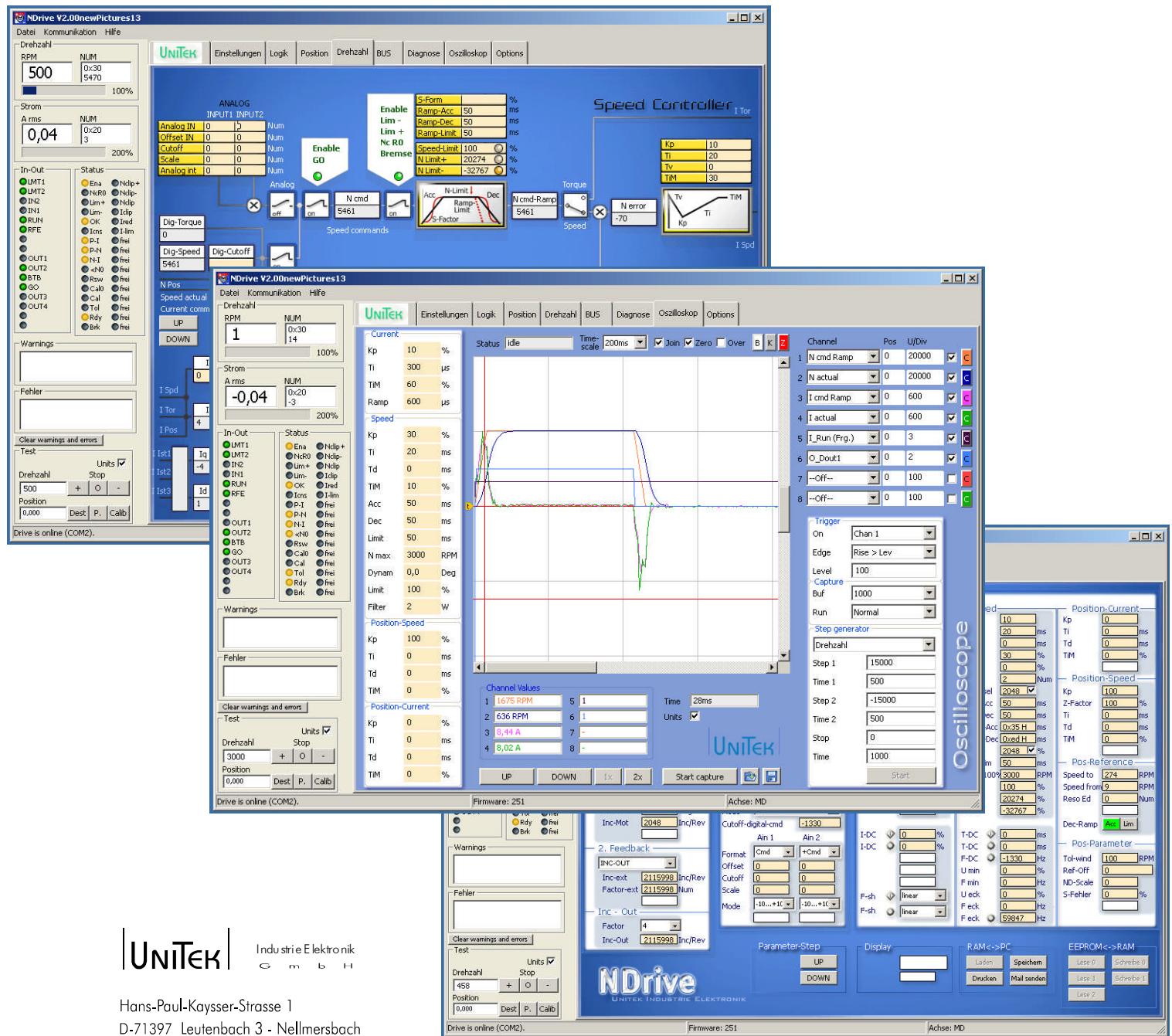


Software-Manual

PC-Manual-Software

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



UNITEK

Industrie Elektronik

Hans-Paul-Kayser-Straße 1
 D-71397 Leutensbach 3 - Nellmersbach

Tel.: 07195/9283 0
 Fax: 07195/928329
 email: info@unitek-online.de
 Http:// www.unitek-online.de

Preliminary version E-0808-2-V8-adv

Contents Software Manual

| | Page |
|------------------------------|-------------|
| General information | 4 |
| Safety advice | 4 |
| Operating system | 5 |
| Software installation | 5 |
| Communication | 5 |
| Screen overview | 6 |
| Screen start | 7 |
| Operation | 8 |
| Input | 8 |
| Options | 8 |
| Help | 9 |
| Data saving | 10 |
| Interface | 11 |
| Saved files | 11 |
| Language | 11 |
| Measured values | 12 |
| Measured data conversion | 13 |
| Errors | 14 |
| Warnings | 15 |
| Operating states | 16, 17 |
| Error states | 18 |
| Inputs, outputs | 19 |
| Enable input | 20 |
| Safety | 21 |
| Settings | 23 |
| Motor adjustment | 24, 25 |
| Encoder adjustment | 26, 27 |
| Brake adjustment | 28 |
| Motor temperature adjustment | 30, 31 |
| Servo adjustments | 32-34 |
| Command value adjustment | 36-39 |
| BTB/RDY adjustment | 40 |
| CAN-BUS adjustment | 41 |
| RS232 | 41 |

Software Manual

| Software Manual | Page |
|----------------------------------|-------------|
| Current controller parameters | 42, 43 |
| Current reduction | 44 |
| Current limit | 45 |
| Current controller - speed | 46 |
| Current controller adjustments | 47, 48 |
| Speed controller adjustments | 50, 51 |
| Frequency transformer | 52 |
| Speed controller parameters | 54, 55 |
| Speed controller adjustments | 56 |
| Position controller parameters | 58-64 |
| Position controller optimization | 65 |
| Position controller scale | 66 |
| Logic | 67 |
| Digital logic inputs | 68 |
| Digital logic outputs | 69 |
| Logical links | 70, 71 |
| Diagnosis | 72-75 |
| Monitor | 76, 77 |
| Options | 78-81 |
| Automatic functions | 82-85 |
| Oscilloscope | 86-89 |
| Oscilloscope adjustment | 87, 88 |
| Channel assignment | 87 |
| Parameters | 90-96 |
| Folder | 97 |

Annex:

- Service pack1: Access to protected parameters
- Software update
- Manual read/write
- List of parameters

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 Manual

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 (*NDrive-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.

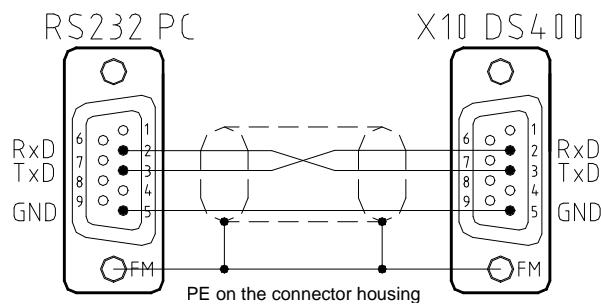
115200 baud rate.

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).



NDrive .2

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.

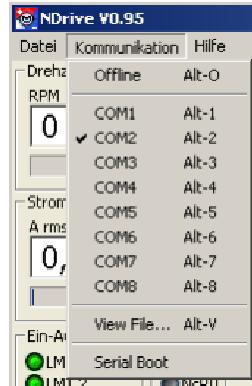
Software Manual

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



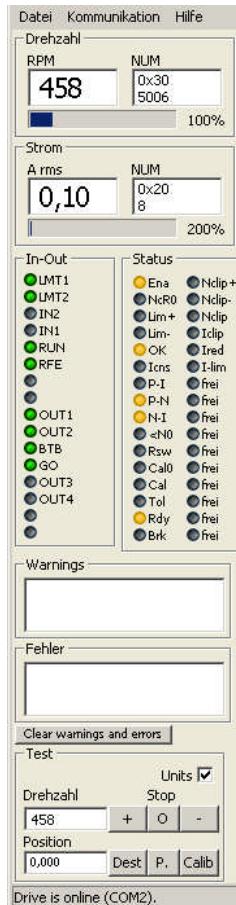
- Help
- Manual (pdf)
- About UniTek
- Select language

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 |
| 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 |

Inputs

Bottom frame



NDrive .2

Operation:

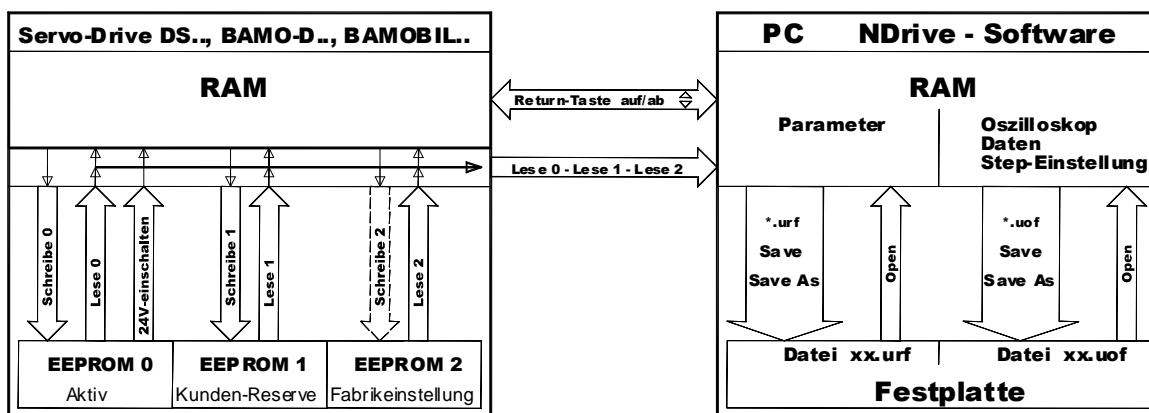
The PC user interface is a standard WINDOWS - format.
Only use whole numbers or write decimals with a point.
Write positive values without a sign, negative values with a - sign.

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 \div communication \div 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 \div file \div save register. The original file may be overwritten or a new file created.

Online Operation

Plug the connecting cable RS232. Switch on the PC and the control unit. Select the baud rate of 115200. Select the communication interface with \div communication \div 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 \div enter. They are now the active drive parameters



N max **3000** RPM



Input

Click the input field (left mouse button), enter a numerical value and click \rightarrow 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.

Software Manual

On screen Help

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



Help Menu

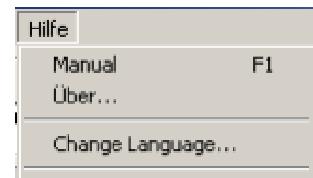
By selecting the → *help* option on the top menu bar, and then selecting → *manual*, a pdf version of the NDrive manual is downloaded. Clicking the topic in the bookmarklet opens the requested page



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.



NDrive .2

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 → *save 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 |
| Drucken | = Print |
| Speichern | = Save |

Software Manual

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.

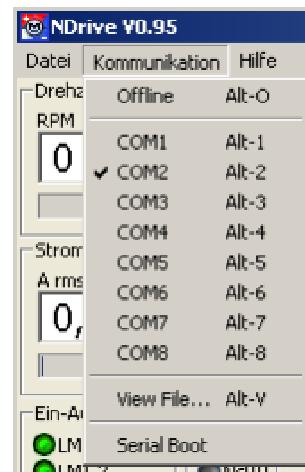
The checked interface is selected and the connection to the control unit (servo) is established.

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 → *view 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'

NDrive .2

Measured values

| Watch variables | Function | Range | ID-address |
|-------------------|---|--------------|------------|
| Selected value | | | |
| OFF | no measured value | | REGID |
| Ncmd | Speed command value before Ramp | ± 32767 | 0x31 |
| Ncmd Ramp | Speed command value after Ramp | ± 32767 | 0x32 |
| Nactual | Speed actual value | ± 32767 | 0x30 |
| Icmd Ramp | Current Command value after Ramp | s.Tabelle | 0x26 |
| Iactual | 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 |
| Nerror | Speed command-Actual error | s.Tabelle | 0x33 |
| Pos error | Position command actual error | ±32767 | 0x70 |
| Ierror | 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 | | | |

Software Manual

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 ± 9 Bit | mV | Nu m | 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 ± 31 bit | Max. value ± 15 bit | 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.

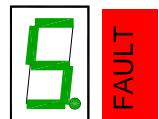
The error messages are displayed in the window 'Error'.

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 |
| POWERVOLTA GE | 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'

Software Manual

Warnings

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

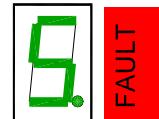
Warning messages

| 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 |
| | | |
| | | |
| | | |

NDrive .2

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 I _{cns} Motor current at max. current limit I _{max} Normal operation; Motor current within the current limits | I _{cns} = 1 I _{cns} = 0 I _{cns} = 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 |

Software Manual

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 |

| Status | |
|--------|--------|
| Ena | Nclip+ |
| NcRO | Nclip- |
| Lim+ | Nclip |
| Lim- | Iclip |
| OK | Ired |
| Icns | I-lim |
| P-I | frei |
| P-N | frei |
| N-I | frei |
| <N0 | frei |
| Rsw | frei |
| Cal0 | frei |
| Cal | frei |
| Tol | frei |
| Rdy | frei |
| Brk | frei |

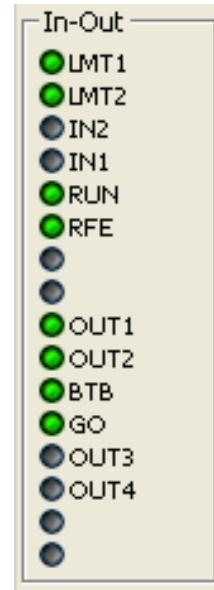
frei = free

Software Manual

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 | |
| | | |



NDrive .2

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 function 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.

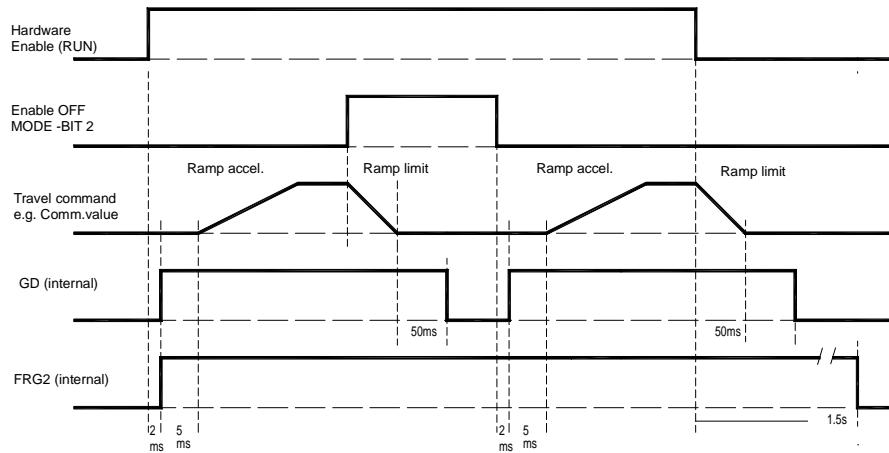
When the enable function is switched off, the internal speed command value **N cmd Ramp** is reduced to zero by means of the **ramp limit** which has been adjusted in the parameter field **speed**. The power section is disabled by means of the internal command **GO** 50ms after the axis has come to a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

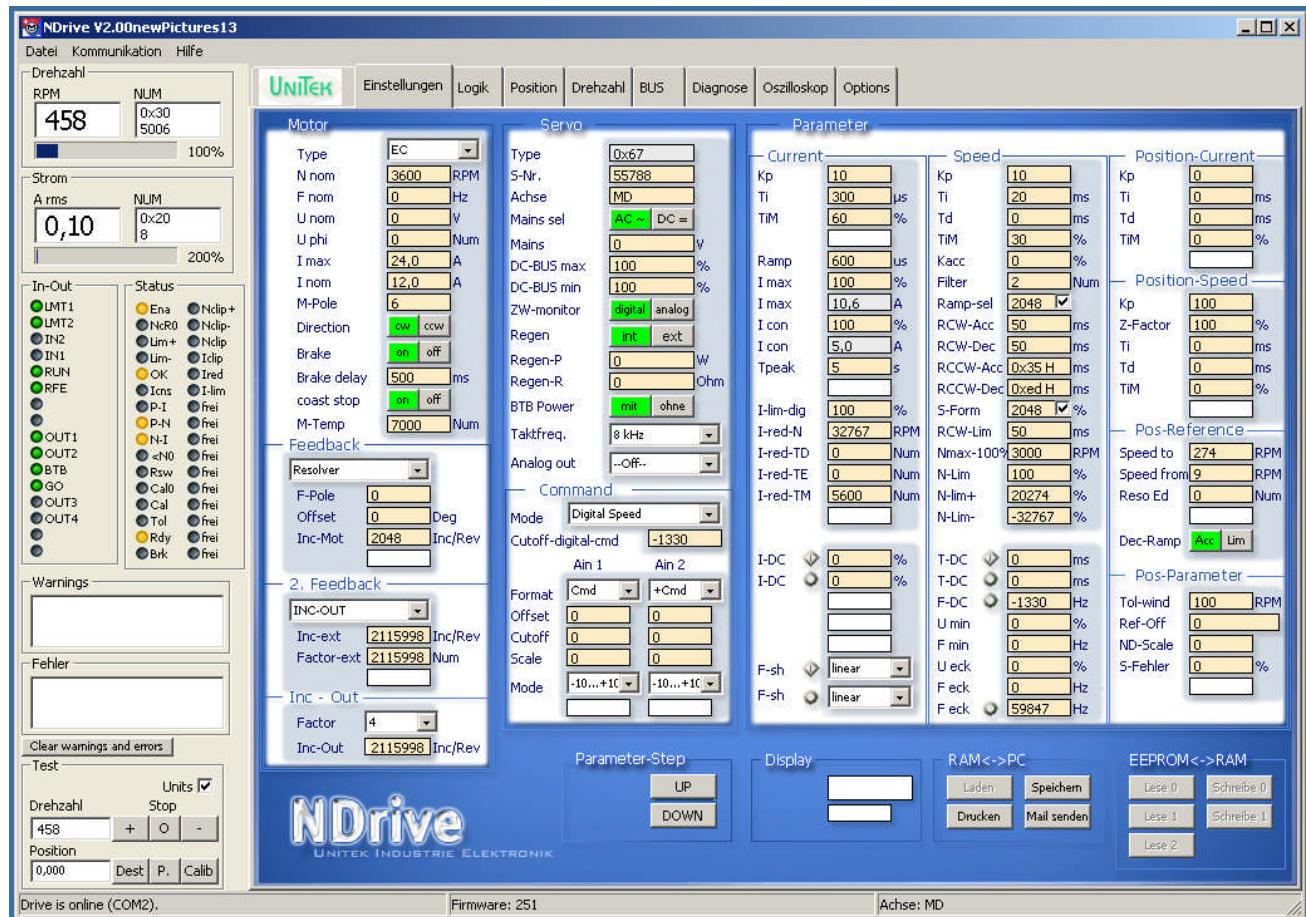
No hardware disable after 1.5s.

NDrive .2

Software Manual

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.



NDrive .2

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 | % | | 0x0e |
| 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 | Switching point motor temperature | | Nu8m | | 0xa3 |
| | | | | | |
| Feedback | Select feedback type | | | | |
| Feedback2 | Select feedback type | | | | |

Motor type selection

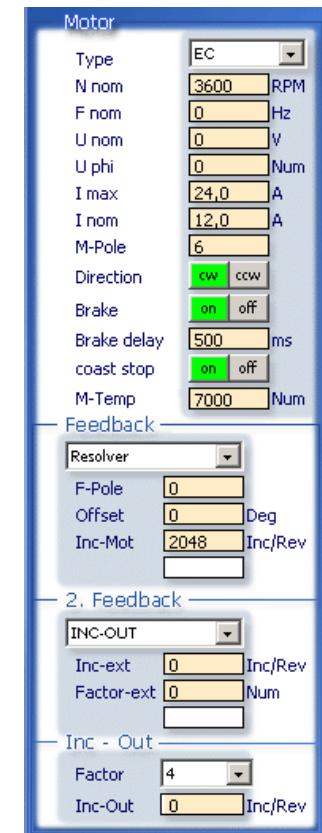
| Motor type | Selection 0x5a | Feedback selection 0xa4 | Fixed settings | Notes |
|-------------------|-----------------------|---|---|--|
| EC sinus | 00xx | Incremental TTL xx00 Resolver xx10 Incremental sin/cos xx20 Sensorlos xx70 | | |
| EC trapez | 10xx | BL-Tacho+Rotor xx30 Rotor xx40 | | |
| AC | 20xx | Inkremental TTL xx00 Resolver xx10 Inkremental sin/cos xx20 Sensorlos xx70 | | |
| DC | 30xx | DC-Tacho xx50 DC-Ankerspannung xx60 | 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 |

Software Manual

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)
- N_{nom}** Motor speed (of the motor typeplate)
The equivalent **N_{max}** parameter value of the **speed** parameter field can be up to 20% superior to the value entered.
- F_{nom}** Frequency at which the rated motor speed is achieved.
Only with frequency conversion mode
- U_{nom}** Voltage for the rated motor speed
Only with frequency conversion mode.
- U_{phi}** Motor power factor (type plate)
Only with frequency conversion mode
- I_{max}** Maximum permitted motor current (I)
(of the motor typeplate)
- I_{nom}** 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

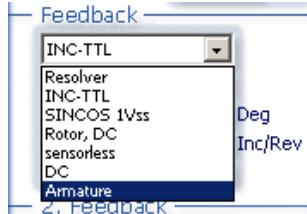
- M-temp** Switching point for the motor over-temperature
The drive is switched off. Error message Bit6
- Feedback** Select the feedback system
(TTL incremental encoder, resolver, SIN/COS, DC tacho, etc.)
- 2.Feedback** Select 2nd feedback as input or output for counter increments

The parameters **I_{max}** and **I_{nom}** are also entered in the parameter field **Current**.
The low value is used as threshold value.

NDrive .2

Encoder adjustment

Adjustment Feedback



**Resolver
F-Pole
Offset**

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

**INC-TTL
Offset
Inc-Mot
Note:**

Incremental encoder with rotor positiontracks
Correction value for the mechanical encoder adjustment.
Impulses per revolution
The encoder rotor position must have the same number of poles as the motor.

**SINCOS-Vss
Offset**

1Vss-Incremental encoder commutation track
Correction value for the mechanical encoder adjustment

**Rotor, DC
Offset**

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

**Without
sensor**

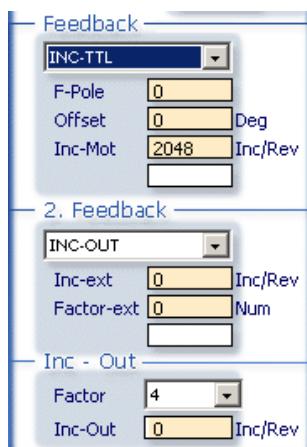
EC/AC motor without feedback encoder
no adjustment

**DC
Offset**

DC motor with tacho
 $120 = M1-M3 \quad (0= M2-M3, -120= M1-M2)$

**Armature
Offset**

DC motor without tacho
 $120 = M1-M3 \quad (0= M2-M3, -120= M1-M2)$



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 ... $\pm 360^\circ$ | 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

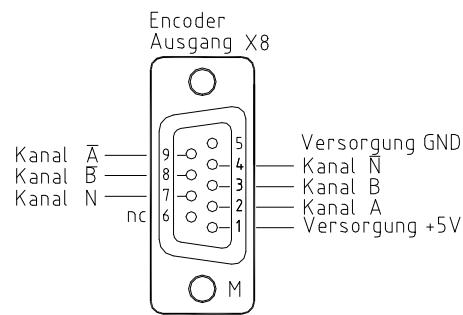


Software Manual

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:

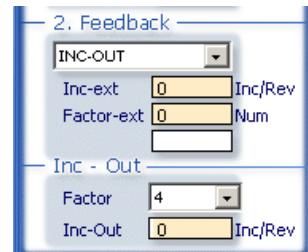
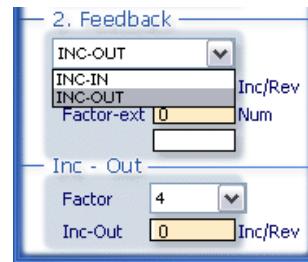
1 Motor revolution corresponds to 0.1 encoder revolutions

No. of encoder pulses 1000/rpm

Pulses per motor revolution $0.1 \times 1000 \times 4 = 400$

Input at encoder_2_Scale = $65536 / 400 = 163,840$

Input factor-ext. (0x7e) = $163,840 \times 16384 = 2684354$



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 $+5V \pm 0.2V$

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 | |

NDrive .2

Brake adjustment

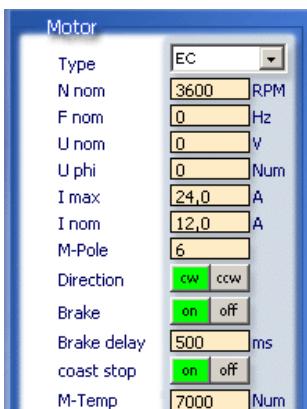
The max. braking power of the motor is applied when the power has been switched off.

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).

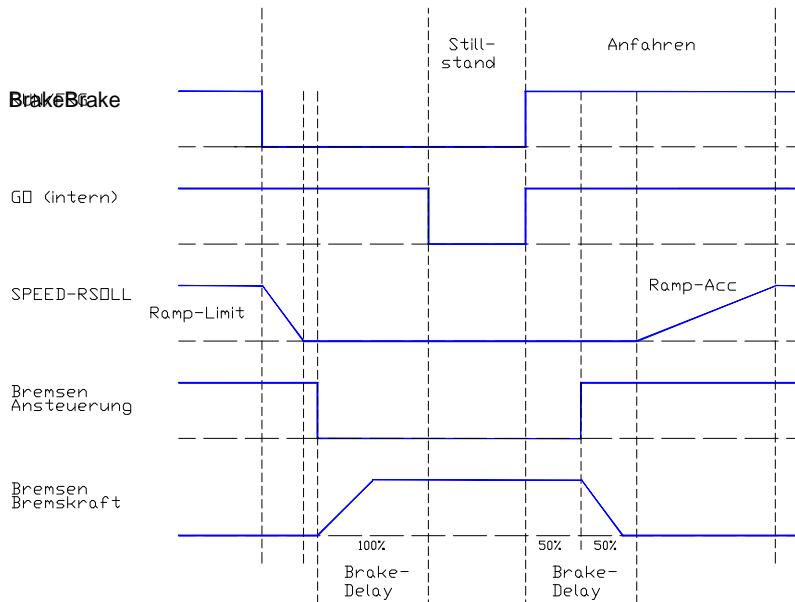


Enter the switch-off delay of the motor brake in the parameter field → **brake delay** (0 to 500ms) of the input field → **motor**.

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. |

| OUTPUT | |
|--------|-------------------|
| Dout1 | I actual > Vari 1 |
| Dout2 | O_Brake = 0 |
| Dout3 | --Off-- Off 0 |
| Dout4 | --Off-- Off 0 |



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..**.

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.

Software Manual

Adjustment

NDrive .2**Motor temperature watchdog**

Parameter motor temperature current reduction
Warning I-MOTORTEMP

0xa2 (only with linear temperature sensors)
Presetting 0xa2 = 5600

Parameter motor temperature error - switch-off
Error message 6 (MOTORTEMP)

0xa3
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

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

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

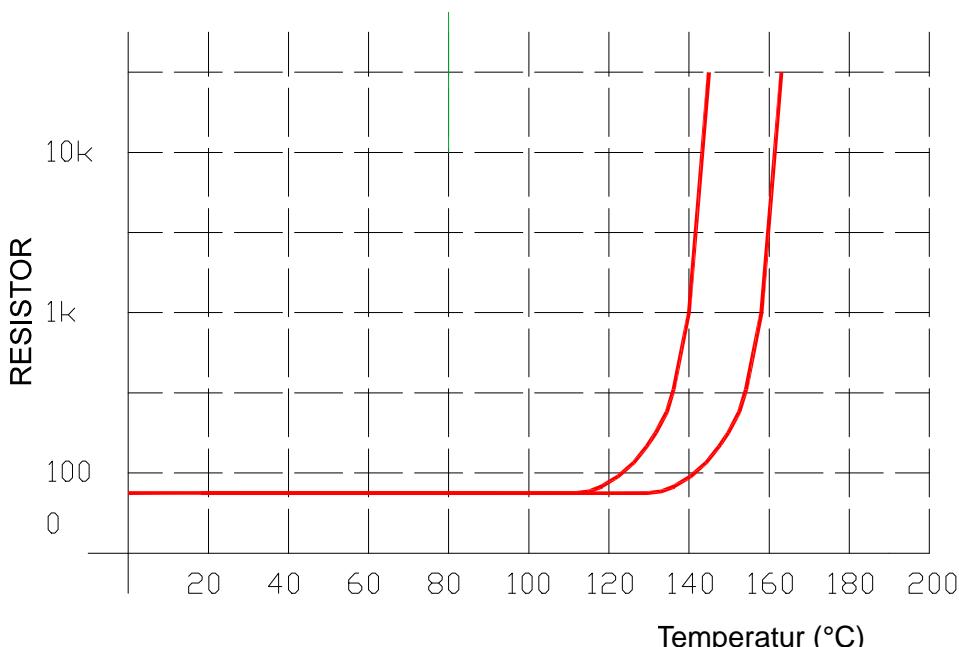
Value for 0xa3 = TSP145/2 + TSP25

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

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

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

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



Software Manual

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

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

Switching point for the temperature error switch-off 0xa3

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

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

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

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

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

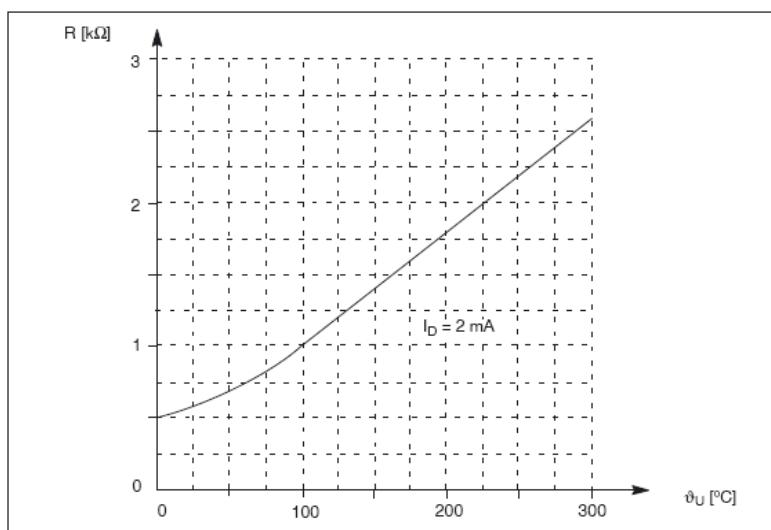


fig. 3-1: Resistance values of KTY 84 against temperature

| 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 |

NDrive .2

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

Servo

| | |
|--------------------|---------------------|
| Type | 0x67 |
| S-Nr. | 55788 |
| Achse | MD |
| Mains sel | AC ~ DC = |
| Mains | 0 V |
| DC-BUS max | 100 % |
| DC-BUS min | 100 % |
| ZW-monitor | digital analog |
| Regen | int ext |
| Regen-P | 0 W |
| Regen-R | 0 Ohm |
| BTB Power | mit ohne |
| Taktfreq. | 8 kHz |
| Analog out | ...Off... |
| <hr/> | |
| Command | |
| Mode | Digital Speed |
| Cutoff-digital-cmd | -1330 |
| Ain 1 | Ain 2 |
| Format | Cmd +Cmd |
| Offset | 0 0 |
| Cutoff | 0 0 |
| Scale | 0 0 |
| Mode | -10...+10 -10...+10 |

- 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

Software Manual

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

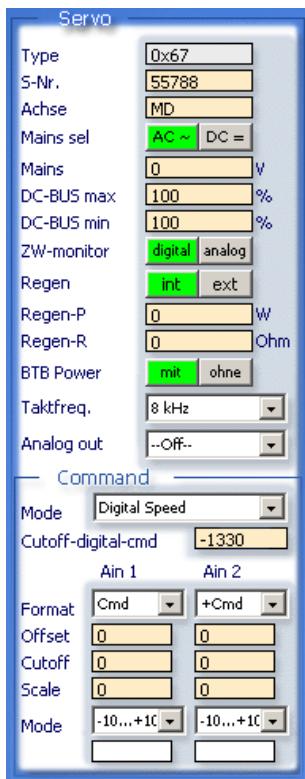
Measured voltage (at 40V battery voltage) = $5/75 * 40 = 2,66$ V

Numerical value for 0xa5 = $1024/5 * 2,66 = 544,7$

0xa5 adjusted to 545

NDrive .2

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

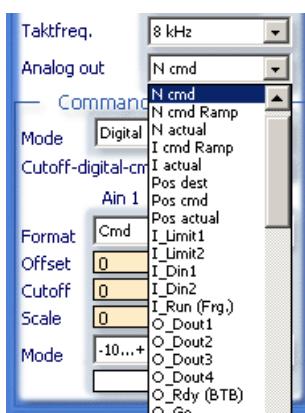
Selection of the pulse frequency = calculation cycle
Values: 8, 12, 16, 20, 24 kHz
The current limits are reduced from 16 kHz on!

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 $\pm 10V$ corresponds to $\pm 100\%$ of the selected signal.
Selected digital signals provide 0 or +10V.

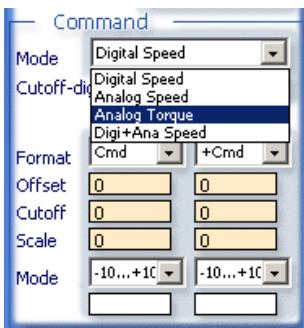


Software Manual

Adjustment

NDrive .2

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 torque command value, voltage ±10V Across the analog inputs AIN1 and AIN2 |
| Digi+Ana speed | 0x90 |

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

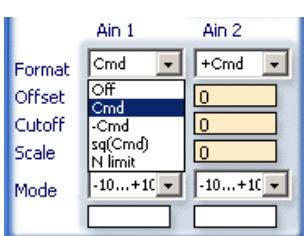
The unipolar command value is reversed by means of the direction command (**N cmd Reverse**) via the programmed digital input. The input must be adjusted to **N cmd Reverse** in the parameter field 'input/output'.

Standstill with an analog command value for the speed and torque

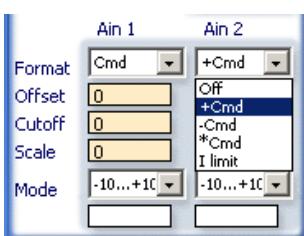
Activate *Speed Ramp 0* via a digital input or send it via the CAN BUS.

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 | Switched 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) |

Software Manual

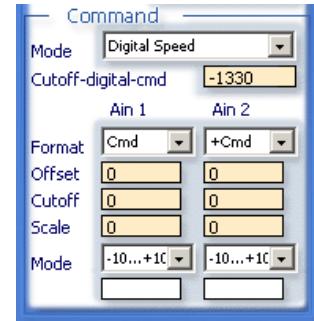
Analog inputs

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 **Ocut**.
(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 **Ocut** should be very low or zero.

Scale

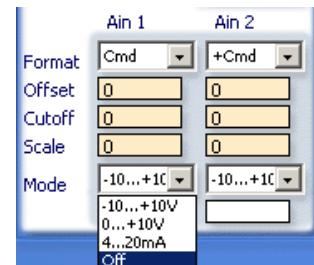
Multiplication factor for the analog input signals

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'.

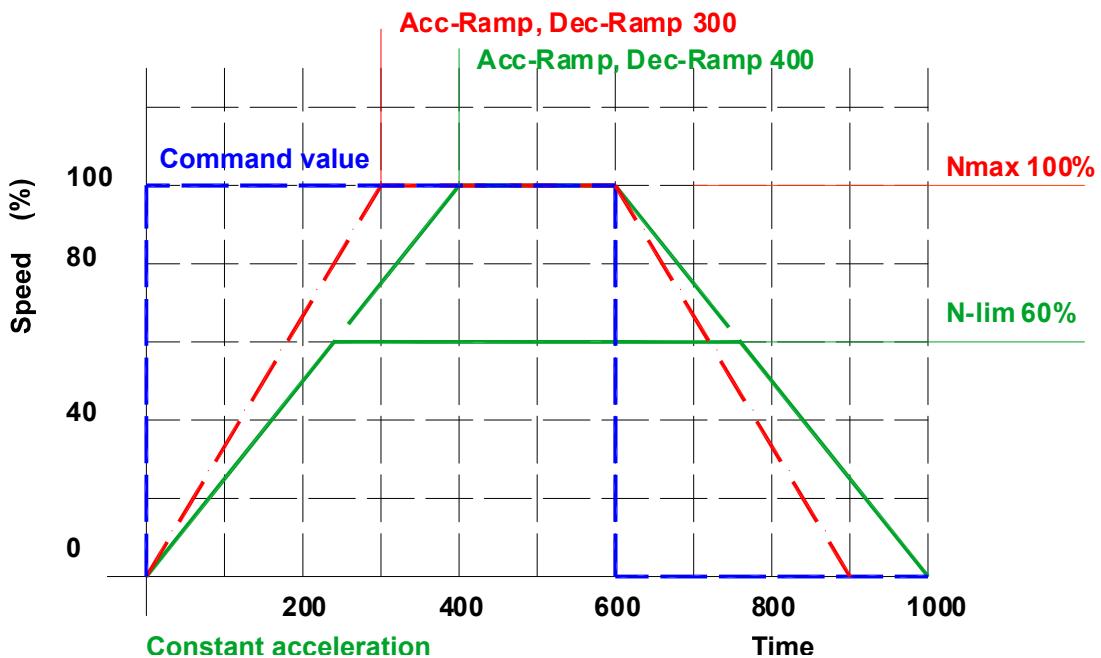
NDrive .2

Einstellung-Sollwert Funktionen

Adjustment - command value functions

| Speed | |
|-----------|--|
| Kp | 10 |
| Ti | 20 ms |
| Td | 0 ms |
| TiM | 30 % |
| Kacc | 0 % |
| Filter | 2 Num |
| Ramp-sel | 2048 <input checked="" type="checkbox"/> |
| RCW-Acc | 50 ms |
| RCW-Dec | 50 ms |
| RCCW-Acc | 0x35 H ms |
| RCCW-Dec | 0xed H ms |
| S-Form | 2048 <input checked="" type="checkbox"/> % |
| RCW-Lim | 50 ms |
| Nmax-100% | 3000 RPM |
| N-Lim | 100 % |
| N-lim+ | 20274 % |
| N-Lim- | -32767 % |

- 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

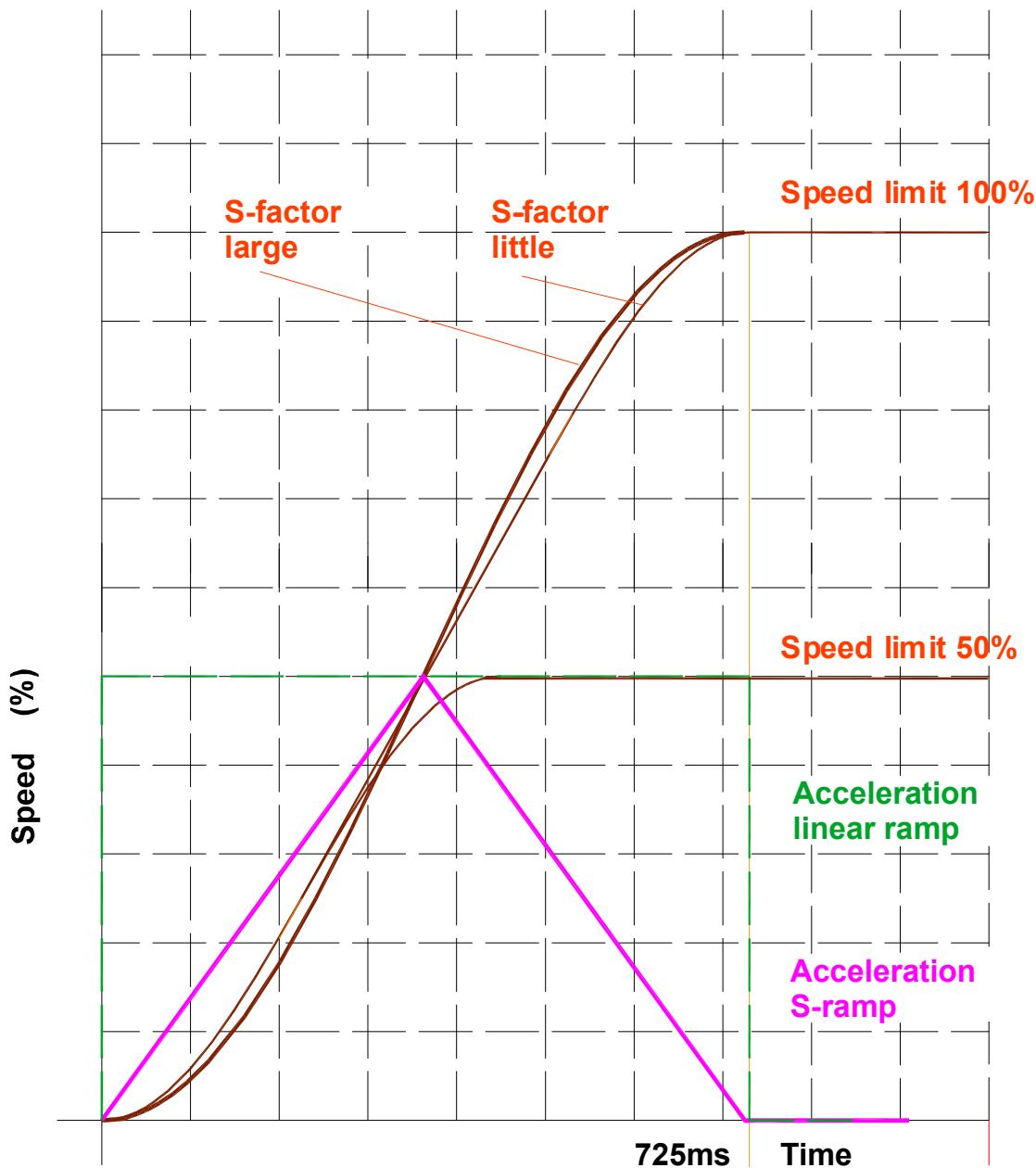
Time input for 100% command value.

Constant acceleration.

Current peaks and acceleration and deceleration peaks are reduced.

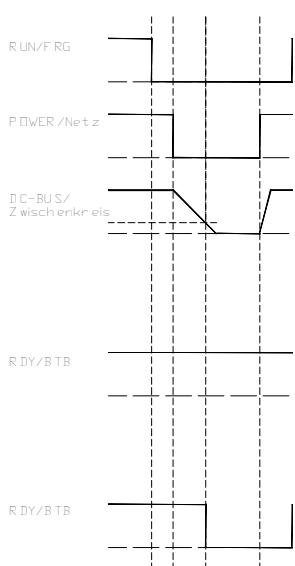
Software Manual

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

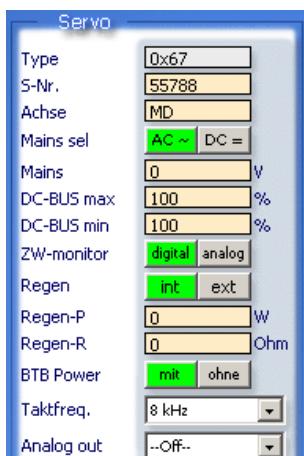
BTB and the power supply voltage

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.

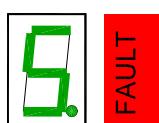
When the enable and the power supply voltage are switched off, **the message RUN/BTB remains active**.



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 (0xE3) = 0)

On the servo:

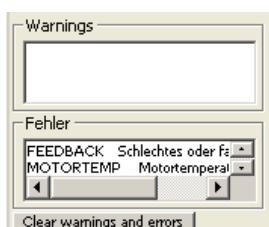
The red LED '**fault**' (0x8f Bit 1) lights.

On the PC:

The error states are displayed in the field '**fault**'

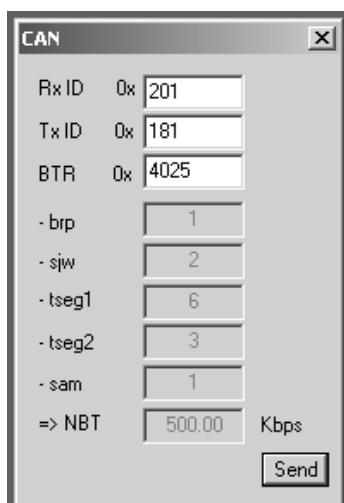
The error messages are reset:

- 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)



Software Manual

Detail in the CAN-BUS mANUAL

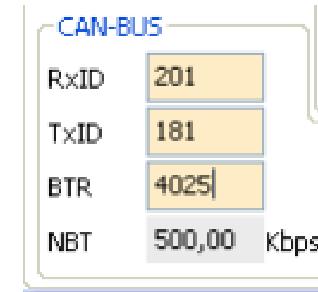


Input Fields:

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

Information:

-Brd
 -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 | |

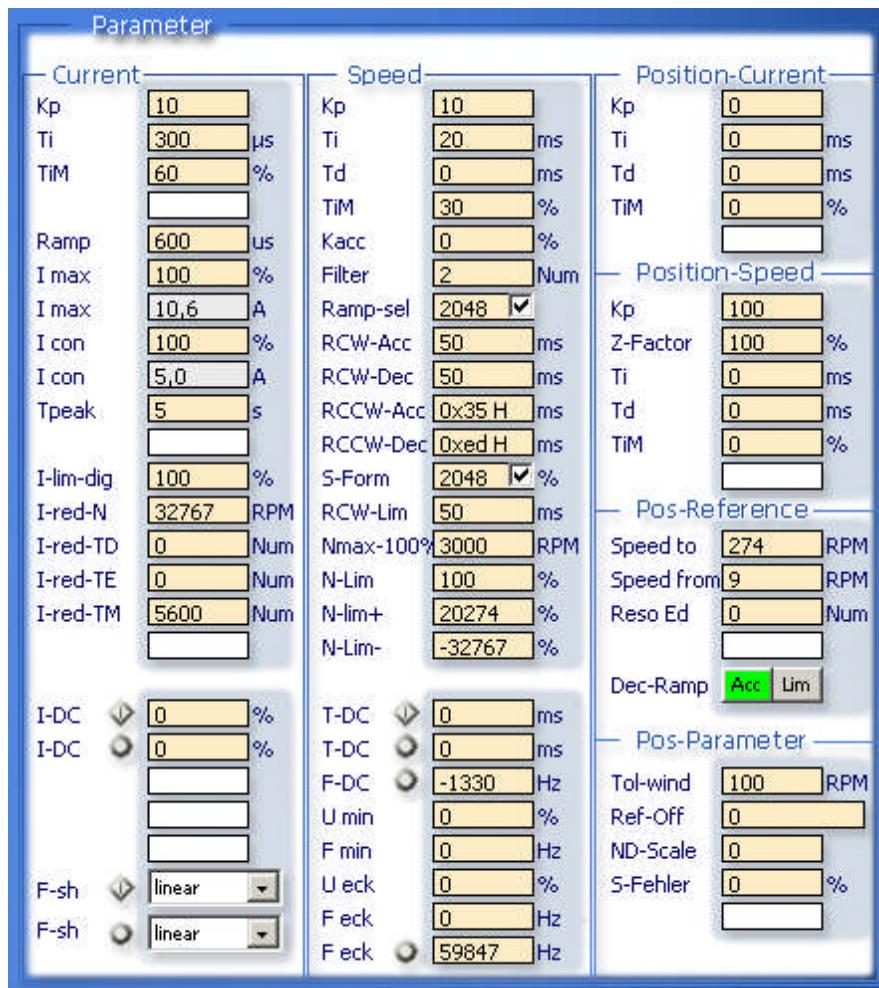
| RS 232 16 bit | | | | | | | Response from the drive to the PC | | |
|----------------------------------|--------------|-------------|-------------|-------------|-------------|-------|-----------------------------------|--------|--|
| Sending from the PC to the drive | | | | | | | Byte1 | Byte2 | |
| Char1 | Char2 | Char3 | Char4 | Char5 | Char6 | Char7 | Data | Data | |
| RegID | RegID | Data | Data | Data | Data | Sync | | | |
| Bits 07..04 | Bit s 03..00 | Bits 15..12 | Bits 11..08 | Bits 07..04 | Bits 03..00 | "X" | | | |
| ascii | ascii | ascii | ascii | ascii | ascii | ascii | | | |
| | | | | | | | binary | binary | |

| RS 232 32 bit | | | | | | | | | | | Response from the drive to the PC | | | | |
|----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------|-----------------------------------|-------|-------|-------|------|
| Sending from the PC to the drive | | | | | | | | | | | Byte1 | Byte2 | Byte3 | Byte4 | |
| Char1 | Char2 | Char3 | Char4 | Char5 | Char6 | Char7 | Char8 | Char9 | Char10 | Char11 | Sync | Data | Data | Data | Data |
| RegID | RegID | Data | Sync | | | | | |
| 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" | | | | | |
| ascii | ascii | ascii | ascii | ascii | ascii | ascii | ascii | ascii | ascii | ascii | | | | | |

| Example 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" | | | | |
| 3 | D | 0 | 0 | 3 | 0 | X | | | | |
| regid read (0x3D) | Actual speed Actual speed value (0x30) | | | | ascii | | | | | |
| | | | | | | | Value off 0x30 | | | |

NDrive .2

Current controller parameter



Setting 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 | μ s | 150 | 0x1d |
| TIM | max. integration time memory | 0 to 100 | 50 | % | 1 | 0x2b |
| Ramp | I command value ramp | 0 bis 10000 | 600 | μ s | 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 threshold value | 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 | | | | | | |

Software Manual

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 |
| 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 is.

I_{max} Input for the peak current in %

Max. dc disable current

100% = 2 * I_{device} in Apk

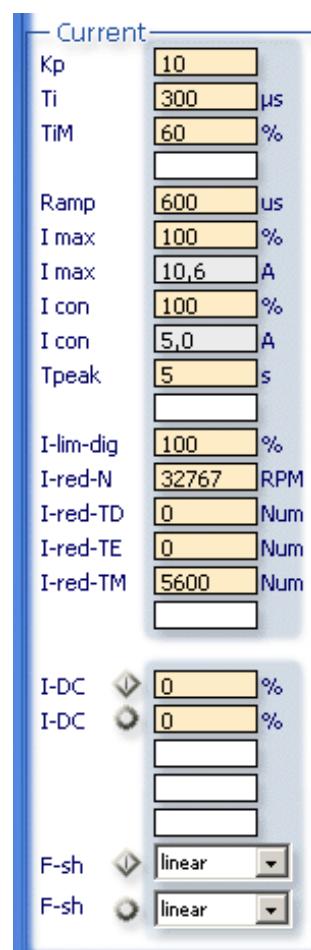
displayed in Apk in the field below

I_{con} 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 |

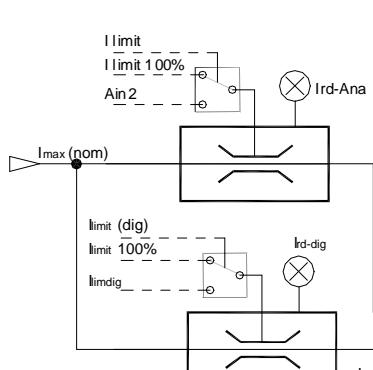
Current reduction parameters

- 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.



Software Manual

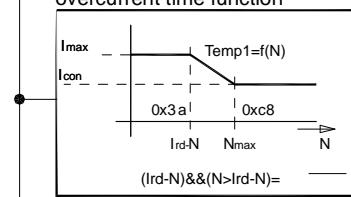
Adjustment of the current limit



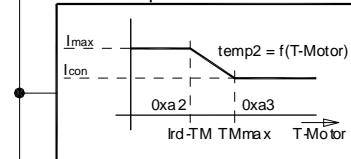
| | | | | |
|--------------|------|------------------------------|------------------------|---------------------------|
| Ilimit | Ain2 | Adjustment current limit | I _{max} (nom) | 100% peak current |
| Ilimit (dig) | | Analog input 2 | I _{max} (nom) | Adjusted I _{max} |
| fact | | Adjustmen current limit dig. | I _{con} (nom) | 100% continuous current |
| a2Hz | | Rotational frequency | I _{con} | Adjusted I _{con} |
| | | Rotational frequency > 2Hz | I _{temp} | Temporary variables |
| | | | linuse | Current limit actual |
| | | | Acculimit | Overshoot memory |

Current limit reduction as overcurrent time function

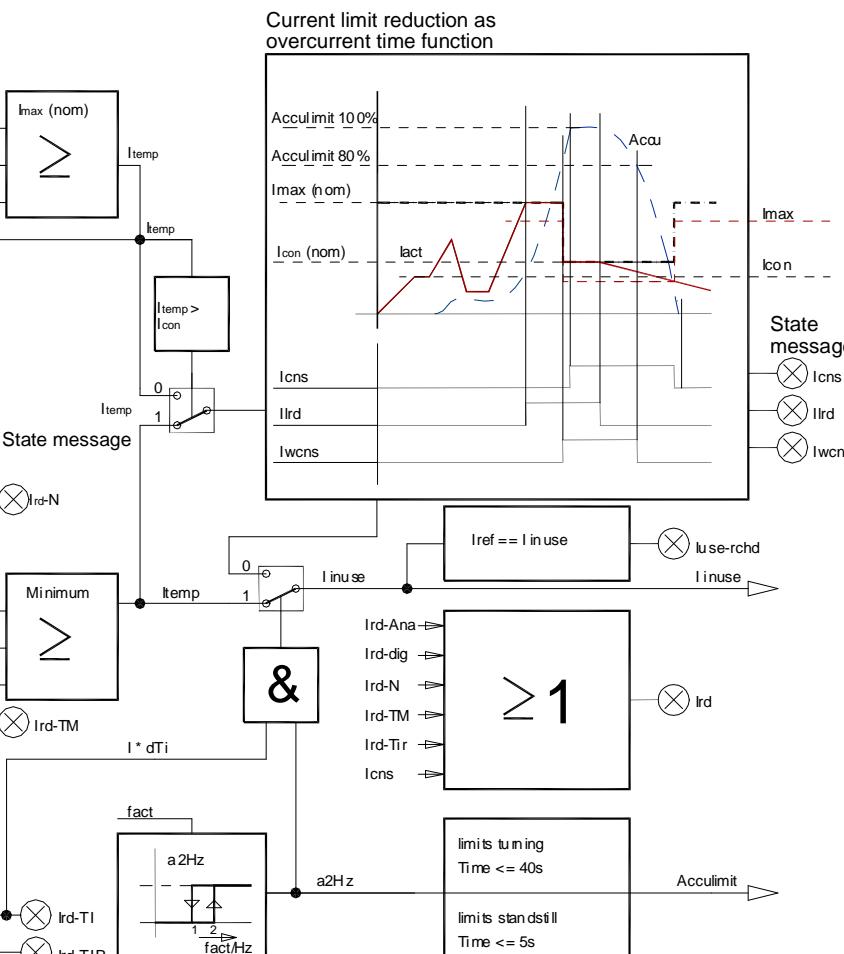
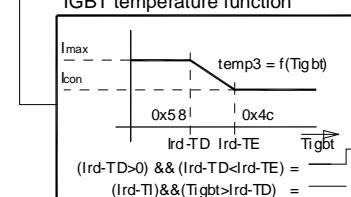
Current limit reduction as overcurrent time function



Motor temperature function



IGBT temperature function



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 |
| Iwcn | The overcurrent time memory (I^*t) is > 80% full |
| Ird | Summary alarm message 'current limit reduced' |

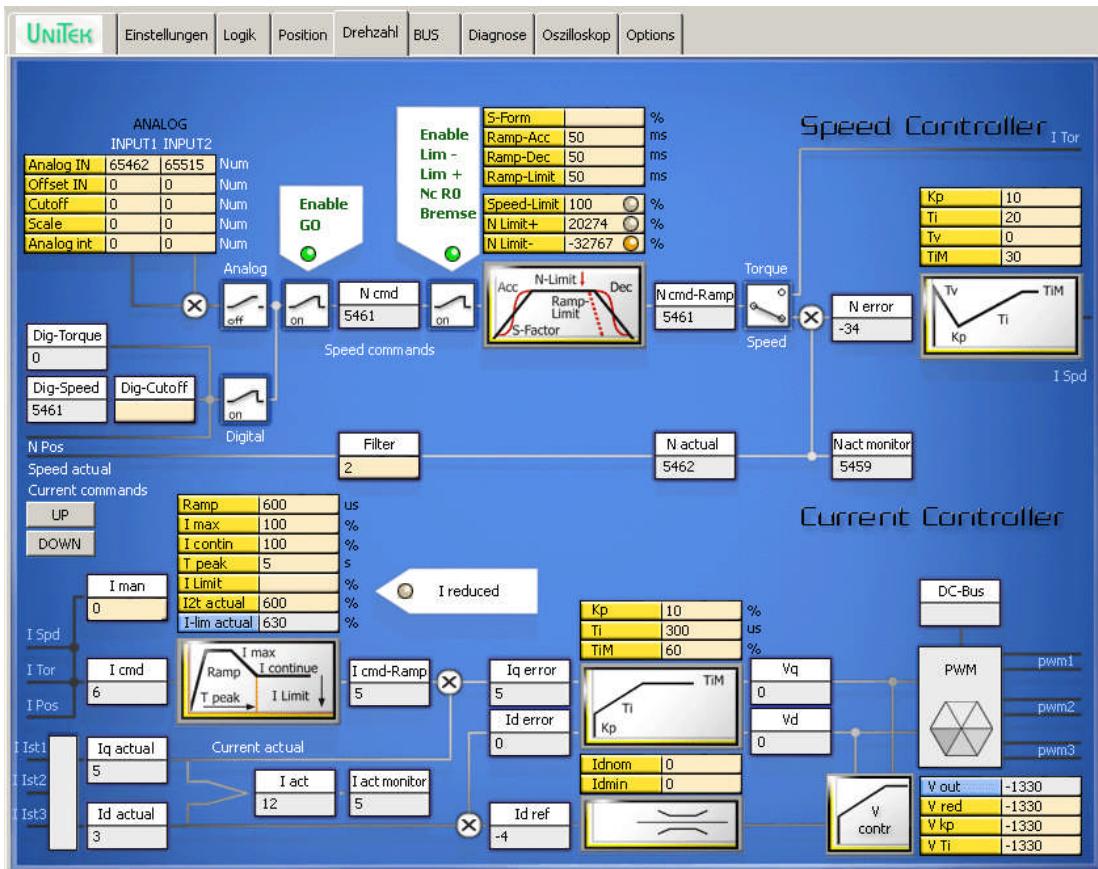
Measured value

| | | |
|--------|--------------------------------------|------|
| Tmotor | Active motor temperature | 0x49 |
| Tigbt | Active output stage temperature | 0x4a |
| Tair | Current air temperature in the servo | 0x4b |
| Ilda | Active current limit | 0x48 |

NDrive .2

Current controller parameters

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 |

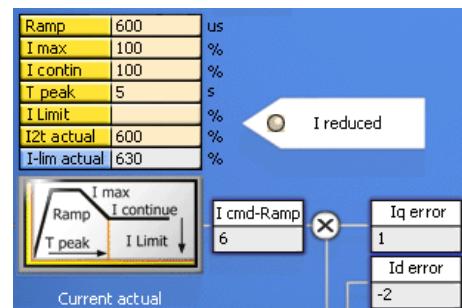
Software Manual

Setting window 'ramp'

The current command value (I_{cmd}) is processed in the setting window 'ramp'. The current ramp-up (ramp), the peak current (I_{max}), the continuous current (I_{contin}), 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' ($I_{cmd-Ramp}$).

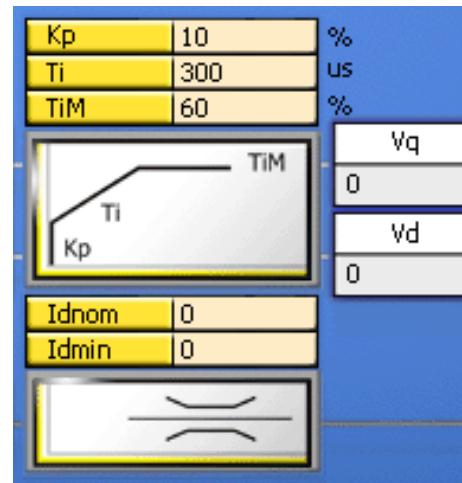


Setting window 'current controller'

The actual current values (I_{lst1} , I_{lst2} , I_{lst3}) are evaluated as $I_{q\text{-actual}}$ and $I_{d\text{-actual}}$. The displayed actual current value ($I_{act\text{ monitor}}$) is generated from the actual current value (I_{actual}) by means of a filter.

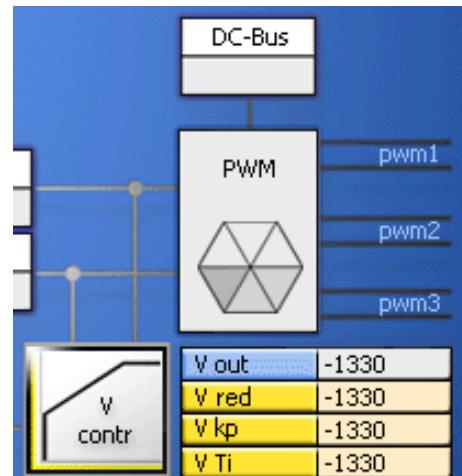
The I_q and I_d errors are processed in the current controller by means of the amplification parameters (K_p , T_i , T_{iM}).

The reference value for the I_d 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 V_q and V_d .



NDrive .2

Adjustment of the current controller amplification

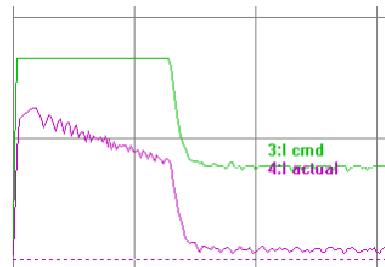
The current controller parameters must only be modified by qualified and experienced personnel.
The current controller parameter adjustment is only necessary when no motor type data exist. For known motor types the current controller parameters can be taken from the Unitek motor lists.
Preset a step 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 ($Ti = 0$)

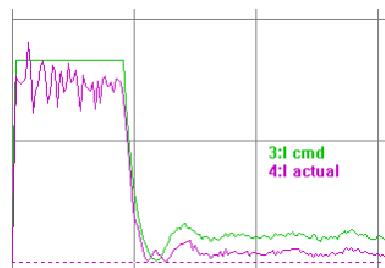
Kp value too low

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.



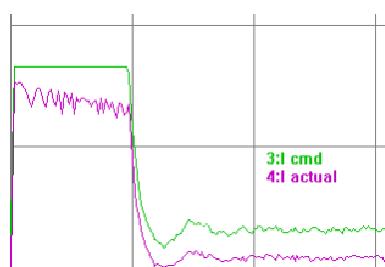
Kp value too high

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

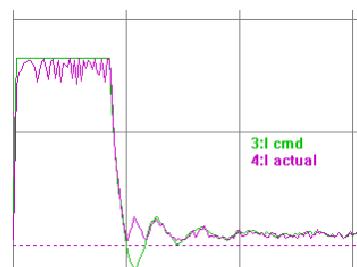
The actual value does not overshoot. The error between actual and command is optimal at approx 20%. Remaining errors can be eliminated by bringing the integral component into play



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.



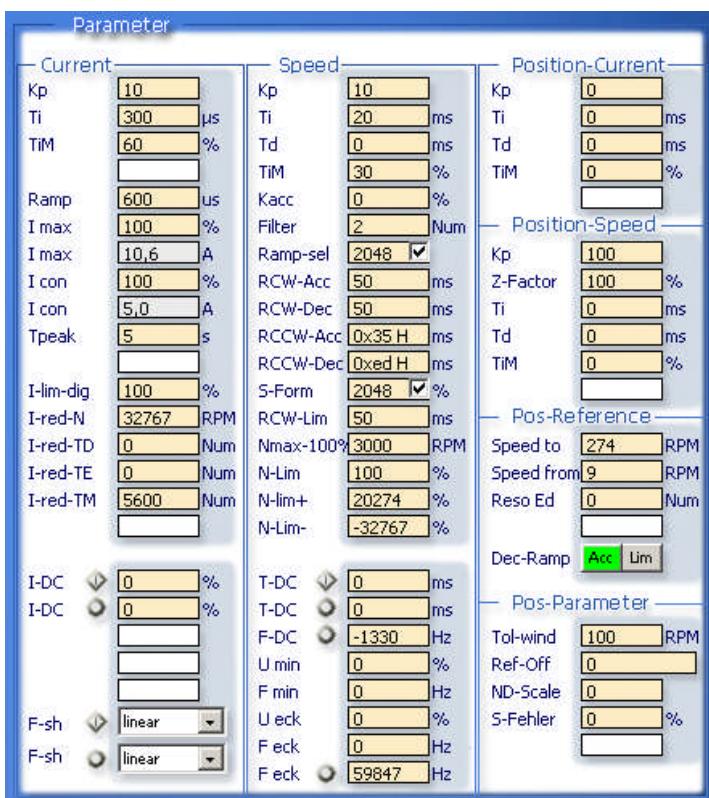
For further set-up information refer to the commissioning manual

Software Manual

Speed controller parameters

NDrive .2

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 + | Positive 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 | 0xa0 |
| F min | Min. frequency | 0 bis 100.0 | 10.0 | Hz | 0.1 | 0xb0 |
| U eck | Max. voltage | 0 bis 100.0 | 100.0 | % | 0.1 | 0xc0 |
| F eck | Frequency with max. voltage | 1 bis 1000.0 | 50.0 | Hz | 0.1 | 0xd0 L |
| F eck Stop | Cut-off frequency with stop operation | 1 bis 1000.0 | 40.0 | Hz | 0.1 | 0xd0 H |

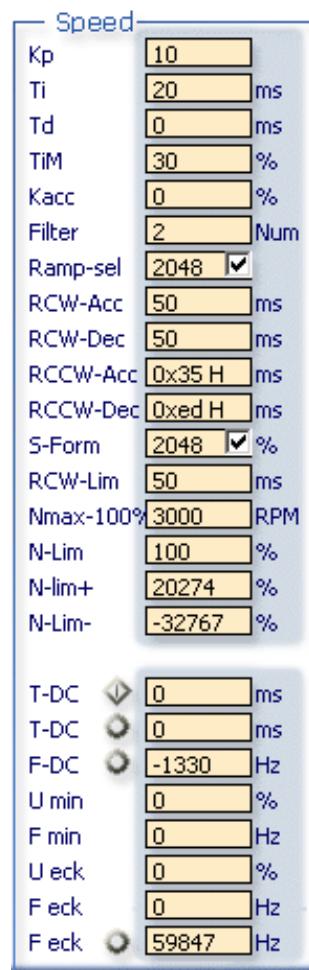
| Speed, actual value range | Calibration Speed n _{max} | Limiting |
|-------------------------------|--|--|
| max. value ±32767 (15 bit -1) | N _{max} value adjusted in the fields "motor" and "speed" of the settings window = 32767 | Via speed-limit in the field "speed" of the setting window. |
| Example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

Software Manual

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 (<i>N-max</i>) in the parameter field ' <i>Motor</i> '. |
| N-Lim | Speed limiting of Nmax (100% = Nmax) Max. speed adjustment for position control |
| N-lm+ | Speed limiting of Nmax for a positive rotation direction (100% = N-max) |



NDrive .2

Frequency transformer

Frequency transformer parameters

Current

| | |
|-----------|--------------------------|
| Kp | 10 |
| Ti | 300 <small>µs</small> |
| TIM | 60 <small>%</small> |
| Ramp | 600 <small>us</small> |
| I_max | 100 <small>%</small> |
| I_max | 10,6 <small>A</small> |
| I_con | 100 <small>%</small> |
| I_con | 5,0 <small>A</small> |
| Tpeak | 5 <small>s</small> |
| I-lim-dig | 100 <small>%</small> |
| I-red-N | 32767 <small>RPM</small> |
| I-red-TD | 0 <small>Num</small> |
| I-red-TE | 0 <small>Num</small> |
| I-red-TM | 5600 <small>Num</small> |

| | |
|------|--------------------|
| I-DC | 0 <small>%</small> |
| I-DC | 0 <small>%</small> |
| F-sh | linear |
| F-sh | linear |

- 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.
- Umin** Min. voltage (boost) when the motor is at a standstill.
U/F characteristics is shifted upwards.
- Fmin** 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

Speed

| | |
|-----------|--|
| Kp | 10 |
| Ti | 20 <small>ms</small> |
| Td | 0 <small>ms</small> |
| TIM | 30 <small>%</small> |
| Kacc | 0 <small>%</small> |
| Filter | 2 <small>Num</small> |
| Ramp-sel | 2048 <input checked="" type="checkbox"/> |
| RCW-Acc | 50 <small>ms</small> |
| RCW-Dec | 50 <small>ms</small> |
| RCCW-Acc | 0x35 H <small>ms</small> |
| RCCW-Dec | 0xed H <small>ms</small> |
| S-Form | 2048 <input checked="" type="checkbox"/> % |
| RCW-Lim | 50 <small>ms</small> |
| Nmax-100% | 3000 <small>RPM</small> |
| N-Lim | 100 <small>%</small> |
| N-lim+ | 20274 <small>%</small> |
| N-lim- | -32767 <small>%</small> |
| T-DC | 0 <small>ms</small> |
| T-DC | 0 <small>ms</small> |
| F-DC | -1330 <small>Hz</small> |
| U min | 0 <small>%</small> |
| F min | 0 <small>Hz</small> |
| U eck | 0 <small>%</small> |
| F eck | 0 <small>Hz</small> |
| F eck | 59847 <small>Hz</small> |

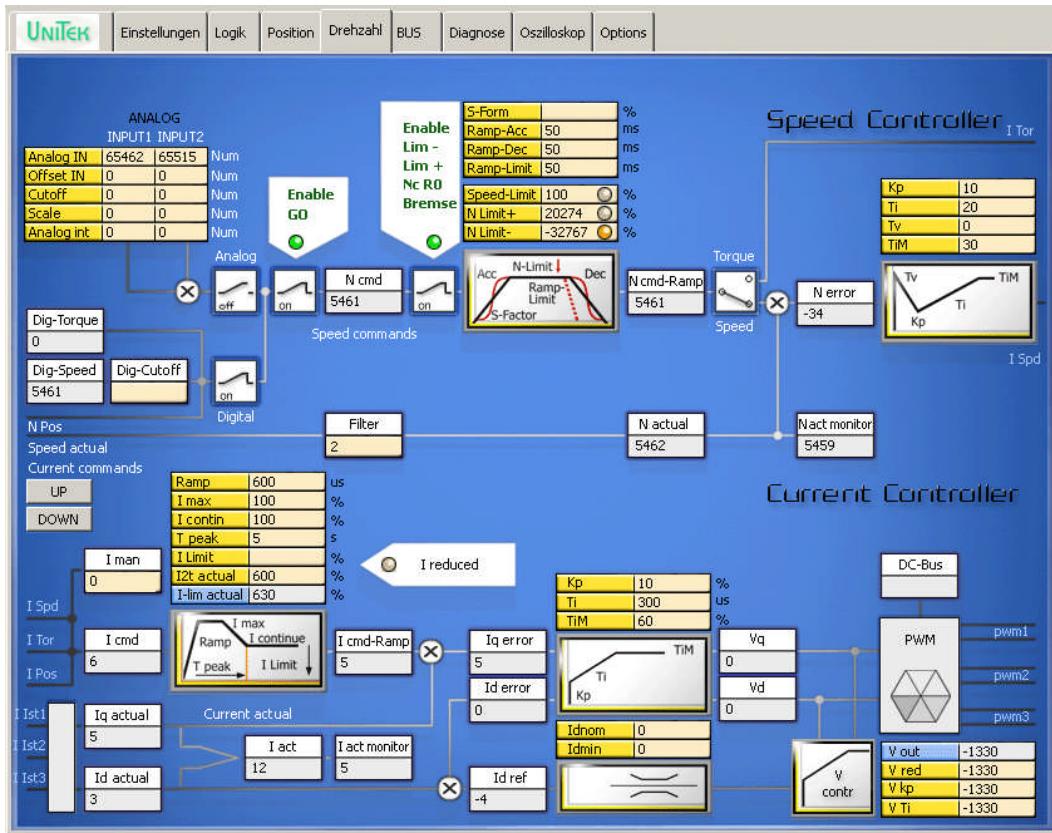
Software Manual

NDrive .2

Speed controller parameters

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 |

Software Manual

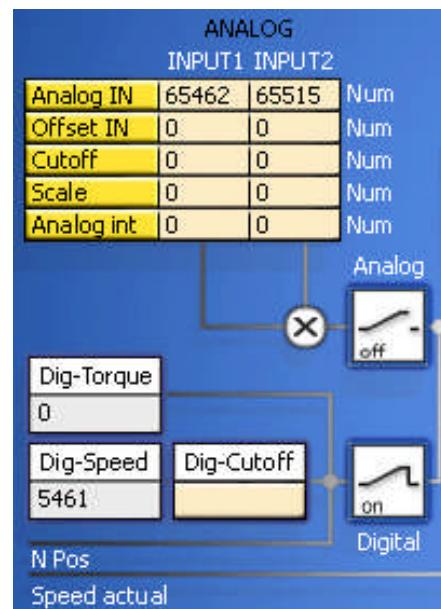
Display/input field for analog command values

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.

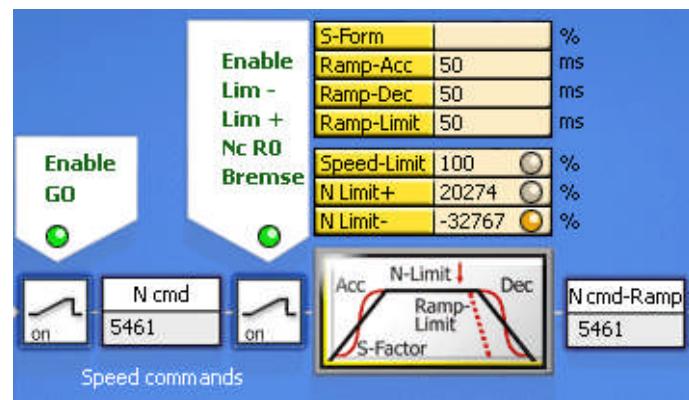
Switching field 2

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).



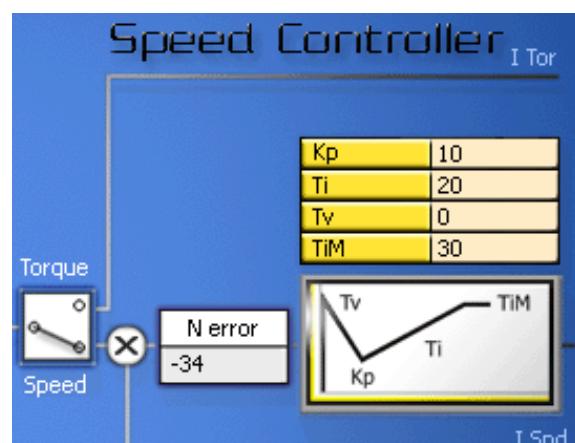
Speed controller

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).



NDrive .2

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.

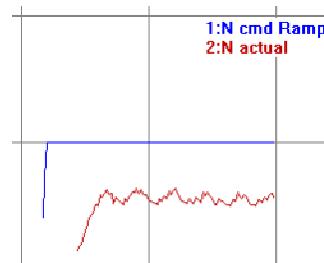
Monitor the speed command value (N cmd-ramp) and the actual speed value (N actual) on the oscilloscope. For further information refer to the commissioning manual.

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.



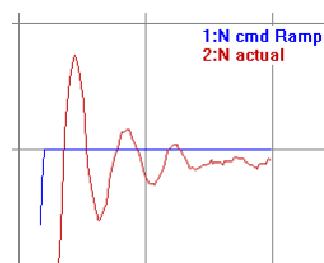
Kp value too high

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 stretched.

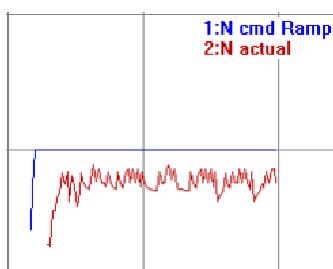


Correct Kp value

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.

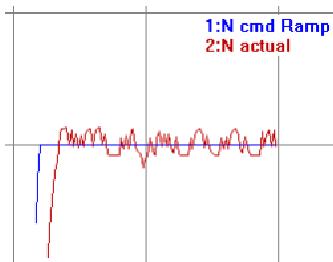
(diagram is exaggerated for explanatory purposes)



Speed controller adjustment of the parameters Kp, Ti, and TiM

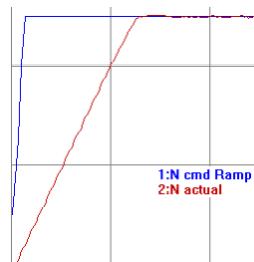
Reduce the control errors to a minimum by means of the parameters 'Ti' and 'TiM'. Values should be kept as small as possible.

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)

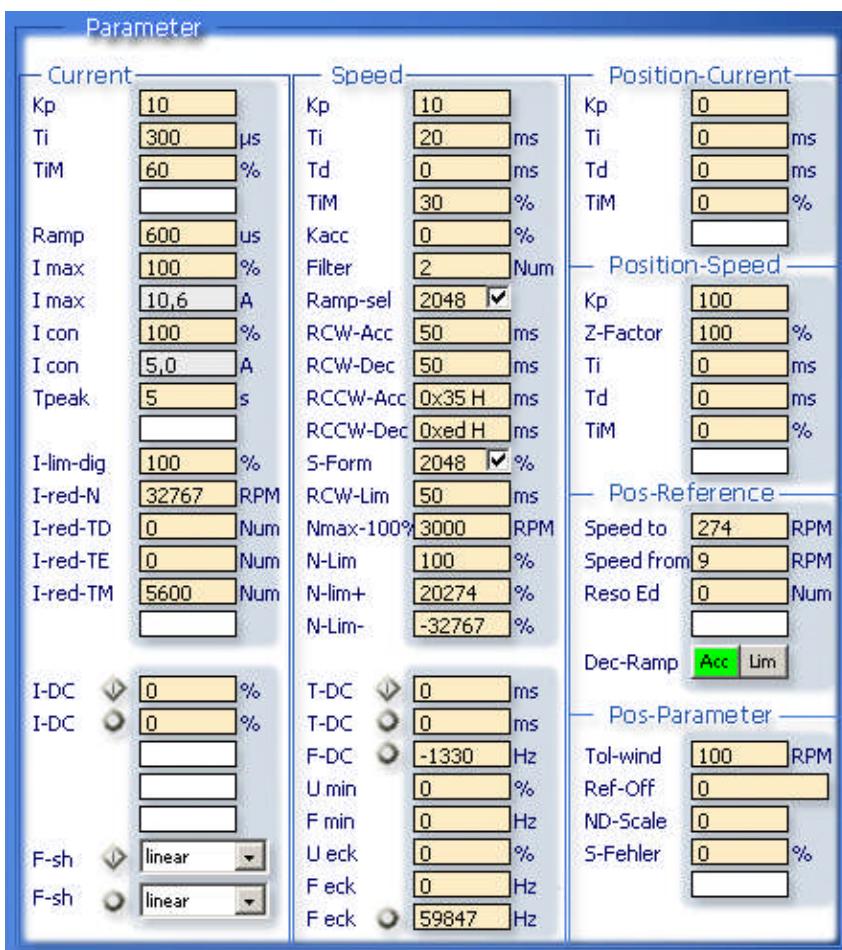


Software Manual

Position controller parameters

NDrive .2

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 point shift | 0 bis ±32676 | 0 | Nim | 1 | 0x72 |
| ND-Scale | | | | | | |
| S-error | Contouring error | | | | | |

Software Manual

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.

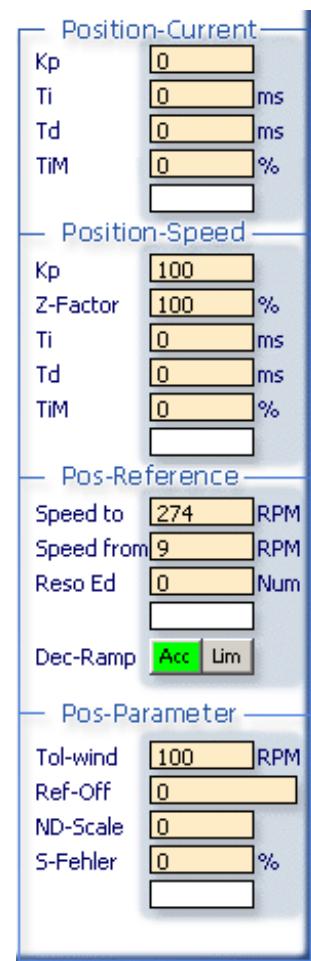
Dynamic control amplification (only effective during ramp-up to final position)

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)

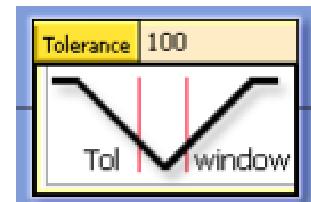
Reference offset Zero point shifting (numeric value)

ND scale

S error Contouring error

One motor revolution corresponds to the numeric value 65536.

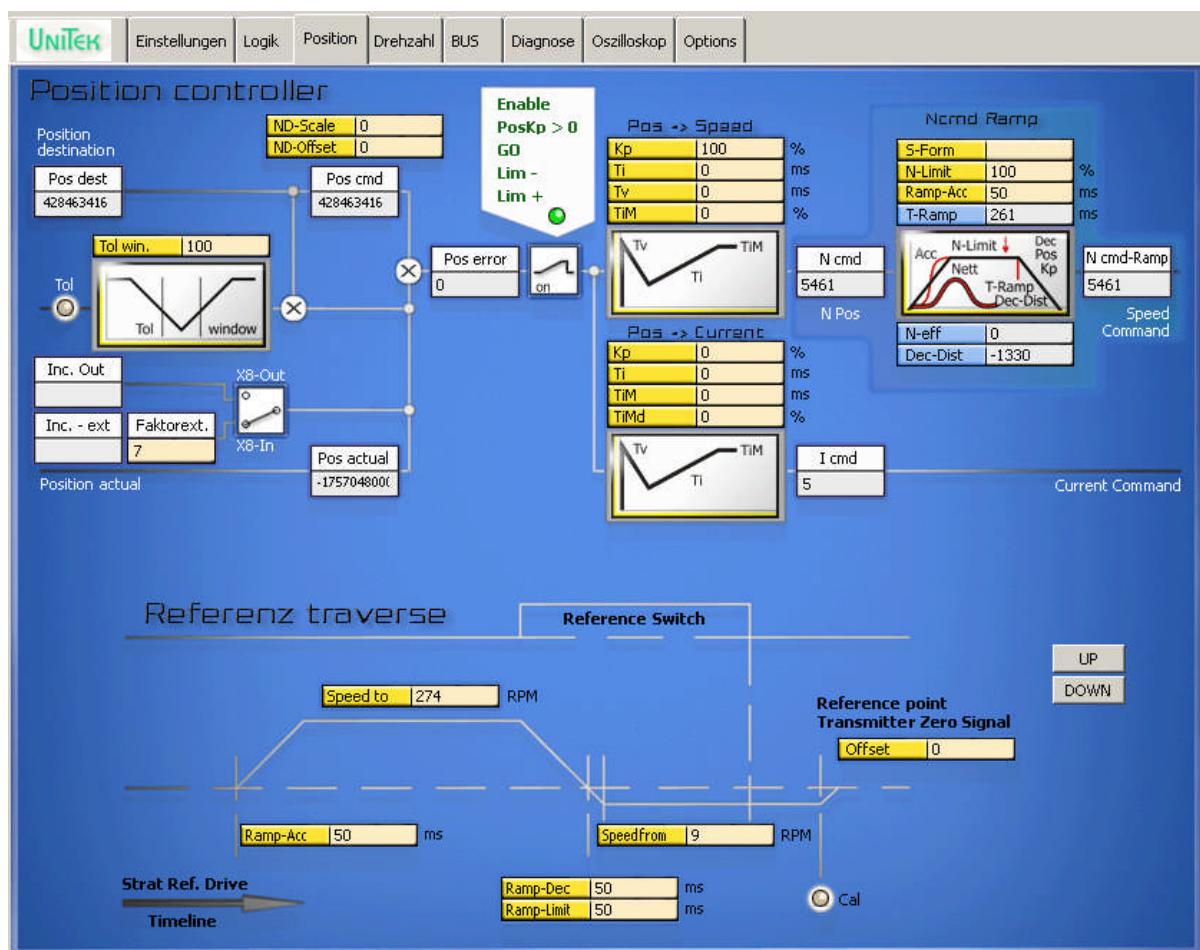
The position command values or position parameter values sent from the control via RS232 or CAN BUS become immediately effective.



NDrive .2

Position controller parameter

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*).

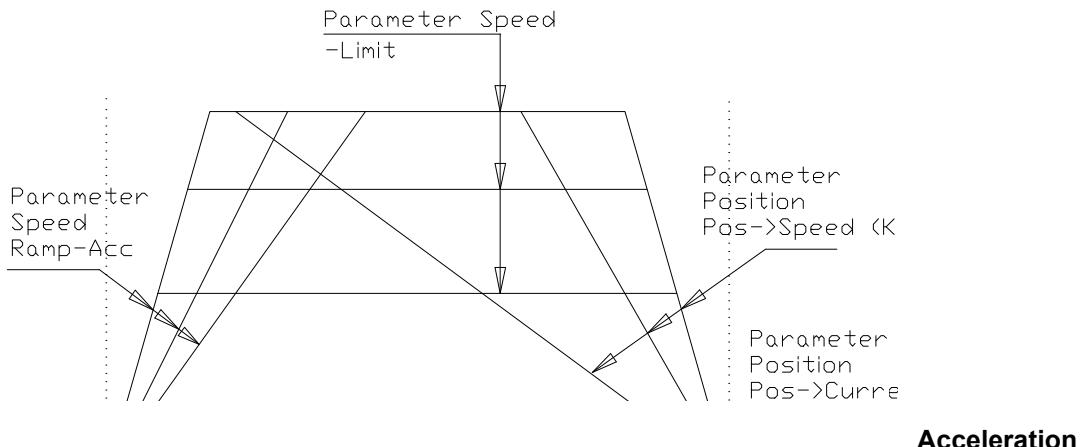
When the enable states (Ena, GO), the output stage switches (Lim-, Lim+), and the position control amplification (*posKp>0*) are active (green), the position error (*pos error*) represents the input to the *Pos -> Speed* and *Pos -> Current* controllers. For both controllers the proportional amplification (*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 |

Software Manual



| | Acceleration |
|------------------------------|--|
| Ramp-Acc | Acceleration time to max. speed in ms. acceleration $a = v / tb$ $v = \text{max. velocity}$, $t = \text{acceleration time}$ |
| 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 $a = v / tv$
 $v = \text{max. velocity in m/s}$, $t = \text{deceleration time}$
 $(t \text{ ramp}) \text{ in s}$

Example $v = 3\text{m/s}$, $t = 0.261$,
 $a = 3 / 0.261 = 11.5 \text{ m/s}^2$

Calculating Kp from a given speed and deceleration time:

$$\begin{aligned} Kp &= \sqrt{a} \times 2603 / v \\ Kp &= \sqrt{11.5} \times 2603 / 3 = 99.9\% \end{aligned}$$

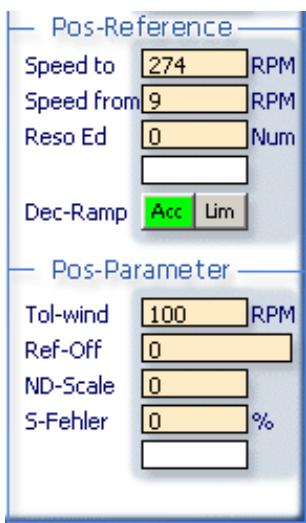
Ramp target distance $s = v^2 / 2 \times a$
 $s = 9 / 2 \times 11.5 = 0.391 \text{ m}$

| 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 |

NDrive .2

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.

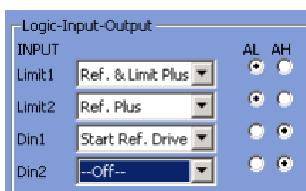
Note: The drive will accept commands such as **Start Ref Drive, N cmd**, etc. only 5s after the drive has been enabled.

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

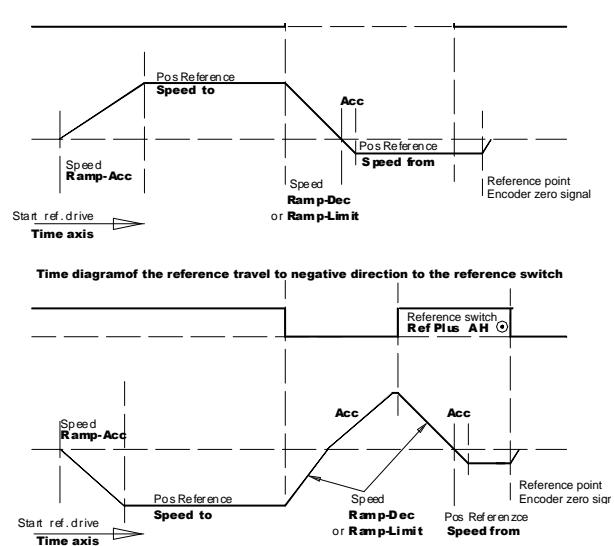
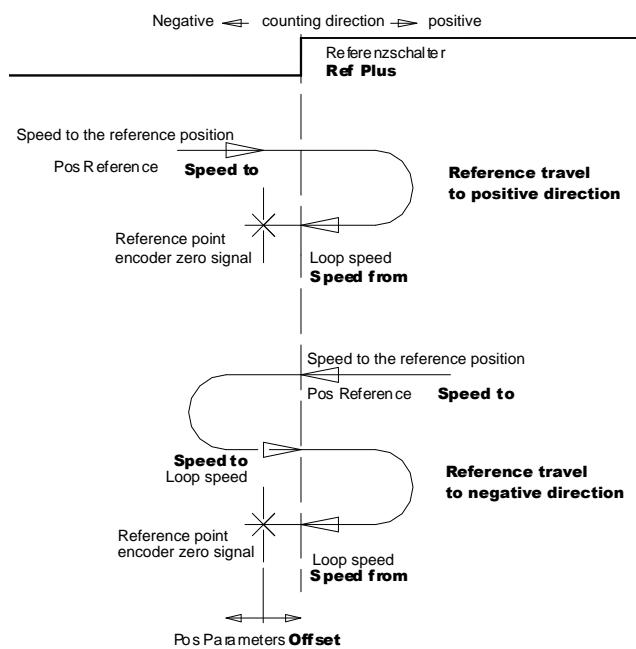
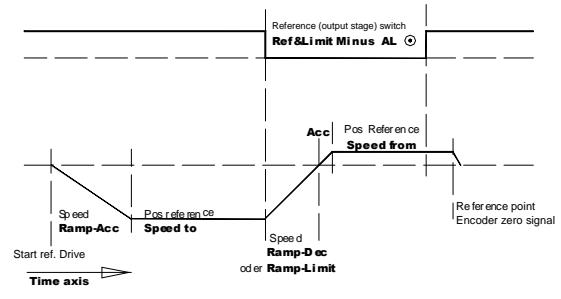
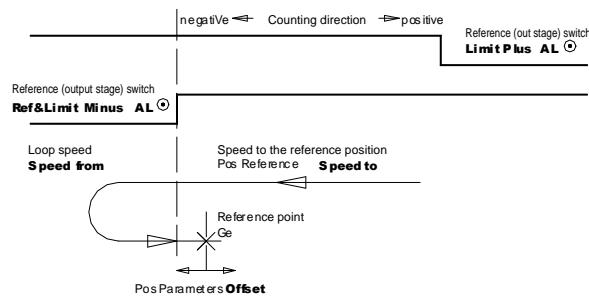
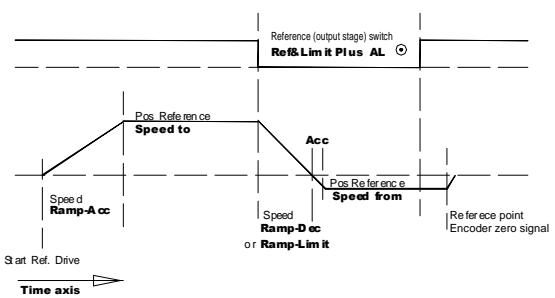
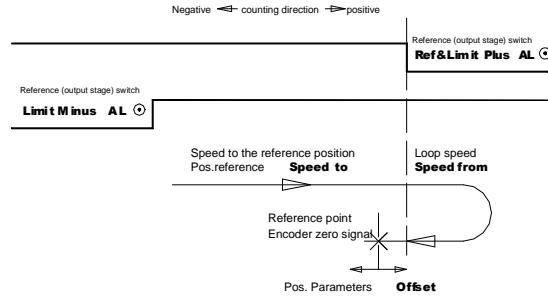
Ref&LimitMINUS Negative rotation to reference switch - Output stage switch

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**.

Software Manual

Reference travel functions



Amplification adjustment Pos -> Speed

The amplified position error provides the speed command value.

| Position-Current | |
|------------------|---------|
| Kp | 30 |
| Ti | 100 ms |
| Td | 5000 ms |
| TiM | 100 % |
| | |
| Position-Speed | |
| Kp | 100 |
| Z-Factor | 100 % |
| Ti | 0 ms |
| Td | 0 ms |
| TiM | 0 % |
| | |

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

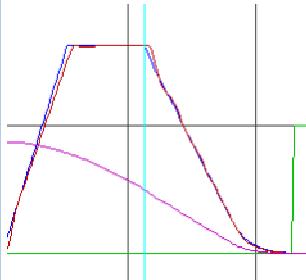
TiM Threshold value - integral term

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.**



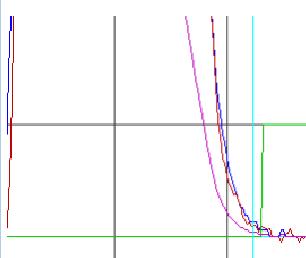
A travel at even speed is determined by means of the parameters **Speed Limit**.

The ramp-up to final position is determined by the **Kp** amplification of the position controller. 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 window Position 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.

Software Manual

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

| Position-Current | |
|------------------|---------|
| Kp | 30 |
| Ti | 100 ms |
| Td | 5000 ms |
| TiM | 100 % |

| Position-Speed | |
|----------------|-------|
| Kp | 100 |
| Z-Factor | 100 % |
| Ti | 0 ms |
| Td | 0 ms |
| TiM | 0 % |

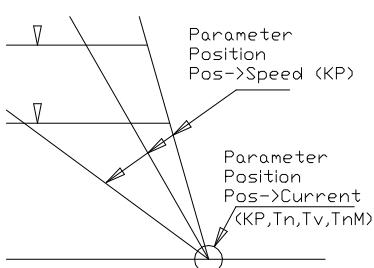
Note:

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.



NDrive .2

Position controller scale

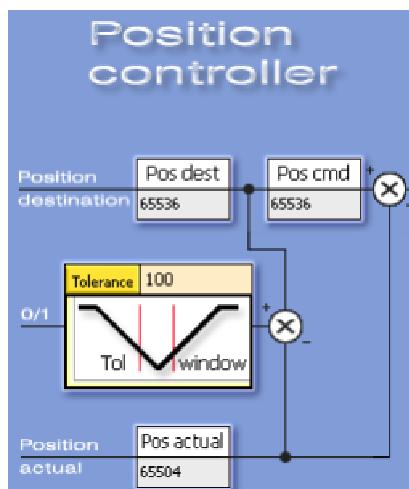
Display factor for the position values

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

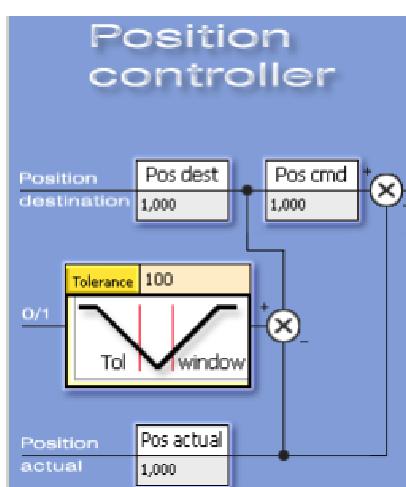
Gear i=20

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

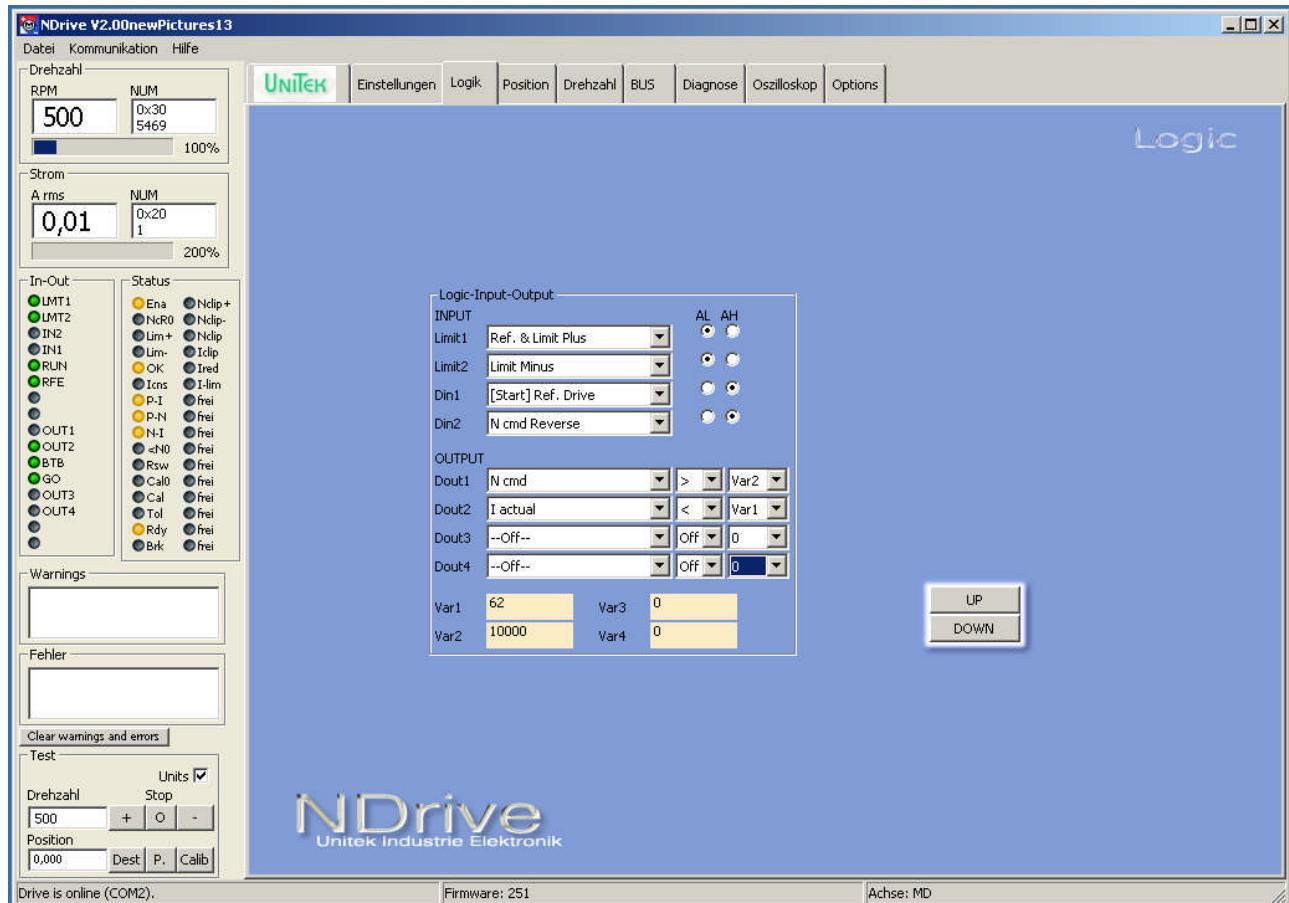
Position display factor $65536.000 * 10 = 655360.000$

NDrive scale = 655360.000

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

Software Manual

Logic window



Setting window for digital inputs and outputs

Inputs

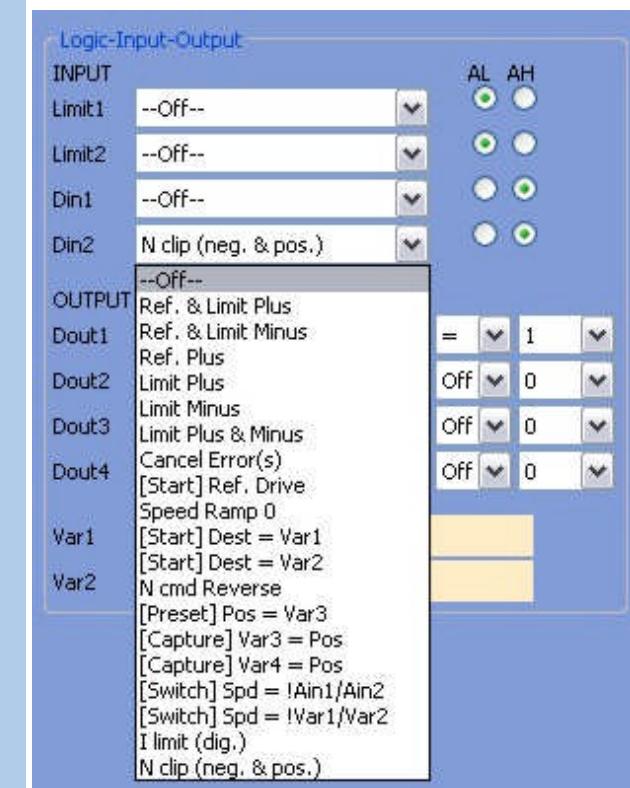
- Limit1 Programmable digital input, with preference given to an output stage switch or switch
Limit2 Programmable digital input, with preference given to an output stage switch or switch
Din1 Programmable digital input
Din2 Programmable digital input

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 logic inputs



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.

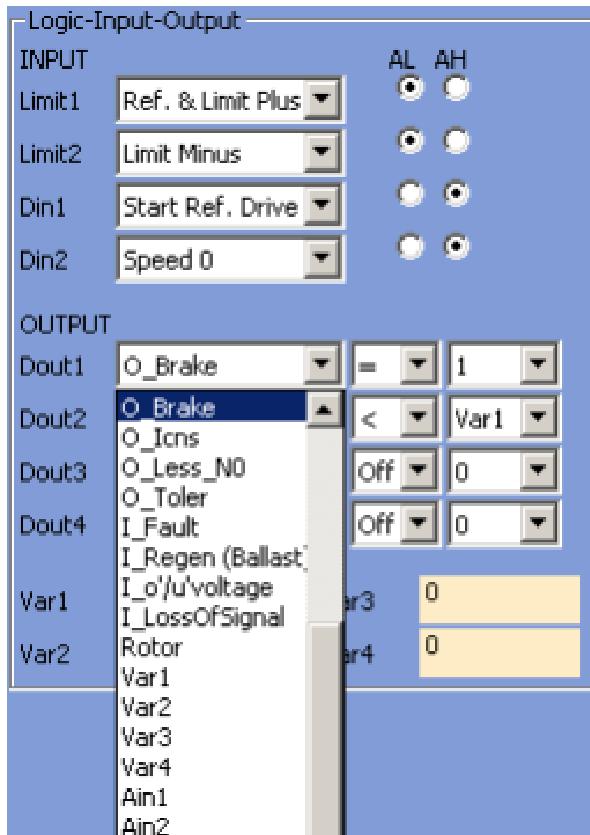
The state of the output stage switches inputs Limit1 and Limit2 are displayed in the field 'state' as **Lim+** and **Lim-**.

| 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.

Software Manual



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 | | 0xd1 |
| VAR2 | | 0xd2 |
| VAR3 | numerical value for comparison purposes | 0xd3 |
| VAR4 | | 0xd4 |
| AIN1 | | |
| AIN2 | Numerical value of the voltages across the analog inputs input. | |
| AIN3 | | |

NDrive .2

Logical links

Free

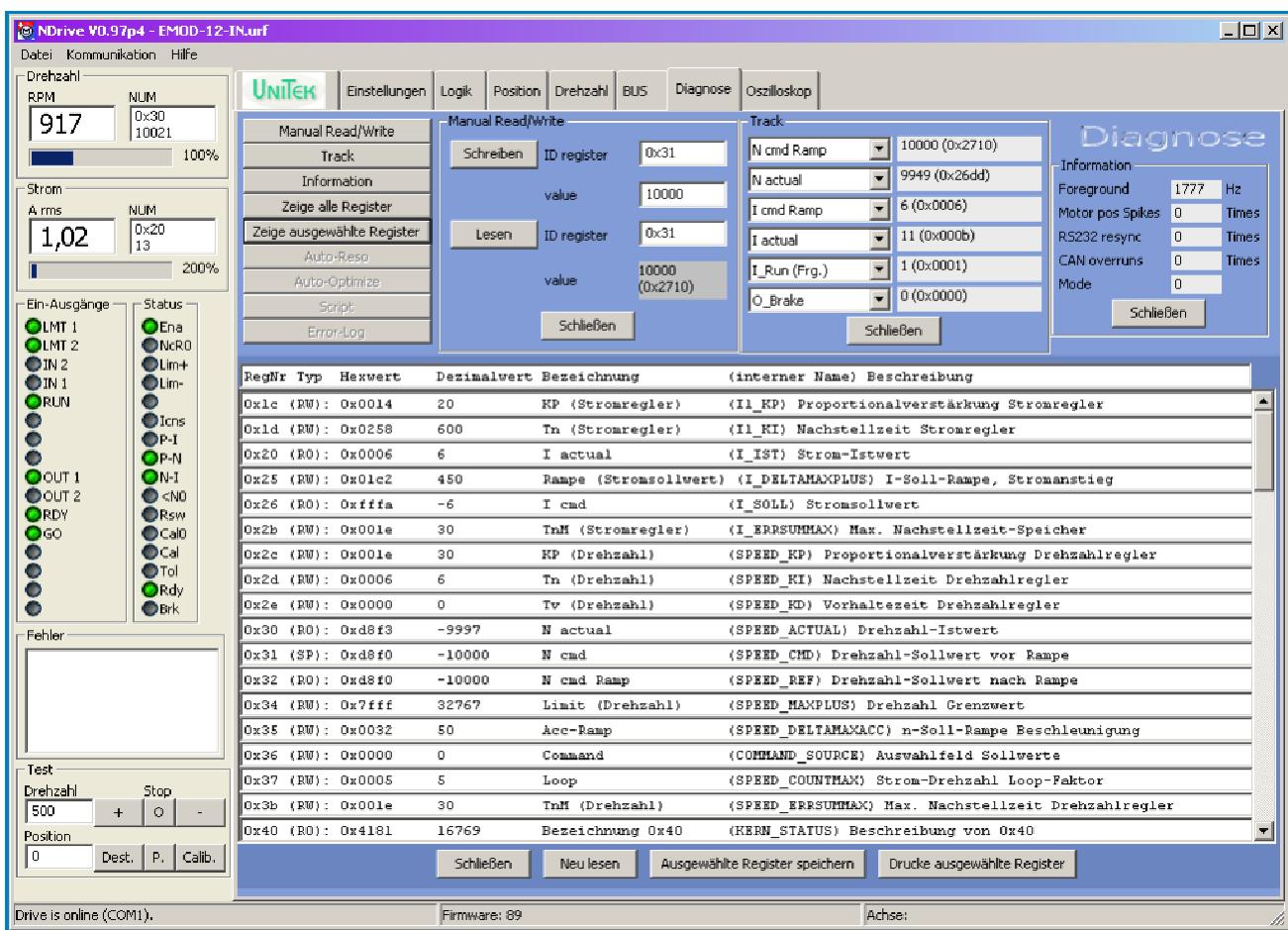
Software Manual

Free

Logical links

NDrive .2

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 |

Software Manual

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.

| Manual Read/Write | |
|-------------------|----------------------------|
| Schreiben | ID register 0x31 |
| | value 10000 |
| Lesen | ID register 0x31 |
| | value 10000 (0x2710) |
| Schließen | |

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.

| Track | |
|------------------|----------------|
| N cmd Ramp | 11000 (0x2af8) |
| N actual | 11074 (0xb42) |
| I cmd Ramp | 64 (0x0040) |
| I actual | 20 (0x0014) |
| I_Run (Frg.) | 1 (0x0001) |
| O_Brake | 0 (0x0000) |
| Schließen | |

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.

Software Manual

Free

Diagnosis

Software Manual

Monitor

NDrive .2

Option



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

| | |
|----------|--------|
| Drehzahl | |
| N-Limit+ | 1000 |
| N-Limit- | -10000 |

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'.

| | |
|--------------------|---------------------------|
| Logic-Input-Output | |
| INPUT | |
| Limit1 | --Off-- |
| Limit2 | --Off-- |
| Din1 | --Off-- |
| Din2 | N clip (neg. & pos.) |
| OUTPUT | |
| Dout1 | Ref. & Limit Plus |
| | Ref. & Limit Minus |
| Dout2 | Ref. Plus |
| | Limit Plus |
| Dout3 | Limit Minus |
| Dout4 | Limit Plus & Minus |
| | Cancel Error(s) |
| [Start] | Ref. Drive |
| | Speed Ramp 0 |
| Var1 | [Start] Dest = Var1 |
| Var2 | [Start] Dest = Var2 |
| | N cmd Reverse |
| | [Preset] Pos = Var3 |
| | [Capture] Var3 = Pos |
| | [Capture] Var4 = Pos |
| | [Switch] Spd = !Ain1/Ain2 |
| | [Switch] Spd = !Var1/Var2 |
| | I limit (dig.) |
| | N clip (neg. & pos.) |

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)

Software Manual

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).

NDrive .2

Option

Software Manual

Option

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.

Software Manual

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’.

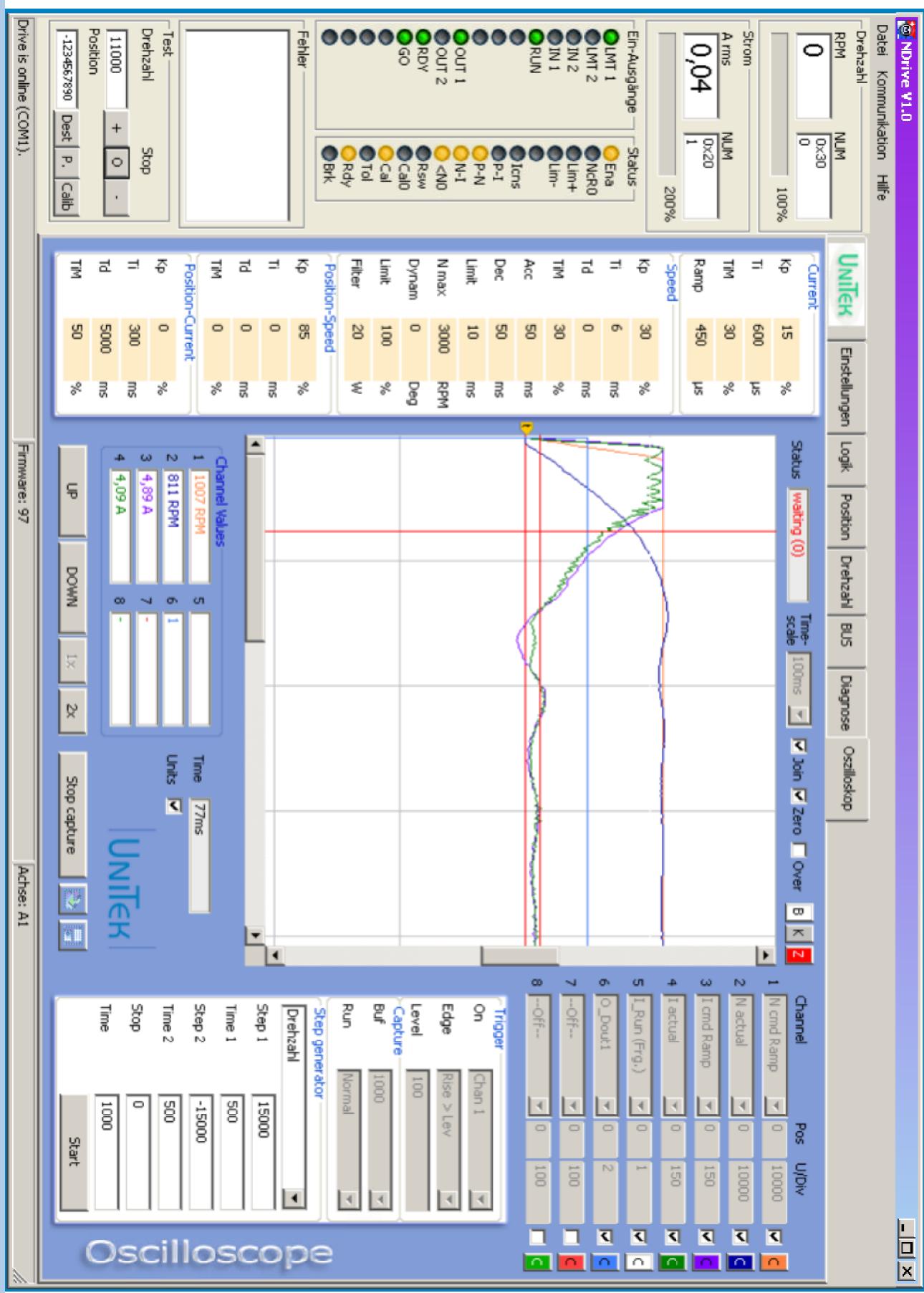
| Function | 7-segment display |
|---|-------------------|
| Command taken over (click ‘write’) | 70 |
| Correct termination | 79 |
| | |
| Error abort | |
| Enable switched on during measuring process | 76 |
| Rotor movement determined | 77 |
| No tacho connected | 78 |

When the adjustment is started ‘7-0’ is displayed in the 7-segment display.

The adjustment is finished when ‘7-9’ is displayed.

NDrive .2

Oscilloscope



Software Manual

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

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

| Channel | Pos | U/Div | |
|----------------|-----|-------|---------------------------------------|
| 1 N cmd Ramp | 0 | 10000 | <input checked="" type="checkbox"/> C |
| 2 N actual | 0 | 10000 | <input checked="" type="checkbox"/> C |
| 3 I cmd Ramp | 0 | 150 | <input checked="" type="checkbox"/> C |
| 4 I actual | 0 | 150 | <input checked="" type="checkbox"/> C |
| 5 I_Run (Frq.) | 0 | 1 | <input checked="" type="checkbox"/> C |
| 6 O_Dout1 | 0 | 2 | <input checked="" type="checkbox"/> C |
| 7 --Off-- | 0 | 100 | <input checked="" type="checkbox"/> C |
| 8 --Off-- | 0 | 100 | <input checked="" type="checkbox"/> C |

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.

NDrive .2

Trigger adjustment

| | |
|---------|------------|
| Trigger | |
| On | Chan 1 |
| Edge | Rise > Lev |
| Level | 100 |
| Capture | |
| Buf | 1000 |
| Run | Normal |

| 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.

| | |
|----------------|--------|
| Step generator | |
| Drehzahl | |
| Step 1 | 15000 |
| Time 1 | 500 |
| Step 2 | -15000 |
| Time 2 | 500 |
| Stop | 0 |
| Time | 1000 |
| Start | |

| | |
|------------|---|
| 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.

Software Manual

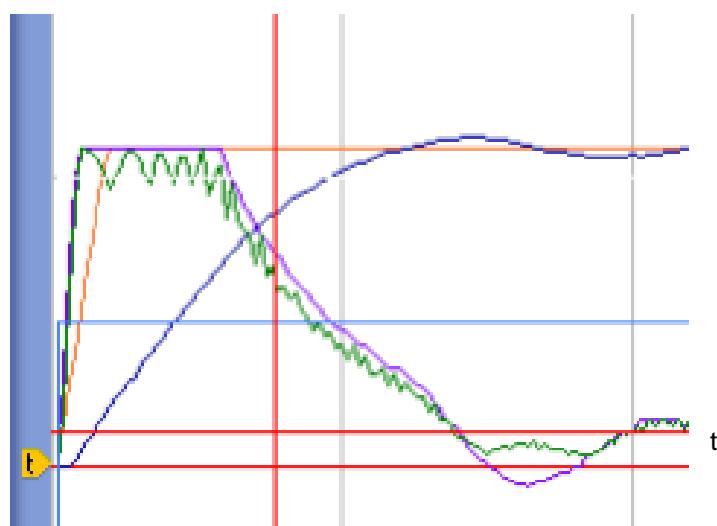
Display of the measured values

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.

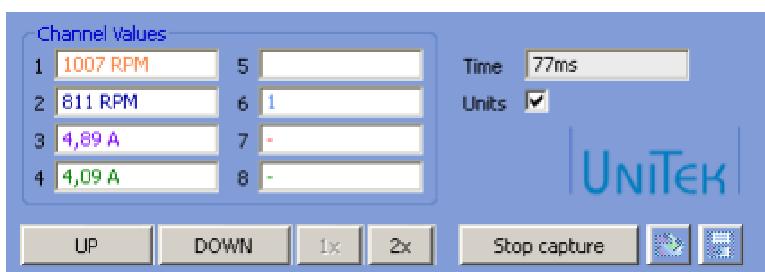
In the field '**Channel values**' the measured values are displayed being the intersection points of the vertical cursor line and the channel record curves. The values can be displayed as numeric values or scaled unit values by clicking the box '**Units**' and ticking the respective box.

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 field and change the value by means of the 'up' or 'down' key.

| Current | | |
|---------|-----|----|
| Kp | 30 | % |
| Ti | 600 | us |
| TIM | 10 | % |
| Ramp | 150 | us |
| Speed | | |
| Kp | 60 | % |
| Ti | 6 | ms |
| Td | 0 | ms |
| TIM | 20 | % |

Test

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

| | | |
|----------|-------|----|
| Test | | |
| Drehzahl | Stop | |
| 1000 | + | - |
| Position | Dest | P. |
| 1000,000 | Calib | |

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!

NDrive .2

Parameters

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 | | | | |

Software Manual

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 2xl 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 |
| O 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 |

Software Manual

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 |
| | | | | | |

NDrive .2

Parameters

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 too 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 | Description | | 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 |

Software Manual

State BIT

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 |
| | | |

NDrive .2

Logic BIT

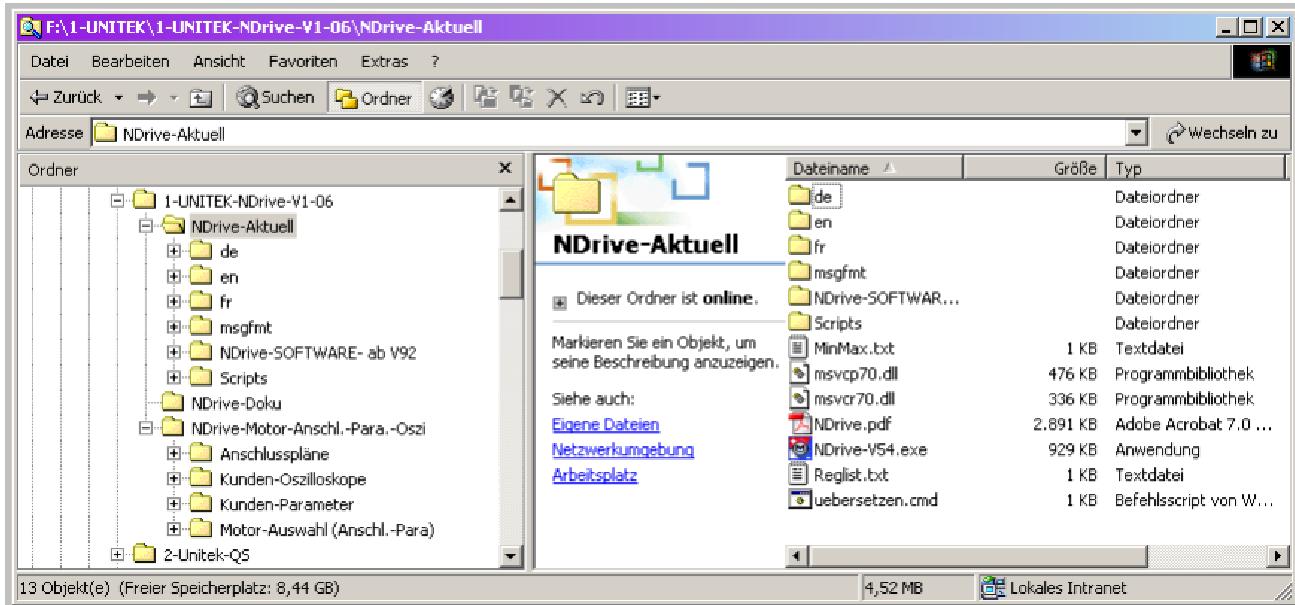
| Short symbols | Description | Address |
|---------------|---------------------------------------|------------|
| | | REGID 0xD8 |
| Limit 1 | Digital input limit 1 active | Bit 0 |
| Limit 2 | Digital input limit 2 active | Bit 1 |
| Din 2 | Digital input Din 2 active | Bit 2 |
| Din 1 | Digital input 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 |

Software Manual

UNITEK-Ndrive-V1-06



| | | | |
|--------------------------------|---|-----------------|---|
| UNITEK-NDrive-V1-06 | UNITEK user software for 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 the requested registers |
| | | uebersetzen.cmd | Translation program for the language modules |

