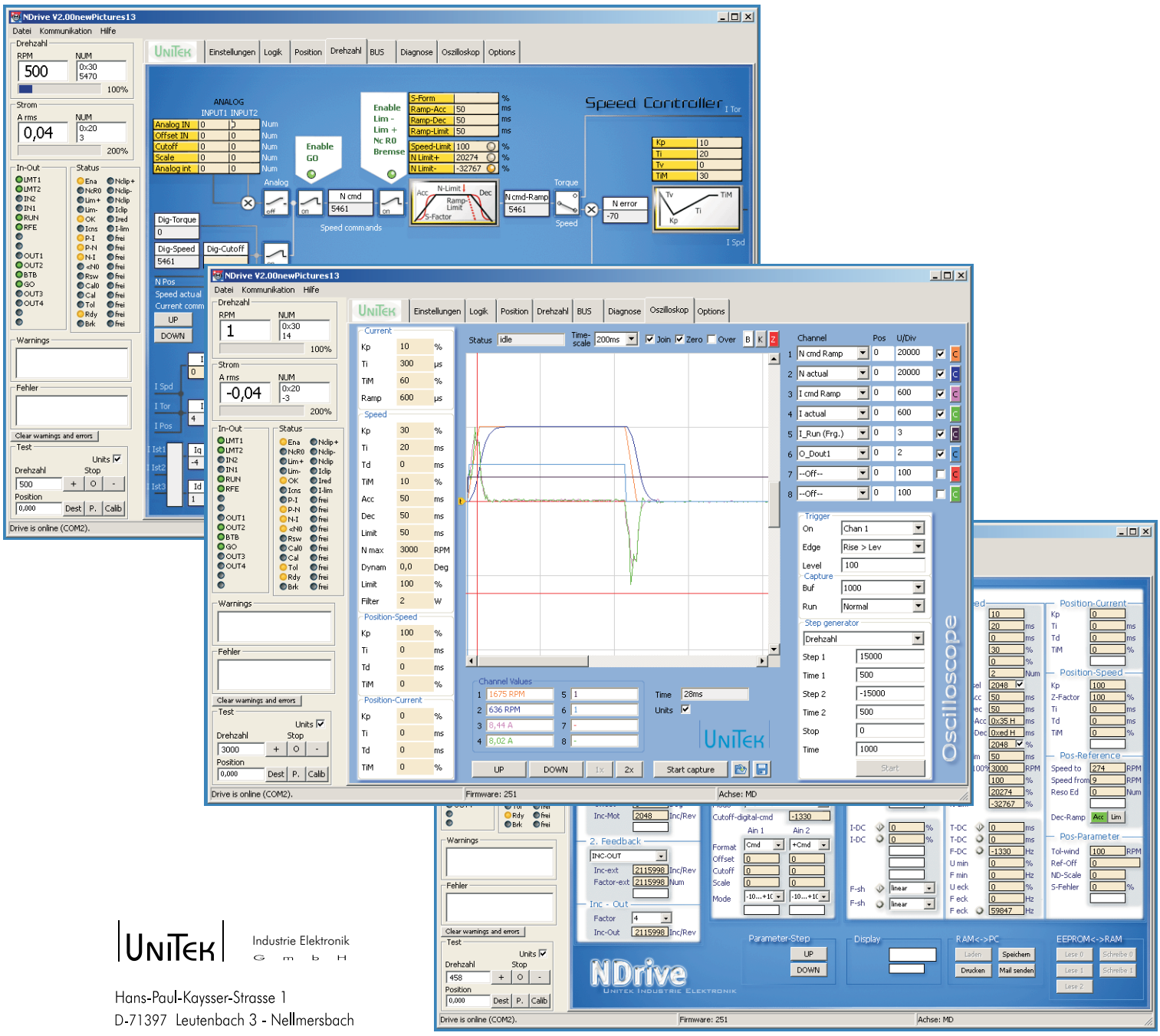
PC-Manual-Software

for
Servo-Amplifier DS 205..475
and
Battery-Motor-Controller
BAMO-D, BAMOBIL-D, BAMOCAR-D



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Preliminary version E-0808-2-V8-adv

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Manuals for other digital Unitek devices:
Hardware manual: DSxx, BAMO-D3, BAMOBIL-Dx
Commissioning: DSxx, BAMO-D3, BAMOBIL-Dx
BUS systems: CAN-BUS

General information

Manual
NDRIVE2 Version:V-en-1 ID-No. 002.17-61 Edition:17-4-2009

Application:
For software version >V220 only
(> Serial no. 58000)

General information
The software NDrive is used to set-up and optimize UNITEK digital servo amplifiers (DS) and motor drives (BAMO-D, BAMOBIL-D, BAMOCAR-D).
Basic computer skills and fundamental knowledge of the Windows software are required.
The NDrive software and the respective manual are available on CD or via the internet.

Safety advice
The parameters and adjustments of the amplifier and the motor are preset.
Operating parameters can be preset and changed during operation.
The computer and the PC programs are not malfunction-proof.
The user must ensure that in case of malfunctions neither personnel nor machines are endangered and that the drive is stopped.

Saved data can be changed by third parties. Any imported data record must be checked prior to re-use.

Any adjustments or optimising work on the running drive must only be carried out by trained competent personnel with knowledge of drive and control engineering and computer handling.
Further to this, the safety advice for the amplifier or drive used must be observed.
Any operation not conform to the safety guidelines is not permissible.

Operating system
NDrive will operate with WINDOWS 2000 and WINDOWS NT4, WINDOWS XP, Windows Vista

Min. required PC equipment
Processor: 80486 or superior
Graphics: WINDOWS compatible
Hard drive, available capacity: 3MB
Floppy disc drive: 3,5"
CD drive: CD-ROM
RAM: min. 8 MB
Interface: COM1 or COM2 (RS232, USB adapter)
WINDOWS is a registered trademark of Microsoft Corp.

Software installation

The user software NDRIVE can be copied. An installation program is not required.

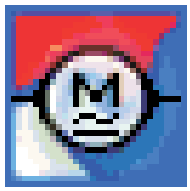
Software installation from a CD (compact disc Unitek-Doku-Soft-Vx)

Copy the software folder (NDrive-software-xx) from the CD to the hard drive (do not install).
Start the software file NDrive.exe with a double click.

Software installation via the internet
Log into >www.unitek-online.de<. Click software button.
Download and save the software (N*Drive-Software.zip*). Decompress in *NDrive-Software-xx* and start the software file *NDrive.exe* with a double click.

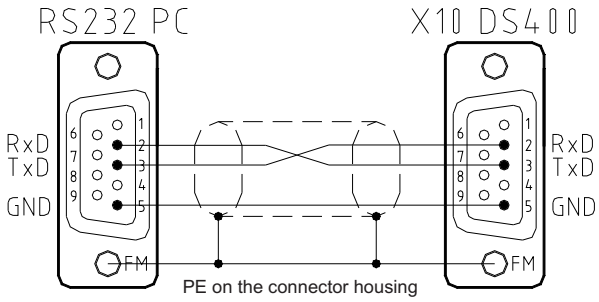
NDrive **Icon**

In order to have the *NDrive* software available as a convenient desktop icon proceed as follows:
Right click on the software file *NDrive.exe*. Send to the desktop. The icon is displayed on the desktop as *Shortcut to NDrive.exe*.
Double click the desktop icon to start NDrive.



Communication

Software communication between the PC and the servo amplifier via RS232.
115200 baud rate.
The connecting cable is a null modem type cable. Do not use a null modem link cable!
Use the USB adapter RS323 for PCs with an USB interface.
Plug and unplug the connecting cable only when all voltages have been removed from the PC.
The interface is galvanically connected to device ground (AND).



Home

Home

Description

The program presents a screen consisting of two elements. A constant outer frame (grey) and an interleaved page area (blue). The pages are accessed by a horizontal tab bar running across the top of the frame.

Top: The top of the frame contains the title bar, the menu bar, and the page tabs.
Left: The left frame section displays speed, current, input/outputs, states, errors, and test functions.
Bottom: The bottom of the frame displays the setup states.

Unitek symbol: Link to the Unitek website

The screen surface switches between pages. The tab structure allows for easy access of relevant data and fast switching between the pages.
The grey frame surface is constantly displayed. The selected pages are opened across the complete blue area.
Multi-page parameters are automatically transferred. Adjustments referring to one page remain unaffected.

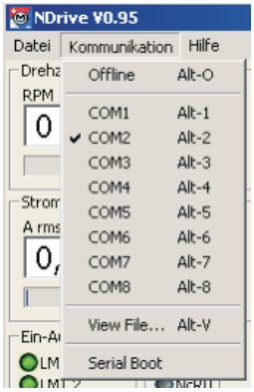
Title bar NDrive version + parameter set name

Menu bar **Drop down menu for Windows commands**

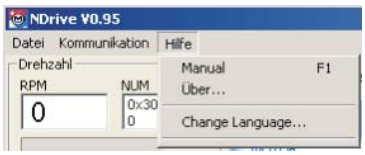
File

Download	NDrive file
Save	NDrive file
Download	NDrive file
Print	NDrive file

Print of selected files
Script (for service only)
Exit

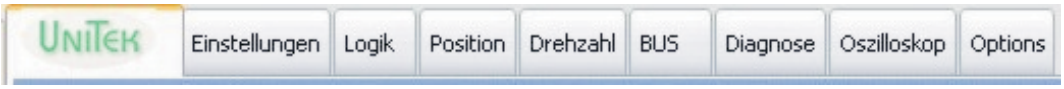


Communication RS 232
Select interface
Show file
Software update



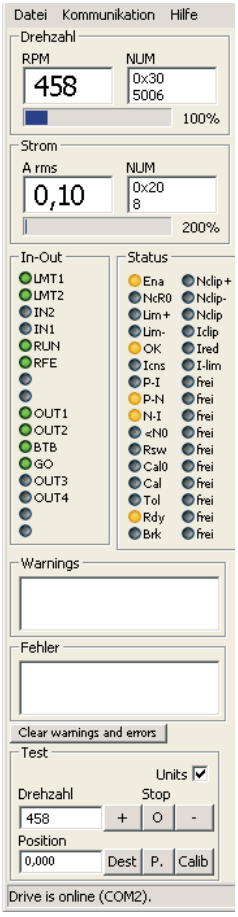
Help
Manual (pdf)
About UniTek
Select language

Page Tabs



Relevant page selection

Displays



Permanently active Display and input fields.

Speed	Numeric speed display in rpm, bar graph 0 – 100% speed
Current	numeric current(I) display in Amps effective bar graph 0 – 200% rated current.
Inputs/Outputs	Display of the active inputs and outputs
Status	Current state
Warning	Display of the warnings
Error	Error display

Inputs

Test	Only for test operation !!!
Speed	Numeric input of a test speed value
Position	
Dest	- numeric input of the test position
P (preset)	- input as actual position value and comm. value
Calib.	- start a test

Bottom frame

Operation:

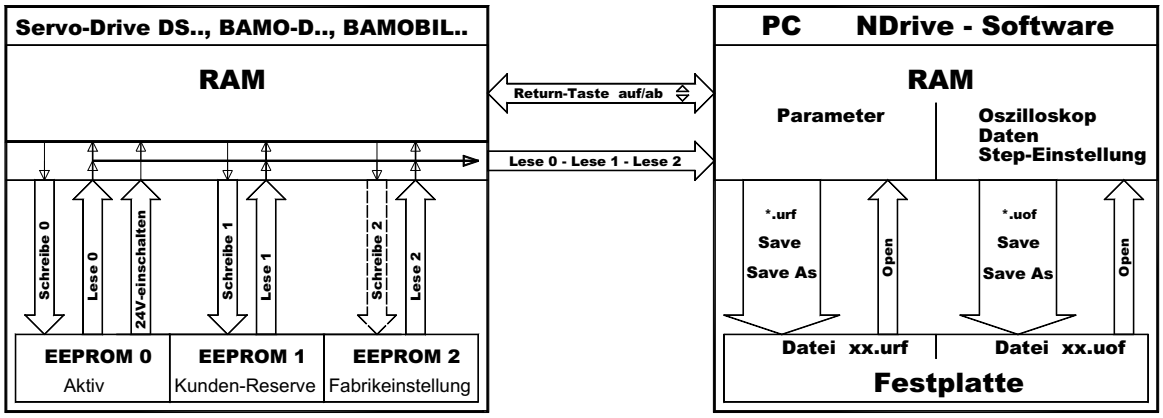
The PC user interface is a standard WINDOWS - format.
Only use whole numbers or write decimals with a point.
Write positive values without a sign, negative values with a - sign.

Offline operation

There is no connection to the control unit (servo amplifier). The message 'Drive is offline' blinks in the bottom line of the frame display.
To download a parameter file click ÷ *communication* ÷ *view file* and use the windows browser to locate and select a file (*.urf). The parameter data are transferred to the input fields. The data can now be optimised and saved again with ÷ *file* ÷ s*ave register*. The original file may be overwritten or a new file created.

Online 0peration

Plug the connecting cable RS232. Switch on the PC and the control unit. Select the baud rate of 115200. Select the communication interface with ÷ *communication* ÷ COM1 to COM8. When the connection is successful, the message 'Drive is online' appears in the bottom frame line. The active drive parameter data will be imported from the drive to the PC and can be manipulated via the input fields as required. Any changed data will be downloaded from the PC to the RAM of the drive by clicking ÷ *enter*. They are now the active drive parameters

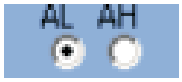


Input

Click the input field (left mouse button), enter a numerical value and click ÷ *enter* to save the new value into the PC RAM and the Drive RAM.
Click an input field (left mouse button). The value can be changed via the *up* and *down* buttons. The values are immediately updated in both device RAMs.

Drop-down menu

Click the *arrow* button of the list box. The menu shows the available options.
Scroll up or down by means of the *arrow* button and select an option. Selecting an option updates the variable and closes the option menu.

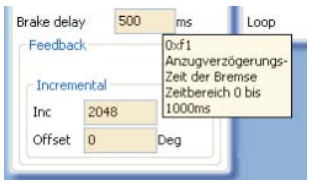


Option buttons

Where two options are available, click either button to select the required setting. A dot displayed in the button shows the selected option.

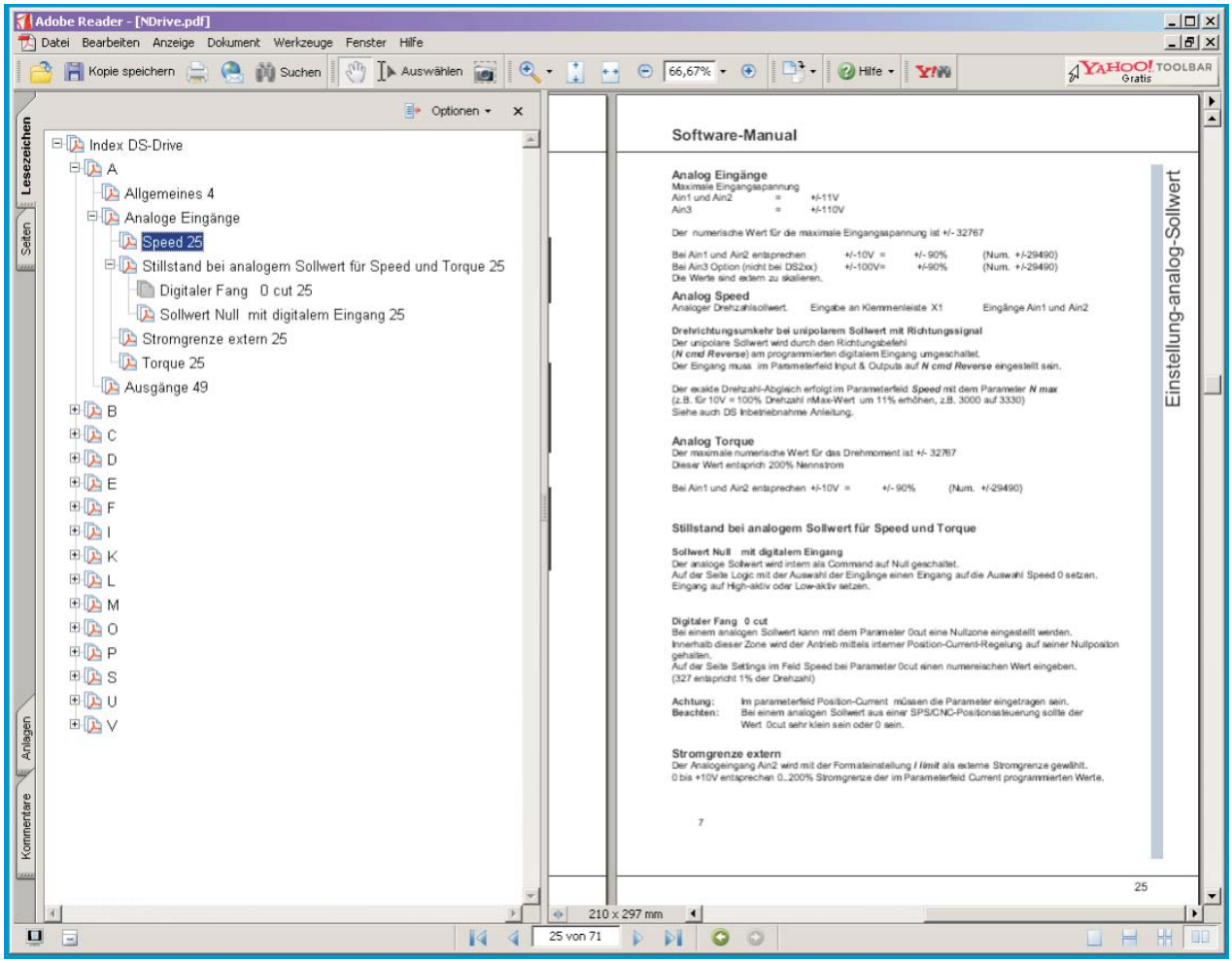
On screen Help

Shift the cursor to anyparameter input field or setup field and pop-up field *help* willappear for approx. 10s. This field contains a brief parameter description.



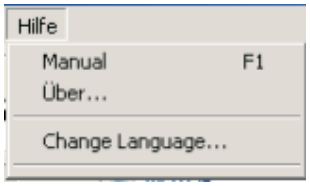
Help Menu

By selecting the ÷ *help* option on the top menu bar,
and then selecting ÷ *manual*, a pdf version of the NDrive manual is downloaded.
Clicking the topic in the bookmarklet opens the requested page



Select language

By clicking the ÷ *help* option on the top menu bar,
and then selecting ÷ *change language*, a list box opens and the language can be selected.
NDrive needs to be restarted in order for the changes to take effect.



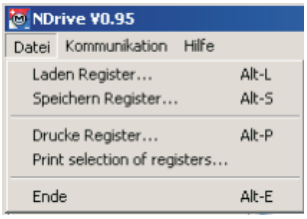
Download of parameter data from a PC to the control unit (servo)

RAM (volatile)
When there is an active communication between the drive and NDrive, the parameters displayed on the screen are those currently active in the drive RAM. When a value is changed on-screen, the value is updated in the drive RAM when the return key is pressed.
Attention: If the +24V auxiliary voltage is switched off, the RAM data will be lost.

EEPROM
(Non-Volatile)
Click ÷ *write0 (1)* on the setting page.
The data are written into the drive EEPROM (level 0, 1).
The EEPROM level 0 contains the current parameter record which is downloaded to the drive RAM each time when the 24V auxiliary voltage is switched on.
Note:
The *Write2* button is code protected and not visible.
The data of *Write2* are write-protected and contain the default parameter record.

Transfer of parameter data from the drive (servo) to the PC
Click ÷ *read0 (1, 2)* on the setting page.
The parameter data are transferred from the drive EEPROM to the drive RAM and from the drive RAM to the PC RAM.

Saving the parameter data of the PC RAM to PC disks (hard drive, CD, floppy disk, etc.)

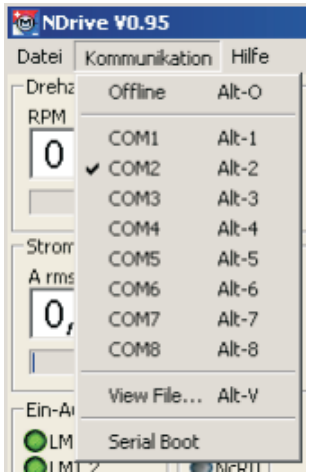


Saving parameter data in the PC (*.urf)
- via the menu bar
Click ÷ *file* in the menu bar.
Click ÷ s*ave registers* and the window is opened. Select the required folder and save with the same or a different file name.
- through the button *save*
Click ÷ *save* on the setting page.
The window *save register file* is opened. Select the required folder and save with the same or a different file name.

Transfer of parameter data from PC disks (hard drive, CD, floppy disk, etc.) to the PC RAM
Click ÷ *download* on the setting page and the window *download register file* is opened.
Select the requested folder and click ÷ *open* to download the data to the NDrive

Lese	= Read
Schreibe	= Write
Lade Register	= Download register
Speicher Register	= Save register
Drucke Register	= Print register
Laden	= Load

Select the communication interface for online operation



Click the menu ÷ *communication* to drop down the options.
Click the requested COMx interface (Com1 to Com8) to select it.
The checked interface is selected and the connection to the control unit (servo) is established.
The message '**Drive is Online (COMx)**' is displayed in the frame footer.

Communication stop

Click the drop-down menu ÷ *communication* and click ÷ *offline* to stop the communication between the PC and the drive.
The connection is cut off and the message '**Drive is offline**' is displayed in the bottom screen frame.

Display of a saved file (*.urf) in the NDrive

Click ÷ v*iew file*. The window *Download register file* is opened.
Select the folder and the file is downloaded to the NDrive.

Download of new firmware to the servo, control unit (firmware update)

Detailed description in the file 'Firmware-update-3 SD Flash'.

Download the SD-Flash files from CD or from the internet (download software) and install SD-Flash.

Open the folder 'firmware update' in the folder 'Unitek-NDrive V2-xx' and start the file 'setup.exe'
Setup Wizard
Target input (proposal: c:\CCStudio_v3.3\specdig\sdflash)
Start 'install'
Read licence and accept
Repeat target
Click ÷ *install*
Click ÷ *next* ÷ *finish*
Click ÷ *exit* to finish setup Wizard
SD Flash windows opens.

SD-Flash program already installed

Click ÷ *SDFlash.exe* in the folder 'firmware update'
SD Flash window opens.
Click ÷ *open file*. Option window opens.
Select 'serialFlashreg2812.sdp' and open it
Click ÷ *device* in the frame header
Click ÷ *flash* in the drop-down menu
Click ÷ *start* in the flash window
Program sequence displayed in the frame
Debug in case of an error message and repeat the program from 'open file' on.
The firmware download has successfully been executed when the message 'MSG: Verify flash succeeded ' is displayed.
Close 'SD Flash'

Watch variables			
Selected value	**Function**	**Range**	**ID-address**
OFF	no measured value		REGID
N cmd	Speed command value before Ramp	± 32767	0x31
N cmd Ramp	Speed command value after Ramp	± 32767	0x32
N actual	Speed actual value	± 32767	0x30
I cmd Ramp	Current Command value after Ramp	s.Tabelle	0x26
I actual	Actual current (I)	s.Tabelle	0x20
Pos dest	Position target	± 2147483647	0x6e
Pos cmd	Position Command value	± 2147483647	0x91
Pos actual	Actual position	± 2147483647	0x6d
I_Limit1	Digital input END1	0/1	0xe4
I_Limit2	Digital input END2	0/1	0xe5
I_Din1	Digital input 1	0/1	0xe6
I_Din2	Digital input 2	0/1	0xe7
I_Run (Frg)	Digital input enable control unit	0/1	0xe8
O_Dout1	Digital output 1	0/1	0xe0
O_Dout2	Digital output 2	0/1	0xe1
O_Rdy (BTB)	Drive Ready output	0/1	0xe2
O_Go	Internal enable	0/10/1	0xe3
O_Brake	Brake active	0/1	0xf2
O_Icns	Limited to continuous Current (I)	0/1	0xf3
O_Less_NO	Speed linferior to 0.1%	0/1	0xf5
O_Toler	Within position tolerance range	0/1	0xf4
I_Fault	Internal error message from the power section	0/1	0xe9
I_Regen (Ballast)	Ballast circuitry state	0/1	0xea
I_o´/u´ voltage	Over-voltage condition	0/1	0xeb
I_LossOfSignal	Resolver signal missing or faulty	0/1	0xec
Rotor	Rotor position signals (RST)		0x5c
Var1	Comparison reference value 1	±32767	0xd1
Var2	Comparison reference value 2	±32767	0xd2
Var3	Comparison reference value 3	±32767	0xd3
Var4	Comparison reference value 4	±32767	0xd4
Ain1	Analog input 1	±32767	0xd5
Ain2	Analog input 2	±32767	0xd6
Icmd	Current (I) command value	s.Tabelle	=x22
I1_cmd	Current (I) command value phase 1	s.Tabelle	0x27
I1_actual	Current (I) actual value phase 1	s.Tabelle	0x54
I2_cmd	Current (I) command value phase 2	s.Tabelle	0x28
I2_actual	Current (I) actual value phase 2	s.Tabelle	0x55
I3_cmd	Current (I) command value phase 3	s.Tabelle	0x29
I3_actual	Current (I) actual value phase 3	s.Tabelle	0x56
N error	Speed command-Actual error	s.Tabelle	0x33
Pos error	Position command actual error	±32767	0x70
I error	Current (I) command-actual error	±750	0x23
I1_error	Current (I) com.-actual error phase 1	±750	0x38
I2_error	Current (I) com.-actual error phase 2	±750	0x39
I3_error	Current (I) com.-actual error phase 3	±750	0x3a
pwm1 (5/6)	Pulse width modulation phase 1	750 ±750	0xac
pwm2 (3/4)	Pulse width modulation phase 2	750 ±750	0xad
pwm3 (1/2)	Pulse width modulation phase 3	750 ±750	0xae
MotorPos1T	Motor actual angular position phase 1	65536	0x42
MotorPos2T	Motor act. angular position phase 2	65536	0x43
MotorPos3T	Motor act. angular position phase 3	65536	0x48
MotorPos1S	Motor act. angular position phase 1	65536	0x49
MotorPos2S	Motor act. angular position phase 2	65536	0x4a
MotorPos3S	Motor act. angular position phase 3	65536	0x4b
I_DCcorr			
Time_1us			0xaf
I1_adc	Current (I) actual 1 direct	500 ±	0xa9
I2_adc	Current (I) actual 2 direct	500 ±	0xaa
Ballast Count			0xa1
Temp-Debug	for service purposes only		0x9a
Logic (Hz)	i/o operating frequency		0xab
*PTR1			
*PTR2			
Unknown			

Interpreting numeric representations of Position, Speed, Current, and Command values

Many of the values encountered when working with *NDrive* are in their raw machine format (termed numeric).
When interpreting values it is important to differentiate between a value, and its numeric representation.
This is especially the case when looking at communications data (CAN BUS, RS232) and also *Track* and *Oscilloscope* data.

Position

Actual position range	Resolver	Incremental encoder
Pulses per revolution Maximum value ± 2147483647 (31 bit-1)	65536	65536
Resolution (lowest value)	16 (65536/4096 (12 bit))	65536/inc x 4
Example Feed drive Factor 5mm/rpm.	Travel 1000mm = 200 rpm 200 rpm = 13107200 resolution = 65536/4096 = 16	Travel1000mm = 200 rpm Inc. encoder = 2048 pulses/rpm. 200 rpm = 1638400 resolution = 65536/8192 = 8

Speed

Actual Speed range	Max. Speed (N_{max}) calibration	Limiting
Max. value ±32767 (15bit-1)	N_{max} value in the parameter field Motor and speed = 32767	Speed limiting via the parameter field "speed limit"
Example	N_{max} = 2000 2000 rpm is represented by 32767	The max. speed is limited to 1500 rpm 1500rpm is represented by 24575 (32767/2000*1500)

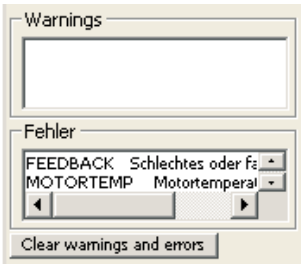
Current (I)

Actual current (I)-range	I 100%	Rated current (I) calibration I-device			Peak current (I) DC disabled		Limiting
Max. value ± 9Bit	mV	Num	Aeff	A=	Num	A=	
DS 205/405	550	110	5	7	160	10	Limit set in parameter field Motor and Current. The smallest value is valid.
DS412	800	160	12	17	230	24	
DS420	700	140	20	28	200	40	
DS 450	416	82	50	70	120	100	
DS 475/BAMO	416	82	75	105	120	150	
Example (DS205/405)		I-device =5A 5A rated current corresponds to the numeric value 110					Limit I continuous to 2A Icon = 110 / 5 *2 =44 Num The maximum continuous current (I) is now limited to 2A

Command Values

Position command value range	Speed command value range	Current (I) command value range
Max. value ±31bit	Max. value ±15bit	Max. value ± 9 bit
± 2147483647 numeric	± 32767 numeric	DS 205/405 rated: 110 max: 160
		DS 412 rated: 160 max: 230
		DS 420 rated: 140 max: 200
		DS 450 rated: 82 max: 120
		DS 475/BAMO rated: 82 max: 120

Attention: For Analog Command Values (AIN1, AIN2). 10V corresponds to a numeric value of 29490. (90% of the maximum representation.)



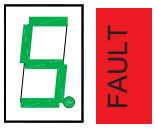
Errors

Error messages.
The error messages are displayed in the window ‘Error’.

Error list

Error message	Description	ID-address
NOREPLY –No RS	RS232 failure. Incorrect connected or missing connecting cable	
		0x8f
BADPARAS	Parameter error	Bit 0
POWER FAULT	Output stage error, over-temperature, over-voltage, short-circuit.	Bit 1
RESERVE		Bit 2
CAN TIMEOUT	Transfer error CAN-BUS	Bit 3
RESOSIGNAL	Incorrect/faulty resolver signal	Bit 4
POWERVOLTAGE	No power supply voltage	Bit 5
MOTORTEMP	Motor temperature too high	Bit 6
IDC	Current too high	Bit 7
I_123	Current out of tolerance	Bit 8
I peak	Over current (I) 300%	Bit 9
RACEAWAY	Racing (command value: missing or incorrect polarity)	Bit 10
CANINIT	CAN failure (hardware)	Bit 11
SPIADCINIT	ADC failure (hardware)	Bit 12
ROTOR	Incorrect/faulty incremental encoder signal	Bit 13
ADCTNT	Software error	Bit 14
BALLAST	Ballast circuitry overload	Bit 15

In case of an error the red LED ‘fault’ lights up and the error no. is indicated.



The BTB (ready) contact is opened.
The software ‘BTB message’ switches from 1 to 0.
The state message ‘RDY’ extinguishes.

When the enable is switched off, the error message is still displayed.

The error message is deleted:
When the enable is switched on, the function ‘cancel errors’ is activated via a digital input or a CAN BUS.

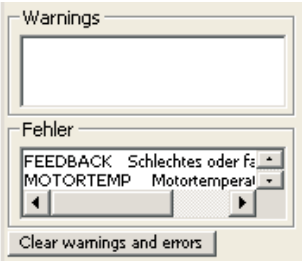
Also refer to: Commissioning manual, chapters ‘Errors’, ‘Debugging’

Warnings

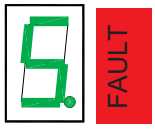
The warning messages are displayed in the window ‘warnings’.

Warning messages

Warning display		Description		ID-address
		Motor temperature superior to 80%		
		Device temperature superior to 80%		
		Programmed value exceeded by I2t		
		Drive disabled		



LED displays on the servo
In case of a warning state the red LED changes (low-frequency) and the seven-segment display shows alternately the warning no. (red LED) and the operating state (LED dark).



Measured values

Symbol		Description		ID-Ad.
Tmotor		Active motor temperature		0x49
Tigbt		Active output stage temperature		0x4a
Tair		Active air temperature in the servo		0x4b
VdcBus		Bus circuit voltage		0xeb
Ireda		Active current limit		0x48

LED displays on the servo

The operating state **“normal”** is signalled by a bright green seven-segment display + decimal point (display of the state).
The state **“fault”** is signalled by a bright red fault LED and the seven-segment display indicates the error no.

Display of the servo-drive state

Display	Point/segment	State	State of NDrive
	Flashing dark	Processor active Auxiliary voltage missing or inherent hardware failure	
	flashing bright dark	Starting state after reset (auxil. voltage 24V off-on). The first enable stops the flashing display. Drive enabled Drive disabled (not enabled)	OK = 0 OK = 1, ENA = 1 OK = 1, ENA = 0
	bright	Speed zero (standstill signal)	N0 = 1
	bright	Drive revolves clockwise, N currently positive	N0 = 0
	bright	Drive revolves anti-clockwise, N currently negative	N0 = 0
	Flashing Bright dark	Motor current reduced to continuous current Icns Motor current at max. current limit I_{max} Normal operation; Motor current within the current limits	Icns = 1 Icsn = 0 Icns = 0
	bright for 0.1s	A new command (value) was received from the BUS or RS232	

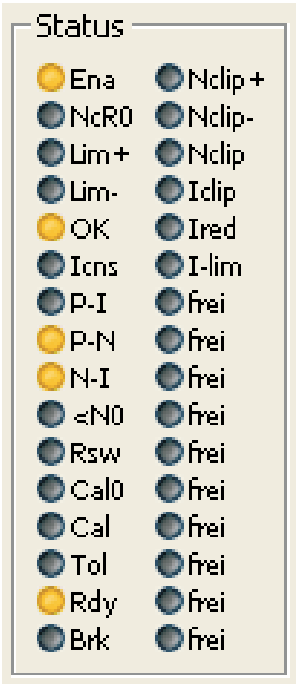
Example: Motor revolving clockwise

Point flashes = active processor
bottom segment = drive enabled
right segment = motor revolves clockwise

The operating states are displayed in the window ‘state’.

List of states

Display of the state	Function	ID-address
		0x40
Ena	Drive enable	Bit 0
NcRO	Speed command value = 0 (drive stopped)	Bit 1
Lim+	Output stage switch Plus active	Bit 2
Lim-	Output stage switch Minus active	Bit 3
—-	vacant	Bit 4
Icns	Current(I) limit reduced to continuous current(I)	Bit 5
P-I	Position control. End position – current(I) controller, directly coupled mode	Bit 6
P-N	Position control	Bit 7
S-I	Speed control	Bit 8
<N0	Speed inferior to 0.1%	Bit 9
Rsw	Reference input active	Bit 10
Cal0	Calibration travel (reference) (Bit 11 + Bit 12 = Ref. traverse)	Bit 11
Cal	Calibrated reference position	Bit 12
Tol	Position within tolerance	Bit 13
Rdy	Drive ready (BTB)	Bit 14
Brk	Brake active	Bit 15
Nclip+	Speed limiting	Bit 16
Nclip-	Speed limiting	Bit 17
Nclip	Speed limiting	Bit 18
Iclip	Current limiting	Bit 19
Ired	Current reduction	Bit 20
I-lim	Current limiting	Bit 21
		Bit 22
		Bit 23
		Bit 24
		Bit 25
		Bit 26
		Bit 27
		Bit 28
		Bit 29
		Bit 30
		Bit 31



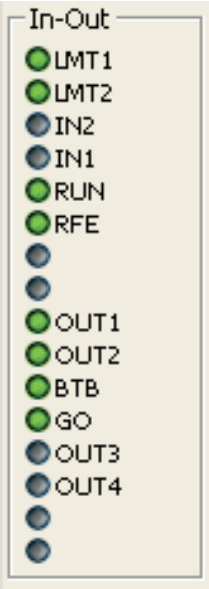
frei = free

Error state memory

Display of the inputs and outputs

The LEDs are bright when the positive input voltage is superior to 10V and the output voltage is positive.

Short symbol		Function		ID-address
Limit 1		Digital input limit 1 active		
Limit 2		Digital input limit 2 active		
Din 2		Digital input Din 2 active		
Din 1		Digital input Din 1 active		
FRG (RUN)		Hardware, enable active		
RFE		Rotating field enable		
Dout 1		Digital output Dout 1 on		
Dout 2		Digital output Dout 2 on		
BTB (Rdy)		Hardware relay, output BTB (Rdy) on		
GO		Internal enable GO active		
Dout 3		Digital output Dout 3 on		
Dout 4		Digital output Dout 4 on		



Drive enable (RUN)

Hardware drive enable

Switching on

Apply a voltage across X1:7 (RUN) > 10V=, >30V=

The power stage of the drive is immediately enabled when the drive enable is switched on. The software control of the power stage is activated 2ms later. Commands such as command values, reference travel, etc. can be sent 5ms after the drive enable (RUN).

The enable state is indicated in the state field with ***'Ena'***.

Switching off

Apply a voltage across X1:7 (RUN) < 4V=

When the enable fuction is switched off, the drive is electronically disabled.

Switching off with emergency stop (standard setting: jumper J2 open)

The drive decelerates to standstill before it is enabled.

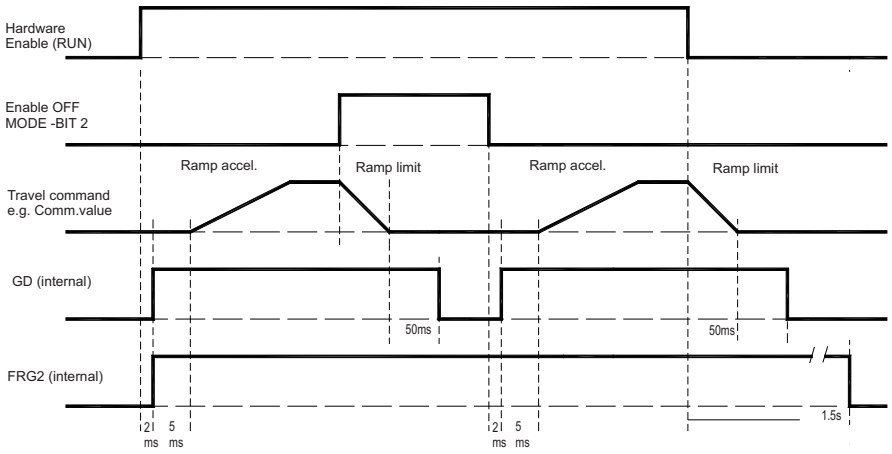
When the enable function is switched off, the internal speed command value ***N cmd Ramp*** is reduced to zero by means of the ***ramp limit*** which has been adjusted in the parameter field ***speed***. The power section is disabled by means of the internal command ***GO*** 50ms after the axis has come to a standstill or after the ramp time (***ramp limit***) + 50ms has elapsed.

The power stage hardware is disabled after 1.5s at the latest.

Switching off without emergency stop (jumper J2 closed)

The power section is immediately disabled when the enable function **RUN** is switched off.

The drive decelerates free of torque.



Enable and disable through interfaces (com. ports CAN BUS, RS232)

The hardware enable (RUN) must be switched on!

Enable

The drive is enabled without delay by means of the command ***not enable off*** (MODE-BIT Bit2=0

Disable

Via the command ***enable off*** the internal speed command value ***N cmd Ramp*** is reduced to zero by means of the ***ramp limit*** which has been adjusted in the parameter field ***speed***.

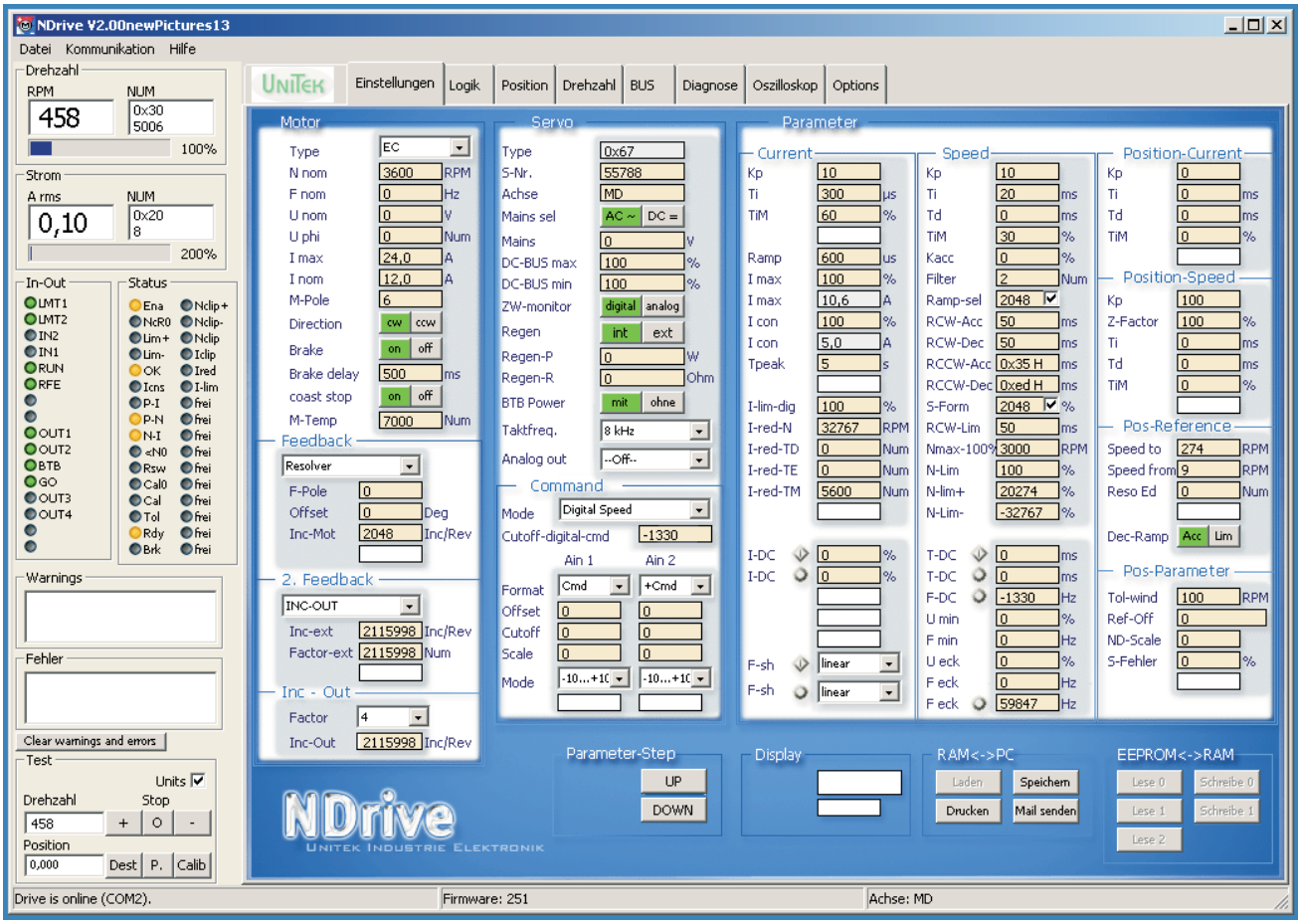
The ramp limit must be adjusted such that the axis is decelerated to standstill.

The power section is disabled after the ramp time (***ramp limit***) of 50ms has elapsed.

50ms after the ramp time (***Ramp-Limit***) the Power Section will be disabled.

No hardware disable after 1.5s.

Setting window Parameters and data input



Input fields for motor data, device data (servo) and parameter data.
Buttons for the saving functions.

The adjustments for the motor and the servo amplifier can only be made via this window. The parameter data can be entered via this and several other windows. The changed parameter data are immediately updated on all pages.
When a value has been changed, the new value is automatically updated on all windows.
See the detailed information for the input fields.

Note:

Prior to the first commissioning and any change of the motor type the data displayed in the setting windows must be checked with the type plate or the data sheet of the motor. Please observe the motor specific connection guidelines!

Any changes of the set value during online operation must only be carried out by competent and qualified personnel.

Setting window for the rated motor data

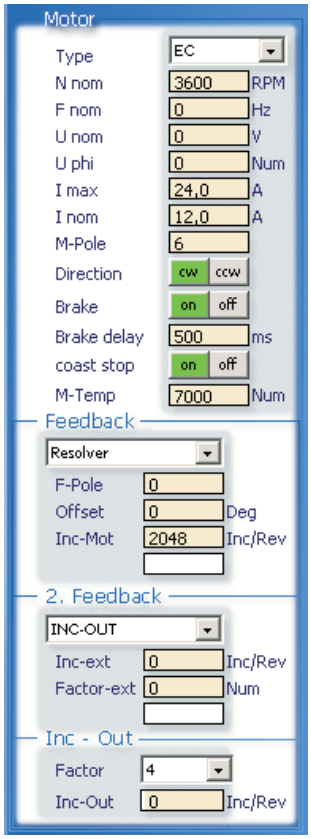
Motor adjustment parameters					
Short symbol	**Function**	**Adjustment range**	**Unit**	**Note**	**ID-address**
Type	Select motor type				
N_{nom}	Rated motor speed	Type plate (600-50000)	Upm		0x59
F_{nom}	Rated motor frequency	20 bis 1200	Hz		0x05
U_{nom}	Rated motor voltage	Type plate	V		0x06
U_{phi}	Motor power factor	Type plate	%		0xoe
I_{max}	max. motor current(I)	Type plate	A		0x4d
I_{nom}	Continuous motor current (I)	Type plate	A		0x4e
M- Pole	No. Of motor poles	2 … 48	Num		0x4f
Direction	Select rotation direction				
Brake	Select with/without Brake				
Brake delay	Response time motor brake	0 … 500	ms		0xf1
Coast stop	Selection				
M-Temp	Swiching point motor temperature		Nu8m		0xa3
Feedback	Select feedback type				
Feedback2	Select feedback type				

Motor type selection

Motor type	**Selection 0x5a**	**Feedback selection 0xa4**		**Fixed settings**	**Notes**
EC sinus	00xx	Incremental TTL	xx00		
		Resolver	xx10		
		Incremental sin/cos	xx20		
		Sensorlos	xx70		
EC trapez	10xx	BL-Tacho+Rotor	xx30		
		Rotor	xx40		
AC	20xx	Inkremental TTL	xx00		
		Resolver	xx10		
		Inkremental sin/cos	xx20		
		Sensorlos	xx70		
DC	30xx	DC-Tacho	xx50	M-Poles = 2 Feedback Offset = 120° (M1-M3)	Ohne Geberstecker (Feedback X7) Parameter 0xa3 auf 0xFFFF setzen ! Die Motortemperaturüberwachung ist außer Funktion Mit Geberstecker (X7) für Tachospannung und Motortemperatur Vorwiderstand im Stecker-Adapter Parameter-Einstellung
		DC-Ankerspannung	xx60		

Motor parameters

Prior to any operation check the motor typeplate, the motor data sheet, and observe the Unitek connecting guidelines.



Type Select the motor type (EC, AC, DC)

Nnom Motor speed (of the motor typeplate)
The equivalent ***Nmax*** parameter value of the ***speed*** parameter field can be up to 20% superior to the value entered.

Fnom Frequency at which the rated motor speed is achieved.
Only with frequency conversion mode

Unom Voltage for the rated motor speed
Only with frequency conversion mode.

Uphi Motor power factor (type plate)
Only with frequency conversion mode

Imax Maximum permitted motor current (I)
(of the motor typeplate)

Inom Continuous motor current (I) permitted
(from motor nameplate)

M-Pole No. of motor poles (2 x pole pairs)

Direction Change of rotation direction. Command value, actual value, and the counting direction are changed

Brake Select motor with/without brake. For 'without brake' the switch-off delay is out of service.

Brake delay Activation delay time of the electro-mechanical brake.
Deceleration time delay when no brake is connected.

Coast stop

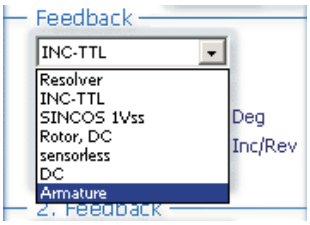
M-temp Switching point for the motor over-temperature
The drive is switched off. Error message Bit6

Feedback Select the feedback system
(TTL incremental encoder, resolver, SIN/COS, DC tacho, etc.)

2.Feedback Select 2nd feedback as input or output for counter increments

The parameters ***Imax*** and ***Inom*** are also entered in the parameter field ***Current*** .
The low value is used as threshold value.

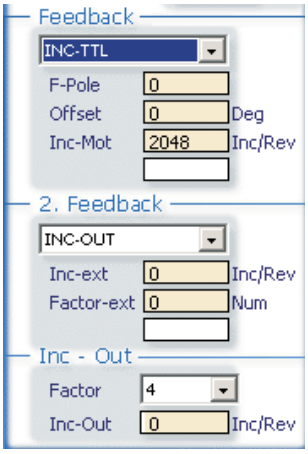
Adjustment Feedback



Resolver
F-Pole Resolver no. of poles 2 - 12
Offset Correction value for the mechanical encoder adjustment (polar wheel angle 0 to 360el).

INC-TTL **Incremental encoder with rotor positiontracks**
Offset Correction valuefor the mechanical encoder adjustment.
Inc-Mot Impulses per revolution
Note: The encoder rotor position must have the same number of poles as the motor.

SINCOS-Vss **1Vss-Incremental encoder commutation track**
Offset Correction valuefor the mechanical encoder adjustment



Rotor, DC **Rotor position encoder with bl-tacho (dc-tacho)**
Offset Correction value for the mechanical encoder adjustment

Without sensor **EC/AC motor without feedback encoder**
no adjustment

DC **DC motor with tacho**
Offset 120 = M1-M3 (0= M2-M3, -120= M1-M2)

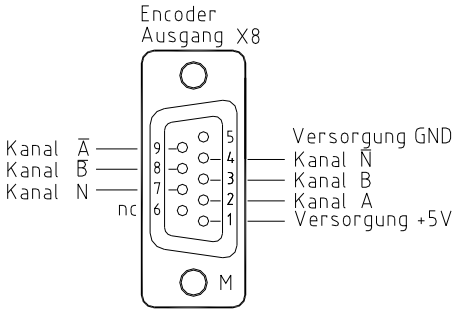
Armature **DC motor without tacho**
0ffset 120 = M1-M3 (0= M2-M3, -120= M1-M2)

Feedback adjustment parameters

Short symbol	Function	Adjustment range	Unit	Note	ID-Adress
Inc	encoder resolution	1024 … 8192	pulses/rev	Only binary	0xa6
Pole	No. Of encoder poles	2 … 12	Num		0xa7
Voltage	DC tacho voltage		mV/RPM		
Offset	Phase angle correction	0 ... ±360°	degree		0x44
Factor	multiplication factor SIN/COS- Inc.	4 … 16	Num		

Note: After any changes of the feedback parameters it is necessary to reset the parameters. Write parameter data EEPROM<->RAM and reload

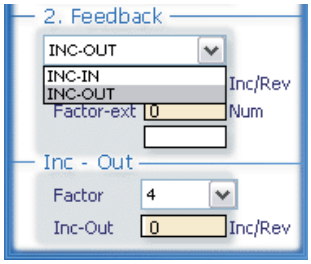
Adjustment X8 as 2nd counter input
Incremental encoder TTL 5V A,B,N + push-pull
Bridge between X8:1 and X8:6 (X8 switched as input)



Encoder output X8
Channel
Supply GND

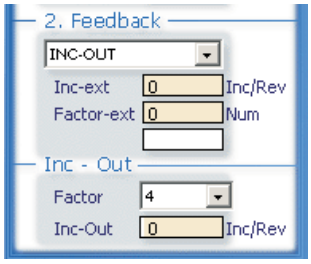
Scale (factor-ext.)
Calculate the transmission
1 motor revolution = 65536 num (internal counter)

Factor-ext for the adaption of the 2nd encoder (0x7e)
Encoder_2_Scale = 65536 / encoder pulses per motor revolution
*4 from the 2
Input at factor-ext. (0x7e) = encoder_2_Scale * 16384



Example:
1 Motor revolution corresponds to 0.1 encoder revolutions
No. of encoder pulses 1000/rpm
Pulses per motor revolution 0,1*1000*4 = 400

Input at encoder_2_Scale = 65536 / 400 = **163,840**
Input factor-ext. (0x7e) = 163,840 * 16384 = **2684354**

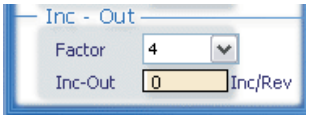


Adjustment X8 as output for incremental encoder signals

The encoder signals from the motor (feedback) are output across the D-connector X8 as TTL encoder signals for the CNC control.
Signals: channel A, channel /A, channel B, channel /B, channel N, channel /N

The encoder output is floating.
The voltage is supplied through the encoder cable of the CNC/PLC control.
Voltage supply +5V ±0.2V
The output signal corresponds to RS485
Option: Internal supply from the servo (LBR1+ LBR2)

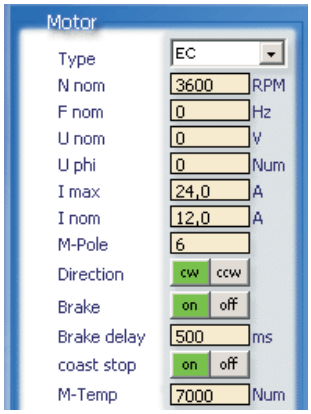
Resolution
For the -RS and -SC versions the resolution can be programmed.
For -IN the output corresponds to the no. of encoder pulses.



Factor Multiplication factor for the basic no. of pulses for SinCos (SC)
Inc-Out Setting value for the no. of pulses for resolver

Pulses per revolution	Resolution	Parameter
256	10 Bit	0xa4 Bit
1024	12 Bit	
4096	14 Bit	

Brake adjustment



The max. braking power of the motor is applied when the power has been switched off.
According to the electrical brake control the **brake delay** (switching on/switching off) corresponds to the respective type.

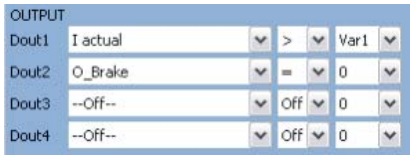
The brake cannot be switched directly via the digital output. It is necessary to connect a relay with a low control voltage (e.g. transistor relay) between the drive brake output and the motor brake input.

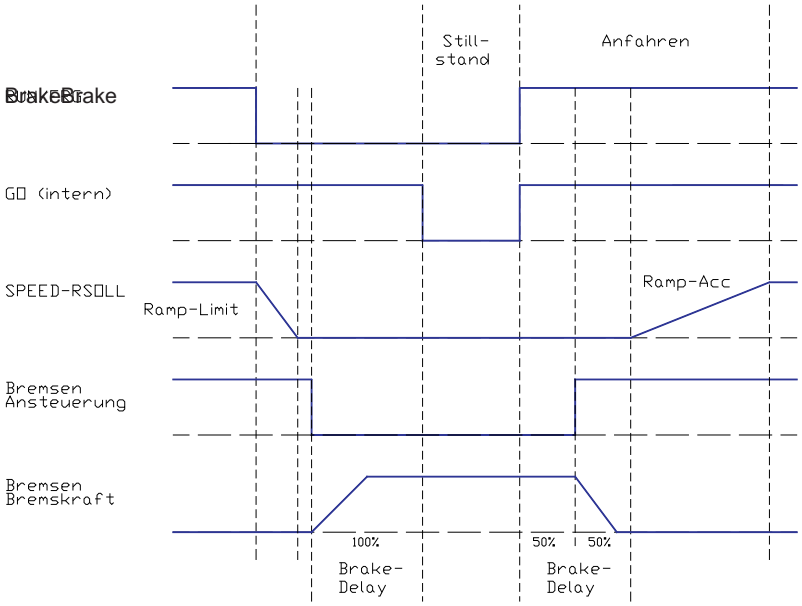
The brake **output** is activated via the parameter field **input/output** on the **logic** side.
Open the **logic** window and click ÷ **brake** in the input fields ÷ **Dout1** or ÷ **Dout2** of the drop-down menu to transfer the command 'brake' to the display field. Adopt the parameter **=(equal)** of the drop down menu by clicking the parameter.
The switching function of the output can be selected by entering **0** or **1** into the parameter field (standard: 0).

Enter the switch-off delay of the motor brake in the parameter field ÷ **brake delay** (0 to 500ms) of the input field ÷ **motor.**

When the brake is active, the state is display (**brk)** in the input field **state.**

Example	
Digital outputs	Options
Dout1	Current actual value superior to variable 1
Dout2	The brake is disconnected from the power supply when the enable is switched off.





Note
The sum of the **Ramp-Limit** time + the **Brake-Delay** time must be inferior to 750ms. 800ms after the drive enable has switched off the output stage hardware will be disabled.

Brake function

When the drive enable is switched off or the CAN command ***ENABLE OFF*** is received, the internal speed command value ***N cmd Ramp*** will be ramped down to zero at a rate defined by ***Ramp-Limit***. After a fixed delay time of 50ms, the ***Brake*** parameter will switch from 1 to 0. The braking power rises. After the programmed time ***Brake delay*** has passed, the internal parameter **GO** is switched to 0 and the servo is disabled (no torque applied)

Brake release function

If the brake is active and drive enable is switched on, the command value is maintained at 0 and **GO** switches immediately to 1. After 50% of the delay time (**brake-delay)** has passed, the brake is switched off, and after the complete delay time has passed, the command value will increase at a rate defined by ***Ramp-Acc***..

Motor temperature watchdog

Parameter motor temperature current reduction	0xa2 (only with linear temperature sensors)
Warning I-MOTORTEMP	Presetting 0xa2 = 5600
Parameter motor temperature error - switch-off	0xa3
Error message 6 (MOTORTEMP)	Presetting 0xa3 = 7000

Adjustment with non-linear temperature sensor (PTC resistor)

For the resistance value of the motor temperature sensor refer to the motor data sheet or measure the resistance value across connector X7, pin 6 against pin 12.
Resistance value at 25°C = t25
Resistance value at 145°C = t145

$$\text{Switching point at 25°C} = \frac{32000}{4700+(t25)} \times t25 = TSP25$$

$$\text{Switching point at 145°C} = \frac{32000}{4700+(t145)} \times t145 = TSP145$$

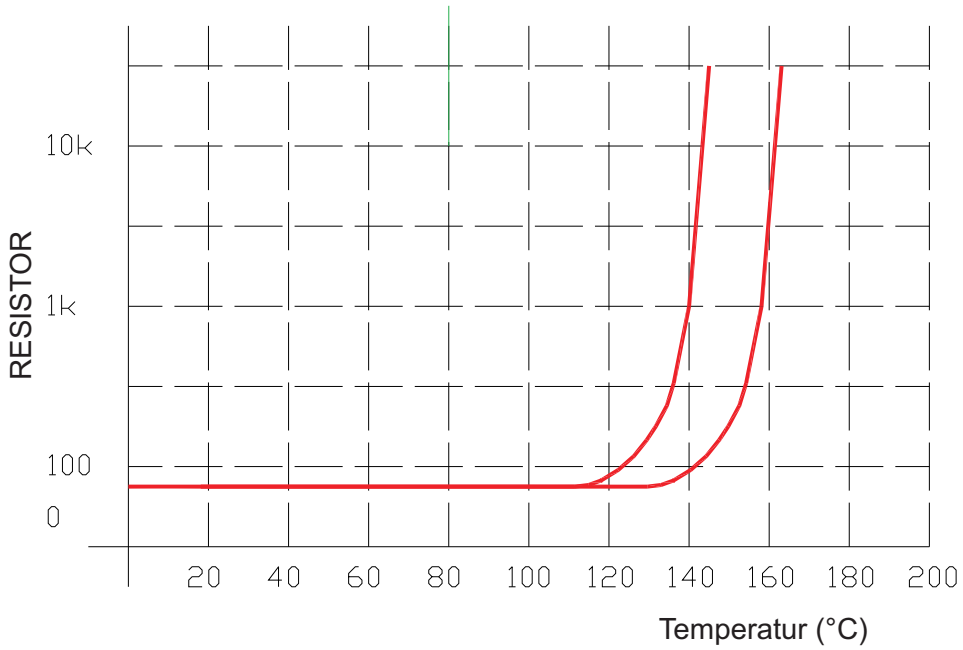
Value for 0xa3 = TSP145/2 + TSP25

Example: (3 sensors in series) t25= 240 Ohm , t145 = 3000 Ohm (from motor data sheet)

$$TSP25 = \frac{32000}{4700+240} \times 240 = 1554 \qquad TSP\ 145 = \frac{32000}{4700+3000} \times 3000 = 12467$$

$$\textbf{Value 0xa3} = \frac{12465}{2} + 1554 = 7787$$

Enter the values by means of the manual read/write (rf. to diagnosis, page 69)



Adjustment with linear temperature sensor (PTC resistor)

For the resistance value of the motor temperature sensor refer to the motor data sheet or measure the resistance value across connector X7, pin 6 against pin 12.
Resistance value at 100°C = t100 (Warning)
Resistance value at 145°C = t145 (Switch-off)

Switching point for the current reduction and the warning 0xa2

$$\text{Switching point at 100°C} = \frac{32000}{4700+ (t100)} \times t100 = TSP100$$

Switching point for the temperature error switch-off 0xa3

$$\text{Switching point at 145°C} = \frac{32000}{4700+ (t145)} \times t145 = TSP145$$

Example: KTY84 100 = 1000 Ohm, t145 = 1300 Ohm (from the motor data sheet)

Input vale for the current reduction and the warning **0xa2** $= \frac{32000}{4700+1000} \times 1000 =$ **5614**

Input value for the over-temperature switch-off **0xa3** $= \frac{32000}{4700+1300} \times 1300 =$ **6933**

Enter the values by means of the manual read/write (rf. to diagnosis, page 69)

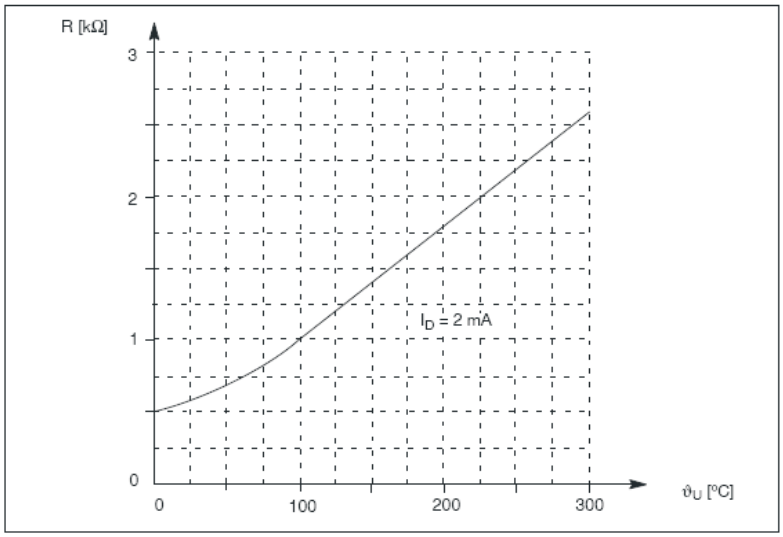


fig. 3-1: Resistance values of KTY 84 against temperature

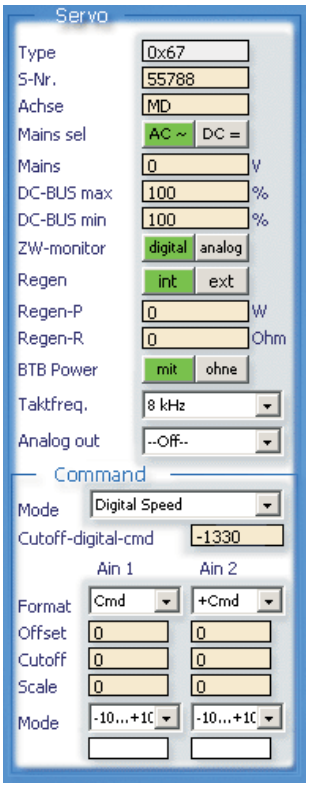
Motor temperature parameters

Short symbol	Function	Adjustment range	Unit	Note	ID-address
I-Motortemp	Switching point current reduction	0… 32000	Nim		0xa2
Motortemp	Switch-off point motor temperature	0… 32000	Num		0xa3
Tmotor	Current motor temperature		Num		0x49

Setting window for the rated servo data

Servo parameters

Short symbol	Function	Adjustment range	Unit	Note	ID-address
Type	Device type	Type plate			0x63
SNr.	Device serial number	Type plate			0x62
Achse	Circuit diagram	2 digits			0xf8
Mains sel	Selection ac or dc voltage				
Mains	Power supply voltage	30 bis 480	V		0x64
DC-BUS max.	max. bus circuit voltage		V		
DC-BUS min.	min. bus circuit voltage		V		
ZW-Monitor	Selection bus	analog-digital			0x5a
Regen	Regenerative (ballast) resistor installation point	internal, external			0x5a
Regen-P	Ballast resistance power	Type plate	W		0x65
Regen-R	Ballast resistance		Ohm		
BTB/RDY	DC bus assignment to BTB	with/without bus voltage			0x5a
Taktfrequenz (pulse frequency)	Drop-down menu				
Analog out	Drop-down menu				
Command	Command designation	analog digital			0x36



Rated servo data parameters

Type The selected type of drive is displayed (only default adjustment changes are possible)

SNr. Serial number (default setting) is displayed

Achse Axis reference number, 2 digits correspond to the machine circuit diagram (set by the user)

Mains sel Device type is displayed (default setting)

Mains Power supply voltage (30 to 480V~)

DC-BUS max. Switching point for the bus overvoltage

DC-BUS min. Switching point for the bus undervoltage

ZW-Monitor Selection of the bus watchdog, digital or analogue

Regen Selection list of the installation point for the regenerative (ballast) resistor (Internal, external)

Regen-P External ballast resistance power

Regen-R Resistance value of the ballast resistor

BTB Power Selection of the function ‘ready for operation’ with or without bus watchdog

Taktfrequenz Selection of the pulse frequency of the output stage

Analog out Selection of the analog output

Mains sel
Selection of the power supply

AC~ Connection of an ac or three-phase voltage
Range: 30V~ to 480V~

DC= Connection of a battery voltage or a dc mains
Range: 12V= to 560V=

Mains Input of the power supply voltage value
For supply voltages inferior to the rated device voltage

ZW-Monitor Selection of the bus circuit watchdog
digital Device DS 405-420
analogue Devices DS 205/403, DS450, DS 4820, BAMO, BAMOBIL, BAMOCAR

DC-BUS max. Setting parameter for the bus circuit overvoltage
Set this parameter when the supply voltages are inferior to the rated device voltage.

DC-BUS min. Setting parameter for the bus circuit undervoltage

Devices: DS 4820, DS450, DS451, DS476, BAMO-D3, BAMOBIL-D3
(no analog evaluation for the devices DS 405,412,420, undervoltage message when <30V)

The setting value of the parameter undervoltage (0xa5) Num 1024 corresponds to 5V measured voltage

Measured voltage 5V corresponds to:

Device	BUS circuit voltage	Num(0xa5)
DS4820	75V	1024
DS450,DS451, DS476	980V	1024

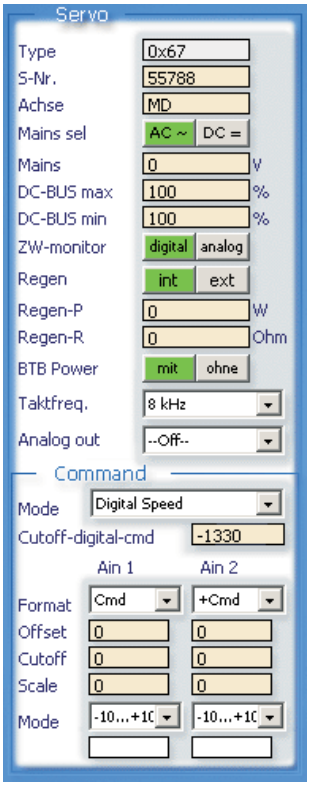
Device	Battery voltage	Num(0xa5)
BAMO-D3-160	265V	1024
BAMO-D3-360	430V	1024
BAMOBIL-D3	75V	1024

Example: DS 4820 battery undervoltage watchdog at 40V
75V correspond to 5V measured voltage

Measured voltage (at 40V battery voltage) = 5/75*40 = 2,66 V
Numerical value for 0xa5 = 1024/5 * 2,66 = 544,7

0xa5 adjusted to 545

Rated servo data parameters



Regen Selection of an internal or external ballast resistor

Regen-P With an external ballast resistor the power value has to be entered (in W).
When the ballast resistor overloads, a warning is displayed.

Regen-W With an external ballast resistor enter the resistance value (in Ohm).
Observe the min. values.

BTB-Power with or without bus undervoltage

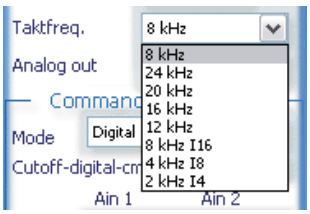
Selecting w-out
BTB without undervoltage watchdog
When the enable and the power supply voltage are switched off, the message RUN/BTB remains active.

Selecting with
BTB with undervoltage watchdog
When the enable and the power supply voltage are switched off, the message RUN/BTB is deactivated.

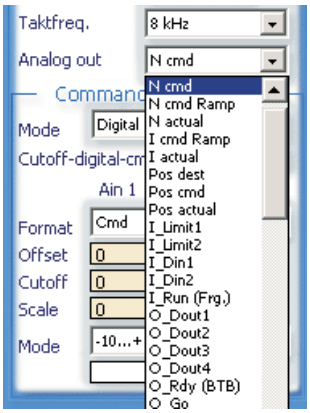
Taktfrequenz (pulse frequency) Selection of the switching frequency of the output stage
Presetting 8kHz
Selection via the drop-down menu

Selection of the pulse frequency = calculation cycle
Values: 8, 12, 16, 20, 24 kHz
The current limits are reduced from 16 kHz on!

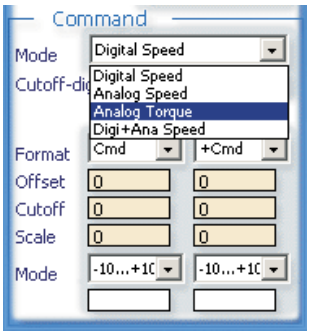
Selection of the pulse frequency = 50% calculation cycle
Values: 2kHz-I4, 4kHz-I8, 8kHz-I16



Selection of analogue outputs
Selection via the drop-down menu
The output voltage ±10V corresponds to ±100% of the selected signal.
Selected digital signals provide 0 or +10V.



Analogue inputs



Click the ÷ button to open the drop-down menu.
Select the command value to be adjusted.
The selected function is highlighted in blue and it is transferred into the display by clicking it.

CmdMode		ID-address
Digital speed	Digital speed command value CAN-BUS, RS232, step oscilloscope	
Analog speed	Analog speed command value	
Analog torque	Analog toque command value, voltage ±10V Across the analog inputs AIN1 and AIN2	0x90
Digi+Ana speed	Digital und analog command value are added	

Analog speed

Analog speed command value. Input via terminal strip X1.
Inputs Ain1 and Ain2
Max. input voltage ±11V corresponds to ±32767 num

Analog torque

Analog current command value. Input via terminal strip X1.
Inputs Ain1 and Ain2
Max. input voltage ±11V corresponds to ±32767 num
This value corresponds to 200% of the rated current.

Reversal of the rotation direction for a unipolar command value with direction signal

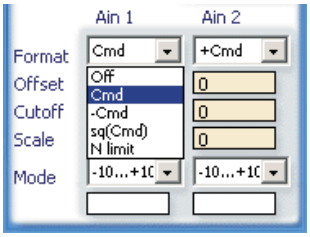
The unipolar command value is reversed by means of the direction command (***N cmd Reverse***) via the programmed digital input. The input must be adjusted to ***N cmd Reverse*** in the parameter field 'input/output.

Standstill with an analog command value for the speed and torque

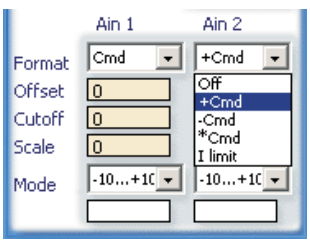
Activate *Speed Ramp 0* via a digital input or send it via the CAN BUS.

Format

The analog inputs Ain1 and Ain2 are assigned to a function via the format field.



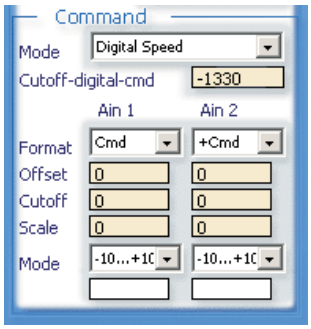
Format Ain1	
Off	Switched off
Cmd	Speed command value
-Cmd	Reversed speed command value
sq (Cmd)	quadratischer Drehzahl-Sollwert
N limit	Speed limiting 0-100% For a digital speed and position control (CmdMode = Digital)



Format Ain2	
Off	Switchet off
+Cmd	Speed command value is added to Ain1
-Cmd	Speed command value is subtracted from Ain1
*Cmd	Speed command value is multiplied with Ain1
I limit	external current limiting 0-200% (for CmdMode = digital, analog speed oder analog torque)

Analog inputs

Offset



Compensation of the command value zero error the the input is analog.
With the command value OV alter the offset value such that the parameter **Ncmd Ramp** is zero.

0 cut

When the command value is analog a zero zone can be adjusted by means of the parameter 0cut.
(327 corresponds to 1% of the speed)

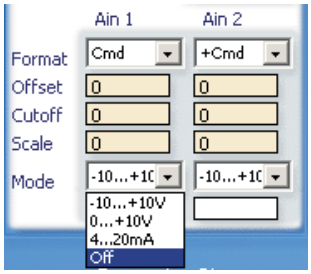
Speed
The command value is switched to zero within this zone. The drive is at a standstill, no drift
(no position parameter entered).

Position
Within the zero zone the drive maintains its zero position by means of an internal position-current-control.

Note:
The parameters must be entered in the parameter field ‘position-current’.
When an analog command value is provided from a PLC/CNC position control, the value 0cut should be very low or zero.

Scale
Multiplication factor for the analog input signals

Setting value 0.5 to 9.9
Note: Any resulting values superior to 11V will be cut.

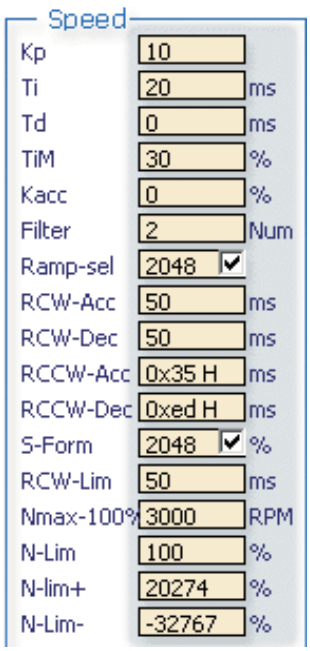


Mode
Input range for the analog command values

External current limit

The analog input Ain2 is selected as external current limit via the format adjustment ***I limit*** **.**
0 to +10V correspond to 0-200% of the current limit for the values programmed in the parameter field ‘current’.

Adjustment - command value functions



Ramp-sel Selection of the ramp function, only RCW or RCW+RCCW

RCW-Acc Acceleration - positive rotation direction

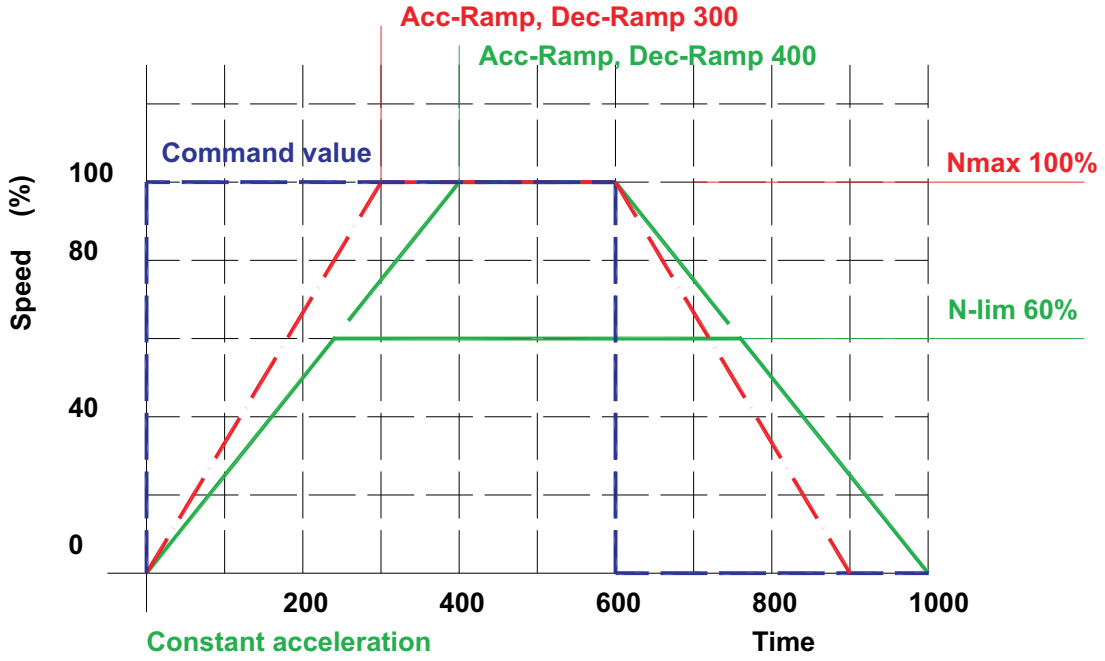
RCW-Dec Deceleration - positive rotation direction

RCCW-Acc Acceleration - negative rotation direction

RCCW-Dec Deceleration - negative rotation direction

S-Form Factor S-shape, selection S-shape

Ramp-Lim Emergency stop, output stage switch ramp

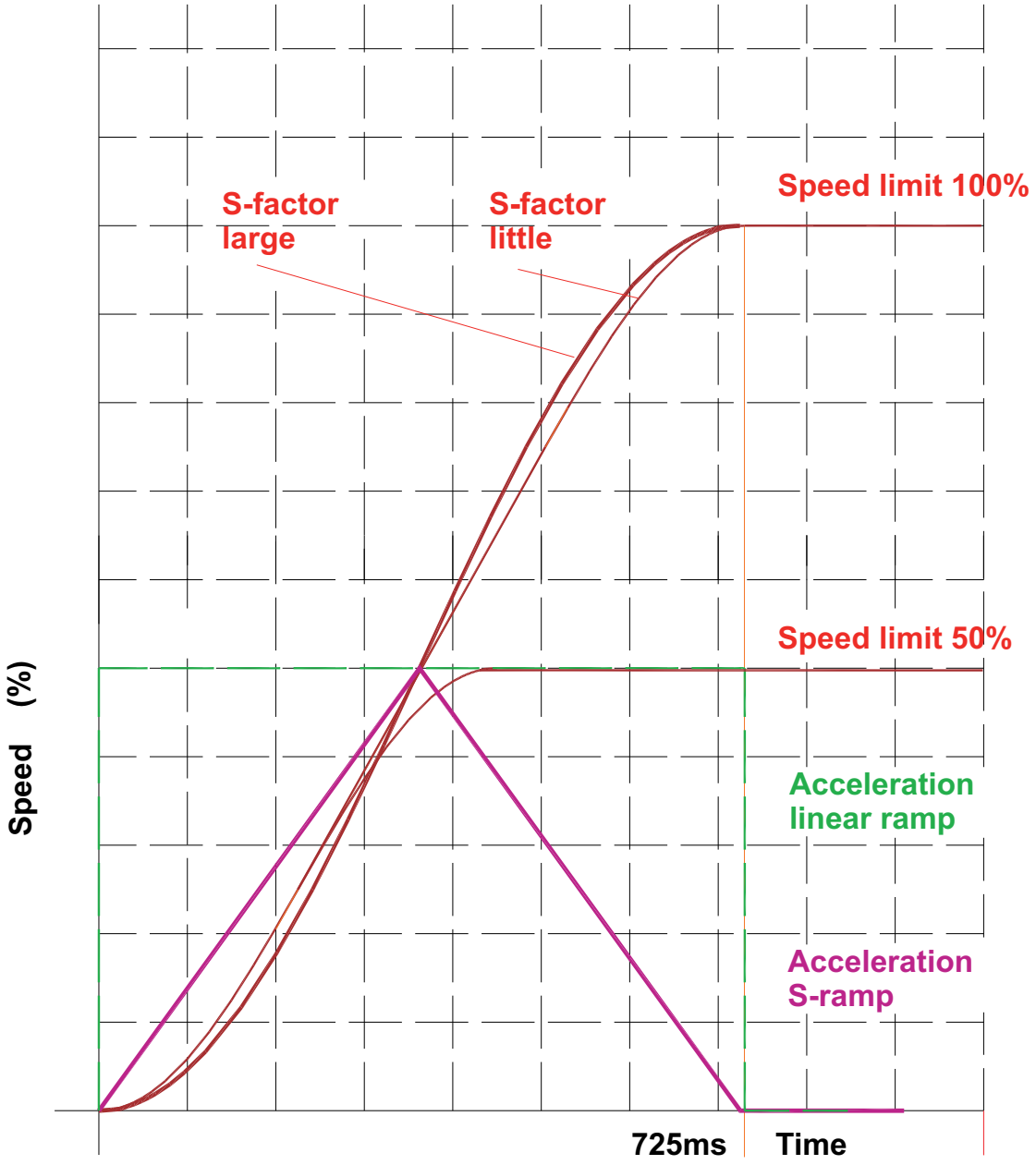


Linear ramps

Time input for 100% command value.

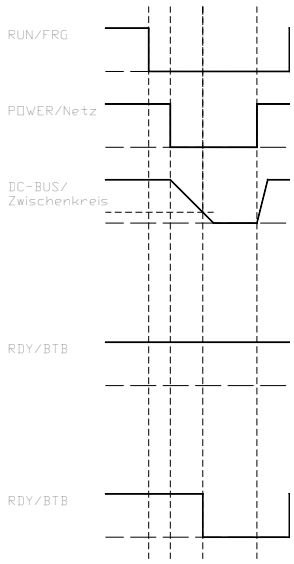
Constant acceleratio.
Current peaks and acceleration and deceleration peaks are reduced.

S-Ramp function



S-Ramp function

The linear time function is altered to a S-shaped function (sine2).
The constant acceleration and deceleration is altered to continuous changing.
Jerk and current peaks are considerably reduced.



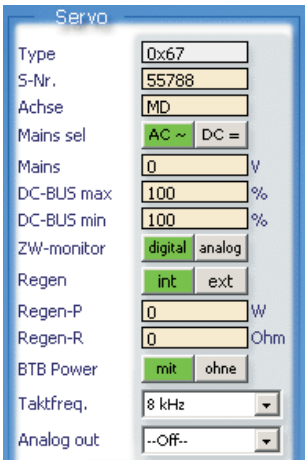
BTB/Rdy message (relay contact)

The BTB relay contact (solid state relay) is closed when the device is ready (residual resistance 30Ohm). The BTB contact is opened when an error occurs (resistance >1MOhm).

The state BTB/Rdy (ready) is is displayed in the state field as **Rdy**.
The state 'not ready/BTB (error)' is indicated by the red LED 'fault' on the front side.

BTB and the power supply voltage
The message state when the power supply voltage is switched off can be selected via **BTB power** in the parameter field **servo** of the setting window (undervoltage watchdog).

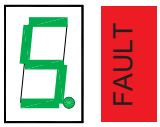
Selecting w-out
BTB without undervoltage watchdog.
When the enable and the power supply voltage are switched off, **the message RUN/BTB remains active.**



Selecting with
BTB with undervoltage watchdog
When the enable and the power supply voltage are switched off, **the message RUN/BTB is deactivated**.

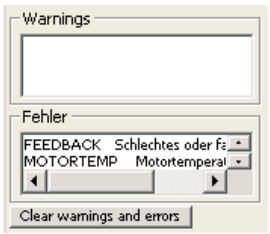
Error message and BTB/RDY

When an error X (see page 14, list of errors) occurs the BTB signal is switched off. The drive will immediately be disabled internally. (O_GO (OxE3) = 0)



On the servo:
The red LED **'fault'** (0x8f Bit 1) lights.

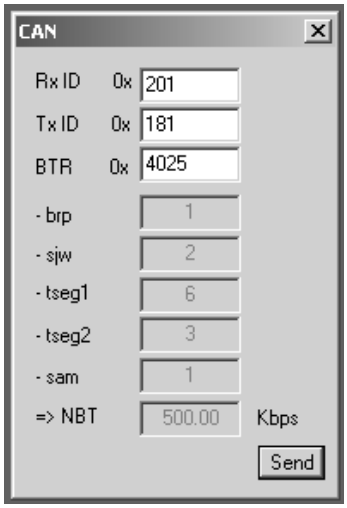
On the PC:
The error states are displayed in the field '**fault**'



The error messages are reset:

- when the drive enable (RUN) is switched on
- when the auxiliary voltage (+24V) is switched on
- when the parameter **'cancel error'** is sent (can also be programmed as digital input)

Detail in the CAN-BUS mANUAL



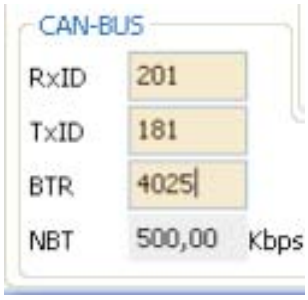
Input Fields:

RxID Receive ID
TxID Send ID
BTR Bit rate (Hex)

Information:

-Brp
-Sjw
-Tseg1
-Tseg2
-Sam

NBT bit rate (kBaud)



The addresses for receive/send ID and the bit rate are set in the CAN bus parameter field of the setting window.

Address	Short symbol	Presetting (default)	ID-addresse
Receiving address	Rx ID (COB-ID RPDO1)	0x201	0x68
Sending address	Tx ID (COB-ID TRDO1)	0x181	0x69

Bit Rate NBT	BTR value	max. cable length	0x73
1000 kBaud	0x4002	20 m	
500 kBaud	0x4025	70 m	Voreinstellung
625 kBaud	0x4014	70m	LABOD-CNC
250 kBaud	0x402F	100m	

RS 232 16 bit

Sending from the PC to the drive								Response from the drive to the PC	
Char1	Char2	Char3	Char4	Char5	Char6	Char7		Byte1	Byte2
RegID	RegID	Data	Data	Data	Data	Sync		Data	Data
Bits 07..04	Bit s 03..00	Bits 15..12	Bits 11..08	Bits 07..04	Bits 03..00	"X"		Bits 07..04	Bits 07..04
ascii	ascii	ascii	ascii	ascii	ascii	ascii		binary	binary

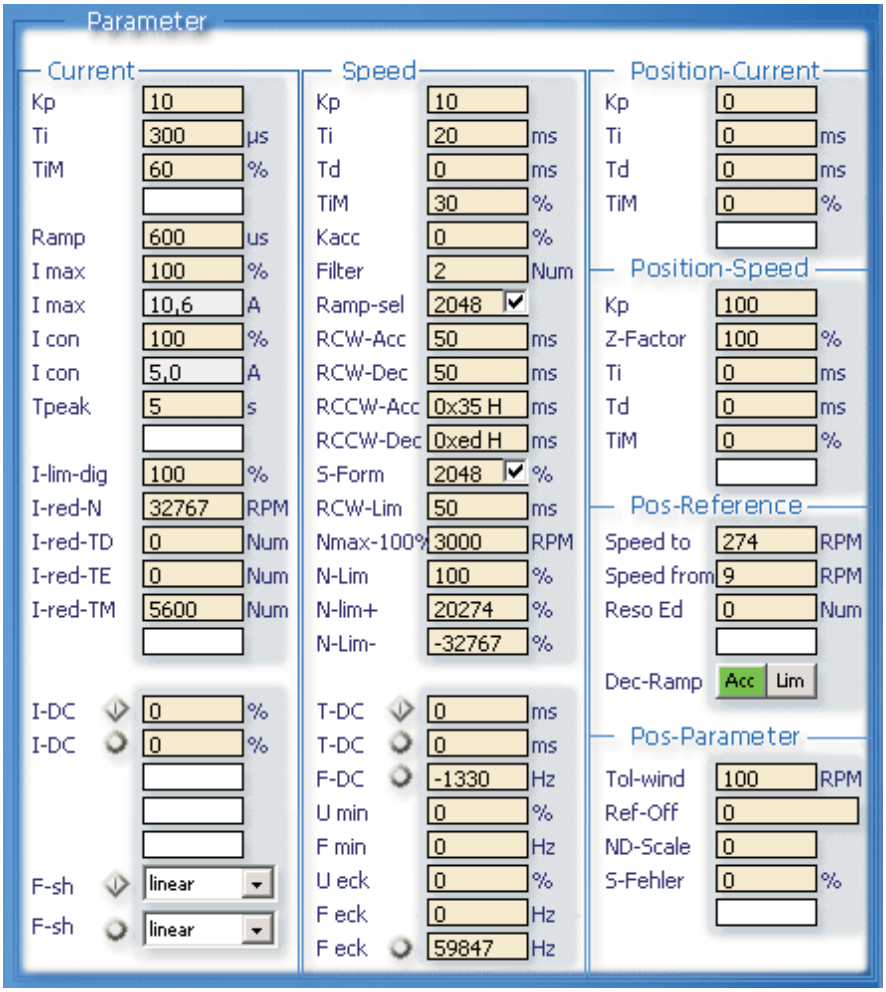
RS 232 32 bit

Sending from the PC to the drive											Response from the drive to the PC			
Char1	Char2	Char3	Char4	Char5	Char6	Char7	Char8	Char9	Char10	Char11	Byte1	Byte2	Byte3	Byte4
RegID	RegID	Data	Data	Data	Data	Data	Data	Data	Data	Sync	Data	Data	Data	Data
Bits 07..04	Bits 03..00	Bits 31..28	Bits 27..24	Bits 23..20	Bits 19..16	Bits 15..12	Bits 12..08	Bits 07..04	Bits 03..00	"X"	Bits 07..04	Bits 07..04	Bits 07..04	Bits 07..04
ascii	ascii	ascii	ascii	ascii	ascii	ascii	ascii	ascii	ascii	ascii	binary	binary	binary	binary

Examble actual speed (actual speed value) 16 bit ± 32767 entspricht ±100%

Sending from the PC to the drive							Response from the drive to the PC	
Char1	Char2	Char3	Char4	Char5	Char6	Char7	Byte1	Byte2
RegID	RegID	Data	Data	Data	Data	Sync	Data	Data
Bits 07..04	Bits 03..00	Bits 15..12	Bits 11..08	Bits 07..04	Bits 03..00	"X"	Bits 07..04	Bits 07..04
3	**D**	**0**	**0**	**3**	**0**	**X**	**lo**	**hi**
regid read (0x3D)		Actual speed Actual speed value (0x30)				ascii	Value off 0x30	

Current controller parameter



Settin window for the controlling parameters.
For further adjustment fields. Further adjustment can be carried out, refer to the pages *"Speed* and *Oscilloscope"*

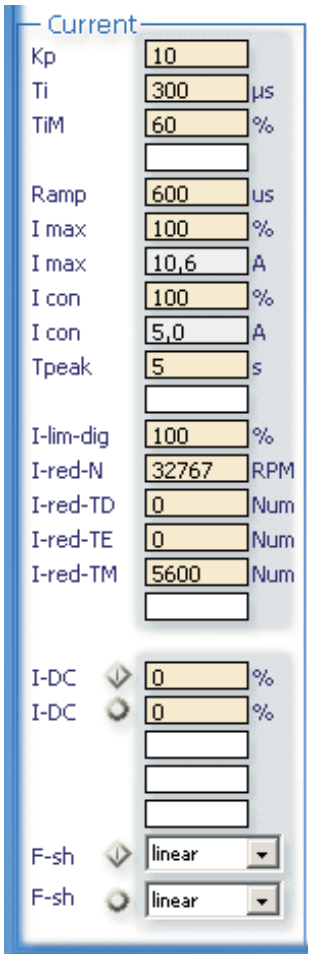
Parameter	Function	Adjustment range	Presetting	Unit	Step	ID-address
Kp	Proportional amplification	0 bis 100	10	Num	1=0.1	0x1c
Ti	Integration time	150 bis 10000	600	µs	150	0x1d
TiM	max. integration time memory	0 to 100	50	%	1	0x2b
Ramp	I command value ramp	0 bis 10000	600	µs	150	0x25
I max	Current limit, peak current	up to 2x I device	2xIdevice	Apeak	0.1	0xc4
I max	Current limit, peak current	up to 2x I device	2xIdevice	Apeak	0.1	0xc4
I con	Current limit, continuous current	0 bis I device	Idevice	Aeff	0.1	0xc5
I con	Current limit, continuous current	0 bis I device	Idevice	Aeff	0.1	0xc5
T peak	Overcurrent time	0 bis 30	5	s	1	0xf0
I limit (dig)	Current treshold valu	0 bis 100	100	%	1	0x46
I-red-N	Current reduction by speed					
I-red-TD	Current reduction by device temperature					
I-red-TE	Current reduction					
I-red-TM	Current reduction by motor temperature					
I-DC Start						
I-DC Stop						
F-shape Start						
F-shape Stop						

Conversion of the current (I) parameter values

For the digital communication via RS232 or CAN-BUS the numerical values for the rated value have to be observed. The numerical values are displayed in the track field.

Actual current range	I 100%	Calibration rated current I-device			Peak current DC disabled		Limiting
Max. value ± 9Bit	mV	Num	Aeff	A=	Num	A=	
DS 205/405	550	110	5	7	160	10	Limiting in the parameter field 'motor' and 'current'. The low value is effective.
DS412	800	160	12	17	230	24	
DS420	700	140	20	28	200	40	
DS 450	416	82	50	70	120	100	
DS 475/BAMO	416	82	75	105	120	150	

Current controller setting window



The current controller parameters are determined by the motor data such as winding inductance and winding resistance
The current controller parameters must only be changed by qualified and trained personnel.

Kp Input for the proportional amplification in the current controller.
Kp too low => Correction error, poor dynamics, low frequency oscillations
Kp too high => Loud motor noise, high frequency oscillations

Ti Input for the integration time in the current controller.
Integral time constant
Ti too high => Low frequency oscillations

TiM Max. value of the integral memory
TiM too high => Low frequency oscillations

Ramp Current(I) ramp-up limiting
The current ramp-up to 100% type current is adjusted in ìs.

Imax Input for the peak current in %
Max. dc disable current
100% = 2 * Idevice in Apk
displayed in Apk in the field below

Icon Continuous current (I) in **%**
Adjustment range 0 to 100% of the rated device current (I device) in A eff
displayed in A eff in the field below

Static current reduction

Current reduction by means of	Short symbol	Function	Parameter	Range
Motor I max	MOTOR_I_MAX	Peak current limiting for the motor	0x4d	0 to xxA
Motor I contin	MOTOR_I_NOM	Continuous current limiting for the motor (type plate)	0x4e	0 to xxA
Servo Imax	I_USER_MAC_PC	Peak current limiting for the servo	0xc4	0 to 100% of Imax
Servo Icon	I_USER_CNS_PC	Continuous current limiting for the servo	0xc5	0 to 100% of Icon

The respectively lower value of the peak current and continuous current values are effective.
They are displayed as current (in A) Imax and Icon in the parameter field ‘servo’

Dynamic current reduction

Current reduction by means of	Short symbol	Function	Parameter Beginning	End	Range (with 0 = off)
Time	T peak	Overcurrent time function	0xf0		0 to 300 s
Input (command)	I lim-dig	Reduction by means of a digital input (CAN)	0x46		0 to 100% Imax
Speed	Ired-N	Overcurrent speed function	0x3c		0 to 32767
Output stage temperature	I-red-TD	Reduction by means of the heat sink temperature	0x58	0x4c	0 to 32767
Effective current I2t	I-red-TE	Effective current			
Motor temperature	I-red-TM	Reduction by means of the motor temperature	0xa2	0xa3	0 to 32767

Current reduction parameters

T peak If the current value exceeds the continuous current value adjusted (Icon), a time function starts. When the time function has expired the current limit is reduced to continuous current. Warning message in the field ‘state’.
The time is adjusted by means of the parameter T peak (0xf0).
If the current value becomes inferior to the continuous current value (Icon), the time memory is reduced again.
Reset time = 2 x T peak.

I lim-dig On the logic side a digital input can be programmed for I limit (dig).
If this input is activated or a CAN command is received for this input, the current limit is reduced to the parameter value I lim-dig (0x46).

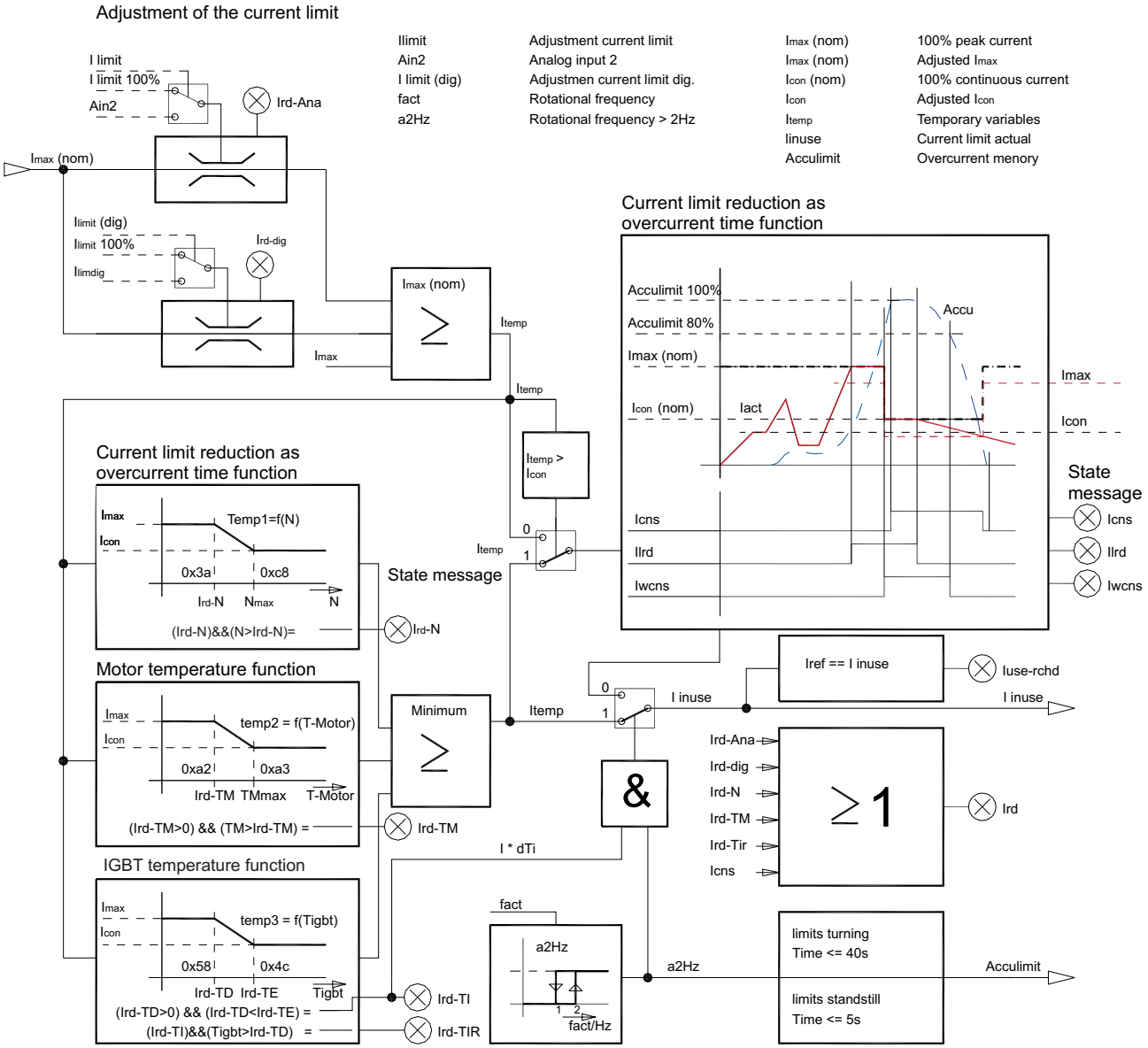
I-red-N When the speed adjusted as parameter I-Nlim (0x3c) is achieved, the current limit is linearly reduced. At rated speed the current limit corresponds to the continuous current value.
There will be no warning message.

I-red-TD When the output stage temperature adjusted as parameter TEMP (0x58) is exceeded, a warning message is displayed in the field ‘state’. If the temperature still rises, the current limit is reduced.
When the value of the parameter 0x4c is achieved, the emergency stop is activated.
If the parameter 0x58 is adjusted to zero or if the 0x4c value is inferior to the 0x58 value, the function is switched off.

I-red-TE In case of motor overload (I2t) a warning is displayed in the field ‘state’. If the load still rises and exceeds the value adjusted as parameter I2t, the current limit is reduced.

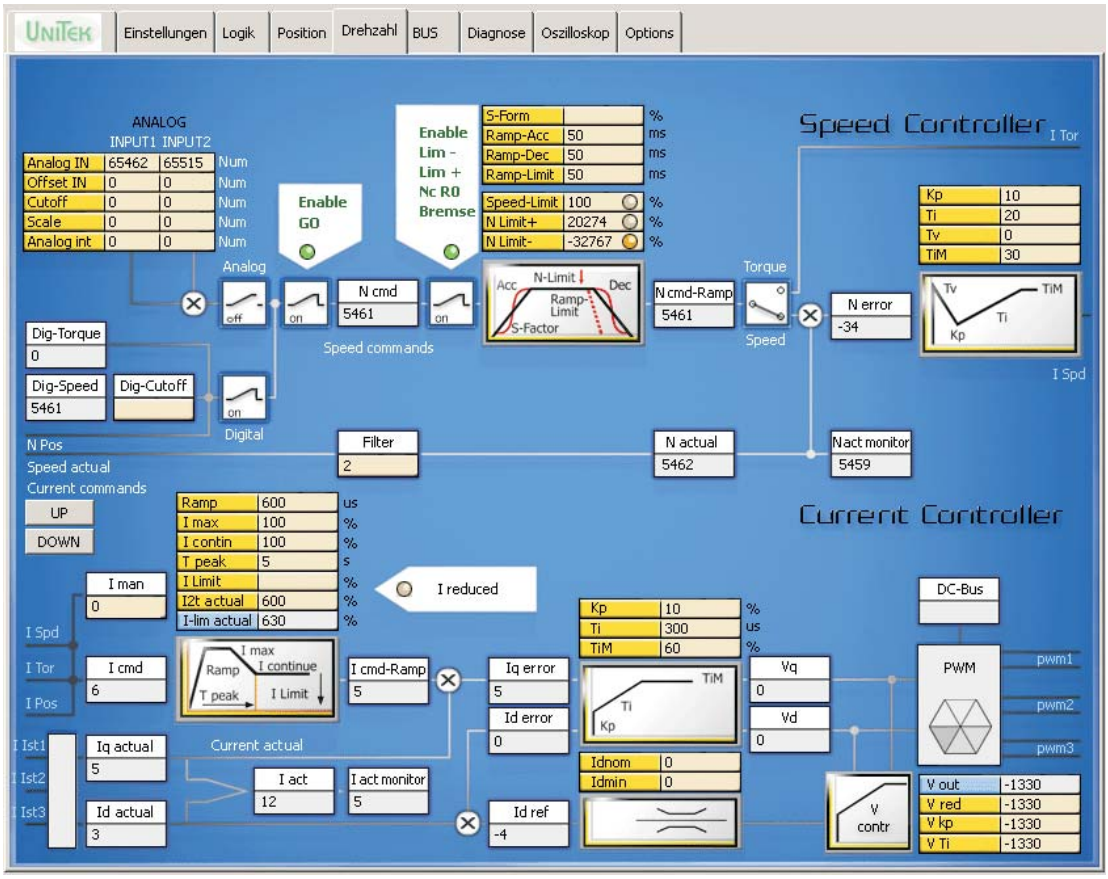
I-red-TM When the motor temperature adjusted as parameter MTEMP (0xa2) is exceeded, there will be a warning. If the temperature still rises, the current limit is reduced.
If the parameter value 0xa3 is achieved, the emergency stop is activated.

Attention: The warning messages displayed in the field ‘state’ must be observed!
If the current limits are reduced, this might cause failures of the machine or the installation.



State		
Ird-Ana	Current limit reduced via analog input 2 , 0 to 10V = 0 to 100% peak current	
Ird-dig	Current limit reduced to the value programmed as Ilim(dig). Activated with 0xa5 Bit ??	
Ird-N	The current limit is reduced by a rising speed.	
Ird-TM	The current limit is reduced by a rising motor temperature.	
Ird-TI	The current limit is reduced by a rising output stage temperature.	
Ird-TIR	The current limit is reduced to continuous current by means of the output stage temperature.	
Icns	The overcurrent time memory (I*t) is 100% full. Reduction to continuous current.	
Ilrd	Current > continuous current	
Iwcns	The overcurrent time memory (I*t) is > 80% full	
Ird	Summary alarm message ‘current limit reduced’	
Measured value		
Tmotor	Active motor temperature	0x49
Tigbt	Active output stage temperature	0x4a
Tair	Current air temperature in the servo	0x4b
Irda	Active current limit	0x48

Speed window (current (I))



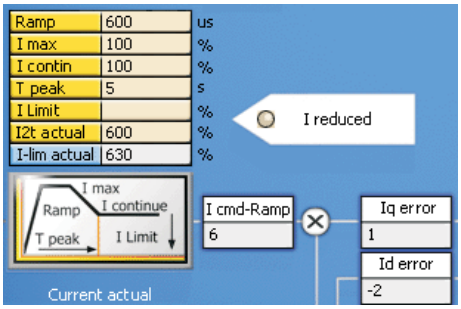
Current controller setting window
Block diagram with the input fields for the control parameters and display fields for numeric values.

Command values (current (I))	The current(I) command value is provided by:		ID-address
I Spd	Speed controller output		
I Tor	Torque command value after ramp		
I Pos	Position controller output (Pos -> current)		
I man	Fixed input		0x21
I cmd	Current command value		0x26
I cmd-Ramp	Current command value after ramp and limiting		0x22

Actual values (current)			
Iq actual			0x27
Id actual			0x28
I act	Summary current		0x20
I act monitor	Summary current after display filter		0x5f

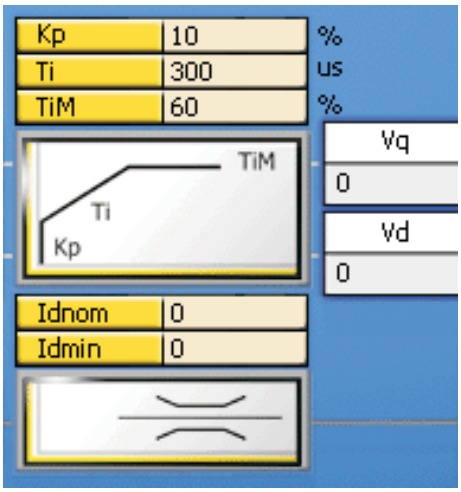
Current control values			
Iq error			0x38
Id error			0x39
Id ref			0x23
Vq			0x29
Vd			0x2a
DC-BUS	Bus voltage		0x????
V out			0x8a
V red			0x8b
V kp			0xac
V Ti			0x8d

Setting window ‘ramp’



The current command value (I cmd) is processed in the setting window ‘ramp’. The current ramp-up (ramp), the peak current (Imax), the continuous current (Icontin), and the peak current time (T peak) are adjusted.
The current reductions by means of speed, current, and temperature are summed up and displayed in the field ‘I Limit’ and ‘I lim actual’.
When the current is reduced, the LED I-reduced lights.
The result of the current command value processing is displayed in the field ‘current command value after ramp’ (I cmd-Ramp).

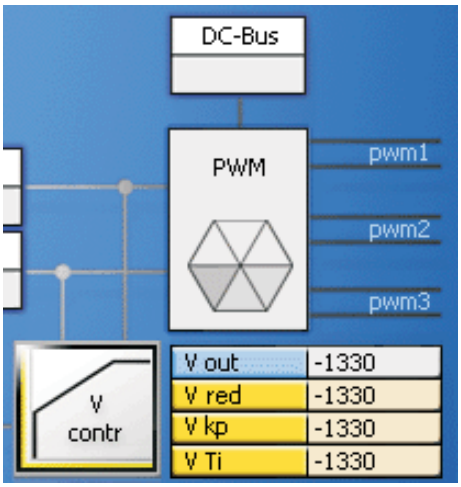
Setting window ‘current controller’



The actual current values (I-Ist1, I-Ist2, I-Ist3) are evaluated as Iq-actual and Id-actual. The displayed actual current value (I act monitor) is generated from the actual current value (I actual) by means of a filter.

The Iq and Id errors are processed in the current controller by means of the amplification parameters (Kp, Ti, TiM).
The reference value for the Id control is generated via the vector control feedback.

Setting window PWM



The PWM pulses for the output stage circuit are created from the current controller output signals Vq and Vd.

Adjustment of the current controller amplification

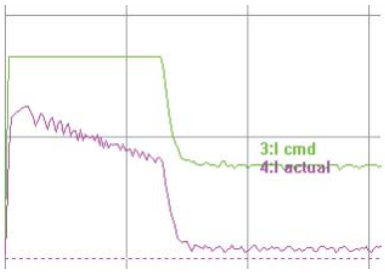
The current controller parameters must only be modified by qualified and experienced personnel.
The current controller parameter adjustment is only necessary when no motor type data exist. For known motor types the current controller parameters can be taken from the Unitek motor lists.
Preset a step function when no load is applied to the motor.
Display the current command value (I cmd) and the actual current value (I actual) on the NDrive oscilloscope.

The actual value must always be smaller than the command value.

Adjustment of the parameter Kp without integral component (Ti = 0)

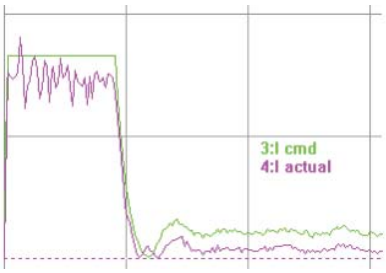
Kp value too low

The difference between the current command value (I cmd) and the actual current value (I actual) is too large.
At high speeds the maximum torque is not achieved.



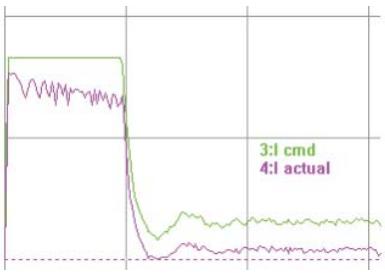
Kp value too high

There are oscillation peaks of the actual current value which exceed the current command value.
The motor will operate noisily and with vibrations.



Kp correct

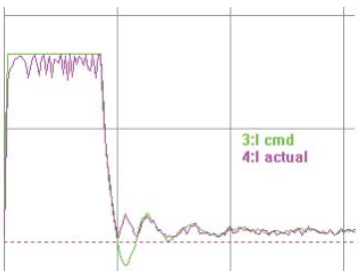
The actual value does not overshoot. The error between actual and command is optimal at approx 20%. Remaining errors can be eliminated by bringing the integral component into play



Adjustment of the parameters Kp, Ti, and TiM

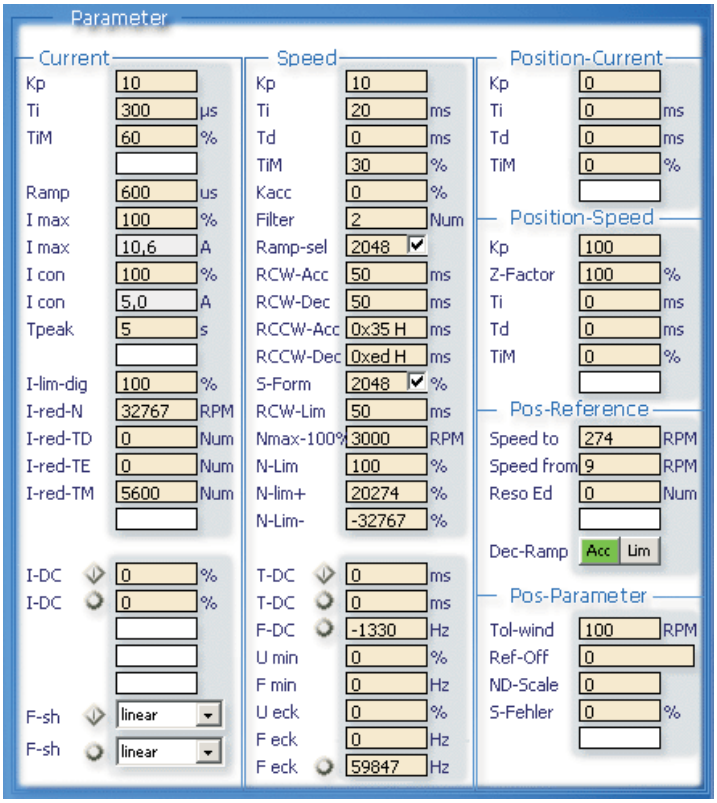
Kp adjustment with integral component

Reduce the control errors to a minimum by means of the parameters ‘Ti’ and ‘TiM’. Values should be kept as small as possible.



For further set-up information refer to the commissioning manual

Settings window for the speed controller parameters



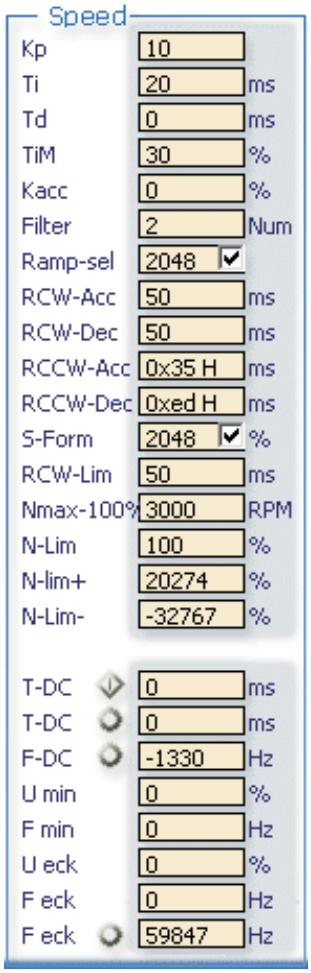
For further adjustments please refer to the pages *"Speed* and *Oscilloscope"*

Parameter	Function	Range	Default	Unit	Step	ID
KP	Proportional amplification	0 to 200	50	Num	1=0.1	0x2c
Ti	Integration time	1 to 100	10	ms	0.75	0x2d
Tv	Rate time	1 bis 1000	0	ms	0.75	0x2e
TiM	max. integration time memory	0 to 100	50	%	1	0x3b
Kacc	Acceleration amplification	0 to 100	0	%	1	0x5b
Filter	Speed actual value filter	0 to 7	5	Num	1	0x5e
Ramp-sel						
RCW-Acc	speed command value ramp, acceleration	0 to 10000	100	ms	0.75	0x35
RCW-Dec	speed command value ramp, deceleration	0 to 10000	100	ms	0.75	0xed
RCCW-Acc	speed command value ramp, acceleration	0 to 10000	100	ms	0.75	0x35
RCCW-Dec	speed command value ramp, deceleration	0 to 10000	100	ms	0.75	0xed
S-Form	Curve shape					
Ramp-limit	speed command value ramp, min.	0 to 10000	10	ms	0.75	0xc7
N Max 100%	Max. speed	600 to 50000	3000	Upm	1	0xc8
N-Lim	Speed limit	0 to 100	100	%	1	0x34
N-lim +	Ppositive speed limit	0 to 100	100	%	1	0x3f
N-lim -	Negative speed limit	0 to 100	100	%	1	0x3e
T-DC Start	Pre-magnetisation time	10 bis 2000	250	ms	1	0x07 L
T-DC Stop	DC-braking time with stop operation	10 bis 5000	250	ms	1	0x07 H
F DC	Switching point frequency, dc	0 bis 100.0	10.0	Hz	0.1	0x09
U min	Min. voltage (boost)	0 bis 100	10	%	1	0x0a
F min	Min. frequency	0 bis 100.0	10.0	Hz	0.1	0x0b
U eck	Max. voltage	0 bis 100.0	100.0	%	0.1	0x0c
F eck	Frequency with max. voltage	1 bis 1000.0	50.0	Hz	0.1	0x0d L
F eck Stop	Cut-off frequency with stop operation	1 bis 1000.0	40.0	Hz	0.1	0x0d H

Speed, actual value range	Calibration Speed n_{max}	Limiting
max. value ±32767 (15 bit -1)	N_{max} value adjusted in the fields "motor and speed" of the settings window = 32767	Via speed-limit in the field "speed" of the setting window.
Example	N_{max} = 2000 A speed of 2000 rpm coresponds to a value of 32767	Speed limit of 1500 Speed-Limit = 32767/2000*1500 = 24575 The max.speed is limited to 1500 rpm.

Speed controller parameters

The speed controller parameters **Kp**, **Ti**, **Td** and **TiM** depend on the axis driven and they have to be optimized accordingly. (Also refer to the commissioning manual)



Kp Input for the proportional amplification in the speed controller

Ti Input for the integration time in the speed controller. Integral time constant.

Td Input for the rate time in the current controller. Differential time constant.

TiM Max. value of the integral memory

Kacc Dynamic acceleration value directly applied to the current controller.

Filter Filter for the actual speed value. Zero without filter, 10 = max. filter effect.

Ramp-sel Selection of 2 or 4 command value ramps. 2 ramps are effective in both rotation directions,
4 ramps are selected according to the respective rotation direction.

RCW-Acc Acceleration ramp, positive rotation direction,
for speed and position control
(can be selected for reference travel).

RCW-Dec Deceleration ramp, positive rotation direction,
only for speed control,
adjust to < 10ms for position control

RCCW-Acc Acceleration ramp, negative rotation direction,
for speed and position control

RCCW-Dec Deceleration ramp, negative rotation direction,
only for speed control,
adjust to < 10ms for position control

S-Form Select for s-shaped ramps. Input of the shape.

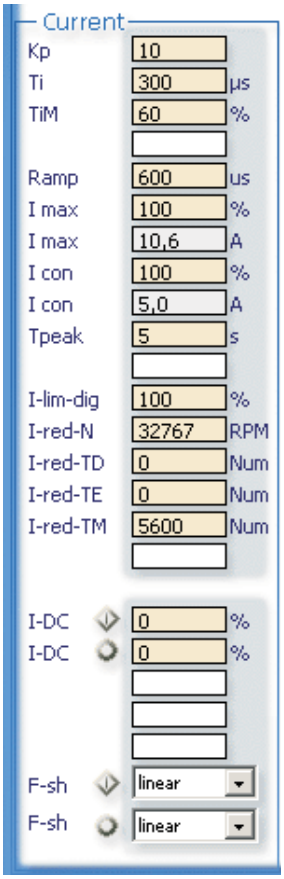
Ramp-Lim Min. braking ramp for output stage switch and emergency stop.
(can be selected for reference travel).

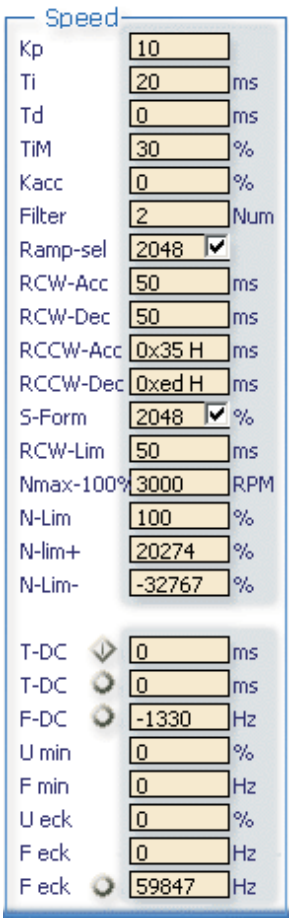
N max-100% Max. speed. The adjusted value corresponds to the numeric value ± 32767.
The value can be adjusted 20% higher than the value given (*N-max)* in the parameter field '*Motor*'.

N-Lim Speed limiting of N_{max} (100% = N_{max})
Max. speed adjustment for position control

N-lm+ Speed limiting of N_{max} for a positive rotation direction
(100% = N-max)

Frequency transformer parameters





I-DC Start Current value for the pre-magnetisation

T-DC Start Pre-magnetisation time. Delay between ‘switch on’ and ‘start of the frequency’.

I-DC Stop Current value for the dc braking.

T-DC Stop Braking current time. Delay between ‘F-dc reached’ and ‘switch off the current feed’.

ABoost Automatic increase in voltage for the compensation of the IxR loss.

F-DC Switching point from frequency to dc current feed for ‘stop’ operation.

U_{min} Min. voltage (boost) when the motor is at a standstill. U/F characteristics is shifted upwards.

F_{min} Min. frequency when the motor is at a standstill

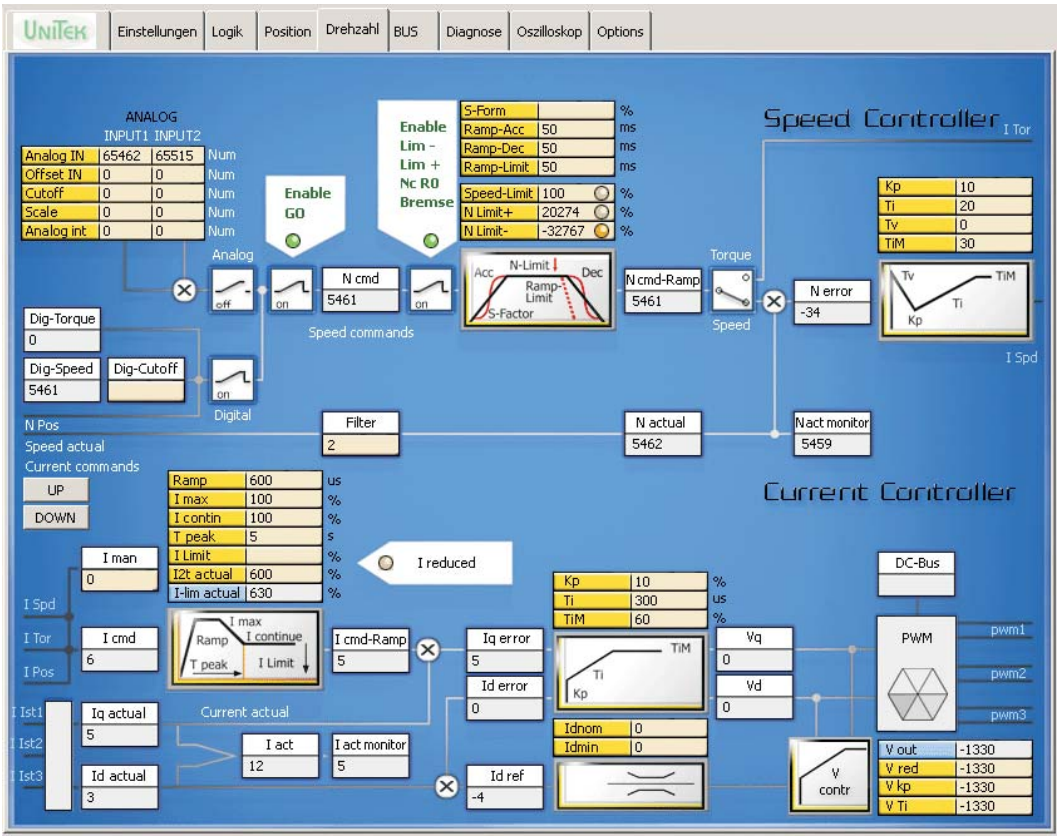
U eck Max. output voltage at cut-off frequency

F eck Cut-off frequency for a max. output voltage

F eck Stop Cut-off frequency for ‘stop’ operation

Setting window for the speed

Speed controller



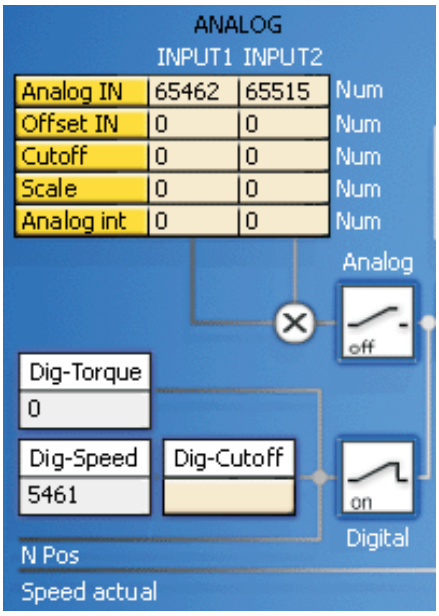
Block diagram with the input fields for the control parameters and display fields for numeric values.

Speed command values	**The speed command value is provided by:**		**ID-address**
Analog IN1/ IN2	Analog input 1		0xd5 L / 0xd6 L
Offset IN1/ IN2	Correction of the zero point error		0x2f H / 0x2f L
Cutoff IN1/ IN2			0x50 H / 0x50 L
Scale IN1/ IN2	Scale for the input value		0x53 H / 0x53 L
Analog int IN1/ IN2	Processed command value		0xd5 H / 0xd6 H
Dig-Torque	digital torque command value		0x90
Dig-Speed	digital speed command value		0x31
Dig-Cutoff			0x????
N-Pos	Position controller output Pos->Speed		

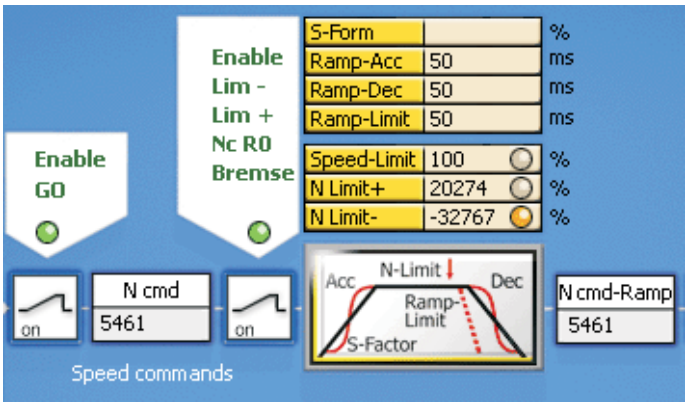
Actual value			
Speed actual	Speed actual value signal		
Filter	Filter for the speed actual value		0x5e
N actual	Speed actual value signal for the control		0x30
N act monitor	Speed actual value signal for the display		0xa8

Speed control values			
Ncmd ramp	Speed command value for the control		0x32
N actual	Speed actual value for the control		0x30
N error	Speed command value minus actual value		0x330x30

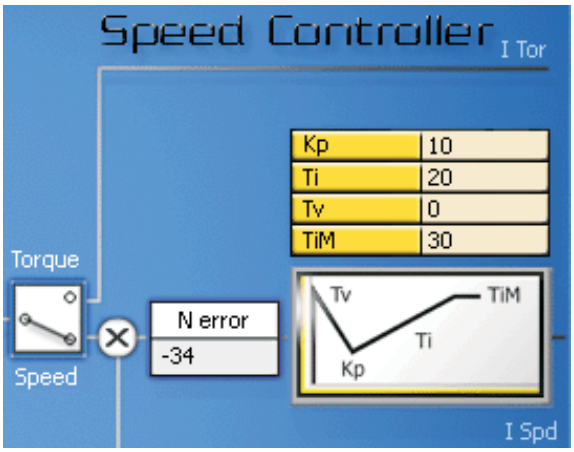
Display/input field for analog command values
The direct input values of ‘input1’ and ‘input2’ are displayed in the field ‘analog IN’.
These signals are processed by means of the parameters ‘offset’, ‘cut-off’, and ‘scale’. The resulting values are displayed in the field ‘analog int’.
Selection between analog or digital command value by means of the switches ‘analog’ and ‘digital’. When both switches are closed, the digital and the analog values are added.
The sum must be ≤ 32767 num.
The digital command values can be entered as digital speed, digital torque or they are provided from the position controller (NPos).



Switching field 1
The speed command value is only proceeded (green) and displayed in the display field ‘speed command value’ (N cmd) when the enable and internal enable (GO) is active.
Switching field 2
The speed command value (N cmd) is processed in the setting window ‘ramp’ when the enable (Ena), the output stage switches (Lim-, Lim+), no speed=0, and no brake are activated (green).
Ramp field
The acceleration ramp (ramp-acc), the deceleration ramp (ramp-dec), the ramp ‘output stage switch/emergency stop’ (ramp-limit), and the speed limiting (speed-limit, N-limit+, N-limit-) are adjusted.
The resulting values are displayed in the field ‘speed command value after ramp’
(N cmd-ramp).



Speed controller
For torque control (torque) the speed command value (Ncmd-ramp) is used as torque command value (I tor).
The actual speed value (speed actual) is displayed after the filter in the field ‘actual speed value’ (N actual) and subtracted from the speed command value .
The resulting value is displayed in the field ‘speed error’ (N error).
The current correction error is processed in the current controller (PID amplifier). The proportional amplification (Kp), the integral component (Ti), the differential component (Td), and the memory limiting for the integral component (Tim) are adjusted.
This results in the current command value (I Spd).

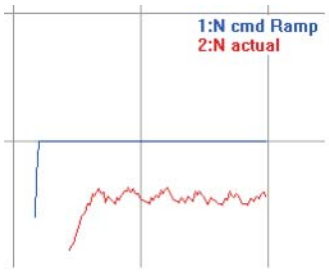


Adjustment of the speed controller amplification

The adjustment of the speed controller is determined by the load, the friction and the inertia presented by the driven axis.
Preset a step function to optimise the settings by monitoring the response at a step input.
The oscilloscope window incorporates a step generator for testing.
Monitor the speed command value (N cmd-ramp) and the actual speed value (N actual) on the oscilloscope.
For further information refer to the commissioning manual.

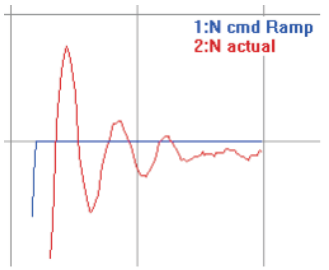
Speed controller adjustment of the parameter Kp without integral component (Ti = 0)

Kp too small
The difference between the current command value (I cmd) and the actual current value (I actual) is too large.
For explanatory purposes the curve of the diagram has been strongly stretched.

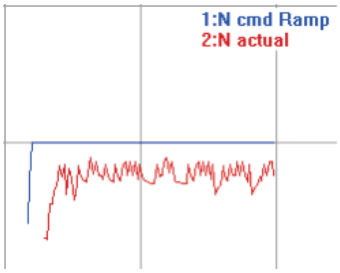


Kp value too high
There are oscillation peaks of the actual current value which exceed the speed command value. The motor will operate noisily and with vibrations and there is a tendency to oscillate.

Kp too large
Speed actual value has large overshoot compared to command value.
Rough travel, tendency to oscillate and noisy.
For explanatory purposes the curve of the diagram has been strongly

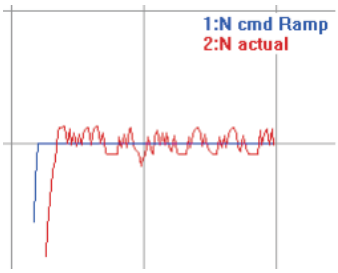


Correct Kp value
The difference between the speed command value and the actual speed value is optimal (control error approx. 5%). Remaining errors can be eliminated by means of the integral adjustment.
For explanatory purposes the curve of the diagram has been strongly stretched.
(diagram is exaggerated for explanatory purposes)



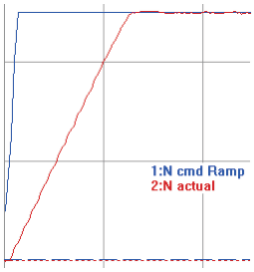
Speed controller adjustment of the parameters Kp, Ti, and TiM
Reduce the control errors to a minimum by means of the parameters **'Ti'** and **'TiM'**. Values should be kept as small as possible.

For explanatory purposes the curve of the diagram has been strongly stretched.

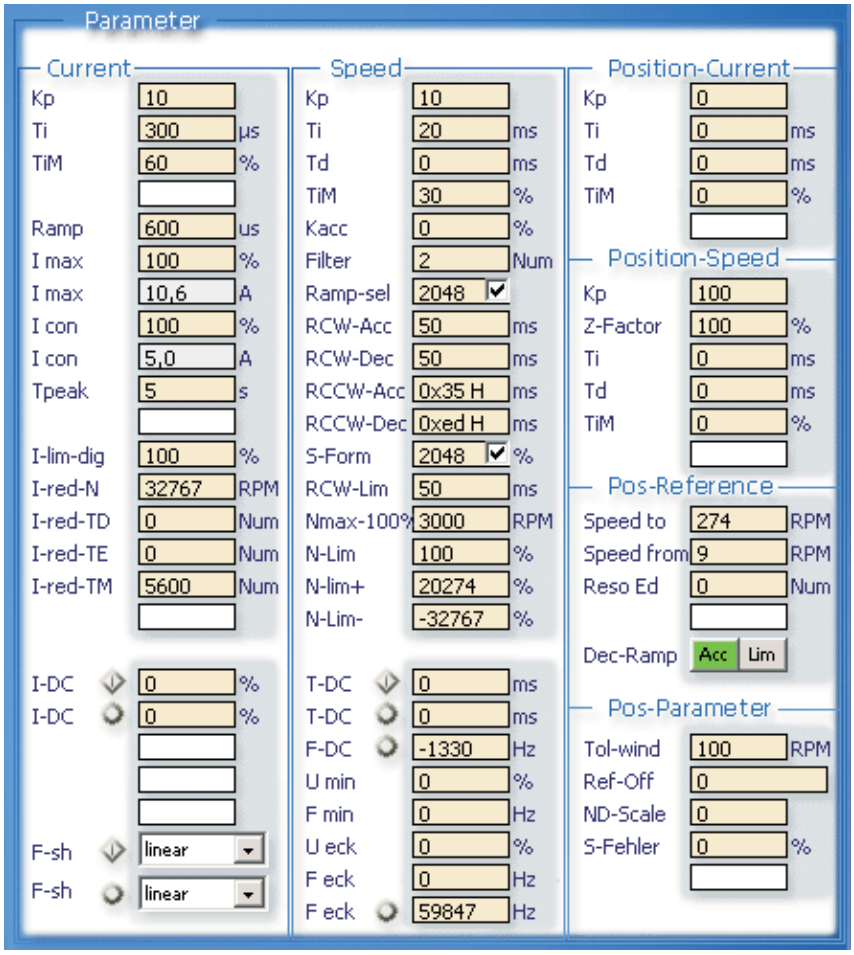


Step response of an optimally adjusted speed controller.
Normal diagram curve.

(actual diagram)



Setting window for the position controller parameters



For further adjustments please refer to the pages *Position* and *Oscilloscope*.

Position Current						
Parameter	**Function**	**Range**	**Default**	**Unit**	**Step**	**ID-address**
Kp	Proportional amplification	0 to 100	50	Num	1=0.1	0xc9
Ti	Integration time	1 to 1000	300	ms	1	0xca
Td	Rate time	1 to 30000	5000	ms	1	0xcb
TiM	max. Integration time memory	0 to 100	50	%	1	0xcd

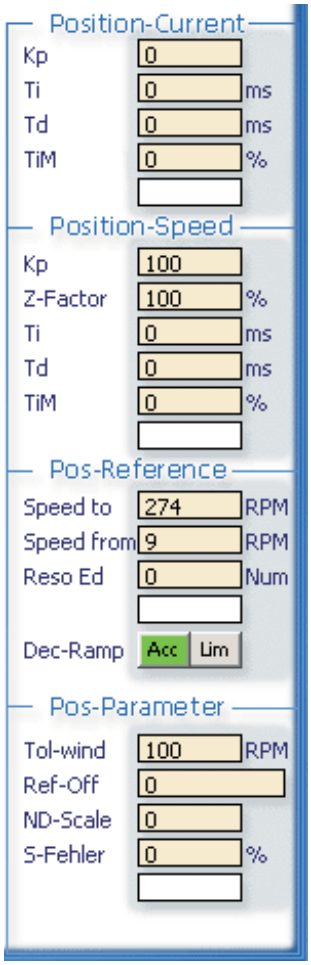
Position Speed						
Parameter	**Function**	**Range**	**Default**	**Unit**	**Step**	**ID-address**
Kp	Proportional amplification	0 to 200	70	Num	1=0.1	0x6a
Z Factor						
Ti	Integration time	1 to 100	0	ms	0.75	0x6b
Td	Rate time	1 to 1000	0	ms	0.75	0x6c
TiM	max. integration time memory	0 to 100	0	%	1	0x71

Pos-Reference						
Parameter	**Function**	**Range**	**Default**	**Unit**	**Step**	**ID**
Speed to	Speed compared to the reference position	10 to 32000	3000	num	1	0x76
Speed from	Loop speed	10 to 2000	500	num	1	0x77
Reso Edge						0x75
Calib.	Switching of "ramp acc" or "limit"					0x78

Parameter position						
Parameter	**Function**	**Range**	**Default**	**Unit**	**Step**	**ID-address**
Tol window	Display of the position	0 bis 2000	100	Num	1	0x79
Ref- Off	Zero pint shift	0 bis ±32676	0	Nim	1	0x72
ND-Scale						
S-error	Contouring error					

Pos -> Current (for special functions)

The amplified position error (< 2048) becomes the direct current command value input for the current controller. In this case, the speed controller is by-passed.



Proportional control amplification

Kp Proportional amplification, target position control circuit

Dynamic control amplification

Ti Integral term
Td Differential term
TiM Threshold value - integral term

Note:
The position controller is switched off when no **Kp** value is adjusted.
For an analog command value with a digital holding position (parameter *0 cutoff* in the parameter field 'speed') the parameters for 'pos -> current' must be adjusted.

Pos -> Speed
The amplified position error represents the speed command value.

Proportional control amplification

Kp Proportional amplification, position control circuit, determines the slope of the delay ramp

Note:
The position controller is switched off when no **Kp** value is adjusted.

Dynamic control amplification (only effective during ramp-up to final position)

Ti Integral term
Td Differential term
TiM Threshold value - integral term
T ramp Position ramp time, ramp-up to final position, Delay time (in ms) from max. speed

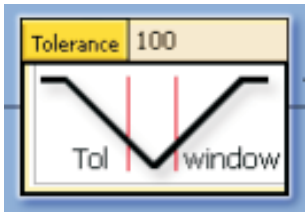
Reference travel

The zero position (no pulses) of the incremental encoder feedback systems is determined by the reference travel.

Speed to Speed to the output stage switch
This determines the speed at which the axis trips the output stage switch.

Speed from Reverse speed to the zero pulse signal from the encoder (Loop speed)

Reso Ed
Dec-ramp The ramp of the reference travel is selected from the ramps RCW-acc and ramp-lim.



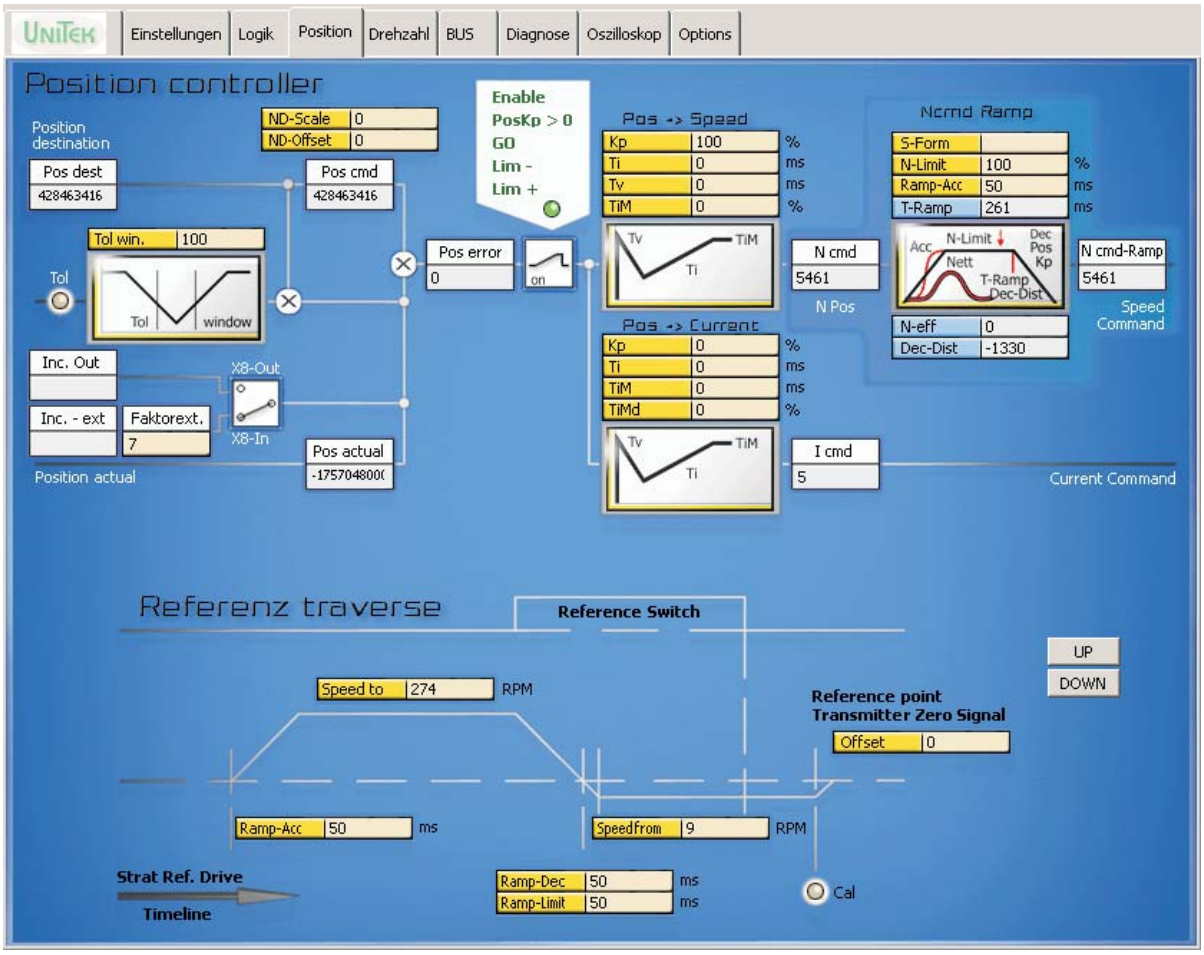
Pos parameters

Tol window Position tolerance window (numeric value)
Reference offset Zero point shifting (numeric value)
ND scale
S error Contouring error

One motor revolution corresponds to the numeric value 65536.

The position command values or position parameter values sent from the control via RS232 or CAN BUS become immediately effective.

Position setting window



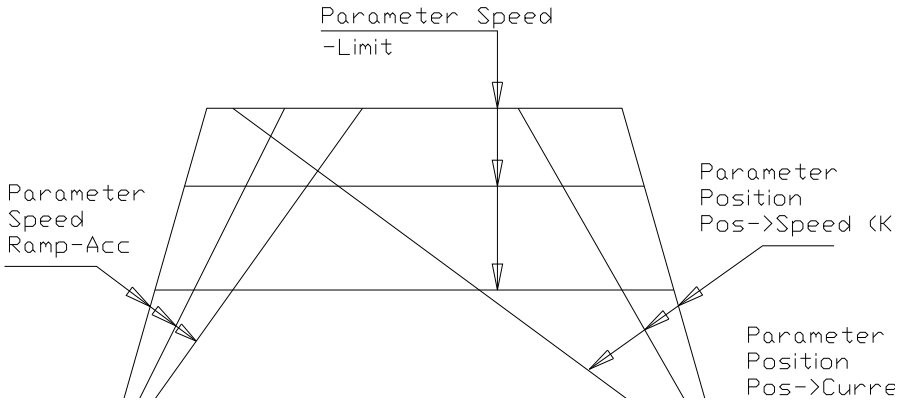
Position controller

Block diagram with the input fields for the control parameters and display fields for numeric values.
The position error *Pos error* is calculated at the summing point by subtracting the actual position value (pos actual) from the position target value (pos dest). If the error is inferior to the adjusted tolerance value, this state will be displayed in the field ‘tol’. At enable the position target value (pos dest) is proceeded as position command value (pos cmd). The position error is calculated at the summing point by subtracting the actual position value (pos actual) from the position command value (pos cmd). The resulting error value is displayed in the field ‘speed error’ (N error).
When the enable states (Ena, GO), the output stage switches (Lim-, Lim+), and the position control amplification (posKp>0) are active (green), the position error (pos error) represents the input to the *Pos -> Speed and Pos -> Current* controllers. For both controllers the proportional amplification (Kp), the integral term (Ti), the differential term (Td), and the memory limiting for the integral term (Tim) are adjusted. This results in the current command value (I pos).

Reference travel

Block diagram with the input fields for the control parameters and display fields for numeric values.

Adjustment	Function	Display	Function
Speed to	Speed to the reference switch	Ramp Acc	Acceleration to speed (ref. switch)
Speed from	Reverse speed from switch to zero pulse	Ramp Dec	Deceleration to reverse speed (selection ‘dec-ramp’)
Offset	Mechanical zero point shift	Ramp-Limit	Deceleration to reverse speed limit



Acceleration

Ramp-Acc Acceleration time to max. speed in ms.
acceleration a = v / tb
v = max. velocity, t = acceleration time

Constant travel Limit Speed limit > max. speed
(max. speed (100%) = 32767 num)

Deceleration Ramp-Dec For position control, adjust to < 10ms

Parameters adjusted via the window 'position'
The slope of the deceleration results from the proportional amplification (*Pos->Speed Kp).*

Deceleration time *T-Ramp* (tv) from max. speed (32767 num) to zero, displayed in ms in the window 'position'.

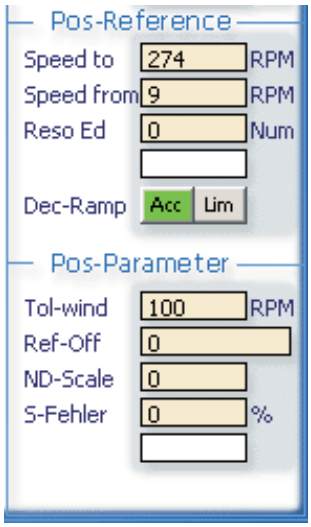
Deceleration a in m/s2 a = v / tv
v = max. velocity in m/s, t = deceleration time (t ramp) in s

Example v = 3m/s, t = 0.261,
a = 3 / 0.261 = 11.5 m/s2

Calculating Kp from a given speed and deceleration time:
Kp = √(a) x 2603 / v
Kp = √(11.5) x 2603 / 3 = 99.9%

Ramp target distance s = v2 / 2 x a
s = 9 / 2 x 11.5 = 0.391 m

Actual position value range	Resolver	Incremental encoder
Pulses/rpm max. value = ±2147483647 (31 bit -1)	65536 per rpm	65536 per rpm
Resolution (smallest value)	16 (65536/4096 (12 bit))	65536/inc * 4
Example Positioning axis 5mm slope/rpm	Travel 1000mm = 200 rpm = 13107200 num Resolution = 65536/4096 = 16	Incremental encoder 2048 inc/rpm Travel = 1000mm = 200 rpm = 1638400 Resolution = 65536/8192 = 8



Reference travel

A reference travel is initiated in order to determine the axis reference position. This is the zero pulse position of the incremental encoder measurement system.

Speed to Speed when travelling towards the reference output stage switch. This determines the speed at which the axis trips the output stage switch.

Speed from Reverse speed to the output stage switch edge (reso) or to the zero pulse signal after the output stage switch edge (inc.). (Loop speed)

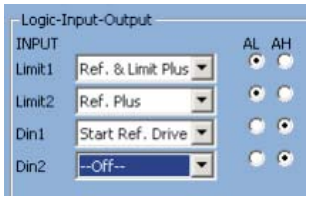
Reso Edge/Offset
Resolver correction value. Zero Enter the measured value 'zero capture'.

Each reference switch is assigned to a digital input of the parameter field and can be selected via these fields.
The reference travel (start ref drive) is started via a digital input (din1, Din2) or an interface (CAN-BUS, RS232, 0x78) when the drive and the enable (RUN) have been switched on.

Note: The drive will accept commands such as ***Start Ref Drive, N cmd***, etc. only 5s after the drive has been enabled.

Reference travel

The axis travels towards the reference output stage switch at a rate determined by ***Speed to***. The axis trips the reference switch and travels back at a loop speed determined by ***Speed from***. Where a reference switch is existing, the axis moves in the positive direction as loop and in the negative direction as double-loop.
The axis reference position becomes the zero pulse position after the reference output stage switch edge.
For a resolver system, the absolute position value (within half a motor revolution) corresponds to the reference output stage switch edge (zero capture).

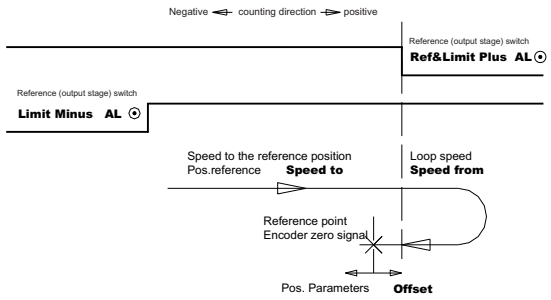


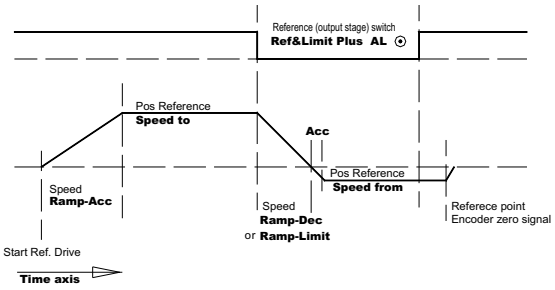
The mechanical reference (zero) position can be shifted in a positive or negative direction by means of the parameter '***Reference Offset'.***

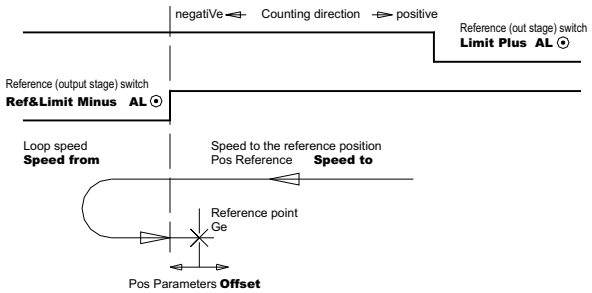
Reference switch
Ref&LimitPLUS Positive rotation to reference switch - Output stage switch
Ref&LimitMINUS Negative rotation to reference switch - Output stage switch
Ref PLUS Positive rotation to reference switch - switch edge, independent of the output stage switches

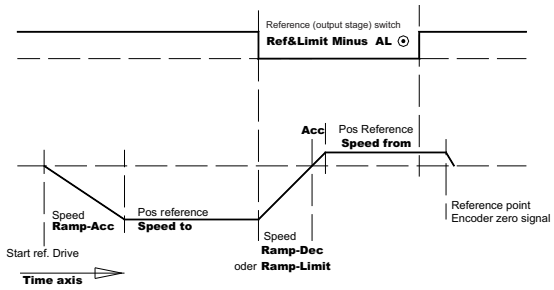
In the field **'Dec-ramp'** of the parameter field 'servo' the deceleration can be switched from ***Ramp-limit*** to ***Dec-Ramp*** when switching over from ***Speed to*** to ***Speed from***.

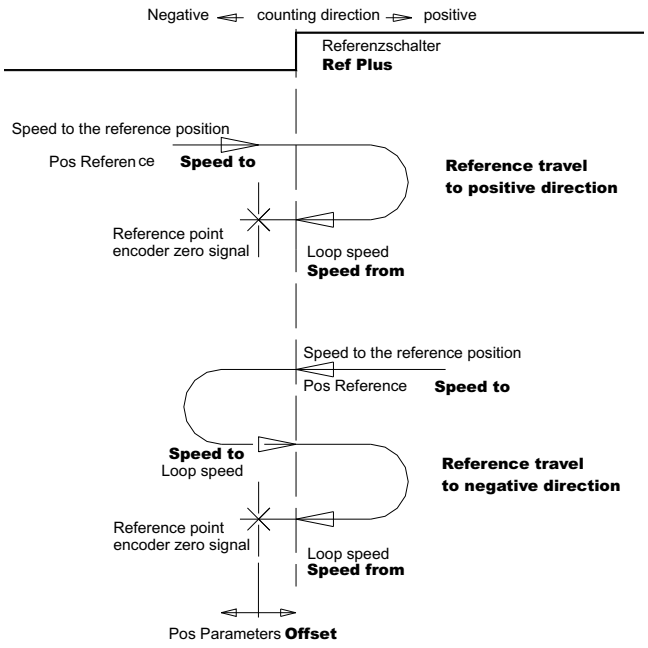
Reference travel functions

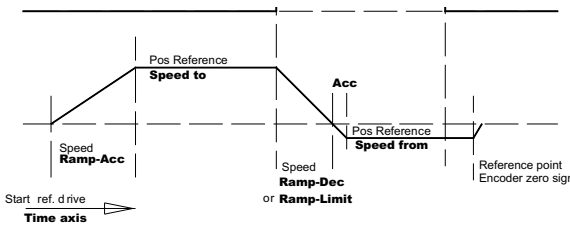




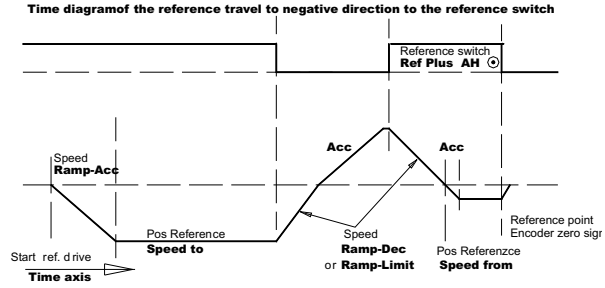


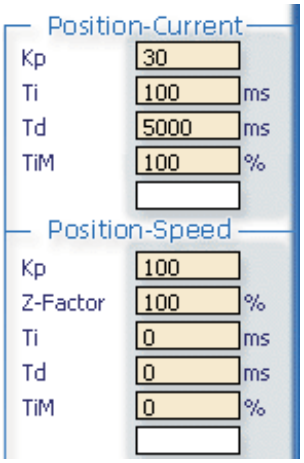






Time diagramof the reference travel to negative direction to the reference switch





Amplification adjustment Pos -> Speed

The amplified position error provides the speed command value.

Proportional control amplification

Kp The proportional amplification for the position controller determines the slope of the deceleration ramp.

Note: The position control is switched off when no **Kp** value is entered.

Dynamic control amplification (only effective during ramp-up to final position)

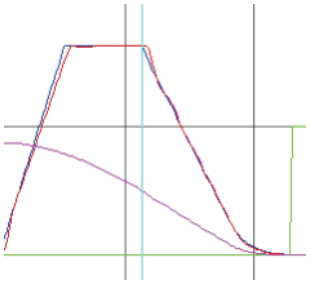
Ti Integral term

Td Differential term

TiM Threshold value - integral term

T ramp Position ramp time, ramp-up to final position, Delay time (in ms) from max. speed

Complete representation



Position travel

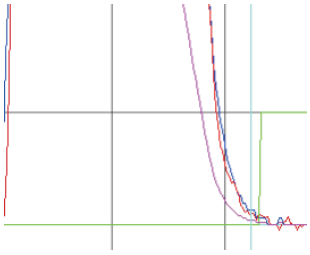
Acceleration is determined by the parameter ***Ramp Acc.***

A travel at even speed is determined by means of the parameters ***Speed Limit*** .

The ramp-up to final position is determined by the ***Kp*** amplification of the position contoller. The deceleration time from 100% speed to zero speed is displayed in the field '***T Ramp***'.

A small Kp amplification results in a long deceleration ramp. A high Kp amplification results in a short, steep deceleration ramp. If the Kp amplification is too high, the axis will overshoot and oscillate in the target position.

Detailed representation



The optimal time ramp is as long as possible and as short as necessary.

Pos parameters

Tol windowPosition tolerance window (numeric value)

When **pos-actual < tol window** the output **O Toler** is set to 1 and displayed as state '**Tol'**

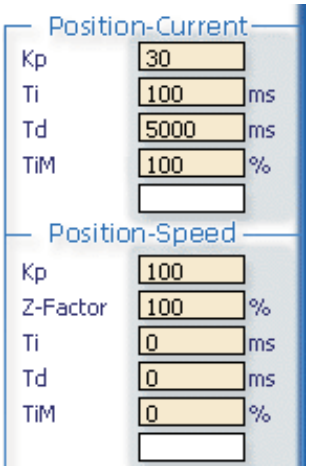
Reference offset Zero position shift (numerical value)
The mechanical zero position is shifted in positive or negative direction.

One motor revolution corresponds to a numerical value of 65555

The position command values or parameter values sent from the controller via the RS232 or the CAN are immediately executed.

Amplification adjustment Pos -> Current

The amplified position error provides the current command value.
The speed controller is by-passed.
The adjusted values are effective at a position error <2048. The stability in the position is determined by these values.



The application of the adjustment 'Pos-Current' is recommended:
for a control with an actual resolver value and
for a control with an incremental encoder actual value with a low position amplification adjusted in the parameter field 'Pos-Speed'.

For an incremental encoder actual value and a high amplification the Kp value for ***Pos-Current*** is set to 0 (no function).

Proportional control amplification

Kp	The proportional amplification for the target position controller

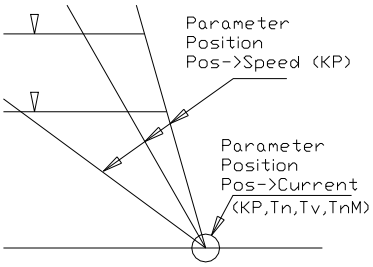
Dynamic control amplification

Ti	Integral term
Td	Differential term
TiM	Threshold value - integral term

Note:
For an analog command value with a digital holding position (parameter *0 cutoff* in the parameter field 'speed') the parameters for 'pos -> current' must be adjusted.

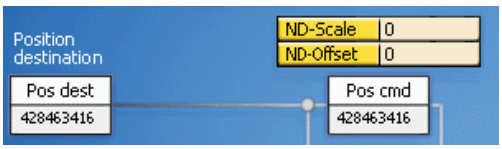
Position stability adjustment

In control loops with a low speed controller amplification or a low position controller amplification

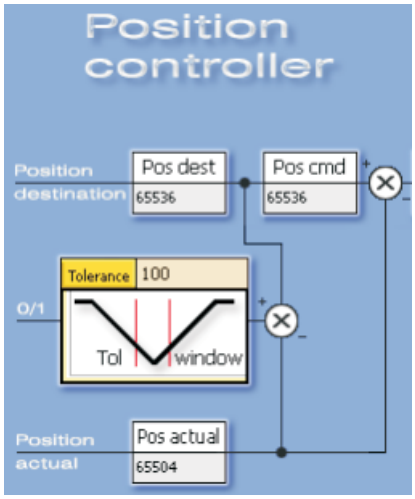


The position stability is adjusted by means of the **Kp** amplification. When the **Kp** values are too high, the axis is uneasy while in position and tends to oscillate.

Display factor for the position values
The display of the values for Pos dest, Pos cmd, and Pos actual is adjusted by means of the parameter ND-Scale (0x7c, Pos-display factor) in the window ‘position’.
At zero the display corresponds to the numerical value. (1 motor revolution = 65536 num)



Adaption of the display to the feed value
Calculate the conversion factor necessary for converting the feed distance to motor revolutions. For the display this factor must be multiplied by the constant 65536.000 (corresponds to 1.000 mm per revolution).

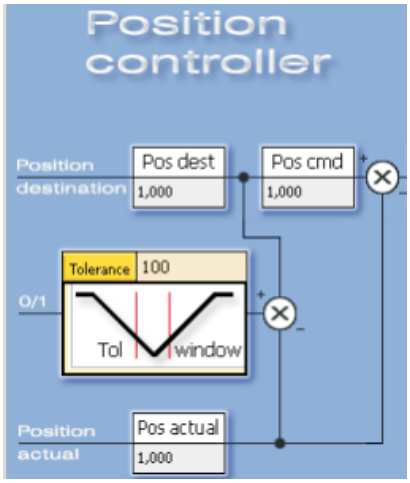


Example: distance in mm
Slope 5mm
Gear i=20
Conversion factor for one revolution 1/5 *20 = 4

Position display factor 65536.000* 4 = 262144.000

NDrive scale = 262144.000

Displayed value in mm for *Pos dest*, *Pos cmd,* and *Pos actual*



Example: angle in degree

Transmission: 1degree = 10 motor revolutions

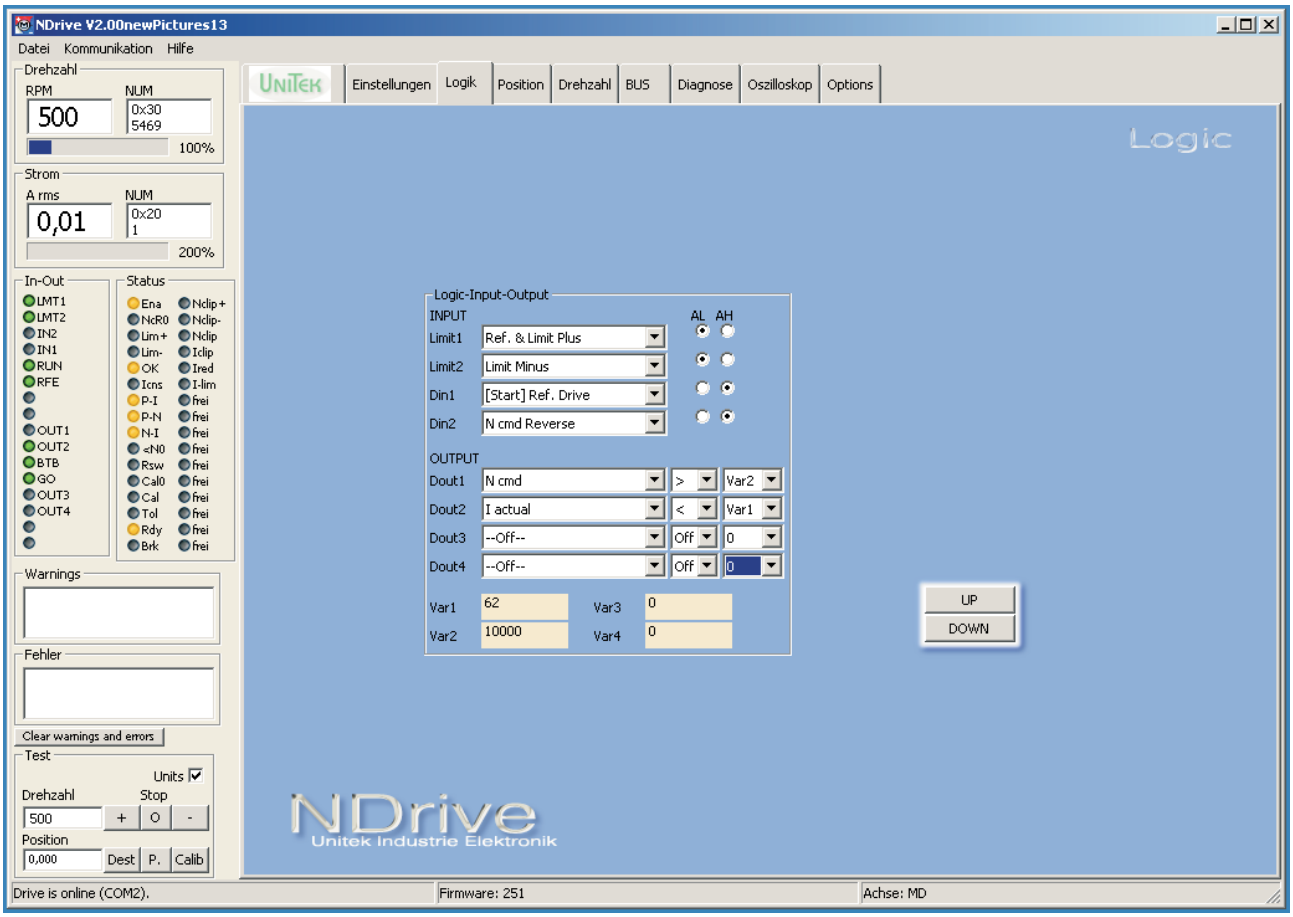
Conversion factor for one revolution = 10

Position display factor 65536.000* 10 = 655360.000

NDrive scale = 655360.000

Displayed value in degree for *Pos dest*, *Pos cmd,* and *Pos actual*

Logic window



Setting window for digital inputs and outputs

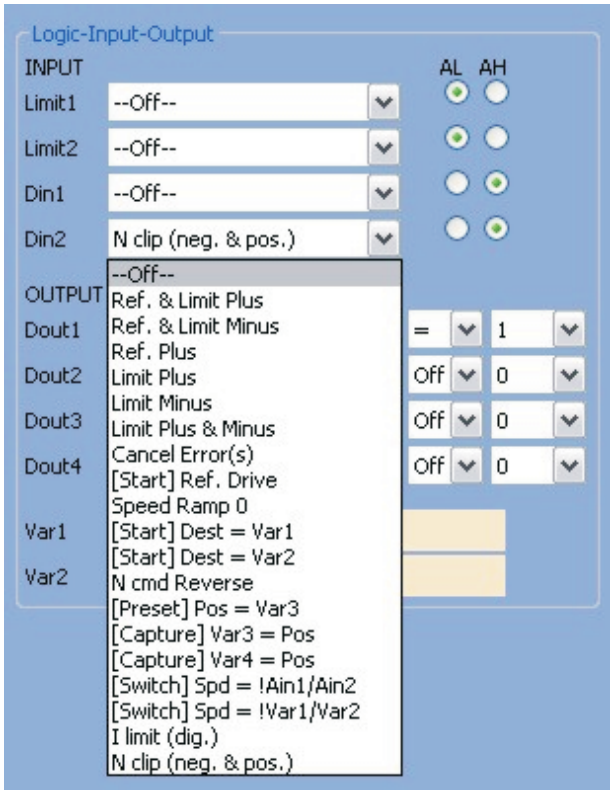
Inputs

Limit1	Programmable digital input, with preference given to an output stage switch or switch
Limit2	Programmable digital input, with preference given to an output stage switch or switch
Din1	Programmable digital input
Din2	Programmable digital input

Outputs

Dout1	Programmable digital output (status of an internal logic signal or the logical output of the comparison between a variable and a comparison value).
Dout2	Programmable digital output (status of an internal logic signal or the logical output of the comparison between a variable and a comparison value).
Dout3	not yet available
Dout 4	not yet available

Var1 to Var4 Comparison values



Digital inputs
Function selection

Click the down arrow to open a drop-down menu showing a list of function options.
Click the required option. The selected function is highlighted in blue and is transferred to the display field by clicking it.

Select the 'input polarity' function

AL = active low (e.g. output stage switch)
AH = active high
Click the respective key to select the polarity of the input.

Saving

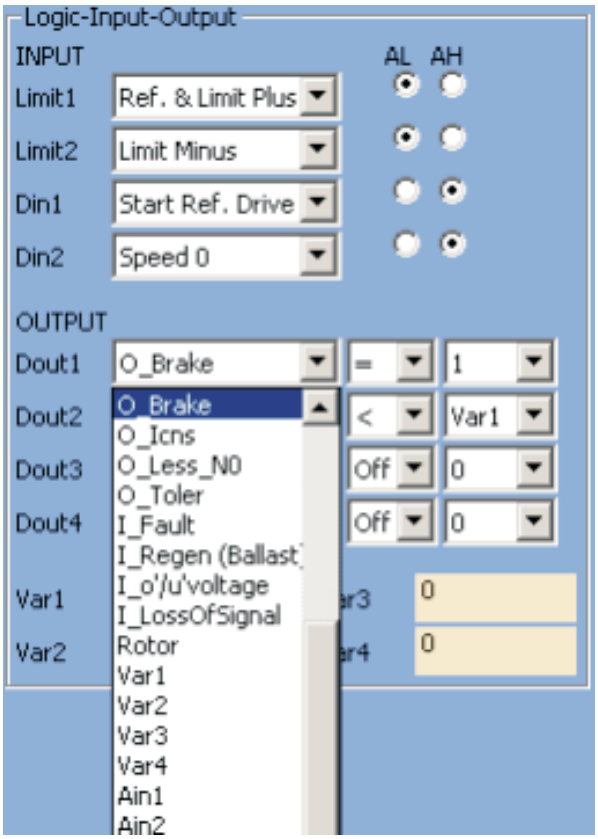
The function is saved in the RAM and activated by pressing the **'enter'** key.

The state of the output stage switches inputs Limit1and Limit2 are displayed in the field 'state' as **Lim+** and **Lim-**.

Example	
Digital inputs	**Function selected**
Limit1	Output stage switch (+) as reference switch (AL active low)
Limit2	Output stage switch (-) (Al active low)
Din1	Start reference travel (AH active high)

Digital input assignment	**Function**	
Ref. & Limit Plus	Output stage switch in positive direction as reference switch	
Ref. & Limit Minus	Output stage switch in negative direction as reference switch	
Ref. Plus	Reference switch in positive direction	
Limit Plus	Output stage switch, positive direction	
Limit Minus	Output stage switch, negative direction	
Limit Plus & Minus	Output stage switch, positive and negative direction	
Cancel Error(s)	Delete error memory	
Start Ref. Drive	Start a reference travel	
Speed 0	Speed command value is internally switched to 0 (while speed 0 is active)	
Start pos = Var1	Position variable 1 is started	
Start pos = Var2	Position variable 2 is started	
Ncmd reverse	Command value polarity is reversed	
Preset Pos = Var3	Position actual value is set to Var3	
Capture Var3 = Pos	Sets variable 3 as position command value (target) and travels to that position	
Capture Var4 = Pos	Sets variable 4 as position command value (target) and travels to that position	
Switch Ain1/Ain2	Switch-over command for the command value Ain1 or Ain2	

The inputs **End1, End2** (Limit1, Limit2) are default set to output stage switch function. However, it is possible to assign them to any of the input functions available.



Digital Logic Outputs

An internal parameter of interest is selected from the drop down list which is accessed by clicking the down arrow in the first column. The second column contains a drop down list, from which an operator is chosen. The third column, again by means of a drop down column, allows for the selection of a comparison variable. The chosen digital output reflects the result of the comparison. A logic low (<1V) or logic high (>10V)

Output function can be altered on the fly. A new selection is stored in Ram and becomes active by hitting the keyboard return key.

Example	
Digital Output	Selected function
Dout 1	Curren t(I) > variable 3
Dout 2	Speed = variable 4

Assignment of the output parameters (selection)	**Function**	**ID-address**
I_cmd	Current (I) command value (Speed controller output)	0x26
I_actual	Current (I) actual value	0x20
N cmd Ramp	Speed command value	0x32
oN actual	Speed actual value	0x30
Pos cmd	Position command value	0x6e
Pos actual	Position actual value	0x6d
I_error	Current (I) error	0x23
N error	Speed error	0x33
Pos error	Position error	0x70
Brake	Brake control signal	0xF2
All parameters of the list "measure value selection" can be assigned to the respective outputs.		

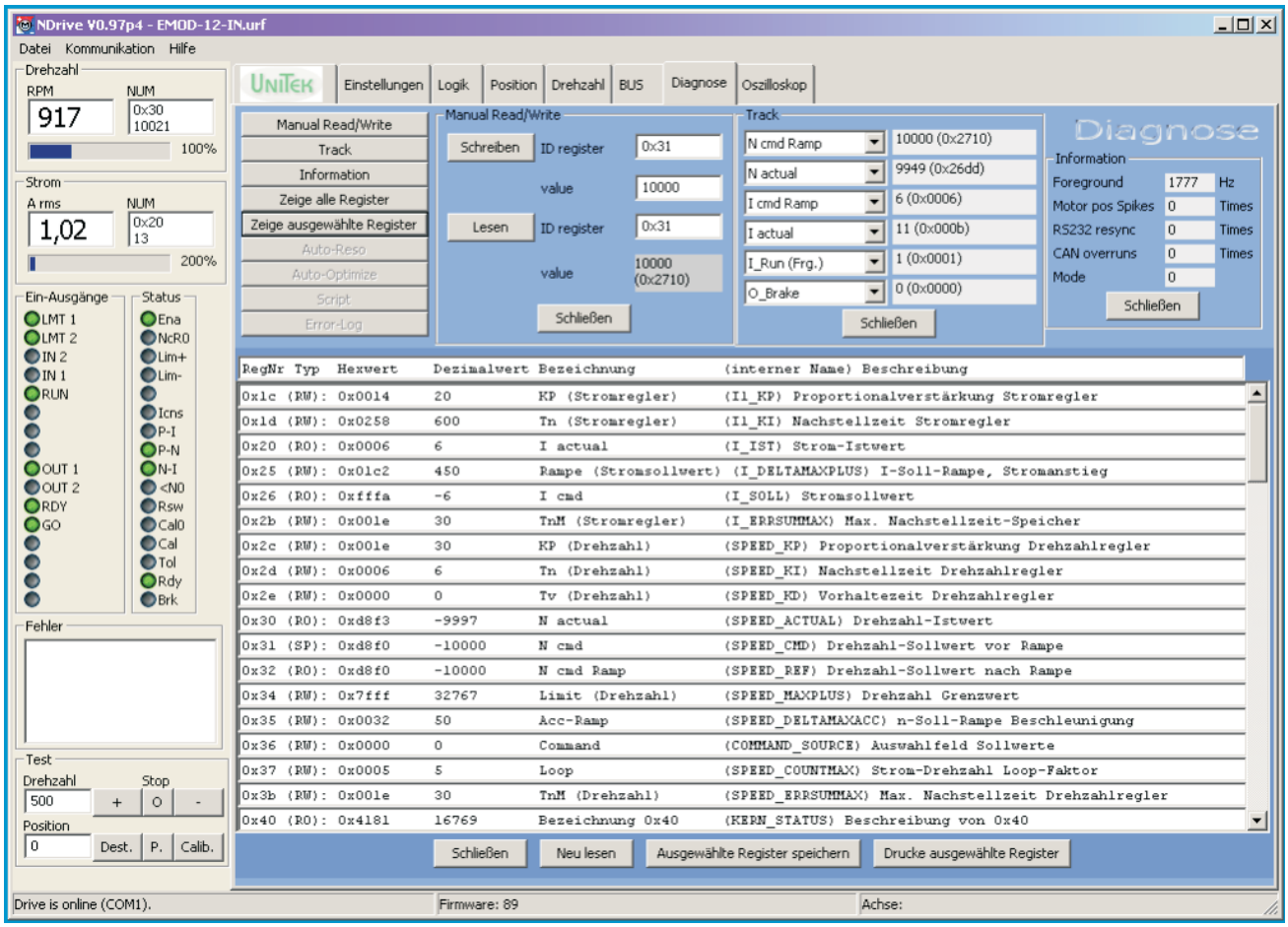
Operand	**Function**	
Off	off	
On	on	
1hz	Test signal	
=	equal	
!=	not equal	
>	greater than	
<	less than	
abs>	absolute value greater than	
abs<	absolute value less than	

Variable	**Function**	**ID-address**
0	logic signal 0	
1	logic signal 1	
VAR1	numerical value for comparison purposes	0xd1
VAR2		0xd2
VAR3		0xd3
VAR4		0xd4
AIN1	Numerical value of the voltages across the analog inputs input.	
AIN2		
AIN3		

Free

Free

Diagnosis



Setting window for the diagnosis

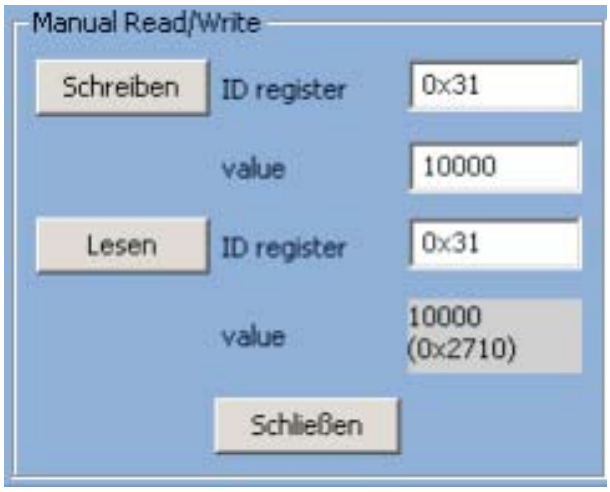
Diagnosis parameters

Manual Read/Write	Direct read or write of the parameter values
Track	Display of the numeric value of the selected parameter
Information	Information about transfer errors
Show all registers	Parameter list with parameter Ids
Show selection of registers	List of all parameters selected and their parameter Ids
Print all registers	Printout of the parameter list
Auto-Reso	see page ‘auto’
Auto-Optimise	see page ‘auto’
Error history	not yet implemented
Script	not yet implemented

Manual Read/Write

Direct read or write of the parameter values

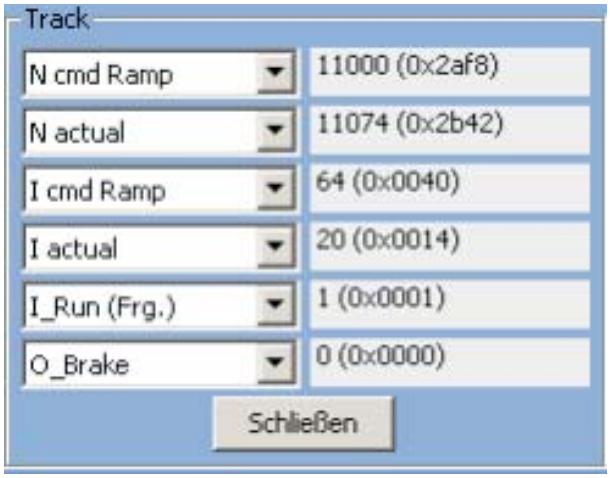
Note: Only to be used by experienced service personnel!



Read a parameter:
Enter the parameter (register) Id in the field **'Id register'** and click **'read'**. The parameter short symbol and its contents are displayed numerically and in hex format below the input field.

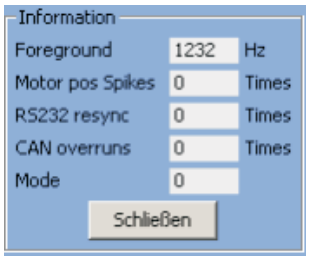
Write a parameter:
Enter the parameter (register) Id in the field **'Id register'.** Enter the value for the selected parameter in the input field '**value**' and click **'write'**. The parameter values are immediately transferred.

Track



Display of the parameter values
The numerical values and hex values (0x..) of the selected parameters are displayed in the 'track' display.
Click the arrow key to open the scroll menu for the selection of a parameter value.
The value is selected by means of the arrow keys or the scroll bar in the scroll field. The selected value is highlighted in blue. When the value is selected the scroll field closes.

Note:
All parameter values can also be displayed on the oscilloscope.



Information

Display field for the active states: (input not possible)

Foreground	Speed of the foreground program
Motor pos spikes	Speed/actual value errors
RS232 resync	RS232 transfer errors
CAN overruns	CAN bus transfer errors
Mode	Mode/bits adjustment

Display field for the register

Show all registers
A list of all 255 parameters is displayed. The contents of the registers cannot be modified.

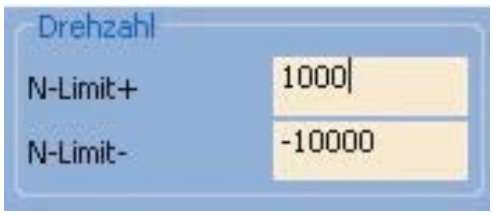
Show selection of registers
A list with all the operating parameters which are relevant for the user is displayed.
Parameters can be selected via the file '**Reglist.txt'**.
The contents of the registers cannot be modified.

Selection via the footer

Schließen	Display field is closed
Neu lesen	The parameter values are newly imported from the servo.
—-Register speichern	The displayed parameters are copied into a file.
Drucke —- Register	The displayed parameters are printed.

Free

Setting window for the option
Parameters and adjustments not yet entered accordingly.
Speed limiting with logic input N clip (neg. and pos.) or mode-Bit 6

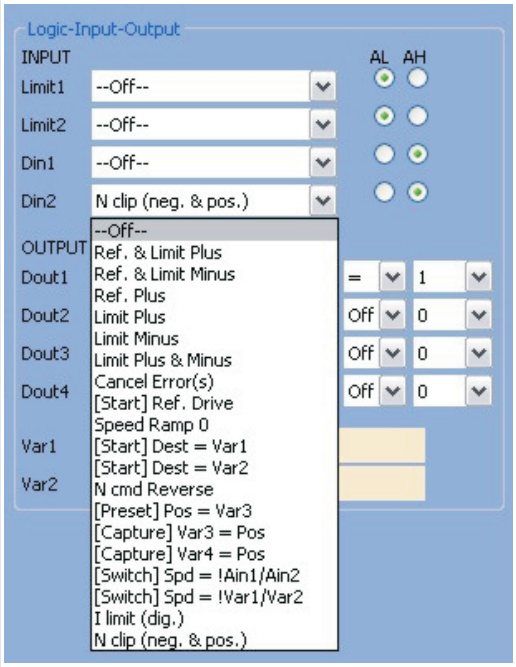


Positive threshold value (num)

Negative threshold value (num)

Check the polarity when entering the data.

With an active input N clip the positive and the negative speed command values are limited to the numeric values entered in the field ‘speed’.



A digital input is assigned to the function N clip on the logic side.
AL = active low (active when the contact is open)
AH = active high (active when the contact is closed)

Change of the baud rate in the drive

Options 9600 or 115200

Default 115200

Adjustment with 0x5a Bit 15 (0x8000)

Bit 15 0 correspond to 115200
Bit 15 1 correspond to 9600

When the auxiliary voltage (24V=) is switched on, the baud rate saved in the device is displayed after the display of the firmware version.

bd0 correspond to 115200
bd1 correspond to 9600

First, the firmware version is displayed (e.g. 2 3 2) then the baud rate (e.g. b d 0).

Automatic adjustment functions
(preliminary functional call with the Read/Write manual)

Function	Description	ID-address
		0x85
		0
		1
		2
		3
Phase rotating	Automatic determination of the rotor angle (reso offset)	4
Angle	Fix current feed angle, adjusted via reso offset	5
Analog offset	Automatic adjustment of the analog inputs	6
Tacho offset	Automatic adjustment of the segment offset for bl-tachos	7

Phasing (0x85 -4) execution

Check the no. of motor poles (MOTOR-Pole) and correct them if necessary.
The rotating speed corresponds to the parameter adjustment ‘speed from’.

Apply a voltage across the device, enable open.

Open the window ‘manual read/write’ on the page ‘diagnosis’.
Enter ‘0x85’ in the ‘write/Id register’ input field.
Enter ‘4’ in the ‘write/value’ input field.

Click ‘write’ and close the enable within 10s.

Function	7-segment display
Command taken over (click ‘write’)	40
Enable closed	41
Current applying (rotation starts)	42
Pole angle and determination of the motor pole no. accomplished	43
Correct termination	49
Error abort	
Enable switched off during measuring process	47
Time out, measuring time exceeded	48

The active states are displayed via the 7-segment display (sequence: 4-0, 4-1, 4-2, 4-3, 4-9) during the process for the automatic determination of the phase angle.

When achieving ‘correct termination’ (49) the resulting value is transferred to the parameter ‘feedback offset (0x44).
When the no. of motor poles and the connection is correct, the motor makes one clockwise rotation (electric periode (360°) times no. of poles/2).
When the motor rotates further than one revolution, the no. of poles is too high. In case of less than one revolution the no. of poles is too small.
When the motor rotates anti-clockwise, the motor connection has to be checked.

Current feed angle (0x85 -5)

A current feed angle is adjusted and the rotor is moved to this angle and hold in this position (dc current feed controlled to rated current, no rotating field).

The function is started as follows:
Apply a voltage to the device, enable open

Adjust the requested angle by means of the parameter reso offset (0x44) on the page ‘adjustments’.

Open the window ‘manual read/write’ on the page ‘diagnosis’.
Enter ‘0x85’ in the ‘write/Id register’ input field.
Enter ‘5’ in the ‘write/value’ input field.

Click ‘write’ and close the enable within 10s.

The drive rotates until reaching the adjusted angle.
New angle data can be entered as long as the enable is closed.
The drive adopts the new angle.

The function is stopped by opening the enable.

Analog offset (0x85 -6)
Adjustment of the offset function for the analog inputs

Execution of the function
Apply a voltage to the device, enable open

Adjust the requested angle by means of the parameter reso offset (0x44) on the page ‘adjustments’.

Open the window ‘manual read/write’ on the page ‘diagnosis’.
Enter ‘0x85’ in the ‘write/Id register’ input field.
Enter ‘6’ in the ‘write/value’ input field.

Click ‘write’

Function	7-segment display
Command taken over (click ‘write’)	60
Correct termination	69
Error abort	
Enable switched on during measuring process	66

When the adjustment is started ‘6-0’ is displayed in the 7-segment display.
The adjustment is finished when ‘6-9’ is displayed.

Tacho offset (0x85 -7)

Adjustment of the segment offset error for brushless tacho systems

Execution of the function

Apply a voltage across the device, enable open.

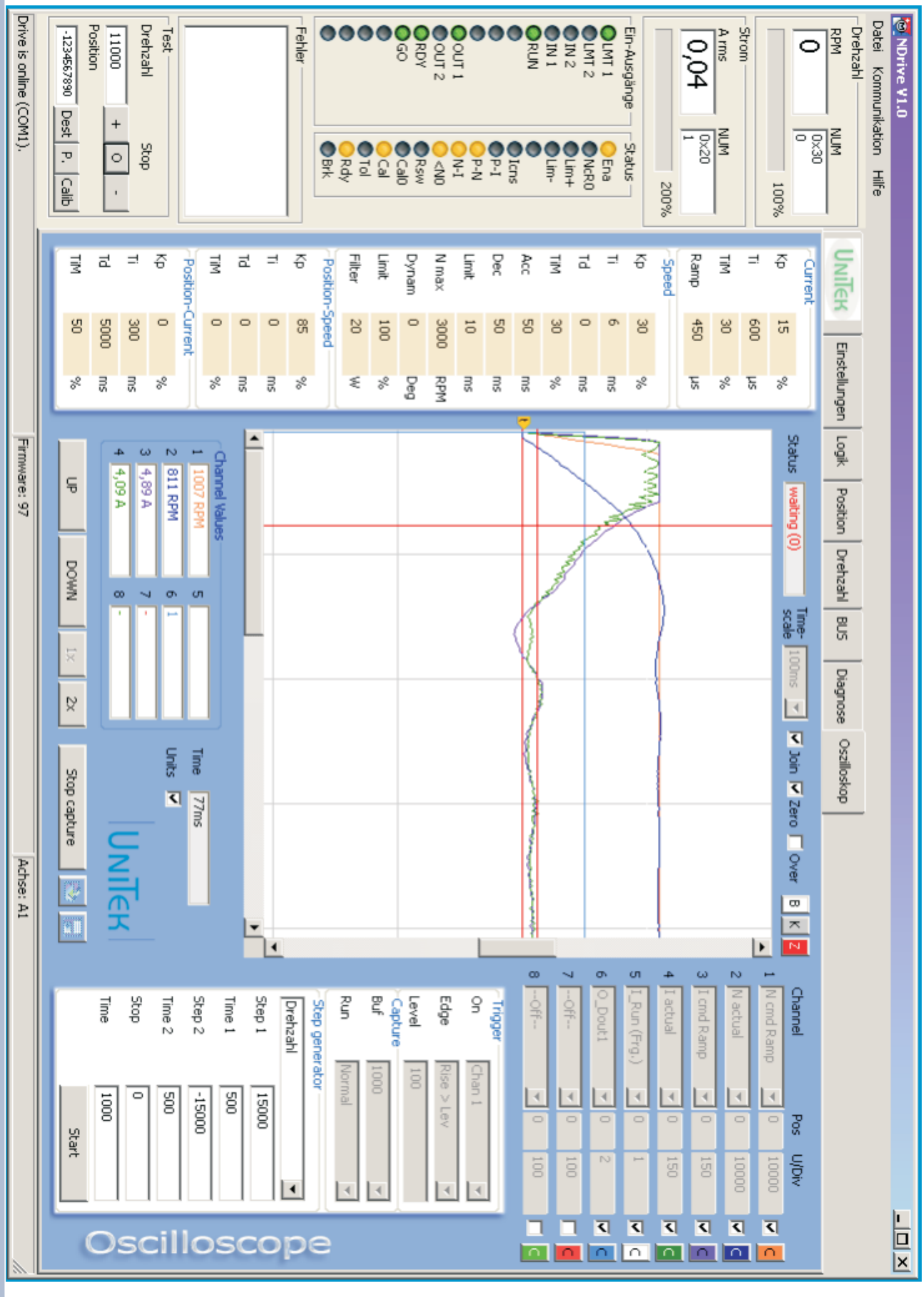
Open the window ‘manual read/write’ on the page ‘diagnosis’.
Enter ‘0x85’ in the ‘write/Id register’ input field.
Enter ‘7’ in the ‘write/value’ input field.

Click ‘write’.

Function	7-segment display
Command taken over (click ‘write’)	70
Correct termination	79
Error abort	
Enable switched on during measuring process	76
Rotor movement determined	77
No tacho connected	78

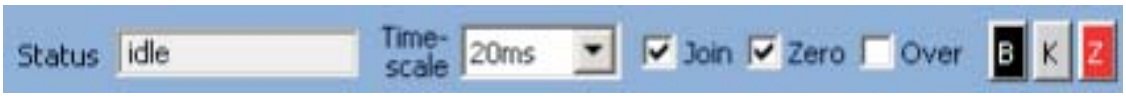
When the adjustment is started ‘7-0’ is displayed in the 7-segment display.
The adjustment is finished when ‘7-9’ is displayed.

Oscilloscope



Oscilloscope adjustment

Screen functions



State	Colour	Function
waiting (0)	red	triggered, the data are saved
waiting (xx)	green	transfer of the data from the drive to the PC
reading	blue	reading data from Drive to PC
drawing		Display of the data on the oscilloscope screen
idle	black	Data freeze following 'stop capture'

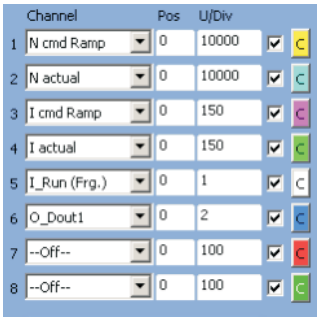
Time-scale	Time period per horizontal division
Join	Dots connected
Zero	Zero line visible
Over	An existing screen image remains on the screen and is overridden with the next image
Screen colours	
B	Oscilloscope background
K	Oscilloscope screen divisions
Z	Oscilloscope zero line

Start-stop-capture

By clicking the key '***Start capture'*** , the oscilloscope recording function is primed. Recording starts with the next triggering signal. The recording is stopped by clicking '***Stop capture***' and the display is frozen.

Selection of the values to be measured

Columm	Function
Channel	Assignment of a parameter to an oscilloscope channel
Pos	Position of the zero line
U/Div	Numeric representation per horizontal division



Channel assignment arrow key

Click the down arrow to open the scroll menu. Click the requested channel on the list. The parameter is highlighted in blue and displayed on the screen.

Channel All values of the selection list can be displayed on the oscilloscope.
Click the arrow key to open the scroll menu.
The requested channel is selected and assigned to the respective channel no.
The channel is switched off at 'off'.
When a channel is not required, always switch it off!

Pos One horizontal division corresponds to a value of 100.
E.g.: a value of 50 shifts the zero line of the selected channel upwards by half a division.

U/div Unit for a horizontal division

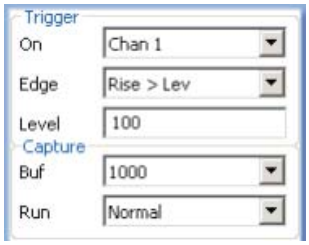
E.g.: U/Div = 32768 with N cmd ramp (Nmax parameter = 2000 rpm).
At 3000 rpm the numeric value (32768) of the speed command value corresponds to one horizontal division on the oscilloscope display.
For the cursor query one horizontal division corresponds to 100, thus, the cursor value of 100 corresponds to a speed of 3000.

Tick box The channel representation is switched on and off.
The screen image of a channel which is switched off remains in the background and is also saved.

Channel colours

Clicking the colour key 'C' opens a colour selection window. A new channel colour can be selected and saved via the 'enter' key.

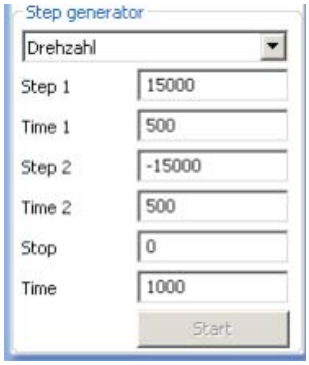
Trigger adjustment



Field	Function
On	Trigger channel selection
Edge	Trigger condition
Lev	Trigger threshold
Buf	Number of points recorded (all channels)
Run	Mode of operation (Normal, single, auto)

Option selection
Clicking the down arrow opens a drop-down menu from which an option can be selected. Click the requested channel. The parameter is highlighted in blue and displayed.

Step generator
The indicated time may vary for values < 2000 depending on the PC.



Start/Stop	Starts or stops the step generator function
Current	generates a current (I) command value
Torque	generate a torque command value
Speed	generate a speed command value
Position	generate a Position command value
Step1	Value 1 for current, speed, or distance
Time1	Time for Step 1
Step2	Value 2 for current, speed, or distance
Time2	Time for Step 2
Stop	Value for stationary condition, for current, speed, or distance
Time	Time for stationary condition

Step functions for test purposes are adjusted using the test generator. They optimise the control parameters for current(I), speed and position loops. The respective ramps are determined via the parameter adjustment for the current and speed controller.
When the enable (RUN) is active, the drive is started by clicking '**start**' and stopped by clicking '**stop**'.
The step functions can be applied to the current(I), torque, speed, or position command values.
At stationary condition the value for the 'stop' function for current, torque, and speed must be 0.
The 'stop' value may be used in exactly the same manner as step (1, 2).

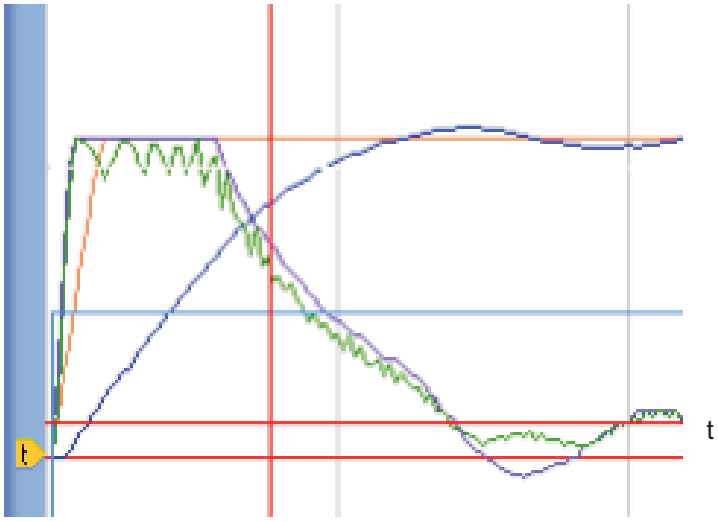
Warning: Max. values for Step1, Step2 and Stop

Current (I)	± 330
Torque	± 32767
Speed	± 32767
Position	± 2147483647
Time	32767

Important Warning
When the travel path of the axis is externally limited, it has to be ensured that the axis' travel distance for a test run must be within the admissible machine dimensions.
During a test run with a current (I) or torque command value being applied, the axis may run at max. speed.

Display of the measured values

To differentiate between signals, different colours can be assigned to each variable.



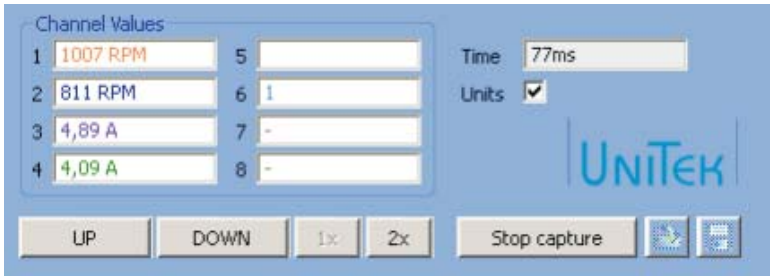
The trigger level is indicated by an arrow signal on the left side of the display. The cursor position is displayed as the intersection between a horizontal and vertical line.

In the field '**Channel values'** the measured values are displayed being the intersection points of the vertical cursor line and the channel record curves. The values can be displayed as numeric values or scaled unit values by clicking he box '**Units**' and ticking the respective box.

The field '**Time**' indicates the value in ms between the left side of the screen and the vertical cursor position.

Zoom

The data displayed on the oscilloscope screen can be enlarged or compressed by means of the keys **'1x' '2x'.**

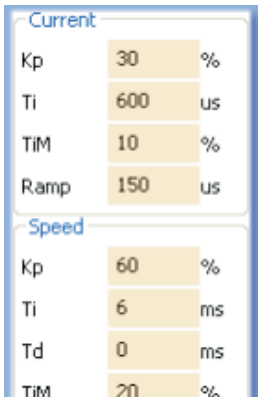


Saving and download function (*.uof)

Screen displays with associated adjustments can be saved with the disk symbol. Previously saved screens with their settings can be loaded using the file-open symbol.
Click the disk symbol to open a selection window. Enter the file name (*.uof) and save it. Click the file-open symbol to open a selection window. Select a file (*.uof) and load it.

UP/DOWN

The control parameters are gradually increased or reduced via the keys **up/down'.** The parameter values are immediately imported. Click the parameter ield and change the value by means of the 'up' or 'down' key.



Test

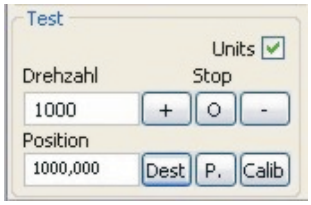
Direct numeric input and execution of the speed (at a digital command value) or position function.

Speed

Enter a speed value. Click **'+'** or **'–'** (direction) and the drive will immediately respond.
Click '**Stop'** and the command value is internally set to zero.

Position

Enter the required position value. Click '**Dest.'** and the drive immediately travels to the command position.
Click '**Calib**.' to initiate a reference travel.
Click '**P.'** to adopt the entered position as actual position value and position command value.



Warning!

These functions should only be used for a test run. These commands are carried out immediately!

Motor value inputs

Short symbol	Function	Adjustment range	Unit	Note	Address REGID
N nom	Rated motor speed	Type plate	UP		0x59
F nom					
U nom					
U phi					
I max	Max. motor current	Type plate	0.1 A		0x4d
I con	Continuous motor current	Type plate	0.1 A		0x4e
Motor Pole	No. of motor poles	2..48	num		0x4f
Brake Delay	Brake deceleration	0 to 1000	ms		0xf1
Dis delay					
Reso Pole	Encoder no. of poles	2..12	Num		0xa7
Offset	Resolver phase angle	0 .. 360	0.1 degree		0x44
Inc/Res	Encoder resolution	1024..8192	Pulses/rpm		0xa6
res					
Inc-ext					
Factor ext					
Factor out					
I-Motortemp	Current reduction, motor temperature	0...32676	Num		0xa2
Motortemp	Switch-off, motor temperature	0...32676	Num		0xa3

Motor options

Short symbol	Function		Address
			REGID 0xa4
Incr. (TTL)	Feedback incremental encoder TTL 5V	0	Bit 0..4
Resolver	Feedback resolver	1	
Incr. (sin)	Feedback incremental encoder Sin/Cos 1Vss	2	
BL-Tacho	Rotor position encoder with brushless tacho	3	
Rotor	Rotor position encoder (without tacho)	4	
DC-Tacho	DC tacho generator	5	
DC-Armature	Armature voltage (internal)	6	
sensorless	without sensor	7	
		8	
ignore		0	Bit 5..7
Incr.(TTL)	X8 as position input	1	
Incr.(TTL)	X8 display only	2	
EC (sinusoidal	Synchronous servo motor sinusoidal voltage	0	Bit 8..10
AC (induction)	Asynchronous motor	1	
DC	DC motor	2	
EC (trapezoidal)	Synchronous servo motor trapezoidal voltage	3	

Servo value inputs

Short symbol	Function	Adjustment range	Unit	Note	Address REGID
SNr.	Serial no.				
Axis	Axis designation				
Mains/ Batt	Power voltage				
U`volt	Undervoltage				
Regen-R	Ballast resistance				

Command values, actal values, correction error

Short symbol	Function	Adjustment range	Unit	Note	Address REGID
I cmd	Current command value (Result speed controller)	± 320	Num		0x26
I cmd ramp	Current command value after ramp	± 320	Num		0x
I actual	Current actual value	± 320	Num		0x20
N cmd	Speed command value	± 32767	Num		0x31
N cmd Ramp	Speed command value after ramp	± 32767	Num		0x32
N actual	Speed actual value	± 32767	Num		0x30
Pos cmd	Position command value	± 2147483647	Num		0x6e
Pos actual	Positions actual value	± 2147483647	Num		0x6d
I error	Correction error, current	± 700	Num		0x23
N error	Correction error, speed	± 32000	Num		0x33
Pos error	Correction error, position	± 32767	Num		0x70

Analog command value

Short symbol	Function	Adjustment range	Unit	Note	Address REGID
Offset IN1					
Cutoff IN1					
Scale IN1					
Offset IN2					
Cutoff IN2					
Scale IN2					

Comparison variable

Short symbol	Function	Adjustment range	Unit	Note	Address REGID
0	Logic signal zero	1/0	Logic		
1	Logic signal 1	1/0	Logic		
VAR1	Numeric value of the adjusted variable fields	± 32767			0xd1
VAR2					0xd2
VAR3					0xd3
VAR4					0xd4

CAN-BUS

Short symbol	Function	Adjustment range	Unit	Note	Address REGID
Rx ID	Receiving address		Dec.	Default 201	0x68
Tx ID	Sending address		Dec.	Default 181	0x69
BTR	Transfer rate	see table	Hex		0x73

Current controller parameters

Parameter	Function	Adjustment range	Unit	Step	Address REGID
KP	Proportional amplification	0 to 200	Num	1=0.1	0x1c
Ti	Integration time	300 bis 2000	µs	150	0x1d
TiM	Max. integration time memory	0 bis 100	%	1	0x2b
Ramp	I-command value ramp	450 to 2000	s	150	0x25
I 100%	Current sensor adjustment	416 to 900	mV	1	0xee
I device	Device type current	5 to 225	A	0,1	0xc6
I max	CPeak current limit	Up to 2xI device	A	0,1	0xc4
I con	Continuous current limit	0 to I device	A	0,1	0xc5
T peak	Over-current time	0 to 30	s	1	0xf0
I limit (dig)	Current threshold value	0 to 100	%	1	0x46

Speed controller parameter

Parameter	Function	Adjustment range	Unit	Step	Address REGID
KP	Proportional amplification	0 to 200	Num	1=0.1	0x2c
Ti	Integration time	5 to 100	ms	0.75	0x2d
Td	Rate time	1 to 10000	ms	0.75	0x2e
TiM	Max. rate time memory	0 to 100	%	1	0x3b
Acc-Ramp	n-command value ramp acceleration	10 to 30000	ms	0.75	0x35
Dec-Ramp	n-command value ramp deceleration	10 to 30000	ms	0.75	0xed
Limit-Ramp	n-command value ramp minimal	10 to 30000	ms	0.75	0xc7
N max	Max. speed	500 to 12000	rpm	1	0xc8
Dynam	Phase correction	0 to 90.0	degree	0,1	0xb2
Limit	Speed threshold value	0 to 100	%	1	0x34
0 cut	Target position window	0 to 3000	Num	1	0x50
Kacc	Acceleration amplification	0 to 100	%	1	0xa1
Filter	Filter speed actual value	0 to 63	Num	1	0x5e
Loop	Current-speed loop factor	3 to 10	Num	1	0x37

Position controller parameters

Reference travel

Parameter	Function	Adjustment range	Unit	Step	Address REGID
Speed to	Speed to the reference position	10 to 32000	Num	1	0x76
Speed from	Loop speed	10 to 2000	Num	1	0x77
Reso Edge					0x75

Position controller Pos->Speed

Parameter	Function	Adjustment range	Unit	Step	Address REGID
KP	Proportional amplification	0 to 200	Num	1=0.1	0x6a
Ti	Integration time	10 to 500	ms	0.75	0x6b
Td	Rate time	500 to 10000	ms	0.75	0x6c
TiM	Max. integration time memory	0 to 100	%	1	0x71
Tol window	Position window	0 to 2000	Num	1	0x79
Offset Pos	Zero position shift	0 ± 2147483647	Num	1	0x72

Position controller Pos->Current

Parameter	Function	Adjustment range	Unit	Step	Address REGID
KP	Proportional amplification	0 to 100	Num	1=0.1	0xc9
Ti	Integration time	10 to 500	ms	1	0xca
Td	Rate time	500 to 10000	µs	1	0xcb
TiM	Max. integration time memory	0 to 100	%	1	0xcd

Error BIT

Error	Description		Address
NOREPLY-No RS	RS232 interface not plugged-in or faulty		
			REGID 0x8f
BADPARAS	Parameter damaged	1	Bit 0
POWER fAULT	Output stage error temperature, overvoltage, short-circuit	2	Bit 1
RESERVE		4	Bit 2
CAN TIMEOUT	Transfer error CAN-Bus	8	Bit 3
RESOSIGNAL	Faulty resolver signal	16	Bit 4
POWERVOLTAGE	Power voltage supply missing	32	Bit 5
MOTORTEMP	Motor temperature to high	64	Bit 6
IDC	Current too high	128	Bit 7
I_123	Current out of tolerance	256	Bit 8
i_peak	Overcurrent 300%	512	Bit 9
RACEAWAY	Racing (without command value, wrong direction)	1024	Bit 10
CANINIT	CAN error (Hardware)	2048	Bit 11
SPIADCINIT	ADC error (Hardware)	4096	Bit 12
ROTOR	Faulty incremental encoder signal	8192	Bit 13
ADCTNT	Software error	16384	Bit 14
BALLAST	Ballast circuit overload	32768	Bit 15

Warnung BIT

Error	Descrption		Address
			REGID 0x8f
		1	Bit 0
		2	Bit 1
		4	Bit 2
		8	Bit 3
		16	Bit 4
		32	Bit 5
		64	Bit 6
		128	Bit 7
		256	Bit 8
		512	Bit 9
		1024	Bit 10
		2048	Bit 11
		4096	Bit 12
		8192	Bit 13
		16384	Bit 14
		32768	Bit 15

Measured values

Error	Description		Address
Tmotor	Active motor temperature		0x49
Tigbt	Active output stage temperature		0x4a
Tair	Current air temperature in the servo		0x4b
VdcBus	Bus voltage		0xeb
Irda	Active current limit		0x48

State BIT

State	Description	Address
		REGID 0x40
Ena	Enable drive (hardware enable)	Bit 0
NCR0	Speed command value = 0 (drive stopped)	Bit 1
Lim+	Output stage switch 'plus' assigned	Bit 2
Lim-	Output stage switch 'minus' assigned	Bit 3
OK	Drive correct (no uncontrolled reset)	Bit 4
Icns	Current limit reduced to continuous current	Bit 5
P-I	Positioncontrol, target range direct position/current controller	Bit 6
P-N	Position control	Bit 7
N-I	Speed control	Bit 8
<N0	Speed inferior to 0.1%	Bit 9
Rsw	Reference input selected	Bit 10
Cal0	Reference travel (Bit 11+Bit12 = Ref. loop travel)	Bit 11
Cal	Reference position determined	Bit 12
Tol	Position within the tolerance	Bit 13
Rdy	Ready (BTB,Rdy)	Bit 14
Brk	Brake active	Bit 15

Mode BIT

Short symbol	Description	Address
		REGID 0x51
Reserve		Bit 0
SPEED = 0	Drive stop Speed command value = 0	Bit 1
ENABLE OFF	Drive disabled, enable internally switched off	Bit 2
CANCEL CAL-CYCLE	Reference travel stopped	Bit 3
d(status)->CAN		Bit 4
I-LIMIT-DIGI	Current limit in % of the type current active	Bit 5
N-clip	Speed limiting (positive and negative)	Bit 6

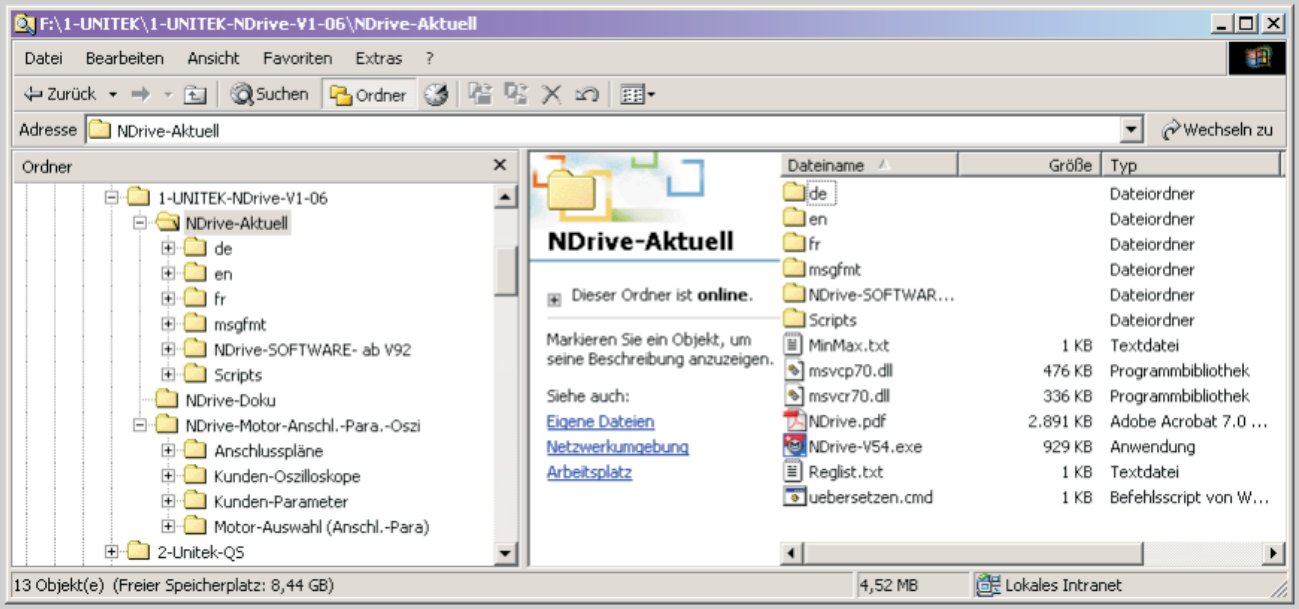
Logic BIT

Short symbols	Description	Address
		REGID 0xD8
Limit 1	Digital input limit 1 active	Bit 0
Limit 2	Digital input limit 2 active	Bit 1
Din 2	Digital input Din 2 active	Bit 2
Din 1	Digital input Din 1 active	Bit 3
FRG (RUN)	Hardware enable active	Bit 4
		Bit 5
		Bit 6
		Bit 7
Dout 1	Digital output Dout 1 active	Bit 8
Dout 2	Digital output Dout 2 active	Bit 9
BTB (Rdy)	Hardware relais output BTB-Rdy active	Bit 10
GO	Internal enable GO active	Bit 11
Dout 3	Digital output Dout 3 active	Bit 12
Dout 4	Digital output Dout 4 active	Bit 13
		Bit 14
		Bit 15

Option BIT

Short symbol	Description	Address
		REGID 0x5a
Regen.resistor	Ballast energy watchdog external ballast resistance 0 = internal ballast resistance 1= 300W, 2= 600W, 3= 1200W	Bit 0
Regen.resistor		Bit 1
		Bit 2
		Bit 3
Invert I-actual	Current actual value polarity reversed (default setting active for DS450, BAMO-D3)	Bit 4
On ref. force Dec. ramp	Reverse ramp during reference travel set from ‘limit’ to ‘Dec’.	Bit 5
excl. u`voltage if RUN off	BTB signal also in case of undervoltage	Bit 6
Analog u`voltage monitor	Analog undervoltage watchdog (default setting active for DS450, BAMO D3)	Bit 7
		Bit 8
		Bit 9
		Bit 10
		Bit 11
		Bit 12
		Bit 13
		Bit 14
		Bit 15

UNITEK-Ndrive-V1-06



UNITEK-NDrive-V1-06	UNITEK user softwarefor digital servo and motor drives		**de**	Language module ‘German’
NDrive-Aktuell	Folder with the current interface (NDrive.exe) and the current firmware (NDrive-Software)		**en**	Language module ‘English’
NDrive-Doku	Documentation with all digital servo and motor drives		**fr**	Language module ‘French’
NDrive-Motor-Anschl.-Para.Oszi	**Folder** with sub-directories **Connection diagrams** (for the motor connection diagrams) **Customer oscilloscope** (customer specific oscilloscope records) **Customer parameters** (customer specific parameter records) **Motor selection** (motor specific information, parameter records, diagrams, oscillograms		**msgfmt**	
			NDrive-Software	Current firmware (reg1.out). Download with UPDATE_x.bat
			Scripts	Scriptfile for default settings
			MinMax.txt	Text file for limiting the inputs values
			msvcp70.dll	
			msvcr70.dll	
			NDrive.pdf	Manual for the PC user software, opened by means of a "help" manual
			NDrive-V54.exe	PC user software
			Reglist.txt	Text file for the selection of therequested registers
			uebersetzen.cmd	Translation program for the language modules