Application Note

FESTO

IO-Link parameter description

A brief explanation of the contents
- identification
- parameter and commands
- block parameterization
- teach-In
- process data
- diagnosis

SCDN-.....
signalconverter

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Table of contents

1 Components/Software used

Type/Name	Version Software/Firmware	Date of manufacture
SCDN-...	general	operative from 2017

Table 1.1: Components/Software used

Note

You can find detailed specifications on the product, the instruction manual and the declaration of conformity at:

➔ www.festo.com

Detailed information on the IO-Link specification V1.1 und the Smart Sensor Profile at:

➔ www.io-link.com

The device description file IODD at:

➔ www.festo.com/sp

2 IO-Link operating mode

In the IO-Link operating mode, programmed switching signals and the continuously measured process values (digitally coded analogue values) are transferred.

– Data transmission is serially and digitally coded in the IO-Link protocol
– Usage of unshielded standard cables up to 20 m length is possible
– Process data: 14 bit for each measurement value (InA and InB) and 2 bit for the binary channels
– Parameters and functions in accordance with Smart Sensor Profile
– There are two binary channels available, which can be individually programmed as threshold value comparator, window comparator or Auto difference monitoring
– The threshold and window comparator can be set for quantity detection, object (presence) detection or position detection
– Each binary channel is adjustable as normally closed (NC) or normally open (NO)
– The continuously measured values are always transferred parallel and independent of the binary channels
– Support of optional functions Block Parameterisation and Data Storage
– Display IO-Link operation: “OutA” segment switches off every 2 seconds for the period of 0,1 seconds
– The keys are locked during a parameter access, afterwards the device returns automatically into the RUN mode
– Device description file IODD for all variants

3 Technical data

3.1 General specification

IO-Link	
Protocol	IO-Link
Protocol version	Device V1.1
Profile	Smart Sensor Profile
Function classes	BinaryDataChannel ProcessDataVariable, Identification, Diagnosis, Teach channel
Communication mode	COM2 (38.4 kBaud)
SIO-Mode support	Yes
Port class	A
Process data length OUT	0 byte
Process data length IN	5 bytes
Process data content IN	2 bit BDC (measured value monitoring) 14 bit PDV (measured value InA) 14 bit PDV (measured value InB)
Min. cycle time	5 ms
Data storage required	0.5 kByte
Device ID	see chapter *3.3.1 Identification parameters*

Table 3.1: General IO-Link specification

3.2 Communication features

- Preoperate: Frame type 1_V, OD-capability 8 bytes
- Operate: Frame type 2_V, OD-capability 2 bytes
- SIO-Mode: supported
- ISDU: supported
- Data storage: supported
- Block parameterization: supported

3.3 On demand data

The detailed description of these parameters can be found in the IO-Link Interface and System specification, in the IODD and in the IO-Link Smart Sensor Profile. The default values and the respective valid ranges of these parameters are listed in the IODD xml file.

3.3.1 Identification parameters

Vendor ID 333 d / 01 4D h
Device ID see the following table

Device ID [dec]	Device ID [hex]	Order Code
163	00 00 A3	SCDN-2V-EC4-PNLK-L1
164	00 00 A4	SCDN-2A-EC4-PNLK-L1

Table 3.2: Device IDs

Index	Subindex	Name	Value (example)	Access[1]			Length	Format
				U	M	S		
0x0010	0	Vendor Name	Festo AG & Co. KG	R	R	R	17 bytes	String
0x0011	0	Vendor Text	http://www.festo.com	R	R	R	20 bytes	
0x0012	0	Product Name	Order code, e.g. SCDN-2V-EC4-PNLK-L1	R	R	R	20 bytes	
0x0013	0	Product ID	SCDN-2V	R	R	R	7 bytes	
0x0014	0	Product Text	Signal converter	R	R	R	16 bytes	
0x0015	0	Serial Number	Product Key, e.g. 3S7PL9V6HHM	R	R	R	11 bytes	
0x0016	0	Hardware Revision	REV01	R	R	R	5 bytes	
0x0017	0	Firmware Revision	V00.43.02.21	R	R	R	13 bytes	
0x0018	0	Application Specific Tag[2]	***	R	R/W	R/W	32 bytes	

1) Authorisation group: U = user, M = maintenance, S = specialist; access: R = read, R/W = read and write, – = no access
2) Value defined by user

Table 3.3: Identification parameters

3.3.2 Standard IO-Link parameters and commands

Index	SubIn-dex	Name	Value	Access[1]			Length	Format
				U	M	S		
0x0002	0	SystemCommand	➔ *Table 3.5:*				1 byte	UInterger8
0x000C	0	Device Access Locks[2]	bitwise: 0 = unlocked 1 = locked	R	R/W	R/W	2 bytes	Record
0x0020	0	Error Count	0	R	R	R	2 bytes	UInterger16
0x0024	0	Device Status	0	R	R	R	1 byte	UInterger8
0x0025	0	Detailed Device Status	➔ *Table 3.19:*	R	R	R	33 bytes	Array of 3 byte records
0x0028	0	ProcessDataInput	➔ *Table 3.16:*	R	R	R	5 bytes	Record

1) Authorisation group: U = user, M = maintenance, S = specialist; access: R = read, R/W = read and write, – = no access

2) Bit 0: lock Parameter Write Access; Bit1: lock data storage (no impact); Bit2: lock local parameterization (EDIT- and TEACH-Mode); Bit3: lock local user interface (not used)

Table 3.4: Standard IO-Link parameters

Value dec	Value hex	Access[1]			Command	Note	Format
		U	M	S			
65	0x41	–	W	W	SP1 Single Value Teach	Determines Teachpoint for Setpoint SP1	UInterger8
66	0x42	–	W	W	SP2 Single Value Teach	Determines Teachpoint for Setpoint SP2	
67	0x43	–	W	W	SP1 Two Value Teach TP1	Determines Teachpoint 1 for Setpoint SP1	
68	0x44	–	W	W	SP1 Two Value Teach TP2	Determines Teachpoint 2 for Setpoint SP1	
75	0x4B	–	W	W	One Action Teach	Device specific Teach-In	
79	0x4F	–	W	W	Teach Cancel	Cancels the Teach-In sequence	
128	0x80	–	W	W	Device reset	Device warm start	
130	0x82	–	W	W	Restore factory settings	Sets the factory settings operative again	
160	0xA0	W	W	W	Reset Min PDV (InA)	Minimal measured InA value reset	
161	0xA1	W	W	W	Reset Max PDV (InA)	Maximal measured InA value reset	
162	0xA2	W	W	W	Reset Min PDV (InB)	Minimal measured InB value reset	
163	0xA3	W	W	W	Reset Max PDV (InB)	Maximal measured InB value reset	

1) Authorisation group: U = user, M = maintenance, S = specialist; access: R = read, R/W = read and write, – = no access

Table 3.5: Standard IO-Link commands

3.3.3 Smart Sensor Profile parameters

Index	Sub-index	Name	Value	Access [1)]			Length (byte)	Format
				U	M	S		
0x000D	0	Profile Characteristics		R	R	R	12	Array of UInteger16
	1	Device Profile ID	0x0001: Smart Sensor Profile	R	R	R	2	UInteger16
	2	Function Class ID	0x8000: Device Identification	R	R	R	2	
	3	Function Class ID	0x8001: BinaryDataChannel	R	R	R	2	
	4	Function Class ID	0x8002: ProcessDataVariable	R	R	R	2	
	5	Function Class ID	0x8003: Device Diagnosis	R	R	R	2	
	6	Function Class ID	0x8004: Teach Channel	R	R	R	2	
0x000E	0	PDInput Descriptor		R	R	R	6	Array of OctetString3
	1	BDC1, BDC2	0x01, 0x02, 0x00	R	R	R	3	OctetString3
	2	ProcessDataVariable InB	0x02, 0x0E, 0x08	R	R	R	3	OctetString3
	3	ProcessDataVariable InA	0x02, 0x0E, 0x18	R	R	R	3	OctetString3
0x003A	0	Teach-In Channel	0: BDC1 (OutA), default 1: BDC1 (OutA) 2: BDC2 (OutB)	-	R/W	R/W	1	UInteger8
0x003B	0	Teach-In Status	0	-	R	R	1	Record
	1	Teach Flag TP2 for SP2	0: not taught, 1 - taught	-	R	R	1	BooleanT
	2	Teach Flag TP1 for SP2	0: not taught, 1 - taught	-	R	R	1	
	3	Teach Flag TP2 for SP1	0: not taught, 1 - taught	-	R	R	1	
	4	Teach Flag TP1 for SP1	0: not taught, 1 - taught	-	R	R	1	
	5	Teach State	0	-	R	R	1	UInteger4
BDC1, Signal monitoring OutA								
0x003C	1	Setpoint SP1	1 ... 16382, default 9830	R	R/W	R/W	2	UInteger16
	2	Setpoint SP2	1 ... 16382, default 11468				2	
0x003D	1	Switchpoint logic	0: normally open, default 1: normally closed				1	UInteger8
	2	Switchpoint mode	0x01 - Single point mode, quantity detection, default 0x02 - Window mode, quantity detection 0x80 - Auto difference monitoring 0x81 - Single point mode, object detection 0x82 - Window mode, object detection 0x84 - Single point mode, position detection 0x85 - Window mode, position detection				1	
	3	Switchpoint hysteresis	0 ... 14745, default 82				2	UInteger16

Index	Sub-index	Name	Value	Access [1]			Length (byte)	Format
				U	M	S		
BDC2, Signal monitoring OutB								
0x003E	1	Setpoint SP1	1 ... 16382, default 9830	R	R/W	R/W	2	UInteger16
	2	Setpoint SP2	1 ... 16382, default 11468				2	
0x003F	1	Switchpoint logic	0: normally open, default 1: normally closed				1	UInteger8
	2	Switchpoint mode	0x01 - Single point mode, quantity detection, default 0x02 - Window mode, quantity detection 0x80 - Auto difference monitoring 0x81 - Single point mode, object detection 0x82 - Window mode, object detection 0x84 - Single point mode, position detection 0x85 - Window mode, position detection				1	
	3	Switchpoint hysteresis	0 ... 14745, default 82				2	UInteger16

1) Authorisation group: U = user, M = maintenance, S = specialist; access: R = read, R/W = read and write, – = no access

Table 3.6: Smart Sensor Profile parameters

3.3.4 IO-Link Teach-In

The remote Teach-In procedure via IO-Link is the same as the manual one. Instead of key pressing the teaching points will be taught by the corresponding commands from IO-Link Smart Sensor Profile. The chronological order of determining teaching points does not matter either.

All switching functions require two applied Teach-In values.

In case of an exceeded signal event every teach command causes ISDU error “function temporarily unavailable” 0x8036 and the Teach-In procedure is cancelled. If the Teach-In mode was not yet started, then the device will remain in the run mode.

An overview of the Teach-In commands ➔ *Table 3.5:*

The device starts the Teach-In procedure as soon as a successful Teach-In command is received. It sets the corresponding teach point, the teach state, the status “successfully taught“ and waits for the second command. The keys A, B and EDIT are locked and the display flashes alternately “t-IN / IOL “ until either the Teach-In procedure is successfully completed or aborted. The display shows the currently measured process value.

In contrast to the manual Teach-In procedure a teach point can be repeatedly set with the commands 0x41, 0x42, 0x43 and 0x44. This procedure is regardless of the chronological order of applying the teach signal TP1 or TP2.

In case an invalid command, respective to the current switching / Teach-In mode, is sent, the device will signal the ISDU error “function temporarily unavailable” 0x8036.

If the first teach command comes once more before the second one, then the currently measured process value will be used again for the first teach point. After sending of second teach command all successfully calculated switching points will be immediately taken over and the remote Teach-In procedure will end. The Teach Apply command 0x40 is not used during Teach-In process.

All Teach-In commands are in format UInterger8. They should be sent with the index 0x0002 (system command) sub-index 0.

➔ **note**

There is also a specific Teach-In command 0x4B, which is used in IODD to simulate key pressing in IODD device tool. This command reflects the logic of the manual Teach-In and operates analogous to the local Teach-In via display and keys. Additionally this command can ease the use of the Teach-In functions provided by IO-Link for customer applications.

- In mode threshold value comparator the first sending of this command equates to the “SP1 two value teach TP1” command 0x43 and the second sending equates to the “SP1 two value teach TP2” command 0x44
- In mode window comparator and Auto Difference Monitoring the first sending equates to the “SP1 single value teach” command 0x41 and the second equates to the “SP2 single value teach” commands 0x42.

For more information see IO-Link Smart Sensor Profile.

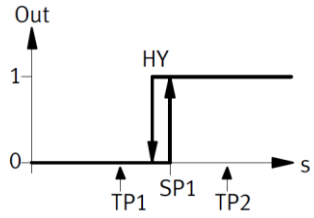
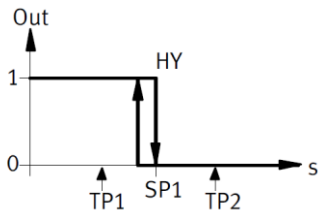
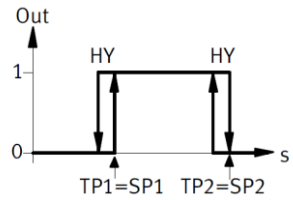
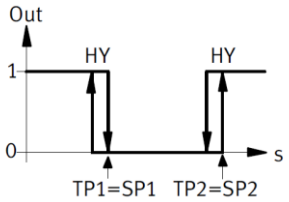
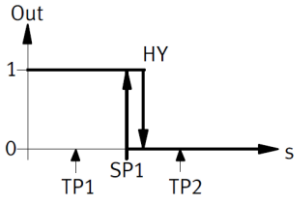
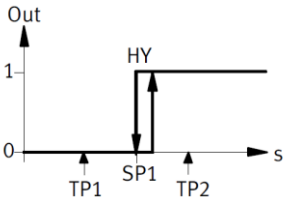
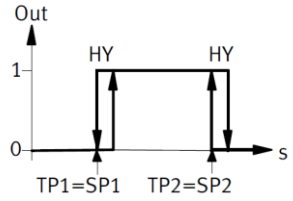
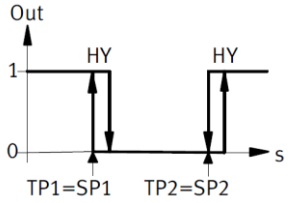
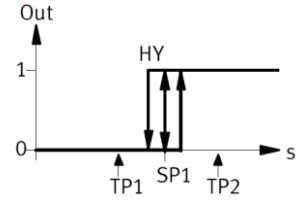
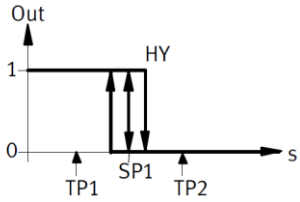
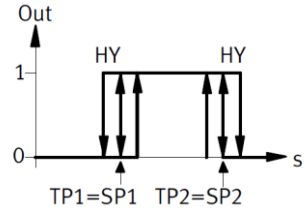
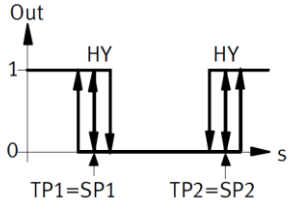
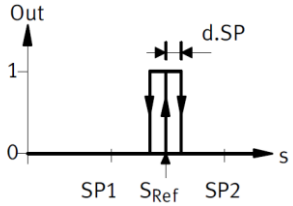
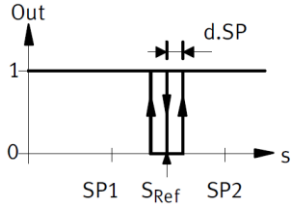
Description	Normally open	Normally closed	Symbol (local menu)	Switchpoint mode
Quantity detection with threshold value comparator (hysteresis on the left)			_⌜ /	0x01
Quantity detection with window comparator (hysteresis on the left)			_⌜⌊_ /	0x02
Object detection with threshold value comparator (hysteresis on the right)			¯⌊_ \	0x81
Object detection with window comparator (hysteresis on the right)			_⌜⌊_ \	0x82
Position detection with threshold value comparator (hysteresis on both sides)			_⌜ X	0x84
Position detection with window comparator (hysteresis on both sides)			_⌜⌊_ X	0x85
Auto difference monitoring			d_⌜⌊_	0x80

Table 3.7: Overview of switching functions

				Detection mode and switch function						
				_⎺ /	_⎺⎽_ /	⎺⎽_ \	_⎺⎽_ \	_⎺ **X**	_⎺⎽_ **X**	**d**_⎺⎽_
				Quantity with threshold	Quantity with window	Object with threshold	Object with window	Position with threshold	Position with window	Auto difference monitoring [1]
Action	**Out**	**Index**	**Sub-Index**	**Data**						
If necessary choose the appropriate switching function[2]	A	0x003D	0x02	0x01	0x02	0x81	0x82	0x84	0x85	0x80
	B	0x003F	0x02							
Choose BDC	A	0x003A	0x00	0x01						
	B	0x003A	0x00	0x02						
Single Value Teach-In					✓		✓		✓	✓
Two Value Teach-In				✓		✓		✓		
Apply the first teach signal										
SP1 Single Value Teach		0x0002	0x00		0x41		0x41		0x41	0x41
SP1 Two Value Teach TP1		0x0002	0x00	0x43		0x43		0x43		
Apply the second teach signal										
SP2 Single Value Teach		0x0002	0x00		0x42		0x42		0x42	0x42
SP1 Two Value Teach TP2		0x0002	0x00	0x44		0x44		0x44		
Canceling Teach-In (always possible during active teach-in process)		0x0002	0x00	0x4F						

1) For Auto Difference Monitoring: Teach-In is only available for the limits of the work range (SP.Lo and SP.Hi).

2) By changing the switching function an inconsistent set of parameters for switchpoint mode, SP1, SP2, HY could occur which prevents the switching function to be changed. An appropriate error message is shown. In this case it is recommended to restore the factory settings. With the factory settings a free choice of a switching function is always possible.

Table 3.8: Teach-In commands

3.3.5 Device specific parameters

Index	Sub-Index	Name	Value	Access[1]			Length bytes	Format
				U	M	S		
0x0028	4	BDC1 (OutA) state	0 = Off 1 = On	R	R	R	2	Unsigned Integer16
0x0101	0	OutA input signal	1= InA 2= InB	R	R/W	R/W		
0x0112	0	OutA, Auto difference monitoring, max. signal delta (s.obS) boundary value for constant signal observation	16 ... 328, default 33	R	R	R/W		
0x0113	0	OutA, Auto difference monitoring, time delta (t.obS) time period for constant signal observation (msec)	5 ... 9999, default 200	R	R/W	R/W		
0x0114	0	OutA , Auto difference monitoring, switchpoint delta (d.SP) threshold for signal change	82 ... 8192, default 328	R	R/W	R/W		
0x0118	0	OutA, backlight color	0: allways blue (default) 1: red if Out = 0 2: red if Out = 1	R	R/W	R/W		
0x0028	3	BDC2 (OutB) state	0 = Off 1 = On	R	R	R	2	Unsigned Integer16
0x011F	0	OutB input signal	1= InA 2= InB	R	R/W	R/W		
0x0130	0	OutB, Auto difference monitoring, max. signal delta (s.obS) boundary value for constant signal observation	16 ... 328, default 33	R	R	R/W		
0x0131	0	OutB, Auto difference monitoring time delta (t.obS) time period for constant signal observation (msec)	5 ... 9999, default 200	R	R/W	R/W		
0x0132	0	OutB, Auto difference monitoring, switchpoint delta (d.SP) threshold for signal change	82 ... 8192, default 328	R	R/W	R/W		
0x0136	0	OutB, backlight color [2) 3)]	0: allways blue (default) 1: red if Out = 0 2: red if Out = 1	R	R/W	R/W		

Index	Sub-Index	Name	Value	Access[1)]			Length bytes	Format
				U	M	S		
0x0028	1	InA PDV signal measured value	0 ... 2^{14} - 1	R	R	R	2	Unsigned Integer16
0x0186	0	InA input signal low limit (In.Lo)	0 ... 75; 0... 150 (0 ... 7.5 V; 0 ...15.0 mA)	R	R/W	R/W		
0x0187	0	InA input signal high limit (In.Hi)	25 ... 100; 50 ... 200 (2.5 ... 10.0 V; 5.0 ... 20.0 mA)	R	R/W	R/W		
0x017F	0	InA predefined range of process value (MV.di)	0: 0 ... 100% 1: 0 ... -1 bar 2: 0 ... -100 kPa 3: 0 ... 10 bar 4: 0 ... 1 MPa 5: x...xx	R	R/W	R/W		
0x0181	0	InA unit of process value (Unit)	0: %; 1: bar; 2: kPa; 3: MPa; 4: PSI; 5: MMHG; 6: inHG; 7: iH2O; 8: kGF; 9: l/min; 10: l/h; 11: SCFM; 12: SCFh; 13: GPM; 14: MM; 15: INCH; 16: V; 17: MA; 18: --	R	R/W	R/W		
0x017C	0	InA decimal point (dec/Pt)	0: x 1: x.x 2: x.xx 3: x.xxx	R	R/W	R/W		
0x017D	0	InA measured value display Min (MV.Lo)	-1999 ... 9999	R	R/W	R/W	2	Signed Integer16
0x017E	0	InA measured value display Max (MV.Hi)	-1999 ... 9999	R	R/W	R/W		
0x0180	0	InA blind range (blind) Process date range around zero will be shown as zero in the display	0 = off 82 ... 819 (0.5 ... 5.0%FS)	R	R/W	R/W	2	Unsigned Integer16
0x0182	0	InA filter response time (Filt) Input signal smoothing	0: Filter Off 1: 2 ms, default value 2: 4 ms 3: 8 ms 4: 16 ms 5: 32 ms 6: 64 ms 7: 128 ms 8: 256 ms 9: 516 ms 10: 1024 ms	R	R/W	R/W		

Index	Sub-Index	Name	Value	Access[1)]			Length bytes	Format
				U	M	S		
0x0028	2	InB PDV signal measured value	0 ... 2^{14} - 1	R	R	R	2	Unsigned Integer16
0x019A	0	InB input signal low limit (In.Lo)	0 ... 75; 0... 150 (0 ... 7.5 V; 0 ...15.0 mA)	R	R/W	R/W		
0x019B	0	InB input signal high limit (In.Hi)	25 ... 100; 50 ... 200 (2.5 ... 10.0 V; 5.0 ... 20.0 mA)	R	R/W	R/W		
0x0193	0	InB predefined range of process value (MV.di)	0: 0 ... 100% 1: 0 ... -1 bar 2: 0 ... -100 kPa 3: 0 ... 10 bar 4: 0 ... 1 MPa 5: x...xx	R	R/W	R/W		
0x0195	0	InB unit of process value (Unit)	0: %; 1: bar; 2: kPa; 3: MPa; 4: PSI; 5: MMHG; 6: inHG; 7: iH2O; 8: kGF; 9: l/min; 10: l/h; 11: SCFM; 12: SCFh; 13: GPM; 14: MM; 15: INCH; 16: V; 17: MA; 18: --	R	R/W	R/W		
0x0190	0	InB decimal point (dec/Pt)	0: x 1: x.x 2: x.xx 3: x.xxx	R	R/W	R/W		
0x0191	0	InB measured value display Min. (MV.Lo)	-1999 ... 9999	R	R/W	R/W	2	Signed Integer16
0x0192	0	InB measured value display Max (MV.Hi)	-1999 ... 9999	R	R/W	R/W		
0x0194	0	InB blind range (blind) Process date range around zero will be shown as zero in the display	0 = off 82 ... 819 (0.5 ... 5.0%FS)	R	R/W	R/W	2	Unsigned Integer16
0x0196	0	InB filter response time (Filt) Input signal smoothing	0: Filter Off 1: 2 ms, default value 2: 4 ms 3: 8 ms 4: 16 ms 5: 32 ms 6: 64 ms 7: 128 ms 8: 256 ms 9: 516 ms 10: 1024 ms	R	R/W	R/W		
0x01DD	0	Shown input in main-display (Main.d)	1: InA 2: InB	R	R/W	R/W	2	Unsigned Integer16
0x01E9	0	Sub-display mode (Sub.d) Display in RUN mode	0 = Units (default) 1 = SP1 2 = SP2 3= d.SP 4= bar graph 5= In.A.B	R	R/W	R/W		
0x01E8	0	Backlight duration (Eco)	0 = always on 1 = 5 sec; 2 = 10 sec, ... 20, 40, 80, 160, 320, 640 sec timeout	R	R/W	R/W		
0x01EA	0	Lock code for local parameter access	0 - no lock (default) 1...9999 – code	R	R/W	R/W		

Index	Sub-Index	Name	Value	Access[1]			Length bytes	Format
				U	M	S		
0x200E	0	InA electric signal Input physical value	0 … 100; 0 … 200 (0 … 10 V; 0 … 20 mA)	R	R	R		
0x2005	0	InA minimal measured value (MIN) - volatile -	0 … 2^{14} - 1	R	R	R		
0x2006	0	InA maximal measured value (MAX) - volatile -	0 … 2^{14} - 1	R	R	R		
0x200F	0	InB electric signal Input physical value	0 … 100; 0 … 200 (0 … 10 V; 0 … 20 mA)	R	R	R		
0x2007	0	InB minimal measured value (MIN) - volatile -	0 … 2^{14} - 1	R	R	R		
0x2008	0	InB maximal measured value (MAX) - volatile -	0 … 2^{14} - 1	R	R	R		

1) Authorisation group: U = user, M = maintenance, S = specialist; access: R = read, R/W = read and write, – = no access

Table 3.9: Device specific parameters

3.3.6 Block parameterization

With this feature the sending of invalid parameters to a device can be prevented. Individually sent parameter values are possibly not compatible with the parameter values already stored in the device. The parameters transmitted as a block will be simultaneously accepted and activated.

For SCDN there are six blocks of parameters:

Block parameterization for **BDC1** (OutA)

Index	Sub-Index	Name
0x003C	1	Setpoint SP1
	2	Setpoint SP2
0x003D	2	Switchpoint mode (Fctn)
	3	Hysteresis (HY)
0x0112	0	Auto difference monitoring, max. signal delta (s.obS) boundary value for constant signal observation
0x0113	0	Auto difference monitoring, time delta (t.obS) time period for constant signal observation (msec)
0x0114	0	Auto difference monitoring, switchpoint delta (d.SP)
0x01E9	0	Sub display (Sub.d)

Table 3.10: Block of OutA coherent parameters

Block parameterization for **BDC2** (OutB)

Index	Sub-Index	Name
0x003E	1	Setpoint SP1
	2	Setpoint SP2
0x003F	2	Switchpoint mode (Fctn)
	3	Hysteresis (HY)
0x0130	0	Auto difference monitoring, max. signal delta (s.obS) boundary value for constant signal observation
0x0131	0	Auto difference monitoring, time delta (t.obS) time period for constant signal observation (msec)
0x0132	0	Auto difference monitoring, switchpoint delta (d.SP)

Table 3.11: Block of OutB coherent parameters

Block parameterization for scaling the input signal **InA**

Index	Sub-Index	Name
0x0186	0	input signal low limit (In.Lo)
0x0187	0	input signal high limit (In.Hi)

Table 3.12: Block of InA signal coherent parameters

Block parameterization for visualisation of input signal **InA** on the display

Index	Sub-Index	Name
0x017D	0	measured value display Min (MV.Lo)
0x017E	0	measured value display Max (MV.Hi)

Table 3.13: Block of InA display coherent parameters

Block parameterization for scaling the input signal **InB**

Index	Sub-Index	Name
0x019A	0	input signal low limit (In.Lo)
0x019B	0	input signal high limit (In.Hi)

Table 3.14: Block of InB signal coherent parameters

Block parameterization for visualisation of input signal **InB** on the display

Index	Sub-Index	Name
0x0191	0	measured value display Min (MV.Lo)
0x0192	0	measured value display Max (MV.Hi)

Table 3.15: Block of InB display coherent parameters

3.4 Process Data IN

Bit	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
Significance	not used		MSB													LSB
Process data			InA PDV													
Data content			14-bit measured value (InA)													
Index			0x0028													
Sub-Index			1													
Data type			UInteger14													

Bit	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8
Significance	not used		MSB													LSB
Process data			InB PDV													
Data content			14-bit measured value (InB)													
Index			0x0028													
Sub-Index			2													
Data type			UInteger14													

Bit	7	6	5	4	3	2	1	0
Process data	not used						BDC2	BDC1
Data content							OutB	OutA
Index							0x0028	
Sub-Index							3	4
Data type							Boolean	

Table 3.16: Process data mapping

3.5 Conversion factors for the parameters ProcessDataVariable, ProcessDataVariable Min, ProcessDataVariable Max, and Setpoints SP1, SP2

The conversion factors, necessary for the correct representation of the measurement values and the switching points in different physical units in the control unit, are:

There are 5 predefined measurement ranges. For conversion between process values and measurement values the following conversions factors can be used.

Range	MV.Lo	MV.Hi	Offset	Gradient
0 ... 100%	0	100	0	0,006103888177
0 ... -1bar	0	-1	0	-0,000061038882
0...-100kPa	0	-100	0	-0,006103888177
0 ... 1MPa	0	1	0	0,000061038882
0...10bar	0	10	0	0,000610388818

Table 3.17: Conversion factors for predefined measurement range

In case of a customer-specific setting of the measured value indicator the conversion between process value and measurement value is done by calculation of Offset and Gradient of the linear equation.

Process value	**Related to**
0	Lower measurement value (MV.Lo) and input signal low (In.Lo)
16383	Upper measurement value (MV.Hi) and input signal high (In.Hi)

Table 3.18: Values for Conversion

MV = Gradient x Process value + Offset

MV.Lo = Gradient x 0 + Offset => **Offset** = MV.Lo
MV.Hi = Gradient x 16383 + Offset => **Gradient** = (MV.Hi – MV.Lo) / 16383

3.6 Conversion factors for the Hysteresis, Switchpoint d.SP and Max Signal-Delta (s.obS)

For predefined measurement ranges see table 3.17

For customer–specific setting of the measure value indicator the conversion between process value and measurement value is done by calculation of Offset and Gradient of the linear equation.

Offset = 0
Gradient = (MV.Hi – MV.Lo) / 16383

3.7 Diagnosis

Event Codes	Event Type	Mode	Device Status	Local Indication	Possible cause	Remedy
0x1802	Error	(Dis)appear	Failure	Display: [Er 02] Subdisplay: [ASIC]	IO-Link driver failure; Device defective	Replace device
0x1809	Warning	(Dis)appear	Out-of-Specification	Display: Measured Value Subdisplay [Er09] / [UNdR]	Measuring range has been exceed – InA underrun	Comply with the specified measuring range
0x180A	Warning	(Dis)appear	Out-of-Specification	Display: Measured Value Subdisplay [Er10] / [OVER]	Measuring range has been exceed – InA overrun	Comply with the specified measuring range
0x180B	Warning	(Dis)appear	Out-of-Specification	Display: Measured Value Subdisplay [Er11] / [UNdR]	Measuring range has been exceed – InB underrun	Comply with the specified measuring range
0x180C	Warning	(Dis)appear	Out-of-Specification	Display: Measured Value Subdisplay [Er12] / [OVER]	Measuring range has been exceed – InB overrun	Comply with the specified measuring range
0x1815	Error	(Dis)appear	Out-of-Specification	Display: Measured Value Subdisplay [Er21] / [SHRt]	Pin2 (OutA) overload / short circuit	Eliminate short circuit
0x1816	Error	(Dis)appear	Out-of-Specification	Display: Measured Value Subdisplay [Er22] / [SHRt]	Pin3 (OutB) overload / short circuit	Eliminate short circuit
0x4000	Error	(Dis)appear	Failure	Display: Measured Value Subdisplay [Er20] / [tEMP]	Temperature fault in IO-Link driver	Check operating temperature and ambient temperature. Check load conditions Check circuitry. Replace device
0x5000	Error	(Dis)appear	Failure	Display: Er01 Subdisplay: FAIL	Device hardware fault	Replace device

Table 3.19: Supported errors and warnings

3.8 I-Port

I-Port is an internal technology for automatically identification of Festo devices on I-Port compatible master.

Index	Name	Default Value	Length (byte)
0x40	Device Attributes	0x00	1
0x41	Extended Parameters	0x0000	2
0x42	Diagnosis Parameter	0x0000	2
0x43	Device Specific Parameters	➔ *Table 3.21:*	8
0xFE	I-Port Revision	0x0100	2

Table 3.20: Supported I-Port Indexes

The parameters for the Switch output OutA can be configured in case of threshold comparator (Single point mode) and window-comparator (Window mode).

Byteorder	1	2	3	4	5	6	7	8
IO-Link Index	0x003C				0x003D			
Subindex	1		2		1	2	3	
Function	SP1		SP2		logic	mode	HY	
Byte	high	low	high	low	-	-	high	low
Default value	➔ *3.3.3 Smart Sensor Profile parameters*							

Table 3.21: Mapping of Smart Sensor Profile Indexes on I-Port parameter 0x43