

AP05 IO-Link

Siemens S7-1200® Interface Module

for TIA Portal® V14 SP1 in SCL

Software Description



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1 General Information

1.1 Trademarks

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1.3 Limitations

The library and its function were tested with a Siemens S7-1215. The module was programmed using Siemens TIA Portal® V14 SP1 Update 10.

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_AP05_IOL_1200_TIA_V14_SP1_Upd10_1.01.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	16.11.2022	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_AP05_IOL_ABS_PDI	Process data input absolute position mode
DT_AP05_IOL_ABS_PDO	Process data output absolute position mode

2.2 DT_AP05_IOL_ABS_PDI UDT

Name	Type	Description
bs08_Reserved	Bool	Used in DisplayMode
bs09_IncrementalMeasurement	Bool	True if incremental measurement is active
bs10_TargetValueState	Bool	True if target value is active
bs11_BatteryState	Bool	True if battery state is critical or low
bs12_SpeedError	Bool	True if max speed was exceeded
bs13_KeyConfiguration	Bool	True if key is actuated
bs14_KeyCalibration	Bool	True if key is actuated
bs15_KeyIncremental	Bool	True if key is actuated
bs00_IndicatorCW	Bool	True if indicator cw is on
bs01_IndicatorCCW	Bool	True if indicator ccw is on

Name	Type	Description
bs02_CalibrationExecuted	Bool	True if calibration was executed by command via interface
bs03_Reserved	Bool	Used in DisplayMode
bs04_GuardingBit	Bool	Communication guarding
bs05_TargetWindowReached	Bool	True if target window is reached
bs06_Deviation	Bool	Deviation from actual value to target
bs07_GeneralError	Bool	True if error occurred
nReserved	Word	
nActualValue	DInt	Absolute position value

2.3 DT_AP05_IOL_ABS_PDO UDT

Name	Type	Description
bc08_Reserved	Bool	Used in DisplayMode
bc09_TargetValueActive	Bool	If true TargetValue is active
bc10_Reserved	Bool	
bc11_Led1Green	Bool	If true LED is on. Function controlled via Parameter LEDMode
bc12_Led1Red	Bool	see bc11
bc13_Led2Green	Bool	see bc11
bc14_Led2Red	Bool	see bc11
bc15_LedBlinking	Bool	If true LEDs are blinking when on
bc00_CalibrationExecute	Bool	If true calibration becomes executed
bc01_Reserved	Bool	
bc02_Reserved	Bool	Used in DisplayMode
bc03_DisplayRange	Bool	If true display range is extended
bc04_GuardingBit	Bool	Communication guarding
bc05_ErrorAck	Bool	If true the actual error is acknowledged
bc06_Reserved	Bool	Used in DisplayMode
bc07_Reserved	Bool	Used in DisplayMode
nReserved	Word	
nTargetValue	DInt	Absolute target value

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

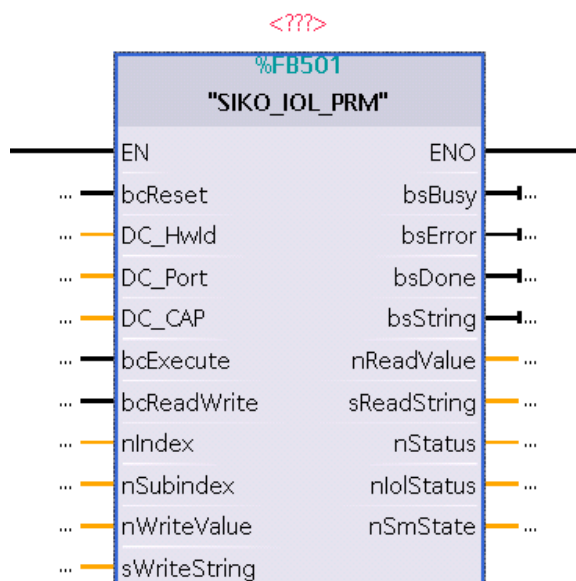


Fig. 1: Function block SIKO_IOL_PRM

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 - response 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
nIoIStatus	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 "nIoIStatus".

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 "nIoIStatus" (in this case, the "nStatus" parameter has the value 16#0000 0000). Device error codes are directly mapped into the "nIoIStatus". For detailed description see the manual of the AP05 IO-Link.

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

nIoIStatus = 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 inconsistent
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 timeout 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 than 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 occurred when calling RDREC, see STATUS
16#8054	WRREC Fault	Error occurred 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.



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