USS

Operation manual

V 5.6-H or later

09/2013   en

STÖBER

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1 Introduction

1.1 Purpose of the manual

This manual has information on the connection of POSIDRIVE® MDS 5000 and POSIDRIVE® FDS 5000 to the USS fieldbus system. In addition, the structure of the USS and the main procedures are explained.

The manual helps you to:

*   familiarize yourself with the basics of USS communication.
*   support you when designing an application and projecting communication.

1.2 Readers

Users who are familiar with the control of drive systems and have a knowledge of commissioning inverter systems are the target group of this manual.

1.3 Other manuals

The documentation of the MDS 5000 includes the following manuals:

Manual	Contents	ID	Latest version[a]
Commissioning Instructions	Reinstallation, replacement, function test	442297	V 5.6-H
Projecting manual	Installation and connection	442273	V 5.6-H
Operating manual	Set up the inverter	442285	V 5.6-H

a) At the time of publication. You can find all versions at www.stoeber.de > Products > Doc Center.

The documentation of the FDS 5000 includes the following manuals:

Manual	Contents	ID	Latest version[a]
Commissioning Instructions	Reinstallation, replacement, function test	442293	V 5.6-H
Projecting manual	Installation and connection	442269	V 5.6-H
Operating manual	Set up the inverter	442281	V 5.6-H

a) At the time of publication. You can find all versions at www.stoeber.de > Products > Doc Center.

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1.4 Further support

If you have technical questions that are not answered by this document, please contact:
- Phone: +49 7231 582-3060
- E-mail: applications@stoeber.de

If you have questions about the documentation, please contact:
- E-mail: electronics@stoeber.de

If you have questions about training sessions, please contact:
- E-mail: training@stoeber.de

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2 Notes on Safety

The devices may cause risks. For these reasons, comply with the following:
- The safety notes listed in the following sections and points
- The technical rules and regulations.

In addition, always read the appropriate documentation. STÖBER ANTRIEBSTECHNIK GmbH + Co. KG accepts no liability for damages caused by non-adherence to the instructions or applicable regulations. Subject to technical changes to improve the devices without prior notice. This documentation is purely a product description. It does not represent promised properties in the sense of warranty law.

2.1 Component part of the product

The technical documentation is a component part of a product.

- Since the technical documentation contains important information, always keep it handy in the vicinity of the device until the machine is disposed of.
- If the product is sold, disposed of, or rented out, always include the technical documentation with the product.

2.2 Operation in accordance with its intended use

The option for the USS connection is only intended for establishing communication between devices from the 5th generation of STÖBER inverters and a USS network.
Improper use includes integration in other communication networks.

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2.3   Qualified personnel

Since the devices may harbor residual risks, all configuration, transportation, installation and commissioning tasks including operation and disposal may only be performed by trained personnel who are aware of the possible risks. Personnel must have the qualifications required for the job. The following table lists examples of occupational qualifications for the jobs:

Activity	Possible occupational qualifications
Transportation and storage	Worker skilled in storage logistics or comparable training
Configuration	- Graduate engineer (electro-technology or electrical power technology) - Technician (m/f) (electro-technology)
Installation and connection	Electronics technician (m/f)
Commissioning (of a standard application)	- Technician (m/f) (electro-technology) - Master electro technician (m/f)
Programming	Graduate engineer (electro-technology or electrical power technology)
Operation	- Technician (m/f) (electro-technology) - Master electro technician (m/f)
Disposal	Electronics technician (m/f)

Tab. 2-1: examples of occupational qualifications

In addition, the valid regulations, the legal requirements, the reference books, this technical documentation and, in particular, the safety information contained therein must be carefully

- read
- understood and
- complied with

2.4   Transportation and storage

Inspect the delivery for any transport damage immediately after you receive it. Notify any damage to the transport company immediately. Do not operate the product if damaged. Store the device in a dry and dust-free room if you do not install it immediately

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2.5 Installation and connection

The accessory installation instructions allow the following actions during the installation of accessories:

• The housing in the upper slot can be opened.

Opening the housing in another place or for other purposes is not permitted.

Installation and connection work are only permitted after the device has been isolated from the power!

Apply the 5 safety rules in the order stated before performing any work on the machine:

1. Enable. Also enable the auxiliary circuits.
2. Secure against restart.
3. Check that voltage is not present.
4. Earth and short circuit.
5. Cover adjacent live parts.

> **Information**
> Note that the discharge time of the DC link capacitors is 5 minutes. You can only determine the absence of voltage after this time period.

Afterwards you can carry out the work.

2.6 Service

Repairs must only be performed by STÖBER ANTRIEBSTECHNIK GmbH + Co. KG. Send faulty devices with a fault description to:

STÖBER ANTRIEBSTECHNIK GmbH + Co. KG
Abteilung VS-EL
Kieselbronner Str.12
75177 Pforzheim, Germany
GERMANY

2.7 Disposal

Please comply with the latest national and regional regulations! Dispose of the individual parts separately depending on their nature and currently valid regulations such as, for example:

• Electronic scrap (PCBs)
• Plastic
• Sheet metal
• Copper
• Aluminum

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2.8 Presentation of notes on safety

NOTICE

Notice

means that property damage may occur

▶ if the stated precautionary measures are not taken.

⚠ **CAUTION!**

Caution

with warning triangle means that minor injury may occur

▶ if the stated precautionary measures are not taken.

⚠ **WARNING!**

Warning

means that there may be a serious danger of death

▶ if the stated precautionary measures are not taken.

⚠ **DANGER!**

Danger

means that serious danger of death exists

▶ if the stated precautionary measures are not taken.

Information
indicates important information about the product or a highlighted portion of the documentation which requires special attention.

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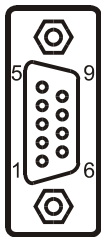
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3 Physical transmission level

This chapter describes the physical link of USS communication.

- Connection: 9-pin, sub D plug connector X3 on front of device
- Signal level: In accordance with TIA/EIA-232-E (previously known as RS232)
- Line length: Max. of between 15 and 20 m (total capacity must be < 2500 pF).
- Baud rate: At the time this document went to print, the following baud rates were available (subject to change without prior notice):

  0:9600 Baud, *1:19200 Baud*, *2:38400 Baud*, *3:57600 Baud*, *4:115200 Baud*

  Selection is made with the parameter A81 for serial baud rates. The list of possible baud rates can be read with service 43 from the device info.
- Character frame: 1 start bit / 8 data bits / even parity / 1 stop bit

PIN[a)		Designation	Function	Data
	1	+10 V	Power for Controlbox	$I_{A\ max}$ = 30 mA
	2	Rx	Communication: Receiving input	
	3	nc	Used internally. Do not activate!	
	4	Tx	Communication: Sending output	
	5	SG	Reference potential for pins 2 and 4	
	6	nc	Used internally. Do not activate!	
	7	nc		
	8	nc		
	9	nc		

a) Sicht auf Sub-D

A connection cable for the connection of a PC (Notebook) to the devices of the 5th generation of STÖBER inverters via the serial interface is available from STÖBER (cat. no. 41488). A conventional serial connection cable (null modem cable) can only be used with an appropriate adapter (cat. no. 41489).

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4 Protocol level

The protocol level is based on the USS protocol of Siemens. For further information, see the following document:

USS protocol (specification of the universal serial interface protocol) of Siemens, 1992, order no. E31930-T9011-X-A.

The following information must be added to the description written by Siemens:

- Data communication always uses semi-duplex mode.
- Only non-cyclic telegram communication is used.
- A fixed telegram length is not used. This is also not set on the INVERTER or in the driver located opposite.
- Default setting of the baud rate depends on the configuration (see *A81* in POSITool). With no configuration, 9600 baud is set.
- "Before it begins to send, the master must provide a start pause of at least 10 characters.
- "The inverter is the slave station during USS communication.
- "The response delay time of the INVERTER (slave) may be up to 500 msec depending on the job. This must be considered when software for the USS master is written.
- Default setting of the slave address is the value zero (0) for every INVERTER.
- A USS ring can be established for the connection of several inverters to one USS master. Several special conditions must be considered here. See chapter 8.

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5   Higher communication level

The bytes of the telegrams of the USS protocol form the framework for all communication services with the INVERTER:

| STX | LGE | ADR | Dat1 | ...... | Datn | BCC |

user data characters

STX = Start of text = 02_{hex}
LGE = Telegramm length
ADR = Address byte
BCC = Block check character
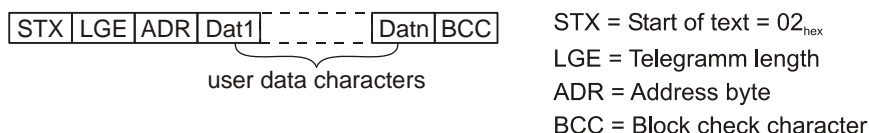
Fig. 5-1 Organization of USS protocol

Remarks
- LGE: The byte for the telegram length contains the number of subsequent bytes including BCC. LGE is thus the number of user data characters + 2.
- ADR: The serial address (*A80*) of the target device must be entered in bits 0 to 4 of the address byte. The default setting of this parameter is 0 for all INVERTERS. Bit 5 is set to 1 if broadcast is to be used. Normally this bit = 0. A 1 in bit 6 indicates the echo telegram. Bit 7 is reserved and must be 0!
- BCC: Block check sum (BCC = Block Check Character). Contains the exclusive OR link of all previous bytes including STX.

The meaning of the user data characters of the USS protocol is specified at the higher communication level. The assignment of the user data characters depends on the communication job.

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6 Services

> **Information**
> When the telegram setup is incorrect (e.g., checksum BCC is wrong), the inverter does not respond in accordance with the USS specification! The master must monitor the timeout itself (500 msec recommended).

The devices of the 5th generation of STÖBER inverters recognize different communication services whose ID is stored in the first byte of the user character (*Dat1*)..

Service	Meaning	Use	Response from device
0	Echo telegram	Establish connection, test communication.	Echo
1 – 31	Reserved for compatibility with the fourth generation.	Do not use!	—
32	Read parameter	Read a parameter with G5 address.	Result + parameter value
33	Write parameter	Write a parameter with G5 address.	Result
34 – 41	Reserved for internal purposes.	Do not use!	—
43	Read device info	The device info is a read-accessible string which gives information on the basic properties of the firmware and any connected option modules.	Device information
44 – 46	Reserved for internal purposes.	Do not use!	—
47	Set baud rate	Switch the baud rate without parameter service.	Result okay and then switchover.
48 – 49	Reserved for internal purposes.	Do not use!	—
50	USS-PZD telegram	Exchange process data with variable length.	PZD response has variable length.
48 – 255	Reserved for internal purposes.	Do not use!	—

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6.1 Service 0: Echo telegram

The echo telegram should be used as the first communication service after the station is turned on or connected to test the functionality of the serial interface. If the telegram is sent to the inverter, the complete and unchanged telegram is returned. This permits the master to compare all bytes and ensure that the transmission is running correctly. The number of bytes in the echo telegram is variable but it may not contain more than 250 bytes. The bytes can have any content. The inverter echoes all bytes back to the master.

The USS master sends the following user data bytes:

Byte No.	1	3	...	n
Meaning	**Service**	**Echo bytes**		
Content $_{hex}$	00	xx	yy	zz

The inverter responds with the echo (i.e., an exact copy):

Byte No.	1	3	...	n
Meaning	**Service**	**Echo bytes**		
Content $_{hex}$	00	xx	yy	zz

Example of a whole USS telegram with frame:

Byte No.	0	1	2	3	4	5	6	7	8	9	10	11
Meaning	STX	LGE	ADR	Service	Sp1	Sp2	Sp3	Sp4	Sp5	Sp6	Sp7	BCC
Content $_{hex}$	02	0A	40	00	01	02	03	04	05	06	07	48

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6.2 Service 32: Read parameter

To read a parameter, the USS master sends the following user data bytes:

Byte No.	1	2	3	4	5	6
Meaning	**Service**	**Repres.**	**G5 address**			
Content $_{hex}$	20	00	xx	yy	zz	xx

Meaning of the elements:
- G5 address: 32-bit address for parameter. See chapter 7.
- Service: ID of the USS service.
- Repres.: ID of the type of representation. The following possibilities are available:

Repr.	Meaning	Telegram Length of Inverter
0	Native (i.e., raw value in internal-inverter scaling) This is the quickest way to read values from the inverter since scaling does not have to be calculated (in contrast to the other methods).	Variable, depends on data type
1	Whole number 4 bytes for fieldbus. In user scaling * number of positions after the decimal point raised to the power of 10. (The scaling is calculated internally for many parameters in whole-number arithmetic which may produce a certain calculating time advantage in some cases but may result in a rounding disadvantage.)	4 bytes
2	Float. In user scaling. (The scaling is calculated with normal accuracy.)	4 bytes
3	Double. In user scaling. (The scaling is calculated with double accuracy.)	8 bytes
4	ASCII string with name + value + unit in the language which was selected with parameter *A12*. The name does not contain the coordinates! This makes it easy to indicate the parameter the same as on the device display or in POSITool. However, processing time on the inverter and also the transmission time via the serial connection is greater than with other types of representation. (The scaling is calculated with double accuracy.)	Variable-length string

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The response only contains the result byte (see chap. 8) and the data of the parameter.

Byte No.	1	2	...
Meaning	**Result**	Dat1	...
Content hex	00	32	...

Depending on the data type of the parameter and the type of representation, the length of the response differs. For the data types of the parameters, see the application documentation or also POSITool.

Example 1: Read E10 AE1 level

The USS master sends as whole USS telegram with frame.

Byte No.	0	1	2	3	4	5	6	7	8	9
Meaning	STX	LGE	ADR	Service	Repr.	G5 address for E10 AE1 level				BCC
Content hex	02	08	00	20	00	05	02	80	00	AD

The master has selected the representation type native here. See byte 4.

The inverter responds with.

Byte No.	0	1	2	3	4	5	9
Meaning	STX	LGE	ADR	Result	MSB	LSB	BCC
Content hex	02	05	00	00	20	63	44

The parameter *E10 AE1 level* has the data type ',I16' (see application manual or POSITool). This means that two bytes are entered between the result byte and the BCC. These two bytes contain the contents of the parameter. The Motorola format applies (i.e., the MSB comes first). The number 2063_{hex} (8291_{dec}) is the value in the internal-inverter unit. The parameter *E10* is defined on the inverter so that the value 32767 corresponds to a voltage of 20 V. The value 2063_{hex} shown in our example thus corresponds to 5.06 V.

Example 2: Read E10 AE1 level as string

The USS master sends as whole USS telegram with frame.

Byte No.	0	1	2	3	4	5	6	7	8	9
Meaning	STX	LGE	ADR	Service	Repr.	G5 address for E10 AE1 level				BCC
Content hex	02	08	00	20	04	05	02	80	00	A9

The master has selected the representation type "string" here. See byte 4.

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The inverter responds with:

Byte No.	0	1	2	3	4	...	...	...	17	18
Meaning	**STX**	**LGE**	**ADR**	**Service**	**String**					**BCC**
Content _hex_	02	16	00	00	41	...	...	...	56	A9

The string looks like this:
41 45 31 2D 50 65 67 65 6C 20 3D 20 35 2E 30 32 39 20 56
"AE1 level = 5.029 V"
This is an easy way to indicate the complete name with value and unit as you are
familiar with on the device display. For efficiency's sake the telegram has no
terminating zero as would be the case in some programming languages.

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6.3 Service 33: Write parameter

The USS master sends the following user data bytes. The length depends on the
type of representation:

Byte No.	1	2	3	4	5	6	7	8, ...	...
Meaning	**Service**	**Repr.**	**G5 address**				**Value**		**BCC**
Content $_{hex}$	21	00	xx	yy	zz	xx	aa	bb	xy

Meaning of the elements:
- G5 address: 32-bit address for parameter. See chap. 7.
- Service: ID of the USS service.
- Repres.: ID of the type of representation. The following possibilities are
  available:

Repr.	Meaning	Telegram Length of Inverter
0	Native (i.e., raw value in internal-inverter scaling) This is the quickest way to write values to the inverter. The inverter accepts the value directly since scaling does not have to be calculated (in contrast to the other methods). For the data types of the parameters, see the application description or also POSITool.	Variable, depends on data type
1	Whole number 4 bytes for fieldbus. In user scaling * number of positions after the decimal point raised to the power of 10. (The scaling is calculated internally for many parameters in whole-number arithmetic which may produce a certain calculating time advantage in some cases but may result in a rounding disadvantage).	4 bytes
2	Float. In user scaling. (The scaling is calculated with normal accuracy).	4 bytes
3	Double. In user scaling. (The scaling is calculated with double accuracy).	8 bytes

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Repr.	Meaning	Telegram Length of Inverter
4	ASCII string with name + value + unit in the language which was selected with parameter *A12*. This is an easy way to write the parameter with the exact setup and form as it was read out before as a string. However, processing time on the inverter and also the transmission time via the serial connection is longer than with other types or representation. (The scaling is calculated with double accuracy). The inverter expects the string in the form "name = value unit." Specification of the name is not mandatory. It is not evaluated. With the parameter type "number" the inverter searches for an equals sign. The partial string is then converted into a number. A terminating zero (\0) is expected! A decimal point can also be used instead of a comma. A unit after the number is not required. It is ignored. With the parameter type "string," the partial string is searched for an equals sign and quotation marks. If quotation marks are found, the part directly behind them is considered as variable content. When an equals sign was found, the part starting with 2 characters after the "=" is the text which is accepted in the variable. If neither equals sign nor quotation marks are found, the whole string is written to the variable. With selection parameters, the number between the equals sign and the colon in the string "Name=Number:Text" is evaluated.	Variabel langer String

The inverter only responds with the result byte. See chap. 8.

Byte No.	1
Meaning	**Result**
Content hex	00

Example: Write the value 1 in A00.0 start save values

The USS master sends as whole USS telegram with frame:

Byte No.	0	1	2	3	4	5	6	7	8	9	10
Meaning	STX	LGE	ADR	Service	Repr.	G5 address for A00.0				Wert	BCC
Content hex	02	09	00	21	00	01	00	00	00	01	2A

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The master has selected the representation type "native" here. See byte 4. Depending on the data type of the parameter and the type of representation, the telegram length differs. All elements of the parameter *A00* are type "U8." These only need 1 byte for representation in "native".

If, as in this example, an action is to be started, the value 1 must be sent in element no. 0 of the applicable parameter. The action on the inverter starts. Processing takes a certain amount of time. During this time the value in element no. 1 of the parameter (action progress) is incremented from 0 to 100 in percentage steps. When 100% is reached, the inverter sets the values in both elements to 0 and writes the result code of the action in element no. 2. This result code is retained unchanged in the parameter until the next action.

The inverter responds with:

Byte No.	0	1	2	3	9
Meaning	**STX**	**LGE**	**ADR**	**Result**	**BCC**
Content hex	02	03	00	00	01

The result byte in the response contains (byte no. 3 = 3 = correct). The inverter has accepted the parameter value and the action "save values" is running.

6.4 Service 43: Read device info

The device info is a read-accessible string which provides information on the basic properties of the firmware and any connected option modules. The contents are set up similar to an INI file. This service is not required for normal operation. It is helpful when an inverter with no valid configuration (e.g., without Paramodule) is to be diagnosed.

The USS master sends the following user data bytes. The length depends on the type of representation:

Byte No.	1	2	3	4	5	6	7	8	9	10
Meaning	**Service**	**In reserve**		**Start address**				**Length**		**BCC**
Content hex	2B	00	00	xx	yy	zz	xx	aa	bb	xy

Meaning of the elements:
- In reserve: Must be zero.
- Start address: The device info is a long text. It can be transmitted in segments. Here the position within the text can be specified starting at which the inverter outputs its information. The USS master reads first starting with start address 0. This causes the device information to be set up again on the device and the first part of the current information string is sent to the USS master. The USS master can continue reading additional parts of the device information until no further data are transferred. When the inverter responds with the number of bytes as stated in the length specified in the job telegram

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(never more than 243 bytes), the device may still contain more data. If this is the case, another request is required. Only when the result code is USD_OK is there a valid entry in the length byte of the response telegram. When the USS master wants to read data starting at a start address which is longer than the total length of the device info, the inverter responds with the result code USD_KSB_MEM_ERROR and the length 0.

- Length: Number of bytes which should be read with this segment. Since the USS telegram frame is used here, no values may be entered which are greater than 243.

The inverter responds with:

Byte No.	1	2	3	4	5	6	7	8	9	10	...
Meaning	**Result**	**In reserve**		**Start address**				**Length**		**Data**	**BCC**
Content hex	00	00	00	xx	yy	zz	xx	aa	bb	...	xy

In Length the inverter specifies how many bytes will actually follow. This number is less than the length specified in the job telegram when no further data follow. This can be used to recognize the end of the segmented transmission.

Example: Read the first part of the device info

The USS master sends as whole USS telegram with frame:

Byte No.	0	1	2	3	4	5	6	7	8	9	10	11	12
Meaning	**STX**	**LGE**	**ADR**	**Service**	**In reserve**		**Start address**				**Length**		**BCC**
Content hex	02	0B	00	2B	00	00	00	00	00	00	00	F0	D2

The inverter responds appropriately to the above described telegram frame and with a long ASCII character string whose beginning as text might look like this, for example:
[Firmware]
Ver=V 5.0 Beta 1
Date=24.06.2003
Build=223
...
[Geraet]
Type=MDS5015
...
[USS]
Baud=9600,19200,38400,57600
...

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6.5 Service 47: Set baud rate

The baud rate can be handled with the normal service 33 (write parameter) on *A81* (serial baud rate). In case no configuration is active, service 47 is offered. The USS master sends the following user data bytes.

Der USS-Master sendet folgende Nutzdatenbytes:

Byte No.	1	2	3
Meaning	Service	Bcode	BCC
Content _{hex}	2F	xx	xy

Meaning of the ID Bcode:

Bcode = Baud Rate Code	Meaning
0	First value from device info section [USS][a]
1	Second value from device info[a]
2	Third value from device info[a]
3	Fourth value from device info[a]
4	Fifth value from device info[a]

a) At the time this document went to print, the following choices were available: *0:9600 Baud*, *1:19200 Baud*, *2:38400 Baud*, *3:57600 Baud*, *4:115200 Baud*

Subject to change without prior notice! To be certain that you select the right baud rate, the device info should be read and evaluated.
The inverter only responds with the result byte. When 0:OK is indicated here, the new baud rate is set. The USS master must be updated with the baud rate before it can continue communication.

Byte No.	1
Meaning	Result
Content _{hex}	00

0: USD_OK: correct
1: USD_ERR: Baud rate cannot be set. Old baud rate remains active.

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6.6   Service 50: USS-PZD telegram

This service is based on the process data transmission scheme for PROFIBUS.
The PC sends a variable number of data bytes without any addressing information.

Byte No.	1	2	3	4	5	6	7	8	9	10	...
Content	**Service**	**Dat 0**	**Dat 1**	**Dat 2**				**...**			
Example	2B	Xx	yy	Zz	...	...	...	...	...	...	...

The inverter responds with a variable number of user data bytes without any address information:

Byte No.	1	2	3	4	5	6	7
Content	**Result**	**Dat 0**	**Dat 1**	**Dat 2**			
Example	00$_{hex}$	Xx	yy	Zz	...	...	...

The result byte always contains 0 for correct.

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7 G5 address

This information is needed the services for reading and writing parameters. All inverter parameters are addressed with the G5 address. The address is a 32-bit number. It is organized as shown below:

| Bits	Name	Meaning	Value Range
31 – 30	Axis	Number of the axis (used to be the parameter record).	3 = fourth axis
29 – 24	Group	Groups, same as with FDS 4000	1 = A.. Inverter, 2 = B.. Motor, ...
23 – 14	Row	Row within a group. Group and row together are called coordinates.	000 – 999
0 – 13	Element	Is either a structure element or an index in an array.	0 for all ‚normal' parameters which are neither structure nor array. Otherwise the elements are counted starting at 0 (e.g., *A00.0* means *start save values action*).
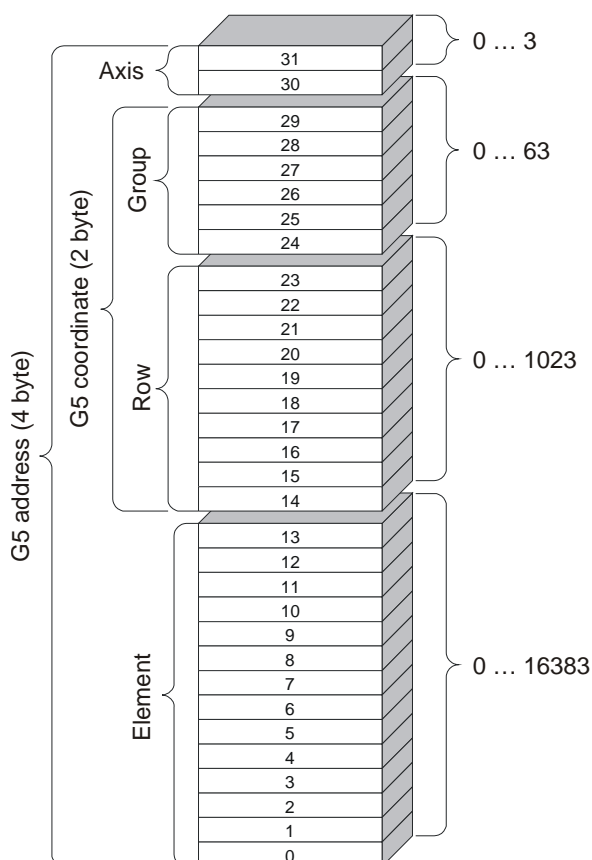
Fig. 7-1 Aufbau Parameteradressierung

8 Meaning of the result byte

Value dec	Value hex	Name	Meaning
0	0	USD_OK	OK = no errors
1 – 63	1 – 3F	Reserviert	Reserved for compatibility with FDS 4000.
64	40	USD_ERR	General error without specification of cause.
65	41	USD_SERV_UNKNOWN	Service unknown
66	42	USD_SERV_ERROR	Error in telegram setup for this service (telegram too short, …)
67	43	USD_FRAME_OVERRUN	The USS telegram frame is too short for this service.
68 – 74	44 – 4A	USD_KSB_xxx	Error number for internal service. This means that the USS master has called an incorrect, reserved service. It is absolutely essential to avoid this!
75	4B	USD_P_NO_PB	Parameter service not possible at this time. No valid PB available.
76	4C	USD_P_PB_INCONSISTENCE	Parameter service: Inconsistency (error) within the PB.
77	4D	USD_P_ADR_UNKNOWN	G5 parameter address is unknown (parameter or element does not exist).
78	4E	USD_P_ADR_NO_RW	Read/write access to this G5 address is not possible (no parameter, but type).
79	4F	USD_P_ACC_DENIED	Parameter service: User role/user level not reached.
80	50	USD_P_INTERFACE	Parameter service: Interface (USS) not permitted.
81	51	USD_P_SKALIER	Parameter service: Invalid scaling type/type of representation.
82	52	USD_P_WR_TOO_LOW	Parameter service: Value is too small.
83	53	USD_P_WR_TOO_HIGH	Parameter service: Value is too large.
84	54	USD_P_WR_INVALID_VALID	Parameter service: Value in definition gap (see ENUM list).
85	55	USD_P_WR_KOLLISION	Parameter service: Collision with other values.
86	56	USD_P_WR_DEVICESTATE	Parameter service: Cannot be written at this time due to device status: enable is off!
87	57	USD_P_NO_PARALIST	Parameter service: No valid parameter list exists.
88	58	USD_P_BUFFERLEN	Parameter service: Wrong buffer length. Communication buffer too small for read or write.
89	59	USD_P_NOT_SUPPORTED	Parameter service: This service with these parameters is not yet supported.
90	5A	USD_KSB_xx	Reserved for internal function.
91	5B	USD_P_PRE_READ	Parameter service: Error in pre-read function.

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Value dec	Value hex	Name	Meaning
92	5C	USD_P_POST_WRITE	Parameter service: Error in post-write function. Value has already arrived in the internal variable.
93 – 98	5D – 62	USD_KSB_xxx	Error number for internal service. This means that the USS master has called an incorrect, reserved service. It is absolutely essential to avoid this!

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9 Slave behavior in the USS ring

It cannot be determined in the echo telegram alone in the USS ring whether the station with this address is present in the ring because the echo telegram of each station is forwarded when it does not have the address entered in the telegram. If no station exists with the address entered in the echo telegram, it is passed on to the master but never processed. This means that any one of the parameters must also be read. If a response is received, the addressed device is present in the ring.

Receipt on Inverter	Reaction with USS Ring
Telegram with error (e.g., wrong check sum) is arriving.	Don't process service. Don't send anything.
Telegram with own address or address 0 is arriving (not broadcast).	Process service. Send service result.
Telegram with another address is arriving (not broadcast).	Don't process service. Send input telegram again.
Broadcast is arriving.	Process service. Send input telegram again.

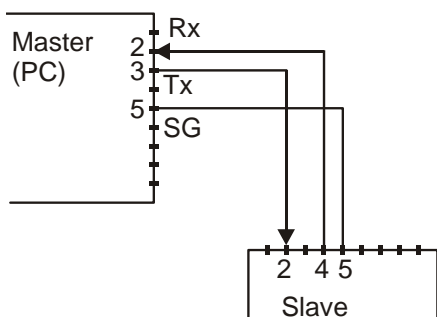Example of possible wiring: Master with one slave.

Fig. 9-1 Example of wiring with one slave

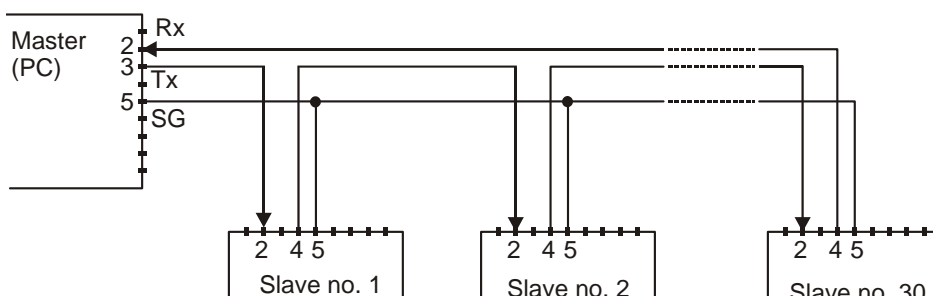Ring wiring (see figure) is used when there is more than one inverter.

Fig. 9-2 Example of wiring with several slaves

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10 Used parameters

Par.	Description	Fieldbus address	
C230 Global r=2, w=2	**Torque limit:** Specfication for the torque limit (absolut value) via fieldbus if the signal source is *C230=4:Parameter*. Value range in %: -200 ... 200 ... 200 Fieldbus: 1LSB=1·%; PDO; type: I16; (raw value:32767=200 %); USS addr.: 03 39 80 00$_{hex}$	24E6h	0h

Access level for read (r=2) and write accesses (w=2)

Value range: Specification of unit, Minimum and maximum value. The default setting is underlined.

PROFIBUS = PNU (PKW1)
CAN-Bus = Index

PROFIBUS = Subindex
CAN-Bus = Subindex

Global: Parameter is not dependent on axis.
Axis: Parameter is axis-specific.
OFF: Parameter can only be changed when enable is off.

Fieldbus: 1st position: Scaling for integer (PROFIBUS and CAN bus)
2nd position:
-PDO - Parameters can be imaged as process data .
-Blank - Parameter can only be accessed via PKW (PROFIBUS) or SDO (CAN bus) .
3rd position: Data type. See application manual, chapter 3.2
4th position: Scaling for raw value
5th position: USS address

Par.	Description	Fieldbus address	
A80 Global r=2, w=2	**Serial address:** Specifies the address of the inverter for serial communication via X3 with POSITool or another USS master. *Value range: 0 ... 0 ... 31* Fieldbus: 1LSB=1; Type: U8; USS addr: 01 14 00 00$_{hex}$	2050h	0h

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Par.	Description	Fieldbus address	
A81 Global r=1, w=1	**Serial baudrate:** Specifies the baud rate for serial communication via the X3 interface. Starting with V 5.1, writing to *A81* no longer changes the baud rate immediately but now not until after device OFF-ON (previously with *A00 save values*) or *A87 activate serial baud rate* = 1 (activate baud rate). This makes the reaction identical to that of the fieldbuses. *0: 9600 Baud;* *1: 19200 Baud;* *2: 38400 Baud;* *3: 57600 Baud;* *4: 115200 Baud;* Fieldbus: 1LSB=1; Type: U8; USS addr: 01 14 40 00$_{hex}$	2051h	0h
A110.0 Global r=1, w=1	**USS PZD Mapping Rx 1. mapped Parameter:** Address of the parameter which is imaged first from the contents of the process data telegram (receiving direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1B 80 00$_{hex}$	206Eh	0h
A110.1 Global r=1, w=1	**USS PZD Mapping Rx 2. mapped Parameter:** Address of the parameter which is imaged second from the contents of the process data telegram (receiving direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1B 80 01$_{hex}$	206Eh	0h

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Par.	Description	Fieldbus address	
A81 Global r=1, w=1	**Serial baudrate:** Specifies the baud rate for serial communication via the X3 interface. Starting with V 5.1, writing to *A81* no longer changes the baud rate immediately but now not until after device OFF-ON (previously with *A00 save values*) or *A87 activate serial baud rate* = 1 (activate baud rate). This makes the reaction identical to that of the fieldbuses. *0: 9600 Baud;* *1: 19200 Baud;* *2: 38400 Baud;* *3: 57600 Baud;* *4: 115200 Baud;* Fieldbus: 1LSB=1; Type: U8; USS addr: 01 14 40 00$_{hex}$	2051h	0h
A110.0 Global r=1, w=1	**USS PZD Mapping Rx 1. mapped Parameter:** Address of the parameter which is imaged first from the contents of the process data telegram (receiving direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1B 80 00$_{hex}$	206Eh	0h
A110.1 Global r=1, w=1	**USS PZD Mapping Rx 2. mapped Parameter:** Address of the parameter which is imaged second from the contents of the process data telegram (receiving direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1B 80 01$_{hex}$	206Eh	0h

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Par.	Description	Fieldbus address	
A110.2 Global r=1, w=1	**USS PZD Mapping Rx 3. mapped Parameter:** Address of the parameter which is imaged third from the contents of the process data telegram (receiving direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1B 80 02$_{hex}$	206Eh	0h
A110.3 Global r=1, w=1	**USS PZD Mapping Rx 4. mapped Parameter:** Address of the parameter which is imaged fourth from the contents of the process data telegram (receiving direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1B 80 03$_{hex}$	206Eh	0h
A110.4 Global r=1, w=1	**USS PZD Mapping Rx 5. mapped Parameter:** Address of the parameter which is imaged fifth from the contents of the process data telegram (receiving direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1B 80 04$_{hex}$	206Eh	0h
A110.5 Global r=1, w=1	**USS PZD Mapping Rx 6. mapped Parameter:** AAddress of the parameter which is imaged sixth from the contents of the process data telegram (receiving direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1B 80 05$_{hex}$	206Eh	0h

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Par.	Description	Fieldbus address	
A113 Global read (1)	**USS PZD Rx Len:** Indicator parameter which shows the length in bytes of the expected process data telegram with reference values of USS master for the current parameterization. **NOTE** Der Parameter ist nur dann sichtbar, wenn in der Geräteprojektierung eine USS-Gerätesteuerung ausgewählt ist oder durch die Option freie, grafische Programmierung die entsprechenden Bausteine eingesetzt wurden. *Value range: 0 ... 0 ... 255* Fieldbus: 1LSB=1; Type: U8; USS addr: 01 1C 40 00$_{hex}$	2071h	0h
A114.0 Global r=1, w=1	**USS PZD Mapping Tx 1. mapped Parameter:** Address of the parameter which is imaged first in the contents of the process data telegram (sending direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1C 80 00$_{hex}$	2072h	0h
A114.1 Global r=1, w=1	**USS PZD Mapping Tx 2. mapped Parameter:** Address of the parameter which is imaged second in the contents of the process data telegram (sending direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1C 80 01$_{hex}$	2072h	0h
A114.2 Global r=1, w=1	**USS PZD Mapping Tx 3. mapped Parameter:** Address of the parameter which is imaged third in the contents of the process data telegram (sending direction as seen by the inverter. **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1C 80 02$_{hex}$	2072h	0h

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Par.	Description	Fieldbus address	
A114.3 Global r=1, w=1	**USS PZD Mapping Tx 4. mapped Parameter:** Address of the parameter which is imaged fourth in the contents of the process data telegram (sending direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1C 80 03$_{hex}$	2072h	0h
A114.4 Global r=1, w=1	**USS PZD Mapping Tx 5. mapped Parameter:** Address of the parameter which is imaged fifth in the contents of the process data telegram (sending direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value: USS addr; USS addr: 01 1B 80 04$_{hex}$	2072h	0h
A114.5 Global r=1, w=1	**USS PZD Mapping Tx 6. mapped Parameter:** Address of the parameter which is imaged sixth in the contents of the process data telegram (sending direction as seen by the inverter). **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. Fieldbus: 1LSB=1; Type: U32; raw value:USS addr; USS addr: 01 1C 80 05$_{hex}$	2072h	0h

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Par.	Description	Fieldbus address	
A117 Global read (1)	**USS PZD Tx Len:** Indicator parameter which indicates the length in bytes of the process data telegram to be sent with actual values to the USS master for the current parameterization. **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. *Value range: 0 ... 0 ... 255* Fieldbus: 1LSB=1; Type: U8; USS addr: 01 1D 40 00$_{hex}$	2075h	0h
A118 Global r=1, w=1	**USS PZD Skalierung:** The selection is made here between internal raw values and whole numbers for the representation/scaling of parameter values during transmission via the process data telegram. Regardless of this setting, the representation can be selected separately via the read-parameter or write-parameter services. **NOTE** The parameter is only visible when a USS device controller is selected in the device configuration or the appropriate blocks were used with the option for free, graphic programming. *0:integer without point;* Values are transferred as whole number in user units * number of positions after the decimal point to the 10th power. *1:native;* Values are transferred in the internal inverter raw format (e.g., increments). Fieldbus: 1LSB=1; Type: U8; USS addr: 01 1D 80 00$_{hex}$	2076h	0h

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