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IO-Link Implementation

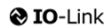
Vendor ID		234 (0x00EA)
Device ID	SXPV/SXMP1	100212 (0x018774)
	SXPV/SXMP1 PC	100213 (0x018775)
SIO-Mode		Yes
IO-Link Revision		1.1 (compatible with 1.0)
IO-Link Bitrate		38.4 kBit/sec (COM2)
Minimum Cycle Time		3.4 ms
Process Data Input		4 bytes
Process Data Output		2 bytes

Process Data

Process Data Input	Name	Bits	Data Type		Access	Special Values	Remark
PD In Byte 0	Signal H2 (part present)	0	Boolean		ro		Vacuum is over H2 & not yet under H2-h2
	Signal H1 (air saving function)	1	Boolean		ro		Vacuum is over H1 & not yet under H1-h1
	Signal HP1 (pressure monitoring)	2	Boolean		ro		Input pressure is over HP1 & not yet under HP1-hp1
	CM-Autoset acknowledged	3	Boolean		ro		Acknowledge that the Autoset function has been completed
	EPC-Select acknowledged	4	Boolean		ro		Acknowledge that EPC values 1 and 2 have been switched according to EPC-Select: 0 - EPC-Select = 00 1 - otherwise
	Signal H3 (part detached)	5	Boolean		ro		The part has been detached after a suction cycle
	Device status	7 ... 6	2 bit integer		ro		00 - [green] Device is working optimally 01 - [yellow] Device is working but there are warnings 10 - [orange] Device is working but there are severe warnings 11 - [red] Device is not working properly
PD In Byte 1	EPC value 1	7...0	8 bit integer		ro		EPC value 1 (byte) Holds 8bit value as selected by EPC-Select 0/1 00 - Input pressure (0.1 bar) 01 - CM-Warnings (ISDU 146, bits 0-7) 10 - Leakage of last suction cycle (mbar/sec) 11 - Primary supply voltage (Volt)
PD In Byte 2	EPC value 2, high-byte	7...0	16 bit integer		ro		EPC value 2 (word) Holds 16bit value as selected by EPC-Select 0/1 00 - System vacuum (mbar) 01 - Evacuation time t1 (msec) 10 - Last measured free-flow vacuum (mbar) 11 - Air consumption of last suction cycle (0.1 NL)
PD In Byte 3	EPC value 2, low-byte	7...0					
Process Data Out	Name	Bit		Access	Availability	Special Values	Remark
PD Out Byte 0	Vacuum	0	Boolean		wo		Vacuum on/off
	Blow-off	1	Boolean		wo		Activate Blow-off
	Setting Mode	2	Boolean		wo		Vacuum on/off with continuous suction disabled (regardless of dCS parameter)
	CM Autoset	3	Boolean		wo		Perform CM Autoset function (teach permissible leakage and permissible evacuation time)
	EPC-Select 0	4	Boolean		wo		Select the function of EPC values 1 and 2 (2-bit binary coded) (see PD In Byte 1...3)
	EPC-Select 1	5	Boolean		wo		
	Profile-Set 0	6	Boolean		wo		Select Production Profile (2-bit binary coded) (see ISDU parameter areas PD to P3)
PD Out Byte 1	Profile-Set 1	7	Boolean		wo		
	Input Pressure (non-PC version only)	6...0	7 bit integer		wo		Input pressure from additional sensor, unit 0.1 bar (non-PC Version only)
	Calibrate all sensors	7	Boolean		wo		Trigger calibration of all sensors (vacuum and pressure if applicable)

ISDU Parameters

ISDU Index	dec	hex	Subindex	dec	Display Appearance	Parameter	Size	Value Range	Access	Default Value / Example	Remark
Identification											
Device Management											
16	0x0010	0				Vendor Name	1...32 bytes		ro	J. Schmalz GmbH	Manufacturer designation
17	0x0011	0				Vendor Text	1...32 bytes		ro	www.schmalz.com	Internet address
18	0x0012	0				Product Name	1...32 bytes		ro	SXPI_SXMP1_V2 / SXPI_SXMP1_PC_V2	General product name
19	0x0013	0				Product ID	1...32 bytes		ro	SXPI_SXMP1_V2 / SXPI_SXMP1_PC_V2	Product variant name
20	0x0014	0				Product Text	1...32 bytes		ro	SXMP1 30 IMP Q PC 1xM12-5	Order-code
21	0x0015	0				Serial Number	9 bytes		ro	000000001	Serial number
22	0x0016	0				Hardware Revision	2 bytes		ro	08	Hardware revision
23	0x0017	0				Firmware Revision	4 bytes		ro	2.13	Firmware revision
240	0x00F0	0				Unique ID	20 bytes		ro		Unique device identification number
241	0x00F1	0				Device Features	11 bytes		ro		Type code of device features (see IODD)
250	0x00FA	0				Article Number	14 bytes		ro	10.06.02.*	Order-number
251	0x00FB	0				Article Revision	2 bytes		ro	00	Article revision
252	0x00FC	0				Production Date	3 bytes		ro	F18	Date code of production (month+year, month is letter coded, e.g. F18 = July 2018)
254	0x00FE	0				Detailed Product Text	1...64 bytes		ro	SXMP1 30 IMP Q PC 1xM12-5	Detailed type description of the device
Device Localization											
24	0x0018	0				Application Specific Tag	1...32 bytes		rw	---	User string to store location or tooling information
242	0x00F2	0				Equipment Identification	1...64 bytes		rw	---	User string to store identification name from schematic
246	0x00F6	0				Geolocation	1...64 bytes		rw	---	User string to store geolocation from handheld device
247	0x00F7	0				IODD Web Link	1...64 bytes		rw	---	User string to store web link to IODD file
248	0x00F8	0				NFC Web Link	1...64 bytes	http://... https://...	rw	https://myproduct.schmalz.com/#/	Web link to NFC app (base URL for NFC tag)
249	0x00F9	0				Storage Location	1...32 bytes		rw	---	User string to store storage location
253	0x00FD	0				Installation Date	1...16 bytes		rw	---	User string to store date of installation
Parameter											
Device Settings											
Commands											
2	0x0002	0				System Command	1 byte	5, 130, 165, 166, 167, 168, 169, 171	wo		0x05 (dec 5): Force upload of parameter data into the master 0x02 (dec 130): Restore device parameters to factory defaults 0xA5 (dec 165): Calibrate vacuum sensor 0xA6 (dec 166): Calibrate pressure sensor (non-PC version only) 0xA7 (dec 167): Reset erasable counters c1, c2, c3 0xA8 (dec 168): Reset voltages HUIO 0xA9 (dec 169): Reset sensors HUIO 0xA8 (dec 171): Calibrate all sensors (vacuum and pressure if applicable)
Access Control											
12	0x000C	0				Device Access Locks	2 bytes	0, 4	rw	0	Bit 0-1: reserved Bit 2: Local parameterization lock (lock menu editing) Bit 3-15: reserved
90	0x005A	0				Extended Device Access Locks	1 byte	0 - 3	rw	0	Bit 0: NFC write lock Bit 1: NFC disable Bit 2: reserved Bit 3: local user interface locked (manual mode locked) Bit 4: IO-Link event lock (suppress sending IO-Link events) Bit 5-7: reserved
77	0x004D	0				Pin	Menu PIN code	0 - 999	rw	0	0 = Menu editing unlocked >0 = Menu editing locked with pin-code
91	0x005B	0				NFC PIN code	2 bytes	0 - 999	rw	0	PIN for writing data from NFC app
Initial Settings											



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69	0x0045	0	bLo	Blow-off mode	1 byte	0 - 2	rw	0	0 = Externally controlled blow-off (-E-) 1 = Internally controlled blow-off – time-dependent (-I) 2 = Externally controlled blow-off – time-dependent (-E-I)	
74	0x004A	0	uni	Display Unit	1 byte	0 - 3	rw	0	0 = mbar 1 = kPa 2 = inHg 3 = psi	
75	0x004B	0	dLY	Output filter	1 byte	0 - 3	rw	1	0 = Off 1 = 10ms 2 = 50ms 3 = 200ms	
76	0x004C	0	Eco	Eco-Mode	1 byte	0 - 2	rw	0	0 = off 1 = on (full eco mode with display switching off completely) 2 = Lo (medium eco mode with display dimmed to 50%)	
79	0x004F	0	dpy	Display Rotation	1 byte	0 - 1	rw	0	0 = Standard 1 = Rotated	
104	0x0068	0	HP1	Setpoint HP1	2 bytes	HP1 <= 9900 & HP1 > HP1	rw	4000	Unit: 1 mbar	
105	0x0069	0	hP1	Hysteresis hP1	2 bytes	hp1 < HP1 & hP1 >= 100	rw	200	Unit: 1 mbar	
Process Settings										
Production Setup - Profile P0										
68	0x0044	0	ctr	Air saving function	1 byte	0 - 2	rw	1	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)	
78	0x004E	0	dCS	Disable continuous suction	1 byte	0 - 1	rw	0	0 = off 1 = on	
100	0x0064	0	H-1	Setpoint H1	2 bytes	998 >= H1 >= (H2+h1)	rw	750	Unit: 1 mbar	
101	0x0065	0	h-1	Hysteresis h1	2 bytes	(H1-H2 >= h1 >= 10	rw	150	Unit: 1 mbar	
102	0x0066	0	H-2	Setpoint H2	2 bytes	(H1-h1 >= H2 >= (h2+2)	rw	550	Unit: 1 mbar	
103	0x0067	0	h-2	Hysteresis h2	2 bytes	(H2-2) >= h2 >= 10	rw	10	Unit: 1 mbar	
106	0x006A	0	tbl	Duration automatic blow	2 bytes	10 - 9999	rw	200	Unit: 1 ms	
107	0x006B	0	t-1	Permissible evacuation time	2 bytes	0 - 9999	rw	2000	Unit: 1 ms. No t-1 Warning if set to 0	
108	0x006C	0	L-	Permissible leakage rate	2 bytes	0 - 999	rw	250	Unit: 1 mbar/sec. No L- Warning if set to 0	
119	0x0077	0		Profile name	1..32 bytes		rw	***		
Production Setup - Profile P1										
180	0x00B4	0		Air saving function	1 byte	0 - 2	rw	1	Profile P-1 (selected by PD Out 0 - Profile-Set = 1)	
181	0x00B5	0		Disable continuous suction	1 byte	0 - 1	rw	0		
182	0x00B6	0		Setpoint H1	2 bytes	998 >= H1 >= (H2+h1)	rw	750		
183	0x00B7	0		Hysteresis h1	2 bytes	(H1-H2 >= h1 > 10	rw	150		
184	0x00B8	0		Setpoint H2	2 bytes	(H1-h1 >= H2 >= (h2+2)	rw	550		
185	0x00B9	0		Hysteresis h2	2 bytes	(H2-2) >= h2 >= 10	rw	10		
186	0x00BA	0		Duration automatic blow	2 bytes	10 - 9999	rw	200		
187	0x00BB	0		Permissible evacuation time	2 bytes	0 - 9999	rw	2000		
188	0x00BC	0		Permissible leakage rate	2 bytes	0 - 999	rw	250		
199	0x00C7	0		Profile name	1..32 bytes		rw	***		
Production Setup - Profile P2										
200	0x00C8	0		Air saving function	1 byte	0 - 2	rw	1	Profile P-2 (selected by PD Out 0 - Profile-Set = 2)	
201	0x00C9	0		Disable continuous suction	1 byte	0 - 1	rw	0		
202	0x00CA	0		Setpoint H1	2 bytes	998 >= H1 >= (H2+h1)	rw	750		
203	0x00CB	0		Hysteresis h1	2 bytes	(H1-H2 >= h1 >= 10	rw	150		
204	0x00CC	0		Setpoint H2	2 bytes	(H1-h1 >= H2 >= (h2+2)	rw	550		
205	0x00CD	0		Hysteresis h2	2 bytes	(H2-2) >= h2 >= 10	rw	10		
206	0x00CE	0		Duration automatic blow	2 bytes	10 - 9999	rw	200		
207	0x00CF	0		Permissible evacuation time	2 bytes	0 - 9999	rw	2000		
208	0x00D0	0		Permissible leakage rate	2 bytes	0 - 999	rw	250		
219	0x00DB	0		Profile name	1..32 bytes		rw	***		
Production Setup - Profile P3										
220	0x00DC	0		Air saving function	1 byte	0 - 2	rw	1	Profile P-3 (selected by PD Out 0 - Profile-Set = 3)	
221	0x00DD	0		Disable continuous suction	1 byte	0 - 1	rw	0		
222	0x00DE	0		Setpoint H1	2 bytes	998 >= H1 >= (H2+h1)	rw	750		
223	0x00DF	0		Hysteresis h1	2 bytes	(H1-H2 >= h1 >= 10	rw	150		
224	0x00E0	0		Setpoint H2	2 bytes	(H1-h1 >= H2 >= (h2+2)	rw	550		
225	0x00E1	0		Hysteresis h2	2 bytes	(H2-2) >= h2 >= 10	rw	10		
226	0x00E2	0		Duration automatic blow	2 bytes	10 - 9999	rw	200		
227	0x00E3	0		Permissible evacuation time	2 bytes	0 - 9999	rw	2000		
228	0x00E4	0		Permissible leakage rate	2 bytes	0 - 999	rw	250		
239	0x00EF	0		Profile name	1..32 bytes		rw	***		
Observation										
Monitoring										
Process Data										
40	0x0028	0		Process Data In Copy	4 bytes		ro		Copy of currently active process data input	
41	0x0029	0		Process Data Out Copy	2 bytes		ro		Copy of currently active process data output	
64	0x0040	1		Vacuum Value	2 bytes		ro		Actual vacuum value	
64	0x0040	2		Vacuum Value LO	2 bytes		ro		Lowest measured vacuum value since power-up	
64	0x0040	3		Vacuum Value HI	2 bytes		ro		Highest measured vacuum value since power-up	
65	0x0041	1		Pressure Value	2 bytes		ro		Actual pressure value (unit: 1 mbar)	
65	0x0041	2		Pressure Value LO	2 bytes		ro		Lowest measured pressure value since power-up	
65	0x0041	3		Pressure Value HI	2 bytes		ro		Highest measured pressure value since power-up	
66	0x0042	1		Supply Voltage	2 bytes		ro		Supply voltage (unit: 0.1 Volt)	
66	0x0042	2		Supply Voltage LO	2 bytes		ro		Lowest measured supply voltage since power-up	
66	0x0042	3		Supply Voltage HI	2 bytes		ro		Highest measured supply voltage since power-up	
67	0x0043	1		Auxiliary Voltage	2 bytes		ro		Auxiliary voltage (unit: 0.1 Volt)	
67	0x0043	2		Auxiliary Voltage LO	2 bytes		ro		Lowest measured auxiliary voltage since power-up	
67	0x0043	3		Auxiliary Voltage HI	2 bytes		ro		Highest measured auxiliary voltage since power-up	
147	0x0093	0		Leakage area	1 byte		ro	0	0 = no actual value 1 = Leakage of last sucking cycle is >200mbar/s 2 = Leakage of last sucking cycle is between 133 ... 200mbar/s 4 = Leakage of last sucking cycle is between 67 ... 133mbar/s 8 = Leakage of last sucking cycle is <67mbar/s	
148	0x0094	0		Evacuation time t _e	2 bytes		ro		Time from start of suction to H2 (unit: 1 ms)	
149	0x0095	0		Evacuation time t _i	2 bytes		ro		Time from H2 to H1 (unit: 1 ms)	
160	0x00A0	0		Leakage rate	2 bytes		ro		Leakage of last suction cycle (unit: 1 mbar/sec)	
161	0x00A1	0		Free-flow vacuum	2 bytes		ro		Last measured free-flow vacuum (unit: 1 mbar)	
164	0x00A4	0		Max. reached vacuum in last cycle	2 bytes		ro		Maximum vacuum value of last suction cycle	
165	0x00A5	0		Min. pressure during last cycle	2 bytes		ro		Minimum input pressure during suction phase of last cycle	
Communication Mode										



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564	0x0234	0		Communication Mode	1 byte		ro		0x00 = SIO mode 0x10 = IO-Link revision 1.0 (set by master) 0x11 = IO-Link revision 1.1 (set by master)
Counters									
140	0x008C	0	cc1	Vacuum-on counter	4 bytes		ro		Not erasable
141	0x008D	0	cc2	Valve operating counter	4 bytes		ro		Not erasable
142	0x008E	0	cc3	Condition monitoring counter	4 bytes		ro		Not erasable
143	0x008F	0	ct1	Erasable vacuum-on counter	4 bytes		ro		Can be reset by System Command "Reset erasable counters"
144	0x0090	0	ct2	Erasable valve operating counter	4 bytes		ro		Can be reset by System Command "Reset erasable counters"
145	0x0091	0	ct3	Erasable condition monitoring counter	4 bytes		ro		Can be reset by System Command "Reset erasable counters"
Diagnosis									
Device Status									
32	0x0020	0		Error Count	2 bytes		ro		Number of errors since last power-up 0 = Device is operating properly 1 = Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure
36	0x0024	0		IO-Link Device Status	1 byte		ro		
37	0x0025	0		Detailed Device Status	96 bytes		ro		Information about currently pending events Fixed-length array format according to IO-Link specification V1.1
130	0x0082	0		Active Errors	2 bytes		ro		Bit 00: Internal error: data corruption (E01) Bit 01: reserved Bit 02: Primary voltage too low (E07) Bit 03: Primary voltage too high (E17) Bit 04: Secondary voltage too low (E05) Bit 05: Secondary voltage too high (E15) Bit 06-10: reserved Bit 11: Measurement range overrun (FFF) Bit 12-14: reserved Bit 15: IO-Link communication interruption (E08)
138	0x008A	1		Extended Device Status - Type	1 byte		ro		Type code of active device status (see below)
138	0x008A	2		Extended Device Status - ID	2 bytes		ro		ID code of active device status (see below, corresponds to IO-Link events)
139	0x008B	0		NFC Status	1 byte		ro		Result of recent NFC activity: 0x00: Data valid, write finished successfully 0x23: Write failed: Write access locked 0x30: Write failed: parameter(s) out of range 0x31: Write failed: parameter value too high 0x32: Write failed: parameter value too low 0x41: Write failed: parameter set inconsistent 0xA1: Write failed: invalid authorisation 0xA2: NFC not available 0xA3: Write failed: invalid data structure 0xA5: Write pending 0xA6: NFC internal error
Condition Monitoring [CM]									
146	0x0092	0		Condition monitoring	2 bytes		ro		Bit 0: Valve protection active Bit 1: Evacuation time t1 above limit [t-1] Bit 2: Leakage rate above limit [-L-] Bit 3: H1 not reached in suction cycle Bit 4: Free-flow vacuum > (H2-H2) but < H1 Bit 5: Primary voltage US outside of optimal range Bit 6: Auxiliary voltage UA outside of optimal range Bit 7: Input pressure too low during suction Bit 8: Input pressure outside of operating range Bit 9-15: reserved
Energy Monitoring [EM]									
155	0x009B	0		Air consumption per cycle in percent	1 byte		ro		Air consumption of last suction cycle (unit: 1 %)
156	0x009C	0		Air consumption per cycle	2 bytes		ro		Air consumption of last suction cycle (unit: 0.1 Ni)
157	0x009D	0		Energy consumption per cycle	2 bytes		ro		Energy consumption of last suction cycle (unit: 1 Ws)
Predictive Maintenance [PM]									
162	0x00A2	0		Quality	1 byte		ro		Quality of last suction cycle (unit: 1 %)
163	0x00A3	0		Performance	1 byte		ro		Last measured performance level (unit: 1 %)

Coding of Extended Device Status (ISDU 138) and IO-Link Events

Extended Device Status ID (= IO-Link Event Code)		Extended Device Status Type		IO-Link Event Type	Display Code	Event name	Remark
dec	hex	hex	Meaning				
0	0x0000	0x10	Everything OK	(no IOL event)		Everything OK	Device is working optimally
6161	0x1811	0x22	Defect/fault, high	Error	E01	Data Corruption	Internal error, user data corrupted
35872	0x8C20	0x81	Defect/fault, lower	Error	FFF	Measurement range overrun	Measured vacuum value too high, sensor fault
2457	0x0099	0x81	Defect/fault, lower	(no IOL event)	E08	IO-Link communication is interrupted (readable via NFC)	
20736	0x5100	0x42	Critical condition, high	Error	E07	General power supply fault	Primary supply voltage (US) too low
20752	0x5110	0x42	Critical condition, high	Warning	E17	Primary supply voltage over-run	Primary supply voltage (US) too high
20754	0x5112	0x42	Critical condition, high	Warning	E05	Secondary supply voltage fault	Secondary supply voltage (UA) too low
6162	0x1812	0x42	Critical condition, high	Warning	E15	Secondary supply voltage over-run	Secondary supply voltage (UA) too high
6146	0x1802	0x42	Critical condition, high	Warning		Supply pressure fault	Input pressure too high or too low
6156	0x180C	0x22	Warning, high	Warning		Primary supply voltage out of optimal range	Condition Monitoring: primary supply voltage US outside of operating range
6157	0x180D	0x22	Warning, high	Warning		Secondary supply voltage out of optimal range	Condition Monitoring: secondary supply voltage outside of operating range
6158	0x180E	0x22	Warning, high	Warning		Supply pressure too low during suction phase	Condition Monitoring: supply pressure too low during suction
6151	0x1807	0x22	Warning, high	Warning		CM: Valve protection active	Condition Monitoring: valve has switched too fast, continuous suction activated
6152	0x1808	0x21	Warning, low	Warning		CM: evacuation time above limit	Condition Monitoring: evacuation time t1 is above limit [t-1]
6153	0x1809	0x21	Warning, low	Warning		CM: leakage rate above limit	Condition Monitoring: leakage rate is above limit [-L-]
6154	0x180A	0x22	Warning, high	Warning		CM: H1 not reached	Condition Monitoring: vacuum level H1 was never reached during suction cycle
6155	0x180B	0x21	Warning, low	Warning		CM: free flow vacuum too high	Condition Monitoring: free flow vacuum above H2
35841	0x8C01	0x21	Warning, low	Warning		Simulation active	Manual mode is active
6144	0x1800	-	(IOL event only)	Notification		Vacuum calibration OK	Calibration offset 0 set successfully
6145	0x1801	0x22	Warning, high	Notification	E03	Vacuum calibration failed	Sensor value too high or too low, offset not changed
6147	0x1803	-	(IOL event only)	Notification		Pressure calibration OK	Calibration offset 0 set successfully
6148	0x1804	0x22	Warning, high	Notification	E04	Pressure calibration failed	Sensor value too high or too low, offset not changed
6167	0x1817	-	(IOL event only)	Notification		Autoset completed successfully	Permissible leakage and permissible evacuation time have been set automatically for the active profile
6168	0x1818	-	(IOL event only)	Notification		Handling Cycle Completed	Handling of the part is complete (neutral state of vacuum system reached or new suction phase begun)