Application
"servoTEC S2xxx FS moving with the help of digital inputs and outputs"

Short Version: Description and notes on:

- Setting the parameters for the digital inputs and outputs
- Positioning, stepping operation, referencing
- Settings in error management
- Function example with up to 4 target positions
- Function example with up to 16 target positions

Author: Edmund Grieshaber

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1 Modifications

Document modifications and life cycle

Document code	Date	Generation and modification
APP5034_EN_1421735_Moving_with_the_help_of_digital_IOs_servoTEC_S2-FS_R1a.doc	September 19, 2018	Translation of the German document “APP5034_DE_1122472_FahrenUeberDigitaleIOs_servoTEC_S2-FS_R1a.doc” (from August 29, 2014)

2 Preface

The servo positioning controller LV servoTEC S2xxx has 10 digital inputs by default (DIN 0 to DIN 9). Additional inputs can be switched by using the analogue inputs DIN AN 1 and DIN AN 2 as digital inputs.

Inputs DIN 4 to DIN 7 are assigned to fixed functions:

- DIN 4: End stage release
- DIN 5: Controller release
- DIN 6: Standard setting: Limit switch E0, left (negative)
- DIN 7: Standard setting: Limit switch E1, right (positive)

Inputs DIN 8 and DIN 9 are reserved.

- DIN 8 for start and sample function, referencing
- DIN 9 for start and sample function, referencing

The freely available digital inputs (DIN 0...DIN 3, DIN 8, DIN 9, DIN AN 1, DIN AN 2) can be assigned functions. These functions can be used to control the drive and move to various positions that are stored in movement sets.

Function example:

- Referencing
- Stepping operation left/right
- Setting speed
- 4 target positions with the option "stop"

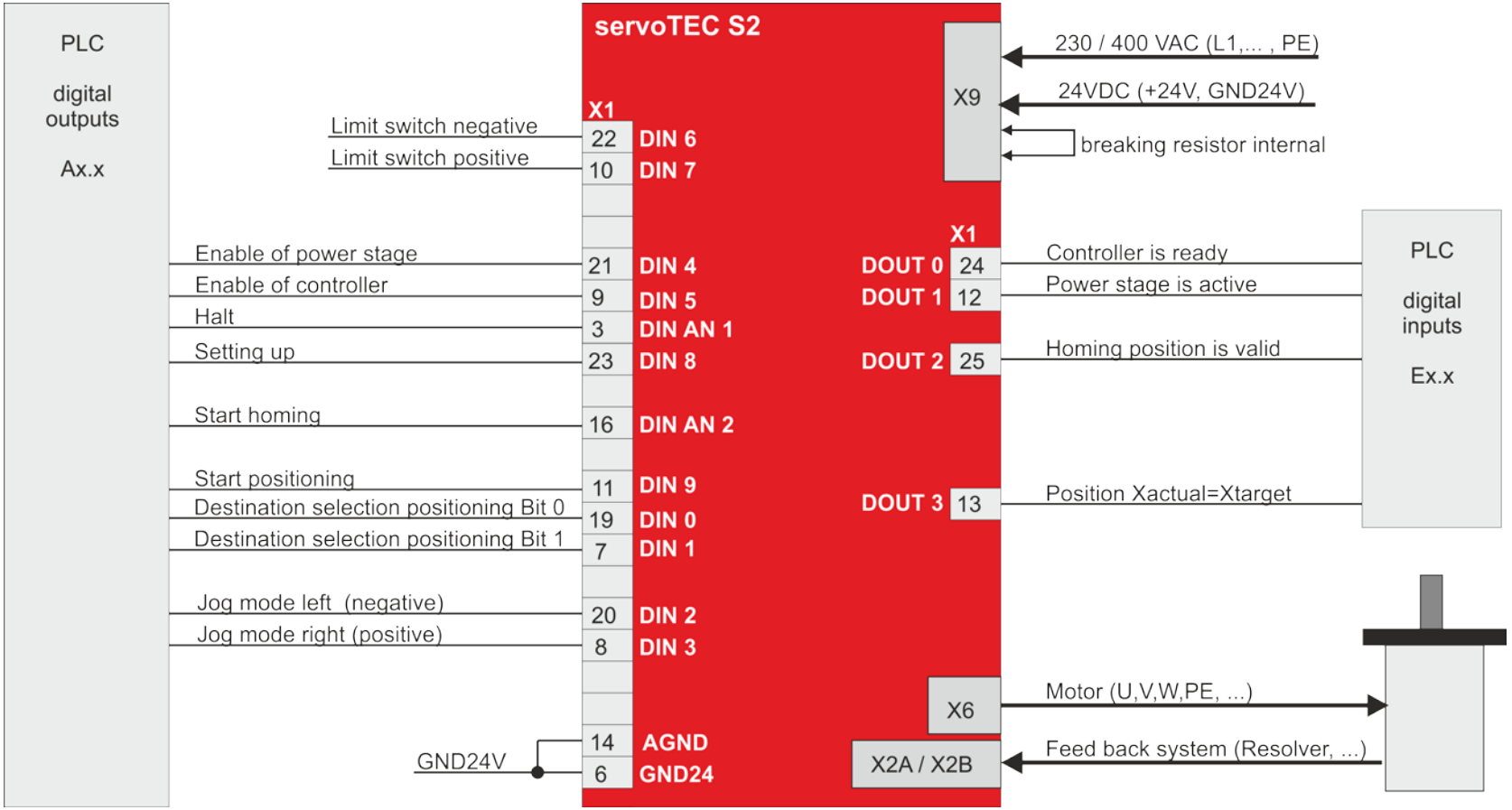
The confirmation necessary for this is described in the following sections.

Function example:

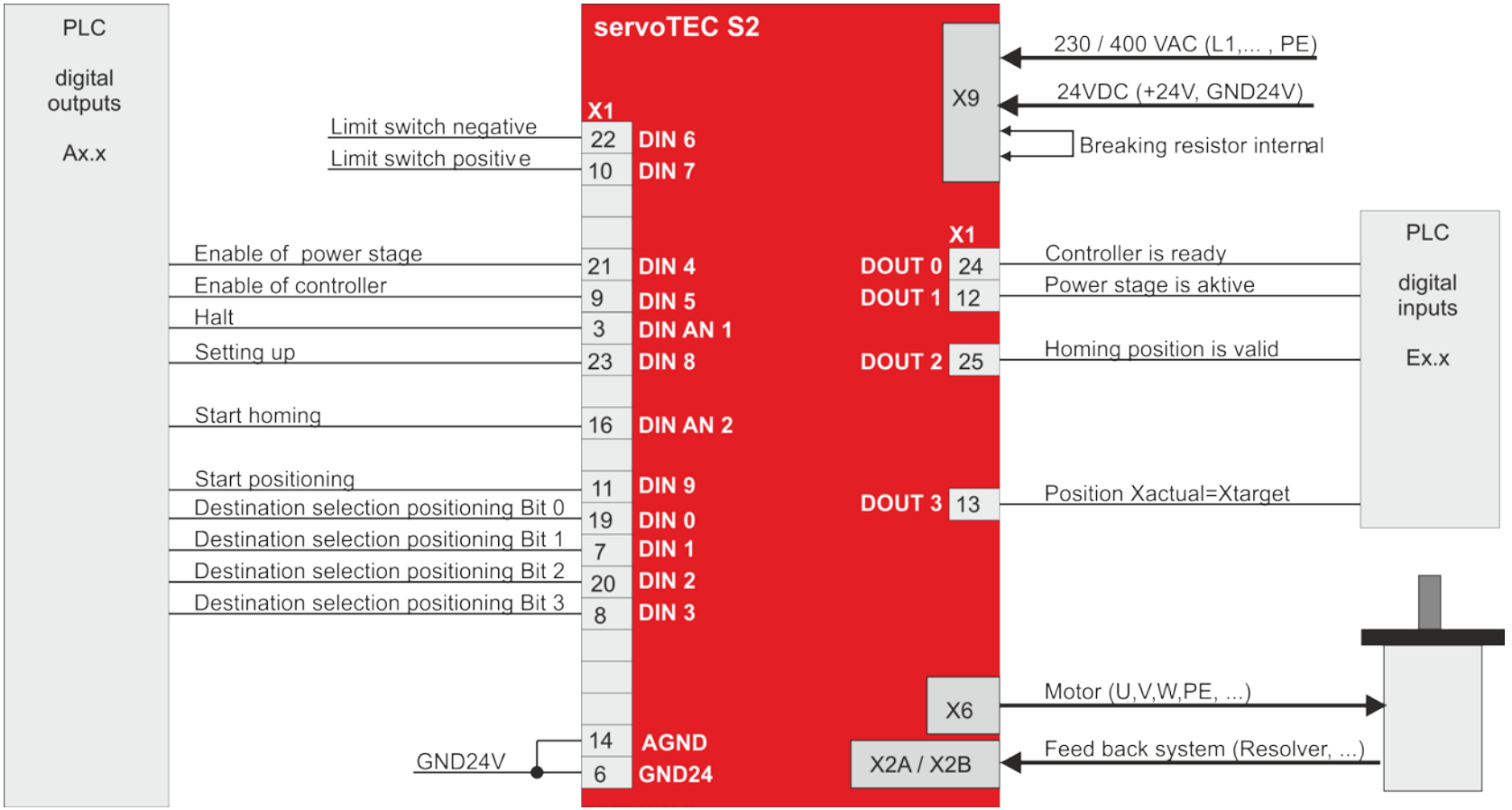
- Referencing
- Setting speed
- 16 target positions with the option "stop"

3 Connection sketches

3.1 Function example with 4 target positions and stepping mode



3.2 Function example with 16 target positions



4 Operation using the function example 4 target positions with stepping mode

4.1 Axis referencing and movement to position

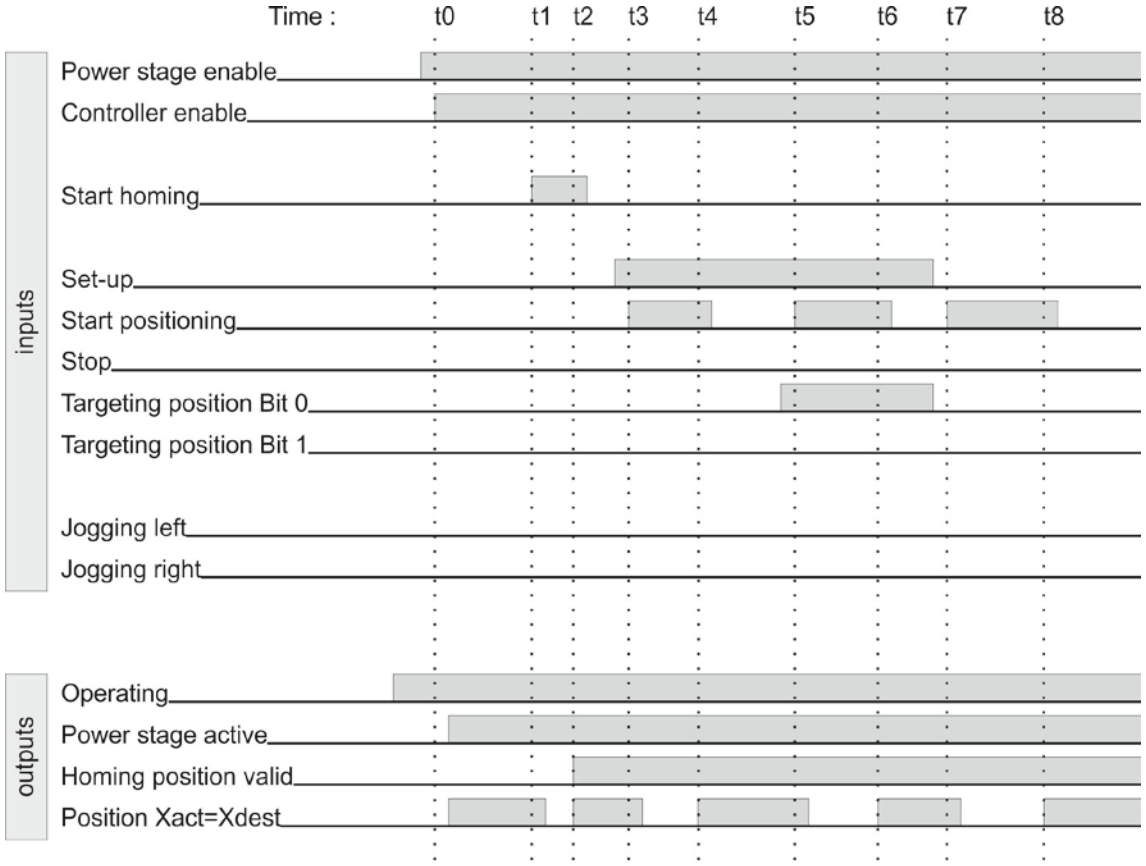


Chart: Axis referencing and movement to position

Actions:

Time t0:
Actuating axis

Time t1 ... t2:
Axis referencing

Time t3 ... t4:
Move movement set (position) 0

Time t5 ... t6:
Move movement set (position) 1

Time t7 ... t8:
Move movement set (position) 0 with setting speed

NOTE:
The movement speed results from the setting speed of the speed limitation

See menu S2Commander:
Parameter → Safety parameters

4.2 Axis stepping mode

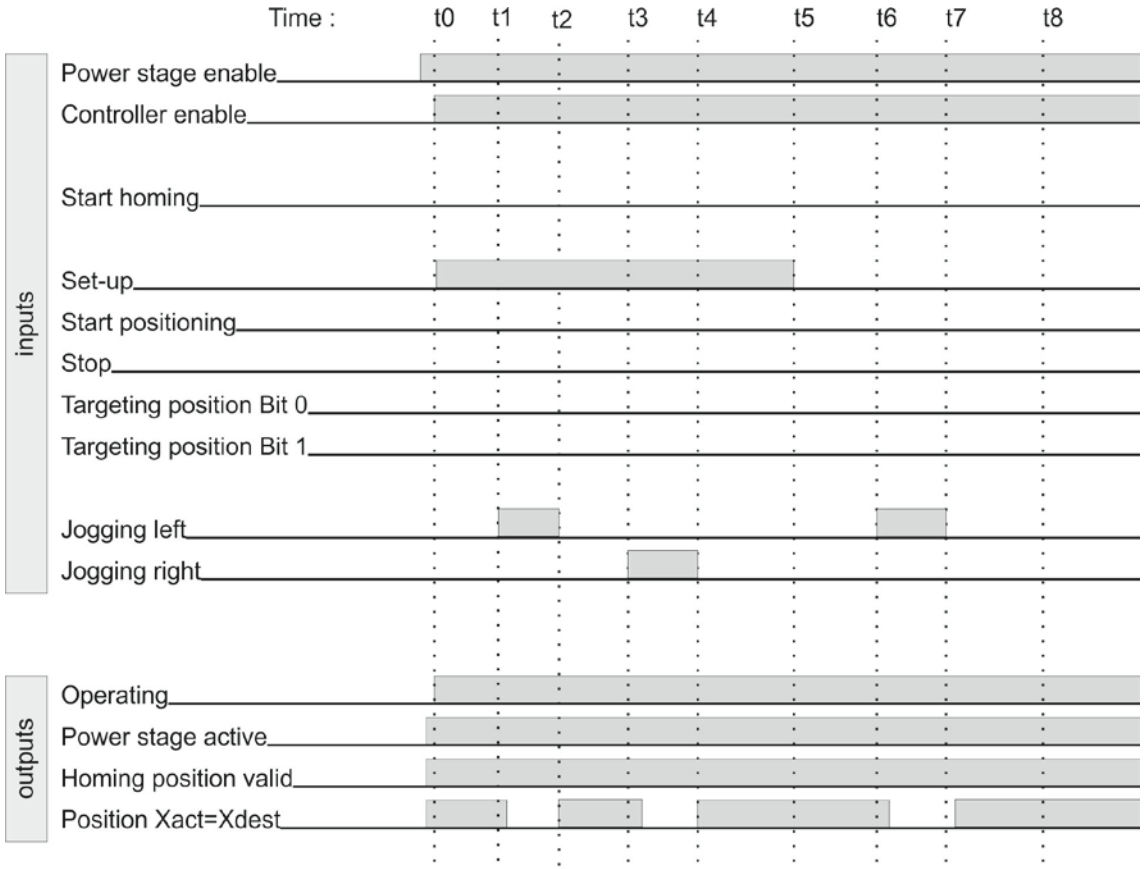


Chart: Axis stepping mode

Actions:

Time t0:
Actuating axis

Time t1 ... t2:
Axis stepping mode left with set speed

Time t3 ... t4:
Axis stepping mode right with set speed

Time t5:
Switching to setting speed

Time t6 ... t7:
Axis stepping mode left with setting speed

NOTE:
In the menu S2Commander:
Parameter → Positioning → Target parameterisation, the speeds can be set under stepping mode for TIPP0 (pos) and TIPP1 (neg)

4.3 Moving the axis and then stopping the running order and cancelling

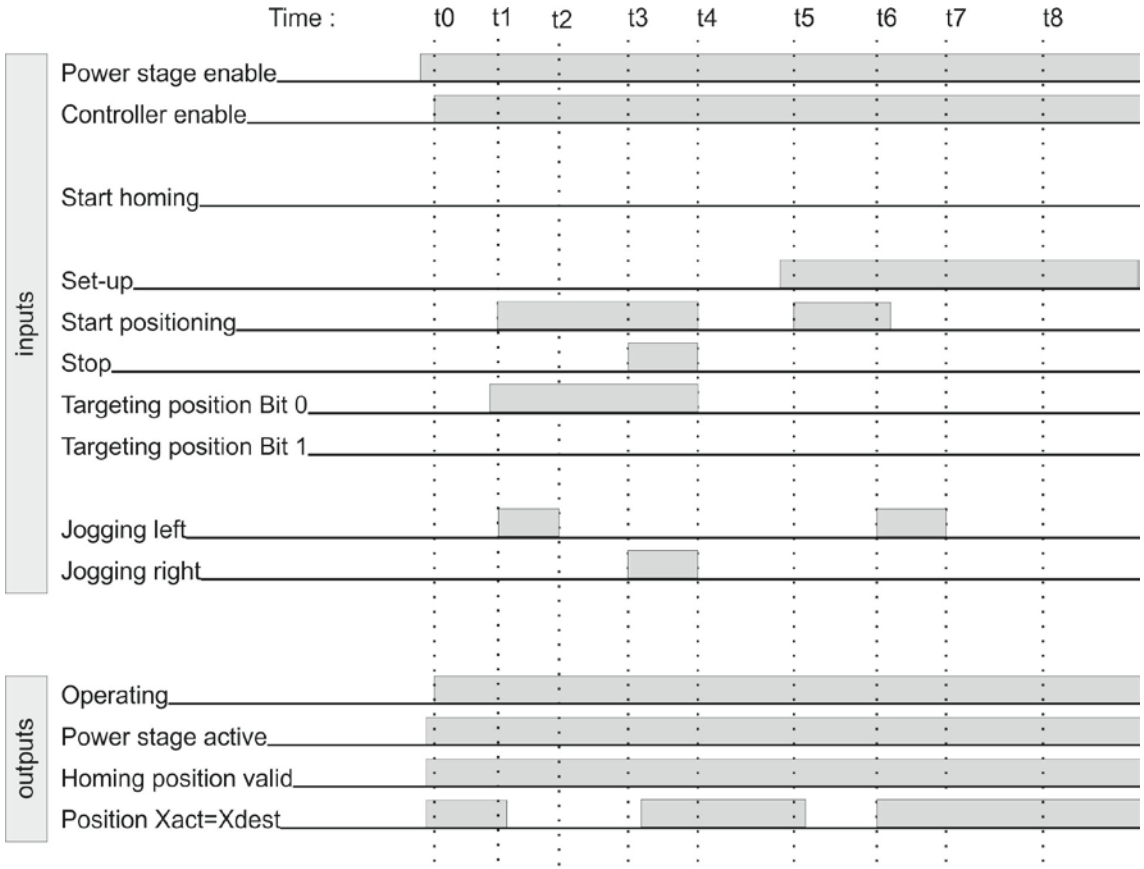


Chart: Moving the axis and then stopping the running order and cancelling

Actions:

Time t0:
Actuating axis

Time t1:
Start Movement set (Position) 1 with setting speed

Time t3:
PLC wants to stop the axis, sets "Digital stop"
Briefly thereafter, when the axis is standing, the controller reports "Position Xist=Xziel"

Time t4:
PLC removes signals

Time t5 ... t6:
Move to movement set (Position) 0

4.4 Moving axis and then fault drag error

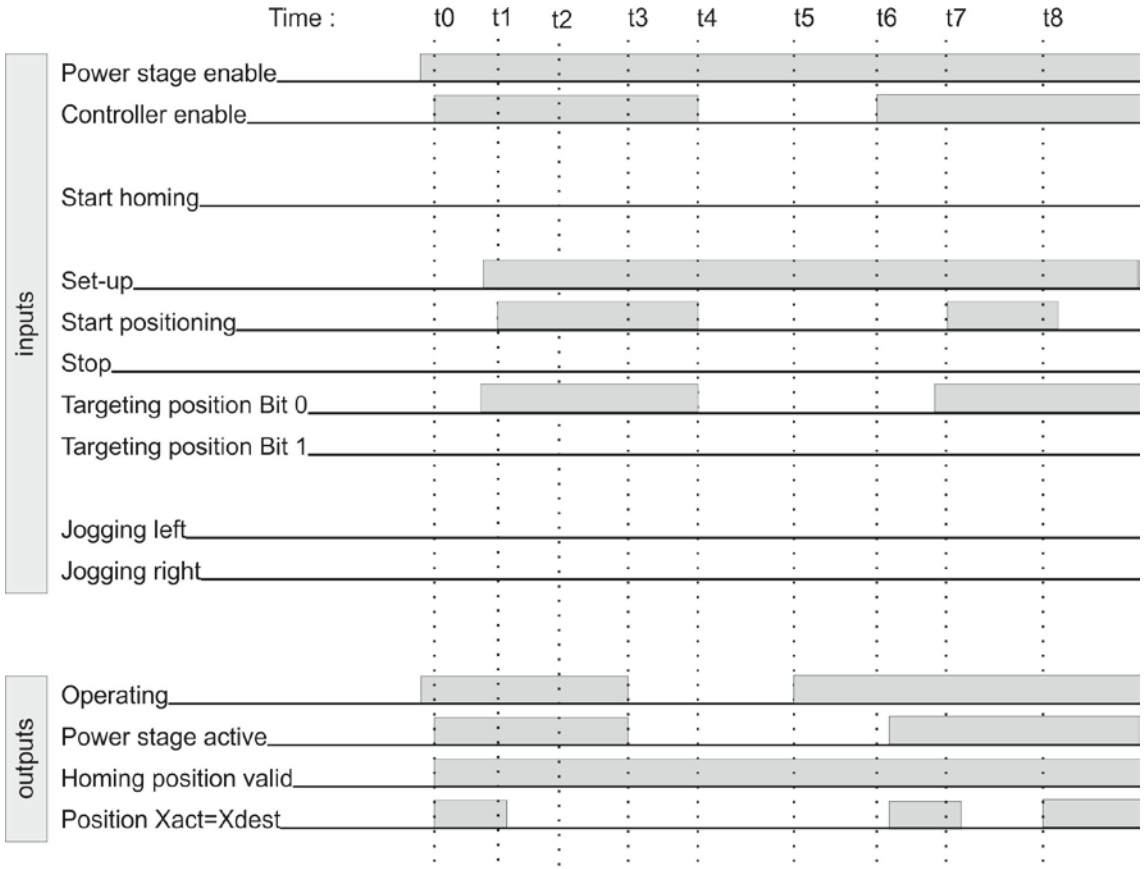


Chart: Moving axis and then fault drag error

Actions:

Time t0:
Actuating axis

Time t1:
Start movement set (Position) 0

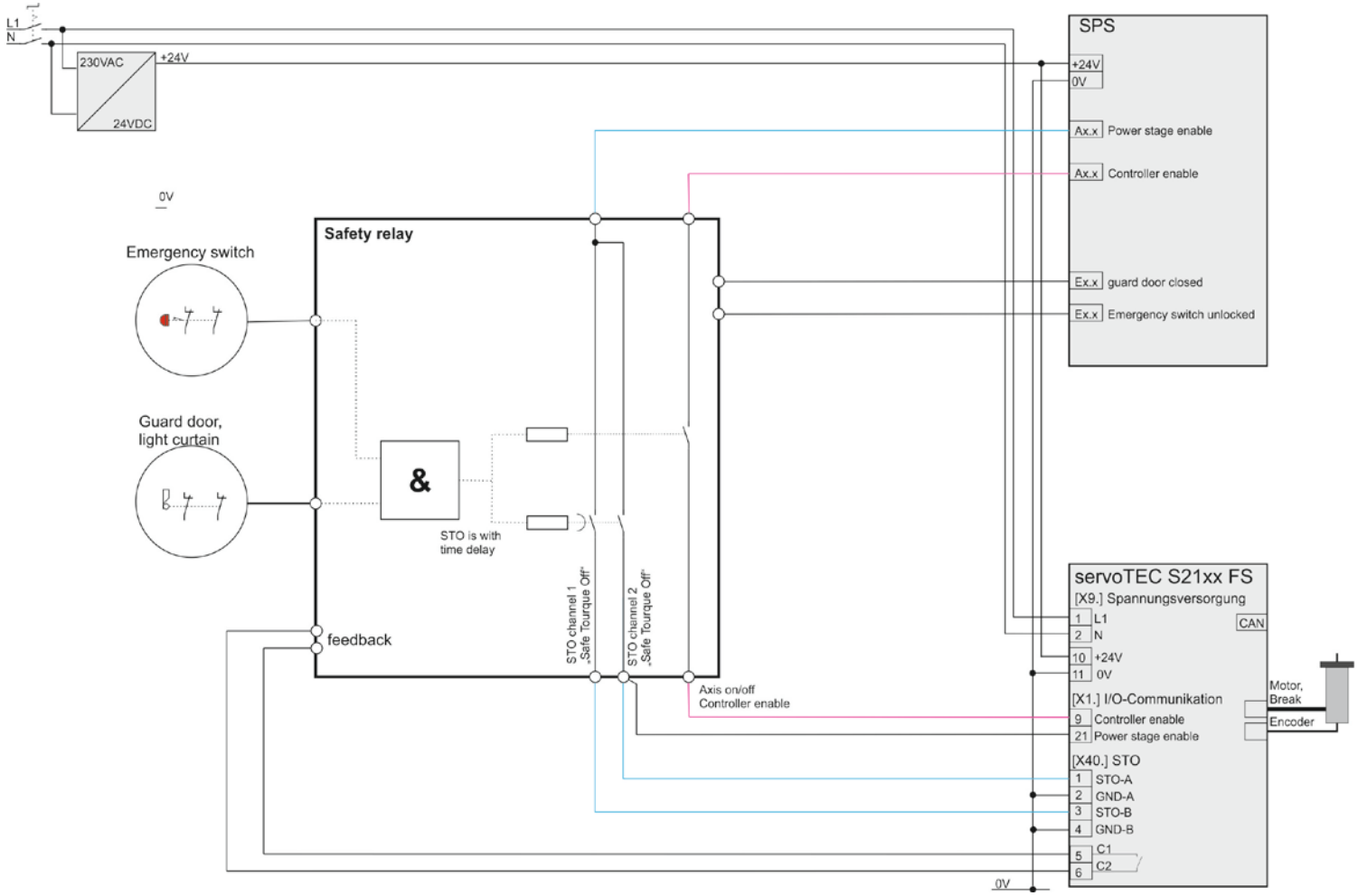
Time t3:
Fault drag error, limit stage is turned off, "Controller ready for operation" turns off

Time t4:
PLC takes away "Release controller" and then "Controller ready" (t5) will appear again

Time t6:
PLC sets "Release controller" and end stage is reactivated. The controller reports "Position Xist=Xziel", but this is not possible due to the fault.
Move to the position again or to another one, remove the error cause and restart the machine

Time t7 ... t8:
Start / move to movement set (Position) 0

5 Principle wiring



6 Configuration of the digital interface

6.1 Function example with 4 target positions and stepping mode

6.1.1 Setting the configuration of the digital inputs

The analogue inputs AIN1 and AIN2 are used as digital inputs

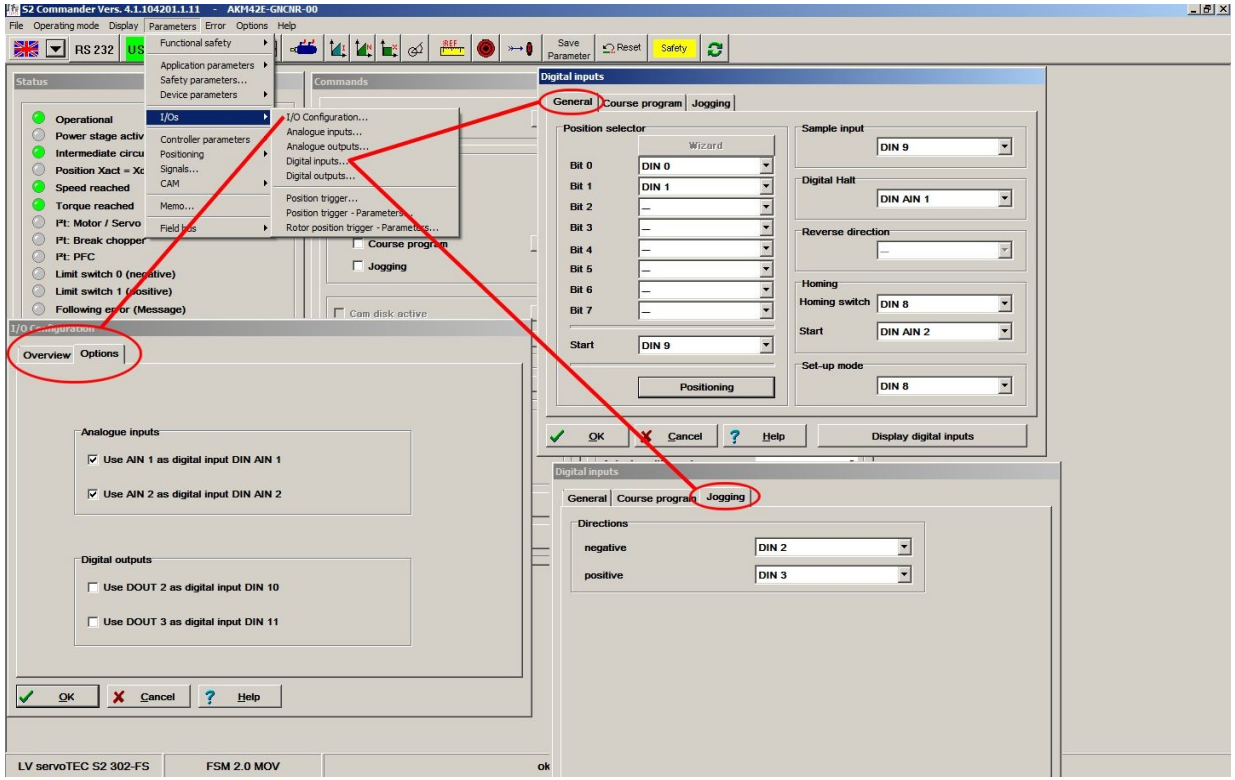
Function of the inputs:

Position selector bit 0:	DIN 0
Position selector bit 1:	DIN 1
Start positioning:	DIN 9
(Digital) stop:	DIN AIN 1
Start reference run:	DIN AIN 2
Setting mode:	DIN 8

Inching mode:

Movement direction negative (left): DIN 2

Movement direction positive (right): DIN 3



6.1.2 Setting the configuration of the digital outputs

Function of the outputs:

Controller ready: DOUT 0

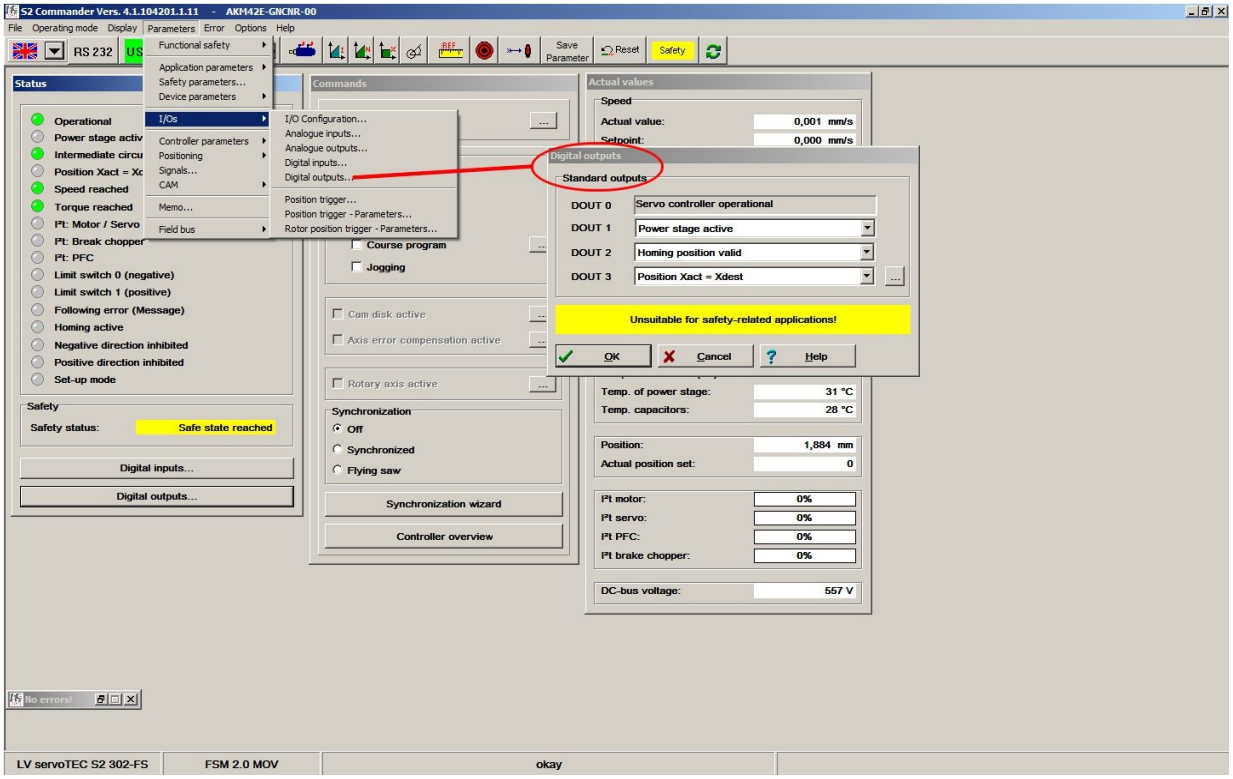
End stage active: DOUT 1

Reference position valid

(axis is referenced): DOUT 2

Position X-actual = X-target

(Complete movement of movement set):
DOUT 3

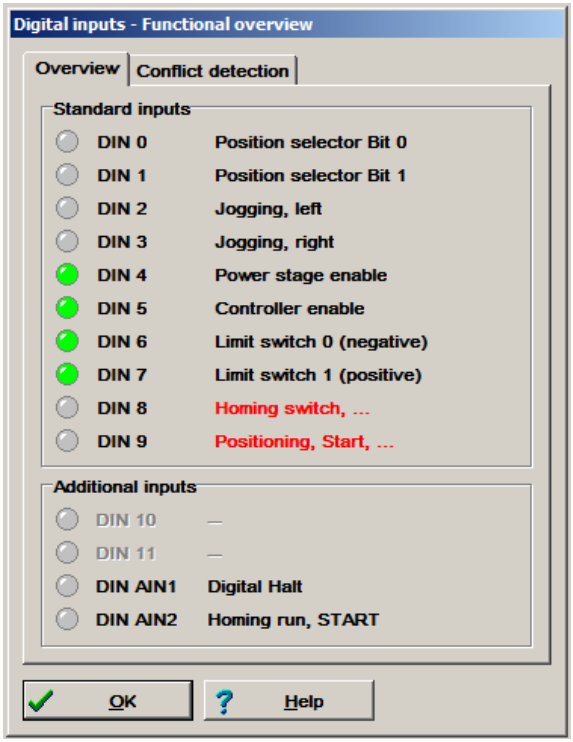


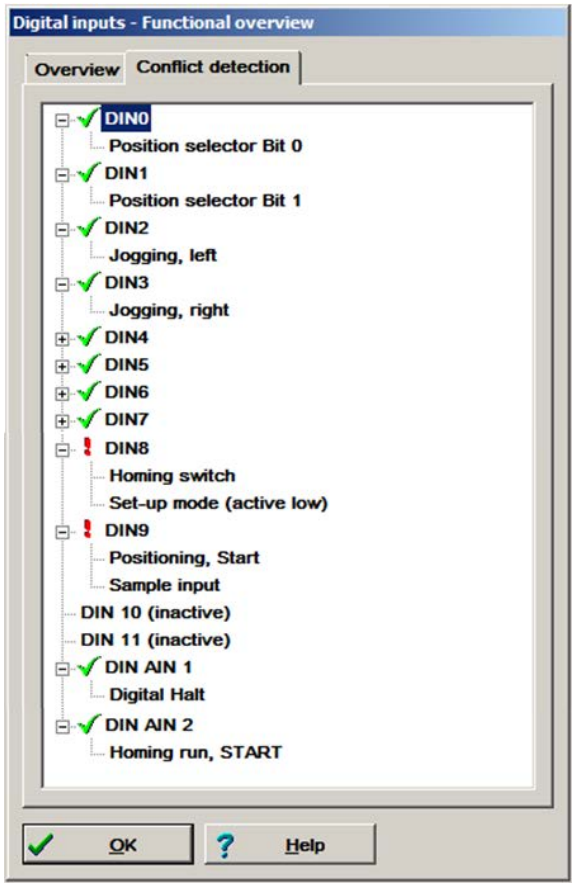
6.1.3 Digital inputs function overview and conflict recognition

The input DIN 8 is at the same time the reference switch and setup mode. While the reference switch is not needed for referencing the axis, this is possible and permissible.

The input DIN 9 is at the same time the START button and the sample input. This double assignment is permitted and possible while the sample function is not used.

To avoid double assignment, functions must be disposed with or the number of digital in- and outputs must be increased with an EA88 interface.





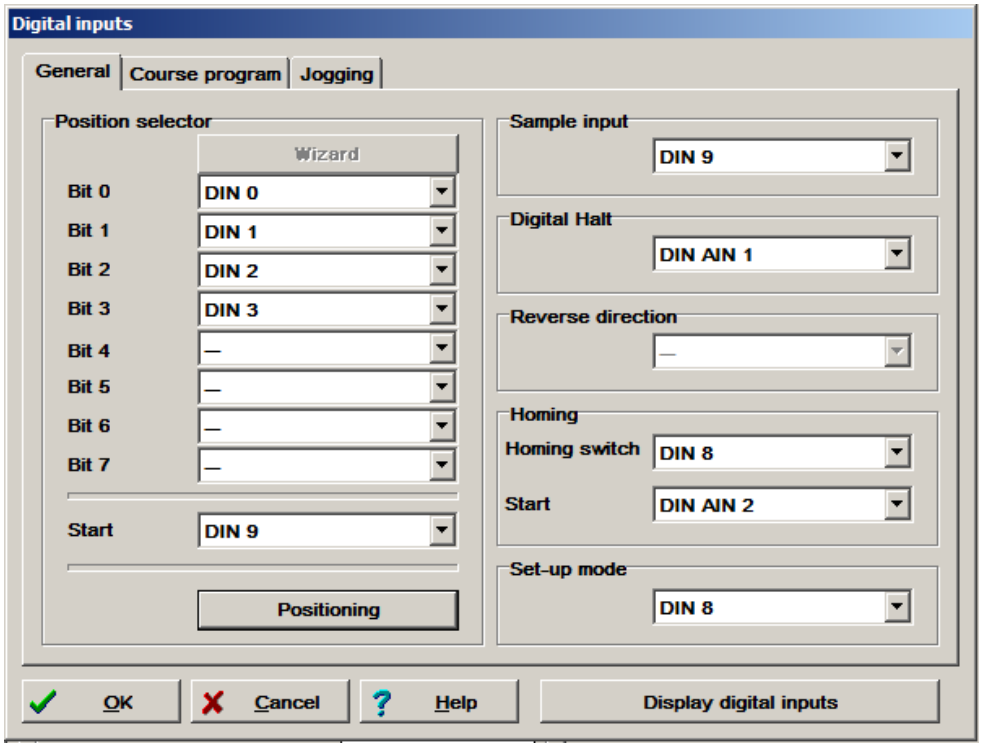
6.2 Function example with 16 target positions

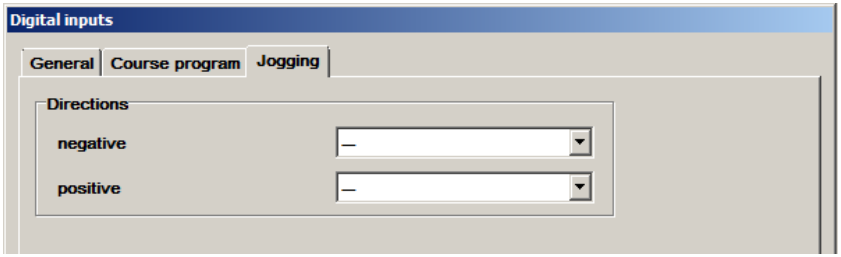
6.2.1 Setting the configuration of the digital inputs

The analogue inputs AIN1 and AIN2 are used as digital inputs

Function of the inputs:

Position selector bit 0:	DIN 0
Position selector bit 1:	DIN 1
Position selector bit 2:	DIN 2
Position selector bit 3:	DIN 3
Start positioning:	DIN 9
(Digital) stop:	DIN AIN 1
Start reference run:	DIN AIN 2
Setting mode:	DIN 8
Stepping mode:	none



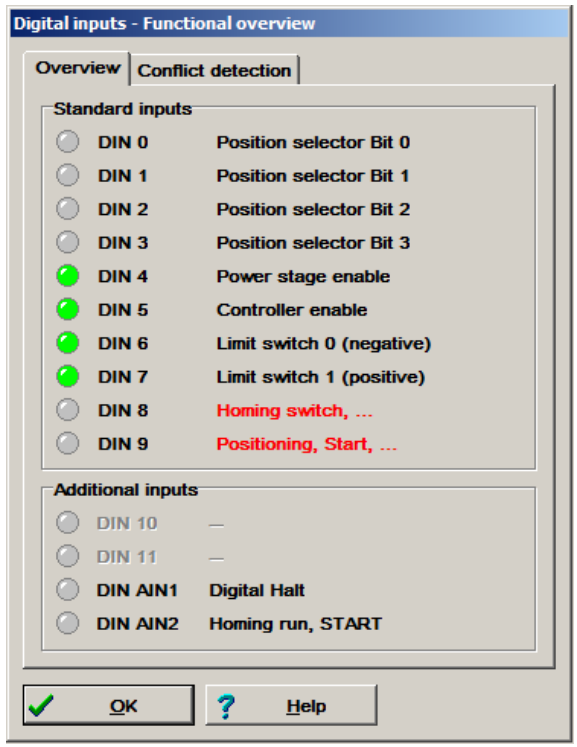


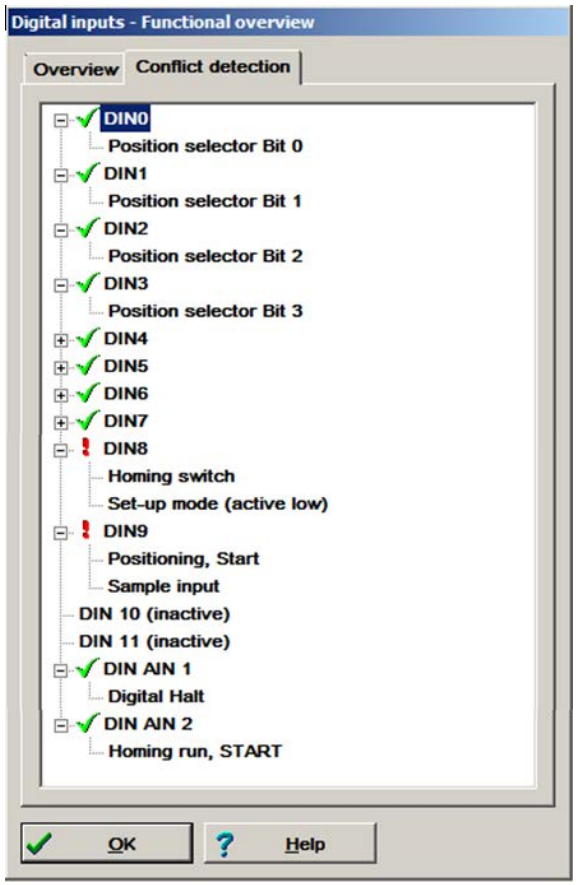
6.2.2 Digital inputs function overview and conflict recognition

The input DIN 8 is at the same time the reference switch and setup mode. While the reference switch is not needed for referencing the axis, this is possible and permissible.

The input DIN 9 is at the same time the START button and the sample input. This double assignment is permitted and possible while the sample function is not used.

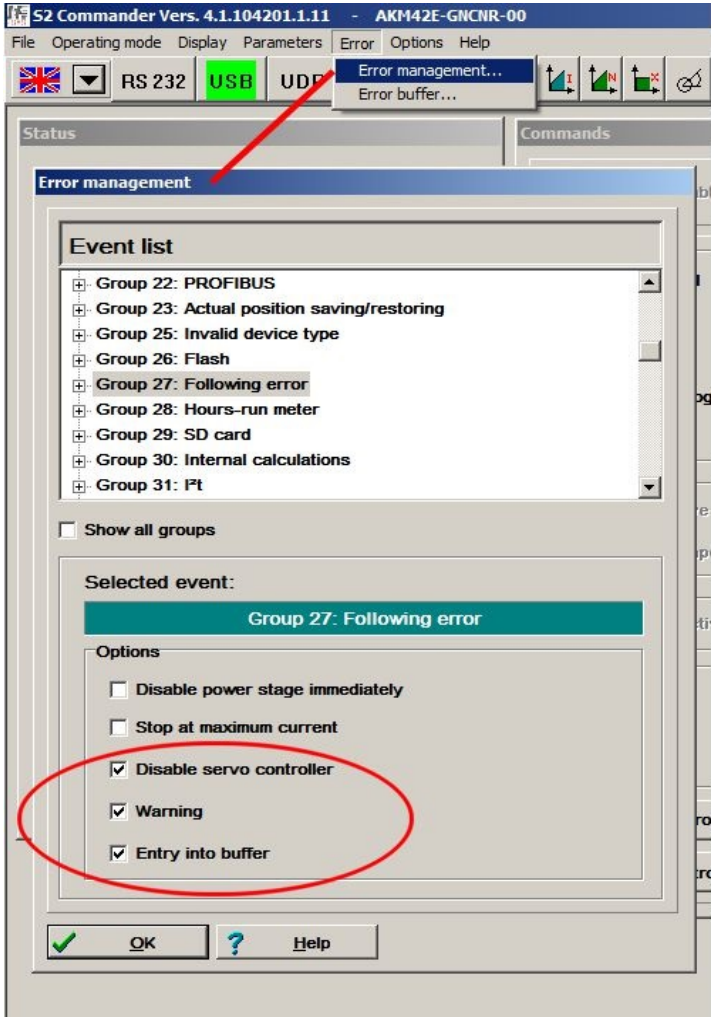
To avoid double assignment, functions must be disposed with or the number of digital in- and outputs must be increased with an EA88 interface.





7 Error management

Since communication between the control (PLC) and the servoTEC S2 only takes place through digital inputs and outputs, the settings in the error management must be made so that the output "Controller ready" is reset in case of an error.



To be activated at the affected events (errors)

- Deactivation of controller release
- Warning
- Entry in buffer

List of events (errors) that must be entered:

- Undervoltage interim circuit
- Angle encoder parameter set
- Spinning prevention
- Exceeded threshold drag error
- Drag error monitoring
- I^2T
- PFC
- Parameter
- SW-limit switch
- Path program
- Positioning
- HW limit switch
- Driver supply IGBT
- Setting mode
- Technology modules

8 Basic configuration and parameters

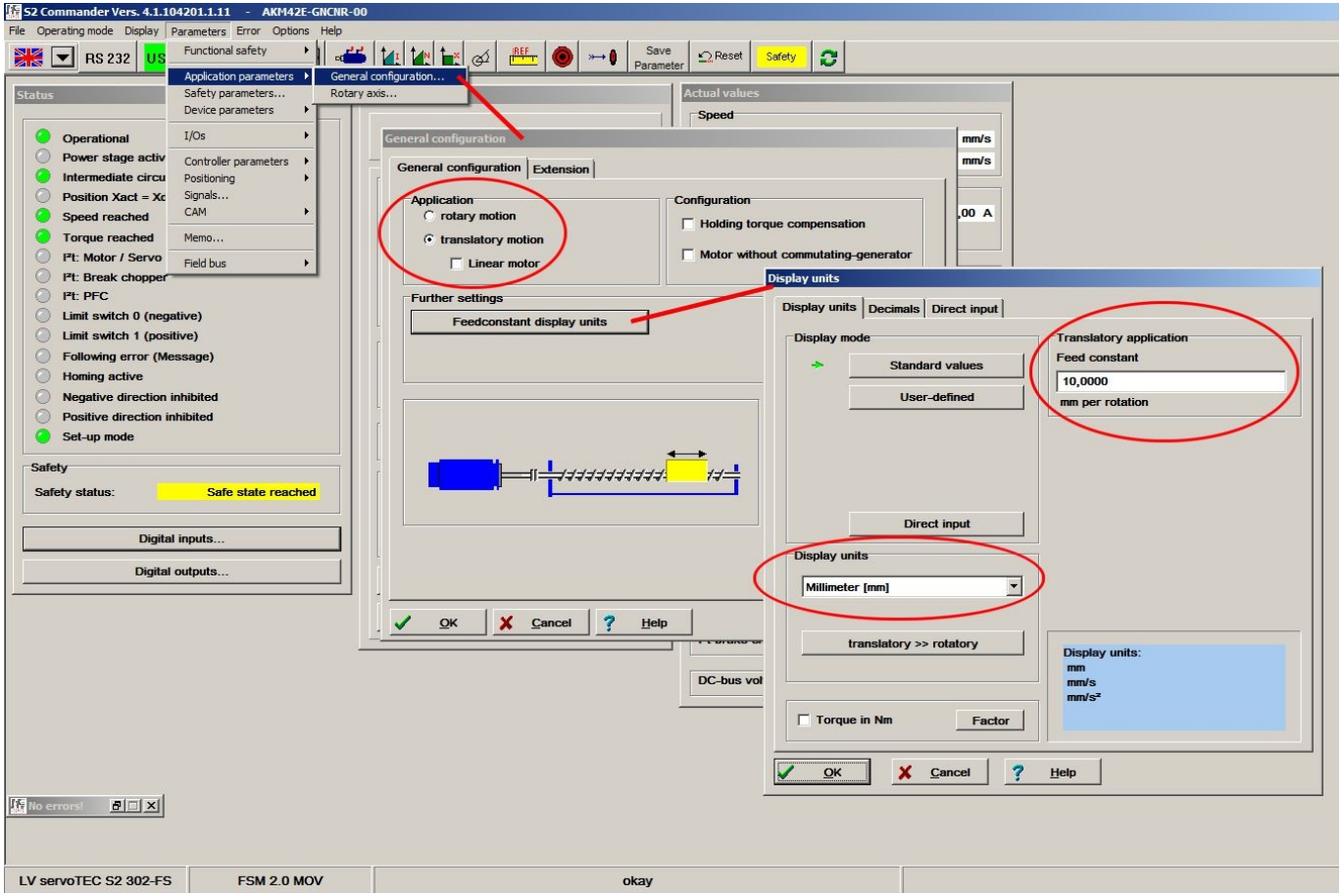
8.1 Basic configuration rotational / translational

The basic configuration sets whether it is a rotational or a translational drive.

The display units and infeed constant are set here as well.

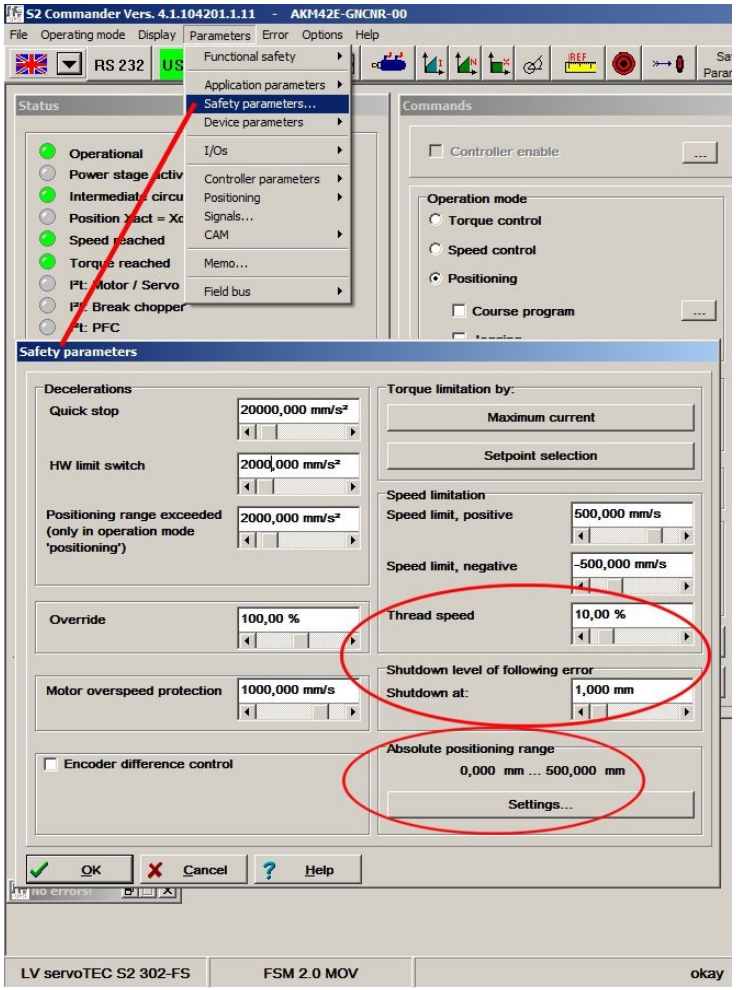
Example: "Linear axis"

Application:	translational
Display units:	mm
Infeed constant:	10 mm



8.2 Safety settings and movement range

The following are set in the window safety parameters:



Setting speed:

- The setting speed is set in percent of the revolutions limit. If the input "Setup" is powered, the speed of the more active function (referencing, stepping mode, positioning) is limited to these speeds.

Deactivation limit drag error:

- Drag error threshold that leads to the error.

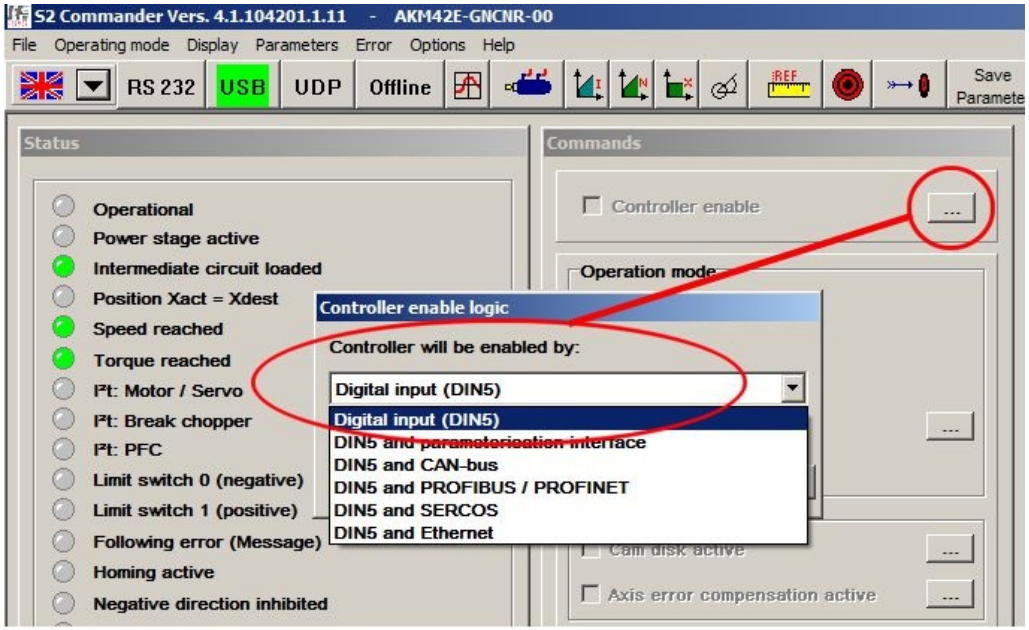
Absolute positioning range:

- The absolute positioning range is used in stepping mode and when positioning as a software limit switch.

8.3 Controller release

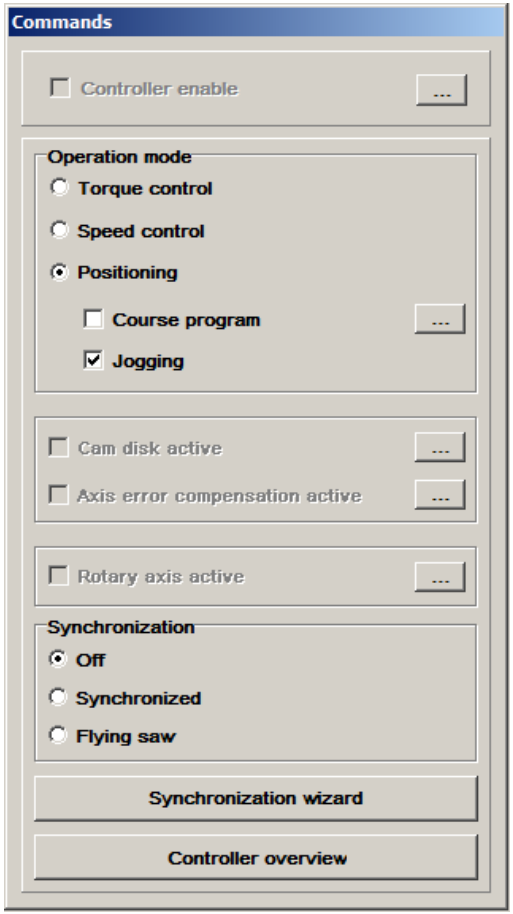
Since the drive is only controlled via digital inputs, release for the controller must be set accordingly

The controller is only released by digital input (DIN 5)



8.4 Operating mode

To permit positioning via digital inputs, the operating mode must be set in the window "Commands":



Operating mode:

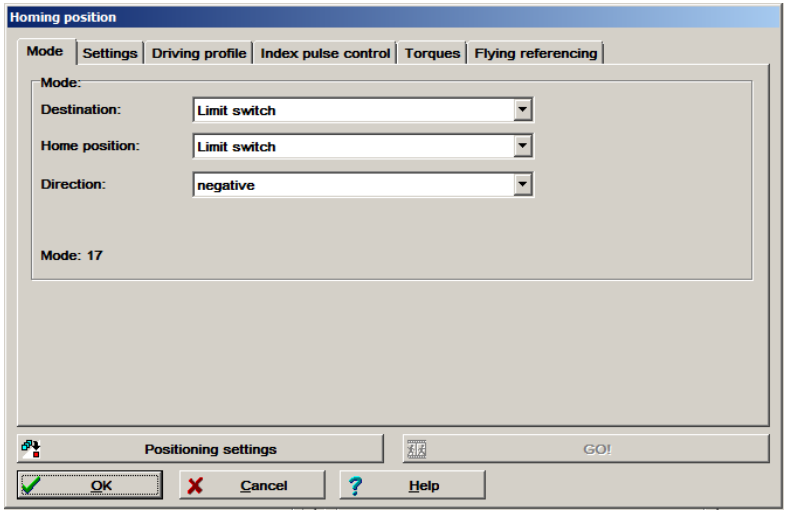
- Positioning
- (Path program)
- Stepping mode

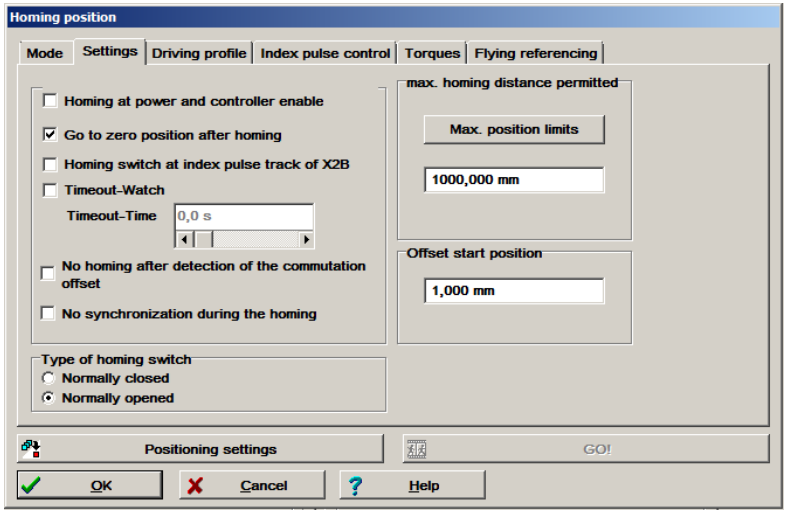
NOTE: **If you want to activate the function Subsequent position for targets in the tab "Path program", "Positioning - Path program" must be active in the operating mode as well.**

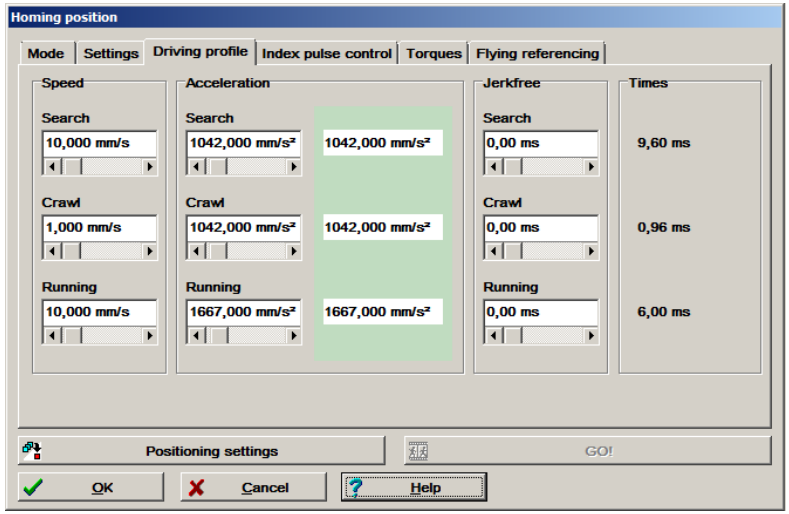
9 Reference run

The settings for referencing the axis are specified in the window "Reference position":

- Reference run type, method
- Reference offset
- Speeds and accelerations during the reference run



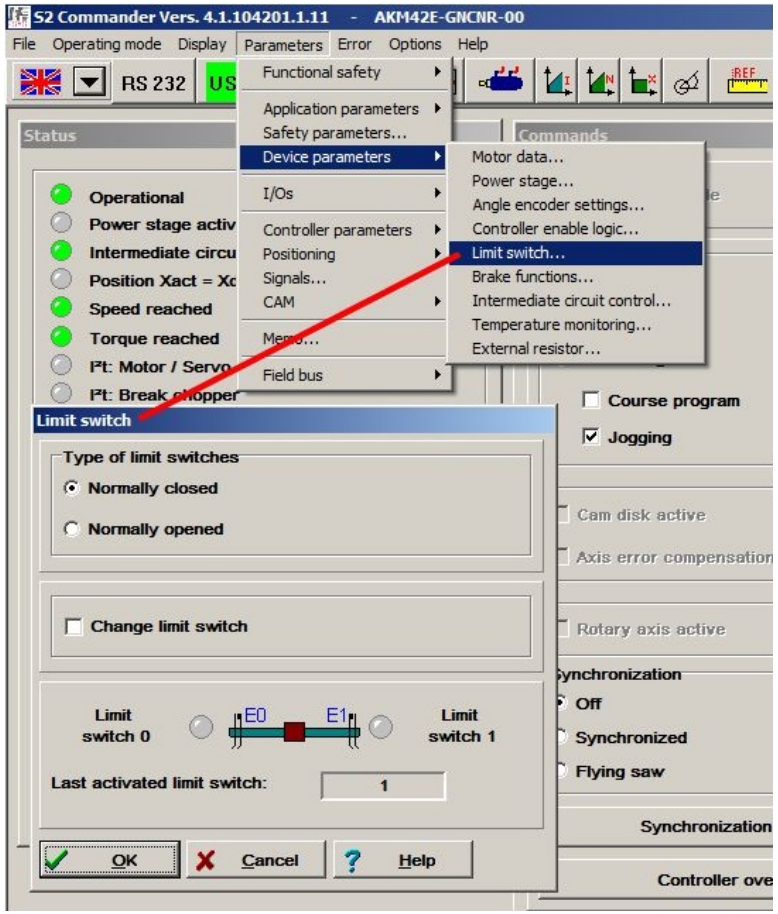




9.1 Setting for the limit switches

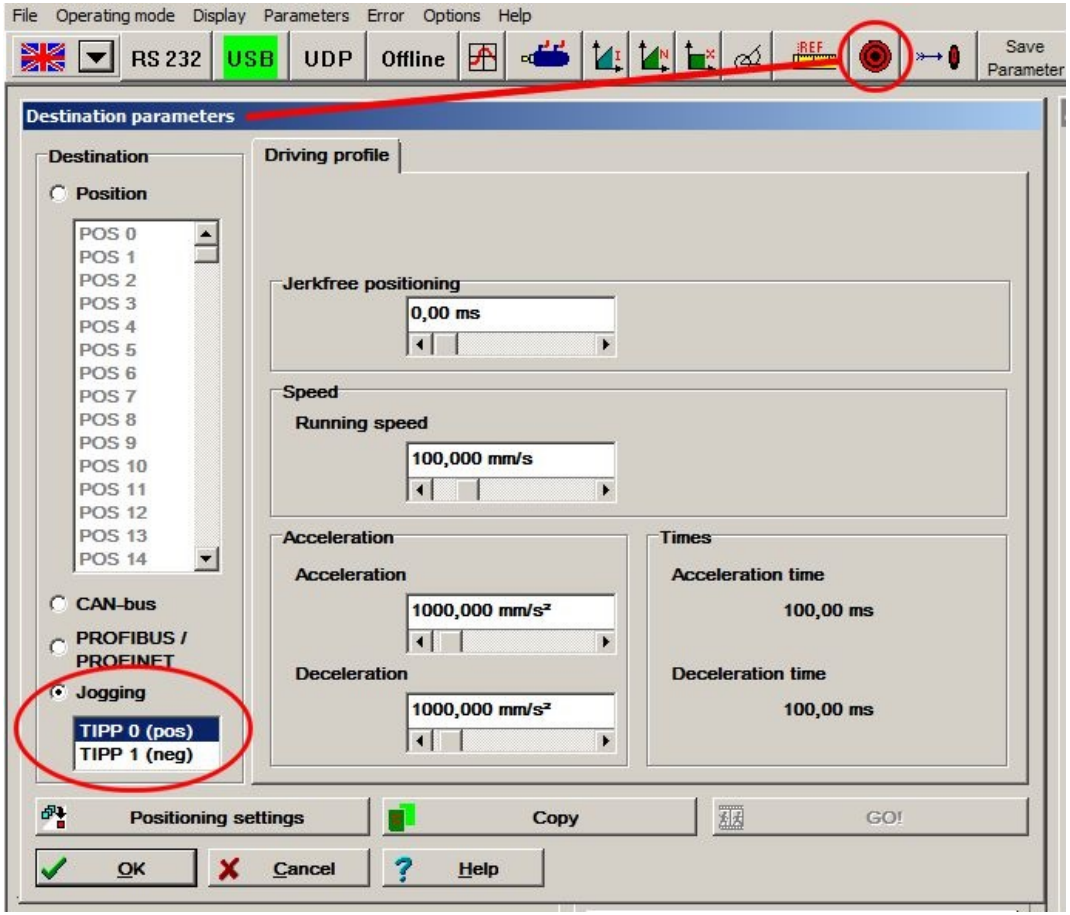
IEF-Werner GmbH usually installs "normally closed" switches as limit switches.

The negative limit switch is located on the motor side. If mechanical installation of the axis in the machine requires a change of the rotating direction, the assignment of the limit switches usually needs to be changed as well (changing limit switch).



10 Stepping mode

For the function "Stepping mode", the window "Setting parameters for targets" has two data records stored.



Stepping mode left: TIPP 1 (neg)

Stepping mode right: TIPP 0 (pos)

11 Parameterising targets

Up to 256 targets can be parameterised in servoTEC S2. In the example APP5021, we can use the digital inputs DIN 0 and DIN 1 to select up to 4 targets. If more than 4 targets are needed for the machine, this can be implemented by changing the function of a present digital input or by expansion of the digital inputs (technology module).

Each target has many parameters for optimal adjustment to the function in the machine.

Positioning: relative, absolute, ...

Messages:

Target position:

Speed:

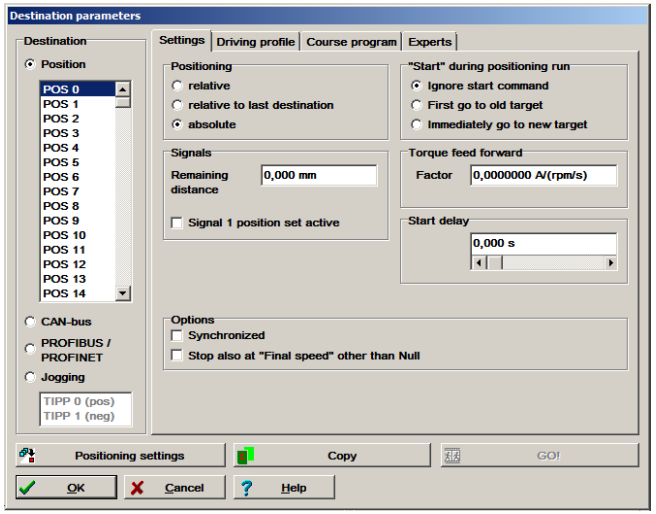
Acceleration, deceleration:

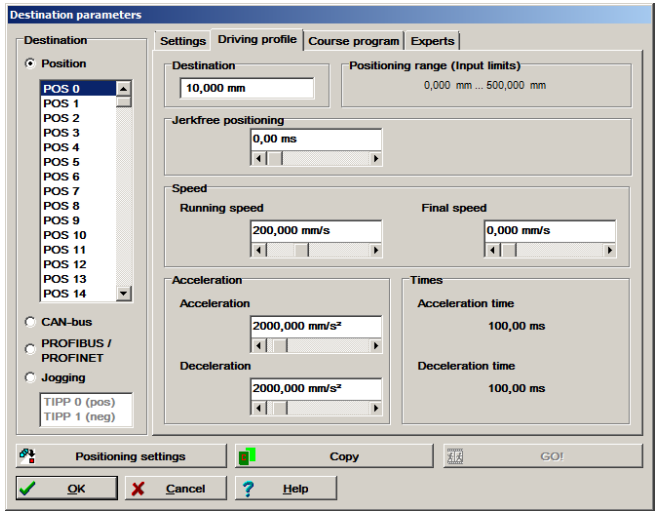
Subsequent position:

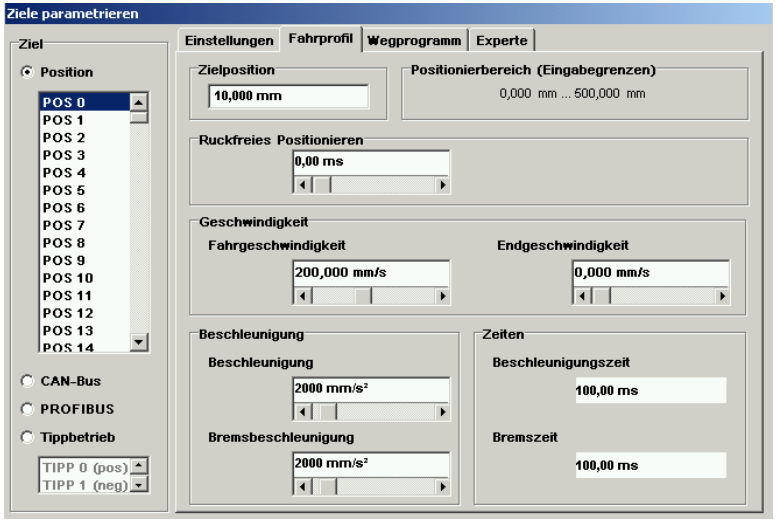
The description for each parameter and the diverse functions can be read in the manual "MAN_EN_1136180_LV-servoTEC_S2_SoftwareManual.pdf", chapter "Positioning".

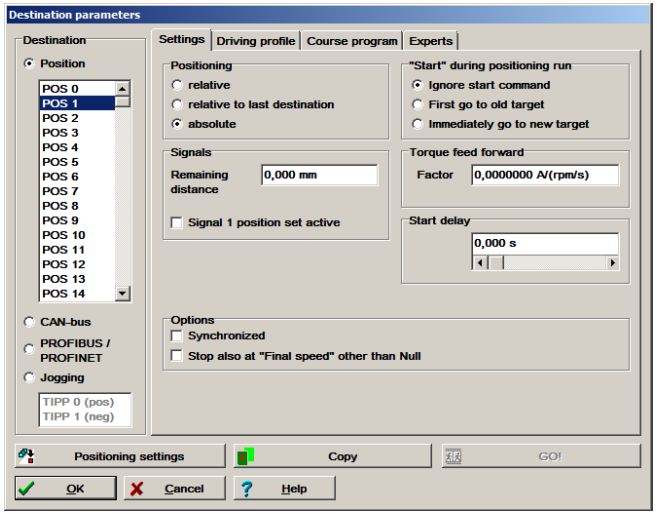
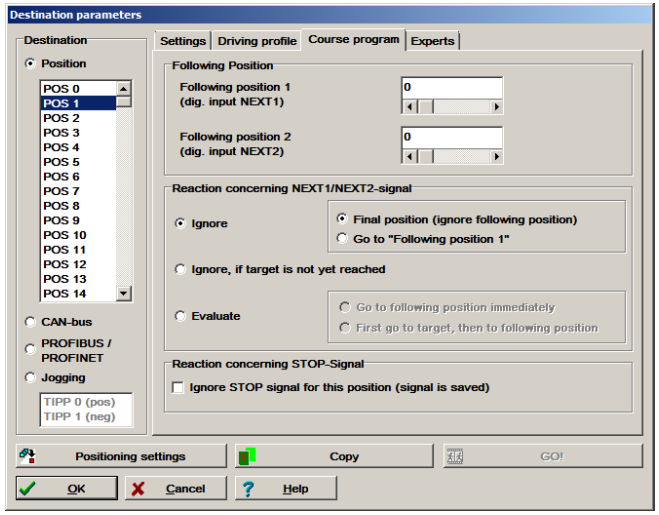
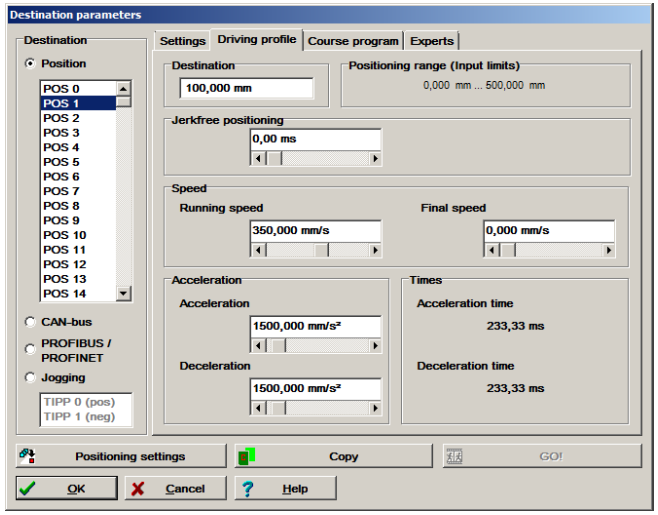
11.1 Target position 0

Positioning:	absolute
Target position:	10.00mm
Driving speed:	200 mm/s
Acceleration:	2000 mm/s²
Deceleration:	2000 mm/s²
Subsequent position:	0







11.2 Target position 1

Positioning:	absolute
Target position:	100.00 mm
Driving speed:	350 mm/s
Acceleration:	1500 mm/s²
Deceleration:	1500 mm/s²
Subsequent position:	0