



PLC Integration of HT110_2173

IO-Link service data function block + process data parser function for Beckhoff (TwinCAT 3.x) PLC systems in combination with a EtherCAT IO-Link Master

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1 Legal information


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2 About this document

Please read this chapter carefully before working with this documentation and the Leuze IO-Link device.

2.1 Purpose of use

These instructions have been designed for the technical personnel for the use of the IO-Link PLC blocks.

These instructions are intended to provide support during the commissioning of a Leuze IO-Link sensor using standard software from Siemens. The described module is part of this standard software.

2.2 Target group

These instructions are addressed to programming engineers and the operators of machines and systems, which are operated by one or several IO-Link devices. They also address people, who connect the IO-Link device via an IO-Link-Master-Gateway to a PLC-Control for data exchange.

3 General use of function block

3.1 Short description

The function block "FB_Leuze_IOL_ HT110_2173" simplifies the usage of Leuze IO-Link devices on Beckhoff (TwinCAT 3.x) PLC controls. This FB supports IO-Link Masters which can be connected via EtherCAT to the PLC system.

The function block is device type-specific and thus only suitable for the appropriate Leuze IO-Link devices. The FB interprets the call-up of the acyclic service data between the PLC and the IO-Link device.

The IO-Link function block can only be used in combination with the listed helper functions / libraries.

3.2 Calling and designation



Fig. 3.1: Example of module call

3.3 Configuration

Tab. 3.1: Parameter IN

Parameter	Data type	Description
bExecute	Bool	Positive trigger: Start data transfer
bRW	Bool	Read or write the selected IO-Link parameter. FALSE: Read parameter TRUE: Write Parameter
nPort	T_AmsPort	Port number of the ADS device.
sNetId	T_AmsNetID	String containing the AMS network identifier of the target device to which the ADS command is directed. Beckhoff EL6224/EP6224: AoeNetId of the IO-Link Master
nIdxGroup	UDInt	Index group number.
tTimeOut	Time	Time, after a Timeout-Error is triggered.

Tab. 3.2: Parameter INOUT

Parameter	Data type	Description
stDeviceData	ST_Leuze_IOL_ HT110_2173	Sensor data

See structure description of ST_Leuze_IOL_ HT110_2173 in chapter 7.

Tab. 3.3: Parameter OUT

Parameter	Data type	Description
bDone	Bool	Indicates whether data is valid.

Parameter	Data type	Description
bBusy	Bool	Request in process. FALSE: Request is terminated TRUE: Request is being processed
bError	Bool	Error flag FALSE: No error TRUE: Error detected
stErrorCode	ST_Leuze_IOL_Error	Status of the function block

See structure description of ST_Leuze_IOL_Error in chapter 6.

3.4 Method of function

The function block uses the data structure "ST_Leuze_IOL_HT110_2173". The PLC data structure contains the values of all IO-Link variables. Before you can use it, the structure must be instantiated by a data block. Each IO-Link FB parameter has a data point representing it in this data structure. This data point will be actualized every time a read request was executed successfully.

The desired parameters can be selected via the input variables. Depending on the device definition, IO-Link parameters are read or writable. The input variable must be "bRW" = FALSE to read parameter. The value that should be written can be defined in the data structure, as soon as the input parameter "bRW" = TRUE. You start each transfer by calling up the "FB_Leuze_IOL_HT110_2173" with a positive trigger at the "bExecute" input. As long as there is no valid answer the output "bBusy" is TRUE. In the case that the chosen timeout period has elapsed a timeout error will be generated and the thread will be terminated. The "bDone" = TRUE output shows that the transmission was successful. The outputs retain there states as long as there is no new positive trigger at the "bExecute" input again.

The function block allows you to read or write multiple IO-Link parameters sequentially (multi-selection). Please note that it may happen, that a single parameter can not be written. The function block aborts at this point and it is possible, that the IO-Link device contains an inconsistent set of parameters.

3.5 Behavior when error occurs

An error bit (bError) is set and an error code (ST_Leuze_IOL_Error) generated, if there is a spurious input value or an incorrect input connection of the FB. In this case, no further processing is carried out, until the input has been corrected.

4 Integration into the PLC project

The function block "FB_Leuze_IOL_ HT110_2173" is a part of the TwinCAT V3.x library. The library can be installed by using the Library Repository. Afterwards the library can be added to your project (References --> Add library...).

Integration step by step:

- Download the library
- Open the Library repository in Library Manager tab in Beckhoff TwinCAT
- Click Install... and select downloaded library
- Open Add library in Library Manager tab
- Find installed library under Leuze electronic GmbH + Co. KG

NOTICE	
	If several devices connect to the IO-Link Master, you can only exchange acyclic data (service data) with one device at the same time. Due this restriction, the service data communication blocks must to be blocked against each other.

5 Process data parser function

The function `F_Leuze_PD_HT110_2173` simplifies the interpretation of composed IO-Link process data. This data is provided as a data structure on the PLC side. Some sensors support different process data output. User must select mode of PD according to the sensors settings.

The function is device type-specific and thus only suitable for the appropriated Leuze IO-Link devices.

5.1 Calling and designation



Fig. 5.1: Example of process data parsing function call

5.2 Configuration

Tab. 5.1: Parameters

Parameter name	Declaration	Data type	Description
aProcessData	INPUT	ARRAY OF BYTE	Raw process data of the IO-Link device.
nPDMODE	INPUT	INT	Mode of the PD. User must select mode of PD according to the sensors settings.
bError	OUTPUT	BOOL	Error flag FALSE: No error TRUE: Error detected
F_Leuze_PD_HT110_2173	OUTPUT	ST_Leuze_PD_HT110_2173	Reference to the instance of the data structure ST_Leuze_PD_HT110_2173. The structure includes the disaggregated values of the process data.

See structure description of `ST_Leuze_PD_HT110_2173` in chapter 7.

6 Error description

The parameter "ErrorCode" can be interpreted using the PLC data type ST_Leuze_IOL_Error. This data type contains the following error information:

Tab. 6.1: ST_Leuze_IOL_Error description

Parameter name	Data type	Description
ErrorStatus.nBlockError	WORD	Error number representing FB where error occurred
ErrorStatus.nAdsReadError	UDINT	ADS read error code
ErrorStatus.nAdsWriteError	UDINT	ADS write error code
ErrorStatus.nIndex	INT	IO-Link index to which the error code refers
ErrorStatus.nSubIndex	INT	IO-Link sub-index to which the error code refers

Tab. 6.2: Error description for nBlockError

Error code (nBlockError)	Error description
0x0000	No error
0x8001	Time out error occurred
0x8002	No parameter selected
0x8003	Error in FB_Leuze_IOL_AdsReadWrite block

For additional information see the Beckhoff ADS Return Codes (<https://infosys.beckhoff.com>).

7 Data structures

Tab. 7.1: ST_Leuze_IOL_HT110_2173

Parameter name	Data type	Description
stDeviceData.stSelection.stCommands.bDeviceReset	BOOL	[WRITE_ONLY] Device Reset
stDeviceData.stSelection.stCommands.bApplicationReset	BOOL	[WRITE_ONLY] Application Reset
stDeviceData.stSelection.stCommands.bRestoreFactorySettings	BOOL	[WRITE_ONLY] Restore Factory Settings
stDeviceData.stSelection.stCommands.bEmitterOff	BOOL	[WRITE_ONLY] Emitter OFF
stDeviceData.stSelection.stCommands.bEmitterOn	BOOL	[WRITE_ONLY] Emitter ON
stDeviceData.stSelection.stCommands.bResetSwitchingChannel	BOOL	[WRITE_ONLY] Reset switching-channel
stDeviceData.stSelection.stCommands.bDetectSensor	BOOL	[WRITE_ONLY] Detect Sensor
stDeviceData.stSelection.stCommands.bTeachApply	BOOL	[WRITE_ONLY] Teach Apply
stDeviceData.stSelection.stCommands.bSingleValueTeachSwitchpoint1	BOOL	[WRITE_ONLY] Single value teach - switchpoint 1
stDeviceData.stSelection.stCommands.bSingleValueTeachSwitchpoint2	BOOL	[WRITE_ONLY] Single value teach - switchpoint 2
stDeviceData.stSelection.stCommands.bTwoValueTeachTeachpoint1ForSwitchpoint1	BOOL	[WRITE_ONLY] Two value teach - teachpoint 1 for switchpoint 1
stDeviceData.stSelection.stCommands.bTwoValueTeachTeachpoint2ForSwitchpoint1	BOOL	[WRITE_ONLY] Two value teach - teachpoint 2 for switchpoint 1
stDeviceData.stSelection.stCommands.bTwoValueTeachTeachpoint1ForSwitchpoint2	BOOL	[WRITE_ONLY] Two value teach - teachpoint 1 for switchpoint 2
stDeviceData.stSelection.stCommands.bTwoValueTeachTeachpoint2ForSwitchpoint2	BOOL	[WRITE_ONLY] Two value teach - teachpoint 2 for switchpoint 2
stDeviceData.stSelection.stCommands.bDynamicTeachSwitchpoint1Start	BOOL	[WRITE_ONLY] Dynamic teach - switchpoint 1 - start
stDeviceData.stSelection.stCommands.bDynamicTeachSwitchpoint1Stop	BOOL	[WRITE_ONLY] Dynamic teach - switchpoint 1 - stop
stDeviceData.stSelection.stCommands.bDynamicTeachSwitchpoint2Start	BOOL	[WRITE_ONLY] Dynamic teach - switchpoint 2 - start
stDeviceData.stSelection.stCommands.bDynamicTeachSwitchpoint2Stop	BOOL	[WRITE_ONLY] Dynamic teach - switchpoint 2 - stop
stDeviceData.stSelection.stCommands.bTeachInCancel	BOOL	[WRITE_ONLY] Teach-in cancel
stDeviceData.stSelection.stDirectParameters1.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stDirectParameters1.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stDirectParameters1.bReserved_1	BOOL	[READ_ONLY]

Parameter name	Data type	Description
stDeviceData.stSelection.stDirectParameters1.bMasterCycleTime	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bMinCycleTime	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bMSequenceCapability	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bIoLinkVersionId	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bProcessDataInputLength	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bProcessDataOutputLength	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bVendorId1	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bVendorId2	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bDeviceId1	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bDeviceId2	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bDeviceId3	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bReserved_13	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bReserved_14	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1.bReserved_15	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters2.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter1	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter2	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter3	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter4	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter5	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter6	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter7	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter8	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter9	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter10	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter11	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2.bDeviceSpecificParameter12	BOOL	[READ_WRITE]

Parameter name	Data type	Description
stDeviceData.stSelection.stDirectParameters2. bDeviceSpecificParameter13	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2. bDeviceSpecificParameter14	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2. bDeviceSpecificParameter15	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParameters2. bDeviceSpecificParameter16	BOOL	[READ_WRITE]
stDeviceData.stSelection.bStandardCommand	BOOL	[WRITE_ONLY]
stDeviceData.stSelection.stDeviceAccessLocks.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.bVendorName	BOOL	[READ_ONLY]
stDeviceData.stSelection.bVendorText	BOOL	[READ_ONLY]
stDeviceData.stSelection.bProductName	BOOL	[READ_ONLY]
stDeviceData.stSelection.bProductId	BOOL	[READ_ONLY]
stDeviceData.stSelection.bProductText	BOOL	[READ_ONLY]
stDeviceData.stSelection.bSerialNumber	BOOL	[READ_ONLY]
stDeviceData.stSelection.bFirmwareVersion	BOOL	[READ_ONLY]
stDeviceData.stSelection.bApplicationSpecificTag	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSwitchingOutputTeachIn.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stSwitchingOutputTeachIn. bTeachChannel	BOOL	[READ_WRITE]
stDeviceData.stSelection.stTeachInStatus.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stTeachInStatus.bTeachStatus	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDefineSwitchingOutputQ1.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stDefineSwitchingOutputQ1. bSwitchpoint1	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDefineSwitchingOutputQ1. bSwitchpoint2	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSetUpSwitchingOutputQ1.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stSetUpSwitchingOutputQ1.bNoNc	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSetUpSwitchingOutputQ1. bSwitchingMode	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSetUpSwitchingOutputQ1.bHysteresis	BOOL	[READ_WRITE]

Parameter name	Data type	Description
stDeviceData.stSelection.stDefineSwitchingOutputQ2.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stDefineSwitchingOutputQ2.bSwitchpoint1	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDefineSwitchingOutputQ2.bSwitchpoint2	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSetUpSwitchingOutputQ2.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stSetUpSwitchingOutputQ2.bNoNc	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSetUpSwitchingOutputQ2.bSwitchingMode	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSetUpSwitchingOutputQ2.bHysteresis	BOOL	[READ_WRITE]
stDeviceData.stSelection.stEventOnOff.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stEventOnOff.bEventOnOff	BOOL	[READ_WRITE]
stDeviceData.stSelection.stTemperature.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stTemperature.bOperatingTemperature	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTemperature.bMaxOperatingTemperatureSinceRestart	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTemperature.bMinOperatingTemperatureSinceRestart	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTemperature.bMaxLifetimeTemperature	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTemperature.bMinLifetimeTemperature	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTemperature_Event_Level.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stTemperature_Event_Level.bLimitTemperatureMin	BOOL	[READ_WRITE]
stDeviceData.stSelection.stTemperature_Event_Level.bLimitTemperatureMax	BOOL	[READ_WRITE]
stDeviceData.stSelection.stOperatingData.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stOperatingData.bCounterOperatingHours	BOOL	[READ_ONLY]
stDeviceData.stSelection.stOperatingData.bCounterSwitchCycle	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTypelabel.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stTypelabel.bMeasurementRange	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTypelabel.bResolution	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTypelabel.bLinearity	BOOL	[READ_ONLY]

Parameter name	Data type	Description
stDeviceData.stSelection.stTypelabel.bHysteresis	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTypelabel.bTypeOfLightAndLaserClass	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTypelabel.bNoLoadCurrent	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTypelabel.bSwitchingFrequency	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTypelabel.bWarmUpTime	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTypelabel.bAmbientTemperature	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTypelabel.bOutputSignal	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTypelabel.bRepeatability	BOOL	[READ_ONLY]
stDeviceData.stSelection.bSignalQualityLevel	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSmartfunctionsSwitchingQ1.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stSmartfunctionsSwitchingQ1.bCounter	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSmartfunctionsSwitchingQ1.bOnDelay	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSmartfunctionsSwitchingQ1.bOffDelay	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSmartfunctionsSwitchingQ1.bImpulse	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSmartfunctionsSwitchingQ1.bMonitoringFrequency	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSmartfunctionsSwitchingQ2.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stSmartfunctionsSwitchingQ2.bCounter	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSmartfunctionsSwitchingQ2.bOnDelay	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSmartfunctionsSwitchingQ2.bOffDelay	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSmartfunctionsSwitchingQ2.bImpulse	BOOL	[READ_WRITE]
stDeviceData.stSelection.stSmartfunctionsSwitchingQ2.bMonitoringFrequency	BOOL	[READ_WRITE]
stDeviceData.stSelection.stFunctionQ1.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stFunctionQ1.bPnpNpn	BOOL	[READ_WRITE]
stDeviceData.stSelection.stFunctionSwitchingOutputQ2.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stFunctionSwitchingOutputQ2.bPnpNpn	BOOL	[READ_WRITE]
stDeviceData.stSelection.stFunctionSwitchingOutputQ2.bFunctionQ2	BOOL	[READ_WRITE]

Parameter name	Data type	Description
stDeviceData.stSelection.stFunctionControllInput.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stFunctionControllInput.bControllInput	BOOL	[READ_WRITE]
stDeviceData.stSelection.bTest_252	BOOL	[READ_WRITE] Event generation
stDeviceData.stSelection.bTest_253	BOOL	[READ_WRITE] Test parameter
stDeviceData.stSelection.bTest_254	BOOL	[READ_WRITE] Test Parameter
stDeviceData.stSelection.bTest_16382	BOOL	[READ_WRITE] Teste Parameter
stDeviceData.stData.stCommands.nDeviceReset	UINT	[WRITE_ONLY] Device Reset
stDeviceData.stData.stCommands.nApplicationReset	UINT	[WRITE_ONLY] Application Reset
stDeviceData.stData.stCommands.nRestoreFactorySettings	UINT	[WRITE_ONLY] Restore Factory Settings
stDeviceData.stData.stCommands.nEmitterOff	UINT	[WRITE_ONLY] Emitter OFF
stDeviceData.stData.stCommands.nEmitterOn	UINT	[WRITE_ONLY] Emitter ON
stDeviceData.stData.stCommands.nResetSwitchingChannel	UINT	[WRITE_ONLY] Reset switching-channel
stDeviceData.stData.stCommands.nDetectSensor	UINT	[WRITE_ONLY] Detect Sensor
stDeviceData.stData.stCommands.nTeachApply	UINT	[WRITE_ONLY] Teach Apply
stDeviceData.stData.stCommands.nSingleValueTeachSwitchpoint1	UINT	[WRITE_ONLY] Single value teach - switchpoint 1
stDeviceData.stData.stCommands.nSingleValueTeachSwitchpoint2	UINT	[WRITE_ONLY] Single value teach - switchpoint 2
stDeviceData.stData.stCommands.nTwoValueTeachTeachpoint1ForSwitchpoint1	UINT	[WRITE_ONLY] Two value teach - teachpoint 1 for switchpoint 1
stDeviceData.stData.stCommands.nTwoValueTeachTeachpoint2ForSwitchpoint1	UINT	[WRITE_ONLY] Two value teach - teachpoint 2 for switchpoint 1
stDeviceData.stData.stCommands.nTwoValueTeachTeachpoint1ForSwitchpoint2	UINT	[WRITE_ONLY] Two value teach - teachpoint 1 for switchpoint 2
stDeviceData.stData.stCommands.nTwoValueTeachTeachpoint2ForSwitchpoint2	UINT	[WRITE_ONLY] Two value teach - teachpoint 2 for switchpoint 2
stDeviceData.stData.stCommands.nDynamicTeachSwitchpoint1Start	UINT	[WRITE_ONLY] Dynamic teach - switchpoint 1 - start
stDeviceData.stData.stCommands.nDynamicTeachSwitchpoint1Stop	UINT	[WRITE_ONLY] Dynamic teach - switchpoint 1 - stop
stDeviceData.stData.stCommands.nDynamicTeachSwitchpoint2Start	UINT	[WRITE_ONLY] Dynamic teach - switchpoint 2 - start
stDeviceData.stData.stCommands.nDynamicTeachSwitchpoint2Stop	UINT	[WRITE_ONLY] Dynamic teach - switchpoint 2 - stop

Parameter name	Data type	Description
stDeviceData.stData.stCommands.nTeachInCancel	UINT	[WRITE_ONLY] Teach-in cancel
stDeviceData.stData.stDirectParameters1.nReserved_1	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nMasterCycleTime	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nMinCycleTime	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nMSequenceCapability	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nIoLinkVersionId	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nProcessDataInputLength	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nProcessDataOutputLength	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nVendorId1	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nVendorId2	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nDeviceId1	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nDeviceId2	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nDeviceId3	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nReserved_13	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nReserved_14	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters1.nReserved_15	UINT	[READ_ONLY]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter1	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter2	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter3	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter4	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter5	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter6	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter7	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter8	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter9	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter10	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter11	UINT	[READ_WRITE]

Parameter name	Data type	Description
stDeviceData.stData.stDirectParameters2. nDeviceSpecificParameter12	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2. nDeviceSpecificParameter13	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2. nDeviceSpecificParameter14	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2. nDeviceSpecificParameter15	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParameters2. nDeviceSpecificParameter16	UINT	[READ_WRITE]
stDeviceData.stData.nStandardCommand	UINT	[WRITE_ONLY]
stDeviceData.stData.stDeviceAccessLocks. bParameterWriteAccessLock	BOOL	[READ_WRITE]
stDeviceData.stData.stDeviceAccessLocks.bDataStorageLock	BOOL	[READ_WRITE]
stDeviceData.stData.stDeviceAccessLocks. bLocalParameterizationLock	BOOL	[READ_WRITE]
stDeviceData.stData.stDeviceAccessLocks. bLocalUserInterfaceLock	BOOL	[READ_WRITE]
stDeviceData.stData.sVendorName	STRING	[READ_ONLY]
stDeviceData.stData.sVendorText	STRING	[READ_ONLY]
stDeviceData.stData.sProductName	STRING	[READ_ONLY]
stDeviceData.stData.sProductId	STRING	[READ_ONLY]
stDeviceData.stData.sProductText	STRING	[READ_ONLY]
stDeviceData.stData.sSerialNumber	STRING	[READ_ONLY]
stDeviceData.stData.sFirmwareVersion	STRING	[READ_ONLY]
stDeviceData.stData.sApplicationSpecificTag	STRING	[READ_WRITE]
stDeviceData.stData.stSwitchingOutputTeachIn.nTeachChannel	UINT	[READ_WRITE]
stDeviceData.stData.stTeachInStatus.nTeachStatus	UINT	[READ_ONLY]
stDeviceData.stData.stDefineSwitchingOutputQ1.nSwitchpoint1	UINT	[READ_WRITE]
stDeviceData.stData.stDefineSwitchingOutputQ1.nSwitchpoint2	UINT	[READ_WRITE]
stDeviceData.stData.stSetUpSwitchingOutputQ1.nNoNc	UINT	[READ_WRITE]
stDeviceData.stData.stSetUpSwitchingOutputQ1.nSwitchingMode	UINT	[READ_WRITE]
stDeviceData.stData.stSetUpSwitchingOutputQ1.nHysteresis	UINT	[READ_WRITE]
stDeviceData.stData.stDefineSwitchingOutputQ2.nSwitchpoint1	UINT	[READ_WRITE]
stDeviceData.stData.stDefineSwitchingOutputQ2.nSwitchpoint2	UINT	[READ_WRITE]

Parameter name	Data type	Description
stDeviceData.stData.stSetUpSwitchingOutputQ2.nNoNc	UINT	[READ_WRITE]
stDeviceData.stData.stSetUpSwitchingOutputQ2.nSwitchingMode	UINT	[READ_WRITE]
stDeviceData.stData.stSetUpSwitchingOutputQ2.nHysteresis	UINT	[READ_WRITE]
stDeviceData.stData.stEventOnOff.nEventOnOff	INT	[READ_WRITE]
stDeviceData.stData.stTemperature.nOperatingTemperature	INT	[READ_ONLY]
stDeviceData.stData.stTemperature. nMaxOperatingTemperatureSinceRestart	INT	[READ_ONLY]
stDeviceData.stData.stTemperature. nMinOperatingTemperatureSinceRestart	INT	[READ_ONLY]
stDeviceData.stData.stTemperature.nMaxLifetimeTemperature	INT	[READ_ONLY]
stDeviceData.stData.stTemperature.nMinLifetimeTemperature	INT	[READ_ONLY]
stDeviceData.stData.stTemperature_Event_Level. nLimitTemperatureMin	INT	[READ_WRITE]
stDeviceData.stData.stTemperature_Event_Level. nLimitTemperatureMax	INT	[READ_WRITE]
stDeviceData.stData.stOperatingData.nCounterOperatingHours	UINT	[READ_ONLY]
stDeviceData.stData.stOperatingData.nCounterSwitchCycle	UINT	[READ_ONLY]
stDeviceData.stData.stTypelabel.sMeasurementRange	STRING	[READ_ONLY]
stDeviceData.stData.stTypelabel.sResolution	STRING	[READ_ONLY]
stDeviceData.stData.stTypelabel.sLinearity	STRING	[READ_ONLY]
stDeviceData.stData.stTypelabel.sHysteresis	STRING	[READ_ONLY]
stDeviceData.stData.stTypelabel.sTypeOfLightAndLaserClass	STRING	[READ_ONLY]
stDeviceData.stData.stTypelabel.sNoLoadCurrent	STRING	[READ_ONLY]
stDeviceData.stData.stTypelabel.sSwitchingFrequency	STRING	[READ_ONLY]
stDeviceData.stData.stTypelabel.sWarmUpTime	STRING	[READ_ONLY]
stDeviceData.stData.stTypelabel.sAmbientTemperature	STRING	[READ_ONLY]
stDeviceData.stData.stTypelabel.sOutputSignal	STRING	[READ_ONLY]
stDeviceData.stData.stTypelabel.sRepeatability	STRING	[READ_ONLY]
stDeviceData.stData.nSignalQualityLevel	UINT	[READ_WRITE]
stDeviceData.stData.stSmartfunctionsSwitchingQ1.nCounter	UINT	[READ_WRITE]
stDeviceData.stData.stSmartfunctionsSwitchingQ1.nOnDelay	UINT	[READ_WRITE]

Parameter name	Data type	Description
stDeviceData.stData.stSmartfunctionsSwitchingQ1.nOffDelay	UINT	[READ_WRITE]
stDeviceData.stData.stSmartfunctionsSwitchingQ1.nImpulse	UINT	[READ_WRITE]
stDeviceData.stData.stSmartfunctionsSwitchingQ1.nMonitoringFrequency	UINT	[READ_WRITE]
stDeviceData.stData.stSmartfunctionsSwitchingQ2.nCounter	UINT	[READ_WRITE]
stDeviceData.stData.stSmartfunctionsSwitchingQ2.nOnDelay	UINT	[READ_WRITE]
stDeviceData.stData.stSmartfunctionsSwitchingQ2.nOffDelay	UINT	[READ_WRITE]
stDeviceData.stData.stSmartfunctionsSwitchingQ2.nImpulse	UINT	[READ_WRITE]
stDeviceData.stData.stSmartfunctionsSwitchingQ2.nMonitoringFrequency	UINT	[READ_WRITE]
stDeviceData.stData.stFunctionQ1.nPnpNpn	UINT	[READ_WRITE]
stDeviceData.stData.stFunctionSwitchingOutputQ2.nPnpNpn	UINT	[READ_WRITE]
stDeviceData.stData.stFunctionSwitchingOutputQ2.nFunctionQ2	UINT	[READ_WRITE]
stDeviceData.stData.stFunctionControllInput.nControllInput	UINT	[READ_WRITE]
stDeviceData.stData.nTest_252	UINT	[READ_WRITE] Event generation
stDeviceData.stData.nTest_253	UINT	[READ_WRITE] Test parameter
stDeviceData.stData.sTest_254	STRING	[READ_WRITE] Test Parameter
stDeviceData.stData.sTest_16382	STRING	[READ_WRITE] Teste Parameter

Tab. 7.2: ST_Leuze_PD_HT110_2173

Parameter name	Data type	Description
ST_Leuze_PD_HT110_2173.nSignalQuality	INT	
ST_Leuze_PD_HT110_2173.bSignalValid	BOOL	
ST_Leuze_PD_HT110_2173.bSwitchingQ2	BOOL	
ST_Leuze_PD_HT110_2173.bSwitchingQ1	BOOL	

8 Parameter descriptions

Tab. 8.1: IODD parameter descriptions

(AR - Access Rights, R - Read only, W - Write only, RW - Read and Write, NS - Not specified)

Parameter	Index	Subindex	Data type	Default	AR	Description
Commands			RecordT		W	
Device Reset			UIntegerT	128	W	Device Reset
Application Reset			UIntegerT	129	W	Application Reset
Restore Factory Settings			UIntegerT	130	W	Restore Factory Settings
Emitter OFF			UIntegerT	160	W	Emitter OFF
Emitter ON			UIntegerT	161	W	Emitter ON
Reset switching-channel			UIntegerT	162	W	Reset switching-channel
Detect Sensor			UIntegerT	175	W	Detect Sensor
Teach Apply			UIntegerT	64	W	Teach Apply
Single value teach - switchpoint 1			UIntegerT	65	W	Single value teach - switchpoint 1
Single value teach - switchpoint 2			UIntegerT	66	W	Single value teach - switchpoint 2
Two value teach - teachpoint 1 for switchpoint 1			UIntegerT	67	W	Two value teach - teachpoint 1 for switchpoint 1
Two value teach - teachpoint 2 for switchpoint 1			UIntegerT	68	W	Two value teach - teachpoint 2 for switchpoint 1
Two value teach - teachpoint 1 for switchpoint 2			UIntegerT	69	W	Two value teach - teachpoint 1 for switchpoint 2
Two value teach - teachpoint 2 for switchpoint 2			UIntegerT	70	W	Two value teach - teachpoint 2 for switchpoint 2
Dynamic teach - switchpoint 1 - start			UIntegerT	71	W	Dynamic teach - switchpoint 1 - start
Dynamic teach - switchpoint 1 - stop			UIntegerT	72	W	Dynamic teach - switchpoint 1 - stop
Dynamic teach - switchpoint 2 - start			UIntegerT	73	W	Dynamic teach - switchpoint 2 - start
Dynamic teach - switchpoint 2 - stop			UIntegerT	74	W	Dynamic teach - switchpoint 2 - stop
Teach-in cancel			UIntegerT	79	W	Teach-in cancel
Direct Parameters 1	0	0	RecordT		RW	
Reserved	0	1	UIntegerT		R	
Master Cycle Time	0	2	UIntegerT		R	

Parameter	Index	Subindex	Data type	Default	AR	Description
Min Cycle Time	0	3	UIntegerT		R	
M-Sequence Capability	0	4	UIntegerT		R	
IO-Link Version ID	0	5	UIntegerT	17	R	
Process Data Input Length	0	6	UIntegerT		R	
Process Data Output Length	0	7	UIntegerT		R	
Vendor ID 1	0	8	UIntegerT		R	
Vendor ID 2	0	9	UIntegerT		R	
Device ID 1	0	10	UIntegerT		R	
Device ID 2	0	11	UIntegerT		R	
Device ID 3	0	12	UIntegerT		R	
Reserved	0	13	UIntegerT		R	
Reserved	0	14	UIntegerT		R	
Reserved	0	15	UIntegerT		R	
Standard Command	0	16	UIntegerT		W	(0 ... 63): Reserved 128: Device Reset 129: Application Reset 130: Restore Factory Settings (131 ... 159): Reserved
Direct Parameters 2	1	0	RecordT		RW	
Device Specific Parameter 1	1	1	UIntegerT		RW	
Device Specific Parameter 2	1	2	UIntegerT		RW	
Device Specific Parameter 3	1	3	UIntegerT		RW	
Device Specific Parameter 4	1	4	UIntegerT		RW	
Device Specific Parameter 5	1	5	UIntegerT		RW	
Device Specific Parameter 6	1	6	UIntegerT		RW	
Device Specific Parameter 7	1	7	UIntegerT		RW	
Device Specific Parameter 8	1	8	UIntegerT		RW	
Device Specific Parameter 9	1	9	UIntegerT		RW	
Device Specific Parameter 10	1	10	UIntegerT		RW	
Device Specific Parameter 11	1	11	UIntegerT		RW	

Parameter	Index	Subindex	Data type	Default	AR	Description
Device Specific Parameter 12	1	12	UIntegerT		RW	
Device Specific Parameter 13	1	13	UIntegerT		RW	
Device Specific Parameter 14	1	14	UIntegerT		RW	
Device Specific Parameter 15	1	15	UIntegerT		RW	
Device Specific Parameter 16	1	16	UIntegerT		RW	
Standard Command	2	0	UIntegerT		W	(0 ... 63): Reserved 128: Device Reset 129: Application Reset 130: Restore Factory Settings (131 ... 159): Reserved 160: Emitter OFF 161: Emitter ON 162: Reset switching-channel 175: Detect Sensor 64: Teach Apply 65: Single value teach - switchpoint 1 66: Single value teach - switchpoint 2 67: Two value teach - teachpoint 1 for switchpoint 1 68: Two value teach - teachpoint 2 for switchpoint 1 69: Two value teach - teachpoint 1 for switchpoint 2 70: Two value teach - teachpoint 2 for switchpoint 2 71: Dynamic teach - switchpoint 1 - start 72: Dynamic teach - switchpoint 1 - stop 73: Dynamic teach - switchpoint 2 - start 74: Dynamic teach - switchpoint 2 - stop 79: Teach-in cancel
Device Access Locks	12	0	RecordT		RW	
Parameter (write) Access Lock	12	1	BooleanT		RW	
Data Storage Lock	12	2	BooleanT		RW	
Local Parameterization Lock	12	3	BooleanT		RW	
Local User Interface Lock	12	4	BooleanT		RW	
Vendor Name	16	0	StringT	Leuze electronic GmbH + Co. KG	R	
Vendor Text	17	0	StringT	www.leuze.com	R	
Product Name	18	0	StringT	HT110L1.3/L6T-M12	R	
Product ID	19	0	StringT	50138062	R	

Parameter	Index	Subindex	Data type	Default	AR	Description
Product Text	20	0	StringT	distance sensor	R	
Serial Number	21	0	StringT	Ser.-No	R	
Firmware Version	23	0	StringT	1.0	R	
Application Specific Tag	24	0	StringT	***** ***** *****	RW	
Switching output Teach-In	58	0	RecordT		RW	
Teach channel	58	1	UIntegerT	0	RW	(0 ... 2): 0...2
Teach-in-status	59	0	RecordT		R	
Teach status	59	1	UIntegerT		R	0: Idle 1: Teach successful 2: Teach successful 3: Teach successful 4: Wait for command 5: Busy 7: Error
Define switching output Q1	60	0	RecordT		RW	
Switchpoint 1	60	1	UIntegerT	3000	RW	(60 ... 5000): 60...5000
Switchpoint 2	60	2	UIntegerT	3100	RW	(60 ... 5000): 60...5000
Set-Up switching output Q1	61	0	RecordT		RW	
NO / NC	61	1	UIntegerT	0	RW	0: NO 1: NC
Switching mode	61	2	UIntegerT	1	RW	0: Off 1: Single Point Mode 2: Window Mode 3: Two Point Mode
Hysteresis	61	3	UIntegerT	0	RW	0: not adjustable
Define switching output Q2	62	0	RecordT		RW	
Switchpoint 1	62	1	UIntegerT	3000	RW	(60 ... 5000): 60...5000
Switchpoint 2	62	2	UIntegerT	3100	RW	(60 ... 5000): 60...5000
Set-Up switching output Q2	63	0	RecordT		RW	
NO / NC	63	1	UIntegerT	0	RW	0: NO 1: NC
Switching mode	63	2	UIntegerT	1	RW	0: Off 1: Single Point Mode 2: Window Mode 3: Two Point Mode
Hysteresis	63	3	UIntegerT	0	RW	0: not adjustable
Event ON / OFF	81	0	RecordT		RW	

Parameter	Index	Subindex	Data type	Default	AR	Description
Event ON / OFF	81	1	IntegerT	31	RW	(0 ... 31)
Temperature	82	0	RecordT		R	
Operating temperature	82	1	IntegerT		R	
Max. operating temperature since restart	82	2	IntegerT		R	
Min. operating temperature since restart	82	3	IntegerT		R	
Max. lifetime temperature	82	4	IntegerT		R	
Min. lifetime temperature	82	5	IntegerT		R	
Temperature_Event_Level	83	0	RecordT		RW	
Limit Temperature min	83	1	IntegerT	-20	RW	(-40 ... 100)
Limit Temperature max	83	2	IntegerT	80	RW	(-40 ... 100)
Operating data	88	0	RecordT		R	
Counter operating hours	88	1	UIntegerT		R	
Counter switch cycle	88	2	UIntegerT		R	
Typelabel	95	0	RecordT		R	
Measurement range	95	1	StringT		R	
Resolution	95	2	StringT		R	
Linearity	95	3	StringT		R	
Hysteresis	95	4	StringT		R	
Type of light and laser class	95	5	StringT		R	
No-load current	95	6	StringT		R	
Switching frequency	95	7	StringT		R	
Warm-up time	95	8	StringT		R	
Ambient temperature	95	9	StringT		R	
Output signal	95	10	StringT		R	
Repeatability	95	11	StringT		R	
Signal quality level	196	0	UIntegerT	10	RW	(10 ... 90)
Smartfunctions switching Q1	208	0	RecordT		RW	

Parameter	Index	Subindex	Data type	Default	AR	Description
Counter	208	1	UIntegerT	0	RW	(0 ... 65535): 0...65535
On-delay	208	2	UIntegerT	0	RW	(0 ... 65535): 0...65535
Off-delay	208	3	UIntegerT	0	RW	(0 ... 65535): 0...65535
Impulse	208	4	UIntegerT	0	RW	(0 ... 65535): 0...65535
Monitoring frequency	208	5	UIntegerT	0	RW	(0 ... 500): 0...50.0
Smartfunctions switching Q2	209	0	RecordT		RW	
Counter	209	1	UIntegerT	0	RW	(0 ... 65535): 0...65535
On-delay	209	2	UIntegerT	0	RW	(0 ... 65535): 0...65535
Off-delay	209	3	UIntegerT	0	RW	(0 ... 65535): 0...65535
Impulse	209	4	UIntegerT	0	RW	(0 ... 65535): 0...65535
Monitoring frequency	209	5	UIntegerT	0	RW	(0 ... 500): 0...50.0
Function Q1	213	0	RecordT		RW	
PNP / NPN	213	1	UIntegerT	2	RW	0: NPN 1: PNP 2: Autodetect
Function switching output Q2	214	0	RecordT		RW	
PNP / NPN	214	1	UIntegerT	2	RW	0: NPN 1: PNP 2: Autodetect
Function Q2	214	2	UIntegerT	0	RW	0: Switching output Q2 1: Antivalent
Function control input	221	0	RecordT		RW	
Control input	221	1	UIntegerT	1	RW	0: Control input disable 1: Control input enable
Test_252	252	0	UIntegerT		RW	Event generation 0: A_Appear 1: A_Disappear 2: B_Appear 3: B_Disappear
Test_253	253	0	UIntegerT		RW	Test parameter
Test_254	254	0	OctetStringT		RW	Test Parameter
Test_16382	16382	0	OctetStringT		RW	Teste Parameter

9 Technical specifications

9.1 General data

Tab. 9.1: Sensor and IODD version

IODD version	V1.0
IODD release date	2018-5-7
Device family	Distance sensors
Device ID	2173
Device name	HT110L1.3/L6T-M12
Device variants	HT110L1.3/L6T-M12 (50138062)