



## PLC Integration of LV463\_514

**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\_ LV463\_514" 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_ LV463_514	Sensor data

See structure description of ST\_Leuze\_IOL\_ LV463\_514 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\_LV463\_514". 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\_LV463\_514" 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\_ LV463\_514" 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\_LV463\_514 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_LV463_514	OUTPUT	ST_Leuze_PD_LV463_514	Reference to the instance of the data structure ST_Leuze_PD_LV463_514. The structure includes the disaggregated values of the process data.

See structure description of ST\_Leuze\_PD\_LV463\_514 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\_LV463\_514

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. bCmdSp1SingleValueTeach	BOOL	[WRITE_ONLY] SP1 Single Value Teach
stDeviceData.stSelection.stCommands. bCmdSp1TwoValueTeachTp1	BOOL	[WRITE_ONLY] SP1 Two Value Teach TP1
stDeviceData.stSelection.stCommands. bCmdSp1TwoValueTeachTp2	BOOL	[WRITE_ONLY] SP1 Two Value Teach TP2
stDeviceData.stSelection.stCommands. bCmdSp1DynamicTeachStart	BOOL	[WRITE_ONLY] SP1 Dynamic Teach Start
stDeviceData.stSelection.stCommands. bCmdSp1DynamicTeachStop	BOOL	[WRITE_ONLY] SP1 Dynamic Teach Stop
stDeviceData.stSelection.stCommands. bCmdS1ExitTeach	BOOL	[WRITE_ONLY] S1 Exit Teach
stDeviceData.stSelection.stCommands. bCmdDisableEmitter	BOOL	[WRITE_ONLY] Disable Emitter
stDeviceData.stSelection.stCommands. bCmdEnableEmitter	BOOL	[WRITE_ONLY] Enable Emitter
stDeviceData.stSelection.stCommands. bCmdStopSensorSearch	BOOL	[WRITE_ONLY] Stop Sensor Search
stDeviceData.stSelection.stCommands. bCmdStartSensorSearch	BOOL	[WRITE_ONLY] Start Sensor Search
stDeviceData.stSelection.stCommands. bCmdBaselineNull	BOOL	[WRITE_ONLY] Baseline Null
stDeviceData.stSelection.stCommands. bCmdBaselineDisable	BOOL	[WRITE_ONLY] Baseline Disable
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. bloLinkVersionId	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1. bProcessDataInputLength	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDirectParameters1. bProcessDataOutputLength	BOOL	[READ_ONLY]

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

Parameter name	Data type	Description
stDeviceData.stSelection.bVendorName	BOOL	[READ_ONLY]
stDeviceData.stSelection.bVendorText	BOOL	[READ_ONLY]
stDeviceData.stSelection.bProductName	BOOL	[READ_ONLY]
stDeviceData.stSelection.bProductId	BOOL	[READ_ONLY]
stDeviceData.stSelection.bProductText	BOOL	[READ_ONLY]
stDeviceData.stSelection.bSerialNumber	BOOL	[READ_ONLY]
stDeviceData.stSelection.bFirmwareVersion	BOOL	[READ_ONLY]
stDeviceData.stSelection.bApplicationSpecificTag	BOOL	[READ_WRITE]
stDeviceData.stSelection.bDeviceStatus	BOOL	[READ_ONLY]
stDeviceData.stSelection.stDetailedDeviceStatus.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stTeachInChannel.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stTeachStatus.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stBdc1Setpoints.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stBdc1Configuration.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stBdc1Configuration. bBdcLogic	BOOL	[READ_WRITE] LO/DO Selection
stDeviceData.stSelection.stBdc1Configuration. bBdcMode	BOOL	[READ_WRITE] Defines how the binary switching information is created depending on Setpoint parameters (SP1, SP2) and the current measurement value
stDeviceData.stSelection.stBdc1Configuration. bHysteresis	BOOL	[READ_WRITE] User selectable hysteresis. Selectable as a multiple of the minimum possible hysteresis level
stDeviceData.stSelection.stConfiguration.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stConfiguration. bResponseSpeed	BOOL	[READ_WRITE] The smallest sensing event the sensor is guaranteed to register
stDeviceData.stSelection.stConfiguration.bGainMode	BOOL	[READ_WRITE] In Auto Gain, the DF-G1 optimizes the gain during a TEACH/SET method for the presented condition(s)

Parameter name	Data type	Description
stDeviceData.stSelection.stConfiguration.bGainLevel	BOOL	[READ_WRITE] Current gain setting. In auto-gain this will be changed to reflect the optimal gain found during the TEACH/SET method
stDeviceData.stSelection.stConfiguration.bProcessDataFilterUpdateTime	BOOL	[READ_WRITE] Amount of time to collect averaged sample for process data (defaults to 2.6 ms - min cycle time)
stDeviceData.stSelection.stConfiguration.bDisplayOrientation	BOOL	[READ_WRITE] The display orientation can be reversed to accomodate any mounting orientation
stDeviceData.stSelection.stBdc1VendorSpecificConfiguration.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stStatistics.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stAllTimeRunTime.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stResetableRunTime.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stBdc1Status.bAll	BOOL	[READ_ONLY] all parameters of complex data type
stDeviceData.stSelection.stBdc1Status.bLowerThreshold	BOOL	[READ_ONLY]
stDeviceData.stSelection.stBdc1Status.bUpperThreshold	BOOL	[READ_ONLY]
stDeviceData.stSelection.stBdc1Status.bOutputStateQ1	BOOL	[READ_ONLY]
stDeviceData.stSelection.stBdc1Status.bAlarmState	BOOL	[READ_ONLY] If any alarm is present, the sensors threshold(s) cannot be optimized. If a threshold warning is present the sensor's output will still continue to function. If a threshold error is present, the sensor's output will stop functioning
stDeviceData.stSelection.stQ1ObjectCounterDarkToLight.bAll	BOOL	[READ_WRITE] all parameters of complex data type
stDeviceData.stSelection.stQ1ObjectCounterLightToDark.bAll	BOOL	[READ_WRITE] all parameters of complex data type
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.nCmdSp1SingleValueTeach	UINT	[WRITE_ONLY] SP1 Single Value Teach

Parameter name	Data type	Description
stDeviceData.stData.stCommands. nCmdSp1TwoValueTeachTp1	UINT	[WRITE_ONLY] SP1 Two Value Teach TP1
stDeviceData.stData.stCommands. nCmdSp1TwoValueTeachTp2	UINT	[WRITE_ONLY] SP1 Two Value Teach TP2
stDeviceData.stData.stCommands. nCmdSp1DynamicTeachStart	UINT	[WRITE_ONLY] SP1 Dynamic Teach Start
stDeviceData.stData.stCommands. nCmdSp1DynamicTeachStop	UINT	[WRITE_ONLY] SP1 Dynamic Teach Stop
stDeviceData.stData.stCommands. nCmdS1ExitTeach	UINT	[WRITE_ONLY] S1 Exit Teach
stDeviceData.stData.stCommands. nCmdDisableEmitter	UINT	[WRITE_ONLY] Disable Emitter
stDeviceData.stData.stCommands. nCmdEnableEmitter	UINT	[WRITE_ONLY] Enable Emitter
stDeviceData.stData.stCommands. nCmdStopSensorSearch	UINT	[WRITE_ONLY] Stop Sensor Search
stDeviceData.stData.stCommands. nCmdStartSensorSearch	UINT	[WRITE_ONLY] Start Sensor Search
stDeviceData.stData.stCommands.nCmdBaselineNull	UINT	[WRITE_ONLY] Baseline Null
stDeviceData.stData.stCommands. nCmdBaselineDisable	UINT	[WRITE_ONLY] Baseline Disable
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]

Parameter name	Data type	Description
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]
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]



Parameter name	Data type	Description
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.stDetailedDeviceStatus.sltem_6	STRING	[READ_ONLY]
stDeviceData.stData.stTeachInChannel. nTeachInChannel	UINT	[READ_WRITE] Teach-in Channel
stDeviceData.stData.stTeachStatus.nTeachState	UINT	[READ_ONLY] Provides feedback on the status and the results of the teach-in activities
stDeviceData.stData.stTeachStatus.bSp1Tp1Flag	BOOL	[READ_ONLY]
stDeviceData.stData.stTeachStatus.bSp1Tp2Flag	BOOL	[READ_ONLY]
stDeviceData.stData.stTeachStatus.bSp2Tp1Flag	BOOL	[READ_ONLY]
stDeviceData.stData.stTeachStatus.bSp2Tp2Flag	BOOL	[READ_ONLY]
stDeviceData.stData.stBdc1Setpoints. nUpperThreshold	INT	[READ_WRITE] Switch point
stDeviceData.stData.stBdc1Setpoints.nSp2	INT	[READ_WRITE] Unused
stDeviceData.stData.stBdc1Configuration.nBdcLogic	UINT	[READ_WRITE] LO/DO Selection
stDeviceData.stData.stBdc1Configuration.nBdcMode	UINT	[READ_WRITE] Defines how the binary switching information is created depending on Setpoint parameters (SP1, SP2) and the current measurement value
stDeviceData.stData.stBdc1Configuration.nHysteresis	UINT	[READ_WRITE] User selectable hysteresis. Selectable as a multiple of the minimum possible hysteresis level
stDeviceData.stData.stConfiguration. nResponseSpeed	UINT	[READ_WRITE] The smallest sensing event the sensor is guaranteed to register
stDeviceData.stData.stConfiguration.nGainMode	UINT	[READ_WRITE] In Auto Gain, the DF-G1 optimizes the gain during a TEACH/SET method for the presented condition(s)

Parameter name	Data type	Description
stDeviceData.stData.stConfiguration.nGainLevel	UINT	[READ_WRITE] Current gain setting. In auto-gain this will be changed to reflect the optimal gain found during the TEACH/SET method
stDeviceData.stData.stConfiguration.nProcessDataFilterUpdateTime	UINT	[READ_WRITE] Amount of time to collect averaged sample for process data (defaults to 2.6 ms - min cycle time)
stDeviceData.stData.stConfiguration.nDisplayOrientation	UINT	[READ_WRITE] The display orientation can be reversed to accomodate any mounting orientation
stDeviceData.stData.stBdc1VendorSpecificConfiguration.nDelayMode	UINT	[READ_WRITE] Select the type of delay to be used. Controls the meaning of the On and Off Delay values
stDeviceData.stData.stBdc1VendorSpecificConfiguration.nTimerOnDelayOff1Shot	UINT	[READ_WRITE] Off delay or on/off oneshot time. If configured in 1-shot mode, this parameter will have a minimum value of 1 ms.
stDeviceData.stData.stBdc1VendorSpecificConfiguration.nTimerOffDelayOn1Shot	UINT	[READ_WRITE] On delay time or additional delay time. In off-on delay mode, this parameter will be the on delay. In on-onshot mode, this parameter will be the on delay. In off-oneshot mode this parameter will be the off delay.
stDeviceData.stData.stBdc1VendorSpecificConfiguration.nTeachSelection	UINT	[READ_WRITE] The teach method to be used for a TEACH/SET performed from the front panel
stDeviceData.stData.stBdc1VendorSpecificConfiguration.nAutoThreshold	UINT	[READ_WRITE] The Auto Thresholds algorithm continuously tracks slow changes in the taught condition(s) and optimizes the threshold(s) to provide for reliable sensing
stDeviceData.stData.stStatistics.nNumberOfSamples	UINT	[READ_ONLY] Number of samples present in Sum and Sum-Squared - Only the first 32767 samples after the last read (approximately 3 seconds) are entered into the Sum, SumSquared, and Number of Samples
stDeviceData.stData.stStatistics.nSum	INT	[READ_ONLY] Sum of Signals in Counts - Compute the Mean Signal as: Mean = Sum / Number of Samples
stDeviceData.stData.stStatistics.nMin_68	INT	[READ_ONLY] Minimal signal measured since last read

Parameter name	Data type	Description
stDeviceData.stData.stStatistics.nMax_68	INT	[READ_ONLY] Maximum signal measured since last read - All samples since the last read are entered into the Min/Max Signals
stDeviceData.stData.stStatistics. nBdc1LightDarkTransitionCount	UINT	[READ_ONLY] Number of times sensor's BDC1 sensing state transitioned from the light to the dark state (will not incorporate on/off delays) - All samples since the last read are entered into the Transition Counts
stDeviceData.stData.stStatistics. nBdc1DarkLightTransitionCount	UINT	[READ_ONLY] Number of times sensor's BDC1 sensing state transitioned from the dark to the light state (will not incorporate on/off delays)
stDeviceData.stData.stAllTimeRunTime. nAllTimeRunTime	UINT	[READ_ONLY] A run time counter that can tracks the total time the sensor has been running since manufacture
stDeviceData.stData.stResetableRunTime. nResetableRunTime	UINT	[READ_WRITE] A run time counter that can be written by the user
stDeviceData.stData.stBdc1Status.nLowerThreshold	UINT	[READ_ONLY]
stDeviceData.stData.stBdc1Status.nUpperThreshold	UINT	[READ_ONLY]
stDeviceData.stData.stBdc1Status.nOutputStateQ1	UINT	[READ_ONLY]
stDeviceData.stData.stBdc1Status.nAlarmState	UINT	[READ_ONLY] If any alarm is present, the sensors threshold(s) cannot be optimized. If a threshold warning is present the sensor's output will still continue to function. If a threshold error is present, the sensor's output will stop functioning
stDeviceData.stData.stQ1ObjectCounterDarkToLight. nObjectCounterDarkToLight	INT	[READ_WRITE]
stDeviceData.stData.stQ1ObjectCounterLightToDark. nObjectCounterLightToDark	INT	[READ_WRITE]

Tab. 7.2: ST\_Leuze\_PD\_LV463\_514

Parameter name	Data type	Description
ST_Leuze_PD_LV463_514.bBdc1OutputStateQ	BOOL	
ST_Leuze_PD_LV463_514.nMeasurement	UINT	

## 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 Single Value Teach			UIntegerT	65	W	SP1 Single Value Teach
SP1 Two Value Teach TP1			UIntegerT	67	W	SP1 Two Value Teach TP1
SP1 Two Value Teach TP2			UIntegerT	68	W	SP1 Two Value Teach TP2
SP1 Dynamic Teach Start			UIntegerT	71	W	SP1 Dynamic Teach Start
SP1 Dynamic Teach Stop			UIntegerT	72	W	SP1 Dynamic Teach Stop
S1 Exit Teach			UIntegerT	79	W	S1 Exit Teach
Disable Emitter			UIntegerT	160	W	Disable Emitter
Enable Emitter			UIntegerT	161	W	Enable Emitter
Stop Sensor Search			UIntegerT	176	W	Stop Sensor Search
Start Sensor Search			UIntegerT	177	W	Start Sensor Search
Baseline Null			UIntegerT	178	W	Baseline Null
Baseline Disable			UIntegerT	179	W	Baseline Disable
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	

Parameter	Index	Subindex	Data type	Default	AR	Description
Vendor ID 1	0	8	UIntegerT		R	
Vendor ID 2	0	9	UIntegerT		R	
Device ID 1	0	10	UIntegerT		R	
Device ID 2	0	11	UIntegerT		R	
Device ID 3	0	12	UIntegerT		R	
Reserved	0	13	UIntegerT		R	
Reserved	0	14	UIntegerT		R	
Reserved	0	15	UIntegerT		R	
Standard Command	0	16	UIntegerT		W	(0 ... 63): Reserved 128: Device Reset 129: Application Reset 130: Restore Factory Settings (131 ... 159): Reserved
Direct Parameters 2	1	0	RecordT		RW	
Device Specific Parameter 1	1	1	UIntegerT		RW	
Device Specific Parameter 2	1	2	UIntegerT		RW	
Device Specific Parameter 3	1	3	UIntegerT		RW	
Device Specific Parameter 4	1	4	UIntegerT		RW	
Device Specific Parameter 5	1	5	UIntegerT		RW	
Device Specific Parameter 6	1	6	UIntegerT		RW	
Device Specific Parameter 7	1	7	UIntegerT		RW	
Device Specific Parameter 8	1	8	UIntegerT		RW	
Device Specific Parameter 9	1	9	UIntegerT		RW	
Device Specific Parameter 10	1	10	UIntegerT		RW	
Device Specific Parameter 11	1	11	UIntegerT		RW	
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
Standard Command	2	0	UIntegerT		W	(0 ... 63): Reserved 128: Device Reset 129: Application Reset 130: Restore Factory Settings (131 ... 159): Reserved 65: SP1 Single Value Teach 67: SP1 Two Value Teach TP1 68: SP1 Two Value Teach TP2 71: SP1 Dynamic Teach Start 72: SP1 Dynamic Teach Stop 79: S1 Exit Teach 160: Disable Emitter 161: Enable Emitter 176: Stop Sensor Search 177: Start Sensor Search 178: Baseline Null 179: Baseline Disable
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 Channel	58	0	RecordT		RW	The parameter 'Teach-in Channel' allows addressing the particular BDC or a set of BDCs for which the teach-in commands apply.

Parameter	Index	Subindex	Data type	Default	AR	Description
Teach-in Channel	58	1	UIntegerT	0	RW	Teach-in Channel 0: Default 1: BDC1
Teach Status	59	0	RecordT		R	Provides feedback on the status and the results of the teach-in activities (See IOL Smart Sensor Profile 12.4)
Teach State	59	1	UIntegerT		R	Provides feedback on the status and the results of the teach-in activities  0: Idle 1: SP1 Success 2: SP2 Success 3: SP12 Success 4: Wait for Command 5: Busy 7: Error
SP1 TP1 Flag	59	2	BooleanT		R	
SP1 TP2 Flag	59	3	BooleanT		R	
SP2 TP1 Flag	59	4	BooleanT		R	
SP2 TP2 Flag	59	6	BooleanT		R	
BDC1 Setpoints	60	0	RecordT		RW	The reference value used for sensor switching (See IOL Smart Sensor Profile 9.2.5)
upper threshold	60	1	IntegerT	2000	RW	Switch point
SP2	60	2	IntegerT	0	RW	Unused
BDC1 Configuration	61	0	RecordT		RW	Parameter coding of the Setpoint and Switchpoint parameter. (See IOL Smart Sensor Profile 9.2.6)
BDC Logic	61	1	UIntegerT	128	RW	LO/DO Selection  0: Light Operate 1: Dark Operate 128: Switch Select
BDC Mode	61	2	UIntegerT	1	RW	Defines how the binary switching information is created depending on Setpoint parameters (SP1, SP2) and the current measurement value  1: Single Point
Hysteresis	61	3	UIntegerT	0	RW	User selectable hysteresis. Selectable as a multiple of the minimum possible hysteresis level  0: small 1: medium 2: large
Configuration	64	0	RecordT		RW	Vender specific user configuration options
Response Speed	64	1	UIntegerT	1	RW	The smallest sensing event the sensor is guaranteed to register  0: 50 µS 1: 250 µS 2: 1000 µS

Parameter	Index	Subindex	Data type	Default	AR	Description
Gain Mode	64	2	UIntegerT	1	RW	In Auto Gain, the DF-G1 optimizes the gain during a TEACH/SET method for the presented condition(s)  0: Fixed Gain 1: Auto Gain
Gain Level	64	3	UIntegerT	31	RW	Current gain setting. In auto-gain this will be changed to reflect the optimal gain found during the TEACH/SET method  0: Gain 1 1: Gain 2 2: Gain 3 3: Gain 4 4: Gain 5 5: Gain 6 6: Gain 7 7: Gain 8 8: Gain 9 9: Gain 10 10: Gain 11 11: Gain 12 12: Gain 13 13: Gain 14 14: Gain 15 15: Gain 16 16: Gain 17 17: Gain 18 18: Gain 19 19: Gain 20 20: Gain 21 21: Gain 22 22: Gain 23 23: Gain 24 24: Gain 25 25: Gain 26 26: Gain 27 27: Gain 28 28: Gain 29 29: Gain 30 30: Gain 31 31: Gain 32
Process Data Filter Update Time	64	4	UIntegerT	0	RW	Amount of time to collect averaged sample for process data (defaults to 2.6 ms - min cycle time)
Display Orientation	64	5	UIntegerT	0	RW	The display orientation can be reversed to accomodate any mounting orientation  0: Normal 1: Flipped
BDC1 Vendor Specific Configuration	65	0	RecordT		RW	Vendor specific user selectable BDC settings
Delay Mode	65	1	UIntegerT	0	RW	Select the type of delay to be used. Controls the meaning of the On and Off Delay values  0: Disabled 1: Off-On Delay 2: Off Oneshot 3: On Oneshot



Parameter	Index	Subindex	Data type	Default	AR	Description
Timer ON Delay / OFF 1-Shot	65	2	UIntegerT	0	RW	Off delay or on/off oneshot time. If configured in 1-shot mode, this parameter will have a minimum value of 1 ms.  (0 ... 9999)
Timer OFF Delay / ON 1-Shot	65	3	UIntegerT	0	RW	On delay time or additional delay time. In off-on delay mode, this parameter will be the on delay. In on-oneshot mode, this parameter will be the on delay. In off-oneshot mode this parameter will be the off delay.  (0 ... 9999)
TEACH Selection	65	4	UIntegerT	0	RW	The teach method to be used for a TEACH/SET performed from the front panel  0: Single Point Set 1: Two-Point Teach 2: Dynamic Teach
Auto Threshold	65	5	UIntegerT	0	RW	The Auto Thresholds algorithm continuously tracks slow changes in the taught condition(s) and optimizes the threshold(s) to provide for reliable sensing  0: Disabled 1: Enabled
Statistics	68	0	RecordT		R	- All statistics are reset on every read - Example statistics procedure: - Read the statistics to reset the statistics - Read the statistics again, or periodically
Number of Samples	68	1	UIntegerT		R	Number of samples present in Sum and Sum-Squared - Only the first 32767 samples after the last read (approximately 3 seconds) are entered into the Sum, SumSquared, and Number of Samples
Sum	68	2	IntegerT		R	Sum of Signals in Counts - Compute the Mean Signal as: Mean = Sum / Number of Samples
Min	68	4	IntegerT		R	Minimal signal measured since last read
Max	68	5	IntegerT		R	Maximum signal measured since last read - All samples since the last read are entered into the Min/Max Signals
BDC1 Light->Dark Transition Count	68	6	UIntegerT		R	Number of times sensor's BDC1 sensing state transitioned from the light to the dark state (will not incorporate on/off delays) - All samples since the last read are entered into the Transition Counts
BDC1 Dark->Light Transition Count	68	7	UIntegerT		R	Number of times sensor's BDC1 sensing state transitioned from the dark to the light state (will not incorporate on/off delays)
All-time Run Time	69	0	RecordT		R	A run time counter that can track the total time the sensor has been running since manufacture
All-time Run Time	69	1	UIntegerT		R	A run time counter that can track the total time the sensor has been running since manufacture

Parameter	Index	Subindex	Data type	Default	AR	Description
Resetable Run Time	70	0	RecordT		RW	A run time counter that can be written by the user
Resetable Run Time	70	1	UIntegerT		RW	A run time counter that can be written by the user
BDC1 Status	71	0	RecordT		R	Status related to the BDC output channel.
Lower Threshold	71	1	UIntegerT		R	
Upper Threshold	71	2	UIntegerT		R	
Output State (Q1)	71	3	UIntegerT		R	0: Inactive 1: Active
Alarm State	71	4	UIntegerT		R	If any alarm is present, the sensors threshold(s) cannot be optimized. If a threshold warning is present the sensor's output will still continue to function. If a threshold error is present, the sensor's output will stop functioning  0: No alarm present 1: Threshold Warning 2: Threshold Error
Q1 Object Counter - Dark to Light	207	0	RecordT		RW	Number of dark to light sensing transitions seen by the sensor (reset on power ON).
Object Counter - Dark to Light	207	1	IntegerT		RW	
Q1 Object Counter - Light to Dark	208	0	RecordT		RW	Number of light to dark sensing transitions seen by the sensor (reset on power ON).
Object Counter - Light to Dark	208	1	IntegerT		RW	

## 9 Technical specifications

### 9.1 General data

Tab. 9.1: Sensor and IODD version

IODD version	V1.0.0
IODD release date	2016-11-9
Device family	LV463
Device ID	514
Device name	LV463.XV
Device variants	LV463.XV7/L4 (50133970), LV463.XV7/L4-M8 (50133969), LV463.XV7/L4-150-M12 (50133971)