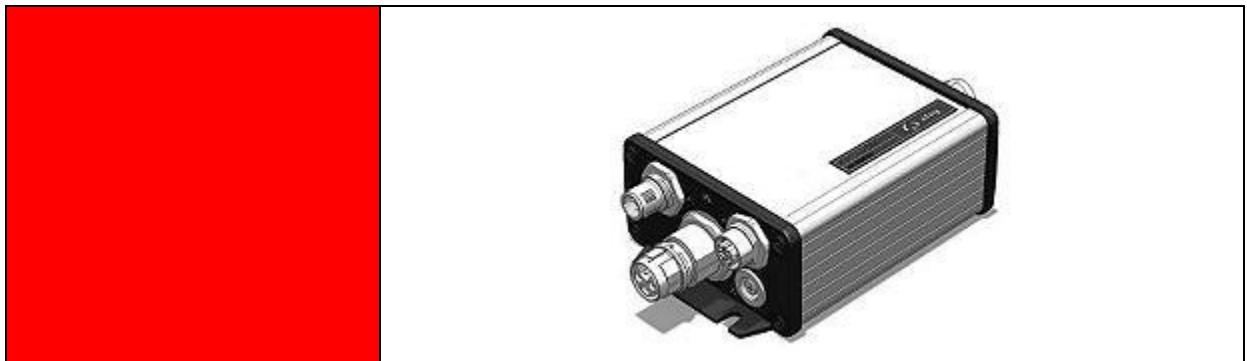


# Servo Controller SE-24

- **Software Manual**



**Complementary document to the  
Operating Instructions**  
© Copyright by Afag Automation AG



This manual is a complementary document to the operating instructions and applies to:

Software	Version
afagTools	V1.00.00.02
Firmware	1.89.00.64
Servo controller	Order No.
SE-24 I/O	50315434
SE-24 Profibus	50315435
SE-24 EtherCAT	50315436
SE-24 CANopen	50315437
Accessories	Order No.
SE-24 programming cable, 3m	50315431
SE-24 stick	50315432

Installation and start-up is to be performed only by qualified personnel in accordance with the operating instructions.

Version of this  
documentation:

SE-24-Software-Manual vers. 1.3 en. 01.06.2022



## CAUTION










As this manual is a complementary document to the operating instructions it alone is not sufficient to carry out installation and commissioning of the device.

Please pay attention to the notes in:

*1.1 Documentation*

## Symbols:

 <b>DANGER</b>	
	<p>Indicates imminent danger.</p> <p>Disregard of this information can result in death or serious personal injuries (invalidity).</p>
 <b>WARNING</b>	
	<p>Indicates a possible dangerous situation.</p> <p>Disregard of this information can result in death or serious personal injuries (invalidity).</p>
 <b>CAUTION</b>	
	<p>Indicates a possibly dangerous situation.</p> <p>Disregard of this information can result in damage to property or light to medium personal injuries.</p>
<b>NOTE</b>	
	<p>Indicates general notes, useful operator tips and operating recommendations which don't affect safety and health of the personnel.</p>

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## 1 General



### 1.1 Documentation

For the Servo Controllers of the SE-24 series are considerably documentations available. There are main documents and complementary documents.

**The documents contain safety instructions that must be followed**

**Main document:**

present	documentation / description
<input type="checkbox"/>	<ul style="list-style-type: none"> <li>▪ <b>SE-24 Operating Manual</b></li> </ul> <p>Description of the technical data and the functions of the device as well as notes on the plug assignment, installation and operation of the SE-24 servo controller.</p> <p>It is meant for persons who want to get familiar with the SE-24 servo controller.</p>

 <b>CAUTION</b>	
	<p><b>The operating manual is the main document and must be read by all means before installation and start-up of all devices of the SE-24 series independent of the respective model.</b></p>



### Complementary documents to the operating manual:

present	documentation / description
<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> <li>SE-24 Software Manual</li> </ul> Description of the “afagTools” parameterization program.
<input type="checkbox"/>	<ul style="list-style-type: none"> <li>SE-24 IO Manual</li> </ul> Description of the I/O control of the SE-24 servo controller.
<input type="checkbox"/>	<ul style="list-style-type: none"> <li>SE-24 Profibus Manual</li> </ul> Description of the fieldbus control of the SE-24 servo controller under PROFIBUS-DP.
<input type="checkbox"/>	<ul style="list-style-type: none"> <li>SE-24 programming example Siemens S7 V5.5</li> </ul> Description to the programming example for Siemens S7 V5.5.
<input type="checkbox"/>	<ul style="list-style-type: none"> <li>SE-24 programming example Siemens TIA V12.0</li> </ul> Description to the programming example for Siemens TIA V12.0.
<input type="checkbox"/>	<ul style="list-style-type: none"> <li>SE-24 EtherCAT Manual</li> </ul> Description of the fieldbus control of the SE-24 servo controller under EtherCAT.
<input type="checkbox"/>	<ul style="list-style-type: none"> <li>SE-24 programming example Beckhoff TwinCAT 2</li> </ul> Description to the programming example for Beckhoff TwinCAT 2.
<input type="checkbox"/>	<ul style="list-style-type: none"> <li>SE-24 CANopen Manual</li> </ul> Description of the fieldbus control of the SE-24 servo controller under CANopen.

These documents are available for download on our homepage:

[www.afag.com](http://www.afag.com)

## 2 Safety instructions

 <b>CAUTION</b>	
	<p>The safety instructions in the operating manual must be followed.</p> <p>The operating manual is the main document and must be read by all means before installation and start-up of all devices of the SE-24 series independent of the respective model.</p>

## 3 Introduction to afagTools

### 3.1 Overview of the tools and functions

The **afagTools** program provides a parameterization software that makes commissioning of the SE-24 servo controller with the corresponding Afag module easy and more convenient. **Commissioning is possible even when no higher level controller (PLC) is connected.** The **afagTools** program is easy to operate and enables a quick and comfortable commissioning. It contains the following tools:

- ❖ Status

Display of device information and actual values.

- ❖ CAN configuration

Setting of communication parameters and of the CAN node address.

- ❖ Profibus configuration

Setting of the Profibus slave address.

- ❖ Firmware update

Execution of the firmware update.

- ❖ Download of parameters

Loading of a configuration file.

- ❖ Manual operation

Commissioning functions for enable, referencing, Jog mode and approach and saving of positions.

- Supported languages: English, German (in preparation: French, Italian, Spanish, Polish).



## 4 Installation

### 4.1 Hardware requirements

#### Minimum requirements on the PC:

Processor: Pentium I or higher

Operating system: Windows 2000 / ME / XP / Vista / 7

Graphics card: Windows compatible, colour

Drives: hard disk (min. 400MB free space)

Main memory: min. 512MB

Interface: one free USB interface (V2.0 downward compatible with V1.1)

### 4.2 Installation of the afagTools program

The **afagTools** program can be downloaded and saved free of charge from the Afag Automation AG website using the following link:

<http://www.afag.com/produkte/download/download-handling-elektrisch.html>

Unpack the file *afagTools-V1.xx.yy.zz-Setup.zip* with a suitable program (WinZip, 7-Zip or similar).

Now execute the file *afagTools- V1.xx.yy.zz-Setup.exe*. Follow the installation instructions of the Setup wizard.

## 4.3 Connection

The following accessories are required to connect the SE-24 servo controller to a PC.

### 4.3.1 SE-24 programming cable, 3m (50315431)

The SE-24 programming cable is needed together with the SE-24 stick if the “afagTools” parameterization program is used to access the controller.

The SE-24 programming cable is the connecting cable between the SE-24 servo controller and the SE-24 stick and can be used for all types of the SE-24 servo controller.

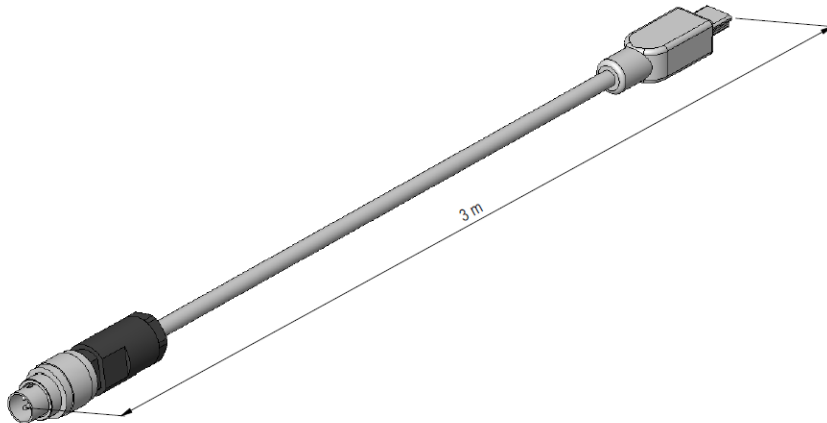


Figure 1: SE-24 programming cable

### 4.3.2 SE-24 stick (50315432)

The SE-24 stick is needed together with the SE-24 programming cable if the “afagTools” parameterization program is used to access the controller.


The SE-24 stick is the gateway from USB to CANopen and can be used for all types of the SE-24 servo controller.



Figure 2: SE-24 stick

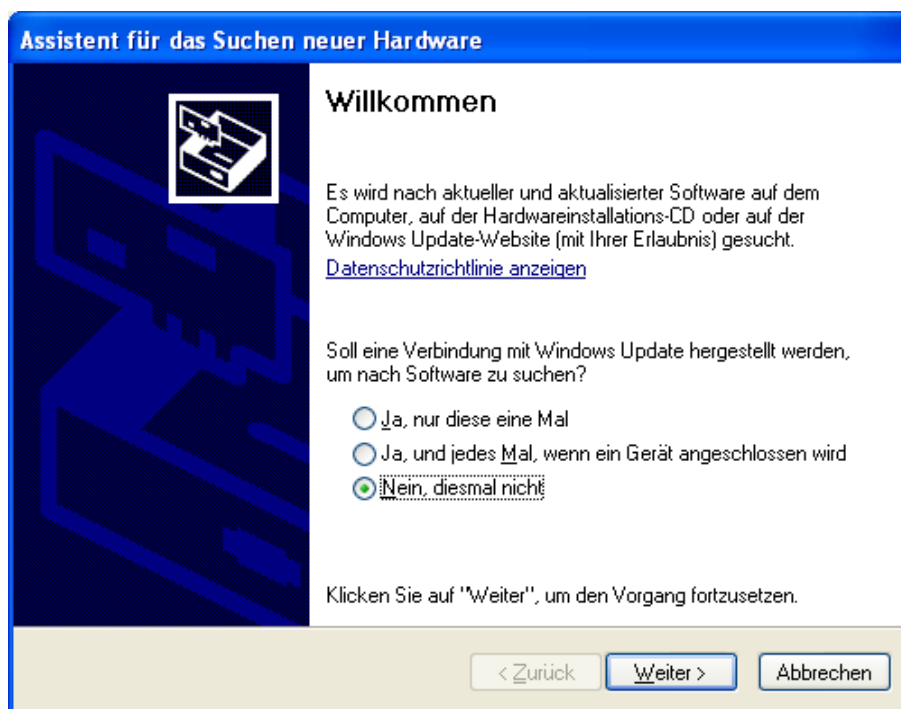
### 4.3.3 Installation of the SE-24 stick

This chapter describes the installation of the SE-24 stick.

NOTE	
	<p>Make sure that the „afagTools“ software from version V1.00.00.00 was installed on the computer before you connect the SE-24 stick.</p> <p><b>Administrator rights</b> are required on the corresponding PC.</p>

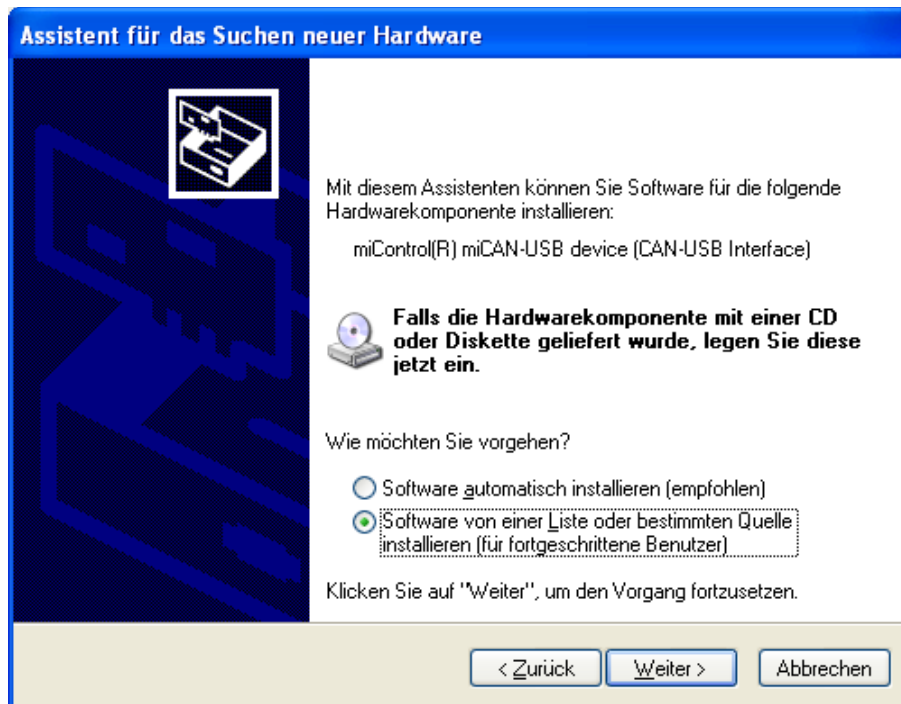
After the „afagTools“ software was installed on the computer, the SE-24 stick can be plugged into a free USB connection.

The following window will open when the device is recognized:



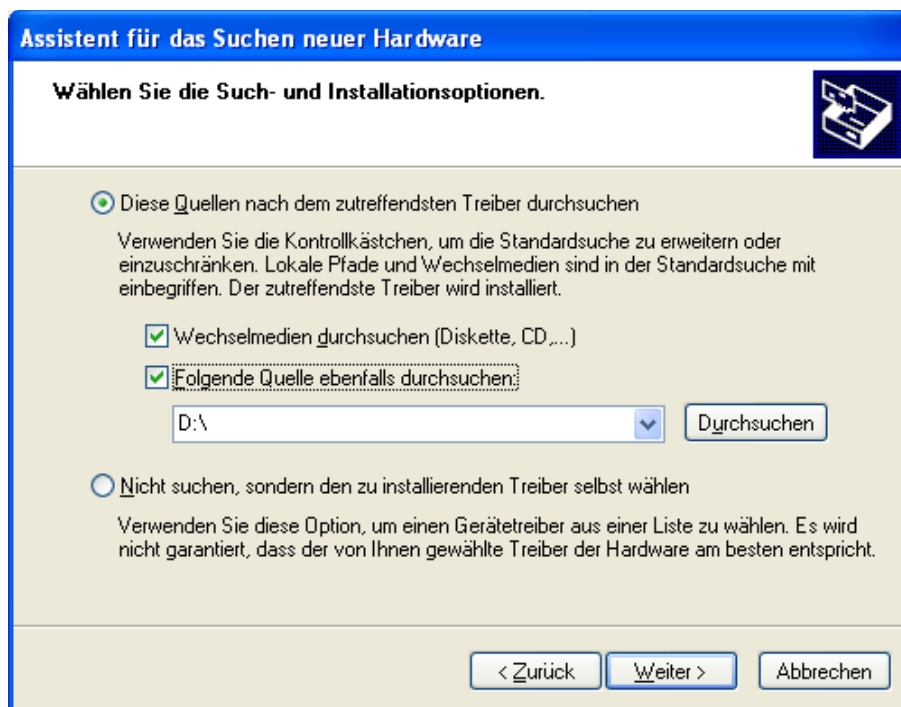
Select “No, not this time” and click on “Continue >”.

The following window will be displayed:



Select option “Install software from a list or a specific location (for advanced users)” and click “Continue >”.

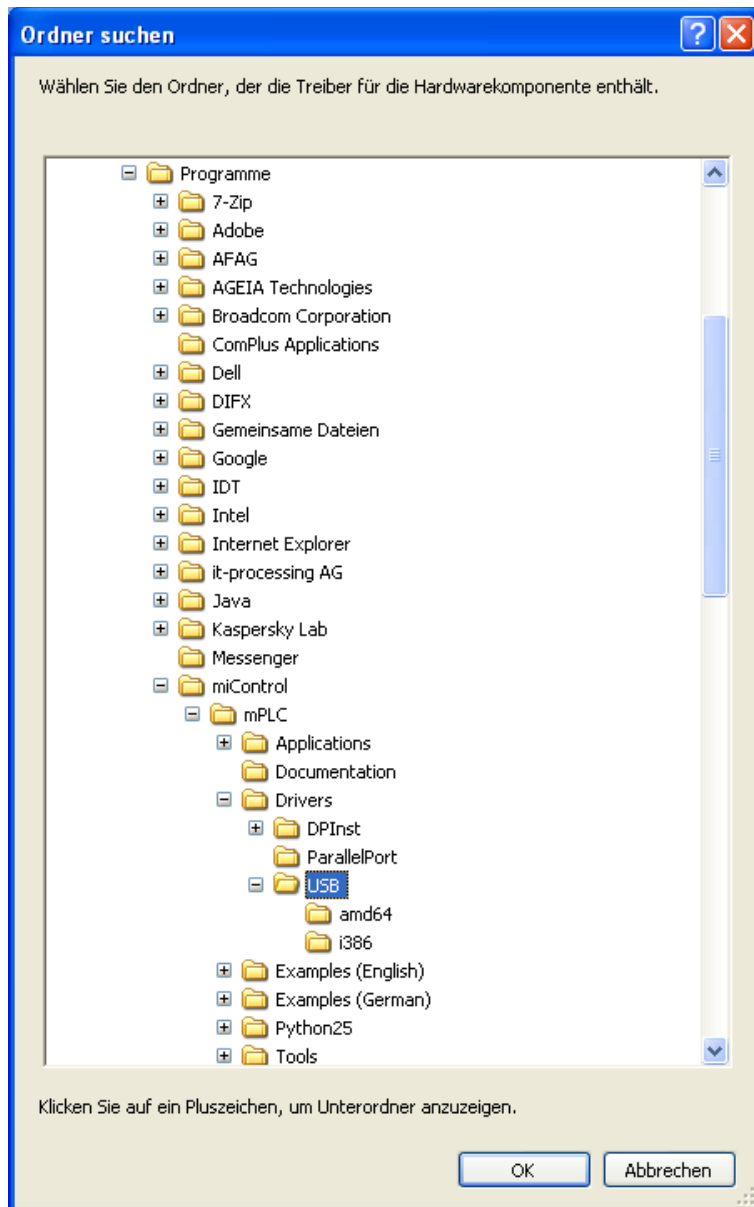
The following window appears:



Select options “Search the following locations for matching driver” and also “Search the following location”.

Then click on “Browse”.

The following window appears:

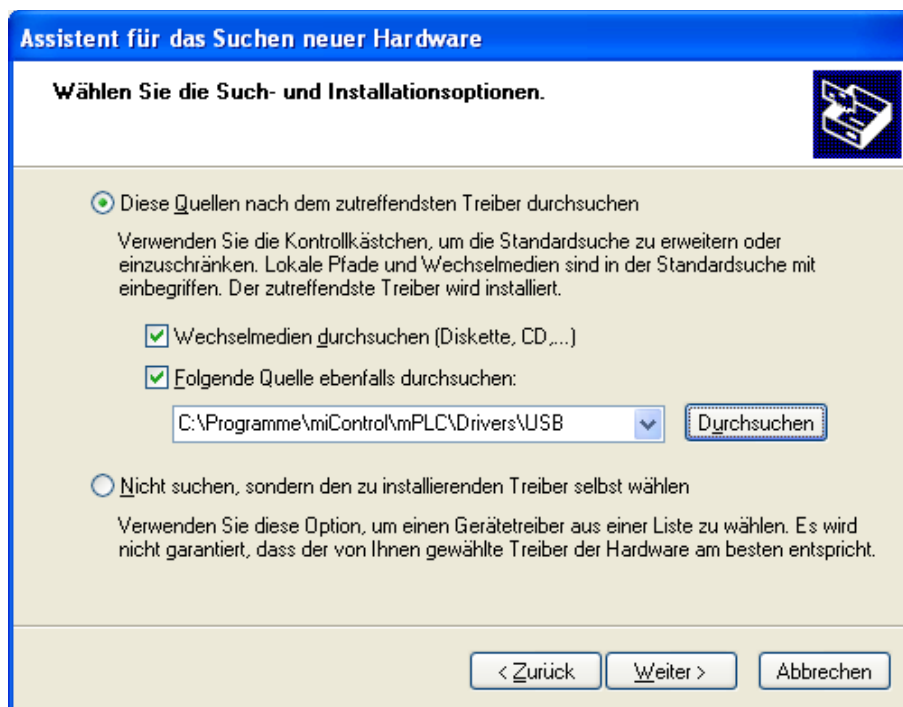


In the installation directory select the “USB” folder of the “afagTools” program.

The default path is: „C:\Programs\miControl\mPLC\Drivers\USB“

Then click on “OK”.

The path will also be displayed in the following window:



Click on “Continue >” when the path is displayed correctly.

The following window opens:



Click on “Complete”. This finishes the installation of the SE-24 stick.

## 5 Working with afagTools

### 5.1 Starting the program

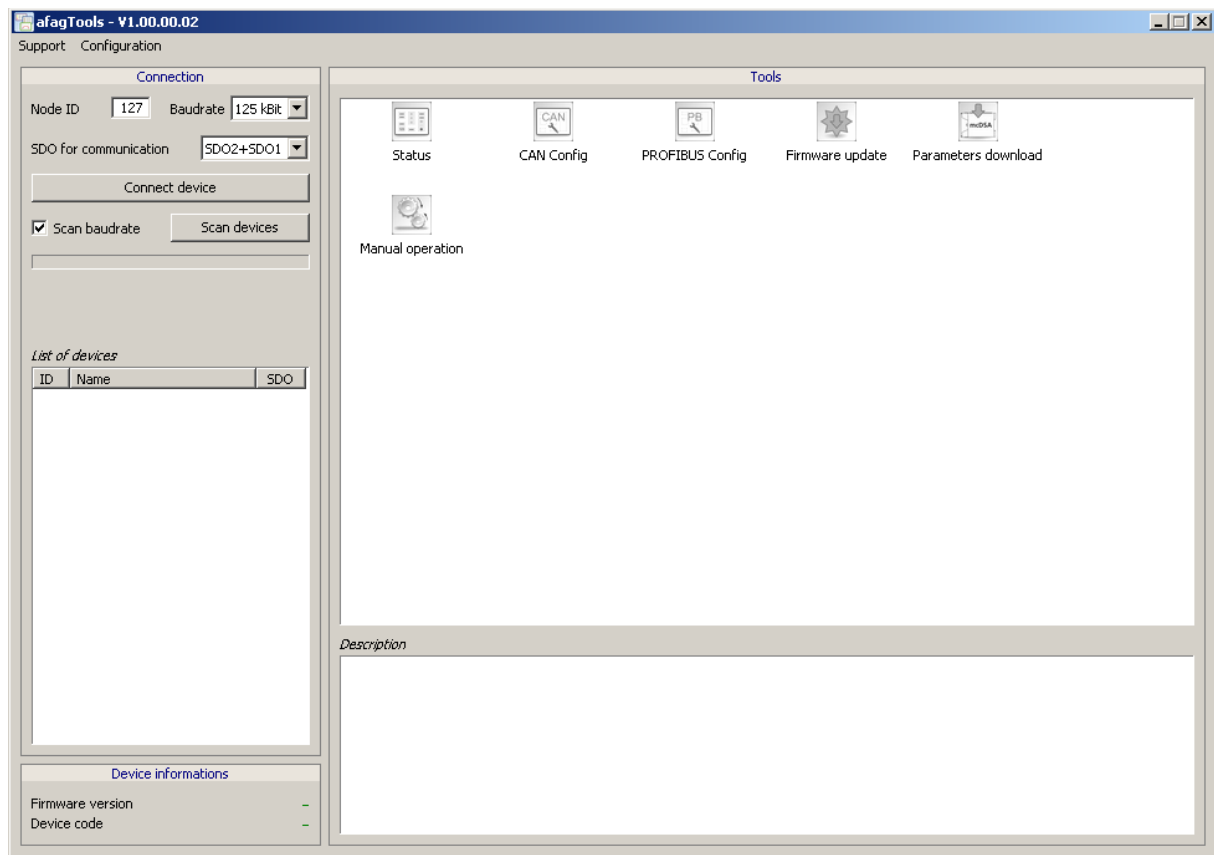
You can start the “afagTools” program by clicking on the corresponding desktop link which was created automatically during installation



or by selecting the program under: Start/Programs/miControl mPLC/afagTools.

### 5.2 Main window

After starting the program the main window will open.

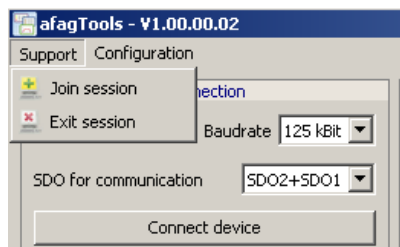


The main window is divided in a number of areas which are explained hereafter.



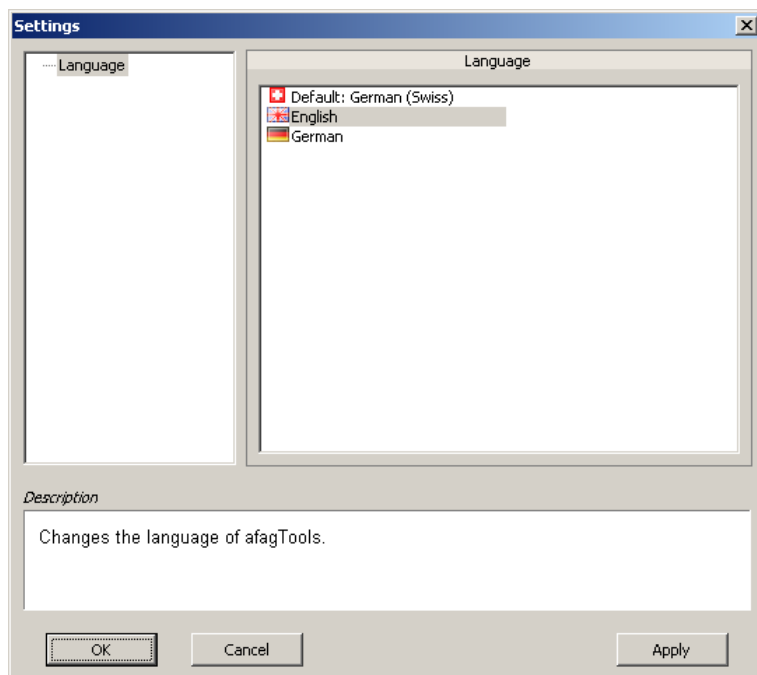
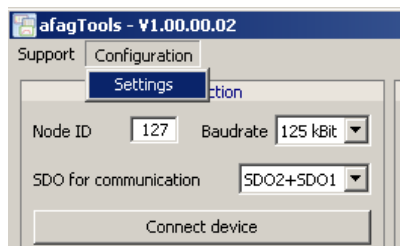
### 5.2.1 Support

The Mikogo program is started via the "Support -> Join session" function which enables a remote desktop connection to the software developer of miControl who has developed the afagTools program. He however first has to specify a code so that a session can be started and is contact person only for program-technical questions and not for an application-oriented support which is guaranteed by Afag Automation AG.



### 5.2.2 Language

The language can be selected via the function "Configuration -> Settings".



The following languages are implemented in the current version of afagTools:  
Default: German (Swiss), English, German.

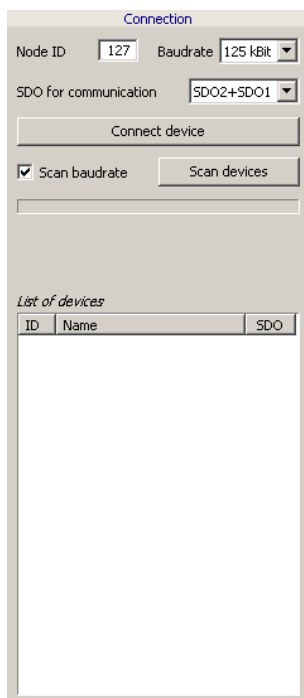
### 5.2.3 Connection

## NOTE



A connection can only be established if the SE-24 stick is inserted in the PC and is correctly connected to the SE-24 servo controller via the SE-24 programming cable.

The required settings for establishing a connection to the SE-24 servo controller can be made in the “Connection” area.

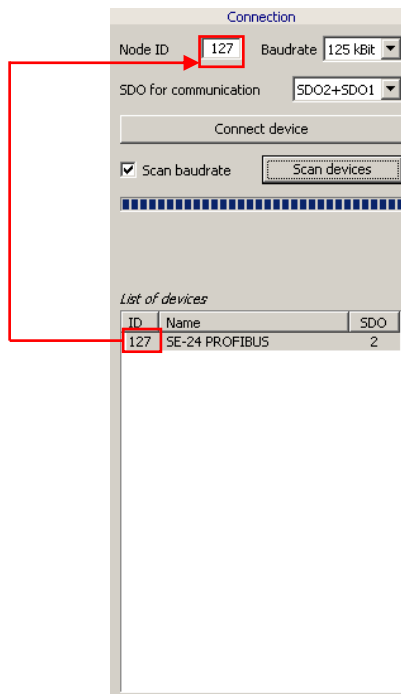


Node ID	CANopen address of the SE-24 servo controller with which a connection is to be established.  The default node ID of the SE-24 servo controller upon delivery is: 127
Baudrate	Communication speed for the connection to the SE-24 servo controller.  The baud rate can be set from 10k to 1M baud.
SDO for communication	Selection of the SDOs ( <b>S</b> ervice <b>D</b> ata <b>O</b> bject) which are to be used for communication with the afagTools parameterization program.
Connect device	Starts communication with the SE-24 servo controller whose address is entered in the “Node ID” box.
Scan baudrate	If this option was activated the connection establishment is tested at different speeds upon clicking the “Scan devices” button.
Scan devices	The connection is tested and all devices connected are displayed in the “List of devices” area.
List of devices	All devices connected are faded in after the “Scan devices” function was selected.

The devices found are displayed in the “List of devices” area after the “Scan devices” button was clicked.

Enter the ID of the device with which a connection is to be established in the “Node ID” box and press the “Connect device” button.

*Enter the Node ID found and press „Connect device“.*

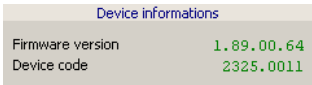


ID	Name	SDO
127	SE-24 PROFIBUS	2

If only one device was found a connection will already be established without entering the ID in the “Node ID” box and without pressing the “Connect device” button.

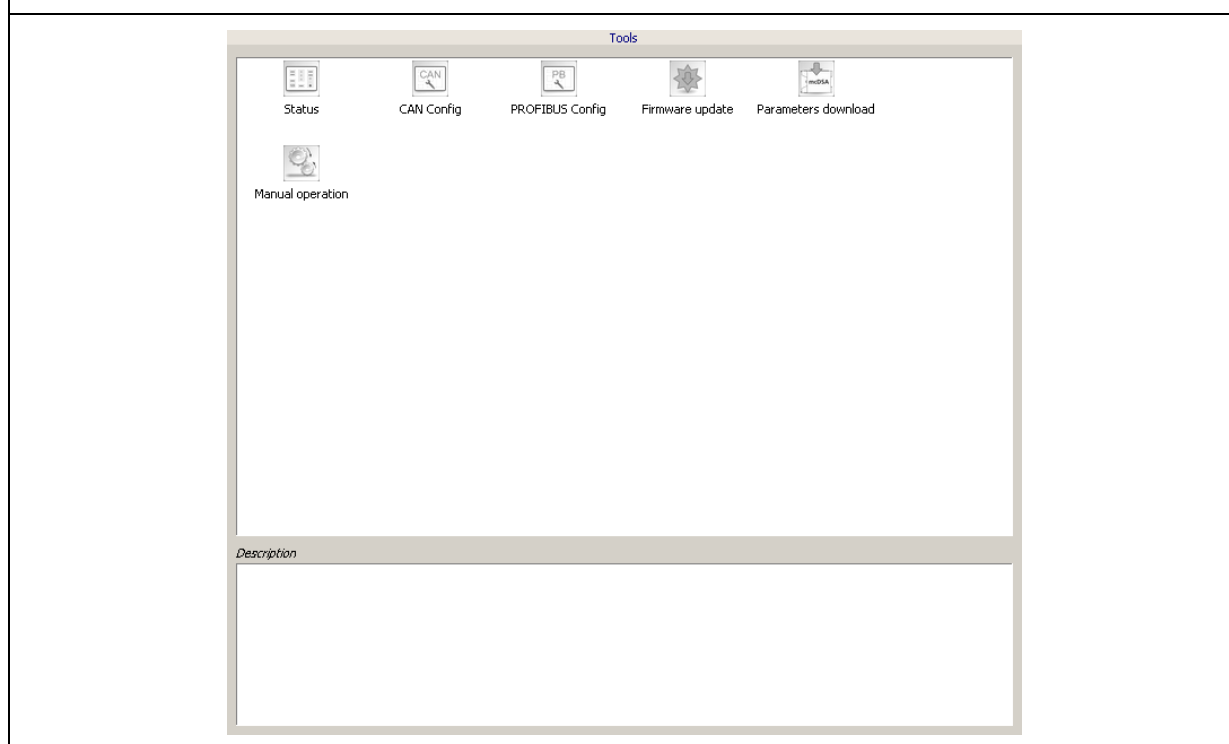
## 5.2.4 Device informations

Information about the connected device are displayed in the “Device informations” area.

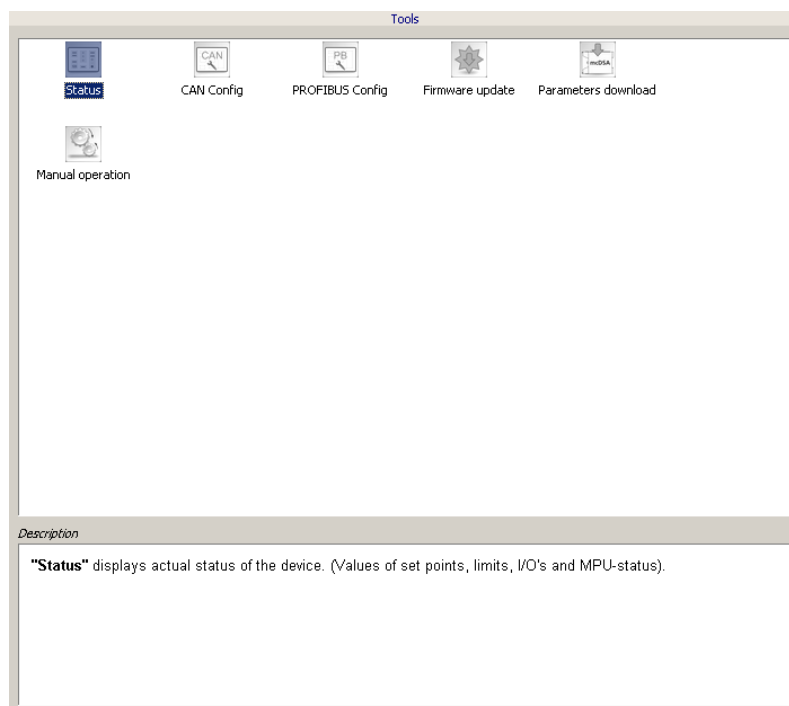
	Firmware version	Version of the currently loaded firmware.
	Device code	Individual code with which every device can be identified.

## 5.2.5 Tools

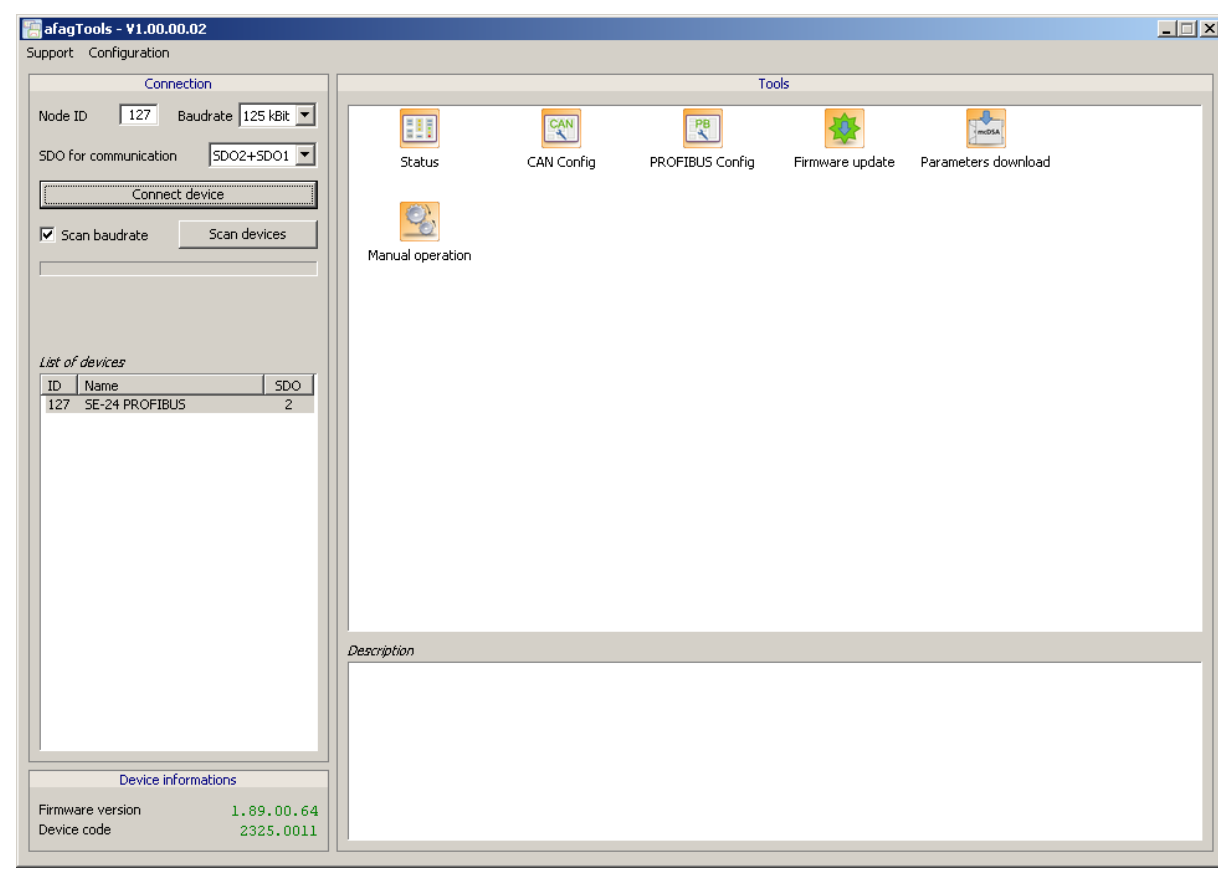
The “Tools” area provides the overview of all functions available.



After a tool was selected a short description will be displayed in this area.



The tools are only released when there is an active connection to a device.



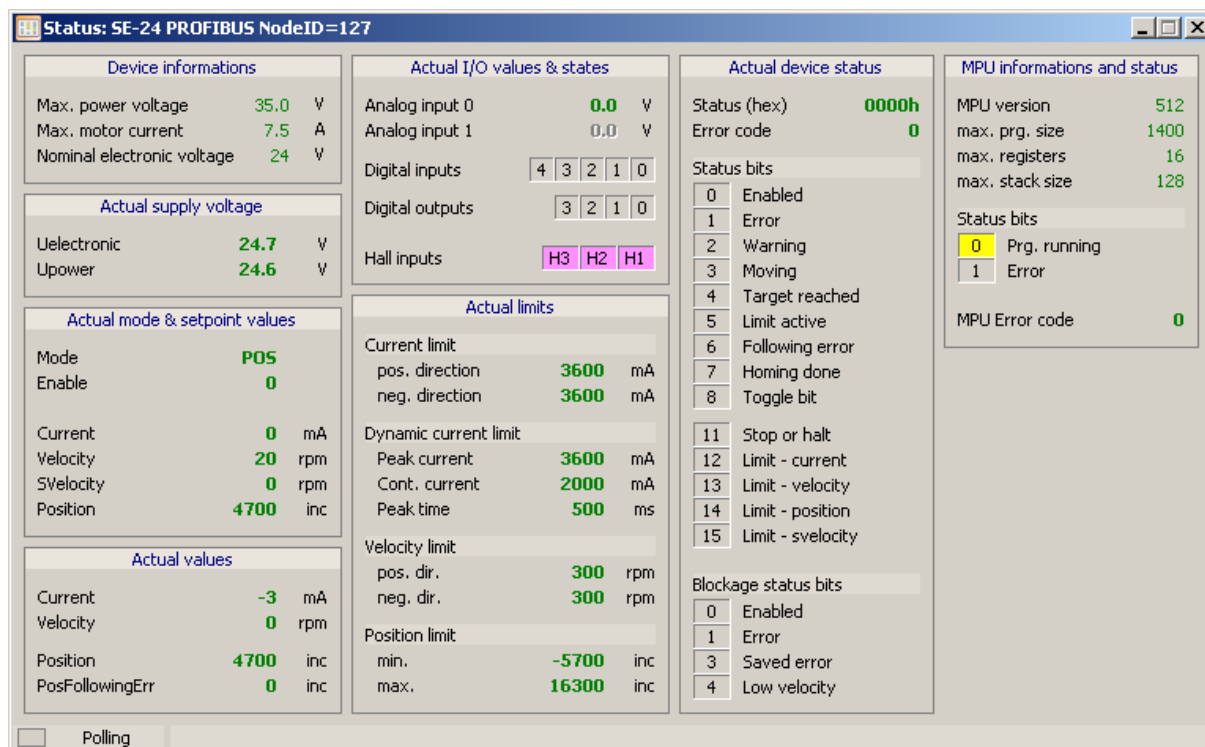
## 5.3 Status



Status

The “Status” tool displays the actual status of the device (target values, actual values, limits, I/O status and MPU status).

**Comment:** As the units vary and are very extensive depending on the corresponding application they are not displayed in the “Status” tool. The units displayed here are current default units. The deviations are however specified in the following descriptions. Please pay attention to the indications for the corresponding objects.



**Status: SE-24 PROFIBUS NodeID=127**

Device informations		Actual I/O values & states		Actual device status		MPU informations and status	
Max. power voltage	35.0 V	Analog input 0	0.0 V	Status (hex)	0000h	MPU version	512
Max. motor current	7.5 A	Analog input 1	0.0 V	Error code	0	max. prg. size	1400
Nominal electronic voltage Ue	24 V	Digital inputs	4 3 2 1 0	Status bits		max. registers	16
		Digital outputs	3 2 1 0	0 Enabled		max. stack size	128
		Hall inputs	H3 H2 H1	1 Error		Status bits	
				2 Warning		0 Prg. running	
				3 Moving		1 Error	
				4 Target reached		MPU Error code	0
				5 Limit active			
				6 Following error			
				7 Homing done			
				8 Toggle bit			
				11 Stop or halt			
				12 Limit - current			
				13 Limit - velocity			
				14 Limit - position			
				15 Limit - svelocity			
				Blockage status bits			
				0 Enabled			
				1 Error			
				3 Saved error			
				4 Low velocity			

☐ Polling

### Device informations

Max. power voltage	Maximum voltage which may be applied to the power voltage input of the SE-24 servo controller. Power supply connector X1, pin 3.
Max. motor current	Maximum current that can be supplied from the SE-24 servo controller to a motor.
Nominal electronic voltage Ue	Nominal voltage of the controller electronics. This voltage is applied to pin 2 of the power supply connector X2.

### Actual supply voltage

Uelectronics (Ue)	Current actual voltage for the electronics which is applied to pin 2 of the power supply connector X1.
Upower (Up)	Current actual voltage for the power which is applied to pin 3 of the power supply connector X1.

Actual mode & setpoint values	
Mode	Currently activated operating mode
Enable	Current target status of the operational enable
Current	Current target current
Velocity	<p>Current target rotational speed for the speed controller in the “Pos” (positioning) operating mode.</p> <p><b>Comment:</b> The unit [rpm] is the default setting. Depending on the application the value is however displayed in the following units:  translatory: [mm/s]                      rotary: [°/s]</p>
SVelocity	<p>Current target rotational speed for the secondary speed controller.</p> <p>Is only used in the “Vel” (rotational speed) operating mode.</p> <p>Not relevant for the SE-24.</p>
Position	<p>Current target position</p> <p><b>Comment:</b> The unit [Ink] is the default setting. Depending on the application the value is however displayed in the following units:  translatory: [μm] (um)                      rotary: [°/1000]</p>
Actual values	
Current	Current actual current
Velocity	<p>Current actual velocity</p> <p><b>Comment:</b> The unit [rpm] is the default setting. Depending on the application the value is however displayed in the following units:  translatory: [mm/s]                      rotary: [°/s]</p>
Position	<p>Current actual position</p> <p><b>Comment:</b> The unit [Ink] is the default setting. Depending on the application the value is however displayed in the following units:  translatory: [μm] (um)                      rotary: [°/1000]</p>
PosFollowingErr	<p>Current position following error</p> <p><b>Comment:</b> The unit [Ink] is the default setting. Depending on the application the value is however displayed in the following units:  translatory: [μm] (um)                      rotary: [°/1000]</p>
Actual I/O values and states	
Analog input 0	Current actual voltage which is applied to the analog input 0.
Analog input 1	Not relevant for the SE-24.
Digital inputs	Current actual status of the digital inputs

Digital outputs	Current actual status of the digital outputs
Hall inputs	Current actual status of the inputs to which the Hall sensors are connected. <b>Comment:</b> <i>Not all the motors have Hall sensors.</i>
<b>Actual limits</b>	
<b>Current limit</b>	
pos. direction	Currently set current limitation for movements in clockwise direction.
neg. direction	Currently set current limitation for movements in counter clockwise direction.
<b>Dynamic current limit</b>	
Peak current	Currently set limitation for the peak current of the dynamic current limitation.
Cont. current	Currently set limitation for the continuous current of the dynamic current limitation.
Peak time	Currently set limitation for the peak time of the dynamic current limitation.
<b>Velocity limit</b>	
pos. dir.	Currently set speed limitation for movements in clockwise direction. <b>Comment:</b> <i>The unit [rpm] is the default setting. Depending on the application the value is however displayed in the following units:</i> <i>translatory: [mm/s]                      rotary: [°/s]</i>
neg. dir.	Currently set speed limitation for movements in counter clockwise direction. <b>Comment:</b> <i>The unit [rpm] is the default setting. Depending on the application the value is however displayed in the following units:</i> <i>translatory: [mm/s]                      rotary: [°/s]</i>



Position limit	
min.	<p>Currently set positioning limitation for movements in counter clockwise direction.</p> <p><b>Comment 1:</b> The unit [Ink] is the default setting. Depending on the application the value is however displayed in the following units:  translatory: [<math>\mu\text{m}</math>] (um)                      rotary: [<math>^{\circ}/1000</math>]</p> <p><b>Comment 2:</b> As the position limitations are set against a stored reference offset the value displayed here does <u>not</u> correspond to the value which can actually be approached (software limit).</p> <p><b>Please see also:</b>  Calculation of the positioning range using the example of the SG-50 servo gripper</p>
max.	<p>Currently set positioning limitation for movements in clockwise direction.</p> <p><b>Comment 1:</b> The unit [Ink] is the default setting. Depending on the application the value is however displayed in the following units:  translatory: [<math>\mu\text{m}</math>] (um)                      rotary: [<math>^{\circ}/1000</math>]</p> <p><b>Comment 2:</b> As the position limitations are set against a stored reference offset the value displayed here does <u>not</u> correspond to the value which can actually be approached (software limit).</p> <p><b>Please see also:</b>  Calculation of the positioning range using the example of the SG-50 servo gripper</p>

### Calculation of the positioning range using the example of the SG-50 servo gripper:

Pos.limit min.      – Reference offset      =    neg. software end position  
-6700 $\mu\text{m}$               – (-5700 $\mu\text{m}$ )                      =    -1000 $\mu\text{m}$

Pos.limit max.      – Reference offset      =    pos. software end position  
15300 $\mu\text{m}$               – (-5700 $\mu\text{m}$ )                      =    21000 $\mu\text{m}$

The SG-50 servo gripper thus has the following positioning range:  
-1000 $\mu\text{m}$  to 21000 $\mu\text{m}$

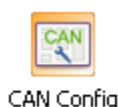
<b>Actual device status</b>	
Status (hex)	Current actual device status in hexadecimal notation.
Error code	Current device error code <b>Comment:</b> For explanations on the error please refer to the document: "SE-24 operating instructions", table „Error Register“
Status bits	Current actual status of the status bits of the device
Blockage status bits	Current actual status of the blocking monitoring Not relevant for the SE-24
<b>MPU information and status (MPU = Motion Process Unit)</b>	
MPU version	Version of the currently loaded MPU
max. prg. size	Maximum size of the MPU program
max. register	Maximum available registers for the MPU program
max. stack size	Maximum stack size of the MPU program
Status bits: Current actual status of the status bits	
Prg. running	Signalizes that the MPU program is running
Error	Signalizes an error of the MPU program
MPU error code	Current device error code <b>Comment:</b> Must not be confused with the "Device error code"

## 5.4 CAN configuration

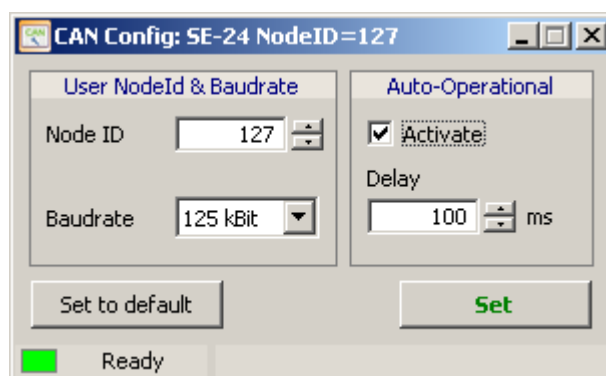
The “CAN configuration” tool sets the CAN parameters of the device (Node ID, CAN Baudrate, Auto-Operational).

Proceed as follows to set the CAN Node address (Node ID) and the communication speed (baud rate):

1. Call up the “afagTools” parameterization program.
2. Select the “CAN Config” tool:



3. Set the Node ID and the baudrate in the following window and confirm with “Set”:



4. **Important:** Changes are only retrieved when the controller is restarted.

### 5.4.1 CAN baudrate

The default transmission speed of the SE-24 servo controller is 125kBit/s and can be set up to maximum 1MBit/s.

## 5.5 Profibus configuration

The “PROFIBUS configuration” tool sets the PROFIBUS parameters of the device (address).

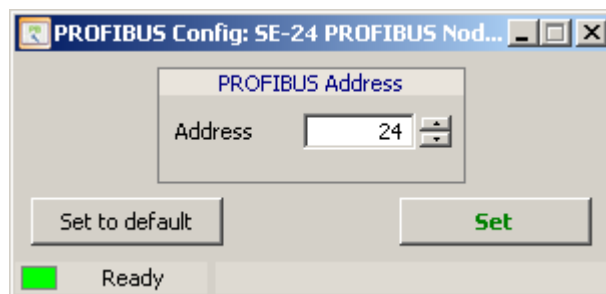
Proceed as follows to set the Profibus-Slave address:

1. Call up the “afagTools” parameterization program.
2. Select the “PROFIBUS Config” tool:



PROFIBUS Config

3. Set the Profibus-Slave address in the following window and confirm with “Set”:





4. **Important:** The address is only retrieved when the controller is restarted.

### 5.5.1 Profibus baud rate

The SE-24 servo controller automatically detects the baud rate of the Profibus communication and supports speeds up to **max. 12Mbaud**.

## 5.6 Firmware update

The “Firmware update” tool updates or changes the firmware of the device.

 <b>CAUTION</b>	
	<p><b>A firmware update deletes all parameters incl. the loaded application which are stored on the SE-24 servo controller.</b></p> <p><b>A firmware update should therefore only be executed if absolutely necessary or upon consultation with the manufacturer Afag Automation.</b></p>

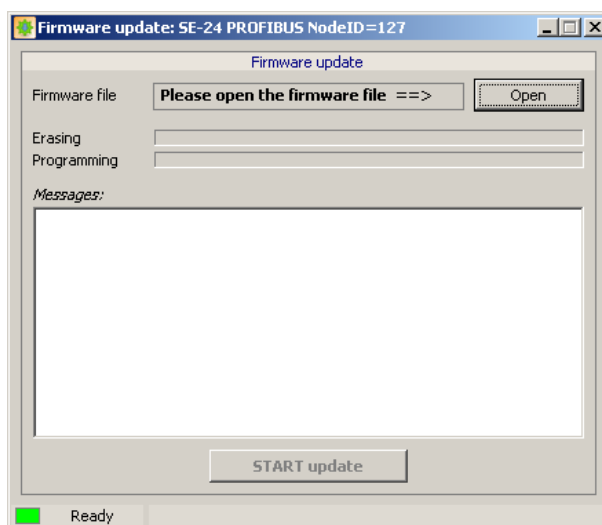
If a firmware update must be executed for an important reason, proceed as follows:

1. Call up the “afagTools” parameterization program.
2. Select the “Firmware update” tool:

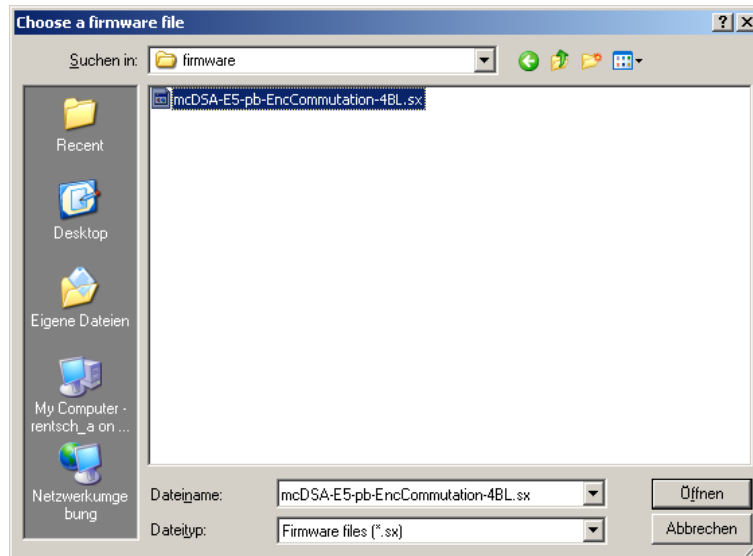


Firmware update

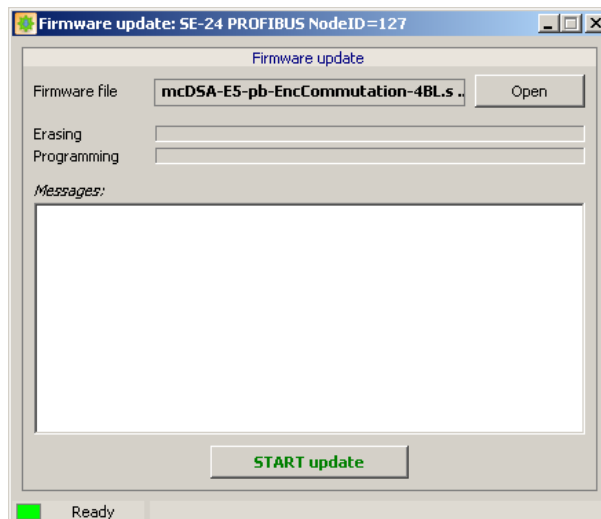
3. Click the “Open” button to open the firmware directory:





4. Browse the directory for the desired firmware, select firmware and confirm by clicking the “Open” button:



5. Click the “START update” button to load the desired firmware:




6. Important:

 <span style="font-size: 1.2em; font-weight: bold; margin-left: 10px;">CAUTION</span>	
	<p><b>After a firmware update the SE-24 servo controller is <u>not</u> ready to operate if the application and parameters were not loaded.</b></p>

## 5.7 Parameters Download

The “Parameters download” tool updates or changes application-specific parameters.

NOTE	
	<p>Afag Automation AG generates and provides the parameter sets for applications with Afag handling modules.</p> <p>The parameter files are identified by the extension *.par.</p>

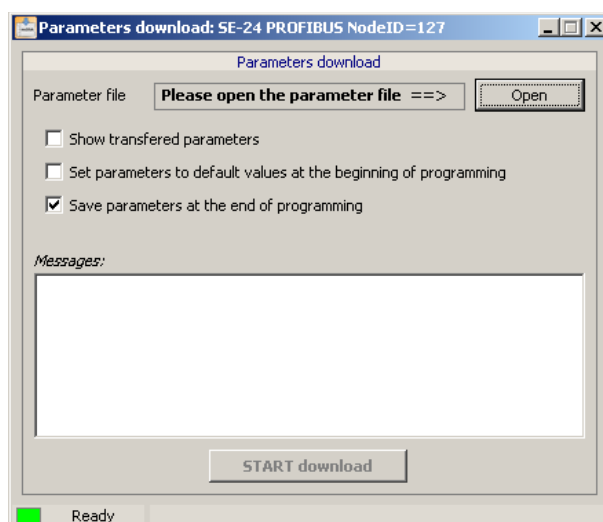
Carry out the following steps to load a parameter file:

1. Call up the “afagTools” parameterization program.
2. Select the “Parameters download” tool:

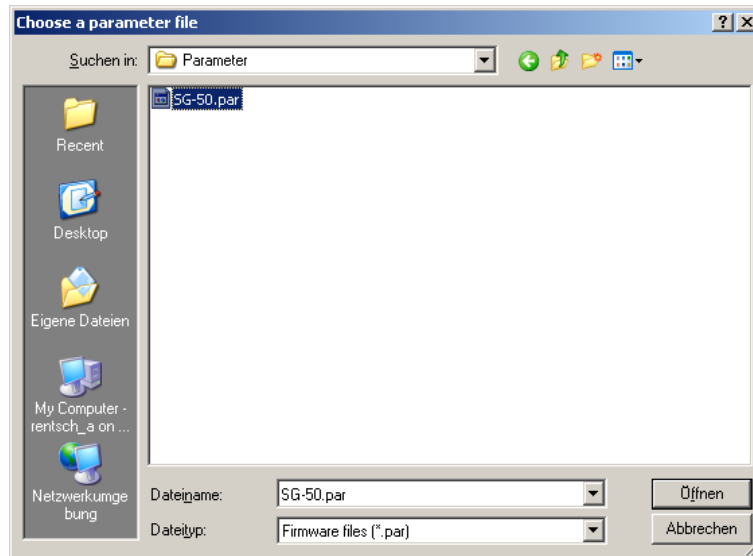


Parameters download

3. Click the “Open” button to open the Parameter file:

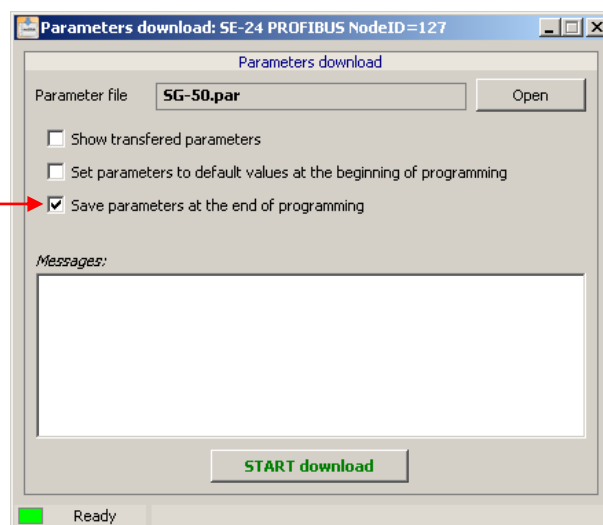


4. Browse the directory for the desired Parameter file, select the file and confirm by clicking the “Open” button:



5. Activate the “Save parameters at the of programming” option and load the selected Parameter file by clicking the “START Download” button:

Activate the „Save parameters at the end of programming“ option.





## 5.8 Manual operation



Manual operation

The “Manual operation” tool is the main application tool for the user.

It enables manual operation of the connected servo axis as well as setting, saving and loading of the position-related parameters.

Manual operation: SE-24 PROFIBUS NodeID=127, SG-50\_Pos\_IB5.pos

File

Enable Disable STOP Homing

**Actual application status**

Status (hex): 0001h

Status bits:

- 0 Ready
- 1 Enabled
- 2 Homing done
- 3 Move OK
- 4 ACK

**Actual device status**

Status (hex): 0200h

Error code: 0

Status bits:

- 0 Enabled
- 1 Error
- 2 Warning
- 3 Moving
- 4 Target reached
- 5 Limit active
- 6 Following error
- 7 Homing done
- 8 Toggle bit
- 9 Command toggle bit
- 10 Command error
- 11 Stop or halt
- 12 Limit - current
- 13 Limit - velocity
- 14 Limit - position
- 15 Limit - svelocity

**Actual values**

Current: -4 mA

Velocity: 0 mm/s

Trg. position: 4700 um

Act. position: 4700 um

PosFollowingErr: 0 um

**Settings**

Pos. window: 100 um

Pos. window time: 50 ms

Curr. window: 100 mA

Curr. window time: 50 ms

Curr. gating time: 200 ms

**Moving data sets**

	Position	Velocity	Acceleration	Deceleration	Current	Delay	Relative positioning	
	um	mm/s	mm/s <sup>2</sup>	mm/s <sup>2</sup>	%	ms		
1.	0	0	0	0	0	0		Set
2.	0	0	0	0	0	0		Set
3.	0	0	0	0	0	0		Set
4.	0	0	0	0	0	0		Set
5.	0	0	0	0	0	0		Set
6.	0	0	0	0	0	0		Set
7.	0	0	0	0	0	0		Set
8.	0	0	0	0	0	0		Set
9.	0	0	0	0	0	0		Set
10.	0	0	0	0	0	0		Set
11.	0	0	0	0	0	0		Set
12.	0	0	0	0	0	0		Set
13.	0	0	0	0	0	0		Set
14.	0	200	2000	2000	0	200		Set
15.	20000	20	200	200	<input checked="" type="checkbox"/>	50	200	Set

Store in device

**Reverse mode**

Pos. 1 <--> Pos. 2

Pos, 1 <--> Pos, 2

**Jog**

Velocity: 4 mm/s

Acceleration: 1000 mm/s<sup>2</sup>

Jog+ Jog-

OK: The parameters have been saved in the device.

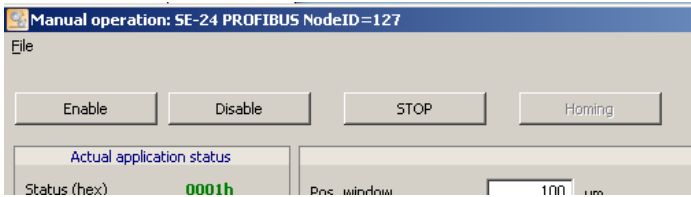
## NOTE





Applies only to the **SE-24 CANopen** model

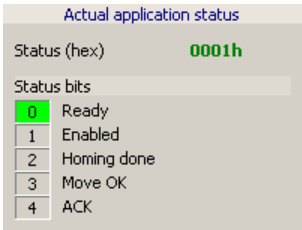
The communication via CANopen to a higher level control system (PLC) must be stopped if the functions of the “Manual operation” tool are to be used for the models of the SE-24 CANopen series.

## 5.8.1 Commands

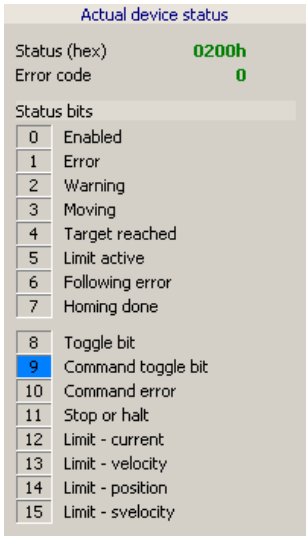
	
Enable	Controller will be activated and the motor energized.
Disable	Controller will be deactivated and the motor no longer energized.
STOP	A current movement is stopped immediately.
Homing	Starts the reference run. <b>Comment:</b> This function is only active if the controller enable was activated.

 <b>CAUTION</b>	
	A movement is triggered after the “Homing” button was actuated.

## 5.8.2 Actual application status

	
Status (hex)	Current actual application status in hexadecimal notation.
<b>Status bits</b> Detailed information are to be found in the interface descriptions of the corresponding manuals for the various SE-24 servo controller models.	
Ready	The device is ready-to-operate, there are no active errors pending. <b>Comment:</b> Corresponds to the “ready” interface signal.
Enabled	The controller is active and the motor is energized. <b>Comment:</b> Corresponds to the “drive_enable_ok” interface signal.
Homing done	A valid reference run was executed. <b>Comment:</b> Corresponds to the “ref_valid” interface signal.
Move OK	A movement was executed. <b>Comment:</b> Corresponds to the “move_ok” interface signal.
ACK	Toggle bit which signalizes that a job (in the application) was recognized. <b>Comment:</b> This signal is used internally.

### 5.8.3 Actual device status

	
Status (hex)	Current actual device status in hexadecimal notation.
Error code	Current device error code <b>Comment:</b> For explanations on the error please refer to the document: <i>“SE-24 operating instructions”, table „Error Register“</i>
<b>Status bits</b>	
Enabled	The controller is active and the motor is energized. <b>Comment:</b> Corresponds to the “drive_enable_ok” interface signal.
Error	An error is active.
Warning	A warning is active.
Moving	The connected servo axis executes a movement.
Target reached	The target value of the specified position was reached.
Limit active	A limit is active.
Following error	A following error is active.
Homing done	A valid reference run was executed. <b>Comment:</b> Corresponds to the “ref_valid” interface signal.
Toggle bit	Toggle bit which changes its status when a command was executed. <b>Comment:</b> This signal is used internally.

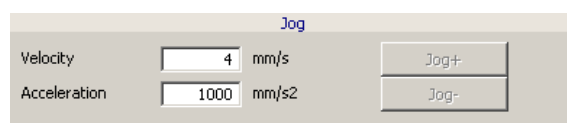
Command – toggle bit	Toggle bit which signalizes that a command was recognized. <b>Comment:</b> <i>This signal is used internally.</i>
Command - error	A command error is active.
Stop or halt	A stop or halt is executed.
Limit - current	The current limit is reached.
Limit - velocity	The speed limit is reached.
Limit - position	The position limit is reached.
Limit - svelocity	The limit for the secondary speed controller is active.

## 5.8.4 Actual values

<div>Actual values</div> <table><tr><td>Current</td><td>-7</td><td>mA</td></tr><tr><td>Velocity</td><td>0</td><td>mm/s</td></tr><tr><td>Trg. position</td><td>4700</td><td>um</td></tr><tr><td>Act. position</td><td>4700</td><td>um</td></tr><tr><td>PosFollowingErr</td><td>0</td><td>um</td></tr></table>		Current	-7	mA	Velocity	0	mm/s	Trg. position	4700	um	Act. position	4700	um	PosFollowingErr	0	um
Current	-7	mA														
Velocity	0	mm/s														
Trg. position	4700	um														
Act. position	4700	um														
PosFollowingErr	0	um														
<b>Interface objects</b>  Detailed information about the objects which are also interface objects are to be found in the interface descriptions of the corresponding manuals for the various SE-24 servo controllers models.																
Current	Current actual current  <b>Comment:</b> <i>Corresponds to the “current_value” interface object (not available for the SE-24 I/O model).</i>															
Velocity	Current actual velocity  <b>Comment:</b> <i>Depending on the application the value is displayed in the following units:</i>  <i>translatory: [mm/s]                      rotary: [°/s]</i>															
Trg. position	Current target position  <b>Comment 1:</b> <i>Depending on the application the value is displayed in the following units:</i>  <i>translatory: [μm] (um)                      rotary: [°/1000]</i>  <b>Comment 2:</b> <i>Corresponds to the “target_position” interface object (not available for the SE-24 I/O model).</i>															
Act. position	Current actual position  <b>Comment 1:</b> <i>Depending on the application the value is displayed in the following units:</i>  <i>translatory: [μm] (um)                      rotary: [°/1000]</i>  <b>Comment 2:</b> <i>Corresponds to the “position_value” interface object (not available for the SE-24 I/O model).</i>															
Pos.FollowingErr	Current position following error  <b>Comment:</b> <i>Depending on the application the value is displayed in the following units:</i>  <i>translatory: [μm] (um)                      rotary: [°/1000]</i>															

## 5.8.5 Jog mode

The Jog mode is a useful aid to executing slow movements for commissioning and to determining the positions for future positionings.



Velocity	<p>Target movement speed used for the Jog mode.</p> <p><b>Comment:</b> Depending on the application the value is displayed in the following units:</p> <p>translatory: [mm/s]                      rotary: [°/s]</p>
Acceleration	<p>Target acceleration used for the Jog mode.</p> <p><b>Comment:</b> Depending on the application the value is displayed in the following units:</p> <p>translatory: [mm/s²]                      rotary: [°/s²]</p>
Jog+	<p>By pressing and holding down the “Jog+” button the drive is accelerated with the acceleration set for the Jog mode up to the velocity in the positive direction which was also set for the Jog mode.</p> <p>When the button is released the drive is braked until stop with the deceleration set for the quick stop.</p> <p><b>Comment:</b> The function is only active when controller enable was activated. A reference run does not have to be executed.</p>
Jog-	<p>By pressing and holding down the “Jog-” button the drive is accelerated with the acceleration set for the Jog mode up to the velocity in the negative direction which was also set for the Jog mode.</p> <p>When the button is released the drive is braked until stop with the deceleration set for the quick stop.</p> <p><b>Comment:</b> The function is only active when controller enable was activated. A reference run does not have to be executed.</p>

## 5.8.6 Settings

### NOTE



The values in the “Settings” area only refer to the “Move OK” signal which corresponds to the “move\_ok” interface signal.

Detailed information about the functions are to be found in the function description of the SE-24 operating instructions, chapter “Function description”.

Settings			
Pos. window	<input type="text" value="100"/>	um	
Pos. window time	<input type="text" value="50"/>	ms	
Curr. window	<input type="text" value="100"/>	mA	
Curr. window time	<input type="text" value="50"/>	ms	
Curr. gating time	<input type="text" value="200"/>	ms	

### Settings for the “Move OK” signal in positioning mode.

**Pos. window**  
This value corresponds to the tolerance for the positioning window and is placed as a symmetric +/- value around the target position.

**Comment:** Double the value corresponds to the “position\_tolerance” value in Figure 3: Positioning mode.

**Pos. window time**  
This value sets the delay time from the moment when the actual position value is in the positioning window until the “Move OK” signal is triggered.

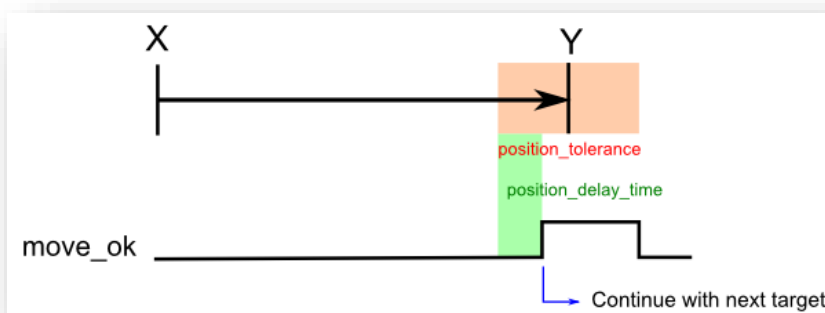
**Comment:** This value corresponds to the “position\_delay\_time” in Figure 3: Positioning mode.

**Comment:** The “Movement OK” signal is triggered when the delay time for the position in the positioning window has passed.

X = position\_value (actual position)      Y = target\_position (target position)

Current = maximum current (from parameterization)

**Figure 3: Positioning mode**





### Settings for the “Move OK” signal in current mode.

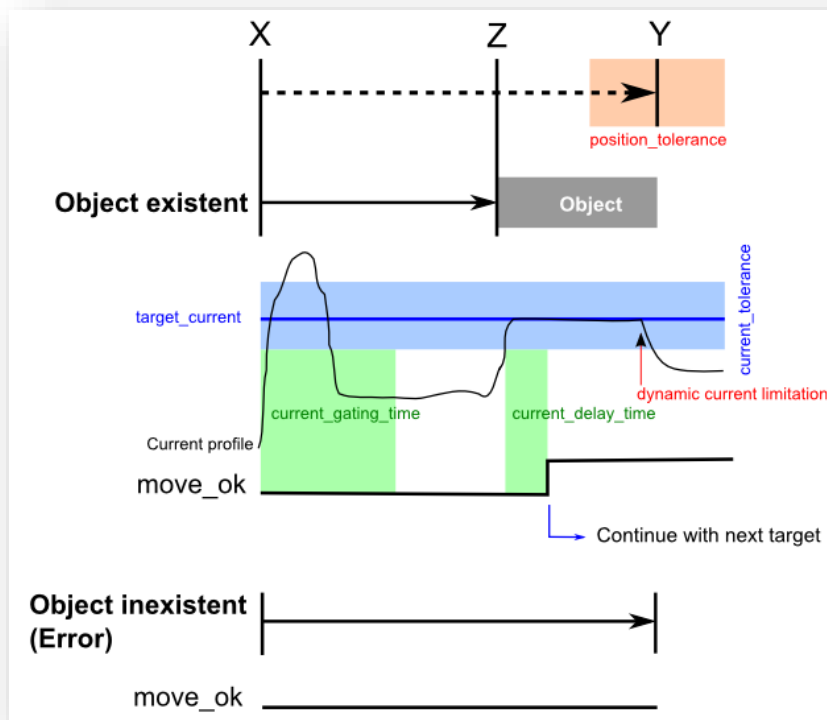
Curr. window	<p>This value corresponds to the tolerance for the current window and is placed as a symmetric +/- value around the target current.</p> <p><b>Comment:</b> Double the value corresponds to the “current_tolerance” value in Figure 4: Current mode.</p>
Curr. window time	<p>This value sets the delay time from the moment when the actual current value is in the current window until the “Move OK” signal is triggered.</p> <p><b>Comment:</b> This value corresponds to the “current_delay_time” value in Figure 4: Current mode.</p>
Curr. gating time	<p>This value fades out the starting current when a movement is started.</p> <p>After start-up the “Move OK” signal is not triggered though the current is within the current window.</p> <p><b>Comment:</b> This value corresponds to the “current_gating_time” value in Figure 4: Current mode.</p>
<p><b>Comment:</b> The “Move OK” signal is triggered after the current fade out time and the delay time for the current in the current window have passed.</p>	

X = position\_value (actual position)


Y = target\_position (abortion position)

Current = target\_current

**Figure 4: Current mode**



### 5.8.7 Moving data sets

NOTE	
	The moving data sets can <u>not</u> be used for all applications.


The moving data sets are used in the following cases:

- for commissioning of the servo controller and the corresponding servo axis
- for operation of the SE-24 I/O servo controller
- for operation of the servo controllers with fieldbus connection only when the moving data sets are controlled via the "pos\_nr\_bit0 to 3" signals.

The moving data sets are not used in the following cases:

- For operation of servo controllers with fieldbus connection when the target values for a motion block are transmitted with the corresponding bus protocol and the "pos\_nr\_bit0 to 3" signals are not used.

**Comment:** *This mode of operation is recommended for servo controllers with fieldbus connection.*

⚠ CAUTION	
	<p><b>Be careful when you enter the values!</b></p> <p><b>A wrong value may lead to unexpected movements, involuntary high speeds and/or forces and approach of unwanted positions.</b></p> <p><b>This can result in personal injury and / or damage to property.</b></p>

Moving data sets							
Position	Velocity	Acceleration	Deceleration	Current	Delay	Relative positioning	
um	mm/s	mm/s <sup>2</sup>	mm/s <sup>2</sup>	%	ms		
1.	0	0	0	0	0	<input type="checkbox"/>	Set
2.	0	0	0	0	0	<input type="checkbox"/>	Set
3.	0	0	0	0	0	<input type="checkbox"/>	Set
4.	0	0	0	0	0	<input type="checkbox"/>	Set
5.	0	0	0	0	0	<input type="checkbox"/>	Set
6.	0	0	0	0	0	<input type="checkbox"/>	Set
7.	0	0	0	0	0	<input type="checkbox"/>	Set
8.	0	0	0	0	0	<input type="checkbox"/>	Set
9.	0	0	0	0	0	<input type="checkbox"/>	Set
10.	0	0	0	0	0	<input type="checkbox"/>	Set
11.	0	0	0	0	0	<input type="checkbox"/>	Set
12.	0	0	0	0	0	<input type="checkbox"/>	Set
13.	0	0	0	0	0	<input type="checkbox"/>	Set
14.	0	200	2000	2000	0	200	Set
15.	20000	20	200	200	<input checked="" type="checkbox"/>	50	Set

Store in device


**A maximum of 15 moving data sets with the following contents can be stored on the SE-24 servo controller:**

Position	<p>Target position</p> <p>The target position value is interpreted as an absolute or relative value depending on the “Relative positioning” option.</p> <p><b>Comment 1:</b> Depending on the application the value is displayed in the following units:  translatory: [<math>\mu\text{m}</math>] (um)      rotary: [<math>^{\circ}/1000</math>]</p> <p><b>Comment 2:</b> For operation in current mode this position must be behind the impact on the object.</p>
Velocity	<p>Target movement speed</p> <p><b>Comment:</b> Depending on the application the value is displayed in the following units:  translatory: [mm/s]      rotary: [<math>^{\circ}/\text{s}</math>]</p>
Acceleration	<p>Target acceleration</p> <p><b>Comment:</b> Depending on the application the value is displayed in the following units:  translatory: [mm/s<sup>2</sup>]      rotary: [<math>^{\circ}/\text{s}^2</math>]</p>
Deceleration	<p>Target deceleration (braking acceleration)</p> <p><b>Comment:</b> Depending on the application the value is displayed in the following units:  translatory: [mm/s<sup>2</sup>]      rotary: [<math>^{\circ}/\text{s}^2</math>]</p>

Current (option selection)	If this option is activated current mode will be applied to this moving set, otherwise the positioning mode will be maintained.
Current (value)	Target current value in % <b>Comment:</b> This value is only active if current mode was selected for this moving set by clicking the "Current" option.
Delay	This value is the approach delay for this moving set.
Relative positioning (option selection)	If this option is activated the target position value will be interpreted as a relative value. Otherwise the value is absolute related to the reference point.
Set	The corresponding moving set is started when this button is clicked. <b>Comment:</b> The function is only active when controller enable was activated and a valid reference run was executed.

 <b>CAUTION</b>	
	<b>A movement is triggered after the "Set" button was actuated.</b>

Store in device	The input values are stored permanently on the servo controller after this button was actuated.
-----------------	---

<b>NOTE</b>	
	Changes are only maintained after a restart of the controller if they were stored by clicking the "Store in device" button.

### 5.8.8 Reverse mode

Reverse mode is used to determine the parameters for later positioning during start-up.



Example



Pos.X selection box	Using this selection box you can select any set from the 15 moving sets which is to be executed first when starting the reverse mode.
Pos.Y selection box	Using this selection box you can select any set from the 15 moving sets which is to be executed as the second one when starting the reverse mode.
Pos.X <--> Pos.Y	<p>Reverse mode is started when the “Pos.X &lt;--&gt; Pos.Y” button is pressed. That means that the two selected moving sets are approached continuously one after the other.</p> <p>The reverse mode can be stopped by clicking the “STOP” button. In this case movement is braked with the braking acceleration defined for the quick stop.</p> <p>The reverse mode can also be interrupted by clicking the “Disable” button. The motor will then coast to stop.</p> <p><b>Comment:</b> The function is only active when controller enable was activated and a valid reference run was executed.</p>

### CAUTION



**A movement is triggered after the “Pos.X <--> Pos.Y” button was actuated.**

### NOTE

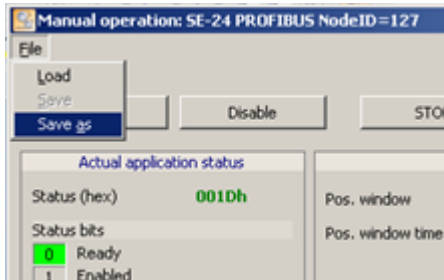


Changes of the moving data sets used for the reverse mode are ignored when reverse mode is active. The reverse mode must be stopped and then restarted again in order to retrieve the changes.

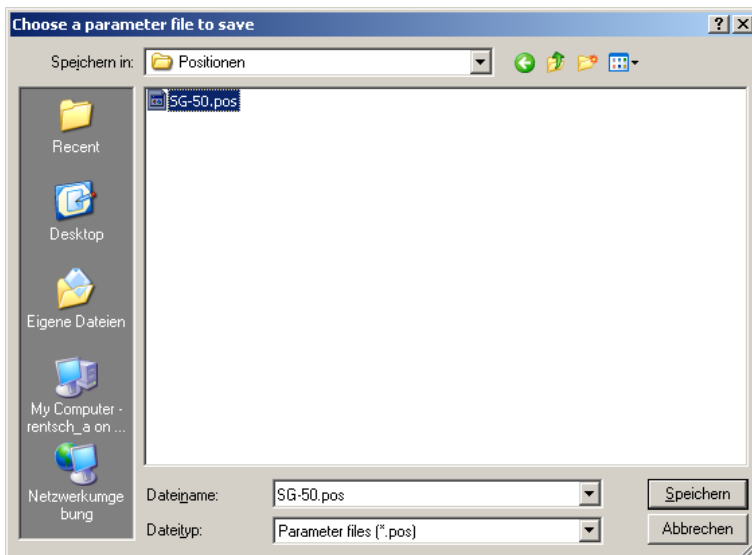
### 5.8.9 Saving position values to a file

The values set in the “Manual operation” tool should be saved to a file.

Select the “File/Save as” function from the “Manual operation” tool.

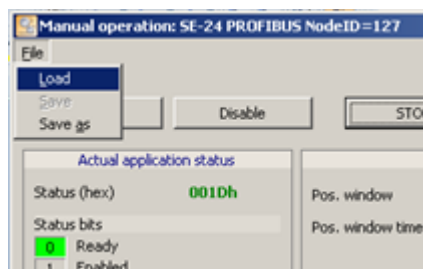


Select the desired directory in the window which opens and save the file by clicking the "Save" button.

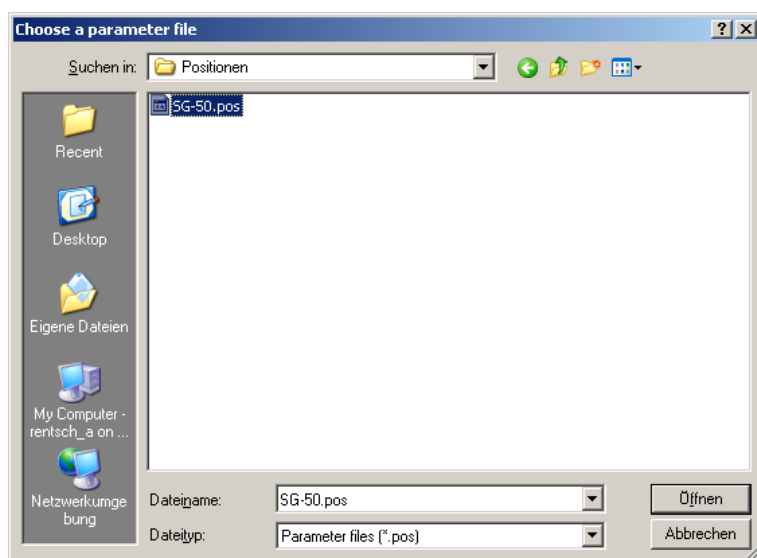


### 5.8.10 Loading position values from a file

Select the “File/Load” function in the “Manual operation” tool in order to load a saved position file into the servo controller.



Open the desired directory in the window which now opens and select the file. The file will be loaded into the servo controller by clicking the “Open” button.





## 6 Quick guide for commissioning

All steps required for commissioning of an SE-24 servo controller with the corresponding Afag handling module are described hereafter in short.

The standard procedure will be described. This procedure is only an example and can vary depending on the application.

**The safety instructions must be followed by all means.**

 <b>CAUTION</b>	
	<p><b>Before commissioning the operator must ensure the following:</b></p> <p>The operating instructions must have been read completely and understood.</p> <p>The complementary documents for the corresponding servo controller model must have been read completely and understood.</p> <p>The safety instructions contained in the operating manual and in the complementary documents must be followed by all means.</p> <p>Only trained and qualified personnel in the meaning of this operating manual are allowed to carry out commissioning of the device.</p>

### 6.1 Checklist for commissioning

Table 1: Checklist for commissioning

Step	Work to be done	OK
1	Connect the cable for motor output, encoder and reference sensor to the Afag handling module. Please see the SE-24 operating instructions for further notes.	<input type="checkbox"/>
2	Connect the cable for motor output, encoder and reference sensor to the Afag SE-24 servo controller. Please see the SE-24 operating instructions for further notes.	<input type="checkbox"/>
3	Connect the SE-24/SE-48 power cable to a suitable 24V DC power supply. Please see the SE-24 operating instructions for further notes.	<input type="checkbox"/>
4	Ensure that the SE-24/SE-48 power cable is still power-free.	<input type="checkbox"/>



Step	Work to be done	OK
5	Ensure that the power supply to the SE-24 servo controller (SE-24/SE-48 power cable, wire no. 3) can be disconnected by a suitable Emergency-Stop switching device if necessary. The electronics supply and ground (SE-24/SE-48 power cable, wires 2 + 1) must however be maintained. Please see the SE-24 operating instructions for further notes.	<input type="checkbox"/>
6	Connect the SE-24/SE-48 power cable to the Afag SE-24 servo controller. Please see the SE-24 operating instructions for further notes.	<input type="checkbox"/>
7	Ensure that the afagTools parameterization program is installed on your PC. Please see chapter „4.2 Installation afagTools program“ in this manual for installation instructions of the program.	<input type="checkbox"/>
8	Connect the SE-24 programming cable to the Afag SE-24 servo controller. Please see the SE-24 operating instructions for further notes.	<input type="checkbox"/>
9	Connect the SE-24 stick to the SE-24 programming cable.	<input type="checkbox"/>
10	Insert the SE-24 stick into the PC. If the hardware installation wizard opens select the path for driver installation as per chapter „4.3.3 Installation of the SE-24 stick“ in this manual.	<input type="checkbox"/>
11	Ensure that the interface cables to a higher level control system (PLC) are <u>not yet</u> connected. Depending on the controller model this applies to the following cables: The SE-24 I/O cable for the SE-24 I/O servo controller. The bus cables for servo controllers with fieldbus connection (Profibus, EtherCAT, CANopen).	<input type="checkbox"/>
12	Switch on the power supply to the electronics.	<input type="checkbox"/>
13	Open the afagTools parameterization program and touch the "Search devices" button. Transfer the ID of the device with which you want to connect from the "Device list" in the "NodeID" box and click on "Connect device". For further notes please see chapter "5.2.3 Connection" in this manual.	<input type="checkbox"/>

Step	Work to be done	OK
14	<p>You can skip this step for the SE-24 I/O and the SE-24 EtherCAT models.</p> <p>Set the device address for the SE-24 CANopen and the SE-24 Profibus models.</p> <p>Open the corresponding tool, i.e. "CAN configuration" or "Profibus configuration".</p> <p>Observe the information in the corresponding chapters „5.4 CAN configuration“ or „5.5 Profibus configuration“ as well as the corresponding information in the "SE-24 CANopen manual" or the "SE-24 Profibus manual".</p> <p><b>Important:</b> Changes of the bus settings are only retrieved after a restart of the servo controller. Switch the power supply off and on again after minimum 30 seconds. Then click on the "Connect device" button.</p>	<input type="checkbox"/>
15	<p>Make sure that there are <u>no</u> persons or objects in the hazardous area of the servo axis and then switch on the voltage supply for the power.</p>	<input type="checkbox"/>
16	<p>Open the "Manual operation" tool.</p> <p>The "ready" status bit in the "Actual application status" should be green. The servo controller is ready to operate.</p> <p>For further notes please see chapter "5.8 Manual operation" in this manual.</p>	<input type="checkbox"/>
17	<p>Actuate the "Enable" button to activate the controller enable.</p> <p>For further notes please see chapter "5.8.1 Commands" in this manual.</p> <p>After a restart a commuting adjustment is carried out for motors <u>without</u> Hall encoder and the "Enabled" status bit will be set. The servo motor is now controlled and the "Referencing", "Jog+" and "Jog-" buttons are active.</p>	<input type="checkbox"/>
18	<p>Carry out a reference run by clicking the "Referencing" button.</p> <p>For further notes please see chapter "5.8.1 Commands" in this manual.</p> <p>The "Homing done" status bit is set after the reference run was finished successfully.</p> <p>The "Set" buttons for the moving sets and the "Pos. 1 &lt; &gt; Pos. 2" button for the reverse mode are now active.</p>	<input type="checkbox"/>
19	<p>Check the settings in the "Jog" area and carry out a reference run at slow speed by traversing in the positive and negative direction with the "Jog+" and "Jog-" buttons.</p> <p>For further notes please see chapter "5.8.5 Jog mode" in this manual.</p>	<input type="checkbox"/>

Step	Work to be done	OK
20	<p>Enter now values for your positioning preferably in lines 1 and 2 of the table with the moving sets.</p> <p><b>Comment:</b> <i>Start with low speeds and accelerations.</i></p> <p>For further notes please see chapter “5.8.7 Moving data sets” in this manual.</p> <p>After one line has been filled in completely approach this position and actuate the “Set” button behind the corresponding moving set.</p> <p>Approach both positions alternately by clicking the “Set” button behind the corresponding moving set.</p> <p>The individual values can now be adjusted and tested again.</p>	<input type="checkbox"/>
21	<p>Adjust the settings for the “Movement OK” signal if necessary.</p> <p>For the positioning mode these are the values in the “Positioning window” and “Positioning window – time”.</p> <p>For the current mode these are the values in the “Current window”, “Current window – time” and “Current fade out time”.</p> <p>For further notes please see chapter “5.8.6 Settings” in this manual.</p>	<input type="checkbox"/>
22	<p>For a continuous run to and fro you should use the “Reverse mode” function.</p> <p>For further notes please see chapter “5.8.8 Reverse mode” in this manual.</p> <p>Ensure that the previously tested moving sets have been activated in the two selection boxes.</p> <p>Click the “Pos.1 &lt; &gt; Pos.2” button to start the reverse mode.</p> <p>Stop reverse mode with the “STOP” button in order to adjust individual values of the moving sets, enter the modified values and restart reverse mode.</p> <p><b>Comment:</b> <i>If you want to generate delay times at individual positions, enter the desired time in milliseconds for the “Delay” object at the corresponding follow-up position in the moving set.</i></p>	<input type="checkbox"/>
23	<p>If more than 2 positions are required for your application carry out the same steps as for the first two positions.</p>	<input type="checkbox"/>
24	<p>Save the values permanently on the servo controller by clicking the “Store in device” button.</p> <p>For further notes please see chapter “5.8.7 Moving data sets” in this manual.</p>	<input type="checkbox"/>
25	<p>Now connect the interface cables to a higher level control system (PLC).</p> <p>Depending on the controller model this applies to the following cables:</p> <p>The SE-24 I/O cable for the SE-24 I/O servo controller.</p> <p>The bus cables for servo controllers with fieldbus connection (Profibus, EtherCAT, CANopen).</p>	<input type="checkbox"/>

Step	Work to be done	OK
26	<p>Start the servo controller via the PLC interface.</p> <p>Start with the "drive_enable/fault_res" signals to enable the controller and the "start/stop_ref" signals to carry out a reference run.</p> <p>Please see the manual on the corresponding servo controller model for more information about the individual interfaces.</p>	<input type="checkbox"/>
27	<p>If an SE-24 I/O servo controller is used or the moving sets are used with a fieldbus variant, then select the corresponding (and previously tested) moving set via the "pos_nr_bit0 to 3" signals and start the moving set using the "start/stop_move" signal.</p> <p>Otherwise this step can be skipped.</p>	<input type="checkbox"/>
28	<p>If a servo controller with fieldbus interface is used and the moving sets are <u>not</u> used but the values are sent via the bus protocol, then use the values from the previously tested moving sets and start the movement with the "start/stop_move" signal. The "pos_nr_bit0 to 3" must imperatively be 0.</p> <p>Otherwise this step can be skipped.</p>	<input type="checkbox"/>

The SE-24 servo controller with the corresponding Afag handling module is successfully started up when the commissioning checklist was completely filled in.





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