Incremental encoder emulation (SIWL)

Translation of the "Original Dokumentation"

Name: FKT_Inkrementalgeber_Emulation_SIWL_en

Version:

Version: 2018/23	
Change	**Letter symbol**
• Images in Chapter 1.4.2 and in chapter 1.12 example 9 corrected	STL

Previous version: 2017/04

Product version:

Product AMK part no.	Firmware Version (AMK part no.)
KW-R06 (O835) KW-R07 (O807)	AE-R05/R06 V1.13 2015/21 (205700)

Publisher:
AMK Arnold Müller GmbH & Co. KG
Gaußstraße 37 – 39,
D-73230 Kirchheim/Teck
Germany
Phone: +49 7021/50 05-0,
Fax: +49 7021/50 05-176
E-Mail: info@amk-group.com
Homepage: www.amk-group.com
Personally liable shareholder: AMK Verwaltungsgesellschaft mbH, Kirchheim/Teck
Registration court: Stuttgart HRB 231283; HRA 230681

1 Incremental encoder emulation (SIWL)

Supported hardware: KW-R06 / KW-R07 /

The AMK identifies the 'incremental encoder emulation' as software pulse transmission (SIWL). The position which is also identified as index, zero or zero pulse is described as homing mark in the subsequent documentation.

The SIWL converts the signals from an input encoder into an incremental encoder with homing mark. The resolution of the output encoder and the output position of the homing mark can be specifically parameterized to an application.

Application options:

- The signals of the output encoder can be evaluated with a higher-ranking controller. With this data reference, a position controller circuit can be made, for example, between the higher-ranking controller and the drive.
- A homing mark can be output to an arbitrary position of the input encoder, e.g. on a rotary table.
- The signals of the output encoder can be directly used as setpoint values for the slave axes.

The input signal for the input encoder can originate from a relative or absolute motor encoder or from a master value, which is calculated by the PLC.

The transmission ratio between the input and output encoder can be adapted with the virtual drive (ID34253 'SIWL factor' and ID34254 'SIWL divisor'). The direction of rotation of the output encoder can be reversed by specifying a negative multiplier.

The encoder resolution on the output encoder is parameterized with ID34251 'Line counts SIWL output'.

The output encoder generates 2 square pulses offset by 90° with homing mark and counts from 0 to ('Line counts SIWL output' -1).

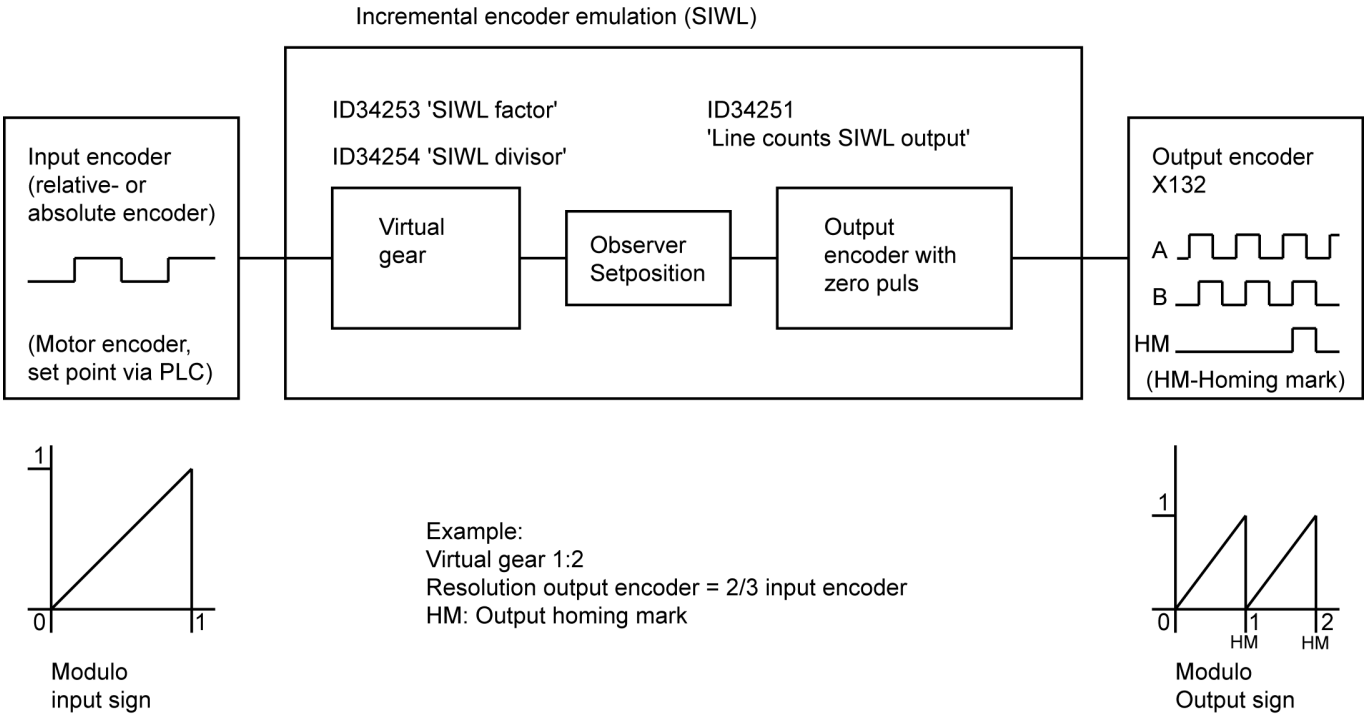
The evaluation of the output pulses depends on the target device; 1-fold or 4-fold evaluation is possible.

Per ID34251 'Line counts SIWL output', the SIWL internal counting unit generates a homing mark on the output encoder. The homing mark of the output encoder can be shifted with respect to the output encoder using ID34252 'Offset position index'.

The observer of the target position makes the signals acceleration, speed and position available. The speed is used for control with feed-forward of the SIWL output encoder. The control with feed-forward amounts to almost 100%.

The SIWL input signals are determined with the adjustable filter time ID34256 'Filter observer'. If an input signal fails, interpolation will be done automatically.

For commissioning, additional functions such as uncoupling of the output encoder or suppression of the homing mark are available.



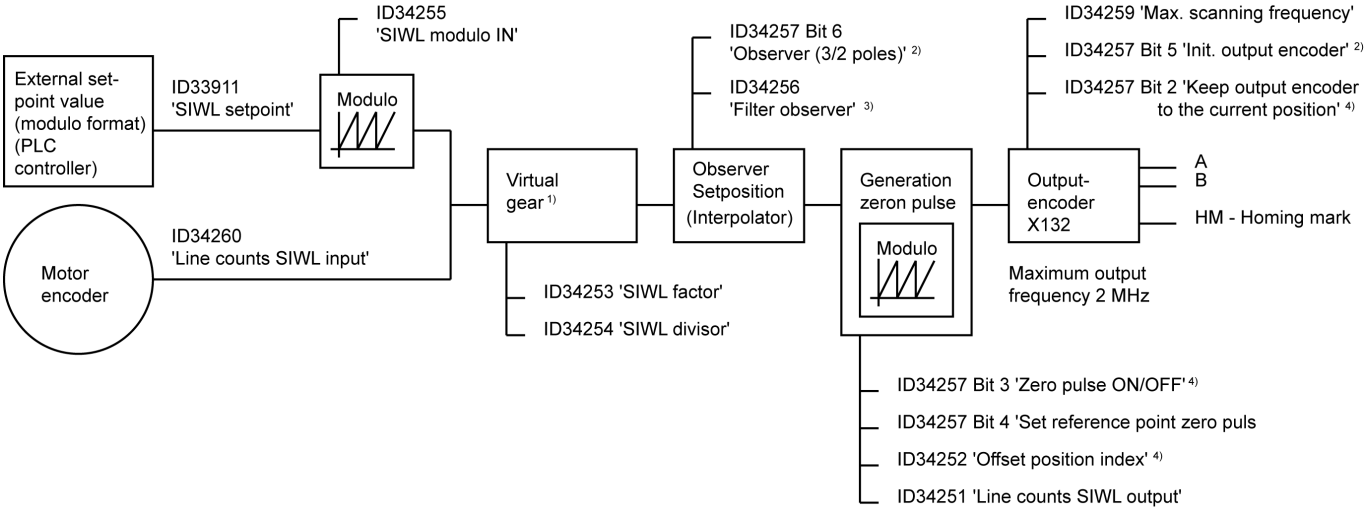
Example:

Input encoder (pulses per revolution)	Virtual gear(box)	Output encoder (pulses per revolution), 'Line counts SIWL output')	Description
100	'SIWL factor' = 1 'SIWL divisor' = 1 'Offset position index' = 0	100	One revolution on the input encoder generates 100 pulses on the output encoder. The homing mark is output with the pulse number 0.
100	'SIWL factor' = 1 'SIWL divisor' = 1 'Offset position index' = 19	100	One revolution on the input encoder generates 100 pulses on the output encoder. The homing mark is offset by 20 pulses in the positive direction of rotation and output with the 120th pulse.
100	'SIWL factor' = 1 'SIWL divisor' = 1 'Offset position index' = 0	1000	Ten revolutions on the input encoder generates 1000 pulses on the output encoder. The homing mark is output with the pulse number 0.
100	'SIWL factor' = **10** 'SIWL divisor' = 1 'Offset position index' = 0	1000	One revolution on the input encoder generates 1000 pulses on the output encoder. The homing mark is output with the 1000th pulse.

Properties of the incremental encoder emulation (SIWL):

- Input encoder (different motor encoder or master value from PLC)
- Virtual gear(box), consisting of multiplier and divisor
- The direction of rotation of the output encoder can be inverted
- Generate/suppress homing mark
- Offset homing mark
- Adoption of the current position of the output encoder as homing mark
- Output encoder can be uncoupled from the input encoder
- With absolute encoders, the output encoder can be preinitialized (no homing necessary)

1.1 Overview



ID34250 'SIWL source' 2)
00 - 'SIWL OFF'
10 - 'SIWL ON,
pulse source motor encoder (ID32953 'Encodetype')'
20 - 'SIWL ON,
pulse source external modulo encoder (PLC onto ID33911 'SIWL setpoint')'

1) Large numbers improve the control behavior
2) Is only evaluated during initialization
3) Large filter time delay output
4) Can be changed online

ID34257 'SIWL Control'

ID34257 Bit 0 'SIWL reinitialize' 4) (only valid for temporary parameters)

ID34257 Bit 7 'SIWL ON/OFF' 4)

ID34257 Bit 8 'Prescaler 256'

ID34258 'SIWL status'

2 Term definition encoder line number - pulses - increments

The following lists the definitions for the terms encoder line number, pulses, and increments.

Encoder line number (used with the SIWL input encoder)

- Encoder line number (line / pulse) describes the physical resolution of a motor encoder with single evaluation. ID34260 'Line counts SIWL input' shows the encoder line number (pulses) on the SIWL input per motor revolution.
- The number of encoder line numbers / pulses on the SIWL input depends on the encoder type and is, e.g. formed on the E-encoder by refining the ID32776 'Sine encoder period' by the factor 2048.
  See 'SIWL sources' on page 7.

Pulse (used with the SIWL output encoder)

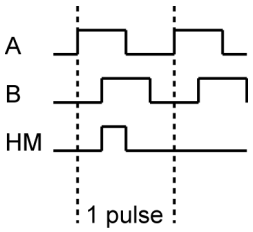
- 2 square-wave pulse encoders offset by 90 degrees, with or without homing mark
- 4 increments are generated from one pulse by the 4-fold evaluation in the target device (e.g. the pulse generator interface X132/IN in the AMK inverter).

The evaluation of the output pulses depends on the target device; 1-fold or 4-fold evaluation is possible.

Die Auswertung am Zielgerät beträgt zwischen 1x und 4x ('Line counts SIWL output' - 1)
z. B entsprechen 1000 Impulse den Impulsnummern 0 - 999.

Beispiel: ID34251 'Line counts SIWL output' = 1000

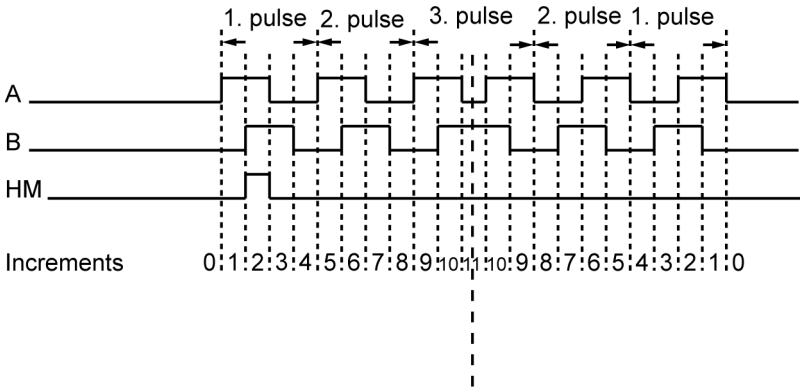
- 1-fache Auswertung:
  1000 Impulse am SIWL Ausgang werden vom Zielgerät mit 1000 Impulsen ausgewertet.
- 4-fache Auswertung:
  1000 Impulse am SIWL Ausgang werden vom Zielgerät mit 4000 Inkrementen ausgewertet.



Increments (used by the position control operating mode and the setpoint setting via PLC)

- The unit increments is used in the position control operating mode
- One revolution of the motor corresponds to the increment value ID116 'Resolution motor encoder' in the parameterization
- A PLC controller works in the position control operating mode with increments
- 4 increments are generated from one pulse by the 4-fold evaluation in the target device (e.g. the pulse generator interface X132/IN in the AMK inverter).

In positive direction of rotation, one increment is added for every edge change. In negative direction of rotation, one increment is subtracted for every edge change.



3 SIWL sources

As SIWL source, a motor encoder, defined in ID32953 'Encoder type' can be addressed (sensorless control, U/f operation and reserved encoders are not supported).

Alternatively, an external PLC can be addressed as SIWL source. In this case, the setpoints (guide values) in the modulo format must be written by a PLC controller in ID33911 'SIWL setpoint'.

The SIWL source is parameterized in ID34250 'SIWL source'.

3.1 SIWL source motor encoder

The motor encoder generates the input pulses for the SIWL.

The number of encoder line numbers / pulses on the SIWL input depends on the encoder type and is, e.g. formed on the E-encoder by refining the ID32776 'Sine encoder period' by the factor 2048.

SIWL source motor encoder, determination of the encoder line number (input pulses per motor revolution)

ID34260 'Line counts SIWL input' shows the encoder line number (pulses) on the SIWL input per motor revolution.

Requirement:

- ID34250 'SIWL source' = 0x10 (motor encoder according to ID32953 'Encoder type')
- ID34257 'SIWL control' Bit 0 = 1 (initialize SIWL)
- ID34257 'SIWL control' Bit 7 = 1 (activate SIWL)
- 24 VDC OFF/ON

Relation between encoder type and encoder line number per motor revolution

Encoder type	Encoder line number per motor revolution
Resolver	128
I-encoder	ID32776 'Sine encoder period'
E-, F-, S-, T-encoder	ID32776 'Sine encoder period' **x 2048**[1)]
P-, Q-encoder	Encoder-specific
U-, V-encoder	ID32776 'Sine encoder period' **x 2048**[1)]

1) 2048 corresponds to the highest internal resolution

3.2 SIWL source external guide value

SIWL source external guide value, increments via fieldbus (PLC controller)

The setpoints in the modulo format must be written by an external PLC controller in ID33911 'SIWL setpoint'.

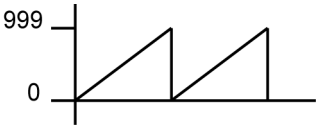
The PLC modulo value must be entered in the SIWL parameter ID34255 'SIWL modulo IN'.

Parametrization ID34255 'SIWL modulo IN' = Maximum input setpoint + 1

Example:

ID34255 'SIWL modulo IN' = 1000

Figure: PLC setpoints written in modulo format ID33911 'SIWL setpoint'



See 'SIWL example with PLC controller' on page 24.

If the PLC setpoint is to correspond to an encoder counter with 4-fold evaluation, then the factor 4 must be taken into account as well when determining the virtual gear ratio.

To do this, multiply the calculated value for ID34253 'SIWL factor' by 4.

After the initialization, no setpoint jump, which violates the limit value, may be recorded by the PLC on the SIWL input.
If the setpoint jump exceeds the limit value, the diagnostic message 1437 I:13 is output.

Calculation of the limit value per internal cycle time (250 µs)

$$\textbf{Limit value} = 87.5\ \% \times \left(\frac{ID34251}{2} - 1 \right)$$

4 Homing mark on the output encoder

Per ID34251 'Line counts SIWL output', the SIWL internal counting unit generates a homing mark on the output encoder. The homing mark of the output encoder can be shifted with respect to the output encoder using ID34252 'Offset position index'.

The homing mark is based on the '0 position SIWL output encoder'.

The input of the ID34252 'Offset position index' is based on the encoder resolution of the output encoder ID34251 'Line counts SIWL output'. The permissible input range is 0 to (ID34251 'Line counts SIWL output' - 1).

The '0 position SIWL output encoder' is generated after the initialization of the SIWL. With an incremental encoder or absolute encoder, the '0 position SIWL output encoder' corresponds to the current position after the initialization (prerequisite: ID34257 'SIWL control' Bit 5 = 0). There is no absolute position reference for the input encoder resp. for the mechanical homing mark.

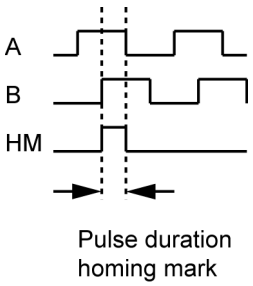
A homing must be carried out for determining the absolute position. Alternatively, the position of the homing mark can be defined with ID34257 'SIWL control', Bit 4: 'set homing mark to current position'.

For an absolute encoder, by setting the ID34257 'SIWL control' Bit 5 = 1, the SIWL output encoder will be initialized with the input setpoint (absolute position) x gear ratio. Thus, a reference to the absolute position exists. The homing mark is always output to the same specified mechanical motor position. A prior referencing of the system is not necessary.

4.1 Homing mark synchronization

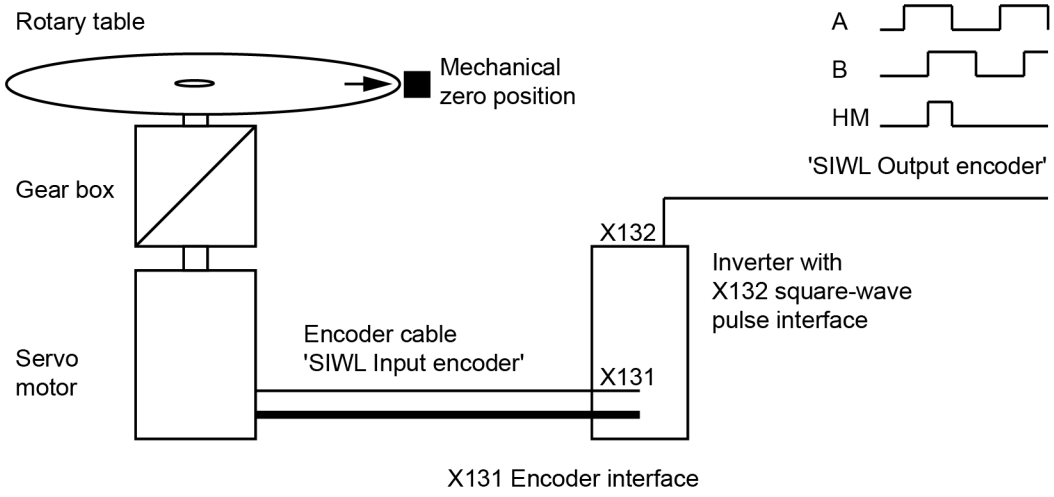
The homing mark is synchronized to: output encoder track A = high and output encoder track B = high.

The synchronization occurs after the device startup.



4.2 Output of a homing mark using a rotary table as example

A servo motor is flange-mounted to the rotary table via a gear(box). The motor encoder provides the 'SIWL input encoder' with the current position values. The 'SIWL output encoder' can output a homing mark to an arbitrary position of the rotary table.



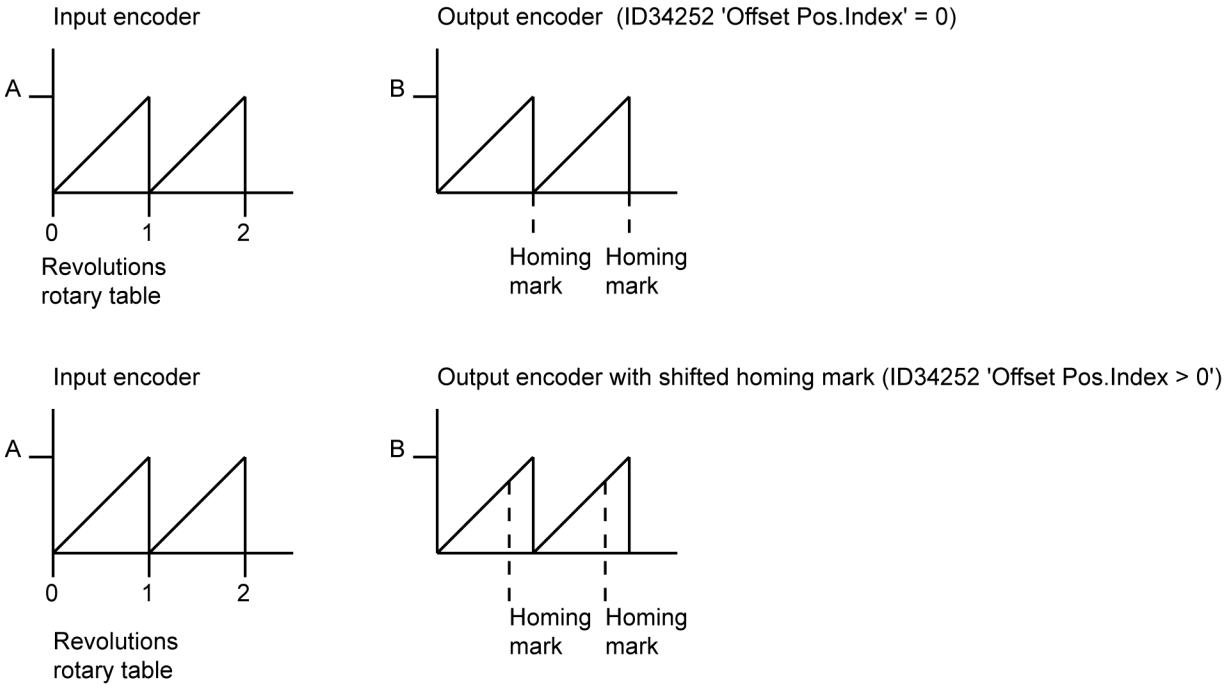
X131 Encoder interface

The gear(box) can be taken into account with the ID34253 'SIWL factor' and ID34254 'SIWL divisor'.

The homing mark is output by the output encoder to an arbitrary position of the rotary table.

Ratio input to output encoder 1/1

Example. The homing mark is always output to an adjustable position within one revolution.



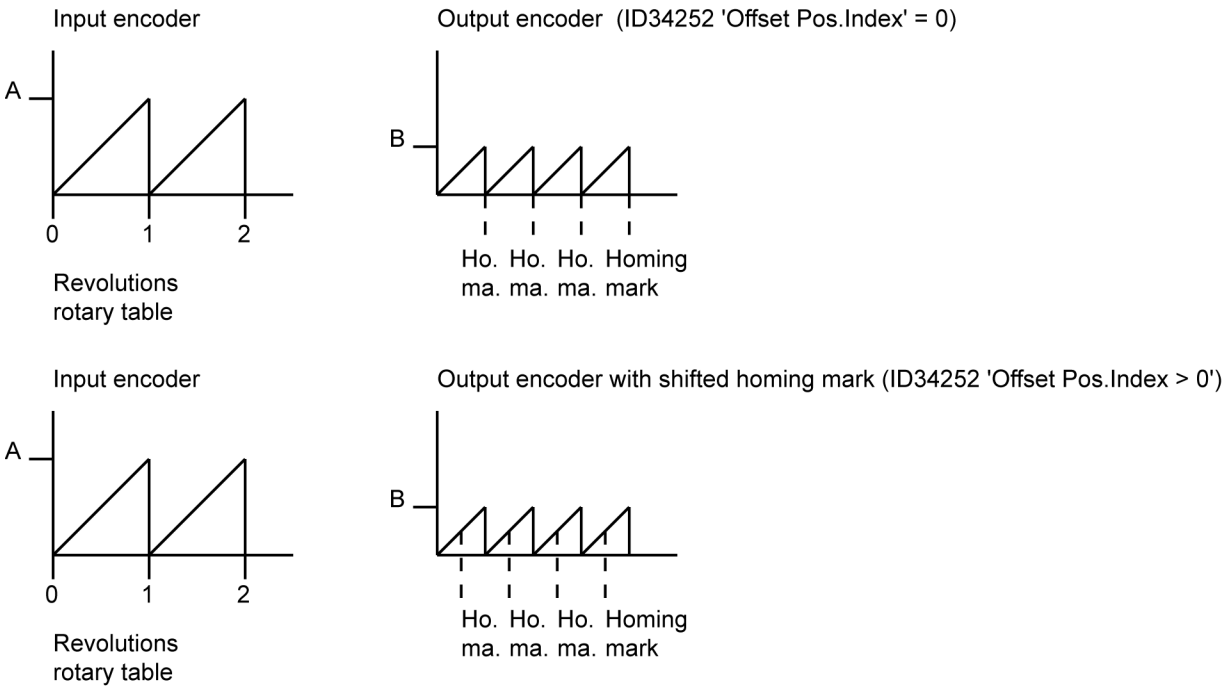
A - ID34260 'Line counts SIWL input' e.g. ID33911 'SIWL setpoint'

B - ID34251 'Line counts SIWL output'

The homing mark is output to a specified position of the rotary table.

Ratio input to output encoder 1/2

Example: Multiple homing marks are output on the output encoder per revolution to the input encoder

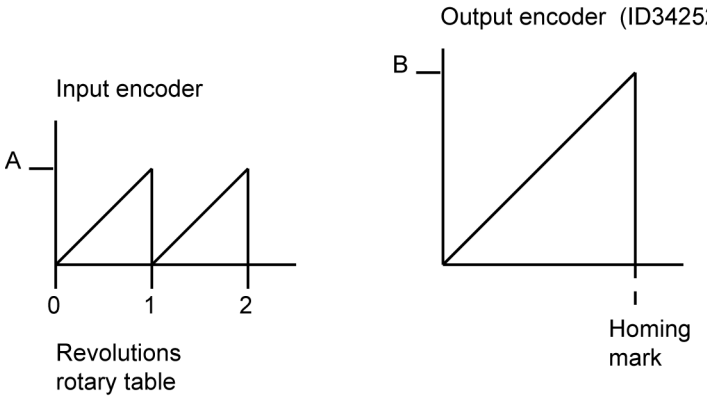


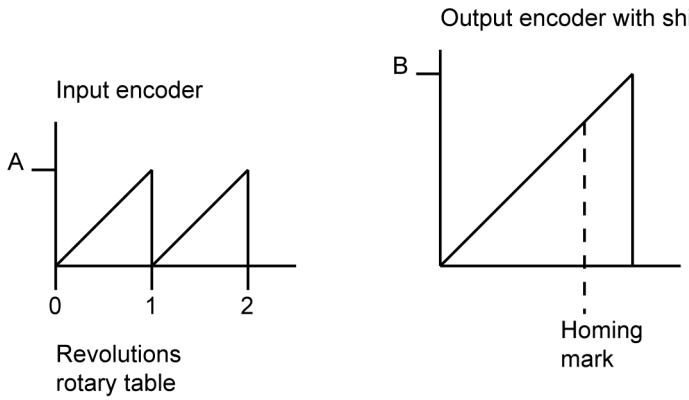
A - ID34260 'Line counts SIWL input' e.g. ID33911 'SIWL setpoint'

B - ID34251 'Line counts SIWL output'

Example: A homing mark on the output encoder is output after several revolutions to the input encoder.

Ratio input to output encoder 2:1





A - ID34260 'Line counts SIWL input' e.g. ID33911 'SIWL setpoint'

B - ID34251 'Line counts SIWL output'

Without homing there is no reference to the absolute position.

4.3 Overview of the relevant parameters that influence the homing mark

ID34251 'Line counts SIWL output'

The encoder resolution on the SIWL output encoder is parameterized with ID34251 'Line counts SIWL output'. The SIWL output encoder generates 2 square pulses offset by 90° with homing mark and counts from 0 to ('Line counts SIWL output' -1).

Example:

'Line counts SIWL output' = 1000 pulses

Output value: = 0 - 999

The maximum permitted number of output pulses per 250 µs amounts to:

$$\frac{\text{ID34251 'encoder line number SIWL output'}}{2} - 1$$

The direction of rotation will be valued incorrectly if exceeded.

ID34252 'Offset position index'

With the 'Offset position index', the position at which the homing mark is output is shifted by the number of the pulses in positive direction of rotation based on the '0 position SIWL output encoder'.

Permitted value range: 0 to (ID34251 'Line counts SIWL output' - 1)

ID34252 'Offset position index' starts to count beginning with 0.

Example:

'Offset position index' = 3999

The offset amounts to 4000 pulses (0 - 3999)

When subsequently ID34257 'SIWL control' Bit 4 is set (homing mark set to current position), the input value is in ID34252 'Offset position index'. The newly set position can not be read back via the parameter ID34252 'Offset position index'. ID34252 'Offset position index' continues to show the previous value.

If the 'Offset position index' is written temporarily, the value will be immediately calculated with the '0 position SIWL output encoder'.

When switching off the 24 VDC, this temporary newly written value 'Offset position index' is not stored. The old stored value appears again with the next 24 VDC ON.

If the 'Offset position index' is written remanently, the value will be calculated during the next system booting or during the next controller enable RF 0→1 edge with the '0 position SIWL output encoder'.

The 'Offset position index' is stored remanently.

ID34257 'SIWL control' Bit 3: Suppress homing mark

Bit 3 = 0: The homing mark on the SIWL output encoder is blocked and is not output

Bit 3 = 1: The homing mark on the SIWL output encoder is enabled for the output (default setting)

ID34257 'SIWL control' Bit 4: Set homing mark to current position

For a 0→1 edge by the PLC on ID34257 'SIWL control' Bit 4, the homing mark is set to the current position.

When setting the ID34257 'SIWL control' Bit 4: 'Set homing mark to current position', the ID34252 'Offset position index' is overwritten internally. The new position value cannot be read back. A value input before this point in time (ID34252 'Offset position index') has no effect.

By writing the ID34252 'Offset position index' again, the set homing mark is discarded and the input value with ID34252 'Offset position index' based on the pulse number 0 of the output encoder is output.

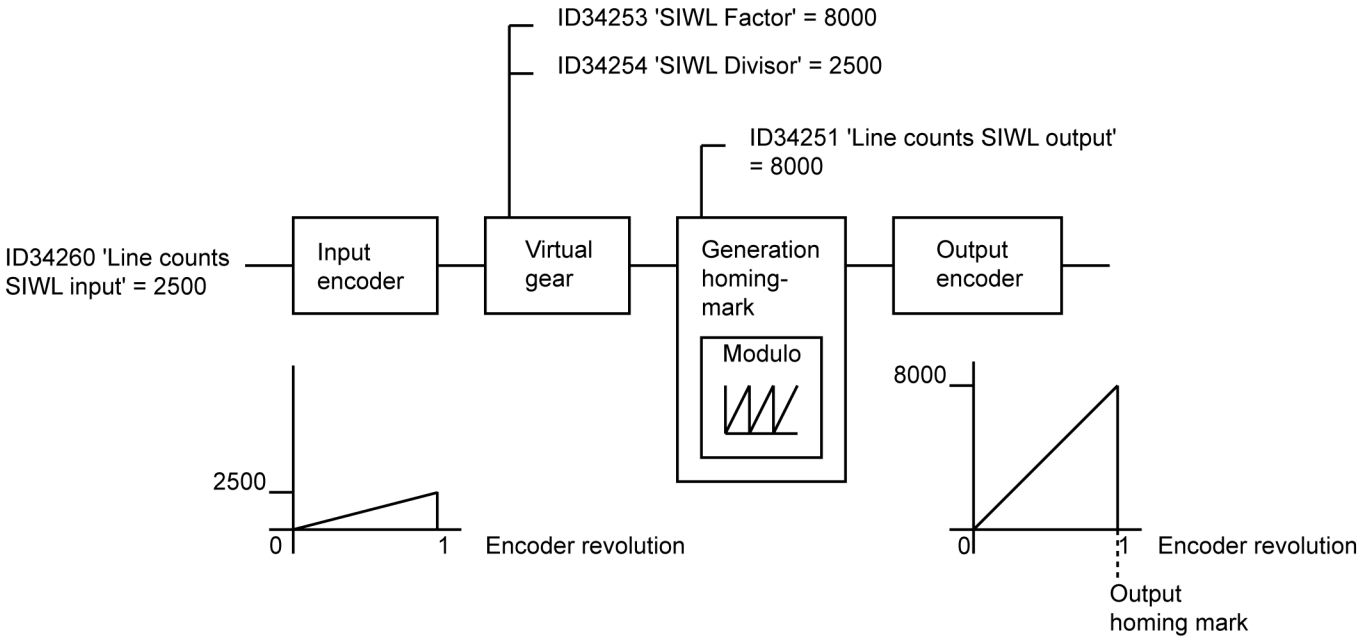
If the user sets Bit 4 temporarily, the homing mark is set to the current position and is valid immediately. The set position is discarded with the next 24 VDC ON.

If the user sets Bit 4 remanently, the homing mark is set to the current position but is not activated. The position is only adopted with the next system booting or with the next controller enable RF 0→1 edge.

The set position is stored remanently.

Example:

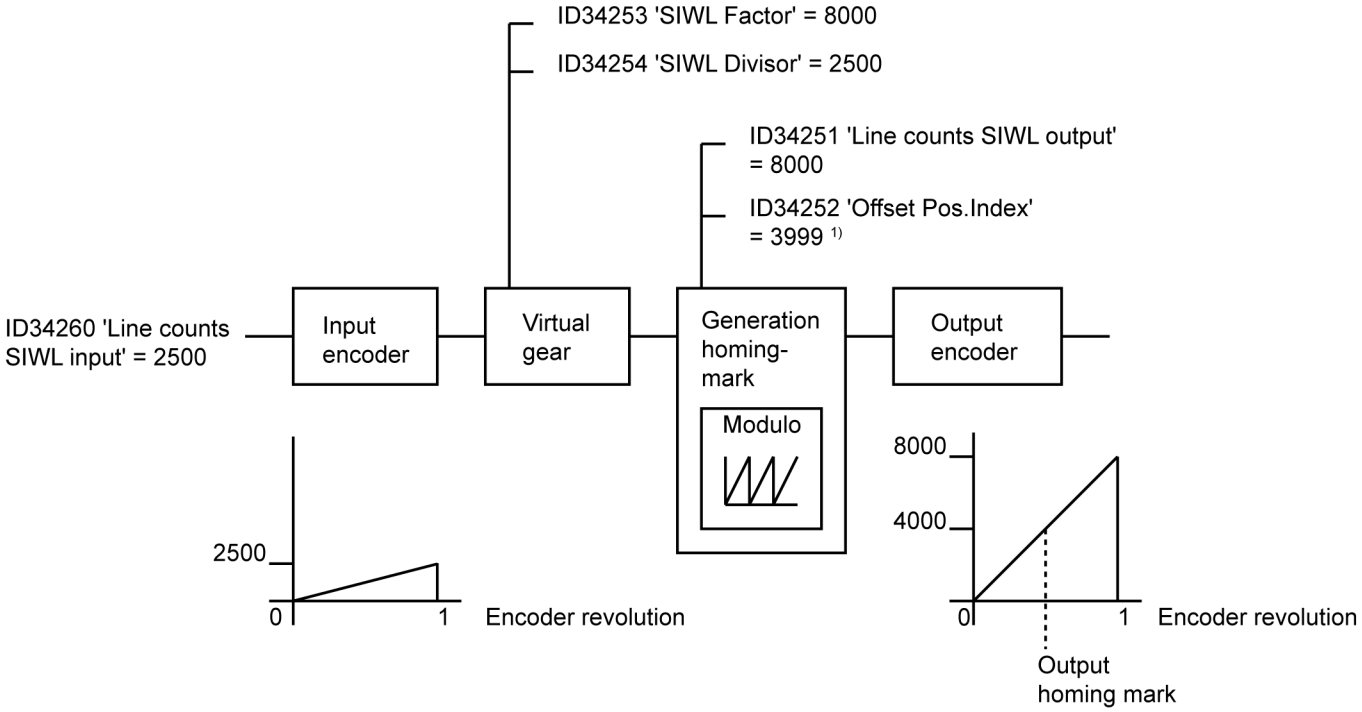
2500 pulses are output per input encoder revolution. The SIWL generates 8000 output pulses from one encoder revolution of the input encoder. One homing mark is output per encoder revolution.



Example:

2500 pulses are output per input encoder revolution. The SIWL generates 8000 output pulses from one encoder revolution of the input encoder. One homing mark is output per encoder revolution.

In addition, the homing mark is offset by 180° (half an encoder revolution) in the clockwise direction.



1) 8000 output pulses are generated for one encoder revolution. 180° offset corresponds to 4000 pulses.

The ID34252 'Offset position index' starts counting at 0.

0 - 3999 corresponds to 4000 pulses.

5 SIWL monitor

The observer of the target position makes the signals acceleration, speed and position available. The speed is used for control with feed-forward of the SIWL output encoder. The control with feed-forward amounts to almost 100%.

The SIWL input signals are determined with the adjustable filter time ID34256 'Filter observer'. If an input signal fails, interpolation will be done automatically.

See 'SIWL filter time' on page 16.

The SIWL is invoked one time per ID2 'SERCOS cycle time' for the recalculation. The SIWL interpolates between two SERCOS cycle times.

The control performance of the SIWL can be modified so that the overshoot is reduced after a jump on the SIWL input. By default, the SIWL works with a monitoring function with three poles. The control performance is very fast, the setpoint is reached after a short time, however, the output value overshoots.

If ID34257 'SIWL control', Bit 6 = 1 is set, the monitor is reduced to two poles. This reduces the overshoot, the setpoint is only reached after a longer time period, however.

ID34257 'SIWL control' Bit 6: control performance SIWL monitor

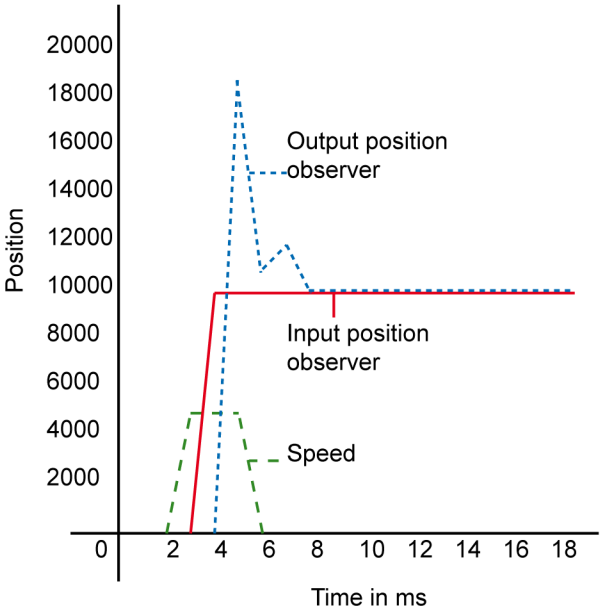
Bit 6 = 0: Very fast control performance, with overshoot (monitor with 3 poles) (default setting)

Bit 6 = 1: Very fast control performance, without overshoot (monitor with 2 poles)

The monitor can be configured as follows:

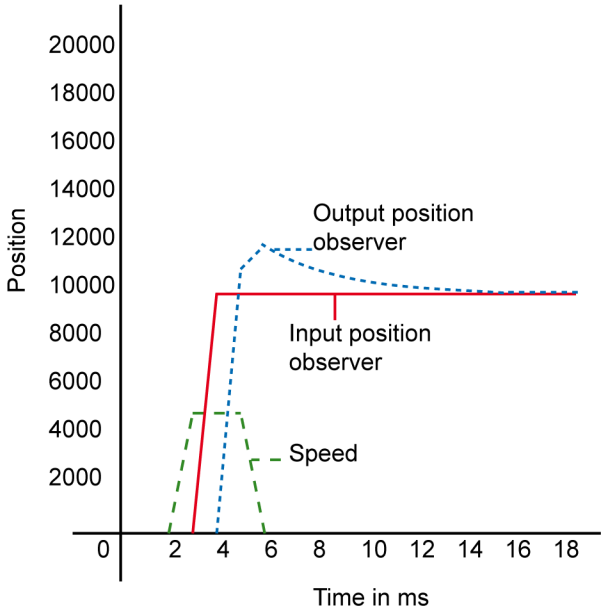
Simulation SIWL observer with 3 poles,
cycle timet 1 ms

ID34257, Bit 6 = 0: very quick control response,
(Example: Set point is reached after 5 ms,
90 % overshoot)



Simulation SIWL observer with 2 poles,
cycle timet 1 ms

ID34257, Bit 6 = 1: quick control response,
(Example: Set point is reached after 12 ms,
20 % overshoot)



Example measurements:

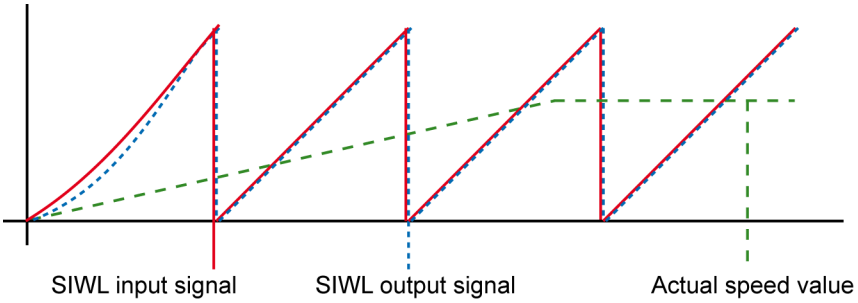
The SIWL is set so that the SIWL input signal of the motor encoder system is reproduced 1/1 on the SIWL output encoder.

Measurement 1: ID34257 'SIWL control' Bit 6 = 0: Very fast control performance, with overshoot (monitor with 3 poles)
ID34256 'Filter observer' = 1ms

SIWL input signal: Red
SIWL output signal: Blue
Actual speed value: Green

Setpoint in the example: Acceleration, then continuous movement

The SIWL output signal (blue) continually follows the SIWL input signal after the shortest time.

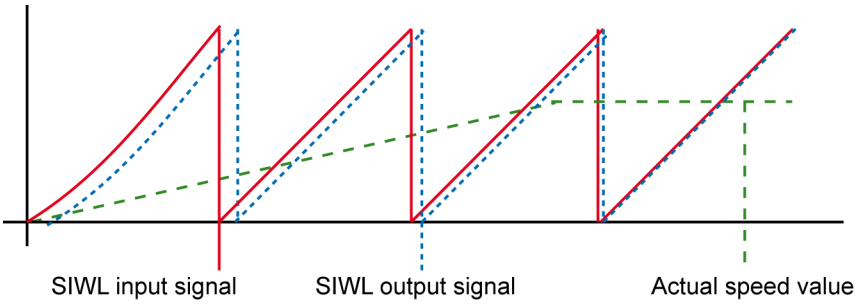


Measurement 2: ID34257 'SIWL control' Bit 6 = 1: Very fast control performance, without overshoot (monitor with 2 poles)
ID34256 'Filter observer' = 1ms

SIWL input signal:	Red
SIWL output signal:	Blue
Actual speed value:	Green

Setpoint in the example: Acceleration, then continuous movement

The SIWL output signal lags behind during accelerating/braking.



6 SIWL filter time

ID34256 'Filter observer' influences the SIWL monitor. Incoming SIWL input signals are determined and acceleration, speed, and position setpoints are generated from these for the drive controller.

If incoming signals fail, the 'Filter observer' interpolates the missing signals and relies on the next, determined set position again.

The filter time can be parameterized between 0.6 ms and 20 ms. The default value is 5 ms.

With increasing filter time a slower behavior occurs on the SIWL output encoder. If the filter time is too small, the effect of the filter is raised.

For a bus cycle time of ID2 'SERCOS cycle time' = 1 ms a filter time of ID34256 'Filter observer' = 1 ms is recommended.

See 'SIWL monitor' on page 14.

Example measurements:

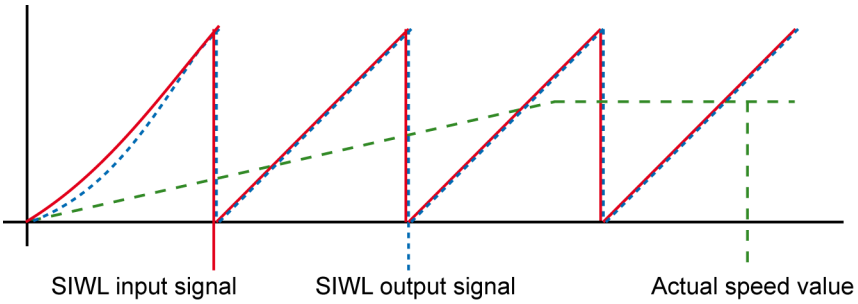
The SIWL is set so that the SIWL input signal of the motor encoder system is reproduced 1/1 on the SIWL output encoder.

Measurement 1: ID34256 'Filter observer' = 1ms

SIWL input signal: Red
SIWL output signal: Blue
Actual speed value: Green

Setpoint in the example: Acceleration, then continuous movement

The SIWL output signal continually follows the SIWL input signal after a short delay.

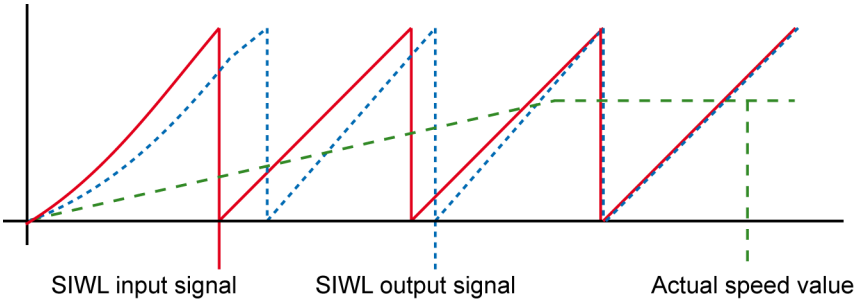


Measurement 2: ID34256 'Filter observer' = 5 ms

SIWL input signal: Red
SIWL output signal: Blue
Actual speed value: Green

Setpoint in the example: Acceleration, then continuous movement

A filter time of 5 ms sets a slow behavior on the motor shaft during load change.



7 Startup instructions

7.1 Relevant SIWL parameters

Parameter	Description	Meaning See document 'Parameter description' (AMK part no. 203704)
ID33911 2)	'SIWL setpoint'	If a PLC has been selected as SIWL source , the PLC input setpoint must be written to ID33911 'SIWL setpoint'.
ID34250 1)	'SIWL source'	SIWL ON/OFF, selection of the pulse source Default value: SIWL OFF See 'ID34250 'SIWL source' bit string' on page 34.
ID34251 1)	'Line counts SIWL output'	Resolution of the SIWL output encoder Default value: 2
ID34252 1)	'Offset position index'	Shifts the position of the homing mark of the SIWL output encoder in the positive direction Default value: 0
ID34253 1)	'SIWL factor'	Multiplier of the virtual SIWL drive Default value: 1
ID34254 1)	'SIWL divisor'	Divisor of the virtual SIWL drive Default value: 1
ID34255 1)	'SIWL modulo IN'	modulo value for the SIWL input signal for an external pulse source (PLC controller)
ID34256 1)	'Filter observer'	Interpolator in order to determine incoming signals via fieldbus. The input value affects the dynamic behavior of the output encoder to changes on the input. Default value: 5000 µs  Slow behavior for ID34256 = 5000 µs Typical values: ID34256 = 1000 µs for ID2 = 1 ms
ID34257 1)	'SIWL control'	Control word of the SIWL Default value: 0000 0000 1000 1001 See 'ID34257 'SIWL control' bit string' on page 34.
ID34258 3)	'SIWL status'	Status word of the SIWL
ID34259 1)	'Maximum scanning frequency'	Limit of the maximum SIWL output frequency
ID34260 3)	'Line counts SIWL input'	Number of SIWL input pulses per encoder revolution (display only)

1) The parameter value must be set specific to the application

2) Parameter value is written or read via the master controller

3) Parameter value is automatically generated by the controller card

The meaning of the sizes relevant for the SIWL and their setting are explained in the parameter description (AMK part no. 203704).

7.2 Behavior for the default setting after 24 VDC ON

Default setting ID34257 'SIWL control':

Bit	Value	Reaction after device initialization (24 VDC)
ID34257 Bit 0	1	SIWL is initialized
ID34257 Bit 1	0	Reserved
ID34257 Bit 2	0	The SIWL output signal changes depending on the SIWL input signal and the SIWL parametrization
ID34257 Bit 3	1	The homing mark on the SIWL output encoder is enabled for the output
ID34257 Bit 4	0	Offset of the homing mark according to ID34252 'Offset position index'
ID34257 Bit 5	0	The SIWL output encoder is preinitialized with 0
ID34257 Bit 6	0	Very fast control performance, with overshoot (monitor with 3 poles)
ID34257 Bit 7	1	SIWL is active
ID34257 Bit 8	0	No prescaler

SIWL behavior output encoder after 24 VDC ON, system booting or command 'Reinitialize SIWL'

Initialization by ...	Parameter value	Meaning	Output encoder behavior
24 VDC OFF/ON	ID34257 Bit 0 = 1	Reinitialize SIWL	The value of the output encoder is dependent on: **ID34257 'SIWL control' Bit 5: Initialization SIWL output encoder** Bit 5 = 0: The SIWL output encoder is preinitialized with 0 Applies to relative and absolute encoders: The homing mark is output for the '0 position SIWL output encoder' + ID34252 'Offset position index'. Bit 5 = 1: With absolute encoders: The SIWL output encoder is preinitialized with the input setpoint (absolute position) x gear ratio (ID34253/ID34254) Only applies to absolute encoders: The homing mark is output for the encoder absolute position 0 + ID34252 'Offset position index'.
	ID34257 Bit 7 = 1 [1]	Activate SIWL	
Command 'System booting' in operation [2]	ID34257 Bit 0 = 1	Reinitialize SIWL	Output value and homing mark are maintained for an absolute encoder and Bit 5 = 1.
	ID34257 Bit 7 = 1	Activate SIWL	
SIWL command 'Reinitialize SIWL' in operation	0 → 1 edge to ID34257 Bit 0	Reinitialize SIWL	Current value of the SIWL output encoder is reset, Homing mark is reset The value of the output encoder is dependent on: **ID34257 'SIWL control' Bit 5: Initialization SIWL output encoder** Bit 5 = 0: The SIWL output encoder is preinitialized with 0 Applies to relative and absolute encoders: The homing mark is output for the '0 position SIWL output encoder' + ID34252 'Offset position index'. Bit 5 = 1: With absolute encoders: The SIWL output encoder is preinitialized with the input setpoint (absolute position) x gear ratio (ID34253/ID34254) Only applies to absolute encoders: The homing mark is output for the encoder absolute position 0 + ID34252 'Offset position index'.
	ID34257 Bit 7 = 1 [1]	Activate SIWL	

1) ID34257 Bit 0 = 1, ID34257 Bit 7 = 0, SIWL is initialized but not activated.
2) The system startup differs from the device initialization (24 VDC OFF/ON).
   The system booting causes a recalculation of the data retention. (actual values are maintained, drive bus continues to run...)

7.3 Determination of the absolute position

On relative encoders, the position information is determined by counting from an arbitrary zero point. An absolute position is not known. To allow the absolute position to be able to be determined, there must be an absolute reference available. This absolute reference is created by an additional homing mark. This homing mark is generated one time at the same position per revolution. The homing mark is also known as zero pulse, index or zero.

Alternatively, an external homing mark can be used for homing.

On absolute encoders, the absolute reference is available immediately after switching on. The absolute position information is determined from the scale division.

Reference to mechanical homing mark for relative encoders

Without homing	With homing
The motor encoder supplies the signals for the SIWL input encoder. By design, the actual position of a relative motor encoder is unknown after switching on. The actual position is output as value 0 for switching on or reinitialization. There is no reference to a homing mark (e.g. a mechanical zero position) present. The value of the SIWL output encoder amounts to 0 after switching on. The output position of the homing mark of the output encoder is always based on this position 0 of the output encoder when switching on. Therefore, without homing mark, no reference to a homing mark can be created on the side of the SIWL input encoder. The output position of the homing mark SIWL output encoder is undefined.	After the homing, a reference between motor encoder and the homing mark (e.g. a mechanical zero position) is created. Thus, an absolute reference between the SIWL output encoder and homing mark motor encoder is also present. The output position of the homing mark SIWL output encoder is defined.

Homing options

Relative encoder	Absolute value encoder
The current position is unknown after switching on. The drive system must be homed again after every switching on. **Version 1:** Homing run to cam. ID34257 'SIWL control' Bit 4: Carry out 'Set homing mark to current position'. **Version 2:** Homing run to the homing mark of the motor encoder. If needed, the ID34252 'Offset position index' can be written with a value. While the motor encoder is homed, 'SIWL control' Bit 2 of the SIWL input encoder can be uncoupled from the SIWL output encoder with ID34257.	ID34257 'SIWL control' Bit 5 = 1 The current position, as well as the ID34252 'Offset position index' is unknown after the switching on.

Reference to the mechanical homing mark with absolute encoders

On drive systems with absolute encoders and SIWL encoder line numbers with one complete motor revolution, the homing mark can always be output to the same specified mechanical motor position. The reference of the input encoder to the mechanical zero position must be created one time during the commissioning.

The SIWL output encoder is initialized with the input setpoint (absolute position) x gear ratio (ID34257 'SIWL control' Bit 5 = 1).

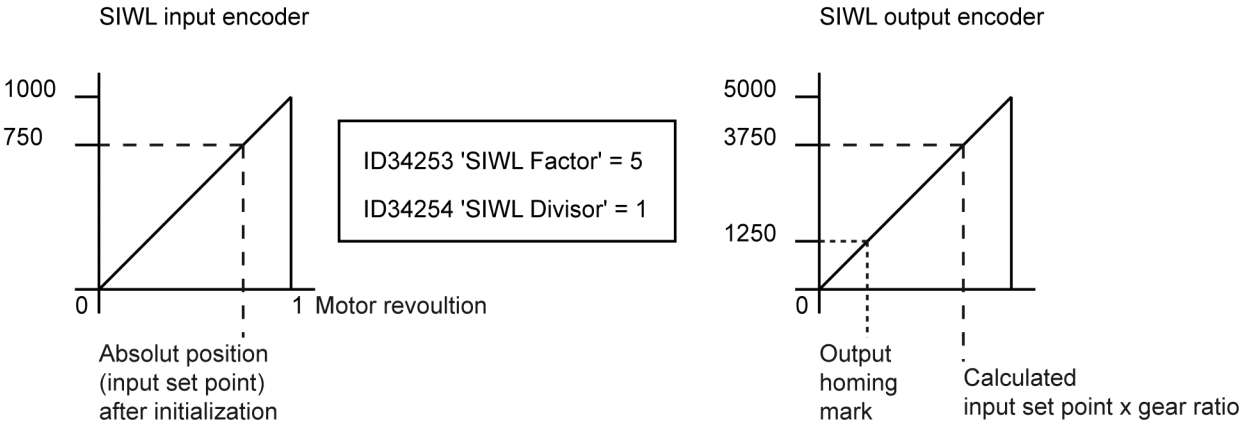
In the example, the homing mark is generated on the output encoder with the ID34252 'Offset position index' after 2500 pulses based on the absolute position 0 (mechanical homing mark) on the input encoder. The homing mark on the output encoder is always output at the same position, independent of the switch-on position on the input encoder.

A single-turn absolute encoder with a resolution of 1000 pulses per motor revolution is utilized as motor encoder. The SIWL output encoder is to generate 5000 pulses per motor revolution.

A prior referencing after switching on is not necessary.

Parametrization:

Parameter ID	Parameter value	Meaning
32953 'Encoder type'	Nibble 0: 0xA	Absolute encoder, type single-turn
34250 'SIWL source'	0x10	SIWL source motor encoder
34260 'Line counts SIWL input'	1000	Encoder-specific
34253 'SIWL factor'	5	$\text{Output pulse} = \frac{\text{ID34260}}{\text{ID34254}} \times \text{ID34253}$
34254 'SIWL divisor'	1	
34251 'Line counts SIWL output'	5000	Output homing mark: 5000 output pulses x 1 motor revolution
34252 'Offset position index'	2500	Homing mark offset: (180°/360°) x 5000



ID34257 'SIWL control', Bit 0: Initialize SIWL

Bit 0 = 0: No function

Bit 0 = 1: SIWL is automatically initialized during device initialization (24 VDC ON) (default setting)

Subsequent system bootings, triggered by functions like 'system startup', 'error deleting' the SIWL will not re-initialized.

In operation, the SIWL can be re-initialized with a 0 → 1 edge by the PLC on ID34257 bit 4.

Thus, the temporarily changeable parameters of SIWL will re-initialized.

For changed remanent SIWL parameters such ID34250 'SIWL source', ID34251 'Line counts SIWL output', the 'SIWL initialization' has no influence. To activate the changing you need a RF + edge or 24 VDC OFF / ON as specified at the parameter attribute.

After the 0 → 1 edge, the bit 0 must be reset to the value 0.

Further information:

Table: SIWL behavior output encoder after 24 VDC ON, system booting or command 'Reinitialize SIWL'

ID34257 'SIWL control', Bit 2: Coupling input and output encoder

The coupling between SIWL input and output encoder can be rescinded for purposes of setting up. This allows the motor to be moved without the output encoder including the position change in the processing.

Bit 2 = 0: The SIWL output encoder changes depending on the SIWL input signal and the SIWL parameterization

Bit 2 = 1: The SIWL output encoder is held in the current position, input and output signal are uncoupled

ID34257 'SIWL control', Bit 5: Preinitialize SIWL output encoder

Bit 5 = 0: The SIWL output encoder is preinitialized with 0

Bit 5 = 1: With absolute encoders: The SIWL output encoder is preinitialized with the input setpoint (absolute position) x gear ratio (ID34253/ID34254)

This function can only be utilized with absolute encoders in order to maintain the relationship between SIWL and homing mark of the slave drive.

Relative encoders are initialized with 0.

If Bit 5 = 1 is set during operation, the SIWL must be subsequently reinitialized.

ID34257 'SIWL control' Bit 6: control performance SIWL monitor

Bit 6 = 0: Very fast control performance, with overshoot (monitor with 3 poles) (default setting)

Bit 6 = 1: Very fast control performance, without overshoot (monitor with 2 poles)

See 'SIWL monitor' on page 14.

ID34257 'SIWL control', Bit 7: Activate SIWL

Bit 7 = 0: SIWL deactivated

Bit 7 = 1: SIWL activated (default setting)

Further information:

Table: SIWL behavior output encoder after 24 VDC ON, system booting or command 'Reinitialize SIWL'

ID34257 'SIWL control', Bit 8: Prescaler 256 for SIWL input setpoint

Bit 8 = 0: Prescaler 256 for SIWL input setpoints deactivated

Bit 8 = 1: Prescaler 256 for SIWL input setpoints activated (Slippage effect for division with remainder)

The Bit 8 = 1 can be used for very high resolution encoder systems. In this case, the SIWL input signals are reduced by a factor of 265.

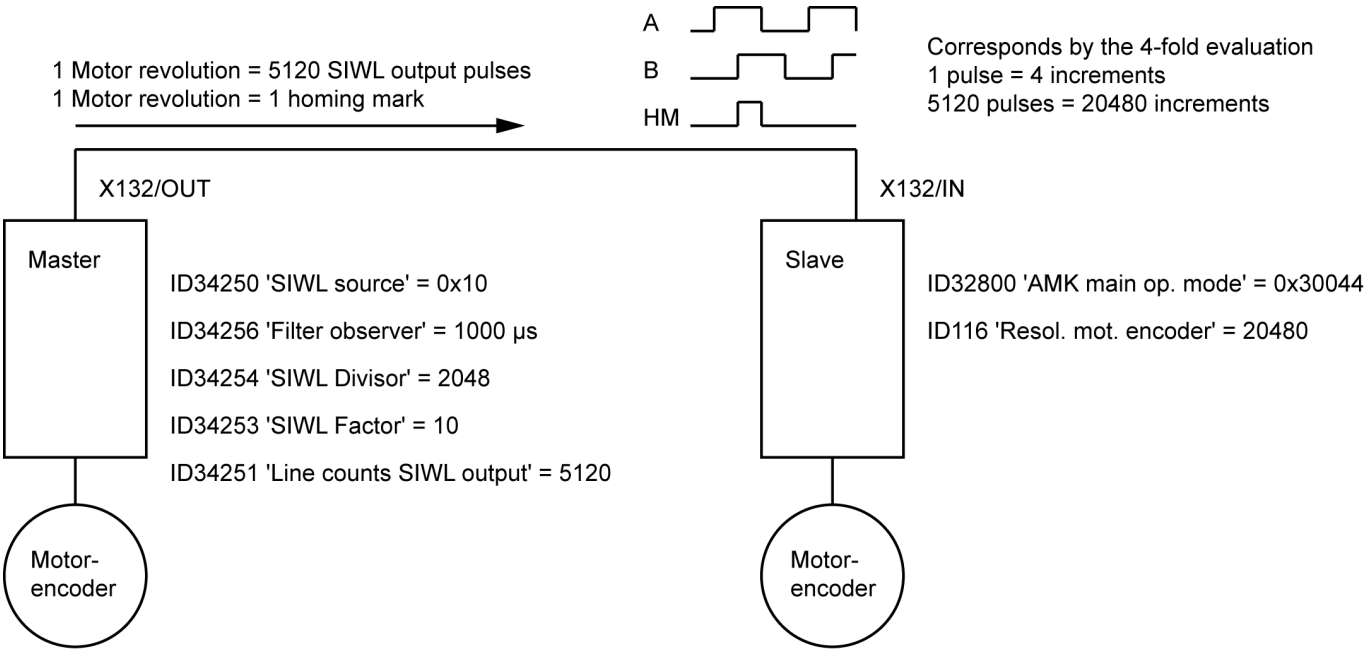
If the division of ID34260 'Line counts SIWL input' by 256 is not an integer value, a slippage effect will occur!

8 SIWL example with motor encoder

Master-Slave mode, the slave follows the master exactly. 1 revolution master motor = 1 revolution slave motor.

One homing mark is to be output per motor revolution.

Overview:



E-encoder (with 512 periods)
ID34260 'Line counts SIWL input' = 1048576

$$\text{SIWL output pulses per motor revolution} = \frac{\text{ID34260 'Line counts SIWL input'}}{\text{ID34254 'SIWL Divisor'}} \times \text{ID34253 'SIWL Factor'}$$

Procedure:

Calculation of the input pulse on the slave:

For one motor revolution of the slave, the increment number configured in ID116 'Resolution motor encoder' is required (in the example ID116 = 20480 increments per motor revolution).

By means of the 4-fold evaluation of the pulse generator interface X132, 5120 input pulses are required (20480 increments / 4).

Calculation of the virtual drive:

In the example, ID34260 'Line counts SIWL input' amounts to 1048576 pulses per motor revolution (ID32776 'Sine encoder period' x highest possible internal resolution (512 x 2048)).

$$\frac{\text{ID34260 'encoder line number SIWL input'}}{\text{SIWL pulse output encoder}} = \text{D34254 'SIWL divisor'}$$

$$\frac{1048576}{5120} = 204.8$$

The input of a decimal place (204.8) is not permitted.

Only whole numbers may be entered in ID34254 'SIWL divisor' and ID34253 'SIWL factor'.

Rounding leads to inaccuracy and drifting of the drive.

Solution:
Multiply 204.8 with the factor 10.
ID34253 'SIWL factor' = 10
ID34254 'SIWL divisor'= 2048

One homing mark per motor revolution

The homing mark is output as soon as the number of output SIWL pulses corresponds to the entered value of the ID34251 'Line counts SIWL output'.

ID34251 'Line counts SIWL output' = SIWL output pulses per motor revolution = 5120

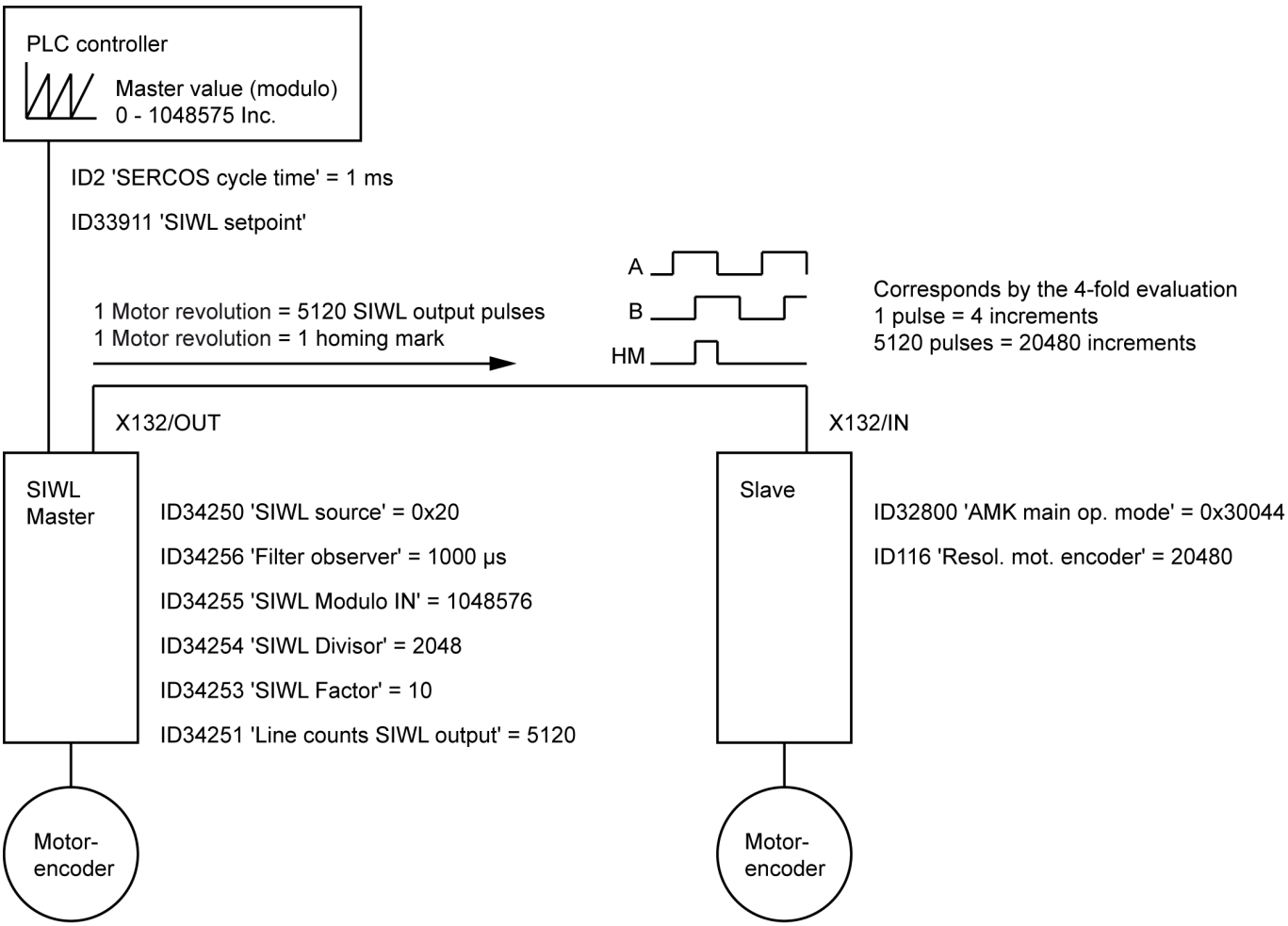
Additional examples:
Two homing marks per motor revolution = ID34251 'encoder line number SIWL output' = 2560
One homing mark per 1.5 motor revolutions = ID34251 'encoder line number SIWL output' = 7680

9 SIWL example with PLC controller

Master-Slave mode, the slave is to exactly follow the PLC master value in the module format.

1 modulo value: 0 - 1045757 = 1 revolution slave motor.

A homing mark is to be output 1 time per modulo value.



$$\text{SIWL output pulses per motor revolution} = \frac{\text{ID34255 'SIWL Modulo IN'}}{\text{ID34254 'SIWL Divisor'}} \times \text{ID34253 'SIWL Factor'}$$

Procedure:

Calculation of the input pulse on the slave:

For one motor revolution of the slave, the increment number configured in ID116'Resolution motor encoder' is required (in the example ID116 = 20480 increments per motor revolution) as setpoint.

By means of the 4-fold evaluation of the pulse generator interface X132, 5120 input pulses are required (20480 increments / 4).

Calculation of the virtual drive:

In the example, ID34255 'SIWL modulo IN' amounts to 1048576 pulses per PLC modulo setpoint value. The required input pulses on the slave motor (SIWL pulse output encoder) amount to 5120 pulses.

$$\frac{\text{ID34255 'SIWL Modulo IN'}}{\text{SIWL pulse output encoder}} = \text{D34254 'SIWL divisor'}$$

$$\frac{1048576}{5120} = 204.8$$

The input of a decimal place (204.8) is not permitted.

Only whole numbers may be entered in ID34254 'SIWL divisor' and ID34253 'SIWL factor'.

Rounding leads to inaccuracy and drifting of the drive.

Solution:
Multiply 204.8 with the factor 10.
ID34253 'SIWL factor' = 10
ID34254 'SIWL divisor'= 2048

One homing mark per motor revolution

The homing mark is output as soon as the number of output SIWL pulses corresponds to the entered value of the ID34251 'Line counts SIWL output'.

ID34251 'Line counts SIWL output' = SIWL output pulses per motor revolution = 5120

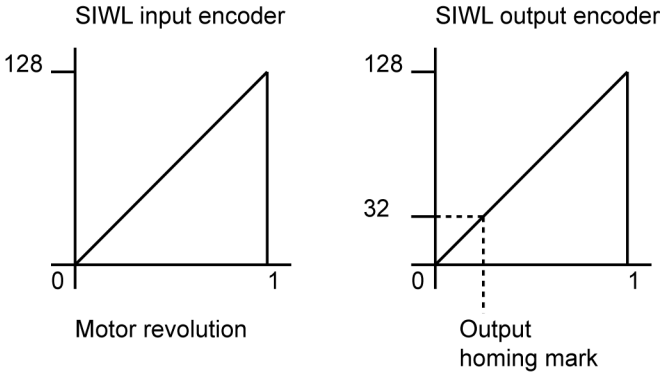
Additional examples:
Two homing marks per motor revolution = ID34251 'encoder line number SIWL output' = 2560
One homing mark per 1.5 motor revolutions = ID34251 'encoder line number SIWL output' = 7680

10 SIWL additional parameterization examples

Example 1:

A resolver with a resolution of 128 pulses per motor revolution is utilized as motor encoder.
The SIWL output encoder is to generate the same number of pulses (128) as the motor encoder.
The SIWL output encoder is to output one homing mark per motor revolution.
In addition, the homing mark is to be offset by 90° (1/4 revolution of the motor encoder) in the positive direction of rotation.
Parametrization:

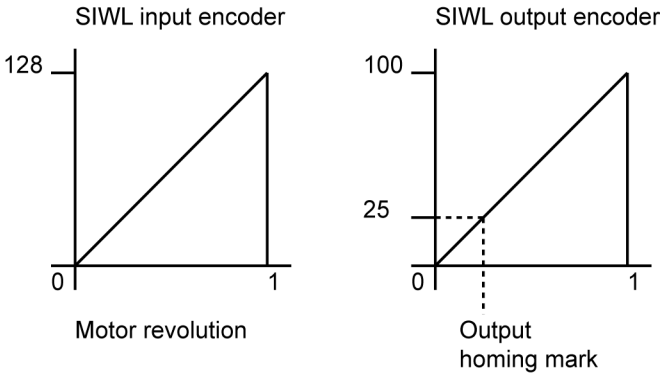
Parameter	Value	Meaning
ID32953 'Encoder type'	Nibble 0: 0x8	Resolver
ID34250 'SIWL source'	0x10	SIWL source motor encoder
ID34260 'Line counts SIWL input'	128	Encoder-specific
ID34253 'SIWL factor'	1	Output pulses = Input pulses
ID34254 'SIWL divisor'	1	
ID34251 'Line counts SIWL output'	128	Output homing mark: 128 output pulses x 1 motor revolutions
ID34252 'Offset position index'	32	Homing mark offset: (90°/360°) x 128



Example 2:

A resolver with a resolution of 128 pulses per motor revolution is utilized as motor encoder.
The SIWL output encoder is to generate 100 pulses per motor revolution.
The SIWL output encoder is to output one homing mark per motor revolution.
In addition, the homing mark is to be offset by 90° (1/4 revolution of the motor encoder) in the positive direction of rotation.
Parametrization:

Parameter	Value	Meaning
ID32953 'Encoder type'	Nibble 0: 0x8	Resolver
ID34250 'SIWL source'	0x10	SIWL source motor encoder
ID34260 'Line counts SIWL input'	128	Encoder-specific
ID34253 'SIWL factor'	100	$\text{Output pulse} = \frac{\text{ID34260}}{\text{ID34254}} \times \text{ID34253}$
ID34254 'SIWL divisor'	128	
ID34251 'Line counts SIWL output'	100	Output homing mark: 100 output pulses x 1 motor revolutions
ID34252 'Offset position index'	25	Homing mark offset: (90°/360°) x 100



Example 3:

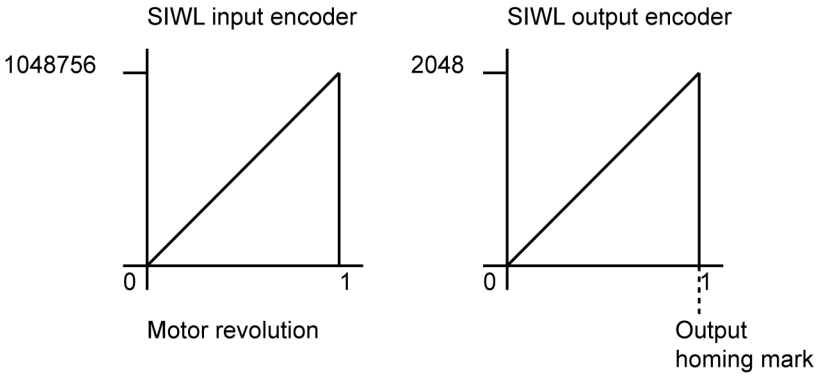
A high-resolution EnDat encoder with 1048576 (= 2^{20}) pulses per motor revolution is utilized as motor encoder.

Without a reduction, even a small number of revolutions would result in a pulse frequency in the MHz range. Therefore, the output frequency is to be reduced by the factor 512 (= 2^9).

The SIWL output encoder is to output one homing mark per motor revolution.

Parametrization:

Parameter	Value	Meaning
ID32953 'Encoder type'	Nibble 0: 0xA	E resp. F encoder
ID34250 'SIWL source'	0x10	SIWL source motor encoder
ID34260 'Line counts SIWL input'	1048576	Encoder-specific
ID34253 'SIWL factor'	1	$\text{Output pulse} = \frac{\text{ID34260}}{\text{ID34254}} \times \text{ID34253}$
ID34254 'SIWL divisor'	512	
ID34251 'Line counts SIWL output'	2048	Output homing mark: 2048 output pulses x 1 motor revolutions
ID34252 'Offset position index'	0	Without offset



Example 4:

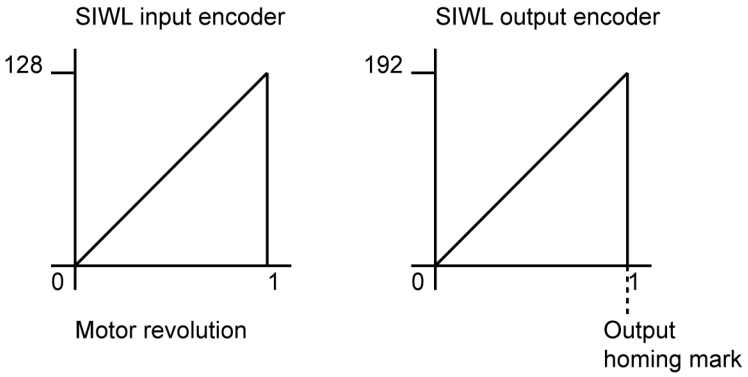
A resolver with a resolution of 128 pulses per motor revolution is utilized as motor encoder.

The SIWL output encoder is to generate 1.5 times the pulses of the motor encoder per motor revolution.

The SIWL output encoder is to output one homing mark per motor revolution.

Parametrization:

Parameter	Value	Meaning
ID32953 'Encoder type'	Nibble 0: 0x8	Resolver
ID34250 'SIWL source'	0x10	SIWL source motor encoder
ID34260 'Line counts SIWL input'	128	Encoder-specific
ID34253 'SIWL factor'	3	$\text{Output pulses} = \frac{\text{ID34260}}{\text{ID34254}} \times \text{ID34253}$
ID34254 'SIWL divisor'	2	
ID34251 'Line counts SIWL output'	192	Output homing mark 192 output pulses x 1 motor revolutions
ID34252 'Offset position index'	0	Without offset



Example 5:

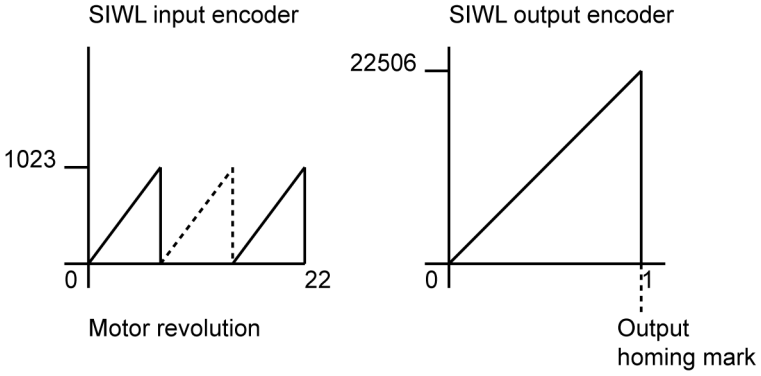
A resolver with a resolution of 128 pulses per motor revolution is utilized as motor encoder.

The SIWL output encoder is to generate 1.5 times the pulses of the motor encoder per motor revolution.

The SIWL output encoder is to output one homing mark per every 2.5 motor revolutions.

Parametrization:

Parameter	Value	Meaning
ID32953 'Encoder type'	Nibble 0: 0x8	Resolver
ID34250 'SIWL source'	0x10	SIWL source motor encoder
ID34260 'Line counts SIWL input'	128	Encoder-specific
ID34253 'SIWL factor'	3	$\text{Output pulses} = \frac{\text{ID34260}}{\text{ID34254}} \times \text{ID34253}$
ID34254 'SIWL divisor'	2	
ID34251 'Line counts SIWL output'	480	Output homing mark: 192 output pulses x 2.5 motor revolutions
ID34252 'Offset position index'	0	Without offset



Example 6:

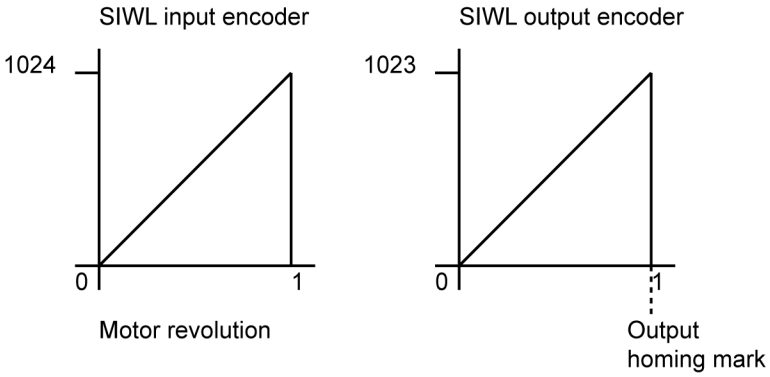
An I-encoder with a resolution of 1024 pulses per motor revolution is utilized as motor encoder.

The SIWL output encoder is to generate 1023 pulses per motor revolution.

The SIWL output encoder is to output one homing mark per motor revolution.

Parametrization:

Parameter	Value	Meaning
ID32953 'Encoder type'	Nibble 0: 0x5	I-encoder
ID34250 'SIWL source'	0x10	SIWL source motor encoder
ID34260 'Line counts SIWL input'	1024	Encoder-specific
ID34253 'SIWL factor'	1023	$\text{Output pulses} = \frac{\text{ID34260}}{\text{ID34254}} \times \text{ID34253}$
ID34254 'SIWL divisor'	1024	
ID34251 'Line counts SIWL output'	1023	Output homing mark: 1023 output pulses x 1 motor revolutions
ID34252 'Offset position index'	0	Without offset



Example 7:

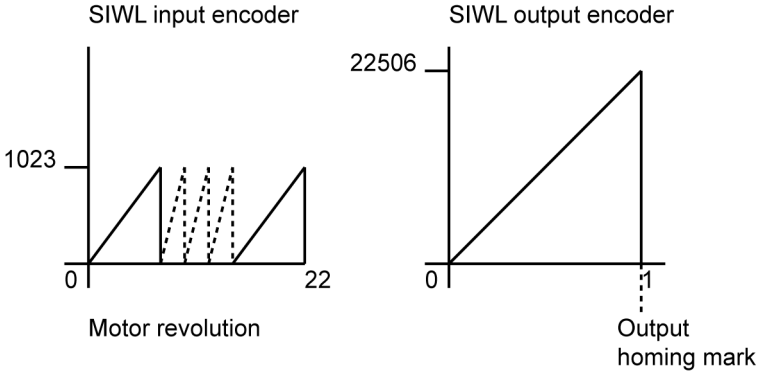
An I-encoder with a resolution of 1024 pulses per motor revolution is utilized as motor encoder.

The SIWL output encoder is to generate 1023 pulses per motor revolution.

The SIWL output encoder is to output one homing mark per every 22 motor revolutions.

Parametrization:

Parameter	Value	Meaning
ID32953 'Encoder type'	Nibble 0: 0x5	I-encoder
ID34250 'SIWL source'	0x10	SIWL source motor encoder
ID34260 'Line counts SIWL input'	1024	Encoder-specific
ID34253 'SIWL factor'	1023	$\text{Output pulses} = \frac{\text{ID34260}}{\text{ID34254}} \times \text{ID34253}$
ID34254 'SIWL divisor'	1024	
ID34251 'Line counts SIWL output'	22506	Output homing mark: 1023 output pulses x 22 motor revolutions
ID34252 'Offset position index'	0	Without offset



Example 8:

An I-encoder with a resolution of 1024 pulses per motor revolution is utilized as motor encoder.

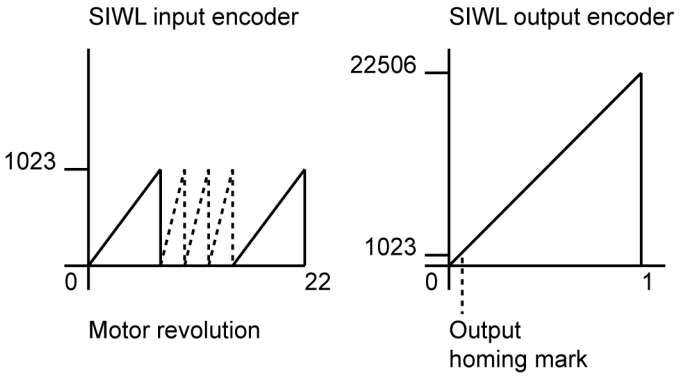
The SIWL output encoder is to generate 1023 pulses per motor revolution.

The SIWL output encoder is to output one homing mark per every 22 motor revolutions.

In addition, the homing mark is to be offset by 360° (a full revolution of the motor encoder) in the positive direction of rotation.

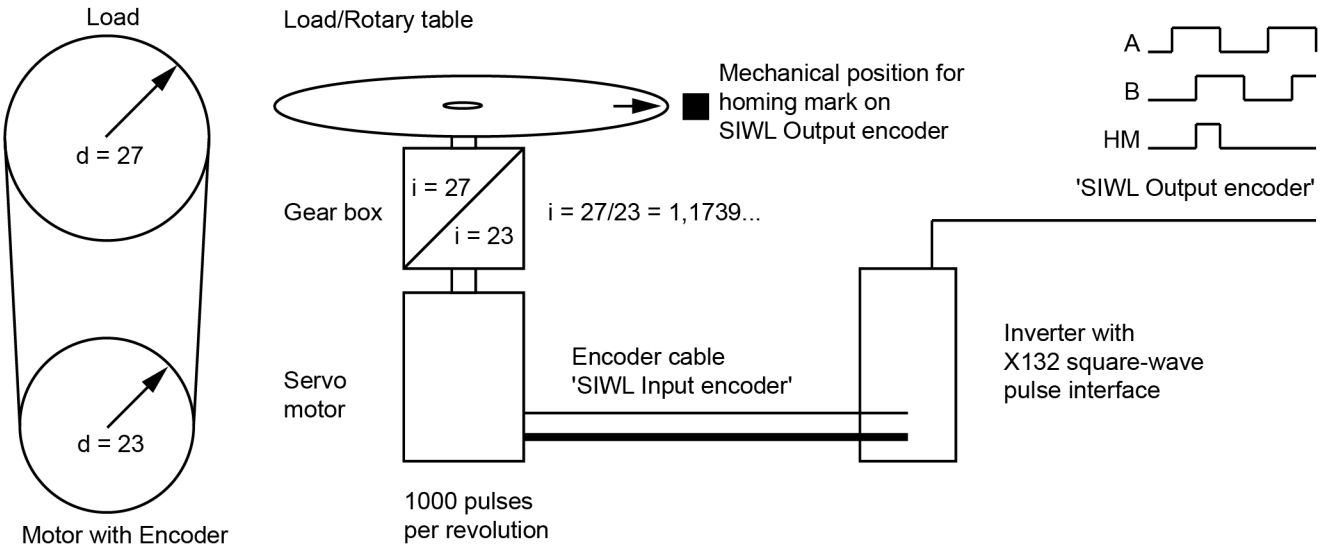
Parametrization:

Parameter	Value	Meaning
ID32953 'Encoder type'	Nibble 0: 0x5	I-encoder
ID34250 'SIWL source'	0x10	SIWL source motor encoder
ID34260 'Line counts SIWL input'	1024	Encoder-specific
ID34253 'SIWL factor'	1023	$\text{Output pulses} = \frac{\text{ID34260}}{\text{ID34254}} \times \text{ID34253}$
ID34254 'SIWL divisor'	1024	
ID34251 'Line counts SIWL output'	22506	Output homing mark: 1023 output pulses x 22 motor revolutions
ID34252 'Offset position index'	1023	Homing mark offset: 1023 output pulses x 1 motor revolutions



Example 9:

A load (e.g. a rotary table) is coupled to a motor via a gear(box) with i = 23/27. A homing mark is to be generated (e.g. for a labeling) at a specific position of the load. The motor is equipped with a motor encoder with 1000 pulses per revolution, the load does not have its own encoder. The ID34251 'Line counts SIWL output' is set to 2000 pulses in the first instance.



1st instance:

A load encoder on the load side is simulated with the following data:

Motor: 1000 pulses/revolution

→ 1000 x (27/23) pulses of the motor encoder correspond to one revolution of the load.

Parametrization:

Parameter	Value	Meaning
ID32953 'Encoder type'	Nibble 0: 0x5	I-encoder
ID34250 'SIWL source'	0x10	SIWL source motor encoder
ID34260 'Line counts SIWL input'	1000	Encoder-specific
ID34253 'SIWL factor'	27	$\text{Output pulses} = \frac{\text{ID34260}}{\text{ID34254}} \times \text{ID34253}$
ID34254 'SIWL divisor'	23	
ID34251 'Line counts SIWL output'	2000 (desired)	2000 output pulses x 1 motor revolutions (desired)
ID34252 'Offset position index'	0	Without offset

This data results in a virtual gear factor of the SIWL of 27/23 = 1.1739.... .

A gear factor of 1.739... cannot be entered directly.

For a homing mark to be able to be output at a specific position, the output encoder must have an integer number of pulses per revolution of the load. With 1000 (pulses of the output encoder per revolution) x 27 (SIWL multiplier) / 23 (SIWL divisor) does not result in an integer number of pulses. The encoder line number on the SIWL output would have to result in 1173.91304.... This cannot be realized.

With an odd gear factor, a precise position of the output encoder cannot be achieved based on a fixed position of the motor encoder. The output encoder will always jitter by ± 1 increments.

With the 'Line counts SIWL output' of 2000 pulses, no homing mark can be generated based on the load.

Solution:

The 'Line counts SIWL output' must be divisible by the ratio of the gear output.

Solution:

For the SIWL output encoder, a line number is set which is divisible by the gear output ratio (27).

SIWL output pulses: 2700 pulses per mechanical revolution

$$\text{Pulses motor encoder per load revolution} = 1000 \times \frac{27}{23}$$

It results in the equation:

$$K = \frac{\text{SIWL output pulses}}{\text{Pulses motor encoder per load revolution}}$$

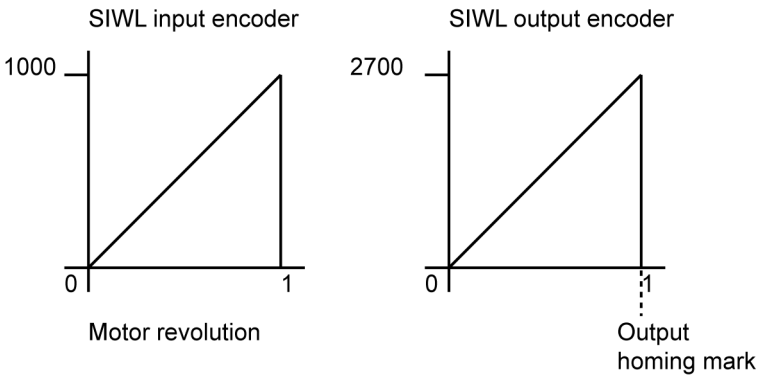
$$K = \frac{2700}{\left(1000 \times \frac{27}{23}\right)} = 2.3$$

The constant K is input as whole number with the parameters 'SIWL factor' and 'SIWL divisor'.

$$K = \frac{23}{10}$$

Parametrization:

Parameter	Value	Meaning
ID32953 'Encoder type'	Nibble 0: 0x5	I-encoder
ID34250 'SIWL source'	0x10	SIWL source motor encoder
ID34260 'Line counts SIWL input'	1000	Encoder-specific
ID34253 'SIWL factor'	23	$K = \frac{23}{10}$
ID34254 'SIWL divisor'	10	
ID34251 'Line counts SIWL output'	2700	Output homing mark per revolution/load $1000 \times \frac{23}{10} \times \frac{27}{23} = 2700$
ID34252 'Offset position index'	0	Homing mark offset: 0 ... 2699



Thus, a homing mark is always output at the same load position.

Variation:
If 3 homing marks are to be output per load revolution, a gear output ratio of 2700/3 = 900 is entered.

11 Diagnostic messages

Diagnotic number	Diagnostic text
1437	'Configuration SIWL'

Appendix

ID34250 'SIWL source' bit string

Structure ID34250 'SIWL source'

Bit number	State Bit 0 (LSB)	Meaning
0-15	0x0000	SIWL switched off, pulse generator interface is switched as input.
	0x0010	SIWL as output active, pulse source is the motor encoder according to ID32953 'Encoder type' If an encoder is selected in ID32953, that the SIWL does not support (e.g. U/f-mode, A-encoder, B- or C-encoder), then no pulses are output from the SIWL and an error message is generated.
	0x0020	SIWL active as output, the SIWL input pulses are specified externally, e.g. from a controller by the controller writing the setpoint in ID33911 'SIWL setpoint'.

ID34257 'SIWL control' bit string

Structure ID34257 'SIWL control'

Bit number	State	Meaning
0	0	No function
	1	SIWL is automatically initialized during device initialization (24 VDC ON) Subsequent system bootings, triggered by functions like 'system startup', 'error deleting' the SIWL will not re-initialized. In operation, the SIWL can be re-initialized with a 0 → 1 edge by the PLC on ID34257 bit 4. Thus, the temporarily changeable parameters of SIWL will re-initialized. For changed remanent SIWL parameters such ID34250 'SIWL source', ID34251 'Line counts SIWL output', the 'SIWL initialization' has no influence. To activate the changing you need a RF + edge or 24 VDC OFF / ON as specified at the parameter attribute. After the 0 → 1 edge, the bit 0 must be reset to the value 0.
1	0	Reserved
	1	Reserved
2	0	The SIWL output encoder changes depending on the SIWL input signal and the SIWL parameterization
	1	The SIWL output encoder is held in the current position, input and output signal are uncoupled
3	0	The homing mark on the SIWL output encoder is blocked and is not output
	1	The homing mark on the SIWL output encoder is enabled for the output
4	0	No function
	1	Set homing mark to current position: For a 0→1 edge by the PLC on ID34257 'SIWL control' Bit 4, the homing mark is set to the current position. When setting the ID34257 'SIWL control' Bit 4: 'Set homing mark to current position', the ID34252 'Offset position index' is overwritten internally. The new position value cannot be read back. A value input before this point in time (ID34252 'Offset position index') has no effect. By writing the ID34252 'Offset position index' again, the set homing mark is discarded and the input value with ID34252 'Offset position index' based on the pulse number 0 of the output encoder is output.

Bit number	State	Meaning
5	0	The SIWL output encoder is preinitialized with 0
	1	With absolute encoders: The SIWL output encoder is preinitialized with the input setpoint (absolute position) x gear ratio (ID34253/ID34254)
6	0	Very fast control performance, with overshoot (monitor with 3 poles)
	1	Very fast control performance, without overshoot (monitor with 2 poles)
7	0	SIWL deactivated
	1	SIWL activated
8	0	Prescaler 256 for SIWL input setpoints deactivated
	1	Prescaler 256 for SIWL input setpoints activated (Slippage effect for division with remainder)
9-15	0	Reserved
	1	Reserved