Motors | Automation | Energy | Transmission & Distribution | Coatings

Frequency Inverter

CFW-11 500...690 V

User's Manual

CFW-11 VECTRUE INVERTER

FREQUENCY INVERTER MANUAL

Series: CFW-11

Language: English

Document: 10001473218 / 03

Models: 2.9...44 A / 500...600 V

2.9...804 A / 500...690 V

Models with Special DC Hardware: 170...804 A / 500...690 V

02/2016

Summary of Revisions

Version	Review	Description
-	R01	First edition
-	R02	General revision
-	R03	General revision

1 SAFETY INSTRUCTIONS

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

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.

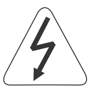
DANGER!
Les procédures concernées par cet avertissement sont destinées à protéger l'utilisateur contre des dangers mortels, des blessures et des détériorations matérielles importantes.

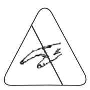
ATTENTION!
The procedures recommended in this warning have the purpose of avoiding material damage.

NOTE!
The information mentioned in this warning is important for the proper 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:


Indicates a high voltage warning.


Electrostatic discharge sensitive components.
Do not touch them.


Indicates that a ground (PE) must be connected securely.


Indicates that the cable shield must be grounded.


Indicates a hot surface warning.

1.3 PRELIMINARY RECOMMENDATIONS

DANGER!
Only trained personnel, with proper qualifications, and familiar with the CFW-11 and associated machinery shall plan and implent the installation, starting, operation, and maintenance of this equipment.
The personnel shall follow all the safety instructions described in this manual and/or defined by the local regulations.
Failure to comply with the safety instructions may result in death, serious injury, and equipment damage.

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

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

DANGER!
Always disconnect the main power supply before touching any electrical device associated with the inverter.
Several components may remain charged with high voltage and/or in movement (fans), even after the AC power supply has been disconnected or turned off.
Wait at least 10 minutes to guarantee the fully discharge of capacitors.
Always connect the equipment frame to the ground protection (PE).

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

ATTENTION!
The electronic boards contain components sensitive to electrostatic discharges. Do not touch the components and terminals directly. If needed, touch first the grounded metal frame or wear an adequate ground strap.

Do not perform a withstand voltage test on any part of the inverter!
If needed, please, consult WEG.

NOTE!
Frequency inverters may cause interference in other electronic devices. Follow the recommendations listed in Chapter 3 INSTALLATION AND CONNECTION on page 3-1, to minimize these effects.

NOTE!
Fully read this manual before installing or operating the inverter.

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

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

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

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

2 GENERAL INSTRUCTIONS

2.1 ABOUT THE MANUAL

This manual exposes how to install, to start-up in V/f (scalar) mode, the main characteristics and shows how to troubleshoot the most common problems of the 500...600 V and 500...690 V models of CFW-11 inverter series.

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

ATTENTION!

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

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

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

2

2.2 TERMS AND DEFINITIONS

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

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

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

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

Rectifier: the input circuit of the inverters that converts the input AC voltage into DC; it is made of thyristors and power diodes.

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

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

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

IGBT: Insulated Gate Bipolar Transistor; it is the output inverter bridge basic component, working as an electronic switch either in the saturated (closed switch) or in the cut off mode (open switch).

Braking IGBT: works as a switch to activate the braking resistors; it is controlled by the DC bus voltage level.

Gate Driver: circuit used to turn-on and turn-off the IGBTs.

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

Switching Frequency: it is the inverter bridge IGBTs commutation frequency, normally specified in kHz. Also known as carrier frequency.

Heatsink: It is a metal part designed for dissipating the heat generated by the power semiconductors.

PE: Protective Earth.

MOV: Metal Oxide Varistor.

RFI Filter: Radio-Frequency Interference Filter; a filter that avoids interference in the radiofrequency range.

PTC: it is a resistor, whose resistance value in ohms increases proportionally to the temperature increase, being used as temperature sensor in motors.

NTC: it is a resistor, whose resistance value in ohms decreases proportionally to the temperature increase, being used as temperature sensor in power modules.

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

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

RAM Memory: Random Access Memory (volatile).

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

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

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

STO: Safe Torque Off; functional safety function available as an option in CFW-11 inverter series. When STO function is enabled the inverter guarantees that there is no movement of the motor shaft. It's also called safety stop function in CFW-11 documentation.

PLC: Programmable Logic Controller.

TBD: value to be defined.

ac: alternated current.

dc: direct current.

Amp, A: ampere.

°C: Celsius degree.

CFM: Cubic Feet per Minute; unit of flow.

cm: centimeter.

°F: Fahrenheit degree.

Hz: hertz.

ft: foot.

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

in: inch.

kg: kilogram = 1000 grams.

kHz: kilohertz = 1000 hertz.

l/s: liters per second.

lb: pound.

m: meter.

mA: miliampere = 0.001 ampere.

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.

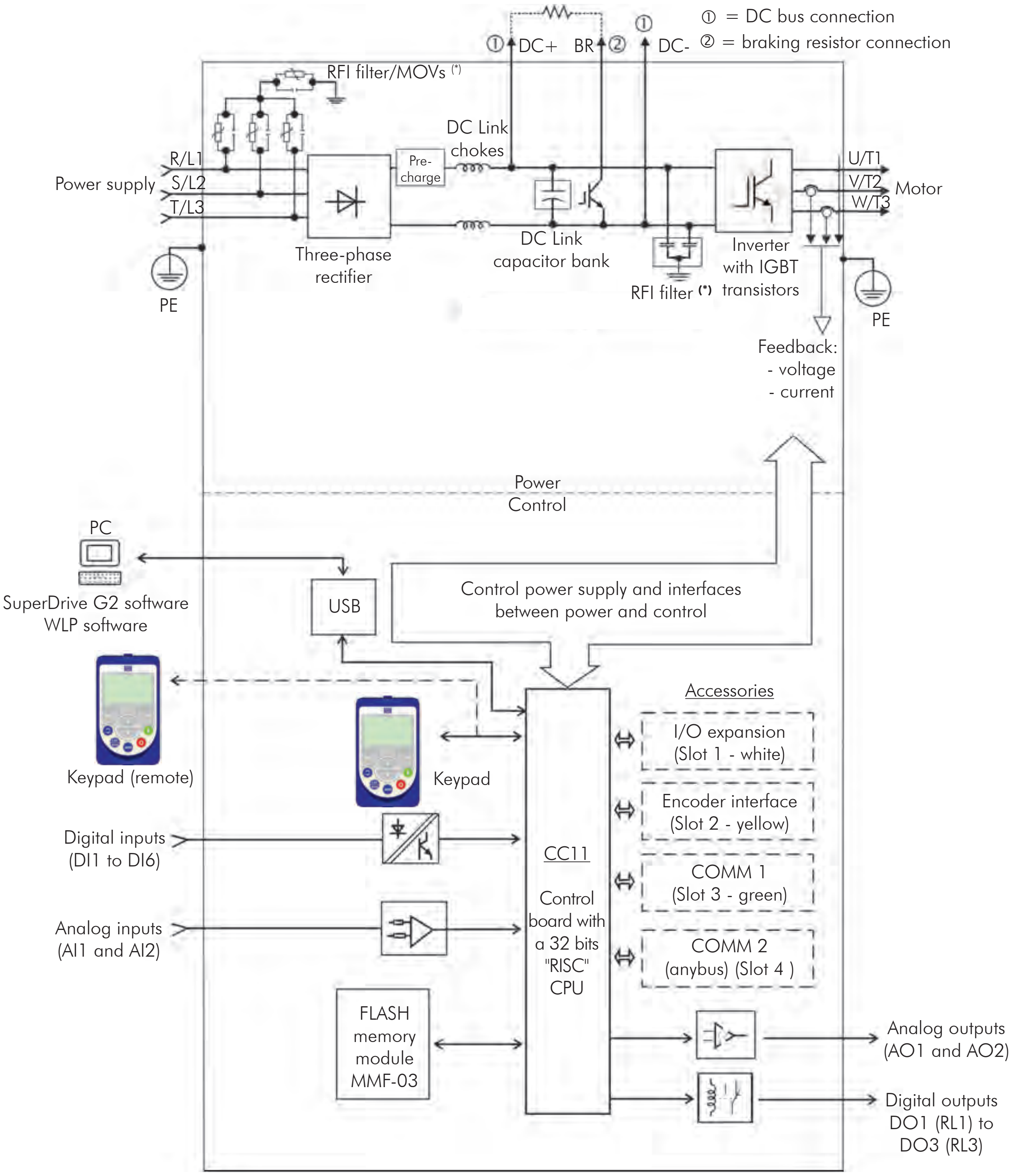
V: volts.

Ω: ohms.

2.3 ABOUT THE CFW-11

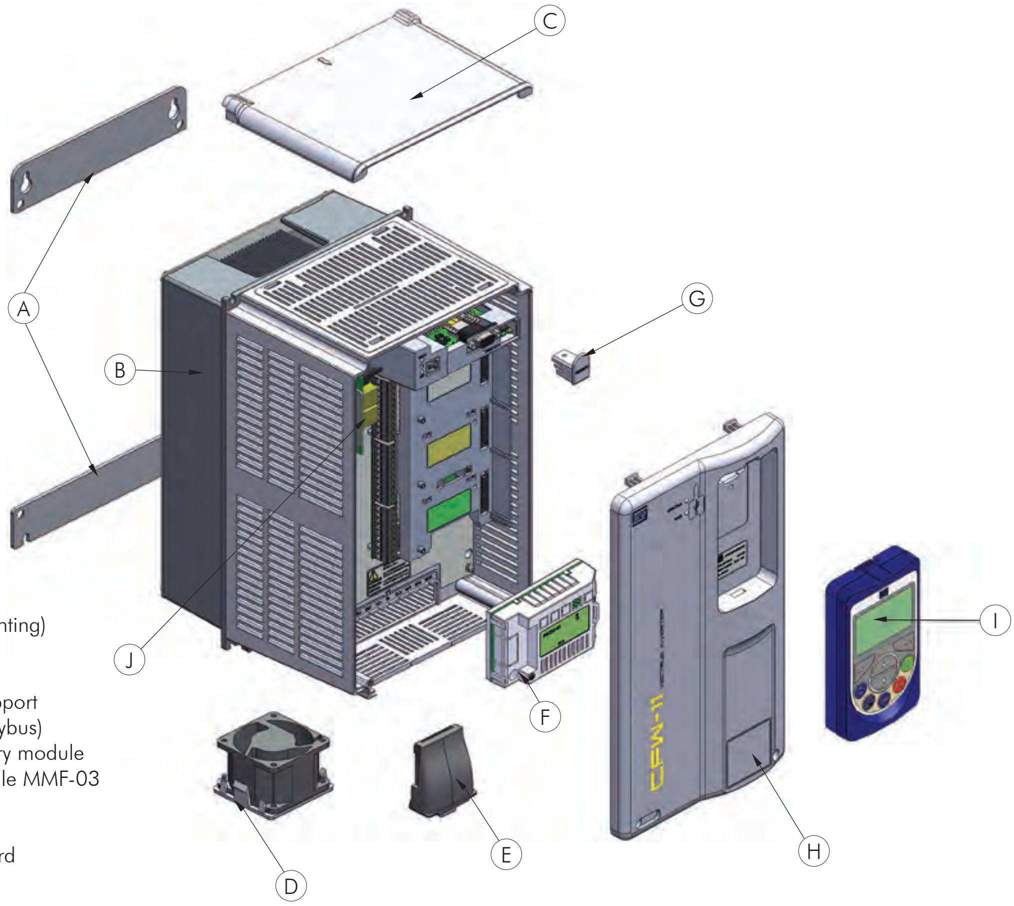
The CFW-11 frequency inverter is a high performance product designed for speed and torque control of three-phase induction motors. The main characteristic of this product is the "Vectrue" technology, which has the following advantages:

- ☑ Scalar control (V/f), VVW or vector control programmable in the same product.
- ☑ The vector control may be programmed as "sensorless" (which means standard motors without using encoders) or as "vector control" with the use of an encoder.
- ☑ The "sensorless" control allows high torque and fast response, even in very low speeds or at the starting.
- ☑ The "vector with encoder" control allows high speed precision for the whole speed range (even with a standstill motor).
- ☑ "Optimal Braking" function for the vector control, allowing the controlled braking of the motor and avoiding the use of the braking resistor in some applications.
- ☑ "Self-Tuning" feature for vector control. It allows the automatic adjustment of the regulators and control parameters from the identification (also automatic) of the motor parameters and load.



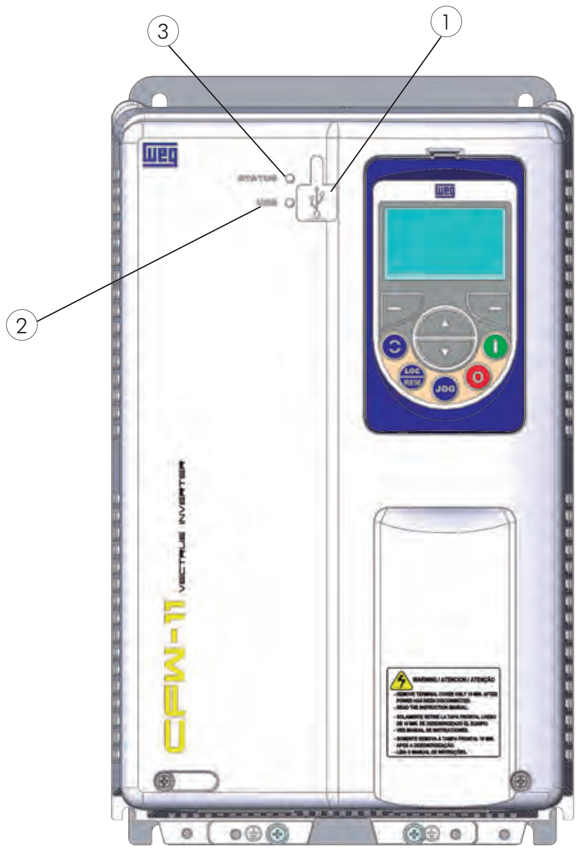
(*) The capacitor of RFI filter and MOV connected to the ground must be disconnected with IT network, high impedance grounding network and corner-grounded delta networks. Refer to item Item 3.2.3.1.2 IT Networks on page 3-35.

***Figure 2.1 -** Block diagram for the CFW-11 - frame sizes B and C*



A - mounting supports
(for through the wall mounting)
B - heatsink
C - top cover
D - fan with mounting support
E - COMM 2 module (anybus)
F - option board/accessory module
G - FLASH memory module MMF-03
H - front cover
I - keypad
J - SRB2A safety stop board

Figure 2.2 - *Main components of the CFW-11 - frame sizes B and C*



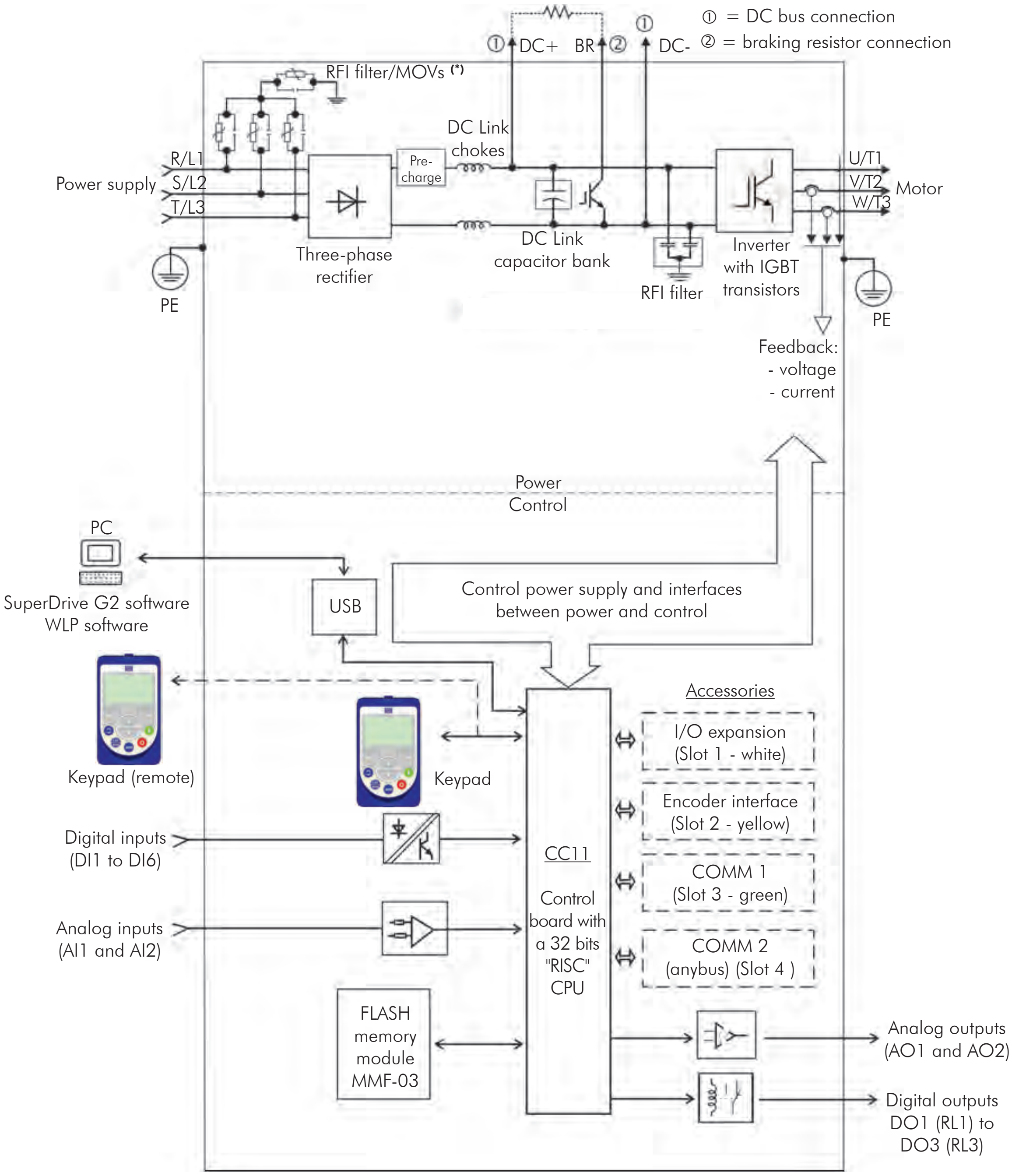
(1) USB connector

(2) USB LED
Off: no USB connection
On/Flashing: USB communication is active

(3) STATUS LED
Green: normal operation with no fault or alarm
Yellow: alarm condition
Flashing red: fault condition

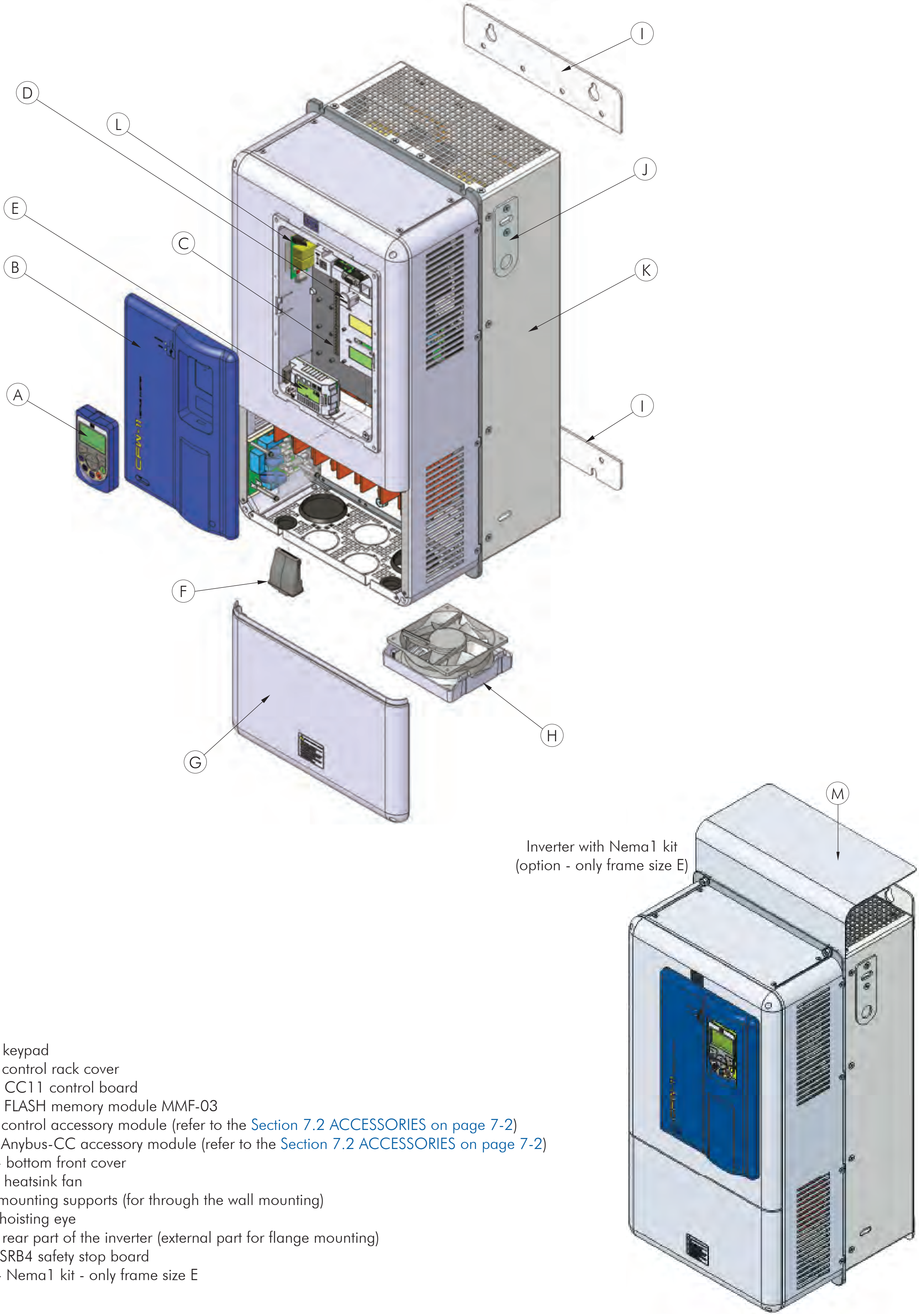
Figure 2.3 - *LEDs and USB connector*

2



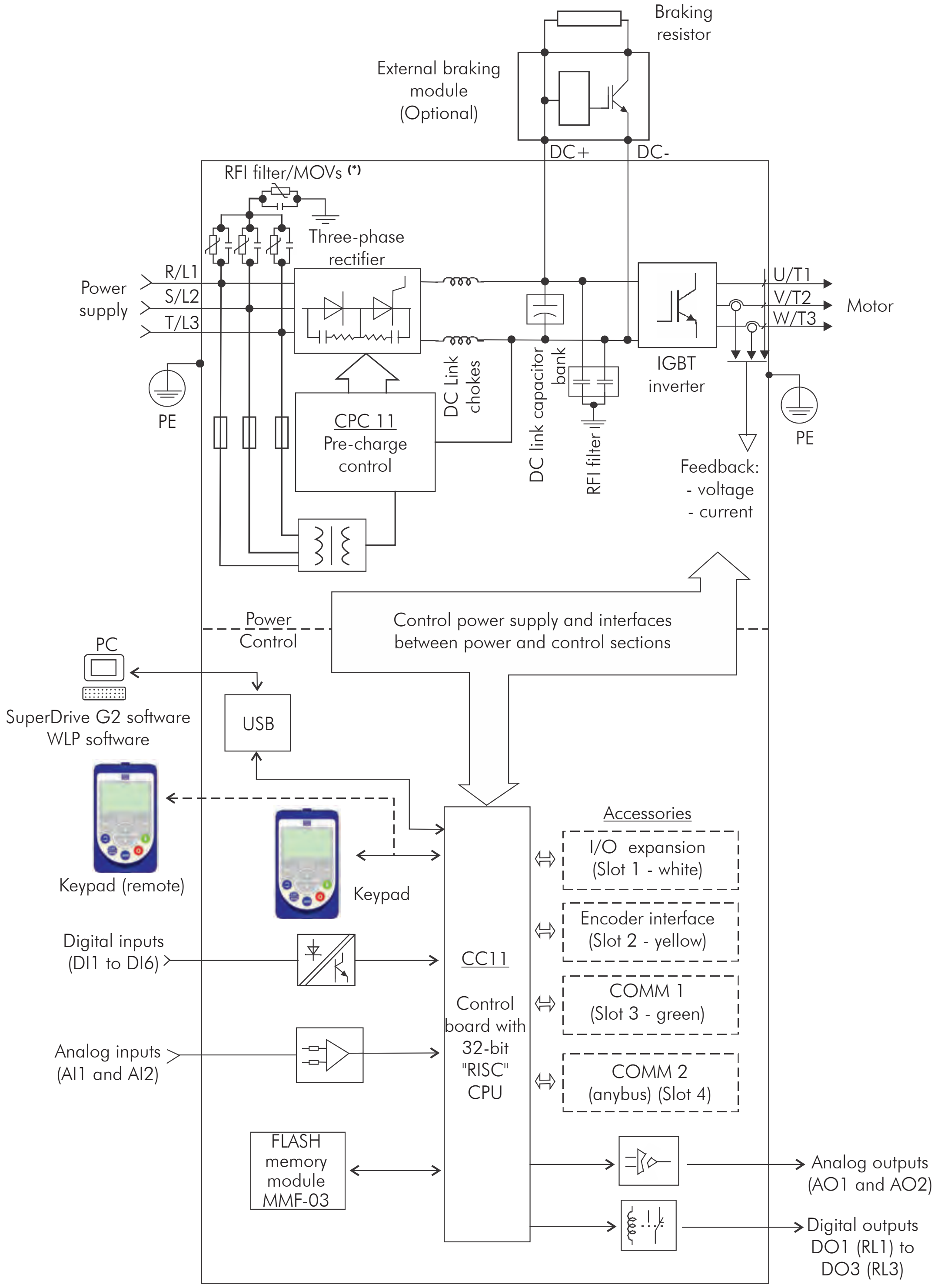
(*) The capacitor of RFI filter and MOV connected to the ground must be disconnected with IT network, high impedance grounding network and corner--grounded delta networks. Refer to Item 3.2.3.1.2 IT Networks on page 3-35.

***Figura 2.4 -** Block diagram for the CFW -11 - frame sizes D and E*



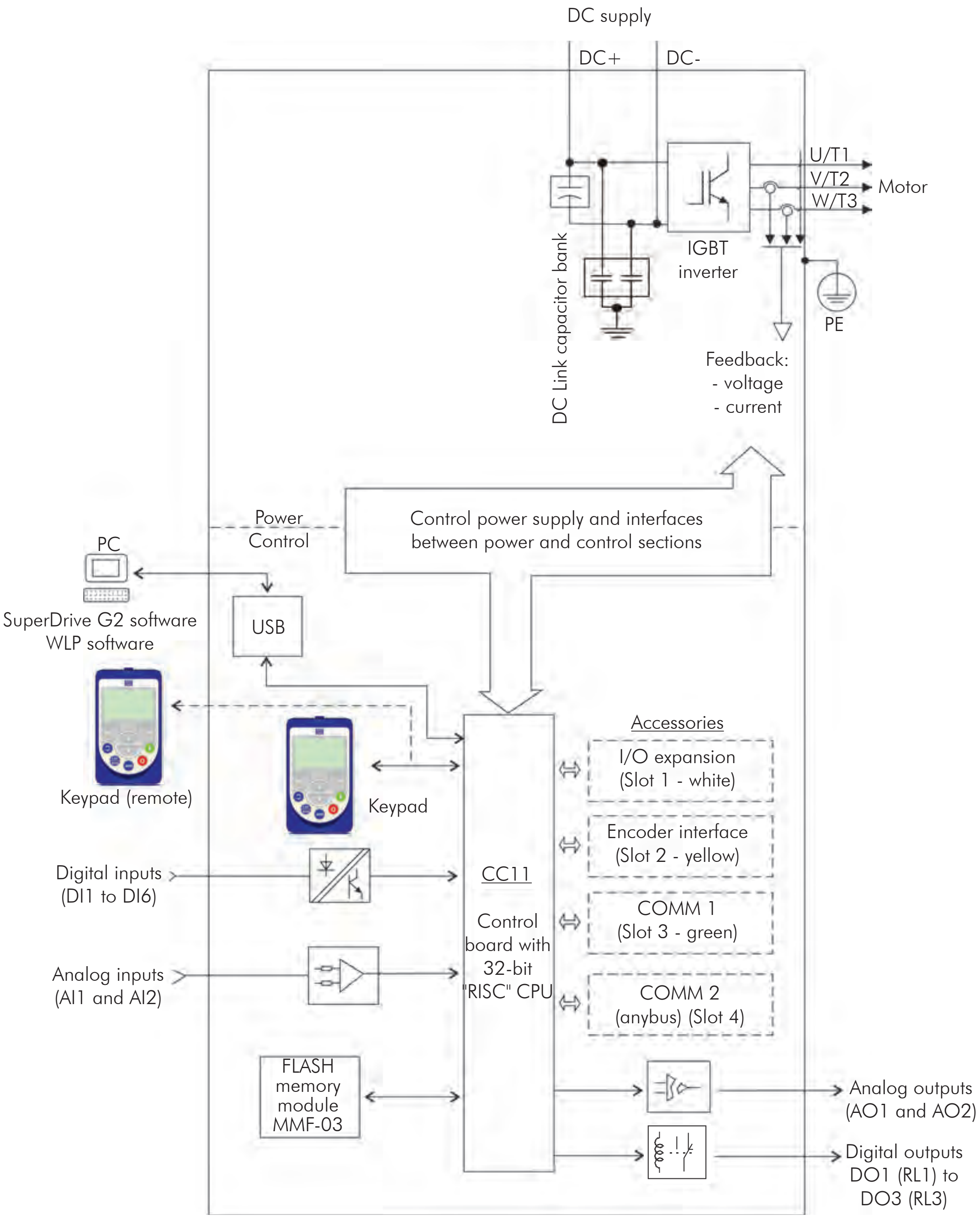
A - keypad
B - control rack cover
C - CC11 control board
D - FLASH memory module MMF-03
E - control accessory module (refer to the Section 7.2 ACCESSORIES on page 7-2)
F - Anybus-CC accessory module (refer to the Section 7.2 ACCESSORIES on page 7-2)
G - bottom front cover
H - heatsink fan
I - mounting supports (for through the wall mounting)
J - hoisting eye
K - rear part of the inverter (external part for flange mounting)
L - SRB4 safety stop board
M - Nema1 kit - only frame size E

***Figure 2.5 -** Main components of the CFW-11 - frame sizes D and E*



(*) The capacitor of RFI filter and MOV connected to the ground must be disconnected with IT network, high impedance grounding network and corner-grounded delta networks. Refer to Item 3.2.3.1.2 IT Networks on page 3-35.

(a) Frame sizes F and G CFW-11 block diagram - Standard models with alternating current feeding

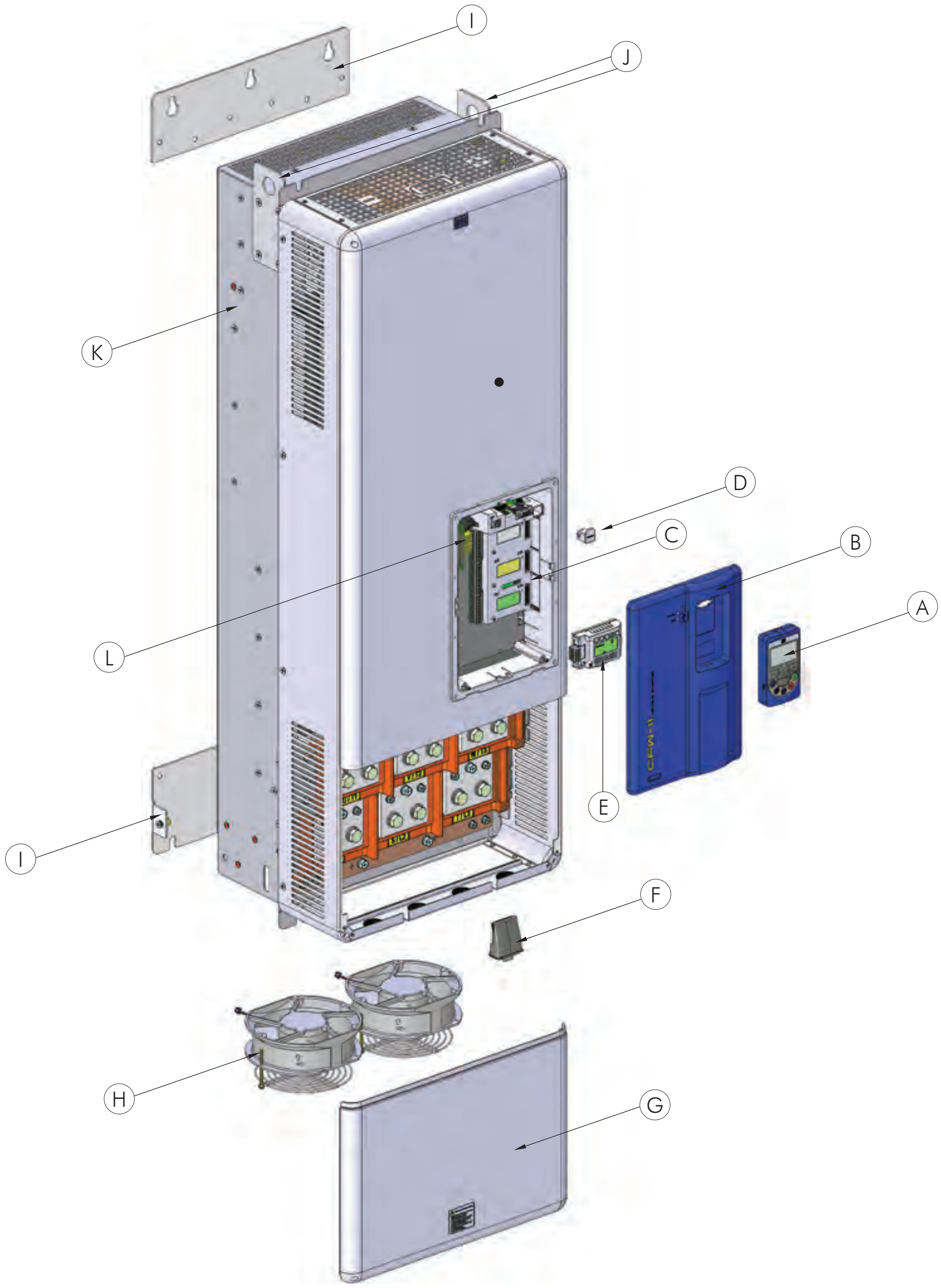


(b) Frame sizes F and G CFW-11 block diagram - Models with DC voltage feeding (Special DC Hardware)

***Figure 2.6 -** (a) and (b) - Block diagram for the CFW-11 - frame sizes F and G*

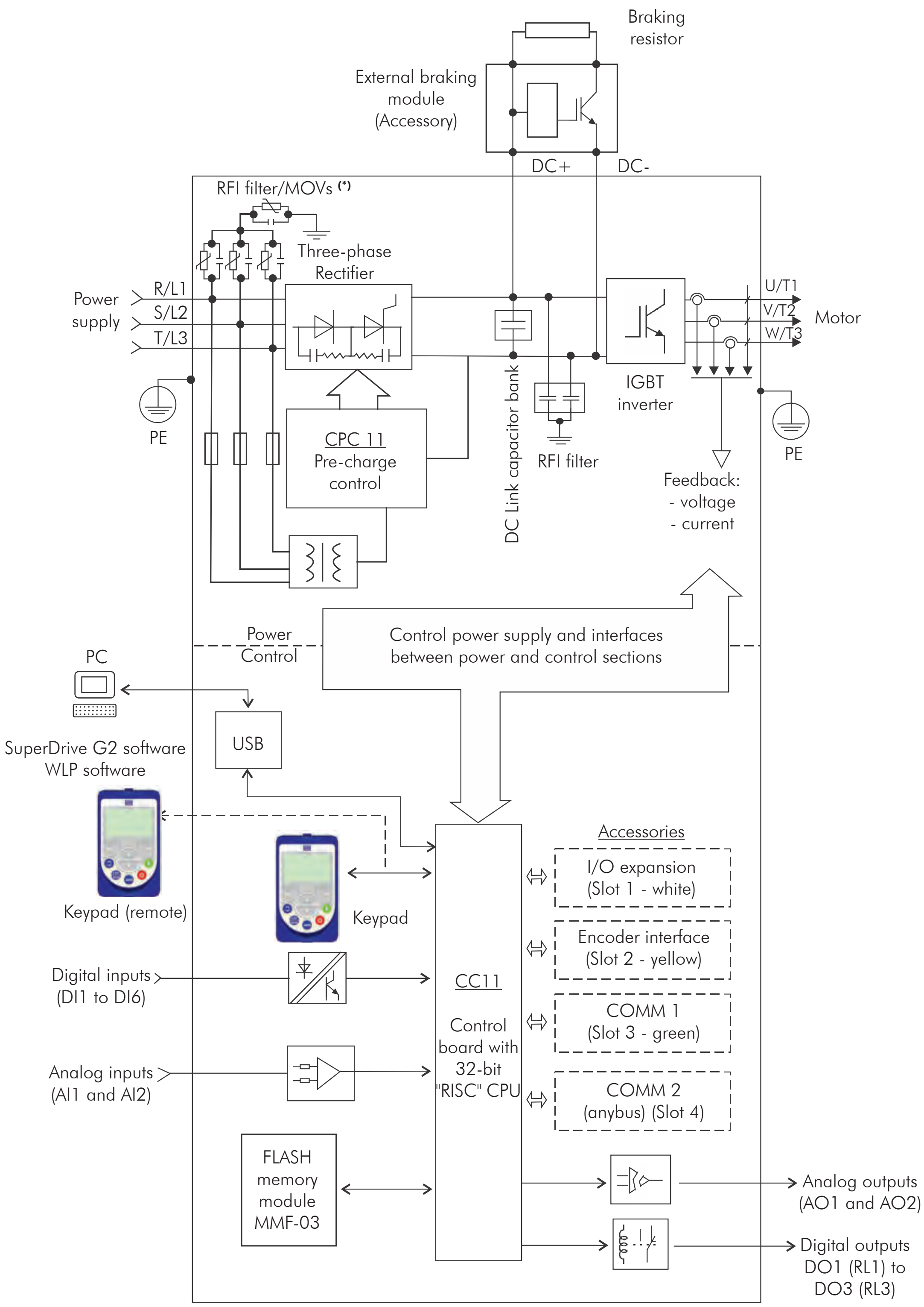
2

2



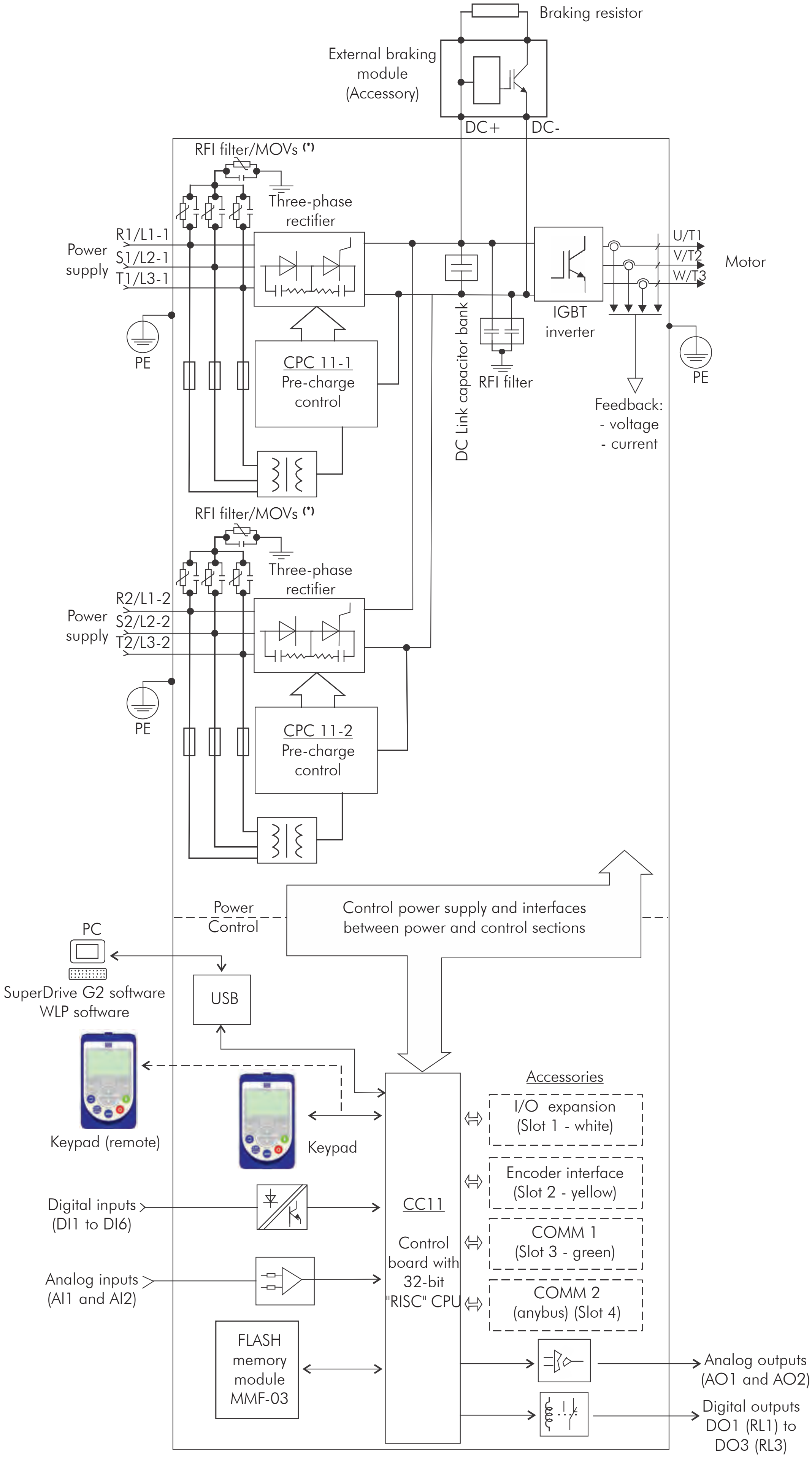
A - keypad
B - control rack cover
C - CC11 control board
D - FLASH memory module MMF-03
E - control accessory module
F - Anybus-CC accessory module
G - bottom front cover
H - bheatsink fan
I - mounting supports (for surface mounting)
J - hoisting eye
K - rear part of the inverter (external part for flange mounting)
L - SRB3 safety stop board

Figure 2.7 - *CFW-11 main components - frame sizes F and G*



(*) The RFI filter capacitor and MOV connected to the ground must be disconnected with IT and corner-grounded delta networks. Refer to Item 3.2.3.1.2 IT Networks on page 3-35.

Figure 2.8 - *Block diagram of standard models of CFW-11 frame size H (584 A and 625 A models) with alternating current feeding*



(*) The capacitor of RFI filter and MOV connected to the ground must be disconnected with IT network, high impedance grounding network and corner-grounded delta networks. Refer to Item 3.2.3.1.2 IT Networks on page 3-35.

Figure 2.9 - *Block diagram of standard models of CFW-11 frame size H (758 A and 804 A models) with alternating current*

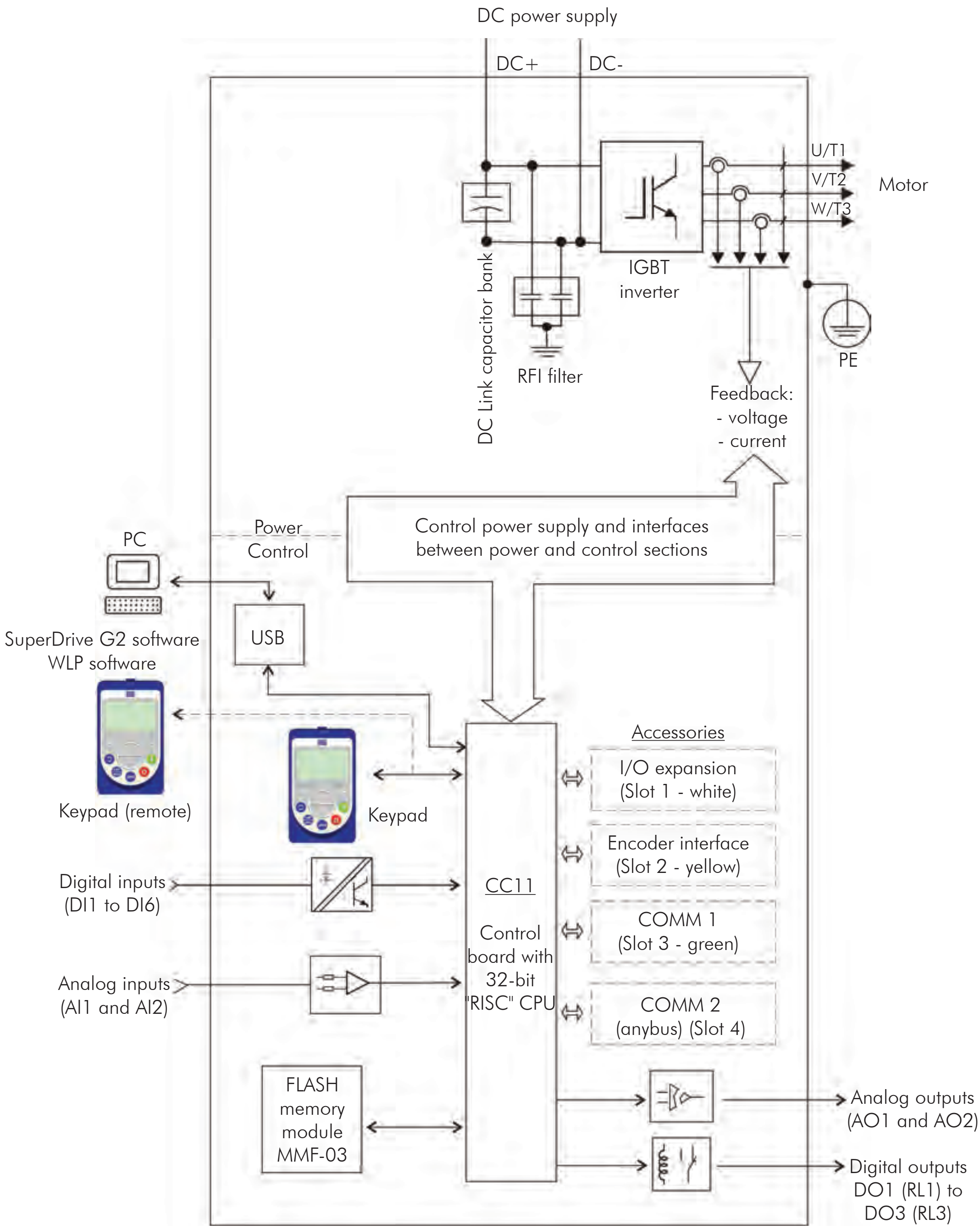
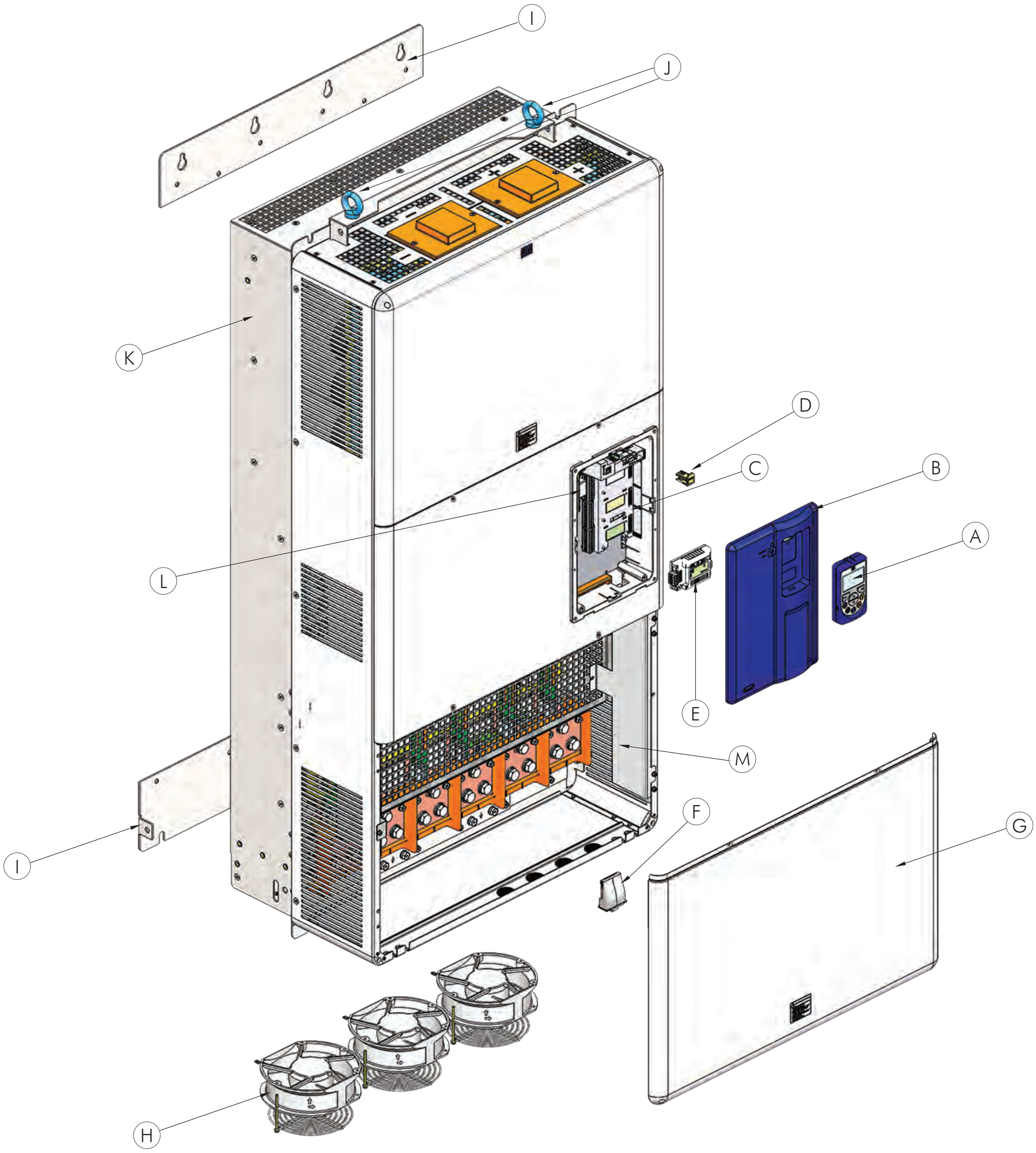


Figure 2.10 - *Block diagram of CFW-11 frame size H models with DC voltage feeding (special hardware DC)*

2

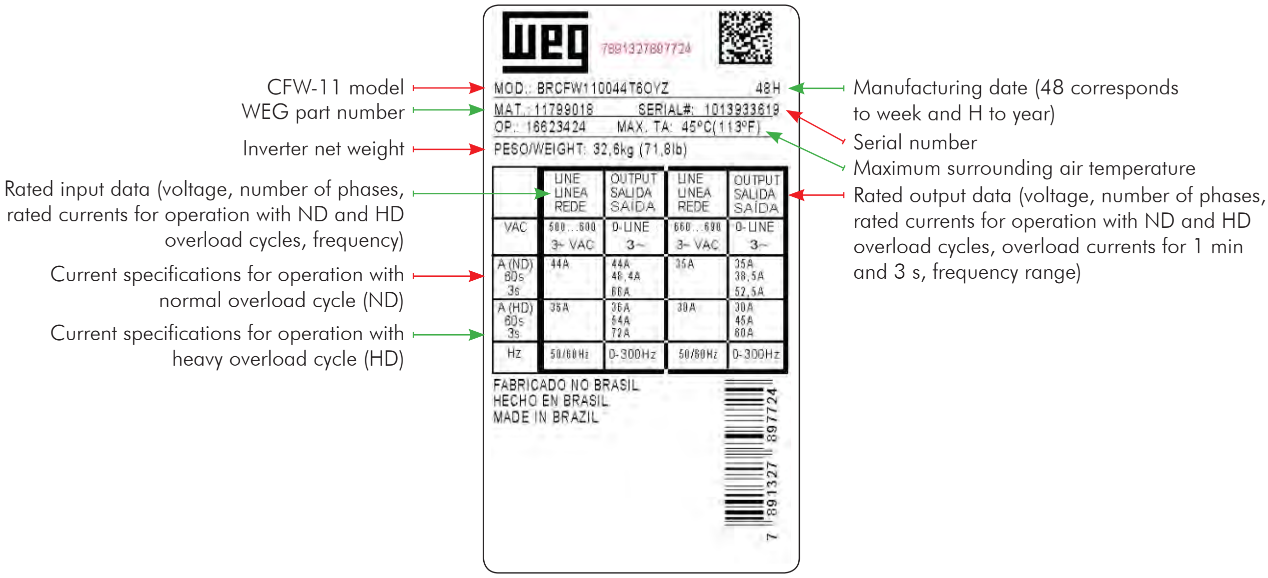


A - keypad
B - control rack cover
C - CC11 control board
D - FLASH memory module MMF-03
E - control accessory module
F - Anybus-CC accessory module
G - bottom front cover
H - heatsink fan
I - mounting supports (for surface mounting)
J - hoisting eye
K - rear part of the inverter (external part for flange mounting)
L - SRB3 safety stop board
M - shield for the control cables

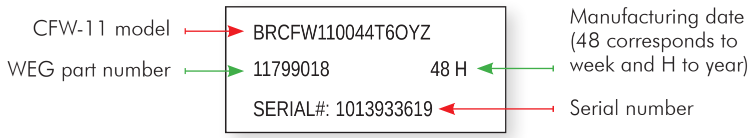
Figure 2.11 - *CFW-11 main components - frame size H*

2.4 IDENTIFICATION LABELS FOR THE CFW-11

There are two nameplates on the CFW-11: one complete nameplate is affixed to the side of the inverter and a simplified one is located under the keypad. The nameplate under the keypad allows the identification of the most important characteristics of the inverter even if they are mounted side-by-side.

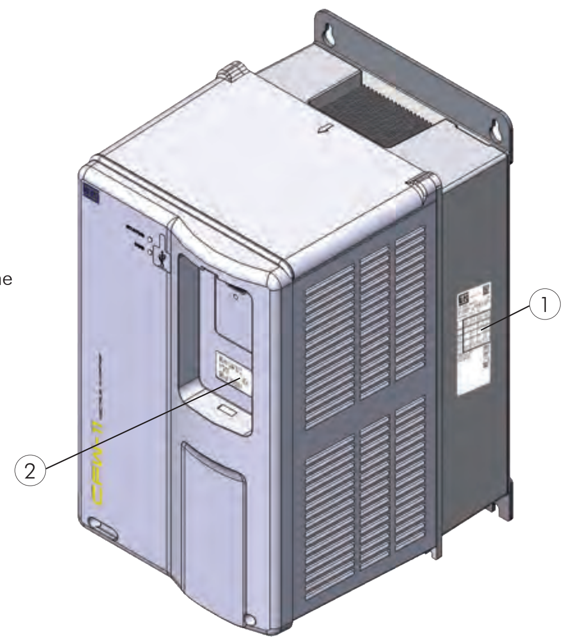


(a) Nameplate affixed to the side of the inverter



(b) Nameplate located under the keypad

Figure 2.12 - *(a) and (b) - Nameplates*



(1) Nameplate affixed to the side of the heatsink

(2) Nameplate under the keypad

Figure 2.13 - *Location of the nameplates*

HOW TO CODIFY THE CFW-11 MODEL (CODIFICATION)

	Inverter Model						Available Option Kits (Can Be Installed in the Product from the Factory)								
	Refer to Chapter 8 TECHNICAL SPECIFICATIONS on page 8-1, for a list of models for the CFW-11 series and for a complete inverter's technical specification						Refer to Chapter 7 OPTION KITS AND ACCESSORIES on page 7-1, to check option kit availability for each inverter model								
Example	BR	CFW11	0044	T	6	S	_ _	_ _	_ _	_ _	_ _	_ _	_ _	_ _	Z
Field description	Market identification (defines the manual language and the factory settings)	WEG CFW-11 frequency inverter series	Rated output current for use with the Normal Duty (ND) cycle	Number of power phases	Power supply voltage	Option kit	Enclosure type	Keypad (HMI)	Braking	RFI filter	Safety stop	24 Vdc external power supply for control	Special hardware	Special software	Character that identifies the code end
Available options	2 characters		According Table 8.1 on page 8-2 and Table 8.3 on page 8-4	T = three-phase power supply	5 = 500...600 V (8) 6 = 500...690 V (9)	S = standard product O = product with option kit	Blank = standard (1) N1 = Nema1 (6) 21 = IP21 (7)	Blank = standard (2) IC = no keypad (blind cover)	Blank = standard (3) NB = without braking IGBT (4)	Blank = standard internal RFI filter NF = without RFI filter (5)	Blank = standard (Safety Stop function is not available) Y = Safety Stop according to EN-954-1 category 3	Blank = standard (not available) W = 24 Vdc external power supply for control	Blank = standard DC= feeding with DC (only valid for frame sizes F and G) H1 = special hardware #1	Blank = standard E.g.: S1 = special software #1	

(1) Standard for frame sizes B and C: IP21.
Standard for frame size D: IP20/NEMA1.
Standard for frame sizes E, F, G and H: IP20.
Standard for frame sizes F, G and H with special hardware DC: IP00.
(2) Standard keypad (HMI-CFW11).
(3) Braking transistor (IGBT) is incorporated in all models of frame sizes B, C, D, and E as standard.
(4) Only valid for frame sizes D and E.
(5) Only valid for frame sizes B, C and D.
(6) Only valid for frame sizes B, C, D and E.
(7) Only valid for frame sizes D, E, F and G.
(8) Only valid for frame sizes B and C.
(9) Only valid for frame sizes D, E, F, G and H.

2.5 RECEIVING AND STORAGE

The CFW-11 is packaged and shipped in a cardboard box for models of frames B, and C.

The frame sizes D, E, F, G and H 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 inverter.

To open the package:

1. Remove the package front cover.

2. Take out the polystyrene foam protection.

Verify whether:

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

2. Any damage occurred during transportation.

Report any damage immediately to the carrier that delivered your CFW-11 inverter.

If the CFW-11 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 inverter is stored for a long period, it becomes necessary to perform the capacitor reforming. Refer to the procedure in the Section 6.5 PREVENTIVE MAINTENANCE on page 6-9 in the Table 6.3 on page 6-9.

2

3 INSTALLATION AND CONNECTION

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

3.1 MECHANICAL INSTALLATION

3.1.1 Installation Environment

NOTE!
The inverter are 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.

Environment conditions for the operation of the inverter:

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

  - 10 °C to 50 °C (14 °F to 122 °F) for frame sizes B, C and D models.

  - 10 °C to 45 °C (14 °F to 113 °F) for frame sizes E, F and G models.

  - 10 °C to 40 °C (14 °F to 104 °F) for frame size H.

- ☑ From 40 °C to 45 °C (104 °F to 113 °F) for frame size H: 1 % of current derating for each Celsius degree above maximum temperature as specified in item above.

  From 50 °C to 60 °C (122 °F to 140 °F) for frame sizes B, C and D models and from 45 °C to 55 °C (113 °F to 131 °F) for frame sizes E, F, G and H models: 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.

3

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

☑ Note that derating specified in items above applies also to dynamyc braking IGBT (columm effective braking current ($I_{effective}$) of Table 3.10 on page 3-40).

☑ 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 inverter weight at the Table 8.1 on page 8-2, Table 8.2 on page 8-3, Table 8.3 on page 8-4 and Table 8.4 on page 8-5.

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

External dimensions and fixing holes position according to the Figure 3.1 on page 3-3, Figure 3.2 on page 3-4 and Figure 3.2 on page 3-4. Refer to the Section 8.5 MECHANICAL DATA on page 8-9, for more details.

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

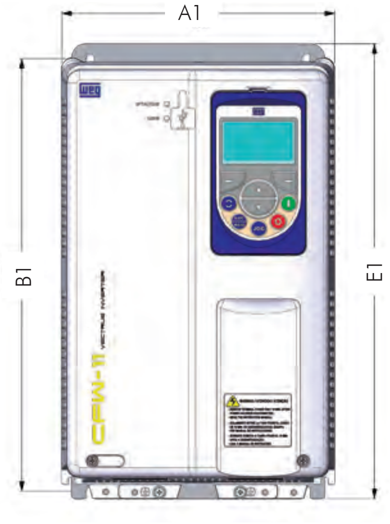
Minimum mounting clearances requirements for proper cooling air circulation are specified in Figure 3.3 on page 3-5, Figure 3.5 on page 3-9 and Figure 3.4 on page 3-6.

Inverters of frame sizes B and C can be arranged side-by-side with no clearance required between them. In this case, the top cover must be removed as shown in Figure 3.3 on page 3-5.

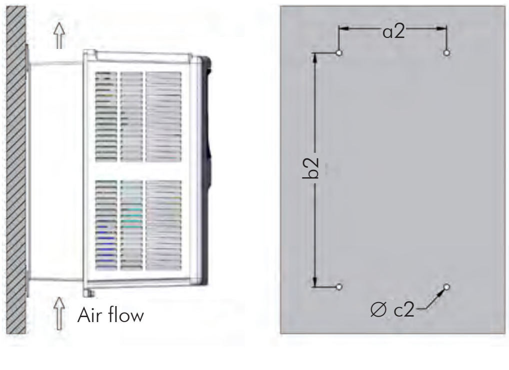
Do not install heat sensitive components right above the inverter.

ATTENTION!
When arranging two or more inverters vertically, respect the minimum clearance A + B (Figure 3.3 on page 3-5, Figure 3.5 on page 3-9 and Figure 3.4 on page 3-6) and provide an air deflecting plate so that the heat rising up from the bottom inverter does not affect the top inverter.

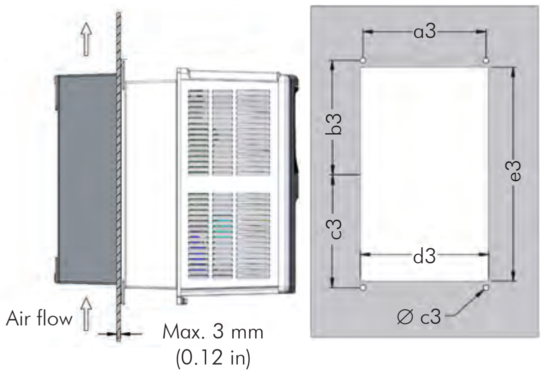
ATTENTION!
Provide conduit for physical separation of the signal, control, and power conductors (refer to Section 3.2 ELECTRICAL INSTALLATION on page 3-14).



(a) Dimension external



(b) Montagem em superfície

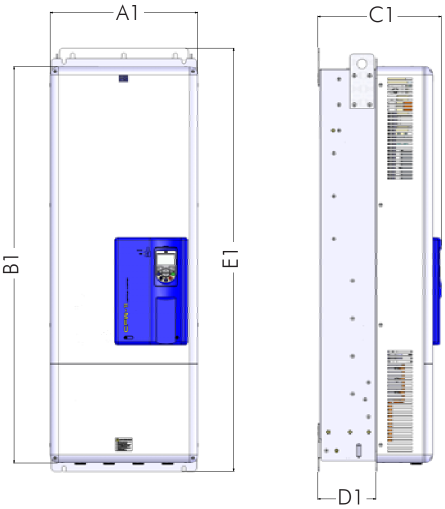


(c) Montagem em flange

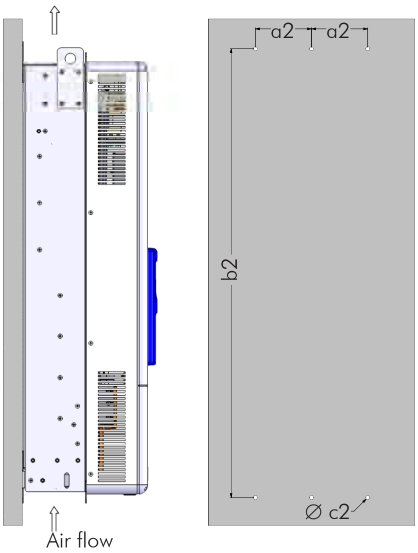
Model	A1	B1	C1	D1	E1	a2	b2	c2	a3	b3	c3	d3	e3	f3	Torque (*)
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	M	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	M	N.m (lbf.in)
Frame Size B	190 (7.48)	293 (11.53)	227 (8.94)	71 (2.79)	316 (12.44)	150 (5.91)	300 (11.81)	M5	175 (6.89)	142.5 (5.61)		180 (7.09)	272 (10.71)	M5	5.0 (44.2)
Frame Size C	220 (8.67)	378 (14.88)	293 (11.52)	136 (5.36)	405 (15.95)	150 (5.91)	375 (14.77)	M6	195 (7.68)	182.5 (7,18)		206 (8.11)	346 (13.62)	M6	8.5 (75.2)
Frame Size D	300 (11.81)	504 (19.84)	305 (12.00)	135 (5.32)	550 (21.65)	200 (7.88)	525 (20.67)	M8	275 (10.83)	255 (10.04)	262 (10.31)	287 (11.30)	487 (19.17)	M8	20.0 (177.0)

Tolerances for dimensions d3 and e3: +1.0 mm (+0.039 in).
Tolerances for remaining dimensions: ±1.0 mm (±0.039 in).
(*) Recommended torque for the inverter mounting (valid for c2 and f3).

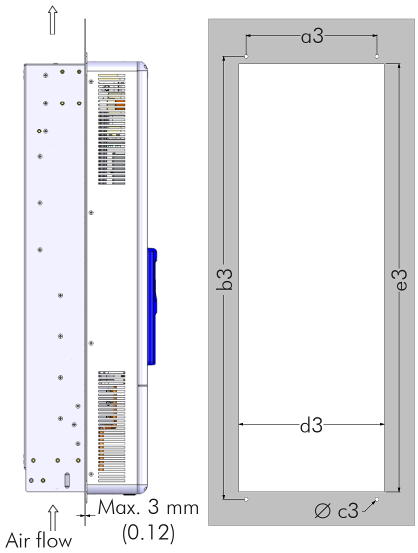
***Figure 3.1** - (a) to (c) - Mechanical installation details - frame sizes B, C and D*



(a) Dimension external



(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 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)
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)
Frame Size H	686.0 (27.00)	1319.7 (51.96)	420.8 (16.57)	171.7 (6.76)	1414.0 (55.67)	175.0 (6.89)	1350.0 (53.15)	M10	595.0 (23.43)	1345.0 (52.95)	M10	647.0 (25.47)	1307.0 (51.46)

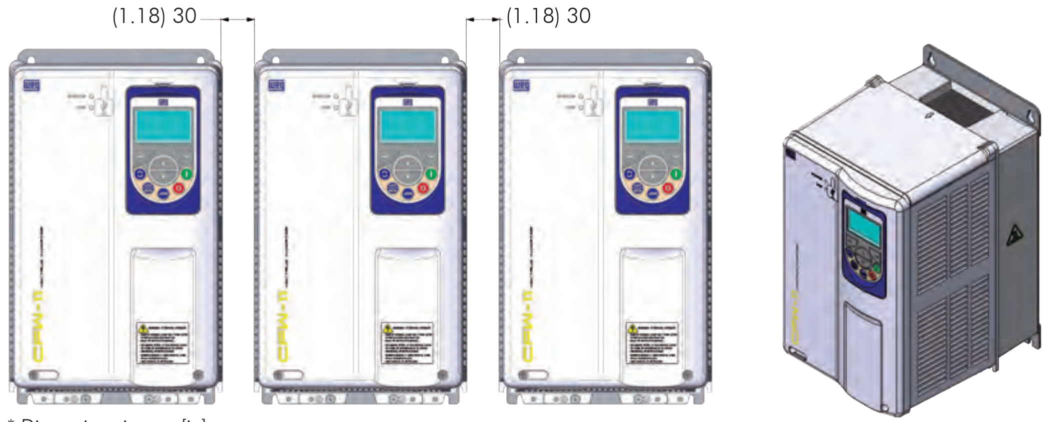
Tolerance for dimensions d3 and e3: +1.0 mm (+0.039 in).
Tolerance for remaining dimensions: ±1.0 mm (±0.039 in).

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

Model	A mm (in)	B mm (in)	C mm (in)
Frame Size B	40 (1.57)	45 (1.77)	10 (0.39)
Frame Size C	110 (4.33)	130 (5.12)	10 (0.39)
Frame Size D	110 (4.33)	130 (5.12)	10 (0.39)

Tolerance: ±1.0 mm (±0.039 in)

(a) Minimum top, bottom, and front clearance requirements for air circulation



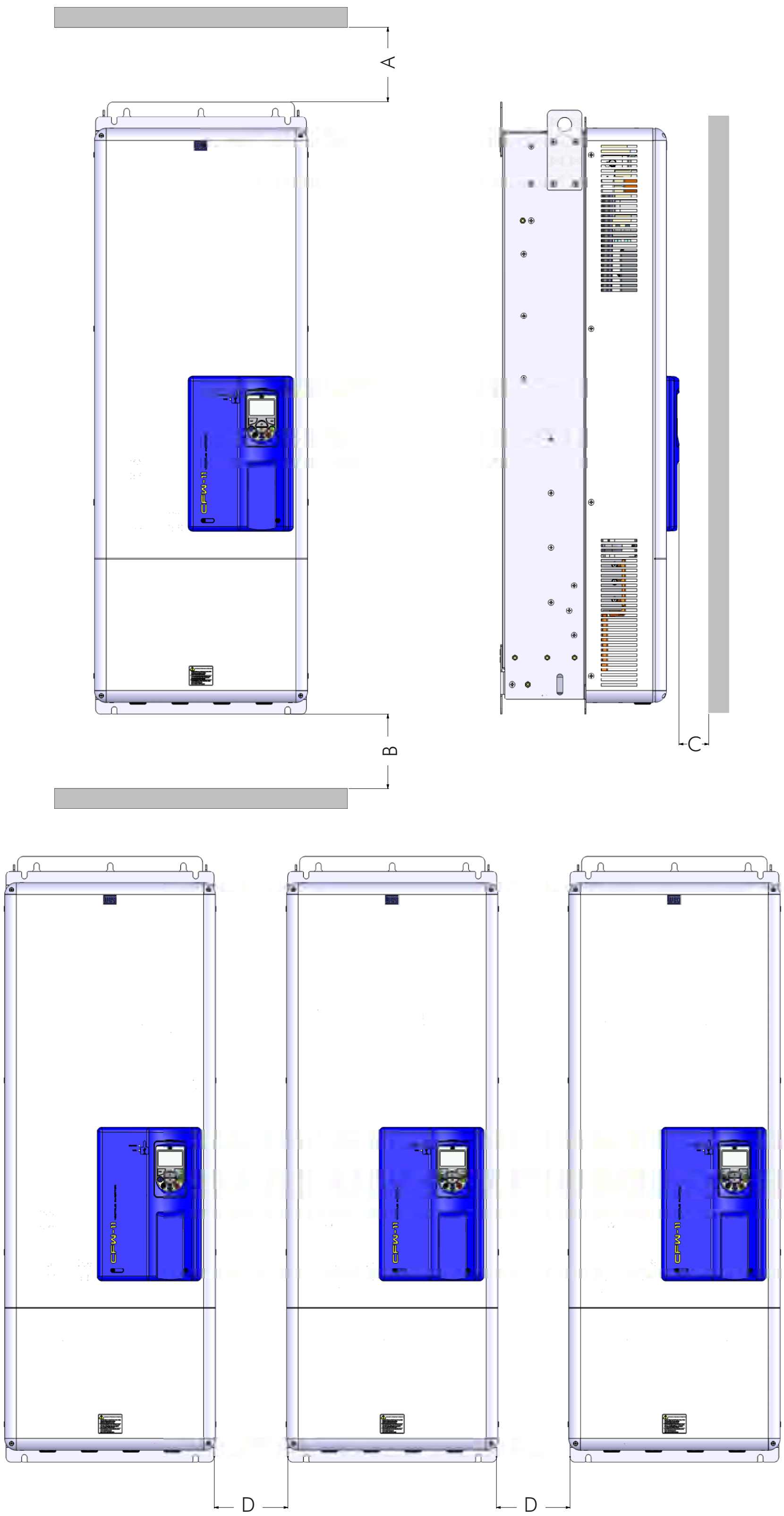
* Dimensions in mm [in]

(b) Minimum side clearance requirements

(c) Only frame sizes B and C: side-by-side mounting - No clearance required between inverters if top cover is removed

Figure 3.3 - *(a) to (c) - Free spaces around inverter for ventilation - frame sizes B, C and D*

3



Model	A mm (in)	B mm (in)	C mm (in)	D mm (in)
Frame Sizes E, F, G and H	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 inverter for ventilation - frame sizes E, F, G and H*

3.1.3 Cabinet Mounting

There are two possibilities for mounting the inverter: through the wall 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 Mounting:

- ☑ Provide adequate exhaustion so that the internal cabinet temperature is kept within the allowable operating range of the inverter.
- ☑ The power dissipated by the inverter 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 - through the wall mounting".
- ☑ The cooling air flow requirements, as shown in Table 3.1 on page 3-8.
- ☑ The position and diameter of the mounting holes, according to Figure 3.1 on page 3-3, Figure 3.2 on page 3-4 and Figure 3.2 on page 3-4.

Flange Mounting:

Frame Sizes B, C and D:

- ☑ The losses specified in Table 8.1 on page 8-2 and Table 8.3 on page 8-4 "Dissipated power in Watts - flange mounting" will be dissipated inside the cabinet. The remaining losses (power module) will be dissipated through the vents.
- ☑ The mounting supports shall be removed and repositioned as illustrated in Figure 3.5 on page 3-9.
- ☑ The portion of the inverter 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 Size E:

- ☑ The losses specified in Table 8.1 on page 8-2 and Table 8.3 on page 8-4 "Dissipated power in Watts - flange mounting" will be dissipated inside the cabinet. The remaining losses (power module) will be dissipated through the vents.
- ☑ The inverter securing supports (position **I** of Figure 2.5 on page 2-9) and the hoisting eyes (position **J** of Figure 2.5 on page 2-9) must be removed and repositioned according to the Figure 3.6 on page 3-10 and Figure 3.7 on page 3-10.
- ☑ For models 53 A, 63 A, 80 A and 107 A, the portion of the inverter 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 3.2 on page 3-4.

Frame Sizes F, G and H:

ATTENTION!
The part of the inverter 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. Use Table 8.1 on page 8-2 and Table 8.3 on page 8-4 for inverters with AC power supply and Table 8.2 on page 8-3 and Table 8.4 on page 8-5 for inverters with DC power supply. The other losses (power modules) will be dissipated at the external ventilation duct.

- ☑ The inverter mounting supports and the hoisting eyes must be removed. Refer to the Figure 3.8 on page 3-11, positions **I** and **J**.

3

- ☑ 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	m^3/min
B	42	20	1.2
C	96	45	2.7
D	132	62	3.7
E	265	125	7.5
F	460	217	13
G	680	321	19.3
H	1100	520	31.2

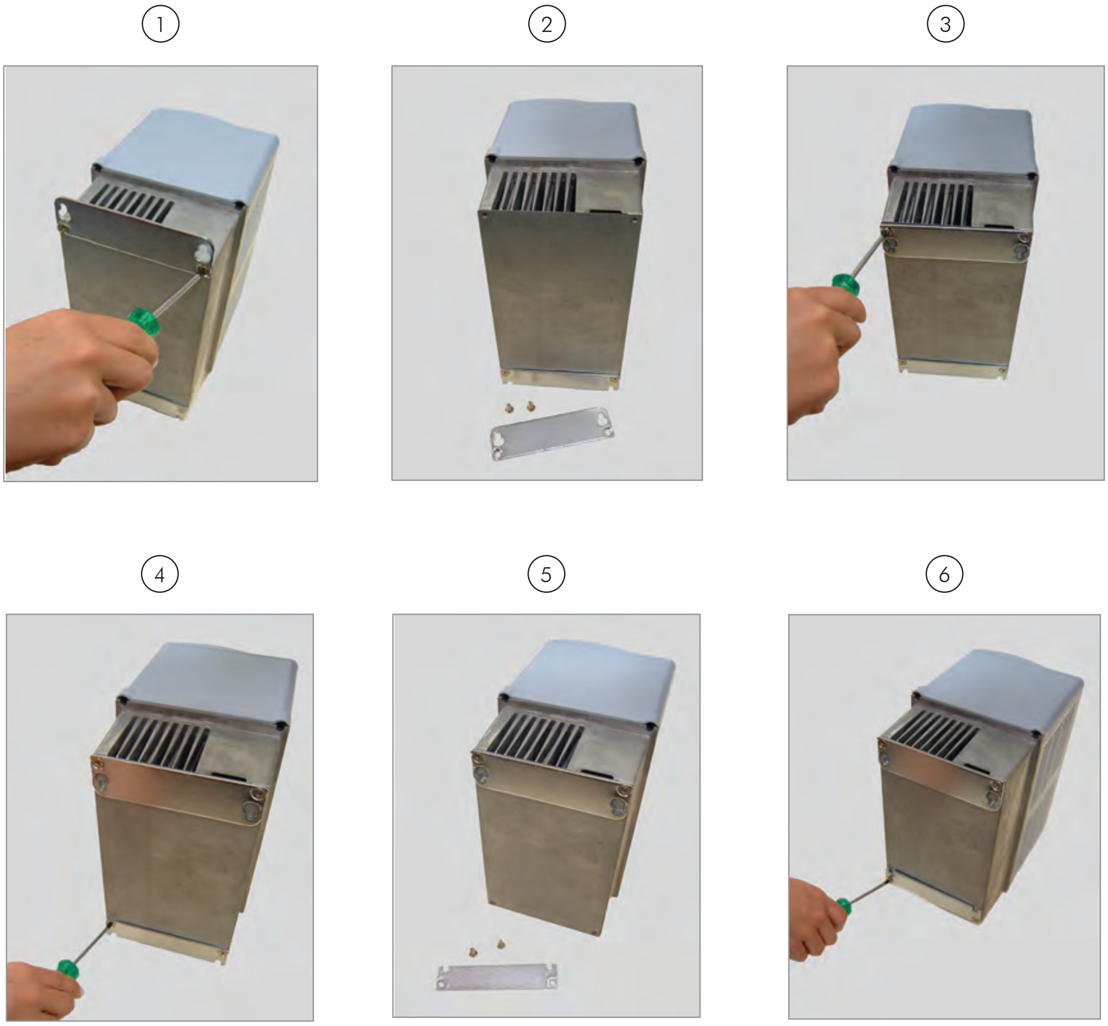


Figure 3.5 - *Repositioning the mounting supports - frame sizes B, C and D*

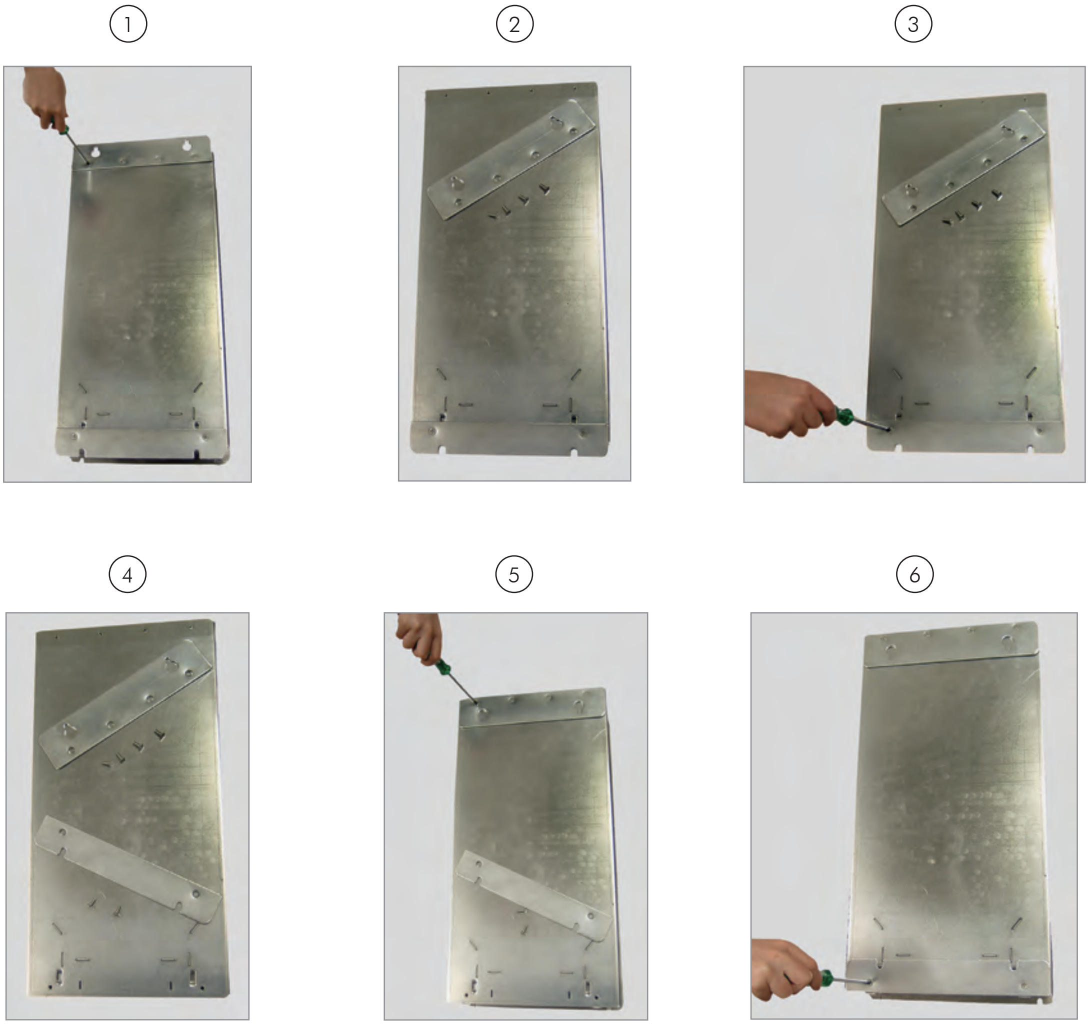


Figure 3.6 - *Repositioning the mounting supports - frame size E*

3.1.4 Installation of the Inverter Hoisting Eyes - Frame Size E

Two hoisting eyes for the inverter lifting, which are mounted at the inverter sides (rear part), are supplied. By inverting their position, as shown in Figure 3.7 on page 3-10, two points for hoisting the inverter, which are very useful during the mechanical installation of the inverter, are obtained.

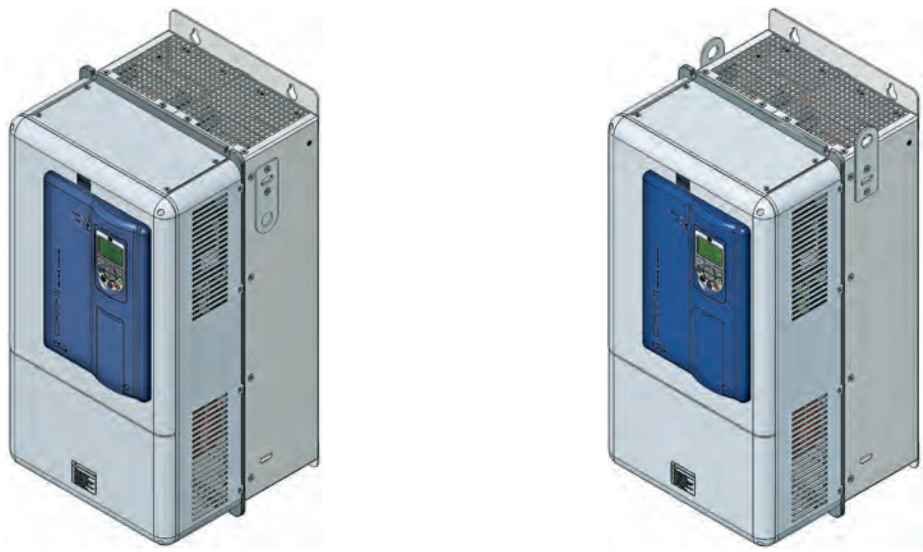


Figure 3.7 - *Installation of the inverter hoisting eyes frame size E*

3.1.5 Installation of the Inverter with Nema1 Kit (Option, CFW11....T...ON1...) on a Wall - Frame Size E

- ☑ Fixing holes position and diameter according to the Figure 3.2 on page 3-4 for frame size E models.
- ☑ External dimensions of the inverter with Nema1 kit according to Section 8.6 NEMA 1 KITs on page 8-16.
- ☑ Fasten the inverter.
- ☑ Install the Nema1 kit on the inverter as shown in Figure 3.8 on page 3-11 using the two M8 screws supplied with the product.

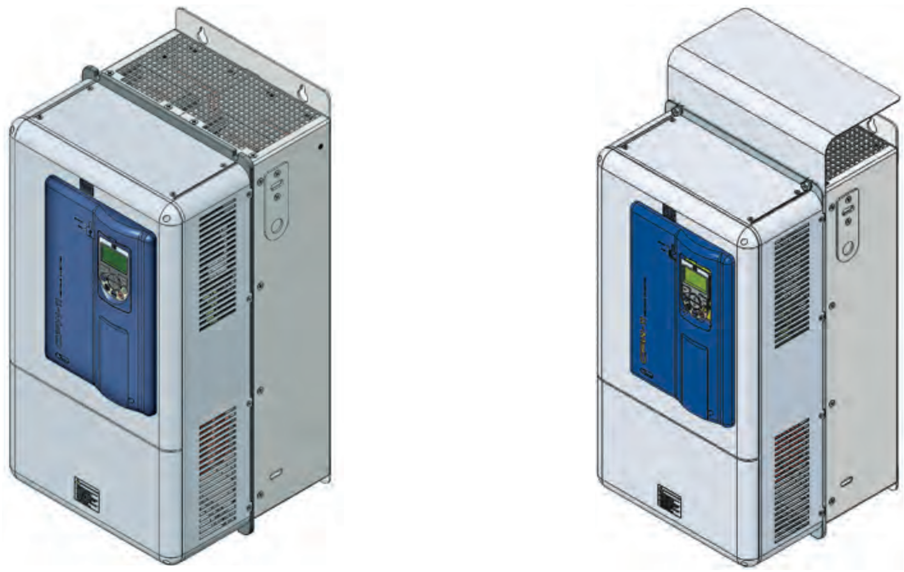


Figure 3.8 - *Installation of the Nema1 kit in frame size E model*

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3.1.6 Access to the Control and Power Terminal Strips

Frame Sizes B and C:

It is necessary to remove the keypad and the front cover in order to get access to the control and power terminal strips.

Figure 3.9 - *Removal of keypad and front cover - frame sizes B and C*

Frame Sizes D and 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 3.10 on page 3-12). In order to get access to the power terminal strip, remove the bottom front cover (see Figure 3.11 on page 3-12).

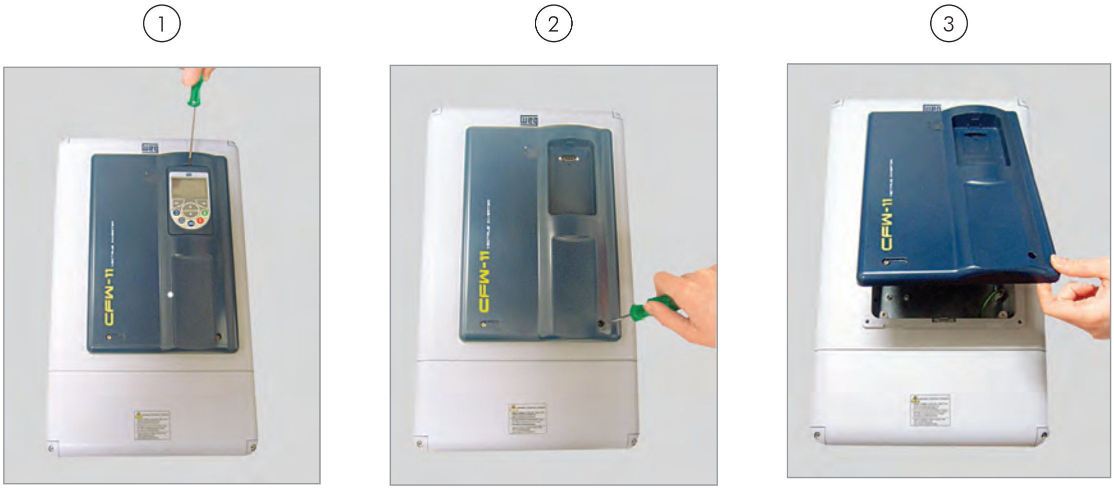

Figure 3.10 - *HMI and control rack cover removal - frame sizes D and E*

Figure 3.11 - *Bottom front cover removal - frame sizes D and E*

Frame Sizes F, G and H:

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 3.12 on page 3-13.

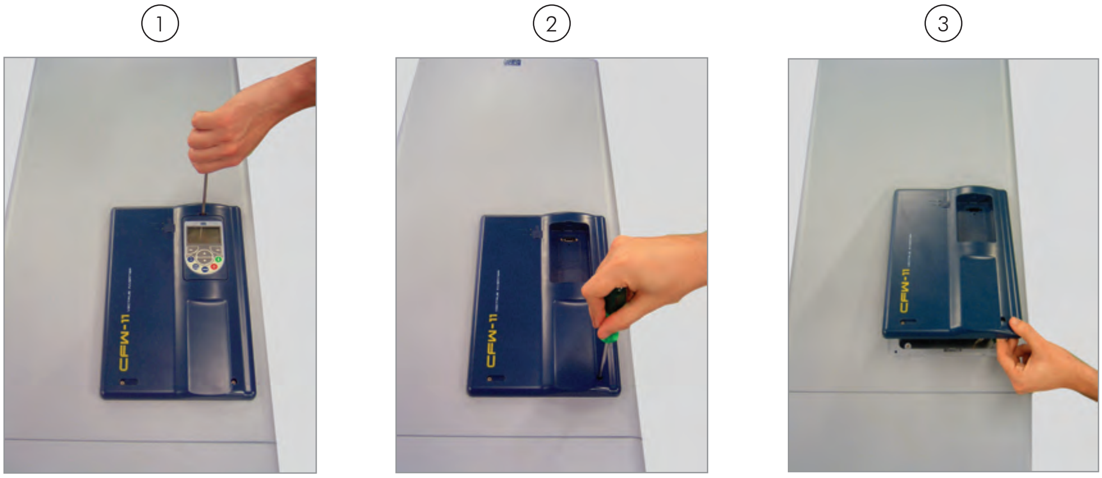

Figure 3.12 - *Removal of the HMI and the control rack cover - frame sizes F, G and H*

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In order to get access to the power terminals, it is necessary to remove the bottom front cover, as shown in Figure 3.13 on page 3-13.

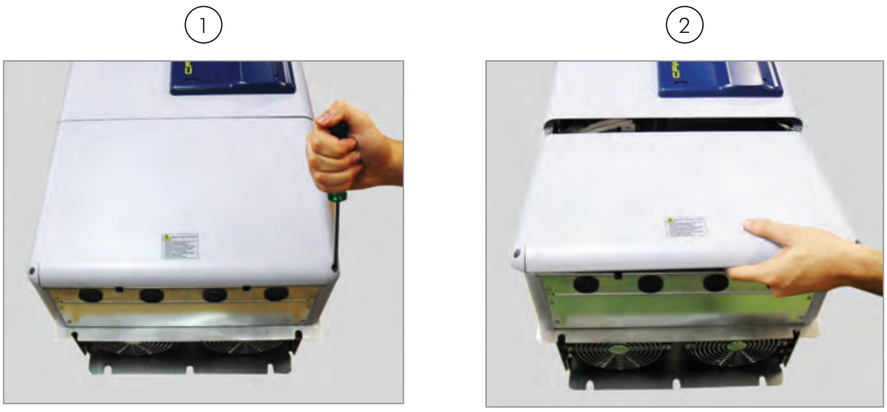


Figure 3.13 - *Removal of the bottom front cover, to access to the power supply and motor connection terminals - frame sizes F, G and H*

In order to connect the power cables (line and motor), remove the bottom plate, as shown in Figure 3.14 on page 3-13. In this case the protection degree of the inverter bottom part will be reduced.

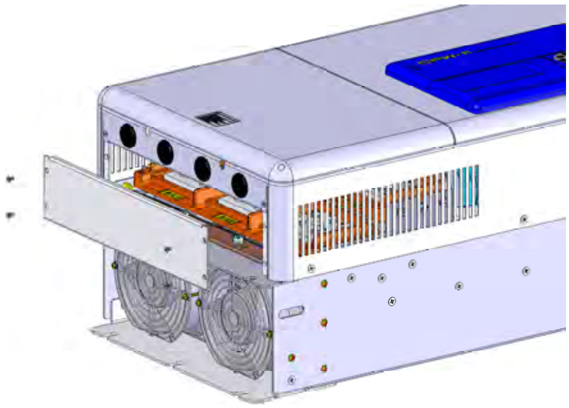


Figure 3.14 - *Removal of the bottom plate, to access the power terminals - frame sizes F, G and H*

3.1.7 Removal of the Cable Passage Plate - Frame Sizes D and E

When it is not necessary neither IP20 nor Nema1 protection degree, the cable passage plate may be removed in order to make the inverter electric installation easier. Remove the four M4 screws, according to the procedure presented in Figure 3.15 on page 3-14.

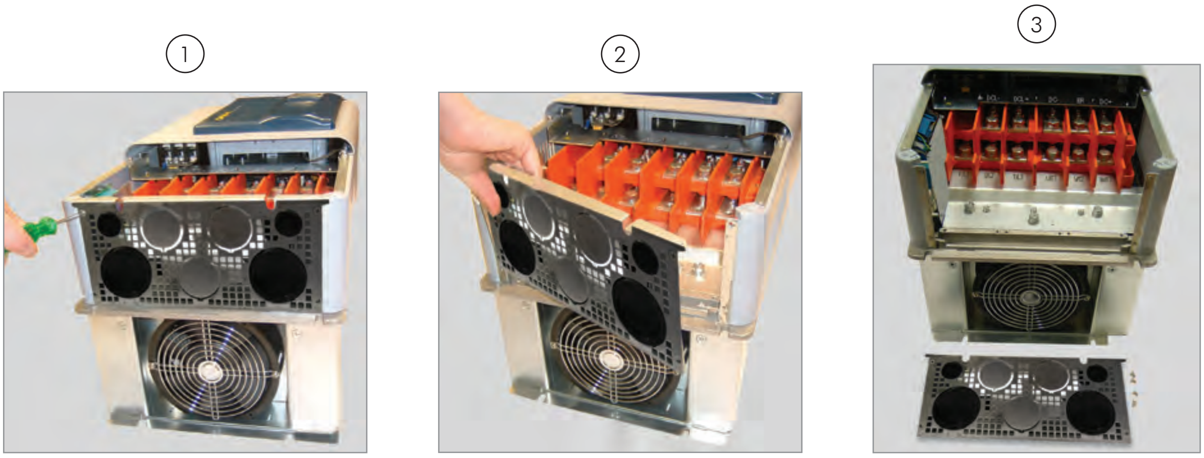


***Figure 3.15** - Removal of the cable passage plate - frame sizes D and E*

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

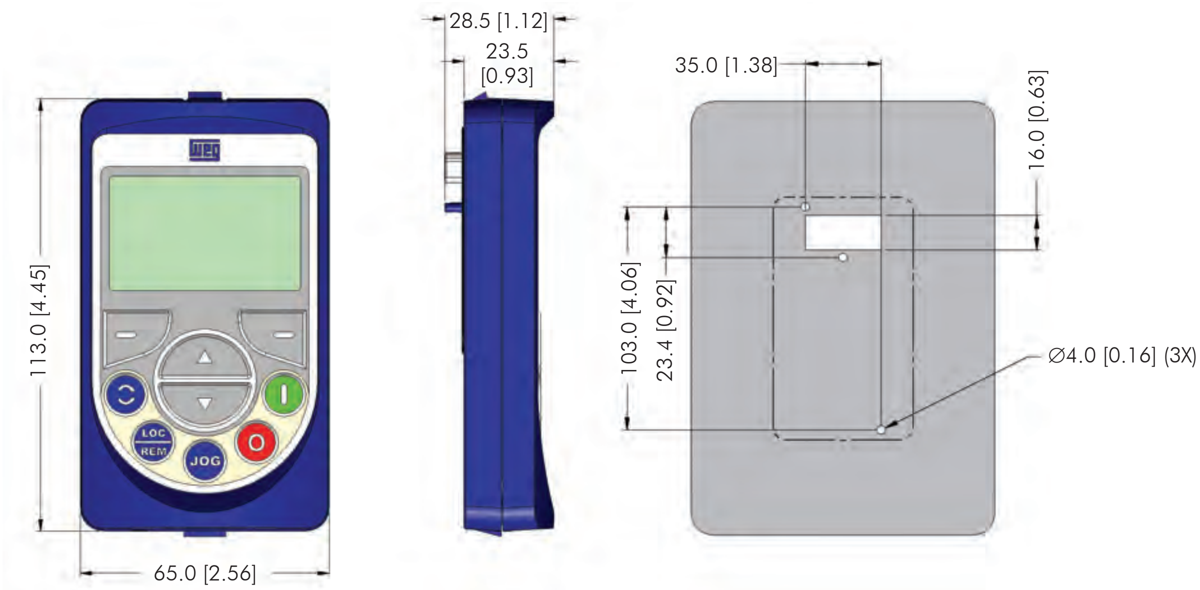


***Figure 3.16** - Data for the HMI installation at the cabinet door or command panel - mm [in]*

The keypad frame accessory can also be used to fix the HMI, as mentioned in 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!
Les informations suivantes constituent uniquement un guide pour une installation correcte. Respectez les réglementations locales en vigueur pour les installations électriques.

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

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

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

3.2.1 Identification of the Power and Grounding Terminals

R/L1, S/L2, T/L3: AC power supply connection.

U/T1, V/T2, W/T3: motor connection.

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

BR: braking resistor connection (frame sizes B, C, D and E only).

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

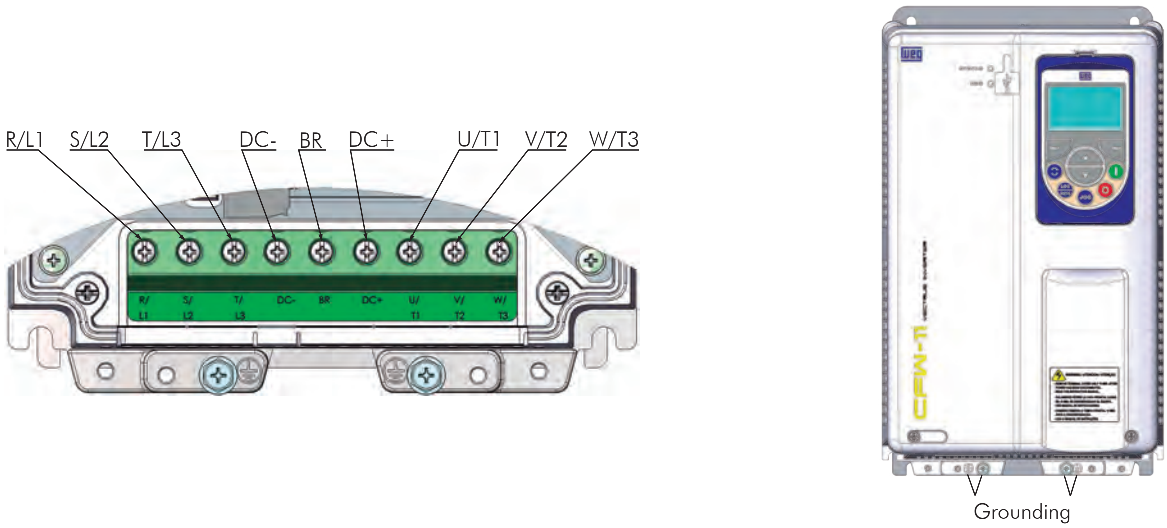


***Figure 3.17** - Grounding and power terminals of frame sizes B and C models*

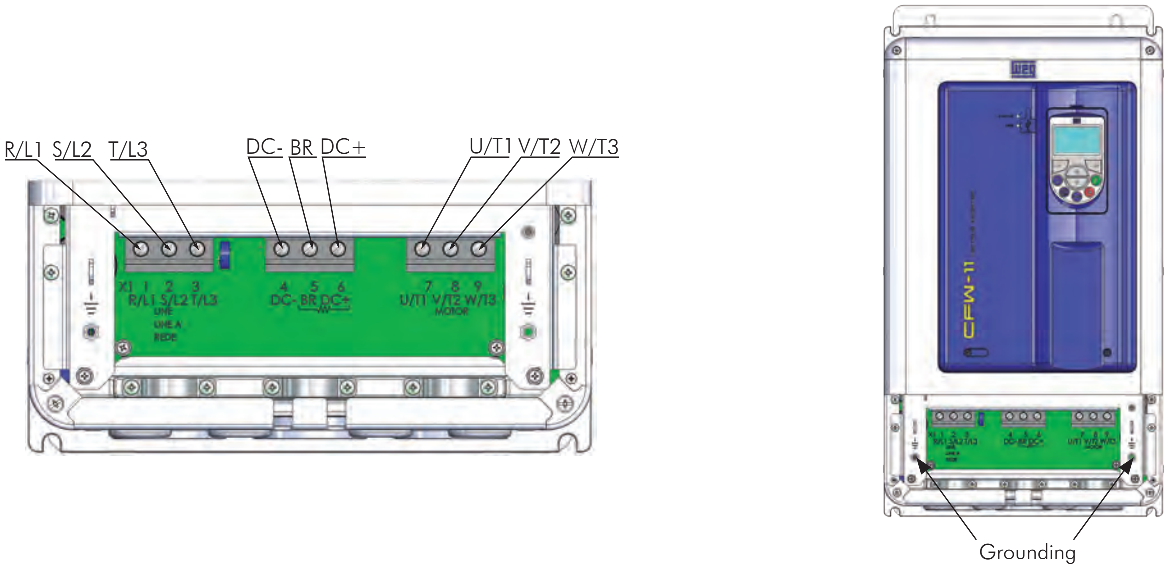


Figure 3.18 - *Grounding and power terminals of frame size D models*

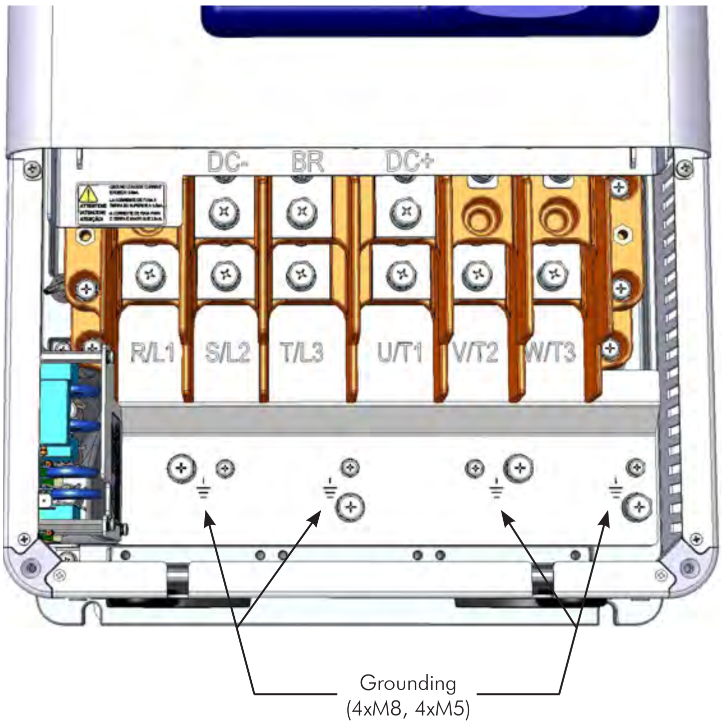
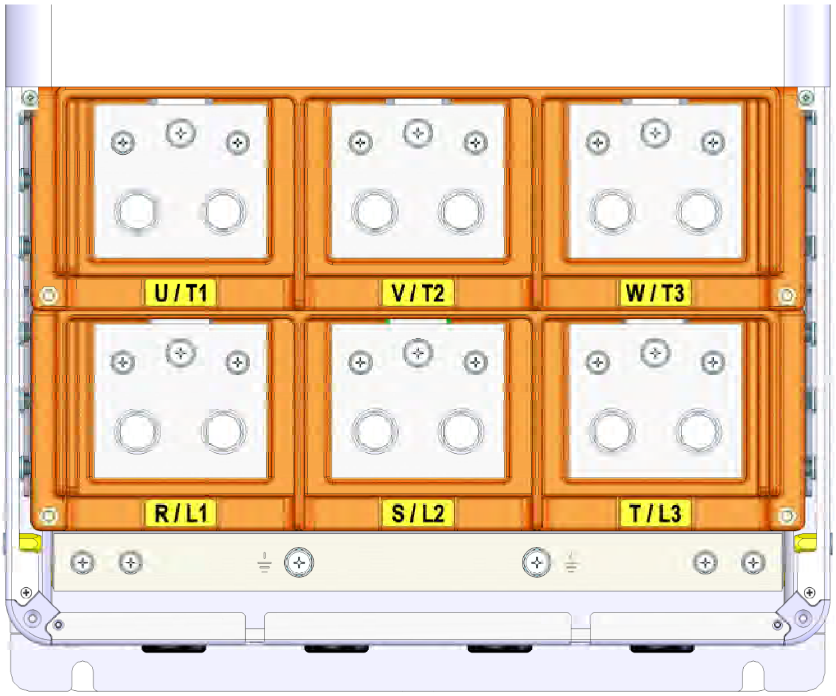


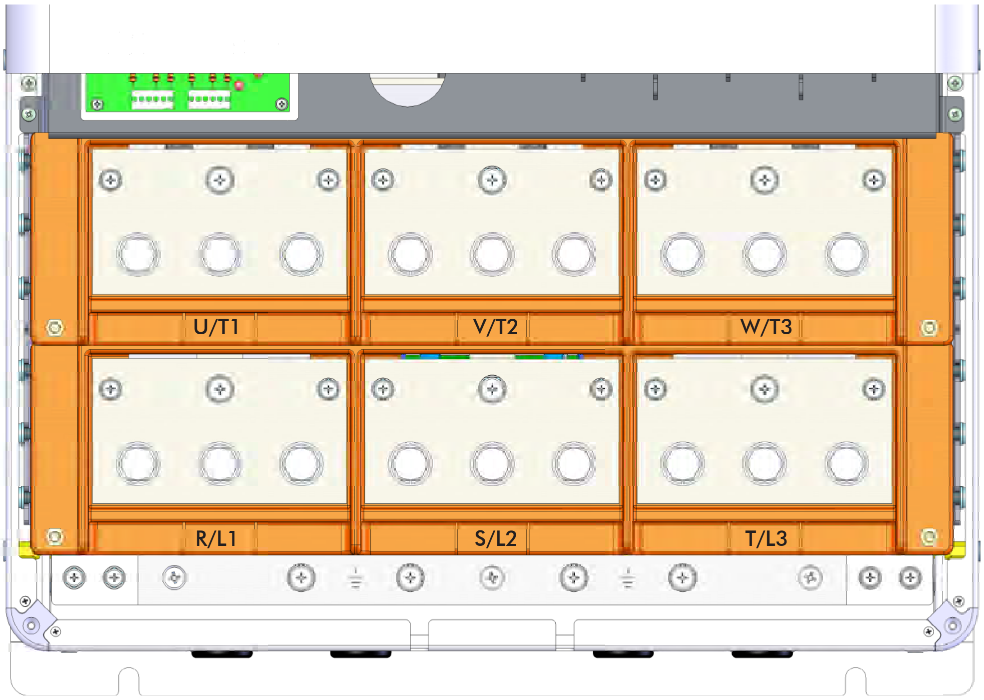
Figure 3.19 - *Grounding and power terminals of frame size E models*



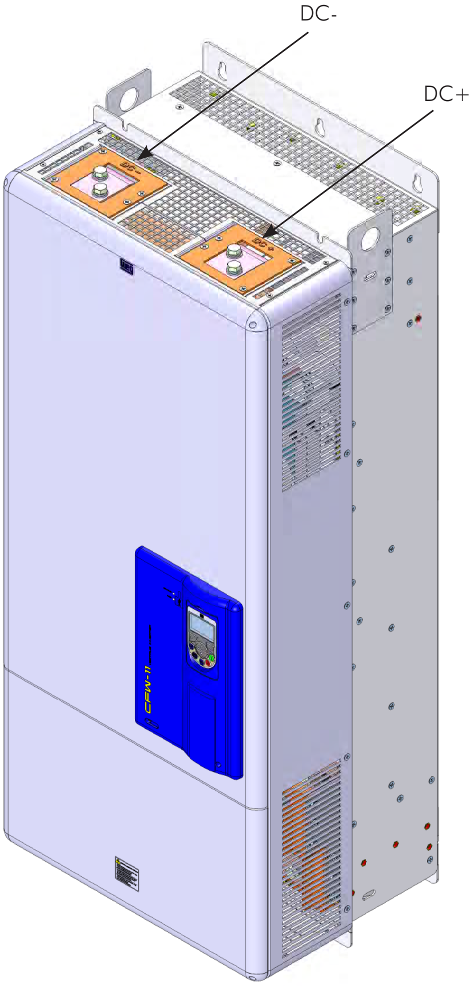
(a) ***Terminals for AC power supply and motor connection (terminals R/L1, S/L2 and T/L3 are not assembled in inverters with special hardware DC)***

(b) ***Terminals for DC power supply connection (only available in inverters with special hardware DC)***

Figure 3.20 - *(a) and (b) - Grounding and power terminals of frame size F models*



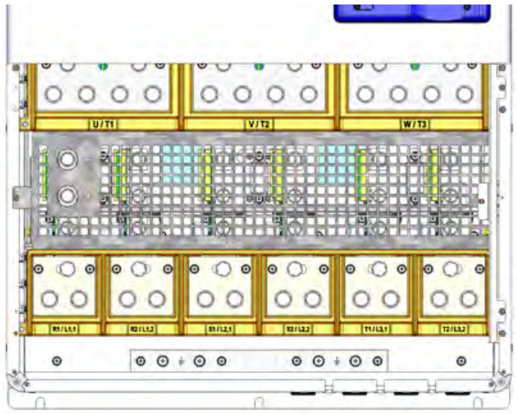
(a) Terminals for AC power supply and motor connection (terminals R/L1, S/L2 and T/L3 are not assembled in inverters with special hardware DC)



(b) Terminals for DC power supply connection (only available in inverters with special hardware DC)

Figure 3.21 - *(a) and (b) - Grounding and power terminals of frame size G models*

(a) Models 584 and 625 A



(b) Models 758 A and 804 A

(c) Frame size H

Figure 3.22 - *(a) to (c) - Grounding and power terminals of frame size H models*

3.2.2 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 frequency inverter and from the cables that connect the inverter to the motor.

DANGER!
Wrong cable connection:
- The inverter will be damaged if the power supply is connected to the output terminals (U/T1, V/T2, or W/T3).
- Check all the connections before powering up the inverter.
- When replacing an existing inverter by a CFW-11, check if the installation and wiring is according to the instructions listed in this manual.

DANGER!
Mauvaise connexion des câbles:
- Le variateur sera endommagé si l’alimentation d’entrée est connectée aux bornes de sortie (U/T1, V/T2 ou W/T3).
- Vérifier toutes les connexions avant de mettre le variateur sous tension.
- En cas de remplacement d’un variateur existant par un CFW-11, vérifier si l’installation et le câblage sont conformes aux instructions figurant dans ce manuel.

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 inverter.
- Depending on the installation (motor cable length, cable type, multimotor configuration, etc.), RCD nuisance trips may occur. Contact the RCD manufacturer for selecting the most appropriate device to be used with inverters.

NOTE!
The wire gauges listed in Table 3.2 on page 3-21 are orientative values. Installation conditions and the maximum permitted voltage drop must be considered for the proper wiring sizing.

Input fuses:

☑ Use High Speed Fuses at the input for the protection of the inverter rectifier and wiring refer to Table 3.2 on page 3-21 for selecting the appropriate fuse rating (I^2t must be equal to or less than indicated in Table 3.2 on page 3-21, consider the cold (and not the fusion) current extinction value).

☑ In order to meet UL requirements, use class **J** fuses at the inverter supply with a current not higher than the values of Table 3.2 on page 3-21.

☑ Optionally, slow blow fuses can be used at the input they must be sized for 1.2 x the inverter rated input current. In this case, the installation is protected against short-circuit, but not the inverter input rectifier. This may result in major damage to the inverter in the event of an internal component failure.

***Table 3.2 -** Recommended wire size/fuses - use copper wire (75 ºC (167 ºF)) - frame size B, 500 to 600 Vac supply voltage*

Model	Power Terminals			Overload Class	Wire Size			Recommended Fuse			
	Terminals	Screw Thread/ Screw Head Type	Recommended Torque N.m (lbf.in)		mm^2	AWG	Wire Terminal Bype	I^2t [A^2s]	UL [A]	WEG Fuse In[A]	WEG Fuse Model
CFW110002T5	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M4 (Slotted and Phillips head) (comb)	1.2 (10.8)	HD/ND	1.5	14	Pin terminal	1250	20	20	FNH00-20K-A
	⏚ (PE)	M4 (Phillips head)	1.7 (15.0)		2.5		Ring tongue				
CFW110004T5	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M4 (Slotted and Phillips head) (comb)	1.2 (10.8)	HD/ND	1.5	14	Pin terminal	1250	20	20	FNH00-20K-A
	⏚ (PE)	M4 (Phillips head)	1.7 (15.0)		2.5		Ring tongue				
CFW110007T5	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M4 (Slotted and Phillips head) (comb)	1.2 (10.8)	HD/ND	1.5	14	Pin terminal	1250	20	20	FNH00-20K-A
	⏚ (PE)	M4 (Phillips head)	1.7 (15.0)		2.5		Ring tongue				
CFW110010T5	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M4 (Slotted and Phillips head) (comb)	1.2 (10.8)	HD/ND	2.5	14	Pin terminal	1250	20	20	FNH00-20K-A
	⏚ (PE)	M4 (Phillips head)	1.7 (15.0)				Ring tongue				
CFW110012T5	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M4 (Slotted and Phillips head) (comb)	1.2 (10.8)	HD/ND	2.5	12	Pin terminal	1250	25	25	FNH00-25K-A
	⏚ (PE)	M4 (Phillips head)	1.7 (15.0)				Ring tongue				
CFW110017T5	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M4 (Slotted and Phillips head) (comb)	1.2 (10.8)	HD/ND	4	10	Pin terminal	1250	40	35	FNH00-35K-A
	⏚ (PE)	M4 (Phillips head)	1.7 (15.0)				Ring tongue				

Table 3.3 - *Recommended wire size/fuses - use copper wire (75 ºC (167 ºF)) - frame size C, 500 to 600 Vac supply voltage*

Model	Power Terminals			Overload Class	Wire Size			Recommended Fuse			
	Terminals	Screw Thread/ Screw Head Type	Recommended Torque N.m (lbf.in)		mm²	AWG	Wire Terminal Bype	I²t [A²s]	UL [A]	WEG Fuse In[A]	WEG Fuse Model
CFW110022T5	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M5 (Pozidriv head)	2.7 (24.0)	ND/HD	6	10	Pin terminal	7.200	40	40	FNH00-40K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				
CFW110027T5	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M5 (Pozidriv head)	2.7 (24.0)	ND/HD	10	8	Pin terminal	7.200	50	50	FNH00-50K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				
CFW110032T5	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M5 (Pozidriv head)	2.7 (24.0)	ND/HD	10	8	Pin terminal	7.200	60	63	FNH00-63K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				
CFW110044T5	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M5 (Pozidriv head)	2.7 (24.0)	ND/HD	10	6	Pin terminal	7.200	60	80	FNH00-80K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				

(1) There is a plastic cover in front of the DC- terminal at the frame sizes B and C inverters. It is necessary to break off that cover in order to get access to this terminal.

3

Table 3.4 - *Recommended wire size/fuses - use copper wire (75 ºC (167 ºF)) - frame size D, 500 to 690 Vac supply voltage*

Model	Power Terminals			Overload Class	Wire Size			Recommended Fuse			
	Terminals	Screw Thread/ Screw Head Type	Recommended Torque N.m (lbf.in)		mm²	AWG	Wire Terminal Type	I²t [A²s]	UL [A]	WEG Fuse In[A]	WEG Fuse Model
CFW110002T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M4 (Slotted and Phillips head) (comb)	1.2 (10.8)	HD/ND	1.5	14	Pin terminal	7200	20	20	FNH00-20K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)		2.5		Ring tongue				
CFW110004T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M4 (Slotted and Phillips) (comb)	1.2 (10.8)	HD/ND	1.5	14	Pin terminal	7200	20	20	FNH00-20K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)		2.5		Ring tongue				
CFW110007T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M4 (Slotted and Phillips) (comb)	1.2 (10.8)	HD/ND	1.5	14	Pin terminal	7200	20	20	FNH00-20K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)		2.5		Ring tongue				
CFW110010T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M4 (Slotted and Phillips((comb)	1.2 (10.8)	HD/ND	2.5	14	Pin terminal	7200	20	20	FNH00-20K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				
CFW110012T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M4 (Slotted and Phillips) (comb)	1.2 (10.8)	HD/ND	2.5	12	Pin terminal	7200	25	25	FNH00-25K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				
CFW110017T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M4 (Slotted and Phillips) (comb)	1.2 (10.8)	HD/ND	4	10	Pin terminal	7200	40	35	FNH00-35K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				
CFW110022T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M4 (Slotted and Phillips) (comb)	1.2 (10.8)	HD/ND	6	10	Pin terminal	7200	50	40	FNH00-40K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				
CFW110027T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M4 (Slotted and Phillips) (comb)	1.2 (10.8)	HD/ND	10	8	Pin terminal	7200	50	50	FNH00-50K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				
CFW110032T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M4 (Slotted and Phillips) (comb)	1.2 (10.8)	HD/ND	10	8	Pin terminal	7200	60	63	FNH00-63K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				
CFW110044T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M4 (Slotted and Phillips) (comb)	1.2 (10.8)	HD/ND	10	6	Pin terminal	7200	60	80	FNH00-80K-A
	⏚(PE)	M5 (Phillips head)	3.5 (31.0)				Ring tongue				

3

Table 3.5 - *Recommended wire size/fuses - use copper wire (75 ºC (167 ºF)) - frame size E, 500 to 690 Vac supply voltage*

Model	Power Terminals: Terminals	Power Terminals: Screw Thread/ Screw Head Type	Power Terminals: Recommended Torque N.m (lbf.in)	Overload Class	Wire Size: mm²	Wire Size: AWG	Wire Size: Terminals	Recommended Fuse: I²t [A²s]	Recommended Fuse: UL [A]	Recommended Fuse: WEG Fuse In[A]	Recommended Fuse: WEG Fuse Model	WEG Recommended Fuses FNHFE aR Flush End: Frame Size	WEG Recommended Fuses FNHFE aR Flush End: In [A]	WEG Recommended Fuses FNHFE aR Flush End: Item SAP
CFW110053T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M8 (hexagonal screw)	15 (132.75)	HD	10	6	Ring tongue	39200	100	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								
CFW110063T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M8 (hexagonal screw)	15 (132.75)	HD	25	5	Ring tongue	39200	100	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								
CFW110080T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M8 (hexagonal screw)	15 (132.75)	HD	25	3	Ring tongue	39200	125	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								
CFW110107T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M8 (hexagonal screw)	15 (132.75)	HD	50	1	Ring tongue	39200	160	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								
CFW110125T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M8 (hexagonal screw)	15 (132.75)	HD	50	1	Ring tongue	218000	200	200	FNH00-200K-A	3	450	12644962
				ND	50	1/0								
	⏚(PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ND	35	2								
CFW110150T6	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC-	M8 (hexagonal screw)	15 (132.75)	HD	50	1/0	Ring tongue	218000	250	250	FNH00-250K-A	3	450	12644962
				ND	70	2/0								
	⏚(PE)	M5 and M8 (hexagonal phillips screw)	M5: 3.5 (31.0) M8: 10 (88.5)	HD/ND	50	1								

Table 3.6 - *Recommended wire size/fuses - use copper wire (75 ºC (167 ºF)) - frame sizes F, G and H standard models, 500 to 690 Vac supply voltage*

Model	Frame Size	Power Terminals: Terminals	Power Terminals: Screw Thread/ Screw Head Type	Power Terminals: Recom-mended Torque N.m (lbf.in)	Overload Class	Wire Size: mm²	Wire Size: AWG	Wire Size: Terminals	Recommended Fuse: I²t [A²s]	Recommended Fuse: UL [A]	Recommended Fuse: WEG Fuse In[A]	Recommended Fuse: WEG Fuse Model	WEG Recommended Fuses FNHFE aR Flush End: Frame Size	WEG Recommended Fuses FNHFE aR Flush End: In [A]	WEG Recommended Fuses FNHFE aR Flush End: Item SAP
CFW110170T6	F	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	70	2/0	Ring tongue	320000	315	350	FNH1-350K-A	3	450	12644962
					ND	120 (2 x 35)	4/0 (2 x 2)								
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	50	1/0								
		⏚ (PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	50	1								
CFW110216T6		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	120 (2 x 35)	4/0 (2 x 2)	Ring tongue	414000	400	400	FNH1-400K-A	3	450	12644962
					ND	150 (2 x 50)	300 (2 x 1)								
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	50	1/0								
		⏚ (PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	70	2/0								
CFW110289T6		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	2 x 70	2 x 2/0	Ring tongue	414000	500	630	FNH2-630K-A	3	450	12644962
					ND	2 x 70	2 x 2/0								
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	50	1/0								
		⏚ (PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	70	2/0								

Model	Frame Size	Power Terminals			Overload Class	Wire Size			Recommended Fuse				WEG Recommended Fuses FNHFE aR Flush End		
		Terminals	Screw Thread/ Screw Head Type	Recom- mended Torque N.m (lbf. in)		mm^2	AWG	Terminals	I^2t [A^2s]	UL [A]	WEG Fuse In[A]	WEG Fuse Model	Frame Size	In [A]	Item SAP
CFW110315T6	G	R/L1 - S/L2 - T/ L3 - U/T1 - V/ T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	2 x 70	2 x 2/0	Ring ton- gue	1051000	630	630	FNH2- 630K-A	3	450	12644962
					ND	2 x 120	2 x 4/0								
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	120	4/0								
		⏚(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	120	4/0								
CFW110365T6		R/L1 - S/L2 - T/ L3 - U/T1 - V/ T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	2 x 120	2 x 4/0	Ring ton- gue	1445000	710	710	FNH2- 710K-A	3	500	12645317
					ND	2 x 120	2 x 4/0								
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	120	4/0								
		⏚(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	120	4/0								
CFW110435T6		R/L1 - S/L2 - T/ L3 - U/T1 - V/ T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	2 x 120	2 x 4/0	Ring ton- gue	1445000	800	800	FNH3- 800K-A	3	630	12660583
					ND	2 x 150	2 x 300								
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	120	4/0								
		⏚(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	150	300								
CFW110472T6		R/L1 - S/L2 - T/ L3 - U/T1 - V/ T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	3 x 70	3 x 2/0	Ring ton- gue	1445000	900	900	FNH3- 900K-A	3	700	12660657
					ND	3 x 120	3 x 4/0								
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	120	4/0								
		⏚(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	150	300								

Model	Frame Size	Power Terminals: Terminals	Power Terminals: Screw Thread/ Screw Head Type	Power Terminals: Recom-mended Torque N.m (lbf.in)	Overload Class	Wire Size: mm²	Wire Size: AWG	Wire Size: Terminals	Recommended Fuse: I²t [A²s]	Recommended Fuse: UL [A]	Recommended Fuse: WEG Fuse In[A]	Recommended Fuse: WEG Fuse Model	WEG Recommended Fuses FNHFE aR Flush End: Frame Size	WEG Recommended Fuses FNHFE aR Flush End: In [A]	WEG Recommended Fuses FNHFE aR Flush End: Item SAP
CFW110584T6	H	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	ND	2 x 150	2 x 300	Ring ton-gue	1620000	2 x 630	1 x 900	FNH3-900K-A	3	700	12660657
					HD	2 x 120	2 x 250								
		DC+, DC-	M10 (Phillips hex head)	30 (265.5)	ND/HD	2 (1)	51 (1)								
		⏚ (PE)	M8 (Phillips hex head)	10 (88.5)	ND/HD	2 x 120	2 x 4/0								
CFW110625T6		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	ND	4 x 120	4 x 4/0	Ring ton-gue	1620000	2 x 630	1 x 1000	FNH3-1000K-A	3	700	12660657
					HD	4 x 70	4 x 2/0								
		DC+, DC-	M10 (Phillips hex head)	30 (265.5)	ND/HD	2 (1)	51 (1)								
		⏚ (PE)	M8 (Phillips hex head)	10 (88.5)	ND/HD	2 x 120	2 x 4/0								
CFW110758T6		R1/L1,1 - R2/L1,2 - S1/L2,1 - S2/L2,2 - T1/L3,1 - T2/L3,2 U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	ND	4 x 150	4 x 300	Ring ton-gue	1620000	2 x 710	2 x 710	FNH2-710K-A	3	800	12661660
					HD	4 x 120	4 x 4/0								
		DC+, DC-	M10 (Phillips hex head)	30 (265.5)	ND/HD	3 (1)	76 (1)								
		⏚ (PE)	M8 (Phillips hex head)	10 (88.5)	ND/HD	2 x 150	2 x 300								
CFW110804T6		R1/L1,1 - R2/L1,2 - S1/L2,1 - S2/L2,2 - T1/L3,1 - T2/L3,2 U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	ND	4 x 150	4 x 300	Ring ton-gue	1620000	2 x 800	2 x 800	FNH3-800K-A	3	900	12661662
					HD	4 x 120	4 x 4/0								
		DC+, DC-	M10 (Phillips hex head)	30 (265.5)	ND/HD	3 (1)	76 (1)								
		⏚ (PE)	M8 (Phillips hex head)	10 (88.5)	ND/HD	2 x 150	2 x 300								

(*) For this application, the fuse cannot be mounted on the FSW and RFW; only on the individual mounting base BNH.

3

Table 3.7 - *Recommended wire size/fuses - use copper wire (75 ºC (167 ºF)) - frame sizes F, G and H with Special Hardware DC, fed from DC voltage*

Model	Frame Size	Power Terminals: Terminals	Power Terminals: Screw Thread/ Screw Head Type	Power Terminals: Recommended Torque N.m (lbf.in)	Overload Class	Wire Size: mm²	Wire Size: AWG	Wire Size: Terminals	Recommended DC Fuses (1): Current	Recommended DC Fuses (1): I²t [A²s]
CFW110170T6 O...DC...	F	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	70	2/0	Ring tongue	315	320000
					ND	120 (2 x 35)	4/0 (2 x 2)			
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	120 (2 x 35)	4/0 (2 x 2)			
		(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	50	1			
CFW110216T6 O...DC...	F	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	120 (2 x 35)	4/0 (2 x 2)	Ring tongue	400	414000
					ND	150 (2 x 50)	300 (2 x 1)			
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	150 (2 x 50)	300 (2 x 1)			
		(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	70	2/0			
CFW110289T6 O...DC...	F	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	2 x 70	2 x 2/0	Ring tongue	500	414000
					ND	2 x 70	2x2/0			
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	2 x 70	2 x 2/0			
		(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	70	2/0			
CFW110315T6 O...DC...	G	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	2 x 70	2 x 2/0	Ring tongue	630	1051000
					ND	2 x 120	2 x 4/0			
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	2 x 120	2 x 4/0			
		(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	120	4/0			
CFW110365T6 O...DC...	G	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	2 x 120	2 x 4/0	Ring tongue	630 800	1445000
					ND	2 x 120	2 x 4/0			
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	2 x 120	2 x 4/0			
		(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	120	4/0			
CFW110435T6 O...DC...	G	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	2 x 120	2 x 4/0			
					ND	2 x 150	2 x 300			
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	2 x 150	2 x 300			
		(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	150	300			
CFW110472T6 ODC...	G	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3	M12 (Phillips hex head)	60 (531.00)	HD	3 x 70	3 x 2/0			
					ND	3 x 120	3 x 4/0			
		DC+, DC- (use them only for braking)	M8 (Phillips hex head)	10 (88.5)	HD/ND	3 x 120	3 x 4/0			
		(PE)	M8 (Phillips hex head)	10 (88.5)	HD/ND	150	300			

(1) 2 fuses, one at + and other at - of supply cables is recommended.
These fuses combined must have interruption capacity for the following maximum DC voltage:
(a) 500/525 V (P0296 = 5); 550/575 V (P0296 = 6); 600 V (P0296 = 7): 1000 Vdc.
(b) 660/690 V (P0296 = 8): 1200 Vdc.

Table 3.8 - (a) and (b) - Recommended cable lugs for power connections

(a) cable gauges in mm²

Wire Size [mm²]	Stud Size	Manufacturer	Ring Lug, P/N	Crimping (Installation) Tool P/N	Number of Crimps
10	M5	Hollingsworth	RM 10 -5	H 6.500	1
		Tyco	710031-2	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583092-1	1
	M8	Hollingsworth	RM 10-8	H 6.500	1
		Tyco	710031-6	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583092-1	1
25	M5	Hollingsworth	RM 25 -5	H 6.500	1
		Tyco	710026-1	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583093-1	1
	M8	Hollingsworth	RM 25-8	H 6.500	1
		Tyco	710026-5	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583093-1	1
35	M5	Hollingsworth	RM 35-5	H 6.500	1
		Tyco	710027-1	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583094-1	1
	M8	Hollingsworth	RM 35-8	H 6.500	1
		Tyco	710027-2	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583094-1	1
	M12	Hollingsworth	RM 35-12	H 6.500	1
		Tyco	710036-4	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583094-1	1
50	M5	Hollingsworth	RM 50-5	H 6.500	1
		Tyco	710025-3	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583095-1	1
	M8	Hollingsworth	RM 50-8	H 6.500	1
		Tyco	710025-2	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583095-1	1
	M12	Hollingsworth	RM 50-12	H 6.500	1
		Tyco	710025-7	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583095-1	1
70	M5	Hollingsworth	RM 70-5	H 6.500	1
		Tyco	36921	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583096-1	1
	M8	Hollingsworth	RM 70-8	H 6.500	1
		Tyco	710028-1	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583096-1	1
	M12	Hollingsworth	RM 70-12	H 6.500	1
		Tyco	710028-5	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583096-1	1
120	M8	Hollingsworth	RM 120-8	H 6.500	1
		Tyco	709820-1	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583098-1	1
	M12	Hollingsworth	RM120-12	H 6.500	1
		Tyco	709820-3	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583098-1	1
150	M12	Hollingsworth	RM150-12	H 6.500	1
		Tyco	709821-3	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1752868-1 + 46751-2	1

(b) cable gauges in AWG

Wire Size [AWG/ kcmil]	Stud Size	Manufacturer	Ring Lug, P/N	Crimping Tool P/N	Number of Crimps
6	M5	Hollingsworth	R 410	H 6.500	1
		Tyco	710030-1	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583092-1	1
	M8	Hollingsworth	R 4516	H 6.500	1
		Tyco	710030-5	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583092-1	1
5	M5	Hollingsworth	R 410	H 6.500	1
		Tyco	710030-1	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583092-1	1
	M8	Hollingsworth	R 4516	H 6.500	1
		Tyco	710030-5	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583092-1	1
4	M5	Hollingsworth	R 410	H 6.500	1
		Tyco	710026-1	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583093-1	1
	M8	Hollingsworth	R 4516	H 6.500	1
		Tyco	710026-5	Manual hydraulic crimp Tooling (TE p/n.: 1490749-1) Die: 1583093-1	1
3	M5	Hollingsworth	R 410	H 6.500	1
		Tyco	710026-1	Manual hydraulic Crimp tooling (TE p/n.: 1490749-1) Die: 1583093-1	1
	M8	Hollingsworth	R 4516	H 6.500	1
		Tyco	710026-5	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583093-1	1
2	M5	Hollingsworth	R 210	H 6.500	1
		Tyco	710027-1	Manual hydraulic crimp Tooling (TE p/n.: 1490749-1) Die: 1583094-1	1
	M8	Hollingsworth	R 2516	H 6.500	1
		Tyco	710027-2	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583094-1	1
	M12	Hollingsworth	R 2516	H 6.500	1
		Tyco	710036-4	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583094-1	1
1	M5	Hollingsworth	R 110	H 6.500	1
		Tyco	710027-1	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583094-1	1
	M8	Hollingsworth	R 1516	H 6.500	1
		Tyco	710027-2	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583094-1	1
	M12	Hollingsworth	R 138	H 6.500	1
		Tyco	710036-4	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583094-1	1
1/0	M5	Hollingsworth	R 10516	H 6.500	1
		Tyco	710025-3	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583095-1	1
	M8	Hollingsworth	R 10516	H 6.500	1
		Tyco	710025-2	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583095-1	1

Wire Size [AWG/ kcmil]	Stud Size	Manufacturer	Ring Lug, P/N	Crimping Tool P/N	Number of Crimps
2/0	M5	Hollingsworth	R 110	H 6.500	1
		Tyco	------	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583096-1	1
	M8	Hollingsworth	R 1516	H 6.500	1
		Tyco	710028-1	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583096-1	1
	M12	Hollingsworth	R 138	H 6.500	1
		Tyco	710028-5	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583096-1	1
4/0	M8	Hollingsworth	R 2038	H 6.500	1
		Tyco	709820-1	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583098-1	1
	M12	Hollingsworth	R 4038	H 6.500	1
		Tyco	709820-3	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1583098-1	1
300	M12	Hollingsworth	R 4038	H 6.500	1
		Tyco	709821-3	Manual hydraulic crimp tooling (TE p/n.: 1490749-1) Die: 1752868-1 + 46751-2	1

3.2.3 Power Connections

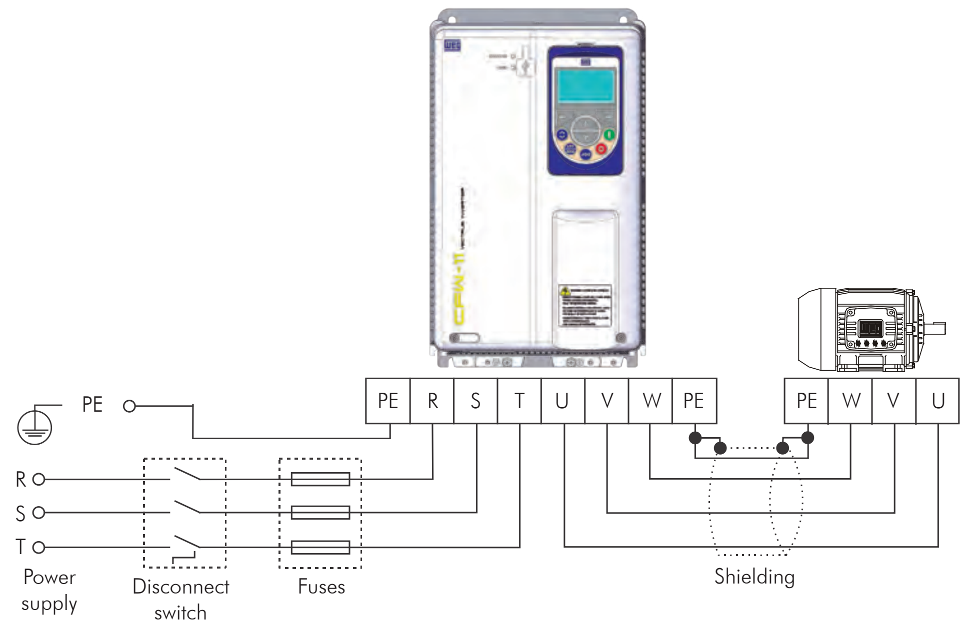
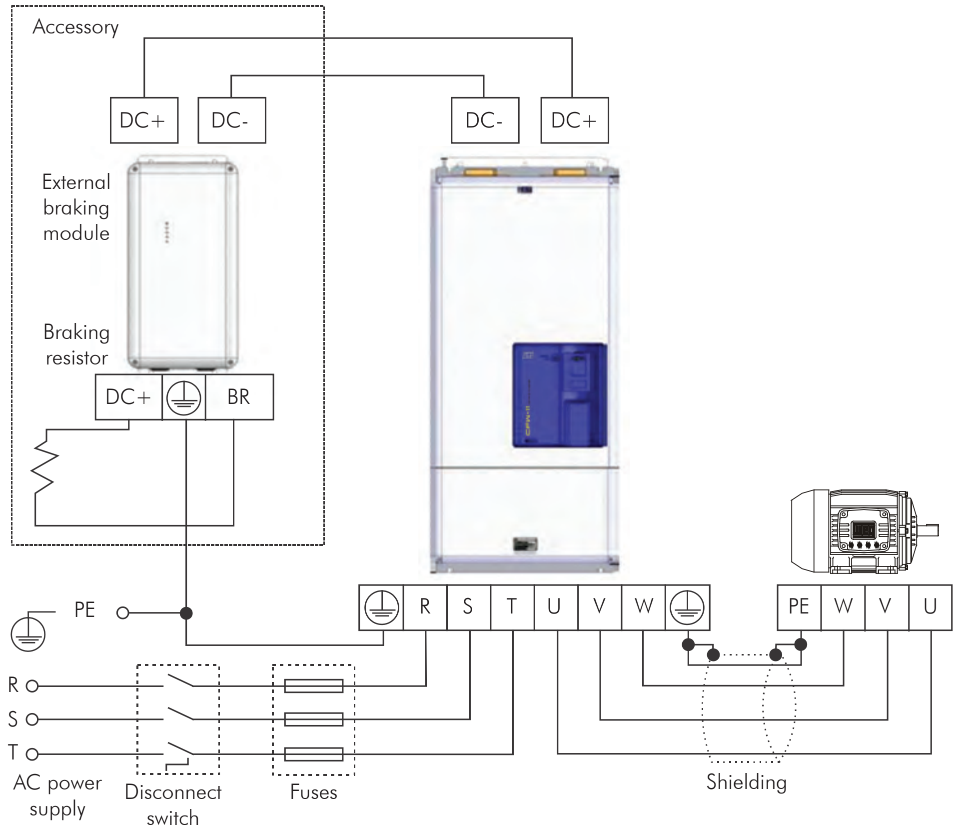
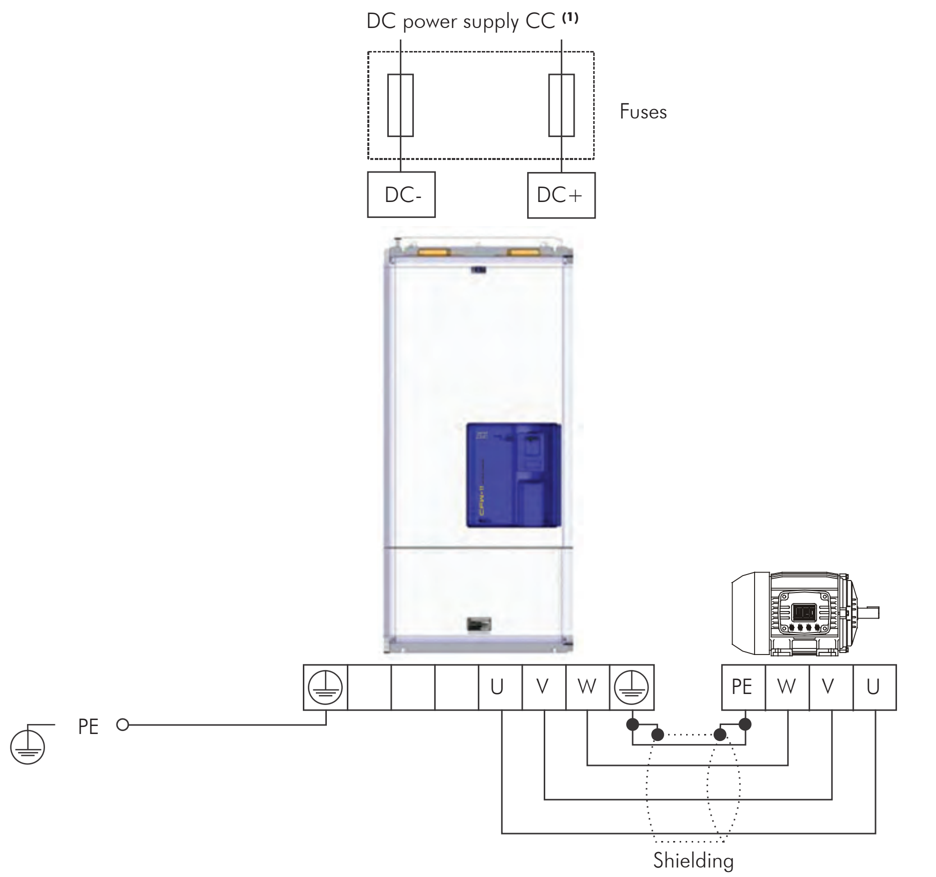


Figure 3.23 - *Power and grounding connections - frame sizes B, C, D and E*



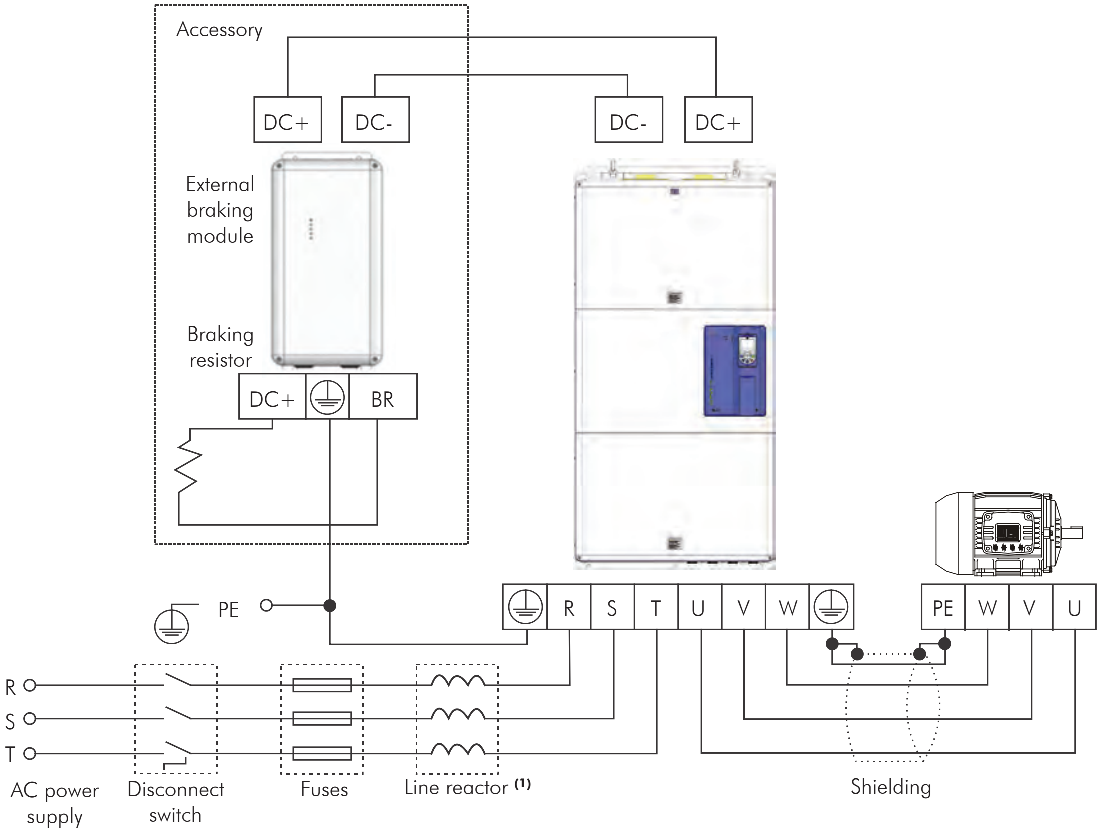
(a) Models with AC power supply (IP20 degree of protection) - frame sizes F and G



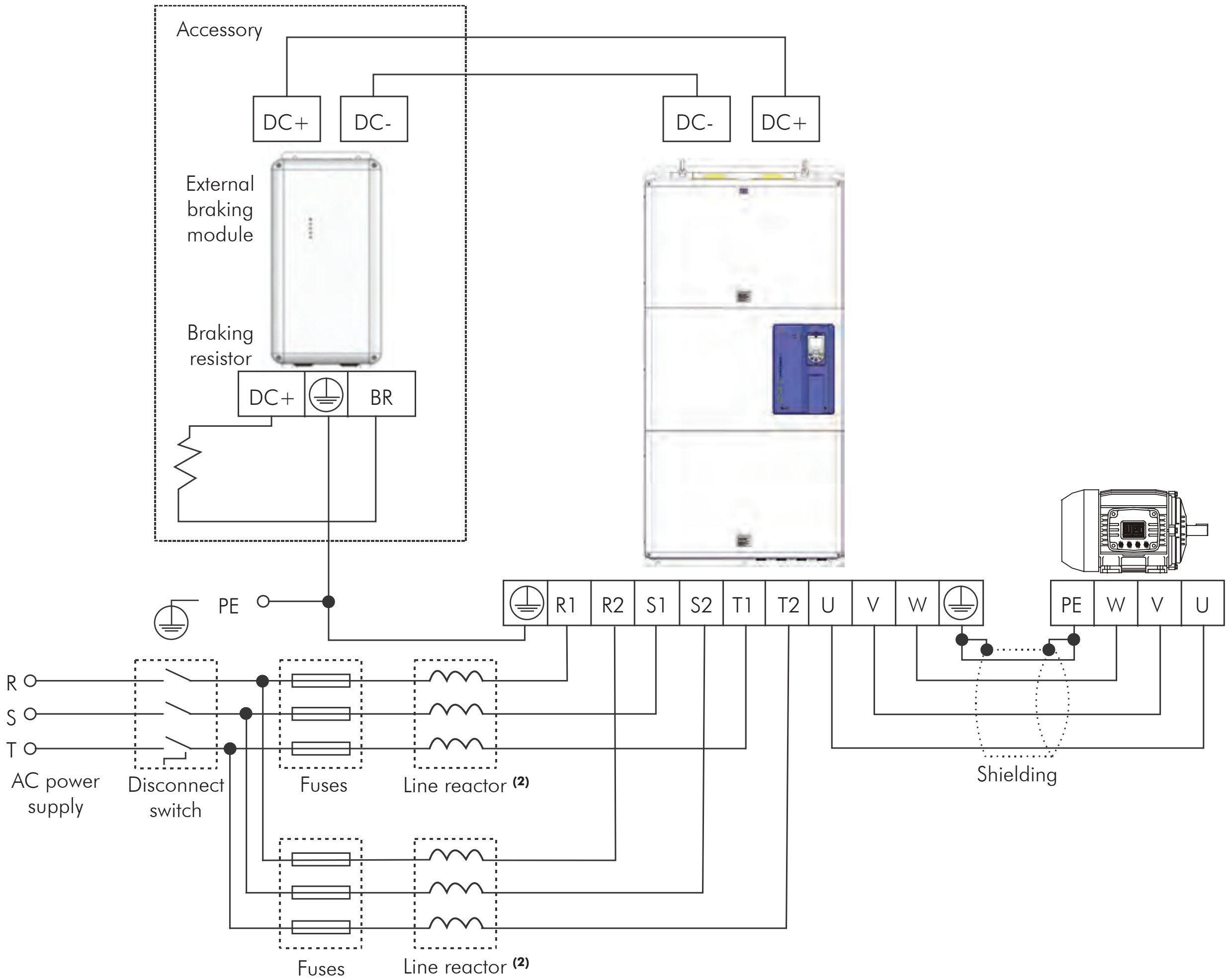
(b) Models with direct current power supply (IP00 degree of protection) - special hardware DC - frame sizes F and G

(1) According Chapter 8 TECHNICAL SPECIFICATIONS on page 8-1, Table 8.1 on page 8-2 and Table 8.4 on page 8-5.

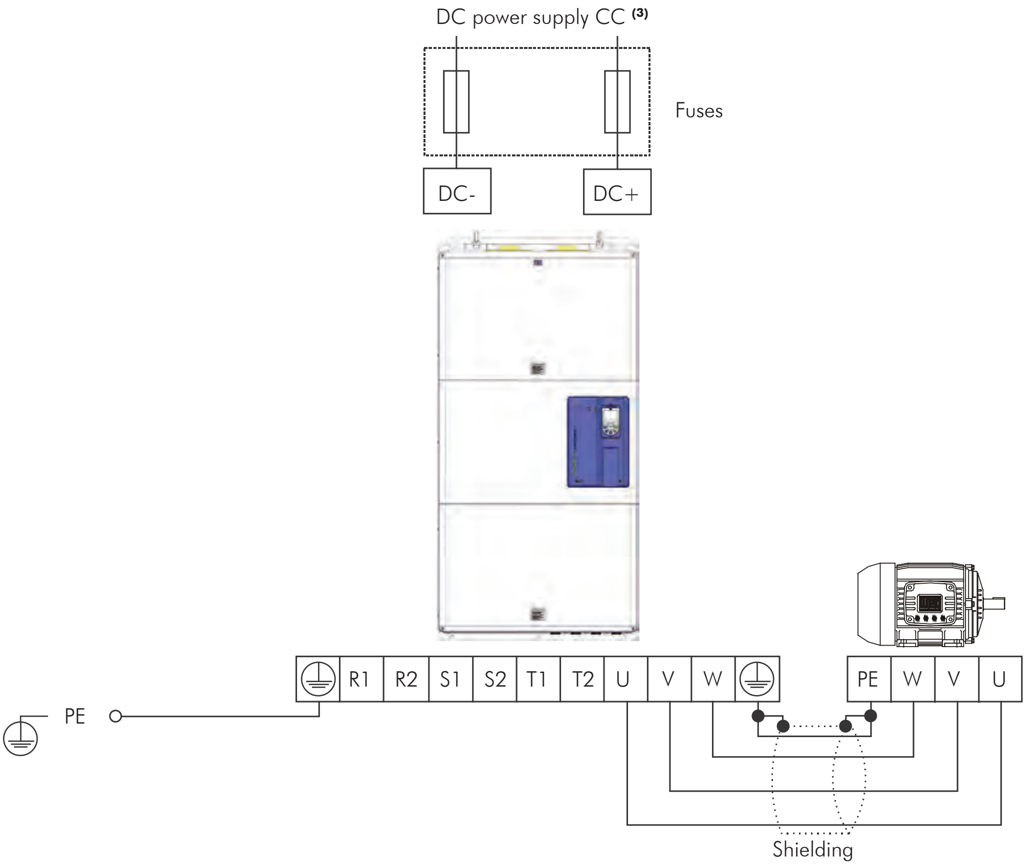
***Figure 3.24 -** (a) and (b) - Power and grounding connections - frame sizes F and G*



(a) Models with AC power supply (IP20 degree of protection) - frame size H (models 584 A and 625 A)



(b) Models with AC power supply (IP20 degree of protection - frame size H (models 758 A and 804 A)



(c) Models with direct current power supply (IP00 degree of protection) - special hardware DC - frame size H

(1) For frame size H models 584 A and 625 A it's necessary a line reactor with 3 % voltage drop minimum in the inverter nominal condition.

$$L = 919 \cdot \frac{\Delta V\,[\%] \cdot V_{LL}\,[V]}{f_R\,[Hz] \cdot I\,[A]}\ [\mu H]$$

ΔV = Percentage voltage drop.

V_{LL} = Inverter supply line voltage.

f_R = Line frequency.

I = Reactor current. Consider half the inverter input current for each reactor and an unbalance 15 %. For example, in model 1141 A, the maximum current of each reactor is 1.15 (1141/2) = 656 A.

(2) For frame size H models 758 A and 804 A it's necessary two line reactors with 3 % voltage drop minimum. Consider a half of inverter input current for each reactor and an unbalance of 15 %. For example in model 758 A, the maximum current in each reactor is 1.15 (758/2) = 436 A).

(3) According Chapter 8 TECHNICAL SPECIFICATIONS on page 8-1, Table 8.2 on page 8-3 and Table 8.4 on page 8-5.

***Figure 3.25 -** (a) to (c) - Power and grounding connections - frame size H*

3.2.3.1 Input Connections

DANGER!

Provide a disconnect device for the input power supply of the inverter.

This device shall disconnect the input power supply for the inverter when needed (for instance, during servicing).

DANGER!

Montez un dispositif de coupure sur l'alimentation du variateur.

Ce composant déconnecte l'alimentation du variateur si cela est nécessaire (ex. pendant l'entretien et la maintenance).

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

ATTENTION!
The power supply that feeds the inverter shall have a grounded neutral. In case of IT networks, follow the instructions described in Item 3.2.3.1.2 IT Networks on page 3-35.

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

NOTE!
Power factor correction capacitors are not needed at the inverter input (R, S, T) and shall not be installed at the output of the inverter (U, V, W).

3

3.2.3.1.1 AC Power Supply Considerations

☑ Suitable for use in circuits capable of delivering not more than 65,000 Arms symmetrical at 240 V or 480 V for maximum 480 V rated models, and 14,000 Arms symmetrical at 600 V for maximum 690 V rated models, when protected by inverse-time circuit breakers rated for the input voltage of the drive and 130 % of the full-load motor output current rating.

Table 3.9 - *Maximum rated current of the circuit breakers according to the inverter model*

Frame Size	Maximum Circuit Breaker Current Rating	Enclosure Dimensions (D x H x W) mm
B	30 A	203 x 457 x 508
C	125 A	203 x 610 x 508
D	250 A	203 x 762 x 610
E	250 A	254 x 914 x 660
F	800 A	600 x 2000 x 800
G	800 A	600 x 2000 x 1400
H	1200 A	600 x 2000 x 1400

3.2.3.1.2 IT Networks

ATTENTION!
For using the inverter CFW11...T5 or T6 in IT networks (neutral conductor not grounded or grounded via high ohmic value resistor) or in corner-grounded delta networks, the following modifications are required in the connections of some internal components to ground:

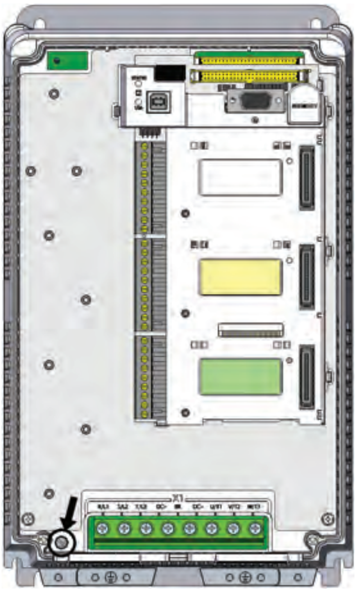
☑ Frame sizes B, C and D: remove the screw as indicated in Figure 3.26 on page 3-36.
☑ Frame size E: change the position of the J1 jumper on the PRT board from ⏚ (XE1) to "NC" (XIT), according to Figure 3.27 on page 3-36.
☑ Frame sizes F, G and H: disconnect the cable with the ring tongue lug from the ground busbar and connect it to the isolated point on the power terminal block as shown in the Figure 3.28 on page 3-37, Figure 3.29 on page 3-37 and Figure 3.30 on page 3-37 .

That is necessary to avoid damage to the inverter when operating with a line input shorted to ground.

NOTE!

The ground-fault protection (F074) is intended for IGBT protection and may not be activated when inverter output is shorted to ground, when fed by IT networks.

External insulation monitoring devices should be used for system fault monitoring.



(a) Frame sizes B and C

(b) Frame size D

Figure 3.26 - *(a) and (b) - Ground connections - location and procedure for adapting to IT or corner-ground networks - frame sizes B, C and D*

(a) Location of board

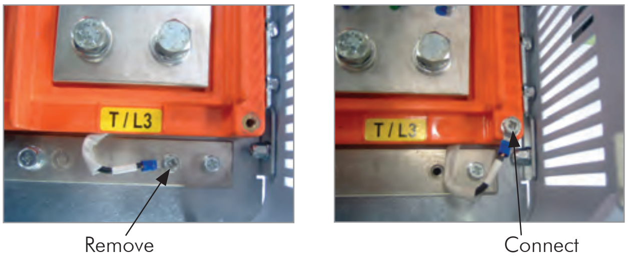
(b) Initial position

(J1 jumper of PRT3 board connected to ⏚ (XE1))

(c) Final position (IT)

(J1 jumper of the board connected to NC)

Figure 3.27 - *(a) to (c) - Ground connections - location and procedure for adapting to IT or corner-ground networks - frame size E*



(a) Initial position **(b) Final position (IT)**

Figure 3.28 - *(a) and (b) - Ground connections - location and procedure for adapting to IT or corner-ground networks - frame sizes F and G*

(a) Initial position **(b) Final position (IT)**

Figure 3.29 - *(a) and (b) - Ground connections - location and procedure for adapting to IT or corner-ground networks - frame size H models 584 A and 625 A*

(a) Initial position **(b) Final position (IT)** **(c) Final position (IT)**

Figure 3.30 - *(a) to (c) - Ground connections - location and procedure for adapting to IT or corner-ground networks - frame size H models 784 A and 804 A*

3.2.3.1.3 Command Fuses of Pre-charge Circuit

Frame size E:

☑ Specifications of the used auxiliary fuse:
Slow blow fuse 1 A / 1000 V.
Manufacturer: Ferraz Shawmut/ Mersen.
Part number: DTC1-2.
WEG part number: 11123302.

☑ Auxiliary fuse is assembled in PRT3 board. Figure 3.27 on page 3-36 shows its location on the inverter.

Frame sizes F, G and H:

☑ Specifications of the used auxiliary fuse:
4 A / 690 V slow blow fuse.
Manufacturer: Ferraz Shawmut / Mersen.
Commercial reference: 17019-G.
WEG part number: 10411503.

3.2.3.2 Dynamic Braking

NOTE!
All frame sizes B and C models do have internal braking IGBT. Models of frame sizes D and E with the codification CFW11...O...NB... and all models of frame sizes F, G and H do not have internal braking IGBT.

NOTE!
For dynamic braking with frame sizes F, G and H models use external braking module (see Item 7.2.1 Use of External Dynamic Braking Module DBW03 and DBW04 on page 7-4). For installation refer to Figure 3.31 on page 3-39.

The braking torque that can be obtained from the frequency inverter without braking resistors varies from 10 % to 35 % of the motor rated torque.

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

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

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

NOTE!
Set P0151 and P0185 to their maximum values (1000 V for power supply voltages from 500 to 600 V; 1200 V for power supply voltage from 660 to 690 V) when using dynamic braking.

3.2.3.2.1 Sizing the Braking Resistor

The following application data shall be considered for the adequate sizing of the braking resistor:

- Desired deceleration time.
- Load inertia.
- Braking duty cycle.

In any case, the effective current value and the maximum braking current value presented in Table 3.8 on page 3-29 shall be respected.

The maximum braking current defines the minimum braking resistor value in ohms.

The DC bus voltage level for the activation of the dynamic braking function is defined by parameter P0153 (dynamic braking level).

The power of the braking resistor is a function of the deceleration time, the load inertia, and the load torque.

For most applications, a braking resistor with the value in ohms indicated in Table 3.10 on page 3-40 and the power of 20 % of the rated driven motor power. Use WIRE type resistors in a ceramic support with adequate insulation voltage and capable of withstanding high instantaneous power with respect to rated power. For critical applications with very short deceleration times and high inertia loads (eg.: centrifuges) or short duration cycles, consult WEG for the adequate sizing of the braking resistor.

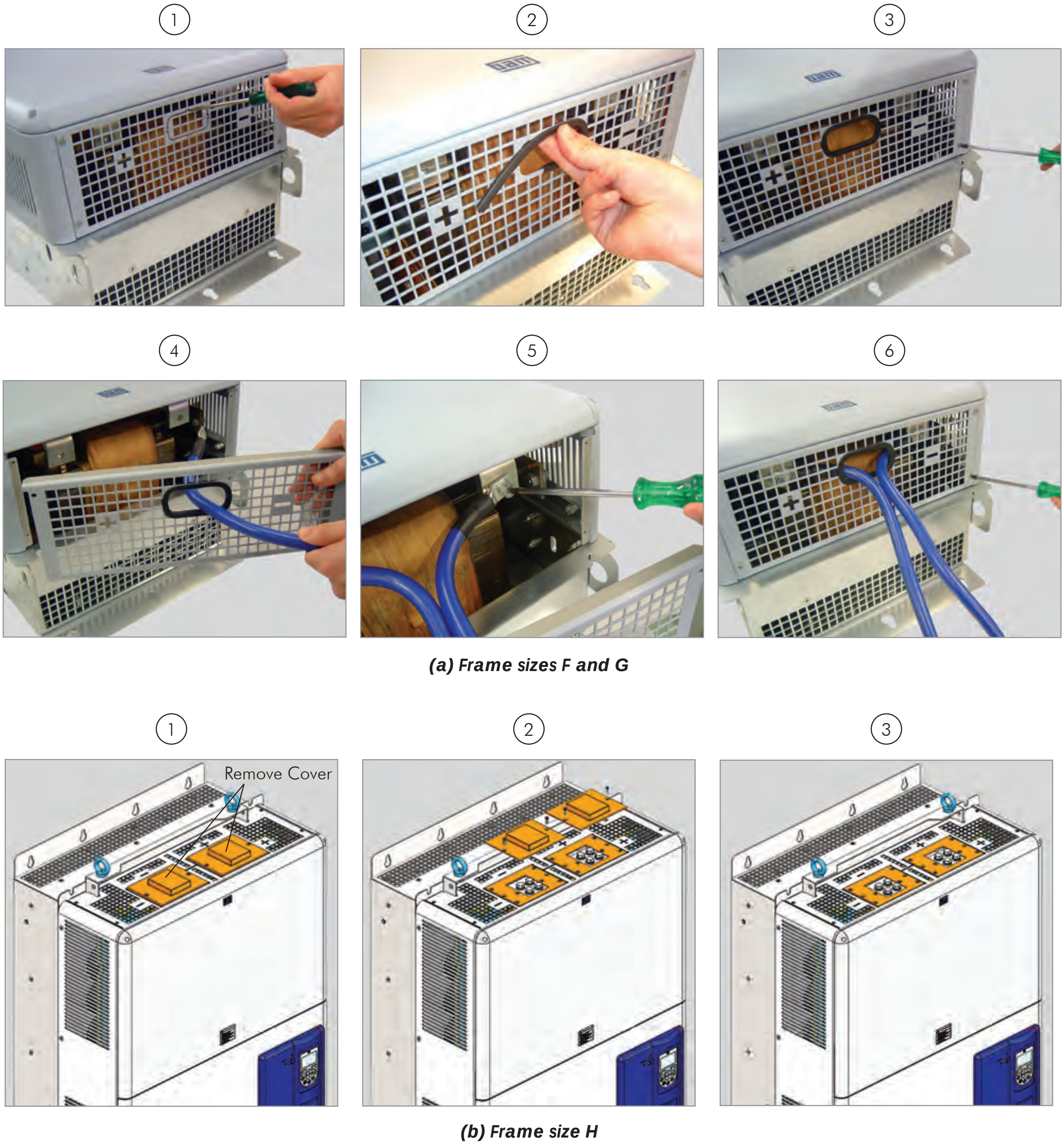


Figure 3.31 - (a) and (b) - Sequence for the connection cables of DC+ and DC- for connection of an external braking module to CFW-11 inverter for models of frame sizes F, G and H

Table 3.10 - *Dynamic braking specifications*

Inverter Model	Maximum Braking Current (I_{max}) [A]	Maximum Braking Power (peak value) (P_{max}) (2) [kW]	Effective Braking Current ($I_{effective}$) (1) [A]	Braking Power (mean value) in the Braking Resistor (P_R) (2) [kW]	Recommended Resistor [Ω]	Power Wire Size (terminals DC+ and BR) (3) [mm² (AWG)]
CFW110002T5	36.4	43.6	31.9	33.5	33	6 (8)
CFW110004T5	36.4	43.6	31.9	33.5	33	6 (8)
CFW110007T5	36.4	43.6	31.9	33.5	33	6 (8)
CFW110010T5	36.4	43.6	31.9	33.5	33	6 (8)
CFW110012T5	36.4	43.6	31.9	33.5	33	6 (8)
CFW110017T5	36.4	43.6	31.9	33.5	33	6 (8)
CFW110022T5	45.5	42.7	31.7	15.1	22	10 (8)
CFW110027T5	45.5	42.7	31.7	15.1	22	10 (8)
CFW110032T5	45.5	42.7	31.7	15.1	22	10 (8)
CFW110044T5	45.5	42.7	31.7	15.1	22	10 (8)
CFW110002T6	45.5	54.5	45.5	54.5	26.4	10 (6)
CFW110004T6	45.5	54.5	45.5	54.5	26.4	10 (6)
CFW110007T6	45.5	54.5	45.5	54.5	26.4	10 (6)
CFW110010T6	45.5	54.5	45.5	54.5	26.4	10 (6)
CFW110012T6	45.5	54.5	45.5	54.5	26.4	10 (6)
CFW110017T6	45.5	54.5	45.5	54.5	26.4	10 (6)
CFW110022T6	45.5	54.5	45.5	54.5	26.4	10 (6)
CFW110027T6	45.5	54.5	45.5	54.5	26.4	10 (6)
CFW110032T6	45.5	54.5	45.5	54.5	26.4	10 (6)
CFW110044T6	45.5	54.5	45.5	54.5	26.4	10 (6)
CFW110053T6	181.8	218.2	152.0	152.5	6.6	95 (3/0)
CFW110063T6	181.8	218.2	152.0	152.5	6.6	95 (3/0)
CFW110080T6	181.8	218.2	152.0	152.5	6.6	95 (3/0)
CFW110107T6	181.8	218.2	152.0	152.5	6.6	95 (3/0)
CFW110125T6	272.7	327.3	152.0	101.7	4.4	2 x 50 (2 x 1/0)
CFW110150T6	272.7	327.3	152.0	101.7	4.4	2 x 50 (2 x 1/0)

(1) The effective braking current presented is just an indicative value, because it depends on the braking duty cycle. The effective braking current can be obtained from the equation below, where t_{br} is given in minutes and corresponds to the sum of all braking times during the most severe cycle of 5 (five) minutes.

$$I_{effective} = I_{max} \times \sqrt{\frac{t_{br}}{5}}$$

(2) The P_{max} and P_R values (maximum and mean power of the braking resistor respectively) presented are valid for the recommended resistors and for the effective braking currents presented in Table 3.10 on page 3-40. The resistor power change according to the braking duty cycle.

(3) For specifications on the recommended terminal type for the connection of the braking resistor (terminals DC+ and BR), refer to the DC+ terminal specification on Table 3.4 on page 3-23 to Table 3.7 on page 3-28.

3.2.3.2.2 Installation of the Braking Resistor - Frame Sizes B, C, D and E

Install the braking resistor between the power terminals DC+ and BR.

Use twisted cable for the connection. Separate these cables from the signal and control cables. Size the cables according to the application, respecting the maximum and effective currents.

If the braking resistor is installed inside the inverter cabinet, consider its additional dissipated energy when sizing the cabinet ventilation.

Set parameter P0154 with the resistor value in ohms and parameter P0155 with the maximum resistor power in kW.

DANGER!

The inverter has an adjustable thermal protection for the braking resistor. The braking resistor and the braking transistor may damage if parameters P0153, P0154, and P0155 are not properly set or if the input voltage surpasses the maximum permitted value.

DANGER!

Le variateur possède une protection thermique réglable pour la résistance de freinage. La résistance de freinage et le transistor de freinage peuvent être endommagés si les paramètres P0153, P0154 et P0155 ne sont pas correctement définis ou si la tension d'entrée dépasse la valeur maximale autorisée.

The thermal protection offered by the inverter, when properly set, allows the protection of the resistor in case of overload; however, this protection is not guaranteed in case of braking circuitry failure. In order to avoid any damage to the resistor or risk of fire, install a thermal relay in series with the resistor and/or a thermostat in contact with the resistor body to disconnect the input power supply of the inverter, as presented in Figure 3.32 on page 3-41.

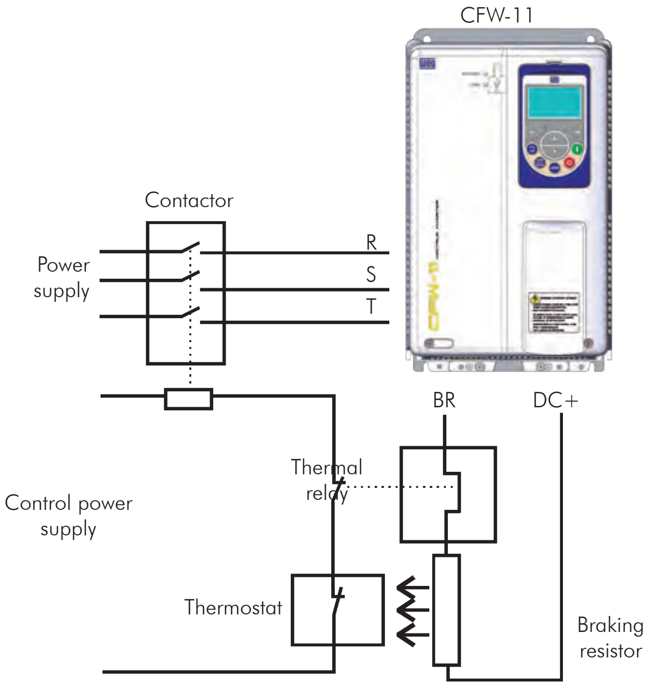


***Figure 3.32 -** Braking resistor connection - frame sizes B, C, D and E*

NOTE!

DC current flows through the thermal relay bimetal strip during braking.

3.2.3.3 Output Connections

ATTENTION!

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

ATTENTION!

The motor overload protection available in the CFW-11 is in accordance with the IEC60947-4-2 and UL508C standards, note the following information:

- ☑ Trip current equal to 1.25 times the motor rated current (P0401) adjusted in the oriented start-up menu.
- ☑ The maximum value for P0398 (Motor service factor) is 1.15.
- ☑ Parameters P0156, P0157 and P0158 (Overload current at 100 %, 50 % and 5 % of the rated speed, respectively) are automatically adjusted when parameters P0401 (Motor Rated Current) and/or P0406 (Motor Ventilation) are adjusted in the oriented start-up routine. If parameters P0156, P0157 and P0158 are manually adjusted, the maximum allowed value is 1.05 x P0401.

ATTENTION!

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

The characteristics of the cable used for the inverter and motor interconnection, as well as the physical location are extremely important to avoid electromagnetic interference in other equipment and to not affect the life cycle of motor windings and motor bearings controlled by inverters.

Recommendations for the motor cables:

Unshielded Cables:

- ☑ Can be used when it is not necessary to meet the European directive of electromagnetic compatibility (2004/108/EC).
- ☑ Keep motor cables away from other cables (signal cables, sensor cables, control cables, etc.), according to Table 3.11 on page 3-43.
- ☑ The emission of the cables may be reduced by installing them inside a metal conduit, which shall be grounded at both ends.
- ☑ Connect a fourth cable between the motor ground and the inverter ground.

NOTE!

The magnetic field created by the current circulation in these cables may induce current in close metal pieces, heat them, and cause additional electrical losses. Therefore, keep the three cables (U, V, W) always together.

Shielded Cables:

- ☑ They are mandatory when the electromagnetic compatibility directive (2004/108/EC) shall be met, as defined by the standard EN 61800-3 "Adjustable Speed Electrical Power Drive Systems". These cables act mainly by reducing the irradiated emission in the radio-frequency range.

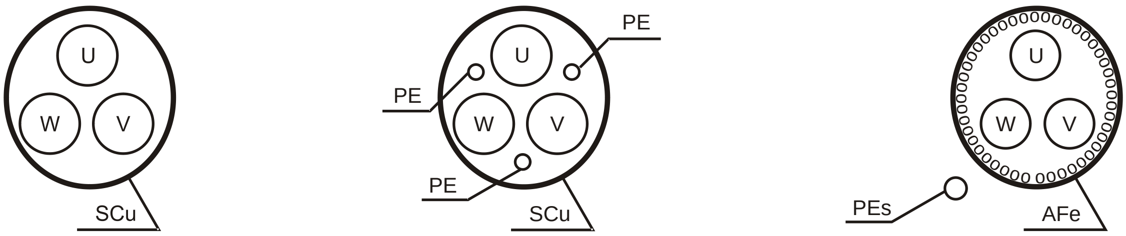
☑ In reference to the type and details of installation, follow the recommendations of IEC 60034-25 "Guide for Design and Performance of Cage Induction Motors Specifically Designed for Converter Supply" - refer to a summary in Figure 3.33 on page 3-43. Refer to the standard for further details and eventual modifications related to new revisions.

☑ Keep motor cables away from other cables (signal cables, sensor cables, control cables, etc.), according to Table 3.11 on page 3-43.

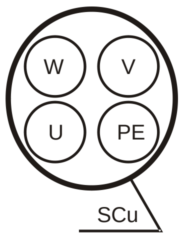
☑ The grounding system shall be well interconnected among the several installation locations such as the grounding points of the motor and the inverter. Voltage difference or impedance between the several points may cause the circulation of leakage currents among the equipment connected to the ground, resulting in electromagnetic interference problems.

Table 3.11 - *Minimum separation distance between motor cables and all other cables*

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



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



(b) Alternatives for conductors up to 10 mm²

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

Figure 3.33 - *(a) and (b) - Motor connection cables recommended by IEC 60034-25*

Connection of the motor cable shield to ground:

☑ Connection of the motor cable shield to ground: make a connection with low impedance for high frequencies.

Frame sizes B and C:

There is a kit for connection of the shielding of power cables that is supplied with the inverters (except for inverters CFW11...T5O...NF...), which assembled on the bottom of the enclosure as shown in Figure 3.34 on page 3-44 and facilitates the connection of the shielding of motor and the line cable. That kit is also an acessory - PCSx-01.

***Figure 3.34 -** Detail of the motor cable shield connection with the power cables shielding kit (PCSx-01) provided with inverters of frame sizes B and C*

For frame sizes D and E, there is a provision for grounding the motor cable shield in the standard inverter enclosure.

3.2.4 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 inverters, follow the procedures presented in Figure 3.35 on page 3-45 for the grounding connection.

DANGER!
Ne pas partager le câblage de mise à la terre avec d'autres équipements opérant avec des intensités élevées (par ex: moteurs haute puissance, postes de soudure, etc.). Lors de l'installation de plusieurs variateurs, appliquer les procédures présentées dans l'illustration Figure 3.35 à la page 3-45 pour la connexion de mise à la terre.

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

DANGER!
The inverter must be obligatorily connected to a protective ground (PE).
Observe the following:
- Use a minimum wire gauge for ground connection equal to the indicated in Table 3.2 on page 3-21 to Table 3.6 on page 3-25. Conform to local regulations and/or electrical codes in case a different wire gauge is required.
- Connect the inverter 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 inverter to the ground by using a single conductor copper cable with a minimum wire gauge of 10 mm^2, since the leakage current is greater than 3.5 mA AC.

DANGER!

Le variateur doit être raccordé à une terre de protection (PE).

Observer les règles suivantes:

- Utilisez la section minimale de raccordement à la terre indiquée dans les Table 3.2 à la page 3-21 à Table 3.6 à la page 3-25. Se conformer aux à la règlementation locale et/ou aux codes de l'électricité si une autre épaisseur de fil est nécessaire.
- Connectez la masse du variateur à une barre collectrice de terre en un seul point ou à un point commun de raccordement à la terre (impédance ≤ 10 Ω).
- Pour assurer la conformité avec la norme CEI 61800-5-1, connecter le variateur à la terre grâce à un câble en cuivre à un conducteur ayant une épaisseur de fil minimale de 10 mm^2, étant donné que le courant de fuite est supérieur à 3,5 mA C.A.

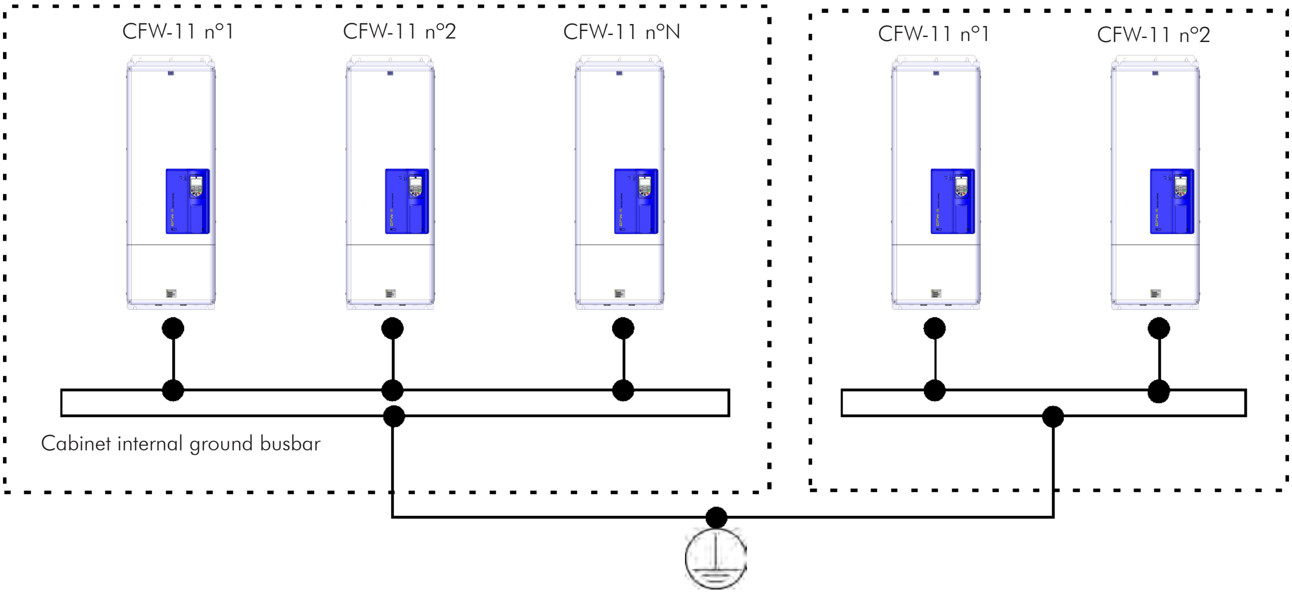
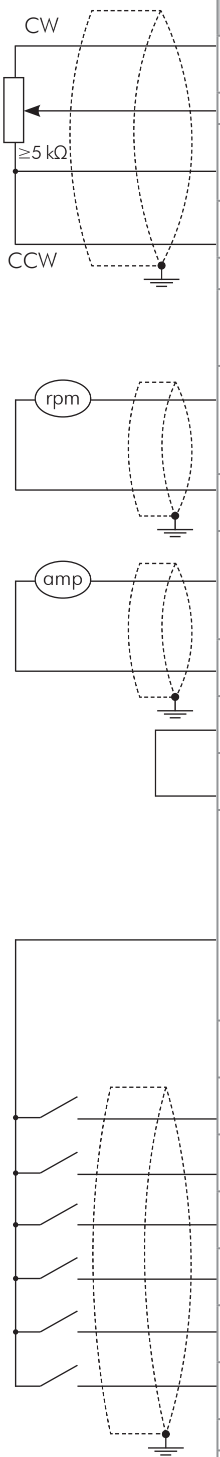


***Figure 3.35 -** Grounding connections with multiple inverters*

3.2.5 Control Connections

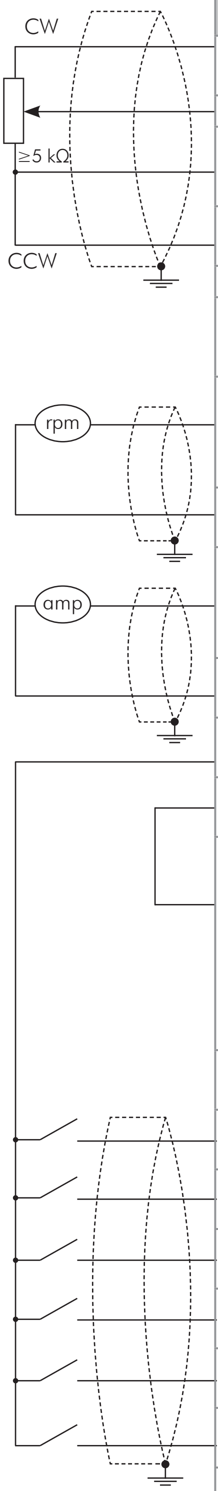
The control connections (analog inputs/outputs, digital inputs/outputs), must be made at the CC11 control board terminal strip XC1.

Functions and typical connections are presented in Figure 3.36 on page 3-47.



XC1 Terminal Strip		Factory Setting Function	Specifications
1	REF+	Positive reference for potentiometer	Output voltage: +5.4 V, ±5 % Maximum output current: 2 mA
2	AI1+	Analog input # 1: speed reference (remote)	Differential Resolution: 12 bits Signal: 0 to 10 V (R_{IN} = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (R_{IN} = 500 Ω) Maximum voltage: ±30 V
3	AI1-		
4	REF-	Negative reference for potentiometer	Output voltage: -4.7 V, ±5 % Maximum output current: 2 mA
5	AI2+	Analog input # 2: no function	Differential Resolution: 11 bits + signal Signal: 0 to ±10 V (R_{IN} = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (R_{IN} = 500 Ω) Maximum voltage: ±30 V
6	AI2-		
7	AO1	Analog output # 1: speed	Galvanic isolation Resolution: 11 bits Signal: 0 to 10 V (R_L ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (R_L ≤ 500 Ω) Protected against short-circuit
8	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of DGND *
9	AO2	Analog output # 2: motor current	Galvanic isolation Resolution: 11 bits Signal: 0 to 10 V (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 an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of DGND *
11	DGND*	Reference (0 V) for the 24 Vdc power supply	Connected to the ground (frame) through an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of AGND (24 V)
12	COM	Common point of the digital inputs	
13	24 Vdc	24 Vdc power supply	24 Vdc power supply, ±8 % Capacity: 500 mA **Note:** in the models with the 24 Vdc external control power supply (CFW11...O...W...) the terminal 13 of XC1 becomes an input, i.e., the user must connect a 24 Vdc power supply for the inverter (refer to the Item 7.1.3 24 Vdc External Control Power Supply on page 7-1, for more details). In all the other models this terminal is an output, i.e., the user has a 24 Vdc power supply available there
14	COM	Common point of the digital inputs	
15	DI1	Digital input # 1: Start/Stop	6 isolated digital inputs High level ≥ 18 V Low level ≤ 3 V Maximum input voltage = 30 V Input current: 11 mA @ 24 Vdc
16	DI2	Digital input # 2: direction of rotation (remote)	
17	DI3	Digital input # 3: no function	
18	DI4	Digital input # 4: no function	
19	DI5	Digital input # 5: Jog (remote)	
20	DI6	Digital input # 6: 2^{nd} ramp	
21	NC1	Digital output #1 DO1 (RL1): no fault	Contact rating: Maximum voltage: 240 Vac Maximum current: 1 A NC - normally closed contact C - common NO - normally open contact
22	C1		
23	NO1		
24	NC2	Digital output #2 DO2 (RL2): N > N_x - speed > P0288	
25	C2		
26	NO2		
27	NC3	Digital output #3 DO3 (RL3): N* > N_X - speed reference > P0288	
28	C3		
29	NO3		

(a) Digital inputs working as "Active High"



XC1 Terminal Strip		Factory Setting Function	Specifications
1	REF+	Positive reference for potentiometer	Output voltage: +5.4 V, ±5 % Maximum output current: 2 mA
2	AI1+	Analog input # 1: speed reference (remote)	Differential Resolution: 12 bits Signal: 0 to 10 V (R_{IN} = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (R_{IN} = 500 Ω) Maximum voltage: ±30 V
3	AI1-		
4	REF-	Negative reference for potentiometer	Output voltage: -4.7 V, ±5 % Maximum output current: 2 mA
5	AI2+	Analog input # 2: no function	Differential Resolution: 11 bits + signal Signal: 0 to ±10 V (R_{IN} = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (R_{IN} = 500 Ω) Maximum voltage: ±30 V
6	AI2-		
7	AO1	Analog output # 1: speed	Galvanic isolation Resolution: 11 bits Signal: 0 to 10 V (R_L ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (R_L ≤ 500 Ω) Protected against short-circuit
8	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of DGND *
9	AO2	Analog output # 2: motor current	Galvanic isolation Resolution: 11 bits. Signal: 0 to 10 V (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 an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of DGND *
11	DGND*	Reference (0 V) for the 24 Vdc power supply	Connected to the ground (frame) through an impedance: 940 Ω resistor in parallel with a 22 nF capacitor. Same reference as the one of AGND (24 V)
12	COM	Common point of the digital inputs	
13	24 Vdc	24 Vdc power supply	24 Vdc power supply, ±8 % Capacity: 500 mA **Note:** in the models with the 24 Vdc external control power supply (CFW11...O...W...) the terminal 13 of XC1 becomes an input, i.e., the user must connect a 24 Vdc power supply for the inverter (refer to the Item 7.1.3 24 Vdc External Control Power Supply on page 7-1, for more details). In all the other models this terminal is an output, i.e., the user has a 24 Vdc power supply available there
14	COM	Common point of the digital inputs	
15	DI1	Digital input # 1: Start/Stop	6 isolated digital inputs High level ≥ 18 V Low level ≤ 3 V Input voltage ≤ 30 V Input current: 11 mA @ 24 Vdc
16	DI2	Digital input # 2: direction of rotation (remote)	
17	DI3	Digital input # 3: no function	
18	DI4	Digital input # 4: no function	
19	DI5	Digital input # 5: Jog (remote)	
20	DI6	Digital input # 6: 2^{nd} ramp	
21	NC1	Digital output #1 DO1 (RL1): no fault	Contact rating: Maximum voltage: 240 Vac Maximum current: 1 A NC - normally closed contact C - common NO - normally open contact
22	C1		
23	NO1		
24	NC2	Digital output #2 DO2 (RL2): N > N_X - speed > P0288	
25	C2		
26	NO2		
27	NC3	Digital output #3 DO3 (RL3): N* > N_X - speed reference > P0288	
28	C3		
29	NO3		

(b) Digital inputs working as "Active Low"

Figure 3.36 - (a) and (b) - Signals at connector XC1

NOTE!
In order to use the digital inputs as "Active Low", remove the jumper between XC1:11 and 12 and install it between XC1:12 and 13.

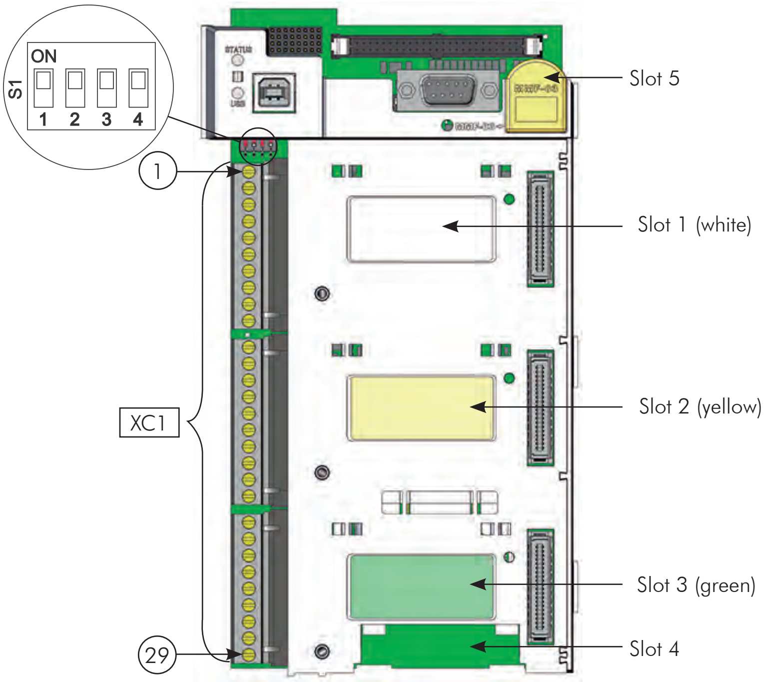


Figure 3.37 - *XC1 terminal strip and DIP-switches for selecting the signal type of analog inputs and outputs*

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

Table 3.12 - *Configuration of DIP-switches for selecting the signal type of analog inputs and outputs*

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

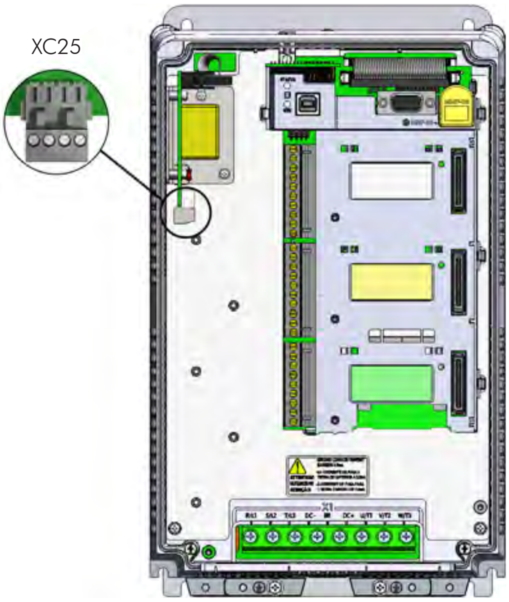
Parameters related to the analog inputs and outputs (AI1, AI2, AO1, and AO2) must be programmed according to the DIP-switches settings and desired values.

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

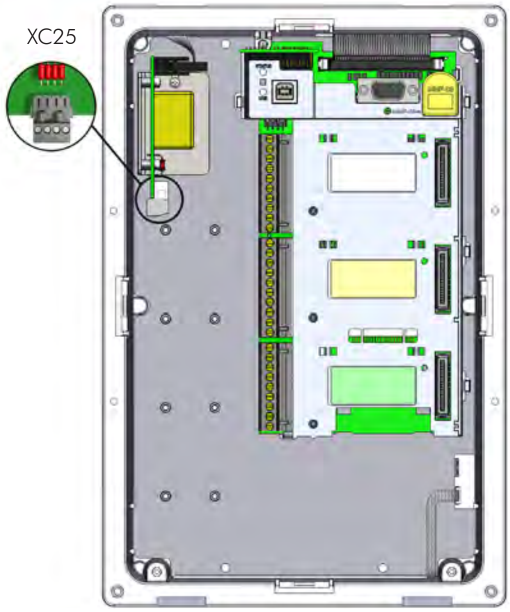
1. Wire gauge: 0.5 mm^2 (20 AWG) to 1.5 mm^2 (14 AWG).

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

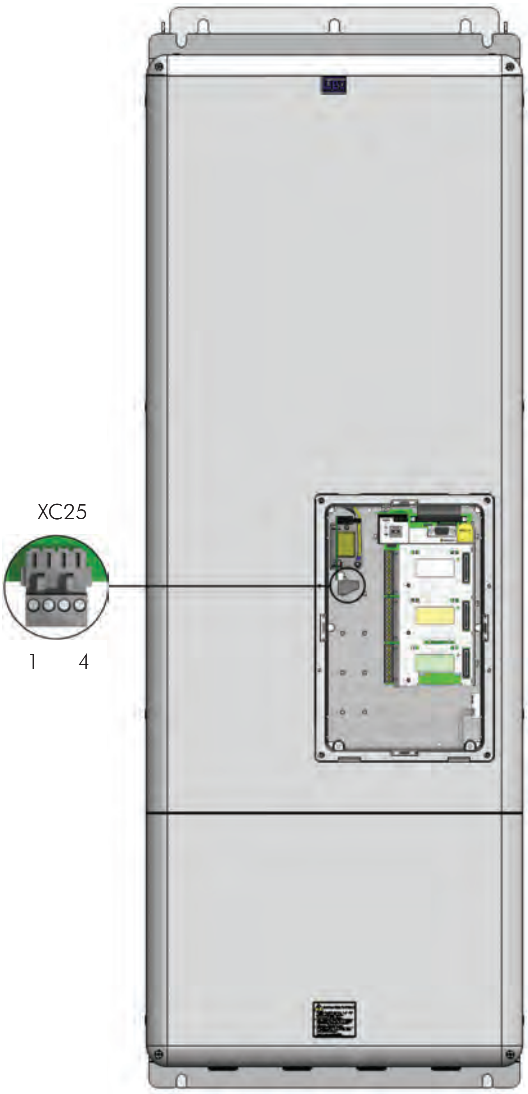
3. Use shielded cables for the connections at XC1 and run the cables separated from the remaining circuits (power, 110 V/220 Vac control, etc.), as presented in Table 3.13 on page 3-50. If control cables must cross other cables, it must be done perpendicularly among them, keeping a minimum of 5 cm (1.9 in) distance at the crossing point.



(a) Frame sizes B and C inverters - SRB2A.00 board



(b) Frame sizes D and E inverters - SRB4.00 board



(c) Frame sizes F, G and H inverters - SRB3.00 board

Figure 3.38 - *(a) to (c) - SRBXX board connections (Safety Stop function)*

NOTE!

Safety Stop function: the inverters with Safety Stop function option (CFW11...O...Y...) are supplied with control connections to disable Safety Stop function as per Figure 3.39 on page 3-50. For using the Safety Stop function see Section 3.3 SAFETY STOP FUNCTION on page 3-54.

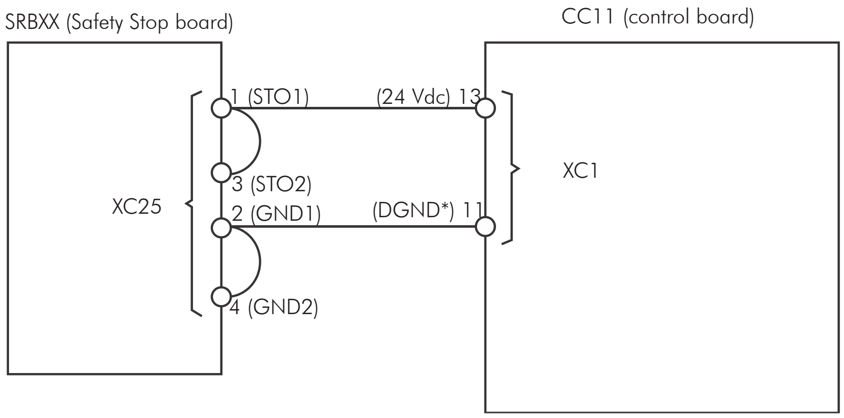


Figure 3.39 - Internal control connections to disable Safety Stop function

Table 3.13 - *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 correct connection of the cable shield is shown in Figure 3.40 on page 3-50 and Figure 3.41 on page 3-51.

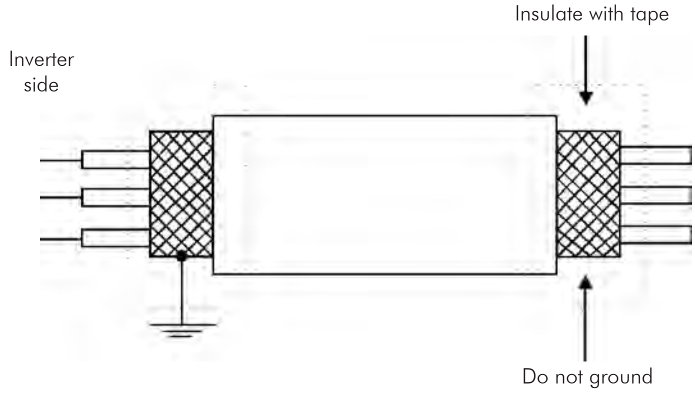


Figure 3.40 - *Shield connection*

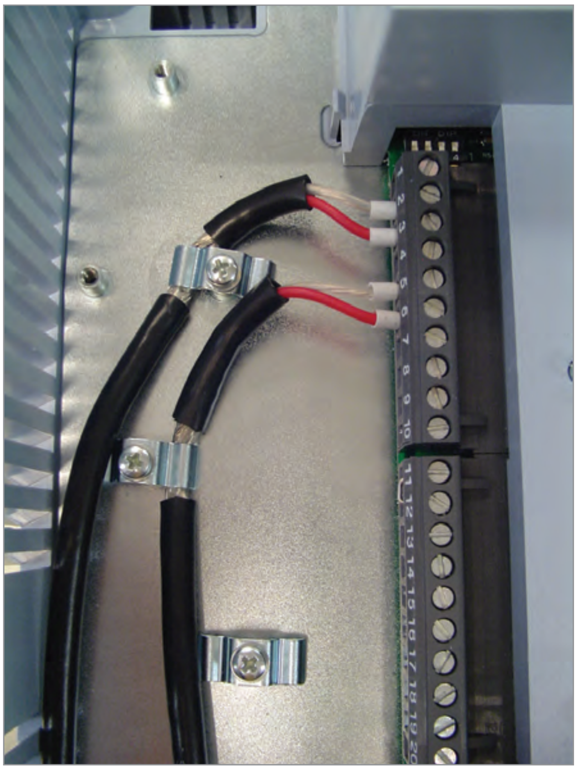


Figure 3.41 - *Example of control wiring shield connection*

5. Relays, contactors, solenoids or coils of electromechanical brakes installed close to the inverter may occasionally generate interferences in the control circuitry. To eliminate this effect, RC suppressors (with AC power supply) or freewheel diodes (with DC power supply) must be connected in parallel to the coils of these devices.

3.2.6 Typical Control Connections

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

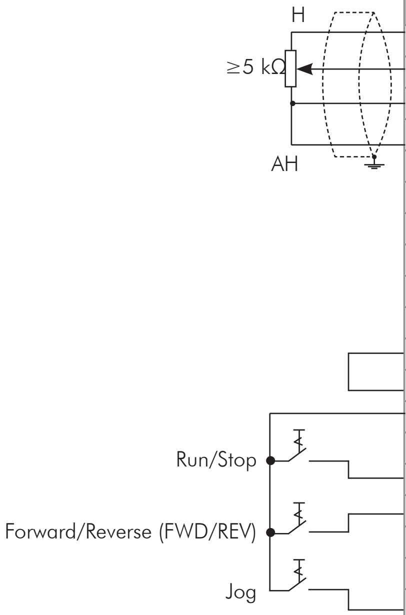
With this control connection, it is possible to run the inverter in local mode with the factory default settings. This operation mode is recommended for first-time users, since no additional control connections are required.

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

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

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

With the factory default settings, the selection of the operation mode (local/remote) is performed through the HMI key LOC REM (local mode is default). Set P0220 = 3 to change the default setting of HMI key LOC REM to remote mode.



XC1 Terminal Strip		
1	+ REF	
2	AI1+	
3	AI1-	
4	- REF	
5	AI2+	
6	AI2-	
7	AO1	
8	AGND (24 V)	
9	AO2	
10	AGND (24 V)	
11	DGND*	
12	COM	
13	24 Vdc	
14	COM	
15	DI1	
16	DI2	
17	DI3	
18	DI4	
19	DI5	
20	DI6	
21	NC1	DO1 (RL1)
22	C1	
23	NO1	
24	NC2	DO2 (RL2)
25	C2	
26	NO2	
27	NC3	DO3 (RL3)
28	C3	
29	NO3	

Figure 3.42 - *XC1 wiring for control connection # 2*

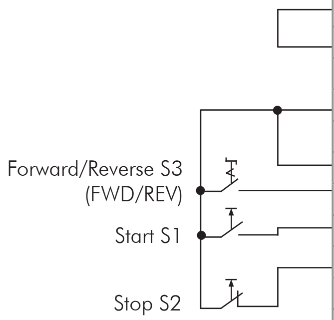
Control connection 3 - 3-Wire Start/Stop function.

Enabling the Run/Stop function with 3-wire control.
Parameters to set:
Set DI3 to START.
P0265 = 6.
Set DI4 to STOP.
P0266 = 7.

Set P0224 = 1 (DIx) for 3-wire control in Local mode.
Set P0227 = 1 (DIx) for 3-wire control in Remote mode.

Set the Forward/Reverse selection by using digital input # 2 (DI2).
Set P0223 = 4 for Local Mode or P0226 = 4 for Remote Mode.
S1 and S2 are Start (NO contact) and Stop (NC contact) pushbuttons respectively.
The speed reference can be provided through the analog input (as in control connection # 2), through the keypad (as in control connection # 1) or through other available source.

3



XC1 Terminal Strip		
1	+ REF	
2	AI1+	
3	AI1-	
4	- REF	
5	AI2+	
6	AI2-	
7	AO1	
8	AGND (24 V)	
9	AO2	
10	AGND (24 V)	
11	DGND*	
12	COM	
13	24 Vdc	
14	COM	
15	DI1	
16	DI2	
17	DI3	
18	DI4	
19	DI5	
20	DI6	
21	NC1	DO1 (RL1)
22	C1	
23	NO1	
24	NC2	DO2 (RL2)
25	C2	
26	NO2	
27	NC3	DO3 (RL3)
28	C3	
29	NO3	

Figure 3.43 - *XC1 wiring for control connection # 3*

Control connection 4 - Forward/Reverse.

Enabling the Forward/Reverse function.
Parameters to set:
Set DI3 to Forward run.
P0265 = 4.
Set DI4 to Reverse run.
P0266 = 5.

When the Forward/Reverse function is set, it will be active either in Local or Remote mode. At the same time, the HMI keys O and I will remain always inactive (even if P0224 = 0 or P0227 = 0).

The direction of rotation is determined by the Forward run and Reverse run inputs.
Clockwise direction for Forward run and counterclockwise for Reverse run.
The speed reference can be provided by any source (as in the control connection # 3).

XC1 Terminal Strip		
1	+ REF	
2	AI1+	
3	AI1-	
4	- REF	
5	AI2+	
6	AI2-	
7	AO1	
8	AGND (24 V)	
9	AO2	
10	AGND (24 V)	
11	DGND*	
12	COM	
13	24 Vdc	
14	COM	
15	DI1	
16	DI2	
17	DI3	
18	DI4	
19	DI5	
20	DI6	
21	NC1	DO1 (RL1)
22	C1	
23	NO1	
24	NC2	DO2 (RL2)
25	C2	
26	NO2	
27	NC3	DO3 (RL3)
28	C3	
29	NO3	

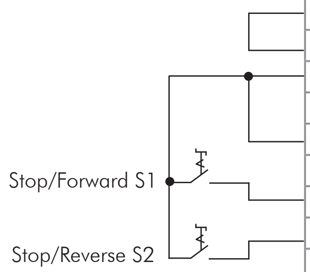


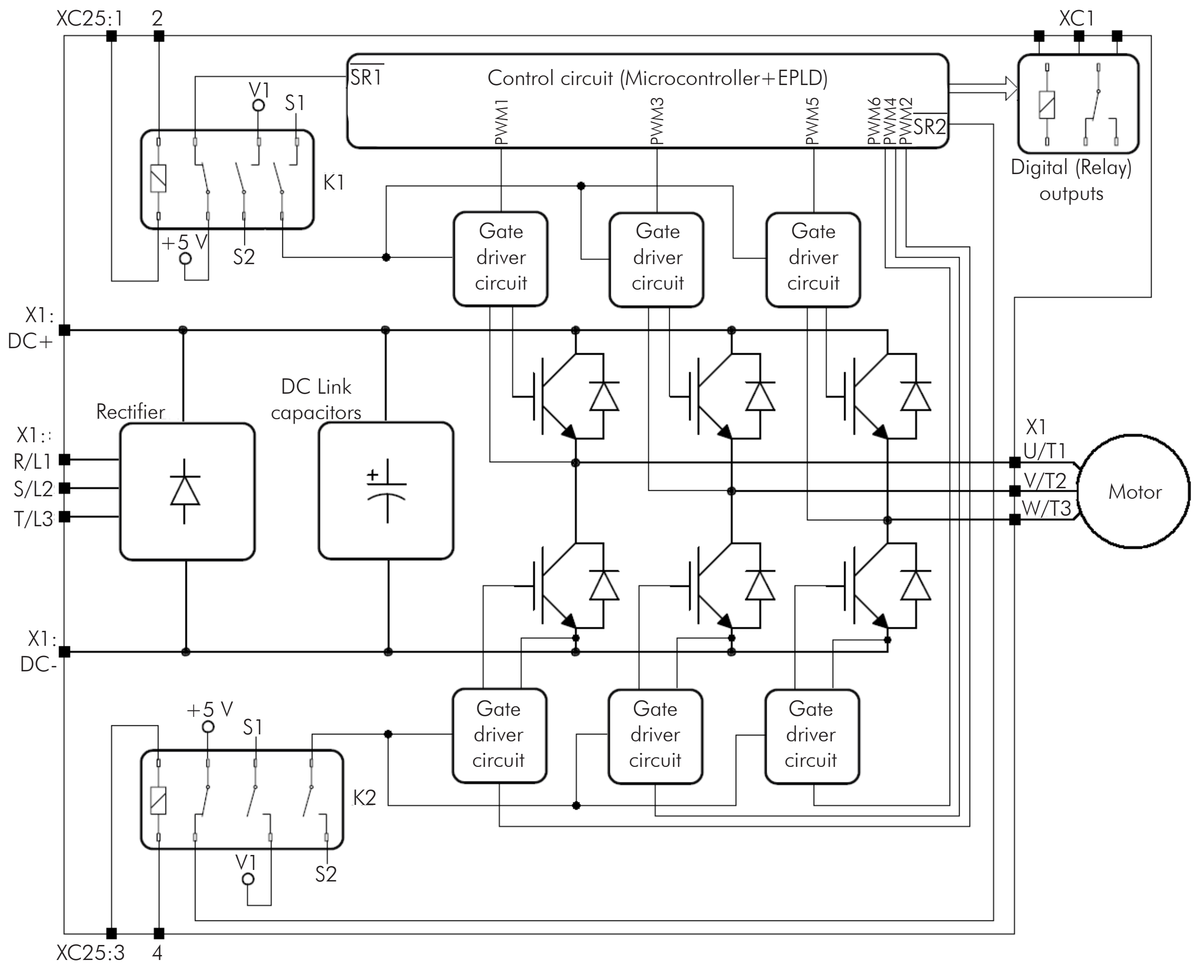
Figure 3.44 - *XC1 wiring for control connection # 4*

3.3 SAFETY STOP FUNCTION

The inverters CFW11...O...Y... have the board SRBXX that implements Safety Stop function. Through this board it is possible to control two safety relays (K1 and K2) that actuate directly on the power circuit, more specifically on the IGBTs gate drivers power supply. The basic functional block diagram is shown in Figure 3.45 on page 3-55.

The safety relays guarantee that the IGBTs remain switched off when Safety Stop function is activated, even in case of an internal single failure. The position of SRBXX board and XC25 terminals (Safety Stop control terminals) on the inverter is shown in Figure 3.38 on page 3-49.

The Safety Stop function prevents the motor starting accidentally.



Note:
V1 = inverter internal voltage.

Figure 3.45 - *Basic block diagram of Safety Stop function available in CFW-11 inverter series*

DANGER!
The activation of the Safety Stop function does not guarantee electrical safety of the motor terminals (they are not isolated from the power supply in this condition).

DANGER!
L'activation de la fonction d'arrêt de sécurité ne garantit pas la sécurité électrique des bornes du moteur (elles ne sont pas isolées de l'alimentation électrique dans cet état).

ATTENTION!
In case of a multiple fault in the power stage of the inverter, the motor shaft can rotate up to 360/ (number of poles) degrees even with the activation of Safety Stop function. That must be considered in the application.

NOTE!
Inverter Safety Stop function is only one component of the safety control system of a machine and/or process. When inverter and its Safety Stop function is correctly used and with other safety components, it's possible to fulfill the requirements of standard EN 954-1 / ISO 13849-1, Category 3 (machine safety) and IEC/EN 61508, SIL2 (safety control/signaling applied to processes and systems).

The parameter P0029 shows if the inverter has identified correctly SRBXX board. See Bit 9 in Table 3.14 on page 3-56 for details.

***Table 3.14** - Content of P0029 parameter*

Bits															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	0	**0** = with braking IGBT **1** = without braking IGBT	0	**0** = control circuit is supplied from an external +24 Vdc power supply **1** = control circuit is fed by the inverter SMPS	**0** = inverter without safety stop option **1** = inverter with Safety Stop option	**0** = inverter without RFI filter **1**= inverter with RFI filter	Voltage rating of the inverter: **00** = 200...240 V **01** = 380...480 V **10** = 500...600 V **11** = 500...690 V or 660/690 V		Inverter output rated current					
Hexadecimal digit #4				Hexadecimal digit #3				Hexadecimal digit #2				Hexadecimal digit #1			

3.3.1 Installation

NOTE!
If the degree of protection of the used inverter is lower than IP54, it must be installed inside an IP54 (minimum) cabinet.

***Table 3.15** - XC25 terminals (Safety Stop terminals) signals*

XC25 Terminals		Function	Specifications
1	STO1	Terminal 1 of safety relay K1 coil	Coil rated voltage: 24 V, range: 20…30 Vdc Coil resistance: 960 Ω ± 10 % @ 20 °C (68 °F)
2	GND1	Terminal 2 of safety relay K1 coil	
3	STO2	Terminal 1 of safety relay K2 coil	Coil rated voltage: 24 V, range: 20…30 Vdc Coil resistance: 960 Ω ± 10 % @ 20 °C (68 °F)
4	GND2	Terminal 2 of safety relay K2 coil	

NOTE!
Terminals XC25: 2 and XC25: 4 are not internally connected to the reference of the inverter power supply +24 V. These terminals are often connected to the control terminal XC1:11.

NOTE!
Follow recommendations of Item 3.2.5 Control Connections on page 3-45.

For XC25 control cabling considers the following:

☑ Use wire gauge from 0.5 mm^2 (20 AWG) to 1.5 mm^2 (14 AWG) and maximum tightening torque of maximum 0.50 N.m (4.50 lbf.in).

☑ Use shielded cables connected to ground only on inverter side. Use the provided metallic pieces as shown on Figure 3.41 on page 3-51.

☑ Run the cables separated from the remaining circuits (power, 110 V / 220 Vac control, etc.).

3.3.2 Operation

3.3.2.1 Truth Table

Table 3.16 - *Safety Stop function operation*

STO1 Logic Level (Voltage Between XC25:1-2 Terminals)	STO2 Logic Level (Voltage Between XC25:3-4 Terminals)	Safety Stop Function	Inverter Behavior
0 (0 V)	0 (0 V)	Activated (enabled)	Inverter remains in STO state and does not accept commands. In order to escape this condition, it's required to have STO1 = 1 and STO2 = 1 simultaneously
0 (0 V)	1 (24 V)	Fault	Inverter is tripped by F160 fault (Safety Stop function related fault). To escape this condition, it's required to reset the inverter
1 (24 V)	0 (0 V)		
1 (24 V)	1 (24 V)	Disabled	Inverter accepts commands normally

NOTE!

Maximum delay between STO1 and STO2 signals: 100 ms (otherwise inverter will be tripped by F160 fault).

Safety Stop function takes priority over all other functions of the inverter.

This function should not be used as a control for starting and/or stopping the inverter.

3.3.2.2 State of Inverter, Fault and Alarm Related to Safety Stop Function

Table 3.17 - *State of inverter, fault and alarm related to Safety Stop function*

State/Fault/Alarm	Description	Cause
STO state	Safety Stop activated	Voltage between terminals 1 and 2 (relay K1 coil) and between terminals 3 and 4 (relay K2 coil) of XC25 lower than 17 V
F160 fault	Safety Stop function fault	It's applied voltage to relay K1 coil (STO1) but it's not applied voltage to relay K2 coil (STO2) or vice-versa or there is a delay of more than 100 ms between one signal and the other. To solve it, correct the external circuit that generates STO1 and STO2 signals

3.3.2.3 STO Status Indication

State of the inverter is shown on the left upper side of the display and in parameter P0006.

Possible states of the inverter: ready, run (inverter enabled), undervoltage, fault, self-tuning, configuration, DC braking and STO (Safety Stop function activated).

It's possible to set one or more digital and relay outputs of the inverter to indicate that Safety Stop function is activated (state of the inverter = STO), if the inverter is or not on a fault state and more specifically if the inverter was tripped by F160 fault (Safety Stop function fault). For that use the parameters P0275 (DO1), P0276 (DO2), P0277 (DO3), P0278 (DO4) and P0279 (DO5) according to Table 3.18 on page 3-58.

Table 3.18 - *P0275...P0279 options for indication of state of inverter or faults on DOx digital outputs*

DOx Digital Output Function	Value to Be Set on P0275...P0279	Comment
State of the inverter = STO (Safety Stop function activated)	33	Safety Stop function disabled: relay/transistor OFF Safety Stop function activated: relay/transistor ON
F160 fault (inverter tripped by Safety Stop function fault actuation)	34	Without F160 fault: relay/transistor OFF With fault F160: relay/transistor ON
Fault (inverter tripped by actuation of any fault)	13	Without fault: relay/transistor OFF With fault: relay/transistor ON
Without fault (state of the inverter is not fault)	26	With fault: relay/transistor OFF Without fault: relay/transistor ON

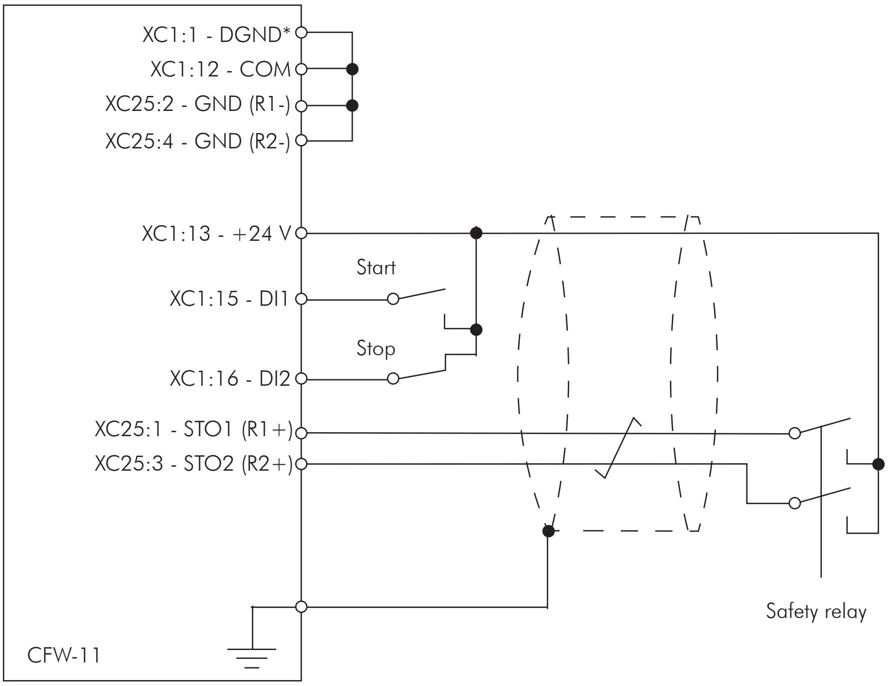
Refer to inverter programming manual for a complete list of options for parameters P0275...P0279.

3.3.2.4 Periodic Test

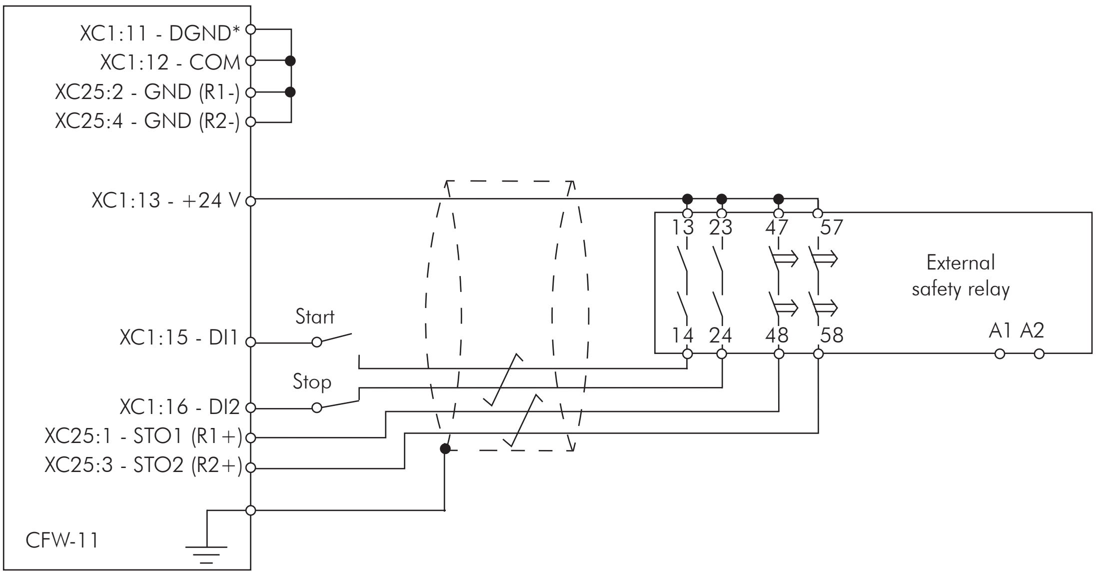
Safety Stop function, alternatively safety stop inputs (STO1 and STO2), must be activated at least once a year for preventive maintenance purposes. Inverter power supply must be switched off and then on again before carrying out this preventive maintenance. If during testing the power supply to the motor is not switched off, safety integrity is no longer assured for the Safety Stop function. The drive must therefore be replaced to ensure the operational safety of the machine or of the system process.

3.3.3 Examples of Wiring Diagrams of Inverter Control Signal

It is recommended to use inverter DI1 and DI2 digital inputs set as 3-wire start/stop commands and the wiring diagrams of inverter control signal according to Figure 3.46 on page 3-59.



(a) STO or SS0 safety function (without an external safety relay)



(b) SS1 safety function with an external safety relay (*)

Note:
(*) For specifications of external safety relay, which is required to realize SS1 (stop category 1), refer to Item 3.3.4 Technical Specifications on page 3-60.

Figure 3.46 - *(a) and (b) - Inverter control wiring examples (XC1 and XC25 terminals) to realize STO (or SS0, i.e., stop category 0) and SS1 (stop category 1) safety functions according to IEC/EN 61800-5-2 and IEC/EN 60204-1 standards - DI1 and DI2 inputs set as 3-wire start/stop commands*

Circuit operation of SS1 function from Figure 3.46 on page 3-59:

In this case, when the activation command is given to the external safety relay, safety relay opens inverter DI2 signal (via terminals 23 to 24) and motor is decelerated first by the inverter (via deceleration ramp). When the time delay set at the external safety relay expires (this delay must be higher than required time to stop the motor, taking into account deceleration time set on the inverter and inertia of the motor load), the safety relay delayed contacts (terminals 47 to 48 and 57 to 58) opens inverter STO1 and STO2 signals and the inverter Safety Stop function is activated. The motor stops according to category 1 (SS1) of standard IEC/EN 60204-1.

In order to drive the motor again, it is required to apply STO1 and STO2 signals again (to close terminals 13 to 23 and 23 to 24) and apply a pulse on inverter DI1 input (START).

3.3.4 Technical Specifications

3.3.4.1 Electrical Control Characteristics

Safety Stop function inputs	XC25:1-2, XC25:3-4	2 independent inputs for Safety Stop function Power supply: 24 Vdc (max. 30 V) Impedance: 960 Ω State 0 if < 2 V, state 1 if > 17 V
External safety relay specifications (only when SS1 function is required according to IEC/EN 61800-5-2 and IEC/EN 60204-1 standards) refer to Figure 3.46 on page 3-59	General requirements	IEC 61508 and/or EN 954-1 and/or ISO 13849-1
	Output requirements	Number of current paths: 2 independent paths (one for each STO path) Switching voltage capability: 30 Vdc per contact Switching current capability: 100 mA per contact Maximum switching delay between contacts: 100 ms
	Example	Type/manufacturer: WEG/ Instrutech CPt-D

3.3.4.2 Operational Safety Characteristics

Protection	Of the machine	Safety Stop function which forces stopping and/or prevents the motor from restarting unintentionally, conforming to EN 954-1 / ISO 13849-1 category 3, IEC/EN 61800-5-2 and IEC/EN 60204-1
	Of the system process	Safety Stop function which forces stopping and/or prevents the motor from restarting unintentionally, conforming to IEC/EN 61508 level SIL2 and IEC/EN 61800-5-2

3.3.4.3 Certification

TÜVRheinland®

ZERTIFIKAT
CERTIFICATE

EC Type-Examination Certificate

Reg.-No.: 01/205/5135/11

Product tested	Safety Function "Safe Torque Off (STO)" within Frequency Inverters	**Certificate holder**	WEG Equipamentos Elétricos S.A. - Automação AV. PREF. Waldemar Grubba, 3000 89259-900 Jaraguá do Sul / SC Brazil
Type designation	Frequency Inverter Types: CFW11, CFW70x, CFW11M Series	**Manufacturer**	see certificate holder
Codes and standards forming the basis of testing	EN 61800-5-2:2007 EN ISO 13849-1:2008 + AC:2009 IEC 62061:2005		IEC 61508 Parts 1-7:2010 EN 50178:1997 IEC 60204-1:2005 (in extracts)
Intended application	The safety function STO complies with the requirements of the relevant standards (Cat. 3 / PL d acc. to EN ISO 13849-1, SIL CL 2 acc. to IEC 61800-5-2 / IEC 62061 / IEC 61508) and can be used in applications up to Cat. 3 / PL d acc. to EN ISO 13849-1 and SIL 2 acc. to IEC 62061 / IEC 61508.		
Specific requirements	The instructions of the associated Installation and Operating Manual shall be considered.		

It is confirmed, that the product under test complies with the requirements for machines defined in Annex I of the EC Directive 2006/42/EC.

This certificate is valid until 2016-06-30.

The test report-no.: 968/M 313.00/11 dated 2011-06-30 is an integral part of this certificate.

This certificate is valid only for products which are identical with the product tested. It becomes invalid at any change of the codes and standards forming the basis of testing for the intended application.

TÜV Rheinland 0035 Notified Body

Berlin, 2011-06-30

Certification Body for Machinery, NB 0035

Dipl.-Ing. Eberhard Frejno

TÜV Rheinland Industrie Service GmbH, Alboinstr. 56, 12103 Berlin / Germany
Tel. +49 30 7562-1557, Fax +49 30 7562-1370, E-Mail: tuval@de.tuv.com

3.4 INSTALLATION ACCORDING TO THE EUROPEAN DIRECTIVE OF ELECTROMAGNETIC COMPATIBILITY

The inverters CFW11...T5... and CFW11...T6... (except the ones with NF option - CFW11...O...NF...) have internal RFI filter for the reduction of the electromagnetic interference.

These inverters, when properly installed, meet the requirements of the electromagnetic compatibility directive ''EMC Directive 2004/108/EC''.

The CFW-11 inverter series has been designed only for industrial applications. Therefore, the emission limits of harmonic currents defined by the standards EN 61000-3-2 and EN 61000-3-2/A14 are not applicable.

ATTENTION!
For using models with internal RFI filters in IT networks follow the instructions on Item 3.2.3.1.2 IT Networks on page 3-35.

3.4.1 Conformal Installation

For the conformal installation use:

1. Shielded output cables (motor cables) with the shield connected at both ends, motor and inverter, by means of a low impedance to high frequencies connection.

   Use the clamps supplied with the product, making sure there is a good contact between the shield and that clamp.

   Keep the separation distance to the other cables according to the Table 3.11 on page 3-43 indication. Refer to the Item 3.2.3 Power Connections on page 3-31, for more information.

   Maximum motor cable length and conduced and radiated emission levels according to the Table 3.19 on page 3-64.

   If a lower conducted emission level category is wished, then an external RFI filter must be used at the inverter input. For more information (RFI filter commercial reference, motor cable length and emission levels) refer to the Table 3.20 on page 3-65.

2. Shielded control cables, keeping the separation distance to other cables according to the Item 3.2.5 Control Connections on page 3-45.

3. Inverter grounding according to the Item 3.2.4 Grounding Connections on page 3-44.

3.4.2 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.
Example: houses, apartments, commercial installations, or offices located in residential buildings.

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

- Categories:

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

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

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

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

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

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.
Note: must be installed and commissioned by a professional when applied in the low-voltage power supply network.

Class A2: equipment intended for use in industrial environments.

3.4.3 Emission and Immunity Levels

Table 3.19 - *Emission and immunity levels*

EMC Phenomenon	Basic Standard	Level
Emission:		
Mains terminal disturbance voltage Frequency range: 150 kHz to 30 MHz	IEC/EN61800-3 (2004) + A1 (2011)	It depends on the inverter model and on the motor cable lenght. Refer to Table 3.20 on page 3-65
Electromagnetic radiation disturbance Frequency range: 30 MHz to 1000 MHz		
Immunity:		
Electrostatic discharge (ESD)	IEC 61000-4-2 (2008)	4 kV for contact discharge and 8 kV for air discharge
Fast transient-Burst	IEC 61000-4-4 (2012)	2 kV / 5 kHz (coupling capacitor) power input cables 1 kV / 5 kHz control cables, and remote keypad cables 2 kV / 5 kHz (coupling capacitor) motor output cables
Conducted radio-frequency common mode	IEC 61000-4-6 (2013)	0.15 to 80 MHz; 10 V; 80 % AM (1 kHz) Motor cables, control cables, and remote keypad cables
Surge immunity	IEC 61000-4-5 (2014)	1.2/50 μs, 8/20 μs 1 kV line-to-line coupling 2 kV line-to-ground coupling
Radio-frequency electromagnetic field	IEC 61000-4-3 (2010)	80 MHz to 1000 GHz 10 V/m 1,4 GHz to 2 GHz 3 V/m 2 GHz to 2,7 GHz 1 V/m 80 % AM (1 kHz)

3

Table 3.20 - *Conducted and radiated emission levels*

Inverter Model	Without External RFI Filter		With External RFI Filter			
	Conducted Emission - Maximum Motor Cable Length	Radiated Emission	External RFI Filter Part Number	Conducted Emission - Maximum Motor Cable Length	Radiated Emission	
	Category C3	Category without metal panel		Category C2	Category without Metal Panel	Category with Metal Panel
CFW110002T5	TBD	TBD	TBD	TBD	TBD	TBD
CFW110004T5	TBD	TBD	TBD	TBD	TBD	TBD
CFW110007T5	TBD	TBD	TBD	TBD	TBD	TBD
CFW110010T5	TBD	TBD	TBD	TBD	TBD	TBD
CFW110012T5	TBD	TBD	TBD	TBD	TBD	TBD
CFW110017T5	TBD	TBD	TBD	TBD	TBD	TBD
CFW110022T5	TBD	TBD	TBD	TBD	TBD	TBD
CFW110027T5	TBD	TBD	TBD	TBD	TBD	TBD
CFW110032T5	TBD	TBD	TBD	TBD	TBD	TBD
CFW110044T5	TBD	TBD	TBD	TBD	TBD	TBD
CFW110002T6	25 m	C3	B84143A25R21	75 m	-	C2
CFW110004T6	25 m	C3		75 m	-	C2
CFW110007T6	25 m	C3		75 m	-	C2
CFW110010T6	25 m	C3		75 m	-	C2
CFW110012T6	25 m	C3	B84143A36R21	75 m	-	C2
CFW110017T6	25 m	C3		75 m	-	C2
CFW110022T6	25 m	C3	B84143A50R21	75 m	-	C2
CFW110027T6	25 m	C3		75 m	-	C2
CFW110032T6	25 m	C3	B84143A80R21	75 m	-	C2
CFW110044T6	25 m	C3		75 m	-	C2
CFW110053T6	100 m	C3	B84143B180S081	50 m	C2	C1
CFW110063T6	100 m	C3		50 m	C2	C1
CFW110080T6	100 m	C3		50 m	C2	C1
CFW110107T6	100 m	C3		50 m	C2	C1
CFW110125T6	100 m	C3		50 m	C2	C1
CFW110150T6	100 m	C3		50 m	C2	C1
CFW110170T6	50 m	C3	B84143B0250S21	25 m	-	C2
CFW110216T6	50 m	C3		25 m	-	C2
CFW110289T6	50 m	C3	B84143B0320S21	25 m	-	C2
CFW110315T6	50 m	C3	B84143B0400S21	25 m	-	C2
CFW110365T6	50 m	C3		25 m	-	C2
CFW110435T6	50 m	C3	B84143B0600S21	25 m	-	C2
CFW110472T6	50 m	C3		25 m	-	C2
CFW110584T6	100 m	C4 (1)	B84143B1000S81	-	-	-
CFW110625T6	100 m	C4 (1)		-	-	-
CFW110758T6	100 m	C4 (1)		-	-	-
CFW110804T6	100 m	C4 (1)		-	-	-

(1) For more details contact Weg.

3

4 KEYPAD AND DISPLAY

This chapter describes:

- ☑ The operator keys and their functions.
- ☑ The indications on the display.
- ☑ How parameters are organized.

4.1 INTEGRAL KEYPAD - HMI-CFW11

The integral keypad can be used to operate and program (view/edit all parameters) of the CFW-11 inverter.

The inverter keypad navigation is similar to the one used in cell phones and the parameters can be accessed in numerical order or through groups (Menu).

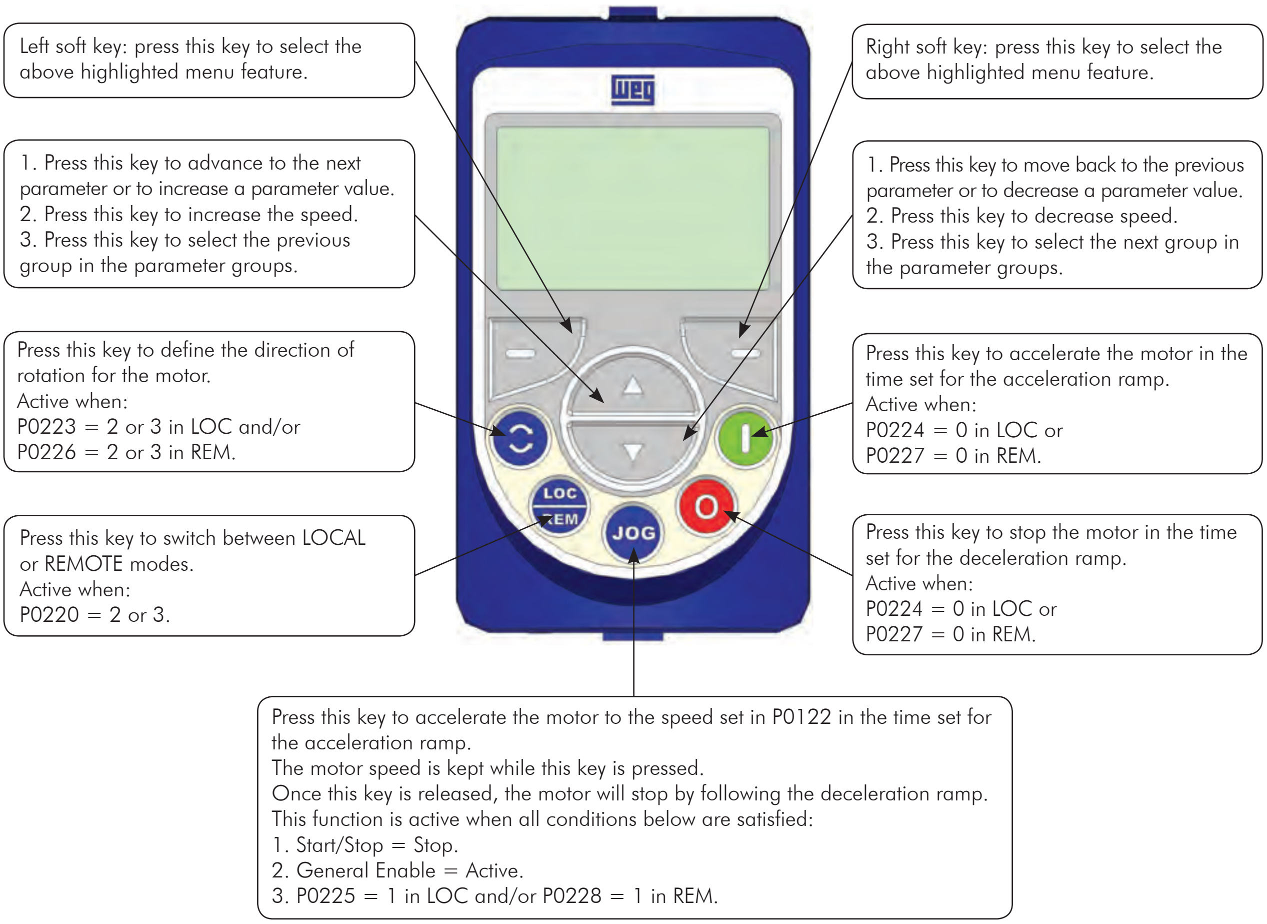


Figure 4.1 - *Operator keys*

Battery:

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

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

①

Cover for battery access

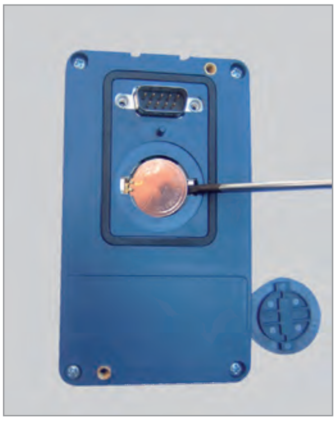
②

Press the cover and rotate it counterclockwise

③

Remove the cover

④



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

⑤

HMI without the battery

⑥

Install the new battery positioning it first at the left side

⑦

Press the battery for its insertion

⑧

Put the cover back and rotate it clockwise

Figure 4.2 - *HMI battery replacement*

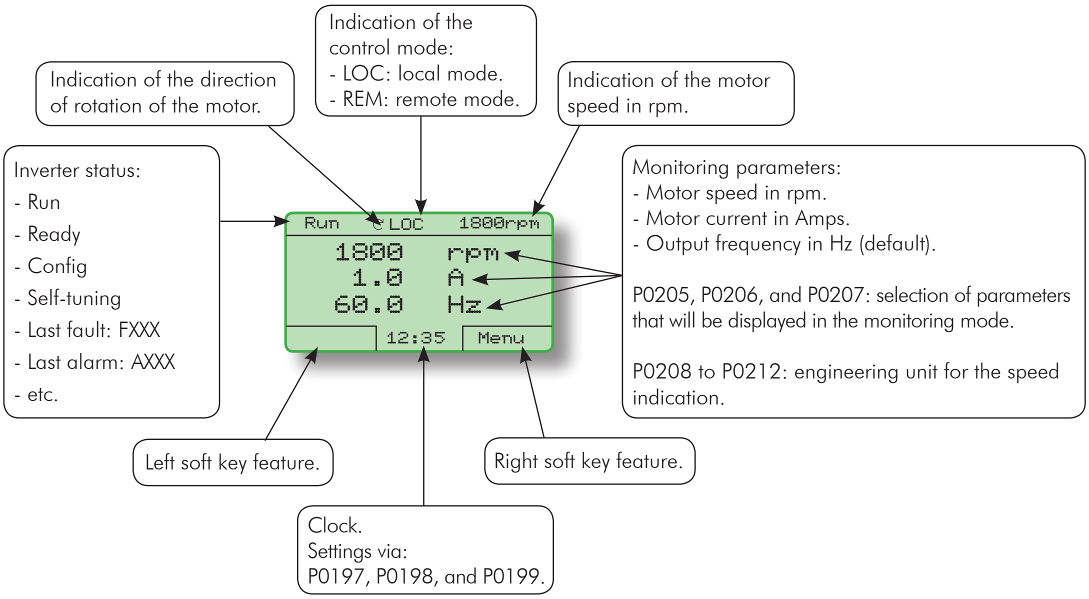
NOTE!
At the end of the battery useful life, please do not discard batteries in your waste container, but use a battery disposal site.

Installation:

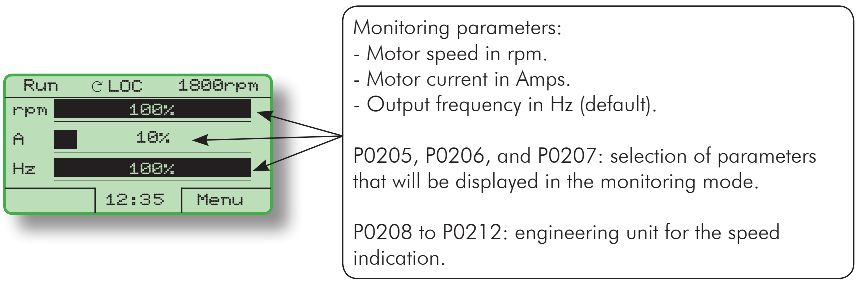
☑ The keypad can be installed or removed from the inverter with or without AC power applied to the inverter.

☑ The HMI supplied with the product can also be used for remote command of the inverter. 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 length of 10 m (33 ft). It is recommended the use of the M3 x 5.8 standoffs supplied with the product. Recommended torque: 0.5 Nm (4.5 lbf in).

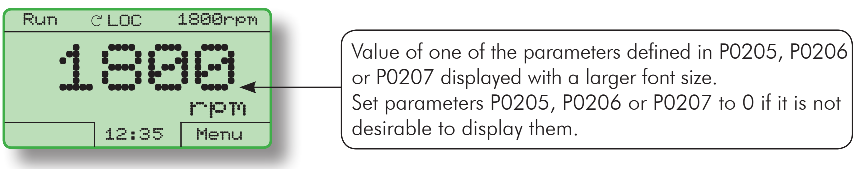
When power is applied to the inverter, the display automatically enters the monitoring mode. Figure 4.3 on page 4-3 presents the monitoring screen displayed for the factory default settings. By properly setting specific inverter parameters, other variables can be displayed in the monitoring mode or the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



(a) Monitoring screen with the factory default settings



(b) Example of a monitoring screen with bar ghaphs



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

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

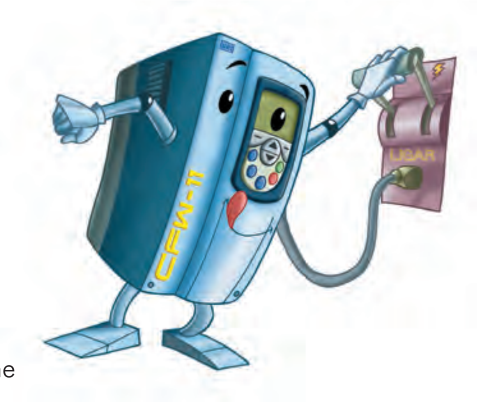
4.2 PARAMETERS ORGANIZATION

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

Table 4.1 - *Groups of parameters*

Level 0	Level 1		Level 2		Level 3	
Monitoring	00	ALL PARAMETERS				
	01	PARAMETER GROUPS	20	Ramps		
			21	Speed References		
			22	Speed Limits		
			23	V/f Control		
			24	Adjust. V/f Curve		
			25	VVW Control		
			26	V/f Current Limit.		
			27	V/f DC Volt. Limit.		
			28	Dynamic Braking		
			29	Vector Control	90	Speed Regulator
					91	Current Regulator
					92	Flux Regulator
					93	I/F Control
					94	Self-Tuning
					95	Torque Curr. Limit.
					96	DC Link Regulator
			30	HMI		
			31	Local Command		
			32	Remote Command		
			33	3-Wire Command		
			34	FWD/REV Run Comm.		
			35	Zero Speed Logic		
			36	Multispeed		
			37	Electr. Potentiom.		
			38	Analog Inputs		
			39	Analog Outputs		
			40	Digital Inputs		
			41	Digital Outputs		
			42	Inverter Data		
			43	Motor Data		
			44	FlyStart/RideThru		
			45	Protections		
			46	PID Regulator		
			47	DC Braking		
			48	Skip Speed		
			49	Communication	110	Local/Rem Config.
					111	Status/Commands
					112	CANopen/DeviceNet
					113	Serial RS-232/485
					114	Anybus
					115	Profibus DP
			50	SoftPLC		
			51	PLC		
			52	Trace Function		
	02	ORIENTED START-UP				
	03	CHANGED PARAMETERS				
	04	BASIC APPLICATION				
	05	SELF-TUNING				
	06	BACKUP PARAMETERS				
	07	I/O CONFIGURATION	38	Analog Inputs		
			39	Analog Outputs		
			40	Digital Inputs		
			41	Digital Outputs		
	08	FAULT HISTORY				
	09	READ ONLY PARAMS.				

5 FIRST TIME POWER-UP AND START-UP



This chapter describes how to:

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

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

ATTENTION!
Firmware version V5.00 or higher **CANNOT** be used on inverters with control board revision prior to "D".
Any firmware version prior to V5.00 **CANNOT** be used on inverters with control board revision "D" or higher.

5.1 PREPARE FOR START-UP

The inverter 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 inverter connection.

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

1. Check if power, grounding, and control connections are correct and firmly secured.
2. Remove from the inside of the inverter all installation material left behind.
3. Verify the motor connections and if the motor voltage and current is within the rated value of the inverter.
4. Mechanically uncouple the motor from the load:
   If the motor cannot be uncoupled, make sure that the chosen direction of rotation (forward or reverse) will not result in personnel injury and/or equipment damage.

5. Return the inverter covers.

6. Measure the power supply voltage and verify if it is within the range listed in Chapter 8 TECHNICAL SPECIFICATIONS on page 8-1.

7. Apply power to the input:
   Close the input disconnect switch.

8. Check the result of the first time power-up:
   The keypad should display the standard monitoring mode (Figure 4.3 on page 4-3) and the status LED should be steady green.

5.2 START-UP

The start-up procedure for the V/f is described in three simple steps by using the **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"** (rigth soft key)	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 15:45 Menu
2	- Group **"00 ALL PARAMETERS"** is already selected - Press **"Select"**	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 15:45 Select
3	- Parameter **"Access to Parameters P0000: 0"** is already selected - Press **"Select"**	Ready LOC 0rpm Access to Parameters P0000: 0 Speed Reference P0001: 90 rpm Return 15:45 Select
4	- To set the password, press the Up Arrow until number **5** is displayed in the keypad	Ready LOC 0rpm P0000 Access to Parameters 0 Return 15:45 Save
5	- When number **5** is displayed in the keypad, press **"Save"**	Ready LOC 0rpm P0000 Access to Parameters 5 Return 15:45 Save
6	- If the setting has been properly performed, the keypad should display **"Access to Parameters P0000: 5"** - Press **"Return"** (left soft key)	Ready LOC 0rpm Access to Parameters P0000: 5 Speed Reference P0001: 90 rpm Return 15:45 Select
7	- Press **"Return"**	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 15:45 Select
8	- The display returns to the monitoring mode	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 15:45 Menu

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

5.2.2 Oriented Start-Up

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

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

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

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

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

Step	Action/Result	Display indication
1	- Monitoring mode - Press "**Menu**" (right soft key)	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 13:48 Menu
2	- Group "**00 ALL PARAMETERS**" has been already selected	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
3	- Group "**01 PARAMETER GROUPS**" is selected	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
4	- Group "**02 ORIENTED START-UP**" is then selected - Press "**Select**"	Ready LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 13:48 Select
5	- Parameter "**Oriented Start-Up P0317: No**" has been already selected - Press "**Select**"	Ready LOC 0rpm Oriented Start-Up P0317: No Return 13:48 Select
6	- The value of "**P0317 = [000] No**" is displayed	Ready LOC 0rpm P0317 Oriented Start-up [000] No Return 13:48 Save
7	- The parameter value is modified to "**P0317 = [001] Yes**" - Press "**Save**"	Ready LOC 0rpm P0317 Oriented Start-up [001] Yes Return 13:48 Save
8	- At this point the Oriented Start-up routine starts and the "Config" status is displayed at the top left corner of the keypad - The parameter "**Language P0201: English**" is already selected - If needed, change the language by pressing "**Select**". Then, press or to scroll through the available options and press "**Save**" to select a different language	Config LOC 0rpm Language P0201: English Type of Control P0202: V/F 60 HZ Reset 13:48 Select
9	- If needed, change the value of P0202 according to the type of control. To do so, press "**Select**" - <u>The settings listed here are valid only for P0202 = 0 (V/f 60 Hz) or P0202 = 1 (V/f 50 Hz). For other options (Adjustable V/f, VVW, or Vector modes), please refer to the programming manual</u>	Config LOC 0rpm Language P0201: English Type of Control P0202: V/F 60 HZ Reset 13:48 Select
10	- If needed, change the value of P0296 according to the line rated voltage To do so, press "**Select**" This modification will affect P0151, P0153, P0185, P0321, P0322, P0323, and P0400	Config LOC 0rpm Type of Control P0202: V/F 50 HZ Line Rated Voltage P0296: 500 - 525 V Reset 13:48 Select
11	- If needed, change the value of P0298 according to the inverter application. To do so, press "**Select**". This modification will affect P0156, P0157, P0158, P0401, P0404 and P0410 (this last one only if P0202 = 0, 1, or 2 - V/f control). The time and the activation level of the overload protection will be affected as well	Config LOC 0rpm Line Rated Voltage P0296: 500 - 525 V Application P0298: Heavy Duty Reset 13:48 Select
12	- If needed, change the value of P0398 according to the motor service factor To do so, press "**Select**" This modification will affect the current value and the activation time of the motor overload function	Config LOC 0rpm Application P0298: Heavy Duty Motor Service Factor P0398: 1.15 Reset 13:48 Select

Step	Action/Result	Display indication
13	- If needed, change the value of P0400 according to the motor rated voltage To do so, press **"Select"** This modification adjusts the output voltage by a factor x = P0400/P0296	Config LOC 0rpm Motor Service Factor P0398: 1.15 Motor Rated Voltage P0400: 525 V Reset 13:48 Select
14	- If needed, change the value of P0401 according to the motor rated current. To do so, press **"Select"**. This modification will affect P0156, P0157, P0158, and P0410	Config LOC 0rpm Motor Rated Voltage P0400: 440V Motor Rated Current P0401: 30.2 A Reset 13:48 Select
15	- If needed, set P0402 according to the motor rated speed. To do so, press **"Select"**. This modification affects P0122 to P0131, P0133, P0134, P0135, P0182, P0208, P0288, and P0289	Config LOC 0rpm Motor Rated Current P0401: 30.2 A Motor Rated Speed P0402: 1750 rpm Reset 13:48 Select
16	- If needed, set P0403 according to the motor rated frequency. To do so, press **"Select"**. This modification affects P0402	Config LOC 0rpm Motor Rated Speed P0402: 1750 rpm Motor Rated Frequency P0403: 50 Hz Reset 13:48 Select
17	- If needed, change the value of P0404 according to the motor rated power To do so, press **"Select"** This modification affects P0410	Config LOC 0rpm Motor Rated Frequency P0403: 50 Hz Motor Rated Power P0404: 30hp 22kW Reset 13:48 Select
18	- This parameter will only be visible if the encoder board ENC1 is installed in the inverter - If there is an encoder connected to the motor, set P0405 according to the encoder pulses number. To do so, press **"Select"**	Config LOC 0rpm Motor Rated Power P0404: 30hp 22kW Encoder Pulses Number P0405: 1024 ppr Reset 13:48 Select
19	- If needed, set P0406 according to the motor ventilation. To do so, press **"Select"** - To complete the Oriented Start-up routine, press **"Reset"** (left soft key) or	Config LOC 0rpm Encoder Pulses Number P0405: 1024 ppr Motor Ventilation P0406: Self-Vent. Reset 13:48 Select
20	- After few seconds, the display returns to the monitoring mode	Ready LOC 0rpm 0 rpm 0.0 A 0.0 Hz 13:48 Menu

***Figure 5.2 -** Oriented Start-up*

5.2.3 Setting Basic Application Parameters

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

The inverter has a number of other parameters that allow its adaptation to the most different applications. This manual presents some basic parameters that shall be set in most cases. There is a group named "Basic Application" to make this task easier. A summary of the parameters inside this group is listed in Table 5.1 on page 5-7. There is also a group of read only parameters that shows the value of the most important inverter variables such as voltage, current, etc. The main parameters comprised in this group are listed in Table 5.2 on page 5-8. For further details, please refer to the CFW-11 programming manual.

Follow steps outlined in Figure 5.3 on page 5-6 to set the parameters of the Basic Application group.

The procedure for start-up in the V/f operation mode is finished after setting these parameters.

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

***Figure 5.3 -** Setting parameters of the Basic Application group*

5

***Table 5.1 -** Parameters comprised in the basic application group*

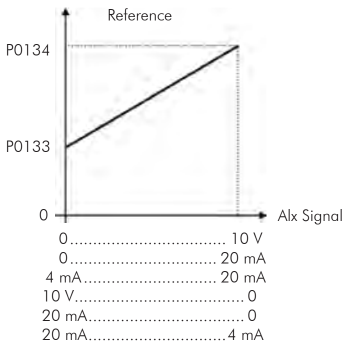
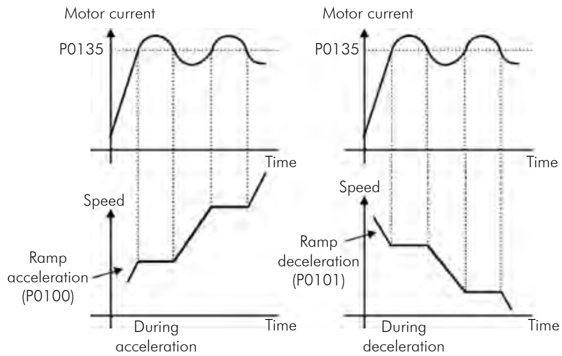
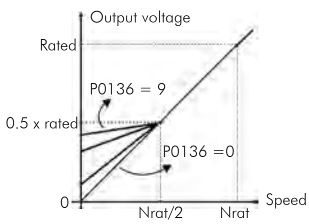
Parameter	Name	Description	Setting Range	Factory Setting	User Setting
P0100	Acceleration time	- Defines the time to linearly accelerate from 0 up to the maximum speed (P0134) - If set to 0.0 s, it means no acceleration ramp	0.0 to 999.0 s	20.0 s	
P0101	Deceleration time	- Defines the time to linearly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

Table 5.2 - *Main read only parameters*

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

5.3 SETTING DATE AND TIME

Step	Action/Result	Display indication
1	Monitoring mode - Press **"Menu"** (right soft key)	Ready ↻LOC 0rpm 0 rpm 0.0 A 0.0 Hz 16:10 Menu
2	- Group **"00 ALL PARAMETERS"** is already selected	Ready ↻LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 16:10 Select
3	- Group **"01 PARAMETER GROUPS"** is selected - Press **"Select"**	Ready ↻LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 16:10 Select
4	- A new list of groups is displayed and group **"20 Ramps"** is selected - Press until you reach group **"30 HMI"**	Ready ↻LOC 0rpm 20 Ramps 21 Speed References 22 Speed Limits 23 V/F Control Return 16:10 Select
5	- Group **"30 HMI"** is selected - Press **"Select"**	Ready ↻LOC 0rpm 27 V/F DC Volt. Limit. 28 Dynamic Braking 29 Vector Control 30 HMI Return 16:10 Select
6	- Parameter **"Day P0194"** is already selected - If needed, set P0194 according to the actual day To do so, press **"Select"** and then, or to change P0194 value - Follow the same steps to set parameters "**Month P0195**" to "**Seconds P0199**"	Ready ↻LOC 0rpm Day P0194: 06 Month P0195: 10 Return 16:10 Select
7	- Once the setting of P0199 is over, the Real Time Clock is now updated - Press **"Return"** (left soft key)	Ready ↻LOC 0rpm Minutes P0198: 11 Seconds P0199: 34 Return 18:11 Select
8	- Press **"Return"**	Ready ↻LOC 0rpm 27 V/F DC Volt. Limit. 28 Dynamic Braking 29 Vector Control 30 HMI Return 18:11 Select
9	- Press **"Return"**	Ready ↻LOC 0rpm 00 ALL PARAMETERS 01 PARAMETER GROUPS 02 ORIENTED START-UP 03 CHANGED PARAMETERS Return 18:11 Select
10	- The display is back to the monitoring mode	Ready ↻LOC 0rpm 0 rpm 0.0 A 0.0 Hz 18:11 Menu

Figure 5.4 - *Setting date and time*

5

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 5-3.

5.5 HOW TO CONNECT A PC

NOTES!

- 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).
  USBC-AM-MB-B-B-S-2 (2 meters).
  USBC-AM-MB-B-B-S-3 (3 meters).
- The USB connection is galvanically isolated from the mains power supply and from other high voltages internal to the inverter. However, the USB connection is not isolated from the Protective Ground (PE). Use an isolated notebook for the USB connection or a desktop connected to the same Protective Ground (PE) of the inverter.

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

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

1. Install the SuperDrive G2 software in the PC.

2. Connect the PC to the inverter through a USB cable.

3. Start SuperDrive G2.

4. Choose "Open" and the files stored in the PC will be displayed.

5. Select the file.

6. Use the command "Write Parameters to the Drive".
   - All parameters are now transferred to the inverter.

For further information on SuperDrive G2 software, please refer SuperDrive manual.

5.6 FLASH MEMORY MODULE

Location as presented in Figure 2.2 on page 2-7, Figure 2.5 on page 2-9 and Figure 2.7 on page 2-12.

Functions:

- Store a copy of the inverter parameters.

- Transfer parameters stored in the FLASH memory to the inverter.

- Transfer firmware stored in the FLASH memory to the inverter.

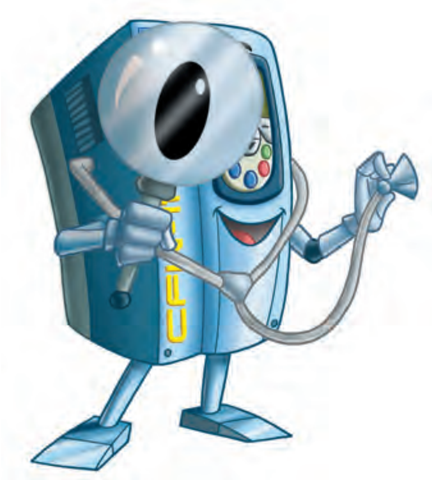
- Store programs created by the SoftPLC.

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

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

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

6 TROUBLESHOOTING AND MAINTENANCE



This chapter:

- 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:

- Keypad and EP (Electronic Pot) speed references, in case the function "Reference backup" is enabled in P0120.
- The "FAULT" or alarm potentiometer code that occurred (shifts the last nine previous faults and alarms).
- The state of the motor overload function integrator.
- The state of the operating hours counter (P0043) and the powered-up hours counter (P0042).

Reset the inverter to return the drive to a "READY" condition in the event of a "FAULT". The following reset options are available:

☑ Removing the power supply and reapplying it (power-on reset).

☑ Pressing the operator key O (manual reset).

☑ Through the "Reset" soft key.

☑ Automatically by setting P0340 (auto-reset).

6

☑ Through a digital input: DIx = 20 (P0263 to P0270).

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

☑ The keypad displays the "ALARM" code and description.

☑ The "STATUS" LED changes to yellow.

☑ The PWM pulses are not blocked (the inverter is still operating).

6.2 FAULTS, ALARMS AND POSSIBLE CAUSES

***Table 6.1** - Faults, alarms and possible causes*

Fault/Alarm	Description	Possible Causes
F006 Imbalance or Input Phase Loss	Mains voltage imbalance too high or phase missing in the input power supply. **Note:** - If the motor is unloaded or operating with reduced load this fault may not occur. - Fault delay is set at parameter P0357 P0357 = 0 disables the fault.	☑ Phase missing at the inverter's input power supply. ☑ Input voltage imbalance >5 %. **For the frame size E:** ☑ Phase loss at L3/R or L3/S may cause F021 or F185. ☑ Phase loss at L3/T will cause F006. **For frame sizes F and G:** ☑ Pre-charge circuit fault.
F021 DC Bus Undervoltage	DC bus undervoltage condition occurred.	☑ The input voltage is too low and the DC bus voltage dropped below the minimum permitted value (monitor the value at parameter P0004): Ud < 530 V - Supply voltage 500 / 525 V (P0296 = 5). Ud < 580 V - Supply voltage 500 / 575 V (P0296 = 6). Ud < 605 V - Supply voltage 600 V (P0296 = 7). Ud < 696 V - Supply voltage 660 / 690 V (P0296 = 8). ☑ Phase loss in the input power supply. ☑ Pre-charge circuit failure. ☑ Parameter P0296 was set to a value above of the power supply rated voltage.
F022 DC Bus Overvoltage	DC bus overvoltage condition occurred.	☑ The input voltage is too high and the DC bus voltage surpassed the maximum permitted value: Ud > 1000 V - For P0296 = 5, 6 or 7. Ud > 1200 V - For P0296 = 8. ☑ Inertia of the driven-load is too high or deceleration time is too short. ☑ Wrong settings for parameters P0151, or P0153, or P0185.
F030 (10) 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 (10) 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 (10) Power Module W Fault	Desaturation of IGBT occured in Power Module W.	☑ Short-circuit between motor phases W and U or W and V.
F042 (1) DB IGBT Fault	Desaturation of Dynamic Braking IGBT occured.	☑ Short-circuit between the connection cables of the dynamic braking resistor.
A046 High Load on Motor	Load is too high for the used motor. **Note:** It may be disabled by setting P0348 = 0 or 2.	☑ Settings of P0156, P0157, and P0158 are too low for the used motor. ☑ Motor shaft load is excessive.
A047 IGBTs Overload Alarm	An IGBTs overload alarm occurred. **Note:** It may be disabled by setting P0350 = 0 or 2.	☑ Inverter output current is too high.
F048 IGBTs Overload Fault	An IGBTs overload fault occurred.	☑ Inverter output current is too high.

Fault/Alarm	Description	Possible Causes
A050 IGBTs 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 (>50 °C (122 °F)) and output current is too high. ☑ Blocked or defective fan. ☑ Very dirty heatsink.
F051 IGBTs Overtemperature U	A high temperature fault was detected by the NTC temperature sensors located on the IGBTs.	
A053 (9) 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 (9) Overtemperature on IGBTs V	Fault of overtemperature measured at the temperature sensors (NTC) of the IGBTs.	
A056 (9) 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 (9) Overtemperature on IGBTs W	Fault of overtemperature measured at the temperature sensors (NTC) of the IGBTs.	
F062 (12) Thermal Imbalance	Fault of power module temperature imbalance.	☑ The temperature difference between IGBTs modules of the same phase (U, V, W) was above 10 °C. ☑ The temperature difference between IGBTs modules of different phases (U and V, U and W, V and W) was above 20 °C. ☑ The temperature difference between rectifier modules of different phases (R and S, R and T, S and T) was above 10 °C.
F067 Encoder/Motor Wiring is Inverted	Fault related to the phase relation of the encoder signals if P0202 = 4 and P0408 = 0, 2, 3 or 4. **Note:** - It is not possible to reset this fault during the self-tuning. - In this case, power down the inverter, solve the problem and then power up. - When P0408 = 0, this fault can be deactivated by means of parameter P0358. In this case, it is not possible to reset the fault.	☑ U, V, W wiring to the motor is inverted. ☑ Encoder channels A and B are inverted. ☑ Error in the encoder assembly position.
F070 (2) Overcurrent/Short-circuit	Overcurrent or short-circuit detected at the output, in the DC bus, or at the braking resistor.	☑ Short-circuit between two motor phases. ☑ Short-circuit between the connection cables of the dynamic braking resistor. ☑ IGBT modules are shorted.
F071 Output Overcurrent	The inverter output current was too high for too long.	☑ Excessive load inertia or acceleration time too short. ☑ Settings of P0135 or P0169, P0170, P0171, and P0172 are too high.
F072 Motor Overload	The motor overload protection operated. **Note:** It may be disabled by setting P0348 = 0 or 3.	☑ Settings of P0156, P0157, and P0158 are too low for the used motor. ☑ Motor shaft load is excessive.
F074 Ground Fault	A ground fault occured either in the cable between the inverter and the motor or in the motor itself. **Note:** It may be disabled by setting P0343 = 0.	☑ Shorted wiring in one or more of the output phases ☑ Motor cable capacitance is too large, resulting in current peaks at the output (11).
F076 Motor Current Imbalance	Fault of motor current unbalance. **Note:** It may be disabled by setting P0342 = 0.	☑ Loose connection or broken wiring between the motor and inverter connection. ☑ Vector control with wrong orientation. ☑ Vector control with encoder, encoder wiring or encoder motor connection inverted.
F077 DB Resistor Overload	The dynamic braking resistor overload protection operated.	☑ Excessive load inertia or desacceleration time too short. ☑ Motor shaft load is excessive. ☑ Wrong setttings for parameters P0154 and P0155.
F078 Motor Overtemperature	Fault related to the PTC temperature sensor installed in the motor. **Note:** - It may be disabled by setting P0351 = 0 or 3. - It is required to set the analog input / output to the PTC function.	☑ Excessive load at the motor shaft. ☑ Excessive duty cycle (too many starts / stops per minute). ☑ Surrounding air temperature too high. ☑ Loose connection or short-circuit (resistance < 100 Ω) in the wiring connected to the motor termistor. ☑ Motor termistor is not installed. ☑ Blocked motor shaft.

Fault/Alarm	Description	Possible Causes
F079 Encoder Signal Fault	Lack of encoder signals. By Hw - fault can be disable with switch of ENC1 and ENC2 board. By Sw - fault can be disable at parameter P0358.	☑ Broken wiring between motor encoder and option kit for encoder interface. ☑ Defective encoder.
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 inverter with a different firmware version.
F084 Auto-diagnosis Fault	Auto-diagnosis fault.	☑ Defect in the inverter internal circuitry.
A088 Communication Lost	Indicates a problem between the keypad and control board communication.	☑ Loose keypad cable connection. ☑ Electrical noise in the installation.
A090 External Alarm	External alarm via 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 inverter internal circuitry.
A110 High Motor Temperature	Alarm related to the PTC temperature sensor installed in the motor. **Note:** - It may be disabled by setting P0351 = 0 or 2. - It is required to set the analog input / output to the PTC function.	☑ Excessive load at the motor shaft. ☑ Excessive duty cycle (too many starts / stops per minute). ☑ Surrounding air temperature too high. ☑ Loose connection or short-circuit (resistance < 100 Ω) in the wiring connected to the motor termistor. ☑ Motor termistor is not installed. ☑ Blocked motor shaft.
A128 Timeout for Serial Communication	Indicates that the inverter stopped receiving valid messages within a certain time interval. **Note:** It may be disabled by setting P0314 = 0.0 s.	☑ Check the wiring and grounding installation. ☑ Make sure the inverter has sent a new message within the time interval set at P0314.
A129 Anybus is Offline	Alarm that indicates interruption of the Anybus-CC communication.	☑ PLC entered into the idle state. ☑ Programming error. Master and slave set with a different number of I/O words. ☑ Communication with master has been lost (broken cable, unplugged connector, etc.).
A130 Anybus Access Error	Alarm that indicates an access error to the Anybus-CC communication module.	☑ Defective, unrecognized, or improperly installed Anybus-CC module. ☑ Conflict with a WEG option board.
A133 CAN Not Powered	Alarm indicating that the power supply was not connected to the CAN controller.	☑ Broken or loose cable. ☑ Power supply is off.
A134 Bus Off	Inverter CAN interface has entered into the bus-off state.	☑ Incorrect communication baud-rate. ☑ Two nodes configured with the same address in the network. ☑ Wrong cable connection (inverted signals).
A135 CANopen Communication Error	Alarm that indicates a communication error.	☑ Communication problems. ☑ Wrong master configuration/settings. ☑ Incorrect configuration of the communication objects.
A136 Idle Master	Network master has entered into the idle state.	☑ PLC in IDLE mode. ☑ Bit of the PLC command register set to zero (0).
A137 DNet Connection Timeout	I/O connection timeout - DeviceNet communication alarm.	☑ One or more allocated I/O connections have entered into the timeout state.
A138 (3) Profibus DP Interface in Clear Mode	It indicates that the inverter received a command from the Profibus DP network master to enter the clear mode.	☑ Verify the network master status, making sure it is in execution mode (Run). ☑ Refer to the Profibus DP communication manual for more information.
A139 (3) Offline Profibus DP Interface	It indicates an interruption in the communication between the Profibus DP network master and the inverter.	☑ Verify whether the network master is correctly configured and operating normally. ☑ Verify the network installation in a general manner - cable routing, grounding. ☑ Refer to the Profibus DP communication manual for more information.
A140 (3) Profibus DP Module Access Error	It indicates an error in the access to the Profibus DP communication module data.	☑ Verify whether the Profibus DP module is correctly fit into the slot 3. ☑ Refer to the Profibus DP communication manual for more information.

Fault/Alarm	Description	Possible Causes
F150 Motor Overspeed	Overspeed fault. It is activated when the real speed exceeds the value of P0134 x (100 % + P0132) for more than 20 ms.	☑ Wrong settings of P0161 and/or P0162. ☑ Problem with the hoist-type load.
F151 FLASH Memory Module Fault	FLASH Memory Module fault (MMF-03).	☑ 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 (>50 °C (122 °F)) and excessive output current. ☑ Defective internal fan. ☑ High temperature (> 45 ºC (113 °F)) inside the cabinet.
F153 Internal Air Overtemperature	Internal air overtemperature fault.	
A156 (14) Undertemperature	Only 1 sensor indicates temperature below -30 ºC (-22 °F).	☑ Surrounding air temperature ≤ -30 °C (-22 °F).
F156 Undertemperature	Undertemperature fault (below -30 °C (-22 °F)(13)) in the IGBTs or rectifier measured by the temperature sensors.	☑ Surrounding air temperature ≤ -30 °C (-22 °F) (13).
F160 Safety Stop Relays	Safety Stop relay fault.	☑ It was only applied +24 Vdc to one STO input (STO1 or STO2). ☑ One of the relays is defective.
F161 Timeout PLC11CFW-11	☑ Refer to the PLC11-01 module programming manual.	
A162 Incompatible PLC Firmware		
A163 Break Detect AI1	It indicates that the AI1 current (4-20 mA or 20-4 mA) reference is out of the 4 to 20 mA range.	☑ Broken AI1 cable. ☑ Bad contact at the signal connection to the terminal strip.
A164 Break Detect AI2	It indicates that the AI2 current (4-20 mA or 20-4 mA) reference is out of the 4 to 20 mA range.	☑ Broken AI2 cable. ☑ Bad contact at the signal connection to the terminal strip.
A165 Break Detect AI3	It indicates that the AI3 current (4-20 mA or 20-4 mA) reference is out of the 4 to 20 mA range.	☑ Broken AI3 cable. ☑ Bad contact at the signal connection to the terminal strip.
A166 Break Detect AI4	It indicates that the AI4 current (4-20 mA or 20-4 mA) reference is out of the 4 to 20 mA range.	☑ Broken AI4 cable. ☑ Bad contact at the signal connection to the terminal strip.
F174 (4) Left Fan Speed Fault	Heatsink left fan speed fault.	☑ Dirt on the blades and in the bearings of the fan. ☑ Defective fan. ☑ Defective fan power supply connection.
F175 (5) Center Fan Speed Fault	Heatsink center fan speed fault.	☑ Dirty on the blades and in the bearings of the fan. ☑ Defective fan. ☑ Defective fan power supply connection.
F176 (4) Right Fan Speed Fault	Heatsink right fan speed fault.	☑ Dirt on the blades and in the bearings of the fan. ☑ Defective fan. ☑ Defective fan power supply connection.
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 referring to the fan speed of the heatsink.	☑ Dirt on the blades and rolling bearings of the fan. ☑ Defective fan. ☑ Defective connection of the fan power supply.
F179 Heatsink Fan Speed Fault	This fault indicates a problem with the heatsink fan. **Note:** This function may be disabled by setting P0354 = 0.	☑ Dirt on the blades and in the bearings of the fan. ☑ Defective fan. ☑ Defective fan power supply connection.
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	Indicates a fault on the output pulses feedback.	☑ No motor connected or the motor connected to the .inverter output is too small. ☑ Possible defect on the internal circuits of the inverter Possible solutions: ☑ Reset inverter and try again. ☑ Set P0356 = 0 and try again.
F183 IGBTs Overload + Temperature	Overtemperature related to the IGBTs overload protection.	☑ Surrounding air temperature too high. ☑ Operation with frequencies < 10 Hz under overload.

6

Fault/Alarm	Description	Possible Causes
F185 (6) Pre-charge Contactor Fault	It indicates fault at the pre-charge Contactor.	☑ Pre-charge contactor defect. ☑ Inverter CFW11 frame size E powered by DC Link: P0355 should be programd to 0.
F186: (7) Sensor 1 Temperature Fault	It indicates a temperature fault at the sensor 1.	☑ Motor high temperature.
F187 (7) Sensor 2 Temperature Fault	It indicates a temperature fault at the sensor 2.	☑ Motor high temperature.
F188 (7) Sensor 3 Temperature Fault	It indicates a temperature fault at the sensor 3.	☑ Motor high temperature.
F189 (7) Sensor 4 Temperature Fault	It indicates a temperature fault at the sensor 4.	☑ Motor high temperature.
F190 (7) Sensor 5 Temperature Fault	It indicates a temperature fault at the sensor 5.	☑ Motor high temperature.
A191 (7) Sensor 1 Temperature Alarm	It indicates a temperature alarm at the sensor 1.	☑ Motor high temperature. ☑ A problem in the wiring connecting the sensor to the IOE 01 (02 or 03).
A192 (7) Sensor 2 Temperature Alarm	It indicates a temperature alarm at the sensor 2.	☑ Motor high temperature. ☑ A problem in the wiring connecting the sensor to the IOE 01 (02 or 03).
A193 (7) Sensor 3 Temperature Alarm	It indicates a temperature alarm at the sensor 3.	☑ Motor high temperature ☑ A problem in the wiring connecting the sensor to the IOE 01 (02 or 03).
A194 (7) Sensor 4 Temperature Alarm	It indicates a temperature alarm at the sensor 4.	☑ Motor high temperature. ☑ A problem in the wiring connecting the sensor to the IOE 01 (02 or 03).
A195 (7) Sensor 5 Temperature Alarm	It indicates a temperature alarm at the sensor 5.	☑ Motor high temperature. ☑ A problem in the wiring connecting the sensor to the IOE 01 (02 or 03).
A196 (7) Sensor 1 Cable Alarm	Sensor 1 cable alarm.	☑ Shorted temperature sensor.
A197 (7) Sensor 2 Cable Alarm	Sensor 2 cable alarm.	☑ Shorted temperature sensor.
A198 (7) Sensor 3 Cable Alarm	Sensor 3 cable alarm.	☑ Shorted temperature sensor.
A199 (7) Sensor 4 Cable Alarm	Sensor 4 cable alarm.	☑ Shorted temperature sensor.
A200 (7) Sensor 5 Cable Alarm	Sensor 5 cable alarm.	☑ Shorted temperature sensor.
F228 Serial Communication Timeout	☑ Refer to the RS-232 / RS-485 Serial communication manual.	
F229 Anybus Offline	☑ Refer to the Anybus-CC communication manual.	
F230 Anybus Access Error		
F233 CAN Bus Power Failure	☑ Refer to the CANopen communication manual and/or the DeviceNet communication manual.	
F234 Bus Off		
F235 CANopen Communication Error	☑ Refer to the CANopen communication manual.	
F236 Master Idle		
F237 DeviceNet Connect Timeout		

Fault/Alarm	Description	Possible Causes
F238 (3) Profibus DP Interface in Clear Mode	☑ Refer to the Profibus DP communication manual.	
F239 (3) Offline Profibus DP Interface		
F240 (3) Profibus DP Module Access Error		
F416 (12) IGBT Curr. Imb. Fault	Fault of current imbalance on the IGBTs.	☑ IGBTs of the same phase presented a current imbalance above 15 %.
F417 (12) Thermal Imbalance	The temperature difference between IGBT modules of the same phase (U, V, W) was above 10 °C (50 ° F).	☑ The temperature difference between IGBT modules of different phases (U and V, U and W, V and W) was above 10 °C (50 ° F). The temperature difference between rectifier modules of different phases (R and S, R and T, S and T) was above 10 °C (50 °F).
F418 (12) Air Control Overtemp	Fault of overtemperature of the internal air on the control board.	☑ Temperature of the internal air of the control board is above 85 °C (185 ° F).
A419 (12) Control Air Temperature High Alarm	Alarm of overtemperature of the internal air on the control board.	☑ When the temperature of the internal air of the control board is above 70 °C (158 °F) .
A700 (8) Detached HMI	Alarm or fault related to the HMI disconnection.	☑ RTC function block has been activated in the applicative and the HMI is disconnected from the inverter.
F701 (8) Detached HMI		
A702 (8) Inverter Disabled	Alarm indicating that the General Enable command is not active.	☑ The SoftPLC Run/Stop command is equal to Run or a movement block has been enable while the inverter is general disabled.
A704 (8) Two Movements Enabled	Two movements have been enabled.	☑ It occurs when two or more movement blocks are enabled simultaneously.
A706 (8) Speed Reference Not Programmed for SoftPLC	Speed reference not programmed for SoftPLC.	☑ It occurs when a movement block has been enabled and the speed reference has not been configured for SoftPLC (check P0221 and P0222).

Models where they can occur and additional notes:
(1) All the models of frame sizes D and E.
(2) All the models of frame sizes B and C.
(3) With a Profibus DB module connected into the slot 3 (XC43).
(4) Frame sizes F, G and H.
(5) All the models of the frame sizes G and H.
(6) All the models of the frame sizes E and H.
(7) With IOE-01 (02 or 03) modules connected into the slot 1 (XC41).
(8) All the models with a SoftPLC applicative.
(9) All the models of frame sizes F, G and H.
(10) All the models of frame sizes D, E, F, G and H.
(11) Long motor cables (with more than 100 meters) (328.08 ft) will have a high leakage capacitance to the ground. The circulation of leakage currents through these capacitances may activate the ground fault protection after the inverter is enabled, and consequently, the occurrence of fault F074.
- Decrease the carrier frequency (P0297).
- Install an output reactor between the inverter and the motor.

(12) All models of frame size H.
(13) Below -20 °C (- 4 °F) for frame size H.
(14) Only for models of frame sizes F and G.

NOTE!

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

6

6.3 SOLUTIONS FOR THE MOST FREQUENT PROBLEMS

Table 6.2 - *Solutions for the most frequent problems*

Problem	Point to be Verified	Corrective Action
Motor does not start	Incorrect wiring	1. Check all power and control connections. For instance, the digital inputs set to Start/Stop, General Enable, or no external error must be connected to the 24 Vdc or to DGND* terminals (refer to Figure 3.36 on page 3-47)
	Analog reference (if used)	1. Check if the external signal is properly connected 2. Check the status of the control potentiometer (if used)
	Incorrect settings	1. Check if the parameter values are correct for the application
	Fault	1. Check whether the inverter is disabled due to a fault condition 2. Make sure that the terminals XC1:13 and XC1:11 are not shorted (short-circuit at the 24 Vdc power supply)
	Stalled motor	1. Decrease the motor overload 2. Increase P0136, P0137 (V/f), or P0169/P0170 (vector control)
Motor speed oscillates	Loose connections	1. Stop the inverter, turn off the power supply, check and tighten all the power connections 2. Check all the internal connections of the inverter
	Defective speed reference potentiometer	1. Replace the potentiometer
	Oscillation of the external analog reference	1. Identify the cause of the oscillation. If it is caused by electrical noise, use shielded cables or separate them from the power and control wiring
	Incorrect settings (vector control)	1. Check parameters P0410, P0412, P0161, P0162, P0175, and P0176 2. Refer to the programming manual
Too high or too low motor speed	Incorrect settings (reference limits)	1. Check whether the values of P0133 (minimum speed) and P0134 (maximum speed) are properly set for the used motor and application
	Control signal from the analog reference (if used)	1. Check the level of the reference control signal 2. Check the settings (gain and offset) of parameters P0232 to P0249
	Motor nameplate	1. Check whether the used motor matches the application
Motor does not reach the rated speed, or motor speed starts oscillating around the rated speed (Vector Control)	Settings	1. Decrease P0180 2. Check P0410
Display is off	Keypad connections	1. Check the inverter keypad connection
	Power supply voltage	1. Rated values must be within the limits specified below: - Minimum: 425 V - Maximum: 759 V
	Mains supply fuses open	1. Replace the fuses
Motor does not operate in the field weakening region (Vector Control)	Settings	1. Decrease P0180
Low motor speed and P0009 = P0169 or P0170 (motor operating with torque limitation), for P0202 = 4 - vector with encoder	Encoder signals are inverted or power connections are inverted	1. Check signals A - $\overline{A}$, B - $\overline{B}$, refer to the incremental encoder interface manual. If signals are properly wired, invert two of the output phases. For instance U and V

6.4 INFORMATION NECESSARY FOR CONTACTING TECHNICAL SUPPORT

NOTE!

For technical support and servicing, it is important to have the following information in hand:

- ☑ Inverter model.
- ☑ Serial number, manufacturing date, and hardware revision that are listed in the product nameplate (refer to the Section 2.4 IDENTIFICATION LABELS FOR THE CFW-11 on page 2-17).
- ☑ Installed software version (check parameter P0023).
- ☑ Application data and inverter settings.

6.5 PREVENTIVE MAINTENANCE

DANGER!

- ☑ Always turn off the mains power supply before touching any electrical component associated to the inverter.
- ☑ 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 at the inverter.

DANGER!

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

ATTENTION!

The electronic boards have electrostatic discharge sensitive components.

Do not touch the components or connectors directly. If necessary, first touch the grounded metallic frame or wear a ground strap.

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

The inverters require low maintenance when properly installed and operated. The Table 6.3 on page 6-9 presents the main procedures and time intervals for preventive maintenance. The Table 6.4 on page 6-10 provides recommended periodic inspections to be performed every 6 months after the inverter 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 6-11
Keypad battery replacement		Every 10 years	Refer to the Chapter 4 KEYPAD AND DISPLAY on page 4-1
Electrolytic capacitors (2)	If the inverter is stocked (not being used): "Reforming"	Every year from the manufacturing date printed on the inverter identification label (refer to the Section 2.4 IDENTIFICATION LABELS FOR THE CFW-11 on page 2-17)	Apply power to the inverter (voltage between 300 and 330 Vac, single-phase or three-phase, 50 or 60 Hz) for at least one hour. Then, disconnect the power supply and wait at least 24 hours before using the inverter (reapply power)
	Inverter is being used: replace	Every 10 years	Contact WEG technical support

(1) The inverters are set at the factory 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 inverter usage conditions (motor current, output frequency, cooling air temperature, etc.). The inverter stores the number of fan operating hours in the parameter P0045. When this parameter reaches 50000 operating hours, the keypad display shows the alarm A177.
(2) Only valid for frame sizes B, C, D, E, F and G.

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

Component	Abnormality	Corrective Action
Terminals, connectors	Loose screws	Tighten
	Loose connectors	
Fans/Cooling system	Dirty fans	Cleaning
	Abnormal acoustic noise	Replace the fan. Refer to the Figure 6.1 on page 6-11 for the removal of the fan. Install the new fan in the reverse sequence of the removal
	Blocked fan	
	Abnormal vibration	Check the fan connections
	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 bus capacitors (DC Link)	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 is necessary to clean the inverter, follow the instructions below:

Ventilation system:

☑ Disconnect the inverter power supply and wait at least 10 minutes.

☑ Remove the dust from the cooling air inlet by using a soft brush or a flannel.

☑ Remove the dust from the heatsink fins and from the fan blades by using compressed air.

Electronic boards:

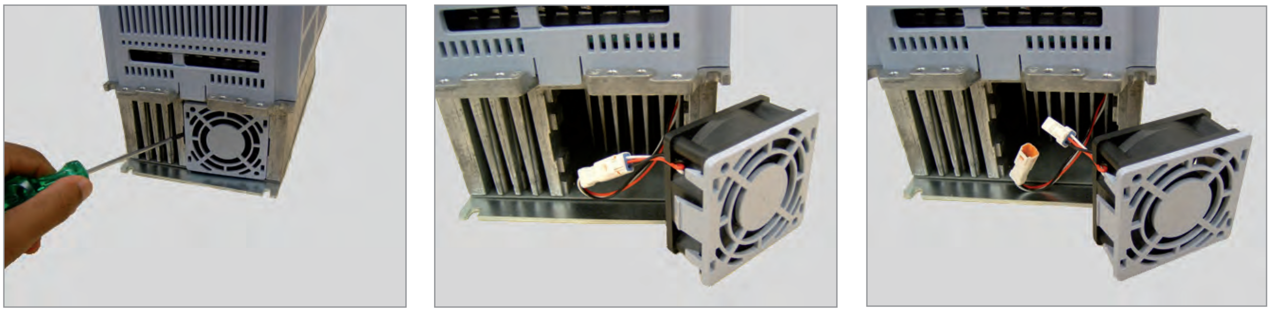
☑ Disconnect the inverter power supply and wait at least 10 minutes.

☑ Remove the dust from the electronic board by using an anti-static brush or an ion air gun (Charges Burtes Ion Gun - reference A6030-6DESCO).

☑ If necessary, remove the boards from the inverter.

☑ Always wear a ground strap.

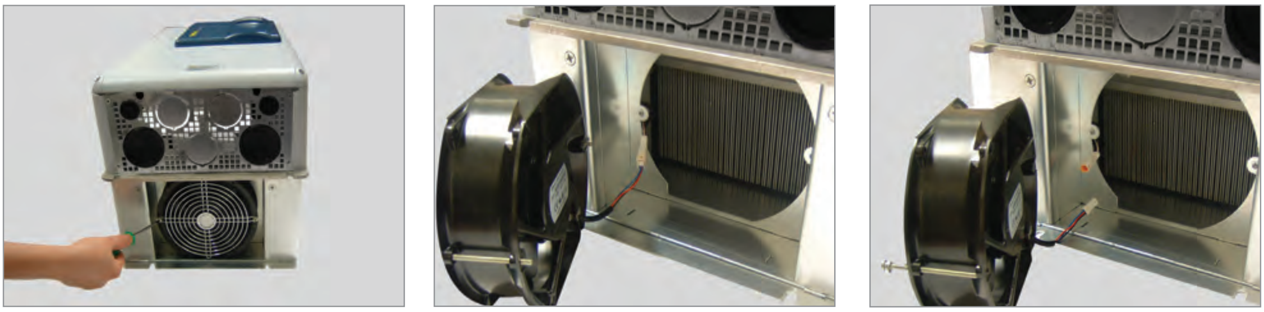
① ② ③



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

(a) Frame sizes B, C and D

① ② ③



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

(b) Frame size E

① ② ③

Fan securing screws removal | ***Fan removal*** | ***Cable disconnection***

(c) Frame sizes F, G and H (example on frame 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 inverter from the factory:

- External 24 Vdc power supply for control and keypad.

- Nema 1 Protection degree (Frame size E).

☑ Instructions for the proper use of the option kits.

☑ The accessories that can be integrated to the inverters.

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 Nema 1 Protection Degree - Frame Sizes B, C and E

Inverters with the following codification: CFW11...O...N1.
Refer to Item 3.1.5 Installation of the Inverter with Nema1 Kit (Option, CFW11....T...ON1...) on a Wall - Frame Size E on page 3-11, and Section 8.6 NEMA 1 KITs on page 8-16.

7.1.2 Safety Stop Function

Inverters with the following codification CFW11...O...Y.... Refer to Section 3.3 SAFETY STOP FUNCTION on page 3-54.

7.1.3 24 Vdc External Control Power Supply

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

The use of this option kit is recommended with communication networks (Profibus, DeviceNet, etc.), since the control circuit and the network communication interface are kept active (with power supply and responding to the network communication commands) even in the event of main power supply interruption.

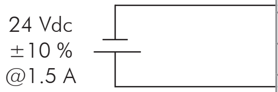
Inverters with this option have a built-in DC/DC converter with a 24 Vdc input that provides adequate outputs for the control circuit. Therefore, the control circuit power supply will be redundant, i.e., it can be provided either by a 24 Vdc external power supply (connection as shown in Figure 7.1 on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

Observe that the inverters 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 the output like in the standard inverter 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.

7

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



XC1 Terminal Strip		
1	+ REF	
2	AI1 +	
3	AI1 -	
4	- REF	
5	AI2 +	
6	AI2-	
7	AO1	
8	AGND (24 V)	
9	AO2	
10	AGND (24 V)	
11	DGND*	
12	COM	
13	24 Vdc	
14	COM	
15	DI1	
16	DI2	
17	DI3	
18	DI4	
19	DI5	
20	DI6	
21	NC1	DO1 (RL1)
22	C1	
23	NO1	
24	NC2	DO2 (RL2)
25	C2	
26	NO2	
27	NC3	DO3 (RL3)
28	C3	
29	NO3	

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 inverter 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 inverter 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, 2, 3, 4 or 5).

7

Table 7.1 - *Accessory models*

WEG Part Number	Name	Description	Slot	Identification Parameters	
				P0027	P0028
Control Accessories for Installation in the Slots 1, 2 and 3					
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--	----
11126674	IOC-01	IOC module with 8 digital inputs and 4 relay outputs (use with SoftPLC)	1	C1	----
11126730	IOC-02	IOC module with 8 digital inputs and 8 NPN open collector digital outputs (use with SoftPLC)	1	C5	----
11820111	IOC-03	IOC module with 8 digital inputs and 7 PNP open collector digital outputs	1	C6	----
11126732	IOE-01	Input module with 5 PTC type sensors	1	25--	----
11126735	IOE-02	Input module with 5 PT100 type sensors	1	23--	----
11126750	IOE-03	Input module with 5 KTY84 type sensors	1	27--	----
11008100	ENC-01	5 to 12 Vdc incremental encoder module, 100 kHz, with an encoder signal repeater	2	--C2	----
11008101	ENC-02	5 to 12 Vdc incremental encoder module, 100 kHz	2	--C2	----
11008102	RS485-01	RS-485 serial communication module (Modbus)	3	----	CE--
11008103	RS232-01	RS-232C serial communication module (Modbus)	3	----	CC--
11008104	RS232-02	RS-232C serial communication module with DIP-switches for programming the microcontroller FLASH memory	3	----	CC--
11008105	CAN/RS485-01	CAN and RS-485 interface module (CANopen/DeviceNet/Modbus)	3	----	CA--
11008106	CAN-01	CAN interface module (CANopen/DeviceNet)	3	----	CD--
11045488	PROFIBUS DP-01	Profibus DP communication module	3	----	C9
11008911	PLC11-01	PLC module	1, 2 and 3	----	--xx (1) (3)
11094251	PLC11-02	PLC module	1, 2 and 3	----	--xx (1) (3)
Anybus-CC Accessories for Installation in the Slot 4					
11008158	DEVICENET-05	DeviceNet interface module	4	----	--xx (2) (3)
10933688	ETHERNET/IP-05	Ethernet/IP interface module	4	----	--xx (2) (3)
11550476	MODBUSTCP-05	Modbus TCP interface module	4	----	--xx (2) (3)
11550548	PROFINETIP-05	PROFINET IO interface module	4	----	--xx (2) (3)
11008107	PROFDP-05	Profibus DP interface module	4	----	--xx (2) (3)
11008161	RS485-05	RS-485 (passive) interface module (Modbus)	4	----	--xx (2) (3)
11008160	RS232-05	RS-232 (passive) interface module (Modbus)	4	----	--xx (2) (3)
Flash Memory Module for Installation in the Slot 5 - Factory Settings Included					
11719952	MMF-03	FLASH memory module	5	----	--xx (6)
Stand-alone HMI, Blank Cover, and Frame for Remote Mounted HMI					
11008913	HMI-01	Stand-alone HMI (4)	HMI	-	-
11010521	RHMIF-01	Remote HMI frame kit (IP56)	-	-	-
11010298	HMID-01	Blank cover for the HMI slot	HMI	-	-
10950192	HMI CAB-RS-1M	1 m serial remote keypad cable set	-	-	-
10951226	HMI CAB-RS-2M	2 m serial remote keypad cable set	-	-	-
10951223	HMI CAB-RS-3M	3 m serial remote keypad cable set	-	-	-
10951227	HMI CAB-RS-5M	5 m serial remote keypad cable set	-	-	-
10951240	HMI CAB-RS-7.5M	7.5 m serial remote keypad cable set	-	-	-
10951239	HMI CAB-RS-10M	10 m serial remote keypad cable set	-	-	-
Miscellaneous					
10960846	CONRA-01	Control rack (containing the CC11 control board)	-	-	-
10960847	CCS-01	Control cable shielding kit (supplied with the product)	-	-	-
11010266	PCSB-01	Kit for power cables shielding - frame size B (standard for option FA)	-	-	-
11010267	PCSC-01	Kit for power cables shielding - frame size C (standard for option FA)	-	-	-
11119781	PCSD-01	Kit for power cables shielding - frame size D (included in the standard product)	-	-	-
10960844	PCSE-01	Kit for power cables shielding - frame size E (included in the standard product)	-	-	-
11010800	KN1B-01	Conduit kit for frame size B (standard for option N1) (5)	-	-	-
11010802	KN1C-01	Conduit kit for frame size C (standard for option N1) (5)	-	-	-
10960842	KN1E-01	Nema1 kit for the frame size E (5)	-	-	-
11417558	KN1F-01	Nema1 kit for the frame size F	-	-	-

7

WEG Part Number	Name	Description	Slot	Identification Parameters	
				P0027	P0028
11417559	KN1G-01	Nema1 kit for the frame size G	-	-	-
11010264	KIP21D-01	IP21 kit for frame size D (standard for option 21)	-	-	-
11337710	KME-01	Frame size E movement kit	-	-	-
11337634	KMF-01	Frame size F movement kit	-	-	-
11337714	KMG-01	Frame size G movement kit	-	-	-
10794631	DBW030250 D5069SZ	Dynamic braking module DBW03	-	-	-
13166838	DBW040250 D5069SZ	Dynamic braking module DBW04	-	-	-

(1) Refer to the PLC module manual.
(2) Refer to the Anybus-CC communication manual.
(3) Refer to the programming manual.
(4) Use DB-9 pin, male-to-female, straight-through cable (serial mouse extension type) for connecting the keypad to the inverter or Null-Modem standard cable. Maximum cable length: 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.

(5) For more details see Section 8.6 NEMA 1 KITs on page 8-16.
(6) The MMF-03 module has a reserved space for the user (for example: write the application software version SoftPLC).

7.2.1 Use of External Dynamic Braking Module DBW03 and DBW04

The dynamic braking module can be added externaly to any model, and particularly to frame sizes F, G and H, which do not have built-in braking IGBT.

This module is connected to the DC link terminals and the braking resistor must be connected to the braking module terminals.

See electrical diagram example for the frame sizes F, G and H in Figure 3.24 on page 3-32 and Figure 3.25 on page 3-34.

See also DBW03 and DBW04 instructions manual for detailed information.

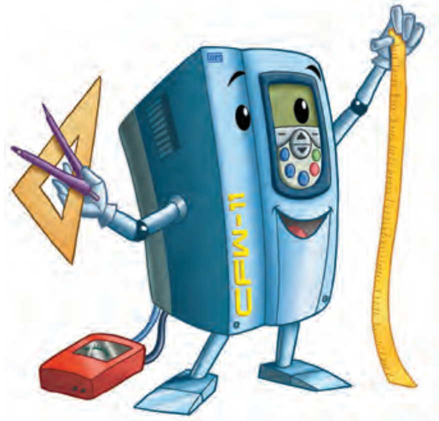
For frame sizes F and G it's recommended to use DBW03 model.

For frame size H it's recommended to use DBW04 model.

NOTE!
Dynamic braking in models from frame sizes F, G and H:
- For accessing the DC link connections it's necessary to remove top cover. See Figure 3.31 on page 3-39.
  - The maximum rms braking currents on DC link terminals of standard models in frame sizes F, G and H are the following:
    Frame size F: 143 Amps-rms
    Frame size G: 216 Amps-rms
    Frame size H: rated DC current according Table 8.2 on page 8-3 and Table 8.4 on page 8-5.

7

8 TECHNICAL SPECIFICATIONS



This chapter describes the technical specifications (electric and mechanical) of CFW11...T5... and CFW11...T6... models.

8.1 POWER DATA

Power Supply:

- ☑ Voltage tolerance: -15 % to +10 % of the nominal voltage.
- ☑ Frequency: 50/60 Hz (48 Hz to 62 Hz).
- ☑ Phase imbalance: ≤3 % of the rated phase-to-phase input voltage.
- ☑ Overvoltage according to Category III (EN 61010/UL 508C).
- ☑ Transient voltage according to Category III.
- ☑ Maximum of 60 connections per hour (1 per minute).
- ☑ Efficiency: according to class IE2 as per EN 50598-2.
- ☑ Typical input power factor: 0.94 in nominal conditions.
- ☑ cos ϕ (displacement factor): > 0.98.

Table 8.1 - *Technical specification for 500 to 600 Vac, three-phase power supply*

Model	Frame Size	Use with Normal Duty (ND) Cycle								Use with Heavy Duty (HD) Cycle								Surrounding Air Temperature	Built-in Dynamic Braking	Built-in Category C3 RFI Filter	Weight [kg/lb]
		Rated Output Current [Arms] (1)	Overload Current [Arms] (2)		Switching Frequency [kHz] (1)(4)	Maximum Motor [HP/kW] (5)	Rated Input Current [Arms]	Dissipated Power [W] (6)		Rated Output Current [Arms] (1)	Overload Current [Arms] (2)		Switching Frequency [kHz] (1)(4)	Maximum Motor [HP/kW] (5)	Rated Input Current [Arms]	Dissipated Power [W] (6)					
			1 min	3 s				Surface Mounting	Flange Mounting		1 min	3 s				Surface Mounting	Flange Mounting				
CFW110002T5	B	2.9	3.2	4.4	5	2/1.5	2.90	107	59	2.7	4.1	5.4	5	1.5/1.1	2.7	103	58	-10...50 °C (14...122 °F)	Yes	Yes, except in models CFW11...O...NF...	9.1/20
CFW110004T5	B	4.2	4.6	6.3	5	3/2.2	4.2	133	62	3.8	5.7	7.6	5	2/1.5	3.8	125	61				
CFW110007T5	B	7.0	7.7	10.5	5	5/3.7	7	188	71	6.5	9.8	13.0	5	3/2.2	6.5	178	69				
CFW110010T5	B	10	11.0	15.0	5	7.5/5.5	10	247	80	9.0	13.5	18.0	5	5/3.7	9	227	77				
CFW110012T5	B	12	13.2	18.0	5	10/7.5	12	287	85	10	15.0	20.0	5	7.5/5.5	10	247	80				
CFW110017T5	B	17	18.7	25.5	5	15/11	17	385	100	17	25.5	34.0	5	10/7.5	17	385	100				
CFW110022T5	C	22	24.2	33	5	20/15	22	550	170	19	28,5	38	5	15/11	19	500	120				19.6/43.2
CFW110027T5	C	27	29.7	40.5	5	25/18.5	27	670	215	22	33	44	5	20/15	22	550	170				
CFW110032T5	C	32	35.2	48	5	30/22	32	790	250	27	40,5	54	5	25/18.5	27	670	215				
CFW110044T5	C	44	48.4	66	5	40/30	44	1080	350	36	54	72	5	30/22	36	790	250				
CFW110002T6	D	2.9	3.2	4.4	5	2/1.5	2.9	107	59	2.7	4.1	5.4	5	1.5/1.1	2.7	103	58		Yes, except in models CFW11...O...NB...		34/75
CFW110004T6	D	4.2	4.6	6.3	5	3/2.2	4.2	133	62	3.8	5.7	7.6	5	2/1.5	3.8	125	61				
CFW110007T6	D	7.0	7.7	10.5	5	5/3.7	7	188	71	6.5	9.8	13.0	5	3/2.2	6.5	178	69				
CFW110010T6	D	10	11.0	15.0	5	7.5/5.5	10	247	80	9.0	13.5	18.0	5	5/3.7	9	227	77				
CFW110012T6	D	12	13.2	18.0	5	10/7.5	12	287	85	10	15.0	20.0	5	7.5/5.5	10	247	80				
CFW110017T6	D	17	18.7	25.5	5	15/11	17	385	100	17	22.5	30.0	5	10/7.5	15	346	94				
CFW110022T6	D	22	24.2	33.0	5	20/15	22	484	115	19	28.5	38.0	5	15/11	19	425	106				
CFW110027T6	D	27	29.7	40.5	5	25/18.5	27	582	130	22	33.0	44.0	5	20/15	22	484	115				
CFW110032T6	D	32	35.2	48.0	5	30/22	32	681	145	27	40.5	54.0	5	25/18.5	27	582	130				
CFW110044T6	D	44	48.4	66.0	5	40/30	44	918	180	36	54.0	72.0	5	30/22	36	760	156				
CFW110053T6	E	53	58.3	79.5	2	50/37	53	878	191	44	66.0	88.0	2	40/30	44	740	171	-10...45 °C (14...113 °F)		Yes	64/141
CFW110063T6	E	63	69.3	94.5	2	60/45	63	1030	214	53	79.5	106.0	2	50/37	53	878	191				
CFW110080T6	E	80	88.0	120.0	2	75/55	80	1289	253	66	99.0	132.0	2	60/45	66	1076	221				
CFW110107T6	E	107	117.7	160.5	2	100/75	107	1700	315	90	135.0	180.0	2	75/55	90	1441	276				
CFW110125T6	E	125	137.5	187.5	2	125/90	125	1975	356	107	160.5	214.0	2	100/75	107	1700	315				
CFW110150T6	E	150	165.0	225.0	2	150/110	150	2356	413	122	183.0	244.0	2	125/90	122	1929	349				
CFW110170T6	F	170	187.0	255.0	2	175/132	170	2740	1037	150	225.0	300.0	2	150/110	150	2436	950		No		168/371
CFW110216T6	F	216	237.6	324.0	2	200/150	216	3441	1302	180	270.0	360.0	2	150/110	180	2893	1110				
CFW110289T6	F	289	317.9	433.5	2	250/185	289	4554	1691	240	360.0	480.0	2	200/150	240	3807	1430				
CFW110315T6	G	315	346.5	472.5	2	300/220	315	5000	1880	289	433.5	578.0	2	250/185	289	4604	1741				258/569
CFW110365T6	G	365	401.5	547.5	2	350/260	365	5762	2147	315	472.5	630.0	2	300/220	315	5000	1880				
CFW110435T6	G	435	478.5	652.5	2	400/300	435	6828	2520	357	535.5	714.0	2	350/260	357	5640	2104				
CFW110472T6	G	472	519.2	708.0	2	450/330	472	7409	2734	418	627,0	836.0	2	400/300	418	6604	2464				
CFW110584T6	H	584	642	876	2	600/440	584	9306	3443	504	756	958 (5s) (3)	2	500/370	504	8031	2972	-10...40 °C (14...104 °F)		No	200
CFW110625T6	H	625	688	938	2	700/515	625	9959	3685	540	810	1026 (5s) (3)	2	550/400	540	8605	3184				
CFW110758T6	H	758	834	1137	2	800/590	758	12079	4469	614	921	1167 (5s) (3)	2	600/440	614	9784	3620				213
FW110804T6	H	804	884	1205	2	900/690	804	12812	4740	682	1023	1296 (5s) (3)	2	700/515	682	10868	4021				

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 models with Special Hardware DC, fed from 757 to 1025 Vdc (equivalent to a rectified 500 to 600 Vac three-phase voltage)*

Model	Frame Size	Use with Normal Duty (ND) Cycle								Use with Heavy Duty (HD) Cycle								Surrounding Air Temperature	Built-in Dynamic Braking	Weight [kg/lb]
		Rated Output Current [Arms] (1)	Overload Current [Arms] (2)		Switching Frequency [kHz] (1)(4)	Maximum Motor [HP/kW] (5)	Rated DC Current [Arms]	Dissipated Power [W] (6)		Rated Output Current [Arms] (1)	Overload Current [Arms] (2)		Switching Frequency [kHz] (1)(4)	Maximum Motor [HP/kW] (5)	Rated DC Current [Arms]	Dissipated Power [W] (6)				
			1 min	3 s				Surface Mounting	Flange Mounting		1 min	3 s				Surface Mounting	Flange Mounting			
CFW110170T60...DC...	F	170	187.0	255.0	2	175/132	196	2436	950	150	225.0	300.0	2	150/110	173	2167	856	-10...45 °C (14...113 °F)	No	105/231
CFW110216T60...DC...	F	216	237.6	324.0	2	200/150	248	3054	1166	180	270.0	360.0	2	150/110	207	2570	997			
CFW110289T60...DC...	F	289	317.9	433.5	2	250/185	332	4036	1510	240	360.0	480.0	2	200/150	276	3377	1279			
CFW110315T60...DC...	G	315	346.5	472.5	2	300/220	362	4435	1682	289	433.5	578.0	2	250/185	332	4086	1560			155/342
CFW110365T60...DC...	G	365	401.5	547.5	2	350/260	420	5107	1918	315	472.5	630.0	2	300/220	362	4435	1682			
CFW110435T60...DC...	G	435	478.5	652.5	2	400/300	500	6049	2247	357	535.5	714.0	2	350/260	411	5000	1880			
CFW110472T60...DC...	G	472	519.2	708.0	2	450/330	543	6564	2438	418	627.0	836.0	2	400/300	481	5854	2201			
CFW110584T6	H	584	642	876	2	600/440	672	8201	3116	504	756	958 (5s) (3)	2	500/370	580	7077	2689	- 10...40 °C (14...104 °F)		186
CFW110625T6	H	625	688	938	2	700/515	719	8777	3335	540	810	1026 (5s) (3)	2	550/400	621	7583	2882			
CFW110758T6	H	758	834	1137	2	800/590	872	10644	4045	614	921	1167 (5s) (3)	2	600/440	706	8622	3276			192
CFW110804T6	H	804	884	1206	2	900/690	925	11290	4290	682	1023	1296 (5s) (3)	2	700/515	784	9577	3639			

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.

8

Table 8.3 - *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								Surrounding Air Temperature	Built-in Dynamic Braking	Built-in Category C3 RFI Filter	Weight [kg/lb]
		Rated Output Current [Arms] (1)	Overload Current [Arms] (2)		Switching Frequency [kHz] (1) (4)	Maximum Motor [hp/kW] (5)	Rated Input Current [Arms]	Dissipated Power [W] (6)		Rated Output Current [Arms] (1)	Overload Current [Arms] (2)		Switching Frequency [kHz] (1) (4)	Maximum Motor [hp/kW] (5)	Rated Input Current [Arms]	Dissipated Power [W] (6)					
			1 min	3 s				Surface Mounting	Flange Mounting		1 min	3 s				Surface Mounting	Flange Mounting				
CFW110002T6	D	2.9	3.2	4.4	5	2/1.5	2.9	119	60	2.7	4.1	5.4	5	1.5/1.1	2.7	114	60	-10...50 °C (14...122 °F)	Yes , except in models CFW11...O...NB...	Yes, except in models CFW11...O...NF...	34/75
CFW110004T6	D	4.2	4.6	6.3	5	3/2.2	4.2	149	65	3.8	5.7	7.6	5	2/1.5	3.8	140	63				
CFW110007T6	D	7.0	7.7	10.5	5	5/3.7	7	216	75	6.5	9.8	13.0	5	3/2.2	6.5	204	73				
CFW110010T6	D	8.5	9.4	12.8	5	7.5/5.5	8.5	251	80	7.0	10.5	14.0	5	5/3.7	7	216	75				
CFW110012T6	D	11	12.1	16.5	5	10/7.5	11	310	89	9.0	13.5	18.0	5	7.5/5.5	9	263	82				
CFW110017T6	D	15	16.5	22.5	5	15/11	15	405	103	13	19.5	26.0	5	10/7.5	13	358	96				
CFW110022T6	D	20	22.0	30.0	5	20/15	20	523	121	17	25.5	34.0	5	15/11	17	452	110				
CFW110027T6	D	24	26.4	36.0	5	25/18.5	24	618	135	20	30.0	40.0	5	20/15	20	523	121				
CFW110032T6	D	30	33.0	45.0	5	30/22	30	760	156	24	36.0	48.0	5	25/18.5	24	618	135				
CFW110044T6	D	35	38.5	52.5	5	40/30	35	878	174	30	45.0	60.0	5	30/22	30	760	156				
CFW110053T6	E	46	50.6	69.0	2	50/37	46	911	196	39	58.5	78.0	2	40/30	39	783	177	-10...45 °C (13...104 °F)		Yes	64/141
CFW110063T6	E	54	59.4	81.0	2	60/45	54	1057	218	46	69.0	92.0	2	50/37	46	911	196				
CFW110080T6	E	73	80.3	109.5	2	75/55	73	1405	270	61	91.5	122.0	2	75/55	61	1185	237				
CFW110107T6	E	100	110.0	150.0	2	125/90	100	1899	344	85	127.5	170.0	2	100/75	85	1624	303				
CFW110125T6	E	108	118.8	162.0	2	125/90	108	2045	366	95	142.5	190.0	2	125/90	95	1807	331				
CFW110150T6	E	130	143.0	195.0	2	150/110	130	2447	427	108	162.0	216.0	2	125/90	108	2045	366				
CFW110170T6	F	147	161.7	220.5	2	175/132	147	2838	1091	127	190.5	254.0	2	150/110	127	2472	963		No		168/371
CFW110216T6	F	195	214.5	292.5	2	200/160	195	3716	1398	165	247.5	330.0	2	150/132	165	3167	1206				
CFW110289T6	F	259	284.9	388.5	2	250/200	259	4886	1808	225	337.5	450.0	2	200/160	225	4264	1590				
CFW110315T6	G	259	284.9	388.5	2	300/220	259	4936	1858	225	337.5	450.0	2	250/200	225	4314	1640				258/569
CFW110365T6	G	312	343.2	468.0	2	350/250	312	5905	2197	259	388.5	518.0	2	300/220	259	4936	1858				
CFW110435T6	G	365	401.5	547.5	2	400/315	365	6874	2536	312	468.0	624.0	2	350/250	312	5905	2197				
CFW110472T6	G	427	469.7	640.5	2	500/370	427	8042	2967	365	547.5	730.0	2	400/300	365	6908	2570				
CFW110584T6	H	478	526	717	2	600/440	478	9140	3382	410	615	820	2	500/370	410	7840	2901	-10...40 °C (14...104 °F)			200
CFW110625T6	H	518	570	777	2	650/480	518	9905	3665	447	671	894	2	600/440	447	8547	3163				
CFW110758T6	H	628	690.8	942	2	800/590	628	12009	4443	518	777	1036	2	650/480	518	9905	3665				213
CFW110804T6	H	703	773	1055	2	900/690	703	13443	4974	594	891	1188	2	750/560	594	11358	4203				

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 8.4 - *Technical specification for Special Hardware DC, fed from 757 to 1025 Vdc (equivalent to a rectified 660 to 690 Vac three-phase voltage)*

Model	Frame Size	Use with Normal Duty (ND) Cycle								Use with Heavy Duty (HD) Cycle								Surrounding Air Temperature	Built-in Dynamic Braking	Weight [kg/lb]
		Rated Output Current [Arms] (1)	Overload Current [Arms] (2)		Switching Frequency [kHz] (1)(4)	Maximum Motor [hp/kW] (5)	Rated DC Current [Arms]	Dissipated Power [W] (6)		Rated Output Current [Arms] (1)	Overload Current [Arms] (2)		Switching Frequency [kHz] (1)(4)	Maximum Motor [hp/kW] (5)	Rated DC Current [Arms]	Dissipated Power [W] (6)				
			1 min	3 s				Surface Mounting	Flange Mounting		1 min	3 s				Surface Mounting	Flange Mounting			
CFW110170T6 O...DC...	F	147	161.7	220.5	2	175/132	169	2838	1091	127	190.5	254.0	2	150/110	146	2472	963	-10...45 °C (13...104 °F)	No	105/231
CFW110216T6 O...DC...	F	195	214.5	292.5	2	200/160	224	3716	1398	165	247.5	330.0	2	150/132	190	3167	1206			
CFW110289T6 O...DC...	F	259	284.9	388.5	2	250/200	298	4886	1808	225	337.5	450.0	2	200/160	259	4264	1590			
CFW110315T6 O...DC...	G	259	284.9	388.5	2	300/220	298	4936	1858	225	337.5	450.0	2	250/200	259	4314	1640			155/342
CFW110365T6 O...DC...	G	312	343.2	468.0	2	350/250	359	5905	2197	259	388.5	518.0	2	300/220	298	4936	1858			
CFW110435T6 O...DC...	G	365	401.5	547.5	2	400/315	420	6874	2536	312	468.0	624.0	2	350/250	359	5905	2197			
CFW110472T6 O...DC...	G	427	469.7	640.5	2	500/370	491	8042	2967	365	547.5	730.0	2	400/300	420	6908	2570			
CFW110584T6 O...DC...	H	478	526	717	2	600/440	550	8055	3061	410	615	820	2	450/330	472	6909	2625	-10...40 °C (14...104 °F)		186
CFW110625T6 O...DC...	H	518	570	777	2	650/480	596	8729	3317	447	671	894	2	500/370	514	7532	2862			
CFW110758T6 O...DC...	H	628	690.8	942	2	800/590	722	10583	4021	518	777	1036	2	600/440	596	8729	3317			192
CFW110804T6 O...DC...	H	703	773.3	1054.5	2	900/690	808	11846	4502	594	891	1188	2	700/515	683	10010	3804			

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.

Notes for Table 8.1 on page 8-2 to 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, F, G and H are not allowed to operate at 10 kHz switching frequency.
- Surrounding air temperature as specified in tables. From 40 °C to 45 °C (104 °F to 113 °F) for frame size H: 1 % of current derating for each Celsius degree above maximum temperature as specified in item above. From 50 °C to 60 °C (122 °F to 140 °F) for frame sizes B, C and D models and from 45 °C to 55 °C (113 °F to 131 °F) for frame sizes E, F, G and H models: 2 % of current derating for each Celsius degree above maximum temperature as specified in item above.
- 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).
- Ambient with pollution degree 2 (according to EN50178 and UL508C).

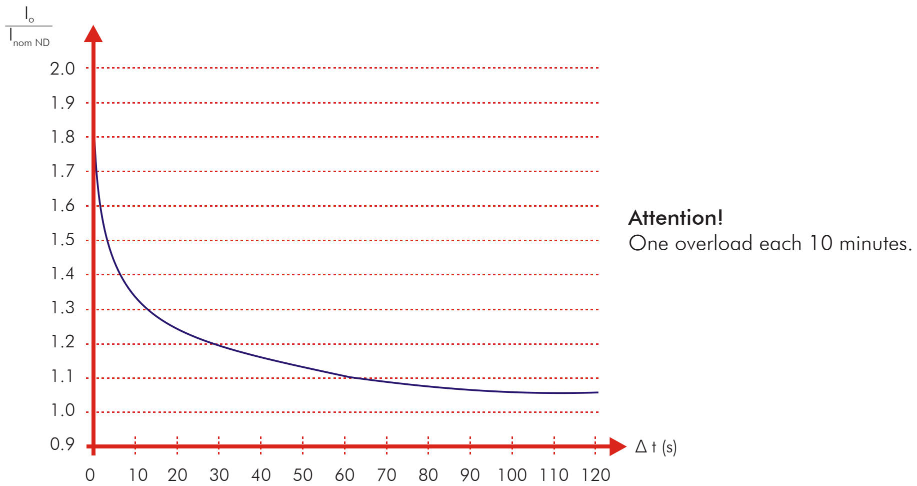
(2) One overload each 10 minutes. Table 8.1 on page 8-2 to Table 8.4 on page 8-5 present only two points of the overload curve (activation time of 1 min and 3 s). The complete IGBT overload curves for Normal Duty (ND) and Heavy Duty (HD) cycles are presented in Figure 8.1 on page 8-6. Depending on the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

(3) Maximum output current of these models. The overload time for frame size H in heavy cicles is 5 s.

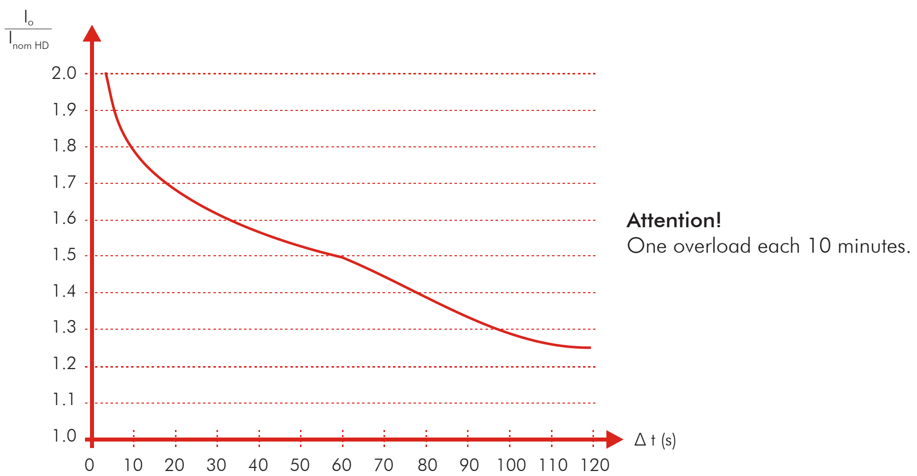
(4) Only for frame sizes B, C and D: the switching frequency may be automatically reduced to 2.5 kHz depending on the operating conditions (surrounding air temperature, output current, etc.) - if P0350 = 0 or 1.
If it is desired to operate always in 5 kHz, set P0350 = 2 or 3 and derate the output current. For additional information, consult WEG.

(5) Motor power ratings are merely a guide considering 575 V, 60 Hz for 500 to 600 Vac supply, or 690 V, 50 Hz for 660 to 690 Vac supply, IV pole WEG motors. The adequate inverter sizing must be based on the used motor rated current.

(6) The information provided about the inverter losses are valid for the rated operating condition, i.e., for rated output current and rated switching frequency.



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



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

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

8

8.2 ELECTRONICS/GENERAL DATA

Control	Method	☑ Voltage source ☑ Type of control: - V/f (Scalar) - VVW: Voltage Vector Control - Vector control with encoder - Sensorless vector control (without encoder) ☑ PWM SVM (Space Vector Modulation) ☑ Full digital (software) current, flux, and speed regulators Execution rate: - current regulators: 0.2 ms (switching frequency of 2.5 kHz and 5 kHz), 0.25 ms (switching frequency = 2 kHz) - flux regulator: 0.4 ms (switching frequency of 2.5 kHz and 5 kHz), 0.5 ms (switching frequency = 2 kHz) - speed regulator / speed measurement: 1.2 ms
	Output Frequency	☑ 0 to 3.4 x rated motor frequency (P0403). The rated frequency is programmable from 0 Hz to 300 Hz in the scalar mode and from 30 Hz to 120 Hz in the vector mode ☑ Output frequency limits as a function of the switching frequency: 125 Hz (switching frequency = 1.25 kHz) 200 Hz (switching frequency = 2.0 kHz) 250 Hz (switching frequency = 2.5 kHz) 500 Hz (switching frequency = 5 kHz)
Performance	Speed Control	<u>V/f (Scalar):</u> ☑ Regulation (with slip compensation): 1 % of the rated speed ☑ Speed variation range: 1:20 <u>VVW:</u> ☑ Regulation: 1 % of the rated speed ☑ Speed variation range: 1:30 <u>Sensorless (P0202 = 3 asynchronous motor):</u> ☑ Regulation: 0.5 % of the rated speed ☑ Speed variation range: 1:100 <u>Vector with Encoder (P0202 = 4 asynchronous motor or P0202 = 6 permanent magnet):</u> ☑ Regulation: ±0.01 % of the rated speed with a 14-bits analog input (IOA) ±0.01 % of the rated speed with a digital reference (Keypad, Serial, Fieldbus, Electronic Potentiometer, Multispeed) ±0.05 % of the rated speed with a 12-bits analog input (CC11) ☑ Speed variation range: 1:1000
	Torque Control	☑ Range: 10 to 180 %, regulation: ±5 % of the rated torque (P0202 = 4, 6 or 7) ☑ Range: 20 to 180 %, regulation: ±10 % of the rated torque (P0202 = 3, above 3 Hz)
Inputs (CC11 Board)	Analog	☑ 2 isolated differential inputs; resolution of AI1: 12 bits, resolution of AI2: 11bits + signal, (0 to 10) V, (0 to 20) mA or (4 to 20) mA, Impedance: 400 kΩ for (0 to 10) V, 500 Ω for (0 to 20) mA or (4 to 20) mA, programmable functions
	DIGITAL	☑ 6 isolated digital inputs, 24 Vdc, programmable functions
Outputs (CC11 Board)	Analog	☑ 2 isolated analog outputs, (0 to 10) V, $R_L \geq 10$ kΩ (maximum load), 0 to 20 mA / 4 to 20 mA ($R_L \leq 500$ Ω) resolution: 11 bits, programmable functions
	Relay	☑ 3 relay outputs with NO/NC contacts, 240 Vac, 1 A, programmable functions
Safety	Protection	☑ Output overcurrent/short-circuit ☑ Under/Overvoltage ☑ Phase loss ☑ Overtemperature ☑ Braking resistor overload ☑ IGBTs overload ☑ Motor overload ☑ External fault/alarm ☑ CPU or memory fault ☑ Output phase-ground short-circuit
Integral Keypad (HMI)	Standard Keypad	☑ 9 operator keys: Start/Stop, Up arrow, Down arrow, Direction of rotation, Jog, Local/Remote, Right soft key and Left soft key ☑ Graphical LCD display ☑ View/edition of parameters ☑ Indication accuracy: - current: 5 % of the rated current - dc link voltage: 3 % for frame sizes B, C, D and E; 5 % for frame sizes F, G and H - speed resolution: 1 rpm ☑ Possibility of remote mounting

Degree of Protection	IP21	☑ Frame sizes B and C (standard models)
	IP20/NEMA1	☑ Frame size D (standard models)
	IP20	☑ Frame sizes E, F, G and H (standard models)
	NEMA1	☑ Frame sizes B, C and E (with option N1)
	IP21	☑ Frame sizes D, E, F, G and H (with option 21)
	IP00	☑ Frame sizes F, G and H (with special hardware DC)
	IP54	☑ Back of the inverter (external part for flange mounting) (1)
Pc Connection For Inverter Programming	USB Connector	☑ USB standard Rev. 2.0 (basic speed) ☑ Type B (device) USB plug ☑ Interconnection cable: standard host/device shielded USB cable

(1) Special hardware H1 – only for frames E (models 125 A and 150 A), F, G and H.

8.3 CODES AND STANDARDS

Safety Standards	☑ UL 508C - power conversion equipment **Note**: suitable for Installation in a compartment handling conditioned air. ☑ UL 840 - insulation coordination including clearances and creepage distances for electrical equipment ☑ EN 61800-5-1 - safety requirements electrical, thermal and energy ☑ EN 50178 - electronic equipment for use in power installations ☑ EN 60204-1 - safety of machinery. Electrical equipment of machines. Part 1: general requirements **Note**: the final assembler of the machine is responsible for installing an safety stop device and a supply disconnecting device ☑ 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 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 ☑ IEC60721-3-3 - classification of environmental conditions - part 3: classification of groups of environmental parameters and their severities - section 3: stationary use at weather protected locations Frame sizes B, C and D: Level 3M4 Frame size E: Level 3M4 ☑ IEC 61800-5-1 - adjustable speed electrical power drive systems - part 5-1: safety requirements - electrical, thermal and energy Frame sizes F…H: Level 10 Hz to 57 Hz – 0,075 mm of range 57 Hz to 150 Hz – 1g

8.4 CERTIFICATIONS

Certifications (*)	Notes
UL and cUL	E184430
CE	
IRAM	
C-Tick	
EAC	
ABS	Link: http://ww2.eagle.org/en/rules-and-resources/type-approval-database.html After accessing the link, click on "Select Option" and select "Data Search". On the new window, the certificate number must be entered on the "Certificate Number" field: 15-RJ2890495. Click on "Search".
TÜV	STO funtion

(*) For updated information on certifications, please, contact WEG.

8

8.5 MECHANICAL DATA

Frame Size B

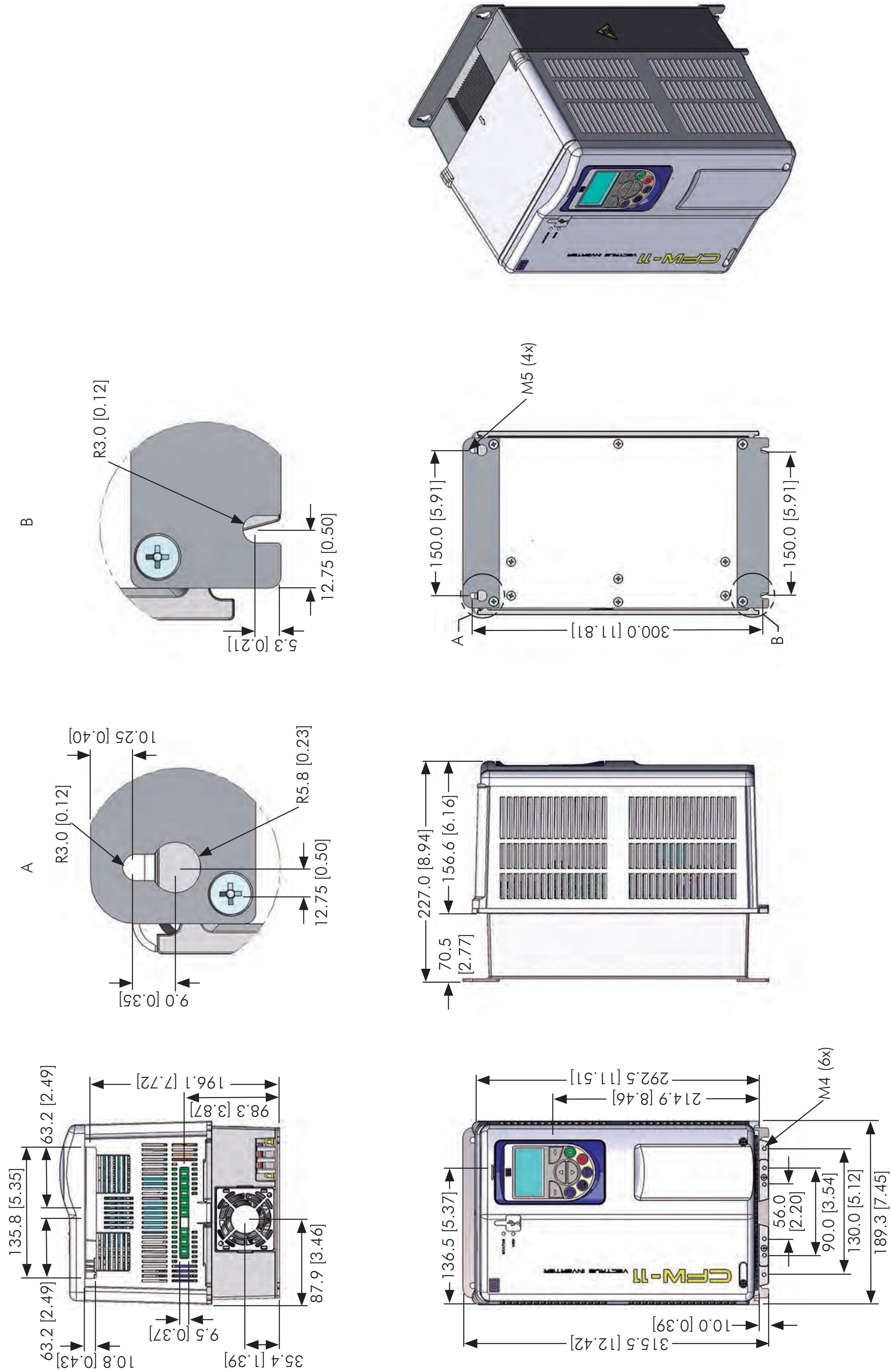


Figure 8.2 - *Frame size B dimensions - mm [in]*

Frame Size C

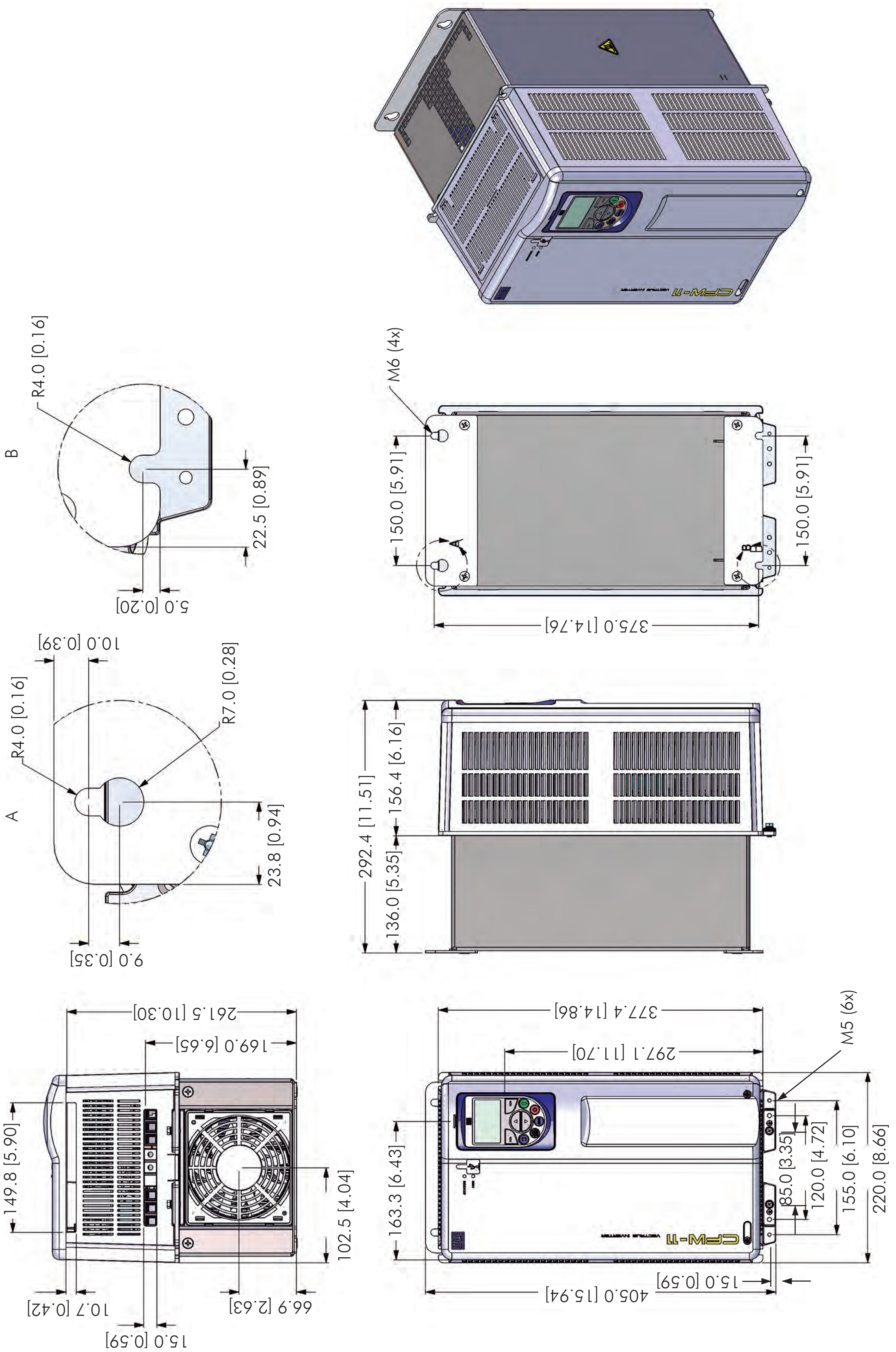


Figure 8.3 - *Frame size C dimensions - mm [in]*

Frame Size D

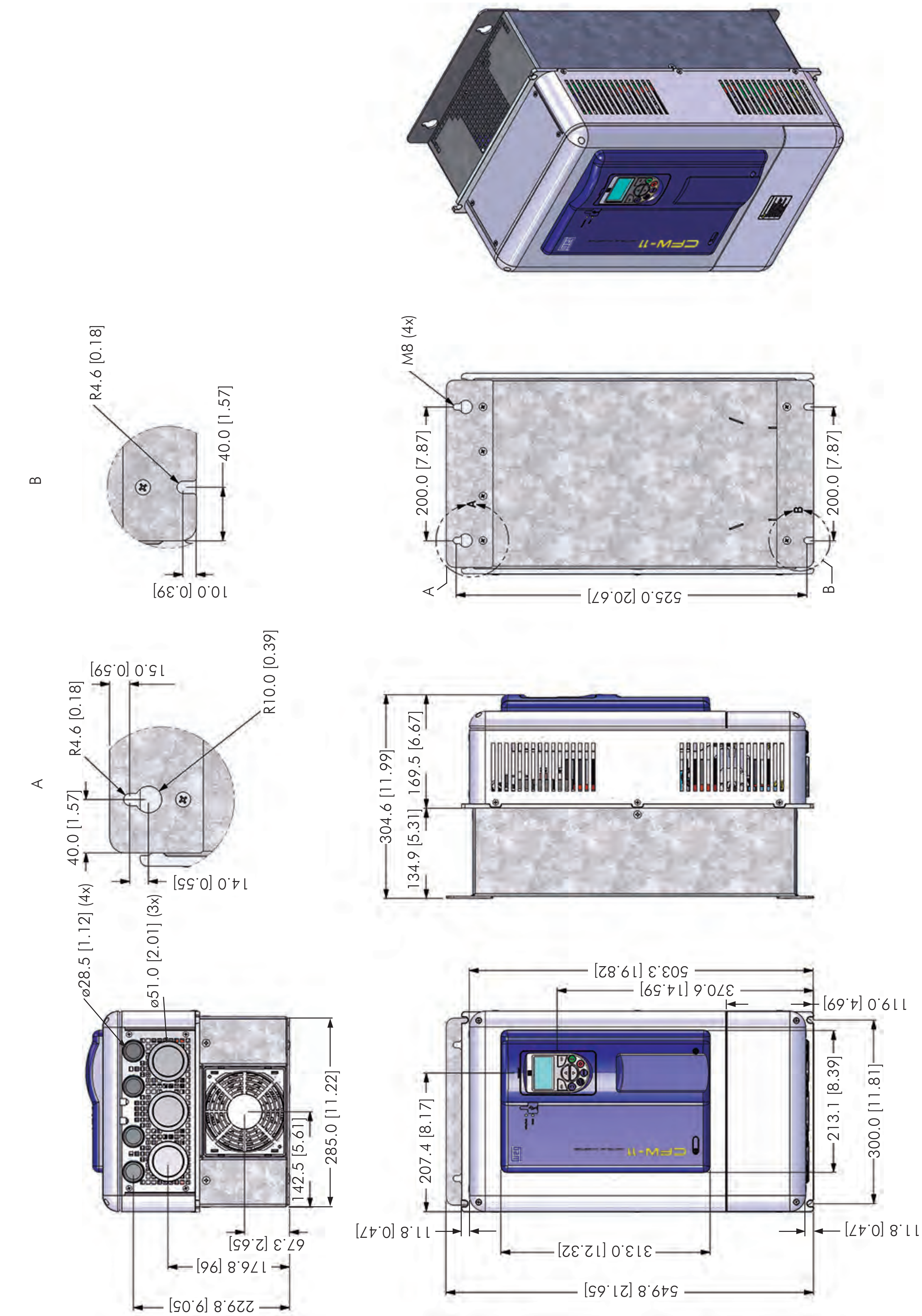


Figure 8.4 - *Frame size D dimensions - mm [in]*

Frame Size E

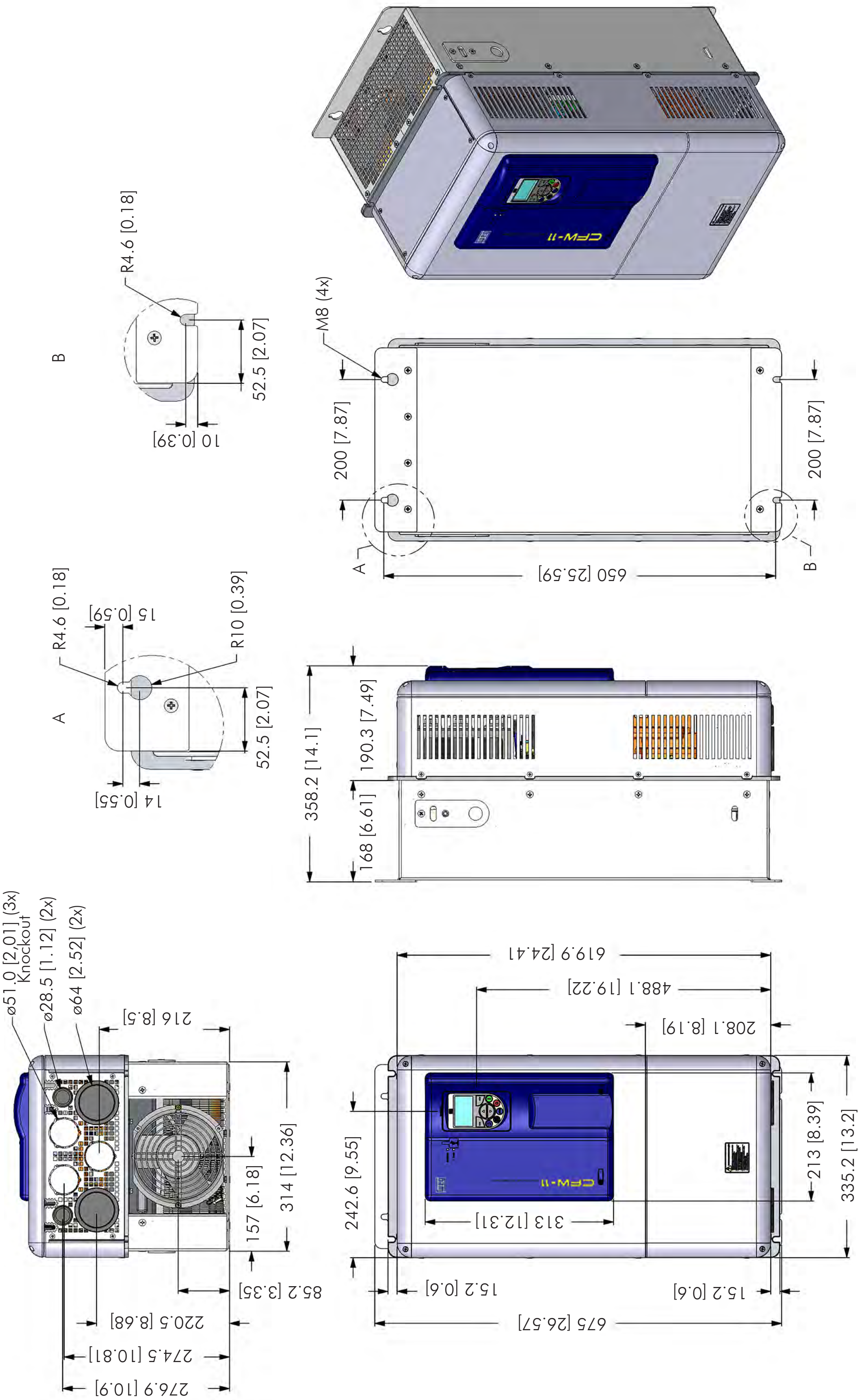


Figure 8.5 - *Frame size E dimensions - mm [in]*

Frame Size F

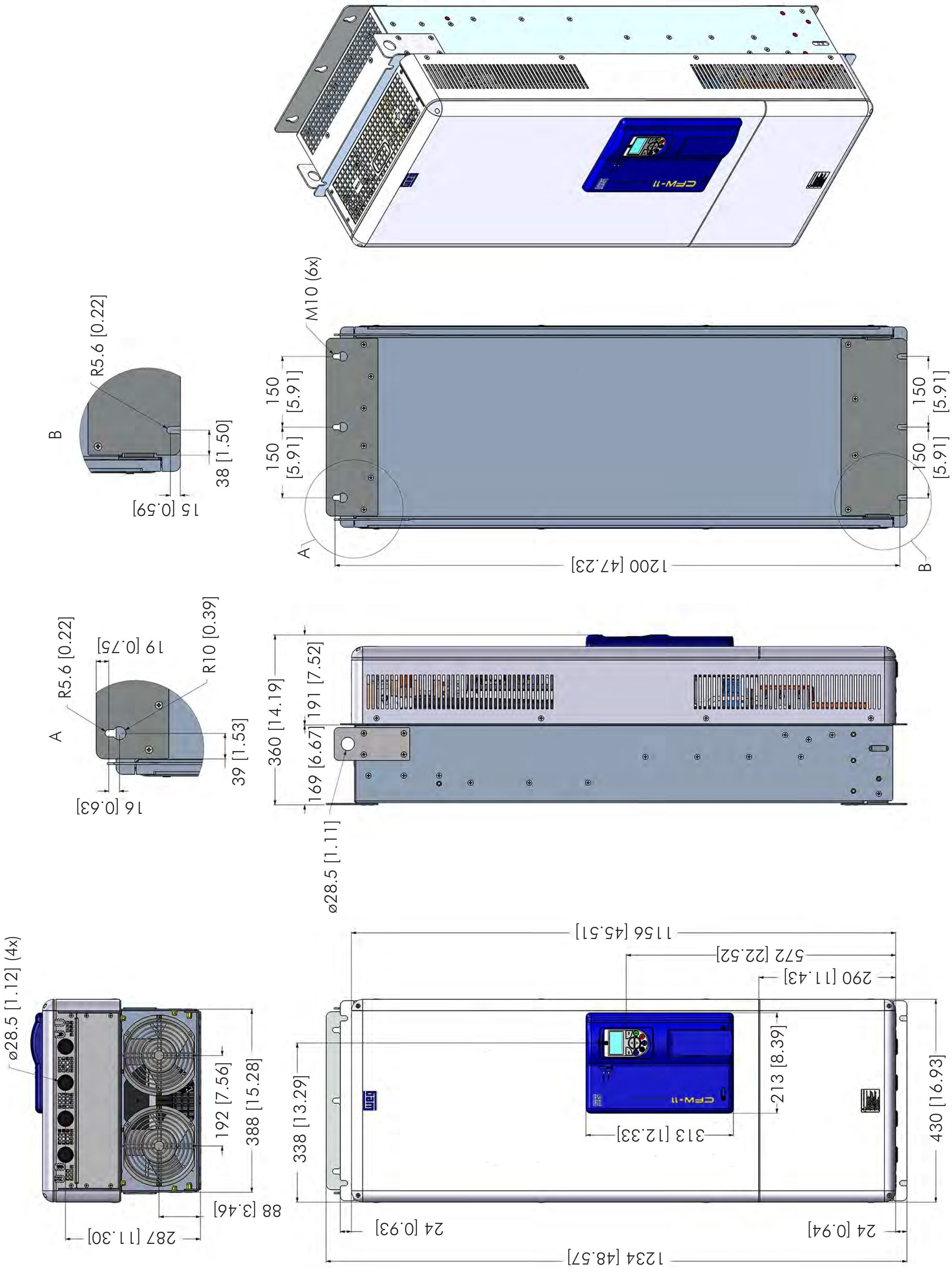


Figure 8.6 - *Frame size F dimensions - mm [in]*

8

Frame Size G

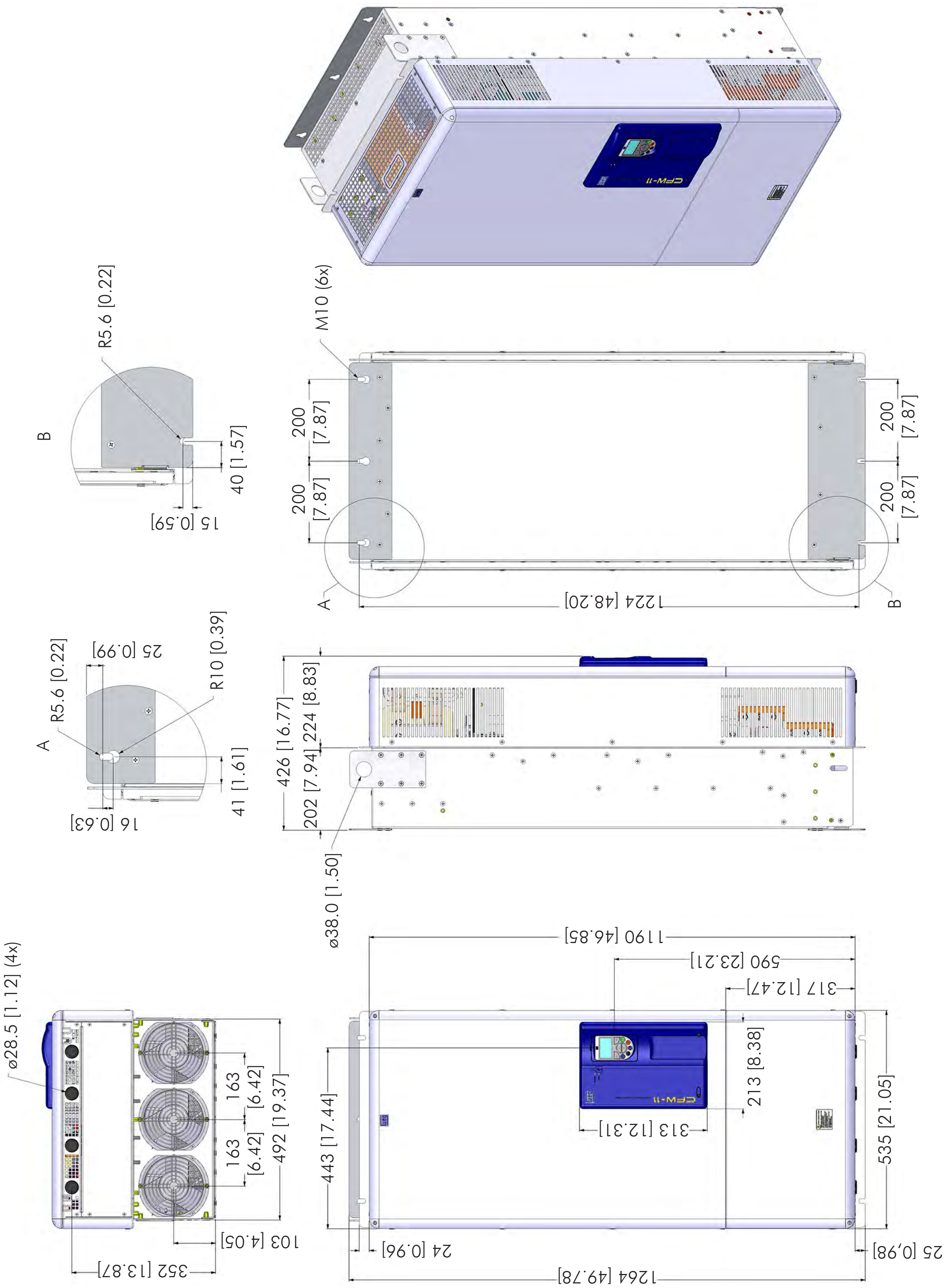


Figure 8.7 - *Frame size G dimensions - mm [in]*

Frame Size H

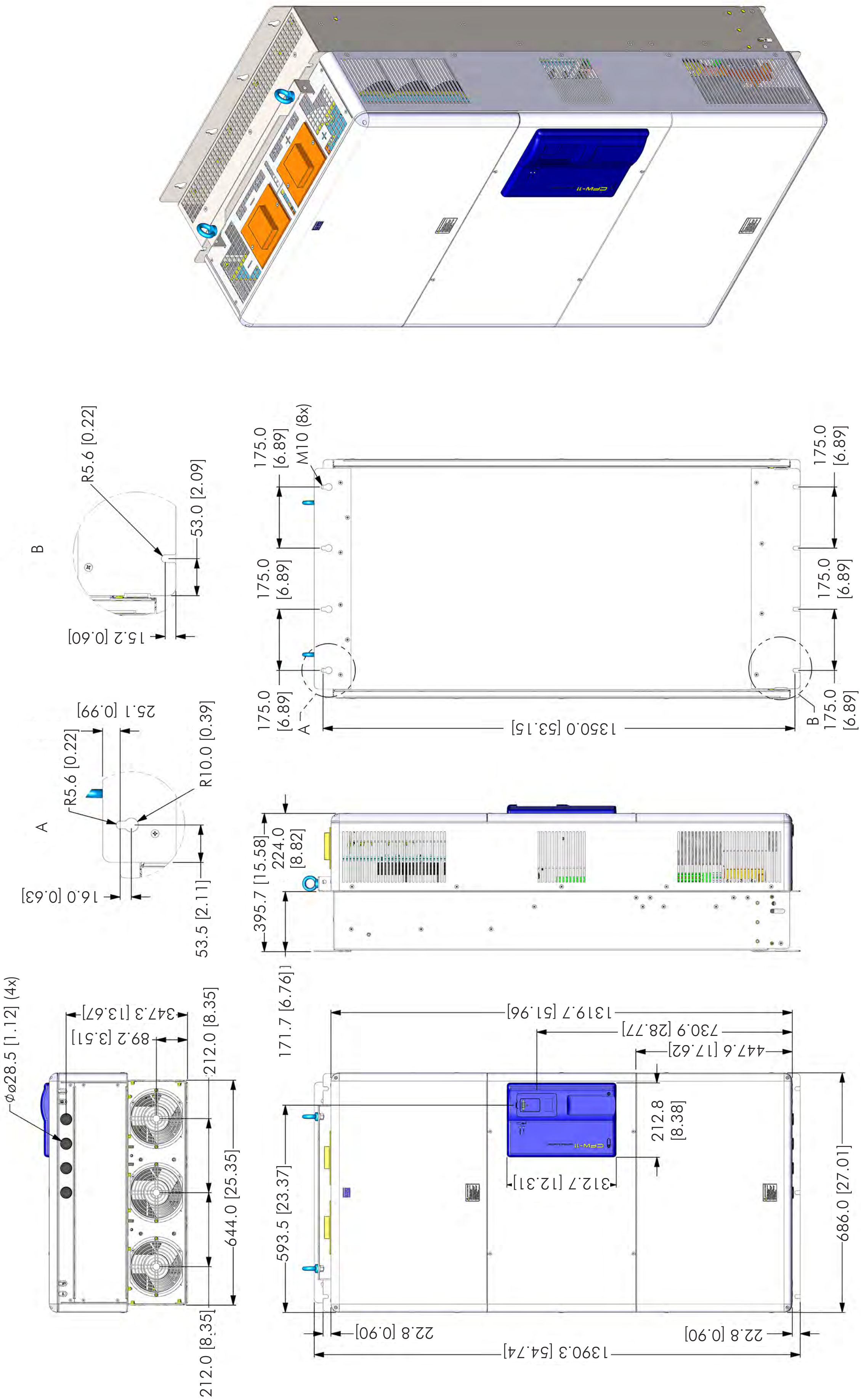
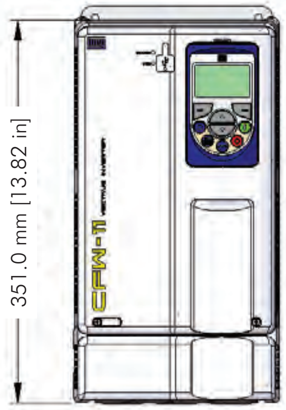
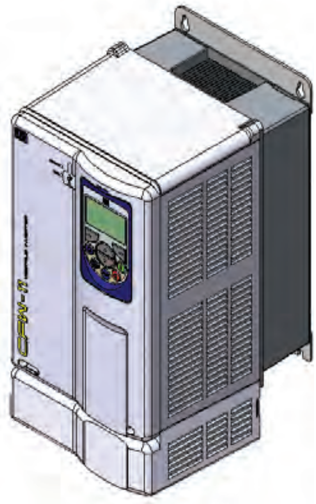


***Figure 8.8 -** Frame size H dimensions - mm [in]*

8.6 NEMA 1 KITS



- Weight of the conduit kit for frame size B: 0.9/2.0 kg/lb

Figure 8.9 - *Frame size B with Nema 1 kit KN1B-01*

KN1C-01


- Weight of the conduit kit for frame size C: 0.9/2.0 kg/lb

Figure 8.10 - *Frame size C with the conduit kit KN1C-01*

- Weight of the KN1E-01 kit: 2.12 kg (4.67 lb)

Figure 8.11 - *Frame size E with Nema1 kit KN1E-01*