SUPPLEMENT TO OPERATING INSTRUCTIONS
IO-Link IODD description

GIOTTO TOP IO-Link

Document version 1.3

Contents

History

Document version	IODD version / Firmware version	Date	Changes
1.3	≥ 1.3 / ≥ A.01.11	2024-12-04	2 System command 173 changed to "Start manual teach function position S4 (MTF4)" (firmware ≥ A.01.11.00) 3.4.12 0x2C15sub1: add teach function state "Teach Position S4" (18) and error codes "Error teaching position S4" (-26) and "Error switch to target type Double Cam" (-27) 3.4.12 0x2C15sub2: add teach function start command "Start manual teach function S4 (MTF4)" (14) 3.4.12 0x2C15sub3: Teach functions: sub3 isTaught: bit3 S4 added 3.4.12 0x2C15sub5, 6: description changed similar to 3.4.15.6 0x2C23 Valve travel times sub1, 2 3.4.15.6 0x2C23 Valve travel times: description enhanced to cover also double cam, 0x2C23 sub1, 2: using 'feedbacked start / end position' instead of 'position (tolerance band or S4)' 3.4.15.7 0x2C24 Valve switching times: description enhanced to cover also double cam, 0x2C24sub1, 2: using reaching 'a (different) static feedbacked end position' instead of 'static position (tolerance band or S4' 3.4.17 Chapter "Selected target type" added:with 0x2C48sub0: Selected target type
	≥ 1.0 / ≥ A.01.03	2024-12-18	Chapter "Notes on IO-Link master configuration" added Title of chapter 4.1 enhanced to "IO-Link Port class A / B devices" 4.1 Event table, event 0x1814 (6164): actions enhanced
1.1	≥ 1.1 / ≥ A.01.08	2024-06-28	2 Systemcommand 173 changed to Reserved (firmware rev. >= A.01.08 3.4.15.1 0x2C1Esub3 Switching time detection: factory settings changed:to 0x3 (MS, LL),
	≥ 1.1 / ≥ A.01.07	2024-07-04	3.4.4.1 0x200A Power supply alarm values: added factory settings for sub 3, 4 3.4.9 0x2C07 Use (external) "sensor" instead of "initiator" for object name, reduce sub1 to "Type", adopt description 3.4.15.6 0x2C23 Valve travel times: description enhanced start / stop / cancel conditions
		2024-05-30	3.4.14.2 /.3 0x2122 LED extern color / 0x2C12 LED device specific setup: description reworked, list only colors which are supported by IODD files 3.4.14.4 0x2C19 LED brightness: fixed wrong decimal object number

		2024-05-29	1.1 Process data – Device status, 3.4.3: Device status
			  texts of values changed to: 0: Diagnosis passive, 1: Diagnosis active (normal)
			  texts of value 4 corrected from "Warning" to "Function check" to comply with terminology of operating instructions
			3.4.12 0x2C15 Teach functions:
			- sub1 teach states reworked:
			  - check position / timeout reaching position 'closed'/'open'/'LL' instead of S1/S2/S3,
			  - states added check position / timeout reaching position'UL' (17 / -20)
			- subA 'Spare' used since A.01.07.00 for opening /closing (travel) time of UL in ATF
			3.4.14.3 0x2C12sub3 renamed to "Lifts" and 0x2C12sub4: renamed to "Spare" since lower and upper lifts share unique color configuration, description updated

		2024-02-15	1.3 Process data out – Locating function – refer to chapter 3.4.6 for details
			3.4.6 0x2101 Locating function: added behavior in case of color settings configured with LED off or 0
			4.1 IO-Link Event 0x5100 (20736) (ERROR) General power supply error - supply voltage too low:
			    added: Position sensor outputs 'invalid position' (-100.0 mm),
			             Position sensor related feedback signals are reset

		2024-02-02	Fixed formating (logo (shoot from Bardiani homepage, table borders chapt. 2) 1.1 Fixed typo of bit offset 1.2 Fixed description of Process output data sub index 3 3.3 Supported common data objects: added details to 0x000C Device Access Locks 3.4.11 0x2C10 Local control lock: added remedy in case of locked / not working buttons 3.4.16 Last actions enhanced sub5 renamed to Successful ATF, sub6 Successful MTF added Abbreviations enhanced by ATF, MTF
	≥ 1.0 / ≥ A.01.03	2024-09-16	2 Supported IO-Link system commands: added ATFx / MTFx to automatic / manual teach functions *) 3.4.7 Feedback fields: fixed moved sub chapters from 3.4.8.x to this chapter 3.4.12 0x2C15 Teach functions: Sharpened description of sub5, 6 (MS opening / closing time) 3.4.12 0x2C15 Teach functions: sub2: added ATFx / MTFx to automatic / manual teach functions *), manual teach function description improved 3.4.14.3 0x2C12 LED specific colors: fixed description of sub1,2, improved description of sub3 3.4.15.7 0x2C24 Valve switching times: added definition of "static position" *) as used in Quickstart
		2024-07-03	Abbreviations: datatype STR/StringT: corrected length to 19 characters, datatype STR2 with 20 characters added. General notes on PLC integration 1.1 Process input data: position: added: "-100.0 mm in case of invalid position" 1.1 Process data – Device status: Added remark "following "NAMUR" 1.1 Process data – Device status, 3.4.3 Device Status: Added remark "Different value meaning than for common IO-Link data object 0x0024 Device status 2 / 3.3 Added How-To explanation for system command execution 3.2 Reset group overview: simplified detail references 3.3 Device Access Locks bit details moved to separate sub chapter 3.3.2 3.3 Added details to 0x0025 Detailed device status 3.4.1.1 0x2000 (Device description object): sub1, sub 3: corrected datatype to STR2 3.4.3: Acyclic (Device) status: changed bits 4-7 to reserved, description of 0x2004sub1 improved 3.4.5 0x200B Temperature Alarm values: corrected limit / hysteresis behaviour 3.4.6 0x2101 Locating function: added visibility only in LED Mode = Device specific 3.4.6 0x210A Locating function: reworked description of behavior in case color setting "LED off" 3.4.10.1 0x2C08 Maintenance Settings – sub2: added decimal value range for On 3.4.12 0x2C15 Teachfunctions: sub1 Teach state: corrected description of value -19 3.4.13 0x2C16 Reset cmd: corrected behaviour after Factory reset: "Device restarts afterwards" 3.4.15.1 0x2C1E Diagnosis Settings: sub1,3 Travel/Switching time: description enhanced / corrected

Document version	IODD version / Firmware version	Date	Changes
			3.4.15.1 0x2C1E Diagnosis Settings: sub4 Switching time: value range added 3.4.15.3,5-8 Added description of corresponding reset options(Maintenance and/or Diagnosis Reset) 4.1 Events: Opening/closing timeout / switching timeout: description /action improved
1.0	≥ 1.0 / ≥ A.01.03	2023-11-28	Initial version

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Abbreviations

Abbreviation	Description
ATF	Automatic teach function
MTF	Manual teach function

Following datatype abbreviations are used in this document:

Abbreviation	IO-Link type	Length
BOOL	BooleanT	1 bit
UI8	UIntegerT	1 byte (8 bit)
UI16	UintegerT	2 bytes (16 bit)
UI32	UintegerT	4 bytes (32 bit)
FL32	Float32T	Real32 (Float, 32bit)
STR	StringT	19 characters characters coded with "US-ASCII"
STR2	StringT	20 characters characters coded with "US-ASCII"

General notes on PLC integration

Observe

- the general IO-Link instructions in the device operating instructions.

- the available documentation for your IO-Link master / PLC in order to achieve the quickest and easiest possible IO-Link integration into your PLC.

The transfer of cyclic process data and acyclic data between IO-Link device and IO-Link master is standardized:

All the data types with multiple bytes are transmitted as a big-endian sequence, i.e.
- the most significant octet (byte) (MSO) is sent first,

- followed by less significant octets (bytes) in descending order,

- with the least significant octet (byte) (LSO) being sent last.

The **bit offset** (used in this documentation and the IODD files) starts with the last octet (byte) within the process data / record (RecordT) sequence; this octet starts with offset 0 for the least significant bit and offset 7 for the most significant bit.

Depending on the PLC / IO-Link master used (manufacturer / type / configuration settings), there may be differences in the transmission of cyclical process data between the IO-Link master and PLC with regard to
- the position of the cyclic process data bytes

- the sequence of the cyclic process data bytes

within the configured I/O address range.

Notes on IO-Link master configuration

The "Port cycle time" ("Scan time") for the Giotto Teach control unit must be set to "Automatic" or "As fast as possible" or to a time value in range 5 … 16 ms (recommended: 5 … 8 ms).

1 Process Data, IO-Link

1.1 Process input data (Pdin)

Length: 6 bytes

Sub-index	Bit offset	Length (bits)	Data type	Description
7	16	32	Float32T	Position in mm (resolution 0.1mm) -100.0 mm in case of invalid position
6	8	8	UintegerT	Device status (following "NAMUR") *) 0: Diagnostics passive 1: Diagnostics active (normal) 2: Maintenance required 3: Out of specification 4: Function check 5: Error Bit 4-7 reserved
5	4	4	UintegerT	Valve Mode 0: Initialization 1: Normal operation 2: Teach function active 3: SafePos active 4: Manual control active 5: Spare 6: Internal SafePos active (all valves off) 7: Spare
4	3	1	BooleanT	Feedback Position 4 (External initiator, S4) True = On False = Off
3	2	1	BooleanT	Feedback position 3 (S3) True = On False = Off
2	1	1	BooleanT	Feedback position 2 (S2) True = On False = Off
1	0	1	BooleanT	Feedback position 1 (S1) True = On False = Off
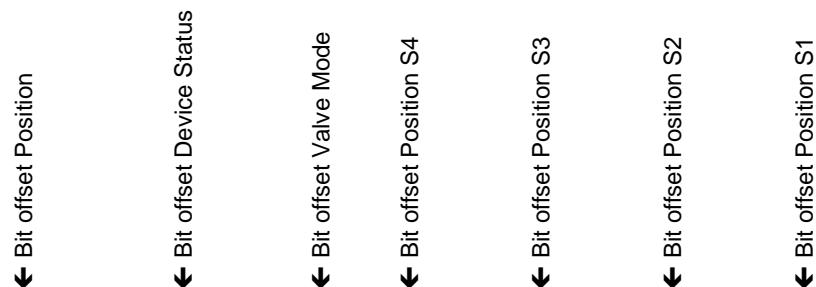
	Bit offset Position		Bit offset Device Status		Bit offset Valve Mode		Bit offset Position S4	Bit offset Position S3	Bit offset Position S2	Bit offset Position S1
Bits	47	.. 16	15	… 8	7	.. 4	3	2	1	0
Sub index	7		6		5		4	3	2	1
Data type	Float32T		UintegerT		UintegerT		BooleanT	BooleanT	BooleanT	BooleanT
Name	Position		Device Status		Valve Mode		S4	S3	S2	S1
Length [Bits]	32		8		4		1	1	1	1

*) Different value meaning than for common IO-Link data object 0x0024 Device status

1.2 Process output data (Pdout)

Length: 1 byte

Sub-index	Bit offset	Length (bits)	Data type	Description
4	3	1	BooleanT	Locating function (fast flashing LEDs) *) True = Activated False = Deactivated
3	2	1	BooleanT	UL: Set point for upper lift (UL) solenoid valve True = Activated False = Deactivated
2	1	1	BooleanT	LL: Set point for lower lift (LL) solenoid valve True = Activated False = Deactivated
1	0	1	BooleanT	MS: Set point for main stroke (MS) solenoid valve True = Activated False = Deactivated

*) For further details refer to 3.4.6 0x2101   Locating function

					Bit offset Locating function	Bit offset Set point UL	Bit offset Set point LL	Bit offset Set point MS
Bits	7	6	5	4	3	2	1	0
Sub-index					4	3	2	1
Data type					BooleanT	BooleanT	BooleanT	BooleanT
Name		Not used			Locate	UL	LL	MS
Length[Bits]		4			1	1	1	1
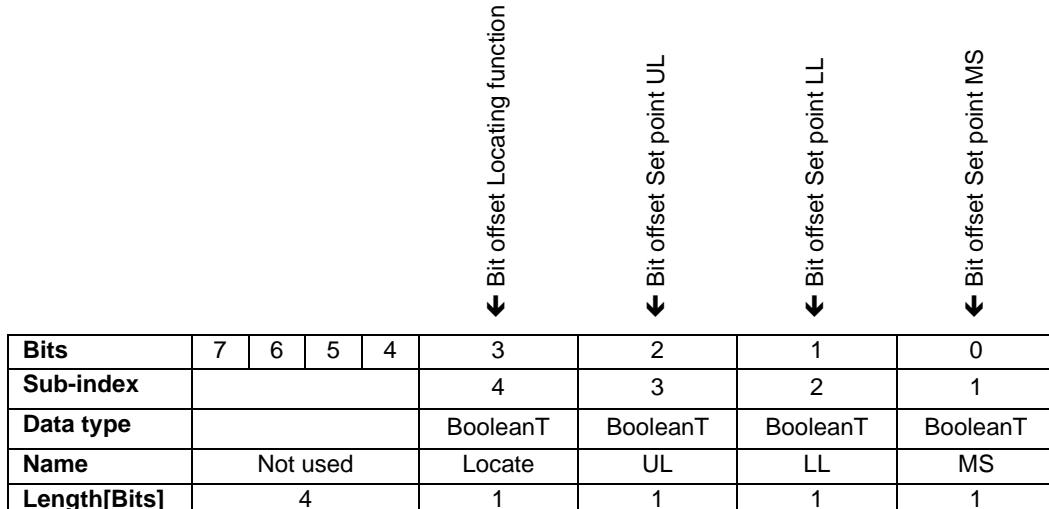
2 Supported IO-Link system commands

command (dec)	command (hex)	description
128	0x80	Device reset (restart)
130	0x82	**Restore factory settings.** **Refer to control top operating instructions before starting this function.** **All ISDU parameters belonging to reset group F are reset to factory default values, too.** **Device is restarted afterwards.**
160	0xA0	Start automatic teach function 1 (ATF1)
161	0xA1	Start automatic teach function 2 (ATF2)
162	0xA2	Start automatic teach function 3 (ATF3)
163	0xA3	Start automatic teach function 4 (ATF4)
166	0xA6	Start manual teach function position S1 (MTF1)
167	0xA7	Start manual teach function position S2 (MTF2)
168	0xA8	Start manual teach function position S3 (MTF3)
170	0xAA	Maintenance Reset
171	0xAB	Teach Reset
172	0xAC	Diagnosis Reset
173	0xAD	Start manual teach function position S4 (MTF4) (firmware ≥ A.01.11.00)
180-189	0xB4…0xBD	Spare commands

To execute a certain IO-Link system command, write the corresponding command number from the table above as 1 byte data via the ISDU write access to the common IO-Link data object *System-Command* (index 0x0002, sub index 0, refer also to chapter 3.3 Supported common data objects.

3 Non-cyclic parameters (On-Request Data (ISDU))

3.1 Description of used table columns

Column label	Description
Sub	Sub-index of object
Name	Name of object in IODD file
Description	Object description
Access type	IO-Link access rights: RO = read only, RW = read write, WO = write only
Data type	Data type of sub index / object (if only sub index 0 exists)
Data memory	Data storage
Reset group	Sub index will be reset to factory default settings, if corresponding reset group is reset. (Refer to reset group overview below.)

3.2 Reset group overview

Reset Group	Description	For details refer to description of
F	Factory Reset	2 Supported IO-Link system commands
M	Maintenance Reset	
T	Teach Reset	3.4.13 0x2C16Reset command
D	Diagnosis reset command	

3.3 Supported common data objects

Index (dec)	Object name	Access	Length	Data type	Remark *)
0x0000 (0)	*Direct Parameter Page 1*	RO		RecordT	*Redirected to the page communication channel, see 10.7.5*
0x0001 (1)	*Direct Parameter Page 2*	R/W		RecordT	*Redirected to the page communication channel, see 10.7.5*
0x0002 (2)	*System-Command*	WO	1 octet	UintegerT	*Command Code Definition ***) (See B.2.2)*
0x0003 (3)	*Data Storage Index*	R/W	variable	RecordT	*Set of data objects for storage (See B.2.3)*
0x000C (12)	*Device Access Locks*	R/W	2 octets	RecordT	*Standardized Device locking functions (See B.2.4) **)*
0x0010 (16)	*Vendor Name*	RO	max. 64 octets	STR	*Informative (See B.2.8)*
0x0011 (17)	*Vendor Text*	RO	max. 64 octets	STR	*Additional vendor information (See B.2.9)*
0x0012 (18)	*Product Name*	RO	max. 64 octets	STR	*Detailed product or type name (See B.2.10)*
0x0013 (19)	*Product ID*	RO	max. 64 octets	STR	*Product or type identification (See B.2.11 for details)*
0x0014 (20)	*Product Text*	RO	max. 64 octets	STR	*Description of Device function or characteristic (See B.2.12)*
0x0015 (21)	*Serial-Number*	RO	max. 16 octets	STR	*Vendor specific serial number (See B.2.13)*
0x0016 (22)	*Hardware Revision*	RO	max. 64 octets	STR	*Vendor specific format (See B.2.14)*
0x0017 (23)	*Firmware Revision*	RO	max. 64 octets	STR	*Vendor specific format (See B.2.15)*
0x0018 (24)	*Application Specific Tag*	R/W	19 octets	STR	*Tag location or tag function defined by user (See B.2.16)*
0x0024 (36)	*Device Status*	RO	1 octet	UintegerT	*Contains current status of the Device (See B.2.18)* **Value / Definition table:** 0: *Device is operating properly* 1: *Maintenance-Required* 2: *Out-Of-Specification* 3: *Functional-Check* 4: *Failure* 5 - 255: *Reserved*
0x0025 (37)	*Detailed Device Status*	RO	variable	ArrayT of OctetStringT3	*Dynamic list of 25 event entries (each 3 octets). Read always whole object by reading sub index 0. See B.2.19 for structure and further remarks. For event codes refer to chapter 2 Supported IO-Link system commands*

*) Referenced chapters refer to "*IO-Link Interface and System Specification*" (File name: IOL-Interface-Spec_10002_V112_Jul13)

**) Device Access Locks: All bits have default value 0 (not locked), not included into restore factory settings / factory reset.
For detailed information refer to chapter 3.3.2 0x000C   Device Access Locks – Bit description.

***) Refer to chapter 2 Supported IO-Link system commands for details.

3.3.1 Default values

Index (dec)	Object name	Default value
0x0010 (16)	*Vendor Name*	*Bardiani Valvole Spa*
0x0011 (17)	*Vendor Text*	*Sanitary valves manufacturer*
0x0012 (18)	*Product Name*	*Giotto Top IO-Link*
0x0013 (19)	*Product ID*	*GT IO-LINK A / GT IO-LINK B*
0x0014 (20)	*Product Text*	*Valve Control Unit*
0x0018 (24)	*Application Specific Tag*	********************

3.3.2 0x000C   Device Access Locks – Bit description

Bit	Lock category	Remarks
0	*Parameter (write) access*	*Write access to parameters except parameter Device Access Locks itself is locked. Parameter block up/download is also locked.* *Single read access of objects possible*
1	*Data storage*	*If set, data storage mechanism is disabled.*
2	*Local parameterization*	**)*
3	*Local user interface*	**)* *If set, buttons are locked.* *Buttons can additionally be locked by parameter 0x2C10 Local Control Lock – refer to chapter 3.4.11 for details.*
4-15	*Reserved*	

*) Is set / reset by the control head internally to ensure consistent data e.g. during parameter (block) up-/ downloads.
In case such an block up-/download is interrupted / not finished (e.g.by power reset),
the lock bit will remain active and the parameterization / local user interface might be blocked.
In this case execute again a parameter (block) upload or reset the bit 2 and 3 of the parameter Device Access Locks
via a direct write access.

3.4 Device specific data objects

3.4.1 Device information

3.4.1.1 0x2000 Device description object

Index: 0x2000 (8192)

sub	name	description	access type	data type	data memory	reset group
0x1	Name	*Device name* *Used to identify the device in Service-Tool via special service interface*	RO	STR2		
0x2	Manufacture ident. number	*Manufacture specific device identification number*	RO	UI32		
0x3	Manufacture date	*Manufacture date*	RO	STR2		
0x4	Software ident number	*Identification number of firmware*	RO	UI32		
0x5	Software version	*Firmware version number *)*	RO	UI32		
0x6	Hardware version	*Hardware version number *)*	RO	UI32		
0x7	Serial number	*Serial number of device*	RO	UI32		

*) Version number 0xAABBCCDD corresponds to version string in format: X.YY.ZZ.CC with
X as character (AA contains ASCII character code for X), YY, ZZ, CC as decimal values of BB, CC, DD,
Example: 0x41000000 corresponds to version string A.00.00.00

3.4.1.2 0x2C00 Additional device identity

Index: 0x2C00 (11264)

sub	name	description	access type	data type	data memory	reset group
0x2	Device ident number	*Device identification number*	RO	STR		
0x5	PCB ident number 1	*Manufacturer specific PCB identification number*	RO	UI32		
0x6	PCB ident number 2	*PCB identification number 2*	RO	UI32		
0x7	PCB serial number	*PCB serial number*	RO	UI32		
0x8	PCB hardware variant	*PCB hardware variant number*	RO	UI8		
0x9	PCB hardware version	*PCB hardware version number*	RO	UI8		

Sub index labeling due to data structure compatibility to 8681 IO-Link

Non-cyclic parameters
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3.4.2 0x2002 User configuration object (device tags)

Index: 0x2002 (8194)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	Unique device name	*Specific (manufacturer) unique device name <ID><SN>* *with* *<ID> manufacture specific device identification number (8digits, with leading zeros)* *<SN> device serial number (8 digits, with leading zeros)*	RO	STR			
0x2	Location	*Additional information about the device location*	RW	STR	x	F	
0x3	Description	*Additional information about the device*	RW	STR	x	F	
0x4	Displayed name	*Device (TAG) name* *(also used for display in Service-Tool via special service interface)*	RW	STR	x	F	Giotto Top IO-Link

3.4.3 0x2004   Device status

Index: 0x2004 (8196)

sub	name	description	access type	data type	data memory	reset group
0x1	Device status	*Corresponds to the device status transmitted in cyclic process data *)*	RO	UI8		
0x2	Device temperature (MCU)	*Internal device temperature (measured in MCU) in kelvin*	RO	FL32		
0x3	Device supply voltage	*Supply voltage in volt*	RO	FL32		
0x4	Operation duration	*Device operating time counter in seconds*	RO	UI32		
0x5	Max. temperature (MCU)	*Maximum internal device temperature (measured in MCU) in kelvin throughout the device's service life*	RO	FL32		
0x6	Min. temperature (MCU)	*Minimum internal device temperature (measured in MCU) in kelvin throughout the device's service life*	RO	FL32		
0x7	Max. supply voltage	*Maximum device power supply voltage since start-up in volt*	RO	FL32		
0x8	Min. supply voltage	*Minimum device power supply voltage since start-up in volt*	RO	FL32		
0xD	Device boot counter	*Number of device starts*	RO	UI32		
0x12	Operation time since last boot	*Device operating time since last device restart in seconds*	RO	UI32		
0x13	Actuator supply voltage	*Class A devices: Supply voltage for actuators in volt.* *Class B devices: Supply voltage of second power supply for actuators in volt.*	RO	FL32		

*) Details of Device status:
Different value meaning than for common IO-Link data object 0x0024 Device status:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
		Reserved		Namur state: 0 – Diagnostics passive 1 – Diagnostics active (normal) 2 – Maintenance required 3 – Out of specification 4 – Function check 5 – Error			

3.4.4 Power supply alarms

3.4.4.1 0x200A   Power supply alarm values

Index: 0x200A (8202)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	Voltage error limit high	*In volt. If the supply voltage exceeds (limit value + voltage hysteresis / 2), an error message is output.*	RO	FL32			
0x2	Voltage error limit low	*In volt. If the supply voltage falls below (limit value - voltage hysteresis / 2), an error message is output.*	RO	FL32			
0x3	Voltage warning limit high	*In volt. If the supply voltage exceeds (limit value + voltage hysteresis / 2), a warning message is output.*	RW	FL32	x	F	31.0
0x4	Voltage warning limit low	*In volt. If the supply voltage falls below (limit value - voltage hysteresis / 2), a warning message is output.*	RW	FL32	x	F	17.7
0x5	Voltage hysteresis	*In volt. 0.4 means limit +/- 0.2 volts.*	RO	FL32			

3.4.4.2 0x2C14   Actuator supply alarm values (Port class B only)

Index: 0x2C14 (11284)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	Voltage error limit high	*In volt. Build-in switching hysteresis +/- 0.5 volts* *If the actuator supply voltage exceeds (limit value + 0.5V), an error message is output.*	RO	FL32			
0x2	Voltage error limit low	*In volt. Build-in switching hysteresis +/- 0.5 volts* *If the actuator supply voltage falls below (limit value - 0.5V), an error message is output.*	RO	FL32			

3.4.5 0x200B   Temperature Alarm Values

Index: 0x200B (8203)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	Temperature error limit high	*In kelvin. If the (MCU) temperature exceeds (limit value + temperature hysteresis / 2), an error message is output.*	RO	FL32			
0x2	Temperature error limit low	*In kelvin. If the (MCU) temperature falls below (limit value - temperature hysteresis / 2), an error message is output.*	RO	FL32			
0x3	Temperature warning limit high	*In kelvin. If the (MCU) temperature exceeds (limit value + temperature hysteresis / 2), a warning message is output.*	RO	FL32			
0x4	Temperature warning limit low	*In kelvin. If the (MCU) temperature falls below (limit value - temperature hysteresis / 2), a warning message is output.*	RO	FL32			
0x5	Temperature hysteresis	*In kelvin. 4.0 means limit +/-2 kelvin.*	RO	FL32			
0x6	Calibration temperature	*For future use.*	RO	FL32			
0x7	Calibration offset	*For future use.*	RO	FL32			

3.4.6 0x2101   Locating function

Index: 0x2101 (8449)

sub	name	description	access type	data type	data memory	reset group
0x1	call/cancel	*Activate or deactivate locating function :* *This function enables a device in the system to be located using the PLC. The Top LED indicator will briefly start to flash for about 10 seconds when the locating function is activated (fast flashing LEDs)* *1 = activated* *0 = deactivated* *Use this function only if device is in DL (Data Link layer) state "PreOperate".* *In DL state "Operate" use the locating function in the cyclic process output data (PDout), refer also to chapter 1.2* *Locating function indication only in LED Mode (0x2120) = 7 (Device specific).* *Firmware ≥ A.01.07.00:* *Color settings for feedback positions (0x2C12) configured with "LED off" are indicated by Top LED with color 'white' when locating function is active.*	RW	UI8		

3.4.7 Feedback fields

3.4.7.1 0x2C03   Feedback field sizes

Index: 0x2C03 (11267)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	TP1 Positive	*Feedback field size at top of position S1 in mm*	RW	FL32	x	F	1.5
0x2	TP1 Negative	*Feedback field size at bottom of position S1 in mm*	RW	FL32	x	F	1.5
0x3	TP2 Positive	*Feedback field size at top of position S2 in mm*	RW	FL32	x	F	1.5
0x4	TP2 Negative	*Feedback field size at bottom of position S2 in mm*	RW	FL32	x	F	1.5
0x5	TP3 Positive	*Feedback field size at top of position S3 in mm*	RW	FL32	x	F	1,5
0x6	TP3 Negative	*Feedback field size at bottom of position S3 in mm*	RW	FL32	x	F	1.5

3.4.7.2 0x2C04   Feedback positions

Index: 0x2C04 (11268)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	S1 teach position	*Teach position S1 in mm *)*	RO	FL32		F, T	-100
0x2	S2 teach position	*Teach position S2 in mm *)*	RO	FL32		F, T	-100
0x3	S3 teach position	*Teach position S3 in mm *)*	RO	FL32		F, T	-100

*) -100.0 if corresponding teach position is not taught

3.4.7.3 0x2C05   Feedback fields

Index: 0x2C05 (11269)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	S1 upper limit	*Upper feedback field limit of S1 in mm *)*	RO	FL32		F, T	-100
0x2	S1 lower limit	*Lower feedback field limit of S1 in mm *)*	RO	FL32		F, T	-100
0x3	S2 upper limit	*Upper feedback field limit of S2 in mm *)*	RO	FL32		F, T	-100
0x4	S2 lower limit	*Lower feedback field limit of S2 in mm *)*	RO	FL32		F, T	-100
0x5	S3 upper limit	*Upper feedback field limit of S3 in mm *)*	RO	FL32		F, T	-100
0x6	S3 lower limit	*Lower feedback field limit of S3 in mm *)*	RO	FL32		F, T	-100

*) -100.0 if corresponding teach position is not taught

3.4.8 0x2C18   Safety position

Index: 0x2C18 (11288)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	Set point error	*Reaction in the event of a set point error (IO-Link communication error or invalid process data):* *0 – Safety position* 　*Solenoid valve is controlled by value from "Valve Safety Position" (refer to object 0x2C18 sub 2)* *1 – Maintain position (Last position)* 　*Solenoid valve controlled by hold set point value of process output data (Pdout) from before the communication loss.*	RW	UI8	x	F	0 (Safety position)
0x2	Valve safety position	*Control bits for solenoid valves safety position* *(used only in case set point error (Safety Mode, 0x2C18 sub 1) is set to 0 "Safety Position")* Bit 7 / Bit 6 / Bit 5 / Bit 4 / Bit 3 / Bit 2 / Bit 1 / Bit 0 Not used | Solenoid Valve (UL | LL | MS) | 0 = OFF, 1 = ON	RW	UI8	x	F	0 (All valves off)

3.4.9 0x2C07 External sensor (Settings)

Index: 0x2C07 (11271)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	Type	*Type of the external sensor (e.g. a proximity switch) connected to S4IN:* *0 – Closer (NO)* *1 – Opener (NC)*	RW	UI8	x	F	0 (Closer)
0x2	Spare	Not used	RW	UI8	x	F	0

3.4.10 Maintenance settings

3.4.10.1 0x2C08 Maintenance settings

Index: 0x2C08 (11272)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	Spare	*Not used*	RW	UI8	x	F	0
0x2	Maintenance at switching cycles MS	*Service indication after expired MS (main stroke) solenoid valve switching cycles :* *0 – Off,* *1 … 4294967295 (0x00000001 … 0xFFFFFFFF) – On. Value defines limit value for resettable solenoid switching cycle counter MS (0x2C20sub2).* *A service indication / IO-Link warning will be raised if the resettable solenoid valve switching cycle counter MS (0x2C20sub2) reaches or exceeds this limit.*	RW	UI32	x	F	0 (Off)
0x3	Maintenance at valve stroke cumulated	*Service indication after expired valve stroke cumulated (movement of piston rod), value in mm:* *<= 0.0 – Off,* *> 0.0 – On. Value defines limit value for resettable valve stroke cumulated (0x2C22sub2).* *A service indication / IO-Link warning will be raised if the resettable valve stroke cumulated (0x2C22sub2) reaches or exceeds this limit.*	RW	FL32	x	F	0.0 (Off)
0x4	Service indication display option	*Optical display of service indication via Top LED indicator if 0x2120 LED Modi is set to 7 Device specific:* *0 – Enabled* *1 – Disabled*	RW	UI8	x	F	0

3.4.10.2 0x210A Trigger maintenance function

Index: 0x210A (8458)

sub	name	description	access type	data type	data memory	reset group
0x1	call/cancel	*Trigger a maintenance signal from PLC.* *0: Deactivated.* *1: Activated.* *The Top LED indicator shows a maintenance required signal until reboot or set 0 to the call/cancel Object, if* • *there is no higher prioritised warning / error to be indicated* *AND* • *The LED mode 7 (Device specific) is selected by 0x2120 LED Mode:* *Additionally a warning is output.*	RW	UI8		

3.4.11 0x2C10 Local control lock

Index: 0x2C10 (11280)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x0	Local control lock	*Activate or deactivate local operation:* *Buttons for manual operation (manual teach / reset functions) inside the device are deactivated to prevent unintentional operation* *0 = Off (buttons enabled, local operation not deactivated)* *1 = On (buttons disabled, local operation deactivated)*	RW	UI8	x	F	0

In case of local control lock = Off and not working / locked buttons refer to description of standard parameter
Device Access Locks 0x000C (12) in chapter *3.3 Supported common data objects.*

Non-cyclic parameters
(On-Request Data (ISDU))   Supplement to operating instructions 12/2024
IODD description V 1.3   15

3.4.12   0x2C15   Teach functions

Index: 0x2C15 (11285)

sub	name	description	access type	data type	data memory	reset group
0x1	Teach function state	*State of teach function* *0: Completed* *1..127 : Current step* *< 0: Error codes:* *-1: Abort by user* *-127: Function not available* *Current steps:* *1: Started* *2: Open MS* *3: Close MS* *4: Open LL* *5: Close LL* *6: Open UL* *7: Close UL* *11: Teach position S1* *12: Teach position S2* *13: Teach position S3* *14: Check position 'closed'* *15: Check position 'open'* *16: Check position 'LL'* *17: Check position 'UL'* *18: Teach position S4*[*] *20: Apply teach reset* *21: Initial checks* *99: Completing* *126: Internal error* *Error codes for automatic teach functions:* *-2: Timeout reaching position 'closed'* *-3: Timeout reaching position 'open'* *-4: Error teaching position S1* *-5: Error teaching position S2* *-6: Error teaching position S3* *-7: Error teach reset* *-8: Reserved teach function.* *-9: Error storing values* *-11: Function not started (not all solenoid valves off)* *-12: Function not started (valve control by service tool)* *-13: Function not started (invalid position signal)* *-14: Error - impermissible signal of proximity switch / input S4IN* *-15: Error - impermissible valve movement detected at function start* *-16: Error - valve control by service tool* *-17: Error - invalid position signal* *-18: Timeout reaching position 'LL'* *-19: Internal error* *-20: Timeout reaching position 'UL'* *-26: Error teaching position S4*[*] *-27: Error switch to target type Double Cam*[*]	RO	SI8		

sub	name	description	access type	data type	data memory	reset group
		Error codes for manual teach functions: *-21: Common teach error* *-22: Teach error – invalid position* *(Position signal out of range)* *-23: Teach error – instable position signal* *(too much movement or noise)* *-24: Teach error – Distance to other* *taught teach position too small* *-29 : Teach error – memory error during storing values*				
0x2	Teach function start	*Start teach function* *Manual teach functions assign the current position value to the selected feedback field* 0: Finished / aborted 1: Start automatic teach function 1 (ATF1) 2: Start automatic teach function 2 (ATF2) 3: Start automatic teach function 3 (ATF3) 4: Start automatic teach function 4 (ATF4) 11: Start manual teach function S1 (MTF1) 12: Start manual teach function S2 (MTF2) 13: Start manual teach function S3 (MTF3) 14: Start manual teach function S4 (MTF4) [*] Note: The "manual teach function S4" switches to target type "double cam" before teaching S4.	RW	UI8		
0x3	Is taught (Teach state)	*Indicates, which positions S1 … S4 are taught – bit coded:* *Bit0 = Position S1* *Bit1 = Position S2* *Bit2 = Position S3* *Bit3 = Position S4[*]* *Values:* *0 – not taught, 1 – taught*	RO	UI8		
0x4	Teach reset command	*Reset automatic or manually taught values* 0: Finished / teach reset function aborted 1: Reset all taught positions (S1, S2, S3, S4[*]) and measured opening / closing times during last automatic teach function (0x2C15sub5 – subA) Note: The teach reset switches to target type "single cam".	RW	UI8		
0x5	MS opening time	*If solenoid valve MS was switched on:* *Time (in ms) measured during last automatic teach function from leaving a feedbacked start position* *until reaching a (different) static feedbacked end position.* *Refer to 0x2C23 Valve travel times for details.*	RO	UI32		F, T
0x6	MS closing time	*If solenoid valve MS was switched off:* *Time (in ms) measured during last automatic teach function from leaving a feedbacked start position* *until reaching a (different) static feedbacked end position.* *Refer to 0x2C23 Valve travel times for details.*	RO	UI32		F, T
0x7	LL opening time	*Refer to MS opening time, but with solenoid valve LL* *(since v.0.3)*	RO	UI32		F, T
0x8	LL closing time	*Refer to MS closing time, but with solenoid valve LL* *(since v.0.3)*	RO	UI32		F, T
0x9	UL opening time	*Refer to MS opening time, but with solenoid valve UL* *(since v.1.1)*	RO	UI32		F, T
0xA	UL closing time	*Refer to MS closing time, but with solenoid valve UL* *(since v.1.1)*	RO	UI32		F, T

[*] since IODD v1.3 / firmware ≥ A.01.11.00

3.4.13 0x2C16 Reset command

Index: 0x2C16 (11286)

sub	name	description	access type	data type	data memory	reset group
0x0	Reset command	*0 – Done / Finished* *11 – Device restart* *22 – Maintenance Reset **)* *88 – Diagnosis Reset **)* *111 – Factory Reset *)* *254 – Command failed* *255 – Command not supported*	RW	UI8		

*) **Refer to control top operating instructions before starting this function.**
   All ISDU parameters belonging to reset group F are reset to factory default values, too.
   Device restarts afterwards.

**) Maintenance / Diagnosis Reset overview

Objects	Index/Subindex	Objects reset by	
		Maintenance Reset	**Diagnosis Reset**
Switching cycles MS resettable	0x2C20sub2	X	X
Switching cycles LL resettable	0x2C20sub4	X	X
Switching cycles UL resettable	0x2C20sub6	X	X
Valve stroke cumulated resettable	0x2C22sub2	X	X
Valve travel times	0x2C23sub1-sub6		X
Valve switching times	0x2C24sub1-sub6		X
Event counter opening / closing timeouts	0x2C25sub1		X
Event counter switching timeouts	0x2C25sub2		X
Event counter spare	0x2C25sub4-subA		X

3.4.14 LED settings

3.4.14.1 0x2120 LED mode

Index: 0x2120 (8480)

sub	name	description	access type	data type	data memory	reset group	factory setting

0x0	LED mode	*Select LED indicator mode.*
		Please refer to the operating instructions for a description of the possible indicator modes.
		4 – Fixed color mode
		   configured by object 'LED extern color' (0x2122)
		5 – Demo Mode
		6 – (Top) LEDs off
		7 – Device specific (position signal + errors (red)
		             + warnings (orange, yellow, blue) *)
		*) Position colors can be configured by object 'LED device specific setup' (0x2C12)
			RW	UI32	x	F	7

Device status	Class	Color	Trigger example
Error	Error	Red	IO-Link communication error, position sensor fault, internal error
Check function	Warnings	Orange	Manual override of solenoid valve via service tool active
Out of specification		Yellow	No position taught
Maintenance required		Blue	Service/maintenance notification active.

3.4.14.2 0x2122 LED extern color

Index: 0x2122 (8482)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x0	LED extern color	*In case of setting object 'LED mode' (0x2120) to 4 (Fixed color) the color of Top LEDs is controlled externally by writing a corresponding value to this object *)*	RW	UI32	x	F	0x10000001 (White)

*) Details on supported color value:

Top LED color (Always on)	Value	Byte 3	Byte 2	Byte 1	Byte 0
White	0x10000001	0x10	0x00	0x00	0x01
Red	0x10000006	0x10	0x00	0x00	0x06
Orange	0x10000005	0x10	0x00	0x00	0x05
Yellow	0x10000004	0x10	0x00	0x00	0x04
Green	0x10000002	0x10	0x00	0x00	0x02
Blue	0x10000003	0x10	0x00	0x00	0x03
Turquoise	0x00FFFF00	0x00	0xFF	0xFF	0x00
Pink	0x00FF00FF	0x00	0xFF	0x00	0xFF
LED off	0x10000000	0x10	0x00	0x00	0x00

3.4.14.3   0x2C12   LED device specific colors

Index: 0x2C12 (11282)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	Valve closed	*Color for indication of end position 'valve closed' *)*	RW	UI32	x	F	0x10000004 (Yellow)
0x2	Valve open	*Color for indication of end position 'valve open' *)*	RW	UI32	x	F	0x10000002 (Green)
0x3	Lifts	*Color for indication of end position 'lower lift' and 'upper lift' *)*	RW	UI32	x	F	0x10000001 (White)
0x4	Spare	*Not used since both lifts use the same color configured via 0x2C12sub3*	RW	UI32	x	F	0x10000001 (White)
0x5	Intermediate position	*Color for indication of intermediate position of the valve *)*	RW	UI32	x	F	0x10000000 (LED Off)

*) Details on supported color value:

Top LED color	Value	Byte 3	Byte 2	Byte 1	Byte 0
White	0x10000001	0x10	0x00	0x00	0x01
Red	0x10000006	0x10	0x00	0x00	0x06
Orange	0x10000005	0x10	0x00	0x00	0x05
Yellow	0x10000004	0x10	0x00	0x00	0x04
Green	0x10000002	0x10	0x00	0x00	0x02
Blue	0x10000003	0x10	0x00	0x00	0x03
Turquoise	0x00FFFF00	0x00	0xFF	0xFF	0x00
Pink	0x00FF00FF	0x00	0xFF	0x00	0xFF
LED off	0x10000000	0x10	0x00	0x00	0x00

3.4.14.4   0x2C19   LED brightness

Index: 0x2C19 (11289)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x0	LED brightness	*Brightness of Top LED in percent*	RW	UI8	x	F	100

3.4.15   Diagnosis

3.4.15.1   0x2C1E   Diagnosis settings

Index: 0x2C1E (11294)

sub	name	description	access type	data type	data memory	reset group	factory setting
0x1	Travel timeout detection *)	*Activates / deactivates valve travel timeout detection for certain solenoid valves – for details refer to 0x2C1Esub2.* *Bit0 = Valve travel timeout detection MS* *Bit1 = Valve travel timeout detection LL* *Bit2 = Valve travel timeout detection UL* *Value: 1: Activated, 0: Deactivated* *If activated, the corresponding opening / closing time (from 0x2C23) will be checked against the travel time limit (0x2C1Esub2): If the limit value is exceeded and the end position is not yet reached, a warning will be indicated via Top LED and an IO-Link warning event will be raised.* *Travel timeouts are measured, if only 1 solenoid valve is switched on / off and max. 1 solenoid valve is active.* *The IO-Link warning event will be reset if the end position (different from start position) is reached or solenoid valves setpoint changes.*	RW	UI8	x	F	7 (All valves)
0x2	Travel time limit	*Adjustable maximum travel time [1..120] in seconds for valve travel timeout detection (valve opening / closing time). Measured from leaving static position (tolerance band or S4) until reaching static position (tolerance band or S4) if solenoid valve was switched on or off.*	RW	UI8	x	F	60
0x3	Switching timeout detection *)	*Activates / deactivates valve switching time timeout detection for certain solenoid valves:* *Bit – coded:* *Bit0 = Switching timeout detection MS* *Bit1 = Switching timeout detection LL* *Bit2 = Switching timeout detection UL* *Values: 1: Activated, 0: Deactivated* *If activated, switching time timeouts will be detected whenever the end position is not reached after switching a solenoid valve on / off within the configured valve switching time limit (0x2C1Esub4) and an IO-Link warning event is output.* *Requires at least two detectable end positions.* *Not active during automatic teach function.* *Switching timeouts are measured, if only 1 solenoid valve is switched on / off and max. 1 solenoid valve is active.* *The IO-Link warning event will be reset if the end position (different from start position) is reached or solenoid valves setpoint changes..*	RW	UI8	x	F	3 (MS, LL)
0x4	Switching time limit	*Adjustable maximum time [1..120] in seconds for valve switching timeout detection, by which the end position should be reached (measured from switching solenoid valve on / off to static end position).*	RW	UI8	x	F	60

*) no monitoring / feedback in case of valve control units with 0 solenoid pilot valves (pure feedback variants).

3.4.15.2   0x2C1F   Solenoid valves state

Index: 0x2C1F (11295)

sub	name	description	access type	data type	data memory	reset group
0x0	Solenoid valves state	*Current state of the solenoid valves (bitwise)* | Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Not used	Solenoid Valve
	UL	LL	MS
0 = OFF, 1 = ON		RO	UI8		

3.4.15.3   0x2C20   Solenoid valve switching cycles

Index: 0x2C20 (11296)

sub	name	description	access type	data type	data memory	reset group
0x1	MS total	*Total switching cycles of main stroke (MS) solenoid valve.*	RO	UI32		
0x2	MS resettable	*Resettable switching cycles of main stroke solenoid valve. *)*	RO	UI32		F, D, M
0x3	LL total	*Total switching cycles of lower lift (LL) solenoid valve.*	RO	UI32		
0x4	LL resettable	*Resettable switching cycles of lower lift solenoid valve. *)*	RO	UI32		F, D, M
0x5	UL total	*Total switching cycles of upper lift (UL) solenoid valve*	RO	UI32		
0x6	UL resettable	*Resettable switching cycles of upper lift solenoid valve. *)*	RO	UI32		F, D, M

*) *Can be reset e.g. with Maintenance Reset / Diagnosis Reset.*

3.4.15.4   0x2C21   Solenoid valve activation times

Index: 0x2C21 (11297)

sub	name	description	access type	data type	data memory	reset group
0x1	MS	*Activation time in s of main stroke (MS) solenoid valve.*	RO	UI32		
0x2	LL	*Activation time in s of lower lift (LL) solenoid valve*	RO	UI32		
0x3	UL	*Activation time in s of upper lift (UL) solenoid valve*	RO	UI32		
0x4	All valves	*Cumulated activation time in s of all solenoid valves.*	RO	UI32		

3.4.15.5   0x2C22   Valve stroke cumulated

Index: 0x2C22 (11298)

sub	name	description	access type	data type	data memory	reset group
0x1	Total	*Total cumulated valve stroke in mm.*	RO	FL32		
0x2	Resettable	*Resettable cumulated valve stroke in mm.* *Can be reset e.g. with Maintenance Reset / Diagnosis Reset.*	RO	FL32		F, D, M

3.4.15.6   0x2C23   Valve travel times

Index: 0x2C23 (11299)

A device restart or a Diagnosis Reset resets all values.

Corresponding time value is updated continuously during measurement.

Measurement start requirements:

- at least one taught valve position, and
- current valve position is feedbacked, and
- only one solenoid valve is switched on/off.

Measurement is canceled / current value is kept, if solenoid valve setpoint changed.

*) Feedbacks of start / end position have to be different, at least one feedback (S1 to S4) needs to be active.
  'Static position' means 2 s no feedback change and no (target 1) position changes > 1 mm.

Sub	name	description	access type	data type	data memory	reset group
0x1	MS opening time	*If solenoid valve MS was switched on:* *Time (in ms) measured* *from leaving a feedbacked start position* *until reaching a (different)static feedbacked end position. *)*	RO	UI32		F, D
0x2	MS closing time	*If solenoid valve MS was switched off:* *Time (in ms) measured* *from leaving a feedbacked start position* *until reaching a (different)static feedbacked end position. *)*	RO	UI32		F, D
0x3	LL opening time	*Refer to MS opening time, but with solenoid valve LL*	RO	UI32		F, D
0x4	LL closing time	*Refer to MS closing time, but with solenoid valve LL*	RO	UI32		F, D
0x5	UL opening time	*Refer to MS opening time, but with solenoid valve UL*	RO	UI32		F, D
0x6	UL closing time	*Refer to MS closing time, but with solenoid valve UL*	RO	UI32		F, D

3.4.15.7 0x2C24 Valve switching times

Index: 0x2C24 (11300)

A device restart or a Diagnosis Reset resets all values.

Corresponding time value is updated continuously during measurement.

Measurement is only active if a single solenoid valve is activated/deactivated.

Measurement start requirements:

- at least one taught valve position, and

- only one solenoid valve is switched on/off.

'Static feedbacked end position' means 2 s no feedback change and no (target 1) position changes > 1 mm and at least one feedback (S1 to S4) needs to be active.

Sub	name	description	access type	data type	data memory	reset group
0x1	MS switching time open	*If solenoid valve MS was switched on:* *Time (in ms) measured from switching pilot valve on until reaching a (different) static feedbacked end position.*	RO	UI32		F, D
0x2	MS switching time close	*If solenoid valve MS was switched off:* *Time (in ms) measured from switching pilot valve off until reaching a (different) static feedbacked end position.*	RO	UI32		F, D
0x3	LL switching time open	*Refer to MS switching time open, but with solenoid valve LL*	RO	UI32		F, D
0x4	LL switching time close	*Refer to MS switching time close, but with solenoid valve LL*	RO	UI32		F, D
0x5	UL switching time open	*Refer to MS switching time close, but with solenoid valve UL*	RO	UI32		F, D
0x6	UL switching time close	*Refer to MS switching time close, but with solenoid valve UL*	RO	UI32		F, D

3.4.15.8 0x2C25 Event counter

Index: 0x2C25 (11301)

sub	name	description	access type	data type	data memory	reset group
0x1	Open / closing timeouts	*Number of opening / closing timeout events. *)*	RO	UI32		F, D
0x2	Switching timeouts	*Number of switching timeout events. *)*	RO	UI32		F, D
0x3	Teach function counter	*Counts number of teach function starts*	RO	UI32		F
0x4	Spare 1	*Not used. *)*	RO	UI32		F, D
0x5	Spare 2	*Not used. *)*	RO	UI32		F, D
0x6	Spare 3	*Not used. *)*	RO	UI32		F, D
0x7	Spare 4	*Not used. *)*	RO	UI32		F, D
0x8	Spare 5	*Not used. *)*	RO	UI32		F, D
0x9	Spare 6	*Not used. *)*	RO	UI32		F, D
0xA	Spare 7	*Not used. *)*	RO	UI32		F, D

*) since last counter reset. Counter can be reset e.g. with Diagnosis Reset.
**) defined by Diagnosis settings, object 0x2C26sub3

3.4.16 0x2C2F Last actions

Index: 0x2C2F (11311)

sub	name	description	access type	data type	data memory	reset group
0x1	*Factory reset*	*Timestamp in seconds *) of last user triggered factory reset / restore factory settings*	RO	UI32		
0x2	*Diagnosis reset*	*Timestamp in seconds*) of last user triggered diagnosis reset*	RO	UI32		F **)
0x3	*Maintenance reset*	*Timestamp in seconds *) of last user triggered maintenance reset*	RO	UI32		F **)
0x4	*Teach reset*	*Timestamp in seconds *) of last user triggered or ATF triggered teach reset*	RO	UI32		F **)
0x5	*Successful ATF ***)*	*Timestamp in seconds *) of last successful automatic teach function (ATF)*	RO	UI32		F **)
0x6	*Successful MTF ***)*	*Timestamp in seconds *) of last successful manual teach function (MTF)*	RO	UI32		F **)
0x7	*Spare 2*		RO	UI32		F **)
0x8	*Spare 3*		RO	UI32		F **)
0x9	*Spare 4*		RO	UI32		F **)
0xA	*Spare 5*		RO	UI32		F **)

*) Timestamps are captured from 0x2004sub4 (Device status - Operation duration).
**) Values are reset to 0 during factory reset
***) Since IODD v1.1

3.4.17 0x2C48 Selected target type

Index: 0x2C48 (11336)

sub	name	description	access type	data type	data memory	reset group
0x0	Selected target type *)	*Indicates, which target type is currently selected* *0 – None* *1 – Single Cam target (target 1)* *2 – Double Cam target (target 1 and target 2)*	RO	UI32		

*) Since IODD v1.3 / firmware ≥ A.01.11.00

4 IO-Link events

4.1 IO-Link Port class A / B devices

Event Code	Event Type	Description	Action
0x1000 (4096)	ERROR	General malfunction – unknown error	Restart device
If fault persists, contact Service.
0x4000 (16384)	ERROR	Temperature fault – overload (Device temperature exceeded upper error threshold)	Check operating conditions.
If fault persists, contact Service
0x4210 (16912)	WARNING	Device temperature over-run (Device temperature exceeded upper warning threshold)	Clear source of heat.
Check operating conditions.
0x4220 (16928)	WARNING	Device temperature under-run (Device temperature undershot lower warning threshold)	Insulate device.
Check operating conditions.
0x5100 (20736)	ERROR	General power supply error – supply voltage for operation of device too low
Solenoid pilot valves are deactivated.
Firmware ≥ A.01.07.00:
Position sensor outputs 'invalid position' (-100.0 mm).
Position sensor related feedback signals are reset.	Check supply voltage
If fault persists, contact Service.
0x5110 (20752)	WARNING	Voltage warning upper threshold exceeded – supply voltage too high	Check supply voltage
0x5111 (20753)	WARNING	Voltage warning lower threshold exceeded – supply voltage too low	Check supply voltage
0x6000 (24576)	ERROR	Internal software error	Restart device
If fault persists, contact Service
0x1801 (6145)	ERROR	General power supply error – supply voltage for operation of device too high.
Solenoid pilot valves are deactivated.	Check supply voltage
If fault persists, contact Service.
0x1802 (6146)	ERROR	Undertemperature detected (Device temperature undershot lower error threshold)	Check operating conditions.
If fault persists, contact Service
0x1804 (6148)	ERROR	Invalid position sensor signal e.g. due to missing magnetic target, or target outside measurement range.	Check the target for correct mounting and magnet alignment.
If fault persists, contact Service
0x1809 (6153)	ERROR	Non-volatile storage memory isn't usable
Solenoid pilot valves are deactivated	Restart device
If fault persists, contact Service
0x180A (6154)	WARNING	Teach function required	Start teach function
0x180B (6155)	ERROR	Teach function error
Last teach function since last device restart failed, due to e.g. no, too slow or unintended valve movement.	Check compressed air supply and tubing
Check pilot valves
Restart teach function
If fault persists, contact Service

Event Code	Event Type	Description	Action
0x180C (6156)	WARNING	Exceed valve stroke cumulated limit	Where appropriate, check wear-and-tear parts in pneumatic actuator and valve Reset counters via Maintenance Reset *)
0x180D (6157)	WARNING	Exceed valve switching cycle limit pilot valve MS	Where appropriate, check wear-and-tear parts in pneumatic actuator and valve Reset counters via Maintenance Reset *)
0x180F (6159)	WARNING	Valve opening / closing timeout. End position not reached within configured time limit. **) The event is reset in case an end position (different from start position) is reached or the solenoid valves set point changes (usually starting a new travel time measurement).	Check compressed air supply Check actuator and valve for friction Check pilot valve If fault persists, contact Service
0x1811 (6161)	WARNING	Switching timeout. End position not reached within configured time limit. **) The event is reset in case an end position (different from start position) is reached or the solenoid valves set point changes (usually starting a new switching time measurement).	Check pilot pressure Check pilot valve Check / adopt switching timeout settings (refer to chapter 3.4.15.1) Restart teach function If fault persists, contact Service
0x1813 (6163)	WARNING	Automatic teach function active	Wait until automatic teach function has been completed
0x1814 (6164)	ERROR	IO-Link set point error Cyclic IO-Link communication is broken or not yet established. Solenoid pilot valves are actuated according to configured safety position (exception: an error forcing internal safety position (all valves off))	Establish cyclic IO-Link connection. Some IO-Link masters require the transmission of a cyclic value to the device. Check IO-Link wiring. Check IO-Link master port cycle time settings (refer to chapter "Notes on IO-Link master configuration")
0x1815 (6165)	WARNING	Manual valve control active (via service interface)	To disable manual valve control, restart device.
0x1817 (6167)	ERROR	PCB not supported by current firmware	Restart device. If fault persists, contact Service.
0x1818 (6168)	WARNING	User triggered maintenance signal Device marked e.g. for maintenance purposes.	To disable signal refer to description of object 0x210A or restart device.
0x181C (6172)	ERROR	Error power supply measurement	Check supply voltage. Restart device. If fault persists, contact Service.
0x181D (6173)	ERROR	Error position sensor calibration data	Replace valve control unit. Contact Service.
0x181E (6174)	ERROR	Error position sensor configuration data	Replace valve control unit. Contact Service.

Event Code	Event Type	Description	Action
0x181F (6175)	ERROR	Error position sensor.	Restart device. If fault persists, contact Service.
0x1820 (6176)	WARNING	Manual teach function active	Wait until manual teach function has been completed
0x1825 (6181)	WARNING	Active test mode. Following signals maybe manually actuated / simulated by PC tool via service interface for testing purposes: - set points of solenoid pilot valve(s) - feedback signals S1 – S4 - position	IO-Link warning will be automatically reset, if test mode is left or device is restarted. .
0x182F (6191)	ERROR	Initialisation of electronics module failed.	Restart device. If fault persists, contact Service.

*) via process control or via PC tool and service interface

**) no monitoring / feedback in case of valve control units with 0 solenoid pilot valves (pure feedback variants).

4.2 IO-Link Port class B devices only

Event Code	Event Type	Description	Action
0x1819 (6169)	ERROR	Overvoltage actuator supply detected Solenoid pilot valves are deactivated.	Check actuator supply voltage If fault persists, contact Service.
0x181A (6170)	ERROR	Undervoltage actuator supply detected Solenoid pilot valves are deactivated.	
0x181B (6171)	ERROR	Out of specification actuator supply voltage detected Solenoid pilot valves are deactivated.	