Ethernet

CFW500

User's Manual

User’s Manual

CFW500

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The information below describes the reviews made in this manual.

Version	Revision	Description
-	R00	First edition.
-	R01	General review.
V4.0X	R02	General review.

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ABOUT THE MANUAL

This manual supplies the necessary information for the operation of the CFW500 frequency inverter using the Ethernet interface. This manual must be used together with the CFW500 user's manual and programming manual.

NUMERICAL REPRESENTATION

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

IMPORTANT NOTICE ABOUT CYBERSECURITY AND COMMUNICATIONS

This product/equipment can connect and exchange information through networks and communication protocols. It has been designed and subjected to tests to ensure correct operation with other automation systems using the protocols mentioned in this manual. Therefore, it is essential that the customer understands the responsibilities in connection with information and cybersecurity when using this equipment.

Consequently, it is the exclusive obligation of the customer to adopt in-depth defense strategies and implement policies and measures to ensure the security of the system as a whole, including with regard to communications sent and received by the equipment. Among such measures, we can point out the installation of firewalls, antivirus and malware protection applications, data encryption, authentication control and physical user access.

WEG and its affiliates take no liability for damages or losses arising from cybersecurity breaches, including, but not limited to, unauthorized access, intrusion, information, or data leak and/or theft, denial-of-service attacks, or any other form of security breach. Using this product under conditions for which it was not specifically designed is not recommended and may result in damage to the product, the network, and the automation system. Thus, it is essential that the customer understand that the external intervention by third-party software applications, such as sniffers or applications with similar actions, has the potential to cause interruptions or restrictions in the functionality of the equipment.

TRADEMARKS

EtherNet/IP is a trademark of ODVA, Inc.

All other trademarks are the property of their respective holders.

1 EQUIPMENT CHARACTERISTICS IN ETHERNET NETWORK

Below are listed the main features for Ethernet communication module for CFW500 frequency inverter.

- There are 3 different plug-in modules, according to the specified communication protocol:
  - CFW500-CEMB-TCP: Modbus TCP protocol.
  - CFW500-CETH-IP: EtherNet/IP protocol.
  - CFW500-CEPN-IO: PROFINET IO protocol.
- It has an Ethernet communication port, according to the Fast Ethernet 100BASE-TX standard.
- The interface also makes available a Web server (HTTP).

1.1 MODBUS TCP SPECIFIC CHARACTERISTICS

- Operates as Modbus TCP server.
- The server provides up to 4 simultaneous Modbus TCP connections.
- Allows data communication for equipment operation and parameterization, as well as markers and data used for CFW500 ladder programming.

1.2 ETHERNET/IP SPECIFIC CHARACTERISTICS

- It is supplied with an EDS file for the network master configuration.
- Allows up to 14 input words and 14 output words for cyclic data communication.
- Acyclic data available for parameterization.
- Device Level Ring (DLR) and linear network topology supported.
- It features up to 2 Modbus TCP connections.

1.3 PROFINET IO SPECIFIC CHARACTERISTICS

- It is supplied with a XML file for the network master configuration.
- Allows up to 14 input words and 14 output words for cyclic data communication.
- Acyclic data available for parameterization.
- It features up to 2 Modbus TCP connections.

2 ETHERNET OVERVIEW

Following it is presented general information about the Ethernet technology.

2.1 ETHERNET TECHNOLOGY

Ethernet is a technology for interconnecting local area networks (LAN) based on frames forwarding. It defines wiring and electrical signals for the physical layer, the frame format and protocol for media access control layer (MAC) of the OSI model.

Ethernet, however, mainly defines the physical medium and the frame format. Based on Ethernet, multiple protocols and higher-level services were specified and developed in order to perform desired activities over a network, such as packet routing, connection establishment, sending and receiving files, etc. Several of these protocols have also been widely disseminated and employed, such as IP, TCP, UDP, FTP, HTTP.

Widely used to interconnect computers in the office environment, the Ethernet technology also started being used in industrial environments for interconnection of field devices. For industrial environment also emerged different communication protocols based on Ethernet, among which we can mention Modbus TCP, EtherNet/IP, PROFINET.

3 INTERFACES DESCRIPTION

The CFW500 frequency inverter uses the plug-in module to provide a Ethernet interface for communication.

3.1 ETHERNET PLUG-IN MODULE

- Supplied items:
  - Installation guide.
  - Ethernet plug-in module.

NOTE!
There are 3 different plug-in modules, according to the specified communication protocol:

- CFW500-CEMB-TCP: Modbus TCP protocol.
- CFW500-CETH-IP: EtherNet/IP protocol.
- CFW500-CEPN-IO: PROFINET IO protocol.

It is important to use the plug-in model according to the desired protocol for application.

3.2 CONNECTORS

The accessory for Ethernet communication has an RJ45 connector for network connection. The connector pin out follows the Fast Ethernet 100BASE-TX standard, using two pairs of cables for data transmission and reception.

The accessory has a screw connector to connect the protective earth to the product. To improve noise immunity, it is recommended to link the protective earth via this connector. The Ethernet connector housing, usually connected to the cable shield, makes the connection to the protective earth via an RC circuit.

3.3 INDICATION LEDS

The Ethernet accessory has an LED indicator on the Ethernet port, and two bi-color status LEDs. These LEDs have the following functions and indications:

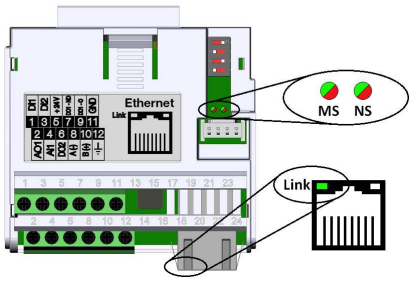

Figure 3.1: *Ethernet Connectors and LEDs*

Table 3.1: *Ethernet Indication LEDs*

LED	Color	Function
Link	Green	LED for link and activity indication.
Module Status (MS)	Bicolor (Green/Red)	Has a different behavior depending on the communication protocol, which is described in the section for each protocol.
Network Status (NS)	Bicolor (Green/Red)	Has a different behavior depending on the communication protocol, which is described in the section for each protocol.

NOTE!
During initialization, a test sequence is performed with MS and NS LEDs.

Table 3.2: *LED Link*

State	Description
Off	No link or powered off.
Green, solid	Link up, no activity.
Green, flashing	Link up and activity.

4 NETWORK INSTALLATION

This chapter presents recommendations related to equipment installation in an Ethernet network.

4.1 IP ADDRESS

Every equipment in an Ethernet network needs an IP address and subnet mask.

The IP addressing is unique in the network, and each equipment must have a different IP. The subnet mask is used to define which IP address range is valid in the network.

The CFW500 frequency inverter allows the use of two methods for programming these features, programmable via P0810:

- DHCP: enable the configuration of the CFW500 via DHCP server. The DHCP can automatically assign IP addresses, subnet mask, etc. to the devices on the network. The configurations performed via parameters are disregarded.
- Parameters: uses the configurations of IP address, mask and gateway as programmed on equipment parameters.

NOTE!
After changing these properties, for the changes to take effect, the equipment must be turned off and on again, or requesting the Ethernet settings update via P0849.

4.2 COMMUNICATION RATE

The Ethernet interfaces of the CFW500 frequency inverter can communicate using the 10 or 100 Mbps rates in half or full duplex mode.

The baud rate is programmed at P0803.

NOTE!

- It is important that, for each Ethernet connection made between two points, the baud rate and the duplex mode are set to the same option. If the option AUTO is used in one of the points, you must set the other point also to AUTO, or to half duplex mode.
- For PROFINET interface, the baud rate is locked to 100 Mbps as required by the protocol.

4.3 CABLE

Recommended characteristics for the cable:

- Standard Ethernet cable, 100Base-TX (FastEthernet), CAT 5e or higher.
- Shielded cable.
- Maximum length between devices: 100 m.

For installation, it is recommended the use of shielded Ethernet cables specific for use in industrial environment.

4.4 NETWORK TOPOLOGY

To connect CFW500 frequency inverter in an Ethernet network, usually the star connection is made using an industrial switch.

Figure 4.1: *Star topology*

4.5 RECOMMENDATIONS FOR GROUNDING CONNECTION AND CABLE ROUTING

The correct connection with the ground decreases problems caused by interference in an industrial environment. The following are some recommendations about grounding and cable routing:

- Always use shielded twisted pair Ethernet cables and connectors with metallic housing.
- Connect the equipment grounding via grounding terminal. Avoid the cable connection on multiple grounding points, especially where there are grounds with different potentials.
- Pass signal cables and communication cables in dedicated pathways. Prevent laying these cables next to power cables.

5 PARAMETERS

5.1 COMMUNICATION STATES AND COMMANDS

Below are the parameters related to the states and commands through the communication networks available for the frequency inverter.

P0313 - Comm. Error Action

Adjustable Range:	0 = Inactive 1 = Ramp Stop 2 = General Disab. 3 = Go to LOC 4 = LOC Keep Enab. 5 = Cause Fault	**Factory Setting:**	1
Properties:	cfg		
Access Groups:	NET		

Description:

It allows the selection of the action to be executed by the device, if it is controlled via network and a communication error is detected.

The actions described in this parameter are executed by means of the automatic writing of the selected actions in the respective bits of the interface control words. Therefore, in order that the commands are effective, it is necessary that the device be programmed to be controlled via the used network interface (with exception of option “Causes a Fault”, which blocks the equipment even if it is not controlled by network). This programming is achieved by means of parameters P0220 to P0228.

Table 5.1: *P0313 options*

Indication	Description
0 = Inactive	No action is taken and the drive remains in the existing status.
1 = Ramp Stop	A stop command with deceleration ramp is executed and the motor stops according to the programmed deceleration ramp.
2 = General Disab.	The drive is disabled by removing the General Enabling and the motor coasts to stop.
3 = Go to LOC	The drive commands change to Local.
4 = LOC Keep Enab.	The drive commands change to Local, but the status of the enabling and speed reference commands received via network are kept, providing that the drive has been programmed to use in Local mode the commands via HMI, or 3-wire start/stop and speed reference via either HMI or electronic potentiometer.
5 = Cause Fault	Instead of an alarm, the communication error causes a drive fault, so that a drive fault reset becomes necessary in order to restore normal operation.

P0680 - Logical Status

Adjustable Range:	0 to FFFF (hexa) Bit 0 = STO Bit 1 = Run Command Bit 2 = Fire Mode Bit 3 = Reserved Bit 4 = Quick Stop Bit 5 = 2nd Ramp Bit 6 = Config. Mode Bit 7 = Alarm Bit 8 = Running Bit 9 = Enabled Bit 10 = Forward Bit 11 = JOG Bit 12 = Remote Bit 13 = Undervoltage Bit 14 = Automatic PID Bit 15 = Fault	**Factory Setting:**	-
Properties:	ro		
Access Groups:	NET		

Description:

The inverter status word is unique for all the sources and can only be accessed for reading. It indicates all the relevant operating status and modes of the inverter. The value of P0680 is indicated in hexadecimal. The function of each bit of P0680 is described in Table 5.2 on page 5-3.

Table 5.2: P0680 bits function

Bit	Value/Description
Bit 0 STO	**0:** STO function inactive (inverter operational) **1:** STO function active (inverter locked A0160)
Bit 1 Run Command	**0:** there was no Run command **1:** there was Run command
Bit 2 Fire Mode	**0:** fire Mode function inactive **1:** fire Mode function active
Bit 3 Reserved	-
Bit 4 Quick Stop	**0:** quick stop inactive **1:** quick stop active
Bit 5 2nd Ramp	**0:** 1st acceleration and deceleration ramp by P0100 and P0101 **1:** 2nd acceleration and deceleration ramp by P0102 and P0103
Bit 6 Config. Mode	**0:** inverter operating in normal conditions **1:** inverter in configuration state. It indicates a special condition in which the inverter cannot be enabled, because it has parameterization incompatibility
Bit 7 Alarm	**0:** inverter is not in alarm state **1:** inverter is in alarm state
Bit 8 Running	**0:** motor is stopped **1:** motor is running according to reference and command
Bit 9 Enabled	**0:** inverter is disabled **1:** inverter is enabled and ready to run the motor
Bit 10 Forward	**0:** motor is running in the reverse direction **1:** motor is running in the forward direction
Bit 11 JOG	**0:** JOG function inactive **1:** JOG function active
Bit 12 Remote	**0:** inverter in Local mode **1:** inverter in Remote mode
Bit 13 Undervoltage	**0:** no undervoltage **1:** with undervoltage
Bit 14 Automatic PID	**0:** in manual mode (PID function) **1:** in automatic mode (PID function)
Bit 15 Fault	**0:** inverter is not in fault state **1:** some fault registered by the inverter

P0681 - Speed at 13 bits

Adjustable Range:	-32768 to 32767	**Factory Setting:**	-
Properties:	ro		
Access Groups:	NET		

Description:

It defines the 13-bit speed reference. The 13-bit Frequency Reference is a scale based on the motor rated speed (P0402) or on the motor rated frequency (P0403). In the inverter, parameter P0403 is taken as the base to determine the frequency reference.

Thus, the 13-bit frequency value has a range of 16 bits with signal, that is, -32768 to 32767; however, the rated frequency in P0403 is equivalent to the value 8192. Therefore, the maximum value in the range 32767 is equivalent to four times P0403:

- P0681 = 0000h (0 decimal) → motor speed = 0
- P0681 = 2000h (8192 decimal) → motor speed = rated frequency

Intermediate or higher frequency values can be obtained by using this scale. E.g., for a 60Hz rated frequency motor, if the value read is 2048 (0800h), then, to obtain the value in Hz one must calculate:

8192 => 60 Hz
2048 => Frequency

$$\text{Frequency} = \frac{2048 \times 60}{8192}$$

Frequency = 15 Hz

Negative values in this parameter indicate that the motor is running in the reverse direction.

NOTE!
The values transmitted over the network have a scale limitation, allowing a maximum of 4 times the rated frequency of the motor, with saturation in 32767 (or -32768).

P0684 - CO/DN/PB/Eth Control

Adjustable Range:	0 to FFFF (hexa) Bit 0 = Run/Stop Bit 1 = General Enable Bit 2 = Run Forward Bit 3 = JOG Enable Bit 4 = Remote Bit 5 = 2nd Ramp Bit 6 = Quick Stop Bit 7 = Fault Reset Bit 8 to 15 = Reserved	**Factory Setting:**	-
Properties:	ro		
Access Groups:	NET		

Description:

The inverter control word has read and write access only via network interface, but read only access is permitted for the other sources (keypad, SoftPLC). Each bit function is described as per Table 5.3 on page 5-4. The value of P0684 is indicated in hexadecimal.

Table 5.3: *P0684 bits function*

Bit	Value/Description
Bit 0 Run/Stop	**0**: stops the motor by deceleration ramp **1**: run the motor according to the acceleration ramp until reaching the speed reference value
Bit 1 General Enable	**0**: disables the inverter, interrupting the power supply to the motor **1**: enables the inverter, allowing the operation of the motor
Bit 2 Run Forward	**0**: run the motor in the opposite direction of the reference signal (reverse) **1**: run the motor in the direction of the reference signal (forward)
Bit 3 JOG Enable	**0**: disable JOG function **1**: enable JOG function
Bit 4 Remote	**0**: inverter goes into Local mode **1**: inverter goes into Remote mode
Bit 5 2nd Ramp	**0**: acceleration and deceleration ramp by P0100 and P0101 **1**: acceleration and deceleration ramp by P0102 and P0103
Bit 6 Quick Stop	**0:** disable quick stop **1:** enable quick stop
Bit 7 Fault Reset	**0**: no function **1**: if in fault state, reset the fault
Bit 8 … 15 Reserved	-

P0685 - CO/DN/PB/Eth SpeedRef

Adjustable Range:	-32768 to 32767	**Factory Setting:**	-
Properties:	ro		
Access Groups:	NET		

Description:

It allows programming the motor speed reference via communication interfaces only. For other sources (HMI, etc.), it behaves as a read-only parameter.

To enable the use of the reference written in this parameter, the product must be programmed to use the speed reference via communication network. This is programming is done using parameters P0221 and P0222.

This word uses a 13-bit resolution with signal to represent the motor rated frequency (P0403):

- P0685 = 0000h (0 decimal) → speed reference = 0.
  P0685 = 2000h (8192 decimal) → speed reference = rated frequency (P0403).

Intermediate or higher reference values can be programmed by using this scale. E.g. 60Hz rated frequency, to obtain a speed reference of 30 Hz one must calculate:

60 Hz => 8192
30 Hz => 13 bits reference

$$\text{13 bits reference} = \frac{30 \times 8192}{60}$$

13 bits reference = 4096 => Value corresponding to 30 Hz in a 13 bit scale

This parameter also accepts negative values to revert the motor speed direction. The reference speed direction, however, depends also on the control word - P0684 bit 2 setting:

- Bit 2 = 1 and P0685 > 0: reference for forward direction
- Bit 2 = 1 and P0685 < 0: reference for reverse direction
- Bit 2 = 0 and P0685 > 0: reference for reverse direction
- Bit 2 = 0 and P0685 < 0: reference for forward direction

NOTE!
The values transmitted over the network have a scale limitation, allowing a maximum of 4 times the rated frequency of the motor, with saturation in 32767 (or -32768).

P0695 - DOx Value

Adjustable Range:	0 to 1F (hexa) Bit 0 = DO1 Bit 1 = DO2 Bit 2 = DO3 Bit 3 = DO4 Bit 4 = DO5	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

It provides access for monitoring and controlling the inverter by using the communication interfaces. Each bit represents the value for a digital output. The value written in this parameter is used as the digital output value,

providing that the function for the desired digital output be programmed for “P0695 value”.

Table 5.4: *P0695 bits function*

Bit	Value/Description
Bit 0 DO1	**0**: DO1 output open. **1**: DO1 output closed.
Bit 1 DO2	**0**: DO2 output open. **1**: DO2 output closed.
Bit 2 DO3	**0**: DO3 output open. **1**: DO3 output closed.
Bit 3 DO4	**0**: DO4 output open. **1**: DO4 output closed.
Bit 4 DO5	**0**: DO5 output open. **1**: DO5 output closed.

P0696 - AOx Value 1

P0697 - AOx Value 2

P0698 - AOx Value 3

Adjustable Range:	-32768 to 32767	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

It provides access for monitoring and controlling the inverter by using the communication interfaces.

They allow the control of the analog outputs by means of network interfaces (Serial, CAN, etc.). These parameters cannot be changed via HMI.

The value written in these parameters is used as the analog output value, providing that the function for the desired analog output be programmed for “P0696 / P0697 / P0698 value”, at the parameters P0251, P0254.

The value must be written in a 15-bit scale (7FFFh = 32767) to represent 100 % of the output desired value, i.e.:

- P0696 = 0000h (0 decimal) → analog output value = 0 %
- P0696 = 7FFFh (32767 decimal) → analog output value = 100 %

The showed example was for P0696, but the same scale is also used for the parameters P0697 and P0698. For instance, to control the analog output 1 via serial, the following programming must be done:

- Choose a parameter from P0696, P0697, P0698 to be the value used by the analog output 1. For this example, we are going to select P0696.
- Program the option “P0696 value” as the function for the analog output 1 in P0254.
- Using the network interface, write in P0696 the desired value for the analog output 1, between 0 and 100 %, according to the parameter scale.

NOTE!
If the analog output is programmed for working from -10 V to 10 V, negative values for this parameter must be used to command the output with negative voltage values, i.e., -32768 to 32767 represent a variation from -10 V to 10 V at the analog output.

P0799 - Eth:Enable protocols

Adjustable Range:	0 to 1 (hexa) Bit 0 = Web Server	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

It allows enabling and disabling functionalities of some protocols, limiting the exposure of the inverter via network.

Table 5.5: *P0799 bits function*

Bit	Value/Description
Bit 0 Web Server	**0**: Protocol disabled. **1**: Protocol enabled.

NOTE!
After changing this configuration, for the modification to be effective, the equipment must be turned off and then turned on again, or the Ethernet settings must be updated via the P0849.

P0800 - Eth:Module Ident

Adjustable Range:	0 = Not Identified 1 = Modbus TCP 2 = EtherNet/IP 3 = PROFINET IO	**Factory Setting:**	-
Properties:	ro		
Access Groups:	NET		

Description:

It allows identifying the Ethernet module type connected to the equipment.

Table 5.6: *P0800 options*

Indication	Description
0 = Not Identified	Module not connected / not identified.
1 = Modbus TCP	Ethernet module for communication with Modbus TCP protocol.
2 = EtherNet/IP	Ethernet module for communication with EtherNet/IP protocol.
3 = PROFINET IO	Ethernet module for communication with PROFINET IO protocol.

P0801 - Eth:Communic Status

Adjustable Range:	0 = Setup 1 = Init 2 = Wait Comm 3 = Idle 4 = Data Active 5 = Error 6 = Reservado 7 = Exception 8 = Access Error	**Factory Setting:**	-
Properties:	ro		
Access Groups:	NET		

Description:

It allows identifying the Ethernet communication status.

Table 5.7: *P0801 options*

Indication	Description
0 = Setup	Module identified, waiting for configuration data (automatic).
1 = Init	Module executing the interface initialization (automatic).
2 = Wait Comm	Module initialized, but without communication with the network master.
3 = Idle	Communication with the network master established, but in idle or programming mode.
4 = Data Active	Communication with the network master established, and I/O data being communicated successfully. ”Online”.
5 = Error	Communication error detected.
6 = Reservado	Reserved.
7 = Exception	Serious error on the communication interface. The interface requires reinitialization.
8 = Access Error	Error in access between the equipment and the Ethernet interface. Requires restart of the Ethernet interface.

P0803 - Eth:Baud rate

Adjustable Range:	0 = Auto 1 = 10Mbit, half 2 = 10Mbit, full 3 = 100Mbit, half 4 = 100Mbit, full	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

It allows to set the desired baud rate for the Ethernet interface.

Table 5.8: *P0803 options*

Indication	Description
0 = Auto	Auto-negotiation in port.
1 = 10Mbit, half	10 Mbps and half duplex in port.
2 = 10Mbit, full	10 Mbps and full duplex in port.
3 = 100Mbit, half	100 Mbps and half duplex in port.
4 = 100Mbit, full	100 Mbps and full duplex in port.

NOTE!
After changing this parameter, for the modification to take effect, the equipment must be turned off and on again, or the Ethernet settings must be updated via P0849.

P0806 - Eth:ModbusTCP Timeout

Adjustable Range:	0 to 66	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

It defines a timeout protection against fault in the Modbus TCP communication.

In case the product does not receive valid Modbus TCP telegrams for a period longer than the setting, a communication error will be indicated, alarm A0149 will be displayed on the Keypad, depending on the programming of P0313, and the action programmed will be executed.

Time will start counting from the first valid telegram received.

The value 0.0 disables this function.

NOTE!
After changing this parameter, for the modification to take effect, the equipment must be turned off and on again, or the Ethernet settings must be updated via P0849.

P0810 - Eth:IP Address Config

Adjustable Range:	0 = Parameters 1 = DHCP 2 = DCP	**Factory Setting:**	1
Properties:	cfg		
Access Groups:	NET		

Description:

It defines how to set the IP address used by the Ethernet interfacee.

Table 5.9: *P0810 options*

Indication	Description
0 = Parameters	The programming of the IP address, configurations of the subnet mask and gateway must be done through parameters P0811 to P0819.
1 = DHCP	Enables the DHCP function. The IP address and other network configurations are received from a DHCP server via network.
2 = DCP	The IP address and other network configurations are received via DCP (PROFINET).

NOTE!
After changing this parameter, for the modification to take effect, the equipment must be turned off and on again, or the Ethernet settings must be updated via P0849.

P0811 - Eth:IP Address 1

Adjustable Range:	0 to 255	**Factory Setting:**	192
Properties:	cfg		
Access Groups:	NET		

P0812 - Eth:IP Address 2

Adjustable Range:	0 to 255	**Factory Setting:**	168
Properties:	cfg		
Access Groups:	NET		

P0813 - Eth:IP Address 3

Adjustable Range:	0 to 255	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

P0814 - Eth:IP Address 4

Adjustable Range:	0 to 255	**Factory Setting:**	14
Properties:	cfg		
Access Groups:	NET		

Description:

It defines the IP address used by the Ethernet interface. It is valid only if P0810 = Parameters.

Each parameter programs one octet of the IP address, where the P0811 is the most significant octet. The programmed IP address, then, has the format “P0811.P0812.P0813.P0814”.

NOTE!
After changing this parameter, for the modification to take effect, the equipment must be turned off and on again, or the Ethernet settings must be updated via P0849.

P0815 - Eth:CIDR Sub-net

Adjustable Range:	0 = Reserved 1 = 128.0.0.0 2 = 192.0.0.0 3 = 224.0.0.0 4 = 240.0.0.0 5 = 248.0.0.0 6 = 252.0.0.0 7 = 254.0.0.0 8 = 255.0.0.0 9 = 255.128.0.0 10 = 255.192.0.0 11 = 255.224.0.0 12 = 255.240.0.0 13 = 255.248.0.0 14 = 255.252.0.0 15 = 255.254.0.0 16 = 255.255.0.0 17 = 255.255.128.0 18 = 255.255.192.0 19 = 255.255.224.0 20 = 255.255.240.0 21 = 255.255.248.0 22 = 255.255.252.0 23 = 255.255.254.0 24 = 255.255.255.0 25 = 255.255.255.128 26 = 255.255.255.192 27 = 255.255.255.224 28 = 255.255.255.240 29 = 255.255.255.248 30 = 255.255.255.252 31 = 255.255.255.254	**Factory Setting:**	24
Properties:	cfg		
Access Groups:	NET		

Description:

It defines the subnet mask used by the Ethernet interface. It is valid only if P0810 = Parameters.

The following table shows the allowed values for the CIDR notation and equivalent dot notation for the subnet mask:

Table 5.10: P0815 options

Indication	Description
0 = Reserved	Reserved.
1 = 128.0.0.0	Subnet mask.
2 = 192.0.0.0	Subnet mask.
3 = 224.0.0.0	Subnet mask.
4 = 240.0.0.0	Subnet mask.
5 = 248.0.0.0	Subnet mask.
6 = 252.0.0.0	Subnet mask.
7 = 254.0.0.0	Subnet mask.
8 = 255.0.0.0	Subnet mask.
9 = 255.128.0.0	Subnet mask.
10 = 255.192.0.0	Subnet mask.
11 = 255.224.0.0	Subnet mask.
12 = 255.240.0.0	Subnet mask.
13 = 255.248.0.0	Subnet mask.
14 = 255.252.0.0	Subnet mask.
15 = 255.254.0.0	Subnet mask.
16 = 255.255.0.0	Subnet mask.
17 = 255.255.128.0	Subnet mask.
18 = 255.255.192.0	Subnet mask.
19 = 255.255.224.0	Subnet mask.
20 = 255.255.240.0	Subnet mask.
21 = 255.255.248.0	Subnet mask.
22 = 255.255.252.0	Subnet mask.
23 = 255.255.254.0	Subnet mask.
24 = 255.255.255.0	Subnet mask. Factory setting.
25 = 255.255.255.128	Subnet mask.
26 = 255.255.255.192	Subnet mask.
27 = 255.255.255.224	Subnet mask.
28 = 255.255.255.240	Subnet mask.
29 = 255.255.255.248	Subnet mask.
30 = 255.255.255.252	Subnet mask.
31 = 255.255.255.254	Subnet mask.

NOTE!
After changing this parameter, for the modification to take effect, the equipment must be turned off and on again, or the Ethernet settings must be updated via P0849.

P0816 - Eth:Gateway 1

Adjustable Range:	0 to 255	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

P0817 - Eth:Gateway 2

Adjustable Range:	0 to 255	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

P0818 - Eth:Gateway 3

Adjustable Range:	0 to 255	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

P0819 - Eth:Gateway 4

Adjustable Range:	0 to 255	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

It defines the IP address of the default gateway used by the Ethernet interface. It is valid only if P0810 = Parameters.

Each parameter programs one octet of the gateway address, where the P0816 is the most significant octet. The programmed gateway IP address, then, has the format “P0816.P0817.P0818.P0819”.

NOTE!
After changing this parameter, for the modification to take effect, the equipment must be turned off and on again, or the Ethernet settings must be updated via P0849.

P0820 - Eth:Read Word #3

P0821 - Eth:Read Word #4

P0822 - Eth:Read Word #5

P0823 - Eth:Read Word #6

P0824 - Eth:Read Word #7

P0825 - Eth:Read Word #8

P0826 - Eth:Read Word #9

P0827 - Eth:Read Word #10

P0828 - Eth:Read Word #11

P0829 - Eth:Read Word #12

P0830 - Eth:Read Word #13

Adjustable Range:	0 to 9999	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

It defines the content of read words 3 to 14 (slave sends to the master). Using these parameters, it is possible to program the number of other parameter whose content shall be made available in the input area of the network master.

For instance, in case it is necessary to read the motor current in amperes from the inverter, the value 3 must be programmed in some of these parameters, since the parameter P0003 is the parameter that contains this information. Note that the reading value of any parameter is represented with a 16-bit word. Even if the parameter has a decimal resolution value, the value is transferred with no decimal indication. For instance, if the parameter P0003 has the value 4.7, the value transferred via network will be 47.

These parameters are only used if the equipment is programmed in parameter P0871 to use options 4, 5 or 8, which have fixed words plus configurable I/Os.

The first parameter of this list programmed with the value 0 (zero) disables the reading of this word and the subsequent ones. The total number of words that must be programmed for reading in the network master then depends on how many parameters values other than 0 have been programmed in sequence.

P0831 - Eth:Read Word #14

Adjustable Range:	0 to 9999	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

It defines the content of read words 3 to 14 (slave sends to the master). Using these parameters, it is possible to program the number of other parameter whose content shall be made available in the input area of the network master.

For instance, in case it is necessary to read the motor current in amperes from the inverter, the value 3 must be programmed in some of these parameters, since the parameter P0003 is the parameter that contains this information. Note that the reading value of any parameter is represented with a 16-bit word. Even if the parameter has a decimal resolution value, the value is transferred with no decimal indication. For instance, if the parameter P0003 has the value 4.7, the value transferred via network will be 47.

These parameters are only used if the equipment is programmed in parameter P0871 to use options 4, 5 or 8, which have fixed words plus configurable I/Os.

The first parameter of this list programmed with the value 0 (zero) disables the reading of this word and the subsequent ones. The total number of words that must be programmed for reading in the network master then depends on how many parameters values other than 0 have been programmed in sequence.

NOTE!
After changing this parameter, for the modification to take effect, the equipment must be turned off and on again, or the Ethernet settings must be updated via P0849.

P0835 - Eth:Write Word #3

P0836 - Eth:Write Word #4

P0837 - Eth:Write Word #5

P0838 - Eth:Write Word #6

P0839 - Eth:Write Word #7

P0840 - Eth:Write Word #8

P0841 - Eth:Write Word #9

P0842 - Eth:Write Word #10

P0843 - Eth:Write Word #11

P0844 - Eth:Write Word #12

P0845 - Eth:Write Word #13

Adjustable Range:	0 to 9999	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

It defines the content of write words 3 to 14 (masters sends to the slave). Using these parameters, it is possible to program the number of other parameter whose content shall be made available in the output area of the network master.

For instance, in case it is necessary to write the acceleration in the device, the value 100 must be programmed in some of these parameters, since the parameter P0100 is the parameter where this information is programmed. Note that the written value of any parameter is represented with a 16-bit word. Even if the parameter has a decimal resolution value, the value is transferred with no decimal indication. For instance, if you want to set the parameter P0100 with the value 5.0s, the value 50 should be written via network.

These parameters are only used if the equipment is programmed in parameter P0871 to use options 4, 5 or 8, which have fixed words plus configurable I/Os.

The first parameter of this list programmed with the value 0 (zero) disables the writing of this word and the subsequent ones. The total number of words that must be programmed for writing in the network master then depends on how many parameters values other than 0 have been programmed in sequence.

P0846 - Eth:Write Word #14

Adjustable Range:	0 to 9999	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

It defines the content of write words 3 to 14 (masters sends to the slave). Using these parameters, it is possible to program the number of other parameter whose content shall be made available in the output area of the

network master.

For instance, in case it is necessary to write the acceleration in the device, the value 100 must be programmed in some of these parameters, since the parameter P0100 is the parameter where this information is programmed. Note that the written value of any parameter is represented with a 16-bit word. Even if the parameter has a decimal resolution value, the value is transferred with no decimal indication. For instance, if you want to set the parameter P0100 with the value 5.0s, the value 50 should be written via network.

These parameters are only used if the equipment is programmed in parameter P0871 to use options 4, 5 or 8, which have fixed words plus configurable I/Os.

The first parameter of this list programmed with the value 0 (zero) disables the writing of this word and the subsequent ones. The total number of words that must be programmed for writing in the network master then depends on how many parameters values other than 0 have been programmed in sequence.

NOTE!
After changing this parameter, for the modification to take effect, the equipment must be turned off and on again, or the Ethernet settings must be updated via P0849.

P0849 - Eth:Config. Update

Adjustable Range:	0 = Normal Operat. 1 = Config Update	**Factory Setting:**	0
Properties:	cfg		
Access Groups:	NET		

Description:

Allows forcing a restart of the Ethernet interface, so that the settings made in the parameters are updated.

When programming this parameter with the value “1”, the Ethernet interface is reinitialized, resulting in loss of communication during this process. After completing the process, this parameter automatically assumes the value ”0”.

Table 5.11: *P0849 options*

Indication	Description
0 = Normal Operat.	Not update the interface.
1 = Config Update	Update interface settings.

6 MODBUS TCP

This chapter shows operating characteristics of the frequency inverter CFW500 using the plug-in module for communication as Modbus TCP server.

6.1 INDICATION LEDS

The MS and NS LEDs have the following information for Modbus TCP protocol:

Table 6.1: *Module Status LED (MS)*

State	Description
Off	No power or initialization.
Green, solid	Normal operation.
Red, solid	Fatal error (interface must be reinitialized).
Red, flashing	IP address is invalid/duplicated.

Table 6.2: *Network Status LED (NS)*

State	Description
Off	No power or no IP address.
Green, solid	Connection established.
Green, flashing	Waiting for connections.
Red, solid	Fatal error (interface must be reinitialized).

6.2 AVAILABLE FUNCTIONS

In the Modbus specification are defined the functions used to access different types of data. In the CFW500, in order to access those data the following services (or functions) have been made available:

Table 6.3: *Supported Modbus Functions*

Code	Name	Description
01	Read Coils	Reading of bit blocks of the coil type.
02	Read Discrete Inputs	Reading of bit blocks of the discrete input type.
03	Read Holding Registers	Reading of register blocks of the holding register type.
04	Read Input Registers	Reading of register blocks of the input register type.
05	Write Single Coil	Writing in a single bit of the coil type.
06	Write Single Register	Writing in a single register of the holding type.
15	Write Multiple Coils	Writing in bit blocks of the coil type.
16	Write Multiple Registers	Writing in register blocks of the holding register type.
43	Read Device Identification	Identification of the device model.

6.3 MEMORY MAP

The frequency inverter CFW500 has different types of data accessible through the Modbus communication. These data are mapped at data addresses and access functions as described in the following items.

6.3.1 Parameters

The CFW500 Modbus communication is based on the reading/writing of the equipment parameters. All the drive parameters list is made available as 16-bit holding registers type. The data addressing is done with the offset equal to zero, which means that the parameter number corresponds to the register number. The following table illustrates the parameters addressing, which can be accessed as holding register:

Table 6.4: Parameters Access - Holding Registers

Parameter	Modbus data address (decimal)
P0000	0
P0001	1
⋮	⋮
P0100	100
⋮	⋮

It is necessary to know the device list of parameters to be able to operate the equipment. Thus, it is possible to identify what data are needed for the status monitoring and the control of the functions. The main parameters are:

Monitoring (reading):

- P0680 (holding register 680): Status word
- P0681 (holding register 681): Motor speed

Command (writing):

- P0682 (holding register 682): Command Word
- P0683 (holding register 683): Speed Reference

Refer to the Programming Manual for a complete parameter list of the equipment.

NOTE!

- All the parameters are treated as holding registers. Depending on the master that is used, those registers are referenced starting from the base address 40000 or 4x. In this case, the address that must be programmed in the master for a parameter is the address showed in the table above added to the base address. Refer to the master documentation to find out how to access holding registers.
- It should be noted that read-only parameters can only be read from the equipment, while other parameters can be read and written through the network.

6.3.2 Memory Markers

Besides the parameters, other types of data as bit markers, word or float, can also be accessed using the Modbus protocol. Those markers are used mainly by the ladder programming function, available for the CFW500. Refer to the WLP software documentation for the description of those markers, as well as for the addresses via Modbus.

6.4 COMMUNICATION ERRORS

Communication errors may occur in the transmission of telegrams, as well as in the contents of the transmitted telegrams. Transmission and connection errors are directly processed by the Ethernet interface and by the TCP/IP protocol.

In the event of a successful reception, during the treatment of the telegram, the server may detect problems and send an error message, indicating the kind of problem found:

Table 6.5: Error codes for Modbus

Error Code	Description
1	Invalid function: the requested function is not implemented for the equipment.
2	Invalid data address: the data address (register or bit) does not exist.
3	Invalid data value: ■ Value out of the allowed range. ■ Writing on data that cannot be changed (read only register or bit).

NOTE!
It is important that it be possible to identify at the client what type of error occurred, in order to be able to diagnose problems during the communication.

6.5 STARTUP GUIDE

The following items describe main steps for CFW500 commissioning using the Modbus TCP protocol. These steps represent an example of use. Refer to specific chapters for details on the steps.

6.5.1 Installing the Product on an Ethernet Network

1. Install the Ethernet communication module, as indicated in the installation guide supplied with the module.
2. Connect the Ethernet cable to the device, considering the recommended instructions in network installation, as described in item 4:
   - Use shielded cable.
   - Properly ground network equipment.
   - Avoid laying communication cables next to power cables.

6.5.2 Configuring the Drive

1. Follow the recommendations described in the user's manual to program the device parameters related to motor settings, desired operation mode, I/O signs, etc.
2. Program command sources for local and remote mode, as desired for application.
3. Program communication parameters such as DHCP, IP address, baud rate, etc.
4. Program the timeout for Modbus TCP communication in parameter P0806.
5. Define which parameters will be read and written at CFW500 frequency inverter, based on its parameter list. It is not necessary to define I/O words. The Modbus TCP protocol enables direct access to any device parameter, and does not distinguish between cyclic and acyclic data. The main parameters that can be used to control the device, we can mention:
   - P0680 - Status Word
   - P0681 - Speed in 13 bits
   - P0684 - Control Word
   - P0685 - Speed reference
6. If necessary, restart the Ethernet interface using P0849.

6.5.3 Configuring the Master

The way you do the network setup is highly dependent on the network master and the network configuration tool. It is important to know the tools used to perform this activity. In general, the following steps are required to perform the network configuration.

1. Program the master to read and write holding registers, based on the defined equipment parameters to read and write. The register number is based on the parameter number, as shown in table 6.4.
2. It is recommended that reading and writing are done in a cyclic manner, allowing detection of communication errors by timeout.

6.5.4 Communication Status

Once you install the network and program the master, you can use the LEDs and equipment parameters to identify some states related to communication.

- The LEDs ”MS”, ”NS” and ”Link” provide information about the state of the interface and communication.
- The parameter P0801 indicates the status of communication between the device and the network master.

The network master must also provide information about communication with slave.

6.5.5 Operation Using Process Data

Once communication is established, data is written and read by the Modbus TCP network master automatically. Using these parameters, the master is able to control the equipment and monitor its operation. It is important to know the device parameters to program the master as desired for the application.

7 ETHERNET/IP

Following it shows operating characteristics of the CFW500 frequency inverter using the plug-in module for EtherNet/IP communication.

7.1 INDICATION LEDS

The MS and NS LEDs present on the Ethernet module, have the following information for EtherNet/IP protocol:

Table 7.1: *Module Status LED (MS)*

State	Description
Off	No power.
Green, solid	Controlled by a Scanner in Run state.
Green, flashing	Not configured, or scanner in Idle state.
Red, solid	Fatal error (interface must be reinitialized).
Red, flashing	Recoverable fault.

Table 7.2: *Network Status LED (NS)*

State	Description
Off	No power or no IP address.
Green, solid	Connection established.
Green, flashing	Waiting for connections.
Red, solid	Duplicate IP address, or fatal error (interface must be reinitialized).
Red, flashing	One or more I/O connection timed out.

7.2 CYCLIC DATA

Cyclic data is the data normally used for status monitoring and equipment control. For EtherNet/IP protocol, the interface supports an I/O connection that allows communication up to 14 input words and 14 output words.

It is necessary the configuration to be made both at the slave and master.

7.3 ACYCLIC DATA

In addition to the cyclic data, the interface also provides acyclic data via explicit messaging. Using this type of communication, you can access any equipment parameter. Access to this type of data is commonly done using instructions for reading or writing data, which should indicate the class, instance, and attribute to the desired parameter. The following table describes how to address the parameters for CFW500 frequency inverter.

Table 7.3: *Parameter Addressing*

Parameter	Class	Instance	Atribute
P0001	162 (A2h)	1	5
P0002	162 (A2h)	2	5
P0003	162 (A2h)	3	5
⋮	⋮	⋮	⋮
P0400	162 (A2h)	400	5
⋮	⋮	⋮	⋮

The data is transmitted as an integer value, without the indication of the decimal places.

7.4 EDS FILE

Each device on an EtherNet/IP network has an EDS configuration file, which contains information about the device functions on the network. This file is used by a master or configuration software to program devices present at EtherNet/IP network.

The EDS file is available from WEG website (http://www.weg.net). It is important to note if the EDS configuration file is compatible with the firmware version of the CFW500 frequency inverter.

7.5 MODBUS TCP CONNECTIONS

The plug-in module for EtherNet/IP also provides up to 2 Modbus TCP connections. These connections can be used for parameterization, as well as access to markers and data used for CFW500 ladder programming. The available Modbus functions and communication data are described in item 6.

7.6 STARTUP GUIDE

Next it describes the main steps for commissioning CFW500 frequency inverter on Ethernet network using EtherNet/IP protocol. These steps represent an example of use. Refer to specific chapters for details on the steps.

7.6.1 Installing the Product on an Ethernet Network

1. Install the Ethernet communication module, as indicated in the installation guide supplied with the module.
2. Connect the Ethernet cable to the device, considering the necessary care in network installation, as described in section 4:
   - Use shielded cable.
   - Properly ground the network devices.
   - Avoid laying communication cables next to power cables.

7.6.2 Configuring the Drive

1. Follow the recommendations described in the user's manual to program the related to device settings, motor parameters, desired functions for I/O signs, etc..
2. Program command sources for local and remote mode, as desired for application.
3. Program communication parameters such as DHCP, IP address, baud rate, etc.
4. Set the desired action for communication errors, through the P0313.
5. Set number of I/O words as well as the contents of each word using parameters P0820 to P0831 and P0835 to P0846.
6. If necessary, restart the Ethernet interface using P0849.

7.6.3 Configuring the Master

The way you do the network setup depends largely on the master and the configuration tool. It is important to know these tools to perform this activity. In general, the following steps are required to do the network configuration.

1. Load the EDS file[1] to the list of devices in the network configuration tool.
2. Select CFW500 frequency inverter from the available list of devices on the network configuration tool. This can be done manually or automatically, if allowed by the tool.
3. For the master configuration, in addition to the IP address used by the EtherNet/IP module, you must indicate the number of instances of I/O and the amount of data exchanged with the master in each instance. For the communication module for EtherNet/IP, the following values must be programmed:
   - Input instance: 100

[1] The EDS file is available from WEG website (http://www.weg.net). It is important to note if the EDS configuration file is compatible with the firmware version of the CFW500 frequency inverter.

- Output instance: 150

4. The EtherNet/IP device is described as “Generic Ethernet Module” on the device list. Using these settings you can program the network master to communicate with the equipment.

7.6.4 Communication Status

Once you install the network and program the master, you can use the LEDs and equipment parameters to identify some states related to communication.

- The LEDs ”MS”, ”NS” and ”Link” provide information about the state of the interface and communication.
- The parameter P0801 indicates the status of communication between the device and the network master.

The network master must also provide information about the communication with slave.

7.6.5 Operation Using Process Data

Once the communication is established, the data mapped in the I/O area is automatically updated between master and slave. Among the main parameters that can be used to control the device, we can mention:

- P0680 - Status word
- P0681 - Motor speed em 13 bits
- P0684 - Control word
- P0685 - Speed reference

It is important to know these parameters to program the master as desired for the application.

8 PROFINET IO

Following it shows operating characteristics of the CFW500 frequency inverter using the plug-in module for PROFINET communication.

8.1 INDICATION LEDS

The MS and NS LEDs present on the Ethernet module, have the following information for PROFINET protocol:

Table 8.1: *Module Status LED (MS)*

State	Description
Off	No power or initialization.
Green, solid	Normal operation.
Green, flashing (2 flashes and 1 interval)	Used by engineering tools to identify the node on the nerwork.
Red, solid	Fatal error (interface must be reinitialized).
Red, flashing (1 flash and 1 interval)	Configuration error, expected identification differs from real identification.
Red, flashing (2 flashes and 1 interval)	IP address not set.
Red, flashing (3 flashes and 1 interval)	Station name not set.
Red, flashing (4 flashes and 1 interval)	Internal error (interface must be reinitialized).

Table 8.2: *Network Status LED (NS)*

State	Description
Off	No power or no connection with controller.
Green, solid	Connection with controller established, controller in RUN mode.
Green, flashing	Connection with controller established, controller in STOP mode.

8.2 CYCLIC DATA

Cyclic data is the data normally used for status monitoring and equipment control. For PROFINET protocol, the interface supports an I/O connection that allows communication up to 14 input words and 14 output words.

It is necessary the configuration to be made both at the slave and master.

8.3 ACYCLIC DATA

In addition to the cyclic data, the PROFINET protocol also provides acyclic data, mainly used to communicate diagnoses and parameterization data. For the CFW500 frequency inverter using the Ethernet module, the parameter list is available using this communication method.

The PROFINET protocol defines the following structure to address the components for network configuration:

- AR (Application Relation)
- API (Application Process Identifier)
- Slot
- Subslot

The AR and API are used to identify the Ethernet module during the network configuration steps. Slot/subslot are not relevant for accessing acyclic data. Once the module is identified, the parameters are accessed indicating the index and the data length:

- Index: represents the parameter number;

- Length: the length of data, in bytes. All device parameter are 2 bytes in length (Word).

The data is transmitted as an integer value, without the indication of the decimal places.

8.4 XML FILE – GSDML

Each device on an PROFINET network has an GSDML configuration file, which contains information about the device functions on the network. This file is used by a master or configuration software to program devices present at PROFINET network.

The GSDML file is available from WEG website (http://www.weg.net). It is important to note if the GSDML configuration file is compatible with the firmware version of the CFW500 frequency inverter.

8.5 MODBUS TCP CONNECTIONS

The plug-in module for PROFINET IO also provides up to 2 Modbus TCP connections. These connections can be used for parameterization, as well as access to markers and data used for CFW500 ladder programming. The available Modbus functions and communication data are described in item 6.

8.6 CONFORMANCE CLASS

The plug-in module for PROFINET S2 complies to conformance class B.

8.7 STARTUP GUIDE

Next it describes the main steps for commissioning CFW500 frequency inverter on Ethernet network using the PROFINET protocol. These steps represent an example of use. Refer to specific chapters for details on the steps.

8.7.1 Installing the Product on an Ethernet Network

1. Install the Ethernet communication module, as indicated in the installation guide supplied with the module.
2. Connect the Ethernet cable to the device, considering the necessary care in network installation, as described in section 4:
   - Use shielded cable.
   - Properly ground the network devices.
   - Avoid laying communication cables next to power cables.

8.7.2 Configuring the Drive

1. Follow the recommendations described in the user's manual to program the related to device settings, motor parameters, desired functions for I/O signs, etc..
2. Program command sources for local and remote mode, as desired for application.
3. Program communication parameters such as Station Name, etc.
4. Set the desired action for communication errors, through the P0313.
5. Set number of I/O words as well as the contents of each word using parameters P0820 to P0831 and P0835 to P0846.
6. If necessary, restart the Ethernet interface using P0849.

8.7.3 Configuring the Master

The way you do the network setup depends largely on the master and the configuration tool. It is important to know these tools to perform this activity. In general, the following steps are required to do the network configuration.

1. Load the GSDML file[2] to the list of devices in the network configuration tool.
2. Select CFW500 frequency inverter from the available list of devices on the network configuration tool. This can be done manually or automatically, if allowed by the tool.
3. For the master configuration, you must indicate the number of I/O words exchanged with the master. It is necessary to select word by word, first selecting all input words and then all output words.
4. The PROFINET plug-in module is recognized as ”CFW500”, at the ”General” category. Using these settings you can program the network master to communicate with the equipment.

8.7.4 Communication Status

Once you install the network and program the master, you can use the LEDs and equipment parameters to identify some states related to communication.

- The LEDs ”MS”, ”NS” and ”Link” provide information about the state of the interface and communication.
- The parameter P0801 indicates the status of communication between the device and the network master.

The network master must also provide information about the communication with slave.

8.7.5 Operation Using Process Data

Once the communication is established, the data mapped in the I/O area is automatically updated between master and slave. Among the main parameters that can be used to control the device, we can mention:

- P0680 - Status word
- P0681 - Motor speed em 13 bits
- P0684 - Control word
- P0685 - Speed reference

It is important to know these parameters to program the master as desired for the application.

[2]The GSDML file is available from WEG website (http://www.weg.net). It is important to note if the GSDML configuration file is compatible with the firmware version of the CFW500 frequency inverter.

9 WEB SERVER

Besides the communication protocol, the Ethernet interface also provides a WEB server with a simple HTML page to access CFW500 frequency inverter data. If the IP address is known, you can use a web browser by typing the IP address in the browser address bar, and it will present a web page with links to interface settings and device data.

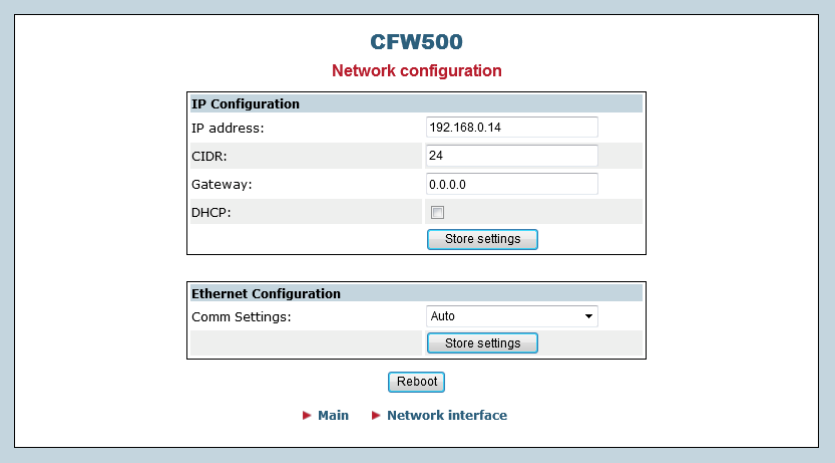

Figure 9.1: *WEB page for interface configuration*

In the interface settings, it presents several fields for programming the IP address, subnet, DHCP, among others. The parameter list of the equipment can also be accessed through the WEB browser via ”Parameter Data” link. This list is presented in a simplified format, with only the integer values, with no indication of decimal places.

NOTE!
For security reasons, access to the WEB server is disabled by default and it can be enabled using the parameter P0799.

10 FAULTS AND ALARMS

A0148/F0248 - Ethernet interface access error

Description:

Indicates error in data exchange between CFW500 frequency inverter and Ethernet module.

Actuation:

It occurs when the control board can not exchange data with the Ethernet module, when the Ethernet module identifies some internal error, or when there is a hardware incompatibility.

In this case, the device will show in the HMI an alarm message A0148 - or fault F0248, depending on the P0313 programming. You must reboot the Ethernet module, power cycling the product or using P0849.

Possible Causes/Correction:

- Check if Ethernet module is properly connected to product.
- Check it the device firmware version supports this module.
- Hardware errors caused by the improper handling or installation of the accessory can cause this error. If possible, test it by replacing the communication module.

A0149/F0249 - Ethernet Offline

Description:

Indicates communication failure between the slave and the network controller.

Actuation:

It occurs when, once established communication between the slave and the network master, there is an interruption in this communication. The method for detecting the interruption of communication depends on the network:

- Modbus TCP: not receiving a valid Modbus TCP telegram by preset period at P0806.
- EtherNet/IP: timeout in I/O connection, or master goes to IDLE state.
- PROFINET: timeout on the cyclic communication between master and slave, or master goes to STOP state.

In this case, the device will show in the HMI an alarm message A0149 - or fault F0249, depending on the P0313 programming. In case of alarm, the indication will automatically disappear at the moment when the communication is reestablished.

Possible Causes/Correction:

- Verify whether the network master is properly configured and operating normally.
- Search for short-circuit or bad contact in the communication cables.
- Verify the entire network installation – cable laying, grounding.

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