



PLC Integration LV463_514

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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Table of Contents

- 1 Legal information.....4**
 - 1.1 Disclaimer..... 4
- 2 About this document.....5**
 - 2.1 Purpose of use.....5
 - 2.2 Target group..... 5
- 3 General use of function block..... 6**
 - 3.1 Short description..... 6
 - 3.2 Calling and designation..... 6
 - 3.3 Configuration..... 6
 - 3.4 Method of function..... 7
 - 3.5 Behavior when error occurs.....7
- 4 Integration into the PLC project.....8**
- 5 Process data parser function..... 9**
 - 5.1 Calling and designation..... 9
 - 5.2 Configuration..... 9
- 6 Error description..... 11**
- 7 Data structures..... 14**
- 8 Parameter descriptions..... 23**
- 9 Technical specifications..... 30**
 - 9.1 General data..... 30

1 Legal information

1.1 Disclaimer

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	NOTICE
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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_LV463_514" 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.

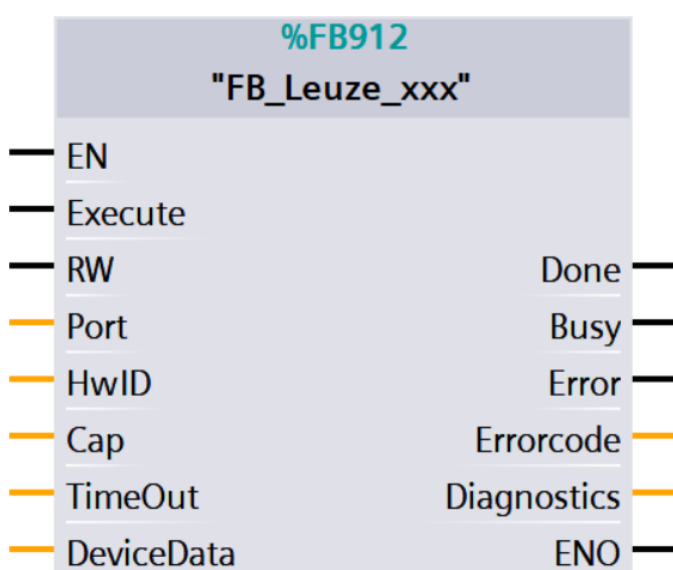


Fig. 3.1: Example of module call with single instance

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_LV463_514	Sensor data

See structure description of Leuze_type_LV463_514 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_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 "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_LV463_514" 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_LV463_514" 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_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. 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_LV463_514	Reference to the instance of the data structure Leuze_type_PD_LV463_514. The structure includes the disaggregated values of the process data.

See structure description of Leuze_type_PD_LV463_514 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_LV463_514

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.CmdSp1SingleValueTeach	Bool	[WRITE_ONLY] SP1 Single Value Teach
DeviceData.Selection.Commands.CmdSp1TwoValueTeachTp1	Bool	[WRITE_ONLY] SP1 Two Value Teach TP1
DeviceData.Selection.Commands.CmdSp1TwoValueTeachTp2	Bool	[WRITE_ONLY] SP1 Two Value Teach TP2
DeviceData.Selection.Commands.CmdSp1DynamicTeachStart	Bool	[WRITE_ONLY] SP1 Dynamic Teach Start
DeviceData.Selection.Commands.CmdSp1DynamicTeachStop	Bool	[WRITE_ONLY] SP1 Dynamic Teach Stop
DeviceData.Selection.Commands.CmdS1ExitTeach	Bool	[WRITE_ONLY] S1 Exit Teach
DeviceData.Selection.Commands.CmdDisableEmitter	Bool	[WRITE_ONLY] Disable Emitter
DeviceData.Selection.Commands.CmdEnableEmitter	Bool	[WRITE_ONLY] Enable Emitter
DeviceData.Selection.Commands.CmdStopSensorSearch	Bool	[WRITE_ONLY] Stop Sensor Search
DeviceData.Selection.Commands.CmdStartSensorSearch	Bool	[WRITE_ONLY] Start Sensor Search
DeviceData.Selection.Commands.CmdBaselineNull	Bool	[WRITE_ONLY] Baseline Null
DeviceData.Selection.Commands.CmdBaselineDisable	Bool	[WRITE_ONLY] Baseline Disable
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]

Parameter name	Data type	Description
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]
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

Parameter name	Data type	Description
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]
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.TeachInChannel.All	Bool	[READ_WRITE] all parameters of complex data type
DeviceData.Selection.TeachStatus.All	Bool	[READ_ONLY] all parameters of complex data type
DeviceData.Selection.Bdc1Setpoints.All	Bool	[READ_WRITE] all parameters of complex data type
DeviceData.Selection.Bdc1Configuration.All	Bool	[READ_WRITE] all parameters of complex data type
DeviceData.Selection.Bdc1Configuration.BdcLogic	Bool	[READ_WRITE] LO/DO Selection
DeviceData.Selection.Bdc1Configuration.BdcMode	Bool	[READ_WRITE] Defines how the binary switching information is created depending on Setpoint parameters (SP1, SP2) and the current measurement value
DeviceData.Selection.Bdc1Configuration.Hysteresis	Bool	[READ_WRITE] User selectable hysteresis. Selectable as a multiple of the minimum possible hysteresis level
DeviceData.Selection.Configuration.All	Bool	[READ_WRITE] all parameters of complex data type
DeviceData.Selection.Configuration.ResponseSpeed	Bool	[READ_WRITE] The smallest sensing event the sensor is guaranteed to register
DeviceData.Selection.Configuration.GainMode	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
DeviceData.Selection.Configuration.GainLevel	Bool	[READ_WRITE] Current gain setting. In auto-gain this will be changed to reflect the optimal gain found during the TEACH/SET method
DeviceData.Selection.Configuration.ProcessDataFilterUpdateTime	Bool	[READ_WRITE] Amount of time to collect averaged sample for process data (defaults to 2.6 ms - min cycle time)
DeviceData.Selection.Configuration.DisplayOrientation	Bool	[READ_WRITE] The display orientation can be reversed to accomodate any mounting orientation
DeviceData.Selection.Bdc1VendorSpecificConfiguration.All	Bool	[READ_WRITE] all parameters of complex data type
DeviceData.Selection.Statistics.All	Bool	[READ_ONLY] all parameters of complex data type
DeviceData.Selection.AllTimeRunTime.All	Bool	[READ_ONLY] all parameters of complex data type
DeviceData.Selection.ResetableRunTime.All	Bool	[READ_WRITE] all parameters of complex data type
DeviceData.Selection.Bdc1Status.All	Bool	[READ_ONLY] all parameters of complex data type
DeviceData.Selection.Bdc1Status.LowerThreshold	Bool	[READ_ONLY]
DeviceData.Selection.Bdc1Status.UpperThreshold	Bool	[READ_ONLY]
DeviceData.Selection.Bdc1Status.OutputStateQ1	Bool	[READ_ONLY]
DeviceData.Selection.Bdc1Status.AlarmState	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
DeviceData.Selection.Q1ObjectCounterDarkToLight. All	Bool	[READ_WRITE] all parameters of complex data type
DeviceData.Selection.Q1ObjectCounterLightToDark. All	Bool	[READ_WRITE] all parameters of complex data type
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.CmdSp1SingleValueTeach	UInt	[WRITE_ONLY] SP1 Single Value Teach

Parameter name	Data type	Description
DeviceData.Data.Commands. CmdSp1TwoValueTeachTp1	UInt	[WRITE_ONLY] SP1 Two Value Teach TP1
DeviceData.Data.Commands. CmdSp1TwoValueTeachTp2	UInt	[WRITE_ONLY] SP1 Two Value Teach TP2
DeviceData.Data.Commands. CmdSp1DynamicTeachStart	UInt	[WRITE_ONLY] SP1 Dynamic Teach Start
DeviceData.Data.Commands. CmdSp1DynamicTeachStop	UInt	[WRITE_ONLY] SP1 Dynamic Teach Stop
DeviceData.Data.Commands.CmdS1ExitTeach	UInt	[WRITE_ONLY] S1 Exit Teach
DeviceData.Data.Commands.CmdDisableEmitter	UInt	[WRITE_ONLY] Disable Emitter
DeviceData.Data.Commands.CmdEnableEmitter	UInt	[WRITE_ONLY] Enable Emitter
DeviceData.Data.Commands.CmdStopSensorSearch	UInt	[WRITE_ONLY] Stop Sensor Search
DeviceData.Data.Commands.CmdStartSensorSearch	UInt	[WRITE_ONLY] Start Sensor Search
DeviceData.Data.Commands.CmdBaselineNull	UInt	[WRITE_ONLY] Baseline Null
DeviceData.Data.Commands.CmdBaselineDisable	UInt	[WRITE_ONLY] Baseline Disable
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]

Parameter name	Data type	Description
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]
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]

Parameter name	Data type	Description
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.DetailedDeviceStatus.Item_6	String	[READ_ONLY]
DeviceData.Data.TeachInChannel.TeachInChannel	UInt	[READ_WRITE] Teach-in Channel
DeviceData.Data.TeachStatus.TeachState	UInt	[READ_ONLY] Provides feedback on the status and the results of the teach-in activities
DeviceData.Data.TeachStatus.Sp1Tp1Flag	Bool	[READ_ONLY]
DeviceData.Data.TeachStatus.Sp1Tp2Flag	Bool	[READ_ONLY]
DeviceData.Data.TeachStatus.Sp2Tp1Flag	Bool	[READ_ONLY]
DeviceData.Data.TeachStatus.Sp2Tp2Flag	Bool	[READ_ONLY]
DeviceData.Data.Bdc1Setpoints.UpperThreshold	Int	[READ_WRITE] Switch point
DeviceData.Data.Bdc1Setpoints.Sp2	Int	[READ_WRITE] Unused
DeviceData.Data.Bdc1Configuration.BdcLogic	UInt	[READ_WRITE] LO/DO Selection
DeviceData.Data.Bdc1Configuration.BdcMode	UInt	[READ_WRITE] Defines how the binary switching information is created depending on Setpoint parameters (SP1, SP2) and the current measurement value
DeviceData.Data.Bdc1Configuration.Hysteresis	UInt	[READ_WRITE] User selectable hysteresis. Selectable as a multiple of the minimum possible hysteresis level
DeviceData.Data.Configuration.ResponseSpeed	UInt	[READ_WRITE] The smallest sensing event the sensor is guaranteed to register
DeviceData.Data.Configuration.GainMode	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
DeviceData.Data.Configuration.GainLevel	UInt	[READ_WRITE] Current gain setting. In auto-gain this will be changed to reflect the optimal gain found during the TEACH/SET method
DeviceData.Data.Configuration.ProcessDataFilterUpdateTime	UInt	[READ_WRITE] Amount of time to collect averaged sample for process data (defaults to 2.6 ms - min cycle time)
DeviceData.Data.Configuration.DisplayOrientation	UInt	[READ_WRITE] The display orientation can be reversed to accomodate any mounting orientation
DeviceData.Data.Bdc1VendorSpecificConfiguration.DelayMode	UInt	[READ_WRITE] Select the type of delay to be used. Controls the meaning of the On and Off Delay values
DeviceData.Data.Bdc1VendorSpecificConfiguration.TimerOnDelayOff1Shot	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.
DeviceData.Data.Bdc1VendorSpecificConfiguration.TimerOffDelayOn1Shot	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.
DeviceData.Data.Bdc1VendorSpecificConfiguration.TeachSelection	UInt	[READ_WRITE] The teach method to be used for a TEACH/SET performed from the front panel
DeviceData.Data.Bdc1VendorSpecificConfiguration.AutoThreshold	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
DeviceData.Data.Statistics.NumberOfSamples	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
DeviceData.Data.Statistics.Sum	Int	[READ_ONLY] Sum of Signals in Counts - Compute the Mean Signal as: $\text{Mean} = \frac{\text{Sum}}{\text{Number of Samples}}$
DeviceData.Data.Statistics.Min	Int	[READ_ONLY] Minimal signal measured since last read

Parameter name	Data type	Description
DeviceData.Data.Statistics.Max	Int	[READ_ONLY] Maximum signal measured since last read - All samples since the last read are entered into the Min/Max Signals
DeviceData.Data.Statistics. Bdc1LightDarkTransitionCount	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
DeviceData.Data.Statistics. Bdc1DarkLightTransitionCount	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)
DeviceData.Data.AllTimeRunTime.AllTimeRunTime	UInt	[READ_ONLY] A run time counter that can tracks the total time the sensor has been running since manufacture
DeviceData.Data.ResetableRunTime. ResetableRunTime	UInt	[READ_WRITE] A run time counter that can be written by the user
DeviceData.Data.Bdc1Status.LowerThreshold	UInt	[READ_ONLY]
DeviceData.Data.Bdc1Status.UpperThreshold	UInt	[READ_ONLY]
DeviceData.Data.Bdc1Status.OutputStateQ1	UInt	[READ_ONLY]
DeviceData.Data.Bdc1Status.AlarmState	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
DeviceData.Data.Q1ObjectCounterDarkToLight. ObjectCounterDarkToLight	Int	[READ_WRITE]
DeviceData.Data.Q1ObjectCounterLightToDark. ObjectCounterLightToDark	Int	[READ_WRITE]

Tab. 7.2: Leuze_type_PD_LV463_514

Parameter name	Data type	Description
FC_Leuze_PD_LV463_514.Bdc1OutputStateQ	Bool	
FC_Leuze_PD_LV463_514.Measurement	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-onshot 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)