



PLC Integration of HTU218_3069

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_ HTU218_3069" 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_ HTU218_3069	Sensor data

See structure description of ST_Leuze_IOL_ HTU218_3069 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_HTU218_3069". 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_HTU218_3069" 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_ HTU218_3069" 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_HTU218_3069` 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.
nPDMMode	INPUT	INT	Mode of the PD. User must select mode of PD according to the sensors settings. The PD Mode parameter only appears for some sensors.
bError	OUTPUT	BOOL	Error flag FALSE: No error TRUE: Error detected
F_Leuze_PD_HTU218_3069	OUTPUT	ST_Leuze_PD_HTU218_3069	Reference to the instance of the data structure ST_Leuze_PD_HTU218_3069. The structure includes the disaggregated values of the process data.

See structure description of `ST_Leuze_PD_HTU218_3069` 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>).

Tab. 6.3: Description of device specific errors.

Error code	Error name	Description
0x800	Device application error - no details	Service was denied by the technology-specific application. No detailed root-cause information is available.
0x8011	Index not available	Read or write access attempt to a non-existing index.
0x8012	Subindex not available	Read or write access attempt to a non-existing subindex of an existing index.
0x8020	Service temporarily not available	Parameter not accessible due to the current state of the technology-specific application.
0x8023	Access denied	Write access to a read-only parameter or read access to write-only parameter.
0x8030	Parameter value out of range	Written parameter value is outside of the permitted value range.
0x8031	Parameter value above limit	Written parameter value is above its specified value range.
0x8032	Parameter value below limit	Written parameter value is below its specified value range.
0x8033	Parameter length overrun	Written parameter is longer than specified.
0x8034	Parameter length underrun	Written parameter is shorter than specified.

Error code	Error name	Description
0x8035	Function unavailable	Written command is not supported by the technology-specific application.
0x8036	Function temporarily unavailable	Written command is unavailable due to the current state of the technology-specific application.
0x8040	Invalid parameter set	Written single parameter value collides with other existing parameter settings.
0x8041	Inconsistent parameter set	Parameter set inconsistencies at the end of block parameter transfer. Device plausibility check failed.
0x8082	Application not ready	Read or write access denied. The technology-specific application is temporarily unavailable.

7 Data structures

Tab. 7.1: ST_Leuze_IOL_HTU218_3069

Parameter name	Data type	Description
stDeviceData.stSelection.stCommands.bCmdRestoreFactorySettings	BOOL	[WRITE_ONLY] Restore Factory Settings
stDeviceData.stSelection.stCommands.bCmdTeachApply	BOOL	[WRITE_ONLY] Teach Apply
stDeviceData.stSelection.stCommands.bCmdSetpoint1SingleValueTeach	BOOL	[WRITE_ONLY] Setpoint 1 Single Value Teach
stDeviceData.stSelection.stCommands.bCmdSetpoint2SingleValueTeach	BOOL	[WRITE_ONLY] Setpoint 2 Single Value Teach
stDeviceData.stSelection.stCommands.bCmdTwoValueTeachTp1Sp1	BOOL	[WRITE_ONLY] Two Value Teach TP1 SP1
stDeviceData.stSelection.stCommands.bCmdTwoValueTeachTp2Sp1	BOOL	[WRITE_ONLY] Two Value Teach TP2 SP1
stDeviceData.stSelection.stCommands.bCmdTwoValueTeachTp1Sp2	BOOL	[WRITE_ONLY] Two Value Teach TP1 SP2
stDeviceData.stSelection.stCommands.bCmdTwoValueTeachTp2Sp2	BOOL	[WRITE_ONLY] Two Value Teach TP2 SP2
stDeviceData.stSelection.stCommands.bCmdSetpoint1DynamicTeachStart	BOOL	[WRITE_ONLY] Setpoint 1 Dynamic Teach Start
stDeviceData.stSelection.stCommands.bCmdSetpoint1DynamicTeachStop	BOOL	[WRITE_ONLY] Setpoint 1 Dynamic Teach Stop
stDeviceData.stSelection.stCommands.bCmdSetpoint2DynamicTeachStart	BOOL	[WRITE_ONLY] Setpoint 2 Dynamic Teach Start
stDeviceData.stSelection.stCommands.bCmdSetpoint2DynamicTeachStop	BOOL	[WRITE_ONLY] Setpoint 2 Dynamic Teach Stop
stDeviceData.stSelection.stCommands.bCmdTeachCancel	BOOL	[WRITE_ONLY] Teach Cancel
stDeviceData.stSelection.stCommands.bCmdResetDiagnosisInformation	BOOL	[WRITE_ONLY] Reset Diagnosis Information
stDeviceData.stSelection.stCommands.bCmdStopMeasurement	BOOL	[WRITE_ONLY] Stop measurement
stDeviceData.stSelection.stCommands.bCmdStartMeasurement	BOOL	[WRITE_ONLY] Start measurement
stDeviceData.stSelection.stCommands.bCmdSingleMeasurement	BOOL	[WRITE_ONLY] Single measurement
stDeviceData.stSelection.stCommands.bCmdIoLink11SystemTestCommand240Event8DfeAppears	BOOL	[WRITE_ONLY] IO-Link 1.1 system test command 240, Event 8DFE appears
stDeviceData.stSelection.stCommands.bCmdIoLink11SystemTestCommand241Event8DfeDisappears	BOOL	[WRITE_ONLY] IO-Link 1.1 system test command 241, Event 8DFE disappears
stDeviceData.stSelection.stCommands.bCmdIoLink11SystemTestCommand242Event8DffAppears	BOOL	[WRITE_ONLY] IO-Link 1.1 system test command 242, Event 8DFF appears
stDeviceData.stSelection.stCommands.bCmdIoLink11SystemTestCommand243Event8DffDisappears	BOOL	[WRITE_ONLY] IO-Link 1.1 system test command 243, Event 8DFF disappears
stDeviceData.stSelection.stDirectParametersPage1.bAll	BOOL	[READ_WRITE] all parameters of complex data type

Parameter name	Data type	Description
stDeviceData.stSelection.stDirectParametersPage1.bReserved_1	BOOL	[READ_ONLY] ; Suffix "_1" (parameter index or subindex) added because of duplicate parameter names.
stDeviceData.stSelection.stDirectParametersPage1.bMasterCycleTime	BOOL	[READ_ONLY] Communication: Current communication cycle duration used by the master. This value defines the process data cycle.
stDeviceData.stSelection.stDirectParametersPage1.bMinCycleTime	BOOL	[READ_ONLY] Communication: Minimum communication cycle duration supported by the device. This value defines the lowest possible process data cycle.
stDeviceData.stSelection.stDirectParametersPage1.bMSequenceCapability	BOOL	[READ_ONLY] Communication: Information on the structure and the supported features of the communication messages.
stDeviceData.stSelection.stDirectParametersPage1.bIoLinkRevisionId	BOOL	[READ_ONLY] Communication: Identifier for the currently used communication protocol revision.
stDeviceData.stSelection.stDirectParametersPage1.bProcessDataInputLength	BOOL	[READ_ONLY] Communication: Information on width and features of the process input data (Process Data from Device to Master).
stDeviceData.stSelection.stDirectParametersPage1.bProcessDataOutputLength	BOOL	[READ_ONLY] Communication: Information on width of the process output data (Process Data from Master to Device).
stDeviceData.stSelection.stDirectParametersPage1.bVendorId1	BOOL	[READ_ONLY] Identification: Highest octet of the Vendor ID. Combined with the parameter Vendor ID 2, this parameter defines the 16-bit value of the unique Vendor ID as assigned by the IO-Link Community.
stDeviceData.stSelection.stDirectParametersPage1.bVendorId2	BOOL	[READ_ONLY] Identification: Lowest octet of the Vendor ID. Combined with the parameter Vendor ID 1, this parameter defines the 16-bit value of the unique Vendor ID as assigned by the IO-Link Community.

Parameter name	Data type	Description
stDeviceData.stSelection.stDirectParametersPage1.bDeviceId1	BOOL	[READ_ONLY] Identification: Highest octet of the Device ID. Combined with the parameters Device ID 2 and 3, this parameter defines the 24-bit value of the vendor-specific Device ID.
stDeviceData.stSelection.stDirectParametersPage1.bDeviceId2	BOOL	[READ_ONLY] Identification: Middle octet of the Device ID. Combined with the parameters Device ID 1 and 3, this parameter defines the 24-bit value of the vendor-specific Device ID.
stDeviceData.stSelection.stDirectParametersPage1.bDeviceId3	BOOL	[READ_ONLY] Identification: Lowest octet of the Device ID. Combined with the parameters Device ID 1 and 2, this parameter defines the 24-bit value of the vendor-specific Device ID.
stDeviceData.stSelection.stDirectParametersPage1.bReserved_13	BOOL	[READ_ONLY] ; Suffix "_13" (parameter index or subindex) added because of duplicate parameter names.
stDeviceData.stSelection.stDirectParametersPage1.bReserved_14	BOOL	[READ_ONLY] ; Suffix "_14" (parameter index or subindex) added because of duplicate parameter names.
stDeviceData.stSelection.stDirectParametersPage1.bReserved_15	BOOL	[READ_ONLY] ; Suffix "_15" (parameter index or subindex) added because of duplicate parameter names.
stDeviceData.stSelection.stDirectParametersPage1.bSystemCommand	BOOL	[WRITE_ONLY] Application: Command interface for devices without ISDU support. Validity and execution of commands are not confirmed.
stDeviceData.stSelection.stDirectParametersPage2.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stDirectParametersPage2.bDeviceSpecificParameter1	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2.bDeviceSpecificParameter2	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2.bDeviceSpecificParameter3	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2.bDeviceSpecificParameter4	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2.bDeviceSpecificParameter5	BOOL	[READ_WRITE]

Parameter name	Data type	Description
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter6	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter7	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter8	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter9	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter10	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter11	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter12	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter13	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter14	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter15	BOOL	[READ_WRITE]
stDeviceData.stSelection.stDirectParametersPage2. bDeviceSpecificParameter16	BOOL	[READ_WRITE]
stDeviceData.stSelection.bSystemCommand	BOOL	[WRITE_ONLY] Command interface for applications. A positive acknowledge indicates the complete and correct finalization of the requested function.
stDeviceData.stSelection.stDeviceAccessLocks.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.bVendorName	BOOL	[READ_ONLY] The vendor name that is assigned to a Vendor ID.
stDeviceData.stSelection.bVendorText	BOOL	[READ_ONLY] Additional information about the vendor.
stDeviceData.stSelection.bProductName	BOOL	[READ_ONLY] Complete product name.
stDeviceData.stSelection.bProductId	BOOL	[READ_ONLY] Vendor-specific product or type identification (e.g., item number or model number).
stDeviceData.stSelection.bProductText	BOOL	[READ_ONLY] Additional product information for the device.
stDeviceData.stSelection.bFirmwareRevision	BOOL	[READ_ONLY] Unique, vendor-specific identifier of the firmware revision of the individual device.
stDeviceData.stSelection.bApplicationSpecificTag	BOOL	[READ_WRITE] Possibility to mark a device with user- or application-specific information.
stDeviceData.stSelection.bErrorCount	BOOL	[READ_ONLY] Number of errors that occurred in the technology-specific application since power on or restart.

Parameter name	Data type	Description
stDeviceData.stSelection.bDeviceStatus	BOOL	[READ_ONLY] Indicator for the current device condition and diagnosis state.
stDeviceData.stSelection.stTeachState.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stSetpoints.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stSetpoints.bParam1Bdc1Q1	BOOL	[READ_WRITE] threshold measurement value
stDeviceData.stSelection.stSetpoints.bParam2Bdc1Q1	BOOL	[READ_WRITE] threshold measurement value
stDeviceData.stSelection.stSwitchpointBdc1.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stSwitchpointBdc1.bLogic	BOOL	[READ_WRITE] switching information is transmitted in inverted or not inverted manner
stDeviceData.stSelection.stSwitchpointBdc1.bMode	BOOL	[READ_WRITE] operation mode for binary signal
stDeviceData.stSelection.stSwitchpointBdc1.bHysteresis	BOOL	[READ_WRITE]
stDeviceData.stSelection.bLot	BOOL	[READ_ONLY] production lot
stDeviceData.stSelection.bOnDelaySwitchingOutput	BOOL	[READ_WRITE] on delay for the binary data channel
stDeviceData.stSelection.bOffDelaySwitchingOutput	BOOL	[READ_WRITE] off delay for the binary data channel
stDeviceData.stSelection.bMultiIOPin4	BOOL	[READ_WRITE] polarity of the switching output
stDeviceData.stSelection.bTemperatureCompensation	BOOL	[READ_WRITE]
stDeviceData.stSelection.stTeachpointSp1.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stTeachpointSp1.bTp1	BOOL	[READ_ONLY] detected lower limit during teach-in procedure
stDeviceData.stSelection.stTeachpointSp1.bTp2	BOOL	[READ_ONLY] detected upper limit during teach-in procedure
stDeviceData.stSelection.stTeachpointSp2.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stTeachpointSp2.bTp1	BOOL	[READ_ONLY] detected lower limit during teach-in procedure
stDeviceData.stSelection.stTeachpointSp2.bTp2	BOOL	[READ_ONLY] detected upper limit during teach-in procedure
stDeviceData.stSelection.stProcessDataLimits.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stProcessDataLimits.bLower	BOOL	[READ_ONLY] lower limit after power-up or reset

Parameter name	Data type	Description
stDeviceData.stSelection.stProcessDataLimits.bUpper	BOOL	[READ_ONLY] upper limit after power-up or reset
stDeviceData.stSelection.bSwitchCounter	BOOL	[READ_ONLY] number of switching after power-up or reset
stDeviceData.stSelection.bTemperatureInternal	BOOL	[READ_ONLY] Sensor temperature
stDeviceData.stData.stCommands.nCmdRestoreFactorySettings	UINT	[WRITE_ONLY] Restore Factory Settings
stDeviceData.stData.stCommands.nCmdTeachApply	UINT	[WRITE_ONLY] Teach Apply
stDeviceData.stData.stCommands.nCmdSetpoint1SingleValueTeach	UINT	[WRITE_ONLY] Setpoint 1 Single Value Teach
stDeviceData.stData.stCommands.nCmdSetpoint2SingleValueTeach	UINT	[WRITE_ONLY] Setpoint 2 Single Value Teach
stDeviceData.stData.stCommands.nCmdTwoValueTeachTp1Sp1	UINT	[WRITE_ONLY] Two Value Teach TP1 SP1
stDeviceData.stData.stCommands.nCmdTwoValueTeachTp2Sp1	UINT	[WRITE_ONLY] Two Value Teach TP2 SP1
stDeviceData.stData.stCommands.nCmdTwoValueTeachTp1Sp2	UINT	[WRITE_ONLY] Two Value Teach TP1 SP2
stDeviceData.stData.stCommands.nCmdTwoValueTeachTp2Sp2	UINT	[WRITE_ONLY] Two Value Teach TP2 SP2
stDeviceData.stData.stCommands.nCmdSetpoint1DynamicTeachStart	UINT	[WRITE_ONLY] Setpoint 1 Dynamic Teach Start
stDeviceData.stData.stCommands.nCmdSetpoint1DynamicTeachStop	UINT	[WRITE_ONLY] Setpoint 1 Dynamic Teach Stop
stDeviceData.stData.stCommands.nCmdSetpoint2DynamicTeachStart	UINT	[WRITE_ONLY] Setpoint 2 Dynamic Teach Start
stDeviceData.stData.stCommands.nCmdSetpoint2DynamicTeachStop	UINT	[WRITE_ONLY] Setpoint 2 Dynamic Teach Stop
stDeviceData.stData.stCommands.nCmdTeachCancel	UINT	[WRITE_ONLY] Teach Cancel
stDeviceData.stData.stCommands.nCmdResetDiagnosisInformation	UINT	[WRITE_ONLY] Reset Diagnosis Information
stDeviceData.stData.stCommands.nCmdStopMeasurement	UINT	[WRITE_ONLY] Stop measurement
stDeviceData.stData.stCommands.nCmdStartMeasurement	UINT	[WRITE_ONLY] Start measurement
stDeviceData.stData.stCommands.nCmdSingleMeasurement	UINT	[WRITE_ONLY] Single measurement
stDeviceData.stData.stCommands.nCmdIoLink11SystemTestCommand240Event8DfeAppears	UINT	[WRITE_ONLY] IO-Link 1.1 system test command 240, Event 8DFE appears
stDeviceData.stData.stCommands.nCmdIoLink11SystemTestCommand241Event8DfeDisappears	UINT	[WRITE_ONLY] IO-Link 1.1 system test command 241, Event 8DFE disappears
stDeviceData.stData.stCommands.nCmdIoLink11SystemTestCommand242Event8DffAppears	UINT	[WRITE_ONLY] IO-Link 1.1 system test command 242, Event 8DFF appears
stDeviceData.stData.stCommands.nCmdIoLink11SystemTestCommand243Event8DffDisappears	UINT	[WRITE_ONLY] IO-Link 1.1 system test command 243, Event 8DFF disappears

Parameter name	Data type	Description
stDeviceData.stData.stDirectParametersPage1.nReserved_1	UINT	[READ_ONLY] ; Suffix "_1" (parameter index or subindex) added because of duplicate parameter names.
stDeviceData.stData.stDirectParametersPage1.nMasterCycleTime	UINT	[READ_ONLY] Communication: Current communication cycle duration used by the master. This value defines the process data cycle.
stDeviceData.stData.stDirectParametersPage1.nMinCycleTime	UINT	[READ_ONLY] Communication: Minimum communication cycle duration supported by the device. This value defines the lowest possible process data cycle.
stDeviceData.stData.stDirectParametersPage1.nMSequenceCapability	UINT	[READ_ONLY] Communication: Information on the structure and the supported features of the communication messages.
stDeviceData.stData.stDirectParametersPage1.nIoLinkRevisionId	UINT	[READ_ONLY] Communication: Identifier for the currently used communication protocol revision.
stDeviceData.stData.stDirectParametersPage1.nProcessDataInputLength	UINT	[READ_ONLY] Communication: Information on width and features of the process input data (Process Data from Device to Master).
stDeviceData.stData.stDirectParametersPage1.nProcessDataOutputLength	UINT	[READ_ONLY] Communication: Information on width of the process output data (Process Data from Master to Device).
stDeviceData.stData.stDirectParametersPage1.nVendorId1	UINT	[READ_ONLY] Identification: Highest octet of the Vendor ID. Combined with the parameter Vendor ID 2, this parameter defines the 16-bit value of the unique Vendor ID as assigned by the IO-Link Community.
stDeviceData.stData.stDirectParametersPage1.nVendorId2	UINT	[READ_ONLY] Identification: Lowest octet of the Vendor ID. Combined with the parameter Vendor ID 1, this parameter defines the 16-bit value of the unique Vendor ID as assigned by the IO-Link Community.

Parameter name	Data type	Description
stDeviceData.stData.stDirectParametersPage1.nDeviceId1	UINT	[READ_ONLY] Identification: Highest octet of the Device ID. Combined with the parameters Device ID 2 and 3, this parameter defines the 24-bit value of the vendor-specific Device ID.
stDeviceData.stData.stDirectParametersPage1.nDeviceId2	UINT	[READ_ONLY] Identification: Middle octet of the Device ID. Combined with the parameters Device ID 1 and 3, this parameter defines the 24-bit value of the vendor-specific Device ID.
stDeviceData.stData.stDirectParametersPage1.nDeviceId3	UINT	[READ_ONLY] Identification: Lowest octet of the Device ID. Combined with the parameters Device ID 1 and 2, this parameter defines the 24-bit value of the vendor-specific Device ID.
stDeviceData.stData.stDirectParametersPage1.nReserved_13	UINT	[READ_ONLY] ; Suffix "_13" (parameter index or subindex) added because of duplicate parameter names.
stDeviceData.stData.stDirectParametersPage1.nReserved_14	UINT	[READ_ONLY] ; Suffix "_14" (parameter index or subindex) added because of duplicate parameter names.
stDeviceData.stData.stDirectParametersPage1.nReserved_15	UINT	[READ_ONLY] ; Suffix "_15" (parameter index or subindex) added because of duplicate parameter names.
stDeviceData.stData.stDirectParametersPage1.nSystemCommand	UINT	[WRITE_ONLY] Application: Command interface for devices without ISDU support. Validity and execution of commands are not confirmed.
stDeviceData.stData.stDirectParametersPage2.nDeviceSpecificParameter1	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2.nDeviceSpecificParameter2	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2.nDeviceSpecificParameter3	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2.nDeviceSpecificParameter4	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2.nDeviceSpecificParameter5	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2.nDeviceSpecificParameter6	UINT	[READ_WRITE]

Parameter name	Data type	Description
stDeviceData.stData.stDirectParametersPage2. nDeviceSpecificParameter7	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2. nDeviceSpecificParameter8	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2. nDeviceSpecificParameter9	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2. nDeviceSpecificParameter10	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2. nDeviceSpecificParameter11	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2. nDeviceSpecificParameter12	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2. nDeviceSpecificParameter13	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2. nDeviceSpecificParameter14	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2. nDeviceSpecificParameter15	UINT	[READ_WRITE]
stDeviceData.stData.stDirectParametersPage2. nDeviceSpecificParameter16	UINT	[READ_WRITE]
stDeviceData.stData.nSystemCommand	UINT	[WRITE_ONLY] Command interface for applications. A positive acknowledge indicates the complete and correct finalization of the requested function.
stDeviceData.stData.stDeviceAccessLocks. bParameterWriteAccess	BOOL	[READ_WRITE] This lock prevents the write access to all read/write parameters of the device except for the parameter 'Device Access Locks'.
stDeviceData.stData.stDeviceAccessLocks.bDataStorage	BOOL	[READ_WRITE] This lock prevents the write access to the device parameters via the data storage mechanism.
stDeviceData.stData.stDeviceAccessLocks. bLocalParameterization	BOOL	[READ_WRITE] This lock prevents the device settings from being changed via local operating elements on the device.
stDeviceData.stData.stDeviceAccessLocks.bLocalUserInterface	BOOL	[READ_WRITE] This lock prevents the access to the device settings and display via a local user interface. The user interface is disabled.
stDeviceData.stData.sVendorName	STRING	[READ_ONLY] The vendor name that is assigned to a Vendor ID.
stDeviceData.stData.sVendorText	STRING	[READ_ONLY] Additional information about the vendor.
stDeviceData.stData.sProductName	STRING	[READ_ONLY] Complete product name.

Parameter name	Data type	Description
stDeviceData.stData.sProductId	STRING	[READ_ONLY] Vendor-specific product or type identification (e.g., item number or model number).
stDeviceData.stData.sProductText	STRING	[READ_ONLY] Additional product information for the device.
stDeviceData.stData.sFirmwareRevision	STRING	[READ_ONLY] Unique, vendor-specific identifier of the firmware revision of the individual device.
stDeviceData.stData.sApplicationSpecificTag	STRING	[READ_WRITE] Possibility to mark a device with user- or application-specific information.
stDeviceData.stData.nErrorCount	UINT	[READ_ONLY] Number of errors that occurred in the technology-specific application since power on or restart.
stDeviceData.stData.nDeviceStatus	UINT	[READ_ONLY] Indicator for the current device condition and diagnosis state.
stDeviceData.stData.stTeachState.nTeachState	UINT	[READ_ONLY] indication of the current state of the teach-in procedure
stDeviceData.stData.stSetpoints.nParam1Bdc1Q1	UINT	[READ_WRITE] threshold measurement value
stDeviceData.stData.stSetpoints.nParam2Bdc1Q1	UINT	[READ_WRITE] threshold measurement value
stDeviceData.stData.stSwitchpointBdc1.nLogic	UINT	[READ_WRITE] switching information is transmitted in inverted or not inverted manner
stDeviceData.stData.stSwitchpointBdc1.nMode	UINT	[READ_WRITE] operation mode for binary signal
stDeviceData.stData.stSwitchpointBdc1.nHysteresis	UINT	[READ_WRITE]
stDeviceData.stData.sLot	STRING	[READ_ONLY] production lot
stDeviceData.stData.nOnDelaySwitchingOutput	UINT	[READ_WRITE] on delay for the binary data channel
stDeviceData.stData.nOffDelaySwitchingOutput	UINT	[READ_WRITE] off delay for the binary data channel
stDeviceData.stData.nMultiIOPin4	UINT	[READ_WRITE] polarity of the switching output
stDeviceData.stData.nTemperatureCompensation	UINT	[READ_WRITE]
stDeviceData.stData.stTeachpointSp1.nTp1	UINT	[READ_ONLY] detected lower limit during teach-in procedure
stDeviceData.stData.stTeachpointSp1.nTp2	UINT	[READ_ONLY] detected upper limit during teach-in procedure
stDeviceData.stData.stTeachpointSp2.nTp1	UINT	[READ_ONLY] detected lower limit during teach-in procedure

Parameter name	Data type	Description
stDeviceData.stData.stTeachpointSp2.nTp2	UINT	[READ_ONLY] detected upper limit during teach-in procedure
stDeviceData.stData.stProcessDataLimits.nLower	UINT	[READ_ONLY] lower limit after power-up or reset
stDeviceData.stData.stProcessDataLimits.nUpper	UINT	[READ_ONLY] upper limit after power-up or reset
stDeviceData.stData.nSwitchCounter	UINT	[READ_ONLY] number of switching after power-up or reset
stDeviceData.stData.nTemperatureInternal	INT	[READ_ONLY] Sensor temperature

Tab. 7.2: ST_Leuze_PD_HTU218_3069

Parameter name	Data type	Description
ST_Leuze_PD_HTU218_3069.nMeasuredValue	UINT	
ST_Leuze_PD_HTU218_3069.bSwitchStateBdc1Q1	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	Command interface for applications. A positive acknowledge indicates the complete and correct finalization of the requested function.
Restore Factory Settings			UIntegerT	130	W	Restore Factory Settings
Teach Apply			UIntegerT	64	W	Teach Apply
Setpoint 1 Single Value Teach			UIntegerT	65	W	Setpoint 1 Single Value Teach
Setpoint 2 Single Value Teach			UIntegerT	66	W	Setpoint 2 Single Value Teach
Two Value Teach TP1 SP1			UIntegerT	67	W	Two Value Teach TP1 SP1
Two Value Teach TP2 SP1			UIntegerT	68	W	Two Value Teach TP2 SP1
Two Value Teach TP1 SP2			UIntegerT	69	W	Two Value Teach TP1 SP2
Two Value Teach TP2 SP2			UIntegerT	70	W	Two Value Teach TP2 SP2
Setpoint 1 Dynamic Teach Start			UIntegerT	71	W	Setpoint 1 Dynamic Teach Start
Setpoint 1 Dynamic Teach Stop			UIntegerT	72	W	Setpoint 1 Dynamic Teach Stop
Setpoint 2 Dynamic Teach Start			UIntegerT	73	W	Setpoint 2 Dynamic Teach Start
Setpoint 2 Dynamic Teach Stop			UIntegerT	74	W	Setpoint 2 Dynamic Teach Stop
Teach Cancel			UIntegerT	79	W	Teach Cancel
Reset Diagnosis Information			UIntegerT	163	W	Reset Diagnosis Information
Stop measurement			UIntegerT	164	W	Stop measurement
Start measurement			UIntegerT	165	W	Start measurement
Single measurement			UIntegerT	166	W	Single measurement
IO-Link 1.1 system test command 240, Event 8DFE appears			UIntegerT	240	W	IO-Link 1.1 system test command 240, Event 8DFE appears
IO-Link 1.1 system test command 241, Event 8DFE disappears			UIntegerT	241	W	IO-Link 1.1 system test command 241, Event 8DFE disappears
IO-Link 1.1 system test command 242, Event 8DFF appears			UIntegerT	242	W	IO-Link 1.1 system test command 242, Event 8DFF appears
IO-Link 1.1 system test command 243, Event 8DFF disappears			UIntegerT	243	W	IO-Link 1.1 system test command 243, Event 8DFF disappears

Parameter	Index	Subindex	Data type	Default	AR	Description
Direct Parameters - Page 1	0	0	RecordT		RW	Comprises the required parameters defining the communication characteristics and identifiers for device validation.
Reserved	0	1	UIntegerT		R	
Master Cycle Time	0	2	UIntegerT		R	Communication: Current communication cycle duration used by the master. This value defines the process data cycle.
Min Cycle Time	0	3	UIntegerT		R	Communication: Minimum communication cycle duration supported by the device. This value defines the lowest possible process data cycle.
M-Sequence Capability	0	4	UIntegerT		R	Communication: Information on the structure and the supported features of the communication messages.
IO-Link Revision ID	0	5	UIntegerT	17	R	Communication: Identifier for the currently used communication protocol revision.
Process Data Input Length	0	6	UIntegerT		R	Communication: Information on width and features of the process input data (Process Data from Device to Master).
Process Data Output Length	0	7	UIntegerT		R	Communication: Information on width of the process output data (Process Data from Master to Device).
Vendor ID 1	0	8	UIntegerT		R	Identification: Highest octet of the Vendor ID. Combined with the parameter Vendor ID 2, this parameter defines the 16-bit value of the unique Vendor ID as assigned by the IO-Link Community.
Vendor ID 2	0	9	UIntegerT		R	Identification: Lowest octet of the Vendor ID. Combined with the parameter Vendor ID 1, this parameter defines the 16-bit value of the unique Vendor ID as assigned by the IO-Link Community.
Device ID 1	0	10	UIntegerT		R	Identification: Highest octet of the Device ID. Combined with the parameters Device ID 2 and 3, this parameter defines the 24-bit value of the vendor-specific Device ID.
Device ID 2	0	11	UIntegerT		R	Identification: Middle octet of the Device ID. Combined with the parameters Device ID 1 and 3, this parameter defines the 24-bit value of the vendor-specific Device ID.
Device ID 3	0	12	UIntegerT		R	Identification: Lowest octet of the Device ID. Combined with the parameters Device ID 1 and 2, this parameter defines the 24-bit value of the vendor-specific Device ID.
Reserved	0	13	UIntegerT		R	
Reserved	0	14	UIntegerT		R	
Reserved	0	15	UIntegerT		R	

Parameter	Index	Subindex	Data type	Default	AR	Description
System Command	0	16	UIntegerT		W	Application: Command interface for devices without ISDU support. Validity and execution of commands are not confirmed. (0 ... 63): Reserved 128: Device Reset 129: Application Reset 130: Restore Factory Settings 131: Back-to-box (132 ... 159): Reserved
Direct Parameters - Page 2	1	0	RecordT		RW	A set of parameters for devices without ISDU support.
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	

Parameter	Index	Subindex	Data type	Default	AR	Description
System Command	2	0	UIntegerT		W	<p>Command interface for applications. A positive acknowledge indicates the complete and correct finalization of the requested function.</p> <p>130: Restore Factory Settings (0 ... 63): Reserved (132 ... 159): Reserved 64: Teach Apply 65: Setpoint 1 Single Value Teach 66: Setpoint 2 Single Value Teach 67: Two Value Teach TP1 SP1 68: Two Value Teach TP2 SP1 69: Two Value Teach TP1 SP2 70: Two Value Teach TP2 SP2 71: Setpoint 1 Dynamic Teach Start 72: Setpoint 1 Dynamic Teach Stop 73: Setpoint 2 Dynamic Teach Start 74: Setpoint 2 Dynamic Teach Stop 79: Teach Cancel 163: Reset Diagnosis Information 164: Stop measurement 165: Start measurement 166: Single measurement 240: IO-Link 1.1 system test command 240, Event 8DFE appears 241: IO-Link 1.1 system test command 241, Event 8DFE disappears 242: IO-Link 1.1 system test command 242, Event 8DFF appears 243: IO-Link 1.1 system test command 243, Event 8DFF disappears</p>
Device Access Locks	12	0	RecordT		RW	The access to the device parameters can be restricted by setting appropriate flags within this parameter.
Parameter Write Access	12	1	BooleanT	0	RW	<p>This lock prevents the write access to all read/write parameters of the device except for the parameter 'Device Access Locks'.</p> <p>True: Locked False: Unlocked</p>
Data Storage	12	2	BooleanT		RW	<p>This lock prevents the write access to the device parameters via the data storage mechanism.</p> <p>True: Locked False: Unlocked</p>
Local Parameterization	12	3	BooleanT	0	RW	<p>This lock prevents the device settings from being changed via local operating elements on the device.</p> <p>True: Locked False: Unlocked</p>
Local User Interface	12	4	BooleanT		RW	<p>This lock prevents the access to the device settings and display via a local user interface. The user interface is disabled.</p> <p>True: Locked False: Unlocked</p>

Parameter	Index	Subindex	Data type	Default	AR	Description
Vendor Name	16	0	StringT	Leuze electronic GmbH + Co. KG	R	The vendor name that is assigned to a Vendor ID.
Vendor Text	17	0	StringT	The Sensor People	R	Additional information about the vendor.
Product Name	18	0	StringT		R	Complete product name.
Product ID	19	0	StringT		R	Vendor-specific product or type identification (e.g., item number or model number).
Product Text	20	0	StringT		R	Additional product information for the device.
Firmware Revision	23	0	StringT		R	Unique, vendor-specific identifier of the firmware revision of the individual device.
Application-specific Tag	24	0	StringT		RW	Possibility to mark a device with user- or application-specific information.
Error Count	32	0	UIntegerT		R	Number of errors that occurred in the technology-specific application since power on or restart.
Device Status	36	0	UIntegerT		R	Indicator for the current device condition and diagnosis state.
Teach State	59	0	RecordT		R	indication of the current state of the teach-in procedure and teach point setting
Teach State	59	3	UIntegerT	0	R	indication of the current state of the teach-in procedure 0: Idle 1: Switchpoint Set 2: Switchpoint 2 Set 3: Switchpoint 1+2 Set 4: Wait for Command 5: Busy 6: Reserved 7: Error
Setpoints	60	0	RecordT		RW	threshold measurement value of a sensor for the edge of a binary output signal 1
(1) (BDC1, Q1)	60	1	UIntegerT	150	RW	threshold measurement value (150 ... 1500)
(2) (BDC1, Q1)	60	2	UIntegerT	1500	RW	threshold measurement value (150 ... 1500)
Switchpoint BDC1	61	0	RecordT		RW	mode, logic and hysteresis for binary data channel 1
Logic	61	1	UIntegerT	0	RW	switching information is transmitted in inverted or not inverted manner 0: NO 1: NC
Mode	61	2	UIntegerT	2	RW	operation mode for binary signal 0: Deactivated 1: Single point mode 2: Window mode 3: Two point mode 128: Reflex mode

Parameter	Index	Subindex	Data type	Default	AR	Description
Hysteresis	61	3	UIntegerT	2	RW	(2 ... 20)
Lot	64	0	StringT		R	production lot
On delay switching output	66	0	UIntegerT	0	RW	on delay for the binary data channel (0 ... 10000)
Off delay switching output	67	0	UIntegerT	0	RW	off delay for the binary data channel (0 ... 10000)
Multi I/O (Pin 4)	70	0	UIntegerT	0	RW	polarity of the switching output 0: PP 1: NPN 2: PNP
Temperature Compensation	74	0	UIntegerT	0	RW	0: Off 1: On
Teachpoint SP1	80	0	RecordT		R	Values detected during teach
TP1	80	1	UIntegerT		R	detected lower limit during teach-in procedure
TP2	80	2	UIntegerT		R	detected upper limit during teach-in procedure
Teachpoint SP2	81	0	RecordT		R	Values detected during teach
TP1	81	1	UIntegerT		R	detected lower limit during teach-in procedure
TP2	81	2	UIntegerT		R	detected upper limit during teach-in procedure
Process data limits	84	0	RecordT		R	Process data limit values
lower	84	1	UIntegerT		R	lower limit after power-up or reset
upper	84	2	UIntegerT		R	upper limit after power-up or reset
Switch counter	85	0	UIntegerT	0	R	number of switching after power-up or reset
Temperature internal	86	0	IntegerT		R	Sensor temperature

9 Technical specifications

9.1 General data

Tab. 9.1: Sensor and IODD version

IODD version	V1.2
IODD release date	2023-08-01
Device family	HTU... series
Device ID	3069
Device name	HTU218-1500/LT-M12
Device variants	HTU218-1500/LT-M12 (50149540)