COMBIVERT

INSTRUCTION MANUAL **Powerlink Operator**

Translation of original manual		
Document	Part	Version
20099027	GBR	01

KEB

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1. Preface

The described hard- and software are developments of the Karl E. Brinkmann GmbH. The enclosed documents correspond to conditions valid at printing. Misprint, mistakes and technical changes reserved.

1.1 Information on special measures

The used pictograms have following significance:

Danger	Is used, when death or serious bodily injury may be the consequence of non-observance of the measure.
Warning	Is used, when bodily injury and/or substantial property damage may be the consequence of non-observance of the measure.
Caution	Is used, when property damage may be the consequence of non-observance of the measure.
Attention	Is used, when noise sensitive or unrequested operation may be the consequence of non-observance of the measure.
Info	Is used, when a better or simpler result can be the consequence of the measure.

For a special case the instructions can be supplemented by additional pictograms and text.

1.2 Documentation

Prior to performing any work on the unit the user must familiarize himself with the unit. This includes especially the knowledge and observance of the safety and operating instructions.

Attention	**Observe safety and operating instructions**
	Precondition for all further steps is the knowledge and observance of the safety and operating instructions. This is provided accompanied by the device or by the download site of www.keb.de.

Non-observance of the safety and operating instructions leads to the loss of any liability claims. The warnings and safety instructions in this manual work only supplementary. This list is not exhaustive.

1.3 Validity and liability

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.

Danger  **by tamper from unauthorized personnel**	
	Unauthorised opening and tampering may lead to death, bodily injury, property damage and malfunctions. Modification or repair is permitted only by authorized personnel by KEB. Infringement will annul the liability for resulting consequences.

The suspension of liability is especially valid also for operation interruption loss, loss of profit, data loss or other damages. Disclaimer of warranty will cause void the guarantee. This is also valid, if we referred first to the possibility of such damages.

If single regulations should be or become void, invalid or impracticable, the effectivity of all other regulations or agreements is not affected.

Through multitude applications not each possible case of installation, operation or maintenance can be considered. If you require further information or if special problems occur which are not treated detailed in the documentation, you can request the necessary information via the local Karl E.Brinkmann GmbH agency.

1.4 Copyright

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

KEB®, COMBIVERT®, COMBICONTROL® and COMBIVIS® are registered trademarks of Karl E. Brinkmann GmbH.

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

When creating our documents we pay attention with the utmost care to the rights of third parties. Should we have not marked a trademark or breach a copyright, please inform us in order to have the possibility of remedy.

1.5 Specified application

Info 	Is used, when a better or simpler result can be the consequence of the measure.
Functional Safety FS  	Pay special attention to units with one of these markings on the nameplate..See documentation for special installation or operation requirements!

1.6 Product Description

KEB-Antriebstechnik develop, produce and sell static frequency inverters worldwide in the industrial power range. The inverters of the type F5 can be equipped optionally with a Power-Link-Controlled-Node-Interface. The F5 PowerLink operator is integrated into the frequency inverter housing by simple plug-in and fits into all F5 units. Here it concerns to an intelligent interface which controls the data transfer from PowerLink to the frequency inverter control and reverse.

1.7 Order data

F5-PowerLink-Operator:	00F5060-H000
Additional components for the diagnostics interface:	
HSP5 cable between PC and F5-Powerlink operator:	00F50C0-0010
Adapter of DSUB to Western:	00F50C0-0020

1.8 List of literature

[1]: Ethernet Powerlink V2.0 Communication Profile, Draft Standard Version 1.0.0

[2]: CANopen Application Layer and Communication Profile DS301 V4.02

[3]: Application manual of the used inverter control.

[4]: CANopen Device profile drives and motion control DSP402 V2.0

[5]: Ethernet Powerlink V2.0 XML Device description, EPSG Draft Standard 1311 V1.0.0

2. Description of the Hardware

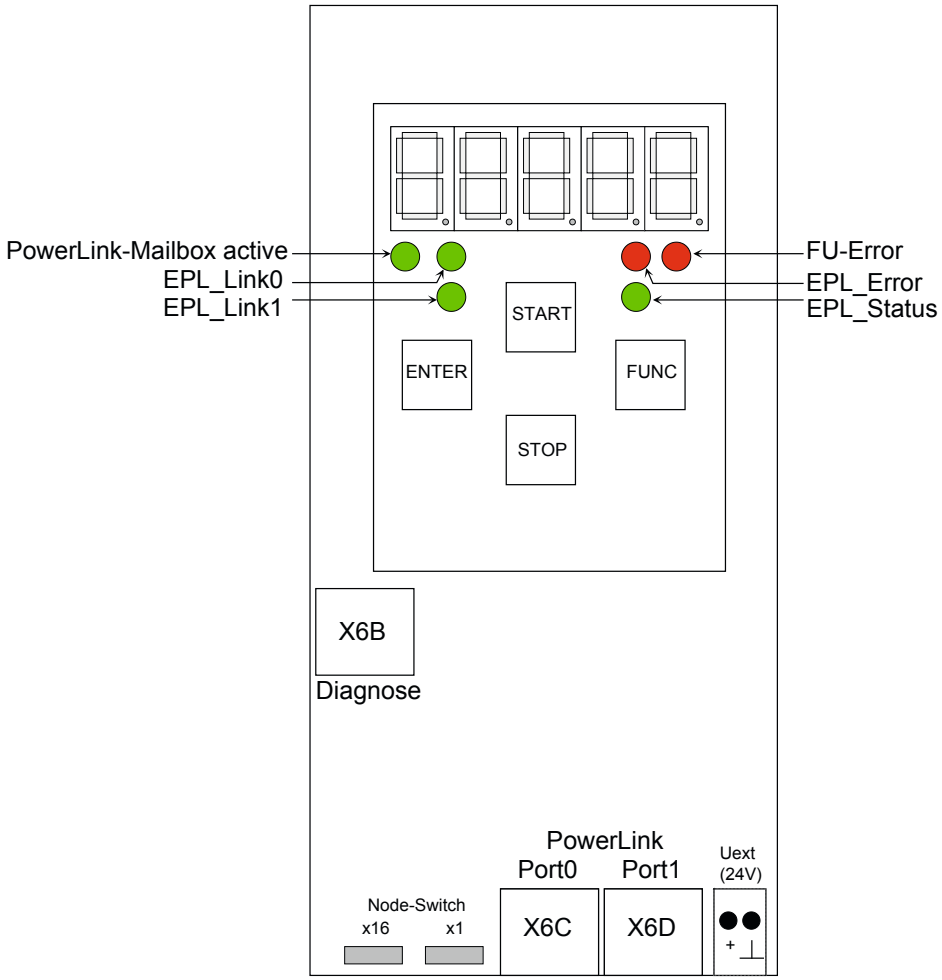


Figure 1: Overview of the Powerlink Operator

PowerLink Command-Layer active: Flashes, as long as the parameter channel communication is active.

EPL_Link0: Flashes, if a link is recognized at Powerlink-Port0. Flashes in case of activity on this port.

EPL_Link1: Flashes, if a link is recognized at Powerlink-Port1. Flashes in case of activity on this port.

FU-Error: Red LED as copy of the FI error LED:

Flashing	Description
Constantly off	No voltage supply at FI control circuit
blinking	FI control in error status
Constantly on	No error

EPL_ERROR: Red LED in accordance with the specification "ERROR Led` in the Powerlink specification ([1]):

Flashing	Description
Constantly off	No error
Constantly on	Active error status

EPL_STATUS: Red LED in accordance with the specification "STATUS Led` in the Powerlink specification ([1]):

Flashing	Description
Constantly off	NMT_GS_OFF, NMT_GS_INITIALISATION, NMT_CS_NOT_ACTIVE
cyclic flickering with ON(50ms) / OFF(50ms)	NMT_CS_BASIC_ETHERNET
single lightning with ON(200ms) / OFF(1000ms)	NMT_CS_PREOPERATIONAL_1
double lightning with ON(200ms) / OFF(200ms) / ON(200ms) / OFF(1000ms)	NMT_CS_PREOPERATIONAL_2
triple lightning with ON(200ms) / OFF(200ms) / ON (200ms) / OFF(200ms) / ON (200ms) / OFF(1000ms)	NMT_CS_READY_TO_OPERATE
Constantly on	NMT_CS_OPERATIONAL
cyclic flashing with ON(200ms) / OFF(200ms)	NMT_CS_STOPPED

X6B: RJ45 socket of the diagnostic interface (Combivis):

X6C,**X6D**: Standard Ethernet-RJ45-connector in accordance with IEEE 802.3 100Base-T:

Caution To prevent the damage of the serial interface on your Personal Computer be sure that you use the special HSP5 cable from KEB for connecting your PC to the serial interface of the ModBus operator.

Info Powerlink uses a fix baudrate of 100 Mbit/s

Node Switch (x16, x1)

Node-Switch: The Powerlink node address is set with these two node switches. The left node switch (x16) puts out the High Nibble, the right node switch (x16) puts out the Low Nibble of the unit address. .

Thus, the node address is set as follows:

Info Node address = switch position (x16) * 16 + switch position (x1)

Example:

:

Switch postion x16:	9	->	$9*16^1$
			+
Switch postion x1:	5	->	$5*16^0$
			=
Node address:			149 (95 Hex)

3. Software

3.1 Fundamentals of the KEB-Powerlink connection

The KEB-F5-Powerlink operator contains a separate Powerlink slave controller for processing of time-critical communication tasks. An extensive Powerlink compatibility is also ensured by using this external component. The supported Powerlink versions are EPL V1 and **EPL** V2.

Technical data of the Powerlink interface:

Supported Powerlink version(s)	EPL V1, EPL V2
Response Time	2 µs

3.1.1 EPL-Command-Layer protocol(parameter channel)

The Command-Layer-protocol' is supported by the KEB-F5-Powerlink operator. Thus it is possible to address any parameter itself in the FI control and in the Powerlink operator via acyclic SDO protocol. The supported services on the "COMMAND Layer" are:

- Expedited Download Transfer with Write-by-Index as Server (writing of a parameter via index, subindex)
- Expedited Upload Transfer with Read-by-Index as Server (reading of a parameter via index, subindex)

Parameter-addressing with 16-Bit index plus 8-Bit subindex

1.Index	Last index	Description
1000h	1FFFh	Communication parameter in accordance with [2]
2000h	5FFFh	Parameter of FI control and operator with index = KEB-Parameter-Address + 2000h(*1). KEB uses the subindex for set-addressing.
6000h	9FFFh	Parameter of the unit profile DSP402 in accordance with [4]

(*1): The KEB parameter address can be found here or in [3]. It is also possible to display the KEB parameter address in the KEB start-up software COMBIVIS. See annex for specific informations.

3.1.2 Set-addressing with subindex

The subindex is used for set-addressing at KEB parameters (Index = 2000h...5FFFh). The following coding is valid:

Subindex	Description
0	Indirect set-addressing: The addressed set is determined by a respective set indicator. Parameter Fr.09 is used for parameters of the FI control
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	Direct set-addressing of set 4
32	Direct set-addressing of set 5
64	Direct set-addressing of set 6
128	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 the illustration of the process PDOCUT data (Rx-PDO). The same reservation (like reading via SDO commands) applies to the PDIN data illustration.

3.2 Process data communication

New process output data (PDOUT) can be sent to the KEB Powerlink slave and the actual process input data (PDIN) can be determined by means of process data communication. Which parameters concern to the data is determined by the process data illustration in the Powerlink operator. Up-to-date a maximum of **8 byte** process data for each data direction can be transferred.

3.2.1 Funktionality

Process data mapping

The process data mapping is located in the Powerlink operator. The default setting for this is:

PDOUT data (Powerlink-Master KEB-Slave):

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Sy.43: Control word (long)				Sy.52: Set speed		IN.22: User Parameter 1	
LSByte			MSByte	LSByte	MSByte	LSByte	MSByte

PDIN-data (KEB-Slave -> PowerLink-Master):

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Sy.44: Status word (long)				Sy.53: Actual Speed		IN.22: User Parameter 1	
LSByte			MSByte	LSByte	MSByte	LSByte	MSByte

The mapping is adjustable as well as Powerlink parameters with index = 1600h and 1A00h and via operator parameters PD_Inx_Map and PD_Outx_Map (see below).

A mapping entry according to Powerlink specification for objects (1600h, 1A00h) is based on the following:

b63 b48	b47 b32	b31 b24	b23 b16	b15 b0
BitLength	BitOffset	Reserved	Subindex	Index

The default setting of the mapping parameters according to the Powerlink coding (s. [1]) is as follows:

Index	**Subindex**	**Value**				
1600h	0	3				
		BitLen	BitOffs	Res.	SI	Index
1600h	1	0020	0000	00	01	202Bh
1600h	2	0010	0020	00	01	2034h
1600h	3	0010	0030	00	01	2E16h
1A00h	0	3				
		BitLen	BitOffs	Res.	SI	Index
1A00h	1	0020	0000	00	01	202Ch
1A00h	2	0010	0020	00	01	2035h
1A00h	3	0010	0030	00	01	2E16h

Info The internal structure of mapping-parameters (PD_Inx_Map, PD_Outx_Map) does not support the attribute ‚BitOffs'. Therefore the BitOffs is related to the order of the mappings.

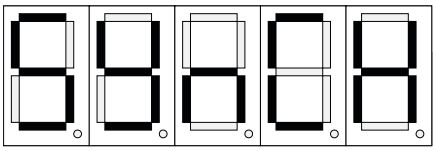
I.e.: BitOffs(1) = 0
BitOffs(2) = BitLen(1)
BitOffs(3) = BitOffs(2) + BitLen(2)
BitOffs(4) = BitOffs(3) + BitLen(3)

Info The process data of the structure 1*32-Bit + 1-2 times 16-Bit for output data and input data must follow for the synchronous mode.

Finally, after changing the mappings, the number of the mapped objects (Subindex=0) must be written via mailbox-command-layer (SDO) in the respective mapping object (1600h or 1A00h, s [2]) in order that the process data processing becomes active.

3.2.2 Synchron-Modus

The Powerlink SoC-Interrupt is used as synchronization signal for internal communication between Powerlink operator and FI control in this special kind of communication. The synchronous mode causes a process data assignment according to the rules specified above. The receipt of an SoC interrupt is referred as **SYNC event** in the following documentation. The operator display is fixed to ‚Synch' in the synchronous mode.

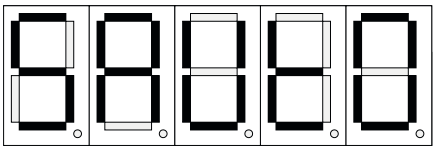


This special communication mode causes some restrictions in the functionality of the Powerlink operator. To the mentioned display also the keyboard is inactive.

The diagnostic interface remains in operation. The adjusted synchronous cycle time can be read off via diagnostic interface at operator parameter **FB.00: ComCycle**.

The PDOUT data are transferred to the FU control and the current PDIN data to Powerlink are updated during each synchronous cycle.

The Powerlink operator (at HS_SyncToutMode !=0) changes into automatic synchronous mode if the synchronous mode is activated, but no SoC interrupts are received. This is displayed in the operator display:



Thus the operator simulates itself the SoC interrupts time controlled in the adjusted Synch cycle time. The timeout-time when changing into automatic synchronous mode is in standard 4 * SYNC cycle time (Com Cycle).

The operator switches only into synchronous-mode , if

- Processdata-mapping in both direction follows the structure 1*32-Bit + 1-2*16-Bit is.
- Bit "EnableSyncMode" is activated in operator parameter "FBS Config".

3.2.3 Fieldbus watchdog

The field bus watchdog is a monitoring function of the Powerlink operator. The field bus watchdog serves to place the FI control into error status (E.BUS or A.BUS) if special communication events do not appear cyclically. Two operator parameters (**Watchdog inhibit, Watchdog activation**) configure the watchdog at operator side. Furthermore parameters **Pn.05, Pn.06** must be set in the FI control in order to define the timeout-time and the reaction to carry out in a timeout-case.

The Powerlink operator monitores the occurrence of the configurated field bus events (Watchdog inhibit). These events reset the watchdog-timer. Several fieldbus events can be defined as reset-event. The operator instructs the FI control via a special command if the watchdog time counts down without at least one of the configurated field bus events. The FI control reaction is determined by parameters **Pn.05, Pn.06** (already mentioned). The coding of these two parameters can be taken from [3].

3.2.4 Support of DSP402 profile

The KEB-F5-Powerlink operator supports some elementary objects of the DSP402 profile. This parameters are defined in [4]. Only the velocity mode is integrated. A list of these parameters can be found in the annexe.

4. Operator Parameters

The operator parameters are managed by the Powerlink operator. Access to this parameters can be done through diagnosis-interface with KEB-COMBIVIS software or through the SDO channel of Powerlink. The following list containes only those parameters which are important for the user. . All other parameters are for debugging-purposes and have not to be changed by the user.

Name:	**Com_Cycle (Fb00)**
Meaning:	Indicates the adjusted SoC interrupt cycle time in µs.
Combivis-Parameteraddress:	0280h
SDO-Index:	**2280h**
SDO-Subindex:	0
Data length:	4 Byte
Access:	READ_ONLY
Coding:	1 µs
Notes:	

Name:	**HS_SyncToutMode (Fb01)**
Meaning:	Defines the reaction on a SoC-interrupts timeout. Der Sync timeout is given, if no SoC-interrupt has been received since four times of the cycle time set by Com_Ccyle.
Combivis-Parameteraddress:	0281h
SDO-Index:	**2281h**
SDO-Subindex:	0
Data length:	1 Byte
Access:	READ_WRITE
Coding:	0: Automatic return to normal mode. Otherwise: Switch to Auto-synch-mode. In this mode SoC-Interrupts are emulated timercontrolled. As cycletime the value of Com_Cycle is used.
Standard value:	0
Notes:	A changed value is stored immediately active and non-volatile.

Name: **HS_SyncToutDelay (Fb02)**

Meaning: Defines the number of SoC-interrupts, after which the SoC-interrupt-supervising is activated.

Combivis-Parameteraddress: 0282h

SDO-Index: **2282h**

SDO-Subindex: 0

Data length: 2 Byte

Access: READ_WRITE

Coding: 1

Standard value: 0

Notes: A changed value is stored immediately active and non-volatile.

Name: **FBS Command (Fb04)**

Meaning: Through writing to this parameter certain commands can be requested in the Powerlink operator.

Combivis-Parameteraddress: 0284h

SDO-Index: **2284h**

SDO-Subindex: 0

Data length: 2 Byte

Access: READ_WRITE

Coding: 0: no command

1: Write default values of all non-voletile parameters into the non-voletile memory. This values are not active before the next restart of the PowerLink-operator.

Standard value: 0

Notes: For confirmation that the operator has executed the requested command, the operator sets Bit 15 to value 1 after conclusion of the command.

Name:	**Watchdog Activation (Fb07)**
Meaning:	Defines the activation of the fieldbus-watchdog after POWER On.
Combivis-Parameteraddress:	0287h
SDO-Index:	**2287h**
SDO-Subindex:	0
Data length:	1 Byte
Access:	READ_WRITE
Coding:	0: The Fieldbus-Watchdog is active immediately. Values unequal to Zero are bitcoded: Bit0: Activation of the Fieldbus-Watchdog after the first SoC-interrupt Bit1: reserved Bit2: Activation of the Fieldbus-Watchdog after the first transition of the PowerLink(FPGA) into state operational. Bit3: Activation of the Fieldbus-Watchdog after the first receive of PDOUT-data. Bit4: reserved Bit5: Activation of the Fieldbus-Watchdog after the first receive of a SDO-demand.
Standard value:	04h
Notes:	A new value takes effect immediately and is stored non-volatile.

Name:	**Watchdog Inhibit (Fb08)**
Meaning:	Defines the events that reset the fieldbus-watchdog. The bitcoding of this parameter makes it possible to define more than one event for resetting the fieldbus-watchdog.
Combivis-Parameteraddress:	0288h
SDO-Index:	**2288h**
SDO-Subindex:	0
Data length:	1 Byte
Access:	READ_WRITE
Coding:	Bit coded: Bit0: Reset of the Fieldbus-Watchdog after receive of PDOUT-data. Bit1: Reset of the Fieldbus-Watchdog after receive of a SDO-demand. Bit2: Reset of the Fieldbus-Watchdog, if a link-signal is set at Port0 or Port1 of the Powerlink-opterator. Bit3: Reset of the Fieldbus-Watchdog after receive of a SoC-interrupts.

Bit4: Reset of the Fieldbus-Watchdog, if the Powerlink-status (FPGA) is operational.

Standard value: 07h

Notes: A new value takes effect immediately and is stored non-volatile.

Name: **FBS Config (Fb09)**

Meaning: Serves for configuration of some special functions in the Powerlink operator.

Combivis-Parameteraddress: 0289h

SDO-Index: **2289h**

SDO-Subindex: 0

Data length: 2 Byte

Access: READ_WRITE

Coding: Bit coded:

Bit0: = 1: Switches automatically into the synchronous-mode, if the Powerlink (FPGA) changes into state operational.

= 0 : No activation of the synchronous-mode possible.

Standard value: 0000h

Notes: A new value takes effect immediately and is stored non-volatile.

Name: **PD_In_Cycle (Fb16)**

Meaning: Displays the cycle time the PDIN data are read by the FI, in order to transmit the data to Powerlink. This parameter adjustment has no effect in the synchronous mode. In synchronous mode the PDIN data are read once by the FI with each SoC cycle.

Combivis-Parameteraddress: 0290h

SDO-Index: **2290h**

SDO-Subindex: 0

Data length: 2 Byte

Access: READ_WRITE

Coding: 1 ms

Standard value: 25 ms

Notes: A new value takes effect immediately and is stored non-volatile.

Name: **PD_Inx_Map with x = 1-4 (Fb17-Fb20)**
Meaning: Defines the xth mapping for PDIN-data.
Combivis-Parameteraddress: 0291h-0294h
SDO-Index: **2291h-2294h**
SDO-Subindex: 0
Data length: 4 Byte
Access: READ_WRITE
Coding: Mapping according to [2]

b31 b24	b23 b16	b15 b8	b7 b0
Index		Subindex	BitLen

Standard value:

Parameter-Name	Value	Mapped parameter
PD_In1_Map	202C0120h	SY.44: Status word (long)
PD_In2_Map	20350110h	SY.53: Actual speed
PD_In3_Map	2E160110h	IN.22: User Parameter 1
PD_In4_Map	20350110h	SY.53: Actual speed

Notes: A changed value leads to the automatic deactivation of the PDIN-operation by resetting the parameter Nr_PDIN_Objs = 0.

Name: **Nr_PDIN_Objs (Fb21)**
Meaning: Displays the number of the mapped objects of the PDIN data.
Combivis-Parameteraddress: 0295h
SDO-Index: **2295h**
SDO-Subindex: 0
Data length: 1 Byte
Access: READ_WRITE
Coding: 1
Standard value: 3
Notes: If the values of mapping parameters (Fb17-Fb20) are changed, the value of Nr_PDIN_Objs is automatically reset to 0 and thereby the PDIN-operation deactivated. This parameter must be set to the required value if the mapping is completely described. If the mapping is accepted, it is given to the FI and stored automatically non-volatile.

Name: **PD_Outx_Map with x = 1-4 (Fb23-Fb26)**
Meaning: Defines the xth mapping for PDOUT-data.
Combivis-Parameteraddress: 0297h-029Ah
SDO-Index: **2297h-229Ah**
SDO-Subindex: 0
Data length: 4 Byte
Access: READ_WRITE
Coding: Mapping according to [2]

b31 b24	b23 b16	b15 b8	b7 b0
Index		Subindex	BitLen

Standard value:

Parameter-Name	Value	Mapped parameter
PD_Out1_Map	202B0120h	SY.43: Control word (long)
PD_Out2_Map	20340110h	SY.52: Setpoint speed
PD_Out3_Map	2E160110h	IN.22: User Parameter 1
PD_Out4_Map	20340110h	SY.52: Setpoint speed

Notes: A changed value leads to the automatic deactivation of the PDOUT-operation by resetting the parameter Nr_PDOUT_Objs = 0.

Name: **Nr_PDOUT_Objs (Fb27)**
Meaning: Displays the number of the mapped objects of the PDIN data.
Combivis-Parameteraddress: 029Bh
SDO-Index: **229Bh**
SDO-Subindex: 0
Data length: 1 Byte
Access: READ_WRITE
Coding: 1
Standard value: 3
Notes: If the values of mapping parameters (Fb23-Fb26) are changed, the value of Nr_PDOUT_Objs is automatically reset to 0 and thereby the PDOUT-operation deactivated. This parameter must be set to the required value if the mapping is completely described.If the mapping is accepted, it is given to the FI and stored automatically non-volatile.

Name: **PDO_TxMappParam_00h_AU64 (s. [1])**

Meaning: Displays the PDIN mapping according to Powerlink-coding. This 64-Bit-Array containes in Subindex = 0 the number of mapped objects. Through this subindex the PDIN-operation is activated (Value > 0) or deaktivated (Value = 0).

SDO-Index: **1A00h**

SDO-Subindex: **0 (NumberOfEntries)**

Data length: 8 Byte

Access: READ_WRITE

Coding: = 0 : PDIN-operation deactivated.

> 0: PDIN-operation aktivated.

Standard value: 3

Notes: When changing the value from 0 to a value > 0, the complete mapping is exam ined, transferred to the FI and stored non-volatile after error-free activation.

SDO-Subindex: **1..4 (ObjectMapping)**

Data length: 8 Byte

Access: READ_WRITE

Coding:

b63 b48	b47 b32	b31 b24	b23 b16	b15 b0
BitLength	BitOffset	Reserved	Subindex	Index

Standard value: see above

Notes: The value for bit offset is ignored on writing of a mapping entry, since this value follows automatically by the sequence of the mapping entries. The value of the bit offset is determined on reading by means of the mapping sequence and accordingly returned.

Name: **PDO_RxMappParam_00h_AU64 (s. [1])**

Meaning: Displays the PDOUT mapping according to the Powerlink-coding. This 64-Bit-Array containes in Subindex = 0 the number of mapped objects. Through this subindex the PDOUT-operation is activated (Value > 0) or deaktivated (Value = 0).

SDO-Index: **1600h**

SDO-Subindex: **0 (NumberOfEntries)**

Data length: 8 Byte

Access: READ_WRITE

Coding: = 0 : PDIN-operation deactivated.

> 0: PDIN-operation aktivated.

Standard value: 3

Notes: When changing the value from 0 to a value > 0, the complete mapping is examined, transferred to the FI and stored non-volatile after error-free activation.

SDO-Subindex:

Data length: 8 Byte

Access: READ_WRITE

Coding:

b63 b48	b47 b32	b31 b24	b23 b16	b15 b0
BitLength	BitOffset	Reserved	Subindex	Index

Standard value: see above

Notes: The value for bit offset is ignored on writing of a mapping entry, since this value follows automatically by the sequence of the mapping entries. The value of the bit offset is determined on reading by means of the mapping sequence and accordingly returned.

5. Annex

5.1 Operator Parameters

Index	Name	Obj Type	Sub-Index	Combivis-Addr.	Data length in Byte	Access
2280h	Com_Cycle	VAR	0	0280h	4	ro
2281h	HS_SyncToutMode	VAR	0	0281h	1	rw
2282h	HS_SyncToutDelay	VAR	0	0282h	2	rw
2283h	EmergencyCycle	VAR	0	0283h	2	rw
2284h	FBS Command	VAR	0	0284h	2	rw
2285h	Take Stored PD-Map	VAR	0	0285h	1	rw
2287h	Watchdog Activation	VAR	0	0287h	1	rw
2288h	Watchdog Inhibit	VAR	0	0288h	1	rw
2289h	FBS Config	VAR	0	0289h	2	rw
2290h	PD_In_Cycle	VAR	0	0290h	2	rw
2291h	PD_In1_Map	VAR	0	0291h	4	rw
2292h	PD_In2_Map	VAR	0	0292h	4	rw
2293h	PD_In3_Map	VAR	0	0293h	4	rw
2294h	PD_In4_Map	VAR	0	0294h	4	rw
2295h	Nr_PDIn_Objs	VAR	0	0295h	1	rw
2296h	PDIN_HSP5Service	VAR	0	0296h	1	ro
2297h	PD_Out1_Map	VAR	0	0291h	4	rw
2298h	PD_ Out 2_Map	VAR	0	0292h	4	rw
2299h	PD_ Out 3_Map	VAR	0	0293h	4	rw
229Ah	PD_ Out 4_Map	VAR	0	0294h	4	rw
229Bh	Nr_PDOut_Objs	VAR	0	0295h	1	rw
229Ch	PDOUT_HSP5Service	VAR	0	029Ch	1	ro
1600h	PDO_TxMappParam_00h_AU64	ARRAY				
1600h	NumberOfEntries	VAR	0	-----	8	rw
1600h	ObjectMapping	VAR	1	-----	8	rw
1600h	ObjectMapping	VAR	2	-----	8	rw
1600h	ObjectMapping	VAR	3	-----	8	rw
1600h	ObjectMapping	VAR	4	-----	8	rw
1A00h	PDO_RxMappParam_00h_AU64	ARRAY				
1A00h	NumberOfEntries	VAR	0	-----	8	rw
1A00h	ObjectMapping	VAR	1	-----	8	rw
1A00h	ObjectMapping	VAR	2	-----	8	rw
1A00h	ObjectMapping	VAR	3	-----	8	rw
1A00h	ObjectMapping	VAR	4	-----	8	rw

5.2 DSP402-Parameter

Index	Name	Obj Type	Sub-Index	Combivis-Addr.	Data length in Byte	Access
6040h	DSP402_Controlword	VAR	0	-----	2	rw
6041h	DSP402_Statusword	VAR	0	-----	2	ro
6042h	VL_TargetVelocity	VAR	0	-----	2	rw
6043h	VL_VelocityDemand	VAR	0	-----	2	ro
6044h	VL_ControlEffort	VAR	0	-----	2	ro
603Fh	DSP402_ErrorCode	VAR	0	-----	2	ro
6046h	VL_VelocityMinMaxAmount	RECORD				
6046h	NumberOfEntries	VAR	0	-----	4	ro
6046h	VL_VelocityMinAmount	VAR	1	-----	4	rw
6046h	VL_VelocityMaxAmount	VAR	2	-----	4	rw
6048h	VL_VelocityAcceleration	RECORD				
6048h	NumberOfEntries	VAR	0	-----	1	ro
6048h	DeltaSpeed	VAR	1	-----	4	rw
6048h	DeltaTime	VAR	2	-----	2	rw
6049h	VL_VelocityDeceleration	RECORD				
6049h	NumberOfEntries	VAR	0	-----	1	ro
6049h	DeltaSpeed	VAR	1	-----	4	rw
6049h	DeltaTime	VAR	2	-----	2	rw
604Ah	VL_VelocityQuickStop	RECORD				
604Ah	NumberOfEntries	VAR	0	-----	1	ro
604Ah	DeltaSpeed	VAR	1	-----	4	rw
604Ah	DeltaTime	VAR	2	-----	2	rw
604Dh	VL_PoleNr	VAR	0	-----	2	ro
605Ah	VL_QuickStopOptionCode	VAR	0	-----	2	rw
6502h	DSP402_SuppDriveModes	VAR	0	-----	4	ro
6007h	DSP402_AbortConnOption-Code	VAR	0	-----	2	rw
6060h	DSP402_ModesOfOperation	VAR	0	-----	1	rw
6061h	DSP402_ModesOfOpera-tionDisplay	VAR	0	-----	1	ro

5.3 Unit desciption by XML files

The Ethernet Powerlink standardization Group (EPSG) has specified a technical manual file in form of a XML file in its Draft standard 1311 [5]. These files are marked as XML device description (XDD). KEB will make XDD files available up to sample. Thereby, each drive with own KEB Config ID receives its own XDD file.

The file name of the XDD files contains the Config_Id for classification of the FI type and the version of the Powerlink software. The file name of a KEB-F5-XML file is structured completely as follows.

‚KEBccccF5EPLxd.xdd: ‚cccc' is the decimal value of the Config_Id (value of parameter SY.02) of the used KEB-FI and ‚x' the value of the revision of the Powerlink software. Observe that not each new software version in the Powerlink operator gets also a new revision.

Example: Use the XDD file: KEB4612F5EPL0.xdd for FI with Config_id(SY.02) = 4612 and Powerlink revision = 0.

5.4 Integration of the KEB-F5 Powerlink drive in the AutomationStudio of the B&R company

5.4.1 Integration as Generic Powerlink Station

The following pictures shall help to integrate a KEB Powerlink slave into a SPS project of the B&R company. The unit must which contains the Powerlink interface must be selected in the left part of the window (hardware tree). Go onto Powerlink side in the right window. After this a right-clicks on the interface module must be done and afterward select "INSERT... ':

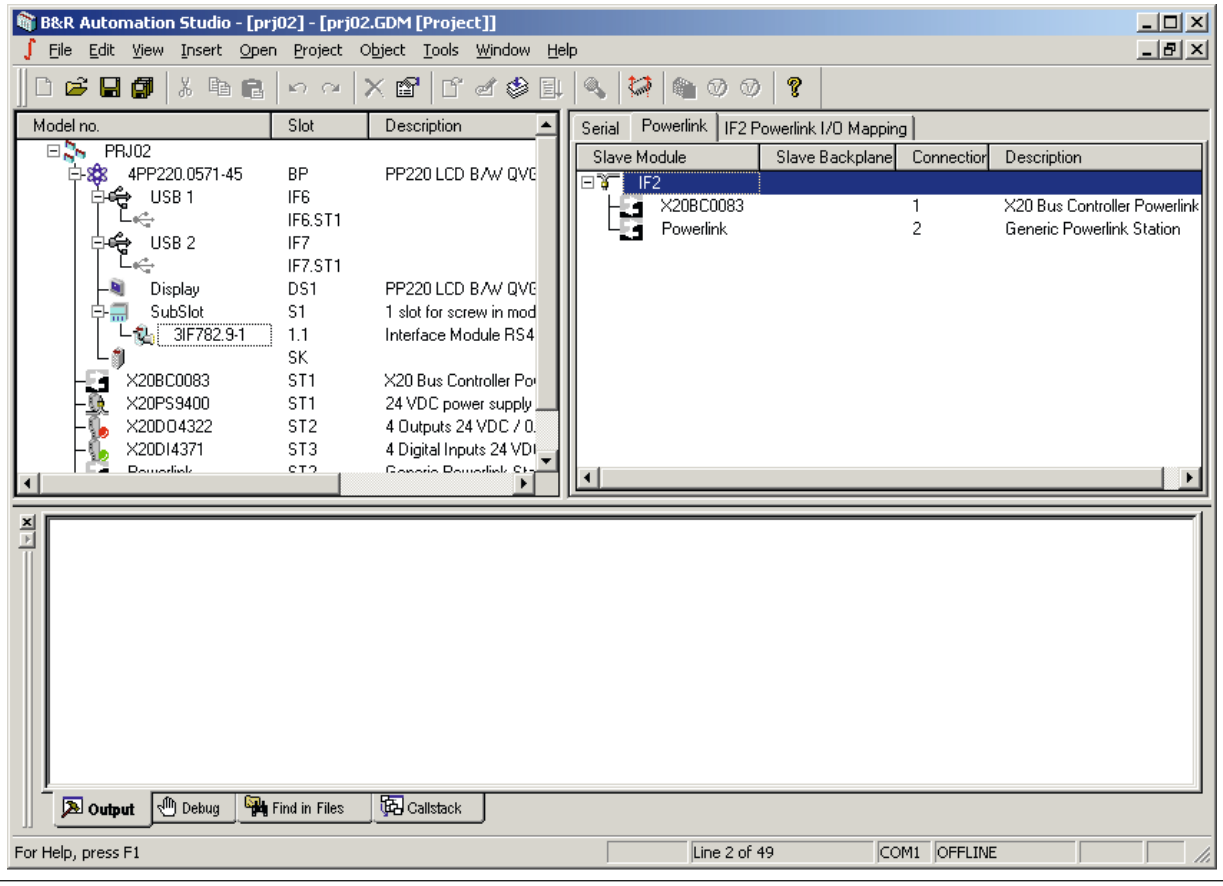


Figure 1: Device selection

Select ‚Generic Powerlink Station' in group ‚Powerlink Devices' in the following window:

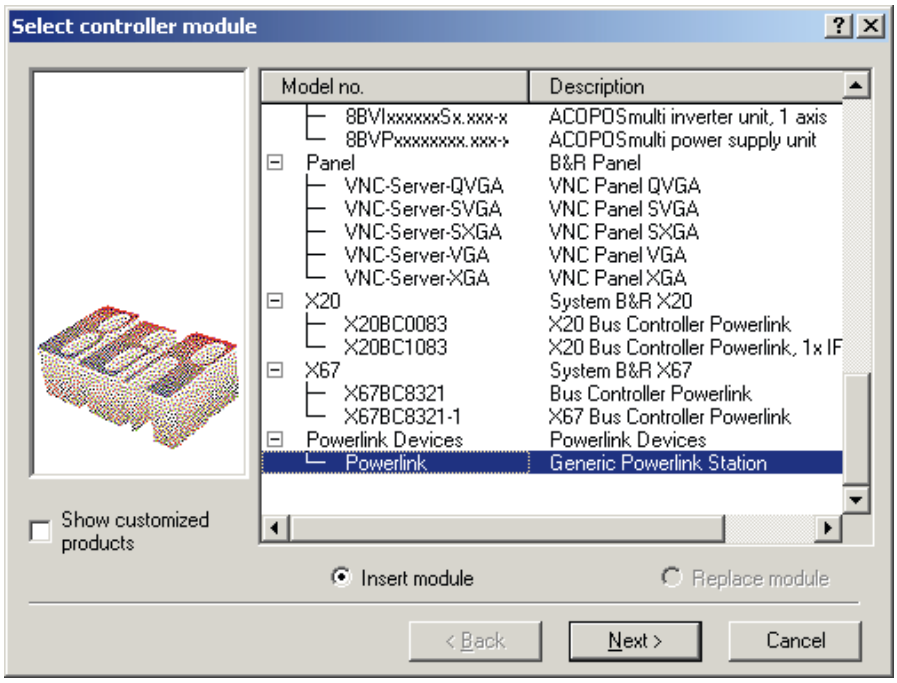


Figure 2: Controller module selection

Enter the desired "Node number' and adjust the node switch on the Powerlink operator applicable. Then press the button "Advanced'

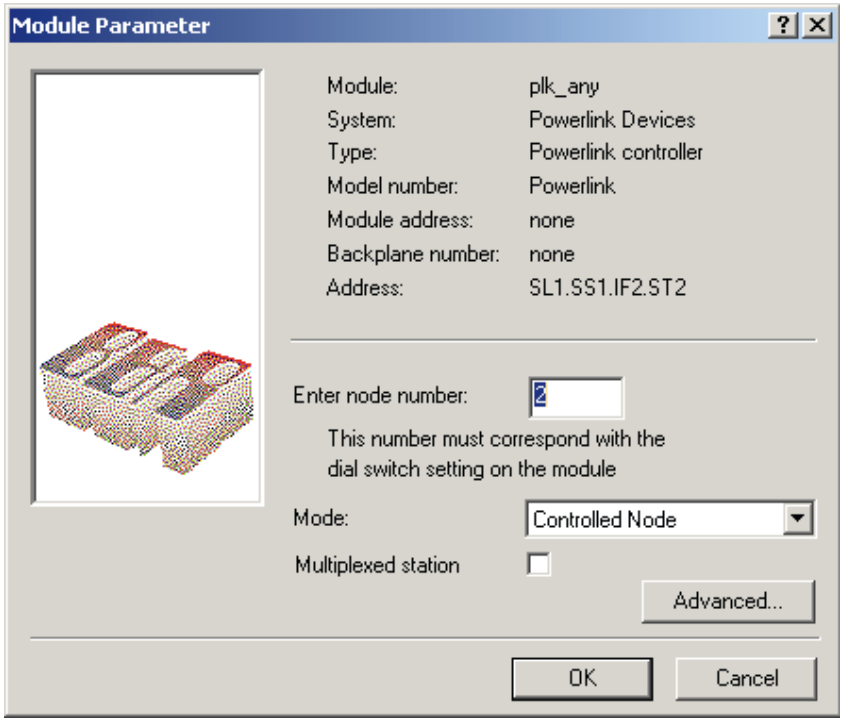


Figure 3: Node number

The adjustmentss can be taken from the following picture:

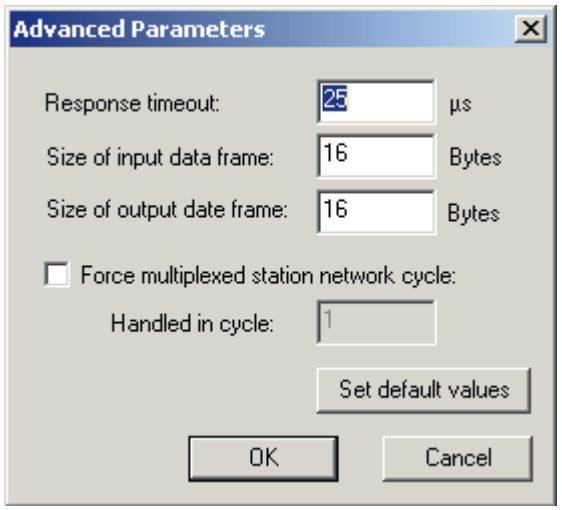


Figure 4: Advanced Parameters

Afterwards the KEB Powerlink unit should be completely integrated. Please note that the changed project must be transferred to the target hardware.

5.5 Display of the KEB parameter address with COMBIVIS

As condition for this function the check box "display parameter info in Explorer" must be activated in Combivis in menue, process->configuration' under side "parameter text".

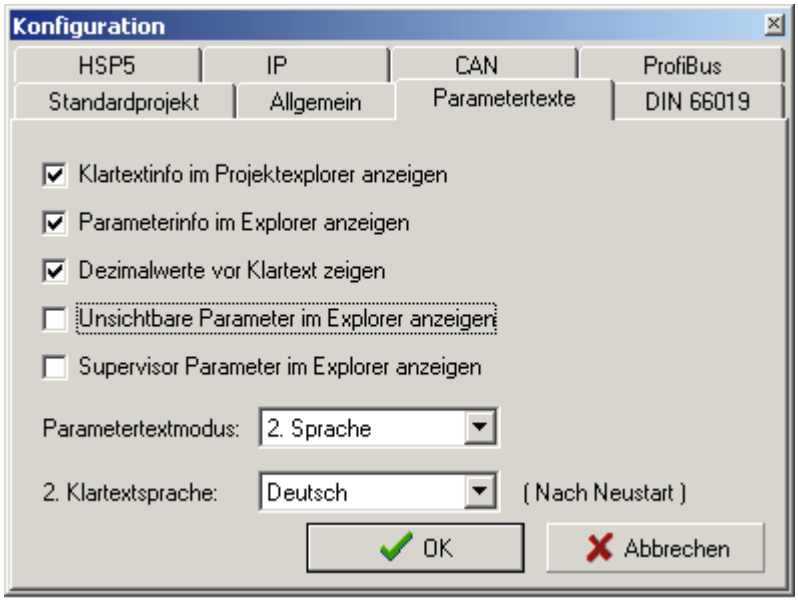


Figure 5: Configuration

Afterwards the feature display can be opened in the Project Explorer window with double click onto the parameter group. The KEB parameter address can be read out under side "parameter features" in the right part of the window:

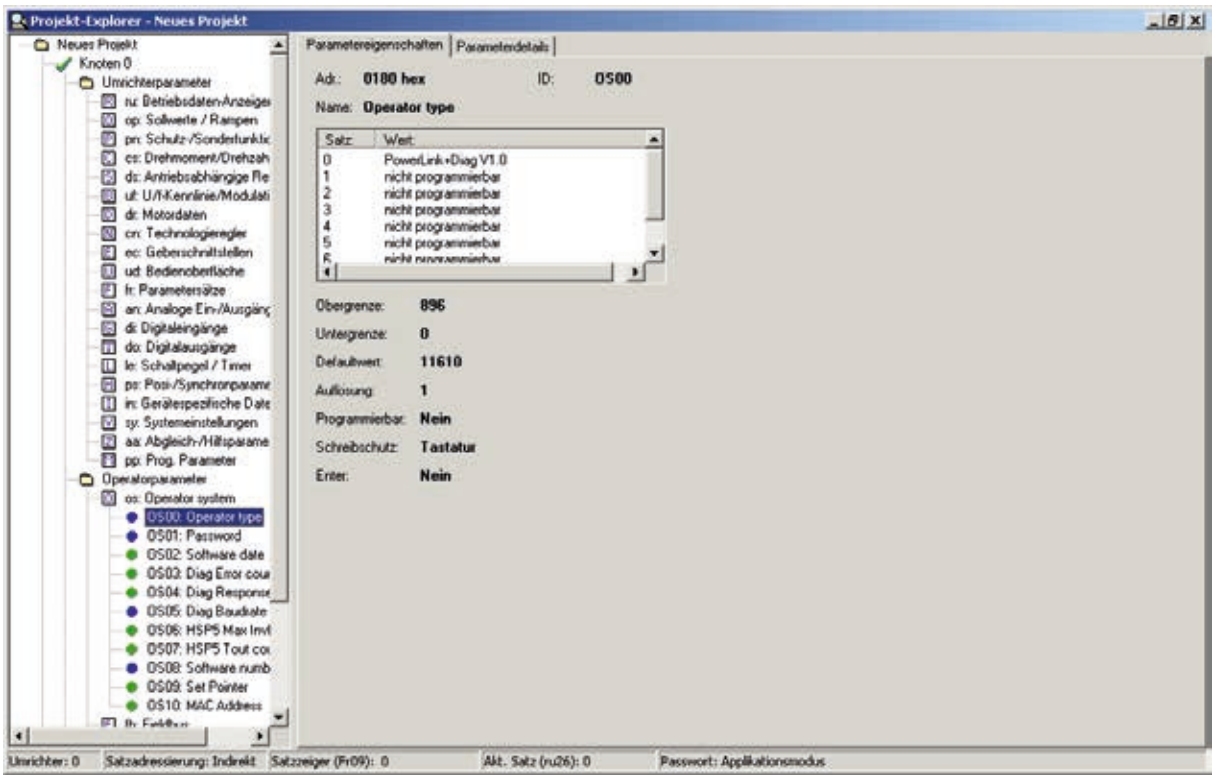


Figure 6: Projec eplorer

Parameter address = 0180h for parameter "0S00 operator type' is displayed in the example.

5.6 F5 Operator internal error messages

General error messages

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	Inverter 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
EEEPX	with X = 1,2,3..: fatal error during test of serial eeprom
EEEPR	fatal error during test of serial eeprom

Special error messages for the Powerlink operator

EEPL1	Is displayed until Config_Done of the FPGA is set
EEPL2	Is displayed, as long as FPGA_State = Init
EEPL4	Is displayed, as long as FPGA_State != Pre_operational

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