

Your Global Automation Partner

TURCK

SCIL-G1-1A...-VI

IO-Link Analog Converters

Instructions for Use

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1 About These Instructions

These operating instructions describe the structure, functions and the use of the product and will help you to operate the product as intended. Read these instructions carefully before using the product. This is to avoid possible damage to persons, property or the device. Retain the instructions for future use during the service life of the product. If the product is passed on, pass on these instructions as well.

1.1 Target groups

These instructions are aimed at qualified personnel and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols

The following symbols are used in these instructions:



DANGER

DANGER indicates an dangerous situation, with high risk, the death or severe injury, if not avoided.



WARNING

WARNING indicates a dangerous situation with medium risk, the death or severe injury, if not avoided.



CAUTION

CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.



NOTICE

NOTICE indicates a situation that may lead to property damage, if it is not avoided.



NOTE

NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.

➤ CALL TO ACTION

This symbol identifies steps that the user has to perform.

➡ RESULTS OF ACTION

This symbol identifies relevant results of steps

1.3 Additional documents

The following additional documents are available online at www.turck.com:

- Data sheet
- EU Declaration of Conformity
- Quick Start Guide

1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to techdoc@turck.com.

2 For Your Safety

The product is designed according to state-of-the-art technology. However, residual risks still exist. Observe the following warnings and safety notices to prevent damage to persons and property. Turck accepts no liability for damage caused by failure to observe these warning and safety notices.

2.1 Intended use

SCIL-G1-A...-VI are IO-Link analog converters for converting IO-Link input or output signals into analog input or output signals.

The device is not suitable for:

- Communication and process control
- General control and automation tasks
- Operation according to the ambient conditions specified in the technical data
- Industrial use up to degree of protection IP67

Intended use also includes EMC compliant electrical installation

When used in residential or mixed areas, the applicable standards must be observed and suitable measures taken for radio interference suppression.

The devices may only be used as described in this manual. Any other use is not in accordance with the intended use. Turck accepts no liability for any resulting damage.

2.2 Obvious misuse

The device is not suitable for:

- Outdoor use
- The use in potentially explosive atmospheres (Ex zone)
- The permanent operation in liquids
- The cleaning with high pressure

2.3 General safety instructions

- The device must only be mounted, installed, operated and maintained by trained and qualified personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.
- Do not alter the design, engineering, or electrical features of the connected devices.

3 Notes on the Product

3.1 Product identification

This instruction is valid for the following products:

- SCIL-G1-1AI-VI
- SCIL-G1-1AO-VI

3.2 Scope of delivery

- IO-Link converter
- Quick Start Guide

3.3 Legal requirements

The device falls under the following EU directives:

- 2014/30/EU (electromagnetic compatibility)
- 2011/65/EU (RoHS directive)

3.4 Turck service

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database under www.turck.com contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats.

The contact details of Turck subsidiaries worldwide can be found on **page 57**.

4 Product Description

4.1 Device overview

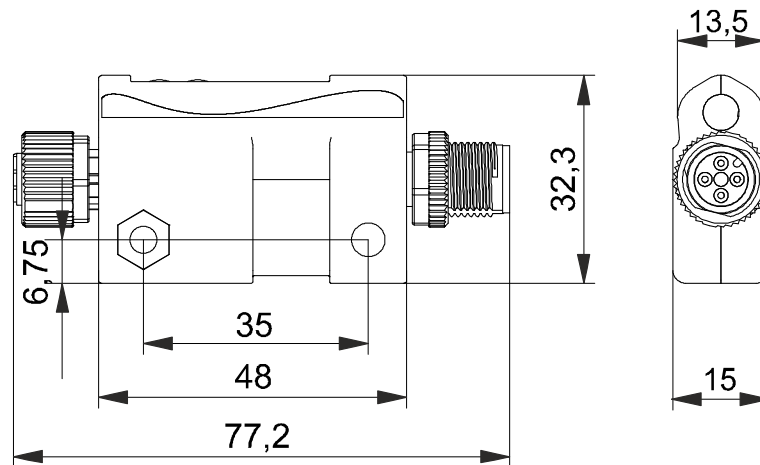


Abb. 1: SCIL-G1-1A...-VI

4.2 Properties and features – SCIL-G1-1AI-VI

- IO-Link converter with analog input
- Input: M12 female connector, A coded
- IO-Link: M12 male connector, A coded
- Resolution 16 bit
- Drift 45 ppm
- Sampling rate ≤ 200 Hz

4.3 Properties and features – SCIL-G1-1AO-VI

- IO-Link converter with analog output
- Output: M12 female connector, A coded
- IO-Link: M12 male connector, A coded
- Resolution 16 bit
- Drift 45 ppm
- Conversion rate ≤ 200 Hz

5 Installation

- Select a mounting location in the immediate vicinity of the sensor or actuator.
- Mount the device on a flat mounting surface for stress-free mounting.
- Ground the mounting surface for grounding the ground strap.
- Install the device so that the cable routes to all components are short.
- Select the installation site so that the device can be replaced without difficulty and there is sufficient space for the plug connections.
- Select a suitable mounting location with regard to vibration and shock load, temperature and humidity (see section Technical data).
- Mount the device in a protected location to prevent the connection cables from being torn off by personnel or the device.
- Mount the device in such a way that the diagnostic LEDs of the device can be seen during operation.

5.1 Mounting the device



ATTENTION

Use of inappropriate fastening screws

Damage to the device

- Use fastening screws which are suitable for the mounting surface structure.

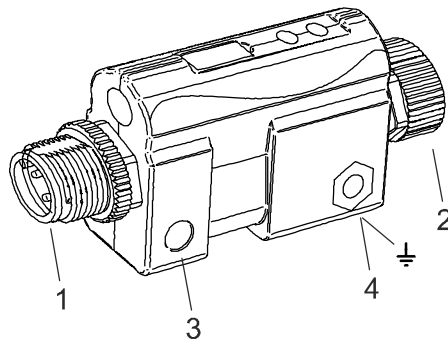


Abb. 2: SCIL-G1-1A...-VI – mounting

- 1 M12 male connector IO-Link
- 2 M12 female connector, analog
- 3 M5 mounting hole, Ø 5.2 mm
- 4 FE connection sleeve, M5

- Fasten the device with two M5 screws. The maximum tightening torque is 2.5 Nm.

6 Connecting



DANGER

Wrong selection of power supply

Danger to life due to overvoltage and electric shock!

➤ Only operate devices at SELV/ SELV power supplies. The power supply must not allow more than 60 VDC or 25 VAC in the event of a fault.

The device has two M12 connectors for connecting IO-Link devices and analog sensors and actuators. The maximum tightening torque is 0.6 Nm.

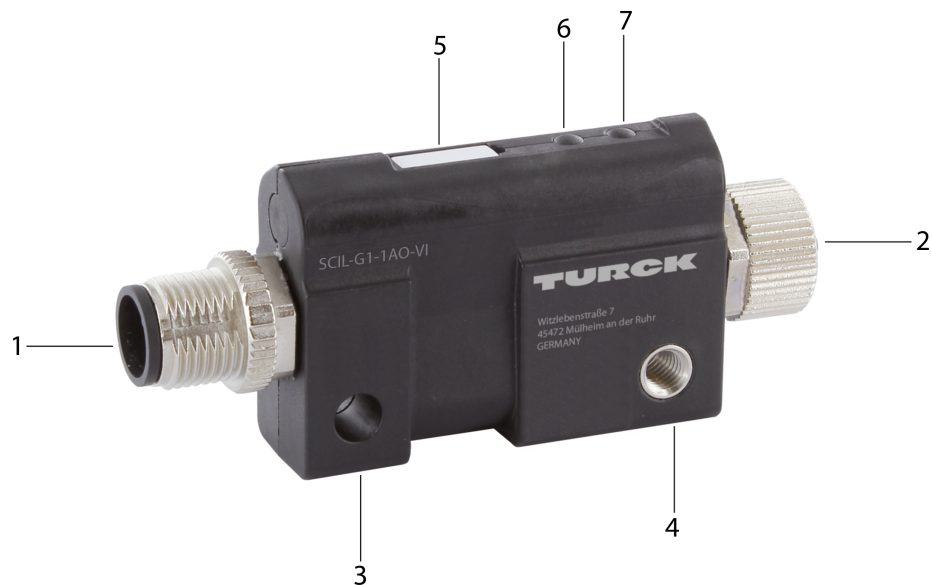


Abb. 3: SCIL-G1-1A...-VI – device design

- 1 IO-Link port M12, male connector, 4-pin A coded
- 2 Analog port, female connector M12, 4-pin A coded
- 3 Mounting hole, M5
- 4 FE connection sleeve, internal thread, M5
- 5 Designation label, exchangeable
- 6 LED 1 device status/diagnostics
- 7 LED 2 IO-Link status

➤ Connect the FE connection on the housing with low impedance to the functional earth.



CAUTION

Temperatures exceeding 70 °C

Minor injuries possible

➤ Wear thermally suitable protective gloves.



ATTENTION

Temperatures exceeding 70 °C

Line damage possible

➤ Use only thermally suitable connection cables.

6.1 Connecting sensors and actuators to the IO-Link analog converter

6.1.1 Analog inputs

Sensors with analog output can be connected to the IO-Link analog converter SCIL-G1-1AI-VI.

Signal types:

- 0...20 mA
- 4...20 mA
- 0...10 V
- -10...+10 V

Connecting sensors with single wire port

- Connect the sensors to the device according to the pin assignment.

Sensors with current output (0/4...20 mA)

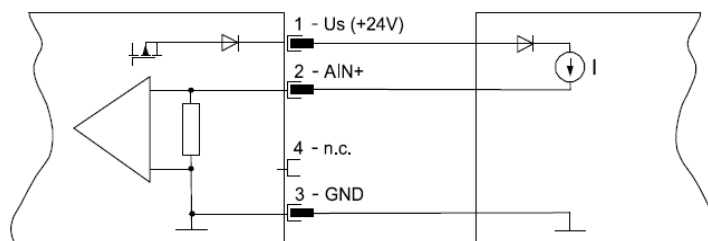
Pin assignment

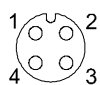


Pin 1	US, +24 VDC
Pin 2	AIN+
Pin 3	GND
Pin 4	n. c.

IN 0/4...20 mA

Sensor



Sensors with voltage output (0...10 V, -10...+10 V)
Pin assignment


Pin 1 $U_S, +24\text{ V}$

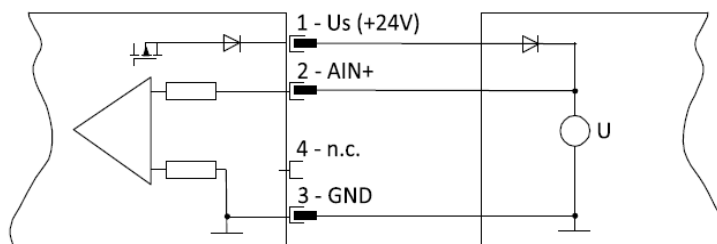
Pin 2 A_{IN+}

Pin 3 GND

Pin 4 n. c.

IN 0/-10...+10 V

Sensor



6.1.2 Analog outputs

Actuators with analog input can be connected to the IO-Link analog converter SCIL-G1-1AO-VI.

Signal types:

- 0...20 mA
- 4...20 mA
- 0...10 V
- -10...+10 V

Connecting actuators

- Connect the actuators to the device according to the pin assignment.

Actuators with current input (0/4...20 mA)

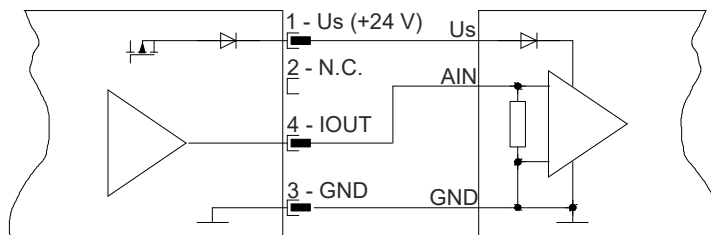
Pin assignment



Pin 1	US, +24 VDC
Pin 2	n. c.
Pin 3	GND
Pin 4	IOUT

IOUT 0/4...20 mA

Actuator



Actuators with voltage input (0...10 V, -10...+10 V)

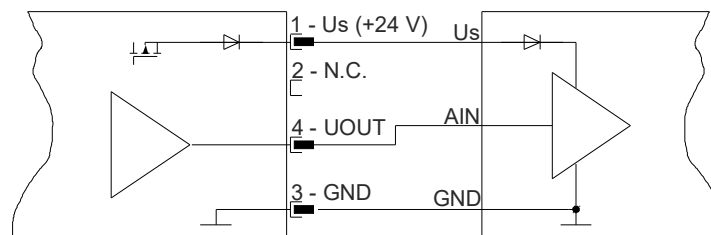
Pin assignment



Pin 1	US, +24 VDC
Pin 2	n. c.
Pin 3	GND
Pin 4	UOUT

OUT 0/-10...+10 V

Actuator



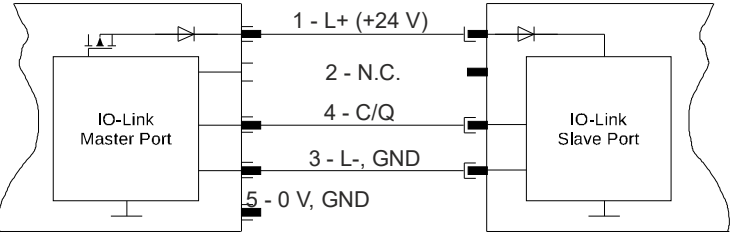
6.2 Connecting the IO-Link interface

6.2.1 Usable IO-Link masters

The device is suitable for connecting all IO-Link masters that support IO-Link standard 1.0 or higher.

6.2.2 Connecting the IO-Link master

► Connect the IO-Link master to the device according to the pin assignment.

Pin assignment	
	Pin 1 L+ (+24 VDC)
	Pin 2 n. c.
	Pin 3 GND, L-
	Pin 4 IO-Link data line, C/Q
IO-Link master port	IO-Link analog converter
	

6.2.3 Pin assignment

■ IO-Link M12male connector, A coded

AI and AO	
	Pin 1 + 24 VDC
	Pin 2 n. c.
	Pin 3 GND (L-)
	Pin 4 C/Q, IO-Link data line

■ Analog input, M12 female connector, A coded

AI	
	Pin 1 + Us
	Pin 2 A+
	Pin 3 GND (analog Us)
	Pin 4 A-

■ Analog output, M12 female connector, A coded

AO		
	Pin 1	+ U _s
	Pin 2	n. c.
	Pin 3	GND (analog U _s)
	Pin 4	AOUT (U/I)

7 Operating

7.1 LED displays

The IO-Link converters have two LEDs for status display.

LED1: bicolor red/green

- Indicates device- and function-related status information.
 - Green indicates the general device status.
 - Red indicates the status of the analog channel.

LED 1	Meaning	
Green	SCIL-G1-1AI-VI	SCIL-G1-1AO-VI
Off	Device without voltage supply	
On	Device is on, status ok	
Flashing 1 Hz	Undervoltage in device supply ($U_b < 18\text{ V}$)	
Flashing 2 Hz	Critical device supply ($U_b < 12\text{ V}$)	
Asymmetrically flashing 4 Hz/1 Hz	Undervoltage in device supply ($U_b > 30\text{ V}$)	

LED 1	Meaning	
Red	SCIL-G1-1AI-VI	SCIL-G1-1AO-VI
Off	Device without voltage supply	
Flashing 1 Hz	Input voltage or input current outside the rated measuring range or outside the adjustable range	Specified voltage or current outside the rated output range or outside the adjustable range
Flashing 2 Hz	Overcurrent sensor supply	Overcurrent sensor supply
Asymmetrically flashing 4 Hz/1 Hz	Wire break	Channel error $U_{out} > U_{rated}$ or Channel error $U_{out} < U_{rated}$

LED 2: green

- Indicates the status of the IO-Link communication connection.

LED 2	Meaning
Green	
Off	No IO-Link communication
On	No IO-Link process data communication (pre-operate mode)
Asymmetrically flashing 4 Hz/1 Hz	IO-Link process data communication (operate mode)

7.2 Parameter data

7.2.1 IO-Link object directory

ISDU index	ISDU sub index	Object name	Access	Length in bytes	Meaning/standard value	
Identification						
0x00	0x08	VendorID	R	2	0x013D (317)	
	0x09					
					SCIL-G1-AI-VI	SCIL-G1-AO-VI
	0x0A	DeviceID	R	3	0x1F0001(2031617)	0x200001 (2097153)
	0x0B					
	0x0C					
0x10		VendorName	R	19	Turck	
0x11		VendorText	R	29	Your Global Automation Partner	
					SCIL-G1-AI-VI	SCIL-G1-AO-VI
0x12		ProductName	R	30	SCIL-G1-AI-VI	SCIL-G1-AO-VI
0x13		ProductID	R	18	100001151	100001152
0x14		ProductText	Rts	64	IOL Analog Conv. straight M12 AI MULTI U/I 16Bit IOL V1.1	IOL Analog Conv. straight M12 AO MULTI U/I 16Bit IOL V1.1
0x15		SerialNumber	R	16	Sequential serial number Set during production	
0x16		Hardware revision	R	5	E. g. „01.00“	
0x17		Firmware Revision	R	10	E. g.„01.00.01-T“	
0x18		Application SpecificTag	RW	Max. 32	User-specific ref. e.g. "Plant 3/Port 4".	

ISDU index	ISDU sub index	Object name	Access	Length in bytes	Meaning/standard value	
Diagnostics						
0x24		Device Status	R	1	Value	Definition
					0	The device works properly
					1	Maintenance required
					2	Out of specification
					3	Functional check
					4	Error
					5...255	Reserved
0x25		Detailed Device status	R	18	Current events	
0x28		Process DataInput	R	2	Last valid process data (Only AI type)	
0x29		Process DataOutput	R	2	Last valid process data (Only AO type)	
ISDU index	ISDU sub index	Object name	Access	Length in bytes	Meaning/standard value	
Parameterization						
0x40		ParamDiagnosisSetup	RW	2	AI: 0xCC3E (I 0...20 mA) 0xCC3E (I 4...20 mA) 0xC8FE (U 0...10 V) 0xC8FE (U -10...10 V) AO: 0xC83E (I 0...20 mA) 0xC83E (I 4...20 mA) 0xC83E (U 0...10 V) 0xC83E (U -10...10 V)	
0x41		ParamLowerLimit	RW	2	0x8000	
0x42		ParamUpperLimit	RW	2	0x7FFF	
0x43		ParamFilterTime	RW	1	0x00	
0x44		ParamDeviceFunction	RW	1		
0x45		DiagnosisState	R	4	Currently available diagnostics and device statuses. The meaning of bits 0...15 corresponds to the meaning of bits 0...15 in ISDU index 0x40. Bits 16...31 are reserved and are not relevant for the user.	
0x97		Processor Temperature	R	1	Processor temperature	

7.2.2 Object description analog inputs

7.2.3 ISDU index 0x40

The object **ParamDiagnosisSetup** is used to parameterize the diagnostic events that the IO-Link converter is to generate.

The respective event is only generated if the corresponding bit is set.

The meaning of bits 0...15 in the ParamDiagnosisSetup object (ISDU index 0x40) depends on the parameterized channel function in the ParamDeviceFunction object (ISDU index 0x44).

Setting ISDU index 0x44	Channel mode	Valid DiagnosisSetup, definition corresponds to the variant
0x01	AI U unipolar 0...10 V	AI-U, 0...10 V unipolar
0x02	AI U bipolar -10...+10 V	AI-U, -10...+10V bipolar
0x03	AI I unipolar 0...20 mA	AI-I, 0...20 mA unipolar
0x04	AI I unipolar 4...20 mA	AI-I, 4...20 mA unipolar

AI-U, 0...10 V unipolar

Bit 15...0	Description
Bit 0	Reserved
Bit 1	Lower limit underrun
Bit 2	Upper limit overrun
Bit 3	Temperature overrun $T(uC) > 85\text{ }^{\circ}\text{C}$
Bit 4	Supply overvoltage ($U_b > 30\text{ V}$)
Bit 5	Supply undervoltage ($U_b < 18\text{ V}$)
Bit 6	Reserved
Bit 7	Reserved
Bit 8	Reserved
Bit 9	Reserved
Bit 10	Reserved
Bit 11	Overcurrent sensor supply
Bit 12	Reserved
Bit 13	Reserved
Bit 14	Nominal range underrun $U_{IN} < 0\text{ V}$
Bit 15	Nominal range overrun $U_{IN} > 10\text{ V}$

AI-U, -10...+10V bipolar

Bit 15...0	Description
Bit 0	Reserved
Bit 1	Lower limit underrun
Bit 2	Upper limit overrun
Bit 3	Temperature overrun $T(uC) > 85\text{ }^{\circ}\text{C}$
Bit 4	Supply overvoltage ($U_b > 30\text{ V}$)
Bit 5	Supply undervoltage ($U_b < 18\text{ V}$)
Bit 6	Reserved
Bit 7	Reserved
Bit 8	Reserved
Bit 9	Reserved
Bit 10	Reserved
Bit 11	Overcurrent sensor supply
Bit 12	Reserved
Bit 13	Reserved
Bit 14	Nominal range underrun $U_{IN} < -10\text{ V}$
Bit 15	Nominal range overrun $U_{IN} > 10\text{ V}$

AI-I, 0...20 mA unipolar

Bit 15...0	Description
Bit 0	Reserved
Bit 1	Lower limit underrun
Bit 2	Upper limit overrun
Bit 3	Temperature overrun $T(uC) > 85\text{ }^{\circ}\text{C}$
Bit 4	Supply overvoltage ($U_b > 30\text{ V}$)
Bit 5	Supply undervoltage ($U_b < 18\text{ V}$)
Bit 6	Reserved
Bit 7	Reserved
Bit 8	Device defect
Bit 9	Reserved
Bit 10	Reserved
Bit 11	Overcurrent sensor supply
Bit 12	Reserved

Bit 15...0	Description
Bit 13	Reserved
Bit 14	Nominal range underrun $I_{IN} < 0 \text{ mA}$
Bit 15	Nominal range overrun $I_{IN} > 20 \text{ mA}$

AI- I, 4...20 mA unipolar

Bit 15...0	Description
Bit 0	Reserved
Bit 1	Lower limit underrun
Bit 2	Upper limit overrun
Bit 3	Temperature overrun $T(uC) > 85 \text{ }^{\circ}\text{C}$
Bit 4	Supply overvoltage ($U_b > 30 \text{ V}$)
Bit 5	Supply undervoltage ($U_b < 18 \text{ V}$)
Bit 6	Reserved
Bit 7	Reserved
Bit 8	Reserved
Bit 9	Reserved
Bit 10	Reserved
Bit 11	Overcurrent sensor supply
Bit 12	Reserved
Bit 13	Reserved
Bit 14	Nominal range underrun $I_{IN} < 4 \text{ mA}$
Bit 15	Nominal range overrun $I_{IN} > 20 \text{ mA}$

7.2.4 Object description analog outputs

7.2.5 ISDU index 0x40

The object **ParamDiagnosisSetup** is used to parameterize the diagnostic events that the IO-Link converter is to generate.

The respective event is only generated if the corresponding bit is set.

The meaning of bits 0...15 in the ParamDiagnosisSetup object (ISDU index 0x40) depends on the parameterized channel function in the ParamDeviceFunction object (ISDU index 0x44).

Setting ISDU index 0x44	Channel mode	Valid DiagnosisSetup, definition corresponds to the variant
0x06	AO U unipolar 0...10 V	AO-U, 0...10 V unipolar
0x07	AO U bipolar -10...+10 V	AO-U, -10...+10 V bipolar
0x08	AO I unipolar 0...20 mA	AO- I, 0...20 mA unipolar
0x09	AO I unipolar 4...20 mA	AO- I, 4...20 mA unipolar

AO-U, 0...10 V unipolar

Bit 15...0	Description
Bit 0	Reserved
Bit 1	Lower limit underrun
Bit 2	Upper limit overrun
Bit 3	Temperature overrun T(uC) > 85 °C
Bit 4	Supply overvoltage (Ub > 30 V)
Bit 5	Supply undervoltage (Ub < 18 V)
Bit 6	Channel error Uout < Urated
Bit 7	Channel error Uout < Urated
Bit 8	Reserved
Bit 9	Reserved
Bit 10	Reserved
Bit 11	Overcurrent sensor supply
Bit 12	Reserved
Bit 13	Reserved
Bit 14	Nominal range underrun PDOOUT-DATA < 0d
Bit 15	Nominal range overrun PDOOUT-DATA > 27648d

AO-U, -10...+10 V bipolar

Bit 15...0	Description
Bit 0	Reserved
Bit 1	Lower limit underrun
Bit 2	Upper limit overrun
Bit 3	Temperature overrun T(uC) > 85 °C
Bit 4	Supply overvoltage (Ub > 30 V)
Bit 5	Supply undervoltage (Ub < 18 V)
Bit 6	Channel error Uout < Urated
Bit 7	Channel error Uout < Urated
Bit 8	Reserved
Bit 9	Reserved
Bit 10	Reserved
Bit 11	Overcurrent sensor supply
Bit 12	Reserved
Bit 13	Reserved
Bit 14	Nominal range underrun PDOUT-DATA < 27648d
Bit 15	Nominal range overrun PDOUT-DATA > 27648d

AO-I, 0...20 mA unipolar

Bit 15...0	Description
Bit 0	Reserved
Bit 1	Lower limit underrun
Bit 2	Upper limit overrun
Bit 3	Temperature overrun T(uC) > 85 °C
Bit 4	Supply overvoltage (Ub > 30 V)
Bit 5	Supply undervoltage (Ub < 18 V)
Bit 6	Reserved
Bit 7	Reserved
Bit 8	Reserved
Bit 9	Reserved
Bit 10	Wire break sensor
Bit 11	Overcurrent sensor supply
Bit 12	Reserved

Bit 15...0	Description
Bit 13	Reserved
Bit 14	Nominal range underrun PDOUT-DATA < 0d
Bit 15	Nominal range overrun PDOUT-DATA > 27648d

AO- I, 4...20 mA unipolar

Bit 15...0	Description
Bit 0	Reserved
Bit 1	Lower limit underrun
Bit 2	Upper limit overrun
Bit 3	Temperature overrun T(uC) > 85 °C
Bit 4	Supply overvoltage (Ub > 30 V)
Bit 5	Supply undervoltage (Ub < 18 V)
Bit 6	Reserved
Bit 7	Reserved
Bit 8	Reserved
Bit 9	Reserved
Bit 10	Wire break sensor
Bit 11	Overcurrent sensor supply
Bit 12	Reserved
Bit 13	Reserved
Bit 14	Nominal range underrun PDOUT-DATA < 0d
Bit 15	Nominal range overrun PDOUT-DATA > 27648d

7.3 Object description

7.3.1 ISDU index 0x41

The object **ParamLowerLimit** is used to parameterize the lower warning threshold which, if **exceeded**, triggers the generation of an IO-Link event.

The scaling of the values corresponds to the process data of the selected channel function, also refer to **ParamDeviceFunction**. Only values from the rated measuring range are valid.

For SCIL-G1-1AO-VI, the threshold monitoring affects the process output data sent by the master.

For SCIL-G1-1AI-V, the threshold monitoring affects the process input data sent to the master.

7.3.2 ISDU index 0x42

The object **ParamUpperLimit** is used to parameterize the upper warning threshold which, if **exceeded** triggers the generation of an IO-Link event.

The scaling of the values corresponds to the process data of the the selected channel function, also refer to **ParamDeviceFunction**. Only values from the rated measuring range are valid.

For SCIL-G1-1AO-VI, the threshold monitoring affects the process output data sent by the master.

For SCIL-G1-1AI-V, the threshold monitoring affects the process input data sent to the master.

7.3.3 ISDU index 0x43

The object **ParamFilterTime** is used to parameterize the software filtering for the measured values. The IO-Link converters implement a simple floating average-value filter.

Additionally, the object indicates the length of the floating mean value in the number of IO-Link cycles.

For SCIL-G1-1AO-VI, the filter affects the process output data sent by the master.

For SCIL-G1-1AI-V, the filter affects the measured values sent to the master.

ParamFilterTime

Permissible range of values

0	No average-value generation
1...64	Average-value generation over 1 ... 64 measured values
Any other value triggers an error message of the IO-Link converter.	

7.3.4 ISDU index 0x44

The channel function of the IO-Link converter can be read out via the **ParamDeviceFunction** object.

Permissible range – analog output	
Setting	Channel mode
0x06	Analog OUT U unipolar 0...10 V
0x07	Analog OUT U bipolar -10...+10 V
0x08	Analog OUT I unipolar 0...20 mA
0x09	Analog OUT I unipolar 4...20 mA
Any other value triggers an error message of the IO-Link converter.	

7.4 Diagnostics

7.4.1 IO-Link Events

The IO-Link events which are sent depend of the selected channel function.

Event code	Description	Device status (ISDU index 0x24)	Event type	Qualifier	Note/comment
General events					
0x0000	No malfunction	0	Notification		
0x4210	Overtemperature of the device	2	Warning	Appearing Disappearing	Corresponds to bit 3 in ISDU index 0x40
0x5110	Overvoltage in primary device supply – check tolerance	2	Warning	Appearing Disappearing	If $U_b > 30\text{ V}$, corresponds to bit 4 in ISDU index 0x40
0x5111	Undervoltage in primary device supply – check tolerance	2	Warning	Appearing Disappearing	If $U_b < 18\text{ V}$, corresponds to bit 5 in ISDU index 0x40
0x6320	Parameter error – check data sheet and/or values	4	Error	Appearing Disappearing	Invalid value has been written to a parameter
0x7700	Wire break at connected device – check wiring	4	Error	Appearing Disappearing	Corresponds to bit 10 in ISDU index 0x40 Only valid for: SCIL-G1-1AO-V1, 0/4...20 mA
0x8C10	Process value above the valid range	2	Warning	Appearing Disappearing	Corresponds to bit 15 in ISDU index 0x40 Only valid for: SCIL-G1-1AO-V1
0x8C30	Process value below the valid range	2	Warning	Appearing Disappearing	Corresponds to bit 14 in ISDU index 0x40 Only valid for: SCIL-G1-1AO-V1

As there is no PROFINET IO integration for IO-Link that can correctly reflect the specified event codes of the IO-Link spec. 1.1 in PROFINET diagnostics, an additional reading of the ISDU index 0x45 is required.

Event code	Description	Device status (ISDU index 0x24)	Event type	Qualifier	Note/comment
Manufacturer-specific events					
0x1800	Production data range contains invalid data	4	Error	Appearing Disappearing	Not maskable via event parameterization in ISDU index 0x40
0x1801	Parameter data range contains invalid data	4	Error	Appearing Disappearing	Not maskable via event parameterization in ISDU index 0x40
0x1802	Lower limit underrun	2	Warning	Appearing Disappearing	Corresponds to bit 1 in ISDU index 0x40
0x1803	Upper limit exceeded	2	Warning	Appearing Disappearing	Corresponds to bit 2 in ISDU index 0x40
0x1804	Overcurrent at sensor supply	4	Error	Appearing Disappearing	Corresponds to bit 11 in ISDU index 0x40
0x1805	Analog input overrun – check sensor signal	2	Warning	Appearing Disappearing	Corresponds to bit 15 in ISDU index 0x40 Only valid for: SCIL-G1-1AI-V1
0x1806	Analog input underrun-check sensor signal	2	Warning	Appearing Disappearing	Only valid for: SCIL-G1-1AI-V1
0x1809	Error analog output – output voltage higher than set point	4	Error	Appearing Disappearing	Corresponds to bit 7 in ISDU index 0x40 Only valid for: SCIL-G1-1AO-V1
0x180A	Error analog output – output voltage lower than set point	4	Error	Appearing Disappearing	Corresponds to bit 6 in ISDU index 0x40 Only valid for: SCIL-G1-1AO-V1
0x1820	Test event warning	4	Warning	Appearing Disappearing	Test events
0x1821	Test event error		Warning	Appearing Disappearing	

Validity matrix IO-Link events

Not all variants of the analog IO-Link converter have the same diagnostic events.

Only certain events are available, depending on the variant and the selected channel function.

The following table lists the availability of events depending on the variant or channel function.

Channel function – analog inputs

Bit ISDU index 0x40	AI U 0...10 V	AI U -10...10 V	AI I 0...20 mA	AI I 4...20 mA
15	Overrun $U_{IN} > 10\text{ V}$	Overrun $U_{IN} > 10\text{ V}$	Overrun $I_{IN} > 20\text{ mA}$	Overrun $I_{IN} > 20\text{ mA}$
14	Underrun $U_{IN} > 0\text{ V}$	Underrun $U_{IN} > -10\text{ V}$	Underrun $I_{IN} < 0\text{ mA}$	Underrun $I_{IN} > 4\text{ mA}$
13	-	-	-	-
12	-	-	-	-
11	Overcurrent sensor supply			
10	-	-	-	-
9	-	-	-	-
8	-	-	-	-
7	-	-	-	-
6	-	-	-	-
5	Supply undervoltage ($U_b < 18\text{ V}$)			
4	Supply overvoltage ($U_b > 30\text{ V}$)			
3	Temperature overrun $T(uC) > 85\text{ °C}$			

Channel function – analog outputs

Bit ISDU index 0x40	AI U 0...10 V	AI U -10...10 V	AI I 0...20 mA	AI I 4...20 mA
15	Nominal range overrun PDOUT-DATA > 27648d			
14	Underrun PDOUT-DATA < 0d	Underrun PDOUT-DATA < -27648d	Underrun PDOUT-DATA < 0d	Underrun PDOUT-DATA < 0d
13	-	-	-	-
12	-	-	-	-
11	Overcurrent sensor supply			
10	-	-	Wire break sensor	
9	-	-	-	-
8	-	-	-	-
7	Channel error Uout < Urated		-	-
6	Channel error Uout < Urated		-	-
5	Supply undervoltage (Ub < 18 V)			
4	Supply overvoltage (Ub > 30 V)			
3	Temperature overrun T(uC) > 85 °C			
2	Upper limit overrun			
1	Lower limit underrun			
0	-	-	-	-

7.5 Process data

7.5.1 Analog Input I, 0...20 mA

Value		Measured value	Range
Dec.	Hex.	0...20 mA	
32767	7FFF	> 23.5178 mA	Overflow
32511	7EFF	23.5178 mA	Overshoot range
27649	6C01	20.0007 mA	
27648	6C00	20.0000 mA	
1	0001	723.4 nA	Nominal range
0	0000	0 µA	
-1	FFFF	-723.4 nA	
-4864	ED00	-3.5185 mA	Underrun range
-32768	8000	< -3.5185 mA	
			Underflow

7.5.2 Analog Input I, 4...20 mA

Value		Measured value	Range
Dec.	Hex.	4...20 mA	
32767	7FFF	> 22.8142 mA	Overflow
32511	7EFF	22.8142 mA	Overshoot range
27649	6C01	20.0006 mA	
27648	6C00	20.0000 mA	
1	0001	4 mA + 348 nA	Nominal range
0	0000	4 mA	
-1	FFFF	4 mA - 348 nA	
-4864	ED00	1.1852 mA	Underrun range
-32768	8000	< 1.1852 mA	
			Underflow

7.5.3 Analog Input U, 0...10 V

Value		Measured value	Range
Dec.	Hex.	0...10 V	
32767	7FFF	> 11.7589 V	Overflow
32511	7EFF	11.7589 V	Ovrrun range
27649	6C01	10.0004 V	
27648	6C00	10.0000 V	
1	0001	361.7	Nominal range
0	0000	0	
-1	FFFF	-361.7	
-4864	ED00	-1.7593 V	Underrun range
-32768	8000	< -1.7593 V	
			Underflow

7.5.4 Analog Input U, -10...+10 V

Value		Measured value	Range
Dec.	Hex.	-10...10 V	
32767	7FFF	> 11.7589 V	Overflow
32511	7EFF	11.7589 V	Ovrrun range
27649	6C01	10.0004 V	
27648	6C00	10.0000 V	
1	0001	361.7	Nominal range
0	0000	0	
-1	FFFF	-361.7	
-27648	9400	-10.0000 V	Underrun range
-27649	93FF	-10.0004 V	
-32512	8100	-11.7593 V	
-32768	8000	< -11.7593 V	Underflow

7.5.5 Analog output I, 0...20 mA

Value		Output value	Range
Dec.	Hex.	0...20 mA	
> 32511	> 7EFF	> 23.5178 mA	Max. output value
32511	7EFF	23.5178 mA	Overrun range
27649	6C01	20.0007 mA	
27648	6C00	20.0000 mA	Nominal range
1	0001	723.4 nA	
0	0000	0 µA	Min. output value
> 0	> 0	0.000 mA	

7.5.6 Analog output I, 4...20 mA

Value		Output value	Range
Dec.	Hex.	4...20 mA	
> 32511	> 7EFF	22.8142 mA	Max. output value
32511	7EFF	22.8142 mA	Overrun range
27649	6C01	20.0006 mA	
27648	6C00	20.0000 mA	Nominal range
1	0001	4 mA + 348 nA	
0	0000	4 mA	Min. output value
> 0	> 0000	4 mA	



HINWEIS

The process data is transferred in the Big Endian sequence.

7.5.7 Analog output U, 0...10 V

Value		Output value	Range
Dec.	Hex.	0...10 V	
> 32511	7EFF	11.7589 V	Max. output value
32511	7EFF	11.7589 V	Overrun range
27649	6C01	10.0004 V	
27648	6C00	10.0000 V	Nominal range
1	0001	361.7	
0	0000	0 V	Min. output value
> 0	> 0000	0 V	

7.5.8 Analog output U, -10...10 V

Value		Output value	Range
Dec.	Hex.	-10...10 V	
> 32511	> 7EFF	11.7589 V	Max. output value
32511	7EFF	11.7589 V	Overrun range
27649	6C01	10.0004 V	
27648	6C00	10.0000 V	Nominal range
1	0001	361.7	
0	0000	0	
-1	FFFF	-361.7	
-27649	93FF	-10.0004 V	Underrun range
-32512	8100	-11.7593 V	
> -32512	> 8100	-11.7593 V	Min. output value

7.5.9 Filter description

A FIR filter is implemented for analog signals or the output values:

$$\frac{1}{N} \sum_{k=0}^{N-1} x[n-k]$$

Abb. 4: FIR Filter

Symbol	Explanation
y(n)	Filtered value at time n
x(n)	Output value or measured value at time n
x(n-k)	k is the number of the predecessor of the output value or measured value at time n
N	Filter time in number of IO-Link cycles

If the input value or the specified process data changes abruptly, the filtered value increases linear until the final value is reached after N IO-Link cycles.

Example:

With a cycle time of 2.3 ms and a filter time of N = 10, the final value is read/output after 23 ms.

8 Troubleshooting

If the device does not work as expected, proceed as follows:

- Exclude environmental disturbances.
- Check the connections of the device for errors.
- Check device for parameterization errors.

If the malfunction persists, the device is faulty. In this case, decommission the device and replace it with a new device of the same type.

9 Maintenance

Ensure that the plug connections and cables are always in good condition.

The devices are maintenance-free, clean dry if required.

10 Repair

The device must not be repaired by the user. The device must be decommissioned if it is faulty. Observe our return acceptance conditions when returning the device to Turck.

10.1 Returning devices

Returns to Turck can only be accepted if the device has been equipped with a Decontamination declaration enclosed. The decontamination declaration can be downloaded from <http://www.turck.de/de/produkt-retoure-6079.php> and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

11 Disposal



The devices must be disposed of correctly and must not be included in normal household garbage.

12 Technical data

12.1 Electrical data

IO-Link port		
IO-Link specification	EN 61131-9	Version 1.1
Communication mode	COM2	38.4 kbit/s
IO-Link transmission protocol		Version 1.1
Cycle time		≥ 2.3 ms
Port class		Class A
Data length	Process data resolution	16 bit/2 bytes
Module supply		
IO-Link operating voltage	Via pin 1	24 VDC
IO-Link range of operating voltage	Via pin 1	18...30 VDC
Current consumption	U _b = 24 VDC, without sensor supply current	≤ 30 mA
Total current		≤ 230 mA
Sensor supply		
Sensor supply current		≤ 200 mA
Output voltage range sensor supply		17...29.8 VDC
Input		
Temperature drift		45 ppm/°K
Conversion principle	DAC	Sigma-Delta
Resolution	DAC	24 bit
Resolution	Process data	16 bit
Sampling rate		≤ 200 Hz
Filters	Process data, average value over N, IO-Link cycles	Yes, averaging, configurable N=... 64

Outputs		
Temperature drift		45 ppm/°K
Conversion principle	DAC	SAR
Resolution	DAC	16 bit
Resolution	Process data	16 bit
Conversion rate		≤ 200 Hz
Filters	Process data, average value over N, IO-Link cycles	Yes, averaging, configurable N=... 64

12.2 Measurement accuracy

Measurement accuracy	At 25 °C (full scale)	
Measurement ranges	Analog inputs	Analog outputs
0...20 mA	0.1 %	0.1 %
4...20 mA	0.1 %	0.1 %
0...10 V	0.1 %	0.1 %
-10...+10 V	0.2 %	0.1 %

12.3 Measurement ranges

12.3.1 SCIL-G1-1AI-VI

Configurable measuring ranges				
Variants	Rated measuring range	Max. measuring range	Input resistance	Significance 1 LSB
1	0...20 mA	0...22.81 mA	232 Ω	348 nA
2	4...20 mA	0...22.81 mA	232 Ω	348 nA
3	0...10 V	0...11.76 V	100 k Ω	179.4 μ V
4	-10...+10 V	-11.76...+11.76 V	100 k Ω	358.9 μ V

12.3.2 SCIL-G1-1AO-VI

Configurable output ranges			
Variants	Rated output range	Max. output range	Significance 1 LSB
1	0...20 mA	0...22.81 mA	348 nA
2	4...20 mA	0...22.81 mA	348 nA
3	0...10 V	0...11.76 V	179.4 μ V
4	-10...+10 V	-11.76...+11.76 V	358.9 μ V

12.4 Environmental characteristics

Mechanical		
Vibration test	EN 60068 Part 2-6	10...58 Hz, 0.35 mm 58...150 Hz, 15 g
Shock test	EN 60068 Part 2-27	50 g, 11 ms, 3 axes
Climatic		
Storage temperature		-40 °C...+85 °C
Operating temperature		-30 °C...+70 °C
Ambient temperature	UL condition	-30 °C...+70 °C
Climate class	EN 60721	3K3
Installation altitude	Above normal altitude	≤ 2000 m
Relative humidity		≤ 85 %
Electrical safety		
Protection class	All connectors attached	IP67(not evaluated by UL)
Overvoltage category		II
Emitted EMC interference		
Emitted radio frequency interference	EN 61000-6-4	30 MHz...230 MHz: 40 dBuV/m (at 10 m) 230 MHz...1 GHz: 47 dBuV/m (at 10 m)
EMC immunity		
Electromagnetic RF fields	EN 61000-4-3	80 MHz...1 GHz, 10 V/m 1.4 GHz...2 GHz, 3 V/m 2 GHz...2.7 GHz, 1 V/m
Fast transients (burst)	EN 61000-4-4	± 2 kV, 5 kHz Measurement accuracy: 3.5 % FS without filter 0.2 % FS with max. filter
Conducted RF interferences	EN 61000-4-6	0.15...80 MHz, 10 V, 80 % AM; 1 kHz
Electrostatic discharge (ESD)	EN 61000-4-3	Contact ±4 kV, air: ±8 kV

12.5 Protection

Device protection	
Reverse polarity protection of module supply	Yes, permanently
Sensor supply reverse polarity protection	Yes, permanently
Sensor supply protected against feedback	Yes, permanently
Short-circuit protection, sensor supply	Yes, permanently
Analog input overvoltage protection	Yes, 30 VDC
Analog input reverse polarity protection	Yes, permanently

12.6 Mechanical data

Material data	
Housing	Plastic PC + PBT
M12 female connector M12 male connector	Zinc cast with Cu/Ni surface
FE connection sleeve	Brass with Cu/Ni surface
Installation data	
Weight	44 g
Dimensions	L × W × H 77.2 × 15 × 32.3 mm

12.7 Product reliability

Analog inputs		
MTTF	SN 29500 and rated data (40 °C)	265 years
Analog outputs		
MTTF	SN 29500 and rated data (40 °C)	206 years

12.8 Conformity, approvals

Conformity, Approvals

Product standard	EN 61131-2 Programmable controllers	
CE	2014/30/EU 2011/65/EU	
REACH	No. 1907/2006	
WEEE	2012/19/EU	Category 5
China RoHS	GB/T 26572	25 EPUP
ULc	CSA-C22.2 No. 61010-1-12 CSA-IEC 61010-2-201:14	E404727
ULus	UL 61010-1 UL 61010-2-201	E404727

Hazardous substance (有害物質)							
	Part Name 零件名稱	Lead (Pb) 鉛	Mercury (Hg) 汞	Cadmium (Cd) 鎘	Hexavalent Chromium (Cr (VI)) 六价铬	Polybrominated biphenyls (PBB) 多溴联苯	Polybrominated diphenyl ethers (PBDE) 多溴联苯醚
	Component part PCB 组件部分 印刷电路板	X	O	O	O	O	O
	Connection Terminal/ Screws 接线端子 / 拧	X	O	O	O	O	O
O: Indicates that the content of the harmful substance in all homogeneous materials of the component part is below the limit defined in GB/T 26572. O: 表明該有害物質在組成部分的所有均質材料的含量低於按GB/ T26572定義的限制。 X: Indicates that the content of the harmful substance in at least one homogeneous material of the component part exceeds the limit defined in GB/T 26572. X: 表示該有害物質在組成部分中的至少一個均質材料的含量超過按GB / T26572定義的限制。							

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