

Siemens
Industry
Online
Support

APPLICATION EXAMPLE

SIMATIC S7-1200 G2 "Flying saw"

LFlyingSawBasic for SIMATIC TIA Portal V20 / V1.0 / 01/2025

SIEMENS

SIEMENS

Introduction 1

Engineering 2

Appendix 3

SIMATIC

S7-1200 G2
Flying saw S71200G2

Application examples

Fast and simple implementation of a flying saw using an example program

01/2025
Entry-ID: 109977573

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Siemens Aktiengesellschaft
Digital Industries
Postfach 48 48
90026 NÜRNBERG
GERMANY

Ⓟ 01/2025 Subject to change

Copyright © Siemens 2017 - 2024.
All rights reserved

Warranty and liability

NOTE

The Application Examples are not binding and do not claim to be complete regarding the circuits or equipment shown, or every eventuality. The Application Examples do not represent customer-specific solutions. They are only intended to provide support for typical applications. You are responsible for ensuring that the described products are used correctly. These Application Examples do not relieve you of the responsibility to use safe practices in application, installation, operation and maintenance. When using these Application Examples, you recognize that we cannot be made liable for any damage/claims beyond the liability clause described. We reserve the right to make changes to this Application Example at any time without prior notice. If there are any deviations between the recommendations provided in this Application Example and other Siemens publications – e.g. catalogs – the contents of the other documents have priority.

We do not accept any liability for the information contained in this document. Our liability for damages resulting from using the examples, notes, programs, configuration and performance data, etc. described in this Application Example regardless of the legal background is excluded unless required by law, e.g. in cases of willful misconduct, gross negligence, personal injury or death, failure to achieve guaranteed characteristics, fraudulent concealment of a defect or in case of breach of fundamental contractual obligations. The damages for breach of a substantial contractual obligation are, however, limited to foreseeable damage, typical for the type of contract, except in the event of intent or gross negligence or injury to life, body or health. The above provisions do not imply a change of the burden of proof to your detriment.

Any form of duplication or distribution of these Application Examples or excerpts hereof is prohibited without the express consent of Siemens AG.

Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/cert.

Table of contents

1 Introduction 8

1.1 Overview 8

1.2 How it works 15

1.3 Components used 17

2 Engineering 18

2.1 Basic functions block for axes and external encoders 18

2.2 Blocks for flying saws and shears 19

2.3 Connecting the external encoder and measuring input via onboard I/O 20

2.4 Function description 26
2.4.1 Symmetric synchronization 26
2.4.2 Cutting to define length 28
2.4.3 Cutting to measuring input signal 29
2.4.4 Fading out the measuring input signal 30
2.4.4.1 Manually fading out the measuring input signal 30
2.4.4.2 Fading out the measuring input signal using fade-out length 31
2.4.5 Cut enable 34
2.4.6 Termination conditions 35
2.4.7 Switching between external encoder and real axis 36
2.4.8 Automatic mode of the saw 37
2.4.9 Immediate cut 38
2.4.10 Return velocity 40
2.4.11 Running Back Optimization (RBO) 41
2.4.12 Detecting the cutting length 43
2.4.13 Optimized settings for external encoders 45

2.5 Interface description 47
2.5.1 Layout of the interfaces 47
2.5.2 Interface description for controlling the saw axis 49
2.5.3 Structure of the global data block 51

2.6 Operation 56
2.6.1 Simulation environment 56
2.6.2 HMI interface 57
2.6.3 Operating the program 67

2.7 Troubleshooting 68
2.7.1 Basic troubleshooting functions 68
2.7.2 Saw axis troubleshooting concept 68
2.7.3 Error codes 69

3 Appendix 70
3.1 Service and Support 70
3.2 Links and literature 71
3.3 Documentation of changes 72

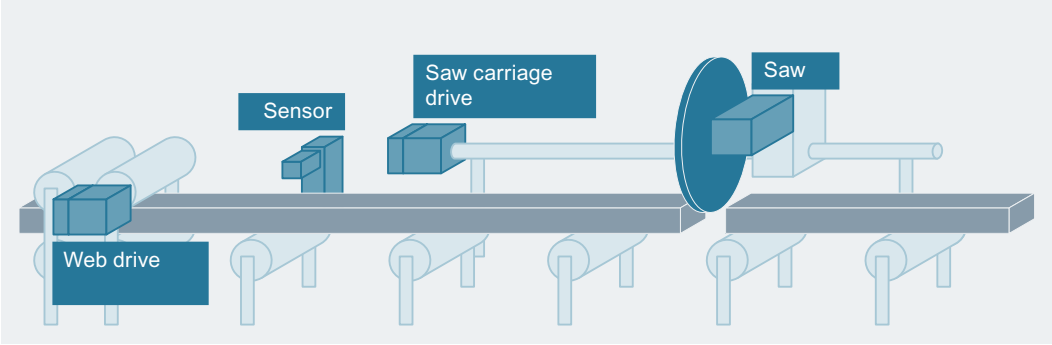
Introduction

1

1.1 Overview

Definition

A "flying saw" cuts product on a web that is continuously moving. In the process the saw axis as following axis is synchronized with the leading axis.



This application example provides a clearly structured solution for implementing a flying saw or shears with an S7-1200 G2. The associated example project "LFlyingSawBasic_S71200G2_V1_0_0" covers various areas of application.

- You can use the included programs straight away or add individual functions to these programs.
- You can integrate the included HMI project in your application case or use it directly for simulation and testing purposes.

Properties of the example project "LFlyingSawBasic_S71200G2_V1_0_0"

The example project contains the following application cases and functions:

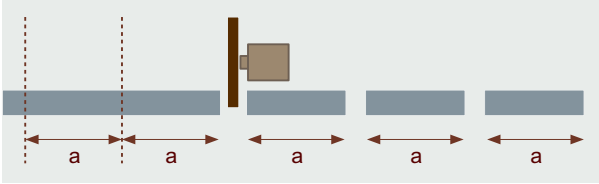
- Cutting method variants
- On-the-fly switching between the following master value sources:
  - Real axis
  - External encoder
- On-the-fly switching of the operating parameters during runtime.
- Immediate cut in deactivated and in activated automatic mode
- Symmetric synchronization
- Configurable return velocities
- Cutting and cutting length sum

- Marking detection when cutting to measuring input signal
- Fading out the measuring input signal
- Running Back Optimization (RBO)
- Defining settings for the first material cut
- Statistical evaluations for the flying saw - Evaluation of the cut length

Cutting method variants

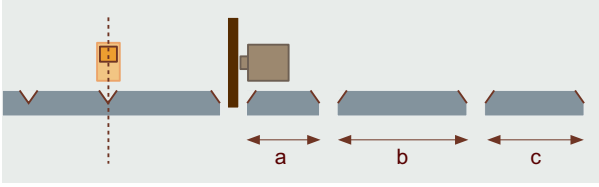
- Cutting to length

  Fixed adjustable material lengths are cut when cutting to length. The saw operator can adjust the material length for each cut.



- Cutting to measuring input signal

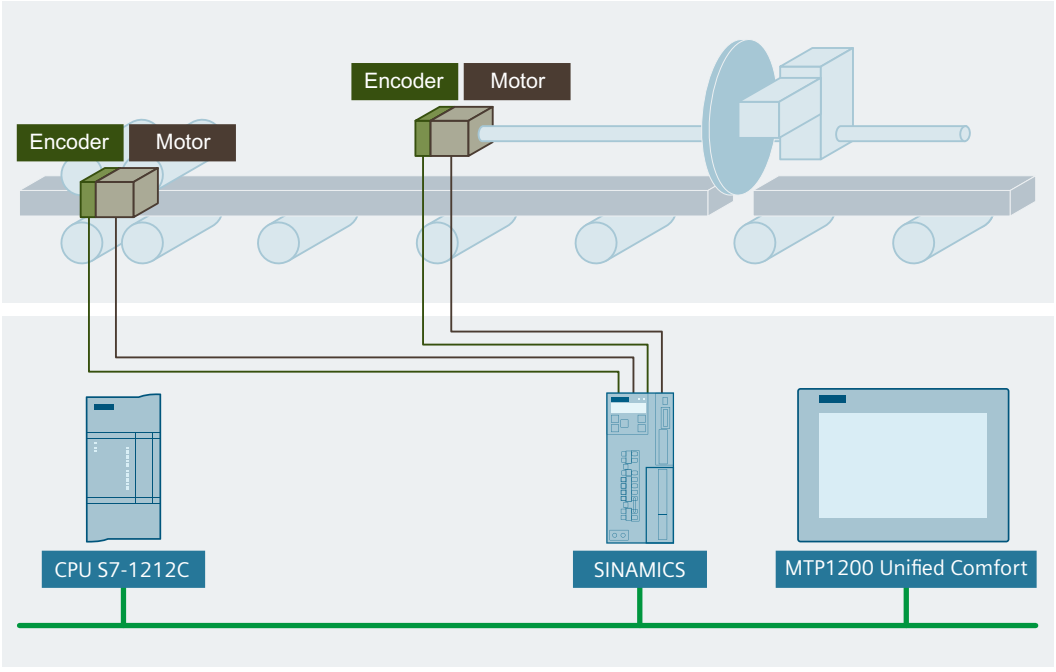
  When cutting to measuring input signal, a sensor detects a marking on the material. The following axis and the cut are synchronized to the marking.



Variants for master value provision

- Master value of the real axis

  The position master value is used directly from the web drive.



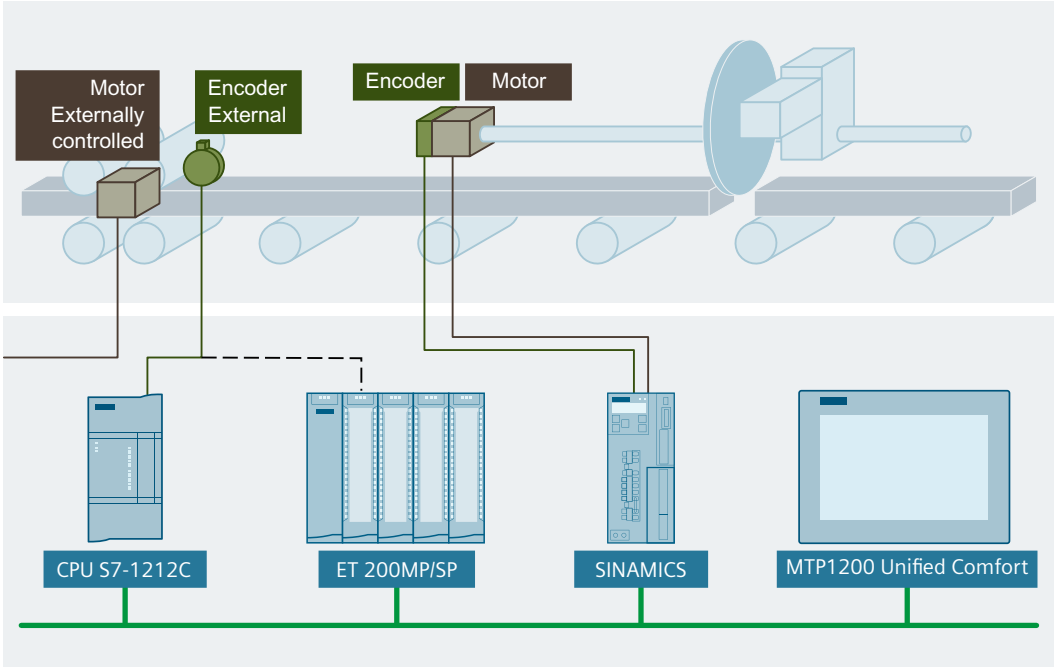
- Master value from external encoder

  The application receives the position master value from an external encoder. The following figure shows the connection of the external encoder to the onboard I/O of the S7-1200 G2 and, optionally, to a distributed I/O (dashed line). As further alternatives, the encoder can also be connected directly to the bus or to the SINAMICS frequency converter.

NOTE

In this example, the standard connection to an external encoder takes place via the high-speed counter (HSC).

You will find more information on connecting an external encoder to HSC in the section Connecting the external encoder and measuring input via onboard I/O (Page 20).

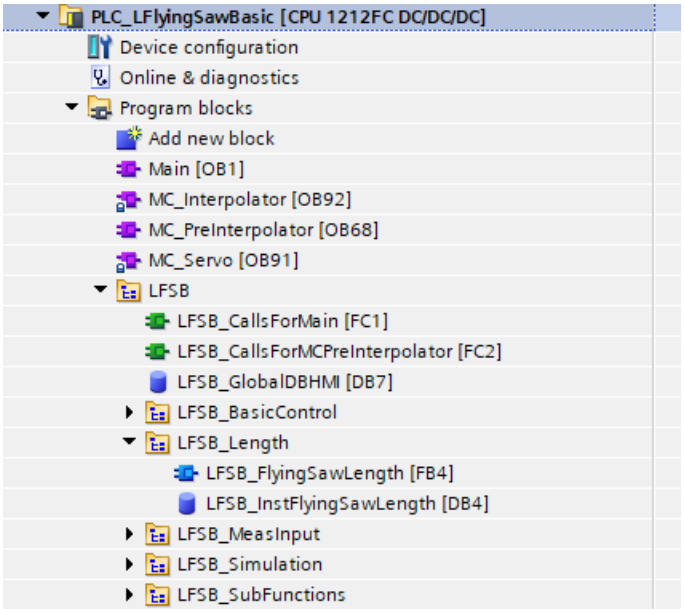


The operator can switch during operation between the application cases "Master value of real axis" and "Master value of external encoder".

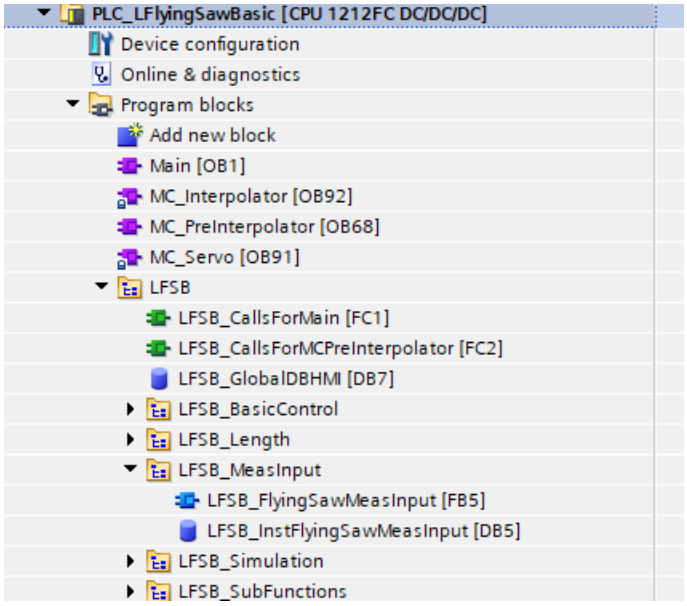
Included blocks

For both application cases "Cutting to length" and "Cutting to measuring input signal", the application example "Flying saw" has a central function block on the CPU:

- Function block "LFSB_FlyingSawLength" for the application case "Cutting to length"



- Function block "LFSB_FlyingSawMeasInput" for the application case "Cutting to measuring input signal"



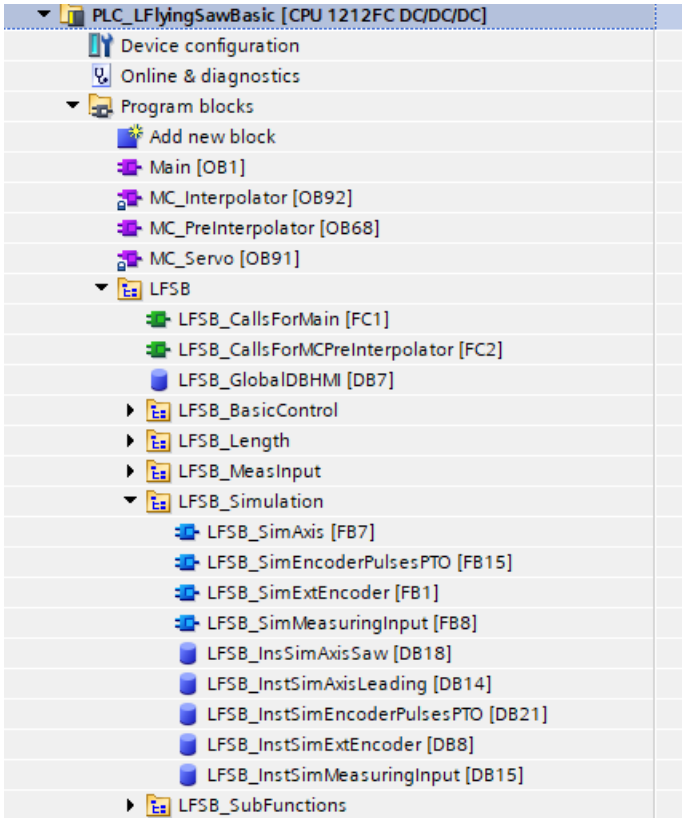
The basic functions of the axes are implemented in the function block "LFSB_BasicControlSaw".

HMI interface and simulation

An HMI project is included in this application example. You can use this to operate the application example in various simulation environments or within your plant.

Additional blocks are prepared in the CPUs of the example project for simulating the provision of master values via an external encoder or a measuring input signal:

- Function block "LFSB_SimExtEncoder" with instance data block
- Function block "LFSB_SimMeasuringInput" with instance data block



The blocks in the "LFSB_Simulation" group are useful for testing the FS function without a real hardware environment. They are not absolutely necessary for integrating the flying saw into your application, but it is recommended that you retain the blocks. For example, by using the simulated leading axis, the real saw can be tested without moving an external encoder for commissioning or diagnostic purposes.

You will find additional information about the testing and simulating of the example project in section "Operation (Page 56)".

Restrictions of the program "LFlyingSawBasic_S71200G2"

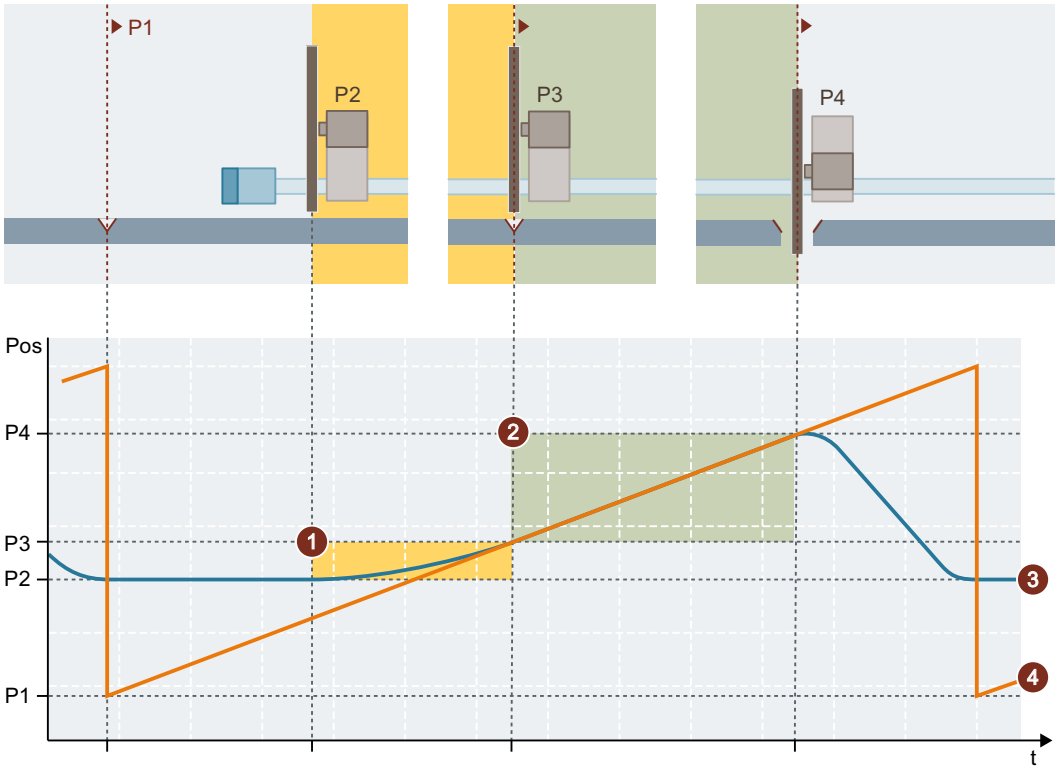
The following functions were not considered in the implementation of the program. The unchanged operation of the example project in a self-created user program is excluded for these functions:

- Switching between cutting to measuring input signal and cutting to length is only possible when the machine is at standstill.
- Safety-related functions and reactions of the plant in case of error, such as the extension of the saw blade in case of a fault, limit switch functions, etc. are your responsibility.

1.2 How it works

Description

The cutting position is the position on the web at which the material is to be cut. The cutting position is detected either as marking via the measuring input or by the PLC via an adjustable material length. Since the web is moving, the cutting position is also moving. The saw synchronizes with the web in such a way that the saw blade travels to the precisely above the cutting position of the material. The cut is enabled as soon as this synchronized position is reached.



P1 Cutting position
P2 Starting position of the saw
P3 Synchronized position, cut is enabled
P4 Cut is finished.
① Acceleration range of the saw
② Range of the synchronizing travel, cut can be triggered, creation of gap can be triggered
③ Saw position
④ Web position

Once the cut has been completed the saw returns to its starting position.

Delimitation

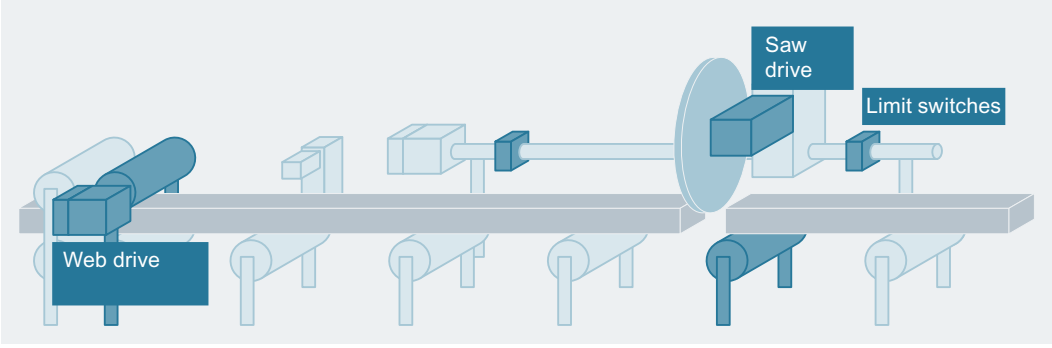
The following configurations are not contained in this example project:

- Configuration of technology objects

  The correct configuration of the technology object used in the example project is your responsibility. The technology objects configured in the example project are configured for the training case SINAMICS S210 , but can also be simulated (Page 56).

  NOTE
  Configuration of technology objects
  The configuration of the technology object is not described in this application example.
  In particular, configure the safety-relevant tags at the technology object, such as software limit switches and dynamic limit values.

- To use the application example belonging to this program as template for your application, implement the areas of the example project shown in the screen outside of the described blocks:



- Safety relevant functions and reactions

  NOTE
  Safety relevant functions and reactions
  Safety relevant functions are not described in this application example.
  Ensure the implementation and monitoring of all safety relevant configurations in your application.

1.3 Components used

components

The two application cases of this application example were created with the following components:

Component	Number	Note
CPU 1212FC	1	Alternatively, you can also use any other CPU of the S7-1200 G2 product family as of firmware version V1.0.
MTP1200 Unified Comfort	1	-
STEP 7 Professional V20	1	-
WinCC Unified Comfort	1	-
Training case SINAMICS S210 (ET 200SP, SINAMICS S210)	1	Alternatively, use an S7-1200 G2 CPU with simulated axes.

Components of the application example

This application example consists of the following components:

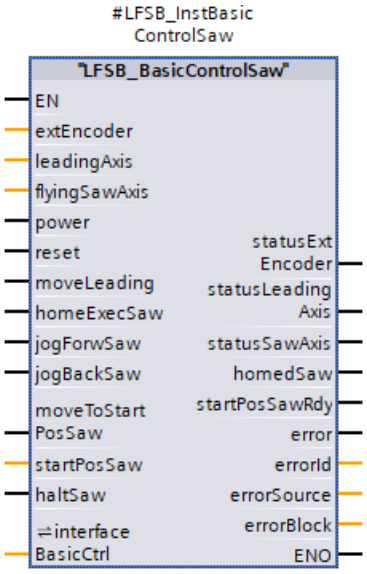
Component	File name	Note
Documentation	LFlyingSawBasic_S71200G2_V1_0-_0_Manual_en.pdf	-
STEP 7 project	LFlyingSawBasic_S71200G2_V1_0-_0_TiaPrj_V20.zip	Incl. HMI project
Global library	LFlyingSawBasic_S71200G2_V1_0-_0_TiaLib_V20.zip	-

Engineering

2

2.1 Basic functions block for axes and external encoders

The basic functions of all axes and the external encoder are contained in the block "LFSB_BasicControlSaw" of the example project.



The implementation of these functions is the responsibility of the user of the example project and is not described here.

2.2 Blocks for flying saws and shears

The functions for controlling the saw axis are contained in the "LFSB_FlyingSawLength" and "LFSB_FlyingSawMeasInput" blocks:



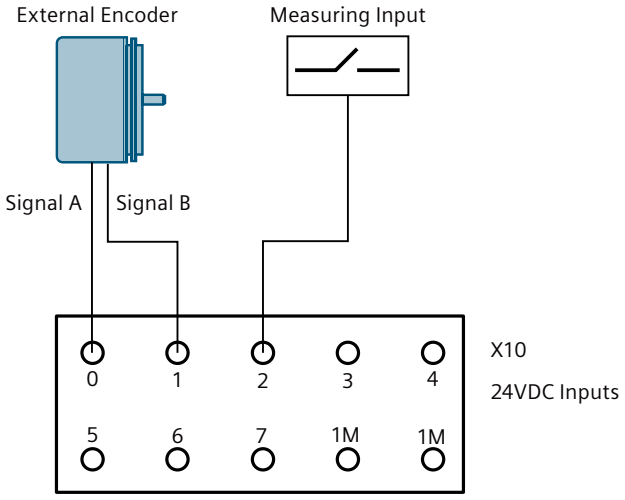


2.3 Connecting the external encoder and measuring input via onboard I/O

The external encoder "ExternalEncorderHSC" is connected to the high-speed counter (HSC) of the onboard I/O of the S7-1200 G2 as standard.

Connecting external encoders to the onboard I/O of the S7-1200 G2

The external encoder and the measuring input are connected to the following digital inputs of the S7-1200 G2 CPU:

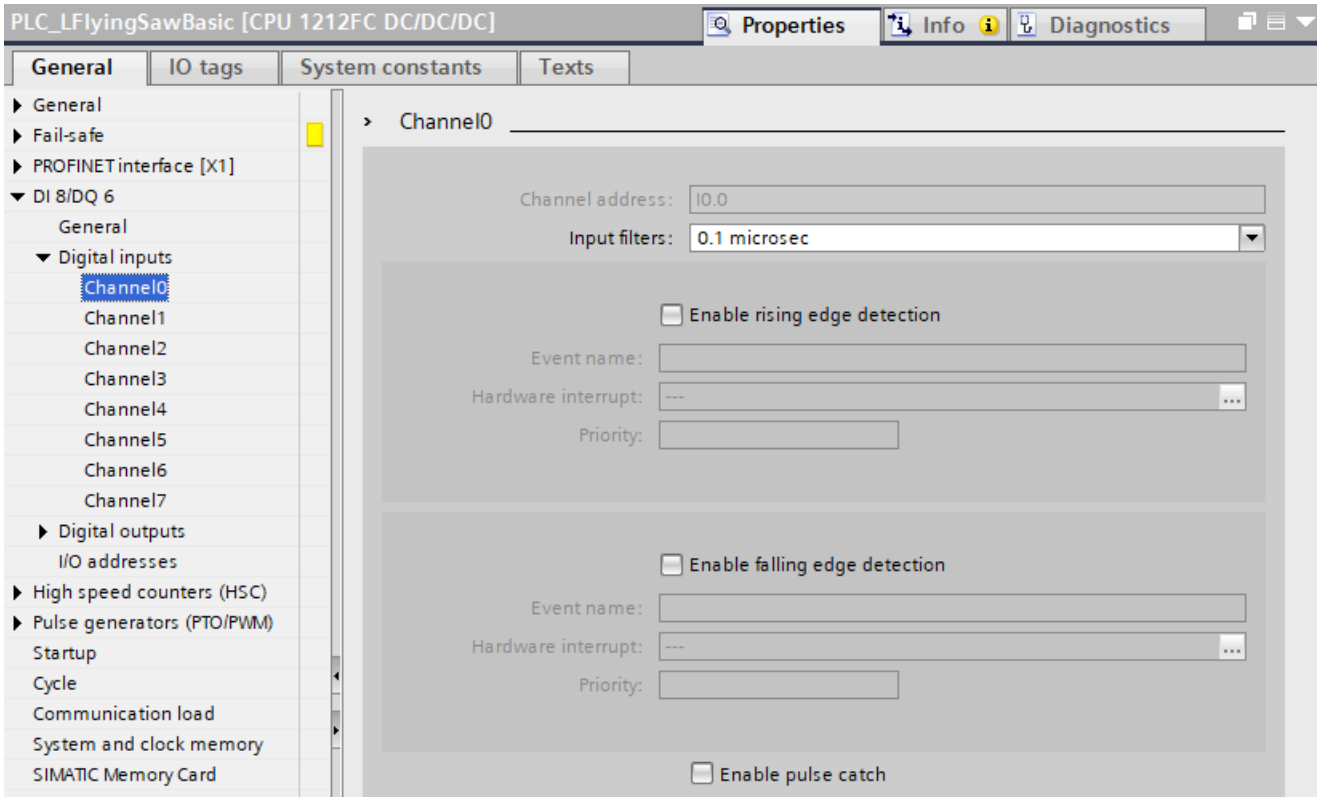


NOTE

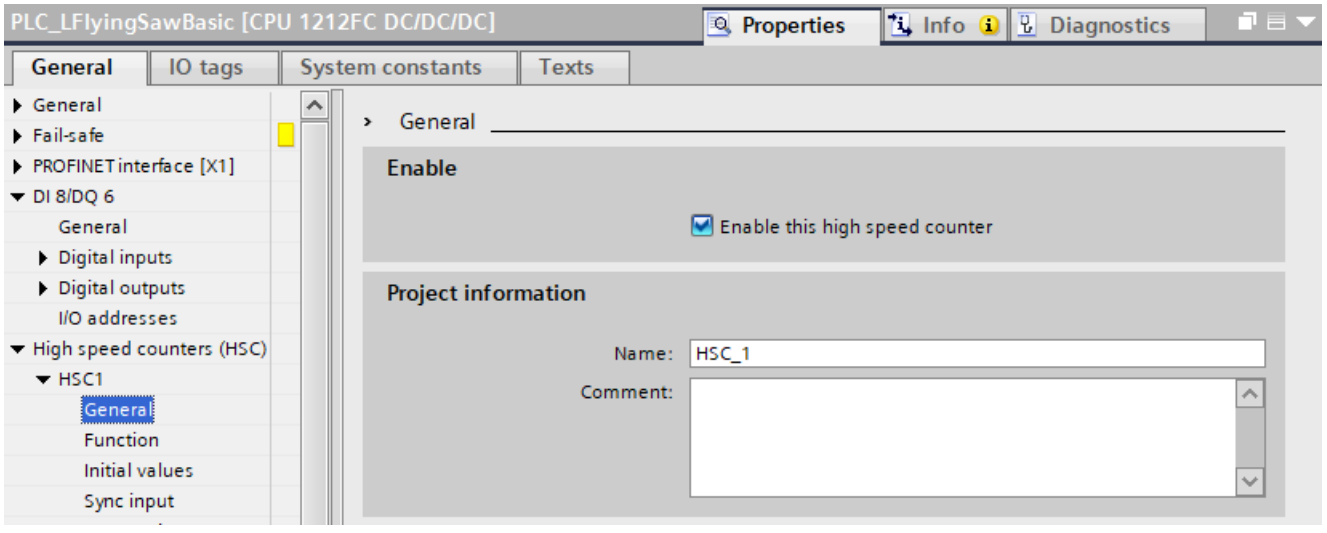
The S7-1200 G2 CPU only supports encoders with 24 V signal level.
For a good signal quality, the encoder used should have a resolution that is as high as possible, e.g. an incremental encoder (HTL) with A/B signal and 4096 increments per revolution.
You can find more information in the System Manual S7-1200 G2 Programmable controller (https://support.industry.siemens.com/cs/ww/en/view/109972011).

CPU device configuration settings

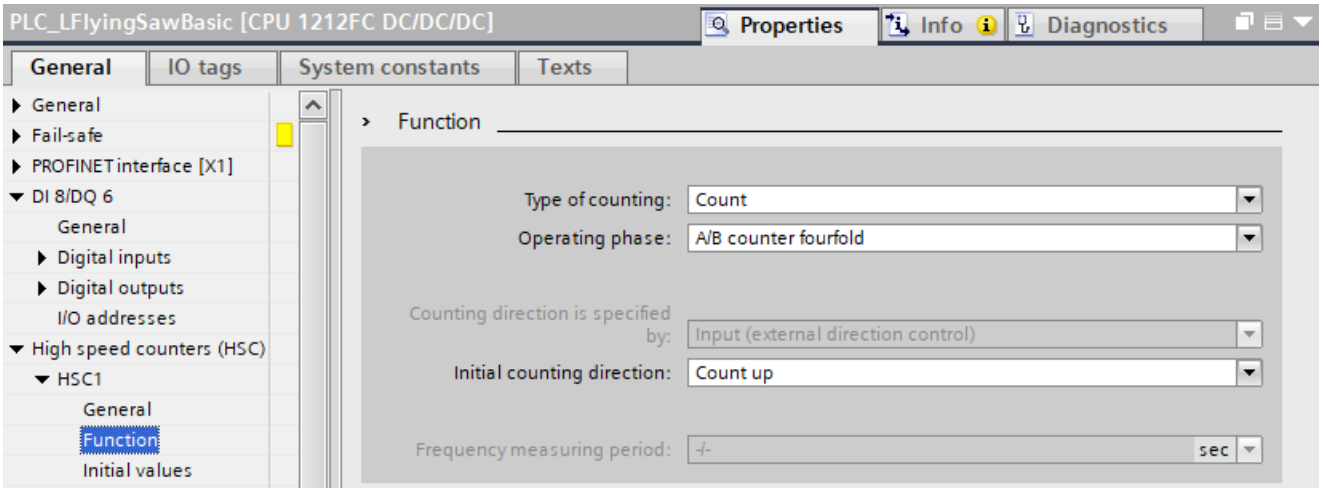
At the digital inputs configure 0.1 µs for the input filters.



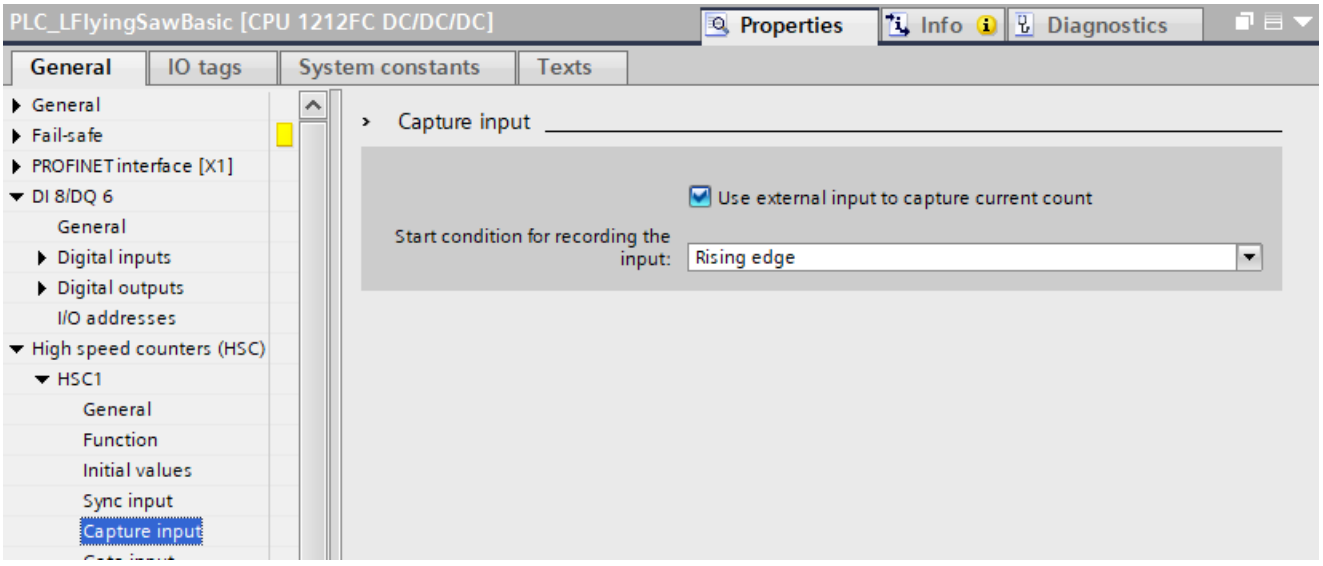
Activate the high-speed counter.



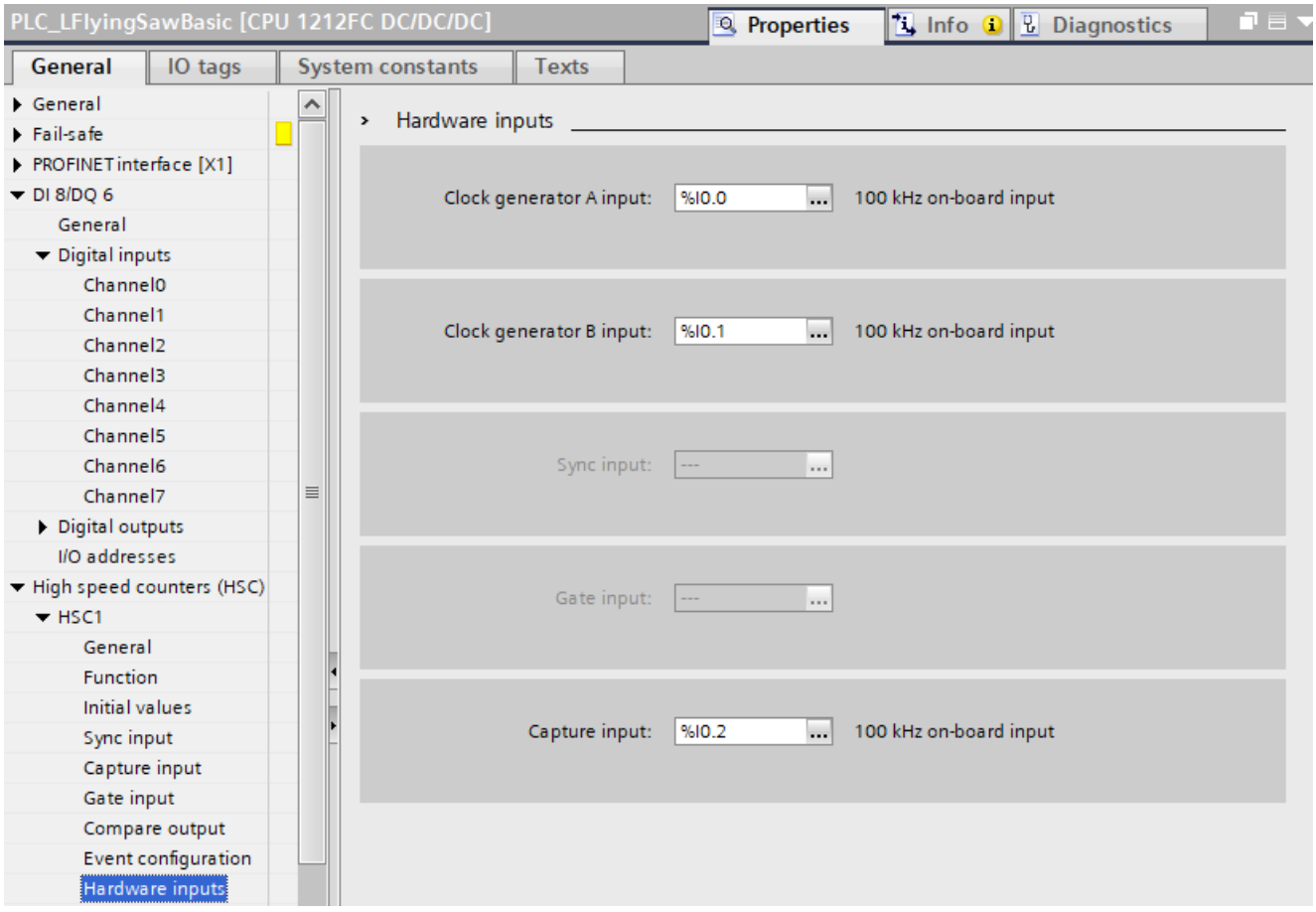
Configure the counter function. You should preferably use A/B counters with fourfold evaluation.



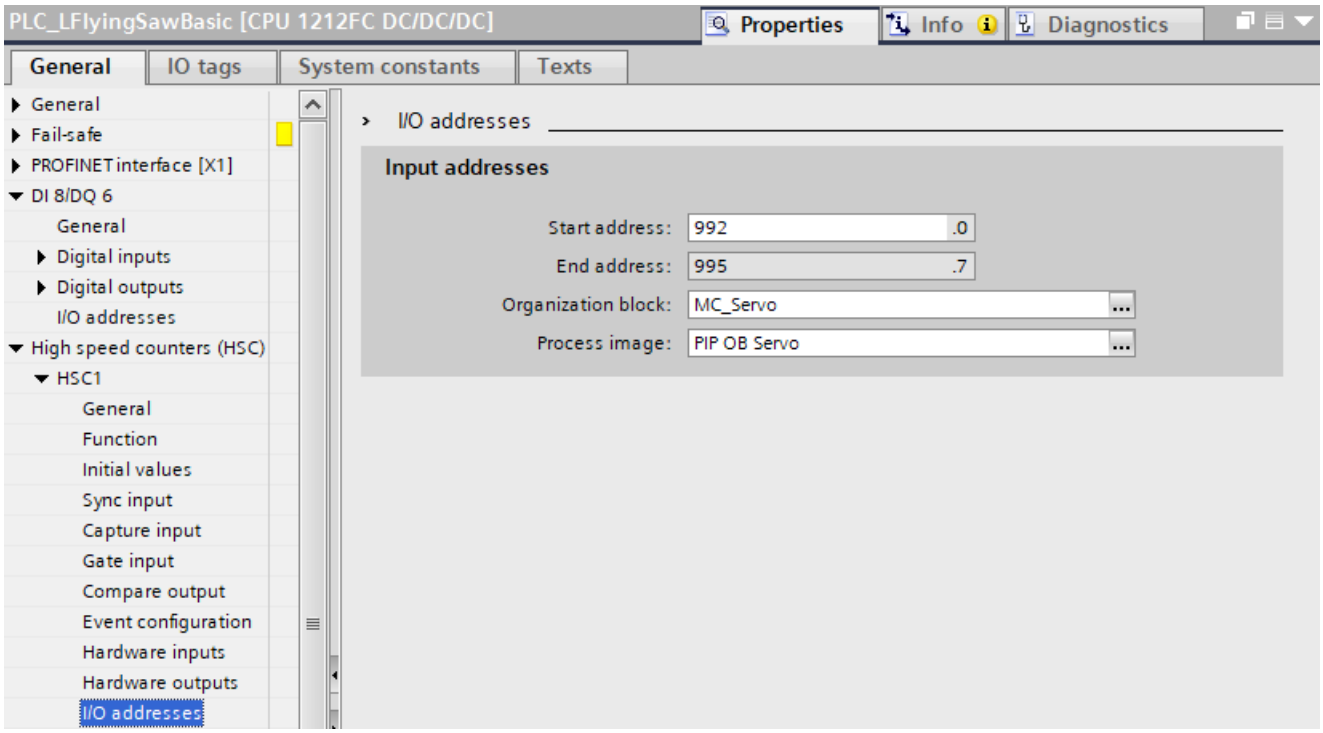
Activate the recording input with rising edge as the start condition. This setting defines the edge evaluation of the measuring input when the "LFSB_FlyingSawMeasInput" function is used.



Assign the hardware inputs.

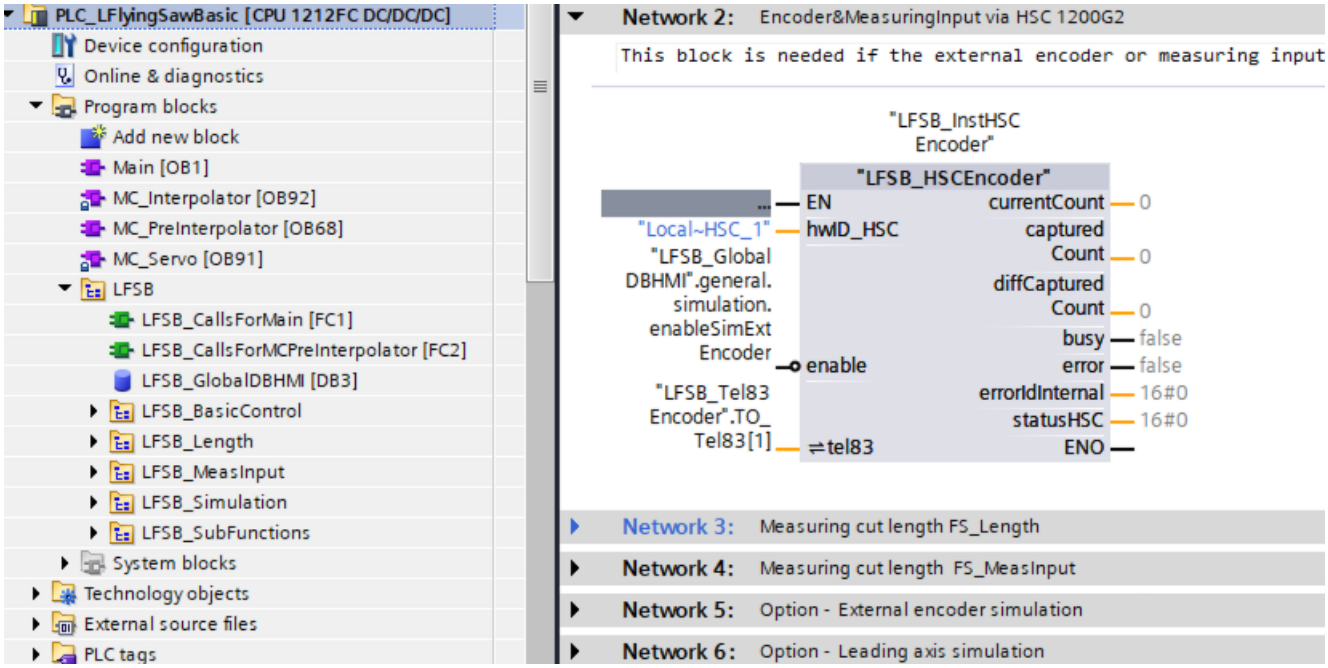


Assign the "MC_Servo" organization block to the input addresses of the high-speed counter.



Assignment of the high-speed counters in the user program

The "hwID_HSC" input at the "LFSB_HSCEncoder" function block is occupied by the system constant of the configured high-speed counter.



Settings on the External encoder technology object

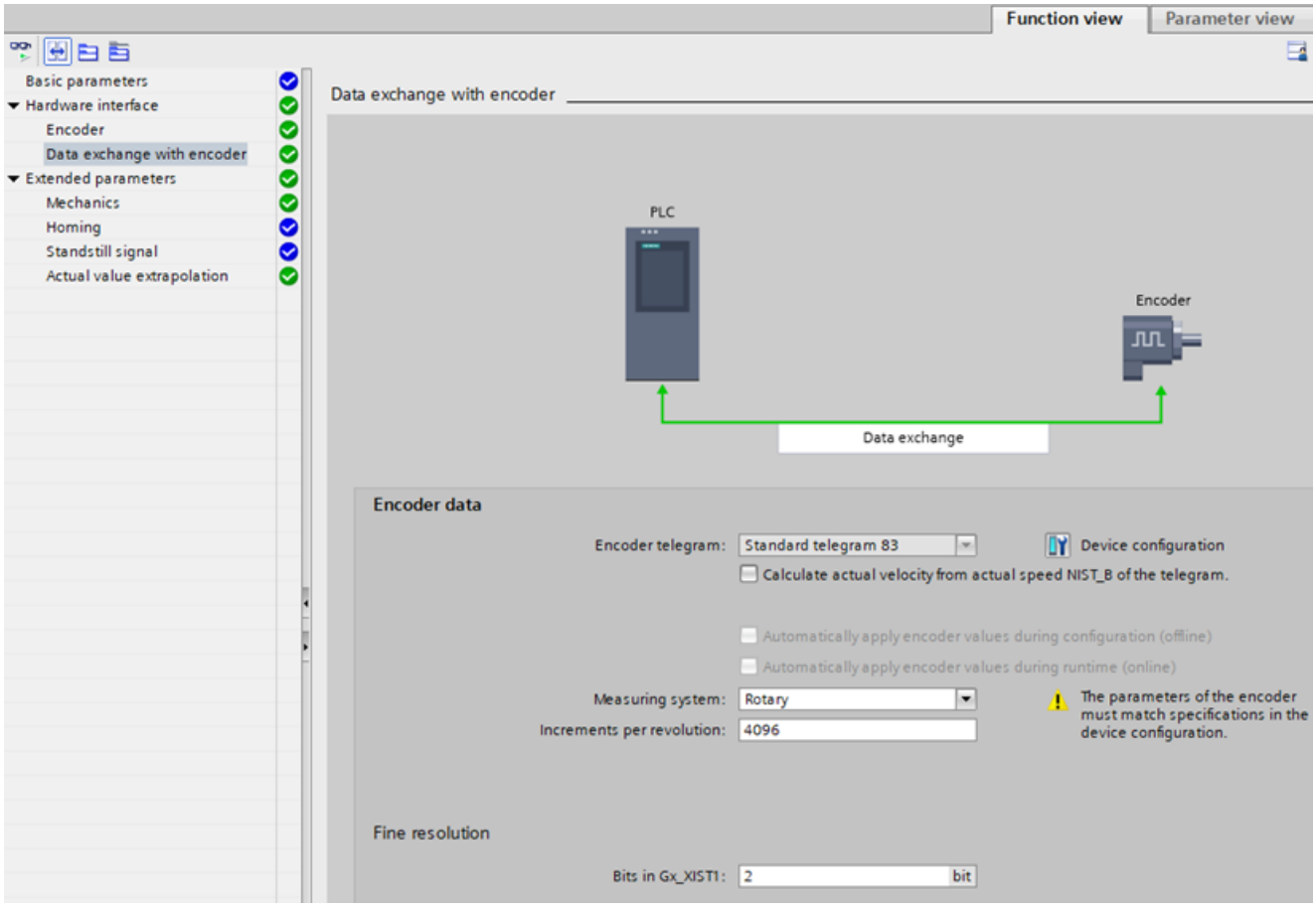
Configure the settings for data exchange with the external encoder.

The figure shows the settings for an incremental encoder with 4096 increments per revolution by way of example. For the high-speed counter, A/B counter with fourfold evaluation is set.

NOTE

Fourfold evaluation corresponds to a fine resolution of 2 bits (offset by 2 bits -> multiplication by 4).

For fourfold counting, the value "2" is required as setting for "Fine resolution > Bits in Gx_XIST1".

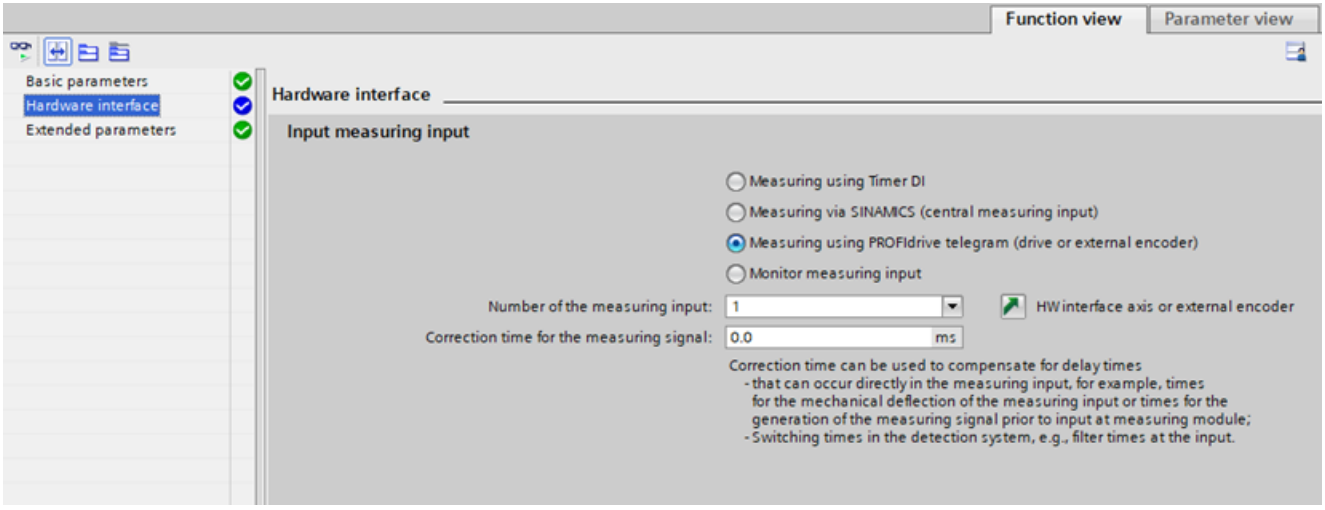


Settings on the Measuring input technology object

Configure measuring via PROFIdrive frame for the "MeasuringInputExtEnc" measuring input.

NOTE

When the MeasuringInput is connected via the onboard HSC, only "Number of measuring input" = 1 is supported.
"Number of measuring input" = 1 corresponds to the recording input configured in the HSC settings.



2.4 Function description

2.4.1 Symmetric synchronization

Description

Defines an acceleration-constant synchronization profile.

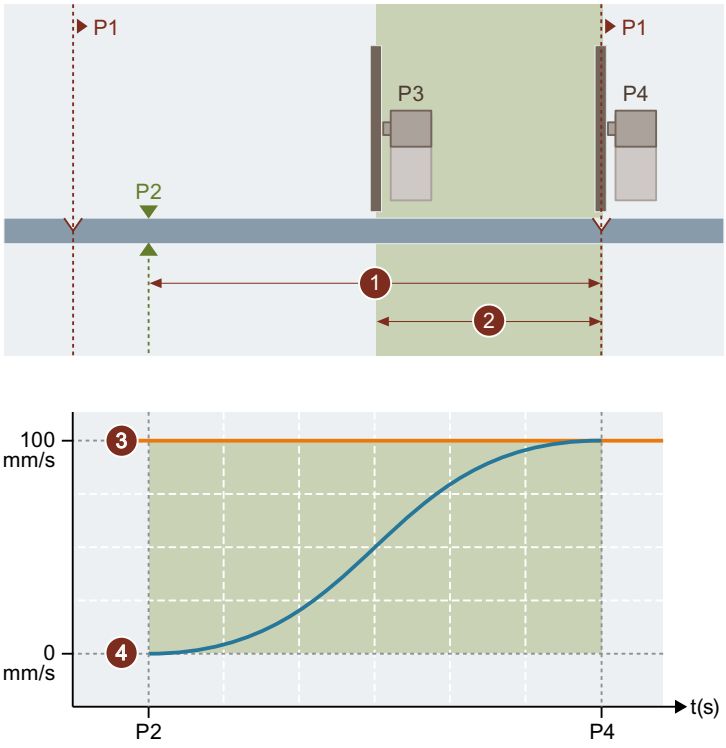
How it works

Based on the synchronization length, the program calculates the required synchronization parameters. As a result, the synchronization profile is always symmetric. With symmetric synchronization, no velocity overshoot of the saw axis is required. The saw synchronizes with a harmonious acceleration-constant movement. The synchronous positions are calculated by the block.

When the leading axis reaches the calculated position of the starting point, the synchronization of the two axes is triggered.

The synchronization length is the distance from the start of the synchronization to the synchronized position at which the two axes travel synchronously. The enable to cut is set as soon as the saw carriage has reached the synchronized position.

The saw hereby travels over the cutting position. The shorter the synchronization length the higher the resulting acceleration during the synchronization.



P1 Cutting point on the web

P2 Starting point of the synchronization

P3 Starting position of the saw carriage

P4 Synchronization reached

① Synchronization length
Path of the web during the synchronization

② Path of the saw carriage during the synchronization

③ Velocity of web

④ Velocity of saw

NOTE

Synchronizing for immediate cut

You set the dynamic parameters for the immediate cut separately. For more information, refer to "Immediate cut (Page 38)".

Relevant values at the interface "InterfaceConfigStatus"

Assigning parameters for symmetric synchronization:

- Setting the synchronization profile:
  `config.sync.syncProfileReference` = 1 (Default value)
- Defining synchronization length:
  `config.sync.syncLengthCutAuto` = <Value>

Relevant output parameters

Cutting is enabled:

- `cutPossible` = TRUE

2.4.2 Cutting to define length

Description

Defines the length of the cut during the automatic operation of the saw.

Relevant input parameters

Defining the material length:

- `cutLength` = <Value>

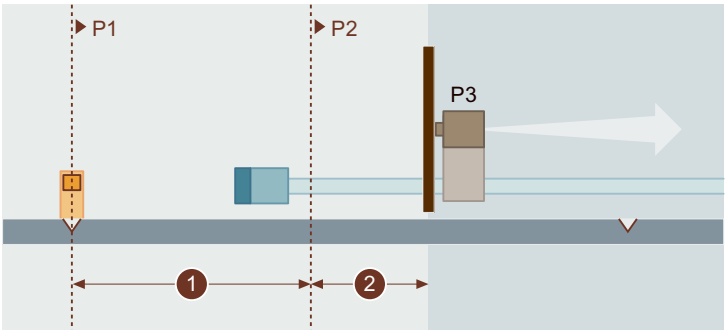
2.4.3 Cutting to measuring input signal

Description

Enables the synchronization of the cut to a marking and the sawing of materials in different lengths. This function is applicable only in automatic operation.

How its works

A measuring input detects a marking on the web. This signal triggers the synchronization of the saw with the web and the cut at the marking. The block calculates the synchronization of the saw to the marking by means of the distance of the measuring input from the origin of the measuring system.



P1 Parameters of the measuring probe

P2 Origin of the measuring system
defined as position 0.0, usually on the left limit stop of the saw

P3 Starting position of the saw

① Distance between measuring input and origin

② Distance between origin and starting position

Relevant input parameters

Defining the distance of the measuring input from origin of the measuring system of the flying saw:

- `distanceMeasInput` = <Value>

Defining cut offset to the marking:

- `distanceMeasInput` = <Value> + Offset

2.4.4 Fading out the measuring input signal

Description

Fades out measuring input signals for skipping over markings. The measuring input continues to detect markings on the web. However, the measuring input signal does not trigger any synchronization of the saw with the web nor any cut at the marking.

Relevant values at the interface "InterfaceConfigStatus"

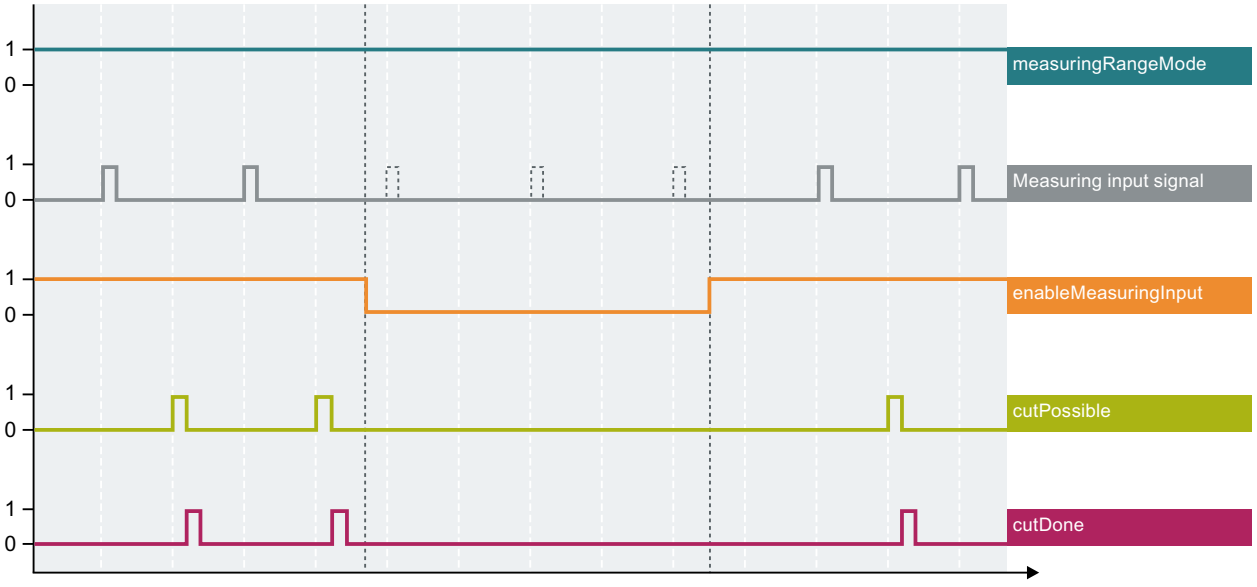
The following modes are available:

- Manually fading out the measuring input signal
  `config.measuringRange.measuringRangeMode` = 1
- Fading out the measuring input signal using fade-out length
  `config.measuringRange.measuringRangeMode` = 0

2.4.4.1 Manually fading out the measuring input signal

How it works

In the "measuringRangeMode" mode = 1, the measuring input signal for the next markings can be manually faded out with "enableMeasuringInput" = 0. As long as "enableMeasuringInput" = 0, no markings are evaluated.



Relevant input parameters

Manually fading out the measuring input signal

- `enableMeasInput` = FALSE

Relevant values at the interface "InterfaceConfigStatus"

Activating the mode for manually fading out the measuring input signal:

- `config.measuringRange.measuringRangeMode` = 1

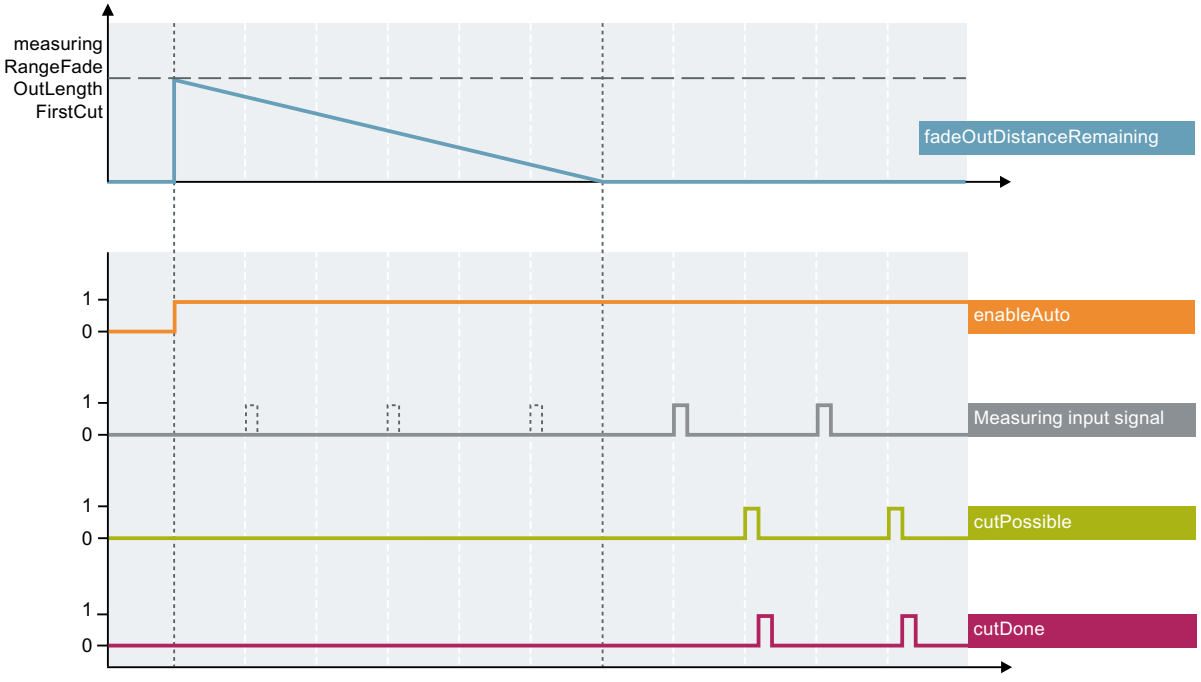
2.4.4.2 Fading out the measuring input signal using fade-out length

In the "measuringRangeMode" mode = 0, the measuring input signal can be faded out for a certain length.

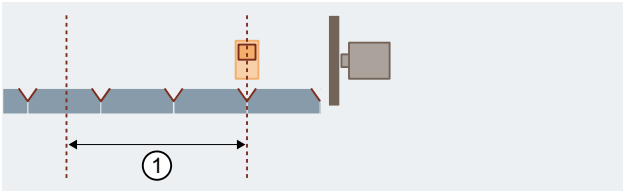
How it works on the first material cut

The measuring input signals for all markings within the "measuringRangeFadeOutLengthFirstCut" fade-out length are faded out before the first material cut.

The status parameter "fadeOutDistanceRemaining" specifies the remaining fade-out distance during the fade-out length.



The fade-out length ① refers to the position of the measuring input.

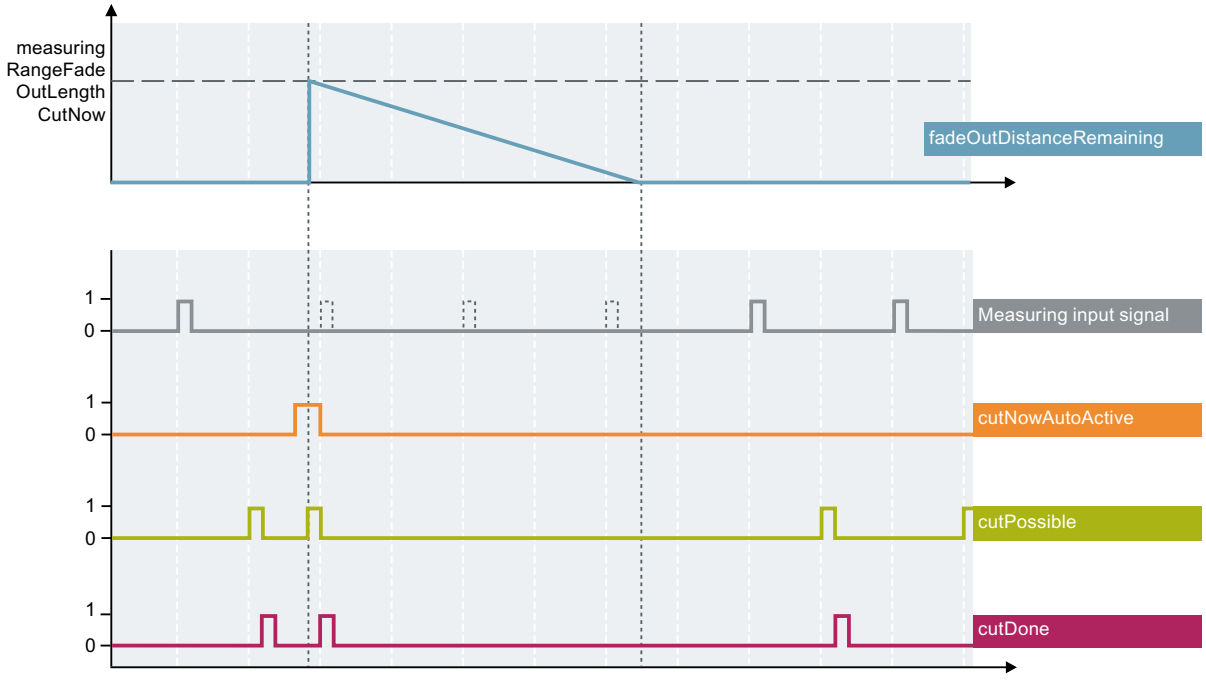


① Fade-out length "measuringRangeFadeOutLengthFirstCut"

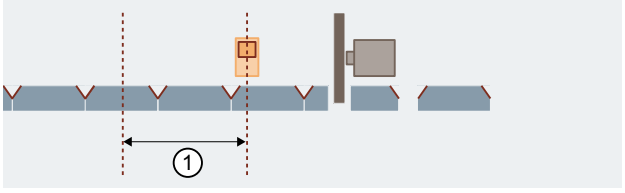
How it works on an immediate cut

The measuring input signals for all markings within the "measuringRangeFadeOutLengthCutNow" are faded out after an immediate cut as soon as the signal "cutPossible" is set.

The status parameter "fadeOutDistanceRemaining" specifies the remaining fade-out distance during the fade-out length.



The fade-out length ① refers to the position of the measuring input.

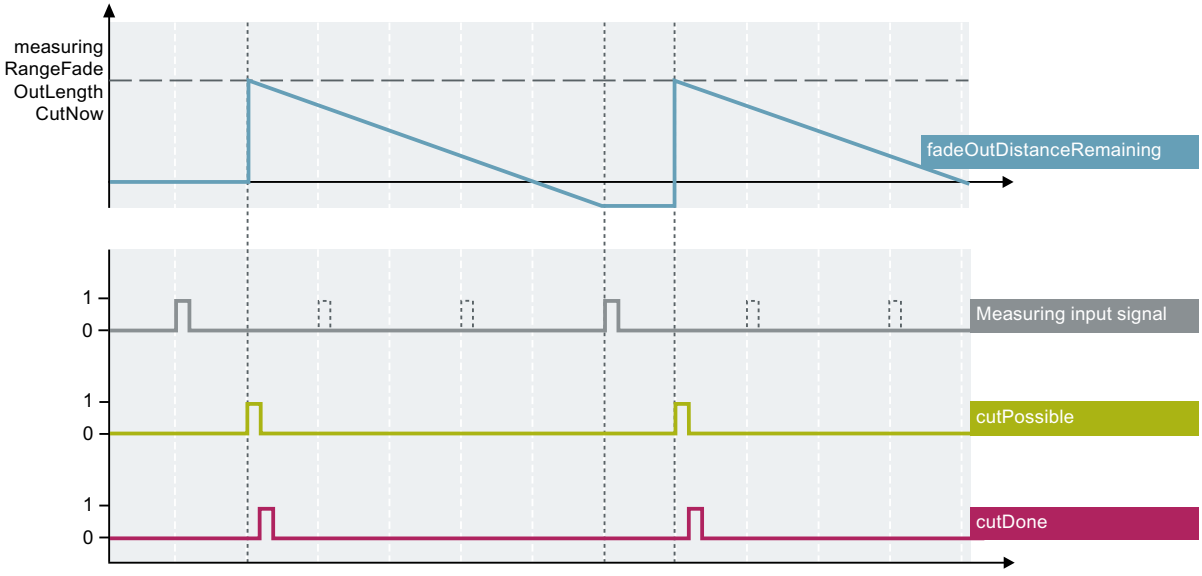


① Fade-out length "measuringRangeFadeOutLengthCutNow"

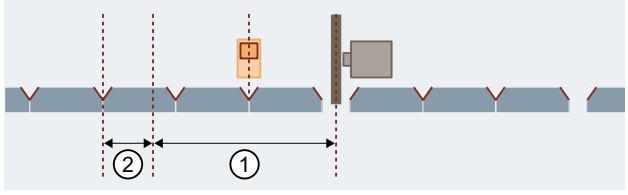
How it works in automatic mode

After the first cut in automatic mode or after the first automatic cut following an immediate cut, the measuring input signals for all the markings within the fade-out length "measuringRangeFadeOutLengthCutAuto" are faded out as soon as the signal "cutPossible" is set.

The status parameter "fadeOutDistanceRemaining" specifies the remaining fade-out distance during the fade-out length. After the fade-out length, the parameter displays the distance that the web has moved after the fade-out length up to the next measuring input signal.



The fade-out length ① refers to the last cutting mark at which the saw has cut the material.



① Fade-out length "measuringRangeFadeOutLengthCutAuto"

② Distance up to the next marking to be evaluated

Ensure that you select the fade-out length ① in such a way that the measuring input is released in time before the next marking to be evaluated ② (at least two clock cycles before the next marking).

Recommendation: Select the fade-out length in such a way that the end of the fade-out length is in the middle between two markings.

Relevant values at the interface "InterfaceConfigStatus"

Activating the mode for using the fade-out length:

- `config.measuringRange.measuringRangeMode` = 0

Defining the fade-out length for the first material cut:

- `config.measuringRange.measuringRangeFadeOutLengthFirstCut` = <Value>

Defining the fade-out length for the immediate cut:

- `config.measuringRange.measuringRangeFadeOutLengthCutNow` = <Value>

Defining the fade-out length for the automatic mode:

- `config.measuringRange.measuringRangeFadeOutLengthCutAuto` = <Value>

Distance display:

- `status.fadeOutDistanceRemaining` = <Value>

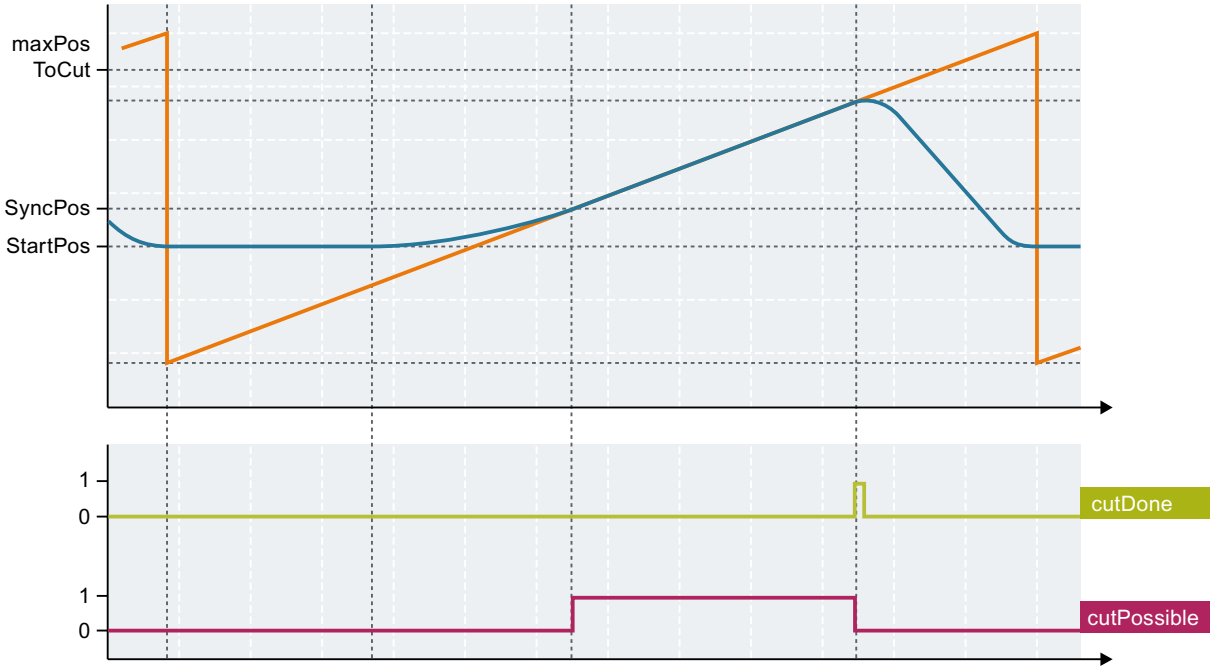
2.4.5 Cut enable

Description

Specifies that the saw runs synchronized with the material and a material cut is possible in the correct length.

How it works

When the saw axis is synchronized the signal "cutPossible" is set and it is hereby signaled that the cut can be triggered. The cut enable is terminated by the feedback signal "cutDone" of the executed cut or if the maximum cut position of the saw axis is reached.



Relevant input parameters

Job is completed:

- `cutDone` = TRUE

Relevant output parameters

Cutting is enabled:

- `cutPossible` = TRUE

Relevant values at the interface "InterfaceConfigStatus"

Define maximum cut position of the saw axis:

- `config.general.maxPosToCut` = <Value>

2.4.6 Termination conditions

Description

The signal for cut enable is reset in the following cases:

- There is an error on the saw.
- The maximum position for the cut was overshot by the saw.

How it works

If there is an error on the saw, an error is output and the automatic material cut is canceled.

If the maximum cut position was overshot, a warning is output and the cut enable is revoked. Automatic mode continues to be active.

Relevant output parameters

Cut enable is reset.

- `cutPossible` = FALSE

Cut was not executed:

- `errorID` = <Value>

Relevant values at the interface "InterfaceConfigStatus"

Define maximum cut position of the saw axis.

- `config.general.maxPosToCut` = <Value>

2.4.7 Switching between external encoder and real axis

Description

Switches the master value provision between an external encoder and a real axis.

If your system is only designed with master value source, you can disable the other source at the module. It is then not necessary to create this technology object.

How it works

The saw axis synchronizes to a master value which is providing by an external encoder or the leading axis.

You can switch the master value provision while the axis is at a standstill or during operation. If you switch the master value provision during operation, the saw carries out the pending cut and then switches the master value. The positions are automatically synchronized with each other.

Relevant input parameters

Assigning parameters for master value provision:

- Activating switching to an external encoder:

  `masterSelectExtEnc` = 1
- Activating switching to a leading axis:

  `masterSelectExtEnc` = 0

Deactivating master value provision via an external encoder or a leading axis:

- Deactivating external encoders:

  `extEcoder` = NULL

  `leadingAxis` = LeadingAxis
- Deactivating real axis:

  `extEcoder` = ExternalEncoder

  `leadingAxis` = NULL

Relevant output parameters

Activating external encoders:

- `activeMasterType` = 2

Leading axis activated:

- `activeMasterType` = 1

2.4.8 Automatic mode of the saw

Description

Activates and deactivates the automatic material cut on the saw axis.

How it works

The signal for the automatic material cut starts the automatic mode. This signal must remain unchanged until the automatic cycle has ended.

If the signal is canceled prior to this, the saw carriage reacts as follows:

- If the saw carriage is in motion, the saw carriage stops at the current position.
- If the saw is currently executing a cut, the saw first completes the cut before the saw carriage stops.

If automatic mode is terminated in the current cycle, the saw carriage completes the current cut and returns to the starting position. You then cancel the signal "enableAuto".

Relevant input parameters

Activate automatic mode:

- `enableAuto` = TRUE

Cancel automatic mode in the current cycle:

- `stopAutoCycleEnd` = TRUE

Relevant output parameters

Automatic mode activated:

- `auto` = TRUE

First material cut in automatic mode

When cutting to length, after starting automatic mode with enableAuto = TRUE, the subsequent first material cut is executed in two possible synchronization variants depending on the state of motion of the leading axis.

- If the leading axis is in motion, then synchronization is performed via the synchronization length as in standard automatic mode.

  The following values of the "InterfaceConfigStatus" interface are relevant for synchronization via the synchronization length:

  – Derivative-action time for setting a reference position before synchronizing for immediate cut and the first material cut if the master is not at standstill

    `config.sync.cutNowFirstCut.preHomeTimeWhenNotStandStill` = <Value>

  – Synchronization length

    `config.sync.syncLengthCutAuto`

- If the leading axis is at a standstill, synchronization is performed immediately.

  The following values of the "InterfaceConfigStatus" interface are relevant for immediate synchronization:

  – Speed threshold value for stationary state detection on the web:

    `config.sync.cutNowFirstCut.standStillVelMaster` = <Value>

  – Acceleration to synchronize for the first material cut:

    `config.sync.cutNowFirstCut.acc` = <Value>

  – Jerk to synchronize for the first material cut:

    `config.sync.cutNowFirstCut.jerk` = <Value>

2.4.9 Immediate cut

Description

Triggers a manual material cut. You can trigger a manual material cut as follows:

- Activated automatic mode

  The operator can trigger additional cuts while the plant is cutting the material to length or at measuring input signal. The saw carriage then travels back to the starting position and waits for the signal for the next immediate cut or automatic cut.

- Deactivated automatic mode

  The operator triggers manual cuts while automatic material cut is not yet activated.

How it works

When the manual material cut is triggered the saw axis starts to synchronize and cuts the material as soon as the saw axis is traveling synchronized to the web.

Precise cut lengths are not possible with this function.

Relevant input parameters

Trigger immediate cut:

- `cutNow` = TRUE

Relevant output parameters

Immediate cut activated while automatic mode is active:

- `cutNowActive` = FALSE
- `cutNowAutoActive` = TRUE

Immediate cut activated while automatic mode is not active:

- `cutNowActive` = TRUE
- `cutNowAutoActive` = FALSE

Relevant values at the interface "InterfaceConfigStatus"

An immediate cut is executed in two possible synchronization variants depending on the state of motion of the leading axis:

- If the leading axis is in motion, then synchronization is performed via the synchronization length as in standard automatic mode.

  The following values of the "InterfaceConfigStatus" interface are relevant for synchronization via the synchronization length:

  – Derivative-action time for setting a reference position before synchronizing for immediate cut and the first material cut if the master is not at standstill

    `config.sync.cutNowFirstCut.preHomeTimeWhenNotStandStill` = <Value>

  – Synchronization length

    `config.sync.syncLengthCutAuto` = <Value>

- If the leading axis is at a standstill, synchronization is performed immediately.

  The following values of the "InterfaceConfigStatus" interface are relevant for immediate synchronization:

  – Speed threshold value for stationary state detection on the web:

    `config.sync.cutNowFirstCut.standStillVelMaster` = <Value>

  – Acceleration to synchronize for the first material cut:

    `config.sync.cutNowFirstCut.acc` = <Value>

  – Jerk to synchronize for the first material cut:

    `config.sync.cutNowFirstCut.jerk` = <Value>

2.4.10 Return velocity

Description

Defines the velocity with which the saw carriage returns to the starting position.

How it works

You configure various return speeds in the example project:

- Return velocity when starting automatic operation

  If the saw is not in the starting position when automatic operation is started, the saw carriage automatically returns to the starting position.
- Return velocity after each step in automatic mode or during immediate cut

Relevant values at the interface "InterfaceConfigStatus"

Dynamic values with which the saw is stopped after the cut

- `config.dynamics.decHaltAfterCut` = <Value>
- `config.dynamics.jerkHaltAfterCut` = <Value>

Dynamic values with which the saw is moved back to the start position after the cut:

- `config.dynamics.velBackToStart` = <Value>
- `config.dynamics.accBackToStart` = <Value>
- `config.dynamics.jerkBackToStart` = <Value>

2.4.11 Running Back Optimization (RBO)

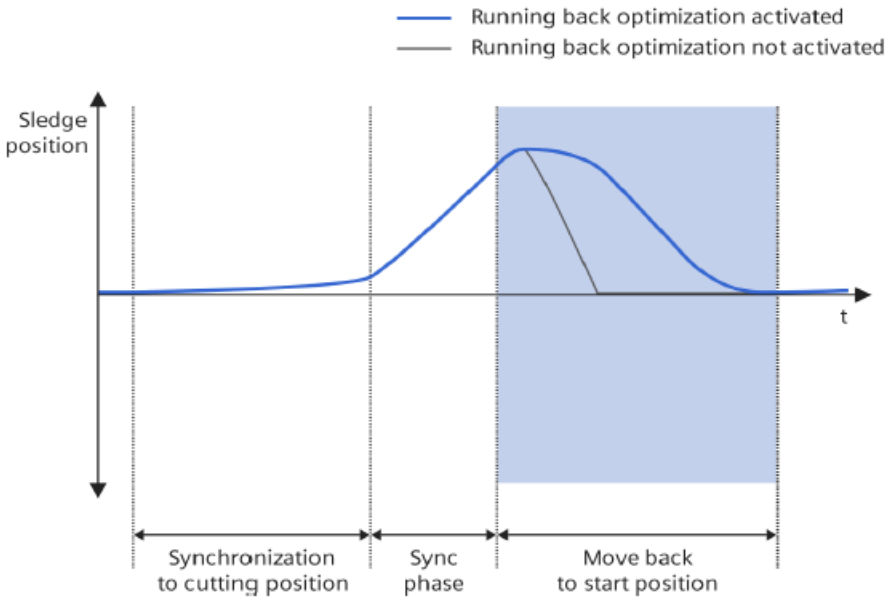
Description

With Running Back Optimization (RBO), the saw is moved back to the start position after the cut just fast enough to achieve the exact synchronization for the next cut.

How it works

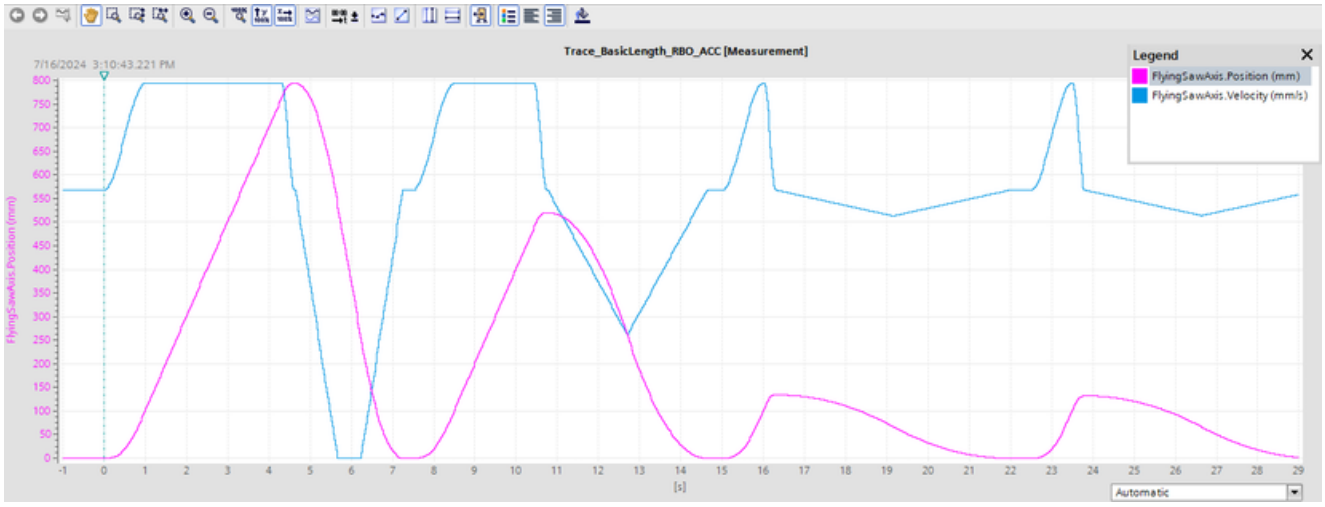
With RBO, the necessary dynamic responses are calculated automatically so that the saw is moved to the start position in good time. Depending on the setting, either the acceleration or the jerk is optimized for the return motion.

The configured values for reversing speed, reversing acceleration and reversing jerk are not exceeded when RBO is enabled.



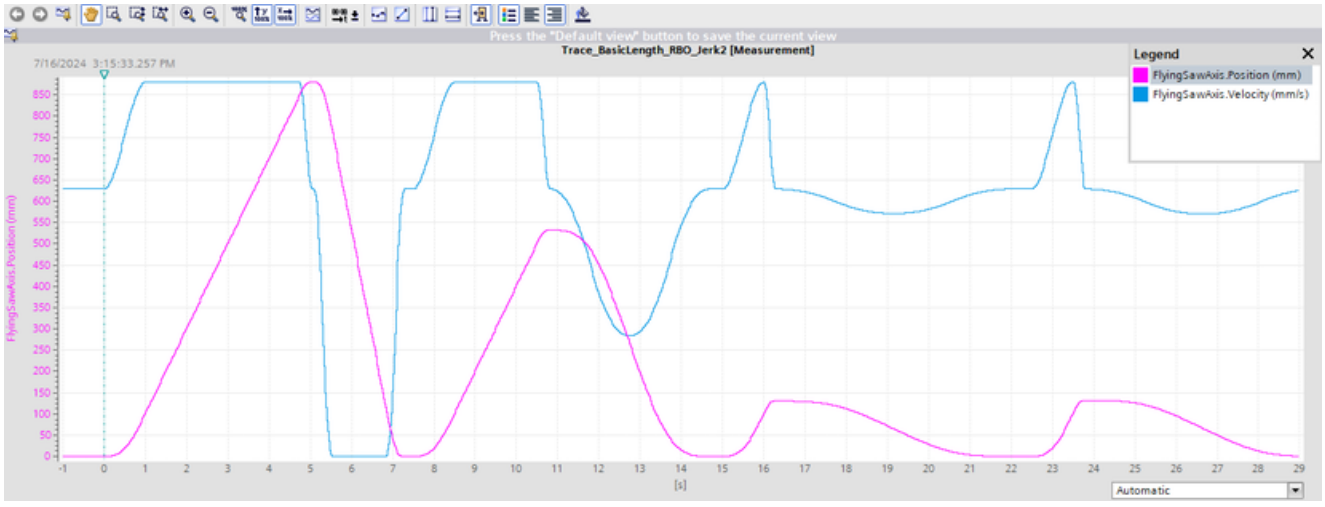
Optimization according to acceleration

With acceleration-optimized RBO, the dynamic responses are calculated in such a way that the saw is moved back to the start position in the specified time with the lowest possible acceleration. The configured values are used for velocity and jerk.



Optimization after jerk

With jerk-optimized RBO, the dynamic responses are calculated in such a way that the saw is moved back to the start position in the specified time with the smallest possible jerk. The configured values are used for the velocity and acceleration.



Relevant values at the interface "InterfaceConfigStatus"

Select RBO mode:

- `config.dynamics.rbo.RBO_Mode` = 0, No RBO, saw returns with standard dynamic parameters
- `config.dynamics.rbo.RBO_Mode` = 1, RBO optimized after acceleration
- `config.dynamics.rbo.RBO_Mode` = 2, RBO optimized after jerk

Additional configurations:

- `config.dynamics.rbo.RBO_MaxRunBackTime` = <Value>, Maximum time for moving the saw to the start position with RBO
- `config.dynamics.rbo.RBO_SafetyFactor` = <Value>, indicates the safety factor with which the saw reaches the start position earlier
- `config.dynamics.rbo.RBO_StartSyncWaitingDistance` = <Value>, indicates the distance at which the saw reaches its starting position to the next synchronization position of the web.
- `config.dynamics.rbo.RBO_TresholdMasterSpeedsUpDetect` = <Value>, if the acceleration on the web exceeds this value, the RBO function is suspended for the next cut and the standard dynamic parameters are applied.

2.4.12 Detecting the cutting length

Description

Detects the cutting length for each cut of the saw.

Saves the last detected steps in a data buffer.

Saves the minimum and maximum cutting length detected.

How it works

- Enable the cutting length detection with "enable"
- Reset the buffer with the detected values with "reset"

Relevant values at the interface "Statistics"

Enable cutting length detection:

- `statistics.enable` = TRUE

Reset values for minimum and maximum cutting length:

- `statistics.reset` =TRUE

Maximum detected cutting length:

- `statistics.minMeasCutLenght` = <Value>

Minimum detected cutting length

- `statistics.maxMeasCutLenght` = <Value>

Data buffer of the detected cuts

- `statistics.FSCutData[0..MEASURUNG_BUFFER_UPPER_BOUND]`

NOTE
Call function blocks for cutting length detection.
To obtain precise measured values for the length measurement, you must call the function blocks FSL_MeasCutLengthFIFO and FSMI_MeasCutLengthFIFO in the OB_PreInterpolator organization block.

Customize size of the data buffer

By default, the 10 most recently detected cuts are saved in the data buffer.

To adjust the size of the data buffer for the last detected sections, follow these steps:

1. Change the value of the user constant "MEASURUNG_BUFFER_UPPER_BOUND".
2. Translate CPU "Software (changes only)".

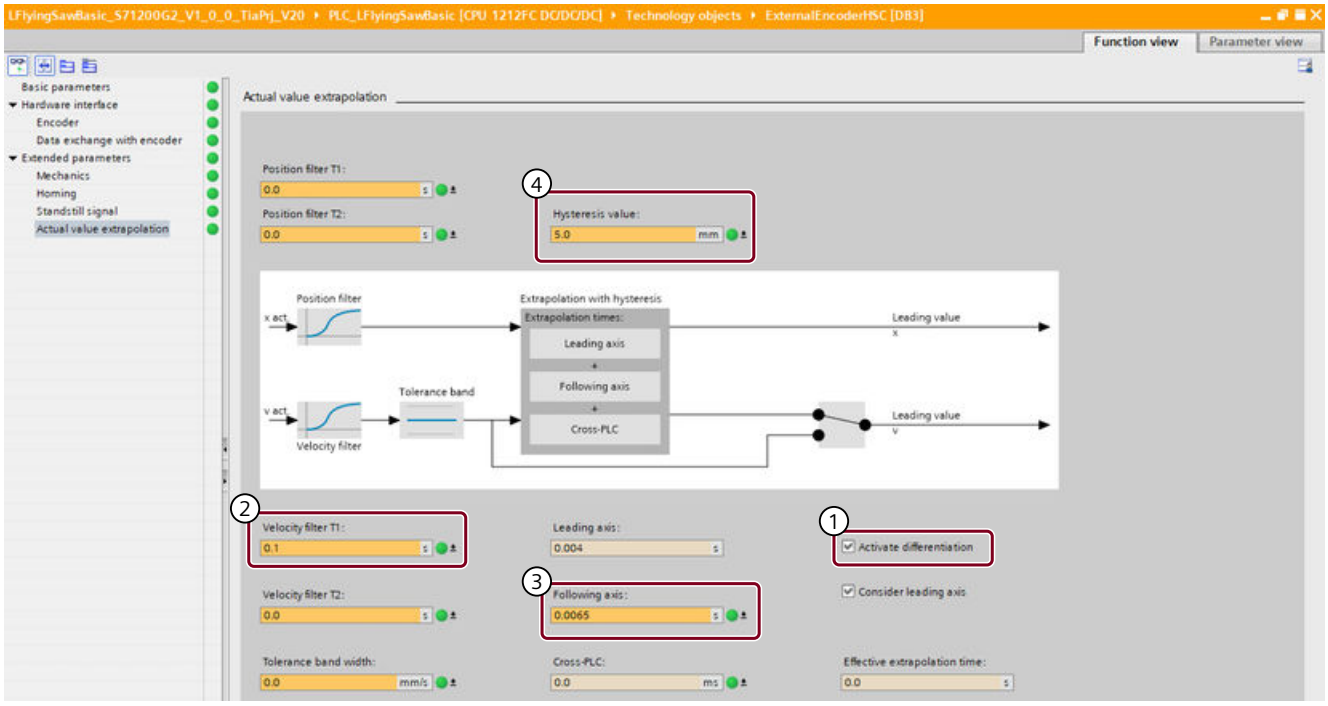
2.4.13 Optimized settings for external encoders

If you use an external encoder as a leading value source for the flying saw, you should configure the following settings on the technology object to achieve optimum cutting results:

- Filtering a possibly noisy encoder signal
- Correction of the delay times by extrapolation of the encoder signal

Settings on the "External encoder" technology object

Make the following settings in the online view of the "External encoder" technology object configuration under "Advanced settings > Actual value extrapolation":



① In order for the following settings to take effect, enable the differentiation and the consideration of the leading axis.

② Set a time constant T1 for the velocity filter for filtering a noisy encoder signal.
Recommended setting as start value: 0.1 s

③ Set a delay time correction for the following axis. This setting is important for cutting accuracy, e.g. hitting the print mark or when changing the leading axis velocity.
Recommended setting as start value: 0.0065 s
Note
The system delay time of the leading axis is automatically corrected ("leading axis"). The total delay time is displayed under "Effective extrapolation time".
Optimize the delay time correction for the following axis if required.

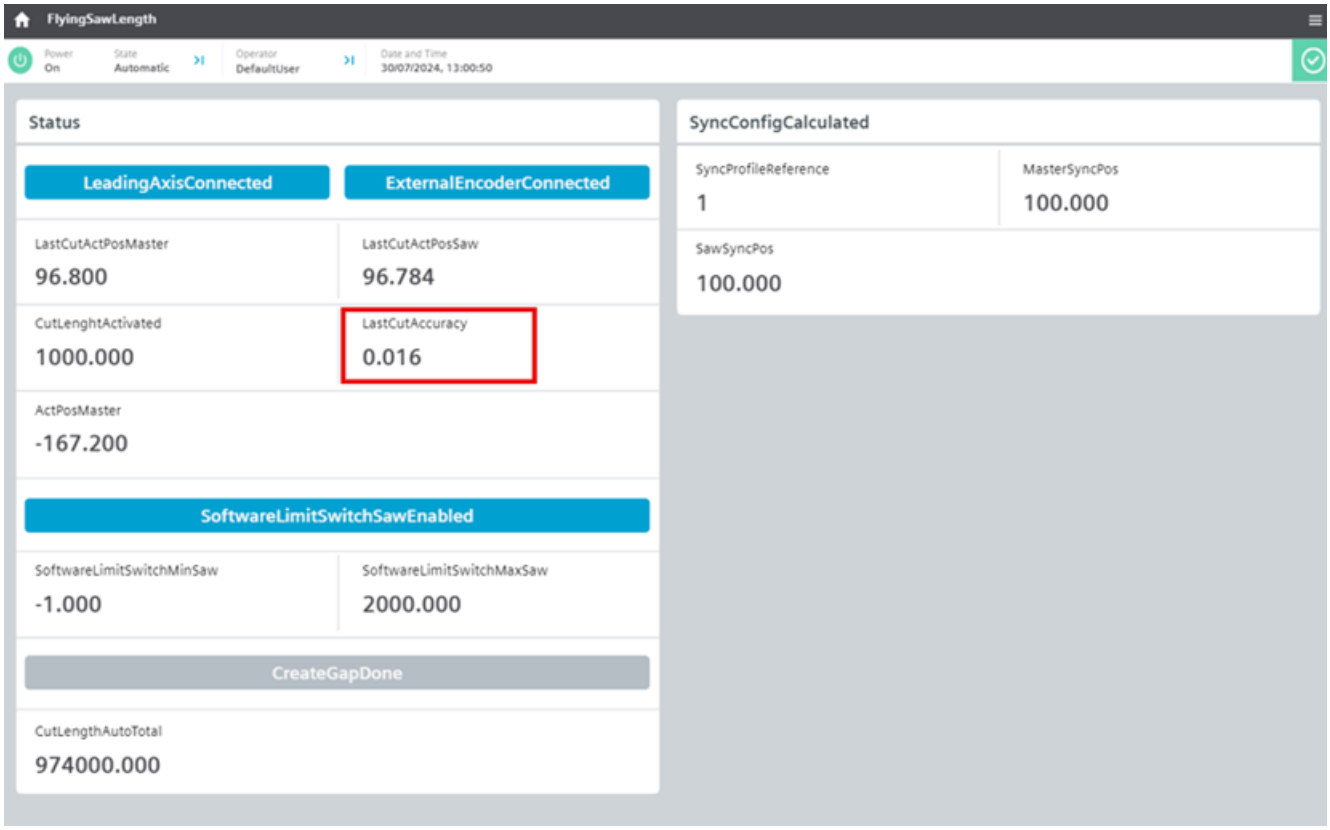
④ Configure a hysteresis for the position value. This prevents the detection of a direction reversal when synchronizing from standstill with a noisy encoder signal, e.g. error 608.
Recommended setting as start value: 5.0 mm

Optimizing delay time correction

NOTE

The cutting length accuracy can be very good, although the cutting position accuracy is inaccurate, as the cutting inaccuracies are compensated from cut to cut at constant velocity. The correct setting of the delay time correction is particularly important for applications with measuring inputs or changing leading axis velocity, e.g. for the first material cut after a standstill.

The cutting position accuracy is displayed on the "Status" HMI page or in the status.lastCutAccuracy parameter.



If required, customize the delay time correction for the following axis step by step until the cutting position accuracy has reached the desired accuracy.

More information

Detailed information on filtering and extrapolation can be found in FAQ SIMATIC S7-1500T: Guideline for filtering and extrapolation (https://support.industry.siemens.com/cs/ww/en/view/109763337)

2.5 Interface description

2.5.1 Layout of the interfaces

Overview

The configuration and the parameter assignment of the application example covers the following areas.

- Configuration of technology objects

  NOTE
  Configuration of technology objects
  The configuration of the technology object is not described in this application example.
  In particular, configure the safety-relevant tags at the technology object, such as software limit switches and dynamic limit values.

  NOTE
  Configuration of the software limit switches
  The HMI user interface requires the value 0.X mm for the negative software limit switch for correct scaling.

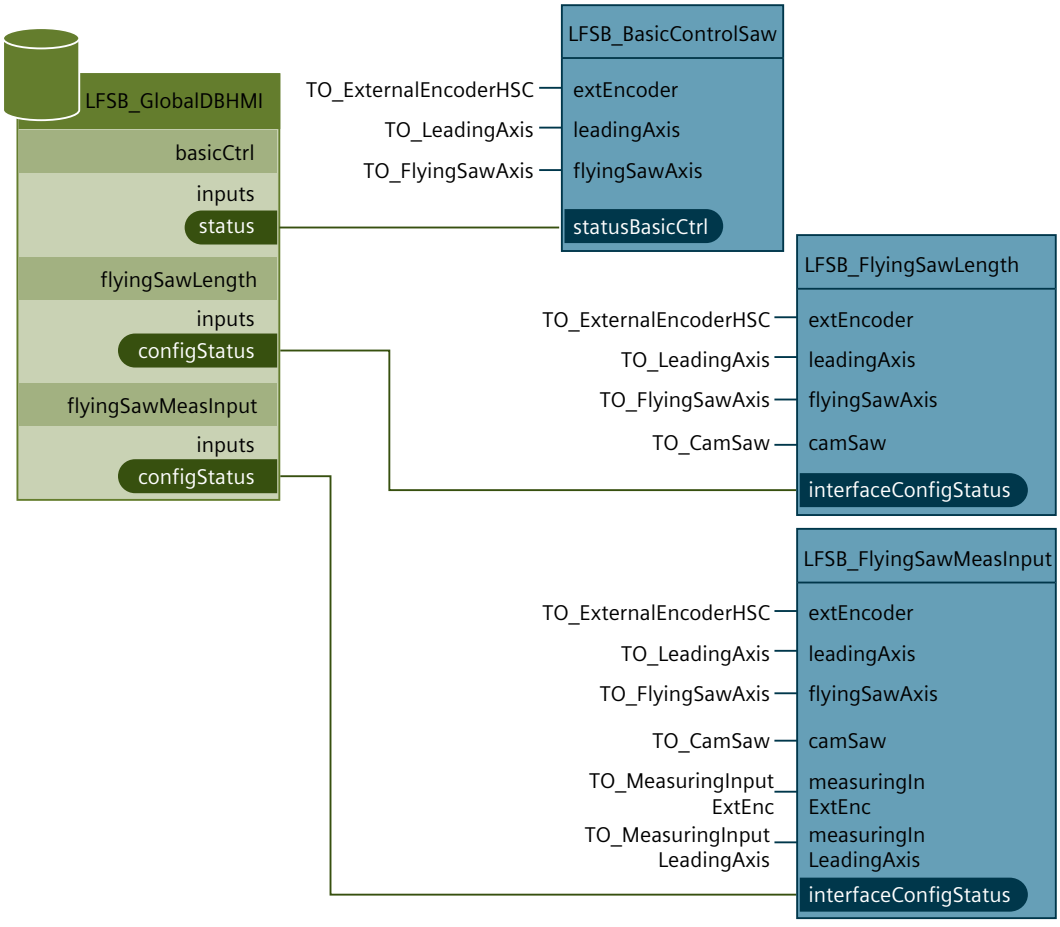
- Parameter assignment of the call of the function blocks "LFSB_FlyingSawLength" or "LFSB_FlyingSawMeasInput"

  Parameters that need to be frequently adjusted.

- Parameter assignment of the global data block "LFSB_GlobalDBHMI"

  Parameters and specifications that generally only need to be adjusted during commissioning.

Interconnection of the blocks



2.5.2 Interface description for controlling the saw axis

Description

The function blocks "LFSB_FlyingSawLength" or "LFSB_FlyingSawMeasInput" control the saw axis of the flying saw depending on the cutting variant.

Requirements

- The technology objects are created in STEP 7 and correctly configured:
  - Web

    Linear positioning axis as leading axis (setpoint coupling)

    An additional measuring input for the leading axis is required for the cutting variant "Cut at measuring input signal".
  - External encoder

    External encoder as master value encoder (actual value coupling)

    An additional sensor (measuring input) for the external encoder is necessary for the cutting variant "Cut at measuring input signal".
  - Saw axis

    Linear synchronous axis as following axis
- The axes are enabled.
- The axes are homed.

Input parameters

The following parameters are available at the function blocks "LFSB_FlyingSawLength" and "LFSB_FlyingSawMeasInput":

Parameter	Data type	Default value	Description	
extEncoder	TO_ExternalEncoder	-	Technology object of the external encoder NULL, if the technology object is not interconnected	
leadingAxis	TO_PositioningAxis	-	Leading axis technology object NULL, if the technology object is not interconnected	
flyingSawAxis	TO_SynchronousAxis	-	Saw axis technology object	
camSaw	TO_Cam	-	Cam technology object	
measuringInExtEnc	TO_ExternalEncoder	-	Only with "LFSB_FlyingSawMeasInput": Measuring input of the technology object of the external encoder	
measuringInLeadingAxis	TO_PositioningAxis	-	Only with "LFSB_FlyingSawMeasInput": Measuring input of the technology object of the leading axis	
masterSelectExtEnc	BOOL	FALSE	TRUE	Master value provision via an external encoder is activated.

Parameter	Data type	Default value	Description	
enableAuto	BOOL	FALSE	TRUE	Automatic mode is being activated.
stopAutoCycleEnd	BOOL	FALSE	TRUE	Automatic mode will be terminated after the pending cut with return to the starting position.
cutNow	BOOL	FALSE	TRUE	An immediate cut is triggered. Only possible if the saw is located in the starting position.
cutDone	BOOL	FALSE	TRUE	The cut is finished. Synchronization is finished. The return is initiated.
cutLenght	LREAL	1000.0	Only with "LFSB_FlyingSawLength": Material length in automatic mode	
enableMeasInput	BOOL	TRUE	FALSE	Only with "LFSB_FlyingSawMeasInput" and "measuringRangeMode" = 1: The next measuring input signal is faded out.
distanceMeasInput	REAL	-1000.0	Only with "LFSB_FlyingSawMeasInput": Distance of the measuring input to the zero position of the saw axis	
startPos	LREAL	0.0	Starting position of the saw axis	
resetCutCounter	BOOL	FALSE	TRUE	The cut counter and the cut-length sum are reset.
createGap	BOOL	FALSE	Reserved	
releaseMoveBack	BOOL	FALSE	Reserved	
interfaceConfigStatus	typeFSConfigStatus	-	Advanced settings in the global data block "LFSB_GlobalDBHMI" (Page 51)	

Output parameters

The following parameters are available at the function blocks "LFSB_FlyingSawLength" and "LFSB_FlyingSawMeasInput":

Parameter	Data type	Default value	Description	
activeMasterType	INT	0	Currently used master value source	
			1	Axis
			2	External encoder
cutPossible	BOOL	FALSE	TRUE	Leading axis and saw axis are synchronized. The material cut can be executed.
cutNowAutoActive	BOOL	FALSE	TRUE	An immediate cut is active during automatic operation.
cutNowActive	BOOL	FALSE	TRUE	An immediate cut is active. Automatic mode is deactivated.
createGapDone	BOOL	FALSE	Reserved	
busy	BOOL	FALSE	TRUE	A function is executed in the block.
auto	BOOL	FALSE	TRUE	Automatic mode is activated.
stepNr	INT	0	Internal step number	

Parameter	Data type	Default value	Description	
inStartPos	BOOL	FALSE	TRUE	The saw carriage is at the starting position.
cutCounter	DINT	0	Cut counter Counts the number of material cuts that have been executed since the last reset via "resetCutCounter" = 1.	
cutLengthAutoCut	LREAL	0.0	Cut-length sum Adds up the material lengths which have been cut since the last reset via "resetCutCounter" = 1 in automatic mode to a cut-length sum.	
error	BOOL	FALSE	TRUE	An error is pending.
errorID	WORD	0	ID of the pending error	
errorSource	DINT	0	Error source For information on this function, refer section "Troubleshooting (Page 68)".	

2.5.3 Structure of the global data block

Description

The following structures are contained in the global data block "LFSB_GlobalDBHMI".

The structures "general" and "basicCtrl" are not directly required for the operation of the flying saw and therefore not part of this description:

- general

  Operating mode, selection of the function type and simulation

- basicCtrl

  Contains the interface to the basic functions. The basic functions are preconfigured in the example project.

All functions of the flying saw are contained in the structures "LFSB_flyingSawLength" and "LFSB_flyingSawMeasInput":

- Structure "inputs"

  This signal range is interconnected with the input parameters (Page 49) of the function blocks "LFSB_FlyingSawLength" and "LFSB_FlyingSawMeasInput".

- Structure "configStatus"
  - config

    Contains the initial parameter assignment of your plant during the commissioning or for further adjustments of the function blocks "LFSB_FlyingSawLength" and "LFSB_FlyingSawMeasInput".

  - status

    Contains extended status displays for actual positions and calculated values.

    This signal range is interconnected with the interface "interfaceConfigStatus" of the function blocks "LFSB_FlyingSawLength" and "LFSB_FlyingSawMeasInput".

- Structure "statistics"

The parameters of the structures "config", "status" and "statistic" are described below.

Parameters of the structure "config"

The following parameters are available in the structure "config":

Parameter	Data type	Default value	Description
config.	typeFSConfig	-	Advanced settings
general.	Struct	-	General settings for the flying saw
subTypSaw	INT	0	Type of flying saw
			0 Standard linear
			1 Diagonal
gearingRatioMaster	DINT	1	Gear ratio of the leading axis You can find more information about the gear ratio in the description of the Motion Control instruction "MC_GearIn" in the STEP 7 online help.
gearingRatioSlave	DINT	1	Gear ratio of the following axis You can find more information about the gear ratio in the description of the Motion Control instruction "MC_GearIn" in the STEP 7 online help.
maxPosToCut	LREAL	1800.0	Interlock point of the material cut enabling via the parameter "cutPossible". If the saw carriage overshoots this position, the "cutPossible" parameter is reset.
dynamics.	Struct	-	Dynamic settings for the saw
velBackToStart	LREAL	500.0	Velocity for moving the saw to the start position in auto mode
accBackToStart	LREAL	1000.0	Acceleration for moving the saw to the start position in Auto mode
jerkBackToStart	LREAL	10000.0	Jerk to move the saw to the start position in Auto mode
decHaltAfterCut	LREAL	1000.0	Delay for stopping the saw after cutting in Auto mode
jerkHaltAfterCut	LREAL	10000.0	Jerk to stop the saw after the cut in Auto mode
rbo.	typeRBOConfig	-	Settings for Running Back Optimization (RBO)
RBO_Mode	INT	0	Selection of the RBO mode
			0 No RBO, the standard dynamic parameters are used
			1 Optimization after acceleration
			2 Optimization after jerk
RBO_MaxRunBackTime	LREAL	5.0	Only effective with RBO_Mode = 1, 2 Maximum time for moving the saw to the start position with RBO
RBO_SafetyFactor	LREAL	1.1	Only effective with RBO_Mode = 1, 2 Safety factor, indicates when the saw reaches the start position

Parameter	Data type	Default value	Description	
RBO_SafetyFactor	LREAL	1.1	= 1.0	Saw reaches the start position exactly at the beginning of synchronization for the next cut
			> 1.0	Saw reaches the start position before synchronization, e.g. with setting 1.1, the saw reaches the start position 10% before the start of synchronization for the next cut.
			< 1.0	Saw will not reach the starting position in time for the next cut
RBO_StartSyncWaitingDistance	LREAL	0.0	Only effective with RBO_Mode = 1, 2 Specifies the distance at which the saw reaches its start position to the next synchronization position of the web.	
RBO_ThresholdMasterSpeedUpDetect	LREAL	50.0	Only effective with RBO_Mode = 1, 2 If the acceleration on the web exceeds this value, the RBO function is suspended for the next cut and the standard dynamic parameters are applied.	
sync.	Struct	-	Settings for synchronizing the saw	
syncLenghtCutAuto	LREAL	200.0	Synchronization length in automatic mode	
syncProfileReference	DINT	1	Synchronization profile	
			1	Symmetrical synchronization
masterSyncPos	LREAL	0.0	Synchronous position of leading axis Is automatically calculated during symmetric synchronization.	
sawSyncPos	LREAL	0.0	Synchronous position of the saw axis Is automatically calculated during symmetric synchronization.	
syncVel	LREAL	-1.0	Velocity for the synchronization using dynamic parameters	
syncAcc	LREAL	-1.0	Acceleration for the synchronization using dynamic parameters	
syncJerk	LREAL	-1.0	Jerk for the synchronization using dynamic parameters	
cutNowFirstCut.	Struct	-	Settings for immediate cut and the first material cut	
standStillVelMaster	LREAL	20.0	For cutting method "Cutting to length" Stationary state detection	
preHomeTimeWhenNotStandStill	LREAL	0.3	For cutting method "Cutting to length" Derivative-action time for setting a reference position before synchronizing for immediate cut and the first material cut if the master is not at standstill	
acc	LREAL	1000.0	For cutting method "Cutting to length" Acceleration for immediate cut and the first material cut from standstill	
			For cutting method "Cut to measuring input signal" Acceleration for immediate cut	
jerk	LREAL	0.0	For cutting method "Cutting to length" Jerk for immediate cut and the first material cut from standstill	
			For cutting method "Cut to measuring input signal" Jerk for immediate cut	

Parameter	Data type	Default value	Description	
createGap.	Struct	-	Reserved	
distance	LREAL	100.0	Size of the gap	
velocityDiff	LREAL	100.0	Difference between the speed of the saw axis and the web	
acceleration	LREAL	-1.0	Acceleration of the saw axis when creating a gap	
deceleration	LREAL	-1.0	Deceleration of the saw axis when creating a gap	
jerk	LREAL	0.0	Jerk of the saw axis when creating a gap	
measuringRange.	STRUCT	-	Only for cutting method "Cutting to measuring input signal": Extended setup for fading out the measuring input signal	
measuringRangeMode	INT	0	Fade-out mode	
			0	Mode for using the fade-out length
			1	Mode for manual fade out
measuringRangeFadeOutLengthFirst-Cut	LREAL	0.0	Fade-out length for the first material cut	
measuringRangeFadeOutLengthCut-Now	LREAL	0.0	Fade-out length for the immediate cut	
measuringRangeFadeOutLength-CutAuto	LREAL	0.0	Fade-out length for the automatic mode	

Parameters of the structure "status"

The following parameters are available in the structure "status":

Parameter	Data type	Default value	Description	
status.	typeFSStatistics	-	Extended status displays	
leadingAxisConnected	BOOL	FALSE	TRUE	The parameter "leadingAxis" is connected to a positioning axis technology object.
extEncoderConnected	BOOL	FALSE	TRUE	The parameter "extEncoder" is connected to an external encoder technology object.
actPosMaster	LREAL	0.0	Actual position of the leading axis	
actPosSaw	LREAL	0.0	Actual position of the saw	
lastCutActPosMaster	LREAL	0.0	Actual position of the web during last material cut	
lastCutActPosSaw	LREAL	0.0	Actual position of the saw during last material cut	
lastCutAccuracy	LREAL	0.0	Accuracy of the last material cut	
cutLengthActiv	LREAL	0.0	Only for cutting method "Cutting to length": Current setpoint material length	
cutLengthAutoTotal	LREAL	0.0	Total cutting length since the last memory reset	
lastCutLengthAuto	LREAL	0.0	Only for cutting method "Cutting to measuring input signal": Length of the last piece of material that was cut in automatic mode	

Parameter	Data type	Default value	Description
lastMeasuredInputPos	LREAL	0.0	Only for cutting method "Cutting to measuring input signal": Last position measured by the measuring input sensor
syncConfigCalculated.	STRUCT	-	Extended displays for synchronization
syncProfileReference	DINT	0	Synchronization profile that was used
masterSyncPos	LREAL	0.0	Calculated synchronization position of the leading axis
slaveSyncPos	LREAL	0.0	Calculated synchronization position of the following axis
swLimitSwitchSawEnabled	BOOL	FALSE	TRUE: The software limit switches are activated.
swLimitSwitchMinSaw	LREAL	0.0	Position of the SW limit switch on the left saw axis end for the representation in the HMI user interface
swLimitSwitchMaxSaw	LREAL	0.0	Position of the SW limit switch on the left saw axis end for the representation in the HMI interface
fadeOutDistanceRemaining	LREAL	0.0	Only for cutting method "Cutting to measuring input signal": Distance display • Remaining distance of the fade-out length • Distance moved after the fade-out length up to the next measuring input signal
fadeOutLengthInUse	BOOL	FALSE	TRUE: Only for cutting method "Cutting to measuring input signal": At least one fade-out length is set.
output	STRUCT	-	Output parameters in the call of the function blocks "LFSB_FlyingSawLength" and "LFSB_FlyingSawMeasInput" (Page 49)

Parameters of the structure "statistics"

The following parameters are available in the structure "statistics":

Parameter	Data type	Default value	Description
statistics.	typeFSStatus	-	Settings for the statistical functions
enable	BOOL	FALSE	TRUE: The cutting length detection is disabled.
reset	BOOL	FALSE	TRUE: The values for the minimum and maximum cutting length are reset.
minMeasCutLenght	LREAL	0.0	Minimum detected cutting length
maxMeasCutLenght	LREAL	0.0	Maximum detected cutting length
FSCutData[]	Array[0.."MEASURING_BUFFER_UPPER_BOUND"] of "typeFSCutData	-	Data buffer of the detected cuts. The default setting for the user constant "MEASURING_BUFFER_UPPER_BOUND" is 10. Detecting the cutting length (Page 43)

2.6 Operation

2.6.1 Simulation environment

The program is ready to run directly on a SIMATIC S7-1200 G2 CPU. The execution of real movements is possible via the training case SINAMICS S210 or connected comparable SINAMICS S210 drives. Thanks to the integrated function simulation, you can simulate the program on a real CPU without real drives. You can test the HMI operation on the engineering PC using the simulation. Via the HMI, you can switch the axes/ext. encoder/measuring input to simulation.

The following table shows the application cases of the example project which can be tested in the respective simulation environment:

Application case	**CPU SIMATIC S7-1200 G2**	**Training case SINAMICS S210 incl. CPU**
Provision of leading value		
Real axis	✓[1)]	✓
External encoder	✓[1)]	✓
Cutting method		
Cutting to length	✓	✓
Cutting to measuring input signal	✓[1)]	✓

1) Switching on the simulation via the HMI is necessary

Depending on the simulation setup, all functions, including switchover of the master value source and the measuring input signal, can be simulated.

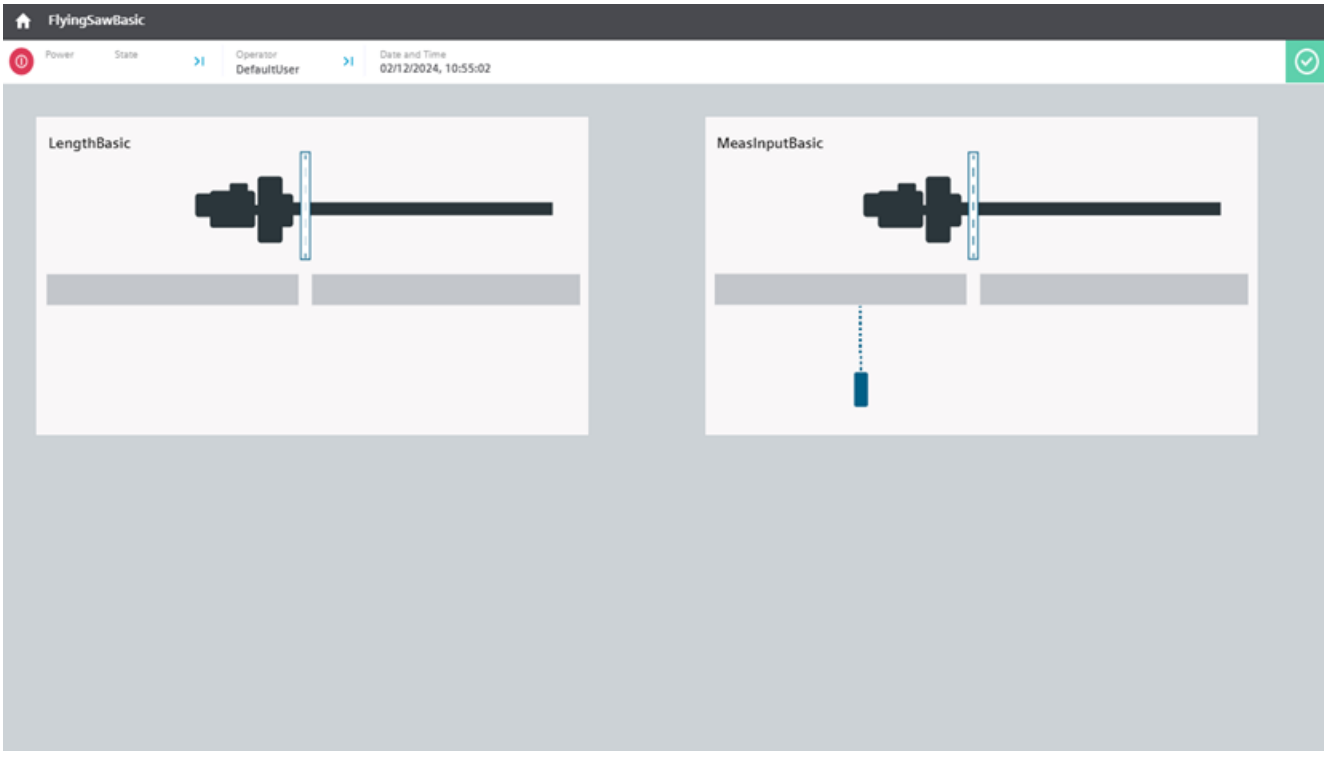
2.6.2 HMI interface

The example project contains a user interface for the flying saw for Classic Panels and Unified Panels; the operation does not differ significantly.
The illustrations in this section show the user interface of the Unified Panels.

The process pictures are used to familiarize users with the functionality of the flying saw and to test and simulate the responses and options of the block. You can also integrate the HMI project directly into your plant.

Function selection

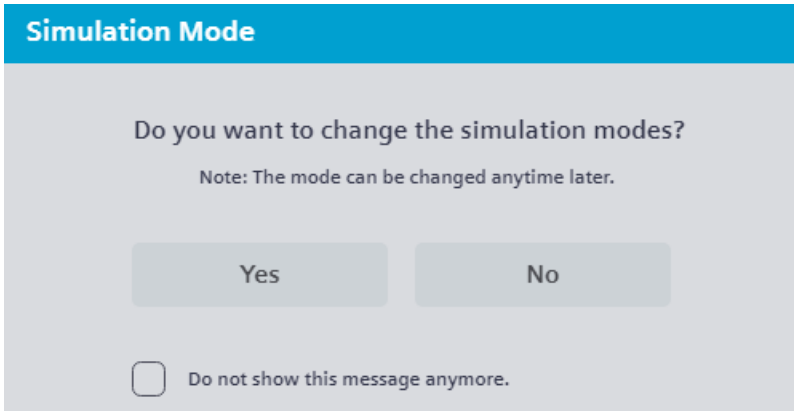
In the "Select_Saw" process picture, select the variant of the cutting method.



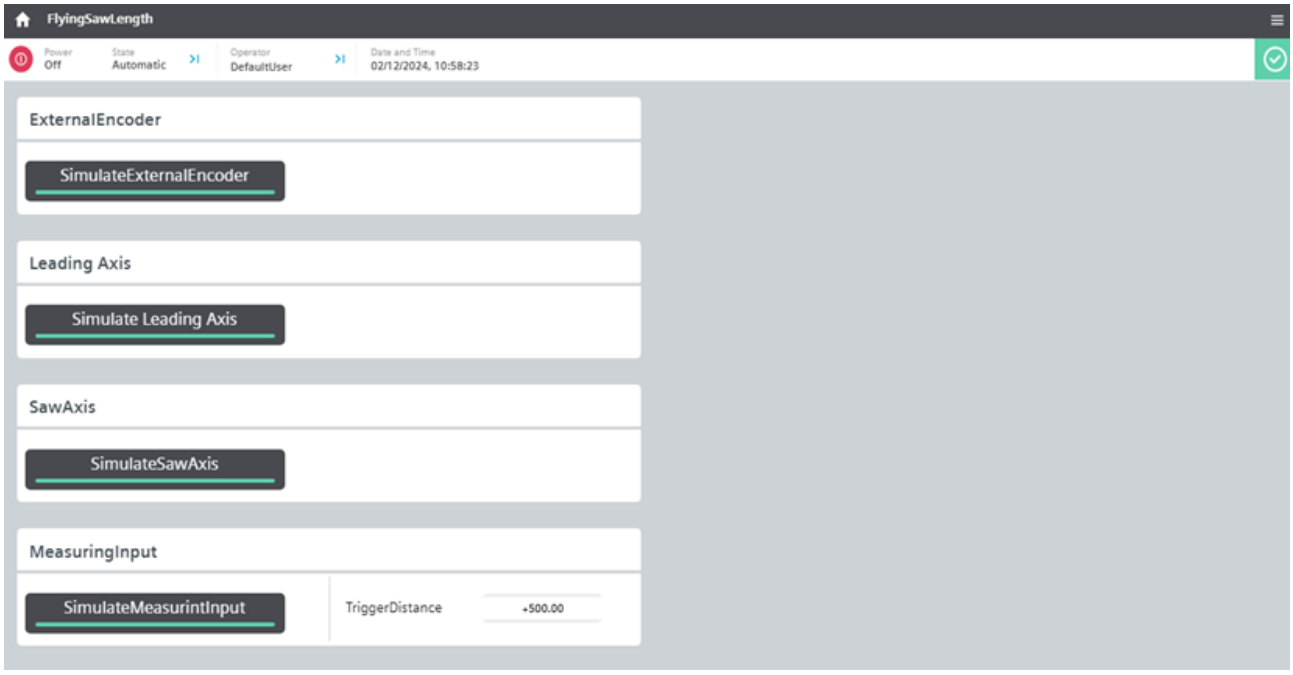
Simulation

You make the simulation settings in the "Simulation" process picture.

- The "Simulation Mode" dialog opens after the function selection.



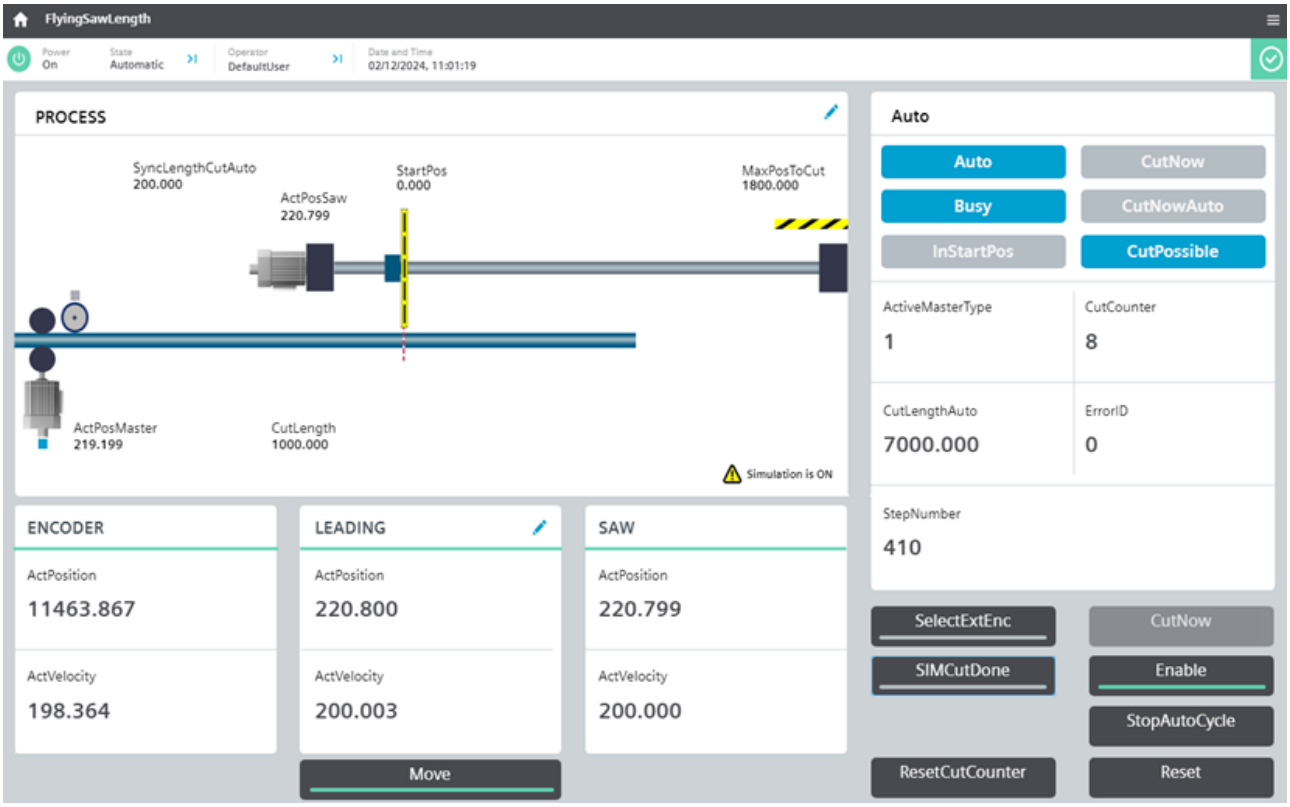
- Process picture "Simulation"



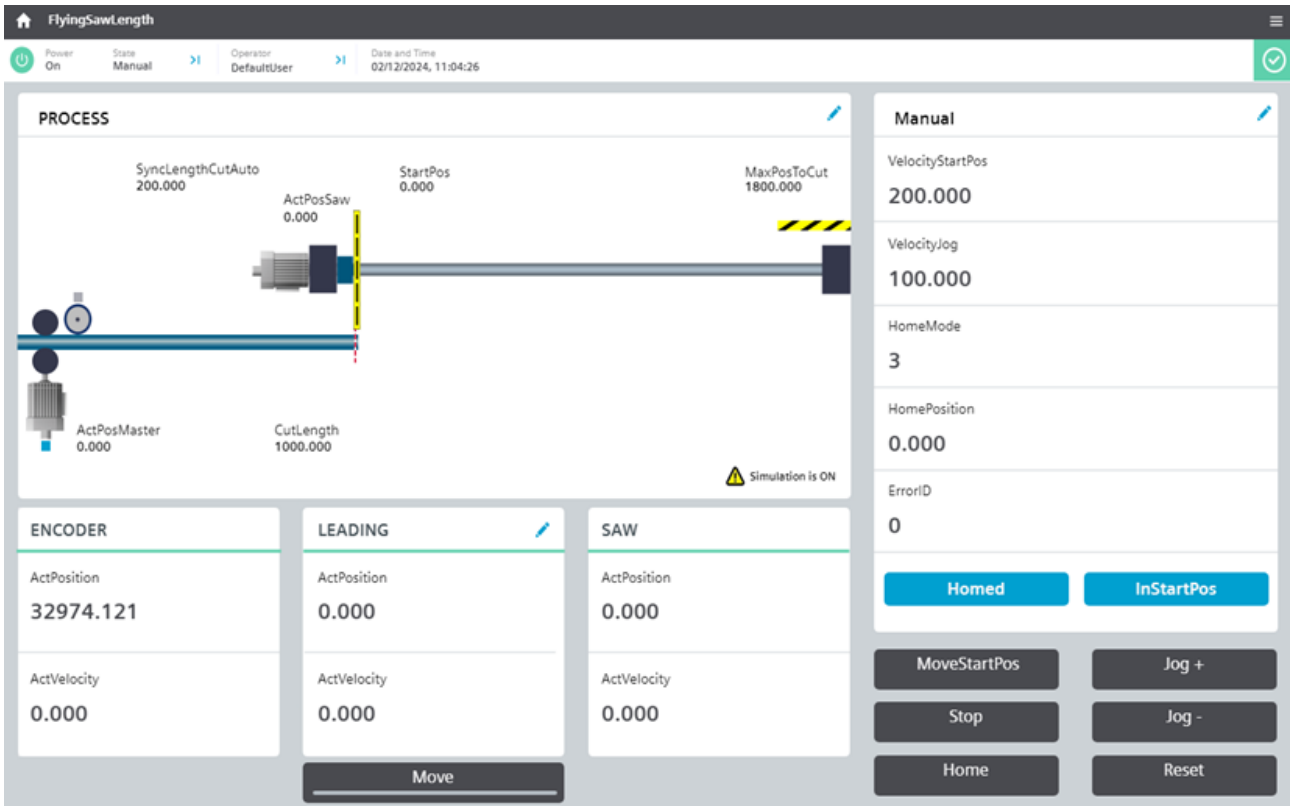
Operation of the axes

You can operate the basic functions of the axes and control the saw axis in the process picture "Operation".

- Process picture "Operation" in automatic mode



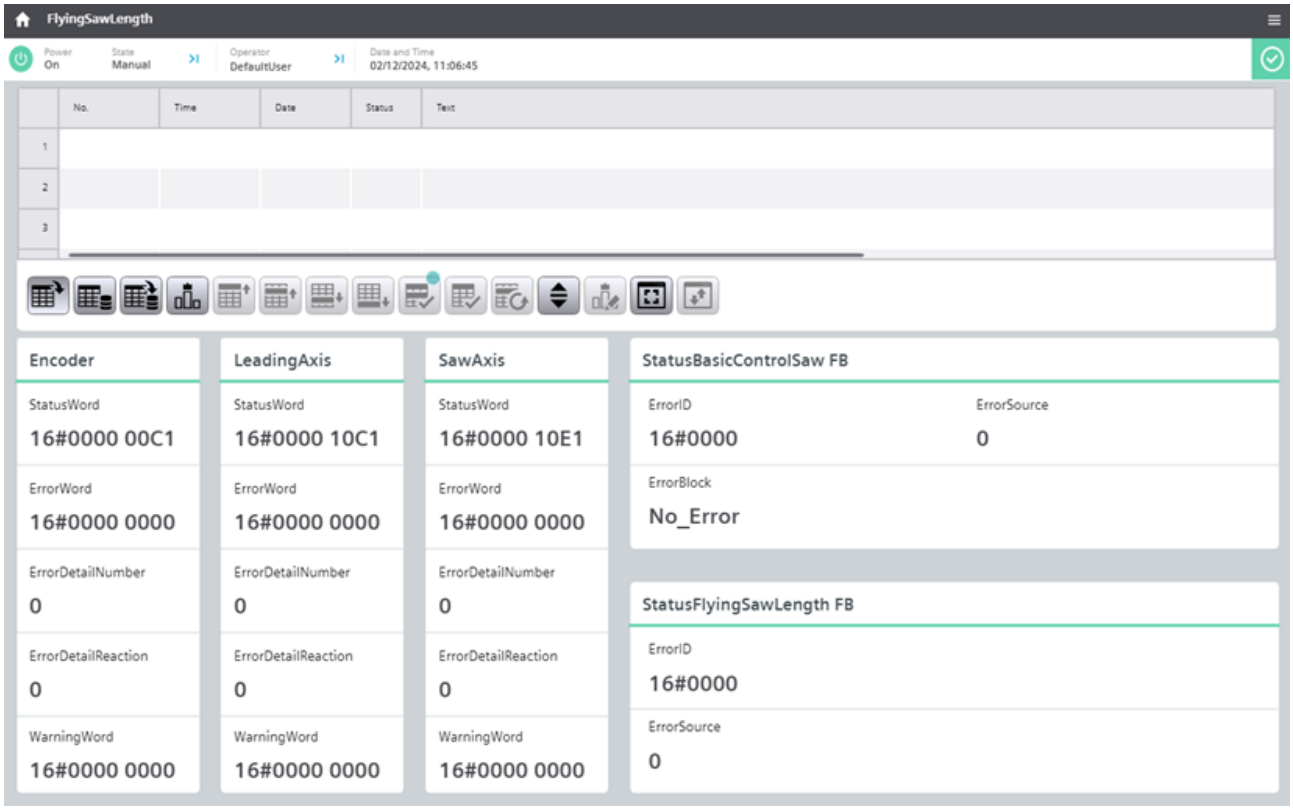
- Process picture "Operation" in manual mode



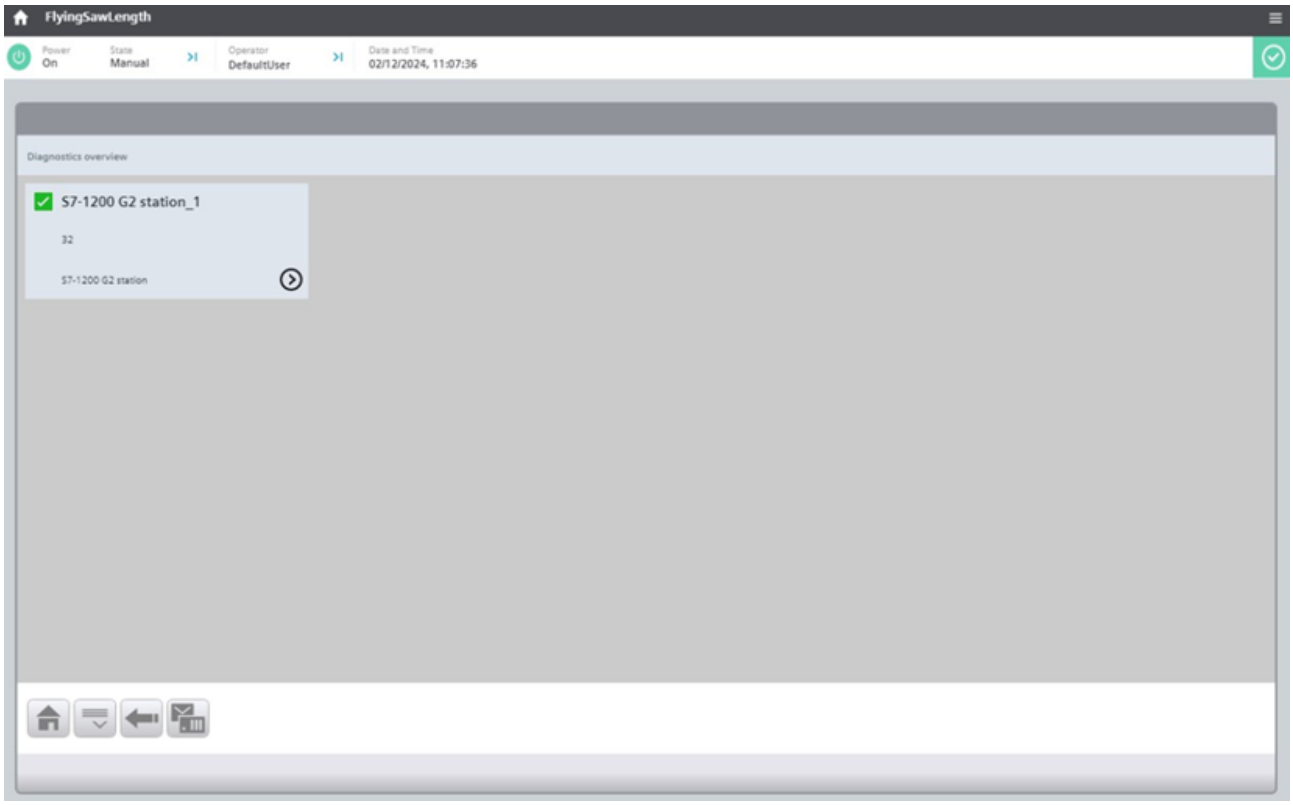
Monitoring

The process pictures "Messages" and "Diagnostics" are used for error analysis.

- Process picture "Messages"



- Process picture "Diagnostics"

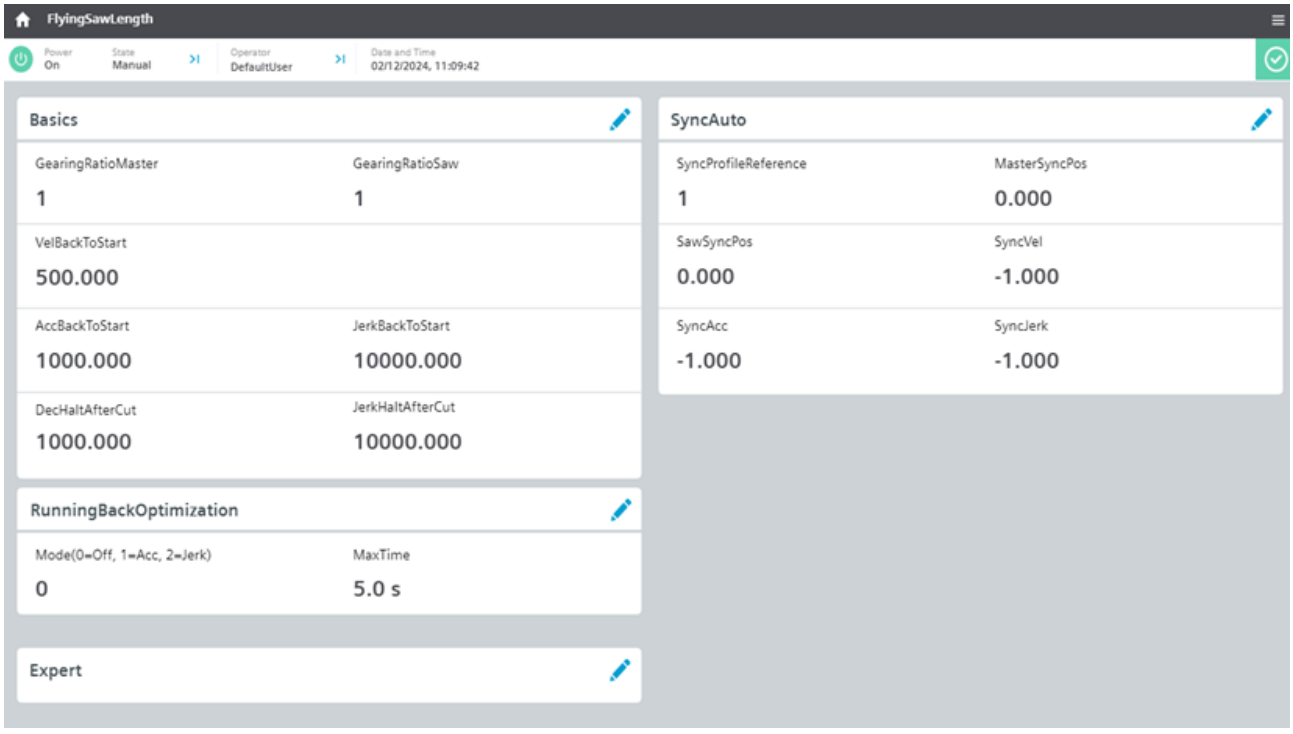


Extended configuration and status indicator

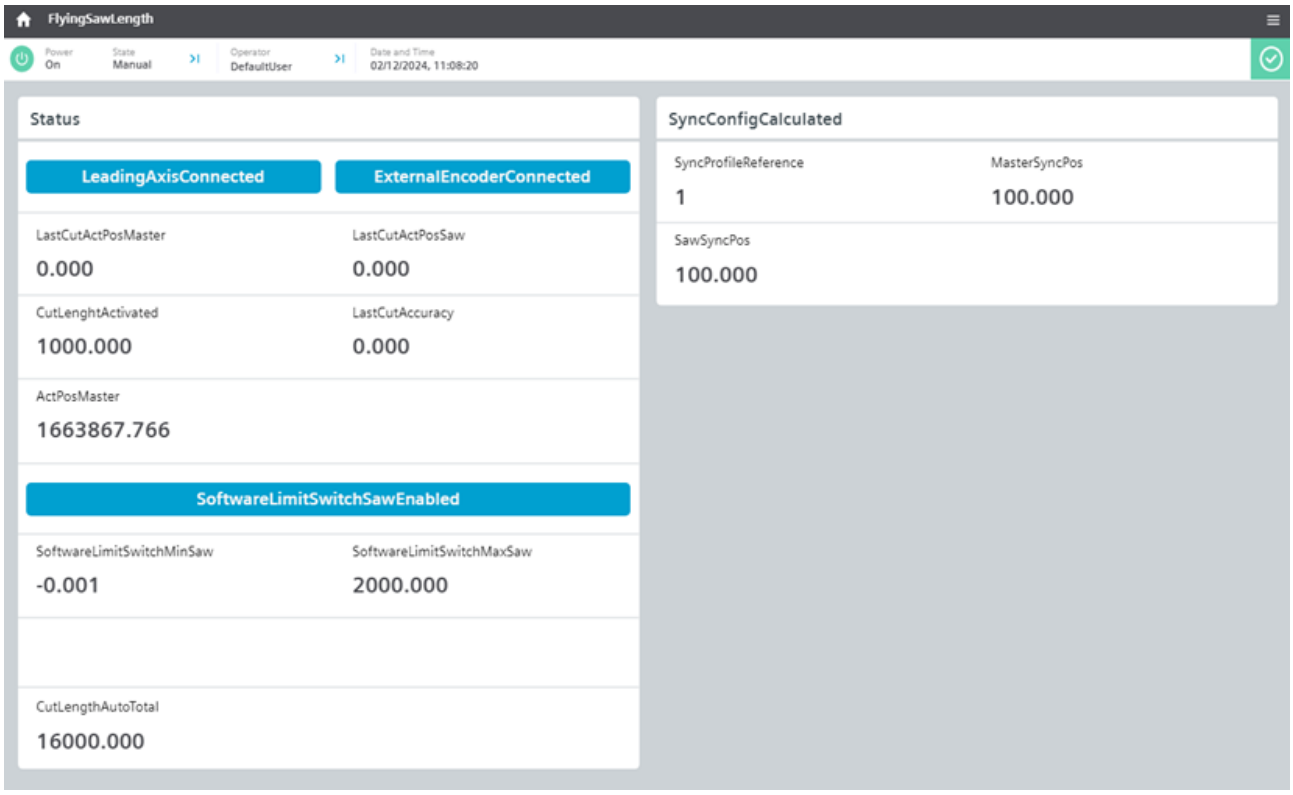
The process pictures "Configuration" and "Status" are used for advanced configuration and advanced status display.

The parameters in the process pictures are contained in the "`ConfigStatus`" structure of the global data blocks. The description is available in the section "Structure of the global data block (Page 51)".

- Process picture "Configuration"

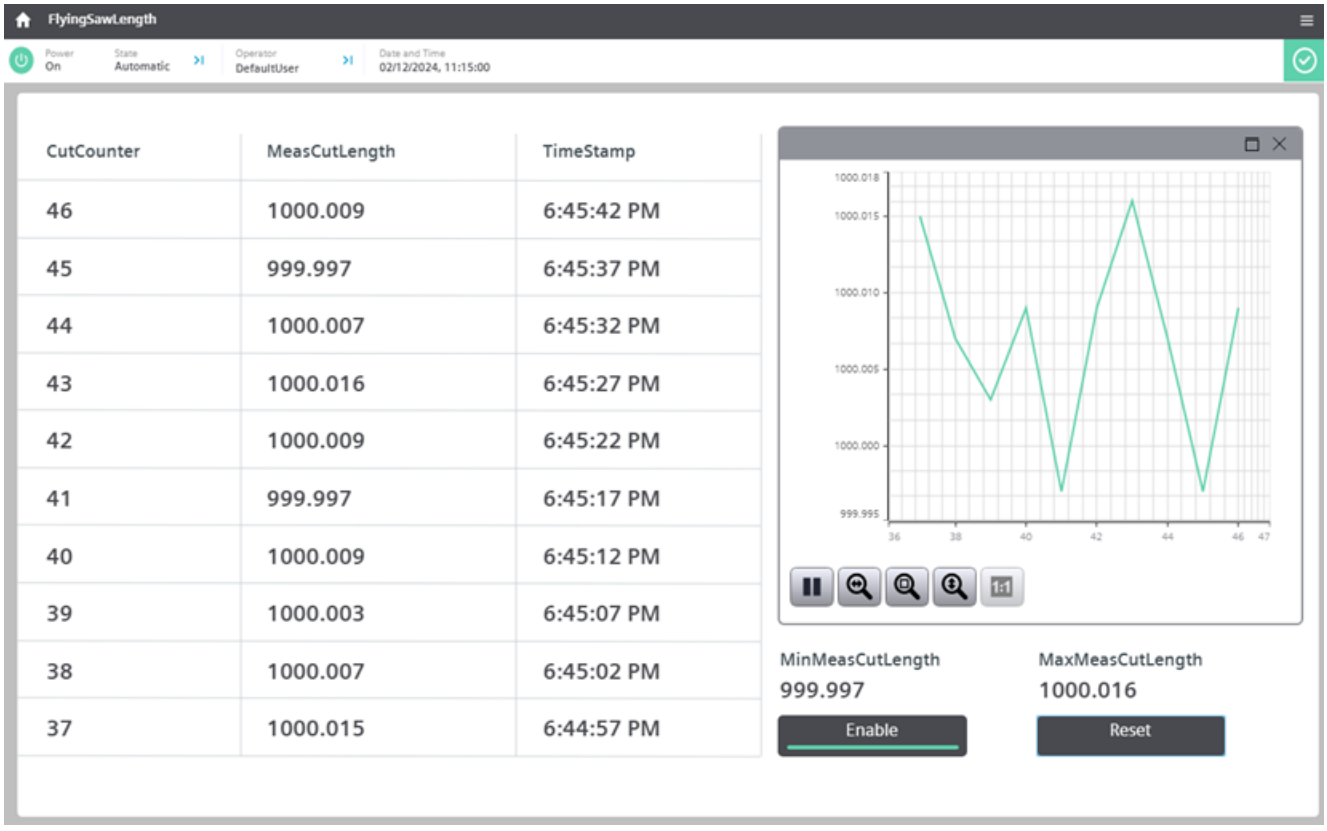


- Process picture "Status"



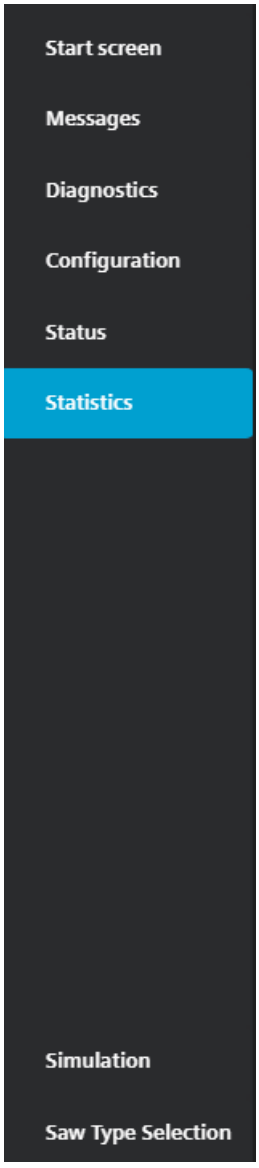
Statistical displays

The "Statistics" process picture show information on the cutting length measurement.

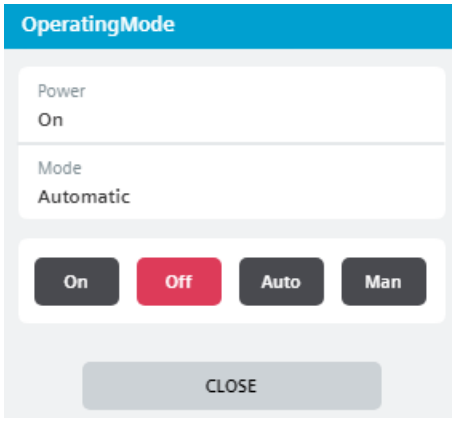


Operating mode and switching process pictures

You can open the navigation using the icon.



Open the "Operating Mode" dialog with the >I icon.



2.6.3 Operating the program

Introduction

The program contained in the example project "FlyingSawBasic_S1200G2" can be executed immediately on a SIMATIC S7-1200 G2 CPU.

Requirements

- The device environment is set up and interconnected for the simulation.
- Alternatively, a SINAMICS S210 PN drive is linked.

Procedure

To test the example project, follow these steps:

1. Download the included program to the PLC and set the PLC to RUN.
2. Depending on the test environment, activate the simulation.
3. Execute the basic functions of the axes:
   - Enable the axes with "ON".
   - Acknowledge possible alarms and faults of the axes with "RESET".
   - Reference the saw axis with "Home".
   - Move the leading axis with "Move".
4. Test the saw operation manually:
   - Test the immediate cut with "Cut Now".
   - Set the feedback signal via "SIM Cut Done".
5. You select automatic mode with "AUTO".

6. You turn on the automatic mode with "Enable".
7. Test the automatic operation of the saw and the immediate cut during automatic operation:
   - Test the immediate cut with "Cut Now".
   - Set the feedback signal via "SIM Cut Done".

2.7 Troubleshooting

2.7.1 Basic troubleshooting functions

Description

Errors in a Motion Control instruction are displayed at the block with error source and error ID.

If an error occurs, you can use these parameters to identify the Motion Control instruction in which the error occurred.

Relevant output parameters

An error is pending:

- `error` = 1

Error ID of the Motion Control instruction:

- `errorID` = <Value>

Field index assigned to the Motion Control instruction that caused the error:

- `errorSource` = <Value>

Type of the Motion Control instruction that caused the error, for example, "MC_Power":

- `errorBlock` = <Value>

2.7.2 Saw axis troubleshooting concept

Description

Multiple error types are displayed at the block with error source and error code.

The following sources of error are possible:

- Motion Control instruction
- Technology objects

  The messages regarding technology objects are displayed with the message number and in the HMI with message text.
- Runtime error

Relevant output parameters

An error is pending:

- `error` = 1

Error ID or message number:

- `errorID` = <Value>

Error source:

- `errorSource` = <Value>

2.7.3 Error codes

Error display at the function blocks "LFSB_FlyingSawLength" and "LFSB_FlyingSawMeasInput"

`errorSource` **(DINT)**	**Meaning**
0	No error
1-32	Error at a Motion Control instruction Block-internal assigned field index of the causative Motion Control instruction: The error ID is stored as an index in the causative Motion Control instruction, in the parameter "`ErrorID`" (8xxx range).
1000	Error at the saw technology object
2000	Runtime error

`errorID` **(WORD)**	**Meaning**
0	No error
8xxx	Error at a Motion Control instruction At the parameter "`errorSource`" read the field index assigned in the block of the causative Motion Control instruction. The error ID and the associated troubleshooting for Motion Control instructions are available in the S7-1500 Motion Control documentation.
9000	The synchronized position was missed - Warning -
9001	The saw has overshot the maximum cutting position - Warning -
9002	Error at the saw technology object - Warning -
9010	Configuration data for RBO invalid - Warning -
9011	Execution of RBO not possible, e.g. calculation results in a value outside the configured dynamic limits - Warning -
9100	FB parameter "`extEncoder`" is faulty - Error -
9101	FB parameter "`LeadingAxis`" is faulty - Error -
9102	Parameter "`measuringInextEcoder`" is faulty - Error -
9102	Parameter "`measuringInLeadingAxis`" is faulty - Error -
9110	Error at the saw technology object - Error -

Appendix

3

3.1 Service and Support

SiePortal

The integrated platform for product selection, purchase and support - and connection of Industry Mall and Online support. The SiePortal home page replaces the previous homes pages of the Industry Mall and the Online Support Portal (SIOS) and combines them.

- Products & Services

  In Products & Services you can find all our offerings as previously available in the Mall Catalog.

- Support

  In Support, you can find all information helpful for resolving technical issues with our products.

- mySiePortal

  mySiePortal collects all your personal data and processes, from your account to current orders, service requests and more. You can only see the full range of functions after you have logged in.

You can access SiePortal via this address:
sieportal.siemens.com (https://sieportal.siemens.com)

Technical Support

The Technical Support of Siemens Industry supports you quickly and competently in all technical requests with a wide range of customized offers – from basic support up individual support agreements.

Please send queries to Technical Support requests via Web form:
support.industry.siemens.com/cs/my/src (https://support.industry.siemens.com/cs/my/src)

SITRAIN - Digital Industry Academy

We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:
siemens.com/sitrain (https://siemens.com/sitrain)

Industry Online Support app

With the "Siemens Industry Online Support" app you can also obtain optimum mobile support. The app is available for iOS and Android:





3.2 Links and literature

The following documentation on S7-1500 Motion Control V8 in TIA V19 is also valid for S7-1200 G2 CPUs.

Number	Topic
\1\	Siemens Industry Online Support (https://sieportal.siemens.com)
\2\	Link to the article page of the application example (https://support.industry.siemens.com/cs/ww/en/view/109977573)
\3\	SIMATIC Technology - Motion Control: Overview and important links (https://support.industry.siemens.com/cs/ww/en/view/109751049)
\4\	System Manual "SIMATIC S7-1200 G2 Programmable controller" (https://support.industry.siemens.com/cs/ww/en/view/109972011)
\5\	FAQ "SIMATIC S7-1500T: Guideline for filtering and extrapolation with actual value coupling" (https://support.industry.siemens.com/cs/ww/en/view/109763337)
\6\	Function Manual "SIMATIC S7-1500/S7-1500T Motion Control Overview V8.0 in TIA Portal V19" (https://support.industry.siemens.com/cs/ww/en/view/109781848)
\7\	Function Manual "SIMATIC S7-1500/S7-1500T Axis Functions V8.0 in TIA Portal V19" (https://support.industry.siemens.com/cs/ww/en/view/109781849)
\8\	Function Manual "SIMATIC S7-1500/S7-1500T Synchronization Functions V8.0 in TIA Portal V19" (https://support.industry.siemens.com/cs/ww/en/view/109781851)
\9\	Function Manual "SIMATIC S7-1500/S7-1500T Touch Probe and Cam Functions V8.0 in TIA Portal V19" (https://support.industry.siemens.com/cs/ww/en/view/109781852)
\10\	Documentation portal (https://docs.tia.siemens.cloud/)

3.3 Documentation of changes

Version	Date	Changes
V1.0	01/2025	First edition