Modulo mode

Translation of the "Original Dokumentation"
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Name: FKT_Modulo-Betrieb_en

Version:

Version: 2018/xx	
Change	**Letter symbol**
Chapter 'Reconstruction of the modulo position' added	STL

Previous version: 2017/14

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 V1.05 2010/32 (203194)
KW-R24-R (O954)	AE-R24-R V2.11 2016/46 (206643)
KW-R25 (O902)	AE-R25 V2.12 2018/23 (206993)
KW-R26 (O903)	AE-R26 V2.12 2018/23 (206647)
KW-R27 (O957)	AE-R26 V2.12 2018/40 (207284)
iX / iC / iDT5	iX V1.00 2011/21 (203699)
iX(-R3) / iC(-R3) / iDT5(-R3) /	iX V2.13 2019/24 (207408)
ihX	ihX V2.13 2019/24 (207416)

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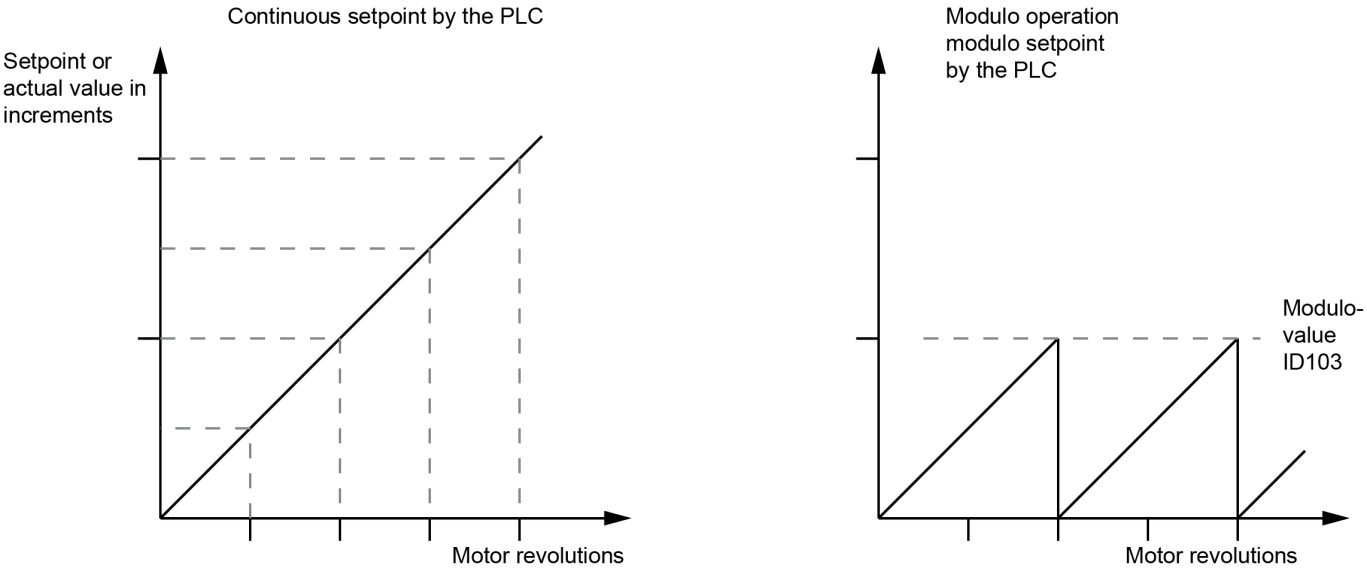
1 Modulo mode

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

The modulo mode subdivides the continuous position run in periodic, configurable sections. Without modulo mode, the position setpoint or position actual value in operation continually increases up to the overflow. In both cases, the motor turns continually in the specified direction.



ID103 'Modulo value'

The modulo value defines the end value of position data in modulo format. Values that are processed by modulo are between zero and the modulo end value. If the modulo end value is reached, the position data runs over and start at '0'. A linear relationship results in a serrated-form position data curve.

The modulo jump is filtered out in modulo mode. Thus, a continuous run of the motor without jump in position is possible.

Application:

In machines with continuously turning motors, one turn of the motor does not usually correspond to on revolution of a machine.

In order to determine at which position the machine is located within the machine revolution, a modulo value is specified as on machine revolution. The position within one machine revolution can subsequently be evaluated using the current modulo value.

The PLC setpoint values must be specified in modulo when using the modulo function. The position actual values are output in modulo format.

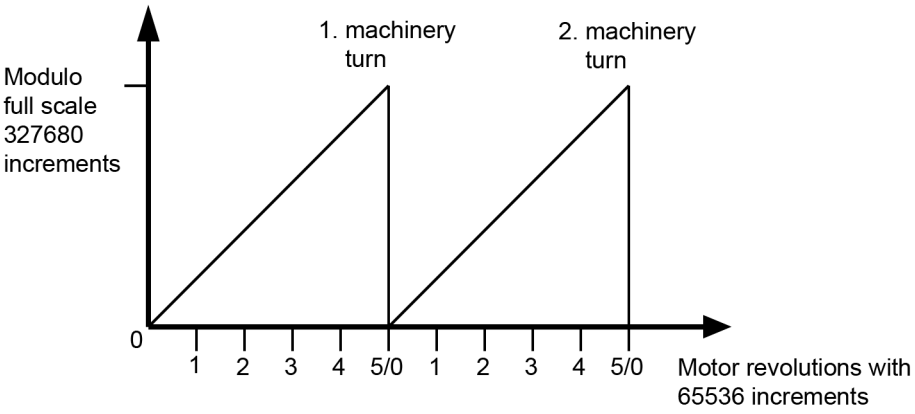
Example

Five motor revolutions are required for one machine revolution. The setpoint in increment per motor revolution is 65536 (ID116 'Resolution motor encoder').

Modulo value calculation:

$$Motorrevolution \times ID116'Motorencoderresolution' = ID103'Modulovalue'$$

$$5 * 65536 = 327680$$

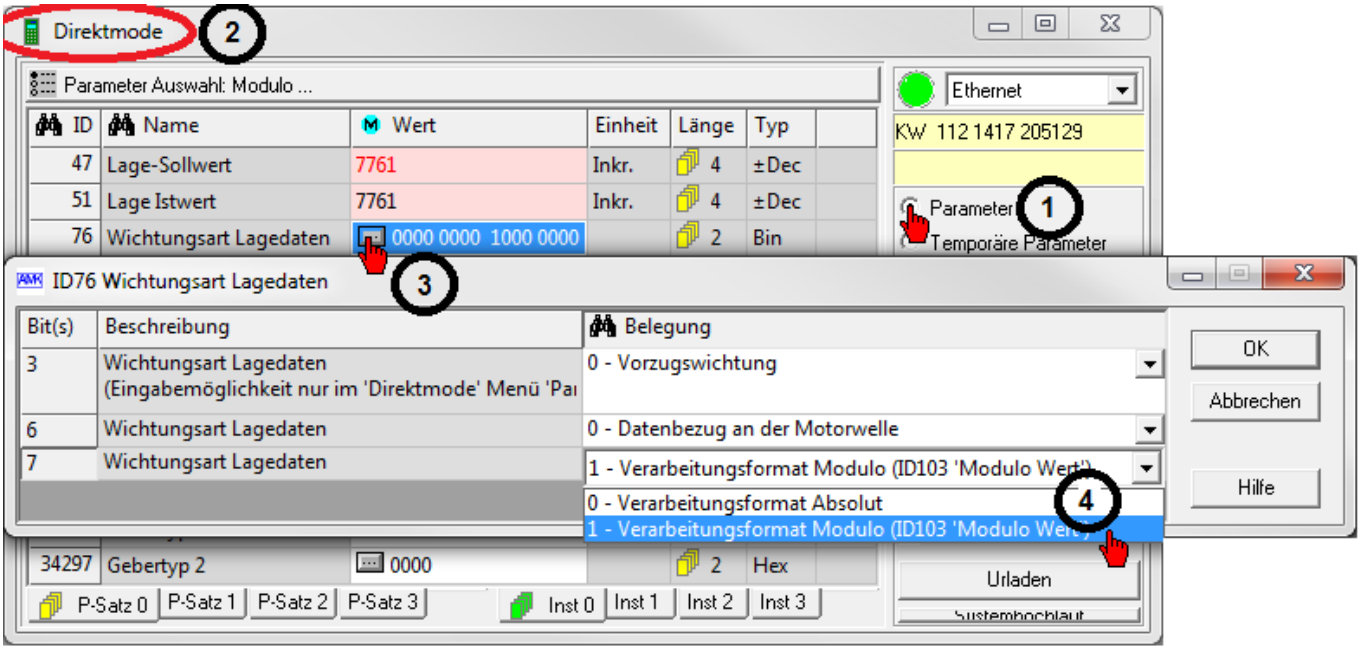


Example parametrization

Parameter ID	Value	Meaning
ID76 'Position scaling data'	Bit 7 = 1	Processing format modulo (ID103 'Modulo value')
ID103 'Modulo value'	327680 increments	Setpoint specification for 5 motor revolutions
ID32800 'AMK main operating mode'	Bit 0-3 = 0x4 Bit 13 = 1 Bit16-23 = 0x41	Position control Modulo value is created according to ID103 Cyclical specification of setpoint via ID47
ID47 'Position command value'	0 to 327679	Modulo setpoint specification via PLC 0 to (ID103 'Modulo value' - 1)
ID51 'Position feedback value'	(read only)	Modulo actual value display 0 to (ID103 'Modulo value' - 1)

2 Startup instructions

The ID76 'Position scaling data' must be modified with the AIPEX PRO 'Direct mode', menu 'Parameter'.



The modified value can subsequently be adopted into the AIPEX PRO project via the menu 'Online' → 'Adopt parameter into the project'.

2.1 Calibrating the actual value position system

The actual value position system must be calibrated so that in modulo mode a defined reference between external mechanics and the internal position actual value system can be created.

With multi-turn absolute encoders (e.g. AMK encoder type F, T, V), the current position is read out of the motor encoder, calculated with configurable offsets and transmitted into the actual value position system of the controller.

With other encoder types, the calibration occurs on the user side by means of a homing cycle.

The function is permissible for F, T or V encoders (modulo mode with Q and Y encoders are not permitted).

2.2 Setpoint position values and actual position values

Overview:

Modulo parameters	Description	Example
Modulo end value ID103 'Modulo value'	Value specification in steps	65536
Modulo setpoint via PLC ID47 'Position command value'	0 to ID103 'Modulo value' - 1 (increments)	0 to 65535
Modulo actual value display ID51 'Position feedback value'		

Modulo setpoints

In modulo mode, modulo setpoints must be specified by the PLC.

Modulo setpoint specification in increments = ID103 'Modulo value' - 1

The following conditions apply for the modulo setpoint:

- The modulo setpoint may never be negative
- The modulo setpoint may never be greater than the modulo end value – 1 increment
- The modulo setpoint exhibits modulo jumps

Setpoint specification: ID47 'Position command value'

PLC modulo setpoint:
For an AMK controller, the AFL function fdiModulo_Modulo can be used.
See AFL - AMK function libraries

Actual position value
In modulo mode, the actual position values (modulo actual values) are displayed in modulo format.
The same properties apply to the modulo actual values as for the modulo setpoint:

- The modulo setpoint never becomes negative
- The modulo setpoint never becomes greater than: Modulo end value – 1 increment
- The modulo actual value exhibits modulo jumps

Actual value display: ID51 'Position feedback value'

2.3 Relevant parameters

Parameter	Meaning / information
ID47 'Position command value'	Modulo setpoint from the PLC
ID51 'Position feedback value'	Modulo actual value display
ID76 'Position scaling data'	Modulo mode activation
ID103 'Modulo value'	Modulo end value specification
ID3280x 'AMK operating modes'	Modulo source selection

3 Reconstruction of the modulo position