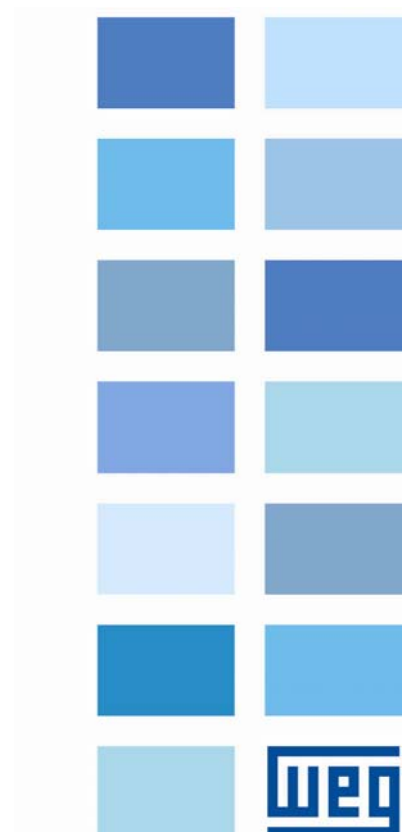# DeviceNet Drive Profile

CFW-09

Communication Manual

DeviceNet Drive Profile Communication Manual

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SUMMARY

1 INTRODUCTION

This manual provides the necessary information for the operation of the CFW-09 frequency inverter using the DeviceNet Drive Profile Anybus-S communication module. This communication module makes available at the product a communication interface for the DeviceNet network with the following characteristics:

■ It makes the inverter parameterization through the network possible with direct access to the parameters via messages sent by the master.
■ It follows the *Device Profile for AC and DC Drives* standard, specified by the ODVA (*Open DeviceNet Vendor Association*), which defines a set of common objects for drives that operate in a DeviceNet network.

This manual brings an overview of the DeviceNet Network operation, focusing mainly on the inverter parameterization and operation in this network. The protocol detailed description can be obtained with the ODVA.

This manual must be used together with the CFW-09 user manual.

2 FIELDBUS KIT

A KFB-DD kit (part number 417102542) containing four items is supplied for the communication with the DeviceNet network:

■ DeviceNet Drive Profile communication board;
■ Cable with a network connector;
■ EDS network configuration file;
■ Installation manual.

3 INTRODUCTION TO THE DEVICENET NETWORK

The DeviceNet communication is used in industrial automation, normally for the control of valves, sensors, I/O units and automation equipments. The DeviceNet communication link is based on a CAN (Controller Area Network) communication protocol. The next figure brings an overview of a DeviceNet network.
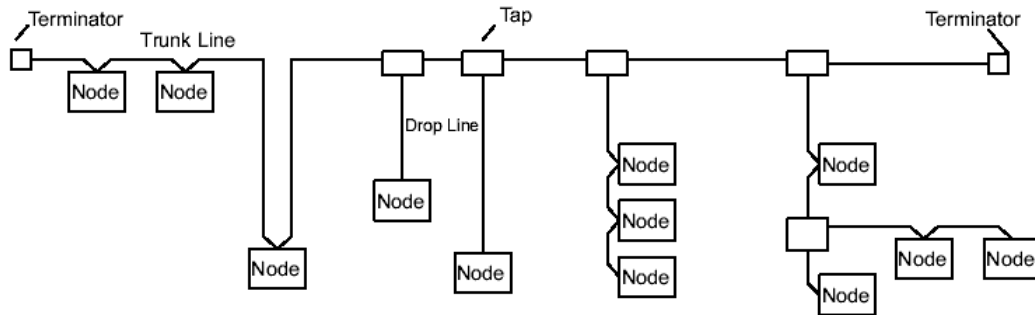
Figure 1: DeviceNet network

3.1 CABLE AND CONNECTOR

The DeviceNet network uses a shielded copper cable with two twisted pairs, being one of the pairs responsible for the 24 Vdc supply distribution, and the other for the communication signal. An example of connector for the CFW-09 is showed next, together with the color codes used for the connection:

1	Black	V-
2	Blue I	CANL
3	Shield	SHIELD
4	White	CANH
5	Red	V+
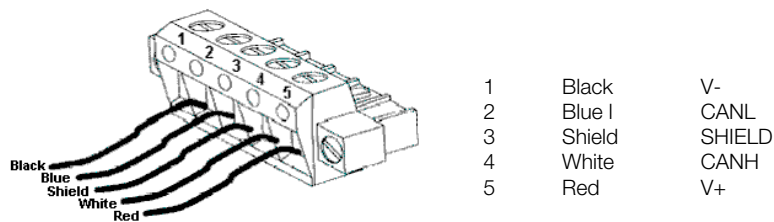
Figure 2: DeviceNet network connector

The maximum current consumption for the 24Vdc power of DeviceNet interface is 30mA.

3.2 LINE TERMINATOR

The initial and final points of the network must be ended with the characteristic impedance in order to avoid reflections. Therefore, a 120 Ω/0.5 W resistor must be connected between the pins 2 and 4 of the connector.

3.3 BAUDRATE AND NODE ADDRESS

There are three different Baudrates for DeviceNet: 125 k, 250 k or 500 kbits/s. The selection is done through DIP switches existent on the communication board. The node address is selected through six DIP switches also present on the electronic board, allowing addresses from 0 to 63.

Baudrate [bits/s]	DIP's 1 and 2	Address	DIP 3...DIP 8
		0	000000
125 k	00	1	000001
250k	01	2	000010
500k	10	.	
Reserved	11	61	111101
		62	111110
		63	111111

Figure 3: Address and baudrate configuration

> **NOTE!**
> The inverter baudrate and address in the network are updated only during the inverter power on.

3.4 INDICATION LEDS

The communication board has four indication LED's for network diagnosis, with the following functions:

Figure 4: *Communication board status LED's*

Table 1: *Signalization of the communication board status LED's*

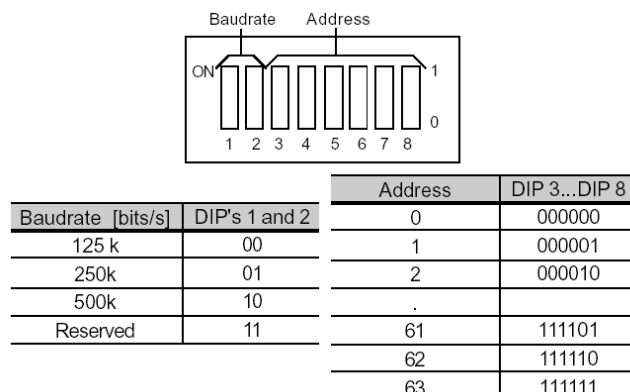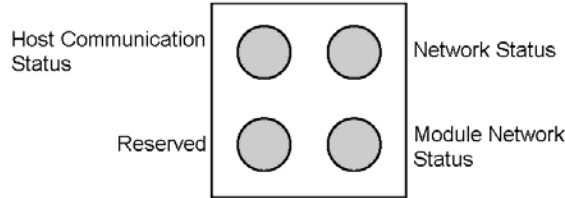| LED	Color	Description
Host Communication Status	Green	Data exchange between the board and the inverter is OK
	Red	Failure in the data exchange between the board and the inverter (permanent))
	Flashing Red	Failure in the data exchange between the board and the inverter (temporary)
Network Status	Off	Without supply/off line
	Green	Operative link, connected
	Red	Link critical fault (double address, *buss off*)
	Flashing Green	*On line,* not connected
	Flashing Red	Connection *Time out*
Module Network Status	Off	Without supply
	Red	Unrecoverable fault
	Green	Operational board
	Flashing Red	Minor fault

3.5 CONFIGURATION FILE (EDS FILE)

Each element in a DeviceNet network is associated to an EDS file, which contains all the information about this element. This file is used by the network configuration program during its configuration. Use the file with the .EDS extension supplied together with the fieldbus kit.

> **NOTE!**
> For this firmware version it is possible to program the master communication with the communication board in different connection types: *Polled* or *Change of State & Cyclic*.

4 DEVICENET DRIVE PROFILE COMMUNICATION PARAMETERS

The parameters used for the configuration of the DeviceNet interface using the DeviceNet Drive Profile communication board are described next.

Parameter	Range [Factory Setting] Unit	Description
P309 Fieldbus	0 to 10 [0] -	■ It allows programming the Fieldbus interface to be used, according to the following options: *Table 2: Fieldbus options* _see table below_ ■ In order to use the DeviceNet Drive Profile communication board, it is necessary to program the option 10 at P309.
P335 DeviceNet I/O Instances	0 to 3 [0] -	■ It allows programming the I/O instances used by the DeviceNet Drive Profile interface. These instances define the contents and the quantity of I/O words exchanged with the network master. *Table 3: DeviceNet I/O instances* _see table below_ ■ The contents of the I/O words for each of the instances are described in the section 5. ■ The modification of this parameter only becomes valid after cycling the power of the inverter.

Table 2: Fieldbus options

Value	Description
0	Inactive
1	Profibus DP/DP-V1 2 I/O
2	Profibus DP/DP-V1 4 I/O
3	Profibus DP/DP-V1 6 I/O
4	DeviceNet 2 I/O
5	DeviceNet 4 I/O
6	DeviceNet 6 I/O
7	EtherNet/IP 2 I/O
8	EtherNet/IP 4 I/O
9	EtherNet/IP 6 I/O
10	DeviceNet Drive Profile

Table 3: DeviceNet I/O instances

Value	Description
0	Instances 20/70
1	Instances 21/71
2	Instances 100/101
3	Instances 102/103

Parameter	Range [Factory Setting] Unit	Description
P336 Write Parameter #3	0 to 749 [0] -	■ The parameters P336 to P340 permit to program the content of the output words 3 to 7 (output: the master sends to the inverter). Using these parameters it is possible to program the number of another parameter whose content must be made available at the network master output area.
P337 Write Parameter #4	0 to 749 [0] -	
P338 Write Parameter #5	0 to 749 [0] -	■ For instance, if one wishes to write the acceleration ramp value in the CFW-09 inverter, one must program the value 100 in one of these parameters, because the parameter P100 is the one where this data is programmed. It is worthwhile to remind that the value read from any parameter is represented with a 16 bit word with sign, in two's complement. Even if the parameter has decimal resolution, the value is transmitted without the indication of the decimal places. E.g., if one wishes to write value 5.0 s in the parameter P100, the value programmed via the network must be 50.
P339 Write Parameter #6	0 to 749 [0] -	
P340 Write Parameter #7	0 to 749 [0] -	■ These parameters are used only if the inverter were programmed for use the I/O instances 102/103, and if the number of Input/output words programmed in P346 were greater than 2.
		■ The first two input words are fixed and represent the control and the speed reference.
P341 Read Parameter #3	0 to 749 [0] -	■ The parameters P341 to P345 permit to program the content of the input words 3 to 7 (input: the inverter sends to the master). Using these parameters it is possible to program the number of another parameter whose content must be made available at the network master input area.
P342 Read Parameter #4	0 to 749 [0] -	
P343 Read Parameter #5	0 to 749 [0] -	■ If for instance one wants to read from the CFW-09 inverter the motor current in Amps, one must program the value 3 in one of these parameters, because the parameter P003 is the one that contains this information. It is worthwhile to remind that the value read from any parameter is represented with a 16 bit word with sign, in two's complement. Even if the parameter has decimal resolution, the value is transmitted without the indication of the decimal places. E.g., if the parameter P003 has the value 4.7 A, the value supplied via the network will be 47.
P344 Read Parameter #6	0 to 749 [0] -	
P345 Read Parameter #7	0 to 749 [0] -	■ These parameters are used only if the inverter were programmed for using the I/O instances 102/103, and if the number of Input/output words programmed in P346 were greater than 2.
		■ The first two input words are fixed and represent the status and the motor speed.

Parameter	Range [Factory Setting] Unit	Description
P346 Number of I/O words	2 to 7 [2] -	■ If the option 3, instances 102/103, is programmed in P335, it will be possible to program in P346 the number of words exchanged with the master from 2 up to 7 words. ■ The first two input and output words are fixed, as explained in the section 5. The other words are programmed in the parameters from P336 to P345. ■ The modification of this parameter only becomes valid after cycling the power of the inverter.

5 CONTENTS OF THE I/O WORDS

The CFW-09 DeviceNet Drive Profile communication board has four different data formats that can be mapped for the inverter I/O area (*assembly instances*). These instances are defined by P335, and the first two options follow the Drive Profile model defined by the ODVA, and the two others are WEG specific. The number of I/O words as well as the contents of each word is summarized in the next table.

Instances (P335)	Number of Input/Output Words	Output Area Data	Input Area Data	Drive Profile
20 / 70	2	word 1 = control word 2 = speed reference	word 1 = status word 2 = motor speed	ODVA
21 / 71	2	word 1 = control word 2 = speed reference	word 1 = status word 2 = motor speed	ODVA
100 / 101	2	word 1 = control (WEG) word 2 = speed reference (WEG)	word 1 = status (WEG) word 2 = motor speed (WEG)	WEG
102 / 103	2 ... 7 Defined through P346	word 1 = control (WEG) word 2 = speed reference (WEG) The other words are defined by the parameters P336, P337, P338, P339 and P340	word 1 = status (WEG) word 2 = motor speed (WEG) The other words are defined by the parameters P341, P342, P343, P344 and P345	WEG

5.1 DATA CONTENTS FOR THE INSTANCES 20 / 70

By programming P335 = 0 (20/70), the inverter will automatically make available at the I/O area two writing words (output) and two reading words (input), with the following contents:

Output (master → inverter) Instance 20		*Input* (inverter → master) Instance 70
Control word	1st word	Status Word
Speed reference	2nd word	Motor Speed

5.1.1 Writing Words (Instance 20)

1 = Control word
The control word is formed by 16 bits, where each bit has the following function:

Bit number	Bit = 0	Bit = 1
0	Stop	Run
1	Reserved	
2	No function	Error reset
3 ... 15	Reserved	

■ Bit 0: Run
 Bit 0 = 0: It sends the command to stop the inverter via ramp.
 Bit 0 = 1: It sends the command for enabling via ramp (run the motor).
 Note: This command only works if the inverter is programmed to be commanded via fieldbus (refer to the parameters P224 and P227).

■ Bit 2: Error reset
 Bit 2 = 0: It does not reset the errors.
 Bit 2 = 1: It sends the command to reset the inverter errors.

2 = Speed reference
Refer to the section 5.2.3 - Speed Reference for the Instances 20 and 21.

5.1.2 Reading Words (Instance 70)

1 = Status word
The status word is formed by 16 bits, where each bit has the flowing function:

Bit number	Bit = 0	Bit = 1
0	Without error	With error
1	Reserved	
2	Stopped	Running
3 ... 15	Reserved	

■ Bit 0: Error
Bit 0 = 0: The inverter is not in error state.
Bit 0 = 1: The inverter is with an active error.

■ Bit 2: Running
Bit 2 = 0: The inverter is stopped.
Bit 2 = 1: The inverter is running the motor.

2 = Motor speed
Refer to the section 5.2.4 - Motor Speed for the Instances 70 and 71

5.2 DATA CONTENTS FOR THE INSTANTES 21 / 71

By programming P340 = 1 (21/71), the inverter will automatically make available at the I/O area two writing words (output) and two reading words (input), with the following contents:

Output (master -> inverter) Instance 21		Input (inverter -> master) Instance 71
Control word	1st word	Status Word
Speed reference	2nd word	Motor speed

5.2.1 Writing words (instance 21)

1 = Control word
The control word is formed by 16 bits, where each bit has the following function:

Bit number	Bit = 0	Bit = 1
0	Stop	Run forward
1	Stop	Run reverse
2	No function	Error reset
3	Reserved	
4	Reserved	
5	Local Control	Control via network
6	Reserved	
7 ... 15	Reserved	

■ Bit 0: Run forward
Bit 0 = 0: It sends the command to stop the inverter via ramp. At the end of the ramp the general disabling of the inverter is also executed.
Bit 0 = 1: It sends the command for general enabling and ramp enabling in forward direction.
Note: This command only works if the inverter has been programmed to be commanded via fieldbus (refer to the parameters P224 and P227).

■ Bit 1: Run reverse
Bit 1 = 0: It sends the command to stop the inverter via ramp. At the end of the ramp the general disabling of the inverter is also executed.
Bit 1 = 1: It sends the command for general enabling and ramp enabling in reverse direction.
Note: This command only works if the inverter has been programmed to be commanded via fieldbus (refer to the parameters P224 and P227).

■ Bit 2: Error reset

  Bit 2 = 0: It does not reset the errors.
  Bit 2 = 1: It sends the command to reset the inverter errors.
  Note: After an error reset the inverter will loose the control and the reference via network (bits 5 and 6), being necessary to reset these bits in order to write again the desired values.

■ Bit 5: Control via network

  Bit 5 = 0: It sends a command for the inverter to operate in local mode.
  Bit 5 = 1: It sends a command for the inverter to operate in remote mode.
  Note: In order that the inverter be controlled via the DeviceNet network in remote mode, it is necessary that the option "Fieldbus" be programmed in the operation mode configuration parameters, P220 to P228.

2 = Speed reference
Refer to the section 5.2.3 - Speed Reference for the Instances 20 and 21

5.2.2 Reading Words (Instance 71)

1 = Status word
The status word is formed by 16 bits, where each bit has the flowing function:

Bit number	Bit = 0	Bit = 1
0	Without error	With error
1	No function	Warning
2	Stopped	Running forward
3	Stopped	Running reverse
4	No function	Ready
5	Local control	Control via network
6	Local reference	Reference via network
7	The reference has not been reached	Running at the speed reference value
8 ... 15	Inverter status	

■ Bit 0: Error

  Bit 0 = 0: The inverter is not in error state.
  Bit 0 = 1: The inverter is with an active error.

■ Bit 1: Warning

  The CFW-09 does not have warning indications.

■ Bit 2: Running forward

  Bit 2 = 0: The inverter is stopped.
  Bit 2 = 1: The inverter is running the motor in the forward direction.

■ Bit 3: Running reverse

  Bit 2 = 0: The inverter is stopped.
  Bit 2 = 1: The inverter is running the motor in the reverse direction.

■ Bit 4: Ready

  Bit 4 = 0: The inverter is initializing or in error condition.
  Bit 4 = 1: The inverter has been initialized and it is without error.

■ Bit 5: Control via network

  Bit 3 = 0: The inverter is in local mode.
  Bit 3 = 1: The inverter is in remote mode.
  Note: P220, P226, P227 and P228 must be programmed for "Fieldbus", so that this bit does really represent the control done via fieldbus.

■ Bit 6: Reference via network

  Bit 6 = 0: The inverter is not using the reference received via network.
  Bit 6 = 1: The inverter is using the reference received via network.

■ Bit 7: Running at the speed reference value

Bit 7 = 0: The inverter is not running the motor at the indicated reference value.

Bit 7 = 1: The inverter is running the motor at the speed reference value.

Note: The inverter considers an error of 0.5 % of the synchronous speed in order to analyze whether or not the motor is running at the reference value.

■ Inverter status: It is a byte that can assume the following values:

Byte value	Meaning	Note
0	Specific of the manufacturer	Not used
1	Initializing	
2	Not ready	
3	Ready	
4	Enabled	
5	Stopping	It detects it only If the command was issued via network
6	Stopped by error	The inverter does not have this state
7	With error	

2 = Motor speed

Refer to the section 5.2.4 - Motor Speed for the Instances 70 and 71.

5.2.3 Speed Reference for the Instances 20 and 21

The speed reference for the instances 20 and 21 (output) is received by the inverter in form of an integer with sign (in two's complement). Each unit represents 1 rpm, and the negative values are interpreted by the inverter as reference for rotating in the reverse direction. E.g.:

1200   = $04B0_{hex}$ = 1200 rpm with forward speed direction
-1200   = $FB50_{hex}$ = 1200 rpm with reverse speed direction

⊘ **NOTE!**
- The reference value will only be used by the inverter if it has been programmed to receive the reference via fieldbus (refer to parameters P221 and P222).
- Negative values will only change the speed direction if it has been programmed to be commanded via fieldbus (refer to parameters P223 and P226).
- It is necessary that the sent values respect the minimum and maximum limits permitted for the reference, which are programmed in the parameters P133 and P134.
- If a negative reference value were sent together with a command to rotate in the reverse direction, the inverter will run the motor in the forward direction.

5.2.4 Motor Speed for the Instances 70 and 71

The speed that the inverter is running the motor is transmitted by the inverter in form of an integer with sign (in two's complement). Each unit represents 1 rpm, and the positive values indicate that the motor is running in the forward direction, whereas the negative values indicate that the motor is running in the reverse direction. E.g.:

1800   = 0708_{hex} = the motor is running at 1800 rpm in the forward speed direction
-1800   = $F8F8_{hex}$ = the motor is running at 1800 rpm in the reverse speed direction

5.3 DATA CONTENTS FOR THE INSTANCES 100/101

By programming P335 = 2 (100/101), the inverter will be operating in a WEG specific mode. There will also be made available two writing words (output) and two reading words (input) for the I/O area, with the following contents:

Output (master -> inverter) Instance 100		*Input* (inverter -> master) Instance 101
WEG control word	1st word	WEG status Word
WEG speed reference	2nd word	WEG motor speed

5.3.1 Writing Words (Instance 100))

1 = WEG control word
It is the word, through which commands are sent to the inverter via the network. In order to know this word structure, refer to the section 5.5 - WEG control word.

2 = WEG speed reference
It is the fieldbus speed reference word for the inverter. In order to know this word structure, refer to the section 5.6 - WEG speed reference.

5.3.2 Reading Words (Instance 101)

1 = WEG status word
It is the word, through which the inverter indicates its status to the network. In order to know this word structure, refer to the section 5.7 - WEG status word.

2 = WEG motor speed
It is the word with the actual motor speed. In order to know this word structure, refer to the section 5.8 - WEG motor speed.

5.4 DATA CONTENTS FOR THE INSTANCES 102/103

The number of words and the contents of the I/O area data for the instances 102 (output) and 103 (input) is configurable by the user through the parameters P336 to P346.

5.4.1 Selection of the Number of I/O Words

The number of I/O words for the instances 102/103 is selected through P346. It is possible to program from 2 up to 7 words, and the number of reading words (input) will always be equal to the number of writing words (output).

The first two reading and writing words have pre-defined functions, and the others are programmable, according to the next table.

Output (master -> inverter) Instance 102		*Input* (inverter -> master) Instance 103
WEG control word	1st word	WEG status Word
WEG speed reference	2nd word	WEG motor speed
Function defined by the parameters P336, P337, P338, P339 and P340	3rd word 4th word 5th word 6th word 7th word	Function defined by the parameters P341, P342, P343, P344 and P345

5.4.2 Writing Words (Instance 102)

1 = WEG control word
It is the word, through which commands are sent to the inverter via the network. In order to know this word structure, refer to the section 5.5 - WEG control word.

2 = WEG speed reference
It is the fieldbus speed reference word for the inverter. In order to know this word structure, refer to the section 5.6 - WEG speed reference.

3 to 7 = Programmable parameters
The words 3 to 7 are programmable, and each word represents a parameter, whose number is selected by the parameters from P336 to P340. It is possible to program in these parameters the number of another parameter, whose contents will be made available at the master output area.

For instance, if one wishes to send the acceleration ramp value at the third writing word, it is only necessary to program P336 = 100, because P100 is the parameter that permits to program the time used by the acceleration ramp.

5.4.3 Reading Words (Instance 103)

1 = WEG status word

It is the word, through which the inverter indicates its status to the network. In order to know this word structure, refer to the section 5.7 - WEG status word.

2 = WEG motor speed

It is the word with the actual motor speed. In order to know this word structure, refer to the section 5.8 - WEG motor speed.

3 to 7 = Programmable parameters

The words 3 to 7 are programmable, and each word represents a parameter, whose number is selected by the parameters from P341 to P345. It is possible to program in these parameters the number of another parameter, whose contents will be made available at the master input area.

For instance, if one wishes to read the value of the motor current in Amps at the third writing word, it is only necessary to program P341 = 3, because P003 is the parameter that contains this information of the motor current.

> **NOTE!**
> - The parameters P204, P215 and P408 are not available for communication.
> - The parameters mapped for writing have their values constantly updated by the network, but they are not stored in the nonvolatile memory (EEPROM), so that they are restored to their previous value in case of an inverter reset.
> - The content of each parameter is transmitted as a 16 bit word representing an integer, and in order to interpret the transmitted and received values correctly, it is necessary to observe the number of decimal places used at the parameter. For instance, for a 5.0 s acceleration time (P100), since we have one decimal place resolution, the actual value to be transmitted with the word is 50 (0032_{hex}).
> - For the list of inverter existent parameters, refer to the user manual.

5.5 WEG CONTROL WORD

It is a word accessible only via fieldbus, through which commands to the inverter are sent via the network. It is formed by 16 bits where each one has the following function:

Bit number	Bit = 0	Bit = 1
0	Ramp disabling	Ramp enabling
1	General disabling	General enabling
2	Reverse speed direction	Forward speed direction
3	JOG Disabling	JOG enabling
4	Local	Remote
5	Reserved	
6	Reserved	
7	No reset	Error reset occurs
8	Inactive command	Ramp enabling mask
9	Inactive command	General enabling mask
10	Inactive command	Speed direction mask
11	Inactive command	JOG command mask
12	Inactive command	Local/remote command mask
13	Reserved	
14	Reserved	
15	Inactive command	Reset command mask

The control word has the 8 high order bits responsible for enabling each of the commands sent through the 8 low order bits. If the mask (at the high order bits) is enabled, the inverter will execute the command indicated in the correspondent low order bit. If the mask is disabled, the inverter will disregard the command sent at the correspondent low order bit.

In order to enable the functions of the Control Word, it is necessary to set the inverter respective parameters with the option "Fieldbus":

- Local/Remote Selection Source - P220;
- FWD/REV Selection - P223 and/or P226;
- General enabling, Start/stop Selection - P224 and/or P227;
- JOG Selection - P225 and/or P228.

5.6 WEG SPEED REFERENCE

It is a word accessible only via fieldbus, through which the inverter receives the speed reference value from the network. This variable is represented using a 13 bit resolution for the motor synchronous speed. Therefore, the 8191(1FFF$_{hex}$) reference value will correspond to the motor synchronous speed (equal to 1800 rpm for a 4 pole motor in a 60 Hz line). It is possible to send values higher than the synchronous speed (greater than 13 bits), provided that the value sent to the inverter be within minimum and maximum speed reference limits programmed at the inverter (P133 and P134).

The speed reference value is always positive. In order to invert the speed direction, the bits 2 and 10 of the Control Word must be used. In order that the reference be accepted by the inverter, it is necessary to program the parameters P221 and/or P222 with the "Fieldbus" option.

5.7 WEG STATUS WORD

It is a reading word where the inverter status is indicated, and accessible only via fieldbus. It is formed by 16 bits divided into 8 low order bits that indicate the error code, and the 8 high order bits indicating the status of the inverter:

Bit number	Bit = 0	Bit = 1
0 ... 7	Error code	
8	Ramp disabled	Ramp enabled
9	General disabled	General enabled
10	Reverse speed direction	Forward speed direction
11	JOG disabled	JOG enabled
12	Local	Remote
13	Without undervoltage	With undervoltage
14	PID Regulator– Manual	PID Regulator– Automatic
15	Without error	With error

When the status word bit 15 is active (indicating inverter with error), the eight low order bits will indicate the error code, which can be a hardware error (refer to the inverter manual section 7.1 – Faults and Possible Causes), or a software error (Refer to the section 5.10 - Software errors).

5.8 WEG MOTOR SPEED

It is a reading word that makes the motor speed reading possible. This variable is showed using a 13 bit resolution with signal (in two's complement). Therefore, the nominal value will be equal to 8191(1FFF$_{hex}$) (forward rotation) or – 8191(1FFF$_{hex}$) (reverse rotation) when the motor is running at the synchronous speed (or base speed, for instance 1800 rpm for a 4 pole motor in a 60 Hz line). The 13 bit value is used only as base for the representation, speed values greater than 13 bits can also be indicated.

5.9 P347: COMMAND FOR THE DIGITAL OUTPUTS

The P347 is a special parameter, accessible only through the fieldbus interface, which makes it possible to command the inverter digital outputs. This parameter has 16 data bits, divided into 8 high order bits and 8 low order bits, with the following structure.

Bit number	Bit = 0	Bit = 1
0	Inactive DO1 output	Active DO1 output
1	Inactive DO2 output	Active DO2 output
2	Inactive RL1 output	Active RL1 output
3	Inactive RL2 output	Active RL2 output
4	Inactive RL3 output	Active RL3 output
5	Reserved	
6	Reserved	
7	Reserved	
8	Inactive command	DO1 command mask
9	Inactive command	DO2 command mask
10	Inactive command	RL1 command mask
11	Inactive command	RL2 command mask
12	Inactive command	RL3 command mask
13	Reserved	
14	Reserved	
15	Reserved	

In the same way as for the control word, the activation of the digital outputs is also divided into mask (high order bits) and output values (low order bits). The value for the output will only be updated if the correspondent mask is active, otherwise it will be disregarded.

In order that the outputs be activated via the network, it is necessary to program P347 at one of the programmable words in the inverter writing area, besides configuring the parameters regarding the outputs (P275…P280) for the "fieldbus" option.

5.10 SOFTWARE ERRORS

When the inverter receives an improper command via the network, it indicates some specific errors to the master, informing which the cause of that error is. These indications appear only at the status word (refer to the section 5.7 - WEG status word), and are not showed at the inverter HMI. The following error indications may occur:

■ E24 – Parameter modification allowed only with disabled inverter.
  - Programming error (Refer to the section 5.2.3 - Speed Reference for the Instances 20 and 21).

■ E27 – caused by:
  - Function selected at the Control Word not enabled for Fieldbus.

6 COMMUNICATION ERRORS

Regarding the communication of the inverter with the DeviceNet Drive Profile network, two types of errors may occur: E29 or E30.

6.1 E29: INACTIVE FIELDBUS COMMUNICATION

The error 29 indicates that some kind of communication problem between the network master and the communication board has occurred. The main causes of this type of error are:

■ Problems with the communication cable: The cable that connects the network master to the slave may be broken, some point of it with a contact problem, being without terminator resistors, or having inverted wiring.
■ Master with configuration problems: The network master must be on and configured for communicating with the inverter.
■ Incorrect number of I/O words: Besides the master being configured to communicate with the inverter, it is also necessary that the number of input and output words of the master be in accordance with the programmed at the inverter.

> **NOTE!**
> The E29 indication occurs whenever the inverter is not communicating cyclic data. If a master or a configuration tool that uses only acyclic messages is used, this error will be indicated even if no communication errors between master and inverter occur.

6.2 E30: INACTIVE FIELDBUS BOARD

The error 30 indicates that a data transfer problem between the communication board and the inverter control board has occurred. This error is indicated mainly during the inverter initialization. But if after the initialization problems are identified, this error will also be indicated. The main causes of this error are:

■ Inverter configuration problem: It is necessary to configure P309 correctly for the desired fieldbus option, according to the type of communication board. It is necessary to program P309 = 10 for DeviceNet Drive Profile.
■ Board installation problem: If the communication board is not connected or with problems at the bus connection (bad contact, bent pin), the inverter may indicate this error.

> **NOTE!**
> ■ If the inverter is being controlled via the fieldbus network when E29 or E30 occurs, then the action programmed in P313 – Type of disabling by E28/E29/E30 – will be executed.
> ■ In order to perform the self-tuning routine for the vector mode, it is necessary to disable the communication at P309.
> ■ After an E30 indication, it is necessary to cycle the power of the inverter, so that it operates normally again.