1   IO-Link Technical Reference Manual

This TRM refers to the IODD files

Firmware revision: V8.0

IO-Link Specification: IO-Link Interface and System Specification Version 1.1.2 July 2013

Communication Interface

Parameter	Value
IO-Link Version	1.1
Bitrate	COM2
Min Cycle Time	14800 µs
Process Data Input Bits	80
Process Data Output Bits	64
SIO supported	Yes
ISDU supported	Yes
Data Storage	Yes
Block Parameters	No

Device Variants

Product ID	Name	Description
CS10H-MSDT	CANEO series10 Hygienic	SENSORswitch hygienic with stainless steel housing and M12 connector
CS10K-MLDT	CANEO series10 Standard	SENSORswitch with black cover ring and M12 connector
CS10S-MTDT	CANEO series10 Stainless Steel	SENSORswitch with stainless steel housing and M12 connector

Process Data

Process Data Input
Bit Length: 80

Process Data Input Condition LED Contol Mode 0 - 3			
Bit Offset	**Name**	**Value**	**Description**
0	Pin 2		E1 input pin state.
		4 - Input - OFF	No Input signal on Pin
		5 - Input - ON	Input signal on Pin
		8 - Pin unused	Pin not used - parameter "Active input" is set to "None"
			Input On/Off depends on "E1/E2 Mode": For "Active High" high = "Input - On", low = "Input – OFF". For "Active Low" high = "Input -Off", low = "Input – On".
8	Pin 4		Sensor switching state
		0 - Output - OFF	Sensor doesn't switch
		1 - Output - ON	Sensor switches

Process Data Output
Bit Length: 64

Process Data Output Condition LED Control Mode 0		
Bit Offset	**Name**	**Value**
0	unused	

Process Data Output Condition LED Control Mode 1			
Bit Offset	**Name**	**Value**	**Description**
0	LED Scene	0...7 255 - Automatic	Switch between LED scenes "0" to "7" For control by input pins set value to "255".

Process Data Output Condition LED Control Mode 2			
Bit Offset	**Name**	**Value**	**Description**
0	Active LEDs	0...1	Define if LEDs are active, via Bin code "00" to"01"
16	LED Brightness	0...100 255 - Automatic Control [%]	Brightness of LED ring in percent. Value of "255" means automatic brightness control by sensor
24	LED Color R	0 ... 255	"R" – red value
32	LED Color G	0 ... 255	"G" – green value
40	LED Color B	0 ... 255	"B" – blue value
48	LED Effect	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	LED Ring Effect.
56	Effect Frequency	1...60 0 - Default Frequency [0.1 Hz]	Frequency of LED effect in 1/10 Hz, range: "0.1" to "6" Hz

Process Data Input
Bit Length: 80

Process Data InputCondition LED Control Mode 0 - 3			
Bit Offset	**Name**	**Value**	**Description**
16	Pin 5		E2 input pin state
		4 - Input - OFF	No Input signal on Pin
		5 - Input - ON	Input signal on Pin
		8 - Pin unused	Pin not used - parameter "Active input" is set to "None" or "Pin 2 (E1) (4 pin mode)"
24	Actuation Flag	0 - Idle	Sensor is not actuated
		1 - Actuated	Sensor is actuated
32	Actuation Count	0 ... 65535	Number of actuations once sensor is turned on. Count resets on restart and after 65535.
48	Actuation Strength	0...100 [%]	Damping of sensor in percentage.
56	Surrounding Brightness	0...100 [%]	Displays ambient brightness in percentage.

Process Data Output
Bit Length: 64

Process Data Output Condition LED Control Mode 3		
Bit Offset	**Name**	**Value**
0	unused	

Events

EventCodes	Definition and recommended maintenance action	Type
16912	Device temperature over-run - Clear source of heat	Warning
16928	Device temperature under-run - Insulate device	Warning
20496	Component malfunction - Repair or exchange	Error
20752	Primary supply voltage over-run - Check tolerance	Warning
20753	Primary supply voltage under-run - Check tolerance	Warning

Access Rights
ro - Read Only
rw - Read/Write
wo - Write Only

System

Name	Index - Subindex	Access	Value	Description
System Command	2	wo	128 = Device Reset 130 = Restore Factory Settings 160 = Trigger Self-Test	Restart the device Restore Factory Settings Self-Test will activate the switch; in Toggle mode the switch will remain activated

Identification

Name	Index - Subindex	Access	Value	Description
Vendor Name	16	ro	CAPTRON Electronic GmbH	Vendor
Product Name	18	ro	CANEO series10	Producht Line
Product ID	19	ro	CS10X-xxxx	Product Type
Product Text	20	ro		Product Ordercode
Firmware Version	23	ro		
Serial Number	21	ro		Unique Product Serialnumber
Symbol	276	ro		Touch surface symbol

Activation

Name	Index - Subindex	Access	Value	Description
Sensor Mode	261	rw	1 - Toggle	Toggle: The user touches the sensor to activate and touches the sensor once more to deactivate. Can only be set back after "Output Minimum Impulse Time" is over.
			2 - Dynamic	Dynamic: The user touches the sensor and the button will activate momentarily. Sensor switches as long as "Output Minimum Impulse Time" is set, even though the user is still touching the sensor it will go back to an inactive state.
			3 - Static	Static: The user touches the sensor and the button will remain active until the user is no longer touching the sensor.
Touch Sensitivity	260	rw	0 - High	High: "Actuation Strength" > 4%.
			1 - Middle	Middle: "Actuation Strength" > 14%.
			2 - Low	Low: "Actuation Strength" > 24%.
Water Resistance	262	rw	0 - Basic	Basic: Activation by e. g. light rain / dripping water unlikely.
			1 - Enhanced	Enhanced: Activation by water jet / high-pressure cleaner unlikely. No limitation in operability, but activation by water possible in low light conditions.
			2 - Ultimate	Ultimate: Strongly reduced probability of activation by e. g. water jet / high-pressure cleaner. Possible limitation in operability in low light conditions.
Minimum Actuation Time	263	rw	0 ... 65535 [ms]	Time the sensor has to be activated before output on Pin 4 switches, "Actuation Flag" is set to "Actuated" and "Actuation Count" goes up.
Minimum Actuation Time (Toggle OFF)	283	rw	0 ... 65535 [ms]	Only available in Toggle mode Time the sensor has to be touched in "Toggle" mode to before output on Pin 4 turns "OFF" and "Actuation Flag" is set to "Idle".

I/O

Name	Index - Subindex	Access	Value	Description
Active Inputs	271	rw	3 - None (3 pin mode)	None (3 pin mode): Pin 2 and Pin 5 are off, input signals are not monitored.
			4 - Pin 2 (E1) (4 pin mode)	Pin 2 (E1) (4 pin mode): Pin 2 is monitored Pin 5 is off, input signals are not monitored.
			5 - Pin 2 (E1) and Pin 5 (E2) (5 pin mode)	Pin 2 (E1) and Pin5 (E2) (5 pin mode): Pin 2 and Pin 5 are monitored.
E1/E2 Mode	272	rw	0 - Active Low 1 - Active High	Active Low: Accepts a low signal as input to turn on. Active High: Accepts a high signal as input to turn on.
Output Mode	273	rw	0 - NPN	NPN: Output signal pulled down to V0.
			1 - PNP	PNP: Output signal pushed up to +VDC.
			2 - PushPull	Push Pull: Output signal pushed up to +VDC and pulled down to V0.
Output NO/NC	274	rw	0 - NO (Normally Open) 1 - NC (Normally Closed)	
Output Minimum Impulse Time	275	rw	10 …86400000 [ms]	The minimum time (ms) of the output signal when the sensor is activated. The output signal can not be interrupted. In toggle mode the sensor can only be deactivated after the minimal output signal length is over.

LED

Name	Index - Subindex	Access	Value	Description
LED Control Mode	293	rw	0 - Automatic Scene selection	Operation of sensor using "Led Scenes" depending on "Actuation Flag" Status and E1, E2 input. Use for operation without IO-Link.

Name	Index - Subindex	Access	Value	Description
			1 - Scene controlled by IO-Link Process Data	Operation of sensor using "Led Scenes" controlled via IO-Link "Process Data Output". For use of preconfigured Scenes via IO-Link.
			2 - Advanced control by IO-Link Process Data	LED display completely controlled via "Process Data Output". LED scenes are no longer used.
			3 - Classic Two LED Mode	Two status, idle and touch, sensor behavior depends on "Active Inputs". None (3 pin mode): LED color changes when actuated from idle to touch. Pin 2 (E1) (4 pin mode): Idle LED can be controlled via E1 when actuated LED switches to Actuated. Pin 2 (E1) and Pin5 (E2) (5 pin mode): Idle LED is controlled by E1, Touch LED is controlled by E2, actuation has no effect on LED
Adaptive LED Brightness	270	rw	0 - Off 1 - On	If turned "On" the sensor automatically adjusts the LED Brightness depending on the "Surrounding Brightness".
Brightness of the LED	285	rw	0 …100 [%]	Serves as minimum value with automatic brightness control. Brightness of LED sets minimal brightness if "Adaptive LED Brightness" is turned "On".

Classic LED Control (LED Control Mode = 3)

Name	Index - Subindex	Access	Value	Description
LED Color Idle	264	rw	0 - CANEO 1 - Red 2 - Green 3 - Blue 4 - Yellow 5 - Magenta 10 - Orange 11 - Violet 13 - Off 14 - Clean Blue 254 - Manual	Choose color of LED
LED Color Touch	265	rw	0 - CANEO 1 - Red 2 - Green 3 - Blue 4 - Yellow 5 - Magenta 10 - Orange 11 - Violet 13 - Off 14 - Clean Blue 254 - Manual	Choose color of LED
LED Mode Idle	266	rw	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	Choose LED ring behavior Static Ring: Static illumination Flashing Ring: Flashing illumination in default frequency Pulsing Ring: Pulsing illumination in default frequency
LED Mode Touch	267	rw	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	Choose LED ring behavior Static Ring: Static illumination Flashing Ring: Flashing illumination in default frequency Pulsing Ring: Pulsing illumination in default frequency

LED Manual Color Idle

Name	Index - Subindex	Access	Value	Description
R	268-1	rw	0 ... 255	"R" – red value
G	268-2	rw	0 ... 255	"G" – green value
B	268-3	rw	0 ... 255	"B" – blue value

LED Manual Color Touch

Name	Index - Subindex	Access	Value	Description
R	269-1	rw	0 ... 255	"R" – red value
G	269-2	rw	0 ... 255	"G" – green value
B	269-3	rw	0 ... 255	"B" – blue value

LED Scenes (LED Control Mode = 0 and 1)
LED Scene 0 (no Touch, E1 off, E2 off)

Name	Index - Subindex	Access	Value	Description
LED Color	295-1	rw	0 - CANEO 1 - Red 2 - Green 3 - Blue 4 - Yellow 5 - Magenta 10 - Orange 11 - Violet 13 - Off 14 - Clean Blue 128 - Custom Color 1 129 - Custom Color 2	Choose color of LED ring

Name	Index - Subindex	Access	Value	Description
LED Effect	295-2	rw	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	Static Ring: Static illumination Flashing Ring: Flashing illumination, frequency adjustable Pulsing Ring: Pulsing illumination, frequency adjustable
Effect Frequency	295-3	rw	1...60 0 - Default Frequency [0.1 Hz]	Choose LED ring effect Applies only for animated effects

LED Scenes (LED Control Mode = 0 and 1)
LED Scene 1 (Touch, E1 off, E2 off)

Name	Index - Subindex	Access	Value	Description
LED Color	296-1	rw	0 - CANEO 1 - Red 2 - Green 3 - Blue 4 - Yellow 5 - Magenta 10 - Orange 11 - Violet 13 - Off 14 - Clean Blue 128 - Custom Color 1 129 - Custom Color 2	Choose color of LED ring
LED Effect	296-2	rw	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	Static Ring: Static illumination Flashing Ring: Flashing illumination, frequency adjustable Pulsing Ring: Pulsing illumination, frequency adjustable
Effect Frequency	296-3	rw	1...60 0 - Default Frequency [0.1 Hz]	Frequency of LED effect in 1/10 Hz, range: 0.1 ... 6 Hz. Applies only for animated effects

LED Scenes (LED Control Mode = 0 and 1)
LED Scene 2 (no Touch, E1 on, E2 off)

Name	Index - Subindex	Access	Value	Description
LED Color	297-1	rw	0 - CANEO 1 - Red 2 - Green 3 - Blue 4 - Yellow 5 - Magenta 10 - Orange 11 - Violet 13 - Off 14 - Clean Blue 128 - Custom Color 1 129 - Custom Color 2	Choose color of LED ring
LED Effect	297-2	rw	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	Static Ring: Static illumination Flashing Ring: Flashing illumination, frequency adjustable Pulsing Ring: Pulsing illumination, frequency adjustable
Effect Frequency	297-3	rw	1...60 0 - Default Frequency [0.1 Hz]	Frequency of LED effect in 1/10 Hz, range: 0.1 ... 6 Hz. Applies only for animated effects

LED Scenes (LED Control Mode = 0 and 1)
LED Scene 3 (Touch, E1 on, E2 off)

Name	Index - Subindex	Access	Value	Description
LED Color	298-1	rw	0 - CANEO 1 - Red 2 - Green 3 - Blue 4 - Yellow 5 - Magenta 10 - Orange 11 - Violet 13 - Off 14 - Clean Blue 128 - Custom Color 1 129 - Custom Color 2	Choose color of LED ring
LED Effect	298-2	rw	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	Static Ring: Static illumination Flashing Ring: Flashing illumination, frequency adjustable Pulsing Ring: Pulsing illumination, frequency adjustable
Effect Frequency	298-3	rw	1...60 0 - Default Frequency [0.1 Hz]	Frequency of LED effect in 1/10 Hz, range: 0.1 ... 6 Hz. Applies only for animated effects

LED Scenes (LED Control Mode = 0 and 1)
LED Scene 4 (no Touch, E1 off, E2 on)

Name	Index - Subindex	Access	Value	Description
LED Color	299-1	rw	0 - CANEO 1 - Red 2 - Green 3 - Blue 4 - Yellow 5 - Magenta 10 - Orange 11 - Violet 13 - Off 14 - Clean Blue 128 - Custom Color 1 129 - Custom Color 2	Choose color of LED ring
LED Effect	299-2	rw	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	Static Ring: Static illumination Flashing Ring: Flashing illumination, frequency adjustable Pulsing Ring: Pulsing illumination, frequency adjustable
Effect Frequency	299-3	rw	1...60 0 - Default Frequency [0.1 Hz]	Frequency of LED effect in 1/10 Hz, range: 0.1 ... 6 Hz. Applies only for animated effects

LED Scenes (LED Control Mode = 0 and 1)
LED Scene 5 (Touch, E1 off, E2 on)

Name	Index - Subindex	Access	Value	Description
LED Color	300-1	rw	0 - CANEO 1 - Red 2 - Green 3 - Blue 4 - Yellow 5 - Magenta 10 - Orange 11 - Violet 13 - Off 14 - Clean Blue 128 - Custom Color 1 129 - Custom Color 2	Choose color of LED ring
LED Effect	300-2	rw	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	Static Ring: Static illumination Flashing Ring: Flashing illumination, frequency adjustable Pulsing Ring: Pulsing illumination, frequency adjustable
Effect Frequency	300-3	rw	1...60 0 - Default Frequency [0.1 Hz]	Frequency of LED effect in 1/10 Hz, range: 0.1 ... 6 Hz. Applies only for animated effects

LED Scenes (LED Control Mode = 0 and 1)
LED Scene 6 (no Touch, E1 on, E2 on)

Name	Index - Subindex	Access	Value	Description
LED Color	301-1	rw	0 - CANEO 1 - Red 2 - Green 3 - Blue 4 - Yellow 5 - Magenta 10 - Orange 11 - Violet 13 - Off 14 - Clean Blue 128 - Custom Color 1 129 - Custom Color 2	Choose color of LED ring
LED Effect	301-2	rw	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	Static Ring: Static illumination Flashing Ring: Flashing illumination, frequency adjustable Pulsing Ring: Pulsing illumination, frequency adjustable
Effect Frequency	301-3	rw	1...60 0 - Default Frequency [0.1 Hz]	Frequency of LED effect in 1/10 Hz, range: 0.1 ... 6 Hz. Applies only for animated effects

LED Scenes (LED Control Mode = 0 and 1)
LED Scene 7 (Touch, E1 on, E2 on)

Name	Index - Subindex	Access	Value	Description
LED Color	302-1	rw	0 - CANEO 1 - Red 2 - Green 3 - Blue 4 - Yellow 5 - Magenta 10 - Orange 11 - Violet 13 - Off 14 - Clean Blue 128 - Custom Color 1 129 - Custom Color 2	Choose color of LED ring
LED Effect	302-2	rw	0 - Static Ring 1 - Flash Ring 2 - Pulse Ring	Frequency of LED effect in 1/10 Hz, range: 0.1 ... 6 Hz. Static Ring: Static illumination Flashing Ring: Flashing illumination, frequency adjustable Pulsing Ring: Pulsing illumination, frequency adjustable
Effect Frequency	302-3	rw	1...60 0 - Default Frequency [0.1 Hz]	Applies only for animated effects

LED Custom Scene Colors (LED Control Mode = 0 and 1)
Custom Color 1

Name	Index - Subindex	Access	Value	Description
R	306-1	rw	0 ... 255	"R" – red value
G	306-2	rw	0 ... 255	"G" – green value
B	306-3	rw	0 ... 255	"B" – blue value

LED Custom Scene Colors (LED Control Mode = 0 and 1)
Custom Color 2

Name	Index - Subindex	Access	Value	Description
R	307-1	rw	0 ... 255	"R" – red value
G	307-2	rw	0 ... 255	"G" – green value
B	307-3	rw	0 ... 255	"B" – blue value

Observation

Name	Index	Access	Value	Description
LED Control Mode	293	rw	0 - Automatic Scene selection 1 - Scene controlled by IO-Link Process Data 2 - Advanced control by IO-Link Process Data 3 - Classic Two LED Mode	Automatic Scene selection: Usage of scenes via E1 and E2 without IO-Link Scene controlled by IO-Link Process Data: Usage of IO-Link Process Data to switch inbetween LED Scenes advanced control by IO-Link Process Data: Complete control over LED via Processdata Classic Two LED Mode: simple switch configration and behavior depending on active inputs

Diagnose

Name	Index	Access	Value	Description
Supply VoltageState	256	ro	0 ... 65535 [0.001 V]	
Sensor Temperature	257	ro	-32768 … 32767 [0.1°C]	
Flash Erase Count	259	ro	0 ... 65535	
Input E1 Voltage	277	ro	0 ... 65535 [0.001 V]	
Input E2 Voltage	278	ro	0 ... 65535 [0.001 V]	
MCU Core Voltage	279	ro	0 ... 65535 [0.001 V]	
Charge Code	280	ro	0 ... 65535	

Name	Index	Access	Value	Description
Error code	282	ro	0 … 65535	
Device Access Locks (Data Storage Lock)	12	rw	true / false	

series10 supports four modes for controlling its LED.

- Automatic Scene Selection
- Scene controlled by IO-Link-Process Data
- Advanced Control by IO-Link Process Data
- Classic Two LED Mode

The control mode can be selected via IO-Link parameter "LED Control Mode".

Automatic Scene Selection

Number of applicable scenes depends on parameter "Active Inputs":

Active Inputs	Scenes Used
None (3 pin mode)	0, 1
Pin2 (E1) (4 pin mode)	0 ... 3
Pin2 (E1) and Pin5 (E2) (5 pin mode)	0 ... 7

Scene *n* is selected depending on the state of Touch (Sensor actuation) and the state of the input pins E1 and E2:

Input State Table

LED Scene n	Touch	E1	E2	Active Inputs		
				None	Pin2 (E1)	Pin2 (E1) and Pin5 (E2)
0	0	0	0	✔	✔	✔
1	1	0	0	✔	✔	✔
2	0	1	0	✖	✔	✔
3	1	1	0	✖	✔	✔
4	0	0	1	✖	✖	✔
5	1	0	1	✖	✖	✔
6	0	1	1	✖	✖	✔
7	1	1	1	✖	✖	✔

Scene controlled by IO-Link-Process Data

The active Scene is set according to the "LED Scene" value in IO-Link process data.

Advanced Control by IO-Link Process DataScene controlled by IO-Link-Process Data

The LED color, brightness, effect and effect frequency is controlled by IO-Link process data.

Classic Two LED Mode

"Idle" and "Touch" parameters of "Classic LED Control" section are used.
The "Active Inputs" parameter controls, whether the input pins affect the selection of "Idle" or "Touch" configuration:

Active Inputs = None (3 pin mode)

Touch	E1	E2	LED Configuration
0	not monitored	not monitored	Idle
1	not monitored	not monitored	Touch

Active Inputs = Pin2 (E1) (4 pin mode)

Touch	E1	E2	LED Configuration
0	0	not monitored	Off
0	1	not monitored	Idle
1	not monitored	not monitored	Touch

Touch	E1	E2	LED Configuration
not monitored	0	0	Off
not monitored	1	0	Idle
not monitored	0	1	Touch
not monitored	1	1	Idle & Touch colors mixed