

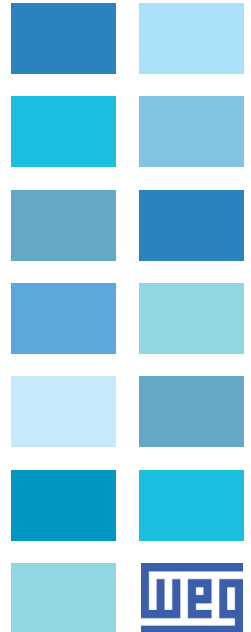
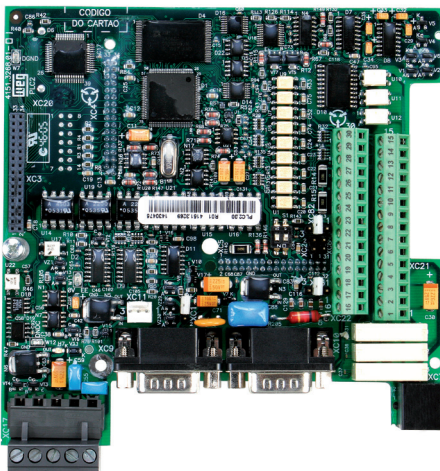
# Programmable Controller

# Controlador Programable

# Controlador Programável

MVW-01 PLC2

**User's Guide**  
**Manual del Usuario**  
**Manual do Usuário**





# Manual PLC2 Board

Serie: MVW-01

Software: V1.5X

Language: English

Document Number: 10000673021 / 00

Publication Date: 11/2009

## Summary of Revisions

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The table below describes all revisions made to this manual.

Revision	Description	Section
00	First Edition	-

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## Quick Parameter Reference, Fault Messages

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### **CHAPTER 4**

#### Detailed Parameter Description

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## QUICK PARAMETER REFERENCE, FAULT MESSAGES

Software: V1.5X

Application:

Model:

Serial Number:

Responsible:

Date: / / .

### I. Parameters

The parameters presented hereby represent the functions provided by the PLC2 board. Besides them, the PLC2 alsomakes available a general-purpose range of parameters fromP800 to P899, which can be programmed by the user (refer to theWLPmanual).

Parameter	Description [Type]	Adjustable Range	Factory Setting	Unit	Page
<b>P750</b>	PLC2 firmware version [Read]	Related to the purchased board	-	-	23
<b>P751</b>	Scan cycle in 100µs units [Read]	0 to 65535	-	x100 µs	23
<b>P752 (*)</b>	Resets the retentive markers [Configuration]	0=No action 1=Reset register	0 = No action	-	23
<b>P753 (*)</b>	Loads factory settings, if =1234 [Configuration]	0 to 65535	0	-	23
<b>P754</b>	Position reference (rotations) [Read]	0 to 65535	-	rotations	23
<b>P755</b>	Position reference (fraction of rotation) [Read]	0 to 3599	-	degrees / 10	23
<b>P756</b>	Real position signal [Read]	0=Negative 1=Positive	-	-	24
<b>P757</b>	Real position (rotations) [Read]	0 to 65535	-	rotations	24
<b>P758</b>	Real position (fraction of rot.) [Read]	0 to 3599	-	degrees / 10	24
<b>P759</b>	Lag error [Read]	0 to 3599	-	degrees / 10	24
<b>P760</b>	Proportional position gain (Kp) [Configuration]	0 to 200	50	-	24
<b>P761</b>	Integral position gain (Ki) [Configuration]	0 to 200	0	-	24
<b>P762</b>	Max. lag error [Configuration]	0 to 65535	1800	degrees / 10	24
<b>P763</b>	Disable user program [Configuration]	0=Program enable 1=Program disable	0=Program enable	-	25
<b>P764 (*)</b>	PLC address at netwrok [Configuration]	1 to 247	1	-	25

(\*) 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
<b>P765 (*)</b>	Baud rate of RS232 [Configuration]	1=1200 bps 2=2400 bps 3=4800 bps 4=9600 bps 5=19200 bps 6=38400 bps	4=9600 bps	bits / second	25
<b>P766 (*)</b>	PID sample time [Configuration]	1 to 10000	1	x1.2 ms	25
<b>P767 (*)</b>	Synchronous motor speed [Configuration]	0 to 10000	1800	rpm	25
<b>P768 (*)</b>	Encoder 1 zero pulse (main) position [Configuration]	0 to 10000	1024	ppr = pulses per revolution	26
<b>P769 (*)</b>	Encoder 1 zero pulse (master) position [Configuration]	0 to 3599	0	degrees / 10	26
<b>P770 (*)</b>	CAN protocol [Configuration]	0=Disabled 1=CANopen 2=DeviceNet	0=Disabled	-	26
<b>P771 (*)</b>	CAN address [Configuration]	0 to 127	63	-	27
<b>P772 (*)</b>	CAN baud rate [Configuration]	0=1 Mbit/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=1 Mbit/s	Mbit/s or Kbit/s	27
<b>P773</b>	Bus off recovery [Configuration]	0=Manual 1=Automatic	0=Manual	-	28
<b>P774</b>	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	-	28
<b>P775</b>	CAN status [Read]	0=Disable 1=Reserved 2=CAN enable 3=Warning 4=Error passive 5=Bus off 6=Not powered	-	-	29
<b>P776</b>	Counter of received telegrams [Read]	0 to 65535	-	-	29
<b>P777</b>	Counter of trasmitted telegrams [Read]	0 to 65535	-	-	29
<b>P778</b>	Counter of detected errors [Read]	0 to 65535	-	-	29

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

Parameter	Description [Type]	Adjustable Range	Factory Setting	Unit	Page
<b>P779</b>	Configuration status CANopen [Read]	0=Slave 1=Master	-	-	29
<b>P780</b>	CANopen communication status [Read]	0=Disabled 1=Reserved 2=CANopen enabled 3=Node guarding enabled 4=Node guarding error	-	-	30
<b>P781</b>	CANopen node status [Read]	0=Not initialized 4=Stopped 5=Operational 127=Pre-operational	-	-	30
<b>P782</b>	DeviceNet network status [Read]	0=Not powered / Not on-line 1=On-line / Not connected 2=Link OK / On-line and Connected 3=Connection timeout 4=Critical link failure 5=Running auto-baud	-	-	31
<b>P783</b>	DeviceNet master status [Read]	0=Master running 1=Idle master	-	-	31
<b>P784</b>	Number of input words [Configuration]	1 to 32	1	-	31
<b>P785</b>	Number of output words [Configuration]	1 to 32	1	-	31
<b>P786</b>	Fieldbus board status [Read]	0=Disable 1=Inactive 2=Active and Off-line 3=Active and On-line	-	-	31
<b>P788</b>	Operation mode for the Analog Output 1 [Configuration]	0=-10 to +10 V (range from -32768 to +32767) 1=0 to 20 mA (range from 0 to 32767) 2=0 to 20 mA (range from 0 to 65535) 3=0 to 20 mA (range from -32768 to +32767) 4=4 to 20 mA (range from 0 to 32767) 5=4 to 20 mA (range from 0 to 65535) 6=4 to 20 mA (range from -32768 to +32767)	0	-	32

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

Parameter	Description [Type]	Adjustable Range	Factory Setting	Unit	Page
<b>P789</b>	Operation mode for the analog output 2 [Configuration]	0= -10 to +10 V (range from -32768 to +32767) 1=0 to 20 mA (range from 0 to 32767) 2=0 to 20 mA (range from 0 to 65535) 3=0 to 20 mA (range from -32768 to +32767) 4=4 to 20 mA (range from 0 to 32767) 5=4 to 20 mA (range from 0 to 65535) 6=4 to 20 mA (range from -32768 to +32767)	0	-	33
<b>P790<sup>(*)</sup></b>	Encoder 2 pulse number (auxiliary) [Configuration]	0 to 10000 (pulses per revolution)	1024	ppr	33
<b>P791<sup>(*)</sup></b>	Enables the position feedback via encoder 2 (auxiliary) [Configuration]	0=Disable 1=Enable	0=Disable	-	33
<b>P792<sup>(*)</sup></b>	Direction of encoder 2 signal (auxiliary) [Configuration]	0=A→B 1=B→A	1=B→A	-	34
<b>P793<sup>(*)</sup></b>	Select serial protocol [Configuration]	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=ModBus odd parity and 1 stop-bit	0	-	34
<b>P794</b>	Operation mode for the analog input [Configuration]	0= -10 to +10 V / -20 to +20 mA (range from -32768 to +32767) 1=0 to 20 mA (range from 0 to 32767) 2=0 to 20 mA (range from 0 to 65535) 3=0 to 20 mA (range from -32768 to +32767) 4=4 to 20 mA (range from 0 to 32767) 5=4 to 20 mA (range from 0 to 65535) 6=4 to 20 mA (range from -32768 to +32767)	0	-	34

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



## II. Error Messages

Display	Description	Note
<b>E50</b>	Lag error	Fatal Error, it disables the converter. Refer to Parameter P762.
<b>E51</b>	Error during program saving	Reset the systems and try again.
<b>E52</b>	Two or more movements enabled simultaneously	Check the user program logic.
<b>E53</b>	Movement data are not valid	Perhaps some speed, acceleration value, etc. was reset to zero.
<b>E54</b>	Inverter disabled	Attempt to execute some movement with disabled inverter.
<b>E55</b>	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).
<b>E56</b>	Wrong CRC	Transmit it again.
<b>E57</b>	Shaft has not been referenced to absolute movement	Before an absolut movement, you must set the machine movement to zero position.
<b>E58</b>	Master Reference Fault	Fatal Error: after enabled initial communication, between master and slave, by any cause has been disabled.
<b>E59</b>	Fieldbus off-line	Specific error of Fieldbus communication. For further information, please, refer to the Fieldbus Communication User's Guide included in the product CD.
<b>E60</b>	Board access / connection fault	Specific error of Fieldbus communication. For further information, please, refer to the Fieldbus Communication User's Guide included in the product CD.
<b>E61</b>	Bus off	<i>Bus off</i> 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.
<b>E63</b>	Transceiver not powered	CANopen or DeviceNet communication error. For further information, please, refer to the CANopen or DeviceNet Communication User's Guide included in the product CD.
<b>E65</b>	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.
<b>E66</b>	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.
<b>E67</b>	Timeout de conexões I/O	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 all necessary information for the correct installation and operation of the PLC2 with the MVW-01 Variable Frequency Drive.

The PLC2 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!**

The nonobservance of the procedures recommended in this warning can lead to death, serious injuries and considerable material damage.



#### **ATTENTION!**

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



#### **NOTE!**

The text intends to supply important information for the correct understanding and good operation of the product.

### 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 MVW-01 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 MVW-01, as well as the PLC2 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.



#### **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.



#### **NOTE!**

Read this entire Manual carefully and completely before installing or operating PLC2 board with the MVW-01.



#### **ATTENTION!**

For correct use of PLC2 board it is necessary to know how to use the WLP software. Read the enclosed WLP software user's guide completely before using the PLC2 board on the drive.

## 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 PLC2 board.

Chapter 1 - Safety Notices;  
Chapter 2 - General Information;  
Chapter 3 - Installation and Configuration;  
Chapter 4 - Detailed Parameter Description.

This Manual provides information required for the correct use of the PLC2. As the PLC2 is very flexible, it allows many different operation modes as described in this manual. As the PLC2 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 PLC2 is not used according to this manual.

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

### 2.2 ABOUT THE PLC2 BOARD

The PLC2 board adds important CLP (Programmable Logical Controller) functions to the MVW-01, 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 PLC2 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.



### ATTENTION!

- The **MVW-01** inverter software version should be the version **V1.6X** or later.

## 2.3 GENERAL CHARACTERISTICS OF THE PLC2

- 2.3.1 Hardware      The PLC2 board has the following hardware characteristics:
- ☑ 9 isolated digital inputs, bi-directional, 24 Vdc;
  - ☑ 1 motor PTC input;
  - ☑ 3 digital relay output 250 V x 3 A;
  - ☑ 3 digital optocoupled outputs, bi-directional, 24 Vdc x 500 mA;
  - ☑ 1 differential analog input (-10 to +10) Vdc or (-20 to +20) mA, 14 Bits;
  - ☑ 2 analog outputs (-10 to +10) Vdc or (0 to +20) mA, 12bits;
  - ☑ 2 isolated encoder input, with external supply of 5 Vdc or 8 Vdc to 24 Vdc;
  - ☑ 1 serial communication interface -- RS-232C (standard Protocol: MODBUS-RTU);
  - ☑ All sizes compatible with MVW-01;
  - ☑ It permits the use of digital and analog inputs/ouputs of the MVW-01, comprising 15 digital inputs<sup>(1)</sup>, 9 digital outputs<sup>(2)</sup>, 3 analog inputs<sup>(3)</sup> and 4 analog outputs<sup>(4)</sup>, accessed by the ladder;
  - ☑ CANopen Master/Slave and DeviceNet Slave communication;
  - ☑ Option for Profibus DP Slave communication;
  - ☑ Option for DeviceNet communication.

(1) DI1 to DI8.

(2) DO1, DO2, RL1 to RL3.

(3) AI1 and AI2.

(4) AO1 and AO2.

- 2.3.2 Software      The software for the PLC2 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 PLC2 board is performed via WLP Software using the Ladder Logic Language, with specific blocks for positioning and CLP functions;
  - ☑ Memory capacity for the user program: 64 kB (65536 bytes);
  - ☑ On-line monitoring.



### ATTENTION!

The PLC2 version 1.5X 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 PLC2 board.



### **ATTENTION!**

Follow the instructions included in this user's guide to guarantee the correct installation and operation of the PLC2 board and the MVW-01 drive.

### 3.1 INSTALLING THE PLC BOARD ON THE DRIVE

The PLC2 board is directly installed on the MVC2 control board.

Follow the steps bellow 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 MVW-01.
- Step 2 - Configure the jumpers of the board according to tables 3.1, 3.2 and 3.3 of the CONFIGURING THE JUMPERS section.
- Step 3 - Replace the metal and plastic spacers installed on the MVC2 control board by the spacers provided with the PLC2 kit.
- Step 4 - Seat the PLC board on the MVW-01 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 MVC2 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.
- Step 8 - When using the PTC input of the PLC2 board, plug the cable connected to connector XC11 of the PLC2 board into connector XC11 of the drive control board (MVC2).

3.2 CONFIGURING THE JUMPERS Some functions and characteristics of the PLC board operation are defined by the setting of the jumpers on the board (see figure 3.1). The following tables describe the possible configurations for the jumpers and their functions.

XC1 Jumper: Selection of Encoder Power Supply Voltage

XC1 Status	Encoder Power Supply
Open	(8 to 24) Vdc
Close	5 Vdc

Table 3.1 - XC1 jumper



ATTENTION!

If XC1 is closed, do not supply the encoders with voltage higher than 5 Vdc. Higher voltages will damage the circuitry.

XC2 and XC6 Jumpers: Firmware Download

XC2 and XC6 Status	Operation
Open	Normal operation
Close	Firmware download

Table 3.2 - XC2 and XC6 jumpers

XC81 and XC82 Jumpers: Analog Outputs AO1 and AO2 Operation Mode

XC81 and XC82 position	Analog output operation mode
1 and 2	Voltage (-10 to +10) Vdc
2 and 3	Current (0 to 20) mA

Table 3.3 - XC81 and XC82 jumpers

3.3 CONNECTORS DESCRIPTION Figure 3.1 shows the connectors and jumpers available on the PLC2 board.

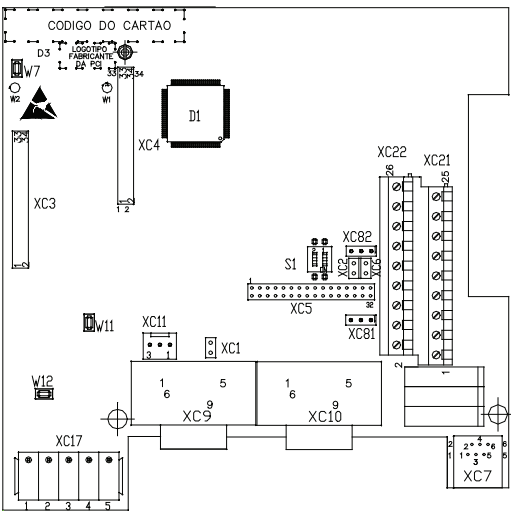


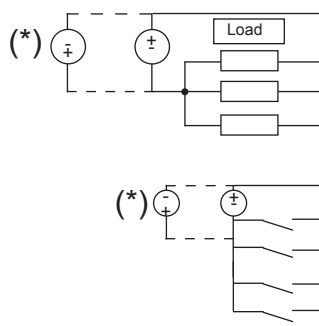
Figure 3.1 - Detailed view of the connectors and jumpers of the PLC2 board

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: 3 A 250 Vac
2	NO			
3	C	DO2		
4	NO			
5	C	DO3		
6	NO			
7	COM DO		Reference for digital outputs DO4, DO5, and DO6	-
8	DO4		Bidirectional Opto-isolated Digital Outputs	Maximum Voltage: 48 Vdc Current capacity: 500 mA
9	DO5			
10	DO6			
11	COM DI		Reference for digital inputs DI1 to DI9	-
12	DI9		Bidirectional Isolated Digital Inputs	Input Voltage: (15 to 30 Vdc) Input Current: 11 mA@24 Vdc
13	DI8			
14	DI7			
15	DI6			

(\*) External Power Supplies.



(\*) External Power Supplies.

Figure 3.2 - Description of XC21 connector

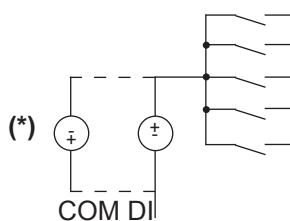
### XC22 Connector: 24Vdc Transistor Outputs and Digital Inputs

XC22 Connector			Function	Specifications
16	PTC1		Motor thermistor input	Actuation: 3.9 k Release: 1.6 k Minimum resistance: 100 Ω
17	PTC2		PTC	
18	GND ENC		Reference for the power supply of the encoder input	-
19	+ ENC		Encoder input power supply	Controlled 5 Vdc or (8 to 24) Vdc Current consumption: 50 mA + Encoders current
20	-	AO2	Analog output 2	(-10 to +10) Vdc or (0 to 20) mA 12 bits
21	+			
22	-	AO1	Analog output 1	(-10 to +10) Vdc or (0 to 20) mA 12 bits
23	+			
24	-	AI1	Differential Analog Input 1	(-10 to +10) Vdc or (-20 to +20) mA 14 bits (**)
25	+			
26	DI1		Bidirectional, Isolated Digital Inputs	Input voltage: (15 to 30) Vdc Input current: 11 mA@24 Vdc
27	DI2			
28	DI3			
29	DI4			
30	DI5			

(\*)

(\*) External Power Supply.

(\*\*) For current switch S1 to ON.



(\*) External Power Supply.

(\*\*) For current switch S1 to ON.

Figure 3.3 - Description of XC22 connector



Figure 3.4 shows the PTC connection to terminals 16 and 17 of XC22 connector, its operation under a motor temperature raise condition, and its return to the regular operation.

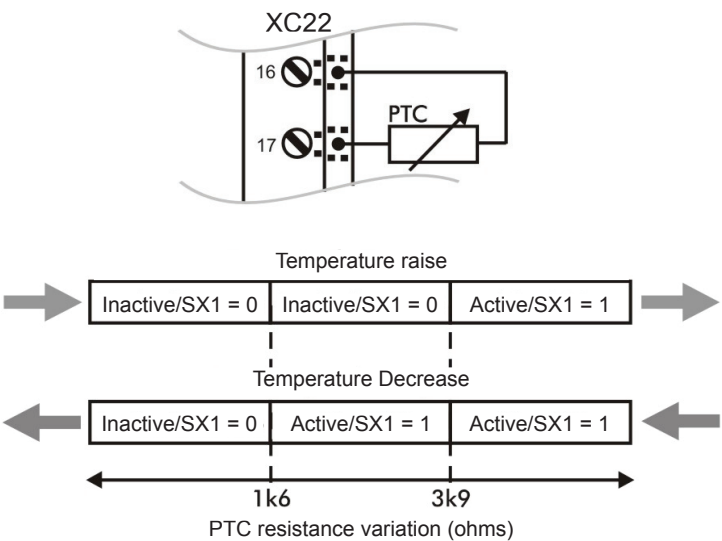


Figure 3.4 - Using PTC

**XC3 Connector: Anybus-S of the HMS Board**

For the connection of the Anybus-S board, which enables the PLC to communicate in a Profibus DP or DeviceNet network.

**XC7 Connector: RS-232C**

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

Table 3.4 - Description of XC7 connector

**XC11 connector: PTC Circuit power supply**

When the PTC sensor is used, the appropriated cable must be connected from PLC2 board XC11 connector to the XC11 from the control board (MVC2).

**XC17 Connector: CAN Network**

XC17 Connector		Function	Specification
1	V-	Reference (GND) for the CANopen power supply	-
2	CANL	CANL	-
3	SHIELD	Shield	-
4	CANH	CANH	-
5	V+	CANopen power supply	(11 to 25) Vdc 50 mA@24 Vdc

Table 3.5 - Description of XC17 connector



**ATTENTION!**

Both ends of the CAN network bus shall be terminated with a 120Ω resistor. The resistor should be connected between terminals CANL and CANH.

### XC9 Connector: Incremental Encoder 1 (Main)

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 PLC2 board. This input has no encoder fault detection.

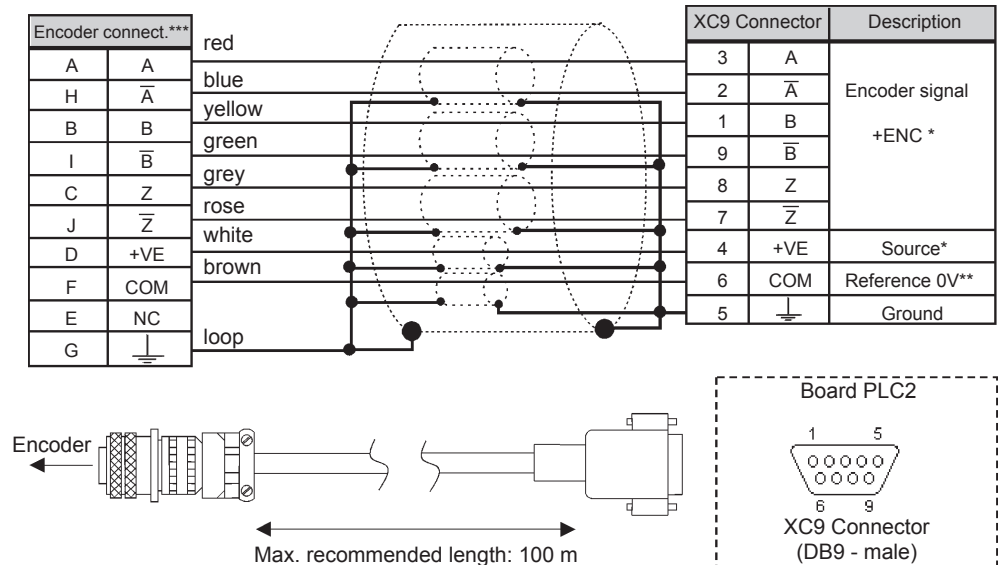
The used encoder should have following features:

- ☑ 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” 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.



\* Power supply connected to XC22: 18 and 19.

\*\* Referenced to ground via 1  $\mu$ F in parallel with 1 k $\Omega$ .

\*\*\* Valid pin location for encoder HS35B-Dynapar. When other encoder models are used, check the correct connection to meet the required sequence.

**Figure 3.5 - Encoder 1 connection**

XC10 Connector: Incremental Encoder 2 (Auxiliary)

The connection of the auxiliary encoder 2 is made through the XC10 connector (DB9) of the PLC2 board.

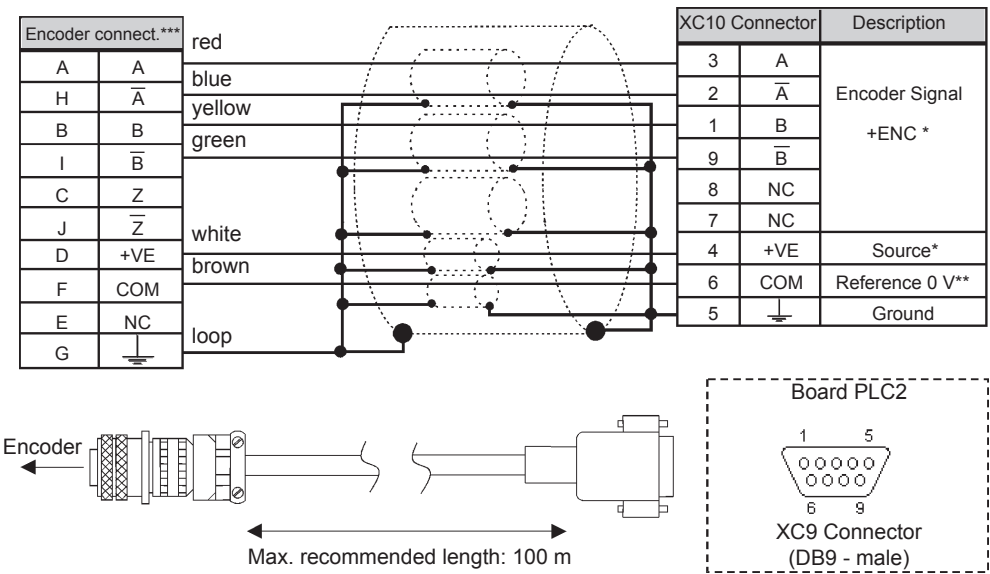
This input can be used in applications where it is necessary to use an external encoder to perform positioning functions.

However, this input shall not be used for motor speed feedback. Motor speed feedback is made through XC9 connector of the main encoder 1. This input has not encoder fault detection.

- The used encoder should have following features:
- ☑ 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”;
  - ☑ Electronic circuit isolated against encoder frame;
  - ☑ Number of pulses recommended per revolution: 1024 ppr.

Use shielded cable for the electrical connection and run it away (at least 25 cm) from the other wiring (power, control cables, etc.). If possible, run the cables inside a metal conduit.

Set P791 to 1 in order to use this input as a position feedback.



\* Power supply connected to XC22: 18 and 19.

\*\* Referenced to ground via 1  $\mu$ F in parallel with 1 k $\Omega$ .

\*\*\* 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 2 connection



**NOTE!**

The maximum permitted frequency for the main/auxiliary encoder is 100 kHz.

### 3.4 CONFIGURING THE MVW-01 TO OPERATE WITH PLC2 BOARD

In order to enable the MVW-01 to be controlled by the PLC2 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 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, the inverter must be operated in vector mode with encoder (**P202 = 4**).

#### **Important Notes:**

- ☑ Always when possible, use the vector mode with encoder;
- ☑ The scalar mode operation (V/Hz) should be avoided 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:**

There is no need of special MVW-01 programming to access the drive's digital inputs through the PLC board.

In the PLC board programming, the digital inputs of the drive (DI1 to DI6) are named DI101 to DI106, respectively.

☑ **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 MVW-01 parameters must also be configured in accordance with the application (refer to the MVW-01 User's Guide for its parameter description).

Parameter	Range [Factory Setting] Unit	Description / Note
<b>P750</b> Firmware version PLC2 [Read parameter]	- [ - ] -	☑ It shows the firmware version of the PLC board. Example: version 1.00. At the parameter you can read 100.
<b>P751</b> Scan cycle of the user program [Read parameter]	0 to 65535 [ - ] x100 µs	☑ It shows the duration of the user program cycle. Each unit corresponds to 100 µs. ☑ 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 $79 \div 10 = 7.9$ ms.
<b>P752 (*)</b> Resets the retentive markers [Configuration parameter]	0 or 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.
<b>P753 (*)</b> Loads factory settings, if =1234 [Configuration parameter]	0 to 65535 [ 0 ] -	☑ It loads the factory setting to the system parameters (P750 to P799). ☑ Set this parameter to 1234 and reset the system.
<b>P754</b> Position reference (rotations) [Read parameter]	0 to 65535 [ - ] rotations	☑ It shows the position reference in rotations. The position reference starts at zero and after the movement has been concluded, it returns to zero.
<b>P755</b> Position reference (fraction of rotation) [Read parameter]	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.

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

Parameter	Range [Factory Setting] Unit	Description / Note
<b>P756</b> Real position signal [Read parameter]	0 or 1 [ - ] -	☑ Signal of the real position shown at Parameters P757 and P758. 0 = negative 1 = positive
<b>P757</b> Real position (rotations) [Read parameter]	0 to 65535 [ - ] rotations	☑ It shows the real position in rotations.
<b>P758</b> Real position (fraction of rotation) [Read parameter]	0 to 3599 [ - ] degrees/10	☑ It shows the fraction of revolution of the real position in tenth of degree.
<b>P759</b> Lag error [Read parameter]	0 to 3599 [ - ] degrees/10	☑ Shows lag error in degrees/10.
<b>P760</b> Proportional position gain (Kp) [Configuration parameter]	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.
<b>P761</b> Integral position gain (Ki) [Configuration parameter]	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 beyond the desired position and return.
<b>P762</b> Max. lag error [Configuration parameter]	0 to 65535 [ 1800 ] 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.

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

Parameter	Range [Factory Setting] Unit	Description / Note														
<b>P763</b> Disables user program if=1 [Configuration parameter]	0 or 1 [ 0 ] -	<input checked="" type="checkbox"/> 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.														
<b>P764 (*)</b> PLC address at network [Configuration parameter]	1 to 247 [ 1 ] -	<input checked="" type="checkbox"/> 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.														
<b>P765 (*)</b> Baud rate of RS-232 [Configuration parameter]	1 to 6 [ 4 (= 9600 bps) ] -	<input checked="" type="checkbox"/> Sets the baud rate of the serial interface. The permitted settings are: <table><tr><th>P765</th><th>Baud-Rate (bps)</th></tr><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></table> <p><b>Table 4.1 - Baud rate of RS-232</b></p>	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															
<b>P766 (*)</b> PID sample time [Configuration parameter]	1 to 10000 [ 1 ] x 1.2 ms	<input checked="" type="checkbox"/> Defines the sampling time for the PID blocks in intervals of 1.2 ms. Example: P766 = 10 means that the PID “sampling time” will be 12 ms.														
<b>P767 (*)</b> Synchronous motor speed [Configuration parameter]	0 to 10000 [ 1800 ] rpm	<input checked="" type="checkbox"/> Set this parameter to the driven motor synchronous speed. <input checked="" type="checkbox"/> In order to calculate the motor synchronous speed use the following equation: $n_s = \frac{120 \times f}{2p}$ <p>Where: ns = Synchronous speed f = Motor frequency p = Number of pole pairs of the motor</p> <input checked="" type="checkbox"/> For instance, a IV pole motor / 50 Hz has a synchronous speed of 1500 rpm.														

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





Parameter	Range [Factory Setting] Unit	Description / Note												
<b>P768</b> (*) Encoder 1 pulse number (main) [Configuration parameter]	0 to 10000 [ 1024 ] ppr	☑ It shows the number of pulses per encoder revolution.												
<b>P769</b> (*) Encoder 1 zero pulse position (main) [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.												
<b>P770</b> (*) CAN protocol [Configuration parameter]	0 to 2 [ 0 ] -	<div>☑ The setting of this parameter allows selecting the communication protocol that will be used for the CAN interface available at the PLC2 board.</div> <table> <tr> <th>P770</th><th>Description</th><th>Note</th></tr> <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 PLC2 board operate as master or slave on the CANopen network. Additional information about how using the PLC2 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 PLC2 board operate as a slave on the DeviceNet network. Additional information about how using the PLC2 board with this protocol can be found on the DeviceNet communication user's guide provided with the product CD.</td></tr> </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 PLC2 board operate as master or slave on the CANopen network. Additional information about how using the PLC2 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 PLC2 board operate as a slave on the DeviceNet network. Additional information about how using the PLC2 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 PLC2 board operate as master or slave on the CANopen network. Additional information about how using the PLC2 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 PLC2 board operate as a slave on the DeviceNet network. Additional information about how using the PLC2 board with this protocol can be found on the DeviceNet communication user's guide provided with the product CD.												

**Table 4.2** - CAN interface available at the PLC2 board**NOTE!**

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

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

Parameter	Range [Factory Setting] Unit	Description / Note																														
<b>P771</b> (*) CAN address [Configuration parameter]	0 to 127 [ 63 ] -	<p><input checked="" type="checkbox"/> Permite P771 sets the address of the PLC2 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><input checked="" type="checkbox"/> It is not necessary to define the device address when the synchronism function via CAN is used.</p> <p> <b>NOTE!</b> Change of parameter P771 (CAN address) is executed when the device is reset or at next power up.</p>																														
<b>P772</b> (*) CAN baud rate [Configuration parameter]	0 to 8 [ 0 ] bits/second	<p><input checked="" type="checkbox"/> Adjust CAN baud rate. The permitted values are:</p> <table border="1"> <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><b>Table 4.3 - CAN baud rate</b></p> <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.</p> <p> <b>NOTE!</b> Change of baud rate is valid only after the device is reset or at next power up.</p>	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																														

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

Parameter	Range [Factory Setting] Unit	Description / Note									
<b>P773</b> Bus off recovery [Configuration parameter]	0 or 1 [ 0 ] -	<div> <input checked="" type="checkbox"/> This parameter allows the PLC2 action selection when a bus off error occurs. The permitted values are: </div> <table> <tr> <th>P773</th><th>Description</th><th>Note</th></tr> <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> </table> <p><b>Table 4.4 - Permitted values when a bus off error occurs</b></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.									
<b>P774</b> Action to be taken upon detection of a communication failure [Configuration parameter]	0 or 1 [ 1 ] -	<div> <input checked="" type="checkbox"/> Permite selecionar qual ação a PLC2 deve tomar caso ocorra erro durante a comunicação CAN: </div> <table> <tr> <th>P774</th><th>Description</th><th>Note</th></tr> <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> </table> <p><b>Table 4.5 - Action a communication failure</b></p> <div> <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. </div>	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.									

Parameter	Range [Factory Setting] Unit	Description / Note																
<b>P775</b> CAN status [Read parameter]	0 to 6 [ - ] -	<div><input checked="" type="checkbox"/> Inform CAN status:</div> <table><tr><th>P775</th><th>CAN Status</th></tr><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><tr><td>6</td><td>Bus not powered</td></tr></table> <div>Table 4.6 - CAN status</div>	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)	6	Bus not powered
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)																	
6	Bus not powered																	
<b>P776</b> Counter of received telegrams [Read parameter]	0 to 65535 [ - ] -	<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.																
<b>P777</b> Counter of transmitted telegrams [Read parameter]	0 to 65535 [ - ] -	<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.																
<b>P778</b> Counter of detected errors [Read parameter]	0 to 65535 [ - ] -	<input checked="" type="checkbox"/> Cyclic counter is incremented each time an error is detected (bus off). Counting is restart each time the counter reaches to upper limit.																
<b>P779</b> Configuration status CANopen [Read parameter]	0 or 1 [ - ] -	<input checked="" type="checkbox"/> Shows the CANopen configuration Status. 0 = slave 1 = master																

Table 4.6 - CAN status

Parameter	Range [Factory Setting] Unit	Description / Note																		
<b>P780</b> Status CANopen communication status [Read parameter]	0 to 4 [ - ] -	<p>☑ Indicates the status of the CANopen communication, informing if the protocol was correctly initialized and the state of the slave node guarding service.</p> <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 P770 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 PLC board error (E65).</td></tr> </tbody> </table> <p><b>Table 4.7 - Status of the CANopen communication</b></p> <p>☑ Refer to CANopen communication user's guide to obtain detailed description about the protocol.</p>	P780	Description	Note	0	Disabled	The CANopen protocol was not set in parameter P770 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 PLC board error (E65).
P780	Description	Note																		
0	Disabled	The CANopen protocol was not set in parameter P770 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 PLC board error (E65).																		
<b>P781</b> CANopen node status [Read parameter]	0 to 127 [ - ] -	<p>☑ Each device in the CANopen network has an associated status. The current status of the PLC2 board is displayed in this parameter.</p> <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 P770 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>Preoperational</td><td>Only some CANopen communication services are available in this state.</td></tr> </tbody> </table> <p><b>Table 4.8 - Status of the CANopen node</b></p> <p>☑ Refer to CANopen communication user's guide to obtain detailed description about the protocol.</p>	P781	Description	Note	0	Not initialized	The CANopen protocol was not set in parameter P770 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	Preoperational	Only some CANopen communication services are available in this state.			
P781	Description	Note																		
0	Not initialized	The CANopen protocol was not set in parameter P770 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	Preoperational	Only some CANopen communication services are available in this state.																		

Parameter	Range [Factory Setting] Unit	Description / Note														
<b>P782</b> DeviceNet network status [Read parameter]	0 to 5 [ - ] -	<table><tr><th>P782</th><th>Description</th></tr><tr><td>0</td><td>Not Powered / Not On-line</td></tr><tr><td>1</td><td>On-line / Not Connected</td></tr><tr><td>2</td><td>On-line 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></table> <p><b>Table 4.9 - DeviceNet network status</b></p> <p>☑ A detailed description of these items can be found on the DeviceNet user's guide for this product.</p>	P782	Description	0	Not Powered / Not On-line	1	On-line / Not Connected	2	On-line and Connected	3	Connection Timeout	4	Critical Link Failure	5	Running Auto-baud
P782	Description															
0	Not Powered / Not On-line															
1	On-line / Not Connected															
2	On-line and Connected															
3	Connection Timeout															
4	Critical Link Failure															
5	Running Auto-baud															
<b>P783</b> DeviceNet master status [Read parameter]	0 or 1 [ - ] -	<table><tr><th>P783</th><th>Description</th></tr><tr><td>0</td><td>Master in run mode</td></tr><tr><td>1</td><td>Master in Idle mode</td></tr></table> <p><b>Table 4.10 - Estado do mestre da rede DeviceNet</b></p> <p>☑ 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															
<b>P784</b> Number of input words [Configuration parameter]	1 to 32 [ 1 ] -	☑ The setting of this parameter defines the number of reading words exchanged with the master of the DeviceNet network.														
<b>P785</b> Number of output words [Configuration parameter]	1 to 32 [ 1 ] -	☑ The setting of this parameter defines the number of writing words exchanged with the master of the DeviceNet network.														
<b>P786</b> Fieldbus board status [Read parameter]	0 to 3 [ - ] -	☑ Indicates the status of the optional communication board. See below the status values and their description: <table><tr><th>P786</th><th>Description</th><th>Note</th></tr><tr><td>0</td><td>Disabled: Indicates that the board was not enabled</td><td>The board is enabled through the WLP software, by using the tool for Fieldbus board configuration.</td></tr></table> <p><b>Table 4.11 - Status of the Fieldbus board</b></p>	P786	Description	Note	0	Disabled: Indicates that the board was not enabled	The board is enabled through the WLP software, by using the tool for Fieldbus board configuration.								
P786	Description	Note														
0	Disabled: Indicates that the board was not enabled	The board is enabled through the WLP software, by using the tool for Fieldbus board configuration.														

Parameter	Range [Factory Setting] Unit	Description / Note												
		<table> <tr> <th>P786</th><th>Description</th><th>Note</th></tr> <tr> <td>1</td><td>Inactive board: Indicates that the board was programmed, however, the PLC2 board could not access the Fieldbus board</td><td>This situation mainly happens during board initialization, (it can also happen during its operation), due to installation and bad connection problems. When the board is inactive, the drive shows an E60 error on the keypad, and it is only possible to enable the board again by resetting the drive.</td></tr> <tr> <td>2</td><td>Active and off-line board: indicates a communication error between the board and the network master</td><td>This error causes the interruption of master-slave communication and may happen due to several reasons (master configuration problems, incorrect installation of communication cables, noise during data transmission, etc.). When the Fieldbus board is offline, the drive shows an E59 error on the keypad.</td></tr> <tr> <td>3</td><td>Active and on-line board: indicates that the masterslave communication was successfully established</td><td>-</td></tr> </table>	P786	Description	Note	1	Inactive board: Indicates that the board was programmed, however, the PLC2 board could not access the Fieldbus board	This situation mainly happens during board initialization, (it can also happen during its operation), due to installation and bad connection problems. When the board is inactive, the drive shows an E60 error on the keypad, and it is only possible to enable the board again by resetting the drive.	2	Active and off-line board: indicates a communication error between the board and the network master	This error causes the interruption of master-slave communication and may happen due to several reasons (master configuration problems, incorrect installation of communication cables, noise during data transmission, etc.). When the Fieldbus board is offline, the drive shows an E59 error on the keypad.	3	Active and on-line board: indicates that the masterslave communication was successfully established	-
P786	Description	Note												
1	Inactive board: Indicates that the board was programmed, however, the PLC2 board could not access the Fieldbus board	This situation mainly happens during board initialization, (it can also happen during its operation), due to installation and bad connection problems. When the board is inactive, the drive shows an E60 error on the keypad, and it is only possible to enable the board again by resetting the drive.												
2	Active and off-line board: indicates a communication error between the board and the network master	This error causes the interruption of master-slave communication and may happen due to several reasons (master configuration problems, incorrect installation of communication cables, noise during data transmission, etc.). When the Fieldbus board is offline, the drive shows an E59 error on the keypad.												
3	Active and on-line board: indicates that the masterslave communication was successfully established	-												

**Table 4.11 - Status of the Fieldbus board (cont.)**

<b>P788</b> Operation mode for the analog output 1 [Configuration parameter]	0 to 6 [ 0 ] -	<b>P788</b>	<b>Description</b>
		0	-10 to +10 V (range from -32768 to +32767)
		1	0 to 20 mA (range from 0 to 32767)
		2	0 to 20 mA (range from 0 to 65535)
		3	0 to 20 mA (range from -32768 to +32767)
		4	4 to 20 mA (range from 0 to 32767)
		5	4 to 20 mA (range from 0 to 65535)
		6	4 to 20 mA (range from -32768 to +32767)

**Table 4.12 - Operation mode for the analog output 1**

Parameter	Range [Factory Setting] Unit	Description / Note																
<b>P789</b> Operation mode for the analog output 2 [Configuration parameter]	0 to 6 [ 0 ] -	<table><tr><th>P789</th><th>Description</th></tr><tr><td>0</td><td>-10 to +10 V (range from -32768 to +32767)</td></tr><tr><td>1</td><td>0 to 20 mA (range from 0 to 32767)</td></tr><tr><td>2</td><td>0 to 20 mA (range from 0 to 65535)</td></tr><tr><td>3</td><td>0 to 20 mA (range from -32768 to +32767)</td></tr><tr><td>4</td><td>4 to 20 mA (range from 0 to 32767)</td></tr><tr><td>5</td><td>4 to 20 mA (range from 0 to 65535)</td></tr><tr><td>6</td><td>4 to 20 mA (range from -32768 to +32767)</td></tr></table> <p><b>Table 4.13</b> - Operation mode for the analog output 2</p>	P789	Description	0	-10 to +10 V (range from -32768 to +32767)	1	0 to 20 mA (range from 0 to 32767)	2	0 to 20 mA (range from 0 to 65535)	3	0 to 20 mA (range from -32768 to +32767)	4	4 to 20 mA (range from 0 to 32767)	5	4 to 20 mA (range from 0 to 65535)	6	4 to 20 mA (range from -32768 to +32767)
P789	Description																	
0	-10 to +10 V (range from -32768 to +32767)																	
1	0 to 20 mA (range from 0 to 32767)																	
2	0 to 20 mA (range from 0 to 65535)																	
3	0 to 20 mA (range from -32768 to +32767)																	
4	4 to 20 mA (range from 0 to 32767)																	
5	4 to 20 mA (range from 0 to 65535)																	
6	4 to 20 mA (range from -32768 to +32767)																	
<b>P790</b> (*) Encoder 2 pulse number (auxiliary) [Configuration parameter]	0 to 10000 [ 1024 ] ppr	<input checked="" type="checkbox"/> This parameter represents the number of pulses per revolution of encoder 2 (auxiliary).																
<b>P791</b> (*) Enables the position feedback via encoder 2 (auxiliary) [Configuration parameter]	0 or 1 [ 0 ] -	<input checked="" type="checkbox"/> Enables the position feedback via encoder 2 (auxiliary). <table><tr><th>P791</th><th>Description</th><th>Specification</th></tr><tr><td>0</td><td>Disabled</td><td>Encoder 1 (main encoder) is responsible for the position feedback.</td></tr><tr><td>1</td><td>Enabled</td><td>Encoder 2 (auxiliary encoder) is responsible for the position feedback.</td></tr></table> <p><b>Table 4.14</b> - Encoder 2</p>	P791	Description	Specification	0	Disabled	Encoder 1 (main encoder) is responsible for the position feedback.	1	Enabled	Encoder 2 (auxiliary encoder) is responsible for the position feedback.							
P791	Description	Specification																
0	Disabled	Encoder 1 (main encoder) is responsible for the position feedback.																
1	Enabled	Encoder 2 (auxiliary encoder) is responsible for the position feedback.																

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



Parameter	Range [Factory Setting] Unit	Description / Note																
<b>P792</b> (*) Direction of encoder 2 signal (auxiliary) [Configuration parameter]	0 or 1 [ 1 ] -	<div><input checked="" type="checkbox"/> Defines the direction of the encoder signal:</div> <div><div>0 = A → B</div><div>Direction of encoder signals</div><div><div>A</div><div>B</div><div>Encoder rotating in forward direction</div></div><div><div>1 = B → A</div><div>Direction of encoder signals</div><div><div>B</div><div>A</div><div>Encoder running clockwise</div></div></div><div>Figure 4.1 - Direction of the encoder</div></div>																
<b>P793</b> (*) Select serial protocol [Configuration parameter]	0 to 5 [ 0 ] -	<div><input checked="" type="checkbox"/> This parameter configures the serial communication: protocol, parity, and number of stop-bits, respectively.</div> <table><tr><th>P793</th><th>Description</th></tr><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></table> <div>Table 4.15 - Select serial protocol</div>	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.																	
<b>P794</b> Operation mode for the analog input 1 [Configuration parameter]	0 to 6 [ 0 ] -	<table><tr><th>P794</th><th>Description</th></tr><tr><td>0</td><td>-10 to +10 V / -20 to +20 mA (range from -32768 to +32767)</td></tr><tr><td>1</td><td>0 to 20 mA (range from 0 to 32767)</td></tr><tr><td>2</td><td>0 to 20 mA (range from 0 to 65535)</td></tr><tr><td>3</td><td>0 to 20 mA (range from -32768 to +32767)</td></tr><tr><td>4</td><td>4 to 20 mA (range from 0 to 32767)</td></tr><tr><td>5</td><td>4 to 20 mA (range from 0 to 65535)</td></tr><tr><td>6</td><td>4 to 20 mA (range from -32768 to +32767)</td></tr></table> <div>Table 4.16 - Operation mode for the analog input</div>	P794	Description	0	-10 to +10 V / -20 to +20 mA (range from -32768 to +32767)	1	0 to 20 mA (range from 0 to 32767)	2	0 to 20 mA (range from 0 to 65535)	3	0 to 20 mA (range from -32768 to +32767)	4	4 to 20 mA (range from 0 to 32767)	5	4 to 20 mA (range from 0 to 65535)	6	4 to 20 mA (range from -32768 to +32767)
P794	Description																	
0	-10 to +10 V / -20 to +20 mA (range from -32768 to +32767)																	
1	0 to 20 mA (range from 0 to 32767)																	
2	0 to 20 mA (range from 0 to 65535)																	
3	0 to 20 mA (range from -32768 to +32767)																	
4	4 to 20 mA (range from 0 to 32767)																	
5	4 to 20 mA (range from 0 to 65535)																	
6	4 to 20 mA (range from -32768 to +32767)																	

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