Innovative Vacuum for Automation

EN

Operating Instructions

Schmalz Compact Terminal SCTMi IO-Link

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Note
These operating instructions were originally written in German and have been translated into English. Store in a safe place for future reference.

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1 Safety Instructions

1.1 Classification of safety instructions

Danger
This warning informs the user of a risk that will result in death or serious injury if it is not avoided.

DANGER	
	Type and source of danger Consequence ► Remedial action

Warning
This warning informs the user of a risk that could result in death or serious injury if it is not avoided.

WARNING	
	Type and source of danger Consequence ► Remedial action

Caution
This warning informs the user of a risk that could result in injury if it is not avoided.

CAUTION	
	Type and source of danger Consequence ► Remedial action

Attention
This warning informs the user of a risk that could result in damage to property if it is not avoided.

ATTENTION	
	Type and source of danger Consequence ► Remedial action

General notes

This symbol is used when important notes and information regarding the use of the machine/the system/the device are provided.

Note/information

1.2 Warning symbol

Explanation of the warning symbols used in the operating instructions.

Warning symbol	Description	Warning symbol	Description
	General warning symbol		Warning of hearing damage
	Warning of environmental damage		Warning of overpressure
	Warning due to vacuum		Warning of crushing injury
	Hand injury warning		Explosive atmosphere warning

1.3 Mandatory symbols

Explanation of the mandatory symbols used in the operating instructions.

Mandatory symbols	Description	Mandatory symbols	Description
	Wear ear protectors		Wear eye protection
	Adhere to the operating instructions		Activate prior to maintenance or repair

1.4 General safety instructions

WARNING

Ignoring the general safety guidelines

Personal injury / damage to plants/systems

- ► The operating instructions contain important information on using the system. Read the operating instructions thoroughly and keep them for later reference.
- ► The system may only be connected and operations started once the operating instructions have been read and understood.
- ► Use only the connections, mounting holes and attachment materials that have been provided.
- ► Carry out mounting or removal only when the device is in an idle, depressurized state.
- ► Only qualified specialist personnel, mechanics and electricians are permitted to perform the installation. Qualified specialist personnel are persons who have received technical training and have the knowledge and experience – including knowledge of applicable regulations – necessary to enable them to recognize possible dangers and implement the appropriate safety measures while performing tasks. The same applies to maintenance!
- ► General safety regulations, European standards and VDE guidelines must be observed and complied with.
- ► No modifications must be made to the product!
- ► Protect the product from damage at all times.

CAUTION

Connected devices may explode due to pressure
Connected devices may implode due to vacuum power

Damage from flying or aspirated parts

- ► Wear eye protection
- ► Wear ear protectors

CAUTION

Compressed air and vacuum can cause damage to the eyes

This may result in personal injury
Eyes can be sucked in

- ► Wear eye protection
- ► Do not look into the compressed air connection
- ► Do not look into the silencer air stream
- ► Do not look into vacuum openings, e.g. suction cups.

ATTENTION	
	**Inappropriate voltage supply** Destruction of the product ► Only operate the product using power supply units with protected extra-low voltage (PELV) ► The system must incorporate safe electrical cut-off of the power supply in compliance with EN60204 ► Do not connect or disconnect the plug connectors when voltage is applied

1.5 Intended use

The Schmalz Compact Terminal SCTMi is used to generate a vacuum for gripping and transporting objects when used in conjunction with suction cups.

Neutral gases are approved as evacuation media. Neutral gases include air, nitrogen and inert gases (e.g. argon, xenon and neon). Aggressive gases or media such as acids, acid fumes, bases, biocides, disinfectants or detergents are not permitted.

SCTMi ejectors are not suitable for transporting or sucking through liquids or bulk material such as granulates.
Personal injury or damage to the ejector may occur as a result.

For further information, see the technical data.

Any other use is considered improper by the manufacturer and is deemed as contrary to the designated use.

1.6 Requirement for the user

All personnel working with the product must be familiar with basic mechanical and pneumatic principles as well as the appropriate technical terminology.

To ensure safe operation, this work may only be performed by qualified personnel or trained persons working under the supervision of qualified personnel.

“A qualified employee is defined as an employee who has received technical training and has the knowledge and experience – including knowledge of applicable regulations – necessary to enable him or her to recognize possible dangers and implement the appropriate safety measures while performing tasks. Qualified personnel must observe the pertinent industry-specific rules and regulations.”

Specialist personnel must be familiar with current safety rules and requirements. These apply to the use of components such as magnetic valves and pressure switches as well as to controllers used in devices, machines and systems.

Specialist personnel must also be familiar with the system’s control concept.

The compact terminal SCTMi is only to be operated by trained personnel.

Individuals who are not able to operate the system safely due to physical, psychological or sensory problems must not operate the system or may only do so under the supervision of a responsible person.

1.7 Emissions

The SCTMi emits noise due to the operation of compressed air.

CAUTION	
	**Noise pollution due to operation of the ejectors with compressed air** Hearing impairments may occur in the long term ► Wear ear protectors ► Operate only with correctly fitted silencers

2 Product description

2.1 General description

The Schmalz compact terminal product described here is referred to below as the SCTMi.

The SCTMi is a compact unit of multiple vacuum generators (ejectors).
It can be used to handle different parts simultaneously and independently using just one vacuum system.

The SCTMi has an IO-Link class B interface.
The compressed air can be supplied centrally for all of the ejectors or, alternatively, separately for each individual ejector.

Thanks to its modular design, up to 16 individual ejectors can be controlled and configured independently. Each ejector has an autonomous energy and process control for monitoring the vacuum circuits.

All of the settings, parameters and measurement and analysis data are made available centrally via IO-Link.

Additionally, a multitude of information and status reports for the SCTMi can be accessed using wireless communication with NFC (Near Field Communication).

Description of the ejectors

The Venturi nozzle is activated and deactivated using the suction command. In the NO version, the Venturi nozzle is deactivated when the suction input signal is present. In the NC version, the Venturi nozzle is activated when the suction input signal is present. An integrated sensor records the vacuum generated by the Venturi nozzle. The exact vacuum level can be read from the IO-Link process data.

The ejector has an integrated air-saving function. The ejector automatically regulates the vacuum while in suction mode. The electronics system switches the Venturi nozzle off when the switching point H1 set by the user is reached.

When objects with dense surfaces are picked up, the integrated non-return valve prevents the vacuum from dropping. If leakage causes the system vacuum to drop below the switching point H1 - h1, the Venturi nozzle is switched on again.

Depending on the vacuum, the H2 process data bit is set once a workpiece is picked up safely. This serves as an approval to continue the handling process.

In blow-off mode, the vacuum circuit of the ejector is supplied with compressed air. This ensures that the vacuum drops quickly, depositing the workpiece quickly as well.

With the integrated status display in each ejector, the current vacuum level can be visualized with an LED bar together with the valve status.

The ejectors also have a button that can be used for manual operation.

2.2 Versions

The exact item designation is composed of a type key.
The type key describes the number of installed ejectors and their exact properties.

SCTMi design type key:

Bus module	Ejectors 1 to 8	Ejectors 9 to 16	Pneumatic collective connection[1)]	Internal code
SCTMi-IOL	12345678	12345678	P	VI00

Type key, for example, SCTMi-IOL-11112222-33334444-P-VI00

Code of the individual SCPSt ejectors:

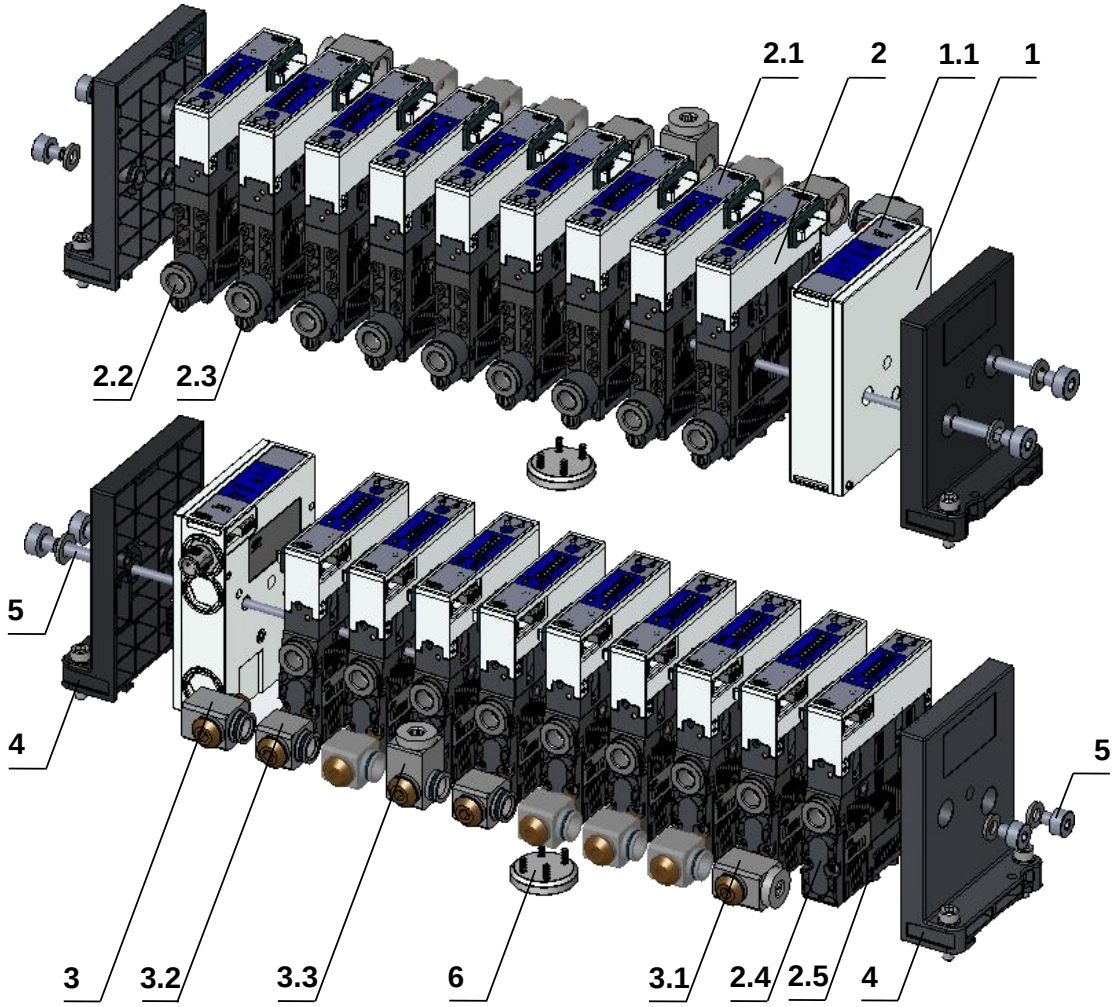
Ejector code	SCPSt ejector
0	No ejector
1	SCPSt 07 G02 NO
2	SCPSt 10 G02 NO
3	SCPSt 15 G02 NO
4	SCPSt 07 G02 NC
5	SCPSt 10 G02 NC
6	SCPSt 15 G02 NC
7	SCPSt 2-07 G02 NO
8	SCPSt 2-09 G02 NO
9	SCPSt 2-14 G02 NO
A	SCPSt 2-07 G02 NC
B	SCPSt 2-09 G02 NC
C	SCPSt 2-14 G02 NC

1) **P** = with collective pneumatic connection **X** = without collective pneumatic connection

Design of the individual SCPSt ejectors:

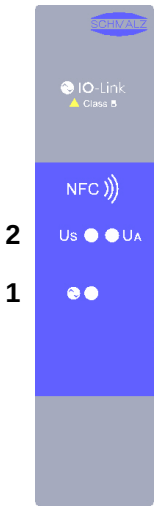
Type of ejector	Nozzle size	Pneumatic connection	Ejector type
SCPSt	07 10 15 2-07 2-09 2-14	G02 (2 × 1/8" thread)	NO (normally open) NC (normally closed)

2.3 SCTMi design

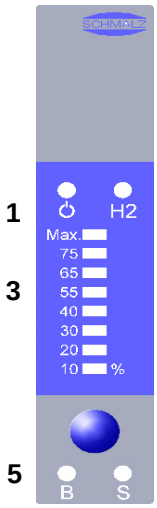


Item	Description
1	IO-Link bus module with M12 IO-Link class B connector
1.1	IO-Link display elements
2	SCPSt ejector (2 to 16 pc.)
2.1	SCPSt ejector display/control
2.2	1/8" thread vacuum connection
2.3	Blow-off valve screw
2.4	Silencer cover
2.5	Exhaust outlet
3	Pressure distributor with 1/4"-thread compressed air connection
3.1	Pressure distributor with additional 1/4"-thread compressed air connection
3.2	Pressure distributor
3.3	Pressure distributor with additional 1/4"-thread compressed air connection for 9 ejectors or more
4	End plate with mounting possibility for M5 screws
5	Connectors
6	Support plate, for 9 ejectors or more

2.3.1 Operating and display elements

Bus module	Item	Meaning	State	Description
	1	“IO-Link” LED	Off Flashing green	No communication IOL communication okay
	2	“Sensor voltage” LED	Off Green Flashing green	No sensor voltage Voltage okay Voltage not okay
	3	“Actuator voltage” LED	Off Green Flashing green	No actuator voltage Voltage okay Voltage not okay
	4	Position of the NFC antenna	Optimum position for connection to an NFC transponder	

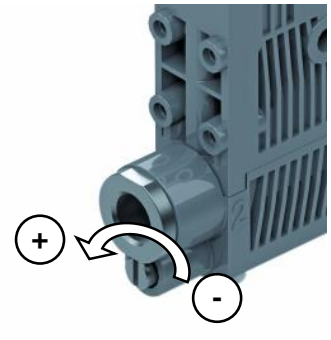
The foil keypad with the LED bar and 4 additional LEDs allows for simple operation of the SCTMi ejectors.

Ejector	Item	Meaning	State	Description
	1	“Operating mode display” LED	Green Flashing green	In operation Connection error
	2	“Threshold value H2” LED	Yellow Off	Switching point H2 reached Switching point H2 not reached
	3	LED bar	Off Yellow Flashing yellow	Vacuum < 10% Current vacuum level Vacuum outside of measurement range (10% blow-off, for example)
	4	“Suction” LED S	Off Yellow	No suction from ejector Suction from ejector
	5	“Blow-off” LED B	Off Yellow	Ejector not blowing off Ejector blowing off
	6	“Manual mode” button	Controls the ejector suction and blow-off functions manually	

The “Suction” and “Blow-off” LEDs are activated only when there is actuator voltage.

In “Manual mode,” the two “Suction” and “Blow-off” LEDs flash.

2.3.2 Setting the blow-off volume flow



The blow-off flow rate can be set for each ejector.

There is a valve screw below the vacuum connection. This valve screw can be used to set the blow-off flow rate.

Turning it in a clockwise direction reduces the flow rate. Turning it in an anticlockwise direction increases the flow rate.

The valve screw is equipped with a stop on both sides.

Do not overwind the stop on the valve screw. A minimum flow rate of approx. 10% is always necessary for technical reasons.
The blow-off flow rate can be set between 10% and 100%.

3 Technical data

3.1 General data

Operating medium	Air or neutral gas, 5 µm filtered, with or without oil, class 3-3-3 compressed air quality acc. to ISO 8573-1
Operating pressure (Flow pressure)	2 to 6 bar (optimally 4 to 4.5 bar)
Degree of protection	IP 65
Working temperature	0 to 50 °C
Storage temperature	-10 to 60 °C
Permitted humidity	10 to 90% RH (free from condensation)
Vacuum sensor precision	± 3% FS

3.2 Electrical data

Power supply for sensor	24 V -20 +10% VDC (PELV) [1]	
Power supply for actuator	24 V -20 +10% VDC (PELV) [1]	
Sensor power consumption [2] (at 24 V)	SCTMi with 4 NC ejectors SCTMi with 8 NC ejectors SCTMi with 16 NC ejectors SCTMi with 4 NO ejectors SCTMi with 8 NO ejectors SCTMi with 16 NO ejectors	66 mA 118 mA 219 mA 70 mA 128 mA 244 mA
Actuator power consumption [2] (at 24 V)	SCTMi with 4 NC ejectors SCTMi with 8 NC ejectors SCTMi with 16 NC ejectors SCTMi with 4 NO ejectors SCTMi with 8 NO ejectors SCTMi with 16 NO ejectors	83 mA 157 mA 293 mA 158 mA 298 mA 586 mA
Polarity reversal protection	Yes, all M12 connector connections	
NFC	NFC Forum Tag type 4	
IO-Link	IO-Link 1.1 Baud rate COM2 (38.4 Kbits/s)	

[1] The power supply must correspond to the regulations in accordance with EN60204 (protected extra-low voltage).

[2] Typical power consumption

3.2.1 IO link process data

Number of connected ejectors	Maximum cycle time	Input process data	Output process data
2 to 4	4.0 ms	5 bytes	3 bytes
5 to 8	4.8 ms	6 bytes	4 bytes
9 to 12	5.4 ms	7 bytes	5 bytes
13 to 16	6.0 ms	8 bytes	6 bytes

3.2.2 Tested IO-Link master

Manufacturer	Type	Index
Phoenix	axl-e-pn-iol-m12-6p	HW/FW: 02/200
Balluff	BNI PNT508-105-Z015	H01 S1.0
Siemens	6ES7148 6JD00-0AB0	V 1.0.1
Beckhoff	EL6224	Rev.no.: 0020

The compatibility test was performed using an SCTMi with 8 NO ejectors and 8 NC ejectors.

3.3 Mechanical data

3.3.1 Performance data

The data is based on an ejector SCPSt:

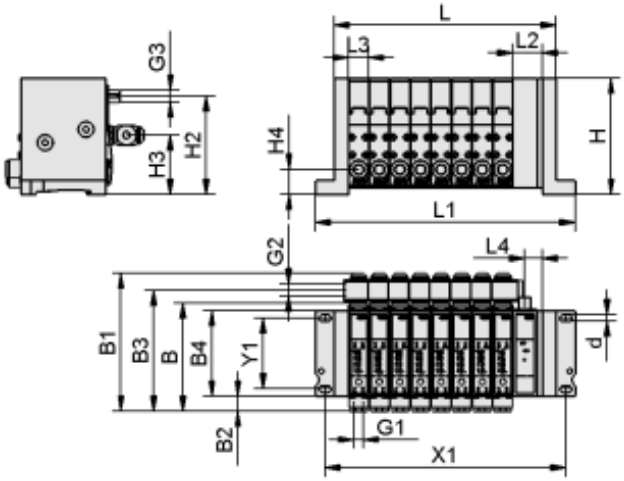
Type	Nozzle size	Max. vacuum[1]	Suction rate[1]	Blow-off air consumption[1]	Air consumption[1]
	mm	%	l/min	l/min	l/min
SCPS-07	0.7	85	16	120	22
SCPS-10	1.0	85	36	120	46
SCPS-15	1.5	85	65.5	120	98
SCPS-2-07	2-07	85	37	120	22
SCPS-2-09	2-09	85	49.5	120	40.5
SCPS-2-14	2-14	85	71.5	120	82

[1)] At 4 bar

Type		Sound level[1]	
		Unobstructed suction	Picked up
		dBA	dBA
SCTMi with 2 ejectors	(07 to 15)	75 to 82	66 to 77
SCTMi with 4 ejectors	(07 to 15)	77 to 84	68 to 79
SCTMi with 8 ejectors	(07 to 15)	78 to 85	70 to 81
SCTMi with 16 ejectors	(07 to 15)	81 to 83	70 to 78
Individual ejector SCPS-07		63	58
Individual ejector SCPS-10		73	60
Individual ejector SCPS-15		73	65
Individual ejector SCPS-2-07		63	58
Individual ejector SCPS-2-09		73	60
Individual ejector SCPS-2-14		75	65

[1)] At 4 bar

3.3.2 Dimensions

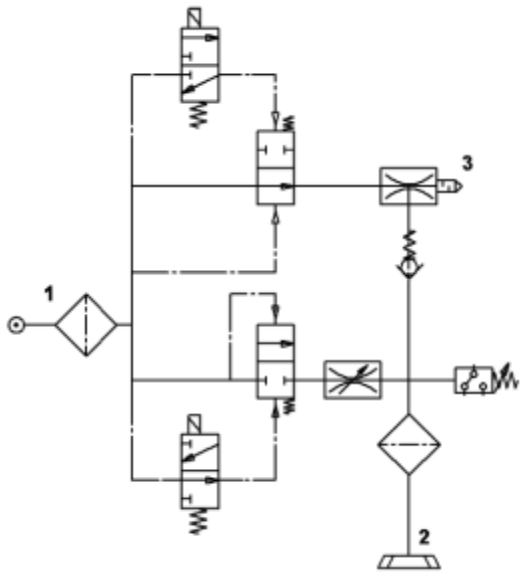
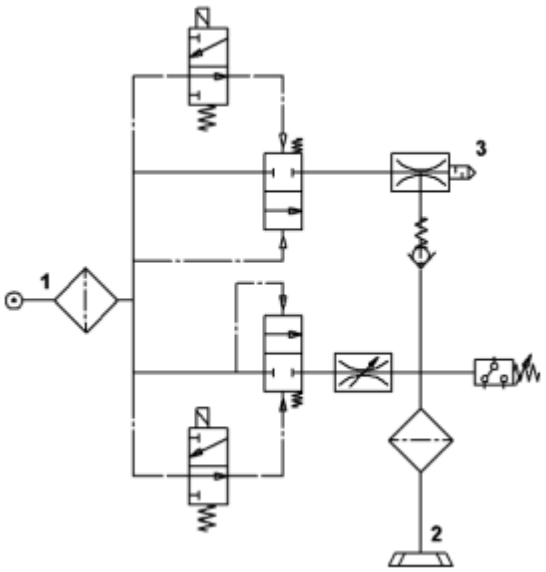
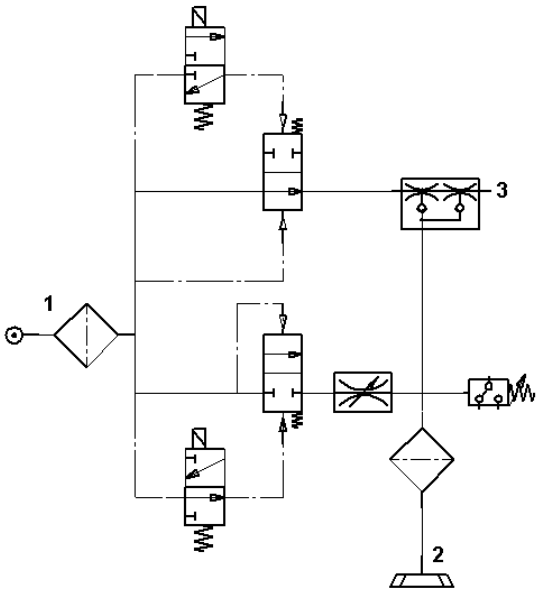
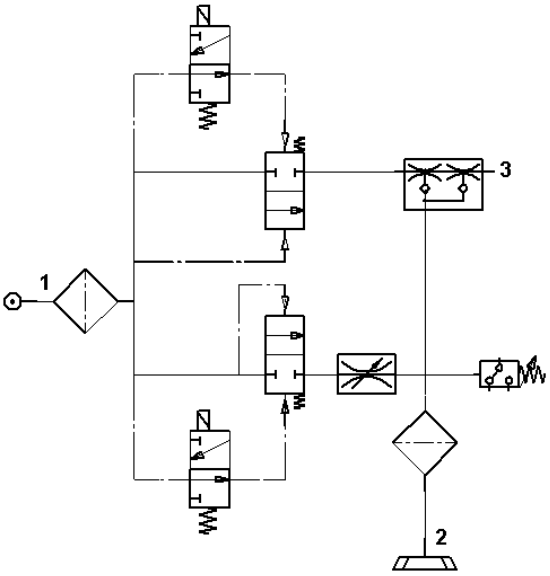


Type[1]	L	L1	L2	L3	L4	B	B1	B2	B3	B4	H
SCTMi-IOL (2)	89.2	123.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (3)	107.7	141.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (4)	126.2	160.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (5)	144.7	178.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (6)	163.2	197.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (7)	181.7	215.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (8)	200.2	234.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (9)	218.7	252.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (10)	237.2	271.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (11)	255.7	289.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (12)	274.2	308.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (13)	292.7	326.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (14)	311.2	345.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (15)	329.7	363.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi-IOL (16)	348.2	382.2	27	18.5	16	97.5	125	13.5	109	77	105

Type[1]	H2	H3	H4	d	X1	Y1	G1	G2	G3	m(g)[2]
SCTMi-IOL (2)	89	54	22.5	5.5	108	64	G1/8" fem	G1/4" fem	M12×1, male	700
SCTMi-IOL (3)	89	54	22.5	5.5	125	64	G1/8" fem	G1/4" fem	M12×1, male	910
SCTMi-IOL (4)	89	54	22.5	5.5	143	64	G1/8" fem	G1/4" fem	M12×1, male	1120
SCTMi-IOL (5)	89	54	22.5	5.5	162	64	G1/8" fem	G1/4" fem	M12×1, male	1330
SCTMi-IOL (6)	89	54	22.5	5.5	180	64	G1/8" fem	G1/4" fem	M12×1, male	1540
SCTMi-IOL (7)	89	54	22.5	5.5	199	64	G1/8" fem	G1/4" fem	M12×1, male	1750
SCTMi-IOL (8)	89	54	22.5	5.5	217	64	G1/8" fem	G1/4" fem	M12×1, male	1960
SCTMi-IOL (9)	89	54	22.5	5.5	236	64	G1/8" fem	G1/4" fem	M12×1, male	2170
SCTMi-IOL (10)	89	54	22.5	5.5	254	64	G1/8" fem	G1/4" fem	M12×1, male	2380
SCTMi-IOL (11)	89	54	22.5	5.5	273	64	G1/8" fem	G1/4" fem	M12×1, male	2590
SCTMi-IOL (12)	89	54	22.5	5.5	291	64	G1/8" fem	G1/4" fem	M12×1, male	2800
SCTMi-IOL (13)	89	54	22.5	5.5	310	64	G1/8" fem	G1/4" fem	M12×1, male	3010
SCTMi-IOL (14)	89	54	22.5	5.5	328	64	G1/8" fem	G1/4" fem	M12×1, male	3220
SCTMi-IOL (15)	89	54	22.5	5.5	347	64	G1/8" fem	G1/4" fem	M12×1, male	3430
SCTMi-IOL (16)	89	54	22.5	5.5	365	64	G1/8" fem	G1/4" fem	M12×1, male	3640

All specifications in mm [1] (2 to 16) Numbers correspond to the number of fitted ejectors [2] With compressed air distributor

3.3.3 Pneumatic circuit plans

SCPS...NO...	SCPS...NC...
	
SCPS 2...NO...	**SCPS 2...NC...**
	

3.4 Factory settings

The factory settings relate to the particular SCTMi ejector.

ISDU Dec	Parameter	Value	Description
100	H1 switching point	750 mbar	
101	h1 hysteresis	150 mbar	
102	H2 switching point	550 mbar	
103	h2 hysteresis	10 mbar	
106	Blow-off pulse duration	100 ms	
107	Permitted evacuation time	500 ms	
108	Permitted leakage	100 mbar/s	
109	Control function	0x02	Control active
110	Blow-off mode	0x00	Externally controlled

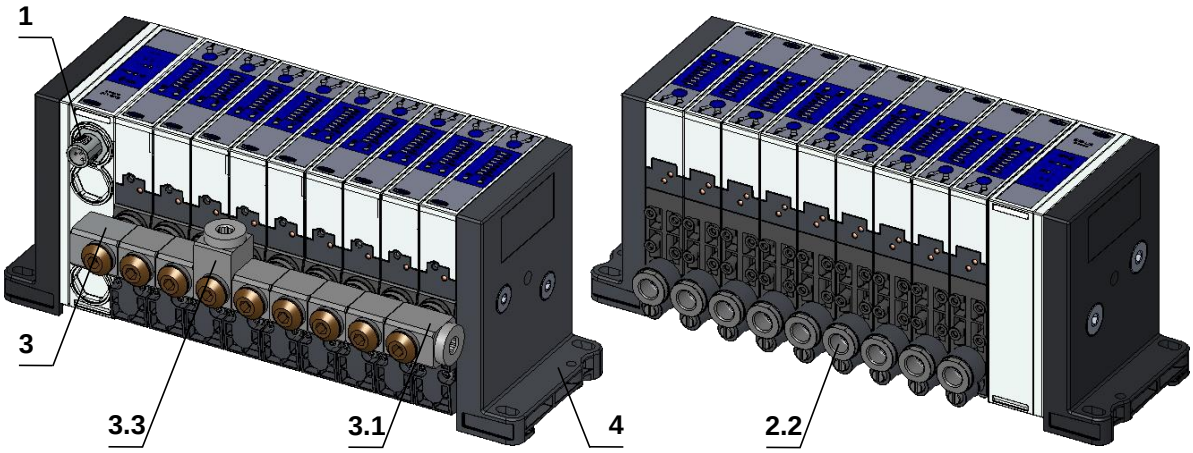
4 Transport, installation and start of operations

4.1 Transport

The compact terminal SCTMi is delivered in cardboard packaging. The packaging must be reused to safely transport the terminal at a later stage.

Retain the packaging!

4.2 Mounting



Item	Description	Max. tightening torque
1	M12 electrical connection	Hand-tight
2.2	1/8"-thread vacuum connection	2 Nm
3	1/4"-thread compressed air connection	2 Nm
3.1	1/4"-thread alternative compressed air connection	2 Nm
3.3	1/4"-thread alternative compressed air connection	2 Nm
4	End plate	

The SCTMi is mounted via the two lateral end plates using M5 screws and washers with max. 4 Nm (not included in delivery).

4.3 Pneumatic connection

CAUTION

Noise pollution due to incorrect installation of the pressure and vacuum connections

Hearing impairments may occur in the long term

- ► Correct installation
- ► Wear ear protectors

CAUTION

Connected devices may explode due to pressure
Connected devices may implode due to vacuum power

Damage from flying or aspirated parts

- ► Wear eye protection
- ► Wear ear protectors

- Use only well-maintained compressed air (air or neutral gas, filtered 5 µm, oiled or unoiled).
- High quality compressed air is important for the prolonged service life of the ejector.
- Dirt particles or foreign bodies in the ejector connections, hoses or pipelines can lead to partial or complete ejector malfunction.
- Hoses and pipelines should be laid as short as possible.
- Insufficient compressed air is supplied if the internal diameter on the compressed air side is too small. This prevents the ejector from performing as specified in its defined performance data.
- Excessive flow resistance occurs if the internal diameter on the vacuum side is too small. This leads to both a reduction in suction capacity and increased evacuation times. Blow-off times are also lengthened.
- Hose lines must be laid without bends or crimps.
- Only use the hose or pipe internal diameters recommended for the ejector. If this is not possible, use the next largest diameter.

Plug any unneeded vacuum connections to reduce noise and prevent foreign objects from being sucked up.

4.3.1 Recommended line cross sections (internal diameters)

SCPS performance class	Cross section, compressed air-side		Cross section, vacuum-side
	2 to 8 ejectors	9 to 16 ejectors	
07	7	9	4
10	7	9	4
15	7	9	6
2-07	7	9	4
2-09	7	9	4
2-14	7	9	6

[1)] based on a maximum hose length of 2 m. For larger hose lengths, larger cross sections are to be chosen accordingly!

If the recommended line cross section is too large due to the cable routing (e.g. an energy chain or robot flange), the additional compressed air connections are available for smaller cross sections.

4.4 Electrical connection

DANGER

Moving systems/parts throughout the production facility during set-up at the workplace

Death or very serious injury/material damage

- ► Do not enter the danger zone when the system is operational.

DANGER

Risk of fire and explosion

Death or very serious injury

- ► The SCTMi must not be used in environments where there is a risk of explosion.

CAUTION

The output signals can change when the power supply is switched on or a plug connector is plugged in.

Serious personal injury and/or damage to property

- ► The electrical connection must be carried out only by persons who are able to assess the impact of signal changes on the overall machine, facility or system.

ATTENTION

Inappropriate voltage supply

Destruction of switch

- ► Only operate the switch using power supply units with protected extra-low voltage (PELV)
- ► The system must incorporate safe electrical cut-off of the power supply in compliance with EN60204
- ► Do not connect or disconnect the plug connectors when voltage is applied

The SCTMi can be operated only via IO-Link communication. To do so, corresponding hardware components are required (IO-Link master).

The SCTMi is designed to supply sensors and actuators with potential separation. It is electrically connected using a 5-pin M12 connector with a pin assignment that corresponds to the IO-Link specification for class B ports.

ATTENTION

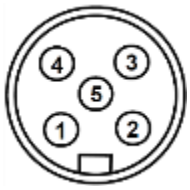
Incorrect connection with the IO-Link class B port

Poss. damage to the IO-Link master or periphery

- ► When operating the IO-Link class A switch with an IO-Link master with a class B port, ensure compliant connection and potential separation.

The maximum length of the electrical supply line is 20 meters in accordance with the IO-Link specification.

4.4.1 Pin assignment of M12 connector for IO-Link class B

M12 connector	Pin	Symbol	Wire color[1)]	Function
	1	U_S	Brown	Power supply for sensor
	2	U_A	White	Power supply for actuator
	3	GND_S	Blue	Sensor ground
	4	C/Q	Black	IO-Link
	5	GND_A	Gray	Actuator ground

1) When using a Schmalz connection line (see accessories)

4.5 Start of Operations

When connecting the SCTMi, the supply voltage for the sensors (U_S) and the C/Q communication cable must be directly connected to the connections of an IO-Link master. A separate port on the master must be used for each SCTMi. Several C/Q wires cannot be connected to just a single IO-Link master port.

The supply voltage for the actuators can also be supplied separately.

Using an IO-Link class B master enables the 1:1 connection of the master port and SCTMi with a single 5-pin connection cable.

The process data width changes depending on the number of SCTMi ejectors. There is a suitable IODD for up to 4, 8, 12 or 16 ejectors for each implementation.

The IO-Link master must be connected in the configuration of the automation system in the same way as other fieldbus components. The necessary device description data (IODD) for the SCTMi can be downloaded from our website www.schmalz.com.

5 Interfaces

5.1 IO-Link

IO-Link communication is used to control the entire SCTMi, set all of the parameters and provide a wide variety of measurement and analysis data.

The IO-Link communication takes place using cyclical process data and acyclical ISDU parameters.

5.1.1 Process data

You use the cyclical process data to control the ejectors and receive the latest information reported back from the SCTMi. There is a difference between the SCTMi output data (Process Data In) and the controlling input data (Process Data Out).

Process Data In

“Process Data In” is used to report a wide variety of information cyclically.

- The SCTMi “Device Status” in the form of a status traffic light
- EPC data
  - Errors and warnings for the overall system and the individual ejectors
  - Sensor voltage, actuator voltage, total air consumption
  - Information for individual ejectors such as the vacuum, evacuation time, dynamic pressure and air consumption of the individual ejector
- The switching values H1 and H2 for all of the connected ejectors

Process Data Out

“Process Data Out” is used to control the SCTMi and the individual ejectors cyclically.

- “Device Select” is used to select who is to send the EPC data
- “EPC Select” is used to define which data is sent
- To determine the air consumption, the system pressure can be preset
- All of the ejectors are controlled using the suction and blow-off commands

The exact meaning of the data and functions is described in more detail below in the “Description of functions” chapter. You can find a detailed diagram of the process data in the data dictionary and IODD.

The process data width changes depending on the number of SCTMi ejectors. There is a suitable IODD for up to 4, 8, 12 or 16 ejectors for each implementation.

5.1.2 ISDU parameters

More precise information regarding the system status can also be retrieved using the acyclical communication channel (or ISDU parameters).

Within the framework of the ISDU channel, all of the settings (e.g. control thresholds, switching points, permitted leakage, and so on) for the SCTMi are read or overwritten. More detailed information about the identity of the SCTMi, such as the part number and serial number, can be retrieved via IO-Link. The SCTMi also provides memory for user-specific information, which means that, for example, it is possible to save an installation or storage site.

The exact meaning of the data and functions is described in more detail below in the “Description of functions” chapter. You can find a detailed diagram of the process data in the data dictionary and IODD.

5.1.3 Configuration server

Since revision 1.1, the IO-Link protocol has contained an automated process for transferring data when a device is replaced. For this data storage mechanism, the IO-Link master mirrors all setting parameters for the device in a separate non-volatile memory. When a device is swapped for a new one of the same type, the setting parameters for the old device are automatically saved in the new device by the master.

For this to work with the SCTMi, it must be operated on a master with IO-Link revision 1.1 or higher and the data storage feature must be activated in the configuration of the IO-Link port.

A detailed description of the data storage mechanism cannot be provided here; however, note the following practical information:

- To ensure that data is transferred in the correct direction when a device is replaced, it must be ensured that the new device is restored to the factory settings before it is connected to the IO-Link master. This can be done at any time using the function for restoring the factory settings, for example, via the operating menu.
- The device parameters are automatically mirrored in the master when the device is configured using an IO-Link configuration tool.
- Changes to the parameters made in the user menu on the device or via NFC are automatically mirrored in the master.
- Changes to the parameters made by a PLC program using a function module are **not** automatically mirrored in the master. In this case, mirroring can be triggered manually by executing ISDU write access to the “System Command” parameter (index 2) with the “ParamDownloadStore” command (numerical value 5) once all the required parameters have been changed.

The parameterization server function of the IO-Link master should be used to ensure that no data is lost when switching the bus module.

5.2 NFC

NFC (Near Field Communication) refers to a standard for wireless data transfer between different devices over short distances.

The SCTMi functions as a passive NFC tag that can be read by a reading device such as a smart phone or tablet. With the NFC applications by Schmalz, the information is displayed using a mobile website in the browser, therefore an app is not required. The reading device must only have NFC activated and be connected to the internet.

The reading distance is very short for NFC applications.

Find the position of the NFC antenna in the reading device used

For the optimum data connection between the reading device and the SCTMi, the reading device should be aligned as parallel to the upper side of the SCTMi as possible and the reading device antenna should be positioned toward the center of the SCTMi antenna.

When parameters of the SCTMi have to be changed via the IO-Link or NFC, it must be ensured that the power supply of the switch then remains stable for at least 3 seconds. Otherwise, it can result in data loss and the subsequent error E01.

Access to the SCTMi parameters via NFC also works when the supply voltage is not connected.

6 Description of functions

The SCTMi primarily consists of the IO-Link bus module and between 2 and 16 ejectors. Depending on the function, it refers to the IO-Link bus module or the individual ejector.

General SCTMi functions

Independently of the ejectors, the SCTMi IO-Link bus module has the following functions:

- Device identification
- System commands
- Access rights

Diagnostics and monitoring functions

A wide range of parameters and values are measured. They are made available via the process data and ISDU parameters and are used for further diagnostics.

- Determining various SCTMi system parameters
- Device status in the form of a system traffic light and detailed ISDU parameters
- Condition monitoring
- EPC values
- IO-Link events

Functions of the individual SCPSt ejectors

The functions described below relate to an SCTMi ejector and apply to the same extent for each individual ejector, regardless of the number of installed ejectors:

- Switching points for control and component checks
- Control functions
- Blow-off functions
- Evacuation time setting t1
- Setting for the permitted leakage
- Permanent and deletable counters for the suction cycles and switching frequency of the valves
- Manual mode

All modifiable parameter data (e.g. switching point settings) is saved in the bus module. When replacing an ejector, the previous data is loaded to the new ejector.

The parameterization server function of the IO-Link master should be used to ensure that no data is lost when switching the bus module.

A detailed description of the process data and all the device parameters can be found in the data dictionary, which can be downloaded together with the IODD as a ZIP archive from www.schmalz.com.

6.1 General SCTMi functions

6.1.1 Device identification

6.1.1.1 Device identity

The IO-Link protocol provides a range of identification data for compliant devices that can be used to uniquely identify a device copy. The SCTMi also includes more detailed identification parameters.
All of these parameters are ASCII character strings that adapt their length to the relevant content.

The following can be queried:

- Manufacturer's name and website
- Product series and exact type name
- Part number and development status
- Serial number and date of manufacture
- Version status of the hardware and firmware
- SCTMi type key

6.1.1.2 User-specific localization

The following parameters are available when saving user-specific information in every individual copy of the SCTMi.

- Identification of the installation location
- Identification of the storage location
- Identification of the device tags on the circuit diagram
- Installation date
- Geo-location
- Web link to the relevant IODD

The mentioned parameters are ASCII character strings with the maximum length given in the data dictionary. They can also be used for other purposes if necessary.

The “NFC web link” parameter is a special feature. This parameter must include a valid web address beginning with http:// or https:// and is automatically used as a web address for NFC read accesses. As a result, read accesses from smart phones or tablets are rerouted e.g. to an address in the company's own intranet or a local server.

6.1.2 System commands

System commands are processes predefined by IO-Link to trigger specific functions. They are controlled using a write access with a predefined value.

ISDU Dec	Parameter	Value Hex	Description
2	System command	0x05	Parameter upload to the IO-Link master
		0x82	Reset to factory settings
		0xA5	Calibration of the sensors of the ejectors
		0xA7	Reset of counters
		0xA8	Reset of the min./max. supply voltages

6.1.2.1 Parameter upload to the IO-Link master

This IO-Link system command is used to load all of the setting parameters for the SCTMi to the IO-Link master and save them there.

6.1.2.2 Resetting to factory settings

This function is used to reset all settings parameters for the ejector to the factory settings. Counter statuses, the zero-point adjustment of the sensor and the maximum and minimum values of the measurements are not affected by this function.

6.1.2.3 Zero-point adjustment of the sensors (calibration)

Since the sensors installed in the ejectors are subject to variants based on the manufacturing process, it is recommended to calibrate the sensors after the SCTMi is installed.

The vacuum connections of all of the ejectors must be ventilated to the atmospheric pressure before a zero-point adjustment can be made to the sensors.

This system command is used to calibrate the sensors of all of the ejectors.

A zero offset is only possible by a maximum of ±3% (FS) around the theoretical zero position.

The result of the calibration is reported by an IO-Link event.

6.1.2.4 Reset of counters

This IO-Link system command is used to delete the two deletable counters in each ejector.

This IO-Link system command is used to delete the two deletable counters (ISDU parameters 143 and 144) in each ejector.

6.1.2.5 Reset of the maximum and minimum values for supply voltages

The minimum and maximum values of the two supply voltages for the sensor and actuator are deleted.

6.1.3 Access rights

6.1.3.1 Extended Device Access Locks

In the extended device access locks parameter, there is the possibility to completely prevent NFC access or limit it to read-only function:

ISDU Dec	Parameter	Bit	Description
90	Extended device access locks	0	Parameters cannot be changed via NFC
		1	NFC tag completely switched off
		2	Firmware update for the ejectors is prevented
		3	Manual mode locked for the ejectors
		4	Prevention of creation of IO-Link events

The NFC lock using the extended device access locks parameter has a higher priority than the NFC PIN. That means that this lock also cannot be bypassed by entering a PIN.

6.1.3.2 PIN code for NFC write protection

The writing of changed parameters via NFC can be controlled using a separate PIN code. When delivered, the PIN code is 000 and a lock is therefore not active. The NFC PIN code can be changed using IO-Link.

When a PIN code is set between 001 and 999, the valid PIN must be entered for every subsequent write process using a mobile NFC device so that the SCTMi accepts the changes.

ISDU Dec	Parameter	Value	Description
91	PIN code	0	PIN code for NFC write protection

6.2 Diagnostics and monitoring functions

The SCTMi provides a variety of diagnostics and monitoring functions.

- Determination of the required system parameters
- Display of the device status through messages and status traffic lights
- Rapid provision of EPC data using the process data
- Condition monitoring
- Provision of IO-Link events

6.2.1 Determination of SCTMi system parameters

The following parameters are used for the system monitoring functions and are made available to the user as ISDU parameters. The values for the individual ejectors are constantly redetermined for each suction cycle.

ISDU Dec	**Description**
66	Sensor voltage: current level, minimum and maximum level
67	Actuator voltage: current, min, max.
148	Evacuation time t0 for ejector 1 to 16
149	Evacuation time t1 for ejector 1 to 16
156	Air consumption per cycle for ejector 1 to 16
160	Leakage for ejector 1 to 16
161	Dynamic pressure for ejector 1 to 16
164	Maximum vacuum reached per suction cycle for ejector 1 to 16

6.2.1.1 Operating voltage measurements

The U_S and U_A operating voltages that are currently applied on the SCTMi are measured.

In addition, the maximum and minimum U_S and U_A operating voltages that were measured since the last activation are logged by the SCTMi.

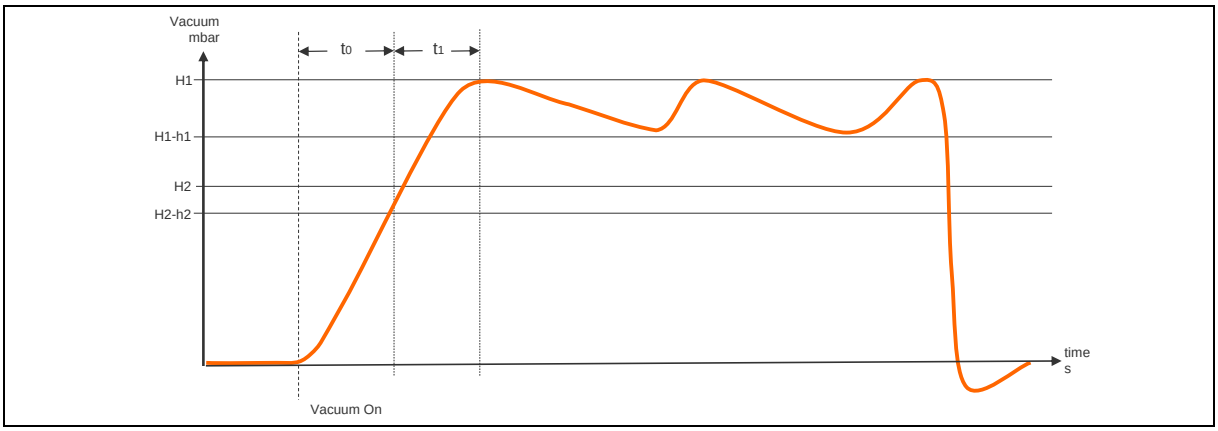
The maximum and minimum values can be reset via IO-Link during operation using the appropriate system commands.

6.2.1.2 Measurement of the evacuation time t_0

The time (in milliseconds) after the start of a suction cycle, which is started by the “Suction ON” command, until switching threshold H2 is reached is measured.

6.2.1.3 Measurement of the evacuation time t_1

The time (in milliseconds) after reaching the switching threshold H2 until the switching threshold H1 is reached is measured.



6.2.1.4 Measurement of air consumption

The actual air consumption of a suction cycle is calculated taking the system pressure and nozzle size into account.

The process data can be used to notified the ejector of the actual system pressure. If this is not available, the system operates with the optimum system pressure.

6.2.1.5 Measurement of leakage

The leakage (represented as the vacuum drop per time unit in mbar/s) after the control function interrupts the suction because switching point H1 was reached is measured.

6.2.1.6 Measurement of dynamic pressure

This measures the system vacuum achieved during unobstructed suction. The duration of the measurement is approx. 1 second. Therefore, to evaluate a valid dynamic pressure, uninterrupted suction is required for at least 1 second after starting the suction, i.e. the suction point must not be covered by a part.

Measured values below 5 mbar or above the switching point H1 are not regarded as valid dynamic pressure measurements and are rejected. The result of the last valid measurement is retained.

Measured values above the switching point (H2 - h2) but simultaneously lower than switching point H1 result in a condition monitoring event.

6.2.1.7 Maximum vacuum

In each suction cycle, the maximum system vacuum level reached is determined and made available as an ISDU parameter.

6.2.2 Device status

The current status of the SCTMi can be accessed and displayed in a variety of different ways.
System states, errors and warning messages are conveyed as follows:

- Using the cyclical “Process Data In”
- Using the standard IO-Link “Device Status” parameters
- Using the specific “Detailed Device Status” parameters
- The “Error Count” is used to count the number of errors since the last power-up
- Using the “Active Error Code” parameter
- Using condition monitoring events
- Using the “Extended Device Status,” which transmits the entire display of the device status with classification of the severity level of errors and warnings.
- The current NFC status is also displayed

6.2.2.1 Device status (process data)

The overall status of the ejector system is displayed as a traffic light in Process Data In. All warnings and errors are used to determine the status shown here.

This basic display provides immediate information about the status of the ejector with all its input and output parameters.

PD In Byte	**Parameter**	**State**	**Description**
0	Device status	00 (green)	System is working perfectly with optimal operating parameters
		01 (yellow)	SCTMi bus module is working but there are warnings.
		10 (orange)	The ejectors are working but maintenance is required.
		11 (red)	Error – Safe operation of the ejector within the operating limits is no longer ensured (Error code is available in the error parameter)

6.2.2.2 IO-Link device status

The ISDU parameters provide additional status traffic lights. The state of the SCTMi is displayed in 5 levels.

ISDU Dec	**Parameter**	**State**	**Description**
36	IO-Link device status	0 (green)	System is working properly
		1 (yellow)	Maintenance of ejectors required
		2 (orange)	SCTMi is working outside the permitted specifications
		3 (orange)	A functional check of the SCTMi is required
		4 (red)	Error – Safe operation of the ejector within the operating limits is no longer ensured

6.2.2.3 Extended system state

The category of the pending event code and the current event code (IO-Link event) itself are shown via the ISDU parameter 138 "Extended Device Status".

ISDU Dec	Parameter	Value Hex	Description
138	Extended Device Status – Event Category	0x10	System is working correctly
		0x21	Warning – Low
		0x22	Warning – High
		0x41	Critical state – Low
		0x42	Critical state – High
		0x81	Defect – Low
		0x82	Defect – High

For more information, see the chapter “IO-Link events.” There is also a detailed display in the IODD.

6.2.2.4 NFC status

The NFC data transmission status is transmitted as follows.

ISDU Dec	Parameter	Value Hex	Description
139	NFC status	0x00	Write process complete with correct data
		0x23	Write error: No write access
		0x30	Write error: Parameter outside the limit value
		0x41	Write error: Contradictory parameters
		0xA1	Write error: No authorization
		0xA2	No NFC connection
		0xA3	Write error: Incorrect data structure
		0xA5	Write process not complete yet
		0xA6	Internal NFC error

6.2.2.5 Error codes

The active error codes for the SCTMi and ejectors are comprised as follows:

ISDU Dec	Parameter	Bit	Description
130[1 to 16]	Ejector error code	0	Measurement range exceeded
130[17]	Bus module error code	0	Internal EEPROM error
		1	Internal bus error
		2	Undervoltage U_S
		3	Overvoltage U_S
		4	Undervoltage U_A
		5	Overvoltage U_A
		6	Supply pressure

For more information, see the chapter “Troubleshooting” (see 7.6)

6.2.3 Condition monitoring (CM):

Any condition monitoring events that occur during the suction cycle cause the system status light to immediately switch from green to yellow. The specific event that caused this switch can be seen in the “Condition Monitoring” IO-Link parameter.

ISDU Dec	Parameter	Bit	Description
146 [1…16]	Condition monitoring	0	Valve protection function activated
	Ejector 1 to 16	1	Set limit value t-1 for evacuation time exceeded
		2	Set limit value for leakage exceeded
		3	Threshold H1 was not reached
		4	Dynamic pressure > (H2 - h2) and < H1
		5	Manual mode activated
146 [17]	Condition monitoring	0	Sensor voltage outside the operating range
	IO-Link bus module	1	Actuator voltage outside the operating range
		2	Preset system pressure outside the operating range

Condition monitoring for the ejectors describes events that can only occur once per suction cycle. They are reset at the start of every suction cycle and remain stable until after suctioning has finished. Bit number 4, which describes excessive dynamic pressure, is initially deleted when the device is switched on and is only updated when a dynamic pressure value is detected again.

The condition monitoring events for the IO-Link bus module are permanently updated independently of the suction cycle and reflect the current values for the supply voltages and system pressure.

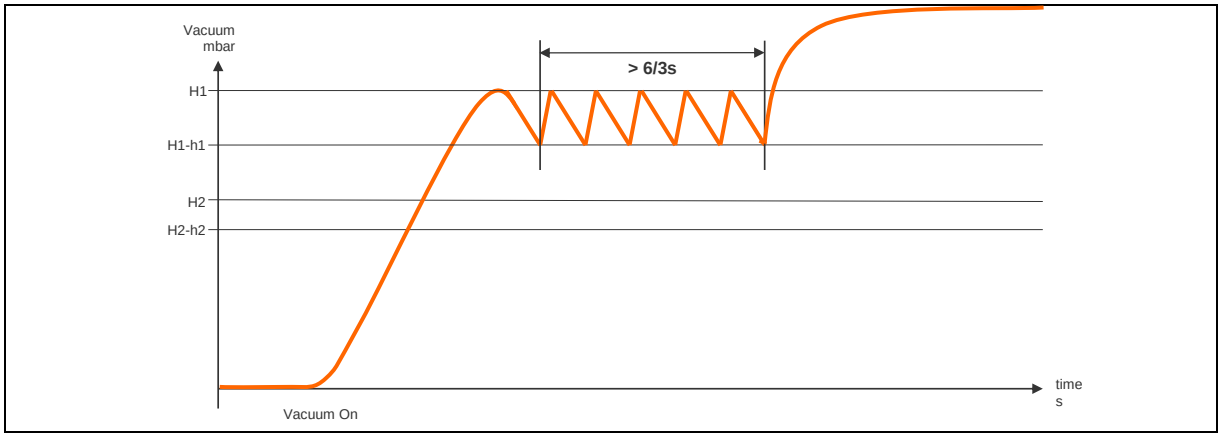
The measurement values for condition monitoring – the evacuation times t0 and t1 as well as the leakage area – are reset at the start of every suction cycle and updated at the point in time when they can be measured.

The CM data is displayed by EPC events in the process data.

6.2.3.1 Monitoring of the valve switching frequency

When the air saving function is activated and there is a high leakage level in the gripping system, the ejector switches between the suction and suction-off states very frequently. The number of valve switching procedures thus increases rapidly within a short time. To protect the ejector and increase its service life, the ejector switches the air saving function off automatically at a switching frequency of > 6 every 3 seconds and activates continuous suction (i.e. the ejector then remains in the suction state).

It also issues and warning and sets the corresponding condition monitoring bit.

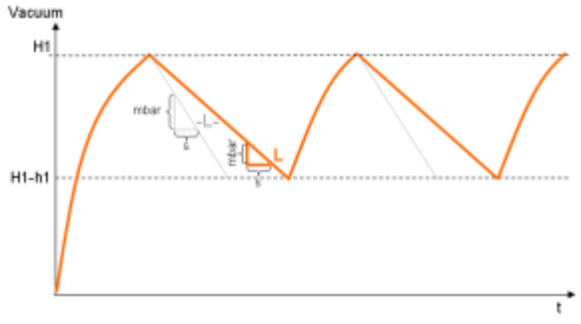
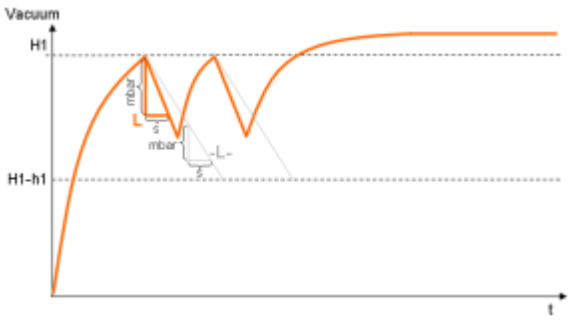


6.2.3.2 Monitoring the evacuation time

If the measured evacuation time t1 (from H2 to H1) exceeds the specified value, the “Evacuation time longer than t-1” condition monitoring warning is triggered and the system status light switches to yellow.

6.2.3.3 Leakage monitoring

In control mode, the loss of vacuum within a certain period is monitored (mbar/s). There are two possible statuses.

Leakage L < permitted value	Leakage L > permitted value
If the leakage is lower than the set value, the vacuum continues to fall until it reaches the switching point H1 - h1, and the ejector starts to suck again (normal control mode). The condition monitoring warning is not activated and there is no effect on the system status light.	If the leakage is higher than the value, the ejector readjusts immediately. If the permitted leakage is exceeded twice, the ejector switches to continuous suction. The condition monitoring warning is activated and the system status light switches to yellow.
	

6.2.3.4 Monitoring the control threshold

If the switching point H1 is never reached during the suction cycle, the “H1 not reached” condition monitoring warning will be triggered and the system status light will switch to yellow.

This warning is available at the end of the current suction phase and remains active until the next suction cycle.

6.2.3.5 Monitoring the dynamic pressure

If possible, a dynamic pressure measurement is taken at the start of every suction cycle. The result of this measurement is compared to the threshold points set for H1 and H2.

If the dynamic pressure is greater than (H2 - h2) but less than H1, the corresponding condition monitoring warning will be set and the system status light will switch to yellow.

6.2.3.6 Monitoring of the supply voltages

The SCTMi measures the level of the U_S and U_A operating voltages. The measured value can be read from the process data by IO-Link.

If the voltages are outside the valid range, the following status messages change:

- Device status
- Condition monitoring parameter
- IO-Link event is generated
- Bus module LED flashes

The SCTMi is not a voltage meter!

However, the measured values and the system responses derived from them provide a helpful diagnostics tool for condition monitoring.

If there are undervoltages, the valves are no longer activated and the ejectors return to their basic setting. NO ejectors switch to “Suction” mode. NC ejectors switch to “pneumatically OFF” mode If the ejector is in manual mode, it leaves manual mode.

A condition monitoring event is also generated If there is an overvoltage.

6.2.3.7 Evaluation of system pressure

The internal analysis functions on the ejectors sometimes require the system pressure with which the ejectors are operated. To make the results more precise, the actual pressure level can be communicated to the SCTMi via the IO-Link process data. If no level is specified, the optimum operating pressure is assumed for the calculations.

6.2.4 EPC values in the process data

To quickly and conveniently capture the most important results from condition monitoring [CM they are also made available via the process input data of the SCTMi.

The top 3 bytes of the process output data are also configured as a multifunctional data range, consisting of an 8 bit value (“EPC Value 1”) and a 16 bit value (“EPC Value 2”).

You use the Process Data Out “Device Select” to choose whether data for the SCTMi bus head (0) or the individual ejectors (1 to 16) is to be displayed. The content of this data that is currently supplied can be changed via the Process Data Out using the 2 “EPC-Select” bits.

EPC value 1

PD Out Device Select	**PD Out** EPC-Select	**PD In Byte 1** EPC Value 1	**EPC-Select Acknowledge**
0	00	Error (ISDU 130)	0
0	01	Warnings (ISDU 146)	1
1 to 16	00	Error (ISDU 130) for the selected ejector	0
1 to 16	01	Warnings (ISDU 146) for the selected ejector	1
1 to 16	11	Leakage in the last cycle for the selected ejector	1

EPC value 2

PD Out Device Select	**PD Out** EPC-Select	**PD In Byte 2+3** EPC Value 2	**EPC-Select Acknowledge**
0	00	Current sensor voltage U_S	0
0	01	Current actuator voltage U_A	1
0	11	Total air consumption in the last cycle	1
1 to 16	00	Vacuum of the selected ejector	0
1 to 16	01	Evacuation time t1 for the selected ejector	1
1 to 16	10	Last dynamic pressure for the selected ejector	1
1 to 16	11	Air consumption in the last cycle for the selected ejector	1

The switch is made depending on the structure of the automation system with some time delay. However, to ensure that the different pairs of values can be read efficiently through a controller program, the bit EPC-Select-Acknowledge is provided in the process input data. The bit always accepts the values shown in the table. To read out all EPC values, the procedure illustrated in the following diagram is recommended:

Always start with EPC-Select = 00 and create the selection for the next value pair required, e.g. EPC-Select = 01. Now wait until the bit EPC-Select-Acknowledge changes from 0 to 1. This signifies that the values transmitted match the selection created and they can be accepted by the controller.

Now, switch back to EPC-Select = 00 and wait until the bit EPC-Select-Acknowledge is reset to 0 by the SCTMi. The process for the next value pair, e.g. EPC-Select = 10, can then be performed in the same way, and so on.

6.2.5 IO-Link events

In accordance with the IO-Link specification, a variety of IO-Link events are provided by default.
These events include, for example:

- General system errors
- Voltage supply errors
- …

The SCTMi also generates system-specific IO-Link events such as:

- Vacuum calibration successful or failed
- Valve protection function activated
- H1 not reached
- Manual mode activated
- Various condition monitoring events
- …

The generated IO-Link events also correspond to the ID codes generated as “Extended Device Statuses” to a great extent.

A detailed description of all the IO-Link events can be found in the data dictionary, which can be downloaded together with the IODD as a ZIP archive from www.schmalz.com.

6.3 Functions of the individual SCPSt ejectors

6.3.1 Switching points

Two separate switching points can be set for the ejector. Each switching point has an activation point and a corresponding hysteresis. The system vacuum is constantly compared to the set values for the switching points during operation.
An LED displays when the switching point for H2 is reached.

The set values for H2 must be lower than the values for H1. The exact conditions for the settings are provided in the SCTMi data dictionary.

ISDU Dec	Parameter	Description
100	H1 for ejector 1 to 16	Control switching point
101	h1 for ejector 1 to 16	Hysteresis of control switching point
102	H2 for ejector 1 to 16	Switching point for component check
103	h2 for ejector 1 to 16	Hysteresis of switching point for component check

6.3.1.1 System vacuum evaluation

Once the system vacuum reaches the value for H2, the following responses are triggered:

- The process data bit for H2 is set
- The H2 LED in the display illuminates

Once the system vacuum reaches the value for H1, the following responses are triggered:

- Depending on the selected control function, vacuum generation is interrupted
- The process data bit for H1 is set

6.3.2 Control functions

With this function, the ejector allows you to save compressed air or prevent a too powerful vacuum from being generated. Vacuum generation is interrupted once the configured switching point H1 is reached. If leakage causes the vacuum to fall below the hysteresis switching point (H1 - h1), vacuum generation resumes.

The following control function operating modes can be selected:

ISDU Dec	Parameter	Value Hex	Description
109	Control mode for ejector 1 to 16	0x00	No control function, H1 in hysteresis mode
		0x01	No control function, H1 in comparator mode
		0x02	Control function activated
		0x03	Control function activated, leakage measurement activated
		0x04	Control function activated, no continuous suction
		0x05	Control function activated, leakage measurement activated, no continuous suction

6.3.2.1 No control (continuous suction), H1 in hysteresis mode

The ejector produces continuous suction with maximum power.

The switch point evaluation for H1 is operated in hysteresis mode.

6.3.2.2 No control (continuous suction), H1 in comparator mode

The ejector produces continuous suction with maximum power.

The switch point evaluation for H1 is operated in comparator mode (window mode).

6.3.2.3 Control

The ejector switches off vacuum generation when the switching point H1 is reached and switches it back on when the vacuum falls below the hysteresis point (H1 - h1). The switch point evaluation for H1 follows the control function.

To protect the ejector, valve switching frequency monitoring is activated in this operating mode.

If the readjustment is too fast, the control function is deactivated and the device switches to continuous suction.

6.3.2.4 Control with leak monitoring

This operating mode is the same as the previous mode, with the addition that the leakage rate within the system is measured and compared to the configurable limit value. If the actual leakage rate exceeds the limit value more than twice in succession, the control function is then deactivated and the ejector switches to continuous suction.

6.3.2.5 Control function, without continuous suction

This operating mode is the same as the “Control” operating mode but it does not switch to continuous suction when the valve switching frequency is exceeded.

When the control shutoff is deactivated, the suction valve makes frequent adjustments. This may destroy the ejector.

6.3.2.6 Control function with leakage monitoring, without continuous suction

This operating mode is the same as the “Control function with leakage monitoring” operating mode, but the device does not switch to continuous suction when the permitted leakage is exceeded or when the valve switching frequency is exceeded.

When the control shutoff is deactivated, the suction valve makes frequent adjustments. This may destroy the ejector.

6.3.3 Blow-off modes

The ejector provides 3 blow-off modes for selection.

ISDU Dec	Parameter	Value Hex	Description
110	Blow-off mode for ejector 1 to 16	0x00	Externally controlled blow-off
		0x01	Internally time-controlled blow-off
		0x02	Externally time-controlled blow-off

6.3.3.1 Externally controlled blow-off

The ejector switches to blow-off mode for as long as the blow-off signal is present.

The blow-off signal is given priority over the suction signal.

6.3.3.2 Internally time-controlled blow-off

After the suction signal is switched off, the ejector switches to blow-off mode automatically for the set time. With this function, the blow-off signal does not have to be additionally controlled.

The blow-off signal is given priority over the suction signal.
This applies even when the set blow-off time is very long.

6.3.3.3 Externally time-controlled blow-off

The blow-off starts with the blow-off signal and is performed for the set time period. Applying the blow-off signal for a longer time does not lead to a longer blow-off period.

The blow-off signal is given priority over the suction signal.
This applies even when the set blow-off time is very long.

6.3.4 Setting for the permitted evacuation time t_1

Here, you set the permitted evacuation time t1 in milliseconds. The measurement starts when the switching threshold H2 is reached and ends when the switching threshold H1 is fallen below.

ISDU Dec	Parameter	Description
107	Permitted evacuation time	Time from H2 to H1

6.3.5 Setting for the permitted leakage

The permitted leakage is set in mbar/s. The leakage after the control function interrupts the suction because switching point H1 was reached is measured.

ISDU Dec	Parameter	Description
108	Permitted leakage	Leakage after reaching H1

6.3.6 Counters

Each ejector has two internal counters that cannot be deleted and two internal counters that can be deleted.

ISDU Dec	Description
140	Counter for suction cycles (suction signal)
141	Counter for suction valve switching frequency
143	Counter for suction cycles (suction signal) – can be deleted
144	Counter for suction valve switching frequency – can be deleted

The deletable counters can be reset to 0 during operation via IO-Link using the appropriate system commands.

The non-volatile storage of the counter statuses only occurs every 256 steps. That means that when the operating voltage is switched off, up to 255 steps of the counter are lost.

6.3.7 Manual mode

CAUTION

The output signals may change during set-up in manual mode.

Severe injury to persons and damage to property due to uncontrolled machine movements

► The machine must be set up only by persons who are able to assess the impact of signal changes on the overall machine, facility or system.

In manual mode, the “Suction” and “Blow-off” ejector functions can be controlled independently of the higher-level controller using the button on the operating panel.

Because the valve protection function is deactivated in manual mode, this function can be used to locate and rectify leaks in the vacuum circuit.

The valve protection function is not active in manual mode.

Activating manual mode

To activate manual mode, you have to hold down the button on the ejector for at least 3 seconds. In this operating mode, the “Suction” and “Blow-off” LEDs both flash. The ejector is set to “pneumatically OFF.”

A prerequisite for activation is that the ejector must also have been in the “pneumatically OFF” state beforehand. Access is not possible from the suction or blow-off state.

Suction in manual mode

When you press the button again (falling edge), the ejector begins the suction process. The suction LED is on and the blow-off LED continues to flash.

Blow-off in manual mode

When you press the button again, the blow-off function is activated for as long as you hold down the button. The blow-off LED is on during this time. The suction LED flashes.

When you release the button, the ejector switches back to the “pneumatically OFF” setting.

When you press the button again, the suction is activated again.

Ending manual mode

To leave manual mode, you have to press down the button for more than 3 seconds when the device is in the pneumatically OFF state. The “Suction” and “Blow-off” LEDs stop flashing once you leave manual mode.

A signal change (suction, blow-off) via IO-Link also ends manual mode.

CAUTION

External signals may end manual mode automatically.
This can cause the object being handled to move due to suction or blow-off force.

Serious personal injury and/or damage to property

Unforeseen work steps

► There must be no people in the system danger area while it is in operation.

7 Maintenance and accessories

7.1 Maintenance

ATTENTION	
	**Maintenance work when voltage is applied** The SCTMi and SCPSt ejectors may be damaged ► Switch off the voltage supply

ATTENTION	
	**Loose screw connections** Damage from flying and aspirated parts ► Wear eye protection

7.1.1 Silencer

CAUTION	
	**Noise pollution due to operation of the ejectors with compressed air** Hearing impairments may occur in the long term ► Wear ear protectors ► Operate only with correctly fitted silencers

When the silencer is open, a heavy infiltration of dust, oil, and so on, may contaminate it and reduce the suction capacity as a result. If this happens, it must be replaced.

Cleaning the silencer is not recommended due to the capillary effect of the porous material.

7.1.2 Press-in screens

The vacuum and compressed air connections of the ejectors contain press-in screens. Dust, chippings and other solid materials may be deposited in these screens over time. If you notice that the performance of the ejectors has declined, simply replace the screens.

ATTENTION	
	**Operation of the ejectors without screens** Damage to ejectors due to the particles transported through the air line ► Only operate the ejectors with screens

7.2 Dirt

⚠ CAUTION	
	**Cleaning the SCTMi when voltage and/or compressed air is applied** Personal injury and/or damage to property ► Disconnect the SCTMi completely from the supply lines ► Secure the machine / plant / system so that it cannot be switched on again

- Remove dirt on the exterior of the device with a soft cloth and soap suds (max. 60°C). Ensure that the SCTMi is not soaked with soap suds.
- Ensure that no moisture can reach the electrical connection.
- Never use abrasive cleaning agents such as industrial alcohol, white spirit or thinners. Use pH 7-12 cleaning agent.

7.3 Warranty

This system is guaranteed in accordance with our general terms of trade and delivery. The same applies to spare parts, provided that these are original parts supplied by us.

We are not liable for any damage resulting from the use of non-original spare parts or accessories.

Wearing parts are not covered by the warranty.

7.4 Spare and wearing parts

ATTENTION

Replacing spare and wearing parts while voltage and/or compressed air is applied

This may result in damage to the SCTMi and the ejectors

► Switch off the voltage supply

The following list contains the primary spare and wearing parts.

Legend: - **S**pare part = **S**
- **W**earing part = **W**

Part no.	Designation	Legend
10.02.02.04141	Silencer insert	W
10.02.02.03376	Screen	S
10.02.02.04152	Insulating plate	W

When tightening the fastening screws on the silencer module, observe the maximum tightening torque of 0.5 Nm.

When you replace the silencer insert, we recommend that you also replace the insulating plate.

7.5 Accessories

Part no.	Designation	Note
10.02.02.00158	Connection cable	M12 5-pin to M12 5-pin connector, 1 m

7.6 Troubleshooting

Fault	Possible cause	Solution
No IO-Link communication	Incorrect electrical connection	Check electrical connection and pin assignment
	Master not correctly configured	Check configuration of the master to see whether the port is set to IO-Link
	IODD connection does not work	Check for the appropriate IODD. The IODD is dependent on the number of ejectors
No NFC communication	NFC connection between SCTMi and reader (e.g. cell phone) not clean	Hold the reader at the intended position on the switch
	NFC function on reader (e.g. cell phone) not activated	Activate the NFC function on the reader (e.g. cell phone)
	NFC via IO-Link deactivated	Activate NFC function
	Write operation canceled	Hold the reader at the intended position on the switch for longer
No parameters can be changed using NFC	PIN for NFC write protection activated via IO-Link	Release of the NFC write permissions via IO-Link
Ejectors are not responding	No actuator supply voltage	Check electrical connection and pin assignment
	No compressed air supply	Check the compressed air supply
Vacuum level is not reach or vacuum is created too slowly	Press-in screen in contaminated	Replace the screen
	Silencer is soiled	Replace silencer
	Leakage in hose line	Check hose connections
	Leakage at suction cup	Check suction cups
	Operating pressure too low	Increase operating pressure (observe the max. limits)
	Internal diameter of hose line too small	See recommended hose diameters
Payload cannot be held	Vacuum level too low	Increase the control range for the air saving function
	Suction cup too small	Select a larger suction cup

7.7 Error codes

If a recognized error occurs, this will be sent via IO-Link ISDU parameter 130 in the form of an error number.

The system status is automatically refreshed on the NFC tag every 5 minutes at the latest. That means that an error may be displayed via NFC even though it has already disappeared.

Error code Hex	**Fault**	**Possible cause**	**Solution**
0x01	Internal EEPROM error	Operating voltage was disconnected too quickly after changing the parameters, saving process was not complete	Reset to factory settings. Recording of a valid data set via IO-Link (with engineering tool)
0x02	Internal bus error	Internal bus was interrupted	Turn the power on again
0x03	Calibration error	Calibration was canceled when measurement value was too high or too low	Ventilate the vacuum circuit before performing the calibration
0x05	Undervoltage U_A	Actuator supply voltage is too low	Check power supply and power load
0x07	Undervoltage U_S	Sensor supply voltage is too low	Check power supply and power load
0x08	IO-Link error	Connection to master interrupted	Check the connection line, power up again
0x0F	Overvoltage U_A	Actuator supply voltage is too high	Check power supply
0x11	Overvoltage U_S	Sensor supply voltage is too high	Check power supply
0x12	Supply pressure	System pressure outside the permitted range	Check the supply pressure and specified value
0x15	Measurement range exceeded	The measurement range of at least one ejector was exceeded.	Check the pressure and vacuum sections of the system

You can find more detailed information in the “Device status” chapter (see 6.2.2)

8 Decommissioning

After being replaced or after final decommissioning, the complete SCTMi IO-Link is to be disposed of in accordance with the country-specific regulations.

ATTENTION	
	**Incorrect disposal of the SCTMi** Environmental damage ► Disposal according to country-specific regulations

8.1 Materials used

Component	Material
Housing	PA6-GF, PC-ABS
Inner components	Aluminum alloy, anodized aluminum alloy, brass, galvanized steel, stainless-steel, PU, POM
Silencer insert	Porous PE
Screws	Galvanized steel
Sealing	Nitrile rubber (NBR)
Lubrication	Silicone-free

9 Conformity Declaration

DE EG-Konformitätserklärung
EN EC- Declaration of Conformity
FR CE-Déclaration de conformité
ES Certificado de conformidad CE
IT Dichiarazione di conformità CE
NL CE Conformiteitsverklaring

Hersteller / Manufacturer/ Fabricant / Fabricante / Produttore / Fabrikant

J. Schmalz GmbH, Aacher-Str. 29, D - 72293 Glatten

Produktbezeichnung / Product name / Designation du produit /
Denominación del producto / Denominazione del prodotto / Beschrijving van de machine

Kompaktterminal der Serie / Compakt-Terminal, **SCTMi**

Erfüllte einschlägige EG-Richtlinien / Applicable EC directives met / Directives CE applicables respectées

2006/42/EG	Maschinenrichtlinie / Machinery Directive / Directive sur les machines / Directiva para máquinas / Direttiva macchine / Machinerichtlijn
2014/30/EU	Elektromagnetische Verträglichkeit / Electromagnetic Compatibility / Compatibilité électromagnétique / Compatibilidad electromagnética / Compatibilità elettromagnetica / Elektromagnetische compatibiliteit

Angewendete harmonisierte Normen / Harmonised standards applied / Normes d'harmonisation appliquées

EN ISO 12100	Sicherheit von Maschinen - Grundbegriffe, allgemeine Gestaltungsleitsätze - Risikobeurteilung / Safety of Machinery - Basic concepts, general principles for design – Risk assessment / Sécurité des machines - Notions fondamentales, principes généraux de conception - Appréciation du risque / Seguridad de máquinas - Principios generales de diseño - Evaluación del riesgo y reducción del riesgo / Sicurezza delle macchine - Principi generali di progettazione - Valutazione del rischio e riduzione del rischio / Veiligheid van machines - Algemene beginselen voor ontwerp - Risicobeoordeling en de risicoreductie
EN 61000-6-2	Elektromagnetische Verträglichkeit - Störfestigkeit / Electromagnetic Compatibility - Immunity / Compatibilité électromagnétique – Immunité / Compatibilidad electromagnética – Resistencia a interferencias / Compatibilità elettromagnetica – Immunità / Elektromagnetische compatibiliteit - immuniteit
EN 61000-6-4	Elektromagnetische Verträglichkeit - Störaussendung / Electromagnetic Compatibility - Emission / Compatibilité électromagnétique – Norme sur l'émission / Compatibilidad electromagnética – Emisión de interferencias / Compatibilità elettromagnetica – Norma generica sull'emissione / Elektromagnetische compatibiliteit - emissie

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Unterschrift, Angaben zum Unterzeichner / Signature, details of signatory / Signature, indications sur le soussigné / Firma y datos del firmante / Firma, dati concernenti il firmatario / Handtekening, omschrijving van de ondertekenaar

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