Application 5009: Commissioning Manual LV-servoTEC S2

Short Version	This commissioning manual describes work with the programmes: S2 Commander WINPAC
	The following are explained as well:
	Quick start
	LV-servoTEC S2 motor database
	 Settings for fieldbus (Profibus DP, CANopen)
	 Initial commissioning
	 Setting the drive parameters (euroLINE,)
	 Optimisation of the drive parameters
	 Adjustment of the drive to the mechanics

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1 Modification

Modifications of document and life cycle

Code of Document	Date	Generation and modification
APP5009_EN_1117809_servoTEC_S2_CommissioningManual_R1a.doc	2013- 09-19	Translation of original German documentation: "APP5009_DE_1077750_servoTEC_S2_Inbetriebnahmehandbuch_D2e/R2e.doc "
APP5009_EN_1117809_servoTEC_S2_CommissioningManual_R1b.doc	2015- 12-16	Data of euroLINE 120 and euroLINE 170 added and new layout of this application



2 Quick start

2.1 LV-servoTEC S2 via CANopen at the PA-CONTROL

	Task	Action	Comment
1	Prepare the amplifier for connection to the CAN-bus.	Use the S2 Commander to install the default parameter set on the amplifier.	Is done by IEF before delivery.
2	Connect amplifier to the CAN-bus of the PA-CONTROL.	Create connections	See "APP5010" (Wiring)
3	Set CAN address at "DIN[03] as address offset	Set slider to "LV-servoTEC S2-IO-adapter" or wire firmly in X1-IO-plug	Input "DIN0-DIN3" serves as offset to the basic address (default parameter set)
	Set CAN address without offset via digital inputs	Set the address with the S2 Commander	
4	Include amplifier in the hardware configuration of the PA-CONTROL as axis 1 (1 to 16)	PA-CONTROL "new initialisation"	For "new initialisation", the PA-CONTROL transfers all participants at the CAN-bus to the hardware configuration
5	Install motor parameters on the amplifier	Use WINPAC to select the corresponding parameter file from the motor database. Use WINPAC to transfer all parameters to the PA-CONTROL.	Import with the right mouse button Menu: "Send parameters"
6	Optimising drive parameters	Use the S2 Commander to adjust the drive parameters to the geometry of the axis.	



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2.2 LV-servoTEC S2 via Profibus-DP

	Task	Action	Comment
1	Prepare the amplifier for connection to the Profibus-DP	Use the S2 Commander to install the default parameter set on the amplifier	Is done by IEF-Werner before delivery
2	Install motor parameters on the amplifier	Use the S2 Commander to select the corresponding parameter file from the motor database and send the parameters to the amplifier	
3	Set Profibus-DP address	Set slider to "LV-servoTEC S2 -IO-adapter" or wire firmly in X1-IO-plug	Input "DIN0-DIN3" serves as offset to the basic address (default parameter set)
	Set CAN address without offset via digital inputs	Set the address with the S2 Commander	
4	Connect amplifier to the Profibus	Create connections	See "APP5010" (Wiring)
5	Set physical units for the Profibus-DP	Set the settings for Display units Infeed constant with the S2 Commander.	See: "MAN_DE_1083730_servoTECS2_ ProfibusDP_SiemensS7.pdf
6	Optimising drive parameters	Use the S2 Commander to adjust the drive parameters to the geometry of the axis.	







3 Loading parameter file from the motor database into the LV-servoTEC S2

3.1 Load with S2 Commander

3.1.1 Default settings for connection to PA-CONTROL

There is a parameter file (*.DCO) in the motor data base with default settings for each controller type. This file can be transferred to the controller with the S2 Commander (File > Parameter record > File >> Servo...) (only necessary when initial commissioning is to take place).

13 52 Commander Vers. 4.0 - Motor	Load from harddisk / floppy disk		
File Operating mode Display Parameters Error Options Help			
First commissioning UDP Offline	Data Comment		
Parameter set File >> Servo	File selection		
Reset Servo >> File			
Firmware download			
Transfer Service module	Default_S2102_V3p5p4201p1p10_V1_0? [→ C:\		
Evit Altuy Save parameters (ELASH)	🗁 Program Files (x86)		
Load default servo parameter set	📄 📄 IEF Werner		
O Position Xact = Xdest	En servoTEC S2 Antriebsparameter		
Speed reached	E servoTEC_S2_102		
C Torque reached	💼 6SM37		
Pt: Motor / Servo		Transfer	
I ² t: Break chopper	Device Communication Objects (*.dco) 🔻 🖃 c: []	Basic parameters	
O Pt: PFC			
Limit switch 0 (negative)	File description:	Positions	
Limit switch 1 (positive)	Type of servo controller: servoTEC S2 102	🗖 Cam disk / axis	
Following error (Message)		error compensation	
	Motor type:		
	Description: Default, kein Motor		
	Name of the parameter set: default parameter set		
	Date: 14.09.2012		
		-	
	V OK X Cancel 7 Help		

Default settings: CAN Baud rate, CAN basic address, I/Os

Note The default settings are made during the production course of IEF-Werner GmbH.



	Digital inputs - Functional overview
e	Overview Conflict detection Standard inputs DIN 0 -
Options Check for identical node numbers	 DIN 1 DIN 2 DIN 3 DIN 4 Power stage enable DIN 5 Control to contro
Node number 1 Basic node number 1 + Offset from: 1 Image: Add D1N0D1N3 to the node number	 DIN 5 Controller enable DIN 6 Limit switch 0 (negative) DIN 7 Limit switch 1 (positive) DIN 8 Homing switch DIN 9 Sample input
Add AIN1 to node number Add AIN2 to node number	Additional inputs O DIN 10 O DIN 11 O DIN 11 O
Effective node number; 2	O DIN AIN1 - O DIN AIN2 -
CAN must be inactive to parameterize the disabled parameters!	
X Cancel ? Help	У ОК ? Нер
	e

- 500kBaud
- Basic node number = 1
- Addition of DIN0 to DIN3 to the node number



3.1.2 Select motor parameter file and load into the LV-servoTEC S2

The parameters are stored for many motor types in the motor database. If there is no parameter file for a motor, trained specialists must perform "initial commissioning" and the data record in the motor database must be supplemented.





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■ The motor files for the PA-CONTROL (CANopen) start with
"CV0-00.DCO"

■ The motor files for Profibus-DP start with "P......V0-00.DCO"

(Setup of the file name, see: "servoTEC_S2_Motordatenbank_V3-01.pdf")

CMR_AKM24C-ANB2DB-00 CMR_AKM24C-ANB2R-00 CMR_AKM24C-ANBNDB-0 CMR_AKM24C-ANBNDB-0 PMR_AKM24C-ANB2DB-00 PMR_AKM24C-ANB2DB-00	0_52102_3 S2102_3 0_52102_3 S2102_3	Transfer
Device Communication Object	s (*.dco) 🔽 🖃 c: [] 📃 💌	Basic parameters Positions
Type of servo controller:	servoTEC S2 102	Cam disk / axis
Motor type:	AKM24C-ANBNDB-00	error compensation
	ohne Bremse, EnDat, CAN-Bus	
Description:		
Description: Name of the parameter set:	CAN-Bus	

Note	For motors with "EnDat" as a return, the data for the commuting encoder may have to be determined and saved in the motor. See
	section 4 EnDat-Motors, page 15.



3.2.1 Load PA-CONTROL configuration





3.2.2 Select motor from database and load parameter file

Activate menu with the right mouse button	select parameter file and start the import with OK
12 PA CONTROL Configuration	11 Select new motor
File PA-CONTROL Transfer Help	Data Comment
PA-CONTROL General configuration Controller ov CANOpen V0 V0 V0 V0 Axis - 2 Motor Names of Variations Variations	File selection CHR_AM0424-4N82059-00_52102_3p5p1p8_V1-01.DCO CHR_AM0424-4N8206-00_52102_3p5p1p8_V1-02.DCO CHR_AM0424-4N8206-00_52102_3p5p1p8_V1-02.DCO CHR_AM0424-4N8206-00_52102_3p5p1p8_V1-02.DCO PHR_AM0424-4N8206-00_52102_3p5p1p8_V1-02.DCO PHR_AM0424-4N8206-00_52102_3p5p1p8_V1-02.DCO PHR_AM0424-4N8206-00_52102_3p5p1p8_V1-02.DCO PHR_AM0424-4N8206-00_52102_3p5p1p8_V1-03.DCO PHR_AM0424-4N80R-00_52102_3p5p1p8_V1-03.DCO
Application Application S51 EnDat Import servoTEC S2 drive-parameter-record Send axis parameters Load axis parameters Load drive parameters Load drive parameters	Device Communication Objects (*.doo) Image: C File description Type of servo controller: servoTEC 52 102 Motor type: AV0124C-ANBILDB-00 Description: ohne Brense, EnDat, CAN-Blus Name of the parameter set:
export drive parameters to motor-type-PDR-file import drive parameters from motor-type-PDR-file	QK Cancel HELP
	and wait for confirmation.

This process must be repeated accordingly for every further axis.



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3.2.3 Send motor parameters to servo amplifier

Then the parameters for the selected motors to the PA-CONTROL and the servo controller have been transferred and saved in the servo amplifier.

Note For motors with "EnDat" as a return, the data for the commuting encoder may have to be determined and saved in the motor. See section 4 EnDat-Motors, page 15.



4 EnDat-Motors

The data structures in the EnDat memory (memory component in the motor) are not standardised. Every controller manufacturer has its own specific data structure with its own ID in the EnDat memory.

After switching on or RESET, the controller reads the data stored from the motor if the ID and the data structure is OK.

Stored data in the motor:

- Commuting encoder data (offset of the angle encoder, phase sequence, ...)
- Zero point offset (offset from the reference run) to calculate the absolute position of the drive

The commuting encoder data are motor specific and must be determined by first-time connecting the motor with a servoTEC S2 and then written into the motor at initial connection of the motor.

The zero point offsets are plant-specific data and result after referencing (unique after installation) of the axis. These data must be written into the motor after the reference run.

A PA-CONTROL with LV-servoTEC S2, the zero point offset is written into the motor by the PA-CONTROL after the reference run.

With a connection via Profibus-DP to an S7 and use of the IEF driver, the zero offset is written into the motor at the command "ServotecS2Cmd.ABS_NeuLernen" and "StandardCmd.RefStart".

For the other interfaces, this action must take place manually with the S2 Commander.

4.1 Determining and saving commuting encoder data





4.2 Save zero offset

Perform reference run ②: Perform reference run of the axis with the button "GO". Save zero offset ③: Use the button "Save in the encoder" to write the data into the motor. Mode Settings Driving profile Index pulse control Torques Flying referencing Mode Settings Driving profile Index pulse control Torques Flying referencing Mode Settings Driving profile Index pulse control Torques Flying referencing Mode Settings Driving profile Index pulse control Torques Flying referencing Mode Settings Driving profile Index pulse control Torques Flying referencing Mode Settings Driving profile Index pulse control Torques Flying referencing Mode Settings Driving profile Index pulse control Torques Flying referencing Honing at power and controller enable Go to zero position after homing Honing switch at index pulse track of X28 Timeout-Viatch Timeout-Time 0.0 s No homing after detection of the commutation offset start position No homing switch No synchronization during the homing Basic parameters Save to encoder Temp. of the motor: 25 °C Temp. of power stage: 32 °C	Select REF (reference position) button $①$.	If \$2 Commander Vers. 4.0 • Motor File Operating mode Display Parameters Error Options Help Image: Status Image: Status Status Commands Actual values
Perform reference run of the axis with the button "GO". "GO". "A boning at power and controller enable Go to zero position after homing Homing at power and controller enable Go to zero position after homing Homing switch at index pulse track of X2B Timeout-Time Offset start position offset start position Offs	Perform reference run ②:	Mode Settings Driving profile Index pulse control Torques Flying referencing Actual value: 0,000 mm/s
Save zero offset ③: Use the button "Save in the encoder" to write the data into the motor. No homing after detection of the commutation No synchronization during the homing Type of homing switch Normally closed C Normally closed C Normally closed	Perform reference run of the axis with the button "GO".	Homing at power and controller enable Go to zero position after homing Homing switch at index pulse track of X2B Timeout-Watch Timeout-Time 0,0 s 1 Officet start section
Use the button "Save in the encoder" to write the data into the motor. Image: No synchronization during the homing	Save zero offset ③:	No homing after detection of the commutation Offset Offset Offset
B1 Positioning settings Image: Control of the setting setti	Use the button "Save in the encoder" to write the data into the motor.	No synchronization during the homing ✓ OK Cancel Type of homing switch Basic parameters Z Cancel Normally closed Save to encoder Temp. of the motor: 25 °C ✓ Normally opened Save to encoder Temp. of power stage: 32 °C ✓ Positioning settings III GOI Position: 0,003 mm ✓ QK X Cancel Pelp 2 Actual position set: 0

5 Applications with several angle encoders (external glass scale)

Use of a separate angle encoder for the layer dissolution is sensible, e.g. in the following case:

The motor is connected to a positioning mechanism subject to high accuracy requirements via a gearbox with tolerance. This positioning mechanism has an angle encoder with high resolution. In this case, it is sensible to use this information to determine the current position while the speed and commuting position continue to be provided by the motor encoder.





6 Adjusting drive to the mechanics

- 6.1 Basic configuration, resolution and axis parameters for motors (6SM...,DBL2...,SEW...)
- 6.1.1 Basic configuration with the S2 Commander

🛃 52 Commander Vers. 4.0 - Motor	_	. 8 ×
Ele Operating mode Display Parameters Error Options Help		
💦 🔽 RS 232 Us Application parameters Ceneral configuration 🕢 👫 🕘 := 🚱 Reset 🙄		
Etable Overage annetes Construction and		
Status		
Operation Controller over analyce Display units Decimals Direct input		
Power subge activ Positioning Display mode Display mode		
🧶 Intermediate circu Signals Feed constant		
Position Xacl = Xd Currin C Torque control 5,0000		
Speed reacting Memo C Speed control User-defined mm per rotation		
Pet Motor / Servo Field bus Postoning	Actual values	
Pt: Break chopper	Speed	
General configuration	Actual value: 0,000 m	m/s
General configuration Extension	Setpoint: 0,000 m	m/s
Direct input		
Application Configuration	Torque	
C translatory motion	Actual value: 0,00	
Linear motor		
	Motor current rms: 0,00	A
Purifier settings translatory >> rotatory Display units:	Effective sever	
Feedconstant display units mm/s		~
mu/s ²	Encoder angle: -165,35	9 *
Torque in Nm Factor		
	Temperatures	°C
Display units:	Temp of power stage: 32	°C
	Temp capacitors:39	°C
	\sim	
Settings	Position: 0,013 m	.m)
	Actual position set:	✓
	I ² t motor: 0%	51
	I ² t servo: 0%	=
	I ² t PFC: 0%	51
V OK X Cancel ? Help	I ² t brake chopper: 0%	51
	DC-bus voltage: 378	3 V



For a LV-servo increments per Configuration be province, investe Configuration be province configuration configura	TEC S2 axis, the default setting for r turn is 10 000.	The gear factor must	t be set accordingly then.	
	Motor Increments per Rotation: [10000.00	H PA CONTROL Configuration		<u>? ×</u>
			General configuration Controller overview Avis-Info Cucle times Comment	
			Axis-2	
	Reset Error	 Motor Names of Variations Axis-2 (servoTEC S2 102) Axis parameters Drive parameters 	Application Display units Or rotary motion mm mm/s mm/s	
Parameter File Name: STANDARD.PAR				
PA CONTROL Configuration File PA-CONTROL Transfer Help Pa-CONTROL PA-CONTROL	2) X		Display units Millimeter (mm)	
CANOpen I/0 I/0 Motor Names of Variations Assoc (servoTEC S2 102) Motor Names of Variations	Avids - 2 Release mode: (1) with change to a motion mode		Feed constant Increments / rotation = 10000,00 = 5,000000 Gear factor 2000,000	
Drive parameters	Turn on advance mode: 3 ¥ Max, postion deviation. 10000.00 Group number, if asis is moved. Group 1: SM207 ¥		NOTE : the adjustements are only for WINPAC and PA-CONTROL HELP	
	Spinshoviriation on encoder C Activate brake in the state IDLE / SAFE C Get position from encoder		Besel Firm	
	Unit mm 🗶 Gear Factor 2000.000	1		
	Tiseves Range (min) 0.00000 mm	Parameter File Name: STANDARD.PAR		
	Travers Range (max): 400,0000 mm			
Parameter File Name: STANDARD.PAR				

6.1.2 Basic configuration with WINPAC together with PA-CONTROL



- 6.2 Basic configuration, resolution and axis parameters for euroLINE
- 6.2.1 Basic configuration with the S2 Commander

17 52 Commander Vers. 4.0 - Motor	
Ele Operating mode Display Parameters Error Options Help	
Image: Second system Application parameters General configuration Image: Second system Save Save Second system Second system Save <	
Status Device parameters Commandes Disolary units	
Operation Controller garanteers Controller enable Display units Decimals Direct input	
Power stage activ Positioning Display mode Transla	tory application
Intermediate circu Signals Operation mode Standard values Feed or	onstant
O Poston Xact = Xd CAM C Torque control 30,480	
Spred reached Memo C Spred control User-defined mm per	rotation
porque reached Field bus Field bus Field bus	Actual values
PF Break chooper	
General configuration	Speed
	Actual value: -0,002 mm/s
General configuration Extension	Serbourt. 0,000 minus
Application Configuration	Torque
C rotary motion	Actual value: 0,00 A
© translatory motion	
Linear motor	
Further settings	Motor current rms: -0,02 A
Eactory visite translatory >> rotatory Displa	y units: Effective power: 0 W
(
muls	Encoder angle: -165,39 °
Torque in Nm Factor	Tomostura
	Temp of the motor: 25 °C
	Temp of power store: 32 °C
mm/s v Qr Lance f Help	Temp capacitors: 39 °C
Settings	Position: 0,081 mm
	Actual position set: 0
	lit mater
	12 DEC 0%
	It brake chopper: 0%
V QK X Cancel Y Help	
	DC-bus voltage: 379 V
	·

Axis type	euroLINE KL32	euroLINE KL85	euroLINE 120	euroLINE 170
Infeed constant	30,480 mm	60,960 mm	24,00 mm	24,00 mm



6.2.2 Basic configuration with WINPAC together with the PA-CONTROL

For a LV-servoTEC S2 axis, the default setting for increments per turn is 10 000.

To achieve the highest resolution (accuracy) of an euroLINE, the setting for increments per motor turn should be adjusted to the return system used.

In case of a visual encoder with $4\mu m$ resolution and 4-fold assessment it can be received a $1\mu m$ resolution of the return system.



The following results for calculation of the gear factor:

Motor/Axis-Type	Resolution Return System	Infeed / pole distance	Increments per turn	Formula	Gear ratio
euroLINE KL32	1µm	30,48mm	30480	30480 / 30,48	1000
euroLINE KL85	1µm	60,96	60960	60960 / 60,96	1000
euroLINE 120	0,001µm	24,00 mm	2400000	24000000 / 24,0	1000000
euroLINE 170	0,001µm	24,00 mm	2400000	24000000 / 24,0	1000000



6.3 Safety parameters

With S2 C	Commander		With WINPAC	
Safety parameters		🔣 Safety parameters		×
Decelerations Quick stop 5000 mm/s ²	Torque limitation by: Maximum current	Decelerations Quick stop look OFF	RAMP Maxi	mum current
HW limit switch 5000 mm/s ² Positioning range exceeded (only in operation mode 'positioning')	Setpoint selection Speed limitation Speed limit, positive	HW limit switch inactive (Positioning range exceeded (only in operation mode 'opstitioning')	(look help) (look help) Speed limitation Speed limit,	250,000 mm/s
Override 100.00 %	Speed limit, negative 0,000 mm/s Image: Thread speed 10,00 % Image: Shutdown level of following error	Motor 250,000 overspeed protection	mm/s positive Speed limit, negative Thread speed	-250,000 mm/s
Motor overspeed protection 50,000 mm/s	Shutdown at:	Encoder difference control	Shutdown level of follow	ving error
Encoder difference control Control	Absolute positioning range -214748,365 mm 214748,365 mm Settings	<u>QK</u>	<u>H</u> elp	



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6.4 Reporting Parameters

With S2 Commander	With WINPAC
Signals Comparison torque Speed signal Destination Following error Tolerance window for "target reached"	Speed signal Destination Following error Tolerance window for "target reached"
Signals Comparison torque Speed signal Destination Following error Following error ranges positive limit 0,694 mm Image: Comparison for the second se	Speed signal Destination Following error Following error ranges positive limit 0,694 mm negative limit -0,694 mm Response delay 0,00 ms QK Cancel Help



The change to the rotating or movement direction is implemented by "Inverting the return system" (Resolver, Encoder, ...). The action is performed with the "S2 Commander" directly in the LV-servoTEC S2 or with WINPAC.

6.5.1 Rotating direction / movement direction with S2 Commander

Reversal of direction takes place by changing the prefix of the value "Gear factor - drive" (e.g.: "1" becomes "-1").

Angle encoder settings Angle encoder settings Angle encoder settings Commutating-encoder x2A x2B x10 X2A (Resolver) x2A (Resolver) active active Becoder settings Controller parameters Angle encoder settings Angle encoder settings Controller parameters Angle encoder settings Controller parameters Controller parameters		For Resolver	For Encoder
Power stage activ Postioning Postioning Intermediate circu Signals Brake functions Brake functions Postion Xact = Xa CAM Intermediate circuit control Temperature monitoring PFC Field bus External resistor PH: Motor / Servo PF: Motor / Servo Positioning	Image: Status Operating mode Display Parameters Error Options Help Image: Status RS 232 US Application parameters Image: Status Image:	Angle encoder settings Commutating-encoder X2A X2B X10 X2A (Resolver) active Gear factor Mode Ingoing shaft: 1 C Resolver Outgoing shaft: 1 C Anatogue hall sensors	Angle encoder settings Commutating-encoder X2A X2B X10 X2B Heidenhain / EnDat (multitum coder) Image: statuse << Back Gear factor Power supply << Back Ingoing shaft: 1 0 to 5 v 12 v Outgoing shaft: 1 0 to 5 v 12 v Line count 512 Mode 0 togue rober with 20-track Encoder with z0-track Encoder with reference pulse EnDat 2.1 Image: series and the ser



6.5.2 Rotating direction / movement with WINPAC

Reversal of direction takes place by changing the prefix of the value "Gear factor - drive" (e.g.: "1" becomes "-1")

For Resolver	For Encoder
File PA-CONTROL Transfer Field Image: PA-CONTROL Image: PA-CONTROL	Parcontrol. Transfer Help Pie PA-CONTROL. Transfer Help Pie Parcenter of Valisions Encoder selection: Surchronisation Pie Axis 2 (service) EE 02/100 Encoder selection: Surchronisation Pie Axis 2 (service) EE 02/100 Encoder selection: Surchronisation Pie Axis 2 (service) EE 02/100 Encoder selection: Surchronisation Pie Axis 2 (service) EE 02/100 Encoder selection: Surchronisation Pie Axis 2 (service) EE 02/100 Encoder selection: Surchronisation Pie Axis 2 (service) EE 02/100 Encoder selection: Surchronisation Pie Axis 2 (service) EE 02/100 Encoder with 20-12/100 Pie Encoder with 20-12/100 Pie Parameter File Name: STANDARD.PAR Encoder with 20-12/100 QK Garcel Encoder with 20-12/100

6.5.3 Reference run

PA-CONTROL	Axis parameters Travers Parameters Limit-switch / Homing Axis-1/0 Motor Gantry Load drive pa	arameter
	Axis - 2	
Motor Names of Variations Axis-2 (servoTEC S2 102) Axis parameters Drive parameters	without Absolut-Position-System with Absolut-Position-System Reference / Calibrate Reference by Homing with Limitswitch Reference by Calibrate (without Limitswitch)	
	Referenzieren durch Referenzfahrt	
	Axis Limit Switch Exchanged:	
	Limit Switch Type: NC NO O	
	Reference traverse type:	
	17 : Homing on the negative Limit Switch	
	Change Direction at reach Limitswitch or mechanical Block	
	Distance reference switch - reference point: 1,000000 mm	
	Reference offset: 0,000000 mm	



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6.6 Starting axes with a time offset

Depending on hardware constellation, it may happen that the axes interfering with each other during starting.

The PA-CONTROL receives the error message "E345 – A1 : FFFDhex - drivers (X3.2) or interim circuit voltage is missing" for example. A remedy for this behaviour can be to activate the axes with a time offset. For this, there is the parameter "ON-AXIS : Delay time [ms]" in the axis parameters.

Axis parameter Axis 1	Axis parameter Axis 2				
Axis parameters Travers Parameters Limit-switch / Homing Axis-I/O Motor Gantry Load drive	Axis parameters Travers Parameters Limit-switch / Homing Axis-I/O Motor Gantry Load drive				
Axis - 1	Axis - 2				
Release mode: (1) with change to a motion mode Release mode: (1) with change to a motion mode					
Turn on advance mode: 3 Image: Comparison of the system of the syst					
Axis parameters Travers Parameters Limit-switch / Homing Axis-1/0 Moto					
Axis - 1 Axis - 2					
 Axis-I/O with digital inputs /outputs or markers Axis I/O with digital inputs / outputs Axis-I/O with markers 	 Axis-I/O with digital inputs /outputs or markers Axis I/O with digital inputs / outputs Axis-I/O with markers 				
- Axis I/O with digtial inputs / outputs Input No. Delay time [ms]	Axis I/O with digtial inputs / outputs Input No. Delay time [ms]				
STOP-AXIS: 0 START-AXIS: 0 OFF-AXIS: 0 ON-AXIS: 0 100	STOP-AXIS: 0 START-AXIS: 0 OFF-AXIS: 0 OFF-AXIS: 0 ON-AXIS: 0 300				
Axis 1: 290 ms	Axis 2: 300 ms				



7 Optimise motor parameters with the S2 Commander

The motor parameters should be optimised with the S2 Commander. All parameters are accessible in the S2 Commander. There is an oscilloscope in the S2 Commander for observation the effects of changes.

7.1 The reversing generator

The reversing generator window can be opened in the menu "Display – reversing generator"



Depending on axis type, the settings are displayed in "U" (turns) or "mm" (linear axis).

This window is very well suitable for optimising the settings for the rotating speed and position controllers.

Reversing generator	
Parameters Reversing distance	10,000 mm
Speed	83,333 mm/s
Acceleration	833 mm/s ² Acceleration time 100,0 ms
Deceleration	833 mm/s ² Deceleration time 100,0 ms
active/inactive	START
<u>✓ о</u> к Х	<u>Cancel</u> <u>?</u> <u>H</u> elp



7.2 The oscilloscope function

There is an oscilloscope in the S2 Commander for observation the effects of changes.

🛃 52 Commander Vers. 4.0 - Motor	Oscilloscope - Settings
File Operating mode Display Parameters Error Option-Help	
RS 232 USB UDP Offline 🕑 🛁 🗽 🕼 🔤 🖉 🚟 Save Parameter	CH1 CH2 CH3 CH4 Time base Trigger
Status Commands Actual Oscilloscope	Trigger source
At B Q Q B B C C Settings Act	CH2 Speed - setpoints
CH1 Real current - set points (rms) - Scaling: 0,0500 A/div - Offset: 0,00 div CH2 Speed - setpoints - Scaling: 50 rpm/div	Level:
Offset: 0,00 div Mol	Mode O Auto O Normal O Single
Scaling: 0,0020 r/div Offset: 0,00 div □ ○ Time base □ Time: 200 ms/div □ □ Delay: 0,00 ms □ Trigger CH2 Speed - setpoints □ Level: 100,00 rpm Rising Pos	
200 [ms] / div Act	
Cursor CH1 1950 [ms], 0,001293 A 0x78 ✓ CH1 ✓ CH3 ✓ CH4 IPt s X Exit ? Help Refresh Force ✓ RUN / STOP wait for trigger IPt I	
	<u> </u>



7.3 Optimising the speed controller

7.3.1 Optimising speed controller: Amplification and time constant

The time constant and amplification of the speed controller take place by specification of a target value jump. On the oscilloscope, you can observe the reaction of the speed controller to target value jumps and then set the controller parameters.

The speed controller has to be set so that only one runout of the rotating speed actual value occurs. The runout should be about 15% above the target speed. The dropping flank of the runout should, however, not undercut the speed target or do so only a little to then reach the rotating speed target. This setting applies to most motors that can be operated with the servo position controller. If an even stricter controller conduct is required, the amplification of the speed controller can be increased further. The amplification limit is specified by the drive tending to vibrate at high rotating speeds.

The amplification that can be achieved in the speed controller range depends on the load situation at the motor shaft. Therefore you need to inspect the speed controller settings again with the drive installed.



Application (EN)

7.3.2 Strategies for optimisation (speed controller)

Generally, amplification factor and time constant figures must not be changed in large intervals but only in small sequences. Note

After the figures have been changed, two cases can be:

- If the setting is too hard, the speed controller becomes unstable.
- If the setting is too soft, the drive does not move stiffly enough; drag error in later operation is the consequence.

The speed controller parameters are not independent of each other. A measuring curve that looks differently from try to try can Note therefore have several causes. Therefore, change only one parameter at a time, either only the amplification factor or only the time constant.

- To reconcile the speed controller, increase amplification until vibration occurs. Then reduce amplification in small steps until the vibration conduct disappears.
- Then reduce the time constant until the vibration conduct occurs, then increase the time constant in small steps until the controller is stable and stiff enough at the target value = 0.

Controller type		
P-controller		
Pl-controller (reco	ommended)	
Gain:	2,00	2,00
Court.	• •	
Time constant:	3,68 ms	3.69 ms
Think Constant.	• •	
Sneed filter	0,40 ms	0,40 ms
opecu miter.	1	
	tuto dotoot	1
	Auto detect	



Application (EN)



Note	Usually only the amplification in the speed controller is increased (changed). The time constant and the speed actual value filter are changed rarely
	or only a little.



7.3.3 Optimising the position controller

Note	This section can be skipped if you drive only works in speed an torque operation
Note	A requirement for reconciliation of the position controller are correctly set current and speed controllers (see above chapters)
Note	The position controller optimisation uses the reversing operation. Please ensure that the motor shaft can turn freely or that the movements of the drive cannot cause any damage. When optimising initial commissioning, it would be good if the motor shaft could be turned freely.

 The position controller (menu item: Parameters > Control parameters > Position controller) forms a resulting speed from the difference between target and actual position that is forwarded to the speed controller as a target value. The functions of the position controller are explained. This section explains how amplification is optimised. 	Position controller Controller type Position controller Gain: Auto detect
	Max. correction 500,000 rpm speed:
	positive dead range: 0,00003 r Inegative dead range: -0,00003 r Image: -0,00003 r
	✓ OK X Cancel ? Help



The following steps are required for optimisation

First activate the position controller (menu item Parameters > Control parameters > Position controller) and set the amplification to value 0.5 first.



Note	For best design and adjustment of the control to the moving mass, the highest possible force/mass ratio is required. This ratio is not beneficial in
	the direct drives and leads to the control quickly becoming instable.

Examples for direct drives are:

- Torque motor without gear at a heavy turntable with large diameter
- Motor shaft connected directly to a load with a high mass E.g. a sprocket at the motor shaft that interlocks with the rack to move a large sledge.

The following procedure is recommended when adjusting the control in this kind of case:

- Use of an encoder with a high resolution
- Increase of the amplification in the speed to the oscillation limit
- Lowering the amplification and correction speed in the position controller
- Reduction of the acceleration of the positioning set
- Activating and adjusting the torque pre-control of the positioning set



Application (EN)

7.4 Settings for the brake

Once the controller is released, the contacts in the motor plug X6 "BR+ u. BR" become active and the brake is opened.

For vertical axes, the maintenance torque compensation in the application parameters/basic confirmation can be selected.

This prevents dropping of the axis at high loads.



Delay of running start (delay time until brake is released):

This parameter serves to adjust the control of the retention brake to its mechanical inertia. The controller release is set to zero in the operating mode rotating speed control and position control/positioning during this delay time of the target rotating speed. This keeps the drive at a standstill until the brake is completely released again. Increased mechanical wear of the maintenance brake is avoided.

Deactivation delay (delay until the brake is fixed):

When taking away the controller release, the target rotating speed is set to zero. Once the actual speed is about zero, the maintenance brake drops in. From this time onward, the set delay time takes effect as well. During this time, the drive is kept in the current position until the maintenance brake develops its full torque. Only now will the controller release be deactivated internally. This prevents dropping due to premature deactivation of the control. Additional wear from dropping into the falling brake is avoided.

Automatic brake:

This function is only effective in the operating mode positioning. After completion of positioning, the time to the next positioning process is monitored with the automatic brake active. If no new request is present, the brake is activated after the end of the parameterised waiting time and the torque target is set to zero. The controller release and therefore the end stage remains active. This function reduces the thermal load of the motor. This can be of benefit specifically with smaller motors and/or in vertical applications.

elay to unlock brake	20 ms 20 ms
op delay	20
ay until brake locked	20 ms 20 ms
<u>O</u> K X <u>C</u> ancel	<u>? H</u> elp



8 Perform initial commissioning with S2 Commander

Initial commissioning is an aid to permit users who are not experts to commission the motor/drive. Several menus are gone through in a dialogue-oriented manner. Partially, they use automatic identification mechanisms of the firmware.

A description of the individual steps of initial commissioning can be taken from the documentation MAN_EN_1136180_LV-servoTEC_S2_SoftwareManual.pdf.

Some IEF-specific information is described in the following sections as well.

8.1 Settings for motors (AKM, DBL, ...)

8.1.1 Temperature monitoring

In motors in which a switch is installed for temperature monitoring and if this switch is not wired to the motor plug [X6] but to the resolver or encoder plug, the monitoring is set as follows:

The temperature values for the "warning threshold (25°C) and the "Overtemperature motor" (100°C) are without function since the motor only has one switch and no temperature value can be derived via this switch.

	🕼 52 Commander Vers. 4.0 - Motor	
 Motor temperature: analogue (X2A or X2B)" 	Eile Operating mode Display Parameters Error Options Help	
 Type: Generic type (linear) 	Application parameters Application parameters Safety parameters Image: Constraint of the second sec	Save Parameter ∴ Reset Actual values
 Warning threshold: 25°C (value has no meaning) 	Operational Ontroller parameters Ontroller parameters Power stage activ Positioning Intermediate circu Signals Brake functions	Speed Actual value: Setpoint:
 Overtemperature: 100°C (value has no meaning) 	Position Xact = Xd Adm Position Xact = Xd Adm Premeature monitoring Temperature monitoring PFC Field bus Field bus Premeature monitoring	Torque Actual value:
The temperature display is incorrect!	Temperature monitoring Motor temperature (X2A or X2B) Type Generic type (linear) Warning threshold motor temperature Warning threshold motor temperature Voertemperature motor 100 °C Vertemperature motor √ ✓ Short circuit monitoring 0,63 Ω √ ✓ Wire break monitoring 108192,00 Ω √ digital (Motor connector X6)	Motor current rms: Effective power: Effective power: Encoder angle: Temperatures - Characteristic curve Current settings stor at 25 °C 10,00 Ω stor at 25 °C 10,00 Ω Accept values and close dialog Quit without changes Pt brake chopper: Pt brake chopper:



Settings for euroLINE 8.2

8.2.1 Temperature monitoring

The euroLINE-axes can be equipped with different temperature sensors (see type sign, enclosed datasheet, ...).

Installed temperature sensor	Setting in the menu: "Temperature monitoring"
NTC-resistance (old version)	"Generic type (non-linear)"
PTC-resistance	"Generic type (linear)"





Erstellt von: Riemer Sonja | December 2015

NTC-resistance (old version)	Ef 52 Commander Vers. 4.0 • Motor File Operating mode Display Parameters Error Options Help Application parameters Image: State of the parameters Image: State of the parameters Image: State of the parameters Image: State of the parameters	<u>#-</u> 💿 >	⊶ ≬ Save Parameter	Reset ∂	
 Temperature motioning to "analogue (X2A or X2B)" 	Status Device parameters Motor data I/Os Power stage Angle encoder settings Operational Solutional Solutional		A	ctual values Speed	
 "Generic type (non-linear)" 	Controller parameters Controller parameters Controller enable logic Power stage activ Positioning Linits witch Intermediate circui Signals Position Xact = Xd CAM Intermediate circuit control			Actual value: Setpoint:	0 rpm 0 rpm
 Set warning threshold at 95°C. 	Speed reached Memo Premound Field bus Freduct Field bus Premound Premound	_,		Actual value:	A 00,0
 Set overtemperature to 100°C 	Temperature monitoring Motor temperature		Temperature - C	haracteristic curve	
(euroLINE coils: max. 110°C)	(X2A or X2B) Type Generic type (nonlinear) ✓ Warning threshold motor temperature 05 °C () Overtemperature motor 00 °C () ✓ Short circuit monitoring 0,63 Ω () ✓ Wire break monitoring 108192,00 Ω () ✓ Wire break monitoring 108192,00 Ω () ✓ Wire break monitoring 0,63 Ω () ✓ Wire break monitoring 108192,00 Ω () ✓ Wire break monitoring 0,63 Ω () ✓ Wire break monitoring 108192,00 Ω () ✓ Wire break monitoring 0,63 Ω () () ✓ Wire break monitoring 0,63 Ω () () () () () () () () () ()	vizard	Characteris Entry 1 Entry 2 Entry 3 Entry 4 Entry 5 Entry 6 Entry 7 Entry 8 Entry 9 Entry 10	tic curve 23 °C 74 °C 75 °C 75 °C 77 °C 88 °C 95 °C 104 °C 108 °C 124 °C	11481,00 Ω 1610,00 Ω 1578,00 Ω 1578,00 Ω 1502,00 Ω 844,00 Ω 643,00 Ω 555,00 Ω 337,00 Ω
	C Normally opened		×	Accept values and c Quit without cha	anges
	digital (Motor connector X6) © Normally closed © Normally opened	view	Entry 10	108 °C 124 °C Accept values and c Quit without cha	555,00 Ω 337,00 Ω 337,00 Ω 337,00 Ω 337,00 Ω



8.2.2 Setting commuting

- The euroLINE have no "Resolver" and no "Analogue Hall sensors" for commuting.
- Commuting is determined according to the "reaction procedure" at first activation.
- Spinning prevention 10000 mm/s
- Scaling test current: 100%

eneral configuration Extension	1	General configuration Extension	
Application	Configuration Holding torque compensation Image: Motor without commutating-generator	Mode:	Reaction method
Further settings Feedconstant display units		Scaling test current	100,00 %
	/≠ /≠ Settings	Commutating position valid	Reset
OK X Cancel 2 H	ata		

At a very smooth-running axes, e.g. euroLINE with air bearing, the test current is reduced to 5% (scaling test current = 5%).	NOTE	General configuration
	At a very smooth-running axes, e.g. euroLINE with air bearing, the test current is reduced to 5% (scaling test current = 5 %).	General configuration Extension Mode: Reaction method Motor overspeed protection: 1000,00 mm/s
Scaling test current		Scaling test current 5,00 %



8.2.3 Setting angle encoder (return system)

Angle encoder settings Commutating-encoder X2A X2B X10		1	Angle encoder settings Commutating-encoder X2A X2B X10		1	Angle encoder settings Commutating-encoder X2A X2B	X10	
×2A	(Resolver)		X2B Heidenhain / EnDa	t (multiturn coder)		X2B Heiden	ihain / EnDat (multiturn coder)	1
☐ active			[⊽ active				<< Back	1
Gear factor	Mode		Properties:			Gear factor	Power supply	
Ingoing shaft: 1	Resolver		Name = <user-defined encoder=""> Line count = 512 Power supply = 5 V</user-defined>	Edit Encoder >> List		Outgoing shaft: 1	Mode © digital	
Outgoing shaft: 1	C Analogue hall sensors		Analogue + serial interface Encoder with Z0-track Encoder with EnDat-interface	Encoder >> Servo		Line count 512	C analogue C analogue + serial interface	These settings become only effective after
			Life orginal industry, for active	Administration			Digital mode	and 'Reset' of the servo controller!
							Encoder with Hall signals	Save & Reset
							Interface Yaskawa 1	
		Save basic			Save basic			Save basic parameters to the
		parameters to the encoder			encoder		Error signal	encoder
		Save			Save		C High active C Low active	Save
✓ <u>O</u> K <u>Cancel</u>	? Help		V OK Cancel	? <u>H</u> elp			cel <u>?</u> Help	

The stroke number is actuated according to the following formula: Stroke number = (encoder strokes per mm * infeed) / assessment procedure

- Encoder strokes per mm: Corresponds to the strokes on the measuring system per mm (e.g.: L5 Interpolator Numerik Jena = 1000, ...)
- Infeed: Corresponds to the motor infeed per turn or from pole to pole
- Assessment procedure: The encoders perform a 4fold assessment of the A-B-signals \rightarrow 4

Motor/Axis-Type	Infeed / pole distance	Encoder strokes per mm	Encoder assessment	Calculation	Stroke number
euroLINE KL32	30,48mm	1000 strokes per mm	4-fold assessment	(1000 * 30,48) / 4	7620
euroLINE KL85	60,96	1000 strokes per mm	4- fold assessment	(1000 * 60,96) / 4	15240
euroLINE 120	24,00 mm	1000000 strokes per mm	1- fold assessment	1000000 * 24	2400000
euroLINE 170	24,00 mm	1000000 strokes per mm	1- fold assessment	1000000 * 24	2400000



Application (EN)

8.2.3.1 Invert rotating direction or movement direction

- The counting direction of the encoder and therefore the axis is determined by the wiring.
- If the rotating direction of the machine axis is to be adjusted, this may be implemented by a "-1" in the gear factor drive (see graphic on the right).

	×28		
be he Gear factor Ingoing shaft: Outgoing shaft: Line count	-1 1 512	<pre> << Back </pre> Power supply	These settings become only effective after 'Save (Parameter)' and 'Reset' of the servo controller! Save & Reset
		Error signal G High active C Low active	

Application (EN)

8.2.4 Settings for motor current

The maximum current and the rated current ar assumed according to the datasheet of the connected motor.

• The value for the torque constant is assumed the datasheet of the connected motor.

	ect new motor
Limit value	
Maximum current in A, rms value:	5,00 A 5,00 A
Nominal current in A, rms value:	2,23 A 2,23 A
I ² t-time:	2,0 s 2,0 s
power stage!	
power stage!	Power stage
Number of poles 8	Power stage
Number of poles 8 4	Power stage



- Reference switch to zero impulse track of X2B
- Suppress reference run after determination of the commuting position

wode Settings Driving profile Index pulse control □ Homing at power and controller enable □ Go to zero position after homing □ Homing switch at index pulse track of X2B □ Timeout-Watch □ Timeout-Time □ (0.0 s □ (1.0 s) □ No homing after detection of the commutation □ Offset □ No synchronization during the homing Type of homing switch ○ ○ Normally closed ○ Normally competition	I Orques Flying referencing max. homing distance permitted Max. position limits 100,000 mm Offset start position 0,010 mm
Positioning settings	

8.2.5.1 Reference run method

- If the PA-CONTROL does not perform the reference run via CAN-bus, the following settings must be made with the S2 commander:
- In an application with a Profibus-DP, reference run can b written via the Profibus (see German document: "MAN_DE_1083730_servoTECS2 ProfibusDP_SiemensS7")

wode Settings	Driving profile Index pulse o	ontrol Torques	Elving referencing	
Mode: Destination: Home position:	Limit switch			
Direction:	negative		×	
@1		1 570		



8.3 Set safety parameters

			Decelerations		Torque limitation by:	
2 Commander Vers. 4.0	- Motor		Quick stop	1000 mm/s ²	Maximum	current
Operating mode Display	Parameters Error Options Help	:	HW limit switch	1000 mm/s ²	Setpoint set	election
atus	Safety parameters	:	Positioning range exceeded (only in operation mode 'positioning')	1000 mm/s ²	Speed limitation Speed limit, positive	50,000 mm/s
 Operational Power stage activ 	Controller parameters		Ouerride	100.00 %	Speed limit, negative	10,00 %
 Intermediate circu Position Xact = Xd 	Signals	-			Shutdown level of following	q error
 Speed reached Torque reached 	Memo	1	Motor overspeed protection	50,000 mm/s	Shutdown at:	0,500 mm
I ² t: Motor / Servo ¬			Encoder difference contro	4	Absolute positioning range -214748,365 mm	214748,365 mm
					Setting	s

Note The parameter "Emergency stop" is overwritten by the PA-CONTROL with the axis parameter "OF	JFF-ramp".
--	------------



1 52 Commander Vers. 4.0 - Motor	Signals	Error management
File Operating mode Display Parameters Error Options Help	Comparison torque Speed signal Destination Following error	
BS 232 US Safety parameters	Following error ranges	Event list
Status Device parameters	positive limit 0.139 mm	Group 21: Current measurement
I/Os →		Group 22: PROFIBUS
Operational Controller parameters	negative limit -0,139 mm	Group 25: Invalid device type
Intermediate circu Signals		Group 27: Following error
O Position Xact = Xd CAM	Response delay 0,00 ms 0,00 ms	O Following error warning level Group 28: Hours run meter
Speed reached Memo		Group 30: Internal calculations
Torque reached Field bus Field bus		Group 31: I ² t
Pt: Break chopper		Show all groups
		Selected event:
	Cancel ? Help	Group 27: Following error
		Options
	Example: euroLINE: +/- 2,0 mm, 2,0 ms	Disable power stage immediately
	Signals	Stop at maximum current
	Comparison torque Speed signal Destination Following error	Disable servo controller
	Tolerance window for "target reached"	Warning
	Angle/distance, pos. 0,028 mm	Entry into buffer
	Angle/distance, neg0,028 mm	
	Response delay 0,00 ms 0,00 ms	✓ <u>O</u> K <u>Help</u>
	The completing distance is forced position expected, declared	Determine, what is to happen at "drag error message"?
	The remaining distance is target position separately declared.	
	OK Cancel ? Help	



9 Installing LV-servoTEC S2 motor database or installing updates

The LV-servoTEC S2 motor database can be loaded via the "INTERNET" or the "Product -DVD".

Cownloads - IEF-Werner GmbH - Windows	s Internet Explorer	EF-Werner GmbH ×	tin the second sec			
× 2 ·						
W E R N E R	Innovation for Automation	IEF Werner (imbH Controls	Home backward		×
PRODUCTS DOWNLOADS COMPANY TRADE FAIRS & EVENTS PRESS & NEWS SERVICE & SUPPORT	Downloads Please select your type of Download: Vour selection Manuals 20-Models Software 20-Models Software Application notes Control dogram Application notes Control dogram Application notes Control dogram Policitates Firmware PA-CONTROL MP V5.26 (0.46 MByte)	te)	Cantrols Stepper motor: technology Sarvo-technology Tauch-Screen Terminals Accessoires Circuit diagrams Software Operating_systems	Software	programming- u. diagnostic Software for PA-CONTROL <u>WIRPAC VS.10</u> system requirements: Windows 97, Vists, 379, 2000 <u>WIRPAC V4.75</u> system requirements: Windows 99, 98, Me, 2000, 399 <u>PA-CONTROL documentation V1.16</u> configuration-tool for LV servoTEC 52 S2 Commander V4.0.4201.1.1 LV servoTEC 52 engine database V1.30	
DEUTSCH HOME	 Firmware PA-CONTROL servoTEC V5.26 (0.44 ME Firmware PA-CONTROL Single/Compact/Control u Firmware PA-CONTROL Smart V5.26 (0.45 MByte Firmware PA-CONTROL Smart V5.26 (0.45 MByte Firmware PA-CONTROL Touch V6.05 (0.34 MByte LV-servoTEC S2 engine database V1.30 (2.61 ME Manuals PA-CONTROL for WINPAC V1.16 (88.7 M S2 Commander V4.0.4201.1.1 (22.21 MByte) WINPAC Demo V6.07 (22.85 MByte) WINPAC Update V6.08 (22.85 MByte) 	iyte) nit V5.26 (0.47 MByte) e) e) (yte) (Byte)		ereting systems	configuration- tool for LV servoTEC Drive V5.53	
	f 🗵 👑 🍇	© 2013 IEF Werner GmbH Sitemap Con	act Imp			





9.1 Installation or Update of the Motor Database









10 Annex

10.1 Error messages and solutions

Error number	Error message	Suggested solution			
Error 80-2	Overflow speed controller:	Increase cycle times (e.g. to column 2 or 3) (Also see software manual "Cycle times of the control circ	uits")		
		Power controller [µs]	80	100	125
		Speed controller [µs]	160	200	250
		Position controller [µs]	320	400	500
		Interpolation calculation (position control) [µs]	640	800	1000
Error 11-5	Reference run : I ² T / drag error	Activate: Suppress reference run after determination of the commuting position (see section 8.2.5 Settings for the reference run, page 45) In the window messages: Set "drag error" small.			

PA-CONTROL- Error number	Error message	Suggested solution
E345	A1 : FFFDhex - drivers (X3.2) or interim circuit voltage is missing	Activate axes with a time offset (see section 6.5 Direction of rotation / movement, pp 25 et seq.)



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10.2 Problems / features and solutions, tricks and advice

Problem / Feature	Suggested solution
Axis "vibrates (oscillates)" until balanced in position	Increase max. correction speed on the position controller.
Invert direction of rotation	See section 6.5 Direction of rotation / movement, pp 25 et seq.)

