



# COMBIVERT F5

INSTRUCTIONS FOR USE | INSTALLATION F5 PROFINET OPERATOR

Translation of the original manual  
Document 20098495 EN 03



# Preface

The described hard- and software are developments of the KEB Automation KG. The enclosed documents correspond to conditions valid at printing. Misprint, mistakes and technical changes reserved.

## Signal words and symbols

Certain operations can cause hazards during the installation, operation or thereafter. There are safety informations in the documentation in front of these operations. Security signs are located on the device or machine. A warning contains signal words which are explained in the following table:

<b>DANGER</b>	Dangerous situation, which will cause death or serious injury in case of non-observance of this safety instruction.
<b>WARNING</b>	Dangerous situation, which may cause death or serious injury in case of non-observance of this safety instruction.
<b>CAUTION</b>	Dangerous situation, which may cause minor injury in case of non-observance of this safety instruction.
<b>NOTICE</b>	Situation, which can cause damage to property in case of non-observance.

### RESTRICTION

Is used when certain conditions must meet the validity of statements or the result is limited to a certain validity range.



Is used when the result will be better, more economic or trouble-free by following these procedures.

## More symbols

- ▶ This arrow starts an action step.
- / - Enumerations are marked with dots or indents.
- => Cross reference to another chapter or another page.



Note to further documentation.  
[www.keb.de/nc/search](http://www.keb.de/nc/search)



## Laws and guidelines

KEB Automation KG confirms with the EC declaration of conformity with the CE mark on the unit name plate, that the device complies with the essential safety requirements. The EC declaration of conformity can be downloaded on demand via our website. Further information is provided in chapter "Certification".

## Warranty

The warranty on design, material or workmanship for the acquired device is given in the current terms and conditions.



Here you will find our current terms and conditions.  
[www.keb.de/terms-and-conditions](http://www.keb.de/terms-and-conditions)



Further agreements or specifications require a written confirmation.

## Support

Through multiple applications not every imaginable case has been taken into account. If you require further information or if problems occur which are not treated detailed in the documentation, you can request the necessary information via the local KEB Automation KG agency.

**The use of our units in the target products is beyond of our control and therefore exclusively the responsibility of the machine manufacturer, system integrator or customer.**

The information contained in the technical documentation, as well as any user-specific advice in spoken and written and through tests, are made to best of our knowledge and information about the application. However, they are considered for information only without responsibility. This also applies to any violation of industrial property rights of a third-party.

Selection of our units in view of their suitability for the intended use must be done generally by the user.

**Tests can only be done within the application by the machine manufacturer. They must be repeated, even if only parts of hardware, software or the unit adjustment are modified.**

## Copyright

The customer may use the instruction manual as well as further documents or parts from it for internal purposes. Copyrights are with KEB Automation KG and remain valid in its entirety.

Other wordmarks or/and logos are trademarks (™) or registered trademarks (®) of their respective owners and are listed in the footnote on the first occurrence.

# Table of Contents

<b>Preface</b> .....	<b>3</b>
Signal words and symbols .....	3
More symbols.....	3
Laws and guidelines.....	4
Warranty .....	4
Support .....	4
Copyright.....	4
<b>Table of Contents</b> .....	<b>5</b>
<b>List of Figures</b> .....	<b>7</b>
<b>List of Tables</b> .....	<b>8</b>
<b>1 Basic Safety Instructions</b> .....	<b>9</b>
1.1 Target group.....	9
1.2 Validity of this manual.....	9
1.3 Electrical connection .....	10
1.4 Start-up and operation .....	10
<b>2 Product Description</b> .....	<b>11</b>
2.1 Intended use .....	11
2.1.1 Residual risks .....	11
2.2 Unintended use.....	11
2.3 List of literature .....	12
<b>3 Hardware</b> .....	<b>13</b>
3.1 Overview of the control elements.....	13
3.2 Diagnostic interface X6B (COMBIVIS) .....	15
3.3 Node switch (x16, x1).....	15
<b>4 Software</b> .....	<b>16</b>
4.1 Fundamentals of the KEB PROFINET interface connection .....	16
4.2 PROFINET acyclic data (parameter channel) according to PROFIdrive .....	16
4.2.1 Parameter addressing with 16-Bit PNU plus 16 Bit Subindex (PROFIdrive).....	19
4.2.2 Set-addressing with subindex .....	20
4.2.3 Error codes of the acyclic communication.....	21
4.3 Differences between normal and synchronous mode .....	21
4.3.1 Process data communication (general).....	23
4.3.2 Process data communication (synchronous mode) .....	23
4.3.3 PROFINET-IRT communication and synchronous mode.....	23
4.3.4 Process data communication (asynchronous mode) .....	24
4.3.5 Profile mode (from SW V3.3) .....	25
4.3.6 DRIVECOM profile mode (Fb.01.Bit9, 8 = 01) .....	26

4.3.7 Process data mapping.....	27
4.3.8 Fieldbus watchdog .....	28
4.3.9 PROFINET alarms .....	28
4.3.10 PROFINET-Name (DCP-Set).....	28
4.3.11 Identification of a device by flashing LED (DCP-set).....	30
<b>5 Diagnosis.....</b>	<b>31</b>
5.1 Diagnosis via the diagnostic interface (X6B).....	31
5.2 Diagnosis via the second EtherNet interface parallel to PROFINET (X6C/X6D).....	31
<b>6 Project Design and Unit Description with GSDML File 33</b>	
<b>7 Operator Parameters .....</b>	<b>34</b>
7.1 Parameter overview.....	34
7.2 Parameter description.....	37
<b>8 Instructions for F5 PROFINET operator to Simatic S7 59</b>	
8.1 Standard project design .....	59
8.2 Additional project design for synchronous communication according PROFINET IO-IRT ...	62
8.3 Step7 Software.....	67
8.3.1 Acyclic communication (parameter channel).....	67
8.3.2 Cyclic communication (process data).....	67
<b>9 Annex.....</b>	<b>68</b>
9.1 F5 Operator internal error messages .....	68
<b>10 Examples for the setting of PD mappings.....</b>	<b>69</b>
10.1 Mixed mapping (special case).....	69
10.2 2 x 32-Bit Pout plus 4 x 16-Bit Pdin .....	70

## List of Figures

Figure 1:	Cycle time of the synchronization signal-- .....	24
Figure 2:	Read IP address .....	31
Figure 3:	Address several IP devices.....	32
Figure 4:	Select node address .....	32
Figure 5:	SIMATIC Info window.....	59
Figure 6:	Install GSD files .....	60
Figure 7:	PN-IO interface .....	60
Figure 8:	Configure object properties as sync master.....	61
Figure 9:	PROFINET system .....	61
Figure 10:	Graphical view of the PROFINET communication .....	62
Figure 11:	Set KEB slave as Sync slave.....	63
Figure 12:	Set synchronization role.....	64
Figure 13:	Selection of the transmission clock.....	64
Figure 14:	Synchronous alarms .....	65
Figure 15:	IO-cycle characteristics.....	66

## List of Tables

Table 1:	Overview of the operator.....	13
Table 2:	Description of the LEDs .....	14
Table 3:	Description of the slots.....	33
Table 4:	Extended slot 3 .....	33

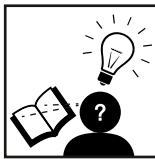


# 1 Basic Safety Instructions

The COMBIVERT is designed and constructed in accordance with state-of-the-art technology and the recognised safety rules and regulations. However, the use of such devices may cause functional hazards for life and limb of the user or third parties, or damages to the system and other material property.

The following safety instructions have been created by the manufacturer for the area of electric drive technology. They can be supplemented by local, country- or application-specific safety instructions. This list is not exhaustive. Non-observance will lead to the loss of any liability claims.

## NOTICE



### Hazards and risks through ignorance.

- ▶ Read the instruction manual!
- ▶ Observe the safety and warning instructions!
- ▶ If anything is unclear, please contact KEB Automation KG!

## 1.1 Target group

This instruction manual is determined exclusively for electrical personnel. Electrical personnel for the purpose of this instruction manual must have the following qualifications:

- Knowledge and understanding of the safety instructions.
- Skills for installation and assembly.
- Start-up and operation of the product.
- Understanding of the function in the used machine.
- Detection of hazards and risks of the electrical drive technology.
- Knowledge of *DIN IEC 60364-5-54*.
- Knowledge of national safety regulations (e.g. *DGUV regulation 3*).

## 1.2 Validity of this manual

This manual describes the control part of the COMBIVERT F6 EtherCAT. The manual

- contains only supplementary safety instructions.
- is only valid in connection with the power unit manual of COMBIVERT F6.

### 1.3 Electrical connection

#### ⚠ DANGER



#### Voltage at the terminals and in the device !

##### Danger to life due to electric shock !

- ▶ For any work on the unit switch off the supply voltage and secure it against switching on.
- ▶ Wait until the drive has stopped in order, that perhaps regenerative energy can be generated.
- ▶ Wait until the DC-Link capacitors are discharged (5 minutes). Verify by measuring the DC voltage at the terminals.
- ▶ Never bridge upstream protective devices (also not for test purposes).

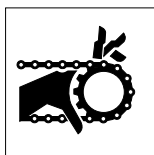
For a trouble-free and safe operation, please pay attention to the following instructions:

- The electrical installation shall be carried out in accordance with the relevant requirements.
- Cable cross-sections and fuses must be dimensioned by the user accordly to the specified minimum / maximum values for the operation.
- Within systems or machines the person installing electrical wiring must ensure that on existing or new wired safe ELV circuits the EN requirement for safe insulation is still met!
- For drive converters that are not isolated from the supply circuit (in accordance with [EN 61800-5-1](#)) all control lines must be included in other protective measures (e.g. double insulation or shielded, earthed and insulated).
- When using components without isolated inputs/outputs, it is necessary that equipotential bonding exists between the components to be connected (e.g. by the equipotential line). Disregard can cause destruction of the components by equalizing currents.

### 1.4 Start-up and operation

The drive converter must not be started until it is determined that the installation complies with the machine directive; Account is to be taken of [EN 60204-1](#).

#### ⚠ WARNING



#### Software protection and programming !

##### Hazards caused by unintentional behavior of the drive!

- ▶ Check especially during initial start-up or replacement of the drive converter if parameterization is compatible to application.
- ▶ Securing a unit solely with software-supported functions is not sufficient. It is imperative to install external protective measures (e.g. limit switch) that are independent of the drive converter.
- ▶ Secure motors against automatic restart.

## 2 Product Description

KEB Automation KG develop, produce and sell static drive converters worldwide in the industrial power range. Drive converters of type F5 can be equipped optionally with a PROFINET-IO slave interface. The F5 PROFINET operator is integrated into the drive converter housing by simple plug-in and fits into all F5 units. Here it concerns to an intelligent interface which controls the data transfer from PROFINET to the drive converter control and reverse. The data are internally transferred via the KEB own serial protocol named HSP5.

### 2.1 Intended use

The KEB COMBIVERT serves exclusively for the control and regulation of three-phase motors. It is intended for the installation into electrical systems or machines.

Technical data and information for connection conditions shall be taken from the type plate and from the instruction manual and must be strictly observed.

The used semiconductors and components of the KEB Automation KG are developed and dimensioned for the use in industrial products.

#### Restriction

If the product is used in machines, which work under exceptional conditions or if essential functions, life-supporting measures or an extraordinary safety step must be fulfilled, the necessary reliability and security must be ensured by the machine builder.

#### 2.1.1 Residual risks

Despite intended use, the drive converter can reach unexpected operating conditions in case of error, with wrong parameterization, by faulty wiring or non-professional interventions and repairs. This can be:

- Wrong direction of rotation
- Motor speed too high
- Motor is running into limitation
- Motor can be under voltage even in standstill
- Automatic start

### 2.2 Unintended use

The operation of other electric consumers is prohibited and can lead to the destruction of the unit. The operation of our products outside the indicated limit values of the technical data leads to the loss of any liability claims.

## 2.3 List of literature

- [1]: Application Layer Protocol for decentralized periphery and distributed automation Specification for PROFINET V2.2
- [2]: Application Layer Services for decentralized periphery and distributed automation Specification for PROFINET V2.2
- [3]: Profile Drive Technology PROFIdrive Technical Specification for PROFIBUS and PROFINET V4.1
- [4]: GSDML Specification for PROFINET IO V2.10
- [5]: Application manual of the used drive converter control.
- [6]: Profile Guidelines Part1 Identification and Maintenance Functions.

### 3 Hardware

#### 3.1 Overview of the control elements

Overview	Type	Description
	LED1	PROFINET communication
	LED2	Acyclic data access
	LED3	Process data
	LED4	PROFINET link
	LED5	Identification
	LED6	Error display
	X6B	Diagnostic interface
	x16	High nibble of the node switch
	x1	Low nibble of the node switch
	X6C	PROFINET, Port 0, default Ethernet-RJ45 socket in accordance with IEEE 802.3 100 Base-T
X6D	PROFINET, Port 1, default Ethernet-RJ45 socket in accordance with IEEE 802.3 100 Base-T	

Table 1: Overview of the operator

<b>LED1</b>	<b>Flashing</b>	<b>Actual condition</b>
	Double blinking (200ms ON/200ms OFF/200ms ON/1000ms OFF)	PROFINET firmware not ready
	Constantly off	PROFINET firmware ready
	Constantly on	PROFINET communication completely started, internal communication asynchronous
	Blinking (500ms ON/500ms OFF)	PROFINET communication completely started, internal communication synchronous
<b>LED2</b>	Acyclic data access	
<b>LED3</b>	Flashes, as long as process data access to the drive converter is running. If the synchronous mode as well as the IRT communication is active, the LED is flashing like LED1.	
<b>LED4</b>	Flashes, if a link is recognized at PROFINET Port0 or Port1.	
<b>LED5</b>	Serves as identification LED. This LED can be controlled from the PROFINET master via the discovery and configuration DCP set service.	
	<b>Flashing</b>	<b>Actual condition</b>
	Constantly off	non-operated
	Blinking (500 ms ON/500 ms OFF) for 3 s	DCP set service with signal = FLASH_ONCE
<b>LED6</b>	<b>Flashing</b>	<b>Actual condition</b>
	Constantly off	No voltage supply at the drive converter control unit
	Blinking (500 ms ON/500 ms OFF)	Drive converter control in error status
	Fast blinking (50 ms ON/50 ms OFF)	No information obtained from the drive converter
	Double blinking (200ms ON/200ms OFF/200ms ON/1000ms OFF)	Fatal error during initialization. No function of the operator! Can occur e.g.: - no valid KEB MAC address assigned. - inconsistent configuration.
	Constantly on	No error
<i>Table 2: Description of the LEDs</i>		

### 3.2 Diagnostic interface X6B (COMBIVIS)

RJ45 connector of the diagnostic interface.

#### ATTENTION

#### Destruction of the PC interface!

- The connection of the diagnostic interface with a serial interface of a PC may only be connected with a special HSP5 cable.

### 3.3 Node switch (x16, x1)

Node switch: Setting of an unit address in hexadecimal via two node switches. The left node switch (x16) presets the high nibble, the right node switch (x1) presets the low nibble of the unit address. The actual value can be read out in operator parameter 'OS14 NodeSwitchVal'. With the adjustment of this value the active PROFINET name will be influenced. Furthermore special configurations can be set with this value (see 7.1.10. ProfiNet-Name (DCP-Set)).



Unit address = switch position (x16) \* 16 + switch position (x1)

#### Example:

Switch position x16:	9	→	$9 \cdot 16^1$
			+
Switch position x1:	5	→	$5 \cdot 16^0$
			=
Unit address:			149 (95 Hex)

NodeSwitchVal	Effect on PROFINET name	Effect on IP address, IP mask, IP gateway
0...239 / 0...EFh	kebf5•n, whereby „n“ is the decimal value of the node switch.	Last stored values.
240 / F0h	Last stored name.	Last stored values.
241 / F1h <sup>1)</sup> (reset to default)	empty	IP address: 0.0.0.0 IP mask: 0.0.0.0 IP gateway: 0.0.0.0
242...253 / F2h...FDh	Last stored name.	Last stored values.
254 / FEh (KEB production test)	empty	IP address: 192.168.0.100 IP mask: 255.255.255.0 IP gateway: 0.0.0.0
255 / FFh	Last stored name.	Last stored values.

<sup>1)</sup> Delivered condition

## 4 Software

### 4.1 Fundamentals of the KEB PROFINET interface connection

The KEB F5 PROFINET interface connection contains a PROFINET slave controller for time-critical operations of the communication. By using this PROFINET interface connection it is guaranteed that basic communication is compatible to the PROFINET specification. The functionality of the KEB F5 ProfiNet operator is determined by:

- (Application) software (see value of the operator parameter OS00: Operator type)
- (ProfiNet) firmware (see value of the operator parameter OS11: NetX\_FwVersion)

**Technical data of the PROFINET interface connection:**

Supported PROFINET protocol versions	PROFINET IO-RT (PROFINET IO-IRT *)
--------------------------------------	------------------------------------

\* The synchronous operating mode (IRT) is only possible when using an application software version  $\geq 2.6$  and a PROFINET firmware version from 3.x. For this see description of parameter Fb01: FBS Config.

### 4.2 PROFINET acyclic data (parameter channel) according to PROFIdrive

The KEB F5 PROFINET operator supports the coding of the acyclic services according to PROFIdrive profile also called Base Mode Parameter Access. However this applies only for the data transfer, not for the content or the coding. That means the KEB F5 PROFINET interface connection does not support parameters according to PROFIdrive profile, but only the transport mechanism. In the following only the essential information for the transport mechanism of the acyclic data according to Profidrive are listed. A complete specification is find in [3].

The acyclic parameter Request according to PROFIdrive provides a mechanism, whereby a list of maximally 39 parameters can be written or read with two PROFINET record accesses. The basic operation at PROFINET level is as follows:

1. Write-Record-Request of the master with Index = B02Eh, payload data = Parameter-request (see below)
2. Write-Response of the slave, no payload data
3. Read-Record-Request of the master with Index = B02Eh, no payload data
4. Read-Response of the slave, payload data = Parameter response (see below)

Please note that the network byte order (MSByte first) generally applies for the revision.



<b>Parameter request:</b>			
Block-Definition	Byte n	Byte n+1	n
Request Header	Request Reference	Request ID	0
	Axis-No.	No. of parameters = n	2
1st parameter address	Attribute	No. of elements	4
	Parameter Number (PNU)		6
	Subindex		8
:	:	:	:
n th parameter address	Attribute	No. of elements	4 + 6 x (n-1)
	Parameter Number (PNU)		
	Subindex		
1st parameter value(s)	Format	No. of values	4 + 6 x n
	Values		
:	:	:	:
Nth parameter value(s)			

The parameter values are only contained in a request with request ID = 2.

Request Reference: 1 ... FFh: Serial number for differentiation of the different requests

Request ID:

Value	Meaning
01h	Request parameter (Read)
02h	Change parameter (Write)

Axis-No. = 0, since the F5 PROFINET operator represents an 1:1 gateway.

No. of parameters: 1...39 (max. 39 parameters can be read or written via request)

Attribute:

Value	Meaning
10h	Value
20h	Description (not supported here)
30h	Text (not supported here)

No. of elements: =1

Parameter number (PNU): Addressing of the parameter (see below)

Format:

Value	Meaning
1	Boolean
2	Integer8
3	Integer16
<b>4</b>	<b>Integer32</b>
5	Unsigned8
6	Unsigned16
7	Unsigned32
41h	Byte
42h	Word
43h	DWord
44h	Error

The F5 PROFINET operator returns all parameters during reading with format = 4. Also the master can preset all parameters during writing with format = 4.

No. of values: =1

Parameter response:

Block-Definition	Byte n	Byte n+1	n
Response header	Request reference mirrored	Response ID	0
	Axis-No. mirrored	No. of parameters = n	2
1st parameter value(s)	Format	No. of values	4 + 6 x n
	Values		
:	:	:	:
Nth parameter value(s)			

The parameter values are contained in response only at response ID = 1 or 81h or 82h (\*3).

(\*3) The change, which also contains a negative write-response (response ID = 82h) parameter values only supports the F5-PROFINET software from V3.1.

Response ID:

Value	Meaning
01h	Request parameter ok (read)
02h	Change parameter ok (write)
81h	Request parameter with error (read)
82h	Change parameter with error (write)

If an error has occurred during the read access to a parameter, the response ID = 81h is set. Furthermore, the format = 44h (error) is set for this parameter value and the error value is set as 16-bit value as follows:

Value	Description
11h	Timeout on access to the parameter or drive converter busy
14h	Drive converter busy (*4)
00h	Invalid parameter address or password
17h	Data invalid
65h	Error in internal communication (BCC error)
66h	Error in internal communication (invalid service or invalid operation)
67h	Invalid password
68h	Error in internal communication (invalid telegram)
69h	Error in internal communication (parity error)
03h	Invalid parameter set (subindex)
6Bh	Error in internal communication (invalid operation) (*5)

(\*4) The error code „drive converter busy“ was changed in the software version V3.1 from 11h to 14h.

(\*5) The error code „invalid operation“ was changed in the software version V3.1 from 66h to 6Bh.

(to \*3) Free from error requests are listed in a negative Write-response (Response-ID = 82h) with format = 40h (Zeror) and No of Values = 0.

#### 4.2.1 Parameter addressing with 16-Bit PNU plus 16 Bit Subindex (PROFIdrive)

1. PNU	Last PNU	Description
0000h	FFFFh	Parameters of the drive converter control and operator with PNU = KEB-Parameter-Address (*1). KEB uses the subindex for set-addressing. Parameters of the operator always start at PNU = XX80h

(\*1) The KEB parameter address can be found here or in [5]. It is also possible to display the KEB parameter address in the KEB start-up software COMBIVIS (more information see annex).

#### 4.2.2 Set-addressing with subindex

The PROFINET subindex is used for set-addressing for all KEB parameters. A parameter that contains more than one value is called set-programmable at KEB. These parameters have always eight different values. The 1st value is addressed via set 0 and the last value via set 7.

The conversion from PROFINET-subindex to set selection can be adjusted with parameter FBS Config. Bit6 from software version 2.9.

Subindex	Description for FBS config. Bit6 = 0 (subindex bit-coded)
0	Indirect set-addressing: The addressed set is determined by the appropriate set indicator. Parameter Fr.09 is valid for parameters of the drive converter control. The operator does not have a set pointer parameter, an access with subindex = 0 corresponds here to access with subindex = 1
1	Direct set-addressing of set 0
2	Direct set-addressing of set 1
4	Direct set-addressing of set 2
8	Direct set-addressing of set 3
16/10h	Direct set-addressing of set 4
32/20h	Direct set-addressing of set 5
64/40h	Direct set-addressing of set 6
128/80h	Direct set-addressing of set 7

By this bit coding it is generally possible to address several sets with one command. However this should not be used during a read access, since an error code is returned if not all values in the addressed sets are the same. This multiple set-addressing can be used without problems for writing of set-programmable parameters.

Subindex	Description for FBS config. Bit6 = 1 (subindex linear)
0	Indirect set-addressing: The addressed set is determined by the appropriate set indicator. Parameter Fr.09 is valid for parameters of the drive converter control.
1	Direct set-addressing of set 0
2	Direct set-addressing of set 1
3	Direct set-addressing of set 2
4	Direct set-addressing of set 3
5	Direct set-addressing of set 4
6	Direct set-addressing of set 5
7	Direct set-addressing of set 6
8	Direct set-addressing of set 7

This coding of the PROFINET subindex is compatible to the coding of the new PROFINET-PD mapping parameters (see description of parameter Fb28).

### 4.2.3 Error codes of the acyclic communication

The error code, which is returned at acyclic communication, is a 32 bit value, which consists of four components: ErrorCode, ErrorDecode, ErrorCode1, ErrorCode2. Currently, no own error codes are output by the application of the F5-PROFINET operator. Consequently all values  $\neq 0$  are always generated by the used PROFINET stack. The meaning of these error codes can be taken from the PROFINET specification.

### 4.3 Differences between normal and synchronous mode

The KEB F5 PROFINET operator supports the synchronous mode from software version 2.6. This is a special communication between operator and drive converter control and is completely independent of the PROFINET communication. However, an active synchronous mode is the precondition for a synchronization of PROFINET-IRT communication and internal control software. In synchronous mode, the communication between operator and drive converter control runs strictly cyclically in a fixed time pattern (see ComCycle). From software version 2.6 the operator always tries to change into the synchronous communication mode.

The communication mode can be identified by parameter Fb00 ComCycle. The synchronous mode is active if the value of this parameter is unequal zero. The value of the parameter indicates the cycle time in  $\mu\text{s}$ .

There are the following conditions for the change into the synchronous mode:

- Bit SyncMode\_Enable in parameter FBS Config is set
- The PROFINET communication is completely started (RT or IRT)
- The connected drive converter control supports the HSP5 service 56

## DIFFERENCES BETWEEN NORMAL AND SYNCHRONOUS MODE

Feature	Normal mode	Synchronous mode
Maximum PD transfer rate at 8 Byte PD data (*1)	1000 $\mu$ s (*2)	2000 $\mu$ s (*3)
Maximum PD transfer rate at 16 Byte PD data (*1)	2000 $\mu$ s (*2)	2000 $\mu$ s (*3)
Acyclic ProfiNet communication	fully supported	fully supported
Diagnosis via the diagnostic interface (X6B)	fully supported	fully supported
Diagnosis via TCP/UDP via the PROFINET interface	fully supported	fully supported
Support by FI controls	all	Not all
Flexibility of the process data assignment	restricted	almost in any order
Parameter group in the FI for setting the PD assignment	Sy	Pd

(\*1) Here it concerns to the internal process data transfer rate between the operator and drive converter control. There are higher transfer rates possible to the PROFINET.

(\*2) Theoretically possible, non-guaranteed transfer rate, depends at acyclic organized communication strongly on the general communication load between operator and drive converter.

(\*3) Guaranteed, strictly cyclical.

#### 4.3.1 Process data communication (general)

By means of process data communication new process output data (PDOOUT) can be sent to the KEB PROFINET slave and the actual process input data (PDIN) can be determined. Which parameters concern to the data is determined by the process data mapping in the frequency inverter control.

A maximum of 16 byte process data for each data direction can be transferred.

The KEB F5 PROFINET operator expects PDOOUT data on PROFINET in network byte order. For a combined mapping of 1x32 bit and 2x16 bit (PDOOUT1\_Hsp5 Service = 50) the following transmission sequence results:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Value 0				Value 1		Value 2	
MS Byte			LS Byte	MS Byte	LS Byte	MS Byte	LS Byte

MS Byte: Most significant Byte (most significant byte)

LS Byte: Least significant Byte (least significant byte)

Analog applies for the transmission sequence of the PDIN data, if PDIN\_Hsp5 Service = 50.

#### 4.3.2 Process data communication (synchronous mode)

All communication tasks between operator and drive converter control are strictly cyclically processed with only one internal PDO (Process Data Object). Minimum cycle time is 2000  $\mu$ s (see ComCycle). The process data assignment is determined here by parameters of the pd-group in the drive converter control.

Operator parameters

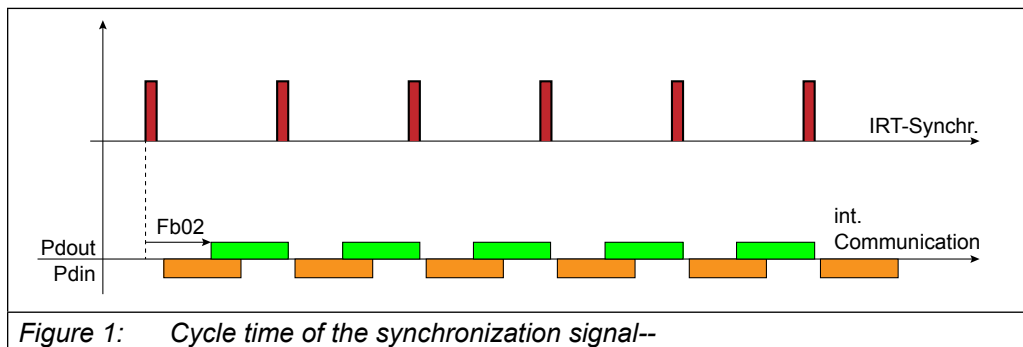
- Fb05 PDOOUT1\_Hsp5Service
- Fb06 PDIN1\_Hsp5Service
- Fb07 PDIN1\_Cycle
- Fb08 PDOOUT2\_Hsp5Service
- Fb09 PDIN2\_Hsp5Service

sind hierbei nicht von Bedeutung. The real number of process data bytes to be exchanged is determined also by the setting of parameters CfgNrPdins and CfgNrPdouts.

#### 4.3.3 PROFINET-IRT communication and synchronous mode

The internal synchronous mode and the PROFINET-IRT communication are independent from each other. The PROFINET-IRT communication makes sense only in synchronous mode. The synchronous mode operates timer-controlled independent of external synchronization signals. If the synchronous mode is active and also the PROFINET-IRT communication, the KEB F5 PROFINET operator receives a synchronization signal (start of red phase/outputs valid) on which the operator tries to synchronize. The required time interval between IRT-synch signal and the following start of the internal synchronous communication cycle is adjustable via parameter Fb02: DelayTimeSyncToAppllrq.

The operator determines the cycle time of the synchronization signal and indicates it in the value of parameter Fb03: RealSyncCycleTime (see below).



#### 4.3.4 Process data communication (asynchronous mode)

The process data assignment is determined by the parameters of the sy-group in the drive converter control. In normal mode only 8 bytes process data can be transferred in one telegram. One internal PDO is required for 8 byte process data, two internal PDOs for 16 bytes process data. Thus the configuration parameters for process data communication are double available:

- PDOOUT1\_Hsp5Service determines the internal communication service for the first 8 bytes of PDOOUT data.
- PDOOUT2\_Hsp5Service is the appropriate parameter for the second 8 bytes PDOOUT data.

The same applies for parameters: PDIN1\_Hsp5Service and PDIN2\_Hsp5Service.

Parameters CfgNrPdins and CfgNrPdouts configure the required number of active PDIN / PDOOUT units and therefore the required process data length. How many PDOs are active for each data direction can be read in parameters ActiveNrPdins and ActiveNrPdouts. Not all drive converter controls support two internal PDOs for each data direction.



Basically the two PDO units are realized separately from each other. The KEB-F5-PROFINET-RT operator executes the necessary process data communication to the drive converter control one after another, since this communication must be done via the internal serial connection. The normal communication sequence for two active PDOs for each data direction is as follows:

- Writing the PDOOUT1 data to the drive converter control
- Writing the PDOOUT2 data to the drive converter control
- Reading of PDIN1 data of the drive converter control
- Reading of PDIN2 data of the drive converter control

The cyclic reading of PDIN1/PDIN2 data of the drive converter control is configured by parameter PDIN\_Cycle.



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At PDOOUT1\_Hsp5Service = PDIN1\_Hsp5Service = 50 respectively PDOOUT2\_Hsp5Service = PDIN2\_H 5Service = 53. This configuration represents a special case, since there are no half duplex counterparts for this full duplex services. That means only PDIN data can be determined by these adjustments, even if PDOOUT data are received from the PROFINET control.

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#### 4.3.5 Profile mode (from SW V3.3)

The software of the F5 PROFINET operator supports the profile mode, from operator software V3.3. This special program mode is activated via bits 8 and 9 of parameter Fb01 FBS Config. For this program mode so-called profile parameters are created in the object directory of the operator. They are defined by a device profile. Then the software of the operator distinguishes the following operating modes:

- ProfileNo.Asynch: No profile active, internal communication asynchronous.
- ProfileNo.Synch: No profile active, internal communication synchronous to internal (PROFINET-RT) or external (PROFINET-IRT) cycle.
- ProfileDrc.Asynch: DRIVECOM profile active, internal communication asynchronous.
- ProfileDrc.Asynch: DRIVECOM profile active, internal communication synchronous to internal (PROFINET-RT) or external (PROFINET-IRT) clock.

In the profile mode the PROFINET process data are decoupled from the internal process data. The operator software takes over the implementation between profile/PROFINET parameters and internal parameters of the FI control. The profile parameters can be accessed both via cyclic process data and via acyclic communication. In profile mode, the PD mapping parameters are internal permanently active and fixed. That means, the PD mapping cannot be changed.

4.3.6 DRIVECOM profile mode (Fb.01.Bit9, 8 = 01)

The following PROFINET process data mapping is permanently preset in this special profile mode and can be read from parameters Fb.28 to Fb.31:

PROFINET-Pdout (fieldbus to operator):

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Pr.00		Pr.02		nb*	nb*	nb*	nb*
HB	LB	HB		nb*	nb*	nb*	nb*

PROFINET-Pdin (operator to fieldbus):

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Pr.01		Pr.03		Pr.04		nb*	nb*
HB	LB	HB	LB	HB	LB	nb*	nb*

The internal process data mapping is also fixed and preset as follows:

HSP5-Pdout (operator to drive converter):

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Sy.41		Sy.50		Sy.52		nb*	nb*
HB	LB	HB	LB	HB	LB	nb*	nb*

HSP5-Pdin (drive converter to operator):

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Sy.42		Sy.51		PP.00		PP.01	
HB	LB	HB	LB	HB	LB	HB	LB

\*nb: not assigned

The internal process data mapping is automatically written to the FI control during the start-up of the F5 PROFINET operator. An additional active profile application software in this profile mode ensures in the F5 PROFINET operator that the profile parameters are correctly mapped to the internal parameters of the drive converter control system. The colors in the above tables indicate these parameter figures:

- Pr.00 → Sy.41, Sy.50: Drc\_Controlword is converted according to DRIVECOM profile to the KEB control word high and low. To this end, a DRIVECOM state machine is running on the PROFINET operator, which converts the DRIVECOM commands to the KEB control word.
- Pr.01 ← Sy.42, Sy.51: The KEB status word high and low is converted to Drc\_Statusword according to DRIVECOM profile. The DRIVECOM state machine of the operator determines the values of the Drc\_Statusword from the values of the KEB status word.
- Pr.02 → Sy.52: Pr.02 is directly mapped to the KEB setpoint speed
- Pr.03 ← PP.00: PP.00 is directly mapped to Pr.03
- Pr.04 ← PP.01: PP.01 is directly mapped to Pr.04

### 4.3.7 Process data mapping

The process data mapping is preset in the drive converter control via the appropriate parameters of the Sy group (normal mode) or parameters of the pd group (synchronous mode).

The structure of the process data is additionally adjusted in the operator via parameters PDOOUT1\_Hsp5Service, PDOOUT2\_Hsp5Service and PDIN1\_Hsp5Service as well as PDIN2\_Hsp5Service (see below). These parameters have no meaning in synchronous mode.

From Software V2.9 the F5 PROFINET operator offers the possibility to store the process data mapping in the operator. This function is activated by the value of bit5 in parameter Fb01 FBS Config. This function is deactivated in delivered condition. The exact specification of the new PD mapping parameters can be found in this description (see Fb28 to Fb31). The new parameters provide the user an uniform programming interface of the PD mapping for the normal and synchronous mode. This leads to restrictions in the settings since both, the mapping of the parameters of the SY group (normal mode) and the mapping of the parameters of the PD group must be possible. The adjustable operator process data mapping does not support gaps. A multiple mapping of a process data value in several parameter sets is also not possible here.

In order to clarify the complex issue of the PD mapping a little more, this document contains an annex with sample mapping settings.

#### 4.3.8 Fieldbus watchdog

The fieldbus watchdog serves to bring the drive converter controlled into the fault state if a cyclically occurring event on the fieldbus suddenly disappears. The function is realized in the PROFINET operator. Currently, the fieldbus watchdog is not configurable on the PROFINET operator. The fieldbus watchdog is parameterized by parameters pn.05 and pn.06 at drive converter control. The fieldbus watchdog becomes active, as soon as PROFINET communication starts running. As soon as the communication is affected in any way, the PROFINET operator releases the watchdog process after expiration of the watchdog time (pn.06) in the drive converter control. The response of the drive converter to this is depending on the adjustments of parameters pn.05 and pn.06 in the drive converter control.

#### 4.3.9 PROFINET alarms

The KEB-F5 PROFINET operator supports alarms (from software V2.9). This functionality is switched off by default and is activated via parameter Fb01 FBS Config.Bit7, if required. When the alarm is activated, the operator monitors the value of the drive converter parameter ru.00 „inverter state“. If there is an error in the drive converter (ru.00 value < 64), the operator outputs a high-priority process alarm and reports the actual value of parameter ru.00. Also when the error disappears, the operator reports this with a process alarm. If it is a coming or a going fault event can be read from the User-Struct-Id of the alarm. The following table summarizes this functionality:

ru.00 value	Alarm type	Priority	User-Struct-Id	User-Struct-Value	Meaning
<64	Process alarm	High	1	16 bit value of ru.00	Error occurred
0 or ≥ 64	Process alarm	High	2	16 bit value of ru.00	Error is no longer present.

#### 4.3.10 PROFINET-Name (DCP-Set)

The PROFINET name (NameOfStation) is determined by the adjustment of the node address switch (NodeSwitchVal) at the front side of the operator. If this value is < 240 the PROFINET-Name is defined as follows:

kebf5-n whereby „n“ is the decimal value of the Node switch. Examples:

NodeSwitchVal = 1      → PROFINET-Name = kebf5-1  
 NodeSwitchVal = 11     → PROFINET-Name = kebf5-11  
 NodeSwitchVal = 123    → PROFINET-Name = kebf5-123

The name can be changed by the master via service ‚DCP set‘. Then this name is non-volatile stored. With next power on the PROFINET slave logs in with the stored name, if NodeSwitchVal > = 240 and no special configuration is selected (see below). The maximum supported length of the PROFINET name is currently 128 digits.

The range for switch positions >= 240 is used in software versions up to V3.1 exclusively to activate the non-volatile stored name.

This value range is also used for special configurations from software V3.2. The function of the values 240 and 255 remains unchanged for downward compatibility with older software versions. The following table shows all values and their meaning (software version V3.2):

NodeSwitchVal	Short text	Description
0...239	FixedName	PROFINET-Name = ‚kebf5-n‘ with ‚n‘ the decimal value of the node switch (see above)
240	UseSavedNoS	Use the last stored as PROFINET name
241	ResetToDefault	Set all non-volatile values to default: <ul style="list-style-type: none"> <li>• PROFINET-Name = ‚‘</li> <li>• PROFINET-Ip-Addr = 0.0.0.0</li> <li>• PROFINET-Ip-Mask = 0.0.0.0</li> <li>• PROFINET-Ip-Gateway = 0.0.0.0</li> </ul>
242	EmptyPnet	(Only) reset of the PROFINET addressing: <ul style="list-style-type: none"> <li>• PROFINET-Name = ‚‘</li> <li>• PROFINET-Ip-Addr = 0.0.0.0</li> <li>• PROFINET-Ip-Mask = 0.0.0.0</li> <li>• PROFINET-Ip-Gateway = 0.0.0.0</li> </ul>
243	EmptyIP	(Only) reset of the PROFINET-IP addressing: <ul style="list-style-type: none"> <li>• PROFINET-Name = last stored value</li> <li>• PROFINET-Ip-Addr = 0.0.0.0</li> <li>• PROFINET-Ip-Mask = 0.0.0.0</li> <li>• PROFINET-Ip-Gateway = 0.0.0.0</li> </ul>
244...253	Reserved	These values are reserved for future special configurations
254	KEBProdTest	Special configuration for KEB production test: <ul style="list-style-type: none"> <li>• PROFINET-Name = ‚‘</li> <li>• PROFINET-Ip-Addr = 192.168.0.100</li> <li>• PROFINET-Ip-Mask = 255.255.255.0</li> <li>• PROFINET-Ip-Gateway = 0.0.0.0</li> </ul>
255	UseSavedNoS	Use the last stored as PROFINET name

### 4.3.11 Identification of a device by flashing LED (DCP-set)

PROFINET defines a special service for easy find out of a special device. This belongs to the Discovery and basic Configuration (DCP) protocol. The flashing of a LED on the device in a predefined flash patterns can be started and stopped via the DCP set service. The device is addressed via its MAC address (OS10). At KEB F5 PROFINET operator the LED5 serves to this end.

## 5 Diagnosis

The KEB F5 PROFINET operator offers two possibilities with the start-up tool KEB COMBIVIS to have access to the parameters of the operator and the connected drive converter.

### 5.1 Diagnosis via the diagnostic interface (X6B)

Here the serial interface of a PC is connected with the diagnostic interface (X6B) of the KEB F5 PROFINET operator with a special HSP5 cable (see order data). All parameters of the drive converter control and the operator can be responded with the start-up software KEB COMBIVIS.

### 5.2 Diagnosis via the second EtherNet interface parallel to PROFINET (X6C/X6D)

If one of the both PROFINET ports (X6C or X6D) is not assigned by the PROFINET wiring this port can be connected with the EtherNet interface of a computer via EtherNet cable. Then KEB COMBIVIS can communicate via this port with the PROFINET slave.

The following must be considered at configuration of COMBIVIS:

The IP address of the PROFINET slave must be entered at host in the menu Edit → Configuration → IP. This address is preset by the PROFINET master. The value can be read in the operator parameters as OS15Pnet\_IPAddress.

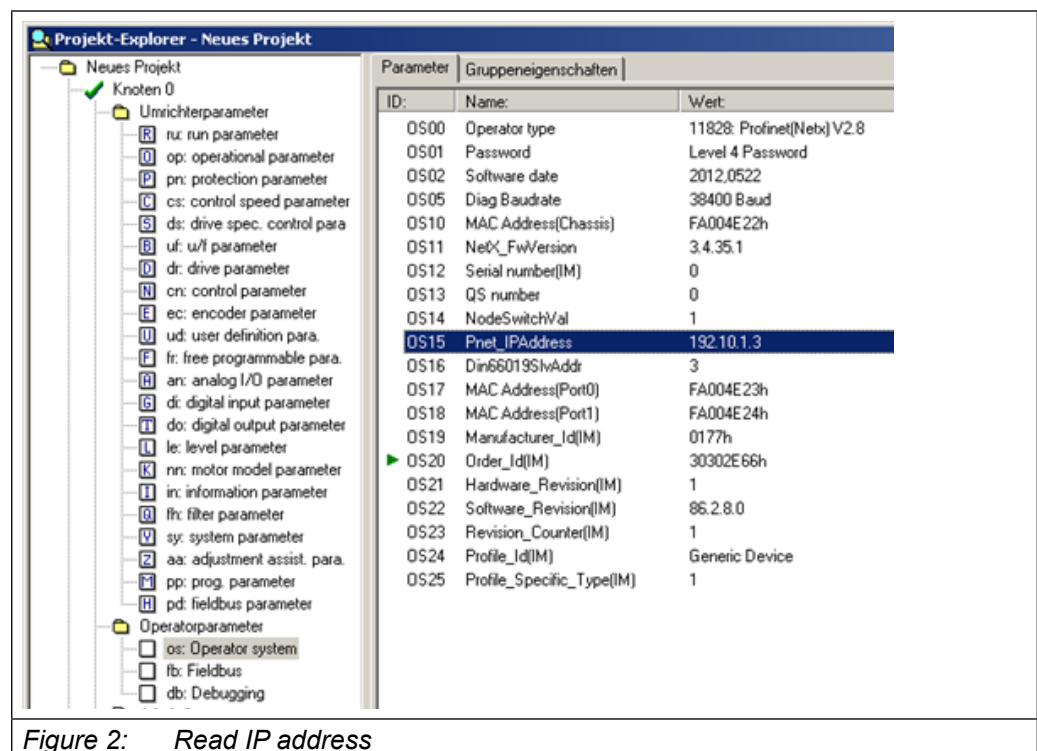


Figure 2: Read IP address

By setting the last digit of the host IP address to value = 255 in the IP configuration of COMBIVIS one ensures that COMBIVIS can address several connected IP devices whose IP address is in the range 192.10.1.x.

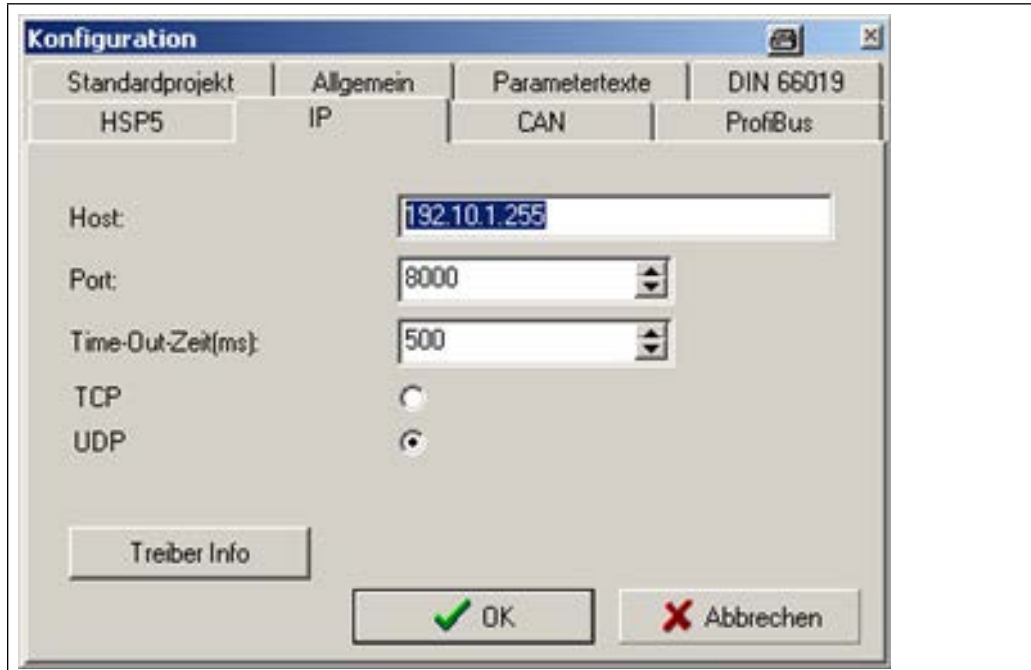


Figure 3: Address several IP devices

If configured by way COMBIVIS addresses the devices via the IP address 192.10.1.x, where x corresponds to the configured node address. The used node address by COMBIVIS for addressing the unit must agree with the adjusted value of parameter Din66019SivAddr. Please observe from software V2.5 of the F5 PROFINET operator the Din66019SivAddr is linked to the Pnet\_IPAddress by way that Din66019SivAddr = last digit of Pnet\_IPAddress.

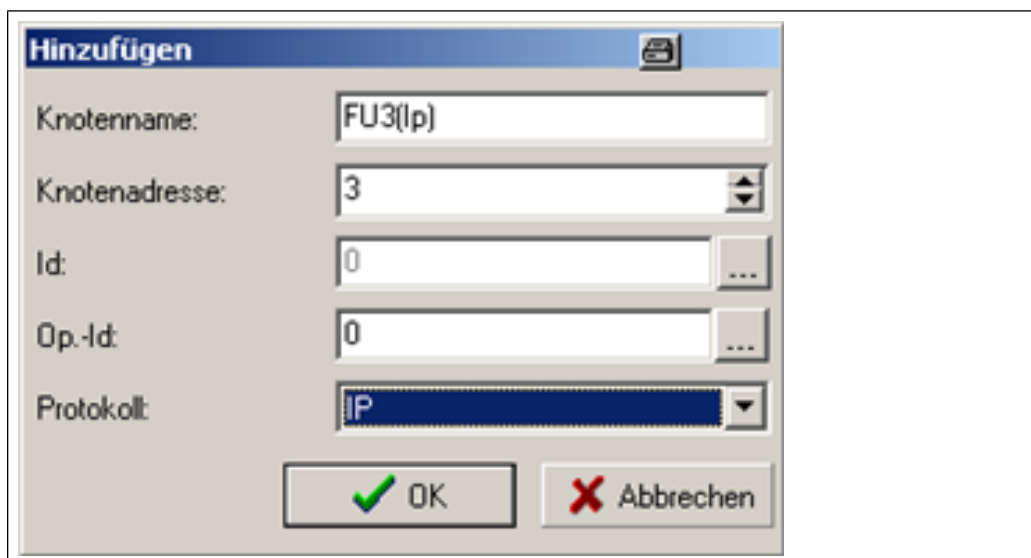


Figure 4: Select node address



## 6 Project Design and Unit Description with GSDML File

A GSDML file is specified as technical manual for PROFINET (see [4]). KEB provides such a technical manual file for the PROFINET slaves. This file is in most cases necessary for a PROFINET configuring tool. The actual version of the KEB F5 PROFINET GSDML file contains no object dictionary and therefore it is not drive converter unit-type dependent.

At PROFINET all slaves contain slots and these slots have one or more subslots. Module/submodule combinations can be plugged into these slots/subslot combinations. The project design in case of the F5 PROFINET operator applies as follows:

Slot 0	Is always available and can not be changed. Acyclic parameter accesses (among other things) are processed via this slot.
Slot 1	Process input data: Only one input module can be plugged into this slot with <ul style="list-style-type: none"> <li>• a submodule for 8 byte process input data (4x16bit inputs) or</li> <li>• a submodule for 16 byte process input data (8x16bit inputs)</li> </ul>
(Slot 2)	Process output data: Only one output module can be plugged into this slot with <ul style="list-style-type: none"> <li>• a submodule for 8 byte process output data (4x16bit outputs) or</li> <li>• a submodule for 16 byte process output data (8x16bit outputs)</li> </ul>
<i>Table 3: Description of the slots</i>	

Slot 3, from software V2.8:

This slot is necessary in order that a standard Siemens PLC with PROFINET controller allows the acyclic parameter access to PROFIdrive-profile to this unit. This functionality is already available in slot0, but is make available again here (see reasons above). The module that can be plugged into this slot and allows the acyclic communication to PROFIdrive Base Mode Parameter Access is named PROFIdrive\_PAP (PROFIdrive Parameter Access Point).

Slot 0	Slot 1	Slot 2	Slot 3
fixed function acyclic data	Process input	Process output	fixed function acyclic data
API - 0			API = 3A00h
<i>Table 4: Extended slot 3</i>			

## 7 Operator Parameters

### 7.1 Parameter overview

The operator parameters are managed by the F5 PROFINET operator. No transmission to the drive converter control is necessary on access to these parameters. Only the parameters which are interesting for the user are listed here. All not listed parameters should not be changed by the user. Each parameter is described via the name or a short identifier (ID). Like the drive converter parameters, the parameters are also arranged in parameter groups. The ID is made up of the code for the parameter group and the serial number of the parameter. Currently the following parameter groups are available in the F5 PROFINET operator:

- Operator system (OS)
- Fieldbus (Fb)
- Debugging (Db)

The following is valid for all operator parameters and all drive converter parameters:  
PNU = COMBIVIS parameter address

PNU	Sub-Index (*1)	ID	Name	Internal data type	Meaning
0180h	0	OS00	OS00: Operator type	Uint32	Operator type + software version
0181h	0	OS01	Password	Int16	Read: Actual password level Write: Password value
0182h	0	OS02	Software date	Uint16	Software date in terms of: Year,MMDD
0185h	0	OS05	Diag Baud rate		Transmission speed of the diagnostic interface
0189h	0	OS09	HSP5_MinTxGap	Uint16	Minimum HSP5-Tx-time gap in $\mu$ s
018Ah	0	OS10	MAC Address (Chassis)	Uint32	Least significant 32-bit MAC address of the operator
018Bh	0	OS11	NetX_FwVersion	Uint32	Firmware version of the PROF-INET-Asics
018Ch	0	OS12	Serial Number	Uint32	Serial number of the operator
018Dh	0	OS13	QS number	Uint16	KEB internal
018Eh	0	OS14	NodeSwitchVal	Uint8	Value of the two hex coding switches at the front of the operator
018Fh	0	OS15	Pnet_IPAddress	Uint32	From PROFINET master preset IP-address of the operator
0190h	0	OS16	Din66019SlvAddr	Uint8	Slave address of the operator for the addressing via UDP/IP
0191h	0	OS17	MAC Address(Port0)	Uint32	Less significant 32-Bit of the MAC address for Port0 (X6C) of the operator
(*1)	Please note that the use of the sub-index is depending on the actual setting of bit6 in parameter Fb01 FBS Config, see chapter "3.1.1.2 Addressing with subindex". „3.1.1.2 Satzadressierung mittels Subindex“				

PNU	Sub-Index (*1)	ID	Name	Internal data type	Meaning
0192h	0	OS18	MAC Address(Port1)	Uint32	Less significant 32-Bit of the MAC address for Port1 (X6D) of the operator
0193h	0	OS19	Manufacturer_Id(IM)	Uint16	Manufacturer-ID
0194h	1,2,4,8,16	OS20	Order_Id (IM)	String[20]	Order number of the operator
0195h	0	OS21	Hardware_Revision (IM)	Uint16	Hardware revision of the operator
0196h	0	OS22	Software_Revision (IM)	Uint32	Software revision of the operator
0197h	0	OS23	Revision_Counter (IM)	Uint16	Revision counter
0198h	0	OS24	Profile_Id (IM)	Uint16	Profile-ID
0199h	0	OS25	Profile_Specific_Type (IM)	Uint16	Profile specific type
019Ah	0	OS26	Pnet_IPMask	Uint32	Actual IP mask
0198h	0	OS27	Pnet_IPGateway	Uint32	Actual IP Gateway setting
0280h	0	Fb00	InternComCycle	Uint32	Cycle time in synchronous mode in $\mu$ s
0281h	0	Fb01	FBS Config	Uint16	Collection of some configuration settings
0282h		Fb02	DelayTimeSyncToAppllrq	Uint16	Delay time between IRT synchsignal and internal synchronous communication in $\mu$ s
0283h	0	Fb03	RealSyncCycleTime	Uint16	The real cycle time of the IRT synchsignal in $\mu$ s determined by the operator
0284h	0	Fb04	FBS Command	Uint16	Setting of certain commands to the F5 PROFINET operator.
0285h	0	Fb05	PDOOUT1_Hsp5Service	Uint8	Service number for the KEB internal protocol for reading the first 8 bytes PDOOUT data
0286h	0	Fb06	PDIN1_Hsp5Service	Uint8	Service number for the KEB internal protocol for reading the first 8 bytes PDIN data
0287h	0	Fb07	PDIN_Cycle	Uint16	Cycle time in ms for reading the PDIN data
0288h	0	Fb08	PDOOUT2_Hsp5Service	Uint8	Service number for the KEB internal protocol for reading the second 8 byte PDOOUT data
0289h	0	Fb09	PDIN2_Hsp5Service	Uint8	Service number for the KEB internal protocol for reading the second 8 byte PDIN data
028Ah	0	Fb10	CfgNrPDINS	Uint8	Required number of PDIN units
028Bh	0	Fb11	CfgNrPDOOUTS	Uint8	Required number of PDOOUT units
028Ch	0	Fb12	ActiveNrPDINS	Uint8	Number of active PDIN units
028Dh	0	Fb13	ActiveNrPDOOUTS	Uint8	Number of active PDOOUT units
028Eh	0	Fb14	PdoutEvCnt	Uint32	Counts the events of received PDOOUT data
028Fh	0	Fb15	Pdout_DW1	Uint32	Actual PDOOUT data bytes 0...3
(*1)	Please note that the use of the sub-index is depending on the actual setting of bit6 in parameter Fb01 FBS Config, see chapter "3.1.1.2 Addressing with subindex". „3.1.1.2 Satzadressierung mittels Subindex“				

## PARAMETER OVERVIEW

PNU	Sub-Index (*1)	ID	Name	Internal data type	Meaning
0290h	0	Fb16	Pdout_DW2	Uint32	Actual PDOOUT data bytes 4...7
0291h	0	Fb17	Pdout_DW3	Uint32	Actual PDOOUT data bytes 8...11
0292h	0	Fb18	Pdout_DW4	Uint32	Actual PDOOUT data bytes 12...15
0293h	0	Fb19	PdinEvCnt	Uint32	Counts the events of updated PDIN data
0294h	0	Fb20	Pdin_DW1	Uint32	Actual PDIN data bytes 0...3
0295h	0	Fb21	Pdin_DW2	Uint32	Actual PDIN data bytes 4...7
0296h	0	Fb22	Pdin_DW3	Uint32	Actual PDIN data bytes 8...11
0297h	0	Fb23	Pdin_DW4	Uint32	Actual PDIN data bytes 12...15
0298h	0	Fb24	ProjSyncCycleTime	Uint32	By the controller proj. cycle time of the IRT-synchsinal in $\mu$ s
0299h	0	Fb25	ProjDiffTimePDIN	Uint32	Set-up time for reading the PDIN data in $\mu$ s
029Ah	0	Fb26	ProjDiffTimePDOOUT	Uint32	Delay time to accept the PDOOUT data in $\mu$ s
029Bh	0	Fb27	IRTCycleCnt	Uint16	IRT cycle counter
029Ch	1	Fb28	1st PDOOUT map.set0	Uint32	1. Pdout mapping parameter
029Ch	2	Fb28	1st PDOOUT map.set1	Uint32	2. Pdout mapping parameter
029Ch	4	Fb28	1st PDOOUT map.set2	Uint32	3. Pdout mapping parameter
029Ch	8	Fb28	1st PDOOUT map.set3	Uint32	4. Pdout mapping parameter
029Ch	16	Fb28	1st PDOOUT map.set4	Uint32	5. Pdout mapping parameter
029Ch	32	Fb28	1st PDOOUT map.set5	Uint32	6. Pdout mapping parameter
029Ch	64	Fb28	1st PDOOUT map.set6	Uint32	7. Pdout mapping parameter
029Ch	128	Fb28	1st PDOOUT map.set7	Uint32	8. Pdout mapping parameter
029Dh	0	Fb29	1st PDOOUT map count	Uint8	Number of active Pdout mapping parameter
029Eh	1	Fb30	1st PDIN map.set0	Uint32	1. Pdin mapping parameter
029Eh	2	Fb30	1st PDIN map.set1	Uint32	2. Pdin mapping parameter
029Eh	4	Fb30	1st PDIN map.set2	Uint32	3. Pdin mapping parameter
029Eh	8	Fb30	1st PDIN map.set3	Uint32	4. Pdin mapping parameter
029Eh	16	Fb30	1st PDIN map.set4	Uint32	5. Pdin mapping parameter
029Eh	32	Fb30	1st PDIN map.set5	Uint32	6. Pdin mapping parameter
029Eh	64	Fb30	1st PDIN map.set6	Uint32	7. Pdin mapping parameter
029Eh	128	Fb30	1st PDIN map.set7	Uint32	8. Pdin mapping parameter
029Fh	0	Fb31	1st PDIN map count	Uint8	Number of active Pdin mapping parameter
02A0h	0	Fb32	Pnet_PDOOUT_Config	Uint32	Specifies the required PROFINET PDOOUT configuration
02A1h	0	Fb33	Pnet_PDIN_Config	Uint32	Specifies the required PROFINET PDIN configuration
(*1)	Please note that the use of the sub-index is depending on the actual setting of bit6 in parameter Fb01 FBS Config, see chapter "3.1.1.2 Addressing with subindex". „3.1.1.2 Satzadressierung mittels Subindex“				

## 7.2 Parameter description

<b>ID:</b>	<b>OS00</b>
<b>Name:</b>	<b>Operator type</b>
Meaning	Indicates the operator type and the software version.
Parameter number (PNU):	0180h
Subindex:	0
Data type:	Uint32
Coding:	11800 + software version as two-digit decimal number with 1 decimal place in the least significant two decimal places.
Standard value:	Depending on actual software version
Note:	Example: 11828: F5 PROFINET operator with software V2.8.

<b>ID:</b>	<b>OS01</b>
<b>Name:</b>	<b>Password</b>
Meaning	Indicates the actual adjusted password level of the operator software.
Parameter number (PNU):	0181h
Subindex:	0
Data type:	Int16
Coding:	KEB internal
Standard value:	Level4 password
Note:	Written and countercheck value are not identical. Currently the password level has no effect on the functionality of the operator and thus has no importance for the user.

<b>ID:</b>	<b>OS02</b>
<b>Name:</b>	<b>Software date</b>
Meaning	Indicates the software date of the actual software.
Parameter number (PNU):	0182h
Subindex:	0
Data type:	Uint32
Coding:	First 4 decimal places = year Next 2 decimal places = month Last 2 decimal places = day
Standard value:	Depending on the actual software version date
Note:	Example: Value = 20120503 : 03.05.2012 is displayed in COMBIVIS as plain-text as ‚2012,0503‘:

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>OS05</b>
<b>Name:</b>	<b>Diag Baud rate</b>
Meaning	Indicates the adjusted transmission speed of the diagnostic interface (X6B).
Parameter number (PNU):	0185h
Subindex:	0
Data type:	Uint8
Coding:	0: 1200 Bit/s 1: 2400 Bit/s 2: 4800 Bit/s 3: 9600 Bit/s 4: 19200 Bit/s 5: 38400 Bit/s 6: 55500 Bit/s
Standard value:	5: 38400 Bit/s
Note:	A changed value is stored immediately active and non-volatile.

<b>ID:</b>	<b>OS09</b>
<b>Name:</b>	<b>HSP5_MinTxGap</b>
Meaning	Specifies the minimum gap time between two HSP5 Tx telegrams. This parameter value is determined after each power on by the connected FI control. This parameter may only be changed for test purposes.
Parameter number (PNU):	0189h
Subindex:	0
Data type:	Uint16
Coding:	1 $\mu$ s
Standard value:	0 (off)
Note:	A changed value becomes active immediately but it is not stored. If a value above the upper limit of 500 $\mu$ s is written, the upper limit of 500 $\mu$ s becomes active.

<b>ID:</b>	<b>OS10</b>
<b>Name:</b>	<b>MAC Address (Chassis)</b>
Meaning	
Parameter number (PNU):	018Ah
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	FAXXXXXXh
Note:	The complete value of the MAC address (chassis) is the result from this value plus prefix of 0008h.

<b>ID:</b>	<b>OS11</b>
<b>Name:</b>	<b>NetX_FwVersion</b>
Meaning	Indicates the actual loaded firmware version of the installed ProfiNet Asics.
Parameter number (PNU):	018Bh
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	Depending on the delivered PROFINET firmware version
Note:	

<b>ID:</b>	<b>OS12</b>
<b>Name:</b>	<b>Serial number (IM)</b>
Meaning	Indicates the serial number of the F5 ProfiNet operator.
Parameter number (PNU):	018Ch
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The suffix (IM) in the parameter name indicates that this value is part of the identification and maintenance parameters.

<b>ID:</b>	<b>OS14</b>
<b>Name:</b>	<b>NodeSwitchVal</b>
Meaning	Indicates the actual adjustment at the two hex-coded node address switches.
Parameter number (PNU):	018Eh
Subindex:	0
Data type:	Uint8
Coding:	1
Standard value:	Depending on switch position.
Note:	The value of this parameter affects the PROFINET name.

<b>ID:</b>	<b>OS15</b>
<b>Name:</b>	<b>Pnet_IPAddress</b>
Meaning	Indicates the actual IP address of the F5 PROFINET operator.
Parameter number (PNU):	018Fh
Subindex:	0
Data type:	Uint32
Coding:	4-byte IP address
Standard value:	0.0.0.0
Note:	The last assigned IP address by the PROFINET controller is stored non-volatile and remains active at the next start-up.

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>OS16</b>
<b>Name:</b>	<b>Din66019SlvAddr</b>
Meaning	Slave address of the F5 PROFINET operator for communication via KEB COMBIVIS with TCP/UDP
Parameter number (PNU):	0190h
Subindex:	0
Data type:	UInt8
Coding:	1
Standard value:	Depending on the setting in OS15
Note:	This parameter is write protected in the actual software. The value is determined by the least significant byte of the Pnet_IPAddress (OS15).

<b>ID:</b>	<b>OS17</b>
<b>Name:</b>	<b>MAC Address (Port0)</b>
Meaning	MAC address of Port0 (X6C) of the PROFINET interface
Parameter number (PNU):	0191h
Subindex:	0
Data type:	UInt32
Coding:	see OS10
Standard value:	FAXXXXXXh
Note:	see OS10

<b>ID:</b>	<b>OS18</b>
<b>Name:</b>	<b>MAC Address (Port1)</b>
Meaning	MAC address of Port1 (X6D) of the PROFINET interface
Parameter number (PNU):	0192h
Subindex:	0
Data type:	UInt32
Coding:	see OS10
Standard value:	FAXXXXXXh
Note:	see OS10

<b>ID:</b>	<b>OS19</b>
<b>Name:</b>	<b>Manufacturer_Id (IM)</b>
Meaning	The assigned manufacturer-ID by the PROFIBUS consortium for KEB.
Parameter number (PNU):	0193h
Subindex:	0
Data type:	UInt16
Coding:	1
Standard value:	177h
Note:	This value is constant.



<b>ID:</b>	<b>OS20</b>
<b>Name:</b>	<b>Order_Id (IM)</b>
Meaning	The order number of the KEB F5 PROFINET operator as long character string (20 characters). Divided into five 32-bit values, each with 4 characters.
Parameter number (PNU):	0194h
Subindex:	1: Character 1 to 4 2: Character 5 to 8 4: Character 9 to 12 8: Character 13 to 16 16: Character 17 to 20
Data type:	Uint32
Coding:	Ascii
Standard value:	00F5060-L100
Note:	This value is constant.

<b>ID:</b>	<b>OS21</b>
<b>Name:</b>	<b>Hardware_Revision (IM)</b>
Meaning	Hardware revision of the F5 PROFINET operator
Parameter number (PNU):	0195h
Subindex:	0
Data type:	Uint16
Coding:	1
Standard value:	1
Note:	This value is constant.

<b>ID:</b>	<b>OS22</b>			
<b>Name:</b>	<b>Software_Revision (IM)</b>			
Meaning	Software revision of the F5 PROFINET operator			
Parameter number (PNU):	0196h			
Subindex:	0			
Data type:	Uint32			
Coding:	in accordance with [6]			
	b31...b24	b23...b16	b15...b8	b7...b0
	Type	X	Y	Z
	,V'(= 86): Released version ,P'(= 80): Prototype ,U'(= 85): in test ,T'(= 84): Test equipment	Upper decimal place of the operator software version (see OS.00)	Lower decimal place of the operator software version (see OS.00)	Here always = 0
Standard value:	Depending on software version			
Note:	This value is constant.			

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>OS23</b>
<b>Name:</b>	<b>Revision_Counter (IM)</b>
Meaning	Revision counter of the F5 PROFINET operator
Parameter number (PNU):	0197h
Subindex:	0
Data type:	Uint16
Coding:	1
Standard value:	1
Note:	This value is constant 1

<b>ID:</b>	<b>OS24</b>
<b>Name:</b>	<b>Profile_Id (IM)</b>
Meaning	Profile-ID of the F5 PROFINET operator. Although the KEB F5 PROFINET operator operates with respect to the acyclic communication to the PROFIDRIVE profile, it is assigned to the group of Generic device units, because it does not support any parameters according to PROFIDRIVE specification.
Parameter number (PNU):	0198h
Subindex:	0
Data type:	Uint16
Coding:	1
Standard value:	F600h: Generic device
Note:	This value is constant.

<b>ID:</b>	<b>OS25</b>
<b>Name:</b>	<b>Profile_Specific_Type (IM)</b>
Meaning	The profile specific type of the F5 PROFINET operator
Parameter number (PNU):	0199h
Subindex:	0
Data type:	Uint16
Coding:	1
Standard value:	0001h: Standard Controller
Note:	This value is constant.

<b>ID:</b>	<b>OS26</b>
<b>Name:</b>	<b>Pnet_IPMask</b>
Meaning	Indicates the actual IP mask of the F5 PROFINET operator.
Parameter number (PNU):	019Ah
Subindex:	0
Data type:	Uint32
Coding:	4-byte IP-Mask
Standard value:	0.0.0.0
Note:	The last assigned IP mask by the PROFINET controller is stored non-volatile and remains active at the next start-up. From software V3.2 the value of this parameter can also be written via diagnostic interface. A new value is stored non-volatile, but active only at the next switch on.

<b>ID:</b>	<b>OS27</b>
<b>Name:</b>	<b>Pnet_IPGateway</b>
Meaning	Indicates the actual IP Gateway setting of the F5 PROFINET operator.
Parameter number (PNU):	0198h
Subindex:	0
Data type:	Uint32
Coding:	4-byte IP-Gateway
Standard value:	0.0.0.0
Note:	The last assigned IP Gateway adjustment by the PROFINET controller is stored non-volatile and remains active at the next start-up. From software V3.2 the value of this parameter can also be written via diagnostic interface. A new value is stored non-volatile, but active only at the next switch on.

<b>ID:</b>	<b>Fb00</b>
<b>Name:</b>	<b>InternComCycle</b>
Meaning	Indicates whether the internal communication is cyclic or acyclic.
Parameter number (PNU):	0280h
Subindex:	0
Data type:	Uint16
Coding:	0: Internal communication is acyclic Otherwise: Internal communication is cyclic with cycle time = Fb00 in $\mu$ s
Standard value:	0
Note:	

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>Fb01</b>							
<b>Name:</b>	<b>FBS Config</b>							
Meaning	Some configuration settings of the F5 PROFINET operator							
Parameter number (PNU):	0281h							
Subindex:	0							
Data type:	Uint16							
Coding:	b15...b7	b6	b5	b4	b3	b2	b1	b0
	xxx	Pnet_SubIdx_Linear	Enable_PDMap	Use_Default_PDMap	PDAPI_Disable	Disable_NetX_Reset	Sync-Mode_Enable	IRT_Enable
	bit0 = 1	IRT_Enable: In preparation						
	bit1 = 1	SyncMode_Enable: Enables the internal cyclic communication.						
	bit2 = 1	Disable NetX-Reset: At fundamental problems when starting the PROFINET firmware, the CPU of the PROFINET operator can carry out a hardware reset of the PROFINET ASIC (NetX). This function can be disabled via this bit.						
	bit3 = 1	PDAPI_Disable: For the function to be able to exchange acyclic data with a standard Siemens S7 PROFINET controller to PROFIDRIVE Base Mode Parameter Access, the F5 PROFINET operator has a second API with value = 3A00h. The module with the name ‚ProfiDrive_PAP‘ is assigned to this API. Via this bit the complete functionality of the API = 3A00h can be disabled with the module ‚ProfiDrive_PAP‘. In this case the acyclic communication to PROFIDRIVE Base Mode-Parameter-Access can be executed also via the standard API with value = 0.						
	bit4 = 1	The default PD mapping is written when starting the software to the drive converter, if bit5 = 1.						
	bit4 = 0	The non-volatile stored PD mapping in the operator (see Fb28 to Fb31) is written to the drive converter at boot-up, if bit5 = 1.						
	bit5 = 0	Writing the PD mapping to the drive converter control is deactivated at boot-up.						
	bit5 = 1	Writing the PD mapping to the frequency inverter control is activated at boot-up.						
	bit6 = 1	When addressing the parameters to PROFINET acyclic data the subindex is not bit-coded, but linearly coded.						
bit7 = 1	Activation of the PROFINET alarm signals. When the alarm is activated, the operator monitors the value of the drive converter parameter ru00 „inverter state“ (see chapter 3.11).							
Standard value:	0							
Note:	A new value is stored non-volatile, but only active at the next switch on.							

<b>ID:</b>	<b>Fb02</b>
<b>Name:</b>	<b>DelayTimeSyncToApplIrq</b>
Meaning	Is only relevant for the synchronous communication mode (PROFINET IO/ IRT). This parameter defines the delay time between PROFINET-Sync-Signal and communication interrupt.
Parameter number (PNU):	0282h
Subindex:	0
Data type:	Uint16
Coding:	1 $\mu$ s
Standard value:	500 $\mu$ s
Note:	A changed value is stored immediately active and non-volatile.

<b>ID:</b>	<b>Fb03</b>
<b>Name:</b>	<b>RealSyncCycleTime</b>
Meaning	Specifies the determined synchronous cycle time of the F5 PROFINET operator. The calculation of this time is updated with each Sync signal.
Parameter number (PNU):	0283h
Subindex:	0
Data type:	Uint16
Coding:	1 $\mu$ s
Standard value:	
Note:	This parameter is read-only.

<b>ID:</b>	<b>Fb04</b>
<b>Name:</b>	<b>FBS Command</b>
Meaning	Certain commands in the F5 PROFINET operator can be requested via this parameter. After execution of the command the operator sets bit 15 of the value to 1.
Parameter number (PNU):	0284h
Subindex:	0
Data type:	Uint16
Coding:	0: no command 1: Sets all non-volatile stored parameters of the operator to default values.
Standard value:	0
Note:	

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>Fb05</b>
<b>Name:</b>	<b>PDOUT1_Hsp5Service</b>
Meaning	The adjustment of this parameter is only relevant for the normal mode. Indicates the service code for the KEB internal protocol HSP5 to output the first 8 PDOOUT data byte from the operator to the drive converter control. The value must be suitable adjusted to the PDOOUT mapping in the drive converter.
Parameter number (PNU):	0285h
Subindex:	0
Data type:	Uint8
Coding:	16: PDOOUT assignment only with 32 bit values 17: PDOOUT assignment only with 16 bit values 48: PDOOUT assignment only with 32 bit values, full duplex (*1) 49: PDOOUT assignment only with 16 bit values, full duplex (*1) 50: PDOOUT assignment with 1 32-bit- and 1-2 16-bit values, full duplex (*1)
Standard value:	17
Note:	A changed value is stored immediately active and non-volatile. This parameter is write protected, if Fb01 FBS Config.Bit5 is 1.

<b>ID:</b>	<b>Fb06</b>
<b>Name:</b>	<b>PDIN1_Hsp5Service</b>
Meaning	The adjustment of this parameter is only relevant for the normal mode. Indicates the service code for the KEB internal protocol HSP5 to read the first 8 PDIN data byte from the operator to the drive converter control. The value must be suitable adjusted to the PDIN mapping in the drive converter.
Parameter number (PNU):	0286h
Subindex:	0
Data type:	Uint8
Coding:	16: PDIN assignment only with 32 bit values 17: PDIN assignment only with 16 bit values 48: PDIN assignment only with 32 bit values, full duplex (*1) 49: PDIN assignment only with 16 bit values, full duplex (*1) 50: PDIN assignment with 1 32-bit- and 1-2 16-bit values, full duplex (*1)
Standard value:	17
Note:	A changed value is stored immediately active and non-volatile. This parameter is write protected, if Fb01 FBS Config.Bit5 is 1.

(\*1): In case of full duplex services the PDOOUT data are transferred in Request to the drive converter control and Response contains the PDIN data. PDOOUT data and PDIN data are independently transferred at non-full duplex services. The outcome of this at full duplex services is that the values for PDOOUT\_Hsp5Service/ PDOOUT2\_Hsp5Service and PDIN\_Hsp5Service/ PDIN2\_Hsp5Service must be identical.

<b>ID:</b>	<b>Fb07</b>
<b>Name:</b>	<b>PDIN_Cycle</b>
Meaning	The adjustment of this parameter is only relevant for the normal mode. The contents of the PDIN data are read cyclically in normal communication mode. The value of this parameter preset the cycle time in ms.
Parameter number (PNU):	0287h
Subindex:	0
Data type:	Uint16
Coding:	1ms
Standard value:	25ms
Note:	A changed value is stored immediately active and non-volatile.

<b>ID:</b>	<b>Fb08</b>
<b>Name:</b>	<b>PDOUT2_Hsp5Service</b>
Meaning	The adjustment of this parameter is only relevant for the normal mode. Indicates the service code for the KEB internal protocol HSP5 to output the second 8 PDOOUT data byte from the operator to the drive converter control, if activated. The value must be suitable adjusted to the PDOOUT mapping in the drive converter.
Parameter number (PNU):	0288h
Subindex:	0
Data type:	Uint8
Coding:	19: PDOOUT assignment only with 32 bit values 20: PDOOUT assignment only with 16 bit values 51: PDOOUT assignment only with 32 bit values, full duplex (*1) 52: PDOOUT assignment only with 16 bit values, full duplex (*1) 53: PDOOUT assignment with 1 32-bit- and 1-2 16-bit values, full duplex (*1)
Standard value:	20
Note:	A changed value is stored immediately active and non-volatile. This parameter is write protected, if Fb01 FBS Config.Bit5 is 1.

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>Fb09</b>
<b>Name:</b>	<b>PDIN2_Hsp5Service</b>
Meaning	The adjustment of this parameter is only relevant for the normal mode. Indicates the service code for the KEB internal protocol HSP5 to read the second 8 PDIN data byte from the operator to the drive converter control, if activated. The value must be suitable adjusted to the PDIN mapping in the drive converter.
Parameter number (PNU):	0289h
Subindex:	0
Data type:	Uint8
Coding:	19: PDIN assignment only with 32 bit values 20: PDIN assignment only with 16 bit values 51: PDIN assignment only with 32 bit values, full duplex (*1) 52: PDIN assignment only with 16 bit values, full duplex (*1) 53: PDIN assignment with 1 32-bit- and 1-2 16-bit values, full duplex (*1)
Standard value:	20
Note:	A changed value is stored immediately active and non-volatile. This parameter is write protected, if Fb01 FBS Config.Bit5 is 1.

<b>ID:</b>	<b>Fb10</b>
<b>Name:</b>	<b>CfgNrPDINS</b>
Meaning	This parameter has two meanings. In normal mode, the value of this parameter indicates how many PDIN units are activated internally. Each internal PDIN unit transfer 8 bytes PDIN data in normal mode. Additionally the parameter determines which PDIN submodule is configured in slot1. The adjustment of this parameter must agree with the project design in the PROFINET controller.
Parameter number (PNU):	028Ah
Subindex:	0
Data type:	Uint8
Coding:	1 (corresponds to 8 byte PDIN data) 2 (corresponds to 16 byte PDIN data)
Standard value:	1
Note:	A changed value is stored non-volatile, but active only at the next switch on. This parameter is write protected, if Fb01 FBS Config.Bit5 is 1.



<b>ID:</b>	<b>Fb11</b>
<b>Name:</b>	<b>CfgNrPDOOTS</b>
Meaning	This parameter has two meanings. In normal mode, the value of this parameter indicates how many PDOOUT units are activated internally. Each internal PDOOUT unit transfer 8 bytes PDOOUT data in normal mode. Additionally the parameter determines which PDOOUT submodule is configured in slot2. The adjustment of this parameter must agree with the project design in the PROFINET controller.
Parameter number (PNU):	028Bh
Subindex:	0
Data type:	Uint8
Coding:	1 (corresponds to 8 byte PDOOUT data) 2 (corresponds to 16 byte PDOOUT data)
Standard value:	1 (corresponds to 8 byte PDOOUT data)
Note:	A changed value is stored non-volatile, but active only at the next switch on. This parameter is write protected, if Fb01 FBS Config.Bit5 is 1.

<b>ID:</b>	<b>Fb12</b>
<b>Name:</b>	<b>ActiveNrPDINS</b>
Meaning	Indicates the number of active PDIN units in normal mode. The value of this parameter usually corresponds to the value of FB10. The cause that the two parameter values differ is that the connected drive converter control supports only one PDIN unit.
Parameter number (PNU):	028Ch
Subindex:	0
Data type:	Uint8
Coding:	1 (corresponds to 8 byte PDIN data) 2 (corresponds to 16 byte PDIN data)
Standard value:	1 (corresponds to 8 byte PDIN data)
Note:	The value of this parameter can only be read.

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>Fb13</b>
<b>Name:</b>	<b>ActiveNrPDOOTS</b>
Meaning	Indicates the number of active PDOOUT units in normal mode. The value of this parameter usually corresponds to the value of FB11. The cause that the two parameter values differ is that the connected drive converter control supports only one PDOOUT unit.
Parameter number (PNU):	028Dh
Subindex:	0
Data type:	Uint8
Coding:	1 (corresponds to 8 byte PDOOUT data) 2 (corresponds to 16 byte PDOOUT data)
Standard value:	1 (corresponds to 8 byte PDOOUT data)
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb14</b>
<b>Name:</b>	<b>PdoutEvCnt</b>
Meaning	Counts the events that new PDOOUT data are received from PROFINET.
Parameter number (PNU):	028Eh
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb15</b>
<b>Name:</b>	<b>Pdout_Dw1</b>
Meaning	Displays the last received first double word (32 bit) of the PDOOUT data.
Parameter number (PNU):	028Fh
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb16</b>
<b>Name:</b>	<b>Pdout_Dw2</b>
Meaning	Displays the last received second double word (32 bit) of the PDOOUT data.
Parameter number (PNU):	0290h
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb17</b>
<b>Name:</b>	<b>Pdout_Dw3</b>
Meaning	Displays the last received third double word (32 bit) of the PDOOUT data.
Parameter number (PNU):	0291h
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb18</b>
<b>Name:</b>	<b>Pdout_Dw4</b>
Meaning	Displays the last received 4th double word (32 bit) of the PDOOUT data.
Parameter number (PNU):	0292h
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>Fb19</b>
<b>Name:</b>	<b>PdinEvCnt</b>
Meaning	Counts the events that new PDIN data to the PROFINET have been updated.
Parameter number (PNU):	0293h
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb20</b>
<b>Name:</b>	<b>Pdin_Dw1</b>
Meaning	Displays the last transmitted first double word (32 bit) of the PDIN data.
Parameter number (PNU):	0294h
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb21</b>
<b>Name:</b>	<b>Pdin_Dw2</b>
Meaning	Displays the last transmitted second double word (32 bit) of the PDIN data.
Parameter number (PNU):	0295h
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb22</b>
<b>Name:</b>	<b>Pdin_Dw3</b>
Meaning	Displays the last transmitted third double word (32 bit) of the PDIN data.
Parameter number (PNU):	0296h
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb23</b>
<b>Name:</b>	<b>Pdin_Dw4</b>
Meaning	Displays the last transmitted 4th double word (32 bit) of the PDIN data.
Parameter number (PNU):	0297h
Subindex:	0
Data type:	Uint32
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb24</b>
<b>Name:</b>	<b>ProjSyncCycleTime</b>
Meaning	Indicates the master projected Sync cycle time in $\mu\text{s}$ at active PROFINET IO/ IRT communication.
Parameter number (PNU):	0298h
Subindex:	0
Data type:	Uint32
Coding:	1 $\mu\text{s}$
Standard value:	0 $\mu\text{s}$
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb25</b>
<b>Name:</b>	<b>ProjDiffTimePDIN</b>
Meaning	Indicates at active PROFINET IO/IRT communication the master projected set-up time where the PDIN data shall be determined.
Parameter number (PNU):	0299h
Subindex:	0
Data type:	Uint32
Coding:	1 $\mu\text{s}$
Standard value:	0 $\mu\text{s}$
Note:	The value of this parameter can only be read.

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>Fb26</b>
<b>Name:</b>	<b>ProjDiffTimePDOOUT</b>
Meaning	Indicates at active PROFINET IO/IRT communication the master projected set-up time where the PDOOUT data shall be accepted.
Parameter number (PNU):	029Ah
Subindex:	0
Data type:	Uint32
Coding:	1 $\mu$ s
Standard value:	0 $\mu$ s
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb27</b>
<b>Name:</b>	<b>IRTCycleCnt</b>
Meaning	Indicates the IRT cycle counter value at active PROFINET IO/IRT communication.
Parameter number (PNU):	029Bh
Subindex:	0
Data type:	Uint16
Coding:	1
Standard value:	0
Note:	The value of this parameter can only be read.

<b>ID:</b>	<b>Fb28</b>		
<b>Name:</b>	<b>1st PDOOUT map</b>		
Meaning	Specifies the PDOOUT mapping. The parameter is set-programmable.		
Parameter number (PNU):	029Ch		
Subindex:	Subindex		Meaning
	Bit-coded	Linear	
	FBS Config.Bit6 = 0	FBS Config.Bit6 = 1	
	0	0	addressed the 1th mapping
	1	1	addressed the 1th mapping
	2	2	addressed the 2nd mapping
	4	3	addressed the 3rd mapping
	8	4	addressed the 4th mapping
	16	5	addressed the 5th mapping
	32	6	addressed the 6th mapping
	64	7	addressed the 7th mapping
	128	8	addressed the 8th mapping
Data type:	Uint32		
Coding:	b31...b24	b23...b16	b15...b8
	PNU		Subindex
	PNU		Bit length
	Pnu: Parameter address of the mapped parameter		
	Subindex:Parameter subindex of the mapped parameter		
	Subindex = 0	→	Parameter is mapped in set0
	Subindex = 1	→	Parameter is mapped in set0
	Subindex = 2	→	Parameter is mapped in set1
	Subindex = 3	→	Parameter is mapped in set2
	Subindex = 4	→	Parameter is mapped in set3
	Subindex = 5	→	Parameter is mapped in set4
	Subindex = 6	→	Parameter is mapped in set5
	Subindex = 7	→	Parameter is mapped in set6
	Subindex = 8	→	Parameter is mapped in set7
	Multiple mappings are not possible.		
Bit length: The mapped data length in bit, only the values = 16.32 are permissible here			
Standard value:	0		
Note:	A changed value is immediately stored non-volatile.A changed mapping entry furthermore causes the shutdown of the corresponding mapping and the setting of parameter 1st PDOOUT map cout = 0. Gaps are not supported by this structure, i.e. there is no way to declare a mapping inactive.		

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>Fb29</b>
<b>Name:</b>	<b>1st PDOOUT map count</b>
Meaning	Indicates how much PDOOUT mapping entries shall be activated in 1st PDOOUT1 map.
Parameter number (PNU):	029Dh
Subindex:	0
Data type:	Uint8
Coding:	1
Standard value:	
Note:	A changed value is stored immediately active and non-volatile.

<b>ID:</b>	<b>Fb30</b>
<b>Name:</b>	<b>1st PDIN map</b>
Meaning	Specifies the Pdin mapping. The parameter is set-programmable.
Parameter number (PNU):	029Eh
Subindex:	see Fb28
Data type:	Uint32
Coding:	see Fb28
Standard value:	0
Note:	A changed value is immediately stored non-volatile. A changed mapping entry furthermore causes the switch off of the corresponding mapping and setting of parameter 1st PDIN map count = 0. Gaps are not supported by this structure, i.e. there is no way to declare a mapping inactive.

<b>ID:</b>	<b>Fb31</b>
<b>Name:</b>	<b>1st PDIN map count</b>
Meaning	Indicates how much PDOOUT mapping entries shall be activated in 1st map.
Parameter number (PNU):	029Fh
Subindex:	0
Data type:	Uint8
Coding:	1
Standard value:	
Note:	A changed value is stored immediately active and non-volatile.



<b>ID:</b>	<b>Fb32</b>			
<b>Name:</b>	<b>Pnet_PDOOUT_Config</b>			
Meaning	Specifies the required PROFINET PDOOUT configuration			
Parameter number (PNU):	02A0h			
Subindex:	0			
Data type:	Uint32			
Coding:	b31...b24	b23...b16	b15...b8	b7...b0
	Module-Id	Submodule-Id	reserved	Pd-length
	00000000h: ,Not used', setting in accordance with Fb11			
	81400002h: ,1x16BitOut'			
	81410004h: ,2x16BitOut'			
	81420006h: ,3x16BitOut'			
	03020008h: ,4x16BitOut'(*1)			
	8144000Ah: ,5x16BitOut'			
	8145000Ch: ,6x16BitOut'			
	8146000Eh: ,7x16BitOut'			
	05040010h: ,8x16BitOut'(*1)			
	(*1): These values are downward compatible and offer the possibility to use the new Fb33 with an 'old' GSDML.			
	Standard value:	0: Setting in accordance with Fb11		
Note:	A changed value is immediately stored non-volatile, but it becomes active only at the next switch on. If bit 5 of parameter Fb01 FBS Config is set, only the value compatible with the process data length of the set PD mapping can be adjusted in parameter Fb32. However, deactivating of parameter Fb32 (value = 0) is always possible.			

## PARAMETER DESCRIPTION

<b>ID:</b>	<b>Fb33</b>				
<b>Name:</b>	<b>Pnet_PDIN_Config</b>				
Meaning	Specifies the required PROFINET PDIN configuration				
Parameter number (PNU):	02A1h				
Subindex:	0				
Data type:	Uint32				
Coding:	b31...b24	b23...b16	b15...b8	b7...b0	
	Module-Id	Submodule-Id	reserved	Pd-length	
	00000000h: ,Not used', setting in accordance with Fb10				
	80400002h: ,1x16BitIn'				
	80410004h: ,2x16BitIn'				
	80420006h: ,3x16BitIn'				
	02010008h: ,4x16BitIn'(*1)				
	8044000Ah: ,5x16BitIn'				
	8045000Ch: ,6x16BitIn'				
	8046000Eh: ,7x16BitIn'				
	04030010h: ,8x16BitIn'(*1)				
	(*1): These values are downward compatible and offer the possibility to use the new parameter Fb33 with an 'old' GSDML.				
	Standard value:	0: Setting in accordance with Fb11			
	Note:	A changed value is immediately stored non-volatile, but it becomes active only at the next switch on. If bit 5 of parameter Fb01 FBS Config is set, only the value compatible with the process data length of the set PD mapping can be adjusted in parameter Fb33. However, deactivating of parameter Fb33 (value = 0) is always possible.			

## 8 Instructions for F5 PROFINET operator to Simatic S7

Simatic is a product group of Siemens AG. This short overview make no claim to be exhaustive, nor replace the original documents of the company Siemens to this issue!

Please note in particular the issue project design of the clock synchronization (PROFINET IO) in the S7 help. The project design of a synchronous PROFINET communication (PROFINET IO-IRT) is more extensive than the project design for a PROFINET IO-RT communication. The following example is used to specify the steps for the project design of such IRT communication. All pictures are screenshots of a Siemens Step7-Simatic-Manager software with the version.

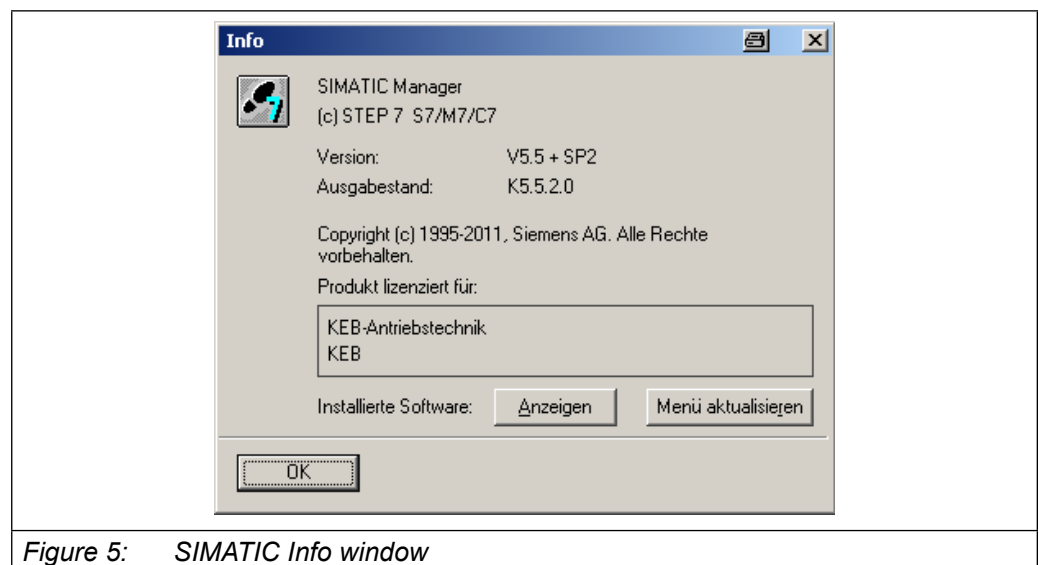


Figure 5: SIMATIC Info window

### 8.1 Standard project design

From software V2.8 of the F5 PROFINET operator the following communication functions are possible:

- Exchange acyclic data (parameter channel) to PROFIdrive profile
- Exchange cyclic data (process data channel) with PROFINET IO-RT or PROFINET IO-IRT

All information about the available functions of the PROFINET protocol receives the PROFINET controller (master) via the unit description file (GSDML) of the slave. Therefore, first it is necessary to import the unit description file of the slave to be connected into the control system. This is done at the Siemens Simatic S7 in the so-called HW config via menu Extras-> install GSD-files.

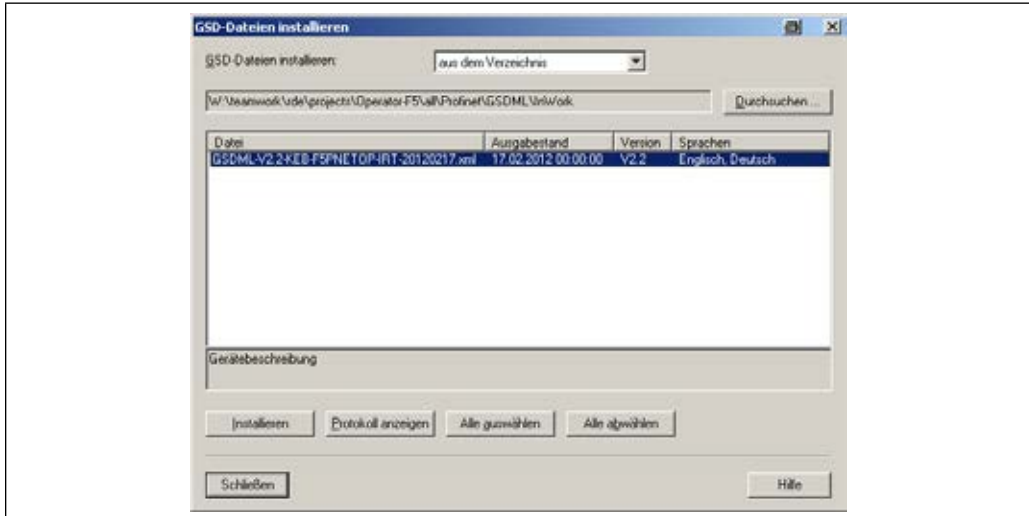


Figure 6: Install GSD files

If you create a new project in the Simatic-Manager (e.g. via file → Assistent New Project...) first select the desired S7-CPU. Then change to hardware configuration and paste by right click to the PN\_IO interface of the CPU and insert selection PROFINET IO-system ... a PROFINET system.

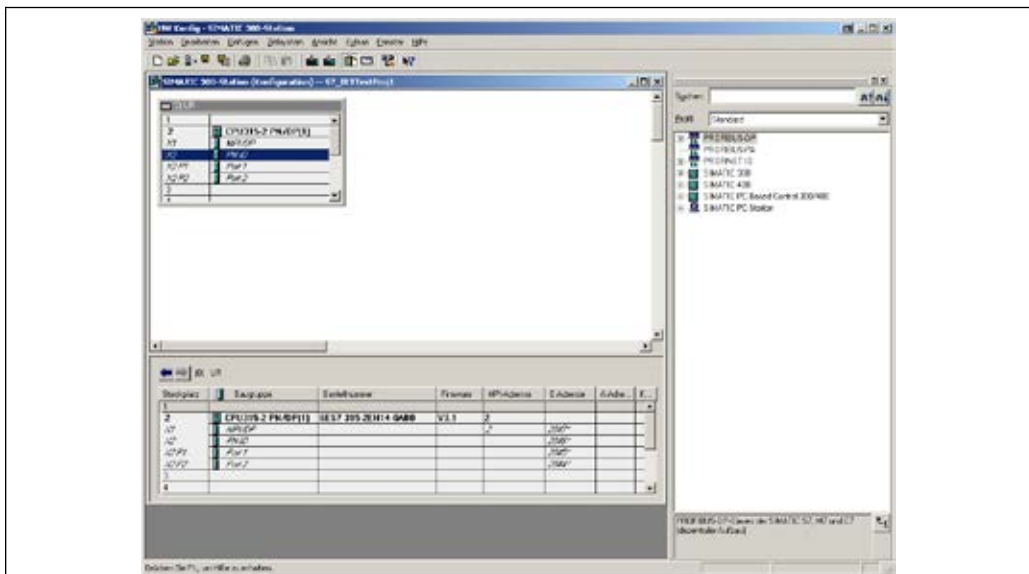


Figure 7: PN-IO interface

If the synchronous communication (PROFINET IO-IRT) shall be used, the PN-IO interface of the CPU can be configured by right-clicking on the PN-IO interface of the CPU and select object properties as a sync master:

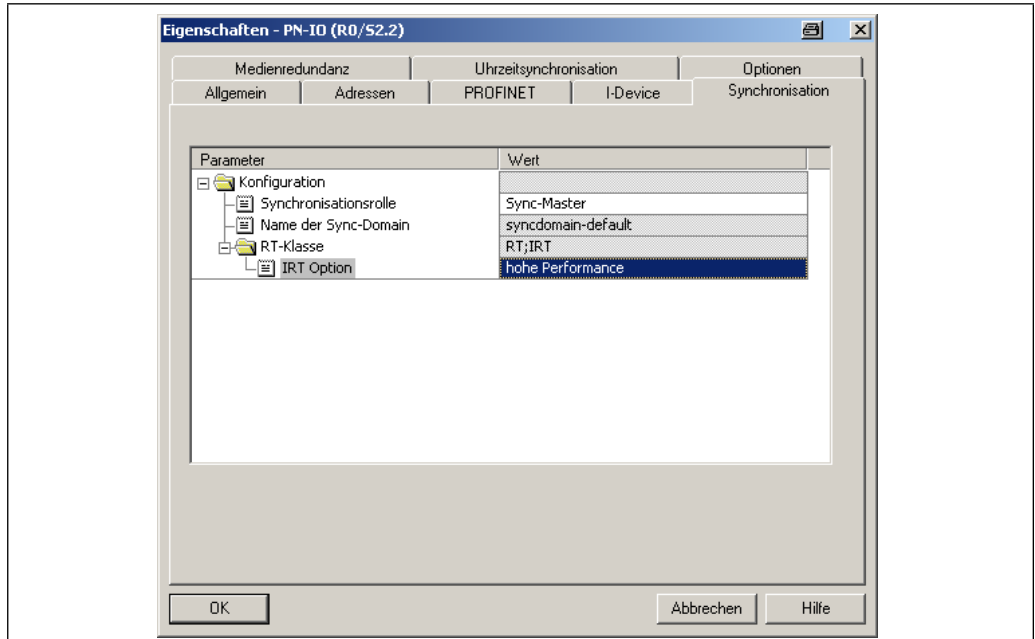


Figure 8: Configure object properties as sync master

Then in the right part of the HW Config window of PROFINET-IO → additional field instruments → ....the KEB F5 PROFINET operator selected and appended with the mouse to the PROFINET System in the left pane. It is important that the PROFIDRIVE\_PAP module is set into slot 3:

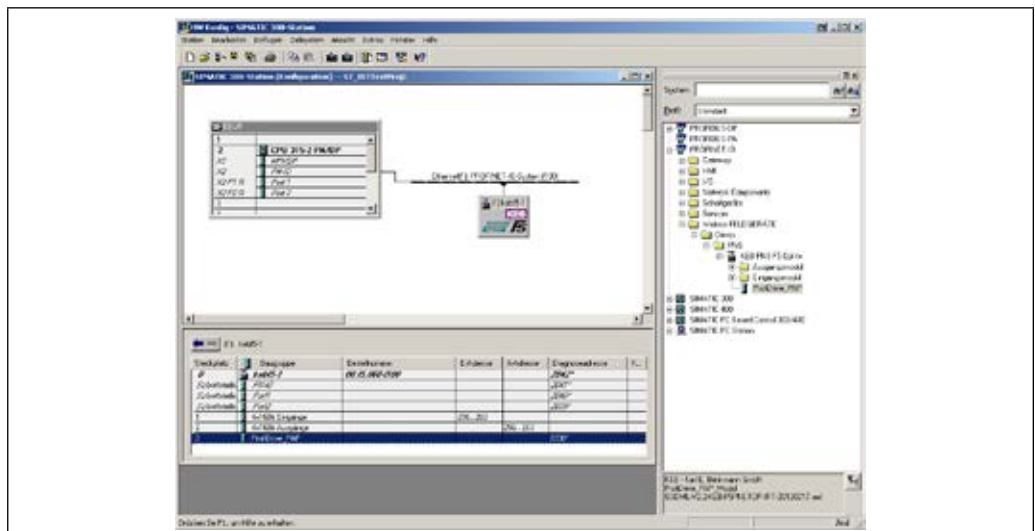


Figure 9: PROFINET system

As standard one 4x16 bit input module and one 4x16 bit output module are automatically inserted for the KEB F5 unit. If required, these can be replaced by one 8x16 bit input module or 8x16 bit output module. The standard project design is used in this example. Thereby 8 byte cyclic data can be transferred from the control to the slave and the same quantity cyclic data can be transferred from the slave to the control. The project design is completed herewith if no synchronous communication is required (PROFINET IO-IRT).

## 8.2 Additional project design for synchronous communication according PROFINET IO-IRT

Additional settings must also be made for the slave if PROFINET IO-IRT shall be activated. First, the exact topology of the PROFINET network must be specified for synchronous communication. This is done by right-click to the PROFINET-IO system and selection of PROFINET IO topology. The graphical view is selected in the following picture, since this gives the best overview. In this example Port2 was selected for the PROFINET communication on control side and Port1 on slave side, since the communication with the programming unit is done via Port1 of the control CPU.

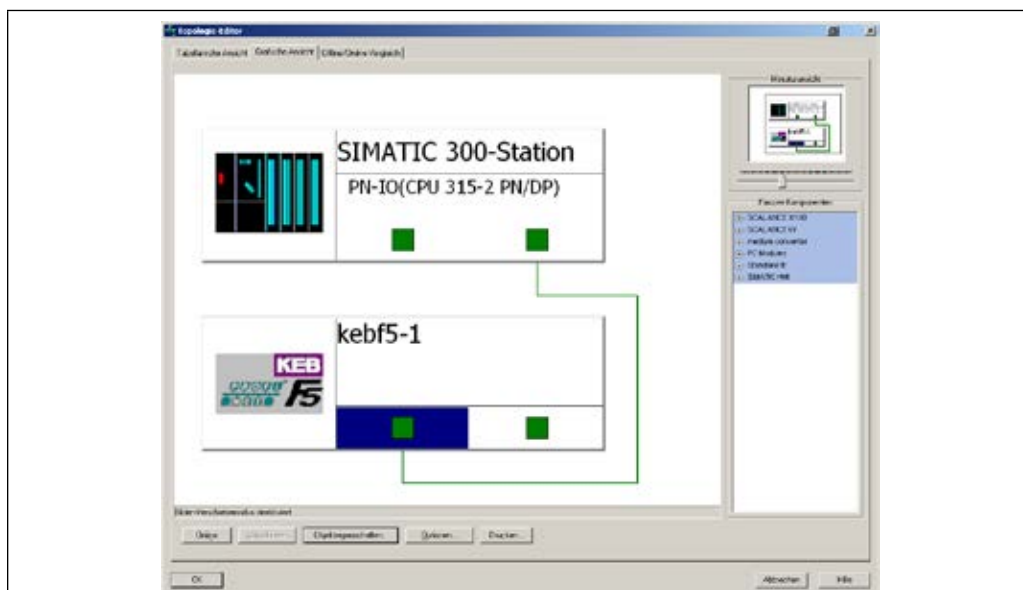


Figure 10: Graphical view of the PROFINET communication

Then the KEB slave must be configured as sync slave. This can be realized via right-click to the PROFINET IO system and selection of PROFINET domain management.

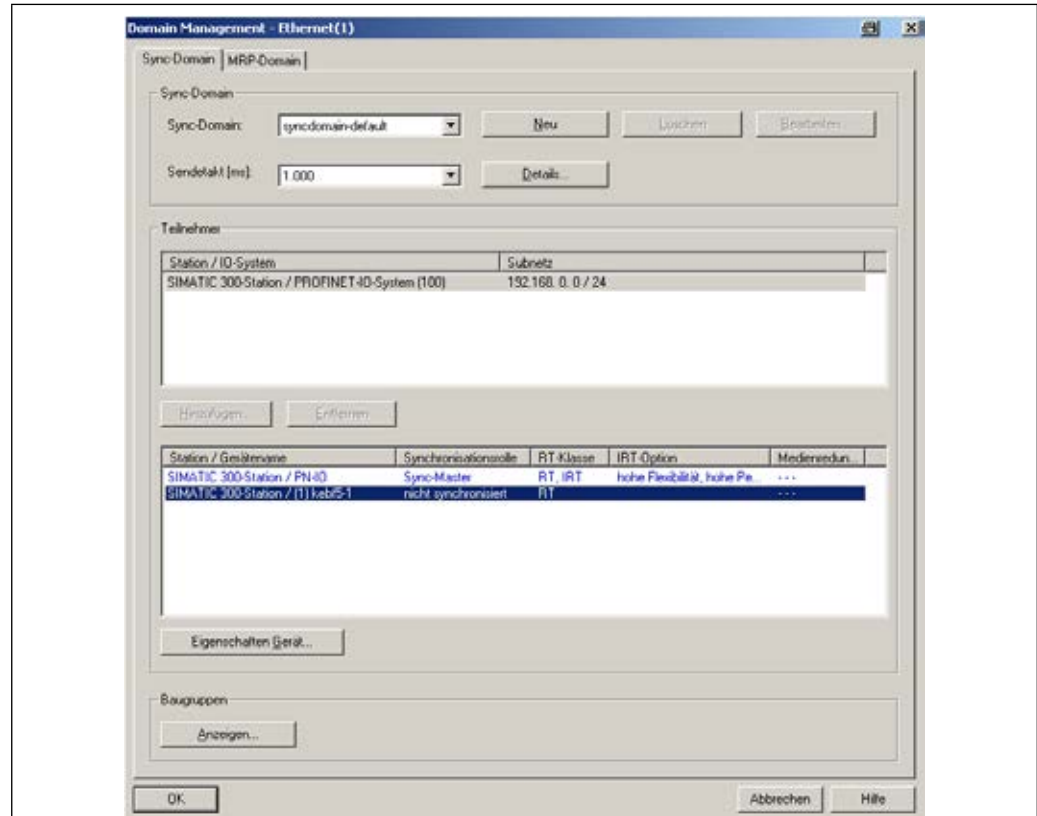


Figure 11: Set KEB slave as Sync slave

It makes sense to set the transmit clocking to 2ms, because this corresponds to the minimum setting of the KEB F5 PROFINET slave. Furthermore the KEB slave is selected here (click on ‚kebf5-1‘) and configured as follows via clicking the button ‚unit characteristics‘:

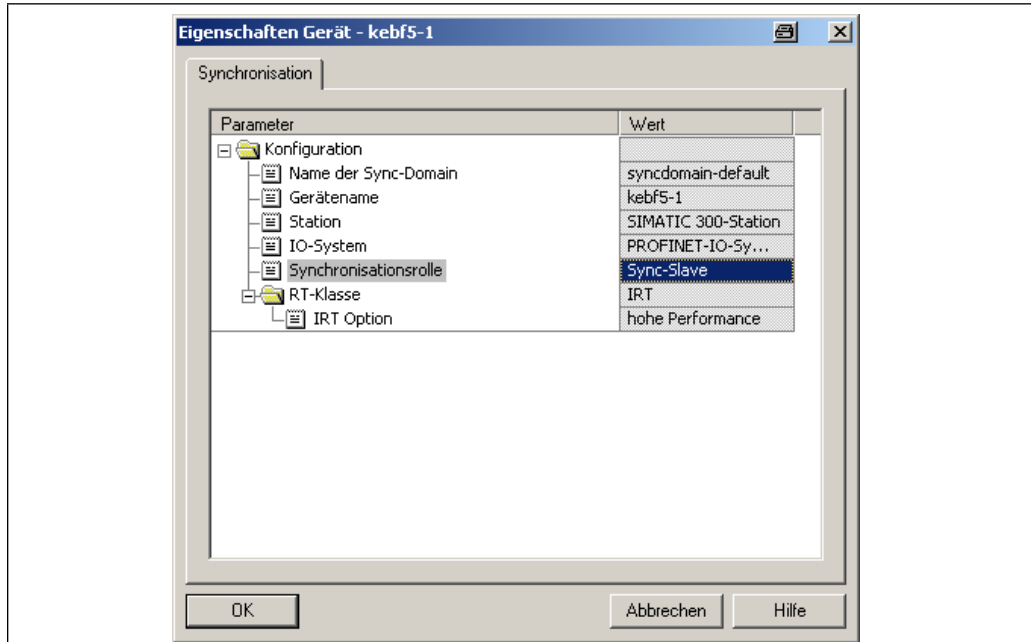


Figure 12: Set synchronization role

Then the domain management is configured as follows:

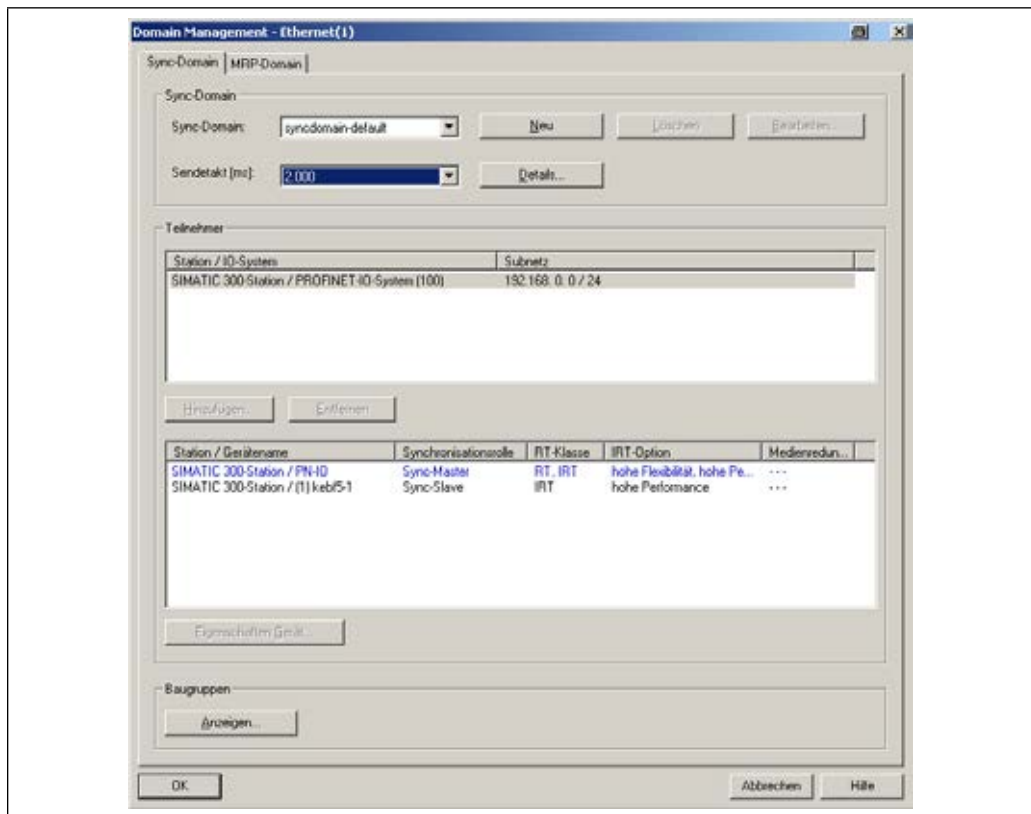


Figure 13: Selection of the transmission clock



The Siemens S7 control provides synchronous alarms for synchronous communication. The exchange of synchronous, cyclic data is programmed in this alarm modules. The OB61 is activated for it in the example. This is done by right click to the CPU and selection of 'object characteristics'. Page 'synchronous alarms' is selected in the opening window.

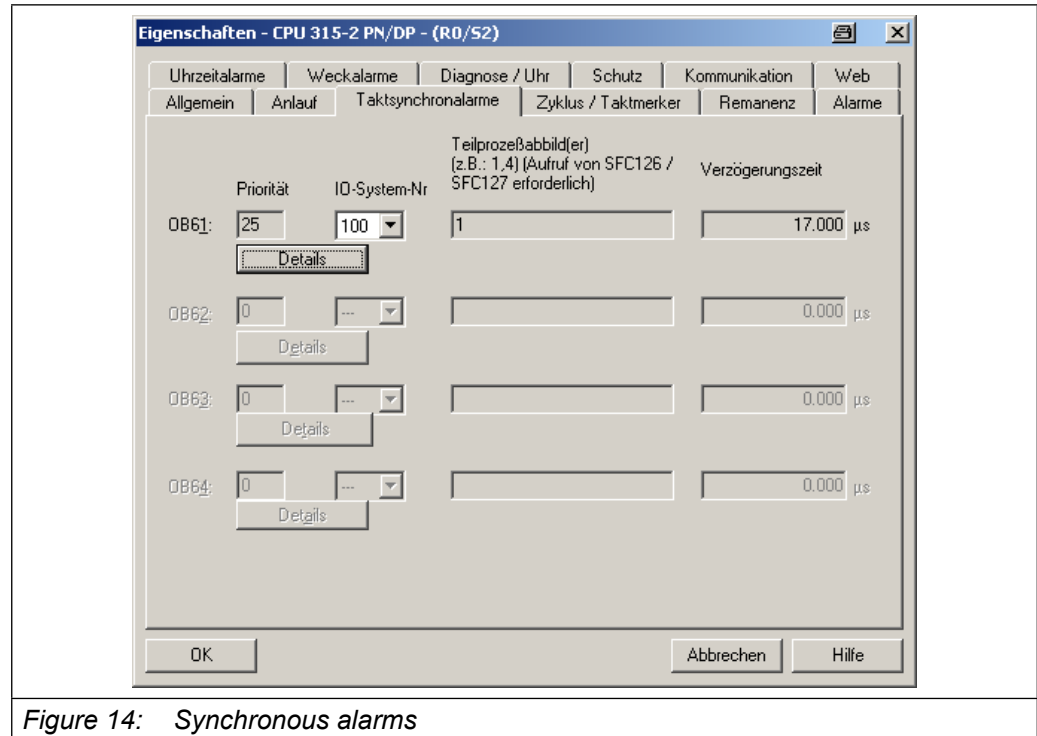


Figure 14: Synchronous alarms

The detail adjustments must be done via the button 'details' of the selected OB.

Finally the slave is assigned to OB61 by right click to the PN-IO interface of the slave and the selection ‚object characteristics‘. Page ‚IO-Cycle‘ is selected in the opening window.

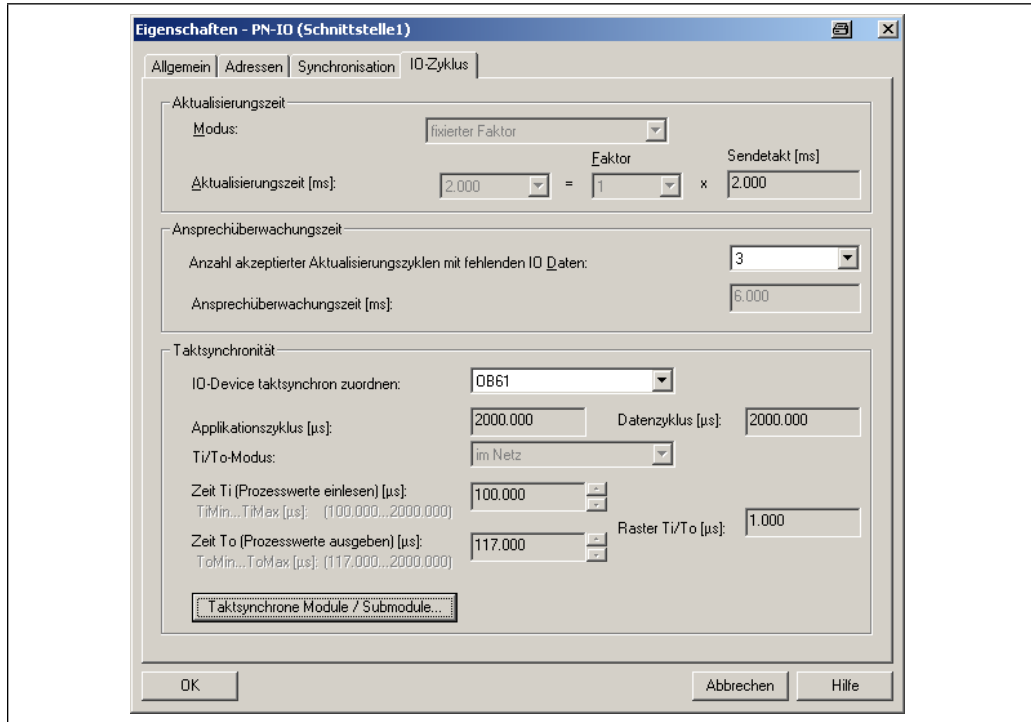


Figure 15: IO-cycle characteristics

## 8.3 Step7 Software

### 8.3.1 Acyclic communication (parameter channel)

The system function blocks SFB53 ("WRREC") and SFB52 ("RDREC") can be used for the realization of acyclic communication according PROFIdrive. The basic process of an acyclic parameter access is described as follows:

- Send the acyclic request by calling SFB53("WRREC")
- Calling SFB53 must be repeated until SFB53-OUTPUT 'DONE' is 1.
- Calling SFB52("RDREC") until SFB52-OUTPUT 'VALID' is 1.

Important transfer parameters for the SFB53/52 calls:

- ,ID': This input parameter must be set with the diagnosis address of the PROFIdrive\_PAP module (see HW-config). In the example above this is 2038(07F6h).
- ,INDEX': This input parameter defines the data set type which is transacted hereby. For reasons of backward compatibility there are several possible values which are treated internally the same by the KEB F5 PROFINET operator:
  - -20434 (= B02EH): Base Parameter Mode Access – Local
  - -20433 (= B02FH): Base Parameter Mode Access – Global
  - 47: Base Parameter Mode Access – Global

### 8.3.2 Cyclic communication (process data)

Access to the cyclical data of the slave is very simple. Access to entered I/O addresses of a slave defined by the hardware configuration can be done via the following commands:

```
L PEW  X // Loading the peripheral input word with offset X in ACCU1
T PAW  Y // Transfer the content of ACCU 1 into the peripheral output word with offset
Y
```

Depending on the organization of the cyclic data also the byte or double-word commands can be used (L PED X, T PAD Y or L PEB X, T PAB Y).

This is valid for the synchronous data exchange at PROFINET IO-IRT in a synchronous alarm block (e.g. OB61) as well as for the non-synchronous data exchange at PROFINET IO-RT.

## 9 Annex

### 9.1 F5 Operator internal error messages

Display	Description
Error	Communication error during initialisation
o_Flo	Overflow in value calculation
t_out	Timeout, control board doesn't answer
IDAtA	Data invalid
rOnly	Parameter Read_Only
E_Bcc	Communication error: wrong checksum
Busy	Drive converter busy
ISruc	Communication error: Invalid service
No PA	Parameter locked by password
I_FrA	Communication error: Invalid character
E_PAr	Communication error: wrong parity
I_SEt	Invalid set
I_Adr	Invalid parameter address
I_OPE	Invalid operation
E xx	xx=error code in hex: all other errors
EEEEPX	with X = 1,2,3..: fatal error during test of serial eeprom
EEEEPR	fatal error during test of serial eeprom

## 10 Examples for the setting of PD mappings

### 10.1 Mixed mapping (special case)

A mixed mapping of 32 bit and 16 bit is a very special PD mapping. In this example the PDOOUT data shall be assigned as follows:

B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15
MSB			LSB	MSB	LSB	MSB	LSB	MSB			LSB	MSB	LSB	MSB	LSB
Sy43			Sy52			In22		PS24			PS25		In23		

Fb28	1 <sup>st</sup> PDOOUT map.set0	= 002B0120h	Sy43	(32-Bit)
Fb28	1 <sup>st</sup> PDOOUT map.set1	= 00340110h	Sy52	(16-Bit)
Fb28	1 <sup>st</sup> PDOOUT map.set2	= 0E160110h	In22	(16-Bit)
Fb28	1 <sup>st</sup> PDOOUT map.set3	= 13180120h	PS24	(32-Bit)
Fb28	1 <sup>st</sup> PDOOUT map.set4	= 13190110h	PS25	(16-Bit)
Fb28	1 <sup>st</sup> PDOOUT map.set5	= 0E160110h	In22	(16-Bit)
Fb29	1 <sup>st</sup> PDOOUT map count	=6		

Assignment of the Pdin data analog:

B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15
MSB			LSB	MSB	LSB	MSB	LSB	MSB			LSB	MSB	LSB	MSB	LSB
Sy44			Sy53			In22		ru54			PS25		In23		

Fb30	1 <sup>st</sup> PDIN map.set0	= 002B0120h	Sy44	(32-Bit)
Fb30	1 <sup>st</sup> PDIN map.set1	= 00340110h	Sy53	(16-Bit)
Fb30	1 <sup>st</sup> PDIN map.set2	= 0E160110h	In22	(16-Bit)
Fb30	1 <sup>st</sup> PDIN map.set3	= 02360120h	ru54	(32-Bit)
Fb30	1 <sup>st</sup> PDIN map.set4	= 02000110h	ru00	(16-Bit)
Fb30	1 <sup>st</sup> PDIN map.set5	= 0E160110h	In22	(16-Bit)
Fb31	1 <sup>st</sup> PDIN map count	=6		

## 10.2 2 x 32-Bit Pdout plus 4 x 16-Bit Pdin

The following example is used to demonstrate that PDout data and PDin data may have a different structure:

Pdout data:

B0	B1	B2	B3	B4	B5	B6	B7
MSB			LSB	MSB			LSB
Sy43				oP63			

Fb28	1 <sup>st</sup> PDOUT map.set0	= 002B0120h	Sy43	(32-Bit)
Fb28	1 <sup>st</sup> PDOUT maps.set1	= 0033F120h	oP63	(32-Bit)
Fb29	1 <sup>st</sup> PDOUTmap count	=2		

Pdin data:

B0	B1	B2	B3	B4	B5	B6	B7
MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB
Sy42		Sy51		ru00		ru15	

Fb30	1 <sup>st</sup> PDIN map.set0	= 002B0110h	Sy42	(16-Bit)
Fb30	1 <sup>st</sup> PDIN map.set1	= 00330110h	oP63	(16-Bit)
Fb30	1 <sup>st</sup> PDIN map.set2	= 0E200110h	ru00	(16-Bit)
Fb30	1 <sup>st</sup> PDIN map.set3	= 020F0110h	ru15	(16-Bit)
Fb31	1 <sup>st</sup> PDIN map count	=4		

Please observe in all examples that the addressing of different sets is dependent on the setting of bit6 in operator parameter Fb01 FBS config (see parameter description Fb28).

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