



COMBICOM F5

INSTRUCTIONS FOR USE | F5 SERCOS OPERATOR V2.2

Translation of the original manual
Document 20154126 EN 00







1 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.

1.1 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.



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

1.2 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 https://www.keb.de/nc/search |  |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|



1.3 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".

1.4 Warranty

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

| | | |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | <p>Here you will find our current terms and conditions.</p> <p>www.keb.de/terms-and-conditions</p> |  |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|

Further agreements or specifications require a written confirmation

1.5 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.

1.6 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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2 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 !

2.1 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*).

2.2 Validity of this manual

This manual describes the SERCOS operator for COMBIVERT F5.
The manual

- contains only supplementary safety instructions.
- is only valid in connection with the power unit manual of COMBIVERT F5.

2.3 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.

2.4 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.

3 General

The presented documentation as well as the herein mentioned hard and software are developments of KEB Automation KG. Errors excepted. The company KEB Automation KG established this documentation to the best of her knowledge but without engagement, that the herein stated specifications may not provide the user with the expected advantages. KEB Automation KG reserves the right to alter specifications without notice to third parties. This instruction manual describes the software status as of 02/2005.

3.1 Unit Description

The herein described unit is a plugable operator with SERCOS-interface for the frequency inverter or servo KEB COMBIVERT F5. As far as possible the hard and software were developed taking the DIN/EN 61491 into consideration. The voltage supply is made by the inverter and as an independent external supply it can be made via the terminal strip of the inverter. The SERCOS-interface is designed as optical fibre ring for plastic (POF) or fibre glass cable (HCS) with F-SMA plugs. The SERCOS-service channel as well as cyclic data transfer are available. Parallel to SERCOS-operation the operation via integrated display/keyboard and also an additional serial interface for diagnosis / parameterization (KEB COMBIVIS) is possible (depending on the operation mode it may be disabled). SERCOS-operation parameters like slave address, transmitting power etc. can be adjusted via the keyboard.

3.2 Legend

| | |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SERCOS | According to DIN/EN 61491 standardized procedure for real time communication between controls and drives |
| MST | Master synchronous telegram; serves for μ s-exact data synchronization |
| MDT | Master data telegram; data from master to all drives (control word, set values) |
| AT | Drive telegram; data from drive to master (status, actual value) |
| Cyclic Data | Are transmitted time synchronous from phase 3 and are valid in phase 4 |
| Service Channel | Subordinate protocol in the telegrams; herewith parameter values, attributes, standardization and names can be transmitted sequentially, even parallel to the time critical cyclic data in phase 3+4 |
| Phase 0..4 | SERCOS-phase states: 0=Master closes the LWL-ring 1=Master identifies all slaves in the ring 2=parameterization mode, from now on the service channel is in operation 3=time slots are kept, cyclic data still not valid 4=cyclic operation mode |
| IDN | Ident number S-x-yyyy or P-x-yyyy S=System defined , P=Product specific ; x=set 0..7 ; yyyy=Data block number |

3.3 Operation Modes

SERCOS-parameters like cycle times and assignment of cyclic data are adjusted in phase 2 via the SERCOS-service channel (refer service channel parameter). The maximum cycle time in phase 0 to 2 is 25000 μ s. The SERCOS-operator can be operated with all KEB COMBIVERT F5 inverters and servos. Depending on the inverter/servo used one of the following operation modes is automatically activated:

3.3.1 Standard Mode

The standard mode is intended for operation with simple frequency inverters. In this case the cyclic data is transmitted to the inverter depending on the time available (not synchronous to MST). In phase 3 and 4 the function of the display/keyboard on the operator as well as the access to the inverter parameter in all sets via the diagnosis interface is possible. The minimum SERCOS cycle time in phase 3 and 4 is 500 μ s.

3.3.2 Synchronous Mode

The synchronous mode is only available for the respective inverter/servo type. Herewith the cyclic data is processed synchronous to the SERCOS MST cycle in the inverter.

Only in phase 3 and 4:

The function of the display/keyboard on the operator is switched off. The access to the inverter parameters via the diagnosis interface is only possible by indirect set addressing. Some service channel lists are not readable. The minimum SERCOS-cycle time is 1000 μ s and depending on the inverter/servo type it has to be a multiple hereof.

3.4 Technical Data

| | |
|-------------------------|----------------------|
| Sercos interface | F-SMA bushing |
| Transmitter wave length | 650nm |
| Transmitter power | Adjustable |
| Transmission rate | 2 or 4 Mbd |
| Device address | Adjustable 0, 1..254 |
| Voltage supply | Via the inverter |
| Housing | Standard F5 operator |
| Operation temperature | -10° to 45° C |
| Part number | 00F5060-6001 |

4 Keyboard / Display

The keyboard/display serves as display for the inverter- or operator parameter as well as the SERCOS phase display. The switching between phase and standard display is done by simultaneous pressing of FUNC and ENTER key until the display shows 5 dots. After releasing the keys the respective other mode is active. (During synchronous operation of phase 3+4 only the phase display is available). In the phase display the current SERCOS phase 0..4 is shown, *PHA=-* indicates a missing SERCOS input signal (Waiting for phase 0).

BscAn shows the active automatic baudrate estimation.

4.1 Inverter Parameter

The operation of the inverter parameter is made als usual. A detailed description is available in the instruction manual of the respective inverter/servo.

4.2 Operator Parameter

The operator parameters are displayed with password level 5. For this the value ,555' (if not changed) has to be entered in parameter UD.01. The values of the configuration parameters are stored nonvolatile in the operator. Following parameters and groups are available (some parameters are not visible on the display and can only be accessed from COMBIVIS):

4.2.1 Group : Operator system

| ID | Name | Meaning |
|-------|--------------------------|-------------------------------------------------------------------------------------------------------------------------|
| OS.00 | Operator type | Display of the operator type. Writeable for verify only with the same value. |
| OS.01 | Password | Input/Display of the password. Serves with this for switching between operator- and inverter parameters on the display. |
| OS.02 | Software date | Date of operator firmware. |
| OS.03 | Diag Error count | Error counter of diagnosis interface. Can be cleared by writing. |
| OS.04 | Diag Response delay time | Adjustable time delay for the diagnosis interface. |
| OS.06 | HSP5 Max InvBusy retries | Setting of retry count with error code 'Inverter Busy'. |
| OS.07 | HSP5 Tout count | Error counter of HSP5 interface. Can be cleared by writing. |
| OS.08 | Set Pointer | Set pointer for indirect addressing of the operator parameter. |
| OS.16 | Load Defaults | By writing a value of 1 all operator parameter are reset to their default values. |

4.2.2 Group : Fieldbus

Setting of SERCOS operation parameters. These can not be changed in phase 3 and 4.

After altering of these parameters the SERCOS operator awaits the transmission of phase 0 from the SERCOS master.

| ID | Name | Meaning |
|-------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fb.00 | Synchron/Phase | Display of the current SERCOS phase 0..4 and the synchronous readiness. <i>OPEn</i> shows a missing SERCOS input signal (waiting for phase 0). |
| Fb.01 | Drive Address | SERCOS device address; 0=device is ignored. |
| Fb.02 | Sercos Baudrate | Used SERCOS baudrate or automatic baudrate detection. |
| Fb.03 | Sercos Tx Power | Output power of LWL transmitter; 0=lowest 5=highest setting. |
| Fb.04 | Sercon Test Mode | SERCON testmode setting 0 = normal operation, 1 = zero bit stream, 2 = permanent light |
| Fb.05 | Setup Mode | Setup mode. Here a special behaviour ist set binary coded: Bit 0 =1 : No synchron mode although Inverter/Servo supports this Bit 1 =1 : Disable Switch-on slope detection of control word bit 14/15 Bit 2 =1 : Disable set adjustment on process data setting / set selection Bit 3 =1 : Control word bit 13 is not used for quickstop Bit 4 =1 : Detection of E.UP/E.LSF for power part readiness disabled |
| Fb.06 | Error Counter Cyc | Error counter of the internal cyclic data transmission to inverter/servo. |
| Fb.07 | MDT Control Word | Control word sent from SERCOS master. |
| Fb.08 | AT Status Word | Status word sent to SERCOS master. |

4.2.4 Group : Profile assignments

In this group the used S-parameters are mapped to inverter/servo internal addresses and the stored values of S-parameter are displayed/changed. These operator parameters can not be altered in phase 3 and 4.

| ID | Name | Meaning |
|-------|-------------------------|-----------------------------------------------------------------|
| Pr.00 | Adr.IDN36 (Set Speed) | Inverter parameter address for IDN S-0-0036 (speed setpoint) |
| Pr.01 | Adr.IDN40 (Act.Speed) | Inverter parameter address for IDN S-0-0040 (actual speed) |
| Pr.02 | Adr.IDN47 (Set Pos.) | Inverter parameter address for IDN S-0-0047 (position setpoint) |
| Pr.03 | Adr.IDN51 (Act Pos.) | Inverter parameter address for IDN S-0-0051 (actual position) |
| Pr.04 | Adr.IDN80 (Set Torq.) | Inverter parameter address for IDN S-0-0080 (torque setpoint) |
| Pr.05 | Adr.IDN84 (Act Torq.) | Inverter parameter address for IDN S-0-0084 (actual torque) |
| Pr.06 | Adr.IDN91 (Max Speed) | Inverter parameter address for IDN S-0-0091 (maximum speed) |
| Pr.07 | Adr.IDN92 (Max Torq.) | Inverter parameter address for IDN S-0-0091 (maximum torque) |
| Pr.08 | Adr.IDN153 (Ref Pos.) | Inverter parameter address for IDN S-0-0153 (position) |
| | | |
| Pr.16 | Val.IDN15 (Tel.Type) | Value for IDN-S-0-0015 (telegram type) |
| Pr.17 | Val.IDN32 (Main Mode) | Value for IDN-S-0-0032 (main mode) |
| Pr.18 | Val.IDN33 (SubMode 1) | Value for IDN-S-0-0033 (submode 1) |
| Pr.19 | Val.IDN44 (Speed Scal.) | Value for IDN-S-0-0044 (speed scaling) |
| Pr.20 | Val.IDN45 (Speed Fac.) | Value for IDN-S-0-0045 (factor speed scaling) |
| Pr.21 | Val.IDN46 (Speed Exp.) | Value for IDN-S-0-0046 (exponent speed scaling) |
| Pr.22 | Val.IDN76 (Pos. Scal.) | Value for IDN-S-0-0076 (position scaling) |
| Pr.23 | Val.IDN77 (Pos. Fac.) | Value for IDN-S-0-0077 (factor position scaling) |
| Pr.24 | Val.IDN78 (Pos. Exp.) | Value for IDN-S-0-0078 (exponent position scaling) |
| Pr.25 | Val.IDN86 (Torq. Scal.) | Value for IDN-S-0-0086 (torque scaling) |
| Pr.26 | Val.IDN93 (Torq. Fac.) | Value for IDN-S-0-0093 (factor torque scaling) |
| Pr.27 | Val.IDN94 (Torq. Exp.) | Value for IDN-S-0-0094 (exponent torque scaling) |

4.2.5 Group : Variable configuration

| ID | Name | Meaning |
|-------|----------------------|--------------------------------------------------------|
| cF.00 | VC Identnumber | Variable Configuration list, see section VC-Parameters |
| cF.01 | VC Parameter Address | Variable Configuration list, see section VC-Parameters |
| cF.02 | VC Value | Variable Configuration list, see section VC-Parameters |
| cF.03 | VC Attribute | Variable Configuration list, see section VC-Parameters |

4.2.6 Group : Debugging

Only for diagnostic while the vendor device tests.

5 Diagnosis Interface

To avoid a destruction of the PC-interface, it is only allowed to connect the diagnosis interface to a PC via a special HSP5 cable with voltage adjustment!

With an adapter the HSP5 cable is connected to the diagnosis interface. Via the PC-software KEB COMBIVIS 5 access is possible to all inverter parameters. The operator parameter can also be read and adjusted or parameterized via Download (starting with COMBIVIS 5.51).

Separately available accessories:

HSP5-cable between PC and adapter: Part no.: 00F50C0-0010
Adapter D-Sub9/Western: Part no.: 00F50C0-0020

6 Service channel

Via the SERCOS service channel access can be made to the elements 1 (IDN), 2 (Name), 3 (Attribute) and 7 (Data). Parameters with the prefix 'S' are system interface parameters according to DIN/EN 61491. The exact description can be taken out of these norm.

6.1 S-Parameter

For entries with preceding * the parameter addresses used in the inverter/servo are to be set up preliminary. (See operator parameter or P-parameter). Entries with preceding # can not be read in Phase 3 and 4.

| IDN | Name | Meaning |
|----------|------------------------|------------------------------------------------------------------------------|
| S-0-0001 | TNcyc | Cycle time of the control |
| S-0-0002 | TScyc | Cycle time of the data transmission |
| S-0-0003 | t1min | Shortest time of AT after MST |
| S-0-0004 | TATMT | Required switching time sending->receiving |
| S-0-0005 | t5 | Min. actual value processing time |
| S-0-0006 | t1 | Transmitting time of the AT |
| S-0-0007 | t4 | Actual value measuring time |
| S-0-0008 | t3 | Time where set values are valid |
| S-0-0009 | Pos.MDT | Byte offset of own data in MDT |
| S-0-0010 | Len.MDT | Length of MDT in bytes |
| S-0-0011 | Class1 Diag | Class 1 diagnosis (error status) |
| S-0-0014 | IF State | Interface status |
| S-0-0015 | Telegram Type | Telegram type of cyclic data |
| S-0-0016 | Cfg.AT | List of configured IDNs in AT |
| S-0-0017 | Lst.All Data | # List of all existing operation data IDNs |
| S-0-0018 | Lst.CP2 Data | List of all IDNs to be transmitted in phase 2 |
| S-0-0019 | Lst.CP3 Data | List of all IDNs to be transmitted in phase 3 |
| S-0-0021 | Lst.CP2 Inval.Data | List of all invalid IDNs before switching to phase 3 |
| S-0-0022 | Lst.CP3 Inval.Data | List of all invalid IDNS before switching to phase 4 |
| S-0-0024 | Cfg.MDT | List of configured IDNs in MDT |
| S-0-0025 | Lst.All Commands | List of all existing command-IDNs |
| S-0-0028 | MST Errorcount | Error counter MST in phase 3+4 |
| S-0-0029 | MDT Errorcount | Error counter MDT in phase 4 |
| S-0-0030 | Version Operator/Drive | Version identifier of the operators as well as software-id of inverter/servo |
| S-0-0032 | Main Mode | Determination of the main operation mode. |
| S-0-0033 | Sub.Mode1 | Determination of alternative operation mode |
| S-0-0036 | Speed Setting | *Speed set value |
| S-0-0040 | Actual Speed | *Speed actual value |
| S-0-0044 | Speed Scaling | Scaling of speeds |
| S-0-0045 | Speed Factor | Factor of speed scaling |

| IDN | Name | Meaning |
|----------|----------------------|----------------------------------------------------|
| S-0-0046 | Speed Exponent | Exponent of speed scaling |
| S-0-0047 | Position Setting | * Position set value |
| S-0-0051 | Actual Position | * Position actual value |
| S-0-0076 | Position Scaling | Scaling of positions |
| S-0-0077 | Position Factor | Factor of position scaling |
| S-0-0078 | Position Exponent | Exponent of position scaling |
| S-0-0080 | Torque Setting | * Torque set value |
| S-0-0084 | Actual Torque | * Torque actual value |
| S-0-0086 | Torque Scaling | Scaling of torque |
| S-0-0087 | tATAT | Shortest time between two ATs |
| S-0-0088 | tMTSY | Shortest time between MDT and MST |
| S-0-0089 | t2 | Transmission time of MDT |
| S-0-0090 | tMTSG | Required copying time of set values |
| S-0-0091 | Max Speed | * Maximum speed bipolar |
| S-0-0092 | Max Torque | * Maximum torque bipolar |
| S-0-0093 | Torque Factor | Factor of torque scaling |
| S-0-0094 | Torque Exponent | Exponent of torque scaling |
| S-0-0095 | State | Actual drive status in plain text |
| S-0-0096 | SLKN | Drive addresses of the slave |
| S-0-0099 | Reset Class1 | Command error reset |
| S-0-0127 | CP3 Transition | Command check transition to phase 3 |
| S-0-0128 | CP4 Transition | Command check transition to phase 4 |
| S-0-0134 | Control Word | Control word from MDT |
| S-0-0135 | Status Word | Status word from AT |
| S-0-0140 | Manufacturer Type | Company name and device type |
| S-0-0142 | Application | Free settable text, storage in non volatile memory |
| S-0-0143 | IF Version | Version of system interface specification |
| S-0-0148 | Start Reference | Command referencing |
| S-0-0152 | Start Position | Command single positioning |
| S-0-0153 | Position Value | * Position value for command S-0-0152 |
| S-0-0185 | Max Len.AT | Max. number of bytes in AT |
| S-0-0186 | Max Len.MDT | Max. number of bytes in MDT |
| S-0-0187 | Possible Cfg.AT | # List of configurable IDNs in AT |
| S-0-0188 | Possible cfg.MDT | # List of configurable IDNs in MDT |
| S-0-0192 | Lst.Backup Data | # List of IDNs to save for backup |
| S-0-0216 | Switch Parameter Set | Command set switching |
| S-0-0217 | Set Preselection | Set to switch to |
| S-0-0254 | Acitve Set | Set which is currently active |

The scaling values can be set to any value, although the scaling of the internal used inverter/servo parameters must be considered.

6.2 P-Parameter

Parameter with the prefix 'P' are product parameters implemented in this operator.

| IDN | Name | Meaning |
|----------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------|
| P-0-0000 to P-7-4050 | (readable in phase 2) | Inverter/servo parameter values, depending of inverter/servo not all are available. See description below. |
| P-0-4088 | Set Pointer | Set pointer for indirect set addressing |
| P-1-4088 | Address IDN-S-153 | Parameter address for IDN S-0-0153 (Position) |
| P-0-4089 | Address IDN-S-36 | Parameter address for IDN S-0-0036 (Speed Setting) |
| P-1-4089 | Address IDN-S-40 | Parameter address for IDN S-0-0040 (Actual Speed) |
| P-2-4089 | Address IDN-S-47 | Parameter address for IDN S-0-0047 (Position Setting) |
| P-3-4089 | Address IDN-S-51 | Parameter address for IDN S-0-0051 (Actual Position) |
| P-4-4089 | Address IDN-S-80 | Parameter address for IDN S-0-0080 (Torque Setting) |
| P-5-4089 | Address IDN-S-84 | Parameter address for IDN S-0-0084 (Actual Torque) |
| P-6-4089 | Address IDN-S-91 | Parameter address for IDN S-0-0091 (Maximum Speed) |
| P-7-4089 | Address IDN-S-92 | Parameter address for IDN S-0-0092 (Maximum Torque) |
| P-s-4090 | VC(s) Identnumber | Variable configuration list, s. section VC-Parameters |
| P-s-4091 | VC(s) Parameter Address | Variable configuration list, s. section VC-Parameters |
| P-s-4092 | VC(s) Value | Variable configuration list, s. section VC-Parameters |
| P-s-4093 | VC(s) Attribute | Variable configuration list, s. section VC-Parameters |
| P-0-4094 | Setup Mode | Adjustment of the setup mode, refer to SERCOS parameter |
| P-0-4095 | Error Counter Cyc | Error counter of cyclic data transmission. If the SERCOS-parameters are adjusted correctly this value is 0. |

6.3 Access to Inverter Parameters

The access to the inverter parameter is done directly via IDN P-s-ggaa with following syntax:
's' is the desired parameter set.

'gg' is the decimal group address, for instance 03 for the 'OP'-parameter group.

'aa' is the decimal parameter address within the group.

If for example parameter OP.01 in set 3 shall be addressed, IDN P-3-0301 is to be used.

A parameter address of 1012h in set 7 is addressed by IDN P-7-1618 .

The available parameter addresses are described in the respective application manual of the inverter or servo, non existent parameters are acknowledged with the appropriate error code. If there are group numbers greater than 40 in the inverter/servo, this groups are addressed under unassigned group addresses below 40. With this there are a maximum of 40 groups with 100 parameters each in 8 sets addressable.

The parameters have a data with of 16 or 32 Bit, by reading the attribute the length can be determined. Furthermore the parameter name can be read out for easier identification.

RESTRICTION

In synchron mode of phase 3/4 following restrictions apply: For the parameter set only '0' is permitted, although the parameter set is fixed indirectly by the set pointer (IDN P-0-4088) ! The attribute always shows a data length of 32 Bit. When writing negative values, the sign must be extended eventually. The parameter name cannot be read out, instead of this '(Name not accessible)' will be returned.

6.4 VC-Parameters

The variable configuration list is made of up to 8 free definable entries to simulate special software requirements with some controls. The 8 single entries are accessed by IDN P-x-4090 to 4093 over the service channel, where x here sets the desired entry. When accessing by the diagnosis interface (COMBIVIS) the 8 single entries are selected by the parameter set. Each entry consists of the 4 members Identnumber, Parameter Address, Value and Attribute.

'Identnumber' selects the IDN, a value of S-0-0000 means that this entry is NOT used.

Only IDNs in the S-range are selectable, but they have priority over the fixed entries in the S-range.

'Parameter Address' assigns an inverter parameter address, from which the value is read/written.

If 'Parameter Address' is 0000h, the value will be used from the member entry 'Value'.

'Attribute' sets the high-word of the service channel attribute, here the data length and representation can be selected.

RESTRICTION

variable lengths (lists/texts) are not allowed here and lead to faulty service channel operation when reading the value !

6.5 Setting up the inverter/servo

For the correct function a presetting of the inverter/servo is absolutely necessary. Here following items are to be taken into consideration:

Sercos control word

The sercos control word is mapped to parameter SY.50. The control release function as well as start/stop and quickstop has to be enabled here. The switching to path control has to be enabled via control word also.

Command Reset Class 1 (S-0-0099)

The error reset is processed by the parameter SY.50. The reset function has to be enabled here, but the reset should not be available by dropping the control release.

Communication errors

To switch down the inverter/servo on communication errors properly, the reaction for 'Error Bus' has to be activated and additionally with some types the watchdog time has to be set.

Command Switch Parameter Set (S-0-0216)

Set switching is done by the parameter SY.50. The parameter set source has to be programmed to SY.50 for this.

Command Start Reference (S-0-0148)

This function is started by parameter SY.50. The inverter/servo has to support this. Parameters as referencing mode/speed can be set via P-Parameters preliminary.

Command Start Position (S-0-0152)

This function is started by parameter SY.50. The inverter/servo has to support this.

The desired set position is pre-programmed via S-0-0153 or the relevant P-Parameter.

A 'continuous' positioning is not possible, the command has to be re-started for this. Parameters as speed or mode have to be set via P-Parameters preliminary.

6.6 Sercos AT Status word

The SERCOS status word is generated from parameter SY.51 and the device status RU.00.

| Sercos AT | SY.51 | Function |
|-----------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bit 14+15 | Bit 0 (Control release) Bit 2 (Start) | Drive state : 01 Ready for Power-ON (Status=E.UP / E.LSF / NoPu) 10 Power part locked (SY.51 Bit 0 or 2 = 0) 11 Operation enabled (SY.51 Bit 0 and 2 = 1) |
| Bit 13 | Bit 1 (Error) | Drive ERROR |
| Bit 8+9 | Bit 12+13 | Actual operation mode |

6.7 Sercos MDT Control word

The SERCOS control word is mapped to parameter SY.50.

| Sercos MDT | SY.50 | Function |
|------------|-------------------------|---------------------------------------------------------------|
| Bit 15 | Bit 2 (Start) | Drive ON, Slope detection disabled by Setup Mode Bit 1 |
| Bit 14 | Bit 0 (Control release) | Drive ENABLE |
| Bit 13 | Bit 8 (Quick Stop) | Drive START, Quick stop function disabled by Setup Mode Bit 3 |
| Bit 8+9 | Bit 12+13 | Operation mode switching |

6.8 Error Codes

The following error codes are used in the service channel:

| Value | Meaning |
|-------|--------------------------------------------------------------|
| 0000h | No error |
| 0001h | Service channel not open |
| 0009h | Invalid closing of the service channel |
| 1001h | IDN not existing |
| 1009h | Invalid access to IDN |
| 2004h | Name cannot be changed |
| 3004h | Attribute cannot be changed |
| 4001h | Unit does not exist |
| 5001h | Minimum value does not exist |
| 6001h | Maximum value does not exist |
| 7003h | Data transmission too long |
| 7004h | Data cannot be changed |
| 7005h | Data is write/read protected during this communication phase |
| 7006h | Data smaller than minimum value |
| 7007h | Data larger than maximum value |
| 7008h | Data is not valid / reading=inverter parameter not existing |
| 8000h | Internal error |

7 Cyclic Data Channel

The content of the cyclic data in phase 3 and 4 are set in advance either as preferred or configured telegrams. The main and the alternate mode 1 can be set up and switched by the SERCOS control word. There is only a difference between position and non-position modes. The torque mode is the same as the speed mode, where the respective limit value affects the actual speed.

7.1 Preferred Telegrams

The telegram type IDN S-0-0015 is set to one of the following values. Herewith the cyclic data is defined.



- The inverter parameter addresses which are used for the various IDNs must be set before by the Operator parameter or IDN P-x-4089.

| Value | Data in MDT (set value) | Data in AT (actual value) |
|-------|---------------------------------|------------------------------------|
| 0 | -none- | -none- |
| 1 | torque set-value IDN S-0-0080 | -none- |
| 2 | Speed set-value IDN S-0-0036 | Speed actual-value IDN S-0-0040 |
| 3 | Speed set-value IDN S-0-0036 | position actual-value IDN S-0-0051 |
| 4 | Position set-value IDN S-0-0047 | position actual-value IDN S-0-0051 |
| 5 | (not possible) | |
| 6 | Speed set-value IDN S-0-0036 | -none- |

7.2 Configured Telegram

The telegram type IDN S-0-0015 is set to value 7.

The assignment and sequence order of the parameters in MDT is determined and set via IDN S-0-0024, a list of possible IDNs can be taken out of IDN S-0-0188. The assignment and sequence order of the parameters in AT is determined and set via IDN S-0-0016, a list of possible IDNs can be taken out of IDN S-0-0187.

With the configuration of the cyclic data, 32-bit parameters are to be included first into the list.

If the desired combination is not possible, the switching to phase 3 is declined and a relevant entry to IDN S-0-0021 is made. Corresponding to operation mode and inverter/servo type different combinations of the data widths are possible:

| 1.Date | 2.Date | 3.Date | 4.Date | Synchronous | Standard |
|---------|----------|----------|----------|-------------|----------|
| 2 Words | not used | not used | not used | X | X |
| 2 Words | 2 Words | not used | not used | - | X |
| 2 Words | 1 Word | not used | not used | X | X |
| 2 Words | 1 Word | 1 Word | not used | X | X |
| 1 Word | not used | not used | not used | X | X |
| 1 Word | 1 Word | not used | not used | X | X |
| 1 Word | 1 Word | 1 Word | not used | X | X |
| 1 Word | 1 Word | 1 Word | 1 Word | - | X |

X: possible occupation

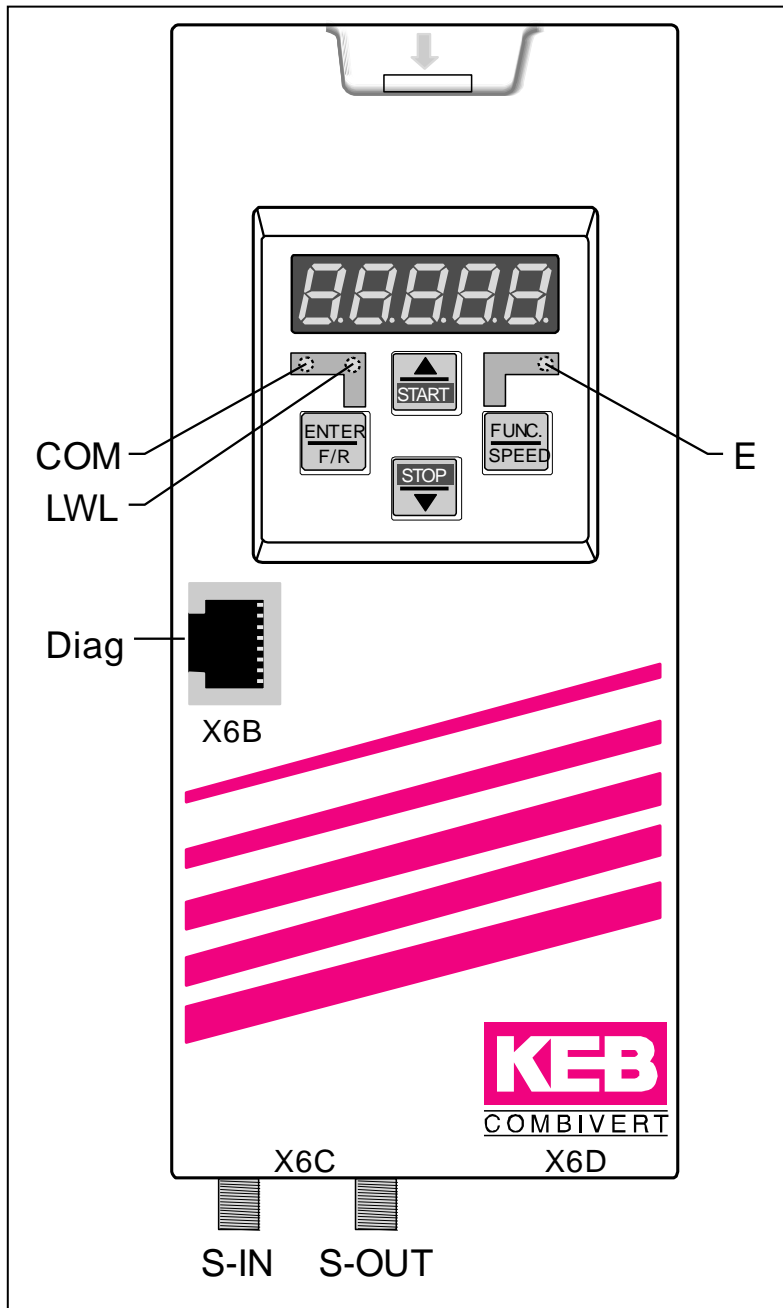
Remark : The correct data length from the attribute of an inverter parameter in the P-range can only be read out in phase 2 when using the synchronous mode.

7.3 Extended service channel

The extended service channel is available only in the synchronous mode.

Beside the 3 cyclically transferred values there are up to 4 additional parameters in the MDT and AT which are supplied in the SERCOS frame cyclically. These are NO real cyclically data, because they are, depending on the settings, transferred to the inverter/servos only every 4. to 10. SERCOS cycle. These parameters are configured in IDN S-0-0016 and IDN S-0-0024 on positions 4 to 7, where 16 or 32-Bit data widths are possible.

8 Operating elements



COM (green)

Lights up when access via the SERCOS service channel

LWL (red)

Full brightness : no SERCOS-input signal (LWL disconnected, previous device switched off)

Low brightness: receive distortion of the SERCOS input signal (transmitting power of the previous device too high or too low, incorrect baud rate)

E (red)

On: servo/inverter ready to operate

Blinking: servo/inverter error state

off: no power supply

Diag

Diagnosis interface to the PC

S-IN

SERCOS Input interface

S-OUT

SERCOS Output interface

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