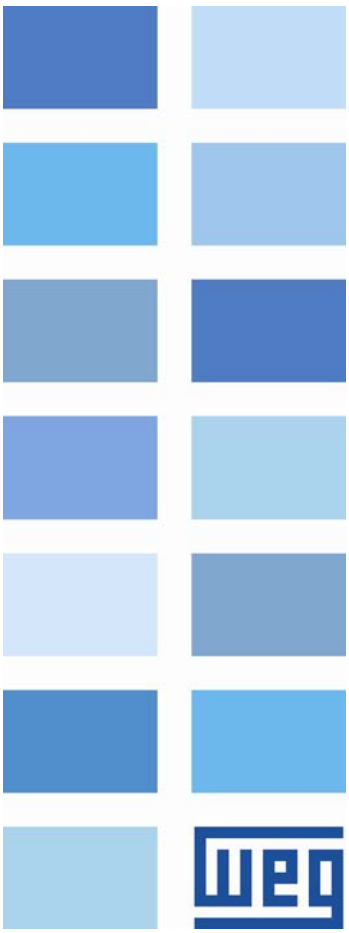
Anybus-CC

CFW-11

User's Manual



Anybus-CC User's Manual

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CONTENTS

ABOUT THE MANUAL

This manual provides the necessary information for the operation of the CFW-11 frequency inverter using the Anybus-CC modules. This manual must be used together with the CFW-11 user manual.

ABBREVIATIONS AND DEFINITIONS

ASCII	American Standard Code for Information Interchange
CAN	Controller Area Network
CIP	Common Industrial Protocol
CSMA/CD	Carrier Sense Multiple Access/Collision Detection
DP	Decentralized Periphery
FMS	Fieldbus Message Specification
HMI	Human Machine Interface
IP	Internet Protocol
MAC	Medium Access Control
MS	Module Status
NS	Network Status
ODVA	Open DeviceNet Vendor Association
OP	Operation Mode
PI	Profibus International
PLC	Programmable Logic Controller
ST	Status
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

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.

1 INTRODUCTION TO THE FIELDBUS

The Fieldbus is a digital communication system used in the industry to interconnect automation primary elements, such as PLC's, drives, valves, sensors, actuators, etc., as illustrated in the figure below.

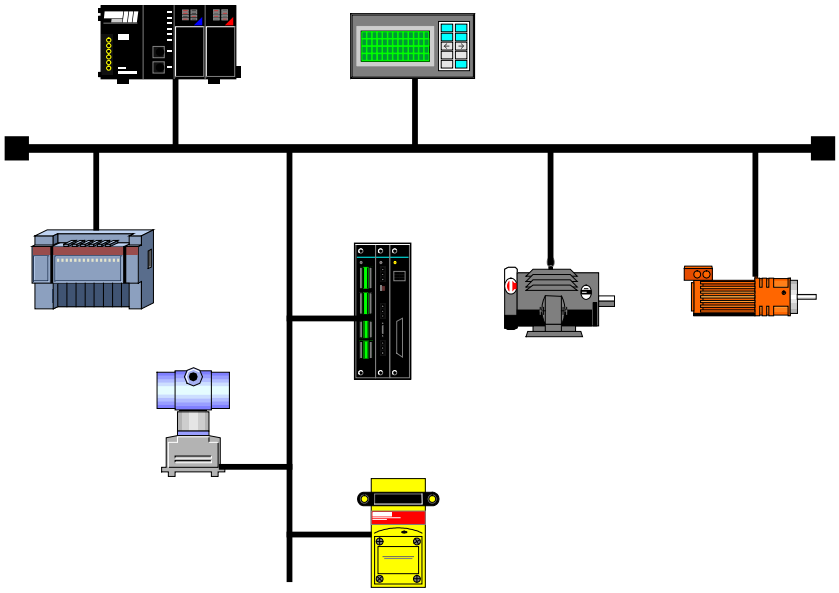

Figure 1.1: *Illustration of a Fieldbus network*

Nowadays, there is a great variety of protocols in the market, each one with its advantages and disadvantages. It is up to the user/project designer to evaluate what the necessary requirements for the application are, and choose among the available options.

Regardless of the choice, the main advantages of the industrial networks are:

- Significant reduction in cable and installation costs;
- Reduction in the *start-up* time;
- More reliability and efficiency;
- Addition, removal and replacement of equipment with the network under load (supply);
- Integration of several suppliers (standardization);
- Effective process monitoring;
- Configuration of devices via the network.

By means of the Anybus-CC communication modules, the CFW-11 supports protocols widely spread in the industry, like DeviceNet, Profibus DP-V1, EtherNet/IP, Modbus TCP and PROFINET IO. Besides this, by means of passive modules, RS232 and RS485/422 interfaces are also available.

Following, the characteristics for Anybus-CC modules available for the frequency inverter CFW-11 are presented.

2 ACCESSORY KITS

Frequency inverter CFW-11 features as accessory the Anybus-CC communication modules. Anybus-CC modules are divided into two types: active and passive.

Active Module: it has all the required hardware and software to perform the communication. The following active modules are available for CFW-11:
- DeviceNet
- Profibus DP-V1
- EtherNet/IP
- Modbus TCP
- PROFINET IO

Passive Module: these passive devices work only as physical layer, not performing any processing over the data flow. CFW-11 features the following interfaces:
- RS232
- RS485/422

NOTE!
For the passive modules, communication is performed through the serial interface of the product. Therefore, the manual of serial communication Modbus RTU User's Manual must be referred to in order to obtain information about how to configure and operate the product using this interface.

2.1 DEVICENET

2.1.1 DEVICENET-05 Accessory

- WEG part number: 11008158.
- Composed by the Anybus ABCC-DEV communication module, mounting instructions and a "torx" screw driver for fixing the module.
- ODVA certified interface.
- It allows the programming of the Frequency inverter via network configuration software.

Connector Pin Function

The DeviceNet communication module presents a male *plug-in* connector with the following pin assignment:

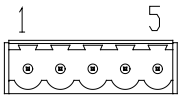

Table 2.1: *DeviceNet plug-in connector pin assignment*

Pin	Name	Function
1	V-	Power supply negative pole
2	CAN_L	CAN_L signal
3	Shield	Cable shield
4	CAN_H	CAN_H signal
5	V+	Power supply positive pole

Power Supply

The power supply of the network must be able to supply enough current to power up the equipment and interfaces connected to the network. The data for individual consumption and input voltage for the DEVICENET-05 accessory are presented in table 2.2.

Table 2.2: *Characteristics of power supply for the interface*

Power Supply (V_{DC})		
Minimum	**Maximum**	**Recommended**
11	25	24
Current (mA)		
Typical		**Maximum**
36		38

Indications

DeviceNet defines two LEDs for state indication: one for the communication module (MS) and another for the network (NS).

The MS LED indicates the conditions of the module itself. That is, whether it is able to work or not. The table below shows the possible states:

Table 2.3: *State of the DeviceNet module*

LED Status	Description	Comments
Off	Without power supply	-
Green	Module operating and in normal conditions	-
Red	Module in error	Reinitializing the equipment is required.
Flashing green/red	Equipment performing self-diagnosis	It occurs during initialization.

The NS LED provides information about the status of the DeviceNet network. The table below presents the description of those states.

Table 2.4: *Status of the DeviceNet network*

LED Status	Description	Comments
Off	Without power supply or not online	Equipment is not connected to a DeviceNet network with other equipment at the same communication rate.
Green	*Online*, connected	Master has allocated a set of I/O type connection with the slave. In this stage data exchange by means of I/O type connections does effectively occur.
Flashing green	*Online*, not connected	Slave has successfully completed the Mac ID verification procedure. This means that the configured communication is correct (or was detected correctly in the case of use of autobaud) and that there are no other nodes in the network with the same address. However, in this stage, there is not a set of I/O type connections established.
Flashing red	One or more I/O type connections have expired	The I/O data exchange has been interrupted.
Red	Serious fault in the link	It indicates that the slave cannot enter the network because of addressing problems or due to the occurrence of *bus off*. Verify if the address is being used by another device, if the chosen communication rate is correct or if there are installation problems.
Flashing green/red	Equipment performing self-diagnosis	It occurs during initialization.

2.1.2 Installation of the DeviceNet network

For the connection of the frequency inverter using the DeviceNet interface, the following points must be observed:

Communication Rate

Equipment with Anybus-CC interface in general allow to configure the desired communication rate, which may vary from 125 Kbit/s to 500 Kbit/s. A communication rate (baud rate) that can be used by a device also depends on the length of the cable used in the installation. It worth to mention that, in order to allow the disconnection of the element from the network without damaging the bus, it is interesting to put active terminations, which are elements that only play the role of the termination. Thus, any equipment in the network can be disconnected from the bus without damaging the termination. The table 2.5 shows the relation between the communication rates and the maximum lengths of the cable which can be used in the installation, according to the recommendation of ODVA.

Table 2.5: *Communication rates supported and cable length*

Communication Rate	Length of the cable
500 Kbit/s	100 m
250 Kbit/s	250 m
125 Kbit/s	500 m

All the equipment of the network must be set to use the same communication rate.

Address in the DeviceNet network

Every device in the Anybus-CC network must have an address, or MAC ID, between 0 and 63. This address must be different for each device.

Termination resistors

The use of termination resistors at the ends of the CAN bus is essential to prevent reflection in the line, which may damage the signal transmitted and cause errors in the communication. Termination resistors of 121 Ω / 0.25 W must be connected between the signals CAN_H and CAN_L at the ends of the main bus.

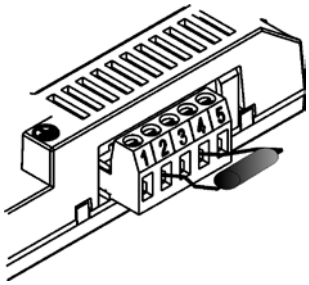

Figure 2.1: *Example of installation of the termination resistor*

Cables

A shielded cable must be used with two pairs of wires, as specified in the DeviceNet protocol.

Installation recommendations

In order to interconnect the network nodes, it is recommended the connection of the equipment directly from the main line, without the use of derivations. If you use derivations, the limits of length for derivation defined by the DeviceNet specification must be observed. During the installation of the cables, you must avoid passing them close to power cables, since that can cause errors during the transmission due to electromagnetic interference.

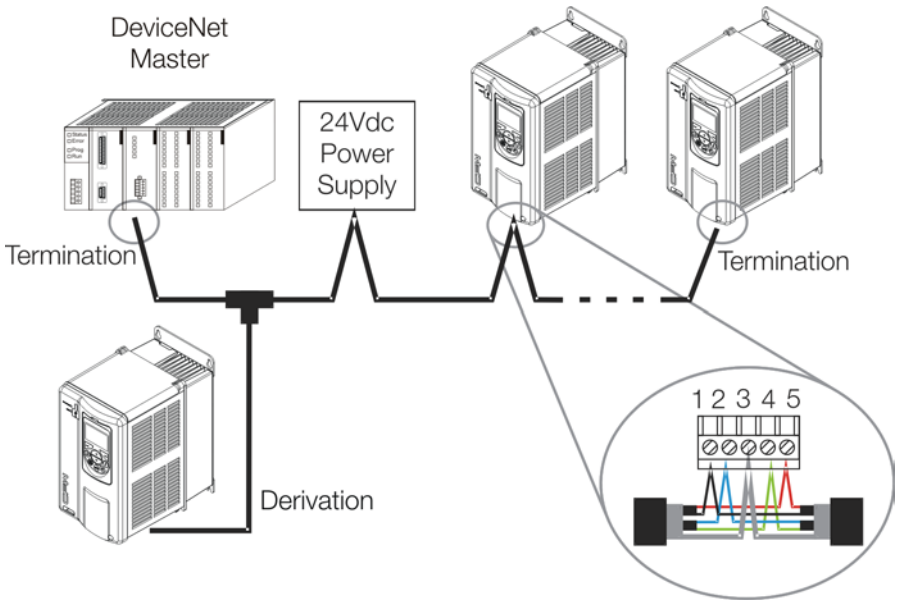

Figure 2.2: *Example of installation in DeviceNet network*

The grounding of the cable shield must be done only in one point, thus avoiding long current loops. This point is normally the network own power supply. It is recommended that the network be powered in only one point, and the power supply signal be taken to all devices by means of the cable. In case more than one power supply is required, they must have the same point as reference.

2.1.3 Configuration of the Communication

In order to configure and use the DeviceNet module, follow the steps below:

- With the module installed, during the recognition stage, a warning message will be displayed on the product HMI, and the MS and NS LEDs test routine performed. After this stage, the MS LED must turn on in green.
- Observe the content of parameter P0723. Check if the module was recognized. The detection is done automatically and does not require the user's intervention.
- Set the parameters as desired for the application:
  - Address: the address of the equipment is set in parameter P0725.
  - Communication rate: the communication rate is set in parameter P0726.
  - I/O configuration: program in P0727 the number of words to be exchanged with the network master. This same value must be set in the DeviceNet master. For this adjustment being complete, it is necessary to program a value different from 0 (zero) in parameters P0728 to P0739 (see item 3).
- Once the parameters are set, if any of the parameters described in the previous item were changed, it is necessary to restart the equipment.

Once the equipment is set, it is necessary to configure the communication in the network master:

- EDS file: register the EDS file in the network configuration tool. The EDS configuration file is supplied in a CD together with the product. It is necessary to observe the equipment software version in order to use an EDS file which is compatible with this version.
- I/O data setting: during the configuration of the network, it is necessary to define the quantity of I/O data communicated between master and slave, as well as the transmission method of these data. The DeviceNet protocol defines different methods of dada exchange, seeing that the module supports the following methods:
  - *Polled:* communication method in which the master sends a telegram to each of the slaves of its list (*scan list*). As soon as it receives the request, the slave immediately answers the request of the master. This process is repeated until all slaves are polled, restarting the cycle.
  - *Bit-strobe:* communication method in which the master sends a telegram to the network containing 8 bytes of data. Each bit of these 8 bytes represents one slave that, if addressed, answers according to the programmed.
  - *Change of State:* communication method in which the data exchange between master and slave only occurs when there are changes in the values monitored/controlled up to a certain time limit. When this limit is reached, the transmission and reception will take place even if changes have not occurred.
  - *Cyclic:* another communication method very similar to the previous one. The only difference is the production and consumption of messages. In this type of communication, every data exchange occurs at regular time intervals, no matter if they have been changed or not.

If everything is correctly configured, the NS LED of the module will be on in green. It is in this condition that cyclic data exchange effectively occurs between the slave and the master of the network.

2.1.4 Access to Parameters – Acyclic messages

Besides the I/O data (cyclic) communication, the DeviceNet protocol also defines a kind of acyclic telegram (*explicit messages*), used especially in asynchronous tasks, such as parameter setting and configuration of the equipment.

After the registration of the EDS file in the network configuration software, the user will have access to the full parameter list of the equipment, which can be accessed via *explicit messages*. Each parameter is accessed using an addressing based on class, instance and attribute. The table 2.6 shows how to address the parameters of the CFW-11.

Table 2.6: Addressing of the parameters

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

2.2 PROFIBUS

2.2.1 PROFIBUS-05 Accessory

- WEG part number: 11008107.
- It is composed by the Anybus ABCC-DPV1 communication module, mounting instructions and a “torx” screw driver for fixing the module.
- Interface certified by Profibus International.
- It supports DP-V1 (acyclic messages).

Connector Pin Function

The Profibus DP-V1 communication module has a female DB9 connector with the following pin assignment:

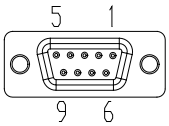

Table 2.7: Profibus female DB9 connector pin assignment

Pin	Name	Function
1	-	-
2	-	-
3	B-Line (+)	RxD/TxD positive
4	RTS	Request To Send
5	GND	Reference (0 V) of the RS485 interface (isolated)
6	+5 V	+5 V for active termination (RS485 isolated power supply)
7	-	-
8	A-Line (-)	RxD/TxD negative
9	-	-

Indications

Profibus defines two LEDs for status indication: one for the communication module (ST) and another for the operating mode (OP).

The ST LED indicates the conditions of the module itself. That is, whether it is able to work or not. The table 2.8 shows the possible states:

Table 2.8: Status of the Profibus DP-V1 module

LED Status	Description	Comments
Off	Without power supply or not initialized	-
Green	Module initialized	-
Flashing green	Initialized, but in event diagnosis	It indicates that a problem was diagnosed in the module and an alarm was generated.
Red	In error	Reinitializing the equipment is required.

The OP LED provides information about the status of the Profibus network. The table 2.9 presents a brief description of those states.

Table 2.9: *Status of the operating mode*

LED Status	Description	Comments
Off	Without power supply or not *online*	-
Green	Device *online*	In this state, data exchange effectively occurs.
Flashing green	*Online* but in the *clear* sate	In this state, data exchange occurs, but the outputs are not updated.
Flashing red (1 flash)	Error in parameter setting	Incorrect configuration of the Profibus communication properties in the master of the network.
Flashing red (2 flashes)	Error in the Profibus configuration	It indicates that the quantity of I/O words (or the order of these words) set in the master is different from that set in the equipment.

2.2.2 Installation of the Profibus network

For the connection of the frequency inverter using the Profibus interface, the following points must be observed:

Communication Rate

It is not necessary to set the communication rate of the Profibus module because it features autobaud and, therefore, this configuration is done in the master of the network.

Address

Every device in the Profibus network, master or slave, is identified in the network by means of an address. This address must be different for each device. Valid values: 1 to 126.

Termination resistors

For each segment of the Profibus DP network, it is necessary to enable a termination resistor at the ends of the main bus. Connectors suitable for the Profibus network that feature a switch to enable the resistor may be used, but the switch must only be enabled (ON position) if the equipment is the first or last element in the segment. It is worth to mention that, in order to allow the disconnection of the element from the network without damaging the bus, it is interesting to put active terminations, which are elements that only play the role of the termination. So any equipment in the network can be disconnected from the bus without damaging the termination.

Cables

It is recommended that the installation be done with A-type cable, whose features are described in table 2.10. The cable has a pair of wires that must be shielded and twisted in order to guarantee greater immunity to electromagnetic interference.

Table 2.10: *Properties of cable A-type cable*

Impedance	135 to 165 Ω
Capacitance	30 pf/m
Resistance in loop	110 Ω/km
Diameter of the cable	> 0.64 mm
Cross section of the wire	> 0.34 mm

Connectors

There are different types of connectors specifically designed for applications in the Profibus network. For CFW-11 frequency inverter, it is recommended to use connectors with cable connection in 180 degrees, because, in general, connectors with different angles can not be used due to mechanical characteristics of the product.

Installation recommendations

The Profibus DP protocol, using physical medium RS485, allows the connection of up to 32 devices per segment, without the use of repeaters. With repeaters, up to 126 addressable devices can be connected to the network. Each repeater must also be included as a device connected to the segment, although it will not take an address in the network.

It is recommended that the connection of all the devices present in the Profibus DP network be done from the main bus. In general, the connector of the Profibus network itself has one input and one output for the cable, allowing the connection to be taken to the other points of the network. Derivations from the main line are not recommended, especially for communication rates over or equal to 1.5Mbps.

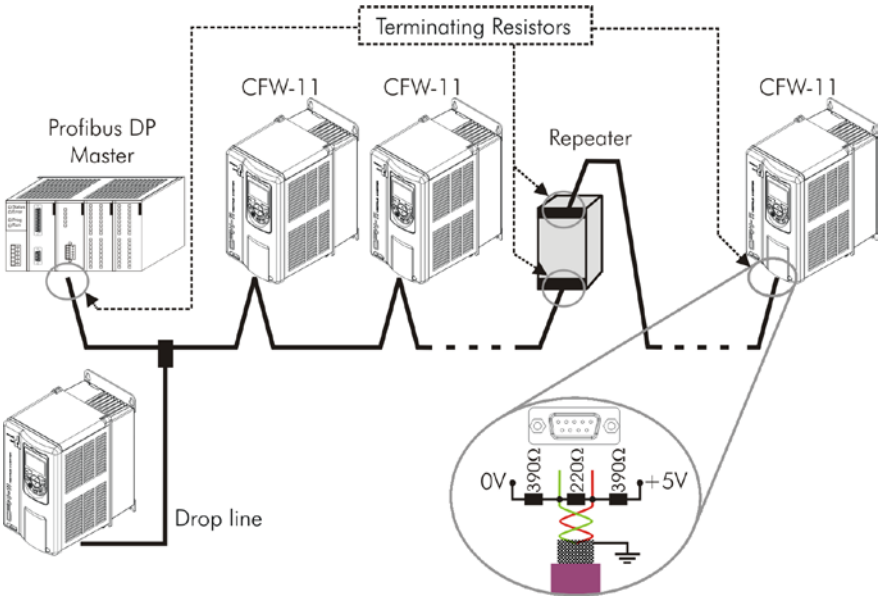

Figure 2.3: *Example of installation of the Profibus DP network*

The Profibus DP network cables must be laid separately (and far away if possible) from the power cables. All the drives must be properly grounded, preferably at the same ground point. The Profibus cable shield must also be grounded. The DB9 connector itself already has a connection with the protective ground and, therefore, makes the connection of the shield to the ground when the Profibus cable is connected to the drive. However a better connection, implemented by clamps that connect the shield to a ground point, is also recommended.

2.2.3 Configuration of the Module

In order to configure and use the Profibus DP-V1 module, follow the steps below:

- With the module installed, during the acknowledgement stage, a warning message will be displayed on the product HMI, and the ST and OP LEDs test routine performed. Then the ST LED of the module must turn on in green.
- Observe the content of parameter P0723. Check if the module was recognized. The detection is done automatically and does not require the user's intervention.
- Set the parameters as desired for the application:
  - Address: the address of the equipment is set in parameter P0725.
  - I/O configuration: Program in P0727 the number of words to be exchanged with the network master. This same value must be set in the Profibus master. For this adjustment being complete, it is necessary to program a value different from 0 (zero) in parameters P0728 to P0739 (see item 3).
- Once the parameters are set, if any of the parameters described in the previous item are changed, it is necessary to restart the equipment.

Once the equipment is set, it is necessary to configure the communication in the master of the network:

- GSD file: every element of the Profibus DP network has an associated configuration file with extension GSD. This file describes the features of each device and it is used by the configuration tool of the master of the Profibus DP network. During the configuration of the master, the GSD configuration file, supplied with the equipment, must be used. This file must be registered in the master of the Profibus DP network. The module will be recognized as "*Anybus CompactCom DPV1*" in the category "*General*".
- I/O data setting: add the CFW-11 to the device list of the master, setting the number of I/O words according to parameter P0727.

If everything is correctly configured, the OP LED of the module will be on in green. It is in this condition that cyclic data exchange effectively occurs between the drive and the master of the network.

NOTE!
In the configuration software of the Profibus network, first you must select all the input words (*inputs*) and then select the output words (*outputs)*, according to parameter P0727.

NOTE!
For further information on the parameters mentioned above, refer to item 3.

2.2.4 Access of the Parameter – Acyclic Messages

The PROFIBUS-05 communication kit allows parameter reading/writing services by means of DP-V1 acyclic functions. The parameter mapping is done based on the slot and index addressing, as showed in the formula below:

- Slot: (parameter number - 1) / 255.
- Index: (parameter number - 1) MOD 255.

NOTE: MOD represents the remainder of the integer division.

2.3 ETHERNET/IP

2.3.1 ETHERNETIP-05 and ETHERNET-2P-05 Accessory

- Ethernet-05 part number: 10933688 (1 Ethernet port).
- Ethernet-2P-05 part number: 12272760 (2 Ethernet ports with integrated switch).
- Composed by the Anybus ABCC-EIP communication module, mounting instructions and a “torx” screw driver for fixing the module.
- Standard RJ45 connector.
- ODVA certified interface.

Connector

The EtherNet/IP communication module has a standard female RJ45 connector (T-568A or T-568B).

Indications

EtherNet/IP defines two LEDs for status indication: one for the communication module (MS) and another for the network (NS).

The MS LED indicates the conditions of the module itself. That is, whether it is able to work or not. The table below shows the possible states:

Table 2.11: *State of the EtherNet/IP module*

LED Status	Description	Comments
Off	Without power supply	-
Green	Module controlled by a scanner in RUN mode.	In this state, data exchange effectively occurs.
Flashing green	Not configured or scanner in IDLE mode	In this stage there is no cyclic data communication with the scanner, or the scanner is in IDLE mode.
Red	Major fault	Internal error of the module. Equipment must be reinitialized.
Flashing red	Recoverable fault	Internal error of the module, but the return to the normal state occurs automatically after the cause of the fault is corrected.
Flashing green/red	Equipment performing self-diagnosis	It occurs during initialization.

The NS LED indicates the conditions of the EtherNet/IP network.

Table 2.12: *Status of the EtherNet/IP network*

LED Status	Description	Comments
Off	Without power supply or IP address	The software IPconfig must be used to configure the communication module address.
Green	*Online*, connected	Master has allocated a set of I/O type connection with the slave. In this stage data exchange by means of I/O type connections does effectively occur.
Flashing green	*Online*, not connected	In this stage, there is not a set of I/O type connections established.
Red	Major fault or duplicated IP address	Equipment must be reinitialized to exit the fault state. Check the IP addresses in the network.
Flashing red	One or more I/O type connections have expired	The I/O data exchange has been interrupted.
Flashing green/red	Equipment performing self-diagnosis	It occurs during initialization.

The LINK LED indicates the state of the physical connection of the network, as well as the activity in the bus.

Table 2.13: *Status of the connection*

LED Status	Description	Comments
Off	Without link	Without connection, without activity
Green	Link	Ethernet link established but without data exchange.
Flashing green	Activity in the bus	It effectively indicates that there is exchange of telegrams with the network.

2.3.2 Installation of the Ethernet network

For the connection of the frequency inverter using the Ethernet interface, the following points must be observed:

Communication Rate

The Ethernet interfaces of the Anybus-CC communication cards can communicate using the 10 or 100 Mbps rates in *half* or *full* duplex mode. As default, the modules are configured with automatic detection of the communication rate.

MAC Address

Each Anybus-CC module has a unique MAC address, which is indicated on a label in its lower part. This MAC address may be useful during the stage of configuration of the interface, when it may be necessary to make a differentiation in case several modules are simultaneously configured, and it must be written down before its installation.

Address in the Ethernet network

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

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

These attributes can be automatically configured by means of a DHCP server present in the network, as long as this option is enabled in the Anybus-CC module.

Cables

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

Installation recommendations

- Each cable segment must have at most 90 m.
- It must be used a direct cable to connect the module to a concentrating element (*switch*), or a *cross-over* cable for direct connection between the module and the PC/CLP.
- As for topology, there are two models of Anybus-CC card: with one or two Ethernet ports.
  - For the models with one port, the most usual topology is star, exactly as it is done with computer networks. In this case all the equipment must be connected to a concentrating element (switch).

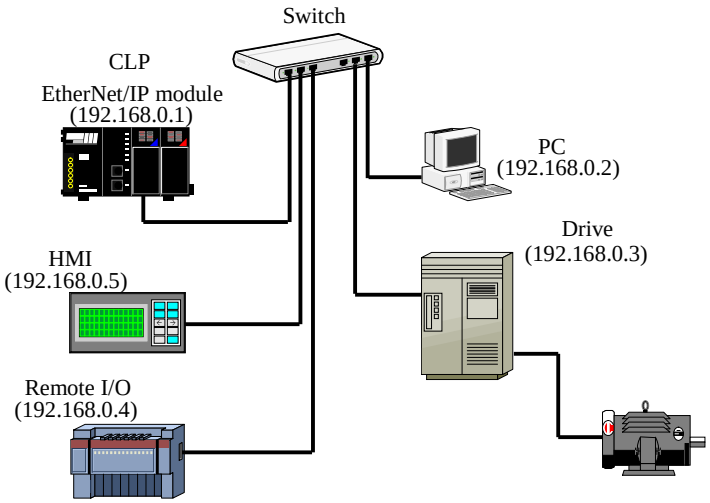

Figure 2.4: *Star topology.*

- The models with two ports have an integrated switch. Thus, besides the connection of the equipment in star for a concentrating element, it is also possible to make the connection in *daisy chain*, allowing a topology equivalent to a bus.

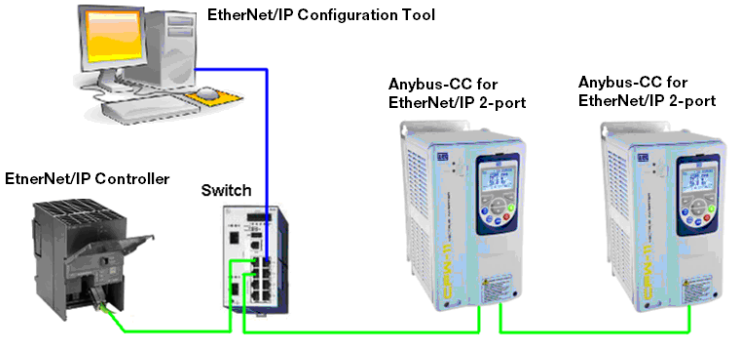

Figure 2.5: *Daisy chain topology.*

2.3.3 Configuration of the Ethernet Interface

In order to configure the Ethernet interface of the communication modules, it is necessary to connect the module to a PC to use the following software:

HMS Anybus IPconfig

This software is used to program the IP address of the module. When you execute this software, it will automatically scan the network in order to find out which modules are connected. The modules found will be listed, showing the information of IP address, subnet, gateway, etc. If more than a module is found, it is necessary to make the differentiation through the MAC address indicated in the lower part of the Anybus-CC module.

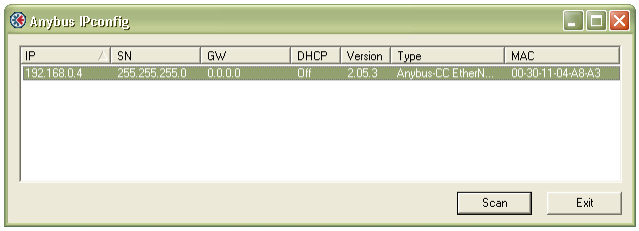

Figure 2.6: *HMS Anybus IPconfig.*

To edit this information, you just click twice on the desired module to open new window, where you can modify these fields.

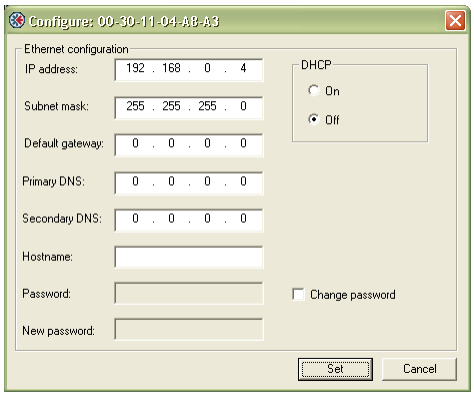

Figure 2.7: *IPconfig software information editing.*

Web Browser

In case the IP address is known, it is possible to use a web browser to access the data configuration of the Anybus-CC module. Typing the IP address in the address bar of the browser, you will see a webpage with links for the configurations of the interface or for the data of the equipment.

In the interface configurations, you will find several fields to program IP address, subnet, DHCP, among others.

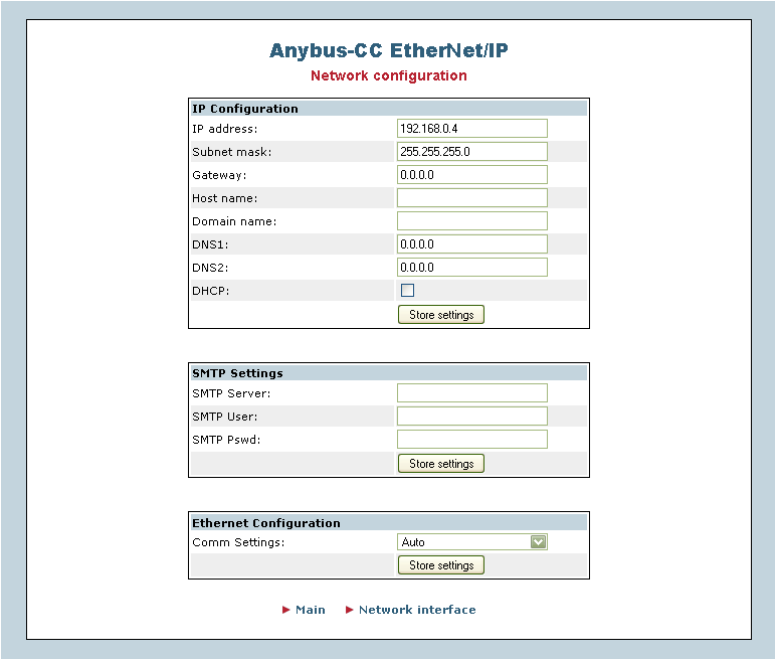

Figure 2.8: *Webpage of interface configuration*

The data mapped in the input/output (I/O) areas can also be accessed by means of the web browser through the link “Parameter Data”. Through this page, it is possible to read the monitoring data, as well as to modify the equipment control data.

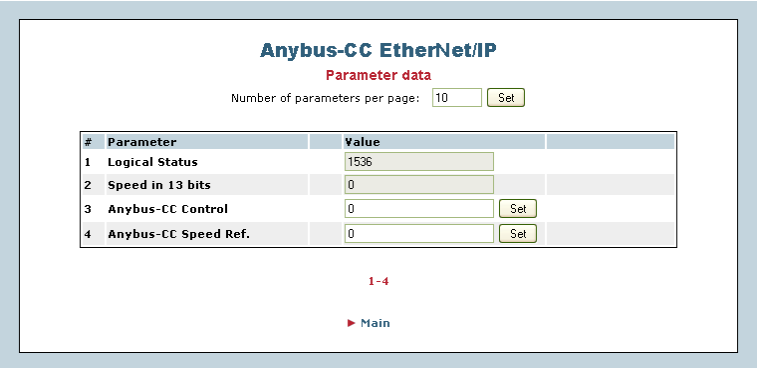

Figure 2.9: *Web page with input/output data*

NOTE!
If there is cyclic communication between the module and the master of the network, the control data sent by the master will overwrite the data sent through this page. Thus, the commands sent by this page will only be executed in case the module is in the offline state.

2.3.4 Configuration of the Communication

In order to configure and use the EtherNet/IP module, follow the steps below:

- With the module installed, during the recognition stage, a warning message will be displayed on the product HMI, and the MS and NS LEDs test routine performed. After this stage, the MS LED must turn on in green.
- Observe the content of parameter P0723. Check if the module was recognized. The detection is done automatically and does not require the user's intervention.
- Set the parameters as desired for the application:
  - Configurations of IP address and communication rate are explained in item 2.3.3.
  - I/O configuration: program in P0727 the number of words to be exchanged with the network master. This same value must be set in the EtherNet/IP scanner. For this adjustment being complete, it is necessary to program a value different from 0 (zero) in parameters P0728 to P0739 (see item 3).
- Once the parameters are set, if any of the parameters described in the previous item are changed, it is necessary to restart the equipment.

Once the equipment is set, it is necessary to configure the communication in the master of the network:

- EDS file: register the EDS file in the network configuration file. The EDS configuration file is supplied in a CD together with the product.
- For the configuration of the master, besides the IP address used by the EtherNet/IP module, it is necessary to indicate a number of the instances of I/O and the quantity of data exchanged with the master in each instance. For the EtherNet/IP communication module, the following values must be programmed:
  - Input instance (input): 100
  - Output instance (output): 150
- The EtherNet/IP module is described in the network as "Generic Ethernet Module". Using these configurations it is possible to program the master of the network to communicate with the equipment.

If everything is correctly configured, the NS LED of the module will be on in green. It is in this condition that cyclic data exchange effectively occurs between the slave and the master of the network.

2.3.5 Access to Parameters – Acyclic messages

Besides the cyclic data communication, the EtherNet/IP protocol also defines a kind of acyclic telegram, used especially in asynchronous tasks, such as parameter setting and configuration of the equipment. The table 2.6 brings the class, instance and attribute for the access of the parameters of the equipment.

2.4 MODBUS TCP

2.4.1 MODBUSTCP-05 Accessory

- WEG part number: 11550476.
- Composed by the Anybus ABCC-EIT communication module, mounting instructions and a “torx” screw driver for fixing the module.
- Standard RJ45 connector.

Connector

The Modbus TCP communication module has a standard female RJ45 connector (T-568A or T-568B).

Indications

Modbus TCP defines two LEDs for status indication: one for the communication module (MS) and another for the network (NS).

The MS LED indicates the conditions of the module itself. That is, whether it is able to work or not. Table 2.14 shows the possible states:

Table 2.14: *Status of the Modbus TCP module*

LED Status	Description	Comments
Off	Without power supply	-
Green	Normal operation	-
Red	Serious fault.	Internal error of the module. Equipment must be reinitialized.
Flashing red	Recoverable fault or conflict of IP address	Internal error of the module, but the return to the normal state occurs automatically after the cause of the fault is corrected. Check the IP addresses in the network.
Flashing green/red	Equipment performing self-diagnosis	It occurs during initialization.

The NS LED indicates the conditions of the Modbus TCP network.

Table 2.15: *Status of the Modbus TCP network*

LED Status	Description	Comments
Off	Without power supply or IP address	The software IPconfig must be used to configure the communication module address.
Green	Module is in Process Active or Idle state	-
Flashing green	Waiting for connections	-
Red	Major fault or conflict of IP address	Equipment must be reinitialized to exit the fault state. Check the IP addresses in the network.
Flashing red	Timeout	The data exchange has been interrupted.
Flashing green/red	Equipment performing self-diagnosis	It occurs during initialization.

The LINK LED indicates the state of the physical connection of the network, as well as the activity in the bus.

Table 2.16: *Status of the connection*

LED Status	Description	Comments
Off	Without link	Without connection, without activity
Green	Link	Ethernet link established but without data exchange between master and slave.
Flashing green	Activity in the bus	It effectively indicates that there is data exchange between the master and the slave.

2.4.2 Installation of the Ethernet Network

For the connection of the frequency inverter using the Ethernet interface, refer to item 2.3.2.

2.4.3 Configuration of the Ethernet Interface

To configure the Ethernet interface of the communication module, refer to item 2.3.3.

2.4.4 Configuration of the Communication

In order to configure and use the Modbus TCP, follow the steps below:

- With the module installed, during the recognition stage, a warning message will be displayed on the product HMI, and the MS and NS LEDs test routine performed. After this stage, the MS LED must turn on in green.
- Observe the content of parameter P0723. Check if the module was recognized. The detection is done automatically and does not require the user's intervention.
- Set the parameters as desired for the application:
  - Configurations of IP address and communication rate are explained in item 2.3.3.
  - I/O configuration: program in P0727 the number of words to be exchanged with the network master. For this adjustment being complete, it is necessary to program a value different from 0 (zero) in parameters P0728 to P0739 (see item 3).
- Once the parameters are set, if any of the parameters described in the previous item are changed, it is necessary to restart the equipment.

Once the equipment is set, it is necessary to configure the communication in the master of the network:

- Configure the master to access the Anybus I/O words as per the memory map presented in item 2.4.5.
- To configure the timeout of the communication and order of the bytes, use the web browser according to the figure 2.10.

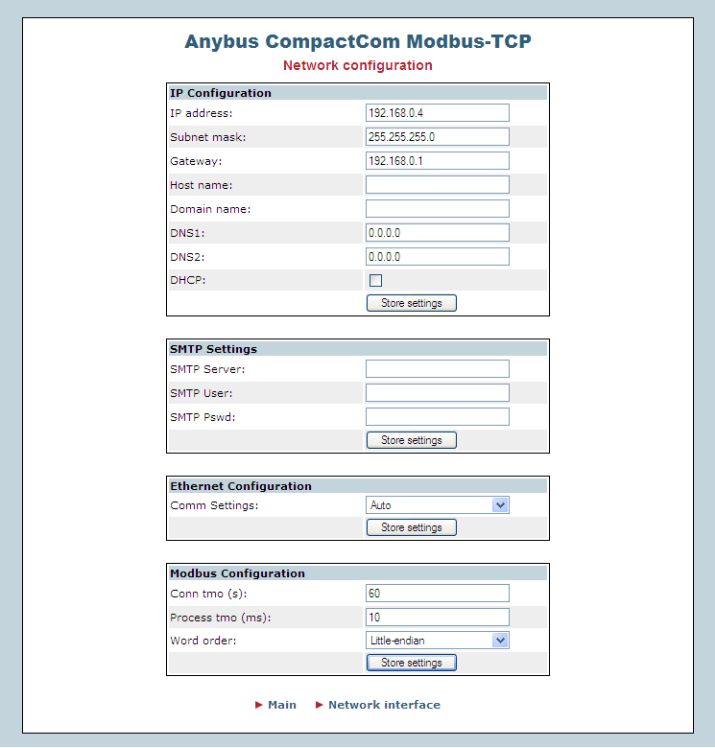

Figure 2.10: *Webpage with configuration of the timeout and order of the bytes*

- The field "Comm tmo" is used to configure the timeout of the TCP connection and the field Process tmo allows to program the time for the detection of communication error.
- The field "Word order" configures the order of the *bytes* of each word in *little endian* (byte 1 most significant) or *big endian* (byte 0 least significant).
- Connect the network cable to the module.
- If everything is correctly configured, the NS LED of the module will be on in green and the LINK LED will start to flash indicating normal activity in the network.

NOTE!
For further information on the parameters mentioned above, refer to item 3.

2.4.5 Addressing of the data

Modbus TCP does not define a channel of cyclic data dedicated like in other networks. However, in the Anybus-CompactCom module, the I/O words can be accessed by the network by means of dedicated registers.

The I/O words can be accessed as bits (Coils and Discrete Inputs) or as registers of 16 bits (Holding Registers and Input Registers).

The parameters of the drive can be accessed only as holding registers.

The Modbus mapping is presented in the table below:

Table 2.17: *Addressing for Holding Registers*

Address range	Description
0000h ... 00FFh	Anybus Writing Words
0100h ... 01FFh	Anybus Reading Words
0210h ... FFFFh	Parameters of the drive To find the address of the register corresponding to the parameter: ADDR = 210h + (Parameter Number – 1) Example: P0003 = 210h + (3h – 1h) = 212h P0100 = 210h + (64h – 1h) = 273h

Table 2.18: *Addressing for Input Registers*

Address range	Description
0000h ... 00FFh	Anybus Reading Words

Table 2.19: *Addressing for Coils*

Address range	Description
0000h ... 0FFFh	Anybus Writing Words

Table 2.20: *Addressing for Discrete Inputs*

Bit address range	Description
0000h ... 0FFFh	Reading Words Anybus

NOTE!
Writings in reading words will have no effect, and the reading of not used registers will return to value zero.

2.5 PROFINET

2.5.1 PROFINETIO-05 Accessory

- WEG part number: 11550548.
- Composed by the Anybus ABCC-EIT communication module, mounting instructions and a “torx” screw driver for fixing the module.
- Two Standard RJ45 connectors.

Connector

The PROFINET IO communication module has two standard female RJ45 connectors (T-568A or T-568B). It features integrated switch, enabling the connection in *daisy chain*.

Indications

PROFINET IO defines two LEDs for status indication: one for the communication module (MS) and another for the network (NS). Figure 2.11 describes the indication LEDs.

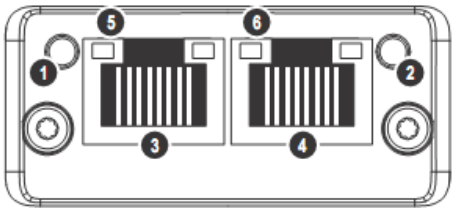

Figure 2.11: *Description of the indication LEDs of the PROFINET module*

The MS LED (2) indicates the conditions of the module itself. Table 2.21 shows the possible states:

Table 2.21: *Status of the operating mode*

Status	Description	COMMENTS
Off	Without power supply	-
Green	Normal operation	-
Flashing green - flashes once	Present diagnosis	No used.
Flashing green - flashes twice	acknowledgement	Signaling used by an engineering tool to recognize the equipment in the network.
Red	Major fault	Internal error in the communication between the Anybus-CC module and drive (Exception). Equipment must be reinitialized.
Flashing red - flashes once	Configuration error	It indicated that the quantity of I/O words (or the order of these words) was not correctly configured in the master of the network.
Flashing red - flashes once	IP address not configured	The software IPconfig must be used to configure the communication module address or use the PROFINET master to choose the automatic configuration of the IP address.
Flashing red - flashes three times	Station name not configured	The equipment must be configured in a PROFINET network so that the station name is attributed by the master of the network.
Flashing red - flashes three times	Internal error	Equipment must be reinitialized.
Flashing green/red	Equipment performing self-diagnosis	It occurs during initialization.

The NS LED (1) indicates the conditions of the PROFINET network.

Table 2.22: *Status of the PROFINET network*

LED Status	Description	Comments
Off	Offline	Module without power supply Without connection with the master of the network.
Green	Online (RUN)	Connection with the master of the network established. Master of the network in RUN.
Flashing green	Online (STOP)	Connection with the master of the network established. Master of the network in STOP.

The LINK LEDs (5 and 6) indicates the state of the physical connection of the network, as well as the activity in the bus.

Table 2.23: *Status of the connection*

LED Status	Description	Comments
Off	Without link	Without connection, without activity.
Green	Link	Ethernet link established but without data exchange between master and slave.
Flashing green	Activity in the bus	It indicates that there is data exchange between the master and the slave.

2.5.2 Installation of the Ethernet Network

For the connection of the frequency inverter using the Ethernet interface, refer to item 2.3.2.

2.5.3 Configuration of the Ethernet Interface

To configure the Ethernet interface of the communication module, refer to item 2.3.3.

2.5.4 Configuration of the Communication

In order to configure and use the PROFINET IO module, follow the steps below:

- With the module installed, during the recognition stage, a warning message will be displayed on the product HMI, and the MS and NS LEDs test routine performed. After this stage, the MS LED must turn on in green.
- Observe the content of parameter P0723. Check if the module was recognized. The detection is done automatically and does not require the user's intervention.
- Set the parameters as desired for the application:
  - Configurations of IP address and communication rate are explained in item 2.3.3.
  - I/O configuration: program in P0727 the number of words to be exchanged with the network master. This same value must be set in the PROFINET master. For this adjustment being complete, it is necessary to program a value different from 0 (zero) in parameters P0728 to P0739 (see item 3).
- Once the parameters are set, if any of the parameters described in the previous item are changed, it is necessary to restart the equipment.

Once the equipment is set, it is necessary to configure the communication in the master of the network:

- GSD file: register the GSD file for PROFINET (GSDML) in the configuration software of the network. The GSD configuration file is supplied in a CD together with the product. The module will be recognized as "*Anybus CompactCom PRT 2-Port*" in the category "*General*".
- For the configuration of the master, the following points must be observed:
  - The same quantity of data set in the slave must be set in the master. These data must be programmed observing the following order: first all input words and then all output words*;*
  - The IP address of the slave can be configured manually (via IPconfig) or attributed automatically by the PROFINET master (in case it has this function);
  - The network topology must be informed, indicating precisely the connections between the PROFINET equipment.

NOTE!
For further information on the parameters mentioned above, refer to item 3.

2.5.5 Access to Parameters – Acyclic messages

Besides the cyclic communication, the PROFINET protocol also allows to perform acyclic requests used especially to transmit diagnosis data, parameter setting and configuration of the equipment. For the drive which uses the Anybus module, practically all the parameters can be accessed by means of this way of communication.

The PROFINET protocol defines the following structures for the addressing of the components used in the configuration of the network:

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

AR and API are used to identify the Anybus module during the stage of configuration of the network. Slot/Subslot are not relevant for acyclic access of the data for the drive. Once the module is identified, the parameters are accessed indicating the Index and the size of the data (Length) accessed:

- Index: it represents the number of the parameter;
- Length: the size of the data accessed. All the parameters of the drive are accessed as Word (2 bytes).

2.6 RS232

2.6.1 RS232-05 Accessory

- WEG part number: 11008160.
- Composed by the Anybus ABCC-RS232 communication module, mounting instructions and a “torx” screw driver for fixing the module.
- It allows transmission rates up to 57.6 kbps.

Connector Pin Function

The RS232 communication module presents a male DB9 connector with the following pin assignment:

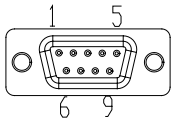

Table 2.24: *RS232 DB9 male connector pin assignment*

Pin	Name	Function
1	-	-
2	RxD	RS232 data reception
3	TxD	RS232 data transmission
4	-	-
5	GND	Reference (0 V) of the interface
6	-	-
7	RTS	Request To Send
8	-	-
9	-	-

Indications

PWR LED: Green LED. When on, it indicates that the module is powered.

Connection with the Network

For the connection of the device using the passive RS232 interface, the following points must be observed:

- Use good quality cables, preferably shielded.
- Keep the cable length within the limits stipulated by the standard, normally about 10m.
- Avoid passing the cables close to power cables.

2.7 RS485

2.7.1 RS485-05 Accessory

- WEG part number: 11008161.
- Composed by the Anybus ABCC-RS485, mounting instructions and a “torx” screw driver for fixing the module.
- It allows transmission rates up to 57.6 kbps.

Connector Pin Function

The RS485/422 interface module presents a female DB9 connector with the following pin assignment:

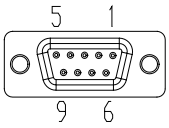

Table 2.25: *RS485/422 female DB9 connector*

Pin	RS422 Mode	RS485 Mode	Function
1	Term Pwr	Term Pwr	+5 V for active termination (isolated)
2	-	-	-
3	-	-	-
4	Mode Select	Mode Select	Not connected: RS485 mode Connected to GND: RS422 mode
5	GND	GND	Reference (0 V) for the interface circuit (isolated)
6	RxD	-	Data reception line in RS422 mode Not connected in RS485 mode
7	RxD (inverted)	-	
8	TxD	RxD/TxD	Data transmission line in RS422 mode Bidirectional data line in RS485 mode.
9	TxD (inverted)	RxD/TxD (inverted)	

Indications

PWR LED: Green LED. When on, it indicates that the module is powered.

Connection with the Network

For the connection of the device using the passive RS485 interface, the following points must be observed:

- Use good quality shielded cables.
- Keep the cable length within the limits stipulated by the standard, normally about 1000 meters.
- Avoid passing the communication cables close to power cables.
- Put termination resistors between the data signal wires (RxD/TxD and TxD/RxD) at the network extreme nodes. This will avoid reflections in the line.

3 PROGRAMMING

Next, only the CFW-11 frequency inverter parameters related to the Anybus-CC communication will be presented.

3.1 SYMBOLS FOR THE PROPERTIES DESCRIPTION

RO	Read-only parameter
CFG	Parameter that can be changed only with a stopped motor
NET	Parameter visible on the HMI if the device has the network interface installed – RS232, RS485, CAN, Anybus-CC, Profibus – or if the USB interface is connected

P0105 – 1ST/2ND RAMP SELECTION

P0220 – LOCAL/REMOTE SELECTION SOURCE

P0221 – SPEED REFERENCE SELECTION – LOCAL SITUATION

P0222 – SPEED REFERENCE SELECTION – REMOTE SITUATION

P0223 – FORWARD/REVERSE SELECTION – LOCAL SITUATION

P0224 – RUN/STOP SELECTION – LOCAL SITUATION

P0225 – JOG SELECTION – LOCAL SITUATION

P0226 – FORWARD/REVERSE SELECTION – REMOTE SITUATION

P0227 – RUN/STOP SELECTION – REMOTE SITUATION

P0228 – JOG SELECTION – REMOTE SITUATION

These parameters are used in the configuration of the command source for the CFW-11 frequency inverter local and remote situations. In order that the device be controlled through the Anybus-CC interface, the options 'Anybus-CC' available in these parameters, must be selected.

The detailed description of these parameters is found in the CFW-11 programming manual.

P0313 – COMMUNICATION ERROR ACTION

Range:	0 = Inactive 1 = Disable via Run/Stop 2 = Disable via General Enable 3 = Change to Local 4 = Change to Local keeping commands and reference 5 = Causes a Fault	**Default:** 1
Properties:	CFG	
Access groups via HMI:	01 PARAMETER GROUPS └ 49 Communication └ 111 Status and commands	

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.

Table 3.1: *P0313 options*

Options	Description
0 = Inactive	No action is taken and the drive remains in the existing status.
1 = Disable via Run/Stop	A stop command with deceleration ramp is executed and the motor stops according to the programmed deceleration ramp.
2 = Disable via General Enable	The drive is disabled by removing the General Enabling and the motor coasts to stop.
3 = Change to Local	The drive commands change to Local.
4 = Change to Local keeping commands and reference	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 = Causes a Fault	Instead of an alarm, the communication error causes an drive fault, so that a drive fault reset becomes necessary in order to restore normal operation.

The following events are considered communication errors:

Anybus-CC communication:
- A129 alarm/F229 fault: Anybus is offline
- A130 alarm/F230 fault: Anybus access error

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 written in this parameter be 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.

P0680 – STATUS WORD

Range: 0000h to FFFFh **Default:** -
Properties: RO
Access groups via HMI: 01 PARAMETER GROUPS
└ 49 Communication
└ 111 Status and commands

Description:
It allows the device status monitoring. Each bit represents a specific status:

Bits	15	14	13	12	11	10	9	8	7	6	5	4	3 to 0
Function	Fault condition	(PID) Automatic	Undervoltage	LOC/REM	JOG	Speed direction	Active General Enable	Motor Running	Alarm condition	In configuration mode	Second ramp	Active fast stop	Reserved

Table 3.2: *P0680 parameter bit functions*

Bits	Values
Bits 0 to 3	Reserved.
Bit 4 Active quick stop	0: The fast stop command is not active. 1: The drive is executing the fast stop command.
Bit 5 Second ramp	0: The drive is configured to use the first ramp values, programmed in P0100 and P0101, as the motor acceleration and deceleration ramp times. 1: The drive is configured to use the second ramp values, programmed in P0102 and P0103, as the motor acceleration and deceleration ramp times.
Bit 6 In configuration mode	0: The drive is operating normally. 1: The drive is in the configuration mode. It indicates a special condition during which the drive cannot be enabled: Executing the self-tuning routine Executing the oriented start-up routine Executing the HMI copy function Executing the flash memory card self-guided routine There is a parameter setting incompatibility There is no power at the drive power section
Bit 7 Alarm condition	0: The drive is not in alarm condition. 1: The drive is in alarm condition. Note: The alarm number can be read by means of the parameter P0048 – Present Alarm.
Bit 8 Motor Running	0: The motor is stopped. 1: The drive is running the motor at the set point speed, or executing either the acceleration or the deceleration ramp.
Bit 9 Active General Enable	0: General Enable is not active. 1: General Enable is active and the drive is ready to run the motor.
Bit 10 Speed direction	0: The motor is running in the reverse direction. 1: The motor is running in the forward direction.
Bit 11 JOG	0: Inactive JOG function. 1: Active JOG function.
Bit 12 LOC/REM	0: Drive in Local mode. 1: Drive in Remote mode.
Bit 13 Undervoltage	0: No Undervoltage. 1: With Undervoltage.
Bit 14 Manual/ Automatic	0: PID in manual mode. 1: PID in Automatic mode.
Bit 15 Fault condition	0: The drive is not in a fault condition. 1: The drive has detected a fault. Note: The fault number can be read by means of the parameter P0049 – Present Fault.

P0681 – MOTOR SPEED IN 13 BITS

Range: - 32768 to 32767 **Default:** -
Properties: RO
Access groups via HMI: 01 PARAMETER GROUPS
└ 49 Communication
└ 111 Status / Commands

Description:
It allows monitoring the motor speed. This word uses 13-bit resolution with signal to represent the motor synchronous speed:

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

Intermediate or higher speed values in rpm can be obtained by using this scale. E.g. for a 4 pole motor and 1800 rpm of synchronous speed if the value read is 2048 (0800h), then, to obtain the speed in rpm one must calculate:

8192 => 1800 rpm
2048 => Speed in rpm

$$\text{Speed in rpm} = \frac{1800 \times 2048}{8192}$$

Speed in rpm = 450 rpm

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

P0686 – ANYBUS-CC CONTROL WORD

Range: 0000h to FFFFh **Default:** 0000h
Properties: -
Access groups via HMI: 01 PARAMETER GROUPS
└ 49 Communication
└ 111 Status and commands

Description:
It is the device Anybus-CC interface control word. This parameter can only be changed via Anybus-CC interface. For the other sources (HMI, etc.) it behaves like a read-only parameter.

In order to have those commands executed, it is necessary to program the equipment to be controlled via Anybus-CC. This programming is achieved by means of parameters P0105 and P0220 to P0228.

Each bit of this word represents a command that can be executed.

Bits	15 to 8	7	6	5	4	3	2	1	0
Function	Reserved	Fault reset	Quick stop	Second ramp	LOC/REM	JOG	Speed direction	General enable	Run/Stop

Table 3.3: *P0686 parameter bit functions*

Bits	Values
Bit 0 Run/Stop	0: It stops the motor with deceleration ramp. 1: The motor runs according to the acceleration ramp until reaching the speed reference value.
Bit 1 General enable	0: It disables the drive, interrupting the supply for the motor. 1: It enables the drive allowing the motor operation.
Bit 2 Speed direction	0: To run the motor in a direction opposed to the speed reference. 1: To run the motor in the direction indicated by the speed reference.
Bit 3 JOG	0: It disables the JOG function. 1: It enables the JOG function.
Bit 4 LOC/REM	0: The drive goes to the Local mode. 1: The drive goes to the Remote mode.
Bit 5 Second ramp	0: The drive uses the first ramp values, programmed in P0100 and P0101, as the motor acceleration and deceleration ramp times. 1: The drive is configured to use the second ramp values, programmed in P0102 and P0103, as the motor acceleration and deceleration ramp times.
Bit 6 Quick stop	0: It does not execute the quick stop command. 1: It executes the quick stop command. Note: This function is not allowed with control types (P0202) V/f or VVW.
Bit 7 Fault reset	0: No function. 1: If in a fault condition, then it executes the reset.
Bits 8 to 15	Reserved.

P0687 – ANYBUS-CC SPEED REFERENCE

Range:	-32768 to 32767	**Default:** 0
Properties:	-	
Access groups via HMI:	01 PARAMETER GROUPS └ 49 Communication └ 111 Status and commands	

Description:
It allows programming the motor speed reference via the Anybus-CC interface. This parameter can only be changed via Anybus-CC interface. For the other sources (HMI, etc.) it behaves like a read-only parameter.

In order that the reference written in this parameter be used, it is necessary that the drive be programmed to use the speed reference via Anybus-CC. This programming is achieved by means of parameters P0221 and P0222.

This word uses a 13-bit resolution with signal to represent the motor synchronous speed.

- P0687 = 0000h (0 decimal) → speed reference = 0
- P0687 = 2000h (8192 decimal) → speed reference = synchronous speed

Intermediate or higher reference values can be programmed by using this scale. E.g. for a 4 pole motor and 1800 rpm of synchronous speed, to obtain a speed reference of 900 rpm one must calculate:

1800 rpm => 8192
900 rpm => 13 bit reference

$$\text{13 bit reference} = \frac{900 \times 8192}{1800}$$

13 bit reference = 4096 => Value corresponding to 900 rpm 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 - P0686 - bit 2 setting:

- Bit 2 = 1 and P0686 > 0: reference for forward direction
- Bit 2 = 1 and P0686 < 0: reference for reverse direction
- Bit 2 = 0 and P0686 > 0: reference for reverse direction
- Bit 2 = 0 and P0686 < 0: reference for forward direction

P0695 – DIGITAL OUTPUT SETTING

Range	00000b to 11111b	**Default:** 00000b
Properties:	-	
Access groups via HMI:	01 PARAMETER GROUPS └ 49 Communication └ 111 Status and commands	

Description:
It allows the control of the digital outputs by means of the network interfaces (Serial, CAN, etc.). This parameter cannot be changed via HMI.

Each bit of this parameter corresponds to the desired value for one digital output. In order to have the correspondent digital output controlled according to this content, it is necessary that its function be programmed for “P0695 Content” at parameters P0275 to P0279.

Bits	15 to 5	4	3	2	1	0
Function	Reserved	DO5 setting	DO4 setting	DO3 setting	DO2 setting	DO1 setting

Table 3.4: *P0695 parameter bit functions*

Bits	Values
Bit 0 DO1 setting	0: DO1 output open. 1: DO1 output closed.
Bit 1 DO2 setting	0: DO2 output open. 1: DO2 output closed.
Bit 2 DO3 setting	0: DO3 output open. 1: DO3 output closed.
Bit 3 DO4 setting	0: DO4 output open. 1: DO4 output closed.
Bit 4 DO5 setting	0: DO5 output open. 1: DO5 output closed.
Bits 5 to 15	Reserved

P0696 – VALUE 1 FOR ANALOG OUTPUTS

P0697 – VALUE 2 FOR ANALOG OUTPUTS

P0698 – VALUE 3 FOR ANALOG OUTPUTS

P0699 – VALUE 4 FOR ANALOG OUTPUTS

Range: -32768 to 32767 **Default:** 0
Properties: -
Access groups via HMI: 01 PARAMETER GROUPS
└ 49 Communication
└ 111 Status and commands

Description:
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 / P0699 value”, at the parameters P0251, P0254, P0257 or P0260.

The value must be written in a 15-bit scale (7FFFh = 32767)[1] 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 / P0698 / P0699. For instance, to control the analog output 1 via serial, the following programming must be done:

- Choose a parameter from P0696, P0697, P0698 or P0699 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.

[1] For the actual output resolution, refer to the product manual.

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.

P0723 – ANYBUS IDENTIFICATION

Range: 0 to 25 **Default:** -
Properties: RO
Access groups via HMI: 01 PARAMETER GROUPS
└ 49 Communication
└ 114 Anybus

Description:
It allows identifying the Anybus-CC module connected to the CFW-11.

Table 3.5: *P0723 Values*

Options	Model
0 = Inactive	No communication module is installed
1 = RS232	RS232 passive module
2 = RS422	RS485/422 passive module installed and configured for RS422
3 = USB	USB passive module
4 = Serial Server	Serial Server (Ethernet) passive module
5 = Bluetooth	Bluetooth passive module
6 = Zigbee	Zigbee passive module
7 = WLAN	WLAN passive module
8...9 = Reserved	Reserved for future use
10 = RS485	Passive module RS485/422 installed and configured for RS485
11...15 = Reserved	Reserved for future use
16 = Profibus DP	Profibus DP active module
17 = DeviceNet	DeviceNet active module
18 = CANopen	CANopen active module
19 = EtherNet/IP	EtherNet/IP active module
20 = CC-Link	CC-Link active module
21 = Modbus TCP	Modbus TCP active module
22 = Modbus RTU	Modbus RTU active module
23 = PROFINET IO	PROFINET IO active module
24 = Reserved	Reserved for future use
25 = Reserved	Reserved for future use

P0724 – ANYBUS COMMUNICATION STATUS

Range: 0 = Disable **Default:** -
1 = Not Supported
2 = Access Error
3 = Offline
4 = Online
Properties: NET
Access groups via HMI: 01 PARAMETER GROUPS
└ 49 Communication
└ 114 Anybus

Description:
It informs the communication module status.

Table 3.6: *P0724 options*

Status	Description
0 = Inactive	Anybus-CC communication module was not detected.
1 = Not Supported	The detected Anybus-CC module is not supported by the CFW-11.
2 = Access Error	Data access problem between drive and Anybus-CC communication module has been detected.
3 = *Offline*	Communication problems. There is no cyclic data exchange with the master.
4 = *Online*	Normal communication. Cyclic and acyclic data exchange between the CFW-11 and the network master is effective.

P0725 – ANYBUS ADDRESS

Range:	0 to 255	**Default:** 0
Properties:	CFG	
Access groups via HMI:	01 PARAMETER GROUPS └ 49 Communication └ 114 Anybus	

Description:
It allows configuring the CFW-11 address in the network. The address range varies according to the used protocol. For DeviceNet the higher limit is 63 (0 to 63) and for Profibus it is 126 (1 to 126). For EtherNet/IP, Modbus TCP and Profinet IO the node address is defined by the HMS Anybus IPconfig, and follows the Internet Protocol (IP) rules.

Refer to the section 2.3.3 for details on the EtherNet/IP, Modbus TCP and Profinet IO module configuration.

P0726 – ANYBUS COMMUNICATION RATE

Range	0 to 3	**Default:** 0
Properties:	CFG	
Access groups via HMI:	01 PARAMETER GROUPS └ 49 Communication └ 114 Anybus	

Description:
It allows programming the desired value for the Anybus-CC communication rate, in bits per second. This rate must be the same for all the devices connected to the network and varies according to the used protocol.

- DeviceNet: 0 = 125 kbps, 1 = 250 kbps, 2 = 500 kbps and 3 = autobaud.
- Profibus[2]: Auto-baud (communication rate defined by the master).
- EtherNet/IP, Modbus TCP and Profinet IO[2]: 10/100Mbps half- or full-duplex (configured by the module own WEB server).

[2] Parameter not visible in the HMI.

P0727 – ANYBUS I/O WORDS

Range:	1 = Flexible Configuration 2 = 2 words 3 = 3 words 4 = 4 words 5 = 5 words 6 = 6 words 7 = 7 words 8 = 8 words 9 = PLC11 Board	**Default:** 2
Properties:	CFG	
Access groups via HMI:	01 PARAMETER GROUPS └ 49 Communication └ 114 Anybus	

Description:
Option 1 – Flexible Configuration:

It allows the user to program the number of I/O words, making it possible that the size of the reading (input) and the writing (output) areas be different. By using this option, two reading and two writing words are already predefined, and they are:

Anybus Reading #1 = P0680 (Logical Status)
Anybus Reading #2 = P0681 (Speed in 13 bits)

Anybus Writing #1 = P0686 (Anybus-CC Control)
Anybus Writing #2 = P0687 (Anybus-CC Speed Reference)

The total size of the input and output areas, which perform the communication with the network master, will also depend on the programming of parameters P0728 to P0739:

- P0728 … P0733: Besides the two predefined reading words, the words programmed in these parameters will also be added to the reading area, provided that their contents are different from zero. The first parameter programmed with zero disables the other ones in the sequence.
- P0734 ... P0739: Besides the two predefined writing words, the words programmed in these parameters will also be added to the writing area, provided that their contents are different from zero. The first parameter programmed with zero disables the other ones in the sequence.

Options from 2 to 8 words:

It allows programming number of I/O words that will be exchanged with the network master. Two reading and two writing words are already predefined. They are:

Anybus Reading #1 = P0680 (Logical Status)
Anybus Reading #2 = P0681 (Speed in 13 bits)

Anybus Writing #1 = P0686 (Anybus-CC Control)
Anybus Writing #2 = P0687 (Anybus-CC Speed Reference)

The other reading and writing words are defined by the parameters P728 to P739. For these options, the number of input words is always equal to the number of output words, regardless of the parameters P0728 to P0739 programming.

Option 9 – PLC11 board:

If this option is selected, the amount of I/O words exchanged with the master, as well as the contents of each word, have to be configured using the PLC-11 board programming software - WLP. In this case there will be no predefined words, and the parameters P0728 to P0739 will have no function.

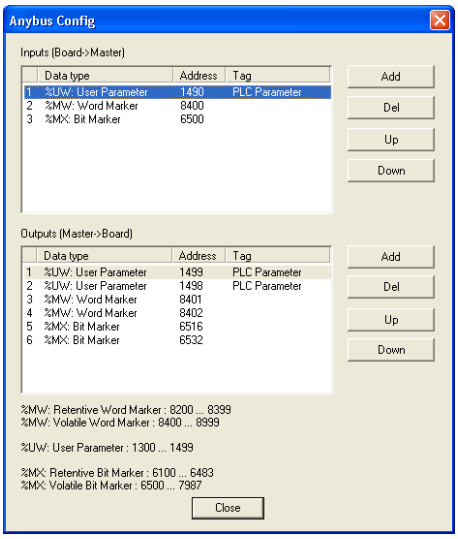

Figure 3.1: *Example of I/O data programming using the WLP software*

In order to get more information on this function, refer to the documentation of the WLP software.

NOTE!
After downloading the I/O words configuration through the WLP, the power of the device must be cycled.

P0728 – ANYBUS READING #3

P0729 – ANYBUS READING #4

P0730 – ANYBUS READING #5

P0731 – ANYBUS READING #6

P0732 – ANYBUS READING #7

P0733 – ANYBUS READING #8

Range:	0 to 1499	**Default:** 0 (disabled)
Properties:	CFG	
Access groups via HMI:	01 PARAMETER GROUPS └ 49 Communication └ 114 Anybus	

Description:
These parameters allow the user to program the reading via network of any other parameter of the equipment[3]. That is, they contain the number of another parameter.

For example, P0728 = 5. In this case, it will be sent via network the content of P0005 (frequency of the motor).

NOTE!
If the PLC11 board is used, it is also possible to program the PLC11 board parameters to be transmitted via Anybus-CC.
These parameters are not used if P0727 = 9 (PLC11 board). In this case, the programming of data transmitted and received via network is done through the WLP software.

[3] Except parameter P0000, which is considered invalid.

P0734 – ANYBUS WRITING #3

P0735 – ANYBUS WRITING #4

P0736 – ANYBUS WRITING #5

P0737 – ANYBUS WRITING #6

P0738 – ANYBUS WRITING #7

P0739 – ANYBUS WRITING #8

Range:	0 to 1499	**Default:** 0 (disabled)
Properties:	CFG	
Access groups via HMI:	01 PARAMETER GROUPS └ 49 Communication └ 114 Anybus	

Description:
These parameters allow the user to program the writing via network of any other parameter of the equipment[4]. That is, they contain the number of another parameter.

For example, P0734 = 100. In this case, it will be sent via network the content to be written in the P0100. This way the PLC memory position corresponding to the third writing word must contain the value for P0100.

NOTE!
If the PLC11 board is used, it is also possible to program the PLC11 board parameters to be transmitted via Anybus-CC.
These parameters are not used if P0727 = 9 (PLC11 board). In this case, the programming of data transmitted and received via network is done through the WLP software.

P0799 – I/O UPDATE DELAY

Range:	0.0 to 999.0	**Default:** 0.0
Properties:	CFG	
Access groups via HMI:	01 PARAMETER GROUPS └ 49 Communication └ 111 Status and commands	

Description:
It allows setting the delay time for the update of the data mapped in the writing words (data received by the equipment) via Profibus DP, Devicenet, CANopen communication networks and Anybus interface. The delay time is activated in the transition of the equipment status in the network from offline to online[5], as in figure 3.1.

[4] Except parameter P0000, which is considered invalid.
[5] For this function, online represents the state where the exchange of cyclic I/O data occurs.

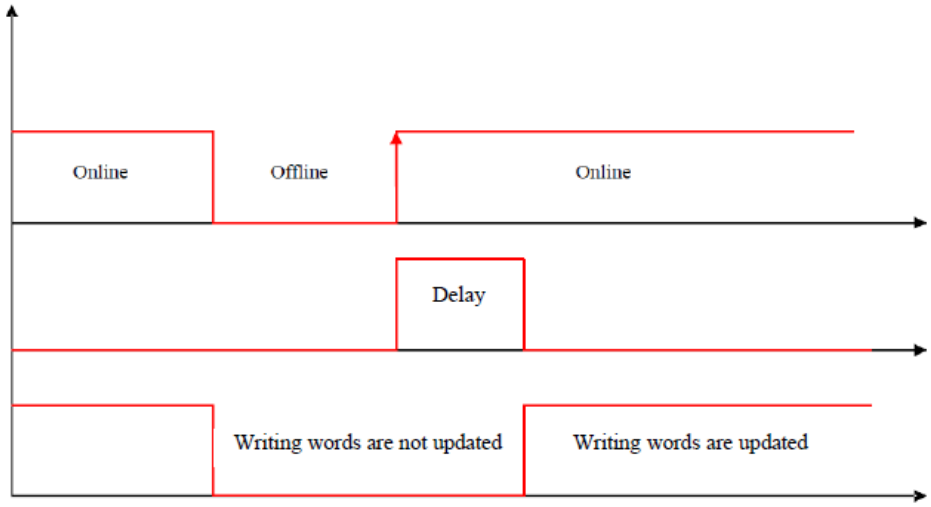

Figure 3.1: *Delay in the update of I/O words*

4 FAULTS AND ALARMS RELATED TO THE ANYBUS-CC COMMUNICATION

A129/F229 – ANYBUS-CC MODULE OFFLINE

Description:
It indicates interruption in the Anybus-CC communication. The communication module went to the Offline state.

Actuation:
It occurs when for any reason there is an interruption in the communication between the CFW-11 and the network master.

In this case the alarm A129 or the fault F229, depending on the P0313 programming, will be signalized through the HMI. In case of alarms, the alarm indication will automatically disappear at the moment the condition that caused the error no longer exists.

It occurs only when the device is *online.*

Corrections:
- Verify whether the network master is configured correctly and operating normally.
- Search for short-circuit or bad contact in the communication cables.
- Make sure the cables are not changed or inverted.
- Depending on the interface, verify whether termination resistors with correct values were installed only at the extremes of the main bus.
- Verify the entire network installation – cable passage, grounding.

A130/F230 – ANYBUS-CC MODULE ACCESS ERROR

Description:
It indicates Anybus-CC communication module access error.

Actuation:
It occurs when the control board is not able to read information from the module or when there is hardware incompatibility.

In this case the alarm A130 or the fault F230, depending on the P0313 programming, will be signalized through the HMI. It is necessary to cycle power of the device so that a new attempt to access the Anybus-CC module be made.

Corrections:
- Verify if the Anybus-CC module is fitted in correctly on the XC44 connector.
- Verify whether the Anybus-CC interface configuration parameters do not present values that are invalid for the type of connected module, or whether the number of programmed I/O words (for the PLC11 option)does not exceed the allowed limit for the module.
- Make sure there are not two options (WEG board and passive Anybus-CC module) installed simultaneously having the same interface (RS232 or RS485). In such case the WEG optional board will have preference over the Anybus-CC module that will remain disabled and indicating A130.

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