



MANUAL

PLC1.01 BOARD

PROGRAMMABLE IN LADDER LANGUAGE
BY WLP SOFTWARE

12/2006

PLC1 Software: V2.0X

0899.5532 E/4

Summary of Revisions

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	-
4	General Revision	-

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QUICK PARAMETER REFERENCE, FAULT MESSAGES

Software: V2.0X

Application:

Model:

Serial Number:

Responsible:

Date: / / .

I. Parameters

The parameter range starts from 750 up to 899, totaling 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.

Parameter	Description [Type]	Adjustable Range	Factory Setting	Unit	Page
P750	PLC1 firmware version [Read]	Related to the purchased board	-	-	22
P751	Scan cycle in 100µs units [Read]	0 to 65535	-	x100µs	22
P752 (*)	Resets the retentive markers [Configuration]	0 = No action 1 = Reset register	0 = No action	-	22
P753 (*)	Loads factory settings, if =1234 [Configuration]	0 to 65535	0	-	22
P754	Position reference (rotations) [Read]	0 to 65535	-	rotations	22
P755	Position reference (fraction of rotation) [Read]	0 to 3599	-	degrees / 10	22
P756	Real position signal [Read]	0 = Negative 1 = Positive	-	-	23
P757	Real position (rotations) [Read]	0 to 65535	-	rotations	23
P758	Real position (fraction of rot.) [Read]	0 to 3599	-	degrees / 10	23
P759	Lag error [Read]	0 to 3599	-	degrees / 10	23
P760	Kp: proportional position gain [Configuration]	0 to 200	50	-	23
P761	Ki: integral position gain [Configuration]	0 to 200	0	-	23
P762	Max. lag error [Configuration]	0 to 65535	1800	degrees / 10	23
P763	Disables user program if = 1 [Configuration]	0=Program enable 1=Program disable	0 = Program enable	-	24
P764 (*)	PLC address at network [Configuration]	1 to 247	1	-	24

(*) 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	Description [Type]	Adjustable Range	Factory Setting	Unit	Page
P765 (*)	Baud rate of RS-232 [Configuration]	1 = 1200bps 2 = 2400bps 3 = 4800bps 4 = 9600bps 5 = 19200bps 6 = 38400bps	4 = 9600bps	bits/second	24
P766	PID sample time [Configuration]	0 to 10000	1	x 1.2ms	24
P767 (*)	Synchronous speed of the motor in rpm [Configuration]	0 to 10000	1800	rpm	24
P768 (*)	Encoder pulse number [Configuration]	0 to 65535	1024	ppr pulses per revoluções	25
P769 (*)	Encoder zero pulse position [Configuration]	0 to 3599	0	degrees / 10	25
P770 (*)	CAN protocol [Configuration]	0=Disabled 1=CANopen 2=DeviceNet	0=Disabled	-	25
P771 (*)	CAN address [Configuration]	0 to 127	63	-	25
P772 (*)	CAN baud rate [Configuration]	0=1Mbit/s 1=Reserved 2=500Kbit/s 3=250Kbit/s 4=125Kbit/s 5=100Kbit/s 6=50Kbit/s 7=20Kbit/s 8=10Kbit/s	0=1Mbit/s	Mbits/s or Kbit/s	26
P773	Bus off recovery [Configuration]	0=Manual 1=Automatic	0=Manual	-	26
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=Cause a fatal error on the device	-	26
P775	CAN status [Read]	0=Disable 1=Reserved 2=CAN enable 3=Warning 4=Error passive 5=Not Powered	-	-	27
P776	Counter of received telegrams [Read]	0 to 65535	-	-	27
P777	Counter of trasmitted telegrams [Read]	0 to 65535	-	-	27
P778	Counter of detected errors [Read]	0 to 65535	-	-	27

(*) 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	Description [Type]	Adjustable Range	Factory Setting	Unit	Page
P780	Status of the CANopen network [Read]	0=Disabled 1=Reserved 2=CANopen enabled 3=Node guarding enabled 4=Node guarding error	-	-	28
P781	Status of the CANopen node [Read]	0=Not initialized 4=Stopped 5=Operational 127=Pre-operational	-	-	28
P782	Status of the DeviceNet network [Read]	0=Not powered / not on-line 1=on-line / not connected 2=Link ok / online and connected 3=Connection timeout 4=Critical link failure 5=Running auto-baud	-	-	28
P783	Status of the DeviceNet master [Read]	0=Run 1=Idle	-	-	29
P784	Number of input words [Configuration]	1 to 10	1	-	29
P785	Number of output words [Configuration]	1 to 10	1	-	29
P793 (*)	Select serial protocol [Configuration]	0=Modbus no parity 1=WegTP no parity 2=Modbus even parity 3=WegTP even parity 4=Modbus odd parity 5=WegTP odd parity	0	-	29

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

II. Error Messages

Display	Description	Note
E50	Lag error	Fatal Error, it disables the converter. Refer to Parameter P762.
E51	Error during	Reset the system and program saving 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 resend it. This error may occur when there is no program on the PLC board (at the first power-up).
E56	Wrong CRC	Transmit it again.
E57	Shaft has not been referenced to absolute movement	Before an absolute 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	<i>Bus off</i> has been detected on the CAN bus due to a high number of transfer errors. These errors 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 DeviceNet communication. For further information, please, refer to the DeviceNet communication user's guide provided with the product CD.
E67	I/O connections timeout	Specific error for the DeviceNet communication. For further information, please, refer to the DeviceNet communication user's guide provided with the product CD.

Note: the drive is disabled with fatal errors E50 and E58 and must be reset. It is possible to use the system bit register SX2 to reset a fatal error.

SAFETY NOTICES

This manual contains information needed to properly use the PLC1 board with the CFW-09 variable frequency drive.

Only trained and qualified personnel should 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.



NOTE!

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.



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 equipment damage.

**NOTE!**

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 may be running (fans) or 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.

If necessary to do so, touch the properly grounded metallic frame or use a suitable ground strap.

**NOTE!**

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

2.1 ABOUT 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.

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 (E/1, E/2 ...) when downloading it from the WEG website.

	PLC1 V2.0X	Revision
User' Guide		
Modbus User' Guide		E/1
WegTP User' Guide		P/1
CANopen Slave User's Guide		E/2
DeviceNet Slave User's Guide		P/2
WLP User' Guide		E/2

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

2.2 ABOUT THE PLC1 BOARD

The PLC1 board adds important CLP (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 accessed 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.

CANopen and DeviceNet protocols were incorporated to the product from version 1.60 on.



ATTENTION!

- The **CFW-09** inverter software version should be the version **V2.40** or later.
- It is possible to use the set speed block with the V/F control mode (scalar) for CFW-09 drives with software version V3.70 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, 24Vdc 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 CLP functions;
- ☑ It permits the use of digital and analog inputs/outputs 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;
- ☑ Volatile (zero-initialized) and retentive BIT, WORD and FLOAT registers;
- ☑ 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).



ATTENTION!

The PLC1 version 2.0X is compatible only with the WLP software version 6.20 or higher.

INSTALLATION AND CONFIGURATION

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

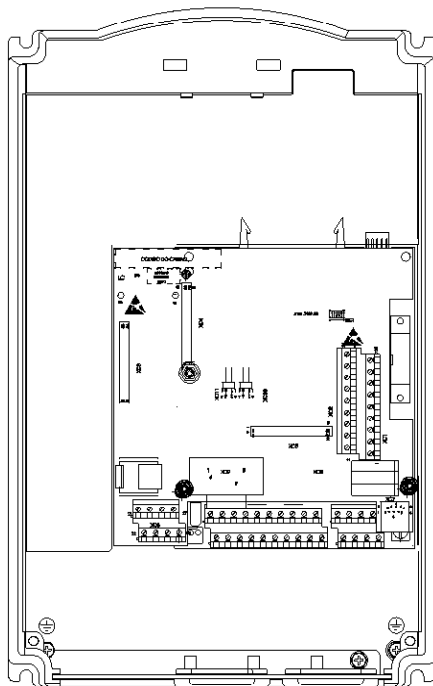


ATTENTION!

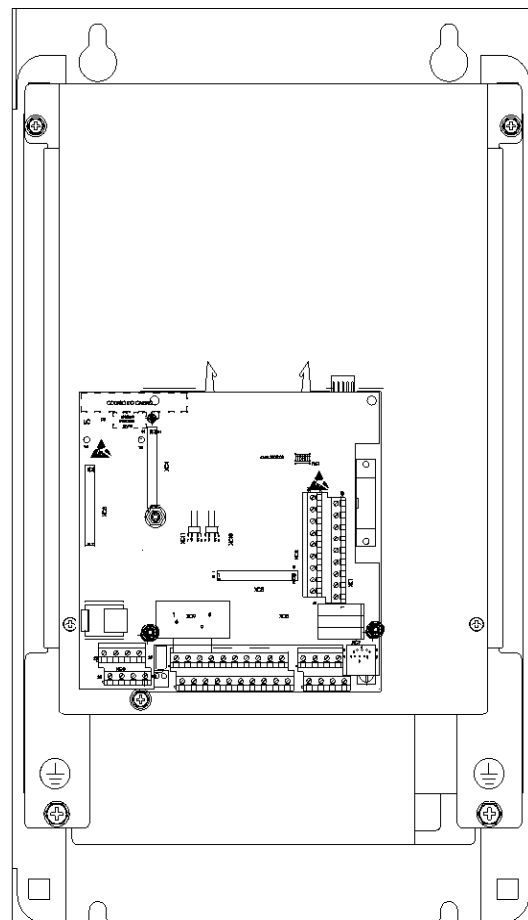
Follow the instructions included in this chapter to guarantee the correct installation and operation of the PLC1 board and the CFW-09 drive.

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.



NOTE!

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.

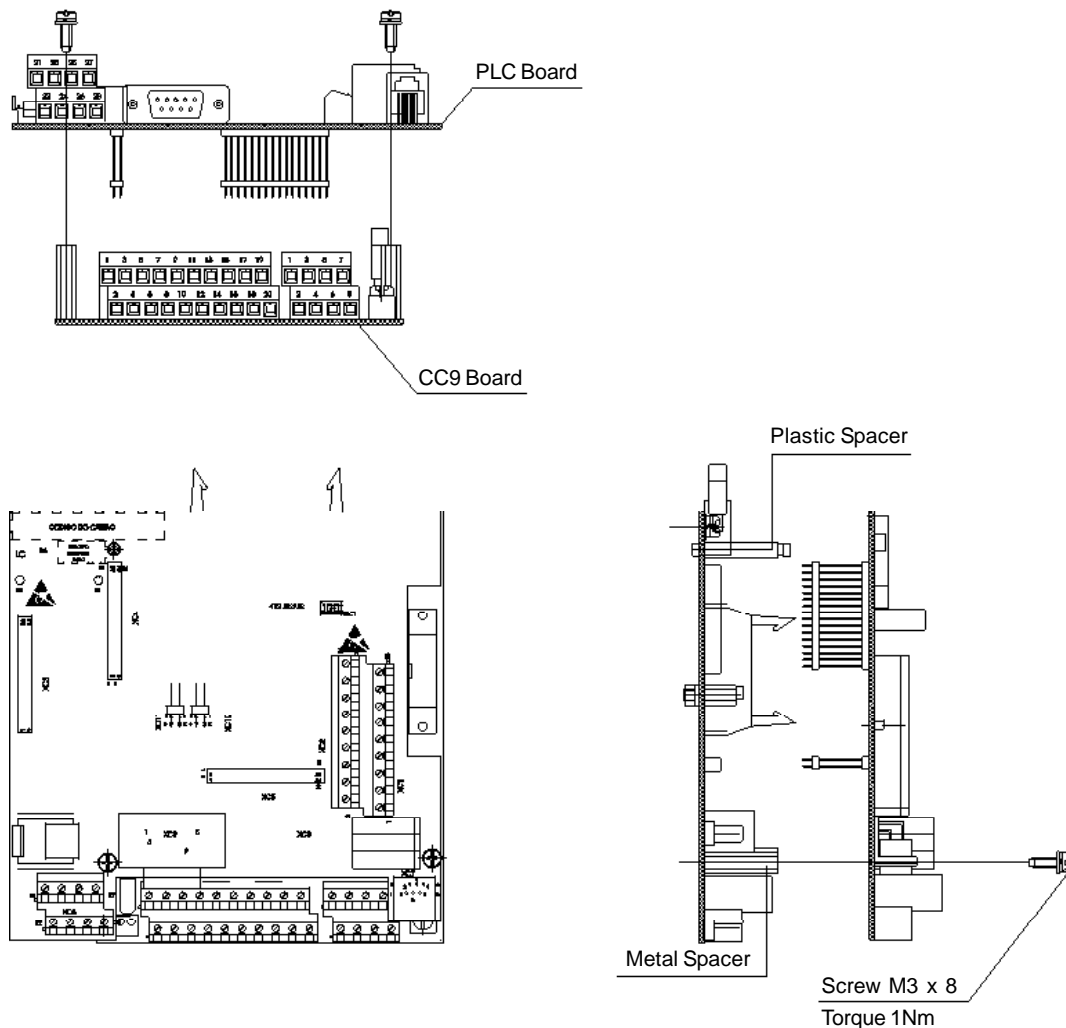


Figure 3.2 - Seating the PLC1 on the CC9 control board

Follow the steps below for the proper installation of the board:

- Step 1** – Make sure the equipment is disconnected from the power supply and remove the frontal cover of the CFW-09;
- 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** – Insert and tighten the screws to firmly secure the board to the 2 metal spacers.

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

Table 3.1 - XC10 jumper

XC11 Jumper: Encoder Error

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

Table 3.2 - XC11 jumper

3.3 DIP-SWITCH CONFIGURATION

The PLC1 board is fitted with an internal CAN network termination resistor, which shall be enabled at both ends of the bus.

DIP-switch S4: Termination Resistor

DIP-switch S4	
ON	Enables the CAN network termination resistor
OFF	Disables the CAN network termination resistor

Table 3.3 – DIP-switch S4

3.4 CONNECTORS DESCRIPTION

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

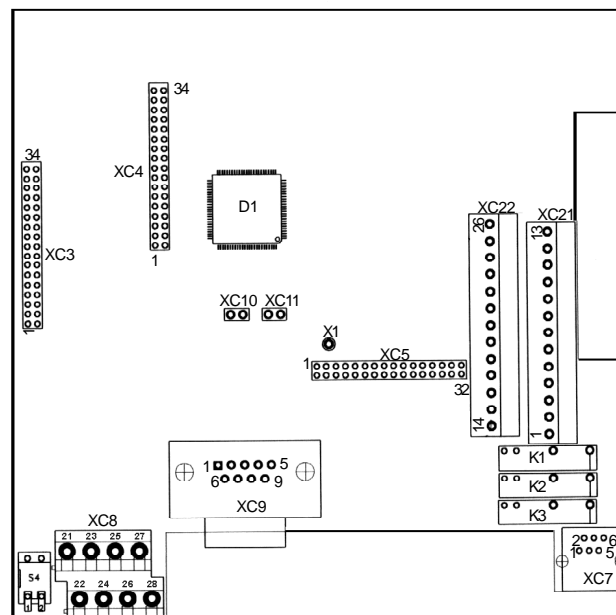


Figure 3.3 - PLC1 board - connectors

The connectors and their terminals function are described below.

XC21 Connector: Relay Outputs and Digital Inputs

XC21 Connector			Function	Specification
1	C	DO1	Digital relay outputs	Contact capacity: 3A 250Vac
2	NO			
3	C	DO2		
4	NO			
5	C	DO3		
6	NO			
7	NC		Not connected	-
8	NC		Not connected	-
9	DI6		Isolated digital Inputs	Input voltage: (15 to 30)Vdc Input current: 11mA @ 24Vdc
10	DI7			
11	DI8			
12	DI9			
13	COM DI		Common to the inputs DI6 to DI9	-

Figure 3.4 - XC21 connector



ATTENTION!

(*) External Power Supply.

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		Bidirectional opto-isolated digital outputs	Max. voltage: 48Vdc Current capacity: 500mA
17	DO5			
18	DO4			
19	NC		Not connected	-
20	NC		Not connected	-
21	DI1		Bidirectional isolated digital inputs	Input voltage: (15 to 30)Vdc Input current: 11mA @ 24Vdc
22	DI2			
23	DI3			
24	DI4			
25	DI5			
26	COM DI		Common to inputs DI1 to DI5	-

Figure 3.5 - XC22 connector



ATTENTION!

(*) External Power Supplies.

XC3 Connector: Functionless

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 3.4 - XC7 connector

XC8 Connector: External 24Vdc Input and CAN Network

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

*Table 3.5 - 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 drive connection is realized through the XC9 (DB9) connector of the PLC1 board.

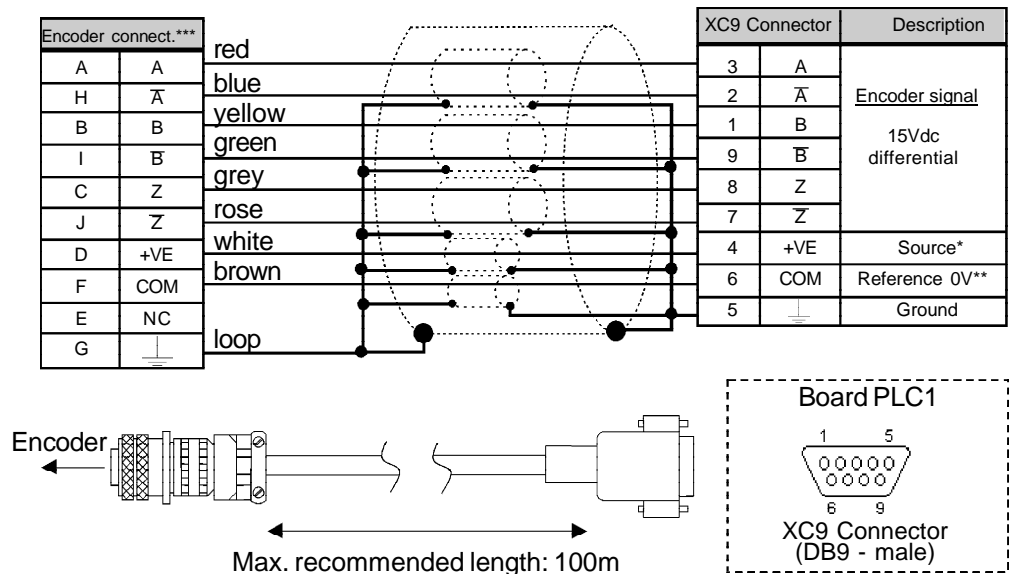
The used encoder should have following features:

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

Follow the instructions below when mounting the encoder on the motor:

- 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 other wirings (power, control cables, etc). If possible, install it inside a metallic conduit.



- * Regardless of the external power supply 18Vdc to 26Vdc, the output voltage will be always 15Vdc.
- ** Referenced to ground via 1 μ F in parallel with 1k Ω
- *** 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



NOTE!

The max. permitted encoder frequency is 100kHz.

Required sequence for encoder signals:

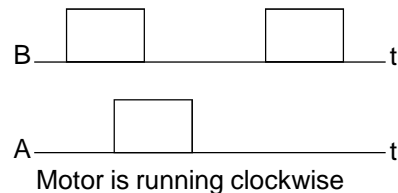


Figure 3.7 - Sequence for encoder signals

3.5 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, you can use the drive 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 drive 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 when the CFW-09 software version lower than 3.70;
- ☑ 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 drive 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 drive 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 drive 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 drive 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 drive 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

This chapter describes in details all the PLC programming and read parameters. Besides these parameters, the CFW-09 parameters must also be configured in accordance with the application (refer to the CFW-09 User's Guide for its parameter description).

Parameter	Range [Factory Setting] Unit	Description / Note
P750 Firmware version of the PLC board [Read parameter]	- [-] -	<input checked="" type="checkbox"/> It shows the firmware version of the PLC board. Example: version 1.30. At the parameter you can read 130.
P751 Scan cycle of the user program [Read parameter]	0 to 65535 [-] x100 µs	<input checked="" type="checkbox"/> 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 $79 \div 10 = 7,9\text{ms}$.
P752 (*) Resets retentive markers [Configuration parameter]	0 or 1 [0] -	<input checked="" type="checkbox"/> 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 parameter]	0 to 65535 [0] -	<input checked="" type="checkbox"/> 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 parameter]	0 to 65535 [-] rotations	<input checked="" type="checkbox"/> 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 parameter]	0 to 3599 [-] degrees/10	<input checked="" type="checkbox"/> 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.

(*) 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 / Note
P756 Position signal [Read parameter]	0 or 1 [-] -	<input checked="" type="checkbox"/> Signal of the real position shown at Parameters P757 and P758. 0 = negative 1 = positive
P757 Real position (rotations) [Read parameter]	0 to 65535 [-] rotations	<input checked="" type="checkbox"/> It shows the real position in rotations.
P758 Real position (fraction of rotation) [Read parameter]	0 to 3599 [-] degrees/10	<input checked="" type="checkbox"/> It shows the fraction of revolution of the real position in tenth of degree.
P759 Lag error [Read Parameter]	0 a 3599 [-] degrees/10	<input checked="" type="checkbox"/> It shows the Lag error in tenth of degree.
P760 Proportional position gain (Kp) [Configuration parameter]	0 to 200 [50] -	<input checked="" type="checkbox"/> 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 parameter]	0 to 200 [0] -	<input checked="" type="checkbox"/> 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 beyond the desired position and return.
P762 Max. lag error [Configuration parameter]	0 to 65535 [1800] degrees/10	<input checked="" type="checkbox"/> 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.

Parameter	Range [Factory Setting] Unit	Description / Note														
P763 Disables user program, if=1 [Configuration parameter]	0 or 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 address at network [Configuration parameter]	1 to 247 [1] -	☑ When, for instance, the MODBUS network connection is used through serial interface RS-485 (inverter RS-232-RS-485), this parameter defines the address at the network board.														
P765 (*) Baud rate of RS-232 [Configuration parameter]	1 to 6 [4 (= 9600bps)] -	☑ Sets the baud rate of the serial interface. The permitted settings are: <table border="1" data-bbox="887 981 1270 1205"> <thead> <tr> <th>P765</th> <th>Baud rate (bps)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1200</td> </tr> <tr> <td>2</td> <td>2400</td> </tr> <tr> <td>3</td> <td>4800</td> </tr> <tr> <td>4</td> <td>9600</td> </tr> <tr> <td>5</td> <td>19200</td> </tr> <tr> <td>6</td> <td>38400</td> </tr> </tbody> </table>	P765	Baud rate (bps)	1	1200	2	2400	3	4800	4	9600	5	19200	6	38400
P765	Baud rate (bps)															
1	1200															
2	2400															
3	4800															
4	9600															
5	19200															
6	38400															
P766 (*) PID sample time [Configuration parameter]	0 to 10000 [1] x 1.2ms	☑ Defines the sampling time for the PID blocks in intervals of 1.2ms. Example: P766 = 10 means that the PID “sampling time will be 12ms.														
P767 (*) Synchronous motor speed [Configuration parameter]	0 to 10000 [1800] rpm	☑ This parameter shall be set with the driven motor synchronous speed. ☑ Use the following equation to obtain the motor synchronous speed: $n_s = \frac{120 \times f}{2p}$ Where, n _s = Motor synchronous speed f = Motor frequency p = Number of pair of poles. ☑ For instance, a 4-pole motor – 50 Hz, has a synchronous speed of 1500rpm.														

Table 4.1 - RS-232 baud rate

(*) 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 / Note												
P768 (*) Encoder resolution [Configuration parameter]	0 to 65535 [1024] ppr	☑ It shows the number of pulses per encoder revolution.												
P769 (*) Position of the encoder zero pulse [Configuration parameter]	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 parameter]	0 to 2 [0] -	<p>☑ The setting of this parameter allows selecting the communication protocol that will be used for the CAN interface available at the PLC1 board.</p> <table border="1"> <thead> <tr> <th>P770</th> <th>Description</th> <th>Note</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Disable</td> <td>CANopen and DeviceNet protocols are disabled. Setting P770 to '0' enables the speed synchronism via CAN, which is programmed via WLP software (FOLLOW and MSCANWEG function blocks).</td> </tr> <tr> <td>1</td> <td>CANopen</td> <td>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.</td> </tr> <tr> <td>2</td> <td>DeviceNet</td> <td>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.</td> </tr> </tbody> </table>	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 MSCANWEG 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.
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 MSCANWEG 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.												
P771 (*) CAN Address [Configuration parameter]	0 to 127 [63] -	<p>☑ 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.</p> <p>☑ It is not necessary to define the device address when the synchronism function via CAN is used.</p>												



Table 4.2 - CAN interface available at the PLC1 board



NOTE!

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

(*) 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 / Note																														
		 NOTE! Change of parameter P771 (CAN address) is executed when the device is reset or at next power up.																														
P772 (*) CAN baud rate [Configuration parameter]	0 to 8 [0] bits/second	<input checked="" type="checkbox"/> Adjust CAN baud rate. Accept Values: <table border="1" data-bbox="794 571 1310 925"> <thead> <tr> <th>P772</th> <th>Description</th> <th>Maximum Cable Length</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1 Mbit/s</td> <td>25 m</td> </tr> <tr> <td>1</td> <td>Reservado</td> <td>-</td> </tr> <tr> <td>2</td> <td>500 Kbit/s</td> <td>100 m</td> </tr> <tr> <td>3</td> <td>250 Kbit/s</td> <td>250 m</td> </tr> <tr> <td>4</td> <td>125 Kbit/s</td> <td>500 m</td> </tr> <tr> <td>5</td> <td>100 Kbit/s</td> <td>600 m</td> </tr> <tr> <td>6</td> <td>50 Kbit/s</td> <td>1000 m</td> </tr> <tr> <td>7</td> <td>20 Kbit/s</td> <td>1000 m</td> </tr> <tr> <td>8</td> <td>10 Kbit/s</td> <td>1000 m</td> </tr> </tbody> </table> <p style="text-align: center;">Table 4.3 - CAN baud rate</p> <input checked="" type="checkbox"/> 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.  NOTE! Change of baud rate is valid only after the device is reset or at next power up.	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
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																														
P773 Bus off recovery [Configuration parameter]	0 to 1 [0] -	<input checked="" type="checkbox"/> This parameter allows the PLC1 action selection when a bus off error occurs. The permitted values are: <table border="1" data-bbox="721 1375 1434 1671"> <thead> <tr> <th>P773</th> <th>Description</th> <th>Note</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Manual</td> <td>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.</td> </tr> <tr> <td>1</td> <td>Automatic</td> <td>The communication will be restart automatically after bus off error has been detected.</td> </tr> </tbody> </table> <p style="text-align: center;">Table 4.4 - Permitted values when a bus off error occurs</p>	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.																					
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.																														
P774 Action to be taken upon detection of a communication failure [Configuration parameter]	0 to 1 [1] -	<input checked="" type="checkbox"/> Setting of this parameter selects the action to be taken by the PLC1 board upon detection of a communication failure on the CAN interface:																														

(*) 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 / Note														
		<table border="1"> <thead> <tr> <th>P774</th> <th>Description</th> <th>Note</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Indicate the error</td> <td>Setting P774 to '0' displays the error code on the HMI upon detection of communication failure.</td> </tr> <tr> <td>1</td> <td>Cause a fatal error on the device</td> <td>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.</td> </tr> </tbody> </table> <p>Table 4.5 - Action a communication failure</p> <p><input checked="" type="checkbox"/> Communication errors may be different according to the protocol used. Please, refer to the communication guide specific for the protocol in use.</p>	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.					
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.														
P775 CAN status [Read parameter]	0 to 5 [-] -	<p><input checked="" type="checkbox"/> Inform CAN Status:</p> <table border="1"> <thead> <tr> <th>P775</th> <th>CAN Status</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Disabled</td> </tr> <tr> <td>1</td> <td>Reserved</td> </tr> <tr> <td>2</td> <td>CAN enabled</td> </tr> <tr> <td>3</td> <td>Warning (some telegrams with error)</td> </tr> <tr> <td>4</td> <td>Error Passive (Much telegrams with error or is the only network device with enabled CAN transmitting telegrams).</td> </tr> <tr> <td>5</td> <td>Bus Off (number of detected errors exceeded the internal device limit and the communication has been disabled)</td> </tr> </tbody> </table> <p>Table 4.6 - CAN status</p>	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)
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)															
P776 Counter of received telegrams [Read parameter]	0 to 65535 [-] -	<p><input checked="" type="checkbox"/> Cyclic counter is incremented at each CAN telegram received with success. Counting is restart each time the counter reaches to upper limit.</p>														
P777 Counter of transmitted telegrams [Read parameter]	0 to 65535 [-] -	<p><input checked="" type="checkbox"/> Cyclic counter is incremented at each CAN telegram received with success. Counting is restart each time the counter reaches to upper limit.</p>														
P778 Counter of detected errors [Read parameter]	0 to 65535 [-] -	<p><input checked="" type="checkbox"/> Cyclic counter is incremented each time an error is detected (<i>warning, error passive or bus off</i>). Counting is restart each time the counter reaches to upper limit.</p>														

Parameter	Range [Factory Setting] Unit	Description / Note																
P780 Status of the CANopen communication [Read parameter]	0 to 4 [-] -	<input checked="" type="checkbox"/> Indicates the status of the CANopen communication, informing if the protocol was correctly initialized and the state of the slave node guarding service.																
		<table border="1"> <thead> <tr> <th>P780</th> <th>Description</th> <th>Note</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Disabled</td> <td>The CANopen protocol was not set in parameter P700 and it is disabled.</td> </tr> <tr> <td>1</td> <td>Reserved</td> <td></td> </tr> <tr> <td>2</td> <td>CANopen enabled</td> <td>The CANopen protocol was correctly started.</td> </tr> <tr> <td>3</td> <td>Node Guarding enabled</td> <td>Node guarding service was started by the master and it is properly working.</td> </tr> <tr> <td>4</td> <td>Node Guarding error</td> <td>Timeout for the node guard service. This event results in a PLC1 board error (E65).</td> </tr> </tbody> </table> <p style="text-align: center;"><i>Table 4.7 - Status of the CAN communication</i></p> <input checked="" type="checkbox"/> Refer to CANopen communication user's guide to obtain detailed description about the protocol.	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
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).																

P781 Status of the CANopen node [Read parameter]	0 to 127 [-] -	<input checked="" type="checkbox"/> Each device in the CANopen network has an associated status. The current status of the PLC1 board is displayed in this parameter.													
		<table border="1"> <thead> <tr> <th>P781</th> <th>Description</th> <th>Note</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Not initialized</td> <td>The CANopen protocol was not set in parameter P700 and it is disabled.</td> </tr> <tr> <td>4</td> <td>Stopped</td> <td>Data transfer between master and slave is not possible in this state</td> </tr> <tr> <td>5</td> <td>Operational</td> <td>All communication services are available in this state.</td> </tr> <tr> <td>127</td> <td>Pre-operational</td> <td>Only some CANopen communication services are available in this state.</td> </tr> </tbody> </table> <p style="text-align: center;"><i>Table 4.8 - Status of the CANopen node</i></p> <input checked="" type="checkbox"/> Refer to CANopen communication user's guide to obtain detailed description about the protocol.	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 state	5	Operational	All communication services are available in this state.	127
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 state													
5	Operational	All communication services are available in this state.													
127	Pre-operational	Only some CANopen communication services are available in this state.													

P782 Status of the DeviceNet network [Read parameter]	0 to 5 [-] -	<table border="1"> <thead> <tr> <th>P782</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Not Powered / Not Online</td> </tr> <tr> <td>1</td> <td>On-line / Not Connected</td> </tr> <tr> <td>2</td> <td>Link Ok / Online and Connected</td> </tr> <tr> <td>3</td> <td>Connection Timeout</td> </tr> <tr> <td>4</td> <td>Critical Link Failure</td> </tr> <tr> <td>5</td> <td>Running Auto-baud</td> </tr> </tbody> </table> <p style="text-align: center;"><i>Table 4.9 - Status of the DeviceNet network</i></p> <input checked="" type="checkbox"/> A detailed description of these items can be found on the DeviceNet user's guide for this product.	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
		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															

Parameter	Range [Factory Setting] Unit	Description / Note														
P783 Status of the DeviceNet master [Read parameter]	0 or 1 [-] -	<table border="1"> <thead> <tr> <th>P783</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Master in Run mode</td> </tr> <tr> <td>1</td> <td>Master in Idle mode</td> </tr> </tbody> </table> <p>Table 4.10 - Status of the DeviceNet master</p> <p><input checked="" type="checkbox"/> For a detailed description of these items, please, refer to the DeviceNet programming user's guide specific for this product.</p>	P783	Description	0	Master in Run mode	1	Master in Idle mode								
P783	Description															
0	Master in Run mode															
1	Master in Idle mode															
P784 Number of reading words [Configuration parameter]	0 to 10 [1] -	<p><input checked="" type="checkbox"/> The setting of this parameter defines the number of reading words exchanged with the master of the DeviceNet network.</p>														
P785 Number of writing words [Configuration parameter]	0 to 10 [1] -	<p><input checked="" type="checkbox"/> The setting of this parameter defines the number of writing words exchanged with the master of the DeviceNet network.</p>														
P793 (*) Select serial protocol [Configuration parameter]	0 to 5 [0] -	<p><input checked="" type="checkbox"/> The setting of this parameter allows selecting the protocol to the serial, parity and stop-bit communication.</p> <table border="1"> <thead> <tr> <th>P793</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Modbus, no parity and 2 stop-bits.</td> </tr> <tr> <td>1</td> <td>WegTP, no parity and 2 stop-bits.</td> </tr> <tr> <td>2</td> <td>ModBus, even parity and 1 stop-bit.</td> </tr> <tr> <td>3</td> <td>WegTP, even parity and 1 stop-bit.</td> </tr> <tr> <td>4</td> <td>ModBus, odd parity and 1 stop-bit.</td> </tr> <tr> <td>5</td> <td>WegTP, odd parity and 1 stop-bit.</td> </tr> </tbody> </table> <p>Table 4.11 - Select serial protocol</p>	P793	Description	0	Modbus, no parity and 2 stop-bits.	1	WegTP, no parity and 2 stop-bits.	2	ModBus, even parity and 1 stop-bit.	3	WegTP, even parity and 1 stop-bit.	4	ModBus, odd parity and 1 stop-bit.	5	WegTP, odd parity and 1 stop-bit.
P793	Description															
0	Modbus, no parity and 2 stop-bits.															
1	WegTP, no parity and 2 stop-bits.															
2	ModBus, even parity and 1 stop-bit.															
3	WegTP, even parity and 1 stop-bit.															
4	ModBus, odd parity and 1 stop-bit.															
5	WegTP, odd parity and 1 stop-bit.															

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