



PLC Integration of HTU_3072

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


1.1 Disclaimer

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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_ HTU_3072" 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_ HTU_3072	Sensor data

See structure description of ST_Leuze_IOL_ HTU_3072 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_HTU_3072". 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_HTU_3072" 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_ HTU_3072" 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_HTU_3072 simplifies the interpretation of composed IO-Link process data. This data is provided as a data structure on the PLC side. Some sensors supports 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_HTU_3072	OUTPUT	ST_Leuze_PD_HTU_3072	Reference to the instance of the data structure ST_Leuze_PD_HTU_3072. The structure includes the disaggregated values of the process data.

See structure description of ST_Leuze_PD_HTU_3072 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_HTU_3072

Parameter name	Data type	Description
stDeviceData.stSelection.stCommands.bCmdDeviceReset	BOOL	[WRITE_ONLY] Device Reset
stDeviceData.stSelection.stCommands.bCmdApplicationReset	BOOL	[WRITE_ONLY] Application Reset
stDeviceData.stSelection.stCommands.bCmdRestoreFactorySettings	BOOL	[WRITE_ONLY] Restore Factory Settings
stDeviceData.stSelection.stCommands.bCmdSp1Teach	BOOL	[WRITE_ONLY] SP1 Teach
stDeviceData.stSelection.stCommands.bCmdSp2Teach	BOOL	[WRITE_ONLY] SP2 Teach
stDeviceData.stSelection.stCommands.bCmdCancelTeach	BOOL	[WRITE_ONLY] Cancel Teach
stDeviceData.stSelection.stCommands.bCmdTransmitterOff	BOOL	[WRITE_ONLY] Transmitter OFF
stDeviceData.stSelection.stCommands.bCmdTransmitterOn	BOOL	[WRITE_ONLY] Transmitter ON
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]
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]

Parameter name	Data type	Description
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]
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]

Parameter name	Data type	Description
stDeviceData.stSelection.bApplicationSpecificTag	BOOL	[READ_WRITE]
stDeviceData.stSelection.bDeviceStatus	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDetailedDeviceStatus.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stTeachInStatus.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stTeachInStatus.bSetpointValueSp2TeachFlag	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTeachInStatus.bSetpointValueSp1TeachFlag	BOOL	[READ_ONLY]
stDeviceData.stSelection.stTeachInStatus.bTeachState	BOOL	[READ_ONLY]
stDeviceData.stSelection.stSetpoints_60.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stSetpoints_60.bSetpointValueSp1Out1	BOOL	[READ_WRITE] Value of far setpoint
stDeviceData.stSelection.stSetpoints_60.bSetpointValueSp2Out1	BOOL	[READ_WRITE] Value of near setpoint
stDeviceData.stSelection.stConfiguration_61.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stConfiguration_61.bLogic	BOOL	[READ_WRITE] The behaviour of the switching output can be inverted
stDeviceData.stSelection.stConfiguration_61.bMode	BOOL	[READ_WRITE] Window Mode: The sensor changes the output state between the switching points SP1 and SP2 Two Point Mode: The switching points SP1 and SP2 define the hysteresis range
stDeviceData.stSelection.stConfiguration_61.bSwitchingOutput1OnDelay	BOOL	[READ_WRITE] defines the delay in number of update cycles until a consecutive logic on signal is propagated to the output (Update Cycle Time can be found in the General Settings)
stDeviceData.stSelection.stConfiguration_61.bSwitchingOutput1OffDelay	BOOL	[READ_WRITE] defines the delay in number of update cycles until a consecutive logic off signal is propagated to the output (Update Cycle Time can be found in the General Settings)
stDeviceData.stSelection.stSetpoints_62.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stSetpoints_62.bSetpointValueSp1Out2	BOOL	[READ_WRITE] Value of far setpoint
stDeviceData.stSelection.stSetpoints_62.bSetpointValueSp2Out2	BOOL	[READ_WRITE] Value of near setpoint

Parameter name	Data type	Description
stDeviceData.stSelection.stConfiguration_63.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stConfiguration_63.bLogic	BOOL	[READ_WRITE] The behaviour of the switching output can be inverted
stDeviceData.stSelection.stConfiguration_63.bMode	BOOL	[READ_WRITE] Window Mode: The sensor changes the output state between the switching points SP1 and SP2 Two Point Mode: The switching points SP1 and SP2 define the hysteresis range
stDeviceData.stSelection.stConfiguration_63.bSwitchingOutput2OnDelay	BOOL	[READ_WRITE] defines the delay in number of update cycles until a consecutive logic on signal is propagated to the output (Update Cycle Time can be found in the General Settings)
stDeviceData.stSelection.stConfiguration_63.bSwitchingOutput2OffDelay	BOOL	[READ_WRITE] defines the delay in number of update cycles until a consecutive logic off signal is propagated to the output (Update Cycle Time can be found in the General Settings)
stDeviceData.stSelection.bOperatingMode	BOOL	[READ_WRITE] Standard mode: The sensor operates as diffuse Multiplex mode: Allocation of an address to run with additional sensors Synchronization mode: Synchronized sensor network Enable mode: Sensor remote enabling Opposed mode: Sensor is emitter or receiver
stDeviceData.stSelection.bPnpNpnSwitchSelection	BOOL	[READ_WRITE] Selection of switching behaviour in p or n type
stDeviceData.stSelection.bErrorBehavior_86	BOOL	[READ_WRITE] In case of failure the switching output can be set to open or closed
stDeviceData.stSelection.bErrorBehavior_87	BOOL	[READ_WRITE] In case of failure the switching output can be set to open or closed
stDeviceData.stSelection.blolinkIndication	BOOL	[READ_WRITE]
stDeviceData.stSelection.bTemperatureCompensation	BOOL	[READ_WRITE] Temperature compensation via internally measured temperature or externally defined temperature

Parameter name	Data type	Description
stDeviceData.stSelection. bTemperatureValueForExternalTemperatureCompensation	BOOL	[READ_WRITE] Value of externally defined temperature that is used for compensation if external temperature compensation is selected
stDeviceData.stSelection.bUnitForTemperatureValue	BOOL	[READ_WRITE] The unit of temperature can be changed between °C and °F
stDeviceData.stSelection.bMultiplexModeAddress	BOOL	[READ_WRITE] In Multiplex Mode every connected sensor is assigned to an own adress to activate it in a time slice
stDeviceData.stSelection.bInternalTemperatureValue	BOOL	[READ_ONLY] Internally measured value of ambient temperature that is used for compensation if internal temperature compensation is selected
stDeviceData.stSelection.bSignalStrengthIndicationViaLed	BOOL	[READ_WRITE] The LED shows the received signal strength
stDeviceData.stSelection.bSignalStrenthIndicationValue	BOOL	[READ_ONLY] Value of signal strength
stDeviceData.stSelection.bUpdateCycleTime	BOOL	[READ_ONLY] Time between output updates in milliseconds.
stDeviceData.stSelection.bTeachOffset	BOOL	[READ_WRITE] This distance offset is added to the measured distance during single point teach sequences.
stDeviceData.stSelection.bAnalogErrorOutputOverride	BOOL	[READ_WRITE] Overrides the default Analog Output Error Behaviour when no Target is in Range.
stDeviceData.stSelection.bPInvalidBehaviour	BOOL	[READ_WRITE] When enabled, the sensor emits a PInvalid Flag on the cyclic Processdata when there is no target in Range.
stDeviceData.stData.stCommands.nCmdDeviceReset	UINT	[WRITE_ONLY] Device Reset
stDeviceData.stData.stCommands.nCmdApplicationReset	UINT	[WRITE_ONLY] Application Reset
stDeviceData.stData.stCommands.nCmdRestoreFactorySettings	UINT	[WRITE_ONLY] Restore Factory Settings
stDeviceData.stData.stCommands.nCmdSp1Teach	UINT	[WRITE_ONLY] SP1 Teach
stDeviceData.stData.stCommands.nCmdSp2Teach	UINT	[WRITE_ONLY] SP2 Teach
stDeviceData.stData.stCommands.nCmdCancelTeach	UINT	[WRITE_ONLY] Cancel Teach
stDeviceData.stData.stCommands.nCmdTransmitterOff	UINT	[WRITE_ONLY] Transmitter OFF
stDeviceData.stData.stCommands.nCmdTransmitterOn	UINT	[WRITE_ONLY] Transmitter ON

Parameter name	Data type	Description
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]
stDeviceData.stData.stDirectParameters2.nDeviceSpecificParameter12	UINT	[READ_WRITE]

Parameter name	Data type	Description
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.nDeviceStatus	UINT	[READ_ONLY]
stDeviceData.stData.stDetailedDeviceStatus.sltem_1	STRING	[READ_ONLY]
stDeviceData.stData.stDetailedDeviceStatus.sltem_2	STRING	[READ_ONLY]
stDeviceData.stData.stDetailedDeviceStatus.sltem_3	STRING	[READ_ONLY]
stDeviceData.stData.stDetailedDeviceStatus.sltem_4	STRING	[READ_ONLY]
stDeviceData.stData.stDetailedDeviceStatus.sltem_5	STRING	[READ_ONLY]
stDeviceData.stData.stTeachInStatus. bSetpointValueSp2TeachFlag	BOOL	[READ_ONLY]
stDeviceData.stData.stTeachInStatus. bSetpointValueSp1TeachFlag	BOOL	[READ_ONLY]
stDeviceData.stData.stTeachInStatus.nTeachState	UINT	[READ_ONLY]
stDeviceData.stData.stSetpoints_60.nSetpointValueSp1Out1	UINT	[READ_WRITE] Value of far setpoint

Parameter name	Data type	Description
stDeviceData.stData.stSetpoints_60.nSetpointValueSp2Out1	UINT	[READ_WRITE] Value of near setpoint
stDeviceData.stData.stConfiguration_61.nLogic	UINT	[READ_WRITE] The behaviour of the switching output can be inverted
stDeviceData.stData.stConfiguration_61.nMode	UINT	[READ_WRITE] Window Mode: The sensor changes the output state between the switching points SP1 and SP2 Two Point Mode: The switching points SP1 and SP2 define the hysteresis range
stDeviceData.stData.stConfiguration_61.nSwitchingOutput1OnDelay	UINT	[READ_WRITE] defines the delay in number of update cycles until a consecutive logic on signal is propagated to the output (Update Cycle Time can be found in the General Settings)
stDeviceData.stData.stConfiguration_61.nSwitchingOutput1OffDelay	UINT	[READ_WRITE] defines the delay in number of update cycles until a consecutive logic off signal is propagated to the output (Update Cycle Time can be found in the General Settings)
stDeviceData.stData.stSetpoints_62.nSetpointValueSp1Out2	UINT	[READ_WRITE] Value of far setpoint
stDeviceData.stData.stSetpoints_62.nSetpointValueSp2Out2	UINT	[READ_WRITE] Value of near setpoint
stDeviceData.stData.stConfiguration_63.nLogic	UINT	[READ_WRITE] The behaviour of the switching output can be inverted
stDeviceData.stData.stConfiguration_63.nMode	UINT	[READ_WRITE] Window Mode: The sensor changes the output state between the switching points SP1 and SP2 Two Point Mode: The switching points SP1 and SP2 define the hysteresis range
stDeviceData.stData.stConfiguration_63.nSwitchingOutput2OnDelay	UINT	[READ_WRITE] defines the delay in number of update cycles until a consecutive logic on signal is propagated to the output (Update Cycle Time can be found in the General Settings)
stDeviceData.stData.stConfiguration_63.nSwitchingOutput2OffDelay	UINT	[READ_WRITE] defines the delay in number of update cycles until a consecutive logic off signal is propagated to the output (Update Cycle Time can be found in the General Settings)

Parameter name	Data type	Description
stDeviceData.stData.nOperatingMode	UINT	[READ_WRITE] Standard mode: The sensor operates as diffuse Multiplex mode: Allocation of an address to run with additional sensors Synchronization mode: Synchronized sensor network Enable mode: Sensor remote enabling Opposed mode: Sensor is emitter or receiver
stDeviceData.stData.nPnpNpnSwitchSelection	UINT	[READ_WRITE] Selection of switching behaviour in p or n type
stDeviceData.stData.nErrorBehavior_86	UINT	[READ_WRITE] In case of failure the switching output can be set to open or closed
stDeviceData.stData.nErrorBehavior_87	UINT	[READ_WRITE] In case of failure the switching output can be set to open or closed
stDeviceData.stData.nIolinkIndication	UINT	[READ_WRITE]
stDeviceData.stData.nTemperatureCompensation	UINT	[READ_WRITE] Temperature compensation via internally measured temperature or externally defined temperature
stDeviceData.stData.nTemperatureValueForExternalTemperatureCompensation	INT	[READ_WRITE] Value of externally defined temperature that is used for compensation if external temperature compensation is selected
stDeviceData.stData.nUnitForTemperatureValue	UINT	[READ_WRITE] The unit of temperature can be changed between °C and °F
stDeviceData.stData.nMultiplexModeAddress	UINT	[READ_WRITE] In Multiplex Mode every connected sensor is assigned to an own address to activate it in a time slice
stDeviceData.stData.nInternalTemperatureValue	INT	[READ_ONLY] Internally measured value of ambient temperature that is used for compensation if internal temperature compensation is selected
stDeviceData.stData.nSignalStrengthIndicationViaLed	UINT	[READ_WRITE] The LED shows the received signal strength
stDeviceData.stData.nSignalStrengthIndicationValue	UINT	[READ_ONLY] Value of signal strength
stDeviceData.stData.nUpdateCycleTime	UINT	[READ_ONLY] Time between output updates in milliseconds.

Parameter name	Data type	Description
stDeviceData.stData.nTeachOffset	INT	[READ_WRITE] This distance offset is added to the measured distance during single point teach sequences.
stDeviceData.stData.nAnalogErrorOutputOverride	UINT	[READ_WRITE] Overrides the default Analog Output Error Behaviour when no Target is in Range.
stDeviceData.stData.nPdinvalidBehaviour	UINT	[READ_WRITE] When enabled, the sensor emits a PDInvalid Flag on the cyclic Processdata when there is no target in Range.

Tab. 7.2: ST_Leuze_PD_HTU_3072

Parameter name	Data type	Description
ST_Leuze_PD_HTU_3072.nProcessValue	UINT	
ST_Leuze_PD_HTU_3072.bSwitchStateOutput1	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
SP1 Teach			UIntegerT	75	W	SP1 Teach
SP2 Teach			UIntegerT	76	W	SP2 Teach
Cancel Teach			UIntegerT	79	W	Cancel Teach
-			UIntegerT	160	W	-
-			UIntegerT	161	W	-
Transmitter OFF			UIntegerT	176	W	Transmitter OFF
Transmitter ON			UIntegerT	177	W	Transmitter ON
Direct Parameters 1	0	0	RecordT		RW	
Reserved	0	1	UIntegerT		R	
Master Cycle Time	0	2	UIntegerT		R	
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	

Parameter	Index	Subindex	Data type	Default	AR	Description
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	
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 75: SP1 Teach 76: SP2 Teach 79: Cancel Teach 160: - 161: - 176: Transmitter OFF 177: Transmitter ON

Parameter	Index	Subindex	Data type	Default	AR	Description
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		R	
Vendor Text	17	0	StringT		R	
Product Name	18	0	StringT		R	
Product ID	19	0	StringT		R	
Product Text	20	0	StringT		R	
Serial Number	21	0	StringT		R	
Firmware Version	23	0	StringT		R	
Application Specific Tag	24	0	StringT		RW	
Device Status	36	0	UIntegerT		R	0: Device is OK 1: Maintenance required 2: Out of specification 3: Functional check 4: Failure (5 ... 255): Reserved
Detailed Device Status	37	0	ArrayT		R	
	37	0	OctetStringT		R	
Teach-In Status	59	0	RecordT		R	
Setpoint Value SP2 Teach Flag	59	1	BooleanT		R	False: Not taught or not successful True: Successfully taught
Setpoint Value SP1 Teach Flag	59	2	BooleanT		R	False: Not taught or not successful True: Successfully taught
Teach State	59	3	UIntegerT		R	0: Idle 1: SP1 successfully taught 2: SP2 successfully taught 7: Error
Setpoints	60	0	RecordT		RW	
Setpoint Value SP1 (OUT1)	60	1	UIntegerT		RW	Value of far setpoint
Setpoint Value SP2 (OUT1)	60	2	UIntegerT		RW	Value of near setpoint
Configuration	61	0	RecordT		RW	

Parameter	Index	Subindex	Data type	Default	AR	Description
Logic	61	1	UIntegerT		RW	The behaviour of the switching output can be inverted 0: Not Inverted Switching 1: Inverted Switching
Mode	61	2	UIntegerT	128	RW	Window Mode: The sensor changes the output state between the switching points SP1 and SP2 Two Point Mode: The switching points SP1 and SP2 define the hysteresis range 128: Window Mode 3: Two Point Mode
Switching Output 1 On Delay	61	3	UIntegerT	0	RW	defines the delay in number of update cycles until a consecutive logic on signal is propagated to the output (Update Cycle Time can be found in the General Settings) (0 ... 255)
Switching Output 1 Off Delay	61	4	UIntegerT	0	RW	defines the delay in number of update cycles until a consecutive logic off signal is propagated to the output (Update Cycle Time can be found in the General Settings) (0 ... 255)
Setpoints	62	0	RecordT		RW	
Setpoint Value SP1 (OUT2)	62	1	UIntegerT		RW	Value of far setpoint
Setpoint Value SP2 (OUT2)	62	2	UIntegerT		RW	Value of near setpoint
Configuration	63	0	RecordT		RW	
Logic	63	1	UIntegerT		RW	The behaviour of the switching output can be inverted 0: Not Inverted Switching 1: Inverted Switching
Mode	63	2	UIntegerT	128	RW	Window Mode: The sensor changes the output state between the switching points SP1 and SP2 Two Point Mode: The switching points SP1 and SP2 define the hysteresis range 128: Window Mode 3: Two Point Mode
Switching Output 2 On Delay	63	3	UIntegerT	0	RW	defines the delay in number of update cycles until a consecutive logic on signal is propagated to the output (Update Cycle Time can be found in the General Settings) (0 ... 255)

Parameter	Index	Subindex	Data type	Default	AR	Description
Switching Output 2 Off Delay	63	4	UIntegerT	0	RW	defines the delay in number of update cycles until a consecutive logic off signal is propagated to the output (Update Cycle Time can be found in the General Settings) (0 ... 255)
Operating Mode	80	0	UIntegerT	0	RW	Standard mode: The sensor operates as diffuse Multiplex mode: Allocation of an address to run with additional sensors Synchronization mode: Synchronized sensor network Enable mode: Sensor remote enabling Opposed mode: Sensor is emitter or receiver 0: Standard Mode 1: Multiplex Mode 2: Synchronization Mode 3: Enable Mode 4: Opposed Mode
PNP/NPN Switch Selection	83	0	UIntegerT	0	RW	Selection of switching behaviour in p or n type 0: PNP 1: NPN
Error Behavior	86	0	UIntegerT	0	RW	In case of failure the switching output can be set to open or closed 0: Open 1: Closed
Error Behavior	87	0	UIntegerT	0	RW	In case of failure the switching output can be set to open or closed 0: Open 1: Closed
IOLink Indication	108	0	UIntegerT	0	RW	0: On 1: Off
Temperature Compensation	112	0	UIntegerT	0	RW	Temperature compensation via internally measured temperature or externally defined temperature 0: Internal 1: External
Temperature Value For External Temperature Compensation	113	0	IntegerT	250	RW	Value of externally defined temperature that is used for compensation if external temperature compensation is selected (-300 ... 850)
Unit For Temperature Value	114	0	UIntegerT	0	RW	The unit of temperature can be changed between °C and °F 0: °C 1: °F
Multiplex Mode Address	116	0	UIntegerT	0	RW	In Multiplex Mode every connected sensor is assigned to an own adress to activate it in a time slice (0 ... 9)

Parameter	Index	Subindex	Data type	Default	AR	Description
Internal Temperature Value	120	0	IntegerT		R	Internally measured value of ambient temperature that is used for compensation if internal temperature compensation is selected (-300 ... 850)
Signal Strength Indication via LED	121	0	UIntegerT	0	RW	The LED shows the received signal strength 0: Off 1: On
Signal Strength Indication Value	122	0	UIntegerT		R	Value of signal strength
Update cycle time	124	0	UIntegerT	0	R	Time between output updates in milliseconds. (0 ... 65535)
Teach offset	125	0	IntegerT	0	RW	This distance offset is added to the measured distance during single point teach sequences. (-32767 ... 32767)
Analog Error Output override	126	0	UIntegerT	0	RW	Overrides the default Analog Output Error Behaviour when no Target is in Range. 0: no override(default) 1: override with low 2: override with high
PDInvalid behaviour	127	0	UIntegerT	0	RW	When enabled, the sensor emits a PDInvalid Flag on the cyclic Processdata when there is no target in Range. 0: inactive 1: active

9 Technical specifications

9.1 General data

Tab. 9.1: Sensor and IODD version

IODD version	V01.0116
IODD release date	2018-1-25
Device family	HTU... series
Device ID	3072
Device name	HTU-LT4-XP
Device variants	HTU418B-400.X3/LT4-M12 (50124267), HTU418B-1300.X3/LT4-M12 (50124271), HTU430B-3000.X3/LT4-M12 (50124273)