Motor model 'asynchronous motor with voltage control'

Translation of the "Original Dokumentation"
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Name: FKT_Async_Maschine_Spannungsregelung_en

Version:

Version: 2019/45	
Change	**Letter symbol**
• Controller card KW-R27 added	STL

Previous version: 2018/44

Product version:

Product (AMK part no.)	Firmware Version (AMK part no.)
KW-R06 (O835) KW-R07 (O807) KW-R16 (O872) KW-R17 (O873)	AE-R05/R06 V1.13 2015/21 (205700)
KW-R24-R /	AE-R24-R V2.11 2016/46 (206643)
KW-R25 /	AE-R25 V2.02 2014/23 (205217)
KW-R26 /	AE-R26 V2.02 2014/23 (205215)
KW-R27 /	AE-R26 V2.12 2018/40 (207284)
iX / iC / iDT5	iX V1.00 2011/21 (203699)
iX(-R3) / iC(-R3) / iDT5(-R3) /	iX V2.08 2015/46 (206017)
ihXT /	ihX V1.00 2015/06 (205440)

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1 Motor model 'asynchronous motor with voltage control'

Supported hardware:	KW-R06 / KW-R16 / KW-R07 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /

On asynchronous motors, the magnetizing current is mostly given by a characteristic curve.
If this characteristic curve was not determined correctly or the motor warms during operation, so that the voltage limits will vary, unintended effects of limitation occur at the voltage limit.

In order to keep the voltage underneath the limit at any time, independent on the sate of the motor, the motor model 'asynchronous motor with voltage control' is implemented.

2 Relevant parameters

Parameter	Name	Meaning See document 'Parameter description' (AMK part no. 203704)
ID32769 [1]	'Magnetising current'	Motor depending magnetising current, see motor data sheet / electronic nameplate
ID32953 [1]	'Encoder type'	ID32953 = 0x xx 6x See 'ID32953 'Encoder type' bit string' on page 5.
ID34148 [1]	'Voltage control proportional gain KP'	See motor data sheet / electronic nameplate
ID34149 [1]	'Voltage control integrating time TN'	See motor data sheet / electronic nameplate
ID34266 [1]	'Voltage reserve'	Begin of field-weakening

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

3 Startup instructions

Within ID32953 'Encoder type', the motor model 'asynchronous motor with voltage control' can be selected and parametrized by ID34148 'Voltage control proportional gain KP' and ID34149 'Voltage control integrating time TN'.

The maximum magnetizing current below the voltage limit is set in ID32769 'Magnetising current' (ID32770 'Magnetising current 1' is without effect).

The threshold when the control starts is the reserve range of the voltage controller. It is set by ID34266 'Voltage reserve'.
A voltage reserve of 30 V may be beneficial. Depending on the application, it can be reduced or raised up to 100.0 V.

Appendix

ID32953 'Encoder type' bit string

Configuration ID32953 'Encoder type'

Bit no.	Condition	Meaning
0-3 **Motor encoder** (Nibble 0)	0x0	**KW-R06 / KW-R07 / KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R25 / KW-R26 / KW-R27 /** I encoder **KW-R24-R /** Reserved
	0x1	**KW-R06 / KW-R07 /** H encoder, connected to the resolver input **iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT /** H encoder, connected to the sine encoder input **KW-R16 / KW-R17 / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0x2	**KW-R06 / KW-R07 / KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R25 / KW-R26 / KW-R27 /** T, V encoder [1) 2)] **KW-R24-R /** Reserved
	0x3	Reserved
	0x4	Reserved
	0x5	**KW-R06 / KW-R07 / KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R25 / KW-R26 / KW-R27 /** I encoder **KW-R24-R /** Reserved
	0x6	Reserved
	0x7	**KW-R06 / KW-R07 / KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R25 / KW-R26 / KW-R27 /** S, U encoder [2)] **KW-R24-R /** Reserved
	0x8	**KW-R06 / KW-R07 / KW-R24-R /** Resolver **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0x9	**KW-R06 / KW-R07 /** Square wave pulse encoder **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved

Bit no.	Condition	Meaning
	0xA	**KW-R06 / KW-R07 / KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R25 / KW-R26 / KW-R27 /** E or F encoder Linear encoder LC183 and LC483 **KW-R24-R /** Reserved
	0xB	Reserved
	0xC	**KW-R06 / KW-R07 / KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R25 / KW-R26 / KW-R27 /** P or Q encoder **KW-R24-R /** Reserved
	0xD	**KW-R26 / KW-R27 /** Y encoder **KW-R06 / KW-R07 / KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 /** Reserved
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 **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0x2	**KW-R06 / KW-R07 /** T, V encoder [1) 2)] **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0x3	Reserved
	0x4	Reserved
	0x5	**KW-R06 / KW-R07 /** I encoder **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0x6	Reserved
	0x7	**KW-R06 / KW-R07 /** S, U encoder [2)] **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved

Bit no.	Condition	Meaning
	0x8	**KW-R06 / KW-R07 /** Resolver **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0x9	**KW-R06 / KW-R07 /** Square wave pulse encoder **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0xA	**KW-R06 / KW-R07 /** E or F encoder (Linear encoder LC183 and LC483) **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0xB	Reserved
	0xC	**KW-R06 / KW-R07 /** P or Q encoder **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
12-15 **Position encoder** (Nibble 3)	0x0	like motor encoder
	0x1	**KW-R06 / KW-R07 /** H encoder, connected to the resolver input **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0x2	**KW-R06 / KW-R07 /** T, V encoder [1) 2)] **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0x3	Reserved
	0x4	Reserved
	0x5	**KW-R06 / KW-R07 /** I encoder **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0x6	Reserved
	0x7	**KW-R06 / KW-R07 /** S, U encoder [2)] **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved

Bit no.	Condition	Meaning
	0x8	**KW-R06 / KW-R07 /** Resolver **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0x9	**KW-R06 / KW-R07 /** Square wave pulse encoder **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0xA	**KW-R06 / KW-R07 /** E or F encoder (Linear encoder LC183 and LC483) **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved
	0xB	Reserved
	0xC	**KW-R06 / KW-R07 /** P or Q encoder **KW-R16 / KW-R17 / iX / iC / iDT5 / iX(-R3) / iC(-R3) / iDT5(-R3) / ihXT / KW-R24-R / KW-R25 / KW-R26 / KW-R27 /** Reserved

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.

In addition to the absolute value, the E and F encoders deliver the analog signals at the correct time and position to the absolute value.

During the absolute value evaluation in the inverter, in addition to the absolute value, the analog signals are evaluated in the correct time and position, thereby improving the accuracy of the absolute value.

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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.

Y-encoder:

The Hiperface DSL protocol transmits digital data between an encoder and the drive controller by modulating the data into the supply line of the encoder. The absolute positions are send serial and cyclic synchronous from the encoder triggered by the trigger signal of the drive controller.