

Lenze

Manual



Global Drive

Software package - Positioner

Template Positioner

ECSxA

This documentation applies to **Template Positioner** as of version 5.0.

Template Positioner can be used for the following Lenze PLCs:

	Type	as of hardware version	as of software version
ECSxA	ECSxAxxx	1C	7.0

Software system requirements:

Drive PLC Developer Studio *Professional* as of version 2.2

Important note:

The software is supplied to the user as described in this document. Any risks resulting from its quality or use remain the responsibility of the user. The user must provide all safety measures protecting against possible maloperation.

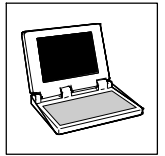
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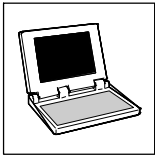
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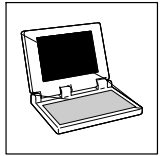
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1 Preface and general information

1.1 About this Manual

This Manual contains information about the **Template Positioner** for the **Drive PLC Developer Studio**.

- **Template Positioner** can be used to implement positioning functions in a PLC.
- In addition to the positioning functionality, the **Template Positioner** includes many pre-designed solutions which can help to save precious time.
- The template is part of the **Software Package - Positioner**.

1.1.1 Conventions used in this Manual

This Manual uses the following conventions to distinguish between different types of information:

Variable identifiers

are written in italics in the explanation:

- "Use *bReset_b...*"



Tip!

Information about the conventions used for the variables of Lenze system blocks, function blocks and functions can be found in the appendix of the DDS online documentation "Introduction into IEC 61131-3 programming". The conventions ensure universal and uniform labelling and make reading the PLC program easier.

Lenze functions/function blocks

can be recognised by their names. They always begin with an "L_":

- "The FB **L_MCPProfileGenerator...**"

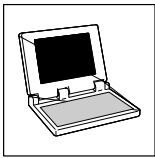
Program listings

are written in "Courier", keywords are printed in bold:

- "**IF** (ReturnValue < 0) **THEN...**"

1.1.2 Pictographs used in this Manual

	Use of pictographs	Signal words	
Warning of material damage		STOP!	Warns of potential damage to material . Possible consequences if disregarded: Damage to the controller/drive system or its environment.
Other notes		Tip! Note!	Indicates a tip or note.



Template Positioner

Preface and general information

1.1.3 Terminology used

Term	In the following text used for
Cxxxx/y	Subcode y of code Cxxxx (e.g. C0470/3 = subcode 3 of code C0470)
DDS	Drive PLC Developer Studio
ECSxA	Any axis module of type ECSxA "Application"
FB	Function block
GDC	Global Drive Control (parameterisation program from Lenze)
Parameter	Code used to set the functionality of a function block or template function
PLC	Axis module ECSxA "Application"
QSP	Quick stop
SB	System block
System bus (CAN)	Lenze standard bus system similar to <i>CANopen</i> for - communication with a host system or other controllers - parameter setting and diagnostics
[unit]	Wildcard for the physical unit of the external measuring system (e.g. "µm", "mm", "cm")

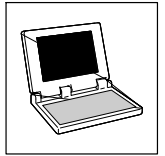
1.2 Information about the template version

As of template version 3.04 you can find information about the version of **Template Positioner** under the following global constants:

Constant	Meaning	Example value
C_w[TemplateName]VersionER	External release	03
C_w[TemplateName]VersionEL	External level	04
C_w[TemplateName]VersionIR	Internal release	00
C_w[TemplateName]VersionBN	Build number	00

Version: 03 04 00 00

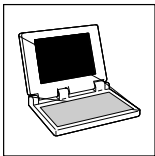
- In the example, the value "01050000" stands for version "3.04.00.00".
- Code C3999 indicates the version in form of the value "3040000".



1.3 Supported functions

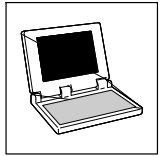
The **Template Positioner** supports the following functions:

- Positioning in different modes:
 - Absolute positioning
 - Modulo positioning (no integrator overflow, e.g. for round tables)
 - Constant traversing
 - Relative positioning (integrator overflow possible)
 - Remaining path positioning (touch probe)
- Profile change during positioning (override)
- Overchange
- Manual positioning
- Homing (16 different modes)
- Jerk limitation/S-ramps for acceleration/deceleration
- "Teach-in" function for easy selection of target positions
- Easy implementation of sequences in different IEC 61131 programming languages
- Profile selection via codes
- Profile selection via program parameters, variables or fieldbus process data with the help of the template function "ChangeProfileInterface"
- Profiles get symbolic names
- Creation of individual error routines and error messages
- Immediate new positioning during an active positioning process
- Operation and diagnostics of template functions via a visualisation
- Visualisation of calculated profiles (profile analysis), template states and signal flows



Template Positioner

Preface and general information



2 Positioning basics

The following sections describe positioning basics.

The functions supported by the template are described in chapter 1.3 (1-3).

2.1 What does positioning mean?

Positioning means to move one or several machine components from a start position to a defined target:

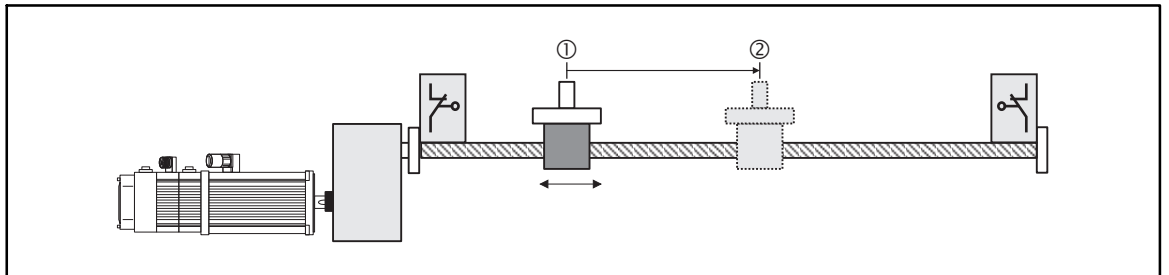


Fig. 2-1

Positioning = Moving machine components from a start position ① to a defined target ②

2.2 Terminology used

2.2.1 Profile

"Profiles" define a positioning process, i.e. profiles determine:

- target
- maximum speed
- acceleration time until maximum speed is reached
- deceleration time from maximum speed to target position
- final speed when reaching the target position
- maximum jerk (jerk = derivation of acceleration)

A profile consists of the following parameters: **Position, speed, acceleration, deceleration, final speed and jerk** and can be indicated as a graphic:

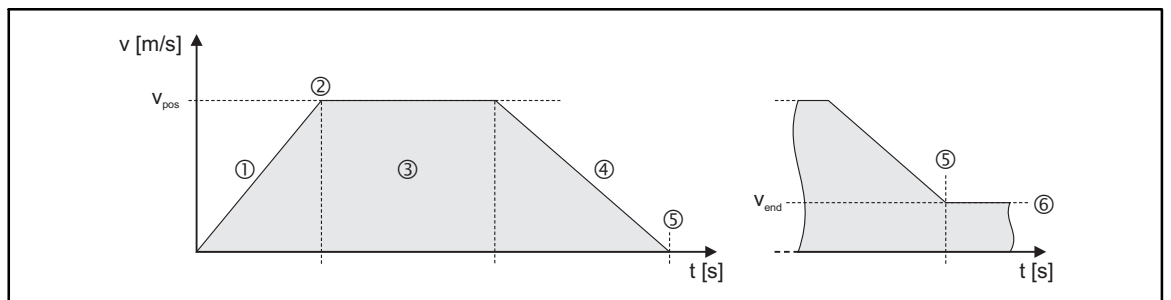
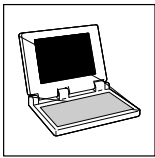


Fig. 2-2

Positioning profile

- | | |
|-------------------------------|-------------------------------------|
| ① Acceleration | ④ Deceleration |
| ② Positioning speed | ⑤ Target position |
| ③ Distance (= trapezium area) | ⑥ Final speed (here other than "0") |

Positioning is built up from many profiles processed in a defined way.



Template Positioner

Positioning basics

2.2.2 Position

Positions can be absolute and relative.

- With absolute positions the distance to the defined zero position (home position) is always indicated:
absolute position = target position - zero position

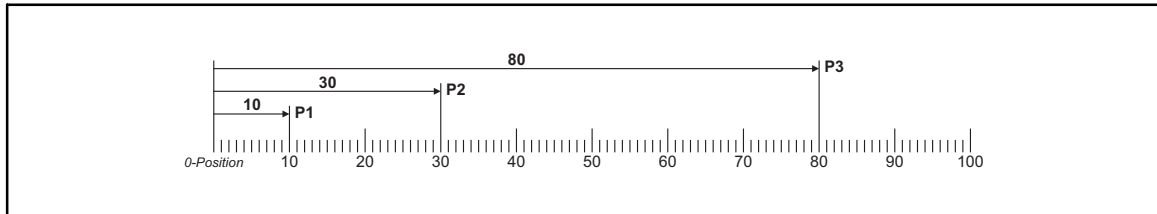


Fig. 2-3

Absolute positions

- With relative positions the distance between start position (current position) and target position is indicated:
relative position = target position - start position

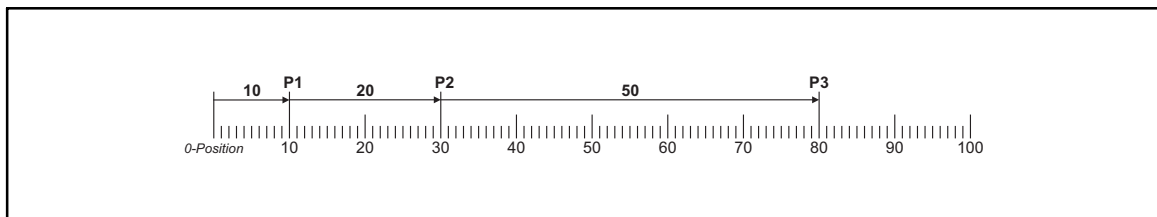


Fig. 2-4

Relative positions (correspond to incremental dimensioning)

2.2.3 Speed

This parameter determines the maximum speed to approach the target.

- It depends on the profile parameters position, acceleration and deceleration whether the drive reaches its maximum speed. If it does not reach its maximum speed, a triangle instead of a trapezium will be displayed:

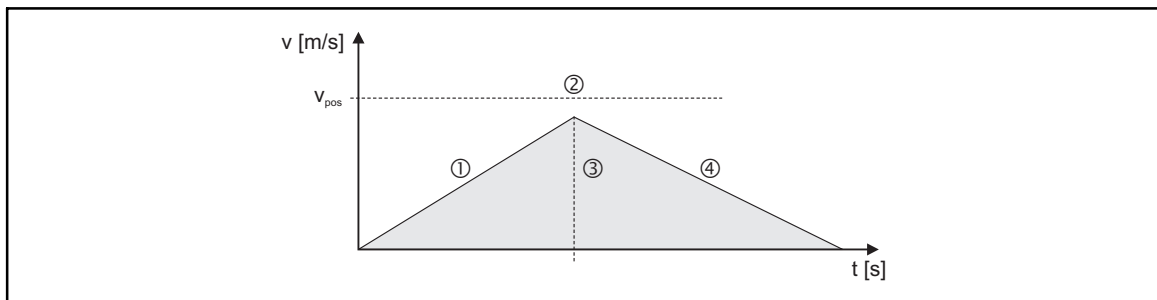
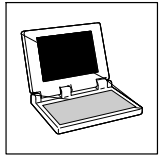


Fig. 2-5

Positioning profile

- ① Acceleration
- ② Positioning speed (not reached here)
- ③ Distance (= triangle area)
- ④ Deceleration



2.2.4 Acceleration/deceleration

These profile parameters determine the acceleration time until reaching the maximum speed and the deceleration time to standstill/until reaching the final speed.



Note

Acceleration differentiates between the following two types:

- Constant acceleration: linear increase in speed.
- Linear increase in speed: speed increases following an S-shaped curve (see chapter "Jerk reduction by means of S-profiles").

2.2.5 Jerk reduction by means of S-profiles

S-ramps (S-profiles) are used for soft acceleration and deceleration to reduce the jerk and protect the drive components.

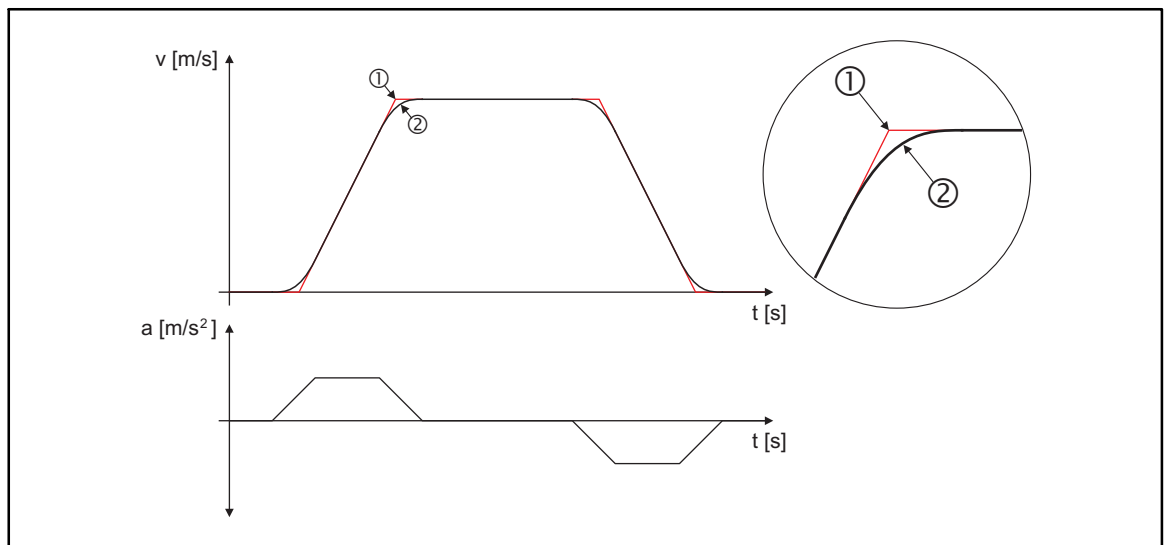


Fig. 2-6

Jerk reduction

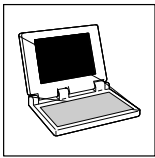
- ① without jerk limitation (L-profile)
- ② with jerk limitation (S-profile)

- The set acceleration/deceleration parameters are only reached after expiry of a defined jerk time.
- This type of acceleration/deceleration is, for instance, needed for sensitive machine components with clearance.



Tip!

Since acceleration rises slower with S-profiles, time required for positioning is longer than with L-profiles.



Template Positioner

Positioning basics

2.2.6 Homing

The measuring system in the machine is selected by means of homing and the zero position is set within the possible traversing range:

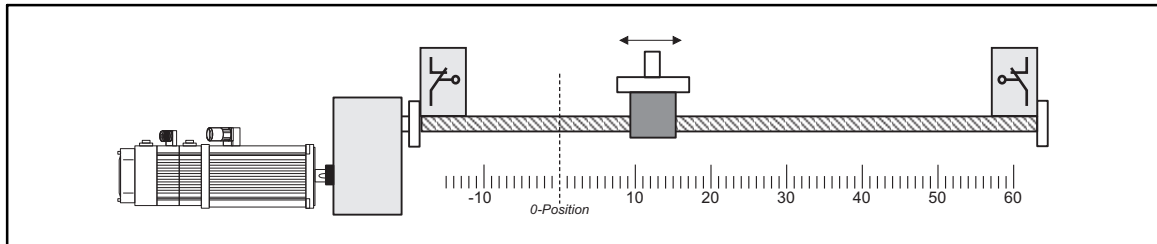


Fig. 2-7 Homing (selection of zero position)

The zero position (home) can be defined by homing or setting a home position:

- With homing the drive follows a previously selected path to find the home position.
- When the drive stands still, the home position is selected manually.

2.2.7 Manual homing

Manual homing means that the drive is moved by manual operation:

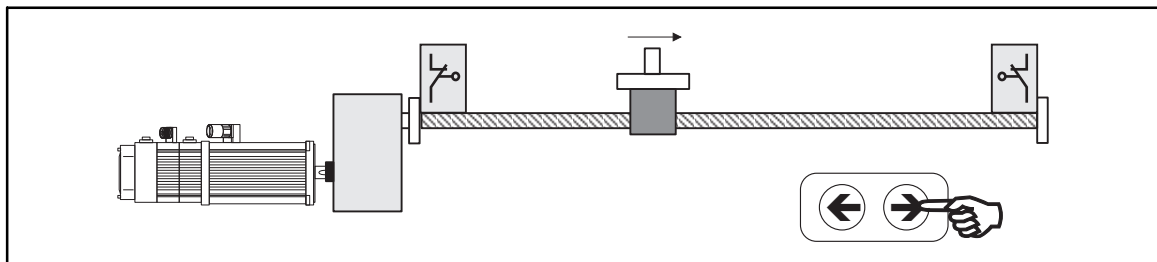
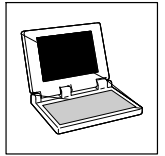


Fig. 2-8 Manual homing

The parameters speed, acceleration and deceleration can also be selected for manual homing.



2.2.8 Remaining path positioning (touch probe)

With remaining path positioning the drive approaches a defined target or traverses constantly until touch probe is activated in the PLC by a sensor. The drive then only traverses a defined remaining path.

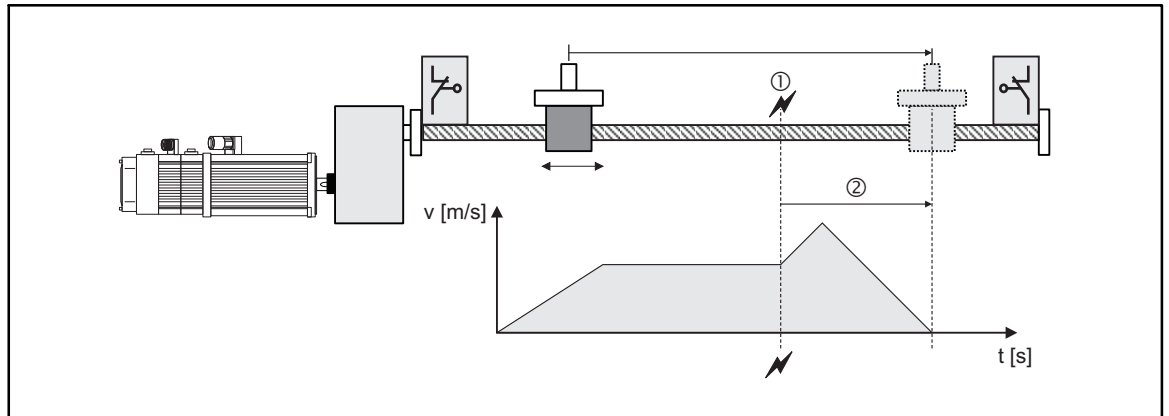


Fig. 2-9

Remaining path positioning (touch probe)
 ① Sensor label transfers touch probe signal
 ② Remaining path

The parameters speed, acceleration and deceleration can also be selected for remaining path positioning.

2.2.9 Profile change during positioning (override)

"Override" means a change of profile parameters and their acceptance during positioning.

The traversing profile must be adapted accordingly to ensure that, for instance, a defined target position is found even if the positioning is changed ("speed override"):

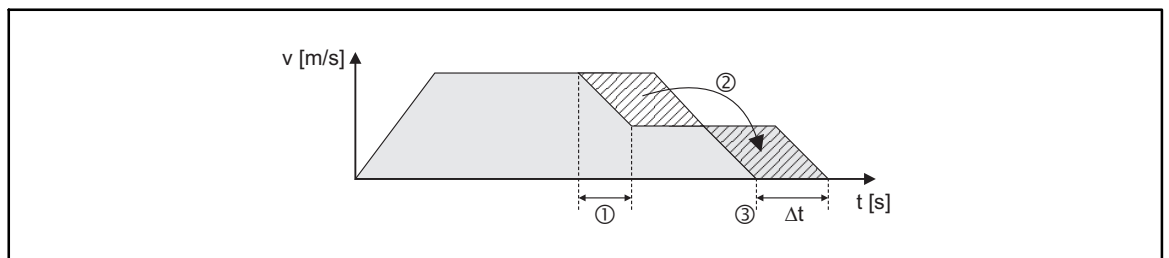
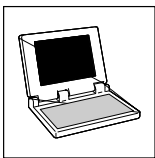


Fig. 2-10

Override (here: speed override)
 ① Speed is reduced during positioning.
 ② The defined position can only be reached if the missing area is "added" to the profile.
 ③ The reduced speed results in a longer positioning process (Δt).



Template Positioner

Positioning basics

2.2.10 Overchange

"Overchange" means positioning with a final speed unequal "0", i.e. a second positioning process is started as soon as the target position is reached. The drive does not stop at the first target position:

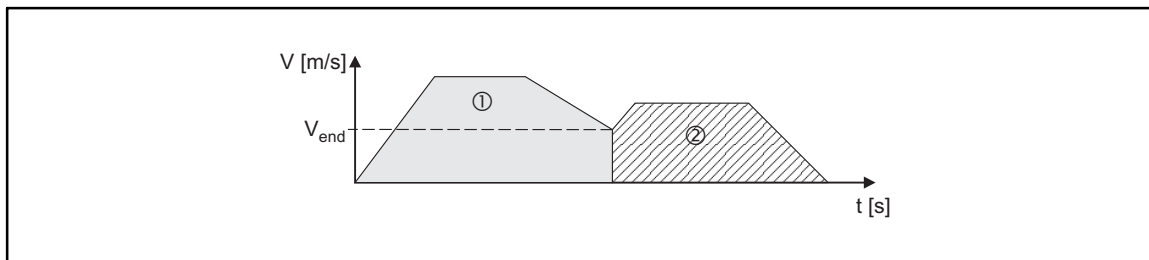


Fig. 2-11

Overchange (overchange of profile 1 target position)

- ① Profile 1
- ② Profile 2

2.2.11 Limit positions

Not only the zero position but also the limits of the traversing range must be defined to avoid damage to the system, e.g. with manual homing. These limits, also called "limit positions", can be defined by means of the hardware and the software:

- Hardware limit positions are, for instance, limit switches connected to the PLC inputs. They activate certain actions (e.g. quick stop).
- Software limit positions limit a possible traversing range within the limits set by the hardware and evaluate whether a position can be approached.

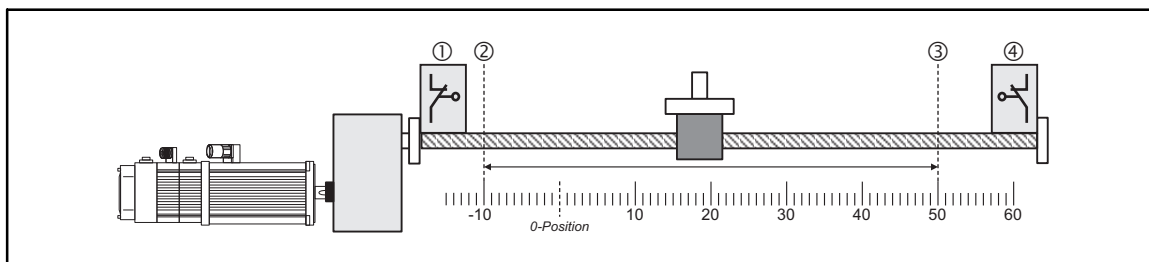
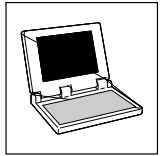


Fig. 2-12

Limit positions in a linear axis with leadscrew

- ① Left hardware limit position (limit switch)
- ② Left software limit position
- ③ Right software limit position
- ④ Right hardware limit position (limit switch)



2.3 Machine parameters

Not only the profile parameters but also machine parameters are important for positioning. The following figure shows a linear shaft with leadscrew and a moving slide:

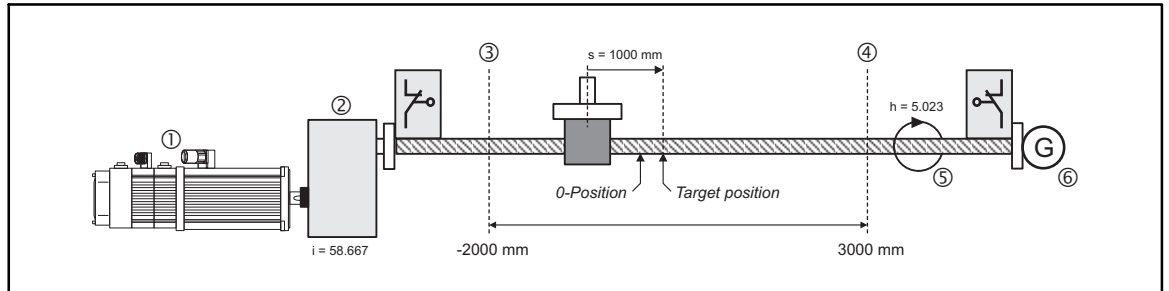


Fig. 2-13

Example: Linear shaft with leadscrew

- ① Motor/encoder
- ② Gearbox with gearbox ratio i
- ③ Left software limit position
- ④ Right software limit position
- ⑤ Feed constant h (in mm/rev.)
- ⑥ Encoder (optionally)

The profile parameters (position, speed, acceleration and deceleration) are selected as real units, for instance 1000 mm as relative position referring to the slide.

The slide can only be moved to the right by exactly 1000 mm if the motor revolution is set according to gearbox ratio and feed constant:

$$\text{Motor revolutions} = \frac{\text{Distance}}{\text{Feed_constant}} \cdot \text{Gearbox ratio} = \frac{s}{h} \cdot i$$

$$\text{Motor revolutions} = \frac{1000 \text{ mm}}{5.023 \text{ mm/rev.}} \cdot 58.667 = 11679.6735$$

Gearbox ratio

The gearbox ratio indicates how many motor revolutions are needed to turn the leadscrew, here: 58.667.

Feed constant

The feed constant indicates the distance traversed by the slide when the leadscrew rotates once, here: 5.023 mm.

The PLC does not only need gearbox ratio and feed constant to convert a profile from real units into motor-related units, but also:

Motor type

Type of motor used for positioning.

Feedback system

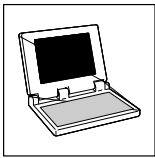
Type of feedback system which sends signals to the PLC where the slide is positioned momentarily.

Gearbox factor of the encoder system

With (optional) external encoders (i = motor speed / encoder speed)

Maximum speed

Max. permissible speed, this parameter depends on the max. motor speed.



Template Positioner

Positioning basics

Maximum acceleration

Max. permissible acceleration and deceleration for positioning.

This parameter depends i.a. on the motor torque and the moment of inertia of the total mechanism to be driven by the axis.

Maximum jerk

The maximum jerk is defined by a set time ($t_{\text{jerk_max}}$) after which the maximum acceleration (a_{max}) is reached.

The jerk reduction can be limited to a maximum value. The maximum jerk is parameterised by defining a time interval in which the acceleration of a profile must be built up at the latest. If the S-ramp time of a profile is larger than the maximum time, smoothening is automatically carried out during the whole maximum time.



Note!

The selection of disproportionately high S-ramp times (jerk times) with low acceleration times can lead to a faulty profile generation.

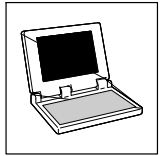
Example: $v = 100 \text{ mm/s}$, $a = 1000 \text{ mm/s}^2$

$$\Rightarrow t_{\text{acc}} = 0.1 \text{ s}$$

$$\Rightarrow t_{\text{jerk_max}} = 1 \text{ s}$$

Therefore, only select plausible S-ramp times not higher than half the value of t_{acc} .

Under template parameter code C3037 you can select a profile-optimised S-profile generation. If $C3037 = 1$, there are no restrictions for the profile parameters. Profile-optimised S-profile generation requires a much longer processing time.



3 Introduction

3.1 What is a template?

Templates are program patterns that are used to create IEC 61131 projects by means of the Drive PLC Developer Studio (**DDS**). The templates already include pre-defined function modules and program parts that can be used as a basis for solving different automation tasks.

Lenze offers templates for a variety of technology functions. The functions of the individual templates have been specially designed for the individual automation tasks.

- This functional demarcation ensures that the user program only contains program parts that have been tailored and optimised for the corresponding automation task.
- The use of uniform user interfaces and program structures makes program handling and program maintenance easier.
- The templates are based on the application know how and technical expertise of Lenze.

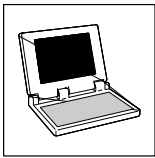
3.2 Areas of application

We recommend to use a template if:

- A substantial part of the automation task can be solved by means of the basic template functions.
- The user cannot or does not want to program the core functions of the technology system (positioner, cam, winder, ...) himself.
- The user wants to save time by using pre-fabricated function modules.
- The project requires a uniform, protected user interface.
- The user wants to take advantage of Lenze know-how.

We do not recommend to use a template if:

- A task is very complex and the implementation of the core functions requires detailed know-how.
- A task is so easy that the use of a template definitely exceeds the scope of functions required.
- The user does not want to use any pre-fabricated functions made by Lenze.



Template Positioner

Introduction

3.3 Software architecture

The templates are part of a multi-layer software architecture:

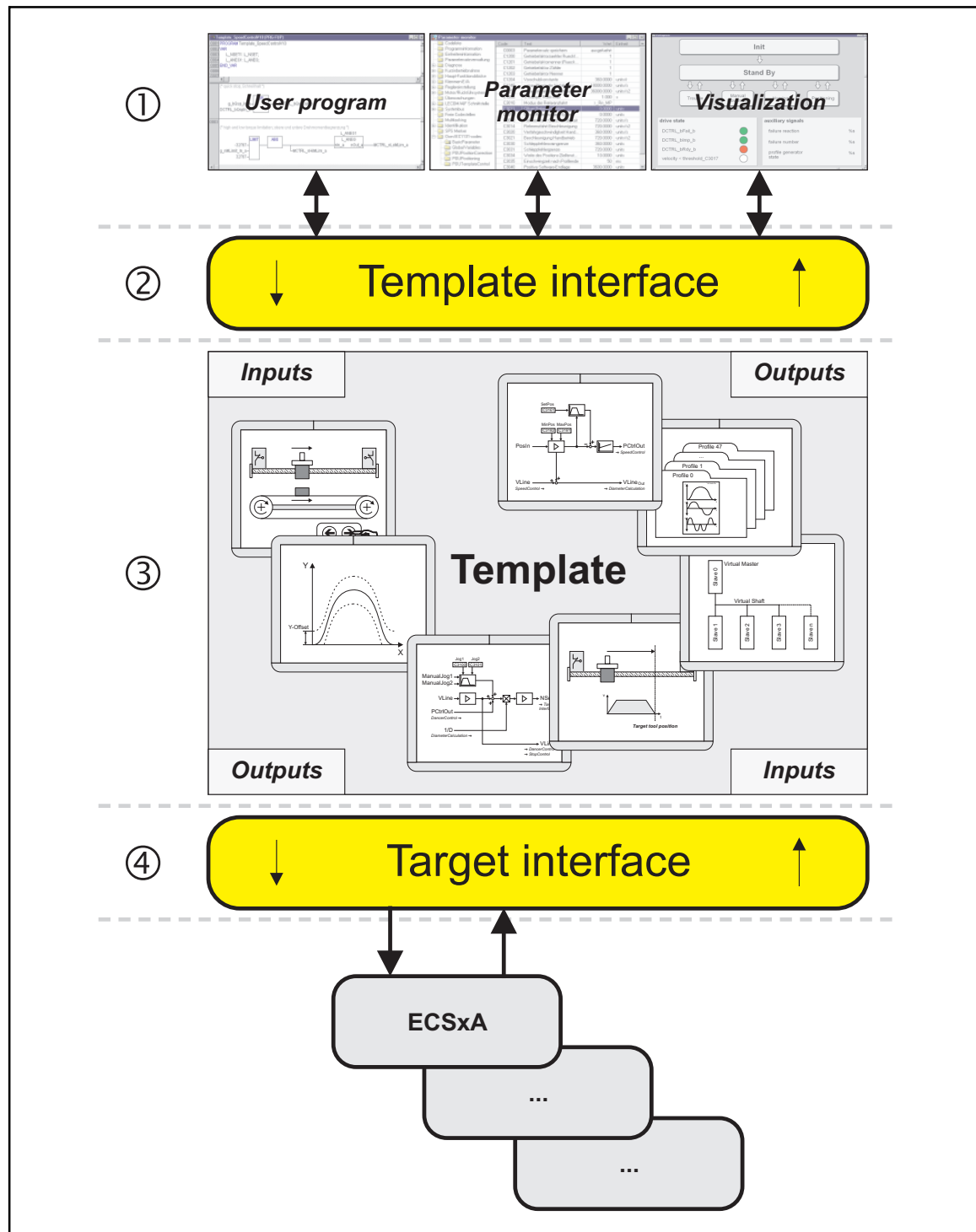
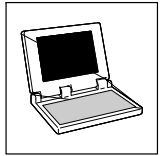


Fig. 3-1 Software architecture
 ① Application layer
 ② Defined interface between application layer and template
 ③ Template with pre-fabricated technology functions
 ④ Defined interface between template and target system



3.3.1 Basic concept

Basic concept for the use of templates:

- The template provides all core functions of the corresponding technology and cannot be modified by the user.
- The user uses the defined template interface to activate the core functions of the template from his program.
- All functional extensions or adaptations implemented by the user are implemented in a separate project area (application layer).

3.3.2 Application layer

The application layer is the project area from which the user controls and monitors the template, defines user-specific parameters, and creates his own template-based IEC 61131 programs to solve individual tasks.

Possible tasks:

- Processing of operator setpoint selections
- Connection of host systems or Human Machine Interfaces (HMIs)
- Monitoring of user-specific processes
- Control of peripheral devices (terminals, additional drive systems)

The application layer also includes:

- The **Parameter monitor** which can be used to parameterise codes "online".
- The **Visualisations** which make operation and handling of the template easier.



Tip!

Program Organisation Units (POUs)

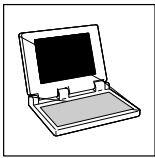
The template includes a variety of POUs which can be adapted and extended by the user. The name of these POUs begins with the word "user".

Project organisation

Take advantage of the opportunity to create your own folders and sub-folders in the *Object Organizer* to organise your individual extensions in a logical project structure. This makes the subsequent transfer to other templates and template updates easier.

Objects which cannot be changed

Some objects in the *Object Organizer* which are part of the template functionality can be displayed in the editor area for program documentation, but cannot be changed by the user.



Template Positioner

Introduction

3.3.3 Template interface

With its permanently defined inputs and outputs, the *template interface* forms the interface between the application layer and the template. The template interface enables:

- Access to setpoint and actual template values
- Template control (e.g. start/stop of a drive function)
- Template status checks (e.g. query of error messages)
- Configuration and parameterisation of the template

Within the template, the template interface is represented by the global variables in the **TemplateInterface** folder and the template codes.



Note!

Codes 3000 to 3999 are designed for the configuration of the template.

We therefore recommend not to use any of these codes for your own extensions to make sure that the code numbers will not collide during subsequent updates of the template.

3.3.4 Target interface

Since the template has been designed for different platforms it can be used for different target systems.

The template and the target system communicate via a permanently defined interface (*target interface*). The *target interface* connects internal signals to the target system and re-normalises them.



Note!

The inputs of the *target interface* are written by the template and must **not** be written in parallel in the application layer!

- A list of the input variables of the *target interface* can be found in the appendix. (📖 7-11)

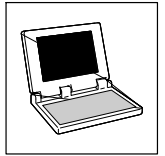
3.3.5 Template

The template is the functional core of the project. It provides precisely defined functions for specific tasks which are called/activated from the application layer (user program).

- Via its "upper" inputs, the template cyclically reads all information from the *template interface* and then executes the corresponding functions.
- Via its "upper" outputs, the template cyclically sends status information to the *template interface*. This information can then be evaluated and processed by permanently defined global variables in the user program.

Information between the "lower" inputs and outputs of the template and the *target interface* is exchanged accordingly:

- Via its "lower" outputs, the template cyclically sends control information to the *target interface*. The target interface conditions the information and transfers it to the target system.
- Via its "lower" inputs, the template cyclically reads the status information of the target system via the *target interface*.



4 Template commissioning

This chapter uses a **sequential function chart** to lead you step by step through the template commissioning and explain all basic functions.

- Information about the principles are given in the following section 4.1.
- General information about the sequential function chart can be found in section 4.2. (▢ 4-2)
- The sequential function chart for commissioning can be found in section 4.3. (▢ 4-3)

4.1 Preconditions

The template commissioning described in this chapter is based on the following system principles:

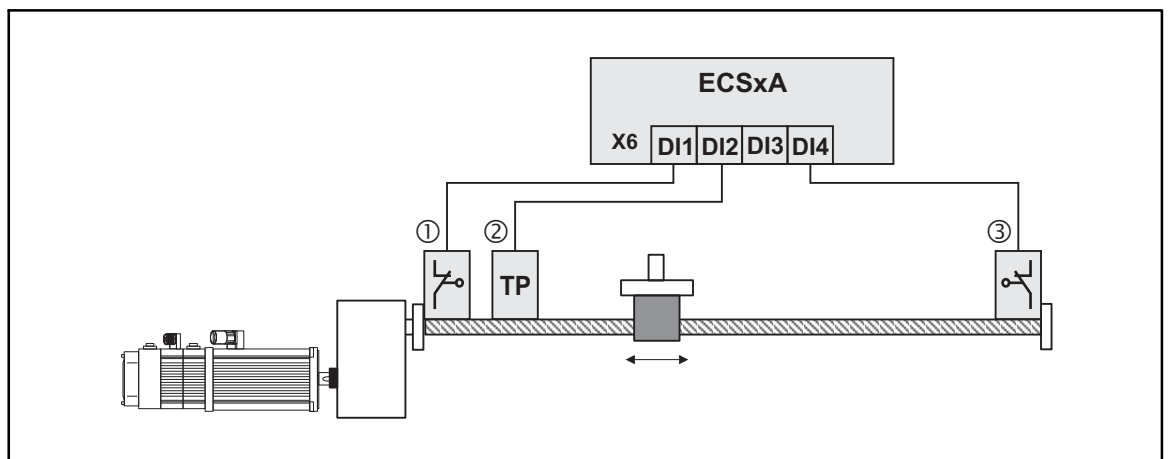


Fig. 4-1

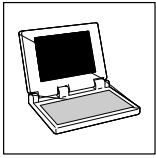
System principles

- ① **Left limit switch** (LOW active), connected to digital input 1 (X6/DI1).
- ② **Touch probe initiator**, connected to digital input 2 (X6/DI2).
- ③ **Right limit switch** (LOW active), connected to digital input 4 (X6/DI4).



STOP!

Please read the Safety and application instructions for Lenze controllers in the Mounting Instructions for the ECSxA axis module!



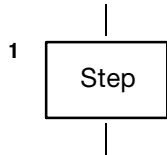
Template Positioner

Template commissioning

4.2 General information about the sequential function chart

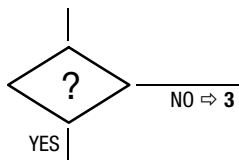
The sequential function chart consists of instructions (steps) and branches which depend on a query (condition).

- The following symbols/conventions are used:



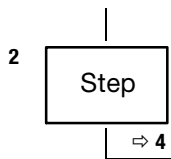
This symbol describes a **step** (here: step no. 1)

- Follow the instructions for a step one after the other.
- After you have carried out all instructions for a step, the following step is to be processed.



This symbol describes a **branch** which depends on a query (condition).

- If you answer a question with "Yes" the next step will be processed, otherwise the step connected to "NO =>" will be processed (here: step no. 3).



This symbol describes a **step and a jump** to another step.

- After this step has been completed, do not proceed with the next step but the step indicated behind "&=>" (here: step no. 4).

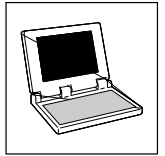
- Additional information and notes are indicated by the following pictographs:



This pictograph indicates a tip or additional information.



This pictograph indicates an important note.

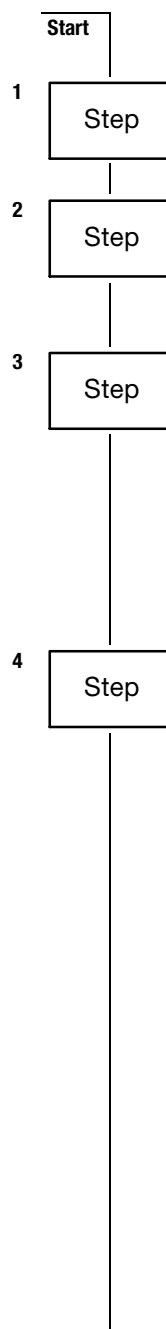


4.3 Sequential function chart for commissioning the template



Tip!

The following template commissioning describes the approach of four different target positions.



Prepare the ECSxA axis module by setting the factory values:

- Load the factory setting with C0002 = 0
- Save the parameter set with C0003 = 1 after the factory setting has been completed

Go to the Drive PLC Developer Studio (DDS) and create a new project:

- Select **File → New, with template** to create a new template-based project.
- Go to the *Open* dialog box, select the file **TemplatePositionerECSV0400.lpc** and confirm with **OK**.

The *Password for working group* dialog box will be indicated.

- Go to **Step 2** and do not enter anything under **Password**.
- If "Project file is read only" is displayed confirm this message with **OK**.

i The project will be indicated with visualisation.

Save the project under a new name.

- Select **File → Save as**.

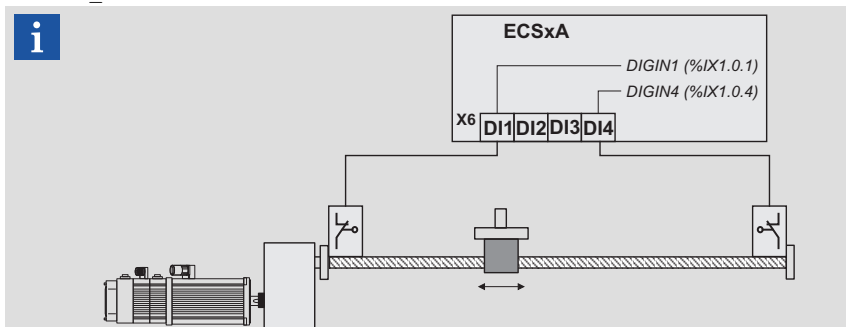
i Go to **Project → Project Information** and enter author, version and history.

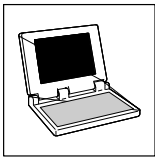
Assign the digital inputs 1 & 4, which are used for the limit switches, to the corresponding template variables:

- Go to the *Object Organizer* and open the variable list **VarHardwareSignals** (register **Resources → folder Global variables → folder TemplateInterface**).
- Define the variables *g_bLimitSwitchNeg* (left limit switch) and *g_bLimitSwitchPos* (right limit switch) as follows:

```

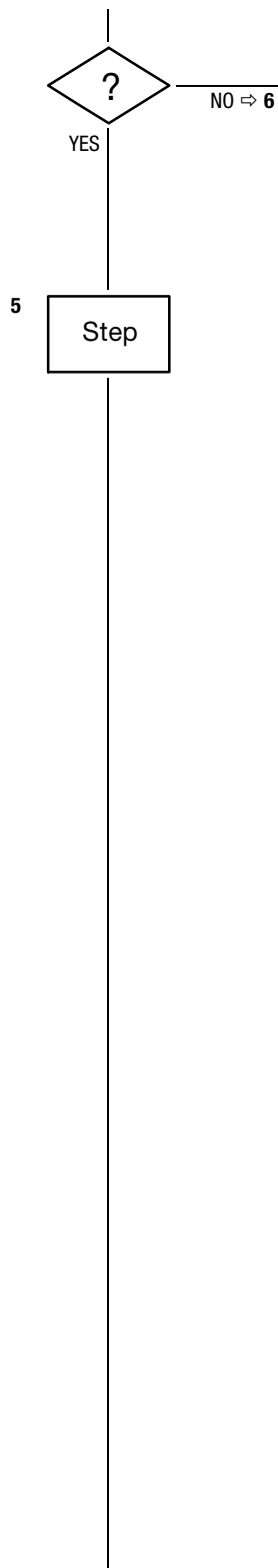
VAR GLOBAL
  (* Hardware signals *)
  ...
  → g_bLimitSwitchNeg AT %IX1.0.1: BOOL; (* DIGIN1 *)
  → g_bLimitSwitchPos AT %IX1.0.4: BOOL; (* DIGIN4 *)
  ...
END_VAR
  
```





Template Positioner

Template commissioning



Do you want to carry out the positioning as a sequencer?



Positioning as sequencer means that the 4 positions defined for this example are automatically approached one after another:

Position 1 → 2 → 3 → 4 → 1 → 2 → 3 → 4, etc.

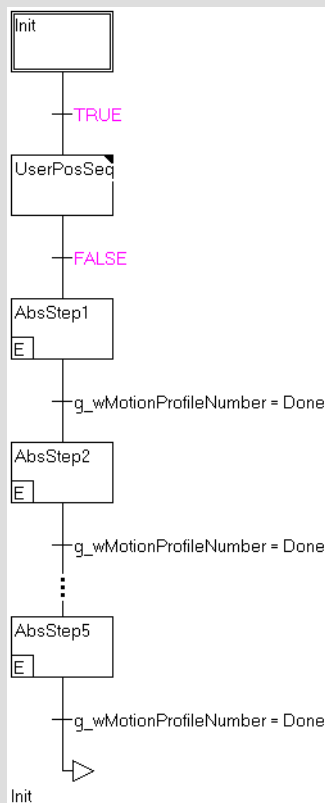
If you do not want to use a sequencer, each one of the 4 positions defined for this example can be approached individually by entering the corresponding profile name into the visualisation.

Enable the attached positioning sequencer:

- Go to the *Object Organizer* and open the POU **UserInterface (PRG)** (register **Organisation units** → folder **UserExtensions** → folder **UserPOUs**).



The POU **UserInterface** does not only comprise the initialisation routine (Init) but also a step to call up individual positioning programs (UserPosSeq) and a sequencer with 5 positions (AbsStep1 - AbsStep2 - AbsStep3 - RelStep4 - AbsStep5).

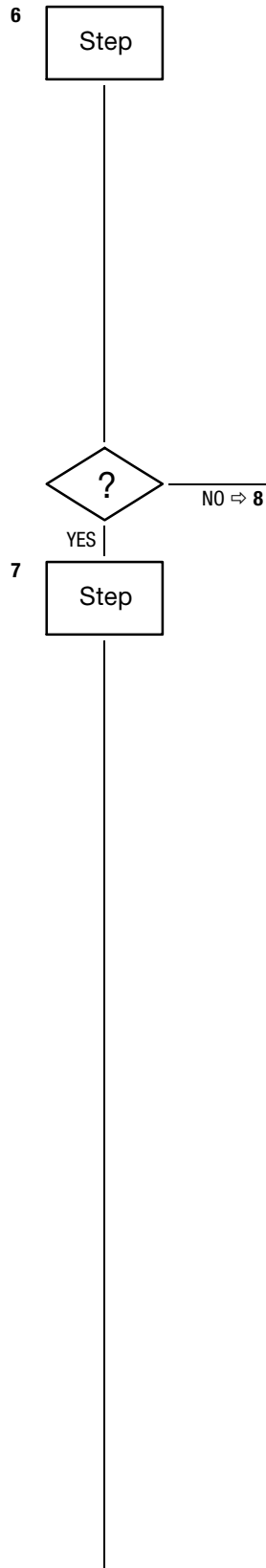
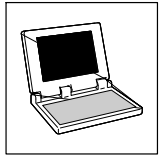


- The principle of this sequencer is the transfer of a traversing profile ("Profile1" ... "Profile5") to the variable `g_wMotionProfileNumber`. The profile is either being processed (and the variable indicates "Done") or a new profile is transferred to `g_wMotionProfileNumber` during the process. If this is the case, the new profile will be processed.
- More information about this POU can be found in chapter 6.2. (6-3)

- Set the second transition TRUE to enable the sequencer.
- Delete "AbsStep5" and the following transition "`g_wMotionProfileNumber = Done`", since this example is only for a sequencer with four positions.



The profile names can be selected under the data type **ProfileNames (ENUM)**, however, this example uses the preset profile names "Profile1" ... "Profile4".



Adapt the number of profiles to be processed:

- Go to the *Object Organizer* and open the variable list **VarTemplateSettings (CONSTANT)** (register **Resources** → folder **Global variables** → folder **TemplateInterface**).
- Go to the variable **C_wNumberOfMotionObjects** and enter the corresponding number (here: "4"):

```

VAR_GLOBAL CONSTANT
(* constant *)
→ C_wNumberOfMotionObjects: WORD := 4;
END_VAR
  
```



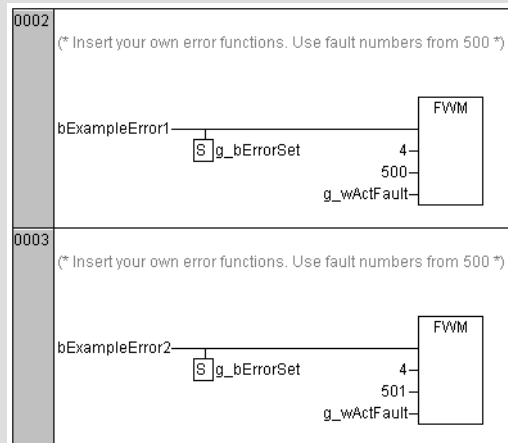
After the compilation, the following codes with 4 sub-codes each are assigned to the 4 profiles, i.e. every profile (1 ... 4) has a sub-code (1 ... 4):

- C3100/1 ... C3100/4 (positions)
- C3200/1 ... C3200/4 (speeds)
- C3300/1 ... C3300/4 (accelerations)
- C3400/1 ... C3400/4 (decelerations)
- C3500/1 ... C3500/4 (final speeds)
- C3600/1 ... C3600/4 (jerk times)

Is the system to react to user-defined errors?

Complete the list of error messages:

- Go to the *Object Organizer* and open the program **UserErrors (PRG)** (register **Organisation units** → folder **UserExtensions** → folder **UserPOUs**).
- Create new networks by copying & pasting of the first network.
- Assign an error number between 500 and 999 to the variables **wFaultNumber** of every network.



- Go to the *Object Organizer* data type **ErrorCode (ENUM)** (register **Data types** → folder **UserDataTypes**).
- Assign the corresponding text messages to the error numbers between 500 ... 999:

```

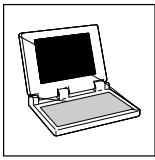
TYPE ErrorCode : (
  NoError:=0,
  CCr:=71,
  CE0:=61,
  ...
  → UserMessage1:=500,
  → UserMessage2:=501
);
END_TYPE
  
```



Do not change the error numbers 0 ... 499 and the corresponding text messages!

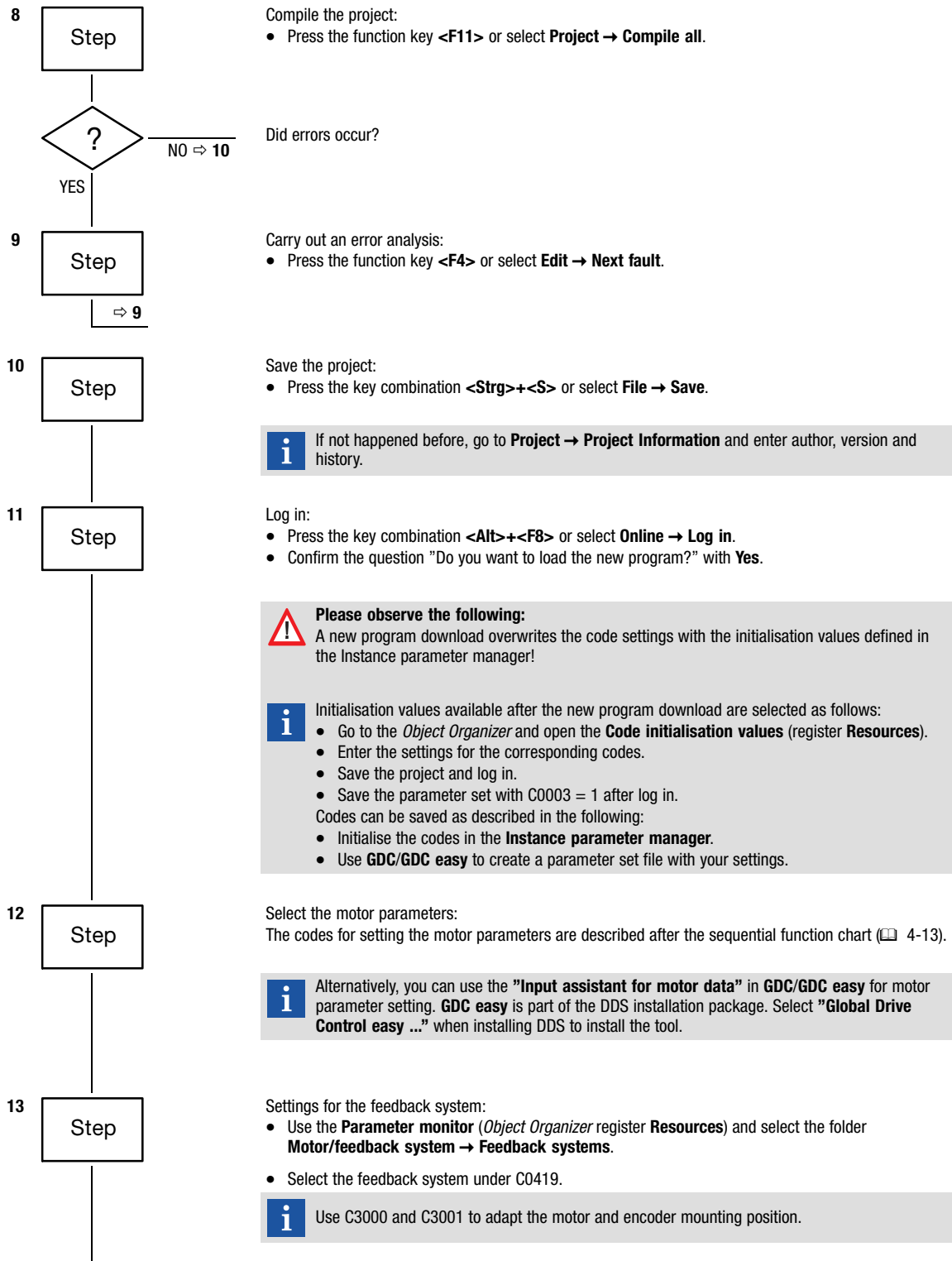


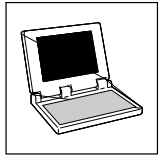
The template function block **FWM** works in the same way as the function block **L_FWM**, but without history buffer.



Template Positioner

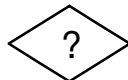
Template commissioning





14

Step



YES

NO ⇒ 16

Select the system parameters:

- Use the **Parameter monitor** (*Object Organizer* register **Resources**) and select the folder **Individual IEC1131 codes** → **BasicParameter**.
- Enter the gear factor for the optional feedback system under C1200 and C1201.
- Enter the gear factor for the motor gearbox under C1202 and C1203.
- Enter the feed constant under C1204.



The feed constant defines the distance traversed while one revolution at the gearbox output.

Example:

- Gear factor for the optional feedback system:
Motor speed/encoder speed = 5.1432 ⇒ C1200/C1201 = 51432/10000
- Gear factor of the motor gearbox:
Motor speed/speed = 58.667 ⇒ C1202/C1203 = 58667/1000
- Feed constant:
One revolution at the gearbox output side corresponds to a distance of 5.023 mm.
⇒ [unit] = 1 mm ⇒ Feed constant = 5.023 [unit]
⇒ [unit] = 1 cm ⇒ Feed constant = 0.5023 [unit]

Do you want to approach the home position by means of homing?



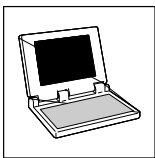
The measuring system in the machine is selected by means of homing and the zero position is set within the possible traversing range. The zero position is found by a home signal and the corresponding offset selections.

Possible home signals:

- Marker pulse (signal edge of the encoder system, one per motor revolution)
- Touch probe (signal edge at input DI2)
- User signal (signal edge through the variable *g_bHomePositionSet*)
- Limit switch (negative signal edge through the variable *g_bLimitSwitchNeg* or *g_bLimitSwitchPos*)
- Reaching a defined motor torque value (code C3008)

Homing/setting of home position:

- Homing means that the drive traverses according to a certain mode and independently finds the home position.
- The home position can also be set (instead of homing), i.e. the home position is set while the drive is at standstill.



Template Positioner

Template commissioning

15

Step

Select the homing parameters:

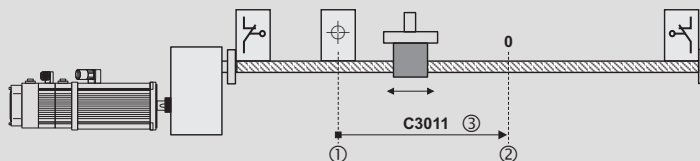
- Use the **Parameter monitor** (*Object Organizer* register **Resources**) and select the folder **Individual IEC1131 codes** → **BasicParameter**.
- Enter the offset in [unit] under C3011. The offset indicates the travel path between homing point and zero position.
- Enter the offset in [unit] under C3012. The offset indicates the distance between homing point and zero position.



The machine position where the home signal occurs is known as home position.

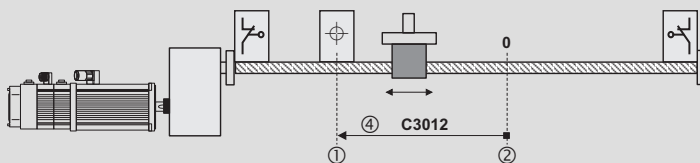
The zero position of the machine can be determined by two different offset entries (measured from the home position):

- Zero position offset **with traversing** of the drive by offset in C3011 (with C3012 = 0):



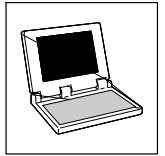
- ① Home position
- ② Zero position
- ③ Drive traverses the offset in C3011 from the home position

- Zero position offset **without traversing** of the drive by offset in C3012 (with C3011 = 0):



- ① Home position
- ② Zero position
- ④ Drive stops at home position, C3012 determines the distance to the zero position.

It is also possible to combine the two offset entries! (C3011 ≠ 0 and C3012 ≠ 0)



15 (continued)

Step

- Enter the speed in [unit]/s which can be reached during homing under C3013.
- Enter the acceleration in [unit]/s² which defines the acceleration and deceleration ramp under C3014.



Example:

With a homing speed of 360 [unit]/s under C3013 to be reached within 0.5 s, the value under C3014 is 720 [unit]/s²:

$$720 \text{ [unit]/s}^2 = \frac{360 \text{ [unit]/s}}{0.5 \text{ s}}$$



- Check whether the wanted acceleration is possible.
- Ensure that the speed set under C3013 is not too high and the limit switches are not passed.

- Use the **Parameter monitor** (*Object Organizer* register **Resources**) and select the folder **Individual IEC1131 codes** → **BasicParameter**.
- Select mode 11 ("**<_Ln_>_TP**") under C3010 for homing.



Symbols for code C3010:

>	Movement in positive direction
<	Movement in negative direction
Lp	Limit switch positive - limit switch in positive direction
Ln	Limit switch negative - limit switch in negative direction
Rp	Refmark positive - positive edge of home switch
Rn	Refmark negative - negative edge of home switch
TP	Touch probe edge of input DI2
MP	Marker pulse - zero pulse edge of motor (one per motor revolution)
Mlim	Motor torque limitation (C3008)

Homing mode 11 with "<_Ln_>_TP" means for this example:

1. Movement to the left (<)
2. Movement to the left limit switch (Ln)
3. Change of direction (>)
4. Movement to the right to the touch probe initiator (TP signal at input DI2).

16

Step

Select the homing parameters:

- Enter the offset in [unit] under C3012. The offset indicates the distance between homing point and zero position.



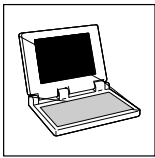
Offset entries: see information about step 15.



- Check whether the acceleration for manual homing (C3021) is possible with the motor torque.
- Ensure that the speed for manual homing set under C3020 is not too high and the limit switches are not passed.



Speed/acceleration value: see information about step 15.



Template Positioner

Template commissioning

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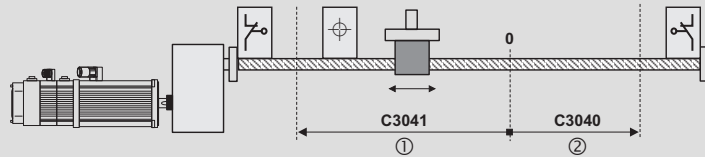
Step

Select the software limit positions (measured from the zero position):

- Use the **Parameter monitor** (*Object Organizer* register **Resources**) and select the folder **Individual IEC1131 codes** → **BasicParameter**.
- Enter the positive software limit position under C3040.
- Enter the negative software limit position under C3041.



Software limit positions are positions or distances measured from the zero position in positive and negative direction. They define the limits of a measuring system determined after homing.



① Negative software limit position

② Positive software limit position

The software limit positions need not be necessarily positive and negative. It is also possible to select two positive or negative software limit positions.

18

Step

Select the parameters for manual homing:

- Enter the speed in [unit]/s which can be reached during manual homing under C3020.
- Enter the acceleration ramp in [unit]/s² under C3021.
- Enter the deceleration ramp in [unit]/s² under C3022.



Manual homing means to rotate the drive in negative or positive direction through a manual homing signal. Manual homing is stopped by taking back the manual homing signal or a system limit (limit switch, software limit position).

Example:

With a manual homing speed of 360 [unit]/s under C3020 to be reached within 0.5 s, the value under C3021 is 720 [unit]/s²:

$$720 \text{ [unit]/s}^2 = \frac{360 \text{ [unit]/s}}{0.5 \text{ s}}$$



- Check whether the wanted acceleration is possible.
- Ensure that the speed set under C3020 is not too high and the limit switches are not passed.

19

Step

Select the following error warning limit and the following error limit:

- Enter the following error warning limit in [unit] which activates a message in the visualisation under C3030.
- Enter the following error limit in [unit] which stops the machine under C3031.



A following error is the difference between position setpoint and actual position which occurs if the drive is slower than the position setpoint because of its moment of inertia.

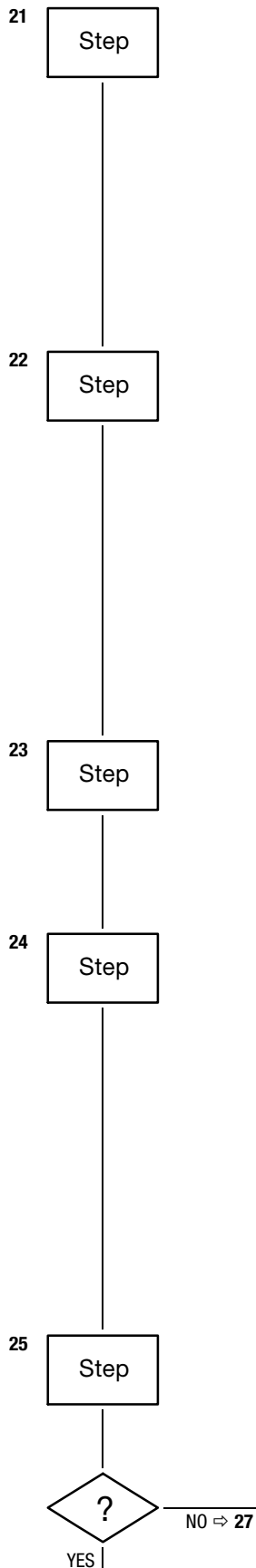
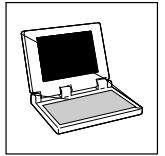
Following errors must be compensated or reduced because they can cause excessive transient reactions.

20

Step

Start the PLC:

- Press the function key <F5> or select **Online** → **Start**.



Select the maximum speed for the system:

- Use the **Parameter monitor** (*Object Organizer* register **Resources**) and select the folder **Individual IEC1131codes** → **Basic Parameter**.
- Read the value of C3060.
This value defines the maximum speed of the system and because of a program-internal calculation it will only be indicated in the **Parameter monitor** when the PLC has been started.
- Enter the value indicated in C3060 under C1240.



Do not enter a value under C1240 higher than the value indicated under C3060.



If you enter a value lower than the value indicated in C3060 under C1240 all speed values determined for the positioning profiles will be limited by this value.

Select the maximum acceleration for the system:

- Enter the maximum permissible acceleration value in [unit]/s² under C1250.



The acceleration value is calculated from the maximum motor torque and the moment of inertia to be accelerated:

$$\text{Maximum acceleration} = \frac{\text{Maximum motor torque}}{\text{Total moment of inertia}}$$

Rough values can be set according to the maximum speed set under C1240. If the machine accelerates to maximum speed within the selected time C1250 is:

$$C1250 = \frac{C1240}{\text{Time from 0 [unit]/s to C1240}}$$

All acceleration and deceleration values selected for the positioning profiles are limited by C1250.

Permanently save the parameter set with C0003 = 1 in the PLC.



Please note:

A repeated program download overwrites the code settings with the initialisation values!

Write the positioning profiles:

- Use the **Parameter monitor** (*Object Organizer* register **Resources**) and select the folder **Individual IEC1131codes** → **POUPositioning**.
- Enter the positions of profiles 1 ... 4 in [unit] under C3100/1 ... 4.
- Enter the speeds of profiles 1 ... 4 in [unit]/s under C3200/1 ... 4.
- Enter the accelerations of profiles 1 ... 4 in [unit]/s² under C3300/1 ... 4.
- Enter the decelerations of profiles 1 ... 4 in [unit]/s² under C3400/1 ... 4.
- Close the **Parameter monitor**.



Reminder:

- In step 6 you have defined four profiles (1 ... 4) via *C_wNumberOfMotionObjects*.
- With the data type **ProfileNames (ENUM)** you have assigned profile names to the profiles "Profile1" ... "Profile4".

The assignment **Profile3:=3** means, e.g.:

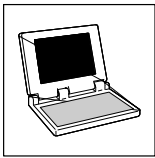
⇒ "Profile3" takes place **3** in data type **ProfileNames (ENUM)**.

⇒ "Profile3" is written by the corresponding sub-code **3** of C3100 ... C3600.

Open the user interface in the visualisation:

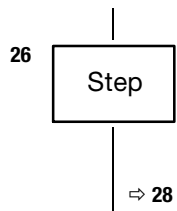
- Go to the *Object Organizer* register **Visualisation** and select the visualisation **VisOperation**.

Do you want to approach the home position by means of homing?



Template Positioner

Template commissioning



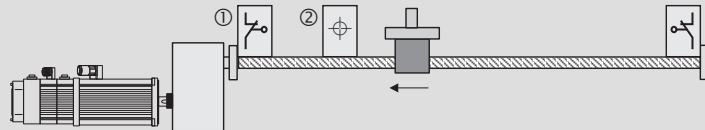
Start homing by clicking the **start** button under **homing** in the visualisation.
(Here homing uses mode 11, see step 16)

- ⇒ The template state "Homing" is displayed.
- ⇒ The drive is carrying out a homing process.
- ⇒ The template state "StandBy" will be indicated as soon as homing is completed.



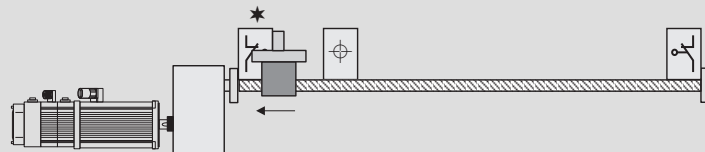
Homing in mode 11 (<_Ln_>_TP):

1. Movement to the left (<)

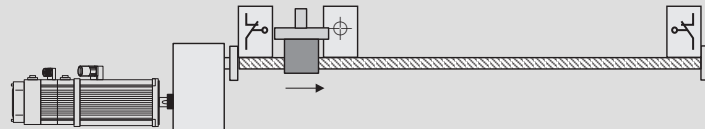


- ① Left limit switch (connected to DI1)
- ② Touch probe initiator (connected to DI2)

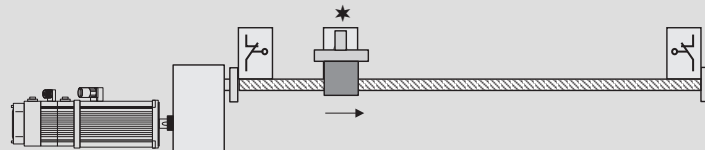
2. Movement to the left limit switch (Ln)



3. Change of direction (>)

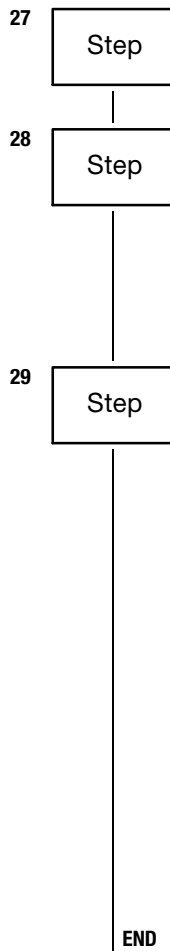
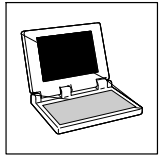


4. Movement to the right to the touch probe initiator (TP signal at input DI2).



If the template state "Trouble" is indicated in the visualisation, an error has been detected.

- Click **Error Reset** to acknowledge the error.
- Internal errors (TRIP) cannot be directly acknowledged via **Error Reset**. They can only be reset after a TRIP reset.



Set the home position manually by clicking the **load** button under **home set** in the visualisation.

Manual homing:

- Click the **jog negative** button under **manual jog** in the visualisation.
⇒ The drive moves in negative direction at manual traversing speed.
- Click the **jog positive** button under **manual jog** in the visualisation.
⇒ The drive moves in positive direction at manual traversing speed.



The template state "ManualJog" will be indicated as long as manual homing is active.

Start the positioning sequencer:

- Ensure that "absolute" (for absolute positioning) is entered under **positioning control**, input field **position mode** in the visualisation.
- Click the **start** button under **positioning control**.
⇒ The template state "Positioning" is displayed.
⇒ The positions of the four profiles are approached one after the other following the selections made in step 25. After profile 4 has been used, the process starts again with profile 1.
- Click the **stop** button under **positioning control**.
⇒ The drive decelerates along the ramp of the currently active profile to standstill.
⇒ The template state "StandBy" is displayed.



If the positioning values are not within the measuring system TRIP will be set:

- The template state "Trouble" is displayed and QSP is indicated.
- Correct the corresponding target position and acknowledge the error (ErrorReset).

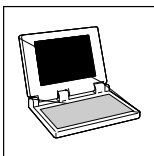


If you have not programmed a sequencer it is also possible to enter the profile name under **positioning control**, input field **profile name**.

- The corresponding positioning profile will be processed and the input field will display "Active" or "Done" as soon as the target position has been reached.
- It is possible to enter a new profile into the input field while "Active" is still being displayed. The approach of the current target position will be stopped and the new profile data will be used immediately.

Motor parameter codes (step 12)

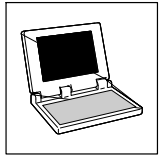
Motor parameters				
Code	Sub-code	Data type	Access	Info
				Possible settings
C0006			R / W	Operating mode of motor control Only possible, if C2108 = 2 (stop). 1 = servo control synchronous motors 2 = servo control asynchronous motors
C0011			R / W	Maximum speed:Reference value for absolute and relative setpoint selection for acceleration and deceleration times. For parameter setting via interface: Greater changes in one step should only be made when the controller is inhibited (CINH). 500 {1 unit} 16000 3000 rpm
C0022			R / W	I _{max} limit (device-dependent list) 0 {0.01 A} see Techn. data
C0070			R / W	Proportional gain of speed controller (V _{pn}) 0.00 {0.01} 127.99 3.00
C0071			R / W	Adjustment time of speed controller (T _{nn}) 1.0 {0.5 ms} 6000.0 24 ms



Template Positioner

Template commissioning

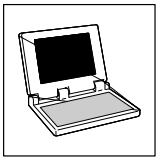
Motor parameters				
Code	Data type	Access	Info	
Sub-code			Possible settings	Pre-setting
C0075		R / W	V _{pi} current controller (upper limit depends on controller)	
			0.00 {0.01 Ω} ECSxA004: 381.80 ECSxA008: 190.90 ECSxA016: 95.46 ECSxA032: 47.72 ECSxA048: 31.82 ECSxA064: 23.86	4 Ω
C0076			T _{ni} current controller	
			0.01 {0.01 ms} 200.00	5.00 ms
C0081		R / W	Rated motor power acc. to nameplate	
			0.01 {0.01 kW} 500.00	3.2 kW
C0084		R / W	Motor stator resistance (upper limit depends on controller)	
			0.00 {0.01 Ω} ECSxA004: 95.44 ECSxA008: 47.72 ECSxA016: 23.86 ECSxA032: 11.93 ECSxA048: 7.95 ECSxA064: 5.96	1.10 Ω
C0085		R / W	Leakage inductance of motor	
			0.00 {0.01 mH} 200.00	5.30 mH
C0087		R / W	Rated motor speed	
			300 {1 unit} 16000	3700 rpm
C0088		R / W	Rated motor current	
			0.5 {0.1 A} 500	7.0A
C0089		R / W	Rated motor frequency	
			10 {1 Hz} 1000	185 Hz
C0090		R / W	Rated motor voltage	
			50 {1 V} 500	325 V
C0091		R / W	cos φ of asynchronous motor	
			0.50 {0.01} 1.00	1.00
C0128		R / W	Thermal time constant of motor for calculating the I ² _{xt} -disconnection	
			1.0 {0.1 min} 25.0	5 min
C1190		R / W	Selection of PTC evaluation for motor	
			0 = standard 1 = characterist.	0
C1191	1	R / W	Selection of PTC temperature characteristic	
			Temperature 1	
			0 {1 °C} 255	25 °C
	2	R / W	Temperature 2	
			0 {1 °C} 255	150 °C
C1192	1	R / W	Selection of resistance characteristic for PTC	
			Temperature 1	
			0 {1 Ω} 30000	1000 Ω
	2	R / W	Temperature 2	
			0 {1 Ω} 30000	2225 Ω



Tip!

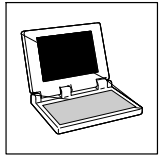
You have learned about the basic functions of the Template Positioner:

- Setting of main machine parameters
- Setting of defined system parameters
- Setting of homing parameters
- Selection of the measuring system
- Selection of movement profiles
- Homing by means of visualisation
- Manual homing by means of visualisation
- Programming of a simple sequencer
- Processing of a programmed sequencer by means of visualisation



Template Positioner

Template commissioning



5 The "Positioning" status machine

The following figure shows the status machine which is the basis for the individual function modules of the template.

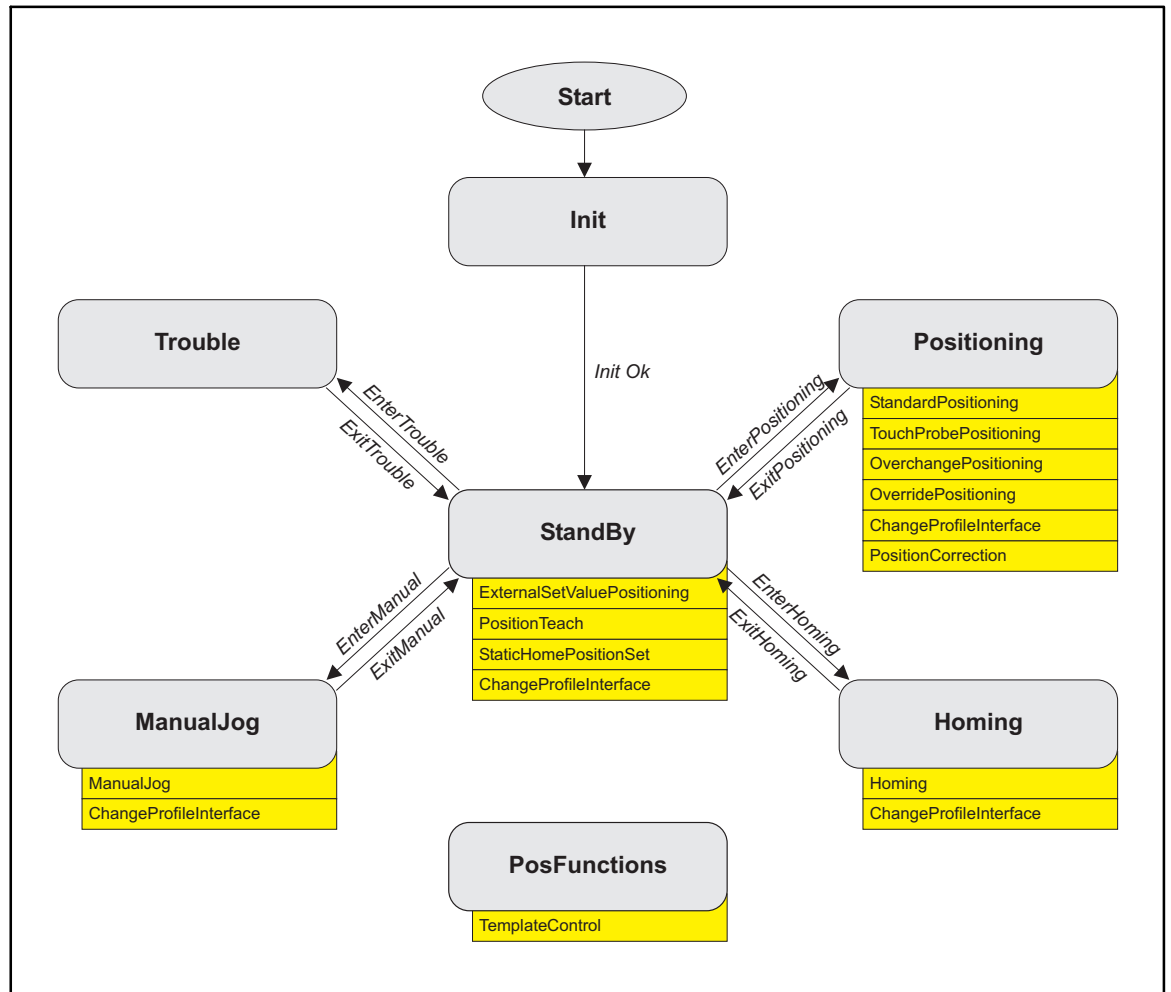


Fig. 5-1 "Positioning" status machine

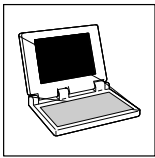
The status machine comprises different statuses and defined status changes, so-called transitions.

- There is always only one status active. This makes diagnostics easier in case of an error.
- A status changes into another if the condition for the corresponding transition is met.

Example:

The change from "StandBy" to "Positioning" can only be carried out if the condition for the "EnterPositioning" transition is met. If the status is to change back to "StandBy" the condition for the "ExitPositioning" transition must be fulfilled.

- The function modules of the template are assigned to different statuses to ensure that specific functions cannot be activated at the same time.
Manual homing cannot be carried out if positioning or homing is active.



Template Positioner

The "Positioning" status machine

5.1 Short status description

Status "Init"

This status is activated after the PLC has been started.

The following actions are executed in "Init":

- Identification and setting of the feedback systems for speed and position detection.
- Checking of the home position if multi-turn encoders/resolvers are used as absolute value encoders.
- Calculation of the internal values for the positioning control.

Status "StandBy"

This status is of central importance since it is always activated when a status changes into another. If you change from "Trouble" to "ManualJog", "StandBy" will be active for one cycle.

The following actions are executed in "StandBy":

- Checking and calculation of the maximum speed indicated in code 3060.
- Calculation of the machine parameters, maximum travel path and internal values for homing.
- Calculation/acceptance of all monitoring limit values, e.g.:
 - Following error warning limit
 - Following error limit
 - Calculation of the positioning window for the message "Target position reached" (*g_bInTarget*)
 - Calculation of the time setting for the message "Dwell time over" (*g_bDwellTime*)
- Enabling of the functions **PositionTeach** and **ExternalSetValuePositioning**.
- Setting of the home position by using the function **StaticHomePositionSet**.

Status "Trouble"

This status is activated if the operating system of the PLC or user program sends an error message.

The following actions are executed in "Trouble":

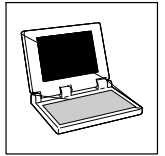
- Display of the current error.
- Enabling of the reset mechanism for user errors.

Status "ManualJog"

This status enables manual traversing of the drive system (manual homing/jog control).

The following actions are executed in "ManualJog":

- Creation of movement profiles for the function **ManualJog** (manual homing).
- Evaluation of the traversing range limit switches during manual homing.
- Retracting from the traversing range limit switch.



Status "Homing"

Setting or automatic finding of the home position.

The following actions are executed in "Homing":

- Creation of movement profiles for the function **Homing**.
- Evaluation of the traversing range limit switches during homing.

Status "Positioning"

This status is used for the core function of the template, the positioning of the drive system.

- Positioning commands are only executed in "Positioning".
- A status change (e.g. as a result of an error or initiated by the user) leads to an immediate quick stop of the drive system.

The following actions are executed in "Positioning":

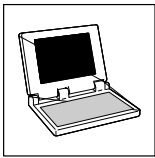
- Creation of movement profiles for the positioning functions:
 - StandardPositioning
 - TouchProbePositioning
 - OverridePositioning
 - OverchangePositioning
- Calculation of the profile parameters during writing by means of the function **ChangeProfileInterface**.

Parallel process "PosFunctions"

This status is always active. It is independent of the status control transitions.

The following actions are executed in "PosFunctions":

- Calculation of the monitoring functions (software limit positions, hardware limit positions, following errors, etc.).
- General template control functions.
- Calculations for the visualisations.

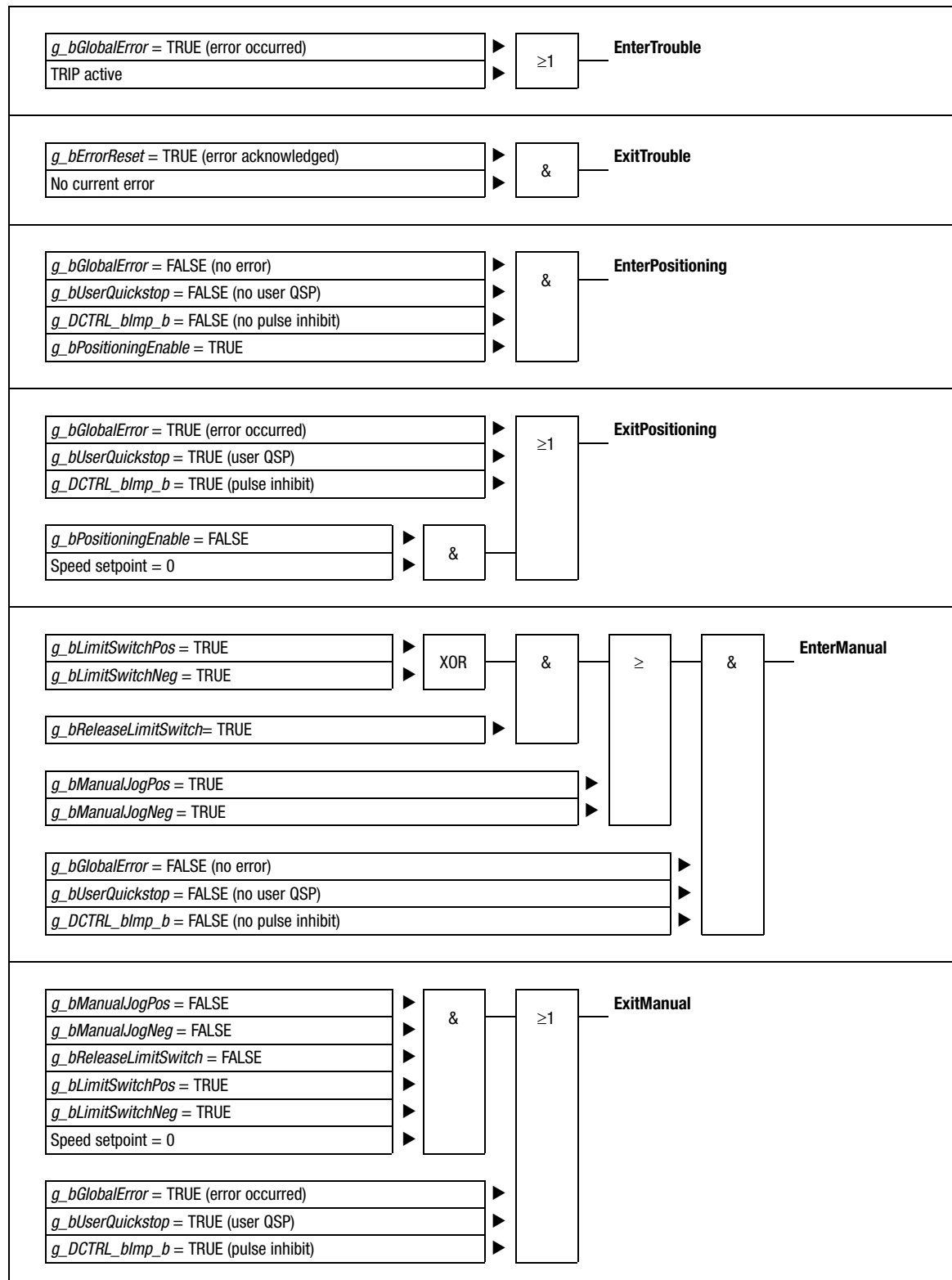


Template Positioner

The "Positioning" status machine

5.2 Conditions for status changes (transitions)

The below figure shows the conditions to be fulfilled for the individual transitions in the form of logic operations:



Template Positioner

The "Positioning" status machine

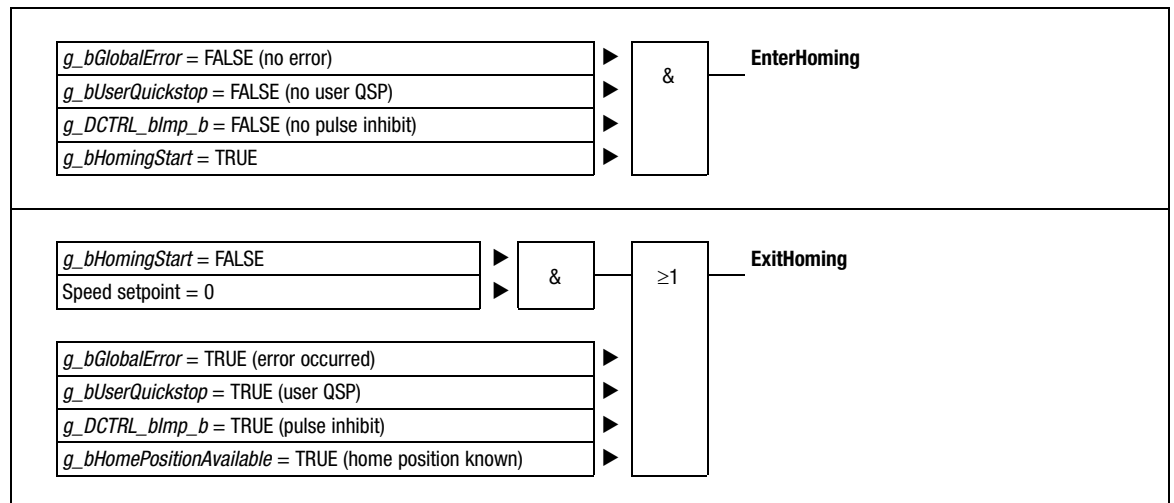
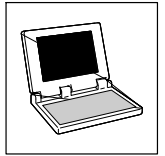


Fig. 5-2

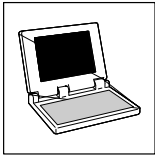
Conditions for transitions of the "Positioning" status machine

& logic AND operation

$\geq$ logic OR operation

XOR logic EXCLUSIVE-OR operation

- Use the "Enter..." transitions to change from "StandBy" to another status machine status ("Homing", "Trouble", ...).
- Use the "Exit..." transitions to change back to "Standby".



Template Positioner

States & Functions

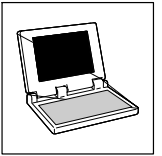
Status "StandBy"

5.3 Status "StandBy"

With "Standby" the drive remains in its current position.

The following template functions can be executed in this status:

Function	Info	
ExternalSetValuePositioning	Direct transfer of external setpoints to the motor control	 5-7
PositionTeach	Saving of the actual position	 5-9
StaticHomePositionSet	Manual setting/resetting of the home position	 5-10



5.3.1 Function "ExternalSetValuePositioning"

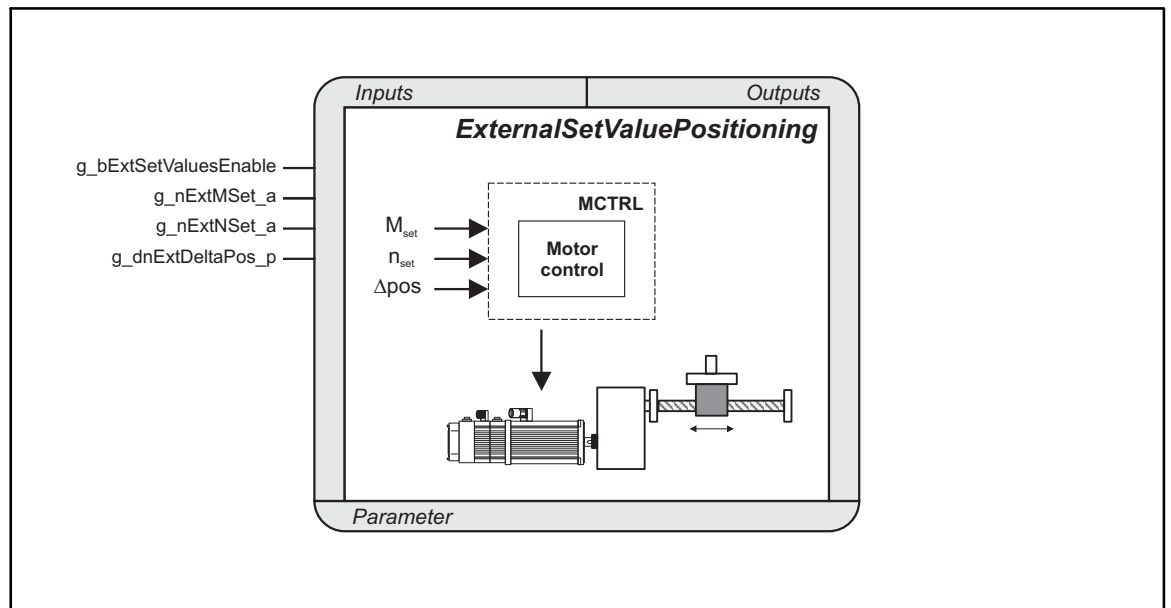
This template function is used to control a motor independently of the positioning control by external setpoint entries.

- The function is only possible with "StandBy".

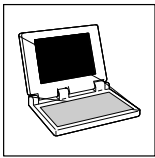


Stop!

The software limit positions are deactivated during external setpoint motor control. If they are passed, you will not receive an error message.



⇒ Inputs				
Identifiers	Data type	Access	Info/possible settings	
g_bExtSetValuesEnable	Bool	R / W	Changeover to external setpoints	
			TRUE	The external setpoints are directly transferred to the motor control: • g_nExtMSet_a ⇒ nMSet_a • g_nExtNSet_a ⇒ nNSet_a • g_dnExtDeltaPos_p ⇒ dnDeltaPos_p
g_nExtMSet_a	Integer	R / W	External setpoint for torque precontrol	
g_nExtNSet_a	Integer	R / W	External setpoint for the setpoint speed	
g_dnExtDeltaPos_p	Integer	R / W	External setpoint for the position difference	



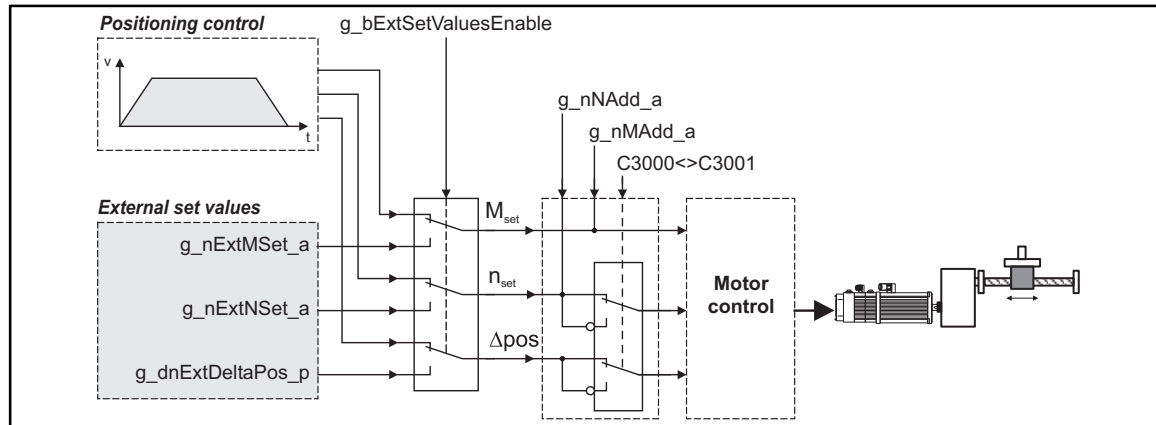
Template Positioner

States & Functions

Function "ExternalSetValuePositioning"

Changeover to external setpoints

Set *g_bExtSetValuesEnable* to TRUE to change from positioning control to external setpoint control:

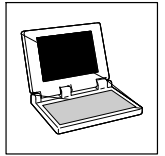


During external setpoint control, the positioning control follows the position changes made. After deactivation of the external setpoint control, it can thus continue precise positioning provided that the max. traversing range of $\pm(2^{31} - 1)$ increments (± 2147483647 increments) is not exceeded.

If motor and encoder mounting position (C3000/C3001) are not identical in the application, this will be automatically considered when using external setpoints for speed and following error. External torque setpoints must be inverted manually.

The speed/torque setpoints can also be influenced via the inputs *g_nNAdd_a* and *g_nMAdd_a*.

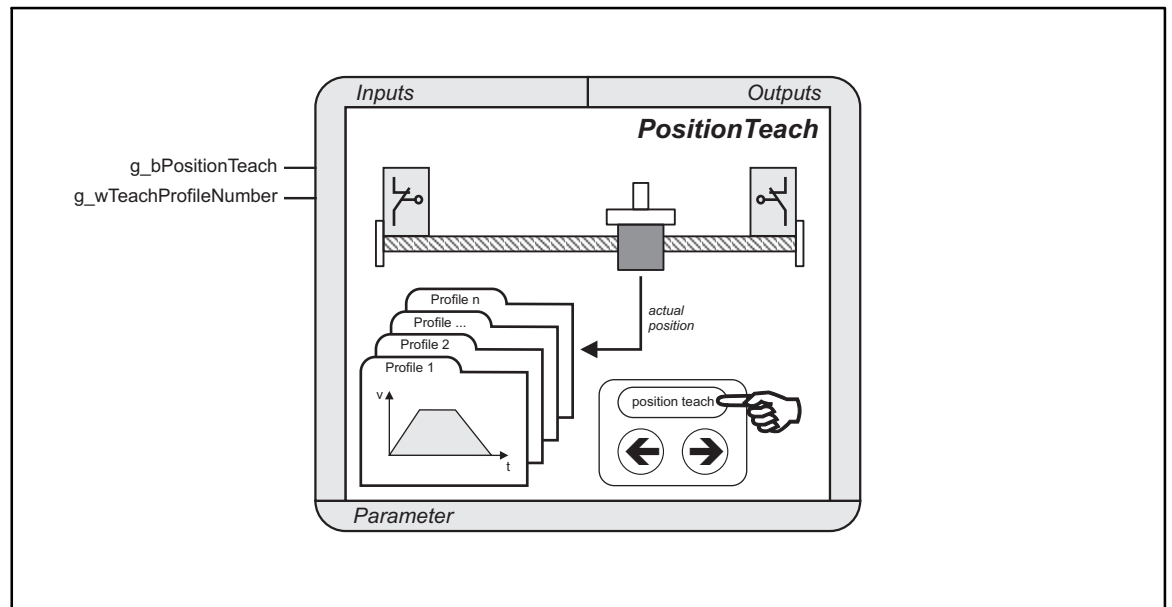
- If the max. traversing range is exceeded, a path integrator overflow will occur.



5.3.2 Function "PositionTeach"

With this template function you can save the current position of the machine part in a profile.

- In this way, the individual target positions can be taught in turns with the function **ManualJog** ("Teach in").
- The function is only possible with "StandBy".



⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bPositionTeach	Bool	R / W	Saving of actual positions FALSE ↗ TRUE Actual position is saved in g_wTeachProfileNumber. • Precondition: g_bHomingDone = TRUE and g_bHomePositionAvailable = TRUE
g_wTeachProfileNumber	ProfileNames	R / W	Profile name for actual position • Indicates in which profile the actual position is saved if g_bPositionTeach= TRUE. Display "Done" The actual position has been saved in the corresponding profile.



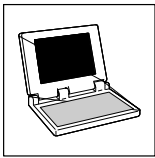
Tip!

The machine part can be moved in different ways into the teach position to be saved:

- With the function **ManualJog** the desired position can be approached through jog control.
- With controller inhibit the machine part can be manually moved into the desired position.
- With the function **ExternalSetValuePositioning** the desired position can be approached by selecting external setpoints.

Saving of the actual position ("teach in")

By setting g_bPositionTeach to TRUE, the actual position will be saved in the profile g_wTeachProfileNumber.



Template Positioner

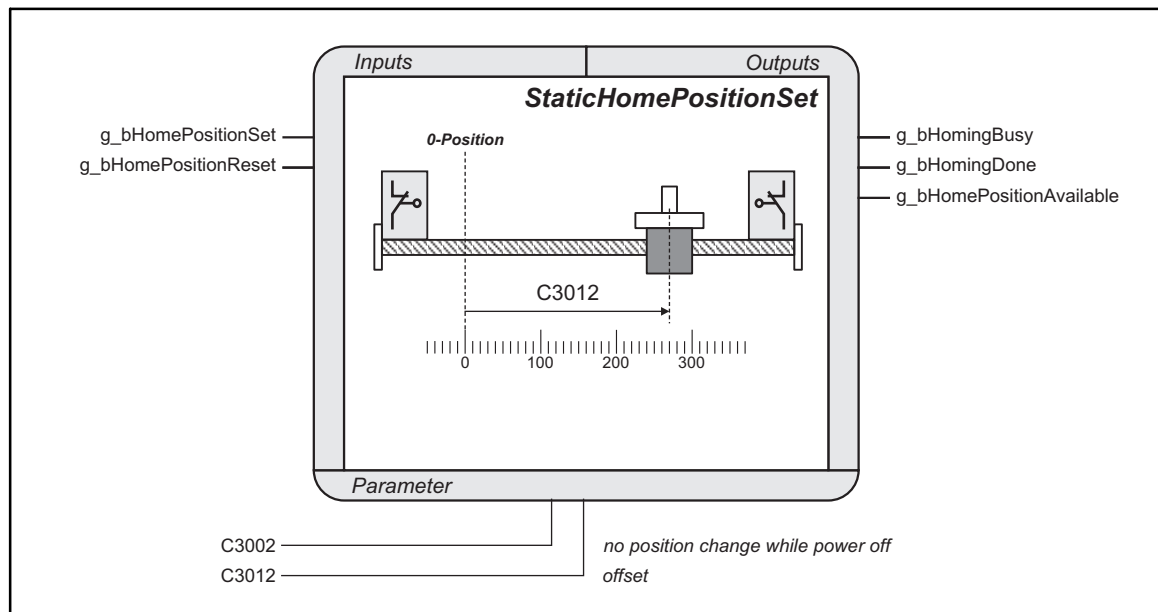
States & Functions

Function "StaticHomePositionSet"

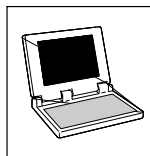
5.3.3 Function "StaticHomePositionSet"

This template function is used to set the home position during commissioning.

- The home position can be set in "StandBy".
- If the home position has been set, the tool position is permanently saved and can be retrieved even after mains disconnection. (This only applies if an absolute value encoder is used.)
- Setting of the home position only has to be repeated if commissioning is repeated, in the event of servicing (e.g. replacement of drive components) or if the home position has been deleted as a result of a corresponding traversing command.



⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bHomePositionSet	Bool	R / W	Acceptance of the home position
			FALSE → TRUE Offset of the reference measuring system selected under code C3012 is accepted.
g_bHomePositionReset	Bool	R / W	Reset of home position
			TRUE • Output <i>g_bHomingDone</i> is reset to FALSE. • Status "Home position known" is reset (<i>g_bHomePositionAvailable</i> = FALSE).



Outputs ⇨			
Identifiers	Data type	Access	Value/meaning
g_bHomingBusy	Bool	R	Message "Homing activated"
			TRUE Homing active
g_bHomingDone	Bool	R	Message "Status of setting of home position"
			TRUE Setting of home position has been successful and home position is known.
g_bHomePositionAvailable	Bool	R	Message "Home position known"
			- The template saves the value of this variable fail-safe under the following memory addresses: QB171.0 to QB171.11, QW171.0 to QW171.5 and QD171.0 to QD171.2. These addresses must not be written by the user. - After mains disconnection or a new program download, the (saved) status will be read from the corresponding memory addresses in "Init".
			FALSE Home position is not known.
			TRUE Home position is known.

Parameters			
Code	Data type	Access	Info
C3002		R / W	Position change during POWER OFF
			0 Machine part position does not change during POWER OFF.
			1 Machine part position changes during POWER OFF (encoder rotation > ½ revolution).
C3012		R / W	Position offset (without traversing)
			-214000.0000 {0.0001 unit} 214000.0000 0 unit



Information about the encoder system!

Please observe the following instructions for the encoder system:

- It is not possible to use incremental encoders for this function.
- Single-turn absolute value encoders and resolvers must not be rotated by more than $\pm 1/2$ revolution when the machine is switched off.
- Multi-turn absolute value encoders must not be rotated by more than $\pm 1/2$ cycle when the machine is switched off. (For Stegmann encoders max. ± 2048 revolutions.)

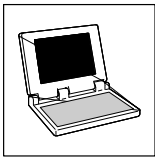
Resolver as absolute value encoder

If the following conditions are met, it is possible to use a resolver instead of an absolute value encoder:

- The home position is known when the PLC is switched off.
- The position of the machine part remains unchanged as long as the PLC is disconnected from the mains (e.g. by means of a brake).
- C3002 is set to "1" ("no change of position during POWER OFF").

In this case, the system saves the actual position when the PLC is switched off. When the PLC is switched on again, the system assumes that the machine part is still at the same position.

- The motor shaft may be rotated by a maximum of $\pm 1/2$ revolution.



Template Positioner

States & Functions

Function "StaticHomePositionSet"

Setting of the home position

The home position is set as follows:

1. Measure the distance between the machine part to be positioned and its zero position (home position).
2. Enter this value under code C3012 in fixed-point format in [unit].
3. Set *g_bHomePositionSet* from FALSE to TRUE to accept the value and transmit the home position to the PLC.



Note!

The function "ExternalSetValuePositioning" must be deactivated for setting the home position.

Status "Home position known"

If the home position has been set the output *g_bHomingDone* is set to TRUE. As soon as the home position is known, the output *g_bHomePositionAvailable* is also set to TRUE.



Note!

Please note that the home position will get lost and the status "Home position known" reset when certain positioning processes are started (e.g. constant traversing and all positioning modes in which the path integrators are reset) or when machine parameters are changed.

Status identification after power-on

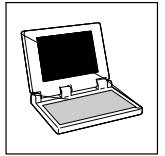
When the PLC is switched on again, the system checks in "Init" if the home position is known and saves the current status in the variable *g_bHomePositionAvailable*:

- *g_bHomePositionAvailable* = TRUE ⇔ Home position is known.
- *g_bHomePositionAvailable* = FALSE ⇔ Home position is not known.

Status reset

The status "Home position known" can be reset by setting *g_bHomePositionReset* to TRUE.

- The output *g_bHomingDone* and the status variable *g_bHomePositionAvailable* are reset to FALSE.



5.4 Status "Homing"

In "Homing" you can carry out a homing process to show the position of the tool or material in the PLC and identify the zero position (home position).

The following function is used for homing:

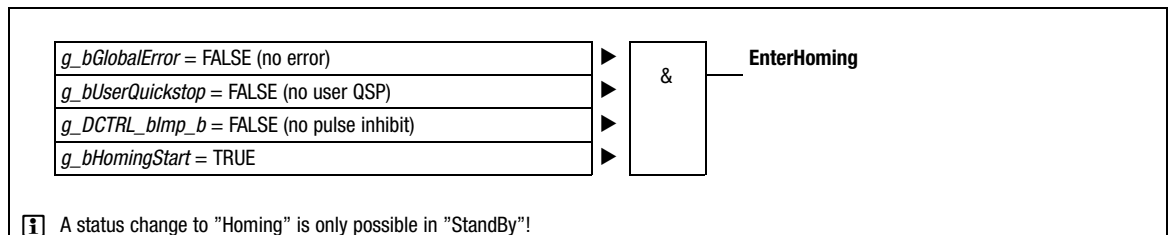
Function	Info	
Homing	Homing The tool is actively moved to find a homing mark and traverse to a defined position.	5-14



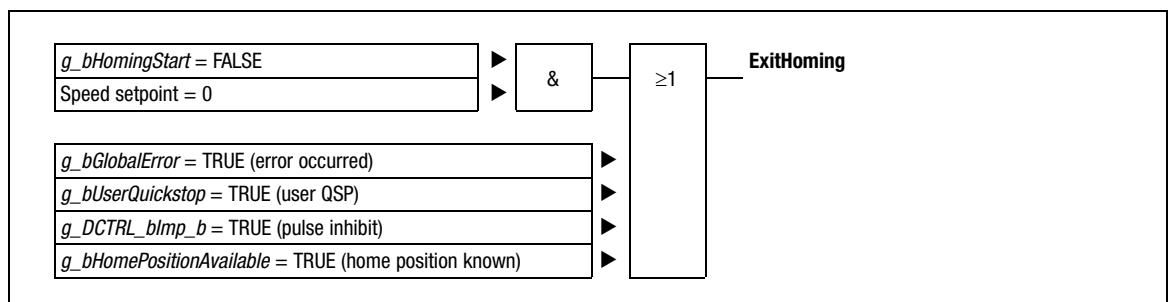
Tip!

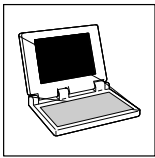
- Homing** is mainly used for systems with feedback via incremental encoders, resolvers or single-turn absolute value encoders, where the home position gets lost when the supply voltage is switched off.
- In general, **setting of home positions** is only carried out during commissioning or in the event of servicing (e.g. replacement of drive components) and is only used for systems with feedback via absolute value encoders. The function **StaticHomePositionSet** is available in "StandBy" for setting the home position. 5-10

Condition (transition) for a status change to "Homing"



Condition (transition) for changing back to "StandBy"





Template Positioner

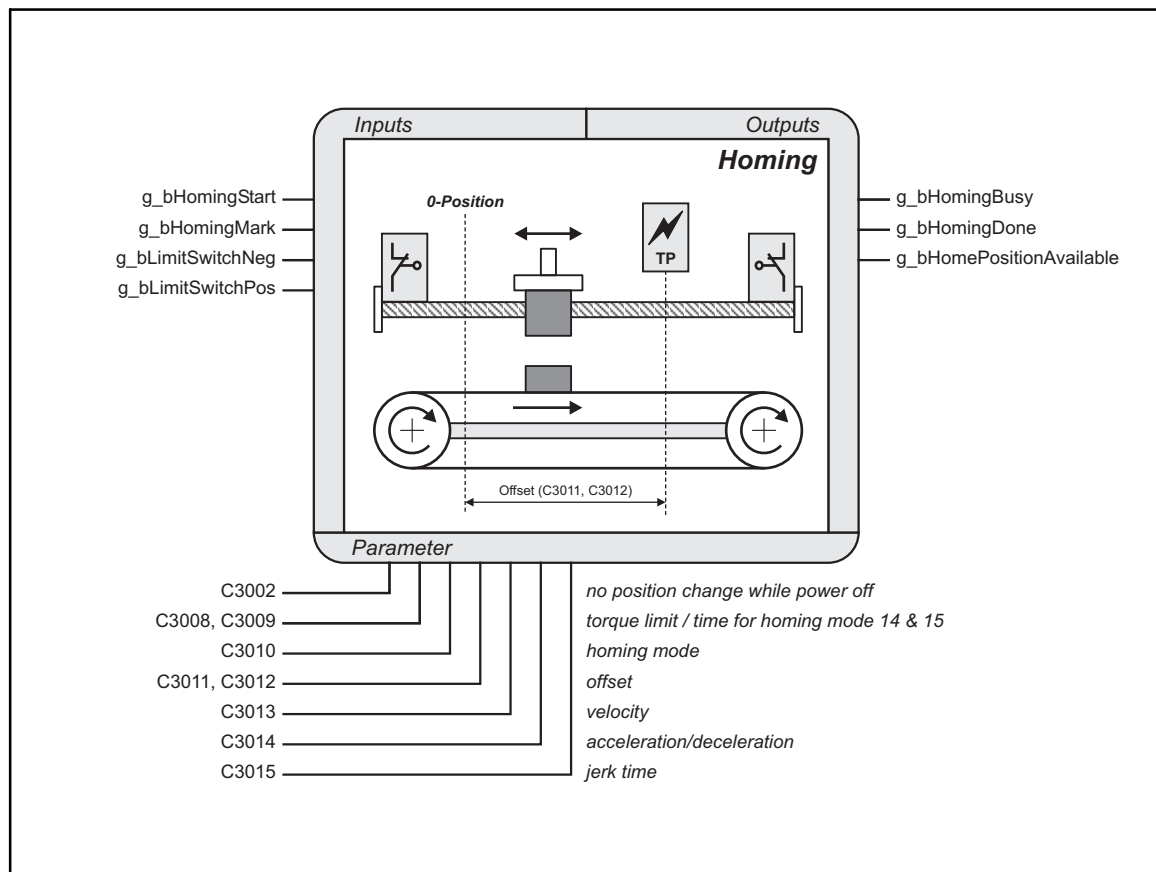
States & Functions

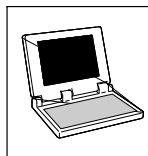
Function "Homing"

5.4.1 Function "Homing"

This template function is used to carry out a homing process. The drive traverses in a pre-selected mode to identify the zero position (home position) by means of a homing mark and transfers it to the drive control. All position values refer to the home position.

- In general, "Homing" is carried out once after every power-on.
- The following internal signals of the PLC operating system can be used as home signals:
 - Marker pulse (signal edge of the encoder system for the actual position value, one per motor revolution)
 - Touch probe (signal edge at the touch probe input)
- It is possible to define a preliminary stop position by means of a home switch. In this case, the home position is the following zero position of the actual value encoder of the motor.

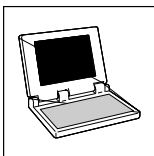




⇒ Inputs							
Identifiers	Data type	Access	Info/possible settings				
g_bHomingStart	Bool	R / W	Homing start/stop - Homing can only be started if the controller is enabled and TRIP is not active. - If TRIP or controller inhibit are set during homing, homing must be started again after TRIP reset or controller enable. <table><tr><td>TRUE</td><td>Homing start</td></tr><tr><td>FALSE</td><td>Homing stop</td></tr></table>	TRUE	Homing start	FALSE	Homing stop
TRUE	Homing start						
FALSE	Homing stop						
g_bHomingMark	Bool	R / W	Waiting for motor zero pulse signal<table><tr><td>TRUE ⇨ FALSE</td><td>Starts waiting for the motor zero pulse signal during homing.</td></tr></table>	TRUE ⇨ FALSE	Starts waiting for the motor zero pulse signal during homing.		
TRUE ⇨ FALSE	Starts waiting for the motor zero pulse signal during homing.						
g_bLimitSwitchNeg	Bool	R / W	Input for limit switch (negative)<table><tr><td>FALSE</td><td>Limit switch reached</td></tr></table>	FALSE	Limit switch reached		
FALSE	Limit switch reached						
g_bLimitSwitchPos	Bool	R / W	Input for limit switch (positive)<table><tr><td>FALSE</td><td>Limit switch reached</td></tr></table>	FALSE	Limit switch reached		
FALSE	Limit switch reached						

Outputs ⇨				
Identifiers	Data type	Access	Value/meaning	
g_bHomingBusy	Bool	R	Message "Homing activated"	
			TRUE	Homing active
g_bHomingDone	Bool	R	Status signal whether homing has been completed.	
			TRUE	Homing has been completed or home position has been manually set through <i>g_bHomePositionSet</i> = TRUE.
g_bHomePositionAvailable	Bool	R	Message "Home position known"	
			- The template saves the value of this variable fail-safe under the following memory addresses: QB171.0 to QB171.11, QW171.0 to QW171.5 and QD171.0 to QD171.2. These addresses must not be written by the user. - After mains disconnection or a new program download, the (saved) status will be read from the corresponding memory addresses in "Init".	
			FALSE	Home position is not known.
			TRUE	Home position is known.

Parameters				
Code	Data type	Access	Info	
Sub-code			Possible settings	Pre-setting
C3002		R / W	Position change during POWER OFF	
			0	Machine part position does not change during POWER OFF
			1	Machine part position changes during POWER OFF (encoder rotation > ½ revolution)
C3008		R / W	Maximum motor torque during homing in [%] of maximum motor torque <i>MCTRL_wMmaxC57</i> .	
			• Only relevant for homing mode 14 & 15	
			0.00	{0.01 %} 100.00 10.00 %
C3009		R / W	"Homing to fixed stop": Time in [ms] for which the maximum motor torque (C3008) may be active before it will be reduced and after which the home position will be determined (including the offset selection).	
			• Only relevant for homing mode 14 & 15	
			0	{1 ms} 65535 100 ms



Template Positioner

States & Functions

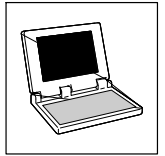
Function "Homing"

Parameters						
Code	Sub-code	Data type	Access	Info		
				Possible settings	Pre-setting	
C3010	Byte	R / W	Homing mode	0	>_Rn_MP	0
				1	<_Rn_MP	
				2	>_Lp<_Rn_MP	
				3	<_Ln>_Rn_MP	
				4	>_Rp<_Rn_MP	
				5	<_Rp>_Rn_MP	
				6	>_Rn>_TP	
				7	<_Rn<_TP	
				8	>_TP	
				9	<_TP	
				10	>_Lp<_TP	
				11	<_Ln>_TP	
				12	>_Lp↗<_Lp↘	
				13	<_Ln↗>_Ln↘	
				14	>_Mlim	
				15	<_Mlim	
 Symbols for code C3010: > Movement in positive direction < Movement in negative direction Lp Limit switch in positive direction (↗ = positive edge; ↘ = negative edge) Ln Limit switch in negative direction (↗ = positive edge; ↘ = negative edge) Rp Positive edge of home switch Rn Negative edge of home switch TP Touch probe edge of input DI2 MP Zero pulse edge of the motor (one per motor revolution) Mlim Motor torque limitation (C3008) • When the last action listed is executed, the home position is set (e.g. zero pulse with "MP"), even if the drive continues traversing. • In all modes without "Lp" or "Ln" it is not possible to retract from the limit switch.						
C3011		R / W	Position offset (with traversing)	-214000.0000 {0.0001 unit} 214000.0000 0 unit		
C3012		R / W	Position offset (without traversing)	-214000.0000 {0.0001 unit} 214000.0000 0 unit		
C3013		R / W	Homing speed	0.0001 {0.0001 unit/s} 214000.0000 360 unit/s		
C3014		R / W	Acceleration/deceleration	0.0001 {0.0001 unit/s²} 214000.0000 720 unit/s²		
C3015		R / W	Jerk time	0.000 {0.001 s} 10.000 0 s		
Note: The acceptance of new settings under C3010 ... C3015 requires a status change to "StandBy"!						



Tip!

The [unit] is to be entered in fixed-comma format with 4 decimal positions, i.e. 1 [unit] = 10000.



Note!

Please ensure that the parameters for touch probe activation (pos./neg. edge) and touch probe selection are set in the PLC to make sure that the touch probe or zero pulse signal will be correctly identified during homing:

- for homing mode 0 ... 5: Touch probe selection via zero pulse
- for homing mode 6 ... 11: Touch probe selection via digital input

More information about touch probe parameter setting can be found in the PLC Manual.

Using the limit switch as a home switch

With homing modes 12 and 13 the corresponding limit switches will be used as reference switches.

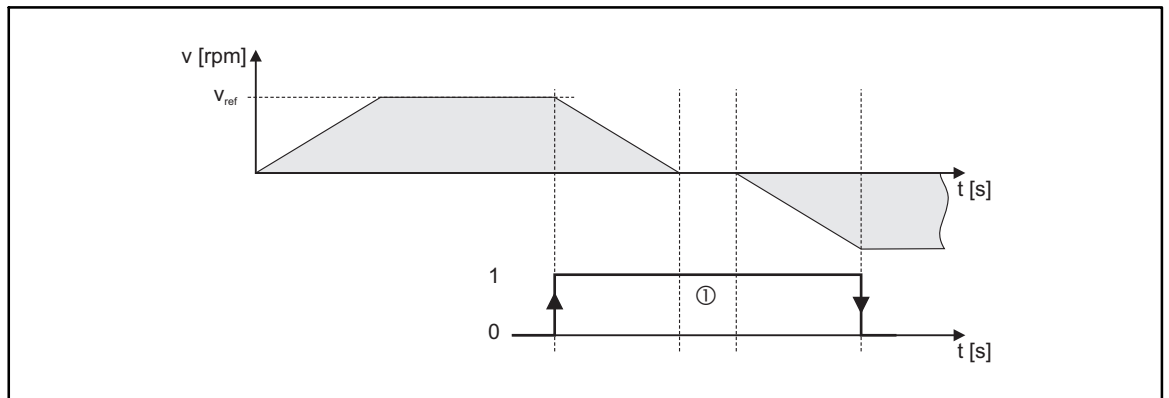


Fig. 5-3

Signal flow for a limit switch ① also used as a reference switch.



Note!

If you want to use a limit switch as reference switch, the homing speed must be selected in a way that the drive stops at the limit switch and reverses from there!

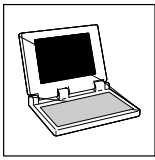
Assigning the digital inputs of the PLC to the limit switch/reference switch variables

The digital inputs of the PLC are assigned via their direct addresses to the corresponding input variables for the limit switch/reference switch signals.

Example:

- Left limit switch (negative) at digital input 1
- Reference switch at digital input 3
- Right limit switch (positive) at digital input 4

```
g_bLimitSwitchNeg AT %IX1.0.1: BOOL;      (* = DIGIN1 *)
g_bHomingMark    AT %IX1.0.3: BOOL;      (* = DIGIN3 *)
g_bLimitSwitchPos AT %IX1.0.4: BOOL;      (* = DIGIN4 *)
```



Template Positioner

States & Functions

Function "Homing"

Offset entries for the selection of the zero position

The machine position where the home signal occurs is known as home position. The zero position of the machine can be determined by two different offset entries (measured from the home position).



Note!

The acceptance of new offset entries requires a status change to "StandBy"!

Zero position offset with traversing of the drive

- Enter the offset in [unit] under C3011 which indicates the distance to be traversed between home position and zero position:

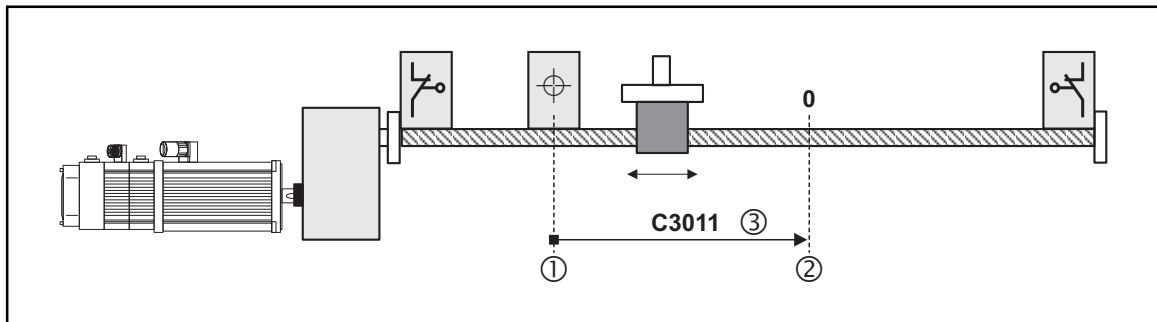


Fig. 5-4

Offset entry under C3011 for traversing the drive by this offset (with C3012 = 0)

- ① Home position (position of the home switch)
- ② Zero position
- ③ Drive traverses the offset under C3011 from the home position

Zero position offset without traversing of the drive

- Enter the offset in [unit] under C3012 which indicates the distance between home position and zero position.

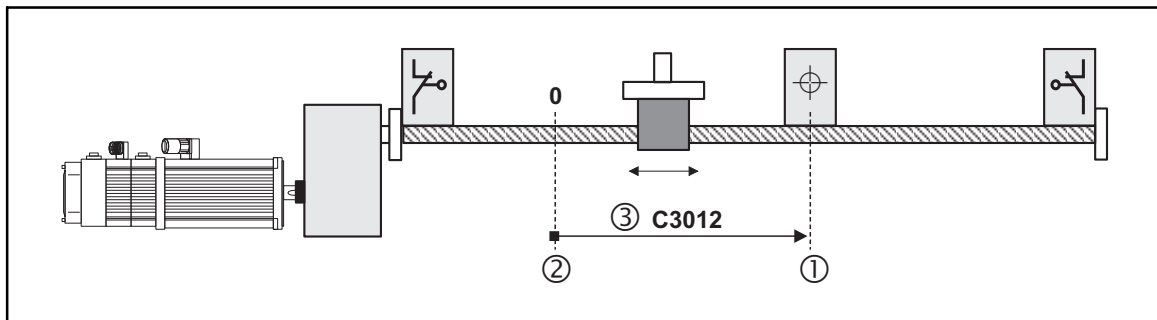


Fig. 5-5

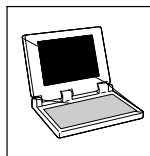
Offset entry under C3012 without traversing the drive by this offset (with C3011 = 0)

- ① Home position (position of the home switch)
- ② Zero position
- ③ Drive stops at home position, C3012 determines the distance to the zero position.



Tip!

It is also possible to combine the offset entries! ($C3011 \neq 0$ and $C3012 \neq 0$).



Example: Homing with a leadscrew drive (limited traversing range)

Settings:

- For the homing mode selected in this example "<_Ln↗>_Ln↘", set C3010 (HomingMode) to "13".
- Assign the address of the negative limit switch to the variable *g_bLimitSwitchNeg*. (See example on page 5-17.)
- Assign the address of the positive limit switch to the variable *g_bLimitSwitchPos*. (See example on page 5-17.)
- Select the traversing speed under C3013.
- Select the acceleration/deceleration under C3014.
- Enter the target position after completion of homing as offset to the home position under C3011. The target position is the zero position of the machine.



Tip!

The parameters C3011 ... C3014 are entered in fixed-comma format with 4 decimal positions, i.e. for 1.0000 [unit] you have to enter "10000".

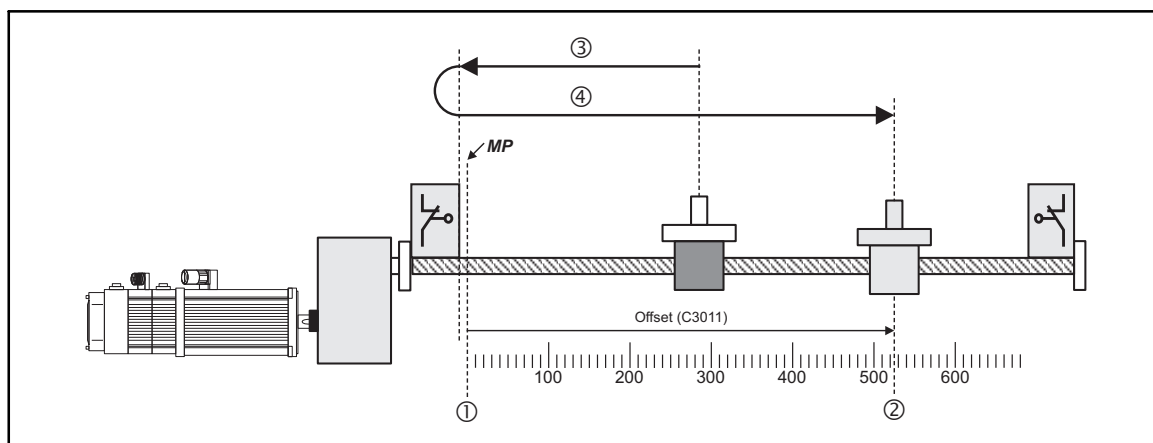


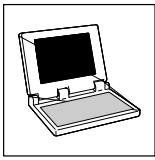
Fig. 5-6

Homing in mode 3 with a negative limit switch used as home switch

- ① Home position (position of the limit switch)
- ② Target position (zero position)
- ③ Traversing to negative limit switch
- ④ Traversing to target position

Functional sequence:

1. Homing is started by setting *g_bHomingStart* to TRUE.
2. During homing *g_bHomingBusy* = TRUE.
3. The drive traverses to the negative limit switch and reverses. ③
4. Since the limit switch is also used as home switch, the preliminary stop position will be set when the drive leaves the limit switch, i.e. when the next zero pulse (MP) of the motor encoder is reached, the drive control will know the home position.
5. The drive continues traversing without interruption to the target position which has been defined as offset to the home position under C3011. ④
6. Homing is completed when the target position is reached and *g_bHomingDone* and *g_bHomePositionAvailable* are set to TRUE.



Template Positioner

States & Functions

Function "Homing"



Example: Homing with a band drive (unlimited traversing range)

In applications with an unlimited traversing range (e.g. conveyor belts and rotary tables) homing is carried out by means of a touch probe sensor.

Settings:

- For the homing mode selected in this example ">_Tp", set C3010 (HomingMode) to "8".
- Select the traversing speed under C3013.
- Select the acceleration/deceleration under C3014.
- Enter the target position after completion of homing as offset to the home position under C3011. The target position is the zero position of the machine.



Tip!

The parameters C3011 ... C3014 are entered in fixed-comma format with 4 decimal positions, i.e. for 1.0000 [unit] you have to enter "10000".

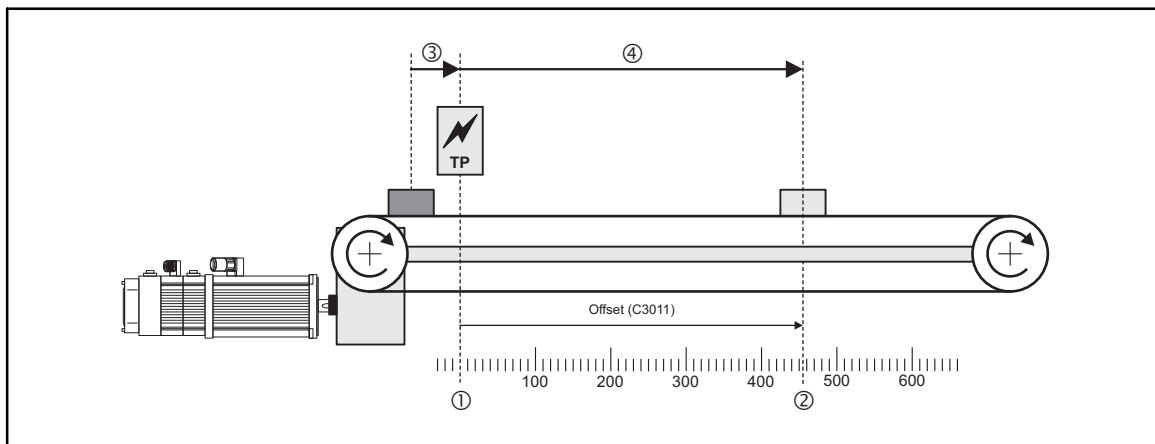


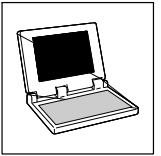
Fig. 5-7

Homing in mode 8

- ① Position of the touch probe sensor
- ② Target position (zero position)
- ③ Traversing in direction touch probe sensor
- ④ Traversing to target position

Functional sequence:

1. Homing is started by setting *g_bHomingStart* to TRUE.
2. During homing *g_bHomingBusy* = TRUE.
3. The drive traverses in positive direction. ③
4. When the touch probe sensor is reached, the drive control knows the home position.
5. The drive continues traversing without interruption to the target position which has been defined as offset to the home position under C3011. ④
6. Homing is completed when the target position is reached and *g_bHomingDone* and *g_bHomePositionAvailable* are set to TRUE.



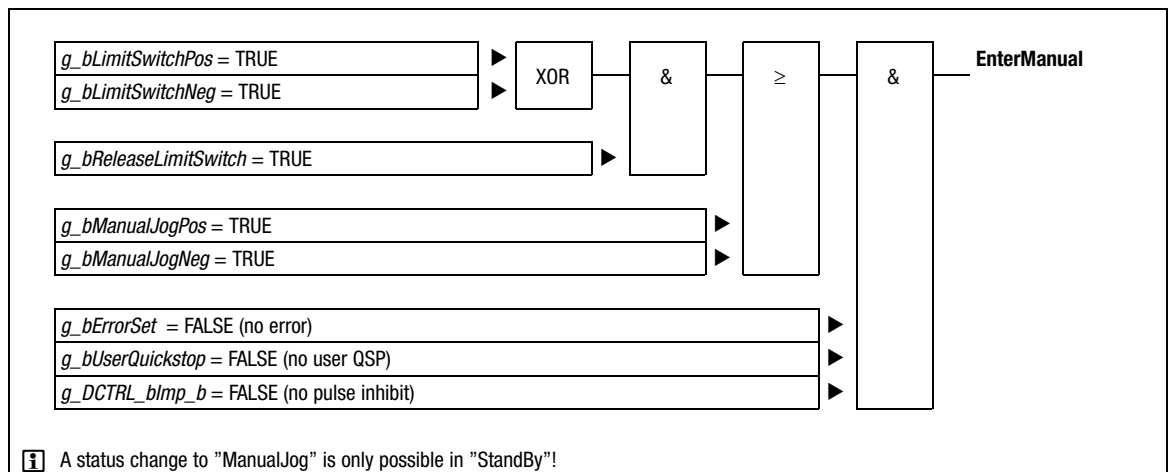
5.5 Status "ManualJog"

With "ManualJog" the drive or tool can be moved by manual operation.

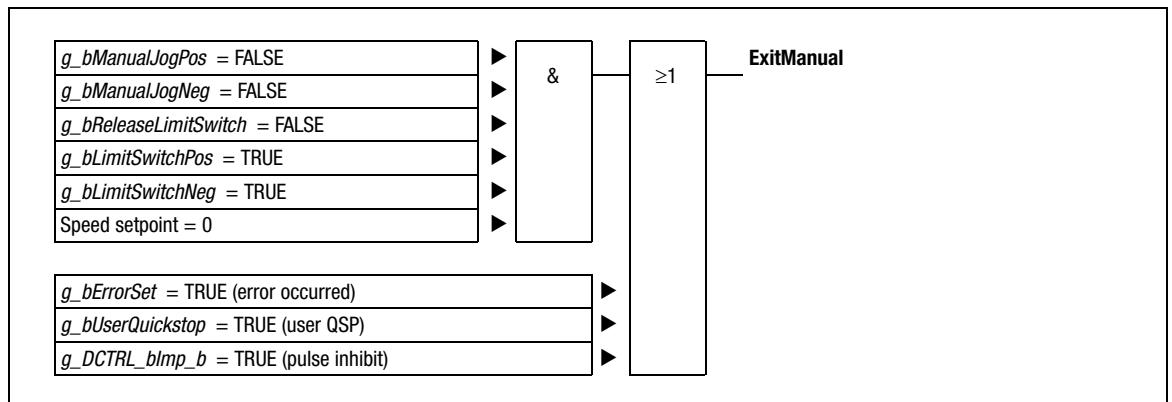
The following function can be used for manual homing ("jog control"):

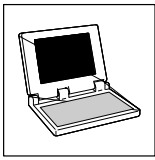
Function	Info
ManualJog	Manual homing 5-22

Condition (transition) for a status change to "ManualJog"



Condition (transition) for changing back to "StandBy"





Template Positioner

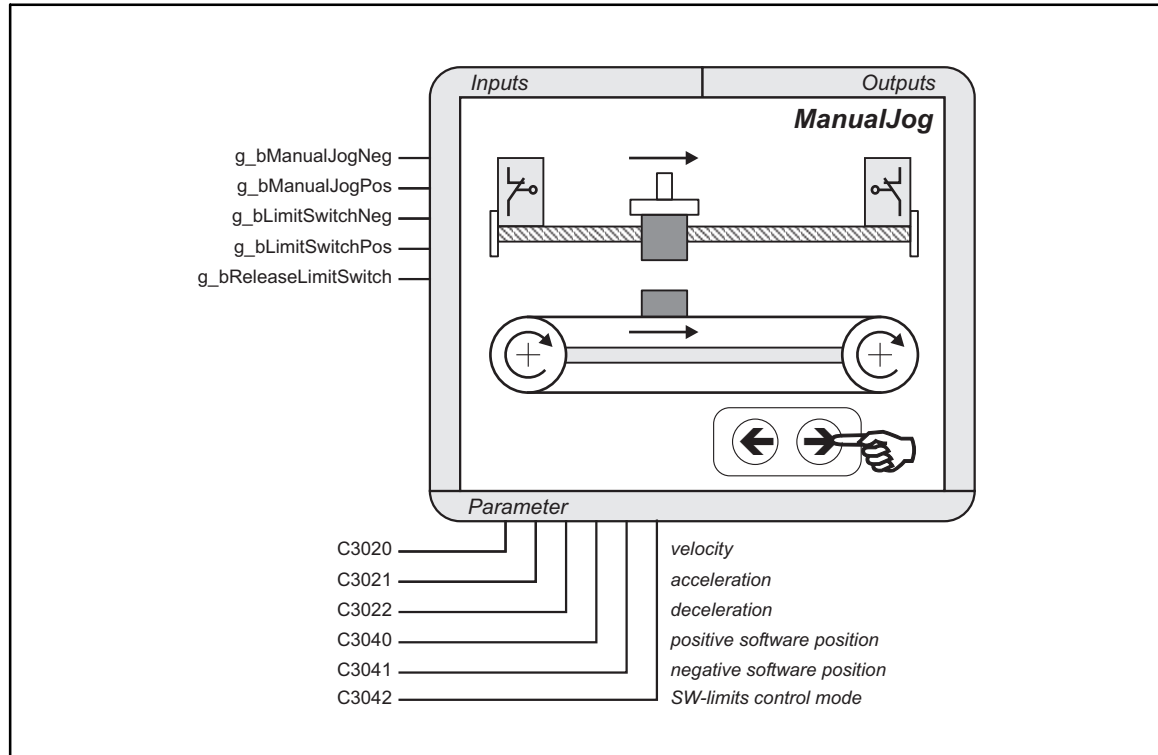
States & Functions

Function "ManualJog"

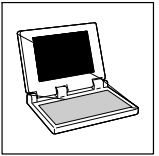
5.5.1 Function "ManualJog"

This template function is used to move the drive by manual operation, e.g. to clean or exchange the tool.

- "Retracting" from limit switches is also supported. In this case, the drive can only traverse in the corresponding clearance direction.



⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
<code>g_bManualJogNeg</code>	Bool	R / W	Manual homing in negative direction - Manual homing can only be started if the controller is enabled and TRIP is not active. - If TRIP or controller inhibit are set during manual homing, manual homing must be started again after TRIP reset or controller enable. TRUE Manual homing
<code>g_bManualJogPos</code>	Bool	R / W	Manual homing in positive direction - Manual homing can only be started if the controller is enabled and TRIP is not active. - If TRIP or controller inhibit are set during manual homing, manual homing must be started again after TRIP reset or controller enable. TRUE Manual homing
<code>g_bLimitSwitchNeg</code>	Bool	R / W	Input for limit switch (negative) TRUE Limit switch reached
<code>g_bLimitSwitchPos</code>	Bool	R / W	Input for limit switch (positive) TRUE Limit switch reached



⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bReleaseLimitSwitch	Bool	R / W	Sub-function "Retracting" TRUE Retracting from the activated limit switch in the corresponding clearance direction until the limit switch is released (no longer activated): - g_bLimitSwitchPos = TRUE: Retracting in direction g_bLimitSwitchNeg until g_bLimitSwitchPos = FALSE - g_bLimitSwitchNeg = TRUE: Retracting in direction g_bLimitSwitchPos until g_bLimitSwitchNeg = FALSE

Parameters												
Code	Sub-code	Data type	Access	Info								
				Possible settings	Pre-setting							
C3020			R / W	Manual homing speed <table><tr><td>0.0001</td><td>{0.0001 unit/s}</td><td>214000.0000</td><td>360 unit/s</td></tr></table>	0.0001	{0.0001 unit/s}	214000.0000	360 unit/s				
0.0001	{0.0001 unit/s}	214000.0000	360 unit/s									
C3021			R / W	Acceleration <table><tr><td>0.0001</td><td>{0.0001 unit/s²}</td><td>214000.0000</td><td>720 unit/s²</td></tr></table>	0.0001	{0.0001 unit/s ² }	214000.0000	720 unit/s ²				
0.0001	{0.0001 unit/s ² }	214000.0000	720 unit/s ²									
C3022			R / W	Deceleration <table><tr><td>0.0001</td><td>{0.0001 unit/s²}</td><td>214000.0000</td><td>720 unit/s²</td></tr></table>	0.0001	{0.0001 unit/s ² }	214000.0000	720 unit/s ²				
0.0001	{0.0001 unit/s ² }	214000.0000	720 unit/s ²									
C3040			R / W	Positive software limit position • Checking of the software limit positions: 5-83 <table><tr><td>0.0000</td><td>{0.0001 unit}</td><td>214000.0000</td><td>0 unit</td></tr><tr><td colspan="4">0 = Software limit position deactivated</td></tr></table>	0.0000	{0.0001 unit}	214000.0000	0 unit	0 = Software limit position deactivated			
0.0000	{0.0001 unit}	214000.0000	0 unit									
0 = Software limit position deactivated												
C3041			R / W	Negative software limit position • Checking of the software limit positions: 5-83 <table><tr><td>0.0000</td><td>{0.0001 unit}</td><td>214000.0000</td><td>0 unit</td></tr><tr><td colspan="4">0 = Software limit position deactivated</td></tr></table>	0.0000	{0.0001 unit}	214000.0000	0 unit	0 = Software limit position deactivated			
0.0000	{0.0001 unit}	214000.0000	0 unit									
0 = Software limit position deactivated												
C3042			R / W	Mode of software limit position monitoring 5-83 <table><tr><td>0</td><td>Current setpoint position + selected direction of motion</td><td rowspan="2">0</td></tr><tr><td>1</td><td>Current actual position</td></tr></table>	0	Current setpoint position + selected direction of motion	0	1	Current actual position			
0	Current setpoint position + selected direction of motion	0										
1	Current actual position											
Note: The acceptance of new settings requires a status change to "StandBy"!												

Note: The acceptance of new settings requires a status change to "StandBy"!



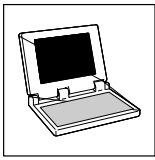
Tip!

The [unit] is to be entered in fixed-comma format with 4 decimal positions, i.e. 1 [unit] ≙ 10000.



Stop!

If the home position is **not** known or the software limit positions are **not** set, the drive can reach its mechanical limits and parts of the machine can be damaged or destroyed during manual homing!



Template Positioner

States & Functions

Function "ManualJog"

Soft start and quick stop of the drive

For a soft start and quick stop of the drive, the acceleration and deceleration for manual homing can be separately selected under C3021/C3022.

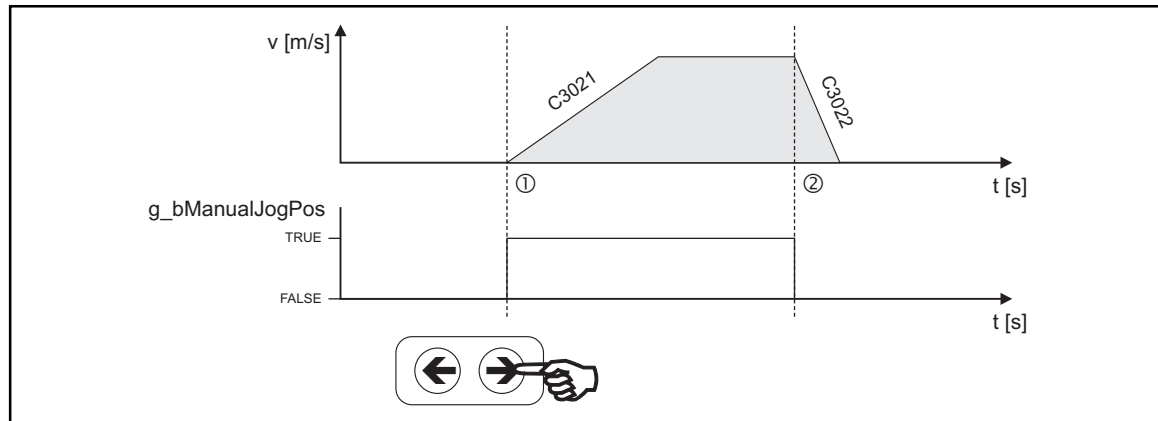
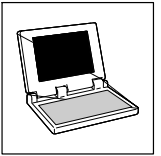


Fig. 5-8

Example: Different settings for acceleration and deceleration

- ① Soft start through slow acceleration (C3021)
- ② Quick stop through quick deceleration (C3022)

- A quick deceleration (C3022) reduces the time between releasing the jog button and the standstill of the drive. This makes positioning "by the eye" easier and ensures that the desired stop position is not passed.



Manual homing to software limit positions

If the home position is known and the software limit positions are set, the drive will start a manual homing process to the corresponding software limit position, if manual homing has not been stopped by resetting `g_bManualJogNeg` or `g_bManualJogPos`:

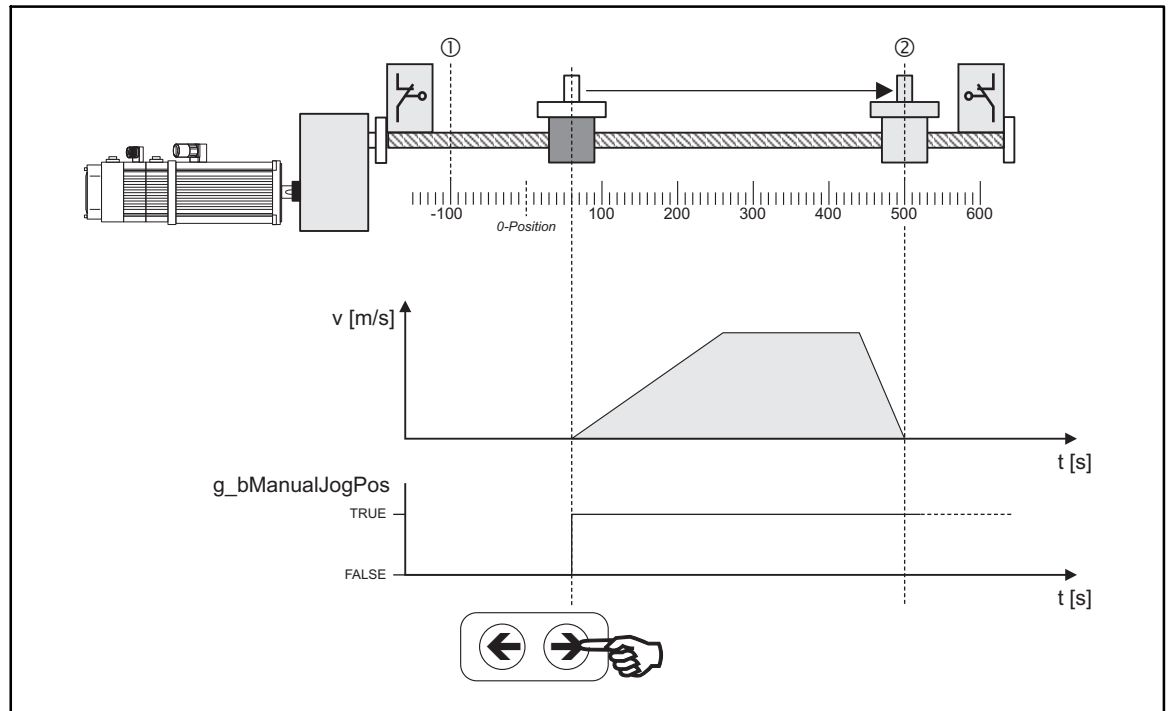
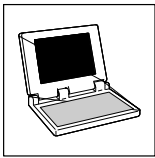


Fig. 5-9

Example: Manual homing to a positive software limit position

- ① Negative software limit position (C3041)
- ② Positive software limit position (C3040)

- The drive decelerates to stop at the software limit position along the selected deceleration ramp (C3022) and the message "Warning NegPositionLimit" or "Warning PosPositionLimit" is indicated.
- This ensures that the set software limit positions cannot be passed in "ManualJog".



Template Positioner

States & Functions

Function "ManualJog"

Manual homing to hardware limit positions (limit switches)

If the drive reaches a limit switch while homing manually, it brakes along the selected quick stop ramp to standstill and the message "Fail_QSPNegLimitSwitch" or "Fail_QSPPosLimitSwitch" is indicated. The drive changes to "Trouble".

- The quick stop ramp can be set under the corresponding motor control parameters (e.g. C0105).

Retracting from limit switches

By setting *g_bReleaseLimitSwitch* to TRUE you can retract from an activated limit switch.

The drive then traverses in the corresponding clearance direction until the limit switch is deactivated again.

- with *g_bLimitSwitchPos* = FALSE:
Retracting in direction *g_bLimitSwitchNeg* until *g_bLimitSwitchPos* = TRUE.
- with *g_bLimitSwitchNeg* = FALSE:
Retracting in direction *g_bLimitSwitchPos* until *g_bLimitSwitchNeg* = TRUE.

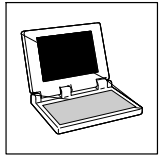


Note!

Retracting from a limit switch is only possible if the limit switch is still activated.

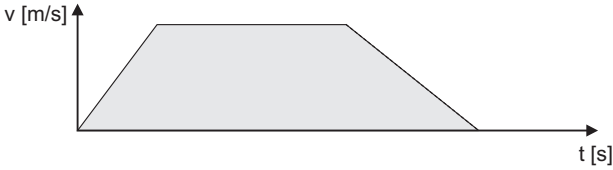
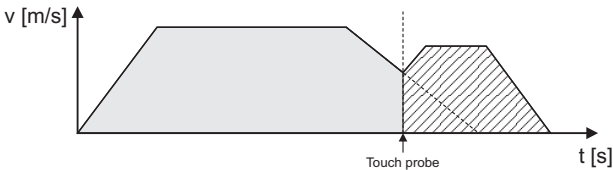
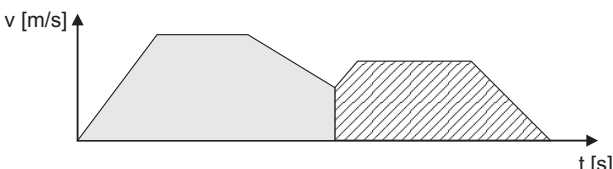
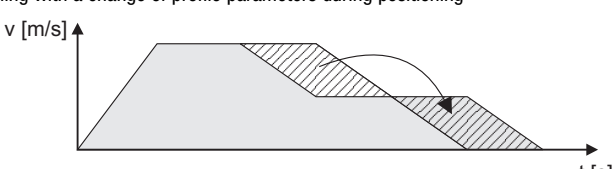
When approaching a limit switch it therefore has to be ensured that the tripping mechanism of the limit switch is not "passed", e.g. through an excessive mass or drive to make sure that the limit switch is activated.

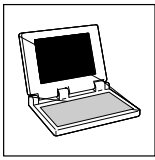
The other limit switch must not be activated and error messages 400 and 401 indicated when a limit switch is passed must have been reset.



5.6 Status "Positioning"

The following functions can be used for positioning:

Function	Info	
StandardPositioning	Standard positioning 	5-35
TouchProbePositioning	Remaining path positioning 	5-44
OverchangePositioning	Positioning with transition from one profile to another 	5-53
OverridePositioning	Positioning with a change of profile parameters during positioning 	5-61
ChangeProfileInterface	Change of profile parameters	5-71
PositionCorrection	Feed correction	5-73

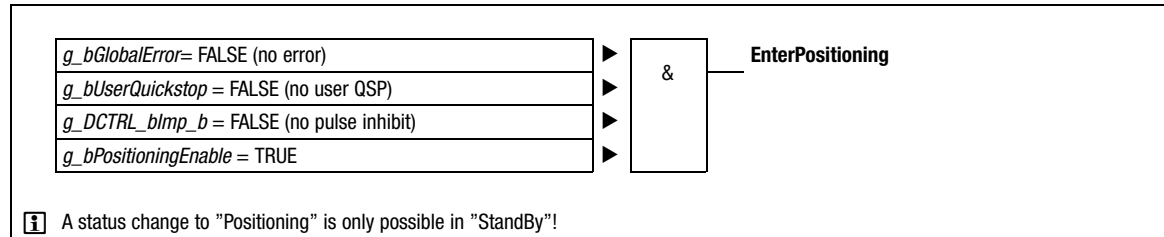


Template Positioner

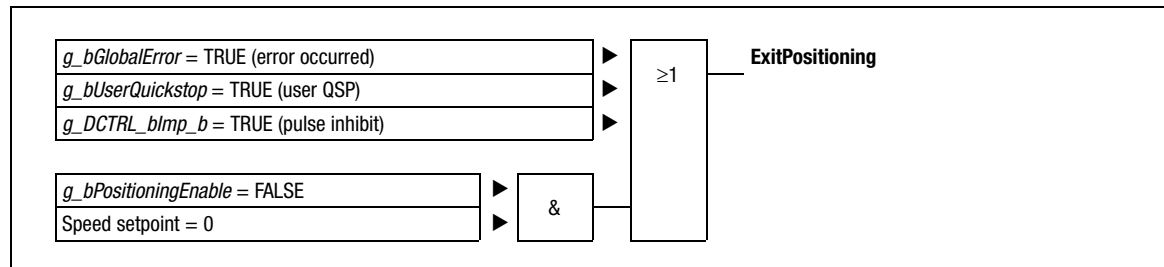
States & Functions

Status "Positioning"

Condition (transition) for a status change to "Positioning"



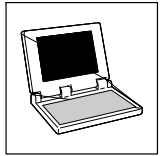
Condition (transition) for changing back to "StandBy"



5.6.1 General information

In the following sub-sections you can find information and notes concerning all positioning functions:

- Assignment of profile names ↔ Profile parameters (sub-codes) (📖 5-29)
- Selection of the number of positioning profiles (📖 5-29)
- Change of profile names (📖 5-30)
- Entry of profile parameters (📖 5-30)
- Checking whether the home position is known (📖 5-30)
- Positioning modes (general) (📖 5-31)
- Positioning start (📖 5-32)
- Cancellation of positioning (📖 5-32)
- Definition of the message window "Target position reached" (📖 5-33)
- Definition of the dwell time (📖 5-34)
- Jerk reduction (📖 5-34)



5.6.1.1 Assignment of profile names ⇔ Profile parameters (sub-codes)

The profile names are assigned to the profile parameters in the data type **ProfileNames** (*Object Organizer* → register **Data types** → folder **UserDataTypes**).

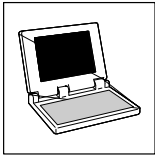
- The profile names can be freely selected. They have been preassigned with "Profile1", "Profile2", "Profile3", etc.
- A number is assigned to every profile name. This number corresponds to the sub-code number of the corresponding profile parameter:

<Profile name>:=<Sub-code>		Profile parameter	Code/sub-code
Profile1:=1, →		Position	C3100/1
		Speed	C3200/1
		Acceleration	C3300/1
		Deceleration	C3400/1
		Final speed	C3500/1
		Jerk time	C3600/1
Profile2:=2, →		Position	C3100/2
		Speed	C3200/2
		Acceleration	C3300/2
		Deceleration	C3400/2
		Final speed	C3500/2
		Jerk time	C3600/2
... →		Position	C3100/...
		Speed	C3200/...
		Acceleration	C3300/...
		Deceleration	C3400/...
		Final speed	C3500/...
		Jerk time	C3600/...
Profile n:=n, →		Position	C3100/n
		Speed	C3200/n
		Acceleration	C3300/n
		Deceleration	C3400/n
		Final speed	C3500/n
		Jerk time	C3600/n

5.6.1.2 Selection of the number of positioning profiles

The number of available sub-codes and thus the number of profiles to be written is defined under the constant **C_wNumberOfMotionObjects**. You can create max. 128 profiles. (*Object Organizer*/register **Resources** → folder **Global variables** → folder **TemplateInterface** → variable list **VarTemplateSettings (CONSTANT)**)

- In the template, the constant has been preset to "5", i.e. the sub-codes for five profiles are already available.
- If you change the number, the corresponding sub-codes will be available after the compilation.



Template Positioner

States & Functions

Status "Positioning"

5.6.1.3 Change of profile names

Please observe the following instructions when changing the preselected profile names:

- Any name can be selected as profile name as long as it has not been used earlier.
- The list can be extended or shortened. (Every entry needs 2 bytes RAM.)
- The last entry must not be closed by a comma.
- If you change the selected profile names and use the sequencer of the POU **UserInterface (PRG)** the profile names in the input actions must also be adapted.
- We recommend to always include the profile number which corresponds to the sub-code number of the profile parameter codes in the name.

Example:

```
TYPE ProfileNames : (  
    ...  
    Motion1:=1,  
    Motion2:=2,  
    ...  
);  
END TYPE
```

5.6.1.4 Entry of profile parameters

Profile parameters can be entered into the corresponding sub-codes using the **Parameter monitor**:

1. Ensure that you are logged in.
2. Use the **Parameter monitor** (*Object Organizer*→ register **Resources**) and select the folder **Individual IEC1131 codes**→**POUPositioning**.
3. Enter the corresponding values into the code.



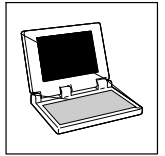
Caution!

A repeated program download overwrites the code settings with the initialisation values!

To avoid this, enter the desired code initialisation values into the object **Code initialization values** of the register **Resources** in the **Object Organizer**.

5.6.1.5 Checking whether the home position is known

If the home position is not known (*g_bHomePositionAvailable* = FALSE), quick stop and "Trouble" will be set when positioning modes 0, 3, 10, 13, 14 and 15 are selected.



5.6.1.6 Positioning modes (general)

Mode "Absolute"

In this positioning mode, the absolute target position is approached with the set profile parameters.

- Precondition: The home position must be known (*g_bHomePositionAvailable* = TRUE).
- The maximum distance comprises ± 2140000000 increments.
- It is possible to change between absolute and relative positioning without losing the home position.

Mode "Modulo"

In this positioning mode, continuous relative movements (e.g. rotary table applications) are possible, since the internal path integrators are always reset before positioning starts.

- After positioning in this mode, absolute or relative positioning is no longer possible since the home position is lost when the path integrators are reset.
- The maximum distance comprises ± 2140000000 increments.

Mode "Speed"

In this positioning mode, the drive traverses constantly ("constant approach"), i.e. accelerates or decelerates to the speed defined in the profile parameters and then constantly traverses at this speed.

- After positioning in this mode, absolute or relative positioning is no longer possible because the path integrators are not reset.
- The maximum distance comprises ± 2140000000 increments.

Mode "Relative"

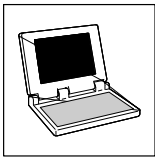
In this positioning mode, the distance between current position and target position is traversed with the set profile parameters.

- Precondition: The home position must be known (*g_bHomePositionAvailable* = TRUE).
- The maximum distance comprises ± 2140000000 increments.
- It is possible to change between relative and absolute positioning without losing the home position.

Touch probe positioning modes

With touch probe positioning, a defined movement with an absolute or relative target (touch probe distance) is activated by a hardware interrupt signal.

- The actual position, which serves as reference position for the touch probe distance, is saved as soon as the hardware interrupt signal is released.
- This type of positioning is also known as remaining path positioning because a touch probe signal is often used to position a remaining path while the drive moves constantly.
- Touch probe positioning can be carried out in different modes.
See function **TouchProbePositioning**. (□ 5-44)



Template Positioner

States & Functions

Status "Positioning"

5.6.1.7 Positioning start

Positioning is started by transferring the name of the profile to be traversed to the variable *g_wMotionProfileNumber*.

- For this, the template must be in the status "Positioning".
- If profile and target position are valid and the following error limit has not been exceeded, the positioning process will be executed according to the profile parameters.
- During positioning, *g_wMotionProfileNumber* is "active", when the target position is reached it changes to "Done".
- The variable *g_wCurrentProfileName* includes the symbolic name of the active profile, the variable *g_wCurrentProfileNumber* includes the corresponding profile number.



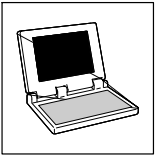
Tip!

If you transfer a new profile name during a positioning process (*g_wMotionProfileNumber* = "active") to *g_wMotionProfileNumber* the processing of the current profile will be interrupted and the new profile will be used.

- The new profile parameters are directly accepted, i.e. the drive does not decelerate to the selected final speed of the previous profile or brake to standstill.

5.6.1.8 Cancellation of positioning

A positioning process can be interrupted by resetting *g_wPositioningEnable* to FALSE. The drive will brake to standstill along the deceleration ramp of the current profile and change into the status "StandBy".



5.6.1.9 Definition of the message window "Target position reached"

Under C3034 you can determine a window which shows if the target has been reached.

- If the current position is within the window *g_blnTarget* is set to TRUE.
- Due to the symmetrical structure of the window around the target position, odd values will be rounded off to even values in C3034 (see ②).

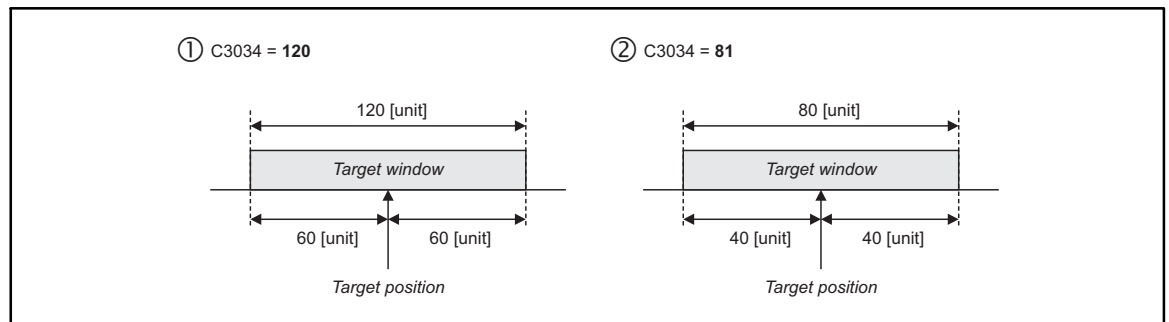


Fig. 5-10

Symmetrical structure of the window around the target position

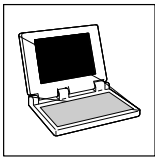
Parameters				
Code	Sub-code	Data type	Access	Info
				Possible settings
C3034			R / W	Message window "Target position reached"
				0 {1 unit} 65535 0 unit

Note: The acceptance of new settings requires a status change to "StandBy"!



Note!

- Target position and message window must be within the maximum traversing range (C3062).
- If *g_blnTarget* is used as transition condition in a sequencer, please observe the following:
Even if a new profile is started, *g_blnTarget* can already be TRUE because it only changes to FALSE when the window is left.



Template Positioner

States & Functions

Status "Positioning"

5.6.1.10 Definition of the dwell time

Under C3035 you can select a dwell time to be passed after the setpoint generation for the target position, before a new positioning process is started.

Mechanical transient reactions can thus be considered when the tool reaches the target position.

- The dwell time starts when the setpoint has reached the target position (output `g_bProfileDone` = TRUE).
- After expiry of the dwell time, `g_bDwellTime` is set to TRUE. The output is automatically reset to FALSE when a new positioning process is started.

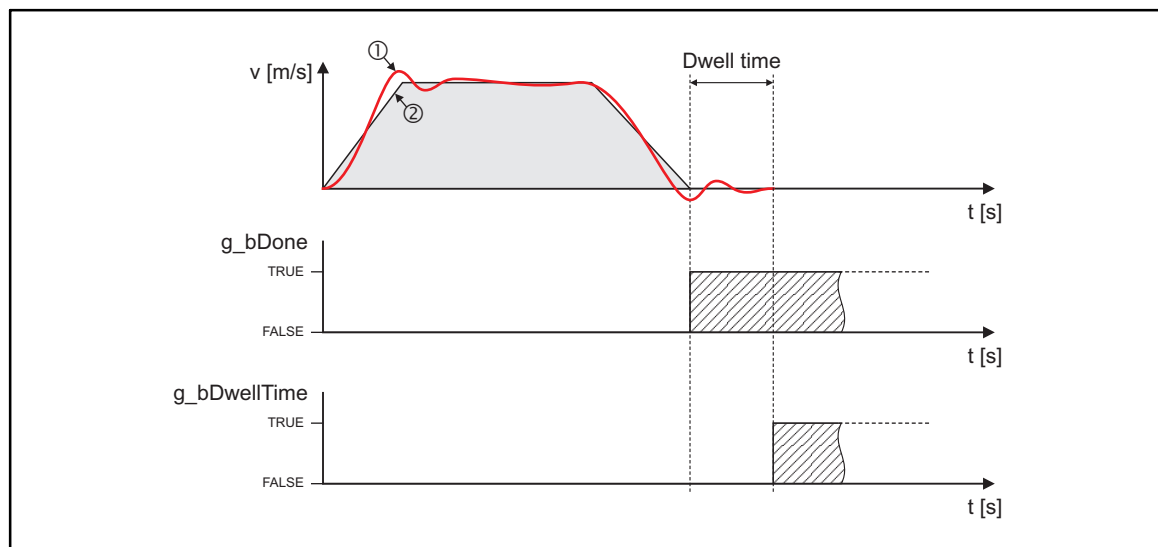


Fig. 5-11

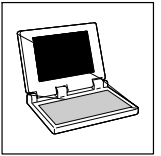
Definition of the dwell time
 ① Actual value profile
 ② Setpoint profile

Parameters				
Code	Data type	Access	Info	
			Possible settings	Pre-setting
C3035		R / W	Dwell time	
			0	{1 ms} 65535 50 ms
Note: The acceptance of new settings requires a status change to "StandBy"!				

5.6.1.11 Jerk reduction

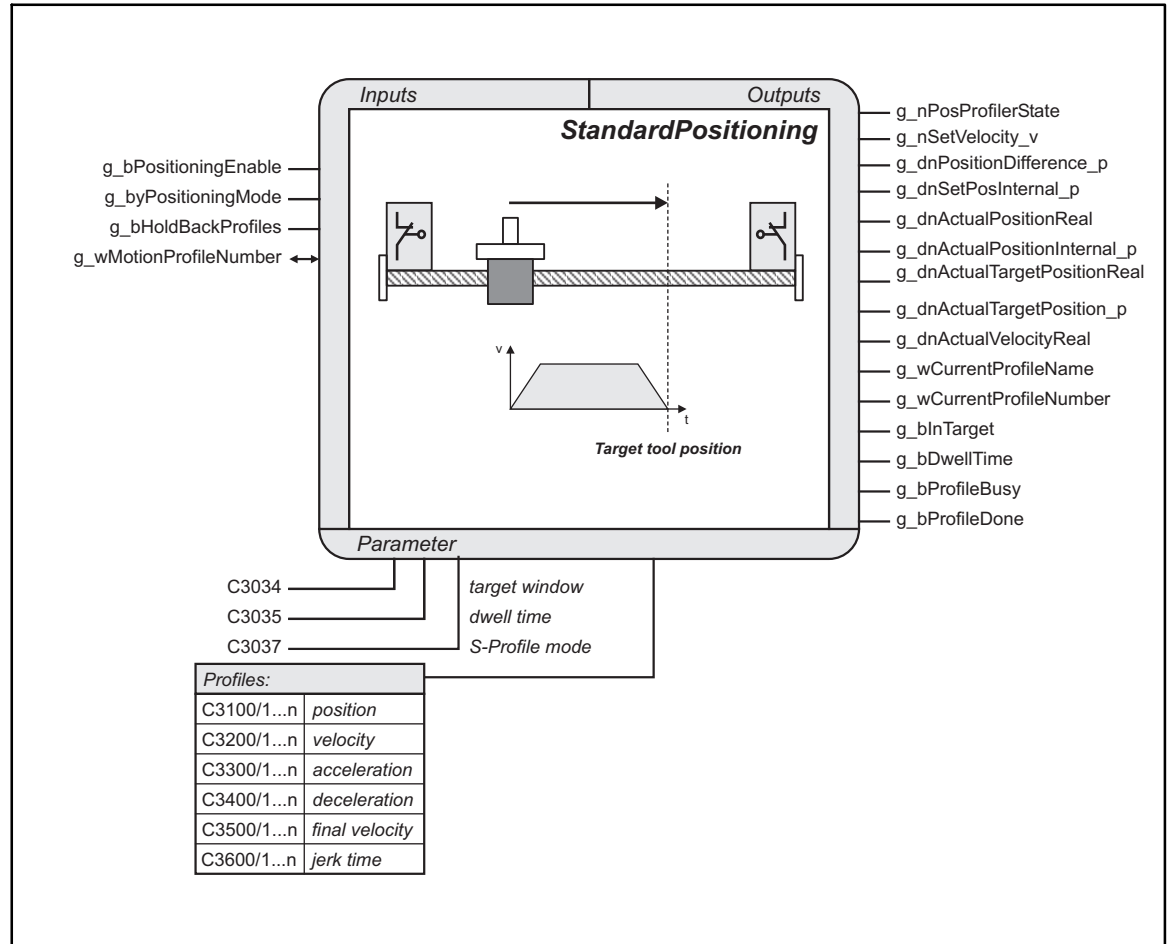
S-ramps (S-profiles) are used for soft acceleration and deceleration to reduce the jerk and protect the drive components. (2-3)

- The selected acceleration/deceleration values will only be reached after the "jerk time" set under C3600/x.
- Select the maximum jerk time under C1256.
- Under code C3037, you can choose between run-time-optimised S-profile generation (default setting) and S-profile-optimised profile generation (the latter requires a much longer processing time; change the task configuration and select longer task interval times, if necessary).

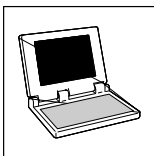


5.6.2 Function "StandardPositioning"

With this template function the drive can approach defined positions in different positioning modes by selecting linear movement profiles.



⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bPositioningEnable	Bool	R / W	Enabling positioning
			TRUE Change to "Positioning"
			FALSE Cancellation of positioning, change to "StandBy"
g_byPositioningMode	Byte	R / W	Positioning mode selection
			0 Absolute positioning • Precondition: g_bHomingDone = TRUE and g_bHomePositionAvailable = TRUE
			1 Modulo positioning • Path integrators are reset before the start. • Application: Rotary tables • Precondition: g_bHomingDone = TRUE
			2 Constant traversing
			3 Relative positioning • max: 2147483647 increments ($2^{31} - 1$) • Path integrators are not reset before the start. • Precondition: g_bHomingDone = TRUE and g_bHomePositionAvailable = TRUE



Template Positioner

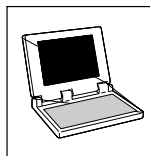
States & Functions

Function "StandardPositioning"

⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bHoldBackProfiles	Bool	R / W	Completing profile processing after interruption. If profile processing has been interrupted because of a status change from "Positioning" to another status, you can use this input to select that profile processing will be completed when the drive changes to "Positioning" again.
			TRUE Profile processing is completed automatically after interruption.
			FALSE Profile processing is not automatically completed after interruption. When the drive changes to "Positioning" again, the interrupted positioning process is considered to be completed (<i>g_wMotionProfileNumber</i> = Done).

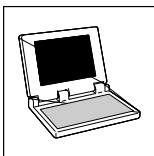
⇒ Inputs/outputs ⇒			
Identifiers	Data type	Access	Info/possible settings
g_wMotionProfileNumber	ProfileNames	R / W	Profile name - If <i>g_wMotionProfileNumber</i> is used with a valid profile name, the positioning process starts with the profile parameters of the selected profile. - Precondition: <i>g_bPositioningEnable</i> = TRUE
			Display "Active" Processing of the selected profile is not completed yet.
			Display "Done" The selected profile has been processed, the drive has reached the target position.

Outputs ⇒			
Identifiers	Data type	Access	Value/meaning
g_nPosProfilerState	Word	R	Positioning status
			Messages:
			0 No action
			1 Positioning completed
			10 Acceleration phase is active
			11 Constant speed phase is active
			12 Deceleration phase is active
			13 Reversing phase is active
			100 Reset is active
			101 Start values are loaded
			102 Positioning stopped
			103 External setpoint interface activated
			200 Touch probe positioning (remaining path positioning) completed, but no touch probe signal detected.
			300 Overflow of the internal path integrator
			Errors:
			-200 Invalid profile: Parameter acceleration = 0
			-201 Invalid profile: Parameter deceleration = 0
			-202 Invalid profile: Parameter speed = 0
			-210 Invalid remaining path profile: Parameter acceleration = 0
			-211 Invalid remaining path profile: Parameter deceleration = 0
			-212 Invalid remaining path profile: Parameter speed = 0
			-300 Positioning with the selected profile parameters is not plausible.
g_nSetVelocity_v	Integer	R	Speed setpoint in [inc/ms] 16384 [inc] ≙ 15000 rpm - Only to be used for encoder systems on the motor side! If a load-side encoder system is used (gearbox factor unequal 1), speed setpoint 0 will be output.



Outputs ⇨							
Identifiers	Data type	Access	Value/meaning				
g_dnPositionDifference_p	Double integer	R	Position difference between setpoint and actual value in [inc] 65536 [inc] ≡ 1 revolution on the motor end				
g_dnSetPosInternal_p	Double integer	R	Internal setpoint angle position in [inc] With Modulo positioning reset every time a profile is started.				
g_dnActualPositionReal	Double integer	R	Actual angle position in [unit] Output in fixed-comma format with 4 decimal positions: 1 [unit] ≡ 10000				
g_dnActualPositionInternal_p	Double integer	R	Actual angle position in [inc] 65536 [inc] ≡ 1 revolution on the motor end - The actual integrator can overflow.				
g_dnActualTargetPositionReal	Double integer	R	Target position of the current profile in [unit] Output in fixed-comma format with 4 decimal positions: 1 [unit] ≡ 10000				
g_dnActualTargetPosition_p	Double integer	R	Target position of the current profile in [inc] 65536 [inc] ≡ 1 revolution on the motor end				
g_dnActualVelocityReal	Double integer	R	Current speed in [unit]/s Output in fixed-comma format with 4 decimal positions: 1 [unit/s] ≡ 10000				
g_wCurrentProfileName	ProfileNames	R	Profile name of the active profile When the "Positioning" status is left, <i>g_wCurrentProfileName</i> is set to "Done".				
g_wCurrentProfileNumber	Word	R	Profile number of the active profile				
g_bInTarget	Bool	R	Message "Target position reached" Window definition (C3034):  5-33 <table><tr><td>TRUE</td><td>The target position is within the window defined under C3034.</td></tr></table>	TRUE	The target position is within the window defined under C3034.		
TRUE	The target position is within the window defined under C3034.						
g_bDwellTime	Bool	R	Message "Dwell time over" - Reset to FALSE when positioning is started. - Definition of the dwell time (C3035):  5-34 <table><tr><td>TRUE</td><td>The dwell time set under C3035 has expired.</td></tr></table>	TRUE	The dwell time set under C3035 has expired.		
TRUE	The dwell time set under C3035 has expired.						
g_bProfileBusy	Bool	R	Message "Positioning is active" <table><tr><td>TRUE</td><td>Positioning is active.</td></tr><tr><td>TRUE (pulse)</td><td><i>g_bProfileBusy</i> and <i>g_bProfileDone</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.</td></tr></table>	TRUE	Positioning is active.	TRUE (pulse)	<i>g_bProfileBusy</i> and <i>g_bProfileDone</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.
TRUE	Positioning is active.						
TRUE (pulse)	<i>g_bProfileBusy</i> and <i>g_bProfileDone</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.						
g_bProfileDone	Bool	R	Message "Positioning has been completed" <table><tr><td>TRUE</td><td>Positioning has been completed.</td></tr><tr><td>TRUE (pulse)</td><td><i>g_bProfileDone</i> and <i>g_bProfileBusy</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.</td></tr></table>	TRUE	Positioning has been completed.	TRUE (pulse)	<i>g_bProfileDone</i> and <i>g_bProfileBusy</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.
TRUE	Positioning has been completed.						
TRUE (pulse)	<i>g_bProfileDone</i> and <i>g_bProfileBusy</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.						

Parameters				
Code	Data type	Access	Info	
Sub-code			Possible settings	Pre-setting
C3034		R / W	Message window "Target position reached" • Window definition:  5-33	
			0 {1 unit} 65535	0 unit
C3035		R / W	Dwell time • Definition of the dwell time:  5-34	
			0 {1 ms} 65535	50 ms
C3037		R / W	Mode S-profile generation	
			0	Run-time-optimised
			1	S-profile-optimised • Requires a much longer processing time • Further information  7-1



Template Positioner

States & Functions

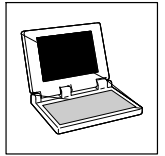
Function "StandardPositioning"

Profile parameters								
Code	Sub-code	Data type	Access	Info				
				<table><tr><th>Possible settings</th><th>Pre-setting</th></tr></table>	Possible settings	Pre-setting		
Possible settings	Pre-setting							
C3100	1 ... n		R / W	Parameter "Position" for positioning profile 1 ... n <table><tr><td>-214000.0000</td><td>{0.0001 unit}</td><td>214000.0000</td><td></td></tr></table>	-214000.0000	{0.0001 unit}	214000.0000	
-214000.0000	{0.0001 unit}	214000.0000						
C3200	1 ... n		R / W	Parameter "Speed" for positioning profile 1 ... n <table><tr><td>0.0001</td><td>{0.0001 unit/s}</td><td>214000.0000</td><td></td></tr></table>	0.0001	{0.0001 unit/s}	214000.0000	
0.0001	{0.0001 unit/s}	214000.0000						
C3300	1 ... n		R / W	Parameter "Acceleration" for positioning profile 1 ... n <table><tr><td>0.0001</td><td>{0.0001 unit/s²}</td><td>214000.0000</td><td></td></tr></table>	0.0001	{0.0001 unit/s ² }	214000.0000	
0.0001	{0.0001 unit/s ² }	214000.0000						
C3400	1 ... n		R / W	Parameter "Deceleration" for positioning profile 1 ... n <table><tr><td>0.0001</td><td>{0.0001 unit/s²}</td><td>214000.0000</td><td></td></tr></table>	0.0001	{0.0001 unit/s ² }	214000.0000	
0.0001	{0.0001 unit/s ² }	214000.0000						
C3500	1 ... n		R / W	Parameter "Dwell time" for positioning profile 1 ... n <table><tr><td>0.0000</td><td>{0.0001 unit/s}</td><td>214000.0000</td><td></td></tr></table>	0.0000	{0.0001 unit/s}	214000.0000	
0.0000	{0.0001 unit/s}	214000.0000						
C3600	1 ... n		R / W	Parameter "Jerk time" for positioning profile 1 ... n <table><tr><td>0.000</td><td>{0.001 s}</td><td>10.000</td><td></td></tr></table>	0.000	{0.001 s}	10.000	
0.000	{0.001 s}	10.000						

Standard profile generator modes

The profile generator uses the following standard positioning modes:

Mode	Info
0 Absolute positioning	This mode is based on absolute zero. In general, zero is found by homing and transferred to the actual position integrator of the profile generator. All profiles refer to this zero.
1 Relative positioning	This mode does not select an absolute position but uses distances. The internal path integrators are set to "0" before every positioning process. It is not possible to run an absolute positioning process after a relative positioning process. Example: If a relative positioning process in mode 1 is activated after an absolute positioning process in mode 0, the zero position could not be found after the system had switched back to mode 0. The axis then uses the last start position of mode 1 as a reference.
2 Constant traversing	This mode does not approach a defined position, but follows the profile. - Acceleration and deceleration are based on profile values. - The traversing direction is defined by the sign of the traversing speed.
3 Relative positioning (max. 2 ³⁰)	Like mode 1, "Relative positioning", only the internal path integrators are not reset, but continue to be incremented. The path integrators are limited to 2³⁰.

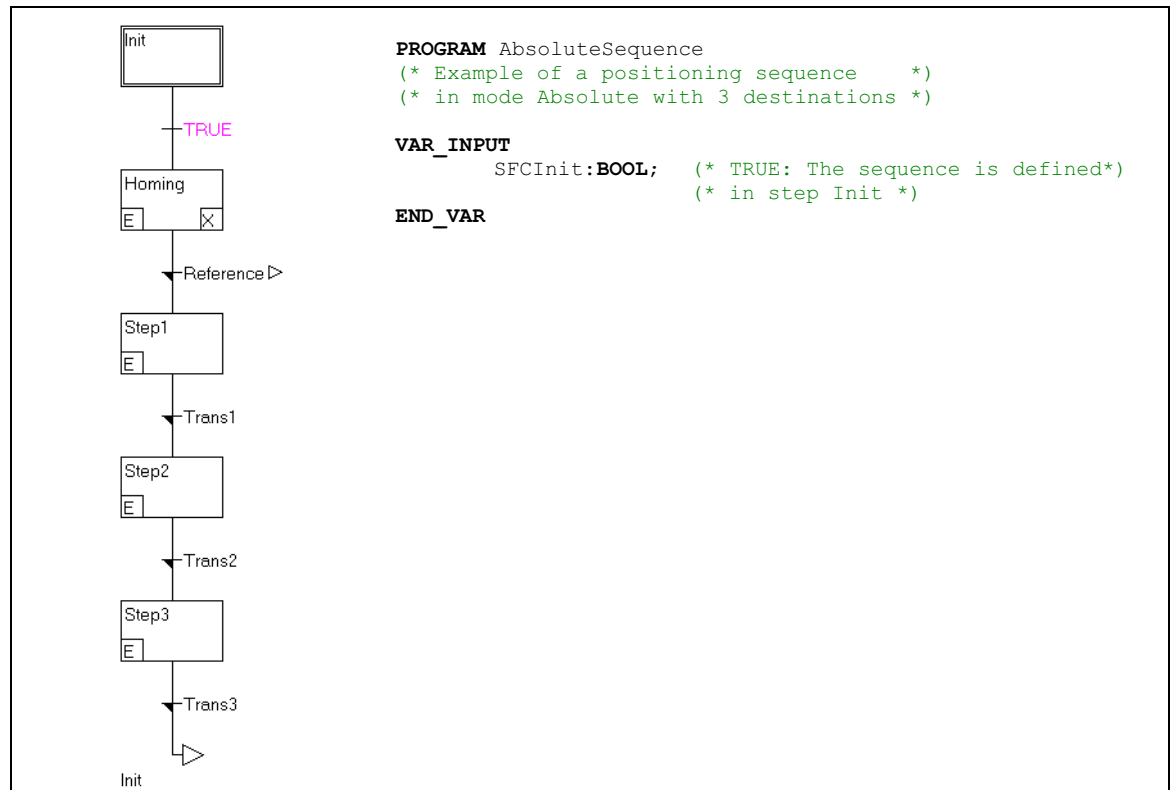


Positioning start

Positioning is started as follows:

1. Set *g_bPositioningEnable* from FALSE to TRUE to change from "StandBy" to "Positioning".
2. Select the positioning mode via *g_byPositioningMode*.
3. Transfer the profile name of the standard positioning profile, e.g. "Profile2" to the variable *g_wMotionProfileNumber*.
 - The corresponding positioning profile will be processed immediately.

Example sequencer "AbsoluteSequence"



Input action Homing:

```

(* Ensure that the reference is known in mode Absolute *)

(* No reference ? *)
IF NOT g_bHomePositionAvailable THEN

    (* Reset of status positioning *)
    g_bPositioningEnable:=FALSE;

    (* Homing start *)
    g_bHomingStart:=TRUE;
END_IF
    
```

Output action Homing:

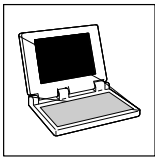
```

(* First, jump to template status positioning *)
g_bPositioningEnable:=TRUE;
    
```

Transition ReferenceOk:

Comment: IF Reference is known, jump TO next step (g_bHomePositionAvailable EQUAL TRUE ?)





Template Positioner

States & Functions

Function "StandardPositioning"

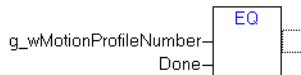
Input action **Step1:**

```
(* Set positioning mode to Absolute *)
(* --> Also possible is 0 instead of Absolute *)
g_byPositioningMode:=Absolute;

(* Copy 1st profile to g_wMotionProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
g_wMotionProfileNumber:=Profile1;
```

Transition **Trans1:**

Comment: Jump TO the next step, IF positioning procedure is finished (g_wMotionProfileNumber is EQUAL Done)



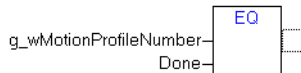
Input action **Step2:**

```
(* Set positioning mode to Absolute *)
(* --> Also possible is 0 instead of Absolute *)
g_byPositioningMode:=Absolute;

(* Copy 2nd profile to g_wMotionProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
g_wMotionProfileNumber:=Profile2;
```

Transition **Trans2:**

Comment: Jump TO the next step, IF positioning procedure is finished (g_wMotionProfileNumber is EQUAL Done)



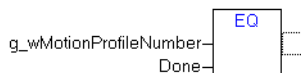
Input action **Step3:**

```
(* Set positioning mode to Absolute *)
(* --> Also possible is 0 instead of Absolute *)
g_byPositioningMode:=Absolute;

(* Copy 3rd profile to g_wMotionProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
g_wMotionProfileNumber:=Profile3;
```

Transition **Trans3:**

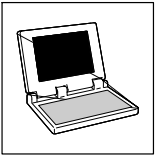
Comment: Jump TO the next step, IF positioning procedure is finished (g_wMotionProfileNumber is EQUAL Done)



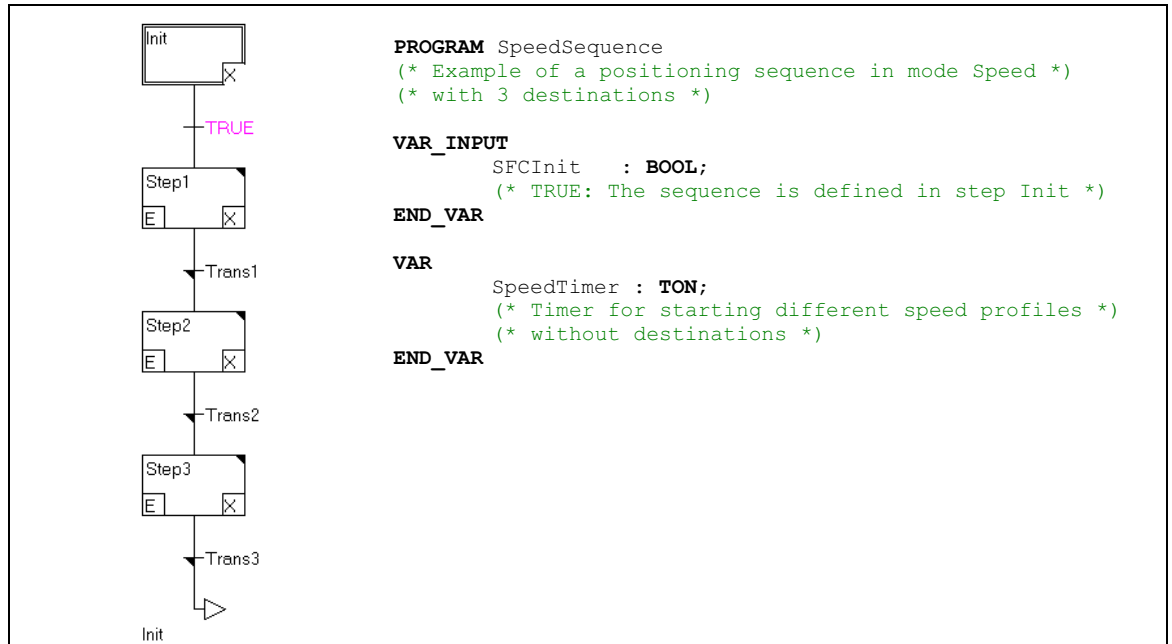
Tip!

The sequencer for a relative positioning process has the same structure as the sequencer for an absolute positioning process. Only the positioning mode has to be adapted in input actions **Step1 ... Step3:**

```
(* Set positioning mode to Relative *)
(* --> Also possible is 3 instead of Relative *)
g_byPositioningMode:=Relative;
...
```



Example sequencer "SpeedSequence"



Output action **Init**:

```

(* First, jump to template status positioning *)
g_bPositioningEnable:=TRUE;
  
```

Input action **Step1**:

```

(* Set positioning mode to Speed *)
(* --> Also possible is 2 instead of Speed *)
g_byPositioningMode:=Speed;

(* Copy 1st profile to g_wMotionProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
g_wMotionProfileNumber:=Profile19;

(* Initialisation of timer to generate transition for the next step, *)
(* because no Done status is transferred to g_wMotionControlNumber *)
SpeedTimer(IN:=TRUE, PT:=t#400ms);
  
```

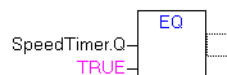
Output action **Step1**:

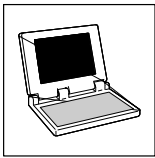
```

(* Reset SpeedTimer to start new timer process in next step *)
SpeedTimer(IN:=FALSE);
  
```

Transition **Trans1**:

Comment: Jump TO the next step IF Timer finished. g_wMotionProfileNumber gets no Done in mode Speed.





Template Positioner

States & Functions

Function "StandardPositioning"

Input action **Step2:**

```
(* Set positioning mode to Speed *)
(* --> Also possible is 2 instead of Speed *)
g_byPositioningMode:=Speed;

(* Copy 2nd profile to g_wMotionProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
g_wMotionProfileNumber:=Profile20;

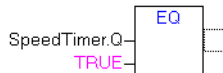
(* Initialisation of timer to generate transition for the next step, *)
(* because no Done status is transferred to g_wMotionControlNumber *)
SpeedTimer(IN:=TRUE, PT:=t#600ms);
```

Output action **Step2:**

```
(* Reset SpeedTimer to start new timer process in next step *)
SpeedTimer(IN:=FALSE);
```

Transition **Trans2:**

Comment: Jump TO the next step IF Timer finished. g_wMotionProfileNumber gets no Done in mode Speed.



Input action **Step3:**

```
(* Set positioning mode to Speed *)
(* --> Also possible is 2 instead of Speed *)
g_byPositioningMode:=Speed;

(* Copy 3rd profile to g_wMotionProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
g_wMotionProfileNumber:=Profile21;

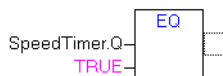
(* Initialisation of timer to generate transition for the next step, *)
(* because no Done status is transferred to g_wMotionControlNumber *)
SpeedTimer(IN:=TRUE, PT:=t#800ms);
```

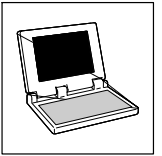
Output action **Step3:**

```
(* Reset SpeedTimer to start new timer process in next step *)
SpeedTimer(IN:=FALSE);
```

Transition **Trans3:**

Comment: Jump TO the next step IF Timer finished. g_wMotionProfileNumber gets no Done in mode Speed.





Function "MoveAxis" for easy positioning

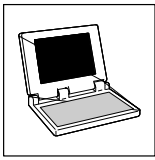
The function **MoveAxis** is a command interface of the **Template Positioner** which enables easy positioning.

- The parameter "Final speed" is not implemented in this function.
- Calling this function changes the profile parameters of profile no. 1!
- The positioning mode (*g_byPositioningMode*) must be selected before the function is activated.

Example: Activating the function **MoveAxis** for absolute positioning:

```
g_byPositioningMode:=Absolute; (* see positioning modes *)

MoveAxis (
    dnPosition:=6000000, (* Profile parameter position [units x 10000] *)
    dnVelocity:=1000000, (* Profile parameter velocity [units/s x 10000] *)
    dnAcceleration:=10000000, (* Profile parameter acceleration [units/s^2 x 10000] *)
    dnDeceleration:=10000000, (* Profile parameter deceleration [units/s^2 x 10000] *)
    dnJerkTime:=0, (* Profile parameter jerk time [s x 1000] *)
);
```



Template Positioner

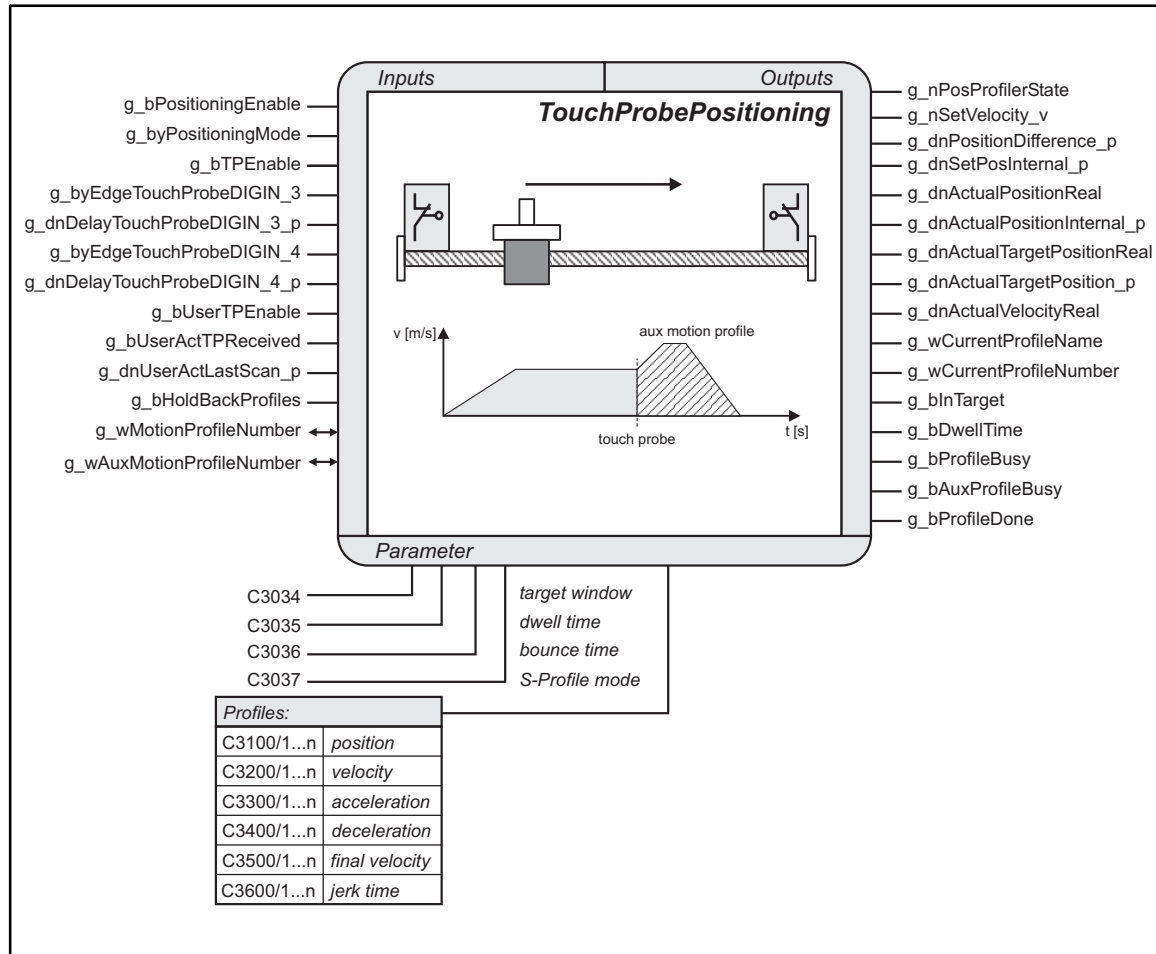
States & Functions

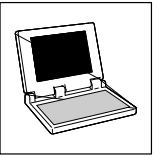
Function "TouchProbePositioning"

5.6.3 Function "TouchProbePositioning"

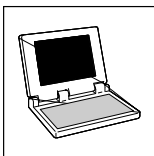
With this template function the drive can approach defined positions in different positioning modes by selecting linear movement profiles.

If touch probe is identified during the traversing process the drive automatically changes from the profile *g_MotionProfileNumber* to the profile *g_AuxMotionProfileNumber*. The profile generator then continues the positioning process with the new parameters in the corresponding positioning mode (remaining path positioning).





⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bPositioningEnable	Bool	R / W	Enabling positioning
			TRUE Change to "Positioning"
			FALSE Cancellation of positioning, change to "StandBy"
g_byPositioningMode	Byte	R / W	Selection of positioning modes with touch probe (remaining path positioning):
			10 Absolute positioning with relative remaining path positioning
			11 Modulo positioning with relative remaining path positioning • Path integrators are reset before the start. • Application: Rotary tables
			12 Constant traversing with relative remaining path positioning
			13 Relative positioning with relative remaining path positioning • max. 2147483647 increments ($2^{31} - 1$) • Path integrators are not reset before the start.
			14 Absolute positioning with absolute remaining path positioning
g_bTPEnable	Bool	R / W	Enabling touch probe positioning via the touch probe interface of the template
			FALSE Touch probe interface is inhibited
			TRUE Touch probe interface is enabled
g_byEdgeTouchProbeDIGIN_3	Byte	R / W	Edge sensitivity of touch probe input 3
			0 Rising signal
			1 Falling signal
			2 Rising and falling signal
			3 Touch probe detection off
g_dnDelayTouchProbe DIGIN_3_p	Double integer	R / W	Dead time compensation of the TP sensor at touch probe input 3 • Value in [inc] referred to the motor shaft.
g_byEdgeTouchProbeDIGIN_4	Byte	R / W	Edge sensitivity of touch probe input 4
			0 Rising signal
			1 Falling signal
			2 Rising and falling signal
			3 Touch probe detection off
g_dnDelayTouchProbe DIGIN_4_p	Double integer	R / W	Dead time compensation of the TP sensor at touch probe input 4 • Value in [inc] referred to the motor shaft.
g_bUserTPEnable	Bool	R / W	Enabling touch probe positioning via the user-defined interface
			FALSE User-defined interface is inhibited TRUE User-defined interface is enabled
g_bUserActTPReceived	Bool	R / W	User-defined interface for touch probe: Receiving touch probe signals • Connect this input e.g. with the output variable <i>g_MCTRL_bActTPReceived_b</i> of the <i>Target Interface</i> .
			TRUE Receive new touch probe signal
g_dnUserActLastScan_p	Double integer	R / W	User-defined interface for touch probe: Current LastScan value • Connect this input e.g. with the output variable <i>g_MCTRL_dnActLastScan_p</i> of the <i>Target Interface</i> .
g_bHoldBackProfiles	Bool	R / W	Completing profile processing after interruption. • If profile processing has been interrupted because of a status change from "Positioning" to another status, you can use this input to select that profile processing will be completed when the drive changes to "Positioning" again.
			TRUE Profile processing is completed automatically after interruption.
			FALSE Profile processing is not automatically completed after interruption. When the drive changes to "Positioning" again, the interrupted positioning process is considered to be completed (<i>g_wMotionProfileNumber</i> = Done).



Template Positioner

States & Functions

Function "TouchProbePositioning"

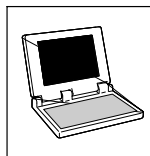


Note!

If the digital input X6/DI2 is used for the touch probe signal of the function block MCTRL, the program can only evaluate the touch probe if code C0911 = 1 (touch probe via terminal) is set. During homing with motor encoder zero pulse evaluation, the template sets code C0911 = 0.

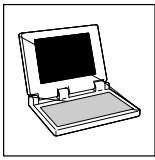
⇒ Inputs/outputs ⇒			
Identifiers	Data type	Access	Value/meaning
g_wMotionProfileNumber	ProfileNames	R / W	Profile name - If <i>g_wMotionProfileNumber</i> is used with a valid profile name, the positioning process starts with the profile parameters of the selected profile. - Precondition: <i>g_bMotionStart</i> = TRUE
			Display "Active" Processing of the selected profile is not completed yet.
			Display "Done" The selected profile has been processed, the drive has reached the target position.
g_wAuxMotionProfileNumber	ProfileNames	R / W	Name of the profile used for remaining path positioning

Outputs ⇒			
Identifiers	Data type	Access	Value/meaning
g_nPosProfilerState	Word	R	Positioning status
			Messages:
			0 No action
			1 Positioning completed
			10 Acceleration phase is active
			11 Constant speed phase is active
			12 Deceleration phase is active
			13 Reversing phase is active
			100 Reset is active
			101 Start values are loaded
			102 Positioning stopped
			103 External setpoint interface activated
			200 Touch probe positioning (remaining path positioning) completed, but no touch probe signal detected.
			300 Overflow of the internal path integrator
			Errors:
			-200 Invalid profile: Parameter acceleration = 0
			-201 Invalid profile: Parameter deceleration = 0
			-202 Invalid profile: Parameter speed = 0
			-210 Invalid remaining path profile: Parameter acceleration = 0
			-211 Invalid remaining path profile: Parameter deceleration = 0
			-212 Invalid remaining path profile: Parameter speed = 0
			-300 Positioning with the selected profile parameters is not plausible.
g_nSetVelocity_v	Integer	R	Speed setpoint in [inc/ms] 16384 [inc] ≈ 15000 rpm - Only to be used for encoder systems on the motor side! If a load-side encoder system is used (gearbox factor unequal "1"), speed setpoint 0 will be output
g_dnPositionDifference_p	Double integer	R	Position difference between setpoint and actual value in [inc] 65536 [inc] ≈ 1 revolution on the motor end
g_dnSetPosInternal_p	Double integer	R	Internal setpoint angle position in [inc] With Modulo positioning reset every time a profile is started.
g_dnActualPositionReal	Double integer	R	Actual angle position in [unit] Output in fixed-comma format with 4 decimal positions: 1 [unit] ≈ 10000



Outputs ⇨							
Identifiers	Data type	Access	Value/meaning				
g_dnActualPositionInternal_p	Double integer	R	Actual angle position in [inc] 65536 [inc] ≡ 1 revolution on the motor end - The actual integrator can overflow.				
g_dnActualTargetPositionReal	Double integer	R	Target position of the current profile in [unit] Output in fixed-comma format with 4 decimal positions: 1 [unit] ≡ 10000				
g_dnActualTargetPosition_p	Double integer	R	Target position of the current profile in [inc] 65536 [inc] ≡ 1 revolution on the motor end				
g_dnActualVelocityReal	Double integer	R	Current speed in [unit/s] Output in fixed-comma format with 4 decimal positions: 1 [unit/s] ≡ 10000				
g_wCurrentProfileName	ProfileNames	R	Profile name of the active profile When the "Positioning" status is left, <i>g_wCurrentProfileName</i> is set to "Done".				
g_wCurrentProfileNumber	Word	R	Profile number of the active profile				
g_bInTarget	Bool	R	Message "Target position reached" Window definition (C3034):  5-33 <table><tr><td>TRUE</td><td>The target position is within the window defined under C3034.</td></tr></table>	TRUE	The target position is within the window defined under C3034.		
TRUE	The target position is within the window defined under C3034.						
g_bDwellTime	Bool	R	Message "Dwell time over" - Reset to FALSE when positioning is started. - Definition of the dwell time (C3035):  5-34 <table><tr><td>TRUE</td><td>The dwell time set under C3035 has expired.</td></tr></table>	TRUE	The dwell time set under C3035 has expired.		
TRUE	The dwell time set under C3035 has expired.						
g_bProfileBusy	Bool	R	Message "Positioning is active" <table><tr><td>TRUE</td><td>Positioning is active.</td></tr><tr><td>TRUE (pulse)</td><td><i>g_bProfileBusy</i> and <i>g_bProfileDone</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.</td></tr></table>	TRUE	Positioning is active.	TRUE (pulse)	<i>g_bProfileBusy</i> and <i>g_bProfileDone</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.
TRUE	Positioning is active.						
TRUE (pulse)	<i>g_bProfileBusy</i> and <i>g_bProfileDone</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.						
g_bAuxProfileBusy	Bool	R	Message "Remaining path positioning is active" <table><tr><td>TRUE</td><td>Remaining path positioning is active.</td></tr></table>	TRUE	Remaining path positioning is active.		
TRUE	Remaining path positioning is active.						
g_bProfileDone	Bool	R	Message "Positioning has been completed" <table><tr><td>TRUE</td><td>Positioning has been completed.</td></tr><tr><td>TRUE (pulse)</td><td><i>g_bProfileDone</i> and <i>g_bProfileBusy</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.</td></tr></table>	TRUE	Positioning has been completed.	TRUE (pulse)	<i>g_bProfileDone</i> and <i>g_bProfileBusy</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.
TRUE	Positioning has been completed.						
TRUE (pulse)	<i>g_bProfileDone</i> and <i>g_bProfileBusy</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.						

Parameters									
Code	Sub-code	Data type	Access	Info					
				Possible settings	Pre-setting				
C3034			R / W	Message window "Target position reached" Window definition:  5-33 <table><tr><td>0</td><td>{1 unit}</td><td>65535</td><td>0 unit</td></tr></table>	0	{1 unit}	65535	0 unit	
0	{1 unit}	65535	0 unit						
C3035			R / W	Dwell time Definition of the dwell time:  5-34 <table><tr><td>0</td><td>{1 ms}</td><td>65535</td><td>50 ms</td></tr></table>	0	{1 ms}	65535	50 ms	
0	{1 ms}	65535	50 ms						
C3036			R / W	Debounce time for touch probe input <table><tr><td>0</td><td>{1 ms}</td><td>65535</td><td>0 ms</td></tr></table>	0	{1 ms}	65535	0 ms	
0	{1 ms}	65535	0 ms						
C3037			R / W	Mode S-profile generation <table><tr><td>0</td><td>Run-time-optimised</td><td rowspan="2">0</td></tr><tr><td>1</td><td>S-profile-optimised - Requires a much longer processing time - Further information  7-1 </td></tr></table>	0	Run-time-optimised	0	1	S-profile-optimised - Requires a much longer processing time - Further information  7-1
0	Run-time-optimised	0							
1	S-profile-optimised - Requires a much longer processing time - Further information  7-1								



Template Positioner

States & Functions

Function "TouchProbePositioning"

Profile parameters				
Code	Sub-code	Data type	Access	Info
				Possible settings
				Pre-setting
C3100	1 ... n		R / W	Parameter "Position" for positioning profile 1 ... n
				-214000.0000 {0.0001 unit} 214000.0000
C3200	1 ... n		R / W	Parameter "Speed" for positioning profile 1 ... n
				0.0001 {0.0001 unit/s} 214000.0000
C3300	1 ... n		R / W	Parameter "Acceleration" for positioning profile 1 ... n
				0.0001 {0.0001 unit/s ² } 214000.0000
C3400	1 ... n		R / W	Parameter "Deceleration" for positioning profile 1 ... n
				0.0001 {0.0001 unit/s ² } 214000.0000
C3500	1 ... n		R / W	Parameter "Dwell time" for positioning profile 1 ... n
				0.0000 {0.0001 unit/s} 214000.0000
C3600	1 ... n		R / W	Parameter "Jerk time" for positioning profile 1 ... n
				0.000 {0.001 s} 10.000

Touch probe evaluation

You can either use the touch probe interface of the template or a user-defined interface to evaluate the touch probe signals in the user program.

Set

- *g_bTPEnable* to TRUE to enable the touch probe interface of the template
or
- *g_bUserTPEnable* to TRUE to enable the user-defined interface.

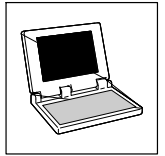


Note!

The user-defined interface consists of the input variables *g_bActTPReceived* and *g_dnUserLastScan_p*. Use the functions & FBs of the function library **LenzeTPDrv.lib** to configure it.

If the user-defined interface is enabled ensure that the touch probe interface of the template is inhibited (*g_bTPEnable* = FALSE).

For a correct evaluation of the touch probe signals, the user program processing the touch probe signals should be added to the task configuration before "Program_Task1".



Remaining path positioning

Just like with a standard positioning process, with remaining path positioning (modes 10 ... 15) the drive first processes the standard profile *g_wMotionProfileNumber* in the corresponding mode.

If touch probe is identified during traversing the drive automatically changes to the profile *g_wAuxMotionProfileNumber*. The profile generator then continues positioning with the new parameters in the corresponding positioning mode.

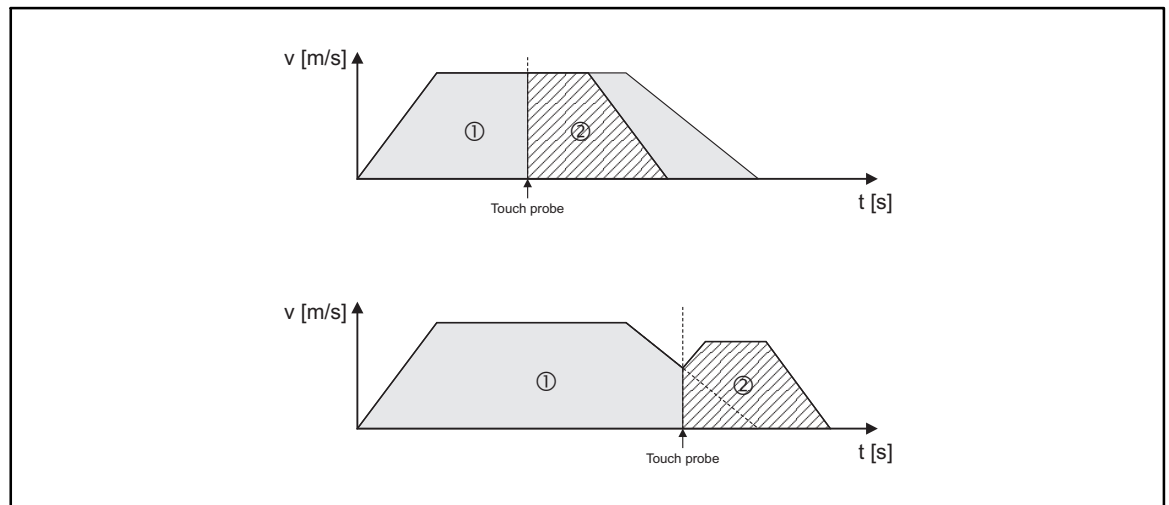


Fig. 5-12

Example: Remaining path positioning after touch probe identification

- ① Standard profile (*g_wMotionProfileNumber*)
- ② Additional profile for remaining path positioning (*g_wAuxMotionProfileNumber*)

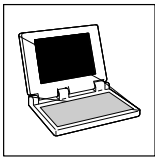
- If remaining path positioning is active TRUE is output at *g_bAuxProfileBusy*.
- If touch probe is activated once again during remaining path positioning, positioning starts again, i.e. the second remaining path positioning profile will be processed once again from the current position. This is only possible if the corresponding positioning mode and the remaining path positioning profile are still selected.
- Under C3036 you can set the debounce time for the touch probe input. After touch probe identification, the evaluation of touch probe signals will be deactivated for the time selected under C3036.



Note!

If the standard profile has been completely processed without touch probe identification, message 200 ("No touch probe identified") will be output at *g_nPosProfilerState*.

The software limit positions are not checked before the touch probe profile is started. If a software limit position is reached during remaining path positioning user QSP is activated. Use the template function **ManualJog** for retracting from the software limit positions. (□ 5-22)



Template Positioner

States & Functions

Function "TouchProbePositioning"

Profile generator modes for remaining path positioning

The profile generator uses the following modes for remaining path positioning with touch probe:

Mode	Info
10 Absolute positioning with relative remaining path positioning	This mode is based on absolute zero. In general, zero is found by homing and transferred to the actual position integrator of the profile generator. All profiles refer to this zero. If touch probe is detected the profile generator automatically changes to the additional profile <i>g_AuxMotionProfileNumber</i> and executes a relative positioning process with the corresponding profile parameters.
11 Modulo positioning with relative remaining path positioning	This mode does not select an absolute position but uses distances. If touch probe is detected the profile generator automatically changes to the additional profile <i>g_AuxMotionProfileNumber</i> and executes a relative positioning process with the corresponding profile parameters.
12 Constant traversing with relative remaining path positioning	See mode 2, "Constant traversing". □ 5-35 If touch probe is detected the profile generator automatically changes to the additional profile <i>g_AuxMotionProfileNumber</i> and executes a relative positioning process with the corresponding profile parameters.
13 Relative positioning with relative remaining path positioning	Like mode 1, "Relative positioning", only the internal path integrators are not reset, but continue to be incremented (internally limited to $2^{31} - 1$). If touch probe is detected the profile generator automatically changes to the additional profile <i>g_AuxMotionProfileNumber</i> and executes a relative positioning process with the corresponding profile parameters.
14 Absolute positioning with absolute remaining path positioning	See mode 0, Absolute positioning". If touch probe is detected the profile generator automatically changes to the additional profile <i>g_AuxMotionProfileNumber</i> and executes an absolute positioning process with the corresponding profile parameters.
15 Relative positioning with absolute remaining path positioning	See mode 3, Relative positioning". - If touch probe is detected the profile generator automatically changes to the additional profile <i>g_AuxMotionProfileNumber</i> and executes an absolute positioning process with the corresponding profile parameters. - In this mode, the internal path integrators are not reset, but continue to be incremented (internally limited to $2^{31} - 1$).



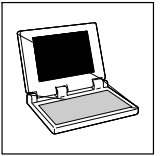
Note!

- With positioning modes 10, 13, 14 and 15 the home position must be known.
- In positioning mode 11 the home position is reset (deleted).
 - Reason for this is the reset of the path integrators in the profile generator which prevents an overflow/incremental loss during continuous movements.
- In positioning mode 12 the home position is reset (deleted) after a possible overflow of the internal path integrators.
 - Reason: During constant traversing, the path integrators may overflow. Otherwise, the drive would approach a wrong position if absolute positioning is started after an overflow.

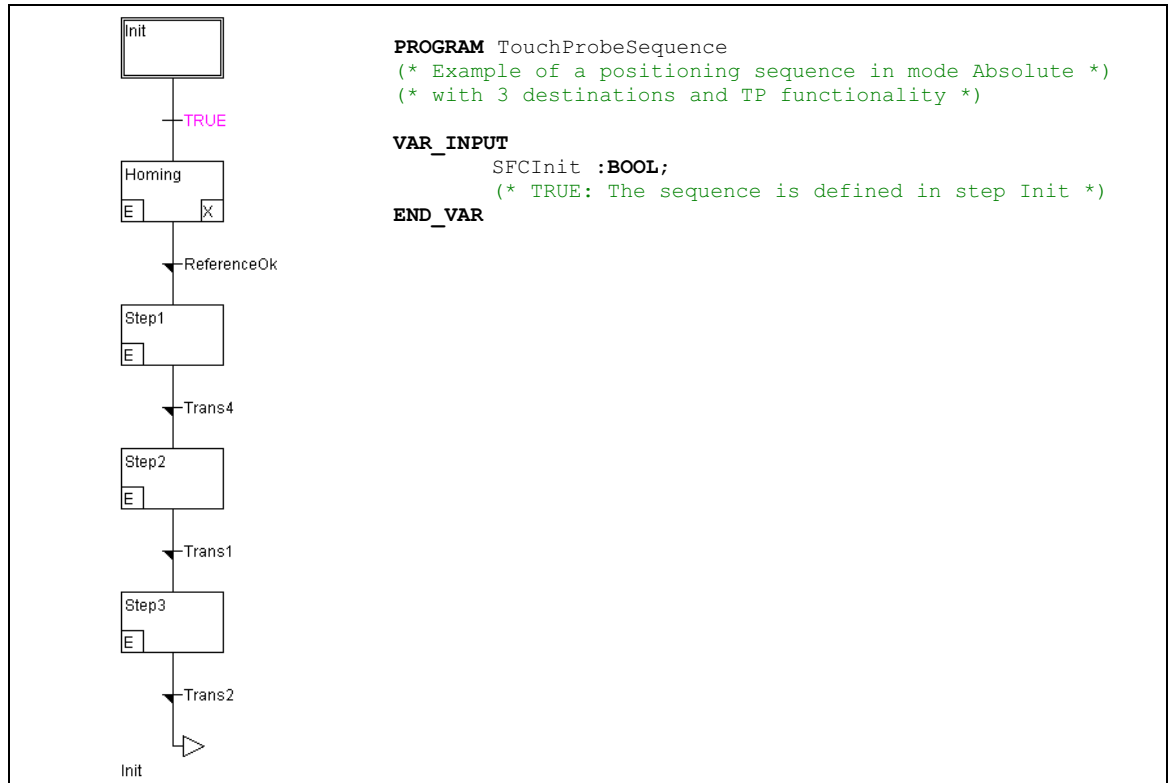
Positioning start

Positioning is started as follows:

- Set *g_bPositioningEnable* from FALSE to TRUE to change from "StandBy" to "Positioning".
- Use *g_byPositioningMode* to select the positioning mode (10 ... 15).
- Transfer the profile name of the remaining path positioning profile, e.g. "Profile3" to the variable *g_wAuxMotionProfileNumber*.
 - The positioning profile is processed after touch probe has been identified.
- Transfer the profile name of the standard positioning profile, e.g. "Profile2" to the variable *g_wMotionProfileNumber*.
 - The corresponding positioning profile will be processed immediately.



Example sequencer "TouchProbeSequence"



Input action Homing:

```

(* Ensure that the reference is known in mode Absolute *)

(* No reference ? *)
IF NOT g_bHomePositionAvailable THEN

    (* Reset of status positioning *)
    g_bPositioningEnable:=FALSE;

    (* Homing start *)
    g_bHomingStart:=TRUE;
END_IF
    
```

Output action Homing:

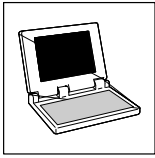
```

(* First, jump to template status positioning *)
g_bPositioningEnable:=TRUE;
    
```

Transition ReferenceOk:

(* If reference is known, jump to next step (g_bHomePositionAvailable EQUAL TRUE ?) *)





Template Positioner

States & Functions

Function "TouchProbePositioning"

Input action **Step1:**

```
(* Start TouchProbe positioning process with positive edge at digital input DI3 while
actual profile is in progress *)
(* Set positioning mode to AbsoluteTPAbsolute --> Also possible is 14 instead of
Absolute *)
g_byPositioningMode:=AbsoluteTPAbsolute;

(* Configuration of TouchProbe source at digital input DI3 *)
(* TouchProbe at positive edge *)
g_byEdgeTouchProbeDIGIN_3 := 0;

(* No TouchProbe delay [incr] *)
g_dnDelayTouchProbeDIGIN_3_p := 0;

(* Copy auxiliary profile to g_wAuxMotionProfileNumber, which is driven if TP edge is
detected --> Also possible is the corresponding number in enum list *)
g_wAuxMotionProfileNumber:=Profile5;
```

Transition **Trans4:**

(* Jump to next step, if TP-profile is calculated (Set to Valid) *)



Input action **Step2:**

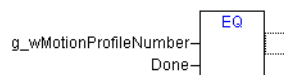
```
(* Set TouchProbe enable bit to TRUE to enable TouchProbe positioning *)
g_bTPEnable:=TRUE;

(* Copy 1st profile to g_wMotionProfileNumber --> Also possible is the corresponding
number in enum list *)
g_wMotionProfileNumber:=Profile4;

(* Configure TouchProbe positioning as described *)
(* 1 -> Add DIGIN/DIGOUT to control configuration *)
(* 2 -> Select TP source and setup under Var_TouchProbe *)
```

Transition **Trans1:**

(* Jump to the next step, if positioning procedure is finished (g_wMotionProfileNumber is EQUAL Done) *)



Input action **Step3:**

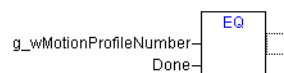
```
(* Deactivate TouchProbe positioning to reset enable interface variable *)
g_bTPEnable:=FALSE;

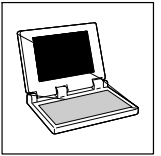
(* Set positioning mode to Absolute --> Also possible is 0 instead of Absolute *)
g_byPositioningMode:=Absolute;

(* Copy 2nd profile to g_wMotionProfileNumber --> Also possible is the corresponding
number in enum list *)
g_wMotionProfileNumber:=Profile6;
```

Transition **Trans2:**

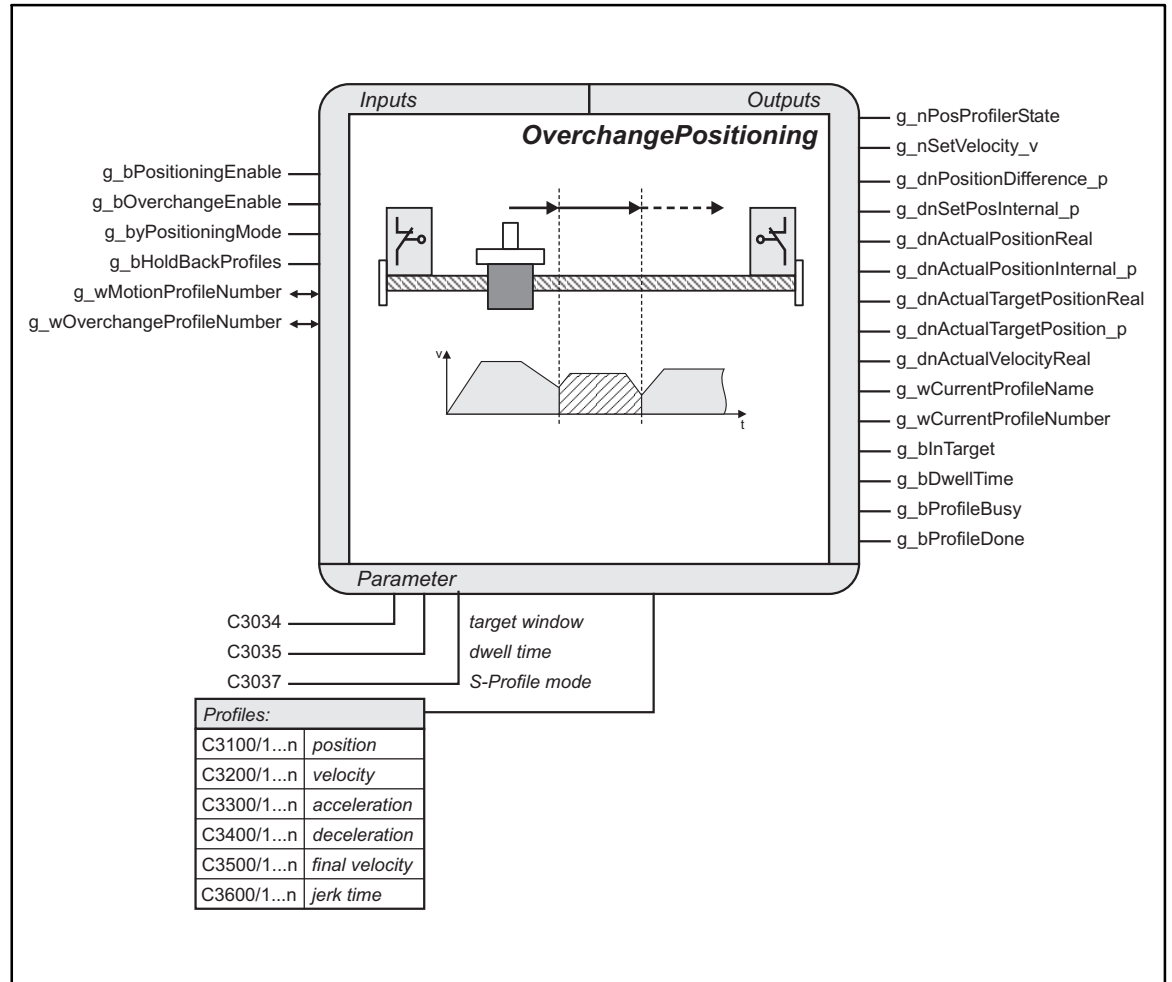
(* Jump to Init step, if positioning procedure is finished (g_wMotionProfileNumber is EQUAL Done) *)



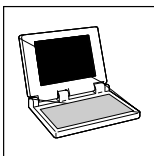


5.6.4 Function "OverchangePositioning"

This template function is used for profile connections with "overchange", i.e. the drive traverses at a selected final speed (unequal "0") from one profile to another.



⇒ Inputs				
Identifiers	Data type	Access	Info/possible settings	
g_bPositioningEnable	Bool	R / W	Enabling positioning	
			TRUE	Change to "Positioning"
			FALSE	Cancellation of positioning, change to "StandBy"
g_bOverchangeEnable	Bool	R / W	Enabling overchange	
			FALSE	Overchange is deactivated.
			TRUE	Overchange is enabled.



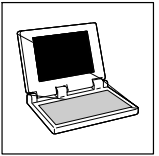
Template Positioner

States & Functions

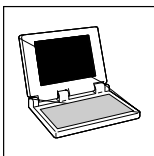
Function "OverchangePositioning"

⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_byPositioningMode	Byte	R / W	Positioning mode selection
			0 Absolute positioning Precondition: <i>g_bHomingDone</i> = TRUE and <i>g_bHomePositionAvailable</i> = TRUE
			1 Relative positioning - Path integrators are reset before the start. - Application: Rotary tables - Precondition: <i>g_bHomingDone</i> = TRUE
			2 Constant traversing
			3 Relative positioning - max. 2147483647 increments ($2^{31}-1$) - Path integrators are not reset before the start. - Precondition: <i>g_bHomingDone</i> = TRUE and <i>g_bHomePositionAvailable</i> = TRUE
			Selection of positioning modes with touch probe (remaining path positioning):
			10 Absolute positioning with relative remaining path positioning
			11 Modulo positioning with relative remaining path positioning - Path integrators are reset before the start. - Application: Rotary tables
			12 Constant traversing with relative remaining path positioning
			13 Relative positioning with relative remaining path positioning - max. 2147483647 increments ($2^{31}-1$) - Path integrators are not reset before the start.
g_bHoldBackProfiles	Bool	R / W	Completing profile processing after interruption. If profile processing has been interrupted because of a status change from "Positioning" to another status, you can use this input to select that profile processing will be completed when the drive changes to "Positioning" again.
			TRUE Profile processing is completed automatically after interruption.
			FALSE Profile processing is not automatically completed after interruption. When the drive changes to "Positioning" again, the interrupted positioning process is considered to be completed (<i>g_wMotionProfileNumber</i> = Done).

⇒ Inputs/outputs ⇒			
Identifiers	Data type	Access	Info/possible settings
g_wMotionProfileNumber	ProfileNames	R / W	Profile name - If <i>g_wMotionProfileNumber</i> is used with a valid profile name, the positioning process starts with the profile parameters of the selected profile. - Precondition: <i>g_bPositioningEnable</i> = TRUE
			Display "Active" Processing of the selected profile is not completed yet.
			Display "Done" The selected profile has been processed, the drive has reached the target position.
			If several profiles are connected by means of overchange, polling in the transition of <i>g_wMotionProfileNumber</i> = Done is only necessary for the last profile (see programming example transition Trans3).
g_wOverchangeProfileNumber	ProfileNames	R / W	Name of the profile to be started automatically
			Display "Active" The profile parameters of the overchange profile are being transferred.
			Display "Done" The profile parameters of the selected overchange profile have been transferred. This variable does not indicate completion of the profile generation of the following profile.



Outputs ⇨					
Identifiers	Data type	Access	Value/meaning		
g_nPosProfilerState	Word	R	Positioning status		
			Messages:		
			0	No action	
			1	Positioning completed	
			10	Acceleration phase is active	
			11	Constant speed phase is active	
			12	Deceleration phase is active	
			13	Reversing phase is active	
			100	Reset is active	
			101	Start values are loaded	
			102	Positioning stopped	
			103	External setpoint interface activated	
			200	Touch probe positioning (remaining path positioning) completed, but no touch probe signal detected.	
			300	Overflow of the internal path integrator	
			Errors:		
			-200	Invalid profile: Parameter acceleration = 0	
			-201	Invalid profile: Parameter deceleration = 0	
			-202	Invalid profile: Parameter speed = 0	
			-210	Invalid remaining path profile: Parameter acceleration = 0	
			-211	Invalid remaining path profile: Parameter deceleration = 0	
			-212	Invalid remaining path profile: Parameter speed = 0	
-300	Positioning with the selected profile parameters is not plausible.				
g_nSetVelocity_v	Integer	R	Speed setpoint in [inc/ms] 16384 [inc] ≙15000 rpm - Only to be used for encoder systems on the motor side! If a load-side encoder system is used (gearbox factor unequal 1), speed setpoint 0 will be output		
g_dnPositionDifference_p	Double integer	R	Position difference between setpoint and actual value in [inc] 65536 [inc] ≙ 1 revolution on the motor end		
g_dnSetPosInternal_p	Double integer	R	Internal setpoint angle position in [inc] With Modulo positioning reset every time a profile is started.		
g_dnActualPositionReal	Double integer	R	Actual angle position in [unit] Output in fixed-comma format with 4 decimal positions: 1 [unit] ≙ 10000		
g_dnActualPositionInternal_p	Double integer	R	Actual angle position in [inc] 65536 [inc] ≙ 1 revolution on the motor end - The actual integrator can overflow.		
g_dnActualTargetPositionReal	Double integer	R	Target position of the current profile in [unit] Output in fixed-comma format with 4 decimal positions: 1 [unit] ≙ 10000		
g_dnActualTargetPosition_p	Double integer	R	Target position of the current profile in [inc] 65536 [inc] ≙ 1 revolution on the motor end		
g_dnActualVelocityReal	Double integer	R	Current speed in [unit/s] Output in fixed-comma format with 4 decimal positions: 1 [unit/s] ≙ 10000		
g_wCurrentProfileName	ProfileNames	R	Profile name of the active profile When the "Positioning" status is left, <i>g_wCurrentProfileName</i> is set to "Done".		
g_wCurrentProfileNumber	Word	R	Profile number of the active profile		
g_bInTarget	Bool	R	Message "Target position reached" Window definition (C3034):  5-33 <table><tr><td>TRUE</td><td>The target position is within the window defined under C3034.</td></tr></table>	TRUE	The target position is within the window defined under C3034.
TRUE	The target position is within the window defined under C3034.				
g_bDwellTime	Bool	R	Message "Dwell time over" - Reset to FALSE when positioning is started. - Definition of the dwell time (C3035):  5-34 <table><tr><td>TRUE</td><td>The dwell time set under C3035 has expired.</td></tr></table>	TRUE	The dwell time set under C3035 has expired.
TRUE	The dwell time set under C3035 has expired.				



Template Positioner

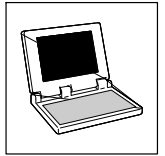
States & Functions

Function "OverchangePositioning"

Outputs ⇨			
Identifiers	Data type	Access	Value/meaning
g_bProfileBusy	Bool	R	Message "Positioning is active"
			TRUE Positioning is active.
			TRUE (pulse) <i>g_bProfileBusy</i> and <i>g_bProfileDone</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.
g_bProfileDone	Bool	R	Message "Positioning has been completed"
			TRUE Positioning has been completed.
			TRUE (pulse) <i>g_bProfileDone</i> and <i>g_bProfileBusy</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.

Parameters									
Code	Sub-code	Data type	Access	Info					
				Possible settings	Pre-setting				
C3034			R / W	Message window "Target position reached" Window definition:  5-33 <table><tr><td>0</td><td>{1 unit}</td><td>65535</td><td>0 unit</td></tr></table>	0	{1 unit}	65535	0 unit	
0	{1 unit}	65535	0 unit						
C3035			R / W	Dwell time Definition of the dwell time:  5-34 <table><tr><td>0</td><td>{1 ms}</td><td>65535</td><td>50 ms</td></tr></table>	0	{1 ms}	65535	50 ms	
0	{1 ms}	65535	50 ms						
C3037			R / W	Mode S-profile generation <table><tr><td>0</td><td>Run-time-optimised - When the overchange function is activated, this setting will lead to discontinuities in the S-profile generation </td><td rowspan="2">0</td></tr><tr><td>1</td><td>Profile-optimised - Requires a much longer processing time - Further information  7-1 </td></tr></table>	0	Run-time-optimised When the overchange function is activated, this setting will lead to discontinuities in the S-profile generation	0	1	Profile-optimised - Requires a much longer processing time - Further information  7-1
0	Run-time-optimised When the overchange function is activated, this setting will lead to discontinuities in the S-profile generation	0							
1	Profile-optimised - Requires a much longer processing time - Further information  7-1								

Profile parameters				
Code	Data type	Access	Info	
Sub-code			Possible settings	Pre-setting
C3100	1 ... n	R / W	Parameter "Position" for positioning profile 1 ... n	
			-214000.0000 {0.0001 unit} 214000.0000	
C3200	1 ... n	R / W	Parameter "Speed" for positioning profile 1 ... n	
			0.0001 {0.0001 unit/s} 214000.0000	
C3300	1 ... n	R / W	Parameter "Acceleration" for positioning profile 1 ... n	
			0.0001 {0.0001 unit/s²} 214000.0000	
C3400	1 ... n	R / W	Parameter "Deceleration" for positioning profile 1 ... n	
			0.0001 {0.0001 unit/s²} 214000.0000	
C3500	1 ... n	R / W	Parameter "Dwell time" for positioning profile 1 ... n	
			• The final speed v_{end} is limited to the value of the set positioning speed (C3200/x).	
			0.0000 {0.0001 unit/s} 214000.0000	
C3600	1 ... n	R / W	Parameter "Jerk time" for positioning profile 1 ... n	
			0.000 {0.001 s} 10.000	



Profile generator modes

Standard positioning: See function **StandardPositioning**. (□ 5-38)

Remaining path positioning with touch probe: See function **TouchProbePositioning**. (□ 5-50)

Profile linkage with overchange

If profiles are linked to each other by means of an overchange the drive traverses at a selected final speed (unequal "0") from one traversing profile ① to another ② :

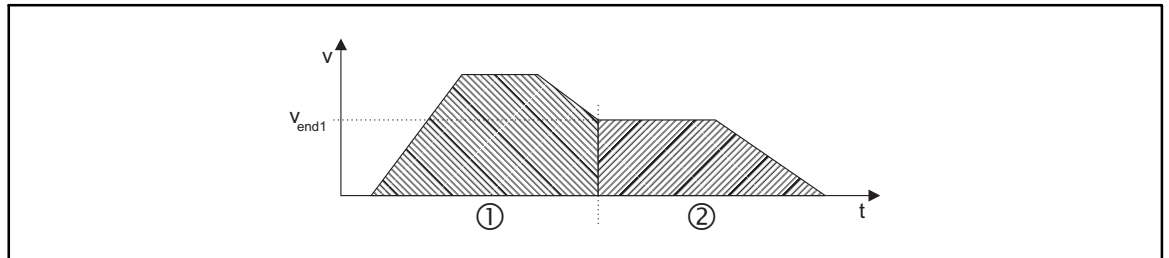
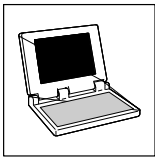


Fig. 5-13

Example: Profile linkage with overchange

- ① First traversing profile with final speed v_{end1} unequal "0".
- ② Second traversing profile with initial speed = final speed of the first traversing profile.

- The final speed v_{end} is selected in the corresponding positioning profile under C3500/x and transferred to the profile generator when positioning is started.
- The final speed v_{end} is limited to the value of the set positioning speed (C3200/x).
- If positioning has been completed and the final speed v_{end} has been reached the drive automatically starts another positioning process with the profile selected at *g_wOverchangeProfileNumber*.
- If the final speed of the following profile is also unequal "0" the profile linkage is continued until a profile with a final speed equal "0" is processed.
- If the target position of a profile cannot be reached due to the final speed of the previous profile and the deceleration of the current profile the drive reverses.
- After remaining path positioning with touch probe, the profile will be linked to the profile selected at *g_wOverchangeProfileNumber* if the final speed of the remaining path positioning profile is unequal "0" (profile *g_wAuxMotionProfileNumber*).



Template Positioner

States & Functions

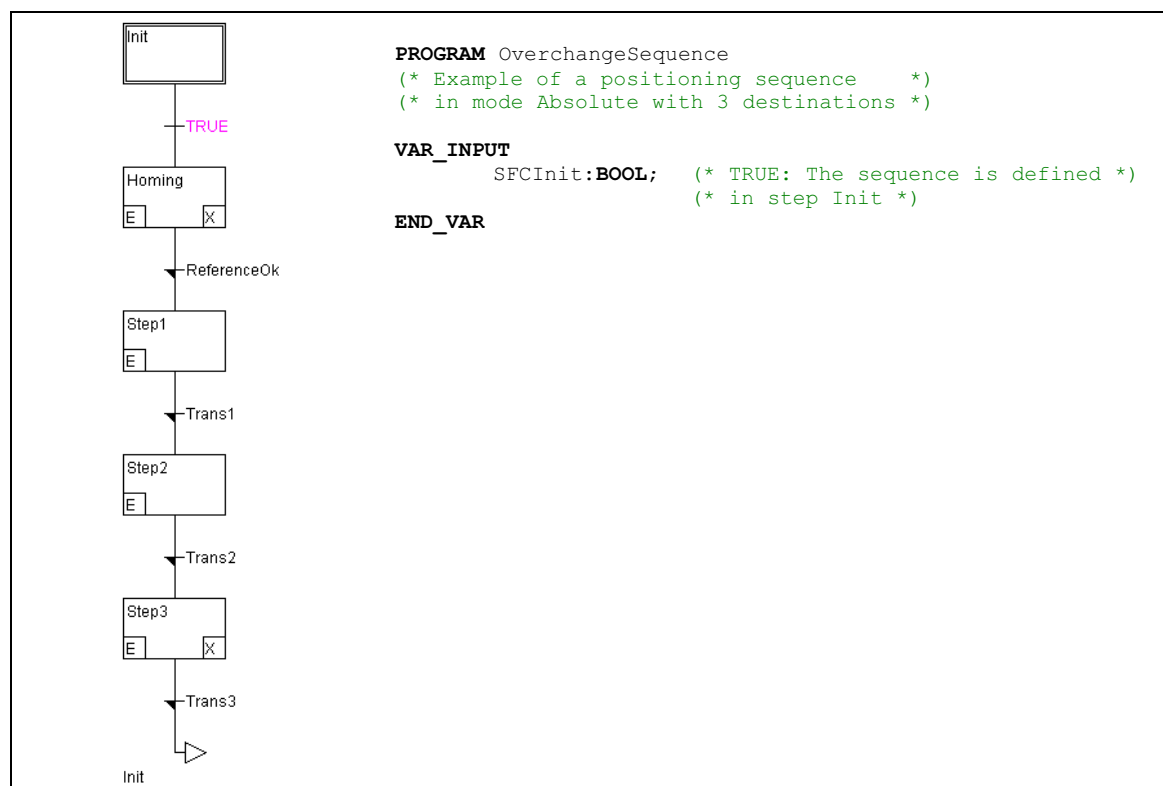
Function "OverchangePositioning"

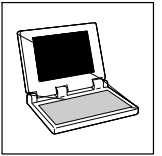
Positioning start

Positioning is started as follows:

1. Set *g_bPositioningEnable* from FALSE to TRUE to change from "StandBy" to "Positioning".
2. Set *g_bOverchangeEnable* from FALSE to TRUE to enable the overchange function.
3. Select the positioning mode via *g_byPositioningMode*.
4. Transfer the name of the profile to be processed after completion of the start profile *g_wMotionProfileNumber* to the variable (*g_wOverchangeProfileNumber*).
5. Transfer the name of the start profile, e.g. "Profile2" to the variable *g_wMotionProfileNumber*.
 - The final speed of the start profile must be unequal "0".
 - The corresponding positioning profile will be processed immediately.
6. If the overchange profile selected in step 4 has been processed *g_wOverchangeProfileNumber* = Done and the name of the following profile can be transferred to the variable *g_wOverchangeProfileNumber*.
 - This step can be repeated with an unlimited number of following profiles.

Example sequencer "OverchangeSequence"





Input action **Homing**:

```
(* Ensure that the reference is known in mode Absolute *)

(* No reference ? *)
IF NOT g_bHomePositionAvailable THEN

    (* Reset of status positioning *)
    g_bPositioningEnable:=FALSE;

    (* Homing start *)
    g_bHomingStart:=TRUE;

END_IF
```

Output action **Homing**:

```
(* First, jump to template status positioning *)
g_bPositioningEnable:=TRUE;
```

Transition **ReferenceOk**:

(* If reference is known, jump to next step (g_bHomePositionAvailable EQUAL TRUE ?) *)



Input action **Step1**:

```
(* Set positioning mode to Absolute *)
(* --> Also possible is 0 instead of Absolute *)
g_byPositioningMode:=Absolute;

(* Copy 1st profile to g_wMotionProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
(* This profile must have a final speed unequal 0 *)
g_wMotionProfileNumber:=Profile9;

(* Copy OverchangeProfile to g_wOverchangeProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
g_wOverchangeProfileNumber:=Profile10;

(* Enabling of overchange *)
g_bOverChangeEnable:=TRUE;
```

Transition **Trans1**:

(* Jump to the next step, if OverchangeProfileNumber is set to Done *)



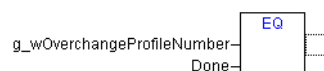
Input action **Step2**:

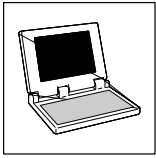
```
(* Set positioning mode to Absolute *)
(* --> Also possible is 0 instead of Absolute *)
g_byPositioningMode:=Absolute;

(* Copy next profile to g_wOverchangeProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
g_wOverchangeProfileNumber:=11;
```

Transition **Trans2**:

(* Jump to the next step, if OverchangeProfileNumber is set to Done *)





Template Positioner

States & Functions

Function "OverchangePositioning"

Input action **Step3:**

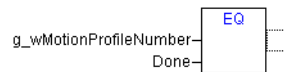
```
(* Set positioning mode to Absolute *)  
(* --> Also possible is 0 instead of Absolute *)  
g_byPositioningMode:=Absolute;  
  
(* Copy next profile to g_wOverchangeProfileNumber *)  
(* --> Also possible is the corresponding number in enum list *)  
g_wOverchangeProfileNumber:=12;
```

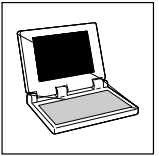
Output action **Step3:**

```
(* Deactivation of overchange *)  
g_bOverChangeEnable:=FALSE;
```

Transition **Trans3:**

(* Jump to Init step, if positioning procedure is finished (g_wMotionProfileNumber is EQUAL Done) *)

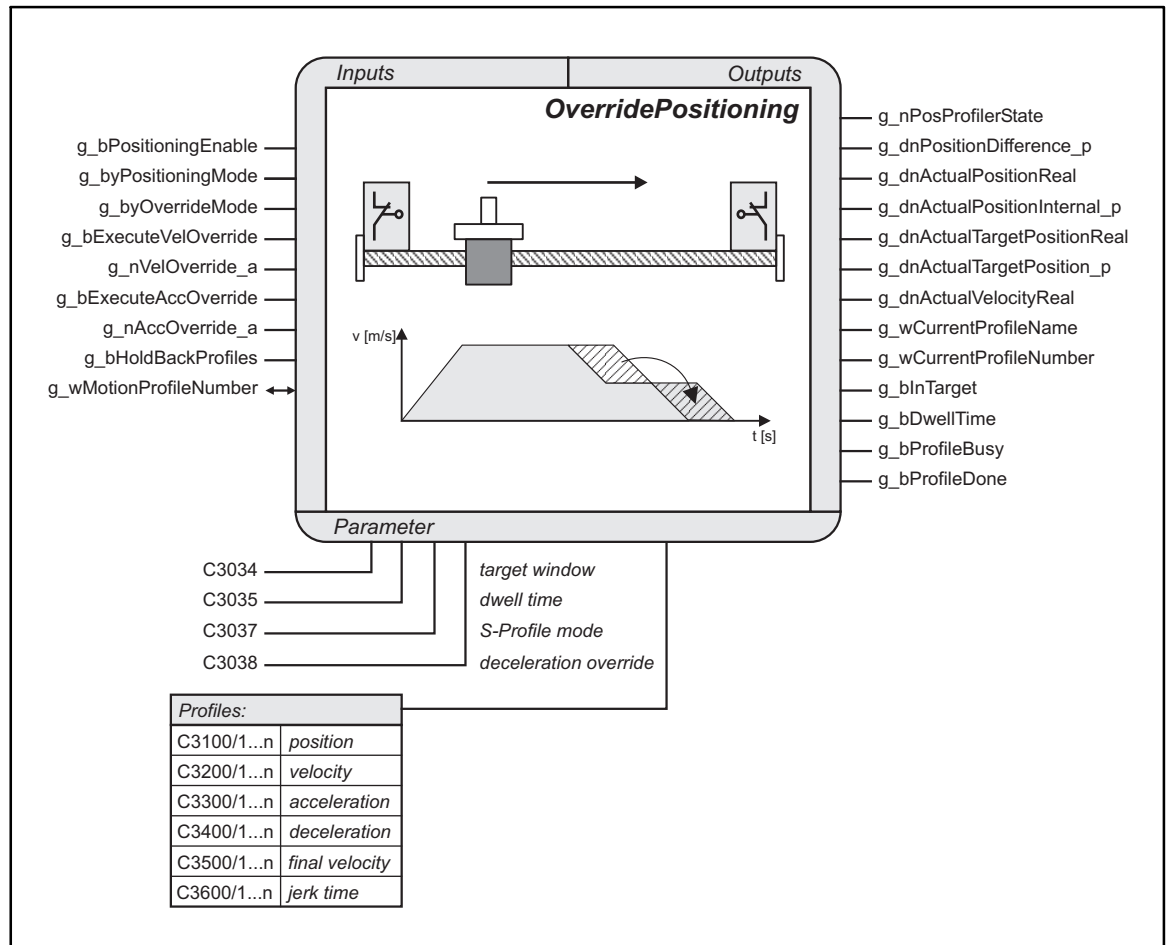




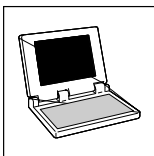
5.6.5 Function "OverridePositioning"

This template function is used to change profile parameters during positioning ("override").

- You can change speed ("Speed override") and acceleration ("Acceleration override").



⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bPositioningEnable	Bool	R / W	Enabling positioning
			TRUE Change to "Positioning"
			FALSE Cancellation of positioning, change to "StandBy"
g_byPositioningMode	Byte	R / W	Positioning mode selection
			0 Absolute positioning • Precondition: $g_bHomingDone = TRUE$ and $g_bHomePositionAvailable = TRUE$
			1 Relative positioning • Path integrators are reset before the start. • Application: Rotary tables • Precondition: $g_bHomingDone = TRUE$
			2 Constant traversing
			3 Relative positioning • max. 2147483647 increments ($2^{31} - 1$) • Path integrators are not reset before the start. • Precondition: $g_bHomingDone = TRUE$ and $g_bHomePositionAvailable = TRUE$



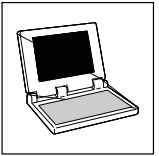
Template Positioner

States & Functions

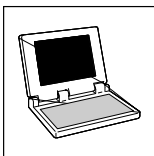
Function "OverridePositioning"

⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_byPositioningMode	Byte	R / W	Positioning mode selection (continued)
			Positioning modes with touch probe (remaining path positioning):
			10 Absolute positioning with relative remaining path positioning
			11 Relative positioning with relative remaining path positioning - Path integrators are reset before the start. - Application: Rotary tables
			12 Constant traversing with relative remaining path positioning
			13 Relative positioning with relative remaining path positioning - max. 2147483647 increments ($2^{31} - 1$) - Path integrators are not reset before the start.
			14 Absolute positioning with absolute remaining path positioning
			15 Relative positioning with absolute remaining path positioning Path integrators are not reset before the start.
g_byOverrideMode	Byte	R / W	Override mode
			0 The override values refer to the maximum speed/acceleration selected for the PLC.
			1 The override values refer to the speed/acceleration of the active profile.
g_bExecuteVelOverride	Bool	R / W	Activation of speed override
			TRUE Speed override is active.
g_nVelOverride_a	Integer	R / W	Override speed $16384 \equiv v_{\max}$ or v_{profile} (depending on the override mode)
g_bExecuteAccOverride	Bool	R / W	Activation of acceleration override
			TRUE Acceleration override is active.
g_nAccOverride_a	Integer	R / W	Override acceleration $16384 \equiv a_{\max}$ or a_{profile} (depending on the override mode)
g_bHoldBackProfiles	Bool	R / W	Completing profile processing after interruption. If profile processing has been interrupted because of a status change from "Positioning" to another status, you can use this input to select that profile processing will be completed when the drive changes to "Positioning" again.
			TRUE Profile processing is completed automatically after interruption.
			FALSE Profile processing is not automatically completed after interruption. When the drive changes to "Positioning" again, the interrupted positioning process is considered to be completed ($g_wMotionProfileNumber = Done$).

⇒ Inputs/outputs ⇒			
Identifiers	Data type	Access	Info/possible settings
g_wMotionProfileNumber	ProfileNames	R / W	Profile name - If $g_wMotionProfileNumber$ is used with a valid profile name, the positioning process starts with the profile parameters of the selected profile. - Precondition: $g_bMotionStart = TRUE$
			Display "Active" Processing of the selected profile is not completed yet.
			Display "Done" The selected profile has been processed, the drive has reached the target position.



Outputs ⇨					
Identifiers	Data type	Access	Value/meaning		
g_nPosProfilerState	Word	R	Positioning status		
			Messages:		
			0	No action	
			1	Positioning completed	
			10	Acceleration phase is active	
			11	Constant speed phase is active	
			12	Deceleration phase is active	
			13	Reversing phase is active	
			100	Reset is active	
			101	Start values are loaded	
			102	Positioning stopped	
			103	External setpoint interface activated	
			200	Touch probe positioning (remaining path positioning) completed, but no touch probe signal detected.	
			300	Overflow of the internal path integrator	
			Errors:		
			-200	Invalid profile: Parameter acceleration = 0	
			-201	Invalid profile: Parameter deceleration = 0	
			-202	Invalid profile: Parameter speed = 0	
			-210	Invalid remaining path profile: Parameter acceleration = 0	
			-211	Invalid remaining path profile: Parameter deceleration = 0	
			-212	Invalid remaining path profile: Parameter speed = 0	
-300	Positioning with the selected profile parameters is not plausible.				
g_nSetVelocity_v	Integer	R	Speed setpoint in [inc/ms] 16384 [inc] ≙15000 rpm - Only to be used for encoder systems on the motor side! If a load-side encoder system is used (gearbox factor unequal 1), speed setpoint 0 will be output		
g_dnPositionDifference_p	Double integer	R	Position difference between setpoint and actual value in [inc] 65536 [inc] ≙ 1 revolution on the motor end		
g_dnSetPosInternal_p	Double integer	R	Internal setpoint angle position in [inc] With Modulo positioning reset every time a profile is started.		
g_dnActualPositionReal	Double integer	R	Actual angle position in [unit] Output in fixed-comma format with 4 decimal positions: 1 [unit] ≙ 10000		
g_dnActualPositionInternal_p	Double integer	R	Actual angle position in [inc] 65536 [inc] ≙ 1 revolution on the motor end - The actual integrator can overflow.		
g_dnActualTargetPositionReal	Double integer	R	Target position of the current profile in [unit] Output in fixed-comma format with 4 decimal positions: 1 [unit] ≙ 10000		
g_dnActualTargetPosition_p	Double integer	R	Target position of the current profile in [inc] 65536 [inc] ≙ 1 revolution on the motor end		
g_dnActualVelocityReal	Double integer	R	Current speed in [unit/s] Output in fixed-comma format with 4 decimal positions: 1 [unit/s] ≙ 10000		
g_wCurrentProfileName	ProfileNames	R	Profile name of the active profile When the "Positioning" status is left, <i>g_wCurrentProfileName</i> is set to "Done".		
g_wCurrentProfileNumber	Word	R	Profile number of the active profile		
g_bInTarget	Bool	R	Message "Target position reached" Window definition (C3034): 5-33 <table><tr><td>TRUE</td><td>The target position is within the window defined under C3034.</td></tr></table>	TRUE	The target position is within the window defined under C3034.
TRUE	The target position is within the window defined under C3034.				
g_bDwellTime	Bool	R	Message "Dwell time over" - Reset to FALSE when positioning is started. - Definition of the dwell time (C3035): 5-34 <table><tr><td>TRUE</td><td>The dwell time set under C3035 has expired.</td></tr></table>	TRUE	The dwell time set under C3035 has expired.
TRUE	The dwell time set under C3035 has expired.				



Template Positioner

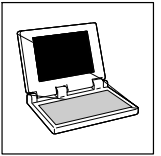
States & Functions

Function "OverridePositioning"

Outputs ⇨			
Identifiers	Data type	Access	Value/meaning
g_bProfileBusy	Bool	R	Message "Positioning is active"
			TRUE Positioning is active.
			TRUE (pulse) <i>g_bProfileBusy</i> and <i>g_bProfileDone</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.
g_bProfileDone	Bool	R	Message "Positioning has been completed"
			TRUE Positioning has been completed.
			TRUE (pulse) <i>g_bProfileDone</i> and <i>g_bProfileBusy</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.

Parameters				
Code	Sub-code	Data type	Access	Info
				Possible settings Pre-setting
C3034			R / W	Message window "Target position reached" • Window definition: 5-33 0 {1 unit} 65535 0 unit
C3035			R / W	Dwell time • Definition of the dwell time: 5-34 0 {1 ms} 65535 50 ms
C3037			R / W	Mode S-profile generation 0 Run-time-optimised 0 1 S-profile-optimised • Requires a much longer processing time • Further information 7-1
C3038			R / W	Activation of deceleration override 0 Deceleration override deactivated 0 1 The override deceleration (value at the input <i>nAcccoverride_a</i> referred to the maximum deceleration) is accepted once when the profile is started.

Profile parameters				
Code	Sub-code	Data type	Access	Info
				Possible settings Pre-setting
C3100	1 ... n		R / W	Parameter "Position" for positioning profile 1 ... n -214000.0000 {0.0001 unit} 214000.0000
C3200	1 ... n		R / W	Parameter "Speed" for positioning profile 1 ... n 0.0001 {0.0001 unit/s} 214000.0000
C3300	1 ... n		R / W	Parameter "Acceleration" for positioning profile 1 ... n 0.0001 {0.0001 unit/s ² } 214000.0000
C3400	1 ... n		R / W	Parameter "Deceleration" for positioning profile 1 ... n 0.0001 {0.0001 unit/s ² } 214000.0000
C3500	1 ... n		R / W	Parameter "Dwell time" for positioning profile 1 ... n 0.0000 {0.0001 unit/s} 214000.0000
C3600	1 ... n		R / W	Parameter "Jerk time" for positioning profile 1 ... n 0.000 {0.001 s} 10.000



Profile generator modes

Standard positioning: See function **StandardPositioning**. (▢ 5-38)

Remaining path positioning with touch probe: See function **TouchProbePositioning**. (▢ 5-50)

Positioning start

Positioning is started as follows:

1. Set *g_bPositioningEnable* from FALSE to TRUE to change from "StandBy" to "Positioning".
2. Select the positioning mode via *g_byPositioningMode*.
3. Transfer the profile name of the standard positioning profile, e.g. "Profile2" to the variable *g_wMotionProfileNumber*.
 - The corresponding positioning profile will be processed immediately.

Profile change during positioning (override)

"Override" means a change of profile parameters and their acceptance during positioning.

The geometry of the traversing profile changes through an override to ensure exact positioning even if the speed is changed during positioning (speed override):

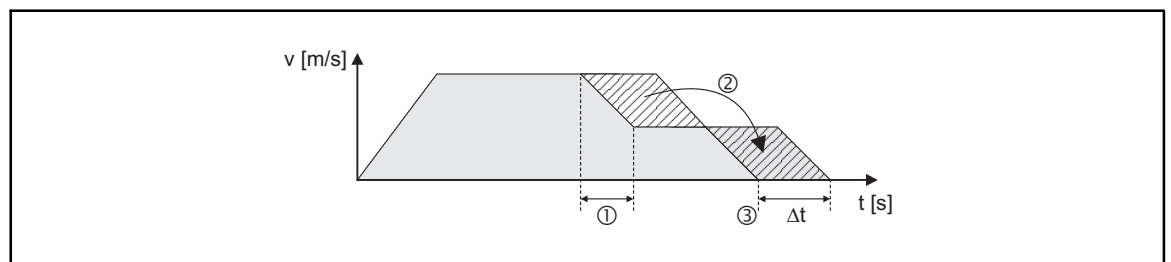


Fig. 5-14

Override (here: speed override)

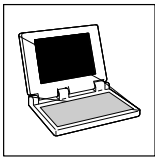
- ① Speed is reduced during positioning.
- ② The defined position can only be reached if the missing area is "added" to the profile.
- ③ The reduced speed results in a longer positioning process (Δt).



Note!

Speed and acceleration override have no effect during deceleration because the target position would not be reached if the selected deceleration ramp was changed during deceleration!

During positioning, the braking distance is continuously calculated from the current speed and the selected deceleration ramp. If the braking distance equals the remaining path to the target position the drive brakes along the selected deceleration ramp.



Template Positioner

States & Functions

Function "OverridePositioning"

Definition of the reference values for override

The reference for the override values is defined under *g_byOverrideMode*:

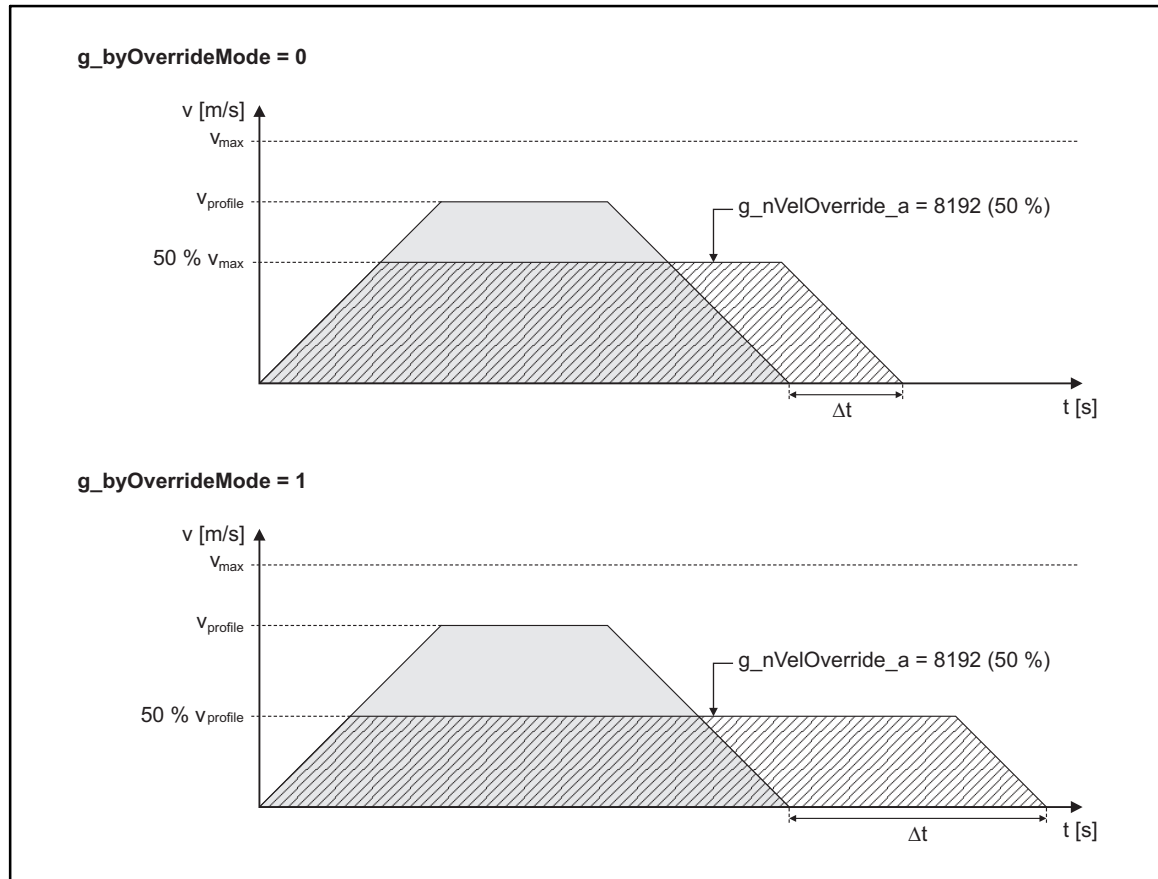


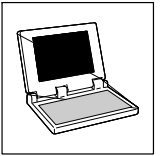
Fig. 5-15

Definition of the reference value for override (here: speed override)



Tip!

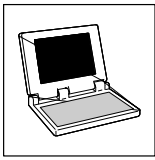
Override mode "1" can be used to reduce the clock pulse rate of the tool, e.g. for machine set-up. In this mode, the profile remains unchanged, only profile processing takes longer.



Execution of override

- The speed override is activated by setting *g_bExecuteVelOverride* to TRUE.
- The acceleration override is activated by setting *g_bExecuteAccOverride* to TRUE.
- The reference for the override values is defined via *g_byOverrideMode*.
- The speed override is selected via the input *g_nVelOverride_a*, the acceleration override via the input *g_nAccOverride_a*:

"Override" parameters			
Identifiers	Data type	Info/possible settings	
<i>g_nVelOverride_a</i>	Integer	1 ... 16384	Speed • Speed overrides are only effective during acceleration and constant traversing (trapezium). • If a speed override is executed during constant traversing the drive decelerates or accelerates until the new speed is reached. The current profile parameters are used for acceleration/deceleration. If an acceleration override is activated in addition the drive accelerates with the new acceleration value. <i>g_byOverrideMode</i> = 0 • Value refers to $v_{\max}$ (selected max. speed) • 16384 $\equiv v_{\max}$ <i>g_byOverrideMode</i> = 1 • Value refers to v_{profile} (speed of the active profile) • 16384 $\equiv v_{\text{profile}}$
<i>g_nAccOverride_a</i>	Integer	1 ... 16384	Acceleration • Acceleration overrides are only effective in the acceleration phase. <i>g_byOverrideMode</i> = 0 • Value refers to $a_{\max}$ (selected max. acceleration) • 16384 $\equiv a_{\max}$ <i>g_byOverrideMode</i> = 1 • Value refers to a_{profile} (acceleration of the active profile) • 16384 $\equiv a_{\text{profile}}$



Template Positioner

States & Functions

Function "OverridePositioning"

Code C3038 can be used to activate the deceleration override. If the deceleration override is activated (C3038= 1), the override deceleration (value at the input *nAccoverride_a* referred to the maximum deceleration) is accepted once when the profile is started. During the subsequent course of the positioning process, the profile deceleration will not be changed again.

Parameters				
Code	Sub-code	Data type	Access	Info
				Possible settings
C3038			R / W	Activation of deceleration override
				0
				1



Tip!

If an override is activated changes at the inputs *g_nVelOverride_a* or *g_nAccOverride_a* **will have a direct effect** on the profile.

If the override is deactivated by resetting *g_bExecuteVelOverride* to FALSE or *g_bExecuteAccOverride* to FALSE profile processing will be completed with the current speed value.

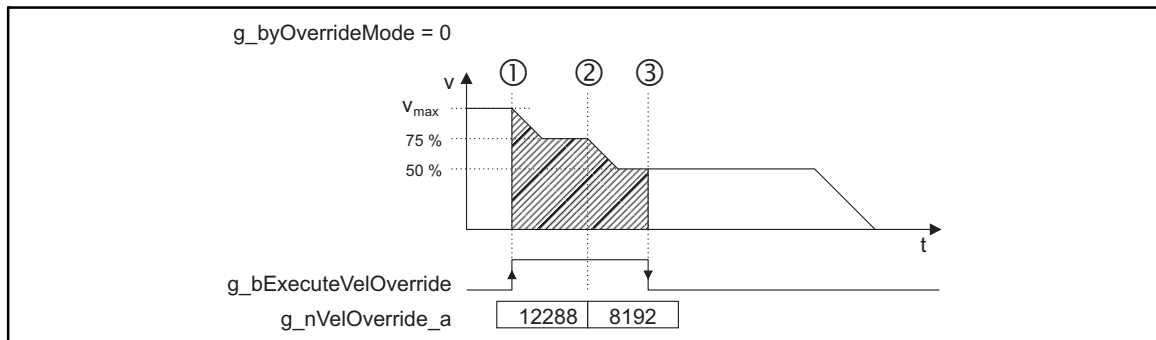
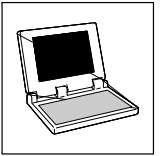


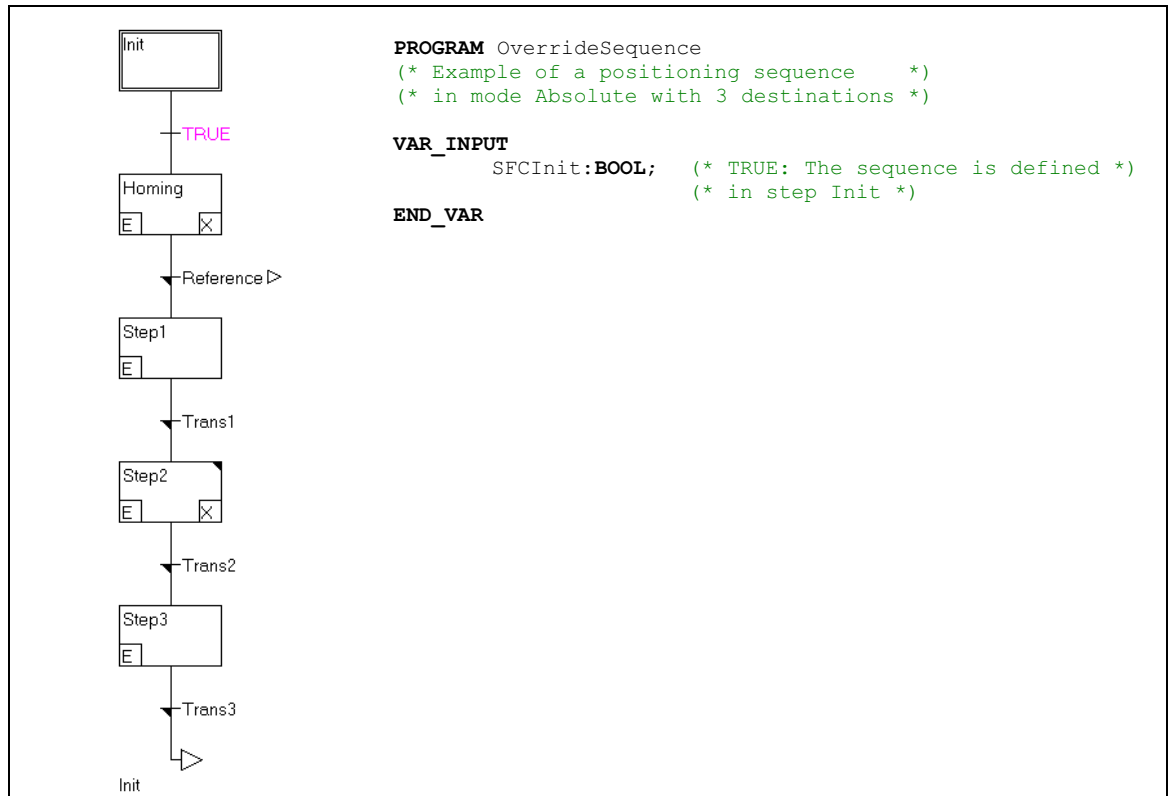
Fig. 5-16

Override (here: speed override)

- ① Speed override is activated (*g_bExecuteVelOverride* = TRUE);
Speed is reduced to 75 % of v_{max} (*g_nVelOverride_a* = 12288)
- ② Speed is once again reduced to 50% of v_{max} (*g_nVelOverride_a* = 8192)
- ③ Speed override is deactivated (*g_bExecuteVelOverride* = FALSE)



Example sequencer "OverrideSequence"



Input action Homing:

```

(* Ensure that the reference is known in mode Absolute *)

(* No reference ? *)
IF NOT g_bHomePositionAvailable THEN

    (* Reset of status positioning *)
    g_bPositioningEnable:=FALSE;

    (* Homing start *)
    g_bHomingStart:=TRUE;
END_IF
    
```

Output action Homing:

```

(* First, jump to template status positioning *)
g_bPositioningEnable:=TRUE;
    
```

Transition ReferenceOk:

Comment: IF Reference is known, jump TO next step (g_bHomePositionAvailable EQUAL TRUE ?)

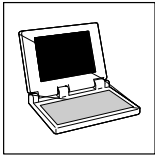


Input action Step1:

```

(* Set positioning mode to Absolute *)
(* --> Also possible is 0 instead of Absolute *)
g_byPositioningMode:=Absolute;

(* Copy 1st profile to g_wMotionProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
g_wMotionProfileNumber:=Profile7;
    
```



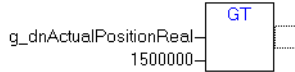
Template Positioner

States & Functions

Function "OverridePositioning"

Transition Trans1:

Comment: Jump TO the next step, where override procedure is activated during positioning procedure in progress. The transition is TRUE, IF actual position is greater than a defined LIMIT.



Input action Step2:

```
(* Override mode limits the override values to their maximum axis parameters *)
g_byOverrideMode:= 0;

(* Activation of speed override *)
g_bExecuteVelOverride:=TRUE;

(* Activation of acceleration override *)
g_bExecuteAccOverride:=TRUE;
```

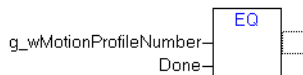
Output action Step2:

```
(* Deactivation of speed override *)
g_bExecuteVelOverride:=FALSE;

(* Deactivation of acceleration override *)
g_bExecuteAccOverride:=FALSE;
```

Transition Trans2:

Comment: Jump TO the next step, IF positioning procedure is finished (g_wMotionProfileNumber is EQUAL Done)



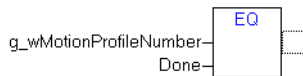
Input action Step3:

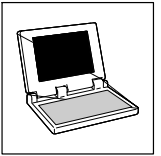
```
(* Set positioning mode to Absolute *)
(* --> Also possible is 0 instead of Absolute *)
g_byPositioningMode:=Absolute;

(* Copy 3rd profile to g_wMotionProfileNumber *)
(* --> Also possible is the corresponding number in enum list *)
g_wMotionProfileNumber:=Profile8;
```

Transition Trans3:

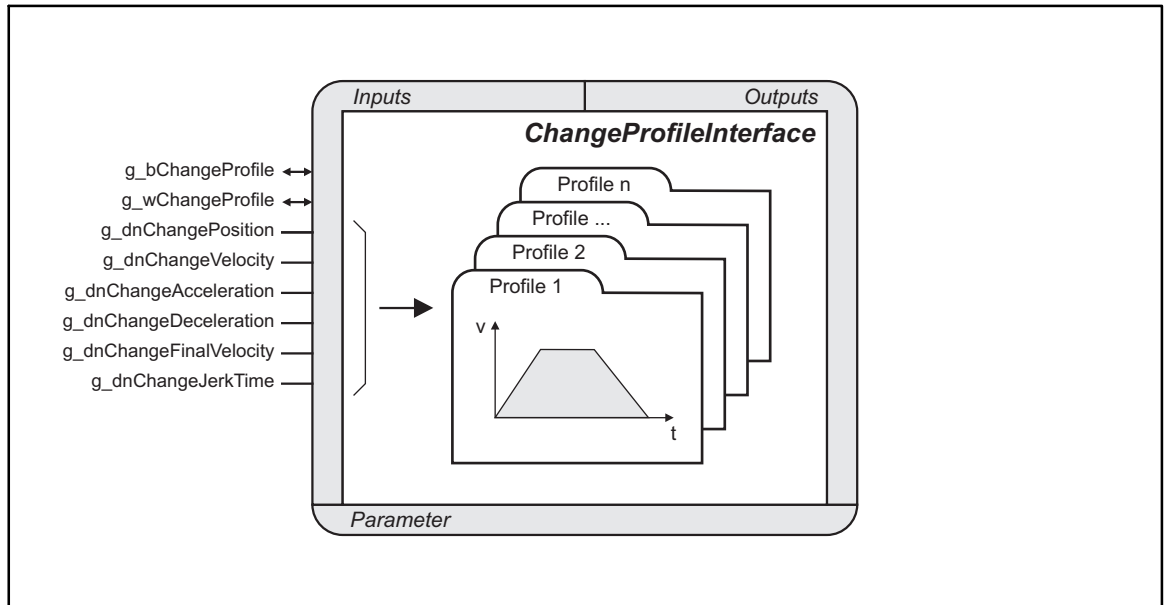
Comment: Jump TO the next step, IF positioning procedure is finished (g_wMotionProfileNumber is EQUAL Done)





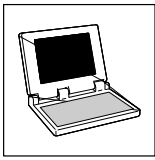
5.6.6 Function "ChangeProfileInterface"

With this template function the parameters of a profile can be changed.



⇒ Inputs/outputs ⇒			
Identifiers	Data type	Access	Info/possible settings
g_bChangeProfile	Bool	R / W	Writing of profiles - Possible with "Stand By", "Homing", "Manual Jog" and "PositioningOperation". - If writing has been successful, g_bChangeProfile and g_wChangeProfile will be set to "0". FALSE → TRUE The profile indicated in g_wChangeProfile is written with the parameters indicated under - g_dnChangePosition, - g_dnChangeVelocity, - g_dnChangeAcceleration and - g_dnChangeDeceleration - g_dnChangeFinalVelocity - g_dnChangeJerkTime
g_wChangeProfile	ProfileNames	R / W	Name of the profile which is written with a FALSE-TRUE transition at g_bChangeProfile. If writing with g_bChangeProfile has been successful g_wChangeProfile is set to "0".

⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_dnChangePosition	Double integer	R / W	Parameter "Position" for a profile change with g_bChangeProfile In [unit] * 10000
g_dnChangeVelocity	Double integer	R / W	Parameter "Speed" for a profile change with g_bChangeProfile - In [unit/s] * 10000 0 = no parameter change in the target profile.
g_dnChangeAcceleration	Double integer	R / W	Parameter "Acceleration" for a profile change with g_bChangeProfile - In [unit/s²] * 10000 0 = no parameter change in the target profile.
g_dnChangeDeceleration	Double integer	R / W	Parameter "Deceleration" for a profile change with g_bChangeProfile - In [unit/s²] * 10000 0 = no parameter change in the target profile.

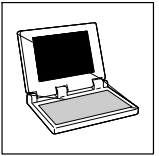


Template Positioner

States & Functions

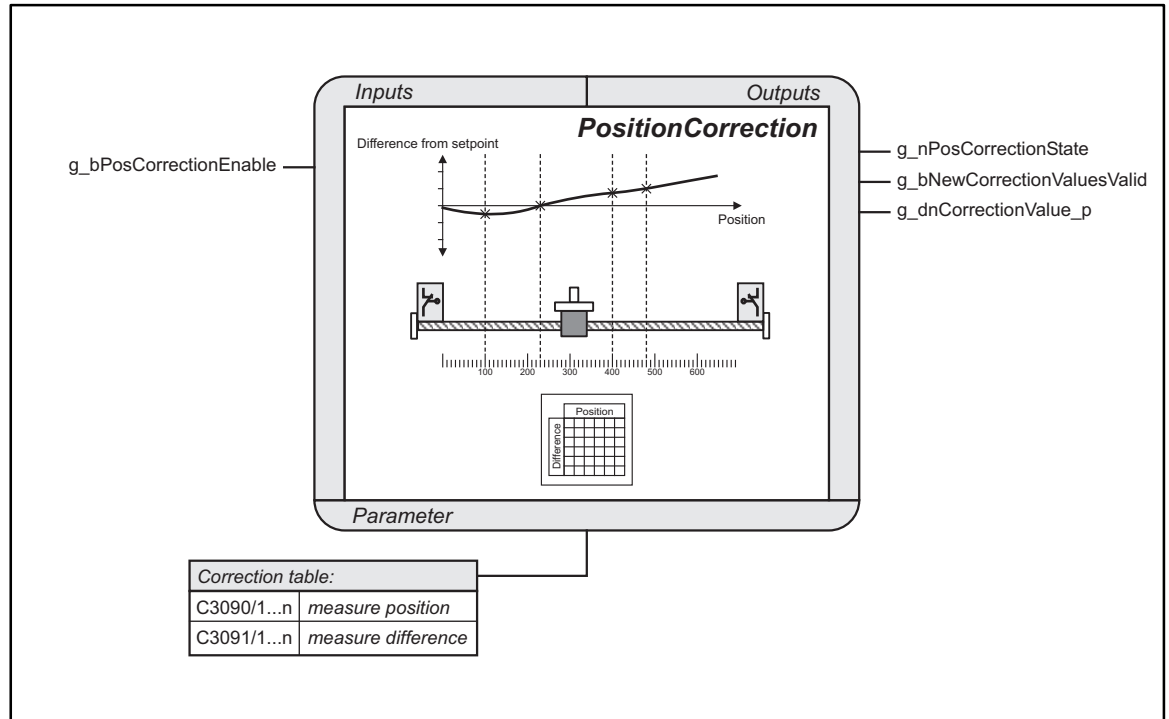
Function "ChangeProfileInterface"

⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_dnChangeFinalVelocity	Double integer	R / W	Parameter "Final speed" for a profile change with <i>g_bChangeProfile</i> • In [unit/s] * 10000 • 0 ≡ no parameter change in the target profile.
g_dnChangeJerkTime	Double integer	R / W	Parameter "Jerk time" for a profile change with <i>g_bChangeProfile</i> • In [ms] • 0 ≡ no jerk limitation.



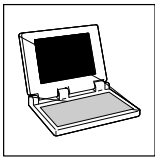
5.6.7 Function "PositionCorrection"

This template function is used to compensate linearity errors at feed mechanisms (e.g. leadscrews) or measuring systems by means of a table of correction values.



⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bPosCorrectionEnable	Bool	R / W	Activation of position correction
			TRUE Position correction is activated.

Outputs ⇒			
Identifiers	Data type	Access	Value/meaning
g_nPosCorrectionState	Integer	R	Status of position correction
			0 Ok
			10 Number of measured values is no 2 ⁿ -value, the corrective calculation is not precise.
g_bNewCorrectionValuesValid	Bool	R	20 Position correction is deactivated. (g_bPosCorrectionEnable = FALSE)
			Message output "Calculation has been completed"
			FALSE Calculation of correction values has not been completed yet. Do not start positioning while calculation is in process.
g_dnCorrectionValue_p	Double integer	R	TRUE Calculation of correction values has been completed.
			Correction value (interpolated position correction value)



Template Positioner

States & Functions

Function "PositionCorrection"

Parameters					
Code	Sub-code	Data type	Access	Info	
				Possible settings	Pre-setting
C3090	1 ... n		R / W	Correction position 1 ... n	
				-214000.0000 {0.0001 unit} 214000.0000	0 unit
C3091	1 ... n		R / W	Position correction value 1 ... n	
				-214000.0000 {0.0001 unit} 214000.0000	0 unit

Creation of the measured-value table

For this, different measuring points are approached along the axis and the deviations from the selected setpoint positions are measured by means of a reference measuring system (e.g. laser measuring system):

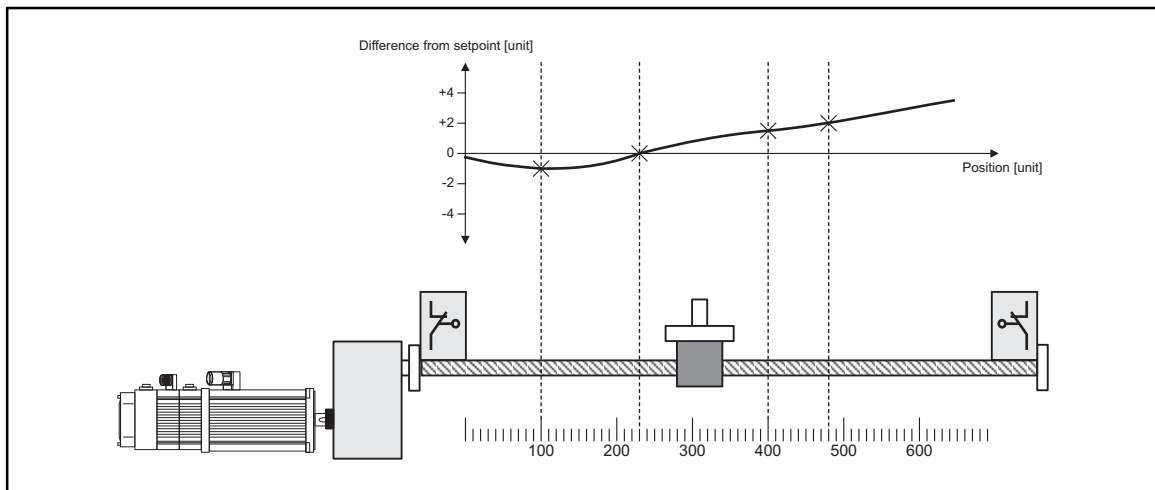


Fig. 5-17

Measurement of position errors at different measuring points

The measured values can be entered into a table:

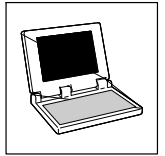
Measurement No.	Approached setpoint position φ_{set}	Deviation from the setpoint position $\Delta\varphi = \varphi_{\text{act}} - \varphi_{\text{set}}$
1	100 [unit]	-1.00 [unit]
2	230 [unit]	0.00 [unit]
3	400 [unit]	1.80 [unit]
4	480 [unit]	2.00 [unit]
...	...	...
n	___ [unit]	___ [unit]

Definition of the number of measuring points

The number of available sub-codes and thus the number of measuring points is defined under the variable *C_byNumberOfPosCorrectionValues*.

(Object Organizer/register **Resources** → folder **Global variables** → folder **TemplateInterface** → variable list **VarTemplateSettings (CONSTANT)**)

- The variable has been preset to "16", i.e. the sub-codes for 16 measuring points are already available.
- Only 2ⁿ-values are permissible, i.e. 2, 4, 8, 16, 32, ...
- If you change the number of profiles, the corresponding sub-codes will be available after the compilation.



Entry of measured values

The measured values of the correction table can be transferred to the sub-codes of parameters C3090 and C3091:

Measurement No.	Approached setpoint position			Deviation from the setpoint position		
	φ_{set}	C3090		$\Delta\varphi = \varphi_{\text{act}} - \varphi_{\text{set}}$	C3091	
		Sub-code	Parameters*		Sub-code	Parameters*
1	100 [unit]	1	1000000	-1.00 [unit]	1	-10000
2	230 [unit]	2	2300000	0.00 [unit]	2	0
3	400 [unit]	3	4000000	1.80 [unit]	3	18000
4	480 [unit]	4	4800000	2.00 [unit]	4	20000
...	...	...	...	...	...	...
n	___ [unit]	n	___	___ [unit]	n	___

* The parameters are entered in fixed-comma format with 4 decimal positions

The **Parameter monitor** can be used to enter the measured-values into the corresponding sub-codes:

1. Ensure that you are logged in.
2. Use the **Parameter monitor** (*Object Organizer* → register **Resources**) and select the folder **Individual IEC1131 codes** → **POUPositionCorrection**.
3. Enter the corresponding values into the code.



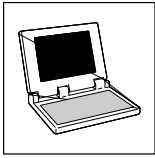
Caution!

A repeated program download overwrites the code settings with the initialisation values!



Notes

- The measuring positions need not be equidistant. You need not start at measuring position "0".
- The measuring positions have to be entered in ascending order.
- Only 2^n -values are permissible for the number of measuring points, i.e. 16, 32, 64, etc.
- The computing time increases linearly with the number of measuring points. To save computing time, an adequate number of measuring points should be selected under *C_byNumberOfPosCorrectionValues*.



Template Positioner

States & Functions

Function "PositionCorrection"

Calculation of correction values

If the feed correction is activated, the FB calculates a correction value which is subtracted from the setpoint position. If the setpoint position is between two measured values, the deviation and the corresponding correction value will be determined through interpolation.

The below figure describes the interpolation method for the calculation of the corrected position value between two interpolation points $P_{(n-1)}$ and $P_{(n)}$ with: $P_{(n)} > P_{(n-1)}$

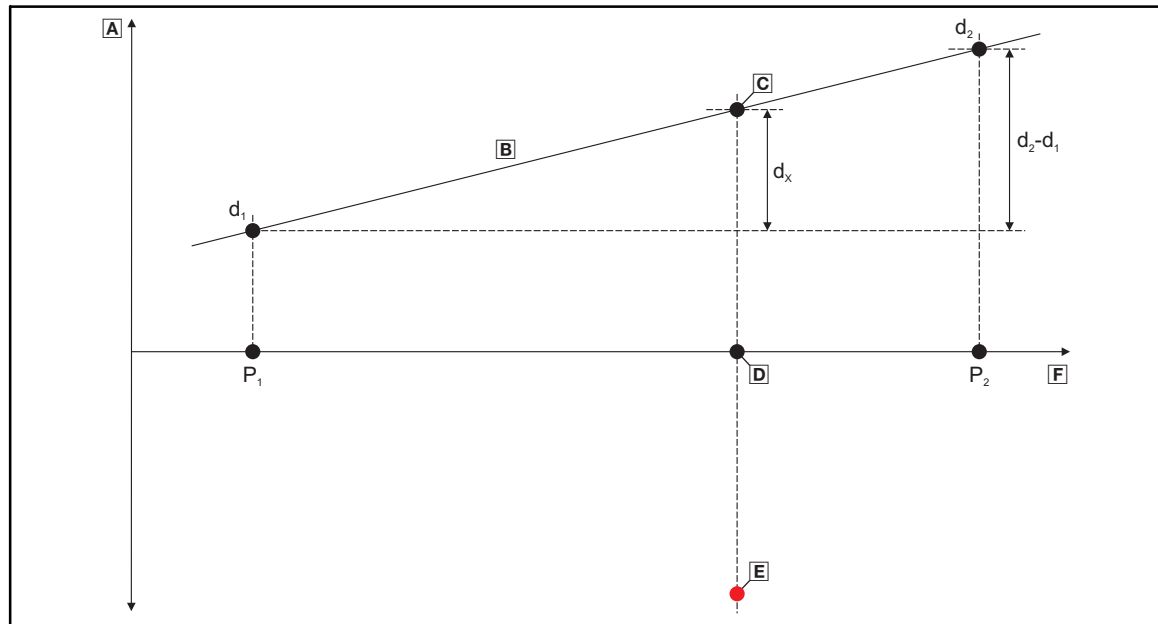


Fig. 5-18

Interpolation method

- A** Position error
- B** Error interpolation line
- C** Correction value
- D** Setpoint position
- E** Corrected position value
- F** Measuring position

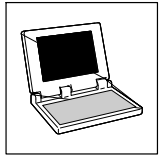
Line gradient (error interpolation line B)	$= \frac{d_2 - d_1}{P_2 - P_1}$
d_x	$= \text{Line gradient} \cdot (\text{Setpoint position} - P_1)$ $= \frac{d_2 - d_1}{P_2 - P_1} \cdot (\text{Setpoint position} - P_1)$
Correction value C	$= d_x + d_1$ $= \frac{d_2 - d_1}{P_2 - P_1} \cdot (\text{Setpoint position} - P_1) + d_1$
Corrected position value E	$= \text{Setpoint position} - \text{Correction value}$ $= \text{Setpoint position} - \left(\frac{d_2 - d_1}{P_2 - P_1} \cdot (\text{Setpoint position} - P_1) + d_1 \right)$



Note!

The correction value is calculated by multiplying $(d_2 - d_1)$ and $(P_2 - P_1)$.

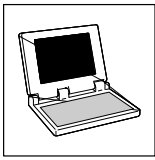
The result of the multiplication $(d_2 - d_1) \times (P_2 - P_1)$ must not be higher than $2^{31} - 1$ or lower than -2^{31} . Otherwise, an internal overflow will occur and the interpolation result will not be correct!



5.7 Parallel processes "PosFunctions"

The following function runs in parallel to the status machine and can therefore be executed in every status:

Function	Info	
TemplateControl	Trouble-shooting and status check	 5-78



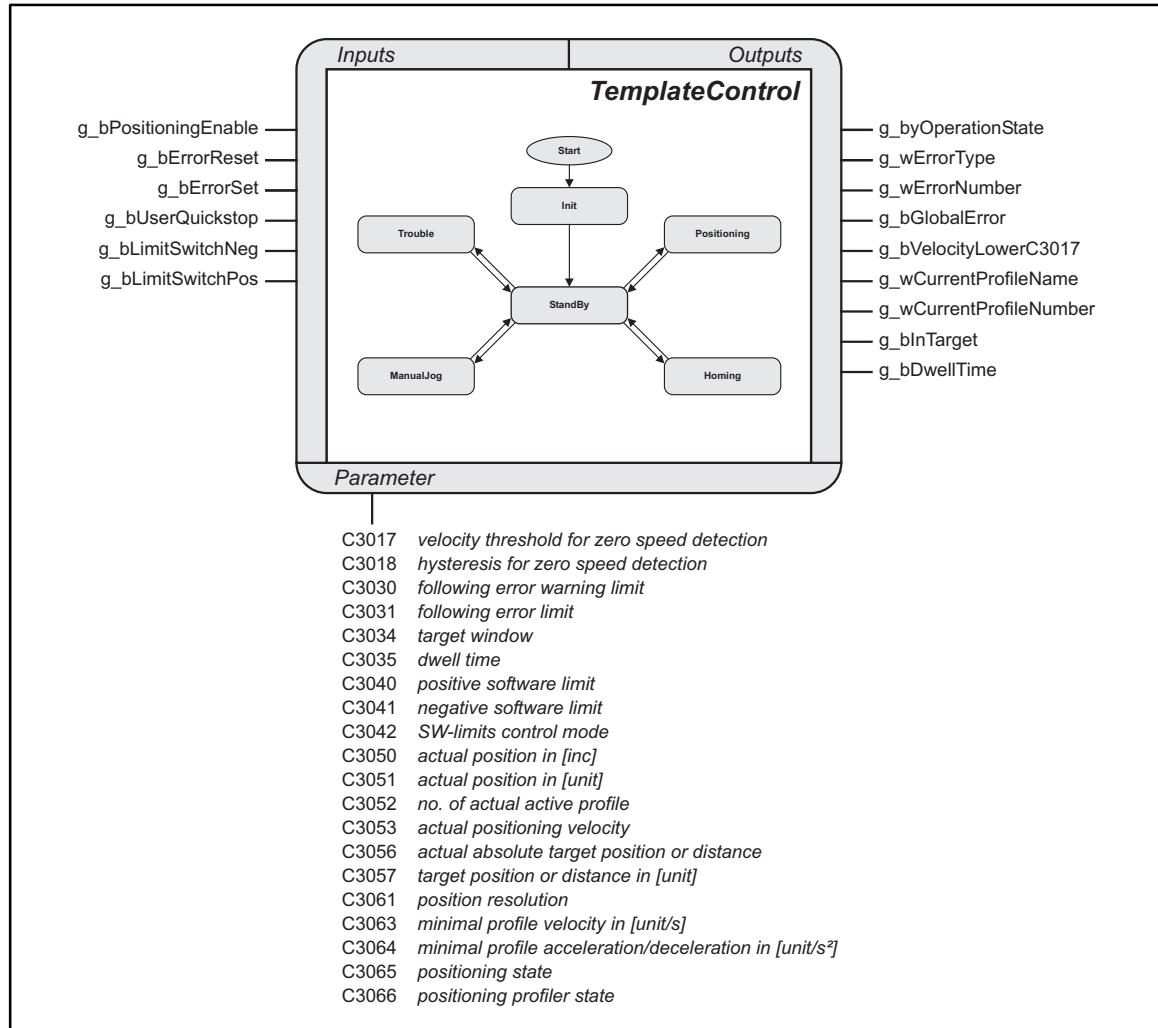
Template Positioner

States & Functions

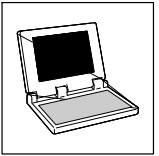
Function "TemplateControl"

5.7.1 Function "TemplateControl"

This template function is used to enter cross-function settings and check the status messages of the template.

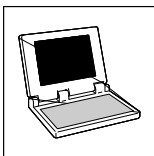


⇒ Inputs				
Identifiers	Data type	Access	Info/possible settings	
g_bPositioningEnable	Bool	R / W	Enabling positioning	
			TRUE	Change to "Positioning"
			FALSE	Cancellation of positioning, change to "StandBy"
g_bErrorReset	Bool	R / W	Reset of template-internal and user-defined errors	
			If the variable <i>g_bErrorResetEqTripReset</i> is set to TRUE a TRIP reset will be carried out together with the error reset. See variable list "VarTemplateSettings (constant)".	
			TRUE	Error reset
g_bErrorSet	Bool	R / W	Change to "Error" if one of the messages configured through the FB FWM is active.	
			- The variables can be set by means of the "Set" instruction. - They are automatically reset to FALSE by the template.	
			TRUE	Change to "Trouble"
g_bUserQuickstop	Bool	R / W	User quick stop (quick stop of the drive system)	
			TRUE	Activates user quick stop
g_bLimitSwitchNeg	Bool	R / W	Input for limit switch (negative)	
			TRUE	Limit switch reached



⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bLimitSwitchPos	Bool	R / W	Input for limit switch (positive)
			TRUE Limit switch reached

Outputs ⇒			
Identifiers	Data type	Access	Value/meaning
g_byOperationState	OperationMode	R	Display of the main template states
			0 Status "StandBy"
			• Status from which the drive changes to all other states.
			1 Status "Trouble"
			20 Status "ManualJog"
			30 Status "Homing"
			40 Status "Positioning"
g_wErrorType	ErrorReaction	R	Display of the error type
			0 Error (TRIP)
			1 Message
			2 Warning
			3 Error with quick stop of the drive system (FAIL-QSP)
			4 Ready, drive is ready (no error - RDY)
g_wErrorNumber	ErrorCode	R	Display of the error name
			• See <i>Object Organizer</i> .
			Register Data types → folder UserDataTypes → ErrorCode (ENUM)
g_bGlobalError	Bool	R	Message "Error"
			TRUE An error has occurred and the template has changed to "Trouble".
g_bVelocityLowerC3017	Bool	R	Display if speed < threshold value for zero speed detection (C3017)
			TRUE Speed < threshold for zero speed detection
g_wCurrentProfileName	ProfileNames	R	Profile name of the active profile
			• When the "Positioning" status is left, <i>g_wCurrentProfileName</i> is set to "Done".
g_wCurrentProfileNumber	Word	R	Profile number of the active profile
g_bInTarget	Bool	R	Message "Target position reached"
			• Window definition (C3034): 5-33
			TRUE The target position is within the window defined under C3034.
g_bDwellTime	Bool	R	Message "Dwell time over"
			• Reset to FALSE when positioning is started.
			• Definition of the dwell time (C3035): 5-34
			TRUE The dwell time set under C3035 has expired.



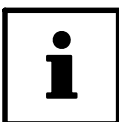
Template Positioner

States & Functions

Function "TemplateControl"

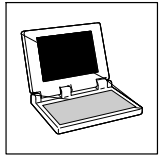
Parameters				
Code	Sub-code	Data type	Access	Info
				Possible settings Pre-setting
C3017			R / W	Threshold for zero speed detection 0.0000 {0.0001 unit/s} 214000.0000 0 unit/s
C3018			R / W	Hysteresis for zero speed detection 0.00 {0.01 %} 100.00 0.10 %
C3030			R / W	Following error warning limit 0.0000 {0.0001 unit} 214000.0000 0 unit
C3031			R / W	Following error limit 0.0000 {0.0001 unit} 214000.0000 0 unit
C3034			R / W	Message window "Target position reached" • Window definition: 5-33 0 {1 unit} 65535 0 unit
C3035			R / W	Dwell time • Definition of the dwell time: 5-34 0 {1 ms} 65535 50 ms
C3040			R / W	Positive software limit position • The value entered under C3040 must not be lower than the value in C3041. Otherwise, FAIL-QSP is activated and the drive changes to "Trouble". -214000.0000 {0.0001 unit} 214000.0000 0 unit 0 = Software limit position deactivated
C3041			R / W	Negative software limit position • The value entered under C3041 must not be higher than the value in C3040. Otherwise, FAIL-QSP is activated and the drive changes to "Trouble". -214000.0000 {0.0001 unit} 214000.0000 0 unit 0 = Software limit position deactivated
C3042			R / W	Mode of software limit position monitoring 5-83 0 Current setpoint position + selected direction of motion 0 1 Current actual position

Note: The acceptance of new settings under C3030, C3031, C3034, C3035, C3040 and C3041 requires a status change to "StandBy"!



Tip!

The [unit] is to be entered in fixed-comma format with 4 decimal positions, i.e. 1 [unit] = 10000.



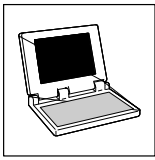
The following parameters can only be read:

Parameters (only display)			
Code	Data type	Access	Info
C3050		R	Current position in [inc]
C3051		R	Current position in [unit]
C3052		R	Number of the active positioning profile
C3053		R	Current speed in [unit/s]
C3056		R	Current absolute target position or distance in [inc]
C3057		R	Target position or distance in [unit]
C3061		R	Position resolution in [inc/unit]
C3063		R	Minimum profile speed in [unit/s]
C3064		R	Minimum acceleration/deceleration in [unit/s ²]
C3065		R	Positioning status 0 StandBy 1 Trouble 20 ManualJog 30 Homing 40 Positioning
C3066		R	Profile generator status 15700 InvProfPar 15788 ProfAuxVelEq0 15789 ProfAuxDecEq0 15790 ProfAuxAccEq0 15798 ProfVelEq0 15799 ProfDecEq0 15800 ProfAccEq0 16000 NoAction 16001 PosDone 16010 Acceleration 16011 ConstSpeed 16012 Deceleration 16013 Reversing 16100 ResetActive 16101 LoadStartVal 16102 AbortActive 16103 ExtSetVal 16300 NoTPDetected

5.7.1.1 Evaluation of user quick stops (UserQuickstop)

During traversing, quick stop can be activated by setting $g_bUserQuickstop = TRUE$, i.e. the drive brakes along the set quick stop ramp to standstill and changes to "StandBy".

- The quick stop ramp can be set under the corresponding motor control parameters (e.g. C0105 with the ECSxA axis module).



Template Positioner

States & Functions

Function "TemplateControl"

5.7.1.2 Monitoring of following errors

The following error monitoring is configured under the parameters C3030 and C3031.



Note!

The acceptance of new settings in C3030/C3031 requires a status change to "StandBy"!

Following error warning limit (C3030)

If the difference between setpoint and actual position is higher than the value selected under C3030 a following error warning is activated.

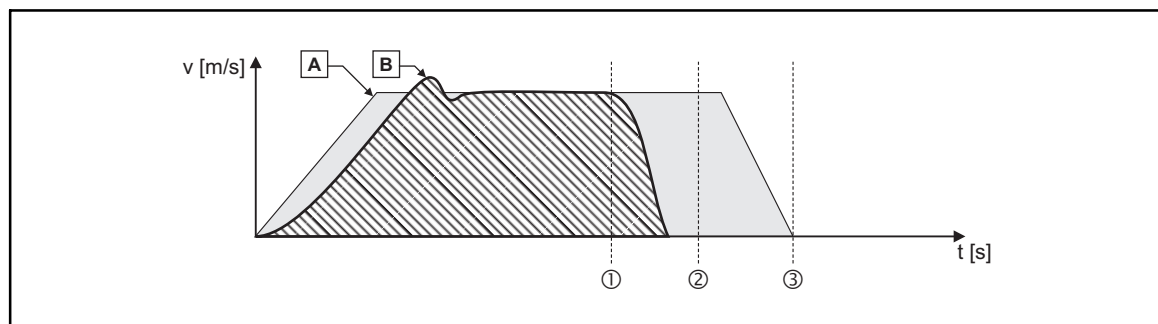


Fig. 5-19

Following error

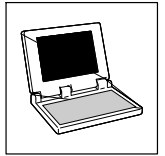
- A Setpoint profile
- B Processed profile
- ① The drive decelerates, a difference occurs between setpoint and actual position.
- ② The difference between setpoint and actual position is higher than the value selected under C3030 ⇒ following error.
- ③ Setpoint profile has been processed.

- If "Positioning" is active processing of the next profile will not be started and the variable *g_wMotionProfileNumber* will remain "Active" until the following error has been removed (actual position monitoring).
g_wMotionProfileNumber will only be set to "Done" if the following error has been removed and profile processing has been completed.
- In all other states, the following error warning will only be indicated in the variables *g_byErrorType* and *g_wErrorNumber*.

Following error limit (C3031)

If the difference between setpoint and actual position is higher than the value selected under C3031 the drive brakes along the set quick stop ramp to standstill and changes to "Trouble".

- The quick stop ramp can be set under the corresponding motor control parameters (e.g. C0105 with the ECSxA axis module).
- Following errors are monitored in all movement states of the drive.



5.7.1.3 Checking the traversing range by means of software limit positions

Software limit positions are position labels which limit the traversing range of the tool to ensure that the hardware limit positions (limit switches) are not activated.



Stop!

If the software limit positions are **not** set the drive can reach its mechanical limits and parts of the machine can be damaged or destroyed!

The software limit positions are selected under the parameters C3040 (positive software limit position) and C3041 (negative software limit position). The software limit positions refer to the home position.



Note!

- The acceptance of new settings in C3034/C3041 requires a status change to "StandBy"!
- The value for the positive software limit position must be higher than the value for the negative software limit position. Otherwise, FAIL-QSP (error number 417) is activated and the drive changes to "Trouble".
- FAIL-QSP is also activated if the home position is known in "Speed" mode and a software limit position is reached.
- If the parameters C3040/C3041 are set to "0" the software limit positions have **not** been set.

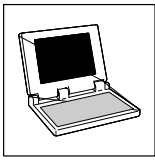
Monitoring operating principle

- Before a positioning process is started, the monitoring system checks whether the target position is within the valid traversing range defined by the software limit positions. If this is not the case, the positioning process will not be started and an error message will be output.
- If the current position is outside the software limit positions and the software limit positions are monitored in a setpoint-based mode (C3042 = 0), the selected motion direction of the drive is checked in addition to the position. If the drive is at standstill or the tool is to move towards the permissible positioning range, no error is generated. Only if the tool is to move away from the valid traversing range, an error message is output and QSP is triggered.
- If the software limit positions are monitored in an actual-value-based mode (C3042 = 1), the current actual position of the drive is checked. If the current actual position is outside the permissible positioning range, an error message is output and QSP is triggered.
- When an error has been generated, the state changes to "Trouble". By acknowledging the error, you return to the "StandBy" state, from where you can start a new positioning process.
- In the "ManualJog" state, the software limit positions cannot be overtravelled because the drive positions to the corresponding software limit position in this state.

When is the monitoring deactivated?

The monitoring of the software limit positions is deactivated if ...

- both software limit positions (C3040/C3041) are set to "0".
- the reference is not known (*g_bHomePositionAvailable* = FALSE).
- a homing run is executed.
- positioning is executed via the external software interface and the software limit positions are monitored in an actual-value based mode (C3042 = 1).



Template Positioner

States & Functions

Function "TemplateControl"

5.7.1.4 Evaluation of hardware limit positions (limit switches)

Use the variables `g_bLimitSwitchNeg` and `g_bLimitSwitchPos` for a fail-safe (LOW active) evaluation of the hardware limit positions (limit switches).

- If limit switches are used transfer the addresses of the inputs for the limit switches to the variables:

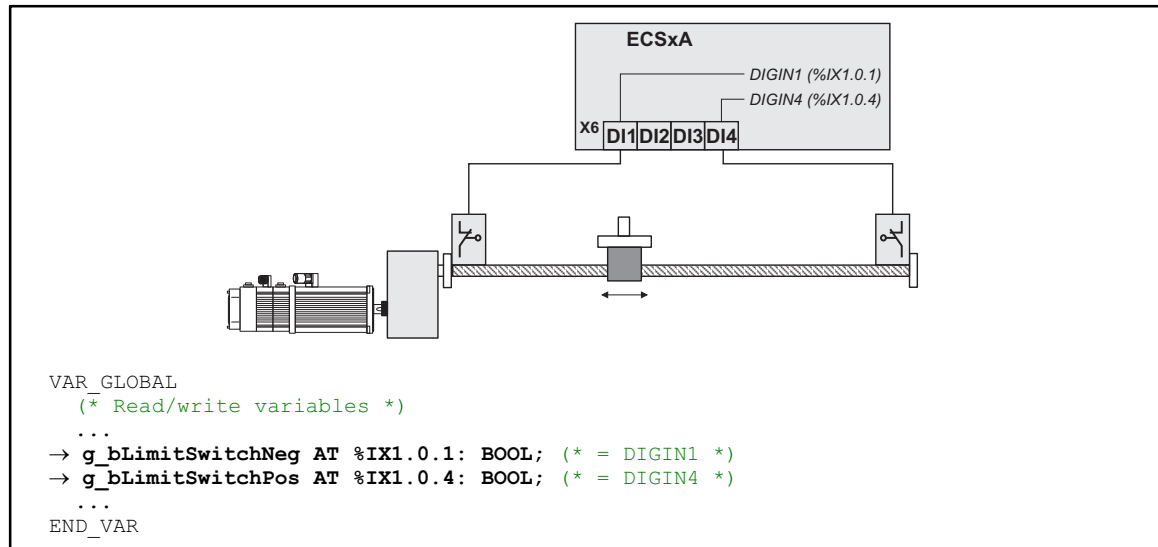
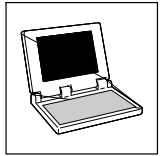


Fig. 5-20

Example: Limit switch at input DI1/DI4 of the ECSxA axis module and address transfer to the corresponding variables.

- If the drive reaches a limit switch in "ManualJog", it brakes along the set quick stop ramp to standstill and the message "Fail_QSPNegLimitSwitch" or "Fail_QSPPosLimitSwitch" is indicated. The drive changes to "Trouble".
 - The quick stop ramp can be set under the corresponding motor control parameters (e.g. C0105 with the ECSxA axis module).
- In "Homing" the drive reverses when a limit switch is reached.



6 Program Organisation Units (POUs)

The template includes the following POUs. They can be adapted and extended:

- The POU **UserErrors (PRG)** to eliminate user-defined errors.
- The POU **UserInterface (PRG)** to program the positioning logic. (6-3)

6.1 Troubleshooting - POU "UserErrors"

This POU is used to eliminate user-defined errors by means of the function block **FWM**.



Tip!

The FB **FWM** is used to transmit error messages to the PLC.

- With the FB it is possible to activate TRIP, FAIL-QSP, message or warning in the PLC directly by the PLC program.

The POU **UserErrors (PRG)** can be found in the register **Organization units** → folder **UserExtensions** → folder **UserPOUs** of the *Object Organizer* and already includes an example network:

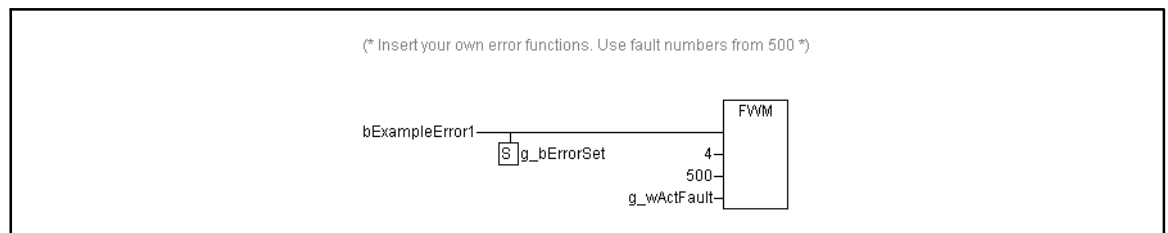
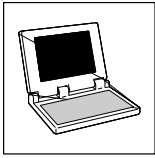


Fig. 6-1

Example network in the POU "UserErrors (PRG)" with an instance of the FB **FWM**

- In the example network, *bExampleError* is the variable for error detection, i.e. this variable activates the configured error by means of a high signal at the input *bExecute* of the FB **FWM**.
- If an error occurs the global template variable *g_bErrorSet* is set to TRUE.
- The error type is set via the input *byTypeOfFault* of the FB **FWM** (0 = TRIP, 1 = message, 2 = warning, 3 = switched off, 4 = FAIL-QSP).
 - With "TRIP" (*byTypeOfFault* = 0), the template will be set to "Trouble".
 - With "message", "warning" and "FAIL-QSP" (*byTypeOfFault* = 1, 2 or 4), the template will remain in the status that was active when the error was activated.
 - If you want the template to be set to "Trouble" with "message", "warning" or "FAIL-QSP", also set the global variable *g_bErrorSet* (see network example in the POU "UserErrors").
 - The template status "Trouble" must be actively reset to return to "StandBy" (e.g. by setting the global variable *g_bErrorSet*).
- The error numbers between 500 ... 999 are set via the input *wFaultNumber* of the FB **FWM**.
- It is also possible to enter a text message for every error number using the data type **ErrorCode (ENUM)**. (7-13)

If the error detection *bExampleError* = TRUE, the PLC activates "FAIL-QSP" and the error number "500" is entered into the history buffer of the PLC.



Template Positioner

Program Organisation Units (POUs)



Tip!

Use this example network as basis and create new networks by copy & paste:

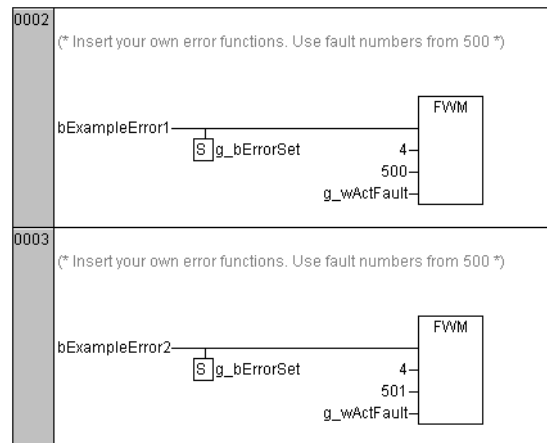


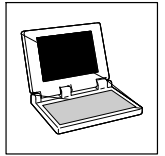
Fig. 6-2 Extended POU "UserErrors (PRG)" with two networks for troubleshooting

- If you add new networks do not forget to adapt the list of text messages in data type **ErrorCode (ENUM)** accordingly:

```

TYPE ErrorCode : (
    NoError:=0,
    CCr:=71,
    ...
    UserError1:=500,
    UserError2:=501
);
END_TYPE

```



6.2 Positioning sequencer - POU "UserInterface"

This POU is used for programming the positioning set control and call up of individual positioning programs.

The POU **UserInterface (PRG)** can be found in the register **Organization units** → folder **UserExtensions** → folder **UserPOUs** of the *Object Organizer*:

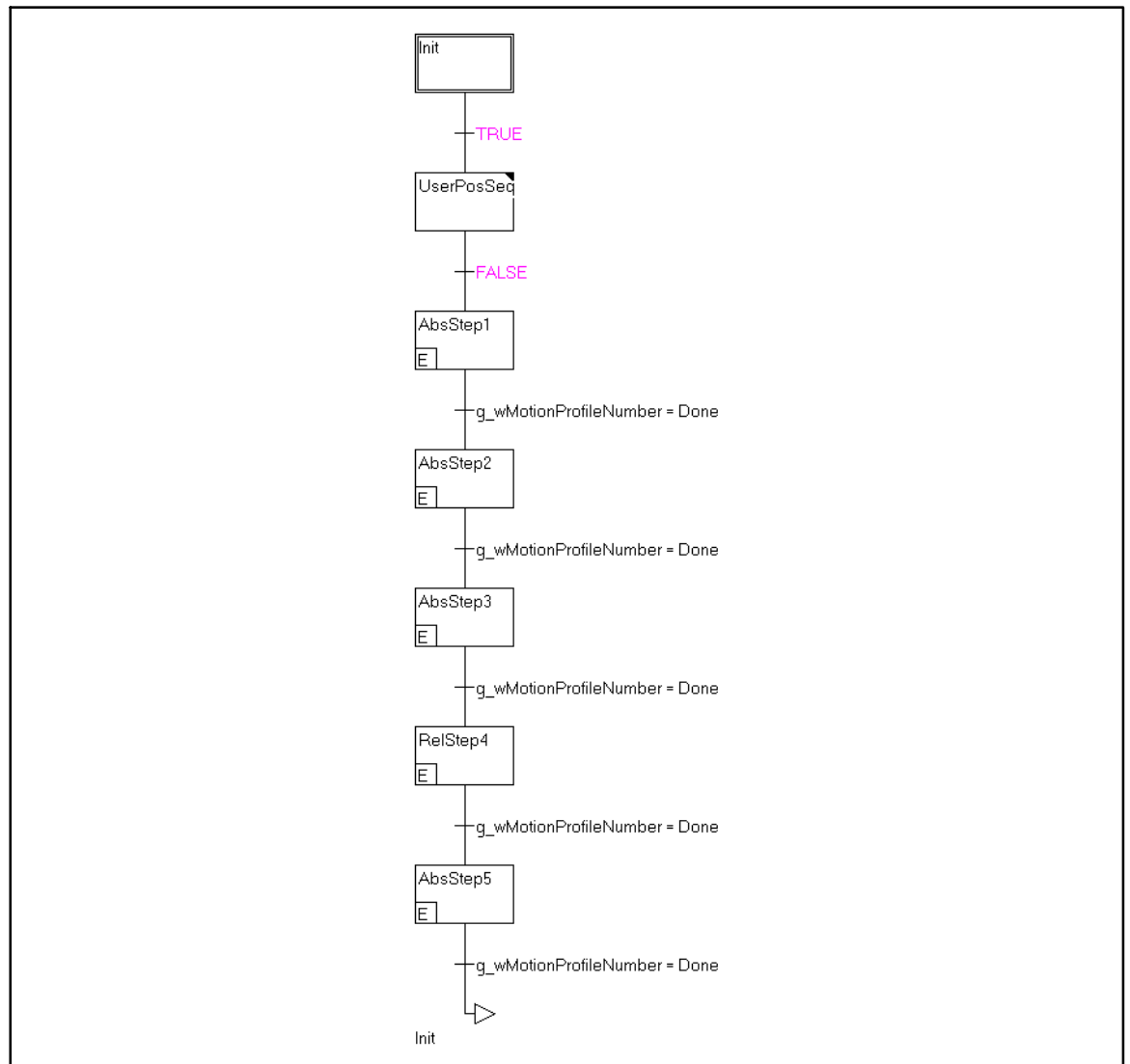


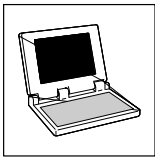
Fig. 6-3

POU "UserInterface (PRG)"

6.2.1 POU to call up individual programs

If you want to use your own positioning program, adapt the step "UserPosSeq" in the POU **UserInterface (PRG)** as follows:

1. Remove all comments around the command **UserPosSequence ()** ; .
2. Create a POU called "UserPosSequence" which contains your individual program.



Template Positioner

Program Organisation Units (POUs)

6.2.2 Use of the positioning sequencer

The POU **UserInterface (PRG)** already includes a sequencer for five positioning profiles. It can be used as a basic element for more complex controls.



Principle of the positioning sequencer in the POU **UserInterface (PRG)**

The principle of the positioning sequencer is the transfer of a traversing profile to the variable *g_wMotionProfileNumber* as well as the positioning mode to the variable *g_byPositioningMode*.

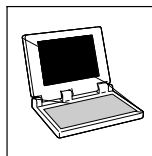
- Every step has an input action which defines the name of the positioning profile to be traversed and the positioning mode:

```
(* Statements of Step2 *)  
g_byPositioningMode:=Absolute;  
g_wMotionProfileNumber:=Profile2;
```

- If the profile assigned to a certain step has been traversed, the variable *g_wMotionProfileNumber* sends the "Done" and thus complies with the transition conditions for the next step of the sequencer.
- If a new profile is transferred to *g_wMotionProfileNumber* during the process, the current profile processing will be stopped and the new profile will be used.
- After the last step has been completed, the system automatically jumps back to the first step and starts processing the sequencer again.

If you want to use the sequencer for positioning, adapt the POU **UserInterface (PRG)** as follows:

1. Set the transition after "UserPosSeq" TRUE to activate the following sequencer.
2. Remove all unnecessary steps or add steps to the sequencer.
3. If you have added steps to the sequencer, the input actions (profile names) of these steps must be adapted.
4. If you have added or removed steps, do not forget to adapt the constant *C_wNumberOfMotionObjects* to the corresponding number of profiles.
(See chapter "Settings") (7-12)



7 Appendix

7.1 Technical data

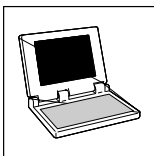
- Up to 128 profiles can be parameterised
- Usable memory:
 - 4.2 kbyte RAM without any profiles created.
 - 400 kbyte ROM for user program
- Memory for a profile:
 - 24 byte RAM (net)
 - 26 byte RAM (gross; incl. profile name assignment in ENUM list)
- Memory for feed correction (template function **PositionCorrection**):
 - 8 bytes per measuring point (4 bytes for correction position + 4 bytes for correction value)
- Task run times:
 - Run-time-optimised S-profile generation (C3037 = 0):

Task	Average run time	Maximum run time
System task	≈ 10 ms	≈ 90 ms
Cyclic task (PLC_PRG)	≈ 20 ms	≈ 30 ms
Task1 (2 ms task)	≈ 525 μs	≈ 625 μs
Task2 (5 ms task)	≈ 450 μs	≈ 1550 μs
User task (5 ms task)	≈ 80 μs	≈ 750 μs

- Profile-optimised S-profile generation (C3037 = 1):

Task	Average run time	Maximum run time
System task	≈ 10 ms	≈ 90 ms
Cyclic task (PLC_PRG)	≈ 20 ms	≈ 30 ms
Task1 (2 ms task)	≈ 800 μs	≈ 900 μs
Task2 (5 ms task)	≈ 450 μs	≈ 1550 μs
User task (5 ms task)	≈ 80 μs	≈ 300 μs

- The user can add maximally 215 organisation units.
- Download time per axis: approx. 30 s
- Task 1 and task 2 are reserved for the template. The priorities must not be changed.
- Task 3 is the user task which the user can use for program extensions. The task interval is default set to 5 ms and cannot be reduced. The interval provides a maximum computing time of 750 μs (run-time-optimised, C3037 = 0) and 300 μs (profile-optimised, C3037 = 1) for user functions. If this time is exceeded, a task overflow may occur (worst case).



Template Positioner

Appendix

Global variables

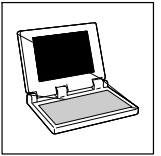
7.2 Global variables

The following variable declarations can be found in the *Object Organizer*/register **Resources**, folder **Global variables** → **TemplateInterface**.

7.2.1 VarChangeProfileInterface

⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_dnChangePosition	Double integer	R / W	Parameter "Position" for a profile change with <i>g_bChangeProfile</i> In [unit] * 10000
g_dnChangeVelocity	Double integer	R / W	Parameter "Speed" for a profile change with <i>g_bChangeProfile</i> - In [unit/s] * 10000 0 ≡ no parameter change in the target profile.
g_dnChangeAcceleration	Double integer	R / W	Parameter "Acceleration" for a profile change with <i>g_bChangeProfile</i> - In [unit/s²] * 10000 0 ≡ no parameter change in the target profile.
g_dnChangeDeceleration	Double integer	R / W	Parameter "Deceleration" for a profile change with <i>g_bChangeProfile</i> - In [unit/s²] * 10000 0 ≡ no parameter change in the target profile.
g_dnChangeFinalVelocity	Double integer	R / W	Parameter "Final speed" for a profile change with <i>g_bChangeProfile</i> - In [unit/s] * 10000 0 ≡ no parameter change in the target profile.
g_dnChangeJerkTime	Double integer	R / W	Parameter "Jerk time" for a profile change with <i>g_bChangeProfile</i> - In [ms] 0 ≡ no jerk limitation.

⇒ Inputs/outputs ⇒			
Identifiers	Data type	Access	Info/possible settings
g_bChangeProfile	Bool	R / W	Writing of profiles "StandBy", "Homing", "ManualJog" and "PositioningOperation" • Possible with "StandBy" and "PositioningOperation". • If writing has been successful, <i>g_bChangeProfile</i> and <i>g_wChangeProfile</i> will be set to "0". FALSE ↗ TRUE The profile indicated in <i>g_wChangeProfile</i> is written with the parameters indicated under • <i>g_dnChangePosition</i>, • <i>g_dnChangeVelocity</i>, • <i>g_dnChangeAcceleration</i> and • <i>g_dnChangeDeceleration</i> • <i>g_dnChangeFinalVelocity</i> • <i>g_dnChangeJerkTime</i> .
g_wChangeProfile	ProfileNames	R / W	Name of the profile which is written with a FALSE-TRUE transition at <i>g_bChangeProfile</i>. • If writing with <i>g_bChangeProfile</i> has been successful <i>g_wChangeProfile</i> is set to "0".



7.2.2 VarExternalSetValues

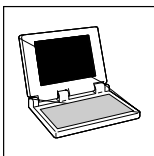
⇒ Inputs					
Identifiers	Data type	Access	Info/possible settings		
g_bExtSetValuesEnable	Bool	R / W	Changeover to external setpoints <table><tr><td>TRUE</td><td>The external setpoints are directly transferred to the motor control: • $g_nExtMSet_a \Rightarrow nMSet_a$ • $g_nExtNSet_a \Rightarrow nNSet_a$ • $g_dnExtDeltaPos_p \Rightarrow dnDeltaPos_p$ </td></tr></table>	TRUE	The external setpoints are directly transferred to the motor control: • $g_nExtMSet_a \Rightarrow nMSet_a$ • $g_nExtNSet_a \Rightarrow nNSet_a$ • $g_dnExtDeltaPos_p \Rightarrow dnDeltaPos_p$
TRUE	The external setpoints are directly transferred to the motor control: • $g_nExtMSet_a \Rightarrow nMSet_a$ • $g_nExtNSet_a \Rightarrow nNSet_a$ • $g_dnExtDeltaPos_p \Rightarrow dnDeltaPos_p$				
g_nExtMSet_a	Integer	R / W	External setpoint for torque precontrol		
g_nExtNSet_a	Integer	R / W	External setpoint for the setpoint speed		
g_dnExtDeltaPos_p	Integer	R / W	External setpoint for the position difference		
g_nNAdd_a	Integer	R / W	Additional speed setpoint		
g_nMAdd_a	Integer	R / W	Additional setpoint for torque precontrol		

7.2.3 VarHardwareSignals

⇒ Inputs				
Identifiers	Data type	Access	Info/possible settings	
g_bLimitSwitchNeg	Bool	R / W	Input for limit switch (negative)	
			FALSE	Limit switch reached
g_bLimitSwitchPos	Bool	R / W	Input for limit switch (positive)	
			FALSE	Limit switch reached
g_bHomingMark	Bool	R / W	Waiting for motor zero pulse signal	
			TRUE ⇒ FALSE	Starts waiting for the motor zero pulse signal during homing.

7.2.4 VarHoming

⇒ Inputs				
Identifiers	Data type	Access	Info/possible settings	
g_bHomingStart	Bool	R / W	Homing start/stop	
			• Homing can only be started if the controller is enabled and TRIP is not active. • If TRIP or controller inhibit are set during homing, homing must be started again after TRIP reset or controller enable.	
			TRUE	Homing start
			FALSE	Homing stop
g_bHomePositionSet	Bool	R / W	Acceptance of the home position	
			FALSE ↗ TRUE	Offset of the reference measuring system selected under code C3012 is accepted.
g_bHomePositionReset	Bool	R / W	Reset of home position	
			TRUE	• Output <i>g_bHomingDone</i> is reset to FALSE. • Status "Home position known" is reset (<i>g_bHomePositionAvailable</i> = FALSE).



Template Positioner

Appendix

Global variables

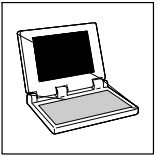
Outputs ⇨			
Identifiers	Data type	Access	Value/meaning
g_bHomingBusy	Bool	R	Message "Homing activated" TRUE Homing active
g_bHomingDone	Bool	R	Status signal whether homing has been completed. TRUE Homing has been completed or home position has been manually set through <i>g_bHomePositionSet</i> = TRUE.
g_bHomePositionAvailable	Bool	R	Message "Home position known" - The template saves the value of this variable fail-safe under the following memory addresses: QB171.0 to QB171.11, QW171.0 to QW171.5 and QD171.0 to QD171.2. These addresses must not be written by the user. - After mains disconnection or a new program download, the (saved) status will be read from the corresponding memory addresses in "Init". FALSE Home position is not known. TRUE Home position is known.

7.2.5 VarManualJog

⇨ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bManualJogNeg	Bool	R / W	Manual homing in negative direction - Manual homing can only be started if the controller is enabled and TRIP is not active. - If TRIP or controller inhibit are set during manual homing, manual homing must be started again after TRIP reset or controller enable. TRUE Manual homing
g_bManualJogPos	Bool	R / W	Manual homing in positive direction - Manual homing can only be started if the controller is enabled and TRIP is not active. - If TRIP or controller inhibit are set during manual homing, manual homing must be started again after TRIP reset or controller enable. TRUE Manual homing
g_bReleaseLimitSwitch	Bool	R / W	Sub-function "Retracting" TRUE Retracting from the activated limit switch in the corresponding clearance direction until the limit switch is released (no longer activated): <i>g_bLimitSwitchPos</i> = TRUE: Retracting in direction <i>g_bLimitSwitchNeg</i> until <i>g_bLimitSwitchPos</i> = FALSE <i>g_bLimitSwitchNeg</i> = TRUE: Retracting in direction <i>g_bLimitSwitchPos</i> until <i>g_bLimitSwitchNeg</i> = FALSE

7.2.6 VarOverchange

⇨ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bOverchangeEnable	Bool	R / W	Enabling overchange FALSE Overchange is deactivated. TRUE Overchange is enabled.



⇒ Inputs/outputs ⇒			
Identifiers	Data type	Access	Info/possible settings
g_wOverchangeProfile Number	ProfileNames	R / W	Name of the profile to be started automatically
			Display "Active" The profile parameters of the overchange profile are being transferred.
			Display "Done" The profile parameters of the selected overchange profile have been transferred. This variable does not indicate completion of the profile generation of the following profile.

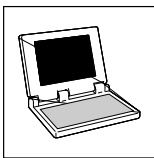
7.2.7 VarOverride

⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_byOverrideMode	Byte	R / W	Override mode
			0 The override values refer to the maximum speed/acceleration selected for the PLC.
			1 The override values refer to the speed/acceleration of the active profile.
g_bExecuteVelOverride	Bool	R / W	Activation of speed override
			TRUE Speed override is active.
g_nVelOverride_a	Integer	R / W	Override speed • $16384 \equiv v_{\max}$ or v_{profile} (depending on the override mode)
g_bExecuteAccOverride	Bool	R / W	Activation of acceleration override
			TRUE Acceleration override is active.
g_nAccOverride_a	Integer	R / W	Override acceleration • $16384 \equiv a_{\max}$ or a_{profile} (depending on the override mode)

7.2.8 VarPositionCorrection

⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bPosCorrectionEnable	Bool	R / W	Activation of position correction
			TRUE Position correction is activated.

Outputs ⇒			
Identifiers	Data type	Access	Value/meaning
g_nPosCorrectionState	Integer	R	Status of position correction
			0 Ok
			10 Number of measured values is no 2 ⁿ -value, the corrective calculation is not precise.
			20 Position correction is deactivated ($g_bPosCorrectionEnable = FALSE$).
g_bNewCorrectionValuesValid	Bool	R	Message output "Calculation has been completed "
			FALSE Calculation of correction values has not been completed yet. • Do not start positioning while calculation is in process.
			TRUE Calculation of correction values has been completed.
g_dnCorrectionValue_p	Double integer	R	Correction value (interpolated position correction value)



Template Positioner

Appendix

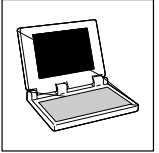
Global variables

7.2.9

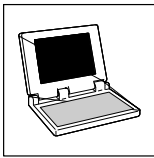
VarPositioning

⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bPositioningEnable	Bool	R / W	Enabling positioning
			TRUE Change to "Positioning"
			FALSE Cancellation of positioning, change to "StandBy"
g_byPositioningMode	Byte	R / W	Positioning mode selection
			0 Absolute positioning • Precondition: <i>g_bHomingDone</i> = TRUE and <i>g_bHomePositionAvailable</i> = TRUE
			1 Modulo positioning • Path integrators are reset before the start. • Application: Rotary tables • Precondition: <i>g_bHomingDone</i> = TRUE
			2 Constant traversing
			3 Relative positioning • max. 2147483647 increments ($2^{31} - 1$) • Path integrators are not reset before the start. • Precondition: <i>g_bHomingDone</i> = TRUE and <i>g_bHomePositionAvailable</i> = TRUE
			10 Absolute positioning with relative remaining path positioning
			11 Modulo positioning with relative remaining path positioning • Path integrators are reset before the start. • Application: Rotary tables
			12 Constant traversing with relative remaining path positioning
			13 Relative positioning with relative remaining path positioning • max. 2147483647 increments ($2^{31} - 1$) • Path integrators are not reset before the start.
			14 Absolute positioning with absolute remaining path positioning
			15 Relative positioning with absolute remaining path positioning • Path integrators are not reset before the start.
g_bHoldBackProfiles	Bool	R / W	Completing profile processing after interruption. • If profile processing has been interrupted because of a status change from "Positioning" to another status, you can use this input to select that profile processing will be completed when the drive changes to "Positioning" again.
			TRUE Profile processing is completed automatically after interruption.
			FALSE Profile processing is not automatically completed after interruption. When the drive changes to "Positioning" again, the interrupted positioning process is considered to be completed (<i>g_wMotionProfileNumber</i> = Done).

⇒ Inputs/outputs ⇒			
Identifiers	Data type	Access	Info/possible settings
g_wMotionProfileNumber	ProfileNames	R / W	Profile name • If <i>g_wMotionProfileNumber</i> is used with a valid profile name, the positioning process starts with the profile parameters of the selected profile. • Precondition: <i>g_bPositioningEnable</i> = TRUE
			Display "Active" Processing of the selected profile is not completed yet.
			Display "Active" The selected profile has been processed, the drive has reached the target position.
			Note: If several profiles are connected by means of overchange, polling in the transition of <i>g_wMotionProfileNumber</i> = Done is only necessary for the last profile (see programming example transition Trans3).



Outputs ⇨			
Identifiers	Data type	Access	Value/meaning
g_nPosProfilerState	Word	R	Positioning status
			Messages:
			0 No action
			1 Positioning completed
			10 Acceleration phase is active
			11 Constant speed phase is active
			12 Deceleration phase is active
			13 Reversing phase is active
			100 Reset is active
			101 Start values are loaded
			102 Positioning stopped
			103 External setpoint interface activated
			Errors:
			-200 Invalid profile: Parameter acceleration = 0
			-201 Invalid profile: Parameter deceleration = 0
			-202 Invalid profile: Parameter speed = 0
			-300 Positioning with the selected profile parameters is not plausible.
g_nSetVelocity_v	Integer	R	Speed setpoint in [inc/ms] 16384 [inc] ≙ 15000 rpm - Only to be used for encoder systems on the motor side! If a load-side encoder system is used (gearbox factor unequal "1"), speed setpoint 0 will be output
g_dnPositionDifference_p	Double integer	R	Position difference between setpoint and actual value in [inc] 65536 [inc] ≙ 1 revolution on the motor end
g_dnSetPosInternal_p	Double integer	R	Internal setpoint angle position in [inc] With Modulo positioning reset every time a profile is started.
g_dnActualPositionReal	Double integer	R	Actual angle position in [unit] Output in fixed-comma format with 4 decimal positions: 1 [unit] ≙ 10000
g_dnActualPositionInternal_p	Double integer	R	Actual angle position in [inc] 65536 [inc] ≙ 1 revolution on the motor end - The actual integrator can overflow.
g_dnActualTargetPositionReal	Double integer	R	Target position of the current profile in [unit] Output in fixed-comma format with 4 decimal positions: 1 [unit] ≙ 10000
g_dnActualTargetPosition_p	Double integer	R	Target position of the current profile in [inc] 65536 [inc] ≙ 1 revolution on the motor end
g_dnActualVelocityReal	Double integer	R	Current speed in [unit]/s Output in fixed-comma format with 4 decimal positions: 1 [unit/s] ≙ 10000
g_wCurrentProfileName	ProfileNames	R	Profile name of the active profile When the "Positioning" status is left, <i>g_wCurrentProfileName</i> is set to "Done".
g_wCurrentProfileNumber	Word	R	Profile number of the active profile
g_bInTarget	Bool	R	Message "Target position reached" Window definition (C3034): ☐ 5-33
			TRUE The target position is within the window defined under C3034.
g_bDwellTime	Bool	R	Message "Dwell time over" - Reset to FALSE when positioning is started. - Definition of the dwell time (C3035): ☐ 5-34
			TRUE The dwell time set under C3035 has expired.
g_bProfileBusy	Bool	R	Message "Positioning is active"
			TRUE Positioning is active.
			TRUE (pulse) <i>g_bProfileBusy</i> and <i>g_bProfileDone</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.



Template Positioner

Appendix Global variables

Outputs ⇨			
Identifiers	Data type	Access	Value/meaning
g_bAuxProfileBusy	Bool	R	Message "Remaining path positioning is active"
			TRUE Remaining path positioning is active.
g_bProfileDone	Bool	R	Message "Positioning has been completed"
			TRUE Positioning has been completed.
			TRUE (pulse) <i>g_bProfileDone</i> and <i>g_bProfileBusy</i> are set to TRUE for a short time if target and start position are identical at the start of absolute positioning and positioning has therefore not been started.

7.2.10

VarPositionTeach

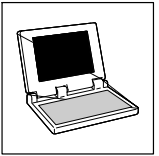
⇨ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bPositionTeach	Bool	R / W	Saving of actual positions
			FALSE → TRUE Actual position is saved in <i>g_wTeachProfileNumber</i> . • Precondition: <i>g_bHomingDone</i> = TRUE and <i>g_bHomePositionAvailable</i> = TRUE
g_wTeachProfileNumber	ProfileNames	R / W	Profile name for actual position • Indicates in which profile the actual position is saved if <i>g_bPositionTeach</i> = TRUE.
			Display "Done" The actual position has been saved in the corresponding profile.

7.2.11

VarTemplateControl

⇨ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bErrorReset	Bool	R / W	Reset of template-internal and user-defined errors • If the variable <i>g_bErrorResetEqTripReset</i> is set to TRUE a TRIP reset will be carried out together with the error reset. See variable list "VarTemplateSettings (constant)".
			TRUE Error reset
g_bErrorSet	Bool	R / W	Change to "Error" if one of the messages configured through the FB FWM is active. • The variables can be set by means of the "Set" instruction. • They are automatically reset to FALSE by the template.
			TRUE Change to "Trouble"
g_bUserQuickstop	Bool	R / W	User quick stop (quick stop of the drive system)
			TRUE Activates user quick stop

Outputs ⇨			
Identifiers	Data type	Access	Value/meaning
g_byOperationState	OperationMode	R	Display of the main template states
			0 Status "StandBy" • Status from which the drive changes to all other states.
			1 Status "Trouble"
			20 Status "ManualJog"
			30 Status "Homing"
			40 Status "Positioning"
g_wErrorType	ErrorReaction	R	Display of the error type
			0 Error (TRIP)
			1 Message
			2 Warning
			3 Error with quick stop of the drive system (FAIL-QSP)
			4 Ready, drive is ready (no error - RDY)

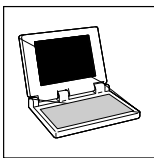


Outputs ⇨						
Identifiers	Data type	Access	Value/meaning			
g_wErrorNumber	ErrorCode	R	Display of the error name See <i>Object Organizer</i>: Register Data types → folder UserDataTypes → ErrorCode (ENUM)			
g_bGlobalError	Bool	R	Message "Error" <table><tr><td>TRUE</td><td>An error has occurred and the template has changed to "Trouble".</td></tr></table>		TRUE	An error has occurred and the template has changed to "Trouble".
TRUE	An error has occurred and the template has changed to "Trouble".					
g_bVelocityLowerC3017	Bool	R	Display if speed < threshold value for zero speed detection (C3017) <table><tr><td>TRUE</td><td>Speed < threshold for zero speed detection</td></tr></table>		TRUE	Speed < threshold for zero speed detection
TRUE	Speed < threshold for zero speed detection					

7.2.12 VarTemplateSettings (constant)

⇒ Inputs				
Identifiers	Data type	Access	Info/possible settings	
g_bVisuOff	Bool	R / W	Activation/deactivation of the visualisation	
			FALSE	Visualisation is activated
			TRUE	Visualisation is deactivated. • All input fields for parameter transfer to the program are deactivated. • The buttons for changing the views remain activated.
g_bErrorResetEqTripReset	Bool	R / W	Configuration of error reset with/without Trip reset	
			FALSE	Error reset (<i>g_bErrorReset</i> = TRUE) does not activate TRIP reset in the PLC.
			TRUE	Error reset (<i>g_bErrorReset</i> = TRUE) activates TRIP reset in the PLC.

Constants			
Identifiers	Data type	Access	Info/possible settings
C_wNumberOfMotionObjects	Word	R	Number of profiles - Presetting: 5 - See chapter "Settings". 7-12
C_byNumberOfPosCorrectionValues	Byte	R	Number of measuring points for feed correction (function PositionCorrection) - Presetting: 16 - See chapter "Settings". 7-12



Template Positioner

Appendix

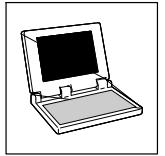
Global variables

7.2.13

VarTouchProbe

⇒ Inputs			
Identifiers	Data type	Access	Info/possible settings
g_bTPEnable	Bool	R / W	Enabling touch probe positioning
			FALSE Touch probe positioning inhibited.
			TRUE Touch probe positioning enabled, touch probe positioning is started by setting <i>g_bActTPReceived</i> to TRUE.
g_byEdgeTouchProbeDIGIN_3	Byte	R / W	Edge sensitivity of touch probe input 3
			0 Rising signal
			1 Falling signal
			2 Rising and falling signal
			3 Touch probe detection off
g_dnDelayTouchProbeDIGIN_3_p	Double integer	R / W	Dead time compensation of the TP sensor at touch probe input 3 • Value in [inc] referred to the motor shaft.
g_byEdgeTouchProbeDIGIN_4	Byte	R / W	Edge sensitivity of touch probe input 4
			0 Rising signal
			1 Falling signal
			2 Rising and falling signal
			3 Touch probe detection off
g_dnDelayTouchProbeDIGIN_4_p	Double integer	R / W	Dead time compensation of the TP sensor at touch probe input 4 • Value in [inc] referred to the motor shaft.
g_bUserTPEnable	Bool	R / W	Enabling touch probe positioning via the user-defined interface
			FALSE User-defined interface is inhibited TRUE User-defined interface is enabled
g_bUserActTPReceived	Bool	R / W	User-defined interface for touch probe: Receiving touch probe signals • Connect this input e.g. with the output variable <i>g_MCTRL_bActTPReceived_b</i> of the <i>Target Interface</i> .
			TRUE Receive new touch probe signal
g_dnUserActLastScan_p	Double integer	R / W	User-defined interface for touch probe: Current LastScan value • Connect this input e.g. with the output variable <i>g_MCTRL_dnActLastScan_p</i> of the <i>Target Interface</i> .
g_bHoldBackProfiles	Bool	R / W	Completing profile processing after interruption. • If profile processing has been interrupted because of a status change from "Positioning" to another status, you can use this input to select that profile processing will be completed when the drive changes to "Positioning" again.
			TRUE Profile processing is completed automatically after interruption.
			FALSE Profile processing is not automatically completed after interruption. When the drive changes to "Positioning" again, the interrupted positioning process is considered to be completed (<i>g_wMotionProfileNumber</i> = Done).

⇒ Inputs/outputs ⇒			
Identifiers	Data type	Access	Info/possible settings
g_wAuxMotionProfileNumber	ProfileNames	R / W	Name of the profile used for remaining path positioning



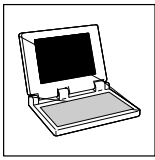
7.3 Reserved input variables of the target interface



Note!

Via the variables listed in the following table, control information is transmitted from the template to the *Target interface*; these variables therefore may **not** be written in parallel from the user level!

Identifiers	Template			
	Cam	Positioner	Winder	
			DancerControl	TensionControl
<i>g_DCTRL_bClnh1_b</i>	•	•	•	•
<i>g_DCTRL_bTripReset_b</i>	•	•	•	•
<i>g_DCTRL_bTripSet_b</i>	•	•		
<i>g_MCTRL_bIload_b</i>			•	•
<i>g_MCTRL_bNMSwt_b</i>			•	•
<i>g_MCTRL_bPosOn_b</i>			•	•
<i>g_MCTRL_bQspOut_b</i>	•	•	•	•
<i>g_MCTRL_dnPosSet_p</i>	•	•		
<i>g_MCTRL_nFldWeak_a</i>			•	•
<i>g_MCTRL_nHiMlim_a</i>	•	•	•	•
<i>g_MCTRL_nLoMlim_a</i>	•	•	•	•
<i>g_MCTRL_nMAdd_a</i>	•	•	•	•
<i>g_MCTRL_nNAdapt_a</i>			•	•
<i>g_MCTRL_nNSet_a</i>	•	•	•	•
<i>g_MCTRL_nNStartMlim_a</i>			•	•
<i>g_STATE_BUS_bOut_b</i>	•			
<i>g_STATE_BUS_bIn_b</i>	•			



Template Positioner

Appendix Settings

7.4 Settings

7.4.1 Number of positioning profiles

The number of profiles to be written is defined under the constant *C_wNumberOfMotionObjects*.
(Object Organizer/register **Resources** → folder **Global variables** → folder **TemplateInterface** → variable list **VarTemplateSettings (CONSTANT)**)

- In the template, the constant has been preset to "5", i.e. the sub-codes for five profiles are already available.
- If you change the number, the corresponding sub-codes will be available after the compilation.

7.4.2 Number of measuring points for feed correction

The number of measuring points is defined in the variable *C_byNumberOfPosCorrectionValues*.
(Object Organizer/register **Resources** → folder **Global variables** → folder **TemplateInterface** → variable list **VarTemplateSettings (CONSTANT)**)

- The variable has been preset to "16", i.e. the sub-codes for 16 measuring points are already available.
- Only 2ⁿ-values are permissible, i.e. 2, 4, 8, 16, 32, ...
- If you change the number, the corresponding sub-codes will be available after the compilation.

7.4.3 Profile names - data type "ProfileNames (ENUM)"

The profile names are defined in the data type **ProfileNames (ENUM)**
(Object Organizer → register **Data types** → folder **UserDataTypes**):

```
TYPE ProfileNames : (  
    ...  
    Profile1:=1,  
    Profile2:=2,  
    Profile3:=3,  
    ...  
) ;  
END_TYPE
```

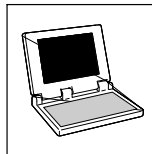
- Any name can be selected as profile name as long as it has not been used earlier.
- The list can be extended or shortened. (Every entry needs 2 bytes RAM.)
- The last entry must not be closed by a comma.



Tip!

If you change the selected profile names and use the sequencer of the POU **UserInterface (PRG)** the profile names in the input actions must also be adapted.

We recommend to always include the profile number which corresponds to the sub-code number of the profile parameter codes in the name.



7.4.4 Error messages - data type "ErrorCode (ENUM)"

General

Troubleshooting distinguishes between system error messages, template error messages and user error messages:

	Error number	Info
System error messages	0 ... 399	System error messages are firmly implemented in the PLC and cannot be changed by the user. • Detailed information about the system error messages can be found in the "Appendix" of the corresponding PLC Manual.
Template error messages	400 ... 499	Template error messages are firmly implemented in the template and cannot be changed by the user.
User error messages	500 ... 999	User error messages can be freely defined by the user.



Tip!

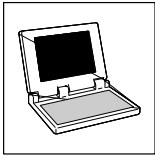
The error number of the current error is indicated in C3998. If you want to display the current errors on a keypad, HMI or higher-level control the code must be cyclically read out.

Template error messages

The following template error messages are implemented in the templates of the software packages:

Error message	Error number	Cause	Relevant for Template	
			Cam	Positioner
PosLimitSwitch	400	The positive limit switch has been activated.	✓	✓
NegLimitSwitch	401	The negative limit switch has been activated.	✓	✓
PosPositionLimit	402	The positive software limit position has been reached.		✓
NegPositionLimit	403	The negative software limit position has been reached.		✓
FollowErrWarning	404	The following error warning limit has been reached or exceeded.	✓	✓
FollowErrFail	405	The following error limit has been reached or exceeded.	✓	✓
HomePosError	406	Positioning with unknown home position		✓
Initialisation	407	A warning has been indicated during the initialisation.		✓
UserQuickstop ¹	408	User quick stop has been activated.	✓	
MaxVelConflict	409	The maximum permissible speed has been exceeded.		✓
DriveNotReady ¹	410	The PLC is not ready.	✓	
VisuQuickstop ¹	411	Quick stop has been activated via the visualisation.	✓	
InitError	412	An error has occurred during the initialisation.		✓
ParameterSaveError	413	An error has occurred during parameter saving.	✓	
SwapPositionMode	414	A wrong positioning mode has been selected.	✓	
XYPosChangeLimit	415	The speed selected for the x-axis is too high.	✓	
PosToExtNoSpeed	416	The positioning speed has not been selected.	✓	
InvalidSoftwareLimits	417	The selections for the software limit positions are invalid/not plausible.		✓
XTPPositionOutOfLimit	418	The position of the touch probe sensor (x-axis) is not within the adjustable range.	✓	
StateBusError	419	Another device has indicated an error via the state bus.	✓	
OU_MCTRL_TemplateError	420	DC bus overvoltage.	✓	
LU_MCTRL_TemplateError	421	DC bus undervoltage.	✓	
InvalidProfileData	422	Error in the profile parameter set.		✓
OverflowInternalSetPos	423	Overflow of the internal path integrator		✓

¹ These error messages only indicate errors in template states in which the tool is actively moved.



Template Positioner

Appendix Settings

User error messages

The error messages for user-defined errors are defined in the data type **ErrorCode (ENUM)** (*Object Organizer* → register **Data types** → folder **UserDataTypes**):

```
TYPE ErrorCode : (  
    NoError:=0,  
    CCr:=71,  
    ...  
    UserError:=500  
);  
END_TYPE
```

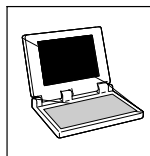
- The texts for user-defined errors (error numbers 500 ... 999) can be freely selected.
- It is also possible to add or take away entries in the field of user-defined errors (error numbers 500 ... 999). (Every entry needs 2 bytes RAM.)
- The last entry must not be closed by a comma.



Caution!

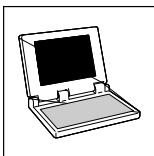
Do not change the entries of error numbers 0 ... 499 since they are system error messages for the PLC!

- More information about troubleshooting can be found in chapter 6.1, "Troubleshooting - POU UserErrors (PRG)". (▢ 6-1)



7.5 Code list

1200	Minimum value / maximum value	1 / 65535
	Initialisation value	1
	Internal minimum value / maximum value	1 / 65535
	Data type / external data type	WORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Fdbk rat num
	GDC display	Feedback of gearbox factor numerator
1201	Minimum value / maximum value	1 / 65535
	Initialisation value	1
	Internal minimum value / maximum value	1 / 65535
	Data type / external data type	WORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Fdbk rat den
	GDC display	Feedback of gearbox factor denominator
1202	Minimum value / maximum value	1 / 65535
	Initialisation value	1
	Internal minimum value / maximum value	1 / 65535
	Data type / external data type	WORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Gear num
	GDC display	Gearbox factor numerator
1203	Minimum value / maximum value	1 / 65535
	Initialisation value	1
	Internal minimum value / maximum value	1 / 65535
	Data type / external data type	WORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Gear denom
	GDC display	Gearbox factor denominator
1204	Minimum value / maximum value	0.0001 / 214000.0000
	Initialisation value	360.0000 units/r
	Internal minimum value / maximum value	1 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	Yes
	Keypad display	Feed const
	GDC display	Feed constant

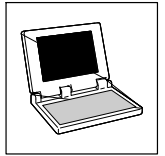


Template Positioner

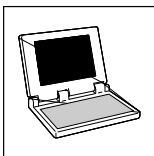
Appendix

Code list

1240	Minimum value / maximum value	0.0001 / 214000.0000
	Initialisation value	18000.0000 units/s
	Internal minimum value / maximum value	1 / 2140000000
	Data type / external data type	DWORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Vel_max
	GDC display	v-max. (maximum traversing speed)
1250	Minimum value / maximum value	0.0001 / 214000.0000
	Initialisation value	36000.0000 units/s ²
	Internal minimum value / maximum value	1 / 2140000000
	Data type / external data type	DWORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Acc_max
	GDC display	a-max. (maximum acceleration)
1256	Minimum value / maximum value	0.000 / 10.000
	Initialisation value	1.000 s
	Internal minimum value / maximum value	0 / 10000
	Data type / external data type	DWORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	S-RMP: Jerk
	GDC display	S-ramp; maximum jerk time
3000	Minimum value / maximum value	0 / 1
	Initialisation value	0
	Internal minimum value / maximum value	0 / 1
	Data type / external data type	BOOL / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	Yes
	Keypad: SHIFT + PRG required?	Yes
	Selection:	1 Non inverted
		2 Inverted
	Keypad display	MotDirInv
	GDC display	Motor mounting position
3001	Minimum value / maximum value	0 / 1
	Initialisation value	0
	Internal minimum value / maximum value	0 / 1
	Data type / external data type	BOOL / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	Yes
	Keypad: SHIFT + PRG required?	Yes
	Selection:	0 Non inverted
		1 Inverted
	Keypad display	EncDirInv
	GDC display	Encoder mounting position



3002	Minimum value / maximum value	0 / 1
	Initialisation value	0
	Internal minimum value / maximum value	0 / 1
	Data type / external data type	BOOL / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	Yes
	Selection:	0 ChangeOfPos 1 NoChangeOfPos
	Keypad display	NoChangeOfPos
	GDC display	Actual position remains unchanged after Power OFF
3008	Minimum value / maximum value	0.00 / 100.00
	Initialisation value	10.00 %
	Internal minimum value / maximum value	0 / 16384
	Data type / external data type	INT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	HomeMlim
	GDC display	MLim for homing mode 14/15
3009	Minimum value / maximum value	0 / 65535
	Initialisation value	100 ms
	Internal minimum value / maximum value	0 / 65535
	Data type / external data type	WORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	TimeHomeMlim
	GDC display	Homing mode 14/15: Waiting time

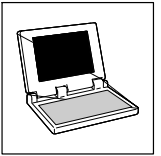


Template Positioner

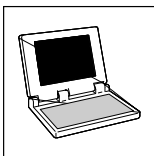
Appendix

Code list

3010	Minimum value / maximum value	0 / 15
	Initialisation value	0
	Internal minimum value / maximum value	0 / 15
	Data type / external data type	BYTE / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	Yes
	Selection:	0 >_Rn_MP
		1 <_Rn_MP
		2 >_Lp_<_Rn_MP
		3 <_Ln_>_Rn_MP
		4 >_Rp_<_Rn_MP
		5 <_Rp_>_Rn_MP
		6 >_Rn_>_TP
		7 <_Rn_<_TP
		8 >_TP
		9 <_TP
		10 >_Lp_<_TP
		11 <_Ln_>_TP
		12 >_Lp↗_<_Lp↘
		13 <_Ln↗_>_Ln↘
		14 >_Mlim
		15 <_Mlim
	Keypad display	HomingMode
	GDC display	Homing mode
3011	Minimum value / maximum value	-214000.0000 / 214000.0000
	Initialisation value	0.0000 units
	Internal minimum value / maximum value	-2140000000 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Home offset
	GDC display	Home position offset
3012	Minimum value / maximum value	-214000.0000 / 214000.0000
	Initialisation value	0.0000 units
	Internal minimum value / maximum value	-2140000000 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Measure offs.
	GDC display	Offset of reference measuring system
3013	Minimum value / maximum value	1.0000 / 214000.0000
	Initialisation value	720.0000 units/s
	Internal minimum value / maximum value	10000 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	HomingVel.
	GDC display	Homing speed



3014	Minimum value / maximum value	1.0000 / 214000.0000
	Initialisation value	720.0000 units/s ²
	Internal minimum value / maximum value	10000 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	HomingAcc.
	GDC display	Homing acceleration
3017	Minimum value / maximum value	0.01 / 100.00
	Initialisation value	0.10 %
	Internal minimum value / maximum value	1 / 16384
	Data type / external data type	INT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Lim.n=0-Flag
	GDC display	Threshold for speed = 0 signal
3018	Minimum value / maximum value	0.00 / 100.00
	Initialisation value	0.10 %
	Internal minimum value / maximum value	0 / 16384
	Data type / external data type	INT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Hyst.n=0-Flag
	GDC display	Hysteresis for speed = 0 signal
3020	Minimum value / maximum value	0.0001 / 214000.0000
	Initialisation value	360.0000 units/s
	Internal minimum value / maximum value	1 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	ManualVel.
	GDC display	Manual traversing speed
3021	Minimum value / maximum value	0.0001 / 214000.0000
	Initialisation value	720.0000 units/s ²
	Internal minimum value / maximum value	1 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	ManualAcc.
	GDC display	Manual acceleration

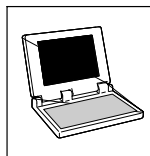


Template Positioner

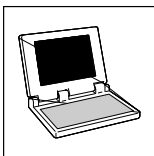
Appendix

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3022	Minimum value / maximum value	0.0001 / 214000.0000
	Initialisation value	720.0000 units/s ²
	Internal minimum value / maximum value	1 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	ManualDec.
	GDC display	Manual deceleration
3030	Minimum value / maximum value	0.0000 / 214000.0000
	Initialisation value	360.0000 units
	Internal minimum value / maximum value	0 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	FollErrWarn
	GDC display	Following error warning limit
3031	Minimum value / maximum value	0.0000 / 214000.0000
	Initialisation value	720.0000 units
	Internal minimum value / maximum value	0 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	FollErrQSP
	GDC display	Following error limit
3034	Minimum value / maximum value	-107000.0000 / 107000.0000
	Initialisation value	10.0000 units
	Internal minimum value / maximum value	-1070000000 / 1070000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Target Window
	GDC display	Width of the target position window
3035	Minimum value / maximum value	0 / 65535
	Initialisation value	50 ms
	Internal minimum value / maximum value	0 / 65535
	Data type / external data type	WORD / 16-bit without sign
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	DwellTime
	GDC display	Dwell time after end of profile



3037	Minimum value / maximum value	0 / 1
	Initialisation value	0
	Internal minimum value / maximum value	0 / 1
	Data type / external data type	WORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	S_PrMode
	GDC display	Mode S-profile generation
3038	Minimum value / maximum value	0 / 1
	Initialisation value	0
	Internal minimum value / maximum value	0 / 1
	Data type / external data type	WORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	DecOverride
	GDC display	Activation of deceleration override
3040	Minimum value / maximum value	0.0000 / 214000.0000
	Initialisation value	3600.0000 units
	Internal minimum value / maximum value	0 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	SW-LimPos
	GDC display	Positive software limit position
3041	Minimum value / maximum value	-214000.0000 / 0.0000
	Initialisation value	-3600.0000 units
	Internal minimum value / maximum value	-2140000000 / 0
	Data type / external data type	DINT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	SW-LimNeg
	GDC display	Negative software limit position
3042	Minimum value / maximum value	0 / 1
	Initialisation value	0
	Internal minimum value / maximum value	0 / 1
	Data type / external data type	WORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	SWLimCtrlMode
	GDC display	Software limit position monitoring mode

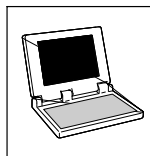


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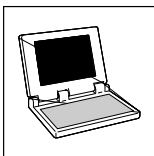
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3050	Minimum value / maximum value	-2147483647 / 2147483647
	Initialisation value	0 inc
	Internal minimum value / maximum value	-2147483647 / 2147483647
	Data type / external data type	DINT / 32-bit with sign
	Access	Read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Current position
	GDC display	Current position in increments
3051	Minimum value / maximum value	-214000.0000 / 214000.0000
	Initialisation value	0.0000 units
	Internal minimum value / maximum value	-2140000000 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Current position
	GDC display	Current position in units
3052	Minimum value / maximum value	0 / 32000
	Initialisation value	0
	Internal minimum value / maximum value	0 / 32000
	Data type / external data type	WORD / fixed comma
	Access	Read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Act. profile
	GDC display	Activated positioning profile
3053	Minimum value / maximum value	-214000.0000 / 214000.0000
	Initialisation value	0.0000 units
	Internal minimum value / maximum value	-2140000000 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Current velocity
	GDC display	Current speed in units/s
3056	Minimum value / maximum value	-214000.0000 / 214000.0000
	Initialisation value	0.0000 inc
	Internal minimum value / maximum value	-2140000000 / 2140000000
	Data type / external data type	DINT / 32-bit with sign
	Access	Read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	ActTargetPos
	GDC display	Current absolute target position or distance



3057	Minimum value / maximum value	-214000.0000 / 214000.0000
	Initialisation value	0.0000 units
	Internal minimum value / maximum value	-2140000000 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	TargetPosReal
	GDC display	Target position or distance in units
3060	Minimum value / maximum value	0 / 4294960000
	Initialisation value	0 units/s
	Internal minimum value / maximum value	0 / 4294960000
	Data type / external data type	DWORD / 32-bit without sign
	Access	Read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Max for C1240
	GDC display	Max. speed for C1240
3062	Minimum value / maximum value	0.0000 / 214000.0000
	Initialisation value	0.0000 units
	Internal minimum value / maximum value	0 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Max. distance
	GDC display	Max. distance traversed / distance
3063	Minimum value / maximum value	0.0000 / 214000.0000
	Initialisation value	0.0000 units/s
	Internal minimum value / maximum value	0 / 2140000000
	Data type / external data type	DINT / fixed comma
	Access	Read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Min velocity
	GDC display	Min. profile speed in units/s
3065	Minimum value / maximum value	0 / 65535
	Initialisation value	0
	Internal minimum value / maximum value	0 / 65535
	Data type / external data type	WORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Selection:	0: StandBy 1: Trouble 20: ManualJog 30: Homing 40: Positioning
	Keypad display	PosState
	GDC display	Positioning status

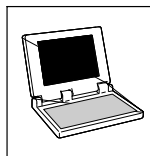


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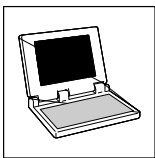
Appendix

Code list

3066	Minimum value / maximum value	0 / 32767
	Initialisation value	0
	Internal minimum value / maximum value	0 / 32767
	Data type / external data type	INT / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Selection:	15700: InvProfPar 15788: ProfAuxVelEq0 15789: ProfAuxDecEq0 15790: ProfAuxAccEq0 15798: ProfVelEq0 15799: ProfDecEq0 15800: ProfAccEq0 16000: NoAction 16001: PosDone 16010: Acceleration 16011: ConstSpeed 16012: Deceleration 16013: Reversing 16100: ResetActive 16101: LoadStartVal 16102: AbortActive 16103: ExtSetVal 16300: NoTPDetected
	Keypad display	ProfilerState
	GDC display	Profile generator status
3090	Minimum value / maximum value	-2147483647 / 2147483647
	Initialisation value	0 units
	Internal minimum value / maximum value	-2147483647 / 2147483647
	Data type / external data type	DINT / 32-bit with sign
	Array size	10 (Determined via the global variable <i>C_wNumberOfPosCorrectionValues</i> .)
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	CorrPosition
	GDC display	Correction position
3091	Minimum value / maximum value	-2147483647 / 2147483647
	Initialisation value	0 units
	Internal minimum value / maximum value	-2147483647 / 2147483647
	Data type / external data type	DINT / 32-bit with sign
	Array size	10 (Determined via the global variable <i>C_wNumberOfPosCorrectionValues</i> .)
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	CorrPosValue
	GDC display	Position correction value



3100	Minimum value / maximum value	-214000.0000 / 214000.0000
	Initialisation value	0.0000 units
	Internal minimum value / maximum value	-2140000000 / 2140000000
	Data type / external data type	DINT / fixed comma
	Array size	5 (Determined via the global variable <i>C_wNumberOfMotionObjects</i> .)
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Prof.Position
	GDC display	Profile parameter position
3200	Minimum value / maximum value	-214000.0000 / 214000.0000
	Initialisation value	0.0000 units/s
	Internal minimum value / maximum value	-2140000000 / 2140000000
	Data type / external data type	DINT / fixed comma
	Array size	5 (Determined via the global variable <i>C_wNumberOfMotionObjects</i> .)
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Prof.Velocity
	GDC display	Profile parameter speed
3300	Minimum value / maximum value	0.0000 / 214000.0000
	Initialisation value	0.0000 units/s ²
	Internal minimum value / maximum value	0 / 2140000000
	Data type / external data type	DINT / fixed comma
	Array size	5 (Determined via the global variable <i>C_wNumberOfMotionObjects</i> .)
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Prof.Acc
	GDC display	Profile parameter acceleration
3400	Minimum value / maximum value	0.0000 / 214000.0000
	Initialisation value	0.0000 units/s ²
	Internal minimum value / maximum value	0 / 2140000000
	Data type / external data type	DINT / fixed comma
	Array size	5 (Determined via the global variable <i>C_wNumberOfMotionObjects</i> .)
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Prof.Dec
	GDC display	Profile parameter deceleration
3500	Minimum value / maximum value	-214000.0000 / 214000.0000
	Initialisation value	0.0000 units/s
	Internal minimum value / maximum value	-2140000000 / 2140000000
	Data type / external data type	DINT / fixed comma
	Array size	5 (Determined via the global variable <i>C_wNumberOfMotionObjects</i> .)
	External data type / external data type	Fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Prof.FinalVel
	GDC display	Profile parameter final speed

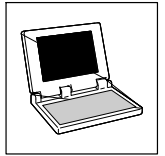


Template Positioner

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3600	Minimum value / maximum value	0.0000 / 214000.0000
	Initialisation value	0.0000 ms
	Internal minimum value / maximum value	0 / 2140000000
	Data type / external data type	DINT / fixed comma
	Array size	5 (Determined via the global variable <i>C_wNumberOfMotionObjects</i> .)
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Prof.JerkTime
	GDC display	Profile parameter jerk time
3998	Minimum value / maximum value	0 / 65535
	Initialisation value	0
	Internal minimum value / maximum value	0 / 65535
	Data type / external data type	WORD / fixed comma
	Access	Write/read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Selection:	All error messages
	Keypad display	Act. Failure
	GDC display	Current PLC or template error
3999	Minimum value / maximum value	0 / 4294967295
	Initialisation value	0
	Internal minimum value / maximum value	0 / 4294967295
	Data type / external data type	DWORD / fixed comma
	Access	Read
	Controller inhibit (CINH) required?	No
	Keypad: SHIFT + PRG required?	No
	Keypad display	Templ.Version
	GDC display	Version of the template



7.6 Visualisation

All visualisations used in the Lenze templates have the same structure:

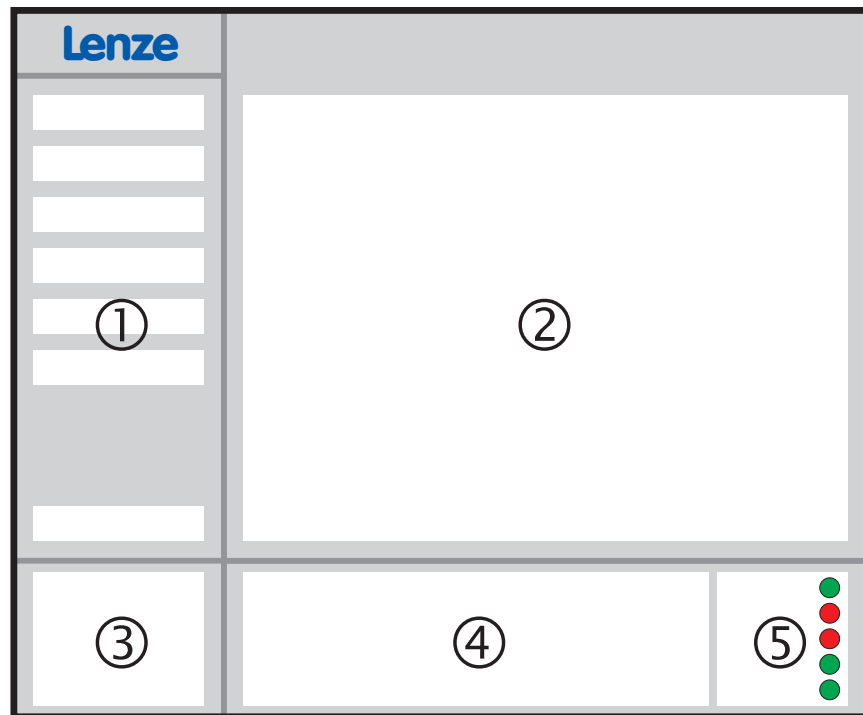


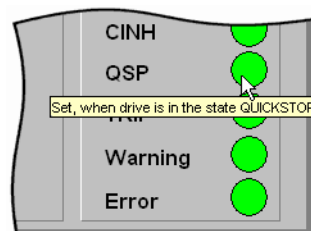
Fig. 7-1 Basic structure of the visualisation used in the template

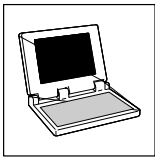
①	Menu	You can select the desired template function from the menu. After selection, the function is visualised in the dialog area.
②	Dialog area	
③	Control fields	Area for cross-function control fields (buttons). Important: The "software switches" QSP and CINH only trigger quick stop or controller inhibit when online connected to the PLC. They therefore do <u>not</u> fulfill the safety requirements for EMERGENCY STOP devices which have to be effective in all operating states of the plant or system.
④	Current values	Area in which the current parameter values of the template are displayed.
⑤	Status messages	Area in which cross-function status messages from the PLC or the template are displayed.



Tip!

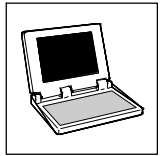
You can obtain additional information on a visualisation object by positioning the mouse pointer over the object until a "tool tip" is displayed:





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Appendix ***Visualisation***



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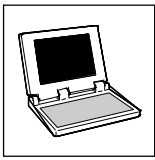
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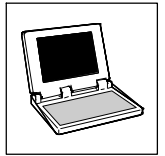
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