedure shown in Figure 6.1 on page 6-6
Keypad battery replacement		Every 10 years	Refer to Chapter 4 HMI on page 4-1
Electrolytic capacitors	If the converter is stocked (not being used): "Reforming"	Every year from the manufacturing date printed in the converter identification label (refer to Section 2.4 IDENTIFICATION LABELS FOR THE CFW-11 RB on page 2-9)	Supply the CFW-11 RB (at the +UD and -UD terminal) with a voltage 250 to 350 Vdc, during 1 hour at least. Then, disconnect the power supply and wait at least 24 hours before using the converter (reapply power)
	Converter is being used: replace	Every 10 years	Contact WEG technical support to obtain replacement procedures

(1) The converter are factory set for automatic fan control (P0352=2), which means that they will be turned on only when the heatsink temperature exceeds a reference value. Therefore, the operating hours of the fan will depend on the converter usage conditions (input current, cooling air temperature, etc.). The converter stores the number of operating hours of the fan in parameter P0045. When this parameter reaches 50000 operating hours, the keypad display will show alarm A177.

Table 6.4: Recommended periodic inspections - Every 6 months

Component	Problem	Corrective Action
Terminals, connectors	Loose screws	Tighten
	Loose connectors	
Fans / Cooling system	Dirty fans	Cleaning
	Abnormal acoustic noise	Replace fan. Refer to Figure 6.1 on page 6-6 Check the fan connection
	Blocked fan	
	Abnormal vibration	
	Dust in the cabinet air filter	Cleaning or replacement
Printed circuit boards	Accumulation of dust, oil, humidity, etc	Cleaning
	Odor	Replacement
Power module / Power connections	Accumulation of dust, oil, humidity, etc	Cleaning
	Loose connection screws	Tighten
DC Link capacitors	Discoloration / odor / electrolyte leakage	Replacement
	Expanded or broken safety valve	
	Frame expansion	
Power resistors	Discoloration	Replacement
	Odor	
Heatsink	Dust accumulation	Cleaning
	Dirty	

6.5.1 Cleaning Instructions

When it becomes necessary to clean the converter, follow the instructions below:

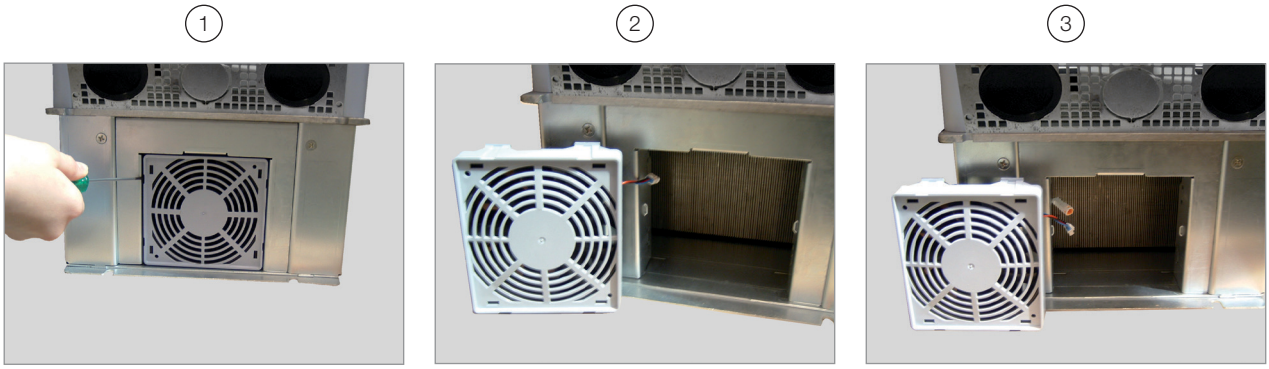
Ventilation system:

- Cut off the converter supply and wait 10 minutes.
- Remove the dust accumulated at the ventilation inlets with a plastic brush or a flannel.
- Remove the dust accumulated on the heatsink fins and on fan blades using compressed air.

Electronic boards:

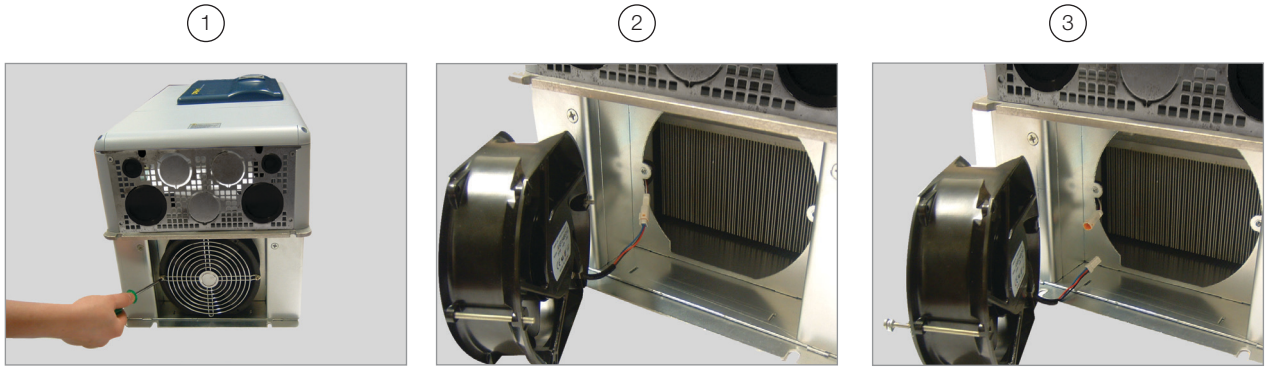
- Cut off the converter supply and wait 10 minutes.
- Remove the dust accumulated on the boards using an anti-static brush or ionized compressed air (E.g.: Charges Burtes Ion Gun (non nuclear) reference A6030-6DESCO).
- If necessary, remove the boards from the converter.
- Use always an ESD wrist strap.

Inspect the heatsink fins of the power units regularly verifying if there is any dirt accumulation that could impair the converter cooling. Therefore, remove the power unit side cover.



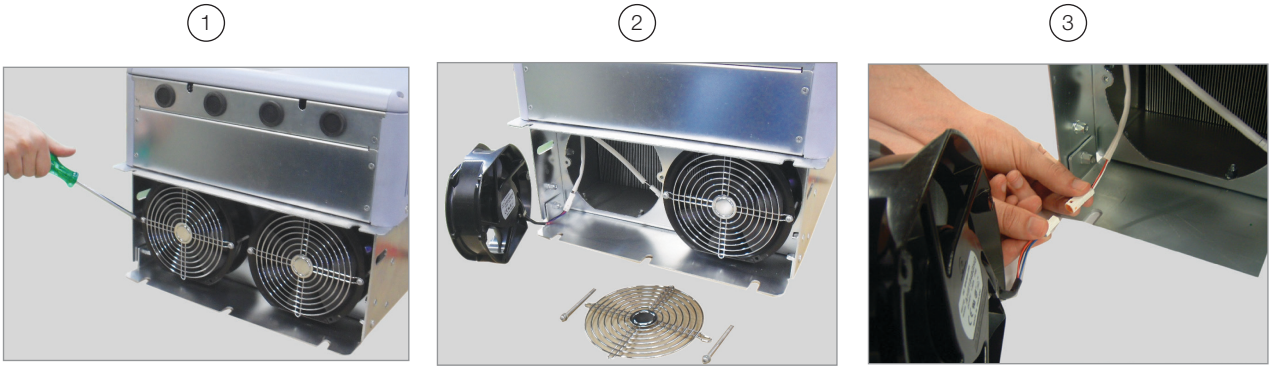
Releasing the latches of the fan cover *Fan removal* *Cable disconnection*

(a) Frame size E (only model CFW110105T4O...RB...)



Fan grill screws removal *Fan removal* *Cable disconnection*

(b) Frame size E (except model CFW110105T4O...RB...)



Fan grill screws removal *Fan removal* *Cable disconnection*

(c) Frame sizes F and G (example on size F)

Figure 6.1: *(a) to (c) - Removal of the heatsink fans*

7 OPTION KITS AND ACCESSORIES

This chapter presents:

- The option kits that can be integrated to the converter from the factory:

  - External 24 Vdc power supply for control and keypad.

- Instructions for the proper use of the option kits.
- The accessories that can be integrated to the converters.

Instructions for the installation, operation, and programming of the accessories are described in their own manuals and are not present in this chapter.

7.1 OPTION KITS

7.1.1 24 Vdc External Control Power Supply

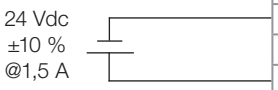
Converters with the following codification: CFW11...O...W...

Converters with this option have a built-in DC/DC converter with a 24 Vdc input that provides adequate outputs for the control circuit. Therefore, the control circuit power supply will be redundant, i.e., it can be provided either by a 24 Vdc external power supply (connection as shown in Figure 7.1 on page 7-2) or by the standard internal switched mode power supply of the converter.

Observe that the converters with the external 24 Vdc power supply option use terminals XC1:11 and 13 as the input for the external power supply and no longer as an output as in the standard converter Figure 7.1 on page 7-2.

In case of interruption of the external 24 Vdc power supply, the digital inputs/outputs and analog outputs will no longer be fed, even if the mains power is on. Therefore, it is recommended to keep the 24 Vdc power supply always connected to the terminals XC1:11 and 13.

The keypad displays warnings indicating the converter status: whether the 24 Vdc power source is connected, whether the mains power source is connected, etc.



XC1 Conector		
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 7.1: *External 24 Vdc power supply capacity and connection terminals*

NOTE!
A class 2 power supply must be used in order to comply with the UL508C standard.

7.2 ACCESSORIES

The accessories are installed in the converter easily and quickly using the "Plug and Play" concept. Once the accessory is inserted into the slot, the control circuitry identifies its model and displays the installed accessory code in P0027 or P0028. The accessory must be installed with the converter power supply off.

Part number and model of each available accessory are presented in Table 7.1 on page 7-3. The accessories can be ordered separately and will be shipped in individual packages containing the components and the manual with detailed instructions for the product installation, operation, and programming.

ATTENTION!
Only one module at a time can be fitted into each slot 1 or 5.

Table 7.1: Accessory models

WEG Part Number	Name	Description	Slot	Identification Parameters	
				P0027	P0028
11008162	IOA-01	IOA module: 1 voltage/current analog input (14 bits); 2 digital inputs; 2 voltage/current analog outputs (14 bits); 2 open-collector digital outputs	1	FD--	----
11008099	IOB-01	IOB module: 2 isolated analog inputs (voltage/current); 2 digital inputs; 2 isolated analog outputs (voltage/current) (the programming of the outputs is identical as in the standard CFW-11); 2 open-collector digital outputs	1	FA--	----
11719952	MMF-03	Flash memory module	5	----	--xx (1)
11008913	HMI-01	Stand-alone HMI (2)	HMI	-	-
11010521	RHMIF-01	Remote HMI frame kit (IP56)	-	-	-

(1) Refer to the programming manual.
(2) Use DB-9 pin, male-to-female, straight-through cable (serial mouse extension type) for connecting the keypad to the converter or Null-Modem standard cable. Maximum cable length: 10 m (33 ft).
Examples:
- Mouse extension cable - 1.80 m (6 ft); Manufacturer: Clone.
- Belkin pro series DB9 serial extension cable 5 m (17 ft); Manufacturer: Belkin.
- Cables Unlimited PCM195006 cable, 6 ft DB9 m/f; Manufacturer: Cables Unlimited.

8 TECHNICAL SPECIFICATIONS

This chapter describes the technical specifications (electrical and mechanical) of the CFW-11 RB converter series.

8.1 POWER DATA

Power supply:

- Maximum rated line voltage: 480 V for models 380...480 V, 600 V for models 500...600 and 690 V for models 660...690 V, for altitude up to 2000 m. For higher altitudes, the voltage derating will be 1.1 % for each 100 m above 2000 m – maximum altitude: 4000M.
- Voltage tolerance: - 15 % to + 10 %.
- Frequency: 50/60 Hz (48 Hz to 62 Hz).
- Phase imbalance: ≤ 3 % of the rated phase-phase input voltage.
- Overvoltage according to Category III (EN 61010/UL 508C).
- Transient voltages according to Category III.
- Typical efficiency: ≥ 97 %
- Typical input power factor: 0,99 at rated condition.
- Typical Total Harmonic Distortion of the input current: 4 % at rated condition.

Table 8.1: Technical specification for 220 to 230 Vac, three-phase power supply

Model	Frame Size	Use with Normal Duty (ND) Cycle							Use with Heavy Duty (HD) Cycle							Input Filter	Surrounding Air Temperature the Converter [°C]	Weight [kg (lb)]
		Rated Input Current (1) (4) [Arms]	Overload Current (2) [Arms]		Rated Switching Frequency [kHz]	Rated Output Current [Acc]	Dissipated Power (3) [W]		Rated Input Current (1) (4) [Arms]	Overload Current (2) [Arms]		Rated Switching Frequency [kHz]	Rated Output Current [Acc]	Dissipated Power (3) [W]				
			1 min	3 s			Surface Mounting	Flange Mounting		1 min	3 s			Surface Mounting	Flange Mounting			
CFW110142T2O...RB...	E	142	156.2	213	2.5	163	1850	240	115	172,5	230	5 (5)	132	1700	230	WLCL0142T2	-10...45	64 (141)
CFW110180T2O...RB...		180	198	270	2.5	207	2200	410	142	213	284	5 (5)	163	2120	390	WLCL0180T2		
CFW110211T2O...RB...		211	232	317	2.5	242	2490	410	180	270	360	2.5	207	2240	400	WLCL0211T2		

The notes for Table 8.1 on page 8-2 to Table 8.4 on page 8-5 are located after the Table 8.4 on page 8-5.

Table 8.2: *Technical specification for 380 to 480 Vac, three-phase power supply*

Model	Frame Size	Use with Normal Duty (ND) Cycle							Use with Heavy Duty (HD) Cycle							Input Filter	Surrounding Air Temperature the Converter [°C]	Weight [kg (lb)]
		Rated Input Current (1) (4) [Arms]	Overload Current (2) [Arms]		Rated Switching Frequency [kHz]	Rated Output Current [Acc]	Dissipated Power (3) [W]		Rated Input Current (1) (4) [Arms]	Overload Current (2) [Arms]		Rated Switching Frequency [kHz]	Rated Output Current [Acc]	Dissipated Power (3) [W]				
			1 min	3 s			Surface Mounting	Flange Mounting		1 min	3 s			Surface Mounting	Flange Mounting			
CFW110105T4O...RB...	E	105	115.5	157.5	2.5	121	1650	230	88	132	176	2.5	101	1340	220	WLCL0105T4	-10...45	64 (141)
CFW110142T4O...RB...		142	156.2	213	2.5	163	2230	240	115	172.5	230	2.5	132	1710	230	WLCL0142T4		
CFW110180T4O...RB...		180	198	270	2.5	207	2660	410	142	213	284	2.5	163	2140	390	WLCL0180T4		
CFW110211T4O...RB...		211	232.1	317	2.5	243	3040	410	180	270	360	2	207	2530	400	WLCL0211T4		
CFW110242T4O...RB...	F	242	266	363	2	278	2098	515	211	317	422	2	243	1814	442	WLCL0242T4	-10...45	105 (231)
CFW110312T4O...RB...		312	343	468	2	359	3228	693	242	363	484	2	278	2481	533	WLCL0312T4		
CFW110370T4O...RB...		370	407	555	2	426	3679	750	312	468	624	2	359	3071	615	WLCL0370T4		
CFW110477T4O...RB...		477	525	716	2	549	4866	1028	370	555	740	2	426	3743	794	WLCL0477T4		
CFW110515T4O...RB...	G	515	567	773	2	592	5235	1140	477	716	954	2	549	4842	1062	WLCL0515T4		155 (342)
CFW110601T4O...RB...		601	662	900	2	691	5543	1334	515	773	1030	2	592	4719	1137	WLCL0601T4		
CFW110720T4O...RB...		720	792	1080	2	828	6672	1366	560	840	1120	2	644	5142	1060	WLCL0720T4	-10...40	
CFW110760T4O...RB...		760	836	1140	2	874	8070	1253	600	900	1200	2	690	6341	1328	WLCL0760T4		

The notes for Table 8.1 on page 8-2 to Table 8.4 on page 8-5 are located after the Table 8.4 on page 8-5.

Table 8.3: Technical specification for 500 to 690 Vac, three-phase power supply

Model	Frame Size	Use with Normal Duty (ND) Cycle							Use with Heavy Duty (HD) Cycle							Input Filter	Surrounding Air Temperature the Converter [°C]	Weight [kg (lb)]
		Rated Input Current (1) (4) [Arms]	Overload Current (2) [Arms]		Rated Switching Frequency [kHz]	Rated Output Current [Acc]	Dissipated Power (3) [W]		Rated Input Current (1) (4) [Arms]	Overload Current (2) [Arms]		Rated Switching Frequency [kHz]	Rated Output Current [Acc]	Dissipated Power (3) [W]				
			1 min	3 s			Surface Mounting	Flange Mounting		1 min	3 s			Surface Mounting	Flange Mounting			
CFW110053T6O...RB...	E	53	58.3	79.5	2	61	878	191	44	66	88	2	51	740	171	WLCL0053T5	-10...45	64 (141)
CFW110063T6O...RB...		63	69.3	94.5	2	73	1030	214	53	79.5	106	2	61	878	191	WLCL0063T5		
CFW110080T6O...RB...		80	88	120	2	92	1289	253	66	99	132	2	76	1076	221	WLCL0080T5		
CFW110107T6O...RB...		107	117.7	160.5	2	123	1700	315	90	135	180	2	104	1441	276	WLCL0107T5		
CFW110125T6O...RB...		125	137.5	187.5	2	144	1975	356	107	160.5	214	2	123	1700	315	WLCL0125T5		
CFW110150T6O...RB...		150	165	225	2	173	2356	413	122	183	244	2	140	1929	349	WLCL0150T5		
CFW110170T6O...RB...	F	170	187	255	2	196	2436	950	150	225	300	2	173	2167	856	WLCL0170T5		105 (231)
CFW110216T6O...RB...		216	237.6	324	2	248	3054	1166	180	270	360	2	207	2570	997	WLCL0216T5		
CFW110289T6O...RB...		289	317.9	433.5	2	332	4036	1510	240	360	480	2	276	3377	1279	WLCL0289T5		
CFW110315T6O...RB...	G	315	346.5	472.5	2	362	4435	1682	289	433.5	578	2	332	4086	1560	WLCL0315T5		155 (342)
CFW110365T6O...RB...		365	401.5	547.5	2	420	5107	1918	315	472.5	630	2	362	4435	1682	WLCL0365T5		
CFW110435T6O...RB...		435	478.5	652.5	2	500	6049	2247	357	535.5	714	2	411	5000	1880	WLCL0435T5		
CFW110472T6O...RB...		472	519.2	708	2	543	6564	2438	418	627	836	2	481	5854	2201	WLCL0472T5	-10...40	

The notes for Table 8.1 on page 8-2 a Table 8.4 on page 8-5 are located after the Table 8.4 on page 8-5.

Table 8.4: *Technical specification for 660 to 690 Vac, three-phase power supply*

Model	Frame Size	Use with Normal Duty (ND) Cycle							Use with Heavy Duty (HD) Cycle							Input Filter	Surrounding Air Temperature the Converter [°C]	Weight [kg (lb)]
		Rated Input Current (1) (4) [Arms]	Overload Current (2) [Arms]		Rated Switching Frequency [kHz]	Rated Output Current [Acc]	Dissipated Power (3) [W]		Rated Input Current (1) (4) [Arms]	Overload Current (2) [Arms]		Rated Switching Frequency [kHz]	Rated Output Current [Acc]	Dissipated Power (3) [W]				
			1 min	3 s			Surface Mounting	Flange Mounting		1 min	3 s			Surface Mounting	Flange Mounting			
CFW110053T6O...RB...	E	46	50.6	69	2	53	911	196	39	58.5	78	2	45	783	177	WLCL0046T6	-10...45	64 (141)
CFW110063T6O...RB...		54	59.4	81	2	62	1057	218	46	69	92	2	53	911	196	WLCL0054T6		
CFW110080T6O...RB...		73	80.3	109.5	2	84	1405	270	61	91.5	122	2	71	1185	237	WLCL0073T6		
CFW110107T6O...RB...		100	110	150	2	115	1899	344	85	127.5	170	2	98	1624	303	WLCL0100T6		
CFW110125T6O...RB...		108	118.8	162	2	124	2045	366	95	142.5	190	2	109	1807	331	WLCL0108T6		
CFW110150T6O...RB...		130	143	195	2	150	2447	427	108	162	216	2	124	2045	366	WLCL0130T6		
CFW110170T6O...RB...	F	147	161.7	220.5	2	169	2838	1091	127	190.5	254	2	146	2472	963	WLCL0147T6		105 (231)
CFW110216T6O...RB...		195	214.5	292.5	2	224	3716	1398	165	247.5	330	2	190	3167	1206	WLCL0195T6		
CFW110289T6O...RB...		259	284.9	388.5	2	298	4886	1808	225	337.5	450	2	259	4264	1590	WLCL0259T6		
CFW110315T6O...RB...	G	259	284.9	388.5	2	298	4936	1858	225	337.5	450	2	259	4314	1640	WLCL0259T6		155 (342)
CFW110365T6O...RB...		312	343.2	468	2	259	5905	2197	259	388.5	518	2	298	4936	1858	WLCL0312T6		
CFW110435T6O...RB...		365	401.5	547.5	2	420	6874	2536	312	468	624	2	359	5905	2197	WLCL0365T6		
CFW110472T6O...RB...		427	469.7	640.5	2	491	8042	2967	365	547.5	730	2	420	6908	2570	WLCL0427T6	-10...40	

The notes for Table 8.1 on page 8-2 a Table 8.4 on page 8-5 are located after the Table 8.4 on page 8-5.

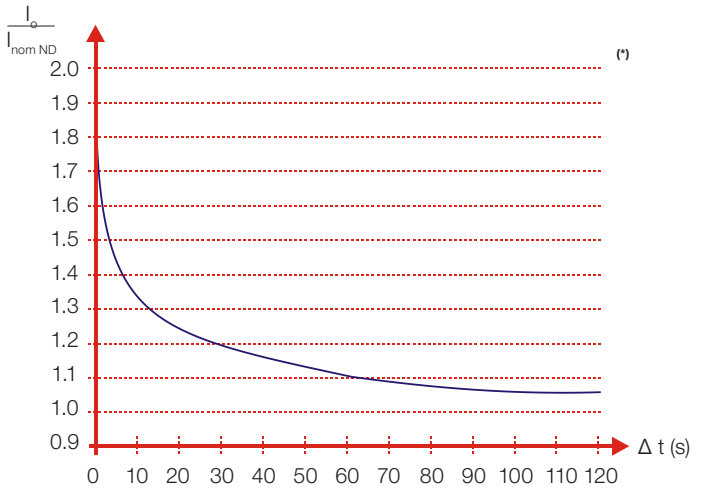
(1) Steady-state rated current in the following conditions:
- Indicated switching frequencies or lower. For higher switching frequency consult WEG.
- Models on frame sizes E (only line 500...690 V), F and G are not allowed to operate at 10 kHz switching frequency.
- Surrounding air temperature as specified in tables. For higher temperatures, the input current must be derated according to Chapter 3 INSTALLATION AND CONNECTION on page 3-1.
- Relative air humidity: 5 % to 95 % non-condensing.
- Altitude: 1000 m (3.300 ft). Above 1000 m (3.300 ft) up to 4000 m (13.200 ft) the output current must be derated by 1 % for each 100 m (330 ft) above 1000 m (3.300 ft). 2000 m to 4000 m above sea level – derating of 1.1% of the maximum voltage for each 100m above 2000 m.
- Ambient with pollution degree 2 (according to EN50178 and UL508C).

(2) One overload each 10 minutes. Table 8.1 on page 8-2 to Table 8.4 on page 8-5present only two points of the overload curve (activation time of 1 min and 3 s). The complete IGBT overload curves for Normal Duty (ND) and Heavy Duty (HD) cycles are presented in Figure 8.1 on page 8-6.
Depending on the converter operational conditions such as surrounding air temperature and output frequency, the maximum time for operation of the converter with overload may be reduced.

(3) The information provided about the converter losses is valid for the rated operating condition, i.e., for rated output current and rated switching frequency.

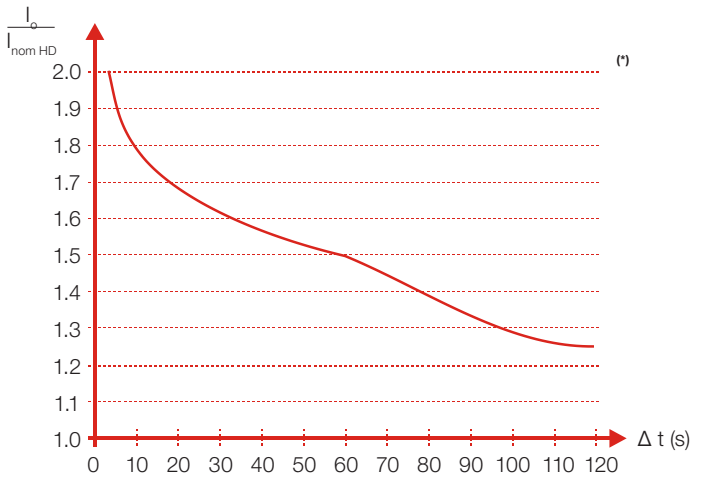
(4)) In frame size E, F and G, for operation with voltage on the DC link above 650 Vdc for P0296 = 1, 2, 3 and 4 (380, 400 / 415, 440 / 460 and 480 V), above 810 Vdc for P0296 = 5, 6 and 7 (500 / 525, 550 / 575 and 600 V) and above 940 Vdc for P0297 = 8 (660 / 690 V), it is necessary to derate the input current. The derating is proportional to the difference between the DC link voltage and the voltage limit (650, 810 or 940 V, depending on the value of P0296). The derating is 10% for DC link voltage of 800 Vdc for P0296 = 1, 2, 3 and 4 (380, 400 / 415, 440 / 460 and 480 V), 1000 Vdc for P0296 = 5, 6 and 7 (500 / 525, 550 / 575 and 600 V) and 1200 Vdc for P0296 = 8 (660 / 690 V).

(5) The switching frequency may be automatically reduced to 2.5 kHz, depending on the operating conditions (ambient temperature around the inverter, output current, etc.) - if P0350 = 0 or 1. If it is necessary to operate always at 5 kHz, set P0350 = 2 or 3; in this case it is necessary to derate the inverter rated input current. In order to do so, contact WEG.



(*) Attention!
One overload each 10 minutes.

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



(*) Attention!
One overload each 10 minutes.

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

Figure 8.1: *(a) and (b) - Overload curves for the IGBTs*

8.2 ELECTRONICS/GENERAL DATA

Control	Method	■ Type of control - Vector Control ■ PWM SVM (Space Vector Modulation) ■ Current, DC link voltage and reactive regulators
Inputs (CC11 RB board)	Digital	■ 6 isolated differential inputs, 24 Vdc, programmable functions
Outputs (CC11 RB board)	Analog	■ 2 isolated analog outputs, (0 to 10) V, RL ≥ 10 kΩ (maximum load), 0 to 20 mA / 4 to 20 mA (RL ≤ 500 Ω) resolution: 11 bits, programmable functions
	Relay	■ 3 relay outputs with NO/NC contacts, 240 Vac, 1 A, programmable functions
Safety	Protection	■ Input Overcurrent/Short-circuit ■ Under/Overvoltage ■ Phase loss ■ Overtemperature ■ IGBTs overload ■ External Fault/Alarm ■ CPU or memory fault ■ DC link phase-ground short-circuit
Integral Keypad (HMI)	Standard Keypad	■ 4 keys: active : Up Arrow, Down Arrow, Right Soft Key and Left Soft Key. disabled: General Enable/Disable, Direction of Rotation, JOG, Local/Remote ■ Graphical LCD display ■ View/edition of all parameters ■ Indication accuracy: - current: 5 % of the rated current ■ Possibility of remote assembly
Enclosure	IP20	■ Frame size E
	IP00	■ Frames sizes F and G
PC Connection for Converter Programming	USB Connector	■ USB standard Rev. 2.0 (basic speed) ■ Type B (device) USB plug ■ Interconnection cable: standard host/device shielded USB cable

8.2.1 Codes and Standards

Safety Standards	■ UL 508C - Power conversion equipment ■ UL 840 - Insulation coordination including clearances and creepage distances for electrical equipment ■ EN61800-5-1 - Safety requirements electrical, thermal and energy ■ EN 50178 - Electronic equipment for use in power installations ■ EN 60146 (IEC 146) - Semiconductor converters ■ EN 61800-2 - Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for low voltage adjustable frequency AC power drive systems
Electromagnetic Compatibility (EMC)	■ EN 61800-3 - Adjustable speed electrical power drive systems - Part 3: EMC product standard including specific test methods ■ EN 55011 - Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment ■ CISPR 11 - Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement ■ EN 61000-4-2 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 2: Electrostatic discharge immunity test ■ EN 61000-4-3 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio-frequency, electromagnetic field immunity test ■ EN 61000-4-4 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 4: Electrical fast transient/burst immunity test ■ EN 61000-4-5 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 5: Surge immunity test ■ EN 61000-4-6 - Electromagnetic compatibility (EMC)- Part 4: Testing and measurement techniques - Section 6: Immunity to conducted disturbances, induced by radio-frequency fields
Mechanical Standards	■ EN 60529 - Degrees of protection provided by enclosures (IP code) ■ UL 50 - Enclosures for electrical equipment

8.3 MECHANICAL DATA

Frame Size E

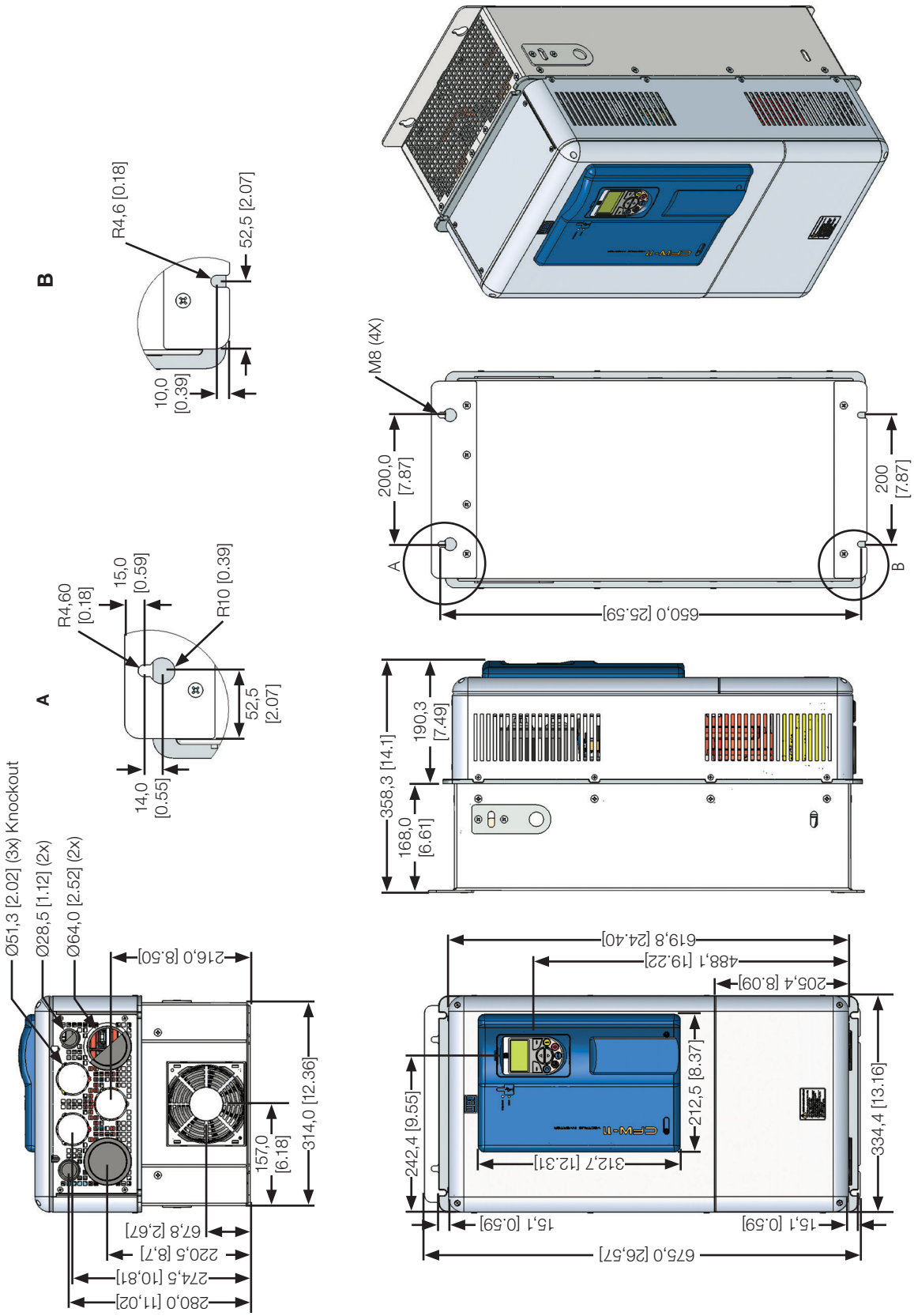


Figure 8.2: *Frame size E dimensions - mm [in]*

Frame Size F

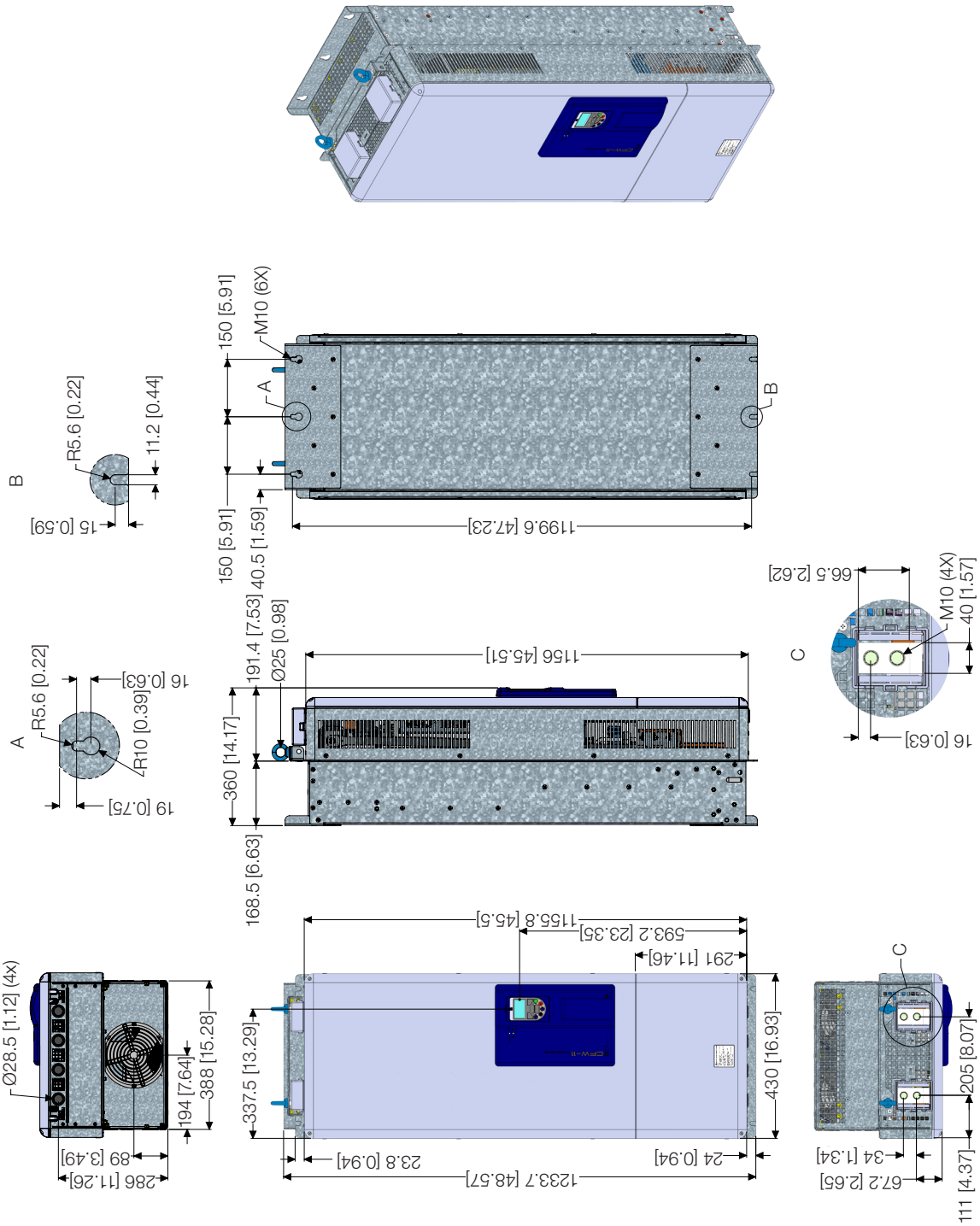


Figure 8.3: *Frame size F dimensions - mm [in]*

Frame Size G

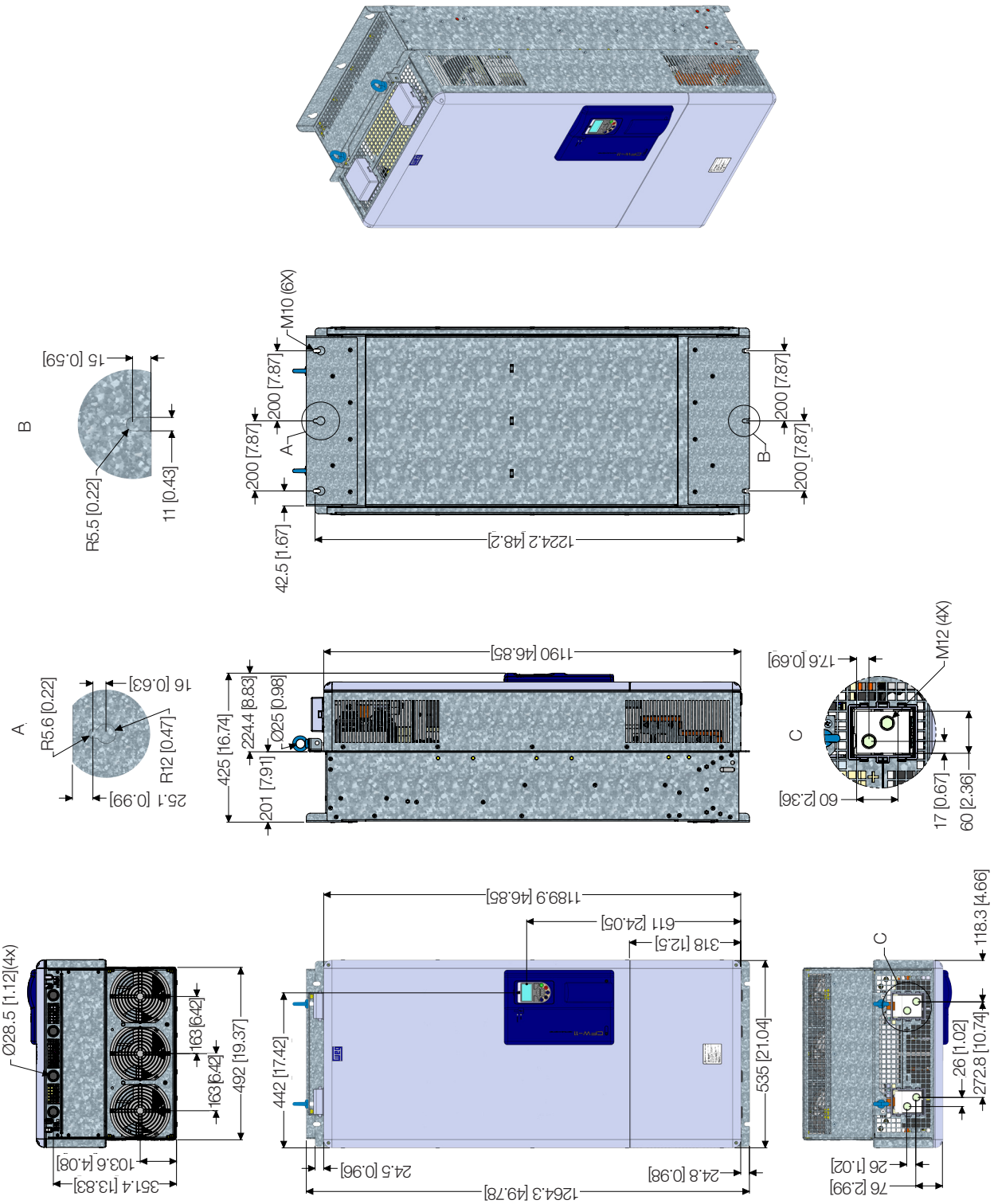


Figure 8.4: *Frame size G dimensions - mm [in]*