IO-Link

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IO-Link Implementation

	IO-Link Version 1.1
Vendor ID	234 (0x00EA)
Device ID	100320
SIO-Mode	Yes
Baudrate	38.4 kBd (COM2)
Minimum cycle time	4,6 ms
Processdata input	6 byte
Processdata output	4 byte
Supported profiles	Firmware Update

Process Data

Process data In		Bits	Access	Remark
PD in byte 0	Signal H2 (part present)	0	ro	Vacuum is over H2 & not yet under H2 - h2
	Signal H1 (in control range)	1	ro	Vacuum value within setpoint area (only in setpoint mode)
	Control mode	2	ro	1 = Speed demand
	CM-Autoset acknowledged	3	ro	Acknowledge that the autoset function has been completed
	EPC-Select acknowledged	4	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	ro	The part has been detached after a suction cycle
	Device status	7..6	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	ro	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	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	
PD in byte 4	Freedrive desired	0	ro	Both buttons are activated, signaling to transfer in freedrive
	Freedrive activated	1	ro	Freedrive was activated on pd out 3, bit 0
	Reserved	7..2	ro	Reserved
PD in byte 5	Reserved	7…0	ro	Reserved

Process data Out		Bits	Access	Remark
PD out byte 0	Vacuum	0	wo	Vacuum on/off
	Drop-off	1	wo	Activate drop-off
	control mode	2		1 = Speed demand 0 = setpoint for control
	CM-Autoset	3	wo	Perform CM-autoset function (Info:Values are beeing safed in selected profile)
	EPC-Select	5..4	wo	Select the function of EPC values 1 and 2 in PD in (content is 2 bit binary coded integer) 0: EPC value 1 = Actual power in % 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 (1ml/min) EPC value 2 = Last measured free-flow vacuum (1 mbar) 3: EPC value 1 = Primary supply voltage (0.1 Volt) max.25,5V EPC value 2 = Energy consumption of last suction cycle (Ws)
	Profile-Set	7..6	wo	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	Vacuum demand / setpoint for control	7…0	wo	Vacuum demand in % / setpoint for control mode H1 in 10 mbar (if 0 use data from profiles)
PD out byte 2	Setpoint H2 demand	7…0	wo	Setpoint H2 in 10 mbar (if 0 use data from profiles)
PD out byte 3	Enable Freedrive	0	wo	Enable Freedrive
	Set error robot	1	wo	ECBPMi transfers in error state, LEDs red, blinking
	Set warning robot	2	wo	ECBPMi transfers in warning state,LEDs orange
	Reserved	7…3	wo	Reserved

ISDU Index (for IO-Link) dec	ISDU Index (for IO-Link) hex	Subindex (for IO-Link) dec	Parameter	Data width	Value range	Access	Default value	Remark
Identification								
Device Management								
16	0x0010	0	Vendor name	15 bytes		ro	J. Schmalz GmbH	Manufacturer designation
17	0x0011	0	Vendor text	15 bytes		ro	www.schmalz.com	Internet address
18	0x0012	0	Product name	32 bytes		ro	ECBPMi	General product name
19	0x0013	0	Product ID	32 bytes		ro	ECBPMi	General product name
20	0x0014	0	Product text	30 bytes		ro		Order-Code (partial); for complete order-code read Index 254, z.B. ECBPMi
21	0x0015	0	Serial number	9 bytes		ro		Serial number, z.B. 999000101
22	0x0016	0	Hardware revision	2 bytes		ro		Hardware revison, z.B. 00
23	0x0017	0	Firmware revision	4 bytes		ro		Firmware revision, z.B. 1.12
240	0x00F0	0	Unique Device Identification	20 bytes		ro		10,14,1,1,3,2,2,0,30,0,0,VendorID,Device ID, Serialnumber: z.B.:0x0A0E010103020200820000 00EA 0187D7 3B8B8825
241	0x00F1	0	Device features	11 bytes		ro		z.B. 0x0A0E010103020200820000
250	0x00FA	0	Article number	14 bytes		ro		Order-Nr., z.B. 10.03.01.00500
251	0x00FB	0	Article revision	2 bytes		ro		Article revision, z.B. 00
252	0x00FC	0	Manufacture date	3 bytes		ro		Manufacture date, z.B. I19
254	0x00FE	0	Product text (detailed)	64 bytes		ro		Order-Code (complete), z.B. ECBPMi
Device Localization								
24	0x0018	0	Application specific tag	0...32 bytes		rw	***	Device identification
242	0x00F2	0	Equipment identification: (tag 3)	64 bytes		rw	***	Installation idetification
246	0x00F6	0	Geolocation	64 bytes		rw	***	OPC-UA companion standard for auto-ID
247	0x00F7	0	Weblink to IODD	64 bytes		rw	***	User string to store web link to IODD file
248	0x00F8	0	Link to IOT-server	64 bytes	"http://"… "https://"…	rw	https://myproduct.schmalz.com/#/	Web link to NFC app (base URL for NFC tag)
249	0x00F9	0	Storage location (tag 2)	0...32 bytes		rw	***	User string to store storage location
253	0x00FD	0	Installation date	16 bytes		rw	***	User string to store date of installation
Robot Specific Data								
83	0x0053	1	Tool center point	2 bytes	0 - 65535	rw	100	Centerpoint x-axes in mm- reset by ISDU 2 by writing 0xAD

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83	0x0053	2	Tool center point	2 bytes	0 - 65535	rw	100	Centerpoint y-axes in mm- reset by ISDU 2 by writing 0xAD
83	0x0053	3	Tool center point	2 bytes	0 - 65535	rw	100	Centerpoint z-axes in mm- reset by ISDU 2 by writing 0xAD
83	0x0053	4	Tool center point	2 bytes	-6283…+6283	rw	0	Angle alpha (Unit: Millirad, signed Integer)- reset by ISDU 2 by writing 0xAD
83	0x0053	5	Tool center point	2 bytes	-6283…+6283	rw	0	Angle beta (Unit: Millirad, signed Integer)- reset by ISDU 2 by writing 0xAD
83	0x0053	6	Tool center point	2 bytes	-6283…+6283	rw	0	Angle gamma (Unit: Millirad * 1000, signed Integer)- reset by ISDU 2 by writing 0xAD
84	0x0054	1	Center of gravity	2 bytes	0 - 65535	rw	100	Center of Gravity, x-axes in mm- reset by ISDU 2 by writing 0xAD
84	0x0054	2	Center of gravity	2 bytes	0 - 65535	rw	100	Center of Gravity, y-axes in mm- reset by ISDU 2 by writing 0xAD
84	0x0054	3	Center of gravity	2 bytes	0 - 65535	rw	100	Center of Gravity, z-axes in mm- reset by ISDU 2 by writing 0xAD
85	0x0055	1	Grippershape	2 bytes	0 - 1	rw	1	0: Cuboid 1: Cylindrical - reset by ISDU 2 by writing 0xAD
85	0x0055	2	Length	2 bytes	0 - 65535	rw	100	Length of endeffector in mm- reset by ISDU 2 by writing 0xAD
85	0x0055	3	Width	2 bytes	0 - 65535	rw	100	Width of endeffector in mm- reset by ISDU 2 by writing 0xAD
85	0x0055	4	Height	2 bytes	0 - 65535	rw	100	Height of endeffector in mm- reset by ISDU 2 by writing 0xAD
86	0x0056	0	Weight	2 bytes	0 - 65535	rw	224	Weight of endeffector in g - reset by ISDU 2 by writing 0xAD
Parameter								
Device Settings								
Commands								
2	0x0002	0	System command	1 byte		wo		0x05 (dec 5): Force upload of parameter data into the master 0x82 (dec 130): Reset device parameters to factory defaults 0xA5 (dec 165): Calibrate vacuum sensor 0xA7 (dec 167): Reset erasable counters 0xA8 (dec 168): Reset min/max values of supply voltage and temperature 0xA9 (dec 169): Reset vacuum min/max 0xAC (dec 172): Reset LED color 0xAD (dec 173): Reset robot-specific parameters
Access Control								
12	0x000C	0	Device access locks	2 bytes	0, 4 , 8, 12	rw	0	Bit 0:reserved Bit 1: reserved Bit 2: Lock local parameterization Bit 3: Lock HMI
90	0x005A	0	Extended device access locks	1 byte	0-255	rw	0	Bit 0: NFC write lock Bit 1: NFC disable Bit 2 + 3: reserved Bit 4: IO-Link event lock (suppress sending IO-link events) Bit 5: Lock freedrive desired (freedrive disabled) Bit 6-7: reserved
91	0x005B	0	NFC PIN code	2 bytes	0-999	rw	0	Pass code for writing data from NFC app
Initial Settings								
69	0x0045	0	Drop-off mode	1 byte	0 - 2	rw	0	0 = Externally controlled drop-off (-E-) 1 = Internally controlled drop-off – time-dependent (I-t) 2 = Externally controlled drop-off – time-dependent (E-t)
73	0x0049	1	Signal type output	1 byte		ro		0 = PNP 1 = NPN Dip-Position for SIO mode
73	0x0049	2	Signal type input	1 byte		ro		0 = PNP 1 = NPN Dip-Position for SIO mode
75	0x004B	0	Output filter	1 byte	0 - 3	rw	1	0 = Off 1 = 10ms 2 = 50ms 3 = 200ms
82	0x0052	0	Color-Profile	8 byte	0x00-0xFF for colors, 0x00-0x64 for brightness	rw	0x00, 0xFF, 0x00, 0x28, 0x00, 0xFF, 0x00, 0x64	Byte 0-3: Vacuum<H2 (0 = Red, 1 = Green, 2 = Blue, 3 = Brightness 0-100%) Byte 4- 7:Vacuum >H2 (4 = Red, 5= Green, 6= Blue, 7 = Brightness 0-100%)
Process Settings								
Production Setup - Profile P0/ Setup for SIO Mode								
78	0x004E	0	control mode vacuum/speed	1 bytes	0-1	rw	0	0 = vacuum as controlled value 1 = motor speed as controlled value only adopted in SIO mode
100	0x0064	0	Setpoint H1	2 bytes	H1 > H2 + h2; H1 < 999	rw	600	H1 Value for Control, Unit: 1 mbar
101	0x0065	0	Speed	1 bytes	0-100	rw	100	Unit: % only adopted in SIO Mode
102	0x0066	0	Setpoint H2	2 bytes	H2 < H1 - h2; H2 > h2 + 2	rw	480	Unit: 1 mbar
103	0x0067	0	Hysteresis h2	2 bytes	h2 < H1 - H2; h2 < H2 - 2; h2 >= 10	rw	20	Unit: 1 mbar
106	0x006A	0	Duration automatic drop-off	2 bytes	100 - 9999	rw	2000	Unit: 1 ms
107	0x006B	0	Permissible evacuation time	2 bytes	0, 10 - 9999	rw	1000	Unit: 1 ms, no surveillance if 0 can be set by CM autoset
108	0x006C	0	Permissible leakage rate	2 bytes	0- 2000	rw	1000	Unit: 1 ml/min, no surveillance if 0 can be set by CM Autoset
119	0x0077	0	Profile name	1...32 bytes		rw	***	
Production Setup - Profile P1								
182	0x00B6	0	Setpoint H1	2 bytes	H1 > H2 + h2; H1 < 999	rw	400	
184	0x00B8	0	Setpoint H2	2 bytes	H2 < H1 - h2; H2 > h2 + 2	rw	300	
185	0x00B9	0	Hysteresis h2	2 bytes	h2 < H1 - H2; h2 < H2 - 2; h2 >= 10	rw	15	
186	0x00BA	0	Duration automatic drop-off	2 bytes	100 - 9999	rw	1500	
187	0x00BB	0	Permissible evacuation time	2 bytes	0, 10 - 9999	rw	400	
188	0x00BC	0	Permissible leakage rate	2 bytes	0- 2000	rw	1000	
199	0x00C7	0	Profile name	1...32 bytes		rw	***	
Production Setup - Profile P2								
202	0x00CA	0	Setpoint H1	2 bytes	H1 > H2 + h2; H1 < 999	rw	600	
204	0x00CC	0	Setpoint H2	2 bytes	H2 < H1 - h2; H2 > h2 + 2	rw	500	
205	0x00CD	0	Hysteresis h2	2 bytes	h2 < H1 - H2; h2 < H2 - 2; h2 >= 10	rw	15	
206	0x00CE	0	Duration automatic drop-off	2 bytes	100 - 9999	rw	2000	
207	0x00CF	0	Permissible evacuation time	2 bytes	0, 10 - 9999	rw	600	
208	0x00D0	0	Permissible leakage rate	2 bytes	0- 2000	rw	1000	
219	0x00DB	0	Profile name	1...32 bytes		rw	***	
Production Setup - Profile P3								
222	0x00DE	0	Setpoint H1	2 bytes	H1 > H2 + h2; H1 < 999	rw	500	
224	0x00E0	0	Setpoint H2	2 bytes	H2 < H1 - h2; H2 > h2 + 2	rw	300	
225	0x00E1	0	Hysteresis h2	2 bytes	h2 < H1 - H2; h2 < H2 - 2; h2 >= 10	rw	15	
226	0x00E2	0	Duration automatic drop-off	2 bytes	100 - 9999	rw	2000	
227	0x00E3	0	Permissible evacuation time	2 bytes	0, 10 - 9999	rw	1000	
228	0x00E4	0	Permissible leakage rate	2 bytes	0- 2000	rw	1000	
239	0x00EF	0	Profile name	1...32 bytes		rw	***	
Observation								
Process Data								
40	0x0028	0	Process data in copy	see PD in		ro		Copy of currently active process data input (length see above)
41	0x0029	0	Process data out copy	see PD out		ro		Copy of currently active process data output (length see above)
Monitoring								
64	0x0040	1	Vacuum value, live	2 bytes		ro		Vacuum value as measured by the device (unit: 1 mbar)

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64	0x0040	2	Vacuum value, min	2 bytes		ro		min. value of vacuum value as measured by the device - reset by ISDU 2 by writing 0xA9
64	0x0040	3	Vacuum value, max	2 bytes		ro		max. value of vacuum value as measured by the device-reset by ISDU 2 by writing 0xA9
66	0x0042	1	Primary supply voltage, live	2 bytes		ro		Primary supply voltage (US) as measured by the device (unit: 0.1 Volt)
66	0x0042	2	Primary supply voltage, min	2 bytes		ro		min. value of primary supply voltage (unit: 0.1 Volt) - reset by ISDU 2 by writing 0xA8
66	0x0042	3	Primary supply voltage, max	2 bytes		ro		max. value of primary supply voltage (unit: 0.1 Volt) - reset by ISDU 2 by writing 0xA8
68	0x0044	1	Temperature, live	2 bytes		ro		Temperature (unit 1 °C) live
68	0x0044	2	Temperature, min	2 bytes		ro		Lowest measured temperature since power-up (unit 1 °C) - reset by ISDU 2 by writing 0xA8
68	0x0044	3	Temperature, max	2 bytes		ro		Highest measured temperature since power-up (unit 1 °C) - reset by ISDU 2 by writing 0xA8
564	0x0234	0	Communication mode	1 byte		ro		Currently active communication mode: 0x00 = SIO mode 0x10 = IO-Link Revision 1.0 (set by master) 0x11 = IO-Link Revision 1.1 (set by master)
Diagnosis								
Device Status								
32	0x0020	0	Error count	2 byte		ro		Errors since power-on or reset
36	0x0024	0	Device status	1 byte		ro		0 = Device is operating properly (GN) 1 = Maintenance required (Yellow) 2 = Out of spec (Yellow - Red) 3 = Functional check (Yellow - Red) 4 = Failure (red)
37	0x0025	0	Detailed device status	96 byte		ro		Information about currently pending events (event-list) Byte 1: 0x74 = error, 0xE4 = warning, 0xD4 = notification Byte 2..3 = ID Event Code (see below)
138	0x008A	1	Extended device status - Type	1 byte		ro		Extended device status - Type (see below) 0x10: Device operation properly 0x21 Warning lower 0x22 Warning upper 0x42 Critical condition upper 0x81 Defect lower
138	0x008A	2	Extended device status - ID	2 byte		ro		Event code of current device status (see table below)
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: value greater then limit 0x32: value lesser then limit 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
130	0x0082	0	Active error code	2 byte		ro		00 = No error (1x blink =sensor voltage too low/high, 2x blink = temperature, 3 x blink = electronic error, pump not working properly, sensor calibration failed or EEprom error, always blink = error robot) Bit 0 = Electronic error (IO-link connection abrupted) Bit 1 = Sensor voltage too low Bit 2 = Sensor voltage overrun Bit 3 = Pump not working properly Bit 4 = Temperatur overrun Bit 5 = Error Robot Bit 6 = Sensor calibration failed Bit 7 = reserved EEPROM
Condition Monitoring [CM]								
146	0x0092	0	Condition monitoring	2 byte		ro		Bit 0 = H1 selected under H2 Bit 1 = Evacuation time t1 above limit [t-1] last cycle Bit 2 = Leakage rate above limit [-L-] last cycle Bit 3 = H1 not reached in suction cycle last cycle Bit 4 = Free-flow vacuum > (H2-h2) but < H1 last cycle Bit 5 = Warning Robot Bit 6 = Vacuum under H2 - h2 if pump running and vacuum was over H2 prior bit 7= reserved
Counters								
140	0x008C	0	Vacuum-on counter	4 bytes		ro		Total number of suction cycles (stored all 30 mins)
142	0x008E	0	Condition monitoring counter	4 bytes		ro		Total number of warnings (stored all 30 mins)
143	0x008F	0	Vacuum-on counter erasable	4 bytes		ro		Can be reset by system command "Reset erasable counters" (stored all 30 mins) by writing 0xA7
145	0x0091	0	Condition monitoring counter erasable	4 bytes		ro		Can be reset by system command "Reset erasable counters" (stored all 30 mins) by writing 0xA7
Timing								
150	0x0096	0	Total Cycle time	4 bytes		ro		Total cycle time of last cycle (uint: 1ms)
148	0x0094	0	Evacuation time t0	2 bytes		ro		Time from start of suction to H2 (unit: 1 ms)
149	0x0095	0	Evacuation time t1	2 bytes		ro		Time from H2 to H1 (unit: 1 ms)
167	0x00A7	0	Pump-On total time	4 bytes		ro		Total time of pump-on-in min (stored all 30 min)
168	0x00A8	0	Power-On total time	4 bytes		ro		Total time of power-on in min (stored all 30 min)
Energy Monitoring [EM]								
157	0x009D		Energy consumption per cycle	2 bytes		ro		Energy consumption of last suction cycle (unit: 1 Ws)
Predictive Maintenance [PM]								
162	0x00A2	0	Quality (tightness)	1 byte		ro		Quality of last suction cycle (unit: 1 %)
163	0x00A3	0	Performance (flow)	1 byte		ro		Last measured performance level (unit: 1 %)
169	0x00A9	0	Maximum Temperature	2 bytes		ro		Highest measured temperature in lifecycle (unit 1 °C)
160	0x00A0	0	Leakage rate	2 bytes		ro		Leakage of last suction cycle (unit: 1 ml/min)
161	0x00A1	0	Free-flow vacuum	2 bytes		ro		Last measured free-flow vacuum (unit: 1 mbar)
164	0x00A4	0	Maximum reached vacuum in last cycle	2 bytes		ro		Maximum vacuum value of last suction cycle

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

Event code dec	Event code hex		Event name	Event type	Extended Device Status -Type		Remark
4096	0x1000		General malfunction	Error	0x81	Defect lower	Internal error
6144	0x1800		Calibration OK	Notification	0x10	Device operation properly	Calibration offset 0 set successfully
6145	0x1801		Calibration failed	Notification	0x10	Device operation properly	Sensor calibration failed
20736	0x5100		Primary supply voltage overrun	Error	0x42	Critical Condition upper	Primary supply voltage US to low (19.2/19.0V)
20752	0x5110		Primary supply voltage overrun	Error	0x42	Critical Condition upper	Primary supply voltage US to high (26.8/26.6V)
16384	0x4000		CM: Temperature out of range	Warning	0x22	Warning upper	Temperature over 60°C
6152	0x1808		CM: Evacuation time t1 above limit	Warning	0x21	Warning lower	Evacuation time t1 above limit
6153	0x1809		CM: Leakage rate above limit	Warning	0x21	Warning lower	Leakage rate above limit
6154	0x180A		CM: H1 not reached in suction cycle	Warning	0x22	Warning upper	H1 not reached in suction cycle
6155	0x180B		CM: Free-flow vacuum > (H2-h2) but < H1	Warning	0x21	Warning lower	Free-flow vacuum > (H2-h2) but < H1
6161	0x1811		EEPROM error	Error	0x81	Defect lower	Wrong data in EEPROM or EEPROM fault
36003	0x8CA3		Factory reset triggered	Notification	0x10	Device operation properly	Factory reset was triggered
6168	0x1818		Cycle completed	Notification	0x10	Device operation properly	Cycle was completed