Frequency Inverter

CFW-11

User's Manual

CFW-11 VECTRUE INVERTER

FREQUENCY INVERTER MANUAL

Series: CFW-11

Language: English

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Models: 6...105 A / 200...240 V

3,6...88 A / 380...480 V

07/2016

Summary of Revisions

Versión	Revision	Description
-	R01	First edition
-	R02	General revision
-	R03	Setting in Table 3.6 on page 3-30
-	R04	General revision
-	R05	General revision
-	R06	It was added: The Section 3.3 SAFETY STOP FUNCTION on page 3-35 Modifications of Slot 4 and Slot 5 New accessory models Additional information on the HMI New models of recommended fuses 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!
Failure to follow the recommended procedures listed in this warning may result in death, serious injury, and equipment 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!
Failure to follow the recommended procedures listed in this warning may result in equipment damage.

NOTE!
This warning provides important information for the proper understanding and operation of the equipment.

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.

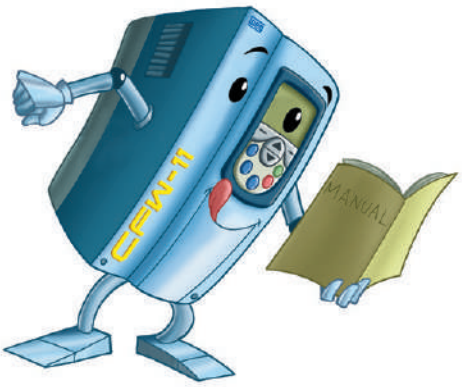
DANGER!
Crushing Hazard
In order to ensure safety in load lifting applications, electric and/or mechanical devices must be installed outside the inverter for protection against accidental fall of load.

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

The purpose of this manual is to provide you with the basic information needed to install, start-up in the V/f control mode (scalar), and troubleshoot the most common problems of the CFW-11 frequency 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.
- ☑ RS-232/RS-485 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 TERMS AND DEFINITIONS

Normal Duty Cycle (ND): inverter duty cycle that defines the maximum continuous operation current (I_{nom-ND}) and the overload current (110 % for 1 minute). The ND cycle is selected by setting P0298 (Application) = 0 (Normal Duty (ND)). This duty cycle shall be used for the operation of motors that are not subjected to high torque loads (with respect to the motor rated torque) during its operation, starting, acceleration, or deceleration.

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

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

I_{nom-HD}: inverter rated current for use with the heavy duty (HD) cycle.
Overload: 1.5 x I_{nom-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; feeds the output inverter bridge with IGBTs.

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

IGBT: insulated Gate Bipolar Transistor; basic component of the output inverter bridge. The IGBT works as an electronic switch in the saturated (closed switch) and cut-off (open switch) modes.

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

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

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

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

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

PE: Protective Earth.

MOV: Metal Oxide Varistor.

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

PTC: resistor which resistance value in ohms increases proportionally to the temperature increase; used as a temperature sensor in electrical motors.

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

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

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

RAM Memory: Random Access Memory (volatile).

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

General Enable: when activated, this function accelerates the motor via acceleration ramp set in the inverter. When deactivated, this function immediately blocks the PWM pulses. The general enable function may be controlled through a digital input set to this function or via serial communication.

Start/Stop: when enabled in the inverter (Start), this function accelerates the motor via acceleration ramp up to the speed reference. When disabled (Stop), this function decelerates the motor via deceleration ramp up to the complete motor stop; at this point, the PWM pulses are blocked. The Start/Stop function may be controlled through a digital input set for this function or via serial communication. The operator keys I Start, and O Stop of the keypad work in a similar way.

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: Ampères.

°C: celsius degree.

CFM: Cubic Feet per Minute; unit of flow.

cm: centimeter.

°F: Fahrenheit degree.

ft: foot.

hp: Horse Power = 746 Watts (unit of power, used to indicate the mechanical power of electrical motors).

Hz: hertz.

in: inch.

kg: kilogram = 1000 grams.

kHz: kilohertz = 1000 hertz.

l/s: liters per second.

lb: pound.

m: meter.

mA: miliampère = 0.001 Ampère.

min: minute.

mm: millimeter.

ms: millisecond = 0.001 seconds.

Nm: 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 ("Voltage Vector WEG") 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: allows the controlled braking of the motor, eliminating the additional braking resistors in some applications.
- ☑ "Self-Tuning" feature for vector control and VVW. It allows the automatic adjustment of the regulators and control parameters from the identification (also automatic) of the motor parameters and load.

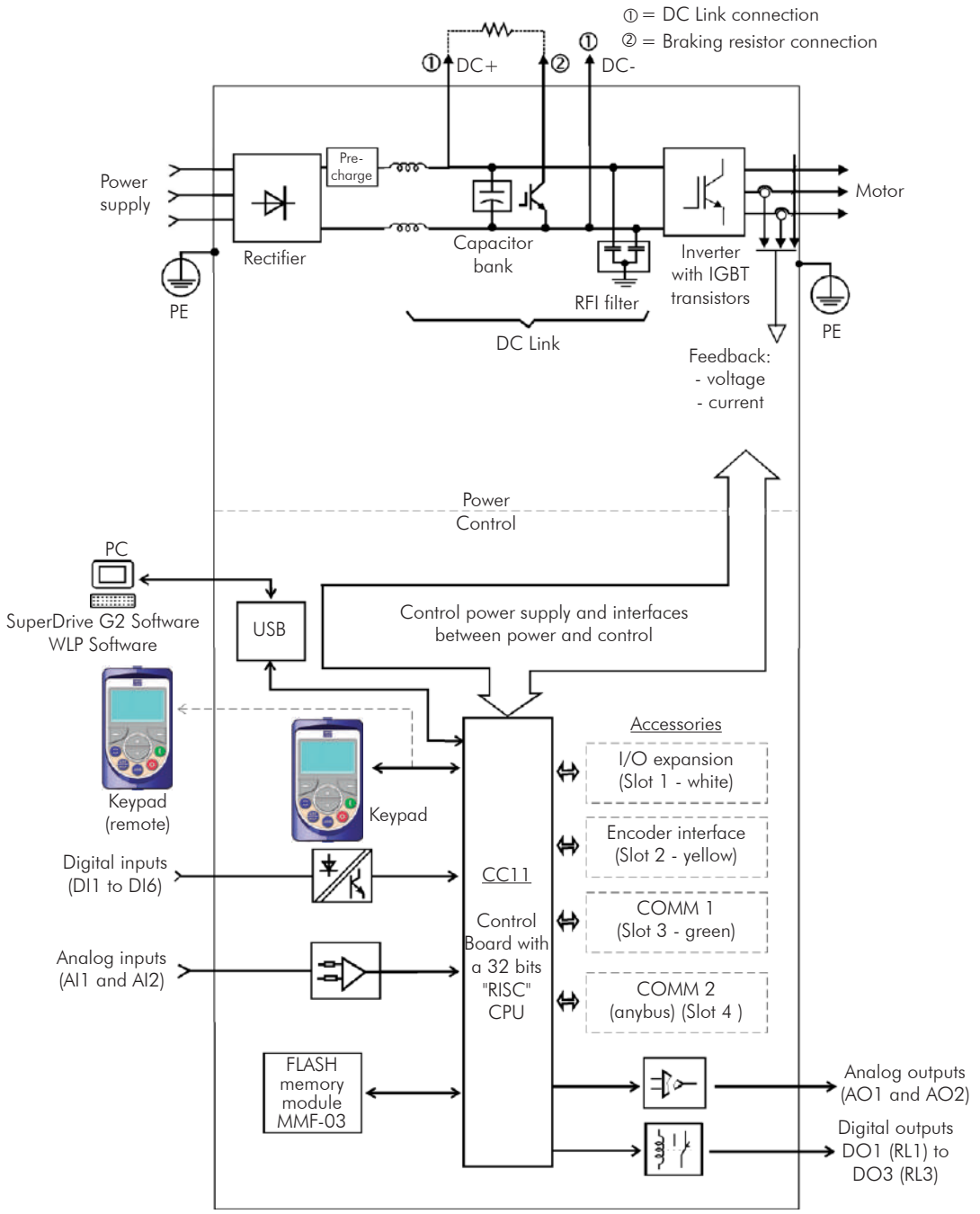
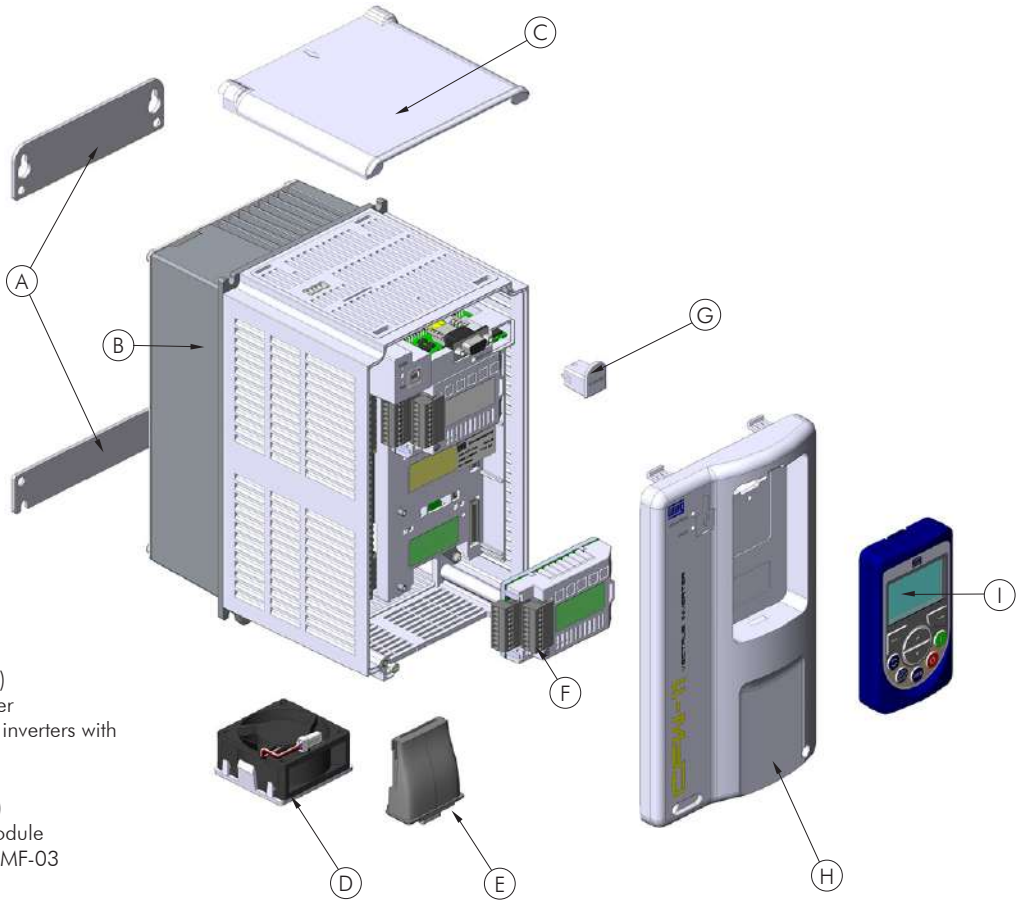
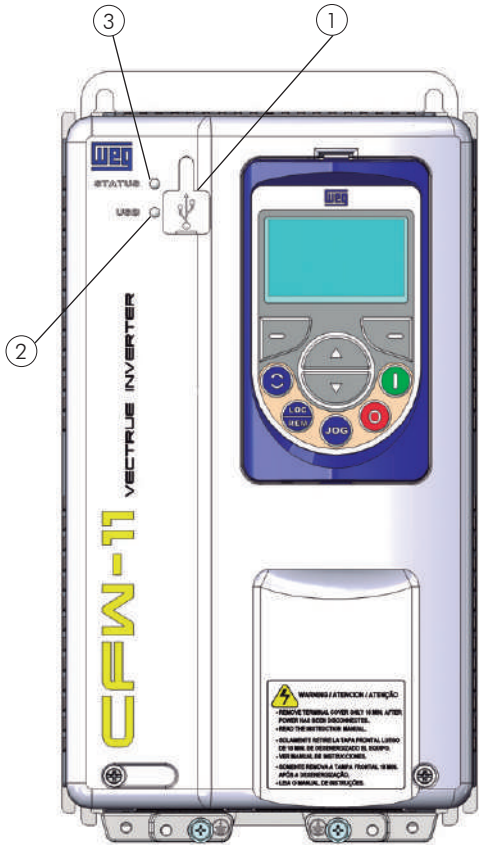


Figure 2.1 - *Block diagram for the CFW-11*



A - mounting supports
(for through the wall mounting)
B - heatsink/back of the inverter
C - top cover(does not exist in inverters with IP55 degree protection)
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 - HMI

Figure 2.2 - *Main components of the CFW-11*



(1) USB Connector

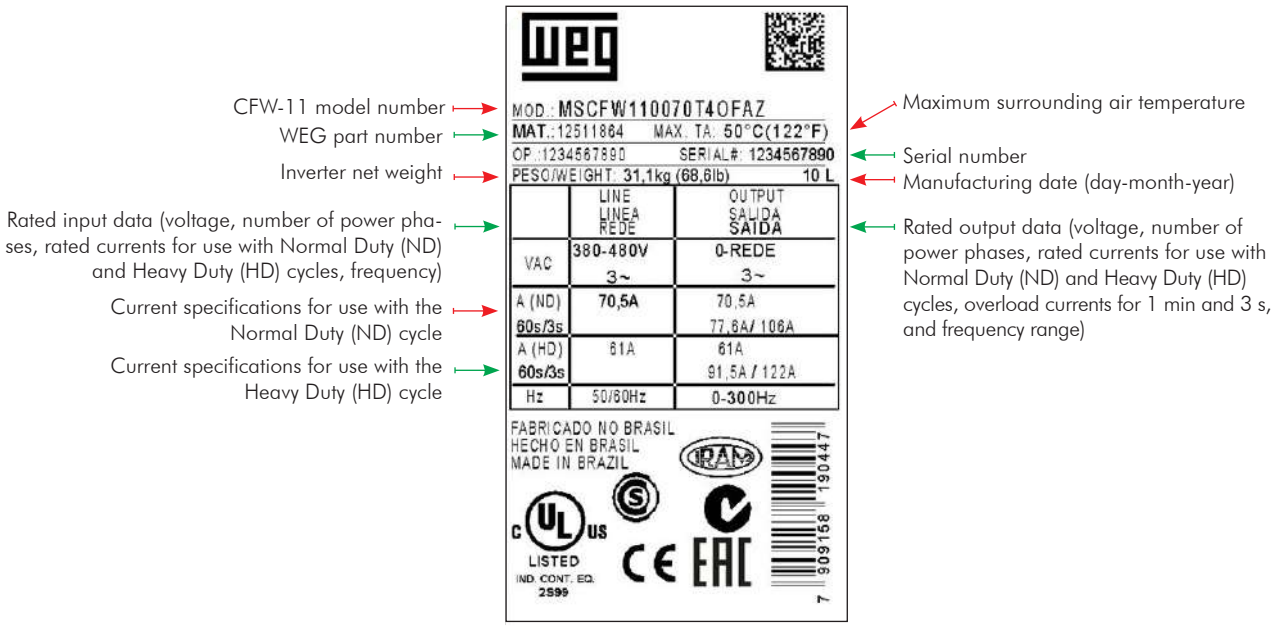
(2) USB LED
Off: no USB connection
On/Flashing: USB communication is active

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

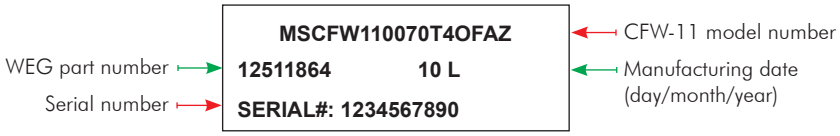
Figure 2.3 - *LEDs and USB connector*

2.4 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 2.4 - *(a) and (b) - Nameplates*

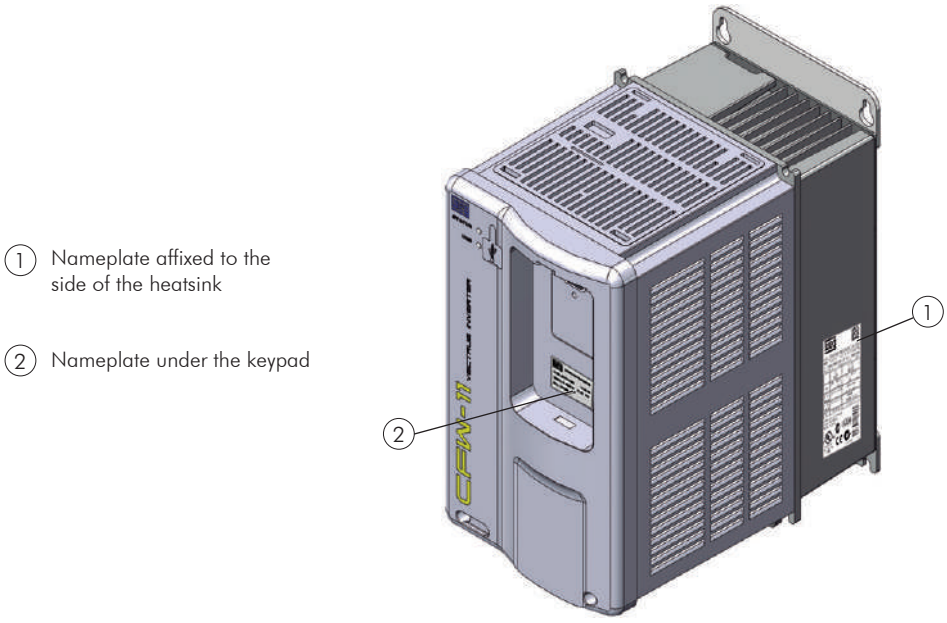


Figure 2.5 - *Location of the nameplates*

HOW TO CODIFY THE CFW-11 MODEL (SMART CODE)

	Inverter Model 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						Available Option Kits (Can be Installed in the Product From the Factory) Refer to Chapter 7 OPTION KITS AND ACCESSORIES on page 7-1 to check option kit availability for each inverter model									
Example	**BR**	**CFW-11**	**0016**	**T**	**4**	**S**	**_ _**	**_ _**	**_ _**	**_ _**	**_ _**	**_ _**	**_ _**	**_ _**	**_ _**	**Z**
	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	Disconnect switch in inverter supply	Disconnect switch in inverter supply **(8)**	Safety stop	24 Vdc external power supply for control	Special hardware	Special software	Digit final indicator of encoding
Available options	2 characters			S = single-phase power supply T = three-phase power supply B = single or three-phase power supply	2 = 200...240 V 4 = 380...480 V	S = standard product O = product with option kit	Blank = standard **(1)** N1 = Nema1 **(6)** 21 = IP21 **(7)** 55 = IP55	Blank = standard **(2)** IC = no keypad (blind cover)	Blank = standard **(3)**	Blank = standard FA = class 3 internal RFI filter	Blank = Without disconnecting switch DS = With disconnect switch	Blank = standard (Safety Stop function is not available) Y = Safety Stop according to ISO 13849-1 category 3 **(4) (5)**	Blank = standard (not available) W = 24 Vdc external power supply for control	Blank = standard H1 = Special hardware n° 1	Blank = standard S1 = Special software n° 1	

(1) Degree of protection standard frame sizes A, B and C: IP21; frame size D: IP20/Nema1.

(2) Standard HMI CFW-11.

(3) Braking transistor (IGBT) is incorporated in all models of frame sizes A, B, C and D as standard.

(4) Refer to Section 3.3 SAFETY STOP FUNCTION on page 3-35 for further information.

(5) It is not possible to specify simultaneously optional items Nema1 and safety stop function for inverters of frame size A.

(6) This option is not valid for inverters of frame size D since the standard degree of protection is already Nema1.

(7) Only applicable for inverters of frame size D.

(8) It is only possible to specify the optional item with switch-disconnector for inverters with degree of protection IP55.

2.5 RECEIVING AND STORAGE

The CFW-11 is packaged and shipped in a cardboard box until the models of frame size C. The bigger frame models are packaged and shipped in a wood crate.

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

Follow the instructions below to remove the CFW-11 models above frame size C from the package:

1. Put the shipping container over a flat and stable area with the assistance of another two people.

2. Open the wood crate.

3. Remove all the packing material (the cardboard or styrofoam protection) before removing the inverter.

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.

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 of CFW-11 inverters with degree of protection IP2X or Nema1: from -10 °C to 50 °C (104 °F to 122 °F) - rated conditions (measured around the inverter).
- ☑ Temperature of CFW-11 inverter with degree of protection IP55: from -10 °C to 40 °C (50 °F to 104 °F) - rated conditions (measured around the inverter).
- ☑ Current derating according to the ambient temperature:
  CFW-11 inverters with degree of protection IP2X or Nema1: from 50 °C to 60 °C (122 °F to 140 °F) - current derating of 2 % for each degree Celsius above 50 °C (122 °F).

  CFW-11 inverters with degree of protection IP55: from 40 °C to 50 °C (104 °F to 122 °F) - current derating of 2 % for each degree Celsius above 40 °C (104 °F).
- ☑ Humidity: from 5 % to 95 % non-condensing.
- ☑ Maximum altitude: up to 1000 m (3,300 ft) - rated conditions.
- ☑ From 1000 m to 4000 m (3,300 ft to 13,200 ft) - 1 % of current derating for each 100 m (330 ft) above 1000 m (3,300 ft) altitude. From 2000 m to 4000 m (6,600 ft to 13,200 ft) - maximum voltage (240 V for models 220...240 V and 480 V for models 380...480 V) derating 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 dynamic braking IGBT (column effective braking current ($I_{effective}$) of Table 3.4 on page 3-22).

- ☑ 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.

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. Refer to Section 8.6 CONDUIT KIT on page 8-15 for further details. For external sizes of frame sizes A, B and C with conduit kit (with optional item Nema1), refer to Section 8.7 CONDUIT KIT IP21 on page 8-16.

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 3.2 on page 3-4 and Figure 3.3 on page 3-4.

Inverters of frame sizes A, 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 3-4.

Do not install heat sensitive components right above the inverter.

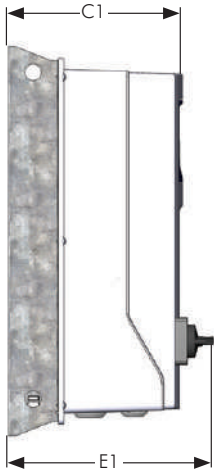
ATTENTION!

When arranging two or more inverters vertically, respect the minimum clearance A + B (Figure 3.2 on page 3-4) and provide an air deflecting plate so that the heat rising up from the bottom inverter does not affect the top inverter.

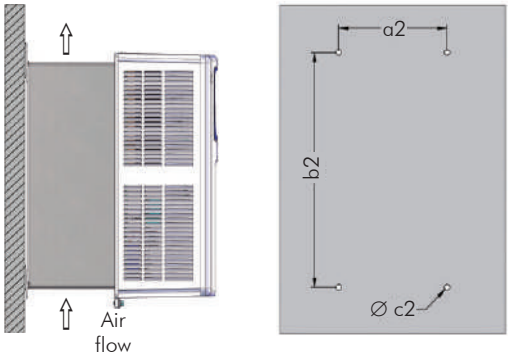
ATTENTION!

Provide conduit for physical separation of the signal, control, and power conductors (refer to Section 3.2 ELECTRICAL INSTALLATION on page 3-9).

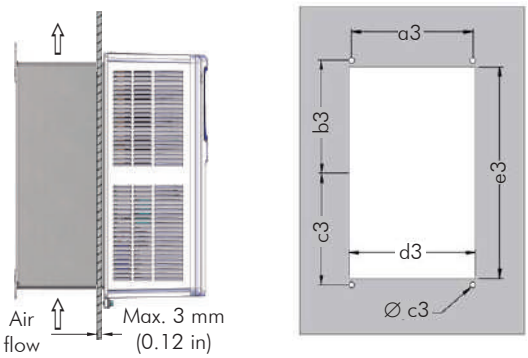
(a.1) Dimensions external in inverters with degree protection IP2X



(a.2) Dimensions external in inverters with degree protection IP55



(b) Surface mounting



(c) Flange mounting

Model	Protection Degree	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 A	IP2X	145 (5.70)	247 (9.72)	227 (8.93)	70 (2.75)	270 (10.62)	115 (4.52)	250 (9.84)	M5	130 (5.11)	120 (4.72)		136 (5.35)	226 (8.89)	M5	5.0 (44.2)
Frame Size B	IP2X	190 (7.48)	293 (11.53)	227 (8.94)	71 (2.79)	316 (12.44)	150 (5.90)	300 (11.81)	M5	175 (6.89)	142.5 (5.61)		180 (7.09)	272 (10.71)	M5	5.0 (44.2)
	IP55	273 (10.74)	497.4 (19.58)	237 (9.33)	68 (2.67)	529 (20.82)	200 (7.87)	505 (19.88)	M8	-	-		-	-	M8	5.0 (44.2)
Frame Size C	IP2X	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)
	IP55	307 (12.08)	588 (23.14)	348 (13.70)	137 (5.39)	670 (26.37)	200 (7.87)	642 (25.75)	M8	-	-		-	-	M8	8.5 (75.2)
Frame Size D	IP2X	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)
	IP55	375 (14.76)	707 (27.83)	338.8 (13.33)	129 (5.07)	754 (29.68)	250 (9.84)	725 (28.54)	M8	-	-		-	-	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 c3).

Figure 3.1 - *(a) to (c) - Mechanical installation details*

Model	A	B	C
	mm (in)	mm (in)	mm (in)
Frame Size A	25 (0.98)	25 (0.98)	10 (0.39)
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)

Figure 3.2 - *Minimum top, bottom, and front clearance requirements for air circulation*

3

* Dimensions in mm [in]

(a) Minimum side clearance requirements

(b) Frame sizes A, B, and C: side-by-side mounting without clearance required between inverters if top cover is removed

Figure 3.3 - *(a) and (b) - Minimum side clearance requirements for inverter ventilation*

3.1.3 Cabinet Mounting

It is possible to mount the inverters with degree of protection IP2X in two ways: 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). Inverters Nema1 and with degree of protection IP55 can only be surface mounted. The following information can be considered in those 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 "Dissipated power in Watts - through the wall mounting".
- ☑ The cooling air flow requirements, as shown in Table 3.1 on page 3-5.
- ☑ The position and diameter of the mounting holes, according to Figure 3.1 on page 3-3.

Flange mounting:

- ☑ The losses specified in Table 8.1 on page 8-2 "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 3.4 on page 3-6.
- ☑ 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.

Table 3.1 - *Cooling air flow*

Frame Size	CFM	l/s	m^3/min
A	18	8	0.5
B	42	20	1.2
C	96	45	2.7
D	132	62	3.7

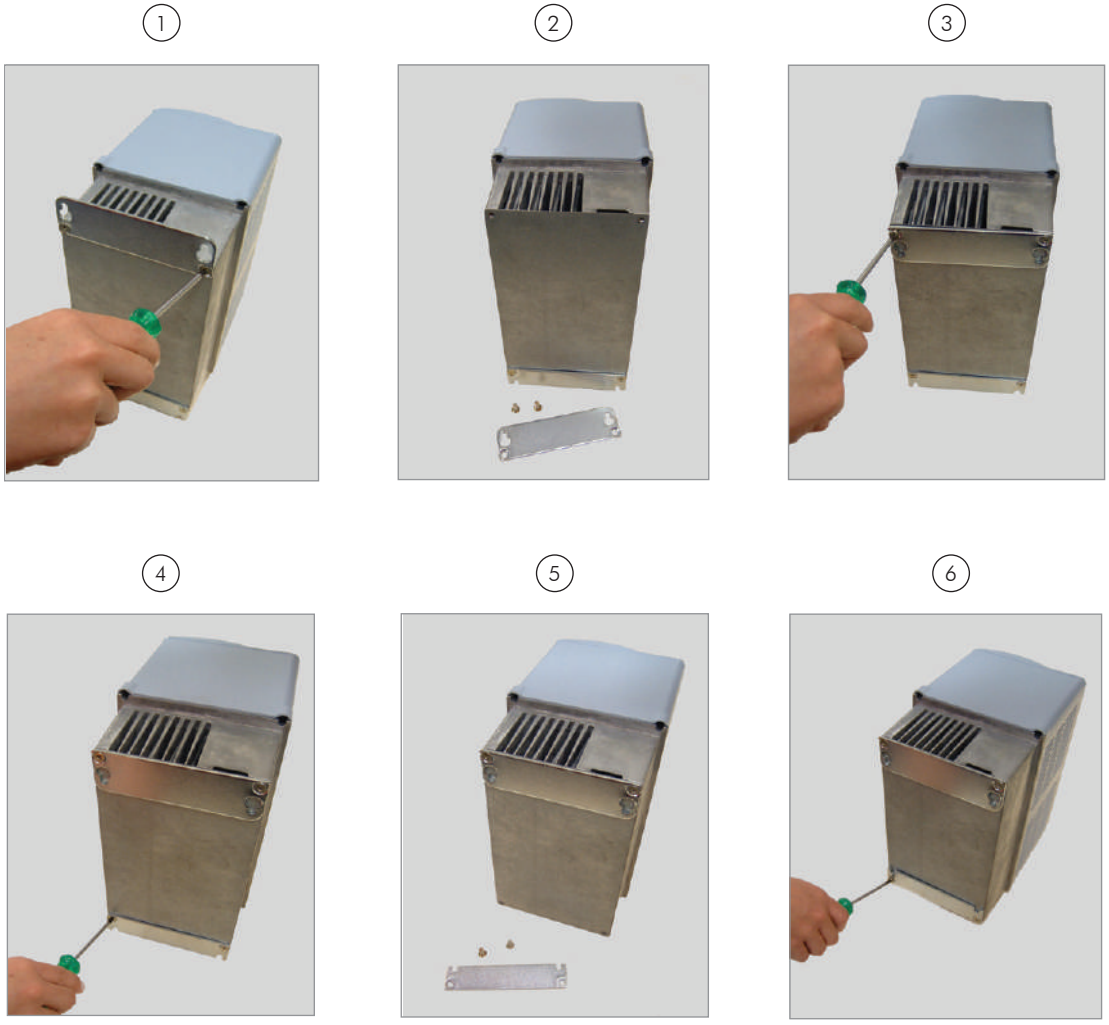


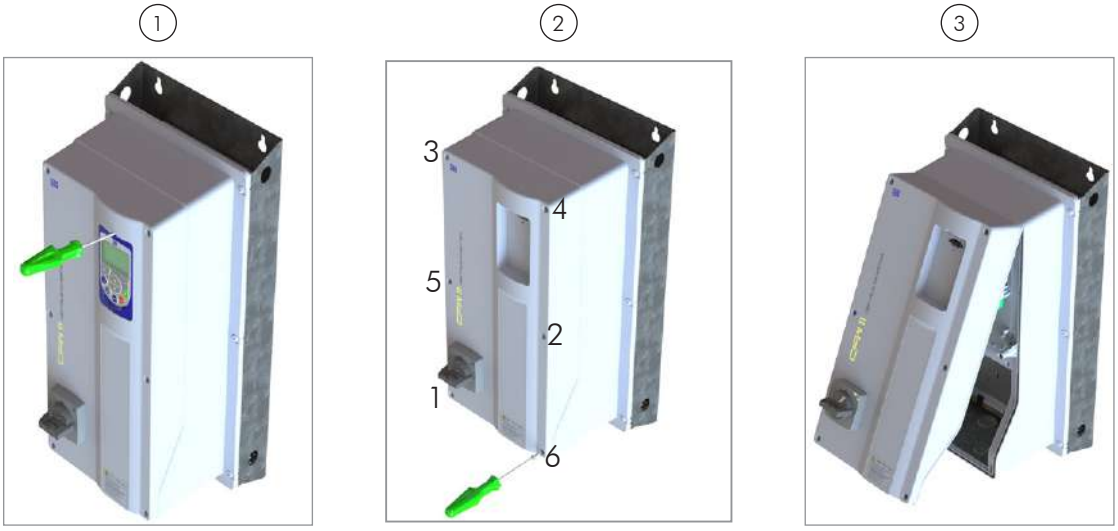
Figure 3.4 - *Repositioning the mounting supports*

3.1.4 Access to the Control and Power Terminal Strips

On CFW-11 inverters of frame sizes A, B and C with degree of protection IP2X and Nema1 and on all the CFW-11 inverters with degree of protection IP55, it is necessary to remove the HMI and the front cover to access the control and power terminals.

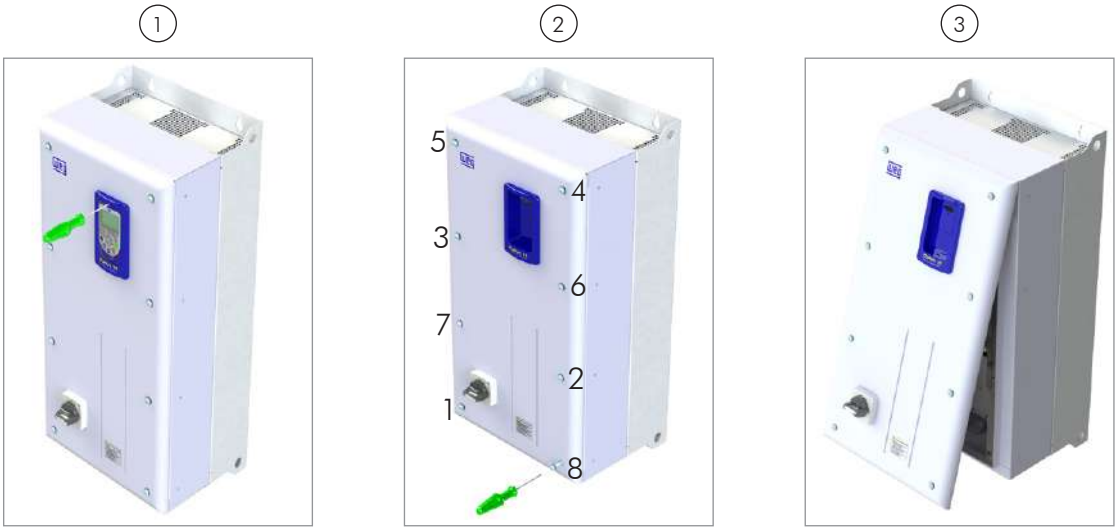
Figure 3.5 on page 3-7 (b) also shows the sequence to tighten the screws to mount the front cover of the inverters with degree of protection IP55.

(a) Frame sizes A, B and C with degree of protection IP2X or Nema1



Note: The tightening sequence for mounting the front cover is: 1-2-3-4-5-6. Torque: 2.5 Nm.

(b.1) Frame sizes B and C



Note: The tightening sequence for mounting the front cover is: 1-2-3-4-5-6. Torque: 2.5 Nm.

(b.2) Frame size D

(b) Models CFW-11 with degree of protection IP55

Figure 3.5 - *(a) and (b) - Removal of HMI and front cover*

In case of inverters of frame size D with degree of protection IP2X/Nema1, it is necessary to remove the HMI and control rack cover to access the control connectors (see Figure 3.6 on page 3-8). In order to access the power connectors, remove the lower front cover (see Figure 3.7 on page 3-8).

Figure 3.6 - *HMI and control rack cover removal*

Figure 3.7 - *Bottom front cover removal*

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

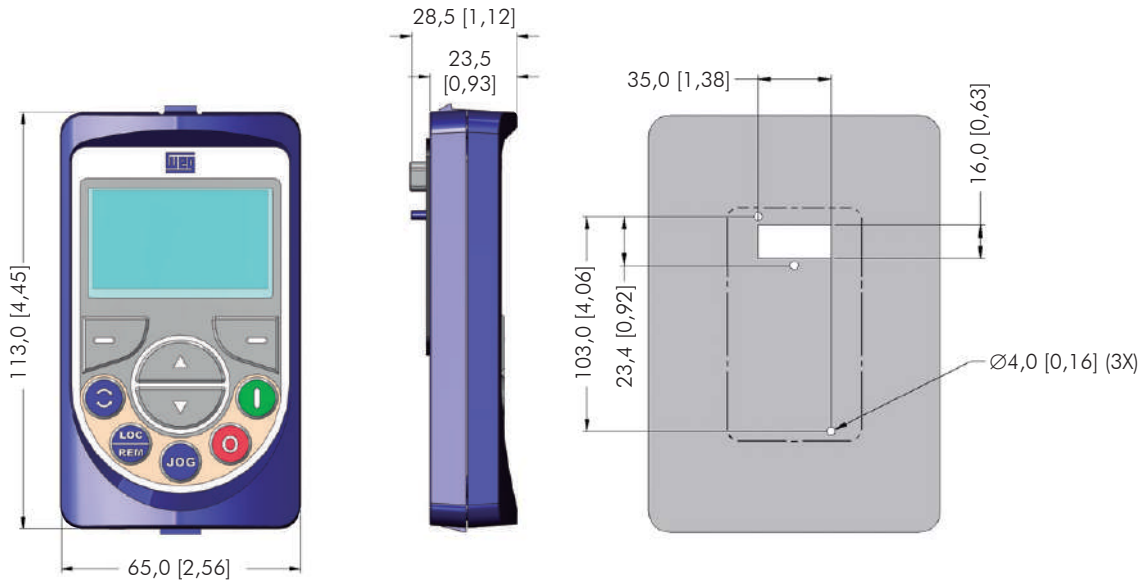


Figure 3.8 - *Data for the HMI installation at the cabinet door or command panel - mm [in]*

The keypad frame accessory can also be used to fix the HMI, as mentioned in Table 7.1 on page 7-4.

3.2 ELECTRICAL INSTALLATION

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

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

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

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

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

3.2.1 Identification of the Power and Grounding Terminals

NOTE!
Models CFW110006B2 and CFW110007B2 may operate with single-phase power supply without rated output current derating. In this case, the single-phase power supply may be connected to two of any input terminals.
Models CFW110006S2OFA, CFW110007S2OFA, and CFW110010S2 not operate with three-phase voltage. In this case, the single-phase power supply shall be connected to terminals **R/L1** and **S/L2**.

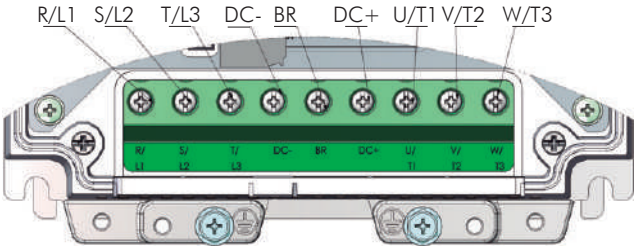
R/L1, S/L2, T/L3: AC power supply.

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

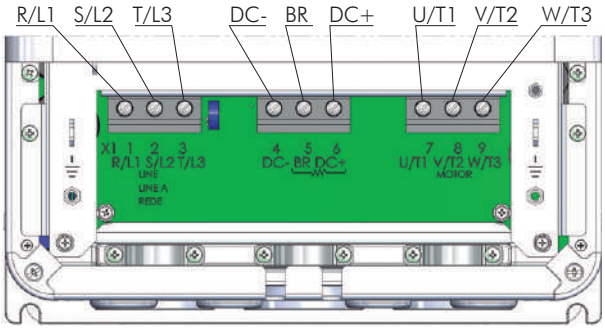
BR: braking resistor connection.

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

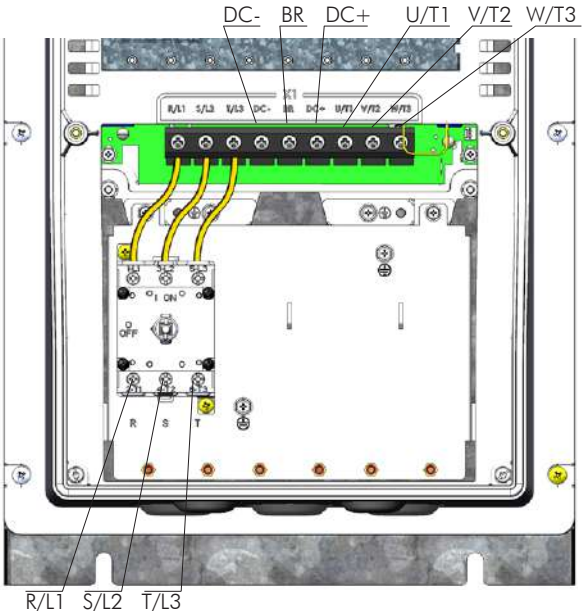
U/T1, V/T2, W/T3: motor connection.



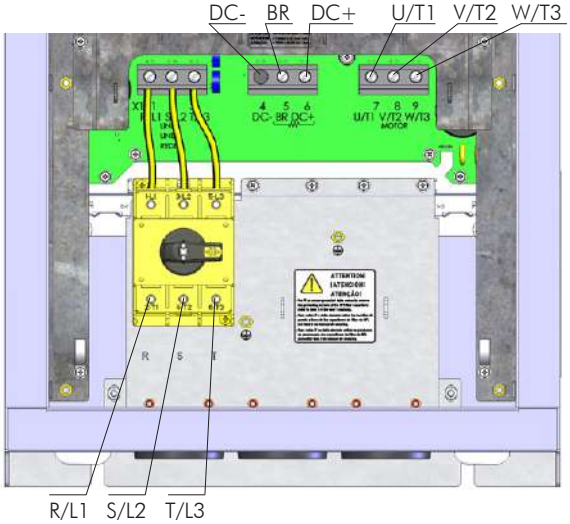
(a) Frame sizes A, B and C



(b) Frame size D

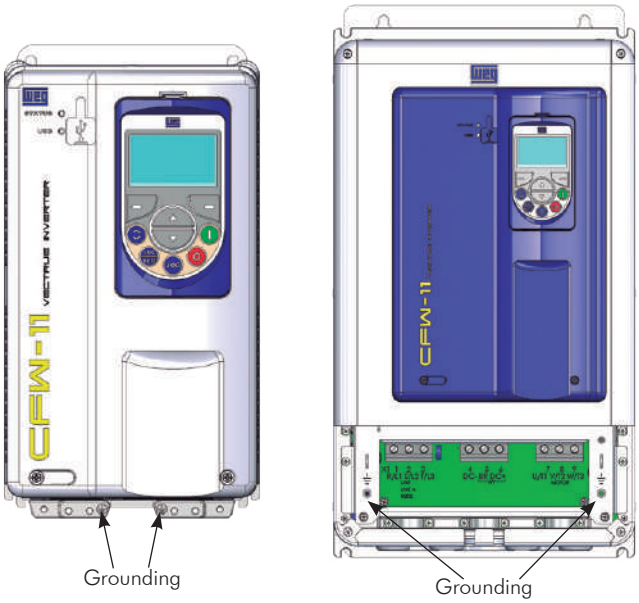


(c) Frame sizes B and C with switch-disconnector (inverters with degree of protection IP55)



(d) Frame size D with switch-disconnector (inverters with degree of protection IP55)

Figure 3.9 - *(a) to (d) - Power terminals*



(a) Frame sizes A, B and C with degree of protection IP2X

(b) Frame size D with degree of protection IP2X/Nema1

(c) Frame sizes B, C and D with degree protection IP55

Figure 3.10 - *(a) to (c) - Grounding terminals*

3.2.2 Power/Grounding Wiring and Fuses

ATTENTION!

Provide adequate terminals when flexible cables are used for the power and grounding connections.

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 in case the input power supply is connected to the output terminals (U/T1, V/T2, or W/T3).
- Check all the connections before powering up the inverter.
- In case of 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.), the RCD protection may be activated. 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 3-14 are orientative values. Installation conditions and the maximum permitted voltage drop must be considered for the proper wiring sizing.

Input fuses:

- ☑ The fuse to be used in the input must be of the UF type (Ultra-Fast) with I^2t equal to or smaller than the specified in Table 3.2 on page 3-14 (consider the cold current extinction value (not the melting value) to protect the input rectifier diodes of the inverter and wiring.

- ☑ In order to meet UL requirements, use fuses at the inverter supply with a current not higher than the values of Table 3.3 on page 3-18.

- ☑ 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 only copper wire (75 °C (167 °F))*

Model	Frame Size	Power Terminals			Wire Size			Fuse In [A]	Fuse I^2t @ 25 °C (77 °F) [A^2s]	Recommended WEG aR Fuse
		Terminals	Screw (type)	Recommended Torque N.m (lbf.in)	mm²	AWG	Terminals			
CFW110006B2	A	R/L1 - S/L2 - T/L3	M4 (slotted/ phillips)	1.8 (15.6)	2.5(1ϕ) (*)/1.5(3ϕ)	14	Pin terminal	20	420	FNH00-20K-A
		U/T1 - V/T2 - W/T3 DC+ - DC- (1)			1.5		Ring tongue			
		⏚ (PE)	M4 (phillips)		2.5					
CFW-110006S2OFA		R/L1/L - S/L2/N	M4 (slotted/ phillips)	1.8 (15.6)	2.5	14	Pin terminal	20	420	FNH00-20K-A
		U/T1 - V/T2 - W/T3 DC+ - DC- (1)			1.5					
		⏚ (PE)	M4 (phillips)		2.5		Ring tongue			
CFW110007B2		R/L1 - S/L2 - T/L3	M4 (slotted/ phillips)	1.8 (15.6)	2.5(1ϕ) (*)/1.5(3ϕ)	12(1ϕ) (*)/14(3ϕ)	Pin terminal	20	420	FNH00-20K-A
		U/T1 - V/T2 - W/T3 DC+ - DC- (1)			1.5	14	Ring tongue			
		⏚ (PE)	M4 (phillips)		2.5	12(1ϕ) (*)/14(3ϕ)				
CFW-110007S2OFA		R/L1/L, S/L2/N	M4 (slotted/ phillips)	1.8 (15.6)	2.5	12	Pin terminal	20	420	FNH00-20K-A
		U/T1 - V/T2 - W/T3 DC+ - DC- (1)			1.5	14				
		⏚ (PE)	M4 (phillips)		2.5	12	Ring tongue			
CFW110007T2		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (slotted/ phillips)	1.8 (15.6)	1.5	14	Pin terminal	20	420	FNH00-20K-A
		⏚ (PE)	M4 (phillips)		2.5		Ring tongue			
CFW110010S2		R/L1/L - S/L2/N	M4 (slotted/ phillips)	1.8 (15.6)	6	10	Pin terminal	20	1000	FNH00-20K-A
		U/T1 - V/T2 - W/T3 DC+ - DC- (1)			2.5	14				
		⏚ (PE)	M4 (phillips)		6	10	Ring tongue			
CFW110010T2		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+, DC- (1)	M4 (slotted/ phillips)	1.8 (15.6)	2.5	14	Pin terminal	20	420	FNH00-20K-A
		⏚ (PE).	M4 (phillips)				Ring tongue			
CFW110013T2		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (slotted/ phillips)	1.8 (15.6)	2.5	12	Pin terminal	25	420	FNH00-25K-A
		⏚ (PE)	M4 (phillips)				Ring tongue			
CFW110016T2		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (slotted/ phillips)	1.8 (15.6)	4	12	Pin terminal	35	420	FNH00-35K-A
		⏚ (PE)	M4 (phillips)				Ring tongue			
CFW110024T2	B	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.2 (10.8)	6	10	Pin terminal	40	1000	FNH00-40K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)			Ring tongue			
CFW110028T2		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.2 (10.8)	6	8	Pin terminal	50	1000	FNH00-50K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)			Ring tongue			
CFW110033T2		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.2 (10.8)	10	8	Pin terminal	63	1000	FNH00-63K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)			Ring tongue			

Model	Frame Size	Power Terminals			Wire Size			Fuse In [A]	Fuse I^2t @ 25 °C (77 °F) [A^2s]	Recommended WEG aR Fuse
		Terminals	Screw (type)	Recommended Torque N.m (lbf.in)	mm²	AWG	Terminals			
CFW110045T2	C	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ (2) - DC- (2)	M5 (slotted/ phillips)	2.0 (18.0)	10	6	Pin terminal	80	2750	FNH00-80K-A
		⏚ (PE)	M5 (phillips)	3.5 (31.0)			Ring tongue			
CFW110054T2		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ (2) - DC- (2)	M5 (slotted/ phillips)	2.0 (18.0)	16	6	Pin terminal	80	2750	FNH00-80K-A
		⏚ (PE)	M5 (phillips)	3.5 (31.0)			Ring tongue			
CFW110070T2		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ (2) - DC- (2)	M5 (slotted/ phillips)	2.0 (18.0)	25	4	Pin terminal	100	2750	FNH00-100K-A
		⏚ (PE)	M5 (phillips)	3.5 (31.0)	16		Ring tongue			
CFW110086T2	D	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC-	M6 (slotted/ phillips)	2.0 (18.0)	35	2	Pin terminal	125	3150	FNH00-125K-A
		⏚ (PE)	M5 (phillips)	3.5 (31.0)	16	4	Ring tongue			
CFW110105T2		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC-	M6 (slotted)	2.0 (18.0)	50	1	Pin terminal	125	3150	FNH00-125K-A
		⏚ (PE)	M5 (phillips)	3.5 (31.0)	25	4	Ring tongue			
CFW110003T4	A	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.1 (10.0)	1.5	14	Tipo forquilha	20	190	FNH00-20K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)	2.5		Ring tongue			
CFW110005T4		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.1 (10.0)	1.5	14	Tipo forquilha	20	190	FNH00-20K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)	2.5		Ring tongue			
CFW110007T4		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.1 (10.0)	1.5	14	Tipo forquilha	20	190	FNH00-20K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)	2.5		Ring tongue			
CFW110010T4		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.1 (10.0)	2.5	14	Tipo forquilha	20	495	FNH00-20K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)			Ring tongue			
CFW110013T4		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.1 (10.0)	2.5	12	Tipo forquilha	25	495	FNH00-25K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)			Ring tongue			
CFW110017T4	B	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.2 (10.8)	4	10	Pin terminal	35	495	FNH00-35K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)			Ring tongue			
CFW110024T4		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.2 (10.8)	6	10	Pin terminal	40	500	FNH00-40K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)			Ring tongue			
CFW110031T4		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC- (1)	M4 (pozidriv)	1.2 (10.8)	10	8	Pin terminal	50	1250	FNH00-50K-A
		⏚ (PE)	M4 (phillips)	1.7 (15.0)			Ring tongue			

Model	Frame Size	Power Terminals			Wire Size			Fuse In [A]	Fuse I^2t @ 25 °C (77 °F) [A^2s]	Recommended WEG aR Fuse
		Terminals	Screw (type)	Recommended Torque N.m (lbf.in)	mm²	AWG	Terminals			
CFW110038T4	C	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ (2) - DC- (2)	M5 (slotted/ phillips)	2.0 (18.0)	10	8	Pin terminal	63	1250	FNH00-63K-A
		⏚ (PE)	M5 (phillips)	3.5 (31.0)			Ring tongue			
CFW110045T4		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ (2) - DC- (2)	M5 (slotted/ phillips)	2.0 (18.0)	10	6	Pin terminal	80	2100	FNH00-80K-A
		⏚ (PE)	M5 (phillips)	3.5 (31.0)			Ring tongue			
CFW110058T4		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ (2) - DC- (2)	M5 (slotted/ phillips)	2.0 (18.0)	16	4	Pin terminal	100	2100	FNH00-100K-A
		⏚ (PE)	M5 (phillips)	3.5 (31.0)			Ring tongue			
CFW110070T4	D	R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC-	M5 (slotted/ phillips)	2.9 (24.0)	25	3	Pin terminal	100	2100	FNH00-100K-A
		⏚ (PE)	M5 (phillips)	3.5 (31.0)	16	4	Ring tongue			
CFW110088T4		R/L1 - S/L2 - T/L3 - U/T1 - V/T2 - W/T3 DC+ - DC-	M5 (slotted/ phillips)	2.9 (24.0)	35	2	Pin terminal	125	3150	FNH00-125K-A
		⏚ (PE)	M5 (phillips)	3.5 (31.0)	16	4	Ring tongue			

1ϕ: **(*)** Wire size for single-phase power supply.
(1) There is a plastic cover in front of the DC- terminal at the frame sizes A and B inverters. It is necessary to break off that cover in order to get access to this terminal.
(2) There are plastic covers in front of the DC-, DC+ and BR terminals at the frame size C. It is necessary to break off those covers in order to get access to these terminals.

3.2.3 Power Connections

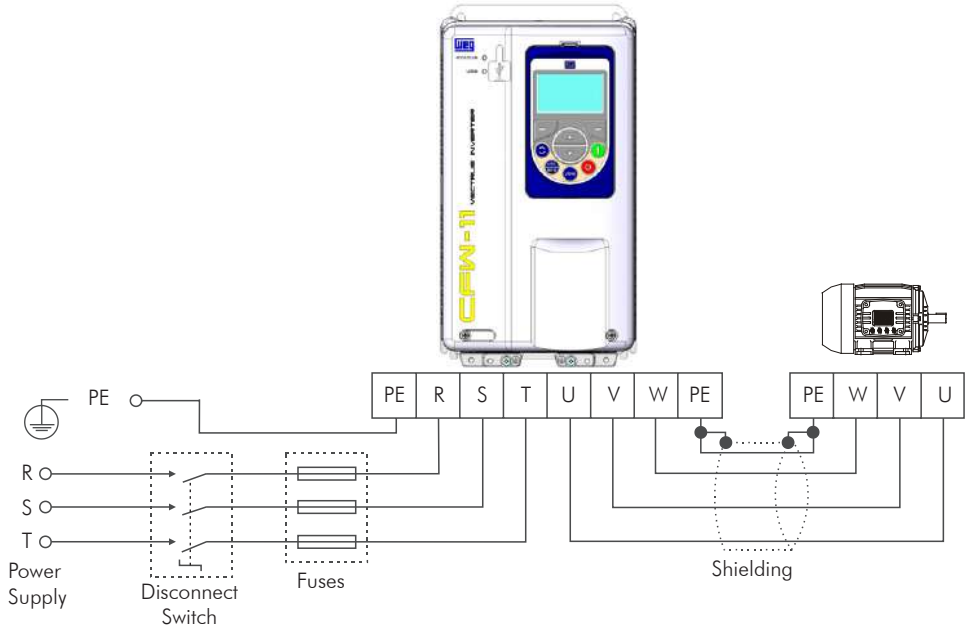


Figure 3.11 - *Power and grounding connections*

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 3.2.3.1.1 Power Supply Capacity on page 3-18.

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).

3.2.3.1.1 Power Supply Capacity

☑ Suitable for circuits with capacity to deliver no more than:
- 100 kA symmetric at 240 V or 480 V when the inverter is protected by fuses;
- 65 kA symmetric at 240 V or 480 V when the inverter is protected by reverse-type circuit breakers.

For compliance with UL standard and specification of current of fuses and circuit breaker see Table 3.3 on page 3-18.

Table 3.3 - *Fuses and circuit breaker specifications according to UL standard*

Model	Inverter Protection With Class J Fuses (*)		Inverter Protection With Circuit Breaker		
	Rated Current of Fuse	Maximum Power Supply Short-Circuit Current	Rated Current of Circuit Breaker	Minimum Cabinet Dimensions (Depth X Height X Width)	Maximum Power Supply Short-Circuit Current
CFW11 0006 B 2	20 A	100 kA	15 A	203 x 457 x 508 mm (8 x 18 x 20 in)	65 kA
CFW11 0006 S 2 O FA	20 A		15 A		
CFW11 0007 T 2	20 A		15 A		
CFW11 0007 B 2	20 A		15 A		
CFW11 0007 S 2 O FA	20 A		15 A		
CFW11 0010 S 2	25 A		15 A		
CFW11 0010 T 2	25 A		15 A		
CFW11 0013 T 2	25 A		15 A		
CFW11 0016 T 2	25 A		20 A		
CFW11 0024 T 2	35 A		30 A		
CFW11 0028 T 2	35 A		30 A		
CFW11 0033 T 2	35 A		40 A		
CFW11 0045 T 2	60 A		50 A	203 x 610 x 508 mm (8 x 24 x 20 in)	
CFW11 0054 T 2	60 A		60 A		
CFW11 0070 T 2	100 A (*)		80 A		
CFW11 0086 T 2	100 A		100 A	203 x 762 x 610 mm (8 x 30 x 24 in)	
CFW11 0105 T 2	125 (*)		125 A		
CFW11 0003 T 4	20 A		15 A	203 x 457 x 508 mm (8 x 18 x 20 in)	
CFW11 0005 T 4	20 A		15 A		
CFW11 0007 T 4	20 A		15 A		
CFW11 0010 T 4	20 A		15 A		
CFW11 0013 T 4	25 A		20 A		
CFW11 0017 T 4	35 A		20 A		
CFW11 0024 T 4	35 A		30 A		
CFW11 0031 T 4	35 A		40 A		
CFW11 0038 T 4	50 A		40 A	203 x 610 x 508 mm (8 x 24 x 20 in)	
CFW11 0045 T 4	60 A		50 A		
CFW11 0058 T 4	60 A		60 A		
CFW11 0070 T 4	80 A		80 A	203 x 762 x 610 mm (8 x 30 x 24 in)	
CFW11 0088 T 4	100 A		100 A		

(*) In the indicated models use semiconductor fuses instead of class J fuses.

3.2.3.1.2 IT Networks

ATTENTION!

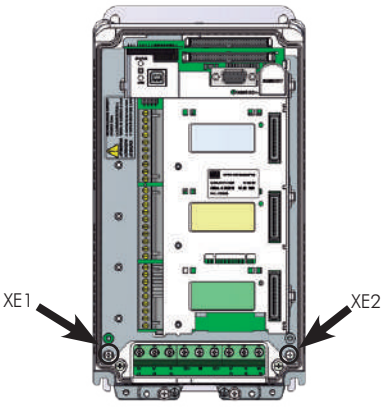
Do not use inverters with internal RFI filters in IT networks (neutral is not grounded or grounding provided by a high ohm value resistor) or in grounded delta networks ("delta corner earth"), because these type of networks damage the inverter filter capacitors.

The CFW-11 inverter series, except the models with internal RFI filters – CFW11XXXXXXOFA, can be normally used in IT networks. If the available model is equipped with an internal filter, remove the two grounding screws from the filter capacitors as presented in Figure 3.12 on page 3-20. Remove the keypad and the front cover to have access to these screws in frame sizes A, B, and C. For frame size D, the bottom front cover shall be removed as well.

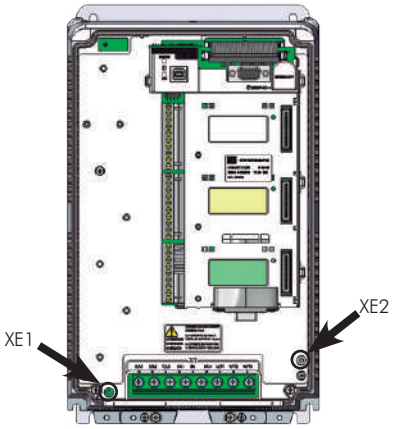
Consider the following items for the use of protection devices on the supply side of the inverter such as residual current devices or isolation monitors:

- The detection of a phase-to-ground short-circuit or an insulation fault shall be processed by the user, i.e., the user shall decide whether to indicate the fault and/or block the inverter operation.

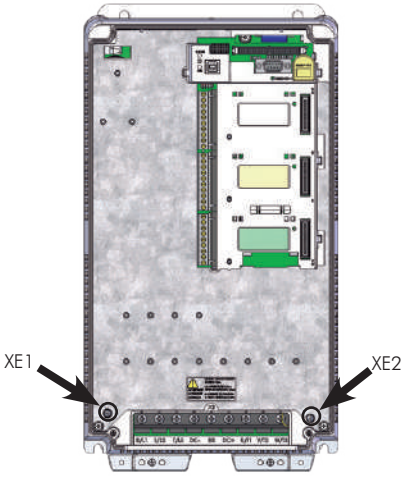
- Contact the RCD manufacturer for selecting the most appropriate device to be used with inverters in order to avoid nuisance tripping due to the high frequency leakage currents that flow through the leakage capacitances of the inverter, cable, and motor system to the ground.



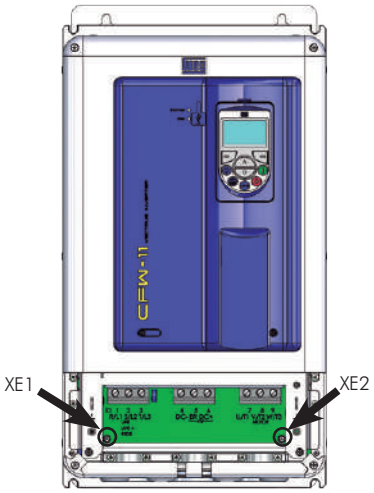
(a) Frame size A - IP2X or Nema1



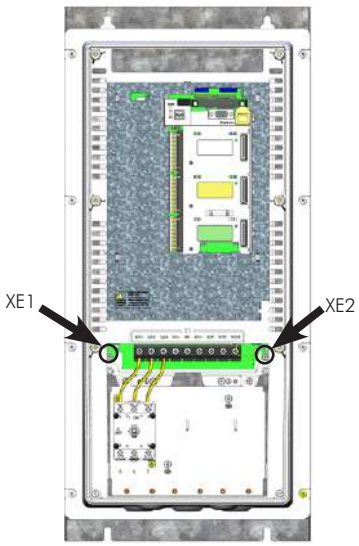
(b) Frame size B - IP2X or Nema1



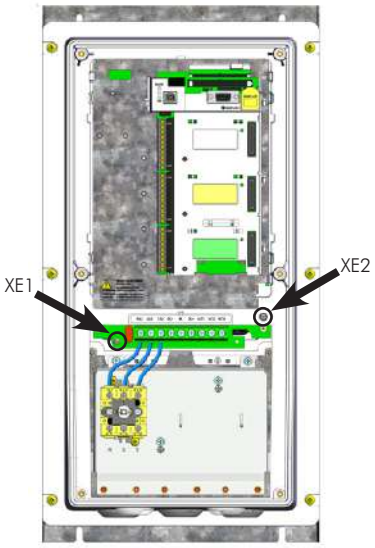
(c) Frame size C - IP2X or Nema1



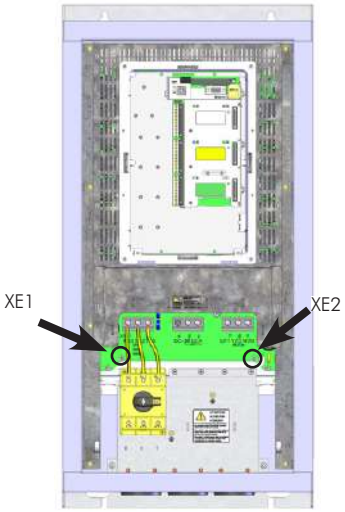
(d) Frame size D - IP2X or Nema1



(e) Models up to 16T2 and 13T4 with degree of protection IP55 (frame size B) all of frame size C with degree of protection IP55



(f) Models 24T2, 28T2, 33T2, 17T4, 24T4 and 31T4 with degree of protection IP55 (frame size B)



(g) Frame size D IP55

Figure 3.12 - *(a) to (g) - Grounding screws of the filter capacitors - valid for models with internal RFI filters*

3.2.3.2 Dynamic Braking

NOTE!
All frame sizes A, B, C and D models do have internal braking IGBT.

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 (400 V or 800 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 3.4 on page 3-22 shall be respected.

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

The DC Link 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 3.4 on page 3-22 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 (ex.: centrifuges) or short duration cycles, consult WEG for the adequate sizing of the braking resistor.

Table 3.4 - *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]	Dissipated Power (Mean Value) in the Braking Resistor (P_R) (2) [kW]	Recommended Resistor [Ω]	Power Wire Size (Terminals DC+ and BR) (3) [mm² (AWG)]
CFW11 0006 B2	7.8	3.1	5.20	1.4	51	1.5 (16)
CFW11 0006 S2 O FA	7.8	3.1	5.20	1.4	51	1.5 (16)
CFW11 0007 B2	12.1	4.8	6.96	1.6	33	1.5 (16)
CFW11 0007 S2 O FA	12.1	4.8	6.96	1.6	33	1.5 (16)
CFW11 0007 T2	7.8	3.1	5.20	1.4	51	1.5 (16)
CFW11 0010 S2	14.8	5.9	10.83	3.2	27	2.5 (14)
CFW11 0010 T2	12.1	4.8	6.96	1.6	33	1.5 (16)
CFW11 0013 T2	14.8	5.9	8.54	2.0	27	2.5 (14)
CFW11 0016 T2	20.0	8.0	14.44	4.2	20	4 (12)
CFW11 0024 T2	26.7	10.7	19.15	5.50	15	6 (10)
CFW11 0028 T2	30.8	12.3	18.21	4.3	13	6 (10)
CFW11 0033 T2	30.8	12.3	16.71	3.6	13	6 (10)
CFW11 0045 T2	44.0	17.6	33.29	10.1	9.1	10 (8)
CFW11 0054 T2	48.8	19.5	32.17	8.49	8.2	10 (8)
CFW11 0070 T2	48.8	19.5	26.13	5.60	8.2	6 (8)
CFW11 0086 T2	133	53.3	90.67	24.7	3.0	35 (2)
CFW11 0105 T2	133	53.3	90.87	24.8	3.0	35 (2)
CFW11 0003 T4	8.0	6.4	3.54	1.3	100	1.5 (16)
CFW11 0005 T4	8.0	6.4	5.20	2.7	100	1.5 (16)
CFW11 0007 T4	8.0	6.4	5.20	2.7	100	1.5 (16)
CFW11 0010 T4	14.3	11.4	8.57	4.1	56	2.5 (14)
CFW11 0013 T4	14.3	11.4	10.40	6.1	56	2.5 (14)
CFW11 0017 T4	14.3	11.4	12.58	8.9	56	2.5 (12)
CFW11 0024 T4	36.4	29.1	16.59	6.1	22	4 (10)
CFW11 0031 T4	40.0	32.0	20.49	8.4	20	6 (10)
CFW11 0038 T4	40.0	32.0	26.06	13.6	20	6 (8)
CFW11 0045 T4	66.7	53.3	40.00	19.2	12	10 (8)
CFW11 0058 T4	66.7	53.3	31.71	12.1	12	10 (8)
CFW11 0070 T4	66.7	53.3	42.87	22.1	12	10 (6)
CFW11 0088 T4	129	103	63.08	24.7	6.2	25 (4)

(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.

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

(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 3.4 on page 3-22. The resistor power shall be changed according to the braking duty cycle.

(3) For specifications on the recommended terminal type (screw and tightening torque) for the connection of the braking resistor (terminals DC+ and BR), refer to the DC+ terminal specification at the Table 3.2 on page 3-14. There are plastic covers in front of the DC-, DC+ and BR terminals at the frame size C. It is necessary to break off those covers in order to get access to these terminals.

3.2.3.2.2 Installation of the Braking Resistor

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 3.13 on page 3-23.

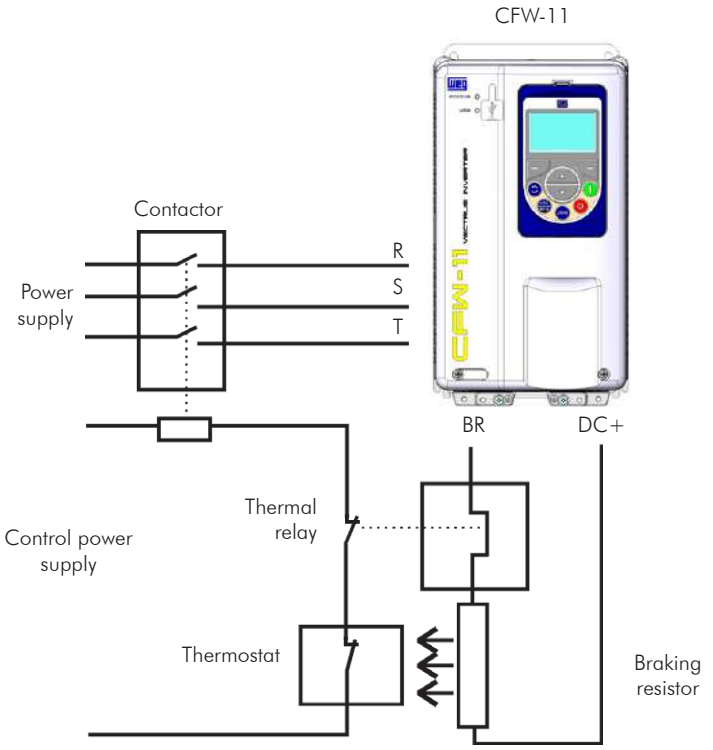


Figure 3.13 - *Braking resistor connection*

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), unless the RFI filters be used as presented in the Table 3.15 on page 3-47 and Item 3.3.1 Installation on page 3-38.
- ☑ Keep motor cables away from other cables (signal cables, sensor cables, control cables, etc.), according to Table 3.5 on page 3-25.
- ☑ 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 3 (three) cables (U, V, W) always together.

Shielded Cables:

- ☑ 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", unless the RFI filters be used as presented in the Table 3.15 on page 3-47 and Item 3.4.1 Conformal Installation on page 3-43.

  These cables act mainly by reducing the irradiated emission in the radio-frequency range.

- ☑ Are mandatory when RFI filters, internally or externally mounted, are installed at the inverter input, unless the RFI filters be used as presented in the Table 3.15 on page 3-47 and Item 3.4.1 Conformal Installation on page 3-43.

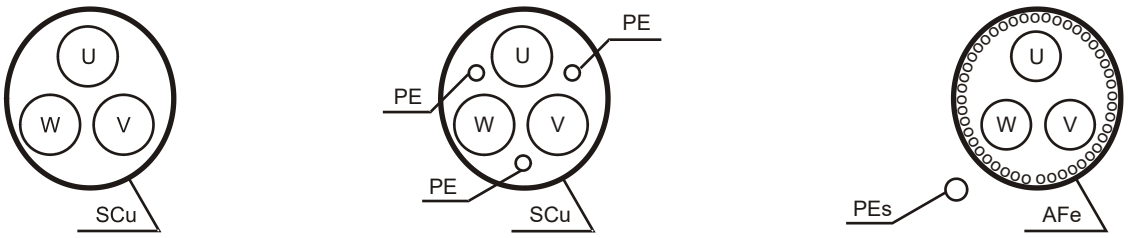
- ☑ In reference to the type and details of installation, follow the recommendations of IEC 60034-25 "Guide for Design and Performance of Cage Induction Motors Specifically Designed for Converter Supply" - refer to a summary in Figure 3.14 on page 3-25. Refer to the standard for further details and eventual modifications related to new revisions.

- ☑ Keep motor cables away from other cables (signal cables, sensor cables, control cables, etc.), according to Table 3.5 on page 3-25.

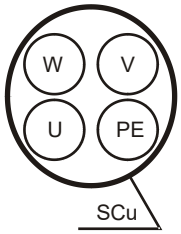
- ☑ The grounding system shall be well interconnected among the several installation locations such as the grounding points of the motor and the inverter. Voltage difference or impedance between the several points may cause the circulation of leakage currents among the equipment connected to the ground,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

Table 3.5 - *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

(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. Refer to Figure 3.15 on page 3-26.
(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 a s an EMC protection.
(6) Shielding conductivity at high-frequencies shall be at least 10 % of the power cables conductivity.

Figure 3.14 - *(a) and (b) - Motor connection cables recommended by IEC 60034-25*

Connection of the motor cable shield to ground

The CFW-11 inverter series has some accessories that make the connection of the motor cable shield to the ground easier, resulting in a low impedance connection for high-frequencies.

There is an option accessory for frame sizes A, B, and C with degree of protection IP2X named "Kit for power cables shielding – PCSx-01" (refer to Section 7.2 ACCESSORIES on page 7-3) that can be adapted in the bottom of the enclosure of these frames. See an example of the cable connection with the accessory PCSx-01 in Figure 3.15 on page 3-26. The kit for power cables shielding is provided for the inverters with internal RFI filters (CFW11XXXXXXOFA).

When the "Conduit Kit" (refer to Section 7.2 ACCESSORIES on page 7-3) is used for frame sizes A, B, and C, motor cable shield shall be grounded similarly as in Figure 3.15 on page 3-26.

For frame size D with degree of protection IP2X/Nema1 and all models with degree of protection IP55, there is a provision for motor cable shield grounding in the standard inverter enclosure.

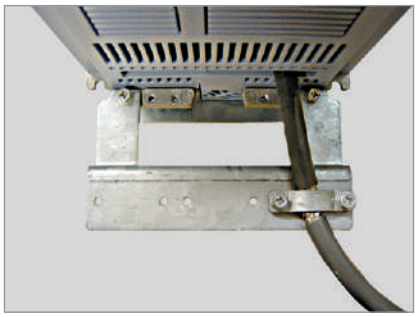


Figure 3.15 - *Detail of the motor cable shield connection with the accessory PCSx-01 installed*

3.2.4 Grounding Connections

DANGER!
Do not share the grounding wiring with other equipment that operate with high currents (ex.: high power motors, soldering machines, etc.). When installing several inverters, follow the procedures presented in Figure 3.16 on page 3-27 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 3.16 à la page 3-27 pour la connexion de mise à la terre.

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

DANGER!

The inverter must be obligatorily connected to a protective ground (PE).

Observe the following:

- Minimum wire gauge for grounding connection is provided in Table 3.2 on page 3-14. 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 or a two-conductor cable with the same wire gauge of the grounding cable specified in Table 3.2 on page 3-14, 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 3-14. 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 se conformer à la norme CEI 61800-5-1 standard, connectent l'inverseur au sol à l'aide d'un câble cuivre conducteur unique avec un calibre de fil minimum de 10 mm2 ou un câble à deux conducteurs avec le même fil de jauge du câble de mise à la terre spécifié dans le Table 3.2 à la page 3-14, depuis le courant de fuite est supérieure à 3,5 mA AC.

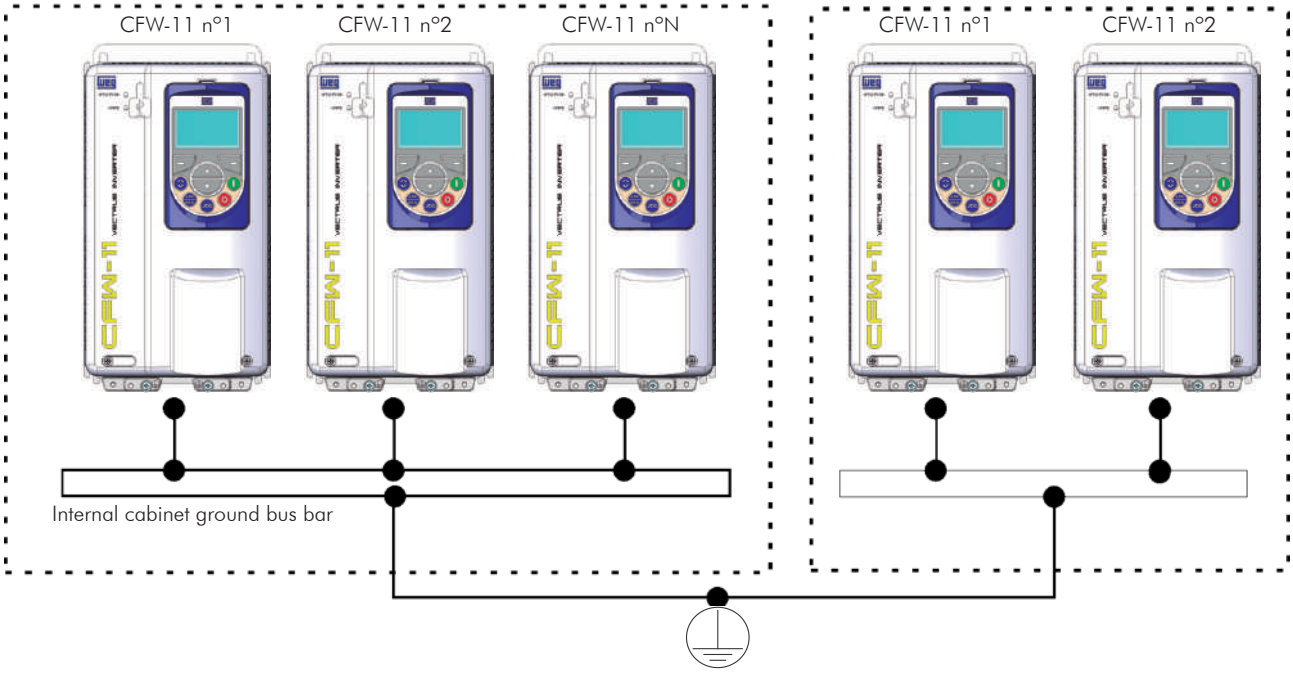
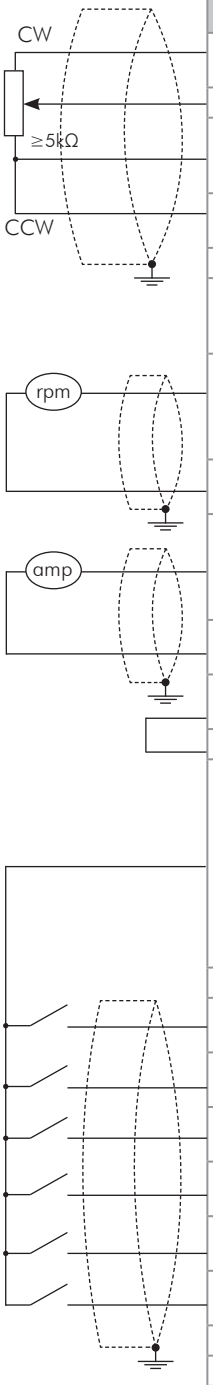


Figure 3.16 - *Grounding connections with multiple inverters*

3.2.5 Control Connections

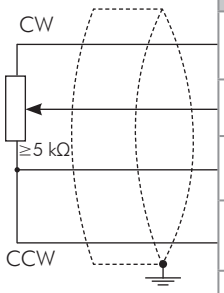
The control connections (analog inputs/outputs, digital inputs/outputs), shall be performed in connector XC1 of the CC11 Control Board.

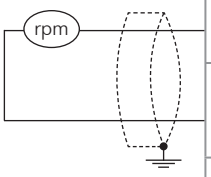
Functions and typical connections are presented in Figure 3.17 on page 3-29.

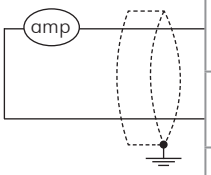


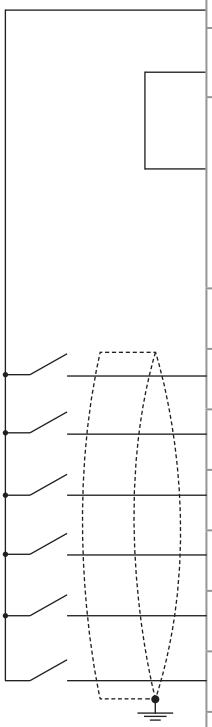
Connector XC1		Factory Default Function	Specifications
1	+REF	Positive reference for potentiometer	Output voltage: +5.4 V, ±5 %. Maximum output current: 2 mA
2	AI1+	Analog input #1: Speed reference (remote)	Differential Resolution: 12 bits Signal: 0 to 10 V (R_{IN} = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (R_{IN} = 500 Ω) Maximum voltage: ±30 V
3	AI1-		
4	REF-	Negative reference for potentiometer	Output voltage: -4.7 V, ±5 %. Maximum output current: 2 mA
5	AI2+	Analog input #2: No function	Differential Resolution: 11 bits + signal Signal: 0 to ±10 V (R_{IN} = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (R_{IN} = 500 Ω) Maximum voltage: ±30 V
6	AI2-		
7	AO1	Analog output #1: Speed	Galvanic Isolation Resolution: 11 bits Signal: 0 to 10 V (R_L ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (R_L ≤ 500 Ω) Protected against short-circuit.
8	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor.
9	AO2	Analog output #2: Motor current	Galvanic Isolation Resolution: 11 bits Signal: 0 to 10 V (R_L ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (R_L ≤ 500 Ω) Protected against short-circuit.
10	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor.
11	DGND*	Reference (0 V) for the 24 Vdc power supply	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor.
12	COM	Common point of the digital inputs	
13	24 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 (CFW11XXXXXXOW) the terminal 13 of XC1 becomes an input, i.e., the user must connect a 24 V power supply for the inverter (refer to the Item 7.1.2 24 Vdc External Control Power Supply on page 7-2 for more details). In all the other models this terminal is an output, i.e., the user has a 24 V 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: 11mA @ 24 Vdc
16	DI2	Digital input #2: Direction of rotation (remote)	
17	DI3	Digital input #3: No function	
18	DI4	Digital input #4: No function	
19	DI5	Digital input #5: Jog (remote)	
20	DI6	Digital input #6: 2nf ramp	
21	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) Signals at connector XC1 - Digital inputs working as 'Active High'









Connector XC1		Factory Default Function	Specifications
1	+REF	Positive reference for potentiometer	Output voltage: +5.4 V, ±5 %. Maximum output current: 2 mA
2	AI1+	Analog input #1: Speed reference (remote)	Differential Resolution: 12 bits Signal: 0 to 10 V (R_{IN} = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (R_{IN} = 500 Ω) Maximum voltage: ±30 V
3	AI1-		
4	REF-	Negative reference for potentiometer	Output voltage: -4.7 V, ±5 %. Maximum output current: 2 mA
5	AI2+	Analog input #2: No function	Differential Resolution: 11 bits + signal Signal: 0 to ±10 V (R_{IN} = 400 kΩ) / 0 to 20 mA / 4 to 20 mA (R_{IN} = 500 Ω) Maximum voltage: ±30 V
6	AI2-		
7	AO1	Analog output #1: Speed	Galvanic Isolation Resolution: 11 bits Signal: 0 to 10 V (R_L ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (R_L ≤ 500 Ω) Protected against short-circuit.
8	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor.
9	AO2	Analog output #2: Motor current	Galvanic Isolation Resolution: 11 bits Signal: 0 to 10 V (R_L ≥ 10 kΩ) / 0 to 20 mA / 4 to 20 mA (R_L ≤ 500 Ω) Protected against short-circuit.
10	AGND (24 V)	Reference (0 V) for the analog outputs	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor.
11	DGND*	Reference (0 V) for the 24 Vdc power supply	Connected to the ground (frame) through impedance: 940 Ω resistor in parallel with a 22 nF capacitor.
12	COM	Common point of the digital inputs	
13	24 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 (CFW11XXXXXXOW) the terminal 13 of XC1 becomes an input, i.e., the user must connect a 24 V power supply for the inverter (refer to the Item 7.1.3 Nema1 Degree Protection - Frame Sizes A, B and C on page 7-3 for more details). In all the other models this terminal is an output, i.e., the user has a 24 V power supply available there.
14	COM	Common point of the digital inputs	
15	DI1	Digital input #1: Start / Stop	6 isolated digital inputs High level ≥ 18 V Low level ≤ 3 V Input voltage ≤ 30 V Input current: 11 mA @ 24 Vdc
16	DI2	Digital input #2: Direction of rotation (remote)	
17	DI3	Digital input #3: No function	
18	DI4	Digital input #4: No function	
19	DI5	Digital input #5: Jog (remote)	
20	DI6	Digital input #6: 2nf ramp	
21	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) Signals at connector XC1 - Digital inputs working as 'Active Low'

Figure 3.17 - *(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.

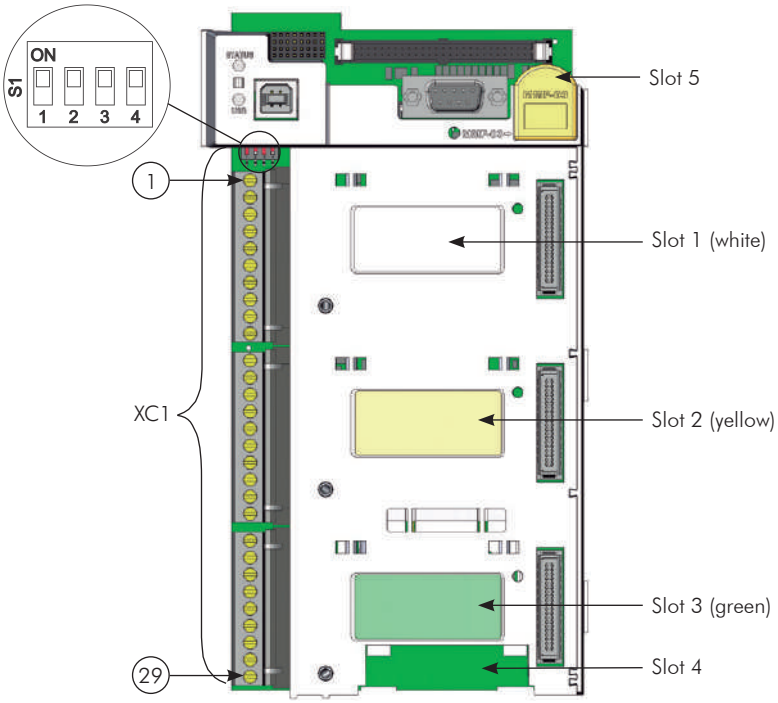


Figure 3.18 - *Connector XC1 and DIP-switches for selecting the signal type of the analog inputs and outputs*

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

Table 3.6 - *DIP-switches configuration for the selection of the signal type for the analog inputs and outputs*

Signal	Factory Default 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) shall be programmed according to the DIP-switches settings and desired values.

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

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

2. Maximum tightening torque: 0.50 N.m (4.50 lbf.in).

3. Use shielded cables for the connections in XC1 and run the cables separated from the remaining circuits (power, 110 V / 220 Vac control, etc.), as presented in Table 3.7 on page 3-31. If control wiring must cross other cables (power cables for instance), make it cross perpendicular to the wiring and provide a minimum separation of 5 cm (1.9 in) at the crossing point.

Table 3.7 - *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 adequate connection of the cable shield is shown in Figure 3.19 on page 3-31 and Figure 3.20 on page 3-31 shows how to connect the cable shield to the ground.

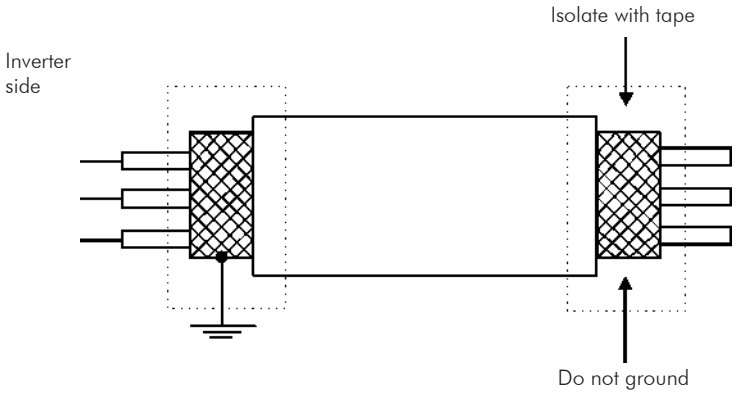


Figure 3.19 - *Shield connection*

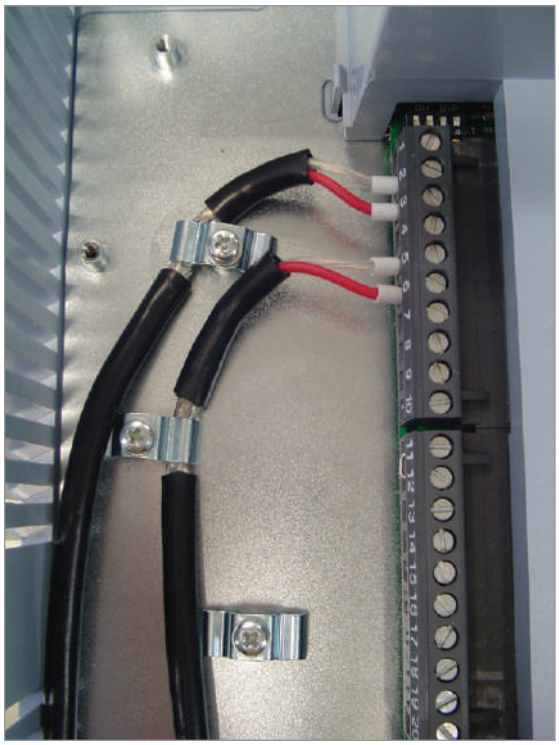


Figure 3.20 - *Example of shield connection for the control wiring*

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

6. On inverters of frame size D IP2X/Nema1, a shield kit is supplied for better organization of the cables of the communication network. For further information, refer to the installation data sheet supplied with the kit.

3.2.6 Typical Control Connections

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

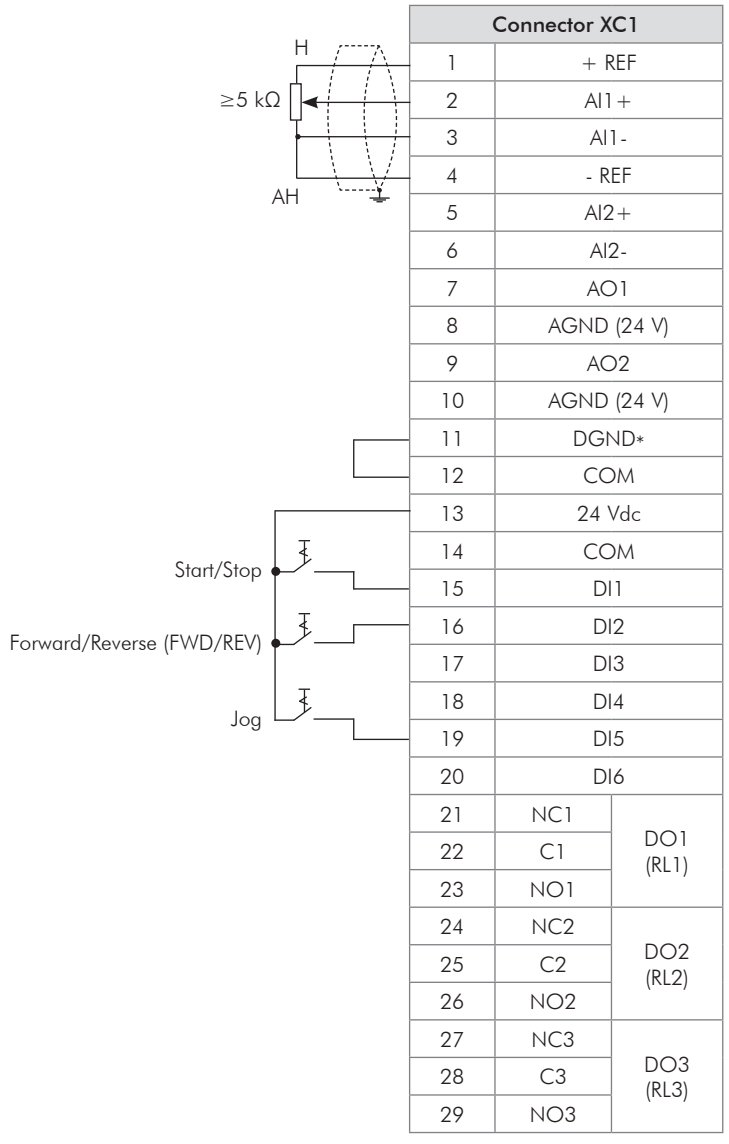
With this control connection it is possible to run the inverter in local mode with the factory default settings. This operation mode is recommended for first-time users, since no additional control connections are required.

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 Start/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 operator key LOC REM (local mode is default). Set P0220 = 3 to change the default setting of operator key LOC REM to remote mode.



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

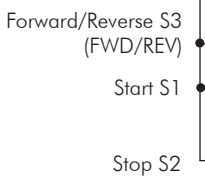
Figure 3.21 - *XC1 wiring for control connection #2*

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

Enabling the Start/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 to Local Mode or P0226 = 4 to Remote mode.
S1 and S2 are Start (NO contact) and Stop (NC contact) push-buttons 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 any other available source.



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

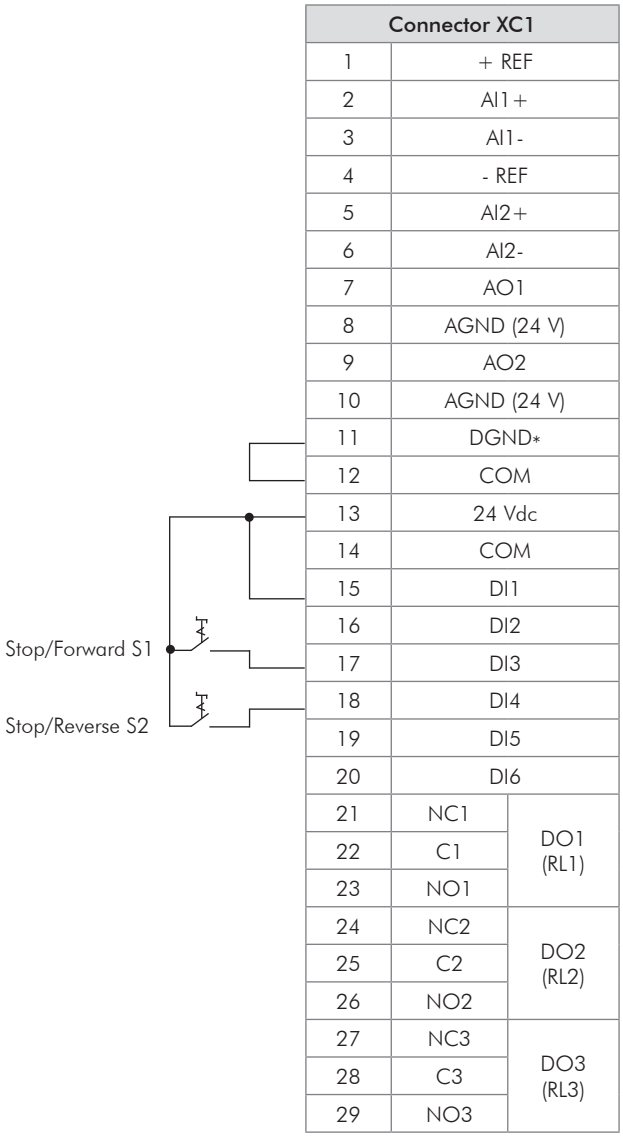
Figure 3.22 - *XC1 wiring for control connection #3*

Control connection 4 - Forward/Reverse.

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

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

The direction of rotation is determined by the forward and reverse inputs.
Clockwise to forward and counter-clockwise to reverse.
The speed reference can be provided by any source (as in control connection #3).



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

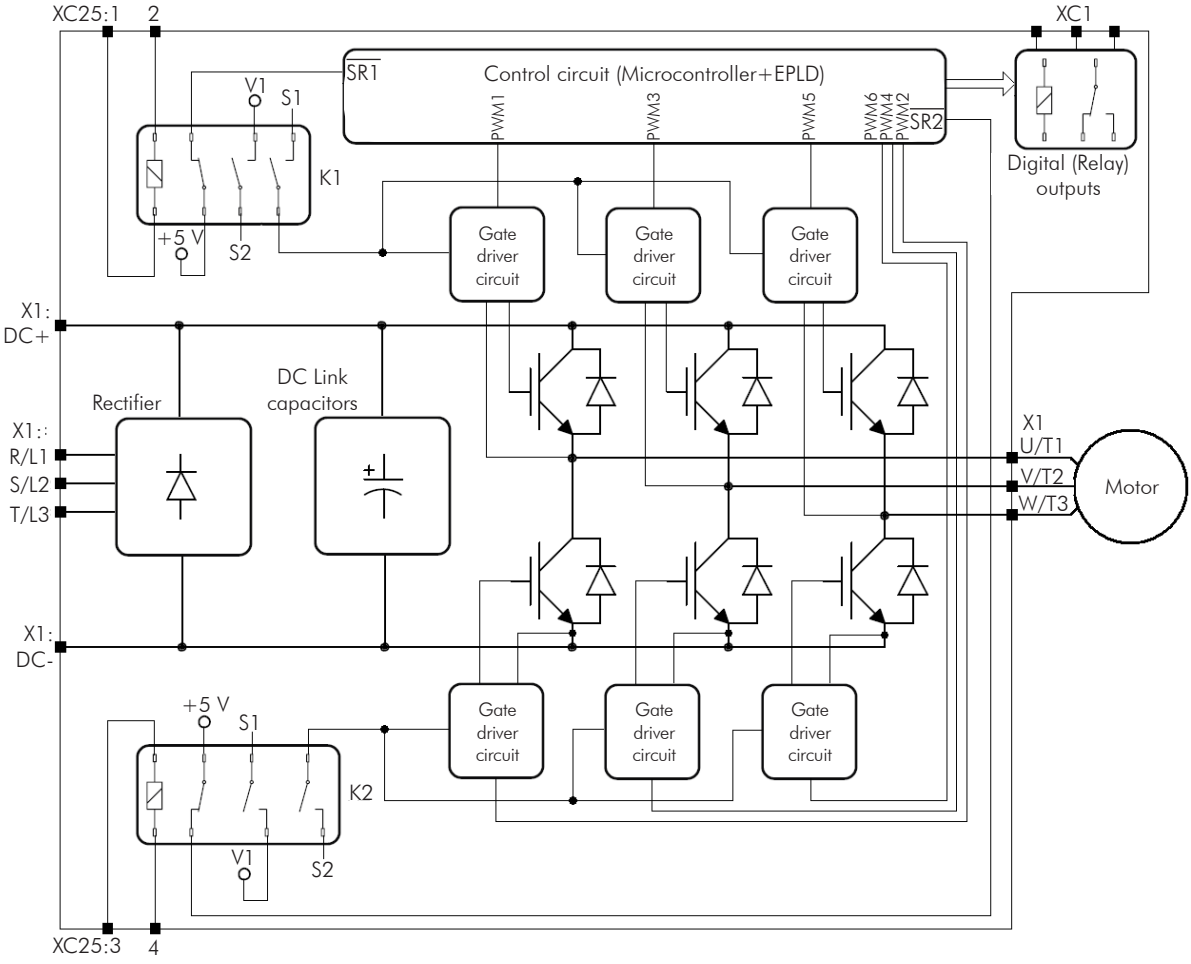
Figure 3.23 - *XC1 wiring for control connection #4*

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 3.24 on page 3-35.

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 3.25 on page 3-37.

The Safety Stop function prevents the motor starting accidentally.



Note:

V1 = inverter internal voltage.

Figure 3.24 - *Basic block diagram of Safety Stop function available in CFW-11 inverter series*

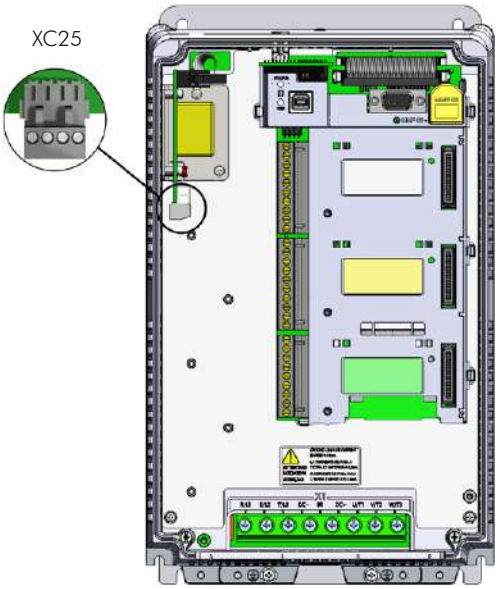
DANGER!
The activation of the Safety Stop function does not guarantee electrical safety of the motor terminals (they are not isolated from the power supply in this condition).

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).

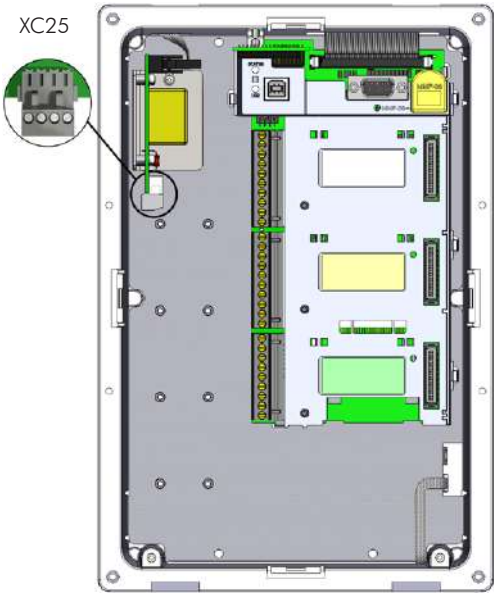
ATTENTION!
In case of a multiple fault in the power stage of the inverter, the motor shaft can rotate up to 360/ (number of poles) degrees even with the activation of Safety Stop function. That must be considered in the application.

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

(a) Inverters CFW-11 frame size A



(b) Inverters CFW-11 frame sizes B and C - with IP2X degree of protection or Nema1



(c) Inverter CFW-11 frame size D - with degree of protection IP2X/Nema1 and all CFW-11 Inverters with degree of protection IP55

Figure 3.25 - *(a) to (c) - SRBXX board connections (Safety Stop function)*

The parameter P0029 shows if the inverter has identified correctly SRBXX board. See Bit 9 in Table 3.8 on page 3-38.

Table 3.8 - *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.

3

Table 3.9 - *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 3-28.

For XC25 control cabling considers the following:

- ☑ Use wire gauge from 0.5 mm² (20 AWG) to 1.5 mm² (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 3.20 on page 3-31.
- ☑ 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 3.10 - *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 1 (24 V) 0 (0 V) 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).

3

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 3.11 - *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 3.12 on page 3-40.

Table 3.12 - *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

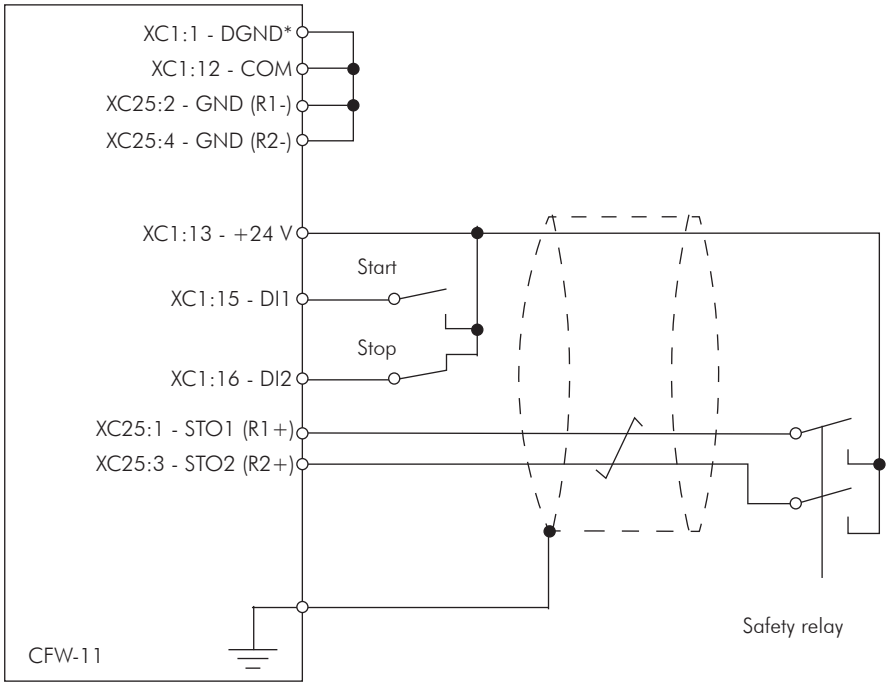
Refer to inverter programming manual for a complete list of options for parameters P0275...P0279.

3.3.2.4 Periodic Test

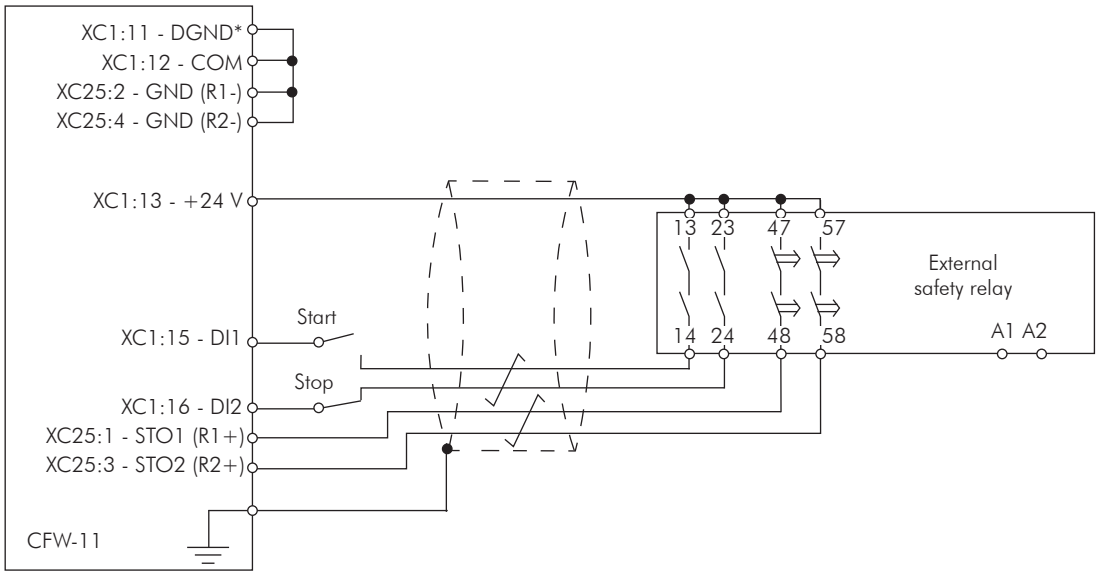
Safety Stop function, alternatively safety stop inputs (STO1 and STO2), must be activated at least once a year for preventive maintenance purposes. Inverter power supply must be switched off and then on again before carrying out this preventive maintenance. If during testing the power supply to the motor 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 3.22 on page 3-33.



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



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

(*) 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 3-42.

Figure 3.26 - *(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 3.26 on page 3-41**:**

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 3.26 on page 3-41	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

3.4 INSTALLATION ACCORDING TO THE EUROPEAN DIRECTIVE OF ELECTROMAGNETIC COMPATIBILITY

The inverters with the option FA (CFW11XXXXXXOFA) are equipped with an internal RFI filter to reduce 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/A 14.

ATTENTION!
Do not use inverters with internal RFI filters in IT networks (neutral is not grounded or grounding provided by a high ohm value resistor) or in grounded delta networks ("delta corner earth"), because these type of networks damage the filter capacitors of the inverter.

3.4.1 Conformal Installation

For the conformal installation use:

1. Inverters with internal RFI filters option CFW11XXXXXXOFA (with grounding screws of the internal RFI filter capacitors).

2. a) Shielded output cables (motor cables) and connect the shield at both ends (motor and inverter) with a low impedance connection for high frequency. Use the PCSx-01 kit supplied with the frame size A, B and C inverters. For the frame sizes D models, use the clamps supplied with the product. Make sure there is a good contact between the cable shield and the clamps. Refer to the Figure 3.15 on page 3-26 as an example. The required cable separation is presented in Table 3.5 on page 3-25. For further information, please refer to Item 3.2.3 Power Connections on page 3-16.
   Maximum motor cable length and conduced and radiated emission levels according to the Table 3.14 on page 3-46. If a lower emission level and/or a longer motor cable were 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 3.14 on page 3-46.

   b) As a second option only for the V/f and VVW control modes when using a sinusoidal output filter:
   Output cables (motor cables) that are not shielded can be used, provided that RFI filters are installed at the inverter input and output, as presented in the Table 3.15 on page 3-47 In that table the maximum cable length and the emission levels for each configuration are also presented. Keep the separation from the other cables according to the Table 3.5 on page 3-25. Refer to the Item 3.2.4 Grounding Connections on page 3-26.

3. Shielded control cables, keeping them separate from the other cables as described in Item 3.2.5 Control Connections on page 3-28.

4. Inverter grounding according to the instructions on Item 3.2.4 Grounding Connections on page 3-26.

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"

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 3.13 - *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 3.14 on page 3-46
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 80 % AM (1 kHz)

Table 3.14 - *Conducted and radiated emission levels and further information - installations with shield motor cable*

Inverter Model (With Built-in RFI Filter)	Without External RFI Filter			With External RFI Filter				
	Conducted Emission - Maximum Motor Cable Length		Radiated Emission	External RFI Filter Part Number (Manufacturer: EPCOS) (1)	Conducted Emission - Maximum Motor Cable Length		Radiated Emission - Category	
	Category C3	Category C2	Category (No Metallic Cabinet Required)		Category C2	Category C1	Without Metallic Cabinet	Inside a Metallic Cabinet (3)
CFW11 0006 S2 O FA	100 m	7 m	C2	B84142-A16-R122	75 m	50 m	C2	C2
				B84142-B16-R	100 m (2)	100 m		
CFW11 0007 T2 O FA	100 m	5 m	C2	B84143-G8-R110	100 m	-	C2	C2
				B84143-A8-R105	50 m (2)	50 m		
CFW11 0007 S2 O FA	100 m	7 m	C2	B84142-A16-R122	75 m	50 m	C2	C2
				B84142-B16-R	100 m (2)	100 m		
CFW11 0010 S2 O FA	100 m	7 m	C2	B84142-A30-R122	75 m	50 m	C2	C2
				B84142-B25-R	100 m (2)	100 m		
CFW11 0010 T2 O FA	100 m	5 m	C2	B84143-G20-R110	100 m	-	C2	C2
				B84143-A16-R105	50 m (2)	50 m		
CFW11 0013 T2 O FA	100 m	5 m	C2	B84143-G20-R110	100 m	-	C2	C2
				B84143-A16-R105	50 m (2)	50 m		
CFW11 0016 T2 O FA	100 m	5 m	C2	B84143-G20-R110	100 m	-	C2	C2
				B84143-A25-R105	50 m (2)	50 m		
CFW11 0024 T2 O FA	100 m	No	C2	B84143-A36-R105	100 m (2)	100 m	C2	C2
CFW11 0028 T2 O FA	100 m	No	C2	B84143-A36-R105	100 m (2)	100 m	C2	C2
CFW11 0033 T2 O FA	100 m	No	C2	B84143-A50-R105	100 m (2)	100 m	C2	C2
CFW11 0045 T2 O FA	100 m	No	C3	B84143-A50-R105	100 m (2)	100 m	C3	C2
CFW11 0054 T2 O FA	100 m	No	C3	B84143-A66-R105	100 m (2)	100 m	C3	C2
CFW11 0070 T2 O FA	100 m	No	C3	B84143-A90-R105	100 m (2)	100 m	C3	C2
CFW11 0086 T2 O FA	100 m	No	C3	B84143-A120-R105	100 m (2)	100 m	C3	C2
CFW11 0105 T2 O FA	100 m	No	C3	B84143-A120-R105	100 m (2)	100 m	C3	C2
CFW11 0003 T4 O FA	100 m	5 m	C2	B84143-G8-R110	100 m	-	C2	C2
				B84143-A8-R105	50 m (2)	50 m		
CFW11 0005 T4 O FA	100 m	5 m	C2	B84143-G8-R110	100 m	-	C2	C2
				B84143-A8-R105	50 m (2)	50 m		
CFW11 0007 T4 O FA	100 m	5 m	C2	B84143-G8-R110	100 m	-	C2	C2
				B84143-A8-R105	50 m (2)	50 m		
CFW11 0010 T4 O FA	100 m	5 m	C2	B84143-G20-R110	100 m	-	C2	C2
				B84143-A16-R105	50 m (2)	50 m		
CFW11 0013 T4 O FA	100 m	5 m	C2	B84143-G20-R110	100 m	-	C2	C2
				B84143-A16-R105	50 m (2)	50 m		
CFW11 0017 T4 O FA	100 m	No	C2	B84143-A25-R105	100 m (2)	100 m	C2	C2
CFW11 0024 T4 O FA	100 m	No	C2	B84143-A36-R105	100 m (2)	100 m	C2	C2
CFW11 0031 T4 O FA	100 m	No	C2	B84143-A36-R105	100 m (2)	100 m	C2	C2
CFW11 0038 T4 O FA	100 m	No	C3	B84143-A50-R105	100 m (2)	100 m	C3	C2
CFW11 0045 T4 O FA	100 m	No	C3	B84143-A50-R105	100 m (2)	100 m	C3	C2
CFW11 0058 T4 O FA	100 m	No	C3	B84143-A66-R105	100 m (2)	100 m	C3	C2
CFW11 0070 T4 O FA	100 m	No	C3	B84143-A90-R105	100 m (2)	100 m	C3	C2
CFW11 0088 T4 O FA	100 m	No	C3	B84143-A120-R105	100 m (2)	100 m	C3	C2

(1) The external RFI filters shown in table above were selected considering inverter rated input current specified for ND application (normal duty cycle) and surrounding air temperature of 50 °C (122 °F). In order to optimize, take into account inverter input current and surrounding air temperature in the application to define the rated current of external RFI filter to be used. For further information contact EPCOS.

(2) It's possible to use larger motor cables, but in this case it's required a specific test.

(3) Standard cabinet without additional EMC measures. It's possible to meet category C1 radiated emission levels, adding EMC accessories in the cabinet.

In this case it's required to perform specific test to check the emission levels.

Table 3.15 - *Required RFI filters for unshielded motor cable installations and further information on conducted and radiated levels*

Inverter Model (With Built-in RFI Filter)	External RFI Filters Part Number (Manufacturer: EPCOS) (1)		Conducted Emission - Maximum Motor Cable Length	Radiated Emission - Category	
	Inverter Input	Inverter Output (2)	Category C1	Without Metallic Cabinet	Inside a Metallic Cabinet
CFW11 0006 S2 O FA	B84142-A16-R122	B84143-V11-R127	250 m	C3	C3
CFW11 0007 T2 O FA	B84143-A8-R105	B84143-V11-R127	250 m	C2	C2
CFW11 0007 S2 O FA	B84142-A16-R122	B84143-V11-R127	250 m	C3	C3
CFW11 0010 S2 O FA	B84142-A30-R122	B84143-V16-R127	250 m	C3	C3
CFW11 0010 T2 O FA	B84143-A16-R105	B84143-V16-R127	250 m	C2	C2
CFW11 0013 T2 O FA	B84143-A16-R105	B84143-V16-R127	250 m	C2	C2
CFW11 0016 T2 O FA	B84143-A25-R105	B84143-V33-R127	250 m	C2	C2
CFW11 0024 T2 O FA	B84143-A36-R105	B84143-V33-R127	250 m	C3	C2
CFW11 0028 T2 O FA	B84143-A36-R105	B84143-V66-R127	250 m	C3	C2
CFW11 0033 T2 O FA	B84143-A50-R105	B84143-V66-R127	250 m	C3	C2
CFW11 0045 T2 O FA	B84143-D50-R127	B84143-V66-R127	250 m	C3	C2
CFW11 0054 T2 O FA	B84143-D75-R127	B84143-V66-R127	250 m	C3	C2
CFW11 0070 T2 O FA	B84143-D75-R127	B84143-V95-R127	250 m	C3	C2
CFW11 0086 T2 O FA	B84143-A120-R105	B84143-V180-R127	250 m	C3	C2
CFW11 0105 T2 O FA	B84143-A120-R105	B84143-V180-R127	250 m	C3	C2
CFW11 0003 T4 O FA	B84143-A8-R105	B84143-V11-R127	250 m	C2	C2
CFW11 0005 T4 O FA	B84143-A8-R105	B84143-V11-R127	250 m	C2	C2
CFW11 0007 T4 O FA	B84143-A8-R105	B84143-V11-R127	250 m	C2	C2
CFW11 0010 T4 O FA	B84143-A16-R105	B84143-V16-R127	250 m	C2	C2
CFW11 0013 T4 O FA	B84143-A16-R105	B84143-V16-R127	250 m	C2	C2
CFW11 0017 T4 O FA	B84143-A25-R105	B84143-V33-R127	250 m	C3	C2
CFW11 0024 T4 O FA	B84143-A36-R105	B84143-V33-R127	250 m	C3	C2
CFW11 0031 T4 O FA	B84143-A36-R105	B84143-V66-R127	250 m	C3	C2
CFW11 0038 T4 O FA	B84143-D50-R127	B84143-V66-R127	250 m	C3	C2
CFW11 0045 T4 O FA	B84143-D50-R127	B84143-V66-R127	250 m	C3	C2
CFW11 0058 T4 O FA	B84143-D75-R127	B84143-V95-R127	250 m	C3	C2
CFW11 0070 T4 O FA	B84143-A90-R105	B84143-V95-R127	250 m	C3	C2
CFW11 0088 T4 O FA	B84143-A120-R105	B84143-V180-R127	250 m	C3	C2

(1) The external RFI filters shown in table above were selected considering inverter rated input/output current specified for ND application (normal duty cycle) and surrounding air temperature of 50 °C (122 °F). In order to optimize, take into account inverter input/output current and surrounding air temperature in the application to define the rated current of external RFI filter to be used. For further information contact EPCOS.

(2) The output filter is of the sinusoidal type, i.e., the motor voltage waveform is approximately sinusoidal, not pulsed as in the aplications without this filter.

4 HMI

This chapter contains the following information:

- ☑ 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).

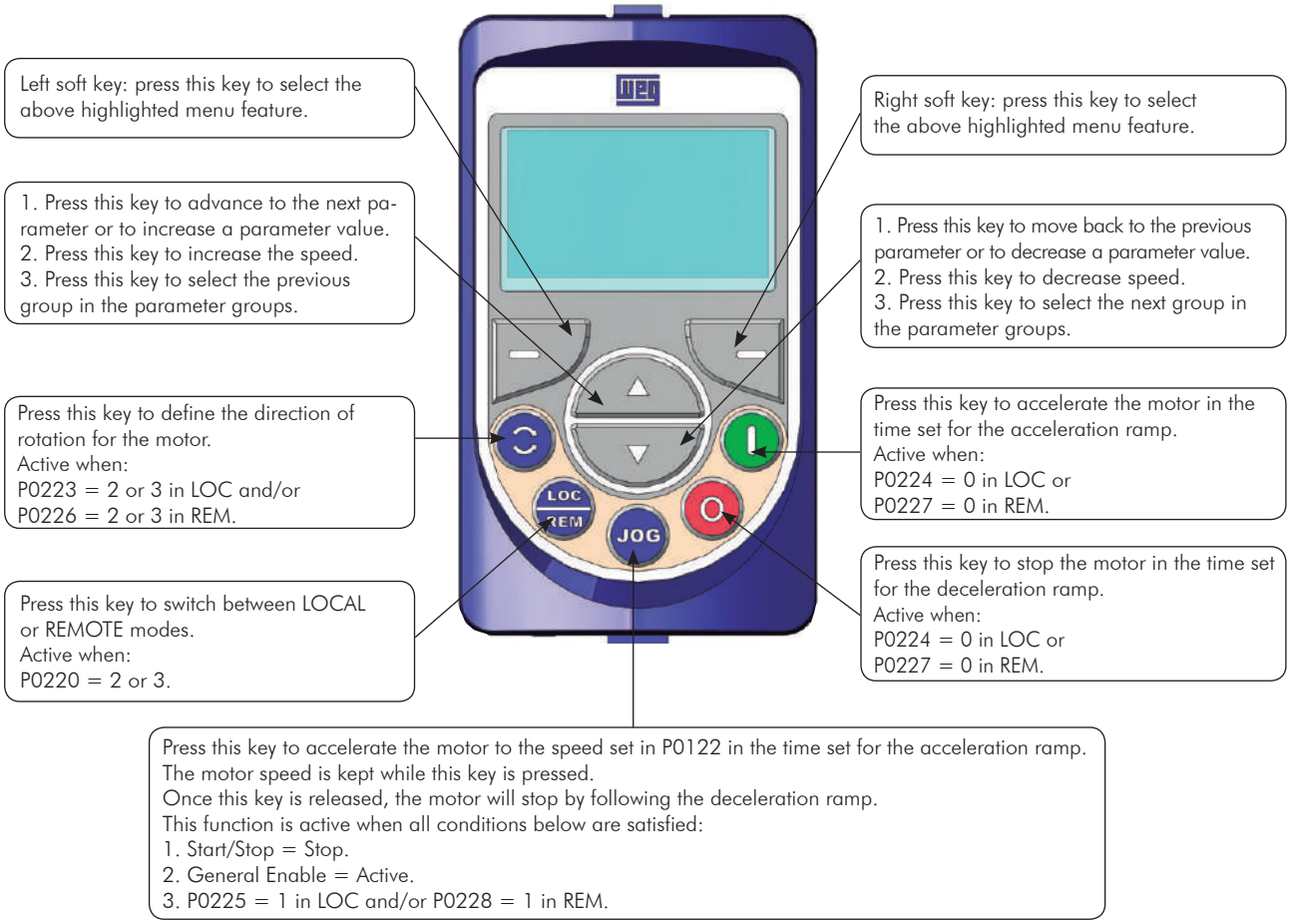


Figure 4.1 - *Operator keys*

Battery:

NOTE!

The battery is only required for the clock-related functions. If the battery is completely discharge or if it 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

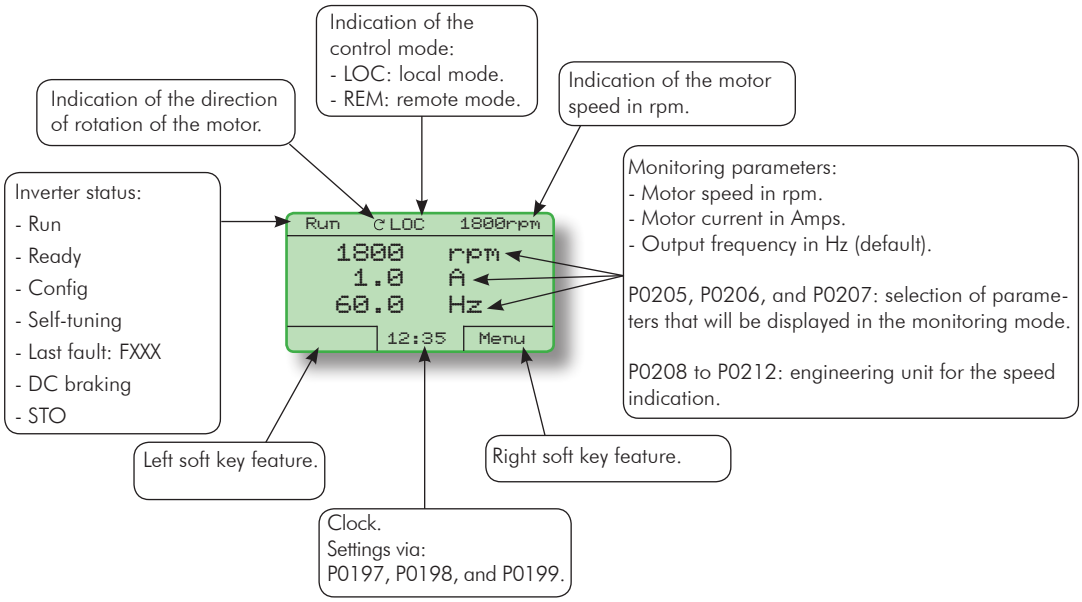
Figure 4.2 - *HMI battery replacement*

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

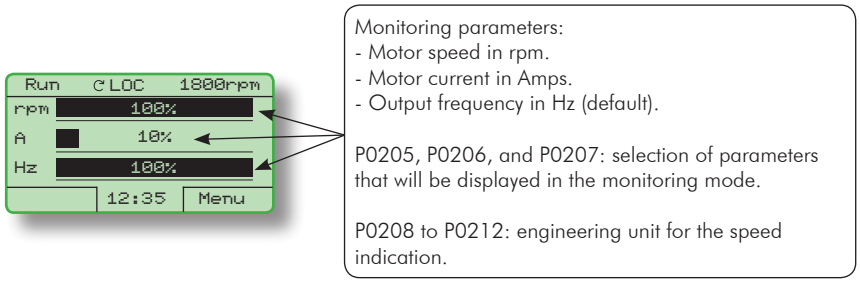
Installation:

- ☑ 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. 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).

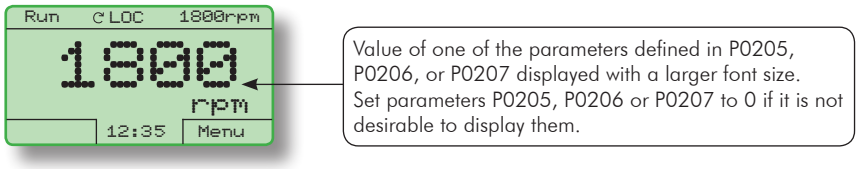
When power is applied to the inverter, the display automatically enters the monitoring mode. Figure 4.3 on page 4-4 presents the monitoring screen displayed for the factory default settings. By properly setting specific inverter parameters, other variables can be displayed in the monitoring mode or the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



(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*

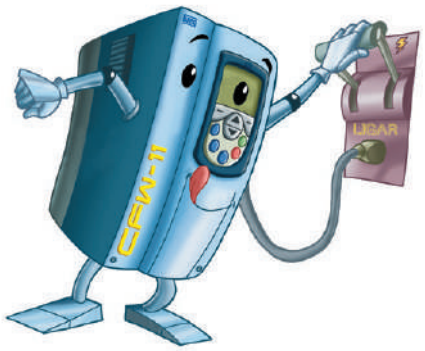
4.2 PARAMETERS ORGANIZATION

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 4-5. The number and name of the groups may change depending on the firmware version used. For further details on the existent groups for the firmware version used, please refer to the programming manual.

Table 4.1 - *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 RS232/485
					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 standar monitoring mode (Figure 4.3 on page 4-4) 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

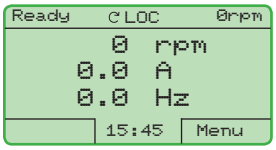
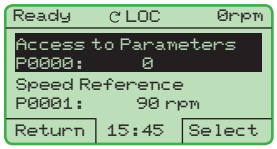
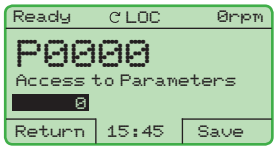
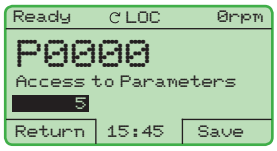
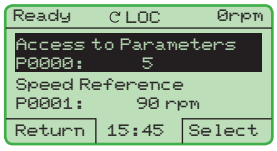
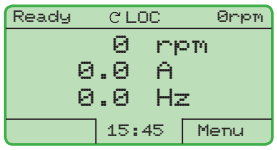
Step	Action/Result	Display Indication
1	- Monitoring mode - Press**"Menu"** (rigth soft key)	
2	- Group **"00 ALL PARAMETERS"** is already selected - Press **"Select"**	
3	- Parameter **"Access to Parameters P0000: 0"** is already selected - Press **"Select"**	
4	- To set the password, press the Up Arrow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

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

5.2.2 Oriented Start-Up

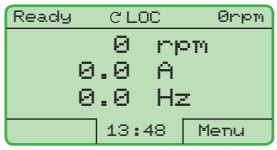
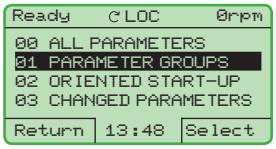
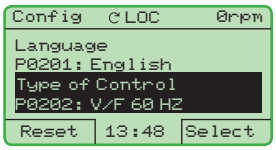
There is a group of parameters named "Oriented Start-up" that makes the inverter settings easier. Inside this group, there is a parameter – P0317, that shall be set to enter into the Oriented Start-up routine.

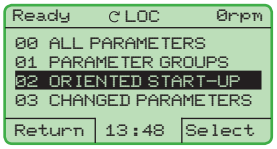
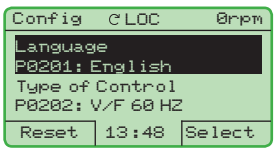
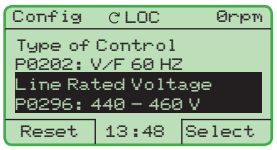
The Oriented Start-up routine allows you to quickly set up the inverter for operation with the line and motor used. This routine prompts you for the most commonly used parameters in a logic sequence.

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)	
3	- Group **"01 PARAMETER GROUPS"** is selected 	
5	- Parameter **"Oriented Start-Up P0317: No"** has been already selected. - Press **"Select"**	
7	- The parameter value is modified to **"P0317 = [001] Yes"** - Press **"Save"**	
9	- If needed, change the value of P0202 according to the type of control. To do so, press **"Select"** - The settings listed here are valid only for P0202=0 (V/f 60 Hz) or P0202=1 (V/f 50 Hz). For other options (Adjustable V/f, VVW, or Vector modes), please refer to the programming manual 	

Step	Action/Result	Display Indication
2	- Group **"00 ALL PARAMETERS"** has been already selected 	
4	- Group **"02 ORIENTED START-UP"** is then selected - Press **"Select"**	
6	- The value of **"P0317 = [000] No"** is displayed 	
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 	
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 	

5

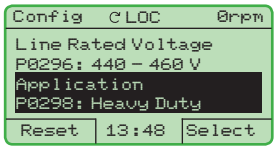
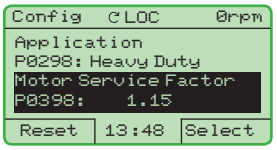
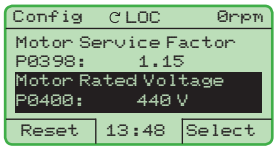
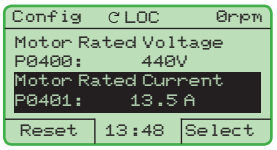
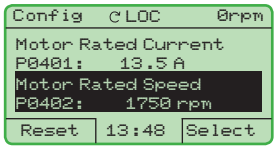
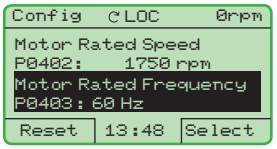
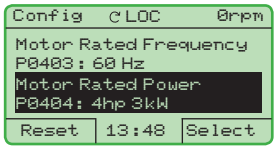
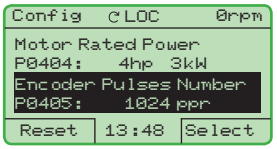
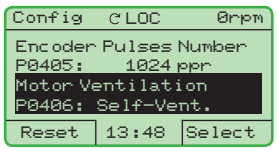
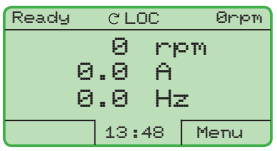
Step	Action/Result	Display Indication
11	- If needed, change the value of P0298 according to the inverter application. To do so, press **"Select"** This modification will affect P0156, P0157, P0158, P0401, P0404 and P0410 (this last one only if P0202 = 0, 1, or 2 – V/f control). The time and the activation level of the overload protection will be affected as well 	
12	- If needed, change the value of P0398 according to the motor service factor To do so, press **"Select"** This modification will affect the current value and the activation time of the motor overload function 	
13	- If needed, change the value of P0400 according to the motor rated voltage To do so, press **"Select"** This modification adjusts the output voltage by a factor x = P0400/P0296 	
14	- If needed, change the value of P0401 according to the motor rated current. To do so, press **"Select"** This modification will affect P0156, P0157, P0158, and P0410 	
15	- If needed, set P0402 according to the motor rated speed. To do so, press **"Select"**. This modification affects P0122 to P0131, P0133, P0134, P0135, P0182, P0208, P0288, and P0289 	
16	- If needed, set P0403 according to the motor rated frequency. To do so, press **"Select"**. This modification affects P0402 	
17	- If needed, change the value of P0404 according to the motor rated power To do so, press **"Select"** This modification affects P0410 	
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"** 	
19	- If needed, set P0406 according to the motor ventilation. To do so, press **"Select"** - To complete the Oriented Start-Up routine, press **"Reset"** (left soft key) or O	
20	- After few seconds, the display returns to the monitoring mode	

Figure 5.2 - *Oriented Start-up*

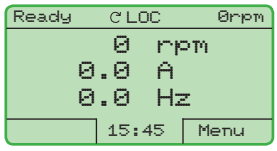
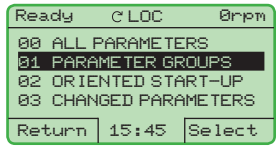
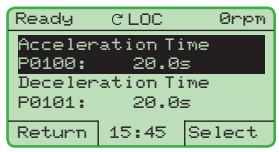
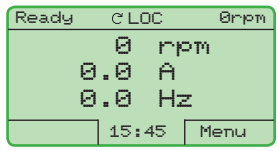
5.2.3 Setting Basic Application Parameters

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)	
3	- Group **"01 PARAMETER GROUPS"** is then selected 	
5	- Group **"03 CHANGED PARAMETERS"** is selected 	
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)	
9	- The display returns to the Monitoring Mode and the inverter is ready to run	

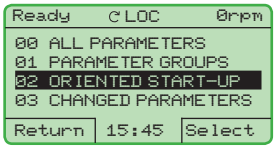
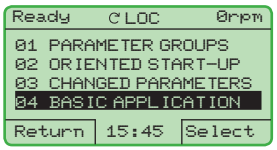
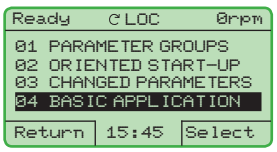
Step	Action/Result	Display Indication
2	- Group **"00 ALL PARAMETERS"** has been already selected 	
4	- Group **"02 ORIENTED START-UP"** is then selected 	
6	- Group **"04 BASIC APPLICATION"** is selected - Press **"Select"**	
8	- Press **"Return"**	

Figure 5.3 - *Setting parameters of the basic a pplication group*

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

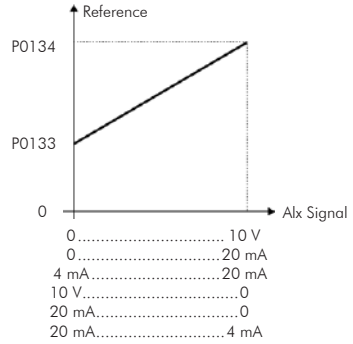
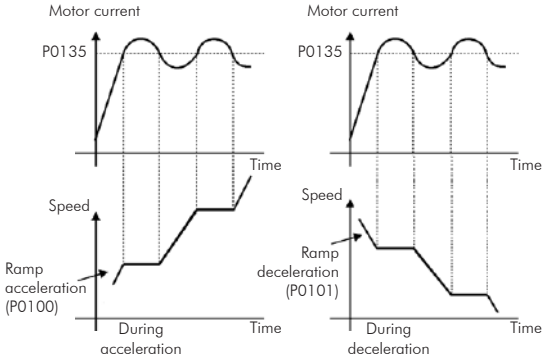
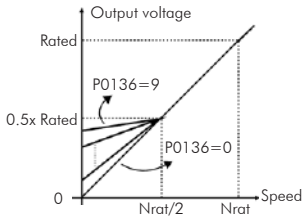
Parameter	Name	Description	Setting Range	Factory Setting	User Setting
P0100	Acceleration Time	- Defines the time to linearly accelerate from 0 up to the maximum speed (P0134) - If set to 0.0 s, it means no acceleration ramp	0.0 to 999.0 s	20.0 s	
P0101	Deceleration Time	- Defines the time to linearly 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 x I_{rat-HD} to 2 x I_{rat-HD}	1.5 x I_{rat-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 Chapter 7 OPTION KITS AND ACCESSORIES on page 7-1
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

Parameter	Description	Setting Range
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 Flt. 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 Flt. 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 Flt.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 Flt. 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

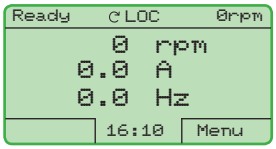
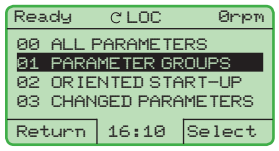
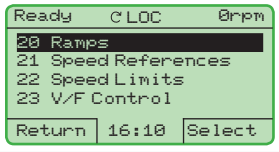
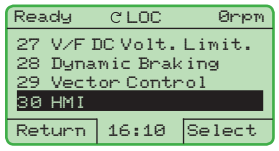
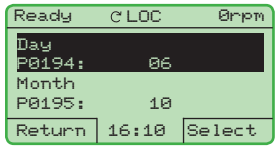
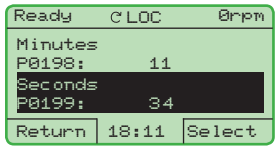
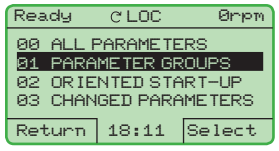
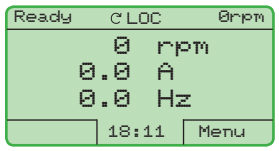
Step	Action/Result	Display Indication
1	Monitoring mode - Press **"Menu"** (right soft key)	
2	- Group **"00 ALL PARAMETERS"** is already selected	
3	- Group **"01 PARAMETER GROUPS"** is selected - Press **"Select"**	
4	- A new list of groups is displayed and group **"20 Ramps"** is selected - Press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

Figure 5.4 - *Setting date and time*

5.4 BLOCKING PARAMETERS MODIFICATION

To prevent unauthorized or unintended parameters modification, parameter P0000 should be set to a value different from 5. Follow the same procedures described in Item 5.2.1 Password Setting in P0000 on page 5-3.

5.5 HOW TO CONNECT A PC

NOTE!

- Always use a standard host/device shielded USB cable. Unshielded cables may lead to communication errors.
- Recommended cables: Samtec:
  USBC-AM-MB-B-B-S-1 (1 meter).
  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.

Features:

- Store a copy of the inverter parameters.

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

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

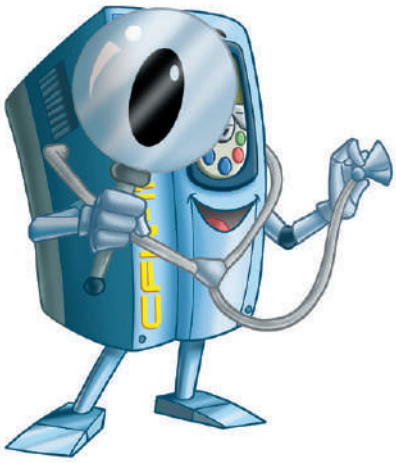
- Store programs created by the SoftPLC.

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

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

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

6 TROUBLESHOOTING AND MAINTENANCE



This chapter presents:

- 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 (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:

- HMI and EP (Electronic Pot) speed references, in case the function "Reference backup" is enabled in P0120.
- The "FAULT" 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 (manual reset).

☑ Through the "Reset" soft key.

☑ Automatically by setting P0206 (auto-reset).

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

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

- ☑ The keypad displays the "ALARM" code and description.
- ☑ The "STATUS" LED changes to yellow.
- ☑ The PWM pulses are not blocked (the inverter is still operating).

6.2 FAULTS, ALARMS, AND POSSIBLE CAUSES

Table 6.1 - *Faults, alarms and possible causes*

Fault/Alarm	Description	Possible Causes
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 %.
A010 Rectifier High Temperature	A high temperature alarm was detected by the NTC temperature sensors located in the rectifier modules. **Note:** - This is valid only for the following models: CFW110086T2, CFW110105T2, CFW110045T4, CFW110058T4, CFW110070T4 and CFW110088T4. - 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. ☑ Inverter heatsink is completely covered with dust.
F011 Rectifier Overtemperature	An overtemperature fault was detected by the NTC temperature sensors located in the rectifier modules. **Note:** - This is valid only for the following models: CFW110086T2, CFW110105T2, CFW110045T4, CFW110058T4, CFW110070T4 and CFW110088T4.	
F021 DC Link Undervoltage	DC Link undervoltage condition occurred.	☑ The input voltage is too low and the DC Link voltage dropped below the minimum permitted value (monitor the value at parameter P0004): Ud < 223 V - for a 200 / 240 V three-phase input voltage Ud < 170 V - for a 200 / 240 V single-phase input voltage (models CFW11XXXXS2 or CFW11XXXXB2) (P0296 = 0). Ud < 385 V - for a 380 V input voltage (P0296 = 1). Ud < 405 V - for a 400 / 415 V input voltage (P0296 = 2). Ud < 446 V - for a 440 / 460 V input voltage (P0296 = 3). Ud < 487 V - for a 480 V input voltage (P0296 = 4). ☑ Phase loss in the input power supply. ☑ Pre-charge circuit failure. ☑ Parameter P0296 was set to a value above of the power supply rated voltage.
F022 DC Link Overvoltage	DC Link overvoltage condition occurred.	☑ The input voltage is too high and the DC Link voltage surpassed the maximum permitted value: Ud > 400 V - for 220 / 230 V input models (P0296 = 0). Ud > 800 V - for 380 / 480 V input models (P0296 = 1, 2, 3, or 4). ☑ Inertia of the driven-load is too high or deceleration time is too short. ☑ Wrong settings for parameters P0151, or P0153, or P0185.
F030 Power Module U Fault	Desaturation of IGBT occured in power module U. **Note:** This protection is available only for frame size D models.	☑ Short-circuit between motor phases U and V or U and W.
F034 Power Module V Fault	Desaturation of IGBT occured in power module V. **Note:** This protection is available only for frame size D models.	☑ Short-circuit between motor phases V and U or V and W.

Fault/Alarm	Description	Possible Causes
F038 Power Module W Fault	Desaturation of IGBT occured in power module W. **Note:** This protection is available only for frame size D models.	☑ Short-circuit between motor phases W and U or W and V.
F042 DB IGBT Fault	Desaturation of dynamic braking IGBT occured. **Note:** This protection is available only for frame size D models.	☑ 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 IGBT Overload Alarm	An IGBT overload alarm occurred. **Note:** It may be disabled by setting P0350 = 0 or 2.	☑ Inverter output current is too high.
F048 IGBT Overload Fault	An IGBT overload fault occurred. **Note:** It may be disabled by setting P0350 = 0 or 2.	☑ Inverter output current is too high.
A050 IGBT High Temperature	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 IGBT Overtemperature	A high temperature fault was detected by the NTC temperature sensors located on the IGBTs.	
F065 Encoder Signal Fault (SW)	Feedback obtained via encoder does not match the commanded speed. The fault can be disabled via parameter P0358.	☑ Wiring between encoder and encoder interface accessory interrupted. ☑ Encoder is defective. ☑ Encoder coupling to the motor is broken. ☑ Inverter operating in current limit (In case the application needs to run in such condition, this fault should be disabled via parameter P0358).
F066 Encoder Signal Fault (SW)	Feedback obtained via encoder does not match the commanded speed. The fault can be disabled via parameter P0358.	☑ Wiring between encoder and encoder interface accessory interrupted. ☑ Encoder is defective. ☑ Encoder coupling to the motor is broken. ☑ Inverter operating in current limit (In case the application needs to run in such condition, this fault should bedisabled via parameter P0358).
F067 Incorrect Encoder/ Motor Wiring	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 (when P0408>1). - In this case, turn off the power supply, solve the problem, and then turn it on again. - When P0408 = 0, it is possible to reset this fault. This fault could be disabled by means of parameter P0358. In this case it is possible to reset this fault.	☑ Output motor cables U, V, W are inverted. ☑ Encoder channels A and B are inverted. ☑ Encoder was not properly mounted. ☑ Motor with locked rotor or dragging at the start.
F070 Overcurrent/ Short-circuit	Overcurrent or short-circuit detected at the output, in the DC Link, or at the braking resistor. **Note:** It is available only for models of frame sizes A, B, and C.	☑ 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, P0169 and P0170 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. (1)
F076 Motor Current Imbalance	Fault of motor current imbalance. **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.

Fault/Alarm	Description	Possible Causes
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.
F079 Encoder Signal Fault	Lack of encoder signals. The fault can be disabled via switches of the ENC1, ENC2 board.	☑ Broken wiring between motor encoder and option kit for encoder interface. ☑ Defective encoder. ☑ Encoder accessory defective or not well installed on the product, and control configured for vector with encoder.
F080 CPU Watchdog	Microcontroller watchdog fault.	☑ Electrical noise.
F082 Copy Function Fault	Fault while copying parameters.	☑ Communication problem with the HMI.
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.

Fault/Alarm	Description	Possible Causes
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.
F150 Motor Overspeed	Overspeed fault. It is activated when the real speed exceeds the value of P0134+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 (if installed).
F153 Internal Air Overtemperature	Internal air overtemperature fault.	
F156 Undertemperature	Undertemperature fault (below -30 °C (-22 °F)) in the IGBT or rectifier measured by the temperature sensors.	☑ Surrounding air temperature ≤ -30 °C (-22 °F).
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 PLC11 CFW-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.
A177 Fan Replacement	Heatsink 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.
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.

Fault/Alarm	Description	Possible Causes
F183 IGBTs Overload + Temperature	Overtemperature related to the IGBTs overload protection.	☑ Surrounding air temperature too high. ☑ Operation with frequencies < 10 Hz under overload.
F186 (2) Sensor 1 Temperature Fault	It indicates a temperature fault at the sensor 1.	☑ Motor high temperature.
F187 (2) Sensor 2 Temperature Fault	It indicates a temperature fault at the sensor 2.	
F188 (2) Sensor 3 Temperature Fault	It indicates a temperature fault at the sensor 3.	
F189 (2) Sensor 4 Temperature Fault	It indicates a temperature fault at the sensor 4.	
F190 (2) Sensor 5 Temperature Fault	It indicates a temperature fault at the sensor 5.	
A191 (2) 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 (2) Sensor 2 Temperature Alarm	It indicates a temperature alarm at the sensor 2.	
A193 (2) Sensor 3 Temperature Alarm	It indicates a temperature alarm at the sensor 3.	
A194 (2) Sensor 4 Temperature Alarm	It indicates a temperature alarm at the sensor 4.	
A195 (2) Sensor 5 Temperature Alarm	It indicates a temperature alarm at the sensor 5.	
A196 (2) Sensor 1 Cable Alarm	Sensor 1 cable alarm.	☑ Shorted temperature sensor.
A197 (2) Sensor 2 Cable Alarm	Sensor 2 cable alarm.	
A198 (2) Sensor 3 Cable Alarm	Sensor 3 cable alarm.	
A199 (2) Sensor 4 Cable Alarm	Sensor 4 cable alarm.	
A200 (2) Sensor 5 Cable Alarm	Sensor 5 cable alarm.	
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	☑ Refer to the DeviceNet communication manual.	
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		
A700 (4) 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 (4) Detached HMI		
A702 (4) 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 (4) Two Movements Enabled	Two movements have been enabled.	☑ It occurs when two or more movement blocks are enabled simultaneously.
A706 (4) 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).

(1) Long motor cables (with more than 100 meters) 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. Possible solutions:

- Decrease the carrier frequency (P0297).
- Install an output reactor between the inverter and the motor.

(2) With IOE-01 (02 or 03) modules connected into the slot 1 (XC41).

(3) With a Profibus DB module connected into the slot 3 (XC43).

(4) All the models with SoftPLC applicative.

NOTE!

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

6.3 SOLUTIONS FOR THE MOST FREQUENT PROBLEMS

Table 6.2 - *Solutions for the most frequent problems*

Problem	Point to be Verified	Corrective Action
Motor does not start	Incorrect wiring connection	1. Check all power and control connections. For instance, the digital inputs set to Start/Stop, General Enable, or no external error shall be connected to the 24 Vdc or to DGND* terminals (refer to Figure 3.17 on page 3-29)
	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 parameters are properly set for the application
	Fault	1. Check if the inverter is not blocked due to a fault condition 2. Check if terminals XC1:13 and XC1:11 are not shorted (short-circuit at the 24 Vdc power supply)
	Motor stall	1. Decrease motor overload 2. Increase P0136, P0137 (V/f), or P0169/P0170 (vector control)
Motor speed fluctuates (oscillates)	Loose connection	1. Stop the inverter, turn off the power supply, and check and tighten all power connections 2. Check all internal connections of the inverter
	Defective reference potentiometer	1. Replace potentiometer
	Oscillation of the external analog reference	1. Identify the cause of the oscillation. If it is caused by electrical noise, use shielded cables or separate from the power and control wiring
	Incorrect settings (vector control)	1. Check parameters P0410, P0412, P0161, P0162, P0175, and P0176 2. Refer to the programming manual
Motor speed too high or too low	Incorrect settings (reference limits)	1. Check if the values of P0133 (minimum speed) and P0134 (maximum speed) are properly set for the motor and application used
	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 if the motor has been properly sized for the application
Motor does not operate in the field weakening region (Vector Control)	Settings	1. Decrease P0180 2. Check P0410
Off display	Keypad connections	1. Check the inverter keypad connection
	Power supply voltage	1. Rated values shall be within the limits specified below: 200-230 V power supply: - Min: 187 V - Max: 253 V 380-480 V power supply: - Min: 323 V - Max: 528 V
	Blown fuses	1. Replace fuses
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 connection is inverted	1. Check signals A - $\overline{A}$, B - $\overline{B}$, refer to the incremental encoder (ENC -01 and ENC-02) interface manual. If signals are properly installed, exchange two of the output phases. For instance U and V

6.4 INFORMATION 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 Section 2.4 IDENTIFICATION LABELS FOR THE CFW-11 on page 2-8).
- ☑ 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 in 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 needed, first touch the grounded mettalic frame or wear a ground strap.

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

The inverters require low maintenance when properly installed and operated. Table 6.3 on page 6-9 presents main procedures and time intervals for preventive maintenance. Table 6.4 on page 6-10 provides recommended periodic inspections to be performed every 6 months after inverter start-up.

Table 6.3 - *Preventive maintenance*

Maintenance		Interval	Instructions
Fan replacement		After 50.000 operating hours (1)	Replacement procedure shown in Figure 6.1 on page 6-11 and Figure 6.2 on page 6-11
Keypad battery replacement		Every 10 years	Refer to Chapter 4 HMI on page 4-1
Electrolytic capacitors	If the inverter is stocked (not being used): "Reforming"	Every year from the manufacturing date printed in the inverter identification label (refer to Section 2.4 IDENTIFICATION LABELS FOR THE CFW-11 on page 2-8)	Apply power to the inverter (voltage between 200 and 230 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.

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

Component	Problem	Corrective Action
Terminals, connectors	Loose screws	Tighten
	Loose connectors	
Fans / Cooling system	Dirty fans	Cleaning
	Abnormal acoustic noise	Replace fan. Refer to Figure 6.1 on page 6-11 for the removal of the fan. Install the new fan in the reverse sequence of the removal Check the fan connection.
	Blocked fan	
	Abnormal vibration	
	Dust in the cabinet air filter	Cleaning or replacement.
Printed circuit boards	Accumulation of dust, oil, humidity, etc.	Cleaning
	Odor	Replacement
Power module / Power connections	Accumulation of dust, oil, humidity, etc.	Cleaning
	Loose connection screws	Tighten
DC Link capacitors	Discoloration / odor / electrolyte leakage	Replacement
	Expanded or broken safety valve	
	Frame expansion	
Power resistors	Discoloration	Replacement
	Odor	
Heatsink	Dust accumulation	Cleaning
	Dirty	

6.5.1 Cleaning Instructions

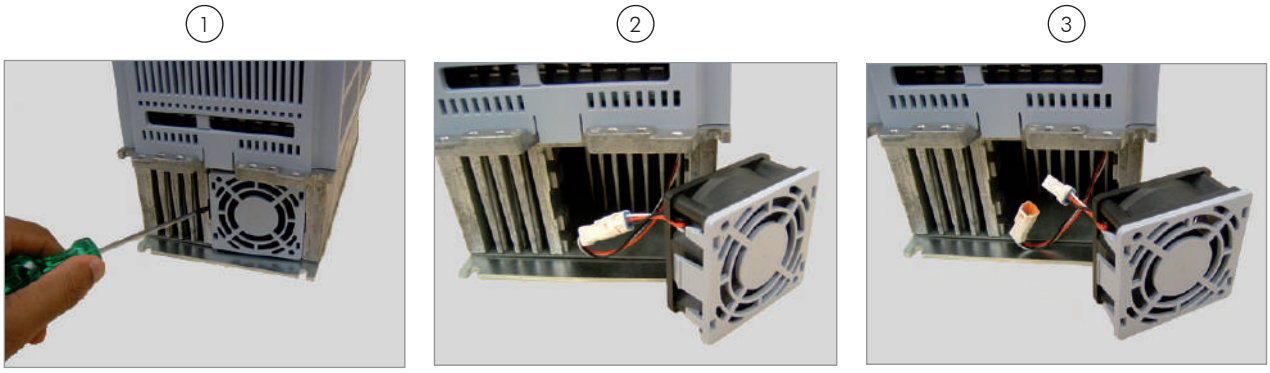
If needed to clean the inverter, follow the guidelines below:

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.

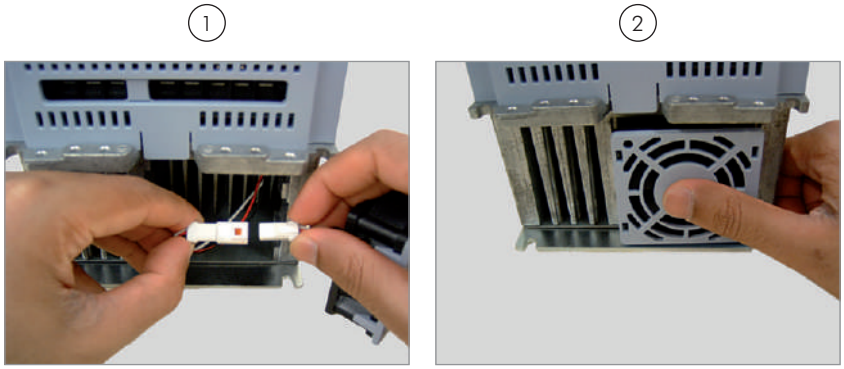
Electronic boards:

- ☑ 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 needed, remove the boards from the inverter.
- ☑ Always wear a ground strap.



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

Figure 6.1 - *Removing the heatsink fan*



Cable connection ***Fan fitting***

Figure 6.2 - *Fan installation*

7 OPTION KITS AND ACCESSORIES

This chapter presents:

- ☑ The option kits that can be incorporated to the inverter from the factory:
  - RFI filter.
  - External 24 Vdc power supply for control and HMI.
- ☑ Instructions for the proper use of the option kits.
- ☑ The accessories that can be incorporated 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

Some models cannot incorporate all available option kits. Refer to Table 8.1 on page 8-2 for a detailed description of the option kits that are available for each inverter model.

The inverter codification is described in Chapter 2 GENERAL INSTRUCTIONS on page 2-1.

7.1.1 RFI Filter

Inverters with the following codification: CFW11XXXXXXOFA. Refer to Table 8.1 on page 8-2 for information on availability of this option kit for each inverter model.

ATTENTION!
Do not use inverters with internal RFI filters in IT networks (ungrounded neutral or grounding provided by a high ohm value resistor) or in grounded delta networks ("delta corner earth"). These type of installations will damage the inverter filter capacitors.

The RFI filter reduces the conducted noise of the inverter to the electrical supply system in the high frequency range (>150 kHz).

The RFI filter is required for the compliance with conducted emissions limits established by the Electromagnetic Compatibility standards such as EN 61800-3 and EN 55011.

For the proper operation of the RFI filter, please follow the instructions listed in Section 3.4 INSTALLATION ACCORDING TO THE EUROPEAN DIRECTIVE OF ELECTROMAGNETIC COMPATIBILITY on page 3-43. This chapter also provides information on the compliance of these standards, such as the maximum motor cable length.

7.1.2 24 Vdc External Control Power Supply

Inverters with the following codification: CFW11XXXXXXOW.

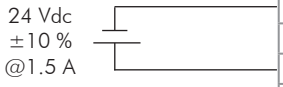
The use of this option kit is recommended with communication networks (Profibus, DeviceNet, etc.), since the control circuit and the network communication interface are kept active (with power supply and responding to the network communication commands) even in the event of main power supply interruption.

Inverters with this option have a built-in DC/DC converter with a 24 Vdc input that provides an adequate output for the control circuit. In such manner the power supply of the control circuit will be redundant, i.e., it can be provided 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 an output as in the standard inverter (Figure 7.1 on page 7-2).

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

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



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

Figure 7.1 - *Connection terminals and 24 Vdc external power supply rating*

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

7.1.3 Nema1 Degree Protection - Frame Sizes A, B and C

Inverters with the following codification:
CFW11...ON1...
Refer to Section 8.7 CONDUIT KIT IP21 on page 8-16.

7.1.4 IP21 Degree Protection

Inverters with the following codification:
CFW11...O21...
This optional item is only available on inverters of frame size D.

7.1.5 IP55 Degree Protection

Inverters with the following codification:
CFW11...O55...
Note that when this optional item is specified, the rated ambient temperature is reduced from 50 to 40 °C (122 °F to 104 °F).

7.1.6 Safety Stop Function

Inverters with the following codification CFW11...O...Y.... Refer to Section 3.3 SAFETY STOP FUNCTION on page 3-35.

7.1.7 Switch-Disconnector on the Inverter Power Supply

Inverters with the following codification:
CFW11...O55...DS...
This optional item is only available on inverters with degree of protection IP55.

7.2 ACCESSORIES

The accessories are installed to the inverter easily and quickly using the "Plug and Play" concept. Once the accessory is connected to the slot, the control circuitry identifies the model and displays the installed accessory code in P0027 or P0028. The accessory shall be installed with the inverter power supply off.

Part number and model of each available accessory are presented in Table 7.1 on page 7-4. The accessories can be ordered separately and will be shippe in an individual package containing the components and the manual with detailed instructions for the product installation, operation, and programming.

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

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 (Modbus)	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			
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)
12272760	ETHERNET/IP-2p-05	EtherNet/IP-2p interface module	4	----	--xx (2) (3)
11550476	MODBUSTCP-05	Modbus TCP interface module	4	----	--xx (2) (3)
11550548	PROFINETIO-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 (3)
Stand-alone HMI, Blank Cover, and Frame for Remote Mounted HMI					
11008913	HMI-01	Stand-alone HMI (4)	HMI	-	-
11010521	RHMIF-01	Remote HMI frame kit (IP65)	-	-	-
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	4 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					
11010787	KN1A-01	Conduit kit for frame size A (standard for option N1) (5)	-	-	-
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)	-	-	-
11010264	KIP2XD-01	IP2X kit for frame size D (standard for option 21)	-	-	-
11010265	PCSA-01	Kit for power cables shielding - frame size A (standard for option FA)	-	-	-
11010266	PCSB-01	Kit for power cables shielding - frame size B with degree protection IP2X (standard for option FA)	-	-	-
12705234	PCSBC-01	Kit for power cables shielding - frame sizes B and C with degree protection IP55	-	-	-
11010267	PCSC-01	Kit for power cables shielding - frame size C with degree protection IP2X (standard for option FA)	-	-	-
11119781	PCSD-01	Kit for power cables shielding - frame size D (included in the standard product)	-	-	-
10960847	CCS-01	Control cable shielding kit (supplied with the product)	-	-	-
13429125	CFW11-KSDC-01	Kit cables and connector to disable STO valid for all models except those of frame size A with degree protection IP2X	-	-	-

(1) Refer to the PLC module manual.

(2) Refer to the Anybus-CC communication manual.

(3) Refer to the programming manual.

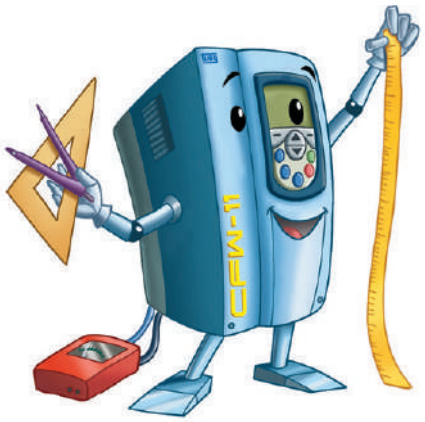
(4) Use DB-9 pin, male-to-female, straight-through cable (serial mouse extension type) for connecting the HMI to the inverter or Null-Modem standard cable. Maximum cable length: 10 m (33 ft).

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) Refer to the Section 8.7 CONDUIT KIT IP21 on page 8-16 for more details.

8 TECHNICAL SPECIFICATIONS



This chapter describes the technical specifications (electric and mechanical) of CFW-11 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.
- ☑ Efficiency: according to class IE2 as per EN 50598-2.
- ☑ Power factor (valid for rated condition):
  - 0.94 for models with three-phase power supply.
  - 0.70 for models with single-phase power supply.
- ☑ Displacement factor (cos φ): > 0.98.

Table 8.1 - *Technical specification for the CFW-11 series*

	Model	Frame Size	Number of Power Phases	ND: Rated Output Current (1) [Arms]	ND: Overload Current (2) [Arms] 1 min	ND: Overload Current (2) [Arms] 3 s	ND: Rated Switching Frequency (3) [kHz]	ND: Maximum Motor (4) [CV/kW]	ND: Rated Input Current [Arms]	ND: Dissipated Power [W] Surface Mounting (6)	ND: Dissipated Power [W] Flange Mounting (7)	HD: Rated Output Current (1) [Arms]	HD: Overload Current (2) [Arms] 1 min	HD: Overload Current (2) [Arms] 3 s	HD: Rated Switching Frequency (3) [kHz]	HD: Maximum Motor (4) [CV/kW]	HD: Rated Input Current [Arms]	HD: Dissipated Power [W] Surface Mounting (6)	HD: Dissipated Power [W] Flange Mounting (7)	Surrounding Air Temperature (1)	Dynamic Braking	Weight [kg/lb] IP2X/Nema1	Weight [kg/lb] IP55	Degree of Protection of Cabinet	RFI Filter Supressor	Safety Stop	24 Vdc External Control Power Supply
Models with 200...240 V power supply	CFW11 0006 B 2	A (IP21/ Nema1) and B (IP55)	1ϕ / 3ϕ	6.0	6.60	9.00	5	1.5/1.1	12.3/6.0 (5)	130	25	5.0	7.50	10.0	5	1.5/1.1	10.3/5.0 (5)	120	25	-10 ... 50 °C (14...122 °F) for inverters with degree of protection IP2X/Nema1 and -10...40 °C (14...104 °F) for inverters with IP55 degree of protection	Built-in	5.7/12.6	17/37.5	Nema1 (9) (conduit kit for frame size A - 10413635) and IP55	Yes (*)	Yes (9)	Yes
	CFW11 0006 S 2 O FA		1ϕ	6.0	6.60	9.00	5	1.5/1.1	12.3	130	25	5.0	7.50	10.0	5	1.5/1.1	10.3	120	25			5.7/12.6	17/37.5		Built-in		
	CFW11 0007 T 2		3ϕ	7.0	7.70	10.5	5	2/1.5	7.0	140	25	5.5	8.25	11.0	5	1.5/1.1	5.5	120	25			5.7/12.6	17/37.5		Yes (*)		
	CFW11 0007 B 2		1ϕ / 3ϕ	7.0	7.70	10.5	5	2/1.5	14.4/7.0 (5)	140	25	7.0	10.5	14.0	5	2/1.5	14.4/7.0 (5)	140	25			6.1/13.4	17/37.5				
	CFW11 0007 S 2 O FA		1ϕ	7.0	7.70	10.5	5	2/1.5	14.4	140	25	7.0	10.5	14.0	5	2/1.5	14.4	140	25			6.1/13.4	17/37.5		Built-in		
	CFW11 0010 T 2		3ϕ	10	11.0	15.0	5	3/2.2	10.0	170	30	8.0	12.0	16.0	5	2/1.5	8.0	170	30			5.7/12.6	17/37.5		Yes		
	CFW11 0010 S 2		1ϕ	10	11.0	15.0	5	3/2.2	20.5	180	30	10	15.0	20.0	5	3/2.2	20.5	140	25			6.1/13.4	17/37.5				
	CFW11 0013 T 2		3ϕ	13	14.3	19.5	5	4/3.0	13.0	200	30	11	16.5	22.0	5	3/2.2	11.0	170	30			6.1/13.4	17/37.5				
	CFW11 0016 T 2		3ϕ	16	17.6	24.0	5	5/3.7	16.0	230	30	13	19.5	26.0	5	4/3.0	13.0	190	30			6.3/13.9	17/37.5				
	CFW11 0024 T 2	B	3ϕ	24	26.4	36.0	5	7.5/5.5	24.0	310	50	20	30.0	40.0	5	6/4.5	20.0	250	40			9.1/20	17/37.5	Nema1 (conduit kit for frame size B - 10413638) and IP55			
	CFW11 0028 T 2		3ϕ	28	30.8	42.0	5	10/7.5	28.0	370	60	24	36.0	48.0	5	7.5/5.5	24.0	290	40			9.1/20	17/37.5				
	CFW11 0033 T 2		3ϕ	33.5	36.9	50.3	5	12.5/9.2	33.5	430	60	28	42.0	56.0	5	10/7.5	28.0	350	50			9.1/20	17/37.5				
	CFW11 0045 T 2	C	3ϕ	45	49.5	67.5	5	15/11	45.0	590	90	36	54.0	72.0	5	12.5/9.2	36.0	450	70			15.6/34.4	30/66.2	Nema1 (conduit kit for frame size C - 10413640) and IP55			
	CFW11 0054 T 2		3ϕ	54	59.4	81.0	5	20/15	54.0	680	100	45	67.5	90.0	5	15/11	45.0	540	80			16.0/35.3	30/66.2				
	CFW11 0070 T 2		3ϕ	70	77.0	105	5	25/18.5	70.0	900	140	56	84.0	112	5	20/15	56.0	680	100			17.9/39.5	30/66.2				
	CFW11 0086 T 2	D	3ϕ	86	94.6	129	5	30/22	86.0	970	150	70	105	140	5	25/18.5	70.0	740	110			29.5/65.1	49/108	IP21 (IP21 kit for frame size D - 10525277) and IP55			
	CFW11 0105 T 2		3ϕ	105	116	158	5	40/30	105.0	1200	180	86	129	172	5	30/22	86.0	920	140			31.4/69.2	49/108				
Models with 380...480 V power supply	CFW11 0003 T 4	A (IP21/ Nema1) and B (IP55)	3ϕ	3.6	3.96	5.40	5	2/1.5	3.6	130	25	3.6	5.40	7.20	5	2/1.5	3.6	110	25	-10 ... 50 °C (14...122 °F) for inverters with degree of protection or IP2X/Nema1 and -10...40 °C (14...104 °F) for inverters with IP55 degree of protection	Built-in	5.7/12.6	17/37.5	Nema1 (9) (conduit kit for frame size A - 10413635) and IP55	Yes	Yes (9)	Yes
	CFW11 0005 T 4		3ϕ	5.0	5.50	7.50	5	3/2.2	5.0	140	25	5.0	7.50	10.0	5	3/2.2	5.0	140	25			5.9/13	17/37.5				
	CFW11 0007 T 4		3ϕ	7.0	7.7	10.5	5	4/3	7.0	180	30	5.5	8.25	11.0	5	3/2.2	5.5	140	25			5.9/13	17/37.5				
	CFW11 0010 T 4		3ϕ	10	11.0	15.0	5	6/4.5	10.0	220	30	10	15.0	20.0	5	6/4.5	10.0	200	30			6.1/13.4	17/37.5				
	CFW11 0013 T 4		3ϕ	13.5	14.9	20.3	5	7.5/5.5	13.5	280	40	11	16.5	22.0	5	6/4.5	11.0	220	30			6.3/13.9	17/37.5				
	CFW11 0017 T 4	B	3ϕ	17	18.7	25.5	5	10/7.5	17.0	360	50	13.5	20.3	27.0	5	7.5/5.5	13.5	270	40			9.1/20	17/37.5	Nema1 (conduit kit for frame size B - 10413638) and IP55			
	CFW11 0024 T 4		3ϕ	24	26.4	36.0	5	15/11	24.0	490	70	19	28.5	38.0	5	10/7.5	19.0	360	50			9.7/21.4	17/37.5				
	CFW11 0031 T 4		3ϕ	31	34.1	46.5	5	20/15	31.0	560	80	25	37.5	50.0	5	15/11	25.0	430	60			10.4/22.9	17/37.5				
	CFW11 0038 T 4	C	3ϕ	38	41.8	57.0	5	25/18.5	38.0	710	110	33	49.5	66.0	5	20/15	33.0	590	90			16.4/36.2	30/66.2	Nema1 (conduit kit for frame size C - 10413640) and IP55			
	CFW11 0045 T 4		3ϕ	45	49.5	67.5	5	30/22	45.0	810	120	38	57.0	76.0	5	25/18.5	38.0	650	100			19.6/43.2	30/66.2				
	CFW11 0058 T 4		3ϕ	58.5	64.4	87.8	5	40/30	58.5	1050	160	47	70.5	94.0	5	30/22	47.0	800	120			20.5/45.2	30/66.2				
	CFW11 0070 T 4	D	3ϕ	70.5	77.6	106	5	50/37	70.5	1280	190	61	91.5	122	5	40/30	61.0	1050	160			31.1/68.6	49/108	IP21 (IP21 kit for frame size D - 10525277) and IP55			
	CFW11 0088 T 4		3ϕ	88	96.8	132	5	60/45	88.0	1480	220	73	110	146	5	50/37	73.0	1170	180			32.6/71.8	49/108				

Column group "Availability of Option Kits that Can be Integrated into the Product (Refer to the Smart Code in the Chapter 2 GENERAL INSTRUCTIONS on page 2-1) (8)": Degree of Protection of Cabinet, RFI Filter Supressor, Safety Stop, 24 Vdc External Control Power Supply.

The notes for Table 8.1 on page 8-2 to Table 8.2 on page 8-3 are located after the Table 8.2 on page 8-3.

Table 8.2 - *Specification for the CFW-11 series with a carrier frequency of 10 kHz (important: only valid for inverters with degree of protection IP2X/Nema1)*

	Model	Frame Size	Number of power phases	Carrier Frequency of 10 kHz and Surrounding Air Temperature = 50 °C (122 °F)															Carrier Frequency of 10 kHz and Surrounding Air Temperature = 40 °C (104 °F)													
				Use with Normal Duty (ND) Cycle							Use with Heavy Duty (HD) Cycle							Use with Normal Duty (ND) Cycle							Use with Heavy Duty (HD) Cycle						
				Number of power phases (1) [Arms]	Number of power phases (2) [Arms]		Maximum Motor (4) [CV/kW]	Rated Input Current [Arms]	Dissipated Power [W]		Rated Output Current (1) [Arms]	Overload Current (1) [Arms]		Maximum Motor (1) [CV/kW]	Rated Input Current [Arms]	Dissipated Power [W]		Number of power phases (1) [Arms]	Number of power phases (2) [Arms]		Maximum Motor (4) [CV/kW]	Rated Input Current [Arms]	Dissipated Power [W]		Rated Output Current (1) [Arms]	Overload Current (2) [Arms]		Maximum Motor (4) [CV/kW]	Rated Input Current [Arms]	Dissipated Power [W]	
					1 min	3 s			Surface Mounting (6)	Flange Mounting (7)		1 min	3 s			Surface Mounting (6)	Flange Mounting (7)		1 min	3 s			Surface Mounting (6)	Flange Mounting (7)		1 min	3 s			Surface Mounting (6)	Flange Mounting (7)
Models with 200...240 V power supply	CFW11 0006 B 2	A	1ϕ / 3ϕ	5.5	6.05	8.25	1.5/1.1	11.3/5.5 (5)	140	25	4.6	6.90	9.20	1.5/1.1	9.4/4.6	130	25	6.00	6.60	9.00	2/1.5	12.3/6.0	150	25	5.00	7.50	10.0	1.5/1.1	10.3/5.0	130	25
	CFW11 0006 S 2 O FA		1ϕ	5.5	6.05	8.25	1.5/1.1	11.3	140	25	4.6	6.90	9.20	1.5/1.1	9.4	130	25	6.00	6.60	9.00	2/1.5	12.3	150	25	5.00	7.50	10.0	1.5/1.1	10.3	130	25
	CFW11 0007 T 2		3ϕ	6.2	6.82	9.30	2/1.5	6.2	140	25	4.9	7.35	9.8	1.5/1.1	4.9	120	25	7.00	7.70	10.5	2/1.5	7.0	150	25	5.50	8.3	11.0	1.5/1.1	5.5	130	25
	CFW11 0007 B 2		1ϕ / 3ϕ	6.6	7.26	9.90	2/1.5	13.5/6.6 (5)	140	25	6.6	9.90	13.2	2/1.5	13.5/6.6	140	25	7.00	7.70	10.5	2/1.5	14.4/7.0	150	25	6.90	10.4	13.8	2/1.5	14.1/6.9	150	25
	CFW11 0007 S 2 O FA		1ϕ	7.0	7.26	9.90	2/1.5	14.35	140	25	6.6	9.90	13.2	2/1.5	13.53	140	25	7.00	7.70	10.5	2/1.5	14.35	150	25	6.90	10.4	13.8	2/1.5	14.15	150	25
	CFW11 0010 S 2		1ϕ	8.0	8.80	12.00	2/1.5	16.4	160	25	8.0	12.00	16.0	2/1.5	16.4	160	25	9.40	10.34	14.1	3/2.2	19.3	180	30	9.40	14.1	18.8	3/2.2	19.3	180	30
	CFW11 0010 T 2		3ϕ	8.4	9.24	12.6	2/1.5	8.4	160	25	6.7	10.1	13.4	2/1.5	6.7	140	25	10.0	11	15.0	3/2.2	10.0	180	30	8.00	12.0	16.0	2/1.5	8.0	160	25
	CFW11 0013 T 2		3ϕ	9.8	10.8	14.7	3/2.2	9.8	180	30	8.3	12.5	16.6	2/1.5	8.3	160	25	10.7	11.8	16.1	3/2.2	10.7	190	30	9.00	13.5	18.0	3/2.2	9.0	170	30
	CFW11 0016 T 2		3ϕ	12.8	14.1	19.2	4/3.0	12.8	210	30	10.4	15.6	20.8	3/2.2	10.4	180	30	14.6	16.1	21.9	5/3.7	14.6	240	40	12.0	18.0	24.0	4/3	12.0	200	30
	CFW11 0024 T 2	B	3ϕ	23.0	25.3	34.5	7.5/5.5	23.0	320	50	19.2	28.8	38.4	6/4.5	19.2	280	40	23.8	26.2	35.7	7.5/5.5	23.8	330	50	19.9	29.9	39.8	7.5/5.5	19.9	280	40
	CFW11 0028 T 2		3ϕ	23.0	25.3	34.5	7.5/5.5	23.0	330	50	19.7	29.6	39.4	6/4.5	19.7	290	40	23.8	26.2	35.7	7.5/5.5	23.8	340	50	20.4	30.6	40.8	7.5/5.5	20.4	300	50
	CFW11 0033 T 2		3ϕ	25.2	27.7	37.8	7.5/5.5	25.2	360	50	21.0	31.5	42.0	7.5/5.5	21.0	310	50	27.5	30.3	41.3	10/7.5	27.5	390	60	23.0	34.5	46.0	7.5/5.5	23.0	330	50
	CFW11 0045 T 2	C	3ϕ	36.6	40.3	54.9	12.5/9.2	36.6	540	80	29.3	44.0	58.6	10/7.5	29.3	450	70	39.3	43.2	59.0	15/11	39.3	580	90	31.4	47.1	62.8	10/7.5	31.4	470	70
	CFW11 0054 T 2		3ϕ	43.2	47.5	64.8	15/11	43.2	600	90	36.0	54.0	72.0	12.5/9.2	36.0	510	80	47.0	51.7	70.5	15/11	47.0	660	100	39.3	59.0	78.6	15/11	39.3	550	80
	CFW11 0070 T 2		3ϕ	38.5	42.4	57.8	12.5/9.2	38.5	560	80	30.8	46.2	61.6	10/7.5	30.8	460	70	42.0	46.2	63.0	15/11	42.0	610	90	33.6	50.4	67.2	12.5/9.2	33.6	500	80
	CFW11 0086 T 2	D	3ϕ	68.8	75.7	103	25/18.5	68.8	770	120	56.0	84.0	112	20/15	56.0	640	100	75.7	83.3	114	30/22	75.7	850	130	61.6	92.4	123	20/15	61.6	700	110
	CFW11 0105 T 2		3ϕ	84.0	92.4	126	30/22	84.0	930	140	68.8	103	138	25/18.5	68.8	770	120	96.4	106	145	30/22	96.4	1070	160	79.0	119	158	30/22	79.0	870	130
Models with 200...240 V power supply	CFW11 0003 T 4	A	3ϕ	3.6	3.96	5.40	2/1.5	3.6	140	25	3.6	5.40	7.20	2/1.5	3.6	140	25	3.60	3.96	5.40	2/1.5	3.6	140	25	3.60	5.40	7.20	2/1.5	3.6	140	25
	CFW11 0005 T 4		3ϕ	4.0	4.40	6.00	2/1.5	4.0	140	25	4.0	6.00	8.00	2/1.5	4.0	140	25	4.50	4.95	6.75	3/2.2	4.5	160	25	4.50	6.75	9.00	2/1.5	4.5	160	25
	CFW11 0007 T 4		3ϕ	5.2	5.72	7.80	3/2.2	5.2	170	30	4.1	6.15	8.20	2/1.5	4.1	150	25	5.80	6.38	8.70	3/2.2	5.8	180	30	4.60	6.90	9.20	2/1.5	4.6	160	25
	CFW11 0010 T 4		3ϕ	9.2	10.1	13.8	5/3.7	9.2	250	40	9.2	13.8	18.4	5/3.7	9.2	250	40	10.0	11.0	15.0	6/4.5	10.0	260	40	10.0	15.0	20.0	6/4.5	10.0	260	40
	CFW11 0013 T 4		3ϕ	11.5	12.7	17.3	7.5/5.5	11.5	290	40	9.5	14.3	19.0	6/4.5	9.5	250	40	12.7	14.0	19.1	7.5/5.5	12.7	320	50	10.4	15.6	20.8	6/4.5	10.4	270	40
	CFW11 0017 T 4	B	3ϕ	11.9	13.1	17.9	7.5/5.5	11.9	320	50	9.5	14.3	19.0	6/4.5	9.5	270	40	13.1	14.4	19.7	7.5/5.5	13.1	350	50	10.4	15.6	20.8	6/4.5	10.4	290	40
	CFW11 0024 T 4		3ϕ	14.4	15.8	21.6	7.5/5.5	14.4	390	60	11.5	17.3	23.0	7.5/5.5	11.5	330	50	15.8	17.4	23.7	10/7.5	15.8	420	60	12.5	18.8	25.0	7.5/5.5	12.5	350	50
	CFW11 0031 T 4		3ϕ	23.6	26.0	35.4	15/11	23.6	560	80	19.0	28.5	38.0	10/7.5	19.0	470	70	28.3	31.1	42.5	15/11	28.3	650	100	24.0	36.0	48.0	15/11	24.0	560	80
	CFW11 0038 T 4	C	3ϕ	23.6	26.0	35.4	15/11	23.6	620	90	20.5	30.8	41.0	12.5/9.2	20.5	560	80	28.5	31.4	42.8	15/11	28.5	710	110	24.8	37.2	49.6	15/11	24.8	640	100
	CFW11 0045 T 4		3ϕ	30.6	33.7	45.9	20/15	30.6	730	110	25.9	38.9	51.8	15/11	25.9	650	100	33.8	37.2	50.7	20/15	33.8	790	120	28.5	42.8	57.0	15/11	28.5	700	110
	CFW11 0058 T 4		3ϕ	35.1	38.6	52.7	20/15	35.1	820	120	28.2	42.3	56.4	15/11	28.2	700	110	41.0	45.1	61.5	25/18.5	41.0	930	140	32.9	49.4	65.8	20/15	32.9	780	120
	CFW11 0070 T 4	D	3ϕ	38.8	42.7	58.2	25/18.5	38.8	910	140	33.6	50.4	67.2	20/15	33.6	810	120	42.3	46.5	63.5	25/18.5	42.3	970	150	36.6	54.9	73.2	20/15	36.6	870	130
	CFW11 0088 T 4		3ϕ	48.4	53.2	72.6	30/22	48.4	1080	160	40.2	60.3	80.4	25/18.5	40.2	940	140	52.6	57.9	78.9	30/22	52.6	1160	170	43.7	65.6	87.4	30/22	43.7	1000	150

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Note for Table 8.1 on page 8-2 and Table 8.2 on page 8-3:

- 1ϕ = single-phase power supply, 3 ϕ = three-phase power supply

(*) This model with the optional RFI filter has single-phase power supply only.

(1) Rated current in permanent duty under the following conditions:

- Recommended switching frequencies. For operation with switching frequencies of 10 kHz, it is necessary a derating of the rated output current according to Table 8.2 on page 8-3.
- Ambient temperature around the inverter: -10 °C to 50 °C (14 °F to 122 °F) for inverters with degree of protection IP2X/Nema1 and -10 °C to 40 °C (14 °F to 104 °F) for inverters with degree of protection IP55. For operation of the inverter in environments with higher ambient temperatures around the inverter, refer to Item 3.3.1 Installation on page 3-38.
- Air relative 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), output current derating of 1 % for each 100 m (330 ft) above 1000 m (3.300 ft).
- From 2000 m (6.600 ft) to 4000 m (13.200 ft) - maximum voltage (240 V for models 220...240 V and 480 V for models 380...480 V) derating of 1.1 % for each 100 m (330 ft) above 2000 m (6.600 ft).
- Note that the derating specified in the items above also apply to the dynamic braking IGBT (column effective braking current ($I_{effective}$) of Table 3.4 on page 3-22).
- Environment with pollution degree 2 (as per EN50178 and UL 508C).

(2) Table 8.1 on page 8-2 presents only two points of the overload curve (actuation time of 1 min and 3 s). The complete overload curves of the IGBTs for ND and HD are presented in Figure 8.1 on page 8-5.

(3) The switching frequency may be automatically reduced to 2.5 kHz, depending on the operating conditions (ambient temperature around the inverter, output current, etc.) - if P0350 = 0 or 1.

(4) The motor outputs are only reference values for WEG 4-pole motors of 220 V or 440 V. The correct sizing of the VSD must be done according to the rated current of the motors used.

(5) On the models with single-phase or three-phase power supply, the input current is presented for both cases. The input current for single-phase power supply is presented first.

(6) The specified losses are valid for the nominal operating conditions, that is, for the rated output current and switching frequency. Exception: the values contained in Table 8.2 on page 8-3 are for switching frequency of 10 kHz and the current specified in this table.

(7) The dissipated power for flange mounting corresponds to the total losses of the inverter minus the losses on the power modules (IGBT and rectifier).

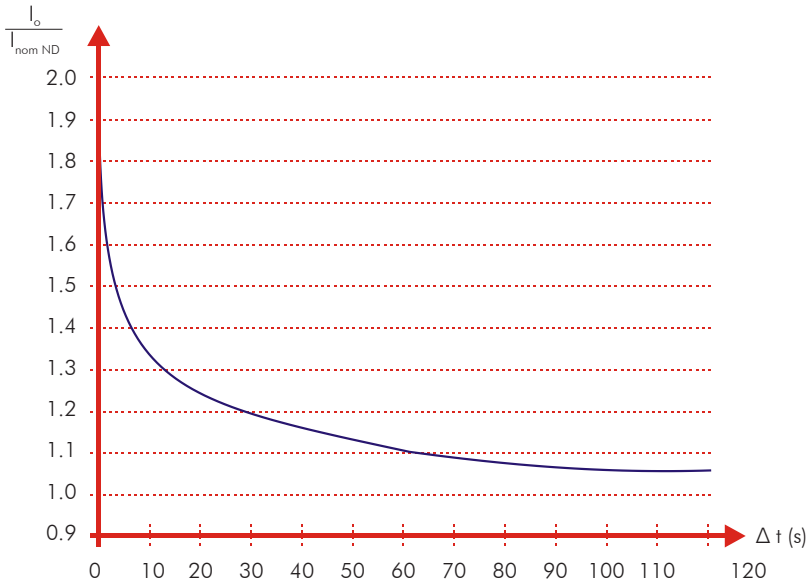
(8) For the inverter to be supplied with such optional item, it is necessary to specify it in the inverter smart code - exception:

The RFI filter is built-in on models CFW110006S2OFA and CFW110007S2OFA. For further details, refer to Chapter 2 GENERAL INSTRUCTIONS on page 2-1.

(9) It is not possible to have simultaneously the optional items Nema1 and Safety Stop function on CFW11 inverters of frame size A.

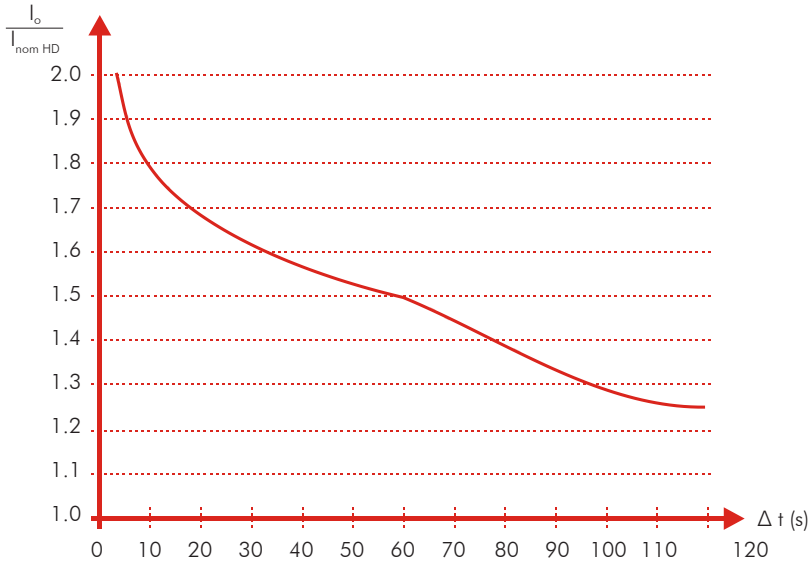
(10) - Ambient temperature around the inverter: -10 to 40 °C (14 °F to 104 °F).

- Air relative 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), output current derating of 1% for each 100 m (330 ft) above 1000 m (3.300 ft).
- Environment with pollution degree 2 (as per EN50178 and UL 508C).



Attention!
One overload each 10 minutes.

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



Attention!
One overload each 10 minutes.

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

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

NOTE!

Depending on the inverter usage conditions (surrounding air temperature, output frequency, possibility or not of reducing the carrier frequency, etc.), the maximum time for operation of the inverter with overload may be reduced.

8.2 ELECTRICAL/GENERAL SPECIFICATIONS

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 (5 kHz) - flux regulator: 0.4 ms (2.5 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) 1000 Hz (switching frequency = 10 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 - speed resolution: 1 rpm ☑ Possibility of remote mounting

Enclosure	IP20	☑ Models of frame sizes A, B, and C without the top cover and conduit kit
	NEMA1/IP20	☑ Models of frame size D without the IP21 kit
	IP21	☑ Models of frame sizes A, B, and C with the top cover
	NEMA1/IP21	☑ Models of frame sizes A, B, and C with the top cover and conduit kit ☑ Models of frame size D with the IP21 kit
	IP54	☑ Back of the inverter (external part for flange mounting)
	IP55	☑ Models with optional 55
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

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 ☑ EN61800-5-1 - 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 ☑ EN 61000-4-11 - testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests
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 weatherprotected locations Level 3M4

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".
Functional Safety	STO Funtion, with certificate issued by TÜV Rheinland.

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

8.5 MECHANICAL DATA

Frame Size A IP21

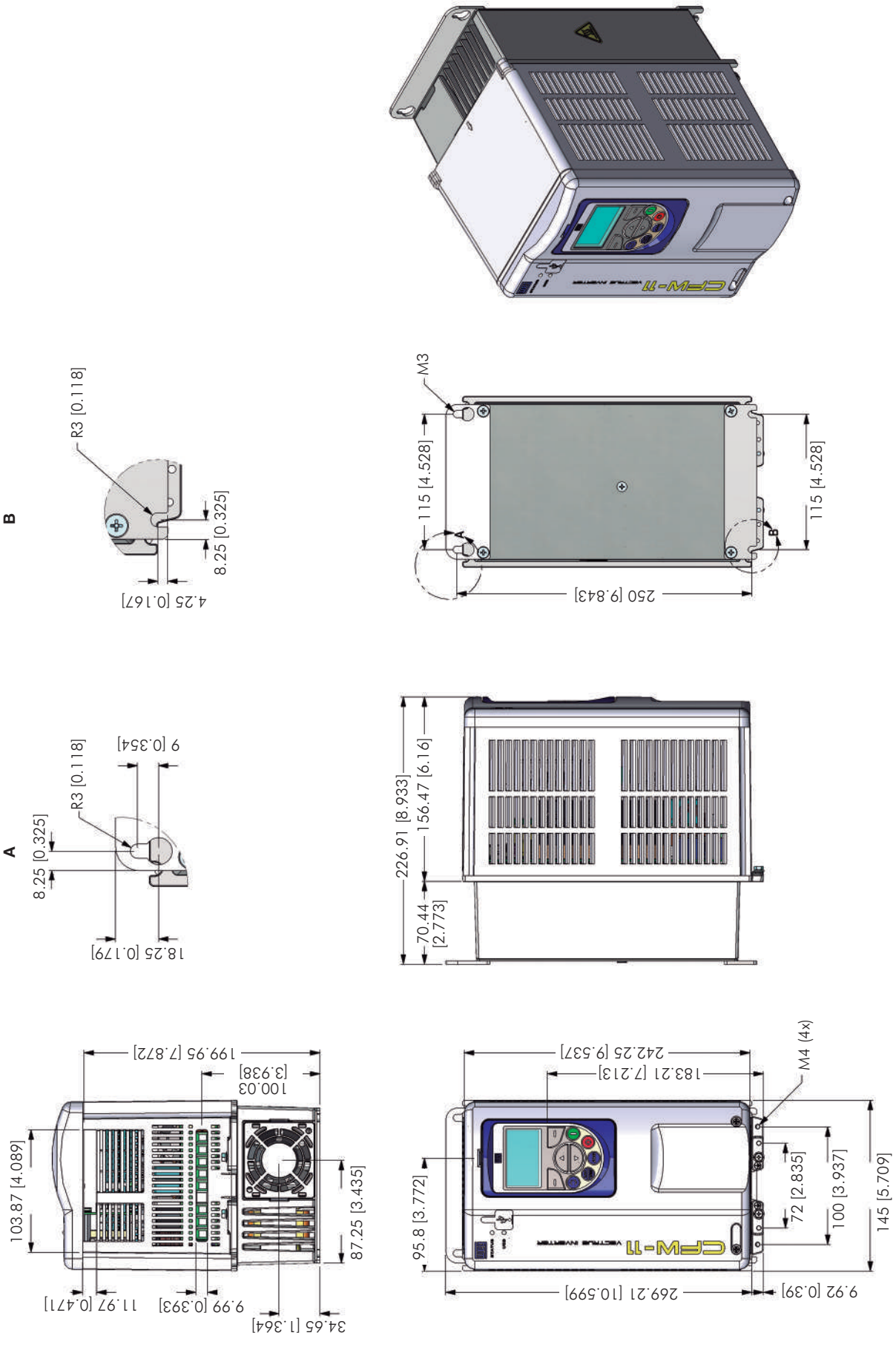


Figure 8.2 - *Inverter dimensions - frame size A - mm [in]*

Frame Size B IP21

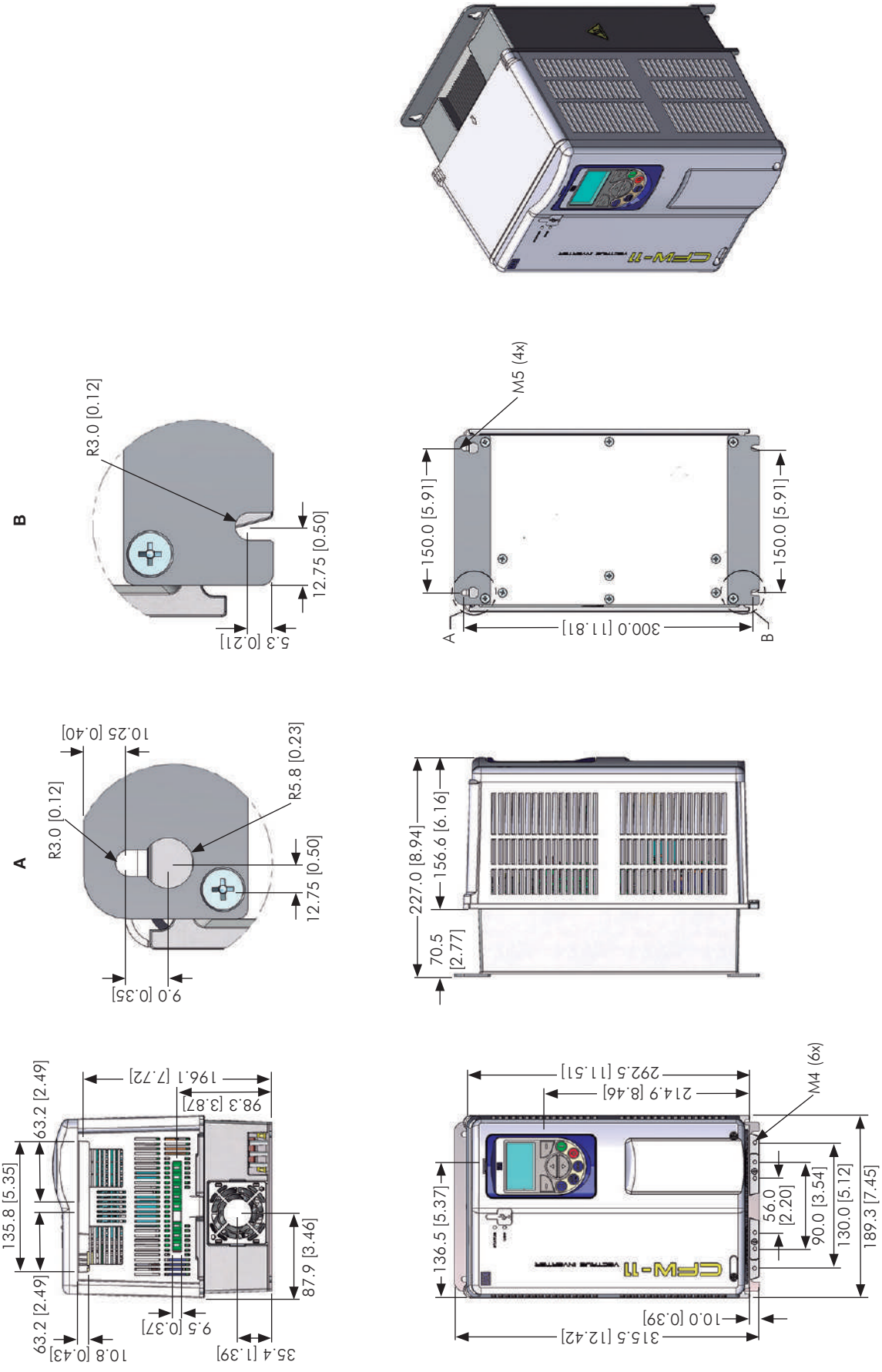


Figure 8.3 - *Inverter dimensions - frame size B - mm [in]*

Frame Size C IP21

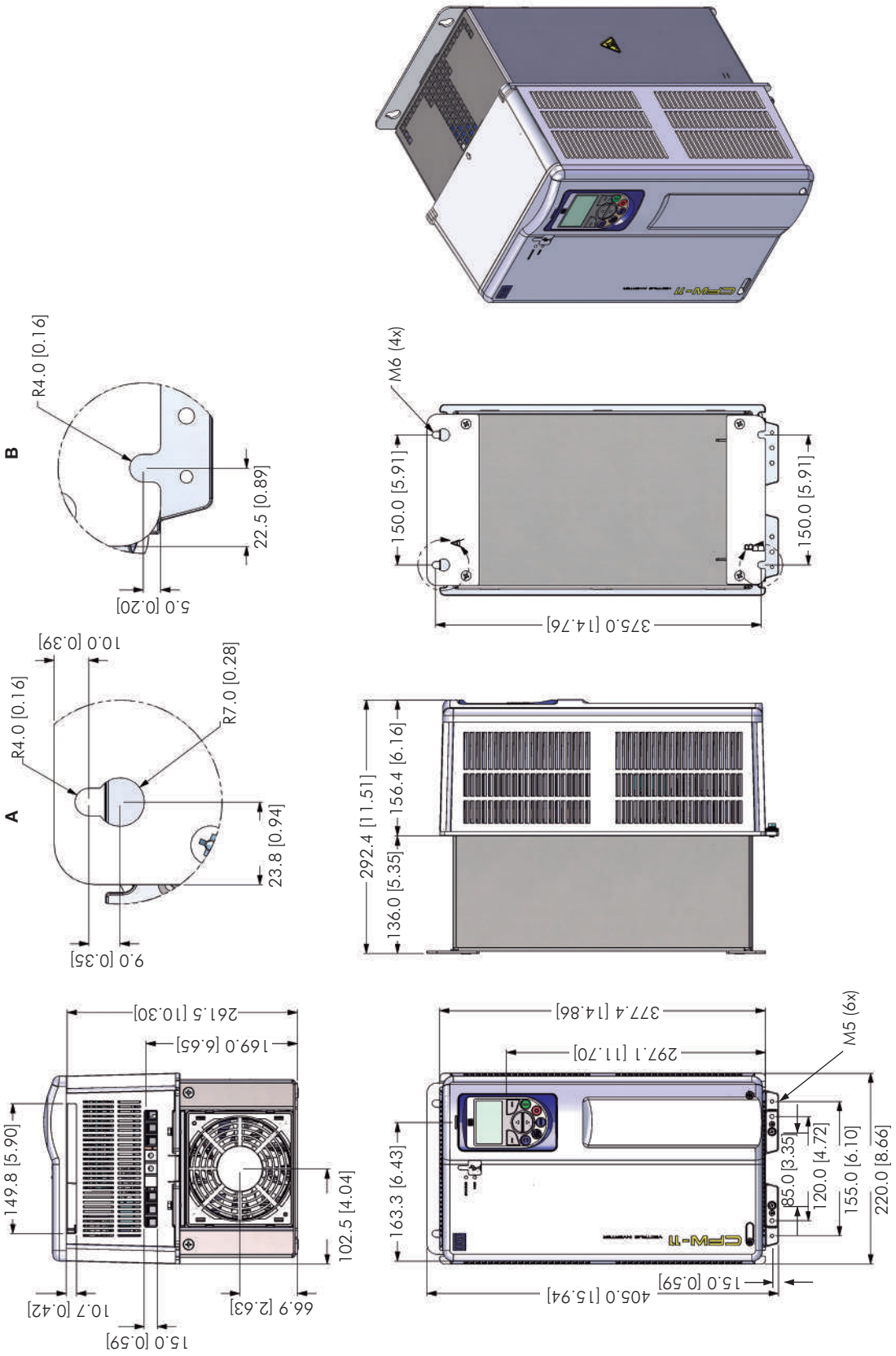


Figure 8.4 - *Inverter dimensions - frame size C - mm [in]*

Frame Size D IP20/Nema1

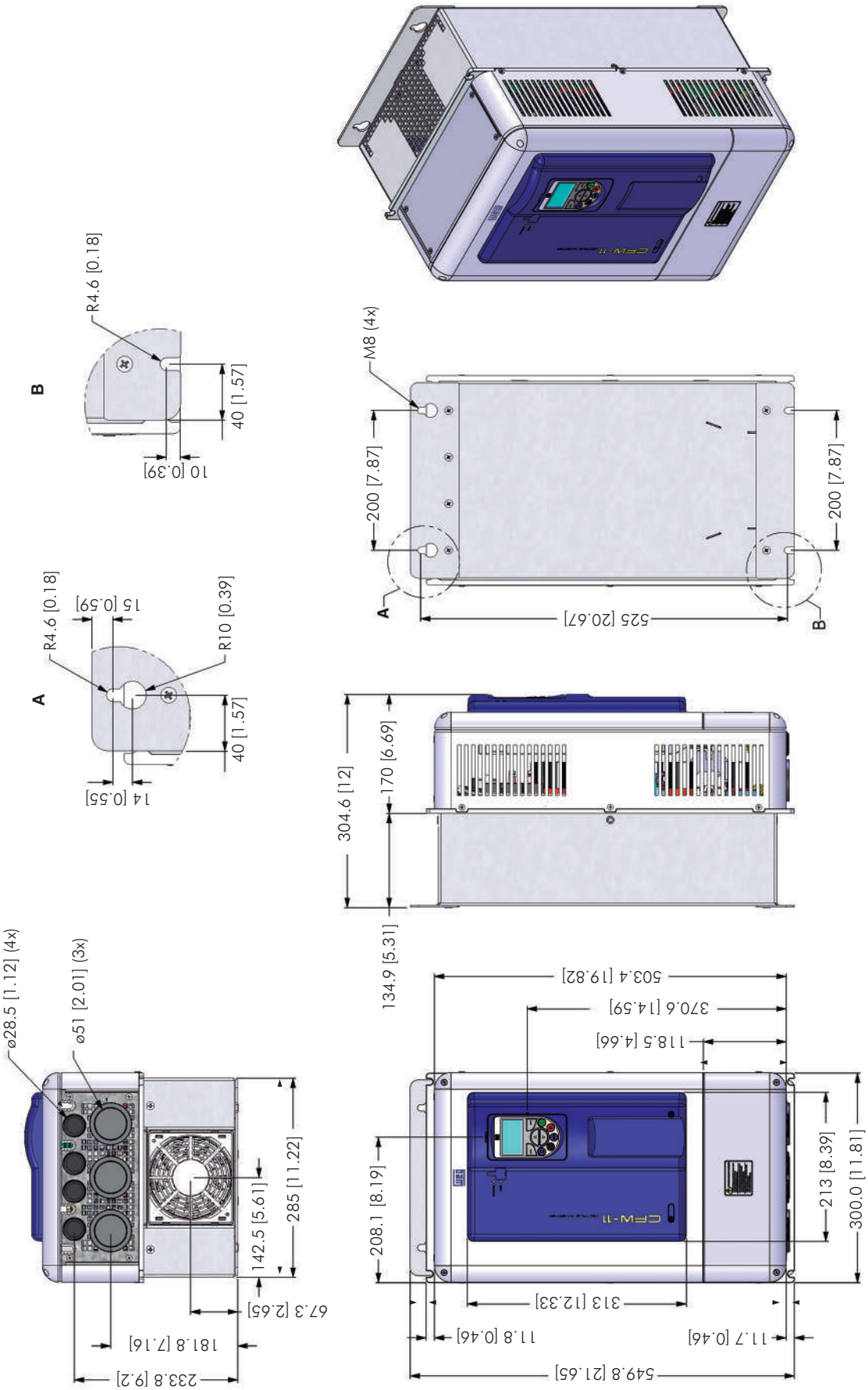


Figure 8.5 - *Inverter dimensions - frame size D - mm [in]*

Frame Size B IP55

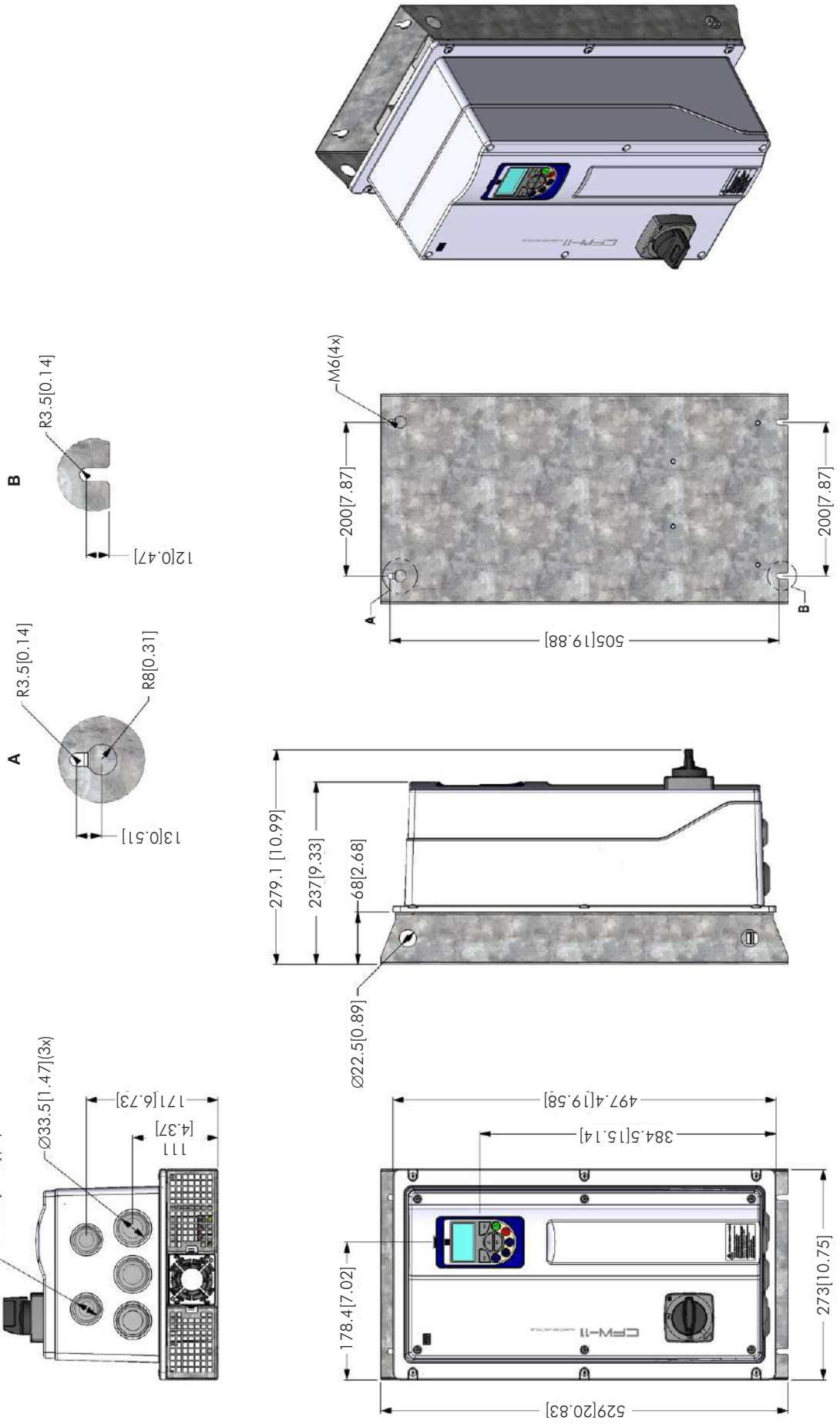


Figure 8.6 - *Inverter dimensions - frame size B - mm [in]*

Frame Size C IP55

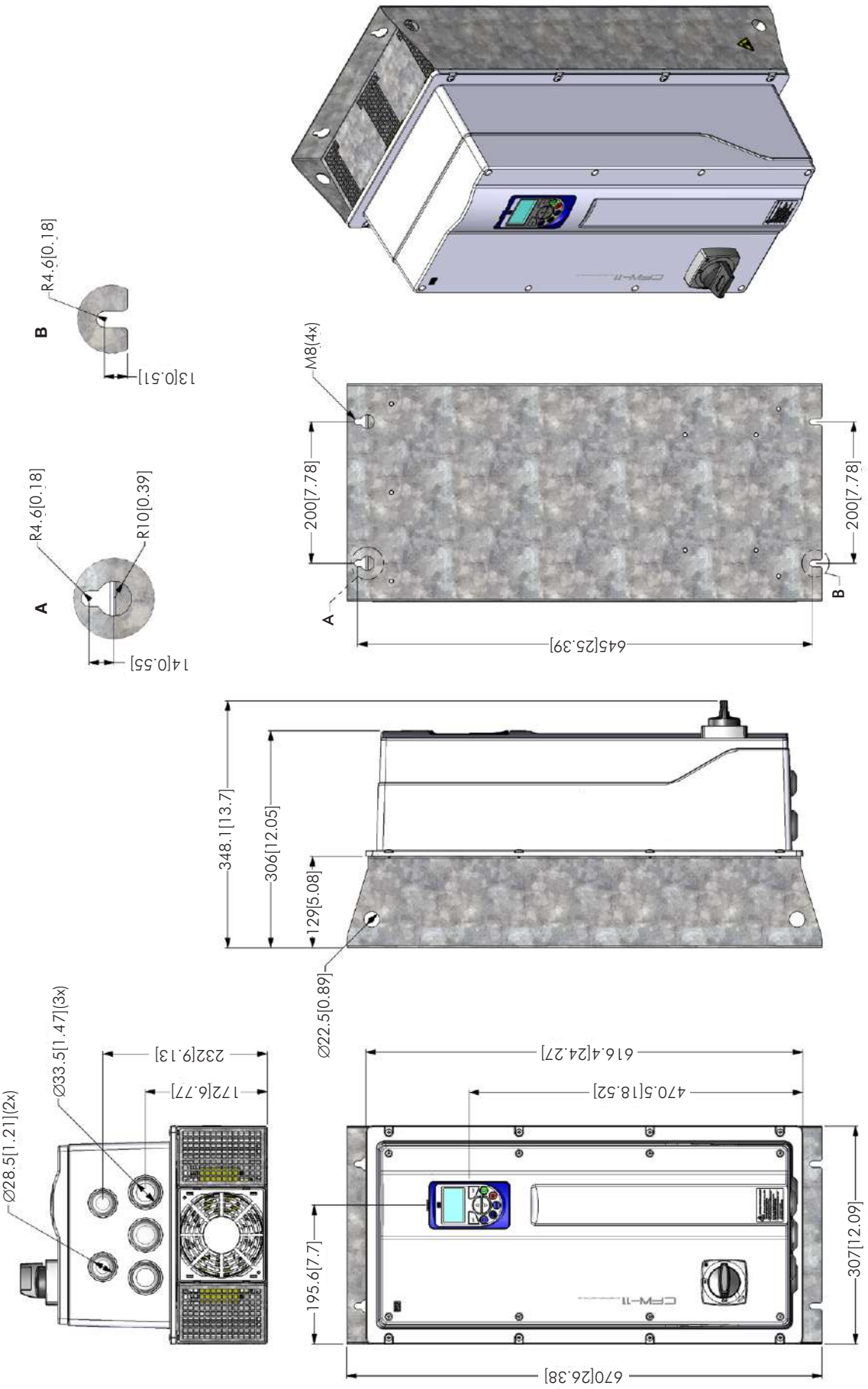


Figure 8.7 - *Inverter dimensions - frame size C - mm [in]*

Frame Size D IP55

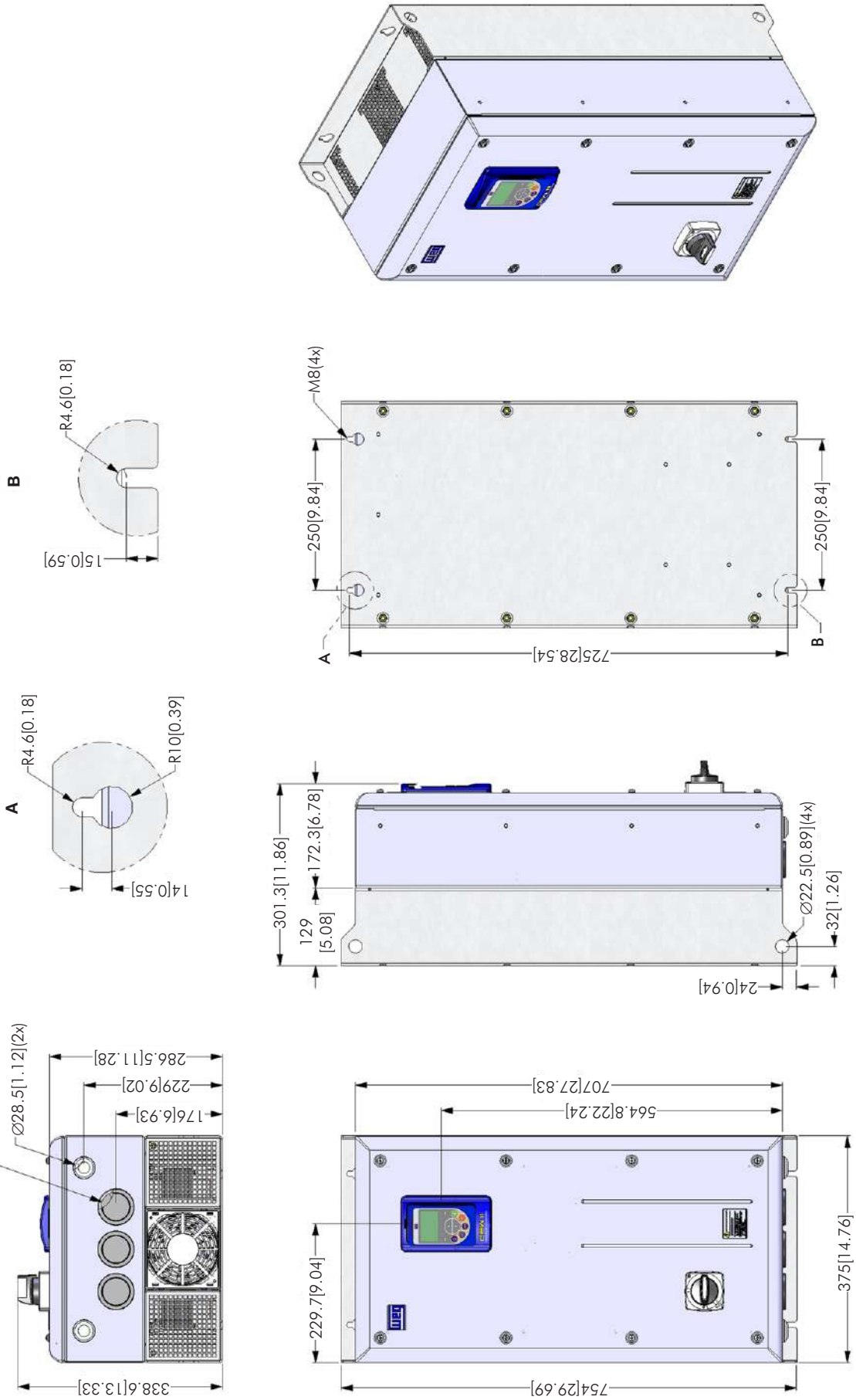
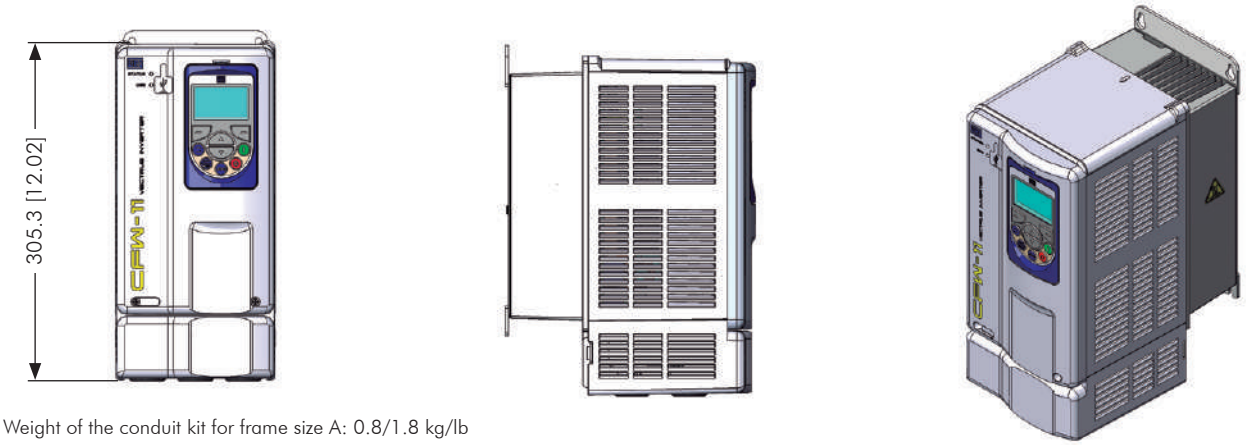


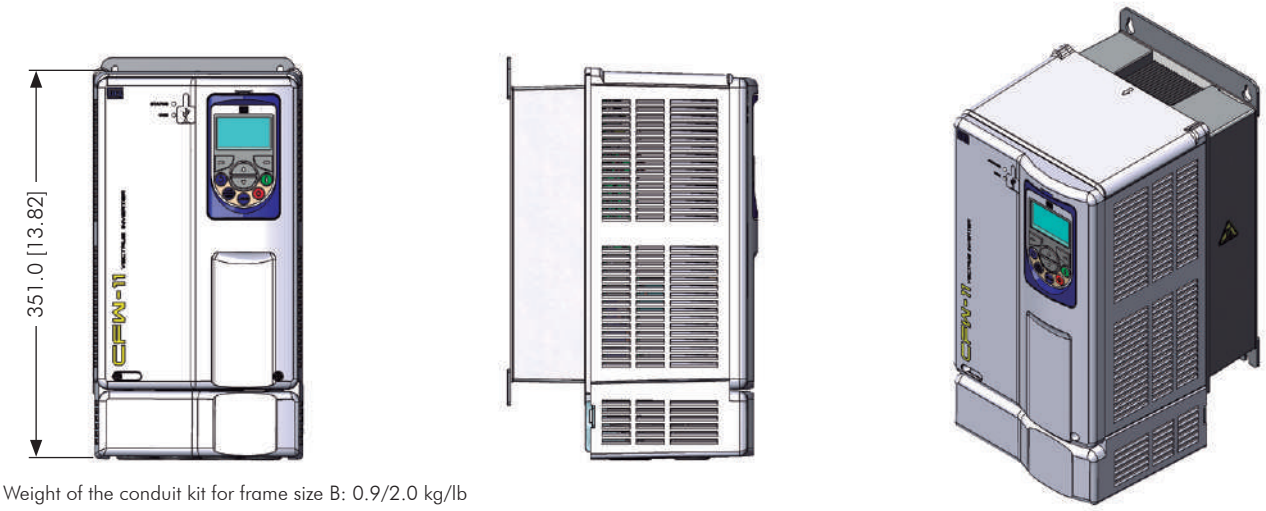
Figure 8.8 - *Inverter dimensions - frame size D - mm [in]*

8.6 CONDUIT KIT



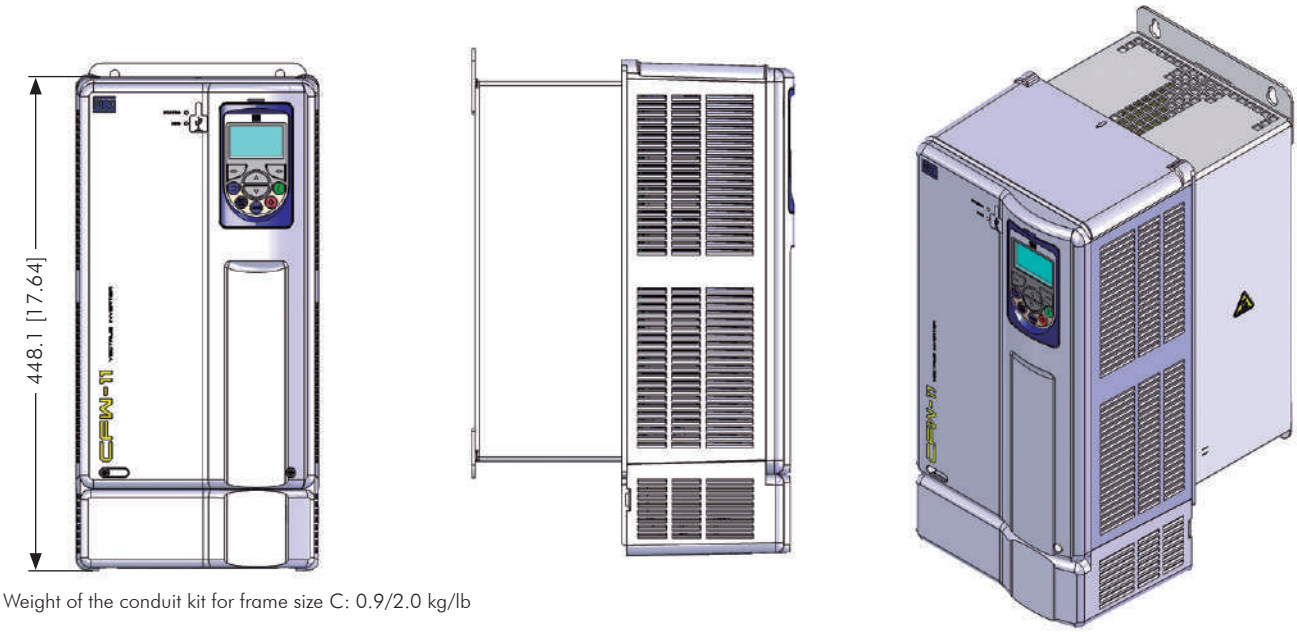
- Weight of the conduit kit for frame size A: 0.8/1.8 kg/lb

(a) Frame size A with the conduit kit KN1A-01



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

(b) Frame size B with the conduit kit KN1B-01



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

(c) Frame size C with the conduit kit KN1C-01

Figure 8.9 - *(a) to (c) - Inverter dimensions with the conduit kit - mm [in]*

8.7 CONDUIT KIT IP21

(a) Frame size A with CONDUIT KIT IP21

Figure 8.10 - *Dimensions of the inverter with CONDUIT KIT IP21 - mm [in]*