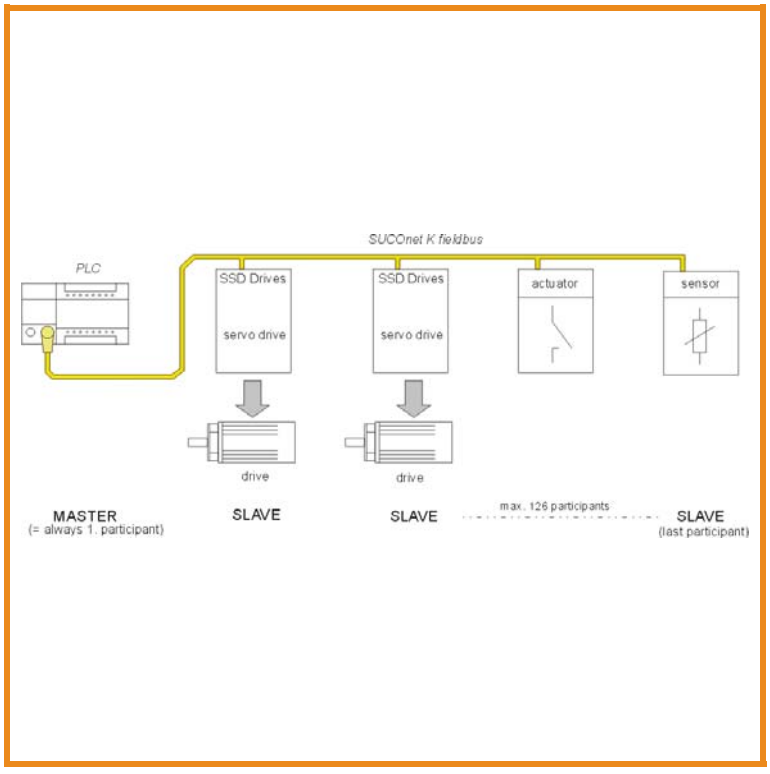
SUCOnet K

Bus interface for servo drive 635/637'series



Product Manual

07-05-02-03-E-V0605.doc

Further descriptions, that relate to this document:

UL: 07-01-05-06 	635 - Product-Manual
UL: 07-02-08-03 	637 - Product-Manual
UL: 07-02-09-01 	637+ - Product-Manual
UL: 07-02-10-01 	637f - Product-Manual
UL: 10-06-03 	Serial transfer protocol EASY-serial - Product-Manual

Made in Germany, 2005

CONTENTS

The most important thing first

Thanks for your confidence choosing our product.

These operating instructions present themselves as an overview of the technical data and features.

Please read the operating instructions before operating the product.

If you have any questions, please contact your nearest SSD Drives representative.
Improper application of the product in combination with dangerous voltage can lead to injuries.
In addition, damage can also occur to motors or other products.
Therefore please observe our safety precautions strictly.

Safety precautions

We assume that, as an expert, you are familiar with the relevant safety regulations, especially in accordance with VDE 0100, VDE 0113,VDE 0160, EN 50178, the accident prevention regulations of the employers liability insurance company and the DIN regulations and that you are able to use and apply them.
As well, relevant European Directives must be observed.

Depending on the kind of application, additional regulations e.g. UL, DIN are subject to be observed.
If our products are operated in connection with components from other manufacturers, their operating instructions are also subject to be observed strictly.

1 Appendix for user manual 635 and 637’ series for the bus system SUCOnet K

The SUCOnet K Bus interface (Option: RP_SUC) can be integrated in the digital drives 635 or 637’ series as an option board. The option get the supply voltage via the terminal strip.
With this option the bus connection with SUCOnet K (Klöckner Moeller) is possible with the 635 or 637’ series as a slave via the physical interface RS 485.

2 Principle function

The SUCOnet K system works on the master slave mode. A master can communicate with a maximum of **126 slaves**. The transmission rate depends on the bus cable length and is configurable over the programming software SUCOsoft S 30-S 4-200.
The **configuration** is as follows: (without repeater)

187,5 kBit/s: up to **600 m** cable length

375 kBit/s: up to **300 m** cable length

For the bus cable you shoud use a **twisted pair cable** with shield.
Für die Kommunikation muss auf dem Bus ein definierter Ruhepegel gewährleistet werden. Dazu verfügt It is necessary for the bus signals to use bus resistors at the first (master) and at the last (slave). On the SUCOnet K bus interface card mounted on the 635/637 there are jumpers which you have to close for the last slave

You can program this identification number in the programming software SUCOsoft S 30-S 4-200 appliance configuration

For the 635/637’ series the following appliance type will be used:

SIS-TYP-A0EF
Note:
Knowledge of the PLC PS 4 - series 200 and the programming software (DOK 9026 - x) is requested.
In the programming software SUCOsoft
S 30-S 4-200 **appliance configuration** each participant on the bus has to have an appliance type as well as an amount of used data bytes. This information must be transferred to the master.
For the 635/637’ series you have to fill in **16 bytes** for the **receive** and **transmit data length**
In this configuration file the participant will automatically get a participant number
(1 - 126). This number appears in the upper left hand corner of the configuration screen

2.2 Bus watching

The 635/637’ series makes it possible, to detect a bus break and to execute a definition reaction
For that, the **bus watching** must be activated by the master!
Follow reaction can activate after detected a bus break:

- no reaction
- stop abrupt
- stop with braking ramp
- disable 635/637’ series

2.3 Participant address

The selection and the setting made by the EASYRIDER ® software
in the menu[1] → **commissioning → fieldbusmodule → mode.**

The station address will be set 635/637 via **DIP-switches** (see page 10) on the interface card or via the **EASYRIDER software**.

- valid address range: 1 - 126

If the station address should be set by the EASYRIDER software, the DIL-switches must set smaller than 2
By the EASYRIDER software you have to program the address in the menu [1]
→ **commissioning → fieldbusmodule → participant address**.

Attention! The participant address must be one more than the participant number.

After programming store this with button in the EEPROM.

Table:

participant address (635/637'series)	participant number (PLC)
00	reserved
01	Master
02	1. Slave
03	2. Slave
...	...
127	126. Slave

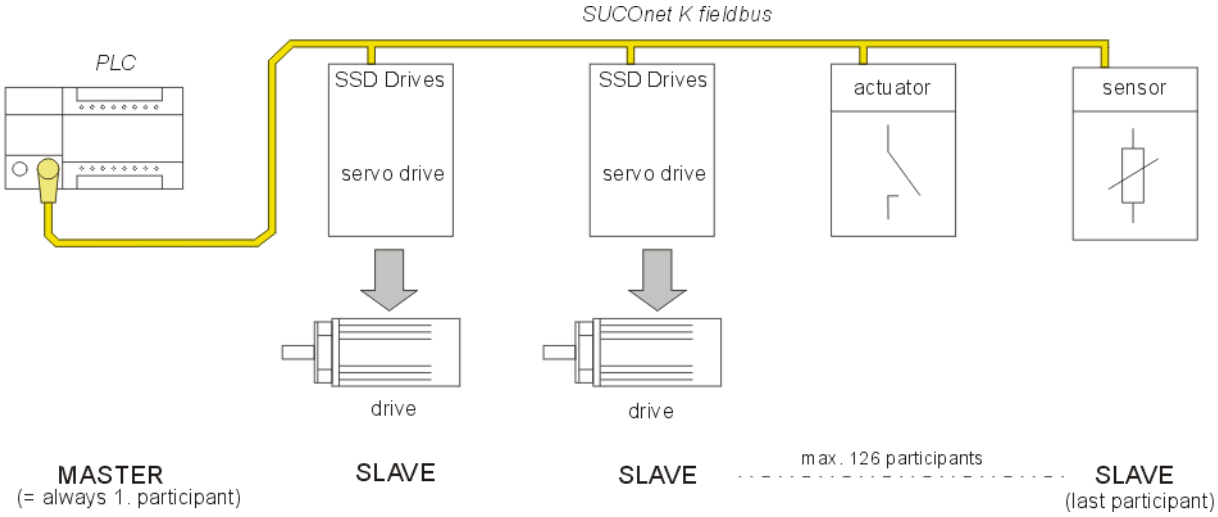
Make sure, that the setting of a bus address is always transferred to the communication program on the interface-board, **only during** initialization of the 635/637' series,
that is after switching on the supply voltage (24V).
i. e.: For taking over the valid participant address, switch the supply voltage on and off again.

[1] up to EASYRIDER version 4.05 is valid: settings configuration axis number

3 Short description

- ❑ The resistor **jumper** must be **closed** on the interface card as **last participant** on the bus.
- ❑ SUCOsoft configurator (software SUCOsoft S 30-S 4-200)
  - For the 635/637' series select the appliance type **SIS-Type-A0EF**.
  - The **receive** and **transmit data length** is **16 bytes**.
- ❑ EASYRIDER program
  - You must add one to the participant address for the slave and enter it in the 635/637'series via the EASYRIDER software.(For example, participant no. 2 in the PLC configurator is → axis no. in the 635/637' series)
  - Store the data with button in theEEPROM
- ❑ Switch the supply voltage 24V of the 635/637' series on and off again, to take over the valid participant address.
- ❑ Connect the 635/637' series with the bus cable.
- ❑ Programming software SUCOsoft S 30-S 4-200
  - It is possible to make a first function check in the menu "**APPLIANCE /IQ STATUS"**.

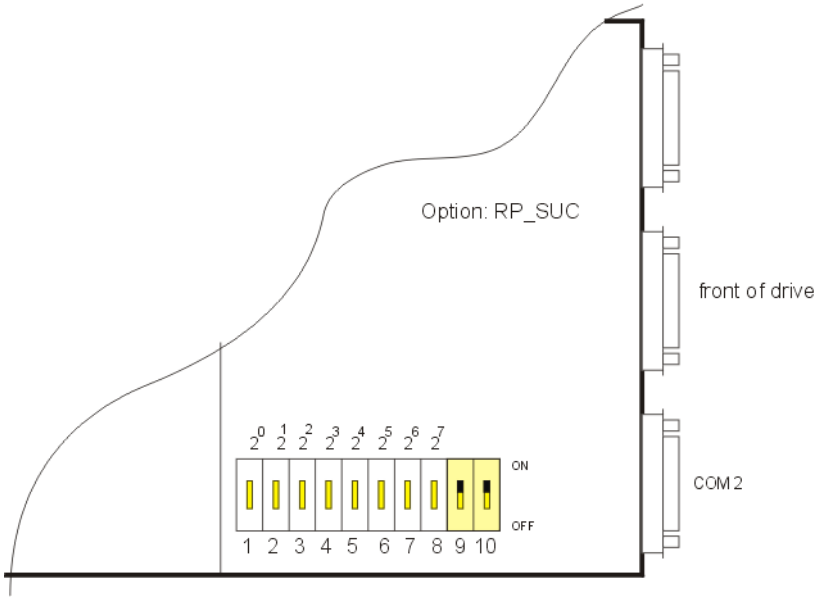
3.1 Schematic diagram



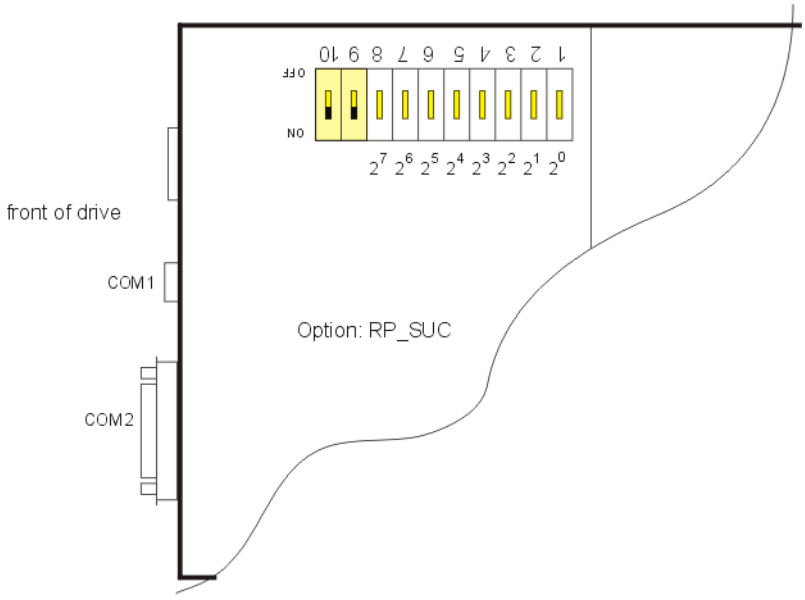
3.2 Bus termination

If an drive from SSD Drives used as the last participant on the SUCOnet K bus system, the terminating resistors must be closed. (switch **on** jumper 9 and 10)

a) 635 top view



b) 637’ series - top view

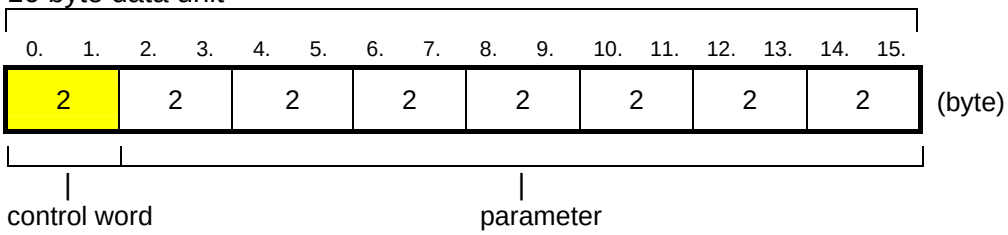


4 Definitions of the data field

Definition of the data field in the SUCOnet K fieldbus system for the 635/637' series:

Output data (master → Digital drive 635/637' series):

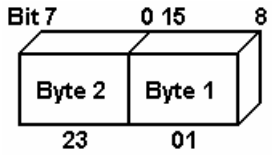
16 byte data unit



4.1 Numbers representation in the serial commands

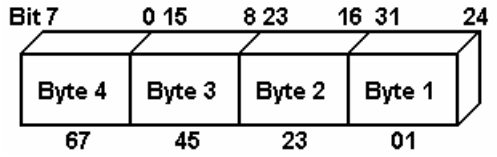
4.1.1 2 byte hexadecimal values (WORD)

Number range ±215 (signed integer)
Example: The hexadecimal value 0123h
represents itself as follows:
01 = High-Byte (Byte 1)
23 = Low-Byte (Byte 2)
Precedence within the serial command:



4.1.2 4 byte hexadecimal values (LWORD)

Number range ±231 (signed long)
Example: The hexadecimal value 01234567h
represents itself as follows:
01 = High-Byte (Byte 1)
23 = Low-Byte (Byte 2)
45 = High-Byte (Byte 3)
67 = Low-Byte (Byte 4)
Precedence within the serial command:



4.2 Parameter scaling

number	scaling
speed:	value = v [min^{-1}]
acceleration, deceleration:	value = a [min^{-1}/s] x 5

Definitions of the data field

4.3 Contents of the control word

Byte 0 : Befehlsauswahl							
7	6	5	4	3	2	1	0

|	|	|	|	|	|	|	|	
0	0	0	0	0	0	0	0	(0) status
0	0	0	0	0	0	0	1	(1) host login
0	0	0	0	0	0	1	0	(2) host logout
0	0	0	0	0	0	1	1	(3) start absolute *
0	0	0	0	0	1	0	0	(4) start incremental dimension *
0	0	0	0	0	1	0	1	(5) start reference run * (Byte 15: reference mode; see chapter 9)
0	0	0	0	0	1	1	0	(6) stop abrupt
0	0	0	0	0	1	1	1	(7) stop (with braking ramp)
0	0	0	0	1	0	0	0	(8) preset counter *
0	0	0	0	1	0	0	1	(9) set BIAS processing pointer (byte 2, 3 : block pointer 0...1499 only in operating mode position control with BIAS) *
0	0	0	0	1	0	1	0	(10) move + *
0	0	0	0	1	0	1	1	(11) move - *
0	0	0	0	1	1	0	0	(12) move synchronous *
0	0	0	0	1	1	0	1	(13) synchronous adjustment *
0	0	0	0	1	1	1	0	(14) eyemark control 1 *
0	0	0	0	1	1	1	1	(15) eyemark control 2 *
0	0	0	1	0	0	0	0	(16) virtual axis 1 *
0	0	0	1	0	0	0	1	(17) read data block
0	0	0	1	0	0	1	0	(18) write data block * (**)
0	0	0	1	0	0	1	1	(19) (..)
0	0	0	1	0	1	0	0	(20) disable 635/637' series
0	0	0	1	0	1	0	1	(21) enable 635/637' series *
0	0	0	1	0	1	1	0	(22) 635/637' series RESET **
0	0	0	1	0	1	1	1	(23) save data in 635/637' Serie **
0	0	0	1	1	0	0	0	(24) operating mode speed loop (serial)
0	0	0	1	1	0	0	1	(25) write variable/ flag

command no. (decimal)

* only after host login

** only after host login and 635/637 is disabled

byte 1 : status selection							
7	6	5	4	3	2	1	0

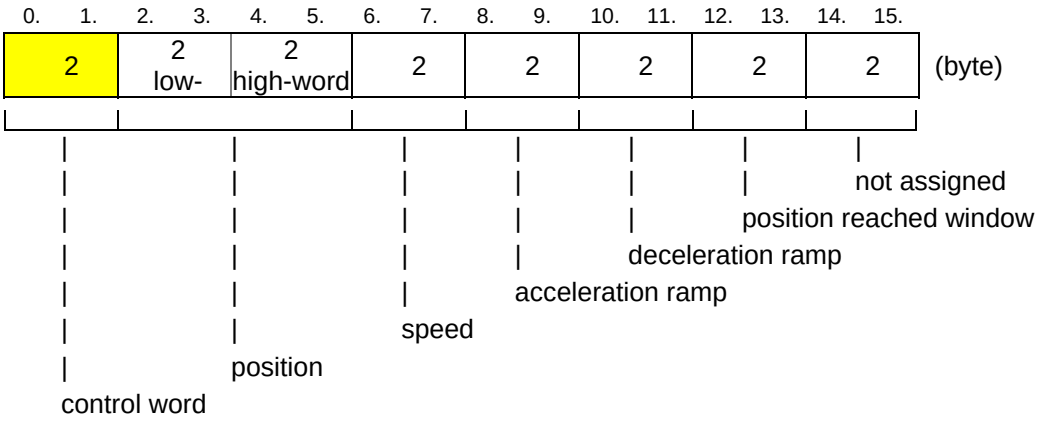
|	|	|	|	|	|	|	|	Status:
0	0	0	0	0	0	0	0	(00) Byte 2-5: actual position 1
0	0	0	0	0	0	0	1	(01) Byte 2-5: actual position 2
0	0	0	0	0	0	1	0	(02) BIAS variable (variable-no. must be entered in the control word byte 2)

5 Data telegram

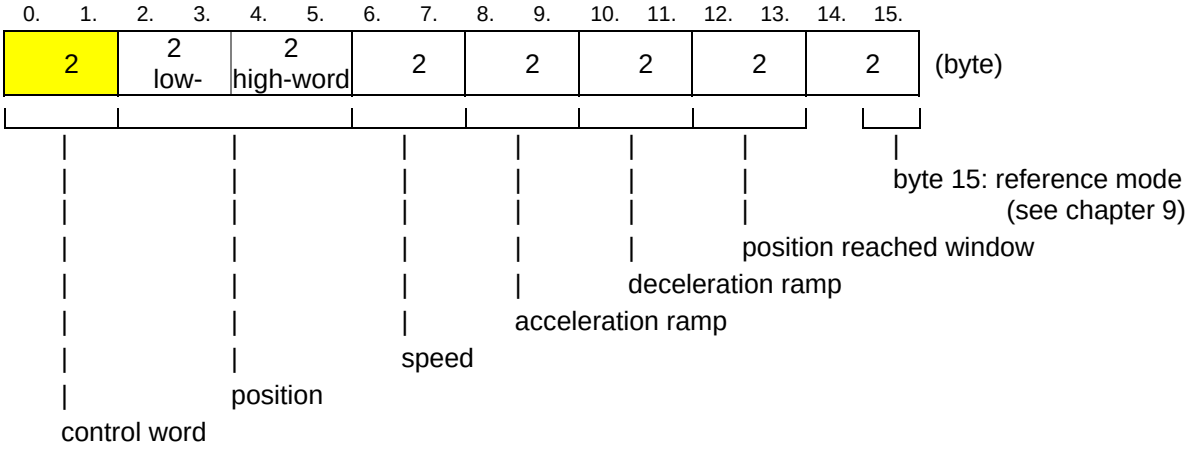
5.1 Host login / logout (1/2)

The most data frames are accepted by the Digital drive only after a host registration. The host registration must only be sent uniquely to connecting the control voltage (24V).
For Host login / logout only the control word from the Digital drive 635/637' series will be evaluated.
The 2nd to 15th bytes can containe any data.only one interface will be have a login (COM1 or COM2).

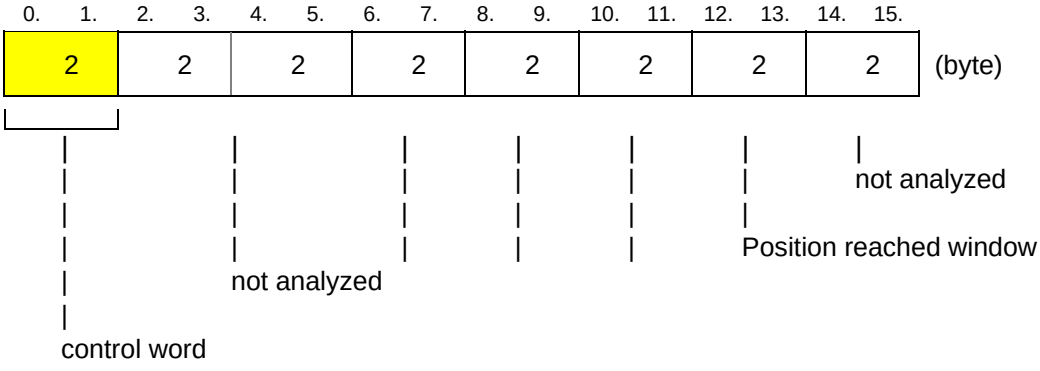
5.2 Control word "start absolute" (3) and "start incremental" (4)



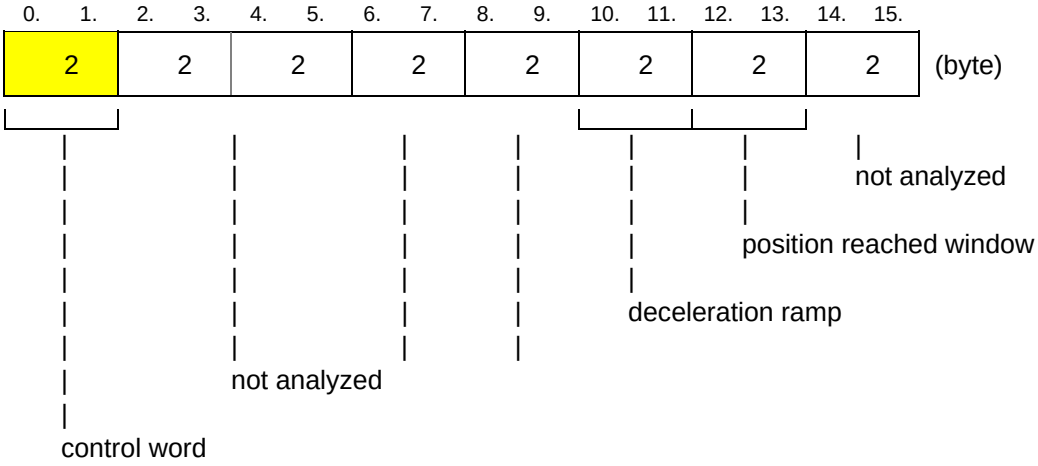
5.3 Control word "start reference run"(5)



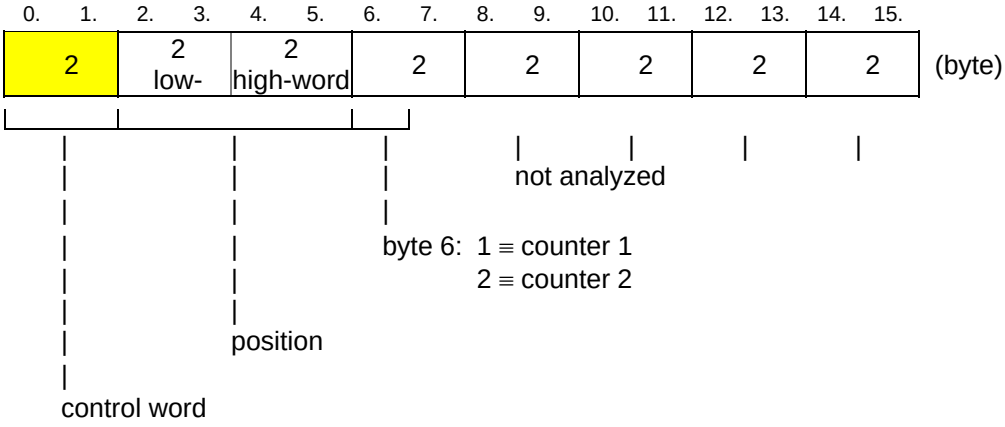
5.4 Control word "Stop" (6)



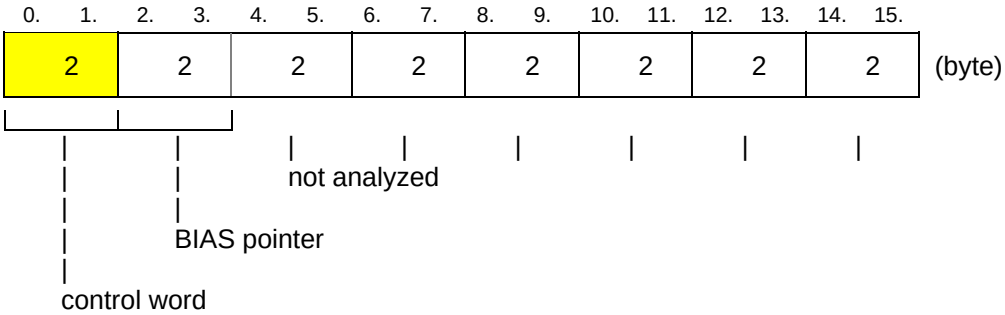
5.5 Control word "Stop with breaking ramp" (7)



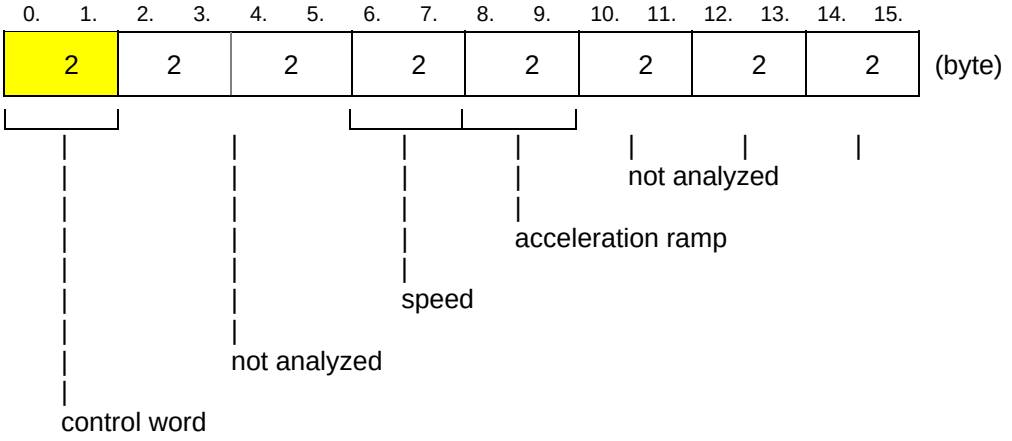
5.6 Control word " preset counter " (8)



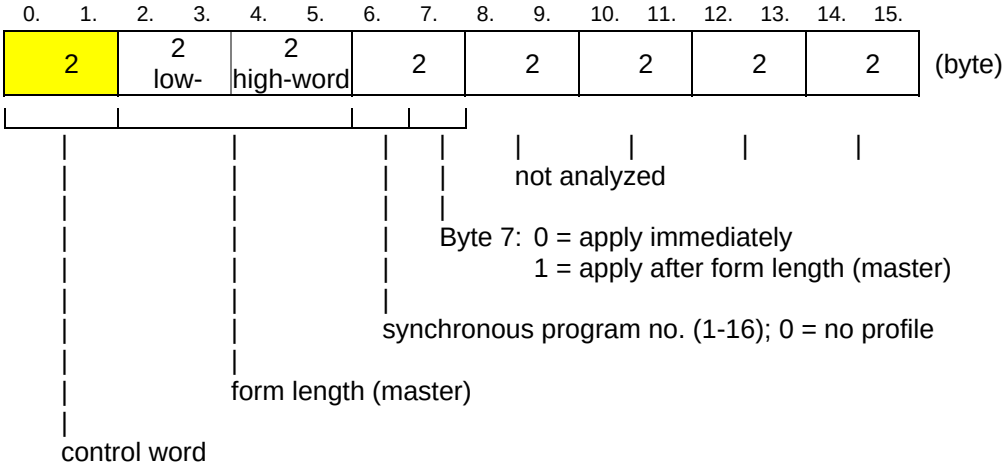
5.7 Control word " set BIAS processing pointer " (9)



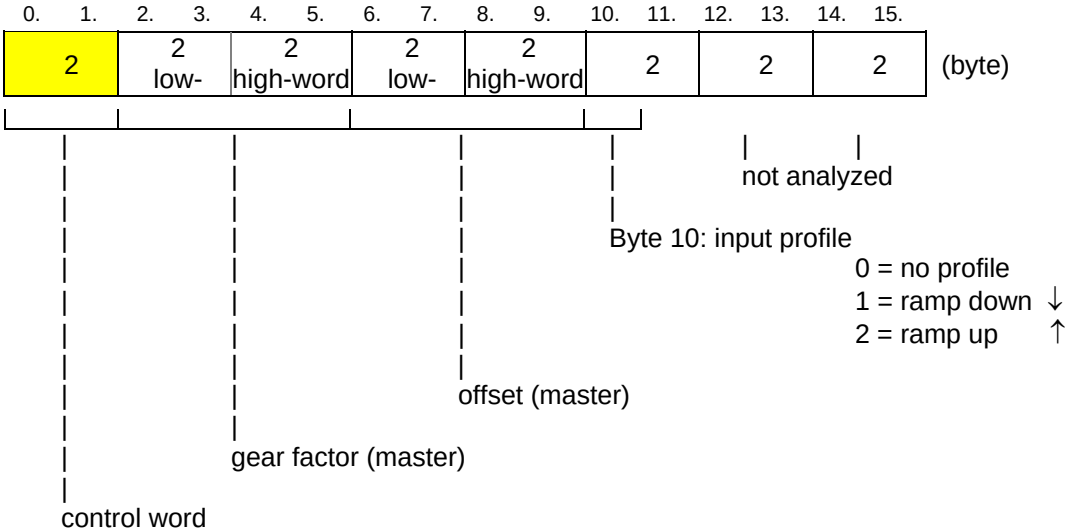
5.8 Control word "move +" (10) and "move -" (11)



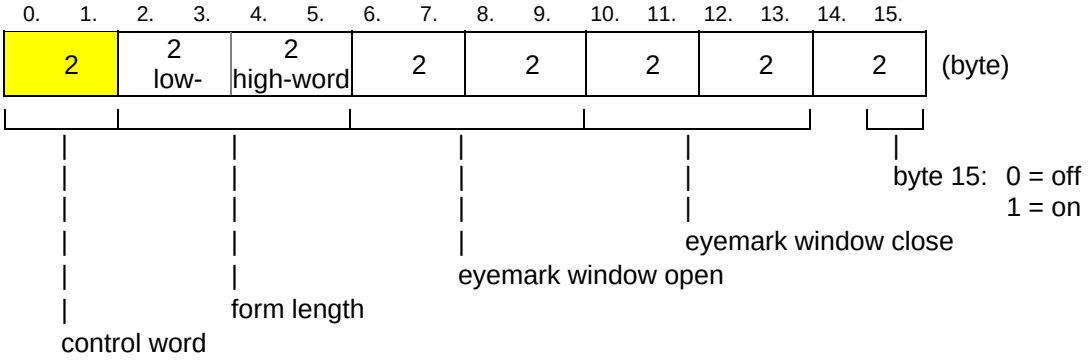
5.9 Control word "move synchronous" (12)



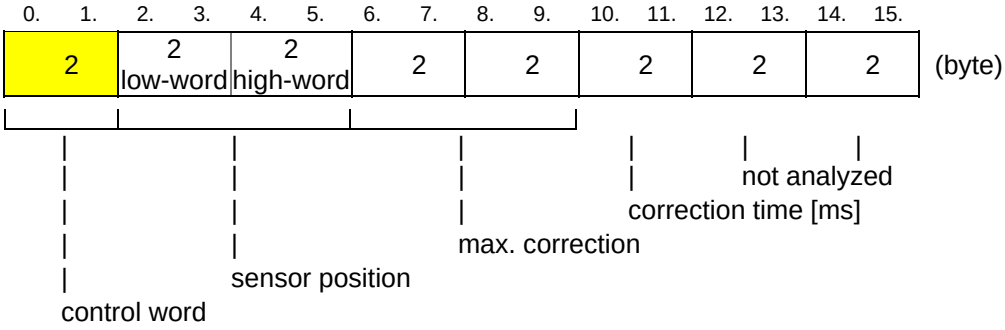
5.10 Control word " synchronous setting " (13)



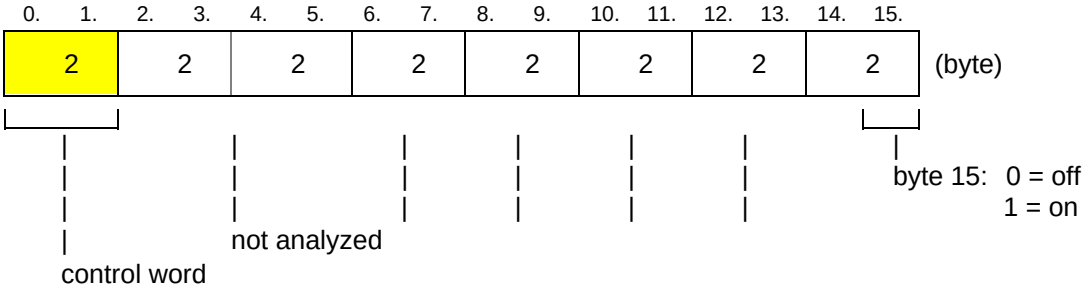
5.11 Control word " eyemark control 1" (14)



5.12 Control word " eyemark control 2" (15)

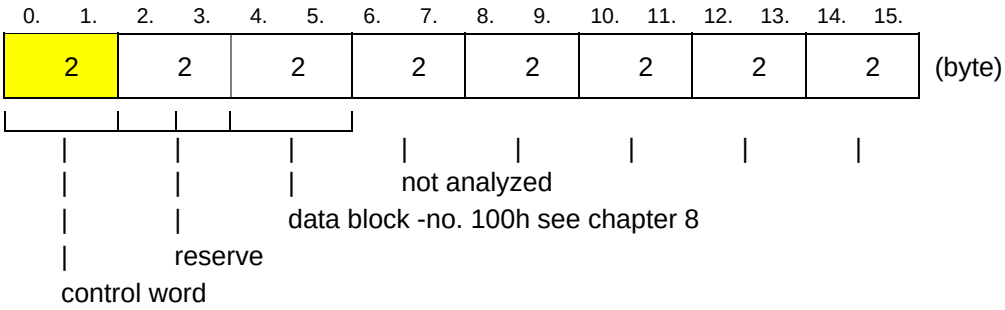


5.13 Control word "virtual axis" (16)



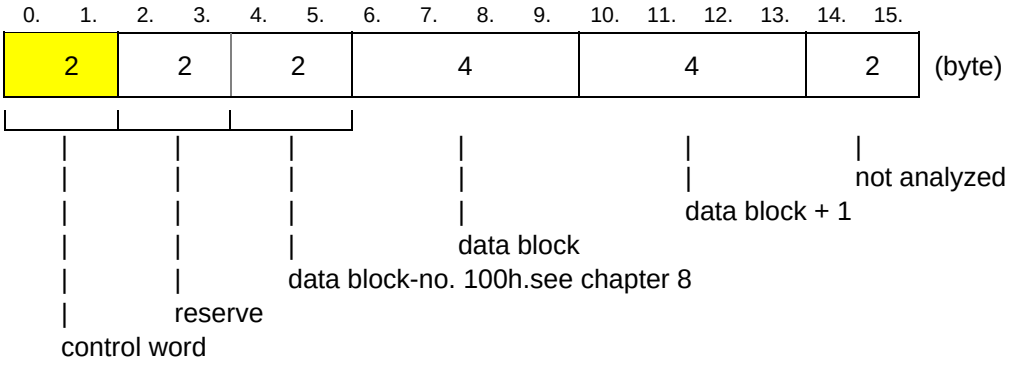
5.14 Control word "read data block" (17)

With 'read data block' the parameters of the requested data block and the following data block in the input data are returned. Only even data block numbers are accepted.



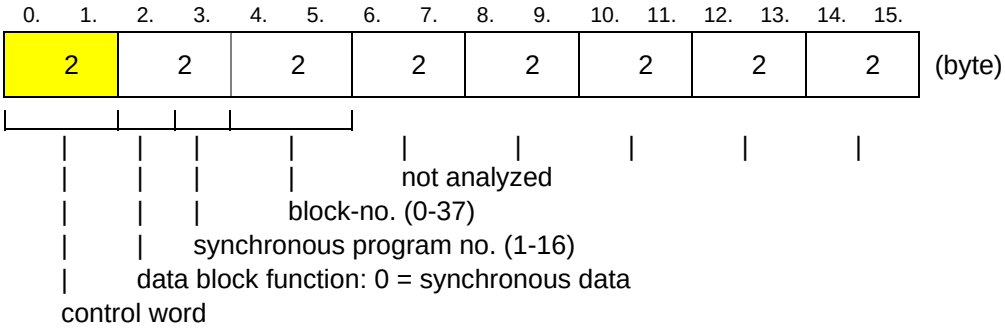
Data telegram

5.14.1 Input data



If an invalid block number is requested, the data contents of the input data of bytes 2 - 15 is **FF_h**

Special function

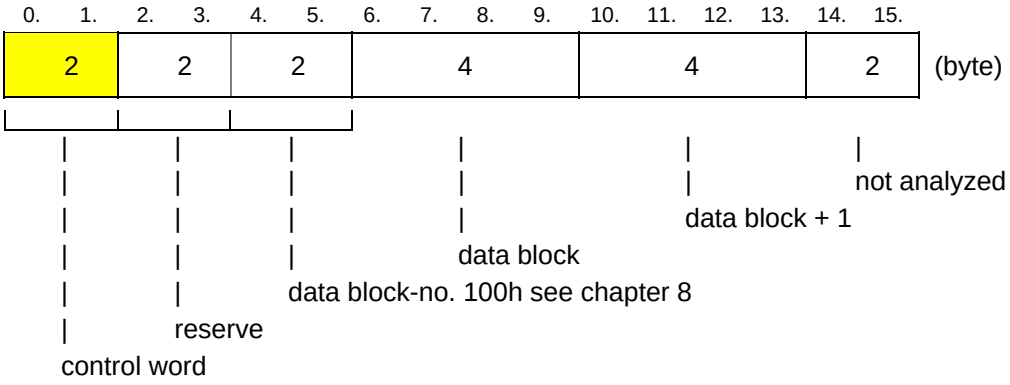


5.15 Control word "write data block" (18)

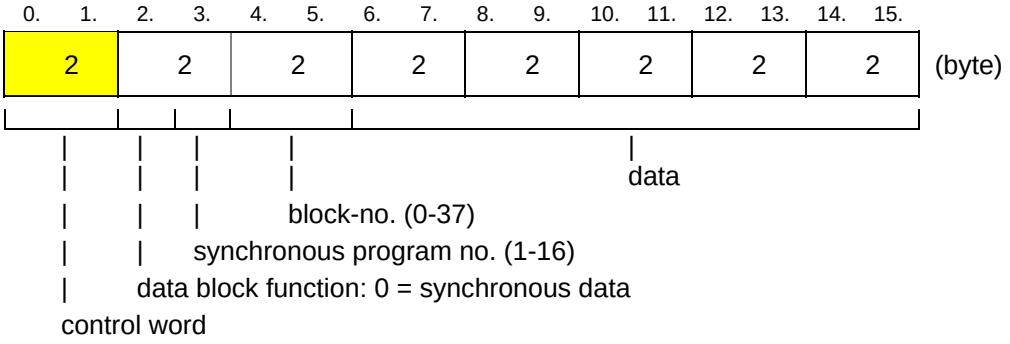
Changing parameters on the 635/637' series is only possible if there has been a login through the master (Host login COM 2).

If parameters are to be changed on the 635/637' series, all 8 bytes of the parameter data must **always** be entered during "write data block" to the selected block number!

The table of block numbers is located in the appendix. In this connection, the marked areas can only be changed in the deactivated state of the drive.

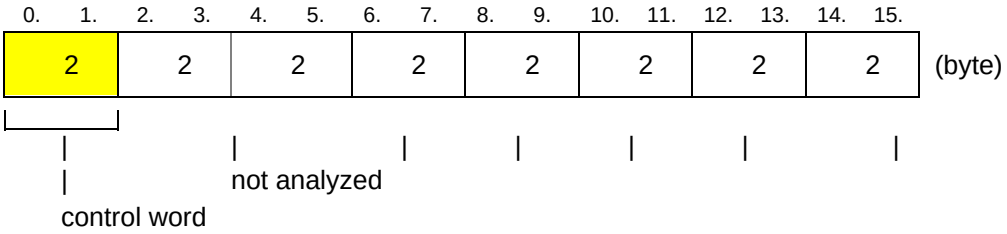


Special function



5.16 Control word reserved (19)

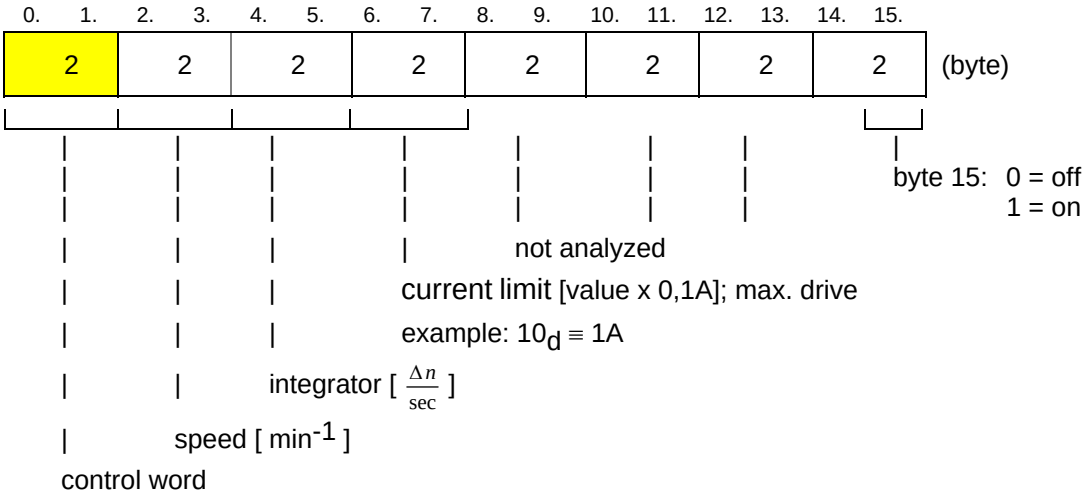
5.17 Control worde 635/637' series: "disable/ enable" (20/21) "RESET" (22) "save data " (23)



5.18 Control word " operating mode speed loop" (24)

With this telegram you can send new speed values to the digital drive.
With byte 15 you can switch between rated value via the Profibus DP and analog rated value.

Caution:
If the the speed loop is switched off via the Profibus DP (byte 15 = 0) an analog value possibly applied to connector X10 pin 18 and 5 can be used.

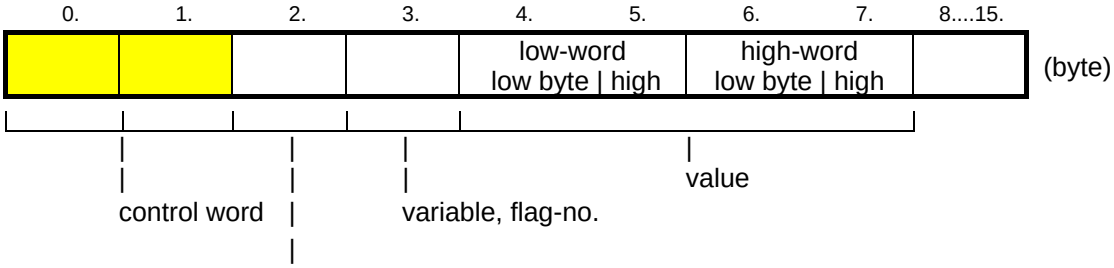


A negative speed is created through the 2 complement.
e.g.

+ 2000 ≡ 0x7D0
- 2000 ≡ 0xF82F

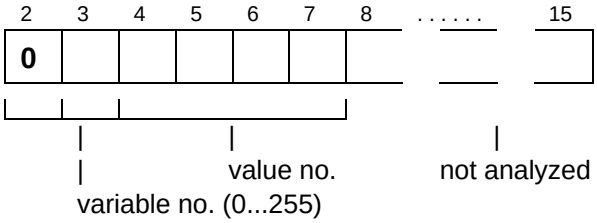
U In order to use this function the operating mode speed control must selected in the digital drive.
This can be done either with the help of EASYRIDER or with the telegram, "write data block".
The operating mode is preselected for the digital drive in block number 0x101.

5.19 Control word "write/read, variable / flags" (25)

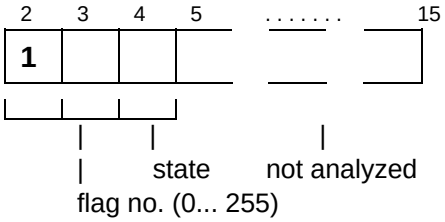


Write

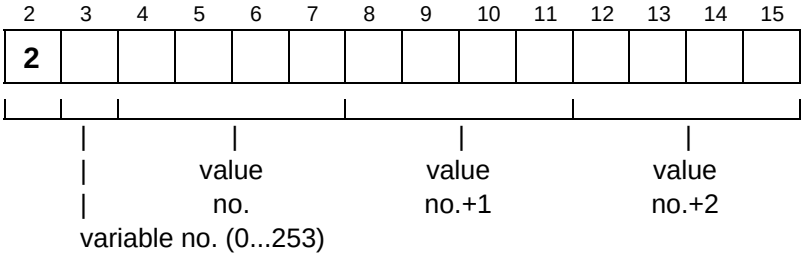
Byte 2: **0**: write variable



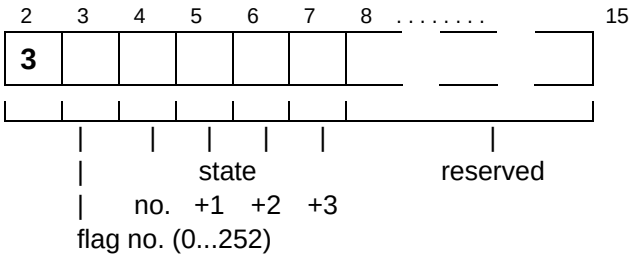
Byte 2: **1**: write flag



Byte 2: **2** : write 3 variables successive



Byte 2: **3** : write 4 flags successive



Data telegram

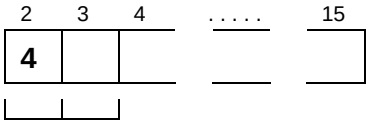
Control word "write/read, variable / flags" (25)

Notice:
After a write command (byte 2: 0 - 3) the Input buffer explained in chapter 5.21 will be received

read

requirement

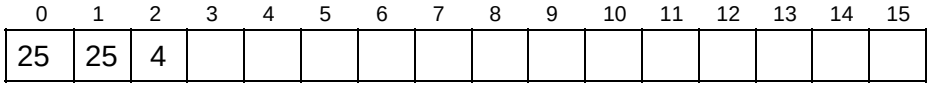
|
Byte 2: **4** : read 2 variables successive + actual position 1



| |
| not analyzed
variable no. (0...254)

Input buffer

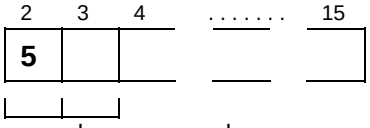
|
Byte 2: 4 : read 2 variables successive + actual position 1



| | | |
| value value I actual position 1
| no. no.+1
variable no. (0...254)

requirement

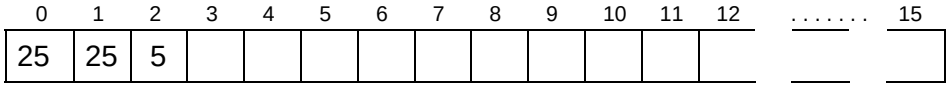
|
Byte 2: **5** : read 8 flags successive



| |
| not analyzed
flag no. (0...248)

Input buffer

Byte 2: 5 : read 8 flags successive

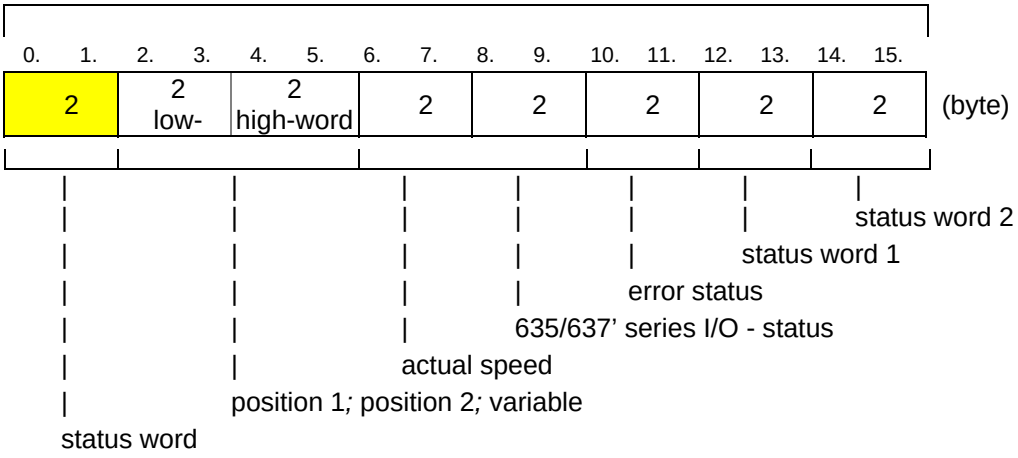


| | | | | | | | | | | | |
| state reserved
| no. +1 +2 +3 +4 +5 +6 +7
flag no. (0...248)

5.20 Receive buffer (635/637’ series → PLC)

(except by "read data block", see 5.14)

16 byte- data unit



5.21 Data contents of the receive buffers

Byte 0: copy of the control word byte 0 (the last command will be stored if > 0)
Byte1: copy of the control word byte 0 (for one data cycle, then 0)
Byte 2-5: actual position 1 / 2 or BIAS variable (byte2) (see "contents of the control word" byte 1)
Byte 6+7: actual speed in rpm

Byte 8: Input status

7	6	5	4	3	2	1	0
X10.4	X10.11	X10.25	X10.2	X10.14	X10.15	X10.24	X10.22

Byte 9: Output status

7	6	5	4	3	2	1	0
			X10.12	X10.13	X10.20	X10.23	X10.8

Byte 10: Error status 1

7	6	5	4	3	2	1	0
I^2t-motor	Overvoltage	Temperature of the output stage too high	Motor temperature too high	Resolver error	internal used	active before ready	Overcurrent (Software)

Byte 11: Error status 2

7	6	5	4	3	2	1	0
Watchdog-Reset	Internal stop	Overcurrent (Hardware)	not used	not used	EEPROM-check total	Ballast power exceeded	I^2t-regulator

Byte 12: Status word 1 Byte 1

7	6	5	4	3	2	1	0
Setpoint within setpoint zero window	Warning output stage temperature	Warning I^2t-regulator	Warning motor temperature	Warning I^2t-motor	Ballast active	Undervoltage	Output stage passive

Byte 13: Status word 1 Byte 2

7	6	5	4	3	2	1	0
Limit switch reached	Warning[2]	Speed regulator without I-gain	internal used	EEPROM-storage runs	Warning ballast power	N/I switchover	internal used

Byte 14: Status word 2 Byte 1

7	6	5	4	3	2	1	0
Position reached	internal used	internal used	COM 2 disabled	internal used	internal used	COM 2 host login	COM 2 active

Byte 15: Status word 2 Byte 2

7	6	5	4	3	2	1	0
Trailing distance ok (dynamically)	internal used	referenced	COM 1 disabled	new format started	registration error	COM 1 hostlogin	COM 1 active

[2] total warning, without T1

6 Pin assignment COM 2 bus interface SUCOnet K via RS485

(The 635/637' series can communicate via the option module RP-SUC with a PLC PS 4 series 200).

The SUCOnet K interface is galvanically isolated, which makes the physical transmission free of interference.

Provided module: **RP-SUC**

635/637' series - COM 2
Connection plug: **SUB D 9-pin**

PIN no.	STATUS	Designation	Comment
1		n.b	not assigned
2		n.b	not assigned
3		TA/RA	Transmit/Receive
4		n.b	not assigned
5		n.b	not assigned
6		n.b	not assigned
7		TB/RB	Transmit/Receive
8		n.b	not assigned
9		n.b	not assigned

7 Example for operating the 635/637’ series via the SUCOnet K field bus system

1. Step:
Host login via the SUCOnet K bus
(once after power on, or always after host logout necessary)

☞ ☞ send control telegram with 01h 'Host login' in the control word byte 0 to the 635/637’ series

data byte

0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
01	00	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx

xx : don`t care

2. Step:
Check host login

☞ read response telegram

After host login in the response telegram in the data byte 14 the bit 1 'COM2 host login' will be set.

data byte

0.	...	14.	...
00		xxxx xx1x	

|_____COM2 'host login''

3. Step:
Position with 'start absolute'

☞ send control telegram which the control word 'start absolute'
and the parameters for position and speed.

1. Example:

- position 500.000 increments (500.000d ≡ 0007A120h)
- speed 2000 (≡ 7D0h) [1/rpm]
- acceleration 1000 (≡ 3E8) [value x 5 $\frac{\text{min}^{-1}}{\text{sec}}$]
- deceleration 1500 (≡ 5DC) [value x 5 $\frac{\text{min}^{-1}}{\text{sec}}$]
- position reached window 100 (≡ 64h)

data byte

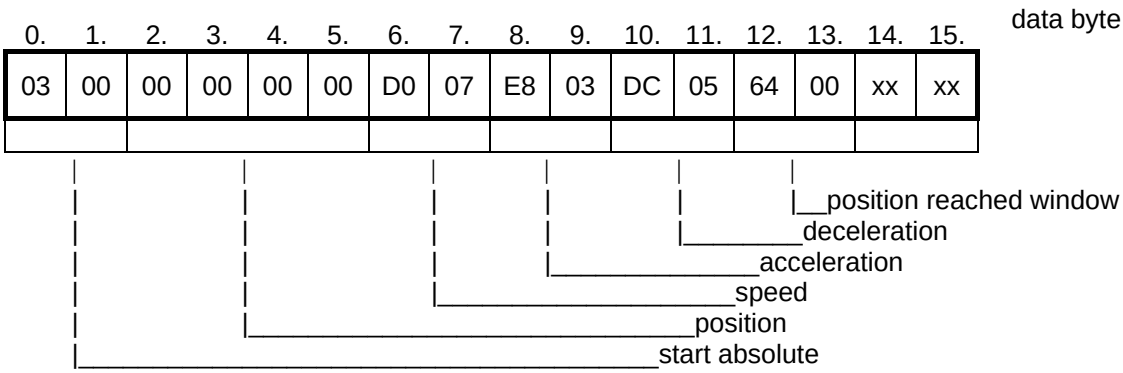
0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
03	00	20	A1	07	00	D0	07	E8	03	DC	05	64	00	xx	xx

|
|
|
|
|
|__position reached window
|
|
|_____deceleration
|
|
|_____acceleration
|
|
|_____speed
|
|_____position
|_____start absolute

Example for operating the 635/637' series via the SUCOnet K field bus system

2. Example:

- position 0 increments (00d ≡ 00h)
- speed 2000 (≡ 7D0h) [1/rpm]
- acceleration 1000 (≡ 3E8) [value x 5 $\frac{min^{-1}}{sec}$]
- deceleration 1500 (≡ 5DC) [value x 5 $\frac{min^{-1}}{sec}$]
- position reached window 100 (≡ 64h)

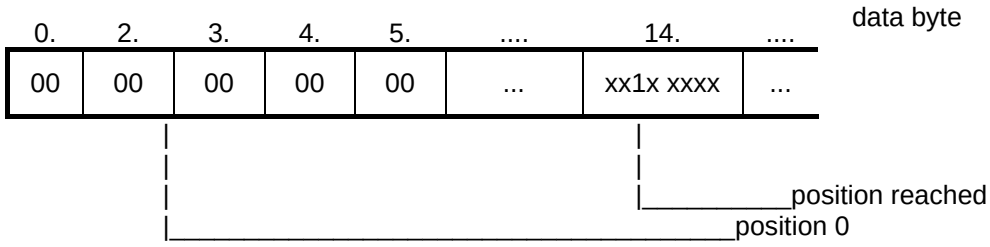


4. Step:

check 'position reached'

☞ read response telegram

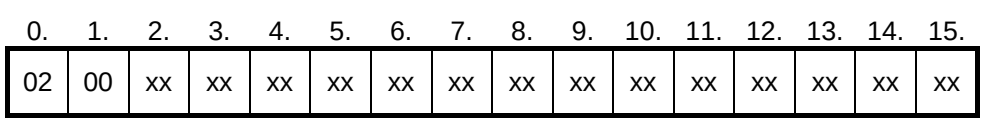
I When position reached in the response telegram in the data byte 15 the bit 5 'position reached' will be set, or you must compare the position value (byte 2 - 5) with the set value.



5. Step:

host logout via the SUCOnet K bus

☞ send control telegram to the 635/637' series with 02h 'host logout' in the control word byte 0



xx : don`t care

8 Table of the block numbers

Note:
The marked block numbers may only be changed in the deactivated state of the regulator.

Block-no.	Meaning	Value range	Byte X in telegram frame
100h	Axis identification with networking	1 - 255	Byte 4
	reserved		Byte 5
	Function identification for ISP function	0 - 3 0 = Output 1 = Input 2 = Stepper motor pulse/direction 3 = Stepper motor pos./negative	Byte6
	Output increments	0 - 3 0 = 1024 1 = 512 2 = 256 3 = 128	Byte 7
101h	635 / 637 operating modes reserved	0 - 5 0 = torque-speed control 1 = speed control 2 = torque control 3 = position-speed control 4 = position control 5 = position control + BIAS	Byte 4 Byte 5
	reserved	0/1	Bit 0 in Byte 6
	reserved	"	Bit 1 in Byte 6
	1 = 14 BIT Resolver resolution (16384 increments / rpm)	"	Bit 2 in Byte 6
	1 = Motor temperature sensor PTC	"	Bit 3 in Byte 6
	1 = current drop with warning active	"	Bit 4 in Byte 6
	1 = program switch locked	"	Bit 5 in Byte 6
	1 = analog input for external current limiting aktive 1 = internal ballast present and active	" "	Bit 6 in Byte 6 Bit 7 in Byte 6
	1 = slope monitoring of the active input	"	Bit 0 in Byte 7
	1 = monitoring control voltage	"	Bit 1 in Byte 7
	1 = position control on actual position 2	"	Bit 2 in Byte 7
	1 = MP2 for position output	"	Bit 3 in Byte 7
	1 = sinus ramps active	"	Bit 4 in Byte 7
	1 = direction of rotation positive	"	Bit 5 in Byte 7
	reserved 1 = counter direction actual position 2 positive	" "	Bit 6 in Byte 7 Bit 7 in Byte 7
102h	Active OK deceleration table level 0 - 4 in 200 ms steps	0 - 4	Byte 4
	position reached low time Ucc overvoltage threshold	0 - 255 ms 400 / 765 V	Byte 5 Byte 6,7
103h	UCC- low threshold UCC-ballast threshold	15 - 350 V 15 - 400 V	Byte 4,5 Byte 6,7
104h	ballast resistor in 1/10 Ω ballast power	10 - 999 ohm 10 - 999 watt	Byte 4,5 Byte 6,7
105h	reserved		Byte 4,5
	reserved		Byte 6,7

Table of the block numbers

continuation

Block-no.	Meaning	Value range	Byte X in telegram frame
106h	rated current motor		Byte 4,5
	number of pole pairs		Byte 6,7
107h	EMF/1000min-1		Byte 4,5
	Motor inductance (terminal inductance)		Byte 6,7
108h	Motor resistance (terminal resistance)		Byte 4,5
	12T Monitoring time		Byte 6,7
109h	resistance value NTC T1		Byte 4,5
	resistance value NTC T2		Byte 6,7
10Ah	resistance value PTC		Byte 4,5
			Byte 6,7
10Bh	motor name ASCII 18 bytes		Byte 4,5
			Byte 6,7
10Ch			Byte 4,5
			Byte 6,7
10Dh			Byte 4,5
			Byte 6,7
10Eh			Byte 4,5
			Byte 6,7
10Fh			Byte 4,5
	reserved		Byte 6,7
110H	Maximum current limit - grade value (grade = I_max/32)	0-31	Byte 4,5
	P_gain - grade value for the current controller [3]	0-31	Byte 6
	I_gain - grade value for the current controller [4]	0-31	Byte 7
111h	P_gain - grade value for the speed controller [4]	0-31	Byte 4
	I_gain - grade value for the speed controller [4]	0-31	Byte 5
	P_gain position controller	1 - 32767	Byte 6,7
112h	I_gain position controller	1 - 32767	Byte 4,5
	V_gain position controller	256 - 1/256	Byte 6,7
113h	Default speed for position controller in rpm * 1,45	(0 - 12000) * 1,45	Byte 4,5
	Default braking ramp for position controller [value x 5 $\frac{min^{-1}}{sec}$]	0 - 64000	Byte 6,7
114h	Default acceleration ramp for position controller [value x 5 $\frac{min^{-1}}{sec}$]	0 - 64000	Byte 4,5
	Default position reached for position controller in increments	0 - 32767	Byte 6,7
115h	Trailing window in increments	0 - 32767	Byte 4,5
	Trailing reaction	0 - 3	Byte 6
		0 = without reaction 1 = stop abrupt 2 = stop 3 = deactivate regulator	
	reserved		Byte 7

[3] see appendix

Table of the block numbers

continuation

Block-no.	Meaning		Value range	Byte X in telegram frame
116h	window for 0 V setpoint		+/- 150 mV	Byte 4,5
	Setpoint integrator-steepness 10000 = off (without integrator)		<= 9999 in 5 min/s Steps	Byte 6,7
117h	Setpoint evaluation X10 5/18		+/-14000 rpm	Byte 4,5
	Setpoint evaluation with torque control in 1/100 A			Byte 6,7
118h	Setpoint value norming test point 1 speed		200 - 15000 rpm	Byte 4,5
	Setpoint value norming test point 2 current in 1/100 A		2 - +10% Imax	Byte 6,7
119h	Norming analog input external current limiting 1/100		0,1 - 20 V	Byte 4,5
	Speed 0 offset storage value +/-311 mV		+/-512	Byte 6,7
11Ah	Offset resolver position		always 0	Byte 4,5
	reserved			Byte 6,7
11Bh				
....	reserved			
136h				
800h - 8FFh	Reserved for EASYRIDER extra info			
900h - 9FFh	Initializing data for the 16 possible synchronous profiles			
A00h	Input definition input X 10.2 (function 0 - 3 see operating instructions)		0 - 3	Byte 4
	Input definition input X 10.4		0 - 3	Byte 5
	Input definition input X 10.11		0 - 3	Byte 6
	Input definition input X 10.14		0 - 3	Byte 7
A01h	Input definition input X 10.15		0 - 3	Byte 4
	Input definition input X 10.24		0 - 3	Byte 5
	Input definition input X10.25		0 - 3	Byte 6
	Output definition output X 10.12		0 - 2	Byte 7
A02h	Output definition output X 10.1		0 - 2	Byte 4
	Output definition output X 10.20		0 - 2	Byte 5
	Output definition output X 10.23		0 - 2	Byte 6
	reserved		x	Byte 7
A03h	reserved			Byte 4-7
	10 position sets a' 14 byte			
A04h	COMMAND	**position set 0**	0 - 255 (see EASYRIDER)	Byte 4
	free	"	-	Byte 5
	speed in rpm * 1,45	"	(0 - 12000) * 1,45	Byte 6,7
A05h	acceleration ramp [value x 5 $\frac{min^{-1}}{sec}$]	"	0 - 32000	Byte 4,5
	braking ramp [value x 5 $\frac{min^{-1}}{sec}$]	"	0 - 32000	Byte 6,7
A06h	position reached window in increments	"	0 - 32767	Byte 4,5
	setpoint position low word	"	32 Bit	Byte 6,7
A07h	setpoint position high word	"	32 Bit	Byte 4,5
↓	COMMAND	**position set 1**	0 - 255 (see EASYRIDER)	Byte 6,7
....		"		
....				
A26h	long SOLL_POS; high word	**position set 9**		

Table of the block numbers

continuation

Block-no.	Meaning	Value range	Byte X in telegram frame
A027h	special funktion I_Conversion 4 Byte	float	
A028h	special funktion S_Conversion 4 Byte	float	
A029h	pulse_z2 4 Byte		
....			
A3F	reserve		
A40h - A7Fh	BIAS program info data		
A40h	BIAS_START_SET	0 - 1499	
	BIAS_STOP_MODE	0/1	
A41h	SPS_STOP_MODE	0 - 2	
	VIRTUAL_MODE	0	
A42h	Program name 64 Byte		
....	....		
A51h			
A52h	BIAS - program data Byte 1 - 4		
	BIAS - program data Byte 5 - 8		
A54h	BIAS - program data Byte 9 - 12		
A55h	BIAS -program version Byte 1 - 4		
A56h	BIAS -program version Byte 5 + 6; reserve 2 Byte		
A57h	reserved until A7Fh		
A80h-ABFh	BUS module data		
A80h	until A83h reserve		
A84h	SUCOnet_K BUS Axis-number	1 - 255	Byte 4
	SUCOnet_K BUS Bus interruption	0 - 3 0 = without reaction 1 = stop abrupt 2 = stop 3 = deactivate regulator	Byte 5
	SUCOnet_K BUS braking ramp [value x 5 $\frac{min^{-1}}{sec}$]	0 - 64000	Byte 6,7
A85h	until A87h reserve		
A88h	PROFIBUS axis-number	1 - 255	Byte 4
	PROFIBUS bus interruption	0 - 3 0 = without reaction 1 = stop abrupt 2 = stop 3 = deactivate regulator	Byte 5
	PROFIBUS braking ramp [value x 5 $\frac{min^{-1}}{sec}$]	0 - 64000	Byte 6,7
A89h	until A8Bh reserved		
A8Ch	CAN-BUS Node number	1 - 255	Byte 4
	CAN-BUS Bus interruption	0 - 3 0 = without reaction 1 = stop abrupt 2 = stop 3 = deactivate regulator	Byte 5
	CAN-BUS braking ramp [value x 5 $\frac{min^{-1}}{sec}$]	0 - 64000	Byte 6,7

Table of the block numbers

continuation

Block-no.	Meaning	Value range	Byte X in telegram frame
A8Dh	CAN-BUS baud rate	0 - 6	Byte 4
	CAN-BUS bus-mode Eurotherm , CAL	0/1	Byte 5
	CAN-BUS extended identifier j/n	0/1	Byte 6
	CAN-BUS send status automatically j/n	0/1	Byte 7
A8Eh	until A8Fh		
A90h	CAN _IID Message 0		
A91h	CAN _IID Message 1		
A92h	CAN _IID Message 2		
A93h	CAN _IID Message 3		
A94h	CAN _IID Message 4		
A95h	CAN _IID Message 5		
A96h	CAN _IID Message 6		
A97h	CAN _IID Message 7		
A98h	CAN _IID Message 8		
A99h	CAN _IID Message 9		
A9Ah	CAN _IID Message A		
A9Bh	CAN _IID Message B		
A9Ch	CAN _IID Message C		
A9Dh	CAN _IID Message D		
A9Eh	CAN _IID Message E		
A9Fh	CAN _IID Message F		
AA0h	INTERBUS Eurotherm profile = 0, profile 22 = 1	0/1	Byte 4
	INTERBUS bus interruption	0 - 3 0 = without reaction 1 = stop abrupt 2 = stop 3 = deactivate regulator	Byte 5
	INTERBUS braking ramp [value x 5 $\frac{\text{min}^{-1}}{\text{sec}}$]	0 - 64000	Byte 6,7
AA1h	until ABFh		
AC0h-FFFh res.			
1000h - 1FFFh	Synchronous profiles (according to EASYRIDER calculation)		
2000h - 2FFFh	BIAS program 0 - 1499 blocks (of 8 bytes)	see EASYRIDER help	
	set number 0 = adress 2C000H - 2C007h = BUS-command 2000h and 2001h		
3000h-	1024 x 64 Byte reseved		

9 Standard reference modes overview

	+	−	Auto +	Auto −	$\overline{\vdash\Delta_0\dashv}$ +	$\overline{\vdash\Delta_0\dashv}$ −	Auto + $\overline{\vdash\Delta_0\dashv}$ +	Auto + $\overline{\vdash\Delta_0\dashv}$ −
α=0°	0	1	0 (6)	1 (7)	12	13	18	19
Ref.	2	3	8	9	14	15	20	21
Ref. + α=0°	4	5	10	11	16	17	22	23

α=0° = resolver zero position

Ref. = reference sensor

\+ = positive direction

− = negative direction

Auto = automatic direction selection

$\overline{\vdash\Delta_0\dashv}$ = reference point shifting

9.1 Reference run and modes

The reference run of the axis is always necessary when there must be a fixed relationship between the electrical and the mechanical zero point of the axis, e. g. with a rotary axis with a tool or a linear axis. In order to be able to solve this task flexibly, 24 standard reference modes are offered. These are explained in the following text.

9.2 Reference run to the resolver zero position

The resolver located in the motor represents an absolute position registering system. The zero position of this system can be used to create a zero point with high repeat accuracy. Figure 1 showes a typical application. The axis to be referenced is connected directly with the motor so that a clear coordination between the motor and output position results.
Process: The axis executes a counter preset according to the resolver zero position and moves to the zero point in the specified direction.

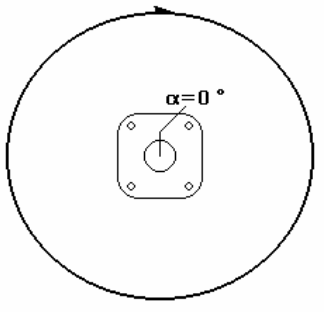


Fig.1: Reference run to the resolver zero position

9.3 Reference run to the reference sensor

Reference runs to an external reference sensor are necessary wherever no exact assignment at the motor to output position can be made. Typical application examples are systems with gearboxes as shown in figure 2
Process: The axis starts the refernce run in the specified direction. The actual position is zeroed upon detection of the low-high slope of the external reference sensor. At the same time the axis is stopped via the active deceleration ramp.
Note:

1. If input X10.24 not configured [4] as "reference sensor", a start fault occurs upon execution of a reference run.
2. If the zero position is not reachable in the specified direction[5] after stopping the axis, the zero point is not moved to.

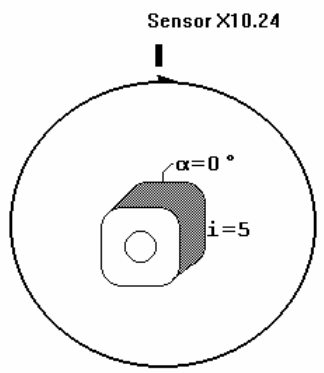
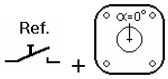


Fig.2: reference run to an external reference sensor

4 "Configuration", in-, outputs, "function 1-reference sensor"

5 in combination with the automatic selection of direction this limitation does not apply

9.4 Reference run to the reference sensor and the resolver zero position



The reference modes with reference sensor and resolver zero position represent a combination of the induvidual modes. They are always required wherever no clear coordination of motor position to output position can be made on the one hand. On the other hand, however the high repeat accuracy of the resolver zero point is required. Typical applications are also on the other hand systems with gearboxes [6] (see figure 2)

Process: The axis starts the reference run in the specified directions. A counter preset is executed according to the following resolver zero position
selection of the high-low slope of the external
reference sensor. At the same time the axis is stopped via the active deceleration ramp.
If the zero point can be reached in the specified direction, this is subsequently moved to.

Note:

1. If input X10.24 is not configured as "reference sensor" a start fault will occur upon execution of a reference run.
2. If the zero position is not reachable in the specified direction after stopping the axis, the zero point will not be moved to.

9.5 Reference run with automatic selection of direction

The previous reference types can be combined with the automatic selection of direction. If the automatic selection of direction is active, there are 2 differences.

1. The axis can use both reference directions. As a result, the zero point can always be moved to.

2. With reference modes with reference sensor, the reference run is started in the opposite direction if the reference sensor is already activeat the start of the reference run (see figure 3).
   After the reference sensor becomes free (inactive) the axis is stopped (see figure 4).
   Subsequently the reference sensor is moved to in the specified reference direction and the reference run is ended according to the reference mode.

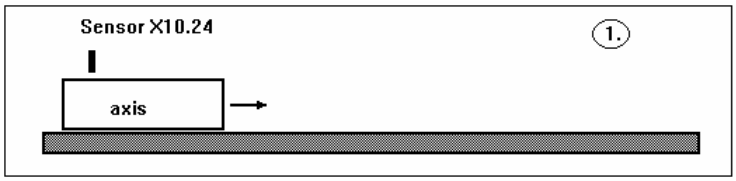


Fig. 3: Start of reference run with automatic selection of direction

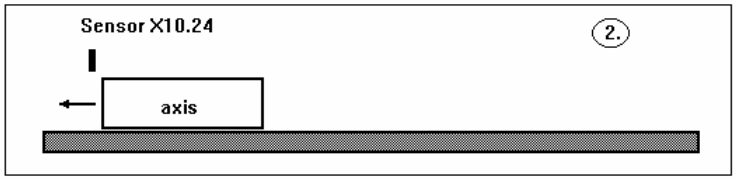


Figure 4:

6 With rotary axes the gearbox ratio must, however, allowa clear position assignment

9.6 Reference run with shifting of reference point

The previous reference modes can also be combined with the reference point shifting. With this, the actual position 0 is shifted by the amount specified in the "path" parameter from the zero point found according to the reference modes (see figure 5).

Note:

1. Is the actual position 0 is not reached in the specified direction after stopping the axis , the actual position 0 is not moved to.

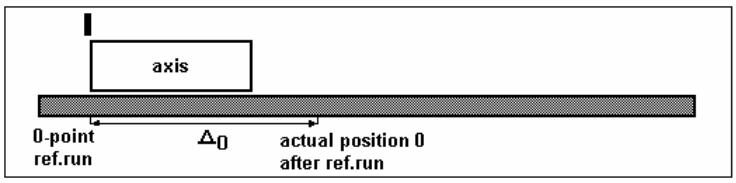


Figure 5: Reference point shifting

10 Appendix

Assignment of the table positions for P- and I-gain in the current and speed controller to the physical value

current controller			speed controller		
Index	**P- gain**	**I- gain in 1/ms**	**Index**	**P- gain**	**I-Anteil in 1/ms**
0	0,77	1/80	0	0,75	120
1	0,87	1/69,6	1	0,87	1/103,2
2	0,99	1/60,55	2	1,01	1/88,75
3	1,12	1/52,68	3	1,17	1/76,33
4	1,27	1/45,83	4	1,36	1/65,64
5	1,44	1/39,87	5	1,58	1/56,45
6	1,64	1/34,69	6	1,84	1/48,55
7	1,86	1/30,18	7	2,14	1/41,75
8	2,11	1/26,26	8	2,49	1/35,91
9	2,4	1/22,85	9	2,9	1/30,88
10	2,73	1/19,88	10	3,37	1/26,56
11	3,1	1/17,3	11	3,92	1/22,84
12	3,52	1/15,05	12	4,56	1/19,64
13	4	1/13,09	13	5,3	1/16,89
14	4,55	1/11,39	14	6,16	1/14,53
15	5,17	1/9,91	15	7,16	1/12,5
16	5,88	1/8,62	16	8,33	1/10,75
17	6,68	1/7,5	17	9,69	1/9,25
18	7,59	1/6,53	18	11,27	1/7,96
19	8,62	1/5,68	19	13,1	1/6,85
20	9,8	1/4,94	20	15,23	1/5,89
21	11,14	1/4,3	21	17,71	1/5,07
22	12,66	1/3,74	22	20,59	1/4,36
23	14,39	1/3,25	23	23,94	1/3,75
24	16,35	1/2,83	24	27,84	1/3,23
25	18,58	1/2,46	25	32,37	1/2,78
26	21,11	1/2,14	26	37,64	1/2,39
27	23,99	1/1,86	27	43,77	1/2,06
28	27,26	1/1,62	28	50,89	1/1,77
29	30,98	1/1,41	29	59,17	1/1,52
30	35,2	1/1,23	30	68,8	1/1,31
31	40	1/1,07	31	80	1/1,13

Assignment of the transmitted parameters to the physical values

P - gain physicalic value * 8
I - gain physicalic value * 150
V - gain percentage * 2,56

11 Update list

Version	Amendment	Chapter	Date	Name	Remarks
V04.31HM97	none	-	16.03.1999	K. Stadler	ET - Format
V05.22HM99	chapter re-worked text addition text addition chapter re-worked	4 - 4.3 5.1 5.18 5.19	31.05.1999	H. Mund	
V0605	separate German / English SSD Drives		24.02.2005	N. Dreilich	Logo

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