Programmable Controller
PLC Board

Controlador Programable
Tarjeta PLC

Controlador Programável
Cartão PLC

PLC-01

CFW 09

User´s guide

Guia del usuario

Manual do usuário

MANUAL
PLC1.01 BOARD

PROGRAMMABLE IN LADDER LANGUAGE

BY WLP SOFTWARE

10/2005

PLC1 Software: V1.7X

0899.5135 E/3

The table below describes all revisions made to this manual.

Revision	Description	Section
1	First Edition	-
2	Functions related to the Online Monitoring	-
3	General Review and Inclusion of CANopen and DeviceNet protocols	-

Summary

QUICK PARAMETER REFERENCE, FAULT MESSAGES

Software: V1.7X
Application:
Model:
Serial Number:
Responsible:
Date: /   /   .

The parameter range starts from 750 up to 899, totalizing 150 parameters. The first 50 parameters are predefined by the system or are reserved parameters. The 100 remaining parameters are for general use and may be set by the user.

Please find below a description of the parameters defined by the system.

I. Parameters

Parameter	Function	Adjustable Range	Factory Setting	Unit	Page
P750	PLC1 firmware version [Read]	Related to the purchased board	-	-	21
P751	Scan cycle in 100µs units [Read]	0 to 65535	-	x100µs	21
P752 (*)	Resets the retentive markers [Configuration]	0 = no action 1 = reset register	0 = no action	-	21
P753 (*)	Loads factory settings, if =1234 [Configuration]	0 to 65535	0	-	21
P754	Position reference (rotations) [Read]	0 to 65535	-	rot	21
P755	Position reference (fraction of rotation) [Read]	0 to 65535	-	degrees / 10	21
P756	Position signal [Read]	0 = negative 1 = positive	-	-	21
P757	Real position (rotations) [Read]	0 to 65535	-	rot	21
P758	Real position (fraction of rot.) [Read]	0 to 3599	-	degrees / 10	21
P760	Kp: proportional position gain [Configuration]	0 to 200	50	-	22
P761	Ki: Integral position gain [Configuration]	0 to 200	0	-	22
P762	Max. lag error [Configuration]	0 to 65535	0	degrees / 10	22
P763	Disables user program if =1 [Configuration]	0=program enable 1=program disable	0	-	22
P764 (*)	PLC address at netwrok [Configuration]	1 to 247	1	-	22
P765 (*)	Baud rate of RS232 [Configuration]	1 = 1200bps 2 = 2400bps 3 = 4800bps 4 = 9600bps 5 = 19200bps	4 = 9600bps	bits/second	22
P766	Status of the Digital Inputs [Read]	0=resolver (SCA-05) 1=encoder (X8)	-	-	22
P767 (*)	Synchronou speed of the motor in rpm [Configuration]	0 to 10000	1800	rpm	23

(*) IMPORTANT: to enable the system to operate according the parameter seeting, the system must be reset after one or more parameters have been changed.

Parameter	Function	Adjustable Range	Factory Setting	Unit	Page
P768 (*)	Encoder pulse number [Configuration]	0 to 65535	1024	ppr	23
P769 (*)	Encoder zero pulse position [Configuration]	0 to 3599	0	degrees / 10	23
P770	CAN Protocol [Configuration]	0 = Disabled 1 = CANopen 2 = DeviceNet	0 = Disabled	-	23
P771	CAN Address [Configuration]	0 to 127	63	-	23
P772	CAN Baudrate [Configuration]	0=1Mbit/s 1=Reserved 2=500 Kbit/s 3=250 Kbit/s 4=125 Kbit/s 5=100 Kbit/s 6=50 Kbit/s 7=20 Kbit/s 8=10 Kbit/s	0=1Mbit/s	bits/second	24
P773	Bus off recovery [Configuration]	0=Manual 1=Automatic	0=Manual	-	24
P774	Action to be taken upon detection of a communication failure [Configuration]	0=Indicate the error 1=Cause a fatal error on the device	1	-	24
P775	CAN Status [Read]	0=Disable 1=Reserved 2=CAN enable 3 = Warning 4= Error pacive 5= Bus off 6 = Not Powered	-	-	25
P776	Counter of received telegrams [Read]	0 to 65535	-	-	25
P777	Counter of trasmitted telegrams [Read]	0 to 65535	-	-	25
P778	Counter of detected erros [Read]	0 to 65535	-	-	25
P780	Status of the CANopen network [Read]	0=Disabled 1=Reserved 2=CANopen enabled 3=Node Guarding enabled 4=Node Guarding error	-	-	26
P781	Status of the CANopen node [Read]	0=Not initialized 4=Stopped 5=Operational 127=Pre-operational	-	-	26
P782	Status of the DeviceNet network [Read]	0=Not Powered / Not On-line 1=On-line / Not Connected	-	-	26

Parameter	Function	Adjustable Range	Factory Setting	Unit	Page
		2=Link OK / Online and Connected 3=Connection Timeout 4=Critical Link Failure 5=Running Auto-baud			
P783	Status of the DeviceNet Master [Read]	0 = Run 1 = Idle	-	-	27
P784	Number of input words [Read]	1 to 10	1	-	27
P785	Number of output words [Read]	1 to 10	1	-	27

II. Error Messages

Display	Description	Note
E50	Lag error	Fatal Error, it disables the converter. Refer to Parameter P762.
E51	Error during program saving	Reset the systems and try again.
E52	Two or more movements enabled simultaneously	Check the user program logic
E53	Movement data are not valid	Perhaps some speed, acceleration value, etc. was reset to zero.
E54	Inverter disabled	Attempt to execute some movement with disabled inverter
E55	Incompatible program or out of memory limits	Check program and install it again. This error also occurs when there is no program installed in the PLC (PLC powered-up first time).
E56	Wrong CRC	Transmit it again.
E57	Shaft has not been referenced to absolute movement	Before an absolut movement, you must set the machine movement to zero position.
E58	Master Reference Fault	Fatal Error: after enabled initial communication, between master and slave, by any cause has been disabled.
E61	Bus off	*Bus off* has been detected on the CAN bus due to a high number of transfer erros. These erros may be caused due to bus problems or due to improper installation.
E65	Node Guarding Error	Specific error for the CANopen communication. For further information, please, refer to the CANopen communication user's guide provided with the product CD.
E66	Master in IDLE mode	Specific error for the CANopen communication. For further information, please, refer to the CANopen communication user's guide provided with the product CD.
E67	Timeout de conexões I/O	Specific error for the CANopen communication. For further information, please, refer to the CANopen communication user's guide provided with the product CD.

Note: In fatal erros, E50 and E58, the inverter is disabled and need restart.

SAFETY NOTICES

This Manual contains all necessary information for the correct installation and operation of the PLC1 with the CFW-09 Variable Frequency Drive.

The PLC1 Manual has been written for qualified personnel with suitable training of technical qualifications to operate this type of equipment

1.1 SAFETY NOTICES IN THE MANUAL

The following Safety Notices will be used in this Manual:

DANGER!
If the recommended Safety Instructions are not strictly observed, it can lead to serious or fatal injuries of personnel and/or equipment damage.

ATTENTION!
Failure to observe the recommended Safety Procedures can lead to material damage.

NOTES!
The content of this Manual supplies important information for the correct
understanding of operation and proper performance of the equipment.

1.2 SAFETY NOTICES ON THE PRODUCT

The following symbols may be attached to the product, serving as Safety Notice:

High Voltages

Components are sensitive to electrostatic discharge. Do not touch them without following proper grounding procedures.

Mandatory connection to ground protection (PE)

Shield connection to ground

1.3   PRELIMINARY
       RECOMMENDATIONS

DANGER!

Only qualified personnel should plan or implement the installation, start-up, operation and maintenance of the CFW-09 and associated equipment.

The personnel must follow all safety instructions included in this Manual and/or defined by the local regulations.

Failure to comply with these instructions may result in personnel injury and/or equipmrnt damage.

NOTES!

In this Manual, qualified personnel are defined as people that are trained to:

1. Install, ground, power up and operate the CFW-09, as well as the PLC1 board, according to this Manual and the local safety procedures;
2. Use the safety equipment according to the local regulations;
3. Give first aid.

DANGER!

Always disconnect the supply voltage before touching any electrical component inside the inverter.

Many components are charged with high voltages, even after the incoming AC power supply has been disconnected or switched OFF. Wait at least 10 minutes for the total discharge of the power capacitors.

Always connect the frame of the equipment to the ground (PE) at the suitable connection point.

ATTENTION!

All electronic boards have components that are sensitive to electrostatic discharges. Never touch any of the electrical components or connectors without following proper grounding procedures. If necessary to do so, touch the properly grounded metallic frame or use a suitable ground strap.

NOTES!

Read this entire Manual carefully and completely before installing or operating PLC1 board with the CFW-09.

GENERAL INFORMATION

This chapter defines the contents and purpose of this manual

This manual provides instructions for installation and use of the PLC1 board.

Chapter 1 - Safety Notices;
Chapter 2 - General Information;
Chapter 3 - Instalation and configuration;
Chapter 4 - Detailed Parameter description.

2.1 ABOUT THIS MANUAL

This Manual provides information required for the correct use of the PLC1. As the PLC1 is very flexible, it allows many different operation modes as described in this Manual. As the PLC1 can be applied in several ways, it is impossible to describe here all application possibilities of this board. WEG does not assume any responsibility when the PLC1 is not used according to this manual.

No part of this Manual may be reproduced in any form, without written consent of WEG.

The communication user's guide for the PLC1 board presented in table 2.1 complements this user's guide. These user's guides are available in PDF format on the product CD and also at WEG website.

The compatibility of these user's guides and the product is directly related to the product software version. Hence, pay attention to the communication user's guide identification (P/1, P/2 ...) when downloading it from the WEG website.

PLC1 V1.7X / User´s Guide	Revision
Serial Communication User's Guide	P/3
CANopen Slave User's Guide	P/2
DeviceNet Slave User's Guide	P/2
WLP User's Guide	P/2

Table 2.1 - Communication user´s guide for the PLC1 board

2.2 ABOUT THE PLC1 BOARD

The PLC1 board adds important PLC (Programmable Logical Controller) functions to the CFW-09, enabling the execution of complex linkage program by using the digital board inputs and outputs as well as the digital and analog inputs and outputs of the own inverter which can be accessed by the user´s program.

Among the several available functions we can mention simple contacts and coils up to functions that uses floating point, such as sum, subtraction, multiplication, division, trigonometry, square root functions, etc.

Other important functions are the PID blocks, high-pass and low-pass filters, saturation, comparison. All these functions operate with floating point.

Besides the functions mentioned above, the PLC1 provides blocks for motor speed and motor position control, that is a trapezoidal-profile positioning and a S-profile positioning, speed reference generation with trapezoidal acceleration ramp, etc. (Note: when positioning functions used, the coupling of an encoder on motor shaft is required).

All functions can interact with the user through the 100 programmable parameters that can be acessed directly through the inverter HMI. The texts and user units of the programmable parameters can be customized by the WLP.

The new Modbus functions introduced with the Version V1.50 of the board PLC1 allow executing advanced on-line monitoring function with the Ladder program through the WLP from Version V4.00 on.

ATTENTION!
The **CFW-09** inverter software version should be the version **V2.40** or later.

2.3   GENERAL CHARACTERISTICS OF THE PLC1

2.3.1   Hardware

The PLC1 board has the following hardware characteristics:
- ☑ 9 isolated digital inputs, bi-directional, 24Vdc;
- ☑ 3 digital relay output 250V x 3A;
- ☑ 3 digital optocoupled outputs, bi-directional, 48Vdc x 500mA;
- ☑ 1 isolated encoder input, with external supply between 18Vdc and 30Vdc;
- ☑ Encoder supply - 15Vdc x 300mA;
- ☑ 1 serial communication interface – RS-232C (standard Protocol: MODBUS-RTU);
- ☑ All sizes compatible with CFW-09;
- ☑ User programming in Ladder language, with specific blocks for positioning and PLC functions
- ☑ It permits the use of digital and analog inputs/ouputs of the CFW-09, comprising 15 digital inputs, 9 digital outputs, 2 analog inputs and 2 analog outputs, accessed by the ladder.

2.3.2   Software

The software for the PLC1 board has the following characteristics:

☑ The Parameter Range comprises the parameter from 750 to 899, totaling 150 parameters. The 50 first parameters are predefined by the system or are reserved parameters. The other 100 remaining parameters are for general use, i. e., they may be programmed by the user and can be used for the most different functions, as contactors, timers, speed, acceleration and position references, etc;

☑ BIT and volatile WORD type Markers (initialized at zero) and retentive and volatile FLOAT type markers;

☑ The programming of the PLC board is performed via WLP Software using the Ladder Logic Language. It is possible to monitor the Ladder logic online with the WLP version V4.00 or higher and the PLC1 firmware version V1.50 or higher.

☑ Memory capacity for the user program: 64kB (65536 bytes).

ATENTTION!
The PLC1 version 1.7X is compatible only with the WLP software version 5.00 or higher.

INSTALLATION AND CONFIGURATION

This chapter is intended to describe the installation and configuration procedures for the PLC1 board.

⚠️ **ATENTTION!**
Follow the instructions included in this user's guide to guarantee the correct installation and operation of the PLC1 board and the CFW-09 drive

3.1   INSTALLING THE PLC BOARD ON THE DRIVE

The PLC1 board is directly installed on the CFW-09 control board (CC9 control board), as presented in figures 3.1 e 3.2.
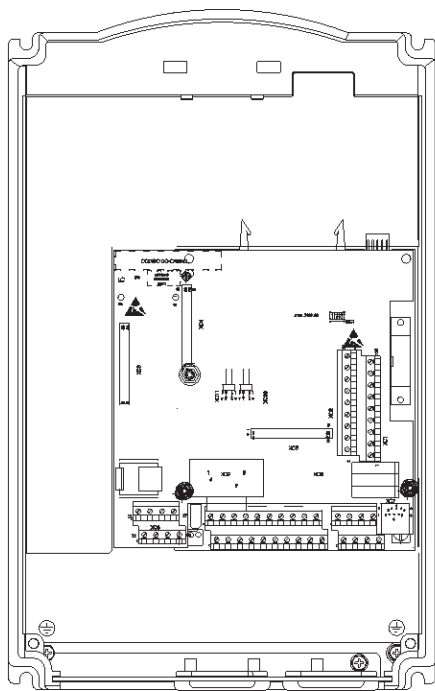
Sizes 1 and 2
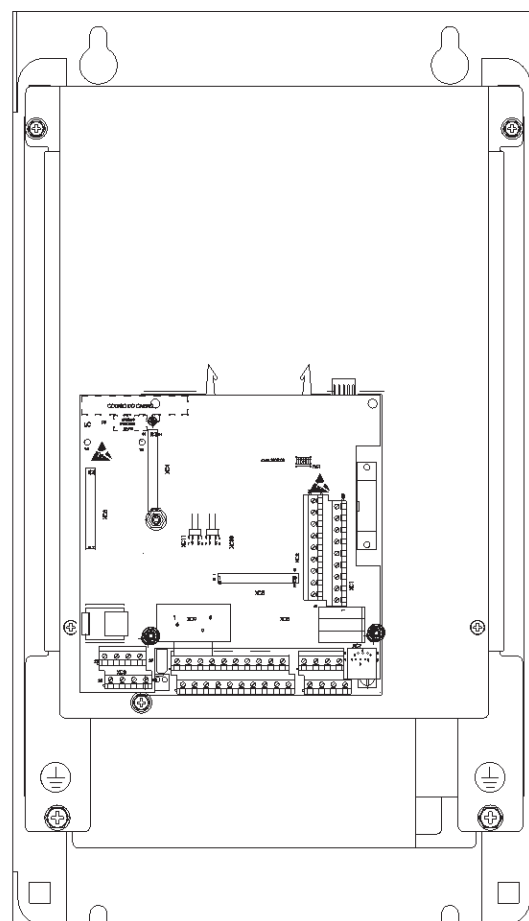
Sizes 3 to 10

Figure 3.1 – *Location of the PLC1 board installation on the CFW-09 drive.*

📑 **NOTES!**
For size 1 drives (models from 6A to 13A/220-230V and models from 3.6A to 9A/380-480V) the plastic side cover shall be removed in order to fit the board in the drive correctly.
For all remaining sizes, the PLC board can be directly fitted in.

Screw M3 x 8
Torque 1Nm
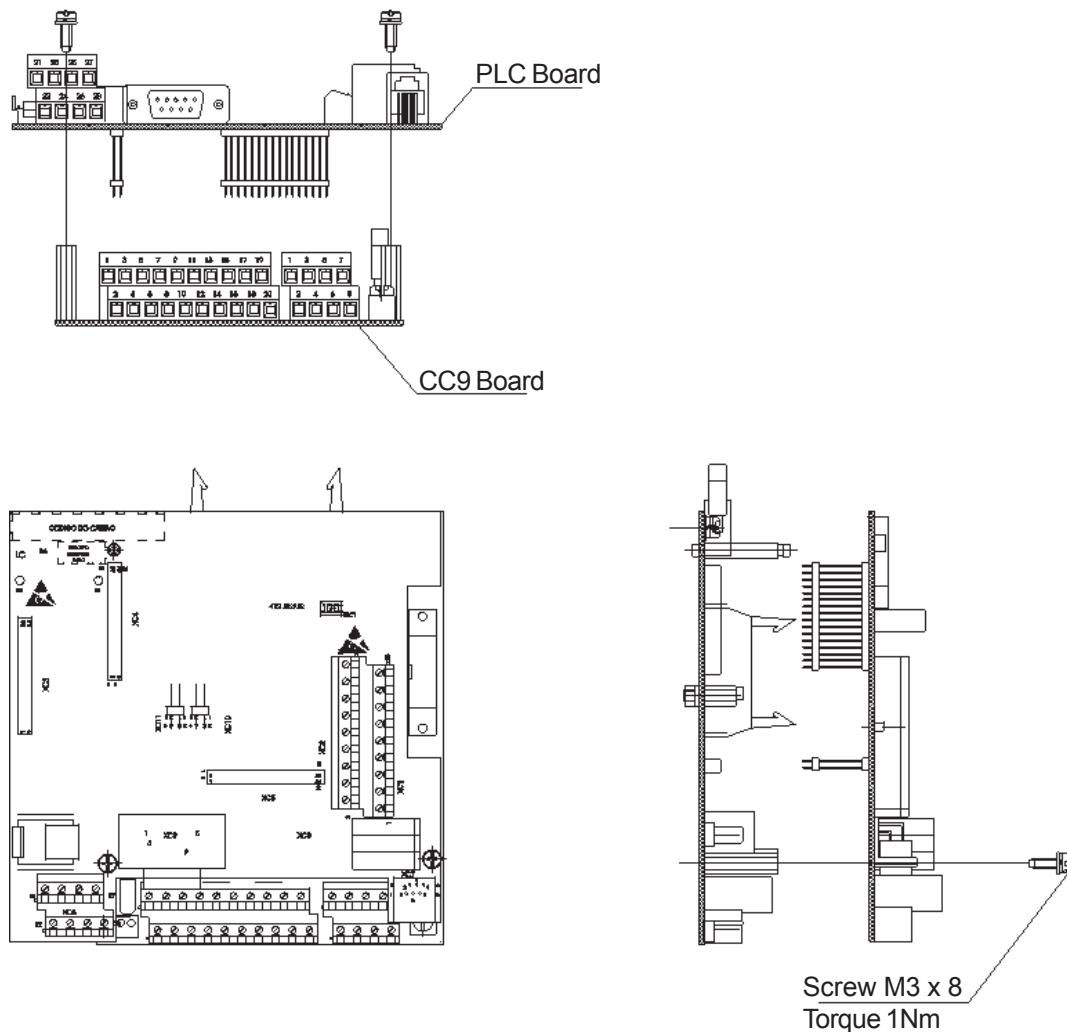
Figure 3.2 - *Seating the PLC1 on the CC9 control board.*

Complete the following steps to install the PLC board:

Step 1 – Disconnect the drive from the power supply and wait at least 15 minutes before touching any electrical components. After that, remove the protective frontal cover of the CFW09.

Step 2 – When using size 1 drives, remove the plastic side cover.

Step 3 – Configure the jumpers of the board according to tables 3.1 and 3.2 of the CONFIGURING THE JUMPERS section.

Step 4 – Seat the PLC board on the CC9 control board aligning the terminals of the XC4 and XC5 connectors (on the PLC board) with the terminals of the female XC140 and XC3 connectors (on the CC9 control board).

Step 5 – Check if all terminals of the XC4 and XC5 connectors are aligned.

Step 6 – Press the center and the left up corner of the board until it is completely seated on the spacers.

Step 7 – Securely tighten the board to the 2 metallic spacers using the bolts provided with the board.

3.2 CONFIGURING THE JUMPERS

Some functions and characteristics of the PLC board operation are defined by the setting of the jumpers on the card (see figure 3.3). The following tables describe the possible configurations for the jumpers and their functions.

XC10 Jumper: Firmware Download

XC10 Jumper	
Open	Normal Operation
Closed	Firmware Download

Tabela 3.1 - XC10 Jumper

XC11 Jumper: Encoder Error

XC11 Jumper	
Open	Enables fault generation for the encoder
Close	Do not generate encoder fault

Tabela 3.2 - XC11 Jumper

3.3 CONNECTORS DESCRIPTION

Figure 3.3 shows the connectors and jumpers available on the PLC1 board.
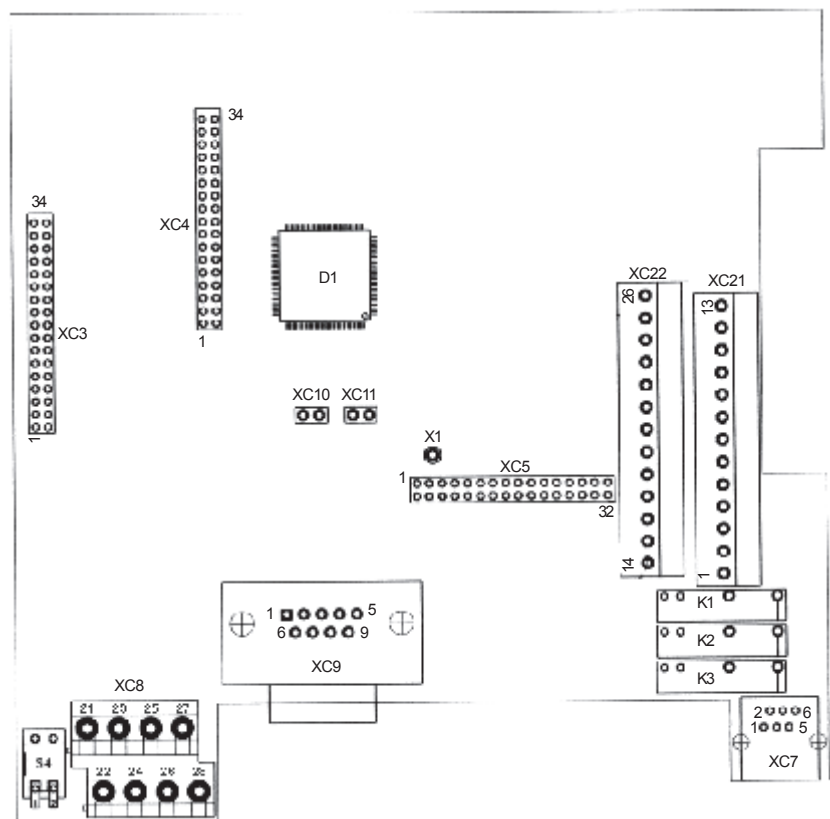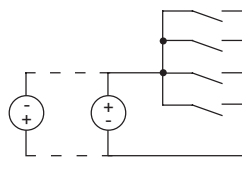
Figure 3.3 - PLC1 board - Connectors

The connectors and their terminals function are described below.
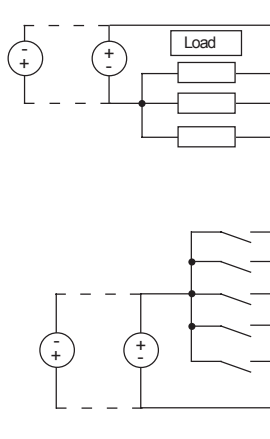
XC21 Connector: Relay outputs and digital inputs

XC21 Connector		Function	Specification
1	DO1	Digital relay outputs	Contact capacity:
2			
3	DO2		3A
4			250Vac
5	DO3		
6			
7	NC	Not connected	
8	NC	Not connected	
9	DI6	Isolated digital Inputs	Input voltage: 15 to 30Vdc
10	DI7		
11	DI8		Input current:
12	DI9		11mA @ 24Vdc
13	COM DI	Common to the inputs DI6 to DI9	

Figure 3.4 - XC21 Connector

XC22 Connector: 24V transistor outputs and digital inputs

XC22 Connector		Function	Specification
14	NC	Not connected	
15	COM DO	Common to the digital outputs DO4, DO5 e DO6	
16	DO6	Bipolar optocoupled digital outputs	Max. voltage: 48Vdc
17	DO5		Current capacity: 500mA
18	DO4		
19	NC	Not connected	
20	NC	Not connected	
21	DI1	Isolated digital inputs	Input voltage: (15 to 30)Vdc
22	DI2		
23	DI3		Input current: 11mA @ 24Vdc
24	DI4		
25	DI5		
26	COM DI	Common to inputs DI1 to DI5	

Figure 3.5 - XC22 Connector

ATTENTION!
(*) External Power Supplies

XC3 Connector: Profibus of the HMS Board

Enable PLC communication Profibus Network.

XC7 Connector: RS-232C

XC7 Connector		Function	Specification
1	5Vdc	5Vdc supply	Current capacity: 50mA
2	RTS	Request to send	
3	GND	Reference	
4	RX	Receives	
5	GND	Reference	
6	TX	Transmits	

Table 3.3 - XC7 Connector

XC8 Connector: Externa 24Vdc input and CAN network

XC8 Connector		Function	Specification
21	CAN GND	CAN GND	
22	24Vdc	Supply for encoder inout	18 to 26Vdc Drawn current: 25mA + the encoder current.
23	CAN L	CANL	
24	GND ENC	24Vdc encoder reference	
25	CAN H	CANH	
26	NC	Not connected	
27	CAN 24Vdc	Network supply CANopen	18 to 26Vdc 50mA @ 24Vdc
28	NC	Not connected	

Table 3.4 - XC8 Connector

XC9 Connector: Incremental Encoder

Applications that require more speed or positioning accuracy, a speed feedback of the motor shaft by means of incremental encoder is required. The inverter connection is realized through the XC9 (DB9) connector of the PLC1 board.

The used encoder should have following features:
- ☑ Supply voltage: 15 Vdc, with current consumption lower than 200 mA;
- ☑ 2 quadrature channels (90°) + zero pulse with
- ☑ supplementary outputs (differential): Signals A, $\overline{A}$, B, $\overline{B}$, Z and $\overline{Z}$;
  "Linedriver" type or "Push-Pull" (level 15Vdc) circuit;
- ☑ Electronic circuit isolated against encoder frame;
- ☑ Number of pulses recommended per revolution: 1024 ppr;

Follow following procedures when encoder is mounted onto motor shaft:

- ☑ Couple the encoder onto the motor shaft directly (by using a flexible coupling, but without torsional flexibility);
- ☑ Both motor shaft and metallic encoder frame must be isolated electrically against motor (min. spacing: 3 mm);
- ☑ Use flexible couplings of high quality to prevent mechanical oscillation or "backlash";

For electrical connection use shielded cable and lay it separately (spacing >25cm) from the oher wirings (power, controle cables, etc). If possible, install it inside a metallic conduit.

During commissioning, program parameter **P202** - control type = 4 (Vector with encoder) to operate the system through speed feedback by incremental encoder.

Encoder connect.***		red
A	A	red
H	$\overline{A}$	blue
B	B	yellow
I	$\overline{B}$	green
C	Z	grey
J	$\overline{Z}$	rose
D	+VE	white
F	COM	brown
E	NC	
G	$\perp$	loop

XC9 Connector		Description
3	A	
2	$\overline{A}$	Encoder signal
1	B	15Vdc
9	$\overline{B}$	diferencial
8	Z	
7	$\overline{Z}$	
4	+VE	Source*
6	COM	Reference 0V**
5	$=$	Ground

Encoder →

Max. recommended length: 100m

Board PLC1

XC9 Connector
(DB9 - male)

* 15V / 220mA power supply for encoder
** Referenced to ground via 1µF in parallel with 1kΩ
*** Valid pin location for encoder HS35B-Dynapar. When other encoder models are used, check the correct connection to meet the required sequence.

Figure 3.6 - Encoder Connection

NOTES!
The max. permitted encoder frequency is 100kHz.

Required sequence for encoder signals:

B ____t

A ____t
Motor is running clockwise
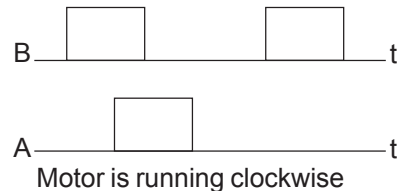
Figure 3.7 - Sequence for encoder signals

3.4 CONFIGURING THE CFW-09 TO OPERATE WITH PLC1 BOARD

In order to enable the CFW-09 to be controlled by the PLC1 board it is necessary to perform the following configurations, depending on the desired functions:

☑ **Control type (P202):**

For the blocks that generate speed reference (JOG and SETSPEED), you can use the converter in 'Sensorless' (**P202=3**) mode. Please consider that in this operation mode there is no high precision at low speed. In addition, the position gain Kp (P760) should be reset to zero to prevent instability when the motor is disabled. For the position blocks (TCURVE and SCURVE), the inverter must be operated in vector mode with encoder (**P202 = 4**).

Important notes:

☑ Always when possible, use the vector mode with encoder;

☑ Avoid scalar mode operation (V/F), if the PLC will generate speed reference;

☑ Check the correct setting of the P161 and P162 parameters that are the proportional speed gain and the integral speed gain, respectively. The correct setting of these parameters are very important for a good inverter performance.

☑ **Local / Remote Selection (P220):**

When the PLC is used as movement generator, this option must be set to 'Always Local' (**P220=0**).

☑ **Local Reference Selection (P221):**

When the PLC is used as movement generator, this option must be set to 'PLC' (**P221=11**), i. e., the speed reference will be given by the PLC board.

☑ **Local Run/Stop Selection (P224)**

To enable the PLC to control the converter through the run/stop options and also enable the PLC to disable the drive, this option must be set to 'PLC' (**P224=4**).

☑ **AO1 Output Function (P251):**

To enable the PLC to control the analog inverter output 1 (AO1), set P251=12. Note that P252 is the gain of the analog output 1.

☑ **AO2 Output Function (P253):**

To enable the PLC to control the analog inverter output 2 (AO2), set P253=12. Note that P254 is the gain of the analog output 2.

☑ **Digital Inputs DI101 to DI106, P263 to P268:**

These parameters correspond to the digital inverter inputs DI1 to DI6 and they are read by the PLC, independent of the functions programmed at the parameters P263 to P268.

☑ **Digital Relay Outputs DO101 to DO103, P277, P279 and P280:**

These Parameters correspond to the RL1 to RL3 drive outputs. To enable the PLC to control these outputs, you must set these parameters to the function 'PLC', i. e. P277=27, P279=27 and P280=27.

DETAILED PARAMETER DESCRIPTION

Parameter	Range [Factory Setting] Unit	Description / Notes
P750 Firmware Version of the PLC board [Read]	- [-] -	☑Example: version 1.30. At the parameter you can read 130.
P751 Scan cycle of the User Program [Read]	- [-] x100 µs	☑It shows the duration of the user program cycle. Each unit corresponds to 100µs. To obtain the value of the scan cycle, divide the value of P751 by 10. Exemple: when 79 is read, this means that the program scan cycle is 79 ÷ 10 = 7,9ms.
P752 (*) Resets retentive markers [Configuration]	0 to 1 [0] -	☑It reset the retentive markers, both bit type and word type. Set the parameter to 1 (one) and restart the system. The value of this parameter returns to 0 (zero) automatically.
P753 (*) Loads default settings, if =1234 [Configuration]	0 to 65535 [0] -	☑It loads the factory setting to the system parameters (750 to P799). Set this parameter to 1234 and reset the system.
P754 Position reference (rotations) [Read]	0 to 65535 [-] rot	☑It shows the position reference in rotations. The position reference starts at zero and after the movement has been concluded, it returns to zero.
P755 Position reference (fraction of rotation) [Read]	0 to 3599 [-] degrees/10	☑It shows the fraction of the revolution of the reference position in tenth of degree. The position reference starts at zero and after the movement has been concluded, it returns to zero.
P756 Position signal [Read]	0 or 1 [-] -	☑Signal of the real position shown at Parameters P757 and P758. 0 = negative 1 = positive
P757 Real position (rotations) [Read]	0 to 65535 [-] rot	☑It shows the real position in rotations.
P758 Real position (fraction of rotation) [Read]	0 to 3599 [-] degrees/10	☑It shows the fraction of revolution of the real position in tenth of degree.

(*) IMPORTANT: for enabling the new values, the system must be restarted when one or more parameters have been changes.

Parameter	Range [Factory Setting] Unit	Description / Notes
P760 Proportional position gain (Kp) [Configuration]	0 to 200 [50] -	☑ Increase this gain to speed up the answer to a position error and decrease this gain when system vibrates or becomes unstable.
P761 Integral position gain (Ki) [Configuration]	0 to 200 [0] -	☑ It has the function to reset eventual position errors. In general, this gain is zero and may cause a position overshoot, i.e. to go beyoud the desired position and return.
P762 Max. lag error [Configuration]	0 to 65535 [0] degrees/10	☑ This is the max. permitted positioning error, i. e., the max. permitted difference between reference position and the real position, in degrees. The parameter and the lag values are divided by 10. For instance 10 at P762 means that the max. following error is 1 degree. When P762 = 0 (default setting), the lag error will not be checked.
P763 Desables user program, if=1 [Configuration]	0 to 1 [0] -	☑ When this Parameter is set to 1, it disables the user program. This setting should be used in any abnormal condition only, where the program is causing some error type, for instance, when it prevents the communication with the serial interface. In this case, disable the program and install the new corrected version and then enable it again.
P764 (*) PLC adrres at network [Configuration]	1 to 247 [1] -	☑ When, for instance, the MODBUS network connection is used through serial interface RS 485 (inverter RS232-RS485), this parameter defines the address at the network board.
P765 (*) Baud rate of RS232 [Configuration]	1 to 5 [4 (= 9600bps)] -	☑ Sets the baud rate of the serial interface. The permitted settings are:

P765	Baud-Rate (bps)
1	1200
2	2400
3	4800
4	9600
5	19200

Parameter	Range [Factory Setting] Unit	Description / Notes
P766 Satus of the Digital Inputs [Read]	0 to 32767 [-] -	☑ It shows the status of the 15 digital inputs: 9 digital inputs of the PLC1 and 6 digital inputs of the inverter. The read number should be converted to binary value, thus obtaining a direct read of the status of each input.

BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
DI101	DI102	DI103	DI104	DI105	DI106	DI9

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
DI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1

(*) IMPORTANT: for enabling the new values, the system must be restarted when one or more parameters have been changes.

Parameter	Range [Factory Setting] Unit	Description / Notes
		The DI101 to DI106 represents the status of the 6 digital inputs of the drive and the DI1 to DI9 represents the status of the 9 digital inputs of the PLC1.
P767 (*) Synchronous motor speed [Configuration]	0 to 10000 [1800] rpm	☑ For instance, a 4 pole motor - 50 Hz, has a synchronous speed of 1500rpm.
P768 (*) Encoder resolution [Configuration]	0 to 65535 [1024] ppr	☑ It shows the number of pulses per encoder revolution.
P769 (*) Position of the encoder zero pulse [Configuration]	0 to 3599 [0] degrees/10	☑ The input value should be in tenth of degree. This value can be used to search for the machine zero and so set the zero position.
P770 CAN Protocol [Configuration]	0 to 2 [0] -	☑ The setting of this parameter allows selecting the communication protocol that will be used for the CAN interface available at the PLC1 board.

P770	Description	Note
0	Disable	CANopen and DeviceNet protocols are disabled. Setting P770 to'0' enables the speed synchronism via CAN, which is programmed via WLP software (FOLLOW and CAN2MS function blocks).
1	CANopen	Setting P770 to '1' makes the PLC1 board operate as a slave on the CANopen network. Additional information about how using the PLC1 board with this protocol can be found on the CANopen communication user's guide provided with the product CD.
2	DeviceNet	Setting P770 to '2' makes the PLC1 board operate as a slave on the DeviceNet network. Additional information about how using the PLC1 board with this protocol can be found on the DeviceNet communication user's guide provided with the product CD.

☑ Change of parameter P770 is executed when the device is reset or at next power up.

Parameter	Range [Factory Setting] Unit	Description / Notes
P771 CAN Adress [Configuration]	0 to 127 [63] -	☑ P771 sets the address of the PLC1 board in the CAN network. The range of valid addresses is dependent on the selected protocol: CANopen: valid addresses from 1 to 127. DeviceNet: valid addresses from 0 to 63.

(*) IMPORTANT: for enabling the new values, the system must be restarted when one or more parameters have been changes.

Parameter	Range [Factory Setting] Unit	Description / Notes
		☑ It is not necessary to define the device address when the synchronism function via CAN is used. ☑ Change of parameter P771 (CAN address) is executed when the device is reset or at next power up.
P772 CAN Baudrate [Configuration]	0 to 8 [0] bit/second	☑ Adjust CAN baudrate. Accept Values: 表格 ☑ The DeviceNet protocol only supports three baud rates: 500 kbps, 250 kbps and 125 kbps. If any other option is chosen the auto-baud is selected. ☑ Change of baud rate is valid only after the device is reset or at next power up.
P773 *Bus off* Recovery [Configuration]	0 to 1 [0] -	☑ This parameter allows the PLC1 action selection when a *bus off* error occurs. The permitted values are: 表格2
P774 Action to be taken upon detection of a communication failure [Configuration]	0 to 1 [1] -	☑ Setting of this parameter selects the action to be taken by the PLC1 board upon detection of a communication failure on the CAN interface: 表格3

Table in P772:

P772	Description	Maximum Cable Length
0	1 Mbit/s	25 m
1	Reservado	-
2	500 Kbit/s	100 m
3	250 Kbit/s	250 m
4	125 Kbit/s	500 m
5	100 Kbit/s	600 m
6	50 Kbit/s	1000 m
7	20 Kbit/s	1000 m
8	10 Kbit/s	1000 m

Table in P773:

P773	Description	Note
0	Manual	After the *bus off* error has been detected, the device displays E61, the CAN communication will be disabled and the device must be reset manually to return to network operation.
1	Automatic	The communication will be restart automatically after *bus off* error has been detected.

Table in P774:

P774	Description	Note
0	Indicate the error	Setting P774 to '0' displays the error code on the HMI upon detection of communication failure.
1	Cause a fatal error on the device	Setting P774 to '1', besides displaying the error code on the HMI, disables the device upon detection of communication failure. Device needs to be reset in order to operate again.

Parameter	Range [Factory Setting] Unit	Description / Notes
		☑Communication errors may be different according to the protocol used. Please, refer to the communication guide specific for the protocol in use.
P775 CAN Status [Read]	0 to 5 [-] -	☑Inform CAN Status:

P775	CAN Status
0	Disabled
1	Reserved
2	CAN enabled
3	Warning (some telegrams with error)
4	Error Passive (Much telegrams with error or is the only network device with enabled CAN transmitting telegrams).
5	Bus Off (number of detected errors exceeded the internal device limit and the communication has been disabled)

Parameter	Range [Factory Setting] Unit	Description / Notes
P776 Counter of received telegrams [Read]	0 to 65535 [-] -	☑Cyclic counter is incremented at each CAN telegram received with success. Counting is restart each time the counter reaches to upper limit.
P777 Counter of transmitted telegrams [Read]	0 to 65535 [-] -	☑Cyclic counter is incremented at each CAN telegram received with success. Counting is restart each time the counter reaches to upper limit.
P778 Counter of detected errors [Read]	0 to 65535 [-] -	☑Cyclic counter is incremented each time an error is detected (*warning*, *error passive* or *bus off*). Counting is restart each time the counter reaches to upper limit.

Parameter	Range [Factory Setting] Unit	Description / Notes
P780 Status of the CANopen communication [Read]	0 to 4 [-] -	☑ Indicates the status of the CANopen communication, informing if the protocol was correctly initialized and the state of the slave node guarding service.

P780	Description	Note
0	Disabled	The CANopen protocol was not set in parameter P700 and it is disabled.
1	Reserved	
2	CANopen enabled	The CANopen protocol was correctly started.
3	Node Guarding enabled	Node guarding service was started by the master and it is properly working.
4	Node Guarding error	Timeout for the node guard service. This event results in a PLC1 board error (E65).

☑ Refer to CANopen communication user's guide to obtain detailed description about the protocol.

Parameter	Range [Factory Setting] Unit	Description / Notes
P781 Status of the CANopen mode [Read]	0 to 127 [-] -	☑ Each device in the CANopen network has an associated status. The current status of the PLC1 board is displayed in this parameter.

P781	Description	Note
0	Not initialized	The CANopen protocol was not set in parameter P700 and it is disabled.
4	Stopped	Data transfer between master and slave is not possible in this sate
5	Operational	All communication services are available in this state.
127	Pre-operational	Only some CANopen communication services are available in this state.

☑ Refer to CANopen communication user's guide to obtain detailed description about the protocol.

Parameter	Range [Factory Setting] Unit	Description / Notes
P782 Status of the DeviceNet network [Read]	0 to 5 [-] -	

P782	Description
0	Not Powered / Not Online
1	On-line / Not Connected
2	Link Ok / Online and Connected
3	Connection Timeout
4	Critical Link Failure
5	Running Auto-baud

☑ A detailed description of these items can be found on the DeviceNet user's guide for this product.

Parameter	Range [Factory Setting] Unit	Description / Notes
P783 Status of the DeviceNet Master [Read]	0 to 1 [-] -	<table><tr><td>P783</td><td>Description</td></tr><tr><td>0</td><td>Master in Run mode</td></tr><tr><td>1</td><td>Master in Idle mode</td></tr></table> ☑ For a detailed description of these items, please, refer to the DeviceNet programming user's guide specific for this product.
P784 Number of reading words [Configuration]	0 to 10 [1] -	☑ The setting of this parameter defines the number of reading words exchanged with the master of the DeviceNet network.
P785 Number of writing words [Configuration]	0 to 10 [1] -	☑ The setting of this parameter defines the number of writing words exchanged with the master of the DeviceNet network.