Bonfiglioli
Vectron

Agile

Profibus Communication manual
Frequency inverter 230V / 400V

Bonfiglioli
power, control and green solutions

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1 General Information on the Documentation

This documentation describes the communication with *Agile* device series frequency inverters using the Profibus DP V1 protocol. The modular hardware and software structure allows the user-friendly customization of the frequency inverters. Applications, which demand high functionality and dynamics can be comfortably implemented.

1.1 Instruction Manuals

For better clarity, the user documentation is structured according to the customer-specific demands made on the frequency inverter.

Quick Start Guide
The "Quick Start Guide" brief instructions manual describes the basic steps for the mechanical and electrical installation of the frequency inverter. The guided commissioning supports you with the selection of the necessary parameters and the software configuration.

Operating Instructions
The Operating Instructions documents the complete functionality of the frequency inverter. The parameters necessary for specific applications for adaptation to the application and the extensive additional functions are described in detail.

Application Manual
The application manual supplements the documentation for purposeful installation and commissioning of the frequency inverter. Information on various subjects connected with the use of the frequency inverter are described specific to the application.

The documentation und further information can be requested from your local BONFIGLIOLI representative.

The following instruction manuals are available for the *Agile* device series:

Agile Operating Instructions	Frequency inverter functionality.
Agile Quick Start Guide	Installation und commissioning. Supplied with the device.
Communication Manual	Communication via the RS485 Interface on the X21 Connection (RJ45): Instructions for Modbus and VABus. Communication via the X12.5 and X12.6 Control Terminals: Instructions for Systembus and CANopen®[1]. Communication via the Communication Modules: CM-232/CM-485: Instructions for Modbus and VABus. CM-CAN: Instructions for Systembus and CANopen®. CM-PDPV1: Instructions for Profibus-DP-V1
PLC Application Manual	Logical interconnections of digital signals. Functions for analog signals such as comparisons and mathematical functions. Graphical support for the programming of functional components.
Service Instructions	For service personnel. Service work, monitoring of service intervals and replacement of ventilators.

This documentation has been produced with the greatest of care and extensively and repeatedly checked. For reasons of clarity, not all the detailed information on all types of the product and also not every imaginable case of installation, operation or maintenance has been taken into account. If you require further information or if specific problems which are not dealt with extensively enough in the documentation exist, you can request the necessary information from the local BONFIGLIOLI representative.

[1] The CANopen®-Communication products fulfill the specifications of the CiA® (CAN in Automation) user organization.

We would also point out that the contents of this documentation are not part of a previous or existing agreement, assurance or legal relationship and are not intended to amend the same. All obligations of the manufacturer result from the underlying purchase contract, which also contains the complete and solely valid warranty regulation. These contractual warranty provisions are neither extended nor limited by the production of this documentation.

The manufacturer reserves the right to correct or amend the contents and the product information as well as omissions without prior notification and assumes no kind of liability for damage, injuries or expenditure to be put down to the aforementioned reasons.

1.2 Used Pictograms and Signal Words

The following pictograms and signal words are used in the documentation:

Danger!

Danger refers to an immediate threat. Non-compliance with the precaution described will result in death, serious injury or material damage.

Warning!

Warning refers to a possible threat. Non-compliance with the warning may result in death, serious injury or material damage.

Caution!

Caution refers to an immediate hazard. Non-compliance may result in personal or material damage.

Attention!
Attention and the related text refer to a possible behavior or an undesired condition which can occur during operation.

Note
Marks information that facilitates handling for you and supplements the corresponding part of the documentation.

2 General Safety Instructions and Information on Use

Warning!

The specifications and instructions contained in the documentation must be complied with strictly during installation and commissioning. Before starting the relevant activity, read the documentation carefully and comply with the safety instructions. The term "Qualified Staff" refers to anybody who is familiar with the installation, assembly, commissioning and operation of the frequency inverter and has the proper qualification for the job.

2.1 General Information

Warning!

The DC-link circuit of the frequency inverter is charged during operation, i.e. there is always the risk of contact with high voltage. Frequency inverters are used for driving moving parts and they may become hot at the surface during operation.

Any unauthorized removal of the necessary covers, improper use, wrong installation or operation may result in serious injuries or material damage.

In order to avoid such injuries or damage, only qualified technical staff may carry out the transport, installation, commissioning, setup or maintenance work required. The standards EN 50178, IEC 60364 (Cenelec HD 384 or DIN VDE 0100), IEC 60664-1 (Cenelec HD 625 or VDE 0110-1) as well as the applicable national regulations must be complied with. The term „Qualified Staff" refers to anybody who is familiar with the installation, assembly, commissioning and operation of the frequency inverter as well as the possible hazards and has the proper qualification for the job.

Persons who are not familiar with the operation of the frequency inverter and children must not have access to the device.

2.2 Purpose of the Frequency Inverters

Warning!

The frequency inverters are electrical drive components intended for installation in industrial plants or machines. Commissioning and start of operation is not allowed until it has been verified that the machine meets the requirements of the EC Machinery Directive 2006/42/EEC and EN 60204. In accordance with the CE marking requirements, the frequency inverters comply with the Low Voltage Directive 2006/95/EC as well as EN 61800-5-1. The user shall be responsible for making sure that the requirements of the EMC Directive 2004/108/EEC are met. Frequency inverters are only available at specialized dealers and are exclusively intended for professional use as per EN 61000-3-2.

Purposes other than intended may result in the exclusion of warranty.

The frequency inverters are also marked with the UL label according to UL508c, which proves that they also meet the requirements of the CSA Standard C22.2-No. 14-95.

The technical data, connection specifications and information on ambient conditions are indicated on the name plate and in the documentation and must be complied with in any case. Anyone involved in any kind of work at the device must have read the instructions carefully and understood them before starting the work.

2.3 Transport and Storage

The frequency inverters must be transported and stored in an appropriate way. During transport and storage the devices must remain in their original packaging.

The units may only be stored in dry rooms which are protected against dust and moisture. The units may be exposed to little temperature deviations only. Observe the conditions according to EN 60721-3-1 for storage, EN 60721-3-2 for transport and the marking on the packaging.

The duration of storage without connection to the permissible nominal voltage may not exceed one year.

2.4 Handling and Installation

Warning!

Damaged or destroyed components must not be put into operation because they may be a health hazard.

The frequency inverters are to be used in accordance with the documentation as well as the applicable directives and standards.

They must be handled carefully and protected against mechanical stress.

Do not bend any components or change the isolating distances.

Do not touch electronic components or contacts. The devices are equipped with components which are sensitive to electrostatic energy and can be damaged if handled improperly. Any use of damaged or destroyed components shall be considered as a non-compliance with the applicable standards.

Removal of seal marks may cause restrictions on warranty.

Do not remove any warning signs from the device.

2.5 Electrical Installation

Warning!

Before any assembly or connection work, discharge the frequency inverter. Verify that the frequency inverter is discharged.

Do not touch the terminals because the capacitors may still be charged.

Comply with the information given in the operating instructions and on the frequency inverter label.

Comply with the rules for working on electrical installations.

Rules for working on electrical installation:

- Separate completely (isolate the installation from all possible sources of electrical power.
- Fix (protect against reconnection). Reconnection must be carried out by suitably qualified persons.
- Verify there is no electrical power. Verify that there is no voltage against earth on the plant component by measuring with measurement device or voltage tester.
- Ground and connect in a short circuit. Connect earth conductors.
- Protect against nearby power sources and delimit the working zone.

[1] In plants with a nominal power up to 1 kV deviation from description may be possible.

When working at the frequency inverters, comply with the relevant accident prevention regulations, the applicable standards, standards governing work on systems with dangerous voltages (e.g. EN 50178), directives for electrical and mechanical equipment erection and other national directives.

Comply with the electrical installation instructions given in the documentation as well as the relevant directives.

Responsibility for compliance with and examination of the limit values of the EMC product norm EN 61800-3 for variable-speed electrical drive mechanisms is with the manu-facturer of the industrial plant or machine. The documentation contains information on EMC-conforming installation.

The cables connected to the frequency inverters may not be subjected to high-voltage insulation tests unless appropriate circuitry measures are taken before.

Do not connect any capacitive loads.

2.6 Information on Use

Warning!

The frequency inverter may be connected to power supply every 60 s. This must be considered when operating a mains contactor in jog operation mode. For commissioning or after an emergency stop, a non-recurrent, direct restart is permissible.

After a failure and restoration of the power supply, the motor may start unexpectedly if the auto start function is activated.

If staff is endangered, a restart of the motor must be prevented by means of external circuitry.

Before commissioning and the start of the operation, make sure to fix all covers and check the terminals. Check the additional monitoring and protective devices according to EN 60204 and applicable the safety directives (e.g. Working Machines Act, Accident Prevention Directives etc.).

No connection work may be performed, while the system is in operation.

2.6.1 Using external products

Please note, that Bonfiglioli Vectron does not take any responsibility for the compatibility of external products (e.g. motors, cables, filters, etc.).

To ensure the best system compatibility, Bonfiglioli Vectron offers components which simplify commissioning and provide the best tuning with each other during operation.

Using the device in combination with external products is carried out at your own risk.

2.7 Maintenance and Service

Warning!

Unauthorized opening and improper interventions can lead to personal injury or material damage. Repairs on the frequency inverters may only be carried out by the manu-facturer or persons authorized by the manufacturer.

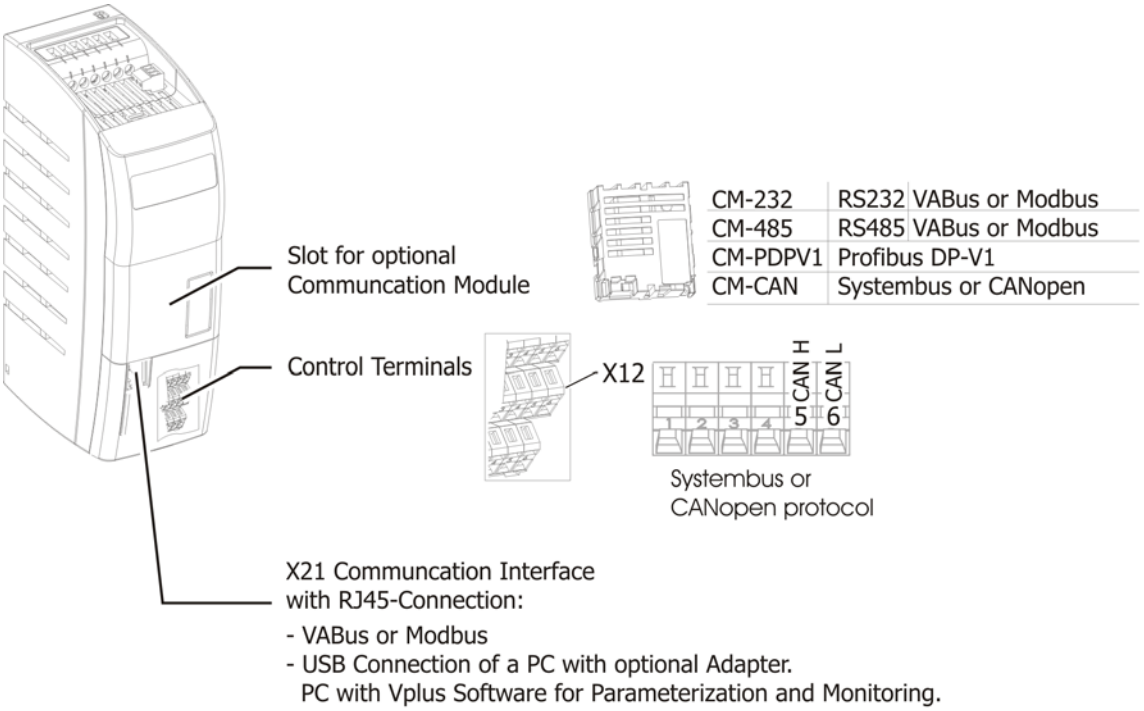
Check protective equipment regularly.

Any repair work must be carried out by qualified electricians.

2.8 Disposal

The dispose of frequency inverter components must be carried out in accordance with the local and country-specific regulations and standards.

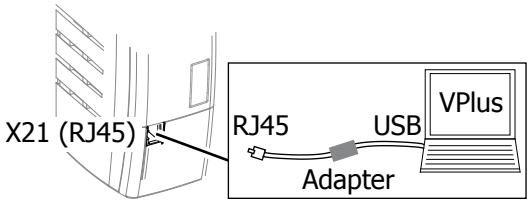
3 Communication Options



	See
CM-232	Instructions for VABus or Modbus.
CM-485	Instructions for VABus or Modbus.
CM-PDPV1	Instructions for Profibus DP-V1.
CM-CAN	Instructions for Systembus or CANopen.
Control Terminals for CAN-Connection	Instructions for Systembus or CANopen®[2].
X21 Communication Interface[3]	Instructions for VABus or Modbus.

3.1 VPlus PC-Software

The USB-Interface of a PC can be connected to the X21 Communication Interface via an optional USB adapter. This enables parameterization and monitoring with the help of the VPlus PC-Software.



[2] The CANopen®-Communication products fulfill the specifications of the CiA® (CAN in Automation) user organization.
[3] Install an interface adapter for connection to a PC. This enables parameterization und monitoring via the VPlus PC-Software.

4 Installation of an optional Communication Module

This chapter describes the assembly of the communication module.

4.1 Assembly

The communication module is pre-assembled in a casing. Additionally, a PE spring is enclosed for PE connection (shield).

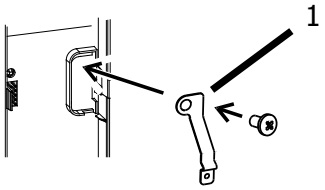
Caution!

The frequency inverter must be disconnected from the power supply before installation of the communication module.

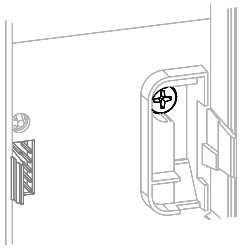
Installation under voltage is not permitted and will destroy the frequency inverter and/or the communication module.

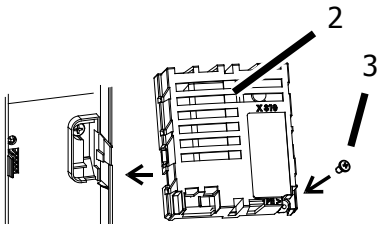
Do not touch the PCB visible on the back of the module, otherwise components may be damaged.

- Remove the cover of the module slot.



- Attach the PE spring (1) using the screw provided on the frequency inverter.



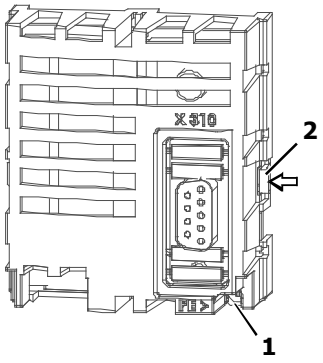


- Insert the communication module (2).
- Screw the communication module (2) onto the frequency inverter with the screw provided (3).

- Break off the pre-punched cut-out from the cover.
- Break off the pre-punched cut-out from the cover.

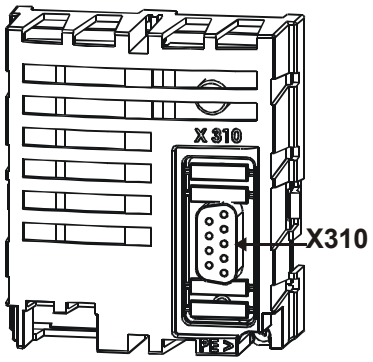
4.2 Disassembly

- Remove the cover of the module slot.



- Loosen the screw (1) on the communication module.
- Using a small screwdriver, firstly unlock the right and then the left snap-in hook (2).
- Remove the communication module from the slot.
- Unscrew the PE spring.
- Replace the cover onto the frequency inverter.

5 Connection



The **X310** (9-pol D-Sub) bus connector is occupied according to the Profibus-DP-Norm EN50170.
See the following table for details of the pin assignment.

The bus termination necessary on the bus line in the physically first and last subscriber can be activated via corresponding circuits in the bus connection sockets (e.g. built by Siemens).

Attention! The device will only communicate with the master if
- the master is connected to the mains (or powered by 24V DC)
- the device is connected to the mains (or powered by 24V DC)
- the first and the last subscriber on the connected branch have a correctly set bus termination
- all other devices in between have no bus termination or a deactivated bus termination.

Bus Connector X310		
Pin	**Name**	**Function**
Housing	Shield	connected with PE
1	PE	PE
2	not used	-
3	RxD/TxD-P	positive Signal RxD/TxD-P, corresponding to RS485 B-Line
4	CNTR-P	control signal for Repeater
5	DGND	isolated Ground Connection for Bus Termination
6	VP	isolated 5V for Bus Connection
7	not used	-
8	RxD/TxD-N	negative Signal RxD/TxD-N, corresponding to RS485 A-Line
9	not used	-

Only admissible types are to be used for the bus socket. They must all be suited for the 12 MBaud transmission rate.
This is, for example, type **Profibus connector 12 MBAUD** (6ES7 972-0BA11-0XA0) from Siemens.

Only admissible types are to be used as a line for the Profibus (line type A).
This is, for example, type **UNITRONIC-BUS L2/F.I.P. 1x2x0,64** from Lappkabel.

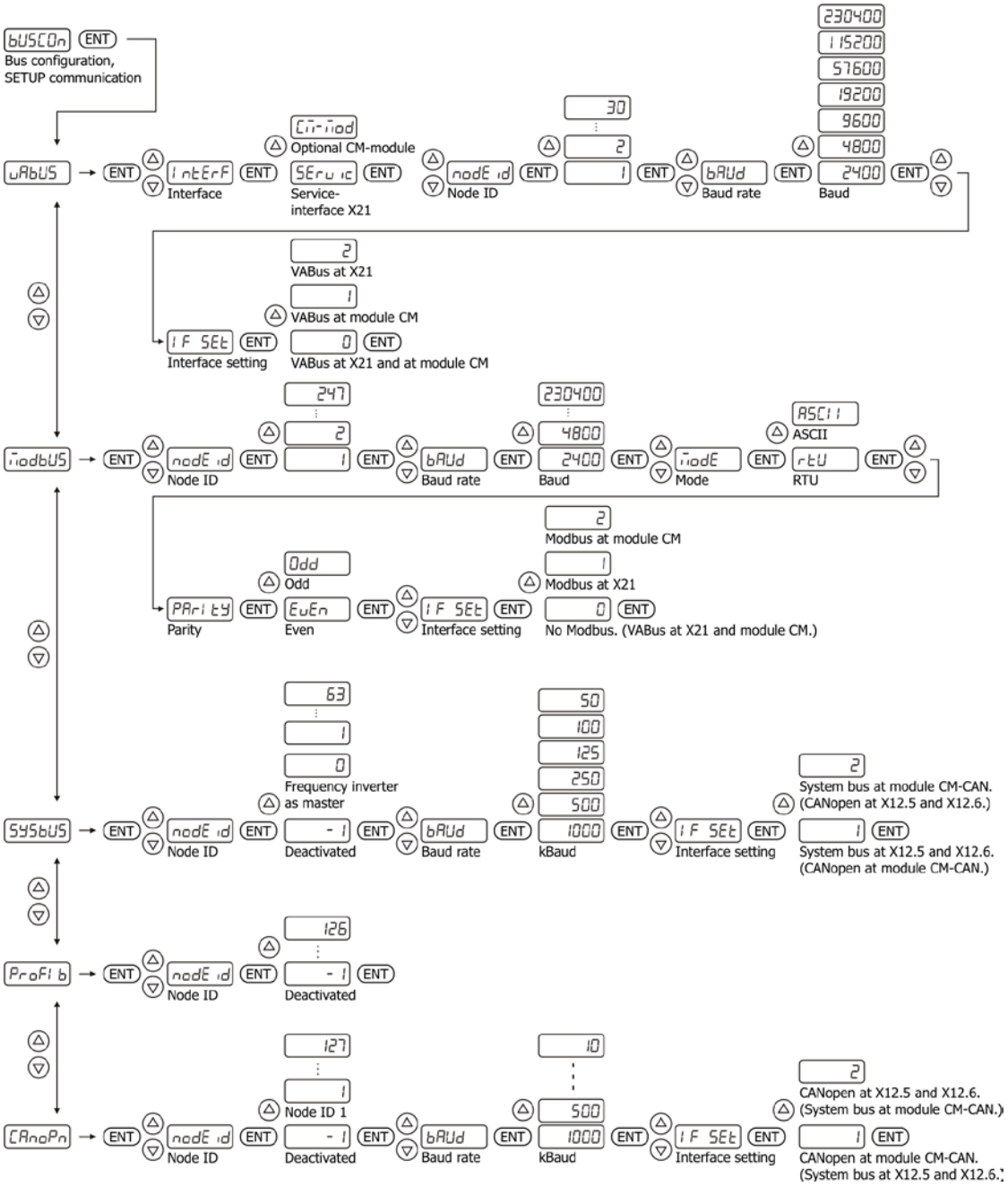
Attention! The line screen is to be connected to ground (PE) on both sides with good conductivity.

6 Commissioning via the Operator Panel

A communication interface can be set up in the "Setup" menu of the Operator Panel. Further communication parameters can be set in the "Para" menu.

6.1 Menu for setting up the Communication

The communication interface can be set up quickly and simple via the Operator Panel.



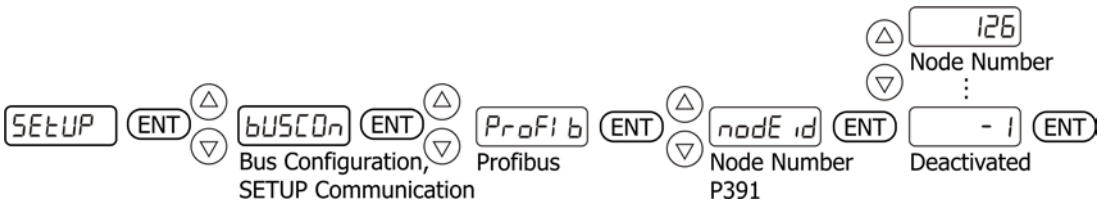
6.2 Select the Protocol

- Select Profibus.

	Display
Select the "Setup" menu using the arrow keys.	SEtUP ENT
Using the arrow keys select:	▲ ▼
Setting up a Communication Interface (Bus Configuration)	buSCOn ENT
Select a protocol using the arrow keys:	▲ ▼
CANopen	CAnoPn
Profibus[4]	PrOFI b
Systembus	SYSbUS
Modbus	ModbUS
VABus	uAbUS
	ENT

6.3 Set the Communication Parameters

Parameter		Display
391	Node Number	nodE id



[4] The selection is only possible if an optional CM-PDPV1 Communication Module is installed.

7 Profibus

This document describes the possibilities and characteristics of the Profibus DP communication module CM-PDPV1 for the device series Agile.

For the Profibus-DP connection, the frequency inverter must be equipped with the Profibus-DP communication module CM-PDPV1. The Profibus component CM-PDPV1 is enclosed with the inverter as a separate part and must be fitted by the user.

Note: These instructions are not to be understood as fundamental information on Profibus-DP. They presuppose underlying knowledge of the methods and modes of effect of Profibus-DP on the part of the user.
In some sections, setting and display possibilities are described, alternatively to the Operator Panel, via the VPlus PC-Software. Operation of a PC with the VPlus PC-Software on the frequency inverter with use of the Profibus component CM-PDPV1 is only possible via an optional interface adapter.

The Profibus component CM-PDPV1 has the **ident number 0x0B2C** (hexadecimal). The device's data set file has the designation **BV__0B2C.GSD**. The identification number and designation of the GSD file were assigned by the Profibus User Organization in Karlsruhe, Germany.

Attention! With the help of the Profibus-DP communication module CM-PDPV1 it is possible to access **ALL** parameters of the frequency inverter from the external control unit. Control of the access via the Control Level (Parameter 28) as with the Operator Panel or the VPlus PC-Software does not exist. A change of parameters with an unknown meaning to user can lead to the inoperability of the frequency inverter.

8 Baud Rate Setting / Line Length

The baud rate is not set explicitly. The Profibus component supports the **Auto_Baud** function and independently determines the baud rate set on the bus.
The maximum line length recommended by the PNO correlates to the baud rate.

Profibus-DP Interface	
Baud Rate/kBaud	**Max. Line Length/m**
9,6	1200
19,2	1200
45,45	1200
93,75	1200
187,5	1000
500	400
1500	200
3000	100
6000	100
12000	100

9 Setting the Station Address

- **391 Profibus Node-ID**

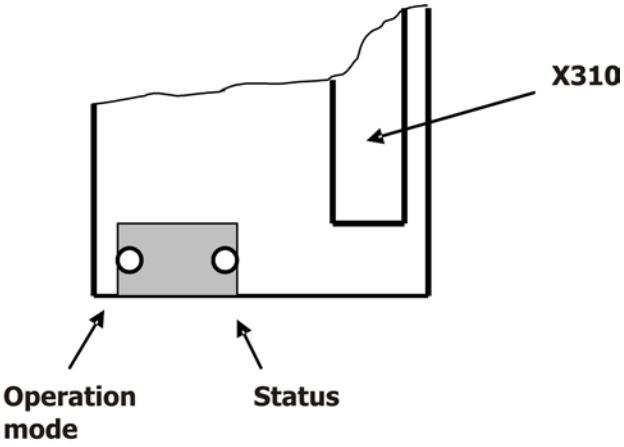
A maximum of 125 slave frequency inverters can be operated on the Profibus-DP. Each frequency inverter is assigned a node ID for its unambiguous identification; this ID may only exist once in the system. The setting of the node ID is carried out via Parameter *Profibus Node-ID* **391**.

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory Setting**
391	Profibus Node-ID	-1	126	-1

Note: *Profibus Node-ID* **391** = -1 means Profibus function switched off.

10 LED Indicators

The communication module has two bicolor LEDs which display the module status and the (Profibus) operation mode.



Operation Mode	
State	**Indication**
Off	not online/no power
Green	online, data exchange
Flashing Green	online clear
Flashing Red (1 flash)	parameterization error
Flashing Red (2 flashes)	configuration error (*)

*** Configuration Error**
The configuration error indicates an incorrect configuration of the data exchange object. See Chapter 13.1"Configuration Process on the DP Master".

Status	
State	**Indication**
Off	not initialized/no power
Green	initialized
Flashing Green	initialized, diagnostic event present (*)
Red	exception error (**)

*** Diagnostic Event**
When the inverter enters the error state a diagnostic event is sent from the inverter controller to the CM-PDPV1. The CM-PDPV1 then sends a diagnostic message to the Profibus master. The Profibus master device is then able to display the inverter error. The LED stops flashing after the acknowledgement of the inverter error.

Note: Diagnostic events are handled by a S7-CPU with OB82/OB86. If these objects are NOT loaded the CPU enters the STOP state in the case of a diagnostic event.

**** Exception Error**
An exception error indicates a fatal error on the CM-PDPV1 or communication loss between CM-PDPV1 and inverter controller. Check the inverter error message with the Operator Panel or VPlus.

11 Status Parameters

The Profibus module CM-PDPV1 has two actual value parameters which display the current status of the module itself as well as that of the controlling software in the inverter.

Status Control **365** displays the software state of the controlling software in the inverter.
Status Fieldbus Module **366** displays the module state.

Status Control 365	Description
Wait_Process_PDP	Waiting for connection to Profibus master
Wait_Process2_PDP	Waiting for reconnection to Profibus master after connection loss
Process_Active_PDP	Connection to Profibus master established, Data-Exchange with Profibus master running

Status Fieldbus Module 366	Description
WAIT_PROCESS	Waiting for connection to Profibus master
PROCESS_ACTIVE	Connection to Profibus master established, Data-Exchange with Profibus master running

These parameters can show other messages that are usually not of interest. These messages are of interest for BONFIGLIOLI VECTRON support in the case of problems and trouble shooting.

12 Error Behavior

- **393 Profibus Error Reaction**

In the event of Profibus errors (e.g. Profibus OFF), the behavior of the inverter can be set with *Profibus Error Reaction* **393**.

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory Setting**
393	Profibus Error Reaction	0	5	1

Operation Mode 393	Function
0 - No Reaction	Inverter remains in the current state.
1 - Error	Inverter enters the error state.
2 - Coast to Stop	Inverter power stages are switched off and drive stops in free run.
3 - Quick-Stop	The drive is decelerated with the quick stop ramps.
4 - Ramp-Stop + Error	The drive is decelerated with the ramp. An error is generated after reaching standstill.
5 - Quick-Stop + Error	The drive is decelerated with the emergency stop ramp. An error is generated after reaching standstill.

Note: The operation modes "2 - Coast to Stop" and "3 - Quick Stop" are only available when *Local/Remote* **412** is set to "1 - Control via Statemachine".

13 Setting PPO Type

As a function of the application in question, various process peripheral objects (PPOs) with differing lengths and contents are used for data exchange. The CM-PDPV1 offers a wide range of PPO settings. With the help of a hardware configuration tool the user is able to construct PPO settings as needed for his application.

Four predefined objects PPO1, PPO2, PPO3 and PPO4 and two additional objects (communication object PKW, process data object PZD) are available for free configuration.

The required object is to be set on the DP master in the hardware configuration. There is no setting for the required object on the side of the frequency inverter; it sets itself automatically to the projected object.

Profibus - Objects		
Object	**Object Length**	**Object Length**
	Bytes	**Words**
PPO 1	12	6
PPO 2	20	10
PPO 3	4	2
PPO 4	12	6
PKW	8	4
PZD	4	2

Note: Further information on the contents of the objects is described in Chapter 16 "Handling of the Objects".

The PKW object is used for accessing parameters (read/write) in the inverter. This object causes additional busload because it sends its contents with every data exchange cycle, whether it is used or not. As an alternative function without the necessity of the PKW object, the CM-PDPV1 module supports the DP-V1 channel. This function is explained in Chapter 16.2 "Parameter Access via the DP-V1 Channel".

Each PZD object has two words of input/output data. The handling of this object is explained in chapter 16.3.1 "Data Types of OUT/IN-Objects".

13.1 Configuration Process on the DP Master

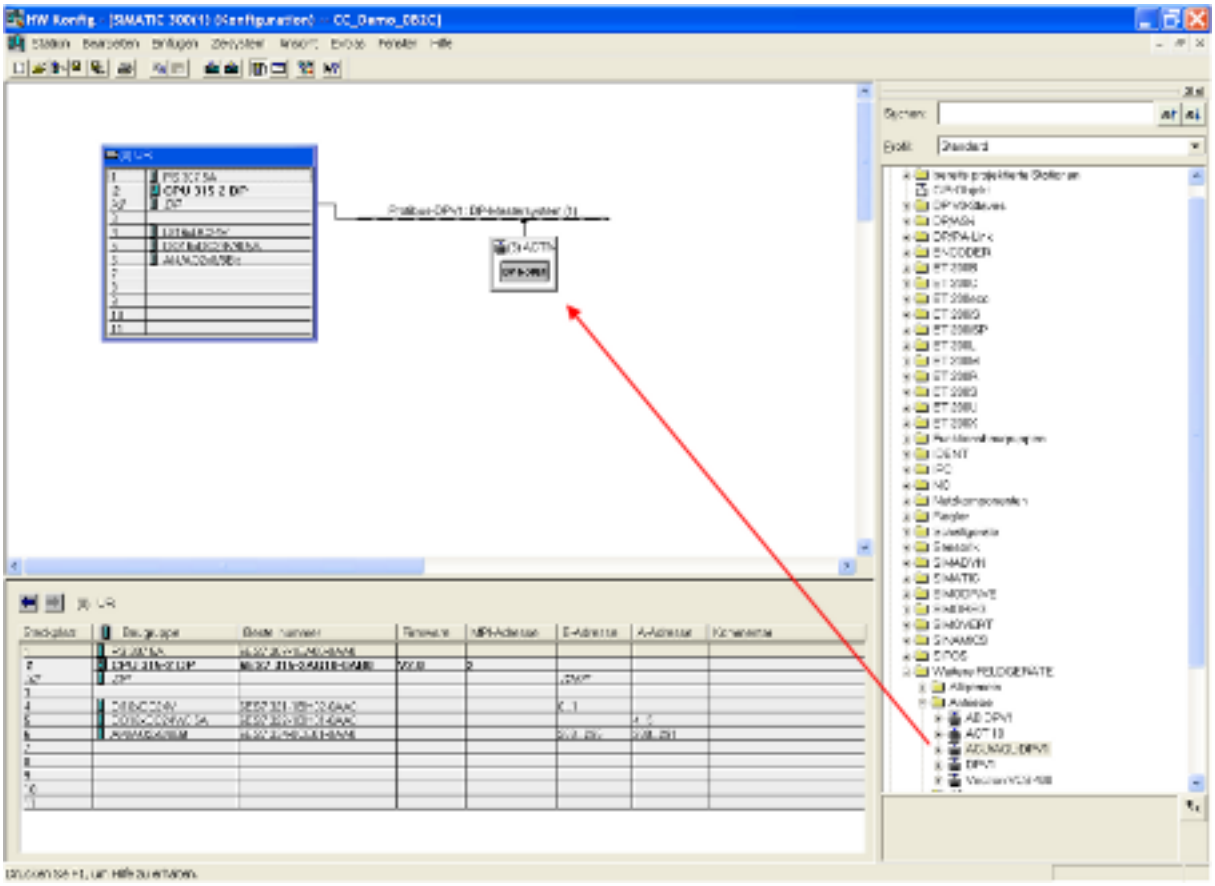
The configuration process of the frequency inverter with the Profibus communication module CM-PDPV1 is shown here using the example of a Siemens STEP7 hardware configurator. The process is principally valid for other configurations in an equivalent form.

First of all the BV__0B2C.GSD is created in the Hardware Configurator (if not already present). This is carried out with by selecting the **Extras\Neue GSD installieren** menu. Here you enter the path and the name of the GSD-file (BV__0B2C.GSD).

If the GSD file is installed then the frequency inverter appears in the menu:

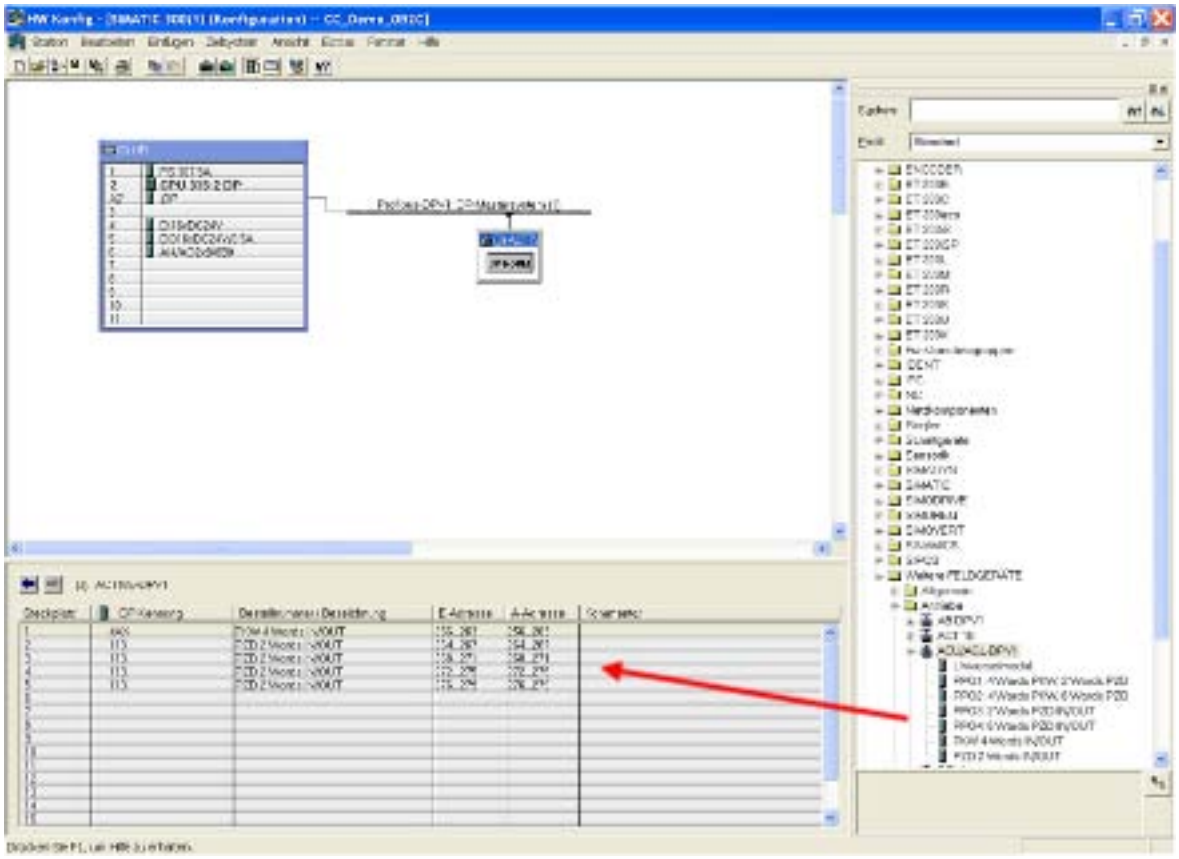
If the GSD file is installed then the frequency inverter appears in the menu:
PROFIBUS-DP\Weitere FELDGERÄTE\Antriebe\ACU/AGL-DPV1

From this position a **ACU/AGL-DPV1** frequency inverter can be created on the Profibus line using drag & drop.



The six possible objects PPO1 to PPO4, PKW and PZD are available in the **ACU/AGL-DPV1** menu. The desired object can be assigned to the frequency inverter using drag and drop.

The screen copy from the STEP7 Hardware Configurator shows a frequency inverter with Station Address 3 and a customer-specific configuration.



The above configuration setting is:
1 PKW Object 8 bytes or 4 words, communication objects (input/output)
4 PZD Objects 16 bytes or 8 words, process data objects (input/output)

Note:
- The data direction IN/input and OUT/output is from the master's point of view.
- Every single configured PZD object results in two word (4 byte) objects PZDn PZDn+1 for both input and output.
- The CM-PDPV1 offers four predefined objects (PPO1…4) to be compatible to the former CM-PDP and two additional objects PKW (communication channel) and PZD (process data) for application specific configurations.

Restrictions for user defined configuration settings:
- The PKW object is allowed only once as the first object.
- As a minimum one PZD object must be configured.
- The resulting number of all objects must be less than or equal to 36 bytes (18 words).

Note: A restriction violation results in a configuration error message from the PLC on the Profibus start up cycle. Also the Operation Mode Led on the CM-PDPV1 flashes red (2 flashes).

14 Commands SYNC / FREEZE

The Profibus component supports the Profibus commands SYNC/UNSYNC and FREEZE/UNFREEZE. These commands are used to synchronize a number of slaves.

With the FREEZE command, all the slaves keep their input data. They are then read out in sequence by the bus master. As all the slaves keep their inputs simultaneously with the FREEZE command, the bus master is given a process pattern of all the slaves at a defined time. With the UNFREEZE command, this state is cancelled and the slaves update their inputs again.

With the SYNC command, all the slaves retain their current outputs. Subsequently arriving data are not put through to the outputs, but buffered. The bus master can give new commands to the slaves and activate all the slaves simultaneously with the UNSYNC command. They immediately transfer the buffer data to their outputs with the UNSYNC command.

15 Available Objects / Scanning Times

If a Profibus slave has been recognized, parameterized and configured by its master on the bus, there is a cyclic exchange of data with the Profibus **DATA_EXCHANGE** service, in which the output data are transmitted from the master to the slave and the input data from the slave to the master **in one cycle**. The repetition rate with which the slaves carry out the exchange of data with the master, the so-called bus rotation time, is a function of the transmission rate, the number of subscribers and the size of the objects transmitted. If there are few subscribers, a high transmission rate and short objects being exchanged, bus rotation times of 1 to 2 ms are possible.
It is therefore sensible to configure the objects to suit the application. Depending on the application the focus can be transmission speed, number of objects or a combination of both.

The configured data exchange objects have principally two components, which are either completely, partly or not at all existent with the differing object configurations. These components are the communication channel and the process data channel.
The **communication channel** (PKW object) is used for accessing (write/read) parameters in the frequency inverter. An exception is formed by the string parameters, to which there is NO access. The communication proceeds according to a firmly defined hand-shake process and lasts for a number of DATA_EXCHANGE cycles.
The **process data channel** (PZD objects) is processed in every cycle. The reference values are accepted and the actual values forwarded. Therefore a data update takes place with every DATA_EXCHANGE.

Direction of transmission Master ➔ Slave (OUT)

Communication Channel				**Process Data Channel**					
PKW area				PZD area					
PKE	**IND**	**PWE**	**PWE**	**PZD 1**	**PZD 2**	**PZD x**	**PZD x**	**PZD x**	**PZD x**
		PWEh	PWEl	STW	HSW	Outx	Outx	Outx	Outx

PKW Parameter identification value
PZD Process data channel STW = Control word HSW = Main reference value
Outx = user defined

Direction of transmission Slave ➔ Master (IN)

Communication Channel				Process Data Channel					
PKW area				PZD area					
PKE	**IND**	**PWE**	**PWE**	**PZD 1**	**PZD 2**	**PZD x**	**PZD x**	**PZD x**	**PZD x**
		PWEh	PWEl	ZSW	HIW	Inx	Inx	Inx	Inx

PKW Parameter identification value
PZD Process data channel ZSW = State word HIW = Main actual value
Inx = user defined

Consistency area

Communication Channel				Process Data Channel					
PKW area				PZD area					
PKE	**IND**	**PWE**	**PWE**	**PZD 1**	**PZD 2**	**PZD x**	**PZD x**	**PZD x**	**PZD x**
full length				word	word	word	word	word	word

The consistency area describes the parts of the object which must have consistent contents. The consistency states are encrypted in the configuration data of the GSD file and have effects on the possible access mechanisms on the part of the DP master. In this way, the 8 bytes of the communication channel in a PLC of type Siemens S7 can only be reached via the special functions **SFC14 (DPRD_DAT)** and **SFC15 (DPWR_DAT)**. The words of the process data channel are directly addressable as **periphery input/output words (PEW, PAW)**.

	Communication Channel				Process Data Channel					
	PKE	IND	PWEh	PWEl	PZD1	PZD2	PZD3	PZD4	PZD5	PZD6
PPO1										
PPO2										
PPO3										
PPO4										

PPO1 … PPO4 are predefined configurations. With the help of the PZD- and PKW-objects you are able to build your own application specific configuration.

The communication channel is always treated identically. This is valid for the predefined configurations PPO1/PPO2 and custom specific configuration with communication object PKW.

The process data channel objects PZD1/PZD2 are firmly defined and its contents cannot be altered.

The contents of process data channels PZD3 to PZD 18 (maximum, without communication channel PKW !) is user defined.

Note: In the data transmission, the **Motorola format** is presupposed for the position of Low/High byte first, as is also supported by a PLC of the type Siemens S7. If the DP master supports the Intel format, Low/High byte are to be swapped on the master side before transmission and after receipt.

Scan Time

Scan time defines the data update cycle between the Profibus module CM-PDPV1 and the inverter's controller which processes the Profibus data. This scan time is independent of the bus rotation time. Regardless of the transmission speed on the Profibus, the scanning time of the inverter is a function of the configured objects and the resultant object length (number of bytes).

No. of configured		Scan Time Controller/CM-PDPV1
bytes	words	[ms]
		Frequency Inverter
4	2	2
8	4	2
12	6	2
16	8	2
20	10	2
24	12	2
28	14	2
32	16	2
36	18	4

The scan time is dependent on the number of configured objects.

16 Handling of the Objects

This chapter describes the handling of the communication channels like i.e. Process data channel and Parameter data channel.

16.1 Parameter Access via Communication Channel PKW

The communication channel (PKW area) has the following structure:

Designation	**PKW Area**							
	PKE				**PKE**			
Content	**Parameter identification**		**Content**		**Parameter identification**		**Content**	
	High Byte		High Byte		High Byte		High Byte	
Byte No.	0	**Byte No.**	0	**Byte No.**	0	**Byte No.**	0	**Byte No.**

The data is transmitted in the **Motorola format** as, for example, supported by the S7 PLC from Siemens. Thus, the high byte is on the lower byte of the telegram and the low byte on the higher byte.

Note: The data set is always on the high byte of "Index" (data set/Byte No. 2).
If the Systembus function is available (EM-module with Systembus) a Systembus address is set on the low byte of "Index" (SB/Byte No. 3). With the help of this parameter the access to a Systembus subscriber is possible. For details see the Systembus manual.

Structure of the Parameter Identification (PKE):																
PKE	**High-Byte**								**Low-Byte**							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	AK				SPM	PNU										

AK: Request or reply identification (value range 0 ..15)
SPM: Toggle bit for spontaneous result processing
PNU: Parameter number (value range 1 to 1599)

The request and reply identifications are stored in the AK area. If no parameter processing is to be carried out, the **"no request"** type of function is to be set.

With bit 11 (SPM), the readiness for spontaneous report processing can be switched on and off (0 = OFF, 1 = ON, in the present application, the spontaneous report processing is not supported, so SPM is always 0).

The PNU area transmits the number of the parameter to be processed.

Parameter values (= data) of the type Integer/Unsigned Integer (16 Bit) and Long (32 Bit) can be written and read. The data type is specified in the request identification. In data set change-over capable parameters (array), the required data set is stated in the Index Byte (Byte 2).

Note: An Excel file, which is available on request, exists for the necessary information on the parameters with regards to the data type and data set change-over capability.

Note: To obtain access to the PKW object on a S7 PLC the functions SFC14/15 must be used.

16.1.1 Request Identification

Structure of the request identification AK (output data set, Master → Slave)		
Request Identification AK	**Data type**	**Function**
0	-	**no request**
1	int/uint , long	read parameter value
2	int/uint	write parameter value int/uint
3	long	write parameter value long
6	int/uint , long Array	read parameter value Array
7	int/uint Array	write parameter value int/uint Array
8	long Array	write parameter value long Array

Array: Applies to data set change-over capable parameters; the required data must be specified in data set/INDEX. Otherwise, data set/INDEX = 0.

16.1.2 Response Identification

Structure of the reply identification AK (input data set, Slave → Master)		
Reply Identification AK	**Data type**	**Function**
0	-	**no request**
1	int/uint	transmit parameter value int/uint
2	long	transmit parameter value long
4	int/uint Array	transmit parameter value int/uint Array
5	long Array	transmit parameter value long Array
7	-	request cannot be implemented
8	-	no control sovereignty for PKW interface

If the reply identification = 7 (request cannot be implemented), an error code is inserted in PWE low (Byte 6/7).
If the reply identification = 8 (no control sovereignty), the master has no writing right to the slave.

16.1.3 Fault Messages

Coding of the fault messages in the reply data set PWE-Low/Low-Byte in Byte 7 (Slave → Master):

Fault No. (dec.) acc. to PROFIDRIVE	Meaning
0	Inadmissible parameter number PNU
1	Parameter value cannot be altered
2	Lower or upper parameter value limit exceeded
3	Faulty data set
4	No data set change-over capable parameter
5	Wrong data type
18	Other fault
20	Systembus not responding

Extension	Meaning
101	Parameter cannot be read
103	Fault occurred in reading the EEPROM
104	Fault occurred in writing the EPROM
105	Check sum fault in EEPROM occurred
106	Parameter may not be written in operation
107	Values of the data sets differ
108	Unknown request

Note:
The fault number „20" can be caused by different reasons.
If you do not use the Systembus: Check, that the Low-Byte is "0" (Zero). Values bigger than zero will try to communicate with a Systembus connected device instead of the Profibus device.
If you use Systembus (in example via an EM-SYS module), the requested device doesn't respond. Check, that the requested device is supplied with power and that the Systembus Node ID in the Index Low Byte and the parameterization of the requested device match.

16.1.4 Parameters, Data Set Selection and Cyclic Writing

Parameters to be set can be taken from the parameter list referring to the configuration of the standard operating instructions. In the parameter list, state whether a parameter is data set change-over capable (data set/INDEX = 1 to 4) or only exists once (data set/INDEX = 0).
The parameter list also provides information on the display format of a parameter and its type (int/uint/long). String parameters cannot be transmitted due to the possible number of bytes.
The values transmitted are always integer values. For values with decimal places, the decimal point is not transmitted.
The word IND passes on the required data set of the parameter. In the present application, the data set number 0 is assigned to existing parameters; a selection from multiple (data set change-over capable) existing parameters is carried out by inserting a number from 1 to 4.
The actual parameter value is transmitted in the PWE area; as a 16 Bit value (int/uint) it occupies PWEl, as a 32 Bit value (long) PWE high and PWE low, with the high word located in PWE high.

If parameters with four data values are set via data set = 0, all four data sets are set to the same transmitted value. A read access with data set = 0 to such parameters is only successful if all four data sets are set to the same value. If this is not the case an error is reported.

Caution! The values are entered automatically into the EEPROM on the controller. If values are to be written cyclically with a high repetition rate, there must be no entry into the EEPROM, as it only has a limited number of admissible writing cycles (about 1 million cycles). If the number of admissible writing cycles is exceeded, the EEPROM is destroyed.

To avoid this, cyclically written data should be transmitted into the RAM (only without a writing cycle onto the EEPROM). Then the data are not stored secure against zero voltage and must be written again after a Power off/on.
This mechanism is activated by the target data set being increased by five in the specification of the data set (IND).

Entry only into the RAM:	
EEPROM	**RAM**
Entry into data set 0	Data set (IND) = 5
Entry into data set 1	Data set (IND) = 6
Entry into data set 2	Data set (IND) = 7
Entry into data set 3	Data set (IND) = 8
Entry into data set 4	Data set (IND) = 9

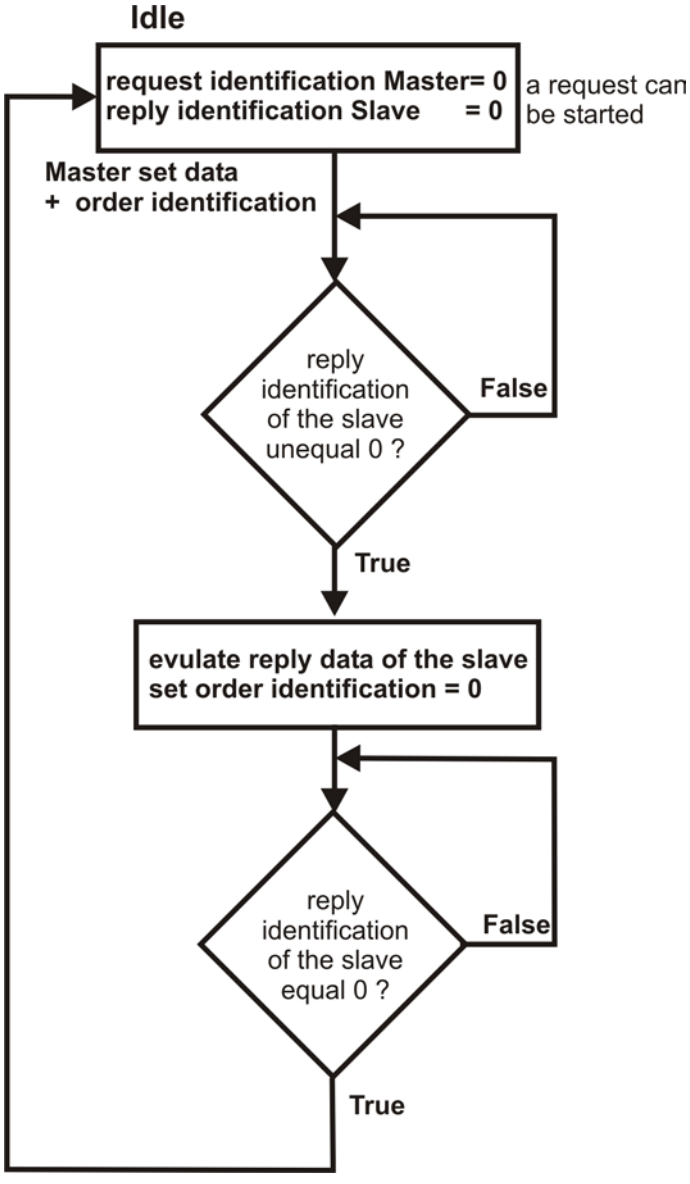
Writing access to data set change-over capable parameters is to be considered as a further special point. If the values of a data set change-over capable parameter are to be set to the same value in all data sets, the parameter can be written via the data set (IND) 0.

16.1.5 Sequence of Communication

A request from the master is **always** answered with a reply from the slave. Each PPO can only accept one request or one reply at a time. In this way, a defined hand-shake procedure between master and slave must be complied with.

In the initial situation, the request **and** reply identification must = 0. The master sets its request identification and waits for the slave to change the reply identification from 0 to ≠ 0. Now, the reply from the slave is available and can be evaluated. Thereupon, the master sets its request identification = 0 and waits for the slave to change the reply identification from ≠ 0 to 0. With this, the communication cycle is completed and a new one can start.

Attention! The slave only replies to new requests if it has reacted to the request identification = 0 with the reply identification = 0.



16.1.6 Communication Examples

Parameter					Setting		
No.	**Description**	**Type**	**Write / Read**	**Format**	**Min.**	**Max.**	**Fact. Sett.**
400	Switching frequency	P-W	S/L	x	1	8	2
480	Fixed frequency 1	P[I]-D	S/L	xxxx.xx Hz	-999.00	999.00	5.00

Example 1:
Parameter 400 is one word (P-W), int, not data set switch-over capable and is to be read.

Request from Master:

AK = 1 (Request Identification = read parameter value
PNU = 400 (= 0x190)
IND = 0
PWEh = 0
PWEl = 0

PKW area								
Designation	**PKE**		**IND**		**PWE high**		**PWE low**	
Content	**Parameter Identification**		**Index**		**Parameter value High Word**		**Parameter value Low Word**	
	High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte
	0x11	0x90	0	0	0	0	0	0
Byte No.	0	1	2	3	4	5	6	7

Reply from Slave:

AK = 1 (reply identification = transmit parameter value int/uint)
PNU = 400 (= 0x190)
IND = 0
PWEh = 0
PWEl = value

PKW area								
Designation	**PKE**		**IND**		**PWE high**		**PWE low**	
Content	**Parameter Identification**		**Index**		**Parameter value High Word**		**Parameter value Low Word**	
	High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte
	0x11	0x90	0	0	0	0	0	value
Byte No.	0	1	2	3	4	5	6	7

Example 2
Parameter 480 is a double word (P[I]-D), long, data set change-over capable, and is to be written. The target data set is data set 3.

Reference value = -300.00 Hz (-30000 is transmitted)

The negative value is portrayed as follows in accordance with integer arithmetic: 0xFFFF8AD0

Request from Master:

AK = 8 (request identification = write parameter value long Array)
PNU = 480 (= 0x1E0)
IND = 3
PWEh = 0xFFFF
PWEl = 0x8AD0

PKW area								
Designation	**PKE**		**IND**		**PWE high**		**PWE low**	
Content	**Parameter Identification**		**Index**		**Parameter value High Word**		**Parameter value Low Word**	
	High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte
	0x81	0xE0	3	0	0xFF	0xFF	0x8A	0xD0
Byte No.	0	1	2	3	4	5	6	7

Reply from Slave:

AK = 5 (reply identification = transmit parameter value long Array)
PNU = 480 (= 0x1E0)
IND = 3
PWEh = 0xFFFF
PWEl = 0x8AD0

PKW area								
Designation	**PKE**		**IND**		**PWE high**		**PWE low**	
Content	**Parameter Identification**		**Index**		**Parameter value High Word**		**Parameter value Low Word**	
	High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte
	0x51	0xE0	3	0	0xFF	0xFF	0x8A	0xD0
Byte No.	0	1	2	3	4	5	6	7

16.2 Parameter Access via the DP-V1 Channel

The Profibus communication module CM-PDPV1 provides the possibility to use the Profibus V1-channel. This is an alternative to the usage of the communication object PKW in the data exchange object. The PKW object is always sent on the bus, whether it is used or not, and therefore causes needless busload.

The V1 telegrams for parameter access are special Profibus telegrams that are sent only when a parameter access is necessary. Contrary to the usage of the PKW object, the V1 telegrams can access all types of parameters including string parameters.

To be compatible to different types of Profibus master devices there are two different methods included for the V1-channel. The behavior of the CM-PDPV1 concerning the different methods is set with *DP-V1 Mode* **329**.

- **329 DP-V1 Mode**

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory Setting**
329	DP-V1 Mode	1	2	2

Operation Mode	Function
1 - Standard	Standard usage of V1 channel
2 - S7 compatible	S7 PLC usage of V1 channel

Note: To get access to the V1-channel on a S7 PLC the functions SFC52/53 must be used.

The two different modes are necessary because V1 telegrams are handled differently on the various Profibus master implementations.

The standard telegram addresses a device by its Profibus node ID and selects the parameters by two 8 bit objects named *slot* and *index*. If the Profibus master device supports the direct setting of the Profibus node ID, *slot* and *index* *DP-V1 Mode* **329** must be set to "1 – Standard" and the handling described for this setting must be used.

A S7 PLC uses two special functions SFC52/53 for the V1-channel. These functions do not offer an independent setting for node ID, *slot* and *index*. The addressing is accomplished by the diagnostic address (with *slot* always set to 0) of the device to be accessed. The only available and variable object for the PLC application is *index* (8 bit). If the Profibus master device does not support the setting of Profibus node ID, *slot* and *index* *DP-V1 Mode* **329** must be set to "2 – S7 compatible" and the handling described for this setting is to be used.

For both types of DP-V1 Mode the parameter data to be read or written uses the Motorola format. The number of bytes depends on the parameter data type.

Parameter data types and byte order

Byte	0	1	2	3	4	5	...	....	max. 98
Data Type	uint/int								
Content	High Byte, Low Byte								
Data Type	long								
Content	High Byte, Low Byte								
Data Type	string								
Content	first char								

uint/int = 2 Bytes
long = 4 Bytes
string = 1 … 99 Bytes

16.2.1 Operation Mode "Standard"

A parameter is accessed by its parameter number and data set number. The valid range for parameter number is 0 … 1599, the range of data set number is 0 … 9.

Note: For the handling of data set selection see chapter 16.1.4 "Parameters, Data Set Selection and Cyclic Writing".

The standard mode uses the direct setting of Profibus node ID, *slot* and *index*. With the setting of the two 8 bit objects *slot* and *index* the selection of parameter number and data set number for read/write is done. The number of bytes to be transferred (read/write) depends on the parameter's data type. In the case of a write cycle and an invalid number of bytes the CM-PDPV1 protocol reacts with an error message.

Calculation of slot and index:
Calculate an "application data index" **ADI** as a 16 bit unsigned integer with

ADI = (Parameter number + 1) + (2000 * (Data Set number + 1))

Calculate the value of *slot* and *index* with

slot = (ADI – 1) / 255

index = (ADI – 1) modulo 255

Example:

Parameter number = 480
Data Set number = 3

ADI = (480 + 1) + (2000 * (3 + 1)) = 8481

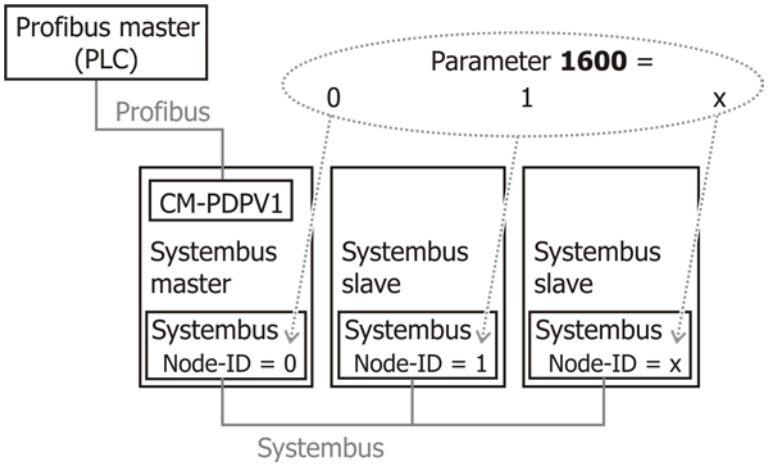
slot = (8481 - 1) / 255 = 33

index = (8481 - 1) modulo 255 = 65

The parameter data structure is explained above.

Access to Systembus:
The Standard Mode also offers a special functionality to obtain access to additional inverters via the Systembus. For example, there exists one inverter with CM-PDPV1 and several additional inverters coupled to the first one via the Systembus.

This function can be implemented with CM-PDPV1 via the virtual parameter **1600**.
After power on/reset this virtual parameter **1600** is set to zero. With **1600** = 0 all parameter accesses by V1 channel are allocated to the inverter with CM-PDPV1 itself.



To obtain access to parameters of inverters via the Systembus, parameter **1600** is written to the desired Systembus node ID.

The data type of parameter **1600** is unsigned integer with a valid data range = 0 … 63.

Parameter **1600** can be read and written.

16.2.2 Operation Mode "S7 Compatible"

A parameter is accessed by its parameter number and data set number. The valid range for parameter number is 0 … 1599, the range of data set number is 0 … 9.

Note: For the handling of data set selection see chapter 16.1.4 "Parameters, Data Set Selection and Cyclic Writing".

The S7-compatible Mode only allows the setting of the object *index*. There are two steps necessary for reading/writing one parameter. The number of bytes to be transferred (read/write) depends on the parameter's data type. In the case of a write cycle and an invalid number of bytes the CM-PDPV1 protocol reacts with an error message.

Step 1:
In the first step the desired parameter number, data set number and Systembus node ID are written. This message is sent with ***index* set to 1**. The object to be sent has 4 bytes with the following structure:

Data Structure for Index = 1:

Byte	**0**	**1**	**2**	**3**
Content	**Parameter Number** High Byte Low Byte		**Data Set Number**	**Systembus Address**

Parameter number = 0 …. 1599
Data Set = 0 …. 9
Systembus Address = 0 …. 63

Step 2:
The desired parameter data can now be read or written by sending a read or write request with ***index* set to 2**.

The parameter data structure is explained above.

16.3 Process Data Channel

In this chapter the handling of the PZDs is described. The mandatory process data objects PZD1/2 are described in chapters 16.4.1 "PZD1, Control Word / Status Word" and 16.4.5 "PZD2, Reference Value / Actual Value".

The PZD 3 … 18 objects can be used in an application specific way. Inside the inverter these objects are represented as sources for PZD Out objects (data received from Profibus master) and input parameters for sources (data to be sent to the Profibus master).

Note: Input/output are defined from the Profibus master point of view.

16.3.1 Data Types of OUT/IN-Objects

Data Type "Boolean"

The valid values for boolean are FALSE/0x0000 and TRUE/0xFFFF.

Data Type – Boolean		
	Boolean value	**Data Content hexadecimal**
OUT/IN-PZDn Boolean	FALSE	0x0000
OUT/IN-PZDn Boolean	TRUE	0xFFFF

n = 3 … 18

Data Type "Word"

The "Word" data type can be used for percentage, current and torque variables. Current and torque are possible in applications with field-orientation. The scalings in question are described below.

Word Data Type "Percentage"

The value range for percentage values is -300.00 to +300.00%. The values in OUT/IN-PZDn are displayed with a multiplication factor of 100.

Word Data Type – Percentage			
	Data Content hexadecimal	**Data Content decimal**	**Logical Interpretation**
OUT/IN-PZDn Word	0x8AD0	- 30000	- 300,00%
OUT/IN-PZDn Word	0x0000	0	0,00%
OUT/IN-PZDn Word	0x7530	+ 30000	+ 300,00%

n = 3 … 18

Word Data Type "Current"

For the current, calculation must be done in the device-internal scaling.
The scaling is:

$$\textbf{Reference value = (Reference current [A] / Scaling current [A]) } \cdot 2^{13}$$

2^{13} = 8192 (decimal) = 0x2000 (hexadecimal)

Word Data Type "Torque"

For the torque specification, the calculation must be done in the device-internal scaling. The scaling for a torque value is identical to the specification of the reference current (see Current). If the machine is operated with nominal flux, a reference torque corresponds to a reference current.

Note: The equation stated for current (torque) applies for operation with nominal flux. If a machine is operated in the field weakening area, this is to be considered in the specification values.

If the current or torque variables are used, please take into account the device-specific scaling.

Data Type "Long"

The "Long" data type can be used for the frequency and position variables.

Frequencies use the internal notation of the inverter
(xxx Hz / 4000 Hz) * 2^{31}.

Examples:

50,00 Hz ➔ (50,00 / 4000,00) * 2^{31} = 0x01999999

-80,00 Hz ➔ (-80,00 / 4000,00) * 2^{31} = 0xFD70A3D8

Data Type – Long			
	Data Content hexadecimal	**Data Content decimal**	**Logical Interpretation**
OUT/IN-PZDx/y Long	0xnnnnmmmm	Application-specific	Application-specific

x/y = 3/4, 5/6, … 17/18

16.3.2 Profibus Output Sources (OUT-PZD x)

The table below lists the available output sources of the PZD Out objects. The content of the sources depends on the application. For the different data types the equivalent sources must be connected to the inverter input parameters.

Note:
- The availability of Out sources depends on the number of configured PZD objects.
- Every configured PZD object consists of either two Boolean, two word or one long output object.
- One PZD out object can be used for one data type only (depending on the application requirements).
- The first configured PZD object (mandatory) represents the PZD1/2 with fixed contents and functions.

No. of configured PZD Objects	Boolean Sources		Word Sources		Long Sources	
	Name	Source No.	Name	Source No.	Name	Source No.
2	Out-PZD3 Boolean	640	Out-PZD3 Word	656	Out-PZD3/4 Long	672
	Out-PZD4 Boolean	641	Out-PZD4 Word	657		
3	Out-PZD5 Boolean	642	Out-PZD5 Word	658	Out-PZD5/6 Long	673
	Out-PZD6 Boolean	643	Out-PZD6 Word	659		
4	Out-PZD7 Boolean	644	Out-PZD7 Word	660	Out-PZD7/8 Long	674
	Out-PZD8 Boolean	645	Out-PZD8 Word	661		
5	Out-PZD9 Boolean	646	Out-PZD9 Word	662	Out-PZD9/10 Long	675
	Out-PZD10 Boolean	647	Out-PZD10 Word	663		
6	Out-PZD11 Boolean	648	Out-PZD11 Word	664	Out-PZD11/12 Long	676
	Out-PZD12 Boolean	649	Out-PZD12 Word	665		
7	Out-PZD13 Boolean	650	Out-PZD13 Word	666	Out-PZD13/14 Long	677
	Out-PZD14 Boolean	651	Out-PZD14 Word	667		
8	Out-PZD15 Boolean	652	Out-PZD15 Word	668	Out-PZD15/16 Long	678
	Out-PZD16 Boolean	653	Out-PZD16 Word	669		
9	Out-PZD17 Boolean	654	Out-PZD17 Word	670	Out-PZD17/18 Long	679
	Out-PZD18 Boolean	655	Out-PZD18 Word	671		

Note:
- Every source can be connected to an inverter input parameter with the same data type. This method is the same as used with Systembus receive objects.
- Boolean sources are representatives for Boolean objects.
- Word sources are representatives for current or torque objects.
- Long sources are representatives for frequency or position objects.

16.3.3 Profibus Input Parameters (IN-PZD x)

The table below lists the available input parameters of the PZD In objects. The content of the sources depends on the application. For the different data types the equivalent input parameters must be connected to the inverter sources.

Note:
- The availability of In parameters depends on the number of configured PZD objects.
- Every configured PZD object consists of either two Boolean, two word or one long input parameter.
- One PZD In object can be used for one data type only (depending on the application requirements).
- The first configured PZD object (mandatory) represents the PZD1/2 with fixed contents and functions.

- **1300 ... 1339 IN-PZD x**

No, of configured PZD Objects	Boolean Parameter		Word Parameter		Long Parameter	
	Name	Parameter No.	Name	Parameter No.	Name	Parameter No.
2	In-PZD 3 Boolean	1300	In-PZD 3 Word	1302	In-PZD 3/4 Long	1304
	In-PZD 4 Boolean	1301	In-PZD 4 Word	1303		
3	In-PZD 5 Boolean	1305	In-PZD 5 Word	1307	In-PZD 5/6 Long	1309
	In-PZD 6 Boolean	1306	In-PZD 6 Word	1308		
4	In-PZD 7 Boolean	1310	In-PZD 7 Word	1312	In-PZD 7/8 Long	1314
	In-PZD 8 Boolean	1311	In-PZD 8 Word	1313		
5	In-PZD 9 Boolean	1315	In-PZD 9 Word	1317	In-PZD 9/10 Long	1319
	In-PZD 10 Boolean	1316	In-PZD 10 Word	1318		
6	In-PZD 11 Boolean	1320	In-PZD 11 Word	1322	In-PZD 11/12 Long	1324
	In-PZD 12 Boolean	1321	In-PZD 12 Word	1323		
7	In-PZD 13 Boolean	1325	In-PZD 13 Word	1327	In-PZD 13/14 Long	1329
	In-PZD 14 Boolean	1326	In-PZD 14 Word	1328		
8	In-PZD 15 Boolean	1330	In-PZD 15 Word	1332	In-PZD 15/16 Long	1334
	In-PZD 16 Boolean	1331	In-PZD 16 Word	1333		
9	In-PZD 17 Boolean	1335	In-PZD 17 Word	1337	In-PZD 17/18 Long	1339
	In-PZD 18 Boolean	1336	In-PZD 18 Word	1338		

The default setting for all input parameters (except parameters 1302/1303/1307/1308) is FALSE or zero.

The default setting for input parameters 1302/1303/1307/1308 is compatible to device series ACT with CM-PDP module:

In-PZD 3 Word **1302** = 770 PDP absolute current
In-PZD 4 Word **1303** = 771 PDP active current
In-PZD 5 Word **1307** = 772 warning status
In-PZD 6 Word **1308** = 773 error status

Note:
- If one object is set to a specific source no., be sure that the corresponding objects for the same location are set to their default values. This method is the same as used with Systembus transmit objects.
- Boolean inputs are representatives for boolean objects.
- Word inputs are representatives for current or torque objects.
- Long inputs are representatives for frequency or position objects.

Note: The displayed "PDP active current" depends on the control system. In field-orientation, the torque-forming current is displayed, in applications with a v/f characteristic control, the active current, which is also a measure for the torque.
The "PDP absolute current" (r.m.s. current) is always positive. Active current and torque-forming current have a sign prefixed.
Positive currents = motor
Negative currents = generator operation.

Current Scaling

Standardization			
Reference value	**Binary**	**Decimal**	**Hexadecimal**
+ 100%	+ 2^{14}	16384	0x4000

The possible range = ±200% = +32768 to -32768 = 0x8000 to 0x7FFF

For the internal scaling, the data set change-over capable parameter *Rated current* **371** is used as a reference.

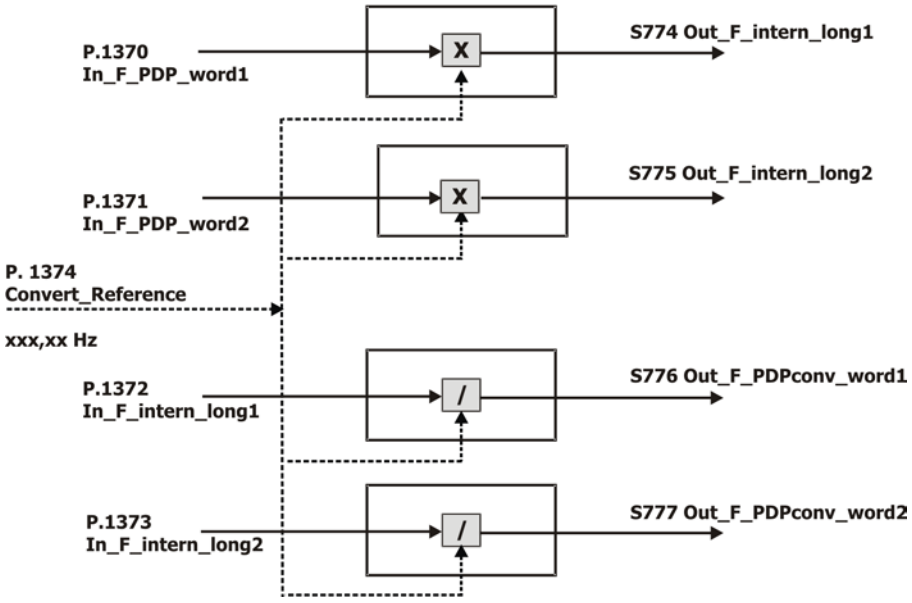
Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory Setting**
371	Rated Current	0,01 · I_{FUN}	10 · I_{FUN}	I_{FUN}

16.4 Frequency Conversion PDP Word to/from Inverter Internal Notation

- **1370 In-F-PDP-word 1**
  1371 In-F-PDP-word 2
  1372 In-F-intern-long 1
  1373 In-F-intern-long 2
  1374 In-F-Convert Reference

The function *Convert PDP/intern* converts frequency values in Profibus notation to frequency values in device-internal notation and vice versa. See Chapter 16.4.5 "PZD2, Reference Value / Actual Value".

Frequency Converter Profibus Notation / Internal Notation



The scaling for In_F_PDP_word1/2 and Out_F_PDPconv_word1/2 is:

Standardization			
Reference Value	**Binary**	**Decimal**	**Hexadecimal**
+ 100%	$+ 2^{14}$	16384	0x4000
- 100%	$- 2^{14}$	49152	0xC000

The possible range = ±200% = +32768 to -32768 = 0x7FFF to 0x8000

This function uses its own reference value *Convert-Reference* **1374** for data conversion. The benefit of this function is the usage of the word data type for frequency values, instead of long.

Note: The usage of this function and the usage of In-PZD/Out-PZD objects is shown in the sample project documented with:

- CM_PDPV1_conf.pdf Cluster with one inverter and CM-PDPV1 and three additional inverters coupled by Systembus
- CM_PDPV1_S7.pdf Functional description
- CC_0B2C.zip Complete STEP7 project including samples for In/Out-PZD usage and parameter access via PKW object and V1 channel
- S7-SoftwareOB1.pdf Listing of OB1 from STEP7 project

16.4.1 PZD1, Control Word / Status Word

In PZD1, the master gives its control commands (control word) to the frequency inverter in the output data set and receives the information on its state (status word) in the input data set.

- **412 Local/Remote**

The control of the frequency inverter can be carried out with three different operation modes. These are set via the data set change-over capable parameter *Local/Remote* **412**.

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory Setting**
412	Local/Remote	0	44	44

For operation on the Profibus, only the settings 0, 1 and 2 are relevant. The remaining settings relate to the possibilities of control via the KP500 control unit.

Operation Mode		Function
0 -	Control via contacts	The Start and Stop command as well as the statement of the direction of rotation are set via digital signals.
1 -	Control via state machine	The Start and Stop command as well as the statement of the direction of rotation are set via the DRIVECOM State machine of the communication interface.
2 -	Control via remote contacts	The Start and Stop command as well as the statement of the direction of rotation are set via logic signals by the communication protocol.

Control word STW and state word ZSW have different contents depending on the operation mode. In each case, all or only some of the bits in the control word are relevant and also only certain feedbacks are possible via the status word. These are explained later in the descriptions of the three possible operation modes.

Note: Parameter *Local/Remote* **412** is data set change-over capable. Thus, switching over between various operation modes via the data set selection is possible. For example, it is possible to control a frequency inverter via the bus and to activate a local emergency operation if the bus master breaks down. This switch-over is also visible via the state word (Bit Remote).

Note: Parameter *Control word* **410** is linked internally to the Control word STW of Out-PZD1. Avoid, changing *Control word* **410** via parameter access.
Parameter *Status word* **411** is linked internally to the Status word ZSW of In-PZD1.

- **414 Data Set Selection**

Data set change-over can be carried out locally on the frequency inverter via contact inputs, or via the bus. For data set change-over via the bus, Parameter *Data Set Selection* **414** is used.

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory Setting**
414	Data Set Selection	0	5	0

With *Data Set Selection* **414** = 0, data set switch-over via contact inputs is active. If *Data Set Selection* **414** has been set to 1, 2, 3, or 4, then the corresponding data set has been activated. Data set switch-over via the contact inputs is then deactivated.

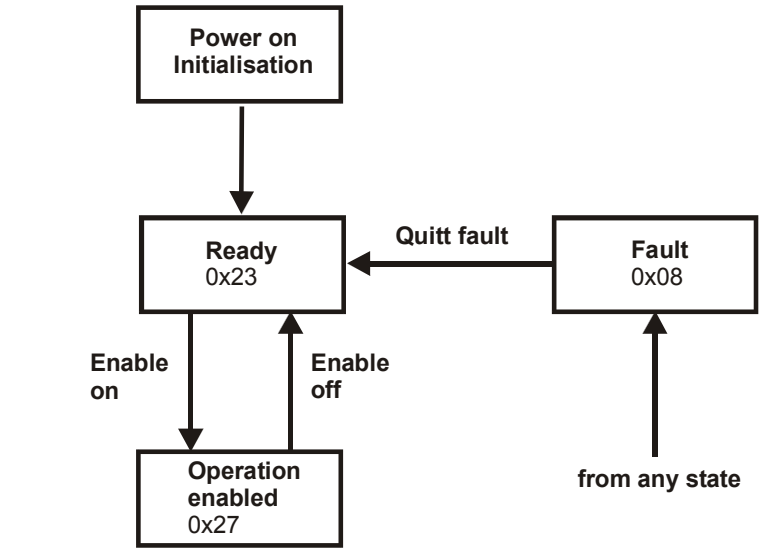
If *Data Set Selection* **414** is set to 5, then the data set switch-over only occurs if the frequency inverter is not released.

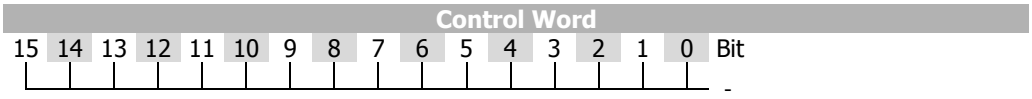
Via Parameter *Active data set* **249**, the currently selected data set can be read out. *Active data set* **249** states the activated data set with the value 1, 2, 3 or 4. This is independent of whether the data set change-over was carried out via control inputs or via *Data Set Selection* **414**.

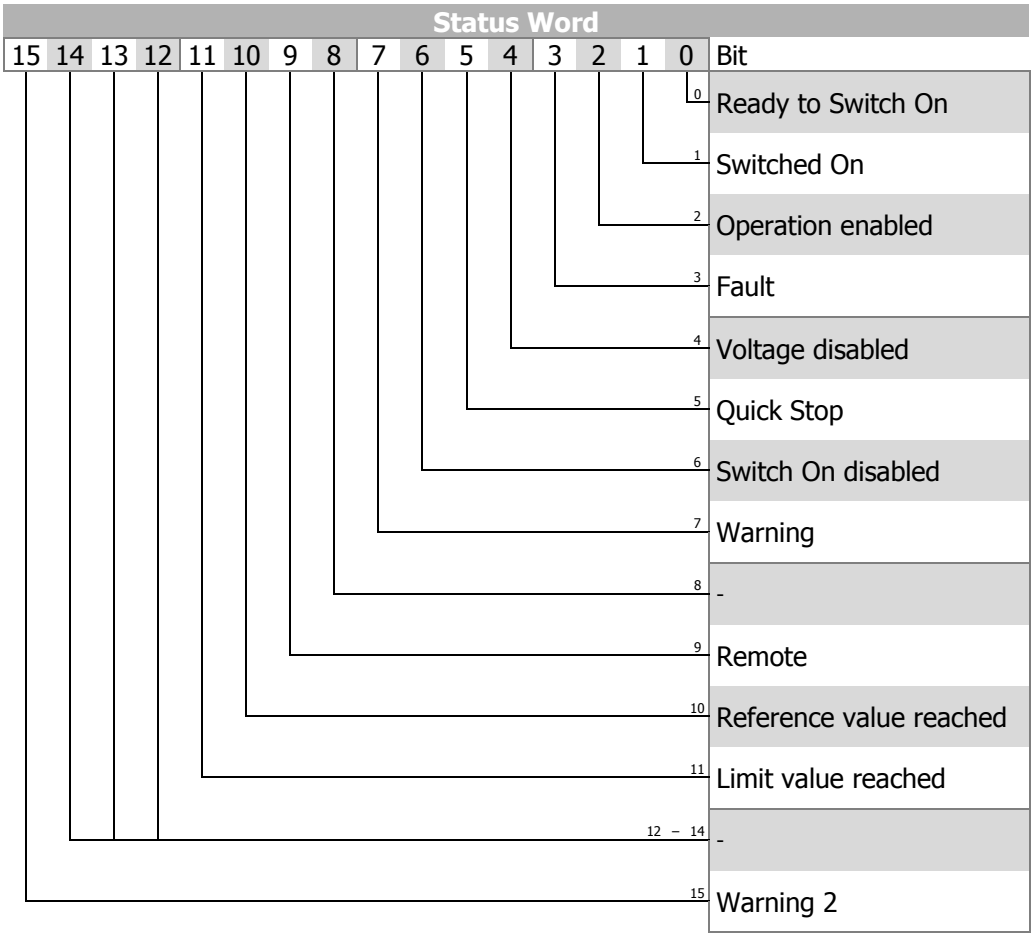
16.4.2 Control via Contacts

In operation mode "Control via Contacts" (*Local/Remote* **412** = 0), the frequency inverter is controlled via the contact inputs S2IND to S6IND. The meaning of these inputs can be taken from the operating instructions. The control word in PZD1 is not relevant for this operation mode.

State machine: The values displayed in the states are reflected in the status word (Bit 0 to Bit 6) in PZD1.







The Status Word reflects the operation state.

Status Word							
State	**HEX (*)**	**Bit 6**	**Bit 5**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Switched On	0x23	0	1	0	0	1	1
Operation enabled	0x27	0	1	0	1	1	1
Fault	0x08	0	x	1	0	0	0

(*) without considering bits 7 to bit 15

Note: The occurrence of a fault leads to a switch-over to the "Fault" state.

Bit 7 "**Warning"** can be set at any time. It indicates a device-internal warning message. The evaluation of the present warning is carried out by reading out the warning status with Parameter *Warnings* **270**.

Bit 9 "**Remote**" is always = 0.

Bit 10 "**Reference value reached"** is set whenever the specified reference value has been reached. In the special case of power failure regulation, the bit is also set if the power failure regulation has reached the frequency 0 Hz (see operating instructions). For "Reference value reached‟ there is a hysteresis (tolerance range), which can be set via parameter *Reference Value Reached: Hysteresis* **549** (see operating instructions).

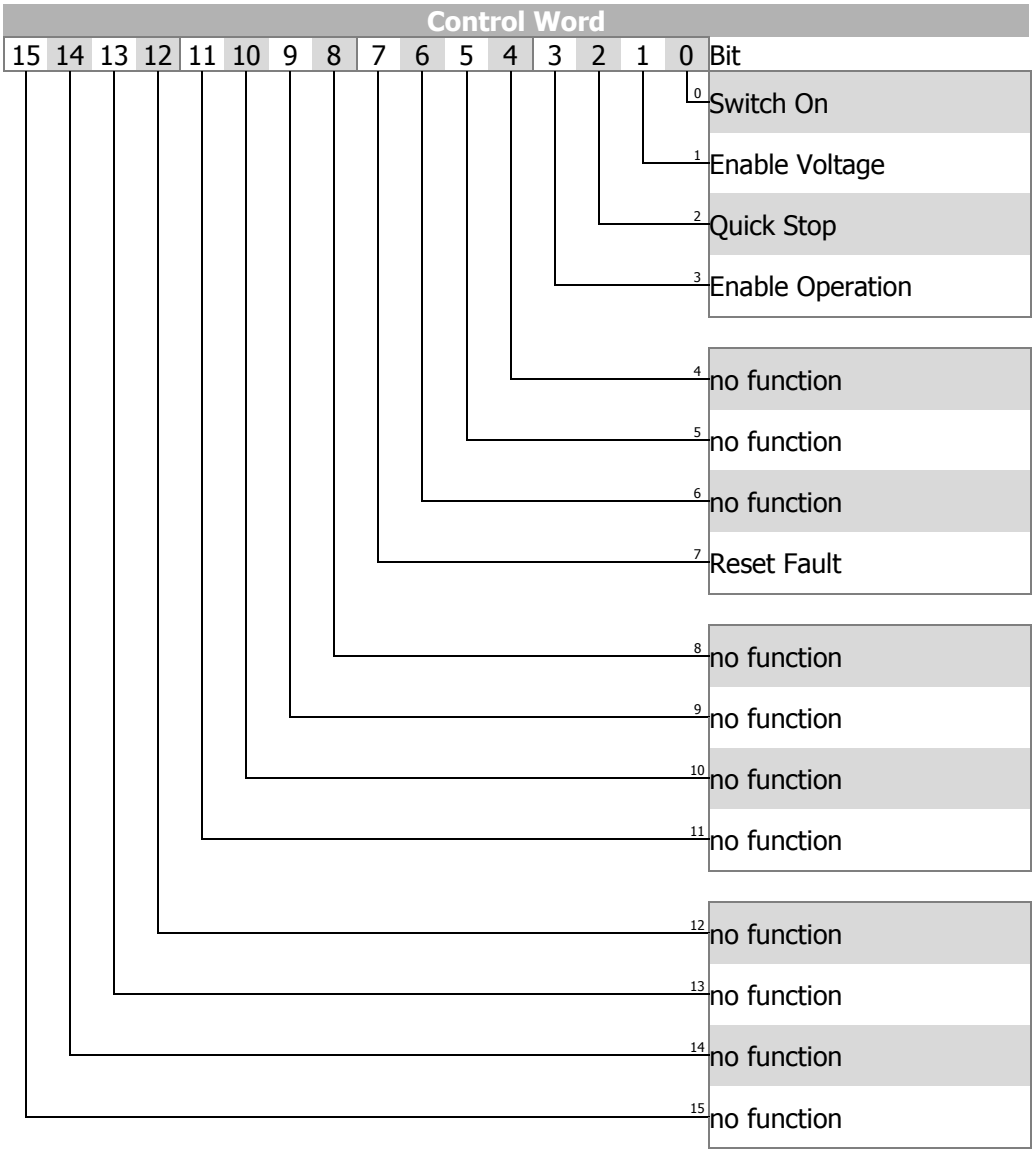
Bit 11 **"Limit value reached"** indicates that an internal limit is active. This can, for example, be the present current limit, the torque limit or the over-voltage limit. All the functions lead to the reference value being quit or not reached.

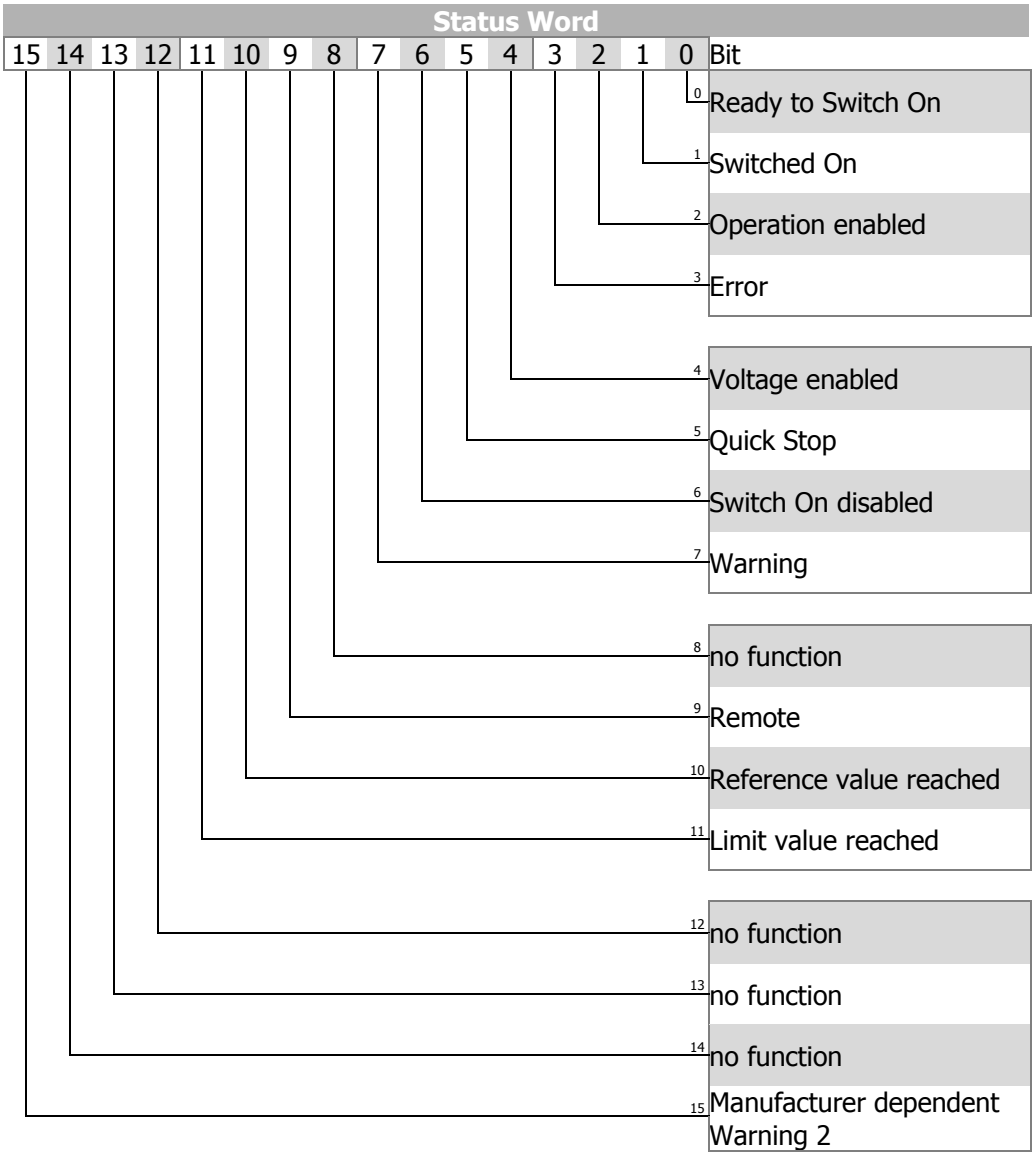
Bit 15 **"Warning 2"** indicates a warning which leads to a fault switch-off of the frequency inverter within a short period of time. This bit is set if there is a warning for motor temperature, heat sink/inside temperature, Ixt monitoring or mains phase failure.

16.4.3 Control via State Machine

In the operation mode control via state machine (*Local/Remote* **412** = 1), the frequency inverter is controlled via the control word in PZD1. The diagram shows the possible states.

State transition 4 to state "Operation enabled" is only possible if the controller release via STOA and STOB and a digital input for Start Clockwise or Start Anticlockwise are set.





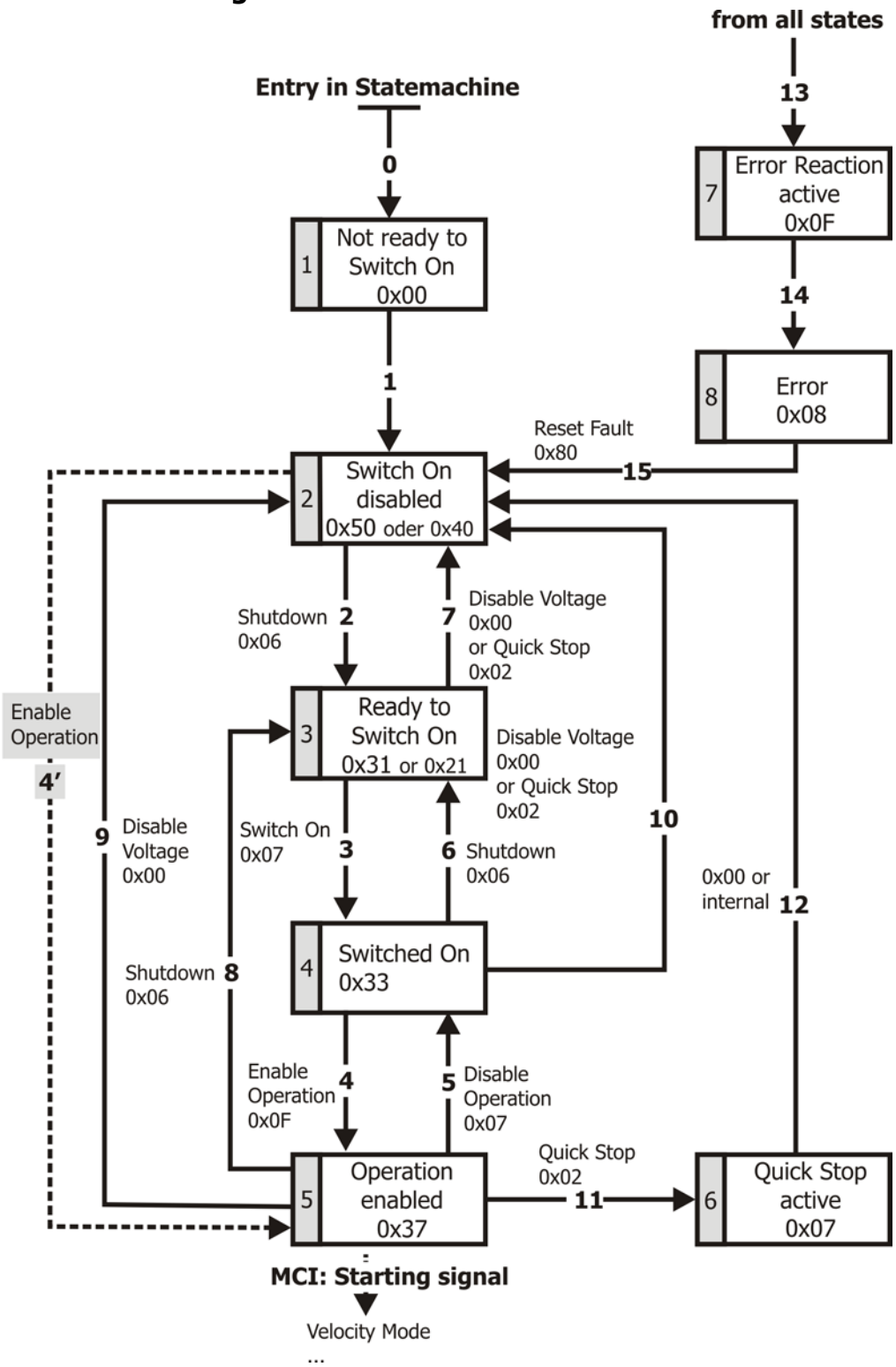
Bit 4 "Voltage enabled" of the Status Word indicates the current state of the mains supply.

Bit 4 "Voltage enabled" = 0 signals "no mains supply" and that starting the drive is not possible.

Bit 4 "Voltage enabled" = 0 signals "mains supply switched on" and drive ready for starting.

Note:
The frequency inverter supports an external 24V supply for the control logic of the inverter. Even if the mains are not switched on, communication between the PLC and the inverter can still be established.

16.4.3.1 State machine diagram



The device control commands are triggered by the following bit pattern in the Control Word:

Control Word						
Command	Bit 7 **Reset Fault**	Bit 3 **Enable Operation**	Bit 2 **Quick Stop**	Bit 1 **Enable Voltage**	Bit 0 **Switch On**	**Transitions**
Shutdown	X	X	**1**	**1**	**0**	2, 6, 8
Switch On	X	**0**	**1**	**1**	**1**	3
Switch On	X	**1**	**1**	**1**	**1**	3
Disable Voltage	X	X	X	0	X	7, 9, 10, 12

Quick Stop	X	X	**0**	**1**	X	7, 10, 11
Disable Operation	X	**0**	**1**	**1**	**1**	5
Enable Operation	X	**1**	**1**	**1**	**1**	4
Reset Fault	**0 ⇨ 1**	x	x	x	x	15

"X" means any value.

Note:
State transition 3 (command "Switch On") is only processed if Bit 4 "Voltage enabled" of the Status Word is set.

State transition 4 is only processed if Bit 4 "Voltage enabled" of the Status Word is set.

The Status Word displays the current operation state.

Status Word						
	Bit 6	Bit 5	Bit 3	Bit 2	Bit 1	Bit 0
State	**Switch On disabled**	**Quick Stop**	**Fault**	**Operation enabled**	**Switched On**	**Ready to Switch On**
Switch On disabled	**1**	X	**0**	**0**	**0**	**0**
Ready to Switch On	**0**	**1**	**0**	**0**	**0**	**1**
Switched On	**0**	**1**	**0**	**0**	**1**	**1**
Operation enabled	**0**	**1**	**0**	**1**	**1**	**1**
Quick Stop active	**0**	**0**	**0**	**1**	**1**	**1**
Fault Reaction active	**0**	X	**1**	**1**	**1**	**1**
Fault	**0**	X	**1**	**0**	**0**	**0**

"X" means any value.

Bit 7 "**Warning**" can be set at any time. It indicates a device-internal warning message. The evaluation of the warning reason is carried out by reading out the warning status with Parameter *Warnings* **270**.

Bit 9 "**Remote**" is set if the operation mode "control via state machine" (*Local/Remote* **412** = 1) has been set **and** the hardware release is available.

Logic linking of the digital control signals:

(STOA **AND** STOB) **AND** (Start clockwise **OR** Start anticlockwise)

The frequency inverter can only be controlled if the logic linking is true. The logic inputs for Start clockwise and Start anticlockwise can be connected directly to "ON" or "OFF" (Parameter *Start-clockwise* **68** and *Start-anticlockwise* **69**).

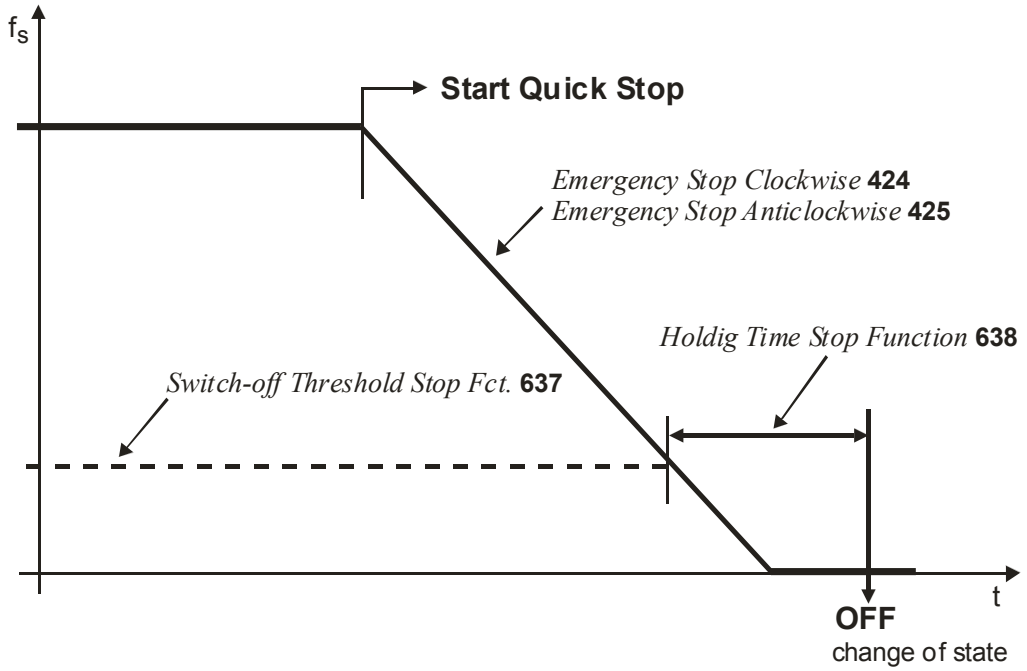
Bit 10 **"Target reached"** is set whenever the specified reference value has been reached.
In the special case of power failure regulation, the bit is also set if the power failure regulation has reached the frequency 0 Hz (see operating instructions).
For "Target reached" there is a hysteresis (tolerance range), which can be set via parameter *Reference Value Reached: Hysteresis* **549** (see operating instructions).

Bit 11 **"Internal limit active"** indicates that an internal limit is active. This can, for example, be the present current limit, the torque limit or the over-voltage limit. All of these limit functions lead to the reference value being quit or not reached.

Bit 15 **"Warning 2"** indicates a warning which leads to a fault switch-off of the frequency inverter within a short period of time. This bit is set if there is a warning for motor temperature, heat sink/inside temperature, Ixt monitoring or mains phase failure.

16.4.3.2 Behavior in Quick Stop

In this, the parameters *Switch-off Threshold Stop Function* **637** (percent of fmax) and *Holding Time Stop Function* **638** (holding time after falling short of the switch-off threshold) are relevant. In a quick stop, the drive is shut down via the emergency stop ramps (*Emergency Stop Clockwise* **424** or *Emergency Stop Antclockwise* **425**).



If the frequency/speed zero has been reached during the holding time, the drive continues to be supplied with direct current until the switch-off time has expired. With this measure, there is an assurance that the drive is stationary in a change of state.

16.4.3.3 Behavior in Transition 5

- **392 State transition 5**

The behavior in transition 5 from "Operation enabled" to "Switched on" can be parameterized. The behavior is set via Parameter *State transition 5* **392**.

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory Setting**
392	State transition 5	0	2	2

Operation Mode	Function
0 - Coast to stop	immediate transition from "Operation enabled" to "Ready", free stoppage of the drive
1 - DC brake	activation of DC brake, with the end of DC braking there is the change from "Operation enabled" to "Ready"
2 - Ramp	transmission with normal stop ramp, after reaching standstill, there is a change from "Operation enabled" to "Ready"

Note: Operation Mode "1 - DC brake" is only possible in applications with v/f characteristic (e.g. configuration 110), as other applications do not know such an operation mode.
If the frequency inverter is operated with a configuration which does not know the DC braking operation mode (e.g. configuration 210, "field-orientation speed controlled"), value "1" cannot be set. It is also not offered in the selection menus of the Operator Panel or the VPlus PC-Software.

Note: The default value for parameter *State transition 5* **392** is operation mode "2 – Ramp". For configurations with torque control, the default value is operation mode "0 – Coast to stop". If the configuration is changed, the value set for *State transition 5* **392** is also altered, if necessary.

If transition 5 has been triggered with *State transition 5* **392** = "1 - DC brake", a new control word is only accepted after the completion of the transition process. The change of state from "Operation enabled" to "Ready" is carried out after the expiry of the time *Braking time* **632** parameterized for the DC brake.

If parameter *State transition 5* **392** = "2 - Ramp" has been set, the control word can be set back to 0x0F during the stoppage of the drive. In this method, the drive runs back up to its set reference value and remains in the state "Operation enabled".

The change of state from "Operation enabled" to "Ready" is carried out after the set switch-off threshold has been reached **and** the set holding time has expired (equivalent to the behavior in a quick stop). In this, the parameters *Switch-off Threshold Stop Function* **637** (percent of fmax) and *Holding Time Stop Function* **638** (holding time after switch-off threshold reached) are relevant.

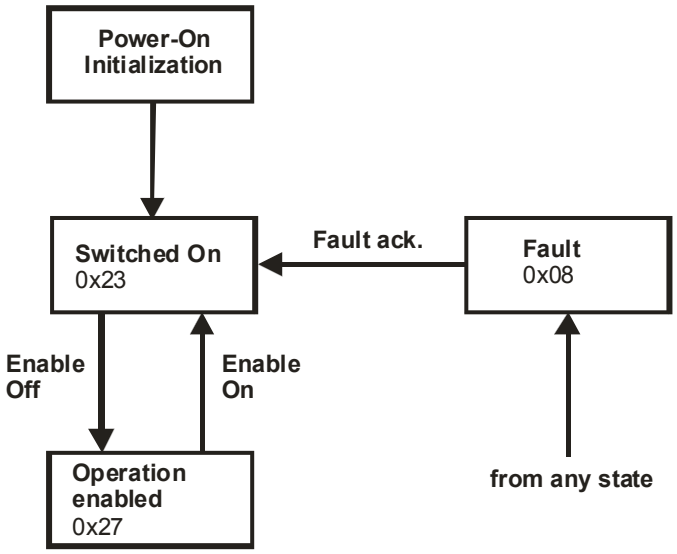
16.4.4 Control via Remote Contacts

In the operation mode *Local/Remote* **412** = "2 - Control via remote contacts", the frequency inverter is controlled via the control word in PZD1, with the bits 0 to 9 corresponding to the contact inputs S1IND to S6IND, multifunctional input MFI1D and the inputs EM-S1IND to EM-S3IND of an expansion module.
In the use of the remote contacts, the frequency inverter behaves in the same way as in control via the hardware contact inputs. The meaning of these inputs can be taken from the operating instructions.

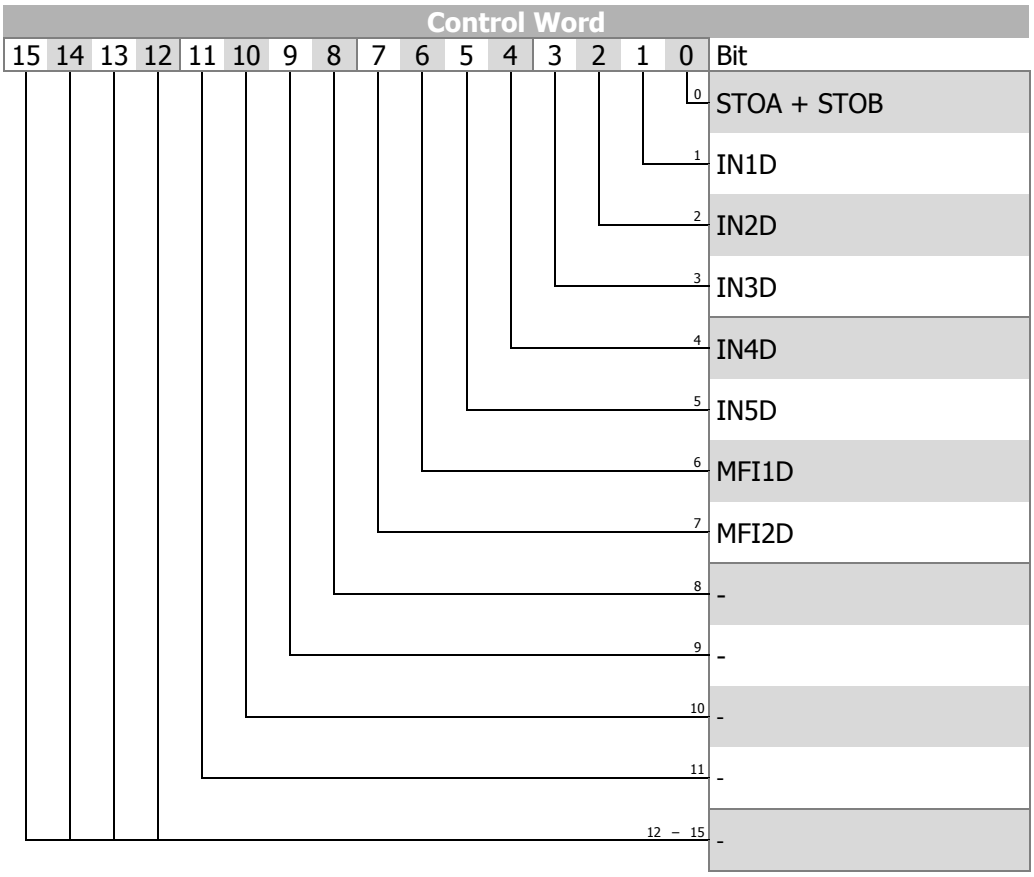
Note: Release is only possible if the hardware release is available via the digital inputs STOA and STOB.

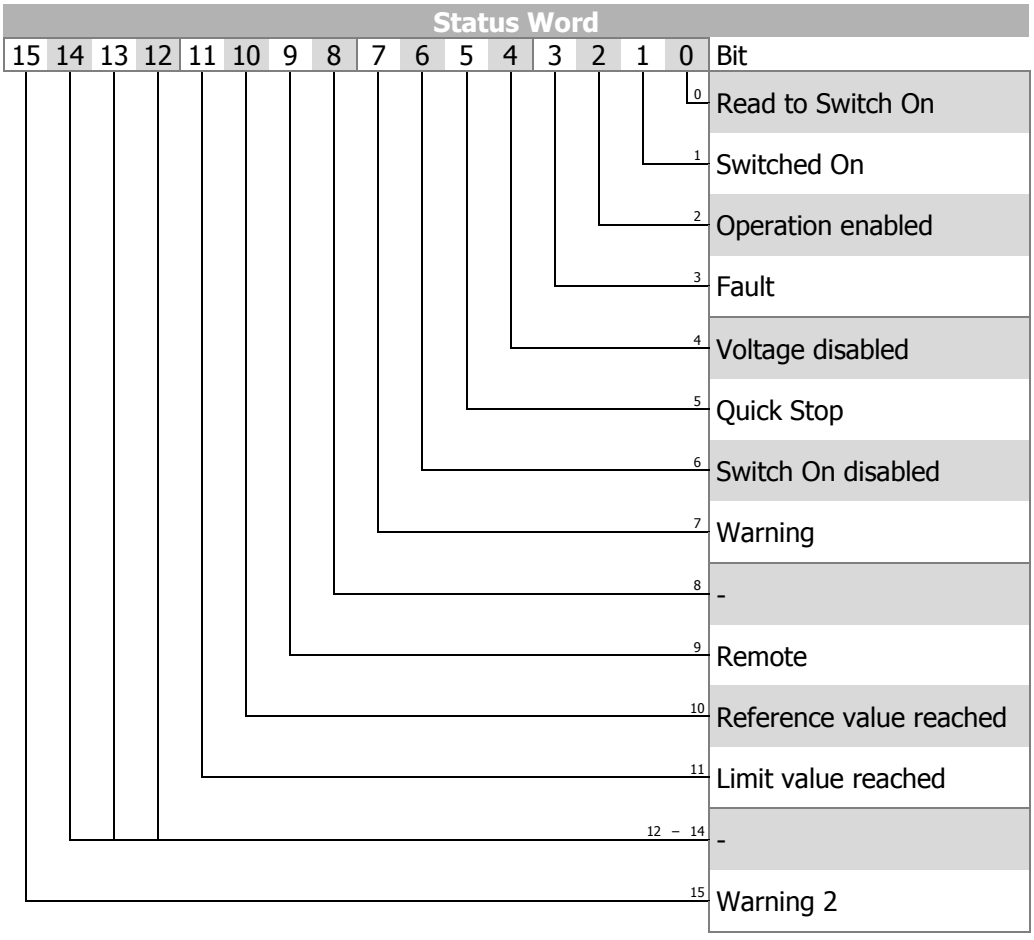
State machine:

The values displayed in the states are reflected in the status word (Bit 0 to 6) in PZD1.



Note: The inputs set via the control word can be observed with the help of parameter *Digital Inputs* **250**. Digital input "Inverter Release" is only displayed as being set if the hardware release is available **and** the control word/Bit 0 has been set.
If the data set switch-over is used, please make sure that parameter *Local/Remote* **412** is set to operation mode "2 – Control via remote contacts" in all the data sets used.


Control Word
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Bit
0 STOA + STOB
1 IN1D
2 IN2D
3 IN3D
4 IN4D
5 IN5D
6 MFI1D
7 MFI2D
8 -
9 -
10 -
11 -
12 – 15 -


Status Word
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Bit
0 Read to Switch On
1 Switched On
2 Operation enabled
3 Fault
4 Voltage disabled
5 Quick Stop
6 Switch On disabled
7 Warning
8 -
9 Remote
10 Reference value reached
11 Limit value reached
12 – 14 -
15 Warning 2

Status Word							
State	**HEX (*)**	**Bit 6**	**Bit 5**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Switch On	0x23	0	1	0	0	1	1
Operation enabled	0x27	0	1	0	1	1	1
Fault	0x08	0	x	1	0	0	0

(*) without considering bits 7 to bit 15

Note: The occurrence of a fault leads to a switch-over to the "Fault" state.
A fault can only be acknowledged 15 seconds after its occurrence, as a blocking time is active internally.

Bit 7 **"Warning"** can be set at any time. It indicates a device-internal warning message. The evaluation of the present warning is carried out by reading out the warning status with parameter *Warnings* **270**.

Bit 9 **"Remote"** is set if the operation mode control via remote contacts (*Local/Remote* **412** = 2) has been set **and** the hardware release is available. Only then can the frequency inverter be controlled via the control word.

Bit 10 **"Reference value reached"** is set whenever the specified reference value has been reached. In the special case of power failure regulation, the bit is also set if the power failure regulation has reached the frequency 0 Hz (see operating instructions). For "Reference value reached" there is a hysteresis (tolerance range), which can be set via parameter *Reference Value Reached: Hysteresis* **549** (see operating instructions).

Bit 11 **"Limit value active"** indicates that an internal limit is active. This can, for example, be the present current limit, the torque limit or the over-voltage limit. All the functions lead to the reference value being quit or not reached.

Bit 15 **"Warning 2"** indicates a warning which leads to a fault switch-off of the frequency inverter within a short period of time. This bit is set if there is a warning for motor temperature, heat sink/inside temperature, Ixt monitoring or mains phase failure.

Note: With the use of remote contacts the signal sources* are taken over from the *Control Word* **410**. Signals at the hardware contacts (terminals) are not evaluated by the standard operation modes (e.g. 71 for S2IND).
For the evaluation of terminal signals special operation modes are available. They are denoted with the additional term "(Hardware)" and numbered from 526 to 546.
Exception: The controller release via the hardware contacts STOA (terminal X210A.3) and STOB (terminal X210B.2) must be set and Bit 0 "Inverter Release" of the Control Word must be set.
It is not possible to release the controller only via software.

* Signal sources are:
IN1D ... IN5D,
MFI1D, MFI2D

16.4.5 PZD2, Reference Value / Actual Value

In the PZD2, the master gives its reference value to the frequency inverter in the output data set and gets information back on its actual value in the input data set.

The use of the reference/actual value channel depends on the configuration setting (control system). The actual value is generated from one of the sources according to the control system.

- **390 Profibus Reference**

The reference value and actual value are related to the Parameter *Rated frequency* **375 OR** the Parameter *Profibus Reference* **390**.

The distinction is made via the setting of parameter *Profibus Reference* **390**. If *Profibus Reference* **390** = 0, *Rated frequency* **375** is the reference variable. If *Profibus Reference* **390** ≠ 0, *Profibus Reference* **390** is used as the reference variable. Both parameters are capable of data set change-over.

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory Setting**
375	Rated Frequency	10,00 Hz	1000,00 Hz	50,00 Hz
390	Profibus Reference	0,00 Hz	999,99 Hz	0,00 Hz

Reference and actual values are transmitted in a standardized form. The standardization is carried out by the variables being related to the reference value (*Rated frequency* **375 OR** *Profibus reference* **390**).

Standardization			
Reference Value	**Binary**	**Decimal**	**Hexadecimal**
+ 100%	$+ 2^{14}$	16384	0x4000
- 100%	$- 2^{14}$	49152	0xC000

The possible range = ±200 % = +32768 to -32768 = 0x7FFF to 0x8000

Example: The setting of parameter *Profibus Reference* **390** is the reference value 60.00 Hz. The required reference frequency is 30.00 Hz. This means 50% of the reference value, thus the set point 8192 (0x2000) has to be transmitted.

With the reference value *Profibus Reference* **390** a machine can also be operated in the field weakening area above its reference frequency.

Example: The parameter *Rated frequency* **375** is set to a frequency of 50.00 Hz. With the setting of parameter *Profibus Reference* **390** to 100.00 Hz the value range of ± 200 Hz is possible.

The reference value for the frequency inverter from PZD2 is provided by the Fieldbus Reference Value.
In the Reference Frequency Channel, setting "20 – Fieldbus Reference Value" can be selected via *Reference Frequency Value Source 1* **475** or *Reference Frequency Value Source* **492**.

Actual Values		
Parameter	**Content**	**Format**
Internal reference frequency **228**	Sum of *Reference Frequency Value Source 1* **475** and *Reference Frequency Value Source 2* **492**.	xxx,xx Hz
Reference bus frequency **282**	Fieldbus reference value from Profibus.	xxx,xx Hz
Reference ramp frequency **283**	Actual Ramp Reference Frequency.	xxx,xx Hz

16.5 Actual Value Display of Profibus Data

For analysis purposes, *DP-Master OUT* **281** and *DP-Master IN* **284** are displayed in the data transmitted via the Profibus under the actual value parameters.

The parameters are situated in the **"Actual values\Actual values frequency inverter"** menu of the VPlus PC-Software.
In these parameters, the data transmitted via the Profibus are displayed in a processed and comprehensible form. The contents of the process data channel with control word, reference value etc. are permanently updated. As the communication channel has the contents zero in idling and transmission is very fast, the contents of the communication channel are stored on the device side and displayed in the actual value parameters with every transmission.

The displayed content of the communication channel does not correspond to the current state, but the last transmission.

The following diagrams show the display for a configuration setting with PPO2. The PPO2 includes the communication PKW channel for parameter access and 6 PZD objects with default settings for In-PZD objects.

Actual Value

Parameter *DP-Master OUT* **281**
= **C:** a nnnn **I:** iiii 00 **V:** wwwwww cccc rrrr xxxx xxxx xxxx xxxx

Meaning			
C: a	a	= request identification	hexadecimal
C: nnnn	nnnn	= parameter number	decimal
I: iiii	iiii	= index	hexadecimal
V: ww..w	ww..w	= parameter value	decimal (with sign in front)
cccc	PZD1	= control word	hexadecimal
rrrr	PZD2	= reference value	hexadecimal, relative to 0x4000 = 100% of the reference value
xxxx	PZD3	user defined	hexadecimal
xxxx	PZD4	user defined	hexadecimal
xxxx	PZD5	user defined	hexadecimal
xxxx	PZD6	user defined	hexadecimal

Actual Value

Parameter *DP-Master IN* **284**
= **C:** a nnnn **I:** iiii 00 **V:** wwwwww cccc ssss xxxx xxxx xxxx xxxx

Meaning			
C: a	a	= reply identification	hexadecimal
C: nnnn	nnnn	= parameter number	decimal
I: iiii	iiii	= index	hexadecimal
V: ww..w	ww..w	= parameter value	decimal (with sign in front)
cccc	PZD1	= state word	hexadecimal
ssss	PZD2	= actual value	hexadecimal, relative to 0x4000 = 100% of the reference value
xxxx	PZD3	= abs. current	hexadecimal, relative to 0x4000 = 100% of the rated motor current
xxxx	PZD4	= active current	hexadecimal, relative to 0x4000 = 100% of the rated motor current
xxxx	PZD5	= Warning	hexadecimal (bit-coded)
xxxx	PZD6	= Fault	hexadecimal

Example:

Actual Value

Parameter *DP-Master OUT* **281**
= **C:** 6 480 **I:** 0300 **V:** -005500 000F 2000 0000 0000 0000 0000

Meaning	
C: 6	Request identification = 6 (Read parameter value Array)
C: 480	Parameter number = 480 (Fixed frequency 1)
I: 0300	Data set = 3
V: -005500	Parameter value = -5500 = -55.00 Hz (0xFFFEA84 hexadecimal)
000F	Release command (transition 4)
2000	Set point = 0x2000 = 50% of the reference value
0000	not used
0000	not used
0000	not used
0000	not used

Actual Value

Parameter *DP-Master IN* **284**
= **C:** 5 480 **I:** 03 00 **V:** -005500 06A7 2000 1147 0CCC 0800 0000

Meaning	
C: 5	Reply identification = 5 (Transmit parameter value long Array)
C: 480	Parameter number = 480 (Fixed frequency 1)
I: 03 00	Data set = 3
V: -005500	Parameter value = -5500 = -55.00 Hz (0xFFFEA84 hexadecimal)
06A7	State = 0x27 "Operation enabled" (Bit 0 ... 6), Warning 2 present (Bit 15 = 1 threat of fault switch-off), reference value reached (Bit 10 = 1), remote operation (Bit 9 = 1), Warning present (Bit 7 = 1)
2000	Actual value = 0x2000 = 50% of the reference value
1147	Abs. current = 0x1147 = 27% of the rated motor current
0CCC	Active current = 0x0CCC = 20% of the rated motor current
0800	Warning, Warning motor temperature available
0000	Fault, no fault pending

17 Parameter List

The parameter list is structured according to the menu branches of the Operator Panel. For better clarity, the parameters have been marked with pictograms:

The parameter is available in the four data sets

☑ The parameter value is set by the SET-UP routine

⊗ This parameter cannot be written when the frequency inverter is in operation

17.1 Actual Values

Actual Values of the Frequency Inverter				
No.	**Description**	**Units**	**Display Range**	**Chapter**
228	Internal Reference Frequency	Hz	-1000,00 ... 1000,00	16.4.5
249	Active Data Set	-	1 ... 4	16.4.1
250	Digital Inputs	-	0 ... 255	16.4.4
260	Actual Error	-	0 ... 0xFFFF	18.2
270	Warnings	-	0 ... 0xFFFF	18.1
274	Application Warnings	-	0 ... 0xFFFF	18.2
281	DP-Master OUT	-	String	16.5
282	Reference bus frequency	Hz	-1000,00 ... 1000,00	16.4.5
283	Reference ramp frequency	Hz	-1000,00 ... 1000,00	16.4.5
284	DP-Master IN	-	String	16.5
365	Status Control	-	0 ... 7	11
366	Status Fieldbus Module	-	1 ... 15	11
411	Status Word	-	0 ... 0xFFFF	16.4.1

Note: The Parameters *DP Master OUT* **281** and *DP Master IN* **284** can only be displayed via the VPlus PC-Software.
The Parameters *Actual Error* **270**, *Warnings* **270** and *Application Warnings* **274** are only accessible via the communication channel of objects PPO1, PPO2 and DP-V1. They cannot be accessed via the VPlus PC-Software or the Operator Panel.

17.2 Parameters

Profibus				
No.	**Description**	**Units**	**Value Range**	**Chapter**
329	DP-V1 Mode	-	1 ... 2	16.2
Rated Motor Parameters				
375	Rated Frequency	Hz	10,00 ... 1000,00	16.4.5
Profibus				
390	Profibus Reference	Hz	0,00 ... 999,99	16.4.5
391	Profibus Node-ID	-	-1 ... 126	9
Bus Control				
392	State Transition 5	-	0 ... 2	16.4.3.2
Profibus				
393	Profibus Error Reaction	-	0 ... 3	12
Bus Control				
410	Steuerwort	-	0 ... 0xFFFF	16.4.1
412	Local/Remote	-	0 ... 44	16.4.1
Data Set change-over				
414	Data Set selection	-	0 ... 4	16.4.1
Frequency Ramps				
424	Emergency stop clockwise	Hz/s	0,01 ... 9999,99	16.4.3.1
425	Emergency stop anticlockwise	Hz/s	0,01 ... 9999,99	16.4.3.1
Digital Outputs				
549	Reference Value Reached:Hysteresis	%	0,01 ... 20,00	16.4.2
Stopping Behavior				
637	Switch-off Threshold	%	0,0 ... 100,0	16.4.3.1
638	Holding Time Stop Function	s	0,0 ... 200,0	16.4.3.1
Profibus				
1300	In-PZD 3 Boolean	-		16.3.3
.				
.	all In-PZD Parameter			
.				
1339	In-PZD 17/18 Long	-		
Profibus				
1370	In-F-PDP-word 1	-	Selection	16.4
1371	In-F-PDP-word 2	-	Selection	16.4
1372	In-F-intern-long 1	-	Selection	16.4
1373	In-F-intern-long 2	-	Selection	16.4
1374	In-F-Convert-Reference	Hz	0.01...999.99 Hz	16.4

Note: Parameter *Data Set Selection* **414** is only accessible via the communication channel of objects PPO1 and PPO2. It cannot be accessed via the Vplus PC-Software or the Operator Panel.

18 Annex

18.1 Warning Messages

The various control functions and methods and the hardware of the frequency inverter contain functions that continuously monitor the application. In addition to the messages documented in the manual, the following warning messages are activated by the Profibus-DP communication module CM-PDPV1.
The warning messages are given via parameter *Warnings* **270**, bit-coded according to the following scheme.
Parameter *Warnings* **269** shows the warnings in clear text on the operator panel and the PC software tool VPlus.
Use Parameter *Warnings* **270** to access the warning codes via Profibus.

Warning Messages		
Bit-No.	**Warning Code**	**Description**
0	0x0001	Warning Ixt
1	0x0002	Warning Short Term - Ixt
2	0x0004	Warning Long Term - Ixt
3	0x0008	Warning Heat Sink Temperature Tk
4	0x0010	Warning Inside Temperature
5	0x0020	Warning Limit
6	0x0040	Warning Init
7	0x0080	Warning Motor Temperature
8	0x0100	Warning Mains Failure
9	0x0200	Warning Motor Protective Switch
10	0x0400	Warning Fmax
11	0x0800	Warning Analog Input MFI1A
12	0x1000	Warning Analog Input MFI2A
13	0x2000	Warning Systembus
14	0x4000	Warning Udc
15	0x8000	Warning Application

Note: The meaning of the individual warnings are described in detail in the operating instructions.

18.2 Warning Messages Application

When the highest bit in the Warning messages is set, a "Warning Message Application" is present. The Application warning messages are given via parameter *Application Warnings* **274**, bit-coded according to the following scheme.
Parameter *Application Warnings* **273** shows the warnings in clear text on the operator panel and the PC software tool VPlus.
Use Parameter *Application Warnings* **274** to access the Application warning codes via Profibus.

Warning Messages		
Bit-No.	**Warning Code**	**Description**
0	0x0001	BELT
1	0x0002	(reserved)
2	0x0004	(reserved)
3	0x0008	(reserved)
4	0x0010	(reserved)
5	0x0020	(reserved)
6	0x0040	SERVICE
7	0x0080	User 1
8	0x0100	User 2
9	0x0200	(reserved)
10	0x0400	(reserved)
11	0x0800	(reserved)
12	0x1000	(reserved)
13	0x2000	(reserved)
14	0x4000	(reserved)
15	0x8000	(reserved)

Note: The meaning of the individual warnings are described in detail in the operating instructions.

18.3 Error Messages

The error code that is stored after a fault occurs is made up of the fault group FXX (high Byte, hexadecimal) followed by the code number XX (low Byte, hexadecimal).

Communication Fault		
Code		**Meaning**
F20	62	Profibus OFF (communication connection to DP Master lost)*
F26	02	Communication watchdog CM-PDPV1 / inverter controller

* This message only appears whenever *Profibus Error Reaction* **393** = 1 – Error.

The Actual error message can also be read out by parameter access via parameter *Actual Fault* **260**.
Parameter *Actual Error* **259** shows the actual error in clear text on the operator panel and the PC software tool VPlus.
In addition to the fault messages stated, there are further fault messages used for internal purposes only and which are not listed here. If you receive any fault messages which are not listed, please contact us by phone.

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