Position encoder on the load-side of a gearbox

Summary

This application note describes how to configure a FAULHABER Motion Controller with Motion Manager 6.2 or higher for the use case:

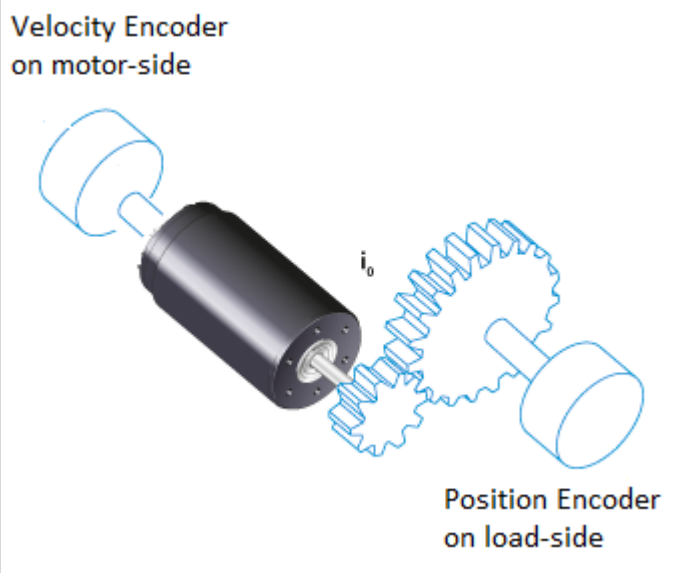
- Position encoder on load-side of a gearbox, drive belt or any other transmission element

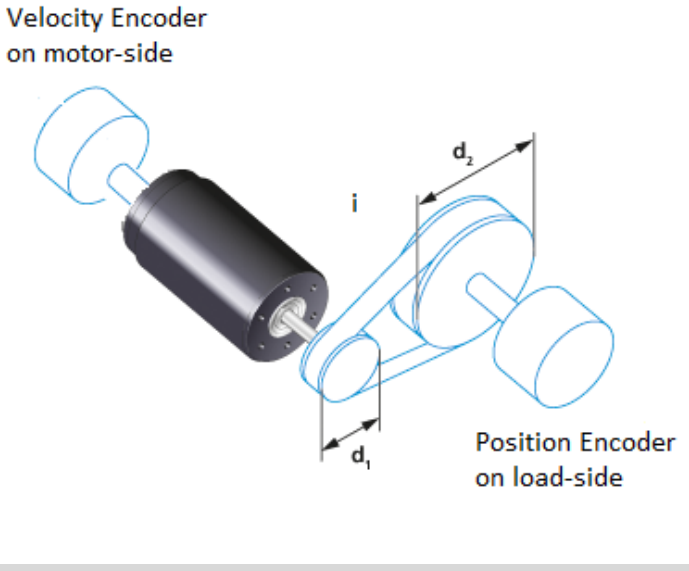
Applies To

FAULHABER Motion Controller MC5004, MC5005, MC5010 and MCS

Description

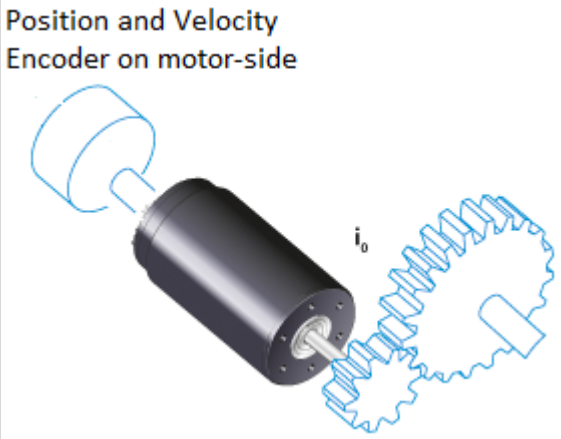
Overview	
Use Case	**Position encoder on load-side of gearbox**, drive belt or any other transmission element
- **Content**	- Sources for actual values: Velocity actual value must be based on motor-side encoder - Usage of Object 0x2319 - reduction ratio - Factor group settings
- **Applies to**	**Use Case applies to:**





- **Does not apply to:**

The use case does not apply to:



Above setup, with position and motor encoder on motor-side, is completely fine, and does not require any special configuration, so it is not described in this application note.

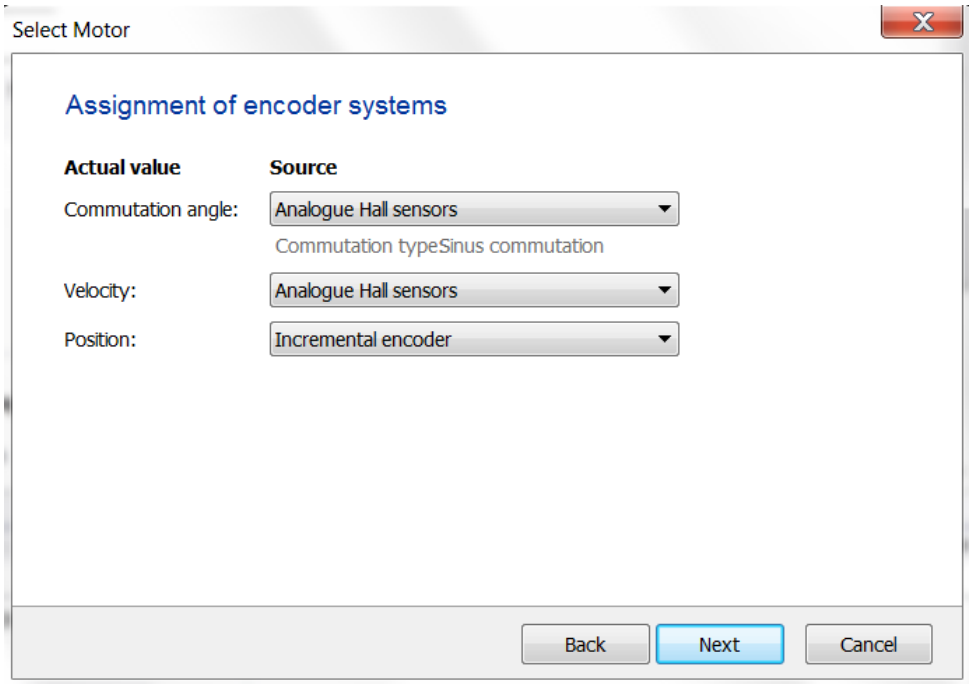
Position encoder on load-side of a gearbox, drive belt or any other transmission element

Sources for actual values

An encoder on the **load-side** of a gearbox, drive belt or any other transmission element must be used for **position control, only**. The velocity loop must be closed based on a motor-side encoder, since the coupling between load-side encoder and motor is not torsionally stiff / rigid.

Configuration example via Motor Wizard

- Incremental Encoder as source for position actual value on load-side of gearbox.
- Velocity actual value and commutation angle via analog hall sensors on motor-side.



Motor Selection Wizard

Usage of object 0x2319 reduction ratio

When the use case applies, the position controller needs to know the reduction ratio between motor- and load-side encoder to perform well, in terms of dynamic.
Object 0x2319 is used to supply the position controller with the **reduction ratio**.
Then the position controller can calculate suitable commands for the velocity loop which operates on the motor-side encoder.

⚠

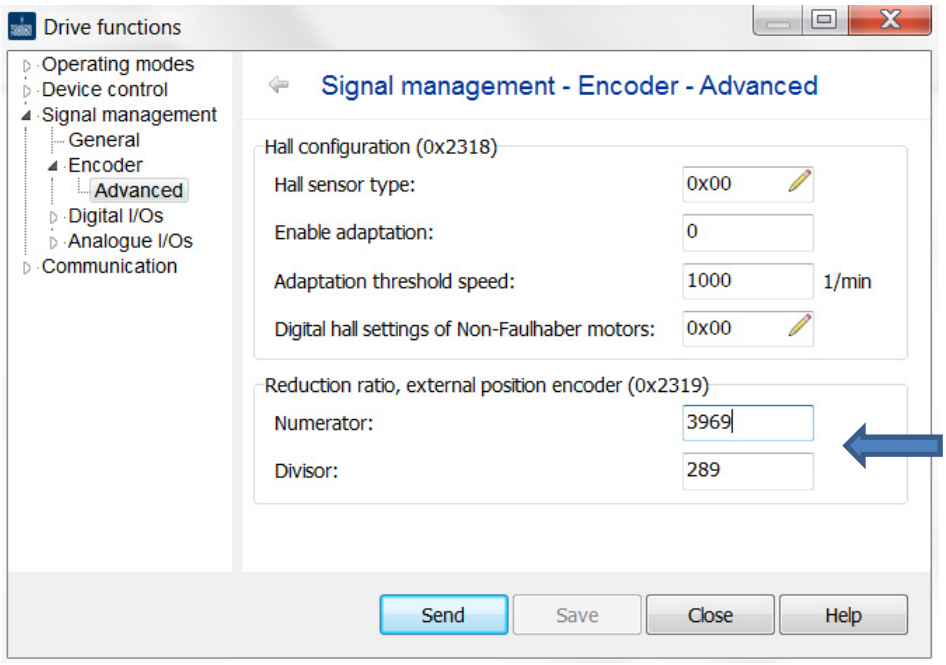
No position tuning should be performed before the reduction ratio is set correctly, since the reduction ratio affects the feedback control **parameter Kv.**

Object 0x2319	Supported ratios
Reduction ratio	up to 3000:1
Transmission ratio	up to 1:30

All **Faulhaber gearboxes** provide a reduction ratio.

Example: gearbox series 32A + position encoder on load-side

Reduction ratio (rounded) 14:1
→Reduction ratio absolute 3969 / 289
(Datasheet values are rounded, for the exact ratio see “Reduction ratio absolute”).



Drive functions / Signal management / Encoder / Advanced

Factor Group Settings

The factor group is not designed for this use case.
It assumes that the velocity encoder and position encoder are on the same side of a transmission element.
As a consequence object 0x6091 “gear ratio” must not be used here.

Thus the use case does not require any factor group modifications:

Factor Group / default units	units
Velocity	rpm (motor-side)
Position	increments (load-side)

If the velocity shall be shown in load-side rpm, the Velocity Factor can be used for the mapping:

Factor Group / modified units	units	Velocity Factor
Velocity	rpm (load-side)	6096.01 = Value of 2319.02 6096.02 = Value of 6092.01 x value of 2319.01
Position	increments (load-side)	

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