C O M B I V E R T

Instructions For Use

COMBIVERT F5
F5 EtherCAT Operator

KEB

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:

⚠ **DANGER**	Dangerous situation, which will cause death or serious injury in case of non-observance of this safety instruction.

⚠ **WARNING**	Dangerous situation, which may cause death or serious injury in case of non-observance of this safety instruction.

⚠ **CAUTION**	Dangerous situation, which may cause minor injury in case of non-observance of this safety instruction.

ATTENTION	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.

ℹ	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

Preface

Laws and guidelines

KEB Automation KG confirms with the CE mark and the EC declaration of conformity, that our device complies with the essential safety requirements.

The CE mark is located on the name plate. 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

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.

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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.

Attention	**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 no regenerative energy can be generated.
>
> ► Await capacitor discharge time (5 minutes) if necessary, measure 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 according to the design of the machine manufacturer. Specified minimum / maximum values may not be fallen below /exceeded.
- With existing or newly wired circuits the person installing the units or machines must ensure the EN requirements are 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*.
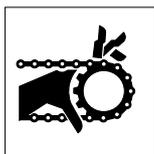
> **⚠ WARNING**
>
> **Software protection and programming!**
>
> **Hazards caused by unintentional behavior of the drive!**
>
> ► Check especially during initial start-up or replacement of the drive converter if parameterization is compatible to application.
>
> ► Securing a unit solely with software-supported 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 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 EhterCAT slave interface. The F5 EtherCAT operator is integrated into the FI housing by simple plug-in and fits into all F5-units. Here it concerns to an intelligent interface which controls the data transfer from EtherCAT to the frequency inverter control and reverse.

2.1 Specified application

The COMBIVERT serves exclusively for the control and regulation of three-phase motors. It is intended for installation in 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 complied with.

Die bei KEB eingesetzten Halbleiter und Bauteile sind für den Einsatz in industriellen Produkten entwickelt und ausgelegt.

Restriction

If the KEB COMBIVERT F5 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

In spite of proper use, the drive converter can assume unpredictable operating conditions in error case, at incorrect parameterisation, by wrong cabling or unauthorized interventions and repairs. This can be:

•   Wrong direction of rotation
•   Motor speed too high
•   Motor is running into limitation
•   Motor can also be under current at standstill
•   Automatic restart

2.2 Improper 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]: ESC10/20 Hardware Data Sheet V1.0 v. 8.3.2005

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

[3]: Application manual of the implemented inverter

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

3 Hardware

3.1 Overview of the operating elements

Overview	No.	Description
	1	EtherCAT Link_IN
	2	EtherCAT-Mailbox active
	3	EtherCAT-Run
	4	EtherCAT-ERR
	5	Inverter ERR
	6	EtherCAT Link_OUT
	X6B	Diagnostic interface
	X6C	EtherCAT-In
	X6D	EtherCAT-Out

Figure 1:   Overview of the EtherCAT operator
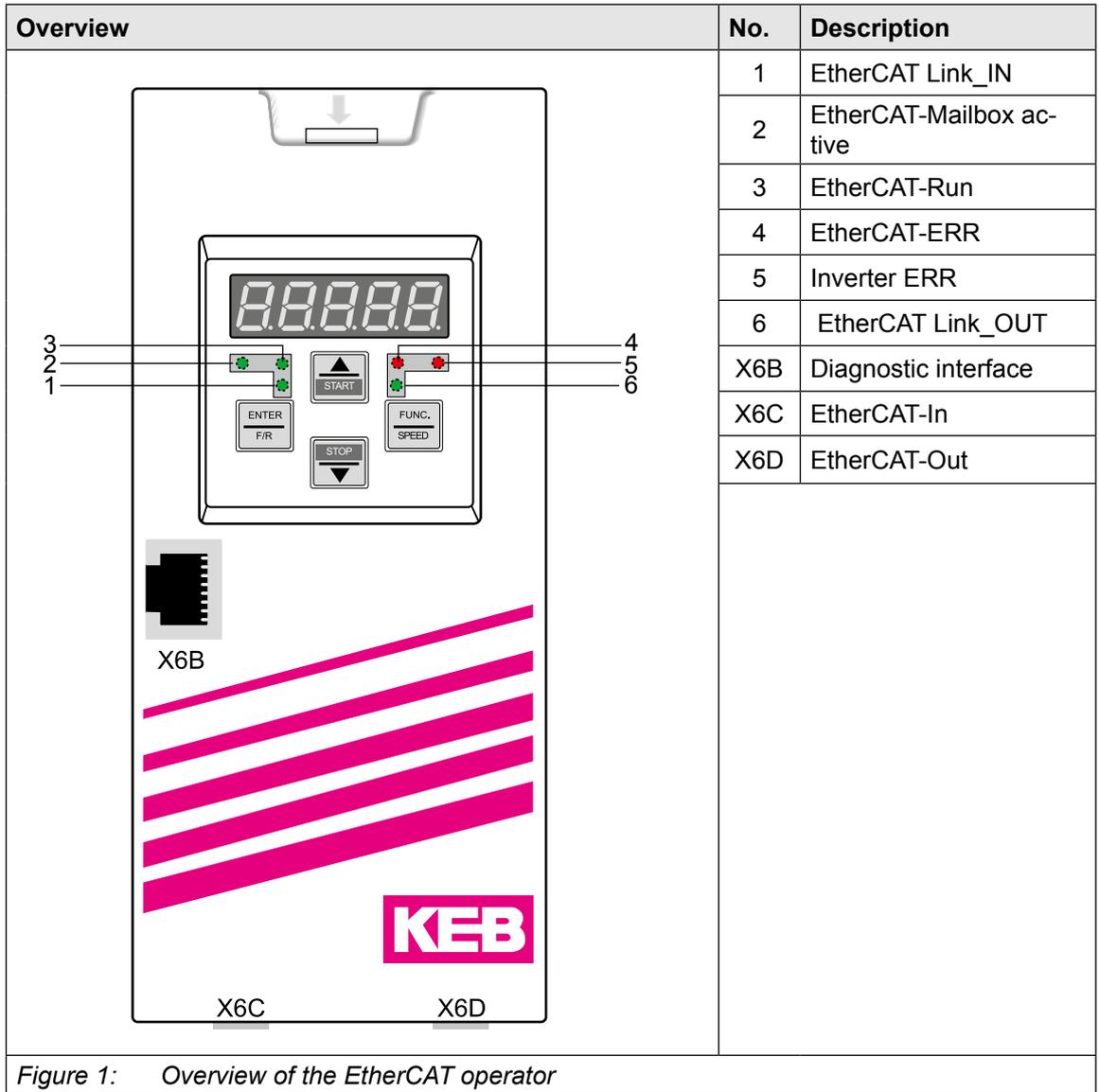
3.2 Meaning of the LEDs on the operator

Component	Meaning	
EtherCAT Link_IN	Green LED displays the Link/Activity of the EtherCAT input port	
EtherCAT-Mailbox active	Flashes as long as a mailbox command is carried out.	
EtherCAT-RUN	Green RUN Led according to the specification of ‚RUN Indicator' in the EtherCAT specification *[1]*:	
	Flashing	**Meaning**
	off	Unit is in INIT state
	Cyclically blinking with ON(200ms) / OFF(200ms)	Unit is in PRE-OPERATIONAL state
	Single flash with ON(200ms) / OFF(1000ms)	Unit is in SAFE-OPERATIONAL state
	on	Unit is in OPERATIONAL state
EtherCAT ERR	Red LED according to specification of ‚ERR Indicator' in the EtherCAT specification *[1]*:	
	Flashing	**Meaning**
	off	No error
	Cyclically blinking with ON(200ms) / OFF(200ms)	General configuration errror
	Single flash with ON(200ms) / OFF(1000ms)	The application of the slave device has automatically changed the communication state
	Double Flash with ON(200ms) / OFF(200ms) / ON(200ms) / OFF(1000ms)	The application watchdog has responded
	on	The process data watchdog has responded. The host controller of the application does not respond any more.
Inverter ERR	Red Led as a repeater of the Error-Led of the inverter control:	
	Flashing	**Meaning**
	off	No power supply on the inverter control board
	blinking	Inverter control board in error status
	on	Operating condition OK
EtherCAT Link_OUT	Green LED displays the Link/Activity of the EtherCAT output port	
Table 1: LED flashing		

3.3 Diagnostic interface X6B

ATTENTION	**Desctruction of the PC interface!**
	► The connection of the diagnostic interface with a serial interface at a PC, may only be connected with a special HSP5 cable.

3.4 EtherCAT interface X6C, X6D

Standard Ethernet-RJ45 c onnector according to IEEE 802.3 100Base-T.
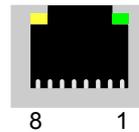
Figure 2:   RJ 45 socket of the EtherCAT operator

3.4.1 Description of the LEDs in the RJ45 socket

Link	Yellow Led in Ethernet connector:	
	Flashing	**Meaning**
	off	No Ethernet link present
	blinking	Ethernet communication active
	on	Ethernet link present
Speed	Green Led in Ethernet connector: Displays, whether the Ethernet communication is running with 100Mbit/s (LED = ON) or not.	
Table 2: EtherCAT interface X6C, X6D		

4 Software

4.1 Software conditions

Not all software versions are available. The operating mode ExtendedPDMode is supported from software V2.3. The mode is deactivated by default and therefore downwards compatible to software V2.0.

4.2 Fundamentals of the EtherCAT interface connection

The KEB F5 EtherCAT operator contains a separate EtherCAT slave controller for time-critical operations of the EtherCat communication. By using this EtherCAT controller it is guaranteed that basic communication is compatible to the EtherCAT specification.

4.2.1 EtherCAT Configuration (EEPROM)

All values are saved in intel format (LSbyte first) into the EEPROM. The following table lists only the main presettings of the EtherCAT EEPROM.

Byte-Offset	Meaning	Value
0	PDI-Control	0009h
2	PDI-Config	0400h
4	SyncImpulseLength	000Ah

4.2.2 Mailbox communication

The KEB F5 EtherCAT operator supports the mailbox communication. All parameters of the FI control and the operator can be read out or preset itself via this mailbox by using the CANoverEtherCAT.

Buffer size of the receive mailbox	**Minimum**	**Maximum**
	16 byte	50 byte
Buffer size of the transmit mailbox	Minimum	Maximum
	16 byte	50 byte
Supported mailbox protocols	CANoverEtherCAT(CoE)	
Supported CoE services	Initiate SDO download expedited in server mode, Initiate SDO upload expedited in server mode, Emergency as client	

4.2.2.1 Parameter addressing by 16 bit index plus 8 bit subindex

The following table shows parameter grouping compatible with *[2]*:

1.Index	Last index	Description
1000h	1FFFh	Communication parameters according to *[2]*
2000h	5E00h	Parameter of the FI control with index = KEB parameter address + 2000h(*1). The subindex is used for set-addressing
6000h	9FFFh	Device profile parameters according to *[4]*

(*1): The KEB parameter address can be found in the application manual of the used FI.

4.2.2.2 Set addressing with subindex up to software V2.0

For KEB parameters (Index = 2000h...5FFFh) the subindex is used for set-addressing. The coding of the subindex can be switched from software version V1.8 to a coding that corresponds to the specification of field parameters (arrays) in *[2]*. The following coding is valid:

Subindex	Meaning for **FBSConfig.Bit8 = 0**
0	Indirect set-addressing: The set to be addressed depends on the value of parameter Fr.09 in the FI control.
1	Direct addressing of set0
2	Direct addressing of set1
4	Direct addressing of set2
8	Direct addressing of set3
16	Direct addressing of set4
32	Direct addressing of set5
64	Direct addressing of set6
128	Direct addressing of set7

By use of this bit-coding it is possible to address more than one parameter-set simultaneously. However this should not be used for parameter-reading, because an error message is returned if not all values in the addressed sets are the same. This mechanism can also be used to map PDO-Rx-data simultaneously to the parameters in several sets of the inverter (**only valid at FBSConfig. Bit8 = 0**).

Subindex	Meaning for **FBSConfig.Bit8 = 1**
0	The highest available subindex is addressed for set-programmable parameters. The value for non-set-programmable parameters is addressed in set0.
1	Direct addressing of set0
2	Direct addressing of set1
3	Direct addressing of set2
4	Direct addressing of set3
5	Direct addressing of set4
6	Direct addressing of set5
7	Direct addressing of set6
8	Direct addressing of set7
9 (*1)	Indirect set-addressing: The addressed set results from the value of parameter Fr.09 in the FI control.

(*1): In case of read access to a set-programmable parameter with subindex = 0, the value 8 is returned. i.e., the access via indirect set-addressing (subindex = 9) cannot be seen from the outside. Process data mapping with indirect set-addressing is not possible.

With this coding of the subindex, it is generally not possible to address several sets simultaneously (**only valid at FBSConfig.Bit8 = 1**).

4.2.2.3 Set-addressing with subindex from software V2.3

Bit 8 of parameter FBS Config was divided from software V2.3. Bit 12 is additionally defined in parameter FBS Config. Thereby it is possible to make the coding of the subindex for the acyclic parameter access (via CoE -> SDO) independent from the coding of the subindex in the values of the process data mappings. Further information can be taken from the description of the FBS Config parameter.

4.2.3 Process data communcation

Non-addressed setpoints can be preset via the process data channel to the KEB F5 and actual values can be requested. Data communication of the process data between application and EtherCAT slave controller occurs via 3-buffer mechanism. The maximum of process data that can be transferred is 8 byte each per direction.

> Maximally 16 byte process data per data direction are supported from software version V2.3. The 'ExtendedPDMode' must be activated for this function.

4.2.4 Distributed clocks

The function of the distributed clocks is used for the synchronous operating mode (*4.3.3*) in the KEB-F5-EtherCAT operator. In this mode the interrupt cycles of the FI control is synchronized to the EtherCAT distributed clock-cycles. Therefore a high-precision synchronisation of several KEB-F5 inverters is possible. If the distributed clocks are not supported or activated by the EtherCAT master, the KEB F5 EtherCAT operator is working completely asynchronous to the EtherCAT cycle.

4.3 Functions

4.3.1 Process data mapping

Which parameters of the inverter control concern to the process data is determined by the process data assignment. The default process data assignment for this is:

Process output data (EtherCAT 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

Process input data (KEB-Slave => EtherCAT-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 process data assignment can be adapted via the EtherCAT parameters with index = 1600h/1601h and Index = 1A00h/1A01h. The default process data assigment has the following meaning:

Index	Subindex	Value
1600h	0	3
1600h	1	202B0120h
1600h	2	20340110h
1600h	3	2E160110h
1A00h	0	3
1A00h	1	202C0120h
1A00h	2	20350110h
1A00h	3	2E160110h

4.3.1.1 Different coding of the PD mapping subindex

The coding of the subindex in a PD mapping entry is switchable.

There are two possibilities:

1. PD mapping subindex linear (DS301 compatible)
2. PD mapping subindex bit-coded (KEB-specific)

Depending on the software version, the two options are selected differently. The following table is intended to illustrate these differences:

Software version V2.0	Software version V2.3	Coding of the PDO mapping subindex
FBS Config.Bit8 = 1	FBS Config.Bit8 = x FBS Config.Bit12 = 1	Linear (DS301 compatible)
FBS Config.Bit8 = 0	FBS Config.Bit8 = x FBS Config.Bit12 = 0	Bit-coded (KEB-specific)

4.3.2 Extension of the maximum process data length in the "ExtendedPDMode" from software V2.3

The operating mode ExtendedPDMode is supported from software V2.3. The mode is deactivated by default and therefore downwards compatible to software V2.0. The mode can be activated via parameter FBS Config Bit 11. The maximum process data length is extended to 16 bytes with this mode.

Activation of the ExtendedPDMode can lead to incompatibility of device description files (ESI file in XML format). A compatible XML file can be created with the start-up wizard in COMBIVIS 6. Further information can be taken from the description of the FBS Config parameter.

4.3.3 Synchronous mode

In synchronous mode the SYNCO interrupt preset by the EtherCat slave controller is used as synchronisation signal for the internal communication. Synchronous operating mode is only possible for the F5 EtherCAT operator, if the SYNC0 signals are activated by the master.

The following register presettings in the KEB-EtherCAT slave must be made by the master for this:

Bit0 and Bit1 must be set to 1 in (byte) register 0981h:

0981h:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
X	X	X	X	X	X	1	1

A multiple of 1ms must be entered in the 32 bit register beginning with the address = 09A0h. Please note that this value is indicated in ns. Value = 1,000,000 is correspond to 1ms:

09A0h	09A1h	09A2h	09A3h
LS-Byte	Byte1	Byte2	MS-Byte

In synchronous mode the operator displays constantly the following output:

Figure 3:   Operator display: Synch

The value of parameter Com_Cycle gives information about the adjusted cycle time.

This synchronous operating mode includes some restrictions. As mentioned above the display is static. Furthermore inputs via keyboard are also no longer possible. The diagnostic interface continues to operate. But the processing speed of all services heavy depends on the synchronous cycle time. The cycle time is preset as multiple of 1 ms, the minimum possible value is 1 ms. During each SYNCO cycle the actual process output data are transferred to the FI control and the actual process intput data are read from it.

If the synchronous operating mode is activated, but no SYNC0 interrupts are released, the F5-EtherCAT operator switches in automatic synchronous mode at default setting which can be identified in the following display string:

Figure 4:   Operator display: Saut0

Herein the operator simulates the SYNC0 interrupts time controlled according to the configured Sync0 cycle time. In the following the SYNCO interrupt is meant if we speak from ,**SYNC event**'. The SYNC timeout time is four times of the adjusted SYNC cycle time (see Com_Cycle). This can be adapted by the user via parameter **User_HS_SyncToutTime**.

A process output data monitoring is additionally running to the SYNC monitoring in the current software, when the EtherCAT operator runs in synchronous operation mode. The operator recognizes the missing of incomming new process output data. The value of parameter Real_HS_SyncTout-Time is accepted as timeout time. That means the PDOUT monitoring operates with the same Timeout adjustment as the SYNC Timeout monitoring.

However this additional functionality can be switched off for downward compatibility reasons via parameter FBS Config. In contrast to the reaction to the SYNC timeout case (HS_SyncToutMode), the reaction to the PDOUT timeout case is not adjustable in the synchronous operation mode. If the PDOUT timeout case occurs, the operator automatically leaves the synchronous operation mode and goes into EtherCAT status PreOperational. The SYNC timeout reaction is carried out, if PDOUT timeout and SYNC timeout occur simultaneously.

The synchronous operating mode is less restricted from software V2.3. It depends on the connected hardware concerning internal communication.

If the FI control supports service number 56:

- Maximum possible process data length per data direction: 16 Byte, if ExtPDMode is set to 1
- Flexible PD assignment possible in synchronous operating mode.
- Process data assignment is adjusted in the frequency inverter via the Pd parameter group for the synchronous operating mode.

If the FI control does not support service number 56:

- No ExtendedPDMode possible
- Maximum possible process data length per data direction: 8 Byte
- Fixed structure of the process data (1x32-bit + 1.2x16 bit) prescribed for the synchronous operating mode
- Process data assignment is adjusted in the FI via the Sy parameter group.

Parameter Fb57 SYNC_HSP5Service is included from software V2.3. This parameter provides information which service is used in synchronous operation.

4.3.4 Emergency

If this function is activated via parameter EmergencyCycle, the EtherCat operator reads cyclically parameter ru.00 from the inverter control. The operator starts an emergency message via CoE channel of the mailbox communication if an error status is recognized. This is also done if the error is no longer present. The message contains 8 bytes of data. The first 3 bytes of this data are defined by [2] the last 5 bytes can be assigned manufacturer-specific. The KEB-F5-EtherCAT operator fills the emergency message as follows:

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
ErrorCode		error register	inverter state (ru.00)		00h	00h	00h
LB	HB		LB	HB			

4.3.5 EtherCAT-Watchdog

It is a monitoring function of the EtherCAT slave controller. The watchdog monitors the cyclic incoming of new process output data in operational state. This function must be activated by the EtherCAT master.

- The register Watchdog devider(WD_Devider: 0400h) must be set.
- SyncManager2-Control-Byte. Bit6 must be set to 1 (XML file).
- Register Watchdog-Time-Syncmanager (WD_Time_SM: 0420h) mut be unequal to 0.

The watchdog timeout time is calculated as follows:

$$WD\_Time = (WD\_Devider + 2) * WD\_Time\_SM * 40ns$$

When responding the Syncmanager watchdog the EtherCAT slave changes automatically into safe operational state.

By the operator parameter watchdog inhibit releasing the EtherCAT watchdog can be used also for releasing the field bus watchdog (*4.3.6*). Thereby the field bus watchdog releases after the EtherCAT watchdog, decelerated by the field bus watchdog time (Pn.05).

4.3.6 Fieldbus watchdog

The field bus watchdog is a function in the EtherCAT operator. It serves to set the inverter control into error (E.BUS) or warning (A.BUS), if certain events on the field bus do not occur cyclically within an adjustable cycle-time. Two operator parameters (**Watchdog inhibit**, **Watchdog activation**) exist for activating the field bus watchdog. Additionally the parameters **Pn.05**, Pn.06 have to be set in the inverter control to define the cycle time and the reaction on the timeout.

The EtherCAT operator monitors the occurance of the configured field bus events. Different events can cause the reset of the watchdog. Does the timeout-time expire without one of the configured events occur, then the operator triggers the watchdog event via the serial interface to the inverter. If and how the FI control reacts on this, is determined by the responded parameters in the FI control of the inverter.

5 Operator parameters

Name:	**Com_Cycle**
Index:	**1006h**
Subindex:	**0**
Meaning:	Serves for control, whether the synchronous operating mode is active. The value is coded in *s, but it has an internal resolution of 1 ms.
Data length:	4 byte
Coding:	0 = OFF (normal operating mode), otherwise 1 µs.
Value range:	0, 1000, 2000, 3000, ..., 65000
Note:	The content of the 32-Bit-Register 09A0h in the EtherCAT slave controller serves as source for this value. From software V2.3, the min. setting is 2000 (2ms) at active ExtPDMode (FBS Config Bit11 = 1)

Name:	**Device type**			
Index:	**1000h**			
Meaning:	Displays the device type according to *[2]*:			
Subindex:	**0**			
Data length:	4 byte			
Coding:	Byte4	Byte5	Byte6	Byte7
	Device profile no.		Additional information	
	LB	HB	LB	HB
Standard value:	0			

Name:	**Error register**							
Index:	**1001h**							
Meaning:	Displays the actual error state according to *[2]*:							
Subindex:	**0**							
Data length:	1 byte							
Coding:	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	Manufacturer spec.	Reserv.	Device profile spec.	Communication	Temperature	Voltage supply	Current	Error generally
Standard value:	0							
Note:	This parameter can be read only.							

Operator parameters

Name:	**Manufacturer Status Register**
Index:	**1002h**
Meaning:	Returns the value of parameter RU.00 as 4 byte value.
Subindex:	**0**
Data length:	4 byte
Coding:	*[3]*
Note:	This parameter can be read only.

Name:	**Pre-defined error field**			
Index:	**1003h**			
Meaning:	This parameter contains a field of maximum 6 entries where the error-history can be read out. Subindex = 0 contains the number of errors that have been saved whereby the entries with subindex = 1-5 contain the real error entries			
Subindex:	**0: number of errors**			
Data length:	4 byte			
Coding:	1			
Note:	Writing on subindex = 0 deletes the error-history completely.			
Subindex:	**1-5: standard error field**			
Data length:	4 byte			
Coding:	according to *[2]*, as follows:			
	Byte4	Byte5	Byte6	Byte7
	ErrorCode		inverter state (ru.00)	
	LB	HB	LB	HB
Note:	The entries are read-only.			

Name:	**Manufacturer Device Name**			
Index:	**1008h**			
Meaning:	Displays the value of parameter inverter identification SY.02 as 4-character hexadecimal coded string.			
Subindex:	**0**			
Data length:	4 byte			
Coding:	Value 0864Ah/2148 would appear in the CAN telegram as follows:			
	Byte4	Byte5	Byte6	Byte7
	30h:'0'	38h:'8'	36h:'6'	34h:'4'
Note:	This parameter can be read only.			

Name:	**Manufacturer Hardware Version**			
Index:	**1009h**			
Meaning:	Displays the value of parameter hardware version (IN.00) as 4-character hexadecimal coded string.			
Subindex:	**0**			
Data length:	4 byte			
				continued on the next page
Coding:	Value 014Ah/330 would appear in the CAN telegram as follows:			
	Byte4	Byte5	Byte6	Byte7
	30h:'0'	31h:'1'	34h:'4'	41h:'A'
Note:	This parameter can be read only.			

Name:	**Manufacturer Software Version**			
Index:	**100Ah**			
Meaning:	Displays the value of parameter software version (IN.06) as 4-character hexadecimal coded string.			
Subindex:	**0**			
Data length:	4 byte			
Coding:	Value 014Ah/330 would appear in the CAN telegram as follows:			
	Byte4	Byte5	Byte6	Byte7
	30h:'0'	31h:'1'	34h:'4'	41h:'A'
Note:	This parameter can be read only.			

Name:	**Identity Object**
Index:	**1018h**
Meaning:	Indicates the identification of the node in form of a structure.
Subindex:	**0: Nr of entries**
Meaning:	Indicates the number of objects in this PDO.
Data length:	1 byte
Coding:	1
Standard value:	2
Subindex:	**1: Vendor ID**
Meaning:	Indicates the code that has been distributed by the CAN in automation user group.
Data length:	4 byte
Coding:	
Standard value:	00000014h
Subindex:	**2: Product Code**
Meaning:	Indicates the product code of the node. This parameter is coded manu-facturer-specific.
Data length:	4 byte
Coding:	see description of parameter FBS Config.
Default value:	
	continued on the next page

Operator parameters

Name:	**Identity Object**
Subindex:	**3: Revision Number**
Meaning:	Indicates the revision number of the node. This parameter is coded manufacturer-specific.
Data length:	4 byte
Coding:	see description of parameter FBS Config.
Default value:	
Note:	All members of this parameter are read-only.

Name:	**ECATAddr**
Index:	**1100h**
Meaning:	Indicates the EtherCAT address.
Subindex:	**0**
Data length:	2 byte
Coding:	1
Note:	This parameter can be read only.

Name:	**Syncman CommType**
Index:	**1C00h**
Meaning:	This parameter indicates the communication type of the used Sync-Manager.
Subindex:	**0: NumbersOfUsedSyncManagerChannels**
Meaning:	Indicates the number of objects in this PDO.
Data length:	1 byte
Coding:	1
Default value:	4
Note:	The value of the parameter is ReadOnly.
Subindex:	**1: CommType SM0**
Meaning:	Indicated the communication type of SyncManager 0.
Data length:	1 byte
Coding:	0: Not used
	1: Mailbox receive (master to slave)
	2: Mailbox send (slave to master)
	3: Processdata output (master to slave)
	4: Processdata input (slave to master)
Default value:	1
Note:	The value of the parameter is ReadOnly.
Subindex:	**2: CommType SM1**
Meaning:	Indicated the communication type of SyncManager 1.
Data length:	1 byte
Coding:	s.a.

Name:	**Syncman CommType**
Default value:	2
Note:	The value of the parameter is ReadOnly.
Subindex:	**3: CommType SM2**
Meaning:	Indicated the communication type of SyncManager 2.
Data length:	1 byte
Coding:	s.a.
Default value:	3
Note:	The value of the parameter is ReadOnly.
Subindex:	**4: CommType SM3**
Meaning:	Indicated the communication type of SyncManager 3.
Data length:	1 byte
Coding:	s.a.
Default value:	4
Note:	The value of the parameter is ReadOnly.

Name:	**Syncman0 PDOAssign**
Index:	**1C10h**
Meaning:	This parameter indicates the PDO assignment for Syncmanager 0.
Subindex:	**0: NumbersOfAssignedPDOs**
Meaning:	Indicated the number of assigned PDOs.
Data length:	1 byte
Coding:	1
Default value:	0
Notice	The value of the parameter is ReadOnly.

Name:	**Syncman1 PDOAssign**
Index:	**1C11h**
Meaning:	This parameter indicates the PDO assignment for Syncmanager 1.
Subindex:	**0: NumbersOfAssignedPDOs**
Meaning:	Indicated the number of assigned PDOs.
Data length:	1 byte
Coding:	1
Default value:	0
Notice	The value of the parameter is ReadOnly.

Operator parameters

Name:	**Syncman2 PDOAssign**
Index:	**1C12h**
Meaning:	This parameter indicates the PDO assignment for Syncmanager 2.
Subindex:	**0: NumbersOfAssignedPDOs**
Meaning:	Indicated the number of assigned PDOs.
Data length:	1 byte
Coding:	1
Default value:	1
Notice	The value of the parameter is ReadOnly.
Subindex:	**1: 1st PDOMappingObjekt**
Meaning:	Indicates the first PDO mapping object.
Data length:	2 byte
Coding:	1
Default value:	1600h
Note:	The value of the parameter is ReadOnly.

Name:	**Syncman3 PDOAssign**
Index:	**1C13h**
Meaning:	This parameter indicates the PDO assignment for Syncmanager 3.
Subindex:	**0: NumbersOfAssignedPDOs**
Meaning:	Indicated the number of assigned PDOs.
Data length:	1 byte
Coding:	1
Default value:	1
Notice	The value of the parameter is ReadOnly.
Subindex:	**1: 1st PDOMappingObjekt**
Meaning:	Indicates the first PDO mapping object.
Data length:	2 byte
Coding:	1
Default value:	1A00h
Note:	The value of the parameter is ReadOnly.

Name:	**1st receive PDO Mapping**
Index:	**1600h**
Meaning:	This parameter defines the process data assignment of the first master to slave.
Subindex:	**0: Nr of Mapped objects**
Meaning:	Indicates the number of mapped objects in this PDO.
Data length:	1 byte
Coding:	1

Name:	**1st receive PDO Mapping**
Default value:	3
Note:	Value "0" deactivates the processing of this PDO. When activating the PDO by writing a value unequal to zero the operator first checks the process data mapping for general validity. Then this mapping is converted into the inverter process data assignment and written to the inverter control. If everything could be done without error, the process data assignment is activated and stored non-volatile.
Subindex:	**1-4: Nth mapped object**
Meaning:	Indicates an object mapping.
Data length:	4 byte
Coding:	According to *[2]* as follows: <table><tr><td>Byte7</td><td>Byte6</td><td>Byte5</td><td>Byte4</td></tr><tr><td colspan="2">Index</td><td rowspan="2">Subindex *</td><td rowspan="2">Bitlength</td></tr><tr><td>HB</td><td>LB</td></tr></table>* The coding of the subindex is not fixed => *4.3.1.1* Please note that the sequence in the CAN telegram follows the Intel format. That means that the first byte (byte4) in the CAN telegram contains the bit length of this mapping and the last byte (byte7) contains the high-byte of the index.
Default value:	see above
Note:	Writing on the mapping automatically deactivates the PDO operation by resetting the value of subindex „0" to zero. Please note that not all parameters of the inverter control can be mapped to process data. Operator parameters can not be mapped to process data.

Operator parameters

Name:	1st transmit PDO Mapping
Index:	1A00h
Meaning:	This parameter defines the process data assignment of the first PDO that carries data from slave to master. All further informations can be taken from the description of parameter 1st receive PDO mapping.

Name:	HS_SyncToutMode
Index:	2281h
Subindex:	0
Meaning:	Defines the reaction to the SYNC timeout event, *4.3.3*
Data length:	1 byte
Coding:	0: Automatic return into normal mode.
	1: Change into automatic synchronous mode.
Default value:	1
Note:	A new value takes effect immediately and is stored non-volatile.

Name:	HS_SyncToutDelay
Index:	2282h
Subindex:	0
Meaning:	Here it can be configured how many SYNC events have to be received until the SYNC timeout-supervising is activated after switching on. This parameter can be used if the cyclic SYNC events cannot be guaranteed immediately after switching into the synchronous operating mode.
Data length:	2 byte
Coding:	Number of SYNC events
Default value:	0
Note:	A new value takes effect immediately and is stored non-volatile.

Name:	**EmergencyCycle**
Index:	**2283h**
Subindex:	**0**
Meaning:	Serves for activation of the emergency function. Values unequal to zero define the cycle time in ms, in which the value of the inverter parameter ru.00 is read. On occurance and leaving of an error-state an emergency message is output via the emergency mechanism.
Data length:	4 byte
Coding:	1ms, 0 = OFF (no Emergency)
Default value:	0
Note:	A changed value becomes immediately active and is stored non-volatile.

Name:	**FBS Command**
Index:	**2284h**
Subindex:	**0**
Meaning:	Serves for carry out of special commands in the EtherCAT operator.
Data length:	2 byte
Coding:	0: Command
	1: Storing of the default values in the nonvolatile memory.
Default value:	0
Note:	After execution of the command the operator sets bit15 of the value as confirmation that the execution is completed.

Name:	**Watchdog Activation**
Index:	**2287h**
Subindex:	**0**
Meaning:	Defines, when the field bus-watchdog is activated after power on.
Data length:	1 byte
Coding:	Mixture of value-coding and bit-coding.

Coding (continued):

0: The field bus-watchdog ist active immediately after power on.

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
		SDO		PDOUT	STATE_OP	STATE_PREOP	SYNC

SYNC: If this bit is set, the field bus-watchdog is activated after occurence of the first SYNC event.

STATE_PREOP: If this bit is set, the field bus-watchdog is activated after first switch to pre-operational-state.

STATE_OP: If this bit is set, the field bus-watchdog is activated after first switch to operational-state.

PDOUT: If this bit is set, the field bus-watchdog is activated after the first reception of process output data.

SDO: if this bit is set, the fild bus-watchdog is activated after the first reception of a SDO-request.

Name:	**Watchdog Activation**
Default value:	04h
Note:	A changed value takes effect immediately and is stored non-volatile.

Name:	**Watchdog inhibit**
Index:	**2288h**
Subindex:	**0**
Meaning:	Indicates the events that reset the field bus-watchdog from running into timeout.
Data length:	1 byte

Coding:								
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	reserved					BUSOK	SDO-Req	PDOUT

	PDOUT: If this bit is set, the field bus watchdog is reset on every transfer of process output data to the inverter control.
	SDO-Req: If this bit is set, the field bus-watchdog is reset on every reception of a SDO-request through the mailbox channel.
	BUSOK: If this bit is set, the field bus-watchdog is reset if bit 4 of the AL status register in the EtherCAT slave controller is 0. This means, that the slave did accept the EtherCAT state-transitions requsted by the master..
Default value:	07h
Note:	A changed value becomes immediately active and is stored non-volatile.

Name:	**Save_VL_Ramps**
Index:	**228Bh**
Subindex:	**0**
Meaning:	Serves for non-volatile storing of the Velocity mode ramps in the EtherCAT operator.
Data length:	1 byte
Access:	READ_WRITE

Coding:								
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
			Save VL-QST. Dtime	Save VL-DEC. Dtime	Save VL_ACC. Dtime	Save VL-QST. Dspeed	Save VL-DEC. Dspeed	Save VL-ACC. Dspeed

	with VL-ACC.Dspeed:	Index=6048h,Subindex=1
	with VL-DEC.Dspeed:	Index=6049h,Subindex=1
	with VL-QST.Dspeed:	Index=604Ah,Subindex=1
	with VL-ACC.Dtime:	Index=6048h,Subindex=2
	with VL-DEC.Dtime:	Index=6049h,Subindex=2
	with VL-QST.Dtime:	Index=604Ah,Subindex=2
Note:	During reading the value 0 is always returned.	

Operator parameters

Name:	**VL_Ramp_CalcMode**
Index:	**228Ch**
Subindex:	**0**
Meaning:	Determines the mode of calculation for the conversion of a KEB ramp time into a DSP402 Velocity-ramp.
Data length:	1 byte
Access:	READ_WRITE
Coding:	0: Both parts of the VL ramp (Dspeed, Dtime) are determined by way that the values become as small as possible, but the accuracy of the ramp time which can be converted remains received.
	1: Only the VL-Ramp. Dtime is calculated, VL-Ramp. Dspeed remains unchanged.
	2: The value of the KEB-ramp time is accepted as value for the VL-ramp .Dtime. VL-Ramp. Dspeed is set accordingly.
Default value:	0

Name:	**User_HS_SyncToutTime**
Index:	**228Dh**
Subindex:	**0**
Meaning:	Serves for the adaption of the SYNC Timeout time in the synchronous operation mode to the application by the user.
Data length:	2 byte
Access:	READ_WRITE
Coding:	Number of missing SYNC events until a SYNC Timeout is determined.
Default value:	0
Note:	A changed value becomes immediately active and is stored non-volatile.

Name:	**Real_HS_SyncToutTime**
Index:	**228Eh**
Subindex:	**0**
Meaning:	Indicates the real active SYNC timeout time.
Data length:	2 byte
Access:	READ_ONLY
Coding:	Number of missing SYNC events until a SYNC timeout is determined.
Default value:	4
Note:	A changed value becomes immediately active and is stored non-volatile.

Name:	**FBS Config**
Index:	**228Fh**
Subindex:	**0**
Meaning:	Determines the configuration of the EtherCAT connection regarding to certain behaviors.
Data length:	2 byte
Access:	READ_WRITE
Coding:	Bit-coding as follows:
	Bit0 = 1: No PDOUT monitoring in the synchronous operation mode. In the actual software version, not only the receive of the SYNC event, but also the cyclic receiving of process output data is monitored in the synchronous operation mode. By setting of this bit, the downward compatibility can be made with the previous software, where this function was not available. Bit8: = 1: The SDO subindex is DS301 compatible (see above) Bit8: = 0 : The SDO subindex is interpreted downwards compatibly to older F5 EtherCAT software (see above). Bit10, 9: Determines the assignment of the identity object, index = 1018h, subindex = 1(ProductCode) and subindex = 2(RevisionNumber): **Bit10,9 / ProductCode / RevisionNumber table below** *: Valid value range = 00200001h…0020FFFFh Bit11: ExtendedPDMode • 0: StandardPDMode is active (see above) • 1: ExtendedPDMode is active (see above) Bit12: DS301PDOMapSubIdx • 0: The subindex in PDO mapping parameter values is bit-coded. • 1: The subindex in PDO mapping parameter values is DS301 compatible.
Default value:	0
Note:	A changed value becomes immediately active and is stored non-volatile. In software version 2.0, it is necessary to link the setting in Bit8 and in Bit10,9.The following dependences are given: • Bit8 = 0 → Bit10,9 = 00 • Bit8 = 1 → Bit10,9 = 01, 10 or 11 From software version 2.3 this dependence is no longer given. The following unusual combinations may occur (see the following table).

Bit10,9	ProductCode	RevisionNumber
00	ConfigId of the FI	Fixed depending on operator-sw
01	00200000h	0
10	00200000h	ConfigId of the FI
11	User-Input (OS.14) [*]	User-Input (OS.15)

Operator parameters

DS301OD (Bit8) [1]	DS301-PDOMap-SubIdx (Bit12)	IdentityObj (Bit10,9)	Recommended for DS301 conform operation	Compatible with KEB COMBI-CONTROL C6 ChannelHandler (EtherCAT Gateway)	Set-addressing B= bit-coded set-addressing (KEB) L = linear subIndex addressing (DS301)	
					SDO	PDO mapping
0	0	Old (00)	No	Yes	B	B
0	1	Old (00)	No	Yes	B	L
1	0	New Generic (01)	No	Yes	L	B
1	0	New Specific (10)	No	Yes	L	B
1	0	New User (11)	No	Yes	L	B
1	1	New Specific (10)	Yes	Yes	L	L
1	1	New Generic (01)	Yes	Yes	L	L
1	1	New User (10)	Yes	Yes	L	L

[1] The flag DS301OD (Bit8) is only relevant from software V2.3 for acyclical parameter accesses (SDO)

Name:	**PD_In_Cycle**
Index:	**2290h**
Subindex:	**0**
Meaning:	Determines the cycle time where the process input data are read by the frequency inverter in non-synchronous operation mode, in order to update them on EtherCAT.
Data length:	2 byte
Access:	READ_WRITE
Coding:	1 ms
Default value:	25 ms
Note:	A changed value takes effect immediately and is stored non-volatile.

6 DSP402-Parameter

The following table shows the parameters which are defined by the CANopen device-profile DSP402 [4]. Some of this parameters are rescaled by the EtherCat operator and then they are mapped to a KEB internal parameter of the inverter control. Partly some of these parameters are completely realized in the operator.

Name:	DSP402_SuppDriveModes
Index:	6502h
Subindex:	0
Meaning:	Indicates the supported DSP402 operation modes.
Data length:	4 byte
Coding:	according to [4]
Default value:	00000002h
PDO-mapping:	unrepresentable
Note:	This parameter can be read only.

Name:	DSP402_ModesOfOperation
Index:	6060h
Subindex:	0
Meaning:	Determines the DSP402 operation mode.
Data length:	1 byte
Coding:	according to [4]
	-1: Manufacturer-specific
	0: reserved
	1: Profile Position Mode (not possible here)
	2: Velocity mode
Default value:	-1: Manufacturer-specific
PDO-mapping:	unrepresentable

Name:	DSP402_ErrorCode	
Index:	603Fh	
Subindex:	0	
Meaning:	Output of an error code.	
Data length:	2 byte	
Coding:	according to [4]	
Default value:	0	
PDO-mapping:	receive PDO	transmit PDO
	NO	YES
Note:	This parameter is read-only and is internally mapped to parameter **RU.00**.	

DSP402-Parameter

Name:	**DSP402_Controlword**
Index:	**6040h**
Subindex:	**0**
Meaning:	Control word with coding according to *[4]*. The parameter is bit-coded.
Data length:	2 byte
Coding:	Bit-coded according to *[4]*. The following table only lists the bits that are realised in this software. Note that some bits are different assigned by the settings of the DSP402-mode (see table below):

Modes of operation	b7	b6	b5	b4	b3	b2	b1	b0
	Fault Reset	Mode-dependent			Enable Operation	Quick Stop	Ennable Voltage	Switch ON
255	„"	Res.	Res.	Res.	„"	„"	„"	„"
2	„"	RFG Use Ref	RFG Unlock	RFG Enable	„"	„"	„"	„"

Default value:	
PDO-mapping:	

receive PDO	transmit PDO
YES	YES

Note:	This parameter is internally mapped to parameter **SY.50**.

Name:	**DSP402_Statusword**
Index:	**6041h**
Subindex:	**0**
Meaning:	Status word with coding according to *[4]*. The parameter is bit-coded.
Data length:	2 byte
Coding:	

Mode	b15... b14	b13	b12	b11	b10	b9	b8... b7
		Mode-dependent		Int. Limit Active	Target Reached	Remote	
255		Res.	Res.	„"	„"	„"	„"
2		Res.	Res.	„"	„"	„"	„"

b6	b5	b4	b3	b2	b1	B0
Switch ON Disabl.	Quick Stop	Volt. Enabl.	Fault	Operation Enabl.	Switched ON	Ready To Switch ON
„"	„"	„"	„"	„"	„"	„"
„"	„"	„"	„"	„"	„"	„"

Default value:	
PDO-mapping:	

receive PDO	Transmit PDO
NO	YES

Note:	This parameter is internally mapped to parameter **SY.51**.

7 Annex

7.1 Overview of operator parameters

Index	Sub-index	Diagnosis Param. Address	Diagnosis Parameter name	DS301 Parameter name	Data length in Byte	Access
1000h	0	-----	-----	Device type	4	RD
1001h	0	-----	-----	Error register	1	RD
1002h	0	-----	-----	Manufacturer Status Register	4	RD
1003h	0-5	-----	-----	Predefine Error Field	4	RD_WR
1006h	0	0280h	-----	ComCycle	4	RD_WR
1008h	0	-----	-----	Manufacturer Device Name	4	RD
100Ah	0	-----	-----	Manufacturer Software Version	4	RD
1018h	-----	-----	-----	Identity Object	-----	
1018h	1	-----	-----	Vendor Id	4	RD
1018h	2	-----	-----	Product Code	4	RD
1100h	0	039Dh	ECATAddr	EtherCAT address	2	RD
1600h	-----	-----	-----	1st receive PDO Mapping	-----	
1600h	0	029Bh	Nr_PDOut1_Objs	Number of mapped objects	1	RD_WR
1600h	1	0297h	PD1_Out1_Map	1st mapped Object	4	RD_WR
1600h	2	0298h	PD1_Out2_Map	2nd mapped Object	4	RD_WR
1600h	3	0299h	PD1_Out3_Map	3rd mapped Object	4	RD_WR
1600h	4	029Ah	PD1_Out4_Map	4th mapped Object	4	RD_WR
1601h	-----	-----	-----	2nd receive PDO Mapping	-----	
1601h	0	02AFh	Nr_PDOut2_Objs	Number of mapped objects	1	RD_WR
1601h	1	02ABh	PD2_Out1_Map	1st mapped Object	4	RD_WR
1601h	2	02ACh	PD2_Out2_Map	2nd mapped Object	4	RD_WR
1601h	3	02ADh	PD2_Out3_Map	3rd mapped Object	4	RD_WR
1601h	4	02AEh	PD2_Out4_Map	4th mapped Object	4	RD_WR
1A00h	-----	-----	-----	1st Transmit PDO Mapping	-----	
1A00h	0	0295h	Nr_PDIn1_Objs	Number of mapped objects	1	RD_WR
1A00h	1	0291h	PD1_In1_Map	1st mapped Object	4	RD_WR
1A00h	2	0292h	PD1_In2_Map	2nd mapped Object	4	RD_WR
1A00h	3	0293h	PD1_In3_Map	3rd mapped Object	4	RD_WR
1A00h	4	0294h	PD1_In4_Map	4th mapped Object	4	RD_WR
1A01h	-----	-----	-----	2nd Receive PDO Mapping	-----	
1A01h	0	02A9h	Nr_PDIn2_Objs	Number of mapped objects	1	RD_WR
1A01h	1	02A5h	PD2_In1_Map	1st mapped Object	4	RD_WR
1A01h	2	02A6h	PD2_In2_Map	2nd mapped Object	4	RD_WR
1A01h	3	02A7h	PD2_In3_Map	3rd mapped Object	4	RD_WR
1A01h	4	02A8h	PD2_In4_Map	4th mapped Object	4	RD_WR
1C00h	-----	-----		Syncman CommType	-----	RD
1C00h	0	-----		NumberOfUsedSyncManager-Channels	1	RD
1C00h	1	-----		CommType SM0	1	RD
1C00h	2	-----		CommType SM1	1	RD
1C00h	3	-----		CommType SM2	1	RD
1C00h	4	-----		CommType SM3	1	RD

Index	Sub-index	Diagnosis Param. Address	Diagnosis Parameter name	DS301 Parameter name	Data length in Byte	Access
1C10h	-----	-----		Syncman0 PDOAssign	1	RD
1C10h	0	-----		NumberOfAssignedPDOs	1	RD
1C11h	-----	-----		Syncman1 PDOAssign	1	RD
1C11h	0	-----		NumberOfAssignedPDOs	1	RD
1C12h	-----	-----		Syncman2 PDOAssign	1	RD
1C12h	0	-----		NumberOfAssignedPDOs	1	RD
1C12h	1	-----		1st PDOMappingObject	2	RD
1C12h	2	-----		2nd PDOMappingObject	2	RD
1C13h	-----	-----		Syncman3 PDOAssign	1	RD
1C13h	0	-----		NumberOfAssignedPDOs	1	RD
1C13h	1	-----		1st PDOMappingObject	2	RD
1C13h	2	-----		2nd PDOMappingObject	2	ro
2281h	0	0281h	HS_SyncToutMode	HS_SyncToutMode	1	RD_WR
2282h	0	0282h	HS_SyncToutDelay	HS_SyncToutDelay	2	RD_WR
2283h	0	0283h	EmergencyCycle	EmergencyCycle	2	RD_WR
2284h	0	0284h	FBS Command	FBS Command	2	RD_WR
2287h	0	0287h	Watchdog Activation	Watchdog Activation	1	RD_WR
2288h	0	0288h	Watchdog Inhibit	Watchdog Inhibit	1	RD_WR
228Bh	0	028Bh	Save_VLRamps	Save_VLRamps	1	RD_WR
228Ch	0	028Ch	VL_Ramp_CalcMode	VL_Ramp_CalcMode	1	RD_WR
228Dh	0	028Dh	User_HS_SyncTout-Time	User_HS_SyncToutTime	2	RD_WR
228Eh	0	028Eh	Real_HS_SyncTout-Time	Real_HS_SyncToutTime	2	RD
228Fh	0	028Fh	FBS Config.	FBS Config.	2	RD_WR
2290h	0	0290h	PD_In_Cycle	PD_In_Cycle	2	RD_WR
22B9h	0	02B9h	SYNC_HSP5Service		1	ro
6502h	0	-----	DSP402_Supp-DriveModes	DSP402_SuppDriveModes	4	RD
6060h	0	-----	DSP402_ModesOfOperation	DSP402_ModesOfOperation	1	RD_WR
603Fh	0	-----	-----	DSP402_ErrorCode	2	RD
6040h	0	-----	DSP402_Controlword	DSP402_Controlword	2	RD_WR
6041h	0	-----	DSP402_Statusword	DSP402_Statusword	2	RD
Legend						
RD	read-only rights					
RD_WR	read and write rights					
Table 3:	*Operator parameter overview*					

7.2 Unit desciption by XML files

KEB provides so-called XML files as unit description files, which are compatible to the actual EtherCAT standard. Since KEB drives cover a wide spectrum of applications, these differ partly significant in their object index. A XML file is generated for each KEB inverter type in order to receive a exact assignment from unit to object index.

The file name of the XML files contains the Config_Id for classification of the inverter type and the version of the EtherCat software.

The file name of a KEB F5 XML file is structured completely as follows.

KEB cccc F5ETG X d.xml		
	x = revision number	e.g. 3 = revision number 3
	‚cccc' = Config_Id (Parameter SY.02)	e.g. 4612 = F5H-M/V1.00 4000 rpm

Observe that not each new software version in the EtherCat operator gets also a new revision.

> The required XML files can directly be generated with COMBIVIS 6.
> Further information can be found in the download area of www.keb.de by the search term "Generate EtherCAT description file".

— Headquarter —

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