



PLC Integration HTU_3072

IO - Link service data function block + process data parser function for Siemens S7-1200 / S7 - 1500 (TIA - Portal V15.1 or higher) PLC systems in combination with a PROFIBUS / PROFINET 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_HTU_3072" simplifies the usage of Leuze IO-Link devices on Siemens S7-1200/S7-1500 (TIA-Portal V15.1 or higher) PLC controls. This FB supports IO-Link Masters which can be connected via PROFIBUS / PROFINET 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

The module can be called as a single-instance.



Fig. 3.1: Example of module call with single instance

3.3 Configuration

Tab. 3.1: Parameter IN

| Parameter | Data type | Description |
|-----------|-----------|--|
| Execute | Bool | Positive trigger: Start data transfer |
| RW | Bool | Read or write the selected IO-Link parameter. FALSE: Read parameter TRUE: Write Parameter |
| Port | Int | Number of the master port the IO-Link device is connected, starting with 1. |
| HwID | HW_IO | Hardware IO-Address of the IO-Link master |
| Cap | DInt | Client access point of the IO-Link function (IO-LinkMaster specific). Siemens: 227 Weidmüller: 227 Other manufacturers: 255 |
| TimeOut | Time | Time, after a Timeout-Error is triggered. |

Tab. 3.2: Parameter INOUT

| Parameter | Data type | Description |
|------------|---------------------|-------------|
| DeviceData | Leuze_type_HTU_3072 | Sensor data |

See structure description of Leuze_type_HTU_3072 in chapter 7.

Tab. 3.3: Parameter OUT

| Parameter | Data type | Description |
|-------------|-------------------------|--|
| Done | Bool | Indicates whether data is valid. |
| Busy | Bool | Request in process. FALSE: Request is terminated TRUE: Request is being processed |
| Error | Bool | Error flag FALSE: No error TRUE: Error detected |
| ErrorCode | Leuze_type_lolError | Status of the function block |
| Diagnostics | LIOLink_typeDiagnostics | Detailed diagnostic information of the FB. See description of Siemens Library for IO-Link (LIOLink). |

See structure description of Leuze_type_lolError in chapter 6.

3.4 Method of function

The function block uses the data structure "FB_Leuze_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 "RW" = FALSE to read parameter. The value that should be written can be defined in the data structure, as soon as the input parameter "RW" = TRUE. You start each transfer by calling up the "FB_Leuze_HTU_3072" with a positive trigger at the "Execute" input. As long as there is no valid answer the output "Busy" 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 "Done" = TRUE output shows that the transmission was successful. The outputs retain there states as long as there is no new positive trigger at the "Execute" input again.

The function block allows you to read or write multiple IO-Link parameters sequentially (multiselection). 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 (Error) is set and an error code (Leuze_type_lolError) 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_HTU_3072" is a part of the TIA-Portal library. To get all relevant blocks into your PLC project, please open the library as a "global" library. Afterwards, the library elements can be copied into the currently opened project.

Integration step by step:

- Downloading the library
- Open the library in the "global" library tab
- Including the blocks of the Leuze library into your project (code-blocks and data type)
- Compiling the PLC project

| 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 FC_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. Each sensor connected to Leuze IO-Link master has its own hardware ID. See Fig. 5.2.

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 |
|----------------|-------------|------------------------|---|
| HwID | INPUT | HW_IO | Hardware IO-Address of the IO-Link master (see HW-Configuration). For masters that do not use the Siemens PCT-Tool please use the HW IOAddress of the configured Master port. |
| RelByteOffset | INPUT | UINT | Relative start address of the IO-Link device on the IO-Link master port (see PCT-Tool -> Addresses -> Inputs Start). If the process date is mapped into a specified logical IO-Address, the relative byte offset = 0. |
| PDMode | INPUT | INT | Mode of the PD. User must select mode of PD according to the sensors settings. |
| ErrorCode | OUTPUT | WORD | Error code details see in the Siemens help system ("DPRD_DAT"). |
| RET_VAL | OUTPUT | Leuze_type_PD_HTU_3072 | Reference to the instance of the data structure Leuze_type_PD_HTU_3072. The structure includes the disaggregated values of the process data. |

See structure description of Leuze_type_PD_HTU_3072 in chapter 7.



Fig. 5.2: Hardware ID for sensors connected to Leuze MD798 IO-Link master

6 Error description

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

Tab. 6.1: Leuze_type_IolError description

| Parameter name | Data type | Description |
|---------------------|-----------|---|
| ErrorCode.status | Word | 16#0000–16#7FFF: Status of the FB, 16#8000–16#FFFF: Error codes |
| ErrorCode.iolMError | Word | IO-Link Master error (see IO-Link specification) |
| ErrorCode.iolError | Word | IO-Link error. Contains the IOL_Error_Code the IOL_Add_Error_Code (see IO-Link specification) and the device specific error codes |
| ErrorCode.isduIndex | Int | IO-Link Index (ISDU) to which the error code refers |

Tab. 6.2: Error description for status

| Error code (status) | Error description |
|---------------------|--|
| 0x0000 | Operation completed, no warning and no further details |
| 0x7000 | No operation in progress (initial value) |
| 0x7001 | First call after input of a new command (rising edge on "execute") |
| 0x7002 | Subsequent cal |
| 0x8001 | Time out error occurred |
| 0x8002 | No parameter selected |
| 0x8201 | Unsupported port |
| 0x8202 | Unsupported index |
| 0x8203 | Unsupported subindex |
| 0x8205 | The length at the "writeLen" parameter does not match the data record that will be written |
| 0x8401 | The IO-Link master has reported an error code, see "diagnostics" |
| 0x8402 | Received data record does not match operation |
| 0x8403 | Operation could not be completed in the specified time |
| 0x8600 | Internal state machine has reached an undefined state |
| 0x8601 | System function WRREC reports an error, see "diagnostics" |
| 0x8602 | System function RDREC reports an error, see "diagnostics" |

Tab. 6.3: Error description for ioLError

| Error code (ioLError) | Error description |
|-----------------------|---|
| 0x0000 | No error |
| 0x0001 ... 0x06FF | Reserved / Master specific |
| 0x7000 | Unexpected Write request instead of read request / Invalid response PDU |
| 0x7001 | Decode error |
| 0x7002 | Port occupied by another task |
| 0x7003 ... 0x7FFF | Reserved / Master specific |
| 0x8000 | Timeout when IOL-Devices or IOL-Master port are busy |
| 0x8001 | IO-Link index > 32767 |
| 0x8002 | Port address beyond defined maximum |
| 0x8003 | Port function not supported |
| 0x8004 | Reserved / Master specific |
| 0x8005 | Invalid length of the data that should be written (>232 / <1) |
| 0x8006 | Reserved / Master specific |
| 0x8007 | IO-Link subindex > 255 |
| 0x8008 ... 0x8051 | Reserved / Master specific |
| 0x8052 | Error during acyclic data access (FB RDREC error) |
| 0x8053 | Error during acyclic data access (FB WRREC error) |
| 0x8054 ... 0x8FFFF | Reserved / Master specific |

For additional information see the technical specification "IO-Link Integration Part 1" (www.profibus.com).

Tab. 6.4: Error description for ioLError

| Error code (ioLError) | Error description |
|-----------------------|------------------------------------|
| 0x0000 | No error |
| 0x1000 | Master communication error |
| 0x1100 | ISDU time out / Device event error |
| 0x5200 | Device checksum error |
| 0x5600 | Device checksum error |

| Error code (IoError) | Error description |
|----------------------|--|
| 0x5700 | Master ISDU illegal service |
| 0x5800 | Device error: Byte length does not fit to the chosen parameter |
| 0x8000 | The requested service has been refused by the device application |
| 0x8011 | Read write access to a not existing Index |
| 0x8012 | Read write access to a not existing sub index |
| 0x8020 | Parameter is not accessible for a read or write service due to the current state in the device |
| 0x8021 | Parameter is not accessible for a read or write service due to an ongoing local operation at the device |
| 0x8022 | Parameter is not accessible for a read or write service due to an remote triggered state of the device application |
| 0x8023 | Write service tries to access a read-only parameter |
| 0x8030 | Write service to a parameter outside its permitted range of values |
| 0x8031 | Write service to a parameter above its specified value range |
| 0x8032 | Write service to a parameter below its specified value range |
| 0x8033 | Write service to a parameter above its specified length |
| 0x8034 | Write service to a parameter below its predefined length |
| 0x8035 | Write service with a command value not supported by the device application |
| 0x8036 | Write service with a command value calling a device function not available due to the current state |
| 0x8040 | The value via single parameter transfer collide with other actual parameter settings |
| 0x8041 | Inconsistent parameter set (at least an ISDU cannot be written) |
| 0x8082 | The read or write service is refused due to a temporarily unavailable application |
| 0x8100 | Unspecified |
| 0x8101 ... 0x81FF | Device specific (see device description) |

For additional information see the specification "IO-Link Communication" (www.IO-Link.com).

7 Data structures

Tab. 7.1: Leuze_type_HTU_3072

| Parameter name | Data type | Description |
|--|-----------|--|
| DeviceData.Selection.Commands.CmdDeviceReset | Bool | [WRITE_ONLY] Device Reset |
| DeviceData.Selection.Commands.CmdApplicationReset | Bool | [WRITE_ONLY] Application Reset |
| DeviceData.Selection.Commands.CmdRestoreFactorySettings | Bool | [WRITE_ONLY] Restore Factory Settings |
| DeviceData.Selection.Commands.CmdSp1Teach | Bool | [WRITE_ONLY] SP1 Teach |
| DeviceData.Selection.Commands.CmdSp2Teach | Bool | [WRITE_ONLY] SP2 Teach |
| DeviceData.Selection.Commands.CmdCancelTeach | Bool | [WRITE_ONLY] Cancel Teach |
| DeviceData.Selection.Commands.CmdTransmitterOff | Bool | [WRITE_ONLY] Transmitter OFF |
| DeviceData.Selection.Commands.CmdTransmitterOn | Bool | [WRITE_ONLY] Transmitter ON |
| DeviceData.Selection.DirectParameters1.All | Bool | [READ_WRITE] all parameters of complex data type |
| DeviceData.Selection.DirectParameters1.All | Bool | [READ_WRITE] all parameters of complex data type |
| DeviceData.Selection.DirectParameters1.Reserved_1 | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.MasterCycleTime | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.MinCycleTime | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.MSequenceCapability | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.IoLinkVersionId | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.ProcessDataInputLength | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.ProcessDataOutputLength | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.VendorId1 | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.VendorId2 | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.DeviceId1 | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.DeviceId2 | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.DeviceId3 | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.Reserved_13 | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters1.Reserved_14 | Bool | [READ_ONLY] |

| Parameter name | Data type | Description |
|--|-----------|--|
| DeviceData.Selection.DirectParameters1.Reserved_15 | Bool | [READ_ONLY] |
| DeviceData.Selection.DirectParameters2.All | Bool | [READ_WRITE] all parameters of complex data type |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter1 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter2 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter3 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter4 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter5 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter6 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter7 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter8 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter9 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter10 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter11 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter12 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter13 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter14 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter15 | Bool | [READ_WRITE] |
| DeviceData.Selection.DirectParameters2.DeviceSpecificParameter16 | Bool | [READ_WRITE] |
| DeviceData.Selection.StandardCommand | Bool | [WRITE_ONLY] |
| DeviceData.Selection.DeviceAccessLocks.All | Bool | [READ_WRITE] all parameters of complex data type |
| DeviceData.Selection.VendorName | Bool | [READ_ONLY] |
| DeviceData.Selection.VendorText | Bool | [READ_ONLY] |
| DeviceData.Selection.ProductName | Bool | [READ_ONLY] |
| DeviceData.Selection.ProductId | Bool | [READ_ONLY] |
| DeviceData.Selection.ProductText | Bool | [READ_ONLY] |
| DeviceData.Selection.SerialNumber | Bool | [READ_ONLY] |
| DeviceData.Selection.FirmwareVersion | Bool | [READ_ONLY] |

| Parameter name | Data type | Description |
|---|-----------|---|
| DeviceData.Selection.ApplicationSpecificTag | Bool | [READ_WRITE] |
| DeviceData.Selection.DeviceStatus | Bool | [READ_ONLY] |
| DeviceData.Selection.DetailedDeviceStatus.All | Bool | [READ_ONLY] all parameters of complex data type |
| DeviceData.Selection.TeachInStatus.All | Bool | [READ_ONLY] all parameters of complex data type |
| DeviceData.Selection.TeachInStatus. SetpointValueSp2TeachFlag | Bool | [READ_ONLY] |
| DeviceData.Selection.TeachInStatus. SetpointValueSp1TeachFlag | Bool | [READ_ONLY] |
| DeviceData.Selection.TeachInStatus.TeachState | Bool | [READ_ONLY] |
| DeviceData.Selection.Setpoints_60.All | Bool | [READ_WRITE] all parameters of complex data type |
| DeviceData.Selection.Setpoints_60.SetpointValueSp1Out1 | Bool | [READ_WRITE] Value of far setpoint |
| DeviceData.Selection.Setpoints_60.SetpointValueSp2Out1 | Bool | [READ_WRITE] Value of near setpoint |
| DeviceData.Selection.Configuration_61.All | Bool | [READ_WRITE] all parameters of complex data type |
| DeviceData.Selection.Configuration_61.Logic | Bool | [READ_WRITE] The behaviour of the switching output can be inverted |
| DeviceData.Selection.Configuration_61.Mode | 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 |
| DeviceData.Selection.Configuration_61. SwitchingOutput1OnDelay | 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) |
| DeviceData.Selection.Configuration_61. SwitchingOutput1OffDelay | 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) |
| DeviceData.Selection.Setpoints_62.All | Bool | [READ_WRITE] all parameters of complex data type |
| DeviceData.Selection.Setpoints_62.SetpointValueSp1Out2 | Bool | [READ_WRITE] Value of far setpoint |
| DeviceData.Selection.Setpoints_62.SetpointValueSp2Out2 | Bool | [READ_WRITE] Value of near setpoint |

| Parameter name | Data type | Description |
|--|-----------|--|
| DeviceData.Selection.Configuration_63.All | Bool | [READ_WRITE] all parameters of complex data type |
| DeviceData.Selection.Configuration_63.Logic | Bool | [READ_WRITE] The behaviour of the switching output can be inverted |
| DeviceData.Selection.Configuration_63.Mode | 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 |
| DeviceData.Selection.Configuration_63.SwitchingOutput2OnDelay | 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) |
| DeviceData.Selection.Configuration_63.SwitchingOutput2OffDelay | 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) |
| DeviceData.Selection.OperatingMode | 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 |
| DeviceData.Selection.PnpNpnSwitchSelection | Bool | [READ_WRITE] Selection of switching behaviour in p or n type |
| DeviceData.Selection.ErrorBehavior_86 | Bool | [READ_WRITE] In case of failure the switching output can be set to open or closed |
| DeviceData.Selection.ErrorBehavior_87 | Bool | [READ_WRITE] In case of failure the switching output can be set to open or closed |
| DeviceData.Selection.IolinkIndication | Bool | [READ_WRITE] |
| DeviceData.Selection.TemperatureCompensation | Bool | [READ_WRITE] Temperature compensation via internally measured temperature or externally defined temperature |

| Parameter name | Data type | Description |
|---|-----------|---|
| DeviceData.Selection.TemperatureValueForExternalTemperatureCompensation | Bool | [READ_WRITE] Value of externally defined temperature that is used for compensation if external temperature compensation is selected |
| DeviceData.Selection.UnitForTemperatureValue | Bool | [READ_WRITE] The unit of temperature can be changed between °C and °F |
| DeviceData.Selection.MultiplexModeAddress | Bool | [READ_WRITE] In Multiplex Mode every connected sensor is assigned to an own adress to activate it in a time slice |
| DeviceData.Selection.InternalTemperatureValue | Bool | [READ_ONLY] Internally measured value of ambient temperature that is used for compensation if internal temperature compensation is selected |
| DeviceData.Selection.SignalStrengthIndicationViaLed | Bool | [READ_WRITE] The LED shows the received signal strength |
| DeviceData.Selection.SignalStrenthIndicationValue | Bool | [READ_ONLY] Value of signal strength |
| DeviceData.Selection.UpdateCycleTime | Bool | [READ_ONLY] Time between output updates in milliseconds. |
| DeviceData.Selection.TeachOffset | Bool | [READ_WRITE] This distance offset is added to the measured distance during single point teach sequences. |
| DeviceData.Selection.AnalogErrorOutputOverride | Bool | [READ_WRITE] Overrides the default Analog Output Error Behaviour when no Target is in Range. |
| DeviceData.Selection.PdinvalidBehaviour | Bool | [READ_WRITE] When enabled, the sensor emits a PDInvalid Flag on the cyclic Processdata when there is no target in Range. |
| DeviceData.Data.Commands.CmdDeviceReset | UInt | [WRITE_ONLY] Device Reset |
| DeviceData.Data.Commands.CmdApplicationReset | UInt | [WRITE_ONLY] Application Reset |
| DeviceData.Data.Commands.CmdRestoreFactorySettings | UInt | [WRITE_ONLY] Restore Factory Settings |
| DeviceData.Data.Commands.CmdSp1Teach | UInt | [WRITE_ONLY] SP1 Teach |
| DeviceData.Data.Commands.CmdSp2Teach | UInt | [WRITE_ONLY] SP2 Teach |
| DeviceData.Data.Commands.CmdCancelTeach | UInt | [WRITE_ONLY] Cancel Teach |
| DeviceData.Data.Commands.CmdTransmitterOff | UInt | [WRITE_ONLY] Transmitter OFF |
| DeviceData.Data.Commands.CmdTransmitterOn | UInt | [WRITE_ONLY] Transmitter ON |

| Parameter name | Data type | Description |
|---|-----------|--------------|
| DeviceData.Data.DirectParameters1.Reserved_1 | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.MasterCycleTime | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.MinCycleTime | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.MSequenceCapability | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.IoLinkVersionId | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.ProcessDataInputLength | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.ProcessDataOutputLength | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.VendorId1 | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.VendorId2 | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.DeviceId1 | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.DeviceId2 | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.DeviceId3 | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.Reserved_13 | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.Reserved_14 | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters1.Reserved_15 | UInt | [READ_ONLY] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter1 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter2 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter3 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter4 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter5 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter6 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter7 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter8 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter9 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter10 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter11 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter12 | UInt | [READ_WRITE] |

| Parameter name | Data type | Description |
|---|-----------|------------------------------------|
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter13 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter14 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter15 | UInt | [READ_WRITE] |
| DeviceData.Data.DirectParameters2.DeviceSpecificParameter16 | UInt | [READ_WRITE] |
| DeviceData.Data.StandardCommand | UInt | [WRITE_ONLY] |
| DeviceData.Data.DeviceAccessLocks.ParameterWriteAccessLock | Bool | [READ_WRITE] |
| DeviceData.Data.DeviceAccessLocks.DataStorageLock | Bool | [READ_WRITE] |
| DeviceData.Data.DeviceAccessLocks.LocalParameterizationLock | Bool | [READ_WRITE] |
| DeviceData.Data.DeviceAccessLocks.LocalUserInterfaceLock | Bool | [READ_WRITE] |
| DeviceData.Data.VendorName | String | [READ_ONLY] |
| DeviceData.Data.VendorText | String | [READ_ONLY] |
| DeviceData.Data.ProductName | String | [READ_ONLY] |
| DeviceData.Data.ProductId | String | [READ_ONLY] |
| DeviceData.Data.ProductText | String | [READ_ONLY] |
| DeviceData.Data.SerialNumber | String | [READ_ONLY] |
| DeviceData.Data.FirmwareVersion | String | [READ_ONLY] |
| DeviceData.Data.ApplicationSpecificTag | String | [READ_WRITE] |
| DeviceData.Data.DeviceStatus | UInt | [READ_ONLY] |
| DeviceData.Data.DetailedDeviceStatus.Item_1 | String | [READ_ONLY] |
| DeviceData.Data.DetailedDeviceStatus.Item_2 | String | [READ_ONLY] |
| DeviceData.Data.DetailedDeviceStatus.Item_3 | String | [READ_ONLY] |
| DeviceData.Data.DetailedDeviceStatus.Item_4 | String | [READ_ONLY] |
| DeviceData.Data.DetailedDeviceStatus.Item_5 | String | [READ_ONLY] |
| DeviceData.Data.TeachInStatus.SetpointValueSp2TeachFlag | Bool | [READ_ONLY] |
| DeviceData.Data.TeachInStatus.SetpointValueSp1TeachFlag | Bool | [READ_ONLY] |
| DeviceData.Data.TeachInStatus.TeachState | UInt | [READ_ONLY] |
| DeviceData.Data.Setpoints_60.SetpointValueSp1Out1 | UInt | [READ_WRITE] Value of far setpoint |

| Parameter name | Data type | Description |
|---|-----------|---|
| DeviceData.Data.Setpoints_60.SetpointValueSp2Out1 | UInt | [READ_WRITE] Value of near setpoint |
| DeviceData.Data.Configuration_61.Logic | UInt | [READ_WRITE] The behaviour of the switching output can be inverted |
| DeviceData.Data.Configuration_61.Mode | 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 |
| DeviceData.Data.Configuration_61.SwitchingOutput1OnDelay | 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) |
| DeviceData.Data.Configuration_61.SwithcingOutput1OffDelay | 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) |
| DeviceData.Data.Setpoints_62.SetpointValueSp1Out2 | UInt | [READ_WRITE] Value of far setpoint |
| DeviceData.Data.Setpoints_62.SetpointValueSp2Out2 | UInt | [READ_WRITE] Value of near setpoint |
| DeviceData.Data.Configuration_63.Logic | UInt | [READ_WRITE] The behaviour of the switching output can be inverted |
| DeviceData.Data.Configuration_63.Mode | 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 |
| DeviceData.Data.Configuration_63.SwitchingOutput2OnDelay | 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) |
| DeviceData.Data.Configuration_63.SwitchingOutput2OffDelay | 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 |
|--|-----------|--|
| DeviceData.Data.OperatingMode | 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 |
| DeviceData.Data.PnpNpnSwitchSelection | UInt | [READ_WRITE] Selection of switching behaviour in p or n type |
| DeviceData.Data.ErrorBehavior_86 | UInt | [READ_WRITE] In case of failure the switching output can be set to open or closed |
| DeviceData.Data.ErrorBehavior_87 | UInt | [READ_WRITE] In case of failure the switching output can be set to open or closed |
| DeviceData.Data.IolinkIndication | UInt | [READ_WRITE] |
| DeviceData.Data.TemperatureCompensation | UInt | [READ_WRITE] Temperature compensation via internally measured temperature or externally defined temperature |
| DeviceData.Data.TemperatureValueForExternalTemperatureCompensation | Int | [READ_WRITE] Value of externally defined temperature that is used for compensation if external temperature compensation is selected |
| DeviceData.Data.UnitForTemperatureValue | UInt | [READ_WRITE] The unit of temperature can be changed between °C and °F |
| DeviceData.Data.MultiplexModeAddress | UInt | [READ_WRITE] In Multiplex Mode every connected sensor is assigned to an own adress to activate it in a time slice |
| DeviceData.Data.InternalTemperatureValue | Int | [READ_ONLY] Internally measured value of ambient temperature that is used for compensation if internal temperature compensation is selected |
| DeviceData.Data.SignalStrengthIndicationViaLed | UInt | [READ_WRITE] The LED shows the received signal strength |
| DeviceData.Data.SignalStrenthIndicationValue | UInt | [READ_ONLY] Value of signal strength |
| DeviceData.Data.UpdateCycleTime | UInt | [READ_ONLY] Time between output updates in milliseconds. |

| Parameter name | Data type | Description |
|---|-----------|--|
| DeviceData.Data.TeachOffset | Int | [READ_WRITE] This distance offset is added to the measured distance during single point teach sequences. |
| DeviceData.Data.AnalogErrorOutputOverride | UInt | [READ_WRITE] Overrides the default Analog Output Error Behaviour when no Target is in Range. |
| DeviceData.Data.PdinvalidBehaviour | 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: Leuze_type_PD_HTU_3072

| Parameter name | Data type | Description |
|---|-----------|-------------|
| FC_Leuze_PD_HTU_3072.ProcessValue | UInt | |
| FC_Leuze_PD_HTU_3072.SwitchStateOutput1 | 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) |