CAN Bus Link for:

- **POSIDRIVE® FAS 4000**
- **POSIDRIVE® FDS 4000**
- **POSIDYN® SDS 4000**

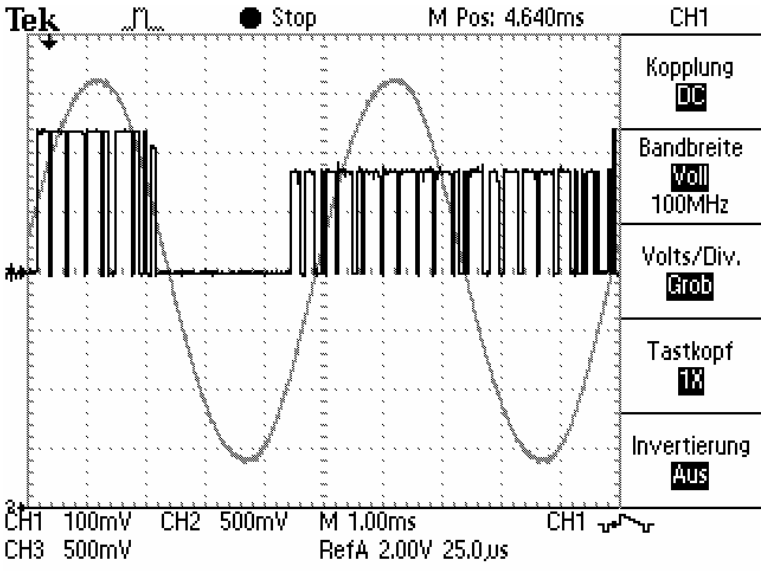
Documentation

Before commissioning the option please read these instructions and the installation and operating instructions for
- **POSIDRIVE® FAS 4000 (publ. no. 441537) and**
- **POSIDRIVE® FDS 4000 (publ. no. 441375) and**
- **POSIDYN® SDS 4000 (publ. no. 441422)**

and strictly follow them!

MANAGEMENTSYSTEM

certified by DQS according to
DIN EN ISO 9001, DIN EN ISO 14001
Reg-No. 000780 UM/QM



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CAN Bus link

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1 INTRODUCTION

To prevent problems during commissioning and/or operation, it is essential to read the complete installation and commissioning instructions of POSIDRIVE® FAS 4000 / FDS 4000 or POSIDYN® SDS 4000 and also this documentation prior to installation and commissioning.

1.1 Basic facts on CAN

The serial bus system CAN (Controller Area Network) is a serial multi-master communication protocol. It was developed by Bosch for the automotive sector and then went on to become the leading bus protocol. Use of CAN for industrial applications also continues to increase. The actual CAN protocol corresponds to the Data Link Layer (layer 2) of the ISO/OSI reference model. Simple or manufacturer-related CAN networks can be established at this level. The disadvantage of this layer 2 solution is that there is no standardized network management.

1.2 CANopen

The higher communication layer "CAN Application Layer (CAL)" and the next layer "CANopen" have been defined as open standards by the international user and manufacturer association "CAN in Automation (CIA)." These have established themselves as the industrial standard. Services and protocols for network initialization, monitoring and configuration have been defined here as well for process data and parameter communication.

STÖBER Antriebstechnik permits all inverters of the **POSIDRIVE®** FAS 4000, **POSIDRIVE®** FDS 4000 and **POSIDYN®** SDS 4000 families to connect to the CAN bus with the CANopen profile. With POSIDRIVE® FAS 4000 and POSIDRIVE® FDS 4000 this is implemented with a plug-in Kommubox. The POSIDYN® SDS 4000 family of devices has the CAN controller on board. All inverters comply with the CANopen profile CiA/DS-301 and all subordinate CiA specifications (see list of literature). Use of the device profile CiA/DSP-402 (motion control) ensures compatibility with this specification. These CiA papers do not have to be studied. The inverters are logical CANopen slaves which are controlled and parameterized by a logical CANopen master (PC, PLC). The device description files can be used as EDS files (Electronic Data Sheet) for easy integration of the inverters in a CANopen network. These files are available for downloading from the Internet at www.stoeber.de.

When commissioning a CAN bus system, adhere to the manuals/commissioning guidelines of all components (CAPopen master/controller, additional slaves, and so on). If you need more information on the CAN bus or the CANopen profile, comprehensive information is available for accessing or downloading from the **CiA** organization under the address www.can-cia.org.

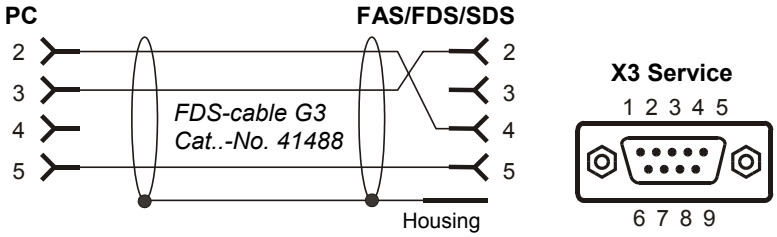
2 INSTALLATION OF KOMMUBOX / OPTION BOARD

1. Turn off the 400 V and the 24 V power supply via the option board.
   Insert Kommubox on plug connector X3 (9-pin sub D) on the front of the FAS / FDS. To secure, tighten the screw on the right-hand side (FDS) or above (FAS) of Kommubox.
2. Kommubox requires no separate voltage supply. It is powered by the sub D plug connector of the FAS / FDS.

2.1 Circuiting of interface X3 (service)

X3 / Pin	Signal	
	FAS/FDS	SDS
1	+10 V, 200 mA	+8V
2	Rx (RS232)	RxD
3	Reserved	TxD
4	Tx (RS232)	TxD
5	SG	PGND[1]
6	Reserved	CANL
7	Reserved	internally connected
8	Reserved	
9	-	CANH

[1] PGND ground (I/O ground) is galvanically isolated from DGND digital ground on plug connector X1.



The connection cable between the serial interface of the PC (Notebook) and serial interface X3 of the FAS/FDS may not be replaced by a conventional serial connection cable since this might destroy the inverter. A conventional serial connection cable can be used with the adapter (cat. no. 41.489).

Tip: Option boards with external 24 V power supply (**FAS**: 24V-LC; **FDS**: *GB4001*, *EA4001*, 24 V supply) permit full fieldbus access even when there is no power.

3 ELECTRICAL INSTALLATION

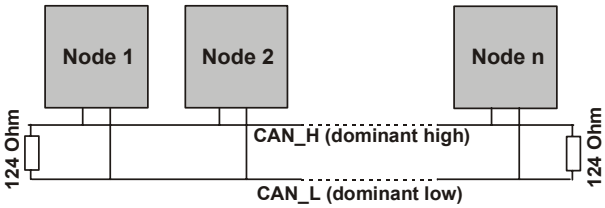
3.1 General layout of a CANopen system

To set up a CAN bus, all stations (nodes) are connected with each other via the CAN_Low and CAN_High cables. Each device which is not located at the end of the bus has an incoming and an outgoing bus cable. A 120 Ohm terminating resistor must be connected between CAN-high and CAN-low at the ends of the CAN bus.

Up to 125 stations can be used. From the electrical and CAN bus viewpoint, all stations are equal and a CAN device can be placed anywhere. STÖBER devices are CANopen slaves which execute communication jobs from the CAN master (Max. number when STÖBER inverters are used = 112).

All stations on the CAN bus must be set to the same transmission speed. This is done with parameter **A82 CAN-baudrate**. Maximum line length depends on the baud rate that is being used. The table shows the maximum permissible lengths over the entire bus.

At the physical layer, STÖBER devices adhere to the ISO 11898-2 high speed standard. We recommend using a cable which is especially shielded for CAN bus communication (in accordance with ISO 11898) since only a suitable fieldbus cable offers the necessary technical prerequisites such as ripple resistance and sufficiently low cable capacity (approx. 60 nF/Km) for error-free operation particularly at high baud rates.

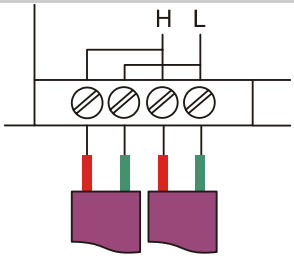


A82 CAN-baudrate	Max. length	
0:10 kbit/s	5000 m	
1:20 kbit/s	2500 m	
2:50 kbit/s	1000 m	
3:100 kbit/s	800 m	
4:125 kbit/s	500 m	
5:250 kbit/s	250 m	
6:500 kbit/s	100 m	
7:800 kbit/s	< 45 m!	Only with special bus cable with <= 60 nF/ km
8:1000 kbit/s	< 20 m!	

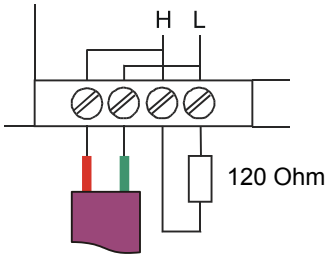
These specifications apply only to the best-case scenario in which only two nodes are connected with each other. When more than two nodes are connected or lower error rates are desired, a shorter length than the maximum length shown should be used.

3.2 Connection of bus cable to Kommubox

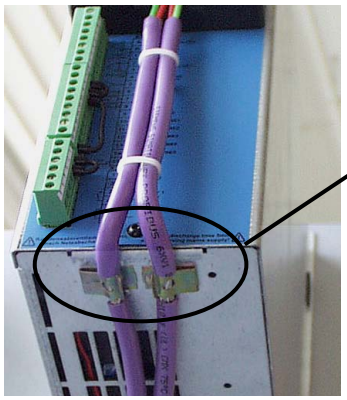
With **POSIDRIVE**® FAS 4000 / FDS 4000, the bus cables are clamped into the terminal strip of Kommubox. With devices located within the bus branch, the incoming and outgoing lines are connected to contacts H for CAN_high and L for CAN_low. A separate screw terminal can be used for each core. The terminals are jumpered internally. The two outer screw terminals are **not** used!



With devices which are located at the beginning or end of the bus branch, only one bus cable is connected. If this is the case, a terminating resistor of 120 Ohm (not included) must be mounted at the place where the second bus cable would have been.



Two (2) centimeters of the bus cable insulation are bared about 12 cm before the end of the cable (only FDS). The now visible shield is clamped under the EMC clip on the bottom of the FDS's housing. This ensures a large-surface connection between shield and PE.



➔ Kommubox is powered from the FAS / FDS.
If the power is turned off for an FAS/FDS without external 24 V supply, this Kommubox is no longer part of the CAN bus. This does not bother the other bus stations.

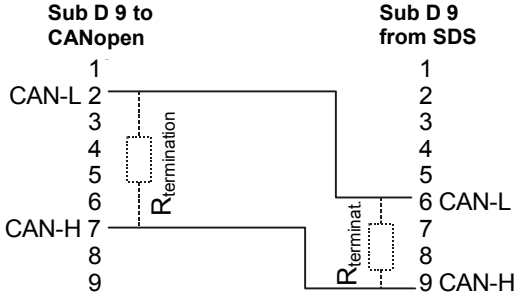
Tip: Option boards with external 24 V power (**FAS**: 24V-LC; **FDS**: *GB4001*, *EA4001*, 24 V supply) allow full fieldbus access even when the network voltage is missing!

3.3 Connection of bus cable to SDS

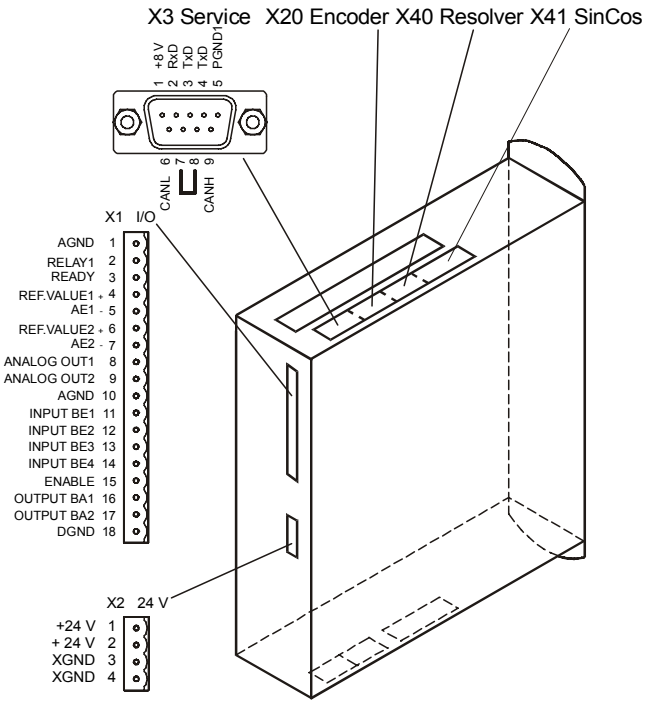
The CAN bus cable is connected to a 9-pin sub D plug connector on service plug connector X3. CAN_Low must be connected to pin 6, and CAN_High must be connected to pin 9.

CAN bus and RS 232 can be operated simultaneously with a T plug connector (e.g., the "SUBCON9" plug connector from Phoenix Contact).

Due to the simultaneous use of the X3 plug connector with CAN and RS 232, the PIN allocation of the SDS does not comply with the CANopen specification (ISO 11898, type 1). The following example shows the connection of a CANopen station to the SDS.



The shield of the bus cable is usually connected via the pull relief to the housing of the sub D plug connector. This ensures a good connection of the cable shield with the device housing when the connection is inserted on service plug connector X3.



4 COMMISSIONING THE INVERTER ON THE CAN BUS

All stations on the CAN bus must be set to the same transmission speed. This is done with parameter **A82** CAN-baudrate. The lower the selected baud rate, the greater the distance the CAN bus can handle (see chap. 3.1).
As with all other parameters, the parameters can be changed on the FDS with keys and display, on the FAS/SDS with the CONTROLBOX external operator panel, with a PC with the programs FDS Tool or SIMUBOX or even via the CAN bus.

Each station on the CAN bus has its own bus address. This address is used to calculate the identifiers for the CAN messages (s. chap. 4.3). Several devices with the same bus address may not be used together on one CAN bus. The parameter **A83** bus-address can be set to values between 0 and 125. The default setting is 0. This parameter must be set to a separate value (>0) on each inverter before the devices can be operated together on the CAN bus. This can also be done directly on the inverter or via the CAN bus. To change the bus address via the CAN bus, only this one device should be connected to the CAN bus.

The applicable EDS file can be used for the inverters for simple connection to a CANopen network. The EDS file describes the characteristics of the device on the CAN bus including all communication objects available via SDO and the PDO channel.

The modified values for **A82** CAN-baudrate and **A83** busaddress do not take effect until the **A00** save parameter action *and* the power has been turned off and on or after the "Reset_Node" NMT service. This permits the values to be changed conveniently on each device in succession and the values to be activated simultaneously on all devices over the entire bus.

A82 CAN-baudrate and **A83** busaddress can be changed like all other parameters. With FDS this is done directly with keys and display. With FAS/SDS the external CONTROLBOX operator panel is used or a PC with the FDS Tool programs or SIMUBOX or also with CAN bus.

4.1 Additional information

4.1.1 For POSIDRIVE® FAS 4000 and POSIDRIVE® FDS 4000

After power-on, a high-speed serial connection between Kommubox and FAS / FDS is set up. After the connection has been established, initialization data are read from and written to the FAS / FDS. After the procedure has been concluded, Kommubox is ready for bus operation. These phases are indicated with the green LED of Kommubox as shown below.

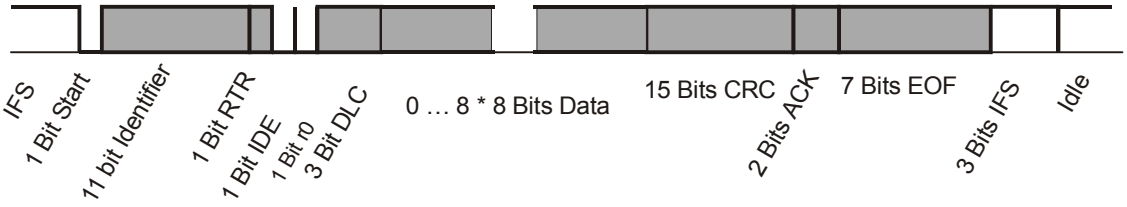
- Power of the FAS/FDS is off. — LED is off.
- Power is on and serial connection is being set up, read init file. — LED flashes rapidly. (8 x per sec)
- Connection was established, Kommubox was initialized. — LED is on continuously.
- Kommubox was started via CAN bus (Start_Remote_Node, NMT) — LED flashes slowly. (1 x per sec)

4.1.2 For POSIDRIVE® FAS 4000

- Particularly important for FAS: When parameterization is performed via fieldbus, the parameter set identifiers **E56** and **E57** are set to 254. The "**A00**Savevalues" action must be started so that the correct settings are automatically read from the Paramodule to the new FAS when devices are replaced.

4.2 CAN telegram

The exact structure of the CAN telegram is described in the documentation of CANopen/CiA.



The following specifications are applicable to users when they send or receive CAN telegrams.

- Each CAN telegram is uniquely specified with its identifier. Kommubox CAN and SDS use several definite identifiers. For more information, see chapter 4.3.
- CAN telegrams can contain data with lengths between 0 and 8 bytes. This length varies for communication with Kommubox CAN and SDS for the different services.
- The contents of the data in the CAN telegrams are specified by type of service. See the next few chapters for a description.
- The RTR (Remote Transmission Request) flag is not used by Kommubox CAN and SDS. It is always inactive.

Although use of the CAN interface for all possible controllers cannot be described here, you will find this information (identifier, length, data bytes and RTR) in the applicable documentation. The next few sections give you a brief description.

4.3 CAN bus identifiers used

When data are transmitted over the CAN bus, not the stations are addressed but the destinations of communication objects (COB). For instance, this might be the reference speed for axis 1 or the parameter service of station 2. The messages (telegrams) are identified with identifiers (COB-ID) which are unique throughout the entire network. In addition to the content, the identifier also specifies the priority of the message. This is important for granting sending rights when several stations want bus access rights at the same time.

CAN protocol V2.0a which was used permits identifiers from 0 to 2031. To give you an easy way to determine these identifiers, the FAS/FDS/SDS inverters use the mechanism used by the CANopen profile to specify the identifiers. The following rule applies to each CANopen telegram (message which can be sent or received by Kommubox).

Identifier = COB-ID = Function code for the service + **A83** bus address

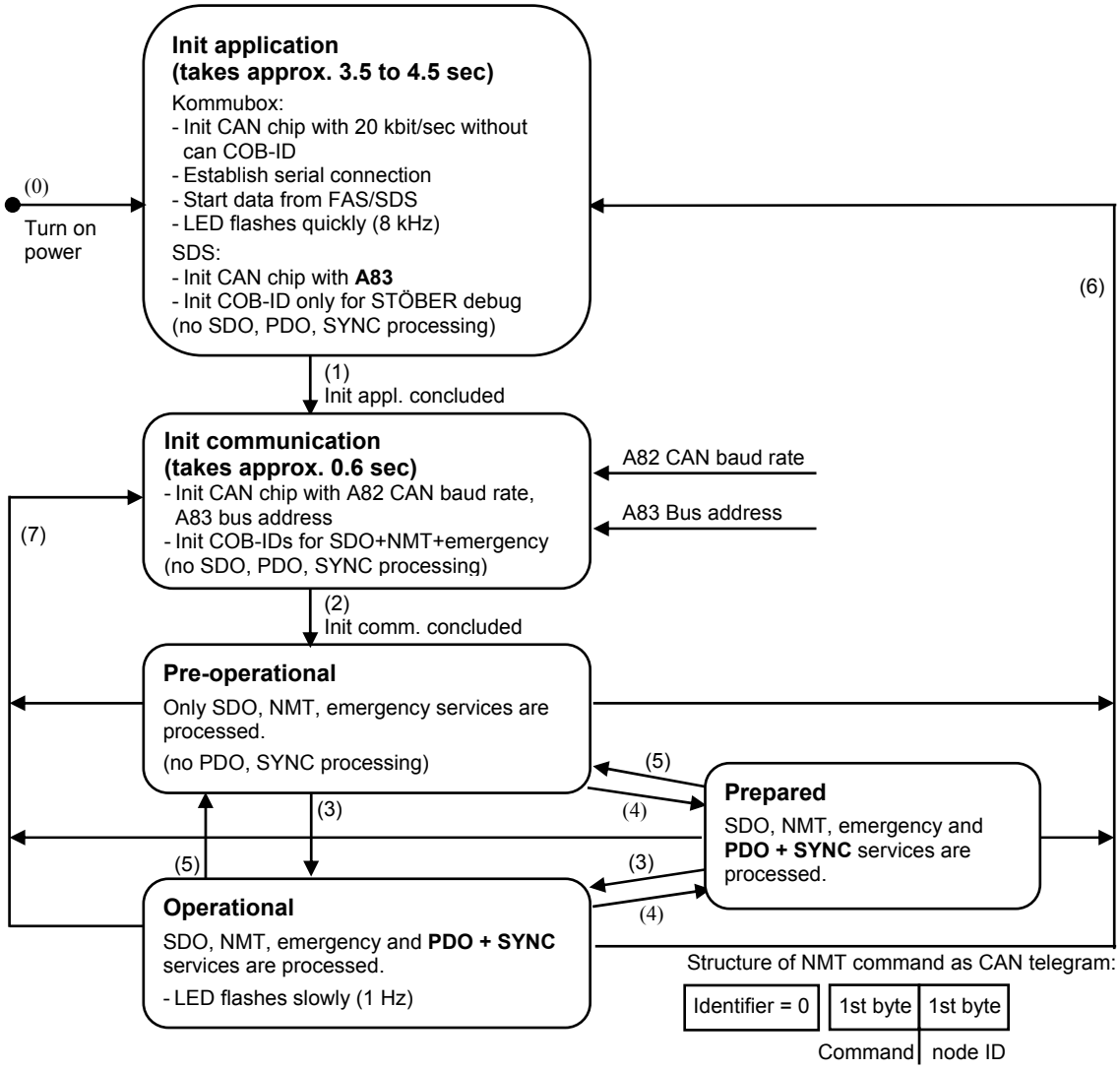
The overview below shows the services used by Kommubox CAN and SDS and their COB IDs. Their meaning is explained in the next few chapters.

Service	COB-ID (= Identifier)	Use	Priority	Data Length
NMT	0	Network management services for start phase	0 (highest)	2
SYNC	128 80_{hex}	CANopen master sends cyclic synchronization signal to all.		0
EMERGENCY	128 80_{hex} + **A83** busaddress	The inverter sends emergency object for malfunction.	1	8
PDO(rx)	384 180_{hex} + **A83** busaddress	The inverter sends process data to CANopen master.	2	0 to 8
PDO(tx)	512 200_{hex} + **A83** busaddress	CANopen master sends process data to the inverter.	3	0 to 8
SDO(rx)	1408 580_{hex} + **A83** busaddress	The inverter sends parameter service to CANopen master.	4	8
SDO(tx)	1536 600_{hex} + **A83** busaddress	CANopen master sends parameter service to the inverter.	5	8

4.4 Start station with network management service

All slaves which use the CANopen standard use the same routine for initializing the CAN interface on power-up and controlling it with commands. This mechanism is presented in the Network Management State Machine (see figure). The following points are particularly important in understanding the devices.

1. Initialization of the CAN interface with identifier assignment only occurs after power-up and after the commands Reset-Node or Reset-Communication. If a change in **A82** or **A83** is to become effective, the **Init Communication** state must be assumed.
2. To be able to use the process data (PDO service), **Start-Remote-Node** must be sent as the only command after each power-on. With Kommubox CAN and SDS 4000, the **Prepared** state is identical to the **Operational** state. The PDO service also functions here.
3. The device state machine or the electrification of the motor is **not** affected by this NMT machine! Only the characteristics of the CAN interface concerning communication are described here.



Transitions between states sometimes occur automatically (1 + 2) with the inverter (NMT slave) or intentionally with network management commands which are sent as messages by the NMT master. All NMT commands are sent with the identifier 0 and a data length of 2. The first byte contains the command ID and the second byte contains the station address (node ID) which must correspond with the **A83** busaddress. If 0 is specified in the second byte, the NMT command becomes a broadcast command for all connected NMT slaves.

Attention!
When NMT commands to which individual stations are to react are sent, the Kommubox CAN and SDS 4000 must wait a sufficient amount of time between these telegrams so that each station has time to recognize its special command with its node ID before this information is overwritten by a new telegram. Kommubox CAN and SDS 4000 require a minimum wait time of approx. 8 msec. This minimum wait time must be increased if SDO or other services also have to be processed at the same time.
If, after the Kommubox is powered up but the **Init Application** state is still running (approx. 4.5 seconds), telegram communication takes place on the CAN bus with a baud rate other than 20 kbit/sec, the Kommubox CAN is unable to understand these messages and marks them as invalid!

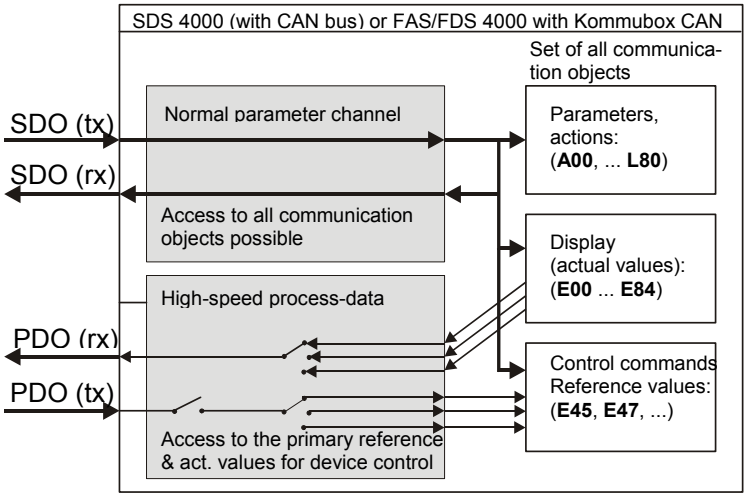
If the Kommubox CAN is set to the **Init Application** state with the **Reset Node** command, no SDO services should be started during these (approx.) 3 seconds!
The following table shows the state transitions.

No.	Transition to State	Triggered by	NMT Command
0	Init Application	Turn on power	-
1	Init Communication	Device concluded Init Application.	-
2	Pre-Operational	Device concluded Init Communication.	-
3	Operational	NMT command **Start-Remote-Node**	1
4	Prepared	NMT command **Stop-Remote-Node**	2
5	Pre-Operational	NMT command **Enter-Pre-Operational-State**	128 decimal = 80_{hex}
6	Init Application	NMT command **Reset-Node**	129 decimal = 81_{hex}
7	Init Communication	NMT command **Reset-Communication**	130 decimal = 82_{hex}

5 DATA TRANSMISSION VIA CAN BUS

Two different methods of transmission are available to exchange data between CANopen master and inverter.

All parameters of the inverter can be read or changed by the SDO service (SDO = Service Data Object) on the parameter channel. The desired parameter (communication object) is addressed with index and subindex in each SDO telegram.



The process data channel quickly transmits data which are used to control and monitor the running process and which require particularly short transmission times. The PDO telegrams (PDO = Process Data Ojbect) specified by CANopen are used for this. No objects are addressed in the telegram. Instead the contents are sent directly with previously sleected parameters.

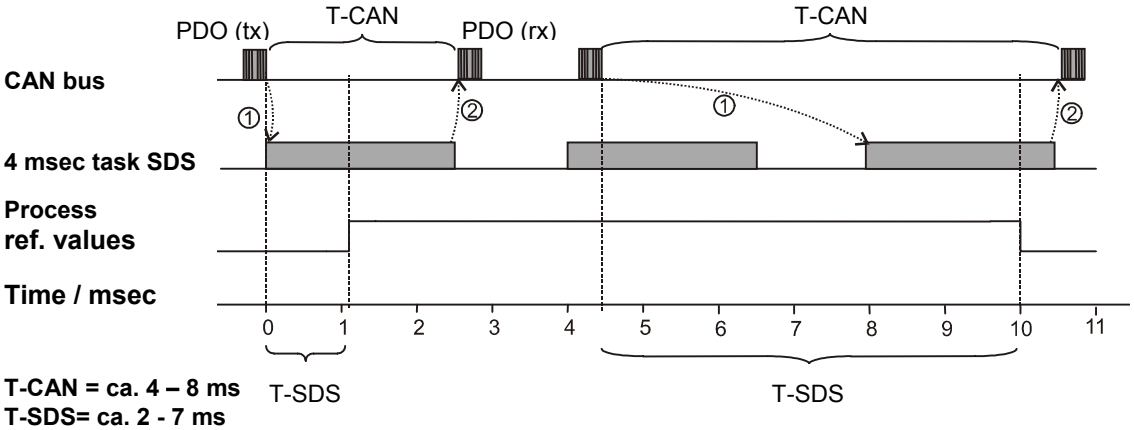
The following transmission times show the throughput times via the CAN-Bus interface and of the inverter.

Transmission Channel	FAS/FDS with Kommubox CAN-Bus	SDS (with CAN-Bus)
Process data reference values - from the bus to processing on the device	Approx. 2 to 12 msec	Normal reference value: approx. 1 to 4 msec Fast reference value: for **A100**=1 AND **D99**=1 ≤ 1msec
Complete processing of an SDO service	Approx. 50 to 75 msec **Exceptions:** • Writing process block 1 and changes of **C60** may take much longer. • Reading **E30** and **E31** - approx. 150 msec	Approx. 20 to 40 msec **Exceptions:** Writing process block 1 and changes of **C60** may take much longer.

5.1 Example of time requirements during data communication

The time requirements of the data flow of the process data (PDO service) from the CAN bus over the CAN interface to the machine's controller and the path of the response back to the CAN bus is different for **POSIDRIVE**® FAS 4000, **POSIDRIVE**® FDS 4000 and **POSIDYN**® SDS 4000.
With simple applications which make cyclic use of the PDO service, this difference can be ignored and the rest of this chapter can be skipped. For the transmission times of the CAN bus up to the machine controller of the inverter, see chapter 5 (table).

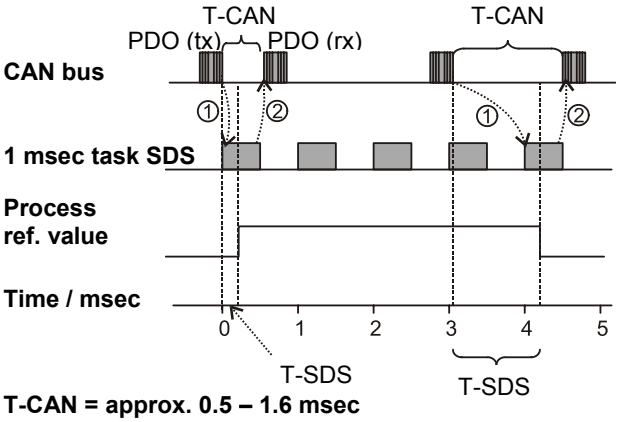
With **POSIDYN**® SDS 4000, the CAN interface is located directly in the basic device and is connected with the main processor. This gives you the following time-optimized flow of process data from the CAN bus to the device and back to the bus.



T-CAN = ca. 4 – 8 ms
T-SDS= ca. 2 - 7 ms

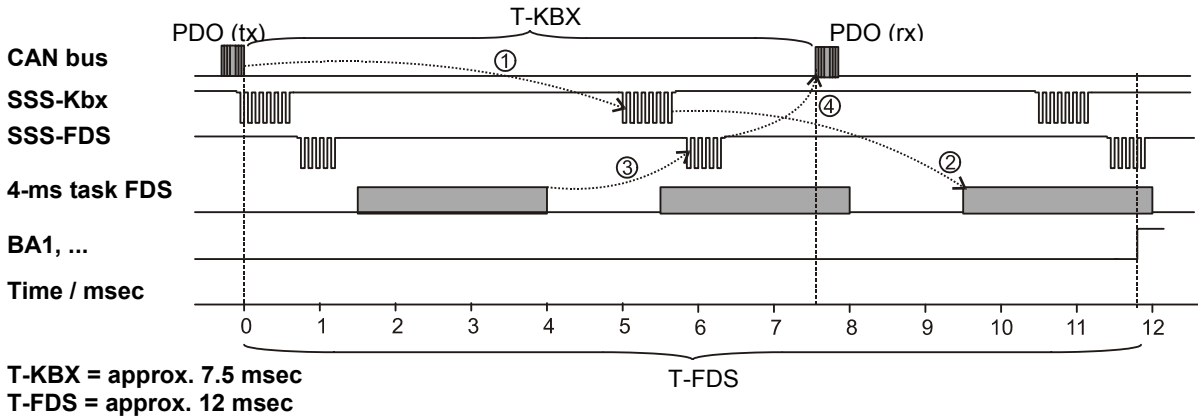
1. Incoming PDO(tx) telegram is recognized and fetched by the SDS with an interrupt. At the beginning of the next 4-msec task, the process output data are usually imaged on the reference value. The 4-msec task is then executed (processing the state machine, inputs and outputs, control and status bits).
2. At the end of this task, the current actual values of the SDS which already contain the reaction to the CAN reference values are imaged on the process input data and are sent as PDO(rx) telegram to the CANopen master.

When the parameter **A100** scaling deviceintern = *1:deviceinternal* and **D99** fastreferencevalue = *1:active* are set, the SDS executes this PDO service once every millisecond. For instance, this is useful for applications for which high-speed positioning is to executed via the CAN bus with internal SDS speed control.



T-CAN = approx. 0.5 – 1.6 msec
T-SDS = ca. 0.3 - 1.5 msec

With **POSIDRIVE**® FAS 4000 and FDS 4000, the CAN interface is located on the external Kommubox CAN. This has its own processor which cyclically exchanges data with the FAS/FDS processor via a high-speed, serial interface (SSS). Usually (software versions older than V 4.5 D or **A104** Max-SSS-Pause = 0) a data telegram is sent from Kommubox to the FAS/FDS and a response telegram is sent from the FAS/FDS to Kommubox every 5.5 to 14 msec depending on the maximum amount of process input or output data and possible simultaneous processing of SDO services. This SSS telegram communication is triggered by Kommubox and is executed asynchronously to the 4-msec task on the FAS/FDS and also asynchronously to the arriving PDO(tx) telegrams from the CAN bus.



T-KBX = approx. 7.5 msec
T-FDS = approx. 12 msec

The example on page 8 shows the data flow of asynchronous communication between Kommubox / FAS/FDS (SSS) and the PDO telegrams on the CAN bus (PDO data length < 5 bytes).

1. Arriving CAN data cannot be taken during the current SSS cycle since this cycle has just started. The data are sent to the FAS/FDS during the next SSS cycle.
2. The 4-msec task of the FAS/FDS doesn't process the new reference values from CAN bus until the next cycle. At the end of this cycle, these new reference values take effect (e.g., on the drive or a binary output). In our example, this can take between approx. 8 msec and 12 msec.
3. The actual values of the last 4-msec task are scanned and sent to Kommubox before the new CAN reference values arrive.
4. Kommubox forwards the latest actual values as PDO(rx) message to the CAN bus. In our example, this occurs approx. 4 to 7.5 msec after the PDO(tx) message is received.

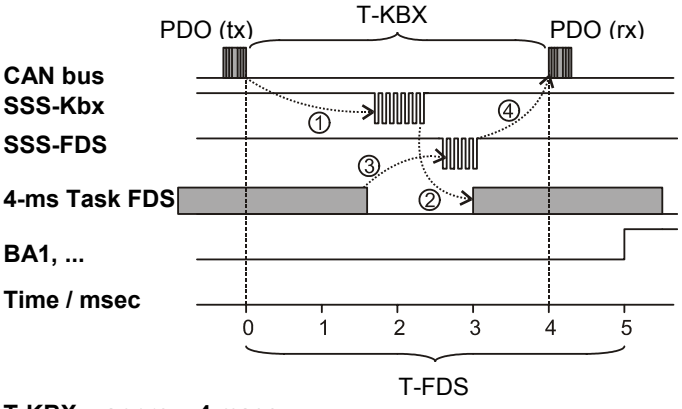
If an application requires fast access to the current actual values, time-optimized communication can be established with the parameter **A104** max-SSS-delay. The **A104** parameter synchronizes CAN-PDO and SSS communication. The cycle time of the controller on the CANopen master and the related sending of PDO(tx) telegrams must be adjusted to the current speed of the SSS communication.

Procedures:

- The desired selection of process imaging parameters and the other parameter assignments for the desired operation on an FAS/FDS must be set.
- **A104** Max-SSS-delay must be set to a very large value (e.g., 30 msec)
- A trial run must be started with a controller on the CANopen master with a somewhat shorter PDO cycle time.
- The throughput time of all PDO processing on Kommubox including the SSS communication must be measured with an oscilloscope or a CAN analyzer (e.g., CANalyzer from Vector Informatik) directly on the CAN bus lines. Two telegrams occur during one controller cycle – the PDO(tx) from the controller and the response PDO(rx) from Kommubox.
- Setting of the measured time in msec for the **A104** parameter of the FAS/FDS.
- "Save values" and "new start" of the FAS/FDS with Kommubox must be triggered.

The speed of SSS communication is slowed down to the point that SSS communication begins just after the next PDO(tx) telegram arrives and this accelerates the reaction time to new reference values. The larger **A104** is set, the slower SDO services are processed. Depending on the parameterization, cycle times can be set between 6 msec and 15 msec.
Even with this adjustment between controller, CAN bus and Kommubox, a basic characteristic of SSS communication remains between Kommubox and FAS/FDS. On the FAS/FDS, the last actual values are sent to Kommubox (Kommubox forwards these values to the CAN bus) immediately after new reference values are received. This means that the FAS/FDS responds differently from the SDS with old actual values before processing the current reference values.
In the best case scenario, the following time sequence can be achieved between CAN bus, Kommubox and FAS/FDS (PDO length < 5 bytes, **A100**=1).

1. Arriving PDO(tx) telegram is detected on Kommubox and conditioned for SSS.
2. The SSS telegram is sent to the FAS/FDS with these new reference values.
3. Immediately after the arrival of the SSS telegram on the FAS/FDS, the FAS/FDS answers with its own latest actual values.
4. Kommubox sends these actual values to the CAN bus and the FAS/FDS processes the new reference values during the next 4-msec task.



T-KBX = approx. 4 msec
T-FDS = approx. 5 msec

6 PROCESS DATA IMAGE

The process data image is used to specify which communication objects are to be transferred via the high-speed process data channel (PDO service). The inverters support very flexible imaging of communication objects on the process input data and process output data.

6.1 Process output data image

The process output data contain the communication objects which are transferred from the CANopen master to the inverter. They are sent with the PDO (tx) service via the CAN bus. Control commands and reference values are transferred here which the drive is to follow.

The length of the data of the PDO service (process data) can be from 0 to 8 bytes. Up to four communication objects can be transferred here simultaneously. These are selected with the parameters **A110** to **A117**. The number of bytes in the PDO telegram of the inverter depends on the number and type of selected objects. If more bytes are received than indicated by **A130**/**A131**, the remaining data are ignored. If fewer bytes are received, the incomplete destination objects remain unchanged. If the drive is only controlled by the CANopen master, the controller offers its services with control/status word and reference speed value/actual speed value. This is the default setting.

Master sends PDO (TX) telegram to the inverter:
Identifier: 200_{hex} + bus address of the inverter.
Data length: 4 bytes of data divided into 2 words.
1st word: Control word in acc. w. Drivecom profile 21.
2nd word: Reference speed in rpm in acc.w. Drivecom.

Sending time sequence of the user data on CAN bus:

1st byte	2nd byte	3rd byte	4th byte
LSB	MSB	LSB	MSB
E45 control word		**E47** ref. speed	

Parameters for the process output data image:
With FAS and FDS with Kommubox CAN, parameters **A110** to **A113** are used. With SDS, parameters **A114** to **A117** are used for the same task. **This only applies for CAN bus.**

Name	Index	Sub-index	Device	Use
A110 process output data 0	206E	0	FAS / FDS	Describes the communication object which is imaged in the first bytes of the process output data
A114 CAN process output data 0	2072		SDS	
A111 process output data 1	206F	0	FAS / FDS	Describes the 2nd communication object assigned to the next bytes. The location of this object within the process data varies depending on the length of the object described by **A110**.
A115 CAN process output data 1	2073		SDS	
A112 Process output data 2	2070	0	FAS / FDS	Describes the 3rd communication object assigned to the next bytes. The location of this object within the process data varies depending on the length of the previous objects.
A116 CAN process output data 2	2074		SDS	
A113 Process output data 3	2071	0	FAS / FDS	Describes the 4th communication object assigned to the next bytes. The location of this object within the process data varies depending on the length of the previous objects.
A117 CAN process output data 3	2075		SDS	
A119 process output data enable	2077	0		This value must be 1 (default setting) if the process output data are to be processed on the inverter. The data must be briefly disabled for the switchover of the image (set value = 0).
1st rec.PDO map / 1st object	1600	1		This parameter is identical to **A110** for FAS/FDS and **A114** for SDS and is for CANopen access.
1st rec.PDO map / 2nd object	1600	2		This parameter is identical to **A111** for FAS/FDS and **A115** for SDS and is for CANopen access.
1st. rec.PDO map / 3rd object	1600	3		This parameter is identical to **A112** for FAS/FDS and **A116** for SDS and is for CANopen access.
1st rec.PDO map / 4th object	1600	4		This parameter is identical to **A113** for FAS/FDS and **A117** for SDS and is for CANopen access.

The parameters for the image are 4 bytes in length and are written with the index and subindex of the communication object to be imaged. The length in bits does not have to be specified when sending to the inverter although this is supplied by the inverter during read-accessing.

1st byte	2nd byte	3rd byte	4th byte
Length	Subindex	LSB	MSB
in bits		Index	

In our example, the default setting of the **A114** parameter is a hexadecimal number. The number is divided into individual bytes the same as it is transferred in the SDO message on the CAN bus.

Length	Subindex	Index	
10	00	2D	28

Example 28 2D=**E45** Steuerword

Remarks: When the parameters are changed (e.g., with FDS Tool), the inverter contains the new parameters. For correct operation, the changes must also be reported to Kommubox. This is done by reading at least one process output data parameter or by using the "save parameters" action and turning the FAS/FDS off and on (not required for SDS).

List of the parameters (communication objects) which can be imaged on process output data:

Name	Value to be set via CAN Bus	Composed of			Use
		Index	Sub-index	Length *in Bytes*	
inactive	$FFFFFFFF_{hex}$ / 2147483647_{dec}	-	-	-	Inactive is valid selection (e.g., if not all bytes of the PDO telegram are needed).
D12 fix ref. value 1	$260C0010_{hex}$ / 638320656_{dec}	260C	0	2	Fixed ref. val. 1 from parameter record 1 is useful for ref. value switchover between CAN and terminal strip, for example.
E45 Control word	$282D0010_{hex}$ / 674037776_{dec}	282D	0	2	Control commands in acc. with CiA/DS-402 / DRIVECOM. *remote control*
E47 n-field-bus	$282F0010_{hex}$ / 674168848_{dec}	282F	0	2	Speed reference value in acc. with CiA/DS-402 / DRIVECOM. Only if **A30≥**2.
E101 control bits	28650020_{hex} / 677707808_{dec}	2865	0	4	32 control bits for posi operation
E102 torque-limit	28660010_{hex} / 677773328_{dec}	2866	0	2	Torque limit M-max
E103 power-limit	28670010_{hex} / 677838864_{dec}	2867	0	2	Power limit
E104 additional RV	28680010_{hex} / 677904400_{dec}	2868	0	2	Additive offset reference value
E105 RV-factor	28690010_{hex} / 677969936_{dec}	2869	0	2	Reference value factor is multiplied with main RV.
E106 override	$286A0010_{hex}$ / 678035472_{dec}	286A	0	2	Factor for posi speed / sync n-ratio
E107 posi.offset	$286B0020_{hex}$ / 678101024_{dec}	286B	0	4	Offset for reference position. Scaling as w. every target position in **I05** * $1E^{I06}$.
E108[1] wind. diameter	$286C0010_{hex}$ / 678166544_{dec}	286C	0	2	Measured value for winding diameter
E109[1] M-rot.magnet	$286D0010_{hex}$ / 678232080_{dec}	286D	0	2	Torque setting for rotary magnet
E110[1] analog output 1	$286E0010_{hex}$ / 678297616_{dec}	286E	0	2	Output of analog voltage 1 for **F40**=0. Is affected by **F41**, **F42** and **F43**.
E111 BA2	$286F0008_{hex}$ / 678363144_{dec}	286F	0	1	Direct switching of relay 2/BA2 and other BAs when applicable parameters for BA function (**F80** to **F86**) are set to *0:inactive*
E112[1] BA1	28700008_{hex} / 678428680_{dec}	2870	0	1	
E113[1] BA3	28710008_{hex} / 678494216_{dec}	2871	0	1	
E114[1] BA4	28720008_{hex} / 678559752_{dec}	2872	0	1	
E115[1] BA5	28730008_{hex} / 678626288_{dec}	2873	0	1	
E116[1;2] BA6	28740008_{hex} / 678691824_{dec}	2874	0	1	
E117[1;2] BA7	28750008_{hex} / 678757360_{dec}	2875	0	1	
E118[1;2] analog output 2	28760010_{hex} / 678821904_{dec}	2876	0	2	Output of analog voltage for **F45**=0. Is affected by **F46** and **F47**.
E119 reference value	28770010_{hex} / 678887440_{dec}	2877	0	2	Speed/torque reference value on input of ref. val. characteristic curve Use depends on **C60**.
E120[1] tension reduction	28780010_{hex} / 678952976_{dec}	2878	0	2	Tension drop (dependent on diameter) for winder software
E121[1] PID-reference	28790010_{hex} / 679018512_{dec}	2879	0	2	Reference value for PID controller
E122[1] winder-roller	$287A0010_{hex}$ / 679085048_{dec}	287A	0	2	Roller position for winder software
E123[1] sync.offset	$287B0020_{hex}$ / 679149600_{dec}	287B	0	4	Winding offset of slave axis in relation to master
E125[1] synchron n-RV	$287C0010_{hex}$ / 679215120_{dec}	287C	0	2	Speed pre-control for synchronous winding in rpm (**A100**=0)
E126 n-Max	$287D0010_{hex}$ / 679280656_{dec}	287D	0	2	Limitation of the max. speed
E129[1;2] Position difference	28810010_{hex} / 679542800_{dec}	2881	0	2	Diff. ref. position for **C60** = *3: position ext.*
P1.G14[1] begin. winding diameter	$2C0E0010_{hex}$ / 739115024_{dec}	2C0E	0	2	**G14** in parameter set 1
P2.G14[1]	$2C0E0110_{hex}$ / 739115280_{dec}	2C0E	1	2	**G14** in parameter set 2

[1] Not available with FAS
[2] Not available with FDS

All parameters listed here can also be accessed with the SDO service.

E45 control word and **E47** n-fieldbus (default setting) are only effective when **A30** control input is set to "*2:fieldbus*" with the FAS/FDS or to "4*:CAN-Bus"* for the SDS. For use of **E100** and **E101** via CAN bus, **A30** is set to "*0:ctrl.inter."*

6.2 Process input data image

The process input data contain the communication objects which the inverter (FAS/FDS/SDS) transfers to the CANopen master. They are sent via the CAN bus with the PDO(rx) service. Status signals and actual values of the drive are transmitted here.

The data of the PDO service (process data) can have a length up to 8 bytes. Four different communication objects can be transferred at the same time. These are selected with the parameters **A120** to **A127**.
Depending on how many objects are selected and which objects these are, the inverter sends a certain number of bytes in the PDO telegram. **The maximum length of a CAN telegram may not exceed 8 bytes.**

If the drive is exclusively controlled by the CANopen master in speed mode, we recommend control via control/status word and speed reference/actual value. This is the default setting.

Slave (inverter) replies with PDO (RX) telegram:
Identifier: 180_{hex} + bus address of the inverter.
Data length: 4 bytes data divided into 2 words.
1rd word: Status word in acc. with Drivecom profile 21.
2nd word: Ref. speed in Rpm in acc. with Drivecom.

Sending time sequence of user data on CAN-Bus:

1rd byte	2nd byte	3rd byte	4th byte	
LSB	MSB	LSB	MSB	(This corresponds to Intel format)
E46 Status word		**E08** Actual speed		

Parameters for the process input data image: With FAS and FDS with Kommubox CAN, parameters **A120** to **A123** are used. With SDS, parameters **A124** to **A127** are used for the same task. **This only applies for CAN bus.**

Name	Index	Sub-index	Device	Use
A120 Process input data 0	2078	0	FAS / FDS	Describes the communication object which is imaged in the first bytes of the process input data
A124 CAN process input data 0	207C		SDS	
A121 Process input data 1	2079	0	FAS / FDS	Describes the 2nd communication object assigned to the next bytes. The location of this object within the process data varies depending on the length of the object described by **A120**.
A125 CAN process input data 1	207D		SDS	
A122 Process input data 2	207A	0	FAS / FDS	Describes the 3rd communication object assigned to the next bytes. The location of this object within the process data varies depending on the length of the previous objects.
A126 CAN process input data 2	207E		SDS	
A123 Process input data 3	207B	0	FAS / FDS	Describes the 4th communication object assigned to the next bytes. The location of this object within the process data varies depending on the length of the previous objects.
A127 CAN process input data 3	207F		SDS	
1st tra. PDO map/1st object	1A00	1		This parameter is identical to **A120** with FAS/FDS and **A124** with SDS and is for CANopen access.
1st tra. PDO map/2nd object	1A00	2		This parameter is identical to **A121** with FAS/FDS and **A125** with SDS and is for CANopen access.
1st tra. PDO map/3rd object	1A00	3		This parameter is identical to **A122** with FAS/FDS and **A126** with SDS and is for CANopen access.
1st tra. PDO map/4th object	1A00	4		This parameter is identical to **A123** with FAS/FDS and **A127** with SDS and is for CANopen access.

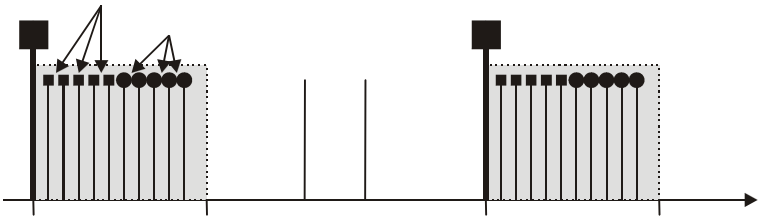
The coding of these parameters is the same as that of the parameters for process output data imaging except that no switch is required for the process data enable.

List of the parameters which can be imaged on process input data (communication objects):

Name	Value to be set via CAN Bus	Composed of:			Use
		Index	Sub-index	Length *in Bytes*	
Inactive	$FFFFFFFF_{hex}$/2147483647_{dec}	-	-	-	Inactive is valid selection (e.g., if not all bytes of the PDO telegram are needed).
E02 M-motor	28020010_{hex} / 671219728_{dec}	2802	0	2	Current motor torque
E08 n-motor	28080010_{hex} / 671612944_{dec}	2808	0	2	Actual speed value in acc. with CiA/DS-402 / DRIVECOM
E08 n-motor smoothed	28080110_{hex} / 671613200_{dec}	2808	1	2	Actual speed value smoothed
E09 Rotor position	28090020_{hex} / 671678496_{dec}	2809	0	4	Position of rotor at 0.001 revolutions
E10 analog input 1-level	$280A0010_{hex}$ / 671744016_{dec}	280A	0	2	Level on analog input 1/2 without effects of **F21**-**F24** / **F26-F27**. ±10V = ±100%=±8192
E11[1] analog input 2-level	$280B0010_{hex}$ / 671809552_{dec}	280B	0	2	
E16[1] analog output 1-level	28100010_{hex} / 672137232_{dec}	2810	0	2	Level on analog output 1 after inclusion of **F41**, **F42, F43**
E19 BE15...BE1 & enable	28130010_{hex} / 672333840_{dec}	2813	0	2	Level of all binary inputs
E27 BA15...1&Relais 1	$281B0010_{hex}$ / 672858128_{dec}	281B	0	2	Level of all binary outputs
E28[1;2] analog output2-level	$281C0010_{hex}$ / 672923664_{dec}	281C	0	2	Level on analog output 2 after inclusion of **F46**, **F47**
E46 status word	$282E0010_{hex}$ / 674103312_{dec}	282E	0	2	Status word in acc. with CiA/DS-402 / DRIVECOM
E100 status bits	28640020_{hex} / 677642272_{dec}	2864	0	4	32 status signals
E127 BE-encoder-position	$287F0010_{hex}$ / 679411728_{dec}	287F	0	2	Increment number of encoder on BEs
E128[1] X20-encoder-position	28800010_{hex} / 679477264_{dec}	2880	0	2	Increment number of encoder on X20
E131 Posi next latched	28830020_{hex} / 679673888_{dec}	2883	0	4	Actual position for rising posi-next edge within one process block chain. Only takes effect for limited traversing range. Only with FAS (starting SV 4.5 E).
E132[1] SSI raw value	28830020_{hex} / 679739424_{dec}	2884	0	4	Raw value of SSI encoder in 1/4096 r.
G19[1] actual winding diameter	$2C130010_{hex}$ / 739442704_{dec}	2C13	0	2	Actual winding diameter
I80 actual position	30500020_{hex} / 810549280_{dec}	3050	0	4	Actual position
I84 following error	30540020_{hex} / 810811424_{dec}	3054	0	4	Following error
I88 speed	30580020_{hex} / 811073568_{dec}	3058	0	4	Speed during positioning

[1] Not available with FAS
[2] Not available with FDS

6.3 Types of transmission for the PDO service



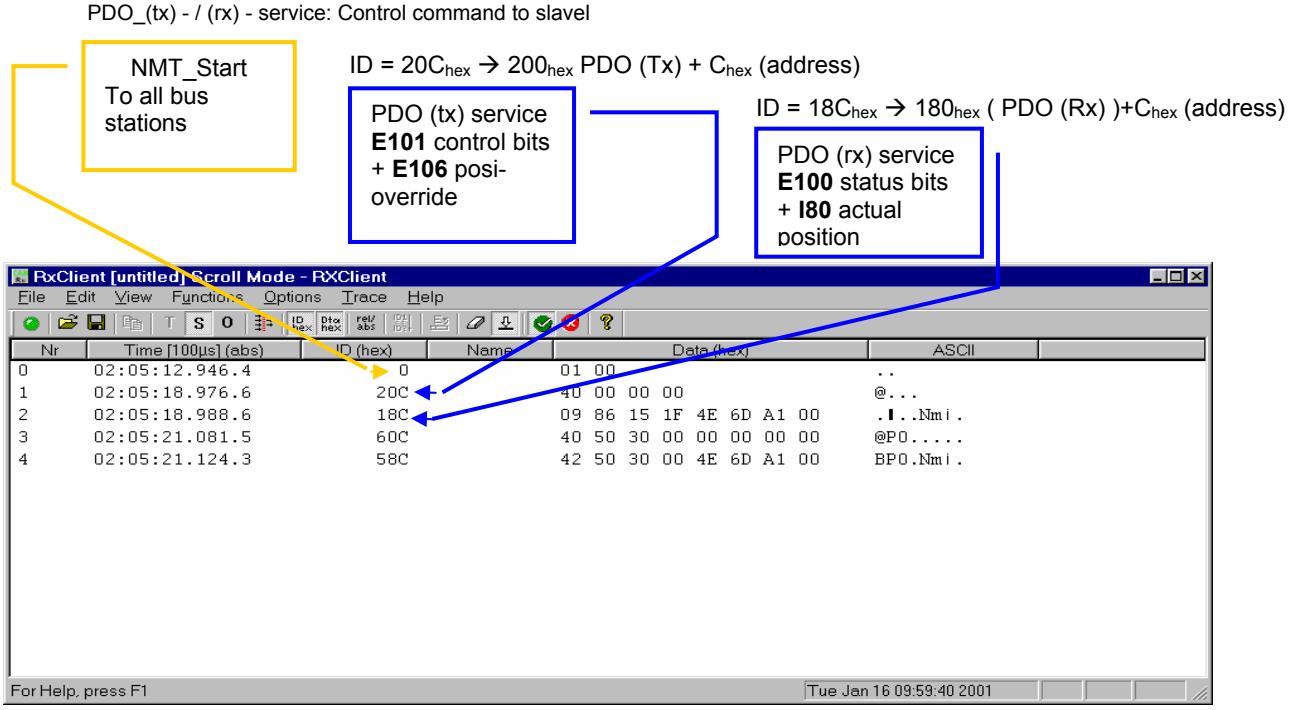
The PDO service distinguishes between asynchronous and synchronous transmissions.

With asynchronous transmission, the CANopen master starts the PDO service with a (tx) message (COB-ID 200_{hex} + **A83**) with reference values for the inverter. This sends its current actual values to the bus as PDO(rx) message (COB ID 180_{hex} + **A83**). The master can then address the next CANopen slave. A SYNC message is not needed and the transmission is asynchronous to the SYNC object. This type of transmission is preset on all inverters. It is particularly suitable for simple CAN networks with low bus load and few stations.

Synchronous transmission can be used to obtain a simultaneous reaction from all slaves (e.g., axes) when there are several drives, for instance. The PDO messages are transferred in connection with the SYNC object. The CANopen master cyclically sends the SYNC message (COB-ID is always and the message has no data bytes) to all stations. The received SYNC signal is used by all devices to simultaneously accept the previously sent process data reference values. It is also used as the start signal for sending the current process data actual values.

The type of transmission for the process data reference values can be set with CANopen object **1400/2** "1st rec. PDO para / trans. type" (see also parameter **A102**). Values from 1 to 240 specify the number of received SYNC objects after the inverter accepts the last received process data reference values one time. The value 254 is the asynchronous operating mode during which every received PDO(tx) message is accepted. Separately from this, the CANopen object **1800/2** "1st tra. PDO para / trans. type" (see also parameter **A103**) can be used to set the type of transmission of the process data actual values sent by the inverter. In this case, the values 1 to 240 stand for the number of received SYNC objects after the inverter sends the currently latest process data actual values once. The value 254 sets the asynchronous operating mode during which the inverter sends its process data actual values with the PDO(rx) message after each received PDO(tx) message.

PDO_(tx) - / (rx) - service: Control command to slavel



PDO (rx) process data from slave:

	1st Double Word				2nd Double Word			
	1st byte LSB	2nd byte MSB	3rd byte LSB	4th byte MSB	5th byte LSB	6th byte MSB	7th byte LSB	8th byte MSB
	1F	15	86	**09**	00	A1	6D	**4E**
Data in CAN telgram:								
	09	86	15	1F	**4E**	6D	A1	00

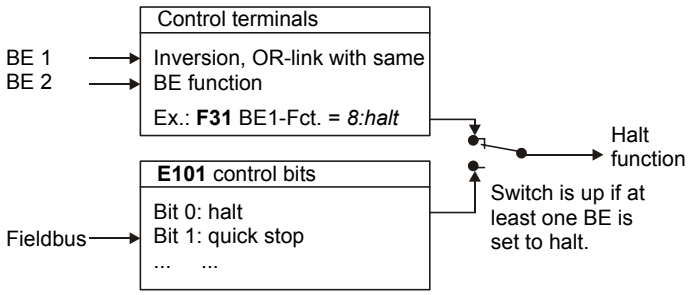
A PDO message can contain up to 8 bytes of user information. Transmission of a byte begins with the **most significant bit.** This must be kept in mind when the CAN message is put together.
In our example, the first double word contains the status bits and the second double word contains the actual position. The first double word in the previous Tx message transfers bit 6 (additional enable) and the next word contains the posi-override.

7 CONTROL WITH CONTROL AND STATUS BITS

The inverter functions can be controlled via fieldbus. The parameter **A30** control input must be set to "0:ctrl.inter." for control with **E101** control bits. This provides an easy way to control the device's state using the additional enable (bit 6 in **E101**) and the acknowledgment (bit 3 in **E101**). Imaging of the control and status bits on the process input and output data requires that one of the process output data parameters **A110** to **A117** be set to **E101** (control bits) and one of the process input data parameters **A120** to **A127** be set to **E100** (status bits).
Note: The selected bit parameter may not be assigned to a BE function.

7.1 Specification of the source for control signals

One of the 32 functions (e.g., halt, posi start) can be assigned to each binary input of the control terminal strip (see parameter **F31**, **F32** and so on, FAS documentation, publ. no. 441581, FDS documenation, publ. no. 441408 and SDS documentation, publ. no. 441449).
Each control signal which was not assigned to a binary input can be addressed via fieldbus (**E101** control bits). One of the 14 functions can be assigned to the analog inputs. (See parameter **F20** and **F25** in the above documentation.)
The missing functions can be specified via fieldbus (e.g., **E102** torque limit,...).



The binary and analog signals from the terminal strip have priority over specification via fieldbus!

Meaning of the bits in E101 control bits				
Bit	Name	Meaning for Bit = 1		**F31***
0	halt	Drive is decelerated to standstill on selected ramp. Then brake is applied if activated by **F00** or **F08**. Manual traversing (tip) is now possible. (Allow min. of 4 msec pause until manual traversing, *posi-start, ...*).		*8*
1	quick stop	At change from 0→1, drive decelerated on **D81** (decel-quick). Then brake is applied if activated by **F00** or **F08**. Short pulse (≥ 4 msec) is sufficient to trigger brake. Quick stop can be terminated with **F19**=1.		*9*
2	ext. fault	At rising edge, inverter assumes fault *"44:ext.fault."*		*12*
3	fault reset	Rising edge acknowledges fault if cause no longer exists.		*13*
4	wind.setD-ini	The current value of the winding diameter is set to **G14** (wind.setD-ini).		*29*
5	parameter set-select	0 selects parameter set 1. 1 selects parameter set 2. Parameter set can only be selected if **A41**=0. Selected set does not become active until enable is removed.		*11*
6	additional enable	Additional enable (must be on together with enable X1.x) to enable inverter. (Allow pause of at least 4 msec until manual traversing (tip), **posi-start, ...**).		*7*
7	torque select	Switching of torque limit from **C03** M-max 1 to **C04** M-max 2		*10*
8	RV-select 0	Used together with bit 19 (only SDS) to select process blocks or fixed reference values. The bits on RV-select 0 to 4 are interpreted as binary coded numbers. See chapter 10.3 of FAS/FDS/SDS documentation[1] and chapter 4.3 of FAS-Posi-Upgrade documentation (publ. no. 441587).		*1*
9	RV-select 1			*2*
10	RV-select 2			*3*
11	RV-select 3			*30*
12	disable PID-controller	PID controller is disabled, and integrator is reset.		*26*
13	direction of rotation	Negation of the current speed reference value during speed mode		*6*
14	motorpoti up	With **D90**=1, motor potentiometer can be simulated. **D00** and **D01** are used as ramps.		*4*
15	motorpoti down			*5*
16	posi.start	Starts positioning (the process block selected with RV-select 0 to 4). Any positioning procedure in progress is terminated, and the new target is approached (changing targets on the fly).		*19*
17	posi.step	Starts positioning (same as above but the running positioning procedure is not interrupted). Used primarily for manual block stepping with a process block sequence (cf.		*16*
18	posi.next	With chained process blocks, the running block is interrupted, and a jump is made to the next block. Important: A braking path may be defined there, for example. The *posi.next* evaluation must be programmed for the specific process block (cf. **J17**=*3:posi.next*.). Otherwise the drive does not react to *posi.next.*		*20*
19	RV-select 4	See bits 8 to 11.		*31*
20	start reference	Change in edge from low to high starts reference traversing.		*24*
21	tip +	Manual traversing (tip) in positive direction. Halt function must be active.		*17*
22	tip -	Manual traversing (tip) in negative direction. Halt function must be active.		*18*
23	brake release	Manual releasing of the brake. Has priority over internal braking function.		*32*
24	stop +	"Stop input" at positive end of the traversing area. In position mode (**C60**=2), "stop input" causes malfunctions. In speed and torque mode, the direction of rotation is disabled.		*21*
25	stop -	"Stop input" at negative end of the traversing area		*22*
26	reference input	Defines the reference position for **I30**=0		*23*
27	synchron free-run	The reference value for synchronous free run is decoupled. For example, the drive can be handled as desired via **E46**. Speed is adjusted on the current reference value ramp (e.g., **D00**).	Do not apply to **POSIDRIVE®** FAS 4000	*27*
28	synchron reset	The angle of deviation of synchronous running control is reset.		*28*
29 ... 31	In reserve			-

* This column shows the available selections with the same function for the BE functions (**F31**, ...).

[1] FAS standard documentation (publ. no: 441581)
FDS documentation (publ. no.: 441408)
SDS documenation (publ. no.: 441449)

7. Control with control and status bits

Meaning of the bits in E100 status bits			
Bit	Name	Meaning for Bit = 1	**F00**
0	standstill	Amount of **E08** n-motor < **C40** n-window	*2*
1	refVal-reached	With **C60**=*0:torque:* Operation is enabled. With **C60**=*1:speed*: Amount of (**E06** n-reference value - **E08** n-motor) < **C40** n-window. With **C60**=*2:position*: Changes to 1 when posi controller reaches target position and amount of (**I80** to **I81**) < **I22** is reached. During pauses, bit remains = 1. Changes to 0 when process block or reference traversing was started or axis was shifted out of window **I22** (only if enable=0).	*3*
2	acceleration	Drive is accelerated or delayed.	-
3	standstill ramp reached	Only with **C60**=1: Ramp generator is at zero (±0.5 Hz for FAS/FDS).	-
4	ref. value ramp reached	Only with **C60**=1: Ramp generator has reached reference value.	-
5	ramp diff. > 0	Only with **C60**=1: Ramp generator accelerates.	-
6	torque limit	Drive is at current torque limit during static operation.	*4*
7	Accel. overload	Drive is at torque limit during an acceleration procedure.	-
8	Decel overload	Drive is at the tension limit during a braking procedure.	-
9	relay 1	Relay 1 (ready relay) is closed (no fault, warning, message).	-
10	clockwise (n-motor>0)	**E08** n-motor is positive. During zero crossing, hysteresis with **C40**.	*14*
11	capturing	Only for FAS/FDS with **C60**=1: FAS/FDS captures running motor.	-
12	skip speed	Only for FAS/FDS with **C60**=1: Reference value in skip speed range	-
13	load start	Only for FAS/FDS with **C60**=1: Load start (breakaway) is active.	-
14	active parameter set	0 = parameter set 1 is active. 1 = parameter set 2 is active. The bit changes at the beginning of the parameter-set switch-over. Bit 15 indicates the end of the switchover.	*7*
15	parameters active	0 = not all parameters are imaged internally. 1 = parameter imaging after write-access with SDO service or change via device menu, parameter set switch-over. Actions are completely executed and active.	*32*
16	referenced	Indicates that the drive is referenced (reference traversing concluded). Only applies when **C60**=2.	*13*
17	electronic cam 1	Actual axis position is between **I60** and **I61**. Only valid when **C60**=2.	*8*
18	operation range	Drive is within the defined operation range (**C41** to **C46**).	*6*
19	posi traversing	Indicates when **E80** operating condition = *"18:moving"* (when a process block was started - not with manual traversing)	-
20	M-motor>0	**E02** M-motor is positive (without hysteresis).	-
21	switch-memory 1	Output of switch memory 1, 2 and 3. Each posi switching point defined in group **N**.. can simultaneously address switch memory 1, 2 and 3.	*19*
22	switch-memory 2		*20*
23	switch-memory 3		*21*
24	RV-ackn.0	Only valid for **C60**=*2:position*. If no *posi.start* or *posi.next* signal is queued, the reference-value-select signals are output **inverted**. Otherwise the active **I82** process block is output. See chapter 10.3 of FAS/FDS/SDS documentation[1] and FAS-Posi-Upgrade documentation (publ. no. 441587) chap. 4.3.	*23*
25	RV-ackn.1		*24*
26	RV-ackn.2		*25*
27	RV-ackn.3		*26*
28	RV-ackn.4		*27*
29	In reserve	-	-
30	posi.active	Is 1 when **E80** (operating condition) = *17:posi.active*. This is true when **C60**=2, and power section is on, and a traversing job can be started (no process block or sequence in progress). This permits a concluded sequence to be indicated. Is also 0 when **E80**=*19:delay* or *20:wait* is indicated.	*10*
31	ref. value-reached	The drive is powered, the brakes are released, and, with the FAS/FDS, magnetization is established.	*22*

* This column shows the available selection with the same function for the BA/relay functions (**F00**, ...).

[1] FAS standard documentation (publ.-no.: 441581)
FDS documentation (publ. no.: 441408)
SDS documenation (publ. no.: 441449)

8 CONTROL WITH CONTROL/STATUS WORD AND SPEED REF./ACTUAL VALUE/DRIVECOM

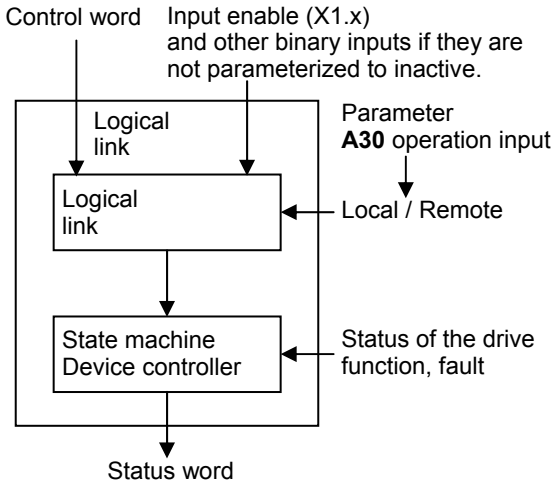
Control of the inverter with **E45** control word, **E46** status word, **E47** n-field-bus and **E08** n-motor allows the drive to be controlled with variable speed. This type of control is based on the specifications of DRIVECOM profile 21 (cf. the following chapters).

For this mode it is sufficient to use the default setting (**A110** / **A114** = **E45**, **A111** / **A115** = **E47**, **A120** / **A124** = **E46**, **A121** / **A125** = **E08**) and to select **A30**=*2:fieldbus* (FAS/FDS) or **A30**=*4:CAN-bus* (SDS).

Controlling the inverter based on DRIVECOM profile 21 involves specification of the reference value and various control commands for the drive (e.g., turn on, shutdown, and so on).
The "device control" function block processes the control commands. The "speed" function block handles processing of the reference value. The function blocks will now be explained in more detail.

8.1 Device control

The "device control" function block controls the entire device function (drive function and power section). A state machine handles the control sequence. The device control is affected by the "control word" and the following internal signals.
The "local/remote" switch, the status of the drive function and faults.
The device control affects the drive functions. The "status word" is generated from the device state and internal signals and can be read via the fieldbus.



8.2 Local / Remote

This internal signal indicates whether the inverter can be controlled by the fieldbus. With the SDS, this signal is set to "remote" when parameter **A30** (operation input) is set to "*2:fieldbus*" (FAS/ FDS) or "*4:CAN-Bus*" (SDS). Other settings set the signal to "local." If "local" is selected, the inverter disregards the control commands in the "control word." Regardless of this signal, the controller can be activated by terminals and the fieldbus (mixed mode). See chapter 9.
The inverter uses mixed operation when at least one of the parameters is not set to "*0:inactive*" for the function of the BEs or **F20** AE2-function.


If control is to be exclusively performed via fieldbus, all parameters for the functions of the BEs and for AE2 must be parameterized to *"0:inactive"* in both parameter sets.

8.3 Input enable

The binary input enable (X1.x) on the terminals must be addressed with a high level so that the control commands from the "control word" can take effect on the "device control" state machine and the drive can be started. If the input is not high, the drive function is disabled immediately and the power section is turned off.

8.4 States of device control

State	Description	Drive Function
Not ready for switch-on	Voltage supply on inverter has just been turned on. Self-test and initialization are running.	Disabled
Switch-on disable	Initialization concluded. Switch-on is disabled.	Disabled
Ready for switch-on	Switch-on is enabled.	Disabled
Switched on	Switch to operation is enabled.	Disabled
Operation enabled	Power section is on. Drive follows the reference value.	Enabled
Quick stop active	Quick stop function. Drive is slowed to standstill.	Disabled
Fault	Power section is off.	Disabled
Fault reaction active	Power section is off.	Disabled

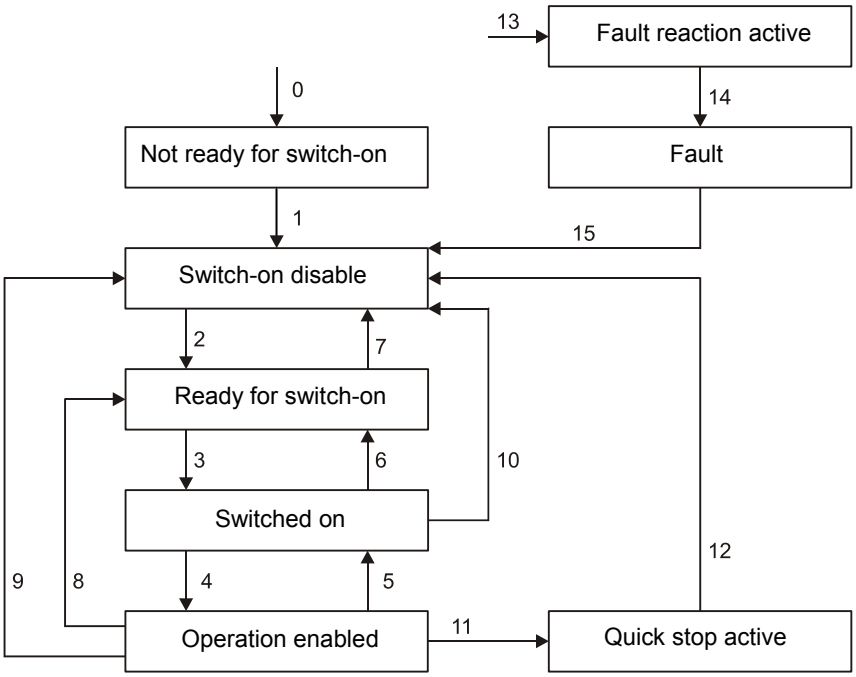
Definitions:
Drive function is disabled: Inverter does not process speed reference value.
Drive function is enabled: Inverter processes speed reference value, and the power section is enabled. (Motor is powered.)

Drive malfunctions: Faults can occur in any state of device control. They always cause a change to the state "fault reaction active." In this state, the inverter turns off the power section immediately and logs the fault in fault memory. After these actions have been executed, a change is made to the "malfunction" state.
This state can only be exited with the "fault reset" command. The reason for the fault must have been corrected (e.g., motor overheated -> motor must have cooled off)

8.5 "Device control" state machine

The state machine describes the states of the device and the possible control sequence on the drive. A state represents a certain internal and external status. It can only be exited via defined events. Appropriate state transitions are assigned to the events.

The state can be changed with device-control commands and internal events. This can be used to execute a control sequence. The current device state can be read with the "status word."



8.6 State trnsitions of device control

A change in state only occurs when the actions have been completely performed.
After the actions have been fully processed, the next state is assumed, and new commands are accepted.

State Transition		Event/Commands	Action
0	Input, state machine ➔ Not ready for switch-on	Turn on voltage	Start self-test. Start initialization.
1	Not ready for switch-on ➔ switch-on disable	Self-test okay Initialization okay	None
2	Switch-on disable ➔ ready for switch-on	"Shutdown" command and "enable" input on high	None
3	Ready for switch-on ➔ switched on	"Turn on" command and "enable" input on high	None
4	Switched on ➔ operation enabled	"Enable operation" command and "enable" input on high	Enable drive function
5	Operation enabled ➔ switched on	"Disable operation" command and "enable" input on high	Decelerate drive on the currently selected ramp. Then change to "switched on" state and turn off power section.
6	Switched on ➔ ready for switch-on	"Shutdown" command and "enable" input on high	None
7	Ready for switch-on ➔ switch-on disable	"Quick stop" command or "disable voltage" command or "enable" input on low	None
8	Enable operation ➔ ready for switch-on	"Shutdown" command and "enable" input on high	Disable drive function Turn off power section immediately
9	Enable operation ➔ switch-on disable	"Disable voltage" command or "enable" input on low	Disable drive function Turn off power section immediately
10	Switched on ➔ switch-on disable	"Quick stop" command or "enable" input on low	None
11	Enable operation ➔ quick stop active	"Quick stop" command and "enable" input on high	Drive is decelerated on quick-stop ramp until standstill.
12	Quick stop active ➔ switch-on disable	Quick stop is concluded or "enable" input on low	Disable drive function Turn off power section
13	All states ➔ fault reaction active	Drive fault detected	Turn off power section (motor coasts down). Disable drive function. Store fault on device.
14	Fault reaction active ➔ malfunction	Reaction to fault concluded	None
15	Fault ➔ switch-on disable	"Fault reset" command when fault no longer present	Fault is reset.

8.7 Control word

The "control word" and the level of the "enable" binary input use logical links to produce the device-control commands which affect the state machine of the device controller. The control word consists of 16 bits whose meaning is shown below.

Bit Number	Name	Meaning
0	Turn on	Device-control command; Link with the other bits as described in tab. in 8.8.
1	Disable voltage	Device-control command; Link with the other bits as described in tab. in 8.8.
2	Quick stop	Device-control command; Link with the other bits as described in tab. in 8.8.
3	Enable operation	Device-control command; Link with the other bits as described in tab. in 8.8.
4	Disable HLG (HLG = ramp function generator)	If the bit = 0, the drive is decelerated on the selected ramp (without mixed mode, **D01** RV-Decel). If the bit = 1, the drive is accelerated on the selected ramp (without mixed mode, **D00** RV-Accel).
5	Stop HLG	If the bit = 0, the current output value of the ramp function generator is retained. If the bit = 1, the drive follows the reference value over the ramp function.
6	HLG zero	Same function as bit 4 (disable HLG)
7	Reset fault	Device-control command (rising edge > 10 msec)
8 to 15	Reserved	

8.8 Device control commands in the control word

	Reset fault	HLG zero	HLG stop	HLG disable	Enable operation	Quick stop	Disable voltage	Turn on	
Command \ Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Transitions**
Shut down	X	X	X	X	X	1	1	0	2, 6, 8
Turn on	X	X	X	X	X	1	1	1	3
Disable voltage	X	X	X	X	X	X	0	X	7, 9, 10, 12
Quick stop	X	X	X	X	X	0	1	X	7, 10, 11
Disable operation	X	X	X	X	0	1	1	1	5
Enable operation	X	X	X	X	1	1	1	1	4
Reset fault	0 ➔ 1	X	X	X	X	X	X	X	15

Explanation:

X This bit has no meaning at this location.
0 ➔ 1 A change from 0 to 1 is expected (rising edge).

8.9 Status word

Bit Number	Name	Meaning
0	Ready for switch-on	Device state; According to the table in 8.10.
1	Switched on	Device state; According to the table in 8.10.
2	Operation enabled	Device state; According to the table in 8.10.
3	Fault	Device state; According to the table in 8.10.
4	Voltage disabled	If the bit = 0, the control word contains the request to disable voltage or the "enable" binary input is not high.
5	Quick stop	Device state; According to table in 8.10.
6	Switch-on disable	Device state; According to table in 8.10.
7	Warning	Inverter has a warning which is indicated on Controlbox and can be read via **E82** (event name). The inverter continues operation until the warning time expires and then changes to the "fault reaction active" state.
8	Message	The inverter cannot fully handle the requested drive task. The type of message is shown on the display and can be read via **E82** (event name).
9	Remote	Is 1 if parameter **A30** is set to **A30**=*2:Fieldbus* (FDS) or **A30**=*4:CAN-Bus* (SDS). Otherwise 0.
10	Reference value reached	Indicates 1 when the drive has reached the requested reference value (speed or position). The bit only enables this function in the "operation" device state. The HLG bits in the control word must all be set so that this signal is indicated correctly. Otherwise the bit is set to 1.
11	Limit value	Is 1 when the speed limit is active (**C00** n-min, **C01** n-max).
12	Reserved	
13 to 15	Reserved	With the **POSIDYN**® SDS 4000, these bits have a spezial meaning for **C60**=*3:position ext.* See additional SDS documentation (pub. no. 441542 - german).

8.10 Indication of the device states in the status word

	Switch-On Disable	Quick Stop	Voltage Disabled	Fault	Operation Enabled	Switched On	Ready for Switch-On
State/Bit	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Not ready for switch-on	0	X	X	0	0	0	0
Switch-on disable	1	X	X	0	0	0	0
Ready for switch-on	0	1	X	0	0	0	1
Switched on	0	1	X	0	0	1	1
Operation enabled	0	1	X	0	1	1	1
Fault	0	X	X	1	0	0	0
Fault reaction active	0	X	X	1	1	1	1
Quick stop active	0	0	X	0	1	1	1

8.11 Example of controlling via Fieldbus: Start drive with speed RV 3000 rpm

No.	Action	Reaction of the inverter	Indicated on FDS Display or Controlbox
1	Install Kommubox CAN on FAS/FDS. Turn on the power. (Parameter **A30** control input must already have been set to "2*:Fieldbus*" (FAS/FDS) or "*4:CAN-Bus*" (SDS). Apply high level to input "enable" (X1.x).	FAS/FDS and Kommubox start up.	After startup the LED of the Kommubox is on continuously (SDS has no LED!) Line 2 in the display indicates: **`12:Inhibited`**
2	Start the CANopen master with the baud rate set on the inverter.	-	-
3	Send NMT command Start-Remote-Node (careful with bus address of the inverter).	NMT state on Kommubox/SDS changes from Pre-Operational to Operational.	LED of Kommubox flashes slowly at $T_{ein} = T_{aus} = 0.5$ sec. (SDS has no LED!)
4	Send PDO(tx) message with control word "**shut down**" 15 Control word 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0	Device status on the inverter changes to "ready for switch-on." Status word then changes to: 15 Status word 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 1 Bit 0 = 1: Ready for switch-on Bit 4 = 1: "Disable voltage" command is not active. Bit 5 = 1: "Quick stop" command is not active. Bit 9 = 1: The inverter is on remote.	Line 2 of the display indicates: **`0:Ready`**
5	Send PDO(tx) message with control command "**switch on**" 15 Control word 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1	Device state changes to "switched on." 15 Status word 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 1 1 Bit 1 = 1: Switched on Bit 4 = 1: "Disable voltage" command is not active. Bit 5 = 1: "Quick stop" command is not active. Bit 9 = 1: The inverter is on remote.	`Line 2 of display indicates:` **`14:Enabled`**
6	Send PDO(tx) message with control command "**enable operation**," and set the three HLG bits. 15 Control word 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 And specify reference value as 3000 Rpm. (= 0BB8 Hex). 15 Ref. value 0 0 0 0 0 1 0 1 1 1 0 1 1 1 0 0 0 Cyclic sending this PDO(tx) message permits continuous monitoring of status word and actual value by the inverter.	Device states changes to "operation enabled." 15 Status word 0 0 0 0 0 0 1 1 0 0 1 1 0 0 1 1 1 Bit 2 = 1: Operation enabled Bit 4 = 1: "Disable voltage" command is not active. Bit 5 = 1: "Quick stop" command is not active. Bit 9 = 1: The inverter is on remote. Bit 10 = 1: Reference value reached (Bit 10 = 0: For time for acceleration and deceleration) The drive runs up until the reference value. The actual speed after reaching the reference value is indicated as 2999 rpm (= 0BB7Hex). 15 Actual value 0 0 0 0 0 1 0 1 1 1 0 1 1 0 1 1 1	Line 2 of display indicates: **`1:Clockwise`** (Other texts are displayed for other reference values or load states.)

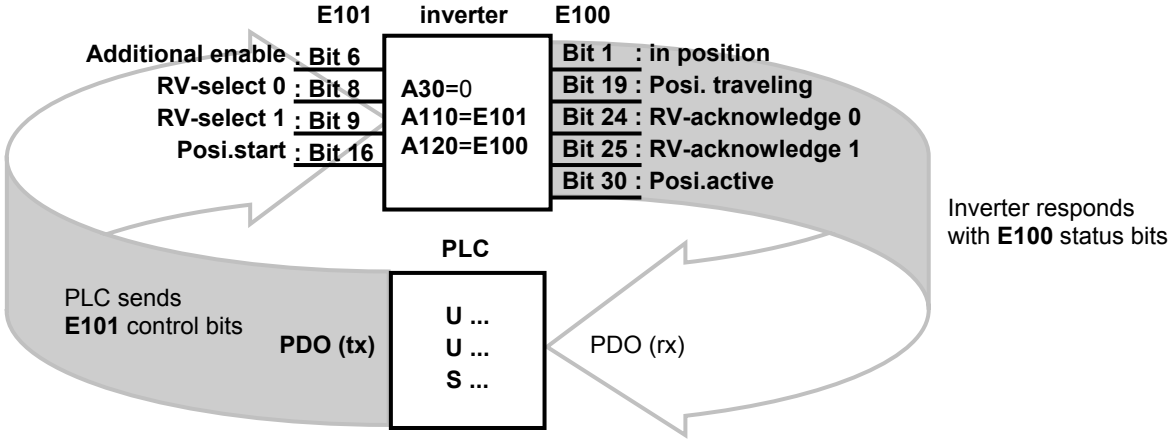
* FAS/FDS responds with PDO(rx) message with old device state in status word. SDS already responds with new device state!

9 POSITIONING WITH THE FIELDBUS

The control/status bits are available for positioning with the fieldbus. To utilize the function, make the following settings. **A30**=*0: ctrl.inter.*; **A110/A114**=***E101*** *control bits*; **A120/A124**=***E100*** *status bits*. For a detailed description of the bits, see chap. 7.1 of this documentation.

Important: For all control bits which are handled by the bus, set the appropriate assignment to inactive in the **F..** parameters (BE functions).

Sample application:



In control, **the drive must be enabled with bit 6 in E101**. Bit 30 in **E100** changes from "0" to "1", a process block selected with bit 8 to 11 in **E101** can be started with rising edge bit 16 in **E101** (> 10 msec). The active process block is indicated with bits 24 to 28 in **E100** as long as the start signal is available. Bit 19 in **E100** signals the movement of the axis, and the end of the process block can be evaluated with a positive edge on bit 1 in **E100** (only when block processing > 10 msec).

9.1 Preference of process block 1

If you only want to use one process block in which you continuously enter a new target, we recommend using process block 1. An SDO service for these parameters (**J10** to **J18**, **L10** to **L12**) receives special handling on the device. The data for process block 1 are immediately imaged on the internal posi controller. The service is not concluded until these internal routines have been completed. The process block can be started immediately after SDO acknowledgment. With all other process blocks, the internal imaging takes place in the background after SDO acknowledgment. You can query when the data will become useable on the device via bit 5 in **E100**.

9.2 Special function of E124 start position 1

Writing a value with the SDO service to this parameter has the following effect.
1. The value in **J10** position is copied and imaged immediately for internal positioning control.
2. Process block 1 is then started with *posi.start*.
3. The SDO service is not concluded until now.

This saves having to parameterize and start process blocks separately on the controller.

10 EXPANSION OF THE INVERTER TO I/O MODULE FOR FIELDBUS

When the inverter is controlled via fieldbus, the inputs and outputs of the terminals may not need to be used for the inverter. These inputs and outputs can then be used for other purposes with the CAN bus. Communication objects **E10** and **E11** can be used to measure the analog input level. **E12, E13** or **E19** can be used for the binary inputs (several binary inputs are shown here as individual bits).

If the inverter does not need the outputs for relay 2, analog output and BA1 to generate signals on the device (e.g., brake or analog speed indication), these outputs can be controlled with the fieldbus for other purposes. The applicable parameters which describe the function of the outputs must then be set to *"0:inactive"* in both parameter sets.
For example, if parameter **F00** (relay 2 function) is set to *"0:inactive,"* the relay can be circuited from the fieldbus with **E111** (1 = make contact). The same procedure can be used with **F20** and **E110** for the analog output and with **F80** and **E112** (BA1) on the *SEA 4000* option board.
Additional binary outputs can be addressed with **E112** (BA1), **E114** (BA4), **E115** (BA5), **E116** (BA6), **E117** (BA7).

10.1 Using all the AE1/AE2 functions via CAN bus

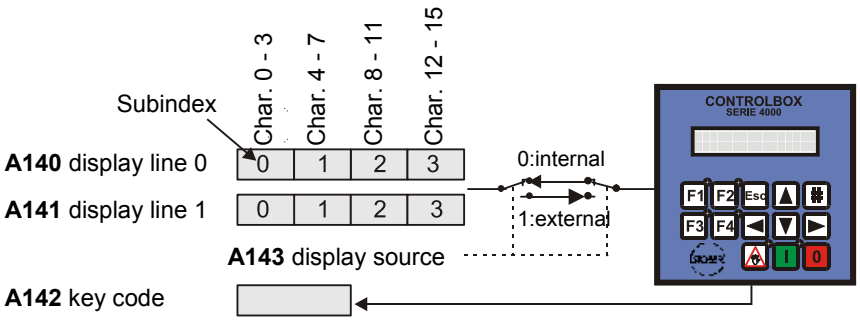
F20 and **F25** can be used to execute one of several functions with analog inputs 1 and 2. The fieldbus also permits direct access to all available selections which are not selected under **F20** and **F25**.

Selection of AE1/AE2 Function	Parameter via CAN Bus	Remarks
0: inactive	-	
1: additional RV	**E104** additional reference value	For meaning, see **F20** or **F25** in the documentation of: - The frequency inverter **POSIDRIVE**® FAS 4000 (publ. no. 44181) **POSIDRIVE**® FDS 4000 (publ. no. 441408) - **Or** the servo inverter **POSIDYN**® SDS 4000 (publ. no. 441449)
2: torque limit	**E102** torque limit	
3: power limit (FAS/FDS) *3: inactive (SDS)*	**E103** power limit	
4: RV-factor	**E105** RV-factor	
5: override	**E106** override	
6: posi.offset	**E107** posi. offset	
7: winding diameter [1]	**E108** winding diameter	
8: M-rot. magnet (FAS/FDS) *8: inactive (SDS)*	**E109** M-rot. magnet	
9: n-Max	**E126** n-Max	
10: reference value	**E119** reference value	
11: PID reference [1]	**E121** PID reference	
12: winding roller [1]	**E122** winder roller	
13: synchron offset [1]	**E123** synchron offset	
14: synchron n-ref. value [1]	**E125** synchron n-ref. value	
-	**E110** analog output 1	When **F40/F45** = *"0:inactive,"* the level of analog outputs 1 and 2 can be specified directly via the bus. ±10 V = ±100% = ±8192
-	**E118** analog output 2	
-	**E120** tension reduction	

[1] Not available with FAS

➔ While only up to two variables can be controlled with the analog inputs, all variables (**E104** to **F120** are available in principle simultaneously with the fieldbus.

10.2 Using the keys and display via CAN bus

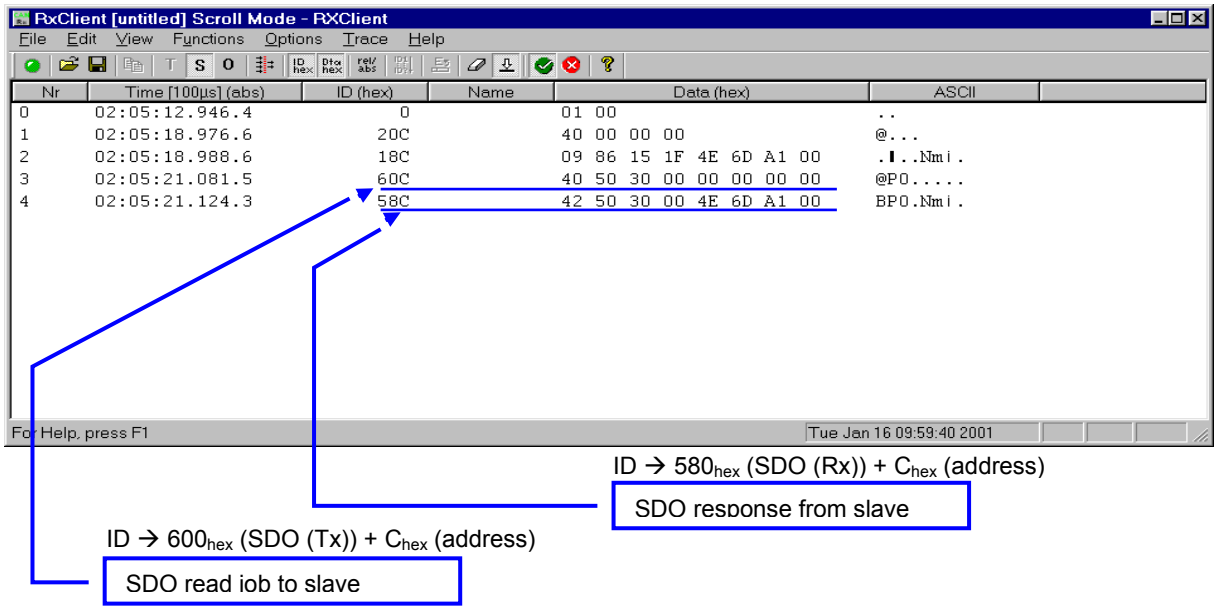


When parameterization, control and diagnosis are completely handled via the fieldbus, the keys and the display of the FDS and Controlbox are no longer needed. In such cases, these resources can be used with the fieldbus like an operator panel. The currently pressed key can be read with parameter **A142** (key code). The text on the display can be read from the device as ASCII characters (one character in each byte) with parameters **A140** and **A141** and then written from the fieldbus to the display when **A143** (display source) changes to *"1:external."*

If **A143** (display source) was changed to *"1:external,"* faults, warnings and messages can no longer be indicated. This task must then be handled by the controller! The device only sets parameter **A143** to *"0:internal"* when the device is turned on.
A142 (key code) can only recognize one pressed key. The relationship between pressed key and read number is: 0 = no key, 1 = ◀, 2 = ▶, 3 = ▼,
4 = ▲, 5 = #, 6 = Esc ., 7=F1, 8=F2, 9=F3, 10=F4, 11= key, 12= I key (green), 13= 0 key (red).

11 PARAMETER COMMUNICATION WITH SDO SERVICE

The SDO service is used to read and write all parameters and indications. The inverter supports the short form of the services which permits 4 bytes of user data. The messages for the SDO service are always 8 bytes in length. The CANopen master sends a request signal with identifier 600_{hex} + **A83** bus address of the desired station. This station then responds with identifier 580_{hex} + **A83** bus address.
This service is always supported regardless of all NMT services and parameters of the FDS/SDS. The CANopen master starts the service with an SDO(tx) message. The inverter then responds with the appropriate SDO(rx) message. All communication objects of the inverter are addressed via index and subindex. The object directory for all STÖBER parameters are located in chap. 15. All data are transferred via the bus with a length of 4 bytes and are stored there in Intel format (most significant byte/word stands for high memory address or is sent later to the bus (= Little Endian).



In addition to the ID a command is sent in the user data field during communication with the SDO service to start the appropriate action. These commands are listed below.

23_{hex} ➔ Initiate Domain Download Request	➔ Write parameter job
60_{hex} ➔ Initiate Domain Download Response	➔ Write job was accepted.
40_{hex} ➔ Initiate Domain Upload Request	➔ Read parameter job
42_{hex} ➔ Initiate Domain Upload Response	➔ Read job was accepted.
80_{hex} ➔ Abort Domain Transfer	➔ Job cannot be executed.

SDO response telegram:

Data in CAN telgram:

SDO service, 8 bytes of data							
				4 bytes of user data			
1st Byte COM-MAND	2nd Byte LSB	3rd Byte MSB	4th Byte SUB-index	5th Byte LSB	6th Byte MSB	7th Byte LSB	8th Byte MSB
	Index			LSW Data		MSW Data	
42h	30	**50**	00	00	A1	6D	**4E**
42h	**50**	30	00	**4E**	6D	A1	00

11. Parameter communication with SDO service

Writing a parameter

1) The client (i.e., CAN master) sends Initiate Domain Download Request.
2) The server (FAS / FDS / SDS) acknowledges the request with positive Initiate Domain Download Response.

Reading a parameter, an indication

1) The client (controller) sends Initiate Domain Upload Request.
2) The server (FAS / FDS / SDS) acknowledges the request with positive Initiate Domain Upload Response.

Negative response to an attempt to read or write

In case of a fault, the server (FAS / FDS / SDS) responds with Upload or Download-Request with Abort Domain Transfer.

1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
23Hex	LSB	MSB		LSB	MSB	LSB	MSB
Command	Index		Sub-index	LSW-Data		MSW-Data	

1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
60Hex	LSB	MSB		0	0	0	0
Command	Index		Sub-index	unused			

1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
40Hex	LSB	MSB		-	-	-	-
Command	Index		Sub-index	reserved			

1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
42Hex	LSB	MSB		LSB	MSB	LSB	MSB
Command	Index		Sub-index	LSW-Data		MSW-Data	

1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
80Hex	LSB	MSB		LSB	MSB	LSB	MSB
Command	Index		Sub-index	Additional-Code		Error-Code	Error-Class

The following error descriptions can be reported by the inverter.

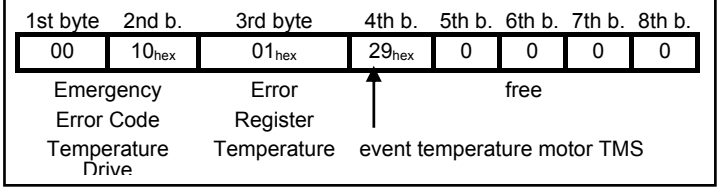
Add. Code 5. + 6. Byte	Error-Code 7. Byte	Error-Class 8. Byte	Meaning
0	2	6	Object with this index and subindex doesn't exist in object directory.
0	7	5	Invalid command byte received (in addition to CANopen)
0	1	6	Attempt to write-access read-only data or attempt to read-access write-only parameter.
30 hex	0	8	Invalid value of parameter during attempted write-access
31 hex	0	8	Parameter value too large for write attempt
32 hex	0	8	Parameter value too small for write attempt
40 hex	0	8	Value conflicts with values of other parameters for write attempt (e.g., if **B00** is not *0:user defined*, no motor parameters may be changed).
22 hex	0	8	Value may not be changed while device is in this state. Turn off release.
44 hex	0	8	Software version conflict between inverter and CAN bus interface

12 EMERGENCY SERVICE

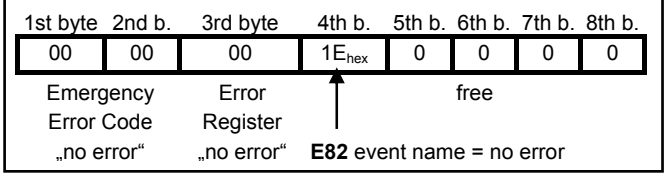
When parameter **A108** emergency service is *1:active*, the CAN bus interface of the inverter continuously monitors the device state. If the inverter actively changes to the state "malfunction" or "malfunction reaction," the EMERGENCY object is sent exactly once with one of the error codes described below. When the inverter leaves the "malfunction" state (due to acknowledgment), the EMERGENCY object is sent once with the error code "no error." This relieves the CANopen master from having to poll the device state of the inverter for malfunctions at regular intervals. The master is automatically informed each time a malfunction occurs or is corrected. The master is also informed of the exact cause of the malfunction.
The inverter provides three different kinds of information on the type of malfunction within this telegram.

The coding of "error code" in the first and second bytes and "error register" in the third byte complies with the specifications in the CiA/DS-301 profile. The fourth byte contains the value of the STÖBER parameter **E82** event name or **E40** fault type.

The inverter changes to malfunction (temperature motor TMS):



The inverter leaves the malfunction:



This service can be deactivated by changing parameter **A108** (emergency service) from *1:active* to *0:inactive*. When parameter **A83** (bus address) is set to 0, an EMERGENCY object is never sent regardless of **A108** since the 128 identifier to be used might interfere with synchronization of the process data with the SYNC object (also identifier 128).

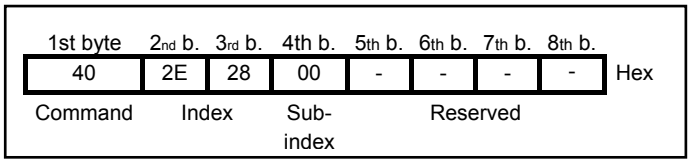
List of possible coding in the EMERGENCY message:

Error Code **Hex Value : Designation**	**Error Register** **Hex Value : Designation**	**E82 Event Code** **Hex Value : Designation**
0: no error	0: no error	1E: no event
2110: short circuit earth	2: current	1F: short circuit/short to ground
2230: intern short circuit earth	2: current	20: short circuit/short to ground intern
2310: continous overcurrent	2: current	21: overcurrent
5000: device hardware	1: generic error	22: hardware fault
6010: software reset	1: generic error	23: watchdog
3110: mains overvoltage	4: voltage	24: high voltage
7303: resolver 1 fault	1: generic error	25: n-feedback
4210: temperature device	8: temperature	26: temperature device sensor
4280: temperature device I2t	8: temperature	27: temperature device i2t
6310: loss of parameters	1: generic error	28: invalid data
4310: temperature drive	8: temperature	29: temperature motor TMS
7110: brake chopper	8: temperature	2A: temperature braking resistor
7000: additional module	1: generic error	2B: reference value wire break
9000: external error	1: generic error	2C: extern fault
4380: temperature drive I2t	8: temperature	2D: over temperature motor i2t
3120: mains undervoltage	4: voltage	2E: low voltage
8311: excess torque	1: generic error	2F: drive overload
8312: difficult start up	1: generic error	30: acceleration overload
8331: torque fault	1: generic error	31: deceleration overload
8400: velocity speed control	1: generic error	32: operation range
F004: additional function control	1: generic error	33: refused
8100: communication	10: communication	34: communication
0500: position control	1: generic error	35: stop input
8611: following error	1: generic error	36: following error
5200: device hw control	1: generic error	37: option board
8480: spec. Velocity speed	1: generic error	38: overspeed (only for SDS 4000)

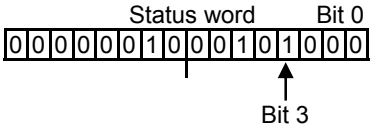
13 EXAMPLE OF PROCESSING A MALFUNCTION VIA CAN BUS

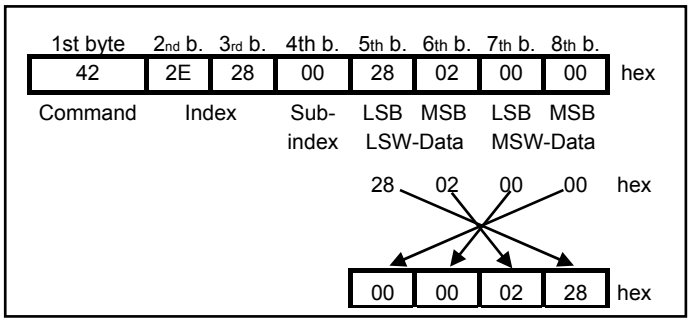
If automatic reporting of malfunctions with the EMERGENCY service is not desired, the parameter **A108** emergencyservice=*0:inactive* can be used. Another method is to proceed as follows:CYCLICALLY READ THE CONTENTS OF **E46** STATUS WORD FROM THE INVERTER.

If there is no automatic message via EMERGENCY service, the current value by **E46** status word must be read cyclically. If bit 3 in this status word is 1, the inverter is in the "malfunction" or "malfunction reaction active" state.



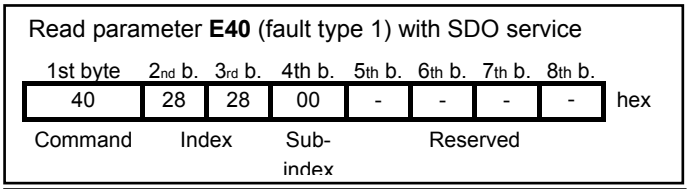
Indication of the status word in a binary number shows that bit 3 (malfunction) is 1.

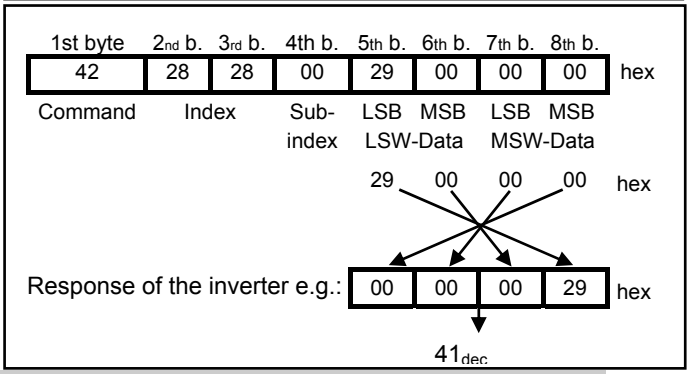




13.1 Read E40 fault type 1

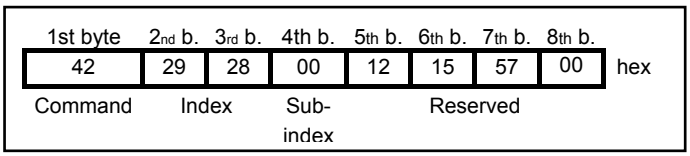
When a malfunction has occurred, read out type of malfunction. The inverter store the last 10 malfunctions (type and time of occurrence) in **E40** and **E41**. This information is stored in the order in which it occurred. Malfunction 1 (subindex 0) is the latest or the current malfunction. If the inverter is still in the "malfunction" state, this information canalso be read out with parameter **E82** event code. The meaning of the value which was read in corresponds to the fourth byte in EMERGENCY service (see chap. 12).





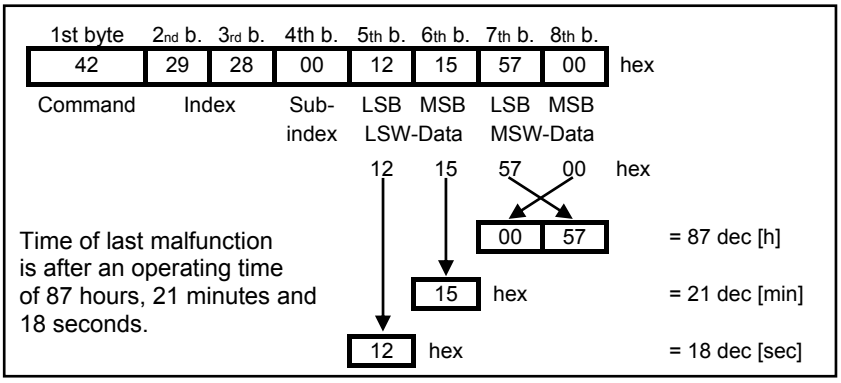
13.2 Read E41 fault time

If you want to know the exact time at which the malfunction occurred, you can read out this information with **E41** fault time 1.



SDO telegram for reading **E41** fault time 1

Response telegram of inverter



13.3 Acknowledging the fault via CAN bus

The reason for the fault must be corrected first before a fault can be acknowledged (e.g., let the motor cool off for "temp. motor TMS"). Since acknowledgment only occurs with a rising edge (i.e., bit changes from 0 to 1), you may have to set the bit to 0 beforehand.
Although there are several ways to perform acknowledgment, the particular setting may not permit all methods to be used.

1. State change (0 → 1) of bit 7 (reset fault) of the control word in E45
Control input **A30** must be set to "*2:fieldbus*" (for FAS/FDS) or "*4:CAN-Bus*" (for SDS). Otherwise, the control word has no effect.
If parameter **A110** or **A111** is set to **E45** control word ($282D_{hex}$), the status word can only be changed via the PDO service. Otherwise, the status word can only be changed via the SDO service.

2. State change (0 → 1) of bit 3 (acknowledgment) of parameter E101 control bits
No binary input (parameters **F31 to F35**/with option board **F60 to F64**) may be set to *13:faultReset* since the BEs always take priority over **E101** control bits.
If parameter **A110** is set to **E101** (control bits) (2865_{hex}), the status word can only be changed via the PDO service. Otherwise, the status word can only be changed via the SDO service.

3. State change (0 → 1) of bit 6 (additional enable) of parameter E101 control bits.
No BE binary input (parameters **F31 to F35**/with option board **F60 to F64**) may be set to *7:addienable* since the BEs always take priority over **E101** control bits. The enable on the inverter must be switched on or jumpered since it is AND-linked to the additional enable.
If parameter **A110** is set to **E101** control bits (2865_{hex}), the status word can only be changed via the PDO service. Otherwise, the status word can only be changed via the SDO service.

14 MONITORING THE PROCESS DATA

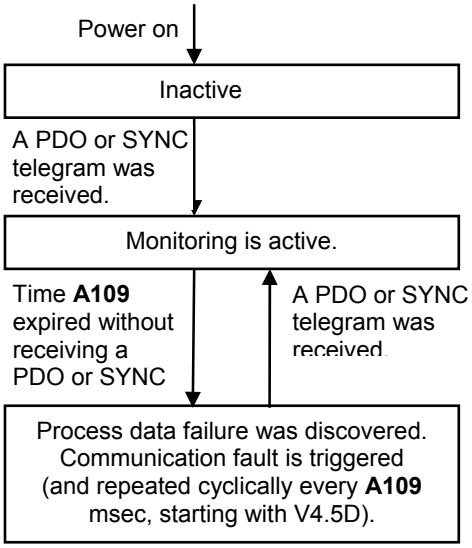
Process data monitoring should be activated to prevent the FAS/FDS or SDS from
continuing with the last received reference values if the CAN bus system or the CAN master fails. In contrast to the life guarding routine defined in CANopen, no further messages on monitoring must be transferred to the CAN bus.

Kommubox or the SDS monitors the PDO(tx) and SYNC messages which are
sent cyclically by the CAN master during normal operation. Parameter **A109** (proc.output control time) is used to activate this monitoring routine.

A time between 1[1] or 100[2] msec and 65534 msec is set here.
The default setting is 65535. This value also means that monitoring is switched off.
This setting is recommended when commissioning the inverter on CAN bus and
for service and maintenance work. Monitoring should only be activated during the running process when a bus master is cyclically sending process data to the inverter.

The monitoring time must be adapted to the maximum total cycle time on CAN bus plus a sufficient reserve for possible delays on CAN bus. If process data monitoring is triggered on the inverter and parameter **A30** (control input) is set to *"2:fieldbus"* (for FAS/FDS) or *"4:CAN-Bus"* (for SDS), the fault *"52:communication"* is triggered.

[1] SDS
[2] FAS/FDS



15 PARAMETER LIST

All the inverter's parameters are available as communication objects via the SDO service (see chapter 11). The list of these objects is included both in this document (see rest of this chapter) and in the EDS file (EDS = Electronic Data Sheet). The EDS file makes it easier to integrate the parameter lists in the software systems on the CANopen master side. These EDS files are available on request (download via www.stoeber.de)

15.1 Explanation of the tables

The following tables are the directory of all communication objects. Most of the parameters, displays and actions which can be edited with the menu of the device are also available with CAN bus. The only exceptions are the parameters which directly affect the menu and actions which can only be executed directly on the device. These are disabled for CAN bus access.
The index and subindex for the access via CAN bus are determined from the coordinates of the particular parameter in the menu of the inverter. The following rules apply.

Index = 2000_{hex} + 200_{hex} * letter of the menu coordinate (A=0, B=1,...) + number value of the menu coordinate
Subindex = 0 for parameter set 1 and 1 for parameter set 2

The menu coordinates from 0 to 99_{dec} are indicated on the display of the FDS. Display with the FAS and SDS requires a Controlbox. Starting with 100, menu coordinates can only be indicated with FDS Tool (not via display and Controlbox).

Parameters of groups **B..** to **G..** (not **E..**) are listed twice (parameter set 1 and 2). The menu knows only one coordinate. There are two communication objects which are distinguished between with the subindex for access via CAN bus.

Column	Meaning
Index **Subindex**	These two pieces of information uniquely identify each communication object via CAN-Bus.
Coordinate **Name**	This information defines the object in accordance with the familiar parameter designations in the installation and commissioning guidelines for FAS/FDS and SDS.
Value range	Contains the valid range. It is given as the "lower limit" to "upper limit" or is separated by commas for list types. If the value cannot be changed, only one value is given. Letters enclosed in quotation marks are listed for strings. Character strings which are longer than four ASCII characters are divided into individual objects with the same index but different subindex. These subareas of strings contain 4 ASCII characters.
Scaling / unit	The unit and scaling with the resolution of the parameter is shown here. A blank column indicates a selection parameter and not a number.
Access	Specifies the CAN-Bus access rights separately for the FAS/FDS and SDS devices. **r** Read access permitted **rw** Read and write access permitted **rs** Read access and setting (write access) of value 1 (only for actions)
Rounding	If rounding errors can occur when converting scaling between the representation type of the object on CAN-Bus and the internal resolution on the device, the possible rounding error is given here (discrete-value quantization).

15.2 Switchable scaling

The representation of the value (scaling) can be switched on CAN-Bus for some parameters and displays. Parameter **A100** (scaling deviceintern) can be used for this.

Selection *0: Standard:* Values are transferred as shown in the table (e.g., speed in rpm).
1: device raw: Values are transferred in internal-device scaling via CAN-Bus. This achieves the full resolution of the internal parameters and saves computing time for rescaling.

Auxiliary scaling variables (other parameters) are read (when Kommubox starts) from the FAS/FDS to Kommubox for the rescaling of certain parameters/displays on the CAN-Bus unit. If these parameters are changed from another location (e.g., by the menu of FAS/FDS or FDS Tool), they are no longer current in Kommubox and some of the parameters/displays can no longer be correctly converted. The following list shows the parameters/displays which have auxiliary scaling variables. With such parameters/displays, these auxiliary scaling variables should be read first via CAN-Bus before the related parameters/displays are accessed (not necessary with SDS).

Parameter/ Display	Scaling for A100=0	Scaling for A100=1	Auxiliary Scaling Variable (for A100=0)
All speeds except group **E**..	Rpm	FAS/FDS: ±32768=±400 Hz SDS: rpm	FAS/FDS: **B10** Polzahl des entsprechenden Parametersatzes.
Speeds from group **E**..	Rpm	FAS/FDS: ±32768=±400 Hz SDS: rpm	FAS/FDS: **B10** Number of poles from active para. set SDS: 0,25 rpm
E01 P-motor	0.01 kW	Same as **A100**=0	FAS/FDS: **B11** P-nominal from parameter set 1 SDS: **B11** P-nominal from active parameter set
E02 M-motor	0.01 Nm	Same as **A100**=0	FAS/FDS: **B11** and **B13** n-nominal from para. set 1 SDS: **B11** and **B13** n-nominal from active para. set

Parameter/ Display	Scaling for A100=0	Scaling for A100=1	Auxiliary Scaling Variable (for A100=0)
E09 rotor position	0.001 U	Motor increments	**E84, B26, C60, F36, H20, H22, H41, G27, I02**
G29 synchron difference	°	Motor increments	**E84, B26, C60, F36, H20, H22, H41, G27, I02**
I80, **I81**, **I84**, **I88** (all posi actual values)	Posi unit without positions after decimal point **I05** * 10°**I06**	Posi increments	**E84, B26, C60, F36, H20, H22, H41, G27, I02**

15.3 CANopen Parameter

The following list of communication objects located in the index area between 1000_{hex} and $1FFF_{hex}$ has been implemented in accordance with CiA/DS-301. Using these objects, every CANopen master can read the primary characteristics of the device on the CAN bus without knowing this documentation. Some of these objects are not included in the inverter's menu and therefore do not have coordinates (e.g., 1000 Device Type). Other communication objects have additional manufacturer-specific parameters or indications (e.g., **E51**). These are entered in the "Coordinate" column.

Index (Hex)	Sub-index	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Rounding
						FAS	FDS	SDS	
1000	0	-	Device Type	402		r	r	r	
1001	0	-	Error Register	0, 1, 2, 4, 8		r	r	r	
1004	0	-	No. of PDOs supported	1		r	r	r	
1004	1	-	No. of synchronous PDOs supp	1		r	r	r	
1004	2	-	No. of asynchronous PDOs supp	1		r	r	r	
1005	0	-	COB-ID SYNC-message	80000080_{hex}		r	r	r	
1008	0	E50	Manufac. Device Name B0-3	„SDS “		r	r	r	
1008	1	E50	Manufac. Device Name B4-7	„4xxx “		r	r	r	
1008	2	E50	Manufac. Device Name B8-11	„ “		r	r	r	
1008	3	E50	Manufac. Device Name B12-15			r	r	r	
1009	0	-	Manufac. Hardware Version B0-3	„SDS “		r	r	r	
1009	1	-	Manufac. Hardware Version B4-7	„G1.0“		r	r	r	
1009	2	-	Manufac. Hardw. Version B8-11	„ „		r	r	r	
1009	3	-	Manufac. Hardw. Version B12-15	„ „		r	r	r	
100A	0	E51	Manufac. Softw. Version B0-3	„V 4. “		r	r	r	
100A	1	E51	Manufac. Softw. Version B4-7	„5-A “		r	r	r	
100A	2	E51	Manufac. Softw. Version B8-11	„ “		r	r	r	
100A	3	E51	Manufac. Softw. Version B12-15	„ “		r	r	r	
100B	0	A82	Node-Id	0 to. 125		rw	rw	rw	
100F	0	-	No. of SDOs supp	1		r	r	r	
1018	0	-	Identity Object: number of entries	4		r	r	r	
1018	1	-	Identity Object: Vendor ID	$B9_{Hex}$ = Nr. für Stöber Antriebstechnik GmbH		r	r	r	
1018	2	R00	Identity Object: Product code	51 to 97 für FBS 4008 to SDS 4481		r	r	r	
1018	3	E51/E58	Identity Object: Revision number	Versionsnr. in MSW		r	r	r	
1018	4	E52	Identity Object: Serial number	8000000 to		r	r	r	
1400	0	-	1. rec.PDO para / no. of elem.	2		r	r	r	
1400	1	-	1. rec.PDO para / COB-ID	200_{hex} + Node-ID		r	r	r	
1400	2	A102	1. rec.PDO para / trans. type	1 to 240, 254		rw	rw	rw	
1600	0	-	1. rec.PDO map / no. of mapped	4		r	r	r	
1600	1	A110/A114	1. rec.PDO map / 1. Object	$282D0010_{hex}$ (**E45**), ...		rw	rw	rw	
1600	2	A111/A115	1. rec.PDO map / 2. object	$282F0010_{hex}$ (**E47**), ...		rw	rw	rw	
1600	3	A112/A116	1. rec.PDO map / 3. object	$FFFFFFFF_{hex}$ (inactive), ..		rw	rw	rw	
1600	4	A113/A117	1. rec.PDO map / 4. object	$FFFFFFFF_{hex}$ (inactive), ..		rw	rw	rw	
1800	0	-	1. tra.PDO para / no. of elem.	2		r	r	r	
1800	1	-	1. tra.PDO para / COB-ID	180_{hex} + Node-ID		r	r	r	
1800	2	A103	1. tra.PDO para / trans. type	1 ... 240, 254		rw	rw	rw	
1A00	0	-	1. tra.PDO map / no. of mapped	4		r	r	r	
1A00	1	A120/A124	1. tra.PDO map / 1. object	$282E0010_{hex}$ (**E46**), ...		rw	rw	rw	
1A00	2	A121/A125	1. tra.PDO map / 2. object	28080010_{hex} (**E08**), ...		rw	rw	rw	
1A00	3	A122/A126	1. tra.PDO map / 3. object	$FFFFFFFF_{hex}$ (inactive), ..		rw	rw	rw	
1A00	4	A123/A127	1. tra.PDO map / 4. object	$FFFFFFFF_{hex}$ (inactive), ..		rw	rw	rw	

15.4 Parameters from groups A.. inverter to Z.. fault counter

Index (Hex)	Sub-index	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Rounding
						FAS	FDS	SDS	
2000	0	**A00**	Start save parameter	0 to 1 (set 1 for start)		rs	rs	rs	
2000	1	**A00**	result save parameter	0 to 26		r	r	R	
2002	0	**A02**	start check parameter	0 to 1 (set 1 for start)		rs	rs	rs	
2002	1	**A02**	result check parameter	0 to 26		r	r	r	
2004	0	**A04**	start default settings	0 to 1 (set 1 for start)		rs	rs	rs	
2004	1	**A04**	start default settings	0 to 26		r	r	r	
2005	0	**A05**	load saved values	0 to 1		rs	rs	rs	
2005	1	**A05**	load result of stored values	0 to 26		r	r	r	
200A	0	**A10**	menu level	0 to 2		rw	rw	rw	
200C	0	**A12**	language	0 to 1		rw	rw	rw	
200F	0	**A15**	auto-return	0 to 1		rw	rw	rw	
2014	0	**A20**	braking resistor type	FAS: 0 to 5 (type-dep.) FDS: 0 to 7 (type-dep.) SDS: 19 to 26 (type-dep.)		rw	rw	rw	
2015	0	**A21**	braking resistor resist.	FAS: 100 to 600 (type-dep.) FDS: 30 to 600 (type-dep.) SDS: 10 to 600 (type-dep.)	0.1 Ohm	rw	rw	rw	
2016	0	**A22**	braking resistor rating	FAS/FDS: 0 to 3000 (type-d.) SDS: 0 to 600 (type-dep.)	10 W	rw	rw	rw	
2017	0	**A23**	braking resistor therm.	1 to 1000	0.01 sec	rw	rw	rw	
201E	0	**A30**	operation input	FDS: 0 to 2 SDS: 0 to 4		rw	rw	rw	
201F	0	**A31**	Esc-reset	0 to 1		rw	rw	rw	
2020	0	**A32**	auto-reset	0 to 1		rw	rw	rw	
2021	0	**A33**	time auto-reset	1 to 255	Min	rw	rw	rw	
2022	0	**A34**	auto-start	0 to 1		rw	rw	rw	
2023	0	**A35**	low voltage limit	1500 to 5700 (type-dep.)	0.1 V DC	rw	rw	rw	
2024	0	**A36**	mains voltage	FAS/FDS: Singlephase: 1400 to 2500 Threephaseg: 2200 to 4800	0.1 V eff.	rw	rw	rw	-2
				SDS: 1400 to 4800					
2025	0	**A37**	reset memorized values	0 to 1 (set 1 for start)		rs	rs	rs	
2025	1	**A37**	result reset memorized values	0 to 26		r	r	r	
2026	0	**A38**	DC power-input	0 to 1		-	-	rw	
2029	0	**A41**	select parameter set	0 to 2		rw	rw	rw	
202A	0	**A42**	copy parameter set 1>2	0 to 1 (set 1 for start)		rs	rs	rs	
202A	1	**A42**	result copy parameter set 1>2	0 to 26		r	r	r	
202B	0	**A43**	copy parameter set 2>1	0 to 1 (set 1 for start)		rs	rs	rs	
202B	1	**A43**	result copy parameter set 2>1	0 to 26		r	r	r	
2033	0	**A51**	Tip reference value	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	rw	rw	rw	
2037	0	**A55**	key hand function	0 to 1		rw	rw	rw	
2050	0	**A80**	serial address	0 to 31		rw	rw	rw	
2052	0	**A82**	CAN-baudrate	0 to 8		rw	rw	rw	
2053	0	**A83**	Busaddress	0 to 125		rw	rw	rw	
2084	0	**A84**	Profibus baudrate	0 to 10		r	r	r	
2064	0	**A100**	Scaling Deviceintern	0 to 1		rw	rw	rw	
2065	0	**A101**	Can-Bit-Sample-Access-Point	0 to 1		rw	rw	rw	
2066	0	**A102**	1. tra.PDO para / trans. type	1 to 240, 254		rw	rw	rw	
2067	0	**A103**	1. tra.PDO para / trans. type	1 to 240, 254		rw	rw	rw	
2068	0	**A104**	Max-SSS-Pause (delay)	0 to 255		rw	rw	-	
206C	0	**A108**	Emergencyservice	0 to 1		rw	rw	rw	
206D	0	**A109**	Proc. output control time	FAS/FDS: 100 to 65535 SDS: 1 to 65535	msec	rw	rw	rw	
206E	0	**A110**	Process output data 0	70790400 (**E45**), ...		rw	rw	rw	
206F	0	**A111**	Process output data 1	70790912 (**E47**), ...		rw	rw	rw	
2070	0	**A112**	Process output data 2	70790400 (**E45**), ...		rw	rw	rw	
2071	0	**A113**	Process output data 3	70790912 (**E47**), ...		rw	rw	rw	

[1] rpm: For FAS / FDS: Limit value is dependant to the number of poles.

Index (Hex)	Sub-index	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
2072	0	**A114**	CAN process output data 0	70790400 (**E45**), ...		-	-	rw	
2073	0	**A115**	CAN process output data 1	70790912 (**E47**), ...		-	-	rw	
2074	0	**A116**	CAN process output data 2	70790400 (**E45**), ...		-	-	rw	
2075	0	**A117**	CAN process output data 3	70790912 (**E47**), ...		-	-	rw	
2077	0	**A119**	Process output data enable	0 to 1		rw	rw	rw	
2078	0	**A120**	Process input data 0	70790656 (**E46**), ...		rw	rw	rw	
2079	0	**A121**	Process input data 1	70780928 (**E08**), ...		rw	rw	rw	
207A	0	**A122**	Process input data 2	70790656 (**E46**), ...		rw	rw	rw	
207B	0	**A123**	Prozeß-Eingangsdatum3	70780928 (**E08**), ...		rw	rw	rw	
207C	0	**A124**	CAN process input data 0	70790656 (**E46**), ...		-	-	rw	
207D	0	**A125**	CAN process input data 1	70780928 (**E08**), ...		-	-	rw	
207E	0	**A126**	CAN process input data 2	70790656 (**E46**), ...		-	-	rw	
207F	0	**A127**	CAN process input data 3	70780928 (**E08**), ...		-	-	rw	
2082	0	**A130**	Proc. output data length	0 to 12		r	r	r	
2083	0	**A131**	CAN proc. output data length	0 to 12		-	-	r	
2084	0	**A132**	Proc. input data length	0 to 12		r	r	r	
2085	0	**A133**	CAN proc. input data length	0 to 12		-	-	r	
208C	0	**A140**	Display line0 Byte 0 to 3	„ 1“		rw	rw	rw	
208C	1	**A140**	Display line0 Byte 4 to 7	„23. “		rw	rw	rw	
208C	2	**A140**	Display line0 Byte 8 to 11	„rpm “		rw	rw	rw	
208C	3	**A140**	Display line0 Byte 12 to 15	„1.2A“		rw	rw	rw	
208D	0	**A141**	Display line1 Byte 0 to 3	„1:cw“		rw	rw	rw	
208D	1	**A141**	Display line1 Byte 4 to 7	„ccw“		rw	rw	rw	
208D	2	**A141**	Display line1 Byte 8 to 11	„ts “		rw	rw	rw	
208D	3	**A141**	Display line1 Byte 12 to 15	„ “		rw	rw	rw	
208E	0	**A142**	Key code	0 to 13		rw	rw	rw	
208F	0	**A143**	Display source	0 to 1		rw	rw	rw	

Note on using actions (e.g., **A00** save values):
To start actions, the value 1 is written to the object with subindex 0. The CANopen master must then keep reading this object until the value is set to 0. This concludes the action. Subindex 1 can now be used to query the result of the last executed action. The result of the last executed action is always returned by the inverter even when another action was started directly by the inverter. The result must, therefore, be evaluated directly after the action started via CAN Bus is concluded. For the meaning of the values of the result of the action, see chapter 15 (result table) of the device documentation (publ. no.: FAS 4000 = 441581, FDS 4000 = 441408, SDS 4000 = 441449).

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
2200	0/1	**B00**	motor-type	FAS: 0 to 26 (type-dep.) FDS: 0 to 29 (type-dep.) SDS: 60 to 69 (type-dep.)		rw	rw	rw	
2202	0/1	**B02**	EMC-constant	200 to 2500	0.1 V / 1000 rpm	-	-	rw	
2203	0/1	**B03**	Motor fan	0 to 1		-	-	rw	
220A	0/1	**B10**	poles	2, 4, to 16		rw	rw	rw	-1
220B	0/1	**B11**	P-nominal	FAS: 12 to 1100 (type-dep.) FDS: 12 to 2500 (type-dep.) SDS: 12 to 4500 (type-d.)	10 W	rw	rw	rw	
220C	0/1	**B12**	I-nominal	FAS: 0 to 2000 (type-dep.) FDS: 0 to 4400 (type-dep.) SDS: 0 to 16000 (type-d.)	10 mA	rw	rw	rw	
220D	0/1	**B13**	n-nominal	FAS/FDS: 0 to 12000 SDS: 0 to 6000	rpm[1]	rw	rw	rw	
220E	0/1	**B14**	V-nominal	0 to 4800 (type-dep.)	0.1 Veff	rw	rw	-	-2
220F	0/1	**B15**	f-nominal	819 to 27034	8192 = 100 Hz	rw	rw	-	
2210	0/1	**B16**	cos PHI	50 to 100	%	rw	rw	-	
2211	0/1	**B17**	M0 (standstill)	0 to 32767	0.01 Nm	-	-	rw	
2214	0/1	**B20**	control mode	FAS/FDS: 0 to 2 SDS: 0 to 3		rw	rw	-	
2215	0/1	**B21**	V/f-characteristic	0 to 1		rw	rw	-	
2216	0/1	**B22**	V/f-gain	7373 to 9011	8192 = 100%	rw	rw	-	
2217	0/1	**B23**	boost	0 to 32767	8192 = 100%	rw	rw	-	

[1] rpm: For FAS / FDS: Limit value is dependant to the number of poles.

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Rounding
						FAS	FDS	SDS	
2218	0/1	**B24**	switching frequency	4, 6, 8, 10, 12, 14, 16	kHz	rw	rw	-	-1
2219	0/1	**B25**	halt flux	FAS/FDS: 1 to 4		rw	rw	-	
221A	0/1	**B26**	motor-encoder	FAS: 0 FDS: 0 to 1 SDS: 2 to 3		rw	rw	rw	
221B	0/1	**B27**	time halt flux	0 to 255	sec	rw	rw	-	
221E	0/1	**B30**	addit.motor-operation	0 to 1		rw	rw	-	
221F	0/1	**B31**	oscillation damping	FAS/FDS: 0 to 100	%	rw	rw	-	
2220	0/1	**B32**	SLVC-dynamics	0 to 100	%	rw	rw	-	
2233	0/1	**B51**	J-motor	1 to 32767	1E-6 kgm^2	-	-	rw	
2234	0/1	**B52**	L-motor	1 to 32767	10 µH	-	-	rw	
2235	0/1	**B53**	R1-motor	1 to 32767	0.01 Ohm	rw	rw	rw	
223C	0/1	**B60**	X1S-motor	1 to 32767	0.01 Ohm	rw	rw	-	
223D	0/1	**B61**	therm-motor	1 to 32767	sec	rw	rw	-	
223E	0/1	**B62**	TB-motor	1 to 255	msec	rw	rw	-	
223F	0/1	**B63**	Mbreakdown / Mnom.	1 to 255	0.1	rw	rw	-	
2240	0/1	**B64**	Ki-IQ (moment)	0 to 32767	8192 = 100%	rw	rw	rw	
2241	0/1	**B65**	Kp-IQ (moment)	0 to 32767	8192 = 100%	rw	rw	rw	
2242	0/1	**B66**	Ki-ID (flux)	0 to 32767	8192 = 100%	rw	rw	-	
2243	0/1	**B67**	Kp-ID (flux)	0 to 32767	8192 = 100%	rw	rw	-	

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Rounding
						FAS	FDS	SDS	
2400	0/1	**C00**	n-Min	0 ... **C01**	rpm[1]	rw	rw	rw	
2401	0/1	**C01**	n-Max	FAS/FDS: **C01** to 12000 SDS: **C01** to 6000	rpm[1]	rw	rw	rw	
2402	0/1	**C02**	perm.direction of rotat.	0 to 2		rw	rw	rw	
2403	0/1	**C03**	M-Max 1	0 to **C04**	8192 = 100%	rw	rw	rw	
2404	0/1	**C04**	M-Max 2	**C03** to 32767	8192 = 100%	rw	rw	rw	
240A	0/1	**C10**	skip speed 1	0 to 12000	rpm[1]	rw	rw	-	
240B	0/1	**C11**	skip speed 2	0 to 12000	rpm[1]	rw	rw	-	
240C	0/1	**C12**	skip speed 3	0 to 12000	rpm[1]	rw	rw	-	
240D	0/1	**C13**	skip speed 4	0 to 12000	rpm[1]	rw	rw	-	
2414	0/1	**C20**	startup mode	0 to 3		rw	rw	-	
2415	0/1	**C21**	M-load start	0 to 32767	8192 = 100%	rw	rw	-	
2416	0/1	**C22**	t-load start	0 to 99	0.1 sec	rw	rw	-	
241E	0/1	**C30**	J-mach/J-motor	0 to 10000	0.1	rw	rw	rw	
241F	0/1	**C31**	n-controller Kp	0 to 32767	8192 = 100%	rw	rw	rw	
2420	0/1	**C32**	n-controller Ki	0 to 32767	8192 = 100%	rw	rw	rw	
2421	0/1	**C33**	n-reference value lowpass	0 to 32767	0.1 msec	-	-	rw	
2422	0/1	**C34**	n-motor lowpass	5 to 32767	0.1 msec	-	-	rw	
2423	0/1	**C35**	n-control. Kp standstill	5 to 255	1%	rw	rw	rw	
2428	0/1	**C40**	n-window	0 to 300	rpm[1]	rw	rw	rw	
2429	0/1	**C41**	operating range n-Min.	0 to **C42**	rpm[1]	rw	rw	rw	
242A	0/1	**C42**	operating range n-Max.	FAS/FDS: **C41** to 12000 SDS: **C41** to 6000	rpm[1]	rw	rw	rw	
242B	0/1	**C43**	operating range M-Min.	0 to **C44**	8192 = 100%	rw	rw	rw	
242C	0/1	**C44**	operating range M-Max.	**C43** to 32767	8192 = 100%	rw	rw	rw	
242D	0/1	**C45**	operating range X-Min.	0 to **C46**	8192 = 100%	rw	rw	rw	
242E	0/1	**C46**	operating range X-Max.	-32768 to **C46**	8192 = 100%	rw	rw	rw	
242F	0/1	**C47**	operat. range C45/C46	0 to 12		rw	rw	rw	
2430	0/1	**C48**	operat. range C47abs	0 to 1		rw	rw	rw	
2431	0/1	**C49**	operat. range accel&ena	0 to 1		rw	rw	rw	
2432	0/1	**C50**	display function	0 to 4		rw	rw	rw	
2433	0/1	**C51**	display factor	- 10000000 to 10000000	0.0001	rw	rw	rw	
2434	0/1	**C52**	display decimals	0 to 5		rw	rw	rw	
2435	0/1	**C53**	display text	„xxxx“ (4 Zeichen)		rw	rw	rw	
243C	0/1	**C60**	run mode	FAS/FDS: 1 to 2 SDS: 0 to 3		rw	rw	rw	

[1] rpm: For FAS / FDS: Limit value is dependant to the number of poles.

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Rounding
						FAS	FDS	SDS	
2600	0/1	**D00**	reference value accel	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
2601	0/1	**D01**	reference value decel	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
2602	0/1	**D02**	speed (max.ref.value)	FAS/FDS: 0 to 12000 SDS: 0 to 6000	rpm[1] rpm	rw	rw	rw	
2603	0/1	**D03**	reference value-Max.	__D05__ to 8191	8192 = 100%	rw	rw	rw	
2604	0/1	**D04**	speed (min.ref.value)	FAS/FDS: 0 to 12000 SDS: 0 to 6000	rpm[1] rpm	rw	rw	rw	
2605	0/1	**D05**	reference value-Min.	0 to __D03__	8192 = 100%	rw	rw	rw	
2606	0/1	**D06**	reference value offset	-8192 to 8181	8192 = 100%	rw	rw	rw	
2607	0/1	**D07**	reference value enable	0 to 1		rw	rw	rw	
2608	0/1	**D08**	monitor reference value	0 to 1		rw	rw	rw	
2609	0/1	**D09**	fix reference value no.	0 to 7		rw	rw	rw	
260A	0/1	**D10**	accel 1	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
260B	0/1	**D11**	decel 1	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
260C	0/1	**D12**	fix reference value 1	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1] rpm	rw	rw	rw	
2614	0/1	**D20**	accel 2	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
2615	0/1	**D21**	decel 2	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
2616	0/1	**D22**	fix reference value 2	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1] rpm	rw	rw	rw	
261E	0/1	**D30**	accel 3	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
261F	0/1	**D31**	decel 3	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
2620	0/1	**D32**	fix reference value 3	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1] rpm	rw	rw	rw	
2628	0/1	**D40**	accel 4	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
2629	0/1	**D41**	decel 4	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
262A	0/1	**D42**	fix reference value 4	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1] rpm	rw	rw	rw	
2632	0/1	**D50**	accel 5	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
2633	0/1	**D51**	decel 5	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
2634	0/1	**D52**	fix reference value 5	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1] rpm	rw	rw	rw	
263C	0/1	**D60**	accel 6	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
263D	0/1	**D61**	decel 6	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
263E	0/1	**D62**	fix reference value 6	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1] rpm	rw	rw	rw	
2646	0/1	**D70**	accel 7	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
2647	0/1	**D71**	decel 7	FAS/FDS: 0 to 30000*__D98__ SDS: 0 to 30000	0.1 sec/150 Hz 1 msec/3000 rpm	rw	rw	rw	
2648	0/1	**D72**	fix reference value 7	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1] rpm	rw	rw	rw	
2650	0/1	**D80**	ramp shape	0 to 1		rw	rw	-	
2651	0/1	**D81**	decel-quick	1 to 30000	0.1 sec/150 Hz	rw	rw	rw	

[1] rpm: For FAS / FDS: Limit value is dependant to the number of poles.

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
265A	0/1	**D90**	reference value source	0 to 2		rw	rw	rw	
265B	0/1	**D91**	motorpoti function	0 to 1		rw	rw	rw	
265C	0/1	**D92**	negate reference value	0 to 1		rw	rw	rw	
265D	0/1	**D93**	RV-generator	0 to 1		rw	rw	rw	
265E	0/1	**D94**	ref. val. generator time	0 to 32767	msec	rw	rw	rw	
2662	0/1	**D98**	ramp factor	0=1; -1=0,1; 2=0,01		rw	rw	-	
2663	0/1	**D99**	fast reference value	0 to 1		-	-	rw	

Index (Hex)	Subindex	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
2800	0	**E00**	I-motor	0 to 32767	0.1 A	r	r	r	-1
2801	0	**E01**	P-motor	-32768 to 32767	0.01 kW	r	r	r	-1
2802	0	**E02**	M-motor (fast)	-32768 to 32767	0.01 Nm	r	r	r	-2
2802	1	**E02**	M-Motor (smoothed)	-32768 to 32767	0.01 Nm	r	r	r	-2
2803	0	**E03**	DC-link-voltage	0 to 32767	0.1 V DC	r	r	r	
2804	0	**E04**	V-motor	0 to 32767	0.1 Veff	r	r	-	-2
2805	0	**E05**	f1-motor	-16384 to 16383	8192 = 100 Hz	r	r	-	
2806	0	**E06**	n-reference value	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	r	r	r	
2807	0	**E07**	n-post-ramp	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	r	r	r	
2808	0	**E08**	n-motor (fast)	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	r	r	r	
2808	1	**E08**	n-motor (smoothed)	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	r	r	r	
2809	0	**E09**	rotor position	-2147483647 to 2147483647	0.001 r	r	r	r	-1
280A	0	**E10**	AE1-level	-8192 to 8191	8192 = 100%	r	r	r	
280B	0	**E11**	AE2-level	-8192 to 8191	8192 = 100%	-	r	r	
280C	0	**E12**	FRG-BE1-BE2-BE3-BE4-BE5	0 to 63		r	r	-	
280D	0	**E13**	FRG-BE1-BE2-BE3-BE4-BE5	0 to 63		r	r	-	
280E	0	**E14**	BE5-frequence ref.value	0 to 32767	8192 = 100%	r	r	-	
280F	0	**E15**	n-encoder	-12000 to 12000	rpm[1]	r	r	-	
2810	0	**E16**	analog-output1-level	0 to 32767	8192 = 100%	-	r	r	
2811	0	**E17**	relay 1	0 to 1		r	r	r	
2812	0	**E18**	BA2	0 to 1		-	-	r	
2812	0	**E18**	relay 2	0 to 1		r	r	-	
2813	0	**E19**	BE15...BE1 & enable	0 to 65535	one Bit for every BE	r	r	r	
2814	0	**E20**	device utilization	0 to 32767	8192 = 100%	r	r	r	
2815	0	**E21**	motor utilization	0 to 32767	8192 = 100%	r	r	r	
2816	0	**E22**	i2t-device	0 to 105	%	r	r	r	
2817	0	**E23**	i2t-motor	0 to 100	%	r	r	r	
2818	0	**E24**	i2t-braking resistor	0 to 100	%	r	r	r	
2819	0	**E25**	device temperature	-128 to 127	°C	r	r	r	
281A	0	**E26**	binary output 1	0 to 1		-	r	r	
281B	0	**E27**	BA15...BA1 & Relais1	0000 to $FFFF_{hex}$	one Bit for every BA	r	r	r	
281C	0	**E28**	analog-output2-level	0 to 32767	8192 = 100%	-	-	r	
281D	0	**E29**	n-ref. value raw	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	r	r	r	
281E	0	**E30**	run time	0 to $FFFF3B3B_{hex}$	h/min/sec	r	r	r	
281F	0	**E31**	enable time	0 to $FFFF3B3B_{hex}$	h/min/sec	r	r	r	
2820	0	**E32**	energy counter	0 to $FFFFFFFF_{hex}$	Wh	r	r	r	
2821	0	**E33**	Vi-max-memorized value	0 to 32767	0.1 V DC	r	r	r	
2822	0	**E34**	I-max-memorized value	0 to 32767	0.1 A	r	r	r	-1
2823	0	**E35**	Tmin-memorized value	-128 to 127	°C	r	r	r	
2824	0	**E36**	Tmax-memorized value	-128 to 127	°C	r	r	r	
2825	0	**E37**	Pmin-memorized value	-32768 to 32767	0.01 kW	r	r	r	
2826	0	**E38**	Pmax-memorized value	-32768 to 32767	0.01 kW	r	r	r	
2828	0 to 9	**E40**	fault type fault 1, - 2, -3, to fault type fault 10	0, 31 to 56		r	r	r	

[1] rpm: For FAS / FDS: Limit value is dependant to the number of poles.

Index (Hex)	Subindex	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
2829	0 to 9	**E41**	fault time fault 1, -2, -3, to fault time fault 10	0 to $FFFF3B3B_{hex}$	h/min/sec	r	r	r	
282D	0	**E45**	control word	0000 to $FFFF_{hex}$		rw	rw	rw	
282E	0	**E46**	status word	0000 to $FFFF_{hex}$		r	r	r	
282F	0	**E47**	n-field-bus	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	rw	rw	rw	
2832	0	**E50**	device byte 0-3 of the String	„FDS“		r	r	r	
2832	1	**E50**	device byte 4-7 of the String	„ 402“		r	r	r	
2832	2	**E50**	device byte 8-11 of the String	„4/B“		r	r	r	
2832	3	**E50**	device b. 12-15 of the String	„ „		r	r	r	
2833	0	**E51**	softw.-ver. b. 0-3 of the String	„V 4.“		r	r	r	
2833	1	**E51**	softw.-ver. b. 4-7 of the String	„5 „		r	r	r	
2833	2	**E51**	softw.-ver. b. 8-11 of t. String	„ „		r	r	r	
2833	3	**E51**	softw.-ver. b. 12-15 of t. String	„ „		r	r	r	
2834	0	**E52**	device-number	8000000 ...		r	r	r	
2835	0	**E53**	variant-number	xxxxxxx		r	r	r	
2836	0	**E54**	option-board	0, 1, 2, ...		r	r	r	
2837	0	**E55**	identity-number	0 to 65535		rw	rw	rw	
2838	0	**E56**	parameter set ident.1	0 to 255		rw	rw	rw	
2839	0	**E57**	parameter set ident.2	0 to 255		rw	rw	rw	
283A	0	**E58**	Kommubox b. 0-3 of the String	„KBX“		r	r	-	
283A	1	**E58**	Kommubox b. 4-7 of the String	„ CAN“		r	r	-	
283A	2	**E58**	Kommubox b. 8-11 of the String	„V 4“		r	r	-	
283A	3	**E58**	Kommubox b. 12-15 of the String	„.5 “		r	r	-	
283B	0	**E59**	FAS with Posi-Upgrade	0 to 2		r	-	-	
283C	0	**E60**	reference value selector	FAS/FDS: 0 to 7 SDS: 0 to 31		r	r	r	
283D	0	**E61**	additional ref.value	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	r	r	r	
283E	0	**E62**	actual M-Max	-32768 to 32767	8192 = 100%	r	r	r	
283F	0	**E63**	PID-controller limit	0 to 1		-	r	r	
2840	0	**E64**	brake	0 to 1		-	-	r	
2841	0	**E65**	PID-error	-32768 to 32767	8192 = 100%	-	r	r	
2847	0	**E71**	AE1 scaled	-32767 to 32767	8192 = 100%	r	r	r	
2848	0	**E72**	AE2 scaled	-32767 to 32767	8192 = 100%	-	r	r	
2849	0	**E73**	AE2 scaled 2	-32767 to 32767	8192 = 100%	--	r	r	
2850	0	**E80**	operating condition	0 to 26		r	r	r	
2851	0	**E81**	event level	0 to 3		r	r	r	
2852	0	**E82**	event name	30 to 56		r	r	r	
2853	0	**E83**	warning time	0 to 255	sec	r	r	r	
2854	0	**E84**	active parameter set	1 to 2		r	r	r	
2855	0	**E85**	not saved	0 to 1		r	r	r	
2864	0	**E100**	statusbits	0 to 4294967295		r	r	r	
2865	0	**E101**	control bits	0 to 4294967295		rw	rw	rw	
2866	0	**E102**	torque-limit	-32767 to 32767	8192 = 100% M-mot-N	rw	rw	rw	
2867	0	**E103**	power-limit	-32767 to 32767	8192 = 100% P-mot-N	rw	rw	rw	
2868	0	**E104**	additional RV	FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	rw	rw	rw	
2869	0	**E105**	RV-factor	-32767 to 32767	8192 = 100%	rw	rw	rw	
286A	0	**E106**	posi.override	0 to 32767	8192 = 100%	rw	rw	rw	
286B	0	**E107**	Posi.Offset	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
286C	0	**E108**	wind. diameter	**G12** to **G13**	mm	rw	rw	rw	
286D	0	**E109**	M-rot.magnet	-32767 to 32767	8192 = 100%	rw	rw	rw	
286E	0	**E110**	analog output	-32767 to 32767	8192 = 100%	rw	rw	rw	
286F	0	**E111**	BA2	0 to 1		rw	rw	rw	
2870	0	**E112**	BA1	0 to 1		rw	rw	rw	
2871	0	**E113**	BA3	0 to 1		rw	rw	rw	
2872	0	**E114**	BA4	0 to 1		rw	rw	rw	

[1] rpm: For FAS / FDS: Limit value is dependant to the number of poles.

Index (Hex)	Subindex	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
2873	0	**E115**	BA5	0 to 1		rw	rw	rw	
2874	0	**E116**	BA6	0 to 1		-	-	rw	
2875	0	**E117**	BA7	0 to 1		-	-	rw	
2876	0	**E118**	analog output2	-32767 to 32767	8192 = 100%	rw	rw	rw	
2877	0	**E119**	reference value	-32767 to 32767	8192 = 100%	rw	rw	rw	
2878	0	**E120**	tension reduction	0 to 8192	8192 = 100%	rw	rw	rw	
2879	0	**E121**	PID-reference	-32767 to 32767	8192 = 100%	rw	rw	rw	
287A	0	**E122**	winder-roller	-32767 to 32767	8192 = 100%	rw	rw	rw	
287B	0	**E123**	sync.offset	2147483648 to -2147483647	°	rw	rw	rw	-4
287C	0	**E124**	start position 1	-2147483647 to 2147483647	**I05** * $10^{\mathbf{I06}}$	rw	rw	rw	
287D	0	**E125**	synchron n-RV	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	rw	rw	rw	
287E	0	**E126**	n-Max	FAS/FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	rw	rw	rw	
287F	0	**E127**	BE-encoder-position	-32767 to 32767	Increments	r	r	r	
2880	0	**E128**	X20-encoder-position	-32767 to 32767	Increments	-	r	r	
2881	0	**E129**	position difference	-32767 to 32767	Increments	-	-	rw	
2882	0	**E130**	Posi-Upgrade orderconf.	0 to 2^{31} -1		r	-	-	
2883	0	**E131**	Posi-Next latched	-2147483648 to 2147483647	**I05** * $10^{\mathbf{I06}}$	rw	rw	rw	-2
2884	0	**E132**	SSI raw value	±16777215	1/4096 r	-	r	r	

Remarks on group **E..** (display values):

- The displays of **E12**, "**E13** FRG-BE1-BE2-BE3-BE4-BE5" for the SDS are not the same as those in the menu of the FAS/FDS. Here, both menus show the levels of all six binary inputs in one bit each. Bit 0 = BE5, Bit1 = BE4, Bit3 = BE3, Bit4 = BE2, Bit5 = BE1, Bit6 = enable.
- "**E30** (run time)," "**E31** (enabled time" and "**E41** (fault time)(1-10)" are indicated in hours, minutes and seconds coded in one number. The hours are shown in the most significant word of the "long" word. The lower word contains the minutes in MSB and the seconds in LSB. (Bytes are sorted on CAN bus in accordance with Intel format (Little-endian.)
- In contrast to the menu of the inverter, fault memory **E40**, **E41** and **E42** be accessed with the CAN bus. The number of the historical fault is specified as subindex for **E40** (fault type) and **E41** (fault time). The total number of faults is not indicated under **E42.** Instead it is indicated in group **Z..** and the coordinate of FDS Tool (i.e., there the coordinate equals the number of the fault).

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
2A00	0/1	**F00**	BA2-function	0 to 31		-	-	rw	
2A00	0/1	**F00**	relay2-function	0 to 31		rw	rw	-	
2A01	0/1	**F01**	brake release	0 to 300	rpm[1]	rw	rw	-	
2A02	0/1	**F02**	brake set	0 to 300	rpm[1]	rw	rw	-	
2A03	0/1	**F03**	BA2 t-on	0, 32, to 5024	msec	-	-	rw	
2A03	0/1	**F03**	relay2 t-on	0, 32, to 5024		rw	rw	-	
2A04	0/1	**F04**	BA2 t-off	0, 32, to 5024	msec	-	-	rw	
2A04	0/1	**F04**	relay2 t-off	0, 32, to 5024		rw	rw	-	
2A05	0/1	**F05**	BA2 invert	0 to 1		-	-	rw	
2A05	0/1	**F05**	relay2 invert	0 to 1		rw	rw	-	
2A06	0/1	**F06**	t-brake release	0 to 5024	msec	rw	rw	rw	
2A07	0/1	**F07**	t-brake set	0 to 5024	msec	rw	rw	rw	
2A08	0/1	**F08**	brake	0 to 1		-	-	rw	
2A0A	0/1	**F10**	relay 1-function	0 to 2		rw	rw	rw	
2A13	0/1	**F19**	quick stop end	0 to 1		rw	rw	rw	
2A14	0/1	**F20**	AE2-function	0 to 14		-	rw	rw	
2A15	0/1	**F21**	AE2-offset	-8192 to 8191	8192 = 100%	-	rw	rw	
2A16	0/1	**F22**	AE2-gain	-32768 to 32767	8192 = 100%	-	rw	rw	
2A17	0/1	**F23**	AE2-lowpass	0 to 10000	msec	-	rw	rw	
2A18	0/1	**F24**	AE2-offset2	-32768 to 32767	8192 = 100%	-	rw	rw	
2A19	0/1	**F25**	AE1-function	0 to 14		rw	rw	rw	
2A1A	0/1	**F26**	AE1-offset	-32768 to 32767	8192 = 100%	rw	rw	rw	
2A1B	0/1	**F27**	AE1-gain	-32768 to 32767	8192 = 100%	rw	rw	rw	
2A1E	0/1	**F30**	BE-logic	0 to 1		rw	rw	rw	
2A1F	0/1	**F31**	BE1-function	0 to 32		rw	rw	rw	

[1] rpm: For FAS / FDS: Limit value is dependant to the number of poles.

15. Parameter list

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
2A20	0/1	**F32**	BE2-function	0 to 32		rw	rw	rw	
2A21	0/1	**F33**	BE3-function	0 to 32		rw	rw	rw	
2A22	0/1	**F34**	BE4-function	0 to 32		rw	rw	rw	
2A23	0/1	**F35**	BE5-function	0 to 32		rw	rw	rw	
2A24	0/1	**F36**	BE-increments	30 to 4096	l/r	rw	rw	rw	
2A25	0/1	**F37**	fmax frequency-ref.value	30 to 512	0.1 kHz	rw	rw	-	
2A26	0/1	**F38**	quick stop	0 to 2		rw	rw	rw	
2A27	0/1	**F39**	X20-increments	30 to 4096	l/r	-	-	-	
2A28	0/1	**F40**	analog-output1-function	0 to 11		-	rw	rw	
2A29	0/1	**F41**	analog-output1-offset	-819 to 819	8192 = 100%	-	rw	rw	
2A2A	0/1	**F42**	analog-output1-gain	-32768 to 32767	8192 = 100%	-	rw	rw	
2A2B	0/1	**F43**	analog-output1-absolut	0 to 1		-	rw	rw	
2A2D	0/1	**F45**	analog-output2-function	0 to 8	8192 = 100%	-	-	rw	
2A2E	0/1	**F46**	analog-output2-offset	-819 to 819	8192 = 100%	-	-	rw	
2A2F	0/1	**F47**	analog-output2-gain	-32768 to 32767	8192 = 100%	-	-	rw	
2A31	0/1	**F49**	BE-gear ratio	0 to 32767	0.001	-	rw	rw	
2A33	0/1	**F51**	BE1-invert	0 to 1		rw	rw	rw	
2A34	0/1	**F52**	BE2-invert	0 to 1		rw	rw	rw	
2A35	0/1	**F53**	BE3-invert	0 to 1		rw	rw	rw	
2A36	0/1	**F54**	BE4-invert	0 to 1		rw	rw	rw	
2A37	0/1	**F55**	BE5-invert	0 to 1		rw	rw	rw	
2A3C	0/1	**F60**	BE6-function	0 to 32		-	rw	rw	
2A3D	0/1	**F61**	BE7-function	0 to 32		-	rw	rw	
2A3E	0/1	**F62**	BE8-function	0 to 32		-	rw	rw	
2A3F	0/1	**F63**	BE9-function	0 to 32		-	rw	rw	
2A40	0/1	**F64**	BE10-function	0 to 32		-	rw	rw	
2A41	0/1	**F65**	BE11-function	0 to 32		-	rw	rw	
2A42	0/1	**F66**	BE12-function	0 to 32		-	rw	rw	
2A43	0/1	**F67**	BE13-function	0 to 32		-	rw	rw	
2A44	0/1	**F68**	BE14-function	0 to 32		-	rw	rw	
2A46	0/1	**F70**	BE6-invert	0 to 1		-	rw	rw	
2A47	0/1	**F71**	BE7-invert	0 to 1		-	rw	rw	
2A48	0/1	**F72**	BE8-invert	0 to 1		-	rw	rw	
2A49	0/1	**F73**	BE9-invert	0 to 1		-	rw	rw	
2A4A	0/1	**F74**	BE10-invert	0 to 1		-	rw	rw	
2A4B	0/1	**F75**	BE11-invert	0 to 1		-	rw	rw	
2A4C	0/1	**F76**	BE12-invert	0 to 1		-	rw	rw	
2A4D	0/1	**F77**	BE13-invert	0 to 1		-	rw	rw	
2A4E	0/1	**F78**	BE14-invert	0 to 1		-	rw	rw	
2A50	0/1	**F80**	BA1-function	1 to 32		-	rw	rw	
2A51	0/1	**F81**	Relay2-function	1 to 32		rw	rw	-	
2A51	0/1	**F81**	BA2-function	0 to 32		-	-	rw	
2A52	0/1	**F82**	BA3-function	1 to 32		-	rw	rw	
2A53	0/1	**F83**	BA4-function	1 to 32		-	rw	rw	
2A54	0/1	**F84**	BA5-function	1 to 32		-	rw	rw	
2A55	0/1	**F85**	BA6-function	1 to 32		-	-	rw	
2A56	0/1	**F86**	BA7-function	1 to 32		-	-	rw	

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
2C00	0/1	**G00**	PID-controller	0 to 1		-	rw	rw	
2C01	0/1	**G01**	PID-controller Kp	0 to 1000	0.1	-	rw	rw	
2C02	0/1	**G02**	PID-controller Ki	0 to 1000	0.01	-	rw	rw	
2C03	0/1	**G03**	PID-controller Kd	0 to 1000	1msec	-	rw	rw	
2C04	0/1	**G04**	PID-controller limit	0 to 32767	8192 = 100%	-	rw	rw	
2C05	0/1	**G05**	PID-controller limit2	-32768 to 32767	8192 = 100%	-	rw	rw	
2C06	0/1	**G06**	PID-controller Kp2	0 to 1000	0.01	-	rw	rw	
2C0A	0/1	**G10**	winding operation	0 to 2		-	rw	rw	
2C0B	0/1	**G11**	diameter	0 to 2		-	rw	rw	
2C0C	0/1	**G12**	min.winding diameter	10 to 3000	mm	-	rw	rw	
2C0D	0/1	**G13**	max.winding diameter	10 to 3000	mm	-	rw	rw	

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
2C0E	0/1	**G14**	begin.winding diameter	10 to 3000	mm	-	rw	rw	
2C0F	0/1	**G15**	overdrive ref.value	FDS: -12000 to 12000 SDS: -6000 to 6000	rpm[1]	-	rw	rw	
2C10	0/1	**G16**	diam.calculator ramp	0 to 32767	0.01 mm/sec	-	rw	rw	
2C11	0/1	**G17**	tension reduction	0 to 100	%	-	rw	rw	
2C13	0/1	**G19**	actual winding diameter	0 to 3000	mm	-	r	r	
2C14	0/1	**G20**	electronic gear	0 to 3		-	rw	rw	
2C15	0/1	**G21**	speed master	1 to 2147483647		-	rw	rw	
2C16	0/1	**G22**	speed slave	1 to 2147483647		-	rw	rw	
2C17	0/1	**G23**	Kp synchron	0 to 100	1 / sec	-	rw	rw	
2C18	0/1	**G24**	max.synchron difference	0 to 30000	°	-	rw	rw	
2C19	0/1	**G25**	synchron reset	0 to 3		-	rw	rw	
2C1A	0/1	**G26**	n-correction-Max.	FDS: 0 to 12000 SDS: 0 to 6000	rpm[1]	-	rw	rw	
2C1B	0/1	**G27**	synchronous encoder	FDS: 0 to 1 SDS: 0 to 2		-	rw	rw	
2C1C	0/1	**G28**	n-Master	FDS: -12000 to 12000 SDS: 0 to 6000	rpm[1]	-	r	r	
2C1D	0/1	**G29**	synchron difference	2147483648 to -2147483647	°	-	r	r	-4
2C1E	0/1	**G30**	speed feed forward	0 to 100	%	-	rw	rw	
2C1F	0/1	**G31**	reference direction	0 to 1		-	rw	rw	
2C20	0/1	**G32**	reference speed fast	0 to 12000	rpm[1]	-	rw	rw	
2C21	0/1	**G33**	reference speed slow	0 ... 12000	rpm[1]	-	rw	rw	
2C23	0/1	**G35**	ref.encoder signal 0	0 to 1		-	rw	rw	
2C26	0/1	**G38**	synchronous offset	-2147483648 to 2147483647	0.1 °	-	rw	rw	
2C28	0/1	**G40**	static friction torque	0 to 32767	0.01 Nm	-	rw	rw	
2C29	0/1	**G41**	dynamic friction torque	0 to 32767	0.01 Nm	-	rw	rw	
2C2A	0/1	**G42**	T-dyn lowpass	0 to 10000	msec	-	rw	rw	

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
2E14	0/1	**H20**	X20-function	FDS: 0 to 5 SDS: 0 to 4		-	rw	rw	
2E15	0/1	**H21**	encodersim. increments	0 to 4		-	rw	rw	
2E16	0/1	**H22**	X20-increments	30 to 4096		-	rw	rw	
2E17	0/1	**H23**	X20-gear ratio	0 to 32767	0.001	-	rw	rw	
2E18	0/1	**H24**	X20-zeroPos.	0 to 3600	0.1°	-	rw	rw	
2E1F	0/1	**H31**	resolver poles	2, 4, to 16		-	-	rw	
2E20	0/1	**H32**	commutation-offset	0 to 3600	0.1 ° elec.	-	-	rw	
2E28	0/1	**H40**	X41-function	0 to 3		-	-	rw	
2E29	0/1	**H41**	X41-increments	30 to 4096		-	-	rw	
2E2A	0/1	**H42**	X41-gear ratio	0 to 32767	0.001	-	-	rw	
2E3C	0/1	**H60**	SSI-invert	0 to 1		-	rw	rw	
2E3D	0/1	**H61**	SSI-coding	0 to 1		-	rw	rw	
2E3E	0/1	**H62**	SSI-data bits	24 to 25		-	rw	rw	

Index (Hex)	Subindex	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
3000	0	**I00**	position range	0 to 1		rw	rw	rw	
3001	0	**I01**	circular length	0 to 2147483647	**I05** * $10^{\mathbf{I06}}$	rw	rw	rw	
3002	0	**I02**	posi.encoder	FDS: 0 to 2 SDS: 0 to 3		-	rw	rw	
3003	0	**I03**	direction optimization	0 to 1		rw	rw	rw	
3004	0	**I04**	move direction	0 to 2		rw	rw	rw	
3005	0	**I05**	measure unit selection	0 to 4		rw	rw	rw	
3006	0	**I06**	decimal digits	0 to 3		rw	rw	rw	
3007	0	**I07**	way/revolution numerator	1 to 2147483647	**I05** * $10^{\mathbf{I06}}$	rw	rw	rw	
3008	0	**I08**	way/revolution denomin.	1 to 2147483647	**I05** * $10^{\mathbf{I06}}$	rw	rw	rw	
3009	0	**I09**	measurement unit	xxxx		rw	rw	rw	

[1] rpm: For FAS / FDS: Limit value is dependant to the number of poles.

15. Parameter list

Index (Hex)	Subindex	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
300A	0	**I10**	max.speed	0 to 2147483647	**I05**/sec * 10^{I06}	rw	rw	rw	
300B	0	**I11**	max.acceleration	0 to 2147483647	**I05**/sec² * 10^{I06}	rw	rw	rw	
300C	0	**I12**	tip speed	0 to 2147483647	**I05**/sec * 10^{I06}	rw	rw	rw	
300F	0	**I15**	accel-override	0 to 1		rw	rw	rw	
3010	0	**I16**	S-ramp	0 to 32767	msec	rw	rw	rw	
3013	0	**I19**	ENA-interrupting	0 to 1		rw	rw	rw	
3014	0	**I20**	Kv-factor	0 to 100		rw	rw	rw	
3015	0	**I21**	max.following error	0 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3016	0	**I22**	target window	0 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3017	0	**I23**	dead band pos. control.	0 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3019	0	**I25**	speed feed forward	0 to 8192	8192 = 100%	rw	rw	rw	
301E	0	**I30**	reference mode	0 to 4		rw	rw	rw	
301F	0	**I31**	reference direction	0 to 1		rw	rw	rw	
3020	0	**I32**	reference speed fast	0 to 2147483647	**I05**/sec * 10^{I06}	rw	rw	rw	
3021	0	**I33**	reference speed slow	0 to 2147483647	**I05**/sec * 10^{I06}	rw	rw	rw	
3022	0	**I34**	reference position	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3023	0	**I35**	ref.encoder signal 0	0 to 1		rw	rw	rw	
3024	0	**I36**	continuous reference	0 to 1		rw	rw	rw	
3025	0	**I37**	power-on reference	0 to 2		rw	rw	rw	
3026	0	**I38**	reference block	FAS/FDS: 0 to 8 SDS: 0 to 32		rw	rw	rw	
3028	0	**I40**	posi.-step memory	0 to 1		rw	rw	rw	
3032	0	**I50**	software-stop -	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3033	0	**I51**	software-stop +	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
303C	0	**I60**	electronic cam 1 begin	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
303D	0	**I61**	electronic cam 1 end	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3046	0	**I70**	position-offset	0 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3050	0	**I80**	actual position	-2147483647 to 2147483647	**I05** * 10^{I06}	r	r	r	-2
3051	0	**I81**	target position	-2147483647 to 2147483647	**I05** * 10^{I06}	r	r	r	-2
3052	0	**I82**	active process block	FAS/FDS: 0 to 8 SDS: 0 to 32		r	r	r	
3053	0	**I83**	selected process block	FAS/FDS: 0 to 8 SDS: 0 to 32		r	r	r	
3054	0	**I84**	following error	-2147483647 to 2147483647	**I05** * 10^{I06}	r	r	r	-2
3055	0	**I85**	in position	0 to 1		r	r	r	
3056	0	**I86**	referenced	0 to 1		r	r	r	
3057	0	**I87**	electronic cam 1	0 to 1		r	r	r	
3058	0	**I88**	speed	-2147483647 to 2147483647	**I05**/sec * 10^{I06}	r	r	r	-2
305A	0	**I90**	switchmemory 1	0 to 1		r	r	r	
305B	0	**I91**	switchmemory 2	0 to 1		r	r	r	
305C	0	**I92**	switchmemory 3	0 to 1		r	r	r	

The **POSIDYN**® SDS 4000 servo inverter supports 32 process blocks. The **POSIDRIVE**® FAS/FDS 4000 frequency inverter supports eight process blocks.
All devices have the same parameters and the same access to these parameters for these first eight process blocks. (These parameters are accessed via Index $320A_{hex}$ to Index 3258_{hex} for **J10** to **J88** and via Index $360A_{hex}$ to Index 3652_{hex} for **L10** to **L82**). Here you will notice that there is an easy-to-remember relationship between the menu coordinates on the device and the values for the subindex.
In addition, there is another type of addressing for all 32 process blocks of the SDS. The process block number is used as the subindex, and each element of a process block has one of the Indizes 5410_{hex} to $541C_{hex}$.

List of the **J..** parameters which are not assigned to any process block:

Index (Hex)	Subindex	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
3200	0	**J00**	posi.start	0 to 1 (set 1 for start)		rs	rs	rs	
3200	1	**J00**	result posi.start	0 to 26		r	r	r	
3201	0	**J01**	posi.step	0 to 1 (set 1 for start)		rs	rs	rs	
3201	1	**J01**	result posi step	0 to 26		r	r	r	
3202	0	**J02**	process block number	FDS: 0 to 8 SDS: 0 to 32		rw	rw	rw	
3204	0	**J04**	teach-in	0 to 1 (set 1 for start)		rs	rs	rs	
3204	1	**J04**	result teach-in	0 to 26		r	r	r	

Index (Hex)	Subindex	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
3205	0	**J05**	start reference	0 to 1 (set 1 for start)		rs	rs	rs	
3205	1	**J05**	result start reference	0 to 26		r	r	r	

List of the **J..** parameters for the first eight process blocks organized by FAS / FDS-compatible type of addressing:

Index (Hex)	Sub-index	Coordinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
320A	0	**J10**	position	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
320B	0	**J11**	position mode	0 to 3		rw	rw	rw	
320C	0	**J12**	speed	0 to 2147483647	**I05** / sec * 10^{I06}	rw	rw	rw	
320D	0	**J13**	accel	0 to 2147483647	**I05** / sec² * 10^{I06}	rw	rw	rw	
320E	0	**J14**	decel	0 to 2147483647	**I05** / sec² * 10^{I06}	rw	rw	rw	
320F	0	**J15**	repeat number	0 to 254		rw	rw	rw	
3210	0	**J16**	next block	FAS/FDS: 0 to 8 SDS: 0 to 32		rw	rw	rw	
3211	0	**J17**	next start	0 to 4		rw	rw	rw	
3212	0	**J18**	delay	0 to 65535	msec	rw	rw	rw	
3214 ... 321C	0	**J20 to J28**	position ... delay	see process block 1		rw	rw	rw	
321E ... 3226	0	**J30 to J38**	position ... delay	see process block 1		rw	rw	rw	
3228 ... 3230	0	**J40 to J48**	position ... delay	see process block 1		rw	rw	rw	
3232 ... 323A	0	**J50 to J58**	position ... delay	see process block 1		rw	rw	rw	
323C ... 3244	0	**J60 to J68**	position ... delay	see process block 1		rw	rw	rw	
3246 ... 324D	0	**J70 to J78**	position ... delay	see process block 1		rw	rw	rw	
3250 ... 3258	0	**J80 to J88**	position ... delay	see process block 1		rw	rw	rw	

List of the parameters of all 32 process blocks organized by the new type of addressing **(only for SDS)**:

Index (Hex)	Subindex = Nummer des Fahrsatzes	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
5410	1, 2, ..., 31, 32	**Jxx0**	position	-2147483647 to 2147483647	**I05** * 10^{I06}	-	-	rw	
5411	1, 2, ..., 31, 32	**Jxx1**	position mode	0 to 3		-	-	rw	
5412	1, 2, ..., 31, 32	**Jxx2**	speed	0 to 2147483647	**I05** / sec * 10^{I06}	-	-	rw	
5413	1, 2, ..., 31, 32	**Jxx3**	accel	0 to 2147483647	**I05** / sec² * 10^{I06}	-	-	rw	
5414	1, 2, ..., 31, 32	**Jxx4**	decel	0 to 2147483647	**I05** / sec² * 10^{I06}	-	-	rw	
5415	1, 2, ..., 31, 32	**Jxx5**	repeat number	0 to 254		-	-	rw	
5416	1, 2, ..., 31, 32	**Jxx6**	next block	0 to 32		-	-	rw	
5417	1, 2, ..., 31, 32	**Jxx7**	next start	0 to 4		-	-	rw	
5418	1, 2, ..., 31, 32	**Jxx8**	delay	0 to 65535	msec	-	-	rw	
541A	1, 2, ..., 31, 32	**Lxx0**	brake	0 to 1		-	-	rw	
541B	1, 2, ..., 31, 32	**Lxx1**	switch A	0 to 4		-	-	rw	
541C	1, 2, ..., 31, 32	**Lxx2**	switch B	0 to 4		-	-	rw	

The parameters of the **K..** group are commentary texts which are only visible in the FDS-Tool. With FDS Tool, commentary texts can be entered, saved and printed to provide extra information on a configuration. Parameters **K00** to **K03** (PNU 1200 to 1203) have default values and can be overwritten if necessary. Together they represent the configuration information (name of the clerk, file name and date of the FDS file). The parameter **K00** (P-user) can be changed via fieldbus.

Index (Hex)	Subindex	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
3400	0	**K00**	P-user B0-3	" VOR"		rw	rw	rw	
3400	0	**K00**	P-user B4-7	"NAME"		rw	rw	rw	
3400	0	**K00**	P-user B8-11	"and"		rw	rw	rw	
3400	0	**K00**	P-user B12-15	"NAME"		rw	rw	rw	
3401	0	**K01**	P-Date B0-3	"24.0"		rw	rw	rw	
3401	0	**K01**	P-Date B4-7	"2.20"		rw	rw	rw	

Index (Hex)	Subindex	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
3401	0	**K01**	P-Date B8-11	"00 "		rw	rw	rw	
3401	0	**K01**	P-Date B12-15	" "		rw	rw	rw	
3402	0	**K02**	P-filename B0-3	"TEST"		rw	rw	rw	
3402	0	**K02**	P- filename B4-7	"1234"		rw	rw	rw	
3402	0	**K02**	P- filename B8-11	".FDS"		rw	rw	rw	
3402	0	**K02**	P- filename B12-15	" "		rw	rw	rw	

List of the **L..** parameters for the first eight process blocks organized by FAS / FDS-compatible type of addressing:

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
360A	0	**L10**	brake	0 to 1		rw	rw	rw	
360B	0	**L11**	switch A	0 to 4		rw	rw	rw	
360C	0	**L12**	switch B	0 to 4		rw	rw	rw	
3614	0	**L20**	brake	0 to 1		rw	rw	rw	
3615	0	**L21**	switch A	0 to 4		rw	rw	rw	
3616	0	**L22**	switch B	0 to 4		rw	rw	rw	
361E	0	**L30**	brake	0 to 1		rw	rw	rw	
361F	0	**L31**	switch A	0 to 4		rw	rw	rw	
3620	0	**L32**	switch B	0 to 4		rw	rw	rw	
3628	0	**L40**	brake	0 to 1		rw	rw	rw	
3629	0	**L41**	switch A	0 to 4		rw	rw	rw	
362A	0	**L42**	switch B	0 to 4		rw	rw	rw	
3632	0	**L50**	brake	0 to 1		rw	rw	rw	
3633	0	**L51**	switch A	0 to 4		rw	rw	rw	
3634	0	**L52**	switch B	0 to 4		rw	rw	rw	
363C	0	**L60**	brake	0 to 1		rw	rw	rw	
363D	0	**L61**	switch A	0 to 4		rw	rw	rw	
363E	0	**L62**	switch B	0 to 4		rw	rw	rw	
3646	0	**L70**	brake	0 to 1		rw	rw	rw	
3647	0	**L71**	switch A	0 to 4		rw	rw	rw	
3648	0	**L72**	switch B	0 to 4		rw	rw	rw	
3650	0	**L80**	brake	0 to 1		rw	rw	rw	
3651	0	**L81**	switch A	0 to 4		rw	rw	rw	
3652	0	**L82**	switch B	0 to 4		rw	rw	rw	

Index (Hex)	Subindex	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Roun ding
						FAS	FDS	SDS	
3832	0	**M50**	F1-jump to	0 to 0x1A*63*	1. byte 1=group **A**, ... *2. byte* *00..99 numbers in group*	rw	rw	rw	
3833	0	**M51**	F1-lower limit	-2147483647 to 2147483647	scaling see parameter	rw	rw	rw	
3834	0	**M52**	F1-upper limit	-2147483647 to 2147483647		rw	rw	rw	
383C	0	**M60**	F2-jump to	0 to 0x1A*63*	s. **M50**	rw	rw	rw	
383D	0	**M61**	F2-lower limit	-2147483647 to 2147483647	scaling see parameter	rw	rw	rw	
383E	0	**M62**	F2-upper limit	-2147483647 to 2147483647		rw	rw	rw	
3846	0	**M70**	F3-jump to	0 to 0x1A*63*	s. **M50**	rw	rw	rw	
3847	0	**M71**	F3-lower limit	-2147483647 to 2147483647	scaling see parameter	rw	rw	rw	
3848	0	**M72**	F3-upper limit	-2147483647 to 2147483647		rw	rw	rw	
3850	0	**M80**	F4-jump to	0 to 0x1 A*63*	s. **M50**	rw	rw	rw	
3851	0	**M81**	F4-lower limit	-2147483647 to 2147483647	scaling see parameter	rw	rw	rw	
3852	0	**M82**	F4-upper limit	-2147483647 to 2147483647		rw	rw	rw	

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
3A0A	0	**N10**	s1-position	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3A0B	0	**N11**	s1-method	0 to 2		rw	rw	rw	
3A0C	0	**N12**	s1-memory1	0 to 3		rw	rw	rw	
3A0D	0	**N13**	s1-memory2	0 to 3		rw	rw	rw	
3A0E	0	**N14**	s1-memory3	0 to 3		rw	rw	rw	
3A14	0	**N20**	s2-position	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3A15	0	**N21**	s2-method	0 to 2		rw	rw	rw	
3A16	0	**N22**	s2-memory1	0 to 3		rw	rw	rw	
3A17	0	**N23**	s2-memory2	0 to 3		rw	rw	rw	
3A18	0	**N24**	s2-memory3	0 to 3		rw	rw	rw	
3A1E	0	**N30**	s3-position	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3A1F	0	**N31**	s3-method	0 to 2		rw	rw	rw	
3A20	0	**N32**	s3-memory1	0 to 3		rw	rw	rw	
3A21	0	**N33**	s3-memory2	0 to 3		rw	rw	rw	
3A22	0	**N34**	s3-memory3	0 to 3		rw	rw	rw	
3A28	0	**N40**	s4-position	-2147483647 to 2147483647	**I05** * 10^{I06}	rw	rw	rw	
3A29	0	**N41**	s4-method	0 to 2		rw	rw	rw	
3A2A	0	**N42**	s4-memory1	0 to 3		rw	rw	rw	
3A2B	0	**N43**	s4-memory2	0 to 3		rw	rw	rw	
3A2C	0	**N44**	s4-memory3	0 to 3		rw	rw	rw	

The parameters of the **U..** group are also not visible in the menu of the inverter. They can only be specified via fieldbus and by FDS Tool:
Reactions of the inverter to events can be manipulated by the U.. parameters.

0: Off; No reaction to the event
1: Message; The event is indicated in plain text (see Ux2 text) on Controlbox or on the display of the FDS.
2: Warning; When it occurs, the event is indicated as under "*1:Message*." After a tolerance time expires (Ux1), the inverter assumes malfunction status.
3*: Fault;* When it occurs, the event is indicated as under "*1:Message*." The inverter immediately assumes malfunction status.

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
4800	0	**U00**	level low voltage	2 to 3		rw	rw	rw	
4801	0	**U01**	time low voltage	1 to 10	sec	rw	rw	rw	
4802	0	**U02**	level low voltage device i2t	0 to 3		-	-	rw	
4803	0	**U03**	time low voltage device i2t	1 to 120	sec	-	-	rw	
480A	0	**U10**	level temp.limit mot.i2t	0 to 2		rw	rw	rw	
480B	0	**U11**	time temp.limit mot.i2t	1 to 120	sec	rw	rw	rw	
4814	0	**U20**	level drive overload	0 to 3		rw	rw	rw	
4815	0	**U21**	time drive overload	1 to 120	sec	rw	rw	rw	
4816	0	**U22**	text drive overload	xxxx		rw	rw	rw	
481E	0	**U30**	level accelerat.overload	0 to 3		rw	rw	rw	
481F	0	**U31**	time accelerat.overload	1 to 10	sec	rw	rw	rw	
4820	0	**U32**	text accelerat.overload	xxxx		rw	rw	rw	
4828	0	**U40**	level break overload	0 to 3		rw	rw	rw	
4829	0	**U41**	time break overload	1 to 10	sec	rw	rw	rw	
482A	0	**U42**	text break overload	xxxx		rw	rw	rw	
4832	0	**U50**	level operating range	0 to 3		rw	rw	rw	
4833	0	**U51**	time operating range	1 to 120		rw	rw	rw	
4834	0	**U52**	text operating range	xxxx		rw	rw	rw	
483C	0	**U60**	level following error	0 to 3		rw	rw	rw	
483D	0	**U61**	time following error	0 to 32767	msec	rw	rw	rw	
4846	0	**U70**	level posi.refused	0 to 3		rw	rw	rw	

The indications for the number of faults are located in group **Z..** as with FDS Tool. They can be viewed in the inverter menu with **E42**.

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
521F	0	**Z31**	short circuit/to ground	0 to 65535		r	r	r	
5220	0	**Z32**	short circ./toGround int	0 to 65535		r	r	r	
5221	0	**Z33**	overcurrent	0 to 65535		r	r	r	
5222	0	**Z34**	hardware fault	0 to 65535		r	r	r	

Index (Hex)	Subindex Pset 1/2	Coor-dinate	Name	Value Range	Scaling / Unit	Access			Round ing
						FAS	FDS	SDS	
5223	0	**Z35**	watchdog	0 to 65535		r	r	r	
5224	0	**Z36**	high voltage	0 to 65535		r	r	r	
5225	0	**Z37**	n-feedback	0 to 65535		r	r	r	
5226	0	**Z38**	temp.limit device sensor	0 to 65535		r	r	r	
5227	0	**Z39**	temp.limit device i2t	0 to 65535		r	r	r	
5228	0	**Z40**	invalid data	0 to 65535		r	r	r	
5229	0	**Z41**	temp.limit motor TMP	0 to 65535		r	r	r	
522A	0	**Z42**	temp.limit motor resist.	0 to 65535		r	r	r	
522B	0	**Z43**	line break ref.value	0 to 65535		r	r	r	
522C	0	**Z44**	extern fault	0 to 65535		r	r	r	
522D	0	**Z45**	temp.limit motor i2t	0 to 65535		r	r	r	
522E	0	**Z46**	low voltage	0 to 65535		r	r	r	
522F	0	**Z47**	drive overload	0 to 65535		r	r	r	
5230	0	**Z48**	acceleration overload	0 to 65535		r	r	r	
5231	0	**Z49**	deceleration overload	0 to 65535		r	r	r	
5232	0	**Z50**	operating range	0 to 65535		r	r	r	
5233	0	**Z51**	posi.refused	0 to 65535		r	r	r	
5234	0	**Z52**	communication	0 to 65535		r	r	r	
5235	0	**Z53**	stop input	0 to 65535		r	r	r	
5236	0	**Z54**	following error	0 to 65535		r	r	r	
5237	0	**Z55**	option-board	0 to 65535		r	r	r	
5238	0	**Z56**	overspeed	0 to 65535		r	r	r	

16 LIST OF RELATED LITERATURE

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17 GLOSSARY

Baud rate	Transmission speed in bits per second
Bus address	Address of the inverter on the CAN bus
Bus termination	Terminating resistors on the ends of the bus prevent interference.
CAL	CAN Application Layer,
CAN	Controller Area Network,
CANopen	A communication and device profile based on CAL,
CiA	user organization „CAN in Automation“
CiA/DS-xxx	Profile of CiA with standardized communication definitions
Client	CANopen master starts communication job (service).
COB	Communication object corresponds to network-wide SDO, PDO, ...
COB-ID	Communication object identifier is the identifier of a CAN message
Control word	For controlling the device
Device states	Possible states of an inverter (turned on, operational, ...)
DRIVECOM	User organization of Interbus-S
DRIVECOM profile 21	Communication profile for drive technology
EDS	Electronic Data Sheet = device description file for CANopen Configuration tools
EMC	ElectroMagnetic Compatibility
EMERGENCY service	Inverter sends message with fault report.
FAS	Designation of STÖBER **POSIDRIVE®** FAS 4000 frequency inverter
FBS	Designation of single-phase STÖBER **POSIDRIVE®** FDS 4000 frequency inverter
FDS	Designation of three-phase STÖBER **POSIDRIVE®** FDS 4000 frequency inverter
HLG	Startup encoder, corresponds to ramp function generator
Identifier	Specifies the destination object of a CAN message
Index	Parameter index number
Intel Format	Byte format, most significant byte has higher address.
ISO	International Standardization Organization
LSB	Least Significant Byte
LSW	Least Significant Word
MSB	Most Significant Byte
MSW	Most Significant Word
NMT	Network Management
Node	Station on CAN bus in acc. w. CANopen
PDO service	Service for transmitting Process Data Objects
Process data	Rapidly changing data for control of inverter
SDS	Designation of STÖBER **POSIDYN®** SDS 4000 servo inverter
SDO service	Service for transmitting Service Data Objects
Station	Station on CAN bus in acc. w. CANopen
Status word	For reading the device status
Server	CANopen slave (FAS/FDS/SDS) answers communication job (service)
Subindex	Extra identification number in addition to the index, for parameter selection
SYNC	Synchronization of CAN master to all slaves
Terminating resistance	124 Ω resistance at the ends of the CAN bus
X1	Control terminals on the inverters FAS / FDS and SDS
X3	Sub D plug connector for connection cable to PC (for SDS with CAN)

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