

Second position encoder

Translation of the "Original Dokumentation"

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Version:

| | |
|-------------------------|----------------------|
| Version: 2018/44 | |
| Change | Letter symbol |
| • New Document | STL |

Previous version: -/-

Product version:

| Product (AMK part no.) | Firmware Version (AMK part no.) |
|------------------------|-----------------------------------|
| KW-R06 (O835) | AE-R05/R06 V1.10 2013/15 (204486) |
| KW-R07 (O807) | |

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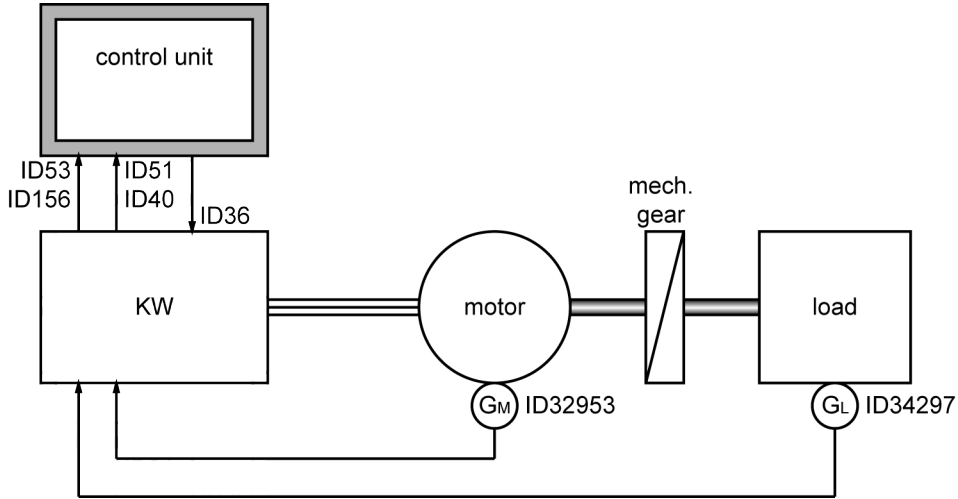
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1 Second position encoder

Supported hardware: KW-R06 / KW-R07 /

The second external position encoder provides actual position and speed values independent from the motor encoder. By means of these values, the PLC of a parent control unit can compensate the influence of a mechanical gear between motor and load.



Thus, a lift car can be positioned exactly by means of a linear scale while the motor operates under speed control in order to realise soft acceleration and deceleration characteristics.

2 Parametrization

Relevant parameters

| Parameter | Name | Meaning |
|-----------|---|---|
| | | See document 'Parameter description' (AMK part no. 203704) |
| ID36 | 2) 'Velocity command value' | Operating mode speed control: speed setpoint transmitted from the parent control unit |
| ID40 | 2,3) 'Velocity feedback value' | Operating mode speed control: actual speed value, evaluated by the parent control unit |
| ID51 | 2,3) 'Position feedback value' | Actual position value from motor encoder |
| ID53 | 2,3) 'Position feedback value 2' | Actual position value from external encoder |
| ID115 | 1) 'Position feedback type' | External encoder rotational or linear |
| ID116 | 1) 'Resolution motor encoder' | Resolution of motor encoder |
| ID117 | 1) 'Resolution external position feedback system' | Resolution of external encoder |
| ID121 | 1) 'Load gear input revolution' | Mechanical gear: motor revolution |
| ID122 | 1) 'Load gear output revolution' | Mechanical gear: load revolution |
| ID156 | 2,3) 'Velocity feedback value 2' | Actual speed value from external encoder |
| ID32800 | 1) 'AMK main operating mode' | Bit 14: actual position value source internal / external encoder See 'ID32800 ... ID32809 'AMK operating modes' bit 14' on page 5. |
| ID32953 | 1) 'Encoder type' | Definition of motor encoder type See 'ID32953 'Encoder type' bit string' on page 5. |
| ID34297 | 1) 'Encoder type 2' | Definition of external encoder type |

- 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



3 Startup instructions

Example lift control:

| Parameter | Name | Value | Meaning |
|------------------|--|------------------|---|
| Motor encoder | | | |
| ID32953 | 'Encoder type' | 0x0018 | motor encoder = Resolver non-field weakening synchronous motor position and speed encoder = motor encoder |
| ID116 | 'Resolution motor encoder' | 4 x 128 x PV | value depends on position refinement PV |
| External encoder | | | |
| ID34297 | 'Encoder type 2' | 0x2000 | external position encoder = T / V encoder |
| ID115 | 'Position feedback type' | 0x0001 | external position encoder linear |
| ID117 | 'Resolution external position feedback system' | 4 x ID32776 x PV | value depends on sine encoder period and position refinement PV |
| Operating mode | | | |
| ID32800 | 'AMK main operating mode' | 0x0043 | speed control setpoint ramps active (bit 14 is not evaluated because ID34297 'Encoder type 2', nibble3 ≠ 0) |

Appendix

ID32800 ... ID32809 'AMK operating modes' bit 14

| Bit no. | Condition | Meaning |
|---------|-----------|---|
| 14 | 0 | <p>KW-R06 / KW-R07 / Actual position value source of motor encoder ID32953 'Encoder type', ID116 'Resolution motor encoder'</p>  The actual position value source must be set in the ID32800'AMK main operating mode' and automatically applies for the operating modes. |
| | 1 | <p>KW-R06 / KW-R07 / The actual position value source of the external encoder ID32953 'Encoder type', ID117 'Resolution external position feedback system', ID115 'Position feedback type', gear ratio ID121 'Load gear input revolution', ID122 'Load gear output revolution' is taken into consideration</p>  The actual position value source must be set in the ID32800 'AMK main operating mode' and automatically applies for all operating modes. Bit 14 is not evaluated if a second. encoder is selected in ID34297 'Encoder type 2'. |

ID32953 'Encoder type' bit string

Configuration ID32953 'Encoder type'

| Bit no. | Condition | Meaning |
|---|-----------|--|
| 0-3 Motor encoder (Nibble 0) | 0x0 | KW-R06 / KW-R07 / I encoder |
| | 0x1 | KW-R06 / KW-R07 / H encoder, connected to the resolver input |
| | 0x2 | KW-R06 / KW-R07 / T, V encoder ^{1) 2)} |
| | 0x3 | Reserved |
| | 0x4 | Reserved |
| | 0x5 | KW-R06 / KW-R07 / I encoder |
| | 0x6 | Reserved |
| | 0x7 | KW-R06 / KW-R07 / S, U encoder ²⁾ |
| | 0x8 | KW-R06 / KW-R07 / Resolver |
| | 0x9 | KW-R06 / KW-R07 / Square wave pulse encoder |
| | 0xA | KW-R06 / KW-R07 / E or F encoder Linear encoder LC183 and LC483 |
| | 0xB | Reserved |
| | 0xC | KW-R06 / KW-R07 / P or Q encoder |
| | 0xD | KW-R06 / KW-R07 / Reserved |

| Bit no. | Condition | Meaning |
|--|-----------|---|
| 4-7 Motor model (Nibble 1) | 0x0 | Asynchronous motor |
| | 0x1 | Non-field weakening synchronous motor |
| | 0x2 | U/f control |
| | 0x3 | Field weakening synchronous motor |
| | 0x5 | Sensorless operation of an asynchronous motor (Nibble 0 has to be set to the value 0) |
| | 0x6 | Asynchronous motor with voltage control (control of the magnetising current) |
| 8-11 Speed encoder (Nibble 2) | 0x0 | like motor encoder |
| | 0x1 | KW-R06 / KW-R07 / H encoder, connected to the resolver input |
| | 0x2 | KW-R06 / KW-R07 / T, V encoder ^{1) 2)} |
| | 0x3 | Reserved |
| | 0x4 | Reserved |
| | 0x5 | KW-R06 / KW-R07 / I encoder |
| | 0x6 | Reserved |
| | 0x7 | KW-R06 / KW-R07 / S, U encoder ²⁾ |
| | 0x8 | KW-R06 / KW-R07 / Resolver |
| | 0x9 | KW-R06 / KW-R07 / Square wave pulse encoder |
| | 0xA | KW-R06 / KW-R07 / E or F encoder (Linear encoder LC183 and LC483) |
| | 0xB | Reserved |
| | 0xC | KW-R06 / KW-R07 / P or Q encoder |
| 12-15 Position encoder (Nibble 3) | 0x0 | like motor encoder |
| | 0x1 | KW-R06 / KW-R07 / H encoder, connected to the resolver input |
| | 0x2 | KW-R06 / KW-R07 / T, V encoder ^{1) 2)} |
| | 0x3 | Reserved |
| | 0x4 | Reserved |
| | 0x5 | KW-R06 / KW-R07 / I encoder |
| | 0x6 | Reserved |
| | 0x7 | KW-R06 / KW-R07 / S, U encoder ²⁾ |
| | 0x8 | KW-R06 / KW-R07 / Resolver |
| | 0x9 | KW-R06 / KW-R07 / Square wave pulse encoder |
| | 0xA | KW-R06 / KW-R07 / E or F encoder (Linear encoder LC183 and LC483) |
| | 0xB | Reserved |
| | 0xC | KW-R06 / KW-R07 / P or Q encoder |

1) Also applies for the linear scale "LinCoder L230" from the company Sick/Stegmann with the Hiperface interface.

- 2) When switching on the power supply, or when doing a homing cycle, the encoder must not turn because the digital position is read twice and plausibility checked. If the difference between both read positions is out of the internal defined range, the diagnosis message 2310 'Encoder communication' info 1 = 7 is issued.

Encoder evaluation

E-, F-encoder:

The encoder evaluation (type E / F) is a combination of analogue and digital evaluation. The absolute value is generated in the encoder after mains on and send to the inverter via EnDat 2.1 protocol. The absolute value is evaluated in the inverter only once, during operation only the SIN/COS tracks are evaluated for the motor control. The multiturn encoder (type F) not need a homing. For singleturn encoder (type E) a homing cycle must be executed to built a relation between the machine position and the encoder signal. The necessary homing mark is built in the drive controller.

H-encoder:

The Hall encoder generates directly a SIN/COS signal with 1 period/revolution. Out of them the drive controller calculates the position angle of the rotor.

Per revolution the drive controller generates one homing mark to evaluate during the function homing cycle.

I-encoder:

The encoder evaluation (type I) is an analogue evaluation of the SIN/COS tracks and a homing signal.

The rotary rotor field of the permanent magnets of a synchronous motor is not aligned to the rotary stator rotary field. At synchronous motors with I-type encoder the alignment is done automatically with the function software commutation after the first switch on of the controller enable (RF) after mains on



The function software commutation automatically writes values in ID34174. As the function changes parameter values, the device will automatically startup the device at the next RF change. A device startup causes the temporarily changed parameter to be reset to its initial value. Temporary parameters must therefore be written cyclically or only after the software commutation function, followed by another RF change, on the application side.

P-, Q-encoder:

The encoder evaluation (type P / Q) is a complete digital evaluation. The absolute position is send via EnDat 2.1 commands cyclic synchronous from the encoder, triggered by the trigger signal (CLOCK) of the drive controller.

Any available SIN/COS signals are not evaluated!

R-encoder:

The evaluation electronic for the encoder signals scans the high frequency output signals of the encoder by an A/D converter at this time, where the exciter signal has his maximum. The scan cycle is known, because the evaluation electronic is generating also the exciter signal. The evaluation electronic scans the peak values of the encoder signal, in this way the exciter signal is eliminated. A SIN/COS signal with 1 period/revolution remains. Out of them the drive controller calculates the angle position of the rotor. To become a position relation between the machine and the encoder signals a homing cycle function must be executed. The necessary homing mark of the encoder (1/revolution) is built in the drive controller.

S-, T-, U-, V-encoder:

The encoder evaluation (type S / T / U / V) is a combination of analogue and digital evaluation. The absolute value is generated in the encoder after mains on and send to the inverter via Hiperface protocol. The absolute value is evaluated in the inverter only once, during operation only the SIN/COS tracks are evaluated for the motor control. The multiturn encoder (type T / V) not need a homing. For singleturn encoder (type S / U) a homing cycle must be executed to built a relation between the machine position and the encoder signal. The necessary homing mark of the encoder is built in the drive controller.