English

Quick Installation Guide

CFW500 Frequency Inverter

13348698

1 SAFETY INSTRUCTIONS

This quick installation guide contains the basic information necessary to commission the CFW500. It has been written to be used by qualified personnel with suitable training or technical qualification for operating this type of equipment. The personnel shall follow all the safety instructions described in this manual defined by the local regulations. Failure to comply with the safety instructions may result in death, serious injury, and/or equipment damage.

2 SAFETY WARNINGS IN THIS MANUAL AND IN THE PRODUCT

DANGER!
The procedures recommended in this warning aim at protecting the user against death, serious injuries and considerable material damages.

ATTENTION!
The procedures recommended in this warning aim at preventing material damages.

NOTE!
The information mentioned in this warning is important for the proper understanding and good operation of the product.

High voltages present.

Components sensitive to electrostatic discharges.
Do not touch them.

The connection to the protection grounding is required (PE).

Connection of the shield to the grounding.

3 PRELIMINARY RECOMMENDATIONS

DANGER!
Always disconnect the general power supply before changing any electric component associated to the inverter. Many components may remain loaded with high voltages and/or moving (fans), even after the AC power supply input is disconnected or turned off. Wait for at least ten minutes in order to guarantee the full discharge of the capacitors. Always connect the grounding point of the inverter to the protection grounding.

NOTE!
Frequency Inverter may interfere with other electronic equipment. Follow the precautions recommended in manual available in **www.weg.net**.

NOTE!
It is not the intention of this guide to present all the possibilities for the application of the CFW500, as well as WEG cannot take any liability for the use of the CFW500 which is not based on this guide. For further information about installation, full parameter list and recommendations, visit the website **www.weg.net**.

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

ATTENTION!
Electronic boards have components sensitive to electrostatic discharges.
Do not touch directly on components or connectors. If necessary, first touch the grounding point of the inverter, which must be connected to the protection earth (PE) or use a proper grounding strap.

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.

ATTENTION!
The operation of this equipment requires detailed installation and operation instructions provided in the user's manual, programming manual and communication manuals.

4 ABOUT THE CFW500

The frequency inverter CFW500 is a high-performance product which allows the speed and torque control of three-phase induction motors. This product provides the user with the options of vector (VVW) or scalar (V/f) control, both programmable according to the application.
In the vector mode (VVW), the operation is optimized for the motor in use, obtaining a better performance in terms of speed regulation. The scalar mode (V/f) is recommended for simpler applications, such as the activation of most pumps and fans. The V/f mode is used when more than a motor is activated by an inverter simultaneously (multimotor applications).

5 NOMENCLATURA

Table 1: Nomenclature of the inverters CFW500

	Product and Series	Identification of the Model				Brake	Protection Rate	Conducted Emission Level	Hardware Version	Special Software Version
		Frame	Rated Current	Nº of Phases	Rated Voltage					
Ex.:	CFW500	A	02P6	T	4	NB	20	C2	---	---
Available options	CFW500	See Table 2								Blank = standard Sx = special software
		NB = without dynamic braking								
		DB = with dynamic braking							Blank = standard plug-in module	
		20 = IP20							H00 = without plug-in	
		N1 = cabinet Nema1 (type 1 as per UL) (protection rate according to standard IEC IP20)						Blank = it does not meet the levels of standards for conducted emission C2 or C3 = as per category 2 (C2) or 3 (C3) of IEC 61800-3, with internal RFI filter		

Table 2: Available options for each field of the nomenclature according to the rated current and voltage of the inverter

Frame	Output Rated Current	Nº de Phases	Rated Voltage	Available Options for the Remaining Identification Codes of the Inverters			
				Brake	Protection Rate	Conducted Emission Level	Hardware Version
A	01P6 = 1,6 A 02P6 = 2,6 A 04P3 = 4,3 A 07P0 = 7,0 A	S = singlephase power supply	2 = 200... 240 V	NB	20 or N1	Blank or C2 Blank or C3	Blank or H00
B	07P3 = 7,3 A 10P0 = 10 A			DB		C2	
A	01P6 = 1,6 A 02P6 = 2,6 A 04P3 = 4,3 A	B = single-phase or three-phase power supply		NB		Blank	
B	07P3 = 7,3 A 10P0 = 10 A			DB			
A	07P0 = 7,0 A 09P6 = 9,6 A	T = three-phase power supply		NB			
B	16P0 = 16 A						
C	24P0 = 24 A						
D	28P0 = 28 A 33P0 = 33 A 47P0 = 47 A			DB		Blank or C3	
E	56P0 = 56 A						
A	01P0 = 1,0 A 01P6 = 1,6 A 02P6 = 2,6 A 04P3 = 4,3 A 06P1 = 6,1 A	T = three-phase power supply	4 = 380...480 V	NB		Blank or C2 Blank or C3	
B	02P6 = 2,6 A 04P3 = 4,3 A 06P5 = 6,5 A 10P0 = 10 A			DB		Blank or C2 Blank or C3	
C	14P0 = 14 A 16P0 = 16 A					Blank or C2	
D	24P0 = 24 A 31P0 = 31 A					Blank or C3	
E	39P0 = 39 A 49P0 = 49 A						
C	01P7 = 1,7 A 03P0 = 3,0 A 04P3 = 4,3 A 07P0 = 7,0 A 10P0 = 10 A 12P0 = 12 A		5 = 500...600 V			Blank	

6 IDENTIFICATION LABEL

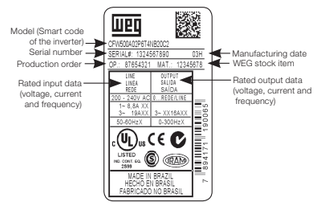


Figure 1: Description of the identification labels on the CFW500

7 RECEIVING AND STORAGE

The CFW500 is supplied packed in a cardboard box. On this package, there is an identification label which is the same as the one attached to the side of the inverter.
Check if:
- The identification of the CFW500 matches the model purchased.
- Any damages occurred during transportation.

Report any damage immediately to the carrier.
If the CFW500 is not installed soon, store it in a clean and dry location (temperature between -25 °C and 60 °C (-77 °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 recommended in **www.weg.net**.

8 INSTALLATION AND CONNECTION

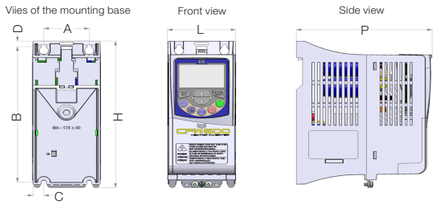
8.1 Environmental Conditions:

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

Environmental conditions permitted for the operation of the inverter:
- Temperature surrounding the inverter: from -10 °C (14 °F) to the nominal temperature.
- For temperatures surrounding the inverter higher than the specifications in Table B.2 in the user's manual, it is necessary to apply of 2 % of current derating for each Celsius degree, limited to an increase of 10 °C (50 °F).
- Air relative humidity: 5 % to 95 % non-condensing.
- Maximum altitude: up to 1000 m (3.300 ft) - nominal conditions.
- 1000 m to 4000 m (3.300 ft to 13.200 ft) - 1 % of current derating for each 100 m (328 ft) above 1000 m of altitude.
- From 2000 m to 4000 m (6.600 ft to 13.200 ft) above sea level - maximum voltage reduction (240 V for 200...240 V models, 480 V for 380...480 V models and 600 V for 500...600 V models) of 1.1 % for each 100 m (330 ft) above 2000 m (6.600 ft).
- Pollution degree: 2 (according to EN 50178 and UL 508C), with non-conductive pollution. Condensation must not originate conduction through the accumulated residues.

8.2 Positioning and Mounting

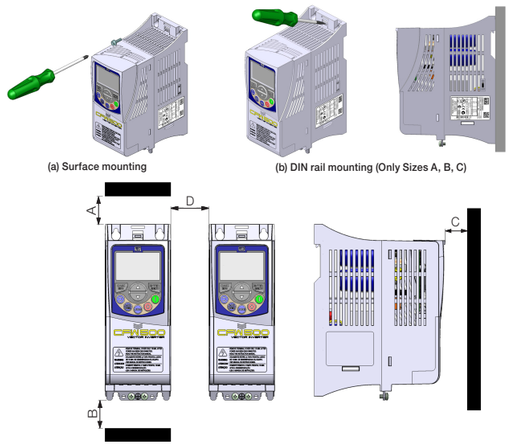
The external dimensions and the drilling for the mounting, as well as the net weight (mass) of the inverter are presented in Figure 2.
Mount the inverter in the upright position on a flat and vertical surface. First, put the screws on the surface where the inverter will be installed, install the inverter and then tighten the screws observing the maximum torque for the screws indicated in Figure 2.
Allow the minimum clearances indicated in Figure 3, in order to allow the cooling air circulation. Do not install heat sensitive components right above the inverter.



Frame	A	B	C	D	H	L	P	Weight	Mounting Bolt	Recommended Torque
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	kg (lb)		N.m (lbf.in)
A	50 (1,97)	175 (6,89)	11,9 (0,47)	7,2 (0,28)	189 (7,44)	75 (2,95)	150 (5,91)	0,8 (1,76) (1)	M4	2 (17,7)
B	75 (2,95)	185 (7,30)	11,8 (0,46)	7,3 (0,29)	199 (7,83)	100 (3,94)	160 (6,30)	1,2 (2,65) (1)	M4	2 (17,7)
C	100 (3,94)	195 (7,70)	16,7 (0,66)	5,8 (0,23)	210 (8,27)	135 (5,31)	165 (6,50)	2 (4,4)	M5	3 (26,5)
D	125 (4,92)	290 (11,41)	27,5 (1,08)	10,2 (0,40)	306,6 (12,1)	180 (7,08)	166,5 (6,55)	4,3 (0,16)	M6	4,5 (39,82)
E	150 (5.9)	330 (13)	34 (1.34)	10.6 (0.4)	350 (13.8)	220 (8.7)	191.5 (7.5)	10 (22.05)	M6	4.5 (39.82)

Dimension tolerance: ±1,0 mm (±0,039 in)
(1) This value refers to the heaviest weight of the frame size.

Figure 2: Inverter dimensions for mechanical installation



(c) Minimum ventilation free spaces

Frame	A	B	C	D
	mm (in)	mm (in)	mm (in)	mm (in)
A	15 (0.59)	40 (1.57)	30 (1.18)	10 (0.39) (1)
B	35 (1.38)	50 (1.97)	40 (1.57)	15 (0.59) (1)
C	40 (1.57)	50 (1.97)	50 (1.97)	30 (1.18)
D	40 (1.57)	50 (1.97)	50 (1.97)	40 (1.57)
E	110 (4.33)	130 (5.11)	50 (1.96)	40 (1.57)

Dimension tolerance: ±1,0 mm (±0,039 in)
(1) It is possible to mount inverters side by side without lateral free space (D = 0), however with maximum ambient temperature of 40 °C (104 °F).

Figure 3: (a) to (c) - Mechanical installation data (surface mounting and minimum ventilation free espaces)

ATTENTION!
- When installing two or more inverters vertically, respect the minimum clearance A + B (as per Figure 3) and provide an air deflecting plate so that the heat rising up from the bottom inverter does not affect the top inverter.
- Provide independent conduits for the physical separation of signal, control, and power cables (refer to the Chapter 9 ELECTRICAL INSTALLATION).

8.3 Cabinet Mounting

For inverters installed inside cabinets or metallic boxes, provide proper exhaustion, so that the temperature remains within the allowed range. Refer to the dissipated powers in Table 3 shows the air flow of nominal ventilation for each frame.
Cooling Method: fan with air flow upwards.

Table 3: Air flow of the fan

Frame	CFM	l/s	m³/min
A	20	9.4	0.56
B	30	14.1	0.85
C	30	14.1	0.85
D (T2)*	100	47.2	2.83
D (T4)**	80	37.8	2.27
E	180	84.5	5.09

(*) T2 - CFW500 frame D line 200 V (200...240 V).
(**) T4 - CFW500 frame D line 400 V (380...480 V).

8.4 Surface Mounting

Figure 3 illustrates the procedure for the installation of the CFW500 on the mounting surface.

8.5 DIN-Rail Mounting

In frames A, B and C, the inverter CFW500 can also be mounted directly on 35-mm rail as per DIN EN 50.022. For this mounting, you must first position the lock(*) down and then place the inverter on the rail, position the lock(*) up, fixing the inverter.

(*) The fastening lock of the inverter on the rail is indicated with a screwdriver in Figure 3.

9 ELECTRICAL INSTALLATION

DANGER!
- The following information is merely a guide for proper installation. Comply with applicable local regulations for electrical installations.
- Make sure the power supply is disconnected before starting the installation.
- The CFW500 must not be used as an emergency stop device. Provide other devices for that purpose.

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

9.1 Identification of the Power Terminals and Grounding Points

The power terminals can be of different sizes and configurations, depending on the model of the inverter, according to Table 4. The maximum torque of the power terminals and grounding points must be checked in Table 4.

Table 4: Power terminals, grounding points and recommended tightening torque

Frame	Power Supply	Recommended Torque			
		Grounding Points		Power Terminals	
		N.m	Lbf.in	N.m	Lbf.in
A	200...240 V	0,5	4,34	0,5	4,34
	380...480 V	0,5	4,34	0,5	4,34
B	200...240 V	0,5	4,34	0,5	4,34
	380...480 V	0,5	4,34	0,5	4,34
C	200...240 V	0,5	4,34	1,7	15,00
	380...480 V	0,5	4,34	1,8	15,93
	500...600V	0,5	4,34	1,0	8,68
D	200...240 V	0,5	4,34	2,4	21,24
	380...480 V	0,5	4,34	1,76	15,57
E	200...240 V	0,5	4,34	3.05	27
	380...480 V	0,5	4,34	3.05	27

Description of the power terminals:
L/L1, N/L2, L3 (R,S y T): AC power supply. Some models of voltage 200-240 V (see option of models in Table 10) can operate in 2 or 3 phases (single-phase/ three-phase inverters) without derating of the rated current. In this case, the AC power supply can be connected to two of the three input terminals without distinction. For the single-phase models only, the power voltage must be connected to L/L1 and N/L2.
U, V, W: connection for the motor.
-UD: negative pole of the voltage of the DC bus.
+UD: positive pole of the voltage of the DC bus.
BR: connection of the brake resistor.
DCR: connection to the external DC link inductor (optional). Only available for models 28 A, 33 A, 47 A and 56 A / 200-240 V and 24 A, 31 A, 39 A and 49 A / 380-480 V.

9.2 Power and Grounding Wiring, Circuit Breakers and Fuses

ATTENTION!
- Use proper cable lugs for the power and grounding connection cables. Refer to Table 10 for recommended wiring, circuit breakers and fuses.
- Keep sensitive equipment and wiring at a minimum distance of 0.25 m from the inverter and from the cables connecting the inverter to the motor.
- It is not recommended the use of mini circuit breakers (MDU), because of the actuation level of the magnet.

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 10 sare orientative values. Installation conditions and the maximum permitted voltage drop must be considered for the proper wiring sizing.
- In order to meet UL requirements, use ultra fast (for frame sizes A, B and C), and use fuse type J or circuit breaker (for frame sizes D and E) fuses at the inverter supply with a current not higher than the values presented in Table 10.

9.3 Power Connections

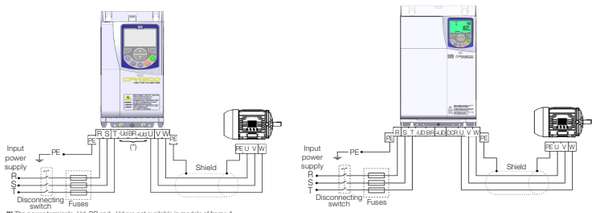


Figure 4: (a) and (b) - Power and grounding connections

9.3.1 Input Connections

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

ATTENTION!
The power supply that feeds the inverter must have a grounded neutral. In case of IT networks, follow the instructions described in the user's manual.

NOTE!
- The input power supply voltage must be compatible with the inverter rated voltage.
- Power factor correction capacitors are not needed at the inverter input (L/L1, N/L2, L3 or R, S, T) and must not be installed at the output (U, V, W).

Power supply capacity
- Suitable for use in circuits capable of delivering not more than 30.000 Arms symmetrical (200 V, 480 V or 600 V), when protected by fuses as specified in Table 10.

9.3.2 Inductor of the DC Link/ Reactance of the Power Supply

- In order to prevent damages to the inverter and assure the expected useful life, you must have a minimum impedance that provide a voltage drop of the input power supply of 1 %. If the impedance of the input power supply (due to the transformers and cabling) is below the values listed in this table, we recommend the use of reactance in the input power supply.

- For the calculation of the input power supply reactance necessary to obtain the desired percentage voltage drop, use:

$$L = 1592 \, . \, \Delta V \, . \, \frac{V_e}{I_{s,\,rat} \, . \, f} \; [\mu H]$$

Sendo que:
ΔV - queda de rede desejada, em percentual (%).
V_e - tensão de fase na entrada do inversor, em volts (V).
$I_{s,\,rat}$ - corrente nominal de saída do inversor.
f - frequência da rede.

9.3.3 Dynamic Braking

NOTE!
The dynamic braking is available from frame B. For installation information, refer to Item 3.2.3.4 Dynamic Braking of the user's manual, available on **www.weg.net**.

9.3.4 Output Connections

ATTENTION!
- The inverter has an electronic motor overload protection that must be adjusted according to the driven motor. When several motors are connected to the same inverter, install individual overload relays for each motor.
- The motor overload protection available in the CFW500 is in accordance with the UL508C standard. Note the following information:
1. Trip current equal to 1.2 times the motor rated current (P0401).
2. When parameters P0156, P0157 and P0158 (Overload current at 100 %, 50 % and 5 % of the rated speed, respectively) are manually set, the maximum value to meet the condition 1 is 1.1 x P0401.

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

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

Keep motor cables away from other cables (signal cables, sensor cables, control cables, etc.), according to Item 9.3.7 Cable Separation Distance.
Connect a fourth cable between the motor ground and the inverter ground.

When using shielded cables to install the motor:
- Follow the safety recommendations of IEC 60034-25.
- Use the low impedance connection for high frequencies to connect the cable shield to the grounding. Use parts supplied with the inverter.
- The accessory "CFW500-KPCSx power and control cable shielding kit" can be mounted in the lower part of the cabinet. Figure 5 shows a detailed example of the connection of the power supply and the motor cable shield to the accessory CFW500-KPCSA. Besides, this accessory allows the connection of the control cable shield.

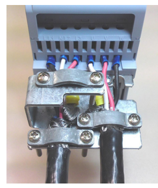


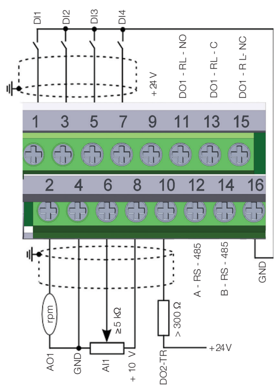
Figure 5: *Details of the connection of the power supply and the motor cable shield to the accessory CFW500-KPCSA*

9.3.5 Grounding Connections

DANGER!
- The inverter must be connected to a protection grounding (PE).
- Use grounding wiring with a gauge at least equal to that indicated in Table 10.
- The maximum tightening torque of the grounding connections is of 1.7 N.m (15 lbf.in).
- Connect the grounding points of the inverter to a specific grounding rod, or specific grounding point or to the general grounding point (resistance ≤ 10 Ω).
- The neuter conductor that powers up the inverter must be solidly grounded; however, this conductor must not be used to ground the inverter.
- Do not share the grounding wiring with other equipment that operate with high currents (e.g. high power motors, soldering machines, etc.).

9.3.6 Control Connections

The control connections (analog input/output, digital input/output and interface RS485) must be performed according to the specification of the connector of the plug-in module connected to the CFW500. Refer to the guide of the plug-in module in the package of the product. The typical functions and connections for the CFW500-IOS standard plug-in module are shown in Figure 6.



	Connector		Description (**)
Top connection	1	DI1	Digital input 1
	3	DI2	Digital input 2 (*)
	5	DI3	Digital input 3
	7	DI4	Digital input 4
	9	+24 V	Fonte +24 Vcc
	11	DO1-RL-NO	Power supply 1 (NA contact of relay 1)
	13	DO1-RL-C	Digital output 1 (Common point of relay 1)
	15	DO1-RL-NC	Digital output 1 (NF contact of relay 1)
Bottom connection	2	AO1	Analog output 1
	4	GND	Reference 0 V
	6	AI1	Analog input 1
	8	+10 V	Reference +10 Vdc for potentiometer
	10	DO2-TR	Digital output 2 (Transistor)
	12	RS485 - A	RS485 (terminal A)
	14	RS485 - B	RS485 (terminal B)
	16	GND	Reference 0 V

(*) The digital input 2 (DI2) can also be used as input in frequency (FI). For further details refer to the programming manual of the CFW500.
(**) For further information, refer to the detailed specification in Table 8.

Figure 6: *Signals of the connector of the CFW500-IOS plug-in module*

For the correct connection of the control, use:
1. Gauge of the cables: 0.5 mm² (20 AWG) to 1.5 mm² (14 AWG).
2. Maximum torque: 0.5 N.m (4.50 lbf.in).
3. FWiring of the plug-in module connector with shielded cable and separated from the other wiring (power, command in 110 V / 220 Vac, etc), according to Item 9.3.7 Cable Separation Distance.
4. Relays, contactors, solenoids or coils of electromechanical brake installed close to the inverters may occasionally generate interference in the control circuitry. To eliminate this effect, RC suppressors (with AC power supply) or freewheel diodes (with DC power supply) must be connected in parallel to the coils of these devices.
5. When using the external HMI, the cable that connects to the inverter must be separated from the other cables in the installation, keeping a minimum distance of 10 cm.
6. When using analog reference (AI1) and the frequency oscillates (problem of electromagnetic interference), interconnect the GND of the connector of the plug-in module to the inverter grounding connection.

9.3.7 Cable Separation Distance

Table 5: *Cable separation distance*

Inverter Output Rated Current	Length of the Cable(s)	Minimum Separation Distance
≤ 24 A	≤ 100 m (330 ft) > 100 m (330 ft)	≥ 10 cm (3,94 in) ≥ 25 cm (9,84 in)
≥ 28 A	≤ 30 m (100 ft) > 30 m (100 ft)	≥ 10 cm (3,94 in) ≥ 25 cm (9,84 in)

10 INSTALLATIONS ACCORDING TO EUROPEAN DIRECTIVE OF ELECTROMAGNETIC COMPATIBILITY

Inverters with the option C2 or C3 (CFW500...C...) feature internal RFI filter to reduce the electromagnetic interference. Those inverters, when properly installed, meet the requirements of the directive of the electromagnetic compatibility.
The CFW500 inverter series was developed for professional applications only. Therefore, the emission limits of harmonic currents by the standards EN 61000-3-2 and EN 61000-3-2/A 14 are not applicable.

10.1 Conformal Installation

1. Inverters with option internal RFI filter CFW500...C... (with grounding switch of the capacitors of the internal RFI filter in the position ⏚). Check the location of the grounding switch in Figure A.2 in the user's manual.
2. Shielded output cables (motor cables) with shield connected at both ends, motor and inverter, by means of a low impedance to high frequency connection. Maximum motor cable length and conduced and radiated emission levels according to Table 7. For more information (RFI filter commercial reference, motor cable length and emission levels) refer to the Table 7.
3. Shielded control cables, keeping the separation distance from other cables according to Table 5.
4. Grounding of the inverter according to instruction of the Item 9.3.5 Grounding Connections.
5. Grounded power supply.

10.2 Emission and Immunity Levels

Table 6: *Emission and immunity levels*

EMC Phenomenon	Basic Standard	Level
Emission:		
Mains terminal disturbance voltage Frequency range: 150 kHz to 30 MHz)	IEC/EN 61800-3	It depends on the inverter model on the length of the motor cable. Refer to Table 7
"Electromagnetic Radiation Disturbance" Frequency range: 30 MHz to 1000 MHz)		
Immunity:		
Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV for contact discharge and 8 kV for air discharge 8 kV
Fast transient-burst	IEC 61000-4-4	2 kV / 5 kHz(coupling capacitor) input cables 1 kV / 5 kHz control cables and remote HMI cables 2 kV / 5 kHz (coupling capacitor) motor cables
Conducted radio-frequency common mode	IEC 61000-4-6	0.15 to 80 MHz; 10 V; 80 % AM (1 kHz) Motor, control and HMI cables
Surges	IEC 61000-4-5	1.2/50 μs, 8/20 μs 1 kV line-to-line coupling 2 kV line-to-ground coupling
Radio-frequency electromagnetic field	IEC 61000-4-3	80 to 1000 MHz 10 V/m 80 % AM (1 kHz)

Definition of Standard IEC/EM 61800-3: "Adjustable Speed Electrical Power Drives Systems"

- Environments:

First Environment: environments that include domestic installations, as well as establishments directly connected without intermediate transformer to a low-voltage power supply network which supplies buildings used for domestic purposes.
Second Environment: includes all establishments other than those directly connected to a lowvoltage power supply network that supplies buildings used for domestic purposes.

- 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 movable installations. They must be installed and commissioned by a professional.
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.

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

Table 7: *Conducted and radiated emission levels, and additional information*

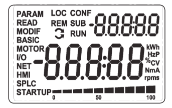
Inverter Model (with build-in RFI filter)		Conducted Emission - Maximum Motor Cable Length		Radiated Emission
		Category C3	Category C2	Category
1	CFW500A01P6S2...C2...	30 m (1182 in)	11 m (433 in)	C3
2	CFW500A02P6S2...C2...	30 m (1182 in)	11 m (433 in)	C3
3	CFW500A04P3S2...C2...	30 m (1182 in)	11 m (433 in)	C3
4	CFW500A07P0S2...C3...	6 m (236 in)	-	C3
5	CFW500B07P3S2...C2...	30 m (1182 in)	11 m (433 in)	C3
6	CFW500B10P0S2...C2...	30 m (1182 in)	11 m (433 in)	C3
7	CFW500A01P0T4...C2...	20 m (787 in)	11 m (433 in)	C3
8	CFW500A01P6T4...C2...	20 m (787 in)	11 m (433 in)	C3
9	CFW500A02P6T4...C2...	20 m (787 in)	11 m (433 in)	C3
10	CFW500A04P3T4...C2...	20 m (787 in)	11 m (433 in)	C3
11	CFW500A06P1T4...C3...	6 m (236 in)	-	C3
12	CFW500B02P6T4...C2...	6 m (236 in)	6 m (236 in)	C3
13	CFW500B04P3T4...C2...	6 m (236 in)	6 m (236 in)	C3
14	CFW500B06P5T4...C2...	6 m (236 in)	6 m (236 in)	C3
15	CFW500B10P0T4...C3...	20 m (787 in)	-	C3
16	CFW500C14P0T4...C2...	30 m (1182 in)	20 m (787 in)	C3
17	CFW500C16P0T4...C2...	30 m (1182 in)	20 m (787 in)	C3
18	CFW500D28P0T2...C3...	5 m (196 in)	-	C3
19	CFW500D33P0T2...C3...	5 m (196 in)	-	C3
20	CFW500D47P0T2...C3...	5 m (196 in)	-	C3
21	CFW500D24P0T4...C3...	5 m (196 in)	-	C3
22	CFW500D31P0T4...C3...	5 m (196 in)	-	C3
23	CFW500E56P0T2...C3...	Refer to the WEG		
24	CFW500E39P0T4...C3...			
25	CFW500E49P0T4...C3...			

For conducted emission category C2, the switching frequency is 10 KHz for models 1, 2, 3, 5 and 6.
For conducted emission category C2, the switching frequency is 5 KHz for models 7, 8, 9, 10, 12, 13, 14, 16 and 17.
For conducted emission C2, in models 12, 13 and 14, use the ferrite 12480705 on the output cables (1 turn).
For conducted emission C2, in models 16 and 17, use the ferrite 12473659 on the output cables (2 turns).
For conducted emission category C3, the switching frequency is 10 KHz for models 1, 2, 3, 5 and 6.
For conducted emission category C3, the switching frequency is 5 KHz for models 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 and 22.
For conducted emission C3, in model 4, use the ferrite 12480705 on the output cables (1 turn).
For conducted emission category C3, in model 11, use the ferrite 12480705 on the output cables (2 turns) and use the ferrite 12480705 on the input cables (2 turns).
For conducted emission C3, in models 15, use the ferrite 12480705 on the output cables (2 turns) and use the ferrite 12480705 on the input cables (2 turns).
For conducted emission C3, in models 16 and 17, use the ferrite 12473659 on the output cables (1 turn).
For conducted emission C3, in models 18, 19, 20, 21 and 22, use the ferrite 12983778 on the output cables (1 turn) and use the ferrite 12983778 on the input cables (2 turns).
For Radiated Emission, in models 1, 2, 3, 4, 7, 8, 9, 10 and 11, use shielded cable up to 6 m (236 in).
For Radiated Emission, in models 5, 6, 12, 13, 14, 15, 18, 19, 20, 21 and 22, use shielded cable up to 30 m (1182 in).
For Radiated Emission, in models 16 and 17, use the ferrite 12473659. Use shielded cable up to 30 m (1182 in).

11 PREPARATION AND POWERING UP

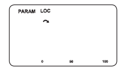
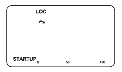
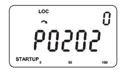
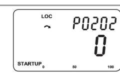
DANGER!
Always disconnect the general power supply before making any connection.

1. Check if the power, grounding and control connections are correct and firm.
2. Remove all materials left from the inside of the inverter or drive.
3. Check if the motor connections and if the motor current and voltage match the inverter.
4. Mechanically uncouple the motor from the load. If the motor cannot be uncoupled, be sure that the turning in any direction (clockwise or counterclockwise) will not cause damages to the machine or risk of accidents.
5. Close the covers of the inverters or drive.
6. Measure the voltage of the input power supply and check if it is within the permitted range, as presented in Chapter 13 TECHNICAL SPECIFICATIONS
7. Power up the input: close the disconnecting switch.
8. Check the success of the powering up:
The display of the HMI indicates:



11.1 STARTUP

11.1.1 V/f Control Type (P0202 = 0)

Seq	Indication on the Display/Action	Seq	Indication on the Display/Action
1	 - Monitoring mode - Press the key **ENTER/MENU** to enter 1st level of programming mode	2	 - The **PARAM** group is selected, press the keys ▲ or ▼ until selecting the **STARTUP** group
3	 - When the **STARTUP** group is selected - Press the key **ENTER/MENU**	4	 - If necessary, press **ENTER/MENU** to modify the content of "P0202 - Control Type" for P0202 = 0 (V/f)
5	 - When the desired value is reached, press **ENTER/MENU** to save the modification - Press the key ▲ for the next parameter	6	 - If necessary, modify the content of "P0401 - Motor Rated Current" - Press the key ▲ for the next parameter
7	 - If necessary, modify the content of "P0402 - Motor Rated Speed" - Press the key ▲ for the next parameter	8	 - If necessary, modify the content of "P0403 - Motor Rated Frequency" - Press the key ▲ for the next parameter
9	 - To end the Start-up routine, press the key **BACK/ESC** - To return to the monitoring mode, press the key **BACK/ESC** again		

12 OPTIONAL KITS AND ACCESSORIES

12.1 RFI Filter

Inverters with code CFW500...C... are used to reduce the disturbance conducted from the inverter to the main power supply in the high frequency band (> 150 kHz). It is necessary to meet the maximum levels of conducted emission of electromagnetic compatibility standards, such as EN 61800-3 and EN 55011. For further details, refer to Chapter 10 IINSTALLATIONS ACCORDING TO EUROPEAN DIRECTIVE OF ELECTROMAGNETIC COMPATIBILITY.

ATTENTION!
When inverters with internal RFI filter are used in IT networks (neuter not grounded or grounded through a high ohmic value resistor), always set the grounding switch of the capacitors of the internal RFI filter to the NC position, since those kinds of network cause damage to the filter capacitors of the inverter.

12.2 Accessories

The accessories are hardware resources that can be added in the application. Thus, all models can receive all the options presented.
The accessories are incorporated to the inverters in an easy and quick way by using the concept "Plug and Play". When an accessory is connected to the inverter, the control circuitry identifies the model and informs the code of the accessory connected in parameter P0027. The accessory must be installed or modified with the inverter de-energized. They may be ordered separately, and are sent in their own package containing the components and manuals with detailed instructions for their installation, operation and setting.

13 TECHNICAL SPECIFICATIONS

13.1 Power Data

Power Supply:
- Tolerance: -15 % to +10 %.
- 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 10 connections (power up cycles - ON/OFF) per hour (1 every 6 minutes).
- Typical efficiency: ≥ 97 %.

13.2 Electronics/General Data

Table 8: *Electronics/general data*

Control	Method	- Type of control:
		  - V/f (Scalar)
		  - VVW: Voltage vector control
		- PWM SVM (Space Vector Modulation)

	Output frequency	- 0 to 500 Hz, resolution of 0.015 Hz
Performance	V/f control	- Speed regulation: 1 % of the rated speed (with slip compensation) - Speed variation range: 1:20
	Vector control (VVW)	- Speed regulation: 1 % of the rated speed - Speed variation range: 1:30
Inputs (*)	Analog	- 1 insulated input. Levels: (0 to 10) V or (0 a 20) mA or (4 to 20) mA - Linearity error ≤ 0.25 % - Impedance: 100 kΩ for voltage input, 500 Ω for current input - Programmable functions - Maximum voltage permitted in the input: 30 Vdc

Inputs (*)	Digital	- 4 insulated inputs
		- Programmable functions:
		  - active high (PNP): maximum low level of 15 Vdc
		  minimum high level of 20 Vdc
		  - active low (NPN): maximum low level of 5 Vdc
		  minimum high level of 9 Vdc
		- Maximum input voltage of 30 Vdc
		- Input current: 4.5 mA
		- Maximum input current: 5.5 mA

Outputs (*)	Analog	- 1 insulated output. Levels (0 to 10) V or (0 to 20) mA or (4 to 20) mA - Linearity error ≤ 0.25 % - Programmable functions - R_L ≥ 10 kΩ (0 to 10 V) or R_L ≤ 500 Ω (0 to 20 mA / 4 to 20 mA)
	Relay	- 1 relay with NA/NC contact - Maximum voltage: 240 Vac - Maximum current: 0.5 A - Programmable functions
	Transistor	- 1 insulated digital output open sink (uses as reference the 24 Vdc power supply) - Maximum current 150 mA(**) (maximum capacity of the 24 Vdc) power supply) - Programmable functions
	Power supply	- 24 Vdc -15 % + 20 % power supply. Maximum capacity: 150 mA (**) - 10 Vdc power supply. Maximum capacity: 2 mA
Communication	Interface RS-485	- Insulated RS485 - Modbus-RTU protocol with maximum communication of 38.4 kbps
Safety	Protection	- Overcurrent/phase-phase short circuit in the output - Overcurrent/phase-ground short circuit in the output - Under/overvoltage - Overtemperature in the heatsink - Overload in the motor - Overload in the power module (IGBTs) - External alarm/fault - Setting error

Human-machine interface (HMI)	Standard HMI	- 9 keys: Start/Stop, Up arrow, Down arrow, Direction of Rotation, Jog, Local/Remote, BACK/ESC and ENTER/MENU
		- LCD display
		- View/edition of all parameters
		- Indication accuracy:
		  - current: 5 % of the rated current
		  - speed resolution: 0.1 Hz

Enclosure	IP20	- Models of frames A, B, C, D and E
	Nema1/IP20	- Models of frames A, B, C, D and E with kit NEMA1

(*) The number and/or type of analog/digital inputs/outputs may vary. Depending on the Plug-in module (accessory) used. For the table above, it was considered the standard plug-in module. For further information, refer to the programming manual and the guide supplied with the optional item.
(**) The maximum capacity of 150 mA must be considered adding the load of the 24 V power supply and transistor output, that is, the sum of the consumption of both must not exceed 150 mA.

14 CONSIDERED STANDARDS

Table 9: *Considered standards*

Safety standards	- UL 508C - power conversion equipment. - UL 840 - insulation coordination including clearances and creepage distances for electrical equipment. - EN 61800-5-1 - safety requirements electrical, thermal and energy. - EN 50178 - electronic equipment for use in power installations. - EN 60204-1 - safety of machinery. Electrical equipment of machines. Part 1: general requirements. **Note:** for the machine to comply with this standard, the manufacturer of the machine is responsible for installing an emergency stop device and equipment to disconnect the input power supply. - 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) standards	- EN 61800-3 - adjustable speed electrical power drive systems - part 3: EMC product standard including specific test methods. - EN 61000-4-2 - electromagnetic compatibility (EMC) - part 4: testing and measurement techniques - section 2: electrostatic discharge immunity test. - EN 61000-4-3 - electromagnetic compatibility (EMC) - part 4: testing and measurement techniques - section 3: radiated, radio-frequency, electromagnetic field immunity test. - EN 61000-4-4 - electromagnetic compatibility (EMC) - part 4: testing and measurement techniques - section 4: electrical fast transient/burst immunity test. - EN 61000-4-5 - electromagnetic compatibility (EMC) - part 4: testing and measurement techniques - section 5: surge immunity test. - EN 61000-4-6 - electromagnetic compatibility (EMC)- part 4: testing and measurement techniques - section 6: immunity to conducted disturbances, induced by radio-frequency fields.
Mechanical construction standards	- EN 60529 - degrees of protection provided by enclosures (IP code). - UL 50 - enclosures for electrical equipment.

15 LIST OF MODELS CFW500 SERIES

Table 10: *List of models of CFW500 series, main electrical specifications*

Inverter	Number of Input Phases	Power Supply Rated Voltage [Vrms]	Frame Size	Output Rated Current [Arms]	Maximum Motor [HP/ kW]	Recommended Fuse I²t [A²s]	Recommended Fuse Current [A]	Recommended Fuse Recommended WEG aR Fuse	Circuit Breaker [A]	Circuit Breaker WEG	Power Wire Size mm² (AWG)	Grounding Wire Size mm² (AWG)	Dynamic Braking Maximum Current (I_{max}) [A]	Dynamic Braking Recommended Resistor [Ω]	Dynamic Braking Braking rms Current [A]	Dynamic Braking Power Wire Size for DC+ and BR Terminals mm² (AWG)
CFW500A01P6S2	1	220 ... 240	A	1,6	0,25/0,18	373	20 (2)	FNH00-20K-A	5,5	MPW18-3-D063	1,5 (16)	2,5 (14)	Dynamic braking not available			
CFW500A02P6S2				2,6	0,5/0,37	373	20 (2)	FNH00-20K-A	9,0	MPW18-3-U010	1,5 (16)	2,5 (14)				
CFW500A04P3S2				4,3	1/0,75	373	25 (2)	FNH00-25K-A	13,5	MPW18-3-U016	1,5 (16)	2,5 (14)				
CFW500A07P0S2				7,0	2/1,5	800	40 (2)	FNH00-40K-A	25	MPW40-3-U025	4,0 (12)	4,0 (12)				
CFW500B07P3S2	1		B	7,3	2/1,5	450	40 (2)	FNH00-40K-A	25	MPW40-3-U025	2,5 (14)	4,0 (12)	10	39	7	2,5 (14)
CFW500B10P0S2				10	3/2,2	450	63 (2)	FNH1-63K-A	32	MPW40-3-U032	4,0 (12)	4,0 (12)	15	27	11	2,5 (14)
CFW500A01P6B2	1/3		A	1,6	0,25/0,18	680	20 (2)	FNH00-20K-A	5,5/2,5 (1)	MPW18-3-D063 / MPW18-3-D025 (1)	1,5 (16)	2,5 (14)	Dynamic braking not available			
CFW500A02P6B2				2,6	0,5/0,37	680	20 (2)	FNH00-20K-A	9,0/4,0 (1)	MPW18-3-U010 / MPW18-3-U004 (1)	1,5 (16)	2,5 (14)				
CFW500A04P3B2				4,3	1/0,75	680	25/20 (1) (2)	FNH00-25K-A / FNH00-20K-A (1)	14/6,3 (1)	MPW18-3-U016 / MPW18-3-D063 (1)	1,5 (16)	2,5 (14)				
CFW500B07P3B2			B	7,3	2/1,5	450	40/20 (1) (2)	FNH00-40K-A / FNH00-20K-A (1)	25/12 (1)	MPW40-3-U025 / MPW18-3-U016 (1)	2,5/1,5 (14/16) (1)	4,0 (12)	10	39	7	2,5 (14)
CFW500B10P0B2				10	3/2,2	450	63/25 (1) (2)	FNH1-63K-A / FNH00-25K-A (1)	32/16 (1)	MPW40-3-U032 / MPW18-3-U016 (1)	4,0/2,5 (12/14) (1)	4,0 (12)	15	27	11	2,5 (14)
CFW500A07P0T2	3		A	7,0	2/1,5	680	20 (2)	FNH00-20K-A	10	MPW18-3-U010	1,5 (16)	2,5 (14)	Dynamic braking not available			
CFW500A09P6T2				9,6	3/2,2	1250	25 (2)	FNH00-25K-A	16	MPW18-3-U016	2,5 (14)	2,5 (14)				
CFW500B16P0T2			B	16	5/3,7	1000	40 (2)	FNH00-40K-A	25	MPW40-3-U025	4,0 (12)	4,0 (12)	20	20	14	4,0 (12)
CFW500C24P0T2			C	24	7,5/5,5	1000	63 (2)	FNH00-63K-A	40	MPW40-3-U040	6,0 (10)	4,0 (12)	26	15	13	6 (10)
CFW500D28P0T2			D	28	10/7,5	2750	63 (2)	FNH00-63K-A	40	MPW40-3-U040	10,0 (8)	10,0 (8)	38	10	18	10 (8)
CFW500D33P0T2				33	12,5/9,2	2750	80 (3)	FNH00-80K-A	50	MPW65-3-U050	10,0 (8)	10,0 (8)	45	8,6	22	10 (8)
CFW500D47P0T2				47	15/11	2750	100 (3)	FNH00-100K-A	65	MPW65-3-U065	10,0 (8)	10,0 (8)	45	8,6	22	10 (8)
CFW500E56P0T2			E	56	20/15	6600	125 (4)	FNH00-125K-A	80	MPW80-3-U080	16 (6)	16 (6)	95	4,7	48	16 (6)
CFW500A01P0T4		380 ... 480	A	1,0	0,25/0,18	450	20 (2)	FNH00-20K-A	1,6	MPW18-3-D016	1,5 (16)	2,5 (14)	Dynamic braking not available			
CFW500A01P6T4				1,6	0,5/0,37	450	20 (2)	FNH00-20K-A	2,5	MPW18-3-D025	1,5 (16)	2,5 (14)				
CFW500A02P6T4				2,6	1,5/1,1	450	20 (2)	FNH00-20K-A	4,0	MPW18-3-U004	1,5 (16)	2,5 (14)				
CFW500A04P3T4				4,3	2/1,5	450	20 (2)	FNH00-20K-A	6,3	MPW18-3-D063	1,5 (16)	2,5 (14)				
CFW500A06P1T4				6,1	3/2,2	450	20 (2)	FNH00-20K-A	10	MPW18-3-U010	1,5 (16)	2,5 (14)				
CFW500B02P6T4			B	2,6	1,5/1,1	450	20 (2)	FNH00-20K-A	4,0	MPW18-3-U004	1,5 (16)	2,5 (14)	6	127	4,5	1,5 (16)
CFW500B04P3T4				4,3	2/1,5	450	20 (2)	FNH00-20K-A	6,3	MPW18-3-D063	1,5 (16)	2,5 (14)	6	127	4,5	1,5 (16)
CFW500B06P5T4				6,5	3/2,2	450	20 (2)	FNH00-20K-A	10	MPW18-3-U010	1,5 (16)	2,5 (14)	8	100	5,7	2,5 (14)
CFW500B10P0T4				10	5/3,7	1000	25 (2)	FNH00-25K-A	16	MPW18-3-U016	2,5 (14)	2,5 (14)	16	47	11,5	2,5 (14)
CFW500C14P0T4			C	14	7,5/5,6	1000	35 (2)	FNH00-35K-A	20	MPW40-3-U020	4,0 (12)	4,0 (12)	24	33	14	6 (10)
CFW500C16P0T4				16	10/7,5	1000	35 (2)	FNH00-35K-A	25	MPW40-3-U025	4,0 (12)	4,0 (12)	24	33	14	6 (10)
CFW500D24P0T4			D	24	15/11	1800	60 (3)	FNH00-63K-A	40	MPW65-3-U040	6,0 (10)	6,0 (10)	34	22	21	10 (8)
CFW500D31P0T4				31	20/15	1800	60 (3)	FNH00-63K-A	50	MPW65-3-U050	10,0 (8)	10,0 (8)	48	18	27	10 (8)
CFW500E39P0T4			E	39	25/18,5	2100	80 (4)	FNH00-80K-A	50	MPW65-3-U050	10 (8)	10 (8)	78	8,6	39	10 (8)
CFW500E49P0T4				49	30/22	13000	100 (4)	FNH00-100K-A	65	MPW65-3-U065	10 (8)	10 (8)	78	8,6	39	10 (8)
CFW500C01P7T5		500 ... 600	C	1,7	1/0,75	495	20 (2)	FNH00-20K-A	2,5	MPW18-3-D025	1,5 (16)	2,5 (14)	1,2	825	0,6	1,5 (16)
CFW500C03P0T5				3,0	2/1,5	495	20 (2)	FNH00-20K-A	4	MPW18-3-U004	1,5 (16)	2,5 (14)	2,6	392	1,3	1,5 (16)
CFW500C04P3T5				4,3	3/2,2	495	20 (2)	FNH00-20K-A	6,3	MPW18-3-D063	1,5 (16)	2,5 (14)	4	249	2	1,5 (16)
CFW500C07P0T5				7,0	5/3,7	495	20 (2)	FNH00-20K-A	10	MPW18-3-U010	2,5 (14)	2,5 (14)	6	165	3	1,5 (16)
CFW500C10P0T5				10	7,5/5,5	495	25 (2)	FNH00-20K-A	16	MPW18-3-U016	2,5 (14)	2,5 (14)	9	110	4,5	1,5 (16)
CFW500C12P0T5				12	10/7,5	495	25 (2)	FNH00-20K-A	16	MPW18-3-U016	2,5 (14)	2,5 (14)	12,2	82	6,1	1,5 (16)

(1) The first number refers to the single-phase and the second to the three-phase supply.
(2) In order to comply with UL508C standard, use UL ultra fast fuses, for frames A, B, and C.
(3) In order to comply with UL508C standard, use fuses UL type J for frame D.
(4) The models of the CFW500 frame E are under certification process. Therefore, they still do not have UL certification.