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IO-Link interface description

GSX14E, GSU14E, IGSU14E, IGSU14E SD
Ultrasonic fork sensor

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1 IO-Link interface

Sensors in the GSX14E/…, IGSU14E/…, IGSU14E/..K.., IGSU14E/..SD.. and GSU14E/… variant have a dual channel architecture. Available on pin 4 is the IO-Link interface in accordance with specification 1.1.2 (July 2013) with support of Smart Sensor Profile 1.0 (March 2017) with profile type SSP 2.6. You can easily, quickly and economically configure the devices via the IO-Link interface. Furthermore, the sensor transmits the process data via the IO-Link interface and makes diagnostic information available through it.

In parallel with the IO-Link communication, the sensor can output the continuous switching signal for object detection on pin 2 (SSC1 by default) by means of the dual channel architecture. The IO-Link communication does not interrupt this signal.

1.1 IO-Link identification

VendorID dec/hex	DeviceID dec/hex	Device
338/0x152	2500/0x0009C4	GSX14E/LWT.3-M12 GSX14E/LWT.3-M12V
	2501/0x0009C5	GSX14E/1WT.3-M12 GSX14E/1WT.3-M12V
	2502/0x0009C6	GSX14E/LGT.3-M12
	2510/0x0009CE	IGSU14E/LWT.3-M12 IGSU14E/LWT.3-M12V
	2511/0x0009CF	IGSU14E/1WT.3-M12 IGSU14E/1WT.3-M12V
	2512/0x0009D0	IGSU14E/LWT.3SD-M12
	2513/0x0009D1	IGSU14E/LWT.3K-M12
	2520/0x0009D8	GSU14E/LGT.3-M12 GSU14E/LGT.3-M12V
	2521/0x0009D9	GSU14E/16T.3-M12 GSU14E/16T.3-M12V
	…	…

Please refer to the respective product data sheet for the identification data of other IO-Link devices.

1.2 IO-Link process data

Device input data (PDout)

Data bit	Assignment	Meaning
0	Deactivation	0: transmitter active 1: transmitter not active
1	Not assigned	Free
2	Not assigned	Free
3	Not assigned	Free
4	Not assigned	Free
5	Not assigned	Free
6	Not assigned	Free
7	Not assigned	Free

Device output data (PDin)

Data bit	Assignment	Meaning	Present in device
0	Switching signal SSC1	0: not active 1: active	GSX14E/.. IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..
1	Not assigned	Free	
2	Not assigned	Free	
3	Sensor operation	Sensor operation off when detection is not possible (e.g if deactivated or during the teach event) 0: off 1: on	GSX14E/.. IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..
4	Measurement value	Measurement value that indicates whether device functionality is present 0: No valid measurement value 1: Measurement value available	GSX14E/.. IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..
5	Warning	Warning output 0: no warning 1: warning	GSX14E/.. IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..
6	Teach-in method	0: Teach process not ended (or not yet started) 1: Teach process ended	GSX14E/.. IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..
7	*ALC* function (Auto-Level-Control: automatic optimization of the switching threshold)	0: *ALC* function not active 1: *ALC* function active	GSX14E/.. IGSU14E/.. IGSU14E/..K..

1.3 Device-specific IODD

At **www.leuze.com** in the download area for IO-Link sensors you will find the IODD zip file with all data required for the installation.

On the IODDfinder platform (https://ioddfinder.io-link.com/#/), a central cross-manufacturer database, you can also find the description files (IODDs) of the IO-Link sensors.

1.4 IO-Link parameters documentation

The complete description of the IO-Link parameters can be found in the *.html files. Double-click on a language variant:

- German: *IODD*-de.html
- English: *IODD*-en.html

2   Functions configurable via IO-Link

PC configuration and visualization is performed comfortably with the USB-IO-Link Master SET US2-IL1.1 (part no. 50121098) and the *Sensor Studio* configuration software (in the download area of the sensor at **www.leuze.com**).

System commands

	NOTICE
🛈	The system commands trigger an action in the device.

Parame-ter	Index	Sub-index	Data type, octets	Ac-cess	Value range	De-fault	Explanation	Valid for sensor
System command	2	0	UInte-gerT, 1	WO	65, 71, 72, 79, 128, 130, 192, 193, 200, 214, 215, 226, 227		65: Perform static teach 71: Start dynamic teach 72: Stop dynamic teach 79: Cancel teach 128: Reset device 130: Reset factory set-tings 192: easyTune Down (re-duce sensitivity) 193: easyTune Up (in-crease sensitivity) 200: Delete error (teach-ing error, *ALC* function at control limit, *EasyTune* function at control limit) 214: Ultrasonic detection principle active 215: Optical detection principle active 226: Save work index (save current teach value as recipe - see chapter 3 "Recipe management") 227: Load work index (load saved teach value as recipe - see chapter 3 "Recipe management")	GSX14E/..

Parame-ter	Index	Sub-index	Data type, octets	Ac-cess	Value range	De-fault	Explanation	Valid for sensor
System command	2	0	UInte-gerT, 1	WO	65, 71, 72, 79, 128, 130, 192, 193, 200, 226, 227		65: Perform static teach 71: Start dynamic teach 72: Stop dynamic teach 79: Cancel teach 128: Reset device 130: Reset factory set-tings 192: easyTune Down (re-duce sensitivity) 193: easyTune Up (in-crease sensitivity) 200: Delete error (teach-ing error, *ALC* function at control limit, *EasyTune* function at control limit) 226: Save work index (save current teach value as recipe - see chapter 3 "Recipe management") 227: Load work index (load saved teach value as recipe - see chapter 3 "Recipe management")	IGSU14E/.. IG-SU14E/..K..
System command	2	0	UInte-gerT, 1	WO	71, 79, 128, 130, 192, 193, 200, 226, 227		71: Start dynamic teach 79: Cancel teach 128: Reset device 130: Reset factory set-tings 192: easyTune Down (re-duce sensitivity) 193: easyTune Up (in-crease sensitivity) 200: Delete error (teach-ing error, EasyTune func-tion at control limit) 226: Save work index (save current teach value as recipe - see chapter 3 "Recipe management") 227: Load work index (load saved teach value as recipe - see chapter 3 "Recipe management")	IG-SU14E/..S D.. (Model for splice in-spection)

Parame-ter	Index	Sub-index	Data type, octets	Ac-cess	Value range	De-fault	Explanation	Valid for sensor
System command	2	0	UInte-gerT, 1	WO	71, 72, 79, 128, 130, 192, 193, 200, 226, 227		71: Start dynamic teach 72: Stop dynamic teach 79: Cancel teach 128: Reset device 130: Reset factory set-tings 192: easyTune Down (re-duce sensitivity) 193: easyTune Up (in-crease sensitivity) 200: Delete error (teach-ing error, *EasyTune* func-tion at control limit) 226: Save work index (save current teach value as recipe - see chapter 3 "Recipe management") 227: Load work index (load saved teach value as recipe - see chapter 3 "Recipe management")	GSU14E/..

General configuration

Parame-ter	Index	Sub-index	Data type, octets	Ac-cess	Value range	De-fault	Explanation	Valid for sensor
Device Access Locks	12	0	UInte-gerT, 2	RW	0, 8	0	0: Teach button not locked 8: All buttons locked	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..S D.. GSU14E/..
SSC Con-fig – Logic	57	0	UInte-gerT, 1	RW	0, 1	0, 1	0: SSC1 not inverted (high active, light switch-ing) 1: SSC1 inverted (low ac-tive, dark switching) The default settings are device-dependent.	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..S D.. GSU14E/..

Parameter	Index	Sub-index	Data type, octets	Access	Value range	Default	Explanation	Valid for sensor
TI Result	59	0	UIntegerT, 2	RO	0, 1, 4, 5, 7	0	Teach status: 0: Teach not yet started 1: Teach successfully finished 4: Teach waiting for input 5: Teach currently being performed 7: Teach ended with error or last teach returned error The value range is device dependent.	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..SD.. GSU14E/..
Teach Settings Dynamic	71	0	UIntegerT, 1	RW	0, 1	0	0: easyTeach – Intelligent mode 1: easyTeach – Manual mode	GSX14E/..
System	80	0	UIntegerT, 4	RO			Diagnostic information Bit 0 to 7: see chapter 1.2 "IO-Link process data" device output data (PDin) Bit 8: Ultrasonic detection principle active Bit 9: Optical detection principle active Bit 10: Device calibrated Bit 11: Buttons locked Bit 12: Device deactivated Bit 14: *ALC* function: readjusts Bit 16: *ALC* function: error Bit 17: Teach error Bit 18: *easyTune* function: limit reached Bit 19: Tape rupture (only present in IG-SU14E/..SD..) Bit 20: Temperature error. Temperature above specification Bit 24: *ALC* function: gain control at limit Bit 25: *ALC* function: threshold control at limit	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..SD.. GSU14E/..

Parame-ter	Index	Sub-index	Data type, octets	Ac-cess	Value range	De-fault	Explanation	Valid for sensor
Amplitude	81	0	UInte-gerT, 2	RO	0…4095		Current reception signal	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..S D.. GSU14E/..
Threshold	85	0	UInte-gerT, 2	RO	0…4095		Current switching thresh-old	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..S D.. GSU14E/..
Working Parameter	99	0	UInte-gerT, 16	RW			Teach value that is stored after teaching. The teach value contains the taught switching threshold, the hysteresis and the used operating principle for the label or web material that is to be detected. With the possibility to store multiple teach val-ues in the device and to call them back up later if necessary, the user is able process various la-bel materials without the operator needing to per-form a teach event. see chapter 3 "Recipe management"	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..S D.. GSU14E/..

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Parameter	Index	Sub-index	Data type, octets	Access	Value range	Default	Explanation	Valid for sensor
Working Parameter load / save index	98	0	UIntegerT, 1	RW	0…19	0	Storage location of the teach value that is stored after teaching. Up to 20 teach values can be stored simultaneously in the sensor. With the help of this function, recipe management can be realized by means of which the teach event can be eliminated when changing to a different label format. The teach value that corresponds to the given label material is simply loaded in the sensor and the sensor works reliably with the previously taught teach values. see chapter 3 "Recipe management"	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..SD.. GSU14E/..
Ultrasonic Analysis Depth	135	0	IntegerT, 1	RW	1…100	2	1 … 100: Range of analysis depth Analysis depth: to suppress interference, changing of the switching output is delayed by this number of identical measurement results. The default setting in the factory settings refers to the specified response time in the device data sheet.	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..SD.. GSU14E/..

Parame-ter	Index	Sub-index	Data type, octets	Ac-cess	Value range	De-fault	Explanation	Valid for sensor
Ultrasonic Auto-Level-Control (Tracking Enable US)	136	0	BooleanT, 1	RW	0, 255	255	0: Auto-Level-Control not active 255: Auto-Level-Control active *ALC* function (Auto-Level-Control): With the *ALC* function, the sensor automatically corrects the switching threshold in such a way that the maximum function reserve is always available during operation. As a result, signal changes that could negatively affect the function reserve of the sensor, e.g., due to material fluctuations of the label/carrier or changes of the dynamic system parameters, are automatically corrected. The default settings are device-dependent.	GSX14E/.. IGSU14E/.. IGSU14E/..K..
Optical Analysis Depth	145	0	IntegerT, 1	RW	1…100	2	Analog to parameter *Ultrasonic Analysis Depth*	GSX14E/..
Optical Auto-Level-Control (Tracking Enable Opt)	146	0	BooleanT, 1	RW	0, 255	255	Analog to parameter *Ultrasonic Auto-Level-Control*	GSX14E/..
Timer Unit	192	0	BooleanT, 1	RW	0, 255	0	0: time module not active (off) 255: time module active (on) Time module: *On* (255) activates the internal time function. The default settings are device-dependent.	GSX14E/ IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..

Parameter	Index	Subindex	Data type, octets	Access	Value range	Default	Explanation	Valid for sensor
Function of Timer Unit	193	0	UIntegerT, 1	RW	0…3	2	0: Switch-on delay 1: Switch-off delay 2: Pulse stretching 3: Pulse suppression Function selection of the switching delay. Activation of a suitable switching delay is possible. It is not possible to combine switching delays.	GSX14E/.. IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..
Time	194	0	UIntegerT, 2	RW	1…50000	200	Definition of the time basis in 100 µs increments, configurable from 100 µs to 5000 ms	GSX14E/.. IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..
Number of Objects	195	0	UIntegerT, 4	RW	0 … 4294967295	0	Object counter: The device has an internal, volatile object counter. This counts the switching events and can be freely read out, edited and reset. This function enables a simple validation of the process. As soon as the object counter has reached the maximum end value, the count process starts over again at 0.	GSX14E/.. IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..
Temperature	220	0	IntegerT, 2	RO			The device is equipped with an integrated temperature sensor for transmitting the internal temperature in 1/10 °Celsius.	GSX14E/.. IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..
Minus Button easyTune Disable	227	0	BooleanT, 1	RW	0, 255	0	easyTune function – Manual fine tuning of the switching threshold: The sensitivity of the sensor and, thus, the switching threshold can be adjusted with the *easyTune* function, which is in principle comparable to a potentiometer. 0: easyTune active 1: easyTune not active	GSX14E/.. IGSU14E/.. IGSU14E/..K.. IGSU14E/..SD.. GSU14E/..

Parame-ter	Index	Sub-index	Data type, octets	Ac-cess	Value range	De-fault	Explanation	Valid for sensor
Teach Button easyTune Disable	230	0	BooleanT, 1	RW	0, 255	0	Analog to parameter *Minus button easyTune disable*	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..SD.. GSU14E/..
Minus Button Function Level 1	238	0	IntegerT, 1	RW	-1, 0, 1, 2, 3, 7, 8, 15, 16, 21, 24, 27, 31	-1, 8, 27	Assignment of teach level 1 (2 … 7 s) via the minus button: -1 = Disable 0 = Teach level not as-signed 1 = easyTeach 2 = Manual teach 3 = Static teach 7 = Toggle button lock (On/Off) 8 = Toggle method (ultra-sonic/optical) 15 = easyTune Down 16 = easyTune Up 21 = Toggle logic (On/Off) 24 = Toggle pulse stretching (On/Off) 27 = Toggle ALC (Auto-Level-Control) (on/off) 31 = Toggle easyTeach mode (intelligent/manual) The value range and the default setting are device dependent.	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..SD.. GSU14E/..
Minus Button Function Level 2	239	0	IntegerT, 1	RW	-1, 0, 1, 2, 3, 7, 8, 15, 16, 21, 24, 27, 31	-1, 8, 27	Assignment of teach level 2 (7 … 12 s) via the mi-nus button: Analog to parameter *Minus Button Function Level 1*	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..SD.. GSU14E/..
Minus Button Function Level 3	240	0	IntegerT, 1	RW	-1, 0, 1, 2, 3, 7, 8, 15, 16, 21, 24, 27, 31	-1, 8, 27	Assignment of teach level 3 (> 12 s) via the minus button: Analog to parameter *Minus Button Function Level 1*	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..SD.. GSU14E/..

Parame-ter	Index	Sub-index	Data type, octets	Ac-cess	Value range	De-fault	Explanation	Valid for sensor
Teach Button Function Level 1	241	0	IntegerT, 1	RW	-1, 0, 1, 2, 3, 7, 8, 15, 16, 21, 24, 27, 31	-1, 8, 27	Assignment of teach level 1 (2 … 7 s) via the teach button: Analog to parameter *Minus Button Function Level 1*	GSX14E/.. IGSU14E/ … IG-SU14E/..K.. IG-SU14E/..S D.. GSU14E/..
Teach Button Function Level 2	242	0	IntegerT, 1	RW	-1, 0, 1, 2, 3, 7, 8, 15, 16, 21, 24, 27, 31	-1, 8, 27	Assignment of teach level 2 (7 … 12 s) via the teach button: Analog to parameter *Minus Button Function Level 1*	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..S D.. GSU14E/..
Teach Button Function Level 3	243	0	IntegerT, 1	RW	-1, 0, 1, 2, 3, 7, 8, 15, 16, 21, 24, 27, 31	-1, 8, 27	Assignment of teach level 3 (> 12 s) via the teach button: Analog to parameter *Minus Button Function Level 1*	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..S D.. GSU14E/..
Pin 4 function	251	0	UInte-gerT, 1	RW	0, 1, 2, 7, 8	1	Assignment of pin 4: 0 = No function 1 = SSC1 2 = SSC1 inverted 7 = Warning 8 = Warning inverted The value range is device dependent.	GSX14E/.. IGSU14E/.. IG-SU14E/..K.. IG-SU14E/..S D.. GSU14E/..
Pin 2 function	252	0	UInte-gerT, 1	RW	0, 1, 2, 7, 8	2, 8	Assignment of pin 2: Analog to parameter *Pin 4 function* The default settings are device-dependent.	GSX14E/.. IGSU14E/ IG-SU14E/..K.. IG-SU14E/..S D.. GSU14E/..

3 Recipe management

General description

The fork sensors of the GSX14E/.., IGSU14E/.., IGSU14E/..K.., IGSU14E/..SD.. as well as GSU14E/.. variant can be used to realize recipe management by means of IO-Link. At the same time, up to 20 teach values can be stored directly in the sensor and called up if necessary. As a result, the teach settings are stored in the sensor for 20 different label formats.

When changing a roll to a new label format, it is then possible to simply load the corresponding recipe without needing to perform a teach event. After calling up the recipe for the new label format, the sensor operates reliably with the teach value stored for that format. This eliminates the need to re-teach the sensor when changing a roll to a different label format, and the format change is performed faster and more easily.

Tab. 3.1: Parameters for recipe management

Index	Parameter	Action
99	Working Parameter	Save current teach value after the teach event.
98	Working parameter load/save index	Storage location of the recipe (values 0 … 19)
2	System command	Value 226: Save work index Save current teach value as recipe. Value 227: Load work index Load saved teach value as recipe.

The current teach value, which is saved after the teach event, is stored under parameter *Working parameter* at index 99. It contains the taught switching threshold, the hysteresis and the used operating principle for the label or web material that is to be detected.

The recipes are stored under parameter *Working parameter load/save index* at index 98.

New recipes are saved or existing recipes loaded via parameter *System command* at index 2.

Save current teach value as recipe

- ✋ Select the storage location of the recipe for the current teach value by writing a value from 0 … 19 in index 98 (parameter *Working parameter load/save index*).
- ✋ Save the recipe in the selected storage location by writing value 226 (parameter *Save work index*) in index 2 (parameter *System command*).

Example:

1. Save teach value for label format A in storage location 3:
   Write value 3 in index 98.
2. Save label format A as recipe at storage location 3:
   Write value 226 in index 2.

If the sensor is taught to a new label format (e.g., label format B), the teach value for the new label format B is again stored under parameter *Working parameter* at index 99. The teach value for label format A is still available as a recipe in the sensor and can be reloaded if necessary.

Using the steps described above, up to 20 different recipes can be stored in the sensor.

Load saved teach value as recipe

- ✋ Select the storage location of the desired recipe by writing the corresponding value (0 … 19) in index 98 (parameter *Working parameter load/save index*).
- ✋ Load the recipe form the selected storage location by writing value 227 (parameter *Load work index*) in index 2 (parameter *System command*).
  - ⇨ The recipe for label format A is thereby loaded with the corresponding teach value and active in the sensor. The labels of this label format can be detected without reteaching the sensor.

Example:

1. Select recipe with the teach value for label format A from storage location 3:
   Write value 3 in index 98.
2. Load selected recipe:
   Write value 227 in index 2.