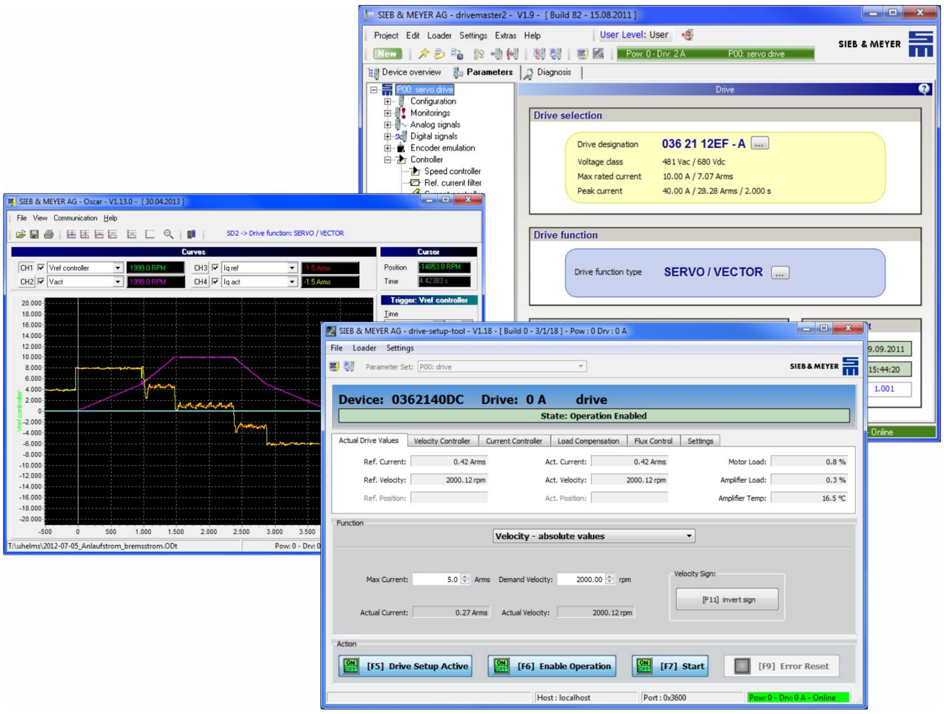
SIEB & MEYER

drivemaster2

User Manual



Valid for version 1.19
P-TD-0000017.7
2019-09-24

Copyright

Trademarks

SIEB & MEYER worldwide

For questions regarding our products and technical problems please contact us.

SIEB & MEYER AG
Auf dem Schmaarkamp 21
21339 Lueneburg
Germany

Phone: +49 4131 203 0
Fax: +49 4131 203 2000
support@sieb-meyer.de
http://www.sieb-meyer.de

SIEB & MEYER Shenzhen Trading Co. Ltd.
Room A208, 2/F,
Internet Innovation and Creation services base
Building (2),
No.126, Wanxia road, Shekou, Nanshan district,
Shenzhen City, 518067
China

Phone: +86 755 2681 1417 / +86 755 2681 2487
Fax: +86 755 2681 2967
sm_china_support1@163.com
http://www.sieb-meyer.cn

SIEB & MEYER Asia Co. Ltd.
4 Fl, No. 532, Sec. 1
Min-Sheng N. Road
Kwei-Shan Hsiang
333 Tao-Yuan Hsien
Taiwan

Phone: +886 3 311 5560
Fax: +886 3 322 1224
smasia@ms42.hinet.net
http://www.sieb-meyer.com

About this Manual	1
General Information	2
Installation	3
Device Connection to PC	4
Description of the User Interface	5
Password Protection and User Rights	6
First Steps	7
Device Overview	8
Parameters of a PS2	9
Parameters of an SD2x	10
Parameters of an FC2	11
Diagnosis	12
Tools	13
Working with Projects	14
Communication	15
Appendix	16
Index: Parameters	17
Index	18

1	About this Manual	13
1.1	Illustration of Warnings	13
1.2	Illustration of General Notices	14
1.3	Abbreviations	14
2	General Information	15
2.1	*drivemaster2* Applications	15
3	Installation	17
3.1	PC Hardware Requirements	17
3.2	Install *drivemaster2*	17
3.3	Uninstall *drivemaster2*	18
3.4	USB Driver Installation	18
3.4.1	USB Driver – Troubleshooting	19
3.4.1.1	LibUSB Device Not Detected	19
3.4.1.2	Wrong USB Driver Loaded	20
4	Device Connection to PC	23
4.1	Connection of PS2 and SD2	23
4.2	Connection of Double-axis Compact Device SD2	24
4.3	Connection SD2B / SD2B plus	25
4.4	Connection of SD2M	26
4.5	Connection of SD2S	27
4.6	Connection of SD2T	27
4.7	Connection FC2	28
5	Description of the User Interface	29
5.1	General Operating Instructions for *drivemaster2*	29
5.2	Screen Layout	29
5.3	Menu Description	31
5.3.1	Menu “Project”	31
5.3.2	Menu "Edit"	32
5.3.3	Menu “Loader”	32
5.3.4	Menu “Settings”	33
5.3.5	Menu “Extras”	33
5.3.6	Menu “Help”	34
5.4	Program Start	34
5.5	Online / Offline Mode	35
5.5.1	The Online Mode	36
5.5.1.1	Searching for Connected Devices	36
5.5.1.2	Online Monitoring	36
5.5.1.3	Changing a Parameter Set	37
5.5.1.4	Switching into the Offline Mode	38
5.5.2	The Offline Mode	38
5.5.2.1	Switching to the Online Mode	38
5.6	Download New System Software	39
5.7	Update of the Software *drivemaster2*	40
6	Password Protection and User Rights	43
6.1	User Levels	43

6.2 Switch User Level ... 44
6.3 Assigning User Rights ... 44

7 First Steps ... 47
7.1 Creating an Online Project ... 47
7.2 Creating a Parameter Set of a Drive ... 48
7.2.1 Selecting a drive ... 49
7.2.2 Creating a parameter set ... 49
7.2.3 Download of Parameter Set ... 53
7.3 Positioning via Setup Tool ... 54
7.4 Analyzing a Drive via the Diagnosis Pages ... 56

8 Device Overview ... 57

9 Parameters of a PS2 ... 59
Power (PS2) ... 59
Parameter set (PS2) ... 60
Power supply (PS2) ... 60
External Ballast Resistor (PS2) ... 60
Switching-off Temperature (PS2) ... 61
External Precharge Resistor (PS2) ... 61
DC link capacity (PS2) ... 62

10 Parameters of an SD2x ... 63
10.1 Multi Parameters ... 64
10.1.1 Create Several Parameter Sets for One Device ... 64
10.1.2 Select Parameter Set ... 65
10.1.3 Switching the parameter set in the drive ... 66
10.1.3.1 Parameter Set Change via the Digital Inputs ... 67
10.2 Configuration ... 67
10.2.1 Drive ... 68
Drive Selection (SD2x) ... 68
Drive Function (SD2x) ... 69
Identification (SD2x) ... 69
Parameter set (SD2x) ... 70
10.2.2 Power supply unit ... 70
Mains (SD2x) ... 70
Power (SD2x) ... 71
Chopper (SD2x) ... 71
External Ballast Resistor (SD2x) ... 72
Internal Ballast Resistor (SD2x) ... 73
10.2.3 Power Output Stage ... 74
Currents (SD2x) ... 74
DC Link (SD2x) ... 75
Operating Frequency (SD2x) ... 75
Shutdown Temperatures (SD2x) ... 76
Choke (SD2x) ... 76
10.2.4 Motor ... 77
Motor File (SD2x) ... 77
Motor Type (SD2x) ... 77
10.2.4.1 Motor Parameters ... 78
Motor Parameters for Rotary Synchronous and Voice Coil Motors (SD2x) ... 78
Motor Parameters for Linear Synchronous and Voice Coil Motors (SD2x) ... 80
Motor Parameters for Rotary Asynchronous Motors (SD2x) ... 81
Variable Rated Current ... 83
10.2.5 Motor measuring system ... 83
Motor Measurement System (SD2x) ... 84
Hall Sensor (SD2x) ... 86

	Pulse Generator (SD2x)	86
	Incremental Encoder TTL / 12 V (SD2x)	87
	Commutation Controller (SD2x)	87
	Linear Hall (SD2x)	88
	Resolver (SD2x)	88
	Magnetic Alignment Current (SD2x)	89
	SineCosine Encoder (SD2x)	89
	Tachometer (SD2x)	90
	Angle Controller (SD2x)	91
10.2.6	Drive Control	92
	Operating Mode of the Drive (SD2x)	92
	Drive control (SD2x)	93
	Behavior in Case of (SD2x)	94
10.2.7	Bus System	95
10.2.7.1	CAN Bus	95
	CAN (SD2x)	96
	PDO 0 / PDO 1 (SD2x, CAN Bus)	97
10.2.7.2	DNC 8 Byte Telegram	98
	DNC (SD2x)	98
	PDO 0 / PDO 1 (SD2x, DNC)	99
10.2.8	User Level Rights	100
10.2.9	Units	101
	Units (SD2x)	101
	Position Factor (SD2x)	102
10.3	Monitorings	102
10.3.1	Messages	103
	Message M12 - 'Speed zero' (SD2x)	103
	Message 10 - 'Ref. value reached' (SD2x)	104
	Message 10 - 'Position reached' (SD2x)	104
10.3.2	Warnings	105
	Warnings Power Output Stage (SD2x)	105
	Warnings Motor (SD2x)	106
	W24 – Warning threshold 'current' (SD2x)	106
	W26 – Warning threshold 'overload current' (SD2x)	110
	Different Warnings (SD2x)	111
10.3.3	Error	111
	Error E31 - 'Speed error/Slip' (SD2x)	112
	Error E38 - 'Overspeed' (SD2x)	112
	Error E39 - 'Tracking error' (SD2x)	113
	Error E44 - 'Commutation lost' (SD2xHSPWM)	113
	Error E44 - 'Commutation lost' (SD2xSVC)	114
10.3.4	Safety	115
	Safety Functions (SD2x)	116
10.4	Analog Signals	116
10.4.1	Analog Inputs	117
	Analog In (SD2x)	117
10.4.2	Analog Outputs	118
	Analog Out (SD2x)	118
10.5	Digital Signals	119
10.5.1	Digital inputs	120
	Digital In (SD2x)	120
10.5.2	Digital Outputs	121
	Digital Out (SD2x)	121
10.6	Motor Potentiometer	122
	Motor Potentiometer Setup	122
	Motor Potentiometer Parameters – MOP Time Controlled	123
	Motor Potentiometer Parameters – MOP Edge Controlled	124
10.7	Target Values	125
	Internal Target Values (SD2x)	126
10.8	Encoder Emulation	128

	Function Encoder Emulation (SD2x)	128
	Encoder Emulation Motor Measuring System, AB Quadrature Signals (SD2x)	129
	Encoder Emulation Speed Pulse (SD2x)	129
	Encoder Emulation Trigger Signals (SD2x)	130
10.9	Electronic Gear	130
	Electronic Gear (SD2x)	131
10.10	Controller	131
10.10.1	Controller Parameters for SERVO / VECTOR Operation	132
	Current Feed Forward (SD2x, SERVO / VECTOR)	132
	Current Reference Filter (SD2x, SERVO / VECTOR)	133
	Current Controller (SD2x, SERVO / VECTOR)	135
	Speed Controller (SD2x, SERVO / VECTOR)	136
	Position Controller (SD2x, SERVO / VECTOR)	137
	Field Weakening (SD2x, SERVO / VECTOR)	139
	Winding Detection (SD2x, SERVO / VECTOR)	140
10.10.2	Controller Parameters for SVC Operation	141
	Speed Reference Values (SD2x, SVC)	141
	Variable Ramps (SD2x, SVC)	144
	Speed Controller (SD2x, SVC)	146
	Current Reference Filter (SD2x, SVC)	147
	Current Controller (SD2x, SVC)	148
	Start-up (SD2x, SVC)	150
	Field Weakening (SD2x, SVC)	152
	Winding Detection (SD2x, SVC)	153
10.10.3	Controller Parameters for HSBLOCK / FPAM Operation	155
	Speed Reference Values (SD2x, HSBLOCK / FPAM)	155
	Variable Ramps (SD2x, HSBLOCK / FPAM)	158
	Speed Controller (SD2x, HSBLOCK / FPAM)	160
	Current Reference Filter (SD2x, HSBLOCK / FPAM)	161
	Current Controller (SD2x, HSBLOCK / FPAM)	162
	Start-up (SD2x, HSBLOCK / FPAM)	163
	Winding Detection (SD2x, HSBLOCK / FPAM)	165
10.10.4	Controller Parameters for HSPWM Operation	166
	Speed Reference Values (SD2x, HSPWM)	166
	Variable Ramps (SD2x, HSPWM)	170
	Speed Controller (SD2x, HSPWM)	171
	Current Controller (SD2x, HSPWM)	172
	Flux Controller (SD2x, HSPWM)	174
	Flux Reference Value (SD2x, HSPWM)	175
	Compensation (SD2xHSPWM)	175
	Vibration Absorption (SD2x, HSPWM)	176
	Winding Detection (SD2x, HSPWM)	177
10.10.5	Controller Parameters for HSPAM / VF Operation	178
	Speed Reference Values (SD2x, HSPAM / VF)	179
	Variable Ramps (SD2x, HSPAM / VF)	182
	Current Controller (SD2x, HSPAM / VF)	183
	V/f Characteristic Curve (SD2xHSPAM / VF)	186
	Speed Controller (SD2x, HSPAM / VF)	187
	Compensation (SD2xHSPAM / VF)	188
	Winding Detection (SD2x, HSPAM / VF)	189
11	Parameters of an FC2	191
11.1	Configuration	191
11.1.1	Drive	192
	Drive Selection (FC2)	192
	Drive Function (FC2)	193
	Identification (FC2)	193
	Parameter Set (FC2)	193
11.1.2	Power supply unit	194
	Mains (FC2)	194
	Power (FC2)	195
	Internal Ballast Resistor (FC2)	195

11.1.3 Power Output Stage 196
Currents (FC2) 196
DC Link (FC2) 197
Shutdown Temperatures (FC2) 197
Choke (FC2) 197
11.1.4 Drive Control 198
Operating Mode of the Drive (FC2) 198
Control (FC2) 198
Behavior in Case of (FC2) 199
11.2 Analog Signals 200
11.2.1 Analog Inputs 200
Analog In (FC2) 200
11.2.2 Analog Outputs 201
Analog Out (FC2) 202
11.3 Digital Signals 202
11.3.1 Digital Inputs 203
Digital In (FC2) 203
11.3.2 Digital Outputs 204
Digital Out (FC2) 204
11.4 Motor Configuration 1 /2 204
11.4.1 Motor Parameters 205
Motor File (FC2) 205
Motor Type (FC2) 205
Motor Parameters for Rotary Asynchronous Motors (FC2) 206
11.4.2 Motor Measurement System 207
Motor Measurement System (FC2) 208
Pulse Generator (FC2) 208
Error E31 - 'Speed error/Slip' (FC2) 209
11.4.3 V/f Characteristic Curve 209
V/f Characteristic Curve (FC2) 210
11.4.4 Messages 210
Message Load Limit (FC2) 210
Message Reference Value (FC2) 211
Message Temperature Monitoring (FC2) 211
11.4.5 Holding Function 212
Holding Function (FC2) 212
11.4.6 Speed Reference Values 214
Speed Reference Values (FC2,) 214
11.4.7 Compensation 217
Compensation (FC2) 217

12 Diagnosis 219
12.1 Actual Values (PS2) 220
12.2 Drive Actual Values (SD2x) 221
12.3 Drive Actual Values (FC2) 222
12.4 Errors and Warnings 223
12.5 Error Memory 224
12.6 Position Measurement Systems 225
12.7 Inputs / Outputs (PS2) 226
12.8 Digital Inputs 227
12.9 Digital Outputs 228
12.10 Sine-Cosine Display 229
12.11 Delta Z Measurement 229
12.12 Analog Inputs 230
12.13 Analog Outputs 231
12.14 Spindle Select (FC2) 232

12.15 Spindle Actual Values (FC2) 233
12.16 SERVOLINK 4 Monitor 233
12.16.1 Configuration 234
12.16.2 Reference values 235
12.16.3 Actual Values 236
12.17 CAN Bus Monitor 236
12.18 DNC Bus Monitor 237
12.19 Object Browser 238
12.20 Type Plate (PS2) 241
12.21 Version Information 242

13 Tools 245
13.1 Oscar 245
13.1.1 Menu Description 245
13.1.1.1 Menu “File” 246
13.1.1.2 Menu “View” 246
13.1.1.3 Menu “Communication” 247
13.1.1.4 Menu “Help” 248
13.1.2 Curve Selection 248
13.1.3 Cursor 249
13.1.4 Trigger "Parameter" 249
13.1.5 Start / Stop 250
13.1.6 Curve Display 250
13.1.7 Status Bar 251
13.2 *drive-setup-tool* 251
13.2.1 Action 252
13.2.2 Menu Description 253
13.2.3 Actual Values and Parameters 254
13.2.3.1 Actual drive values 254
13.2.3.2 Position Controller 254
13.2.3.3 Velocity Controller 255
13.2.3.4 Current feed forward 255
13.2.3.5 Current Reference Filters 255
13.2.3.6 Current Controller 256
13.2.3.7 Flux controller 256
13.2.3.8 Load Compensation 256
13.2.3.9 Settings 256
13.2.4 Function 257
13.2.4.1 Velocity - absolute values 257
13.2.4.2 Velocity - reversing function 257
13.2.4.3 Velocity - pushing 258
13.2.4.4 Current - absolute values 258
13.2.4.5 Current - DC resolver offset 259
13.2.4.6 Current - AC frequency 259
13.3 *converter-setup-tool* 259
13.3.1 Control 260
13.3.2 Menu Description 262
13.3.3 Motor Selection 262
13.3.4 Actual Values 263
13.3.5 Reference values 263
13.4 Motor Analyzer 264
13.4.1 Operating Point 265
13.4.2 Current Waveform 265
13.4.3 Characteristics (Electrical) 266

13.4.4 Characteristics (Mechanical) ... 267
13.4.5 Pointer Diagram ... 267
13.5 *spindle-service-tool* ... 268
13.5.1 Action ... 269
13.5.2 Menu Description ... 270
13.5.3 Create/Save Running-in Cycle ... 270
13.5.4 Create Log File ... 271
13.5.5 Define Limit Values ... 272
13.5.6 Running-in the Spindle ... 272
13.6 *comparer* ... 274
13.7 SDx Datalogger ... 275
13.8 *hiper-endat-tool* ... 276

14 Working with Projects ... 279
14.1 Project Files and Project Paths ... 279
14.2 Saving a Project ... 281
14.3 Reading a Project ... 281
14.4 Writing a Project ... 281
14.5 Creating a New Project ... 282
14.5.1 Project Wizard ... 282
14.5.1.1 Select Project ... 282
14.5.1.2 Edit Devices ... 283

15 Communication ... 287
15.1 Applications and Server ... 287
15.1.1 USB Communication Server ... 288
15.1.1.1 Main Window ... 288
15.1.1.2 Menu Description ... 289
15.1.1.3 Diagnosis ... 290
15.1.2 Serial Communication Server ... 291
15.1.2.1 Main Window ... 291
15.1.2.2 Menu Description ... 292
15.1.2.3 Diagnosis ... 293
15.2 Addressing the Devices ... 294
15.3 Communication with a Local PC via USB ... 295
15.3.1 Hardware Configuration ... 295
15.3.2 Software Configuration ... 297
15.4 Communication with a Local PC via RS232/RS485 ... 298
15.4.1 Hardware Configuration ... 298
15.4.2 Software Configuration ... 300
15.5 Network Communication via Remote PC ... 301
15.5.1 Preparation of the Remote PC for Network Operation ... 301
15.5.1.1 Allow Network Access ... 301
15.5.1.2 Start the Communication Server ... 302
15.5.2 Preparation of the Application PC for Network Operation ... 302
15.5.3 Communication with a Remote PC via USB ... 302
15.5.3.1 Hardware Configuration ... 303
15.5.3.2 Software Configuration ... 303
15.5.4 Communication with a Remote PC via RS232/RS485 ... 304
15.5.4.1 Hardware Configuration ... 304
15.5.4.2 Software Configuration ... 305

16 Appendix ... 307

16.A Troubleshooting ... 307
16.A.1 Driver Installation and Security Programs ... 307
16.A.2 Using the Software with Restricted Rights ... 307
16.B FAQ ... 311

17 Index: Parameters ... 313

18 Index ... 317

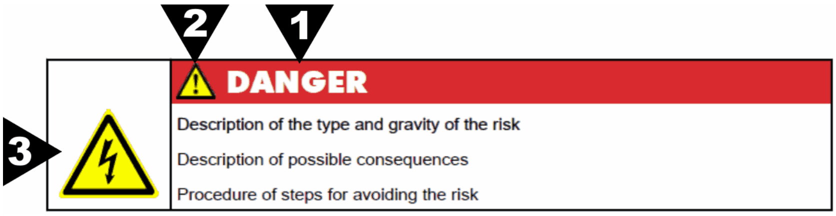
1 About this Manual

This chapter descirbes symbols, signal words and abbreviations used in this manual.

More documentation can be downloaded from the SIEB & MEYER website under http://www.sieb-meyer.de/downloads.html.

1.1 Illustration of Warnings

Depending on their degree of risk, warnings are classified into different levels. In the manual, the different levels and types of dangers are represented as follows:



[1] Risk level (signal word/warning color)
Classification of the risk

[2] Safety symbol
Risk of injury

[3] Risk symbol
Graphic representation of the source of risk

Risk levels

Risk Level	Description
DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage.
NOTICE	Indicates a hazardous situation which, if not avoided, may result in property damage.

Risk symbols

Risk symbol	Description
	General hazardous situation
	Risk of injury due to electric shock
	Risk of injury due to hot surfaces

Risk symbol	Description
	Potentially risk of injury when working on machines with open covers/ doors
	Risk of injury due to flying objects
	Destruction risk of electrostatically sensitive components
	Risk of property damage

1.2 Illustration of General Notices

Symbol	Description
	Hint with additional, further information
	Tip with suggestions and useful information

1.3 Abbreviations

FPAM	flux pulse amplitude modulation
HSBLOCK	high-speed **block** commutation
HSPAM	high-speed pulse amplitude modulation
HSPWM	high-speed pulse width modulation
n.c.	not connected
PAM	pulse amplitude modulation
PWM	pulse width modulation
SERVO	servo control
SFM	safety function: Safe Frequency Monitor
SLOF	safety function: Safe Limited Output Frequency
STO	safety function: Safe Torque Off
SVC	sensorless vector control
VF	V/f Characteristic Curve
VCC	voltage at the common collector
VECTOR	vector control

2 General Information

This manual describes version 1.19 of the software *drivemaster2*.

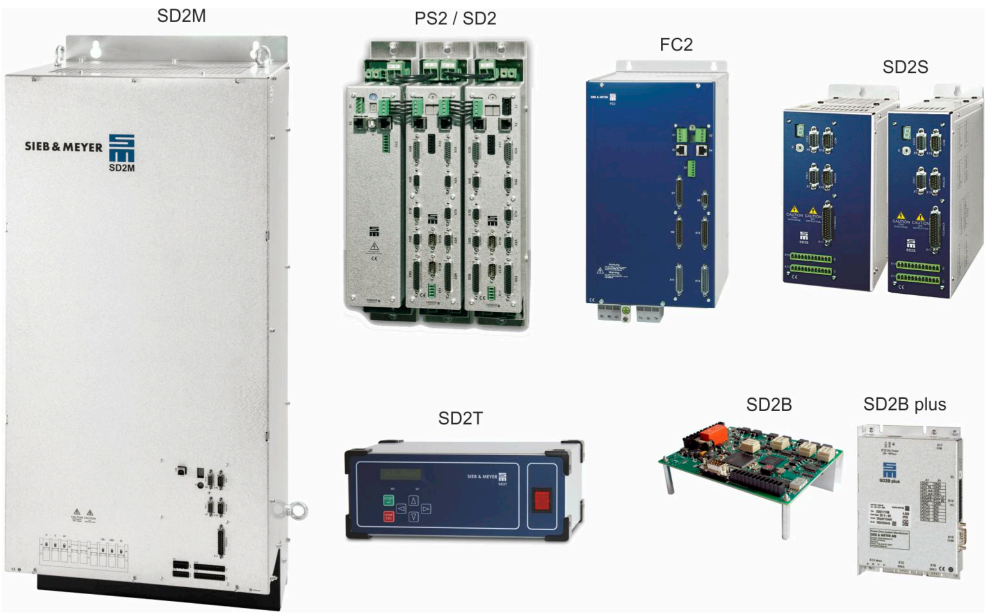
This manual will give you basic knowledge of the functions and how to use the operating software *drivemaster2* with a SIEB & MEYER drive. You find a list comprising all drives compatible to the software in section 2.1 "*drivemaster2* Applications", page 15. The software allows to enter and change the performance parameters of the device in a systematical and clear way. In addition the functions for error diagnosis and application are described. Any made settings have an immediate effect on the operation of the drive. Besides the software provides different tools, which will help you to put the drive into operation, set its parameters and analyze its performance. Further information on the hardware of the individual drive is to find in the technical manual for this drive.

Read the hardware documentation of your device and pay attention to the safety instructions.

2.1 *drivemaster2* Applications

You can configure the following devices using the software *drivemaster2*:

Device type	Device	Device designation
Drive amplifier SD2x	SD2	036211X / 036213X / 036231X
	SD2B / SD2B plus	036217X
	SD2M	036228X
	SD2S	036212X / 036214X / 036224X
	SD2T	036216X
	SD2x customized	03698XX
Power supply unit	PS2	036219X
Frequency converter	FC2	02190XXX / 02192XXX



3 Installation

This chapter contains the following information:

- list with the hardware requirements to be met by the PC
- information on how to install and uninstall the software *drivemaster2*
- information on how to install the USB driver

Install the software *drivemaster2* before connecting a device to the PC.

3.1 PC Hardware Requirements

The PC hardware to which the software will be installed must meet the following requirements:

Processor	Pentium 3 or higher, 1 GHz
Operating system	Windows Vista or higher (32/64 bit), Windows XP up to software version 1.18.000
Graphics card	Windows compatible, SVGA resolution, Color
Hard disc	free memory size at least 500 Mbyte
Main storage	at least 1 GByte
Interfaces	a free serial interface (COM) or a USB port

3.2 Install *drivemaster2*

If there are any applications from the software package *drivemaster2* installed on the PC, you must close these before starting the installation.

These are the applications *drivemaster2*, communication server, *drive-setup-tool*, *converter-setup-tool*, *hiper-endat-tool*, SDx Datalogger and Oscar.

You need administrator rights to install the software.

Take the following steps to install *drivemaster2*:

➩ **Installation from Internet:** Download the latest version of the software *drivemaster2* from the Internet. This is located in the download directory of the SIEB & MEYER web page under www.sieb-meyer.de. (Please use the guest login.)
➩ Start the installation: Double-click on the executable file drivemaster2_V_x_x_xxx.exe.
➩ Choose a destination directory (folder).

Windows 7 or higher: You should not select the default path C:\Programs because this can cause problems with user rights.

➩ Click on the button “Install” to start the installation.
✓ When the installation was successful, the installation program has created the program group SIEB & MEYER AG in the start menu.

3.3 Uninstall *drivemaster2*

Before uninstalling the software close all applications from the software package *drivemaster2*.

Proceed as follows to uninstall the software *drivemaster2*:

- In the start menu of your PC select “Programs → SIEB & MEYER AG → drive-master2”.
- Click on the entry “Uninstall drivemaster2” to start the uninstall wizard.
- Follow the steps in the wizard until the uninstall process is finished.

Additional files that have been saved after installation in the directories of the software are also deleted by the uninstall program, i.e. these files become lost. If additional files have been saved in a **newly** created directory in the installation path, these files will not be removed by the uninstall program. If necessary, these files must be deleted manually.

3.4 USB Driver Installation

The USB driver is automatically copied when the Windows software is installed. The installation of the USB driver is automatically started by the Windows operating system as soon as a device is connected to a USB port of the computer.

You need administrator rights to install the USB driver.

The following dialog window appears when you connect the device to the USB port:

Fig. 1: Dialog window "Found New Hardware Wizard"

- Select the option “No, not this time”, because a connection with the Windows Update server is not necessary for the installation. Click “Next” to confirm.
  Then the USB hardware will be detected. USB>RS232/485 Converter 050201 is detected with the name "LibUsb-Win32 SM2 TUSB1340 FirmwareLoader" and installed.

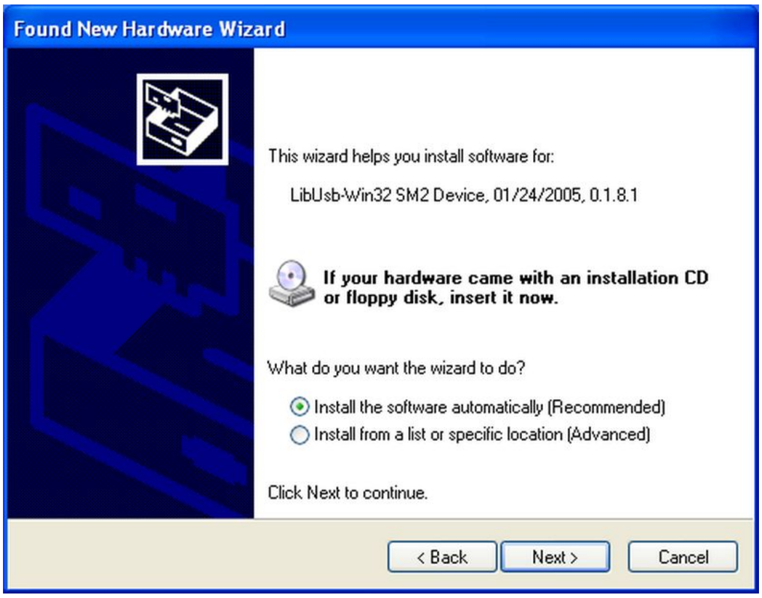


Fig. 2: Dialog window "Found New Hardware Wizard"

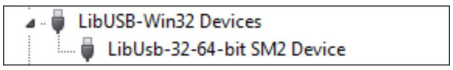
- Select “Install the software automatically (Recommended)” and click “Next”. The driver is now installed.
- Click “Finish” to finish the installation.

The installation process must be repeated for every USB port. Besides, the driver must be installed again, if you modify the structure of the USB tree, e.g. by using a USB hub.

3.4.1 USB Driver – Troubleshooting

If the USB connection to the drive can not be established, the USB driver installation was possibly not successful. In order to check the driver installation, start Device Manger on your PC (e.g. execute the file devmgmt.msc).

When the installation was successful, the Device Manager tool of the Windows operating system displays the drive as LibUSB device as shown in the figure.



3.4.1.1 LibUSB Device Not Detected

If the drive is not indicated in Device Manager as shown in the figure above but appears by means of a question mark under the item “Other devices”, it has not been detected properly. This can occur when the device has been connected to the PC before the software *drivemaster2* was installed on it for the first time. Proceed as described in the following:

- Check the driver installation by disconnecting the USB connector from the PC for a few seconds. Then reconnect the USB connector. Now, the PC repeats the USB driver installation.
  If the drive ist still not displayed correctly in Device Manager, take the following steps.
- Right-click on the question mark under “Other Devices” in the Device Manager and select “Uninstall”.

- ➪ Then right-click on “Other Devices” and select “Scan for hardware changes”. Now, the USB driver is installed again. Proceed as described in section 3.4 "USB Driver Installation", page 18.

3.4.1.2 Wrong USB Driver Loaded

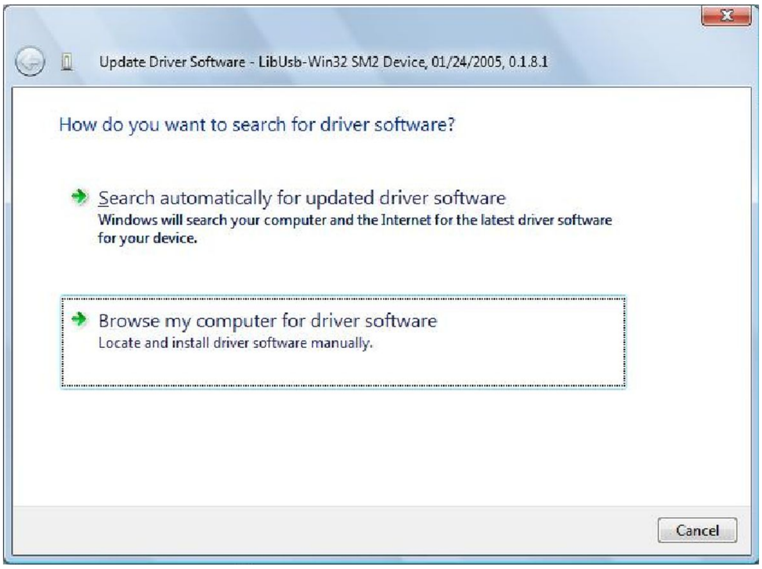
If there is more than one USB driver installed on the PC, Windows might not detect the drive and another USB driver is loaded.

Symptoms of the problem:

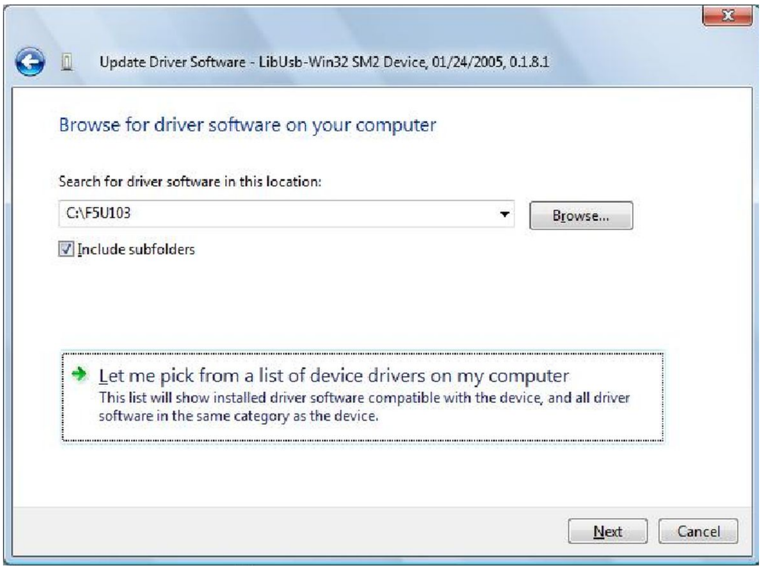
- the drive is properly connected to the PC/laptop via USB (display must be on).
- The USB driver displayed in the taskbar on the bottom right indicates 0 (0).

Change the driver for the drive as follows:

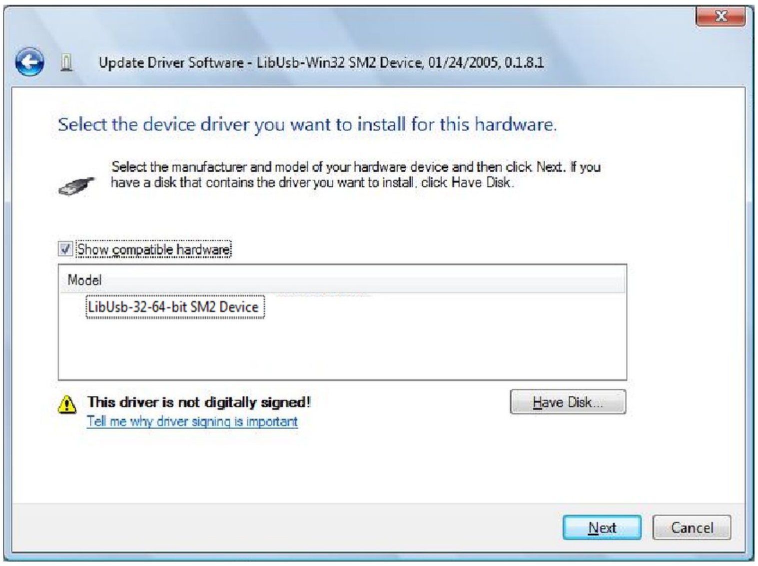
- ➪ Connect the drive via USB to the PC.
- ➪ Search for the loaded driver in Device Manager. The driver appears the moment the USB cable is connected.
- ➪ Right-click on the 'wrong' driver and select “Update driver software...” in the context menu.
- ➪ The following dialog appears. Click on the button “Browse my computer for driver software”.



➪ In the following dialog window click on the button "Let me pick from a list of device drivers on my computer".



➪ Select "LibUsb-Win32 SM2 TUSB1340 FirmwareLoader" in the following dialog window and click "Next".
At this point error messages may appear but you can ignore these.



➪ Restart the drive now. For that purpose you can simply unplug the USB connector for a few seconds. The USB driver should be loaded properly now.

4 Device Connection to PC

The following instructions describe how to connect the different devices to the PC, on which the software *drivemaster2* is installed.

Further information on serial and USB communication as well as the connection and addressing of several devices is to find in chapter 15 "Communication", page 287.

4.1 Connection of PS2 and SD2

4

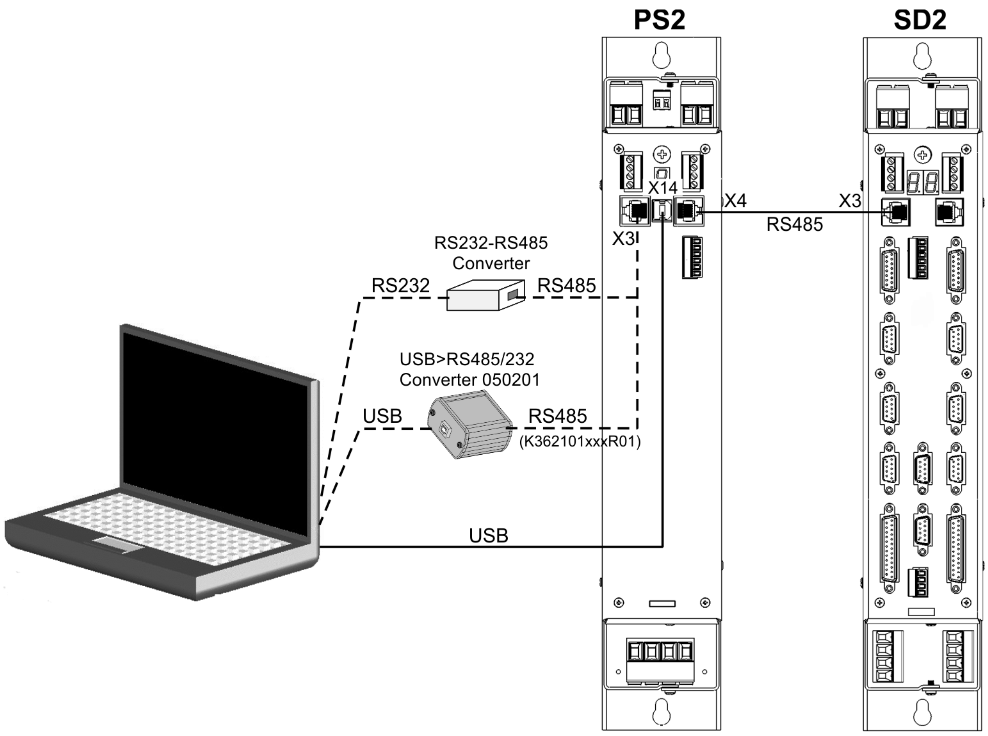


Fig. 3: Possible connections between PC, PS2 and SD2

- Connect the power supply unit PS2 to the PC:
  - Via USB cable: Connect the USB cable between the female connector X14 of the PS2 and a USB port of the PC.
  - Via USB>RS232/485 Converter 050201: Connect the SIEB & MEYER USB>RS232/485 converter to the female connector X3 of the PS2 and to a USB port of the PC.
  - Via RS232 to RS485 converter: Connect a commercially available RS232 to RS485 converter to the female connector X3 of the PS2 and to the serial interface of the PC.

  The pin assignment of the RS485 cable is described in “Drive System SD2 Hardware Description” .

- Connect the power supply unit PS2 (female connector X4) via a standard Ethernet patch cable to the first drive amplifier SD2 (female connector X3).

4.2 Connection of Double-axis Compact Device SD2

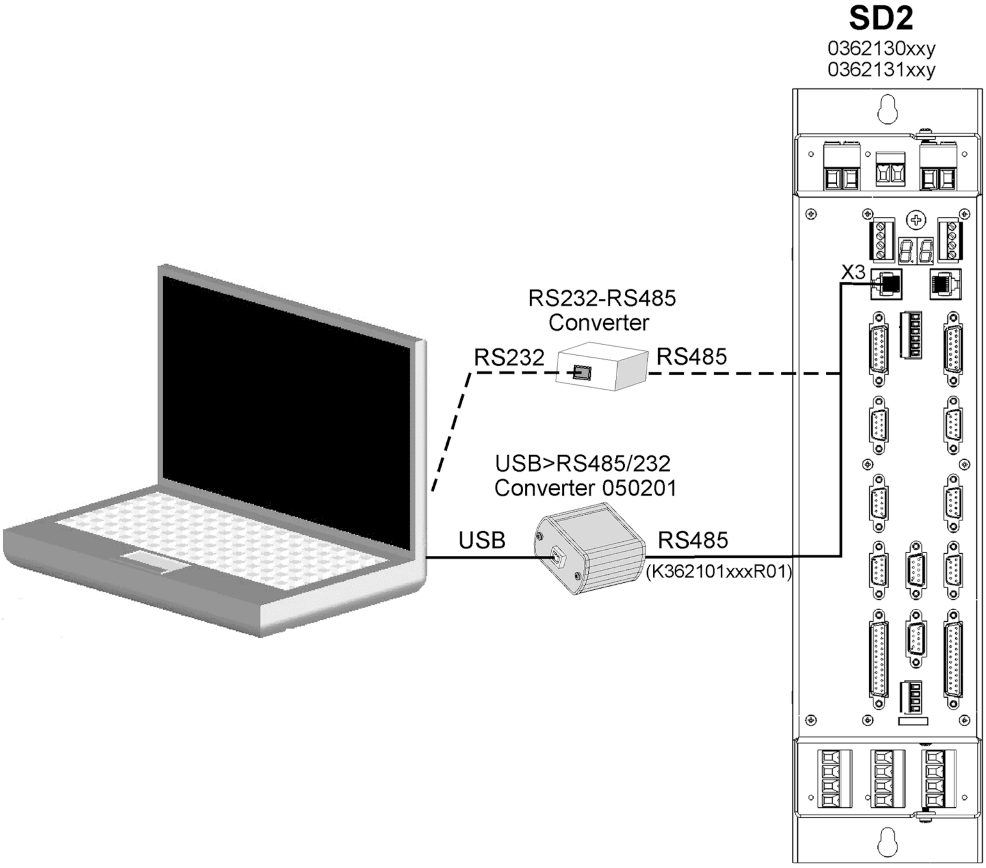


Fig. 4: Possible connections between PC and SD2 (036213X)

➪ Connect the drive amplifier SD2 (036213X) to the PC:
- Via USB>RS232/485 Converter 050201: Connect the SIEB & MEYER USB>RS232/485 converter to the female connector X3 of the SD2 and to a USB port of the PC.
- Via RS232 to RS485 converter: Connect a commercially available RS232 to RS485 converter to the female connector X3 of the SD2 and to the serial interface of the PC.

☞ The pin assignment of the RS485 cable is described in “Drive System SD2 Hardware Description” .

4.3 Connection SD2B / SD2B plus

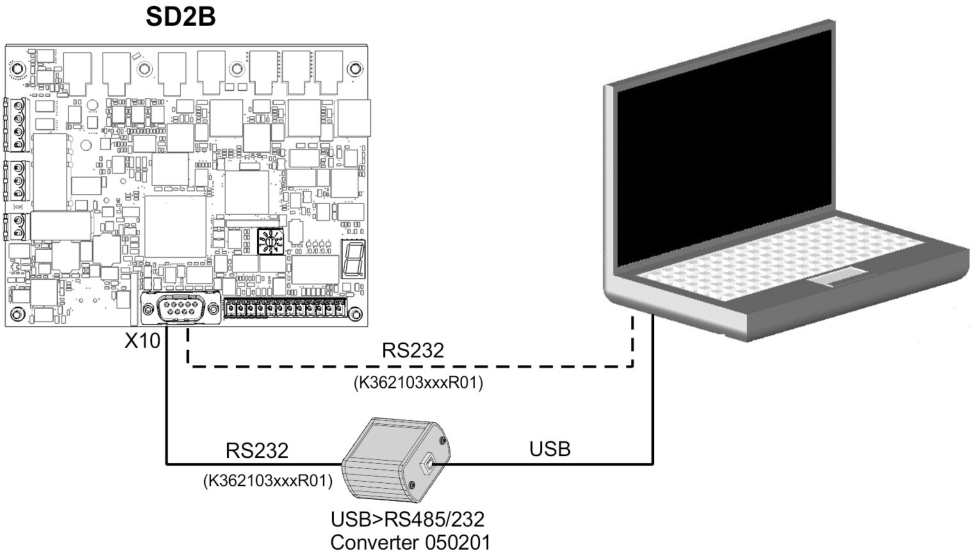


Fig. 5: Possible connections between PC and SD2B

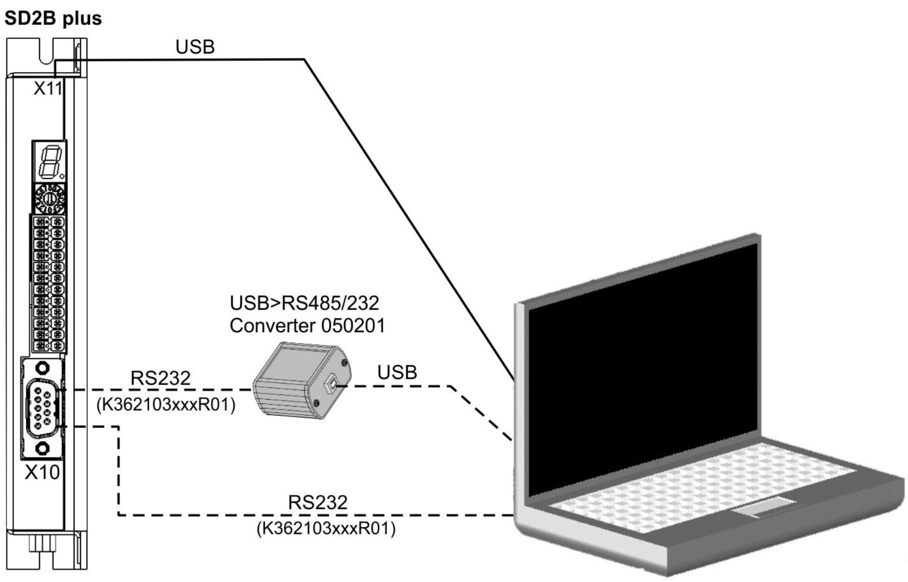


Fig. 6: Possible connections between PC and SD2B plus

➪ Connect the drive amplifier SD2B / SD2B plus to the PC:
- Via USB cable: (SD2B plus only): Connect the USB cable between the female connector X11 of SD2B plus and a USB port of the PC.
- Via USB>RS232/485 Converter 050201: Connect the SIEB & MEYER USB>RS232/485 converter to the female connector X10 of SD2B (plus) and to a USB port of the PC.
- Via RS232 cable: Connect the RS232 cable between the male connector X10 of SD2B (plus) and the serial interface of the PC.

☞ The pin assignment of the RS232 cable is described in “Drive System SD2B – Hardware Description” .

4.4 Connection of SD2M

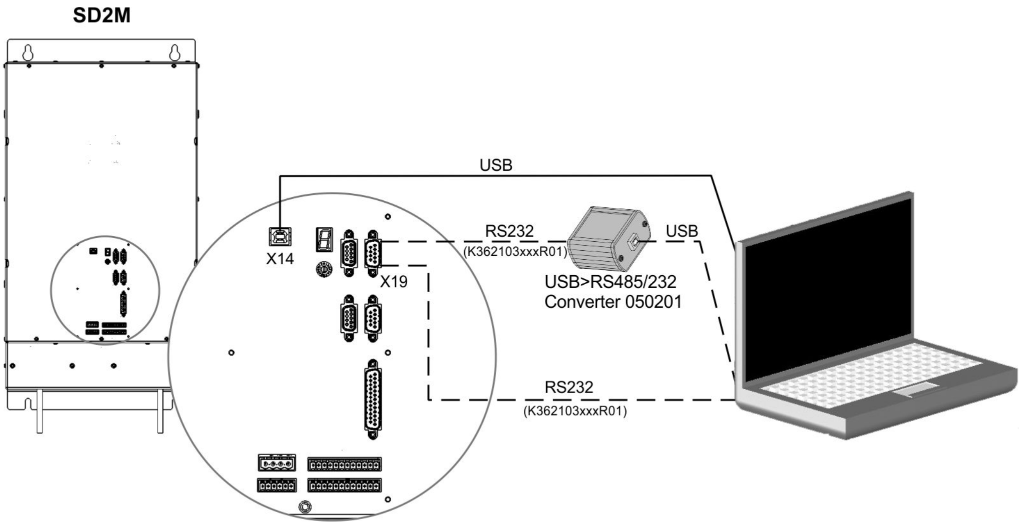


Fig. 7: Possible connections between PC and SD2M

➪ Connect the drive amplifier SD2M to the PC:

- Via USB cable: Connect the USB cable between the female connector X14 of SD2M and a USB port of the PC.
- Via USB>RS232/485 Converter 050201: Connect the SIEB & MEYERUSB>RS232/485 converter to the female connector X19 of the SD2Mand to a USB port of the PC.
- Via RS232 cable: Connect the RS232 cable between the male connector X19 of the SD2M and the serial interface of the PC.

☞ The pin assignment of the RS232 cable is described in “Drive System SD2M – Hardware Description” .

4.5 Connection of SD2S

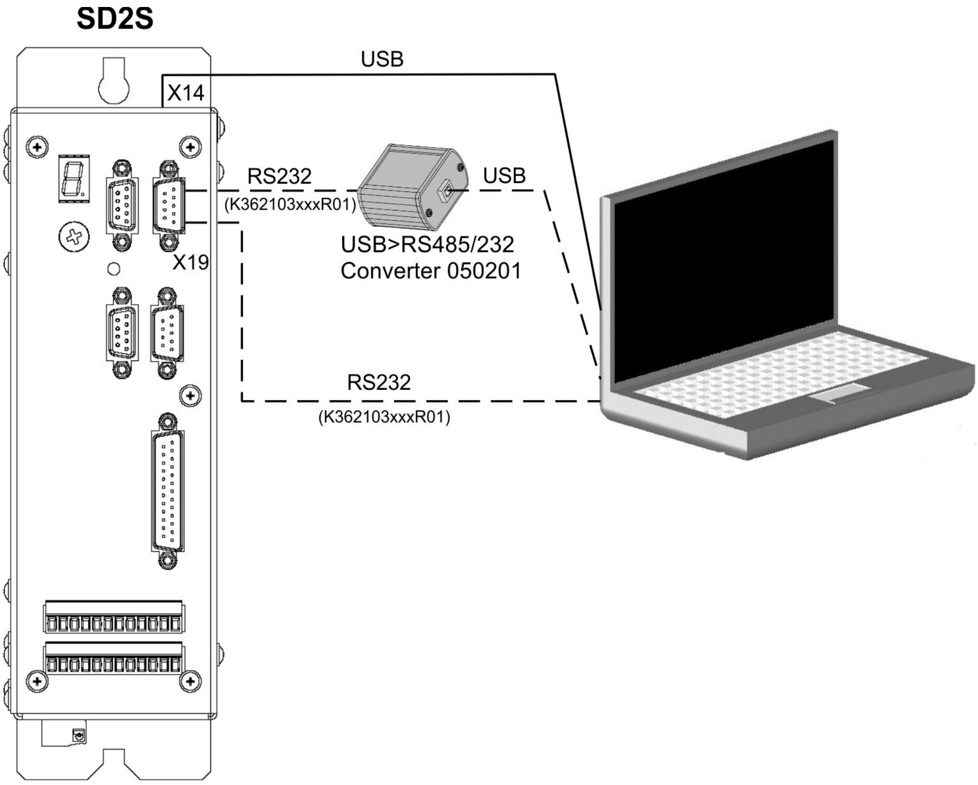


Fig. 8: Possible connections between PC and SD2S

- Connect the drive amplifier SD2S to the PC:
  - Via USB cable: Connect the USB cable between the female connector X14 of SD2S and a USB port of the PC.
  - Via USB>RS232/485 Converter 050201: Connect the SIEB & MEYERUSB>RS232/485 converter to the female connector X19 of the SD2Sand to a USB port of the PC.
  - Via RS232 cable: Connect the RS232 cable between the male connector X19 of the SD2S and the serial interface of the PC.

The pin assignment of the RS232 cable is described in “Drive System SD2S – Hardware Description” .

4.6 Connection of SD2T

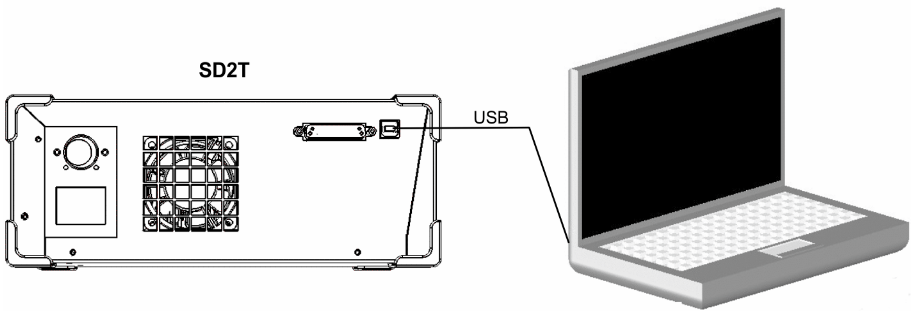


Fig. 9: Possible connections between PC and SD2T

➪ Connect the drive amplifier SD2T via a USB cable to the PC. For this purpose connect the USB cable between the female connector X14 of the SD2T and the USB port of the PC.

4.7 Connection FC2

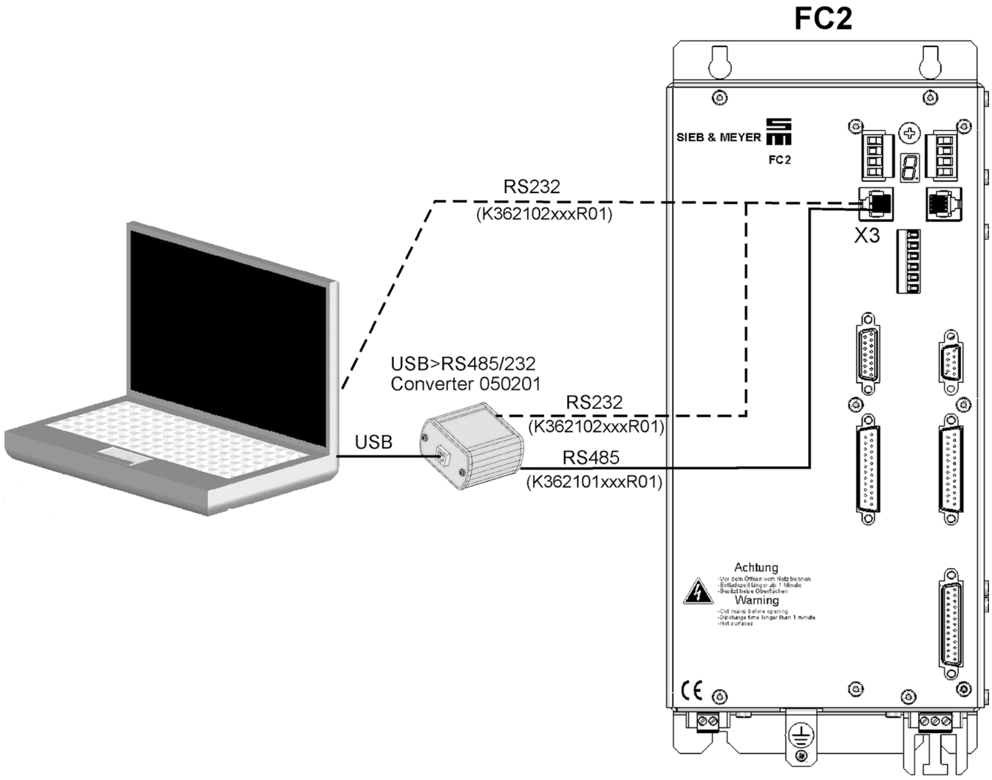


Fig. 10: Possible connections between PC and FC2

➪ Connect the frequency converter FC2 to the PC:
- Via USB>RS232/485 Converter 050201: Connect the SIEB & MEYER USB>RS232/485 converter to the female connector X3 of the FC2 and to a USB port of the PC.
- Via RS232 cable: Connect the RS232 cable between the female connector X3 of the FC2 and the serial interface of the PC.

☞ The pin assignment of the RS232 or RS485 cable is described in the documentation “FC2 Frequency Converter for Asynchronous Motors – Hardware Description”.

5 Description of the User Interface

The operation of the software *drivemaster2* corresponds to the Windows conventions. The software can be operated with the keyboard, but operation via the mouse is easier.

5.1 General Operating Instructions for *drivemaster2*

The following instructions shall help you using the software.

- Input fields currently edited are displayed with a green background. Press the enter key to apply your entries.
- When you hold the mouse pointer over an input field for a short time, the value range is displayed.
- Input fields with values outside the specified value range are displayed with a red background.
- When you change a parameter, the tab “Parameters” is highlighted in yellow color. This is reset as soon as the parameter set is saved or written into a device.

☞ When entering floating decimal numbers, use points instead of commas.

5.2 Screen Layout

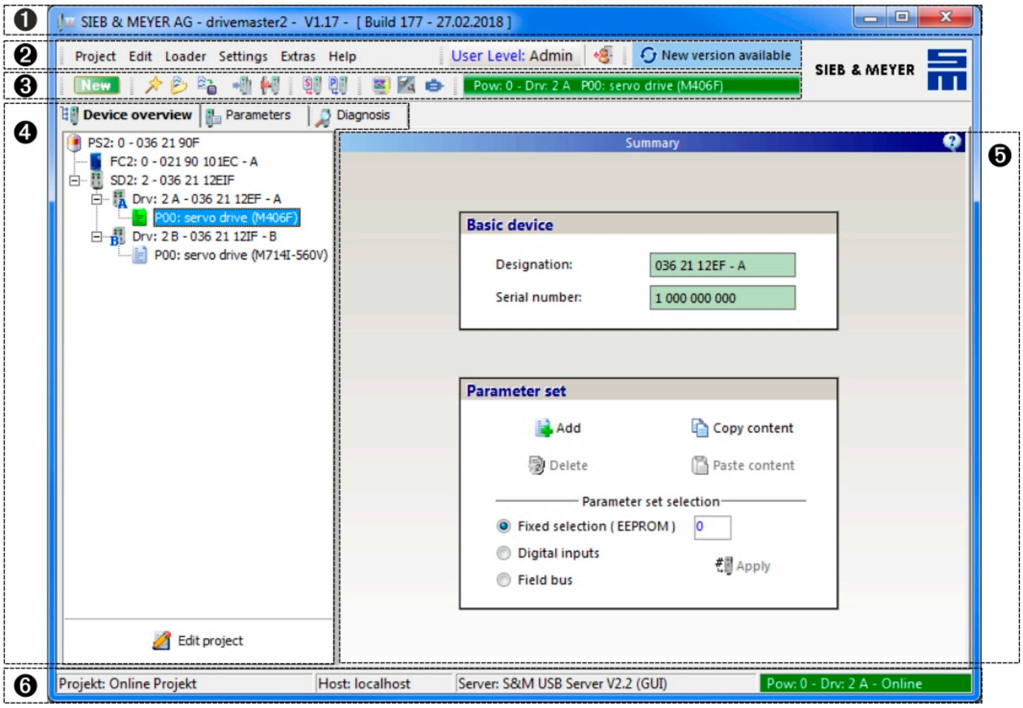


Fig. 11: Start page of the user interface

[1] Title bar
The title bar indicates the program name, the version number and the creation date of the software.

[2] Menu bar

The program menu looks similar to that of common Windows programs and provides all functions required for operating the software.

- User Level: Indicates the current user level (see page 43).
- New version available: Opens the update dialog (see page 40). This button is only displayed when a new software version of *drivemaster2* is available.

[3] Tool bar
Using the buttons here you can directly access frequently used functions of the program menu. When you move the mouse pointer over a button of the tool bar, a note indicating the function of this tool button is displayed for a short time.
The field to the right of the symbols indicates the parameter set currently in process.

[4] Tab pages
The tab pages structure the operating functions of the software for the used hardware thematically.
There is a directory tree in the tab page. The directory tree structures the content of the selected tab page in nodes and sub-branches. When you select a branch, the respective page is displayed in the display area [5].

- Edit project: Opens the project wizard. There you can edit the devices in the project (see page 283).

[5] Display area
Here the page selected on the tab page is displayed.

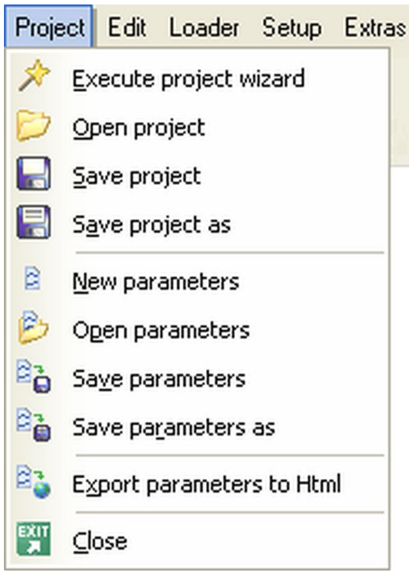
[6] Status bar
The status bar displays information on the program and project status:

- Project: name of the current project
  - **Online Project**: The project was created with the function “Searching for connected devices” and has not been saved under a new name yet.
  - **New project**: The project was created with the function “Create a new project” and has not been saved under a new name yet.
  - **"My project name"**: The name of an already saved project is displayed.
- Host: name or IP address of the PC running the communication server that is connected with the software *drivemaster2*
  - Here: “localhost”
- Server: name of the set communication server
  - Here: “S&M USB Server”.
- Status of communication: device address and communication status of the selected device
  - Communication address
    Pow: Address of the power supply unit
    Drv: Address of the drive
  - Communication status
    Green display: Online. The software is communicating with a device.
    Red display: Offline. Communicating with a device is not possible under the selected type of communication.
    Background without special coloring: offline. A project is edited file-based without device connection.

5.3 Menu Description

The program menu provides all project operations, a loader function for loading new system software or parameter sets into the hardware, optional settings of the program and the access to setup tools, parameter code and help.

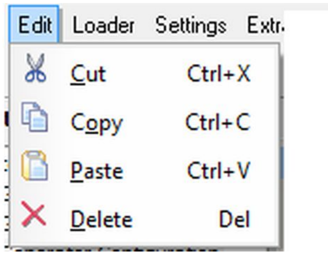
5.3.1 Menu “Project”



- Execute project wizard: Opens the project wizard. The project wizard allows creating a new project or editing the currently loaded project.
- Open project: A project is loaded from an existing file (file extension *.smp).
- Save project: Saves the current project under the selected file name. If the project has not been saved yet, the dialog “Save project as” appears.
- Save project as: Saves the current project in a new file. Select a target directory for the file and enter a new file name. The file is saved with the file extension *.smp.
- New parameters: Opens the parameter wizard. The parameter wizard helps you to create a new parameter set for the first parameterization of a device. The parameter wizard is opened only for the device that is selected in the device overview.
- Open parameters: Opens a saved parameter file for the device selected in the device overview and replaces the values in the current parameter set by the values in the parameter file.
- Save parameters: Saves the current parameters of the device selected in the device overview under the existing file name. If the parameter set has not been saved yet, the dialog “Save parameters as” appears.
- Save parameters as: Saves the current parameters of the selected device in a new file. Select a target directory for the file and enter a new file name. The file is saved with the file extension *.I36.
- Export parameters to HTML: Creates a new HTML file with the parameter set of the device selected in the device overview. Select a directory in which the HTML file is to be saved and enter a file name.
- Close: The program is closed.

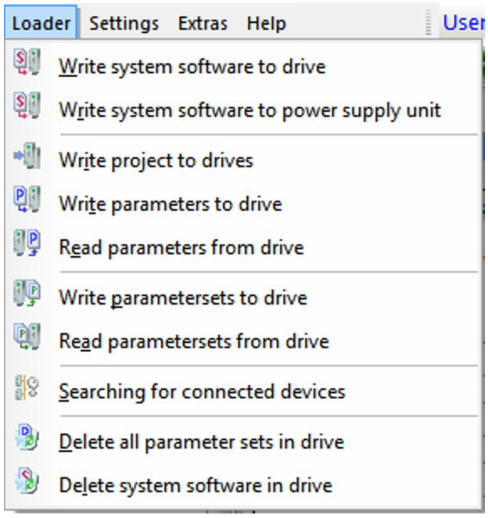
5.3.2 Menu "Edit"

- Cut: The marked value of a text field is cut from the text field and stored in the clipboard. Since open parameters are not allowed, a new value must be entered.
- Copy: The value of a text field is copied into the clipboard.
- Paste: The content of the clipboard is pasted into an input field, provided that it is a value.
- Delete: Deletes the selected part of an input field.

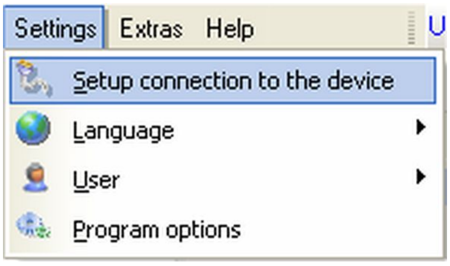


5.3.3 Menu “Loader”

- Write system software to drive: Writes a firmware file (*.X36) or a logic file (*.L36) into the selected drive. For further information refer to section 5.6 "Download New System Software", page 39.
- Write system software to power supply unit: Writes a new system software (*.PS2) into the connected power supply unit.
- Write project to drives: Writes all parameter sets of the current project into the devices.
- Write parameters to drive: Writes the current parameter set into the selected drive and saves it.
- Read parameters from drive: Reads the current parameter set from the selected drive.
- Write parameter sets to drive: Writes all parameter sets created for the selected drive into the device. This menu item is only displayed for devices that support the function multi parameters, page 64.
- Read parameter sets from drive: Reads all available parameter sets from the selected drive. This menu item is only displayed for devices that support the function multi parameters, page 64.
- Searching for connected devices: Searches for the devices connected to the PC.
- Delete all parameter sets in drive: Deletes the parameters or parameter sets of the selected drive.
- Delete system software in drive: Deletes the firmware or the logic programming of the selected drive.



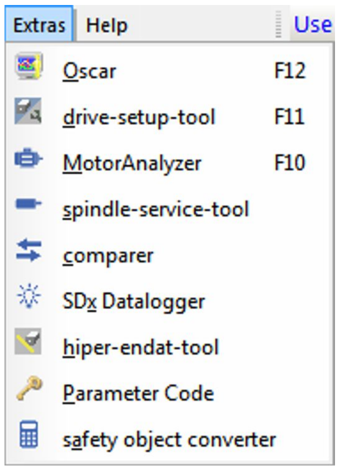
5.3.4 Menu “Settings”



- Setup connection to the device: Opens the dialog “Setup connection to the device” for setting the communication server.
- Language: Opens the language selection. The languages German and English are provided. The selected language is immediately active.
- User: Opens a dialog to log in or log out a user and to set the user level.
- Program options: Opens a dialog to make global settings for the units. For devices of the series FC2 this dialog allows defining the unit of the motor speed: Either as frequency in *hertz* or as speed in *revolutions per minute*. In addition you can set the unit of the currents for all devices here. Either they are indicated as RMS value (Arms) or as sine peak amplitude (A).

5.3.5 Menu “Extras”

The menu items displayed in the menu "Extras" depend on the device selected in the device overview. The following figure is an example of the menu “Extras” for an SD2x.

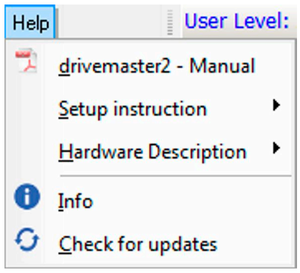


- Oscar: Opens the application Oscar in a new window. Oscaris a diagnosis tool to be used for recording values and displaying these as curves (see page 245).
- drive-setup-tool: Opens the application *drive-setup-tool* in a new window. *drive-setup-tool* is used for initial operation of a drive amplifier or operating a motor without higher-ranking control (see page 251).
- converter-setup-tool: Opens the application *converter-setup-tool* in a new window. *converter-setup-tool* is used for initial operation of a frequency converter or operating a motor without higher-ranking control (see page 259).
- Motor Analyzer: Opens the application Motor Analyzer in a new window. With Motor Analyzer users can simulate the operating points and the expectable ripple currents that result from the interaction of motors or spindles with the respective drive amplifier (see page 264).
- spindle-service-tool: Opens the application *spindle-service-tool* in a new window. *spindle-service-tool* allows an automated and monitored execution of spindle running-in cycles (see page 268).
- hiper-endat-tool: Opens the application *hiper-endat-tool* in a new window. *hiper-endat-tool* is used for diagnosis and parameterization of the absolute encoders Hiperface and EnDat (see page 276). Using the *hiper-endat-tool* is only possible, when a motor with an absolute encoder is connected.
- comparer: Opens the application *comparer* in a new window. With *comparer* users can compare two parameter files (see page 274).
- SDx Datalogger: Opens the application SDx Datalogger in a new window. Using the application SDx Datalogger up to four parameters can be recorded over a longer period of time (see page 275).
- Parameter Code: Opens a dialog window indicating the encrypted parameter code. A parameter code is provided for each parameter set. Via this code the

SIEB & MEYER service staff can read the according parameter set out or decode the passwords in case of an emergency (e.g. password loss).
- safety object converter: Opens the application *safety object converter* in a new window. *safety object converter* is only available for devices with the safety functions SFM and SLOF. Using this application users can trigger the communication with the safety controllers manually. For more information refer to the documentation “Drive System SD2 – Safety Functions SFM / SLOF”.

When one of the applications (except Parameter Code) is started, it communicates with the device currently selected in the device overview. If another device is selected in the device overview, the new address will not be sent to the application. In this case the application must be closed and restarted.

5.3.6 Menu “Help”



- drivemaster2 - Manual: Opens the user manual for the software *drivemaster2* as PDF file.
- Setup instruction: Displays the available setup instructions for the different drive functions. These are stored as PDF files. You can open the desired manual with one click.
- Hardware description: Displays the available hardware descriptions for the different devices. These are stored as PDF files. You can open the desired manual with one click.
- Info: Displays version information of the software and the contact address of SIEB & MEYER
- Check for updates: Opens the dialog “Check for updates” to download an update for the software *drivemaster2* directly from the SIEB & MEYER web page. For further information refer to section 5.7 "Update of the Software *drivemaster2*", page 40.

5.4 Program Start

The software *drivemaster2* is started via the Windows start menu “Programs → SIEB & MEYER AG → drivemaster2”. The welcome screen appears as long as the program is initialized.

Then a dialog window appears asking the user for the first working step:

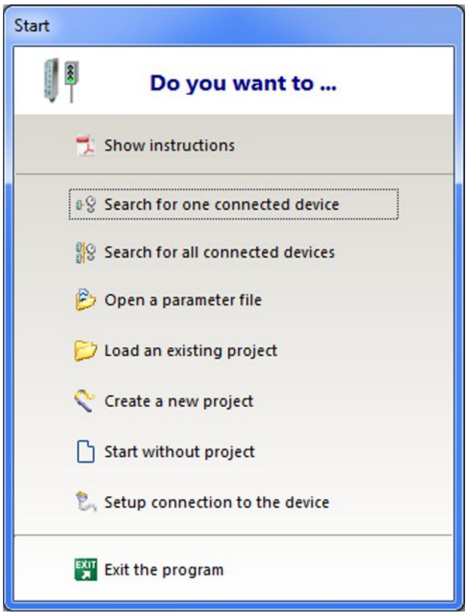


Fig. 12: Dialog window “Start”

The following options are available:
- Show instructions: Provides a selection of PDF documents about the initial operation and the hardware of the individual devices. Click on the desired document to open it.
- Search for one connected device: Searches the address range for one addressable device. As soon as the device is found, it is displayed in the user interface and a so-called online project is created.
- Search for all connected devices: Searches for addressable devices in the complete address range and creates a so-called online project.
- Open a parameter file: Opens a parameter file of a drive that is already saved in the file system of the PC. Then, this file can be edited offline.
- Load an existing project: Loads an already existing project that can be edited in the offline mode.
- Create a new project: Creates a new project by means of the project wizard that can be edited in the offline mode.
- Start without project: Opens the software *drivemaster2* without a project. This way the user can make some settings without creating a project beforehand, e.g. loading firmware into a power supply unit.
- Setup connection to the device: Opens the dialog for setting the communication server. “After the program installation the USB server is set as default server for the communication.”
- Exit the program: Closes the software *drivemaster2*.

5.5 Online / Offline Mode

The software *drivemaster2* offers two operating modes: online and offline mode.

When the online mode is active, the software is permanently connected to the device selected in the device overview. Changed parameter sets can be loaded directly into the connected devices. In the online mode the tab page “Diagnosis” offers assistance for analyzing the behavior of the device.

The offline mode, however, only works on the basis of files. The tab page “Diagnosis” is not provided in the offline mode.

5.5.1 The Online Mode

The online mode is probably the most commonly used working mode for the software *drivemaster2*. When the user activates the function “Searching for connected devices”, the software automatically works in the online mode.

5.5.1.1 Searching for Connected Devices

In order to work in the online mode, select the option “Searching for connected devices” after program start. The corresponding dialog is displayed. Later you can switch into the online mode via the menu “Loader → Searching for connected devices”.

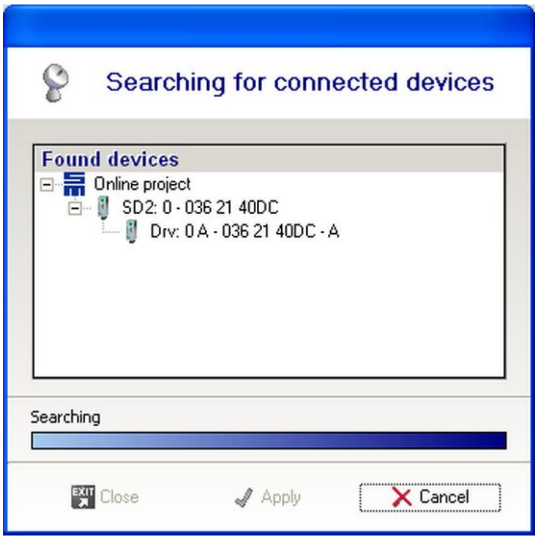


Fig. 13: Dialog window “Searching for connected devices”

When the dialog is opened, the software starts immediately to search for addressable devices in the complete address range. The software searches for every power supply address in the address range of the drive addresses from 0 to 31. During the search all addressable devices are already arranged in an online project and listed in a tree-type structure in the window “Found devices”. The progress bar below indicates the progress of the device address scan.

The following buttons can be selected:
- Cancel / New search: This button has two functions. A currently running search can be canceled. Then the “Cancel” button is renamed in “New search” and the device search can be restarted.
- Apply: Closes the dialog. All found devices are applied to the software and form a new online project. A previously opened project will be overwritten.
- Close: Closes the dialog and the search result is not applied. The former project is kept.

5.5.1.2 Online Monitoring

When the online mode is active the software *drivemaster2* permanently monitors the device selected in the device overview (so-called "online monitoring").

The online monitoring sets the device status in the status bar to “online” or “offline”.

The following values are read out for instance:
- CRC check sum of the parameter set

- serial number of the device
- identification of the device

If one or several values are changed in the background, e.g. by a higher-ranking control, a message appears saying that the parameter set does not match the parameter set in the device. In this case the parameter set from the device will be uploaded automatically.

This function has been implemented to ensure that during online operation the parameter set in the software is identical to the parameter set in the device.

5.5.1.3 Changing a Parameter Set

You can change parameters also during online operation. Any modification of parameters in the software must be sent to the device via the menu “Loader → Write parameters to drive”.

You can also click on the symbol in the tool bar.

If you have changed more than one parameter set for the connected device (see multi parameters, page 64), you can download all changes into the drive at once via the menu “Loader → Write parameter sets to drive”.

If the modified parameter set is not transmitted to the device, the following dialog will appear in the moment another device is selected in the device overview:

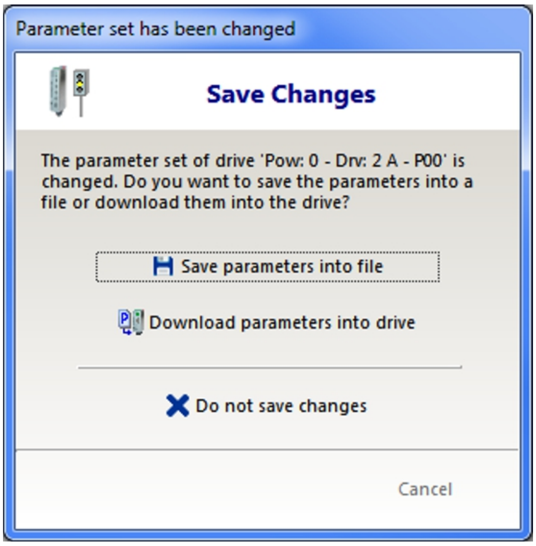


Fig. 14: Dialog window “Save changes”

The following options are available:

- Save parameters into file: Saves the modified parameter set in a file. Then, the device is changed.
- Download parameters into drive: Loads the changed parameter set into the corresponding drive. Then, the device is changed.
- Do not save changes: The changes are not saved and not written into the device. They remain, however, in the user interface. Then, the device is changed.

If the user selects another device in the device overview, whose parameter set has been modified in the software but not saved, the software will detect inconsistencies with the online device.

The following dialog appears:

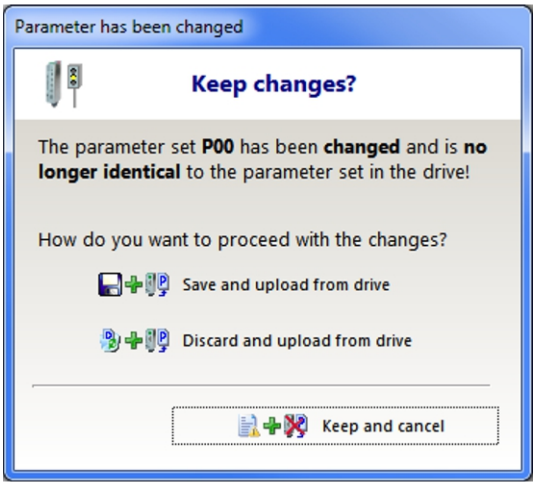


Fig. 15: Dialog window “Keep changes?”

The following options are available:

- Save and upload from drive: The changes are saved in a file. Then, the parameter set is loaded from the target device and applied to the user interface.
- Discard and upload from drive: The changes are not saved. Then, the parameter set is loaded from the target device and applied to the user interface.
- Keep and cancel: The changes are not saved, but remain in the user interface for the target device. The parameter set is not read from the target device.

5.5.1.4 Switching into the Offline Mode

When you have finished all changes in the parameter sets of the project currently loaded in the *drivemaster2* software, you can switch into the offline mode for safety reasons.

By click on the offline symbol the software switches into the offline mode. Consequently the online monitoring and the diagnosis pages are deactivated.

5.5.2 The Offline Mode

In the offline mode you can create a project without device connection and prepare it for later use as online project.

To check or compare parameter sets an already existing project can be opened. This way the user can access all devices and parameters, whereas it does not matter whether the system is connected to a machine.

The software *drivemaster2* works automatically in the offline mode when a project is created or opened after the program was started. This status is displayed by a colorless display in the status bar. The online monitoring is not active in this mode. The parameters of a single parameter set can be edited.

5.5.2.1 Switching to the Online Mode

The offline mode does not allow writing a single parameter set into a special device as well as reading a single parameter set from a special device. The menu items in the menu “Loader” are not available. The purpose of this function is to prevent that a wrong parameter set is loaded by mistake into a correctly parameterized device.

The user must select one of the following items from the menu “Loader” to switch from the offline to the online mode:

- Write project to drives (or symbol): Loads all parameter sets of the offline project into the devices. For this purpose the software switches into the online mode and writes the parameter sets one after the other into the devices. Therefore it is necessary that the structure of the offline project is identical to that of the connected devices.
- Searching for connected devices: Switches the software to the online mode and searches for all addressable devices. The previously loaded offline project is deleted from the user interface and replaced by the new online project.

5.6 Download New System Software

Via the software *drivemaster2* you can write new device firmware and logic software into the connected drive.

When you install the software *drivemaster2*, all firmware and logic files currently available for the different drives are copied into the directory “SM_Sys” in the installation path of the *drivemaster2* software. The system software is filed according by device, type (logic or firmware) and function.

You find the latest system software in the download directory of the SIEB & MEYER web page under www.sieb-meyer.com. (Please use the guest login.) For assistance refer to the software catalog (“SystemsoftwareCatalog.pdf”), which indicates the suitable logic and firmware needed for a particular drive function. Save the desired firmware and/or logic file in the directory “SM_Sys” in the installation path of the software *drivemaster2*.

Make sure that the device version of the device corresponds to the software version. Otherwise an error message will be displayed when you load the software.

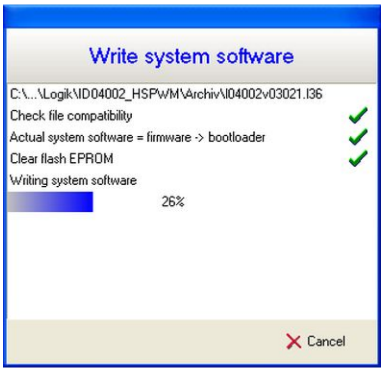
The appropriate device version is indicated in the software designation as follows:

- Device version: **7**.000
- Software: f01001**v07**014.x36

Proceed as follows to write a new system software to the drive:

- ➪ Select the menu item “Loader → Write system software to drive”. A dialog window for selecting the firmware or logic file is opened.
- ➪ Navigate to the directory “SM_Sys” in the installation path of the software *drivemaster2*.

➪ Select the desired system software and click “Open”. Then the new system software is downloaded to the drive. In the dialog “Write system software” you can watch the progress of the download.



✓ When the dialog window is closed, the download is finished.

5.7 Update of the Software *drivemaster2*

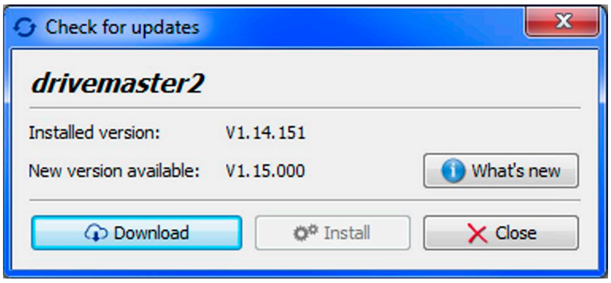
The software *drivemaster2* provides an update service, so the user can find and install new software versions. For this purpose the PC must have Internet access.

If a new software version is available, the button “New version available” appears in the menu bar of the software *drivemaster2*.

☞ The update contains the standard version of the software *drivemaster2*. If you have an individual installation with other company logos, addresses etc., you can adapt or hide the update service. For detailed information refer to the documentation “drivemaster2 – Individual Installation”.

Proceed as follows to update the software:

➪ Click the button “New version available” or open the menu “Help → Check for updates”.
The dialog “Check for updates” appears:



- Installed version: Indicates the version of the software *drivemaster2* that is currently running on your PC.
- New version available: Indicates the version number of the new software version, if available.
  If not, the text “No newer Version available” is displayed. In this case you can exit the dialog via the button “Close”.
- What's new: Opens the changelog for the new software version.

➪ Click the button “Download” to save the new software version on your PC. (Moving the mouse pointer over the button “Download” shows a tooltip with the target directory.)

➪ After the download the button “Install” is active. Close all other program parts of the *drivemaster2* software package at first. Then, click on “Install”.

✓ The new software version is being installed on your PC now. Follow the steps in the installation wizard until the installation process is finished.

6 Password Protection and User Rights

Via password protection the OEM (machine manufacturer) can define passwords for different user groups and assign corresponding access rights. Thus certain parameters and functions (e.g. Write parameters to drive) can be protected against unwanted access.

Currently password protection is not supported for devices of the series PS2 and FC2. These devices appear in the user level “User” in the menu bar.

The passwords are organized together with the parameter set of the device. They are deposited in the data block in coded form. Thus they are known by the device and the software *drivemaster2*.

Via the page “User Level Rights” on the tab page “Parameters” different passwords for the access can be assigned. A user hierarchy with up to three user levels can be created.

6.1 User Levels

The software provides the following three user levels:

User level	Description	Password
Admin	User with all predetermined access right	Password with max. 8 characters
OEM	User with changeable access rights	Password with max. 8 characters
User	User with changeable access rights	No password

User level after software start

After starting the software the user is logged in the currently lowest user level defined in the parameter set.

The lowest user level depends on the password assignment:
- When passwords were assigned to the Admin Level and the OEM Level, the User Level is the lowest user level.
- When a password was assigned to the Admin Level only, the OEM Level is the lowest user level.
- When no passwords were assigned for the parameter set, the Admin Level is the lowest user level.
- When no device is connected to the software on startup, the user is logged in as Admin and can create a new parameter set.

User level of a parameter set

When a new parameter set is created, the passwords are not assigned yet and the user has administrator rights for this parameter set.

If you load a parameter set from the device, this parameter set is protected by the passwords saved in the device. The parameter set is opened in the lowest user level.

If you load a parameter set from a file, this parameter set is protected by the pass-words saved in this file. The parameter set is opened in the lowest user level.

☞ In order to write a parameter set to the device you must enter the password of the Admin or the OEM Level (depending on the assigned rights for parameter download) before you start the download. After writing the parameter is finished the password saved in the new parameter set is valid.

6.2 Switch User Level

In order to switch to another user level, you must log in using the password of the according user level. For this purpose open the dialog “Login” via the menu “Settings → User → Log in”:

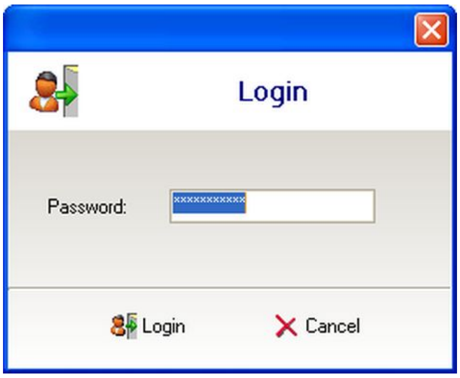


Fig. 16: Login dialog

➪ Enter the password of the desired user level.
✓ If the password is correct, the software switches to the according user level.

Via the menu “Settings → User → Log out” you can leave the current user level. Then the software switches to the lowest user level.

6.3 Assigning User Rights

You can assign passwords and user rights on the parameter page “User Level Rights”.

When you are logged in as Admin, you can change the rights and passwords of all users. When you are logged in as OEM, you can change the rights of the User level and your password (if the corresponding right is assigned). For the level User this page is write-protected.

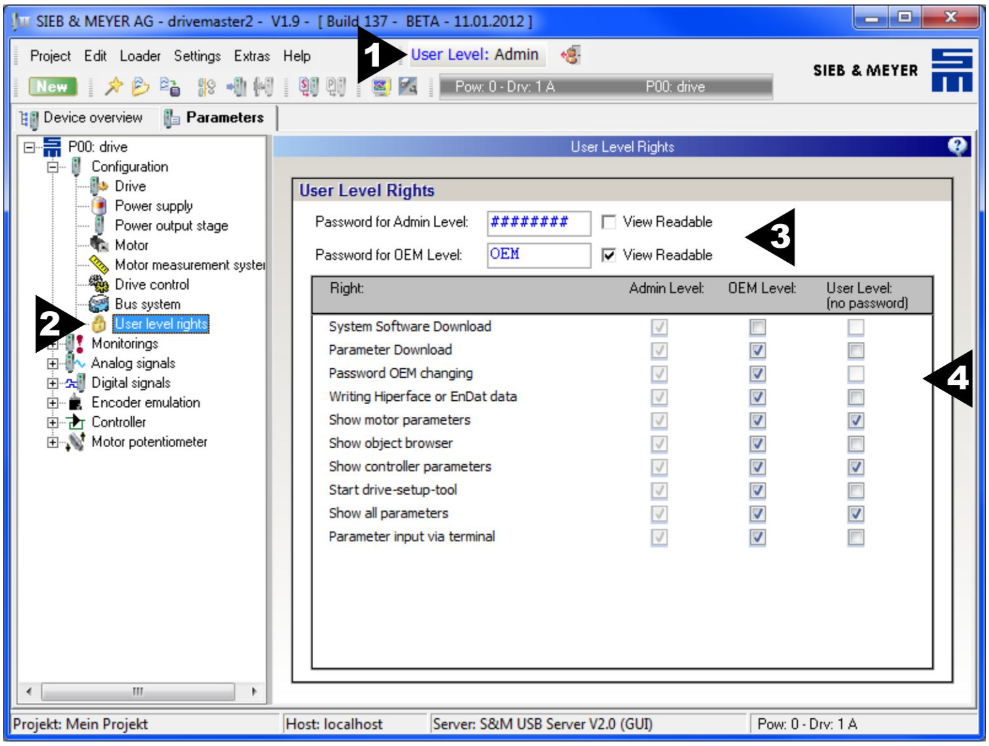


Fig. 17: Parameter page "User Level Rights"

[1] User level
Indicates the user level in which the user is currently logged in.
Via the button you switch to the lowest user level for the parameter set.

[2] Node: User level rights
Node on the tab page “Parameters” that must be clicked to open the page for assigning the passwords and user rights.

[3] Passwords
In this field you can edit the passwords for the Admin level and the OEM level. Activate the check boxes to display the current passwords.

[4] User Level Rights
Field in which you can assign the access rights for the lower user levels. Activate the according check boxes to assign certain access rights to a user level.

Passwords

The passwords must be made up of at least one character and maximum eight characters. The characters can be numbers or letters (except special characters or umlauts). The software differentiates between capital and lower case letters.

Consider the following items when assigning passwords:

- The password of the OEM level can only be assigned when you have already defined a password for the Admin level.
- The passwords of the OEM and the Admin levels must be different.
- If no password is assigned (i.e. the input field is left empty), the respective user level is not protected by password and the user automatically attains this user level.
- For devices with several parameter sets (see multi parameters, page 64) SIEB & MEYER recommends to use the same passwords for all parameter sets.

On delivery no passwords are assigned in the drives and in the software *drivemaster2*.

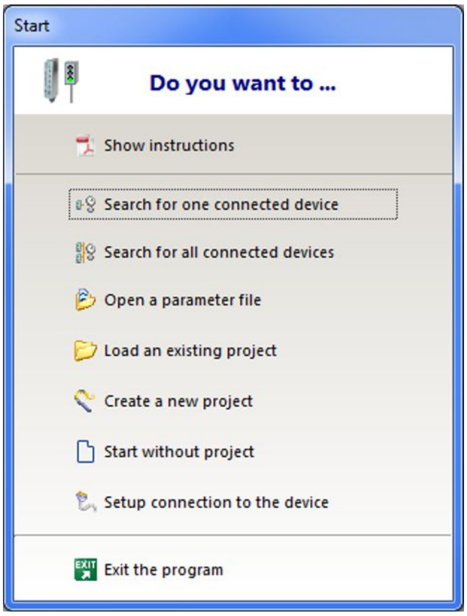
7 First Steps

This chapter is a quick start description for the software *drivemaster2*. The description particularly considers the operating elements for the online parameterization of a drive. It is required that a drive is connected with the PC.

7.1 Creating an Online Project

Program start

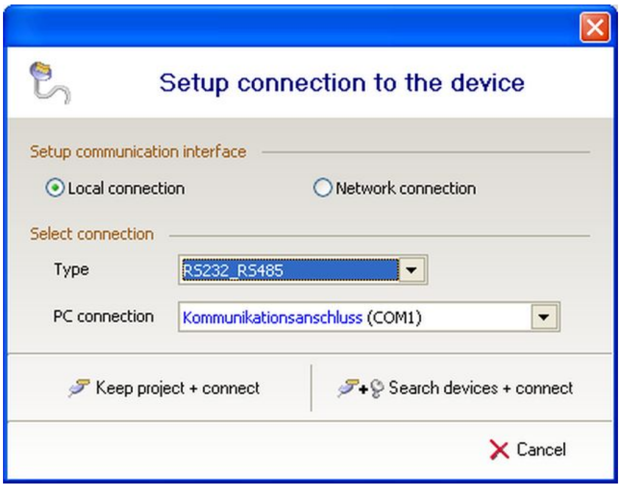
➪ Start the software via the Windows start menu “Programs → SIEB & MEYER AG” (provided that you have saved the software in the default path).
The start screen appears.



7

Settings for the Communication

➪ Click on the button “Setup connection to the device” to open the dialog window “Setup connection to the device”.

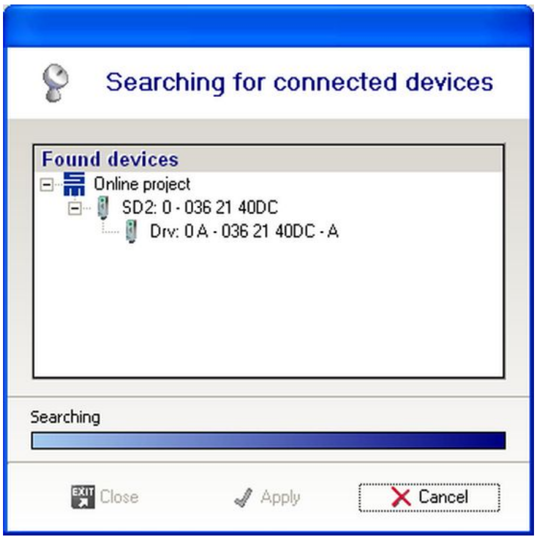


➪ Select and configure the communication server. The selection depends on the used device and its wiring. For detailed information refer to chapter 15 "Communication", page 287.

➪ Click on the button "Search devices + connect" to return to the dialog window "Start".
For the following steps it is provided that the communication server is set correctly.

Searching for connected devices

➪ Select the menu item "Search for all connected devices" in the start screen.



➪ The found devices will be applied to the user interface by mouse click on the button "Apply". All selected drives are combined to form the "online project".

☞ All data required for the operation are summarized in a data structure, the parameter set. Initial operation of a device is only possible with a complete and correct parameter set.

7.2 Creating a Parameter Set of a Drive

A parameter set can be created manually or with the aid of a wizard. Such a wizard is provided for each drive that can be parameterized with the software *drivemaster2*.

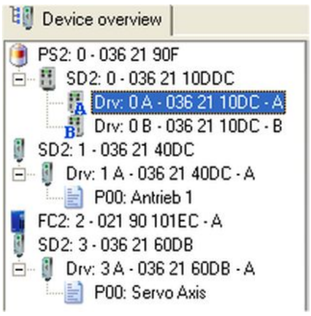
In the following example an SD2 with the drive function SERVO / VECTOR is parameterized via the wizard.

For parameterization and initial operation of an SD2S the following quick start guides are available depending on the required drive function:

FPAM operation:	SD2S Setup Instructions – HSBLOCK / FPAM Operation
HSPWM operation:	SD2S Setup Instructions – HSPWM Converter
SVC operation:	SD2S Setup Instructions – Sensorless Vector Control (SVC)
V/f operation:	SD2S Setup Instructions – V/f Operation

7.2.1 Selecting a drive

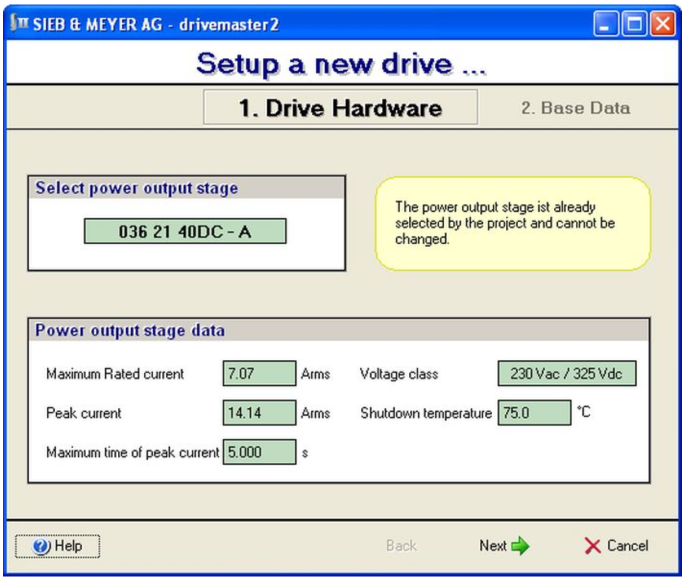
➪ Open the tab page “Device overview” and select the drive you want create a parameter for. In the figure the axis A of a drive amplifier SD2 is selected:



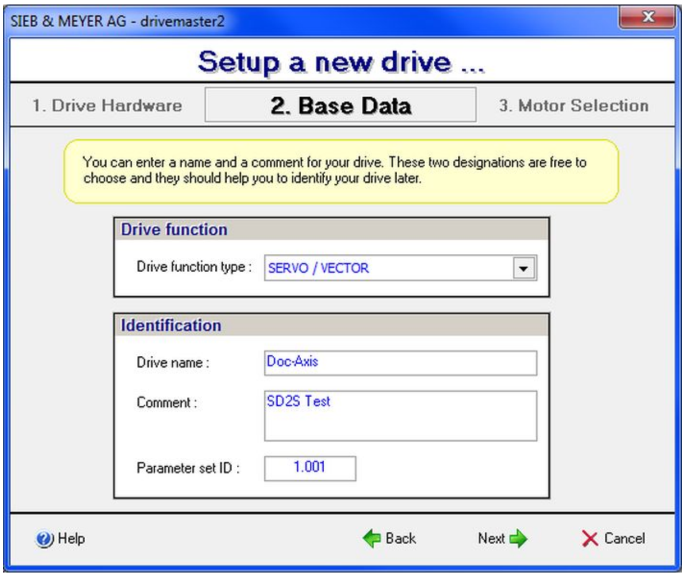
☞ If the selected drive is not parameterized, the device is not displayed on the right side of the user interface. A dialog for the creation of a parameter set will be displayed instead. This you can create manually or with the aid of the wizard described in the following chapter.

7.2.2 Creating a parameter set

➪ Start the wizard via the menu “Project → New parameters”. The wizard for parameterizing an SD2 is started automatically. The structures of the all wizards are similar, the only differences are drive-specific details.
The first page serves for parameterizing the basic device. Since the basic device already exists physically, the displayed parameters are read from the drive and can not be modified.

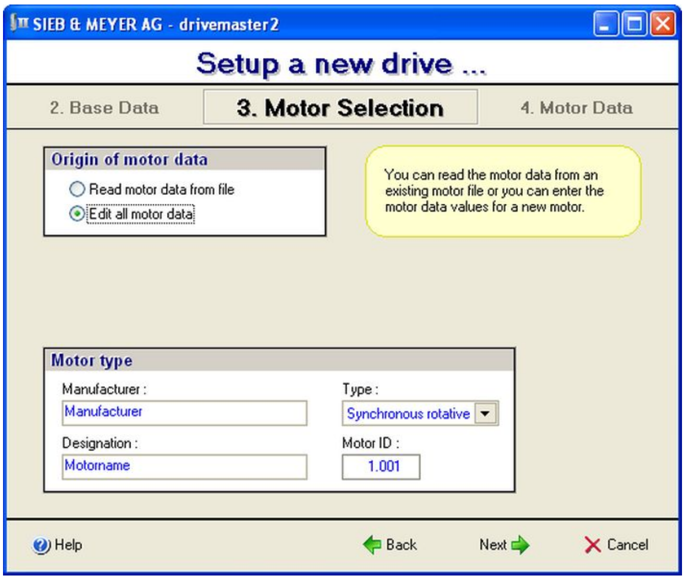


➪ Click “Next” to continue.



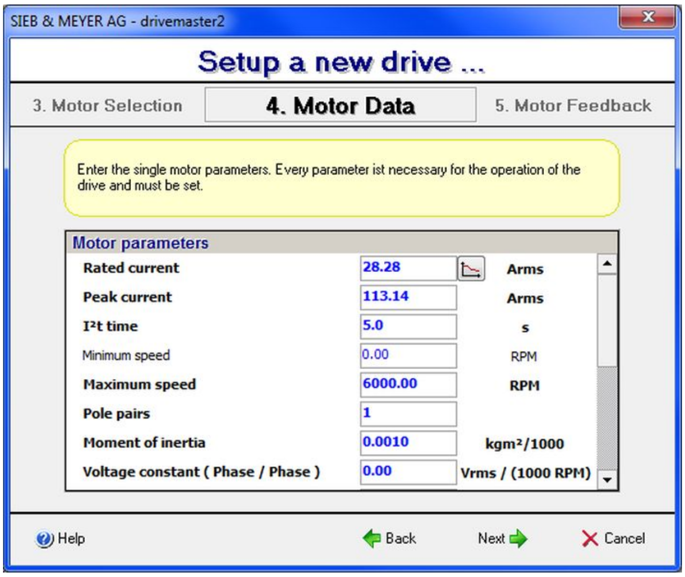
➪ Select the required drive function on the page “Base Data” and enter identifying information for the drive. This identification takes no effect on the function of the drive. It is only used for your administration.

➪ Click “Next” to continue.



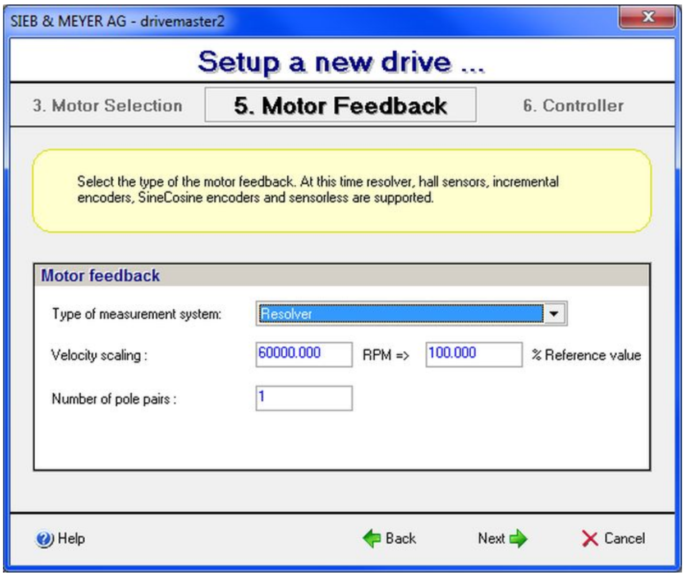
➪ Enter the parameters of the used motor type. This can be done manually or by loading an already existing motor file (*.mot).
When you work for the first time with the software *drivemaster2*, no motor file will be available. Hence, you must enter the motor data manually. In this example a SIEB & MEYER motor is used.

➪ Click “Next” to continue.



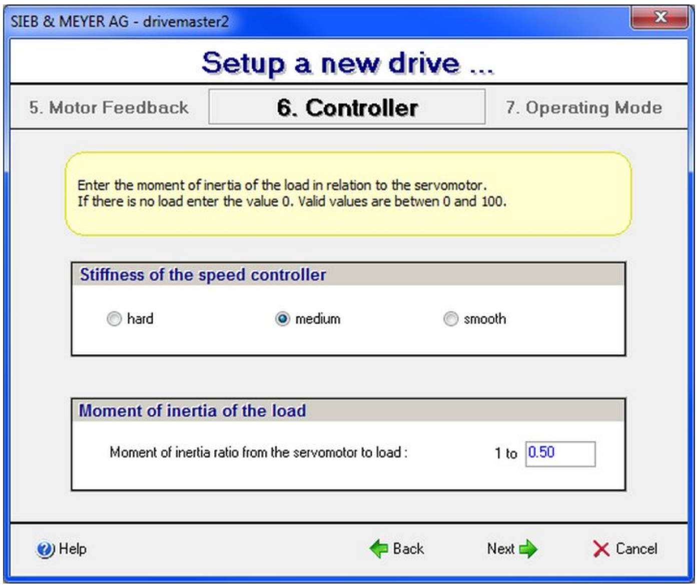
➪ Enter the technical data of the connected motor. All input fields must be filled with the correct motor data, otherwise the parameterization of the motor can not be finished correctly. The highlighted motor data (in bold) are necessary and must be adapted to the connected motor.

➪ Click “Next” to continue.



➪ On this page you must enter the parameters of the measuring system connected to the motor.

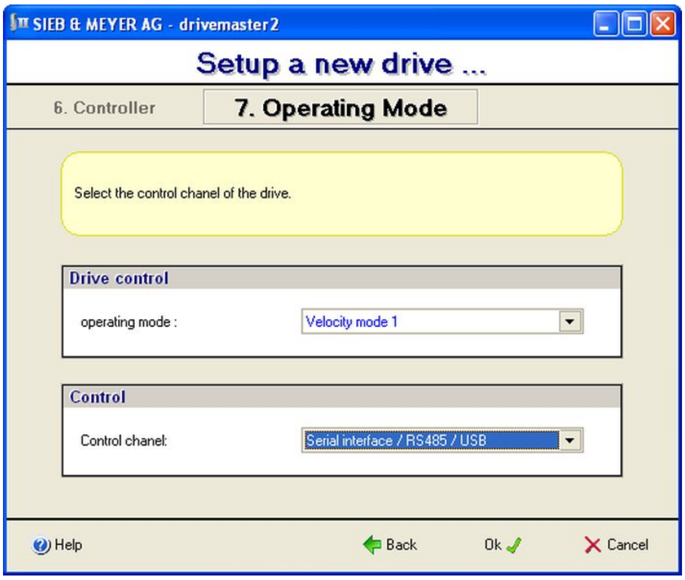
➪ Click “Next” to continue.



➪ On this page you can set the performance of the speed controller via its stiffness. For this purpose the relation of the mass moments of inertia must be known.

☞ This configuration of the controller only works, if the mass moments of inertia are ideally coupled. Complicated mechanical elements (spring mass systems with influence of shafts and couplings) require setting the speed controller manually or by means of special tools!

➪ Click “Next” to continue.



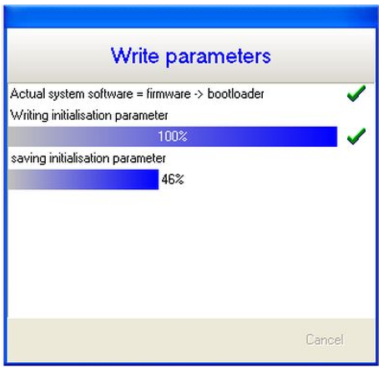
➪ Select the operating mode and the control channel of the drive.

☞ For initial operation we recommend to select Velocity mode 1 and drive control via serial interface. This configuration allows positioning the motor via the setup tool, here via *drive-setup-tool*.

✓ Now the created parameter set exists in the software *drivemaster2* but it is not downloaded to the drive yet. Writing the parameter set into the drive is done via a download.

7.2.3 Download of Parameter Set

➪ Start the download via the menu item “Loader → Write parameters to drive”. In the window “Write parameters” you can watch the progress of the download.



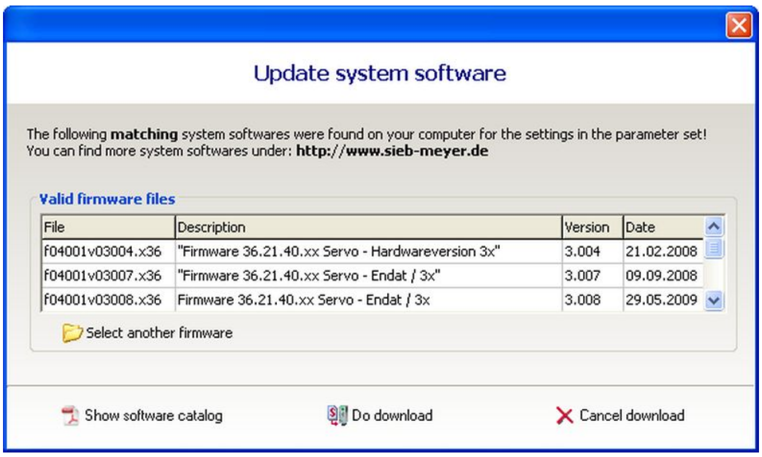
✓ After the window has disappeared the parameter download is finished and the configuration of the drive is completed.

Troubleshooting: wrong system software

If the parameterization of the drive is not suitable for the logic or firmware in the drive, the following dialog opens to point out the problem.

You have the following possibilities:

1. Cancel parameter download: The process is canceled and you can change the parameters of the drive as required.
2. Update system software: You load the logic and firmware file that is suitable for the parameterization into the drive. For this purpose the following dialog is opened:



7

The table lists all firmware and logic files that are available in the installation path of the software *drivemaster2* for the current drive configuration. Select the desired system software.

– For assistance you can click the button “Show software catalog” to open a PDF file indicating the suitable logic and firmware needed for a particular drive function.
– Click on the button “Select another firmware” to open the directory “SM_Sys” in the installation path of the software *drivemaster2*. Here you find all firmware and logic files that were supplied with the software installation.

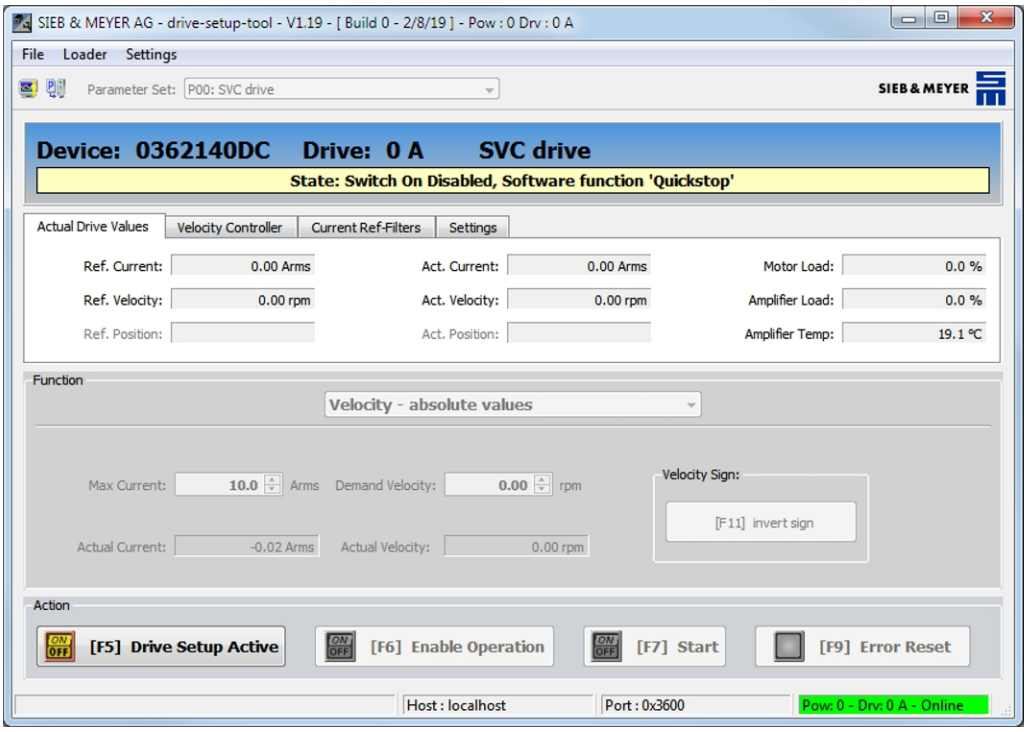
Click the button “Do download” to write the selected system software to the drive. After the download of the system software is finished, the parameter set is automatically downloaded to the drive.

7.3 Positioning via Setup Tool

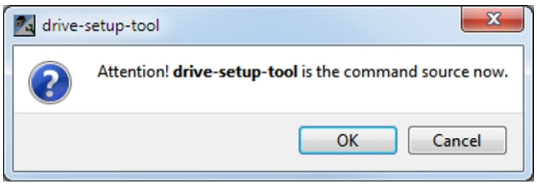
In the following the *drive-setup-tool* is described as an example for all setup tools. The other setup tools are operated the same way.

Calling the setup tool

➪ Start the setup tool via the menu item “Extras → drive-setup-tool”. The tool is an independent program for initial operation of drives.



➪ Click on the button “Drive Setup Active”. The following dialog appears.



➪ Click “OK” to confirm. Thus, the setup tool controls the drive.

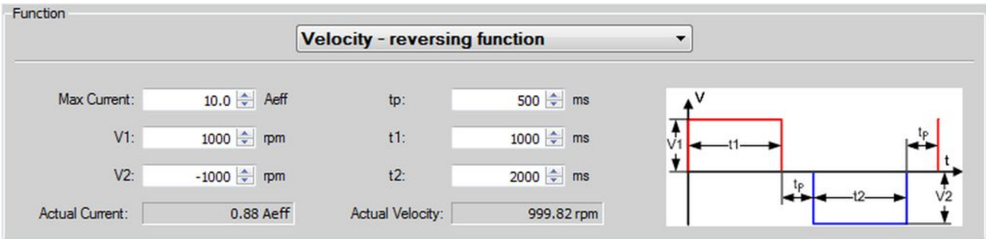
Setting the parameters

For setting up a drive amplifier we recommend using the reversing function.

> **⚠ WARNING**
>
> **Risk of injury while working with the reversing function**
>
> This function in particular needs to be handled carefully. Since the PC writes the values cyclically into the device, the actual time values may differ pretty much from the set time values and these may not be met. Consider the risk of injury while standing near to the motor or other machine parts.
>
> Keep clear from the machine while moving the axes via the setup tool.

> **NOTICE**
>
> **Initial operation with wrong wiring or parameterization**
>
> To avoid damage of the machine due to wrong wiring or parameterization we recommend to limit the maximum current to a small value during initial operation.

➩ Select the entry “Velocity - reversing function” from the list in the field “Function”.

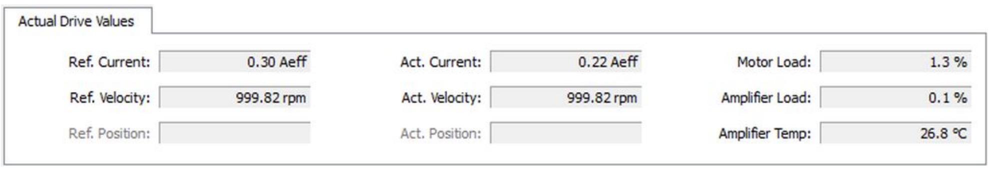


Positioning

The drive can start moving when the parameterization of the selected profile is finished. Therefore, proceed as follows:

➩ Click on the button “Enable Operation” to activate the controller.
➩ Start the positioning of the drive with the set profile by mouse click on the button “Start”.
➩ Positioning the drive can be stopped at any time by a second mouse click on the button “Start”.
➩ In order to deactivate the controller click on the button “Enable Operation” once more.

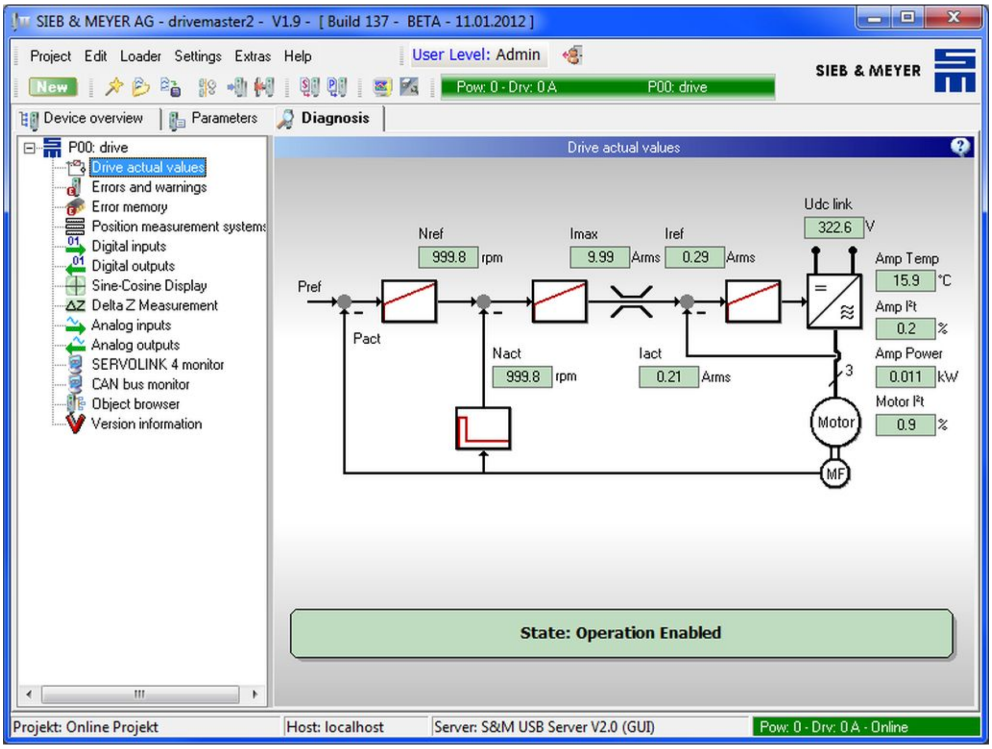
During the positioning process all relevant data is displayed in the setup tool.



7.4 Analyzing a Drive via the Diagnosis Pages

The data of the drive are also displayed on the diagnosis pages of the software *drive-master2*. The pages are available via the tab page “Diagnosis”.

The page “Actual Drive Values” may be of special interest during initial operation.

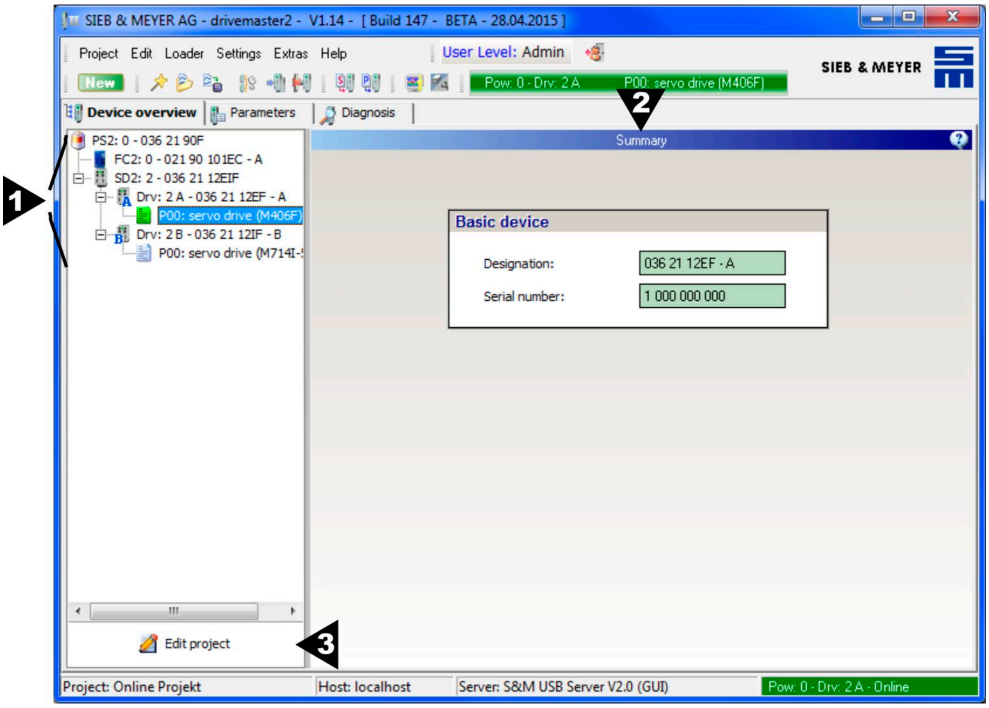


The setup is finished, when the drive positions without error.

7

8 Device Overview

Via the tab page “Device overview” you select the drive/parameter set to be parameterized.



[1] Project tree
The project tree displayes all devices of a project in a tree structure.
SD2x devices are subdivided into their drives: = drive A, = drive B (only available with double-axis drive amplifiers).
You can create several parameter sets for SD2x devices (see Multi Parameters, page 64). Therefore, the available parameter sets are displayed in the project tree as follows:

- = parameter set
- = parameter set that is currently active in the device (only visible when the drive is online)
- = parameter set that is not written into the device yet (only visible when the drive is online)
- = empty parameter set

[2] Device page
This page displays a brief description of the selected device.

[3] Edit project
This button opens the project wizard. There you can edit the devices of the project (see page 283).
When you edit an online project, all parameter sets should be initialized in the project. If this is not the case, the message “Uninitialized parameter sets” appears. Click “OK” to confirm the message. Thus, all parameter sets are read from the devices. Afterwards the project wizard will open.

➩ At first select a device or a parameter set in the project tree and then switch to the tab page “Parameters” or “Diagnosis”. You can always edit only one parameter set.

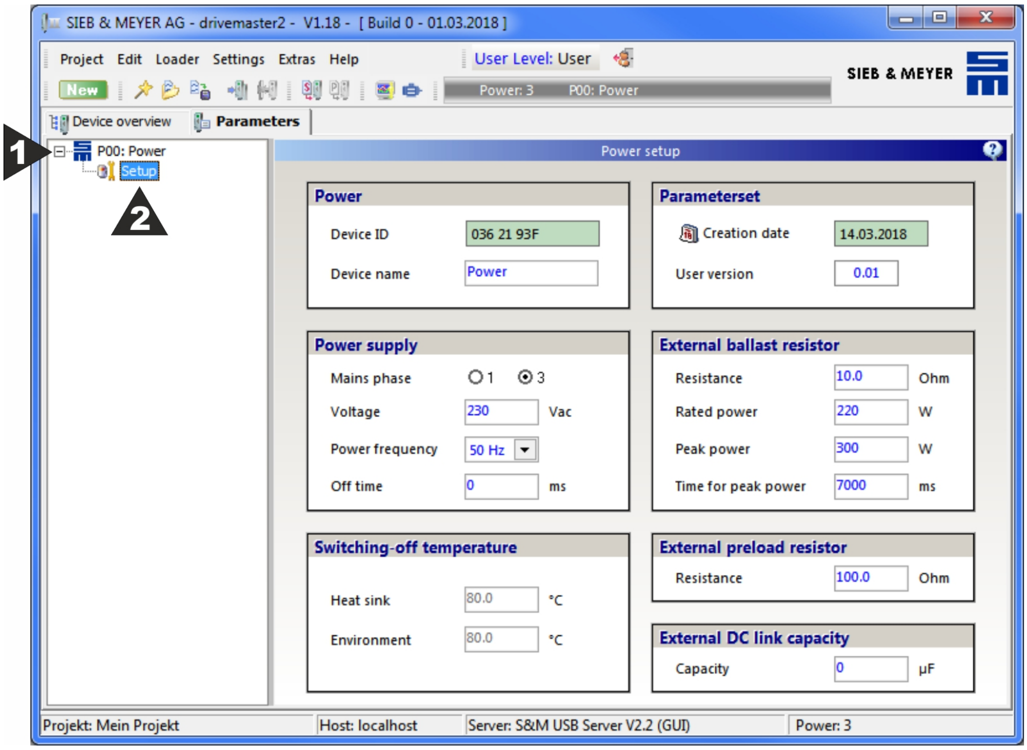
☞ The selection made in the "Device overview" affects the program behavior of the software *drivemaster2*. That means: The selected device influences the contents of the tab pages “Parameters” and “Diagnosis” as well as the menu item “Extras”.

The following parameter descriptions are ordered by device type.

9 Parameters of a PS2

The power supply unit PS2 is always supplied without a valid parameter set (error E08). Before initial operation you must set the following power supply parameters via the software *drivemaster2* and write the parameter set into the device.

All parameters of the power supply unit PS2 are combined in parameter groups and displayed on the page “Setup”.



[1] Power supply unit
The root of the tree is the power supply unit selected in the “Device overview”.

[2] Parameter page
All configurations of the power supply unit PS2 are made on the parameter page “Setup”.

Power (PS2)

This parameter group provides for general information of the current power supply unit.

Device ID

Indicates the general designation (type) of the used drive electronics. If the user interface is not updated and thus can not recognize the drive, question marks '?' are displayed instead of the drive designation.

Device name

The user can enter an individual name for the power supply unit in this field. The maximum length of the name is 15 characters.

9

Parameter set (PS2)

This parameter group displays general information on the parameter set that is currently used in the power supply unit.

Creation date

This field displays date and time of the last modification of the parameter set. The creation date is updated automatically when the parameter set is modified.

User version

The field indicates the version of the parameter set. The user can freely select this number.

Power supply (PS2)

This parameter group serves to enter general data of the mains supply that is connected to the power supply unit.

Mains phases

This parameter specifies the number of mains phases. The user can select between single-phase and three-phase current via radio buttons. The parameter depends on the provided supply system type.

For further information refer to the hardware documentation.

Voltage

The parameter indicates the main voltage of a sine mains supply in *volts* (RMS value).

- Single-phase operation: Voltage is related to the neutral conductor.
- Three-phase operation: Voltage is defined between two phases.

This parameter is used by the load monitoring. In the event of an error the power supply unit is switched off with the errorE01 “Precharge error DC link voltage” or E02 “Overvoltage in DC link”.

Mains frequency

The parameter indicates the frequency of the sine mains supply in *hertz* or the supply of direct current (DC). The available variants are set by means of a selection list.

Off time

The parameter indicates the switchoff time of the mains supply in the event of an error in *milli seconds*.

If e.g. a mains failure occurs, the PS2 will not try to restart before the time indicated here is passed (the power supply unit restarts with pre-loading of the intermediate circuit).

External Ballast Resistor (PS2)

This parameter group provides parameters to enter the technical data of the ballast resistor that must be connected to the power supply unit.

For the values of the ballast resistor refer to the respective data sheet of the manufacturer.

Resistance

The parameter indicates the nominal resistance of the resistor in *ohms*. Depending on the device the resistance can be set within a preset range. If the entered value is not in that range, the parameter is reset to the previous value.

Rated power

The parameter indicates the rated power of the used ballast resistor in *watts*. Refer to the data sheet of the manufacturer for this value.

Peak power

The parameter indicates the peak power of the used ballast resistor in *watts*. Refer to the data sheet of the manufacturer for this value.

Time for peak power

The parameter indicates the maximum period of time in *seconds*, in which the peak power can be supplied continuously.

The parameters are also used for the I^2t calculator of the ballast resistor. If the power converted in the ballast resistor is too much, the I^2t calculator triggers the error E04 “Ballast circuit load (Chopper I^2t)”.

Switching-off Temperature (PS2)

This parameter group displays the limiting values of the thermal load of the power supply unit. These are read-only values loaded from the hardware.

Heat sink

The parameter indicates the maximum heat sink temperature allowed for the operation of the system in *degree centigrade*. If this temperature is exceeded, the device will be switched off automatically and the error message E05 “Heat sink temperature too high” appears.

Environment

The parameter indicates the maximum ambient temperature allowed for the operation of the system in *degree centigrade* . If this temperature is exceeded, the device will be switched off automatically and the error message E06 “Ambient temperature too high” appears.

External Precharge Resistor (PS2)

This parameter group provides a parameter to enter resistance of the optionally connected precharge resistor. This parameter group is displayed for the power supply unit 0362193F only.

Resistance

The parameter indicates the nominal resistance of the resistor in *ohms*. Depending on the device the resistance can be set within a preset range. If the entered value is not in that range, the parameter is reset to the previous value.

DC link capacity (PS2)

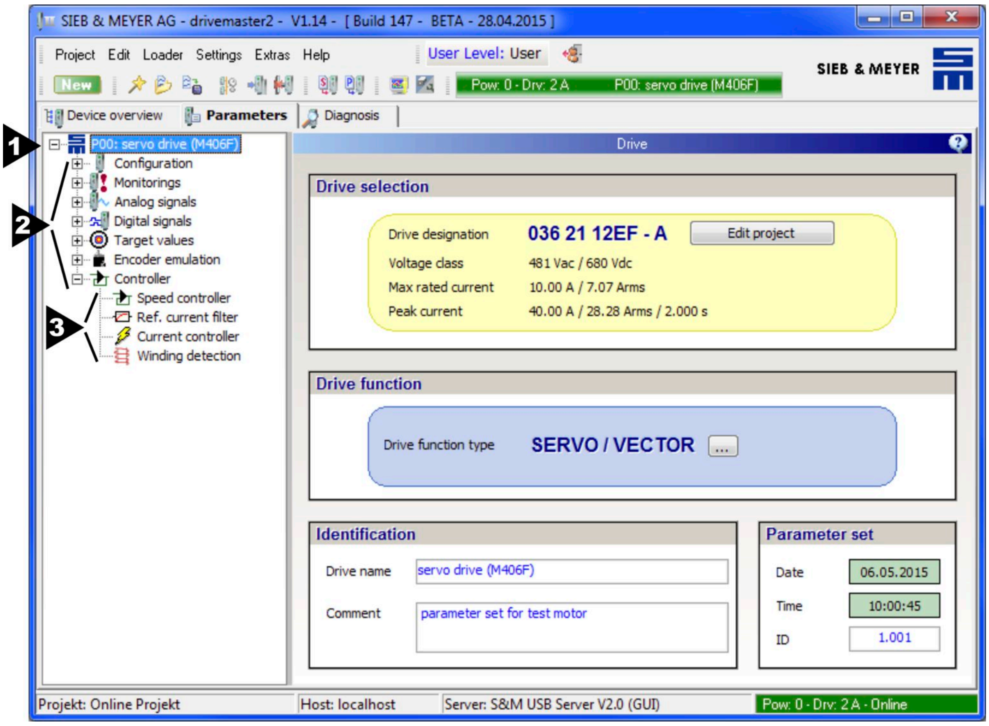
This parameter serves to indicate possible external capacities at a power supply unit. These result from devices or separate capacitors which are connected to the DC link.

External

The parameter indicates the additional electrical capacity in *µfarads* and is used for the pre-load monitoring.

10 Parameters of an SD2x

All parameters of a drive amplifier of the model range SD2x (devices: SD2, SD2B, SD2S, SD2T) are available via the tab page “Parameters”. To provide an overview of the parameters they are combined in pages, whereas these pages are structured via nodes and branches as final nodes (leafs) in a tree structure.



[1] Drive
The root of the tree is the drive selected in the “Device overview”. With a double-axis device the parameterization applies only to the selected axis. When one drive has several parameter sets, the parameter set selected in the “Device overview” is displayed.

[2] Thematic sub-division of the parameterization
The parameter pages are combined thematically by the subordinated nodes.

[3] Parameter pages
Via the parameter pages you configure the drive according to the application. The individual parameters are combined thematically in groups.

Assignment of parameters by drive function/device

The displayed parameter pages depend on the selected drive function.

At the beginning of each parameter group you find a two-rowed table explaining for which drive function (and possibly for which device) the parameters apply:

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / UF
✔	SD2, SD2S	–	–

[1] Drive function

[2] ✓ parameter group is available for the drive function

[3] parameter group is only available with the indicated devices for the drive function

[4] - parameter group is not available for the drive function

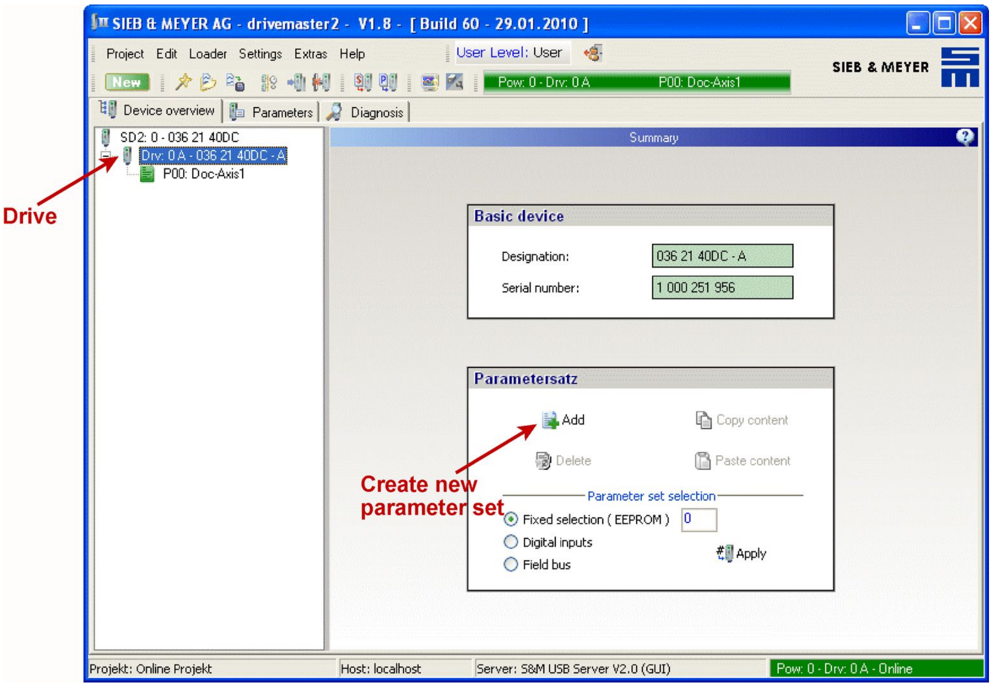
10.1 Multi Parameters

The function multi parameters allows assigning several parameter sets to one drive. The parameter sets are saved in the memory of the drive.

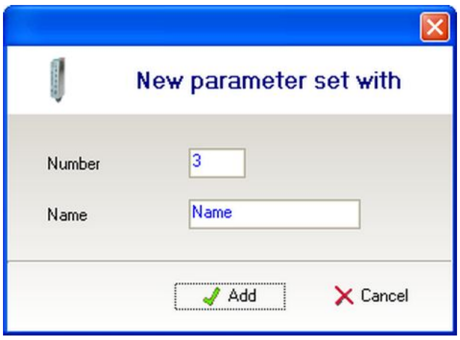
For information on saving and managing several parameter sets in one project refer to chapter 14 "Working with Projects", page 279.

10.1.1 Create Several Parameter Sets for One Device

➪ Switch to the tab page “Device overview” and click on the desired drive. The page “Summary” on the right side displays the parameter group “Parameter set”.



➪ Click on the button “Add” to create a new parameter set. The following dialog appears:

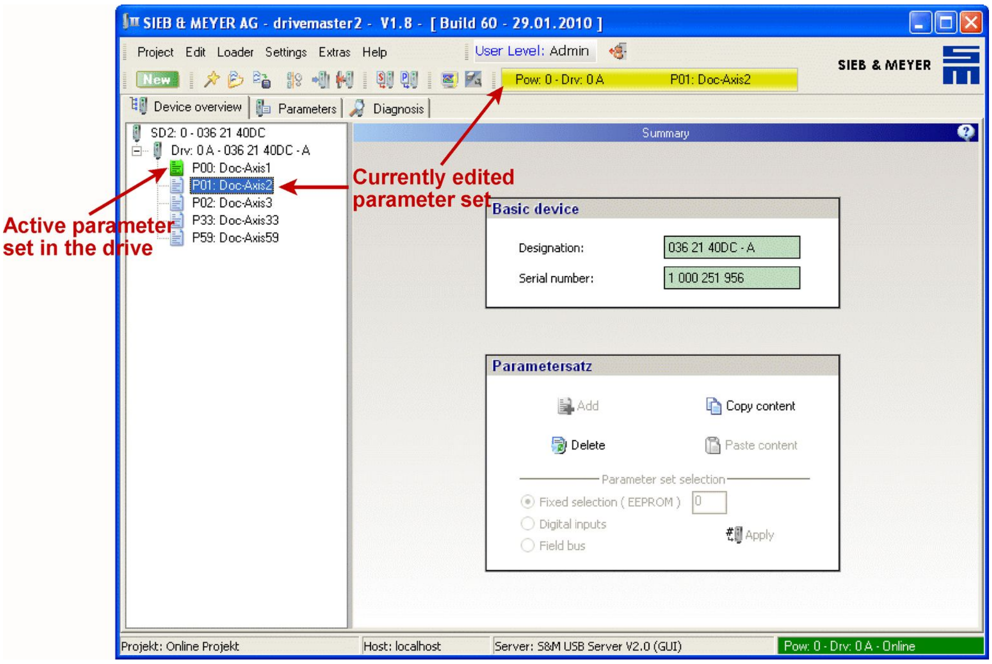


10

➪ Enter a number and a name, so you can identify the parameter set later. You can create up to 64 parameter sets (numbers 0 – 63) for one drive. Consider that the software creates a separate file in the project for each parameter set.
Click on the button “Add” to apply the new parameter set. In the “Device overview” the parameter sets are subordinated to the drive and ordered by number.

➪ Click on a parameter set in order to edit it.

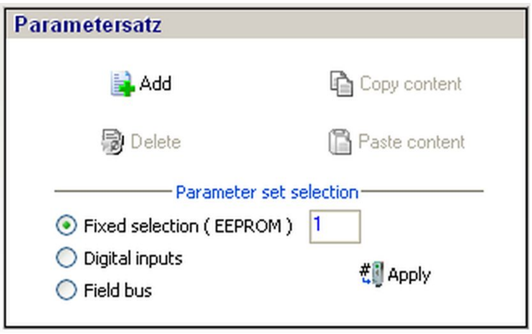
➪ Create the according parameters. Afterward you can copy or delete the entire parameter set via the parameter group “Parameter set”.
Thereby the previous parameter set is still active. The active parameter set is displayed in green color in the device tree. The diagnosis pages always apply to the active parameter set. If you edit another than the active parameter set, the display of the parameter set in process (in the tool bar) is highlighted in yellow color.



10

10.1.2 Select Parameter Set

➪ Click on the drive in the tree-type structure. In the online mode the field “Parameter set selection” in the parameter group “Parameter set” is enabled. In the offline mode this field is write-protected.



➪ Here you can define the way a parameter set of the device is selected.
- Fixed selection (EEPROM): The number of the desired parameter set must be entered.
- Digital inputs: The desired parameter set is determined by the connection of the digital inputs.

☞ If you wish to select the different parameter sets via the digital inputs, the control channel of all parameter sets must be set to “Digital inputs” (see page 93). Pay attention that the digital inputs of all parameter sets of the device are parameterized identically for the parameter set selection (Parameter set Bit x).

– File bus: The desired parameter set is selected via the object DEV_CTRL_SELECT_PARAMETER_SET (153). For further information on using objects refer e.g. to the documentations “Drive System SD2 – DNC 8 Byte Telegram” and “Drive System SD2 – CAN Bus Connection”.

10.1.3 Switching the parameter set in the drive

- In order to change the active parameter set in the drive, you must switch-off the controller first. (Switching to another parameter set is only possible, when the controller is switched off.)
  The drive reacts by removing the bit M01 “Power output stage switched on”. From that moment the parameter set can be changed.
- Change the parameter set by entering the correct parameter set number or by connecting the digital inputs accordingly (see below).
  The devices in table top design of the series SD2T allow changing the parameter set also by means of the push buttons on the device front panel (see hardware description).

10.1.3.1 Parameter Set Change via the Digital Inputs

The following diagram shows the timing when the parameter set is switched via the digital inputs. The functions of the digital inputs must be defined accordingly in the software *drivemaster2*. Switching from one parameter set to another is actually done by unsetting and setting the control input “switch on”:

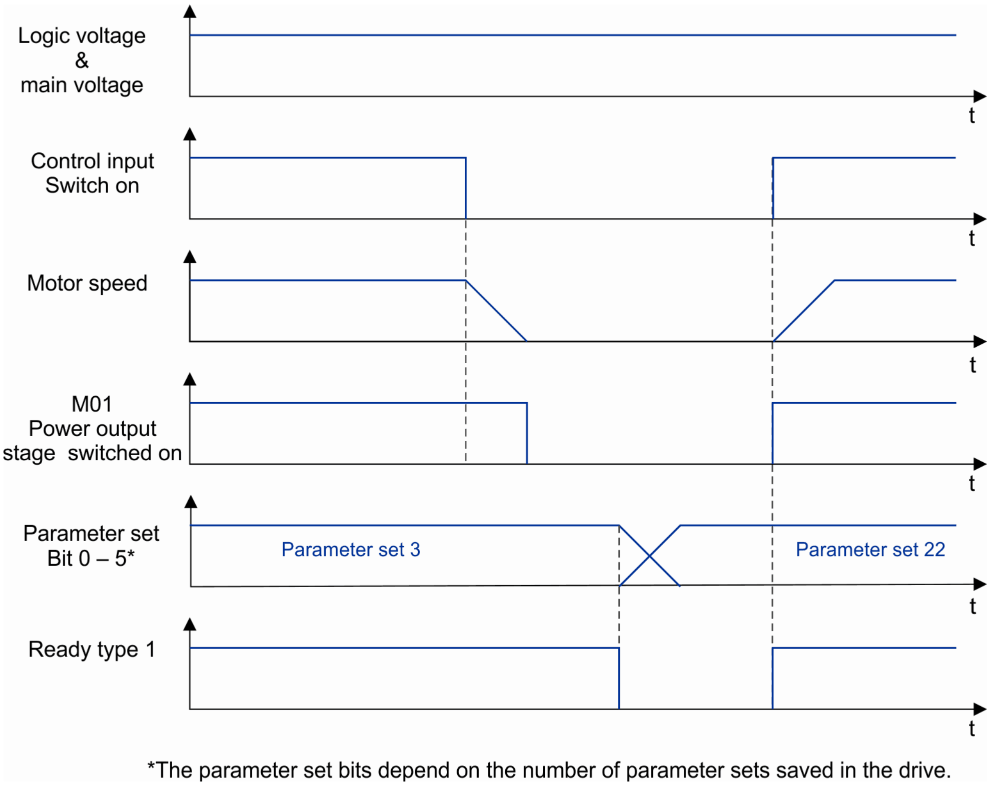
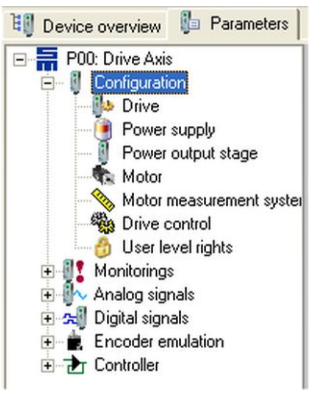


Fig. 18: Timing diagram for parameter set change (via the digital inputs)

10.2 Configuration

The node “Configuration” provides the parameter pages “Drive”, “Power output stage”, “Motor”, “Motor measurement system”, “Drive control” and “User level rights”. Depending on the device and certain settings the pages “Power supply”, “Bus system” and “Units” are displayed additionally.



The individual pages display all data required for the general configuration of the drive system.

10.2.1 Drive

This parameter page serves for general configuration of the drive amplifier and provides information on the current parameter set.

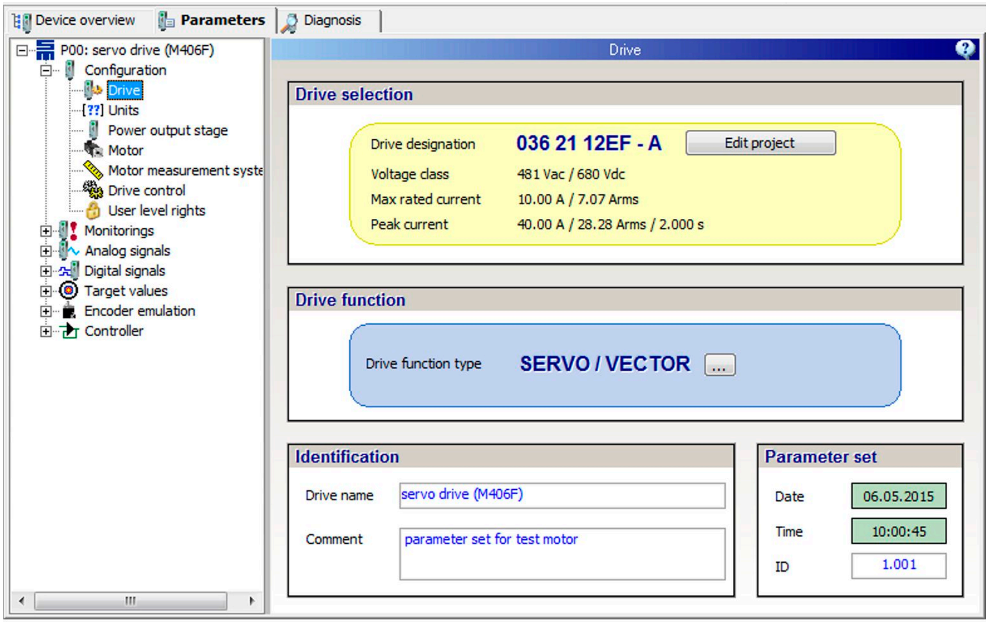


Fig. 19: Parameter page "Drive"

Drive Selection (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This field displays the characteristics of the selected power electronics of the drive amplifier. This parameter group is write-protected.

Drive designation

The parameter indicates the general designation (type) of the used drive electronics. If the user interface is not updated and thus can not recognize the drive, question marks '?' are displayed instead of the drive designation.

The button "Edit project" opens the project wizard to change the device or the entire project (see section 14.5.1.2 "Edit Devices", page 283). When you edit an online project, all parameter sets should be initialized in the project. If this is not the case, the message "Uninitialized parameter sets" appears. Click "OK" to confirm the message. Thus, all parameter sets are read from the devices. Afterwards the project wizard will open.

Voltage class

The parameter specifies the electric strength of the power electronics. The parameter is related to the maximum admissible supply voltage (AC voltage as effective value) and to the corresponding voltage in the rectified intermediate circuit (DC link voltage) in *volts*.

Max. rated current

The parameter specifies the maximum rated current of the power output stage during S1 operation (continuous operation) as peak value as well as the corresponding RMS value in *amperes*. The proper rated current is limited by this parameter. Moreover it depends on other parameters as for example the cooling.

Peak current

The parameter specifies the maximum current of the power output stage as peak value as well as the corresponding RMS value in *amperes*. The time period defined behind the effective value specifies the max. time (I^2t time) the peak current is allowed to flow. The load is monitored by an I^2t calculator. When the device is overloaded, the I^2t calculator triggers the error E30 “Power output stage load too high (I^2t)” and switches the output stage off.

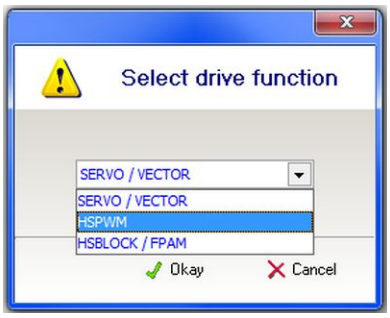
Drive Function (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

In this field the drive function of the drive amplifier is selected.

Drive function type

The parameter indicates the selected drive function. If you mouse click on the button , the following dialog is opened:



The list box provides all drive functions possible with the current device. Select the desired function and confirm with the button “Okay”.

Identification (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This parameter group provides fields to enter individual information on the drive amplifier for later identification.

Drive name

In this field user can enter an individual name for the drive. The maximum length is 32 characters.

Comment

In this field the user can enter further information regarding this drive. The maximum length is 64 characters.

Parameter set (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This field displayes information on the parameter set currently used in the drive amplifier.

Date / Time

The field displays date and time of the last modification of the parameter set. The parameters are updated automatically when the parameter set is modified.

ID

In this field you can enter the parameter set ID. The ID can be selected as desired by the user and can be used for identifying the drive version via the object dictionary. For this purpose the object “DEVICE_PARAMETER_IDENT_CODE” is used. The parameter set ID is a 32 bit value, divided into a 16-bit part before the decimal point and a 16-bit decimal part.

10.2.2 Power supply unit

This page is only displayed for devices with integrated power supply unit. Besides the parameters of the power supply unit the page provides parameters to set the external ballast resistor, if applicable. For devices with internal ballast resistor the respective parameters are displayed as read-only values.

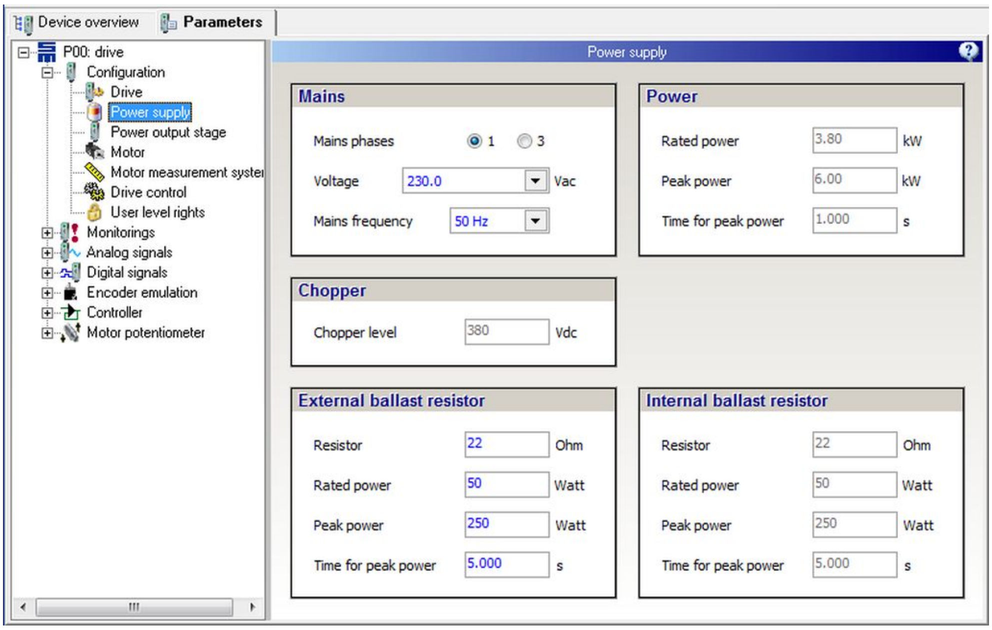


Fig. 20: Parameter page “Power supply”

Mains (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This parameter group serves to enter general data of the mains supply that is connected to the drive amplifier.

Mains phases

This parameter specifies the number of mains phases. The user can select between single-phase and three-phase current via radio buttons. The parameter depends on the provided supply system type.

For further information refer to the hardware documentation.

Voltage

The parameter indicates the main voltage of a sine mains supply in *volts* (RMS value).

- Single-phase operation: Voltage is related to the neutral conductor.
- Three-phase operation: Voltage is defined between two phases.

This parameter is used by the load monitoring. In the event of an error the device is switched off with the error E33 “Power supply load monitoring -> mains voltage too high” or E34 “Power supply load monitoring -> mains voltage too low”.

Mains frequency

The parameter indicates the frequency of the sine mains supply in *hertz* or the supply of direct current (DC). The available variants are set by means of a selection list.

Power (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This parameter group displays information on the maximum output power of the drive amplifier.

The displayed values are read-only values and depend on the used hardware as well as the parameter “Mains phases”.

Rated power

The parameter indicates the rated power of the power supply unit in *kilowatts*. This is the maximum output power during continuous operation. The indicated value is the apparent power of the device.

Peak power

The parameter indicates the peak power of the power supply unit as apparent power in *kilowatts*.

Time for peak power

The parameter specifies the period of time in *seconds* in which the device can provide the peak power once from the cold state.

Chopper (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This parameter group provides information on the intermediate circuit chopper.

When the motor is decelerated electrically, energy is fed back into the intermediate circuit. The chopper ensures that the intermediate circuit does not exceed a preset value. For this purpose energy is converted into heat via an ohmic resistor.

Chopper level

The parameter specifies the maximum admissible voltage in the intermediate circuit before the chopper is activated. This value can only be read and depends on the used hardware.

External Ballast Resistor (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
SD2, SD2S (0362141-43)	SD2, SD2S (0362141-43)	SD2S (0362141-43)	SD2, SD2S (0362141-43)

This parameter group provides the parameters to enter the technical data of the optionally connected ballast resistor.

NOTICE

Resistance value and parameterization of the ballast resistor

If the resistance value of the connected resistor is too small, the drive and the resistor can be damaged. If the resistance is too high, the brake chopper possibly does not work and an error is triggered. The same applies for incorrect parameterization of performance data.

Do not use ballast resistors beyond the adjustable resistance range and enter the correct performance data for the resistor.

The values depend on the used ballast resistor. Refer to the respective data sheet of the manufacturer.

The parameters are also used for the I²t calculator of the ballast resistor. If too much power is converted in the ballast, the I²t calculator triggers the error E04 “Ballast circuit load (Chopper I²t)” and switches the device off.

Resistance

The parameter indicates the nominal resistance of the resistor in *ohms*. Depending on the device the resistance can be set within a preset range. If this parameter is set to the value zero, all other parameters of the group become write-protected and are set to zero, too. Thus, the monitoring of the external ballast resistor is turned off.

Rated power

The parameter indicates the rated power of the used ballast resistor in *watts*. This value is to find in the data sheet of the manufacturer.

Peak power

The parameter indicates the maximum possible power of the ballast resistor in *watts*. This value is to find in the data sheet of the manufacturer.

Time for peak power

The parameter indicates the maximum period of time in *seconds*, in which the peak power can be supplied continuously.

Internal Ballast Resistor (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
SD2S	SD2S, SD2T	✓	SD2S

This parameter group displays the values of the internal ballast resistor of the drive amplifier.

The values of the internal ballast resistor are read from the device and write-protected.

The parameters are also used for the I²t calculator of the ballast resistor. If too much power is converted in the ballast, the I²t calculator triggers the error E04 “Ballast circuit load (Chopper I²t)” and switches the device off.

Resistance

The parameter indicates the nominal resistance of the resistor in *ohms*.

Rated power

The parameter indicates the rated power of the resistor in *watts*.

Peak power

The parameter indicates the maximum possible power of the resistor in *watts*.

Time for peak power

The parameter indicates the maximum period of time in *seconds*, in which the peak power can be supplied continuously.

10.2.3 Power Output Stage

On this page the parameters of the power output stage of a drive amplifier are configured.

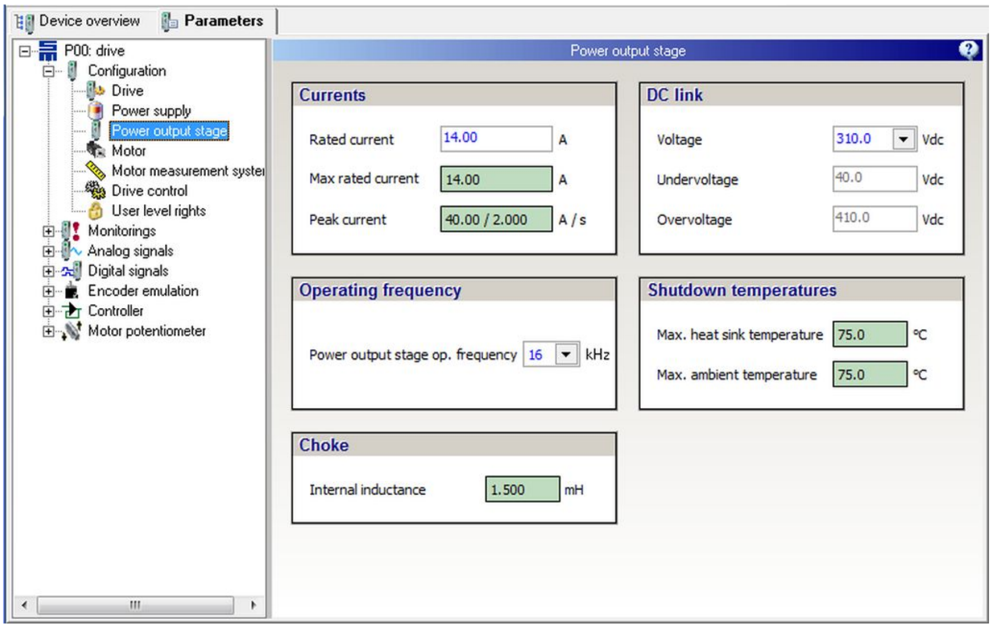


Fig. 21: Parameter page “Power output stage”

Currents (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This parameter group provides parameters to configure the maximum admissible rated and peak current of the drive amplifier.

The parameters are also used for the I²t calculator of the power output stage. When the device is overloaded, the I²t calculator triggers the error message E25 “Power supply load too high” and switches the device off.

Depending on the program configuration the currents are displayed as peak amplitude values or as RMS values in *amperes*.

Rated current

The parameter specifies the rated current of the device during continuous operation (S1 operation). The rated current depends on the cooling and is limited by the parameter “Max. rated current”.

Max. rated current:

The parameter indicates the upper limit of the value range for the parameter “Rated current”. This depends on the used device and on the power stage operating frequency. The parameter is a read-only value.

Peak current

The parameter specifies the peak current of the device. The device can provide this current from the cold state once and not longer than the additionally defined time period. The parameter is a read-only value and depends on the used device.

DC Link (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This parameter group contains values and settings for the DC intermediate circuit of the drive amplifier.

All values are DC values and indicated in *volts*.

Voltage

The parameter indicates the characteristic intermediate circuit voltage. The AC voltage is rectified to supply DC voltage to the intermediate circuit. Therefore the characteristic intermediate circuit voltage corresponds to the peak value of the AC voltage. Possible values are set by means of a list box. If the intermediate circuit voltage of the current device is not variable, the parameter is a read-only value.

Undervoltage

The parameter specifies the lower limit of the DC link voltage. The value is preset and a read-only value. When the voltage is below this limit, the output stage is switched off and the error message E43 “Undervoltage in DC link” appears. The limit may be reached when the load of the DC link is too high, e.g. when the motor accelerates too fast or after a mains failure.

Overvoltage

The parameter specifies the upper limit of the DC link voltage. The parameter is a read-only value. When the voltage is above this limit, the output stage is switched off and the error message E42 “Overvoltage in DC link” appears. The limit can be reached when the motor is decelerated too rapidly or through heavy variations in the mains supply.

Operating Frequency (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This field provides a parameter to set the PWM frequency of the power output stage.

Power output stage operating frequency

The parameter specifies the frequency of the pulse-width modulation used by the output stage transistors. Available values are set by means of a selection list and indicated in *kilohertz*. Each speed scaling requires a certain minimum operating frequency. The output stage operating frequency depends on the driven speed and on the number of pole pairs.

Maximum speed × number of pole pairs	SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM(1)	HSPAM / VF(2)
up to 30,000 rpm (electr.)	8 kHz	8 kHz	8 kHz	8 kHz
up to 60,000 rpm (electr.)	16 kHz	16 kHz	16 kHz	16 kHz
up to 120,000 rpm (electr.)	16 kHz	32 kHz	16 kHz	16 kHz
up to 240,000 rpm (electr.)	–	64 kHz	32 kHz	–
up to 360,000 rpm (electr.)	–	128 kHz	64 kHz	–
up to 480,000 rpm (electr.)	–	128 kHz	–	–

(1) FPAM (HSBLOCK / FPAM for devices with buck converter): In FPAM operation the parameter indicates the switching frequency of the buck converter. (In FPAM operation a maximum speed of 600,000 rpm (electr.) can be reached.) The switching frequency of the buck converter is independent of the required maximum speed.

(2) HSPAM (HSPAM / VF for devices with buck converter): In HSPAM operation the parameter indicates the switching frequency of the buck converter. (In HSPAM operation a maximum speed of 600,000 rpm (electr.) can be reached.) The switching frequency of the buck converter is always 8 kHz.

If you set a higher value for the switching frequency, the device power is reduced (derating). Derating tables for each device are embodied in the hardware documentation.

Shutdown Temperatures (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This parameter group displays the parameters for the monitoring of the thermal load of the output stage of a drive amplifier.

The parameters are read-only values loaded from the connected hardware.

Max. heat sink temperature

10

The parameter indicates the maximum heat sink temperature allowed for the operation of the system in *degree centigrade*. If this temperature is exceeded, the output stage will be switched off automatically and the error message E28 “Power output stage temperature too high” appears.

Max. ambient temperature

The parameter indicates the maximum ambient temperature allowed for the operation of the system in *degree centigrade*. If this temperature is exceeded, the output stage will be switched off automatically and the error message E27 “Ambient temperature too high” appears.

Choke (SD2x)

SERVO / VECTOR	HSPWM	HSPAM / VF	HSBLOCK / FPAM
✓	✓	✓	✓

This parameter group displays information on the internal inductance.

Internal inductance

The parameter indicates the internal inductance of the output stage choke in *millihenry*. If there is no choke in the drive, the inductance value is 0 mH.

10.2.4 Motor

This page contains parameters for the motor that is connected to the drive amplifier.

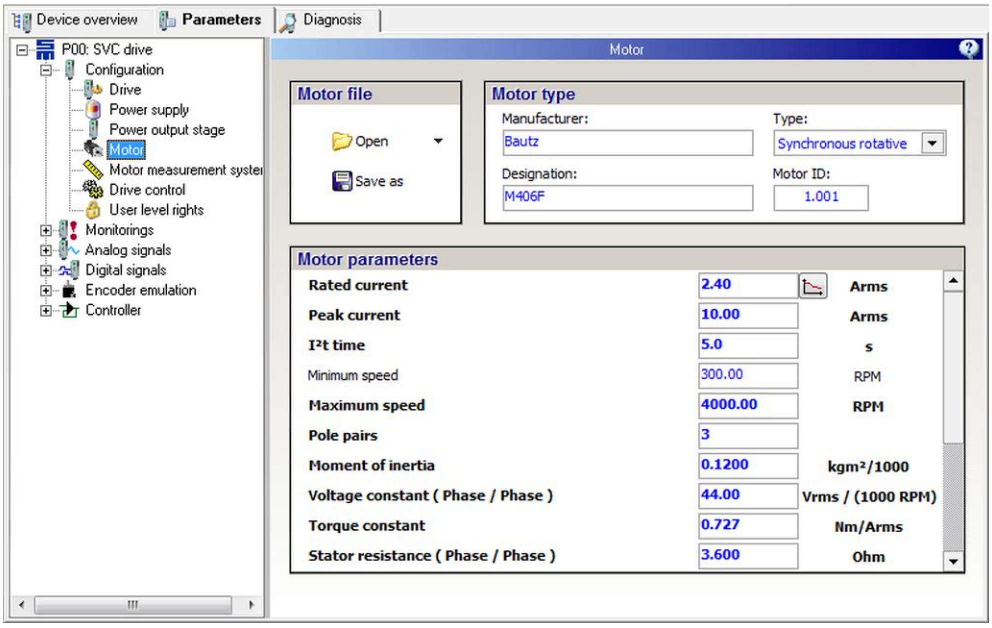


Fig. 22: Parameter page "Motor"

Motor File (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

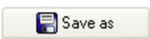
This parameter group provides different methods to save all motor parameters of a drive amplifier in one motor file "*.mot"). Later this motor file can be reloaded.

Open

Via this button you can open an existing motor file. Then the parameters contained in that file are displayed on the page "Motor". For this purpose the dialog "Chose your motor file" appears.

The arrow button located on the right of the button allows to open one of the last four used motor files directly. The dialog does not appear.

Save as



Via this button all parameters of the page "Motor" are saved in one motor file. For this purpose the dialog "Chose your motor file" appears.

Motor Type (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

10

This parameter group provides parameters for the general identification of the connected motor.

Manufacturer

The parameter indicates identification data of the motor manufacturer. The user can enter the manufacturer and information on the series of the motor here. The maximum length is 32 characters.

Designation

This parameter is provided for the exact designation of the motor. The maximum length is 32 characters.

Type

The parameter indicates the type of the motor. This is set via a list box. The settings made here affect the motor and control parameters.

The following motor types can be selected for the drive functions:

Drive type	SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
Motor type	▸ Synchronous rotative ▸ Synchronous linear ▸ Voice Coil rotative ▸ Voice Coil linear	▸ Synchronous rotative ▸ Asynchronous rotative	▸ Synchronous rotative	▸ Asynchronous rotative

Motor ID

This parameter saves a motor specific ID. The ID can be selected as desired by the user and can be used for identifying the motor version via the object dictionary. The object MOTOR_USER_IDENT_CODE is used for this purpose.

The "Motor ID" is a 32 bit value, divided into a 16-bit part before the decimal point and a 16-bit decimal part.

10.2.4.1 Motor Parameters

This parameter group comprises all physical parameters of the motor. Different parameters are displayed for the different motors that can be selected.

The following parameter descriptions depend on the used motor type. All motor data highlighted (in bold) in the user interface are required for the parameterization and must be adapted to the connected motor.

Motor Parameters for Rotary Synchronous and Voice Coil Motors (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	–

When using voice coil motors the units of the parameters are indicated as sinus peak values (and not as RMS values). When you select a voice coil motor as motor type, the software automatically switches the units. A note will appear in a window.

Parameter	Unit	Description
Rated current	A ; A_{rms} (1)	Specifies the rated current of the motor during continuous operation (S1 operation). The parameter is independent from the rated current of the power output stage and is not limited by it. The rated current is also used in the I²t calculator of the motor. By means of the button a dialog to set a variable rated current is opened (see section "Variable Rated Current", page 83).
Peak current	A ; A_{rms} (1)	Specifies the peak current of the motor. The parameter is independent from the peak current of the power output stage, but it is the top limit for the limitation of the current controller. The peak current is also used in the I²t calculator of the motor.
I²t time	s	Indicates the maximum time during which the peak current is allowed to flow once out of the cold state. This parameter is also used for the I²t calculator. When the device is overloaded, the I²t calculator triggers the error message E29 “Motor load too high (Motor I²t)” and switches the drive amplifier off.
Minimum speed	RPM	Specifies the minimum possible reference speed of the motor. The parameter limits indirectly the reference value of the speed control.
Maximum speed	RPM	Specifies the maximum possible mechanical speed of the motor. The parameter is the top limit for the limitation of the speed controller.
Pole pairs		Indicates the number of pole pairs in the stator winding and thus the number of magnetic pole pairs in the rotor. Do not confuse the number of pole pairs (Z_P) with the number of poles (P). The following applies: $Z_p = ½ \times P$
Moment of inertia	kgm² / 1000	Defines the moment of inertia of the motor considering the measuring system and the brake. The moments of inertia of couplings are not considered in this parameter.
Voltage constant (Phase / Phase)	V/ (1000 RPM); V_{rms} / (1000 rpm)(1)	Specifies the countervoltage constant of the motor. The voltage is measured between two phases.
Torque constant	Nm / A; Nm / A_{rms} (1)	Defines the torque generation depending on the impressed current.
Stator resistance (Phase / Phase)	Ohm	Indicates the resistance of the stator winding. The indicated value is the value measured over two phases.
Stator inductivity (Phase / Phase)	mH	Indicates the inductance of the stator winding. The indicated value is the value measured over two phases.
External inductance	mH	Via this parameter external inductivity can be specified, e.g. chokes.
Phase shift (Motor phase / Measurement)	°electr	This parameter is only used for resolver measuring systems. The value indicates the phase between the zero position of the motor and the zero position of the resolver measuring system. The phase is indicated as electric angle in °. It can be determined via the setup tool.
On delay motor holding brake	ms	Indicates the time which passes from the moment the motor holding brake is switched on until the controller (the torque) is switched off.
Off delay motor holding brake	ms	Indicates the time which passes from the moment the controller (the torque) is switched on until the motor holding brake is switched off.
Temperature monitoring		Specifies which type of temperature monitoring is used in the motor. The parameter is set via list box. Depending on the selected type of temperature monitoring the parameter “Limit of temperature monitoring” appears.
Limit of temperature monitoring	Ohm	PTC / thermal contact For a resistor with a positive temperature coefficient (PTC) the parameter defines the maximum admissible value of the resistor before the output stage is switched off. This value and the according switch-off temperature is to find in the motor data sheet. A thermal contact behaves like a PTC.

Parameter	Unit	Description
	Ohm	NTC For a resistor with a negative temperature coefficient (NTC) the parameter defines the minimum admissible value of the resistor before the output stage is switched off. This value and the according switch-off temperature is to find in the motor data sheet.
	°C	KTY83 / 130 For an approximately linear resistance with positive temperature coefficient of the KTY series the parameter indicates the switch-off temperature in °C. For the switch-off temperature refer to the data sheet of the motor. Typically the temperature is about 155°C.

[1] According to the program setting of the units (see page 33) the parameters of a rotary synchronous motor are indicated as peak values or RMS values.

Motor Parameters for Linear Synchronous and Voice Coil Motors (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

When using voice coil motors the units of the parameters are indicated as sinus peak values (and not as RMS values). When you select a voice coil motor as motor type, the software automatically switches the units. A note will appear in a window.

Parameter	Unit	Description
Rated current	A ; A_{rms} [1]	Specifies the rated current of the motor during continuous operation (S1 operation). The parameter is independent from the rated current of the power output stage and is not limited by it. The rated current is also used in the I²t calculator of the motor. By means of the button a dialog to set a variable rated current is opened (see section "Variable Rated Current", page 83).
Peak current	A ; A_{rms} [1]	Specifies the peak current of the motor. The parameter is independent from the peak current of the power output stage, but it is the top limit for the limitation of the current controller. The peak current is also used in the I²t calculator of the motor.
I²t time	s	Indicates the maximum time during which the peak current is allowed to flow once out of the cold state. This parameter is also used for the I²t calculator. When the device is overloaded, the I²t calculator triggers the error message E29 “Motor load too high (Motor I²t)” and switches the drive amplifier off.
Maximum speed	mm/s	Specifies the maximum possible speed of the motor. The parameter is the top limit for the limitation of the speed controller.
Pole distance (180° electrically)	mm	Indicates the distance between the permanently excited magnetic poles in the secondary part of the motor. The pole distance is the distance between the north pole and the south pole. Thus, it is a half period of the permanently excited magnetic field (= 180° electric). The distance between two north and two south poles is the double pole distance (= 360° electric). [$d_p = d_{NS} = ½\, d_{NN} = ½\, d_{SS}$]
Motor mass	kg	Indicates the mass of the motor's primary part including the measuring system and the brake. The mass of additionally mounted components is not considered in this parameter.
Voltage constant (Phase / Phase)	V / (m/s) V_{rms} [1] / (m/s)	Specifies the countervoltage constant of the motor. The voltage is measured between two phases.
Force constant	N / A;	Specifies the force generation depending on the impressed current.

Parameter	Unit	Description
	N / A_{rms} [1]	
Stator resistance (Phase / Phase)	Ohm	Indicates the resistance of the stator winding. The indicated value is the value measured over two phases.
Stator inductivity (Phase / Phase)	mH	Indicates the inductance of the stator winding. The indicated value is the value measured over two phases.
External inductance	mH	Via this parameter external inductivity can be specified, e.g. chokes.
Phase shift (Motor phase / Measurement)	°electr	Currently this parameter has no meaning for linear motors.
On delay motor holding brake	ms	Indicates the time which passes from the moment the motor holding brake is switched on until the controller (the force) is switched off.
Off delay motor holding brake	ms	Indicates the time which passes from the moment the controller (the force) is switched on until the motor holding brake is switched off.
Temperature monitoring		Specifies which type of temperature monitoring is used in the motor. The parameter is set via list box. Depending on the selected type of temperature monitoring the parameter “Limit of temperature monitoring” appears.
Limit of temperature monitoring	Ohm	PTC / thermal contact For a resistor with a positive temperature coefficient (PTC) the parameter defines the maximum admissible value of the resistor before the output stage is switched off. This value and the according switch-off temperature is to find in the motor data sheet. A thermal contact behaves like a PTC.
	Ohm	NTC For a resistor with a negative temperature coefficient (NTC) the parameter defines the minimum admissible value of the resistor before the output stage is switched off. This value and the according switch-off temperature is to find in the motor data sheet.
	°C	KTY83 / 130 For an approximately linear resistance with positive temperature coefficient of the KTY series the parameter indicates the switch-off temperature in °C. For the switch-off temperature refer to the data sheet of the motor. Typically the temperature is about 155°C.

[1] According to the program setting of the units (see page 33) the parameters of a linear synchronous motor are indicated as peak values or RMS values.

Motor Parameters for Rotary Asynchronous Motors (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	–	✓

Parameter	Unit	Description
Rated current	A ; A_{rms} [1]	Specifies the rated current of the motor during continuous operation (S1 operation). The parameter is independent from the rated current of the power output stage and is not limited by it. The rated current is also used in the I^2t calculator of the motor. By means of the button a dialog to set a variable rated current is opened (see section "Variable Rated Current", page 83).
Peak current	A ; A_{rms} [1]	Specifies the peak current of the motor. The parameter is independent from the peak current of the power output stage, but it is the top limit for the limitation of the current controller. The peak current is also used in the I^2t calculator of the motor.
I^2t time	s	Indicates the maximum time during which the peak current is allowed to flow once out of the cold state. This parameter is also used for the I^2t calculator.

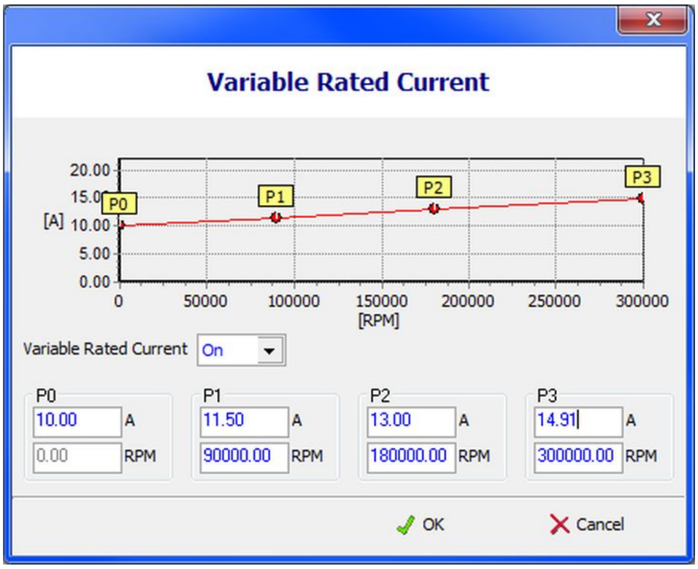
Parameter	Unit	Description
		When the device is overloaded, the I²t calculator triggers the error message E29 "Motor load too high (Motor I²t)" and switches the drive amplifier off.
Minimum speed	RPM	Specifies the minimum possible reference speed of the motor. The parameter limits indirectly the reference value of the speed control.
Maximum speed	RPM	Specifies the maximum possible mechanical speed of the motor. The parameter is the top limit for the limitation of the speed controller.
Rated speed	RPM	Specifies rated speed of the motor during continuous operation (S1 operation).
Rated frequency	Hz	Specifies rated frequency of the motor during continuous operation (S1 operation).
Pole pairs		Indicates the number of pole pairs in the stator winding and thus the number of magnetic pole pairs in the rotor. Do not confuse the number of pole pairs (Z_P) with the number of poles (P). The following applies: $Z_P = ½ \times P$
Moment of inertia	kgm² / 1000	Defines the moment of inertia of the motor considering the measuring system and the brake. The moments of inertia of couplings are not considered in this parameter.
Stator resistance (Phase / Phase)	Ohm	Indicates the resistance of the stator winding. The indicated value is the value measured over two phases.
Maximum voltage	V / V_{rms} (1)	Specifies the maximum possible voltage of the motor. The voltage is measured between two phases.
Power factor cos phi		Indicates the relation of active power P to apparent power S of the motor. $\cos \varphi = P/S$
Rotor time constant	ms	Indicates the relation of rotor inductance (leakage inductance L_R and main field inductance L_H) to rotor resistance R_R. $(L_R + L_H) / R_R$
Rotor resistance	Ohm	Indicates the resistance of the rotor.
Rotor leakage inductance	mH	Indicates the part of inductivity that is generated by magnetic leakage flux of the rotor.
Main field inductance	mH	Indicates the combined inductance of stator and rotor.
Stator leakage inductance	mH	Indicates the part of inductivity that is generated by magnetic leakage flux of the stator.
Magnetizing current	A / A_{rms} (1)	Indicates the maximum rotor related magnetizing current.
Number of parallel motors		Indicates the number of parallel operated motors of the same type.
External inductance	mH	Via this parameter external inductivity can be specified, e.g. chokes.
On delay motor holding brake	ms	Indicates the time which passes from the moment the motor holding brake is switched on until the controller (the torque) is switched off.
Off delay motor holding brake	ms	Indicates the time which passes from the moment the controller (the torque) is switched on until the motor holding brake is switched off.
Temperature monitoring		Specifies which type of temperature monitoring is used in the motor. The parameter is set via list box. Depending on the selected type of temperature monitoring the parameter "Limit of temperature monitoring" appears.
Limit of temperature monitoring	Ohm	PTC / thermal contact For a resistor with a positive temperature coefficient (PTC) the parameter defines the maximum admissible value of the resistor before the output stage is switched off. This value and the according switch-off temperature is to find in the motor data sheet. A thermal contact behaves like a PTC.

Parameter	Unit	Description
	Ohm	NTC For a resistor with a negative temperature coefficient (NTC) the parameter defines the minimum admissible value of the resistor before the output stage is switched off. This value and the according switch-off temperature is to find in the motor data sheet.
	°C	KTY83 / 130 For an approximately linear resistance with positive temperature coefficient of the KTY series the parameter indicates the switch-off temperature in °C. For the switch-off temperature refer to the data sheet of the motor. Typically the temperature is about 155°C.

(1) According to the program setting of the units (see page 33) the parameters of a rotary asynchronous motor are indicated as peak values or RMS values.

Variable Rated Current

You can set limit values for the rated current in the low speed range to ensure smooth startup. Open the following dialog window via the button  and set the rated current according to the actual speed.



Open the list box “Variable rated current” and select the entry “On”. Then you can determine up to 4 speed levels within the speed range of the motor.

Click “OK” to apply the settings.

10.2.5 Motor measuring system

This page provides the parameters of the measuring system the connected motor uses. The page is divided into a fix and one or two variable parameter groups. The settings made in the fixed parameter group “Motor measurement system” determine whether and which parameter group appears as variable parameter group.

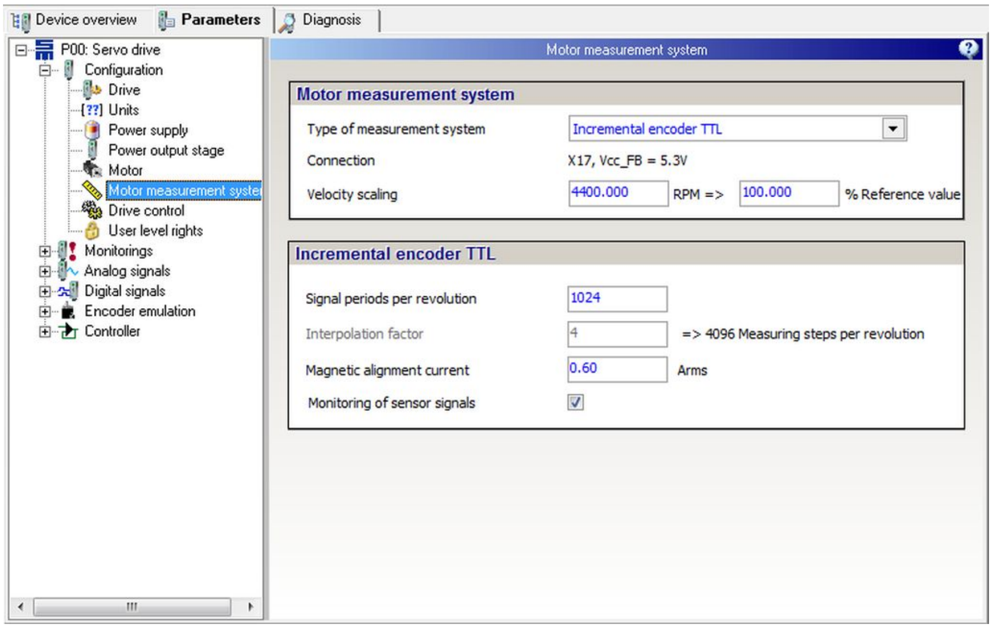


Fig. 23: Parameter page “Motor measurement system”

Motor Measurement System (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

In this parameter group you select the motor measuring system to be used with the drive amplifier and the speed scaling.

10

NOTICE

Voltage (VCC) varies depending on the set measuring system

When the connected measuring system is operated under a wrong voltage, it can be damaged.

Check that you have chosen the right measuring system in the software **before connecting.**

Type of measurement system

The parameter specifies which measuring system will be used. This is set via a list box. Depending on the selected measuring system additional parameter group with additional parameters may be displayed.

The following table indicates which measuring system is supported for the devices and drive functions and which additional parameter groups appear.

Drive function	Device	Measuring system	Additional parameter group
SERVO / VECTOR	SD2 / SD2S	Sensorless vector controlled / SVC	▸ Angle Controller, page 91 ▸ Magnetic alignment current, page 89
		Resolver	▸ Resolver, page 88

Drive function	Device	Measuring system	Additional parameter group
		Incremental encoder TTL[1]	▸ Incremental encoder TTL, page 87
		SineCosine encoder	▸ SineCosine encoder, page 89
		SineCosine encoder with EnDat	
		SineCosine encoder with Hiperface	
		Linear Hall	▸ Linear Hall, page 88
		Incremental Encoder 12 V[2]	▸ Incremental Encoder 12 V, page 87
	SD2B / SD2T	Sensorless vector controlled / SVC	▸ Angle Controller, page 91 ▸ Magnetic alignment current, page 89
HSPWM	SD2S	Hall ABC 12 V[2]	▸ Hall Sensor, page 86 ▸ Magnetic alignment current, page 89 [3]
		SineCosine encoder	▸ SineCosine encoder, page 89
		Sensorless	▸ Magnetic alignment current, page 89 [3]
		Field plate 3 wires	▸ Pulse generator, page 86 ▸ Magnetic alignment current, page 89 [3]
		Field plate 2 wires	
		Pulse generator NAMUR	
		Pulse generator 24V	
		Pulse generator at track Hall A	
		Pulse generator 5V	
		Digital field plate / GMR	
	SD2T	Sensorless	▸ Magnetic alignment current, page 89 [3]
		Field plate 3 wires	▸ Pulse generator, page 86 ▸ Magnetic alignment current, page 89 [3]
		Field plate 2 wires	
		Pulse generator NAMUR	
		Pulse generator 24V	
		Pulse generator at track Hall A	
		Digital field plate / GMR	
HSBLOCK / FPAM	SD2S	Hall ABC 12 V[2]	▸ Hall Sensor, page 86 ▸ Tachometer, page 90 ▸ Commutation Controller, page 87
		Hall ABC 5 V / RS422[1]	
		Phase Voltage Measurement[4]	▸ Magnetic alignment current, page 89 ▸ Commutation Controller, page 87
HSPAM / VF	SD2	Sensorless	▸ None
		Field plate 3 wires	▸ Pulse generator, page 86
	SD2B	Sensorless	▸ None
	SD2S	SineCosine encoder	▸ SineCosine encoder, page 89
		Sensorless	▸ None
		Field plate 3 wires	▸ Pulse generator, page 86
		Field plate 2 wires	
		Pulse generator NAMUR	
		Pulse generator 24V	
		Pulse generator 5V	
		Digital field plate / GMR	

Drive function	Device	Measuring system	Additional parameter group
	SD2T	Sensorless	▸ None
		Field plate 3 wires	▸ Pulse generator, page 86
		Field plate 2 wires	
		Pulse generator NAMUR	
		Pulse generator 24V	
		Pulse generator 5V	
		Digital field plate / GMR	

(1) When this measuring system is parameterized, VCC is switched to 5.3 V.

(2) When this measuring system is parameterized, VCC is switched to 12 V.

(3) This parameter group is displayed when a synchronous motor is used.

(4) This measuring system is available only for devices with controlled intermediate circuit.

Tab. 1: Measuring systems of the drive amplifiers

NOTICE

Type of the measuring system: "Sensorless"

If the measuring system type “Sensorless” was selected, no measuring system is connected and the motor is operated with maximum current.

To avoid property damage we recommend to operate the motor without sensor for a short moment for testing.

Connection

This parameter indicates the device connector and the supply voltage for the selected measuring system.

Velocity scaling

The parameter indicates a reference speed to which all other speed values can be scaled. Moving at speed values that are higher than the speed scaling is not possible.

Hall Sensor (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	✓	–

Via this parameter group the Hall sensors are analyzed. All three Hall sensors are in use.

Adjustment of the Hall sensor:

The parameter specifies the orientation of the Hall sensors. The parameter is set via a list box. If the Hall sensors are rotated by 180°, the Hall signals must be inverted.

Pulse Generator (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	✓

This parameter group is displayed for all pulse generator measuring systems for the drive amplifiers.

Resolution

The parameter specifies the number of pulses per mechanical motor revolution.

Incremental Encoder TTL / 12 V (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

This parameter group contains parameters to configure the monitoring system of an incremental encoder.

Signal periods per revolution

The parameter indicates the number of increments of one mechanical revolution (360°). Refer to the encoder data sheet. The parameter is indicated in *signal periods per mechanical revolution*.

Interpolation factor

The parameter indicates the resolution per signal period. For this measuring system the parameter is write-protected, because it has the fixed value '4'. The unit of the interpolation factor is *Increments per signal period*.

The total resolution of the measuring system is indicated additionally to the parameter and is calculated as follows:

Resolution = signal periods per revolution × interpolation factor

Magnetic alignment current

- SVC operation: The parameter indicates the current in *amperes*, which is to be supplied when the motor is phased in.
- Other operating modes: The parameter indicates the maximum current in *amperes*, which is admissible when the motor is phased in.

The magnetic alignment current should not be higher than the rated current of the motor.

DANGER

Phasing of the motor

Some drive configurations do **not** allow phasing-in a motor. The reason is that in some cases the brakes must be released and torques are effective.

If the motor is not able to phase in, the commutation is incorrect and thus the control does not work.

Commutation Controller (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	SD2S	–

Via this parameter group you can set the commutation controller.

Mode

Via the parameter “Mode” you can switch on/off the commutation controller. For FPAM operation (measuring system = “Phase Voltage Measurement”) this parameter is always set to “On”, i.e. the commutation controller is always active. For HSBLOCK operation with Hall sensors you should activate the commutation controller as well, since the synchronization is much more accurate then.

Bandwidth

The parameter indicates the bandwidth of the controlled commutation correction in *hertz*. A typical bandwidth is 30 Hz.

Offset

The parameter indicates the manual offset of the commutation controller in *degrees*. For the measuring system “Phase Voltage Measurement” this parameter is always **0°**.

Linear Hall (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

This parameter group contains parameters to configure and analyze a linear Hall sensor.

Number of pole pairs

The parameter indicates the number of pole pairs (Z_p) of the linear Hall sensor. Do not confuse the number of pole pairs with the number of poles (P). The following applies: $Z_p = ½ \times P$

Mechanical offset (zero position)

This parameter is not used at present.

Bandwidth tracking filter

The parameter indicates the bandwidth of the measuring system in *hertz*. The system of 2nd order works with a fix damping of D = 0.7.

Resolver (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

This parameter group contains parameters for resolver configuration and resolver evaluation.

Number of pole pairs

The parameter indicates the number of pole pairs (Z_p) of the resolver. Do not confuse the number of pole pairs with the number of poles (P). The following applies: $Z_p = ½ \times P$

Mechanical offset (zero position)

This parameter is not used at present.

Bandwidth tracking filter

The parameter indicates the bandwidth of the measuring system in *hertz*. The system of 2nd order works with a fix damping of D = 0.7.

Magnetic Alignment Current (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	–

This parameter group is used to configure the alignment for motors with pulse measuring system or without any measuring system. The phasing of the motor is also referred to as magnetic alignment.

Magnetic alignment current

- SVC operation: The parameter indicates the current in *amperes*, which is to be supplied when the motor is phased in.
- Other operating modes: The parameter indicates the maximum current in *amperes*, which is admissible when the motor is phased in.

The magnetic alignment current should not be higher than the rated current of the motor.

DANGER

Phasing of the motor

Some drive configurations do **not** allow phasing-in a motor. The reason is that in some cases the brakes must be released and torques are effective.

If the motor is not able to phase in, the commutation is incorrect and thus the control does not work.

Set-up time

The parameter indicates the phasing time in *milliseconds*.

SineCosine Encoder (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	SD2, SD2S	–	–

Via this parameter the sine cosine encoder with magnetic alignment, EnDat and Hiperface is configured.

Lines

The parameter indicates the number of signal periods of one mechanical revolution (360°). Refer to the encoder data sheet. The parameter is indicated in *signal periods per mechanical revolution*.

Interpolation factor

The parameter indicates the resolution per signal period. The unit of the interpolation factor is *Increments per signal period*.

The total resolution of the measuring system is indicated additionally to the parameter and is calculated as follows:

Resolution = signal periods per revolution × interpolation factor

The total resolution of the measuring system is calculated from the parameters “Lines” and “Interpolation factor”. It is indicated additionally to the parameter. The unit of the interpolation factor is *Increments per signal period*.

The parameters “Magnetic alignment current” and “Set-up time” must be set only for synchronous motors.

Magnetic alignment current

- SVC operation: The parameter indicates the current in *amperes*, which is to be supplied when the motor is phased in.
- Other operating modes: The parameter indicates the maximum current in *amperes*, which is admissible when the motor is phased in.

The magnetic alignment current should not be higher than the rated current of the motor.

DANGER

Phasing of the motor

Some drive configurations do **not** allow phasing-in a motor. The reason is that in some cases the brakes must be released and torques are effective.

If the motor is not able to phase in, the commutation is incorrect and thus the control does not work.

Set-up time

The parameter indicates the phasing time in *milliseconds*.

Tachometer (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	✓	–

In the parameter group “Tachometer” you can determine the speed measuring system for HSBLOCK operation: Either via Hall sensors or via TTL encoder.

Usually commutation and speed control are generated at the motor via Hall sensors. Commutation via Hall sensors is advantageous, because there is always an absolute commutation signal available. Thus additional synchronization of the motor measuring system with the rotor is not necessary (in contrast to using a TTL encoder for commutation and tachometer). However, speed measurement via Hall sensors is restricted in dynamics and accuracy at low speeds. This can be improved considerably by the use of a TTL encoder for speed measurement.

Hall ABC (12 V or 5 V/RS422)

The Hall sensors are activated to provide the commutation and the actual speed value. The parameter “Connection” indicates devices connector of the measuring system.

Incremental encoder TTL

The Hall sensors are activated only for the commutation. The speed is measured via TTL encoder. The parameter “Connection” indicates devices connector of the measuring system. Below that the “Signal periods per revolution” of the motor are set. If you activate the check box, the sensor signals are monitored.

Angle Controller (SD2x)

SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

During sensorless vector control an angle controller is used to adapt the commutation.

Max. angle error

The parameter indicates the maximum angle error in *degrees*. A typical maximum angle error is 8°.

If the actual speed is very noisy, you can allow a greater maximum angle error. The maximum angle error indirectly determines the bandwidth of the angle controller.

☞ If the maximum angle error is beyond the normal value range (message in *drivemaster2* software), the motor data are incorrect in most cases.

Bandwidth

The bandwidth of the angle controller determines the dynamics of sensorless commutation finding. The unit is *hertz*.

The bandwidth is normally between 20 Hz and 80 Hz (typical value: 30 Hz). It is set indirectly via the maximum angle error.

10.2.6 Drive Control

Via this page the parameters of the drive control are configured.

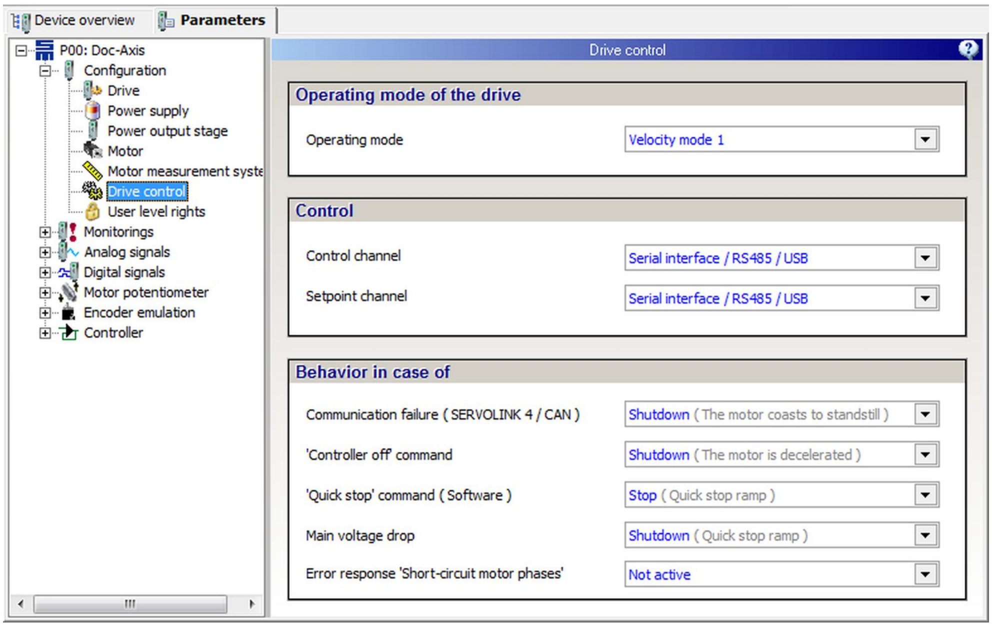


Fig. 24: Parameter page "Drive control"

Operating Mode of the Drive (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Here the operating mode of the drive amplifier is selected.

10

Operating mode

The parameter defines which control cascades are active in the drive amplifier. Possible operating modes are set by means of a list box. For the drive functions HSPWM, HSBLOCK / FPAM and HSPAM / VF you can select only the operating mode "Velocity mode 1" at present.

Description of the operating modes

- Velocity mode 1:
  Only the innermost control cascade (the current control) and the next control cascade (the speed control) are activated. The speed reference value can be set externally.
- Profile Velocity Mode:
  In this mode you can set a reference speed value via SERVOLINK 4. The unit is *increments per sample*.
- Current control:
  Only the innermost control cascade (the current control) is activated. Thus only the reference current and indirectly a torque or force can be set externally.
- Interpolated position control:
  The innermost control cascade (the current control), the second control cascade (the speed control) and the third control cascade (the position control) are activated. The SERVOLINK 4 bus protocol allows external setting of interpolation points. The interpolated position control can only be operated via the control channel SERVOLINK 4.
- Electronic gear:

The drive is controlled by the position control. The reference value of the electronic gear can be set via the encoder 0.

Drive control (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

The communication with the drive amplifier is divided into the groups configuration and control of the drive. In the parameter group “Control” the control channel for the control of the drive is set.

For more information on the control of the drive refer to the document “Drive System SD2 - Device Control”.

Control channel

The parameter specifies the communication channel for the control of the drive.

The following entries can be set by a list box:
- Digital inputs
- Serial interface / RS485 / USB
- SERVOLINK 4 (only for devices of the series SD2 and SD2S)
- CAN bus (not for devices of the series SD2T)
- DNC 8 Byte Telegram
- Start/Stop keys (only for devices of the series SD2T)

Setpoint channel

The parameter indicates the channel to be used for sending reference values to the device. The provided selection depends on the selected control channel.

The following entries can be set by a list box:

Setpoint channel	Control channel					
	Digital inputs	Serial interface / RS485 / USB	SERVO-LINK 4	CAN bus	DNC 8 Byte Telegram	Start/Stop keys
Analog inputs	✓	✓	–	–	–	✓
Serial interface / RS485 / USB	✓	✓	–	–	–	✓
Encoder 0	✓	–	–	–	–	–
Internal setpoints(1)	✓	✓	–	–	–	✓
SERVOLINK 4	–	–	✓	–	–	–
CAN bus(2)	–	–	–	✓	–	–
DNC 8 Byte Telegram(2)	–	–	–	–	✓	–
Cursor keys	–	–	–	–	–	✓

(1) If you select the entry “Internal setpoints”, the page Internal target values, page 125 is provided additionally. On this page you can set up to 16 target values.

(2) If you select the entry “CAN bus” or “DNC 8 Byte Telegram”, the page Bus system, page 95 is provided to set the respective parameters.

10

Behavior in Case of (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

With the aid of this parameter group you can set the behavior of the drive amplifier in different situations.

The parameterization in this parameter group depends on the complete system (mechanical elements, working area) into which the drive is installed.

You can set the following reactions for the indicated events:

Reaction	Event				
	Communication failure (SERVO-LINK 4/CAN)	'Controller off' command	'Quick stop' command (Software)	Main voltage drop	Error
No action	✓	–	–	–	–
Shutdown (The motor coasts to standstill)	✓	✓	✓	✓	–
Shutdown (The motor is decelerated)	–	✓	–	–	–
Shutdown (Quick stop ramp)	✓	–	–	✓	–
Stop (The motor is decelerated)	–	–	✓	–	–
Stop (Quick stop ramp)	–	–	✓	–	–
Stop (Maximum current)	–	–	✓	–	–
Shutdown (Brake with external ref. value)	–	–	–	✓	–
“Short circuit motor phases” = active	–	–	–	–	✓
“Short circuit motor phases” = not active	–	–	–	–	✓

Description of the reactions

- No action:
  The operation is continued without reaction to the fault.
- Shutdown (The motor coasts to standstill):
  The power output stage is switched off immediately. All control circuits are deactivated. The motor coasts to standstill without control. If applicable, the motor is kept in position by a mechanical motor brake.
- Shutdown (The motor is decelerated):
  The motor is decelerated by the standard deceleration ramp, whereas the deceleration is as quick as possible considering the parameterization (current limitation). As soon as the state “Speed zero” is reached, the output stage is switched off. Then, the control of the drive is off. If applicable, it is kept in its position by means of a mechanical brake.
- Shutdown (Quick stop ramp):
  The motor is decelerated by the quick stop ramp, whereas the deceleration is as quick as possible considering the parameterization (current limitation). As soon as the state “Speed zero” is reached, the output stage is switched off. Then, the control of the drive is off. If applicable, it is kept in its position by means of a mechanical brake.
- Stop (The motor is decelerated):

The motor is decelerated by the standard deceleration ramp, whereas the deceleration is as quick as possible considering the parameterization (current limitation). Then, the drive is kept in its position while the control is active. All controllers remain active and the mechanical brake remains deactivated.

- Stop (Quick stop ramp):
  The motor is decelerated by the quick stop ramp, whereas the deceleration is as quick as possible considering the parameterization (current limitation). Then, the drive is kept in its position while the control is active. All controllers remain active and the mechanical brake remains deactivated.
- Stop (Maximum current):
  The motor is decelerated with the maximum peak current. Then, the drive is kept in its position while the control is active. All controllers remain active and the mechanical brake remains deactivated.
- Shutdown (Brake with external ref. value)
  The motor is decelerated by an externally set deceleration ramp, whereas the deceleration is as quick as possible considering the parameterization (current limitation). As soon as the state “Speed zero” is reached or a time of 7.5 seconds has passed, the output stage is switched off. Then, the control of the drive is off. If applicable, it is kept in its position by means of a mechanical brake.
- Error response “Short circuit motor phases”
  - Active: If an error occurs, the motor phases are short circuited.
  - Not active: If an error occurs, the motor phases are not short circuited.

10.2.7 Bus System

The parameter page “Bus system” is only displayed when the control channel “Can bus” or “DNC 8 Byte Telegram” is selected (see "Drive control (SD2x)", page 93). On the page “Bus system” you can set the parameters for the communication accordingly.

10.2.7.1 CAN Bus

The page “Bus system” for CAN bus provides the tab pages “CAN”, “PDO 0” und “PDO 1”.

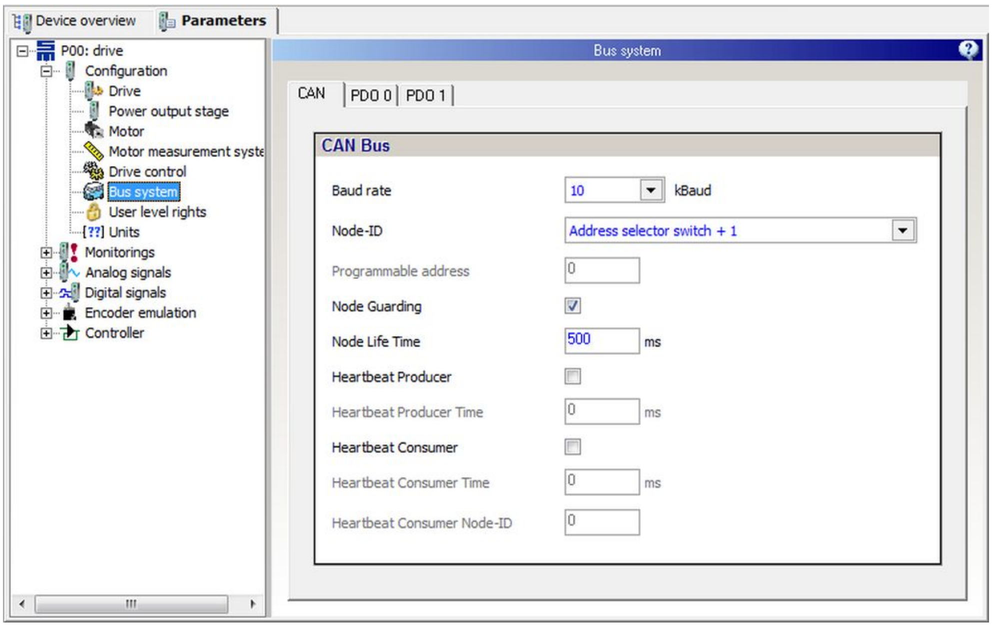


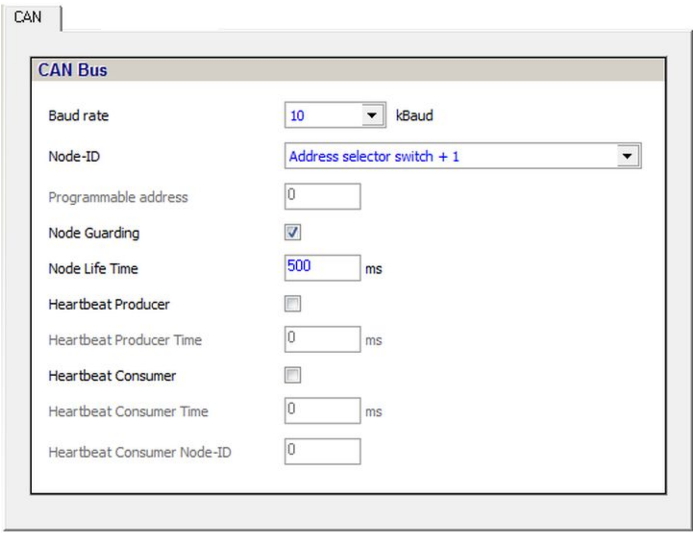
Fig. 25: Parameter page “Bus system” for CAN bus

Further information on the CAN bus connection is to find in the documentation “Drive System SD2 – CAN Bus Connection”.

CAN (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	SD2S	✓	SD2, SD2B, SD2S

Via this tab page the CAN bus is parameterized.



Baud rate

Via this parameter you can set the baud rate of the CAN bus in the range of 10 kbaud to 1 Mbaud.

Node-ID

The node-ID is the address assigned to the device in the bus system. Via the parameter you can select, how to calculate the node-ID.

The following settings are available:

- Address selector switch + 1:
  The node-ID is set via the ID switch on the front panel of the device. Since you can set the ID switch to a value between 0..15 but the CAN bus does not allow the value 0, the value 1 is automatically added. Thus, you can set node-IDs between 1 and 16 via the ID switch.
- Address selector switch + programmable address + 1:
  The node-ID is calculated by the sum of the ID switch value and the value entered in the input field “Programmable address”. In order to remain within the range of the node-ID, you must enter a value between 0..110. Since the number 0 is not allowed in the CAN bus, 1 is automatically added to the result.
- Programmable address + 1:
  The address is entered in the input field “Programmable address”. Here you can set a value in the range of 0..126. Since the number 0 is not allowed in the CAN bus, 1 is automatically added. Thus, the node-ID is in the range of 1..127. The ID switch on the front panel of the device has no function.

Node Guarding / Node Life Time

When the check box for node guarding is activated, the communication via CAN bus is monitored. During operation (state “operational”) the drive now expects to receive node guarding messages from the host at regular intervals. Via the parameter “Node Life Time” you can enter the time interval between two node guarding messages in *milli-seconds*. If the drive does not receive a message within this time, an error is triggered.

When node guarding is active, heartbeat monitoring is not possible.

Heartbeat Producer / Heartbeat Producer Time

When the check box for heartbeat producer is activated, the communication via CAN bus is monitored. After the drive has finished booting, the drive transmits heartbeat protocols containing its node-ID to the host at regular intervals. Via the parameter “Heartbeat Producer Time” you can enter the time interval between two heartbeat protocols in *milliseconds*.

When heartbeat monitoring is active, node guarding is not possible.

Heartbeat Consumer / Heartbeat Consumer Time

When the check box for heartbeat consumer is activated, the communication via CAN bus is monitored. During operation (state “operational”) the drive now expects to receive heartbeat protocols from the host at regular intervals. Via the parameter “Heartbeat Consumer Time” you can enter the time interval between two heartbeat protocols in *milliseconds*. If the drive does not receive a heartbeat protocol within this time, an error is triggered.

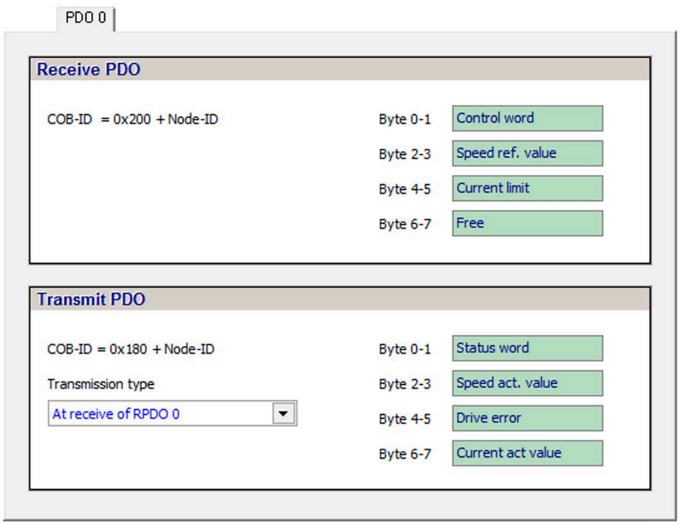
When heartbeat monitoring is active, node guarding is not possible.

PDO 0 / PDO 1 (SD2x, CAN Bus)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	SD2S	✓	SD2, SD2B, SD2S

The tab pages “PDO 0” and “PDO 1” display the assignment of the individual drive objects (functions) in the CAN bus.

10



Receive PDO

The Receive PDO displays the received data. The data can not be changed.

The Receive PDO is always active and does not need to be parameterized.

Transmit PDO

The Transmit PDO displays the transmitted data. Here you can set when and in which form the data are sent.

The following settings are available:

- Disabled:
  No data are sent.
- Send cyclic:
  The drive sends the adjacent data cyclically whereas the time interval can be set. The interval is set via the additional parameter “Cycle time” in *milliseconds*.
- At receive of RPDO 0:
  The drive sends the adjacent data when requested by a Receive PDO from the master.
- At change of a marked value:
  Via activating the check boxes you define, which values must change so that a transmit cycle is triggered. Via the additional parameter “Minimum cycle time” you define the time in *milliseconds*, in which the data will be sent. This setting prevents overloading the CAN bus due to frequently sending the PDO.

10.2.7.2 DNC 8 Byte Telegram

When the drive communicates via DNC 8 Byte telegram, it is able to receive and transmit data (8 byte telegrams) via the serial interface. Thus it is possible to operate the drive in the Profibus (e.g. via Profibus gateway).

The page “Bus system” for the DNC 8 Byte telegram provides the tab pages “DNC”, “PDO 0” and “PDO 1”.

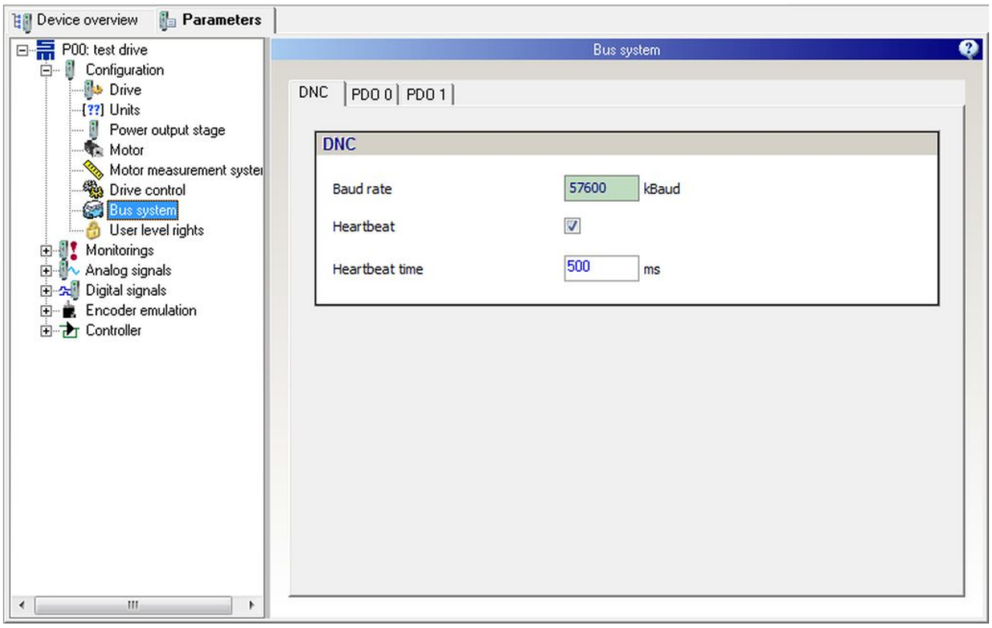


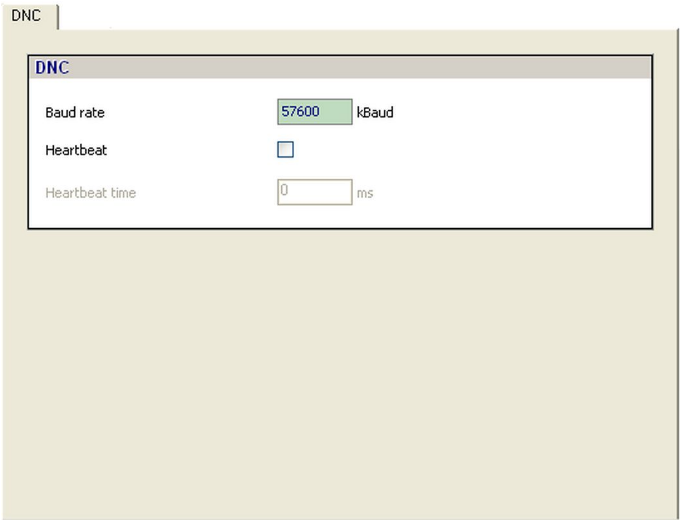
Fig. 26: Parameter page “Bus system” for DNC 8 Byte telegram

Further information on the DNC 8 Byte Telegram is to find in the documentation “Drive System SD2 – DNC 8 Byte Telegram”.

DNC (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Via this tab page the DNC telegram is parameterized.



Baud rate

The baud rate of the DNC 8 byte telegram has a fixed value of 57,600 kBaud.

Heartbeat

When the check box is activated, the communication via the DNC 8 Byte telegram is monitored. During operation the drive now expects to receive prompt telegrams (heartbeat messages) from the host periodically. Via the parameter “Heartbeat time” you can enter the time interval between two prompt telegrams.

Heartbeat monitoring is only active when the communication state machine is in the state “operational” (see documentation Drive System SD2 – DNC 8 Byte Telegram).

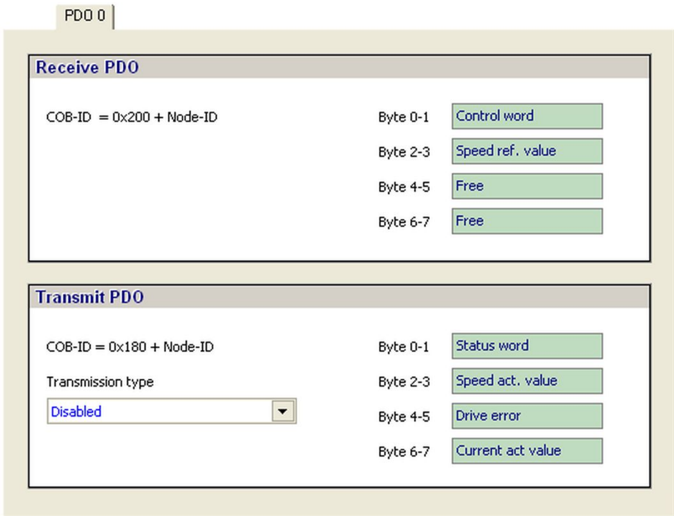
Heartbeat time

The parameter indicates the maximum length of time in *milliseconds*, in which a heartbeat message must be sent to the drive during operation. If the drive does not receive a message within this time, an error is triggered.

PDO 0 / PDO 1 (SD2x, DNC)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

The tab pages “PDO 0” and “PDO 1” display the assignment of the individual drive objects (functions) in the DNC telegram.



There is only this one PDO in the DNC 8 Byte Telegram.

Receive PDO

The Receive PDO displays the received data. The data can not be changed.

Transmit PDO

The Transmit PDO displays the transmitted data. Here you can set when and in which form the data are sent.

The following settings are available:

- Disabled:
  No data are sent.
- At receive of RPDO 0:
  The drive sends the adjacent data when requested by a Receive PDO from the master.

10.2.8 User Level Rights

On this page you define the access rights of the different users. Detailed information on the user level rights is to find in section 6.3 "Assigning User Rights", page 44.

10.2.9 Units

On this page you can define the units for drives operating with the drive function "SERVO / VECTOR" that are indicated for certain values on the user interface.

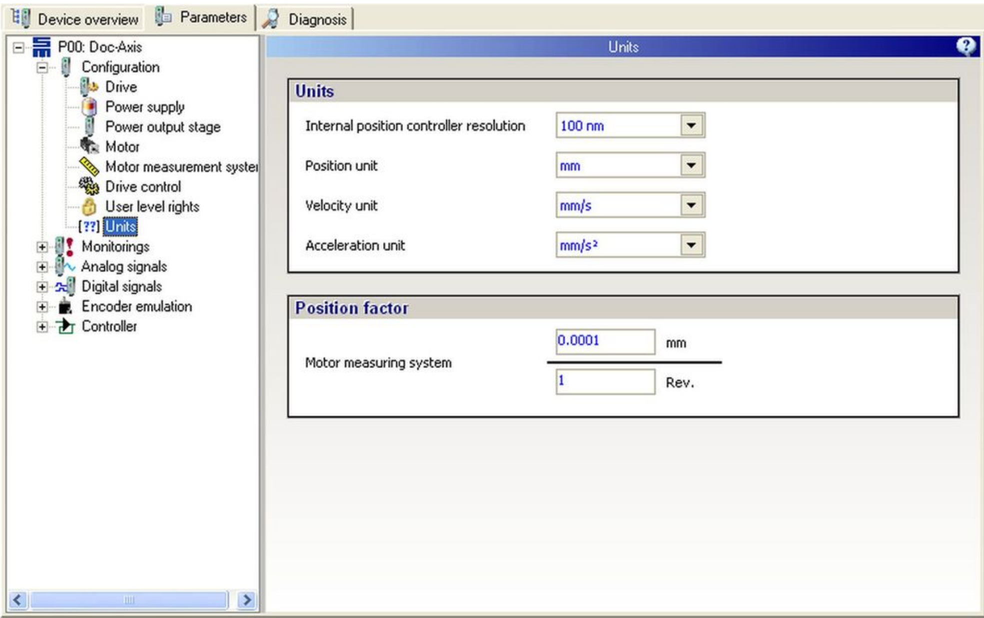


Fig. 27: Parameter page "Units"

Units (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

This parameter group allows setting the units used by the controller internally, i.e. by which it is parameterized.

Internal position controller resolution

The parameter specifies the scaling of the position unit internally used by the position control. The value indicates the position deviation which corresponds to one increment.

Position unit

The parameter indicates the unit for distances in the software. At present only the unit *millimeter* can be selected.

Velocity unit

The parameter indicates the unit for velocity in the software. At present the units *millimeters per second*, *meters per second* and *meters per minute* are available.

Acceleration unit

The parameter indicates the unit for acceleration in the software. At present the units *millimeters per square second* and *meters per square second* are available.

Position Factor (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

Via this parameter the position factor for converting the measuring system is parameterized.

The unit of the position factor depends on the parameters of the group “Units”.

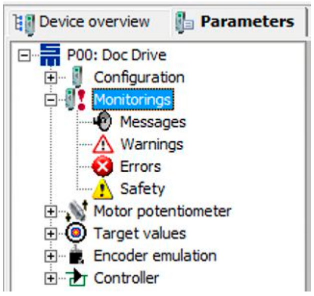
Motor measuring system

This parameter defines the relation between the position unit of the position control (see parameter “Position unit”) and the position unit of the motor measuring system, that means the position unit of the speed control.

For rotary motors the speed unit of the speed control is *rpm*. Thus, the position unit for the speed control is in relation to revolutions. When linear motors are used, the internal position controller resolution is used as position unit of the speed control. For this reason the parameter “Position factor motor measuring system” is a fixed value and write-protected.

10.3 Monitorings

The node “Monitorings” provides the parameter pages “Messages”, “Warnings” and “Errors”. When the device hardware supports the optional safety functions, the page “Safety” is displayed.



On the individual pages you can parameterize the monitoring functions.

10.3.1 Messages

On this page the windows to trigger drive messages are parameterized.

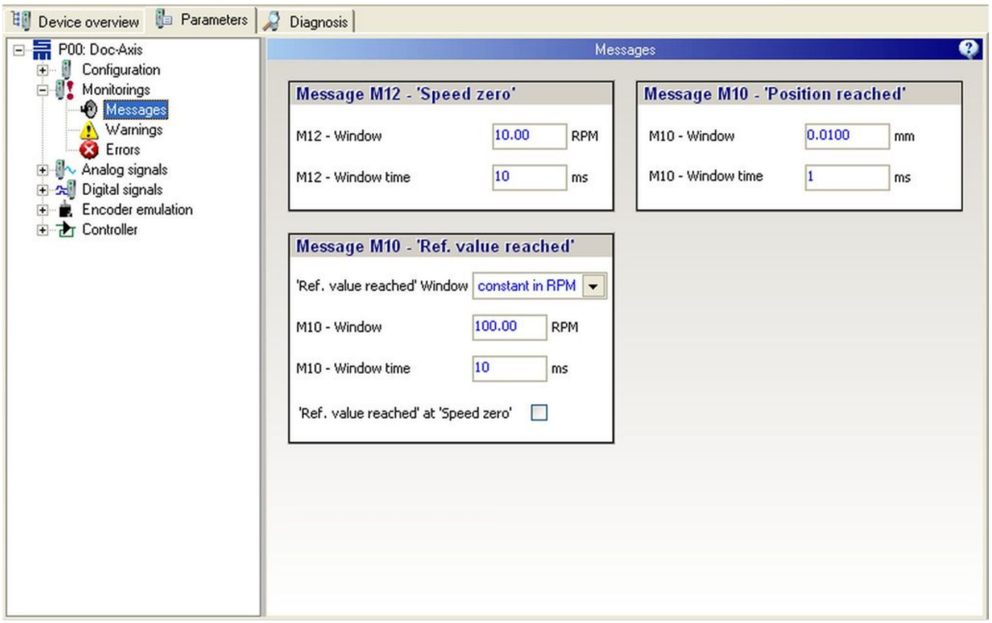


Fig. 28: Parameter page "Messages"

Message M12 - 'Speed zero' (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

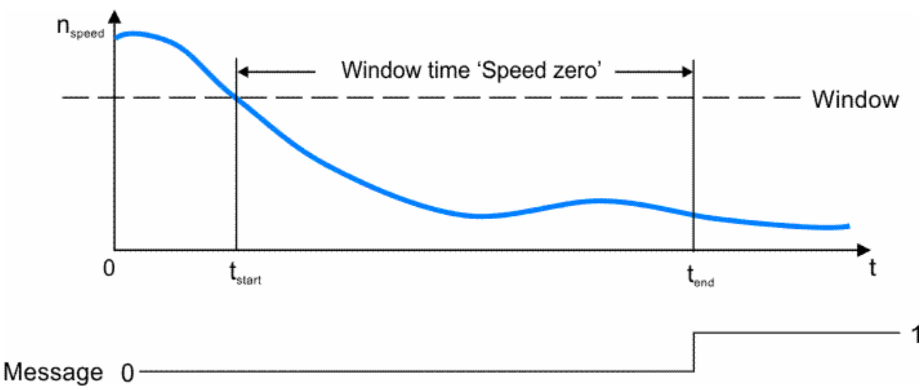
Via this parameter group the window for the message "Speed zero" can be set.

M12 - Window

The parameter indicates the maximum speed at which the 'Speed zero' window is reached.

M12 - Window time

The parameter indicates the width of the 'Speed zero' window. If the speed is within the window for the total window time, the message "M12 – Speed zero" is triggered.



Message 10 - 'Ref. value reached' (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Via this parameter group the window for the message 'Ref. value reached' can be set.

'Ref. value reached' Window

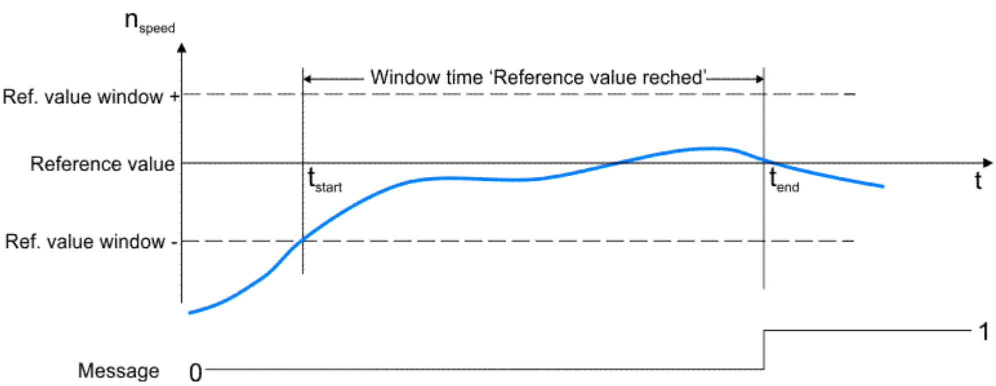
Via this parameter you can define, whether the 'Ref. value reached' window is indicated by a fixed speed in *revolutions per minute* or depending on the reference value in *percent*.

M10 - Window

The parameter indicates the maximum speed tolerance at which the 'Ref. value reached' window is reached.

M10 - Window time

The parameter indicates the width of the 'Ref. value reached' window. If the reference value is within the window for the total window time, the message 'Ref. value reached' is triggered.



’Ref. value reached' at 'Speed zero'

If the check box is activated, the message 'Reference value reached‘ is triggered when 'Speed zero' is reached.

Message 10 - 'Position reached' (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

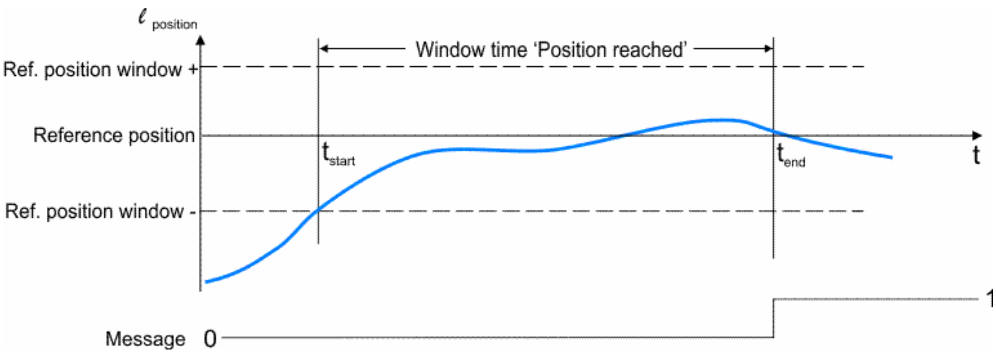
Via this parameter group the message 'Position reached’ can be set. The message is triggered in the drive function SERVO / VECTOR when a measuring system is connected and parameterized.

M10 - Window

The parameter indicates the maximum position tolerance at which the 'Position reached' window is reached.

M10 - Window time

The parameter indicates the width of the 'Position reached' window. If the position error is within the window for the total window time, the message 'Position reached' is triggered.



10.3.2 Warnings

On this page the thresholds to trigger warning messages are parameterized. The hardware documentation of the device provides a list of all warning messages possible.

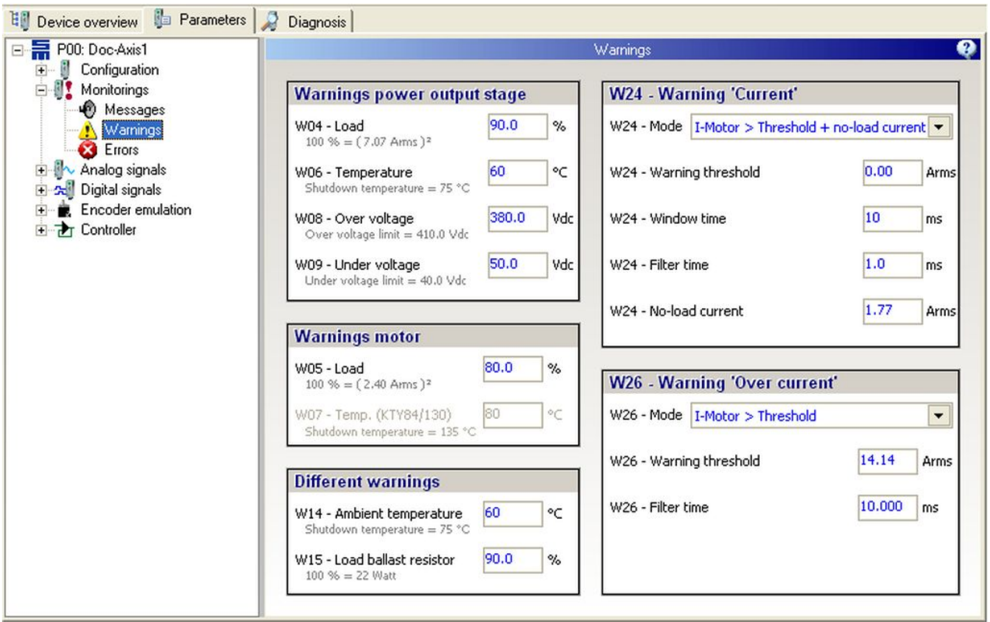


Fig. 29: Parameter page "Warnings"

Warnings Power Output Stage (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Via this parameter group the warnings for the power output stage can be configured.

The according limiting value to trigger an error is indicated below each parameter.

W04 - Load

The parameter indicates a threshold value for the power output stage load in *percent*. As soon as the load has reached this value, the warning W04 is triggered.

W06 - Temperature

The parameter indicates a threshold value for the power output stage temperature in *degree centigrade* . As soon as the temperature has reached this value, the warning W06 is triggered.

W08 - Overvoltage

The parameter indicates a threshold value for overvoltage in the intermediate circuit of the power output stage in *volts*. As soon as the voltage has reached this value, the warning W08 is triggered.

W09 - Undervoltage:

The parameter indicates a threshold value for undervoltage in the intermediate circuit of the power output stage in *volts*. As soon as the voltage is dropped to this value, the warning W09 is triggered.

Warnings Motor (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Via this parameter group the warnings for the motor can be configured.

The according limiting value to trigger an error is indicated below each parameter.

W05 - Load

The parameter indicates a threshold value for the motor load in *percent*. As soon as the load has reached this value, the warning W05 is triggered. The load is based on the I^2t calculator for the motor.

10

W07 - Temp. (KTY84/130)

This parameter is only active, when the temperature is monitored by a KTY84/130. This must be selected in the parameter “Temperature monitoring” on the page “Motor” (see section 10.2.4.1 "Motor Parameters", page 78). If the parameter is active, it indicates a threshold value for the temperature of the motor in *degree centigrade* . As soon as the temperature has reached this value, the warning W07 is triggered.

W24 – Warning threshold ’current' (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Via this parameter group the warning of the current monitoring can be parameterized.

Via the warning 'Current' the message W24 is generated. It indicates that a tool penetrates the material, e.g. when the material is in contact with a grinding wheel. Due to the respective load the current increases. If the current rises too high, the warning 'Current' is triggered. You can make the generated warning message available by setting a digital output accordingly.

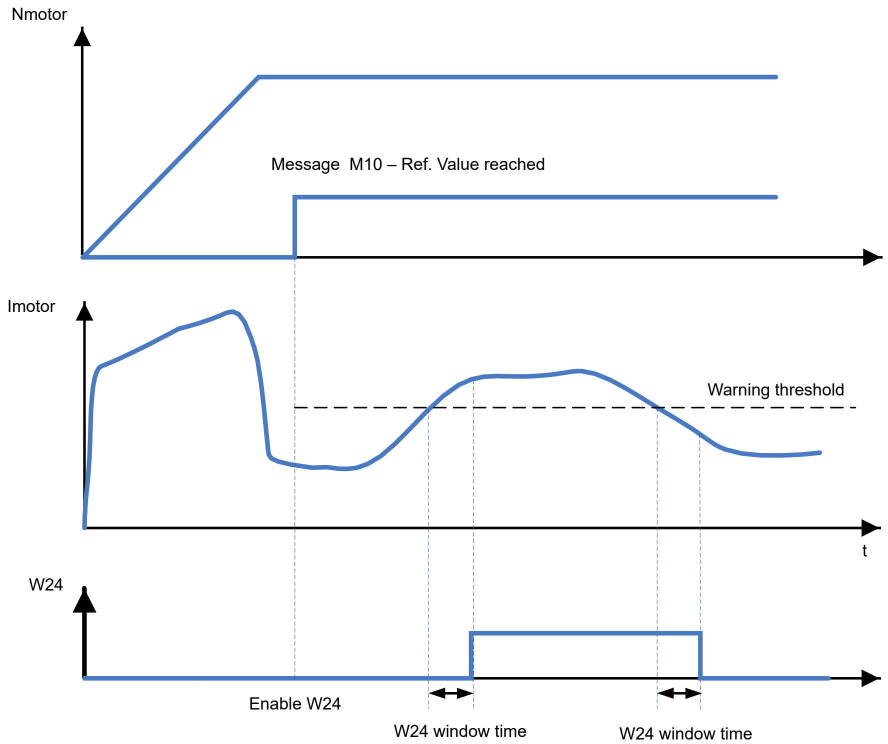
The sampling rate of the motor current for generation of the warning 'Current' is 250 µs.

Via the list box “W24 - Mode” you can set the desired trigger condition for the warning 'Current'. The other parameters depend on the setting made here. Currently three modes for the warning 'Current' are available.

I-Motor > Threshold

Before the warning is generated, the message M10 (reference value reached) must have been signaled. The warning W24 is generated, when the motor current exceeds the indicated warning threshold (in *amperes*). The parameter “W24 - Warning threshold” is either a fixed value or set via an analog input.

The warning message is triggered for at least 200 ms. The “Window time” is the period of time, during which the event must be known internally. When this time is passed, the warning message is generated. By means of the parameter “Filter time” the current to be monitored can be filtered. It is the time of one PT1 filter.

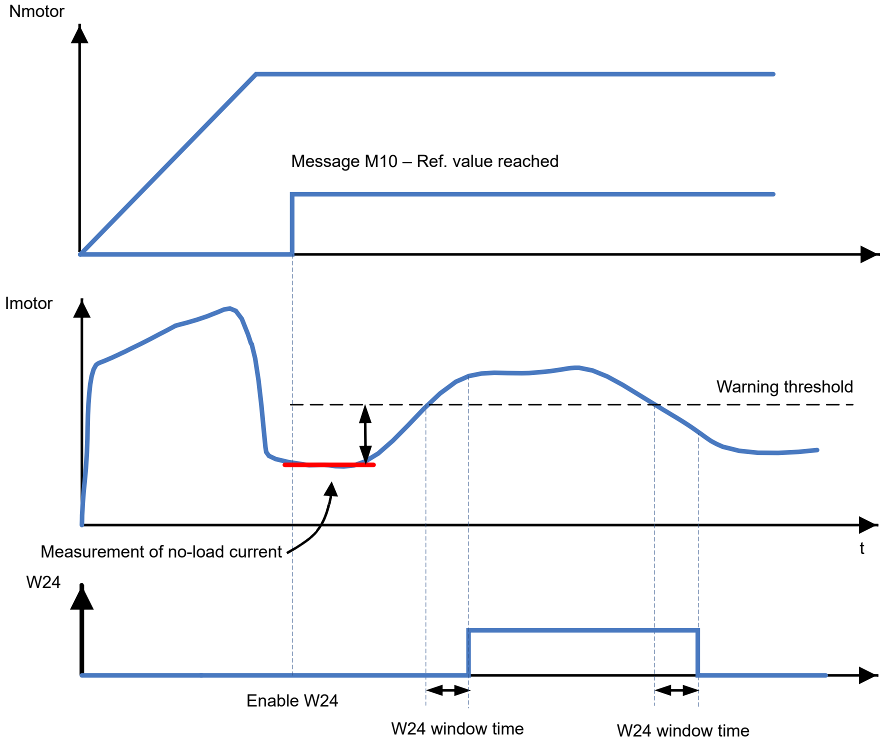


Current monitoring is not enabled until the message “M10 – Ref. value reached” was triggered. Thus peak loads in the acceleration and deceleration ramps are avoided.

I-Motor > Threshold + no-load current

Before the warning is generated, the message M10 (reference value reached) must have been signaled. The warning W24 is generated, when the motor current exceeds the indicated warning threshold (in *amperes*). The parameter “W24 - Warning threshold” is either a fixed value or set via an analog input.

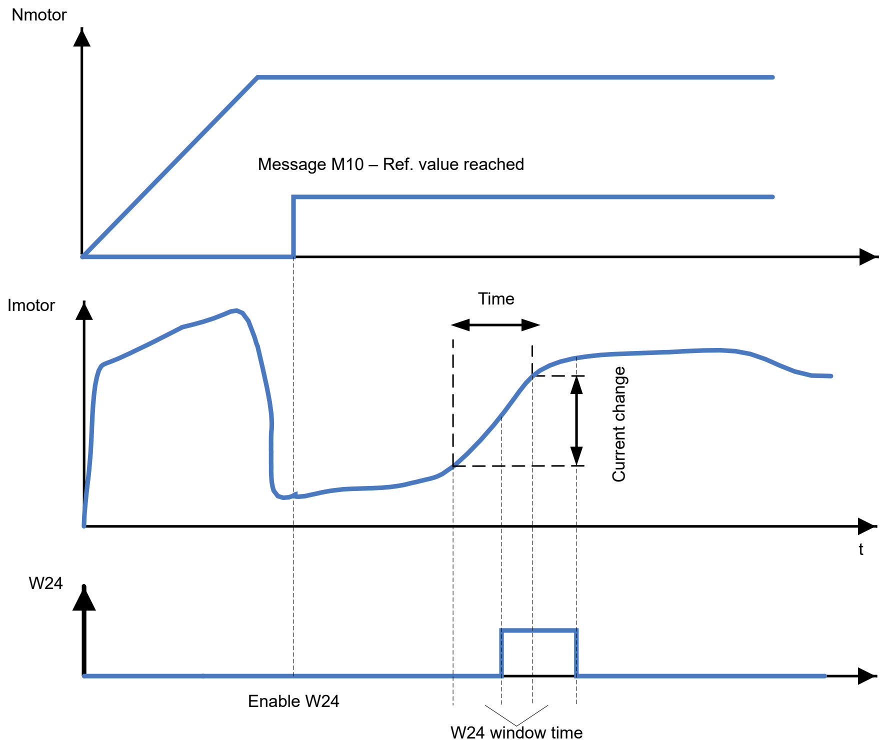
The no-load current is the current, to which the warning threshold refers. The no-load current serves as default value and is usually calibrated during operation via the function “Teach no-load current”. For this reason you must select the function “Teach no-load current” for one digital input. When the no-load current has been reached during operation, the input must be set for at least 200 ms. Then the default value of the no-load current is overwritten by the actual current. The warning message is triggered for at least 200 ms. The “Window time” is the period of time, during which the event must be known internally. When this time is passed, the warning message is generated. By means of the parameter “Filter time” the current to be monitored can be filtered. It is the time of one PT1 filter.



Current monitoring is not enabled until the message “M10 – Ref. value reached” was triggered. Thus peak loads in the acceleration and deceleration ramps are avoided.

Rise I-Motor > Threshold

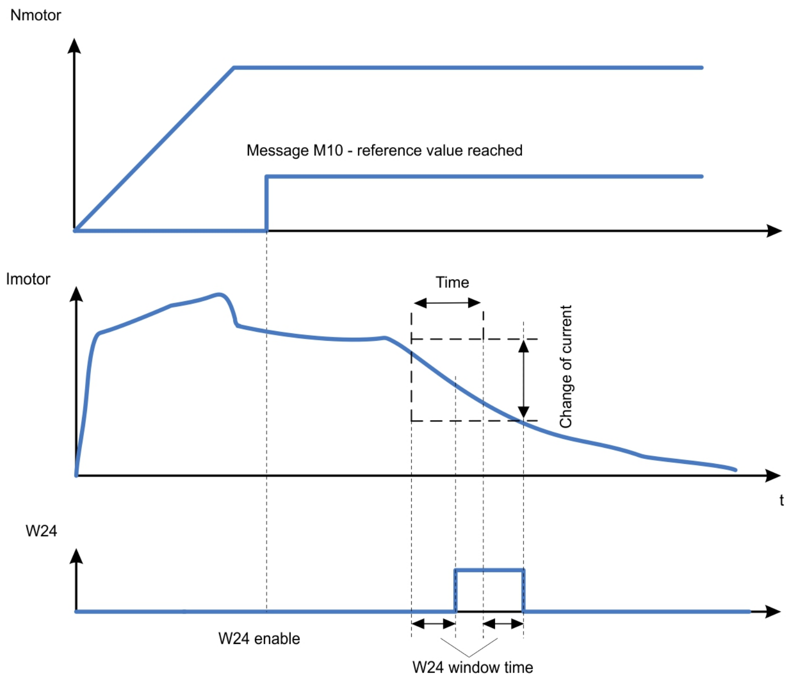
Before the warning is generated, the message M10 (reference value reached) must have been signaled. The warning W24 is generated, when the increase (current change of I-Motor divided by time) exceeds the warning threshold (in *amperes/milliseconds*). The warning message is triggered for at least 200 ms. The “Window time” is the period of time, during which the event must be known internally. When this time is passed, the warning message is generated.



Current monitoring is not enabled until the message “M10 – Ref. value reached” was triggered. Thus peak loads in the acceleration and deceleration ramps are avoided.

Drop I-Motor > threshold

Before the warning is generated, the message M10 (reference value reached) must have been signaled. The warning W24 is generated, when the drop (current change of I-Motor divided by time) falls below the warning threshold (in *amperes/milliseconds*). The warning message is triggered for at least 200 ms. The “Window time” is the period of time, during which the event must be known internally. When this time is passed, the warning message is generated.



Current monitoring is not enabled until the message “M10 – Ref. value reached” was triggered. Thus peak loads in the acceleration and deceleration ramps are avoided.

W26 – Warning threshold ’overload current' (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Via this parameter group the warning of the over current monitoring can be parameterized.

Via the warning 'Over current' the message W24 is generated. The message is generated, when the motor current exceeds a set threshold. You can make the generated warning message available by setting a digital output accordingly.

Via the list box “W26 - Mode” you can set the desired trigger condition for the warning 'Over current'. The other parameters depend on the setting made here. Currently three modes for the warning 'Over current' are available.

Monitoring off:

In this operating mode the over current monitoring is switched off. The other parameters have no meaning.

I-Motor > Threshold:

Before the message is generated, the message M10 (reference value reached) must have been signaled. The warning W26 is generated, when the motor current exceeds the indicated warning threshold (in *amperes*).

The warning message is triggered for at least 200 ms. By means of the parameter “Filter time” the current to be monitored can be filtered. It is the time of one PT1 filter.

Shutdown at I-Motor > Threshold:

Before the message is generated, the message M10 (reference value reached) must have been signaled. As soon as the warning W26 is triggered after the threshold was exceeded, the controller is switched off. The motor is stopped by the quick stop ramp. Then the error E05 (Error caused by warning) is triggered.

The warning message is triggered for at least 200 ms. By means of the parameter “Filter time” the current to be monitored can be filtered. It is the time of one PT1 filter.

Different Warnings (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Via this parameter group further warnings can be configured.

The according limiting value to trigger an error is indicated below each parameter.

W14 - Ambient temperature

The parameter indicates a threshold value for the ambient temperature of the device in *degree centigrade* . As soon as the temperature has reached this value, the warning W14 is triggered.

W15 - Load ballast resistor

The parameter indicates a threshold value for the ballast resistor load in *percent*. As soon as the load has reached this value, the warning W15 is triggered.

10.3.3 Error

10

On this page the windows to trigger error messages are parameterized. The hardware documentation of the device provides a list of all error message possible.

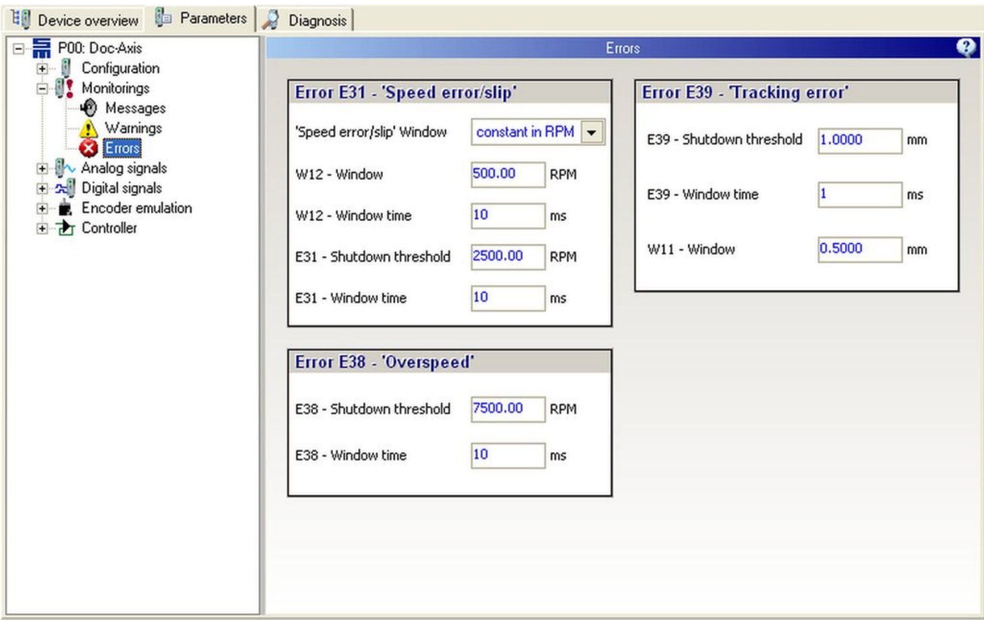


Fig. 30: Parameter page “Errors”

Error E31 - 'Speed error/Slip' (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Via this parameter group the warning and error message for a speed error and slip monitoring can be configured provided that a suitable measuring system is parametrized. The speed of rotary motors is indicated in *revolutions per minute*, the speed of linear motors in *millimeters per second*.

'Speed error/slip' - Window

Via this parameter you can define, whether the 'Slip' window is indicated by a fix speed or depending on the reference value in *percent*.

W12 - Window

The parameter indicates the warning threshold of the speed error at which the warning W12 is generated.

W12 - Window time

The parameter indicates the time of the W12 window in *milliseconds*. If the speed error is within the W12 window for the total window time, the warning W12 is generated.

E31 - Shutdown threshold

The parameter indicates the threshold value of the speed at which the error E31 is triggered.

E31 - Window time

The parameter indicates the time of the E31 window in *milliseconds*. If the speed error is within the E31 window for the total window time, the error E31 “Speed error or slip too great” is triggered and the device is switched off.

Error E38 - 'Overspeed' (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	–

Via this parameter group the error message for overspeed can be configured provided that a suitable measuring system is parameterized. The speed of rotary motors is indicated in *revolutions per minute*, the speed of linear motors in *millimeters per second*.

E38 - Shutdown threshold

The parameter indicates the threshold value of the speed at which the error E38 is triggered.

E38 - Window time

The parameter indicates the time of the E38 window in *milliseconds*. If the speed is within the E38 window for the total window time, the error E38 “Actual speed value greater than overspeed threshold” is triggered and the drive amplifier is switched off.

Error E39 - 'Tracking error' (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

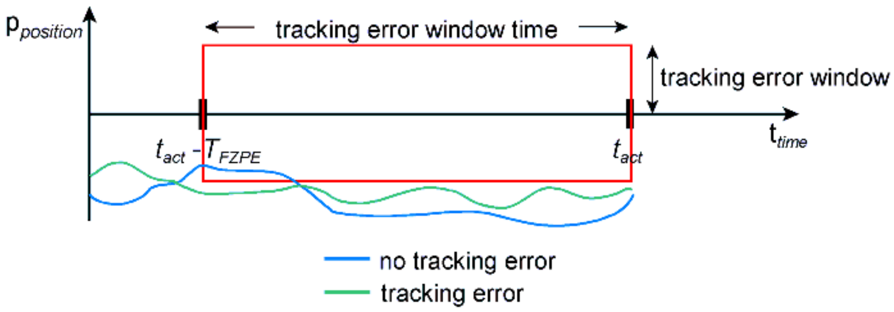
Via this parameter group the warning and error messages for a tracking error can be configured.

E39 - Shutdown threshold

The parameter indicates the threshold value for the tracking error in *millimeters*, at which the tracking error window is left.

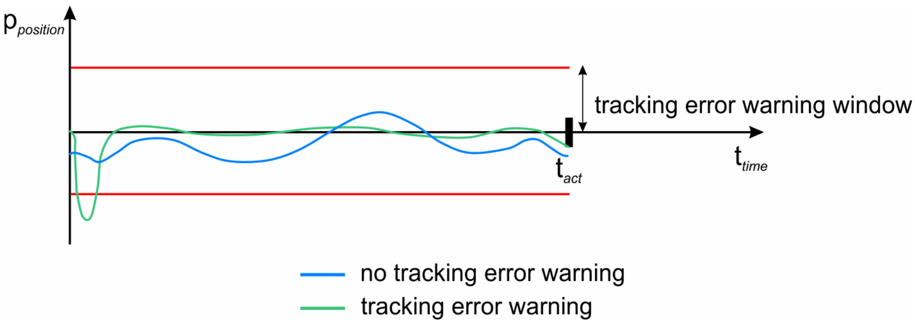
E39 - Window time

The parameter indicates the time of the tracking error window in *milliseconds*. If the tracking error is outside of the tracking error window for the total tracking error window time, the error E39 “Tracking error monitoring and motor slowdown” is triggered and the drive amplifier is switched off.



W11 - Window

The parameter indicates the maximum tracking error before the tracking error window is left and a warning message is triggered. If the tracking error is out of the tracking error window, a warning message is immediately triggered.



Error E44 - 'Commutation lost' (SD2xHSPWM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	–

This parameter group allows to configure the error message for loss of commutation. Via the check boxes you can activate the corresponding monitoring functions. These are writable only for synchronous motors.

10

E44 - Flux monitoring

Via the check box the monitoring function for flux increase is activated.

The parameter “E44 - Start threshold” indicates the speed in *revolutions per minute* at which the flux monitoring is activated.

By means of the parameter “E44 - Flux threshold” you set the maximum flux in a value range of 200 % – 800 %. If this value is exceeded, the error message E44 is triggered.

E44 - Under flux Monitoring

Via the check box the monitoring function for flux drop is activated.

The parameter “E44 - Under flux threshold” indicates the minimum flux current in *amperes*. If the flux falls below this value, the error message E44 is triggered.

In addition you can activate the function “One restart at magnetic alignment error”.

E44 - Over current monitoring

Via the check box the monitoring function for current increase is activated.

The parameter “E44 - Over current threshold” indicates the maximum current in *amperes*. If this value is exceeded, the error message E44 is triggered.

E44 - EMF monitoring

Via the check box the monitoring function for the electromotive force (EMF) is activated. EMF monitoring is configured via the motor parameters (voltage constant and stator resistance), see "Motor Parameters for Rotary Synchronous and Voice Coil Motors (SD2x)", page 78.

Error E44 - 'Commutation lost' (SD2xSVC)

10

SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

This parameter group allows to configure the error message for loss of commutation. Via the check boxes you can activate the corresponding monitoring functions. These are writable only for synchronous motors with sensorless vector control (SVC).

E44 - Minimum speed monitoring

The check box activates the monitoring function for the minimum speed. The minimum speed is specified in the motor parameters, see "Motor Parameters for Rotary Synchronous and Voice Coil Motors (SD2x)", page 78.

E44 - EMF monitoring

The check box activates the monitoring function for the electromotive force (EMF). EMF monitoring is configured via the motor parameters (voltage constant and stator resistance), see "Motor Parameters for Rotary Synchronous and Voice Coil Motors (SD2x)", page 78.

E44 - One restart at magnetic alignment error

If the check box is activated, the drive is restarted once after a magnetic alignment error.

10.3.4 Safety

On this page the user parameterizes the safety functions of the drive amplifier. The page is only displayed, when the device hardware supports the safety functions “Safe Limited Output Frequency ” and “Safe Frequency Monitor”.

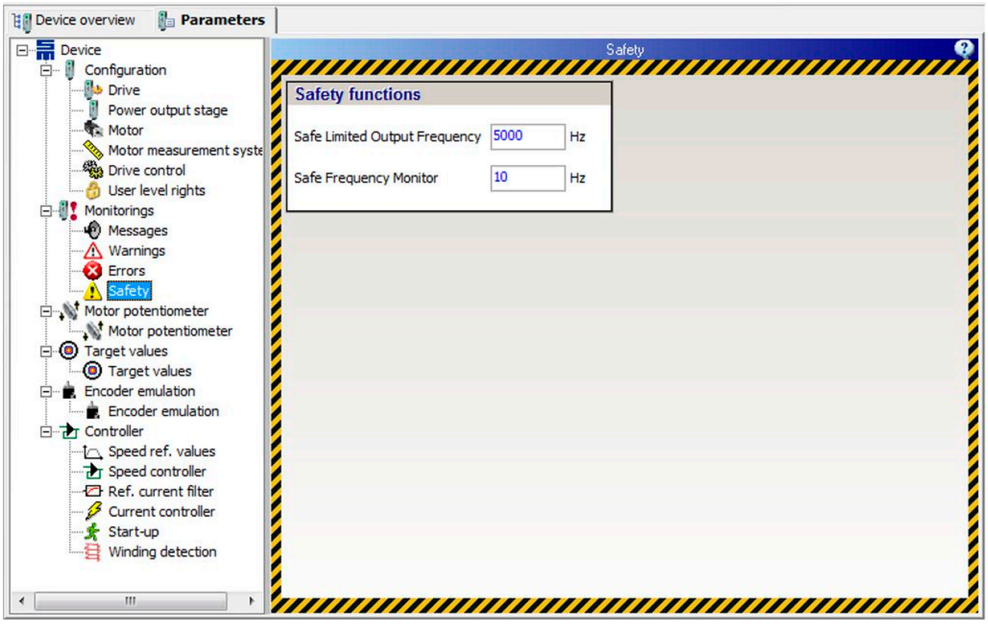


Fig. 31: Parameter page “Safety”

Password protection

You should protect the settings of the safety functions against unauthorized changes. On the page “User level rights” you can define passwords for higher user levels. Use the check boxes to determine the user level required for editing the safety parameters.

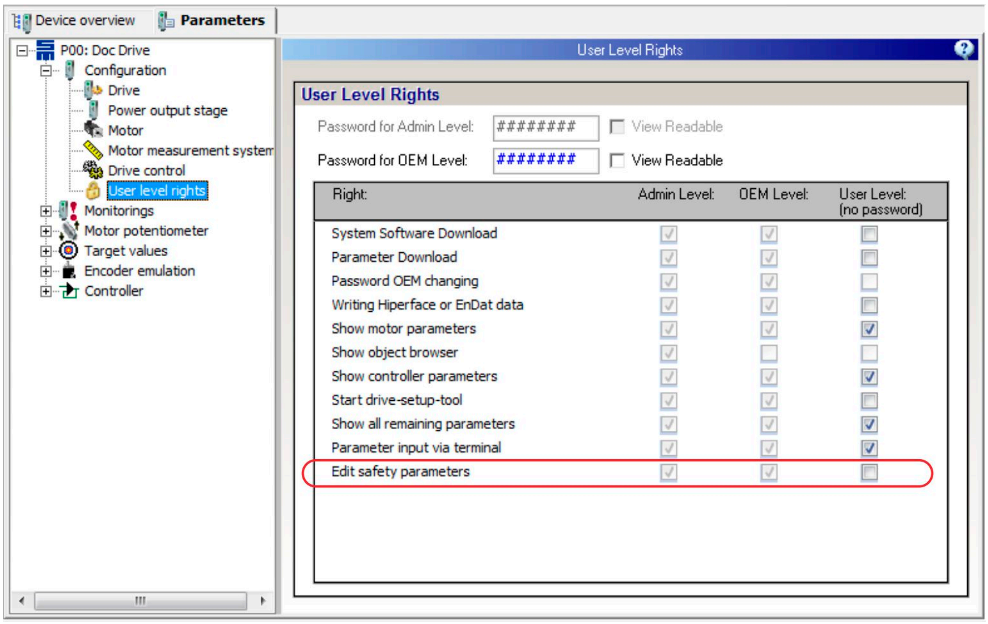


Fig. 32: Parameter page “User level rights”

For further information on password protection refer to chapter 6 "Password Protection and User Rights", page 43.

10

Safety Functions (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

This parameter group is used to set the frequencies of the safety functions “Safe Limited Output Frequency” and “Safe Frequency Monitor”.

Safely Limited Rotating Field

The function “Safe Limited Output Frequency” (SLOF) allows defining a safe limit for the rotating field of a spindle. The function prevents that the drive actively accelerates the connected spindle to a too high frequency. Consider that the function does not prevent exceeding the limit frequency, when an external system actively accelerates the spindle.

The parameter specifies the limit frequency in *hertz* to which the spindle can be accelerated.

If you enter the value 0 Hz, the drive cannot execute any movement. The safety function would disable the drive because any reference value would be greater than 0 Hz.

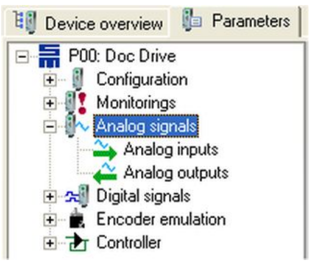
Safe Standstill Monitor

The function “Safe Frequency Monitor” (SFM) allows detecting a standstill of an electric motor. In this case, a standstill matches the specified limit frequency.

The parameter specifies the maximum frequency in *hertz*, at which the status message for safe standstill is generated. The parameterized value must be in the value range of 5 Hz to 2000 Hz.

10.4 Analog Signals

The node “Analog signals” provides the parameter page “Analog inputs” and possibly the page “Analog outputs” (depending on the used hardware).



On these pages you can configure the functions of the analog inputs and outputs.

10.4.1 Analog Inputs

On this page you can configure the inputs Analog In 0 and Analog In 1.

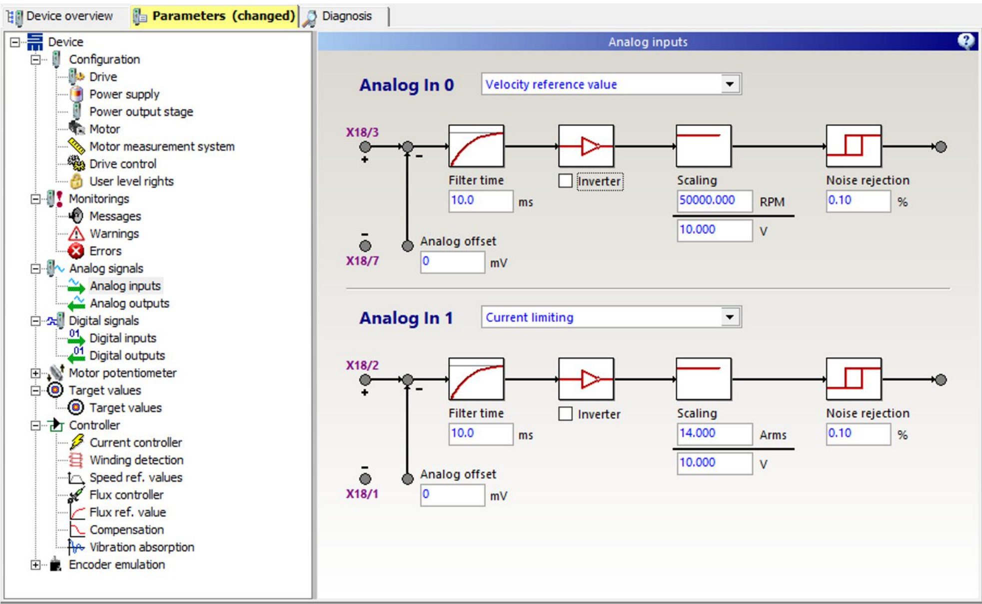


Fig. 33: Parameter page "Analog inputs"

The function to be parameterized is selected by the list box at the top. The parameters below the list box you can configure for each input accordingly.

Analog In (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Function

The parameter indicates the function of the analog input.

The following reference values or limit values can be selected:

- No function
- Speed reference value
- Current reference value
  - only for the drive function "SERVO / VECTOR"
  - negative current reference values are not permitted
- Current limitation
- W24 - Warning threshold 'Current'

Analog offset

The parameter serves for compensating a possibly existing analog offset. The offset is entered in *millivolts*.

Filter time

Via this parameter a first-order low-pass filter is configured. The filter time corresponds to the time constant of the low-pass and is defined in *milliseconds*. If the filter time is set to 0 ms, the low-pass filter is deactivated.

Inverter

The parameter inverts the analog input when the check box is activated. This can be used, for example, for a static reversion of rotational direction.

Scaling

The parameter defines the relation of voltage at the analog input to the reference value or limiting value.

Noise rejection

The parameter specifies a hysteresis threshold for noise rejection in *percent*. 1 % corresponds to a voltage of 0.1 V at the analog input.

10.4.2 Analog Outputs

This page is only displayed for devices with an interface for analog outputs. Here you can configure the outputs Analog Out 0 and Analog 1, if available.

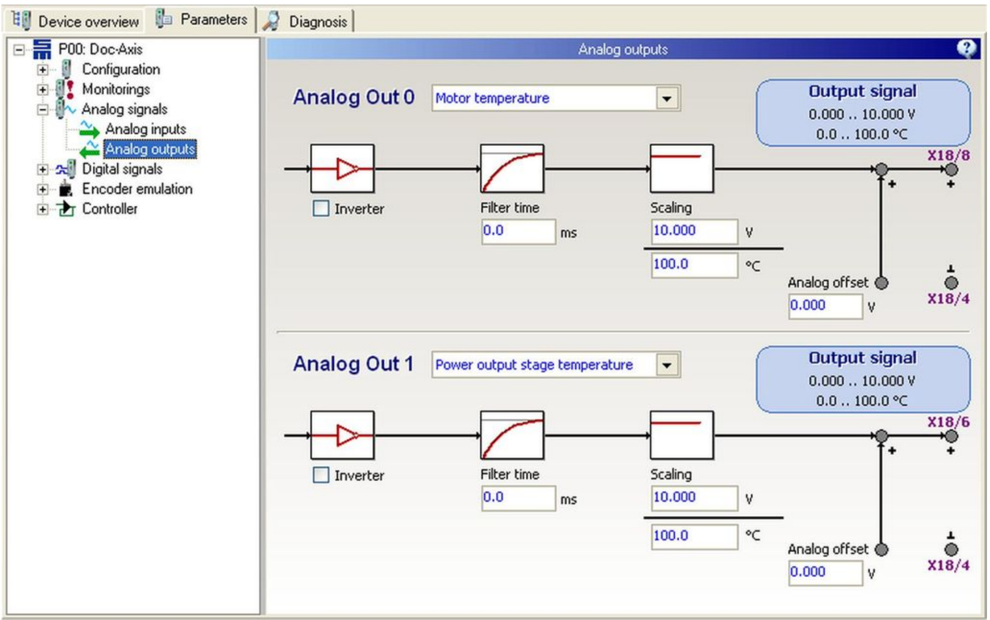


Fig. 34: Parameter page “Analog outputs”

The function to be parameterized is selected by the list box at the top. The parameters below the list box you can configure for each output accordingly.

Analog Out (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Function

The parameter indicates the function of the analog output.

The following target, reference and actual values can be selected:
- No function
- Target speed

- Speed reference value
- Speed actual value
- Speed error
- Current reference value
- Current actual value
- Motor temperature
- Power output stage temperature
- Motor load
- Power output stage load
- Voltage of the bus
- Active power
- DC link current Idc

Inverter

The parameter inverts the analog output, when the check box is activated. This can be used, for example, for a static reversion of rotational direction.

Filter time

Via this parameter a first-order low-pass filter is configured. The filter time corresponds to the time constant of the low-pass and is defined in *milliseconds*. If the filter time is set to 0 ms, the low-pass filter is deactivated.

Scaling

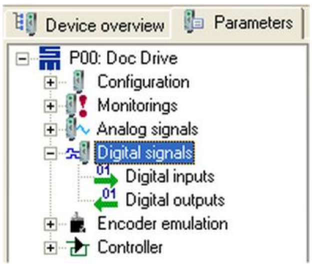
The parameter indicates the relation of voltage at the analog output to target, reference or actual value.

Analog offset

The parameter serves for setting an analog offset. The offset is entered in *volts*.

10.5 Digital Signals

The node “Digital signals” provides the pages “Digital Inputs” and “Digital Outputs”.



On these pages you can configure the functions of the digital inputs and outputs.

10.5.1 Digital inputs

This page provides the parameters of all digital inputs of the drive.

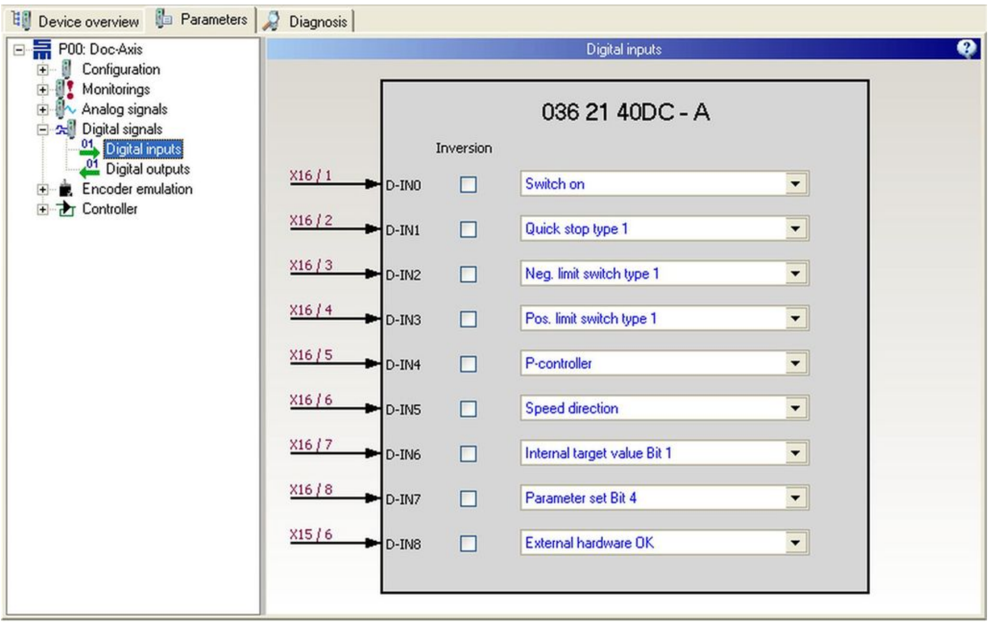


Fig. 35: Parameter page “Digital inputs”

Each input can have the state '0' or '1' and can be parameterized individually. The available parametrization options depend on the device, the operating mode and the system software.

Digital In (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

10

D-IN0 – D-IN8

Depending on the device you can configure up to nine digital inputs. The possible functions of each input depend on the current device and are set by means of a list box. Refer to the hardware documentation of the device for an overview of the configurable input functions for each drive function.

The respective connector and pin of the used device are indicated left hand to the parameter.

Via the check box “Inversion” you can invert the digital input.

10.5.2 Digital Outputs

This page provides the parameters of all digital outputs of the drive.

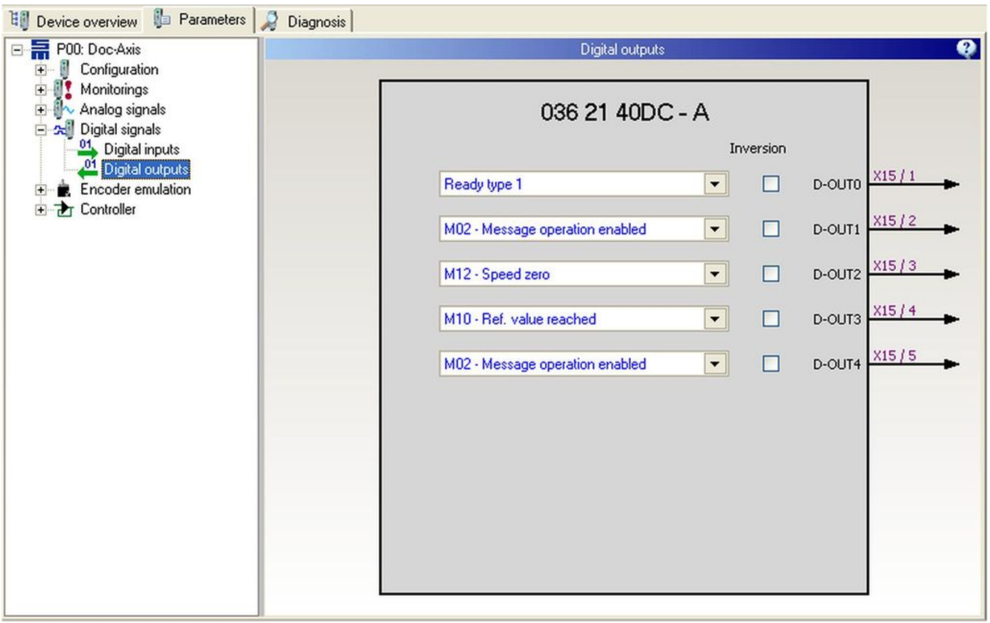


Fig. 36: Parameter page "Digital outputs"

Each output can have the state '0' or '1' and can be parameterized individually. The available parametrization options depend on the device, the operating mode and the system software.

Digital Out (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

10

D-OUT0 – D-OUT5

Depending on the device you can configure up to five digital outputs. The possible functions of each output depend on the current device and drive function and are set by means of a list box. Refer to the hardware documentation of the device for an overview of the configurable output functions for each drive function.

The respective connector and pin of the used device are indicated left hand to the parameter.

Via the check box "Inversion" you can invert the digital output.

10.6 Motor Potentiometer

On the page “Motor potentiometer” you set the parameters of a motor potentiometer in the software *drivemaster2*.

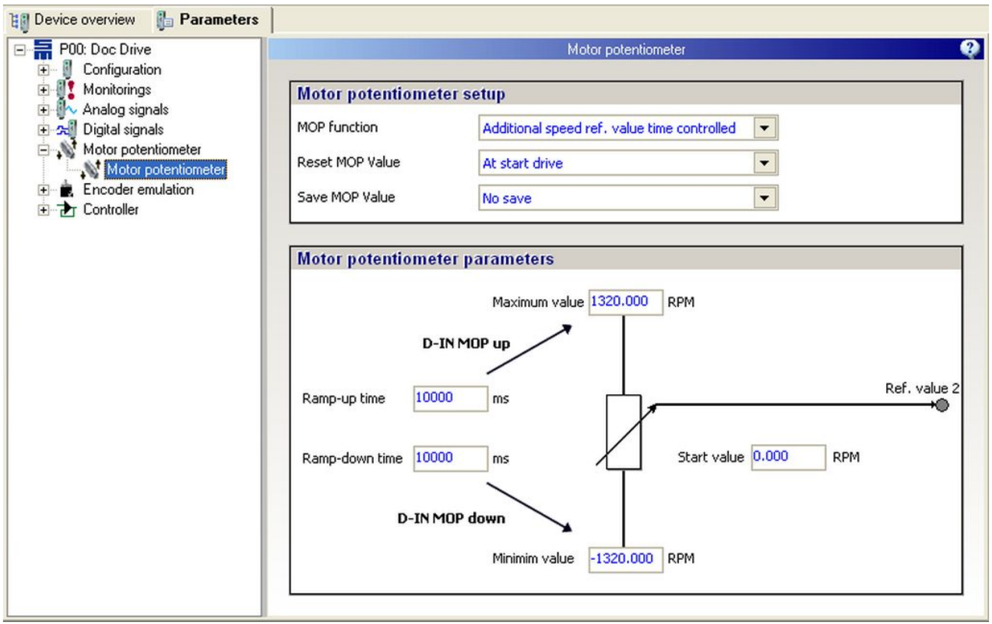


Fig. 37: Parameter page “Motor potentiometer”

Description of the motor potentiometer function

By use of two digital inputs you can simulate a digital motor potentiometer (MOP) in the software *drivemaster2*.

Therefore the reference speed value is increased via one input (function “MOP up”) or reduced via another input (function “MOP down”). For this purpose connect two switches/push buttons with the corresponding digital inputs of the drive.

10

Motor Potentiometer Setup

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	✓	✓

This parameter group serves to make global settings for the motor potentiometer.

MOP function

This parameter group indicates the function of the motor potentiometer, by which the reference value is to be changed. Depending on this selection different parameters for the motor potentiometer can be set.

The following entries are available:

- Disabled: The motor potentiometer function is not used.
- Additional speed ref. value time controlled: The reference value is increased or reduced as long as the corresponding digital input is set (MOP up / MOP down = 1). See "Motor Potentiometer Parameters – MOP Time Controlled", page 123.
- Additional speed ref. value edge controlled: The digital inputs only once have effect on the reference value when an edge change (0→1) takes place and increase or reduce it by a preset value. See "Motor Potentiometer Parameters – MOP Edge Controlled", page 124.

Reset MOP value

This parameter indicates whether or when the motor potentiometer value is reset to the start value.

The following entries are available:
- At start drive: The MOP value is reset to the start value at each start of the drive as soon as the logic voltage is applied.
- At D-IN (MOP up + MOP down) active: The MOP value is reset to the start value when both digital inputs (MOP up and MOP down) are connected to 24 V at the same time.

Save MOP value

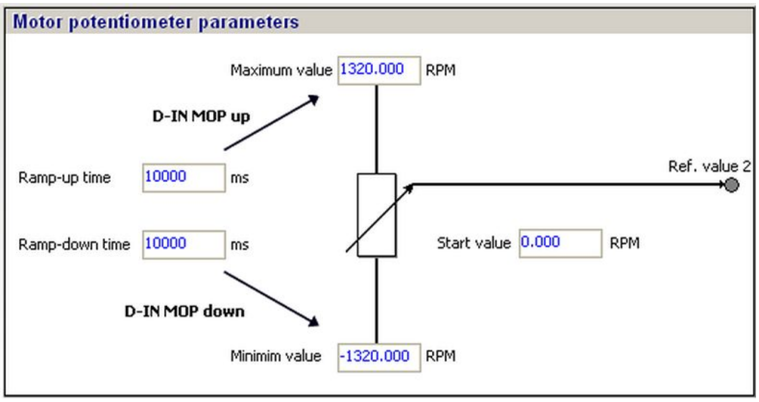
This parameter indicates whether or when the actual motor potentiometer value is saved.

The following entries are available:
- No save: The MOP value is not saved.
- At mains off: The actual MOP value is saved, when the mains supply is switched off.
- At STOP command: The actual MOP value is saved, when the STOP command is triggered.

Motor Potentiometer Parameters – MOP Time Controlled

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	✓	✓

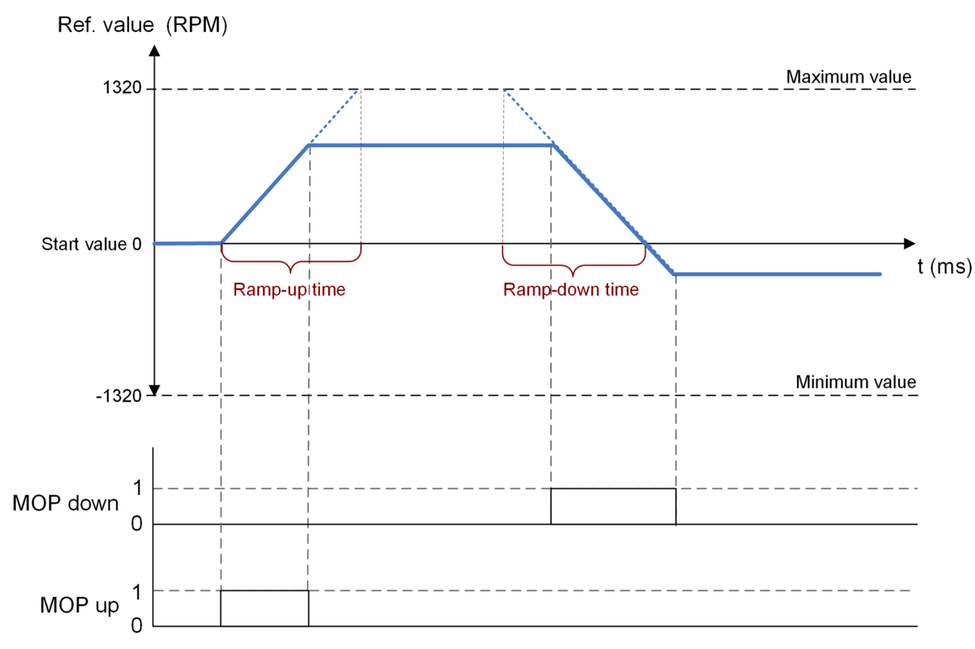
In order to operate the motor potentiometer time controlled you must have selected the entry “Additional speed ref. value time controlled” in the list box “MOP function”.



Motor potentiometer parameters

The parameters below can be set for a time controlled motor potentiometer. There are default values preset for all motor potentiometer parameters.
- Maximum value: Indicates the maximum speed in *revolutions per minute*, by which the reference value can be increased using the motor potentiometer. The default value is determined by means of the set motor parameters.
- Minimum value: Indicates the minimum speed in *revolutions per minute*, by which the reference value can be reduced using the motor potentiometer. The default value is determined by means of the set motor parameters.
- Start value: Indicates the speed value in *revolutions per minute* to which the MOP value is reset after a reset command. With this reference value operation is started again. The default value is zero.

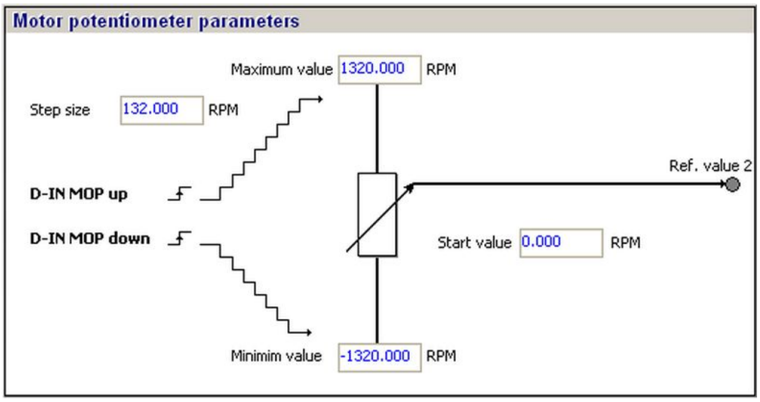
- Ramp-up time: Indicates the time in *milliseconds*, in which the speed can be pushed from 0 to the maximum value using the motor potentiometer. The default value is 10000 ms.
- Ramp-down time: Indicates the time in *milliseconds*, in which the speed can be pushed from the maximum to 0 using the motor potentiometer. The default value is 10000 ms.



Motor Potentiometer Parameters – MOP Edge Controlled

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	✓	✓

In order to operate the motor potentiometer edge controlled you must have selected the entry “Additional speed ref. value edge controlled” in the list box “MOP function”.

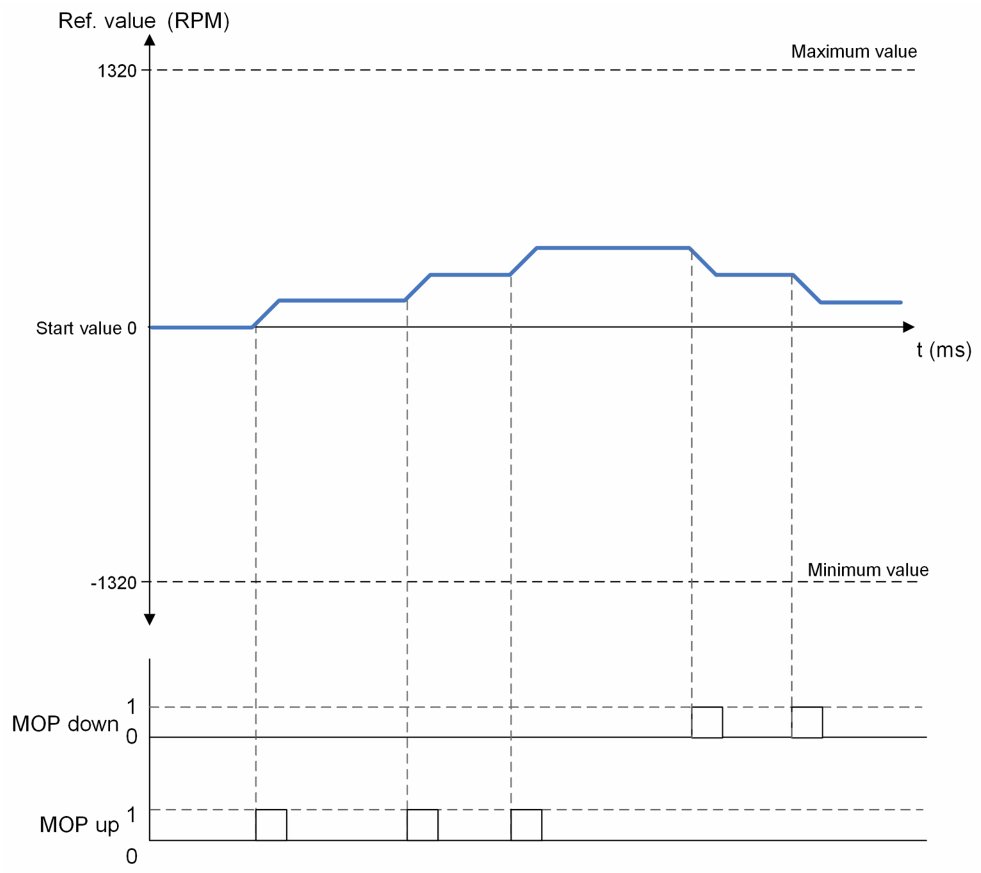


Motor potentiometer parameters

The parameters below can be set for an edge controlled motor potentiometer. There are default values preset for all motor potentiometer parameters.

- Maximum value: Indicates the maximum speed in *revolutions per minute*, by which the reference value can be increased using the motor potentiometer. The default value is determined by means of the set motor parameters.

- Minimum value: Indicates the minimum speed in *revolutions per minute*, by which the reference value can be reduced using the motor potentiometer. The default value is determined by means of the set motor parameters.
- Start value: Indicates the speed value in *revolutions per minute* to which the MOP value is reset after a reset command. With this reference value operation is started again. The default value is zero.
- Step size: Indicates the speed value in *revolutions per minute*, by which the speed is increased or reduced per edge (1 × push).



10.7 Target Values

The node “Target values” is only displayed when the following settings are made for the drive control (see "Drive control (SD2x)", page 93):

- Control channel = “Digital inputs” or “Serial interface / RS485 / USB”
- Setpoint channel = “Internal setpoints”

On the page “Internal target values” you can enter up to 16 target values. These target value are saved in the memory of the drive and can be selected via the digital inputs. In addition, you can parametrize the axis mode via the selection list at the top.

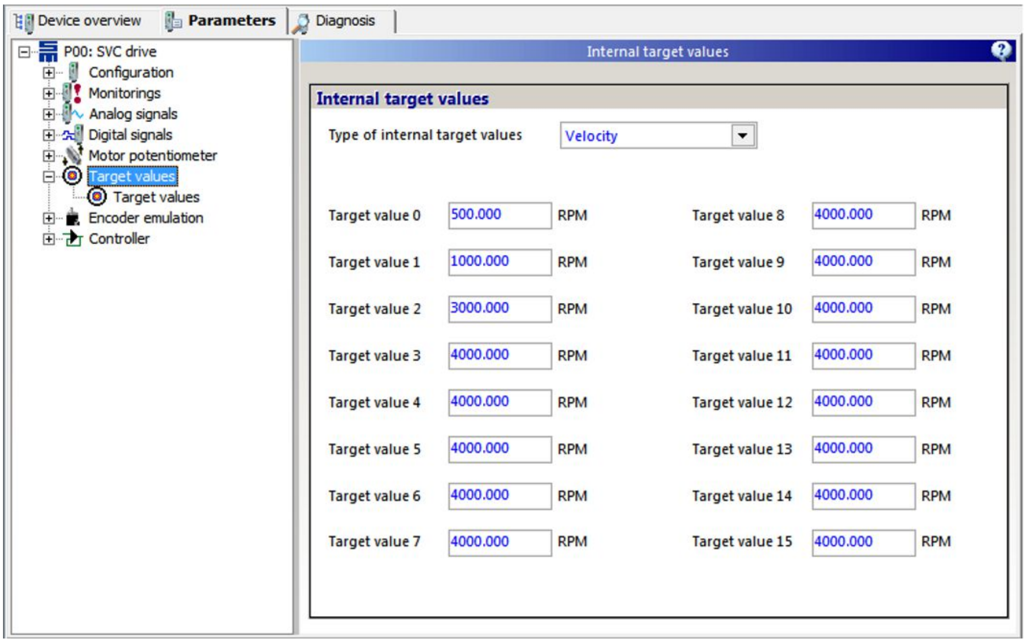


Fig. 38: Parameter page “Target values”

Internal Target Values (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Type of internal target values

The selection list provides the following options:

- Velocity: You can set up to 16 target values for the speed. The target values for rotary motors are indicated in *revolutions per minute*, the target values for linear motors in *millimeters per second*.
- Current limit Iq: You can set up to 16 target values for the current limit Iq. The target values are indicated as RMS values in *amperes*.
- Current Iq: You can set up to 16 target values for the current Iq. The target values are indicated as RMS values in *amperes*.
- Axis mode: Via this function you can switch from spindle mode to axis mode. The relevant parameters of the axis mode are displayed an can be adapted.

Target value 0 – 15

The selection of the target values is binary coded, i.e. if you want to select 4 target values from external, you must reserve 2 digital inputs (“Internal target value Bit 0” and “Internal target value Bit 1”).

The following table illustrates, how to set the digital inputs to select a particular target value:

Internal target value	D-IN7 “Internal target value Bit 0”	D-IN6 “Internal target value Bit 1”	D-IN5 “Internal target value Bit 2”	D-IN4 “Internal target value Bit 3”
Target 0	0 V	0 V	–	–
Target 1	24 V	0 V	–	–

Internal target value	D-IN7 “Internal target value Bit 0”	D-IN6 “Internal target value Bit 1”	D-IN5 “Internal target value Bit 2”	D-IN4 “Internal target value Bit 3”
Target 2	0 V	24 V	–	–
Target 3	24 V	24 V	–	–
Target 4	0 V	0 V	24 V	–
Target 5	24 V	0 V	24 V	–
Target 6	0 V	24 V	24 V	–
Target 7	24 V	24 V	24 V	–
Target 8	0 V	0 V	0 V	24 V
Target 9	24 V	0 V	0 V	24 V
Target 10	0 V	24 V	0 V	24 V
Target 11	24 V	24 V	0 V	24 V
Target 12	0 V	0 V	24 V	24 V
Target 13	24 V	0 V	24 V	24 V
Target 14	0 V	24 V	24 V	24 V
Target 15	24 V	24 V	24 V	24 V

Axis mode

For the axis mode you must adapt the displayed parameters on the page “Internal target values”. For descriptions of these parameters refer to the following sections.

- Speed controller, page 160
- Speed Reference Values, page 141
- Error E38, page 112
- Error E31, page 112
- Analog input 0, page 117

To switch from spindle mode to axis mode, you must set the function “Enable axis mode” for one digital input.

Switching the mode is only possible when the SD2x drive is turned off.

Optionally, you can parameterize a feedback via the digital outputs. For this purpose, you must set the function “Axis mode active” for one digital output.

10.8 Encoder Emulation

The node “encoder emulation” only provides the page “Encoder emulation”.

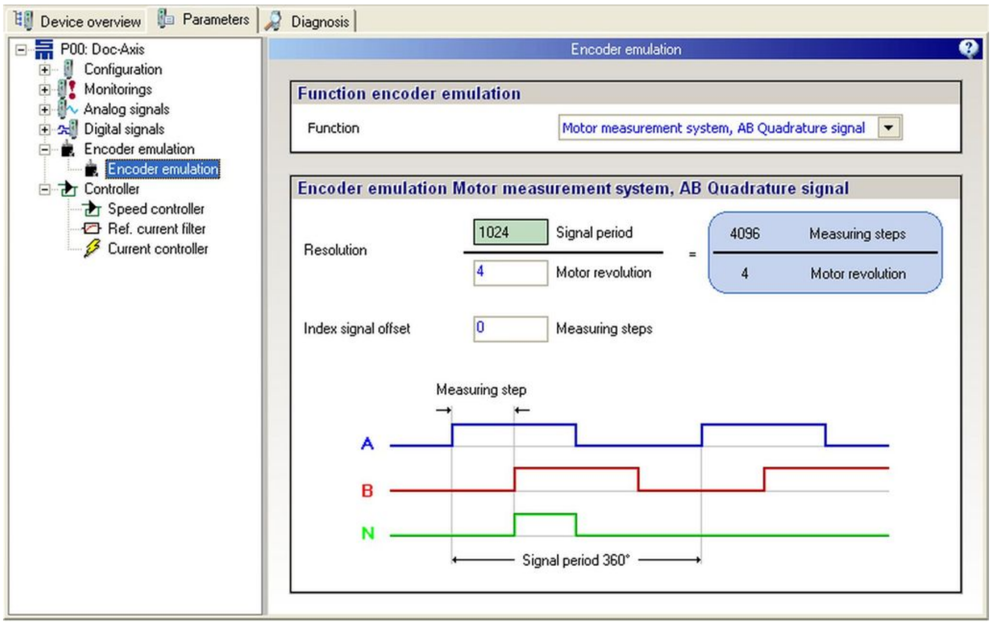


Fig. 39: Parameter page “Encoder emulation”

On this page you configure whether the encoder emulation (actual position values) is passed over to the drive amplifier and in which way.

Function Encoder Emulation (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

This parameter defines whether the encoder emulation is provided and what function for.

Function

The parameter specifies the function of the encoder emulation and is set by means of a list box. Depending on the selection here maybe a second parameter group is displayed.

The following options are available:

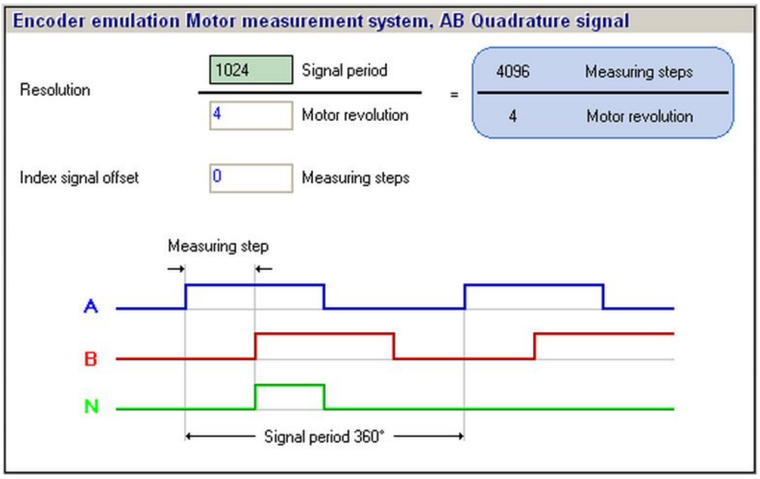
- “No encoder emulation”
  The encoder emulation is deactivated and there is no second parameter group.
- “Motor measurement system, AB Quadrature signals” (available with the drive functions SERVO / VECTOR)
  The encoder emulation is realized via the measuring system by AB quadrature signals. A second parameter group Encoder emulation Motor measurement system, AB Quadrature signals, page 129 is displayed.
- “Speed pulse” (available with the drive functions HSPWM, HSBLOCK / FPAM, HSPAM / VF)
  The encoder emulation is realized via the measuring system by speed pulses. The second parameter group Encoder emulation Speed pulse, page 129 is displayed.
- “Speed pulse”: (available with the drive functions SERVO / VECTOR)
  The encoder emulation is realized via trigger pulses. The second parameter group Encoder emulation Trigger signals, page 130 is displayed.

Encoder Emulation Motor Measuring System, AB Quadrature Signals (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

Via this parameter group the encoder emulation is configured for the selected measuring system by AB quadrature signals.

Quadrature signals are made up of two rectangular signals (A and B) and a signal for the zero position (N). The edge sequence of A and B indicates the counting direction. In addition a zero pulse is transmitted. The zero pulse is signaled once per revolution for rotary encoders and once per travel range for linear scales. By means of the zero pulse an absolute position information can be determined.



Resolution

The parameter specifies the number of signal periods per mechanical motor revolution. The value for the signal periods is defined by the settings of the motor measuring system (see section 10.2.5 "Motor measuring system", page 83). The measuring steps per motor revolution are displayed automatically in the blue colored field behind.

Index signal offset

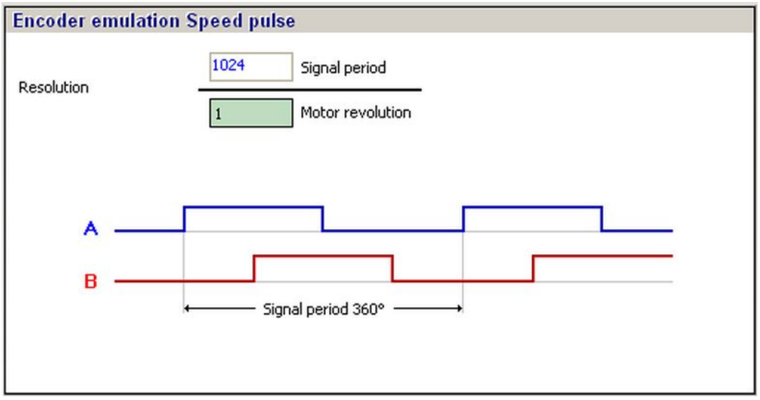
This parameter is only active for the motor measuring systems “Resolver” and “Linear Hall”. The value indicates the number of measuring steps by which the zero pulse is to be displaced (default = 0).

Encoder Emulation Speed Pulse (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	✓	✓	✓

Via this parameter group the encoder emulation is configured for the selected measuring system by speed pulses.

The speed pulses are made up of two rectangular signals (A and B).



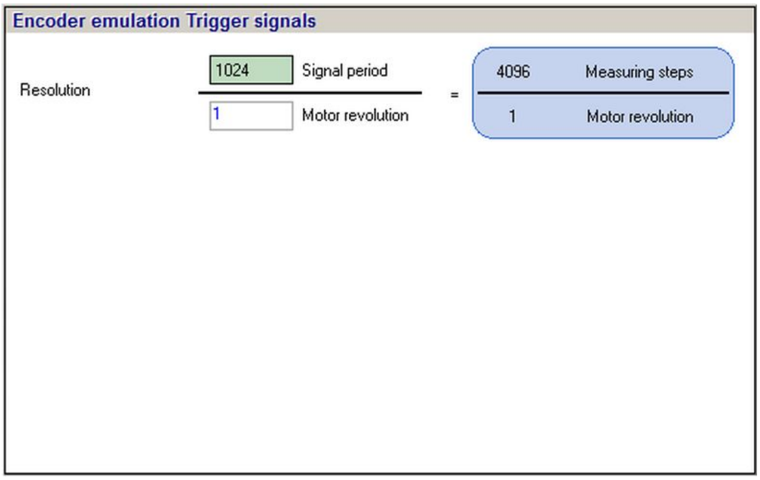
Resolution

The parameter specifies the number of signal periods per mechanical motor revolution.

Encoder Emulation Trigger Signals (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

Via this parameter group the encoder emulation is configured for the selected measuring system by trigger signals.



Resolution

The parameter specifies the number of signal periods per mechanical motor revolution. The measuring steps per motor revolution are displayed automatically in the blue colored field behind.

10.9 Electronic Gear

The node “Electronic gear” is only displayed, when the operating mode “Electronic gear” (see Operating mode of the drive, page 92) is selected and the unit of the internal position controller resolution is set to “counts” (see Units, page 101). It provides only one page: “Electronic gear”.

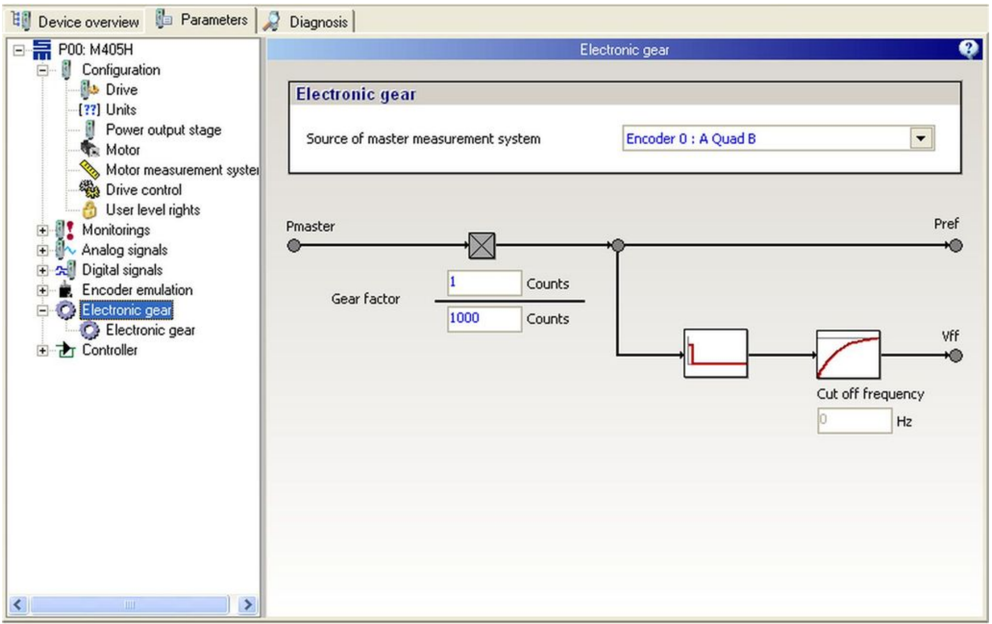


Fig. 40: Parameter page “Electronic gear”

Electronic Gear (SD2x)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

Via this parameters you can set the control signals for the electronic gear.

Source of master measurement system

The parameter defines the source of the control signals.

The following entries can be set by a list box:
- Encoder 0: A Quad B
- Encoder 0: Pulse / Direction
- Encoder 0: CW / CCW

Gear factor

The parameter indicates the relation of motor pulses (numerator) and encoder pulses (denominator).

Cut-off frequency

The measured speed of the master can be limited by a low-pass filter. The parameter is indicated in *hertz*.

10.10 Controller

The node “Controller” provides different pages to set the parameter of the control systems. The available pages depend on the used device and the drive function. The following chapters are ordered by drive function.

10.10.1 Controller Parameters for SERVO / VECTOR Operation

The page “Controller” displays a block diagram showing the functional principal of SERVO / VECTOR operation.

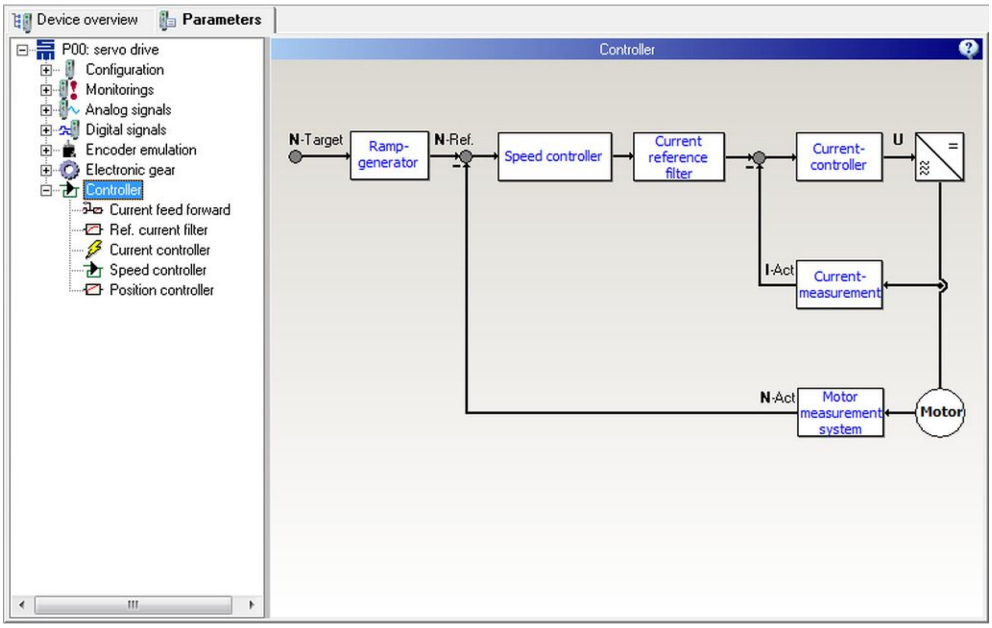


Fig. 41: Parameter page “Controller” for SERVO / VECTOR operation

In the drive function SERVO / VECTOR you set the control characteristics via the pages “Reference current filter”, “Current controller” and “Speed controller”.

If the operating mode is a position control (Profile Velocity Mode, interpolated position control or electronic gear), the pages “Position controller” and “Current feed forward” are displayed additionally (see "Operating Mode of the Drive (SD2x)", page 92).

With sensorless vector control (SVC) the controller configuration changes fundamentally, see section 10.10.2 "Controller Parameters for SVC Operation", page 141.

Current Feed Forward (SD2x, SERVO / VECTOR)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

This page provides the parameters for the current feed forward.

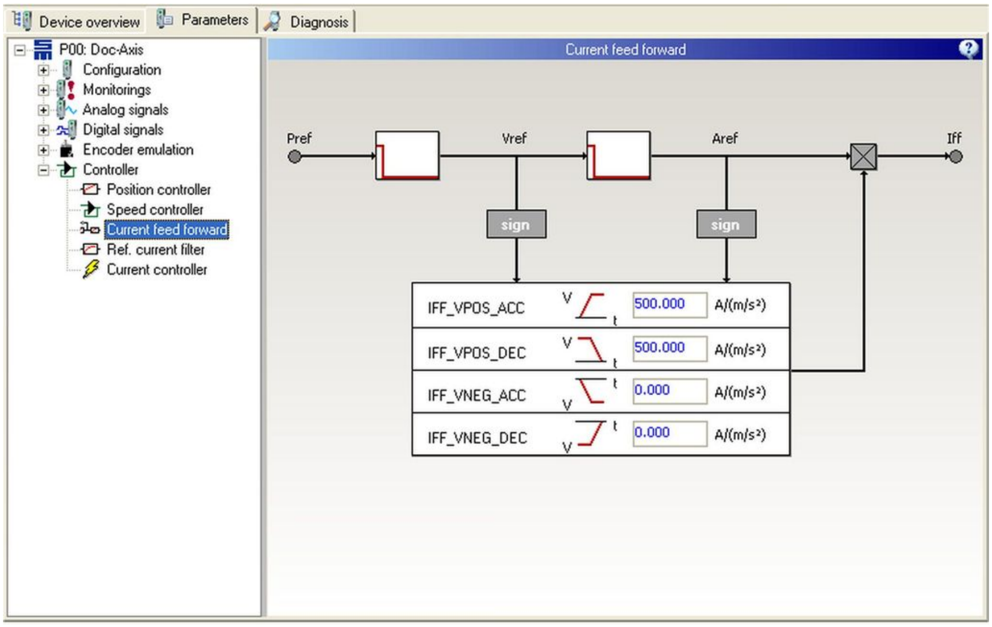


Fig. 42: Parameter page "Current feed forward"

Current feed forward factors

This page allows parameterization of the current feed forward for position-controlled systems. This discharges the control circuits and improves the control capacity. If the values for the current feed forward factors are chosen too high, the control capacity deteriorates, because in this case the control circuits must also compensate the current feed factor.

- IFF_VPOS_ACC
  The parameter sets a positive speed and acceleration for the current feed forward. If the parameter is set to '0', the current feed forward is deactivated for this quadrant. The parameter must correspond to the output current value of the speed controller, when the current feed forward is deactivated and the acceleration is 1 m/s².
- IFF_VPOS_DEC
  The parameter sets a positive speed and deceleration for the current feed forward. If the parameter is set to '0', the current feed forward is deactivated for this quadrant. The parameter must correspond to the output current value of the speed controller, when the current feed forward is deactivated and the acceleration is −1 m/s².
- IFF_VNEG_ACC
  The parameter sets a negative speed and acceleration for the current feed forward. If the parameter is set to 0, the current feed forward is deactivated for this quadrant. The parameter must correspond to the output current value of the speed controller, when the current feed forward is deactivated and the acceleration is −1 m/s².
- IFF_VNEG_DEC
  The parameter sets a negative speed and deceleration for the current feed forward. If the parameter is set to '0', the current feed forward is deactivated for this quadrant. The parameter must correspond to the output current value of the speed controller, when the current feed forward is deactivated and the acceleration is 1 m/s².

Current Reference Filter (SD2x, SERVO / VECTOR)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

This page provides the parameters for the reference current filter of the drive amplifier. You can set up to 4 filters for the torque-generating current (Iq) either as low-pass filter or band-stop filter. If field weakening is active, you can also set a filter (only low-pass 1st order) for the magnetizing current (Id).

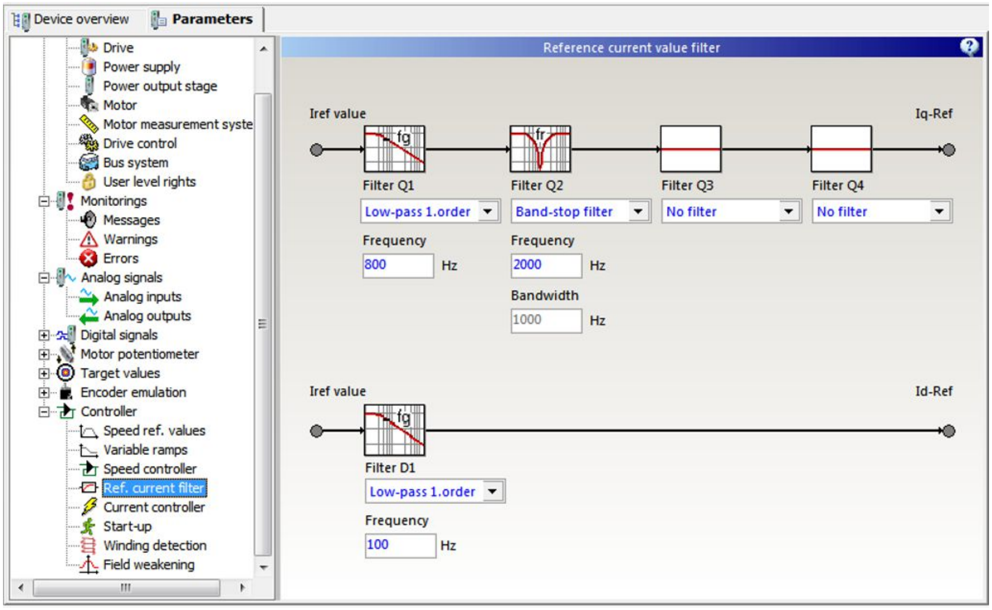


Fig. 43: Parameter page “Ref. current filter”

Filter 1–4

The parameter specifies the type of the filter. It is set by means of a selection list. The options “No filter”, “Low-pass 1. order”, “Low-pass 2. order” and “Band-stop filter” are available.

Low-pass 1st/2nd order

A low-pass is used to suppress noise in the reference current value. This noise is created e.g. by noisy speed measurement. By means of the low-pass losses in the power output stage and in the motor can be reduced.

You can use a low-pass 1st order or a low-pass 2nd order with Butterworth characteristic. Set the desired filter and enter the 3 dB cutoff frequency of the filter. The unit is *hertz*.

Please consider that a low-pass in the reference current value reduces the dynamics of the torque output. For this reason you must possibly adapt the control parameter of the speed controller (reduce the amplification and increase the integration time).

Band-stop filter

A band-stop filter is used to suppress resonance frequencies caused by the mechanical construction of the driven machine.

Enter the center frequency of the band-stop filter. The bandwidth is set automatically. The unit is *hertz*.

Please consider that a band-stop filter in the reference current value can reduce the dynamics of the current control. For this reason you must possibly adapt the control parameter of the speed controller (reduce the amplification and increase the integration time).

Current Controller (SD2x, SERVO / VECTOR)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

On this page you can set the parameters of the current controller for SERVO / VECTOR operation. These are the current limitation, the holding current and the proper control parameters.

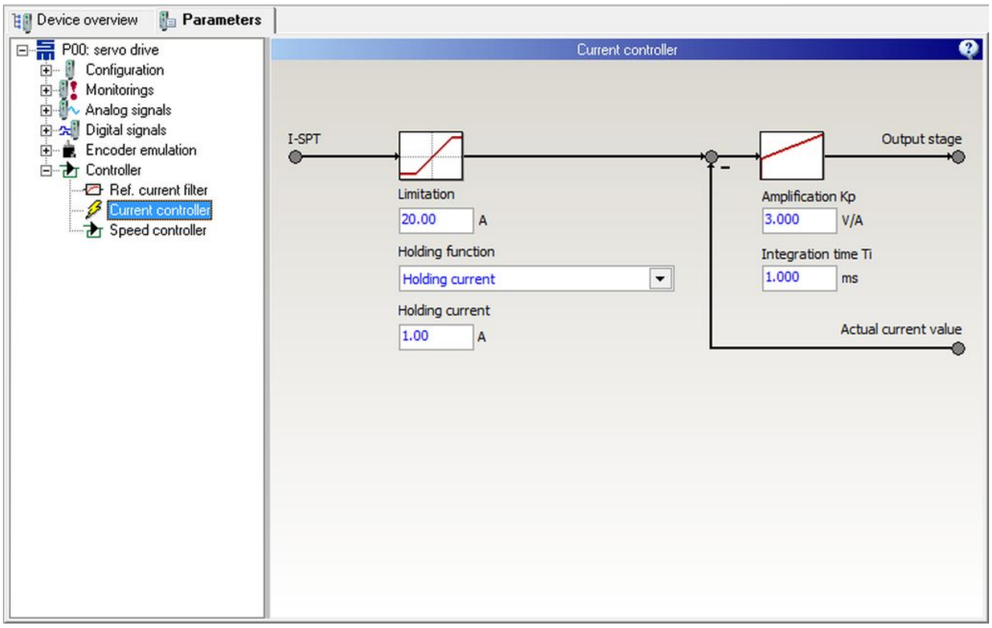


Fig. 44: Parameter page “Current controller”

Limit

The parameter indicates the limitation in the current controller for the reference value of the current. The reference current and its limit are indicated as peak values in *amperes*. The maximum value of the “Limitation” are the peak currents of the motor and the power output stage.

10

Holding function

The parameter indicates whether a holding current is used. The holding current is active when the controller is switched on and no reference value is set. The holding current shall keep the motor in position at standstill.

The desired current is defined in the parameter “Holding current” in *amperes*.

Amplification Kp

The parameter indicates the proportional amplification of the current controller in *volts per ampere*. The reaction time of the current control circuit is reduced if a high proportional amplification is selected. If the amplification value is set too high the current control circuit starts vibrating.

Integration time Ti

The parameter sets the integral amplification of the current controller (therefore it is often called integral time constant Ti). The integration time Ti is indicated in *milliseconds*. The smaller the integration time is selected, the quicker the current control circuit will react. If the value is set too small the current control circuit starts vibrating.

Speed Controller (SD2x, SERVO / VECTOR)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

On this page you can set the parameters of the speed controller for SERVO / VECTOR operation. These are speed limitation, ramps, reversion of rotation and the actual control parameters.

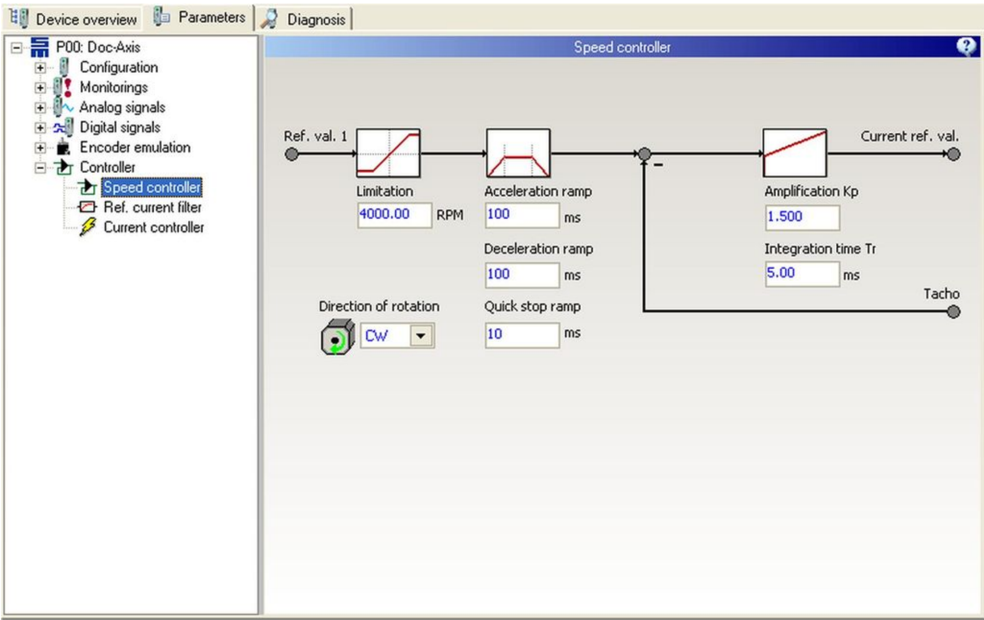


Fig. 45: Parameter page "Speed controller"

Limit

The parameter defines the limiting value of the speed controller. This value limits the reference speed value. The reference speed and its limitation are indicated in *millimeters per second* or in *revolutions per minute*. The maximum value of the "Limitation" is the speed scaling.

Ramps

The ramps limit the acceleration via the reference speed value. They are indicated in *milliseconds*. The parameter displays the time required for reaching the speed scaling from standstill. A ramp of e.g. 12000 ms together with a speed scaling of 120000 rpm makes a maximum acceleration of 167 1/s² or $\frac{10000 \ 1/min}{s}$.

- Acceleration ramp:
  The parameter indicates the time for the acceleration from 0 to the speed limit: (|v (t + Δt)| - |v (t)| > 0)
- Deceleration ramp:
  The parameter indicates the time for a break application to speed 0: (|v (t + Δt)| - |v (t)| < 0)
- Quick stop ramp:
  The parameter indicates the time for a quick stop to speed 0: (|v (t + Δt)| - |v (t)| < 0)

Direction of rotation

The parameter defines the direction of motor rotation for positive reference values (viewed from the shaft end):

- clockwise rotation = CW

- counterclockwise rotation = CCW

For linear drive this parameter is used for inverting the moving direction.

Amplification Kp

The parameter specifies the proportional amplification of the speed controller in dependance on the speed scaling and the peak current of the power output stage. The reaction time of the speed control circuit is reduced, when a high proportional amplification is selected. If the amplification value is set too high, the speed control circuit starts vibrating.

Integration time Ti

The parameter sets the integral amplification of the speed controller (therefore it is often called integral time constant Ti). The integration time Ti is indicated in *milliseconds*. The smaller the integration time is selected, the more accurate the speed control operates. If the value is set too small, the speed control circuit starts vibrating.

Position Controller (SD2x, SERVO / VECTOR)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

This page provides the parameters for the internal position control of a servo drive. These are the controller parameters, limitation of control variables, error weighting, feed forward control and selection of the measuring system.

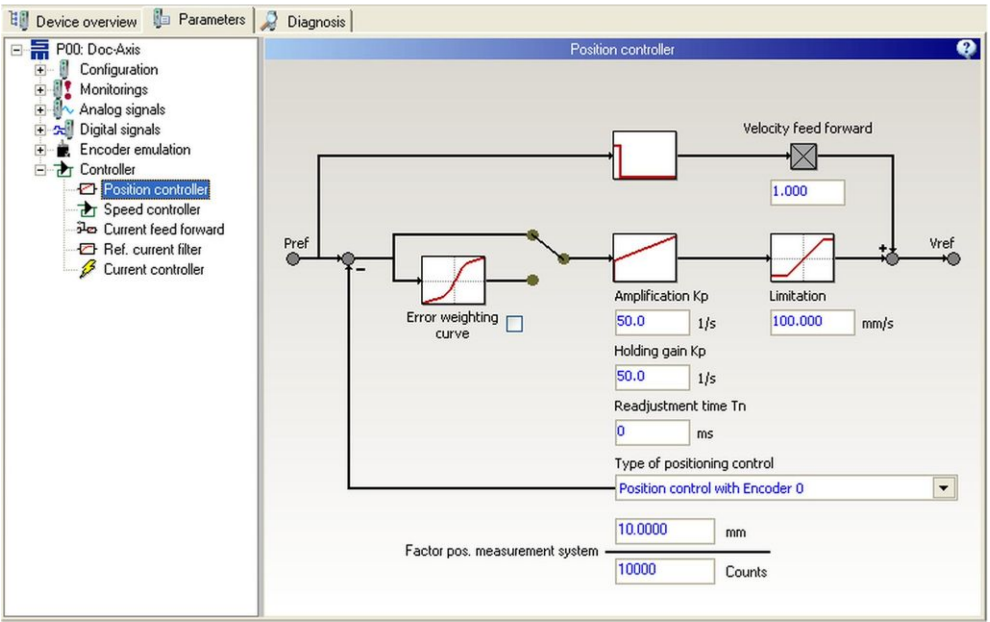


Fig. 46: Parameter page "Position controller"

Velocity feed forward

The parameter specifies the value of the velocity feed forward. Using this parameter the speed required for the profile can be preset via the reference value generator. Thus, the position controller only needs to compensate for errors.

☞ The velocity feed forward also allows realization of a PDF controller (pseudo-derivative feedback).

Amplification Kp

The parameter indicates the proportional amplification of the position controller during positioning in *1/s*. The reaction time of the position control circuit is reduced if a high proportional amplification is selected. If the amplification value is set too high the position control circuit starts vibrating.

Holding gain Kp

The parameter indicates the proportional amplification of the position controller, when the message “Position reached” is received. The unit is *1/s*. The reaction time of the position control circuit is reduced if a high proportional amplification is selected. If the amplification value is set too high the position control circuit starts vibrating.

Integration time Ti

The parameter sets the integral amplification of the position controller (therefore it is often called integral time constant Ti). The value is the integral-action component of the position controller. The integration time Ti is indicated in *milliseconds*. The smaller the integration time, the smaller the residual control deviation of the position control. If the amplification value is set too small the position control circuit starts vibrating.

Limitation

The parameter indicates the maximum value the position controller can generate. This is used to limit the portion of the position control at the reference speed. The reference speed and its limitation are indicated in *counts per second*.

Type of position control

The parameter activates the position control and specifies the measuring system to be used for position feedback.

The following entries can be selected in the list box:
- No position control
- Position control with motor measuring system
- Position control with encoder 0 (position measured by external measuring system)
  The parameter “Factor pos. measurement system” is displayed.

For the operating mode “Electronic gear” you must select the entry “Position control with encoder 0”.

Factor pos. measurement system

This parameter defines the relation between the position unit of the position control and the position control of an external position measuring system. The position of the external position measuring system is measured in increments.

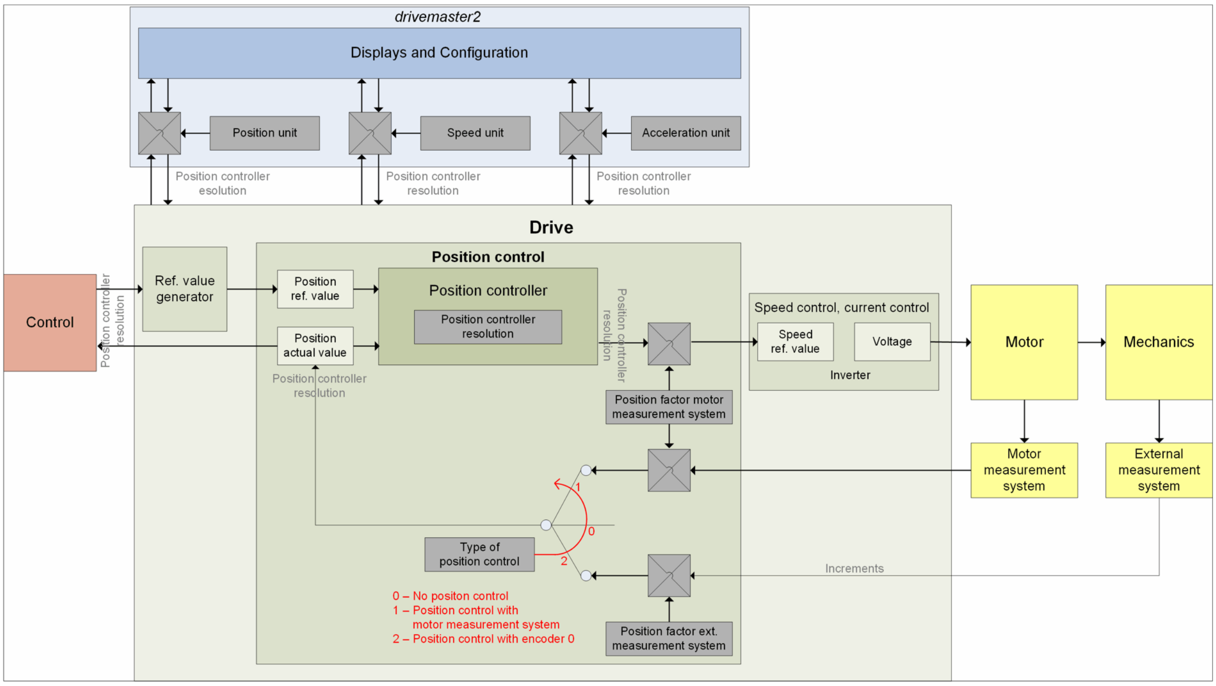
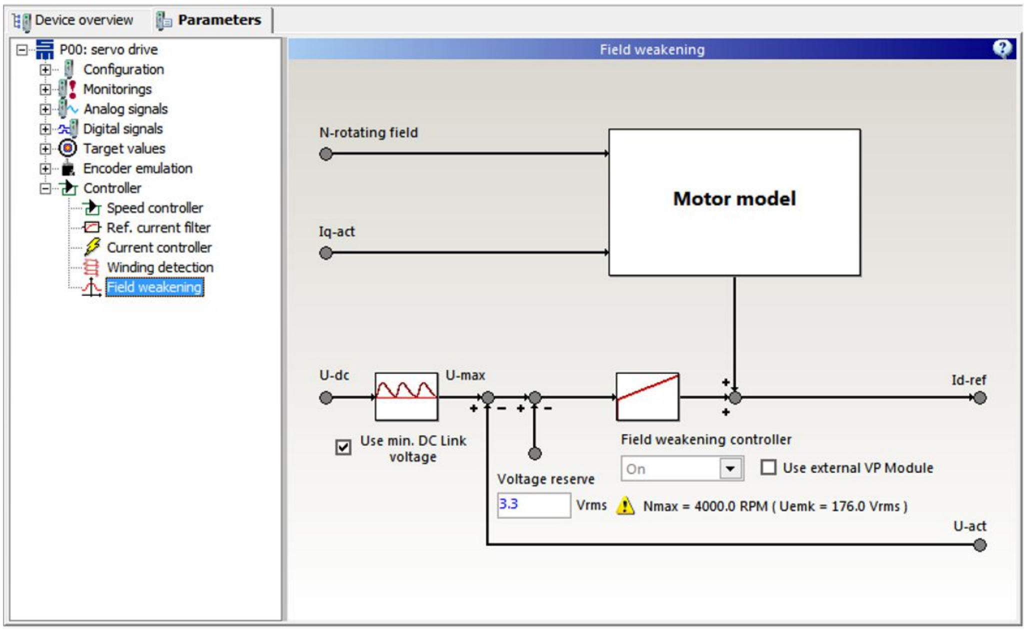


Fig. 47: Principle of the position control

Field Weakening (SD2x, SERVO / VECTOR)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

The parameter page “Field weakening” is only displayed when field weakening is switched on in the current controller. The page provides additional parameters to set the field weakening range.



Use min. DC link voltage

If the check box is activated, the bus voltage of the DC link is smoothed. This reduces fluctuation of current in the field weakening range.

Voltage reserve

The parameter indicates a voltage as RMS value in *volts* that is used as a reserve for dynamic control in the field weakening range.

Use external VP Module

This check box must be activated, when an external VP Module (Voltage Protection Module = module to limit the DC link voltage in the event of an error) is used.

NOTICE

Overvoltage at speeds > Nmax

If the motor is operated at speeds > Nmax, the overvoltage limit of the drive amplifier could be reached in the event of an error and the device will be destroyed.

Use an external VP Module, if the motor will be operated at speeds > Nmax.

Winding Detection (SD2x, SERVO / VECTOR)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

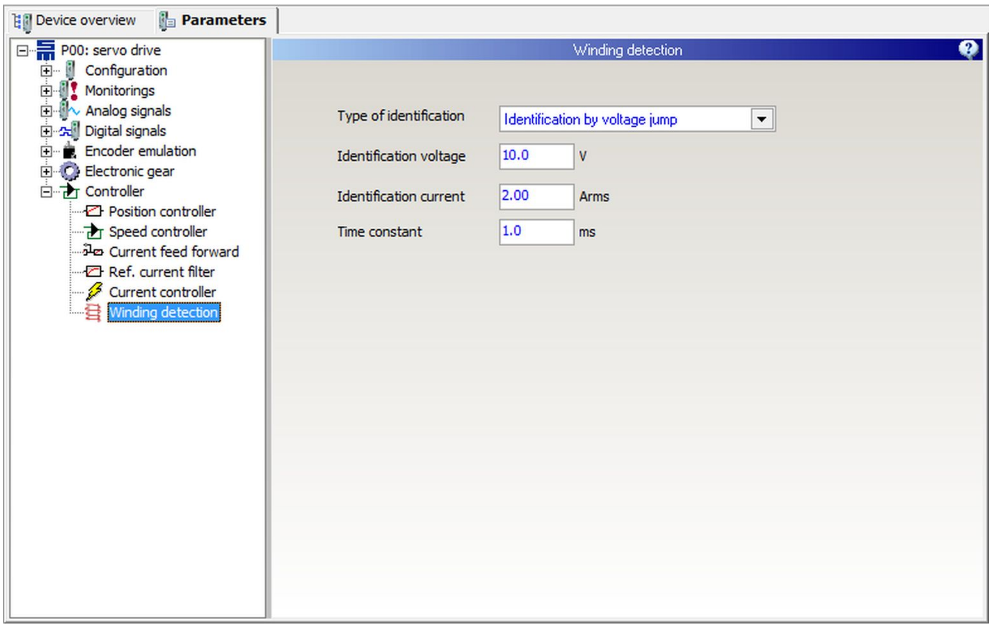


Fig. 48: Parameter page “Winding detection”

At present only special firmware supports the functions "winding detection".

The motor winding can be detected via voltage jumps. For this purpose select the entry “Identification by voltage jump” in the selection list “Type of identification”. The parameters “Identification current” and “Time constant” describe the reaction of the motor winding to a voltage jump with “Identification voltage”. Set these parameters accordingly.

10.10.2 Controller Parameters for SVC Operation

The page “Controller” displays a block diagram showing the functional principal of SVC operation.

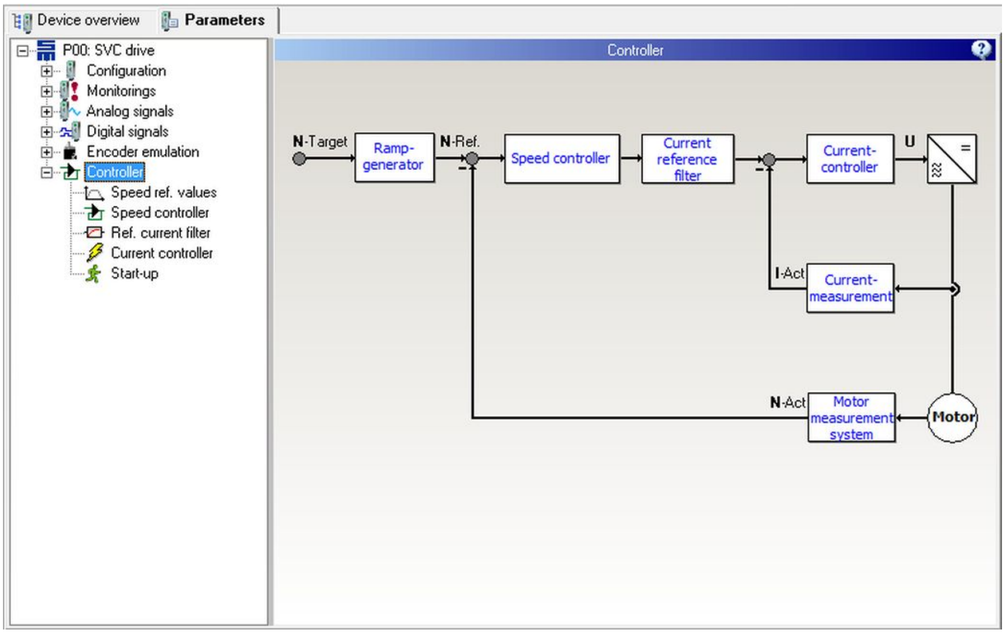


Fig. 49: Parameter page “Controller” for SVC operation

In the drive function SVC you set the control characteristics via the pages “Speed reference values”, “Speed controller”, “Reference current filter”, “Current controller” and “Start-up”.

Speed Reference Values (SD2x, SVC)

SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

On the page “Speed ref. values” you can parameterize the reference value generator.

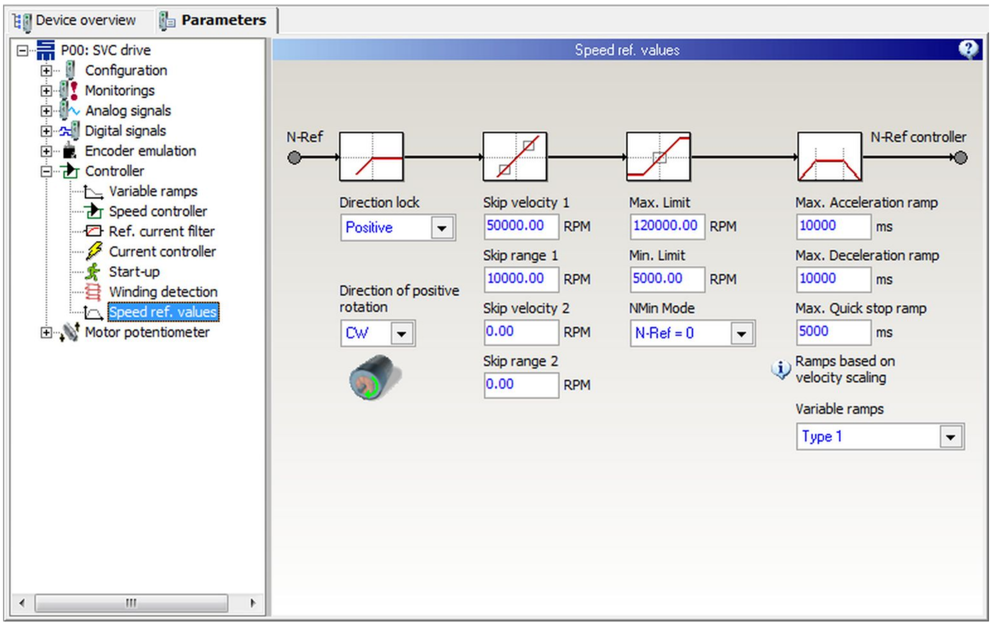


Fig. 50: Parameter page “Speed ref. values”

Direction of rotation

The parameter defines the direction of motor rotation for positive reference values (viewed from the shaft end):

- clockwise rotation = CW
- counterclockwise rotation = CCW

The direction of rotation set in the software should match the actual rotation direction of the motor. If this is not the case, two motor phases must be exchanged.

Direction lock

If only one direction of the motor is permitted, you can lock the other direction via this parameter. The following settings are available:

- None: Both positive and negative speed values are passed to the motor.
- Positive: Positive speed values are not passed to the motor.
- Negative: Negative speed values are not passed to the motor.

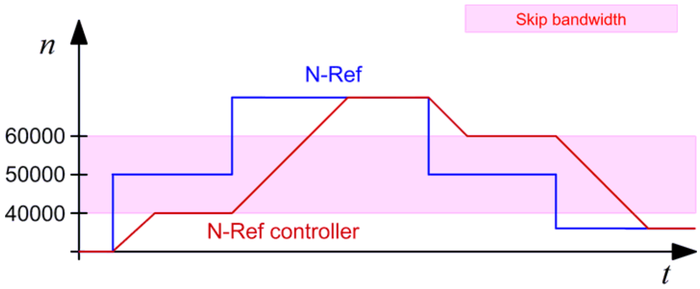
Skip bandwidth

By means of a skip bandwidth you can prevent that definite speeds are driven for a long time. These speeds might be e.g. resonances of a machine.

Example

- Skip velocity: 50000 rpm
- Skip range: 10000 rpm
- max. admissible speed below skip speed = 40000 rpm
- min. admissible speed above skip speed = 60000 rpm

Speed reference values within the skip bandwidth (40000 – 60000 rpm) are suppressed:



Max. limit

The parameter indicates the maximum possible reference speed in *revolutions per minute*.

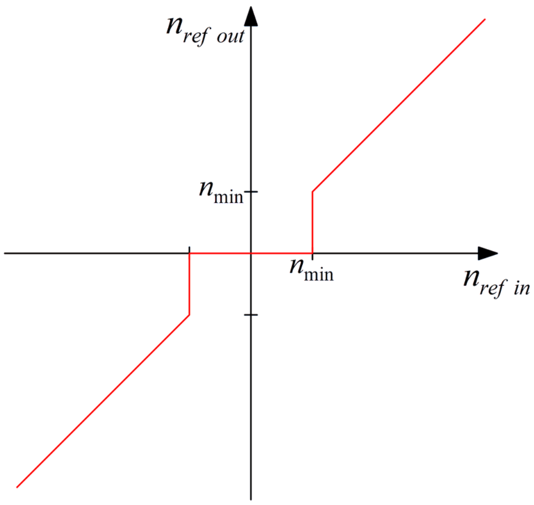
Min. limit

The parameter indicates the minimum possible reference speed in *revolutions per minute*.

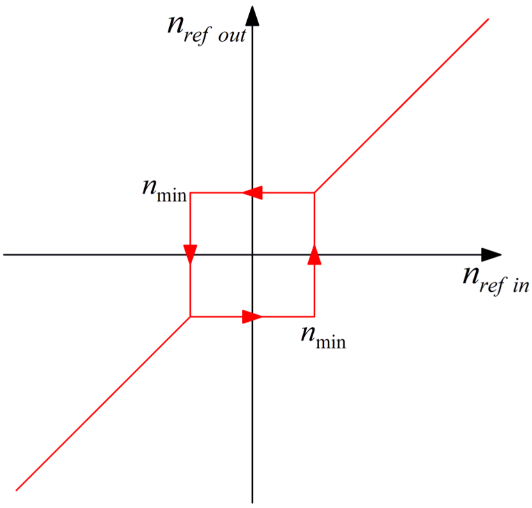
NMin mode

Via this parameter you can select the reference speed to be driven in case a target value below the minimum speed has been selected.

Mode “N-Ref = 0”:



Mode “N-Ref = N-Min” (hysteresis):



It is not possible to reverse the direction of the motor rotation, when the target value is below the determined minimum speed.

Ramps

The ramps limit the acceleration via the reference speed value. They are indicated in *milliseconds*. The parameter displays the time required for reaching the speed scaling from standstill. A ramp of e.g. 12000 ms together with a speed scaling of 120000 rpm makes a maximum acceleration of 167 1/s² or $\frac{10000\ 1/min}{s}$.

- Acceleration ramp:
  The parameter indicates the time for the acceleration from 0 to the speed limit: (|v (t + Δt)| - |v (t)| > 0)
- Deceleration ramp:
  The parameter indicates the time for a break application to speed 0: (|v (t + Δt)| - |v (t)| < 0)
- Quick stop ramp:
  The parameter indicates the time for a quick stop to speed 0: (|v (t + Δt)| - |v (t)| < 0)

Variable ramps

By means of the function “Variable ramps” you can set a limit for the mean actual current. For this purpose the acceleration is reduced depending on the actual current. Typically, variable ramps are applied during the start-up of pumps or fans.

- Off:
  The function is not active – the ramps are fix as specified above.
- Type 1 (Current controlled ramp - relative to Imax):
  The acceleration is relative to the maximum current. For this purpose you must set the characteristic curve on the page “Variable Ramps”.
- Type 2 (Current controlled ramp - absolute currents):
  The acceleration is relative to a fix current value. For this purpose you must set the characteristic curve on the page “Variable Ramps”.

Variable Ramps (SD2x, SVC)

SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

On the page “Variable ramps” you can parameterize a limit for the mean current.

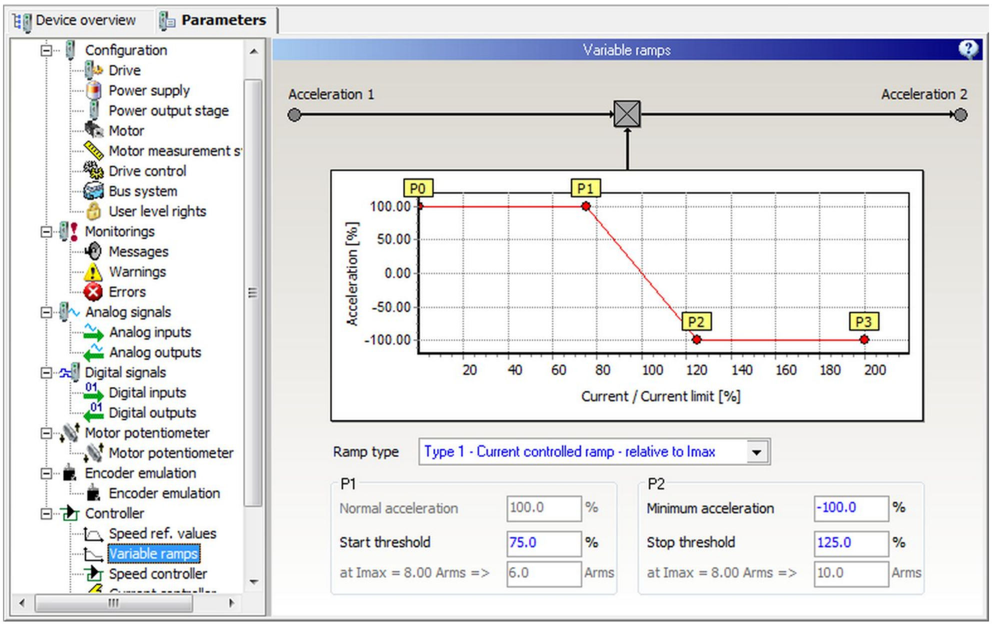
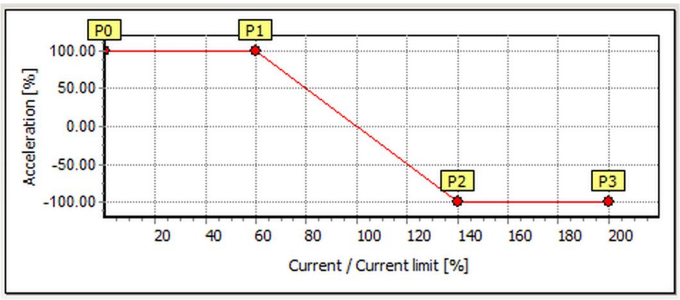


Fig. 51: Parameter page “Variable ramps”

Type 1 – Current controlled ramp – relative to Imax

The acceleration is limited relative to the maximum current:

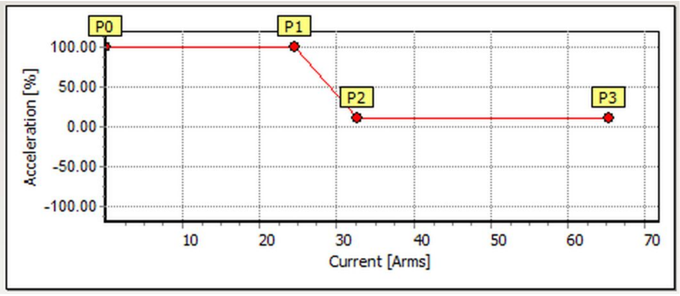


The following parameters must be set:

- Start threshold (P1):
  Indicates the current in *percent* at which the reduction of the acceleration is started. For assistance the corresponding current value is displayed in gray color below.
- Minimum acceleration (P2):
  Indicates the minimum acceleration in *percent*. A negative value corresponds to 'braking'.
- Stop threshold (P2):
  Indicates the current in *percent* at which the reduction of the acceleration is stopped and the minimum acceleration is kept. For assistance the corresponding current value is displayed in gray color below.

Type 2 – Current controlled ramp – absolute currents

The acceleration is limited via absolute current values:



The following parameters must be set:

- Start threshold (P1):
  Indicates the current in *amperes* at which the reduction of the acceleration is started. For assistance the corresponding percent value (of the maximum current) is displayed in gray color below.
- Minimum acceleration (P2):
  Indicates the minimum acceleration in *percent*. A negative value corresponds to 'braking'.
- Stop threshold (P2):
  Indicates the current in *amperes* at which the reduction of the acceleration is stopped and the minimum acceleration is kept. For assistance the corresponding percent value (of the maximum current) is displayed in gray color below.

Speed Controller (SD2x, SVC)

SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

On this page you can set the parameters of the speed controller for SVC operation.

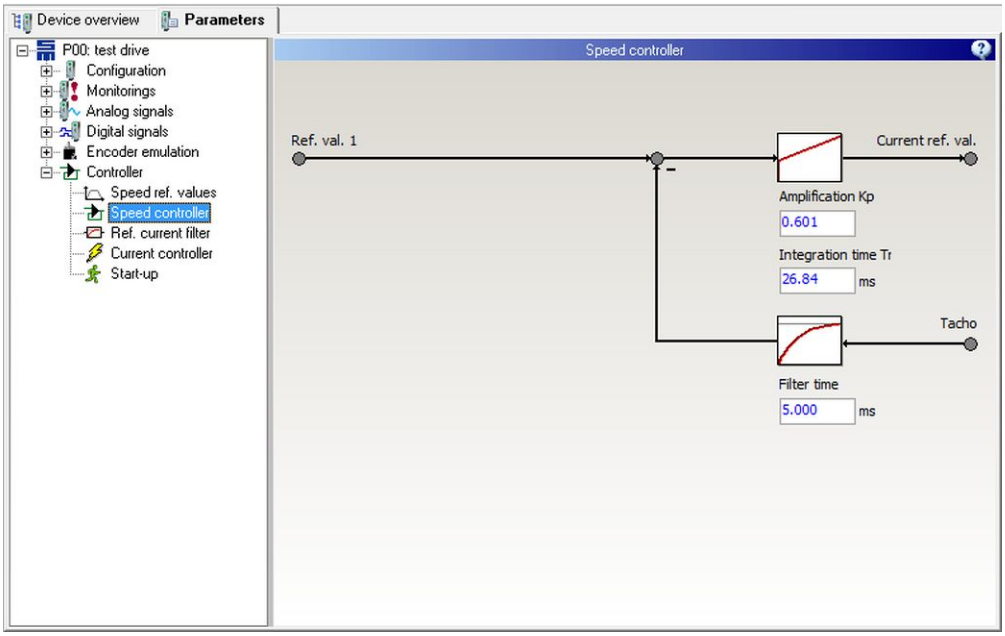


Fig. 52: Parameter page "Speed controller"

10

Amplification Kp

The parameter specifies the proportional amplification of the speed controller in dependance on the speed scaling and the peak current of the power output stage. The reaction time of the speed control circuit is reduced, when a high proportional amplification is selected. If the amplification value is set too high, the speed control circuit starts vibrating.

Integration time Ti

The parameter sets the integral amplification of the speed controller (therefore it is often called integral time constant Ti). The integration time Ti is indicated in *milliseconds*. The smaller the integration time is selected, the more accurate the speed control operates. If the value is set too small, the speed control circuit starts vibrating.

Filter time (tacho filter)

The parameter indicates the filter time for the actual speed (tachometer) in *milliseconds*. If the actual speed is noisy, you can smooth it by means of the filter.

A typical filter time value is 1 ms (at 230 V mains supply) or 3 ms (at 400 V mains supply). You can increase the time constant, if a more smooth actual speed is needed.

Current Reference Filter (SD2x, SVC)

SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

This page provides the parameters for the reference current filter of the drive amplifier. You can set up to 4 filters for the torque-generating current (Iq) either as low-pass filter or band-stop filter. If field weakening is active, you can also set a filter (only low-pass 1st order) for the magnetizing current (Id).

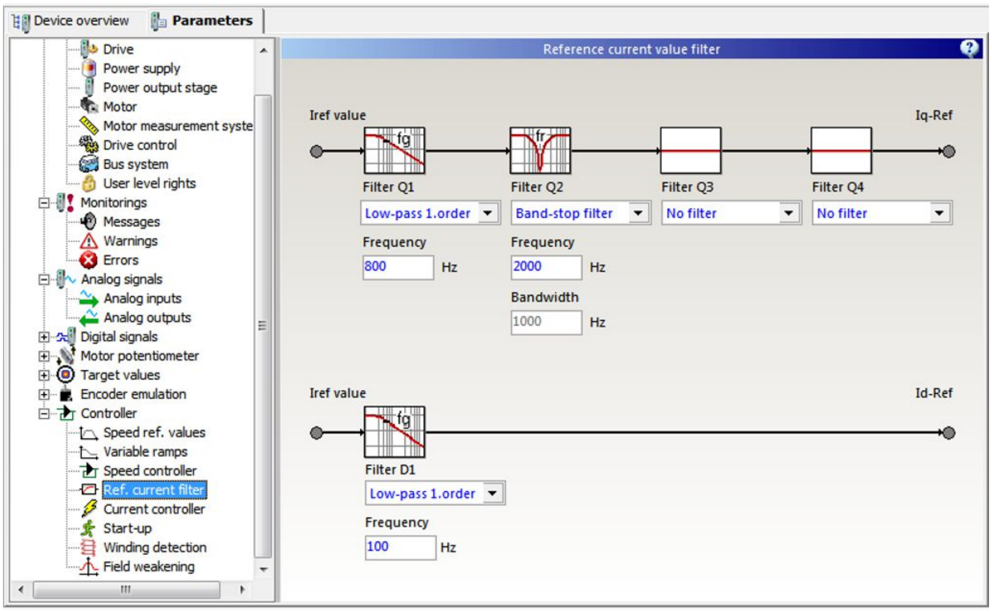


Fig. 53: Parameter page “Ref. current filter”

Filter 1–4

The parameter specifies the type of the filter. It is set by means of a selection list. The options “No filter”, “Low-pass 1. order”, “Low-pass 2. order” and “Band-stop filter” are available.

Low-pass 1st/2nd order

A low-pass is used to suppress noise in the reference current value. This noise is created e.g. by noisy speed measurement. By means of the low-pass losses in the power output stage and in the motor can be reduced.

You can use a low-pass 1st order or a low-pass 2nd order with Butterworth characteristic. Set the desired filter and enter the 3 dB cutoff frequency of the filter. The unit is *hertz*.

Please consider that a low-pass in the reference current value reduces the dynamics of the torque output. For this reason you must possibly adapt the control parameter of the speed controller (reduce the amplification and increase the integration time).

Band-stop filter

A band-stop filter is used to suppress resonance frequencies caused by the mechanical construction of the driven machine.

Enter the center frequency of the band-stop filter. The bandwidth is set automatically. The unit is *hertz*.

Please consider that a band-stop filter in the reference current value can reduce the dynamics of the current control. For this reason you must possibly adapt the control parameter of the speed controller (reduce the amplification and increase the integration time).

Current Controller (SD2x, SVC)

SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

On this page you can set the parameters of the current controller for SVC operation. These are the current limitation, the holding current and the bandwidths as well as the optional field weakening.

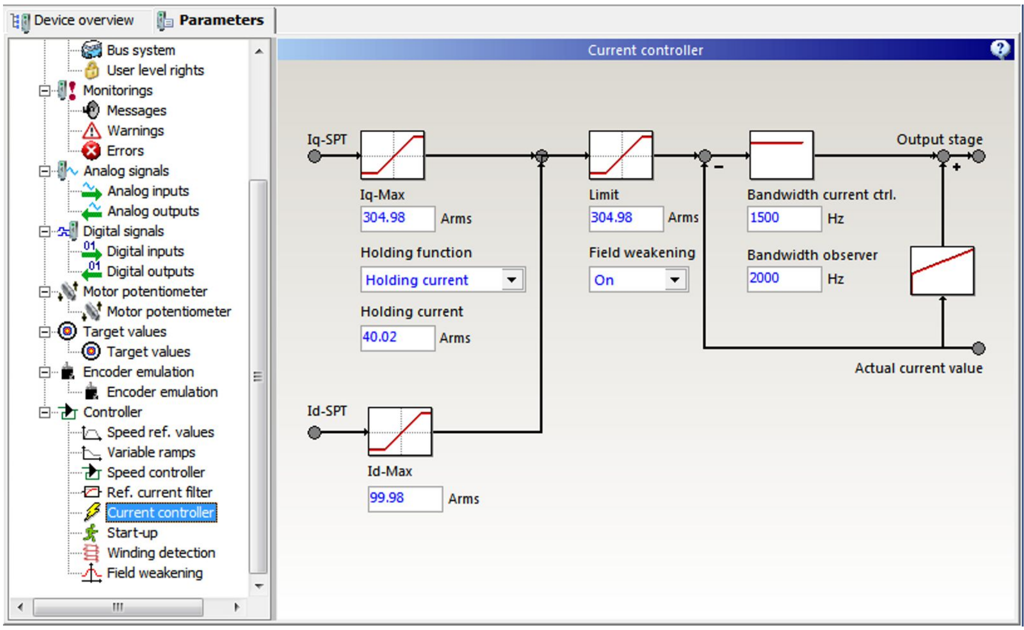


Fig. 54: Parameter page "Current controller"

Iq-Max

The parameter indicates the maximum torque-generating current (Iq) as RMS value in *amperes*. The maximum value of Iq-Max corresponds to the peak currents of motor and power output stage.

Holding function

The parameter indicates whether a holding current is used. The holding current is active when the controller is switched on and no reference value is set. The holding current shall keep the motor in position at standstill.

The desired current is defined in the parameter "Holding current" in *amperes*.

Field weakening

Via this parameter an additional negative magnetizing current (Id) can be applied to electrically attenuate the magnetic field. This way the motor can reach higher speeds at the same voltage supply.

If field weakening is switched on, the parameters "Id-Max" and "Limit" are displayed on the page "Current controller":

Id-Max	The parameter indicates the maximum magnetizing current as RMS value in *amperes*.
Limit	The parameter indicates the limitation in the current controller for the reference value of the current. The limit is indicated as RMS value in *amperes*. The maximum value of the limit corresponds to the peak currents of motor and power output stage.

In addition, the controller page "Field weakening" is displayed for further parameterization.

Bandwidth current controller

The current is controlled via a status controller. The dynamics of the status controller are determined via its bandwidth in *hertz*.

If the bandwidth is set too small, the current controller dynamics are too low, i.e. the current control works rather slowly. If the bandwidth is set too great, the current controller may become unstable. In this case the drive is switched off due to the error E45 “Short circuit in power output stage”.

A typical bandwidth is 1500 Hz.

☞ If the error E45 is triggered, the bandwidth must be reduced to 1100 Hz or possibly to 800 Hz.

Bandwidth observer

A voltage observer is used to determine the commutation. The dynamics of the voltage observer are determined via its bandwidth in *hertz*.

If the bandwidth is set too small, the observer dynamics are too low, i.e. the voltage observer works rather slowly. If the bandwidth is set too great, the observer may become unstable. In this case the drive is switched off due to the error E45 “Short circuit in power output stage”.

A typical bandwidth is 2000 Hz.

☞ If the error E45 is triggered, the bandwidth must be reduced to 1500 Hz or possibly to 1100 Hz.

Start-up (SD2x, SVC)

SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

In the low speed range it is not possible to determine the commutation for sensorless vector control. That means the commutation can not be calculated until a definite minimum output voltage or speed is reached. For this reason the motor must be accelerated to a minimum speed via open-loop control at first. Then it can be controlled by SVC. The same applies for the braking process. The motor is decelerated speed-controlled as long as the commutation can be calculated. In consequence there are two motor driving ranges, “Open loop range” and “Speed-controlled range”.

The page “Start-up” provides parameters to set the behavior of the drive in the open loop range.

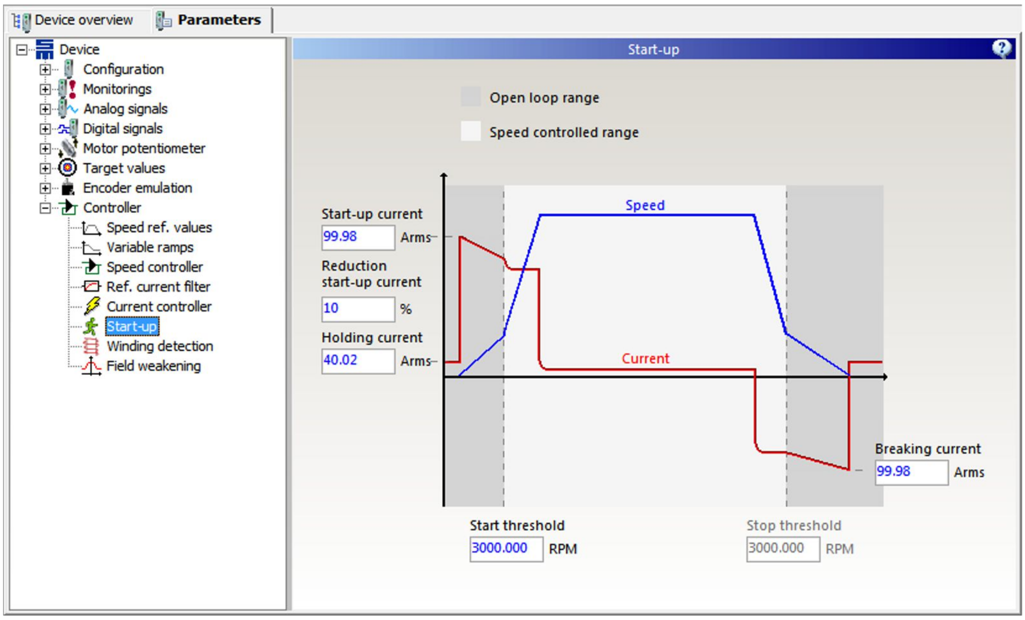


Fig. 55: Parameter page “Start-up”

Start-up current

The parameter indicates a constant current as RMS value in *amperes* that is applied on start-up. The starting current must be greater than the acceleration current of the drive (at least 120 %).

Reduction start-up current

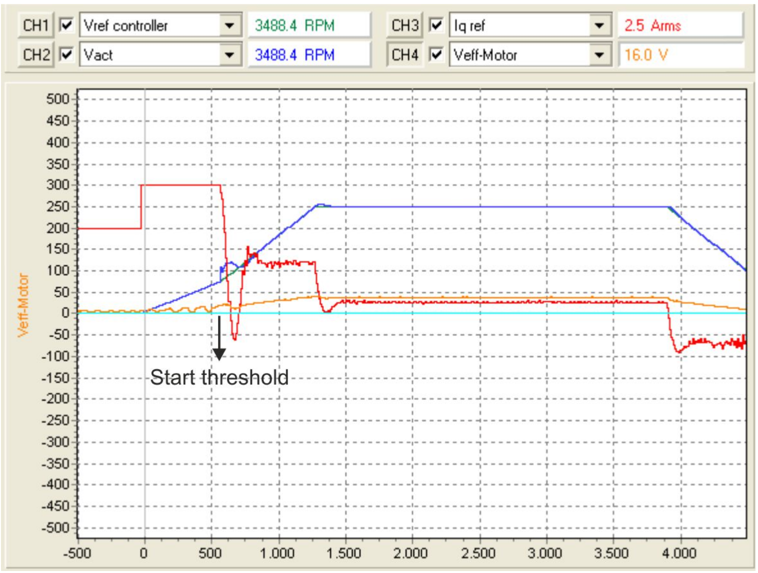
The parameter indicates a reduction of the strart-up current in *percent*.

The start-up current should be reduced for motors with high breakaway torque, for example motors with foil bearings.

Start threshold

The parameter indicates the speed in *revolutions per minute*, at which the commutation is to be calculated and the control circuits are activated. The value can be determined by means of the output voltage (5 to 10 % of the maximum mains voltage are necessary for commutation finding).

The following figure was recorded in the *Oscar*. The start threshold of the motor is at a voltage of 16 V_{rms} and a speed of 3500 rpm.



Holding current

At standstill the drive must not lose the commutation. Therefore a holding current is applied. The holding current should be in the range of 5 to 25 % of the motor rated current.

Stop threshold

When the speed reference value (N-ref controller) drops below this value, braking the motor is continued by open-loop control.

The parameter is write-protected at present. The speed parametrized in the start threshold is applied for the stop threshold as well.

Braking current

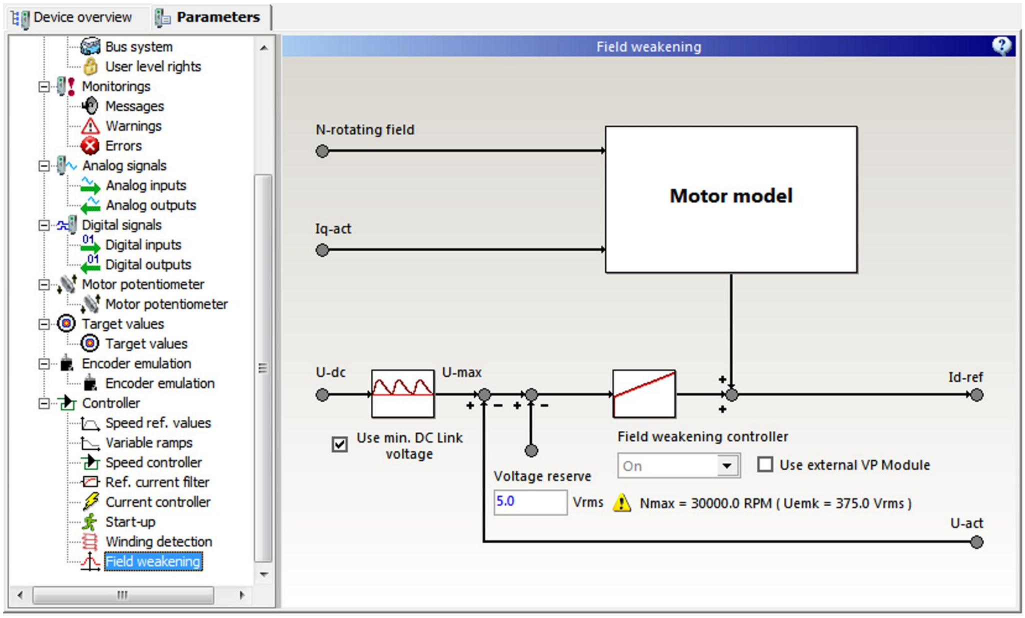
The parameter indicates the braking current as RMS value in *amperes*. This current is applied during open-loop controlled braking.

☞ When operating highly inductive motors the commutation can shift due to high braking torques. In this case the braking rate is reduced automatically, i.e. the deceleration time might be longer.

Field Weakening (SD2x, SVC)

SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

The parameter page “Field weakening” is only displayed when field weakening is switched on in the current controller. The page provides additional parameters to set the field weakening range.



Use min. DC link voltage

If the check box is activated, the bus voltage of the DC link is smoothed. This reduces fluctuation of current in the field weakening range.

Voltage reserve

The parameter indicates a voltage as RMS value in *volts* that is used as a reserve for dynamic control in the field weakening range.

Use external VP Module

This check box must be activated, when an external VP Module (Voltage Protection Module = module to limit the DC link voltage in the event of an error) is used.

NOTICE

Overvoltage at speeds > Nmax

If the motor is operated at speeds > Nmax, the overvoltage limit of the drive amplifier could be reached in the event of an error and the device will be destroyed.

Use an external VP Module, if the motor will be operated at speeds > Nmax.

Winding Detection (SD2x, SVC)

SERVO / VECTOR (SVC)	HSPWM	HSBLOCK / FPAM	HSPAM / VF
✓	–	–	–

On this page you can set the winding detection during magnetic alignment.

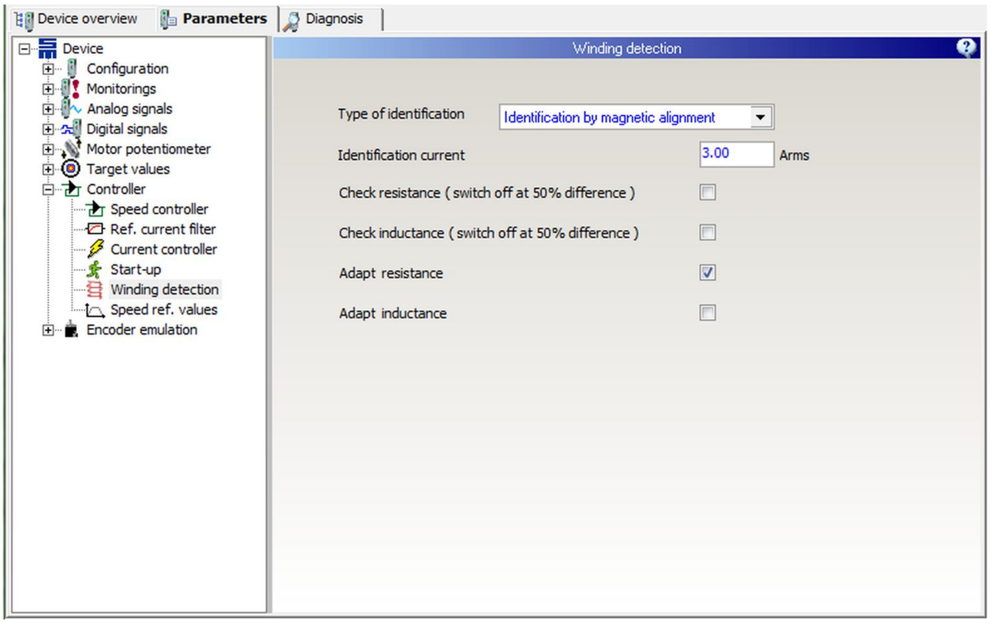


Fig. 56: Parameter page "Winding detection"

Identification current

This parameter indicates the current in *amperes* that is impressed during identification of the motor winding additionally to the alignment current.

You can combine the following four configuration options as you like. If you activate several options, checking the identified values always comes first. The values are not used for adaptation until the check was finished successfully.

10

Check resistance (switch off at 50 % difference)

The resistance identified by the winding detection is compared to the resistance set in the *drivemaster2* software. If the difference between the two values is more than 50 % of the set value, the drive amplifier is switched off due to the error E41-2 "Wrong motor connected".

Check inductance (switch off at 50 % difference)

The inductance identified by the winding detection is compared to the inductance set in the *drivemaster2* software. If the difference between the two values is more than 50 % of the set value, the drive amplifier is switched off due to the error E41-2 "Wrong motor connected".

Adapt resistance

The resistance identified by the winding detection is included in the calculation of the sensorless measuring system. This compensates differences between the set resistance and the real resistance and thus, improves the control performance.

Adapt inductance

The inductance identified by the winding detection is included in the calculation of the sensorless measuring system. This compensates differences between the set inductance and the real inductance and thus, improves the control performance.

The software does not use the identified values for all control parameters. Therefore, you still need to indicate the correct winding data during parameter setting. The adaptation only improves the performance of the measuring system.

10.10.3 Controller Parameters for HSBLOCK / FPAM Operation

The page "Controller" displays a block diagram showing the functional principal of HSBLOCK / FPAM operation.

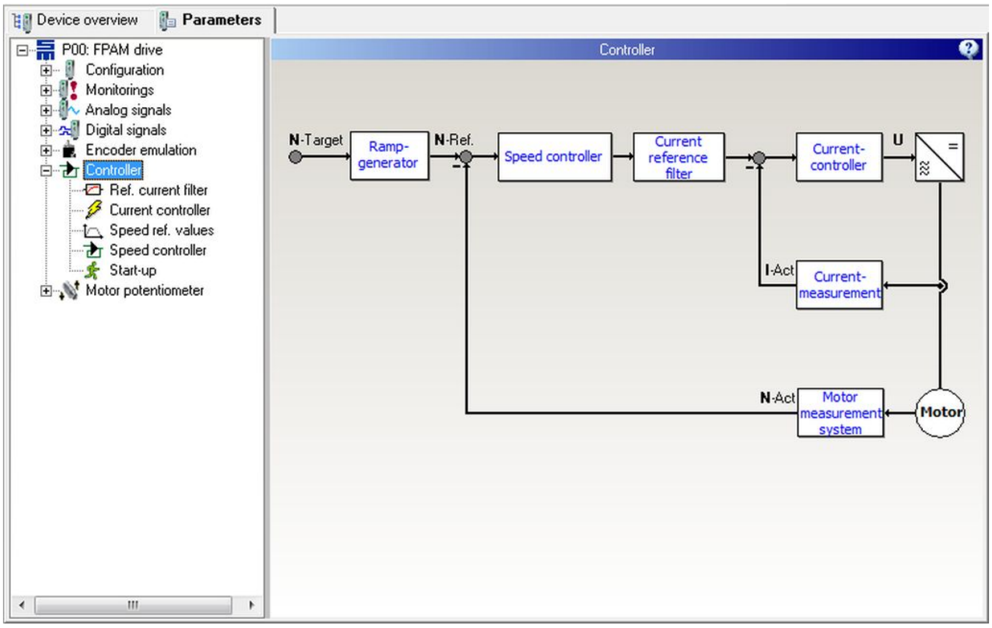


Fig. 57: Parameter page "Controller" for HSBLOCK / FPAM operation

10

In the drive function HSBLOCK / FPAMyou set the control characteristics via the pages "Reference current filter", "Current controller", "Speed reference values" and "Speed controller".

For FPAM operation (sensorless with EMF voltage measurement) the page "Start-up" is provided additionally.

Speed Reference Values (SD2x, HSBLOCK / FPAM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	✓	–

On the page “Speed ref. values” you can parameterize the reference value generator.

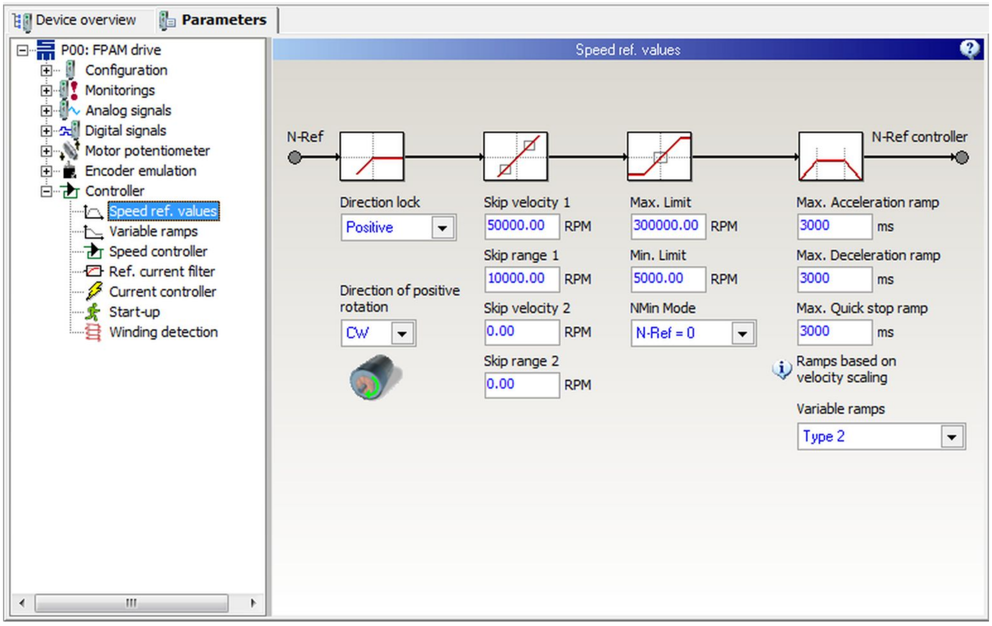


Fig. 58: Parameter page “Speed ref. values”

Direction of rotation

The parameter defines the direction of motor rotation for positive reference values (viewed from the shaft end):

- clockwise rotation = CW
- counterclockwise rotation = CCW

The direction of rotation set in the software should match the actual rotation direction of the motor. If this is not the case, two motor phases must be exchanged.

Direction lock

If only one direction of the motor is permitted, you can lock the other direction via this parameter. The following settings are available:

- None: Both positive and negative speed values are passed to the motor.
- Positive: Positive speed values are not passed to the motor.
- Negative: Negative speed values are not passed to the motor.

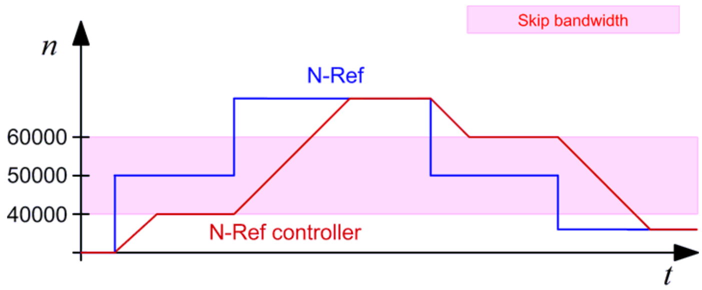
Skip bandwidth

By means of a skip bandwidth you can prevent that definite speeds are driven for a long time. These speeds might be e.g. resonances of a machine.

Example

- Skip velocity: 50000 rpm
- Skip range: 10000 rpm
- max. admissible speed below skip speed = 40000 rpm
- min. admissible speed above skip speed = 60000 rpm

Speed reference values within the skip bandwidth (40000 – 60000 rpm) are suppressed:



Max. limit

The parameter indicates the maximum possible reference speed in *revolutions per minute*.

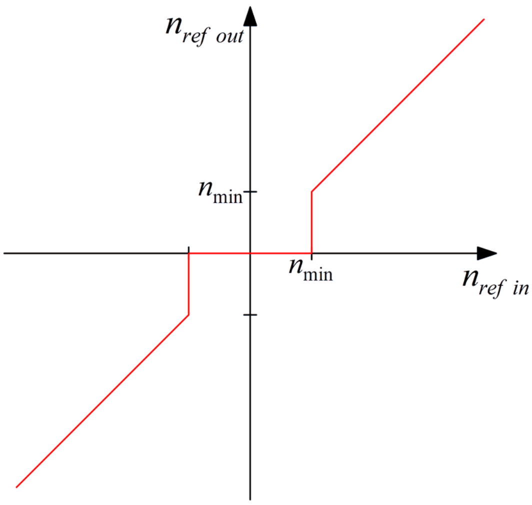
Min. limit

The parameter indicates the minimum possible reference speed in *revolutions per minute*.

NMin mode

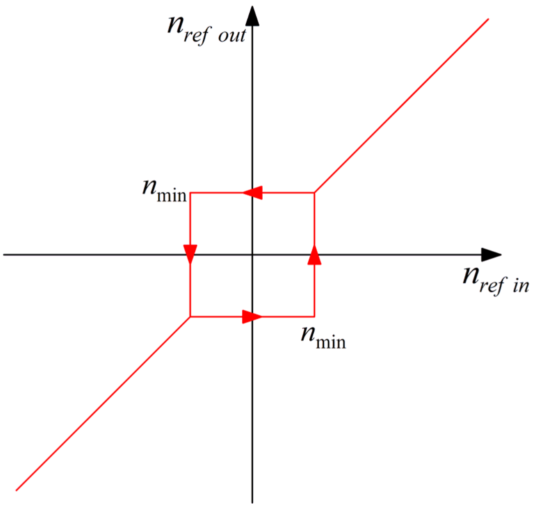
Via this parameter you can select the reference speed to be driven in case a target value below the minimum speed has been selected.

Mode “N-Ref = 0”:



10

Mode “N-Ref = N-Min” (hysteresis):



It is not possible to reverse the direction of the motor rotation, when the target value is below the determined minimum speed.

Ramps

The ramps limit the acceleration via the reference speed value. They are indicated in *milliseconds*. The parameter displays the time required for reaching the speed scaling from standstill. A ramp of e.g. 12000 ms together with a speed scaling of 120000 rpm makes a maximum acceleration of 167 1/s² or $\frac{10000\ 1/min}{s}$.

- Acceleration ramp:
  The parameter indicates the time for the acceleration from 0 to the speed limit: (|v (t + Δt)| - |v (t)| > 0)
- Deceleration ramp:
  The parameter indicates the time for a break application to speed 0: (|v (t + Δt)| - |v (t)| < 0)
- Quick stop ramp:
  The parameter indicates the time for a quick stop to speed 0: (|v (t + Δt)| - |v (t)| < 0)

Variable ramps

By means of the function “Variable ramps” you can set a limit for the mean actual current. For this purpose the acceleration is reduced depending on the actual current. Typically, variable ramps are applied during the start-up of pumps or fans.

- Off:
  The function is not active – the ramps are fix as specified above.
- Type 1 (Current controlled ramp - relative to Imax):
  The acceleration is relative to the maximum current. For this purpose you must set the characteristic curve on the page “Variable Ramps”.
- Type 2 (Current controlled ramp - absolute currents):
  The acceleration is relative to a fix current value. For this purpose you must set the characteristic curve on the page “Variable Ramps”.

Variable Ramps (SD2x, HSBLOCK / FPAM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	✓	–

On the page “Variable ramps” you can parameterize a limit for the mean current.

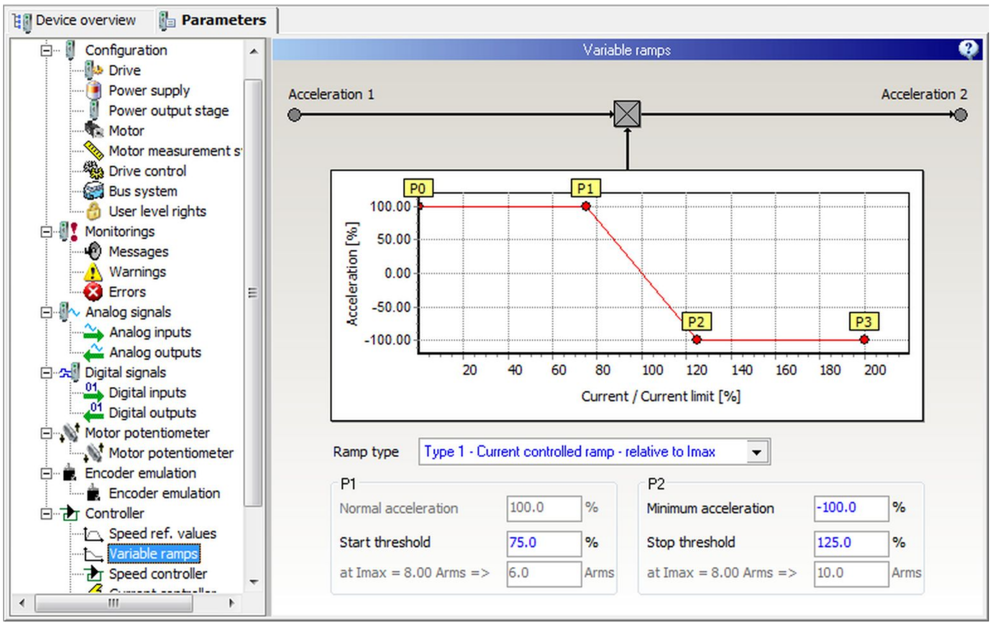
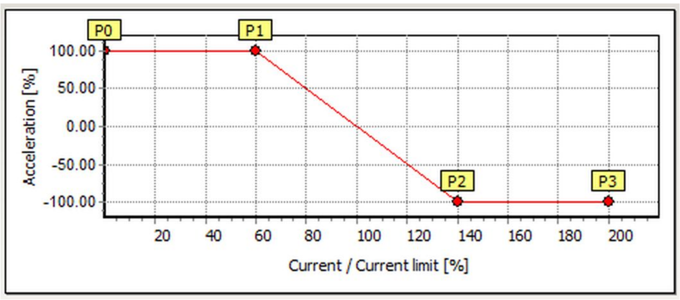


Fig. 59: Parameter page “Variable ramps”

Type 1 – Current controlled ramp – relative to Imax

The acceleration is limited relative to the maximum current:

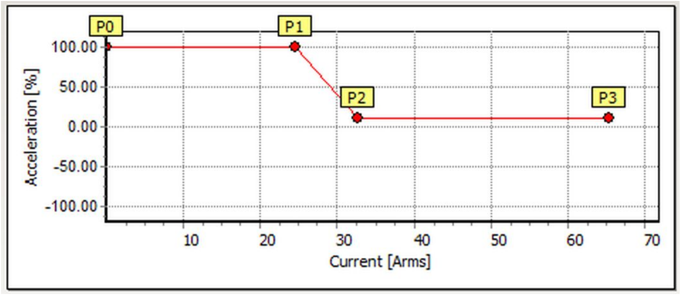


The following parameters must be set:

- Start threshold (P1):
  Indicates the current in *percent* at which the reduction of the acceleration is started. For assistance the corresponding current value is displayed in gray color below.
- Minimum acceleration (P2):
  Indicates the minimum acceleration in *percent*. A negative value corresponds to 'braking'.
- Stop threshold (P2):
  Indicates the current in *percent* at which the reduction of the acceleration is stopped and the minimum acceleration is kept. For assistance the corresponding current value is displayed in gray color below.

Type 2 – Current controlled ramp – absolute currents

The acceleration is limited via absolute current values:



The following parameters must be set:

- Start threshold (P1):
  Indicates the current in *amperes* at which the reduction of the acceleration is started. For assistance the corresponding percent value (of the maximum current) is displayed in gray color below.
- Minimum acceleration (P2):
  Indicates the minimum acceleration in *percent*. A negative value corresponds to 'braking'.
- Stop threshold (P2):
  Indicates the current in *amperes* at which the reduction of the acceleration is stopped and the minimum acceleration is kept. For assistance the corresponding percent value (of the maximum current) is displayed in gray color below.

Speed Controller (SD2x, HSBLOCK / FPAM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	✓	–

On this page you can set the parameters of the speed controller for HSBLOCK / FPAM operation.

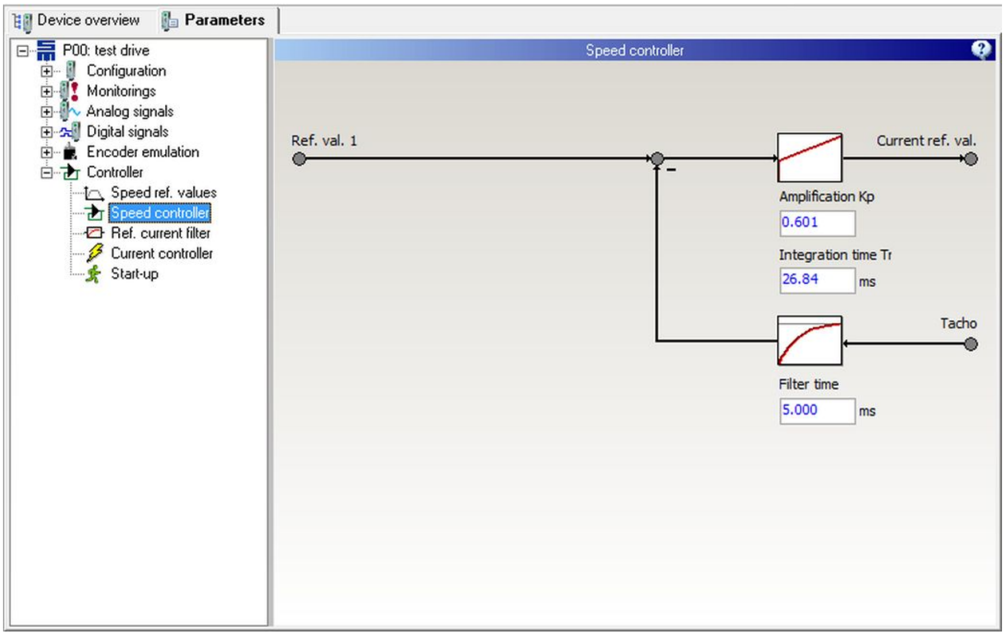


Fig. 60: Parameter page “Speed controller”

Amplification Kp

The parameter specifies the proportional amplification of the speed controller in dependance on the speed scaling and the peak current of the power output stage. The reaction time of the speed control circuit is reduced, when a high proportional amplification is selected. If the amplification value is set too high, the speed control circuit starts vibrating.

Integration time Ti

The parameter sets the integral amplification of the speed controller (therefore it is often called integral time constant Ti). The integration time Ti is indicated in *milliseconds*. The smaller the integration time is selected, the more accurate the speed control operates. If the value is set too small, the speed control circuit starts vibrating.

Filter time (tacho filter)

The parameter indicates the filter time for the actual speed (tachometer) in *milliseconds*. If the actual speed is noisy, you can smooth it by means of the filter.

A typical filter time value is 1 ms (at 230 V mains supply) or 3 ms (at 400 V mains supply). You can increase the time constant, if a more smooth actual speed is needed.

Current Reference Filter (SD2x, HSBLOCK / FPAM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	✓	–

This page provides the parameters for the reference current filter of the drive amplifier. You can set up to 4 filters for the torque-generating current (Iq) either as low-pass filter or band-stop filter.

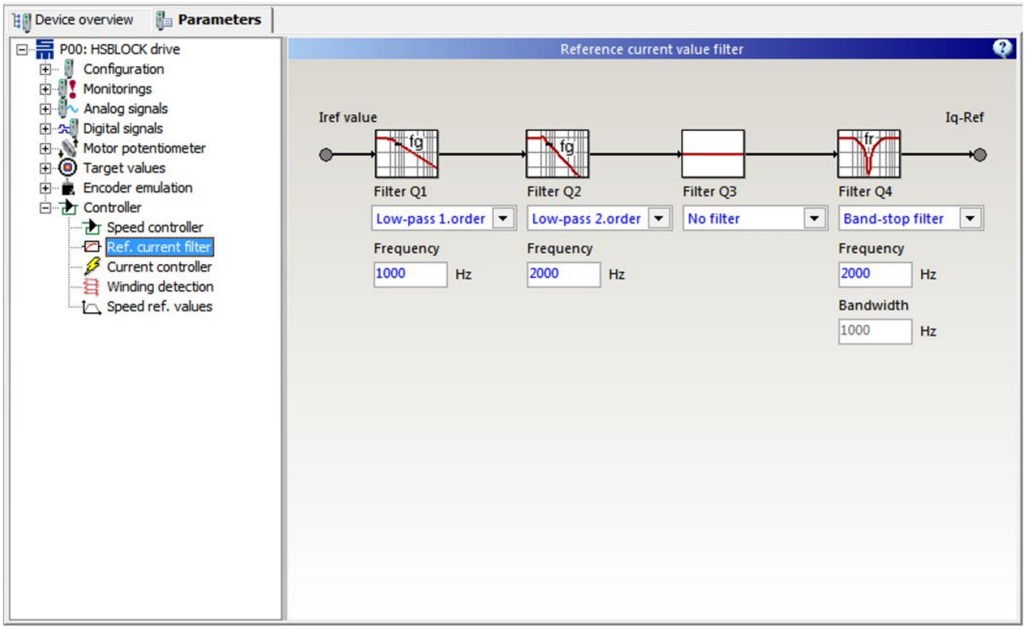


Fig. 61: Parameter page "Ref. current filter"

Filter 1–4

The parameter specifies the type of the filter. It is set by means of a selection list. The options "No filter", "Low-pass 1. order", "Low-pass 2. order" and "Band-stop filter" are available.

Low-pass 1st/2nd order

A low-pass is used to suppress noise in the reference current value. This noise is created e.g. by noisy speed measurement. By means of the low-pass losses in the power output stage and in the motor can be reduced.

You can use a low-pass 1st order or a low-pass 2nd order with Butterworth characteristic. Set the desired filter and enter the 3 dB cutoff frequency of the filter. The unit is *hertz*.

Please consider that a low-pass in the reference current value reduces the dynamics of the torque output. For this reason you must possibly adapt the control parameter of the speed controller (reduce the amplification and increase the integration time).

Band-stop filter

A band-stop filter is used to suppress resonance frequencies caused by the mechanical construction of the driven machine.

Enter the center frequency of the band-stop filter. The bandwidth is set automatically. The unit is *hertz*.

Please consider that a band-stop filter in the reference current value can reduce the dynamics of the current control. For this reason you must possibly adapt the control parameter of the speed controller (reduce the amplification and increase the integration time).

Current Controller (SD2x, HSBLOCK / FPAM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	✓	–

On this page you can set the parameters of the current controller for SERVO / VECTOR operation. These are the current limitation, the holding current and the proper control parameters.

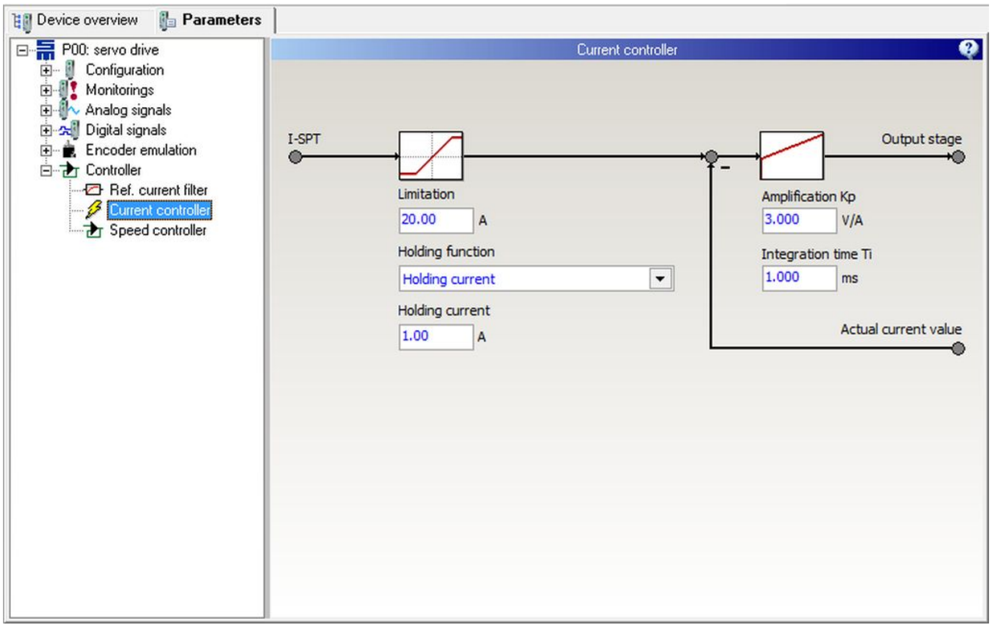


Fig. 62: Parameter page "Current controller"

Limit

The parameter indicates the limitation in the current controller for the reference value of the current. The reference current and its limit are indicated as peak values in *amperes*. The maximum value of the "Limitation" are the peak currents of the motor and the power output stage.

Holding function

The parameter indicates whether a holding current is used. The holding current is active when the controller is switched on and no reference value is set. The holding current shall keep the motor in position at standstill.

The desired current is defined in the parameter "Holding current" in *amperes*.

10

Amplification Kp

The parameter indicates the proportional amplification of the current controller in *volts per ampere*. The reaction time of the current control circuit is reduced if a high proportional amplification is selected. If the amplification value is set too high the current control circuit starts vibrating.

Integration time Ti

The parameter sets the integral amplification of the current controller (therefore it is often called integral time constant Ti). The integration time Ti is indicated in *milliseconds*. The smaller the integration time is selected, the quicker the current control circuit will react. If the value is set too small the current control circuit starts vibrating.

Start-up (SD2x, HSBLOCK / FPAM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	✓	–

For FPAM operation the rotor position is determined by means of the phase voltage. At standstill and at very low speeds it is not possible to measure the phase voltage. For this reason the motor must be accelerated to a minimum speed via open-loop control at first. Then it can be commutated by the phase voltage measuring system. The same applies for the braking process. The motor is decelerated speed-controlled as long as the phase voltage is sufficient to control the rotor position. In consequence there are two motor driving ranges, "Open-loop range" and "Speed-controlled range".

The page “Start-up” provides parameters to set the behavior of the drive in the open loop range.

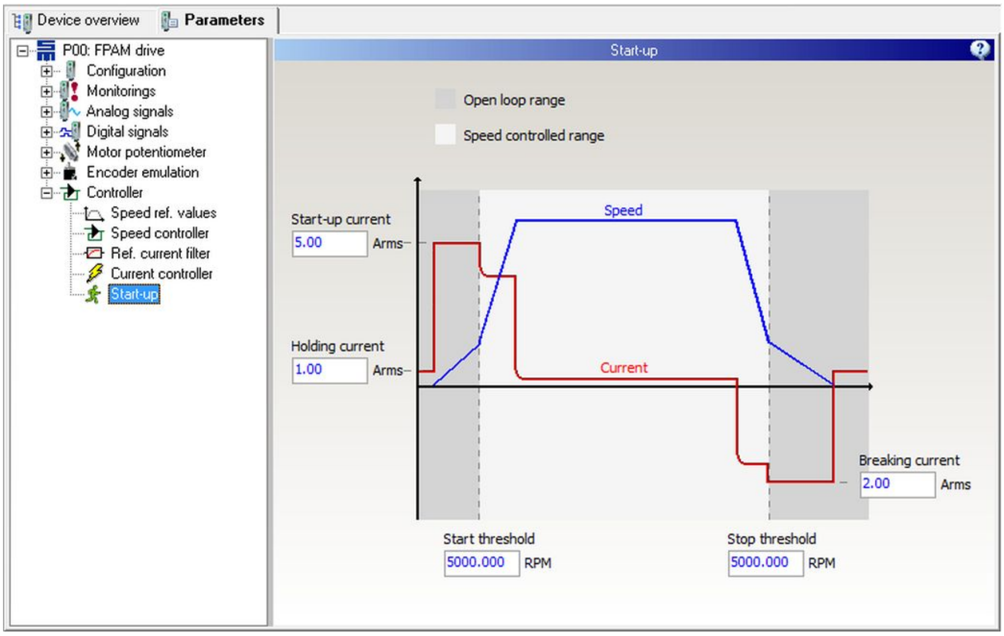


Fig. 63: Parameter page “Start-up”

Start-up current

The parameter indicates a constant current as RMS value in *amperes* that is applied on start-up. The starting current must be greater than the acceleration current of the drive (at least 120 %).

Start threshold

The parameter indicates the minimum speed required for the closed-loop control in *revolutions per minute*. As soon as the reference speed value (N-ref controller) reaches this value, the drive switches to the speed controlled range. From this point the actual speed is determined by the phase voltage measuring system and the commutation is derived from the rotor position

The reference speed values must not be below the start threshold, since the motor can not be driven optimally in this range.

In order to avoid reference values this low, switch to the page “Speed ref. values” and set the parameter “Min. limit” to a value equal to or greater than the start threshold. Thus, the motor can not be operated continuously in the range of open loop control.

Holding current

The parameter “Holding current” equals the set holding current on the page “Current controller”. The value is displayed a second time here to make parameterizing easier.

Stop threshold

When the speed reference value (N-ref controller) drops below this value, braking the motor is continued by open-loop control.

Braking current

The parameter indicates the braking current as RMS value in *amperes*. This current is applied during open-loop controlled braking.

When operating highly inductive motors the commutation can shift due to high braking torques. In this case the braking rate is reduced automatically, i.e. the deceleration time might be longer.

Winding Detection (SD2x, HSBLOCK / FPAM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	✓	–

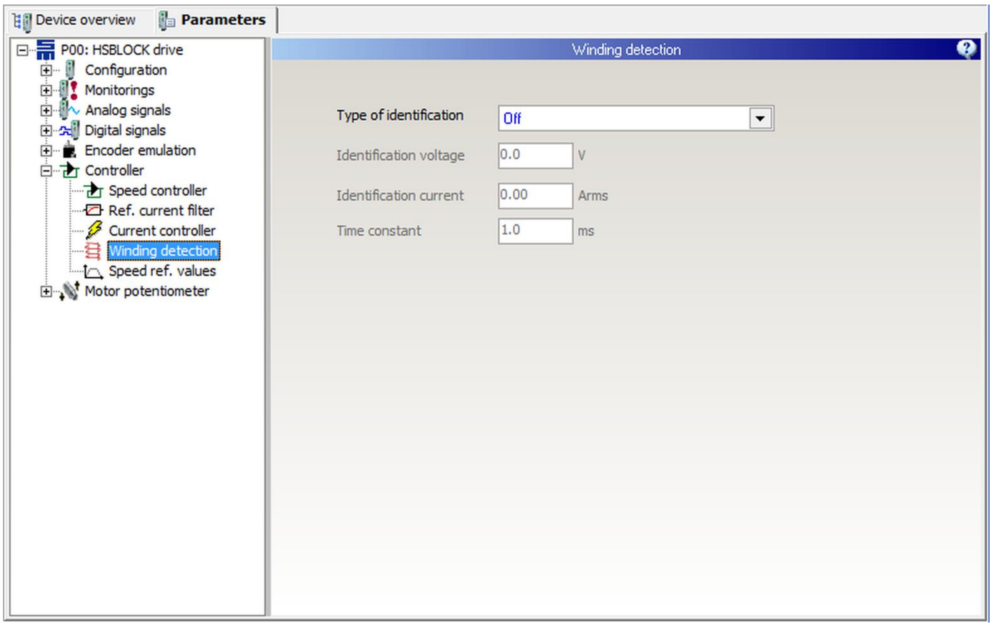


Fig. 64: Parameter page “Winding detection”

At present only special firmware supports the functions "winding detection".

The motor winding can be detected via voltage jumps. For this purpose select the entry “Identification by voltage jump” in the selection list “Type of identification”. The parameters “Identification current” and “Time constant” describe the reaction of the motor winding to a voltage jump with “Identification voltage”. Set these parameters accordingly.

10.10.4 Controller Parameters for HSPWM Operation

The page “Controller” displays a block diagram showing the functional principal of HSPWM operation.

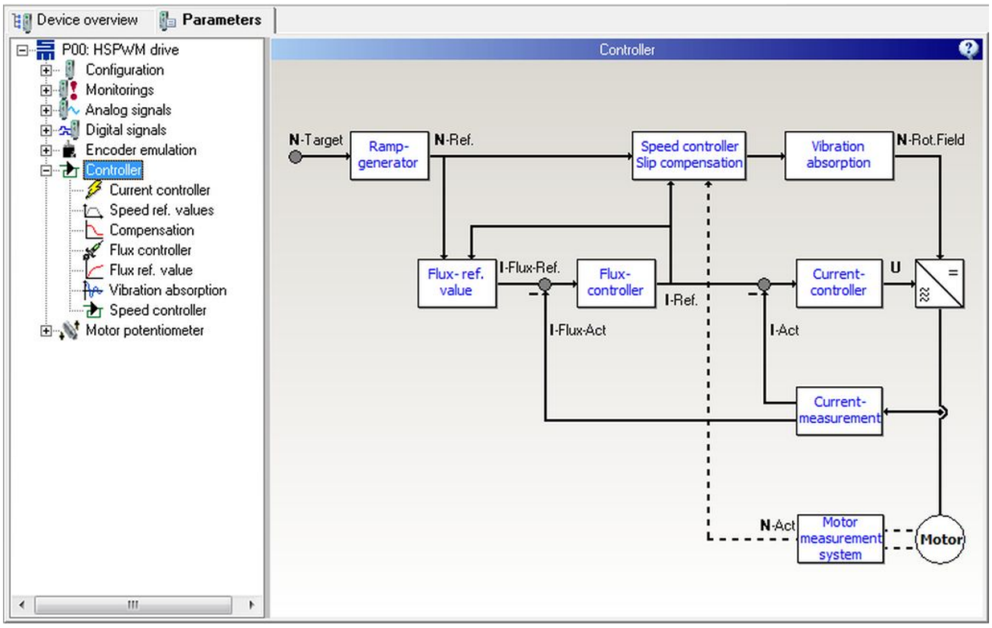


Fig. 65: Parameter page “Controller” for HSPWM converters

In the drive function HSPWM you set the control characteristics via the pages “Current controller”, “Speed reference values”, “Compensation”, “Flux controller”, “Flux reference value”, “Vibration absorption” and “Speed controller”.

For sensorless operation the speed controller is turned off and the page “Speed controller” is not displayed.

10

Speed Reference Values (SD2x, HSPWM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	–

On the page “Speed ref. values” you can parameterize the reference value generator.

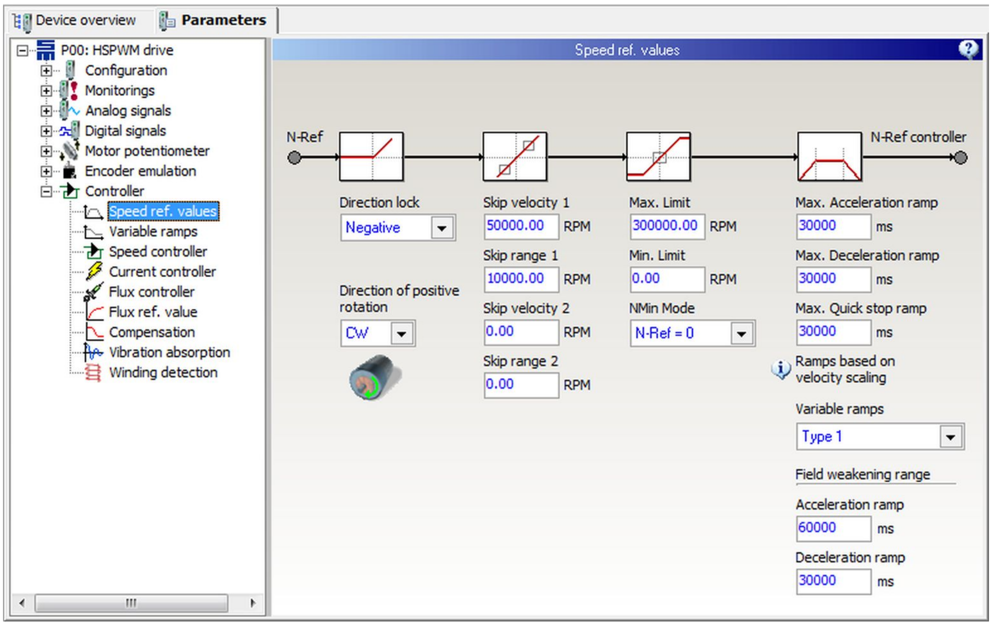


Fig. 66: Parameter page “Speed ref. values”

Direction of rotation

The parameter defines the direction of motor rotation for positive reference values (viewed from the shaft end):

- clockwise rotation = CW
- counterclockwise rotation = CCW

The direction of rotation set in the software should match the actual rotation direction of the motor. If this is not the case, two motor phases must be exchanged.

Direction lock

If only one direction of the motor is permitted, you can lock the other direction via this parameter. The following settings are available:

- None: Both positive and negative speed values are passed to the motor.
- Positive: Positive speed values are not passed to the motor.
- Negative: Negative speed values are not passed to the motor.

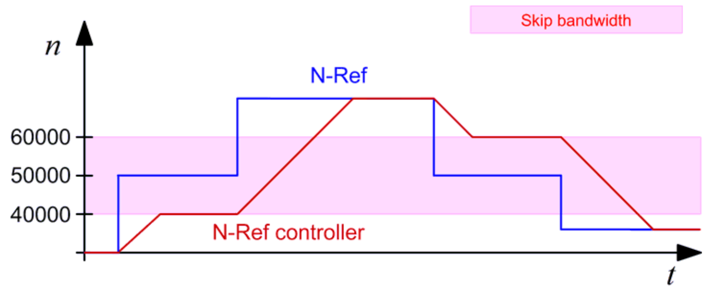
Skip bandwidth

By means of a skip bandwidth you can prevent that definite speeds are driven for a long time. These speeds might be e.g. resonances of a machine.

Example

- Skip velocity: 50000 rpm
- Skip range: 10000 rpm
- max. admissible speed below skip speed = 40000 rpm
- min. admissible speed above skip speed = 60000 rpm

Speed reference values within the skip bandwidth (40000 – 60000 rpm) are suppressed:



Max. limit

The parameter indicates the maximum possible reference speed in *revolutions per minute*.

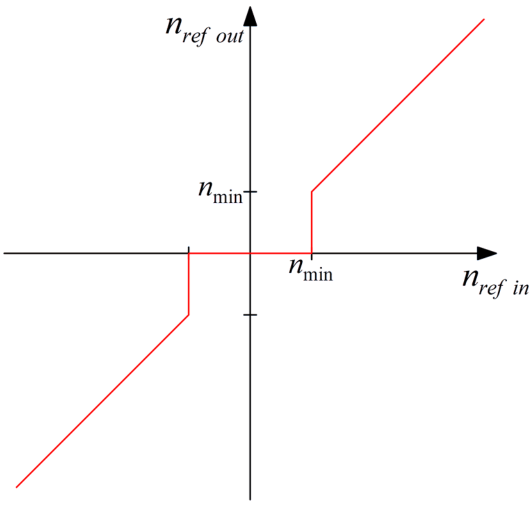
Min. limit

The parameter indicates the minimum possible reference speed in *revolutions per minute*.

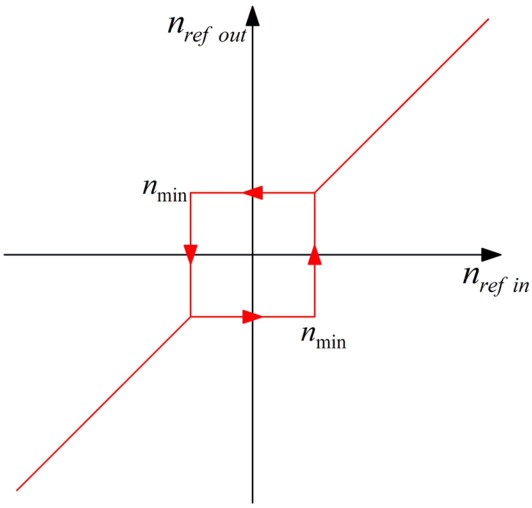
NMin mode

Via this parameter you can select the reference speed to be driven in case a target value below the minimum speed has been selected.

Mode “N-Ref = 0”:



Mode “N-Ref = N-Min” (hysteresis):



It is not possible to reverse the direction of the motor rotation, when the target value is below the determined minimum speed.

Ramps

The ramps limit the acceleration via the reference speed value. They are indicated in *milliseconds*. The parameter displays the time required for reaching the speed scaling from standstill. A ramp of e.g. 12000 ms together with a speed scaling of 120000 rpm makes a maximum acceleration of 167 1/s² or $\frac{10000\ 1/min}{s}$.

- Acceleration ramp:
  The parameter indicates the time for the acceleration from 0 to the speed limit: (|v (t + Δt)| - |v (t)| > 0)
- Deceleration ramp:
  The parameter indicates the time for a break application to speed 0: (|v (t + Δt)| - |v (t)| < 0)
- Quick stop ramp:
  The parameter indicates the time for a quick stop to speed 0: (|v (t + Δt)| - |v (t)| < 0)

Variable ramps

By means of the function “Variable ramps” you can set a limit for the mean actual current. For this purpose the acceleration is reduced depending on the actual current. Typically, variable ramps are applied during the start-up of pumps or fans.

- Off:
  The function is not active – the ramps are fix as specified above.
- Type 1 (Current controlled ramp - relative to Imax):
  The acceleration is relative to the maximum current. For this purpose you must set the characteristic curve on the page “Variable Ramps”.
- Type 2 (Current controlled ramp - absolute currents):
  The acceleration is relative to a fix current value. For this purpose you must set the characteristic curve on the page “Variable Ramps”.

Open-loop range

If a synchronous motor is connected, you must set the times of acceleration and deceleration ramp in the open loop range in addition to the ramps in the speed controlled range.

If an asynchronous motor is connected, you must set the times of acceleration and deceleration ramp in the field weakening range in addition to the ramps in the speed controlled range.

Variable Ramps (SD2x, HSPWM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	–

On the page “Variable ramps” you can parameterize a limit for the mean current.

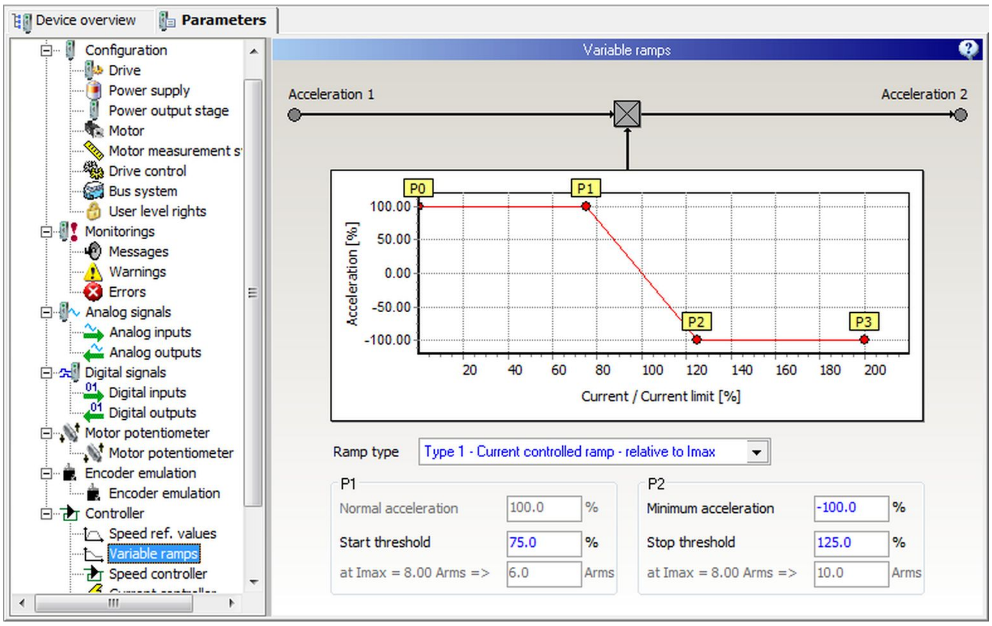
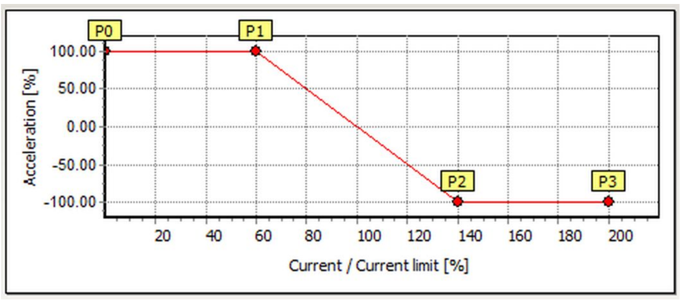


Fig. 67: Parameter page “Variable ramps”

Type 1 – Current controlled ramp – relative to Imax

The acceleration is limited relative to the maximum current:

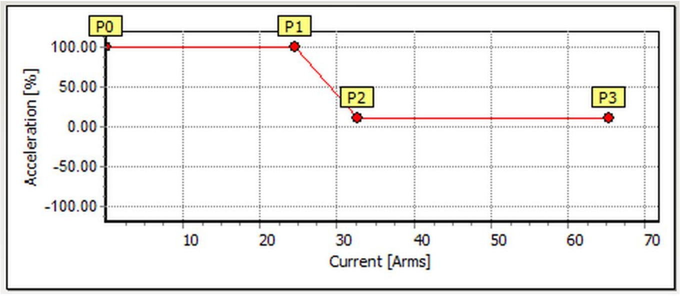


The following parameters must be set:

- Start threshold (P1):
  Indicates the current in *percent* at which the reduction of the acceleration is started. For assistance the corresponding current value is displayed in gray color below.
- Minimum acceleration (P2):
  Indicates the minimum acceleration in *percent*. A negative value corresponds to 'braking'.
- Stop threshold (P2):
  Indicates the current in *percent* at which the reduction of the acceleration is stopped and the minimum acceleration is kept. For assistance the corresponding current value is displayed in gray color below.

Type 2 – Current controlled ramp – absolute currents

The acceleration is limited via absolute current values:



The following parameters must be set:

- Start threshold (P1):
  Indicates the current in *amperes* at which the reduction of the acceleration is started. For assistance the corresponding percent value (of the maximum current) is displayed in gray color below.
- Minimum acceleration (P2):
  Indicates the minimum acceleration in *percent*. A negative value corresponds to 'braking'.
- Stop threshold (P2):
  Indicates the current in *amperes* at which the reduction of the acceleration is stopped and the minimum acceleration is kept. For assistance the corresponding percent value (of the maximum current) is displayed in gray color below.

Speed Controller (SD2x, HSPWM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	–

On this page you can set the parameters of the speed controller for a HSPWM converter. A suitable measuring system must be parameterized.

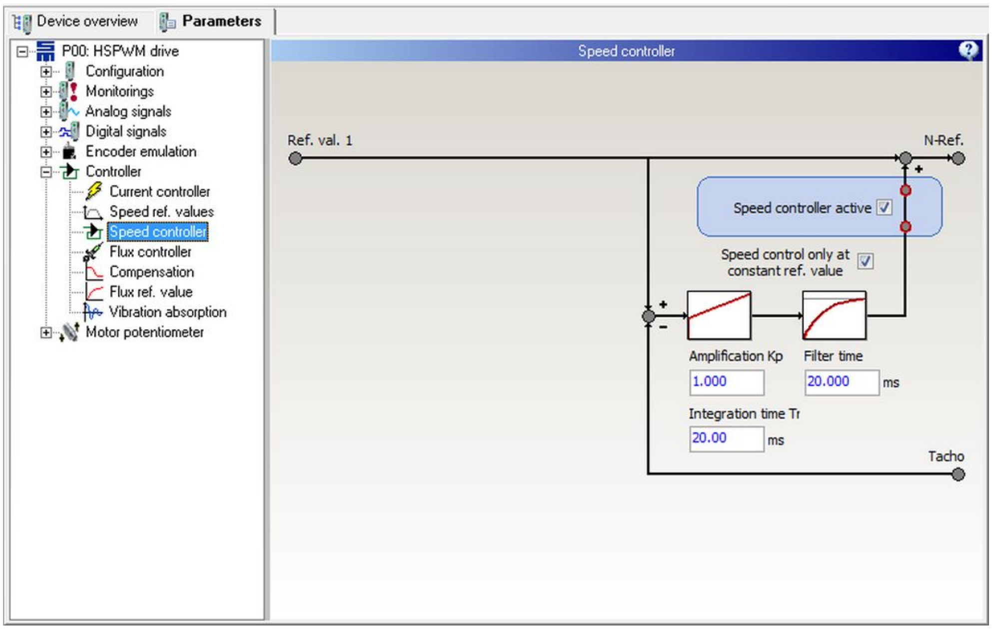


Fig. 68: Parameter page "Speed controller"

Speed controller active

You must activate the check box to switch-on the speed control.

Speed control only at constant ref. value

Activate the check box for less dynamic measuring systems (field plate, pulse generator or Hall sensor). The dynamics of these measuring systems are often not sufficient to control the speed in the ramps already. Thus the speed must have reached a constant reference value for suitable control.

Amplification Kp

The parameter indicates the proportional amplification of the speed controller. The parameter is without unit.

Example: When the slip is 100 rpm and the amplification is 1.0, the reference value is increased by 100 rpm via the proportional component.

Integration time Ti

The parameter sets the integral amplification of the speed controller (therefore it is often called integral time constant Ti). The integration time Ti is indicated in *milliseconds*. Typical values of the integral time constant are in the range of the filter time constant of the speed controller.

If the integral time constant value is too small (especially for slow measuring system, e.g.field plate), the speed control circuit starts vibrating.

Filter time

The parameter indicates the filter time for the correcting variable of the speed controller in *milli seconds*. Take care that the value is in the range of the data transfer rate of the measuring system. For less dynamic measuring systems (field plate, pulse generator or Hall sensor) the filter time is usually approx. 256 ms.

Current Controller (SD2x, HSPWM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	–

On this page you can set the parameters of the current controller for a HSPWM converter. These are the current limitation, the holding current and the proper control parameters.

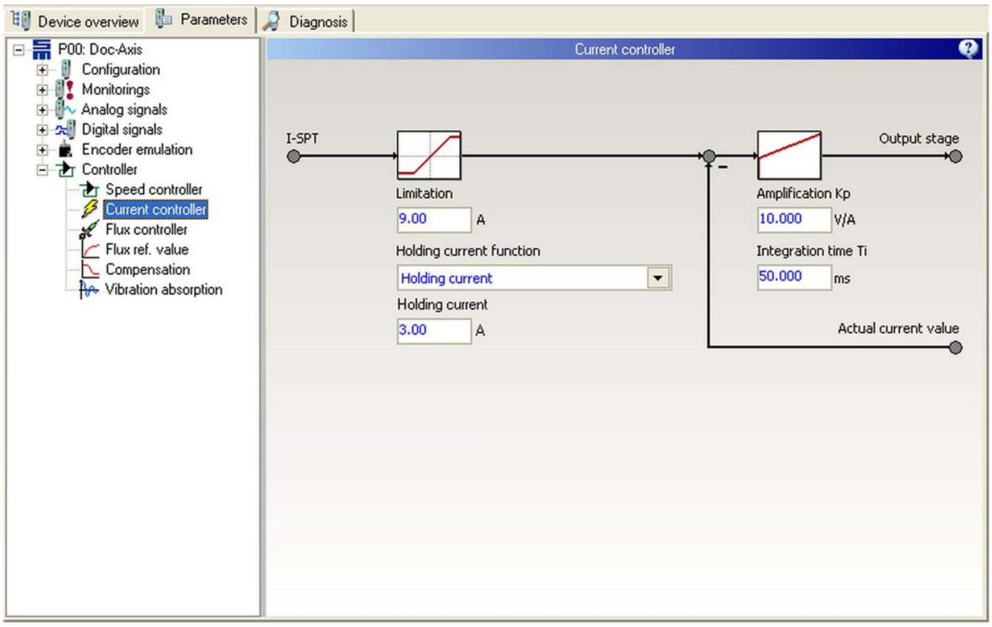


Fig. 69: Parameter page "Current controller"

For synchronous motors the amplification Kp and the integral time constant Tn (readjustment time) of the current controller can be configured via the motor parameters. For asynchronous motors it is necessary to align these parameters manually.

Limit

The parameter indicates the limitation in the current controller for the reference value of the current. The reference current and its limit are indicated as peak values in *amperes*. The maximum value of the "Limitation" are the peak currents of the motor and the power output stage.

Holding Function

The holding function is active when the controller is switched on and no reference speed value is set. The holding current shall keep the motor in position at standstill. You can select one of the following holding functions:

- Holding current:
  A PI current controller induces a voltage at the motor, which then generates the desired current. The desired current is defined in the parameter "Holding current" in *amperes*.
- Holding current with time limit:
  A PI current controller induces a voltage at the motor, which then generates the desired current. The desired current is defined in the parameter "Holding current" in *amperes*. After the reference value zero is reached the holding current is limited to a certain time. Its only purpose is to decelerate the motor securely to standstill. The desired holding time is indicated in *seconds*.

Amplification Kp

The parameter indicates the proportional amplification of the current controller in *volts per ampere*. The reaction time of the current control circuit is reduced if a high proportional amplification is selected. If the amplification value is set too high the current control circuit starts vibrating.

Integration time Ti

The parameter sets the integral amplification of the current controller (therefore it is often called integral time constant Ti). The integration time Ti is indicated in *milliseconds*. The smaller the integration time is selected, the quicker the current control circuit will react. If the value is set too small the current control circuit starts vibrating.

Flux Controller (SD2x, HSPWM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	–

This page provides the parameters for the flux controller of a HSPWM converter. The flux current is proportional to the flux that is generated in the motor gap.

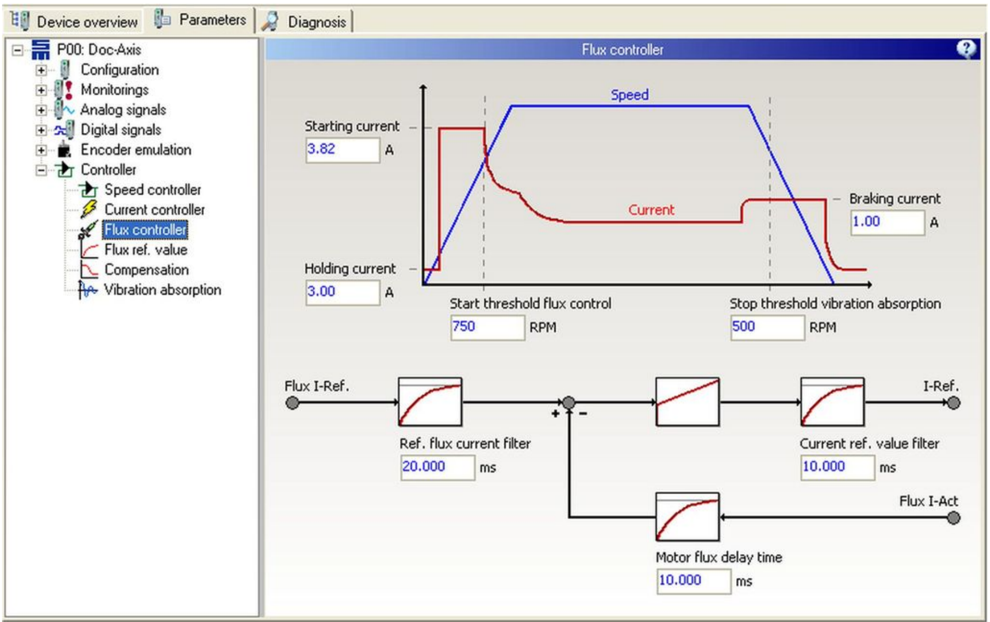


Fig. 70: Parameter page “Flux controller”

Start and stop behavior

In the top section of the page the profile of speed and current is illustrated. The following parameters can be configured:

- Startup current:
  The parameter indicates the starting current of the motor in the range of open loop control in *amperes*.
- Holding current:
  The parameter indicates the holding current in *amperes*. This parameter is only displayed, when a holding current is activated on the page “Current controller”.
- Start threshold flux control:
  The parameter indicates the speed in *revolutions per minute*, at which the control is activated.
- Stop threshold vibration absorption:
  The parameter indicates the speed in *revolutions per minute*, at which the vibration absorption is deactivated, when the motor is decelerated.
- Braking current:
  The parameter indicates the average braking current in *amperes*.

Flux controller

In the bottom section of the page a block diagram of the flux controller is displayed. The following parameters can be configured:

- Reference flux current filter
  The parameter indicates the filter time of the reference flux current in *milliseconds*.
- Current reference value filter:
  The parameter indicates the filter time of the reference current in *milliseconds*.
- Motor flux delay time:
  The parameter indicates the total delay of the current effect on the flux in *milli seconds*, e.g. bandwidth of the current controller etc. The motor flux delay time is only displayed for synchronous motors.

Flux Reference Value (SD2x, HSPWM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	–

On this page you set the parameters of the load and flux compensation for a HSPWM converter.

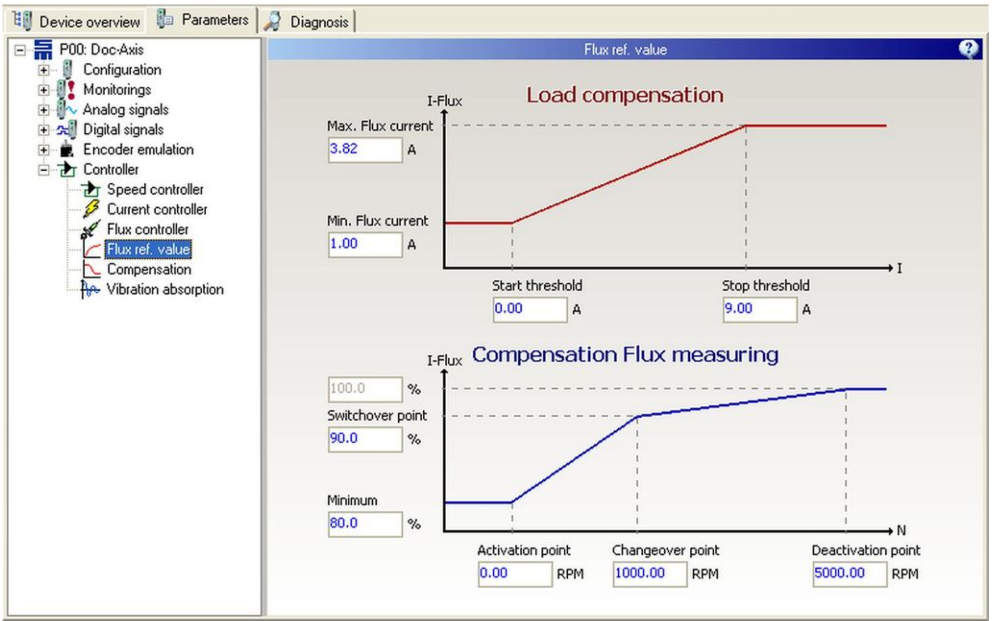


Fig. 71: Parameter page "Flux ref. value"

Characteristic curve of the load compensation

The characteristic curve of the load compensation illustrates the flux current subjected to the reference current.

Characteristic curve of the flux compensation

The characteristic curve of the flux compensation illustrates the rise of the flux current subjected to the speed.

Compensation (SD2xHSPWM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	–

On this page you set the parameters of the field weakening and slip compensation for a HSPWM converter.

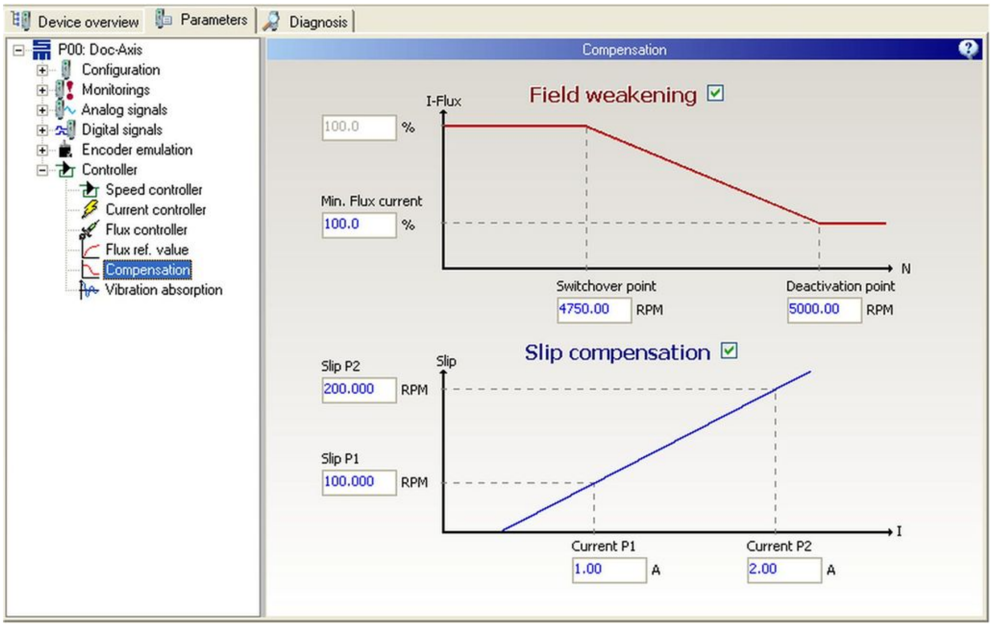


Fig. 72: Parameter page “Compensation”

Characteristic curve of the field weakening

The characteristic curve of the field weakening illustrates the flux current subjected to the speed. At first activate the check box, then you can set the characteristic curve.

Characteristic curve of the slip compensation

The characteristic curve of the slip compensation illustrates the speed deviation subjected to the current. At first activate the check box, then you can set the characteristic curve.

Vibration Absorption (SD2x, HSPWM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	–

On this page the vibration absorption of a HSPWM converter is activated and configured.

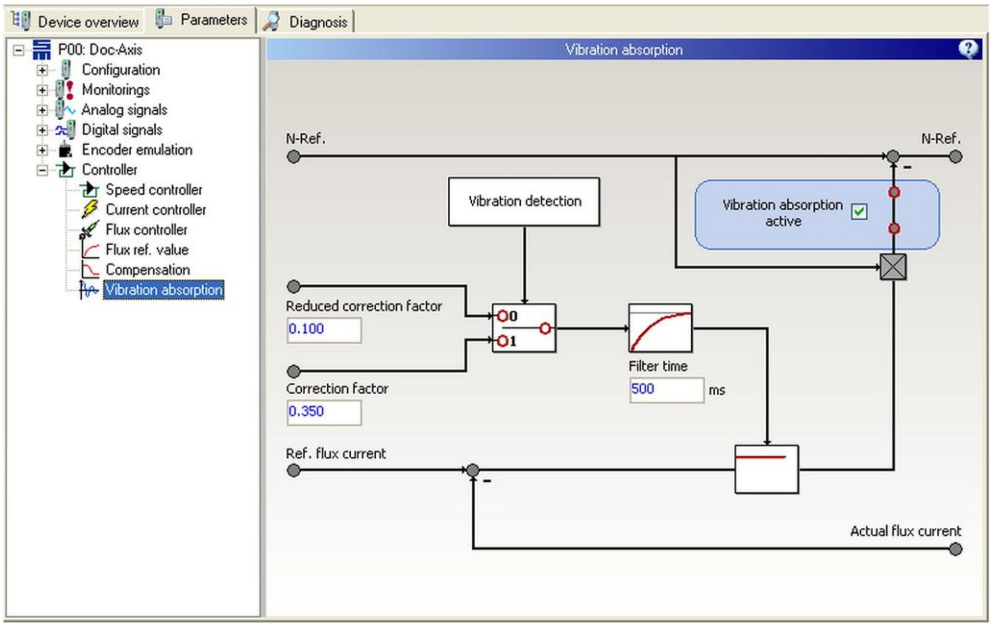


Fig. 73: Parameter page "Vibration absorption"

Vibration absorption active

Via the check box the vibration absorption is activated. The vibration absorption must always be activated for permanently excited synchronous motors, because these do not feature an electrical absorption. For asynchronous motor the vibration absorption can be activated, if required.

Reduced correction factor / Correction factor

The parameter indicate the maximum possible variation of the rotating field by means of the vibration absorption. During operation the reduced correction factor is active. As soon as a vibration is detected, the reduced correction factor will be switched to the standard correction factor. After the vibration has been balanced, the standard correction factor is set back to the reduced correction factor by means of the filter time.

10

The factor 0.1, for example, allows the vibration absorption to alter the rotating field about ±10 %. Typical values of synchronous motors are:

- Reduced factor = 0.1 (±10 %)
- Factor = 0.3 (±30 %)

Filter time

The parameter Indicates the time constant in *milli seconds*. When this times is passed, the vibration absorption is reset from the standard correction factor to the reduced correction factor. A typical value of the filter time is 500 ms.

Winding Detection (SD2x, HSPWM)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	✓	–	–

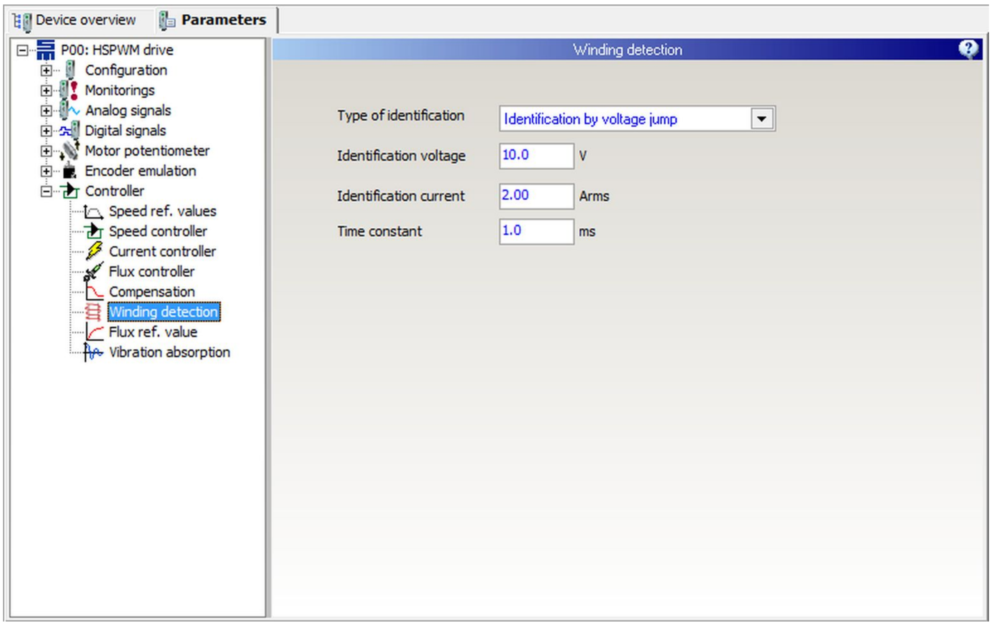


Fig. 74: Parameter page “Winding detection”

At present only special firmware supports the functions "winding detection".

The motor winding can be detected via voltage jumps. For this purpose select the entry “Identification by voltage jump” in the selection list “Type of identification”. The parameters “Identification current” and “Time constant” describe the reaction of the motor winding to a voltage jump with “Identification voltage”. Set these parameters accordingly.

10.10.5 Controller Parameters for HSPAM / VF Operation

10

The page “Controller” displays a block diagram showing the functional principal of HSPAM / VFoperation.

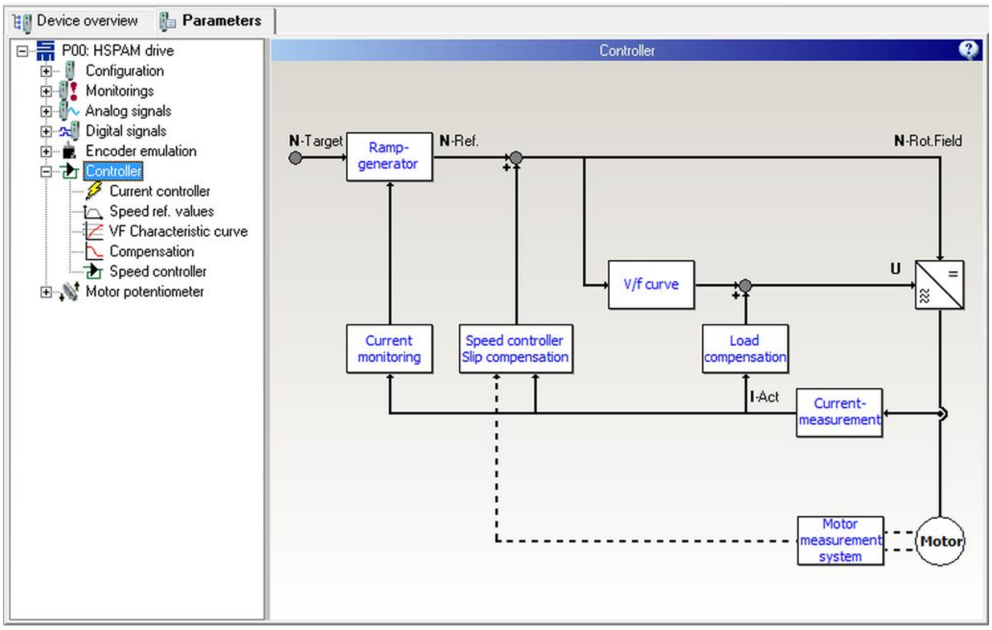


Fig. 75: Parameter page “Controller” for HSPAM / VF converters

In the drive function HSPAM / VF you set the control characteristics via the pages "Current controller", "Speed reference values", "VF Characteristic curve", "Compensation" and "Speed controller".

For sensorless operation the speed controller is turned off and the page "Speed controller" is not displayed.

Speed Reference Values (SD2x, HSPAM / VF)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	–	✓

On the page "Speed ref. values" you can parameterize the reference value generator.

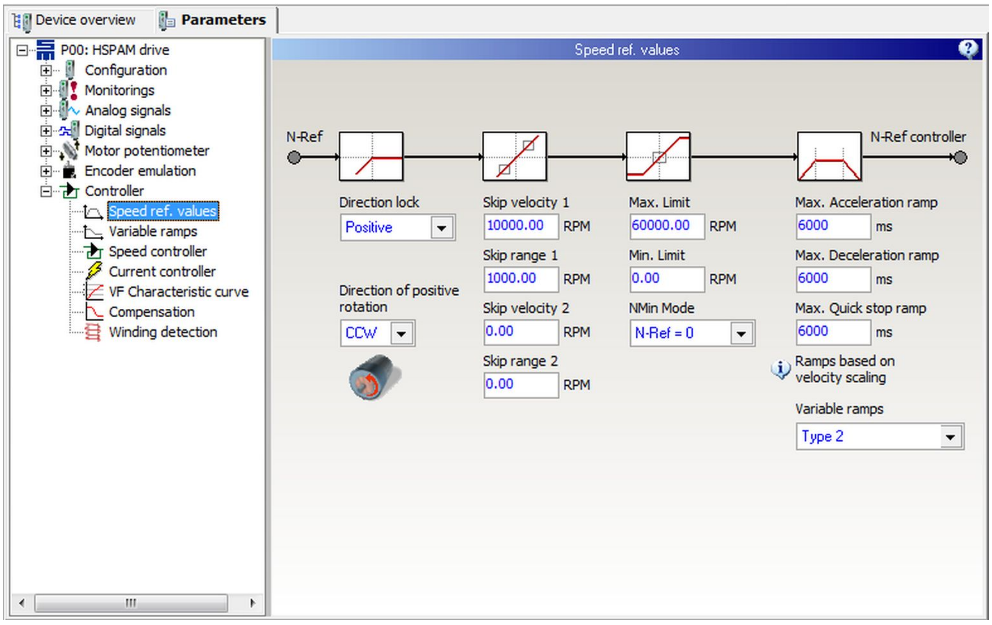


Fig. 76: Parameter page "Speed ref. values"

Direction of rotation

The parameter defines the direction of motor rotation for positive reference values (viewed from the shaft end):

- clockwise rotation = CW
- counterclockwise rotation = CCW

The direction of rotation set in the software should match the actual rotation direction of the motor. If this is not the case, two motor phases must be exchanged.

Direction lock

If only one direction of the motor is permitted, you can lock the other direction via this parameter. The following settings are available:

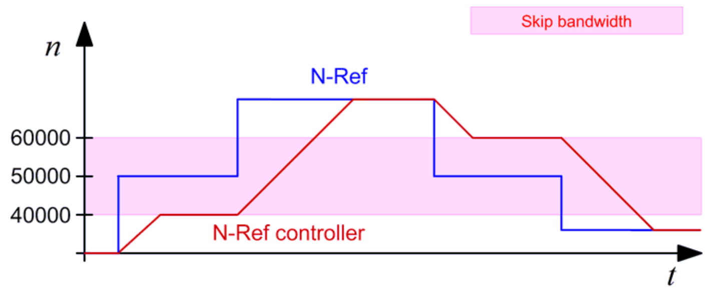
- None: Both positive and negative speed values are passed to the motor.
- Positive: Positive speed values are not passed to the motor.
- Negative: Negative speed values are not passed to the motor.

Skip bandwidth

By means of a skip bandwidth you can prevent that definite speeds are driven for a long time. These speeds might be e.g. resonances of a machine.

Example
- Skip velocity: 50000 rpm
- Skip range: 10000 rpm
- max. admissible speed below skip speed = 40000 rpm
- min. admissible speed above skip speed = 60000 rpm

Speed reference values within the skip bandwidth (40000 – 60000 rpm) are suppressed:



Max. limit

The parameter indicates the maximum possible reference speed in *revolutions per minute*.

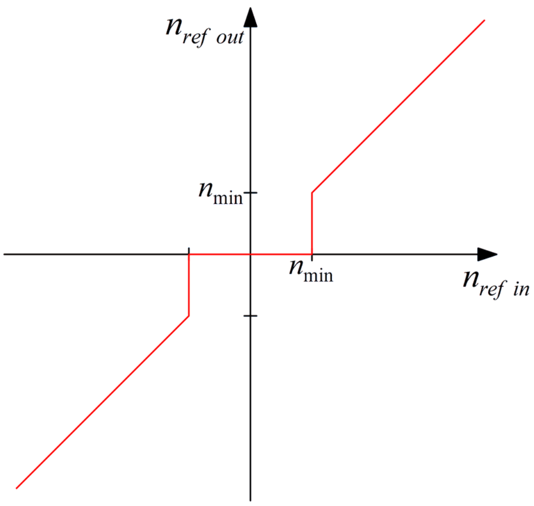
Min. limit

The parameter indicates the minimum possible reference speed in *revolutions per minute*.

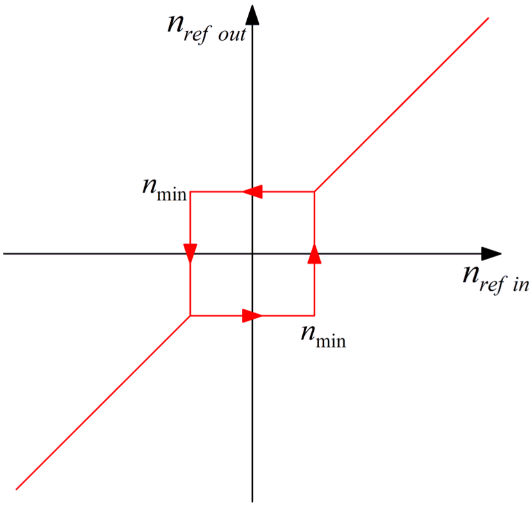
NMin mode

Via this parameter you can select the reference speed to be driven in case a target value below the minimum speed has been selected.

Mode "N-Ref = 0":



Mode “N-Ref = N-Min” (hysteresis):



It is not possible to reverse the direction of the motor rotation, when the target value is below the determined minimum speed.

Ramps

The ramps limit the acceleration via the reference speed value. They are indicated in *milliseconds*. The parameter displays the time required for reaching the speed scaling from standstill. A ramp of e.g. 12000 ms together with a speed scaling of 120000 rpm makes a maximum acceleration of 167 1/s² or $\frac{10000\ 1/min}{s}$.

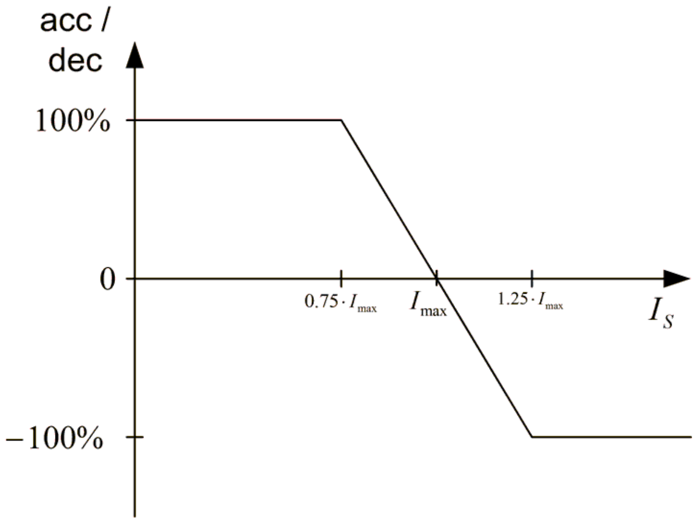
- Acceleration ramp:
  The parameter indicates the time for the acceleration from 0 to the speed limit: (|v (t + Δt)| - |v (t)| > 0)
- Deceleration ramp:
  The parameter indicates the time for a break application to speed 0: (|v (t + Δt)| - |v (t)| < 0)
- Quick stop ramp:
  The parameter indicates the time for a quick stop to speed 0: (|v (t + Δt)| - |v (t)| < 0)

Variable ramps

By means of the function “Variable ramps” you can set a limit for the mean actual current. For this purpose the acceleration is reduced depending on the actual current. Typically, variable ramps are applied during the start-up of pumps or fans. In addition, the function can be used as general current limitation with the drive function HSPAM / VF.

- Norm. current limitation:
  With the normal current limitation the current is limited according to the following figure:

10



- Type 1 (Current controlled ramp - relative to Imax):
  The acceleration is relative to the maximum current. For this purpose you must set the characteristic curve on the page “Variable Ramps”.
- Type 2 (Current controlled ramp - absolute currents):
  The acceleration is relative to a fix current value. For this purpose you must set the characteristic curve on the page “Variable Ramps”.

Variable Ramps (SD2x, HSPAM / VF)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	–	✓

On the page “Variable ramps” you can parameterize a limit for the mean current.

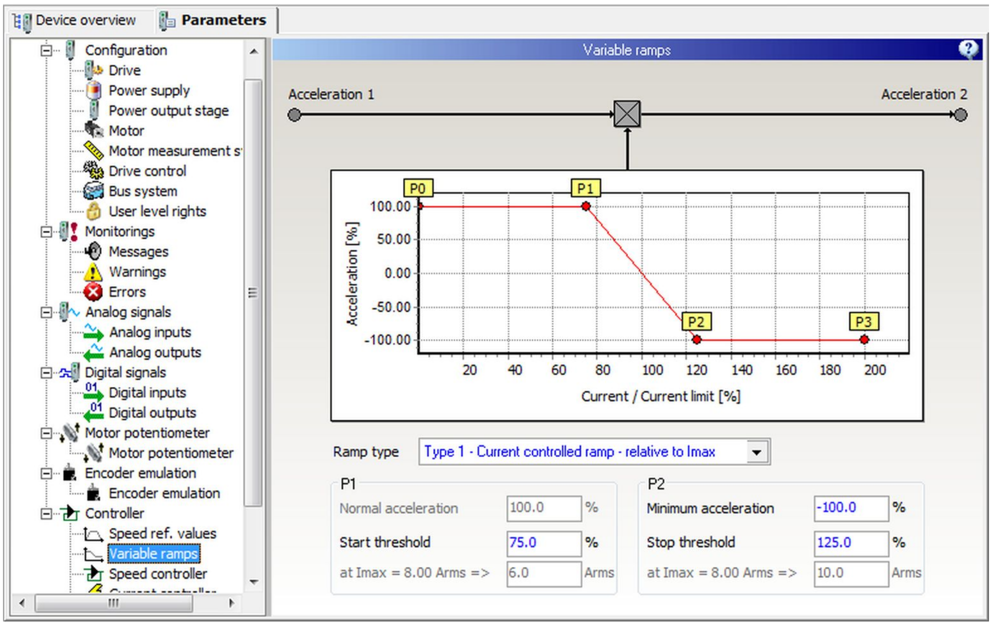
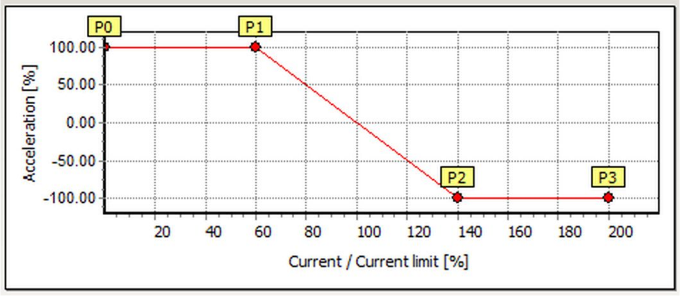


Fig. 77: Parameter page “Variable ramps”

Type 1 – Current controlled ramp – relative to Imax

The acceleration is limited relative to the maximum current:

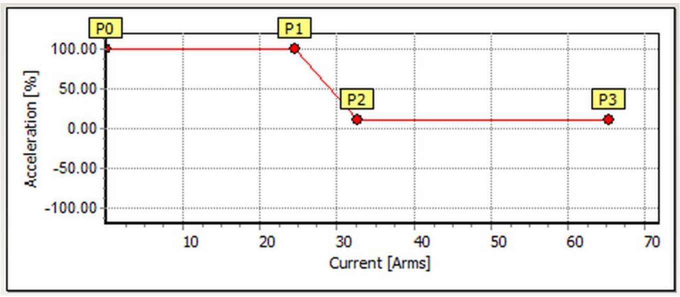


The following parameters must be set:

- Start threshold (P1):
  Indicates the current in *percent* at which the reduction of the acceleration is started. For assistance the corresponding current value is displayed in gray color below.
- Minimum acceleration (P2):
  Indicates the minimum acceleration in *percent*. A negative value corresponds to 'braking'.
- Stop threshold (P2):
  Indicates the current in *percent* at which the reduction of the acceleration is stopped and the minimum acceleration is kept. For assistance the corresponding current value is displayed in gray color below.

Type 2 – Current controlled ramp – absolute currents

The acceleration is limited via absolute current values:



The following parameters must be set:

- Start threshold (P1):
  Indicates the current in *amperes* at which the reduction of the acceleration is started. For assistance the corresponding percent value (of the maximum current) is displayed in gray color below.
- Minimum acceleration (P2):
  Indicates the minimum acceleration in *percent*. A negative value corresponds to 'braking'.
- Stop threshold (P2):
  Indicates the current in *amperes* at which the reduction of the acceleration is stopped and the minimum acceleration is kept. For assistance the corresponding percent value (of the maximum current) is displayed in gray color below.

Current Controller (SD2x, HSPAM / VF)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	–	✓

10

For HSPAM / VF operation the “Current controller” only refers to the holding current. Via this page the holding current controller is parameterized. In addition you can activate the functions “Current-controlled startup / braking” and “Flying restart”.

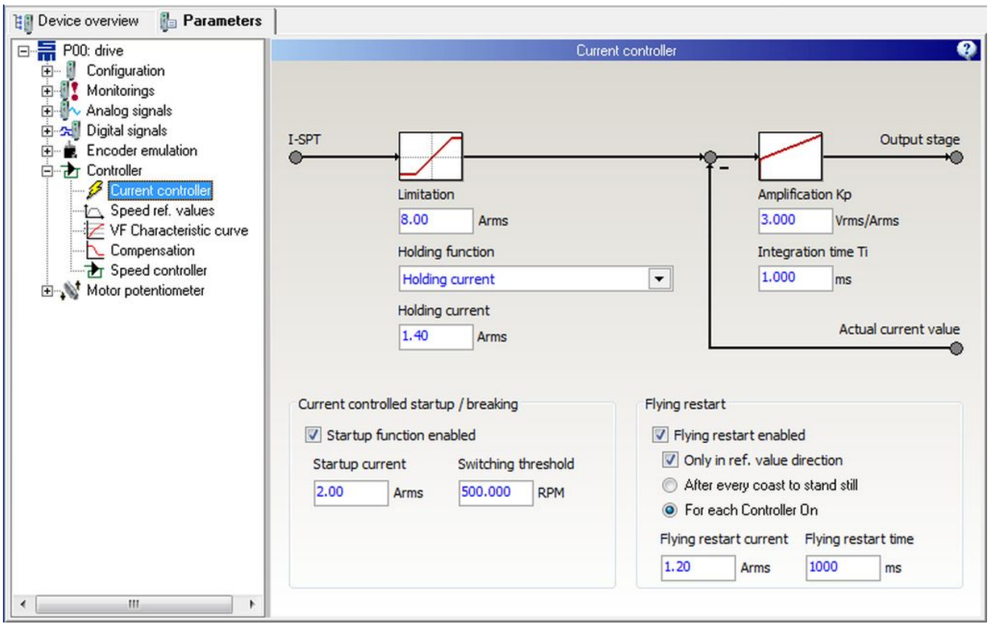


Fig. 78: Parameter page “Current controller”

Limit

The parameter indicates the limitation in the current controller for the reference value of the current. The reference current and its limit are indicated as peak values in *amperes*. The maximum value of the “Limitation” are the peak currents of the motor and the power output stage.

Holding Function

The holding function is active when the controller is switched on and no reference speed value is set. The holding current shall keep the motor in position at standstill (0 Hz). You can select one of the following holding functions:

- Holding current:
  A PI current controller induces a voltage at the motor, which then generates the desired current. The desired current is defined in the parameter “Holding current” in *amperes*.
- Holding current with time limit:
  A PI current controller induces a voltage at the motor, which then generates the desired current. The desired current is defined in the parameter “Holding current” in *amperes*. After the reference value zero is reached the holding current is limited to a certain time. Its only purpose is to decelerate the motor securely to standstill. The desired holding time is indicated in *seconds*.
- Holding voltage:
  A current is generated by means of a fix voltage value. The holding current controller is not active in this mode, i.e. there is no current limitation (not even indirect). The holding voltage can hold the position of the motor permanently. The desired DC voltage is defined in the parameter “Holding voltage” in *volts*.
- Holding voltage with time limit:
  A current is generated by means of a fix voltage value. The holding current controller is not active in this mode, i.e. there is no current limitation (not even indirect). The desired DC voltage is defined in the parameter “Holding voltage” in *volts*. After the reference value zero is reached the holding voltage is limited to a certain time. Its only purpose is to decelerate the motor securely to standstill. The desired holding time is indicated in *seconds*.

> **NOTICE**
>
> Holding voltage too high
>
> If you set the value for the holding voltage too high, the current flow in the motor will be too high and possibly causes device damage. One of the following error messages appears:
> - E45 – Short circuit in power output stage
> - E29 – Motor load too high (Motor I^2t)
> - E30 – Power output stage load too high (I^2t)
>
> If you are not sure of the holding voltage value suitable for your motor, use the function “Holding current”.

Amplification Kp

The parameter indicates the proportional amplification of the holding current controller in *volts per ampere*. The reaction time of the holding current control circuit is reduced if a high proportional gain is selected. If the gain value is set too high the holding current circuit starts vibrating.

Integration time Ti

The parameter sets the integral amplification of the holding current controller (therefore it is often called integral time constant Ti). The parameter is indicated in *milliseconds*. The smaller the time constant the smaller the residual control deviation of the holding current control. If the value is set too small the holding current circuit starts vibrating.

Current-controlled startup / braking

At lower speeds the voltage generated by means of V/f characteristic curve is often not sufficient to impress full magnetizing current. If the startup function is activated, a fix starting or braking current is impressed in the low speed range.

The following parameters can be set:
- Startup current:
  The parameter indicates the desired startup and braking current in *amperes*.
- Switching threshold:
  The parameter indicates the speed in *revolutions per minute*, at which the controller switches to V/f voltage characteristic curve during startup and back to the parameterized current during braking.

Flying Restart

If the function “Flying restart” is activated, the controller determines the actual speed when a new reference value is set and the new target speed is reached from that point.

The following parameters can be set:
- Only in ref. value direction:
  If this check box is activated, the controller searches for the actual speed only in the direction of the actual reference value. Thus, the flying restart time is cut in half.
- After every coast to standstill
  Flying restart is executed each time the spindle was stopped by coasting to standstill.
- For each Controller On:
  Flying restart is executed each time after activating the output stage.
- Flying restart current:

The parameter indicates the current in *amperes* that is used for the spindle restart. Typically this value is approximately 50 % of the rated current.

- Flying restart time:
  The parameter indicates the time for the spindle restart in *milliseconds*. If a measuring system is configured, the actual speed is not determined but directly applied from the measuring system. Thus, no time is lost by searching for the actual speed value.

The spindle only coasts to standstill on controller switch-off, when this reaction is configured on the parameter page “Drive control” in “Behaviors in case of … 'Controller off' command”. Select the entry “Shutdown (The motor coasts to standstill)” in the selection list.

After controller switch-off please do not deactivate the motor relays until the message “M01 – Message power output stage ready” is reset.

V/f Characteristic Curve (SD2xHSPAM / VF)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	–	✓

This page provides up to 8 bending points to edit the V/f characteristic curve. For checking the characteristic curve is displayed graphically in the top of the window. The maximum output voltage of the motor and the power output stage are displayed in the figure to provide assistance during parameterization.

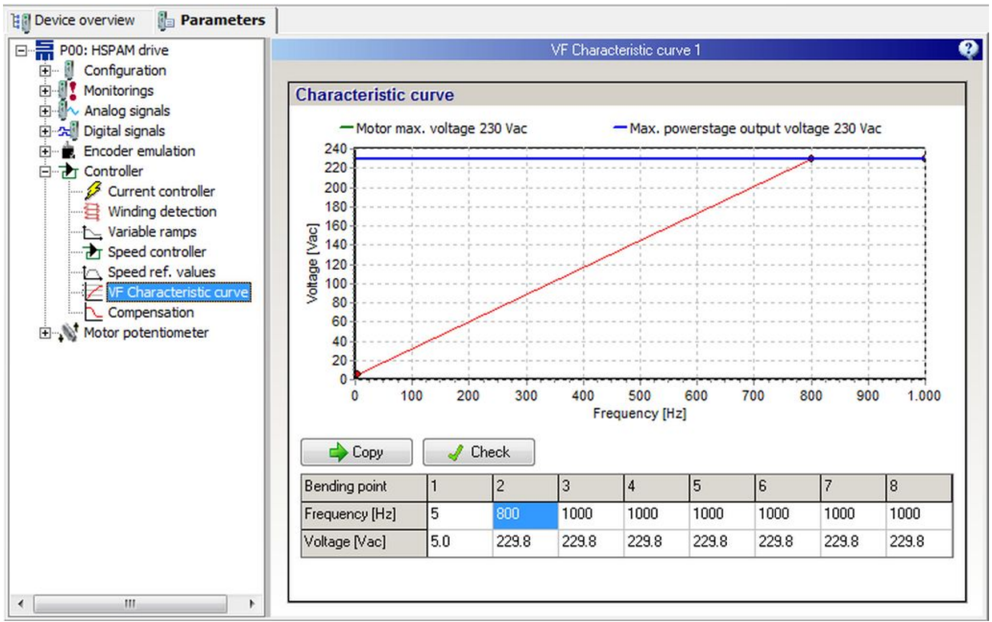


Fig. 79: Parameter page “V/f characteristic curve”

Bending points

The table columns indicate the voltage and the frequency/speed of the individual bending points. The origin (0 Hz or 0 rpm / 0 V) is fixed in the data set, so you do not need to enter it. Interpolation between the value pairs is linear. The number of bending points must grow with increasing frequency/speed or at least remain equal. The voltage however can be reduced. The selected value can be copied into the next column by mouse click on the button “Copy”. Click on the button “Check” to trigger a plausibility check of the entered values.

Speed Controller (SD2x, HSPAM / VF)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	–	✓

On this page you can set the parameters of the speed controller for a HSPAM / VF converter.

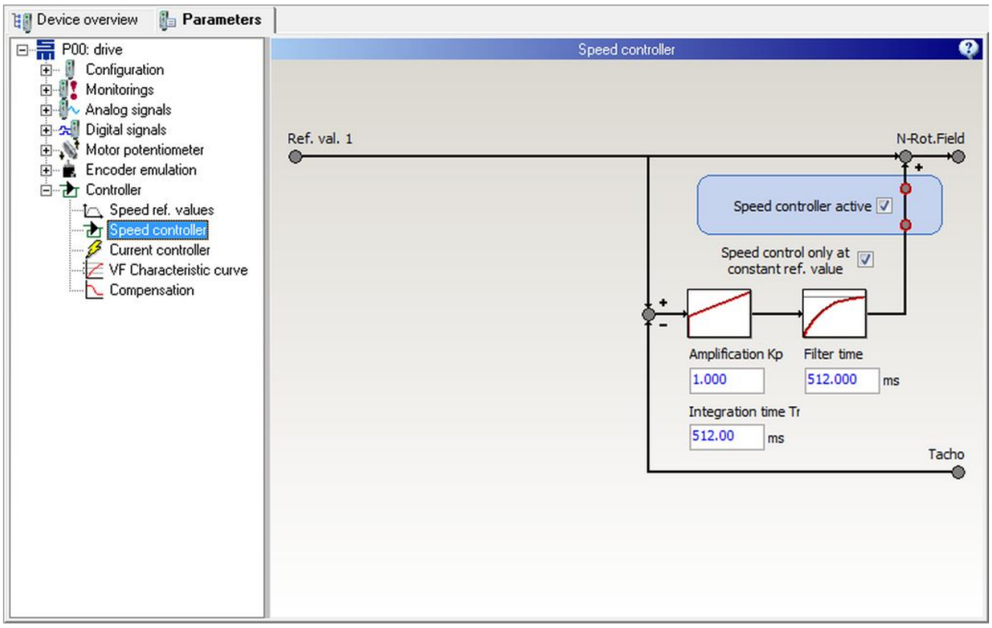


Fig. 80: Parameter page “Speed controller”

Speed controller active

You must activate the check box to switch-on the speed control.

Speed control only at constant ref. value

Activate the check box for less dynamic measuring systems (field plate, pulse generator or Hall sensor). The dynamics of these measuring systems are often not sufficient to control the speed in the ramps already. Thus the speed must have reached a constant reference value for suitable control.

Amplification Kp

The parameter indicates the proportional amplification of the speed controller. The parameter is without unit.

Example: When the slip is 100 rpm and the amplification is 1.0, the reference value is increased by 100 rpm via the proportional component.

Integration time Ti

The parameter sets the integral amplification of the speed controller (therefore it is often called integral time constant Ti). The integration time Ti is indicated in *milliseconds*. Typical values of the integral time constant are in the range of the filter time constant of the speed controller.

If the integral time constant value is too small (especially for slow measuring system, e.g.field plate), the speed control circuit starts vibrating.

Filter time

The parameter indicates the filter time for the correcting variable of the speed controller in *milli seconds*. Take care that the value is in the range of the data transfer rate of the measuring system. For less dynamic measuring systems (field plate, pulse generator or Hall sensor) the filter time is usually approx. 256 ms.

Compensation (SD2xHSPAM / VF)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	–	✓

Via the parameter page “Compensation” you can set load and slip compensation.

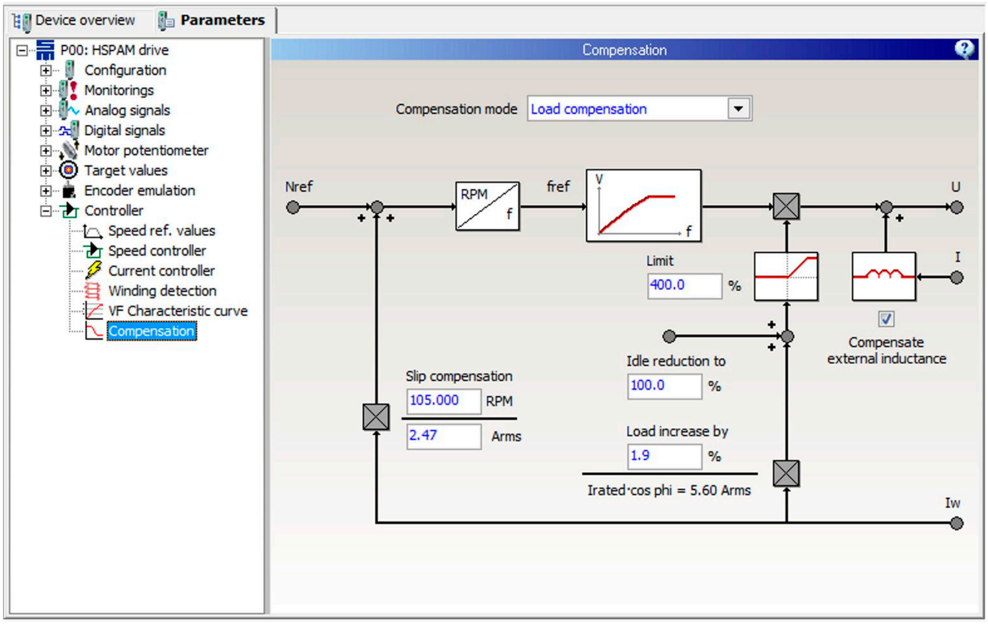


Fig. 81: Parameter page “Compensation”

You can set the following modes for the compensation:

- FC2 load compensation: Compatible with older devices and to the series FC2
  You should use this mode only to apply older parameter sets. For more information on the FC2 load compensation refer to "Compensation (FC2)", page 217.
- Load compensation: Standard load compensation

For V/f control you can switch between FC2 load compensation and standard compensation. The values are converted accordingly.

Load compensation

The standard load compensation allows reducing the V/f characteristic curve during no-load operation. As soon as load is applied the V/f curve is increased again. The following parameters must be set:

- Idle reduction to:
  The parameter indicates the percentage to which the V/f characteristic curve is reduced during no-load operation.
- Load increase by:
  The parameter indicates the percentage by which the V/f characteristic curve is increased when the rated load is applied again.
- Limit:
  The parameter indicates the maximum percentage to which the V/f characteristic curve can be increased on-load.

If you have set an overcompensation via the load increase, the output voltage is higher than the one set in the V/f characteristic curve.

Slip compensation

The slip compensation is an open-loop control to compensate the slip of an asynchronous motor. At the rated load it is calculated from the actual speed value in *revolutions per minute* and the actual current in *amperes*.

The slip compensation is set automatically by the parameter wizard and depends on the entered motor data.

Compensate external inductance

When the check box is activated, the voltage drop at the filter choke is compensated.

Winding Detection (SD2x, HSPAM / VF)

SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
–	–	–	✓

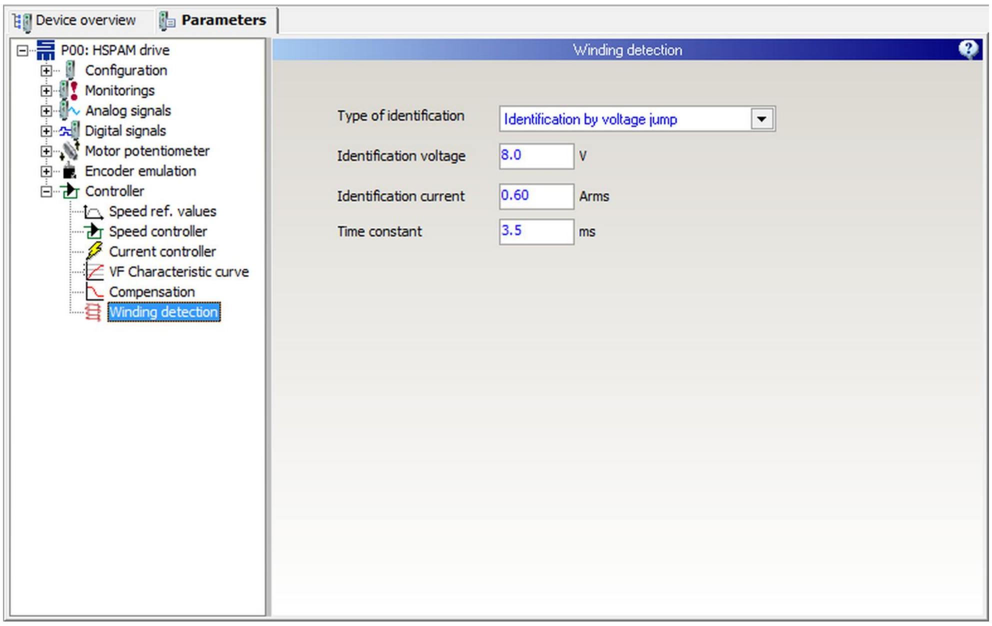


Fig. 82: Parameter page "Winding detection"

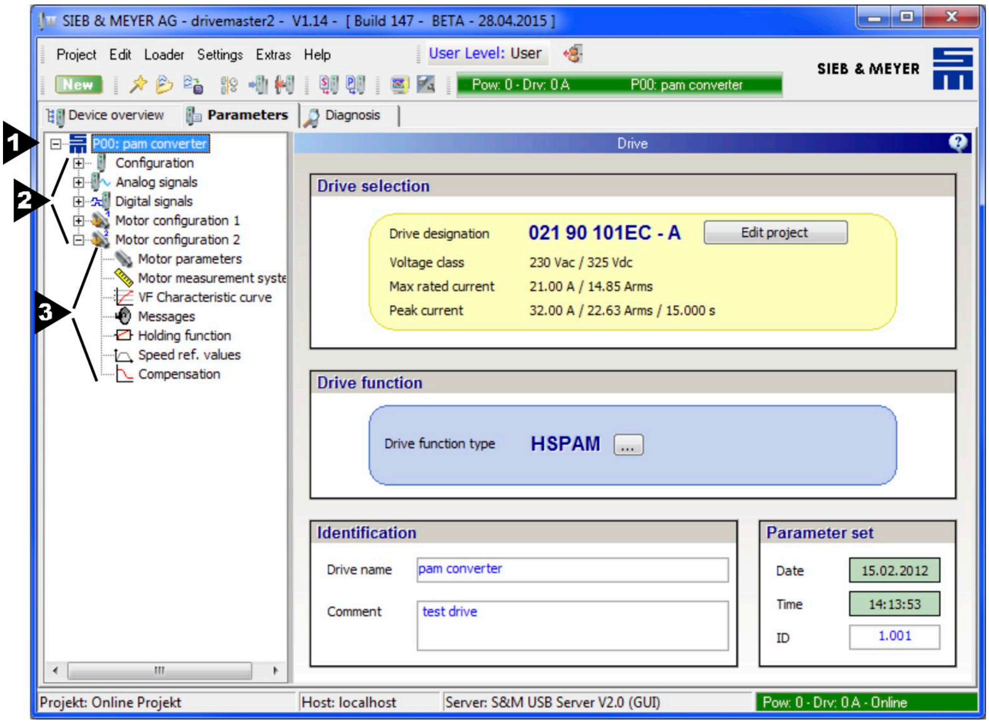
At present only special firmware supports the functions "winding detection".

The motor winding can be detected via voltage jumps. For this purpose select the entry "Identification by voltage jump" in the selection list "Type of identification". The parameters "Identification current" and "Time constant" describe the reaction of the motor winding to a voltage jump with "Identification voltage". Set these parameters accordingly.

10

11 Parameters of an FC2

All parameters of a frequency converter FC2 are available on the tab page “Parameters”. For the sake of clarity the parameters are arranged in pages. These parameter pages are structured via nodes and branches as final nodes (leafs) in a tree structure.



[1] Frequency converter
The root of the tree is the frequency converter selected in the “Device overview”.

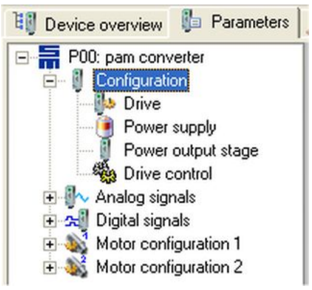
[2] Thematic sub-division of the parameterization
The parameter pages are combined thematically by the subordinated nodes.

[3] Parameter pages
Via the parameter pages you configure the frequency converter according to the application. The individual parameters are combined thematically in groups.

☞ The speed unit of frequency converters of the series FC2 is defined via the Program options, page 33.

11.1 Configuration

The node “Configuration” provides the parameter pages “Drive”, “Power supply”, “Power output stage” and “Drive control”.



The individual pages display all data required for the general configuration of the drive system.

11.1.1 Drive

This parameter page serves for general configuration of the frequency converter and provides information on the current parameter set.

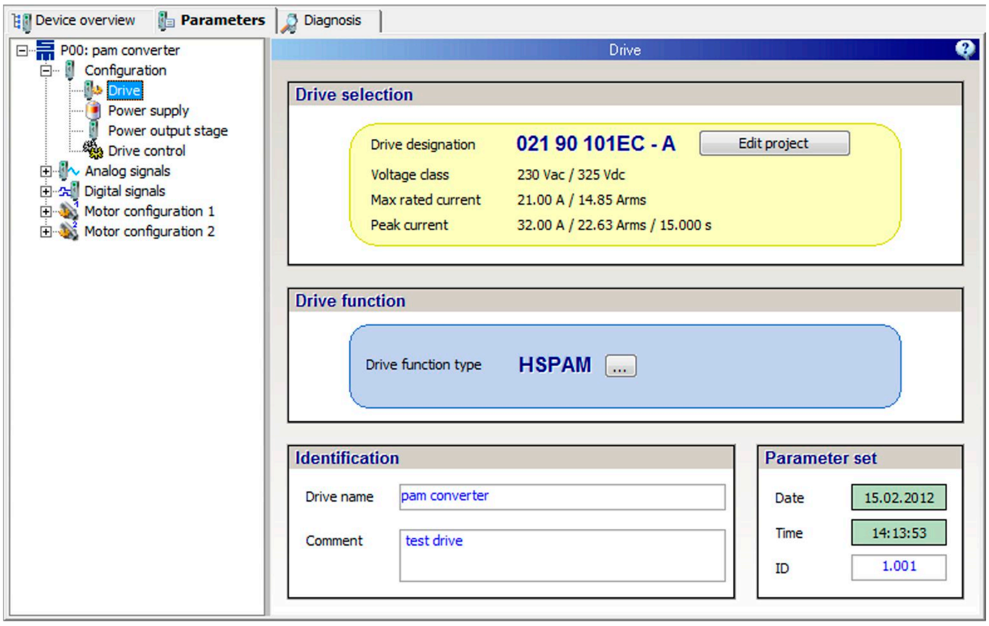


Fig. 83: Parameter page “Drive”

Drive Selection (FC2)

This field displays the characteristics of the selected power electronics of the frequency converter. This parameter group is write-protected.

Drive designation

The parameter indicates the general designation (type) of the used drive electronics. If the user interface is not updated and thus can not recognize the drive, question marks '?' are displayed instead of the drive designation.

The button “Edit project” opens the project wizard to change the device or the entire project (see section 14.5.1.2 "Edit Devices", page 283). When you edit an online project, all parameter sets should be initialized in the project. If this is not the case, the message “Uninitialized parameter sets” appears. Click “OK” to confirm the message. Thus, all parameter sets are read from the devices. Afterwards the project wizard will open.

Voltage class

The parameter specifies the electric strength of the power electronics. The parameter is related to the maximum admissible supply voltage (AC voltage as effective value) and to the corresponding voltage in the rectified intermediate circuit (DC link voltage) in *volts*.

Max. rated current

The parameter specifies the maximum rated current of the power output stage during S1 operation (continuous operation) as peak value as well as the corresponding RMS value in *amperes*. The proper rated current is limited by this parameter. Moreover it depends on other parameters as for example the cooling.

Peak current

The parameter specifies the maximum current of the power output stage as peak value as well as the corresponding RMS value in *amperes*. The time period defined behind the effective value specifies the max. time (I^2t time) the peak current is allowed to flow. The load is monitored by an I^2t calculator. When the device is overloaded, the I^2t calculator triggers the error E30 “Power output stage load too high (I^2t)” and switches the output stage off.

Drive Function (FC2)

In this field the drive function of the frequency converter is selected.

Drive function type

The parameter indicates the selected drive function. At present only the drive function HSPAM is available for FC2.

Identification (FC2)

This parameter group provides fields to enter individual information on the frequency converter for later identification.

Drive name

In this field user can enter an individual name for the drive. The maximum length is 32 characters.

Comment

In this field the user can enter further information regarding this drive. The maximum length is 64 characters.

Parameter Set (FC2)

This field displayes information on the parameter set currently used in the frequency converter.

Date / Time

The field displays date and time of the last modification of the parameter set. The parameters are updated automatically when the parameter set is modified.

ID

In this field you can enter the parameter set ID. The ID can be selected as desired by the user and can be used for identifying the drive version via the object dictionary. For this purpose the object “DEVICE_PARAMETER_IDENT_CODE” is used. The parameter set ID is a 32 bit value, divided into a 16-bit part before the decimal point and a 16-bit decimal part.

11.1.2 Power supply unit

On this page you can set the parameters of power supply unit integrated in the frequency converter.

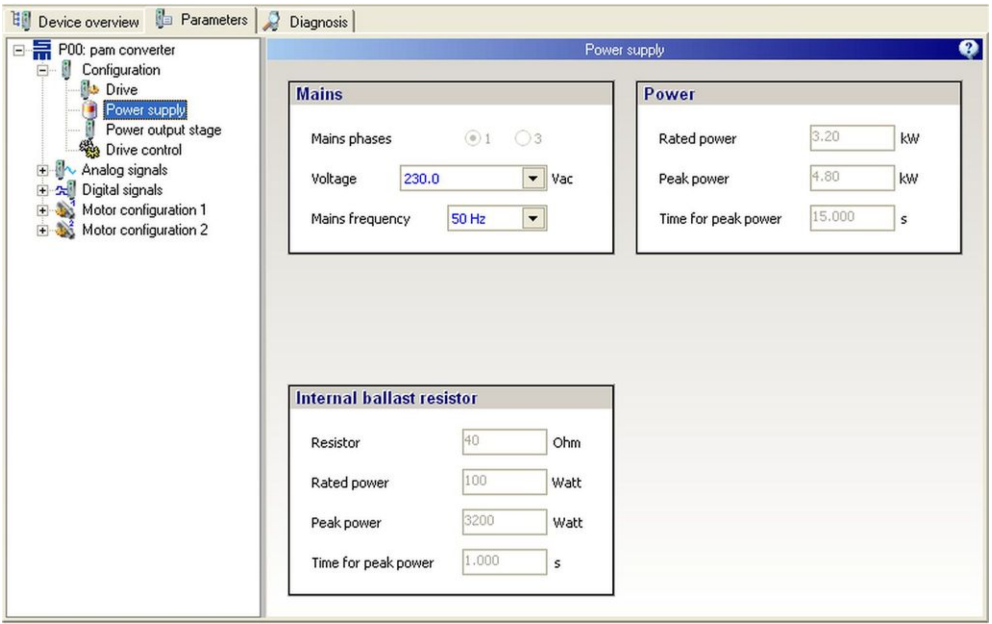


Fig. 84: Parameter page “Power supply”

Mains (FC2)

This parameter group serves to enter general data of the mains supply that is connected to the frequency converter.

Mains phases

This parameter specifies the number of mains phases. The user can select between single-phase and three-phase current via radio buttons. The parameter depends on the provided supply system type.

For further information refer to the hardware documentation.

Voltage

The parameter indicates the main voltage of a sine mains supply in *volts* (RMS value).

- Single-phase operation: Voltage is related to the neutral conductor.
- Three-phase operation: Voltage is defined between two phases.

This parameter is used by the load monitoring. In the event of an error the device is switched off with the error E33 “Power supply load monitoring -> mains voltage too high” or E34 “Power supply load monitoring -> mains voltage too low”.

Mains frequency

The parameter indicates the frequency of the sine mains supply in *hertz* or the supply of direct current (DC). The available variants are set by means of a selection list.

Power (FC2)

This parameter group displays information on the maximum output power of the frequency converter. The displayed values are read-only values. They are statically dependent on the used hardware as well as the parameters “Mains phases” and “Voltage”.

Rated power

The parameter indicates the rated power of the power supply unit in *kilowatts*. This is the maximum output power during continuous operation. The indicated value is the apparent power of the device.

Peak power

The parameter indicates the peak power of the power supply unit as apparent power in *kilowatts*.

Time for peak power

The parameter specifies the period of time in *seconds* in which the device can provide the peak power once from the cold state.

Internal Ballast Resistor (FC2)

This parameter group displays the values of the internal ballast resistor of the frequency converter. The values of the internal ballast resistor are read from the device and write-protected.

Resistance

The parameter indicates the nominal resistance of the resistor in *ohms*.

Rated power

The parameter indicates the rated power of the resistor in *watts*.

Peak power

The parameter indicates the maximum possible power of the resistor in *watts*.

Time for peak power

The parameter indicates the maximum period of time in *seconds*, in which the peak power can be supplied continuously.

11.1.3 Power Output Stage

On this page the parameters of the power output stage of a frequency converter are configured.

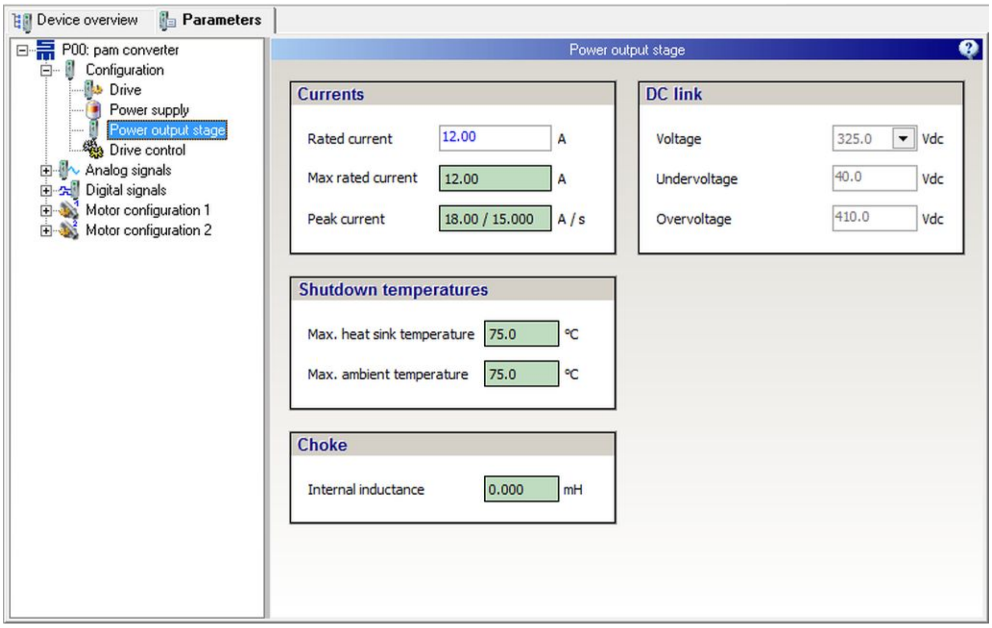


Fig. 85: Parameter page "Power output stage"

Currents (FC2)

This parameter group provides parameters to configure the maximum admissible currents of the frequency converter.

The parameters are also used for the I²t calculator of the power output stage. When the device is overloaded, the I²t calculator triggers the error message E25 "Power supply load too high" and switches the device off.

Depending on the program configuration the currents are displayed as peak amplitude values or as RMS values in *amperes*.

Rated current

The parameter specifies the rated current of the device during continuous operation (S1 operation). The rated current depends on the cooling and is limited by the parameter "Max. rated current".

Max. rated current:

The parameter indicates the upper limit of the value range for the parameter "Rated current". The parameter depends on the used device and is a read-only value.

Peak current

The parameter specifies the peak current of the device. The device can provide this current from the cold state once and not longer than the additionally defined time period. The parameter is a read-only value and depends on the used device.

DC Link (FC2)

This parameter group contains values and settings for the DC intermediate circuit of the frequency converter. All values are DC values and indicated in *volts*.

Voltage

The parameter indicates the characteristic intermediate circuit voltage. The AC voltage is rectified to supply DC voltage to the intermediate circuit. Therefore the characteristic intermediate circuit voltage corresponds to the peak value of the AC voltage. For devices with integrated power supply the value is a read-only value.

Undervoltage

The parameter specifies the lower limit of the DC link voltage. The value is preset and a read-only value. When the voltage is below this limit, the output stage is switched off and the error message E43 “Undervoltage in DC link” appears. The limit may be reached when the load of the DC link is too high, e.g. when the motor accelerates too fast or after a mains failure.

Overvoltage

The parameter specifies the upper limit of the DC link voltage. The parameter is a read-only value. When the voltage is above this limit, the output stage is switched off and the error message E42 “Overvoltage in DC link” appears. The limit can be reached when the motor is decelerated too rapidly or through heavy variations in the mains supply.

Shutdown Temperatures (FC2)

This parameter group displays the parameters for the monitoring of the thermal load of the output stage of a frequency converter. The parameters are read-only values loaded from the hardware.

Max. heat sink temperature

The parameter indicates the maximum heat sink temperature allowed for the operation of the system in *degree centigrade*. If this temperature is exceeded, the output stage will be switched off automatically and the error message E28 “Power output stage temperature too high” appears.

Max. ambient temperature

The parameter indicates the maximum ambient temperature allowed for the operation of the system in *degree centigrade*. If this temperature is exceeded, the output stage will be switched off automatically and the error message E27 “Ambient temperature too high” appears.

Choke (FC2)

This parameter group displays information on the internal inductance.

Internal inductance

The parameter indicates the internal inductance of the output stage choke in *millihenry*. If there is no choke in the drive, the inductance value is 0 mH.

11.1.4 Drive Control

Via this page the parameters of the drive control are configured.

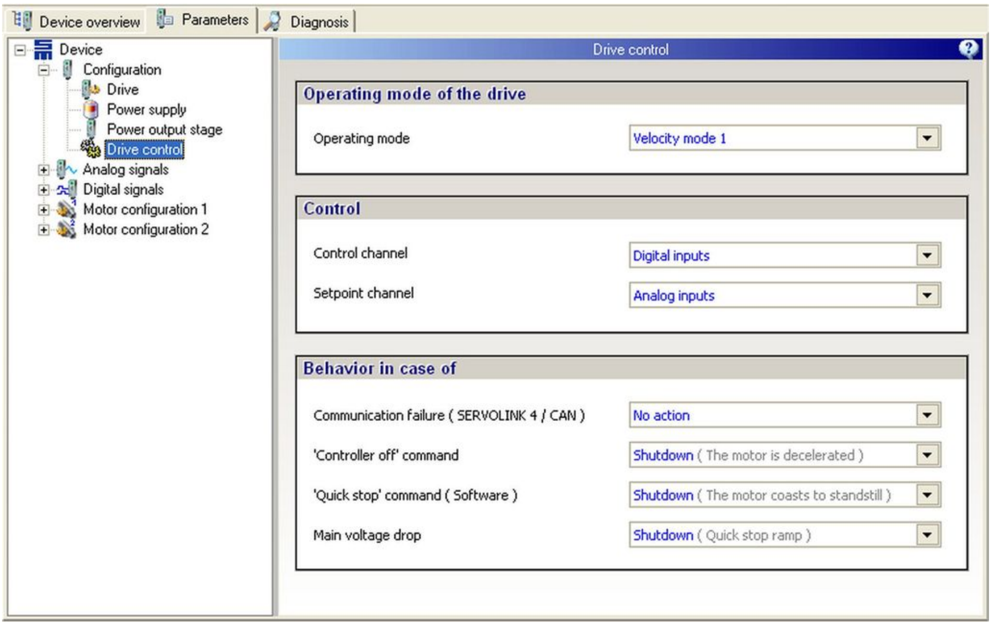


Fig. 86: Parameter page "Drive control"

Operating Mode of the Drive (FC2)

Here the operating mode of the frequency converter is selected.

Operating mode

The parameter indicates the operating mode of the drive. It is set by means of a list box, but at the moment only the operating mode "Velocity mode 1" is available. The speed reference value or the velocity reference value can be set externally.

11

Control (FC2)

The communication with the frequency converter is divided into the groups communication and control of the drive. In the parameter group "Control" the control channel for the control of the drive is set.

Control channel.

The parameter specifies the communication channel for the control of the drive.

The following entries can be set by a list box:
- Digital inputs
- Serial interface / RS485 / USB
- SERVOLINK 4

Setpoint channel

The parameter indicates the channel to be used for sending reference values to the device. The provided selection depends on the selected control channel.

The following entries can be set by a list box:

Control channel	Setpoint channel
Digital inputs	Analog inputs
Serial interface / RS485 / USB	Serial interface / RS485 / USB
SERVOLINK 4	SERVOLINK 4

Behavior in Case of (FC2)

Via this parameter group you can set the behavior of the frequency converter in different situations. The parameterization in this parameter group depends on the complete system (mechanical elements, working area) into which the drive is installed.

You can set the following reactions for the indicated events:

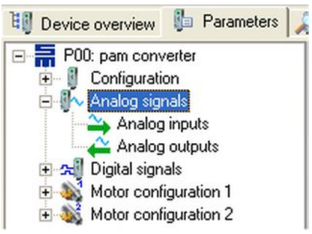
Reaction	Event			
	Communication failure (SERVOLINK 4 / CAN)	'Controller off' command	'Quick stop' command (Software)	Main voltage drop
No action	✓	–	–	–
Shutdown (The motor coasts to standstill)	✓	✓	✓	✓
Shutdown (The motor is decelerated)	–	✓	–	–
Shutdown (Quick stop ramp)	✓	–	–	✓
Stop (The motor is decelerated)	–	–	✓	–

Description of the reactions

- No action:
  The operation is continued without reaction to the fault.
- Shutdown (The motor coasts to standstill):
  The power output stage is switched off immediately. All control circuits are deactivated. The motor coasts to standstill without control. If applicable, the motor is kept in position by a mechanical motor brake.
- Shutdown (The motor is decelerated):
  The motor is decelerated by the standard deceleration ramp, whereas the deceleration is as quick as possible considering the parameterization (current limitation). As soon as the state “Frequency zero” is reached, the output stage is switched off. Then, the control of the drive is off. If applicable, it is kept in its position by means of a mechanical brake.
- Shutdown (Quick stop ramp):
  The motor is decelerated by the quick stop ramp, whereas the deceleration is as quick as possible considering the parameterization (current limitation). As soon as the state “Frequency zero” is reached, the output stage is switched off. Then, the control of the drive is off. If applicable, it is kept in its position by means of a mechanical brake.
- Stop (The motor is decelerated):
  The motor is decelerated by the slow down ramp, whereas the deceleration is as fast as possible considering the parameterization (current limitation). The controller remains active and the mechanical brake remains deactivated.

11.2 Analog Signals

The node “Analog signals” provides the parameter pages “Analog inputs” and “Analog outputs”.



On these pages you can configure the functions of the analog inputs and outputs.

11.2.1 Analog Inputs

On this page you can configure the inputs Analog In 0 and Analog In 1.

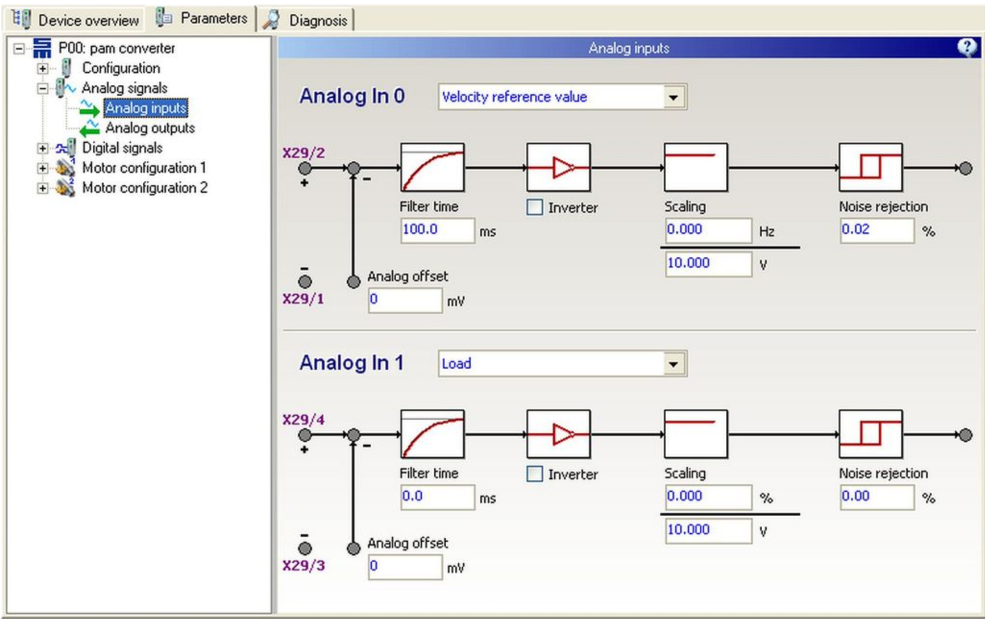


Fig. 87: Parameter page “Analog inputs”

The function to be parameterized is selected by the list box at the top. The parameters below the list box you can configure for each input accordingly.

Analog In (FC2)

Function

The parameter indicates the function of the analog input.

The following entries can be selected:
- No function
- Velocity reference value (Analog In0)
- Load (Analog In1)

11

Analog offset

The parameter serves for compensating a possibly existing analog offset. The offset is entered in *millivolts*.

Filter time

Via this parameter a first-order low-pass filter is configured. The filter time corresponds to the time constant of the low-pass and is defined in *milliseconds*. If the filter time is set to 0 ms, the low-pass filter is deactivated.

Inverter

The parameter inverts the analog input when the check box is activated.

Scaling

The parameter defines the relation of voltage at the analog input to the reference value or limiting value.

Noise rejection

The parameter specifies a hysteresis threshold for noise rejection in *percent*. 1 % corresponds to a voltage of 0.1 V at the analog input.

11.2.2 Analog Outputs

On this page you can configure the outputs Analog Out 0 and Analog Out 1.

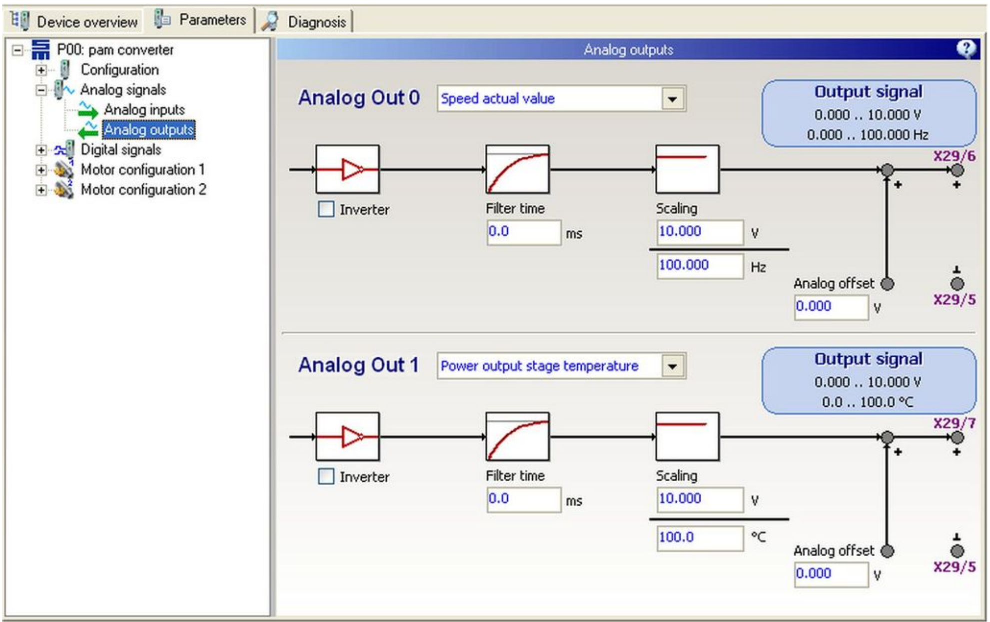


Fig. 88: Parameter page "Analog outputs"

The function to be parameterized is selected by the list box at the top. The parameters below the list box you can configure for each output accordingly.

Analog Out (FC2)

Function

The parameter indicates the function of the analog output.

The following target, reference and actual values can be selected:
- No function
- Target speed
- Speed reference value
- Speed actual value
- Slip
- Current actual value
- Power output stage temperature
- Motor load
- Power output stage load
- Power output stage voltage
- Load

Inverter

The parameter inverts the analog output, when the check box is activated.

Filter time

Via this parameter a first-order low-pass filter is configured. The filter time corresponds to the time constant of the low-pass and is defined in *milliseconds*. If the filter time is set to 0 ms, the low-pass filter is deactivated.

Scaling

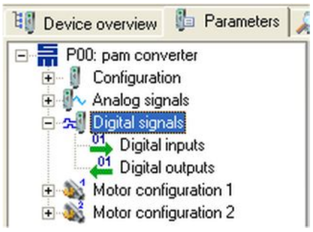
The parameter indicates the relation of voltage at the analog output to target, reference or actual value.

Analog offset

The parameter serves for setting an analog offset. The offset is entered in *volts*.

11.3 Digital Signals

The node “Digital signals” provides the pages “Digital Inputs” and “Digital Outputs”.



On these pages you can configure the functions of the digital inputs and outputs.

11.3.1 Digital Inputs

This page provides the parameters of all digital inputs of the drive.

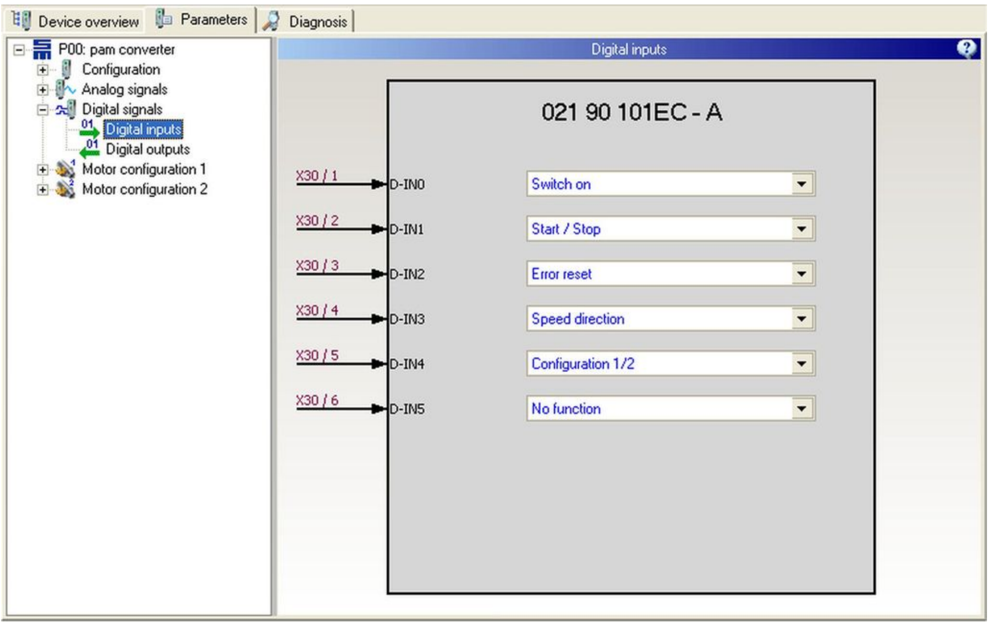


Fig. 89: Parameter page “Digital inputs”

Each input can have the state '0' or '1' and can be parameterized individually.

Digital In (FC2)

D-IN0 – D-IN5

Here you can configure up to six digital inputs. For each input a certain function is available, which is set by means of the list box. The respective connector and pin of the used device are indicated left hand to the parameter.

11.3.2 Digital Outputs

This page provides the parameters of all digital outputs of the drive.

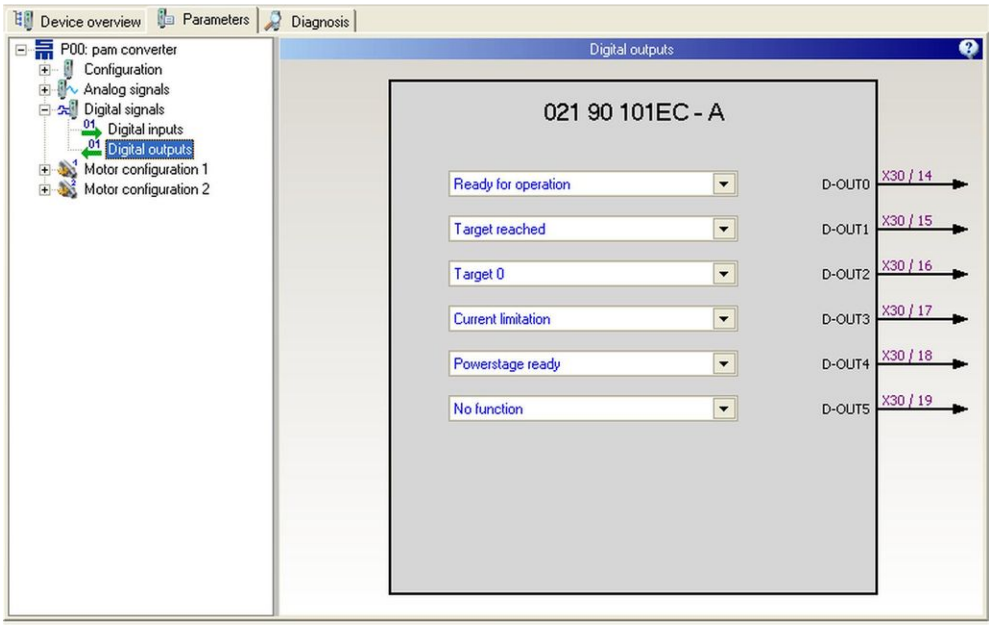


Fig. 90: Parameter page "Digital outputs"

Each output can have the state '0' or '1' and can be parameterized individually.

Digital Out (FC2)

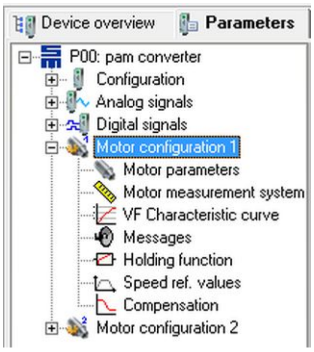
D-OUT0 – D-OUT5

Here you can configure up to five digital outputs. There are different functions for each output. Set the desired function by means of the list box. The respective connector and pin of the used device are indicated left hand to the parameter.

11

11.4 Motor Configuration 1 /2

The nodes "Motor configuration 1" and "Motor configuration 2" provide each the pages "Motor parameters", "Motor measurement system", "V/F Characteristic curve", "Messages", "Holding function", "Speed reference values" and "Compensation".



All motor-specific data are configured via these pages. The configurations 1 and 2 comprise the same pages, but these are independent from each other.

11.4.1 Motor Parameters

This page contains parameters for the motor that is connected to the frequency converter.

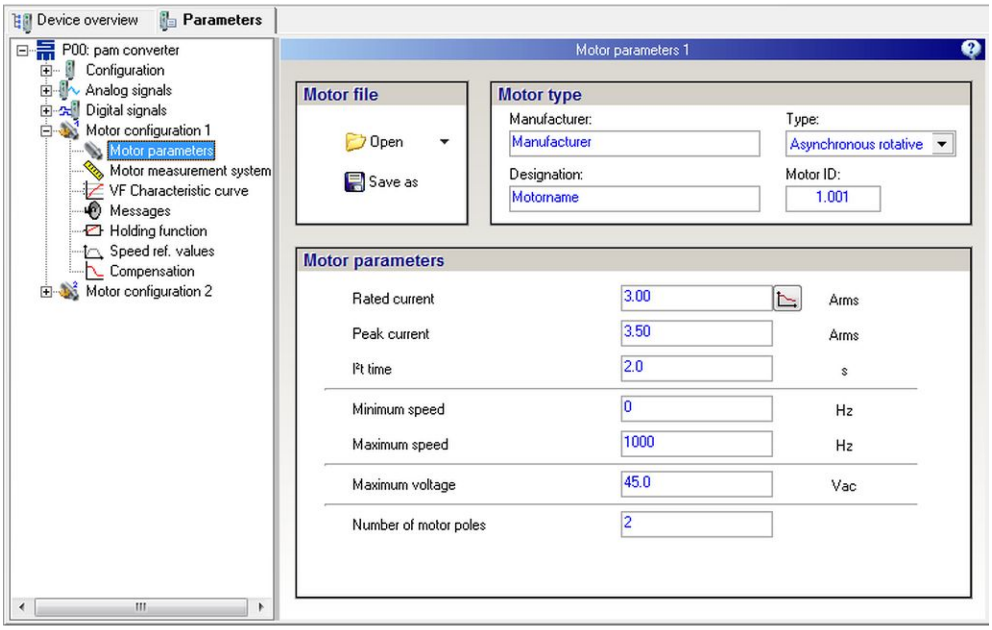


Fig. 91: Parameter page “Motor parameters”

Motor File (FC2)

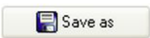
This parameter group provides different methods to save all motor parameters of a frequency converter in one motor file “*.mot”). Later this motor file can be reloaded.

Open

Via this button you can open an existing motor file. Then the parameters contained in that file are displayed on the page “Motor”. For this purpose the dialog “Chose your motor file” appears.

The arrow button located on the right of the button allows to open one of the last four used motor files directly. The dialog does not appear.

Save as



Via this button all parameters of the page “Motor” are saved in one motor file. For this purpose the dialog “Chose your motor file” appears.

Motor Type (FC2)

This parameter group provides parameters for the general identification of the connected motor.

Manufacturer

The parameter indicates identification data of the motor manufacturer. The user can enter the manufacturer and information on the series of the motor here. The maximum length is 32 characters.

Designation

This parameter is provided for the exact designation of the motor. The maximum length is 32 characters.

Type

The parameter indicates the type of the motor. The parameter is set by means of a list box. Currently only the motor type “Asynchronous rotative” is available.

Motor ID

This parameter saves a motor specific ID. The ID can be selected as desired by the user and can be used for identifying the motor version via the object dictionary. The object MOTOR_USER_IDENT_CODE is used for this purpose.

The “Motor ID” is a 32 bit value, divided into a 16-bit part before the decimal point and a 16-bit decimal part.

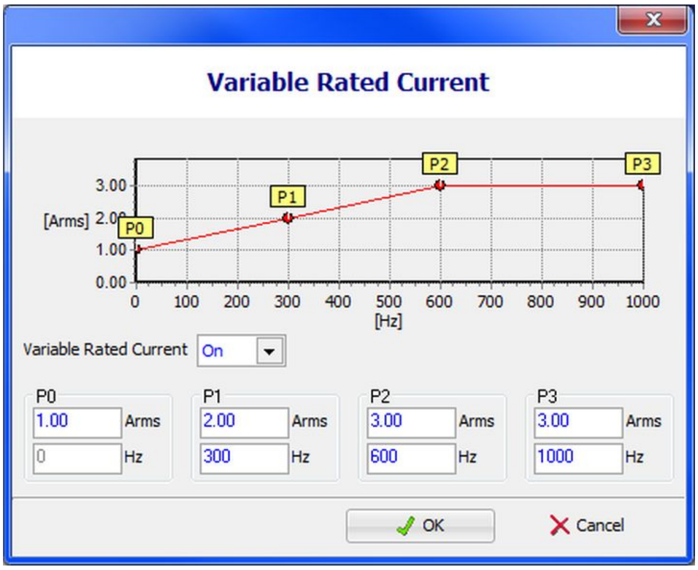
Motor Parameters for Rotary Asynchronous Motors (FC2)

This parameter group comprises all physical parameters of the motor.

Parameter	Unit	Description
Rated current	A_{rms}	Specifies the rated current of the motor during continuous operation (S1 operation). The parameter is independent from the rated current of the power output stage and is not limited by it. The rated current is also used in the I^2t calculator of the motor. By means of the button a dialog to set a variable rated current is opened (see below).
Peak current	A_{rms}	Specifies the peak current of the motor. The parameter is independent from the peak current of the power output stage. The peak current is also used in the I^2t calculator of the motor.
I^2t time	s	Indicates the maximum time during which the peak current is allowed to flow once out of the cold state. This parameter is also used for the I^2t calculator. When the device is overloaded, the I^2t calculator triggers the error message E29 “Motor load too high (Motor I^2t)” and switches frequency converter off.
Minimum speed	Hz; RPM	Specifies the minimum speed of the motor. The parameter is used when an analog reference values is preset. If the reference values are smaller than the minimum speed, the motor is accelerated automatically to the minimum speed.
Maximum speed	Hz; RPM	Specifies the maximum possible mechanical speed of the motor. This value is also not exceeded by the slip compensation.
Maximum voltage	V_{ac}	Specifies the maximum possible motor voltage as RMS value. The maximum voltage is even not exceeded during the linearization of the characteristic curve.
Number of motor poles	-	Specifies the number of poles in the stator.

Variable Rated Current

You can set limit values for the rated current in the low frequency/speed range to ensure smooth startup. Open the following dialog window via the button and set the rated current according to the actual frequency/speed.



Open the list box “Variable rated current” and select the entry “On”. Then you can determine up to 4 levels within the frequency/speed range of the motor.

Click “OK” to apply the settings.

11.4.2 Motor Measurement System

This page provides the parameters of the measuring system the connected motor uses. The page is divided into a fix and two variable parameter group. The settings

11

made in the fixed parameter group “Motor measurement system” determine whether the variable parameter groups appear.

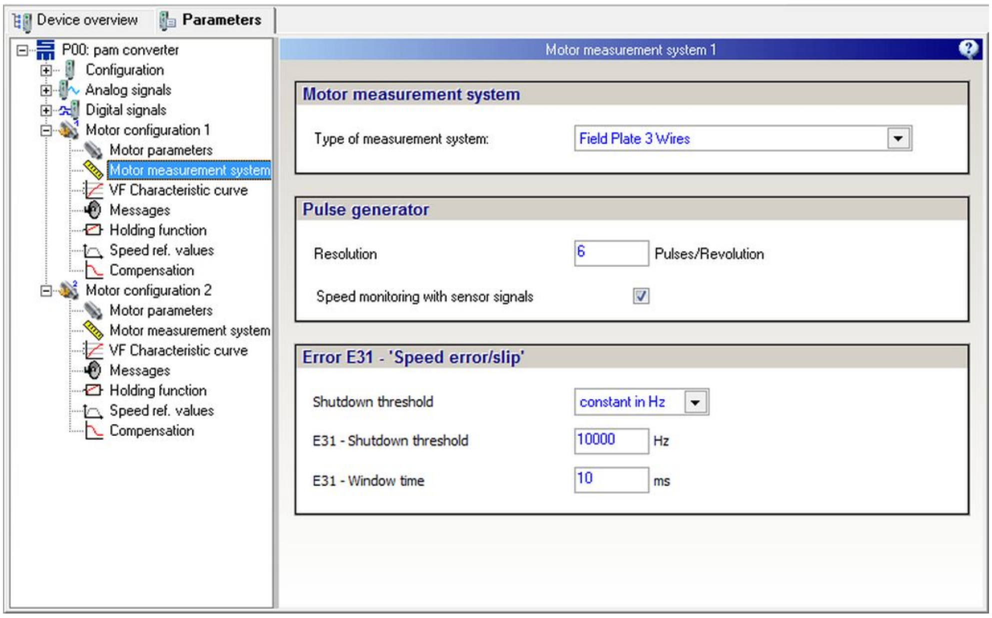


Fig. 92: Parameter page “Motor measurement system”

Motor Measurement System (FC2)

In this parameter group you select the motor measuring system to be used with the frequency converter and the speed scaling.

Type of measurement system

The parameter specifies which measuring system will be used. This is set via a list box. Depending on the selected measuring system additional parameter group with additional parameters may be displayed.

The following table indicates the supported measuring systems and the parameter groups that appear additionally.

Measuring system	Additional parameter group
Sensorless	▸ None
Field plate 3 wires (pulse generator 0.05 V ... 5.00 V)	▸ Pulse generator, page 208 ▸ Error E31 - 'Speed error/slip', page 209

Tab. 2: Measuring systems of a frequency converter

Pulse Generator (FC2)

This parameter group is displayed for a pulse generator measuring system used with the frequency converter.

Resolution

The parameter specifies the number of pulses per mechanical motor revolution.

Sensors with up to 36 pulses can be processed. The speed that results from the pulses is displayed in the corresponding actual values.

11

Speed monitoring with sensor signals

The parameter indicates, whether the speed detected by the pulses is to be used for monitoring purposes. If the check box is activated, the messages “Reference value reached” and “Reference value zero” are transmitted respectively.

Error E31 - 'Speed error/Slip' (FC2)

Via this parameter group the warning and error message for a speed error or slip of the frequency converter can be configured.

Shutdown threshold

Via this parameter you can define, whether the 'Slip' window is indicated by a fix frequency/speed or depending on the reference value in percent.

E31 - Shutdown threshold

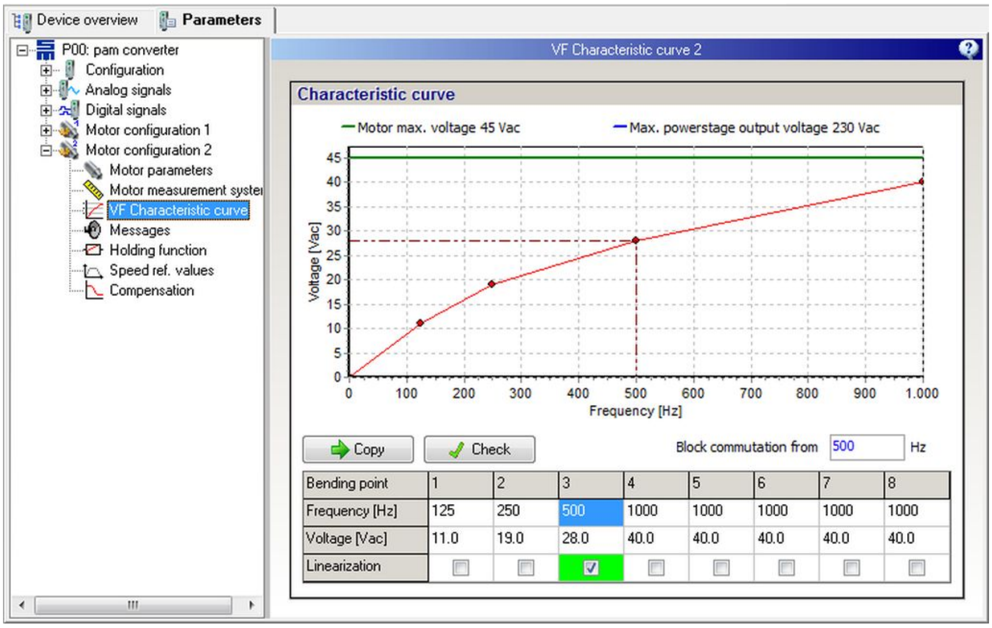
The parameter indicates the threshold value of the frequency/speed in *hertz* or *revolutions per minute*, at which the E31 window is reached.

E31 - Window time

The parameter indicates the time of the E31 window in *milliseconds*. If the speed error is within the E31 window for the total window time, the error E31 “Speed error or slip too great” is triggered and the device is switched off.

11.4.3 V/f Characteristic Curve

This page provides up to 8 bending points to edit the V/f characteristic curve. For checking the characteristic curve is displayed graphically in the top of the window. The maximum output voltage of the motor and the power output stage are displayed in the figure to provide assistance during parameterization.



Bending point	1	2	3	4	5	6	7	8
Frequency [Hz]	125	250	500	1000	1000	1000	1000	1000
Voltage [Vac]	11.0	19.0	28.0	40.0	40.0	40.0	40.0	40.0
Linearization	☐	☐	☑	☐	☐	☐	☐	☐

Fig. 93: Parameter page “V/f characteristic curve”

V/f Characteristic Curve (FC2)

Bending points

The table columns indicate the voltage and the frequency/speed of the individual bending points. The origin (0 Hz or 0 rpm / 0 V) is fixed in the data set, so you do not need to enter it. Interpolation between the value pairs is linear. The number of bending points must grow with increasing frequency/speed or at least remain equal. The voltage however can be reduced. The selected value can be copied into the next column by mouse click on the button “Copy”. Click on the button “Check” to trigger a plausibility check of the entered values.

Linearization

When the check box is activated, the motor is accelerated or decelerated with increased voltage. As soon as the converter reaches the set reference value (M10 – Ref. value reached) the voltage is reduced to the 'normal' voltage of the characteristic curve. The programming of the desired bending point defines the increase of the linearization. The point is displayed as broken line in the graph. The maximum output voltage is defined in the motor parameters.

Block commutation from

Via this parameter you can determine at which frequency the converter switches from V/f operation to block commutation.

11.4.4 Messages

11

On this page you can parameterize the messages regarding the load limit, the reference value and the motor temperature monitoring.

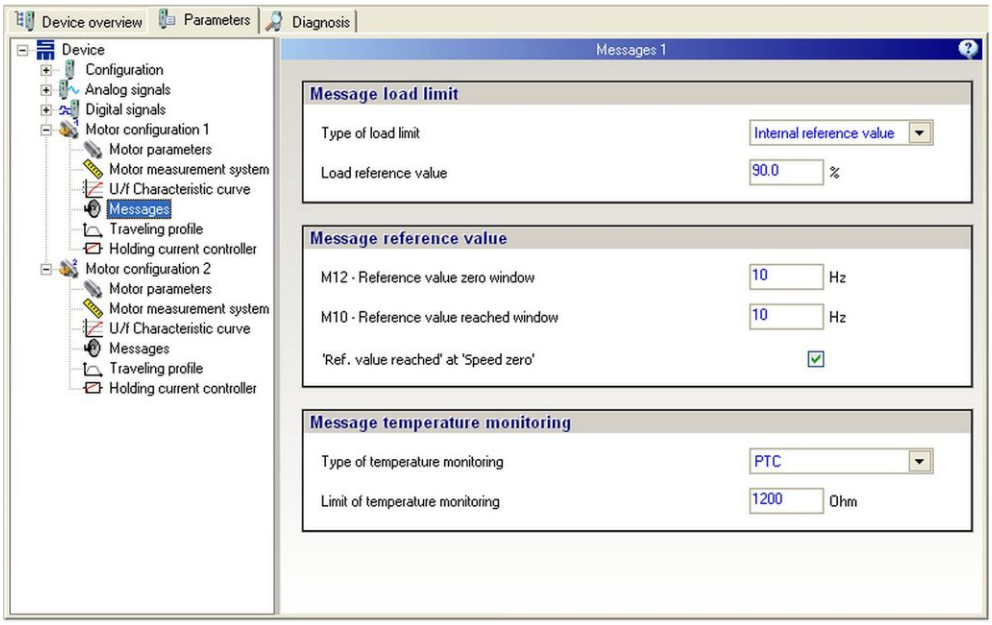


Fig. 94: Parameter page “Messages”

Message Load Limit (FC2)

The load message is parameterized via this parameter group.

Type of load limit

The parameter indicates the source of the load limit. The list box offers the two options “Internal reference value” and “Analog input”. Parameterizing the analog input is explained in the corresponding subchapter.

Load reference value

This parameter is only displayed when “Internal reference value” is selected above. It indicates the switching threshold of the load message in *percent*. The value can be modified by steps of 0.1 %.

Message Reference Value (FC2)

This parameter group contains parameters to set switching thresholds of the digital outputs “Reference value zero” and “Reference value reached”.

M12 - Reference value zero window

The parameter indicates the frequency/speed, at which the “Reference value zero” window is reached. As soon as the value entered here is reached, the message “Reference value zero” is triggered.

M10 - Reference value reached window

The parameter indicates the frequency/speed, at which the “Reference value reached” window is reached. As soon as the value entered here is reached, the message “Reference value reached” is triggered.

’Ref. value reached' at 'Speed zero'

If the check box is activated, the message 'Reference value reached‘ is triggered when 'Speed zero' is reached.

Message Temperature Monitoring (FC2)

Via this parameter group the temperature sensor of the motor is configured.

Type of temperature monitoring

The parameter specifies which type of temperature monitoring is used in the motor. The parameter is set via a list box. Depending on the selected type of temperature monitoring the parameter “Limit of temperature monitoring” appears.

Limit of temperature monitoring

Depending on the type of temperature monitoring the parameter has the following meanings:

- PTC / thermal contact
  For a resistor with a positive temperature coefficient (PTC) the parameter defines the maximum admissible value of the resistor in *ohms*, before the output stage is switched off. This value and the according switch-off temperature is to find in the motor data sheet. A thermal contact behaves like a PTC.
- NTC
  For a resistor with a negative temperature coefficient (NTC) the parameter defines the minimum admissible value of the resistor in *ohms*, before the output stage is switched off. This value and the according switch-off temperature is to find in the motor data sheet.

11.4.5 Holding Function

On this page you can select a holding function.

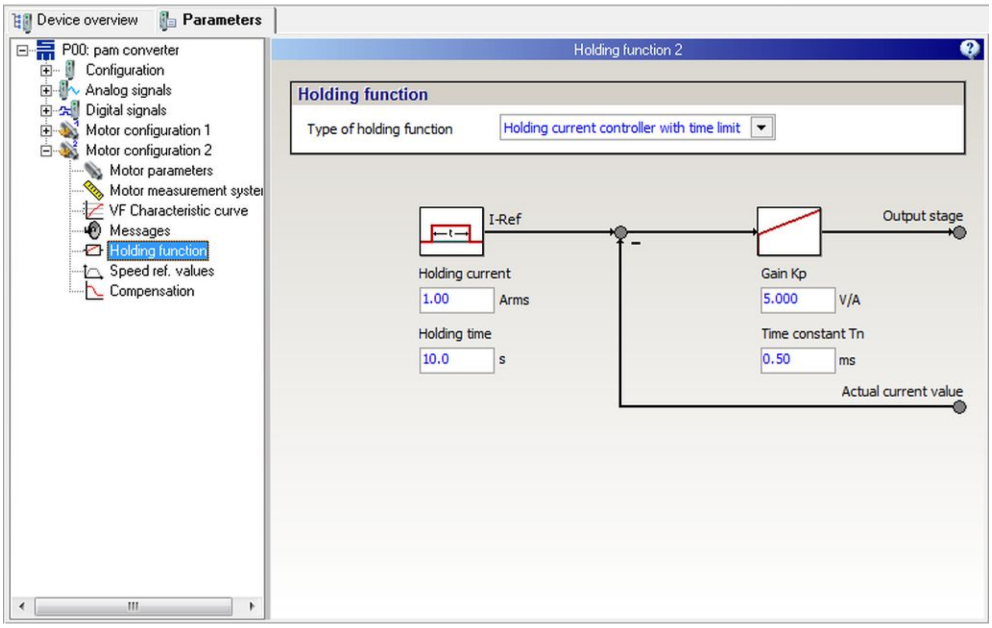


Fig. 95: Parameter page “Holding function”

After a deceleration process is finished it is possible that the rotor still rotates at a low speed. Most of the applications do not accept a residual speed after deceleration, even if the speed value is small. For this reason you can select a holding function for each characteristic curve. The control parameters Kp and Tn refer to the holding current.

Holding Function (FC2)

Via this parameter group you can set a holding function for the motor.

Holding Function

11

The holding function is active when the controller is switched on and no reference speed value is set. The holding current shall keep the motor in position at standstill (0 Hz). You can select one of the following holding functions:

- Holding current:
  A PI current controller induces a voltage at the motor, which then generates the desired current. The desired current is defined in the parameter “Holding current” in *amperes*.
- Holding current with time limit:
  A PI current controller induces a voltage at the motor, which then generates the desired current. The desired current is defined in the parameter “Holding current” in *amperes*. After the reference value zero is reached the holding current is limited to a certain time. Its only purpose is to decelerate the motor securely to standstill. The desired holding time is indicated in *seconds*.
- Holding voltage:
  A current is generated by means of a fix voltage value. The holding current controller is not active in this mode, i.e. there is no current limitation (not even indi-rect). The holding voltage can hold the position of the motor permanently. The desired DC voltage is defined in the parameter “Holding voltage” in *volts*.
- Holding voltage with time limit:
  A current is generated by means of a fix voltage value. The holding current controller is not active in this mode, i.e. there is no current limitation (not even

indirect). The desired DC voltage is defined in the parameter “Holding voltage” in *volts*. After the reference value zero is reached the holding voltage is limited to a certain time. Its only purpose is to decelerate the motor securely to standstill. The desired holding time is indicated in *seconds*.

NOTICE

Holding voltage too high

If you set the value for the holding voltage too high, the current flow in the motor will be too high and possibly causes device damage. One of the following error messages appears:

- E45 – Short circuit in power output stage
- E29 – Motor load too high (Motor I^2t)
- E30 – Power output stage load too high (I^2t)

If you are not sure of the holding voltage value suitable for your motor, use the function “Holding current”.

Amplification Kp

The parameter indicates the proportional amplification of the holding current controller in *volts per ampere*. The reaction time of the holding current control circuit is reduced if a high proportional gain is selected. If the gain value is set too high the holding current circuit starts vibrating.

Integration time Ti

The parameter sets the integral amplification of the holding current controller (therefore it is often called integral time constant Ti). The parameter is indicated in *milliseconds*. The smaller the time constant the smaller the residual control deviation of the holding current control. If the value is set too small the holding current circuit starts vibrating.

11.4.6 Speed Reference Values

On the page “Speed ref. values” you can parameterize the reference value generator.

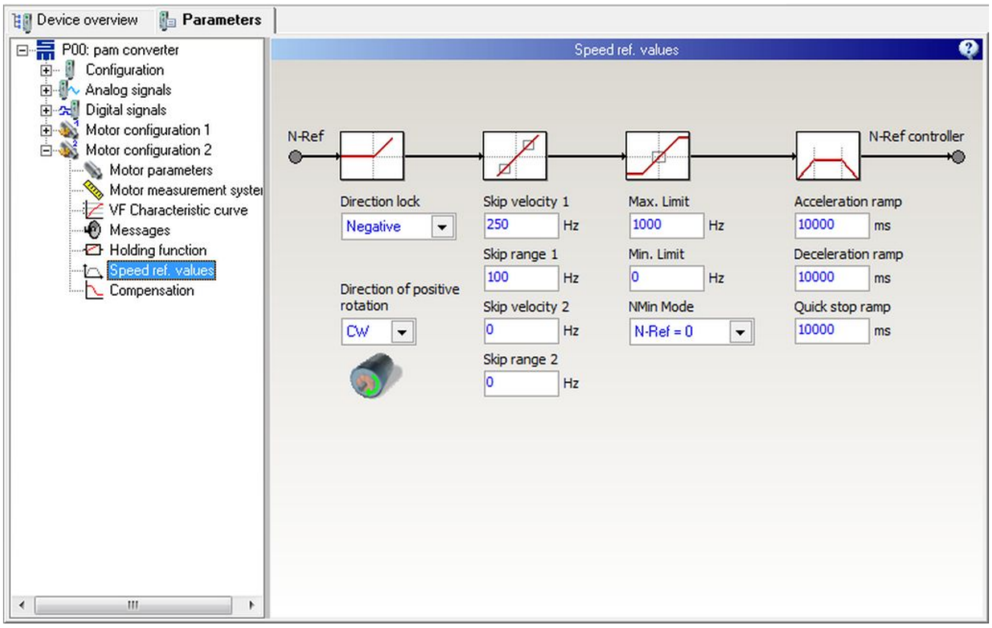


Fig. 96: Parameter page “Speed ref. values”

Speed Reference Values (FC2,)

Direction of rotation

The parameter defines the direction of motor rotation for positive reference values (viewed from the shaft end):

- clockwise rotation = CW
- counterclockwise rotation = CCW

The direction of rotation set in the software should match the actual rotation direction of the motor. If this is not the case, two motor phases must be exchanged.

11

Direction lock

If only one direction of the motor is permitted, you can lock the other direction via this parameter. The following settings are available:

- None: Both positive and negative speed values are passed to the motor.
- Positive: Positive speed values are not passed to the motor.
- Negative: Negative speed values are not passed to the motor.

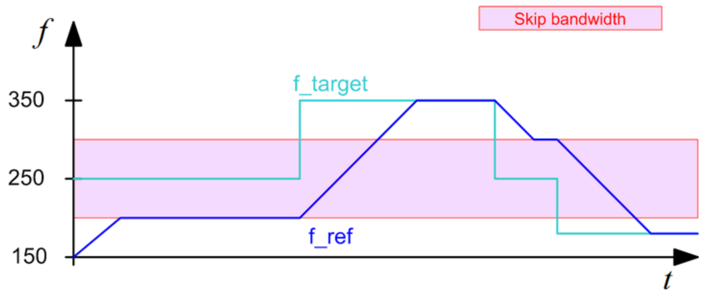
Skip bandwidth

By means of a skip bandwidth you can prevent that definite frequencies/speeds are driven for a long time. These speeds might be e.g. resonances of a machine.

Example

- Skip speed: 250 Hz
- Skip range: 50 Hz
- max. admissible speed below skip speed = 200 Hz
- min. admissible speed above skip speed = 300 Hz

Frequency reference values within the skip bandwidth (200 Hz – 300 Hz) are suppressed:



Max. limit

The parameter indicates the maximum possible frequency/speed in *hertz*/ *revolutions per minute*.

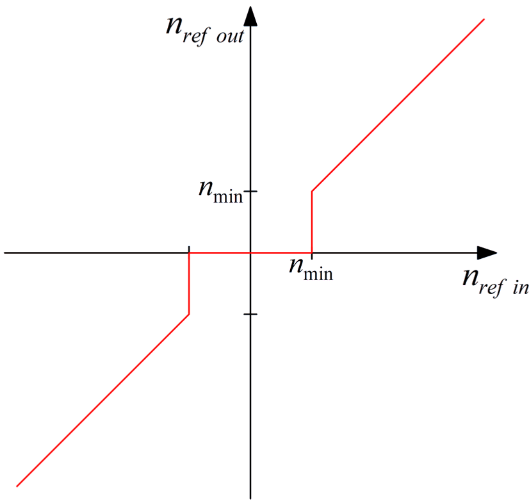
Min. limit

The parameter indicates the minimum possible frequency/speed in *hertz*/ *revolutions per minute*.

NMin mode

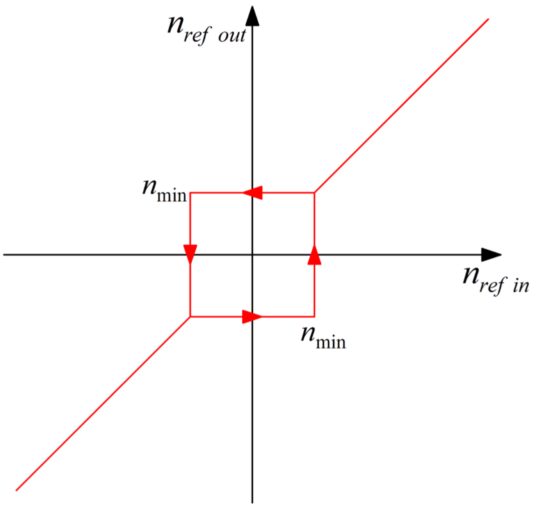
Via this parameter you can select the reference frequency/speed to be driven in case a target value below the minimum limit has been selected.

Mode "N-Ref = 0":



11

Mode “N-Ref = N-Min” (hysteresis):



It is not possible to reverse the direction of the motor rotation, when the target value is below the determined minimum speed.

Ramps

The ramps limit the acceleration via the reference frequency/speed. They are indicated in *milliseconds*.

- Acceleration ramp
  The parameter indicates the time for the acceleration from 0 to the maximum frequency/speed.
- Deceleration ramp
  The parameter indicates the time for a brake application to frequency/speed 0.
- Quick stop ramp
  The parameter indicates the time for a quick stop from the maximum frequency/speed to frequency/speed 0.

The ramps can only be met, when the supplied current is sufficient. If the current limiting function becomes active the ramp time is extended correspondingly.

11.4.7 Compensation

Via this page you set the FC2 load compensation.

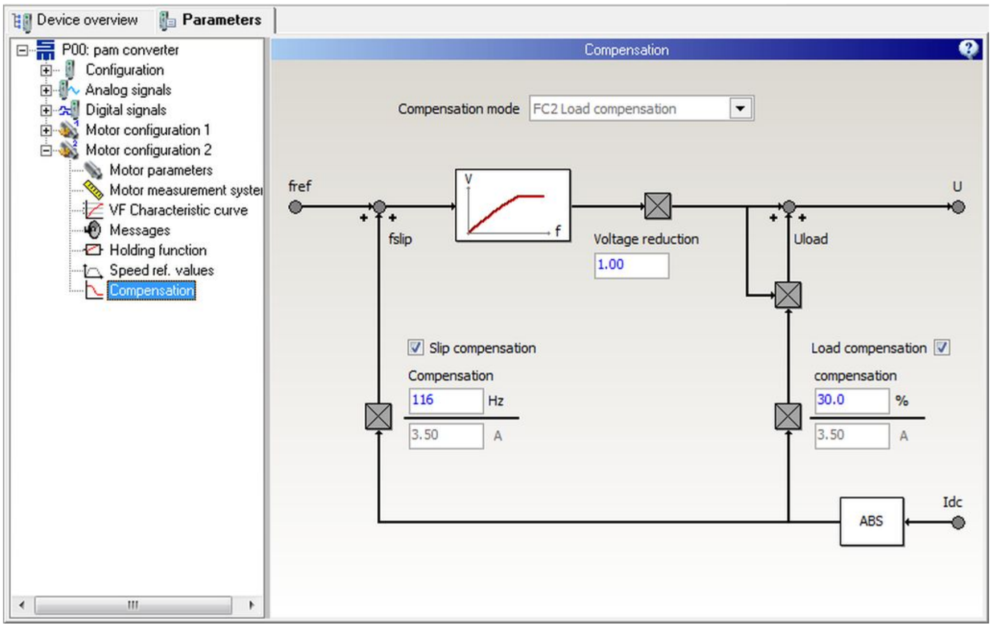


Fig. 97: Parameter page "Compensation"

Compensation (FC2)

This parameter group contains functions used to optimize the operating characteristics of the frequency converter.

Voltage reduction

The parameter indicates the voltage reduction at idle.

Slip compensation

The slip compensation must be activated via the check box.

The writable parameter specifies the load-dependent adaptation of the of the reference value. When you change this parameter, the frequency/speed and the motor voltage are also increased according to the characteristic curve. This adaptation is related to the active motor current.

This function is important because asynchronous motors are at a disadvantage. The actual value and the reference value are only during idle operation almost synchronous. On-load the actual frequency/speed decreases.

Slip compensation: $f^* = \dfrac{\text{actual current}}{\text{motor peak current}} \times \text{input value} + f$

Load compensation

The load compensation must be activated via the check box.

The writable parameter specifies the load-dependent adaptation of the motor voltage in *percent*. This voltage adaptation is related to the active motor current.

Small setting values (up to approx. 15 %) are especially recommended for the compensation of voltage drops in the motor feeding lines or in the motor windings.

11

Higher setting values (up to 100 %) are especially recommended for applications, in which the motor is loaded rarely. Hence, a reduced no-load voltage is sufficient and this consequently leads to heavily reduced no-load losses. Exceeding the maximum programmed output voltage is not possible.

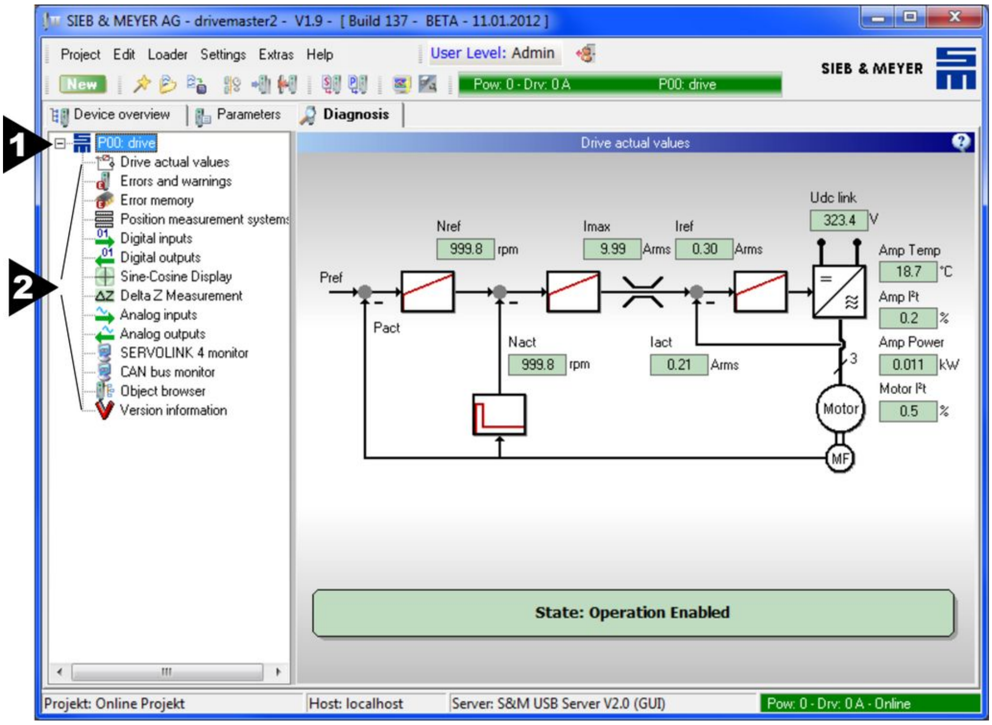
Load compensation: $\text{voltage} = \frac{\text{actual current}}{\text{motor peak current}} \times (100\% + \text{input value}) + U(f^*)$

12 Diagnosis

The tab page “Diagnosis” contains all displays required for the operation of the complete drive or power supply unit.

The tab page “Diagnosis” is only displayed in the online mode. Using the diagnosis pages requires a permanent connection between the PC and the selected drive.

With the aid of the diagnosis pages all important displays of the drive can be analyzed. To provide a clear representation the displays are combined in pages whereas these pages are arranged as final nodes (leafs) in a tree-type structure.



[1] Device
The root of the tree is the device selected in the “Device overview”. With a double-axis drive the diagnosis pages apply only to the selected axis.

[2] Diagnosis pages
The diagnosis pages display actual values and saved values of the device.

12.1 Actual Values (PS2)

This page displays all important data that describe the current status of the power supply unit.

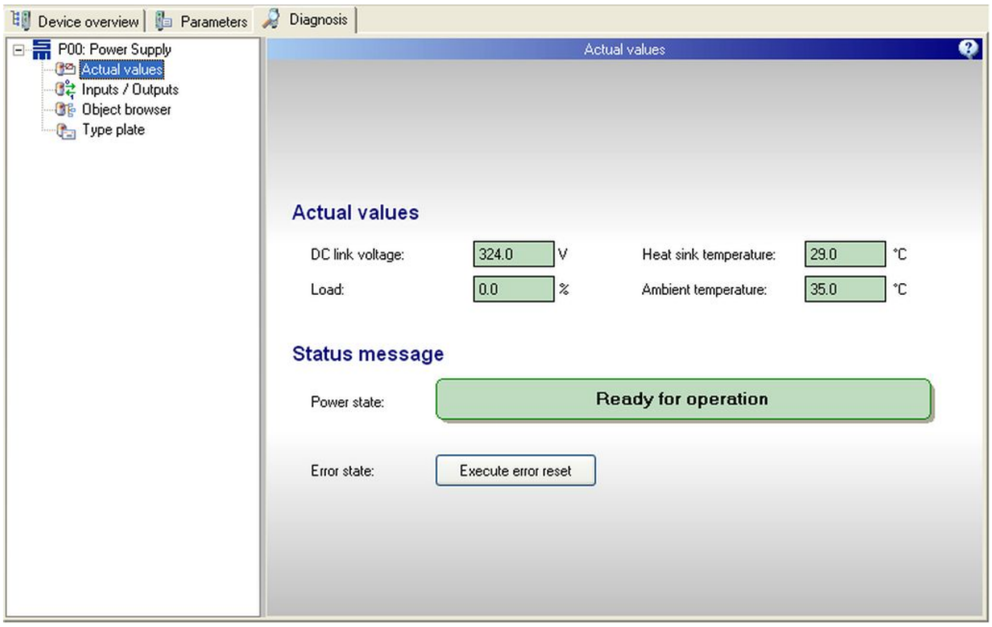


Fig. 98: Diagnosis page “Actual values” for PS2

Displayed actual values

- DC link voltage: Displays the actual voltage in the DC link in *volts*.
- Load: Displays the current load of the brake chopper circuit in *percent*.
- Heat sink temperature: Displays the current temperature of the heat sink in *degree centigrade* .
- Ambient temperature: Displays the current ambient temperature in *degree centigrade* .

Status Messages

- Power state: The status field displays the current state of the device. For this purpose the status word of the device is analyzed. If there are current errors, the error of the highest priority is displayed. If there is no current error, the saved error of the highest priority is displayed.
- Error state: Errors already removed can be reset with the button “Execute error reset”.

12.2 Drive Actual Values (SD2x)

This page displays all important data that describe the current status of the drive.

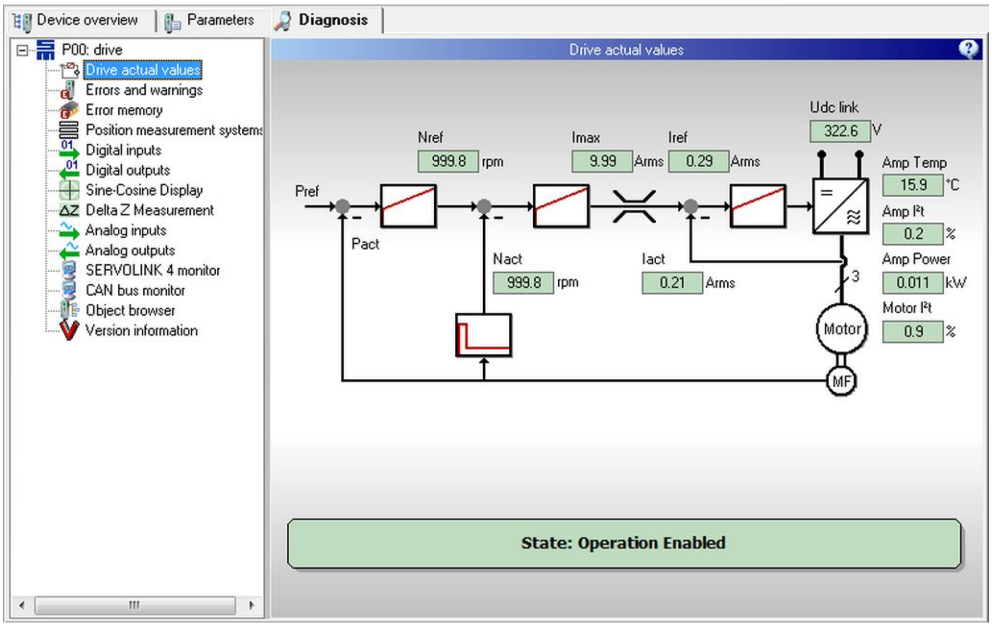


Fig. 99: Diagnosis page “Drive actual values” for an SD2x

Displayed actual values

- Nref: Displays the reference speed value at the input of the speed controller. The unit of the display depends on the type of motor (linear or rotary).
- Nact: Displayes the actual speed value at the input of the speed controller. The unit of the display depends on the type of motor (linear or rotary).
- Imax: Displays the current limitation of the reference current value at the input of the current controller in *amperes*.
- Iref: Displays the reference current value at the input of the current controller in *amperes*.
- Iact: Displays the actual current value of the current controller in *amperes*.
- Udc link: Displays the actual voltage in the second DC link (DC link at the power output stage) in *volts*.
- Amp Temp: Displays the current temperature of the power output stage in *degree centigrade* .
- Amp I²t: Displays the current load of the power output stage in *percent*.
- Amp Power: Displays the current power of the power output stage in *kilowatts*.
- Motor I²t: Displays the current load of the motor in *percent*.

Status

The status field displays the current state of the drive. For this purpose the status word of the drive is analyzed.

If there are current errors, the error of the highest priority is displayed. If there is no current error, the saved error of the highest priority is displayed. If the drive has been stopped via the quick stop command, the event that triggered the quick stop is also displayed.

12.3 Drive Actual Values (FC2)

This page displays all important data that describe the current status of the frequency converter.

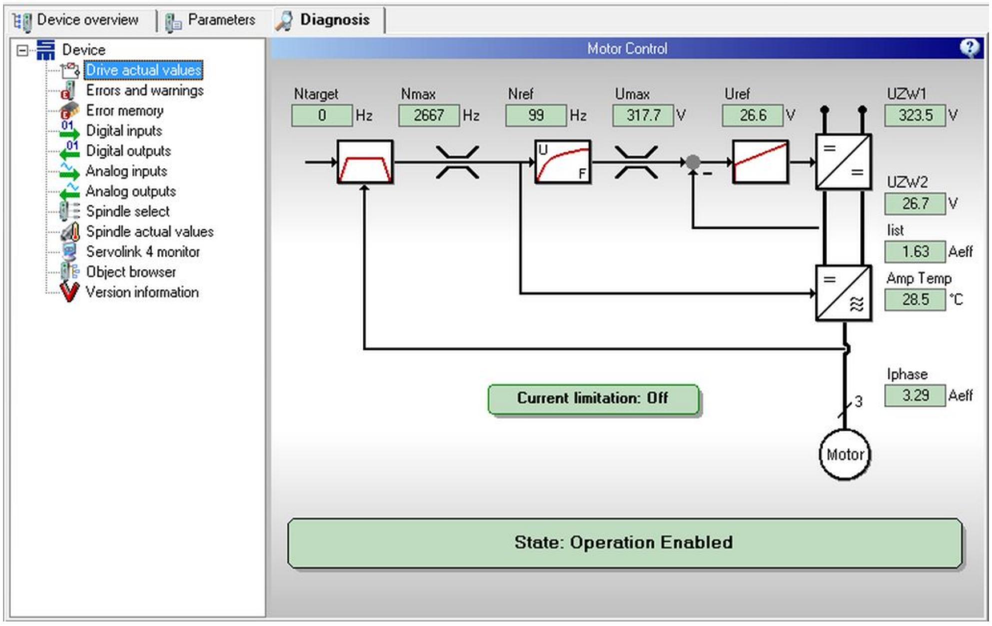


Fig. 100: Diagnosis page "Drive actual values" for an FC2

Displayed actual values

- Ntarget: Displays the set reference speed value in *hertz / revolutions per minute*.
- Nmax: Displays the actual limitation of the reference speed value in *hertz / revolutions per minute*.
- Nref: Displays the actual reference speed value in *hertz / revolutions per minute*. Due to internal limiting functions this value may differ from the set reference speed "Ntarget".
- Umax: Displays the maximum DC link voltage that is currently possible in *volts*. This value depends on the amplitude of the mains voltage.
- Uref: Displays the actual reference voltage value in the DC link in *volts*.
- UZW1: Displays the actual voltage in the first DC link (DC link at the mains rectifier). The voltage is indicated in *volts*.
- UZW2: Displayes the current voltage in the second DC link (DC link at the power stage). The voltage is indicated in *volts*.
- Iact: Displays the current reference voltage value in the second DC link. The current is indicated in *amperes*.
- Amp Temp: Displays the current temperature of the power output stage in *degree centigrade*.
- Iphase: Displays the actual phase current in *amperes*.

In addition the page displays the status of the current limitation in the controller.

Status

The status field displays the current state of the drive. For this purpose the status word of the drive is analyzed.

If there are current errors, the error of the highest priority is displayed. If there is no current error, the saved error of the highest priority is displayed. If the drive has been stopped via the quick stop command, the event that triggered the quick stop is also displayed.

12

12.4 Errors and Warnings

This page displayes all important data on current and saved errors as well as warning and error messages of the selected drive.

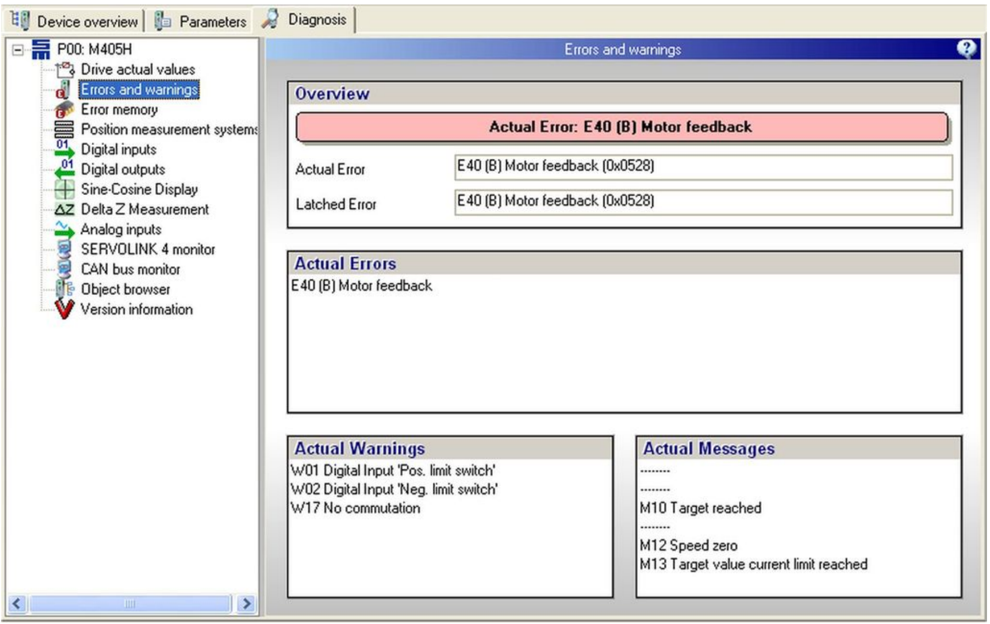


Fig. 101: Diagnosis page "Errors and warnings"

In the section "Overview" you can see the status and errors at a glance.

Status

The status field displays the current state of the drive. For this purpose the status word of the drive is analyzed.

If there are current errors, the error of the highest priority is displayed. If there is no current error, the saved error of the highest priority is displayed. If the drive has been stopped via the quick stop command, the event that triggered the quick stop is also displayed.

Actual errors

The field displays the current error of the drive control, if existent. This is the error of the highest priority. The error class and the internal error code is also displayed. The error classes 'A' (high priority) to 'D' (low priority) are distinguished.

Latched error

The field displays the saved error of the drive control. This is the error that caused the last shutdown of the drive. The error class and the internal error code is also displayed. The error classes 'A' (high priority) to 'D' (low priority) are distinguished. When the error is reset, the saved error is also cleared.

12.5 Error Memory

On this page the error memory of the device is displayed.

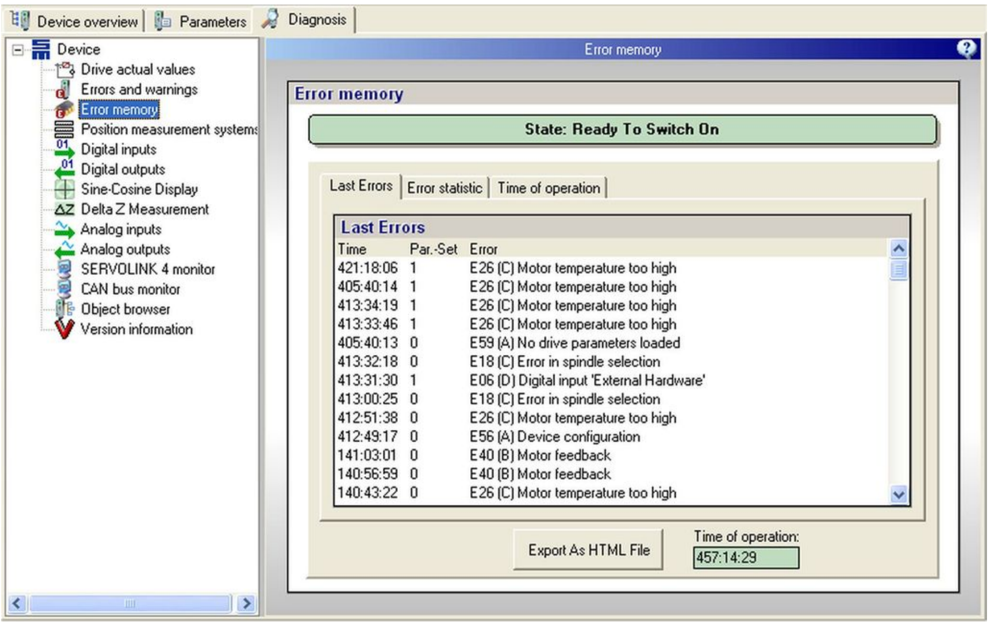


Fig. 102: Diagnosis page “Error memory”

Last errors

On this tab page the entries saved in the device error memory are displayed. This data makes you understand and analyze a malfunction of the drive easier, i.e. by means of the time flow.

All entries in the error memory have a timestamp (running time meter). In addition they provide the number of the parameter set that was active, when the error occurred. The error memory contains up to 32 entries. All following errors overwrite the oldest entries in the error memory list.

Via the button “Export as HTML file” all entries are written into a HTML file. Thus the data can be stored or forwarded.

Error statistic

On this tab page you find a list of the saved errors and their frequency.

Time of operation

This tab page indicates the time period the device has been supplied with logic voltage until now (indicated in hours:minutes:seconds). When a device with several parameter sets (Multi Parameters, page 64) is selected, you can see the operating hours of each individual parameter set.

12.6 Position Measurement Systems

This page displayes position values of the measuring systems.

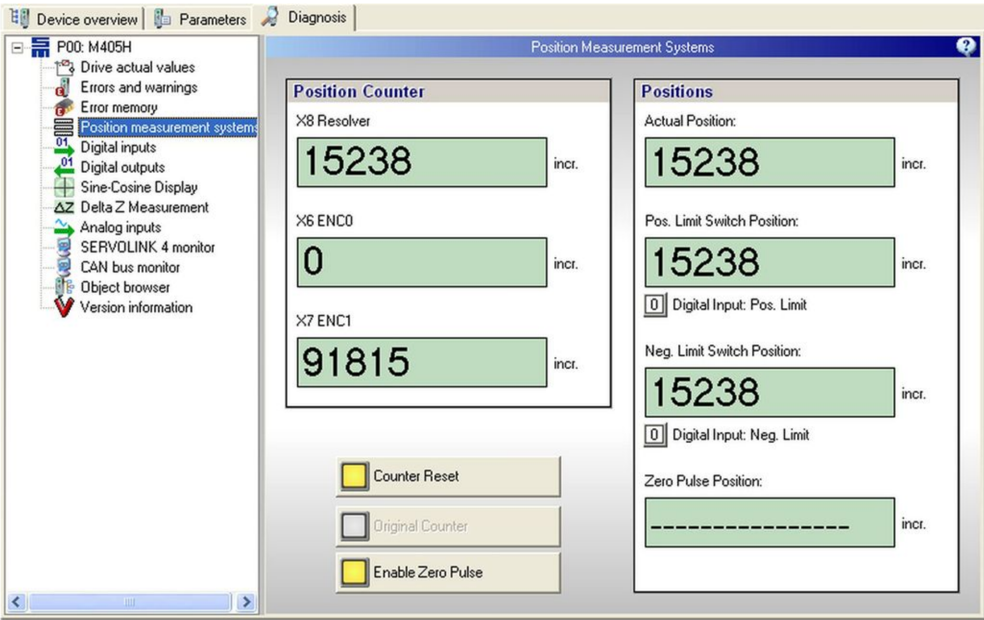


Fig. 103: Diagnosis page “Position measurement systems”

Counter reset / Original counter

Via the button “Counter reset ” you can set the position counter to 0. This only takes place in the user interface in order to improve readability. In the drive the position counter is not reset. Click the button “Original counter” to display the position value of the drive controller again.

Enable zero pulse

The button “Enable zero pulse” enables the zero pulse for one revolution or motor period. When the mark is reached, the zero pulse is displayed in the field Zero Pulse Position. The fields of the positive and negative limit switch indicate the positions of the point in time, when the negative edge occurred at the corresponding input.

Pos./Neg. limit switch position

The fields of the positive and negative limit switch indicate the positions of the point in time, when the positive or negative edge occurred at the corresponding input.

12.7 Inputs / Outputs (PS2)

This page displays the states of the inputs and outputs of a power supply unit PS2.

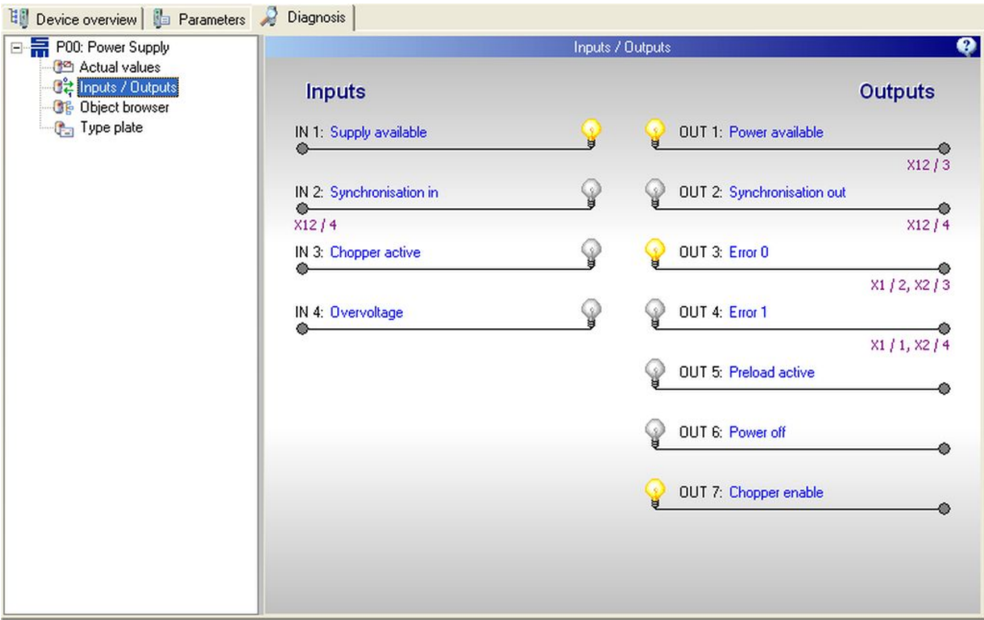


Fig. 104: Diagnosis page “Inputs / outputs”

Each indicator can have the value '0' (light bulb off) or the value '1' (light bulb on). For each signal transmitted via the inputs and outputs of the device the according device connector and pin are indicated. The other signals can be used for a more accurate error diagnosis.

12

12.8 Digital Inputs

This page displays the states of the digital inputs of the drive.

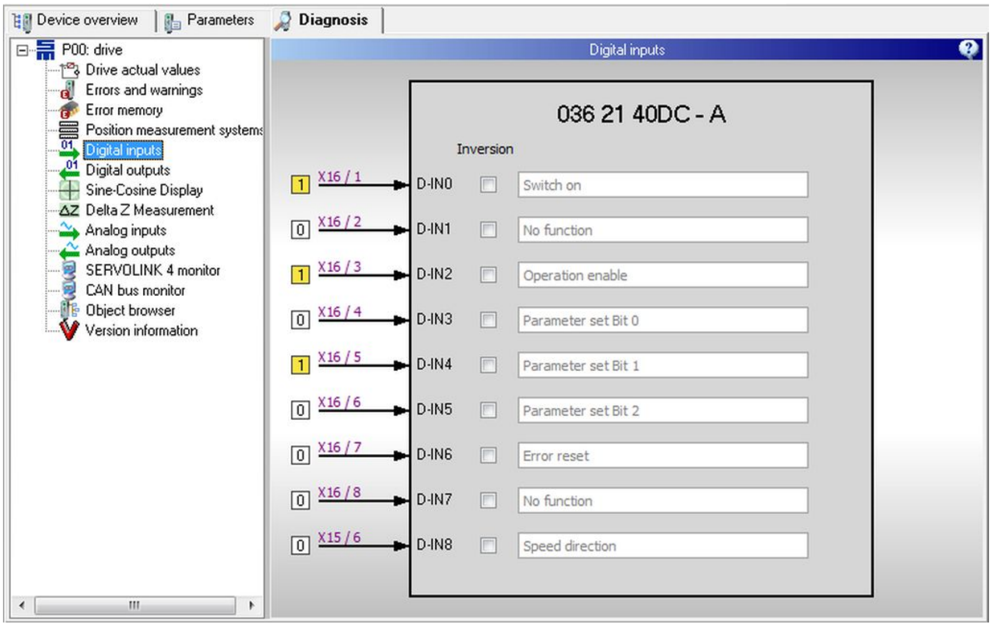


Fig. 105: Diagnosis page "Digital inputs"

Depending on the hardware up to 9 digital inputs (D-IN0 to D-IN8) may be configured. The parameters display the set functions of the digital inputs. Each input can have the value '0' (not active) or '1' (active). In addition the corresponding connector and pin of the device are indicated for each input.

12

12.9 Digital Outputs

This page displays the states of the digital outputs of the drive.

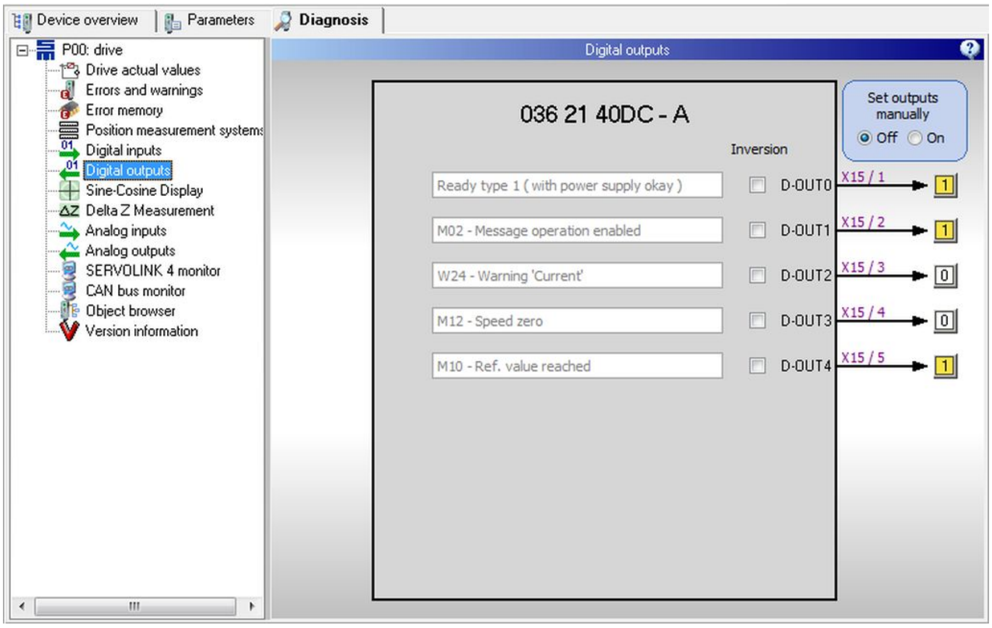


Fig. 106: Diagnosis page "Digital outputs"

Depending on the hardware up to 6 digital outputs (D-OUT0 to D-OUT5) may be configured. The parameters display the set functions of the digital outputs. Each output can have the value '0' (not active) or '1' (active). In addition the corresponding connector and pin of the device are indicated for each output.

Set outputs manually

You can set the hardware outputs manually in order to check their functionality. For this purpose select the option "On" in the blue field "Set outputs manually" at the top right. When the option for manually setting the outputs is on, the control functions are not transmitted via the internal command channel anymore but via the *drive-setup-tool*.

WARNING

Risk of injury due to manual setting of the digital outputs

Take sufficient measures to provide safety at the machines and output functions during manual setting of the outputs.

- Set the desired outputs by clicking on the rectangular boxes. The active outputs have the value '1' and a yellow background; the inactive outputs have the value '0' and a white background.
- Check the outputs now and measure the individual output signal, if required.
- After checking make sure you set the function "Set outputs manually" back to "Off", so the control functions are transmitted by the internal command channel again.

12.10 Sine-Cosine Display

This page displays the analog sine and cosine values of the feedback.

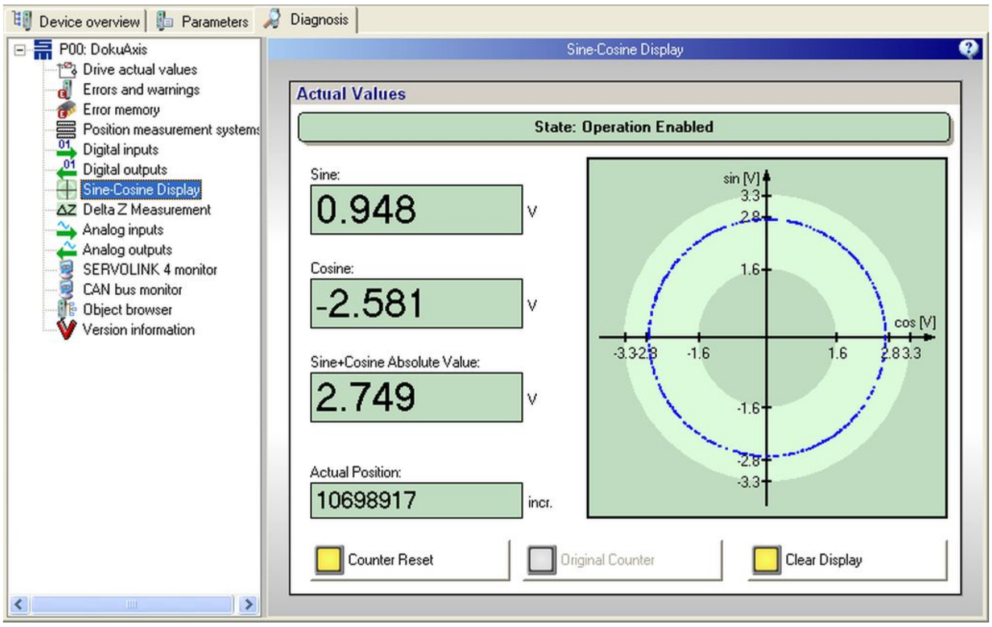


Fig. 107: Diagnosis page “Sine-Cosine display”

On the left side the values of sine and cosine are displayed. On the right side the values are illustrated as x/y curve (cosine = x-axis, sine = y-axis). Thus, the display is only available for double-track measuring systems (e.g. resolver, sine/cosine encoder).

12.11 Delta Z Measurement

Via this page you can analyze a depth measuring system during SERVO / VECTOR operation.

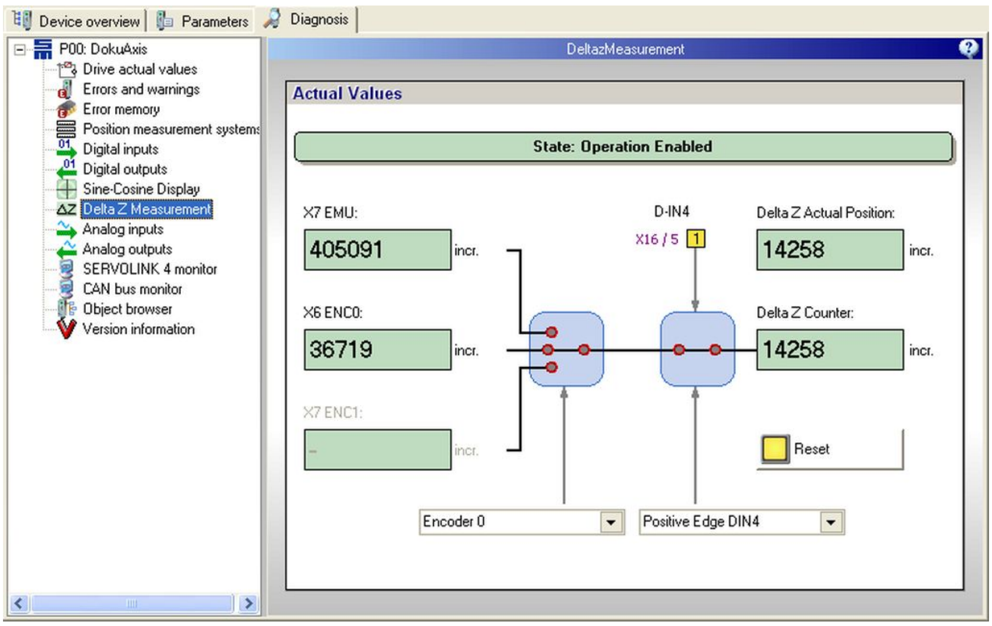


Fig. 108: Diagnosis page “Delta Z measurement”

The source of the delta Z positions can either be the encoder inputs (ENC0 and ENC1) of the drive or the encoder emulation of the motor measuring system. This can be set via the left list box. By means of the right list box you can set, whether the delta Z counter is enabled permanently or just when the edge at the digital input D-IN4 increases.

If you decide to use the internal input D-IN4, this input must be parameterized correspondingly. For this purpose switch to the tab page “Parameters → Digital inputs” and set D-IN4 to “Enable difference measuring system”.

The two delta Z counters displayed only differ in the scalings. The “Delta Z actual position” is not scaled and indicates the absolute value of the delta Z counter. The value of the “Delta Z counter” is scaled to 16 bit (with sign).

12.12 Analog Inputs

This page displays the applied analog voltages and the hence resulting reference values.

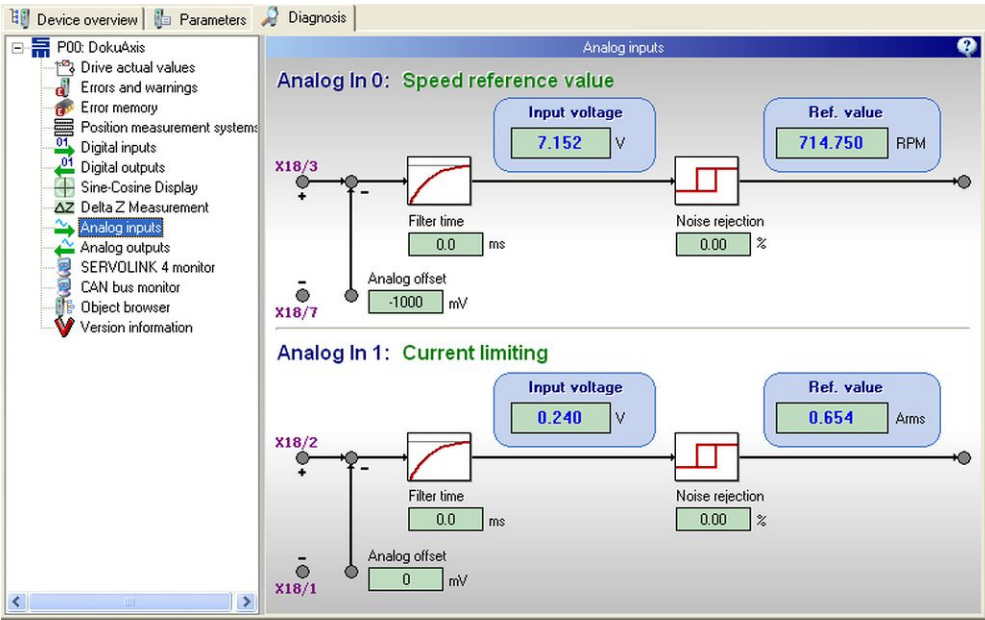


Fig. 109: Diagnosis page “Analog inputs”

The values “Analog offset”, “Filter time” and “Noise rejection” are directly read-out of the configured parameter values.

The drive can only operate according to the analog settings as shown in the figure, when you have selected a suitable Operating mode, page 92 (e.g.. Velocity mode 1).

Input voltage

The field displays the digitalized voltage at the analog input in *volts*.

Ref. value

The field displays the reference value resulting from the voltage at the analog input.

Analog offset

The parameter serves for compensating a possibly existing analog offset. The offset is entered in *millivolts*.

Filter time

Via this parameter a first-order low-pass filter is configured. The filter time corresponds to the time constant of the low-pass and is defined in *milliseconds*. If the filter time is set to 0 ms, the low-pass filter is deactivated.

Noise rejection

The parameter specifies a hysteresis threshold for noise rejection in *percent*. 1 % corresponds to a voltage of 0.1 V at the analog input.

12.13 Analog Outputs

This page displays the configured analog outputs.

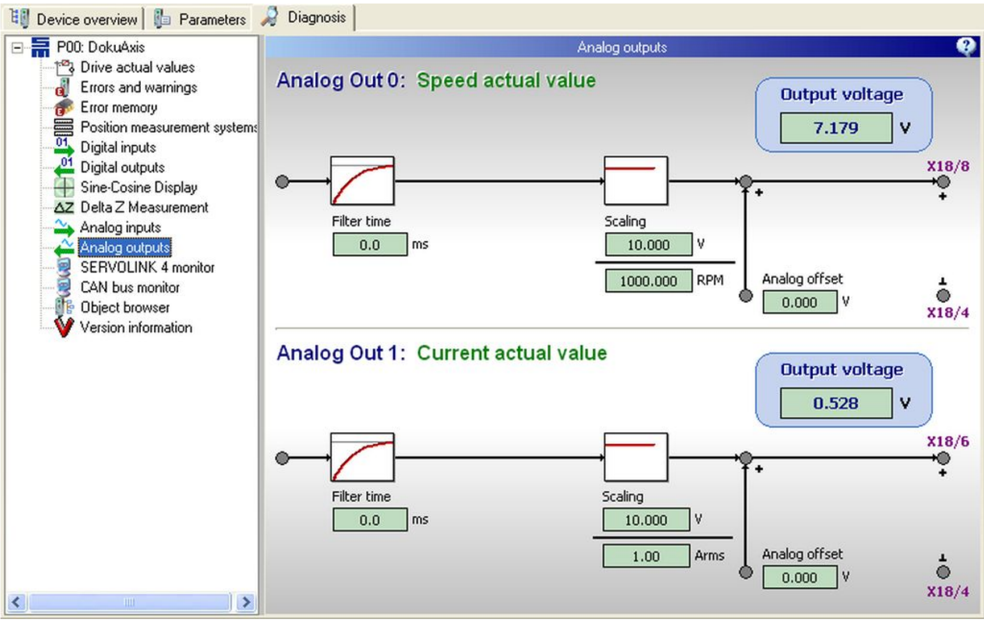


Fig. 110: Diagnosis page “Analog outputs”

12

The values “Analog offset” and “Filter time” are directly read-out of the configured parameter values.

Filter time

Via this parameter a first-order low-pass filter is configured. The filter time corresponds to the time constant of the low-pass and is defined in *milliseconds*. If the filter time is set to 0 ms, the low-pass filter is deactivated.

Analog offset

The parameter serves for setting an analog offset. The offset is entered in *volts*.

Scaling

The parameter indicates the relation of voltage at the analog output to target, reference or actual value.

Output voltage

The field displays the digitalized voltage at the analog output in *volts*.

12.14 Spindle Select (FC2)

This page is only provided for the frequency converters of the series FC2. It displays the new selection of motor spindles (input connector X32) and the selection which is currently used (output connector X33).

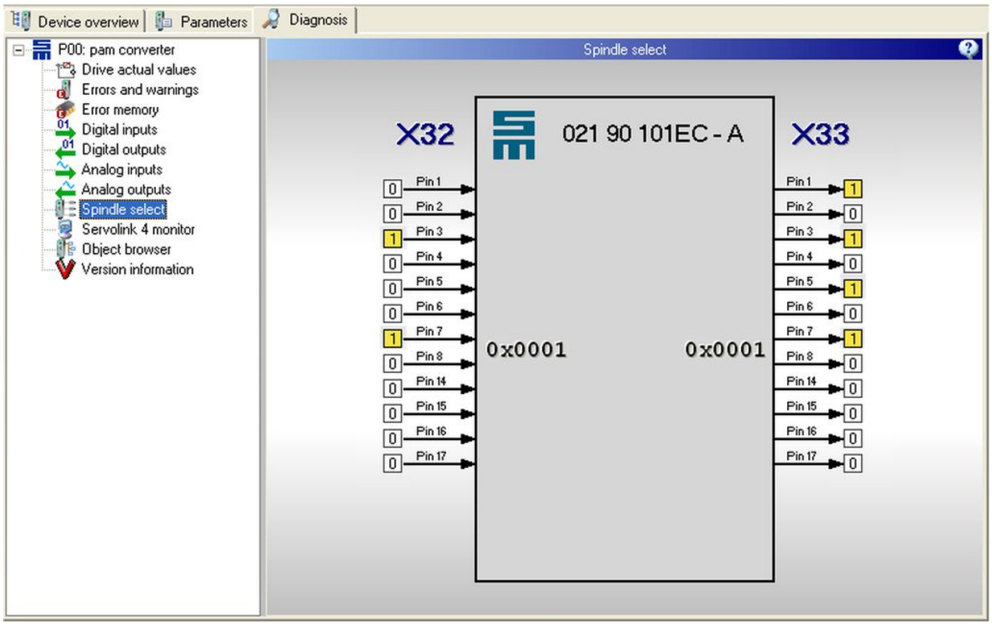


Fig. 111: Diagnosis page "Spindle select"

The example shows 4 active motors, whereas the new selection has only 2 motors.

A new selection is only applied after "Controller off".

12.15 Spindle Actual Values (FC2)

This page displays the active spindles and the most important performance data of these.

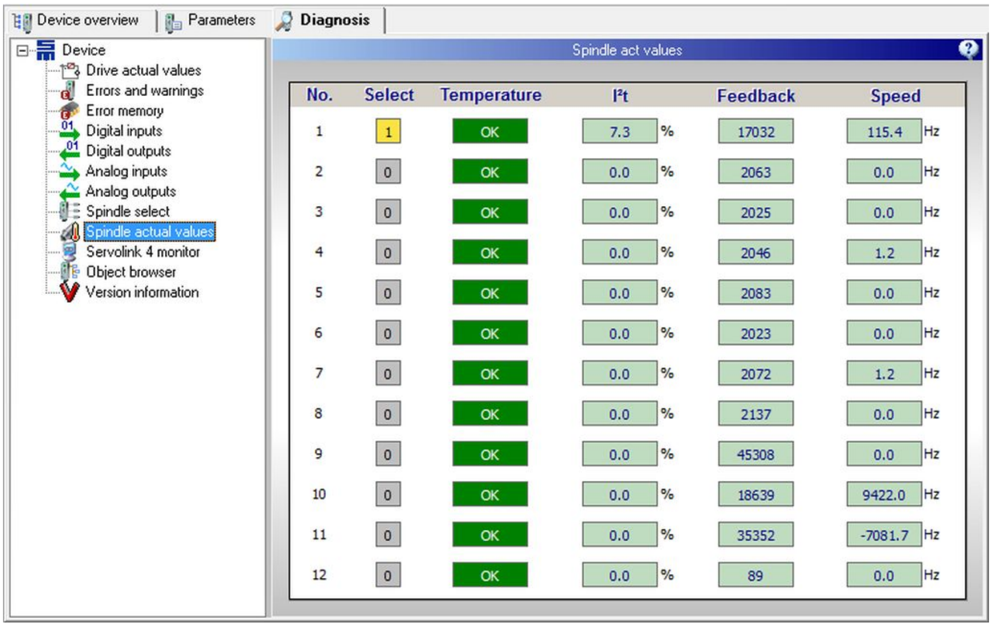


Fig. 112: Diagnosis page "Spindle actual values"

The active spindles have the status '1' in the category "Select". The following actual values are displayed for each spindle:

- Temperature: Indicates the status of the spindle temperature. If you have not parameterized a type of temperature monitoring, the status is always "OK".
- I²t: Displays the I²t load of the spindle in *percent*.
- Feedback: Displays the counting pulses of the measuring system.
- Speed: Indicates the actual speed in *hertz* / *revolutions per minute*.

12.16 SERVOLINK 4 Monitor

This page is used to analyze the communication of the drive via the SERVOLINK 4 bus system. For this purpose the tab pages "Configuration", "Reference values" and "Actual values" are provided. Since data are not read-out in real-time by the software *drivemaster2*, the data may be inconsistent.

For further information refer to the SIEB & MEYER documentation "Drive System SD2 - Device Control".

12

12.16.1 Configuration

The tab page “Configuration” allows analyzing the status and the error frequency of the SERVOLINK 4 communication.

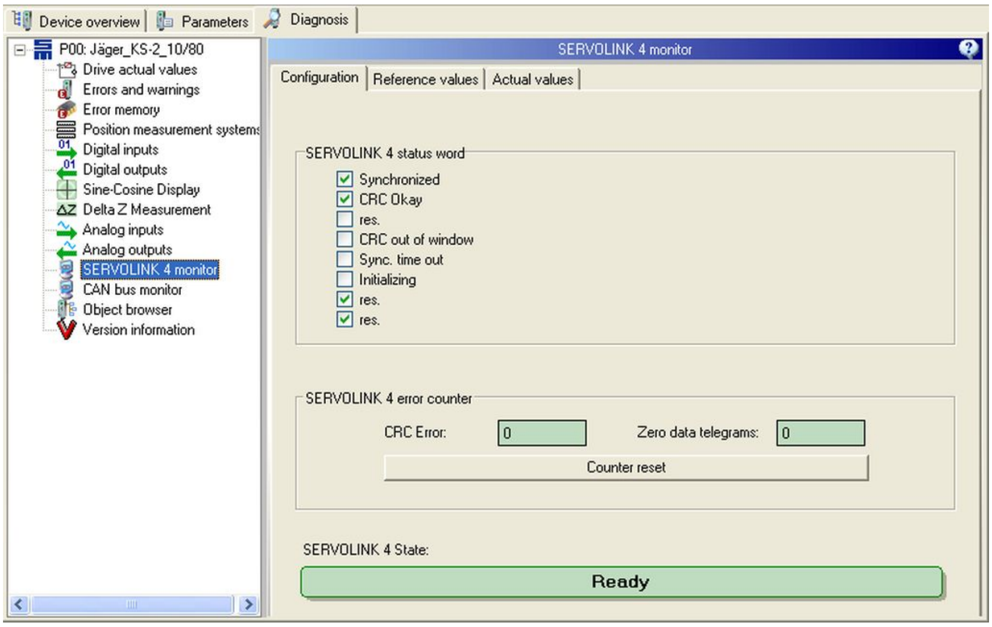


Fig. 113: Diagnosis page “SERVOLINK 4 monitor”, configuration

SERVOLINK 4 status Word

This field indicates the status of the SERVOLINK 4 communication and serves for a general analysis of it. It is displayed whether the synchronization and the check sum are OK.

In the event of an error (too many successive CRC errors, synchronization time out), the corresponding errors will be displayed. If the communication is being initialized, this will also be displayed.

SERVOLINK 4 CRC error

The value “error counter” displays the number of CRC errors, which occurred since the communication was started. After CRC error number 65535 there will be an overflow.

The value “Zero data telegrams” displays the number of zero data telegrams, which occurred since the communication was started. After zero data telegram number 65535 there will be an overflow.

By click on the button “Error reset” the two counters are reset to the value '0'.

SERVOLINK 4 State

The field displays the SERVOLINK 4 status word.

12.16.2 Reference values

The tab page “Reference values” allows analyzing the content of the drive's receive buffer.

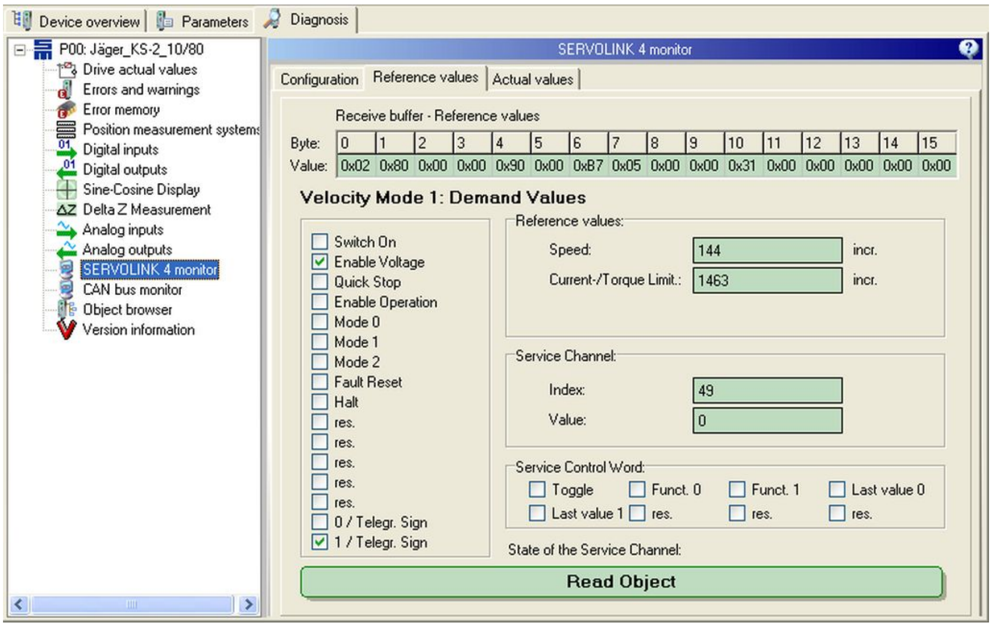


Fig. 114: Diagnosis page “SERVOLINK 4 monitor”, reference values

By means of the displayed information the SERVOLINK 4 reference values can be analyzed. In the top section of the page the complete content of the receive buffer is displayed byte-by-byte in the hexadecimal format.

Below you find the reference values. On the left side the drive control word is indicated and on the right side the actual reference values are displayed. Besides the content of the service channel and the service control word are indicated.

The contents of the service channel and the service control word are displayed in the combined status display “State of the service channel” in the bottom section.

12

12.16.3 Actual Values

The tab page “Actual values” allows analyzing the content of the drive's send buffer.

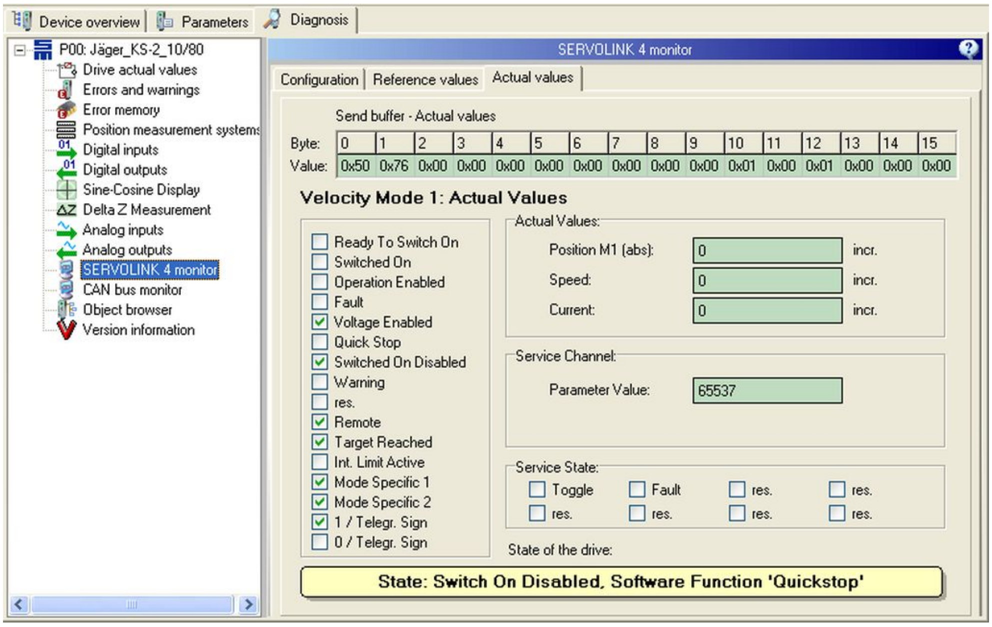


Fig. 115: Diagnosis page “SERVOLINK 4 monitor”, actual values

By means of the displayed information the SERVOLINK 4 actual values can be analyzed. In the top section of the page the complete content of the receive buffer is displayed byte-by-byte in the hexadecimal format.

Below you find the reference values. On the left side the drive control word is indicated and on the right side the actual reference values are displayed. Besides the content of the service channel and the service control word are indicated.

The contents of the service channel and the service status word are displayed in the combined status display “State of the drive” in the bottom section.

12.17 CAN Bus Monitor

This page is used to analyze the communication of the drive via the CAN bus. For this purpose the tab pages “SDO 0 rx/ PDO 0 rx” and “SDO 0 tx/ PDO 0 tx” are provided. Since data are not read-out in real-time by the software *drivemaster2*, the data may be inconsistent.

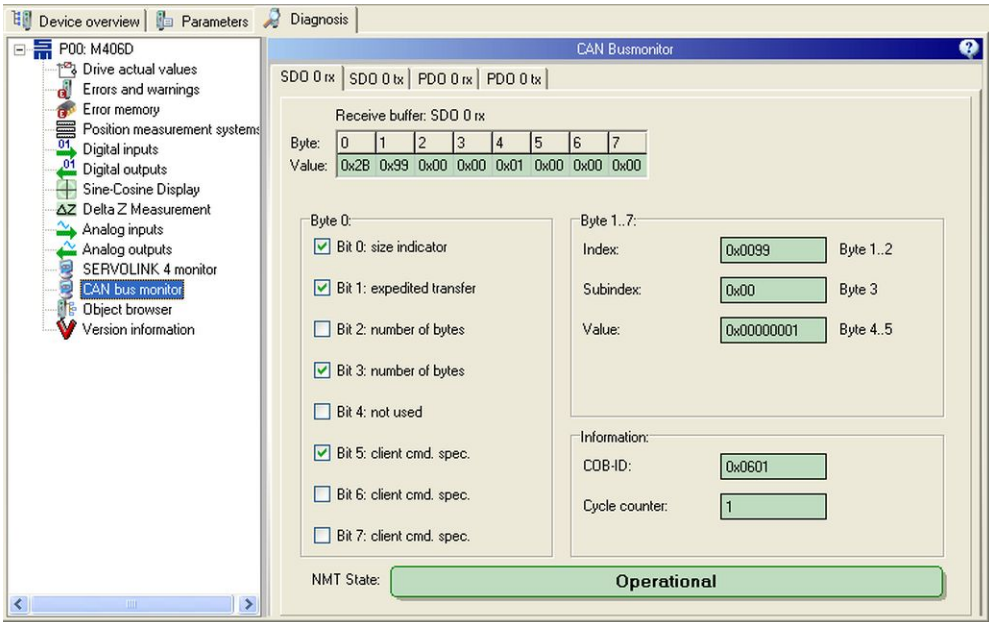


Fig. 116: Diagnosis page "CAN bus monitor"

The tab pages display the received data (rx) and the transmitted data (tx) of the service data objects (SDO) and of the process data objects (PDO).

All tab pages are structured likewise. In the top section of the page the complete content of the receive buffer is displayed byte-by-byte in the hexadecimal format. Below you find information on the set bits in the bytes 0 to 7, the address in the CAN bus (COB-ID) and a cycle counter. In the bottom section of the page the state of the NMT state machine is displayed.

For further information refer to the SIEB & MEYER documentation "Drive System SD2 – CAN Bus Connection".

12.18 DNC Bus Monitor

This page is used to analyze the DNC communication (DNC 8 Byte Telegram) with a drive. For this purpose the tab pages "Receive" and "Transmit" are available. Since data are not read-out in real-time by the software *drivemaster2*, the data may be inconsistent.

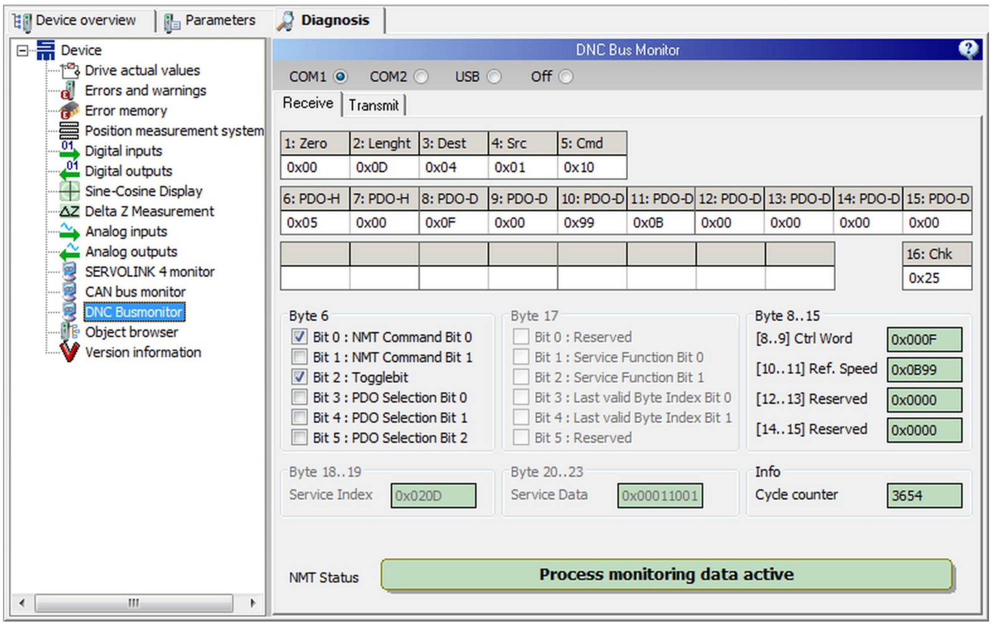


Fig. 117: Diagnosis page “DNC bus monitor”

At the top of the page you select the physical interface for the DNC communication. If you select the option “Off” the DNC communication is not monitored.

The two tab pages display the received and the transmitted data. The tab pages are structured likewise. In the top section of the tab page the content of the received or the transmitted telegram is displayed byte-by-byte in the hexadecimal format. Below that you find information on the set bits in the several bytes. In the bottom section of the page the state of the NMT state machine is displayed.

For further information refer to the SIEB & MEYER documentation “Drive System SD2 – DNC 8 Byte Telegram”.

12.19 Object Browser

The object browser is a debug and diagnosis tool with access to the device-internal display of selected parameters and states in the drive. These individual objects are combined and saved in a device-dependent object directory and are subject to different access rights.

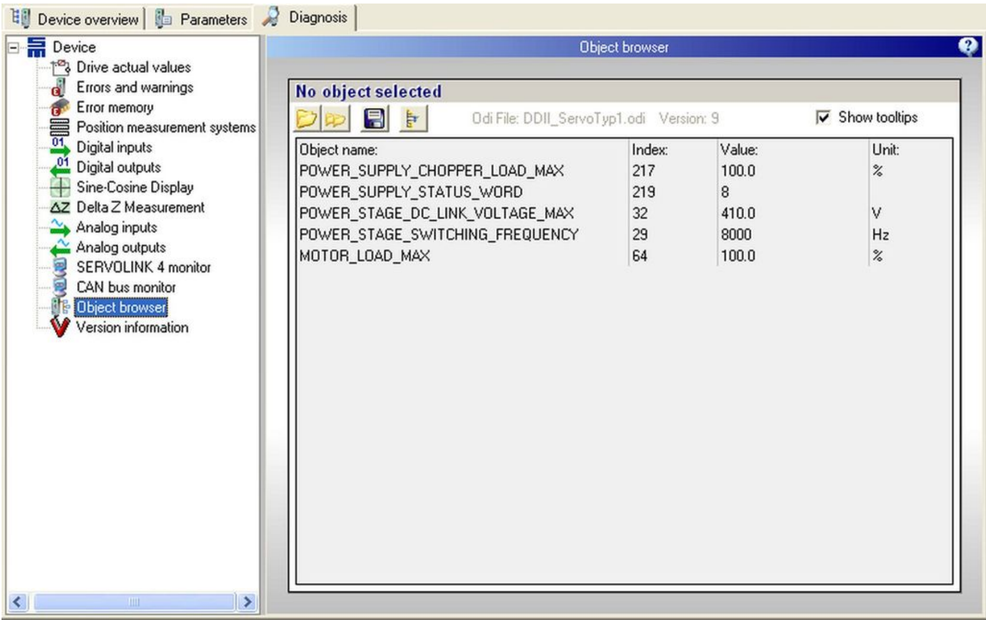


Fig. 118: Diagnosis page “Object browser”

To get a clear overview the user can make an individual list of objects and organize them in files (file extension *.Ose).

All objects shown in the object display are read-out permanently and their values (contents) are displayed. Reading-out the objects is only terminated when the object browser is closed.

DANGER

Use of object browser

Manipulating certain objects can cause uncontrolled movements and may destroy the drive.

Never use the object browser without having consulted SIEB & MEYER AG.

Show tooltips

When the check box is activated, the tooltip for each individual object is displayed. The tooltip for an object appears, when the mouse pointer is located on this object in the object display.

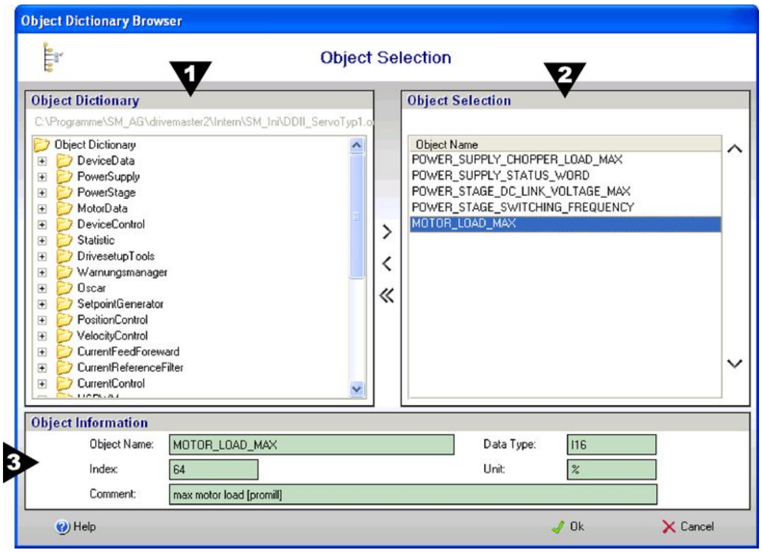
Buttons

- Load object file:
  The button opens an already existing object list and displays the listed objects in the object window. All previously displayed objects are cleared from the display. The opened objects are read-out permanently.
- Add object file:
  The button opens an existing object list and adds the listed objects in there to the already displayed objects in the object window.
- Save object file as:

The button saves the objects currently displayed in the object window into an object list. A file with the file extension "*.ose" will be generated.

- Select objects:
  The button opens the dialog “Object Selection”. This dialog window allows to select objects of a drive and create an individual object list.

Object selection



[1] Object dictionary
This field displays the entire object directory in a tree-type structure. To select an object click on it. Double click on an object in the list to add it to the “Object selection”.

[2] Object selection
This field displays a list of the current objects in the object browser. By click you can select an object. The respective properties of the selected object are displayed in the field “Object information”. By double-click you can remove an object from the list “Object selection”.

Operating Elements

- Add:
  Click on this button to add the object currently selected in the “Object directory” to the list.
- Remove:
  Click on this button to remove the object currently selected in the “Object selection” from the list.
- Remove all:
  Click on this button to remove all objects currently displayed in the “Object selection”.

[3] Object information
This field displayes information on the selected object. These are the object name, the object index, the data type, the unit and a comment with a short description.

12.20 Type Plate (PS2)

This page displays all necessary version information on the hardware. In addition the set parameters are displayed below.

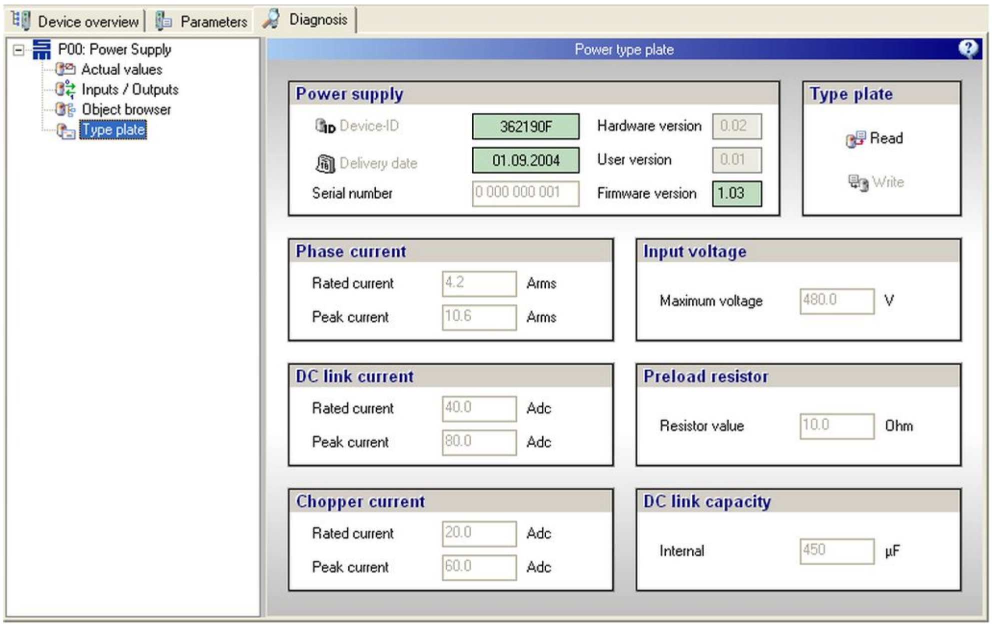


Fig. 119: Diagnosis page “Power type plate”

Power supply

This section provides the following information on the hardware:

- Device ID: Indicates the general designation (type) of the used drive electronics.
- Delivery date: Indicates the date of delivery by SIEB & MEYER AG.
- Serial number: Indicates the SIEB & MEYER serial number of the device.
- Hardware version: Indicates the version of the hardware.
- User version: Indicates the version of the parameter set.
- Firmware: Indicates the version of the firmware.

Type Plate

- Read: Via this button all parameters are read from the device and loaded into the software.
- Write: Via this button all parameters set in the software are written into the device.

12.21 Version Information

This diagnosis page displays general version information on the hardware and software of the current drive. This information you can export as HTML file by use of the button in the bottom.

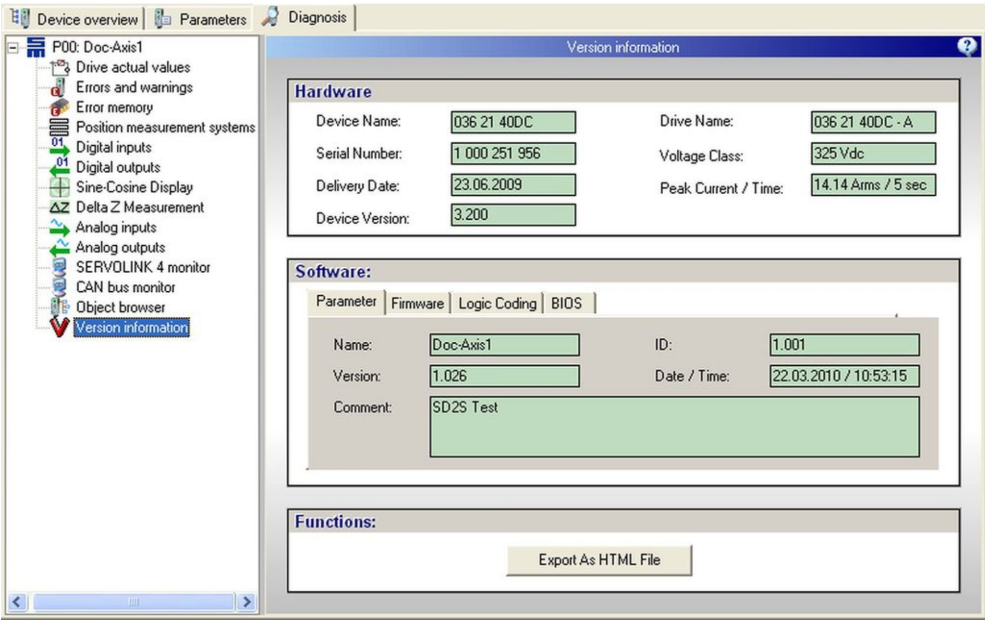


Fig. 120: Diagnosis page "Version Information"

Hardware

In this field the following version information and performance data of the hardware are displayed:

- Device Name: Indicates the general designation of the device.
- Serial Number: Indicates the SIEB & MEYER serial number of the device. The serial number is always related to the device and not to the drive.
- Delivery Date: Indicates the date of delivery by SIEB & MEYER AG.
- Device Version: Indicates the version of the hardware.
- Drive name: Specifies the general designation (type) of the used electronics of the drive. If a version of *drivemaster2* is not updated and can not detect the drive, question marks '?' are displayed instead of the drive designation.
- Voltage range: Specifies the electric strength of the power electronics. The voltage range is related to the maximum voltage in the rectified DC link (DC voltage) and is indicated in *volts*.
- Peak current / time: Specifies the maximum current of the output stage. The peak current is indicated as crest value. In the cold state, this peak current may only flow once for a maximum time period (I^2t time) as indicated here.

Software

This field is divided into four tab pages: Parameter, Firmware, Logic Coding and BIOS. These tab pages provide the respective version information.

- Name
  - Parameter: Indicates the individual designation of the parameter set. which is the same as the user-defined drive name.
  - Firmware: Indicates the general designation of the firmware. This designation is equivalent to the file name of the firmware.
  - Logic coding: Indicates the general designation of the logic coding. This designation is equivalent to the file name of the logic coding.

12

  - BIOS : Indicates the general designation of the BIOS. This designation is equivalent to the file name of the BIOS.
- Version
  - Parameter: Indicates the version of the parameter set. The version is assigned by the software *drivemaster2*.
  - Firmware: Indicates the version of the firmware.
  - Logic coding: Indicates the version of the logic coding.
  - BIOS : Indicates the version of the BIOS.
- ID
  - Parameter: Indicates the identification code of the parameter set. The ID is user-defined and can be used for identifying the drive version via the object directory.
  - Firmware: Indicates the identification code of the firmware.
  - Logic coding: This field displayes the identification code of the logic coding.
  - BIOS : Indicates the identification code of the BIOS.
- Date / Time
  - Parameter: Indicates date and time of the last modification of the parameter set.
  - Firmware: Indicates date and time of the firmware creation.
  - Logic coding: Indicates date and time when the logic coding was created.
  - BIOS : Indicates date and time when the BIOS was created.
- Comment:
  - Parameter: Displayes a comment on the parameter set and thus on the complete drive. This comment can be entered by the user as desired.
  - Firmware: Displayes a comment that contains general information on the firm-ware.
  - Logic coding: Displayes a comment that contains general information on the logic coding.
  - BIOS : Displayes a comment that contains general information on the BIOS.

Functions

Via the button “Export as HTML File” the software generates a file with all information displayed on this page. In case of service requests, for example, you can send this file to the support.

13 Tools

For the initial operation of a drive the software provides additional tools for parameterization and diagnosis. These tools can be started via the menu "Extras".

The available tools depend on the device selected on the tab page "Device overview". For frequency converters the "*converter-setup-tool*" is provided. For drive amplifiers the tools "*drive-setup-tool*" and "*hiper-endat-tool*" are available.

In addition the digital oscilloscope "Oscar" and the data recorder "SDx Datalogger" are available for all devices.

13.1 Oscar

Up to four measured variables can be entered simultaneously and represented graphically with the Oscar.

Basically, the surface of the Oscar can be divided into 7 sections:

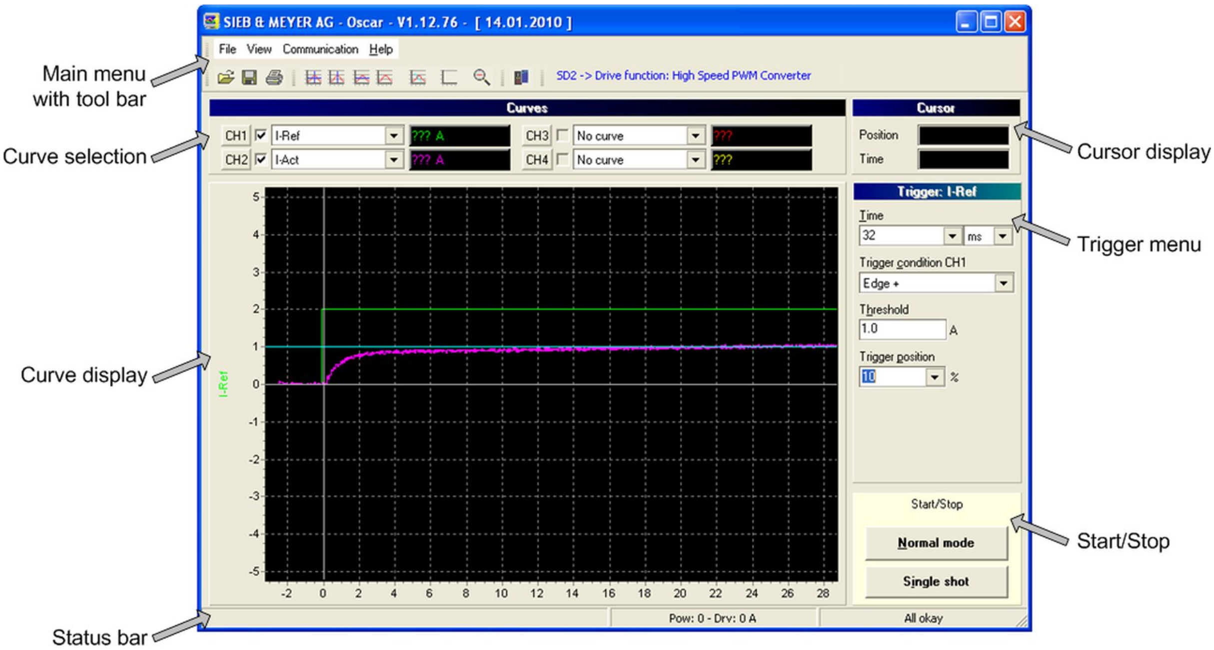


Fig. 121: Oscar

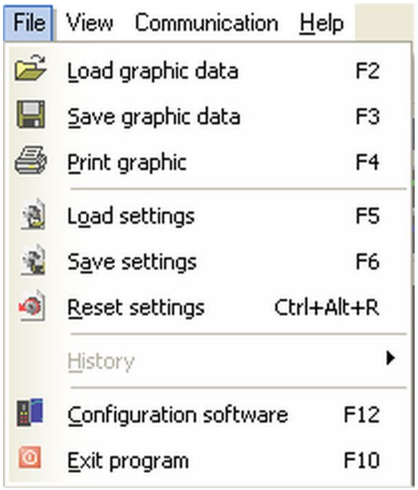
The sections are described in the following chapters.

13.1.1 Menu Description

Via the main menu you can access the most commands and tools.

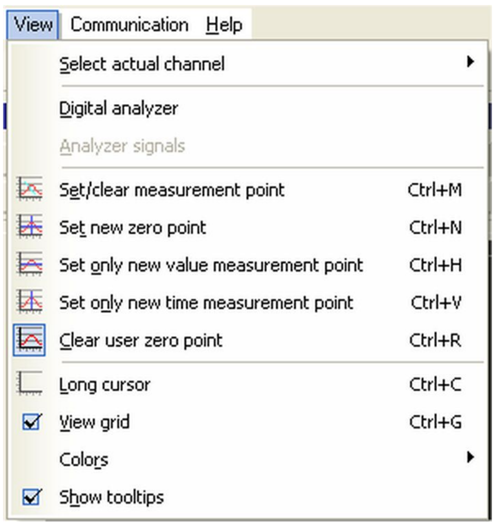
Using the buttons in the tool bar you can directly access frequently used functions of the program menu.

13.1.1.1 Menu “File”



- Load graphic data: Opens the dialog “Oscar Open oscar graphic”, which allows to load a stored graphic from a file. The graphics are stored by default in the directory “SM_Data” in the installation path. The file extension is *.odt (Oscar data).
- Save graphic data: Saves the current record. The dialog “Oscar-Save oscar graphic” is opened. The dialog asks for file name and storage location of the file. Usually the file is stored in the directory “SM_Data” in the installation path.
- Print graphic: Opens the wizard “Printer setup”. Via this dialog the printer is selected, on which the graphic is to be printed. Additional settings such as paper format, paper size and paper orientation can be determined.
- Load settings: Opens the dialog “OscarOpen oscar configuration”, which allows to load a stored configuration from a file. The configuration files are usually stored in the directory “SM_Data” in the installation path. The file extension is *.ocf (Oscar config).
- Save settings: Opens the dialog “OscarSave oscar configuration” in order to save the current settings (curve selection and trigger condition). The dialog asks for file name and storage location of the file. Usually the file is stored in the directory “SM_Data” in the installation path.
- Reset settings: Reset of made settings to the settings before. A dialog is opened asking if all individual settings shall be reset. Confirm with "Yes", to reset the settings.
- History: Provides quick access to the last four graphics which were used.
- Configuration software: Switches back to the software *drivemaster2*.
- Exit program: Closes the Oscar.

13.1.1.2 Menu “View”

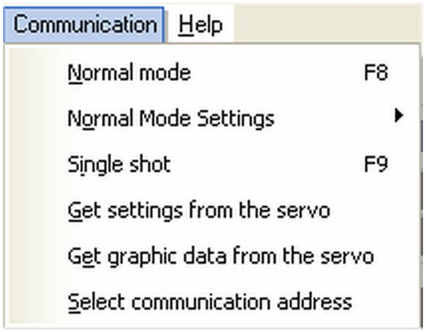


- Select actual channel: Opens a submenu in which the current channel (CH1 – CH4) can be defined.
- Digital analyzer: This menu item has no function. (An empty window is displayed below the curve window.)
- Analyzer signals: This menu item has no function.
- Set/clear measurement point: Activates a function, which allows to set a measurement point with the crosspointer. The difference from this measurement point to the current position of the crosspointer is detected and displayed in the display area “Cursor”. The

measurement point is cleared by deactivating the menu item.

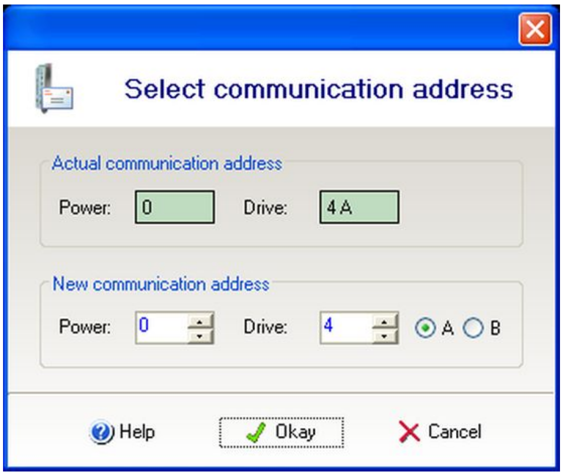
- Set new zero point: Moves the zero point of the value and time axis in order to e.g. detect simple differences quickly. By mouse click on the menu item “Set new zero point” a new zero point can be defined. By a second click with the crosspointer on the graphic display the new zero point is determined. Then, all values refer to the new zero point.
- Set only new value measurement point: Moves the zero point of the value axis in order to e.g. detect simple differences quickly. By mouse click on the menu item “Set only new value measurement point” a new zero point can be defined. By a second click with the crosspointer on the graphic display the new zero point is determined. Then, all values refer to the new zero point.
- Set only new time measurement point: Moves the zero point of the time axis in order to e.g. detect simple differences quickly. By mouse click on the menu item “Set only new time measurement point” a new zero point can be defined. By a second click with the crosspointer on the graphic display the new zero point is determined. Then, all values refer to the new zero point.
- Clear user zero point: Resets the user-defined zero points of the value and time axis.
- Long cursor: Switches the extended crosspointer of the cursor on or off (If the extended crosspointer is active, the graphic display may be delayed).
- View grid: Activates or deactivates the grid of the graphic display.
- Colors: Opens a submenu with elements of the user interface to change their individual color.
- Show tooltips:Activates or deactivates the pop-up window that displays the function of each button as soon as you pass the mouse pointer over it. In the graphic display the tooltip indicates the actual position of the cursor.

13.1.1.3 Menu “Communication”



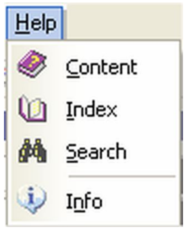
- Normal mode: The curves are permanently recorded and displayed.
- Normal mode settings: Indicates the amount of data to be transmitted and thus the speed of screen layout. The smaller the amount of data to be transmitted, the lower the resolution of the display. The following settings are available:
  - 12 %
  - 37 %
  - 87 %
  - 100 %
- Single shot: The curves are recorded and displayed once.
- Get settings from the servo: Configures the Oscar with the data stored in the drive.
- Get graphic date from the servo: Calls measured values from the last measuring cycle stored in the drive.

- Select communication address: Opens the dialog "Select communication address".
  In the field "New communication address" you can select another drive without switching to the software *drivemaster2*.

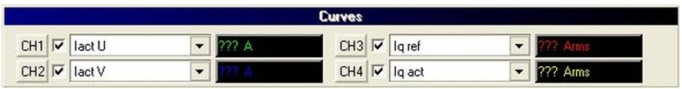


13.1.1.4 Menu "Help"

- Content: Opens the online help on the tab page "Content".
- Index: Opens the online help on the tab page "Index".
- Search: Opens the online help on the tab page "Search".
- Info: Displays version information of the software and the contact address of SIEB & MEYER.



13.1.2 Curve Selection



CH1 - CH4

You can determine the current channel by mouse click on the buttons CH1 to CH4. The scaling of the value axis is determined by the selected channel.

Check box

Using the check boxes on the right side of the tool buttons CH1 to CH4 you can select the channel which is to be displayed in the graphic window.

List box

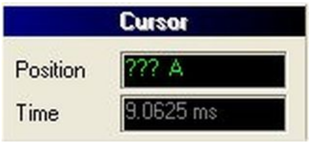
By means of the list box you select the curve that is to be displayed on the correspon-ding channel. Depending on the connected device and set drive function there are different parameters available for the record.

Display

On the right side of each selection box the curve value at the current cursor position is displayed. The display color is the same as the curve color in the graphic window.

13.1.3 Cursor

The current position and the time of the cursor concerning the currently selected channel is displayed in this window. The channel can be selected by mouse click on the buttons CH1 to CH4 in the section “Curves”.



Position

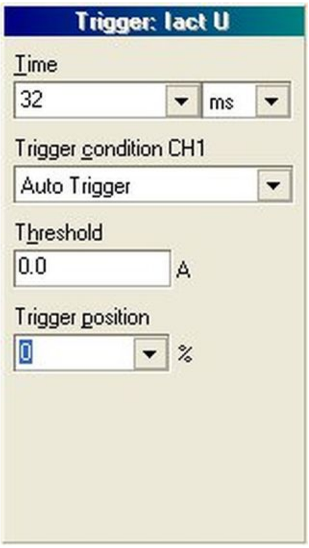
The parameter indicates the coordinate of the cursor on the value axis (y-axis) in the unit of the selected channel.

Time

The parameter indicates the coordinate of the cursor on the time axis in *milliseconds* or *seconds*.

13.1.4 Trigger "Parameter"

All settings in this section always refer to the first curve (channel 0).



Time

The parameter indicates the recording time of the graphic. Value and unit are set by means of list boxes.

Trigger condition

The parameter indicates the condition for starting a record. The following conditions can be selected:

- Auto Trigger The recording is initiated immediately .
- Edge +: The recording is initiated when a positive edge occurs.
- Edge -: The recording is initiated when a negative edge occurs.
- Error <> 0: The recording is initiated in case of an error.

Threshold

The parameter indicates the desired threshold value for the two trigger conditions "threshold value exceeded" and "threshold value fell below".

Trigger position

The parameter indicates the recording delay. The recording time can be extended up to 100% or be reduced by up to 25%. The available values are set by means of a list box.

13.1.5 Start / Stop

By mouse click on the buttons “Normal mode” and “Single shot” the recording of the curve can be started.

In the “Normal mode” the recording of the selected curves is restarted continuously. The “Single shot” records and displayes the curve only once.

13.1.6 Curve Display

Graphic window zoom

In order to zoom in a part of the graphic window the respective part of the window must be marked with the mouse pointer. For this purpose you move the mouse pointer to the left edge of the area to be zoomed and press the left mouse button (continue pressing it). Drag the frame to the right edge of the desired area to be zoomed by pressing the left mouse button. When you release the left mouse button, the marked area is zoomed in.

Reset zoom

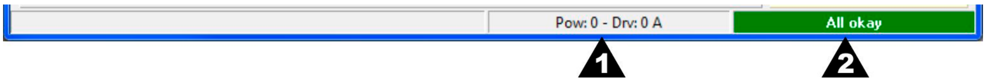
By mouse click on the button “Reset zoom” the whole graphic window is displayed again. The zoom can also be reset by a double-click on the graphic window or by means of the context menu of the graphic window.

Colors

The colors of the individual curves, the background, the grid and of the coordinate axes can be changed via the menu item “View → Colors”.

13.1.7 Status Bar

The status bar is divided into three fields, but only the two fields on the right side are used.



[1] Communication address
Address of the current device

- **Pow:** Address of the power supply unit
- **Drv:** Address of the drive

[2] Operating state or status of communication

- **Green display:** Online. The software is communicating with a device.
- **Red display:** Offline. Communicating with a device is not possible under the selected communication address.

13.2 *drive-setup-tool*

The program *drive-setup-tool* allows initial operation of a drive amplifier SD2x without addressing it by a control system. Via this page, some functions can be tested.

All values set in the *drive-setup-tool* are cleared in the device, as soon as the logic voltage is switched off.

☞ When you position the drive via setup tool, keep in mind that the drive receives its commands from the PC now. That means, in case of an unexpected malfunction of the setup software, a movement started by the PC can not be stopped anymore.

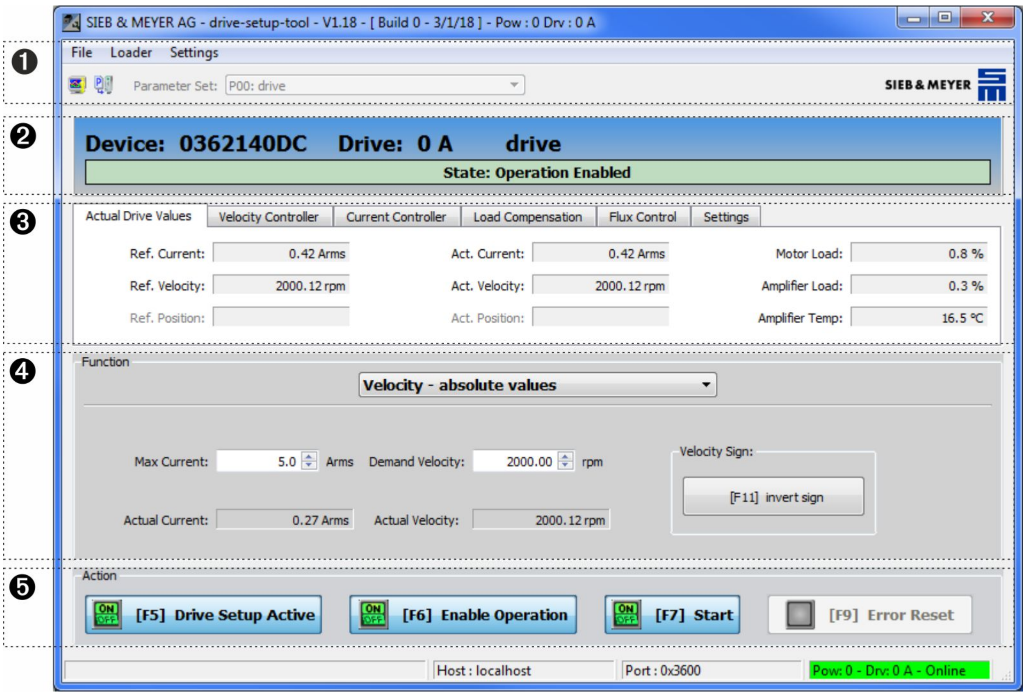


Fig. 122: drive-setup-tool

❶ Menu
The menu contains some additional functions for the *drive-setup-tool*.

❷ Status bar
The status display consists of 2 lines. The first line provides the following information: hardware designation, drive address (here: 0 A) and the name of the current parameter set. The colored status field in the second line indicates the current device status. For this purpose the status word in the device is analyzed:

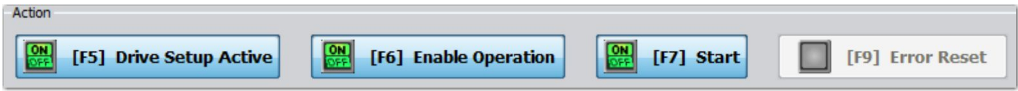
- green: no error (The current operating status is displayed.)
- yellow: offline (*drive-setup-tool* is offline or the device is not ready for operation.)
- red: error (The error with top priority is displayed.)

❸ Actual values and parameters
In this section you can change the device parameters for the test. In addition, the actual values are displayed here during the test.

❹ Function
In this section you can select the function of the test and relevant parameters.

❺ Action
Via the buttons in this section you can control the device via *drive-setup-tool*.

13.2.1 Action



This section contains the following buttons:

- [F5] Drive Setup Active (activates the initial operation in the device)
- [F6] Enable Operation (activates the controller)
- [F7] Start (starts the selected function and loads input values into the device)
- [F9] Error Reset (resets all remedied errors)

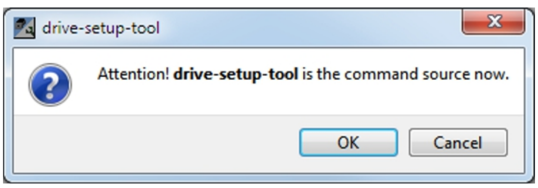
Depending on the device status the buttons can have the following states:

- disabled (gray)
- inactive (yellow)
- active (green)

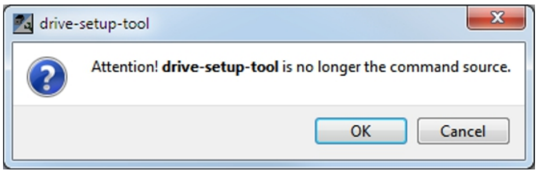
[F5] Drive Setup Active

It is necessary to activate the setup in the device to use *drive-setup-tool*. Then, the drive controller amplifier does not receive its commands from a control system or a field bus anymore but from the software.

Before activating the setup the following dialog appears. Its purpose is to warn the user saying that the control is now turned over to the PC in order to prevent that this action is carried out unintentionally.



Vice versa the following dialog warns the user when deactivating that the control is now turned over from the PC again.



[F6] Enable Operation

“Enable Operation” means that current is supplied to the connected motor. You can switch on the drive via this button as soon as the drive setup is activated and no error occurred.

[F7] Start

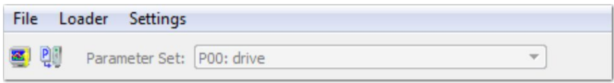
This button starts the selected function and loads all entered input values into the device. The "Start" button cannot be used until the drive is switched on.

By pressing the ESC key you can cancel the test anytime. When you press the ESC key, the power output stage of your drive will be switched off immediately.

[F9] Error Reset

This button can only be used when there is an error in the device. As soon as this error is removed, it is saved and can be reset by click on the button “Error Reset”.

13.2.2 Menu Description



The program menu of the *drive-setup-tool* provides the following functions:

- File:
  - *Oscar* : Opens the application Oscar in a new window. The Oscar is a diagnosis tool to be used for recording values and displaying these as graphs.
  - Close: The program is closed.
- Loader:
  - Write parameters to drive : Writes the parameters set in the *drive-setup-tool* into the drive and saves them.
- Settings:
  - Language: Selection of program language. The languages German and English are provided. The selected language is immediately active.
  - Parameter set: Select the desired parameter set for the test (only for devices with several parameter sets, see multi parameters, page 64)

13.2.3 Actual Values and Parameters

The section for actual values and parameters is made up of several tab pages. Depending on the drive function different tab pages are displayed:

Tab page	SERVO / VECTOR	HSPWM	HSBLOCK / FPAM	HSPAM / VF
Actual drive values	✓	✓	✓	✓
Position controller	✓ (1)	–	–	–
Velocity controller	✓	✓	✓	✓
Current feed forward	✓ (1)	–	–	–
Current ref. filters	✓	–	✓	–
Current controller	✓ (1)	✓	✓	–
Load compensation	–	✓	–	–
Flux controller	–	✓	–	–
Settings	✓	✓	✓	✓

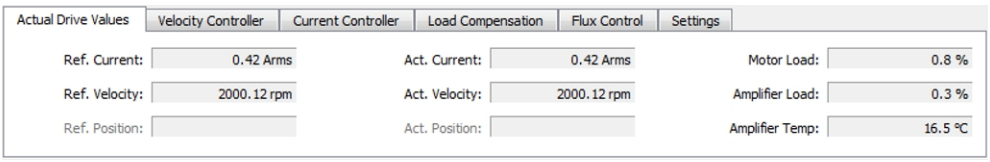
(1) Not displayed for special function SVC.

If you change a parameter, you must apply the new value with the ENTER key. Then, the new value is immediately active for operation.

In order to transfer the parameters changed in the *drive-setup-tool* to the drive parameter set, you must write them into the drive via the button .

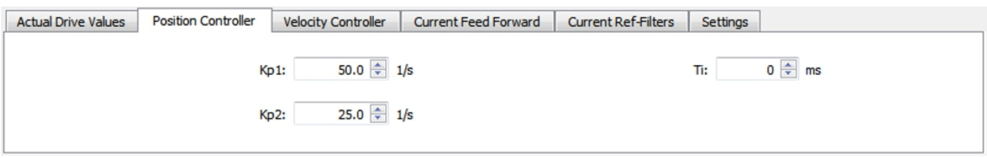
13.2.3.1 Actual drive values

This tab page contains a selection of actual values of particular importance. These values are read-only values.



13.2.3.2 Position Controller

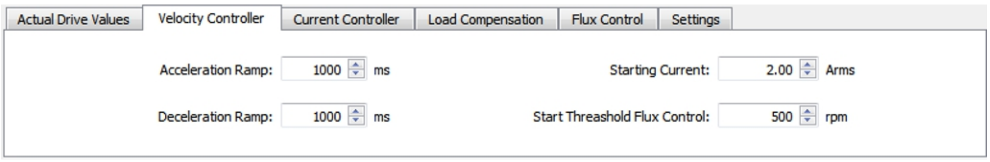
You can change the parameters of the position controller online. The new values are immediately active. The new parameters will only take effect on the drive control, when the operating mode is set to a position control (Profile Velocity Mode, interpolated position control or electronic gear).



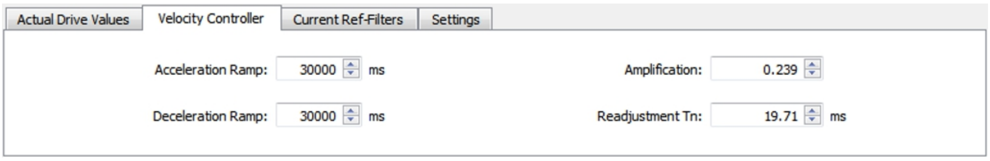
13.2.3.3 Velocity Controller

You can change the parameters of the velocity controller online. The new values are immediately active.

In the drive function HSPWM, you can check the ramps and the startup behavior via this tab page.

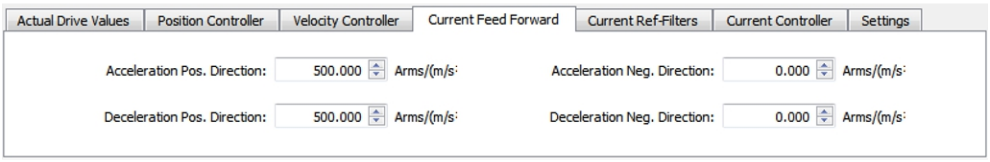


With any other drive function you can check the ramps and the control settings of the measuring system, if available, here.



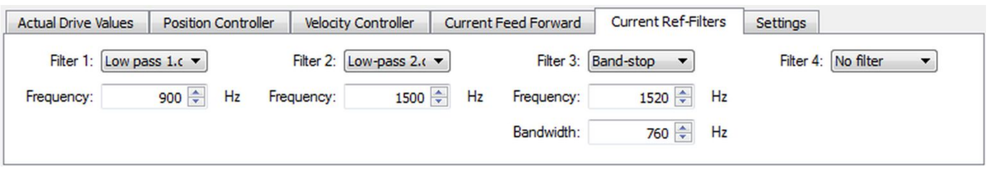
13.2.3.4 Current feed forward

You can change the parameters of the current feed forward online. The new values are immediately active.



13.2.3.5 Current Reference Filters

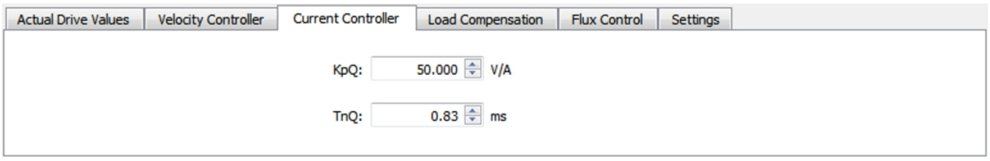
On this tab you can select on the operation of the four reference current filters in the drive: Select them to be active or not and if they should operate as Low-pass 1st/2nd order or Band-stop filter. The set filters are immediately active.



13

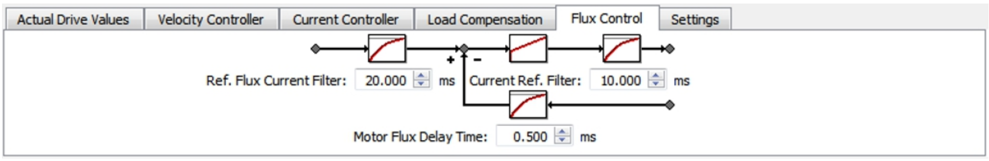
13.2.3.6 Current Controller

You can change the parameters of the current controller online. The new values are immediately active.



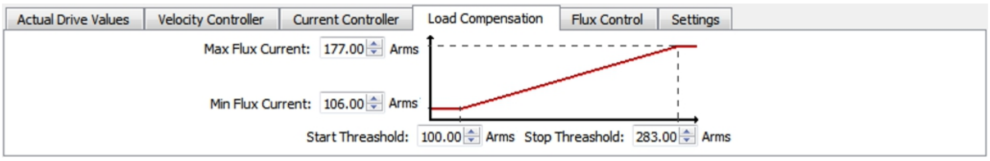
13.2.3.7 Flux controller

You can change the parameters of the flux controller online. The new values are immediately active.



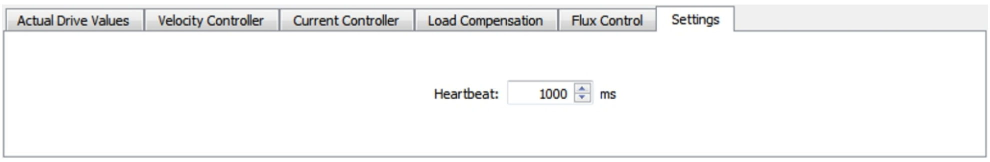
13.2.3.8 Load Compensation

You can change the parameters of the load compensation online. The new values are immediately active.



13.2.3.9 Settings

On this tab page you can set the heartbeat time of the drive. If you set the parameter to zero, the heartbeat monitoring is deactivated. The default value for the heartbeat time is 1000 ms.



By means of heartbeat monitoring the drive detects whether the tool *drive-setup-tool* is still active or not.

When the drive does not receive heartbeat messages within the set heartbeat time from the *drive-setup-tool*, it stops with a quick stop and switches over to the corresponding error status.

This way damage can be avoided, which might be caused when the motor moves and the communication between drive and *drive-setup-tool* is interrupted. In this case the user has no access to the drive from the software anymore.

13.2.4 Function

In this section you can select what is to be tested and how it is to be tested:

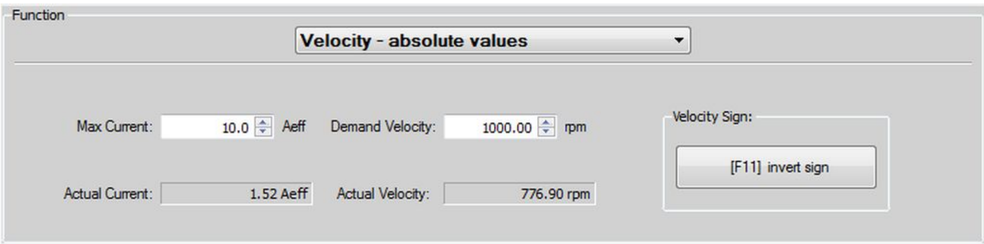
- Velocity - absolute values (presetting of a velocity)
- Velocity - reversing function (presetting of two velocities for reversing)
- Velocity - pushing (Presetting of a velocity for a defined period of time)
- Current - absolute values (presetting of reference current)
- Current - DC resolver offset (presetting of a DC reference current)
- Current - AC frequency (presetting of a reference current and a frequency)

You have access to the input fields as soon as the connection to the device is made (online) and the drive setup is active (button in the bottom left).

At first you must switch-on the controller to perform a function (button “Enable Operation”). This is only possible when there is no error. Errors already removed can be reset with the button “Error Reset”. By pressing the button “Start” the values in the input fields will be loaded into the device and the function will be performed.

13.2.4.1 Velocity - absolute values

This function allows operating the motor taking the maximum current into account. In addition, you can change the direction of movement (also) during operation via the button “[F11] invert sign”.



The new maximum current will immediately be active but the demand velocity will not be active until the button “Start” has been clicked. In addition, the actual current and the actual velocity are displayed to illustrate the current process.

13.2.4.2 Velocity - reversing function

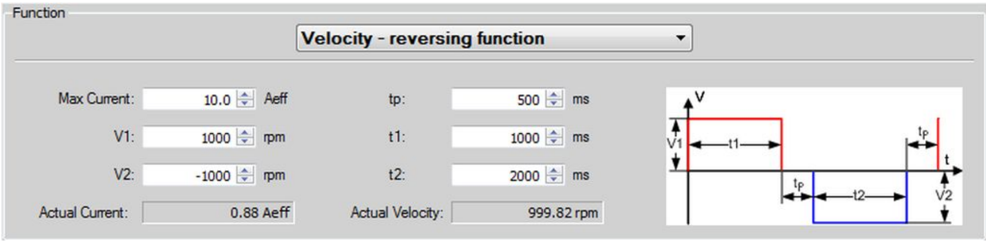
WARNING

Risk of injury while working with the reversing function

This function in particular needs to be handled carefully. Since the PC writes the values cyclically into the device, the actual time values may differ pretty much from the set time values and these may not be met. Consider the risk of injury while standing near to the motor or other machine parts.

Keep clear from the machine while moving the axes via the setup tool.

This function allows cyclic operation of the motor taking the maximum current into account.



In addition the actual current and the actual speed are displayed.

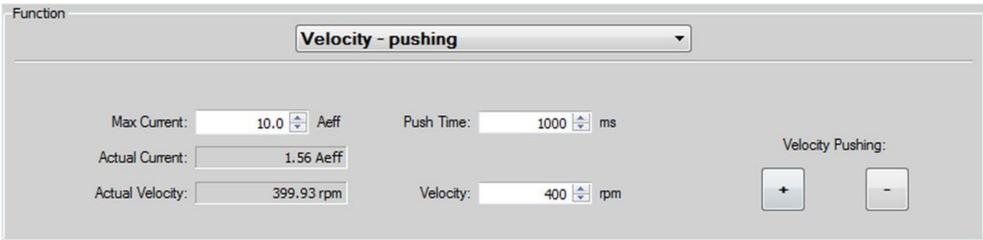
Sequence

First the motor is driven with the speed V1 for t1 ms. This is followed by a waiting period of the time tp with speed 0 (if tp = 0 there is no waiting period). Then, the motor is driven with the speed V2 for t2 ms, followed again by the waiting period tp.

This cycle is repeated continuously. When the time periods are set smaller than 50 ms, they will be treated like times of 0 ms, i.e. not existent.

13.2.4.3 Velocity - pushing

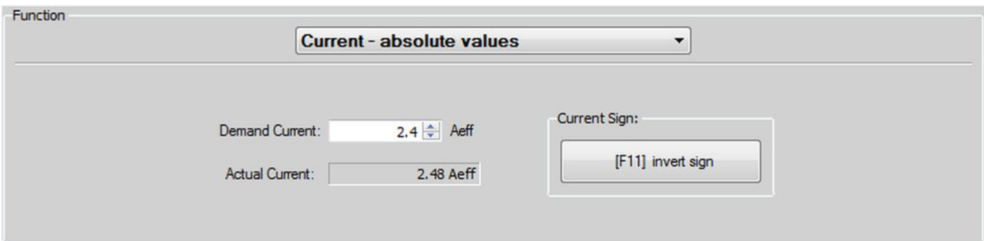
Taking the maximum current into account the motor can be driven with this function for a short time. If one of the buttons ’+’ or ’-’ is pressed (also the corresponding keys on the keyboard are possible), the motor moves with the set speed for the set period of time. If the button ’-’ is pressed, the sign of the velocity will be inverted.



In addition, the actual current and the actual velocity are displayed to illustrate the current process.

13.2.4.4 Current - absolute values

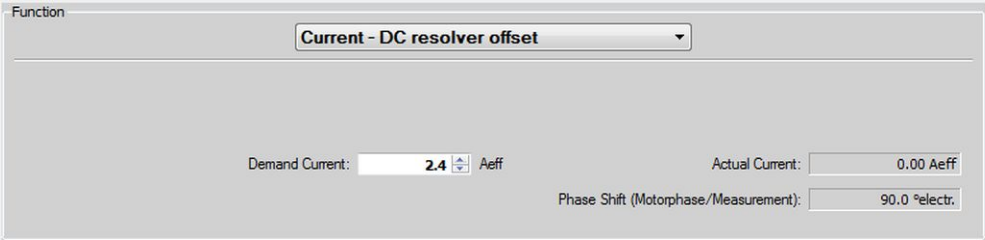
This function allows to supply the connected motor with a preset current. You can change the sign of the current by pressing the button “[F11] invert sign” (also when current is flowing).



In addition, the actual current is displayed to illustrate the current process.

13.2.4.5 Current - DC resolver offset

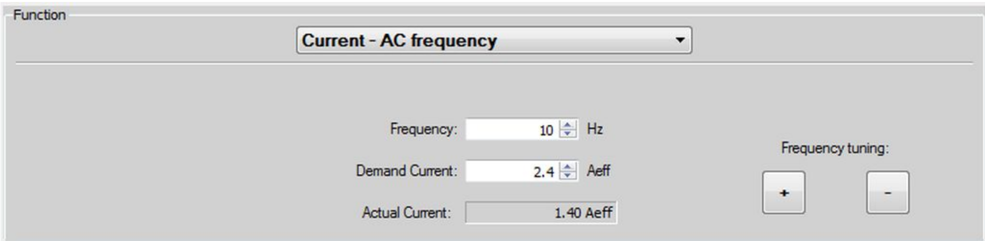
This function allows to supply the connected motor with a preset DC current. This function is only available when a resolver measuring system is specified in the parameters.



In addition, the actual current and the phase shift are displayed to illustrate the current process.

13.2.4.6 Current - AC frequency

This function allows to operate the connected motor with a preset current and frequency. By pressing one of the buttons ’+’ or ’-’ (also the corresponding keys on the keyboard are possible) the frequency will be changed by 1 Hz accordingly.



In addition, the actual current is displayed to illustrate the current process.

13.3 *converter-setup-tool*

The program *converter-setup-tool* allows initial operation of a frequency converter FC2 without addressing it by a control system. Via this page, some functions can be tested.

All values set in the *converter-setup-tool* are cleared in the device, as soon as the logic voltage is switched off.

When you position the drive via setup tool, keep in mind that the drive receives its commands from the PC now. That means, in case of an unexpected malfunction of the setup software, a movement started by the PC can not be stopped anymore.

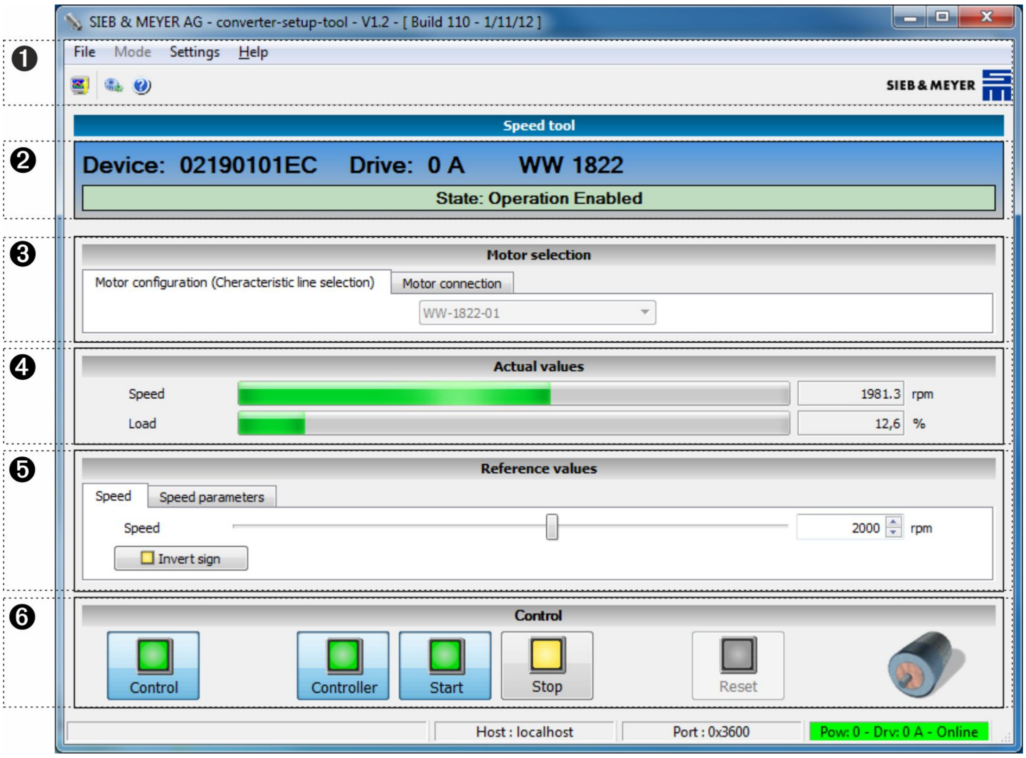


Fig. 123: converter-setup-tool

❶ Menu
The menu contains some additional functions for the *converter-setup-tool*.

❷ Status bar
The status display consists of 2 lines. The first line provides the following information: hardware designation, drive address (here: 0 A) and the name of the current parameter set. The colored status field in the second line indicates the current device status. For this purpose the status word in the device is analyzed:
- green: no error (The current operating status is displayed.)
- yellow: offline (*converter-setup-tool* is offline or the device is not ready for operation.)
- red: error (The error with top priority is displayed.)

❸ Motor selection
In this section you select the motor configuration and the spindles to be operated simultaneously.

❹ Actual Values
In this section the actual values are displayed during the test.

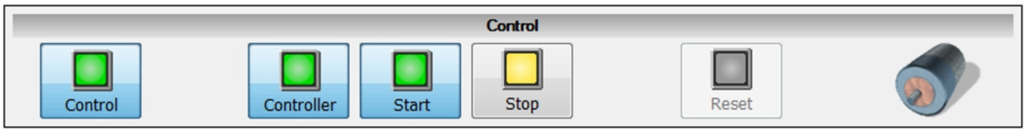
❺ Reference values
In this section you set the reference values for the test.

❻ Control
Via the buttons in this section you can control the device via *converter-setup-tool*.

13.3.1 Control

This section contains the following buttons:
- PC (activates the initial operation in the device)
- Controller (activates the controller)
- Start (starts the device with the set reference values)
- Stop (stops the device)

- Reset (resets all remedied errors)

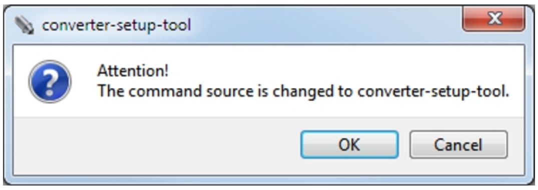


Depending on the device status the buttons can have the following states:
- blocked (gray)
- inactive (yellow)
- active (green)

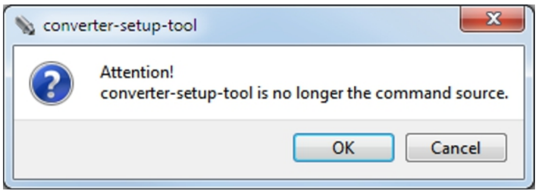
PC

It is necessary to activate the setup in the device to use the *converter-setup-tool*. Thus the frequency converter does not receive its commands by a control system or a field bus anymore but expects them from the software.

Before activating the initial operation the following dialog appears. Its purpose is to warn the user saying that the control is now turned over to the PC in order to prevent that this action is carried out unintentionally.



Vice versa the following dialog warns the user when deactivating that the control is now turned over from the PC again.



Controller

Via this button, the output stage of the frequency converter is activated or deactivated. If the controller is deactivated while a motor is running, the motor can not be controlled by the frequency converter anymore and coasts to standstill uncontrolled.

Start

Via this button the frequency converter is started and the selected motors are accelerated to the set speed.

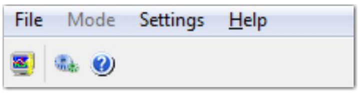
Stop

Via this button the selected motors are decelerated to speed zero.

Reset

Via this button, a previous error message can be reset.

13.3.2 Menu Description



The program menu of the *converter-setup-tool* provides the following functions:

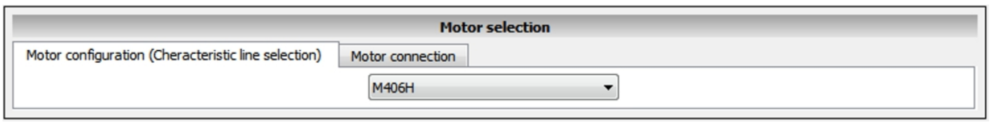
- File:
  - *Oscar* : Opens the application Oscar in a new window. The Oscar is a diagnosis tool to be used for recording values and displaying these as graphs.
  - Exit: The program is closed.
- Operating Mode: This menu item is not active at present.
- Settings :
  - Language: Selection of program language. The languages German and English are provided. The selected language is active immediately.
  - Communication: Setting the heartbeat time. If you set the parameter to zero, the heartbeat monitoring is deactivated. The default value for the heartbeat time is 1000 ms.
    By means of heartbeat monitoring the drive detects whether the tool *converter-setup-tool* is still active or not. When the drive does not receive heartbeat messages within the set heartbeat time from the *converter-setup-tool*, it stops the drive with a quick stop and switches over to the correspon-ding error status. This way damage can be avoided, which might be caused when the motor moves and the communication between drive and *converter-setup-tool* is interrupted. In this case the user has no access to the drive from the software anymore.
- Help:
  - Help : Opens the online help for *converter-setup-tool*.
  - About: Displays version information of the software and the contact address of SIEB & MEYER.

13.3.3 Motor Selection

The motor selection is divided into the motor configuration (selection of the character-istic curve) and the motor selection.

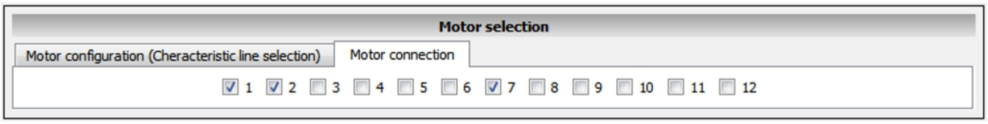
Motor configuration (selection of the characteristic curve)

The drive organizes two motor configurations, which can be selected via a list box. The list box contains the names defined in the parameters.



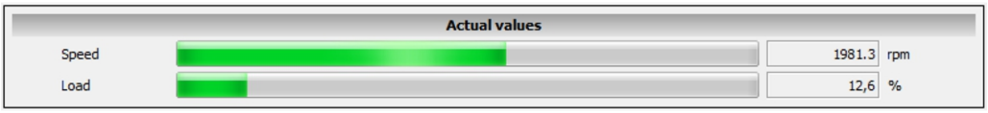
Motor selection

The FC2 allows the operation of 12 spindles at the same time. The spindles are selected and deselected by selection and deselection of the corresponding number.



13.3.4 Actual Values

The section “Actual values” displays the actual “Speed” and the actual “Load” graphically and numerically.



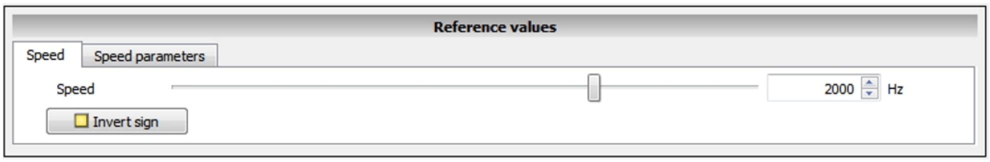
13.3.5 Reference values

The section “Reference values” is divided into the tabs “Speed” and “Speed parameters”.

If you change a reference value, you must apply the new value with the ENTER key. Then, the new value is immediately active for operation.

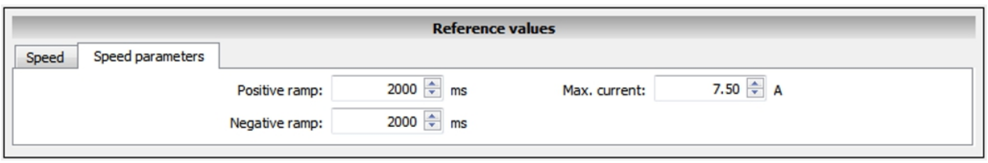
Speed

The speed of the motor can be modified via the adjusting button or by entering the value into the text box behind the adjusting button. In order to change the direction of rotation, click the button “Invert sign”.



Speed parameters

This tab page allows to set the speed parameters.



- Positive ramp:
  The parameter indicates the acceleration of the motor spindle in *milliseconds* during increasement of the actual speed.
- Negative ramp:
  The parameter indicates the deceleration of the motor spindle in *milliseconds* during reduction of the actual speed.
- Max. current:
  The parameter indicates the current limitation for speed operation in *amperes*.

13.4 Motor Analyzer

With Motor Analyzer users can simulate the operating points and the expectable ripple currents that result from the interaction of motors or spindles with the respective drive amplifier.

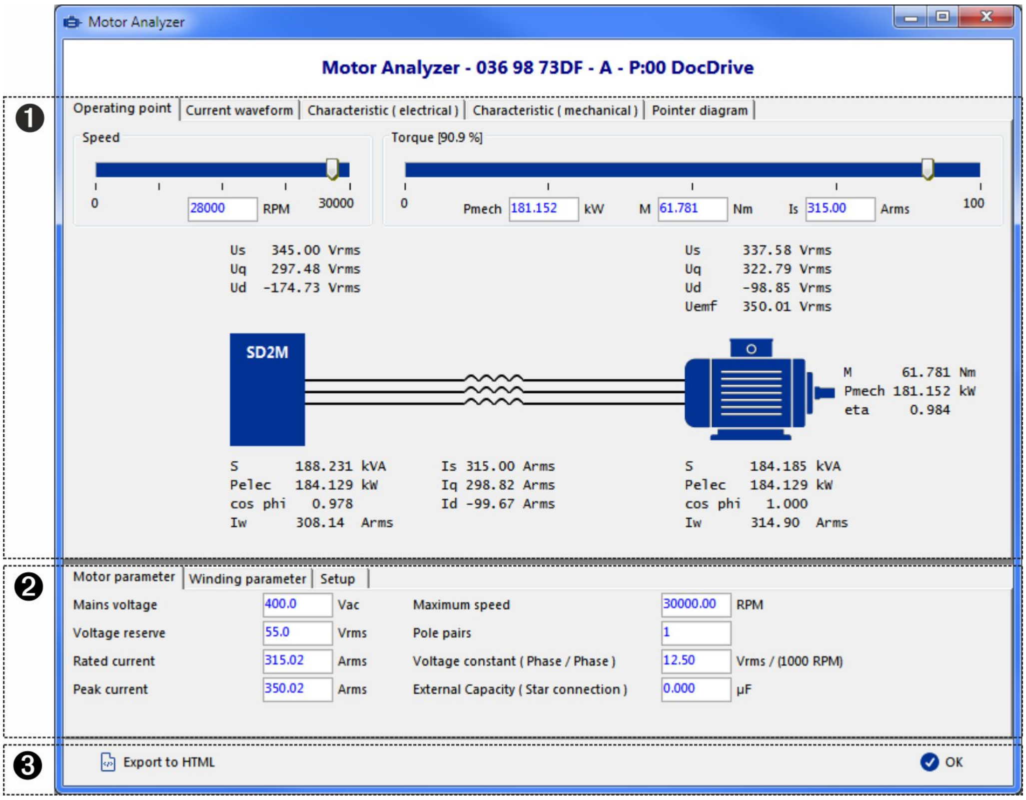


Fig. 124: Motor Analyzer

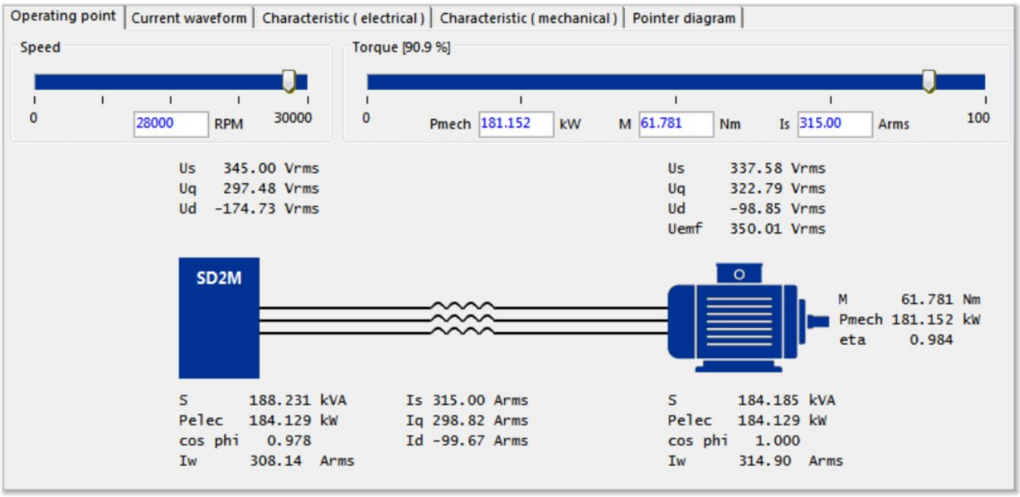
❶ Display area
The simulation display is arranged in different tab pages. Motor Analyzer opens with the tab page “Operating point”.

❷ Parameters
The relevant parameters for motor and drive amplifier are arranged in corresponding tab pages in the bottom part of the page. The parameters are taken from the *drivemaster2* user interface. If you change the parameter values in Motor Analyzer, the simulation is adapted accordingly. The changed values are not automatically applied to the *drivemaster2* user interface.

❸ Bottom bar
The bottom bar provides the following buttons:
- Export to HTML: Creates a HTML file with the simulation data and graphs.
- OK: Exits Motor Analyzer and the simulation.

13.4.1 Operating Point

Via the tab page “Operating point” you can simulate different operating points of your system. The page displays the electrical and mechanical values to be expected:

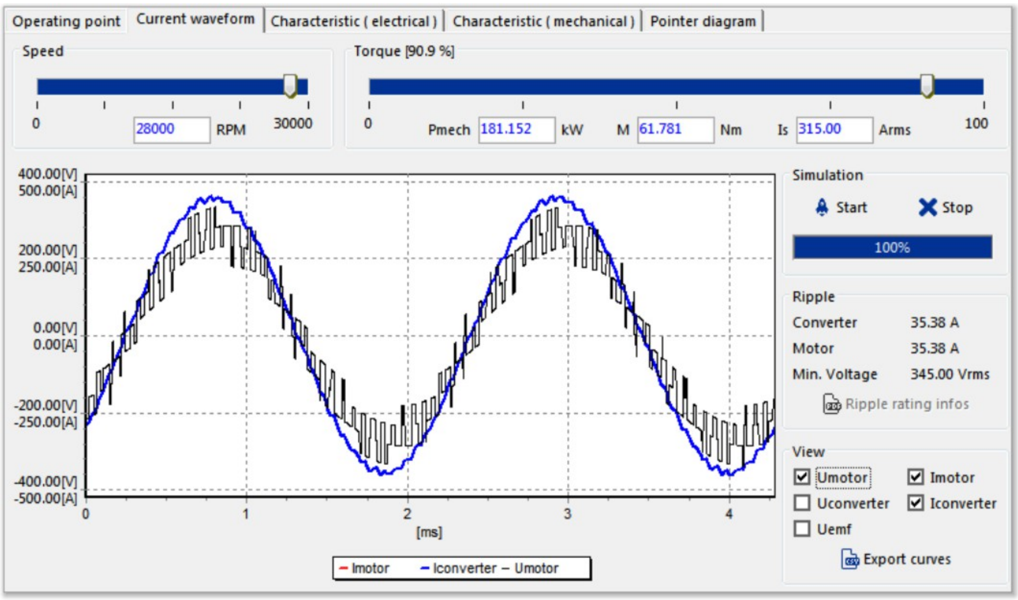


➩ In the top section of the tab page you specify the desired operating point. For this purpose you can use the slide control for speed and torque or the input field below them.
You can set the torque either relatively by means of the slide bar or as absolute value by means of the mechanical power (Pmech), the motor torque (M) or the apparent current (Is).

✓ After setting you can view the values to be expected: The values for the SD2x drive are displayed on the left side of the page and the motor value are on the right side. If no motor filter is specified, the values are the same on both sides.

13.4.2 Current Waveform

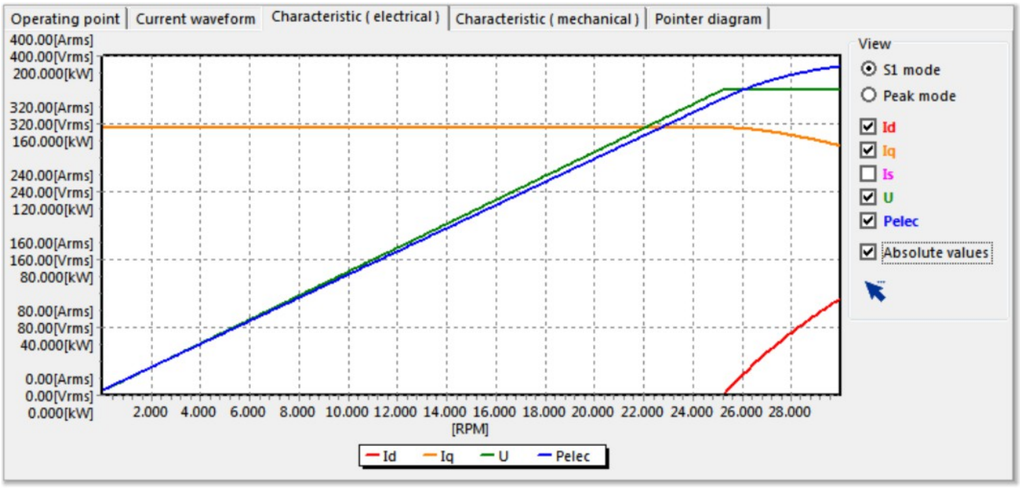
On the tab page “Current waveform” you can graph the current and the voltage curves for the selected operating point:



- ➪ In the top section of the tab page you can change the desired operating point, if necessary.
- ➪ Click on the button “Start” next to the diagram.
- ✓ After a short processing time, the current und voltage curves are displayed in the diagram. To the right of the diagram, the following values and options are available:
  - The section “Ripple” displays the ripple currents to be expected as well as the minimum voltage.
  - In the section "“View”", you can select the current and voltage curves that you want displayed in the diagram.
  - Use the button “Export curves” to save the displayed curve values in a CSV file. You can read and edit csv files e.g. using the program Microsoft Office Excel.

13.4.3 Characteristics (Electrical)

The tab page “Characteristics (electrical)” displays the electrical characteristic curves of the selected operating point:

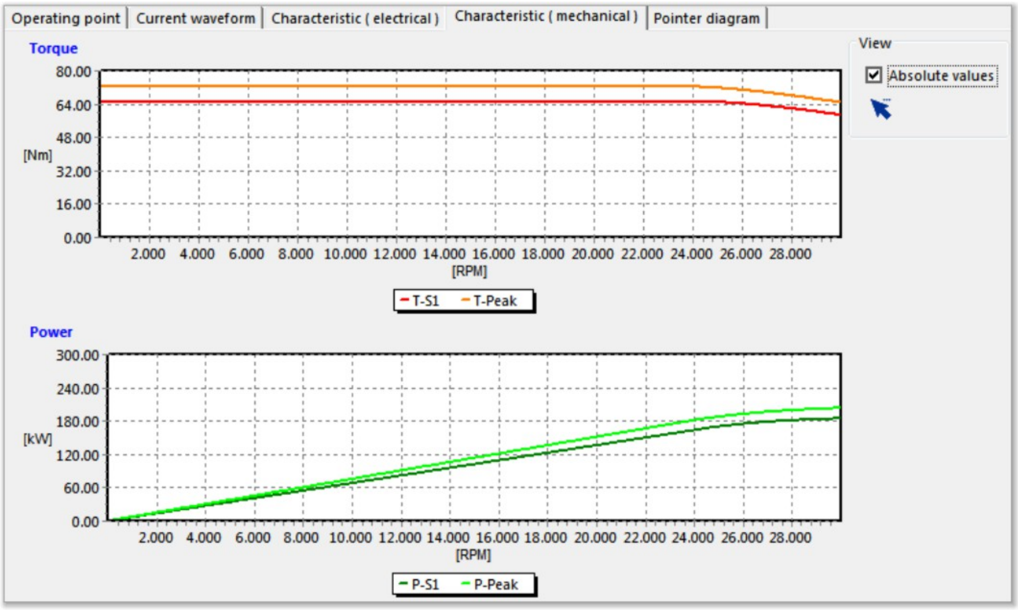


- ➪ To the right of the diagram, you select the operating mode as well as the electrical quantities to be displayed. In addition, you can determine whether or not absolute values are to be used.
- ✓ The diagram displays the selected quantities in proportion to the speed.

13

13.4.4 Characteristics (Mechanical)

The tab page “Characteristics (mechanical)” displays the mechanical characteristic curves of the selected operating point:

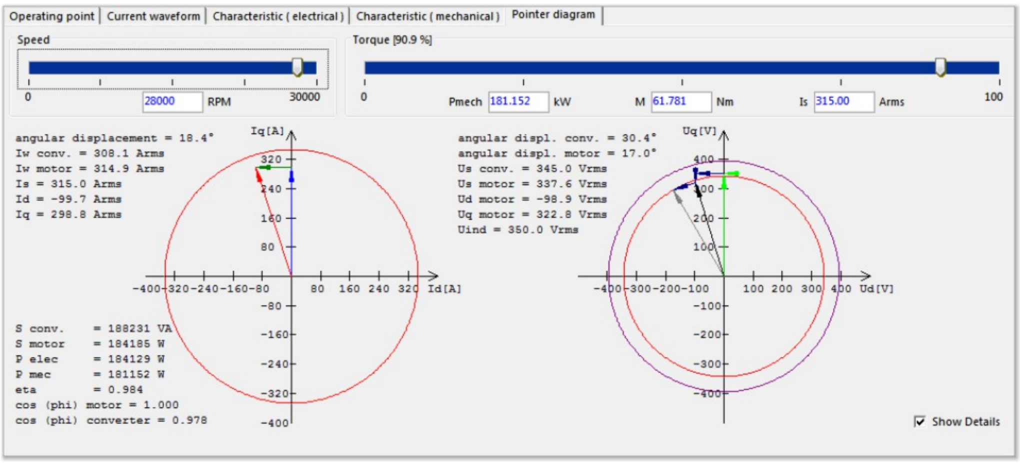


➩ To the right of the diagram, you can determine whether or not absolute values are to be used.

✓ The upper diagram shows the toque to speed ratio and the lower diagram shows the power to speed ratio.

13.4.5 Pointer Diagram

On the tab page “Pointer diagram” you can view the pointer diagrams for current and voltage for the selected operating point:



➩ In the top section of the tab page you can change the desired operating point, if necessary.

✓ The pointer diagram on the left side shows the currents for the operating point, the right digram shows the voltages. In addition, the page displays all electrical and mechanical values to be expected.

13

13.5 *spindle-service-tool*

The program *spindle-service-tool* allows an automated and monitored execution of spindle running-in cycles. Thus, you can put spindles without an external control into operation, even when they require individual and defined running-in cycles like spindles with ball bearings.

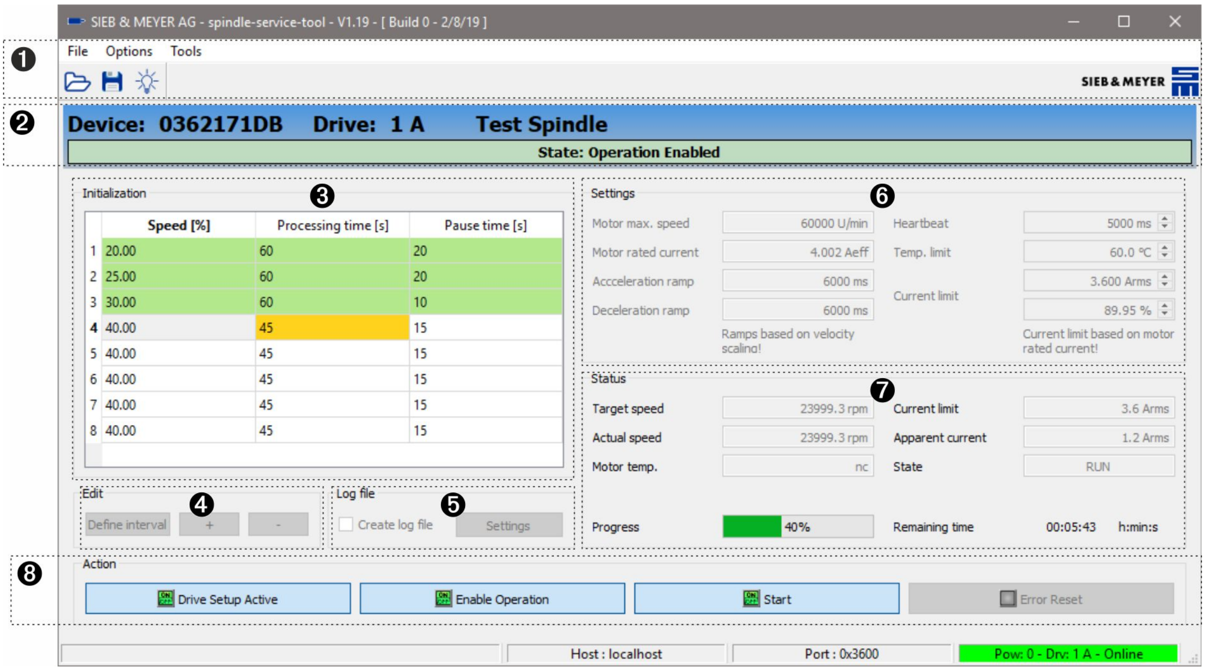


Fig. 125: spindle-service-tool

❶ Menu
The menu contains some additional functions for the *spindle-service-tool*.

❷ Status bar
The status display consists of 2 lines. The first line provides the following information: hardware designation, drive address (here: 0 A) and the name of the current parameter set. The colored status field in the second line indicates the current device status:

- green: no error (The current operating status is displayed.)
- yellow: offline (*spindle-service-tool* is offline or the device is not ready for operation.)
- red: error (The error with top priority is displayed.)

❸ Initialization
This section contains the running-in cycle of the spindle in the form of a table.

❹ Edit
By means of the buttons in this section, you can edit the table with the running-in cycle.

❺ Log file
In this section you can generate a log file about the running-in of the spindle.

❻ Settings
This section indicates the limit values for the running-in of the spindle.

❼ Status
This section displays the current status of the spindle during running-in.

❽ Action
Via the buttons in this section you can control the device via *spindle-service-tool*.

13.5.1 Action

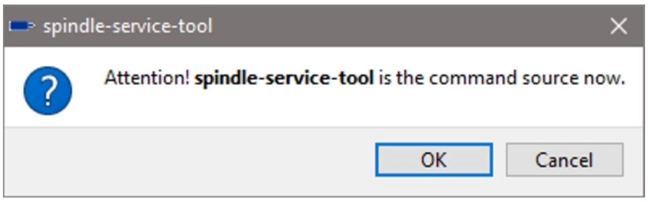
This section contains the following buttons:
- Drive Setup Active (activates the setup in the device)
- Enable Operation (activates the controller)
- Start (starts the running-in of the spindle)
- Error Reset (resets all remedied errors)

Depending on the device status the buttons can have the following states:
- disabled (gray)
- inactive (yellow)
- active (green)

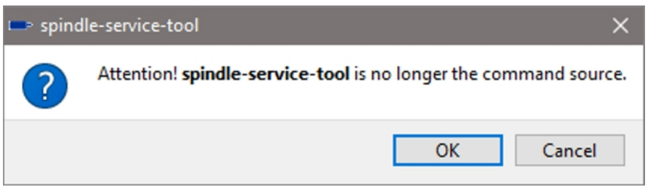
Drive Setup Active

It is necessary to activate the setup in the device to use *spindle-service-tool*. Then, the drive controller does not receive its commands from a control system or a field bus anymore but from the software.

Before activating the setup the following dialog appears. Its purpose is to warn the user saying that the control is now turned over to the PC in order to prevent that this action is carried out unintentionally.



Vice versa the following dialog warns the user when deactivating that the control is now turned over from the PC again.



Enable Operation

“Enable Operation” means that current is supplied to the connected spindle. You can switch on the controller via this button as soon as the drive setup is activated and no error occurred.

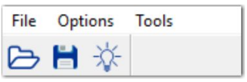
Start

This button starts the running-in of the spindle. The "Start" button can not be used until the controller is switched on.

Error Reset

This button is only active when an error occurred in the device. As soon as this error is removed, it is saved and can be reset by click on the button “Error Reset”.

13.5.2 Menu Description



The program menu of the *spindle-service-tool* provides the following functions:

File
- Read table: Opens a dialog to load a saved running-in cycle from a file. The file extension of running-in cycles is *.ini.
- Save table: Opens the dialog to save the current running-in cycle in a file (file extension *.ini).
- Close: Closes the program.

Options
- Language: Selection of program language. The languages German and English are provided. The selected language is immediately active.

Tools
- SDx Datalogger: Opens the application SDx Datalogger in a new window. SDx Datalogger is a data recorder that you can use to record up to 4 parameters relevant during running-in of the spindle.

13.5.3 Create/Save Running-in Cycle

The running-in cycle for a spindle is defined in the form of a table. Each table row contains one interval of the running-in cycle.

One interval consists of the following values:
- speed [% of the rated speed]
- processing time [s] that the spindle is to be operated at the specified speed
- pause time [s] that is to be waited after the processing time

At the first start of the program *spindle-service-tool* the default table is displayed. The default table is stored as “SpindleServiceDefaultTable.ini” in the directory “SM_Ini” of the *drivemaster2* installation path. Afterwards, the last saved table is displayed at the program start, if available.

You can change and add to the table as described in the following:

Change values

➪ Double-click a value in a table cell to edit it.

Add interval

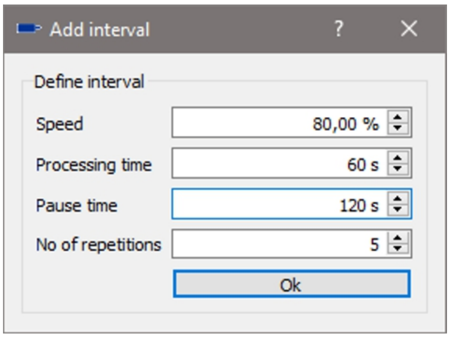
You can add and edit a new interval directly in the table or via a dialog window. In the second case, you have the option of repeating the interval several times.

Edit table

- Click the button “+” in the section “Edit” to add a table row. If the new table row is to be inserted at a specific position, you must select the entire row above beforehand. Otherwise the new row will be added at the end of the table.
- Then double-click each cell to enter the interval values.

Dialog window “Define interval”

- Click the button “Define interval” in the section “Edit”. A dialog window to enter the interval appears.
  - Enter the interval parameters. In addition, you can define the number of repetitions for the interval.
  - Click the button “OK” to copy your entries to the table. The new interval and its repetitions, if defined, are added at the end of the table.



Delete interval

- Select the entire table row of the interval that you want to delete. You can also select several table rows for deletion.
- Click the button “–” in the section “Edit”. The selected table row is deleted. If you did not select a table row beforehand, the last row of the table is deleted.

Save table

When you have finished the table with the running-in cycle, you can save it via the menu “File → Save table” (file extension *.ini). The syntax in the ini file is structured as follows:

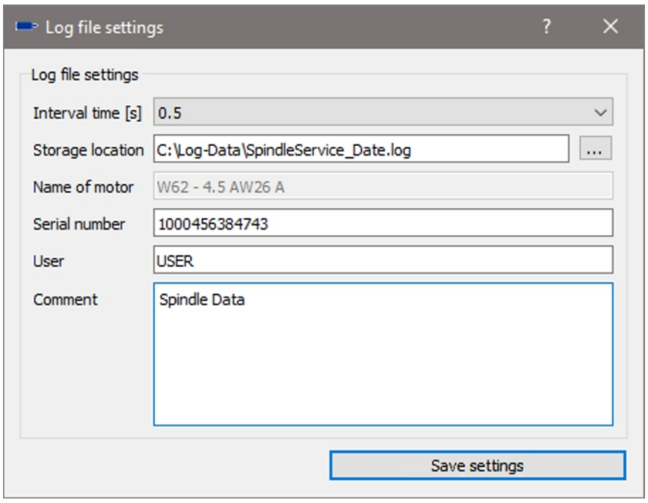
`[Sequence0]`	First row of the table (= interval 1)
`Init00=20`	Speed [%] in interval 1
`Init01=60`	Processing time [s] in interval 1
`Init02=20`	Pause time [s] in interval 1
`[Sequence1]`	Second row of the table (= interval 2)
`Init10=25`	Speed [%] in interval 2
`Init11=60`	Processing time [s] in interval 2
`Init22=20`	Pause time [s] in interval 2

The sequences are consecutively numbered starting at 0. The number of the sequence corresponds to the first digit of the number in the key word “Init”.

13.5.4 Create Log File

If you want to log the spindle values during running-in, you can generate a log file. For this purpose proceed as follows:

➪ Activate the check box “Create log file” in the *spindle-service-tool*. A dialog for the log file settings appears.



– Define the interval time [s] at which the spindle values are to be logged.
– In addition, you can change the storage location and enter a serial number, the user as well as a comment. The motor name is taken from the parameter set.
– Click the button “Save settings” to apply your entries.

✔ During running-in of the spindle the log file saves the actual spindle status with target speed, actual speed and apparent current at the frequency set in the interval time [s].

13.5.5 Define Limit Values

The limit values for running-in of a spindle are partly taken from the parameter set (left side of the section “Settings”) and cannot be edited. These values include the acceleration ramp and the deceleration ramp.

The limit values to the right side of the section “settings” contain default values for the heartbeat time, the temperature limit and the current limit for the ramp stop (in Aeff and %). You can adapt these values for the individual spindle.

Heartbeat

By means of heartbeat monitoring the drive detects whether the tool *spindle-service-tool* is still active or not. When the drive does not receive heartbeat messages within the set heartbeat time from the *spindle-service-tool*, it stops with a quick stop and switches over to the corresponding error status.

This way damage can be avoided, which might be caused when the spindle runs and the communication between drive and *spindle-service-tool* is interrupted. In this case the user has no access to the drive from the software anymore.

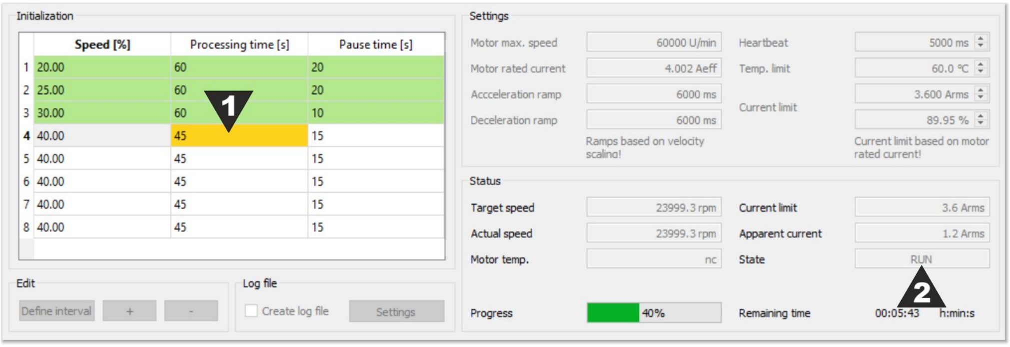
13.5.6 Running-in the Spindle

When you have created the table with the running-in cycle and set the limit values as well as the log file as required, you can carry out the running-in of the spindle as follows:

➪ Click the button “Enable Operation” in the section “Action” to activate the controller.
➪ Start the running-in via click on the button “Start” in the section “Action”.

By pressing the ESC key you can cancel the running-in process anytime. When you press the ESC key, the power output stage of your drive will be switched off immediately.

✓ The following figure shows the *spindle-service-tool* during running-in of the spindle.



The running-in progress is highlighted in color in the table to the left: All completed intervals are highlighted in green color, in the current interval the respective processing step is highlighted orange **[1]**.
In the section “Status” you can check the actual speed, the motor temperature and the currents. A progress bar indicates the completed part of the running-in process [%]. In addition, the remaining process time is displayed.
During running-in the following spindle states are indicated **[2]**:

- RAMPUP: acceleration phase
- RUN: stationary running-in phase
- RAMPDOWN: deceleration phase
- PAUSE: pause phase
- END: end of running-in the spindle
- RAMPSTOP: interruption of the acceleration, maintain current speed

13.6 *comparer*

comparer is a file comparison tool used to compare 2 parameter files.

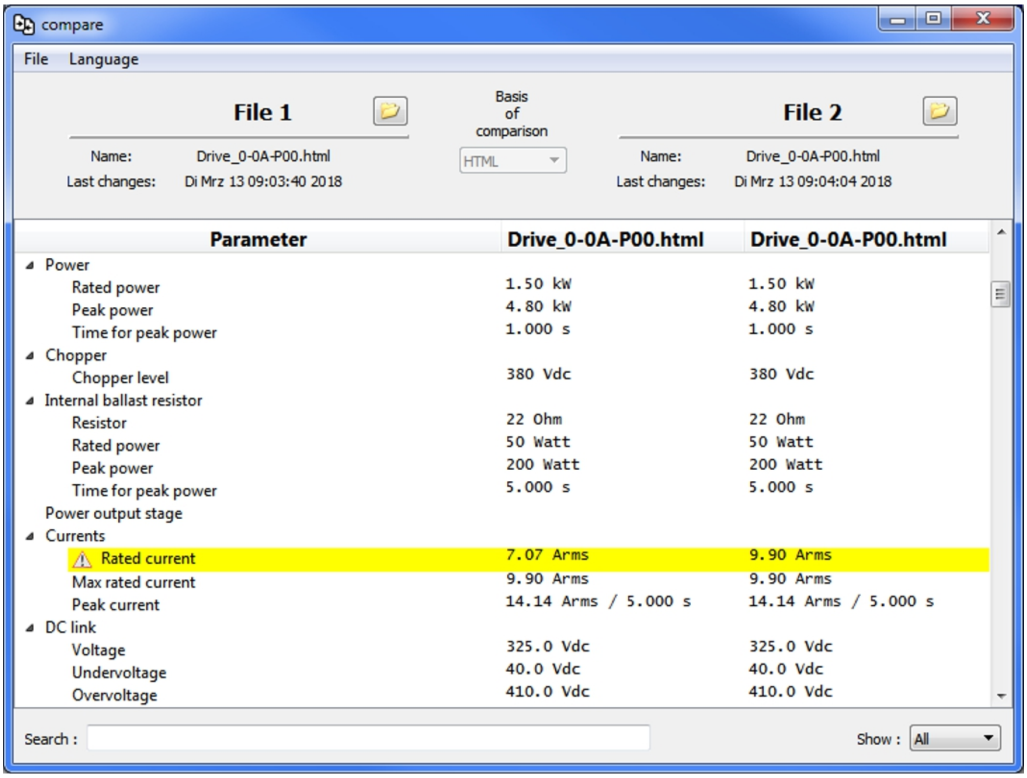


Fig. 126: comparer

- Select the files 1 and 2 to be compared via the button on each side or via the menu “File → Open parameter file → File 1/2”.
  The differences between the files are highlighted in yellow.
- If you want to see the differences between the selected files only, select the option “Changes” in the selection list “Show” in the bottom right.
- Use the search field in the bottom left to search for particular parameters by name.

13

13.7 SDx Datalogger

Using the tool SDx Datalogger you can record and document up to four drive parameters over a longer period of time.

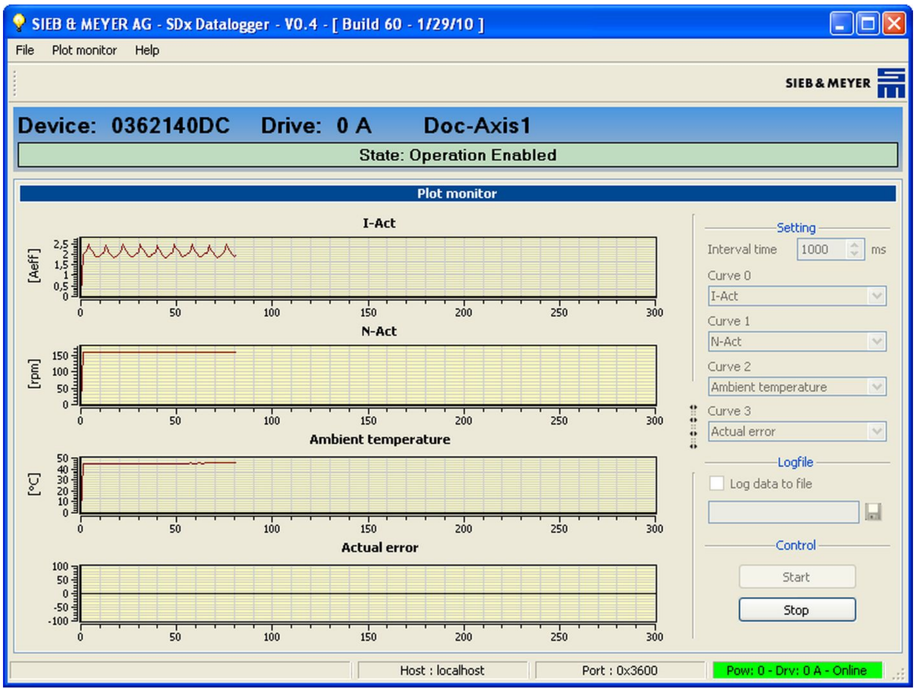
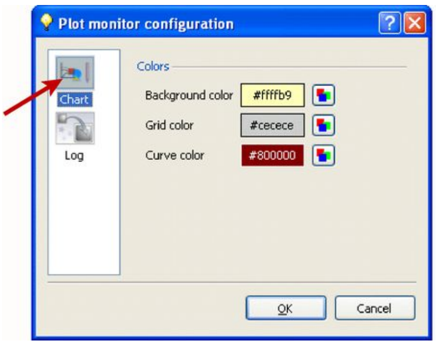
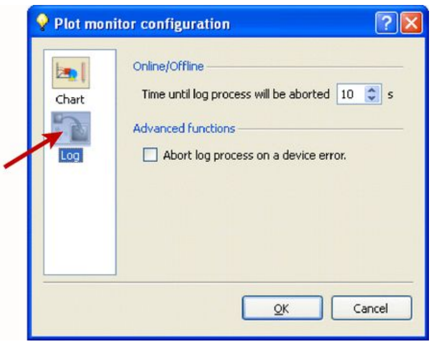


Fig. 127: SDx Datalogger

Program settings

Via the menu "Plot monitor → Settings" you open the dialog "Plot monitor configuration". Here you can set the program behavior of the tool.





- Chart: Selection of program colors.
- Log: Behavior in case of a drive switch-off
  - Set the time after which the record is stopped, in case the drive switches into the offline mode.
  - Define whether the record shall be stopped in case of a drive error or not.

Record data

Proceed as follows to record the drive data:

➪ In the field "Settings" on the right side of the user interface you find the list boxes Curve 0–3. Select up to 4 drive parameters to be recorded via these list boxes.

➪ Enter the interval time. It defines the time between two recorded values. The minimum time value that can be set is 100 ms.

If you need to record values with higher frequency you can use the program Oscar, page 245.

- If you need to save the measured values, you can select a file and directory in the section "Logfile". The data are saved in ASCII format (measured values are divided by the tab character ASCII:09).
- Click on the button "Start" to start the data recording function.
  You can display individual measuring values in the recorded curves by pushing left-hand mouse button. The first value indicates the interval counter (X-axis) and the second value displayes the measured value (Y-axis).
- Click on the button "Stop" to stop the data recording function. Via the menu "Plot monitor → Print record" you can print the current records.

13.8 *hiper-endat-tool*

The tool *hiper-endat-tool* is used to display and set a sine/cosine encoder with Hiperface or EnDat interface. This type of encoder provides a digital channel in addition to the analog sine/cosine channel. Via the digital channel the absolute value of the encoder can be read.

Furthermore the product data (resolution, serial number etc.) of the encoder are displayed in the *hiper-endat-tool*.

Hiperface and EnDat are registered trademarks:

- Hiperface – Sick/Stegmann (Germany)
- EnDat – Heidenhain (Germany)

NOTICE

Wiring of the measuring systems Hiperface or EnDat

Incorrect wiring of the measuring system may cause damage and destroy the measuring system.

Before configuring the Hiperface or the EnDat encoder ensure that the motor and the measuring system are wired correctly. For this purpose select a sine/cosine encoder with magnetic alignment (without Hiperface or EnDat) under "Parameters → Motor measuring system" in the *drivemaster2* software. If the motor moves with this setting, you can select the corresponding absolute value encoder (Hiperface or EnDat).

Setup of a sine/cosine encoder with Hiperface/ EnDat

When you operate a motor with absolute value encoder for the first time, some data, that are important for the drive, must be read from the Hiperface or EnDat encoder and saved once.

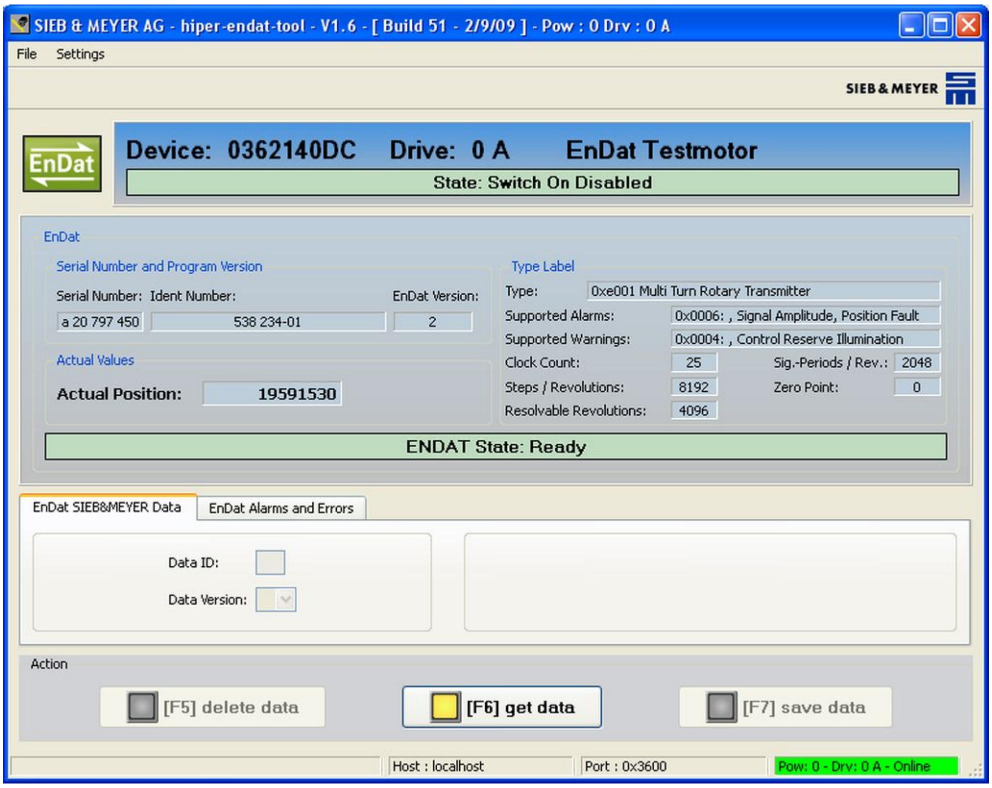


Fig. 128: hiper-endat-tool

➪ Click the button “[F6] detect data” for this purpose. During data detection current is applied to the motor for a short time in order to determine the commutation offset. (Before current is applied to the motor a dialog window is displayed to warn you.)

➪ When the data detection was successful, the detected data must be applied to the permanent memory of the encoder. Click the button “[F7] save data” for this purpose.

✔ The encoder now switches to the operating mode “Ready” and can be used by the drive.

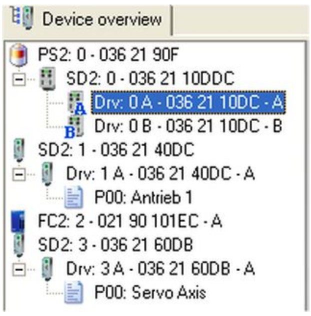
14 Working with Projects

All parameters required for operating a drive are combined in one parameter set.

The software *drivemaster2* allows managing several parameter sets at the same time by combining several drive amplifiers and power supply units in one project.

Projects simplify the work with several devices by the following functions:
- A project can be saved in a project file. The project file contains the used devices and the corresponding device addresses. (The device addresses are required for the communication.) In addition, the parameter files of all device are stored in the project directory.
- The parameter files of a project can be downloaded into the designated devices in a single pass.
- Already saved projects can be read from the project file and the parameter sets are read from the corresponding parameter files.
- The online mode allows creating a project automatically by searching for connected devices.
- In the offline mode a project can be created by means of the project wizard.
- The device addresses for the communication can be changed by means of the project wizard.

In the software *drivemaster2* projects are displayed in a tree structure on the tab page “Device overview”. As usual, the tree structure is hierarchical.
- Device of the series SD2 can consist of several drives. For this reason the drives of an SD2 are subordinated to one common device in a project.
- Devices which communicate with the software via a PS2 are subordinated to this power supply unit in the project.



The name of the project is displayed in the status bar on the left:

Projects that have been created by searching connected devices, will automatically be named “Online project”.

14.1 Project Files and Project Paths

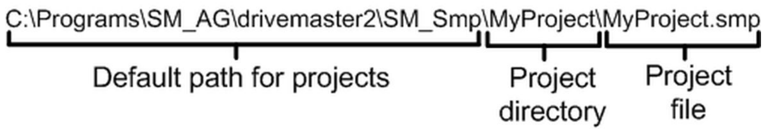
The software *drivemaster2* saves project files with the file extension *.smp.

Saving the project file in any directory is not possible. The following rules must be observed:
- A project file is always saved in a project directory, which has the same name as the project file.

- The project directory is created in the default path for projects. Several project directories can be saved in the default project path. You can select any directory as default project path. The default directory is “sm_smp” in the installation path of the software *drivemaster2*.

Example

We assume that you want to save a project under the name “MyProject”. The software is installed in the target directory “C:\Program Files\SM_AG\drivemaster2”. The following project path will be suggested:



The file selection dialogs for project files consider this name convention automatically.

The parameter files for the individual drives are also saved in the project directory. If you want to archive a complete project, just file the complete project directory. If you want copy a filed project back to the original path, just copy the project directory back to the default path for projects.

Summary of file types used for projects

When a project is saved both the project file and the parameter files are saved. The project file refers to the individual parameter sets, that means to the individual parameter files. The motor data is already included in the parameter sets. Furthermore it is possible to save additional motor files with just the motor data.

The relations are displayed in the following figure:

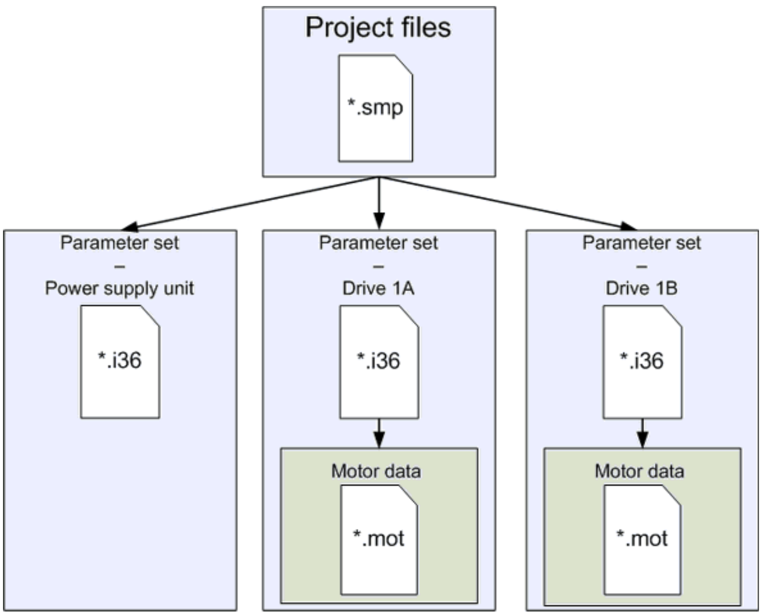
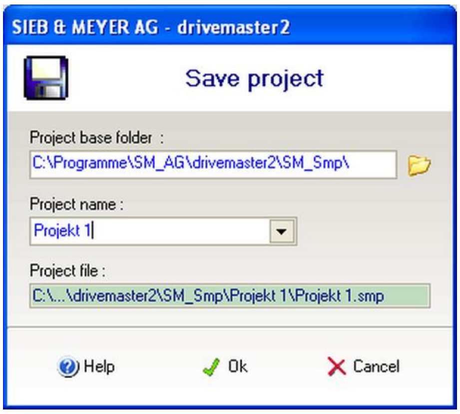


Fig. 129: File types and their relation to each another

14.2 Saving a Project

- To save a project select the menu “Project → Save project/Save project as”. The dialog window “Save project” is opened.



- Select the “Project default folder”. If the path does not exist yet, it will be generated.

  Use the button to select an existing path.
- In the list box “Project name” you can select an existing project or enter a new project name.
  The complete file name of the project is generated automatically on the basis of the default path for the projects and the project name in the corresponding project directory. If the project directory does not exist yet, it will be generated.
- Click on the button “OK”. The project selection dialog will be terminated and the project is saved.
  (If you click on the button “Cancel”, the project selection dialog will be terminated and the project is not saved.)

14.3 Reading a Project

- To read a project select the menu item “Project → Open project”. The Windows Explorer opens the directory of the project last edited.
- Navigate to the desired project directory and open the project file therein (*.smp). The project including all parameter files is uploaded to the user interface.

14.4 Writing a Project

During writing of a project all existing parameter sets are loaded one after the other into the corresponding drives. The download will be canceled, when an error occurs during writing of a parameter set.

Before downloading a project check that the device addresses set in the project match the addresses of the used devices. If this is not the case, the download is cancelled.

- Start the project download via the menu “Loader → Write project to drives”.

  You can also click on the symbol in the tool bar.

14.5 Creating a New Project

A new project can be created as follows:

- searching for connected devices (description see section 5.5.1.1 "Searching for Connected Devices", page 36)
- by means of the project wizard

14.5.1 Project Wizard

Using the project wizard you can create a project manually. For this purpose select the option “Create new project” after you have started the program.

Later, you can modify the current project by means of the project wizard. Then you select the menu “Project → Execute project wizard” or the symbol in the tool bar. Changing the project is necessary, if e.g. the device address of the used hardware has changed compared with the address set in the project.

A project is created/changed in two steps.

14.5.1.1 Select Project

[1] Select project
Edit the basic data of your project here.

- Project base folder: Indicates the default path for projects. The new project will be saved in this path. The default folder is “sm_smp” in the installation path of the software *drivemaster2*.
- Project name: Indicates the project name.
- Project file: Indicates the directory path of the project file. The complete file name of the project is generated automatically on the basis of the default path for the projects and the project name in the corresponding project directory.
- Comment: Enter a note regarding the current project in this field, if you like. This comment is saved with the project file and serves for identifying the project later.

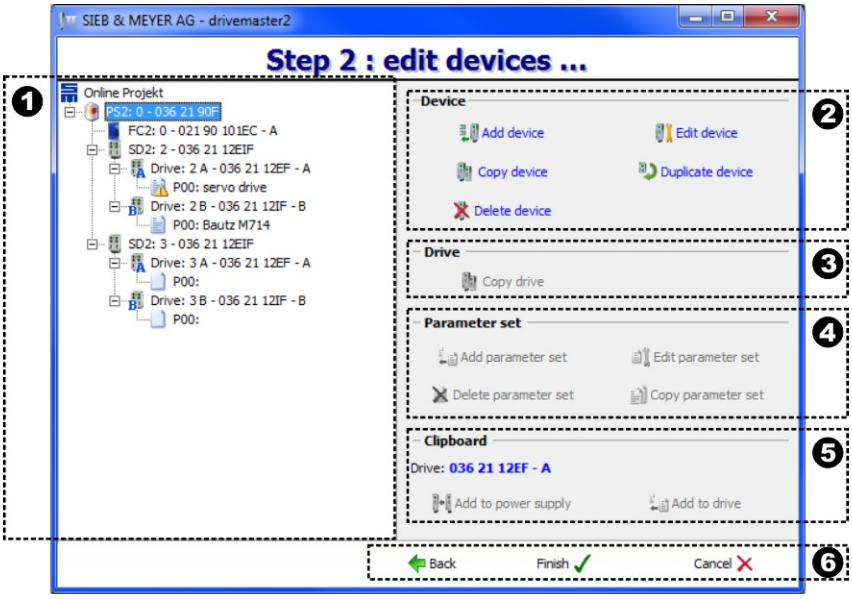
[2] Project Actions

- Next: Applies the entered project data and switches to the second page of the project wizard.
- Cancel: Exits the project wizard. All input will be cleared

14.5.1.2 Edit Devices

On the second page of the project wizard you can edit the devices, drives and parameter sets of the current project.

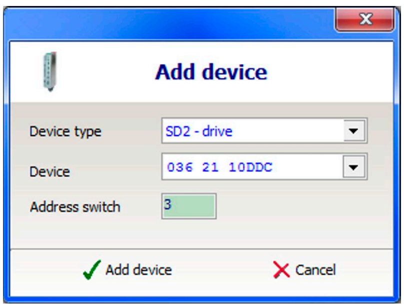
This dialog page is opened directly when you click on the button “Edit project” in the device overview of in the drive parameters.



[1] Project tree
Displays the created project: Depending on the selected node (project, device, drive or parameter set) the possible actions are activated on the right side of the dialog. If no devices have been assigned to the project yet, select the first node in the tree.

[2] Select device action
Here you can edit a device.

- Add device: Opens a dialog to add a device to the project.
  - Edit the type, the number and the address of the new device. (As address the software sets automatically the first address available in the project tree.)
  - Add device: Exits the dialog and applies the new device in the project.
  - Cancel: Exits the dialog without applying the new device.



- Edit device: Opens a dialog to edit the selected device or device address.

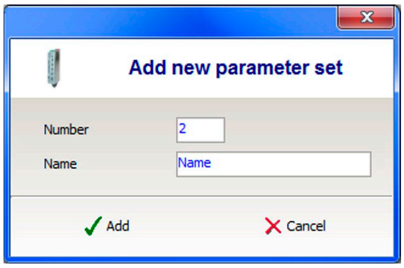
  – You can change the type, the number and the address of the selected device.
  – Apply changes: Exits the dialog and applies the changes in the project
  – Cancel: Exits the dialog without applying the changes.
- Copy device: Copies the selected device including all drives and parameter sets into the clipboard [5].
- Duplicate device: Copies the selected device including all drives and parameter sets and pastes it to the next vacant place in the project tree.
- Delete device: Deletes the selected device.

[3] Select drive action
Here you can edit a drive.

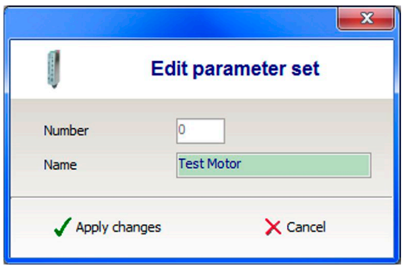
- Copy drive: Copies the selected drive including all parameter sets into the clipboard [5].

[4] Select parameter set action
Here you can edit a parameter set.

- Add parameter set: Opens a dialog to add a parameter set to the selected drive.



  – Edit the name and the number of the new parameter set. (As parameter set number the software sets automatically the first number available.)
  – Add: Exits the dialog and applies the new parameter set in the project.
  – Cancel: Exits the dialog without applying the parameter set.
- Edit parameter set: Opens a dialog to edit the selected parameter set.



  – You can change the name and the number of the selected parameter set. (The parameter set number 0 cannot be changed.)
  – Apply changes: Exits the dialog and applies the changes in the project.
  – Cancel: Exits the dialog without applying the changes.
- Copy parameter set: Copies the selected parameter set into the clipboard [5].
- Delete parameter set: Deletes the selected parameter set.

[5] Clipboard
The clipboard contains the copied object (device, drive or parameter set). Use the available buttons to paste the copied object to the selected place of the project tree.

- Paste drive: The copied drive is adapted to the target drive. All parameter sets are applied. Parameter sets of the target drive, which are not available in the copied drive, are deleted. You can transfer the drive of a single-axis drive amplifier to a double-axis drive amplifiers and vice versa.
- Paste device: The copied device is adapted to the target device. All parameter sets are applied. If you transfer a double-axis drive amplifier to a single-axis drive amplifier, the drive B is not applied.

[6] Project Actions

- Back: The dialog returns to the first page of the project wizard.
- Finish: Exits the project wizard and applies the changed project to the user interface.
- Cancel: The project wizard dialog is closed without applying the project.

15 Communication

15.1 Applications and Server

The software *drivemaster2* involves several independent applications: *drivemaster2*, *drive-setup-tool*, *hiper-endat-tool*, *converter-setup-tool*, Oscar and SDx Datalogger.

All these applications do not communicate directly with the devices but they use independent communication programs. These are called communication servers. One individual communication server is provided for each communication interface. At the moment communication servers are implemented for the serial interface (RS232/ RS485) and for the USB interface. The individual applications are communication clients to the communication servers.

The client applications and the communication servers are connected to each other via the network protocol UDP. Thus the client application and the communication server do not need to be installed on the same PC. They also can communicate via the network.

Status Bar

The following fields are displayed in the status bar of the application:

Fig. 130: Status bar at the bottom of the software drivemaster2 when a communication server is connected

[1] Host
This field contains the network address of the PC, on which the communication server is installed. The network address can either be the PC name or the IP address of the PC. The network address "localhost" designates the PC of the current user.

[2] Server
This field indicates the name of the communication server. The client application receives this name directly from the communication server.

[3] Communication status
This field contains the current communication address. If a communication with the drive is possible, the background of the field is green and the status "online" is displayed behind the address. If a communication with the drive is not possible, the background of the field is red and the status "offline" is displayed behind the address.

Server symbols in taskbar

Normally the communication servers run invisibly in the background of the application. Only a small symbol is displayed in the info area of the taskbar.

Fig. 131: Taskbar with symbols of the communication servers

15

[1] Serial communication server

[2] USB communication server

A **local** bus server is started and closed automatically by the application. Bus servers installed on a remote PC can not be started and terminated automatically. They must be activated separately before starting the application.

Normally, handling the communication server is not necessary. The server runs independently in the background. Open the main window for the display of an error diagnosis. The operation of the bus server is always controlled via the symbol in the info area.

The context menu of the communication server is displayed by right-click on the symbol.

The following entries can be selected:

- Show Normal: Displays the hidden main window.
- Quit: Terminates the communication server.

The main window is displayed by left mouse click on the symbol. It is hidden by another mouse click.

15.1.1 USB Communication Server

The symbol of the USB communication server in the info area of the taskbar changes with the number of detected USB devices. Devices with direct USB connection as well as devices connected via USB>RS232/485 Converter 050201 are detected as USB devices.

The following symbols are displayed:

- 

The communication server has not detected a USB device.
- 

The communication server has detected one USB device.
- 

The communication server has detected two USB devices.
- 

The communication server has detected more than two USB devices.

15.1.1.1 Main Window

The main window of the USB communication server is structured as follows:

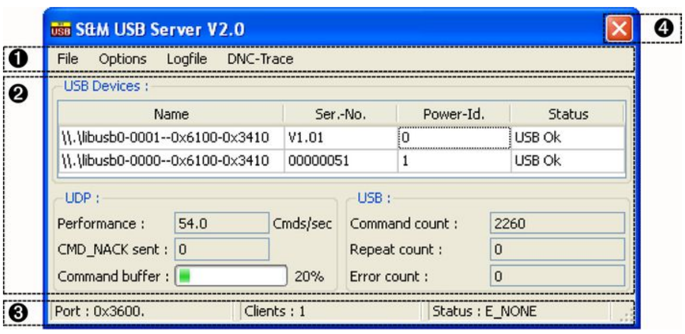


Fig. 132: USB communication server

[1] Menu bar

The program menu provides all functions required for using the communication server.

[2] Diagnosis Display
This section displays statistical values of the communication.

[3] Status bar
Here the following values are displayed:
- Port: Indicates the UDP port number of the communication server. The client application must indicate this number to gain access to the network.
- Clients: Indicates the number of local client applications that are currently logged on to the communication server. Client applications on remote PCs are not counted. If this number is reset from 1 to 0, the communication server will be terminated.
- State: Indicates the communication status of the last command.

[4] Hide main window

Contrary to the standard function under Windows the red cross in the title bar does not close the communication server but hides the window again. Thus, the communication server may not be closed by mistake.

15.1.1.2 Menu Description

Menu “File”

- Rescan USB bus: Searches for USB hardware devices. Usually the operating system gives notice to the USB communication server, when a USB device has been added or removed. If you anyway reason that a connected USB device has not been detected, you ay start a new search via this menu item.
- Quit: Terminates the USB communication server. Still existing connections to applications are interrupted.

Menu “Options”

This menu allows adaptation of the communication server's behavior.
- Allow remote access: This option must be set to allow the applications to access the communication server via network. This option is deactivated for safety reasons (default setting).
- Use command toggle bit: The so-called 'toggle bit' increases the transmission security. Therefore this option should always be activated.

Menu “Logfile”

The communication server always creates a log file, which can be evaluated for diagnosis purposes. This log file called “S36UsbBusDriver.log” is created at the start of the bus server. It is saved in the same path as the communication server. The options in the log file menu allow influencing how many entries can be made in the log file.

Consider that some options may cause a large size of the log file. The complete memory of your hard disk may be filled. In addition the performance of the bus server is reduced hereby.

If you add some options for diagnosis purposes, you should remove them later. As default only the options “Thread ID”, “Timestamp” and “Init-Exit” are activated. These options create a log file of only a few Kilobytes.

- Thread ID: The “Thread ID” is included in every debug output. This way the log file provides information on the thread in which the errors occur. This setting does not create individual outputs and increases the size of the log file only a little.
- Timestamp: Every debug output contains a timestamp. This way, information on the time flow in the bus server are provided. This setting does not create individual outputs and increases the size of the log file only a little.
- Init-Exit: Output is generated for initialization and exit of the bus server and new devices. This setting creates only a small number of debug outputs, which are independent from the amount of communication.
- More details: The other log file options create more information and cause larger data amounts. Especially in combination with communication records this may result in large data amounts.
- Client <-> Server communication: Any communication between the application and the communication server is logged. The amount of data depends on the amount of communication and may increase especially during long operating times of the communication server.
- Server <-> Device communication: Any communication between the devices and the communication server is logged. The amount of data depends on the amount of communication and may increase especially during long operating times of the communication server.
- Log debug events: Additional information on internal processes is logged. Large amounts of data may be created.
- Log extreme debug events: Additional information is logged, even when no communication takes place. Huge amounts of data are created. This option should only be activated for a short time.
- View logfile: The log file is displayed with the editor “notepad.exe”. Consider that the editor does only display the current state when the file was opened and that it is not updated in the editor.

Menu “DNC-Trace”

The DNC Trace can be started in addition to the log file. Recording the communication in the log file is possible, but only the event with its timestamp s displayed. The DNC Trace also records the contents of the communication. That way you can see which object has been read and which was the content of this object. The name of the trace file is “S36UsbDncTrace.log” and it is saved in the same path as the communication server.

- Start/Stop DNC trace: The DNC-Trace is started with this option. If a DNC Trace is running, it can be stopped with it.
- View DNC trace file: The DNC trace file is displayed with the editor “notepad.exe”. Consider that the editor does only display the current state when the file was opened and that it is not updated in the editor.

15.1.1.3 Diagnosis

The diagnosis display is divided into three groups: USB Devices, UDP and USB.

USB Devices

This group displays a list of the detected USB devices. The number of devices determines the selection of the symbol in the info area of the taskbar. Each device is displayed in one table row.

The table rows have the following meaning:

- Name: Name of the USB device. This name was internally defined by the USB device driver.
- Ser.-No.: Directly connected devices: serial number of the device;
  for devices connected via USB>RS232/485 Converter 050201: firmware version of the converter.

- Power-Id: Value of the address selection switch, if existent.
- State: USB status - any other status than “USB OK” indicates a malfunction of the device.

UDP

This group displays small statistics on the network communication with the client applications.

The displays have the following meaning:
- Performance: The value indicates the number of commands that have been executed in the last second. This value determines the sum of the commands from all clients. The performance limit of the bus server is about 150 commands per second.
- CMD_NACK sent: The value indicates the number of commands that have been rejected because the command buffer was full. A rise of this value may indicate that too many client applications try to communicate at the same time.
- Command Buffer: The bar displays the filling level of the command buffer. When the command buffer is full, the next command is rejected with the command CMD_NACK.

USB

This group displays statistics of the USB communication with the devices.

The displays have the following meaning:
- Command count: The value indicates the number of all executed commands.
- Repeat count: The value indicates how often a command was repeated. The USB bus server does not repeat any commands. Consequently the value 0 is always displayed here.
- Error count: The value indicates the number of errors that have already occurred. Not every error displays a faulty connection. Every nonexistent device produces an error during a device scan.

15.1.2 Serial Communication Server

The serial communication server is displayed with the symbol in the info area of the taskbar.

15.1.2.1 Main Window

The main window of the USB communication server is structured as follows:

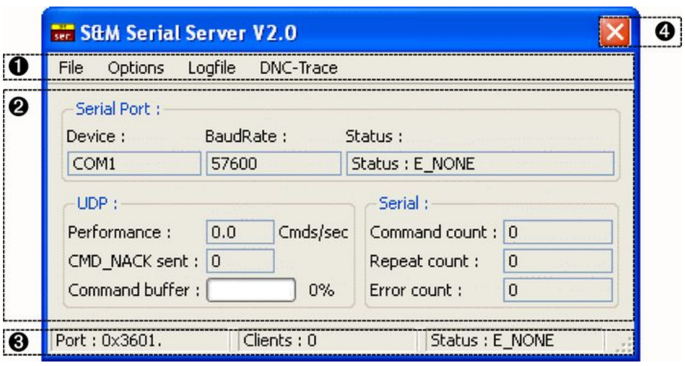


Fig. 133: Serial communication server

[1] Menu bar
The program menu provides all functions required for using the communication server.

[2] Diagnosis Display
This section displays statistical values of the communication.

[3] Status bar
Here the following values are displayed:
- Port: Indicates the UDP port number of the communication server. The client application must indicate this number to gain access to the network.
- Clients: Indicates the number of local client applications that are currently logged on to the communication server. Client applications on remote PCs are not counted. If this number is reset from 1 to 0, the communication server will be terminated.
- State: Indicates the communication status of the last command.

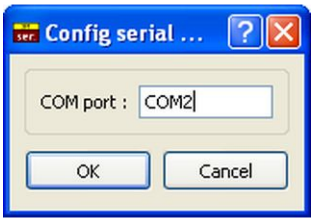
[4] Hide main window

Contrary to the standard function under Windows the red cross in the title bar does not close the communication server but hides the window again. Thus, the communication server may not be closed by mistake.

15.1.2.2 Menu Description

Menu "File"

- Select serial port: Opens the following dialog.



Here the name of the serial interface is entered.
- Quit: Terminates the serial communication server. Still existing connections to applications are interrupted.

Menu "Options"

This menu allows adaptation of the communication server's behavior.
- Allow remote access: This option must be set to allow the applications to access the communication server via network. This option is deactivated for safety reasons (default setting).
- Use command toggle bit: The so-called 'toggle bit' increases the transmission security. Therefore this option should always be activated.

Menu "Logfile"

The communication server always creates a log file, which can be evaluated for diagnosis purposes. This log file called "S36SerialBusDriver.log" is created at the start of the bus server. It is saved in the same path as the communication server. The options in the Logfile menu allow influencing how many entries can be made in the log file.

Consider that some options may cause a large size of the log file. The complete memory of your hard disk may be filled. In addition the performance of the bus server is reduced hereby.

If you add some options for diagnosis purposes, you should remove them later. As default only the options “Thread ID”, “Timestamp” and “Init-Exit” are activated. These options create a log file of only a few Kilobytes.

- Thread ID: The “Thread ID” is included in every debug output. This way the log file provides information on the thread in which the errors occur. This setting does not create individual outputs and increases the size of the log file only a little.
- Timestamp: Every debug output contains a timestamp. This way, information on the time flow in the bus server are provided. This setting does not create individual outputs and increases the size of the log file only a little.
- Init-Exit: Output is generated for initialization and exit of the bus server and new devices. This setting creates only a small number of debug outputs, which are independent from the amount of communication.
- More details: The other log file options create more information and cause larger data amounts. Especially in combination with communication records this may result in large data amounts.
- Client <-> Server communication: Any communication between the application and the communication server is logged. The amount of data depends on the amount of communication and may increase especially during long operating times of the communication server.
- Server <-> Device communication: Any communication between the devices and the communication server is logged. The amount of data depends on the amount of communication and may increase especially during long operating times of the communication server.
- Log debug events: Additional information on internal processes is logged. Large amounts of data may be created.
- Log extreme debug events: Additional information is logged, even when no communication takes place. Huge amounts of data are created. This option should only be activated for a short time.
- View logfile: The log file is displayed with the editor “notepad.exe”. Consider that the editor does only display the current state when the file was opened and that it is not updated in the editor.

Menu “DNC-Trace”

The DNC Trace can be started in addition to the log file. Recording the communication in the log file is possible, but only the event with its timestamp s displayed. The DNC Trace also records the contents of the communication. That way you can see which object has been read and which was the content of this object. The name of the trace file is “S36SerialDncTrace.log” and it is saved in the same path as the communication server.

- Start/Stop DNC trace: The DNC-Trace is started with this option. If a DNC Trace is running, it can be stopped with it.
- View DNC trace file: The DNC trace file is displayed with the editor “notepad.exe”. Consider that the editor does only display the current state when the file was opened and that it is not updated in the editor.

15.1.2.3 Diagnosis

The diagnosis display is divided into three groups: Serial Port, UDP and Serial.

Serial Port

This group displays the serial port used for communication and its status.

The fields have the following meaning:
- Device: Designation of the serial COM ports. (This designation is identical to the designation which was selected in the dialog “Select serial port …”.)
- BaudRate: Transmission rate used for communication. For all devices the value 57600 Baud is set fixed.
- Power-Id: Value of the address selection switch, if existent.
- State: Error status of the communication. The following displays are possible:
  - E_NONE: Serial port has been opened and is ready for operation.
  - E_SERVER_COMM_OPEN: The serial port can not be opened. The port does either not exist or it is currently used by another application.
  - E_SERVER_COMM_CONFIG: The serial port has been opened, but could not be parameterized. Possibly the serial interface can not work with a baud rate of 57600 baud.

UDP

This group displays small statistics on the network communication with the client applications.

The displays have the following meaning:
- Performance: The value indicates the number of commands that have been executed in the last second. The performance limit of the bus server is about 150 commands per second.
- CMD_NACK sent: The value indicates the number of commands that have been rejected because the command buffer was full. A rise of this value may indicate that too many client applications try to communicate at the same time.
- Command Buffer: The bar displays the filling level of the command buffer. When the command buffer is full, the next command is rejected with the command CMD_NACK.

Serial

This group displays statistics of the serial communication with the devices.

The displays have the following meaning:
- Command count: The value indicates the number of all executed commands.
- Repeat count: The value indicates how often a command was repeated. Before a command is returned to the client with an error message, it is repeated once. A rise of this value may indicate that the communication path is sensitive for interferences.
- Error count: The value indicates the number of errors that have already occurred. Not every error displays a faulty connection. During a device test each device not existing produces an error.

15.2 Addressing the Devices

In order to ensure trouble-free communication with several devices, all devices organized in one project must have different communication addresses.

☞ An SD2T device is always organized as single device in one project. Therefore the device address is always (Pow: 0 - Drv: 0A).

The communication address is made up of following three components:
- Address of the power supply unit: An individual address must be assigned to each power supply unit PS2. The address is set with the address selecting switch on the power supply unit. The addresses 0 to 7 are available.

15

Devices that are not connected via an external power supply unit PS2 always have the power address 0. Thus, these devices can not be used together with a power supply unit PS2 with the address 0.

- Address of the device: All devices must have different addresses. The address is set with the address selecting switch on the device. The addresses 0 to 15 are available (the switch positions A to F correspond to the addresses 10 to 15). Devices that are connected to different power supply units can have the same address.
- Drive code within the device: There are devices which combine several drives. For this reason these drives are labeled with a letter. Drive A is the first drive of a device and drive B is the second drive of a device. Devices with one drive always have the letter A.

The communication address is made up of these three parts as follows:

<address of the power supply unit> - <address of the device> <drive code>

The addresses are displayed in the software *drivemaster2* as follows:

- **Power : x**
  Power supply unit with the address x
- **Pow: x – Drv: y Z**
  Drive Z of the device y connected to power supply unit x

All in all the software *drivemaster2* can address 256 different drives and 8 power supply units (8 power supply units with 16 devices each, which include 2 drives each).

15.3 Communication with a Local PC via USB

In the following the hardware and software configuration is described for assemblies, in which the hardware is connected to a local PC via USB.

15.3.1 Hardware Configuration

If the device to be connected provides a USB port, you can connect it directly to the PC via USB cable.

Devices without USB port (e.g. series SD2) are connected by means of a gateway to the PC. This gateway forwards the communication to the connected devices via the RS485 bus.

For devices connected to a power supply unit PS2, the power supply unit is the gateway. If a RS485 to USB converter is used, the converter is the gateway. In the following you find connection examples for both possibilities.

Connection example with power supply unit PS2

This example shows 2 power supply units and 4 devices that are connected to the PC via 2 USB cables.

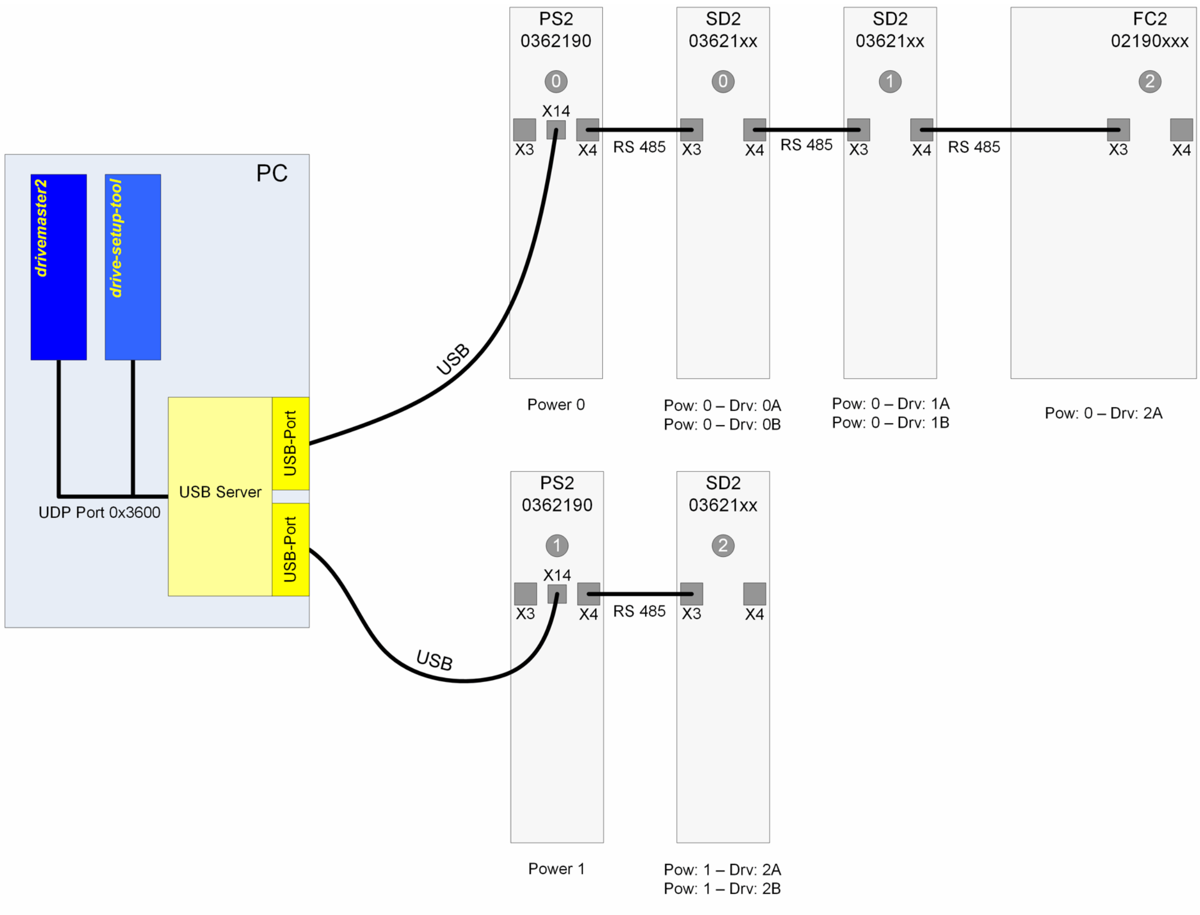


Fig. 134: USB communication via power supply unit PS2

This configuration requires the following connections:
- The individual devices are connected with each other via the X3/X4 bus (RS485).
- The PC is connected directly to the power supply unit via USB.

The following requirements must be met for the address selection switches:
- Up to 16 devices can be connected to a power supply unit via the RS485 bus. An individual address (0 to F) must be set for all devices via the address selection switch.
- Up to 8 power supply units can be connected to a PC. An individual address (0 to 7) must be set for each power supply unit via the address selection switch.
- Devices that are connected to different power supply units can have the same address. (In this example the FC2 at power 0 and the SD2 at power 1 have the device address 2.)

The access to the USB communication server in the PC is shared between the different applications. In the example above the applications *drivemaster2* and *drive-setup-tool* are running.

Connection example with USB>RS232/485 Converter 050201

In the example 3 devices are connected to the PC via the converter.

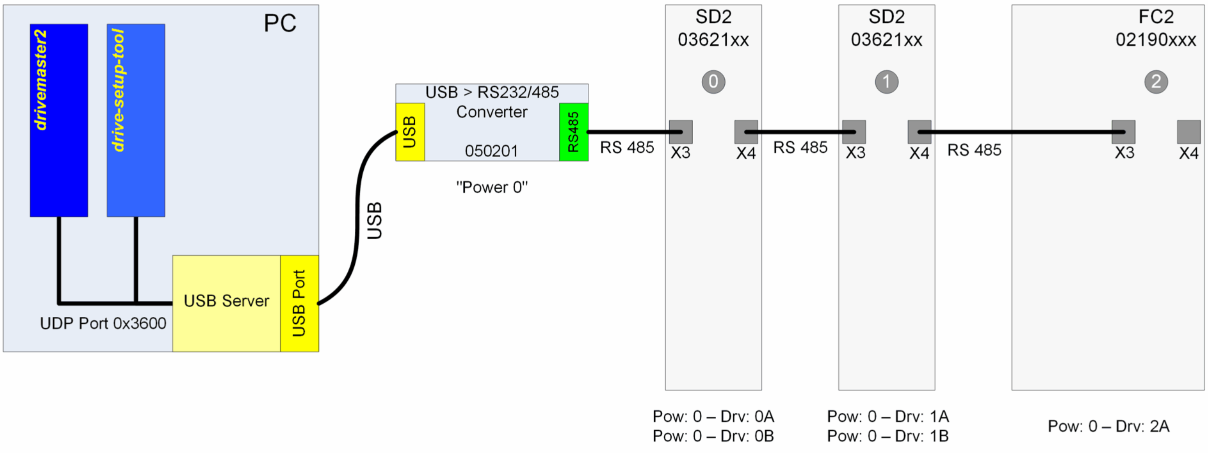


Fig. 135: USB communication via USB>RS232/485 Converter 050201

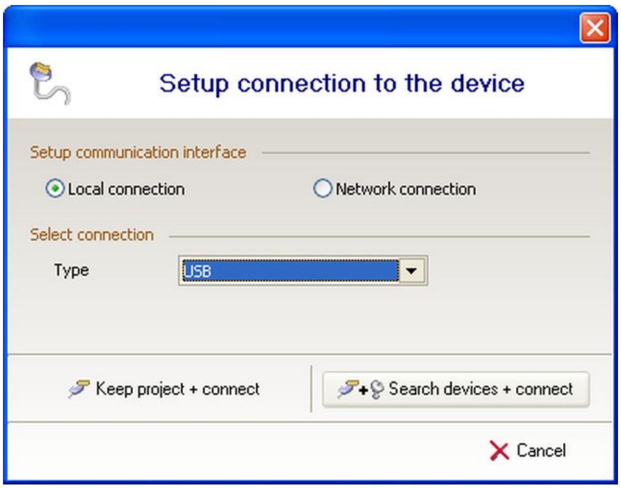
This configuration requires the following connections:
- The individual devices are connected to the converter via the X3/X4 bus (RS485 connection).
- The PC is connected directly to the converter via USB.

The following requirements must be met for the address selection switches:
- Up to 16 devices can be connected to the converter via the RS485 bus. An individual address (0 to F) must be set for all devices via the address selection switch.
- Since the converter has no proper address selection switch, it behaves like a power supply unit with the address 0 during the communication. Thus only one converter can be connected to the PC. In addition to the converter you can not connect a power supply unit with the address 0 to the PC.

The access to the USB communication server in the PC is shared between the different applications. In the example above the applications *drivemaster2* and *drive-setup-tool* are running.

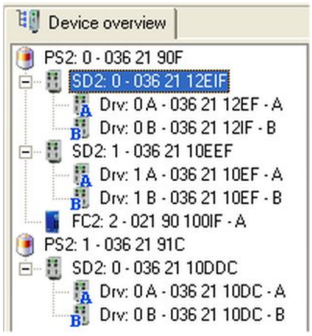
15.3.2 Software Configuration

➪ After you have started the software *drivemaster2* click the button “Setup connection to the device” to open the dialog for the communication. (Later you can also select the menu “Settings → Setup connection to the device” to call the dialog.)

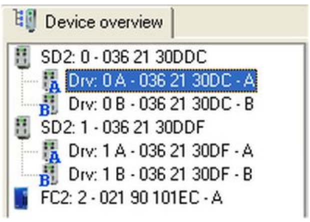


- ➪ Select the settings as shown in the screen shot.
- ➪ Click on the button “Search devices + connect” to apply the settings and create an online project.
- ✓ Then, the corresponding communication server is started and the result is displayed in the status bar. If successful, the following entries should appear:

The created project Connection example with power supply unit, page 296 is structure as follows:



The created project Connection example with converter, page 297 is structure as follows:



Since the converter itself is no communication target, it does not appear in the project.

15.4 Communication with a Local PC via RS232/ RS485

In the following the hardware and software configuration is described for assemblies, in which the hardware is connected to a local PC via RS232/RS485 (serial communication).

15.4.1 Hardware Configuration

Most of the PCs only provide an RS232 interface, only a few industrial PCs feature a RS485 interface. The RS232 connection is a point-to-point connection. For this reason there is always only one RS232 connection with the PC (in contrast to USB connections).

Thus the software can only communicate with an individual device or with several devices that are connected to each other via a bus.

The following connection examples describe the direct RS232 connection with one device and the connection via RS232 to RS485 converter to several devices that communicate via RS485 bus to each other.

Connection example with one device

This example illustrates a frequency converter FC2 that is connected via RS232 cable to the PC. The serial interface X3 of an FC2 can be an RS232 or a RS485 connector.

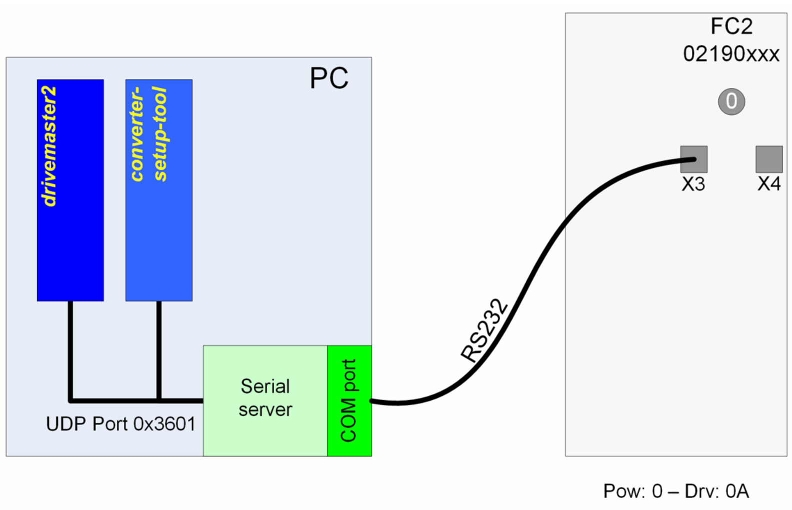


Fig. 136: RS232 communication with an FC2

This configuration requires the following connections:

- The PC is connected to the device via an RS232 cable.

The following requirements must be met for the address selection switches:

- When connected directly to the PC, the power address 0 is assigned to the device.
- Any address (0 to F) can be selected via the address selection switch.

The access to the serial communication server in the PC is shared between the different applications. In the example above the applications *drivemaster2* and *converter-setup-tool* are running.

Connection example with RS232 to RS485 converter and several devices

In the example 3 devices are connected to the PC via a converter. Any common RS232 to RS485 converter can be used.

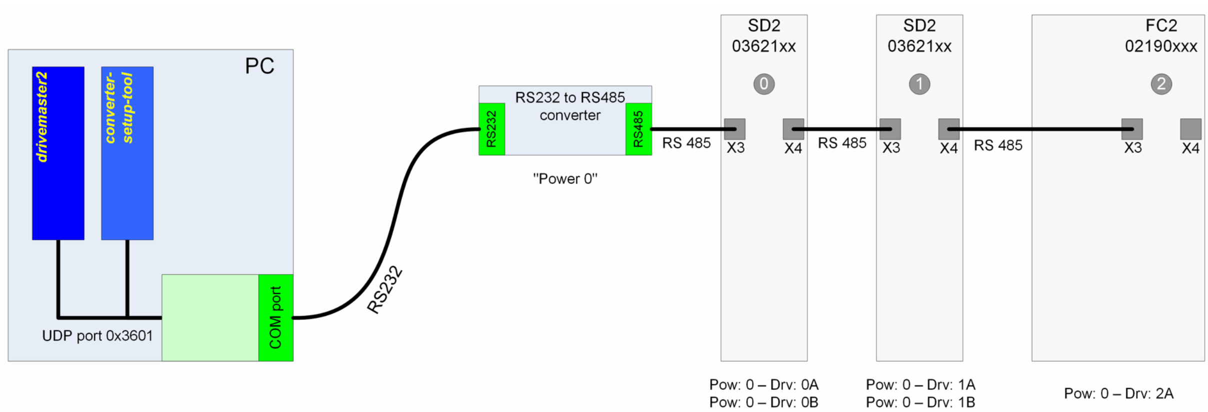


Fig. 137: Serial communication via an RS232 to RS485 converter

This configuration requires the following connections:

- The individual devices are connected to the converter via the X3/X4 bus (RS485 connection).
- The PC is connected directly to the converter via RS232.

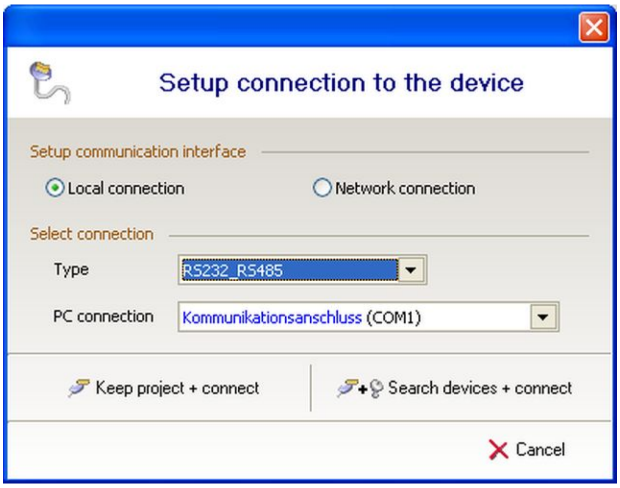
The following requirements must be met for the address selection switches:

- Up to 16 devices can be connected to the converter via the RS485 bus. An individual address (0 to F) must be set for all devices via the address selection switch.
- Since the converter has no proper address selection switch, it behaves like a power supply unit with the address 0 during the communication.

The access to the serial communication server in the PC is shared between the different applications. In the example above the applications *drivemaster2* and *converter-setup-tool* are running.

15.4.2 Software Configuration

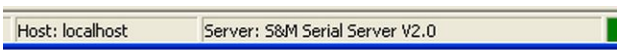
➪ After you have started the software *drivemaster2* click the button “Setup connection to the device” to open the dialog for the communication. (Later you can also select the menu “Settings → Setup connection to the device” to call the dialog.)



➪ Make the following settings.
   – Communication interface: Local connection
   – Type: RS232_RS485
   – PC connection: Select the used serial interface (COM port).

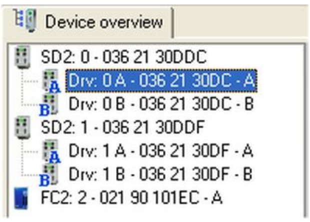
➪ Click on the button “Search devices + connect” to apply the settings and create an online project.

✓ Then, the corresponding communication server is started and the result is displayed in the status bar. If successful, the following entries should appear:



The created project Connection example with one device, page 299 is structured as follows.

The created project Connection example with RS232 to RS485 converter and several devices, page 299 is structure as follows:



Since the converter itself is no communication target, it does not appear in the project.

15.5 Network Communication via Remote PC

It is not necessary that the software *drivemaster2* and the comprised tools run on the same PC as the communication server. Since the applications communicate via the network protocol UDP with the communication server, the applications and the communication server may run on two different remote PCs.

The remote PC, e.g. an industrial PC, is connected to the devices via USB or RS232/RS485. This remote PC could be mounted together with the devices in the same switch cabinet.

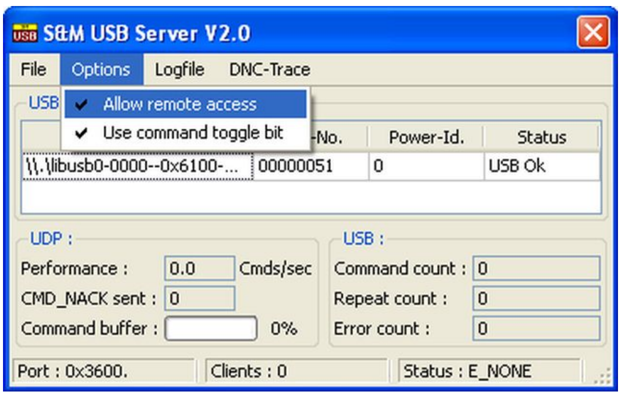
15.5.1 Preparation of the Remote PC for Network Operation

Two alterations are required to operate the communication servers on a remote PC:
1. Allow network access in the communication server
2. Start communication server manually

15.5.1.1 Allow Network Access

For safety reasons the network access is deactivated as a default and must be activated on purpose.

In order to activate the network access take the following steps:
- ➪ Start the communication server and open its main window by mouse click on the symbol in the info area of the taskbar.



- ➪ Activate the menu item “Allow remote access” in the menu item “Options”.

15.5.1.2 Start the Communication Server

Contrary to the local operation the communication servers are not automatically started and terminated during network operation.

➪ Start the required communication server manually on the remote PC via “Start → Programs → SIEB & MEYER AG → xxx server”.

You can create a shortcut to the respective communication server in the Startup folder of the remote PC. Thus the communication server is started automatically when the PC is started.

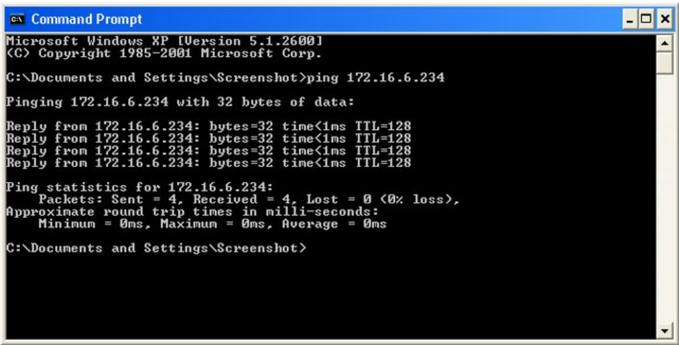
15.5.2 Preparation of the Application PC for Network Operation

Before you access the devices via the software *drivemaster2* by means of the remote PC, you should check the network connection between the application PC and the remote PC.

For this purpose proceed as follows:

➪ Ask your network administrator for the IP address of the remote PC. (The IP address consists of four numbers between 0 and 255 that are separated by point.)

➪ Start the Windows command and enter the following command:
ping <IP address>
When the IP address is e.g. 172.16.6.234, the prompt command should look as follows:



✓ If the network application is OK (0% loss), you can start the software *drive-master2*.

If the connection is not OK, contact your network administrator. A correct network connection between your application PC and the communication server remote PC is necessary. Otherwise the software *drivemaster2* can not access the devices via network.

15.5.3 Communication with a Remote PC via USB

In the following the hardware and software configuration is described for assemblies, in which the hardware is connected to a remote PC via USB.

15.5.3.1 Hardware Configuration

It does not matter for the settings on the application PC, whether the remote PC is connected directly to a device or via a power supply unit or via a converter.

In the following example 2 devices are connected to the USB>RS232/485 Converter 050201 and 3 devices are connected to a power supply unit.

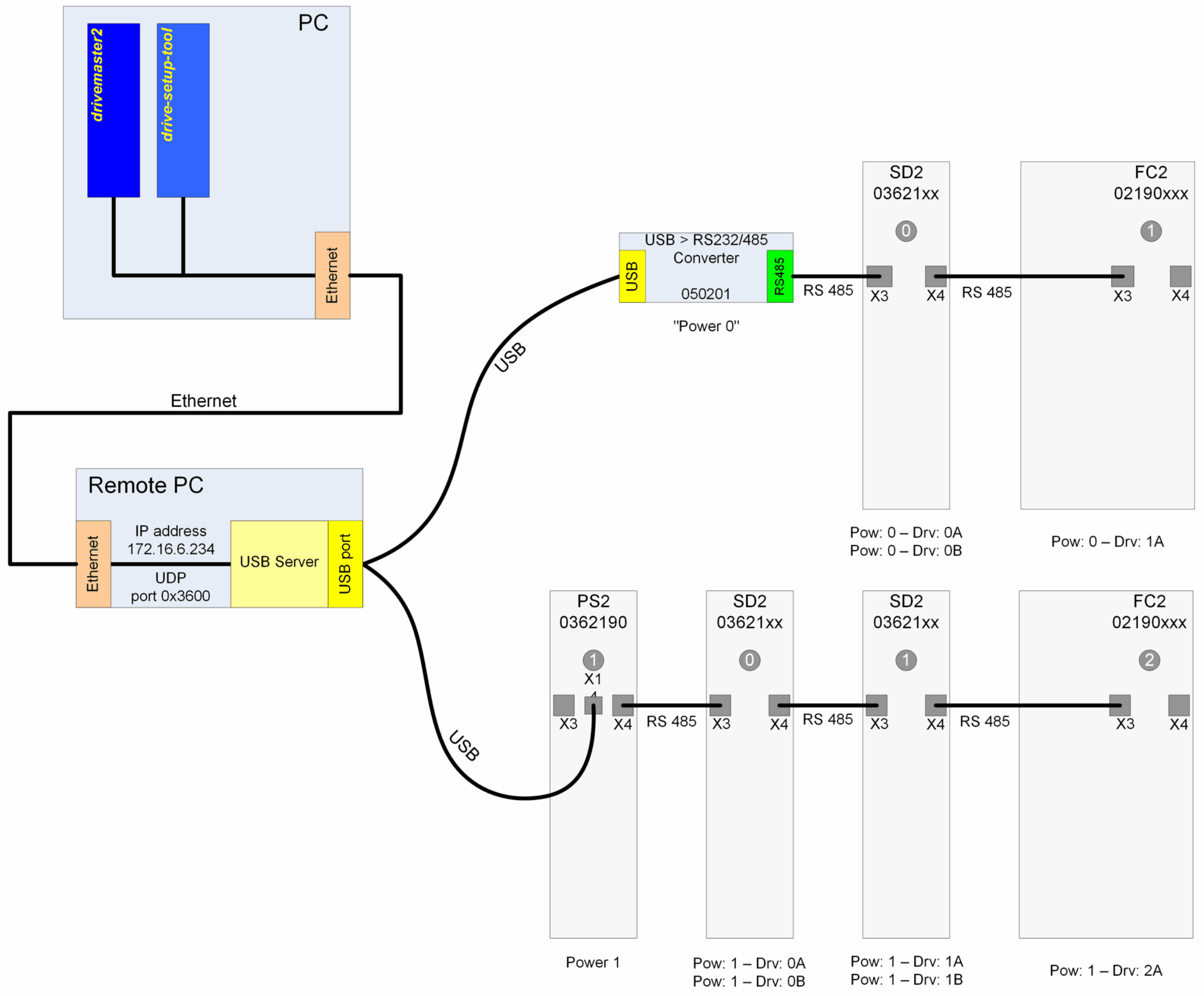


Fig. 138: USB communication via remote PC

This configuration requires the following connections:

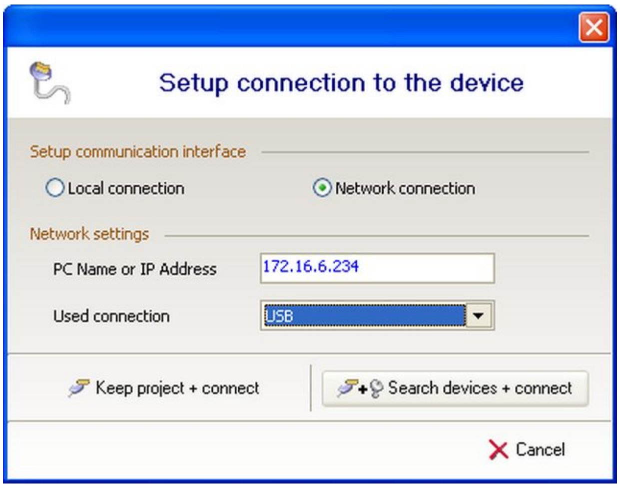
- The individual devices are connected with each other via the X3/X4 bus (RS485).
- The remote PC is connected directly to the power supply unit via USB. In addition the remote PC is connected to the converter via USB. The devices not connected to the power supply unit are connected to the RS485 interface of the converter by the X3/X4 bus.
- The application PC and the remote PC communicate via the Ethernet network with each other.

The individual devices are addressed the same as for local communication.

15.5.3.2 Software Configuration

It is required that the communication server runs on the remote PC and network access is allowed.

➪ After you have started the software *drivemaster2* click the button “Setup connection to the device” to open the dialog for the communication. (Later you can also select the menu “Settings → Setup connection to the device” to call the dialog.)

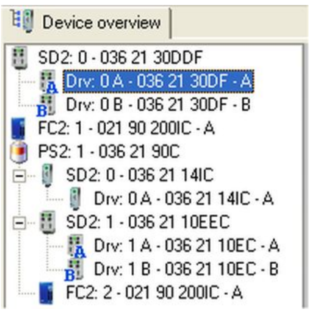


➪ Make the following settings:
- Communication interface: Network connection
- PC Name or IP Address: Name or IP address of the remote PC (in the example above: 172.16.6.234)
- Used connection: USB

➪ Click on the button “Search devices + connect” to apply the settings and create an online project.

✓ Then, the corresponding communication server is started and the result is displayed in the status bar. If successful, the following entries should appear:

The created project for the connection example above is structured as follows:



Since the converter itself is no communication target, it does not appear in the project.

15.5.4 Communication with a Remote PC via RS232/RS485

In the following the hardware and software configuration is described for assemblies, in which the hardware is connected to a remote PC via RS232/RS485 (serial communication).

15.5.4.1 Hardware Configuration

It does not matter for the settings on the application PC, whether the remote PC is connected directly to a device or via a converter.

In the following example 3 devices are connected to an RS232 to RS485 converter.

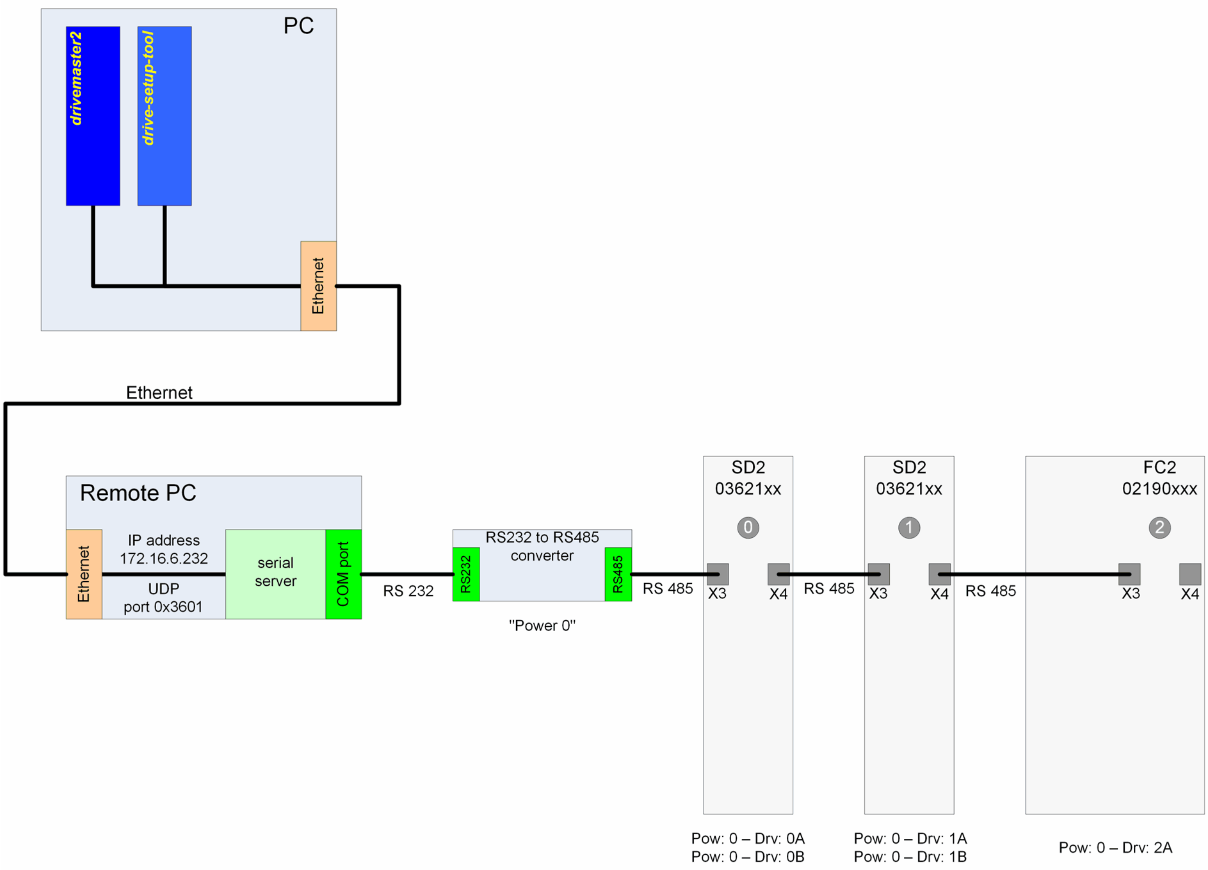


Fig. 139: Serial Communication via Remote PC

This configuration requires the following connections:

- The individual devices are connected to the converter via the X3/X4 bus (RS485 connection).
- The remote PC is connected to the converter via RS232.
- The application PC and the remote PC communicate via the Ethernet network with each other.

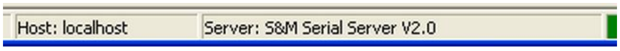
The individual devices are addressed the same as for local communication.

15.5.4.2 Software Configuration

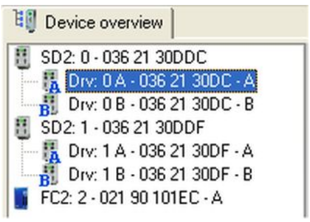
It is required that the communication server runs on the remote PC and network access is allowed.

- ➪ After you have started the software *drivemaster2* click the button “Setup connection to the device” to open the dialog for the communication. (Later you can also select the menu “Settings → Setup connection to the device” to call the dialog.)

- ➪ Make the following settings.
  - – Communication interface: Network connection
  - – Type: RS232_RS485
  - – PC Name or IP Address: Name or IP address of the remote PC (in the example above: 172.16.6.232)
  - – Used connection: RS232_RS485
- ➪ Click on the button “Search devices + connect” to apply the settings and create an online project.
- ✓ Then, the corresponding communication server is started and the result is displayed in the status bar. If successful, the following entries should appear:



The created project for the connection example above is structured as follows:



Since the converter itself is no communication target, it does not appear in the project.

16 Appendix

16.A Troubleshooting

16.A.1 Driver Installation and Security Programs

Spybot - Search & Destroy : DOS Exploit

Security programs like “Spybot - Search & Destroy” are used for closing security gaps in Windows by manipulating entries in the “Registry”.

If you use the program “Spybot - Search & Destroy” consider the following: As long as the protection with the name “DOS Exploit” is active, no device driver can be installed. First, the protection must be deactivated.

16.A.2 Using the Software with Restricted Rights

☞ You need administrator rights to install the software.

Standard users can also use the software *drivemaster2* with restricted rights. According to the operating system certain presetting may be necessary:

Windows 2000

Under the software Windows 2000 *drivemaster2* can also be used by users with restricted rights . But only users with administrator rights are permitted to modify any parameters of the device drivers.

Windows XP, Windows Vista, Windows 7

Under Windows XP/ Vista/ 7 the software *drivemaster2* can also be used by users with restricted rights.

Windows XP, Windows Vista, Windows 7 with NTFS file management system

When you use the file system NTFS under Windows, the access rights for files which have been created in a user account are restricted, i.e. possibly these files can only be read by other users.

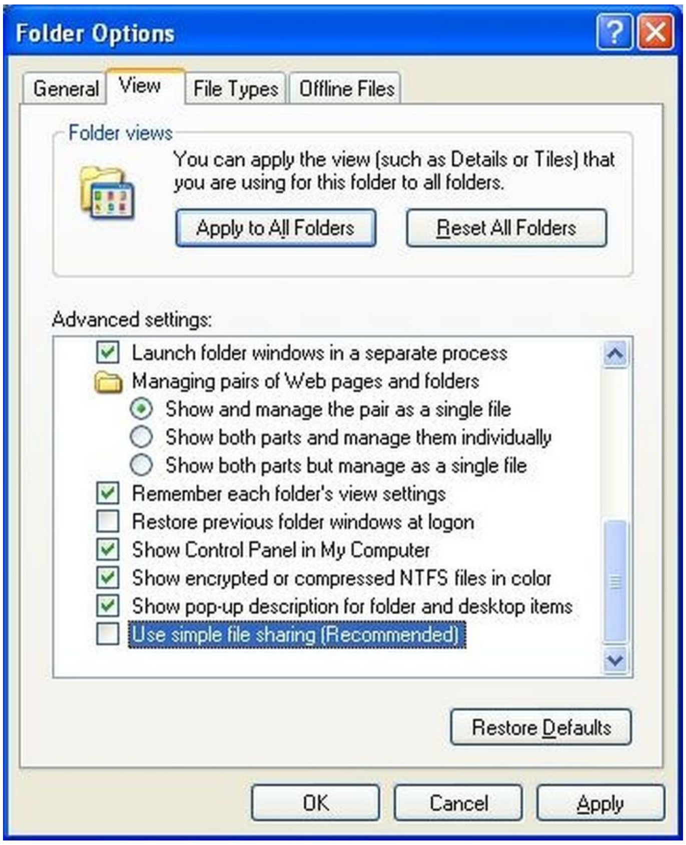
If a user with administrator rights has installed the software *drivemaster2* in an NTFS partition, consequently, files can not be overwritten by other users. Since the software *drivemaster2* has to store lots of data in INI and XML files, it can not be used in this way. For this reason, the administrator must assign write access to the directory, in which the software is stored, for all users who will use the software.

Take the following steps:

- Open the Windows Explorer and open the installation directory of the software *drivemaster2*. The standard directory is “C:\Program Files\SM_AG\drivemaster2”. Right-click on the directory SM_AG and select “Sharing and Security”.
- Select the tab page “Security”. When this is not displayed one of the following reasons might be the cause:
  - You have logged on at a domain via the network. Log out and log on again as local administrator.

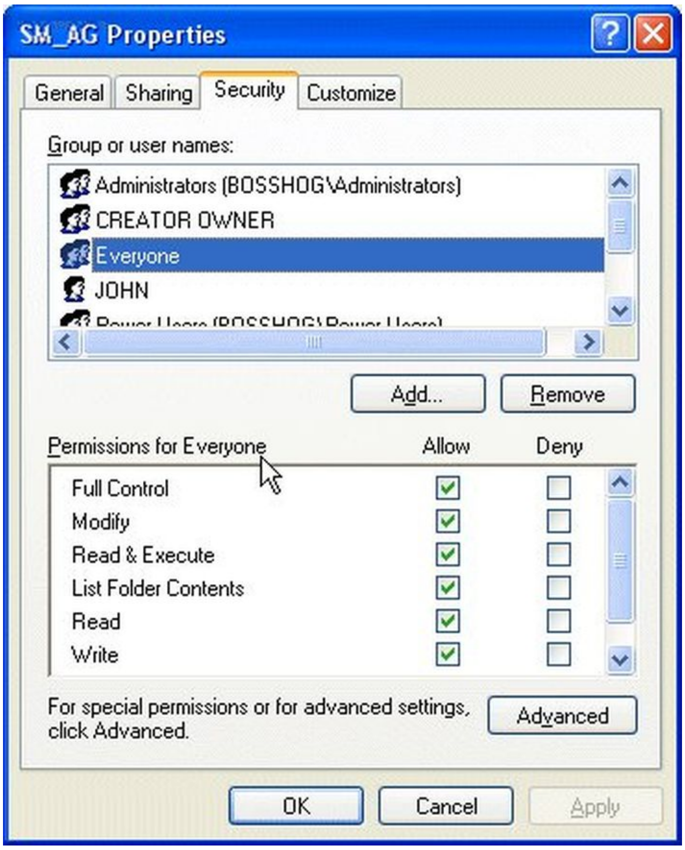
– The check box “Use simple file sharing” is not activated. In order to check this, open the Folder Options in the Explorer.

▪ Activate on the tab page “View” the check box “Use simple file sharing (Recommended)”.

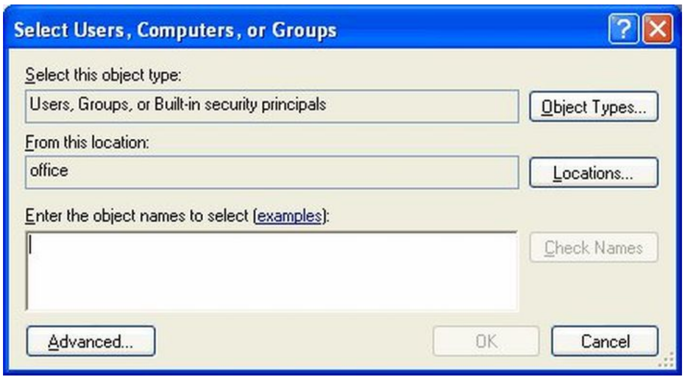


✓ After you have activated the check box “Use simple file sharing” the tab page “Security” in the pop-up menu “Sharing and Security” will be displayed.

16.A

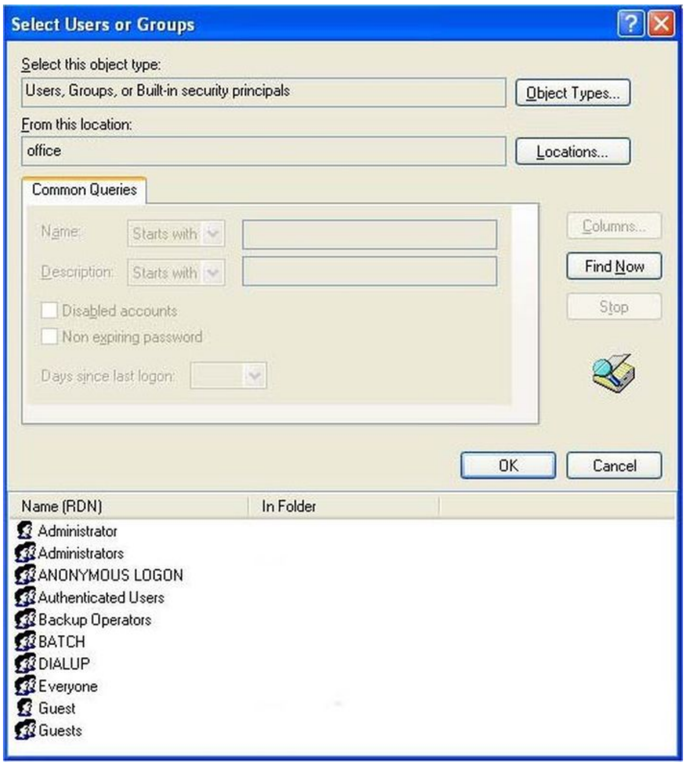


- ➩ Select in the upper list the user group or the users who will use the software *drive-master2*.
  - – If the user or user group is not displayed in the upper list, click on the button “Add”.



16.A

– Enter the name of the user or user group directly into the text field or click the button "Advanced...". The latter opens a list of all users and user groups. Select the respective entry.



– Then, confirm by mouse click on "OK" to return to the dialog "Settings" in the tab page "Security".

➩ In the lower list you must activate the check box "Full Control" in the column "Allow".

➩ Confirm by mouse click on "Apply".

✓ Now, the user or the user group can use the software *drivemaster2*.

16.B FAQ

In this section you find answers to questions frequently asked by our customers.

Why can I not connect to the drive, when I access it via USB?

When you establish a USB connection for the first time, the Windows operating system must search and install the corresponding driver. Copying the driver files can take a long time for the first connection or when you switch the USB port. You can not access the device via the software until this procedure is finished (see also section 3.4 "USB Driver Installation", page 18).

I can not get online access to the device.

There are several possible reasons for this problem. Please check the following items:
- When you have connected the device to a local PC, the option “Allow remote access” in the menu “Options” of the communication server (system tray) must NOT be set.
- When you have connected the device to the serial interface of the PC, this interface might be blocked permanently by another device.
- Is the device address set correctly?
- If you use a very long USB cable, this might cause trouble for permanent online connection.

When I update the software *drivemaster2* to a new version, I always get error messages from the installation program.

Before installing the new version you must always close the old version. This also applies to the corresponding communication server (system tray) and the additional applications in the *drivemaster2* software package (setup tools, Oscar and SDx Datalogger).

Why is it possible for me to write parameters to the drive, although I am a user with restricted rights (User Level) and this function is protected by password?

The rights management takes only effect, when the firmware of the drive supports this function. If the firmware does not have the necessary objects for this function, the rights management is ignored by the software.

When I select the operating mode “Electronic gear”, the corresponding node in the menu tree is not displayed.

There are many menu items that depend on several other settings in the user interface. The electronic gear mode depends on the settings on the page “Configuration → Units”. Here you must select the unit “Counts” for the parameter “Internal position controller resolution ”. Then the page “Electronic gear” is displayed on the tab page “Parameters”.

Why is the motor driving so irregular, when I use the reversing function (*drive-setup-tool*)?

The reversing operation is mapped to individual sequences in the PC. These sequences communicate separately with the drive. Due to the varying load of the PC the sequences can differ widely in time.

When I use the operating terminal (0362150 or 0362153) with drives of the series SD2S, the motor can not be started via the operating terminal.

The following conditions must be met for proper functioning of the operating terminal:

- The drive function must be “HSPWM” or “HSBLOCK / FPAM”.
- On the parameter page “Drive control” you must select the entry “Serial interface” as control channel and setpoint channel.
- On the parameter page “Digital inputs” you must select the entry “No function” for the input DIN-0.

17 Index: Parameters

A

Analog In (FC2) 200
Analog In (SD2x) 117
Analog Out (FC2) 202
Analog Out (SD2x) 118
Angle Controller (SD2x) 91

B

Behavior in Case of (FC2) 199
Behavior in Case of (SD2x) 94

C

CAN (SD2x) 96
Choke (FC2) 197
Choke (SD2x) 76
Chopper (SD2x) 71
Commutation Controller (SD2x) 87
Compensation (FC2) 217
Compensation (SD2xHSPAM / VF) 188
Compensation (SD2xHSPWM) 175
Control (FC2) 198
Current Controller (SD2x, HSBLOCK / FPAM) 162
Current Controller (SD2x, HSPAM / VF) 183
Current Controller (SD2x, HSPWM) 172
Current Controller (SD2x, SERVO / VECTOR) 135
Current Controller (SD2x, SVC) 148
Current Feed Forward (SD2x, SERVO / VECTOR) 132
Current Reference Filter (SD2x, HSBLOCK / FPAM) 161
Current Reference Filter (SD2x, SERVO / VECTOR) 133
Current Reference Filter (SD2x, SVC) 147
Currents (FC2) 196
Currents (SD2x) 74

D

DC Link (FC2) 197
DC Link (SD2x) 75
DC link capacity (PS2) 62
Different Warnings (SD2x) 111
Digital In (FC2) 203
Digital In (SD2x) 120
Digital Out (FC2) 204
Digital Out (SD2x) 121
DNC (SD2x) 98
Drive control (SD2x) 93
Drive Function (FC2) 193

Drive Function (SD2x) 69
Drive Selection (FC2) 192
Drive Selection (SD2x) 68

E

Electronic Gear (SD2x) 131
Encoder Emulation Motor Measuring System, AB Quadrature Signals (SD2x) 129
Encoder Emulation Speed Pulse (SD2x) 129
Encoder Emulation Trigger Signals (SD2x) 130
Error E31 - 'Speed error/Slip' (FC2) 209
Error E31 - 'Speed error/Slip' (SD2x) 112
Error E38 - 'Overspeed' (SD2x) 112
Error E39 - 'Tracking error' (SD2x) 113
Error E44 - 'Commutation lost' (SD2xHSPWM) 113
Error E44 - 'Commutation lost' (SD2xSVC) 114
External Ballast Resistor (PS2) 60
External Ballast Resistor (SD2x) 72
External Precharge Resistor (PS2) 61

F

Field Weakening (SD2x, SERVO / VECTOR) 139
Field Weakening (SD2x, SVC) 152
Flux Controller (SD2x, HSPWM) 174
Flux Reference Value (SD2x, HSPWM) 175
Function Encoder Emulation (SD2x) 128

H

Hall Sensor (SD2x) 86
SineCosine Encoder (SD2x) 89
Holding Function (FC2) 212

I

Identification (FC2) 193
Identification (SD2x) 69
Incremental Encoder TTL / 12 V (SD2x) 87
Internal Ballast Resistor (FC2) 195
Internal Ballast Resistor (SD2x) 73
Internal Target Values (SD2x) 126

L

Linear Hall (SD2x) 88

M

Magnetic Alignment Current (SD2x) 89

Mains (FC2) 194
Mains (SD2x) 70
Message 10 - 'Position reached' (SD2x) 104
Message 10 - 'Ref. value reached' (SD2x) 104
Message Load Limit (FC2) 210
Message M12 - 'Speed zero' (SD2x) 103
Message Reference Value (FC2) 211
Message Temperature Monitoring (FC2) 211
Motor File (FC2) 205
Motor File (SD2x) 77
Motor Measurement System (FC2) 208
Motor Measurement System (SD2x) 84
Motor Parameters for Linear Synchronous and Voice Coil Motors (SD2x) 80
Motor Parameters for Rotary Asynchronous Motors (FC2) 206
Motor Parameters for Rotary Asynchronous Motors (SD2x) 81
Motor Parameters for Rotary Synchronous and Voice Coil Motors (SD2x) 78
Motor Potentiometer Parameters – MOP Edge Controlled 124
Motor Potentiometer Parameters – MOP Time Controlled 123
Motor Potentiometer Setup 122
Motor Type (FC2) 205
Motor Type (SD2x) 77

O

Operating Frequency (SD2x) 75
Operating Mode of the Drive (FC2) 198
Operating Mode of the Drive (SD2x) 92

P

Parameter Set (FC2) 193
Parameter set (PS2) 60
Parameter set (SD2x) 70
PDO 0 / PDO 1 (SD2x, CAN Bus) 97
PDO 0 / PDO 1 (SD2x, DNC) 99
Position Controller (SD2x, SERVO / VECTOR) 137
Position Factor (SD2x) 102
Power (FC2) 195
Power (PS2) 59
Power (SD2x) 71
Power supply (PS2) 60
Pulse Generator (FC2) 208
Pulse Generator (SD2x) 86

R

Resolver (SD2x) 88

S

Safety Functions (SD2x) 116
Shutdown Temperatures (FC2) 197

Shutdown Temperatures (SD2x) 76
Speed Controller (SD2x, HSBLOCK / FPAM) 160
Speed Controller (SD2x, HSPAM / VF) 187
Speed Controller (SD2x, HSPWM) 171
Speed Controller (SD2x, SERVO / VECTOR) 136
Speed Controller (SD2x, SVC) 146
Speed Reference Values (FC2,) 214
Speed Reference Values (SD2x, HSBLOCK / FPAM) 155
Speed Reference Values (SD2x, HSPAM / VF) 179
Speed Reference Values (SD2x, HSPWM) 166
Speed Reference Values (SD2x, SVC) 141
Start-up (SD2x, HSBLOCK / FPAM) 163
Start-up (SD2x, SVC) 150
Switching-off Temperature (PS2) 61

T

Tachometer (SD2x) 90

U

Units (SD2x) 101

V

V/f Characteristic Curve (FC2) 210
V/f Characteristic Curve (SD2xHSPAM / VF) 186
Variable Ramps (SD2x, HSBLOCK / FPAM) 158
Variable Ramps (SD2x, HSPAM / VF) 182
Variable Ramps (SD2x, HSPWM) 170
Variable Ramps (SD2x, SVC) 144
Vibration Absorption (SD2x, HSPWM) 176

W

W24 – Warning threshold 'current' (SD2x) 106
W26 – Warning threshold 'overload current' (SD2x) 110
Warnings Motor (SD2x) 106
Warnings Power Output Stage (SD2x) 105
Winding Detection (SD2x, HSBLOCK / FPAM) 165
Winding Detection (SD2x, HSPAM / VF) 189
Winding Detection (SD2x, HSPWM) 177
Winding Detection (SD2x, SERVO / VECTOR) 140
Winding Detection (SD2x, SVC) 153

18 Index

A

Actual values
- drive amplifier SD2x 221
- frequency converter FC2 222
- power supply unit PS2 220

Addressing 294
Axis mode 126 , 127

C

CAN
- bus monitor 236
- configuration 93 , 95

Communication server 287
- serial 291
- USB 288

comparer 274
converter-setup-tool 259

D

Device overview 57
DNC
- bus monitor 237
- configuration 93 , 98

drive-setup-tool 251

E

EnDat
- initial operation 276
- parameter setting 89

Errors 223

H

hiper-endat-tool 276
Hiperface
- initial operation 276
- parameter setting 89

I

Initial operation 245
- drive amplifier SD2x 251
- frequency converter FC2 259

L

Login/Logout 44

M

Messages 223
Motor Analyzer 264
Multi parameters 64
- create parameter set 64
- select parameter set 65
- switch parameter set 66

N

Network communication 301
New version available 40

O

Object browser 238
Oscar 245

P

Parameter download 53
Parameter set change 66
Parameter set change (timing) 67
Parameter wizard 49
Password protection 43
- passwords 45
- user level rights 44
- User levels 43

Project 279
- create 282
- edit 283
- project files 280

Project wizard 282

R

Remote PC 301

S

SDx Datalogger 275
Serial communication server 291

SERVOLINK 4
bus monitor 233
configuration (FC2) 198
configuration (SD2x) 93
Spindle actual values 233
spindle-service-tool 268
System software
update 53
write 39

U

Update drivemaster2 40
USB
communication server 288
Driver – Troubleshooting 19
driver installation 18
User level rights 44

W

Warnings 223