Application Note

FESTO

IO-Link interface description

A brief explanation of the contents:

- identification
- parameters and commands
- process data
- data storage
- diagnosis
- menu structure

Simplified Motion Series:

- (EMCS-ST)
- EGSS-BS
- ELGS-TB/-BS
- ELGE-TB
- ERMS
- EPCS-BS
- EPCE-TB
- ...

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Note

All following described parameter are available for firmware version **16.0.***

For firmware versions **19.0.4.107** or higher use the Application Note IO-Link parameter description Simplified Motion Series version 1.20.

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1 Technical data

1.1 General IO-Link specification

Characteristic	Specification
Protocol	IO-Link
Protocol version	Device V1.1 (I-Port & V1.0 not supported)
Profile	Common Profile
Function classes	Device identification Device diagnosis Process data mapping Extended identification
Communication mode	COM3 (230,4 kBaud)
SIO-Mode support	Yes
Port class	A
Process data length OUT	2 bytes
Process data length IN	2 bytes
Process data content OUT	1 Bit (Move "In") 1 Bit (Move "Out") 1 Bit (Quit Error)
Process data content IN	1 Bit (State "In") 1 Bit (State "Out") 1 Bit (State "Move") 1 Bit (State "Device")
Min. cycle time	1 ms
Data storage required	0,5 kB
Max. current consumption (Logic)	300 mA

Tab. 1: General IO-Link specification

1.2 Communication functions

- Preoperate: Frame type 1_V, OD-capability 8 bytes
- Operate: Frame type 2_V, OD-capability 8 bytes
- SIO-Mode: supported
- ISDU: supported
- Data storage: supported
- Block parameterization: not supported

2 On-demand data

2.1 Identification parameters

- Vendor-ID: 333 d / 01 4D h
- Device ID: → *Tab. 2*

Device ID [dec]	Device ID [hex]	Order code
601	000259	ELGS-TB
602	00025A	ELGS-BS
603	00025B	EGSS-BS
604	00025C	ELGE-TB
605	00025D	ERMS
606	00025E	EPCS-BS
607	00025F	EPCE-BS
608	000260	reserved
...	...	
615	000267	

Tab. 2: Device ID values

Index (dec)	Sub-index	Name	Value (example)	Access[1]			Length (byte)	Format
				U	M	S		
0x0010 (16)	0	Vendor Name	Festo AG & Co. KG	R	R	R	17	String
0x0011 (17)	0	Vendor Text	http://www.festo.com	R	R	R	20	
0x0012 (18)	0	Product Name	Order code, e.g. EGSS-BS-KF-32-25-8P-ST-M-H1-PLK-AA	R	R	R	max. 64	
0x0013 (19)	0	Product ID	8083801	R	R	R	max. 64	
0x2101 (8449)	0	Part Number[2]	8083801 (= Product ID with Index 0x0013)	R	R	R	max. 64	
0x0014 (20)	0	Product Text	Mini slide unit	R	R	R	max. 64	
0x0015 (21)	0	Serial Number	Product Key, e.g. 3S7PL9V6HHM	R	R	R	11 B	
0x0016 (22)	0	Hardware Revision	V0718_C66	R	R	R	max. 64	
0x0017 (23)	0	Firmware Revision	V16.0.17.87_release	R	R	R	max. 64	
0x0018 (24)	0	Application Specific Tag	***	R/W	R/W	R/W	max. 32	
0x0019 (25)	0	Function Tag	***	R/W	R/W	R/W	max. 32	
0x001A (26)	0	Location Tag	***	R/W	R/W	R/W	max. 32	

[1] Authorisation group: U = user, M = maintenance, S = specialist; access: R = read, W = write, R/W = read and write, – = no access
[2] Usage of this value is defined by the Festo IO-Link standard

Tab. 3: Identification parameters

2.2 IO-Link standard parameters and commands

Index (dec)	Sub-index	Name	Value	Access[1)]			Length (byte)	Format
				U	M	S		
0x0002 (2)	0	SystemCommand	→Tab. 6: Device-specific commands	-	W	W	1	UInterger8
0x000C (12)	0..3	Device Access Locks	bitwise: 0 = unlocked, 1 = locked	-	-	-	2	Record
0x000C (12)	4	Lock local user interface		-	R/W	R/W	1	BooleanT
0x0020 (32)	0	Error Count	0	R	R	R	2	UInterger16
0x0024 (36)	0	Device Status	0	R	R	R	1	UInterger8
0x0025 (37)	0	Detailed Device Status	→Tab. 10: IO-Link events	R	R	R	48	Array of 3 byte records
0x0028 (40)	0	ProcessDataInput	→Tab. 7: Mapping the IN process data	R	R	R	2	Record
0x0029 (41)	0	ProcessDataOutput	→Tab. 8: Mapping the OUT process data	R/W	R/W	R/W	2	Record

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

Tab. 4: IO-Link standard parameters and commands

2.3 Device-specific parameters and commands

Index (dec)	Sub-index	Name	Value / unit / gradient	Access[1)]			Length (byte)	Format
				U	M	S		
Control parameters („Master » Device“)								
0x0100 (256)	0	Speed "In"	1 = 10% ... 10 = 100%, default 1	-	R/W	R/W	1	UInteger8
0x0101 (257)	0	Speed "Out"	1 = 10% ... 10 = 100%, default 1	-	R/W	R/W	1	UInteger8
0x0102 (258)	0	Force	1 = 10% ... 10 = 100%, default 1	-	R/W	R/W	1	UInteger8
0x0103 (259)	0	Reference	linear drive: 0 = motor side, 1 = motor averted rotative drive: 0 = left, 1 = right	-	R/W	R/W	1	BooleanT
0x0104 (260)	0	Exec. "Reference" Movement	0 = no action, 1 = execute command	-	W	W	1	BooleanT
0x0105 (261)	0	Position "Start Press"	linear drive: [mm], 0.01 rotative drive: [°], 0.1	-	R/W	R/W	4	Float32T
0x0106 (262)	0	End Position "Out"	linear drive: [mm], 0.01 rotative drive: [°], 0.1	-	R/W	R/W	4	Float32T
0x0107 (263)	0	Quit Error	0 = no action, 1 = execute command	-	W	W	1	BooleanT
Observation parameters („Device » Master“)								
0x0120 (288)	0	Current position	linear drive: [mm], 0.01 rotative drive: [°], 0.1	R	R	R	4	Integer32
0x0121 (289)	0	Current speed	linear drive: [mm/s], 0.01 rotative drive: [rpm], 1.0	R	R	R	4	Integer32
0x0122 (290)	0	Current force	linear drive: [N], 1.0 rotative drive: [Nm], 0.1	R	R	R	4	Integer32
0x0123 (291)	0	Current temperature	[°C], 1.0	R	R	R	2	Integer16
0x0124 (292)	0	Current electric current	[A], 0.1	R	R	R	4	Integer32
0x0125 (293)	0	Current electric voltage	[V], 0.1	R	R	R	4	Integer32

0x0126 (294)	0	Number of cycles total		R	R	R	4	UInteger32
0x0127 (295)	0	Number of cycles since reset		R	R	R	4	UInteger32
0x0128 (296)	0	Mileage total	linear drive: [km], 0.000001 rotative drive: [r], 0.001	R	R	R	4	UInteger32
0x0129 (297)	0	Mileage since re-set	linear drive: [km], 0.000001 rotative drive: [r], 0.001	R	R	R	4	UInteger32
0x012A (298)	0	Reset cycle & mileage	0 = no action, 1 = execute command	W	W	W	1	BooleanT

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

Tab. 5: Device-specific parameters

Value dec	Value hex	Access[1)]			Command	Note	Format
		U	M	S			
200	0xC8	-	W	W	Execute "Move In"	Command for direct execution of movement towards reference end position "Ref" / End position "Lim_{In}"	UInteger8
201	0xC9	-	W	W	Execute "Move Out"	Command for direct execution of movement towards end position "Lim_{Out}"	
202	0xCA	-	W	W	Stop motion	Command for direct execution of standstill. Defend current position	
203	0xCB	-	W	W	Disable power stage	Command for direct execution of torque free standstill. Disable power stage and stay with no torque (NO STO)	
204	0xCC	-	W	W	Enable power stage	Command for enabling power stage and defending current position	
205	0xCD	-	W	W	Restore factory settings	Resets the actuator unit to factory settings	

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

Tab. 6: Device-specific commands

3 Process Data

3.1 Process Data IN

Bit	15	...	4	3	2	1	0
Process data	not used			ProcessDataVariable (PDV)			
Data content				State "Device"	State "Move"	State "Out"	State "In"
Index				0x28 (40)			
Sub-Index				4	3	2	1
Data type				BooleanT			

Tab. 7: Mapping the IN process data

3.2 Process Data OUT

Bit	15	...	3	2	1	0
Process data	not used			ProcessDataVariable (PDV)		
Data content				Quit Error	Move "Out"	Move "In"
Index				0x29 (41)		
Sub-Index				3	2	1
Data type				BooleanT		

Tab. 8: Mapping the OUT process data

4 Data storage

- The Data Storage (DS) mechanism enables the consistent and up-to-date duplication of the device parameters which were defined for supporting this feature. With DS functionality the parameterization of another connected device can be ensured after replacement. Using this method, the IO-Link master receives the DS parameter set of the first device (Device 1) to provide it and will then proceed to write the data one by one to all other connected devices (Device 2 to Device n)
- The list of implemented Data Storage parameters is as follows:

Index (dec)	Sub-index	Access[1)]			Name	Note	Format
		U	M	S			
0x0100 (256)	0	-	R/W	R/W	Speed "In"		UInteger8
0x0101 (257)	0	-	R/W	R/W	Speed "Out"		UInteger8
0x0102 (258)	0	-	R/W	R/W	Force		UInteger8
0x0103 (259)	0	-	R/W	R/W	Reference		Boolean
0x0105 (261)	0	-	R/W	R/W	Position "Start Press"	linear drive: - unit: [mm] - gradient: 0.01 rotative drive: - unit: [°] - gradient: 0.1	Float32
0x0106 (262)	0	-	R/W	R/W	End Position "Out"		Float32

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

Tab. 9: Data storage parameters

- The device IDs of both devices (Device 1 and Device n) must be the same (e.g. “603” for EGSS-BS)
- Please be aware that the value of End Position "Out" of Device 1 may not be greater than the maximum position of the new Device. The maximum position can be set through a reference run. If the new End Position "Out" value is greater, Device n will discard it and keep the previous value

5 Diagnosis

Event code	Event type	Mode	Device status	Event name
0x1000	Error	Event appears (disappears)	Failure	General malfunction – unknown error
0x1801	Error	Event appears (disappears)	Failure	Supply voltage error – Power supply voltage too high
0x1802	Error	Event appears (disappears)	Failure	Supply voltage error – Power supply voltage too low or not connected
0x1803	Error	Event appears (disappears)	Failure	Supply voltage error – Logic supply voltage too high
0x1804	Error	Event appears (disappears)	Failure	Supply voltage error – Logic supply voltage too low
0x1805	Error	Event appears (disappears)	Failure	Power consumption error – I2t exceeded
0x4000	Error	Event appears (disappears)	Failure	Temperature fault – Overload
0x4210	Warning	Event appears (disappears)	Outside the specification	Device temperature overrun – Clear source of heat
0x4220	Warning	Event appears (disappears)	Outside the specification	Device temperature underrun – Insulate Device
0x8CA0	Notification	Simple message	Device is operating properly	Application information – Device not referenced
0x8CA1	Notification	Simple message	Device is operating properly	Application information – Reference running
0x8CA2	Warning	Event appears (disappears)	Outside the specification	Application warning – Start Press position out of range
0x8CA3	Warning	Event appears (disappears)	Outside the specification	Application warning – End position out of range
0x8CA4	Warning	Event appears (disappears)	Outside the specification	Power consumption warning – I2t close to be exceeded

Tab. 10: IO-Link events

6 Menu structure

Menu name	Access[1)]		
	U	M	S
Identification	V	V	V
Parameters	-	V	V
Observation	V	V	V
Diagnosis	V	V	V

[1)] Authorisation group: U = user, M = maintenance, S = specialist; visibility: V = visible, – = not visible

Tab. 11: General menu structure

Menu		Parameter		
Name	**Group**	**Name**	**Index (dec)**	**Sub-index**
Identification		Vendor Name	0x0010 (16)	0
		Vendor Text	0x0011 (17)	0
		Product Name	0x0012 (18)	0
		Product ID	0x0013 (19)	0
		Part Number	0x2101 (8449)	0
		Product Text	0x0014 (20)	0
		Serial Number	0x0015 (21)	0
		Hardware Revision	0x0016 (22)	0
		Firmware Revision	0x0017 (23)	0
		Application Specific Tag	0x0018 (24)	0
		Function Tag	0x0019 (25)	0
		Location Tag	0x001A (26)	0
Parameters	Control parameters	Device Access Locks: lock local user interface	0x000C (12)	4
		Speed "In"	0x0100 (256)	0
		Speed "Out"	0x0101 (257)	0
		Force	0x0102 (258)	0
		Reference	0x0103 (259)	0
		Exec. "Reference" Movement	0x0104 (260)	0
		Position "Start Press"	0x0105 (261)	0
		End Position "Out"	0x0106 (262)	0
		Quit Error	0x0107 (263)	0
	System commands	Execute "Move In"	0x0002 (2), value = 200	0
		Execute "Move Out"	0x0002 (2), value = 201	0
		Stop motion	0x0002 (2), value = 202	0
		Disable power stage	0x0002 (2), value = 203	0
		Enable power stage	0x0002 (2), value = 204	0
		Restore factory settings	0x0002 (2), value = 205	0

Observation		Current position	0x0120 (288)	0
		Current speed	0x0121 (289)	0
		Current force	0x0122 (290)	0
		Current temperature	0x0123 (291)	0
		Current electric current	0x0124 (292)	0
		Current electric voltage	0x0125 (293)	0
		Number of cycles total	0x0126 (294)	0
		Number of cycles since reset	0x0127 (295)	0
		Mileage total	0x0128 (296)	0
		Mileage since reset	0x0129 (297)	0
		Reset cycle & mileage	0x012A (298)	0
Diagnosis		Error Count	0x0020 (32)	0
		Device Status	0x0024 (36)	0
		Detailed Device Status	0x0025 (37)	0

Tab. 12: Detailed menu structure

7 List of tables

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