Motors | Automation | Energy | Coatings

Frequency Inverter

Convertidor de Frecuencia

Inversor de Freqüência

Frequenzumrichter

Variateur de Vitesse

Frequentie-Omzetter

Frekvensomriktare

Преодразователь частоты

CFW-09

User's Guide
Manual del Usuario
Manual do Usuário
Bedienungsanleitung
Guide d'instalation et d'exploitation
Installatie en Gebruikshandleiding
Bruksanvisning
Руководство пользователя

FREQUENCY INVERTER MANUAL

Series: CFW-09

Software: version 4.0X

Language: English

Document: 0899.5306 / 12

09/2008

ATTENTION!

It is very important to check if the inverter software version is the same as indicated above.

3.3 European EMC Directive - Requirements for Conforming Installations

The CFW-09 inverter series was designed taking in consideration safety and EMC aspects. The CFW-09 units do not have an intrinsic function until connected with other components (e.g. a motor). Therefore, the basic product is not CE marked for compliance with the EMC Directive. The end user takes personal responsibility for the EMC compliance of the whole installation. However, when installed according to the recommendations described in the product manual and including the recommended filters/EMC measures the CFW-09 fulfill all requirements of the EMC Directive (89/336/EEC) as defined by the Product Standard EN61800-3 “Adjustable speed electrical power drives systems”, specific for variable speed drives systems.
Compliance of the whole series of the CFW-09 is based on testing some representative models. A Technical Construction File was checked and approved by a Competent Body.
The CFW-09 inverter series are intended for professional applications only. Therefore, the harmonic current emissions defined by the standards EN 61000-3-2 and EN 61000-3-2/A 14 do not apply.

NOTE!

- ☑ The 500-600 V models are intended to be connected to an industrial low voltage power supply network, or public network which does not supply buildings used for domestic purpose - second environment according to the EN61800-3 standard.
- ☑ The filters specified in items 3.3.2 and 3.3.3 do not apply to the 500-600 V models.

3.3.1 Installation

For installing the frequency inverters in accordance to the Product Standard EN61800-3 the following items are required:

1. Output cables (motor wiring) must be flexible armored or to be installed inside a metallic conduit or in a tray with equivalent attenuation.

2. The control (inputs and outputs) and signal wiring must be shielded or installed inside a metallic conduit or a tray with equivalent attenuation.

3. It is essential to follow the grounding recommendations presented in this manual.

4. **For first environment (low-voltage public network)**: install an RFI filter (radio-frequency interference filter) at inverter input.

5. **For second environment (industrial areas) and unrestricted distribution (EN61800-3)**: install an RFI filter at inverter input.

NOTE!

The use of a filter requires:

- ☑ The cable’s shielding must be solidly connected to the common backplane, using brackets.
- ☑ The inverter and the filter must be mounted in close proximity, electrically connected, to one another, on the same metallic backplane. The wiring between them should be kept as short as possible.

Two filters are suggested: Epcos and Schaffner, detailed on the following items 3.3.2 and 3.3.3. Figures 3.18 and 3.19 present a connection diagram for EMC filters, Epcos and Schaffner respectively.

Description of conducted emission classes according to the standard EN61800-3:

- ☑ Class B: first environment, unrestricted distribution
- ☑ Class A1: first environment, restricted distribution
- ☑ Class A2: second environment, unrestricted distribution

ATTENTION!

For installation with inverters that complies class A1 (first environment restricted distribution), note that this is a product of the restricted sales distribution class according to IEC/EN61800-3 (1996) + A11 (2000). In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

ATTENTION!

For installation with inverters that complies class A2 (second environment unrestricted distribution), note that this product is not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference is expected if used on such a network.

3.3.2 Epcos Filters

The following tables 3.9, 3.10 and 3.11 show the Epcos filters for CFW-09 frequency inverters with 380-480 V, 500-600 V and 660-690 V power supply respectively, the maximum motor cable length for conducted emission classes A1, A2 and B (according to EN61800-3) and the electromagnetic radiation disturbance level.

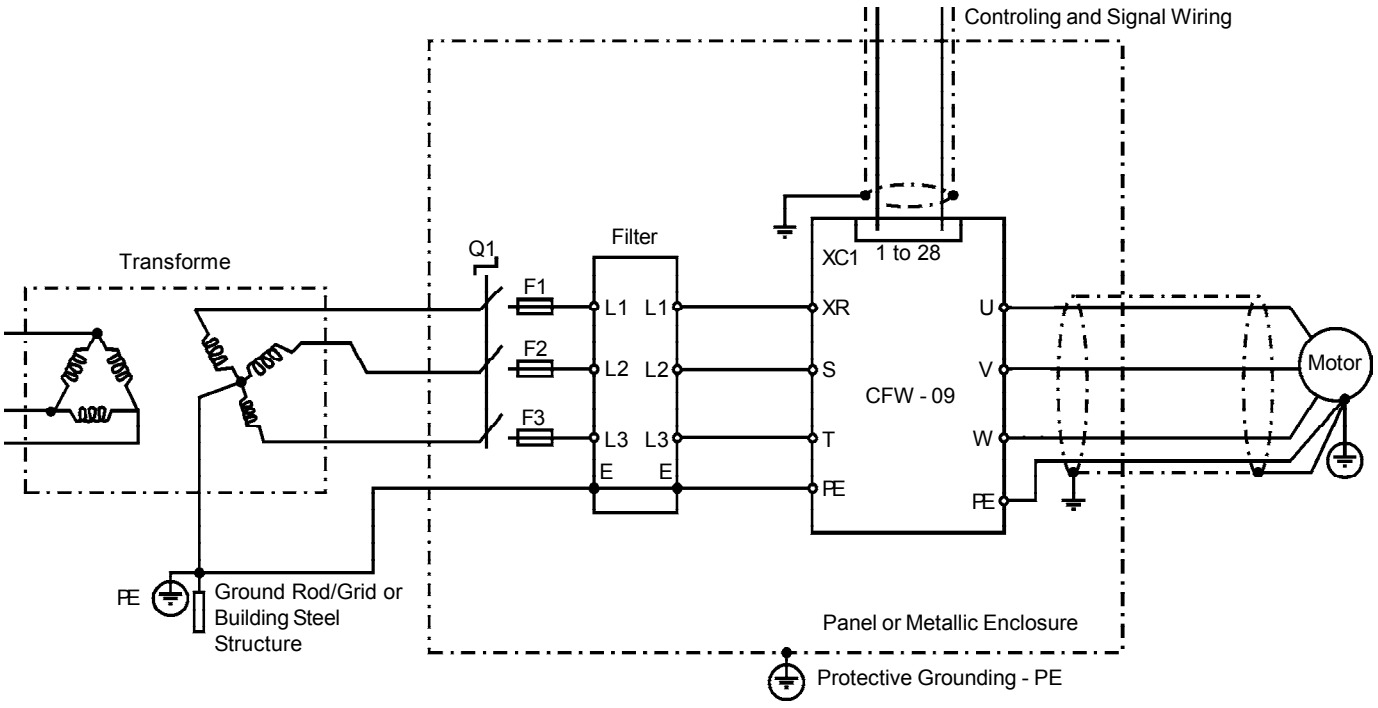

Figure 3.18 *- Epcos EMC filters connection in CFW-09 frequency inverters*

380-480 V power supply:

Inverter Model	Load Type	Epcos Input Filter	Maximum motor cable length according to conducted emission class (EN61800-3)			Inside metallic panel	Electromagnetic radiation disturbance level (Product Standard EN61800-3 (1996)+A11 (2000))
			Class A2	Class A1	Class B		
3.6 A (2)	CT/VT	B84143A8R105	100 m	50 m	20 m	NO	First environment, restricted distribution
4 A (2)	CT/VT						Second environment, unrestricted distribution
5.5 A (2)	CT/VT						Second environment, unrestricted distribution
9 A (2)	CT/VT	B84143A16R105					Second environment, unrestricted distribution
13 A	CT/VT		N/A	100 m	35 m		First environment, restricted distribution
16 A	CT/VT	B84143A25R105					First environment, restricted distribution
24 A	CT/VT	B84143A36R105					First environment, restricted distribution
30 A	CT		85 m	50 m	N/A		First environment, restricted distribution
	VT	B84143A50R105					
38 A (3)	CT		100 m				First environment, restricted distribution
	VT	B84143A66R105					
45 A (3)	CT						First environment, restricted distribution
	VT						
60 A	CT	B84143A90R105	100 m	25 m		YES	Second environment, unrestricted distribution
	VT						
70 A	CT						Second environment, unrestricted distribution
	VT	B84143A120R105					
86 A	CT						First environment, restricted distribution
	VT	B84143G150R110					
105 A	CT						First environment, restricted distribution
	VT	B84143G220R110					
142 A (3)	CT						First environment, restricted distribution
	VT						
180 A	CT/VT		N/A	100 m			First environment, restricted distribution
211 A	CT/VT						First environment, restricted distribution
240 A	CT/VT	B84143B320S20	100 m	25 m			First environment, restricted distribution
312 A (3)	CT/VT						First environment, restricted distribution
361 A (3)	CT/VT	B84143B400S20					First environment, restricted distribution
450 A	CT/VT	B84143B600S20					First environment, restricted distribution
515 A	CT/VT						First environment, restricted distribution
600 A	CT/VT	B84143B1000S20 (1)					First environment, restricted distribution

N/A = Not Applicable – The inverters were not tested with these limits.

Notes:

(1) The RFI filter suggested above for model 600 A/380-480 V considers a power supply with 2 % voltage drop. For a power supply with 4 % voltage drop it's possible to use B84143B600S20 RFI filter. In this case, consider the same motor cable lengths and radiated emission data as shown in table above.

(2) Minimum output frequency = 2.9 Hz.

(3) Minimum output frequency = 2.4 Hz.

Table 3.9 - *Epcos filters list for CFW-09 inverter series with 380-480 V power supply*

8.8 LOAD REACTOR

The use of a three-phase load reactor, with an approximate 2 % voltage drop decreases the dv/dt (voltage rising rate) of the PWM pulses commonly generated at the inverter output of any AC frequency converter.
This practice reduces the voltage spikes on the motor windings and leakage currents that may be generated when long distance cables between inverter and motor are used.
There are many factors that influence the peak level (Vp) and rise time (tr) of voltage spikes: Cable type, cable length, motor size, switching frequency and other variables all affect Vp and dv/dt.
WEG, as specialists in both VSDs and motors are able to provide an integrated solution. The load reactor value is calculated in the same way as the line reactor (refer to item 8.7.1).
If the cables between inverter and motor are longer than 100 m (300 ft), the cable capacitance to ground may cause nuisance overcurrent (E00) or ground fault (E11) trips. In this case it is also recommended to use a load reactor.

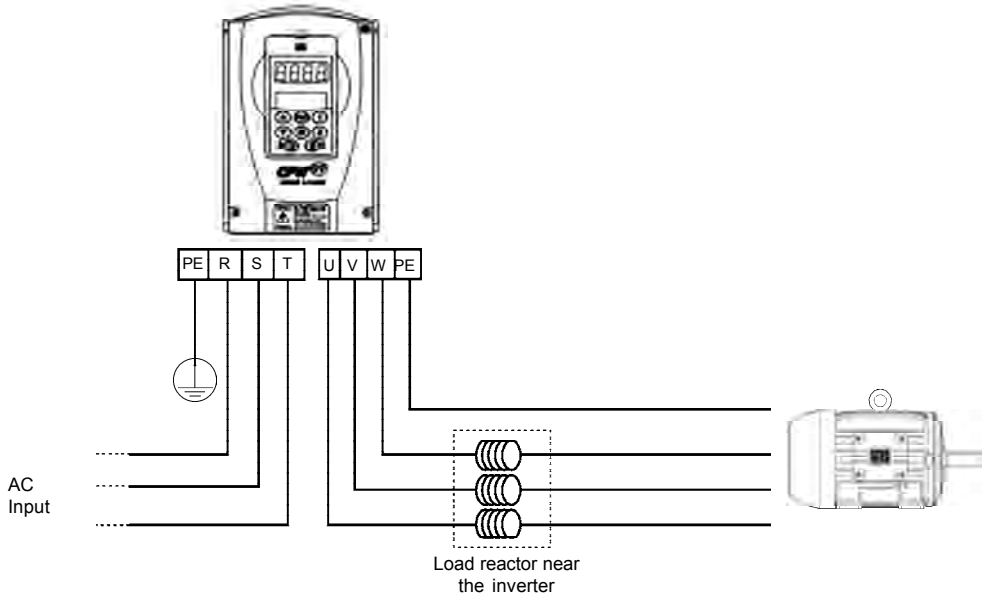

Figure 8.20 *– Load reactor connection*

8.9 RFI FILTER

The installation of frequency inverters requires certain care in order to prevent electromagnetic interference (EMI). This interference may disturb the operation of the inverter itself or other devices, such as, electronic sensors, PLCs, transducers, radio equipment, etc.
To avoid these problems, follow the installation instructions contained in this Manual. Never install electromagnetic noise generating circuits such as input power and motor cables near analog signal or control cables.
Care should also be taken with the radiated interference, by shielding the cables and circuits that tend to emit electromagnetic waves and cause interference.
The electromagnetic interference can also be transmitted through the power supply line. This type of interference is minimized in the most cases by capacitive Radio Frequency Filters (common and differential mode) which are already installed inside the CFW-09. However, when inverters are installed in residential areas, the installation of an external additional filter may be required. In this case contact WEG to select the most suitable filter type.

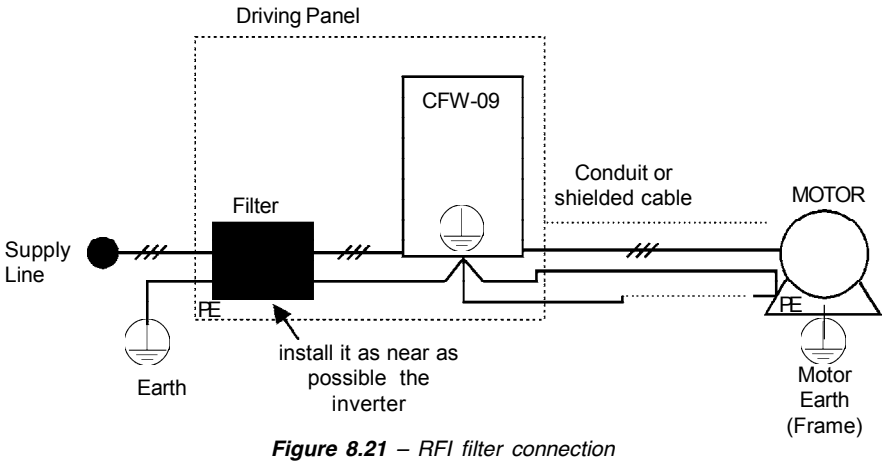

***Figure 8.21** – RFI filter connection*

Instructions for the RFI filter installation:

- ☑ Install the inverter and the filter on a metallic grounded plate as near to each other as possible and ensure a good electrical contact between the grounded plate and the inverter and filter frames;
- ☑ If the cable between inverter and filter is longer than 30 cm (12 in), use a shielded cable and ground each shield end on the grounded mounting plate.

NOTE!
Installations that must meet the European standards, refer to item 3.3.

8.10 DYNAMIC BRAKING

The amount of braking torque that can be generated when a motor is controlled by an inverter, without dynamic braking or any other braking schemes, varies from 10 % to 35 % of the motor rated torque.
During the deceleration process, the kinetic energy of the load is regenerated into the inverter's DC Link. This energy loads up the capacitors increasing the DC Link voltage. When this energy is not fully dissipated, it may generate a DC Link overvoltage trip (E01).
To obtain higher braking torque, the use of Dynamic Braking, where the excess regenerated energy is dissipated in an external resistor, is recommended.
The Dynamic Braking is used in cases where short braking times are required or where high inertia loads are driven.
For Vector Control Modes the "Optimal Braking" feature can be used and in many cases eliminate the need for Dynamic Braking. Refer to chapter 6, Parameter **P151**.

NOTE!
If dynamic braking will be used, set **P151** to its maximum value.

8.10.1 DB Resistor Sizing

For a precise sizing of the dynamic braking resistor, application data, such as: deceleration time, load inertia and braking duty cycle must be considered.

The RMS current capacity of the inverter's dynamic braking transistor must also be taken into account, as well as its maximum peak current, which defines the minimum resistance value (ohms) of the braking resistor. Refer to table 8.12.

The DC Link voltage level at which dynamic braking is activated is defined by the Parameter **P153** – Dynamic Brake Level.