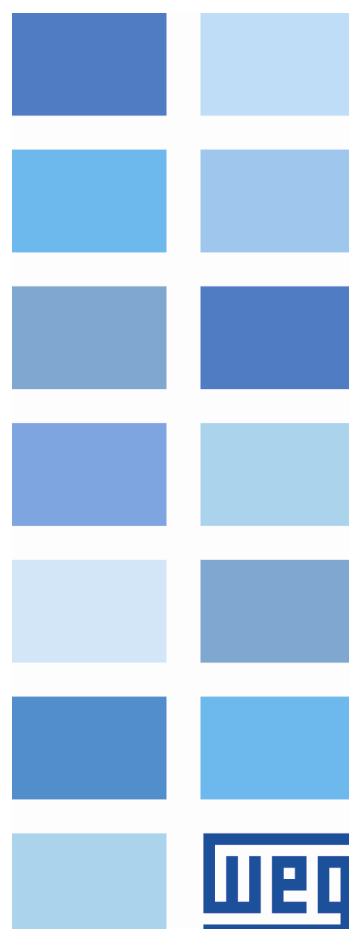


WEG MVW (PROFIBUS DP) communication with Siemens SIMATIC S7-1500

Application Notes

Language: English
Document: 0





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Language: English

Document number: 00000000/0

Publication Date: 12/2020

Summary of the Revisions

Revision	Description	Chapter
0	First Edition	-

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ABOUT THE MANUAL

This document provides information about the configuration and programming for the communication of the Siemens PLC SIMATIC S7-1500 with the MVW01 and MVW3000 Frequency Inverter equipped with PROFIBUS DP module. All presented operations assume the user is familiar with the programming of the Siemens PLC with the application Simatic Manager TIA Portal V16. The equipment is subject to failures and the user must take safety measures for this condition.

ABBREVIATIONS AND DEFINITIONS

PLC	Programmable Logic Controller
RAM	Random Access Memory
USB	Universal Serial Bus
HMI	KEYPAD (HMI)
OP	Operation Mode
GSD	Gerät Sammlung Datei – Database file of the device.
DP	Decentralized Periphery
EDS	Electronic Data Sheet – Data base file of the device.
MVW01	Medium Voltage Frequency Inverter
MVW3000	Medium Voltage Frequency Inverter

NUMERICAL REPRESENTATION

Decimal numbers are represented by means of digits without suffix. Hexadecimal numbers are represented with the letter 'h' after the number.

USED DOCUMENTS AND MANUALS

For a better understanding of the information provided hereby, the following manuals may be referred to:

MANUAL OF THE FREQUENCY INVERTER

Series: MVW01 and MVW3000

Language: English

Document number: 0899.5247-3.3 / 10004823674/01

MANUAL OF THE PROFIBUS COMMUNICATION

Series: MVW

Language: English

Document number: 10004823674/01

Simatic Manager

Software Application: TIA Portal V16

Language: English

GSDs FILE

hms_1003.gsd

Manufacturer: WEG

HARDWARE

MVW Frequency Inverter

Firmware Version: 2.05

Manufacturer: WEG

FIELDBUS KIT interface module

Model: PROFIBUS DP

Manufacturer: WEG

CPU 1513-1 PN

Model: 6ES7 513-1AL02-0AB0

Manufacturer: Siemens

SAFETY INSTRUCTIONS

This manual was developed to be used by people with proper technical training or qualification to operate this kind of equipment.

SAFETY WARNINGS IN THE MANUAL

In this manual are used the following safety warnings:



DANGER!

The not following of the procedures recommended in this warning can lead to death, serious injuries and considerable material damages.



ATTENTION!

The not following of the procedures recommended in this warning can lead to material damages.



NOTE!

The text aims at providing important information for the full understanding and proper operation of the product.

PRELIMINARY RECOMMENDATIONS



DANGER!

Only duly qualified people must operate the INVERTER. Those people must first read the user manual. Executing unknown commands or not complying with the safety instructions may result in risk of life and/or damages to the machine.



ATTENTION!

In order to make the commands on the inverter HMI, you must not use pointed tools or instruments. That could damage the keypad screen.

1. HARDWARE CONFIGURATION

Hardware configuration for communication is described in details below.

1. PLC 1 CONFIGURATION

1.1.1 Hardware architecture.

The hardware configuration to perform the communication in Profibus DP network is described in the figure below. It is composed of a CPU with Profibus DP Master communication port and a communication port for download/monitoring the software.

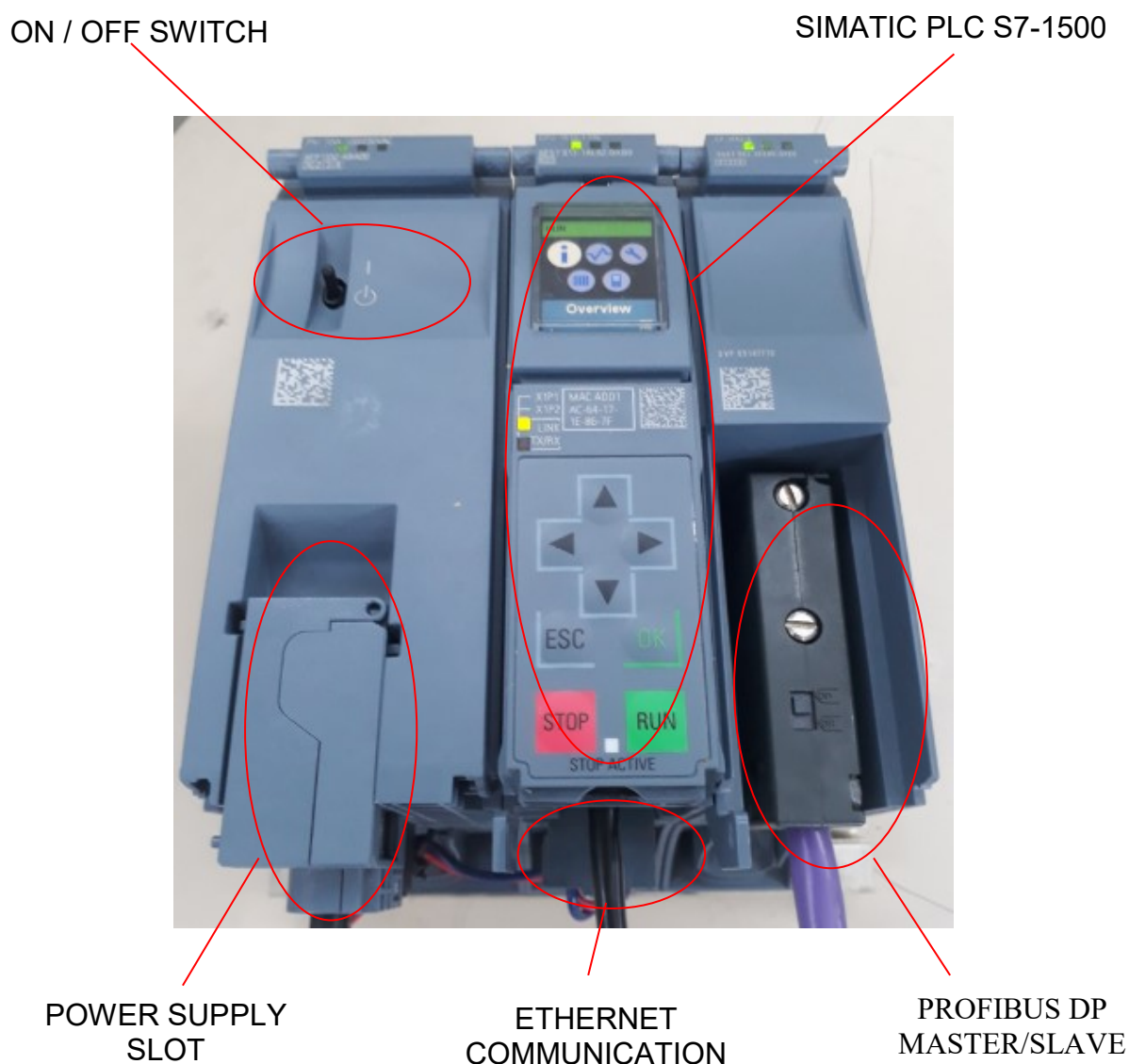


Figure 1.1.1 – PLC hardware Architecture

1.2 INVERTER CONFIGURATION

1.2.1 Installation of the Fieldbus Kit

The hardware configuration to perform the communication in Profibus DP network is described in the figure below. It is composed of a Frequency Inverter MVW and a Profibus DP interface module.

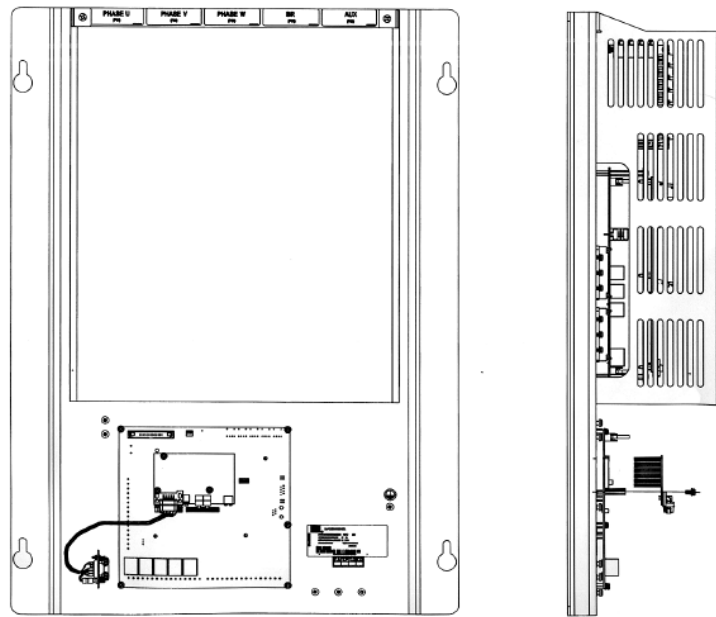


Figure 1.2.2 – Architecture of the Inverter hardware

Profibus interface module must be installed directly on the MVC4 control board and fixed by spacers.

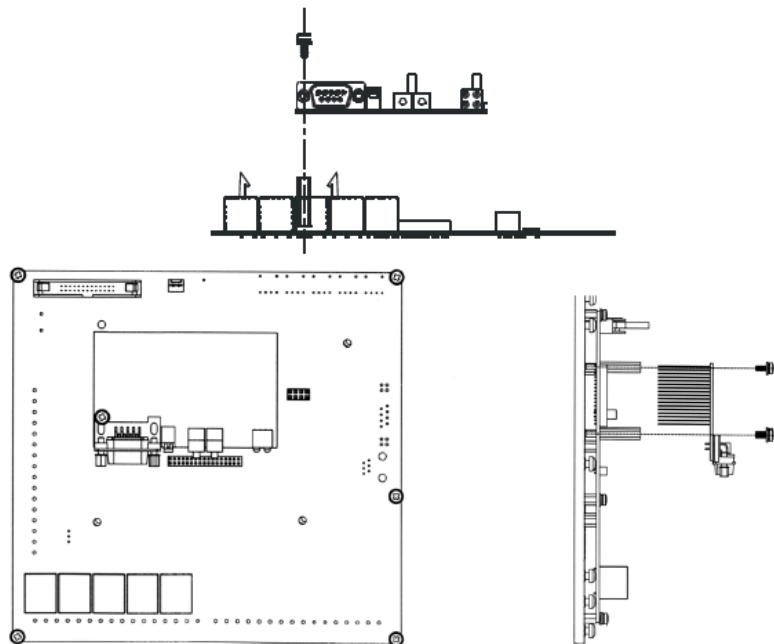


Figure 1.2.3 – Inverter hardware control board MVC4 and Fieldbus Kit.

1.2.2 Fieldbus Kit.

The next figure shows the fieldbus card, we can have two models: Profibus DP-V0 and Profibus DP-V1.

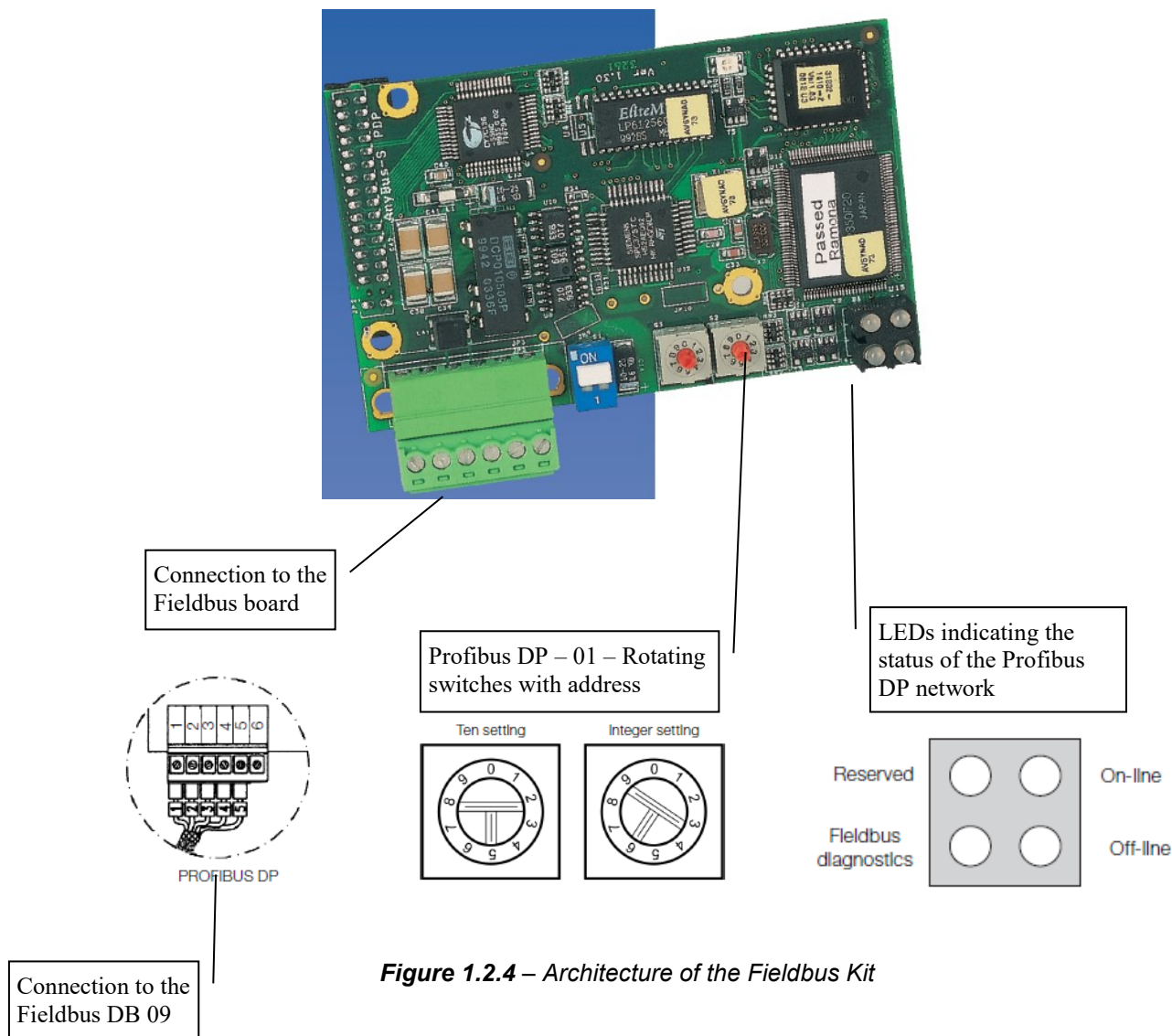


Figure 1.2.4 – Architecture of the Fieldbus Kit



NOTE!

- With the inverter off, install the module on connector XC140.
- Make sure it is properly installed and fastened by the screws.
- Power up the inverter.



NOTE!

- The node address keys must not be changed while the network is running.
- The red LEDs indicate a hardware problem with the electronic card.
- The reset is performed by de-energizing and re-energizing the inverter. If the problem persists, replace the electronic card.

1.2.3 Inverter user Fieldbus Connector.

The figure below D-sub 9-pin female connector, pin assignment according to table below.

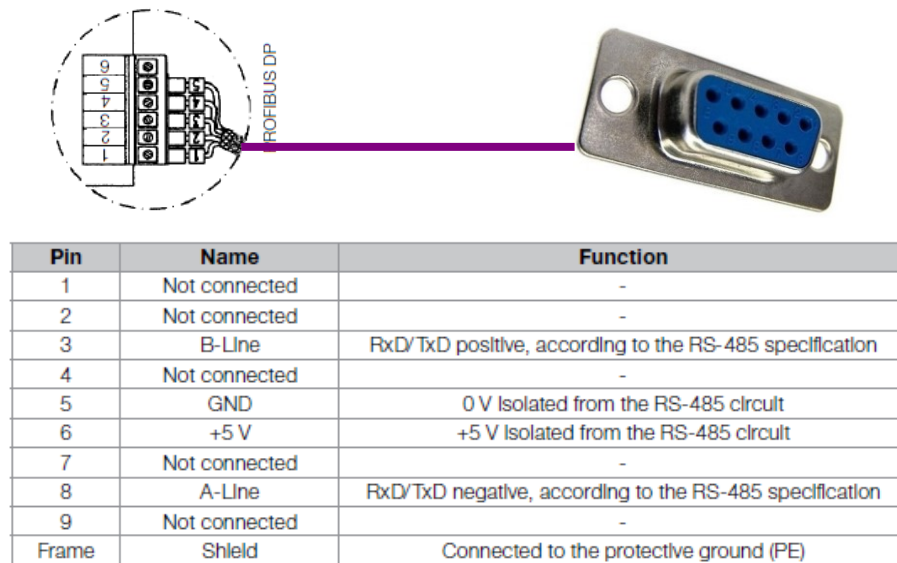


Figure 1.2.5 – Connector DB-09 of the Fieldbus Kit

1.2.4 Fieldbus status LED signaling.

The board also has other four LEDs grouped at the right bottom corner, indicating the Fieldbus network status according Figure below.

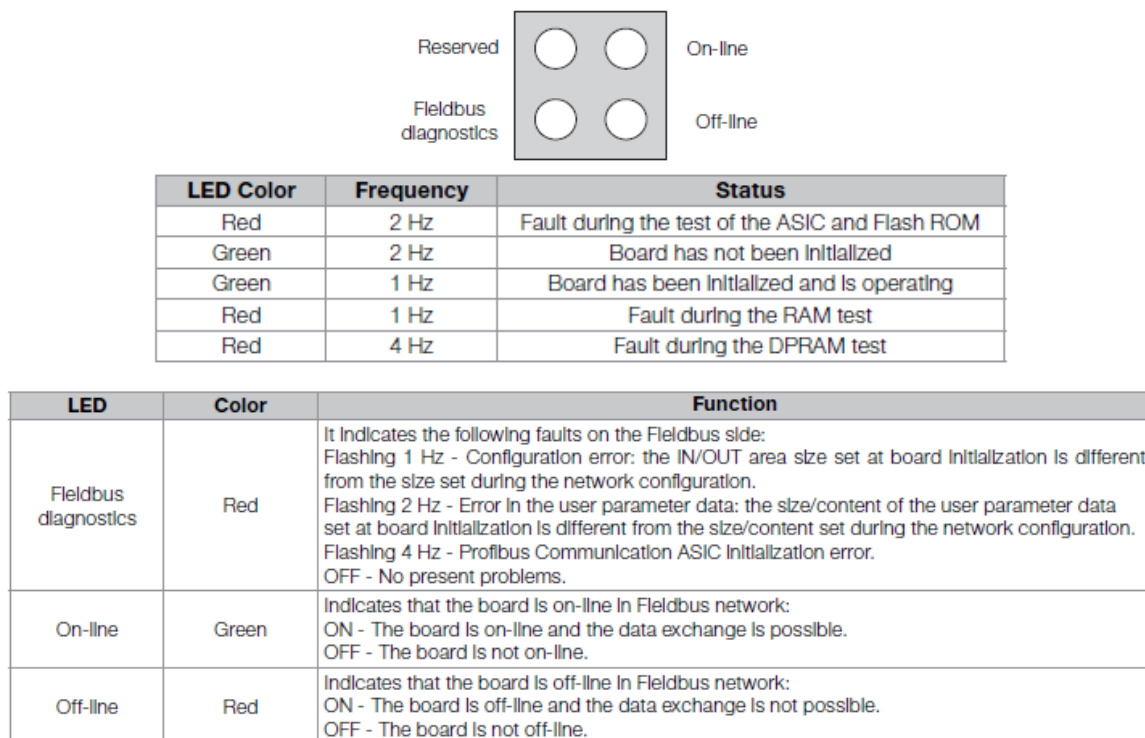


Figure 1.2.6 – LEDs indicating the status of the Profibus DP network.



NOTE!

The red signalizations may indicate hardware problems on the electronic board. Its reset is performed by cycling the power of the inverter. If the problem persists, replace the electronic card.

1.2.5 Power-up.

The figure below shows the proper wiring for the correct power-up of the Frequency Inverter.

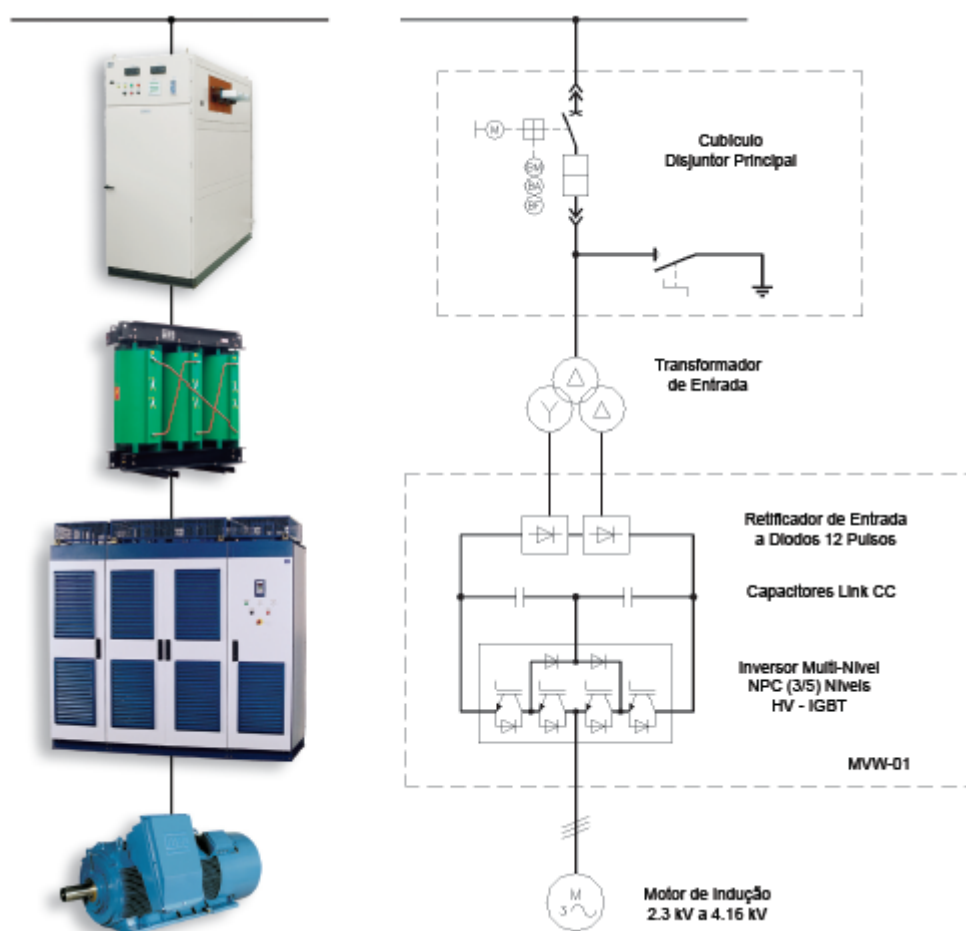


Figure 1.2.5 – Single-line diagram of the MVW inverter energization

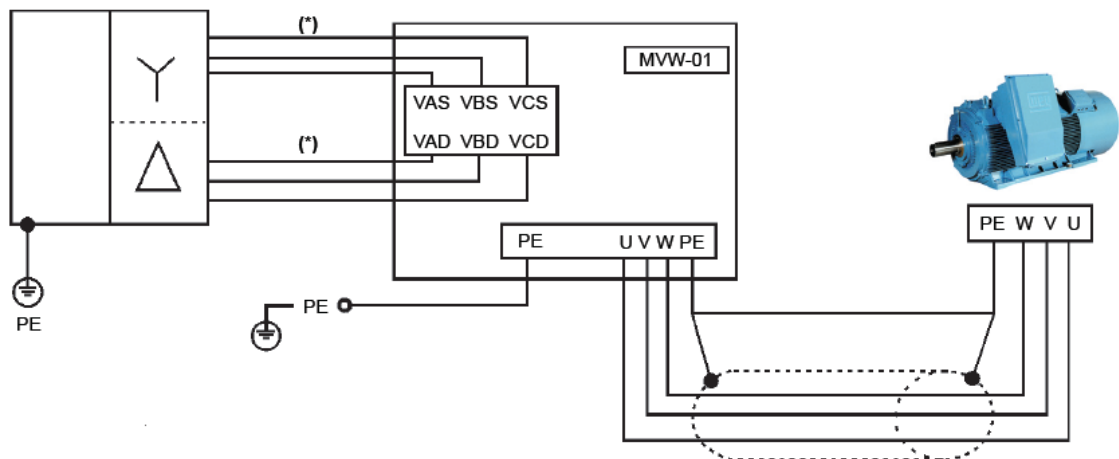


Figure 1.2.7 – Power-up of Inverter hardware MVW-01

1.3 CONFIGURATION OF THE PROFIBUS NETWORK

1.3.1 Architecture of the Profibus DP Network

The figure below shows an example of Profibus-DP network architecture.

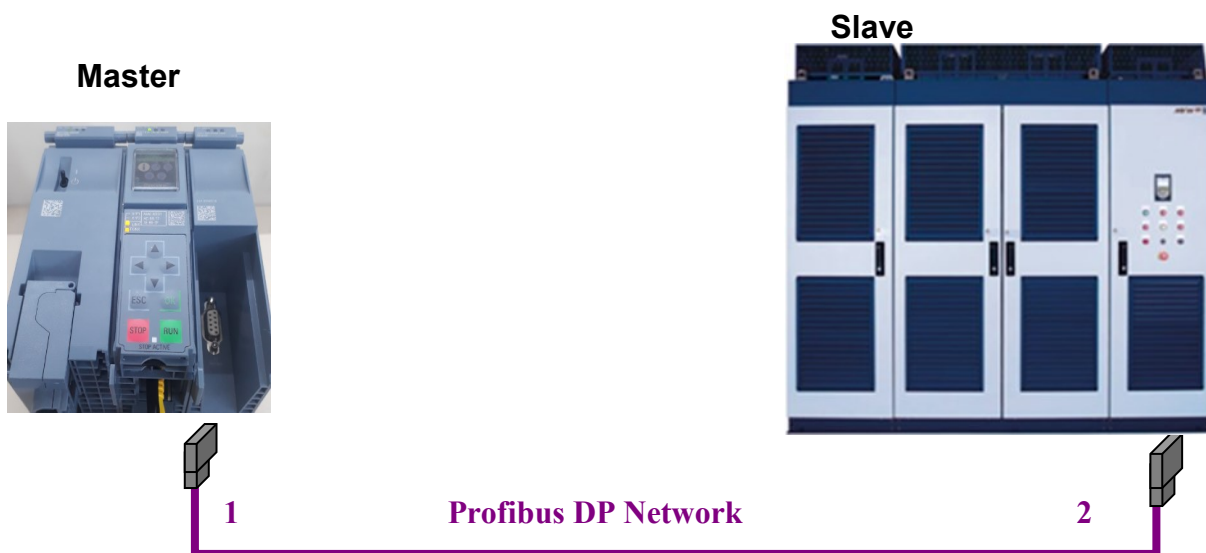


Figure 1.3.1 – Architecture of the Profibus DP Network

1.3.2 Connections and Terminations

The connectors of the Profibus network have input and output connections, connection for the cable loop and network termination resistors. An output point of a connector must always be interconnected to an input point of another connector, except at the ends of the network, where the input points are used as active network termination resistor.

**NOTE!**

For the proper operation of the Profibus DP network, it is necessary that its ends have network termination resistors active and energized by the device connected!

1.3.3 Addressing

In a Profibus DP network, each device has a unique address which varies from 0 to 127. In this example, the master has address 1 and the slave address 2.

2. INVERTER PARAMETER SETTINGS

Below are the parameters that must be verified and configured in order to perform the communication in PROFIBUS DP network.

This parameter setting can be used as a basic example and uploaded directly to the inverter by SuperDrive programming application, which can be downloaded at WEG's website.



NOTE!

This parameter setting is available in the "Parameters" folder of this document.

2.1 SELECTION OF THE INVERTER COMMAND REFERENCES

The Inverter control references (Local and Remote) must be programmed properly. In this example, the local references are programmed so that the inverter control is done via its own keypad and the remote references are programmed for the inverter to be controlled by the PLC via Profibus DP network.

2.1.1 Selection of the Operation Control Mode – Local/Remote

P0220 – LOCAL/REMOTE Source Selection

Adjustable	0 to 14	Value: 8
Range:		
Properties:	CFG	
Access groups via HMI:		

Description:

It defines the command origin source which will select between LOCAL control and REMOTE control.

It also defines which control mode the inverter will adopt when it is powered up.

In this example, the inverter will be programmed for **value 8 "Fieldbus Default Remote"**.



NOTE!

For further information about the parameter, refer to the MVW01 or MVW300 manual!

2.1.2 Selection of Speed Reference – LOCAL Mode

P0221 – Selection of the Speed Reference – LOCAL Mode

Adjustable	0 to 13	Value: 0
Range:		
Properties:	CFG	
Access groups via HMI:		

Description:

It defines the source of the inverter speed reference in the LOCAL control mode.

In this example, the inverter will be programmed for **value 0 “HMI”**.



NOTE!

For further information about the parameter, refer to the MVW01 or MVW3000 manual!

P0223 – Selection of the Direction of Rotation – LOCAL Mode

Adjustable 0 to 16

Value: 2

Range:

Properties: CFG

Access groups via HMI:

Description:

It defines the source for the inverter Direction of Rotation command in the LOCAL control mode.

It also defines the direction of rotation the inverter will adopt when it is powered up.

In this example, the inverter will be programmed for **value 2 “Direction of Rotation Key (FWD)”**.



NOTE!

For further information about the parameter, refer to the MVW01 or MVW3000 manual!

2.1.3 Selection of the Direction of Rotation Control – Remote Mode

P0222 – Selection of the Speed Reference – REMOTO Mode

Adjustable 0 to 13

Value: 10

Range:

Properties: CFG

Access groups via HMI:

Description:

It defines the source of the inverter speed reference in the REMOTE control mode.

In this example, the inverter will be programmed for **value 10 “Fieldbus”**.



NOTE!

For further information about the parameter, refer to the MVW01 or MVW3000 manual!

2.1.4 Selection of the Direction of Rotation – Remote Mode

P0226 – Selection of the Direction of Rotation – REMOTE Mode

Adjustable 0 to 16

Value: 7

Range:

Properties: CFG, V/f, VVW and Vector

Access groups via HMI:

Description:

It defines the source for the inverter Direction of Rotation command in the REMOTE control mode.

It also defines the direction of rotation the inverter will adopt when it is powered up.

In this example, the inverter will be programmed for **value 7 “Fieldbus (Default FWD)”**.



NOTE!

For further information about the parameter, refer to the MVW01 or MVW3000 manual!

2.1.5 Selection of the JOG Control – Remote Mode

P0228 - Selection of JOG – REMOTE Mode

Adjustable 0 to 6

Value: 4

Range:

Properties: CFG

Description:

It defines the source for the inverter JOG command in the REMOTE control mode. In this example, the inverter will be programmed for **value 4 “Fieldbus”**.



NOTE!

For further information about the parameter, refer to the MVW01 or MVW3000 manual!

2.2 CONFIGURATION OF THE PARAMETERS FIELDBUS SETTINGS

2.2.1 Inverter Fieldbus Settings

P0309 – Fieldbus Identification

Adjustable	0 to 13	Value: 03
Range:		
Properties:	RO, Fieldbus	
Access groups via HMI:		

Description:

It identifies the amount of words that will exchange between master and slave. For the communication test, P309 was configured equal to 03 (Profibus DP 6 I/O).



NOTE!

For further information about the parameter, refer to the MVW01 or MVW3000 manual!

2.2.2 Behavior when Fieldbus is with alarm

P0313 – Disabling with Alarm A128, A129 and A130

Adjustable	0 to 3	Value: 03
Range:		
Properties:	CFG, Fieldbus	
Access groups via HMI:		

Description:

Defines the inverter behavior when the physical connection with the master is interrupted and/or the Fieldbus board is inactive (A128, A129 or A130 indicated on the display).

The parameter P313 has the following options:

- 0 = Run/Stop
- 1 = General Enable
- 2 = Inactive
- 3 = Go to Local
- 4 = No function
- 5 = Fatal Failure



NOTE!

Restart the drive to validate these changes; otherwise, it keeps working on the previous configuration.

Fault / Alarm	Description:	Possible causes:
A129: Inactive fieldbus connection	Alarm that indicates a Profibus communication interruption.	<ul style="list-style-type: none"> - PLC idle. - Programming error. Slave and master with different number of reading/writing words. - Communication lost (terminal disconnected, broken cable).
A130: Inactive fieldbus card	Alarm that indicates error during Profibus communication module access.	<ul style="list-style-type: none"> - Module defective, not recognized by the drive or it not installed correctly. - Conflict with another WEG optional module.

Figure 2.1 – Fault and alarm messages description



NOTE!

The alarms A129 / A130 are presented on the conventional HMI as E29 / E30 and the reset automatically after eliminating the cause.

3. CYCLIC DATA COMMUNICATION

The services defined by the first version of the Profibus DP specification (DP-V0), where it is mainly defined as exchanging cyclic data for control and monitoring of the equipment, the MVW with the PROFIBUS DP-V1 communication accessory also supports the additional services for acyclic communication. With the use of these services, it is possible to read / write the parameters through the acyclic functions DP-V1 by the network master.

3.1 VARIABLES READ FROM THE MVW INVERTER

1. Inverter logical status.
2. Motor speed, for the option P309 = 1 or 4 (2I/O) – read 1 and 2.
3. Digital input status (P00120).
4. Parameter contents, for the option P309 = 2 or 5 (2I/O) – read 1 and 2.
5. Parameter contents, for the option (P009).
6. Motor current (P003), for the option P0309 = 3 or 6 (6I/O) – read 1,2,3,4,5, and 6.

3.1.1 *Status word (EL)*

The status word is composed by a total of 16 bits, 8 high order bits and 8 low order bits. It has the following construction:

High-order bits – they indicate the status of the associated function.

EL.15 – Active error:	0 = No	1 = Yes.
EL.14 – PID Control:	0 = Manual	1 = Automatic
EL.13 – Undervoltage of the electronics power supplies:	0 = Without	1 = With.
EL.12 – Local/Remote command:	0 = Local	1 = Remote
EL.11 – JOG command:	0 = Inactive	1 = Active
EL.10 – Forward/Reverse:	0 = Reverse	1 = Forward
EL.09 – General enabling:	0 = Disabled	1 = Enabled
EL.08 – Start/Stop:	0 = Stop	1 = Start.

EL.08 =1, means the inverter received the Run/Stop command via networks. This EL is not intended to signal that the motor is effectively spinning.

Low-order bits – they indicate the error code number, i.e., 03, 07 or 87 (57) This is only valid for MVW01. In MVW3000 these bits are reserved and the fault code is read in parameter P68.

3.1.2 *Motor speed*

This variable is shown by using 13-bit resolution plus signal. Thus, the rated value will be equal to 8191 (1FFFh) (Forward) or -8191 (E001h) (Reverse) when the motor is running at synchronous speed (or base speed, for instance 1800 rpm for a 4-pole, 60Hz).

3.1.3 *Digital input status*

It presents the parameter P0012 contents, where 1 indicate an active input and 0 indicates an inactive input.

The digital inputs of this WORD are distributed as follows:

Bit.7 – DI1 status.
Bit.6 – DI2 status.
Bit.5 – DI3 status.
Bit.4 – DI4 status.
Bit.3 – DI5 status.

Bit.2 – DI6 status.
Bit.1 – DI7 status.
Bit.0 – DI8 status.
Bit.8 – DI9 status.
Bit.9 – DI10 status.

3.1.4 **Parameter contents**

This position allows reading the contents of inverter parameters, which are selected at the position 4 – Number of the parameters to be read – of the variables written in the inverter. The read values have the same order of magnitude of those described in the product manual or showed on the HMI.

3.1.5 **Torque current**

This position indicates P009 parameter contents, without the decimal point. A low pass filter with a time constant of 0.5 s filters this variable.

3.1.6 **Motor current**

This position indicates P003 parameter contents, without the decimal point. A low pass filter with a time constant of 0.3 s filters this variable.



NOTE!

For further information on the faults and alarms, refer to the programming manual available for download on:

<https://static.weg.net/medias/downloadcenter/h55/h11/WEG-mvw-01-medium-voltage-frequency-inverter-users-guide-0899.5247-3.3x-manual-english.pdf>

<https://static.weg.net/medias/downloadcenter/hde/h2e/WEG-MVW3000-user-manual-10004823674-en.pdf>

3.2 **VARIABLES WRITTEN TO MVW INVERTER**

The variables are written in the following order:

1. Control word.
2. Motor speed reference, for the option P309 = 1 or 4 (2I/O) – it writes in 1 and 2.
3. Status of the digital outputs.
4. Number of the parameters to be read, for the option P309 = 2 or 5 (2I/O) – it writes in 1,2,3 and 4.
5. Number of the parameter to be changed.
6. Content of the parameter to be changed, selected in the previous position, for the option P0309 = 3 or 6 (6I/O) – it writes in 1,2,3,4,5, and 6.

3.2.1 **Control word (CL)**

The control word is composed by a total of 16 bits, 8 high order bits and 8 low order bits. It has the following construction:

High-order bits – they select the functions to be controlled, when the correspondent bits are set to 1.

- CL.15 – Inverter fault reset.
- CL.14 – Without function.
- CL.13 – To save the changes of parameters P0169/P0179 in the EEPROM.
- CL.12 – Local/ Remote command.
- CL.11 – Jog command.
- CL.10 – Forward/ Reverse.
- CL.09 – General Enabling.
- CL.08 – Start/ Stop.

Low-order bits – they determine the activation of the functions selected in the high-order bits,

- CL.7 – Inverter fault reset: every time it changes from 0 to 1 it causes an inverter reset, except for the errors (except A0124, A0125, A0126 and A0127);
- CL.6 – No function.
- CL.5 – To save P169/P170 in the EEPROM: 0 = to save, 1 = not to save.
- CL.4 – Local/Remote command: 0 = Local, 1 = Remote.
- CL.3 – Jog command: 0 = Inactive, 1 = Active.
- CL.2 – Forward/Reverse: 0 = Reverse, 1 = Forward.
- CL.1 – General enabling: 0 = Disabled, 1 = Enabled.
- CL.0 – Start/Stop: 0 = Stop, 1 = Start.



NOTE!

The inverter will only execute the command indicated in the lower bit if the corresponding high bit is set to 1 (one). if the upper bit is set to 0 (zero), the inverter will ignore the corresponding lower bit value.

3.2.2 **Motor speed reference**

This variable is presented using a 13-bit resolution. therefore, the speed reference value for the motor synchronous speed will be equal to 8191 (1FFFh).

Examples:

1. 4- Pole, 60Hz motor, synchronous speed = 1800 rpm and speed reference = 600 rpm.

1800 rpm _ 8191
0650 rpm _ X X= 2958 = 0B8Eh

This value (0B8Eh) must be written in the second word, which represents the motor speed reference (according to the beginning of this item).

2. 6- Pole, 60Hz motor, synchronous speed = 1200 rpm and speed reference = 1000 rpm.

1200 rpm_8191

1000 rpm_ X X = 6826 = 1AAAh

This value (1AAAh) must be written in the second word, which represents the motor speed reference (according to the beginning of this item).



NOTE!

Values above 8191 (1FFFh) are allowed when speed references above the motor synchronous speed are required, as long as the maximum programmed speed reference is respected.

3.2.3 Status of the digital outputs

It allows controlling the status of the digital outputs that have been programmed for Fieldbus at the parameters P0275 to P0282. 16 bits, with the following construction, form the word that defines the status of the digital outputs:

High-order bits: they define the outputs to be controlled, hen set in 1.

Bit.08: 1- DO1 output control.

Bit.09: 1- DO2 output control.

Bit.10: 1- RL01 output control.

Bit.11: 1- RL02 output control.

Bit.12: 1- RL03 output control.

Low-order bits: they define the outputs to be controlled, hen set in 1.

Bit.0: 1- DO1 status: 0 = inactive, 1 = active output.

Bit.1: 1- DO2 status: 0 = inactive, 1 = active output.

Bit.2: 1- RL01 status: 0 = inactive, 1 = active output.

Bit.3: 1- RL02 status: 0 = inactive, 1 = active output.

Bit.4: 1- RL03 status: 0 = inactive, 1 = active output.

3.2.4 Number of the parameters to read

Through this position, the reading of any inverter parameter can be defined. The number of the parameter to be read must be programmed here, and its contents will be presented at the position 4 of the variables read from the inverter.

3.2.5 Number of the parameters to be changed

This position operates together with the position 6, described next.
When no parameter has to be changed, then fill this position with the code 999.

Changing process sequence:

- Keep 999 in the position 5.
- Replace 999 by the number of the parameter to be changed.
- If no error code (124 to 127) is signalized in the Status Word, then replace the parameter number by 999, in order to conclude the modification.

The modification can be verified via the HMI or by reading the parameter contents.



NOTE!

1. The command to change from scalar to vector control will not be accepted if parameters P0409 to P0413 are set to zero. That should be done via HMI.
2. Do not program P0204 = 5, because in the factory default settings P0309 = inactive.
3. P0204 and P0408 do not accept modification via network command.
4. The parameter contents must be kept by the master during 15.0 ms. Send a new value or write in another parameter only after this time has elapsed.

3.2.6 Content of the parameter to be changed, selected at the position 5

The format of the values adjusted in this position must be the ones described in the manual. The values, however, must be written without the decimal point, if this is the case. When the parameters P409 are modified, small differences in the contents may occur when comparing the value sent via Fieldbus and the value read at the position 4. (Parameter contents) or at the HMI, because of the truncating during the reading process.



NOTE!

For further information on the faults and alarms, refer to the programming manual available for download on

<https://static.weg.net/medias/downloadcenter/h55/h11/WEG-mvw-01-medium-voltage-frequency-inverter-users-guide-0899.5247-3.3x-manual-english.pdf>

<https://static.weg.net/medias/downloadcenter/hde/h2e/WEG-MVW3000-user-manual-10004823674-en.pdf>

4. FAULT AND ALARM INDICATION MESSAGES

Possible fault and alarm message that may occur during the communication:

4.1 ERROR INDICATIONS

During the Fieldbus reading/writing process the following error indications may occur and be informed at the Status Word variable. Status Word variable inactions:

Fault / Alarm	Description:	Possible causes:
A124: Alarm Indication	Alarm that indicates parameterization error Profibus communication	- Parameterization error - An attempt to change a parameter that can be modified only with disabled inverter.
A125: Alarm Indication	Alarm that indicates error a Profibus communication	- Reading of non-existent parameter, or - Writing on non-existent parameter, or - Writing on P0408 and P0204.
A126: Alarm Indication	Alarm that indicates error a Profibus communication	-An attempt to write a value out of the permitted range.
A127: Alarm Indication	Alarm that indicates error a Profibus communication	- A function selected by the Control Word has not been programmed for Fieldbus, or - Command of a digital output that has not been programmed for Fieldbus, or - An attempt to write in a read-only parameter.
A129: Inactive fieldbus connection	Alarm that indicates a Profibus communication interruption.	- PLC idle. - Programming error. Slave and master with different number of reading/writing words. - Communication lost (terminal disconnected, broken cable).
A130: Inactive fieldbus card	Alarm that indicates error during Profibus communication module access.	- Module defective, not recognized by the drive or it not installed correctly. - Conflict with another WEG optional module.

Figure 4.1 – Fault and alarm messages description

The indication of the listed errors will be removed from the Status Word the indented action is sent correctly, except for A127 (case: Command of a digital output that has not been programmed for Fieldbus), whose reset is performed writing in the Control Word.



NOTE!

The alarms A0124, A0125, A0126 and A127 do not cause any change in the inverter operation status.

5. CLP SIEMENS SIMATIC S7 1500 MANAGER

5.1 GSD INSTALLATION

Access the WEG website and download the MVW inverter GSDs.



NOTE!

For further information on the faults and alarms, refer to the programming manual available for download on

https://www.weg.net/institutional/US/en/search/downloadcenter?q=GSD+MVW&mediaContainerName=*&languageCode=*

5.1.1 Import GSD

Access the hardware options and Install the GSD file.

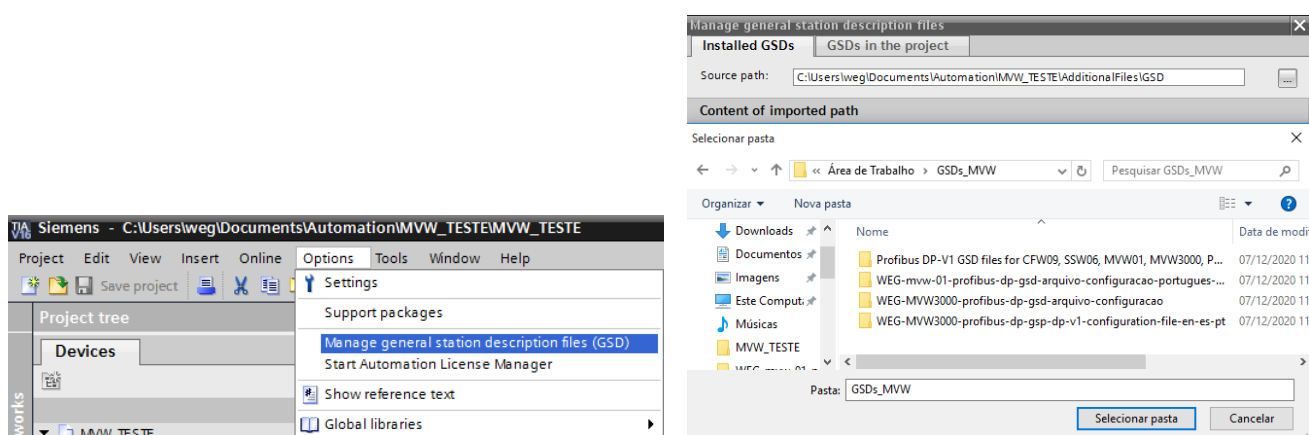


Figure 5.1.1 – Accessing the news GSD file

5.1.2 Installation GSD

Search the file in the directory and install it.

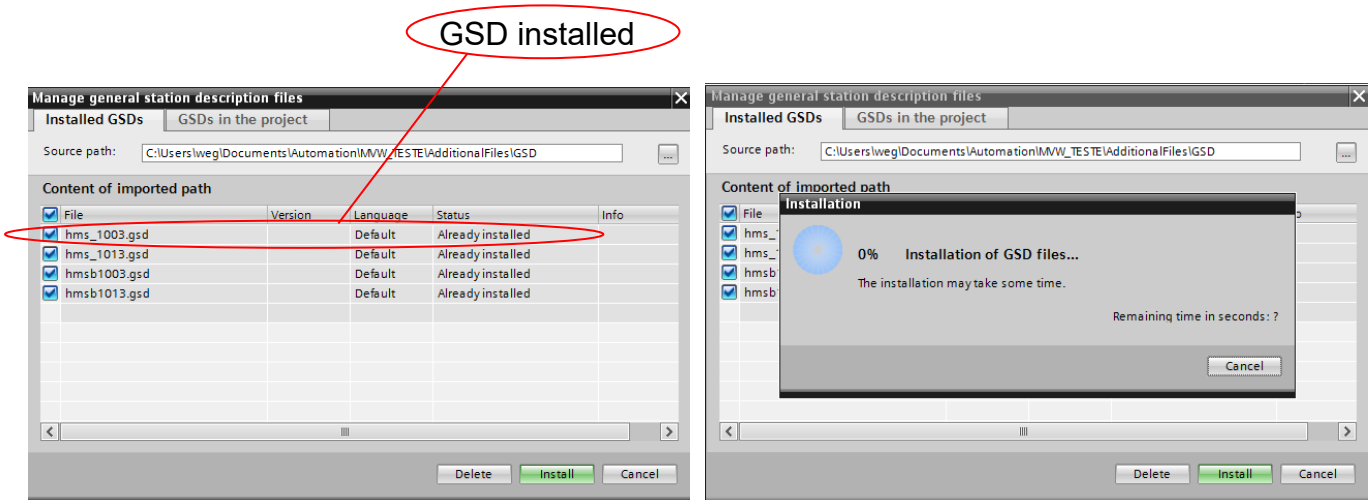


Figure 5.1.2 – importing and Installation GSD file



NOTE!

For the communication tests carried out, the Profibus DP card, mat.: 10413436, was installed on the MVW3000 inverter, with the version of Firmware: HMS_1003.gsd, which would be Anybus-S PDP (FW 1.x)

5.2 MVW PROJECT

Developing the project on the Siemens PLC to monitor and control the MVW inverter of medium voltage WEG

5.2.1 Creating a new project

Add new project

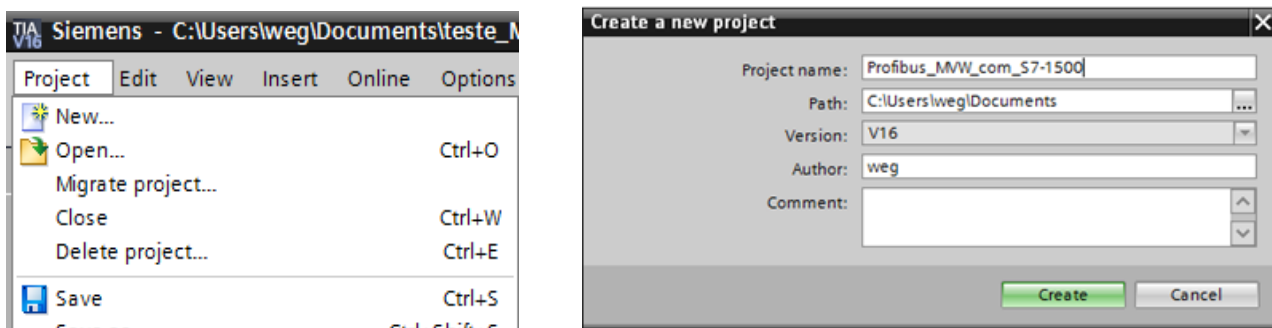


Figure 5.2.1 – New project

5.2.2 Add new CPU and PM

Adding a new PLC and a power supply according to the physical components purchased

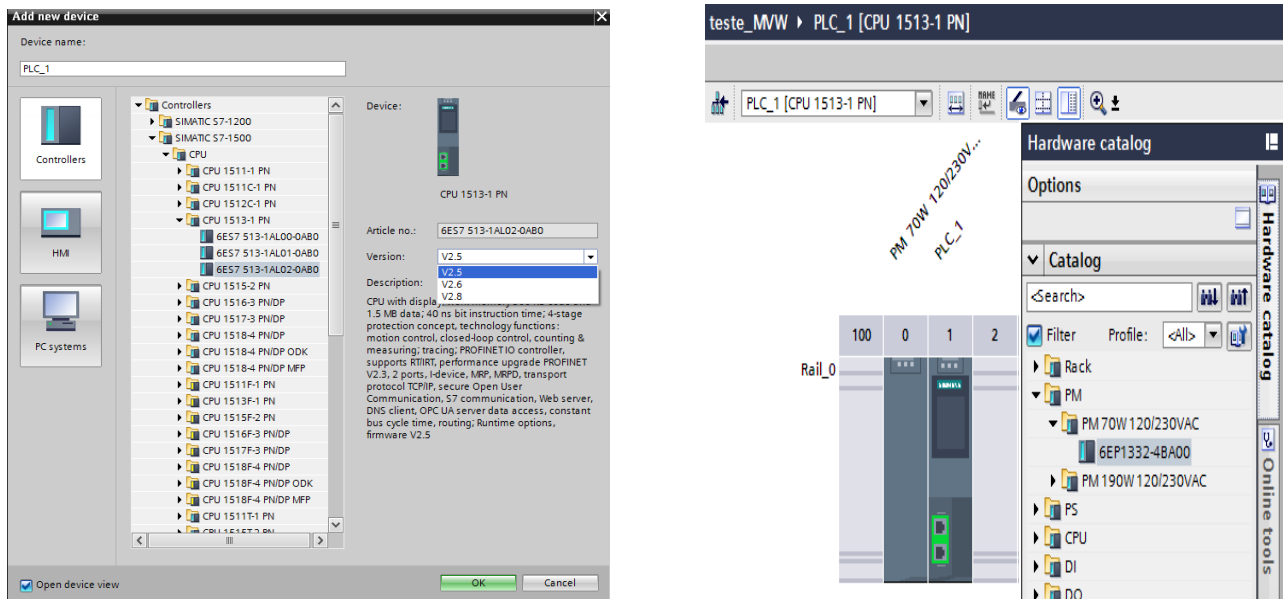


Figure 5.2.2 – Adding the CPU and PM module

5.2.3 Add new device CP

Add new device CP and charge device

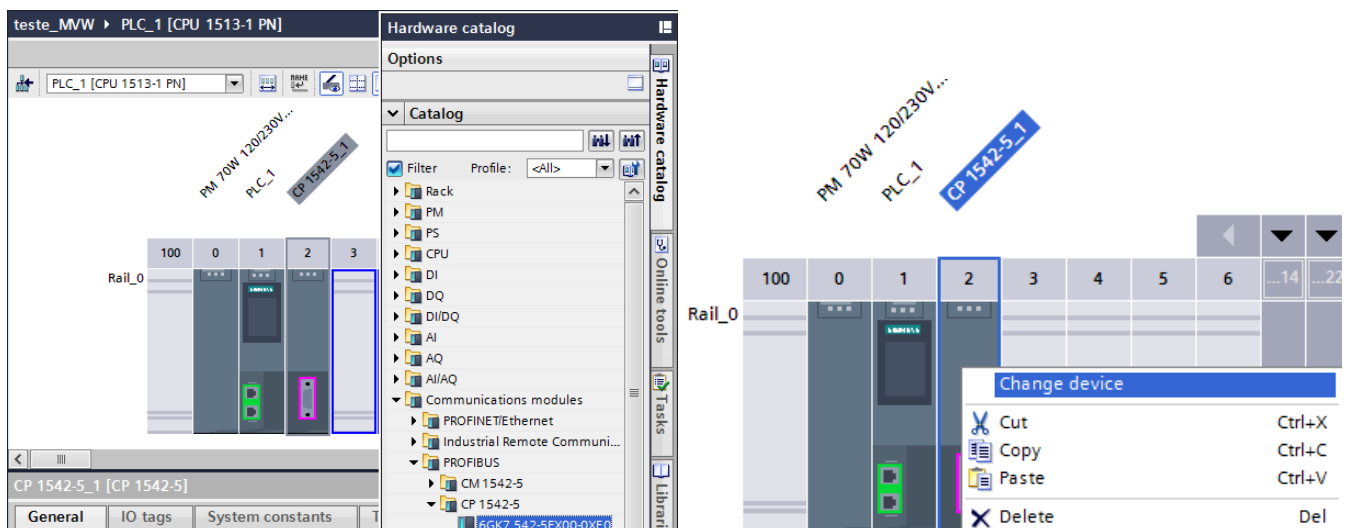


Figure 5.2.3 – Adding the CP module

Charge device CP current or new version device

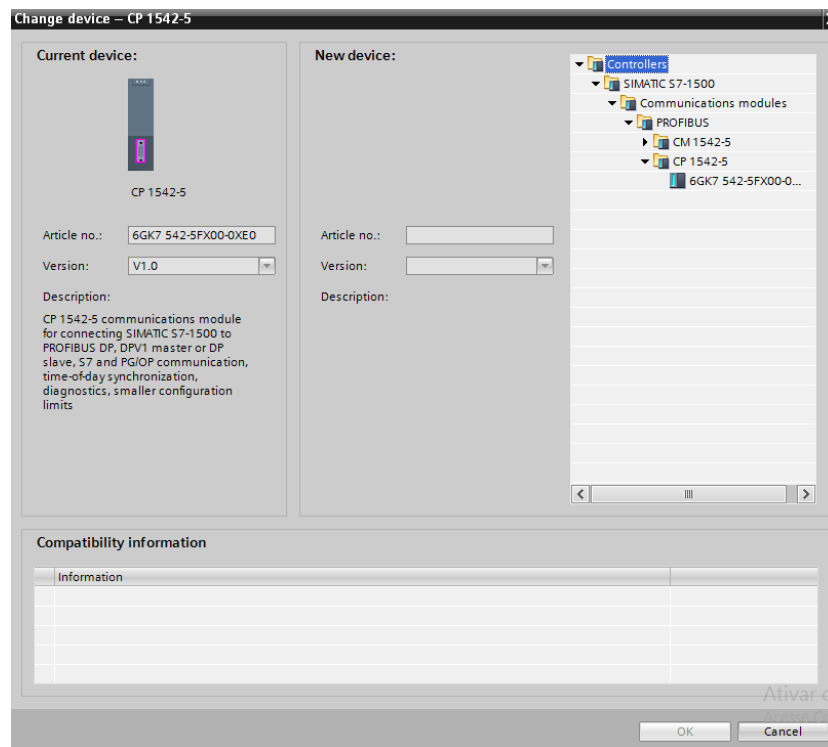


Figure 5.2.4 – Charge device CP version module

5.2.4 Connections new device CP

Add new device Slave_1 and establish the connection

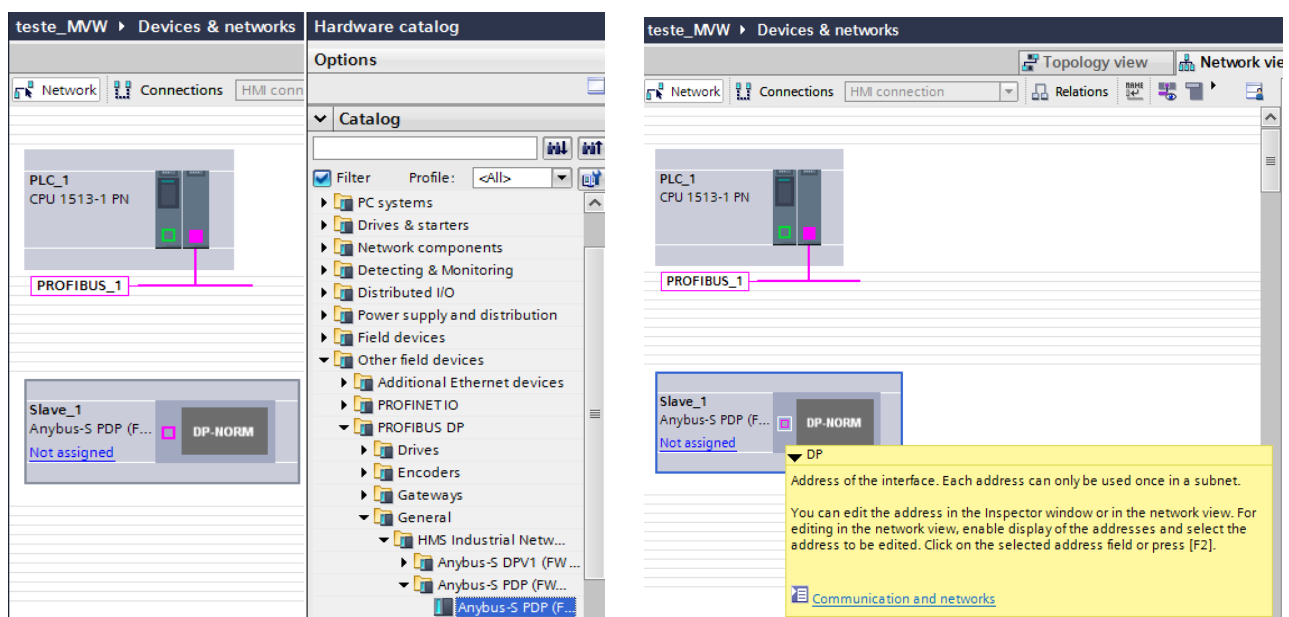


Figure 5.2.5 – Adding the new Slave_1 module to the project

5.2.5 Add the IOs on the slave_1

Add new device module IOs to the slave_1 and connection

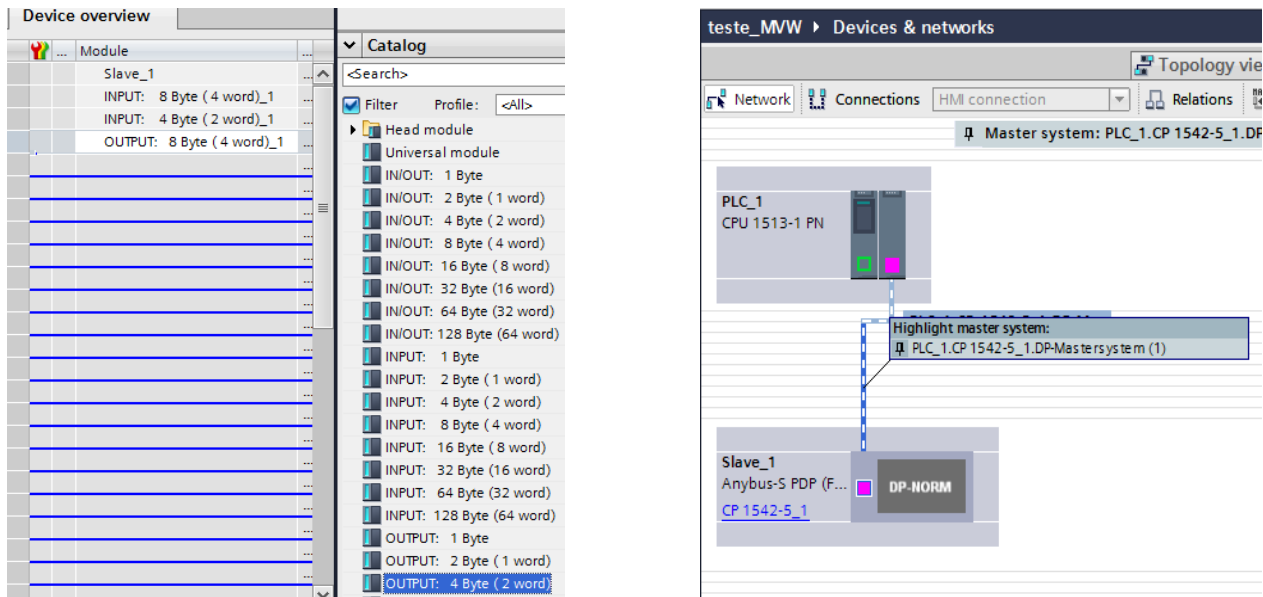


Figure 5.2.6 – Adding the new IOs module and connection

5.2.6 Add PLC IP address

Add and configure the PLC IP address

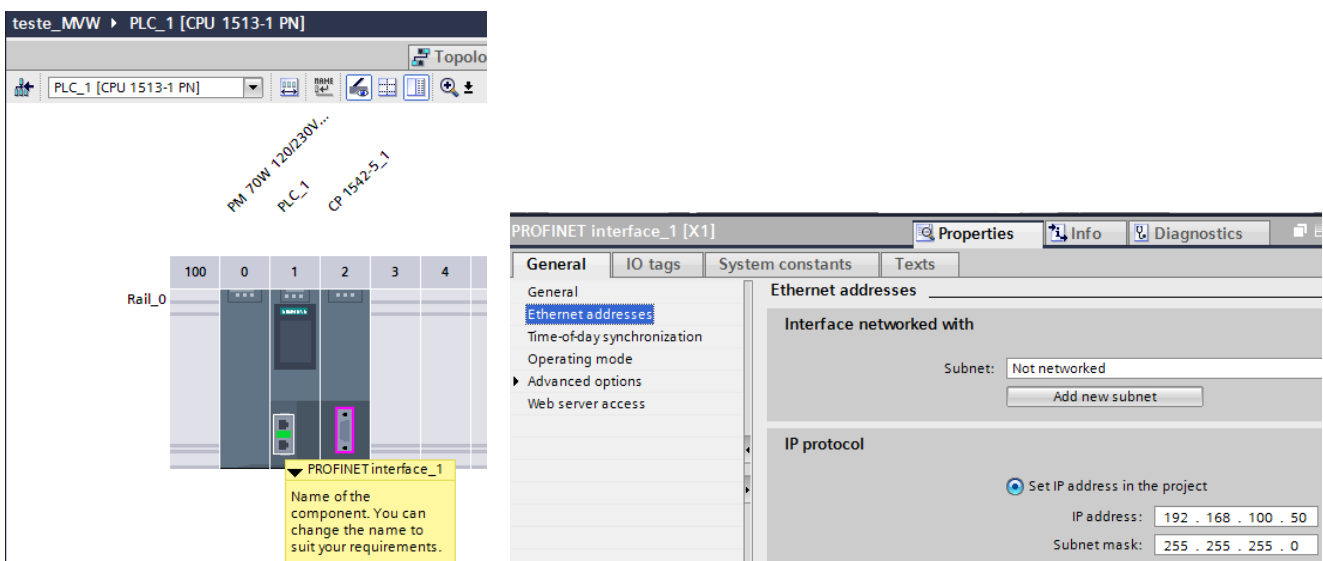


Figure 5.2.7 – Adding the new IP address

5.2.7 link Profibus addresses to internal variables

Link Profibus addresses to internal variables (input and output words).

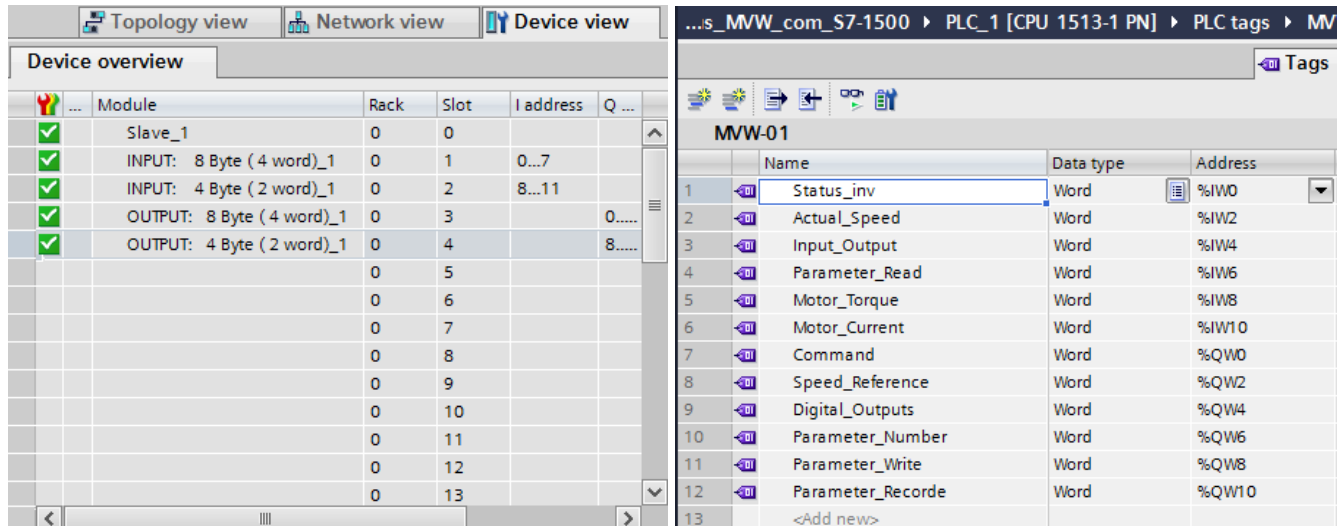


Figure 5.2.8 – Link the variables

5.2.8 Add the table IOs

Add the table and name the words according to the reading and writing parameters

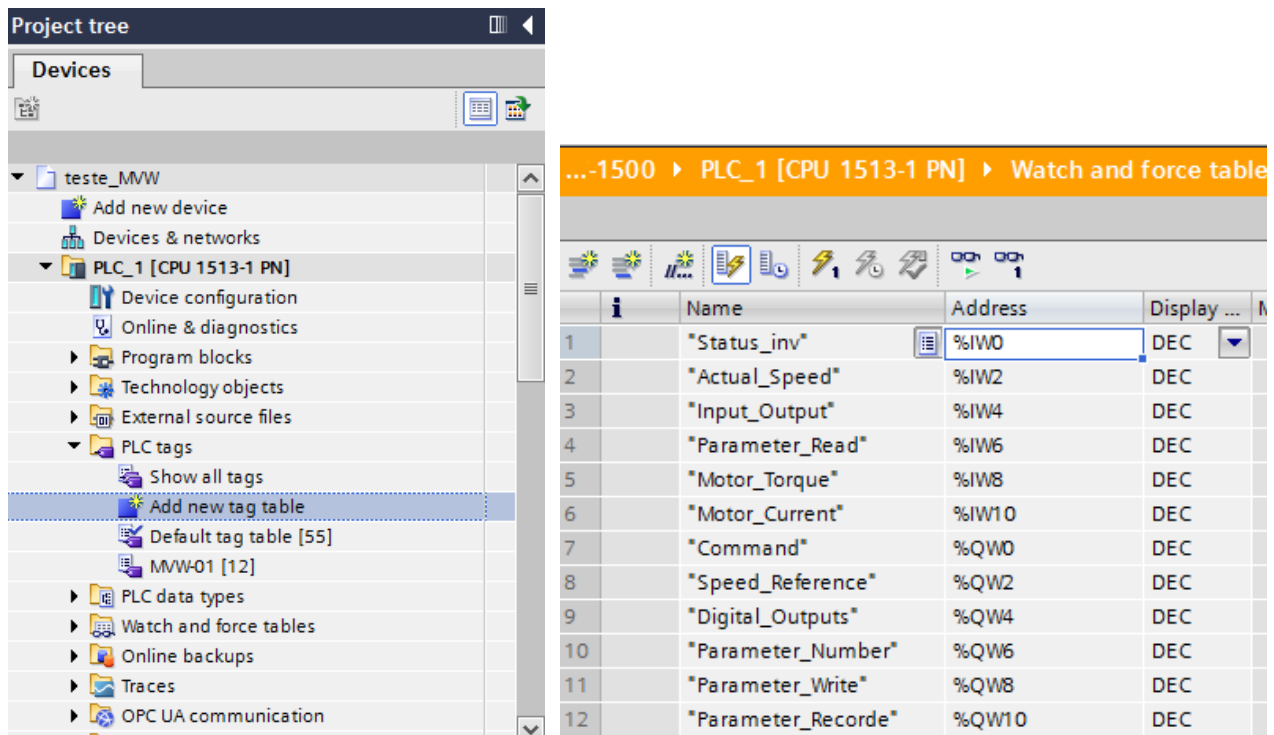


Figure 5.2.9 – Add reading and writing parameters

5.2.9 Compile project

Right-click on PLC_01 [CPU1513-1 PN] and access the compile hardware and software

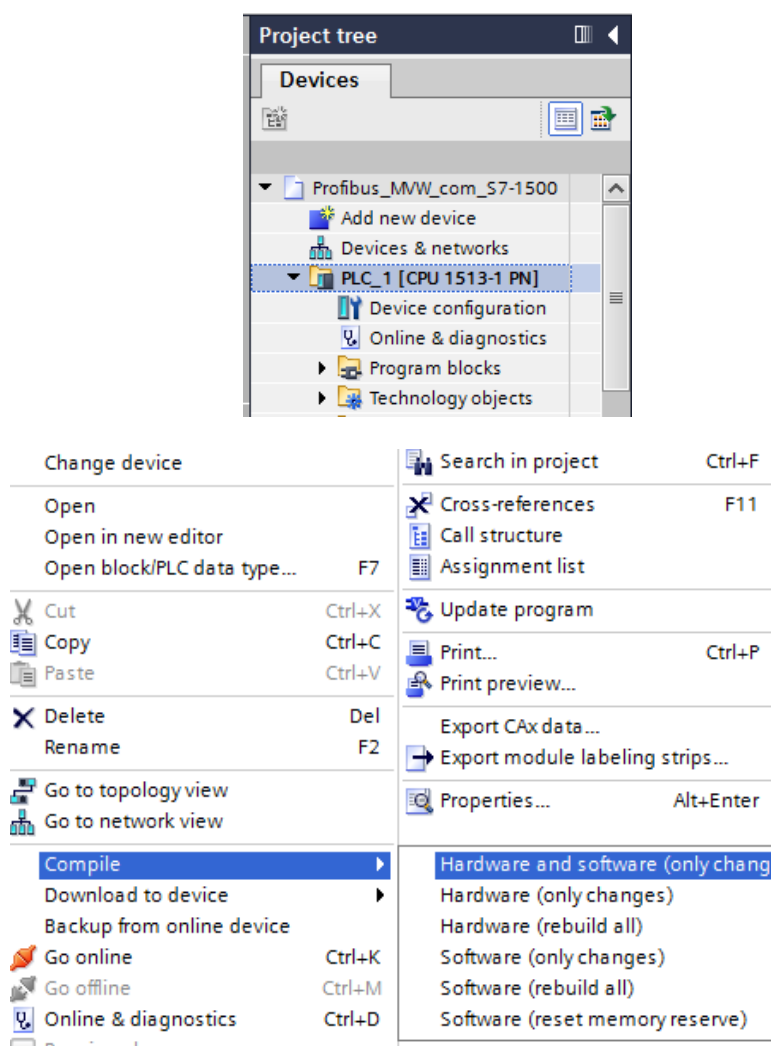


Figure 5.2.10 – Compile the hardware and software

5.2.10 **Download project**

Right-click on PLC_01 [CPU1513-1 PN] and access the download to device the hardware and software

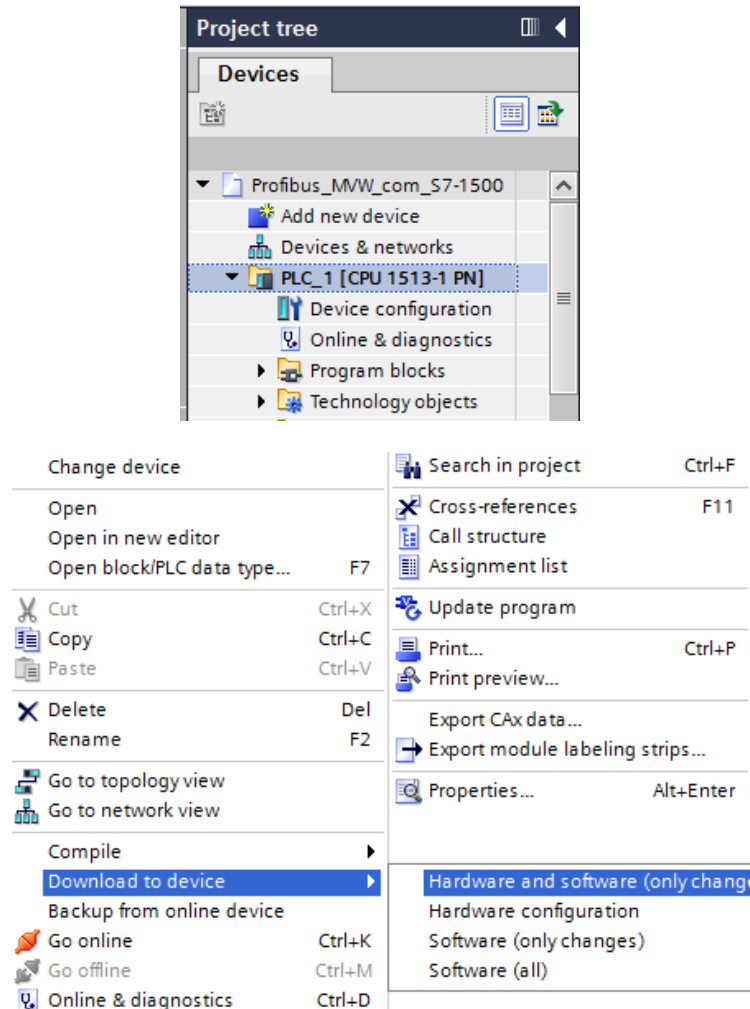


Figure 5.2.11 – Download the hardware and software

5.3 MONITORING AND CONTROLLING THE INVERTER

Some examples of how control and monitor the inverter through Profibus network via PLC can be seen in sequence.

5.3.1 Writing words

Writing words to the outputs from QW0 to QW10

Digital Control Word:

For example, turning the motor off by deacceleration ramp, Command decimal = 770.

Inverter status reading

Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Function	VFD Active Error	Spare Status	undervoltage	Remote	JOG	Rotation Direction	Enabled	Running	Error Code Bit 7	Error Code Bit 6	Error Code Bit 5	Error Code Bit 4	Error Code Bit 3	Error Code Bit 2	Error Code Bit 1	Error Code Bit 0

Profibus_MVW_com_S7-1500 ▶ PLC_1 [CPU 1513-1 PN] ▶ Watch and force tables ▶ Watch table_1

	Name	Address	Display ...	Monitor value	Modify value
1	*Status_inv	%IW0	Bin	2#1001_0110_0111_1110	
2	*Actual_Speed	%IW2	DEC	0	
3	*Input_Read	%IW4	Bin	2#0000_0000_0000_0000	
4	*Parameter_Read	%IW6	DEC	90	
5	*Motor_Torque	%IW8	DEC	0	
6	*Motor_Current	%IW10	DEC	8	
7	*Command	%QW0	Bin	2#0000_0011_0000_0010	
8	*Command	%QW0	DEC	770	770
9	*Speed_Reference	%QW2	DEC	4096	4096
10	*Digital_Outputs	%QW4	Bin	2#0000_0100_0000_0000	
11	*Digital_Outputs	%QW4	DEC	1024	1024
12	*Parameter_Number	%QW6	DEC	133	133
13	*Parameter_Write	%QW8	DEC	134	134
14	*Parameter_Record	%QW10	DEC	10	10
15	*teste_delay_DB*.aciona		Bool	TRUE	TRUE

Command table

Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Function	Reset Mask	Reserved	EEPROM P169/P170 Saving Mask	Remote Mask	JOG Mask	Rotation Direction Mask	Enable Mask	Run Mask	Reset Command	Reserved	EEPROM P169/P170 Saving Command	Remote Command	JOG Command	Rotation Direction Command	Enable Command	Run Command

Figure 5.2.12 – monitoring the turn off command.

For example, starting the motor by acceleration ramp to the rated speed, using the Decimal command = 771.

Inverter status reading

Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Function	VFD Active Error	Spare Status	undervoltage	Remote	JOG	Rotation Direction	Enabled	Running	Error Code Bit 7	Error Code Bit 6	Error Code Bit 5	Error Code Bit 4	Error Code Bit 3	Error Code Bit 2	Error Code Bit 1	Error Code Bit 0

Profibus_MW com_S7-1500 > PLC_1 [CPU 1513-1 PN] > Watch and force tables > Watch table_1

	Name	Address	Display ...	Monitor value	Modify value
1	"Status_inv"	%IW0	Bin	2#1001_0111_0111_1110	
2	"Actual_Speed"	%IW2	DEC	4096	
3	"Input_Read"	%IW4	Bin	2#0000_0000_0000_0000	
4	"Parameter_Read"	%IW6	DEC	90	
5	"Motor_Torque"	%IW8	DEC	0	
6	"Motor_Current"	%IW10	DEC	8	
7	"Command"	%QW0	Bin	2#0000_0011_0000_0011	
8	"Command"	%QW0	DEC	771	771
9	"Speed_Reference"	%QW2	DEC	4096	4096
10	"Digital_Outputs"	%QW4	Bin	2#0000_0100_0000_0000	
11	"Digital_Outputs"	%QW4	DEC	1024	1024
12	"Parameter_Number"	%QW6	DEC	133	133
13	"Parameter_Write"	%QW8	DEC	134	134
14	"Parameter_Record"	%QW10	DEC	10	10
15	"teste_delay_DB".aciona		Bool	TRUE	TRUE

Command table

Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Function	Reset Mask	Reserved	EEPROM P169/P170 Saving Mask	Remote Mask	JOG Mask	Rotation Direction Mask	Enable Mask	Run Mask	Reset Command	Reserved	EEPROM P169/P170 Saving Command	Remote Command	JOG Command	Rotation Direction Command	Enable Command	Run Command

Figure 5.2.13 – Monitoring the start command.

Write Digital Outputs:

Activating relay output RL1, setting the decimal value = 1028 corresponds to this relay.

Profibus_MW_com_S7-1500 ▶ PLC_1 [CPU 1513-1 PN] ▶ Watch and force tables ▶ Watch table_1

	Name	Address	Display ...	Monitor value	Modify value	
1	"Status_inv"	%IW0	Bin	2#1001_0110_0111_1110		<input type="checkbox"/>
2	"Actual_Speed"	%IW2	DEC	0		<input type="checkbox"/>
3	"Input_Read"	%IW4	Bin	2#0000_0000_0000_0000		<input type="checkbox"/>
4	"Parameter_Read"	%IW6	DEC	90		<input type="checkbox"/>
5	"Motor_Torque"	%IW8	DEC	0		<input type="checkbox"/>
6	"Motor_Current"	%IW10	DEC	8		<input type="checkbox"/>
7	"Command"	%QW0	Bin	2#0000_0011_0000_0010		<input type="checkbox"/>
8	"Command"	%QW0	DEC	770	770	<input checked="" type="checkbox"/>
9	"Speed_Reference"	%QW2	DEC	4096	4096	<input checked="" type="checkbox"/>
10	"Digital_Outputs"	%QW4	Bin	2#0000_0100_0000_0100		<input type="checkbox"/>
11	"Digital_Outputs"	%QW4	DEC	1028	1028	<input checked="" type="checkbox"/>
12	"Parameter_Number"	%QW6	DEC	133	133	<input checked="" type="checkbox"/>
13	"Parameter_Write"	%QW8	DEC	134	134	<input checked="" type="checkbox"/>
14	"Parameter_Record"	%QW10	DEC	10	10	<input checked="" type="checkbox"/>
15	"teste_delay_DB".aciona		Bool	TRUE	TRUE	<input checked="" type="checkbox"/>

Digital Outputs table

Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Function	Reserved	Reserved	Reserved	Digital Output RL3 Mask	Digital Output RL2 Mask	Digital Output RL1 Mask	Digital Output DO2 Mask	Digital Output DO1 Mask	Reserved	Reserved	Reserved	Digital Output RL3 Command	Digital Output RL2 Command	Digital Output RL1 Command	Digital Output DO2 Command	Digital Output DO1 Command

Figure 5.2.14 – Monitoring the activation of the written RL1 output.

Disabling the output of relay RL1, applying the decimal value = 1024 corresponds to this relay.

Profibus_MW_com_S7-1500 ▶ PLC_1 [CPU 1513-1 PN] ▶ Watch and force tables ▶ Watch table_1

	Name	Address	Display ...	Monitor value	Modify value	
1	"Status_inv"	%IW0	Bin	2#1001_0111_0111_1110		<input type="checkbox"/>
2	"Actual_Speed"	%IW2	DEC	4096		<input type="checkbox"/>
3	"Input_Read"	%IW4	Bin	2#0000_0000_0000_0000		<input type="checkbox"/>
4	"Parameter_Read"	%IW6	DEC	90		<input type="checkbox"/>
5	"Motor_Torque"	%IW8	DEC	0		<input type="checkbox"/>
6	"Motor_Current"	%IW10	DEC	7		<input type="checkbox"/>
7	"Command"	%QW0	Bin	2#0000_0011_0000_0011		<input type="checkbox"/>
8	"Command"	%QW0	DEC	771	771	<input checked="" type="checkbox"/>
9	"Speed_Reference"	%QW2	DEC	4096	4096	<input checked="" type="checkbox"/>
10	"Digital_Outputs"	%QW4	Bin	2#0000_0100_0000_0000		<input type="checkbox"/>
11	"Digital_Outputs"	%QW4	DEC	1024	1024	<input checked="" type="checkbox"/>
12	"Parameter_Number"	%QW6	DEC	133	133	<input checked="" type="checkbox"/>
13	"Parameter_Write"	%QW8	DEC	134	134	<input checked="" type="checkbox"/>
14	"Parameter_Record"	%QW10	DEC	10	10	<input checked="" type="checkbox"/>
15	"teste_delay_DB".aciona		Bool	TRUE	TRUE	<input checked="" type="checkbox"/>

Digital Outputs table

Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Function	Reserved	Reserved	Reserved	Digital Output RL3 Mask	Digital Output RL2 Mask	Digital Output RL1 Mask	Digital Output DO2 Mask	Digital Output DO1 Mask	Reserved	Reserved	Reserved	Digital Output RL3 Command	Digital Output RL2 Command	Digital Output RL1 Command	Digital Output DO2 Command	Digital Output DO1 Command

Figure 5.2.15 – Monitoring of RL1 output deactivation writings

5.3.2 Reading words

Reading words in the inputs from IW0 to IW08

Inverter Status Word IW0

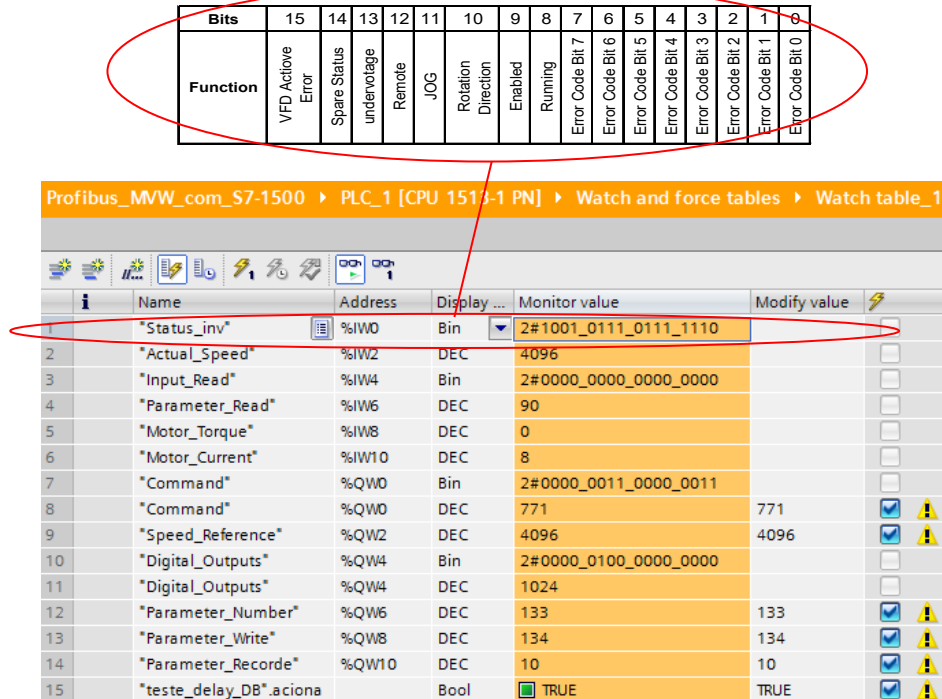


Figure 5.2.16 – Inverter status monitoring

Digital Inputs Status

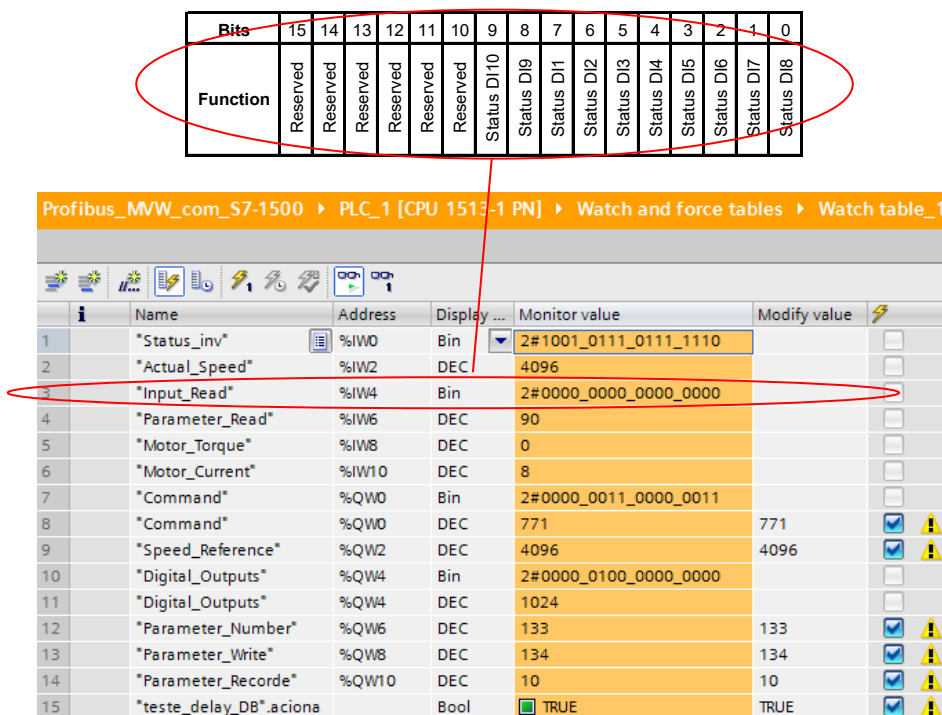


Figure 5.2.16 – Monitoring the digital inputs of the inverter