

AMKmotion Software description AMK Packaging Library

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MEMBER OF THE ARBURG FAMILY

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1 About this documentation

1.1 Structure of this document

Торіс	Chapter	Chapter number
Validity, use and the propose of the documentation	Imprint	-
	About this documentation	1
Description	AMK Packaging Library	2
Standard blocks	Standard blocks	3
With AP Standard Blocks the functionality of the AMK devices can be integrated into a PLC project.		
Technology blocks	Technology blocks	4
AMK support with AP Application blocks complex functions.		
Abbreviations and explanation of terms	Glossary	-

1.2 Keeping this document

This document must permanently be available and readable at the place where the product is in use. If the product is used at another place or changed the owner, the document must be passed on.

1.3 Target group

Any person that is qualified and intends to work with this product must read, understand and follow this document:

• PLC programming

1.4 Purpose

This document is addressed to any person who handles the product. It gives information about the following topics:

• PLC programming

1.5 Display conventions

Display	Meaning
0	This symbol points to parts of the text to which particular attention should be paid!
0x	0x followed by a hexadecimal number, e. g. 0x500A
'Names'	Names are represented with apostrophes e. g. parameters, variables, etc.
See 'chapter name' on page x	Executable cross-reference in electronic output media
Blue text	Executable link in electronic output media

1.6 Appendant documents

Software description

AMK part-no. Title		
204979	Software description AIPEX PRO V3	
205795	AFL - AMK function libraries	
207236	AmkExMotionBase library	

2 AMK Packaging Library

The packaging library is divided into 2 main components.

- Standard blocks With AP standard blocks, the standard functionality of the AMK devices is integrated into a PLC project. The programming effort by using the AP standard blocks is significantly reduced. The AP standard blocks allow the use of standard functions of the packaging machines such as positioning, cam disc or cam shaft control.
- Technology blocks AP technology blocks are used to integrate the technology functions of the packaging machines into a PLC project. The programming effort by using the AP technology blocks is significantly reduced. The AP technology blocks allow the use of technology functions of the packaging machines such as rewinder-/unwinder with dancer control, register controller, preferred controller or temperature controller.

3 Standard blocks

Block	Function
AP_CamSwitch	Camshaft control
AP_CamSwitchTime	Camshaft control with pulse cam
AP_SynchronMotion	Linear coupling with variable transmission ratio
AP_CamMotion	Cam disc, continuous table-based function interpolator
AP_Home	Drive-controlled homing
AP_PositioningAbsolute	Absolute positioning with acceleration and jerk
AP_PositioningRelative	Relative positioning with acceleration and jerk
AP_VirtualAxisBasic	Virtual axis / Conductance generator with acceleration
AP_VirtualAxis	Virtual axis / Conductance generator with acceleration and jerk
AP_Modulo	Modulo counter
AP_InPositionWindow	Display 'In Position'

3.1 AP_CamSwitch (FB)

The 'AP_CamSwitch' function block is a cam switch with a cam activation and a deactivation point. The cam switch controls a digital output variable (Output) as a function of the 'MasterPosition' input variable. The switching points are defined based on the setting of the cam on / off position ('PositionOn' / 'PositionOff'). The switching points can be changed "online", i. e. while the function block is activated ('Execute' = TRUE). Each block instance constitutes a cam track.

User interface

			AP_CamSwitch		
_	Enable	BOOL		BOOL	Acknowledge
	Execute	BOOL		BOOL	Busy
_	MasterPosition	DINT		BOOL	Done
	ModuloPosition	ULINT		BOOL	Error
_	Position On	DINT		DINT	ErrorNumber
	Position Off	DINT		BOOL	Output
	CvcleTimeTask	DINT			
	-,				

Name	Туре	Description		
Enable	BOOL	 Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed. 		
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.		
MasterPosition	DINT	Input value master p	osition	
		Unit incr		
ModuloPosition	ULINT (limited to UDINT)	IT Modulo value ted to this is the value at which cam evaluation restarts at "0"		
	,			
		Unit incr		

Name	Туре	Description	
PositionOn	DINT	Cam activation point Value at and above v Unit	which the output variable 'Output' = TRUE is set
PositionOff	DINT	Cam deactivation point Value at and above which the output variable 'Output' = FALSE is set	
CycleTimeTask	DINT	Cycle time of the call	ing PLC task μs

Output variables

Name	Туре	Description			
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled			
Busy	BOOL	Execution message	: This bit remains set	as long as the block is being processed	
Done	BOOL	Response that the fu	unction block has bee	en completely executed.	
Error	BOOL	The function block is	s in an error state		
		FALSE	No error (permitted	commanding or warning)	
		TRUE	Error		
ErrorNumber	DINT	Diagnostic number is output			
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 1000		Error messages of the subordinate AMK function blocks	
		ErrorNumber = 100	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 100	00	Error messages of the calling PLC- Task	
		Value	Meaning		
		1	Modulo value limite	ed to maximum	
		2	Filter time constant	set to 1	
		3 Filter time constant limited to maximum		limited to maximum	
		4 Dead-time constant set to 0		t set to 0	
		5 Dead-time constant set to 1			
		6 Dead-time constant limited to maximum			
Output	BOOL	Cam output signal			

Description

The camshaft control has the following properties:

- Incremental mode
- 1 cam

Mode

• Set incremental input value

The 'MasterPosition' input variable is processed as a 32-bit signed fixed-point number (32-bit integer value). In response to every call, the block generates the input value differences from two consecutive items of input information and adds these up to a positive 32-bit value. The internal counter works modulo; in other words, it counts up to a configurable final value 'ModuloPosition' and then starts again at zero.

3.2 AP_CamSwitchTime (FB)

The 'AP_CamSwitchTime' function block is a cam switch with a cam activation point and time dependent cam deactivation point. It controls a digital output variable (Output) as a function of the 'MasterPosition' input variable.

The switching points are defined based on the setting of the cam activation position and the time depended cam deactivation point ('PositionOn' / 'TimeOutputOff').

The switching points can be changed "online", i.e. while the function block is activated ('Execute' = TRUE). Each block instance constitutes a cam track.

User interface

		AP_CamSwitchTime		
 Enable	BOOL	1	BOOL	Acknowledge
 Execute	BOOL	L. L	BOOL	Busy
 MasterPosition	DINT	1	BOOL	Done
 ModuloPosition	ULINT	1	BOOL	Error
 PositionOn	DINT		DINT	ErrorNumber
 TimeOutputOff	ULINT	1	BOOL	Output
 CvcleTimeTask	DINT			
,				

Input variables

Name	Туре	Description			
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.			
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.			
MasterPosition	DINT	Input value master p	osition		
		Unit	incr		
ModuloPosition	ULINT (limited to UDINT)	Modulo value this is the value at which cam evaluation restarts at "0" Range 0 +2 ³² -1 Default 20000 Unit incr			
PositionOn	DINT	Cam activation point Value at and above which the output variable 'Output' = TRUE is set			
		Incr			
TimeOutputOff	ULINT	Cam deactivation point Time at and above which the output variable 'Output' = FALSE is set Unit			
CycleTimeTask	DINT	Cycle time of the cal	ling PLC task		
		Unit	μs		

Name	Туре	Description	
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled	
Busy	BOOL	Execution message: This bit remains set as long as the block is being processed	

Name	Туре	Description			
Done	BOOL	Response that the function block has been completely executed.			
Error	BOOL	The function block is in an error state			
		FALSE	No error (permitted	commanding or warning)	
		TRUE	Error		
ErrorNumber	DINT	Diagnostic number is output			
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 1000 ErrorNumber = 1000		Error messages of the subordinate AMK function blocks	
				Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 100	0	Error messages of the calling PLC- Task	
		Value	Meaning		
		1	Modulo value limite	ed to maximum	
		2	Filter time constant	nt set to 1	
		3	Filter time constant	limited to maximum	
		4Dead-time constant5Dead-time constant6Dead-time constant		tant set to 0	
				t set to 1	
				t limited to maximum	
Output	BOOL	Cam output signal			

Description

The camshaft control has the following properties:

- Incremental mode
- 1 cam

Mode

• Set incremental input value

The 'MasterPosition' input variable is processed as a 32-bit signed fixed-point number (32-bit integer value). In response to every call, the block generates the input value differences from two consecutive items of input information and adds these up to a positive 32-bit value. The internal counter works modulo; in other words, it counts up to a configurable final value 'ModuloPosition' and then starts again at zero.

3.3 AP_SynchronMotion (FB)

The 'AP_SynchronMotion' function block calculate a multiplication and division to specific increments; the ratio of input increments to output increments is variable defined.

Abbildung 1: AP_SynchronMotion: Principle



k

Sampling point (in time)

MasterPosition(k-1) := MasterPosition(k) for k = 0

(positive edge of 'Enable')

User interface

			AP_SynchronMotion
_	Enable Execute	BOOL BOOL	BOOL Acknowledge
_	MasterPosition	DINT	BOOL Done
_	Multiplier	DINT	BOOL Error
_	Divisor	ULINT	DINT ErrorNumber
			DINT Position Out

Input variables

Name	Туре	Description		
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.		
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.		
MasterPosition	DINT	Input value master position		
		Unit		
Multiplier	DINT	Multiplier by which the input value differences are multiplied Default 10000		
Divisor	ULINT limited to UDINT	Divisor by which the input value differences are divided Default 10000		

Name	Туре	Description		
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled		
Busy	BOOL	Execution message: This bit remains set as long as the block is being processed		
Done	BOOL	Response that the function block has been completely executed.		
Error	BOOL	The function block is in an error state		
		FALSE No error (permitted commanding or warning)		
		TRUE	Error	

Name	Туре	Description			
ErrorNumber	DINT	Diagnostic number i	s output		
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 100	00	Error messages of the subordinate AMK function blocks	
	ErrorNumb		00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 1000		Error messages of the calling PLC- Task	
		Warning:			
		Value	Meaning		
		2	Divisor = 0; set to 1		
		4 Output difference of the difference is lim		annot be displayed as DINT; hited to the maximum DINT value	
PositionOut	DINT	Output value Sum of incoming increments at the input 'MasterPosition', weighted with the ratio of the inputs 'Multiplier'/'Divisor'			

3.4 AP_CamMotion (FB)

The 'AP_CamMotion' function block provides a table-based function interpolator with XYVA interpolation points.

For some applications, a more complex, mathematically not describable by a formula coupling of master and slave is necessary. This dependency can be described by the XYVA table.

The function interpolator assigns an output value 'PositionOut' to an input value 'MasterPosition' based on table 'Table'.

• In the context of the XYVA format, the assignment y = f(x) is described section by section with 5th order polynomials.

Input value can be any internal or external value, e. g. the current position of a master or a defined incremental number for each sampling time. The output value corresponds to the position setpoint of a slave drive, for example. The inputs 'MasterPositionRelative', 'MasterPosition', 'MasterOffset', 'ModuloPosition', 'LastElementNumber' and 'Table' must be assigned values before the rising edge of Execute.

User interface

		AP_CamMotion	
Enable Execute MasterPositionRelative MasterPosition MasterOffset ModuloPosition LastElementNumber Table	BOOL BOOL DINT DINT DINT DINT CamTable	BOOL BOOL BOOL DINT BOOL DINT	Acknowledge Busy Done Error ErrorNumber AcknowledgeEndOfCamTable PositionOut

Name	Туре	Description
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.

Name	Туре	Description		
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.		
MasterPositionRelative	BOOL	FALSE Absolute relation to 'MasterPosition' TRUE Relativee relation to 'MasterPosition'		
MasterPosition	DINT	X-Input value Unit incr		
MasterOffset	DINT	Offset Correction of the master position Unit Incr.		
ModuloPosition	DINT	Modulo value this is the value at which 'MasterPosition' restarts at "0" Unit incr		
LastElementNumber	DINT	Last used 'camTable' table element		
Table	STRUCT	Reference to configuration structure 'CamTable'		

Name	Туре	Description		
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled		
Busy	BOOL	Execution message: This bit remains set as long as the block is being processed		
Done	BOOL	Response that the function block has been completely executed.		
Error	BOOL	The function block is in an error state		
		FALSE No error (permitted commanding or warning)		
		TRUE	Error	

AMKmotion

Name	Туре	Description			
ErrorNumber	DINT	Diagnostic number	is output		
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 10	00	Error messages of the subordinate AMK function blocks	
		ErrorNumber = 10	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 10	00	Error messages of the calling PLC- Task	
		Warning:			
		Value	Meaning		
		1	Offset too high		
		2	Input angle too hig	h	
		3	Output angle too h	igh	
		Error:			
		Value	Meaning		
		1	Illegal operation m	ode	
		2	Phasing in table re	required	
		3	Operating table red	quired	
		4	Phasing out table r	le required	
		5	Illegal element nur	nber in phasing in table	
		6	Illegal element nur	umber in operating table	
		7	Illegal element nur	umber in phasing out table	
		8	Illegal number of m	number of master increments in phasing in table	
		9	Illegal number of m	number of master increments in operating table	
		10	Illegal number of master increments in phasing out table		
		11	Illegal number of o	perating tables	
		12	Illegal x-value sequ	gal x-value sequence in phasing in table	
		13	Illegal x-value sequence in operating table		
		14	Illegal x-value sequ	uence in phasing out table	
		15	Illegal phasing in ta	able type	
		16	Illegal operating ta	ble type	
		17	Illegal phasing out	table type	
		18	Illegal starting valu	e for phasing in table (≠ 0)	
		19	Illegal starting valu	e for operating table (≠ 0)	
		20	Illegal starting valu	e for phasing out table $(\neq 0)$	
AcknowledgeEndOfCamTable	BOOL	Acknowledge Pulse at end of table; TRUE during 2 cycles of the calling PLC task			
PositionOut	DINT	Y-Output value			
		Unit	incr		

3.4.1 Structures camTable

3.4.1.1 camTable (ST)

The 'camTable' structure with max. 51 interpolation points (Element 0..Element 50) contains the type definitions specific to 3S which are needed by the CODESYS cam disk editor in order to write polynomial tables.

Moreover, the XYVA table supported by 'AP_CamMotion' is based on an 'ARRAY[0.. PROF_MAX_XYVATAB_ELEM] OF CamTableBase'.

Structure elements

Name	Туре	Description		
X	LREAL	x position, master		
		Unit	incr	
Y	LREAL	y position, slave		
		Unit incr		
V	LREAL	Calculated velocity at runtime		
А	LREAL	Calculated accelerat	ion at runtime	

3.5 AP_Home (FB)

Drive homing cycle. The process for the homing is established by the drive parameter ID147 'Homing parameter' and if necessary ID32926 'AMK homing cycle parameter'. The drive to be homed is defined by the fieldbus address 'Address'.

User interface

		AP_Home	
 Enable	BOOL	BOOL Acknowledge	
 Execute	BOOL	BOOL Busy -	
 Address	DINT	BOOL Done -	_
		BOOL Error	
		DINT ErrorNumber -	

Input variables

Name	Туре	Description
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.
Address	DINT	Fieldbus address of the homing drive

Туре	Description			
BOOL	Acknowledgment: Fi	Acknowledgment: Function block is initialized and enabled		
BOOL	Execution message:	Execution message: This bit remains set as long as the block is being processed		
BOOL	Response that the function block has been completely executed.			
BOOL	The function block is in an error state			
	FALSE	No error (permitted commanding or warning)		
	TRUE	Error		
	Type BOOL BOOL BOOL BOOL	TypeDescriptionBOOLAcknowledgment: FullBOOLExecution message:BOOLResponse that the fullBOOLThe function block isFALSETRUE		

Name	Туре	Description		
ErrorNumber	DINT	Diagnostic number i	s output	
		ErrorNumber = 0		No error
		ErrorNumber ≠ 0	Error = TRUE	Error
		ErrorNumber≠0 Error = FALSE V		Warning
		ErrorNumber < 1000		Error messages of the subordinate AMK function blocks
		ErrorNumber = 100	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE
		ErrorNumber > 100	00	Error messages of the calling PLC- Task
		Range: Siehe 'Error	bit information' auf S	eite 80.

3.6 AP_PositioningAbsolute (FB)

The 'AP_PositioningAbsolute' function block performs a absolute positioning.

The movement sequence is defined with the position ('Position'), velocity ('Velocity'), acceleration ('Acceleration') and deceleration ('Deceleration') and jerk ('Jerk') parameters. Additionally, a defined emergency stop delay can be specified. All parameters can be changed during the positioning process.

User interface

		AP_PositioningAbsol	ute	
	Enable Execute Position Velocity Acceleration Deceleration Jerk CurrentPosition EmergencyStop	BOOL BOOL DINT LREAL LREAL LREAL LREAL LREAL DINT BOOL	BOOL BOOL BOOL DINT DINT LREAL LREAL	Acknowledge Busy Done Error ErrorNumber PositionOut VelocityOut AccelerationOut
_	CycleTimeTask	DINT		

Name	Туре	Description		
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.		
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts.		
Position	DINT	Setpoint position Definition of the final position Unit incr		
Velocity	LREAL	Setpoint velocity Definition of the final velocity Unit incr/s		
Acceleration	LREAL	Acceleration with which the target velocity is run Unit incr/s ²		
Deceleration	LREAL	Deceleration with which a lower target velocity is achieved Unit incr/s ²		

Name	Туре	Description		
Jerk	LREAL	Jerk		
		Unit	incr/s ³	
CurrentPosition	DINT	Current position		
		Unit	incr	
EmergencyStop	BOOL	EMERGENCY STOP: The setpoint of the velocity is decreased to zero along the emergency-stop ramp. Once initiated, an emergency stop cannot be aborted. A current positioning can only be aborted with 'EmergencyStop'.		
EmergencyDeceleration	LREAL	Deceleration for 'EmergencyStop'		
		Range	1.43 10 ⁻¹³ < 'EmergencyDeceleration' < 1.43 10 ⁺¹⁶	
		Unit	incr/s ²	
		Default 1000000		
CycleTimeTask	DINT	Cycle time of the calling PLC task		
		Unit	μs	

Name	Туре	Description			
Acknowledge	BOOL	Acknowledgment: F	Acknowledgment: Function block is initialized and enabled		
Busy	BOOL	Execution message:	Execution message: This bit remains set as long as the block is being processed		
Done	BOOL	Response that the function block has been completely executed.			
Error	BOOL	The function block is in an error state			
		FALSE	No error (permitted commanding or warning)		
		TRUE	Error		
		TRUE	Error		

Name	Туре	Description			
ErrorNumber	DINT	Diagnostic number i	s output		
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 100	00	Error messages of the subordinate AMK function blocks	
		ErrorNumber = 100	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 100	00	Error messages of the calling PLC- Task	
		Warning:			
		Range	Meaning		
		1	Setpoint velocity =	0	
		2	Illegal setpoint velo value	city; limited to minimum or maximum	
		3	Acceleration = 0		
		4	Illegal acceleration	; limited to minimum or maximum value	
		5	Deceleration = 0		
		6	Illegal deceleration	limited to minimum or maximum value	
		/	Deceleration value	corrected	
		8	Retrigger not possi	not possible	
		9	previous positioning		
		21	Emergency stop de EmergencyDecele	ency stop deceleration = 0 gencyDeceleration' = 'Deceleration'	
		22	Excess emergency 'EmergencyDecele	cy stop deceleration eleration' = max. value	
		23	Jerk during acceleration = 0 'Jerk' = max. value		
		24	Excess jerk during acceleration 'Jerk' = max. value		
		25	Jerk during deceleration = 0		
		26	Excess jerk during 'Jerk' = max. value	deceleration	
		27	Illegal arguments d	uring calculation of movement profile	
		28	Setpoint velocity ac profile calculation	lapted in the context of movement	
		29	Final velocity adapt calculation during a	ted in the context of movement profile	
		30	Final velocity adapt calculation during c	ted in the context of movement profile leceleration	
		Error:			
		Range	Meaning		
		1	Illegal operation mo	ode	
PositionOut		Output value			
		Unit	incr		
VelocityOut					
volotiyout			y incr/s]	
			11075		

Name	Туре	Description		
AccelerationOut	LREAL	Output value acceleration		
		Unit	incr/s ²	

3.7 AP_PositioningRelative (FB)

The 'AP_PositioningRelative' function block supports a relative positioning.

The movement sequence is defined with the position ('Position'), velocity ('Velocity'), acceleration ('Acceleration') and deceleration ('Deceleration') and jerk ('Jerk') parameters. Additionally, a defined emergency stop delay can be specified. All parameters can be changed during the positioning process.

User interface

		AP_PositioningRelative			
_	Enable	BOOL	BOOL	Acknowledge	
_	Execute	BOOL	BOOL	Busy	
_	Position	DINT	BOOL	Done	_
_	Velocity	LREAL	BOOL	Error	
	Acceleration	LREAL	DINT	ErrorNumber	_
_	Deceleration	LREAL	DINT	PositionOut	_
_	Jerk	LREAL	LREAL	VelocityOut	_
	EmergencyStop	BOOL	LREAL	AccelerationOut	
	EmergencyDeceleration	LREAL			
	CycleTimeTask	DINT			
	,				

Name	Туре	Description		
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.		
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts.		
Position	DINT	Setpoint position Definition of the final position Unit incr		
Velocity	LREAL	Setpoint velocity Definition of the final velocity Unit incr/s		
Acceleration	LREAL	Acceleration with which the target velocity is run Unit incr/s ²		
Deceleration	LREAL	Deceleration with which a lower target velocity is achieved Unit incr/s ²		
Jerk	LREAL	Jerk Unit incr/s ³		
EmergencyStop	BOOL	EMERGENCY STOP: The setpoint of the velocity is decreased to zero along the emergency-stop ramp. Once initiated, an emergency stop cannot be aborted. A current positioning can only be aborted with 'EmergencyStop'.		

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Name	Туре	Description			
EmergencyDeceleration	LREAL	Deceleration for 'Em	Deceleration for 'EmergencyStop'		
		Range	1.43 10 ⁻¹³ < 'EmergencyDeceleration' < 1.43 10 ⁺¹⁶		
		Unit	incr/s ²		
		Default	1000000		
CycleTimeTask	DINT	Cycle time of the calling PLC task			
		Unit	μs		

Туре	Description		
BOOL	Acknowledgment: Function block is initialized and enabled		
BOOL	Execution message: This bit remains set as long as the block is being processed		
BOOL	Response that the function block has been completely executed.		
BOOL	The function block is in an error state		
	FALSE No error (permitted commanding or warning)		
	TRUE	Error	
	Type BOOL BOOL BOOL BOOL	TypeDescriptionBOOLAcknowledgment: FillBOOLExecution message:BOOLResponse that the fullBOOLThe function block isFALSETRUE	

Name	Туре	Description		
ErrorNumber	DINT	Diagnostic number i	is output	
		ErrorNumber = 0	•	No error
		ErrorNumber ≠ 0	Error = TRUE	Error
		ErrorNumber ≠ 0	Error = FALSE	Warning
		ErrorNumber < 100	00	Error messages of the subordinate AMK function blocks
		ErrorNumber = 100	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE
		ErrorNumber > 100	00	Error messages of the calling PLC- Task
		Warning:		
		Range	Meaning	
		1	Setpoint velocity =	0
		2	Illegal setpoint velo value	city; limited to minimum or maximum
		3	Acceleration = 0	
		4	Illegal acceleration	; limited to minimum or maximum value
		5	Deceleration = 0	
		6	Illegal deceleration	; limited to minimum or maximum value
		7	Deceleration value	corrected
		0	Retriggered mover	pent not until after the end of the
		9	previous positioning	
		21	Emergency stop de EmergencyDecele	ration' = 'Deceleration'
		22	Excess emergency EmergencyDecele	rstop deceleration ration' = max. value
		23	Jerk during acceleration = 0 'Jerk' = max. value	
		24	Excess jerk during acceleration 'Jerk' = max. value	
		25	Jerk during deceleration = 0 'Jerk' = max. value	
		26	Excess jerk during deceleration 'Jerk' = max. value	
		27	Illegal arguments during calculation of movement profile	
		28	Setpoint velocity adapted in the context of movement profile calculation	
		29	Final velocity adapt calculation during a	ted in the context of movement profile acceleration
		30 Final velocity adapted in the context of moveme calculation during deceleration		ted in the context of movement profile leceleration
		Error:		
		Range	Meaning	
		1	Illegal operation mo	ode
PositionOut	DINT	Output value	 Dutput value	
Unit incr				
VelocityOut	Out LREAL Output value velocity			
		Unit	incr/s	

AMKmotion

Name	Туре	Description		
AccelerationOut	LREAL	Output value acceleration		
		Unit	incr/s ²	

3.8 AP_VirtualAxisBasic (FB)

The 'AP_VirtualAxisBasic' function block is a velocity generator.

The output value is a position setpoint which changes in proportion with the velocity. It is also possible to output a defined number of increments.

The following functions are supported:

- Generation of an increment increase in accordance with a definable velocity.
- Online changes to input parameters
- · Modes for continuous and cyclic increment generation

Abbildung 2: AP_VirtualAxisBasic: Block diagram



User interface

	AP_VirtualA	∖isBasic	
 Enable	BOOL	BOOL	Acknowledge
 Execute	BOOL	BOOL	Busy -
 Velocity	DINT	BOOL	Done -
 Override	DINT	BOOL	Error -
 CvcleTimeTask	DINT	DINT	ErrorNumber
e jeie inite ruon		DINT	PositionOut

Name	Туре	Description	
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.	
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.	
Velocity	DINT	Setpoint velocity Definition of the final velocity Unit incr/s	

Name	Туре	Description		
Override	DINT	Velocity output facto	Velocity output factor	
		Range	-100 +100	
		Unit	%	
		Default	100	
CycleTimeTask	DINT	Cycle time of the calling PLC task		
		Unit	μs	

Output variables

Name	Туре	Description			
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled			
Busy	BOOL	Execution message	This bit remains set	as long as the block is being processed	
Done	BOOL	Response that the fu	unction block has bee	en completely executed.	
Error	BOOL	The function block is	The function block is in an error state		
		FALSE	No error (permitted	l commanding or warning)	
		TRUE	Error		
ErrorNumber	DINT	Diagnostic number i	s output		
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 1000		Error messages of the subordinate AMK function blocks	
		ErrorNumber = 100	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 1000		Error messages of the calling PLC- Task	
		Warning			
		Range	Meaning		
		1	Illegal mode		
		Error			
		Range	Meaning		
		1 Illegal setpoint velo (limited to minimum		ocity n or maximum value)	
		2 Illegal override (limited to minimum or maximum value)			
PositionOut	DINT	Output value			
		Unit	incr		
	1				

3.9 AP_VirtualAxis (FB)

The function block 'AP_VirtualAxis' is a velocity generator with definable values for acceleration, deceleration, jerk and a defined emergency stop delay can be specified.

The output value is a position with an increment difference proportional to the velocity 'Velocity' a change in increment difference proportional to the acceleration 'Acceleration' / 'Deceleration', and a change in increment difference change proportional to the jerk 'Jerk'.

The block can be used for direct control of a drive.

The following functions are supported:

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- Generation of an increment increase in accordance with a definable velocity.
- Specification of a defined acceleration (deceleration).
- Specification of a defined emergency stop delay.
- Velocity override
- Online changes to input parameters

Abbildung 3: VGEN_AJ: Principle of operation



The figure illustrates the graphical relationship between jerk j_{set} , acceleration, a_{set} , velocity v_{set} , and the resulting position characteristic X.

User interface

	AP_VirtualAxis		
Enable Execute Velocity Override Acceleration Deceleration Jerk	BOOL BOOL DINT DINT LREAL LREAL LREAL	BOOL BOOL BOOL DINT DINT LREAL	Acknowledge Busy Done Error ErrorNumber PositionOut VelocityOut
 EmergencyStop EmergencyDeceleration CycleTimeTask	BOOL LREAL DINT	LREAL	Acceleration Out –

Name	Туре	Description
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.

Name	Туре	Description		
Velocity	DINT	Setpoint velocity Definition of the final velocity		
		Unit incr/s		
Override	DINT	Velocity output factor		
		Range -100 +100		
		Unit %		
		Default 100		
Acceleration	LREAL	Acceleration with which the target velocity is run		
		Unit incr/s ²		
Deceleration	LREAL	Deceleration with which a lower target velocity is achieved		
		Unit incr/s ²		
Jerk	LREAL	Jerk		
		Unit incr/s ³		
EmergencyStop	BOOL	EMERGENCY STOP: The setpoint of the velocity is decreased to zero along the emergency-stop ramp. Once initiated, an emergency stop cannot be aborted.		
EmergencyDeceleration	LREAL	Deceleration for 'EmergencyStop'		
		Range 1.43 10 ⁻¹³ < 'EmergencyDeceleration	tion' < 1.43 10 ⁺¹⁶	
		Unit incr/s ²		
		Default 1000000		
CycleTimeTask	DINT	Cycle time of the calling PLC task		
		Unit µs		

Туре	Description			
BOOL	Acknowledgment: Function block is initialized and enabled			
BOOL	Execution message: This bit remains set as long as the block is being processed			
BOOL	Response that the function block has been completely executed.			
BOOL	The function block is in an error state			
	FALSE No error (permitted commanding or warning)			
	TRUE Error			
	Type BOOL BOOL BOOL BOOL	TypeDescriptionBOOLAcknowledgment: FullBOOLExecution message:BOOLResponse that the fullBOOLThe function block isFALSETRUE		

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Name	Туре	Description			
ErrorNumber	DINT	Diagnostic number i	s output		
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 100	00	Error messages of the subordinate AMK function blocks	
		ErrorNumber = 100	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 100	00	Error messages of the calling PLC- Task	
		Error:			
		Range	Meaning		
		1	Velocity too high		
		2	Acceleration set to	0 / deceleration set to 0	
		3	Acceleration too hi	gh / deceleration too high	
		4	Jerk set to 0		
		5	Jerk too high		
		6	Override too high		
		7	Jerk corrected (mo	ore than 20% of the setpoint)	
PositionOut	DINT	Output value			
		Unit incr			
VelocityOut	LREAL	Output value velocity			
		Unit incr/s			
AccelerationOut	LREAL	Output value acceleration			
		Unit incr/s ²			

3.10 AP_Modulo (FB)

The function block 'AP_Modulo' realizes a modulo counter.

The counter can be preset to a value 'PresetPosition'.



Input variables

Name	Туре	Description				
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.				
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.				
Position	DINT	Input value				
		Unit incr				
Modulo	DINT	Modulo end value of the modulo counter Output 'ModuloOut' counts from 0 to 'Modulo' or at the first time from 'PresetPosition' to 'Modulo'				
		Unit incr				
PresetPosition	DINT	Preset value to which the output 'ModuloOut' is set. The value is applied with the positive edge of 'Execute'.				
		Unit incr				

Name	Туре	Description					
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled					
Busy	BOOL	Execution message	Execution message: This bit remains set as long as the block is being processed				
Done	BOOL	Response that the fu	unction block has bee	en completely executed.			
Error	BOOL	The function block is	The function block is in an error state				
		FALSE	No error (permitted	commanding or warning)			
		TRUE	Error				
ErrorNumber	DINT	Diagnostic number i	s output				
		ErrorNumber = 0 No error					
		ErrorNumber ≠ 0	Error = TRUE	Error			
		ErrorNumber ≠ 0	Error = FALSE	Warning			
		ErrorNumber < 1000		Error messages of the subordinate AMK function blocks			
		ErrorNumber = 100	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE			
		ErrorNumber > 100	00	Error messages of the calling PLC- Task			
ModuloOverflow	BOOL	Display of modulo flow; for overflow or underflow, 'ModuloOverflow' is set TRUE for one cycle.					
ModuloOut	DINT	Modulo output value of the modulo counter Output 'ModuloOut' counts from 0 to 'Modulo' or at the first time from 'PresetPosition' to 'Modulo'					
		Unit	incr				

3.11 AP_InPositionWindow (FB)

Display 'InPosition' - depending on current position ('Position'), target position ('TargetPosition') and position window ('Targetwindow').

User interface

	AP_InPosition	Window		
 Enable	BOOL	BOOL	Acknowledge	
 Execute	BOOL	BOOL	Busy	_
 Position	DINT	BOOL	Done	_
 TargetPosition	DINT	BOOL	Error	_
 TargetWindow	DINT	DINT	ErrorNumber	_
5		BOOL	InPosition	_

Input variables

Name	Туре	Description				
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.				
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.				
Position	DINT	Current position				
		Unit	incr			
TargetPosition	DINT	Target position				
		Unit incr				
TargetWindow	DINT	Target window				
		Unit	incr			

Name	Туре	Description				
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled				
Busy	BOOL	Execution message: This bit remains set as long as the block is being processed				
Done	BOOL	Response that the function block has been completely executed.				
Error	BOOL	The function block is in an error state				
		FALSE No error (permitted commanding or warning)				
		TRUE Error				

Name	Туре	Description				
ErrorNumber	DINT	Diagnostic number is output				
		ErrorNumber = 0		No error		
		ErrorNumber ≠ 0	Error = TRUE	Error		
		ErrorNumber ≠ 0 Error = FALSE		Warning		
		ErrorNumber < 1000 ErrorNumber = 1000 ErrorNumber > 1000		Error messages of the subordinate AMK function blocks		
				Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE		
				Error messages of the calling PLC- Task		
InPosition	BOOL	'InPosition' = TRUE, if the difference between 'Position' and 'TargetPosition' is smaller than the value in 'TargetWindow'				

4 Technology blocks

Block	Function
AP_TemperatureControl	Temperature control
AP_UnwinderDancer	Dancer-controlled center winder as unwinder
AP_WinderDancer	Dancer-controlled center winder as winder
AP_RegistrationCorrectionContinuous	Continuous register control
AP_RegistrationCorrectionDiscontinuous	Discontinuous register control
AP_InsetterCorrectionContinuous	Continuous preferred control
AP_InsetterCorrectionDiscontinuous	Discontinuous preferred control

4.1 AP_TemperatureControl (FB)

Temperature controller with autotuning

User interface

		AP_TemperatureControl		
 Enable	BOOL	BOOL	Acknowledge	_
 Execute	BOOL	BOOL	Busy	—
 ControlStop	BOOL	BOOL	Done –	_
 AutoTune	BOOL	BOOL	Error –	_
 Temperature	LREAL	DINT	ErrorNumber	_
 CurrentTemperature	LREAL	BOOL	AutoTuneDone	_
 CycleTimeControl	LREAL	BOOL	ControlStopped	_
 CycleTimeTask	DINT	BOOL	PWMOut –	_
		LREAL	AnalogueOut	_
 Configuration	Config	Config	Configuration	_

Name	Туре	Description				
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.				
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.				
ControlStop	BOOL	Temperature controller stop				
AutoTune	BOOL	Start automatic determination of the control parameters 'AutoTune' must be set to TRUE before starting the temperature controller with 'Execute'.				
Temperature	LREAL	Setpoint temperature				
CurrentTemperature	LREAL	Current temperature				
CycleTimeControl	LREAL	Call cycle of the temperature controller				
		Unit s				
CycleTimeTask	DINT	Cycle time of the calling PLC task				
		Unit µs				

Output variables

Name	Туре	Description				
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled				
Busy	BOOL	Execution message	: This bit remains set	as long as the bloc	k is being processed	
Done	BOOL	Response that the f	unction block has bee	en completely exec	uted.	
Error	BOOL	The function block is	s in an error state			
		FALSE	No error (permitted	commanding or wa	arning)	
		TRUE	Error			
ErrorNumber	DINT	Diagnostic number i	is output			
		ErrorNumber = 0		No error		
		ErrorNumber ≠ 0	Error = TRUE	Error		
		ErrorNumber ≠ 0	Error = FALSE	Warning		
		0	ControlPid_Ext_Err NoError	orNumber_	No Error	
		1	ControlPid_Ext_ErrorNumber_Limits		Permissible limits violated	
		2	ControlPid_Ext_ErrorNumber_Kp		Kp < 0	
		3	ControlPid_Ext_ErrorNumber_Tn		Tn < 0	
		4	ControlPid_Ext_ErrorNumber_Tv		Tv < 0	
		5	ControlPid_Ext_Err	orNumber_Td	Td < 0	
		6	ControlPid_Ext_Err SampleCount	orNumber_	Ratio (controlCycleTime / taskCycleTime) < 0	
		3000	Kp input parameter	error		
		5000	Error in the program	n flow		
AutoTuneDone	BOOL	Automatic determination	ation of the control pa	arameters is done		
ControlStopped	BOOL	Temperature controller is stopped				
PWMOut	BOOL	Switching output temperature controller				
AnalogueOut	LREAL	Analogue output temperature controller				
		Range 010				
		Unit	it 0.1 VDC			

Input and output variables

Name	Туре	Description
Configuration	STRUCT	Reference to configuration structure 'TemperatureControllerConfig'

4.1.1 Structures TemperatureControllerConfig

Structure elements

Name	Туре	Description
startParameter	PidParameter	
calculatedParameter	PidParameterAutoTune	
endAutoTunePercent	LREAL	'AutoTune' is finished when 'CurrentTemperature' > 'Temperature' x 'endAutoTunePercent' / 100 [%] Unit %

4.1.1.1 PidParameter (ST)

AutoTune = TRUE: Start parameter for 'AutoTune'. AutoTune = FALSE: Parameter for temperature controller.

Structure elements

Name	Туре	Description
Кр	LREAL	Kp for PID-controller
Tn	LREAL	Tn for PID-controller
Tv	LREAL	Tv for PID-controller
Td	LREAL	Td for PID-controller

4.1.1.2 PidParameterAutoTune (ST)

AutoTuneDone = TRUE: Determined parameters for temperature controller by 'AutoTune'.

Structure elements

Name	Туре	Description
Кр	LREAL	Kp for PID-controller
Tn	LREAL	Tn for PID-controller
Τv	LREAL	Tv for PID-controller
Tu	LREAL	Tu for PID-controller
Td	LREAL	Td for PID-controller
Tg	LREAL	Tg for PID-controller

4.2 AP_UnwinderDancer (FB)

The function block 'AP_UnwinderDancer' realizes a dancer controlled center winder as unwinder with the following characteristics:

- PID regulated dancer winder
- Operation as unwinder
- Diameter calculation
- Search diameter at the start of the winder

Setpoints and current values are transferred in a synchronous action. The synchronous action must be called in the synchronous program level FPLC_PRG.

User interface

	AP_UnwinderDancer		
 Enable	BOOL	BOOL	Acknowledge
 Execute	BOOL	BOOL	Busy -
 WinderDirectionCw	BOOL	BOOL	Done –
 DancerToMiddlePositionEnable	BOOL	BOOL	Error –
 DancerTraceModeEnable	BOOL	DINT	ErrorNumber
 DiameterPreset	BOOL	BOOL	DiameterValid –
 DiameterOkPreset	BOOL	BOOL	DiameterLimit
 DiameterNotOkPreset	BOOL	LREAL	Diameter –
 DiameterReset	BOOL	LREAL	WebVelocity
 DiameterValidEnable	BOOL	DINT	VelocityOut -
 DiameterCalculationEnable	BOOL		-
 VelocityOutEnable	BOOL		
 InitialDiameter	LREAL		
 MotorPosition	DINT		
 WebPosition	DINT		
 DancerPosition	LREAL		
 CycleTimeTask	DINT		
 Configuration	Config	Config	Configuration
-			3

Input variables of the asynchronous part of the program (PLC_PRG)

Name	Туре	Description		
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.		
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.		
WInderDirectionCw	BOOL	FALSE: Motor rotation direction counterclockwise: Reel is wound down TRUE: Motor rotation direction clockwise: Reel is wound down		
DancerToMiddlePositionEnable	BOOL	Dancers move to the middle position enable		
DancerTraceModeEnable	BOOL	Dancer mode Follow current value, the current value of the dancer is accepted as setpoint at the PID controller. Only enabled when 'DancerToMiddlePositionEnable' = FALSE		
DiameterPreset	BOOL	Set diameter value of the input 'InitialDiameter'. The input bit is internal automatically reset after set.		
DiameterOkPreset	BOOL	With a positive edge, the diameter value of input variable 'InitialDiameter' is set. The input is automatically reset after set. Diameter status "known":		
DiameterNotOkPreset	BOOL	With a positive edge, the diameter value of input variable 'InitialDiameter' is set. The input is automatically reset after set. Diameter status "unknown":		
DiameterReset	BOOL	Reset output 'DiameterValid', \rightarrow diameter status "unknown"		
DiameterValidEnable	BOOL	Set output 'DiameterValid', \rightarrow diameter status "known"		
DiameterCalculationEnable	BOOL	Enable diameter calculation		
VelocityOutEnable	BOOL	Enable output web velocity as the speed setpoint for winder drive		
InitialDiameter	LREAL	Diameter preset value Value to which the diameter with 'DiameterOkPreset' = TRUE or 'DiameterNotOkPreset' =TRUE is set.		
CycleTimeTask	DINT	Cycle time of the calling PLC task		
		Unit µs		

Input variables of the synchronous part of the program (FPLC_PRG)

Name	Туре	Description		
MotorPosition	DINT	Current position reel drive		
		Unit	incr	
WebPosition	DINT	Current web position		
		Unit	incr	
DancerPosition	LREAL	Current value dancer position		
		Unit	mV	

Output variables of the asynchronous part of the program (PLC_PRG)

Name	Туре	Description			
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled			
Busy	BOOL	Execution message: This bit remains set as long as the block is being processed			
Done	BOOL	Response that the function block has been completely executed.			
Error	BOOL	The function block is in an error state			
		FALSE	No error (permitted	commanding or warning)	
		TRUE	Error		
ErrorNumber	DINT	Diagnostic number i	s output		
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 100	00	Error messages of the subordinate AMK function blocks	
		ErrorNumber = 100	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 100	00	Error messages of the calling PLC- Task	
		Value	Meaning		
		1	The value at input '	CycleTimeTask' = 0	
		2	One of the followin	g parameters has a value <=0:	
			MachineConfig.MotorGearMultiplier, MachineConfig.MotorGearDivisor		
		3	One of the following parameters has a value <=0:		
			ProcessConfig.DiameterMin,		
			ProcessConfig.Dia	meterMax or	
			ProcessConfig.Dia	imeterMax	
		4	The parameter has	rameter has a Value <=0:	
			MachineConfig.Mc	otorEncoderResolution	
		5	One of the followin	g parameters has a value <=0:	
			ProcessConfig.Me	asureCycleDiameterOk,	
			ProcessConfig.Dia	imeterDifferenceOk	
		9	One of the followin	g parameters has a value <=0:	
			MachineConfig.We	ebSpeedMax,	
			MachineConfig.We	ebEncoderResolutionLength,	
			ProcessConfig.We	bSpeedPeriod	
		16	One of the followin	g parameters has a value <=0:	
			DancerConfig.Cyc	leTimeControl,	
			DancerConfig.Kp,		
			MachineConfig.Ve	locityOutputScale,	
			DancerConfig.Ima	X, umatarDidSatting	
		17	One of the following		
			DancerConfig Dan	y parameters has a value <−0. icerPositionFull	
			DancerConfig.Dan	cerPositionMid,	
			DancerConfig.Dan	cerPositionEmpty,	
		DancerConfig. Lime	e∪pκamp, eDownRamp		
		2 3 4 5 9 16 17	MachineConfig.Mc MachineConfig.Mc MachineConfig.Mc One of the followin ProcessConfig.Dia ProcessConfig.Dia ProcessConfig.Dia ProcessConfig.Dia The parameter has MachineConfig.Mc One of the followin ProcessConfig.Me ProcessConfig.Me ProcessConfig.Me ProcessConfig.Me ProcessConfig.Me ProcessConfig.Me ProcessConfig.Me MachineConfig.We MachineConfig.We MachineConfig.We One of the followin DancerConfig.We DancerConfig.Cyc DancerConfig.Ky, MachineConfig.Ve DancerConfig.Ve DancerConfig.Ima ProcessConfig.Dia One of the followin DancerConfig.Dan DancerConfig.Dan DancerConfig.Dan DancerConfig.Dan DancerConfig.Tim DancerConfig.Tim DancerConfig.Tim	g parameters has a value <=0: btorGearDivisor g parameters has a value <=0: meterMin, meterMax or meterMax a Value <=0: btorEncoderResolution g parameters has a value <=0: asureCycleDiameterOk, asureCycleNoDiameter, meterDifferenceOk g parameters has a value <=0: abSpeedMax, abEncoderResolutionLength, abEncoderResolution, abSpeedPeriod g parameters has a value <=0: leTimeControl, locityOutputScale, x, meterPidSetting g parameters has a value <=0: leTimeControl, locityOutputScale, x, meterPidSetting g parameters has a value <=0: leTimeControl, locityOutputScale, x, meterPidSetting g parameters has a value <=0: locerPositionFull, cerPositionEmpty, eUpRamp, eDownRamp	



Name	Туре	Description	
DiameterValid	BOOL	Known diameter	
DiameterLimit	BOOL	Diameter was calculated, and the result was outside of the minimum respectively maximum permissible diameter value in the configuration structure. The value was limited accordingly	
Diameter	LREAL	Current reel diameter	
		Unit	mm

Output variables of the synchronous part of the program (FPLC_PRG)

Name	Туре	Description	
WebVelocity	LREAL	Current value web velocity	
		Unit	mm/s
VelocityOut	DINT	Velocity setpoint reel drive	
		Unit	0.0001 r/min

Input and output variables

Name	Туре	Description
Configuration	STRUCT	Reference to configuration structure

Actions

Name	Description			
syncUnwinderDancer	Synchronous operation - opened in synchronous program section (e. g. FPLC_PRG)			
	<name ap_unwinderdancer="" cycl.="" plc-task.instance="">.syncUnwinderDancer (WebPosition:=, MotorPosition:=, DancerPosition:=, VelocityOut=>,</name>			
	Configuration:=);			

Example

Declaration in PLC_PRG:

apUnwinderDancer: AP_UnwinderDancer;

Opened in synchronous program section (FPLC_PRG)

PLC_PRG.apUnwinderDancer.syncUnwinderDancer (WebPosition:=..., MotorPosition:=..., DancerPosition:=..., VelocityOut=>..., Configuration:=...);

Mechanincal arrangement

Name	Туре	Description
WinderDirectionCw	BOOL	FALSE: reel is wound down when the motor rotation direction clockwise.
		TRUE: reel is wound up when the motor rotation direction clockwise.

Arrangement	Туре	boWindCWise
	AP_UnwinderDancer	FALSE
	AP_UnwinderDancer	TRUE

4.2.1 Structures AP_UnwinderDancer

4.2.1.1 MachineConfig (ST)

Structure elements

Name	Туре	Description	
MotorMechanicalDirectionCcw	BOOL	Mounting position of the motor opposite to the reel	
MotorGearMultiplier	DINT	Gear input (viewed from the motor)	
MotorGearDivisor	DINT	Gear output (viewed from the motor)	
MotorEncoderResolution	DINT	Increments per motor revolution (ID116 'Resolution motor encoder')	
		Unit incr	
WebEncoderResolution	DINT	Number of counted increments with move on the track 'WebEncoderResolutionLength'	
		Unit incr	
WebEncoderResolutionLength	DINT	Distance covered web track	
		Unit mm	
WebSpeedMax	DINT	Maximum web speed	
		Unit mm/s	
VelocityOutputScale	DINT	Scale velocity output 'VelocityOut'	
4.2.1.2 ProcessConfig (ST)

Structure elements

Name	Туре	Description	Description		
DiameterMin	DINT	Minimum permissible	e diameter value		
		Unit	mm		
DiameterMax	DINT	Maximum permissib	le diameter value		
		Unit	mm		
DiameterPidSetting	DINT	Reel diameter, in wh are set	ich the parameters 'Kp', 'Ki', 'Kd' and 'Kv' of the PID controller		
		Unit	mm		
DiameterDifferenceOk	DINT	Maximum difference review "diameter val	between two successively calculated diameters, so that the id" is accepted		
		Unit	mm		
TimeDiameterRamp	DINT	Ramp time for diameter output There is a sharp change in diameter at the input (e. g. setting a preset value), the diameter is adjusted linearly in the set ramp time.			
		Unit	ms		
MeasureCycleDiameterOk	DINT	Reel revolution interval for cycle			
		Calculating diameter	r if diameter known		
		Unit	0.1 r/min		
MeasureCycleNoDiameter	DINT	Reel revolution interv	val for cycle		
		Calculating diameter	r if diameter not known		
		Unit	0.1 r/min		
TimeWebSpeedRamp	DINT	Web speed ramp of the speed output 'VelocityOut'			
		The web velocity is ramped passed to the speed calculation of the reel			
		Unit	ms		
WebSpeedPeriod	DINT	Number of calls cycle	es 'CycleTimeTask' for measurement of the web speed		

4.2.1.3 DancerConfig (ST)

Name	Туре	Description	
PidControlClearKi	BOOL	Delete i component	
PidControlRaiseGain	BOOL	Position dependent dancers gain ramp active	
DancerCompensation	DINT	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	
DancerPositionFull	DINT	Dancers tension when the dancer is filled with material Unit mV	
DancerPositionMiddle	DINT	Dancers tension in the middle position of the dancer (operating point) Unit mV	

Name	Туре	Description		
DancerPositionEmpty	DINT	Dancers tension when the dancer is empty		
		Unit mV		
TimeUpRamp	DINT	Ramp time for the movement of the dancer in the operating point position		
		Unit ms		
TimeDownRamp	DINT	Ramp time for the movement of the dancer in deposition position (dancers filled)		
		Unit ms		
PidControlPeriod	DINT	Call cycle PID-controller 'PidControlPeriod' x 'CycleTimeTask'		
Кр	DINT	Kp for PID-controller		
Кі	DINT	Ki for PID-controller		
Kd	DINT	Kd for PID-controller		
Kv	DINT	Total gain of the PID controller:		
DancerPositionKiActivate	DINT	Dancer position for activating Ki		
		Unit mV		
IMax	DINT	Maximum permissible integral action		
GainShapeType	DINT	Type of the gain adjustment Value = 0: GainShapeP2Kv GainShapeP2Kv GainShapeP1 GainShapeP2 Voltage difference dancer [mV] = (dancer current position - dancer setpoint position) Value = 1: linear gain characteristic Kv Voltage difference dancer [mV] = (dancer current position - dancer setpoint position)		

Name	Туре	Description		
		Value = 2: square gain characteristic Kv Voltage difference dancer [mV] = (dancer current position - dancer setpoint position)		
		Value =3: gain characteristic ³ Kv Voltage difference dancer [mV] = (dancer current position - dancer setpoint position)		
		Value = 4: gain characteristic ⁴ Kv Voltage difference dancer [mV] = (dancer current position - dancer setpoint position)		
GainShapeP1	DINT	(Setpoint dancer- current value dancer) = GainShapeP1 Startpoint of the gain ramp Unit mV		
GainShapeP2	DINT	(Setpoint dancer - current value dancer) = GainShapeP1 Endpoint of the gain ramp Unit mV		
GainShapeP2Kv	DINT	Gain at (Setpoint dancer - current value dancer) > GainShapeP2		

The dancers constant 'DancerCompensation' can be determined or verified by measurement as follows:



By the dancer a rope or a wire is pulled.

The dancer is provided at a lower position. Now the position of the cable end is marked and noted the tension value of the dancer as U1.

Then the dancer is provided at an upper position. Again, the position of the cable end is marked and noted the tension value of the dancer as U2 (U2 > U1).

The distance between the rope ends of the two dancer positions is measured and gives . ΔX . The value . ΔX , used together with the two tension values U1 and U2 in the formula and 'DancerCompensation' is calculated:

Parameter	Unit	Meaning	
DancerCompensation	[mV/1000mm]	Dancers compensation constant	
U1	[mV]	Tension U1 on a dancer position X1	
U2	[mV]	Tension U2 on a dancer position X2	
ΔΧ	[mm]	Difference between the positions X2 - X1	

Example:

Parameter	measured value	Unit	Meaning
U1	3625	[mV]	Tension U1 on a dancer position X1
U2	7453	[mV]	Tension U2 on a dancer position X2
ΔΧ	800	[mm]	Difference between the positions X2 - X1

In the measurement, make sure that the dancer is not moved to the end positions, because there usually is a non-linear relationship between the recorded web and tension difference.

4.3 AP_WinderDancer (FB)

The function block 'AP_WinderDancer' realizes a dancer controlled center winder as rewinder with the following characteristics:

- PID regulated dancer winder
- Operation as rewinder
- Diameter calculation
- Search diameter at the start of the winder

Setpoints and current values are transferred in a synchronous action. The synchronous action must be called in the synchronous program level FPLC_PRG.

User interface

	AP_WinderDancer		
 Enable	BOOL	BOOL	Acknowledge -
 Execute	BOOL	BOOL	Busy -
 WinderDirectionCw	BOOL	BOOL	Done —
 DancerToMiddlePositionEnable	BOOL	BOOL	Error —
 DancerTraceModeEnable	BOOL	DINT	ErrorNumber -
 DiameterPreset	BOOL	BOOL	DiameterValid —
 DiameterOkPreset	BOOL	BOOL	DiameterLimit -
 DiameterNotOkPreset	BOOL	LREAL	Diameter —
 DiameterReset	BOOL	LREAL	WebVelocity -
 DiameterValidEnable	BOOL	DINT	VelocitvOut -
 DiameterCalculationEnable	BOOL		· -···,··
 VelocitvOutEnable	BOOL		
 InitialDiameter	LREAL		
 MotorPosition	DINT		
 WebPosition	DINT		
 DancerPosition	LREAL		
 CycleTimeTask	DINT		
 Configuration	Config	Config	Configuration —
-			-

Input variables of the asynchronous part of the program (PLC_PRG)

Name	Туре	Description	
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.	
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.	
WinderDirectionCw	BOOL	FALSE: Motor rotation direction counterclockwise: Reel is wound up TRUE: Motor rotation direction clockwise: Reel is wound up	
DancerToMiddlePositionEnable	BOOL	Dancers move to the middle position enable	
DancerTraceModeEnable	BOOL	Dancer mode Follow current value, the current value of the dancer is accepted as setpoint at the PID controller. Only enabled when 'DancerToMiddlePositionEnable' = FALSE	
DiameterPreset	BOOL	Set diameter value of the input 'InitialDiameter'. The input bit is internal automatically reset after set.	
DiameterOkPreset	BOOL	With a positive edge, the diameter value of input variable 'InitialDiameter' is set The input is automatically reset after set. Diameter status "known":	
DiameterNotOkPreset	BOOL	With a positive edge, the diameter value of input variable 'InitialDiameter' is set. The input is automatically reset after set. Diameter status "unknown":	
DiameterReset	BOOL	Reset output 'DiameterValid', \rightarrow diameter status "unknown"	
DiameterValidEnable	BOOL	Set output 'DiameterValid', \rightarrow diameter status "known"	
DiameterCalculationEnable	BOOL	Enable diameter calculation	
VelocityOutEnable	BOOL	Enable output web velocity as the speed setpoint for winder drive	

Name	Туре	Description	
InitialDiameter	LREAL	Diameter preset value Value to which the diameter with 'DiameterOkPreset' = TRUE or 'DiameterNotOkPreset' =TRUE is set. Unit mm	
CycleTimeTask	DINT	Cycle time of the calling PLC task	
		Unit µs	

Input variables of the synchronous part of the program (FPLC_PRG)

Name	Туре	Description		
MotorPosition	DINT	Current position reel drive		
		Unit	incr	
WebPosition	DINT	Current web position		
		Unit	incr	
DancerPosition	LREAL	Current value dancer position		
		Unit	mV	

Output variables of the asynchronous part of the program (PLC_PRG)

Name	Туре	Description			
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled			
Busy	BOOL	Execution message:	Execution message: This bit remains set as long as the block is being processed		
Done	BOOL	Response that the function block has been completely executed.			
Error	BOOL	The function block is in an error state			
		FALSE	No error (permitted commanding or warning)		
		TRUE	Error		

Name	Туре	Description			
ErrorNumber	DINT	Diagnostic number is output			
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 100	00	Error messages of the subordinate AMK function blocks	
		ErrorNumber = 100	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 1000		Error messages of the calling PLC- Task	
		Value	Meaning		
		1	The value at input (CycleTimeTask = 0	
		2	One of the following	g parameters has a value <=0:	
			MachineConfig.Mo	torGearMultiplier, torGearDivisor	
		3	One of the following	g parameters has a value <=0:	
			ProcessConfig.Dia	meterMin,	
			ProcessConlig.Dia	meterMax or meterMin. >=	
			ProcessConfig.DiameterMax		
		4	The parameter has	a Value <=0:	
			MachineConfig.MotorEncoderResolution		
		5	One of the following parameters has a value <=0:		
			ProcessConfig.Me	ProcessConfig.MeasureCycleDiameterOk, ProcessConfig.MeasureCycleNoDiameter	
			ProcessConfig.DiameterDifferenceOk		
		9	One of the following	g parameters has a value <=0:	
			MachineConfig.WebSpeedMax,		
			MachineConfig.WebEncoderResolutionLength,		
			ProcessConfig.WebEncoderResolution,		
		16	One of the following	parameters has a value <=0:	
			DancerConfig.CycleTimeControl,		
			DancerConfig.Kp,		
			DancerConfig.Kv,	acityQutputScala	
			DancerConfig.Imax		
			ProcessConfig.Dia	meterPidSetting	
		17	One of the following	g parameters has a value <=0:	
			DancerConfig.Dan	cerPositionFull,	
			DancerConfig.Dan	cerPositionMid, cerPositionEmpty	
			DancerConfig.Time	eUpRamp,	
			DancerConfig.Time	DownRamp	
DiameterValid	BOOL	Known diameter			
DiameterLimit	BOOL	Diameter was calcul	ated, and the result v	vas outside of the minimum respectively	
maximum permissible diameter value in the configurat The value was limited accordingly		he configuration structure.			
Diameter	LREAL	Current reel diamete	er		
		Unit	mm		

Output variables of the synchronous part of the program (FPLC_PRG)

Name	Туре	Description	
WebVelocity	LREAL	Current value web velocity	
		Unit	mm/s
VelocityOut	DINT	Velocity setpoint reel drive	
		Unit	0.0001 r/min

Input and output variables

Name	Туре	Description	
Configuration	STRUCT	Reference to configuration structure	

Actions

Name	Description			
syncWinderDancer	Synchronous operation - opened in synchronous program section (e.g. FPLC_PRG)			
	<name ap_winderdancer="" cycl.="" plc-task.instance="">.syncWinderDancer</name>			
	WebPosition:=,			
	MotorPosition:=, DancerPosition:=,			
	VelocityOut=>,			
	Configuration:=			
);			

Example

Declaration in PLC_PRG:

apWinderDancer: AP_WinderDancer;

Opened in synchronous program section (FPLC_PRG)

PLC_PRG.apWinderDancer.syncWinderDancer (WebPosition:=..., MotorPosition:=..., DancerPosition:=..., VelocityOut=>..., Configuration:=...);

Mechanincal arrangement

Name	Туре	Description	
WinderDirectionCw	BOOL	FALSE: reel is wound down when the motor rotation direction clockwise. TRUE: reel is wound up when the motor rotation direction clockwise.	

Arrangement	Туре	boWindCWise
	AP_WinderDancer	FALSE
	AP_WinderDancer	TRUE

4.3.1 Structures AP_WinderDancer

4.3.1.1 MachineConfig (ST)

Structure elements

Name	Туре	Description	
MotorMechanicalDirectionCcw	BOOL	Mounting position of the motor opposite to the reel	
MotorGearMultiplier	DINT	Gear input (viewed from the motor)	
MotorGearDivisor	DINT	Gear output (viewed from the motor)	
MotorEncoderResolution	DINT	Increments per motor revolution (ID116 'Resolution motor encoder') Unit incr	
WebEncoderResolution	DINT	Number of counted increments with move on the track 'WebEncoderResolutionLength' Unit incr	
WebEncoderResolutionLength	DINT	Distance covered web track Unit mm	
WebSpeedMax	DINT	Maximum web speed Unit mm/s	
VelocityOutputScale	DINT	Scale velocity output 'VelocityOut'	

4.3.1.2 ProcessConfig (ST)

Name	Туре	Description	
DiameterMin	DINT	Minimum permissible diameter value	
		Unit	mm
DiameterMax	DINT	Maximum permissible diameter value	
		Unit	mm

Name	Туре	Description	
DiameterPidSetting	DINT	Reel diameter, in which the parameters 'Kp', 'Ki', 'Kd' and 'Kv' of the PID controller are set	
		Unit mm	
DiameterDifferenceOk	DINT	Maximum difference between two successively calculated diameters, so that the review "diameter valid" is accepted	
		Unit mm	
TimeDiameterRamp	DINT	Ramp time for diameter output There is a sharp change in diameter at the input (e.g. setting a preset value), the diameter is adjusted linearly in the set ramp time.	
		Unit ms	
MeasureCycleDiameterOk	DINT	Reel revolution interval for cycle Calculating diameter if diameter known	
MeasureCycleNoDiameter	DINT	Reel revolution interval for cycle Calculating diameter if diameter not known Unit 0.1 r/min	
TimeWebSpeedRamp	DINT	Web speed ramp of the speed output 'VelocityOut' The web velocity is ramped passed to the speed calculation of the reel Unit ms	
WebSpeedPeriod	DINT	Number of calls cycles 'CycleTimeTask' for measurement of the web speed	

4.3.1.3 DancerConfig (ST)

Name	Туре	Description	
PidControlClearKi	BOOL	Delete i component	
PidControlRaiseGain	BOOL	Position dependent dancers gain ramp active	
DancerCompensation	DINT	Dancers constant \rightarrow tension difference at 1 m way dancers	
		Unit mV / mm	
DancerPositionFull	DINT	Dancers tension when the dancer is filled with material	
		Unit mV	
DancerPositionMiddle	DINT	Dancers tension in the middle position of the dancer (operating point)	
		Unit mV	
DancerPositionEmpty	DINT	Dancers tension when the dancer is empty	
		Unit mV	
TimeUpRamp	DINT	Ramp time for the movement of the dancer in the operating point position	
		Unit ms	
TimeDownRamp	DINT	Ramp time for the movement of the dancer in deposition position (dancers filled)	
		Unit ms	
PidControlPeriod	DINT	Call cycle PID-controller	
		'PidControlPeriod' x 'CycleTimeTask'	



Name	Туре	Description		
		Value =3: gain characteristic ³ Kv Voltage difference dancer [mV] = (dancer current position - dancer setpoint position) Value = 4: gain characteristic ⁴ Kv		
		Voltage difference dancer [mV] = (dancer current position - dancer setpoint position)		
GainShapeP1	DINT	(Setpoint dancer- current value dancer) = GainShapeP1 Startpoint of the gain ramp		
		Unit mV		
GainShapeP2	DINT	(Setpoint dancer - current value dancer) = GainShapeP1		
		Endpoint of the gain ramp		
GainShapeP2Kv	DINT	Gain at (Setpoint dancer - current value dancer) > GainShapeP2		

The dancers constant 'DancerCompensation' can be determined or verified by measurement as follows:

U2 U1 4 dX

By the dancer a rope or a wire is pulled.

The dancer is provided at a lower position. Now the position of the cable end is marked and noted the tension value of the dancer as U1.

Then the dancer is provided at an upper position. Again, the position of the cable end is marked and noted the tension value of the dancer as U2 (U2 > U1).

The distance between the rope ends of the two dancer positions is measured and gives . ΔX . The value . ΔX , used together with the two tension values U1 and U2 in the formula and 'DancerCompensation' is calculated:

Parameter	Unit	Meaning
DancerCompensation	[mV/1000mm]	Dancers compensation constant
U1	[mV]	Tension U1 on a dancer position X1
U2	[mV]	Tension U2 on a dancer position X2
ΔΧ	[mm]	Difference between the positions X2 - X1

Example:

Parameter	measured value	Unit	Meaning
U1	3625	[mV]	Tension U1 on a dancer position X1
U2	7453	[mV]	Tension U2 on a dancer position X2
ΔΧ	800	[mm]	Difference between the positions X2 - X1

In the measurement, make sure that the dancer is not moved to the end positions, because there usually is a non-linear relationship between the recorded web and tension difference.

4.4 AP_RegistrationCorrectionContinuous (FB)

The function block 'AP_RegistrationCorrectionContinuous' implements a print mark control. The position of the treating tool (e.g. cutter, punch) is controlled continuous in relation to a master format (register control)

- The controlled treating tool moves continuous
- Master format and circumference of the treating tool must be equal

Setpoints and current values are transferred in a synchronous action. The synchronous action must be called in the synchronous program level FPLC_PRG.

Application example





User interface

AF	P_RegistrationCor	rectionContinuou	S
Enable	BOOL	BOOL	Acknowledge
Execute	BOOL	BOOL	Busy
PrintmarkLostReset	BOOL	BOOL	Done
PrintmarkDetectEnable	BOOL	BOOL	Erro
PrintmarkReferencePulse	BOOL	DINT	ErrorNumbe
PrintmarkSetpositionMode	BOOL	BOOL	PrintmarkDetected
PrintmarkSetposition	DINT	BOOL	PrintmarkInWindov
 PrintmarkSetpositionOffsetEnable 	e BOOL	BOOL	PrintmarkLos
PrintmarkSetpositionOffset	DINT	DINT	PrintmarkLostCoun
PrintmarkOffset	DINT	DINT	PrintmarkDeviation
CorrectionControlMode	BOOL	DINT	PrintmarkSetpositionOffsetOu
CorrectionLimit	DINT		
CorrectionRange	DINT		
CorrectionControlRange1Start	DINT		
CorrectionControlRange1End	DINT		
Correction ControlOffset1	DINT		
FormatLength	DINT		
FormatLengthWindow	DINT		
MasterPosition	DINT		
MotorPosition	DINT		
PositionOut	DINT	DINT	PositionOu
Configuration	Config	Config	Configuration

Input variables of the asynchronous program level (PLC_PRG)

Name	Туре	Description
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.
PrintmarkLostReset	BOOL	Resetting the output 'PrintmarkLost'
PrintmarkSetpositionMode	BOOL	Mode how to determine the nominal position of the print mark on a positive edge of 'PrintmarkDetectEnable' 'PrintmarkSetpositionMode' = FALSE: The position of the next print mark is set as nominal position. All following print marks are adjusted to this position. 'PrintmarkSetpositionMode' = TRUE: The parameter 'PrintmarkSetposition' specifies the print mark relatively to the current master position. The following print marks are adjusted to this position

Name	Туре	Description
PrintmarkSetposition	DINT	The parameter specifies the nominal position of the print mark relatively to the current master position on a positive edge of 'PrintmarkDetectEnable'. The detected print marks are controlled to this position PrintmarkDetectEnableprintmark PrintmarkSetposition
		format
		Unit incr
PrintmarkSetpositionOffsetEnable	BOOL	Output start of the specified value of 'PrintmarkSetpositionOffset'. This value is an offset and shift the setpoint position of the print mark.
PrintmarkSetpositionOffset	DINT	Operator offsetShifts the setpoint position of the print mark.The shift takes place in the correction range and starts with a $0 \rightarrow 1$ edge at'PrintmarkSetpositionOffsetEnable'. It is independent of changes in the value of 'MasterPosition'.The offset is calculated asUnit
CorrectionControlMode	BOOL	Correction output enabled 'CorrectionControlMode' = FALSE: always correction output 'CorrectionControlMode' = TRUE: correction output only in the ranges specified by 'CorrectionControlRange1Start' and 'CorrectionControlRange1End' resp. 'CorrectionControlRange2Start' and 'CorrectionControlRange2End'. The ranges are OR operated The modulo counting is started with a 0 -> 1 edge at 'CorrectionControlMode' and can be preset by 'CorrectionControlOffset1' or 'CorrectionControlOffset2'
CorrectionLimit	DINT	Maximum correction output per format 'CorrectionLimit' = 0: no limitation 'CorrectionLimit' > 0: maximal value Unit incr
CorrectionRange	DINT	Correction range The print mark control tries to output the correction in the specified range CorrectionControlRange1Start / CorrectionControlRange1End master incr / format Unit % FormatLength

Name	Туре	Description
CorrectionControlRange1Start	DINT	Correction range 1 Start value related to master increments / format CorrectionControlRange1Start / CorrectionControlRange1End
		Unit incr
CorrectionControlRange1End	DINT	Correction range 1 End value related to master increments / format CorrectionControlRange1Start / CorrectionControlRange1End master incr / format
CorrectionControlOffset1	DINT	Current position value 1 (zero offset) at start of the correction control, related to the master increments / format Example: If the controlled drive is positioned in the middle of the format when starting the correction control, >format/2< must be set on a 0 -> 1 edge of 'CorrectionControlMode'. CorrectionControlRange1Start / CorrectionControlRange1End
FormatLength	DINT	Format length Nominal distance between two print marks Unit incr
FormatLengthWindow	DINT	Window length Length in front and after the setpoint position of the print mark. In this range, the print mark sensor is activated and will accept a print mark.

Input variables of the synchronous program level (FPLC_PRG)

Name	Туре	Description	
PrintmarkDetectEnable	BOOL	Start of the print mark control and specification of the print mark setpoint position by parameter 'PrintmarkSetposition' if 'PrintmarkSetpositionMode' = TRUE	
PrintmarkReferencePulse	BOOL	Print mark pulse detected (reference pulse) (See document Software description AmkLibraries, Part no. 205210) BasicSupport - TIME_TO_COUNT	
PrintmarkOffset	DINT	Print mark offset of the current master position (See document Software description AmkLibraries, Part no. 205210) BasicSupport - TIME_TO_COUNT	
MasterPosition	DINT	Master pulses Unit	incr
MotorPosition	DINT	Register controller pulses Pulses of the tools Unit incr	

Output variables of the asynchronous program level (PLC_PRG)

Name	Туре	Description			
Acknowledge	BOOL	Acknowledgment: F	Acknowledgment: Function block is initialized and enabled		
Busy	BOOL	Execution message: This bit remains set as long as the block is being processed		et as long as the block is being	
Done	BOOL	Response that the f	unction block has be	een completely executed.	
Error	BOOL	The function block is in an error state			
		FALSE	FALSE No error (permitted commanding or warning)		
		TRUE	Error		
ErrorNumber	DINT	Diagnostic number	is output		
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 1000		Error messages of the subordinate AMK function blocks	
		ErrorNumber = 1000		Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 1000		Error messages of the calling PLC- Task	
		Value	Meaning		
		101	FormatLength ≤ 0		
		104	CorrectionRange	≤ 0	
PrintmarkDetected	BOOL	Print mark detected, control activated			
PrintmarkInWindow	BOOL	Mark window activates the print mark sensor			
PrintmarkLost	BOOL	Message "Print mark lost" activated when the number of print marks set in 'PrintmarkLostCountLimit' is no detected successively.			
PrintmarkLostCount	DINT	Number of lost print marks			

Name	Туре	Description	
PrintmarkDeviation	DINT	Deviation between setpoint and current position of the current print mark	
		Unit	incr
PrintmarkSetpositionOffsetOut	DINT	Output value contains the currently output operator offset	
		Unit	incr

Input and output variables

Name	Туре	Description	
PositionOut	DINT	Setpoint position of the tool drive	
		Unit	incr
Configuration	STRUCT	Reference to configuration structure	

Actions

Name	Description
syncRegistrationCorrectionCont	Synchronous operation - opened in synchronous program section (e.g. FPLC_PRG)
	<name ap_<="" cycl.="" plc-task.instance="" td=""></name>
	RegistrationCorrectionContinuous>.syncRegistrationCorrectionCont
	(
	PrintmarkDetectEnable:=,
	PrintmarkReferencePulse:=,
	MasterPosition:=,
	MotorPosition:=,
	PrintmarkOffset:=,
	PositionOut=>,
	Configuration:=
);

Example

Declaration in PLC_PRG:

apRegistrationCorrectionContinuous: AP_RegistrationCorrectionContinuous;

Opened in synchronous program section (FPLC_PRG)

```
{\sf PLC\_PRG.apRegistrationCorrectionContinuous.syncRegistrationCorrectionCont}
```

- (
- PrintmarkDetectEnable:=..., PrintmarkReferencePulse:=...,
- MasterPosition:=...,
- MotorPosition:=...,
- PrintmarkOffset:=...,
- PositionOut=>...,
- Configuration:=...
-);

4.4.1 Structures AP_RegistrationCorrectionContinuous

4.4.1.1 MachineConfig (ST)

Structure elements

Name	Туре	Description
MasterDirectionCcw	BOOL	Direction of master-impulse negated
		'MasterDirectionCcw' = FALSE: no negation
		'MasterDirectionCcw' = TRUE: negation
		This input must only be set on a program start.
MotorDirectionCcw	BOOL	Direction of motor rotation negated
		'MotorDirectionCcw' = FALSE: no negation
		'MotorDirectionCcw' = TRUE: negation
		This input must only be set on a program start.

4.4.1.2 ProcessConfig (ST)

Name	Туре	Description
CorrectionControlRange2Start	DINT	Correction range 2 Start value related to master increments / format CorrectionControlRange2Start CorrectionControlRange2End
		Unit incr
CorrectionControlRange2End	DINT	Correction range2 End value related to master increments / format CorrectionRange CorrectionControlRange2Start CorrectionControlRange2End
		Unit incr

Name	Туре	Description
CorrectionControlOffset2	DINT	Current position value 2 (zero offset) at start of the correction control, related to the master increments / format
		Example: If the controlled drive is positioned in the middle of the format when starting the correction control, >format/2< must be set on a 0 -> 1 edge of 'CorrectionControlMode'. CorrectionRange
		CorrectionControlRange2Start CorrectionControlRange2End
		format
		Unit incr

4.4.1.3 PrintmarkConfig (ST)

Structure elements

Name	Туре	Description	
PrintmarkLostCountLimit	DINT	Number of print marks to be missed in succession, before the output 'PrintmarkLost' is set.	

4.5 AP_RegistrationCorrectionDiscontinuous (FB)

The function block 'AP_RegistrationCorrectionDiscontinuous' implements a print mark control. The position of the treating tool (e. g. cutter, punch) is controlled discontinuous in relation to a master format (register control)

- Master format and circumference of the treating tool must not be equal
- While the treating tool is in mesh with the web (e. g. cut), it moves synchronously. After the treatment, an adequate discontinuous compensation movement is done.

Setpoints and current values are transferred in a synchronous action. The synchronous action must be called in the synchronous program level FPLC_PRG.



Input variables of the asynchronous program level (PLC_PRG)

Name	Туре	Description		
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no		
		longer processed.		
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.		
PrintmarkLostReset	BOOL	Resetting the output 'PrintmarkLost'		
PrintmarkSetpositionMode	BOOL	 Mode how to determine the nominal position of the print mark on a positive edge of 'PrintmarkDetectEnable' 'PrintmarkSetpositionMode' = FALSE: The position of the next print mark is set as nominal position. All following print marks are adjusted to this position. 'PrintmarkSetpositionMode' = TRUE: The parameter 'PrintmarkSetposition' specifies the print mark relatively to the current master position. The following print marks are adjusted to this position 		
PrintmarkSetposition	DINT	The parameter specifies the nominal position of the print mark relatively to the current master position on a positive edge of 'PrintmarkDetectEnable'. The detected print marks are controlled to this position PrintmarkDetectEnableprintmarkSetposition		
PrintmarkSetpositionOffsetEnable	BOOL	Output start of the specified value of 'PrintmarkSetpositionOffset'. This value is an offset and shift the setpoint position of the print mark.		
PrintmarkSetpositionOffset	DINT	Operator offsetShifts the setpoint position of the print mark.The shift takes place in the correction range and starts with a $0 \rightarrow 1$ edge at'PrintmarkSetpositionOffsetEnable'. It is independent of changes in the value of 'MasterPosition'.The offset is calculated asUnit		
CorrectionControlMode	BOOL	Correction output enabled 'CorrectionControlMode' = FALSE: always correction output 'CorrectionControlMode' = TRUE: correction output only in the ranges specified by 'CorrectionControlRange1Start' and 'CorrectionControlRange1End' resp. 'CorrectionControlRange2Start' and 'CorrectionControlRange2End'. The ranges are OR operated The modulo counting is started with a 0 -> 1 edge at 'CorrectionControlOffset1' or 'CorrectionControlOffset2'		

Name	Туре	Description
CorrectionLimit	DINT	Maximum correction output per format 'CorrectionLimit' = 0: no limitation 'CorrectionLimit' > 0: maximal value
		Unit incr
CorrectionRange	DINT	Correction range The print mark control tries to output the correction in the specified range CorrectionControlRange1Start / CorrectionControlRange1End
		Unit % FormatLength
RegisterControlFormat	DINT	Number of increments per register rotation Unit incr
RegisterControlRatio	DINT	Synchron ratio:
		Unit %
RegisterControlSynchronRange	DINT	Range where the register controller must run synchronously with the web synchronous area tool tool tool e.g. cut Unit degree
CorrectionControlRange1Start	DINT	Correction range 1 Start value related to master increments / format CorrectionControlRange1Start / CorrectionControlRange1End master incr / format

Name	Туре	Description	
CorrectionControlRange1End	DINT	Correction range 1 End value related to master increments / format CorrectionRange CorrectionControlRange1Start / CorrectionControlRange1End	
CorrectionControlOffset1	DINT	Current position value 1 (zero offset) at start of the correction control, related to the master increments / format Example: If the controlled drive is positioned in the middle of the format when starting the correction control, >format/2< must be set on a 0 -> 1 edge of 'CorrectionControlMode'. CorrectionControlRange1Start CorrectionControlRange1End	
FormatLength	DINT	Format length Nominal distance between two print marks Unit incr	
FormatLengthWindow	DINT	Window length Length in front and after the setpoint position of the print mark. In this range, the print mark sensor is activated and will accept a print mark.	
MotorPosition	DINT	Register controller pulses Pulses of the tools Unit incr	

Input variables of the synchronous program level (FPLC_PRG)

Name	Туре	Description
PrintmarkDetectEnable	BOOL	Start of the print mark control and specification of the print mark setpoint position by parameter 'PrintmarkSetposition' if 'PrintmarkSetpositionMode' = TRUE
PrintmarkReferencePulse	BOOL	Print mark pulse detected (reference pulse) (See document Software description AmkLibraries, Part no. 205210) BasicSupport - TIME_TO_COUNT

Name	Туре	Description		
PrintmarkOffset	DINT	Print mark offset of th (See document Soft BasicSupport - TIME Unit	ne current master position ware description AmkLibraries, Part no. 205210) E_TO_COUNT incr	
MasterPosition	DINT	Master pulses Unit	incr	

Output variables of the asynchronous program level (PLC_PRG)

Name	Туре	Description		
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled		
Busy	BOOL	Execution message: This bit remains set as long as the block is being processed		
Done	BOOL	Response that the f	function block has be	een completely executed.
Error	BOOL	The function block i	s in an error state	
		FALSE	No error (permittee	d commanding or warning)
		TRUE	Error	
ErrorNumber	DINT	Diagnostic number	is output	
		ErrorNumber = 0		No error
		ErrorNumber ≠ 0	Error = TRUE	Error
		ErrorNumber ≠ 0	Error = FALSE	Warning
		ErrorNumber < 10	00	Error messages of the subordinate AMK function blocks
		ErrorNumber = 1000		Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE
		ErrorNumber > 10	00	Error messages of the calling PLC- Task
		Value	Meaning	
		101	FormatLength ≤ 0	
		104	CorrectionRange :	≤0
		105	RegisterControlFo	rmat≤0
		106	AND	
		107	RegisterControlSy RegisterControlSy	nchronRange < 0 OR nchronRange > 180
PrintmarkDetected	BOOL	Print mark detected		
PrintmarkInWindow	ROOL			anaar
		I IVIARK WINDOW ACTIVATES THE PRINT MARK SENSOR		
PrintmarkLost	BOOL	Message "Print mark lost" activated when the number of print marks set in 'PrintmarkLostCountLimit' is not detected successively.		
PrintmarkLostCount	DINT	Number of lost print marks		
PrintmarkDeviation	DINT	Deviation between	setpoint and current	position of the current print mark
		Unit	incr	
PrintmarkSetpositionOffsetOut	DINT	Output value contai	ins the currently outp	out operator offset
		Unit	incr	
	1			

Input and output variables

Name	Туре	Description	
PositionOut	DINT	Setpoint position of the tool drive	
		Unit	incr
Configuration	STRUCT	Reference to configuration structure	

Actions

Name	Description
syncRegistrationCorrectionDiscont	Synchronous operation - opened in synchronous program section (e.g. FPLC_PRG)
	<name ap_<br="" cycl.="" plc-task.instance="">RegistrationCorrectionDiscontinuous>.syncRegistrationCorrectionDiscont (PrintmarkDetectEnable:=,</name>
	PrintmarkReferencePulse:=,
	MotorPosition:=,
	PrintmarkOffset:=, PositionOut=>,
	Configuration:=
);

Example

Declaration in PLC_PRG:

 $apRegistration Correction Discontinuous: AP_Registration Correction Discontinuous;$

Opened in synchronous program section (FPLC_PRG)

 ${\sf PLC_PRG.apRegistrationCorrectionDiscontinuous.syncRegistrationCorrectionDiscont}$

(PrintmarkDetectEnable:=..., PrintmarkReferencePulse:=..., MasterPosition:=..., MotorPosition:=..., PrintmarkOffset:=..., PositionOut=>..., Configuration:=...);

4.5.1 Structures AP_RegistrationCorrectionDiscontinuous

4.5.1.1 MachineConfig (ST)

Structure elements

Name	Туре	Description	
MasterDirectionCcw	BOOL	Direction of master-impulse negated	
		'MasterDirectionCcw' = FALSE: no negation	
		'MasterDirectionCcw' = TRUE: negation	
		This input must only be set on a program start.	
MotorDirectionCcw	BOOL	Direction of motor rotation negated	
		'MotorDirectionCcw' = FALSE: no negation	
		'MotorDirectionCcw' = TRUE: negation	
		This input must only be set on a program start.	

4.5.1.2 ProcessConfig (ST)

Name	Туре	Description
CorrectionControlRange2Start	DINT	Correction range 2 Start value related to master increments / format CorrectionControlRange2Start CorrectionControlRange2End
		Unit incr
CorrectionControlRange2End	DINT	Correction range2 End value related to master increments / format CorrectionRange CorrectionControlRange2Start CorrectionControlRange2End
		Unit incr

Name	Туре	Description
CorrectionControlOffset2	DINT	Current position value 2 (zero offset) at start of the correction control, related to the master increments / format
		Example: If the controlled drive is positioned in the middle of the format when starting the correction control, >format/2< must be set on a 0 -> 1 edge of 'CorrectionControlMode'.
		CorrectionControlRange2Start / CorrectionControlRange2End
		format

4.5.1.3 PrintmarkConfig (ST)

Structure elements

Name	Туре	Description
PrintmarkLostCountLimit	DINT	Number of print marks to be missed in succession, before the output 'PrintmarkLost' is set.

4.6 AP_InsetterCorrectionContinuous (FB)

The function block 'AP_InsetterCorrectionContinuous' implements a print mark control. The position of the web to be treated is controlled in relation to a master format (insetting)

- The controlled web moves continuous
- The speed of the web follows equal the master drive

Setpoints and current values are transferred in a synchronous action. The synchronous action must be called in the synchronous program level FPLC_PRG.

Application example





User interface

AF	P_InsetterCor	rectionContinuous	
 Enable	BOOL	BOOL	Acknowledge
 Execute	BOOL	BOOL	Busy —
 PrintmarkLostReset	BOOL	BOOL	Done -
 PrintmarkDetectEnable	BOOL	BOOL	Error —
 PrintmarkReferencePulse	BOOL	DINT	ErrorNumber
 PrintmarkSetpositionMode	BOOL	BOOL	PrintmarkDetected
 PrintmarkSetposition	DINT	BOOL	PrintmarkInWindow
 PrintmarkSetpositionOffsetEnable	BOOL	BOOL	PrintmarkLost
 PrintmarkSetposition Offset	DINT	DINT	PrintmarkLostCount —
 PrintmarkOffset	DINT	DINT	PrintmarkDeviation
 CorrectionControlMode	BOOL	DINT	PrintmarkSetpositionOffsetOut
 CorrectionLimit	DINT		
 CorrectionRange	DINT		
 CorrectionControlRange1Start	DINT		
 CorrectionControlRange1End	DINT		
 Correction Control Offset1	DINT		
 FormatLength	DINT		
 FormatLengthWindow	DINT		
 MasterPosition	DINT		
 PositionOut	DINT	DINT	PositionOut -
 Configuration	Config	Config	Configuration
			_

Input variables of the asynchronous program level (PLC_PRG)

Name	Туре	Description
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.
PrintmarkLostReset	BOOL	Resetting the output 'PrintmarkLost'
PrintmarkSetpositionMode	BOOL	Mode how to determine the nominal position of the print mark on a positive edge of 'PrintmarkDetectEnable' 'PrintmarkSetpositionMode' = FALSE: The position of the next print mark is set as nominal position. All following print marks are adjusted to this position. 'PrintmarkSetpositionMode' = TRUE: The parameter 'PrintmarkSetposition' specifies the print mark relatively to the current master position. The following print marks are adjusted to this position

Name	Туре	Description
PrintmarkSetposition	DINT	The parameter specifies the nominal position of the print mark relatively to the current master position on a positive edge of 'PrintmarkDetectEnable'. The detected print marks are controlled to this position
		PrintmarkDetectEnable
		format
		Unit incr
PrintmarkSetpositionOffsetEnable	BOOL	Output start of the specified value of 'PrintmarkSetpositionOffset'. This value is an offset and shift the setpoint position of the print mark.
PrintmarkSetpositionOffset	DINT	Operator offset
		The shift takes place in the correction range and starts with a $0 \rightarrow 1$ edge at 'PrintmarkSetpositionOffsetEnable'. It is independent of changes in the value of 'MasterPosition'.
		The offset is calculated as
CorrectionControlMode	BOOL Correction output enabled 'CorrectionControlMode' = FALSE: always correction output 'CorrectionControlMode' = TRUE: correction output only in the range specified by 'CorrectionControlRange1Start' and 'CorrectionControlRange1End' resp. 'CorrectionControlRange2Stat' 'CorrectionControlRange2End'. The ranges are OR operated	
		The modulo counting is started with a 0 -> 1 edge at 'CorrectionControlMode' and can be preset by 'CorrectionControlOffset1' or 'CorrectionControlOffset2'
CorrectionLimit	DINT	Maximum correction output per format 'CorrectionLimit' = 0: no limitation 'CorrectionLimit' > 0: maximal value Unit incr
CorrectionRange		
Concoloni tange		The print mark control tries to output the correction in the specified range CorrectionRange CorrectionControlRange1Start / CorrectionControlRange1End
		master incr /
		format
		Unit % FormatLength

Name	Туре	Description	
CorrectionControlRange1Start	DINT	Correction range 1 Start value related to master increments / format CorrectionRange	
		CorrectionControlRange1Start / CorrectionControlRange1End	
		Unit incr	
CorrectionControlRange1End	DINT	Correction range 1 End value related to master increments / format CorrectionControlRange1Start / CorrectionControlRange1End	
		Unit incr	
CorrectionControlOffset1	DINT	Current position value 1 (zero offset) at start of the correction control, related to the master increments / format Example: If the controlled drive is positioned in the middle of the format when starting the correction control, >format/2< must be set on a 0 -> 1 edge of 'CorrectionControlMode'. CorrectionControlRange1Start CorrectionControlRange1End	
		¦ ≺ format	
		Unit incr	
FormatLength	DINT	Format length Nominal distance between two print marks Unit incr	
FormatLengthWindow	DINT	Window length Length in front and after the setpoint position of the print mark. In this range, the print mark sensor is activated and will accept a print mark.	

Input variables of the synchronous program level (FPLC_PRG)

Name	Туре	Description	
PrintmarkDetectEnable	BOOL	Start of the print mark control and specification of the print mark setpoint position by parameter 'PrintmarkSetposition' if 'PrintmarkSetpositionMode' = TRUE	
PrintmarkReferencePulse	BOOL	Print mark pulse detected (reference pulse) (See document Software description AmkLibraries, Part no. 205210) BasicSupport - TIME_TO_COUNT	
PrintmarkOffset	DINT	Print mark offset of the current master position (See document Software description AmkLibraries, Part no. 205210) BasicSupport - TIME_TO_COUNT Unit incr	
MasterPosition	DINT	Master pulses Unit incr	

Output variables of the asynchronous program level (PLC_PRG)

Name	Туре	Description		
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled		
Busy	BOOL	Execution message: This bit remains set as long as the block is being processed		
Done	BOOL	Response that the f	unction block has be	een completely executed.
Error	BOOL	The function block i	s in an error state	
		FALSE	No error (permitte	d commanding or warning)
		TRUE	Error	
ErrorNumber	DINT	Diagnostic number	is output	
		ErrorNumber = 0		No error
		ErrorNumber ≠ 0	Error = TRUE	Error
		ErrorNumber ≠ 0	Error = FALSE	Warning
		ErrorNumber < 1000		Error messages of the subordinate AMK function blocks
		ErrorNumber = 1000		Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE
		ErrorNumber > 10	00	Error messages of the calling PLC- Task
		Value	Meaning	
		101	FormatLength ≤ 0	
		104	CorrectionRange	≤0
PrintmarkDetected	BOOL	Print mark detected, control activated		
PrintmarkInWindow	BOOL	Mark window activates the print mark sensor		
PrintmarkLost	BOOL	Message "Print mar	'k lost"	
		activated when the number of print marks set in 'PrintmarkLostCountLimit' is not detected successively.		
PrintmarkLostCount	DINT	Number of lost print marks		
PrintmarkDeviation	DINT	Deviation between setpoint and current position of the current print mark		
		Unit	incr	
PrintmarkSetpositionOffsetOut	DINT	Output value contai	ns the currently out	out operator offset
		Unit	incr	



Input and output variables

Name	Туре	Description	
PositionOut	DINT	Setpoint position of the tool drive	
		Unit	incr
Configuration	STRUCT	Reference to configuration structure	

Actions

Name	Description
syncInsetterCorrectionCont	Synchronous operation - opened in synchronous program section (e.g. FPLC_PRG)
	<name ap_<br="" cycl.="" plc-task.instance="">InsetterCorrectionContinuous>.syncInsetterCorrectionCont (PrintmarkDetectEnable:=, PrintmarkReferencePulse:=, MasterPosition:=, PrintmarkOffset:=, PositionOut=>, Configuration:=);</name>

Example

Declaration in PLC_PRG:

apInsetterCorrectionContinuous: AP_InsetterCorrectionContinuous;

Opened in synchronous program section (FPLC_PRG)

PLC_PRG.apInsetterCorrectionContinuous.syncInsetterCorrectionCont
(
PrintmarkDetectEnable:=,
PrintmarkReferencePulse:=,
MasterPosition:=,
PrintmarkOffset:=,
PositionOut=>,
Configuration:=
);

4.6.1 Structures AP_InsetterCorrectionContinuous

4.6.1.1 MachineConfig (ST)

Name	Туре	Description	
MasterDirectionCcw	BOOL	Direction of master-impulse negated 'MasterDirectionCcw' = FALSE: no negation 'MasterDirectionCcw' = TRUE: negation	
		This input must only be set on a program start.	

Name	Туре	Description
MotorDirectionCcw	BOOL	Direction of motor rotation negated 'MotorDirectionCcw' = FALSE: no negation 'MotorDirectionCcw' = TRUE: negation This input must only be set on a program start.

4.6.1.2 ProcessConfig (ST)

Name	Туре	Description		
CorrectionControlRange2Start	DINT	Correction range 2 Start value related to master increments / format CorrectionControlRange2Start CorrectionControlRange2End master incr / ' format		
CorrectionControlRange2End	DINT	Correction range2 End value related to master increments / format CorrectionControlRange2Start CorrectionControlRange2End		
CorrectionControlOffset2	DINT	Unit incr Current position value 2 (zero offset) at start of the correction control, relate the master increments / format Example: If the controlled drive is positioned in the middle of the format when starting correction control, >format/2< must be set on a 0 -> 1 edge of 'CorrectionControlMode'. CorrectionControlRange2Start CorrectionControlRange2End CorrectionControlRange2Start CorrectionControlOffset2 Image: Image: Image: Image: Image: Image: CorrectionControlRange2End Image: Image: Image: Image:		

Туре	Description		
ENUM	EN_CRANK_DRIVE Shape of crank drive	E_SHAPE e curve enCrankS	hanel inear
	enCrankShapeLine	ear	linear 45° straight line
	enCrankShapeSine enCrankShapeSquareSine		SINE - function
	Type ENUM	Type Description ENUM EN_CRANK_DRIVE Shape of crank drive Default Default enCrankShapeLine enCrankShapeSin enCrankShapeSin	Type Description ENUM EN_CRANK_DRIVE_SHAPE Shape of crank drive curve Default Default enCrankS enCrankShapeLinear enCrankShapeSine enCrankShapeSine enCrankShapeSquareSine

4.6.1.3 PrintmarkConfig (ST)

Structure elements

Name	Туре	Description
PrintmarkLostCountLimit	DINT	Number of print marks to be missed in succession, before the output 'PrintmarkLost' is set.

4.7 AP_InsetterCorrectionDiscontinuous (FB)

The function block 'AP_InsetterCorrectionDiscontinuous' implements a print mark control. The position of the web to be treated is controlled in relation to a master format (insetting)

- The controlled web moves discontinuous
- The speed of the web follows clocked the master drive

Setpoints and current values are transferred in a synchronous action. The synchronous action must be called in the synchronous program level FPLC_PRG.

Application example





User interface

AF	P_InsetterCorrecti	onDiscontinuous	
Enable	BOOL	BOOL	Acknowledg
Execute	BOOL	BOOL	Bus
PrintmarkLostReset	BOOL	BOOL	Don
PrintmarkDetectEnable	BOOL	BOOL	Erro
PrintmarkReferencePulse	BOOL	DINT	ErrorNumbe
PrintmarkSetpositionMode	BOOL	BOOL	PrintmarkDetecte
PrintmarkSetposition	DINT	BOOL	PrintmarkInWindov
PrintmarkSetpositionOffsetEnable	BOOL	BOOL	PrintmarkLos
PrintmarkSetpositionOffset	DINT	DINT	PrintmarkLostCour
PrintmarkOffset	DINT	DINT	PrintmarkDeviatio
Correction ControlMode	BOOL	DINT	PrintmarkSetposition OffsetOu
CorrectionLimit	DINT		·
CorrectionRange	DINT		
Correction ControlRange1Start	DINT		
Correction ControlRange1End	DINT		
Correction ControlOffset1	DINT		
FormatLength	DINT		
FormatLengthWindow	DINT		
CrankEnable	BOOL		
CrankOffset	DINT		
CrankStandStillRange	DINT		
MasterPosition	DINT		
PositionOut	DINT	DINT	PositionOu
Configuration	Config	Config	Configuration

Input variables of the asynchronous program level (PLC_PRG)

Name	Туре	Description	
Enable	BOOL	Enable signal: With a positive edge, the initialization of the block starts. As long as 'Enable' = TRUE, the block remains enabled and is processed by the PLC. In the state 'Enable' = FALSE the block is no longer enabled and is thus no longer processed.	
Execute	BOOL	Function execution: With a positive edge, the execution of the block starts. As long as 'Execute' = TRUE, the block is processed by the PLC. In the state 'Execute' = FALSE execution of the block is ended.	
PrintmarkLostReset	BOOL	Resetting the output 'PrintmarkLost'	
PrintmarkSetpositionMode	BOOL	Mode how to determine the nominal position of the print mark on a positive edge of 'PrintmarkDetectEnable' 'PrintmarkSetpositionMode' = FALSE: The position of the next print mark is set as nominal position. All following print marks are adjusted to this position. 'PrintmarkSetpositionMode' = TRUE: The parameter 'PrintmarkSetposition' specifies the print mark relatively to the current master position. The following print marks are adjusted to this position	
Name	Туре	Description	
----------------------------------	------	---	--
PrintmarkSetposition	DINT	The parameter specifies the nominal position of the print mark relatively to the current master position on a positive edge of 'PrintmarkDetectEnable'. The detected print marks are controlled to this position	
		PrintmarkDetectEnableprint mark	
		format	
		Unit incr	
PrintmarkSetpositionOffsetEnable	BOOL	Output start of the specified value of 'PrintmarkSetpositionOffset'. This value is an offset and shift the setpoint position of the print mark.	
PrintmarkSetpositionOffset	DINT	Operator offset Shifts the setpoint position of the print mark. The shift takes place in the correction range and starts with a $0 \rightarrow 1$ edge at 'PrintmarkSetpositionOffsetEnable'. It is independent of changes in the value of 'MasterPosition'. The offset is calculated as	
CorrectionControlMode	BOOL	Correction output enabled 'CorrectionControlMode' = FALSE: always correction output 'CorrectionControlMode' = TRUE: correction output only in the ranges specified by 'CorrectionControlRange1Start' and 'CorrectionControlRange1End' resp. 'CorrectionControlRange2Start' and 'CorrectionControlRange2End'. The ranges are OR operated The modulo counting is started with a 0 -> 1 edge at 'CorrectionControlMode' and can be preset by 'CorrectionControlOffset1' or 'CorrectionControlOffset2'	
CorrectionLimit	DINT	Maximum correction output per format 'CorrectionLimit' = 0: no limitation 'CorrectionLimit' > 0: maximal value Unit incr	
CorrectionRange	DINT	Correction range The print mark control tries to output the correction in the specified range CorrectionControlRange1Start / CorrectionControlRange1End master incr / format Unit % FormatLength	

Name	Туре	Description		
CorrectionControlRange1Start	DINT	Correction range 1 Start value related to master increments / format CorrectionRange CorrectionControlRange1Start / CorrectionControlRange1End		
		Unit incr		
CorrectionControlRange1End	DINT	Correction range 1 End value related to master increments / format CorrectionRange CorrectionControlRange1Start / CorrectionControlRange1End		
CorrectionControlOffset1	DINT	Current position value 1 (zero offset) at start of the correction control, related to the master increments / format Example: If the controlled drive is positioned in the middle of the format when starting the correction control, >format/2< must be set on a 0 -> 1 edge of 'CorrectionControlMode'. CorrectionControlRange1Start / CorrectionControlRange1End		
FormatLength	DINT	Format length Nominal distance between two print marks Unit incr		
FormatLengthWindow	DINT	Window length Length in front and after the setpoint position of the print mark. In this range, the print mark sensor is activated and will accept a print mark.		

AMKmotion

Name	Туре	Description
CrankOffset	DINT	Crank drive start offset. After the crank drive is started, the function waits until the master has passed the offset PositionOut [Incr]
		CrankEnable
CrankStandStillRange	DINT	Crank drive standstill range PositionOut [Incr] CrankStandStillRange
		Unit incr

Input variables of the synchronous program level (FPLC_PRG)

Name	Туре	Description		
PrintmarkDetectEnable	BOOL	Start of the print mark control and specification of the print mark setpoint position by parameter 'PrintmarkSetposition' if 'PrintmarkSetpositionMode' = TRUE		
PrintmarkReferencePulse	BOOL	Print mark pulse detected (reference pulse) (See document Software description AmkLibraries, Part no. 205210) BasicSupport - TIME_TO_COUNT		
PrintmarkOffset	DINT	Print mark offset of the current master position (See document Software description AmkLibraries, Part no. 205210) BasicSupport - TIME_TO_COUNT Unit incr		
CrankEnable	BOOL	Start of the crank drive function, Output at 'PositionOut' starts according to the selected crank shape. The output is only done if 'MasterPosition' changes		
MasterPosition	DINT	Master pulses		
		Unit	incr	

Output variables of the asynchronous program level (PLC_PRG)

Name	Туре	Description
Acknowledge	BOOL	Acknowledgment: Function block is initialized and enabled
Busy	BOOL	Execution message: This bit remains set as long as the block is being processed
Done	BOOL	Response that the function block has been completely executed.

Name	Туре	Description			
Error	BOOL	The function block is in an error state			
		FALSE	No error (permitte	d commanding or warning)	
		TRUE	Error		
ErrorNumber	DINT	Diagnostic number	is output		
		ErrorNumber = 0		No error	
		ErrorNumber ≠ 0	Error = TRUE	Error	
		ErrorNumber ≠ 0	Error = FALSE	Warning	
		ErrorNumber < 10	00	Error messages of the subordinate AMK function blocks	
		ErrorNumber = 100	00	Error on switch-on sequence 'Execute' = TRUE if 'Enable' = FALSE	
		ErrorNumber > 10	00	Error messages of the calling PLC- Task	
		Value	Meaning		
		100	Wrong mode in str 'CrankShapeMod	ructure 'ProcessConfig': Parameter e'	
		101	FormatLength ≤ 0		
		102	CrankStandStillRa	ange to high	
		103	CrankOffset < 0		
		104	CorrectionRange	≤0	
PrintmarkDetected	BOOL	Print mark detected	l, control activated		
PrintmarkInWindow	BOOL	Mark window activates the print mark sensor		ensor	
PrintmarkLost	BOOL	Message "Print mar	rk lost"		
		activated when the detected successiv	number of print mar ely.	ks set in 'PrintmarkLostCountLimit' is not	
PrintmarkLostCount	DINT	Number of lost print	marks		
PrintmarkDeviation	DINT	Deviation between	setpoint and current	t position of the current print mark	
		Unit	incr		
PrintmarkSetpositionOffsetOut	DINT	Output value contai	ins the currently out	put operator offset	
		Unit	incr		

Input and output variables

Name	Туре	Description	
PositionOut	DINT	Setpoint position of the tool drive	
		Unit	incr
Configuration	STRUCT	Reference to configuration structure	

Actions

Name	Description
syncInsetterCorrectionDiscont	Synchronous operation - opened in synchronous program section (e. g. FPLC_PRG)
	<name ap_<="" cycl.="" plc-task.instance="" td=""></name>
	InsetterCorrectionDiscontinuous>.syncInsetterCorrectionDiscont
	(
	PrintmarkDetectEnable:=,
	PrintmarkReferencePulse:=,
	MasterPosition:=,
	CrankEnable:=,
	PrintmarkOffset:=,
	PositionOut=>,
	Configuration:=
);

Example

Declaration in PLC_PRG:

apInsetterCorrectionDiscontinuous: AP_InsetterCorrectionDiscontinuous;

Opened in synchronous program section (FPLC_PRG)

PLC_PRG.apInsetterCorrectionDiscontinuous.syncInsetterCorrectionDiscont (PrintmarkDetectEnable:=..., PrintmarkReferencePulse:=..., MasterPosition:=..., CrankEnable:=..., PrintmarkOffset:=..., PositionOut=>..., Configuration:=...

```
);
```

4.7.1 Structures AP_InsetterCorrectionDiscontinuous

4.7.1.1 MachineConfig (ST)

Structure elements

Name	Туре	Description
MasterDirectionCcw	BOOL	Direction of master-impulse negated
		'MasterDirectionCcw' = FALSE: no negation
		'MasterDirectionCcw' = TRUE: negation
		This input must only be set on a program start.
MotorDirectionCcw	BOOL	Direction of motor rotation negated
		'MotorDirectionCcw' = FALSE: no negation
		'MotorDirectionCcw' = TRUE: negation
		This input must only be set on a program start.

4.7.1.2 ProcessConfig (ST)

Structure elements

Name	Туре	Description	
CorrectionControlRange2Start	DINT	Correction range 2 Start value related to master increments / format CorrectionControlRange2Start CorrectionControlRange2End	
		Unit incr	
CorrectionControlRange2End	DINT	Correction range2 End value related to master increments / format CorrectionControlRange2Start CorrectionControlRange2End	
CorrectionControlOffset2		Current position value 2 (zero	offset) at start of the correction control related to
		the master increments / format Example: If the controlled drive is positioned in the middle of the format when starting the correction control, >format/2< must be set on a 0 -> 1 edge of 'CorrectionControlMode'. CorrectionControlRange2Start / CorrectionControlRange2End CorrectionControlOffset2 format	
CrankShapeMode	ENUM	EN_CRANK_DRIVE_SHAPE	Ē
		Shape of crank drive curve	
		Default enCran	<shapelinear< td=""></shapelinear<>
		enCrankShapeLinear	linear 45° straight line
		enCrankShapeSquareSine	SINE ² - function

4.7.1.3 PrintmarkConfig (ST)

Structure elements

Name	Туре	Description
PrintmarkLostCountLimit	DINT	Number of print marks to be missed in succession, before the output 'PrintmarkLost' is set.

5 Appendix

5.1 Error bit information

Regardless of the type of access (AP_Home block), the following error codes describe the errors during data transport:

Error code	Description
from PLC	
(ErrorNumber)	
0x0002	General error message
0x0003	Source module not available
0x0004	The addressed destination does not exist (routing address is incorrect)
0x0005	Memory errors
0x0006	Wrong module number
0x0007	Wrong element
0x0008	Resource error
0x0009	Protocol error (command)
0x000A	Unused
0x000B	Timeout
0x000C	Internal error
0x000D	Unknown command
0x000E	Unused
0x000F	Internal error
0x0016	No connection to target
0x0017	Error in 'Login', device already used

Valid for EtherCAT SOE

ID access (block AP_Home)

The error codes from the SOE slave device have the following meaning:

Error code	Description
from PLC	
(ErrorNumber)	
0x0000	No error
0x1001	ID number not available
0x1009	Invalid access to element 1
0x2001	Name does not exist
0x2002	Name transmitted too short
0x2003	Name transmitted too long
0x2004	Name can not be changed
0x2004	Name is currently write protected
0x3001	Attribute does not exist
0x3002	Attribute transmitted too short
0x3003	Attribute transmitted too long
0x3004	Attribute can not be changed
0x3005	Attribute is currently write protected
0x4001	Unit not available
0x4002	Unit transmitted too short
0x4003	Unit transmitted too long
0x4004	Unit can not be changed
0x4005	Unit is currently write protected
0x5001	Minimum input value not available
0x5002	Minimum input value transmitted too short
0x5003	Minimum input value transmitted too long
0x5004	Minimum input value can not be changed
0x5005	Minimum input value is currently write protected
0x6001	Maximum input value not available
0x6002	Maximum input value transmitted too short
0x6003	Maximum input value transmitted too long
0x6004	Maximum input value can not be changed
0x6005	Maximum input value is currently write protected
0x7002	Operating date transmitted too short
0x7003	Operating date transmitted too long
0x7004	Operating date can not be changed
0x7005	Operating date is currently write protected
0x7006	Operating date is less than the minimum input value
0x7007	Operating date is greater than the maximum input value
0x7008	Invalid operating date
0x7009	Operating date is write protected by password.
0x700A	Operating date is write protected as a result of cyclic usage
0x700B	Unauthorized indirect addressing
0x700C	Operation date write protected as a result of other defaults (e.g., operating mode,)
0x700D	Invalid floating number
0x700E	Operating date write protected during 'parameterization level'
0x700F	Operating date write protected during 'operating level'
0x7010	Procedure command already active
0x7011	Procedure command can not be interrupted
0x7012	Procedure command can not be executed at this time

Error code from PLC	Description
(ErrorNumber)	
0x7013	Procedure command can not be executed (invalid or incorrect parameters)
0x8009	General access error

Glossary

A

AP

AMK Packaging Library

D

Default

Factory setting

F

FB Function block

FPLC_PRG

Real-time PLC task, synchronized to device cycle

<u>К</u> кр

Proportional gain (speed control, PID controller)

Κv

Position loop factor

Ρ

PDK_xxxxxx_abcdefgh

Product documentation; xxxxxx - AMK part no., abcdefgh - name

PLC_PRG

Task which is not synchronized to the device cycle

POU

Program organization unit (PLC program elements; types program, function or function block)

Т

Τd

Differentiating time in speed control (PID controller)

Tn

Integral-action time in speed control (PID controller)

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