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IO-Link Implementation		
	IO-Link Version 1.1	IO-Link Version 1.0 (legacy mode)
Vendor ID	234 (0x00EA)	234 (0x00EA)
Device ID	100243 (0x018793)	100242 (0x018792)
SIO-Mode	Yes	Yes
Baudrate	38.4 kBd (COM2)	38.4 kBd (COM2)
Minimum cycle time	3.5 ms	3.0 ms
Processdata input	4 byte	1 byte
Processdata output	2 byte	1 byte

Process Data						
Process Data In	Name	Bits		Access	Availability	Remark
PD In Byte 0	Signal H2 (part present)	0		ro	IO-Link V1.1, V1.0	Vacuum is over H2 & not yet under H2-h2
	Signal H1 (automatic air saving function)	1		ro	IO-Link V1.1, V1.0	Vacuum is over H1 & not yet under H1-h1
	-	2		ro	-	unused
	CM-Autosest acknowledged	3		ro	IO-Link V1.1, V1.0	Acknowledge that the Autosest function has been completed
	EPC-Select acknowledged	4		ro	IO-Link V1.1 only	Acknowledge that EPC values 1 and 2 have been switched according to EPC-Select: 0 - EPC-Select = 00 1 - otherwise
	Device status - green	5		ro	IO-Link V1.1, V1.0	Device is working optimally
	Device status - yellow	6		ro	IO-Link V1.1, V1.0	Device is working but there are warnings
Device status - red	7		ro	IO-Link V1.1, V1.0	Device is not working properly, there are errors	
PD In Byte 1	EPC value 1	7...0		ro	IO-Link V1.1 only	EPC value 1 (byte) Holds 8bit value as selected by EPC-Select (see PD Out Byte 0)
PD In Byte 2	EPC value 2, high-byte	7...0		ro	IO-Link V1.1 only	EPC value 2 (word) Holds 16bit value as selected by EPC-Select (see PD Out Byte 0)
PD In Byte 3	EPC value 2, low-byte	7...0		ro	IO-Link V1.1 only	EPC value 2 (word) Holds 16bit value as selected by EPC-Select (see PD Out Byte 0)
Process Data Out	Name	Bits		Access	Availability	Remark
PD Out Byte 0	Vacuum	0		wo	IO-Link V1.1, V1.0	Vacuum on/off
	Blow-off	1		wo	IO-Link V1.1, V1.0	Activate Blow-off
	Vacuum with forced control	2		wo	IO-Link V1.1, V1.0	Vacuum on/off with continuous suction disabled (regardless of dCS parameter)
	CM Autosest	3		wo	IO-Link V1.1, V1.0	Perform CM Autosest function and save EPC data in buffer
	EPC-Select	5.4		wo	IO-Link V1.1 only	Select the function of EPC values 1 and 2 in PD In (content is 2 bit binary coded integer) 0: EPC value 1 = Input pressure (0.1 bar) EPC value 2 = System vacuum (1 mbar) 1: EPC value 1 = CM-Warnings (see ISDU 146 for bit definitions) EPC value 2 = Evacuation time t1 (1 msec) 2: EPC value 1 = Leakage of last suction cycle (1 mbar/sec) EPC value 2 = Last measured free-flow vacuum (1 mbar) 3: EPC value 1 = Primary supply voltage (0.1 Volt) EPC value 2 = Air consumption of last suction cycle (0.1 NL)
Profile-Set	7.6		wo	IO-Link V1.1, V1.0	Select Production Profile (content is 2-bit binary coded integer) 0: Activate Production Setup Profile P0 1: Activate Production Setup Profile P1 2: Activate Production Setup Profile P2 3: Activate Production Setup Profile P3	
PD Out Byte 1	Input pressure	7...0		wo	IO-Link V1.1 only	Pressure value from external sensor (unit: 0.1 bar)

ISDU Parameters									
(all ISDUs use subindex 0 only)									
ISDU Index	Display	Parameter	Data width	Value range	Access	Default value	Remark		
dec	hex	Appearance							
<b>Identification</b>									
16	0x0010		Vendor name	15 bytes		ro	J. Schmalz GmbH	Manufacturer designation	
17	0x0011		Vendor text	15 bytes		ro	www.schmalz.com	Internet address	
18	0x0012		Product name	8 bytes		ro	SCPSi_V2	General product name	
20	0x0014		Product text	30 bytes		ro	SCPSi 00 G2 NC M12-5	Order-Code	
250	0x00FA	Art	Article number	14 bytes		ro	10.02.02.*	Order-Nr.	
251	0x00FB		Article revision	2 bytes		ro	00	Article revision	
22	0x0016		Hardware revision	2 bytes		ro	03	Hardware revision	
23	0x0017	SoC	Firmware revision	4 bytes		ro	2.01	Firmware revision	
21	0x0015	Snr	Serial number	9 bytes		ro	000000001	Serial number	
24	0x0018		Application specific tag	0...32 bytes		rw	***	User string to store location or tooling information	
<b>Parameter</b>									
<b>Access Locks</b>									
12	0x000C		Device access locks	2 bytes	0 - 7	rw	0	Bit 0: parameter access lock (lock ISDU-write access) Bit 1: data storage lock Bit 2: local parameterization lock (lock menu editing)	
77	0x004D	Pin	PIN code	2 bytes	0 - 999	rw	0	0 = menu editing unlocked >0 = menu editing locked with pin-code	
<b>Initial Setup</b>									



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69	0x0045	bLo	Blow-off mode	1 byte	0 - 2	rw	0	0 = Externally controlled blow-off (-E-) 1 = Internally controlled blow-off – time-dependent (I-I) 2 = Externally controlled blow-off – time-dependent (E-I)
71	0x0047	o-2	OUT2 function	1 byte	0 - 1	rw	0	0 = NO 1 = NC
73	0x0049	tyP	Signal type	1 byte	0 - 1	rw	0	0 = PNP 1 = NPN
75	0x004B	dLY	Output filter	1 byte	0 - 3	rw	1	0 = Off 1 = 10ms 2 = 50ms 3 = 200ms
74	0x004A	uni	Vacuum display unit	1 byte	0 - 2	rw	0	0 = mbar 1 = kPa 2 = inHg
79	0x004F	dpy	Display rotation	1 byte	0 - 1	rw	0	0 = standard 1 = rotated
76	0x004C	Eco	Eco-Mode	1 byte	0 - 1	rw	0	0 = off 1 = on
<b>Production Setup - Profile P0</b>								
68	0x0044	ctr	Air saving function	1 byte	0 - 2	rw	1	0 = not active (off) 1 = active (on) 2 = active with supervision (oNS)
78	0x004E	dCS	Disable continuous suction	1 byte	0 - 1	rw	0	0 = off 1 = on
100	0x0064	H-1	Setpoint H1	2 bytes	998 >= H1 >= (H2+h1)	rw	750	Unit: 1 mbar
101	0x0065	h-1	Hysteresis h1	2 bytes	(H1-H2 >= h1 > 10	rw	150	Unit: 1 mbar
102	0x0066	H-2	Setpoint H2	2 bytes	(H1-h1 >= H2 >= (h2+2)	rw	550	Unit: 1 mbar
103	0x0067	h-2	Hysteresis h2	2 bytes	(H2-2) >= h2 >= 10	rw	10	Unit: 1 mbar
106	0x006A	tbL	Duration automatic blow	2 bytes	100 - 9999	rw	200	Unit: 1 ms
107	0x006B	t-1	Permissible evacuation time	2 bytes	0, 10 - 9999	rw	2000	Unit: 1 ms
108	0x006C	-L-	Permissible leakage rate	2 bytes	1 - 999	rw	250	Unit: 1 mbar/sec
<b>Production Setup - Profile P1</b>								
180	0x00B4		Air saving function	1 byte	0 - 2	rw	1	Profile P-1 (selected by PD Out 0 - Profile-Set = 1)
181	0x00B5		Disable continuous suction	1 byte	0 - 1	rw	0	
182	0x00B6		Setpoint H1	2 bytes	998 >= H1 >= (H2+h1)	rw	750	
183	0x00B7		Hysteresis h1	2 bytes	(H1-H2 >= h1 > 10	rw	150	
184	0x00B8		Setpoint H2	2 bytes	(H1-h1 >= H2 >= (h2+2)	rw	550	
185	0x00B9		Hysteresis h2	2 bytes	(H2-2) >= h2 >= 10	rw	10	
186	0x00BA		Duration automatic blow	2 bytes	100 - 9999	rw	200	
187	0x00BB		Permissible evacuation time	2 bytes	0, 10 - 9999	rw	2000	
188	0x00BC		Permissible leakage rate	2 bytes	1 - 999	rw	250	
<b>Production Setup - Profile P2</b>								
200	0x00C8		Air saving function	1 byte	0 - 2	rw	1	Profile P-2 (selected by PD Out 0 - Profile-Set = 2)
201	0x00C9		Disable continuous suction	1 byte	0 - 1	rw	0	
202	0x00CA		Setpoint H1	2 bytes	998 >= H1 >= (H2+h1)	rw	750	
203	0x00CB		Hysteresis h1	2 bytes	(H1-H2 >= h1 > 10	rw	150	
204	0x00CC		Setpoint H2	2 bytes	(H1-h1 >= H2 >= (h2+2)	rw	550	
205	0x00CD		Hysteresis h2	2 bytes	(H2-2) >= h2 >= 10	rw	10	
206	0x00CE		Duration automatic blow	2 bytes	100 - 9999	rw	200	
207	0x00CF		Permissible evacuation time	2 bytes	0, 10 - 9999	rw	2000	
208	0x00D0		Permissible leakage rate	2 bytes	1 - 999	rw	250	
<b>Production Setup - Profile P3</b>								
220	0x00DC		Air saving function	1 byte	0 - 2	rw	1	Profile P-3 (selected by PD Out 0 - Profile-Set = 3)
221	0x00DD		Disable continuous suction	1 byte	0 - 1	rw	0	
222	0x00DE		Setpoint H1	2 bytes	998 >= H1 >= (H2+h1)	rw	750	
223	0x00DF		Hysteresis h1	2 bytes	(H1-H2 >= h1 > 10	rw	150	
224	0x00E0		Setpoint H2	2 bytes	(H1-h1 >= H2 >= (h2+2)	rw	550	
225	0x00E1		Hysteresis h2	2 bytes	(H2-2) >= h2 >= 10	rw	10	
226	0x00E2		Duration automatic blow	2 bytes	100 - 9999	rw	200	
227	0x00E3		Permissible evacuation time	2 bytes	0, 10 - 9999	rw	2000	
228	0x00E4		Permissible leakage rate	2 bytes	1 - 999	rw	250	
<b>Commands</b>								
2	0x0002		System command	1 byte		wo		0x05 (dec 5): Force upload of parameter data into the master 0x82 (dec 130): Restore device parameters to factory defaults 0xA4 (dec 164): Clear diagnostic buffer 0xA5 (dec 165): Calibrate vacuum sensor
120	0x0078	CAL	Calibrate vacuum sensor	1 byte	1	wo		1 = Calibrate vacuum sensor (can also be executed by switching PD Out 0 Bits 2 and 3 simultaneously from 0 to 1)
123	0x007B	rES	Restore to factory defaults	1 byte	1	wo		1 = Restore to factory defaults
<b>Observation</b>								
40	0x0028		Process Data In Copy	1 byte (V1.0) 4 bytes (V1.1)		ro		Copy of currently active process data input
41	0x0029		Process Data Out Copy	1 byte (V1.0) 2 bytes (V1.1)		ro		Copy of currently active process data output
64	0x0040		System vacuum	2 bytes		ro		Current vacuum level (unit: 1 mbar)
66	0x0042		Supply voltage	2 bytes		ro		Supply voltage as measured by the device (unit: 0.1 Volt)
65	0x0041		Input pressure	2 bytes	0 - 99	rw	0	Pressure value from external pressure sensor (unit: 0.1 bar)
<b>Diagnosis</b>								
<b>Error</b>								
130	0x0082	Exx	Active error code	1 byte		ro		1-99 = Error code displayed by the device

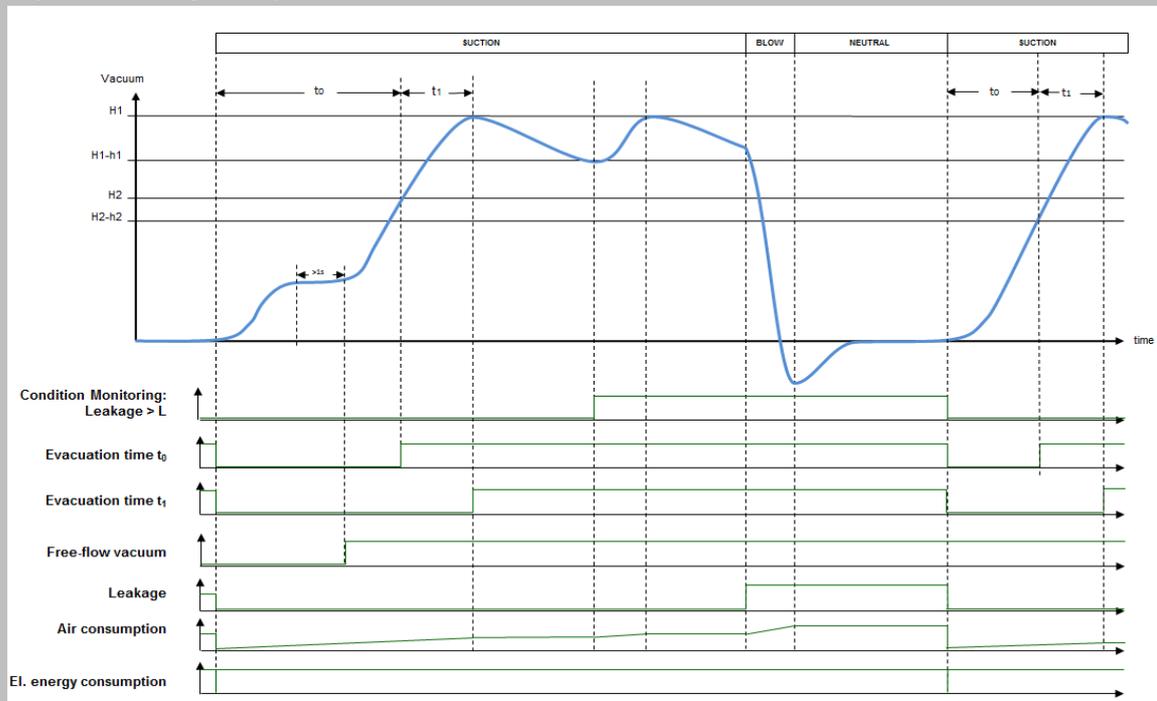


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Counter							
140	0x008C	cc1	Vacuum-on counter	4 bytes		ro	Total number of suction cycles
141	0x008D	cc2	Valve operating counter	4 bytes		ro	Total number of times the suction valve has been switched on
Condition Monitoring [CM]							
146.0	0x0092		Condition monitoring	1 Bit		ro	1 = Valve protection active
146.1	0x0092		Condition monitoring	1 Bit		ro	1 = Evacuation time t1 above limit [t-1]
146.2	0x0092		Condition monitoring	1 Bit		ro	1 = Leakage rate above limit [-L-]
146.3	0x0092		Condition monitoring	1 Bit		ro	1 = H1 not reached in suction cycle
146.4	0x0092		Condition monitoring	1 Bit		ro	1 = Free-flow vacuum > (H2-h2) but < H1
146.5	0x0092		Condition monitoring	1 Bit		ro	1 = Primary voltage US outside of optimal range
146.6	0x0092		Condition monitoring	1 Bit		ro	unused
146.7	0x0092		Condition monitoring	1 Bit		ro	1 = Input pressure outside of operating range
147	0x0093		Leakage area	1 byte		ro	0 = no actual value 1 = Leakage of last suction cycle is >200mbar/s 2 = Leakage of last suction cycle is between 133 ... 200mbar/s 4 = Leakage of last suction cycle is between 67 ... 133mbar/s 8 = Leakage of last suction cycle is <67mbar/s
148	0x0094		Evacuation time t <sub>0</sub>	2 bytes		ro	Time from start of suction to H2 (unit: 1 ms)
149	0x0095		Evacuation time t <sub>1</sub>	2 bytes		ro	Time from H2 to H1 (unit: 1 ms)
Energy Monitoring [EM]							
155	0x009B		Air consumption per cycle in percent	1 byte		ro	Air consumption of last suction cycle (unit: 1 %)
156	0x009C		Air consumption per cycle	2 bytes		ro	Air consumption of last suction cycle (unit: 0.1 NI)
157	0x009D		Energy consumption per cycle	2 bytes		ro	Energy consumption of last suction cycle (unit: 1 Ws)
Predictive Maintenance [PM]							
160	0x00A0		Leakage rate	2 bytes		ro	Leakage of last suction cycle (unit: 1 mbar/sec)
161	0x00A1		Free-flow vacuum	2 bytes		ro	Last measured free-flow vacuum (unit: 1 mbar)
162	0x00A2		Quality	1 byte		ro	Quality of last suction cycle (unit: 1 %)
163	0x00A3		Performance	1 byte		ro	Last measured performance level (unit: 1 %)
Diagnostic Buffer							
131	0x0083		Diagnostic buffer (all entries)	228 bytes		ro	Newest 38 entries in the diagnostic buffer (encoding see table below)
132	0x0084		Diagnostic buffer (newest)	6 bytes		ro	Newest entry in the diagnostic buffer (encoding see table below)
EPC Data Buffer							
133	0x0085		EPC data buffer (all entries)	100 bytes		ro	Newest 10 entries in the EPC data buffer (encoding see table below)
134	0x0086		EPC data buffer (newest)	10 bytes		ro	Newest entry in the EPC data buffer (saved at last autose) (encoding see table below)

Availability of EPC data during suction cycle



Diagnostic Buffer - Details

Data Format of Single Entry (ISDU 132)

Bytes 0...1	Bytes 2...5	Remark
Diagnostic-Type (MSB first)	Counter cc1 (MSB first)	Counter value cc1 of when the entry was recorded



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Data Format of Diagnostic Buffer (ISDU 131)					
Bytes 0...5	Bytes 6...11	Bytes 12...17	...	Bytes 223...228	Remark
Entry 1 (newest)	Entry 2	Entry 3	...	Entry 38 (oldest)	Buffer of 38 entries (newest to oldest) with encoding as in ISDU 131
Encoding of Diagnostic-Type					
Diagnostic-Type	Description				Remark
<div style="text-align: center;"> <b>Notifications</b> </div>					
0x1401	Notification: Device powered on				
0x1402	Notification: Diagnostic buffer cleared				
0x1403	Notification: Parameters restored to factory defaults				
0x1404	Notification: Vacuum sensor calibrated successfully				
0x1405	Notification: Manual mode entered				
0x0405	Notification: Manual mode exited				
0x14AA	Notification: Corrupted entry				Single entry was written incorrectly - do not evaluate
<div style="text-align: center;"> <b>Errors</b> </div>					
0x1201	Error E01: Internal Error				Remains until next power-on
0x1202	Error E02: Internal Error				Remains until next power-on
0x1203	Error E03: Vacuum sensor calibration failed				
0x1207	Error E07 appeared: Primary voltage US too low				
0x0207	Error E07 disappeared: Primary voltage US too low				
0x1208	Error E08 appeared: IO-Link communication interrupted				
0x0208	Error E08 disappeared: IO-Link communication interrupted				
0x120C	Error E12 appeared: Short-circuit at OUT2				
0x020C	Error E12 disappeared: Short-circuit at OUT2				
0x1211	Error E17 appeared: Primary voltage US too high				
0x0211	Error E17 disappeared: Primary voltage US too high				
0x1212	Error E18 appeared: Input pressure outside operating range				
0x0212	Error E18 disappeared: Input pressure outside operating range				
<div style="text-align: center;"> <b>Condition Monitoring Warnings</b> </div>					
0x1101	CM-Warning: Valve protection activated				Remains until next suction cycle
0x1102	CM-Warning: Evacuation time t1 above limit [t-1]				Remains until next suction cycle
0x1104	CM-Warning: Leakage rate above limit [-L-]				Remains until next suction cycle
0x1108	CM-Warning: H1 not reached in suction cycle				Remains until next suction cycle
0x1110	CM-Warning appeared: Free-flow vacuum > (H2-h2) but < H1				
0x0110	CM-Warning disappeared: Free-flow vacuum > (H2-h2) but < H1				
0x1120	CM-Warning appeared: Primary voltage US outside of optimal range				
0x0120	CM-Warning disappeared: Primary voltage US outside of optimal range				
0x1180	CM-Warning appeared: Input pressure outside of operating range				
0x0180	CM-Warning disappeared: Input pressure outside of operating range				

**EPC Data Buffer - Details**

Data Format of Single Entry (ISDU 134)				
Bytes 0...1	Bytes 2...3	Bytes 4...5	Bytes 6...9	Remark
Evacuation time t1 (MSB first)	Leakage rate (MSB first)	Free-flow vacuum (MSB first)	Counter cc1 (MSB first)	Counter value cc1 of when the data was recorded

Data Format of EPC Data Buffer (ISDU 133)					
Bytes 0...9	Bytes 10...19	Bytes 20...29	...	Bytes 90...99	Remark
Entry 1 (newest)	Entry 2	Entry 3	...	Entry 10 (oldest)	Buffer of 10 entries (newest to oldest) with encoding as in ISDU 133

**Implemented IO-Link Events**

Event code	Event name	Event type	Remark
0x1000	General malfunction	Error	Internal error e.g. E01 / E02
0x5100	General power supply fault	Error	Primary supply voltage US too low
0x5110	Primary supply voltage over-run	Warning	Primary supply voltage US too high
0x8C01	Simulation active	Warning	Manual mode active
0x1800	Vacuum calibration OK	Notification	
0x1801	Vacuum calibration failed	Notification	
0x1802	System pressure fault	Warning	System pressure outside of operating range