AG03/1 IO-Link

Siemens S7-1500® Interface Module

for TIA Portal® V14 SP1 in SCL

Software Description

V1.0

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1 General Information

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1.3 Limitations

The library and its function were tested with a Siemens S7-1500 1511-1PN. The module was programmed using Siemens TIA Portal® V14 SP1 Update 9.

1.4 Requirements

- Basic knowledge of handling and programming Siemens systems.
- Familiarity with IO-Link.

1.5 Versions Overview

This manual is related to the following library.

- SIKO_AG03_IOL_1500_TIA_V14_SP1_Upd9_1.00.zal14

1.6 List of Abbreviations

Abbreviation	Definition
FB	Function block
CW	Control word
IOL	IO-Link
ISDU	Indexed service data unit
PLC	Programmable logic controller
SW	Status word
UDT	User data type

1.7 Document History

Version	Date	Description
1.0	15.10.2020	Document created

2 Description of PLC data types

2.1 General

The library contains operating mode dependent data types that can be used for creation of PLC tags. By using PLC data types symbolic access to inputs and outputs is possible.

The library contains following data types:

Name	Description
DT_AG03_IOL_POS_PDI	Process data input position mode
DT_AG03_IOL_POS_PDO	Process data output position mode

2.2 DT_AG03_IOL_POS_PDI UDT

Name	Type	Description
bs08_OperationEnabled	Bool	True if operation is enabled
bs09_SwitchLock	Bool	True if switch-lock is active
bs10_TravelJobAck	Bool	True if travel job is acknowledged
bs11_BatteryState	Bool	True if battery state is critical or low
bs12_TorqueDeactState	Bool	True if torque deactivation is active
bs13_Reserved	Bool	Reserved
bs14_GuardingBit	Bool	Communication guarding
bs15_CalibrationExecuted	Bool	True if calibration command is executed
bs00_Supply	Bool	Output stage voltage status
bs01_ReadyToTravel	Bool	True if ready to travel
bs02_UpperLimit	Bool	True if upper limit is violated

Name	Type	Description
bs03_LowerLimit	Bool	True if lower limit is violated
bs04_ActuatorTravels	Bool	True if actuator travels
bs05_TarWinReached	Bool	True if target window is reached
bs06_ActiveTravelJob	Bool	True if travel job is active
bs07_GeneralError	Bool	True if error is active
nGenMapCh2	Byte	Content selectable via generic mapping parameter 2
nGenMapCh1	Byte	Content selectable via generic mapping parameter 1
nActualValue	DInt	Actual position

2.3 DT_AG03_IOL_POS_PDO UDT

Name	Type	Description
bc08_InchingMode2Neg	Bool	Inching in negative direction
bc09_Reserved	Bool	Reserved
bc10_MoveRelative	Bool	Select absolute or relative positioning
bc11_Reserved	Bool	Reserved
bc12_Reserved	Bool	Reserved
bc13_Reserved	Bool	Reserved
bc14_GuardingBit	Bool	Communication guarding
bc15_CalibrationExecute	Bool	If true calibration becomes executed
bc00_CoastStop	Bool	Coast stop command
bc01_QuickStop	Bool	Quick stop command
bc02_NormalStop	Bool	Normal stop command
bc03_IntermediateStop	Bool	Interrupt active travel job
bc04_StartTravelJob	Bool	Rising edge starts travel job
bc05_ErrorAck	Bool	If true, the actual error is acknowledged
bc06_InchingMode1	Bool	Inching with positioning steps
bc07_InchingMode2Pos	Bool	Inching in positive direction
nGenMapPrm2	Byte	Set content of mapping channel 2
nGenMapPrm1	Byte	Set content of mapping channel 1
nTargetValue	DInt	Target position

3 Description of SIKO_IOL_PRM Function Block

3.1 General

This function block supports read and write of parameters (IO-Link ISDU). The IO-Link block IO_LINK_DEVICE from the Siemens IO-Link library is used. Furthermore the IO_LINK_DEVICE function block uses the system function blocks SFB 52 (RDREC) and SFB 53 (WRREC). A read or write command takes several PLC cycles. The function block can read or write an individual parameter acyclically. For this purpose, an index and a subindex must be passed to the

function block. The input value is transformed to a DINT (nReceiveValue) and the output value nWriteValue is converted from a DINT to the native format of the parameter.

The following parameters are interpreted as strings by the function block. The parameters sReadString and sWriteString are automatically used for write and read accesses.

Index	Name
16	VendorName
17	VendorText
18	ProductName
19	ProductID
20	ProductText
21	SerialNumber
22	HardwareRevision
23	FirmwareRevision
24	ApplicationSpecificTag
25	FunctionTag
26	LocationTag
95	DisplayData
180	ProductionDate

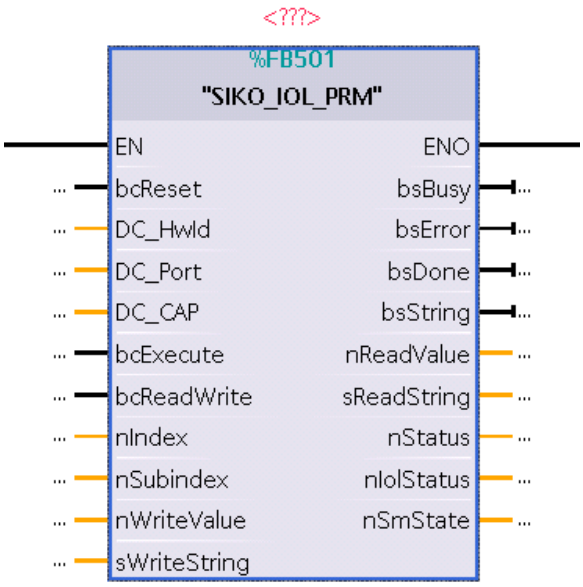

Fig. 1: Function block SIKO_IOL_PRM

3.2 Input Parameter

Name	Type	Description
bcReset	Bool	Reset function block
DC_HwId	HW_IO	Hardware identification of the IOL master module (HW_IO) from HW configuration

Name	Type	Description
DC_Port	Int	Port/channel number on which the IO-Link device is operated. (ET200 = 0 .. 4)
DC_CAP	DInt	Client Access Point (CAP), with ET200 always 227 dec
bcExecute	Bool	Rising edge executes command
bcReadWrite	Bool	Command type 0 = read / 1 write
nIndex	Int	IO-Link index
nSubindex	Int	IO-Link subindex
nWriteValue	DInt	Value to write
sWriteString	String[32]	String to write

3.3 Output Parameter

Name	Type	Description
bsBusy	Bool	Function block status - busy
bsError	Bool	Function block status - error
bsDone	Bool	Function block status - done
bsString	Bool	Function block status - resonse is a string
nReadValue	DInt	Read value
sReadString	String[32]	Read string
nStatus	DWORD	DP/ PNIO - error status ERROR flag = 1 - detailed communication error status
nIolStatus	DWORD	IO-Link error status ERROR flag = 1 - detailed IO-Link error status
nSmState	Int	Status of the function block internal state machine: 0 = SM_IDLE 1 = SM_START_READ_REQUEST 2 = SM_CHECK_READ_RESPONSE 3 = SM_FINISH_READ_CMD 4 = SM_START_WRITE_REQUEST 5 = SM_CHECK_WRITE_RESPONSE 6 = SM_FINISH_WRITE_CMD

3.4 Errors

If a communication error occurs, the output "bsError" will be set. Additionally, an error code will be generated and displayed at the outputs "nStatus" or "nIolStatus".

3.4.1 System Function Block Error Codes

The status of the used SFB 52 (RDREC) or SFB 53 (WRREC) is passed on to the "nStatus" output parameter. The description of the status can, in this case, be found in the online help of the respective SFBs.

3.4.2 IO-Link Specific Error Codes

If there is an IO-Link error, this is displayed at output parameter "nIolStatus" (in this case, the "nStatus" parameter has the value 16#0000 0000). Device error codes are directly mapped into the "nIolStatus". For detailed description see the manual of the AG03 IO-Link.

IO-Link master error codes are also mapped into the nIolStatus.

nIolStatus = DW#16#00000000			
IOL-M Error Code		Device Error Code	
W#16#0000		W#16#0000	
B#16#00	B#16#00	B#16#00	B#16#00

IOL-Master Error Code	Meaning	Explanation
16#0000	No error	No error pending
16#0001	No call	Function ready for new job
16#0002	IO_LINK_CALL write	Function in send state (SEND_REQUEST)
16#0003	IO_LINK_CALL read	Function in polling state (WAIT_ON_RESPONSE)
16#0004 .. 06FF	-	Reserved
16#7000	IO_LINK_CALL conflict	Send and response data inconsitent
16#7001	Wrong IO_LINK_CALL	Decoding error
16#7002	Port blocked	Port occupied by another job or not existing
16#7003 .. 7FFF	-	Reserved
16#8000	Timeout	Timeout. Job could not be performed within the timout period
16#8001	Wrong port address	Port address smaller than 0 or larger than 63
16#8002	Wrong index	Index smaller than 0 or larger than 32767
16#8003	Wrong subindex	Subindex smaller than 0 or larger 255
16#8004	No device	No device connected (however port still in IO-Link mode)
16#8005	Wrong LEN	Invalid length when writing, less than 1 or over 232
16#8006	Wrong LEN	Invalid length when reading, less than 0 or over 232
16#8007	DI/DO mode	Port in DI or DO mode
16#8008	No SPDU	Device in IO-Link mode does not support SPDU
16#8009	-	An upload is not possible, since the function is disabled
16#8010 .. 8051	-	Reserved

IOL-Master Error Code	Meaning	Explanation
16#8053	RDREC Fault	Error occured when calling RDREC, see STATUS
16#8054	WRREC Fault	Error occured when calling WRREC, see STATUS
16#8054	Unexpected acknowledge	Internal error in IO-Link technology (unexpected status during an IO-Link request)
16#8055	Port function failed	Only relevant for port functions
16#8056 .. FFFF	-	Reserved

3.5 Limitations

All parameters are treated as signed integers by the function block during input and output. In the Devices, however, there are also parameters in unsigned representation. As long as these parameters do not exceed the positive value range of a signed integer, the value in the variable nReadValue is displayed correctly.

These value ranges are:

Type	Range MIN	Range MAX
int8_t	-128	127
int16_t	-32768	32767
int32_t	–2147483648	2147483647

The reading and writing of parameters of the data type Record is not supported. If more than 4 characters are returned when reading a numeric parameter, the outputs bsError = 1, bsString = 1 and sReadString = "ERROR: DATA_SIZE_TOO_LARGE" are set.

SIKO GmbH

Weihermattenweg 2
79256 Buchenbach

Phone

+ 49 7661 394-0

Fax

+ 49 7661 394-388

E-Mail

info@siko-global.com

Internet

www.siko-global.com

Service

support@siko-global.com