Operating instructions

Electrical Vacuum Generator GCPi

WWW.SCHMALZ.COM

EN-US · 30.30.01.03291 · 06 · 05/25

Translation of the original operating instructions

Note

The Operating instructions were originally written in German. Store in a safe place for future reference. Subject to technical changes without notice. No responsibility is taken for printing or other types of errors.

Published by

Contact

J. Schmalz GmbH

Johannes-Schmalz-Str. 1

72293 Glatten, Germany

T: +49 (0) 7443 2403-0

schmalz@schmalz.de

www.schmalz.com

Contact information for Schmalz companies and trade partners worldwide can be found at:

www.schmalz.com/salesnetwork

Contents

Index

1 Important Information

1.1 The technical documentation is part of the product

1. For problem-free and safe operation, follow the instructions in the documents.
2. Keep the technical documentation in close proximity to the product. The documentation must be accessible to personnel at all times.
3. Pass on the technical documentation to subsequent users.

⇨ Failure to follow the instructions in these Operating instructions may result in injuries!

⇨ Schmalz is not liable for damage or malfunctions that result from failure to heed these instructions.

If you still have questions after reading the technical documentation, contact Schmalz Service at:

www.schmalz.com/services

1.2 Note on Using this Document

J. Schmalz GmbH is generally referred to as Schmalz in this document.

The document contains important notes and information about the different operating phases of the product:

- Transport, storage, start of operations and decommissioning
- Safe operation, required maintenance, rectification of any faults

The document describes the product at the time of delivery by Schmalz and is intended for:

- Installers who are trained in handling the product and can operate and install it
- Technically trained service personnel performing the maintenance work
- Technically trained persons who work on electrical equipment

The displayed figures are only examples. Depending on the particular design, they can differ from the product.

1.3 Type Plate

The type plate is permanently attached to the product and must always be clearly legible.
It contains product identification data and important technical information.

The QR code enables access to the digital technical documentation for the product.

▸ For spare parts orders, warranty claims or other inquiries, have the information on the type plate to hand.

1.4 Symbols

This symbol indicates useful and important information.

✓ This symbol represents a prerequisite that must be met before an action is performed.

▸ This symbol represents an action to be performed.

⇨ This symbol represents the result of an action.

Actions that consist of more than one step are numbered:

1. First action to be performed.
2. Second action to be performed.

2 Fundamental Safety Instructions

2.1 Intended Use

The GCPi is designed to generate a vacuum for gripping and transporting objects when used in conjunction with suction cups.

Venting dispels the vacuum and the part is deposited.

The GCPi is operated using a higher-level control unit or as an individual unit (e.g. in the laboratory).

The GCPi can also be operated manually via the touchscreen.

"External devices," such as valves or vacuum switches, can also be connected to the GCPi.

Neutral, dry gases in accordance with EN 983 are approved as evacuation media. Neutral gases include air, nitrogen and inert gases (e.g. argon, helium and neon).

The product is built in accordance with the latest standards of technology and is delivered in a safe operating condition; however, hazards may arise during use.

The product is intended for industrial and commercial applications.

Intended use includes observing the technical data and the installation and operating instructions in this manual.

2.2 Non-Intended Use

Schmalz does not accept any liability for any direct or indirect losses or damages that result from using the product. This applies, in particular, to any use of the product that is not in accordance with the intended purpose and to any use that is not described or mentioned in this documentation.

In particular, the following are considered non-intended use:

- Use in potentially explosive atmospheres
- The product must not be operated in aggressive environments (e.g. ambient air containing solvent fumes).
- Applying suction to liquids.
- Transport and through-suction of potentially explosive materials
- Direct contact with perishable goods/food products
- Use in medical applications
- Suction of aggressive gases or media such as acids, acid fumes, bases, biocides, disinfectants or detergents is not permitted.

2.3 Personnel Qualification

Unqualified personnel cannot recognize dangers and are therefore exposed to higher risks!

The operating company must ensure the following points:

- The personnel must be commissioned for the activities described in these operating instructions.
- The staff must be at least 18 years of age and physically and mentally capable.
- The operating staff have been instructed in the operation of the product and have read and understood the operating instructions.
- Work on electrical equipment must be carried out only by qualified electrical specialists.
- Installation, maintenance, and repairs must be carried out only by specialists or by persons who can prove that they have undergone appropriate training.

Applicable for Germany:

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 employees must observe the relevant industry-specific rules and regulations.

2.4 Warnings in This Document

Warnings warn against hazards that may occur when handling the product. The signal word indicates the level of danger.

Signal word	Meaning
⚠ WARNING	Indicates a medium-risk hazard that could result in death or serious injury if not avoided.
⚠ CAUTION	Indicates a low-risk hazard that could result in minor or moderate injury if not avoided.
NOTE	Indicates a danger that leads to property damage.

2.5 Residual Risks

⚠ WARNING

Electric shock

Risk of injury

- Operate the product using a power supply unit with protected extra-low voltage (PELV).

⚠ WARNING

Extraction of hazardous media, liquids or bulk material

Personal injury or damage to property!

- Do not extract harmful media such as dust, oil mists, vapors, aerosols etc.
- Do not extract aggressive gases or media such as acids, acid fumes, bases, biocides, disinfectants or detergents.
- Do not extract liquids or bulk materials, e.g. granulates.

⚠ WARNING

Serious injuries due to improper mounting!

- Carry out mounting and removal only when the device is in an idle, depressurized state.
- Use only the connectors, mounting holes and attachment materials that have been provided.

⚠ CAUTION

Falling product

Risk of injury

- Securely attach the product at the site of operation.
- Wear safety shoes (S1) and safety glasses when handling and mounting/dismounting the product.

⚠ CAUTION

Vacuum close to the eye

Severe eye injury!

- Wear eye protection.
- Do not look into vacuum openings such as suction lines and hoses.

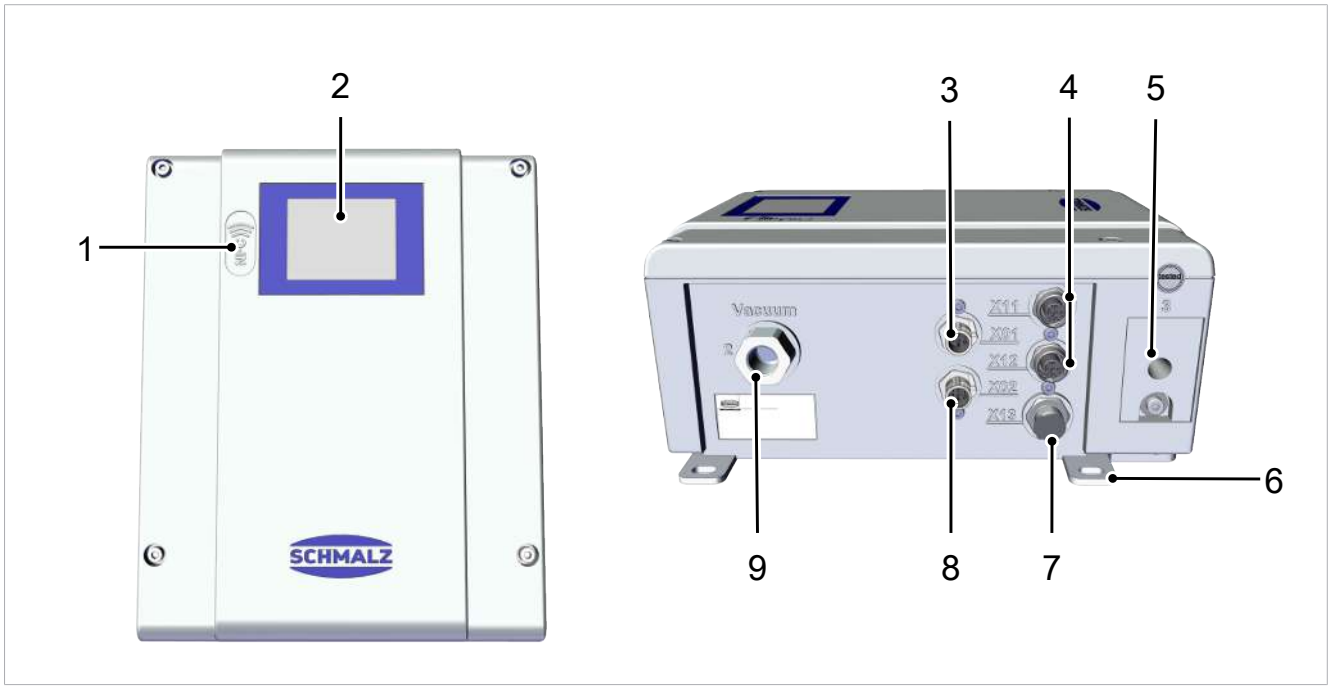
2.6 Modifications to the Product

Schmalz assumes no liability for consequences of modifications over which it has no control:

1. The product must be operated only in its original condition as delivered.
2. Use only original spare parts from Schmalz.
3. The product must be operated only in perfect condition.

3 Product Description

3.1 Design of the GCPi



1	Interface NFC	6	Mounting bracket, 4x
2	Touchscreen	7	Actuator power supply, M12 plug in L-coded design (marked with X13)
3	Class-A IO-Link, 5-pin M12 plug in A-coded design, power supply sensor (marked with X01)	8	Signal inputs (SIO) / actuator power supply for alternative actuator voltage feed; 5-pin M12 connector in A-coded design (marked with X02)
4	Connection of external devices, 5-pin M12 socket in A-coded design (marked with X11 and X12)	9	Vacuum connection (marked with number 2)
5	Exhaust air output / silencer	—	—

3.2 Touchscreen

The device is operated and all relevant information is displayed using the touchscreen (2).

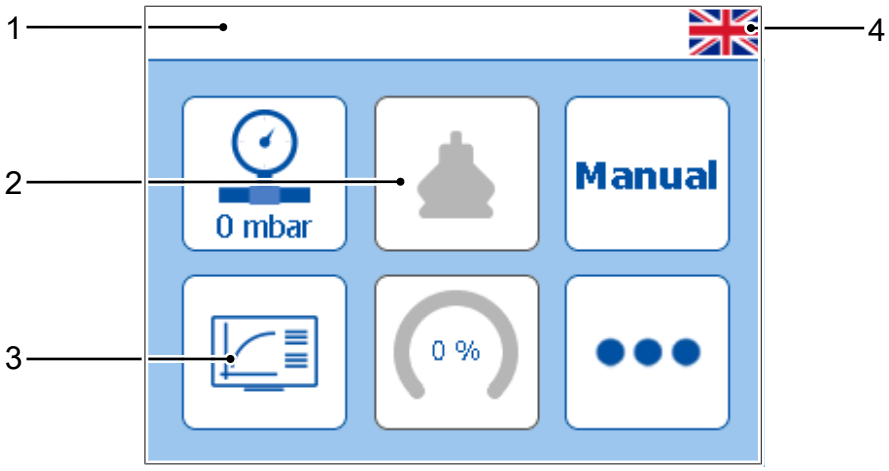
- Manual setting of various parameters
- Displaying operating data
- Manual operation
- Diagnostics in the event of error messages

3.2.1 Touch Gestures

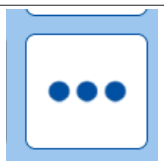
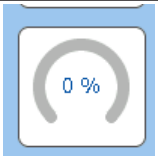
Touch gestures can be used to run applications and access the device's settings. Functions can be activated using specific touch gestures on the touchscreen.

Touch gesture	Action	Description
	Tap	▸ Tap a button to select it.
	Swipe left	• Scroll or define a number (e.g. set a new PIN code). • Position the slider (e.g. set the power of the pump).
	Swipe right	

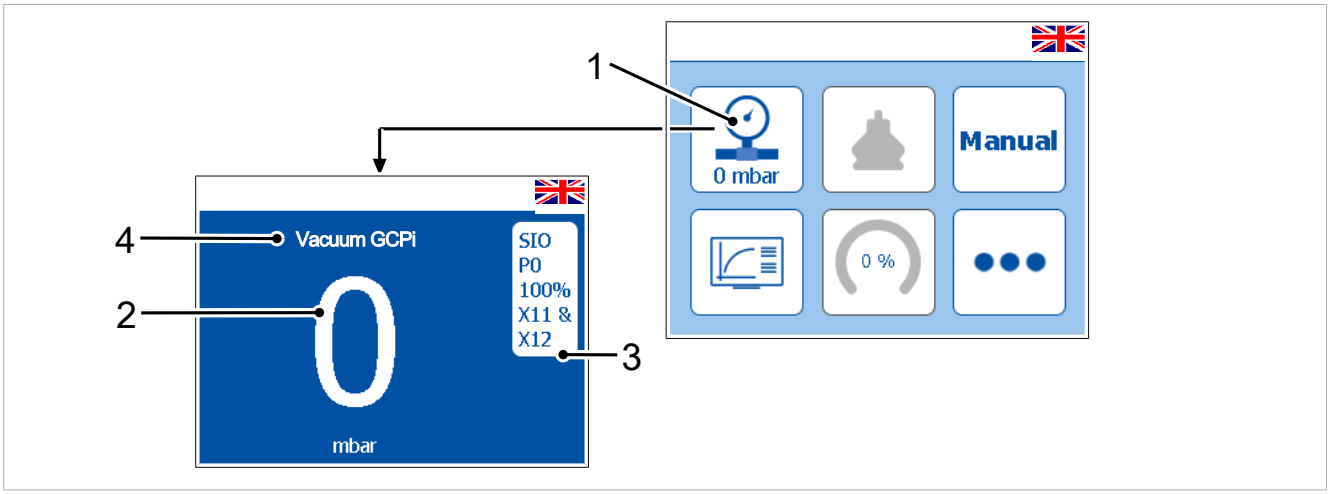
3.2.2 Start Screen or Main Menu



1	Status bar (active field)	3	Button (active field)
2	Icon (information field)	4	Language display (information field)

No.	Fields on the start screen	
Active fields		
1	Status bar	Displays: • Errors, red • Warnings, yellow A message appears: ▸ Tap on the text to get more information.
3		Current vacuum level
		Enable manual mode
		Enable graphical display Display the vacuum value of the GCPi and external devices over a period of time
		Other menus and information
Information fields		
2		Status display for vacuum values of the GCPi The proportion reached is shown as a percentage of SP1 in the center of the display. As a visual indication, the outer ring is filled to represent the vacuum value. Vacuum value: • Smaller than SP2, blue • Greater than SP2, green
		Suction/drop-off status display
4	Flag symbol	Indicates the language currently selected

3.2.3 Vacuum Display



- ▸ Tap the **[BUTTON]** indicated (1)
- ⇨ The screen changes to the vacuum display with the current vacuum value (2).

The displayed vacuum value and the background color depend on what is defined for parameter “SP2 selection/displayed vacuum value” 0x0059.

In automatic mode, the vacuum value of the GCPi is displayed here if no external device is connected.

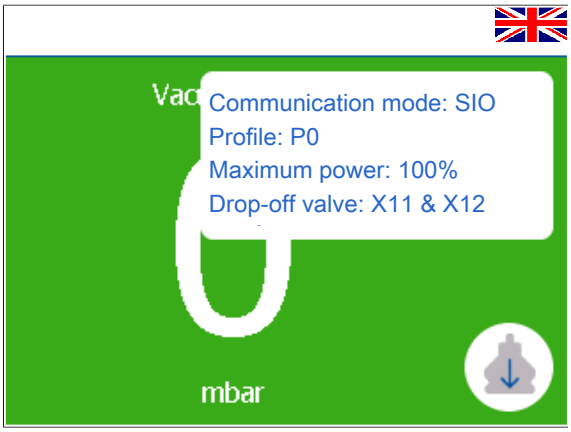
The label (4) indicates which vacuum value is displayed on both the start screen and the touchscreen in manual mode.

The key (3) on the right displays the following information at all times:

- The communication mode of the device (IO-Link or SIO)
- The active profile (P0 to P3) (> See ch. 6.16 Production Setup Profiles, p. 47)
- Maximum permitted pump capacity as a percentage (see parameter “Max. allowed power” 0x006F for profile 0)
- Which vent valves are activated when depositing products, GCPi / X11 / X12 (see parameter “Drop-off valve” 0x0056)

- ▸ Tapping on the white **[KEY FIELD]** (3) enlarges the display.

After 60 seconds, it changes back to its original size.



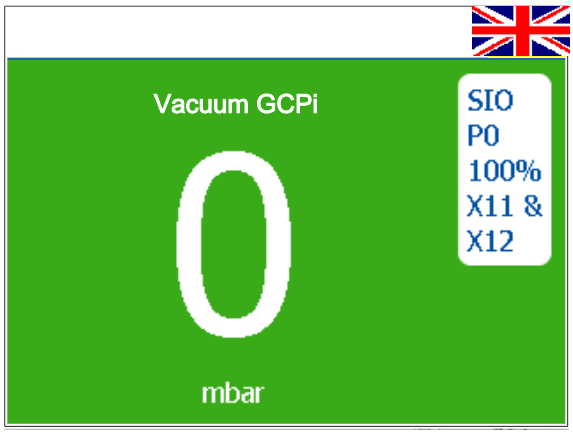
- ▸ Tap the touchscreen
- ⇨ Return to the start screen

If the device is active and the touchscreen is not operated within 60 seconds, the device automatically switches to the vacuum display view.

The following table shows other possible vacuum display screens:

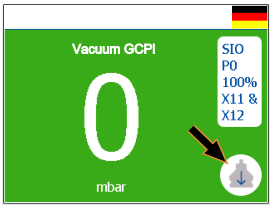
Current vacuum value in mbar
Blue background => current vacuum value < SP2 (i.e. no part picked up)

Current vacuum value in mbar
Green background => current vacuum value > SP2 (i.e. part is securely picked up)



Current vacuum value in mbar
Green background => current vacuum value > SP2

Use the icons at the bottom right to display the suction or drop-off functions.



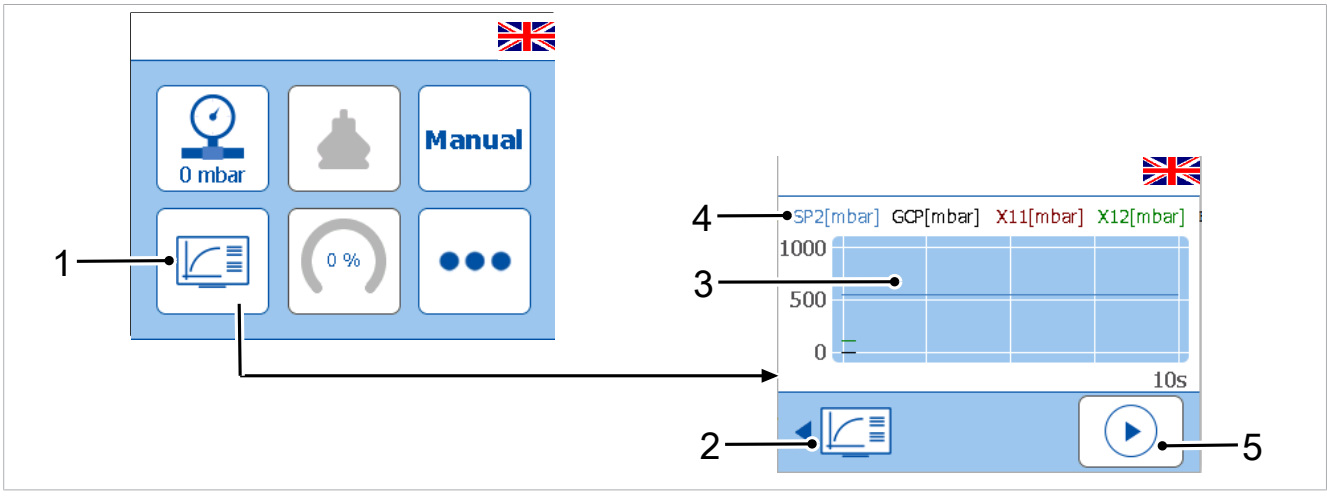
Current vacuum value in mbar
Orange background => warning

Red background => error
(> See ch. 6.14 Displaying Errors and Warnings, p. 44)

- Tap the text displayed in the header to get additional information about the message

After 60 seconds, the device automatically switches to the start screen.

3.2.4 Graphical Display



- Tap the **[BUTTON]** indicated (1)

⇨ The graphical display appears showing a diagram (3).

The graphical display shows a maximum of 4 values. These values are indicated in the key (4).

If external devices such as a VSi V or LQEi are connected to X11 or X12, they are also graphically displayed in the diagram.

If no external devices are connected, only the GCPi data and the SP2 value of the GCPi are displayed.

- By swiping to the left or right on the blue graphical display, you can set the time axis to show between 10 and 60 seconds.

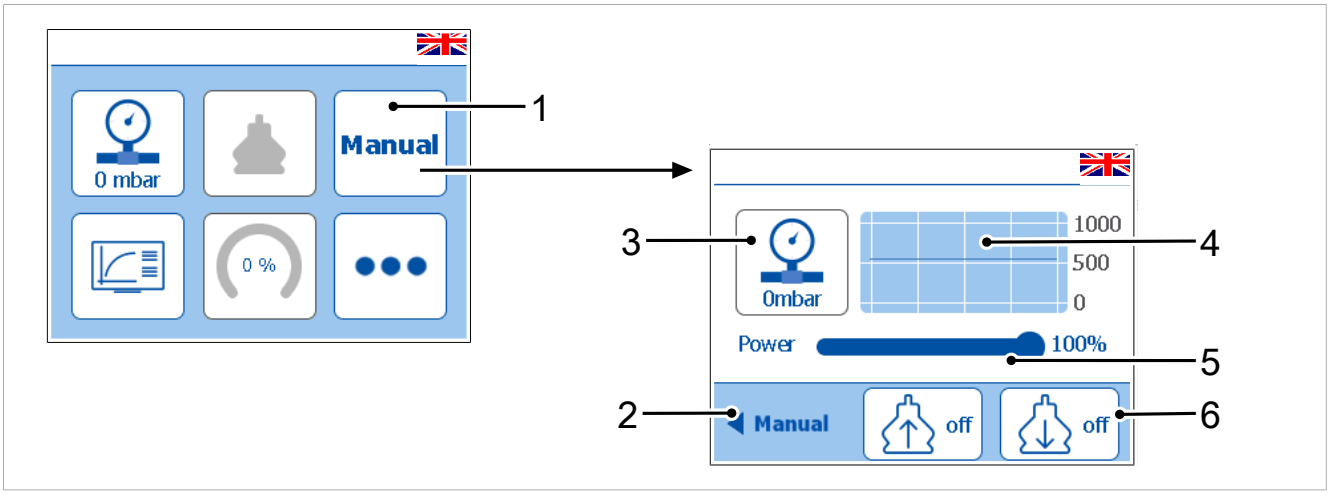
- Tapping on the **[PAUSE/PLAY BUTTON]** (5) stops or restarts the graphical display.

- Tapping on the **[BUTTON AT THE BOTTOM LEFT]** (2) takes you back to the start screen.

The graphical display is automatically restarted after reaching the end of the diagram.

When using this function, the touchscreen **does not** automatically switch to the vacuum display after 60 seconds.

3.2.5 Manual Mode



- Tap the **[MANUAL]** button (1).

⇨ The manual operation display is activated.

- Tap the **[MANUAL ARROW]** (2).

⇨ Return to the start screen

The current vacuum value (3) of the GCPi or of the external devices is displayed in the unit selected in the parameter “Display unit” 0x004A (default, [mbar]) (> See ch. 6.17.3 Unity of Vacuum Display, p. 49).

The suction and drop-off functions are activated or deactivated using the **[ACTION BUTTONS]** (6).

- Tap on the **[MIDDLE BUTTON]** to activate the suction function; tap again to deactivate the suction function.

⇨ When the GCPi reaches the limit value SP1, it goes into regulation.

- Tap on the **[RIGHT BUTTON]** to activate the drop-off function.
  The drop-off function is only enabled for the time that the button remains pressed.

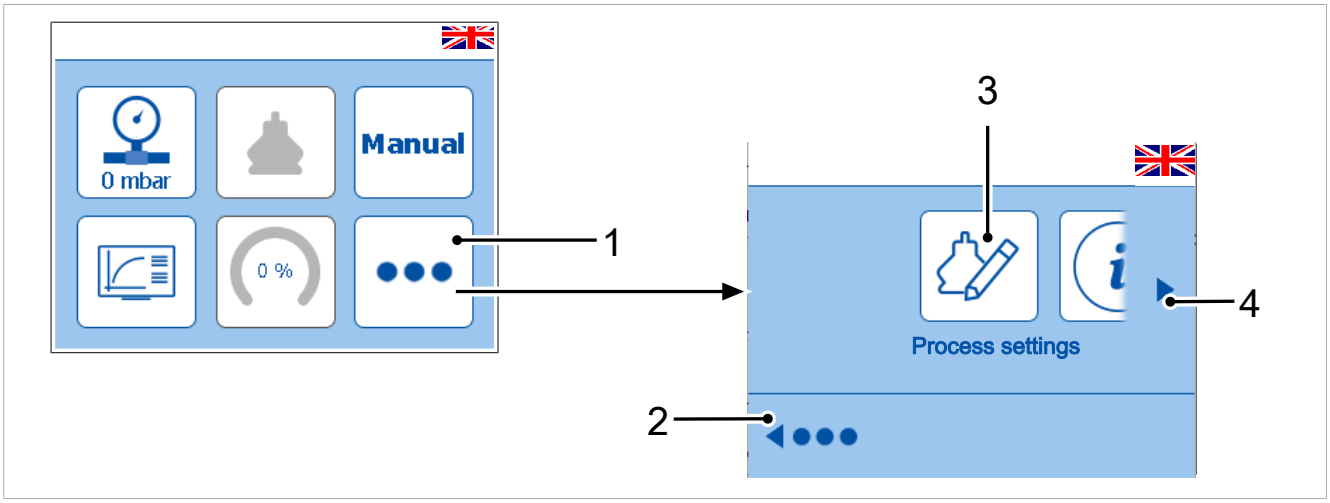
Adjust the power of the vacuum pumpPowerPowerPowerPower

- Tapping and sliding the **[POWER SLIDER]** (5) sets the maximum suction power of the vacuum pump.

This can help to minimize the volume level while the operator is working in close proximity to operate the device. By reducing the power, however, the evacuation time is also increased.

The colors of the key, as well as the unit of time, are taken from the vacuum graph, but are not displayed in detail (> See ch. 3.2.4 Graphical Display, p. 16).

3.2.6 Menus and Information

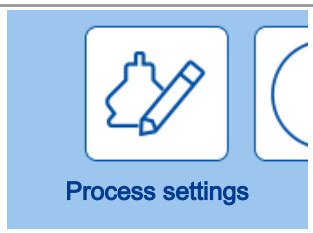
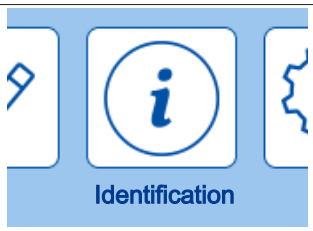
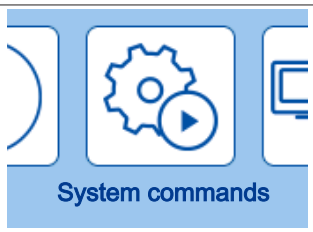


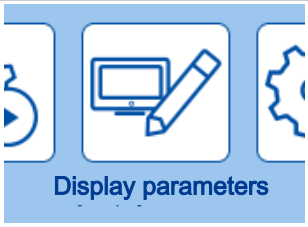
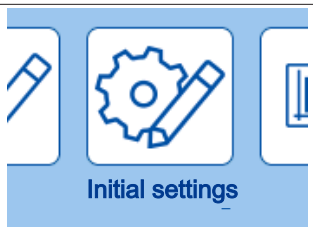
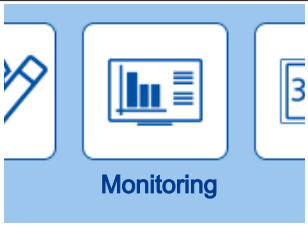
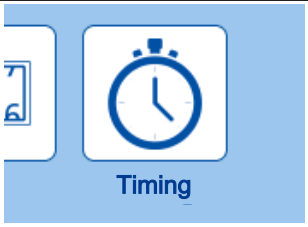
- ▸ Tap the **[BUTTON]** (1) showing three dots.
- ⇨ The menus and information display appears showing the **[PROCESS SETTINGS BUTTON]** (3).

- ▸ Tap the **[ARROW]** (2).
- ⇨ Return to the start screen

Tap the **[ARROW]** (4) on the right or swipe the touchscreen to display the following active fields:

In those active fields displaying a pen icon, it is possible to change/edit the parameters (> See ch. 3.2.7 Changing the Parameters, p. 20).

Active field	Field	Setting options
Process settings		• Switching point 1 (P0) • Switching point 2 (P0) • Reset point 2 (P0) • Drop-off time (P0) • Permitted evacuation time (P0) • Permitted leakage (P0) • Maximum power (P0)
Identification		• Firmware revision • Hardware revision • Part number • Serial number • Coded production date
System commands		• Reset the device to the factory settings • Calibrate the vacuum sensor • Reset counters • Set up external devices

Active field	Field	Setting options
Display parameters		• Set the language • Adjust display brightness • Select unit (vacuum) • Display mode • Display rotation • PIN code
Initial settings		• Adjust NFC status • Drop-off mode • Function output 2 • SIO output signal type • Output delay • X11 function • X12 function • Sensor voltage X11 • Sensor voltage X12 • Actuator voltage X11 • Actuator voltage X12 • Drop-off valve • SP2 function
Monitoring		• Vacuum • Sensor voltage • Actuator voltage • Device temperature • Energy consumption in the last cycle • Leakage value • Dynamic pressure • Quality • Performance • Vacuum X11 • Vacuum X12
Counters		• Vacuum on counter • CM counter • Vacuum on counter, erasable • CM counter, erasable
Timing		• Cycle time of last cycle • Evacuation time t0 of last cycle • Evacuation time t1 of last cycle • Holding time t2 of last cycle • Venting time t3 of last cycle • Pump on time • Device on time

3.2.7 Changing the Parameters

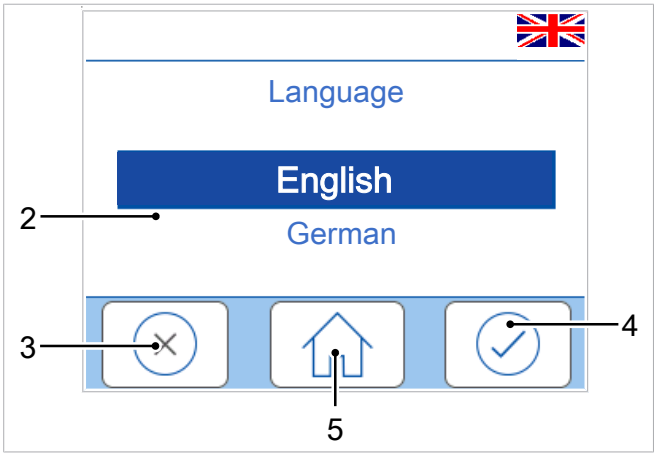
All fields marked with a pen represent adjustable (editable) parameters. Here, you will find a number of different methods for setting the parameters using the touchscreen.

First example: Selecting the parameters

✓ In the following example, the button for the display parameters was selected in the menu item **Menus and information**.

1. To change the displayed parameter (in this case the language), tap on the **[EDITING BUTTON]** (1).

2. Select the desired language by swiping on to the language display (2).



⇨ The selected language is highlighted with a blue background.

3. Tap the **[CONFIRMATION BUTTON]** (4).

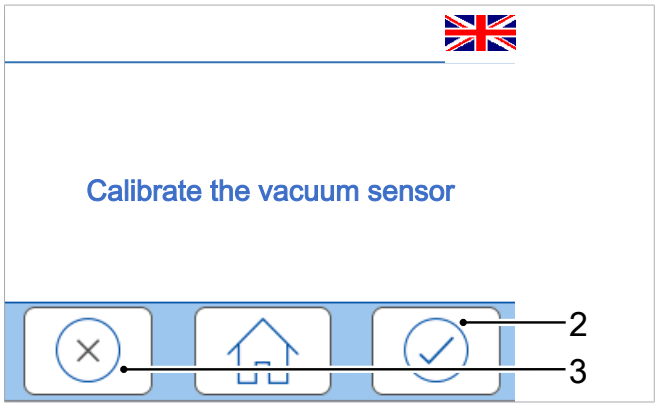
⇨ The new display language is set.

Second example: Performing an operation

✓ In the following example, the button for the system commands was selected in the menu item **Settings**.

1. To start the selected operation, tap the **[EXECUTE BUTTON]** (1).

2. The system command is executed using the **[CONFIRMATION BUTTON]** (2) or the operation is aborted using the **[ABORT BUTTON]** (3).

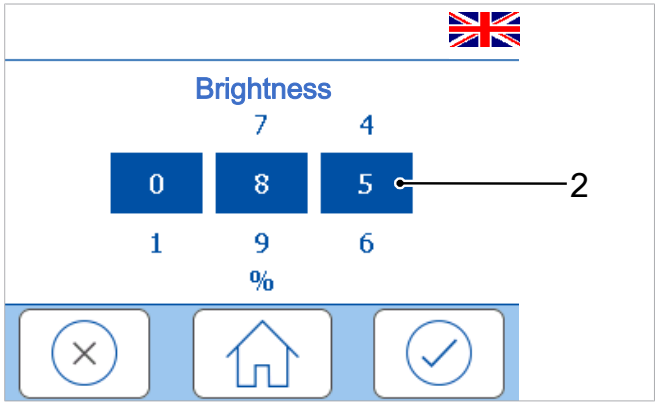


Third example: Entering a parameter value

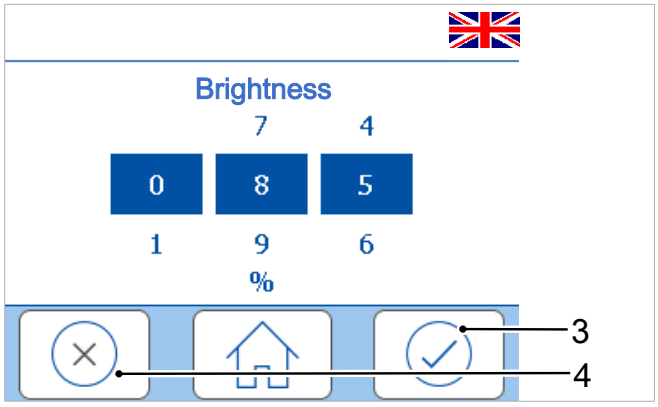
✓ In the following example, the button for the display parameters was selected in the menu item **Settings**.

1. In the **Display parameters** menu, tap on the left and right arrows on the side of the screen to select the parameter to be changed (for example: brightness).

2. To change the displayed parameter, tap on the **[EDITING BUTTON]** (1).



3. Adjust the three digits in the brightness value by swiping the “number wheels” up or down (2) (for example: 85%).



4. Save the value with the **[CONFIRMATION BUTTON]** (3) or cancel the setting with the **[ABORT BUTTON]** (4).

3.2.8 Operation with Gloves

Thanks to the pressure-sensitive operation of the resistive touchscreen, operation with gloves is possible. The gloves do not necessarily have to have touch-sensitive surfaces for capacitive touch function.

The device can also be operated with a pen. Ensure that the pen does not damage the touchscreen surface.

If the buttons do not respond with the gloves you are using, please try without gloves.

3.3 Operating Modes

The device can be operated in two ways:

- SIO mode, with direct connections at inputs and outputs (SIO = standard I/O)
- IO-Link mode, with a communications line (IO-Link)

By default, the device always runs in SIO mode, but it can be switched into and out of IO-Link mode at any time using an IO-Link master.

3.3.1 SIO Operating Mode

During operation in SIO mode, all input and output signals are connected to a control unit, either directly or using intelligent terminal boxes.

For this purpose, in addition to the power supply lines, up to two input signals and one or two output signals must be connected. The device communicates with the control unit via these signals.

This enables the use of the basic “suction” and “drop-off” functions as well as providing “part present” and “CM/Error” feedback.

The individual basic functions:

Inputs	Outputs
Suction ON/OFF (IN1)	SP2 (part present) feedback (OUT2)
Drop-off ON/OFF (IN2)	CM/Error feedback (warnings or errors) (OUT3)

If the device is operated in the “internally time-controlled” drop-off mode, then the “drop-off” signal is not required. This allows operation on a single port in a configurable terminal box (using 1xDO and 1xDI). For this purpose, the parameters in “production setup profile P0” must be configured accordingly beforehand via IO-Link. This is only valid if the drop-off valve of the GCPi is activated by means of the parameter “Drop-off valve (SIO mode & manual mode)” 0x0056.

3.3.2 IO-Link Operating Mode

During operation in IO-Link mode (digital communication), the power supply voltages and the communication line are connected to a control unit, either directly or using intelligent terminal boxes. The device can be finely parameterized in IO-Link mode.

When the device is connected via IO-Link, the following functions are enabled in addition to the basic functions:

- Selection between four production setup profiles
- Error messages and warnings
- Status display of the system
- Access to all parameters
- Condition monitoring
- Energy monitoring
- Predictive maintenance

All modifiable parameters can be read, modified and written back to the product by the higher-level control unit.

Evaluation of the condition monitoring and energy monitoring results affords direct feedback regarding the current handling cycle as well as trend analysis.

The device supports IO-Link version 1.1 with 12 bytes of input data and 2 bytes of output data.

The process data is exchanged cyclically between the IO-Link master and the product (data transmission rate with COM2 = 38.4 kBit/sec.).

ISDU parameter data (acyclical data) is exchanged only on request. It is exchanged by the user program in the control unit (e.g. using communication modules).

4 Technical Data

4.1 General Parameters

Parameter	Symbol	Limit values		Comment
		min.	max.	
Working temperature of medium and environment **under continuous load**	T_{amb}	0° C	45 °C	Continuous suction; GCPi not under regulation (vacuum permanently < SP1)
Storage temperature	T_{Sto}	-10 °C	40 °C	—
Humidity	H_{rel}	10% r.h.	80% r.h.	Max. 80% (at 40° C), free from condensation
			50% r.h.	Max. 50% (at 50° C), free from condensation
Degree of protection		IP54		—

4.2 Electrical Parameters

The outputs are protected against overload and short circuit.

Parameter	Symbol	Limit values			Comment
		min.	typ.	max.	
Sensor supply voltage, plug X01	U_S	20.4V DC	24V DC	28.8V DC	PELV[1)]
Actuator supply voltage, plug X13	U_A	20.4V DC	24V DC	28.8V DC	PELV[1)]
Alternative actuator supply voltage, plug X02	U_A	21.6V DC	24V DC	28.8V DC	PELV[1)]
Rated current from US	I_S	—	50 mA (display 100%), 30 mA (ECO mode)	100 mA (internal fan in operation)	U_S = 24.0 V; without rated current U_S at X11, X12
Rated current from UA	I_A	—	50 mA (without suction / without drop-off). 120 mA (without suction / with drop-off)	3.2 A (300 mbar vacuum)	U_A = 24.0 V; without rated current U_A at X11, X12
Rated current from US X11 and X12; pin 1 to pin 3	I_S	—	—	400 mA	Ensure that plug X13 is used for the power supply
Rated current from UA X11 and X12; pin 2 to pin 5	I_A	—	—	2 A	
Voltage of signal output OUT2+OUT3 (PNP), plug X01	U_{OH}	15 V	—	U_A	I_{OH} < 140 mA
Voltage of signal output OUT2+OUT3 (NPN), plug X01	U_{OL}	0 V	—	9 V	I_{OL} < 140 mA
Current of signal output OUT2+OUT3 (PNP)	I_{OH}	—	—	140 mA	Short-circuit-proof [2)]

Parameter	Symbol	Limit values			Comment
Current of signal output OUT2+OUT3 (NPN)	I_{OL}	—	—	140 mA	Short-circuit-proof [2]
Voltage of signal input IN1 (suction) / IN2 (drop-off) (PNP), X02	U_{IH}	18 V	—	U_A	—
Voltage of signal input IN1 (suction) / IN2 (drop-off) (NPN), X02	U_{IL}	0 V	—	6 V	—
Current of signal input IN1 (suction) / IN2 (drop-off) (PNP)	I_{IH}	—	2.5 mA	—	U_{IH} = 24 V
Current of signal input IN1 (suction) / IN2 (drop-off) (NPN)	I_{IL}	—	-2.5 mA	—	U_{IL} = 0 V
Response time of signal inputs	t_I	—	3 ms	—	—
Response time of signal output	t_O	—	2 ms	10 ms	—
NFC	NFC Forum Tag type 4 f = 13.56 MHz				
IO-Link	IO-Link 1.1 Baud rate COM2 (38.4 Kbits/s)				

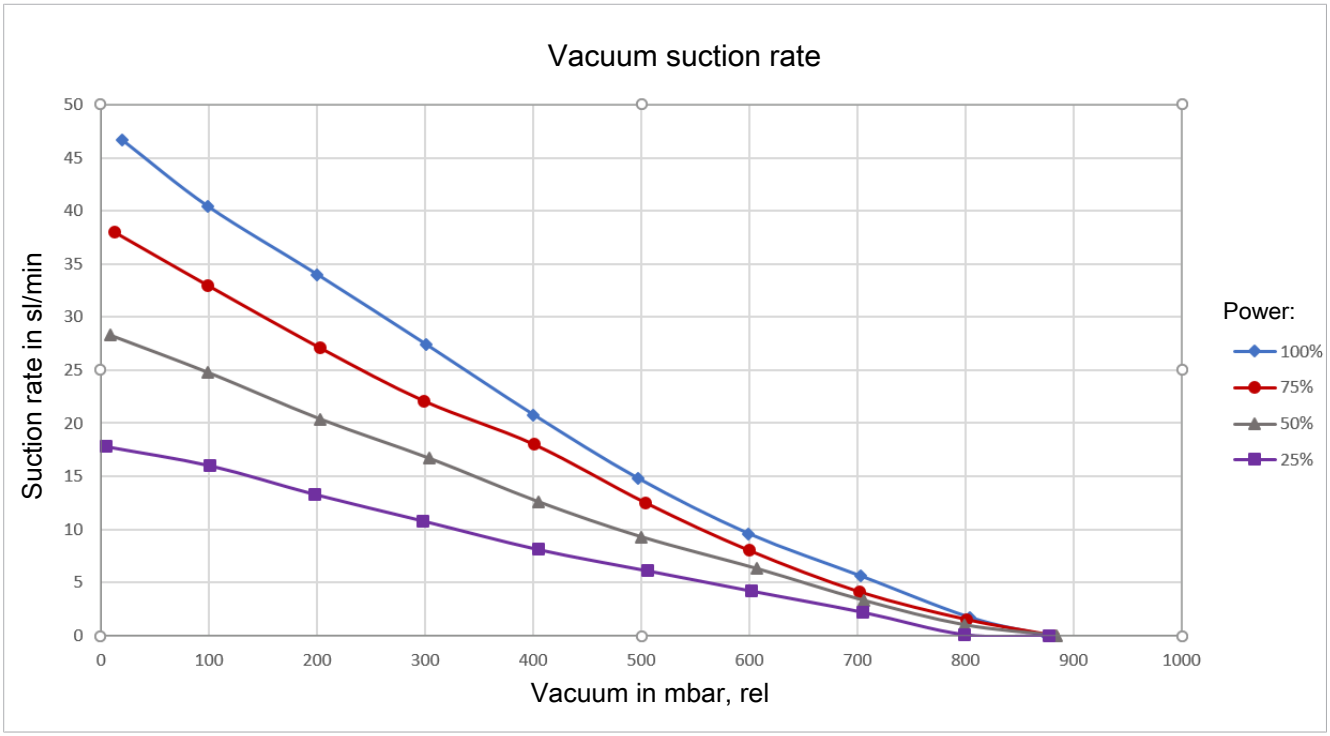
1) The power supply must correspond to the regulations in accordance with EN60204 (protected extra-low voltage). The signal inputs and signal outputs are all protected against reverse polarity.

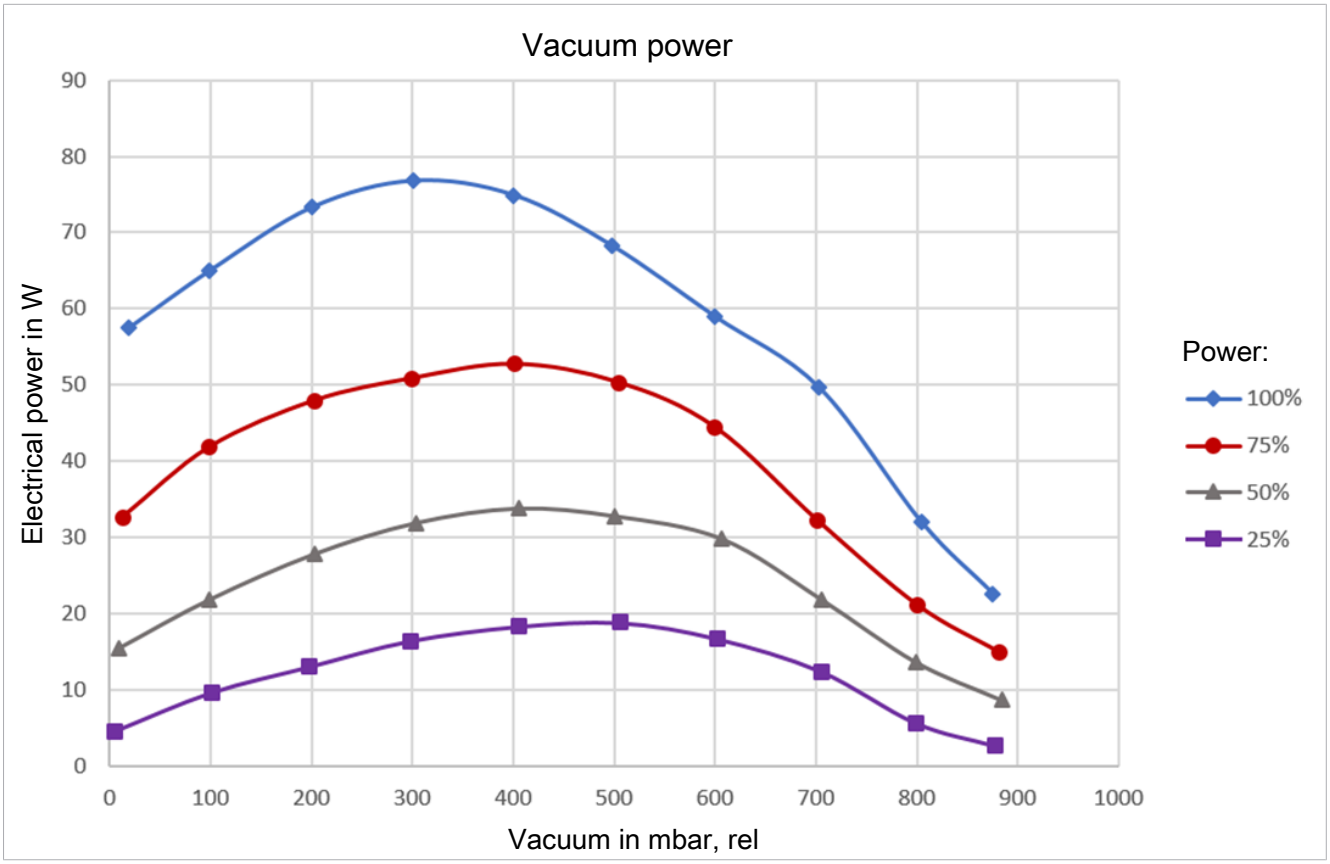
2) The signal outputs OUT2 and OUT3 are short-circuit-proof. However, the signal outputs are not protected against overloading. Constant load currents of > 0.14 A can lead to impermissible heating and subsequent functional failure.

4.3 Performance Data

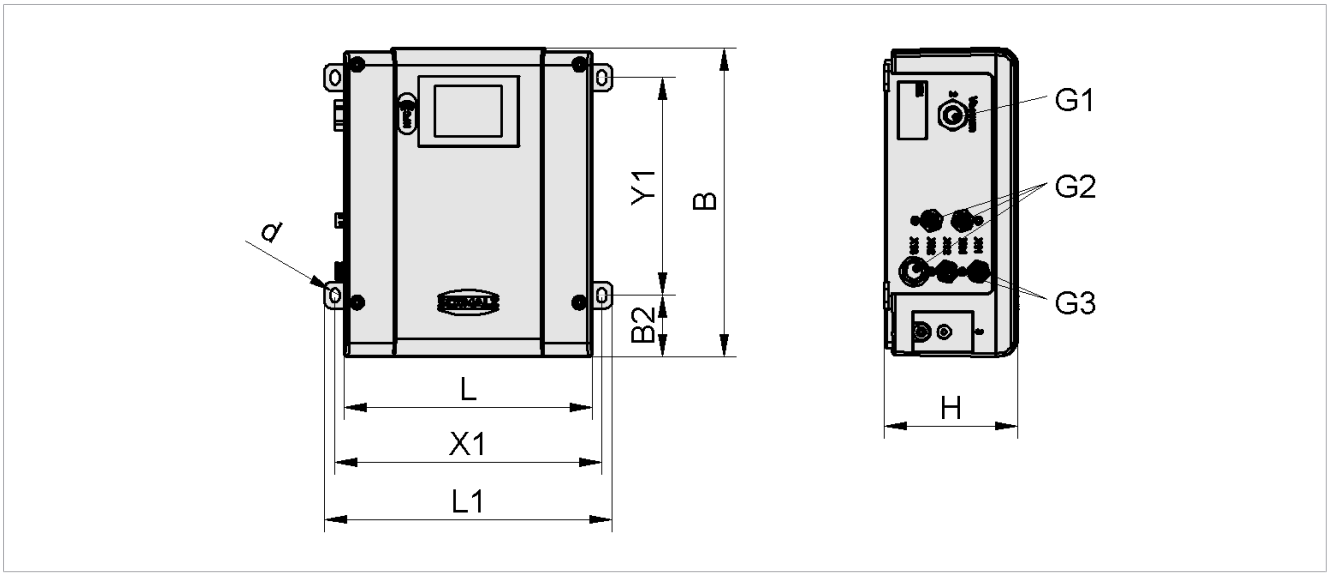
Max. vacuum	Suction rate	Sound level	Weight
800 mbar	0 to 46 l/min	67 dBA [1)]	3220 g

1) This sound level leads to the use of hearing protection in laboratory areas.





4.4 Dimensions

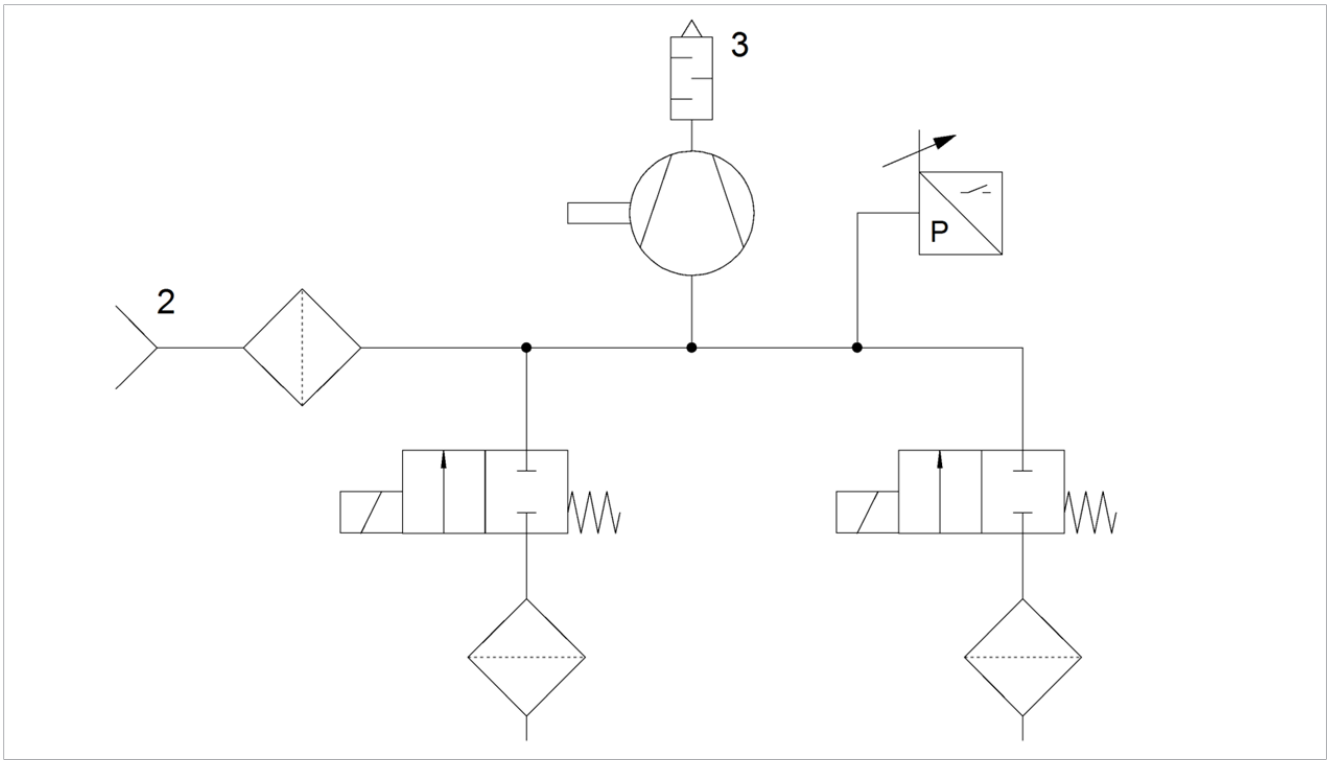


L	B	H	B2	d	L1	X1	Y1	G1	G2	G3
190	236	102	47	6.6	220	204	166	1/4" internal thread	M12x1 external thread	M12x1 internal thread

All dimensions given in millimeters [mm].

4.5 Pneumatic Circuit Diagram

Key:	
P	Vacuum sensor
2	Vacuum connection
3	Exhaust air output



4.6 Factory Settings

Parameter	Value of the factory setting
Signal type for inputs and OUT2	PNP
Signal type for OUT3	PNP
Equipment identification	***
Extended device locks	0
Geolocation	0
NFC web link	https://myproduct.schmalz.com/#/
Storage location	***
Installation date	***
Drop-off mode	Externally controlled drop-off
Screen language	English
Display rotation	Standard
Display unit	mbar
Display mode	Vacuum
Output logic	NO
External valve output logic	NO
Output delay	10
PIN code for NFC	000
PIN code for menu	000

Parameter	Value of the factory setting
Brightness	100
Drop-off valve	Automatic
SP2 function	Automatic
U_A external valve	Linked to SIO
U_S external valve	Linked to SIO

The following parameters apply for all profiles:

Parameter	Value of the factory setting
Vacuum limit value SP1	800 mbar
Reset point	Internally defined value
Vacuum limit value SP2	550 mbar
Reset point RP2	540 mbar
Duration of automatic drop-off	200 ms
Permitted evacuation time	2000
Permitted leakage	2000
Maximum power	100
Profile name	***

The write ISDUs for accessing X11 and X12:

Parameter	Value of the factory setting
ISDU: Index	0
ISDU: Subindex	0
ISDU: RW	0
ISDU: Length	0
ISDU: Data	0
ISDU: Trigger	0
ISDU: Valve select	External valve X11

(> See ch. 6.7 Resetting the Device to the Factory Settings, p. 40)

5 Control Interfaces

5.1 Basic Principles of IO-Link Communication

The component is operated via IO-Link to enable intelligent communication with a controller.

IO-Link is a communication system for connecting intelligent sensors and actuators to an automation system and is described in the standard IEC 61131-9. The standard contains both the electrical connection data as well as a digital communication protocol via which sensors and actuators exchange data with the automation system.

An IO-Link system consists of an IO-Link master and one or more IO-Link enabled sensors or actuators. The IO-Link master provides the interface to the higher level controller (PLC) and controls the communication with the connected IO-Link devices. An IO-Link master can have one or more IO-Link ports, however only one IO-Link device can be connected to each port.

IO-Link devices have parameters that can be read or written via the IO-Link protocol. Parameters can therefore be changed by the higher-level controller during operation. Since the sensor and actuator parameters are device-specific, parameter information is available for each device in the form of an IODD (IO Device Description).

5.2 Process Data

The cyclical process data is used to control the product and receive current information reported from the component. There is a difference between the input data (Process data in) and the output data (Process data out) for control:

The input data Process data in is used to report the following information cyclically:

- The status of SP1, SP2 and SP3
- Status SP2: SP2 for devices connected to X11 and X12
- General device status, status traffic light
- Active parameter profile (production setup profile)
- Feedback about pending errors and warnings
- Vacuum values of the GCPi and the devices connected to X11 and X12

The output data Process data out is used to control the product cyclically:

- The product is controlled using the suction (Vacuum) and drop-off (Drop-off) commands
- Condition monitoring parameters can be determined automatically with CM Autoset
- Activation of predetermined parameter profiles (Production setups)
- Compact valves, if connected to X11 or X12

The exact meaning of the data and functions is described in more detail in the “Description of Functions” chapter. A detailed description of the process data can be found in the Data Dictionary.

The corresponding device description file (IODD) is available for integration into a higher-level control unit.

5.3 ISDU Parameter Data

The acyclical communication channel can be used to retrieve ISDU (Index Service Data Unit) parameters that contain further information about the system status.

The ISDU channel can also be used to read or overwrite all the settings, e.g. the limit values, permissible leakage, etc. Further information on the identity of the product, such as the part number and serial number, can be retrieved via IO-Link. The device also provides space for saving user-specific information here, such as the installation and storage location.

ISDU parameters of additional external devices connected to X11 or X12 can be written and read via ISDU parameters 10200 to 10208 of the GCPi.

Function modules are available for the GCPi for various control unit manufacturers. With the appropriate integration into the control unit, this provides a convenient option for ISDU data exchange (ISDU read and write access) for connected devices (e.g. compact valve LQEi or vacuum switch VSi V).

ISDU read access for additional connected devices

For this purpose, you must specify the index under parameter 10200, the subindex under 10201, the port of the connected device under 10208, and whether read or write access is to be executed under 10202.

R/W	ISDU index	Parameter	Data	Bytes	Example
W	10208	ISDU: Valve select	Device connection 0 = X11 1 = X12	1	0
W	10200	ISDU: Index	ISDU index of the device	2	60
W	10201	ISDU: Subindex	ISDU subindex of the device	1	1
W	10202	ISDU: RW	0 = Read	1	0
W	10205	ISDU: Trigger	1 = Start inquiry	1	1
R	10206	ISDU: Status	Wait until 2 = Process completed successfully 3 = Process completed with errors	1	2

The following data can then be read:

R/W	ISDU index	Parameter	Data	Bytes	Example
R	10203	ISDU: Length	Length of the ISDU index read	1	2
R	10204	ISDU: Data	Data read out	ISDU: Length	0x22 0xEE
R	10202	ISDU: extended error code	Extended error code in accordance with IO-Link specification	1	0x21

ISDU write access for additional connected devices

To execute write access:

1. Under ISDU parameter 10203, specify the length of the parameter
2. Enter the data to be written in ISDU parameter 10204

In the case of write access,

- ▸ the ISDU trigger that initiates the access must then be set under ISDU parameter 10205.
- ⇨ ISDU parameter 10206 is then set to 1 during access, and then set to 2 or 3 depending on whether errors occurred during access.

R/W	ISDU index	Parameter	Data	Bytes	Example
W	10208	ISDU: Valve select	Device connection 0 = X11 1 = X12	1	0
W	10200	ISDU: Index	ISDU index of the device	2	60
W	10201	ISDU: Subindex	ISDU subindex of the device	1	1
W	10202	ISDU: RW	0 = Read	1	0
W	10205	ISDU: Trigger	1 = Start inquiry	1	1
R	10206	ISDU: Status	Wait until 2 = Process completed successfully 3 = Process completed with errors	1	2

The following data can then be read:

R/W	ISDU index	Parameter	Data	Bytes	Example
R	10202	ISDU: extended error code	Extended error code in accordance with IO-Link specification	1	0x21

In the event of an error, the type of error can be found under parameter 10207 in accordance with the IO-Link specification.

The exact meaning of the data and functions is described in more detail in the “Description of Functions” chapter.

You can find a detailed diagram of the process data in Data Dictionary and in the IODD.

To access the ISDU parameters via a control unit, the necessary system functions must be obtained from the manufacturer of the control unit and used.

5.4 Interface NFC

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

The device functions as a passive NFC tag that can be read or written to by a reading device such as a smartphone or tablet with NFC activated. Read access to the device via NFC is also possible when the supply voltage is not connected.

Web link **https://myproduct.schmalz.com/#/**

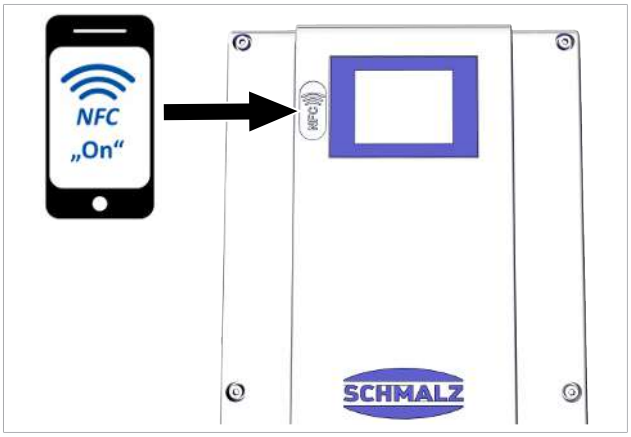
There are two options for communicating via NFC:

- Read access only can be obtained via a website viewed in a browser. For this, no additional app is needed. The reading device requires only that NFC and the Internet connection are enabled.
- Another option for communication is the “Schmalz ControlRoom” control and service app. In addition to pure read access, the app allows you to actively write the parameters of the device via NFC.
  The “Schmalz ControlRoom” app is available in the Google Play Store or Apple App Store.

Process control via NFC is not possible.

For the best data connection, place the reading device central to the NFC symbol next to the touchscreen.

In SIO mode, the values of the “production setup profile P0” are the determining factor. These values can be adapted or set via NFC, for instance.



The reading distance is very short for NFC applications. Determine the position of the NFC antenna in the reading device used. If parameters of the device are modified via IO-Link or NFC, then the power supply must subsequently remain stable for at least three seconds to prevent data loss.

5.5 Connecting External Devices via Interfaces X11 and X12

The GCPi can be used to connect the following external devices:

- Standard valves
- Schmalz compact valve (LQEi)
- Schmalz vacuum switch (VSi V)

Compact valves and vacuum switches communicate with the GCPi via the IO-Link interface. It is therefore possible to configure additional settings or provide status information straight from the GCPi.

Standard valves can be activated via the switchable 24 V outputs on X11 or X12 (pin 2 to pin 5).

Using IO-Link, the parameter “Drop-Off valve” 0x0056 is used to determine which device or interface is controlled when the drop-off signal is activated (via SIO).

If Schmalz external devices (LQEi or VSi V) are connected via the interfaces X11 and X12, these devices are detected by the GCPi. The GCPi then automatically performs certain parameter settings. For example, the GCPi automatically defines a connected LQEi as the only active ventilation valve, and its vacuum value is used for the vacuum indicator and the evaluation of switching point SP2 (part present) (> See ch. 6.2 Monitoring the System Vacuum and Defining Switching Points, p. 35).

If no LQEi is connected, then the GCPi is activated in automatic mode during drop-off.

If standard valves are connected, they cannot be detected automatically by the GCPi. In this case, the following settings must be configured:

1. Specify the vent valves to be activated using parameter “Drop-Off valve (SIO-Mode & manual mode)” 0x0056.
2. Set parameter “Ua Xxx” 0x0058 for standard valves (value = 2) so that the actuator voltage switches with the drop-off signal (SIO or IO-Link signal) and standard valves are activated (> See ch. 6.19 Power Supply to External Devices, p. 50).

If these settings are not configured, it is assumed that no standard valves are present and “drop-off” activates the drop-off valve of the GCPi.

By controlling external vent valves (e.g. standard or compact valves), it is possible to vent the vacuum circuit near the gripper, i.e. close to the suction point.

When 3/2-way valves are used, only the hose content from the suction point to the valve can be vented to atmospheric pressure, while the vacuum circuit from the valve to the GCPi can remain under vacuum. This reduces the venting time. When the suction is applied again, it is only necessary to evacuate the vacuum circuit as far as the valve. This allows for shorter evacuation times. It also reduces energy consumption.

6 Description of Functions

6.1 Control Scheme

When activating the drop-off valve of the GCPi, it is specified that if both inputs are activated at the same time, drop-off has priority and then suction is deactivated.

This specification only applies if the internal drop-off valve of the GCPi is activated.

When connecting external drop-off valves (standard valves or compact valves LQEi) to X11 or X12, the parameter “Drop-Off valve (SIO-Mode & manual mode)” 0x0056 must be used to define which drop-off valves are activated during a drop-off signal (SIO / IO-Link / manual mode). (Prerequisite: parameter 0x0058 = 2).

If only external drop-off valves are selected (0x0056 = 1, 2, 5) or a compact valve LQEi is connected (0x0056 = 7 = automatic), it is possible to activate suction and drop-off simultaneously. In other words, a vacuum duct can remain under vacuum up to a drop-off valve near the gripper, at the same time as external drop-off valves are activated.

(> See ch. 6.6 Deactivating the Vacuum and Venting the System/Dropping off the Part, p. 39)

In SIO mode, the values of the Production-Setup-Profile P0production setup profile P0 are the determining factor.

6.2 Monitoring the System Vacuum and Defining Switching Points

The product has a sensor for measuring the vacuum.

The current vacuum value is shown on the touchscreen and can be called up via IO-Link.

Two independent switching points (SP1 and SP2) can be set. Each switching point has an activation point and a corresponding reset point (RP1 and RP2). The system vacuum is constantly compared to the set values for the switching points during operation.

The switching points SP1, SP2 and RP2 are set via IO-Link or via the touchscreen.

When the switching point for SP2 (part present) is reached, it is displayed on the touchscreen (> See ch. 3.2.3 Vacuum Display, p. 14).

The set values for SP2 must be lower than the values for SP1. The exact configuration conditions can be found in the Data Dictionary.

SP2 and vacuum value assignment

Via IO-Link, parameter “SP2 selection/displayed vacuum level” 0x0059 is used to specify which vacuum value is displayed on the touchscreen and used to activate the output OUT2 (part present). Vacuum values of Schmalz vacuum switches (VSi V) or Schmalz compact valves (LQEi) connected to X11 or X12 can then be used:

- With 0 —> GCPi
- With 1 —> X11
- With 2 —> X12
- With 3 —> GCPi & X11
- With 4 —> GCPi & X12
- With 5 —> X11 & X12
- With 6 —> GCPi & X11 & X12
- With 7 —> Automatic

In automatic mode (0x0059 = 7), the vacuum value of a device connected to X11 (vacuum switch or compact valve) is displayed on the touchscreen (start screen, vacuum display screen and in manual mode).

If the device is not connected to X11, X12 is used. If no external device is connected to X11 or X12, the vacuum value of the GCPi is used.

Important:
For the SP2 evaluation “Signal SP2” and for the activation of the digital output OUT2 (in SIO mode), the SP2 value of the GCPi is always used (based on the active profile) regardless of the selected vacuum level. Application example: When two compact valves LQEi are connected to X11 and X12 for handling different workpieces, different Part-Present values can be used by switching the GCPi profiles.

For the SP2 evaluation of externally connected devices, the separate process output data bits “signal SP2 X11” or “signal SP2 X12” are present.

The same applies to the vacuum values. The vacuum values of the GCPi or of devices connected to X11 or X12 can be read out separately in the process output data (“Current vacuum GCP, Current vacuum X11, Current vacuum X12”).

The SP2 value relevant for switching the output OUT2 is selected via the touchscreen in the menu item **Menus and information > Initial settings > SP2 function**.

Switching points SP1 and RP1

The control function uses switching points SP1 and RP1 to control the vacuum.

Switching point SP3 “(> See ch. part detached)” cannot be adjusted. It is fixed at 20 mbar. Signal SP3 is issued when the vacuum reaches < 20 mbar (provided that the vacuum has already reached SP2 once). By issuing this signal, the ejector tells the control unit that the part has been deposited successfully. The signal is reset by issuing a new suction command.

Parameter	Description
SP1	Vacuum limit value / vacuum control value
RP1	Deactivation value of vacuum limit value
SP2	Activation value of “part present” check signal output (part present)
RP2	Deactivation value of “part present” check signal output
SP3	Part deposited (vacuum < 20 mbar)

System vacuum evaluation:

Once the system vacuum reaches the value for SP2, the following actions are triggered:

- The process data bit for SP2 is set (compare Data Dictionary).
- The display changes from a blue light to a green light on the vacuum display screen (if there is no error (Active Error) or warning (Condition Monitoring)).
- In SIO mode, the SIO output OUT2 (part presentpart present) is activated according to the PNP/NPN configuration in parameter “Signal type: SIO outputs of the device” 0x0049 and according to the configuration “Output functions” 0x0047.

The pump regulates the vacuum to the value for SP1, adjusting the pump capacity to maintain this value.

When SP1 is reached (i.e. when the pump is regulated), the corresponding process data bit SP1 is set.

When the part has been deposited, the process data bit SP3 is set.

Overview of switching points P0; the specified parameters apply to Production-Setup-Profile P0:

ISDU [hex]	Limit value parameter	Description	Factory
P0: 0x0064	SP1	Vacuum control value Vacuum switching point	800 mbar
	RP1	Vacuum hysteresis Vacuum reset point	Internally defined value
P0: 0x0066	SP2	Activation value of “part present” check signal output	550 mbar
P0: 0x0067	RP2	Deactivation value of “part present” check signal output	540 mbar

The current, minimum and maximum applied vacuum (since the supply voltage was applied) can be read from the parameters “System vacuum live / System vacuum min / System vacuum max” 0x0040.
The maximum and minimum values can be reset with the command 0xA9 using the parameter “System command” 0x0002.

6.3 Activating the Vacuum

The electrical pump is activated and deactivated via the “suction” (vacuum) signal input (> See ch. 6.11.1 Signal Inputs, p. 42).

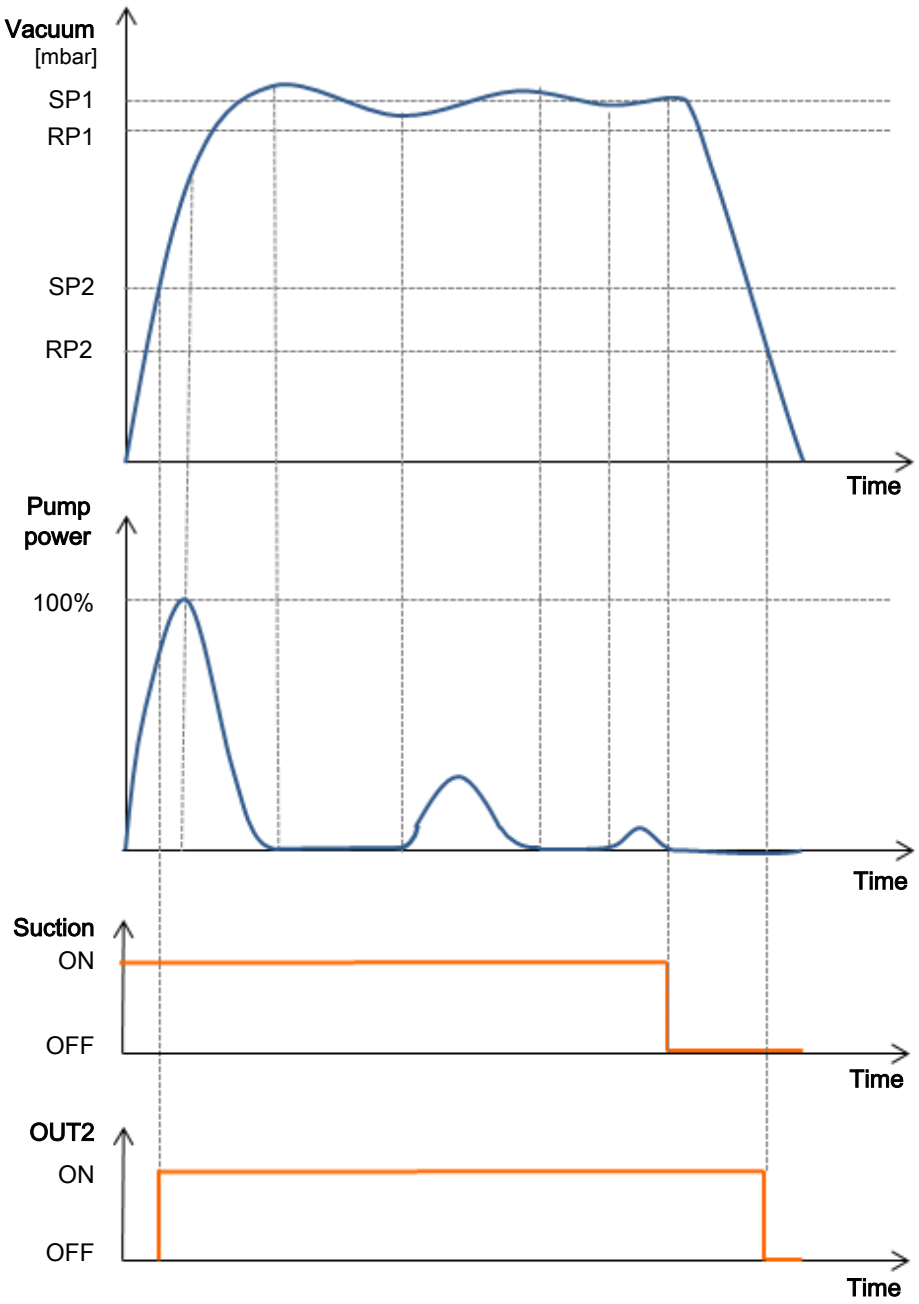
The GCPi has an integrated energy-saving feature. When the machine is in “suction” mode, it automatically controls the vacuum to keep it at the preset vacuum limit value SP1 in accordance with the default settings.

6.4 Control

The vacuum is regulated to the vacuum limit value SP1 by adjusting the motor power.

The leakage is also measured during regulation.

The following diagram illustrates the control function.



The output OUT2 for the “part present” check is activated when the limit value SP2 is reached in SIO mode. If the limit value RP2 is not reached, the output is deactivated.

To bypass the control function, a value that is not reached by the vacuum pump must be set as SP1, which means that it switches to continuous suction.

6.5 Automatic Operation

Once the product is connected to the power supply, it is ready for operation and enters automatic mode. This is the normal operating mode, in which the product is operated by the system control unit.

If external compact valves LQEi are connected during automatic operation or automatic mode, only these values are activated during ventilation. The internal ventilation valves of the GCPi are then deactivated.

6.6 Deactivating the Vacuum and Venting the System/Dropping off the Part

The “drop-off” valve is activated directly by the “drop-off” signal input IN2 in SIO mode (> See ch. 6.11.1 Signal Inputs, p. 42). In IO-Link mode, the device is switched to “drop-off” mode using the “Drop-off” output process data bit.

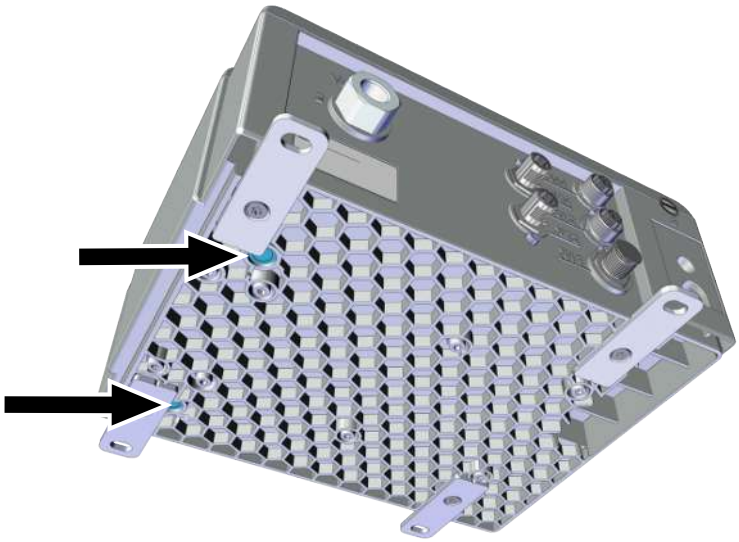
In “drop-off” operating mode, the vacuum circuit of the GCPi is vented to the outer atmosphere while the signal is issued. This ensures that the vacuum drops immediately in the vacuum duct.

If the GCPi is used in conjunction with a compact valve LQEi, a shorter cycle time can be achieved by venting only the line between the LQEi and the suction cup during drop-off. The vacuum in the line between the GCPi and LQEi is maintained.

In IO-Link mode, the set input process data bit “Signal SP3 (part detached)” provides information about:

- Whether, after reaching the limit value SP2 (vacuum > SP2), the vacuum has dropped again during suction (vacuum < 20 mbar)
- Whether a picked-up part has been deposited

The ventilation openings on the underside of the product must not be covered.
Otherwise, error-free drop-off will not be possible.



6.6.1 Setting the Blowoff Time

The drop-off time can be set for internally and externally controlled time-dependent drop-off via the IO-Link parameter “Duration automatic drop off” for each production setup (e.g. for production setup P0 in 0x006A).

This drop-off time comes into effect when externally controlled time-dependent drop-off or internally controlled time-dependent drop-off is selected as the drop-off mode.

The drop-off time is specified in milliseconds [ms].

The drop-off time value is set using the touchscreen in the menu **Menus and information > Process settings > Drop-off time**.

6.6.2 Drop-Off Mode

The following three drop-off modes are available:

- Externally controlled (Externally controlled drop-off)
- Internally controlled (Internally controlled drop-off – time-dependent)
- Externally time-controlled (Externally controlled drop-off – time-dependent)

The function is set via IO-Link using the parameter “Drop-off mode” 0x0045.

If you want to change the drop-off mode for SIO operation, the parameters in the production setup profile P0 must be configured accordingly beforehand via IO-Link.

The touchscreen is used to set the drop-off mode in the menu item **Initial settings > Drop-off mode**.

Externally Controlled Blowoff

In SIO mode, the "drop-off" valve is controlled directly via the "drop-off" signal input IN2 as standard. The device vents to atmosphere as long as the signal is present.

This function is activated via IO-Link with the value in the parameter "Drop-off mode" 0x0045.

Internally Time-controlled Blowoff

The internal drop-off valve or externally connected drop-off valves (standard valve or compact valve LQEi) are automatically activated for the time period set as soon as the device leaves "suction" mode. This function makes it possible to save an output on the control unit.

This function is activated via IO-Link in the parameter "Drop-Off mode" 0x0045 with the value "Internally controlled drop-off – time-dependent."

The duration of the drop-off time is set via the IO-Link parameter "Duration automatic drop off" for each production setup (e.g. for Production Setup P0 in 0x006A).

"Blowoff" mode can still be activated in this mode using the "Blowoff" signal input.

Externally Time-controlled Blowoff

The drop-off pulse is controlled externally via the "drop-off" input IN2. The internal drop-off valve or externally connected drop-off valves (standard valve or compact valve LQEi) are activated for the time period set. A longer input signal does not increase the drop-off duration.

This function is activated via IO-Link in the parameter "Drop-Off mode" 0x0045 with the value "Externally controlled drop-off – time-dependent."

The drop-off time can be set for externally time-controlled drop-off via the IO-Link parameter "Duration automatic drop off" for each production setup (e.g. for Production Setup P0 in 0x006A).

6.7 Resetting the Device to the Factory Settings

In IO-Link operation, the reset command is executed via the parameter "System command" 0x0002 with the value 0x83 (Back to box). This is **not** visually indicated on the touchscreen.

Using the touchscreen, the "Reset application" command can be found in the second position in the menu item **Menus and information > System commands** and can be executed using the **[EXECUTE BUTTON]**.

The function for resetting factory settings does not affect the following elements:

- The counter readings
- The zero-point adjustment of the sensor

6.8 Calibrating the Vacuum Sensor

Since the production conditions for the integrated vacuum sensor can vary, we recommend calibrating the sensor once it is installed. To calibrate the vacuum sensor, the system's vacuum circuit must be open to the atmosphere.

Via IO-Link, the sensor zero-point adjustment command is executed using the parameter "System command" 0x0002 with the value 0xA5 for Calibrate vacuum sensor.

Using the touchscreen, the “Calibrate vacuum sensor” command can be found in the second position in the menu item **Menus and information > System commands** and can be executed using the **[EXECUTE BUTTON]**.

A zero offset is only possible in the range of ±3 percent of the end value of the measuring range.

Any violation of the permissible limit is reported through an event (see Data Dictionary).

6.9 Counter(s)

The GCPi is equipped with four internal counters. The device counts the number of suction cycles and condition monitoring events.

Counter 1 Vacuum-on-counter 0x008C	Increases with each valid pulse at the “suction” signal input, meaning that it counts the suction cycles during the service life. The time of the suction cycle can be read from the parameter “Total cycle time” 0x00A6. Non-erasable, is saved every 20 minutes
Counter 2 Condition monitoring counter 0x008E	Counts the CM events that have occurred Condition Monitoring Events and Status Display. Non-erasable, is saved every 20 minutes
Counter 3 Vacuum-on-counter 0x008F	Increases with each valid pulse at the “suction” signal input, meaning that it counts the suction cycles during the observation period. The time of the suction cycle can be read from the parameter “Total cycle time” 0x00A6. Erasable, is saved every 20 minutes
Counter 4 Condition monitoring counter 0x0091	Counts the CM events that have occurred Condition Monitoring Events and Status Display. Erasable, is saved every 20 minutes

The counters can be read via IO-Link or via the touchscreen in the menu item **Menus and information > Counters**.

Via IO-Link, the command to delete counters 3 and 4 is executed via the parameter “System command” 0x0002 with the value 0xA7.

Using the touchscreen, the “Reset counter” command can be found in the third position in the menu item **Menus and information > System commands** and can be executed using the **[EXECUTE BUTTON]**.

6.10 Setting Up External Valves

This system command is executed in parameter 0x0002 with the command 0xAF. Vacuum switches (VSi V) or compact valves (LQEi) connected to X11 or X12 can be initialized.

- ✓ Due to the calibration of the vacuum sensor of the connected devices, this system command is only executed when the vacuum is not applied

1. Reset the connected devices to their factory settings, and
2. then calibrate
3. Transfer the SP2 and RP2 values of the current GCPi profile to the external device

6.11 Output and Input Signals

In SIO mode, all input and output signals can be connected to the higher-level control unit (e.g. a robot) directly or via IO fieldbus boxes.

For this purpose, in addition to the power supply lines, up to two digital output signals and two input signals must be connected. The product communicates with the control unit via these signals.

The signal type for the digital inputs and outputs can switch between PNP and NPN with the parameters “Signal type: SIO outputs of the device or signal type: SIO inputs of the device” 0x0049.

In addition, the output delay, parameter “Output filter” 0x004B, can be used to determine how long the SIO output OUT2 should remain activated after falling below RP2.

6.11.1 Signal Inputs

The GCPi only has two signal inputs IN1 and IN2 in SIO mode.

The “Suction ON/OFF” function is assigned to signal input IN1, while the “Drop-off/vent ON/OFF” function is assigned to signal input IN2.

6.11.2 Signal Outputs

The GCPi has two signal outputs.

The function of vacuum limit value SP2 (part present) is only assigned to signal output OUT2 in SIO mode. The output is activated when the set vacuum limit value SP2 is reached.

Signal output OUT3 is activated when condition monitoring or an error is present on the device.

Via IO-Link, the signal type (PNP or NPN) for SIO operation is set via the parameter “Signal type” 0x0049. The parameter “Outputs function” 0x0047 Subindex 1 is used to set the function of (NO = normally open or NC = normally closed) OUT2 and OUT3.

To adjust the signal outputs via the touchscreen: Signal outputs can be selected from the menu item **Menus and information > Initial settings**

- under OUT2 function (NO or NC)
- under SIO inputs (PNP or NPN) signal type
- under SIO outputs (PNP or NPN) signal type

6.12 Switch-Off Delay

You can use this function to set a switch-off delay for the SP2 “part present” check signal. This can be used to mask short-term fluctuations in the vacuum level of the vacuum system.

The switch-off delay affects the discrete output OUT2, the process data bit in IO-Link and the status display.

Values from 0 to 999 milliseconds can be set. To deactivate this function, enter the value “off” (0 = off).

The duration of the switch-off delay is set in IO-Link via the parameter “Output filter” 0x004B.

The setting can be configured using the touchscreen in the menu item **Menus and information > Initial settings >Output delay**.

If the output is configured as a normally open contact [NO], there is an electrical switch-off delay. On the other hand, if it is configured as a normally closed contact [NC], there will be an equivalent switch-on delay.

6.13 Access Control

6.13.1 PIN Code

The menus for editing parameters can be protected against unintentional access with a PIN code.

To activate the lock, a valid PIN code from 001 to 999 must be entered using the touchscreen under **Menus and information > Display parameters > PIN code** or via IO-Link “PIN code display” 0x004D.

The PIN is set to 000 on delivery. The menus are not protected.

If write protection is activated, the desired parameters can be changed within one minute after the correct code is entered. If no changes are made within one minute, write protection is automatically reactivated.

The PIN code “000” must be set for permanent deactivation of the lock.

Full access to the device is still possible via IO-Link even if a PIN code is enabled. The current PIN can also be read out, changed or deleted (PIN code = 000) via IO-Link.

A PIN is recommended because carrying out parameterization while the device is in operation can change the status of signals.

6.13.2 NFC PIN Code

Parameterization via NFC can be protected against unintentional access by means of a PIN code.

The PIN code can be set with the ControlRoom app under Device settings > PIN code for NFC or via the IO-Link parameter “PIN code NFC” 0x005B.

When delivered, the PIN code is **000** and a lock is therefore not active.

The NFC PIN code can be changed only using this parameter.

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 device accepts the changes.

For more detailed information, see the data dictionary attached.

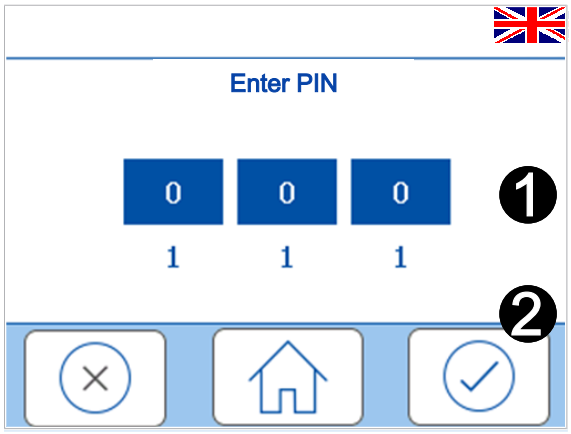
6.13.3 Unlocking the Menu

If the menus are locked by a PIN code, the PIN code is requested before **editing** the parameter value.
The menu is unlocked as follows:

1. Set the valid PIN using the number wheels on the touchscreen ❶
2. Confirm the entry by tapping the **[CONFIRMATION BUTTON]** ❷

⇨ Once the PIN has been entered successfully, you will have one minute to edit the selected parameter.

⇨ If the wrong PIN code is entered, the number wheels for PIN code entry return to “000” and the menus remain locked.



The PIN code 000 must be set for permanent deactivation of the lock.

The PIN is set to 000 on delivery. The menus are not protected.

6.13.4 Restricting Access Using Device Access Locks

In IO-Link mode, the “Device Access Locks” default parameter 0x000C is available to prevent changes to parameter values using the operating element of the device.

Bit	Meaning
2	Local parametrization locked (Parameters cannot be changed via the user menu)

A lock using the Device Access Locks parameter has a higher priority than the menu PIN. In other words, this lock cannot be bypassed by entering a PIN and remains in SIO mode.

It can only be canceled using IO-Link, not on the device itself.

6.13.5 Restricting Extended Access

Extended device functions can be disabled via the parameter “Extended device access locks” 0x005A. For example, there is an option to completely restrict NFC access or limit it to a read-only function.

Bit	Meaning
0	NFC write lock (Parameter changes via NFC are blocked)
1	NFC disable (NFC deactivated. The device cannot be recognized by an NFC reader.)
3	local user interface locked (manual mode locked)
4	IO-Link event lock (IO-Link events are disabled in IO-Link mode)

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

The firmware that is current at the time of delivery is stored on the control unit. When the device is switched on, the existing firmware is updated by the control unit if the device firmware corresponds to an older version (local firmware update). This update can be disabled using the Extended device locks parameter.

For more detailed information, see the data dictionary attached.

6.14 Displaying Errors and Warnings

6.14.1 Displaying Errors

The device monitors the following features in the parameter “Active errors” 0x0082:

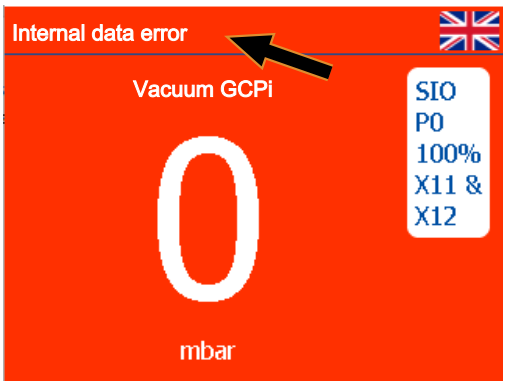
- Power supply
- Actuator voltage
- Short circuit at OUT2
- Short circuit at OUT3
- Internal device temperature
- Pump control unit
- Internal electronic fault
- Calibration error in the vacuum sensor
- IO-Link communication

If the values of one of the specified parameters lie outside the permitted operating conditions or the pump is faulty, the device goes into an error state.

If an error occurs, the GCPi changes to an error state. Error states are indicated on the touchscreen by a red background.

The type of error is indicated in the status bar at the top of the screen.

- Tap on the text to get more information.



The following table shows potential errors and their output on the touchscreen or via IO-Link parameter "Active errors" 0x0082 or the process input data bits. The exact error description can be found in the Data Dictionary:

Error	Explanation / solution
Internal data error	Internal data error is present; please reset application parameters
Temperature too high	Temperature too high. Device may be operated outside the specification. Cycle may only start after cooling
Sensor voltage too low	The sensor voltage is too low. Please increase the sensor voltage
Sensor voltage too high	The sensor voltage is too high. Please reduce the sensor voltage
Actuator voltage too low	The actuator voltage is too low. Please increase the actuator voltage
Auxiliary voltage too high	The actuator voltage is too high. Please reduce the actuator voltage
Short circuit at OUT2	Short circuit at OUT2. Please check the electrical connections
Short circuit at OUT3	Short circuit at OUT3. Please check the electrical connections
Calibration failed	Sensor calibration failed. Calibrate the device without vacuum applied
Pump error	Error on the pump. Please disconnect from the supply voltage and restart device
IOL communication failure	The IO-Link communication has been aborted. Check your connection

The pump can switch off automatically if the temperature is too high and the current suction cycle will no longer run. Before this happens, however, a notification is sent in the form of a warning or error (via IO-Link or OUT3). Warnings can be sent at lower temperature limits so that a response can be initiated in good time.

Suction cycles that are already running can be carried out to the end if an error occurs (depending on the error pattern). The deactivation of a suction request as well as the activation of a drop-off request ends an active suction cycle. However, a new suction cycle cannot be started while the error is ongoing.

Pump errors may only be acknowledged by powering up the GCPi again, if the error has been resolved.

Warnings and errors are issued via IO-Link. They can be processed and evaluated accordingly in the higher-level control unit.

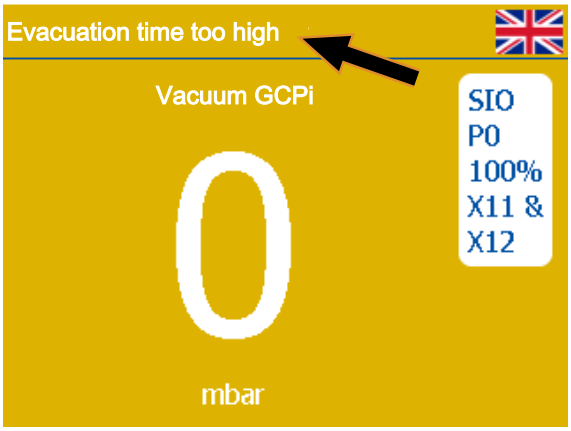
(> See ch. 6.21 Device Status, p. 51)

6.14.2 Display of Warnings

Condition monitoring (CM) events are displayed as warnings on the touchscreen.

When a warning occurs, the GCPi changes to an error state. This is indicated by an orange background on the touchscreen.
The type of warning is specified in the status bar at the top of the screen.

- Tap on the text to get more information.



The following table shows potential warnings and their output on the touchscreen or via IO-Link parameter “Condition monitoring” 0x0092 or the process input data bits. The exact CM description can be found under Condition Monitoring:

CM event	Description / solution
Evacuation time above limit	Evacuation time t1 is too high. Check your system for leakage
Leakage rate above limit	The leakage rate is too high During venting via the LQE, the GCPi detects an impermissible leakage while repeating the evacuation if the “Suction” signal remains continuously active. Solution: Deactivate the leakage measurement (permissable leakage rate = 0). Alternatively: Activate and deactivate the GCPi suction signal before repeating the evacuation. This starts a new cycle.
SP1 not reached in suction cycle	SP1 not reached. Increase the evacuation time or check whether the switching point can be reached
Free Flow vacuum over SP2	The dynamic pressure is above SP2. Please check your vacuum system
Primary voltage US out of operating range	The sensor voltage is at the limit of the permissible range. Please adjust the sensor voltage
Auxiliary voltage UA out of operating range	The actuator voltage is at the limit of the permissible range. Please adjust the actuator voltage
Temperature out of operating range	Temperature out of range. Check whether the device is operating within the specification
Vacuum sank under SP2 during suction	Vacuum dropped below SP2 while suction was activated (This warning is triggered by a leakage that cannot be compensated by a higher pump capacity. The error is acknowledged by issuing the “Suction” command again or pressing a button.)

6.14.3 Temperature Display

The temperature of the GCPi is monitored. If the temperature exceeds an internal limit value, the device does not allow a new suction cycle to start to prevent overheating. If the error occurs, the current suction cycle is terminated. The drop-off signal or the deactivation of the suction function ends the suction cycle.

The error status is displayed on the touchscreen; see "Displaying Errors and Warnings."

The error status is removed as soon as the device temperature falls below the internal limit value.

The current temperature, minimum temperature and maximum temperature (since the supply voltage was applied) can be read from the parameters “Temperature, live / Temperature, min / Temperature, max” 0x0044. The temperature value corresponds to the internal temperature of the pump motor.

The current device temperature is displayed in the unit [°C] on the touchscreen under the menu item **Menus and information > Monitoring > Temperature**.

6.15 Process Data Monitoring

IO-Link provides the current measurements for the following parameters, plus the lowest and highest values measured since switching on:

- From the system vacuum 0x0040
  “System vacuum live / min / max ”
- From the supply voltage 0x0042
  “Primary supply voltage, live / min / max”
- From the actuator voltage 0x0043
  “Auxiliary supply voltage live / min / max”
- From the temperature 0x0044
  “Temperature live / min / max”
- From communication mode 0x0234 (SIO or IO-Link)
  “Communication mode”

The parameter “System command” 0x0002 resets the maximum and minimum values of the system vacuum and the voltage values with the values 0xA8 (voltage) and 0xA9 (vacuum) (see Data Dictionary in the appendix).

The touchscreen only displays the current values of the specified parameters in the menu item **Menus and information > Monitoring**, with the exception of communication mode, which is displayed in the vacuum display in the key field(> See ch. 3.2.3 Vacuum Display, p. 14).

6.16 Production Setup Profiles

In IO-Link mode, the product can store up to four different production setup profiles (P0 to P3). I.e. the process parameters can be adapted to different application conditions.

The following process parameters are stored:

- Switching point 1 (SP1)
- Switching point 2 (SP2)
- Reset point (RP2)
- Duration of automatic drop-off
- Permitted evacuation time
- Permitted leakage rate
- Max. permissible power
- Profile name (can only be defined via IO-Link)

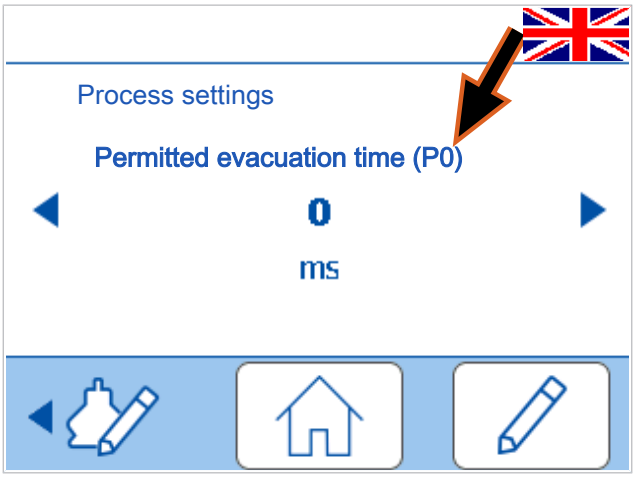
See Data Dictionary in the appendix.

The respective profile is selected using the output process data byte 0 or the selected profile can be read back using the parameter “Active profile” 0x0113.

Production setup profile P0 is selected as the basic setting and in SIO mode, i.e. the settings that are valid for SIO mode are determined by profile P0.

The process parameters for profile P0 are primarily set via the touchscreen in the menu item **Menus and information > Process settings**. The settings for profiles P1 to P3 are generally set via IO-Link.

If a profile is selected in IO-Link, the set values of this profile are also displayed on the touchscreen. The profile can be identified by the profile number shown in brackets (e.g. (P0))



6.17 Display Parameters

6.17.1 Setting the Language

The display language can be selected from the following languages:

- German
- English
- French
- Spanish
- Italian

In IO-Link, the language is set with the parameter “Language selection” 0x0051.

The language is set using the touchscreen in the menu item **Menus and information > Display parameters > Language** or can be selected using the flag symbol.

6.17.2 Touchscreen Brightness

The brightness of the touchscreen can be adjusted to the ambient conditions and for environmentally-friendly operation. The value can range between 0 (dark) and 100 (light) percent. At 0%, the touchscreen is still readable. To switch off the touchscreen completely, the parameter “Display mode” 0x004C is set to Eco mode (> See ch. 6.17.4 Display Mode, p. 49).

In IO-Link, the brightness of the background can be adjusted using the parameter “Display brightness” 0x004E.

The touchscreen controls the brightness (> See ch. 3.2.7 Changing the Parameters, p. 20) in the menu item **Menus and information > Display parameters > Brightness**.

6.17.3 Unity of Vacuum Display

The physical unit used to display the measurement values, limit values and hysteresis on the touchscreen can be adjusted:

Unit	Display unit
Bar	mbar
Pascal	kPa
Inch Mercury	inHg
Pound-force per square inch	psi

In IO-Link, the vacuum unit is set using the parameter “Display unit” 0x004A.

The vacuum unit is set using the touchscreen in the menu item **Menus and information > Display parameters > Unit**.

The selection of the vacuum unit only affects the touchscreen, it has no effect on the valuesdisplayed in IO-Link. These are always measured in mbar, see (> See ch. Data Dictionary).

6.17.4 Display Mode

The display mode determines the screen to which the touchscreen automatically resets itself after 60 seconds of inactivity.

Exception:

- The mode does not change automatically when the touchscreen is in manual mode.
- The mode does not change automatically when the graphical display is active.
- In the event of an error, no change occurs.
- ECO mode is automatically closed if an error occurs.

Choose from:

- vacuum => By default, the touchscreen displays the vacuum over a large area after 60 seconds.
- menu => the touchscreen remains on or jumps to the start screen.
- eco => the backlight of the touchscreen is switched off.

The display mode can be set in IO-Link using the parameter “Display mode” 0x004C.

The display mode is set via the touchscreen in the menu item **Menus and information > Display parameters > Display mode** .

6.17.5 Display Alignment

The alignment of the touchscreen display can be rotated by 180 degrees to adapt to the installation position.

In IO-Link, using the parameter “Display rotation” 0x004F.

The display alignment (normal or rotated) is set via the touchscreen in the menu item **Menus and information > Display parameters > Display rotation**.

6.17.6 PIN Code

(> See ch. 6.13.1 PIN code, p. 43)

6.18 Drop-Off Valve

If external valves are connected to the GCPi, it is necessary to define which valve should vent the GCPi in SIO and manual mode. In IO-Link mode, each drop-off valve can be controlled independently of one another.

In automatic mode, if one or two Schmalz compact valves (LQEi) are connected, these valves are automatically used for venting. The required parameter settings of the GCPi are automatically configured when connecting a compact valve (LQEi).

If a standard valve is connected, a selection must be made regarding whether the one or two standard valves are connected to connection X11 or X12.

If the GCPi is not selected as a drop-off valve, suction and drop-off can be controlled simultaneously. This means that with longer hose lengths, faster cycle times can be achieved using external drop-off valves close to the gripper, since only part of the system has to be evacuated and vented and not the entire hose length.

In IO-Link, the parameter “Drop-Off Valve” 0x0056 is used to determine which valve should be vented:

- With 0 —> GCPi
- With 1 —> X11
- With 2 —> X12
- With 3 —> GCPi & X11
- With 4 —> GCPi & X12
- With 5 —> X11 & X12
- With 6 —> GCPi & X11 & X12
- With 7 —> automatic (for compact valve LQEi)

Using the touchscreen, the drop-off setting is selected in the menu item **Menus and information > Initial settings > Drop-off valve**.

6.19 Power Supply to External Devices

The option to select whether the actuator or sensor voltage is to be switched off or on for both interfaces X11 and X12 is important when connecting external devices which are not produced by Schmalz for the GCPi.

For the actuator voltages, there is also the option in SIO mode of coupling the activation to the “drop-off” signal (selection: SIO signal) (> See ch. 6.18 Drop-Off Valve, p. 50). As a result, an external standard valve near the gripper can be activated or deactivated as a drop-off valve via the actuator supply.

Via IO-Link, you can select independently, for both interfaces X11 and X12, whether the actuator and sensor voltage is to be switched on or off, by means of parameters “Us X11 (Pin 1 and Pin 5) / Us X12 (Pin 1 and Pin 5)” 0x0057 and “Ua X11 (Pin 2 and Pin 4) / Ua X12 (Pin 2 and Pin 4)” 0x0058.

Using the touchscreen, the voltage setting is selected in the menu item **Menus and information > Initial settings > ...**

- **... Sensor voltage X11** (Off; On)
- **... Sensor voltage X12** (Off; On)
- **... Actuator voltage X11** (Off; On; SIO signal)
- **... Actuator voltage X12**(Off; On; SIO signal)

6.20 Timing

The GCPi determines the following process times for the GCPi and the devices connected to the interfaces X11 and X12:

- Total cycle time of last cycle [ms]
  ("Total cycle time of last cycle", 0x00A6)
- Evacuation time t0 of last suction cycle [ms]
  ("Evacuation time t0 of last suction cycle", 0x0094)
- Evacuation time t1 of last suction cycle [ms]
  ("Evacuation time t1 of last suction cycle", 0x0095)
- Holding time t2 of last suction cycle [ms]
  ("Holding time t2 of last suction cycle", 0x00AA)
- Drop-off time t3 [ms]
  ("Drop-off time t3 of last suction-cycle", 0x00AB)

And for the GCPi:

- Pump on time [min]
  ("Pump-on total time", 0x00A7)
- Device on time [min]
  ("Power-on total time", 0x00A8)

The above parameters can be called up via IO-Link (see Data Dictionary in the appendix).

The GCPi times are displayed via the touchscreen under the menu item **Menus and information > Timing**.

The specified times for the devices connected to X11 and X12 are **not** displayed on the touchscreen.

6.21 Device Status

The overall status of the system is displayed as a traffic light in the ISDU parameters. All warnings and errors are used to determine the status shown here. The status of the device is displayed in 4 levels.

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

Parameter 0x0024	Status	Description
Device Status	Green (0)	Device is working correctly (Device is operating properly)
	Yellow (1)	Maintenance or adaptation of settings required (Maintenance required)
	Orange (2)	Device is working outside the permitted specifications (Out of Spec)
	Red (4)	Error – safe operation within the operating limits is no longer ensured

Any Condition Monitoring and Error events that occur during the suction cycle cause the system status light to immediately switch from green to yellow/orange. The specific event that caused this switch can be seen in the parameter IO-Link "Condition Monitoring" 0x0092.

In IO-Link mode, further error messages are available in addition to the error messages displayed in SIO mode.

More details on this can be found in the final section of the enclosed Data Dictionary.

- Device status (process data)

- Device status 0x0024 and Detailed device status 0x0025 (parameter data)
- Extended device status 0x008A(type + ID)
- IO-Link events

6.22 Device Data

The device provides a range of identification data that can be used to uniquely identify a specific device.

The following parameters can be queried via IO-Link or NFC:

- Manufacturer name and web address of the manufacturer
  (“Vendor name 0x0010 / Vendor text 0x0011”)
- Product name and product text
  (“Product name 0x0012 / Product text 0x0014”)
- Supplier text
  (“Product ID 0x0013 ”)
- Serial number
  (“Serial number 0x0015”)
- Version status of the hardware and firmware
  (“Hardware revision 0x0016 / Firmware revision 0x0017”)
- Unique device ID and device properties
  (“Unique device ID 0x00F0”)
- Part number
  (“Article number 0x00FA”)
- Production date
  (“Production date 0x00FC”)
- Detailed product text
  (“Detailed product text 0x00FE”)

6.23 User-Specific Localization

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

- Application specific labeling (Application specific tag 0x0018)
- Function identifier (Function tag 0x0019)
- Location (Location tag 0x001A)
- Device identifier (Equipment identification 0x00F2)
- Location identifier (Geolocation 0x00F6)
- Web link for NFC app (NFC web link 0x00F8)
- Identifier of the storage location (Storage location 0x00F9)
- Installation date (Installation date 0x00FD)

The 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 (link to IoT server). This parameter must include a valid web address beginning with http:// or https:// and is automatically used as a web address for NFC read access operations.

As a result, read access operations from smart phones or tablets are rerouted e.g. to an address in the company's own intranet or a local server.

6.24 Energy and Process Control (EPC)

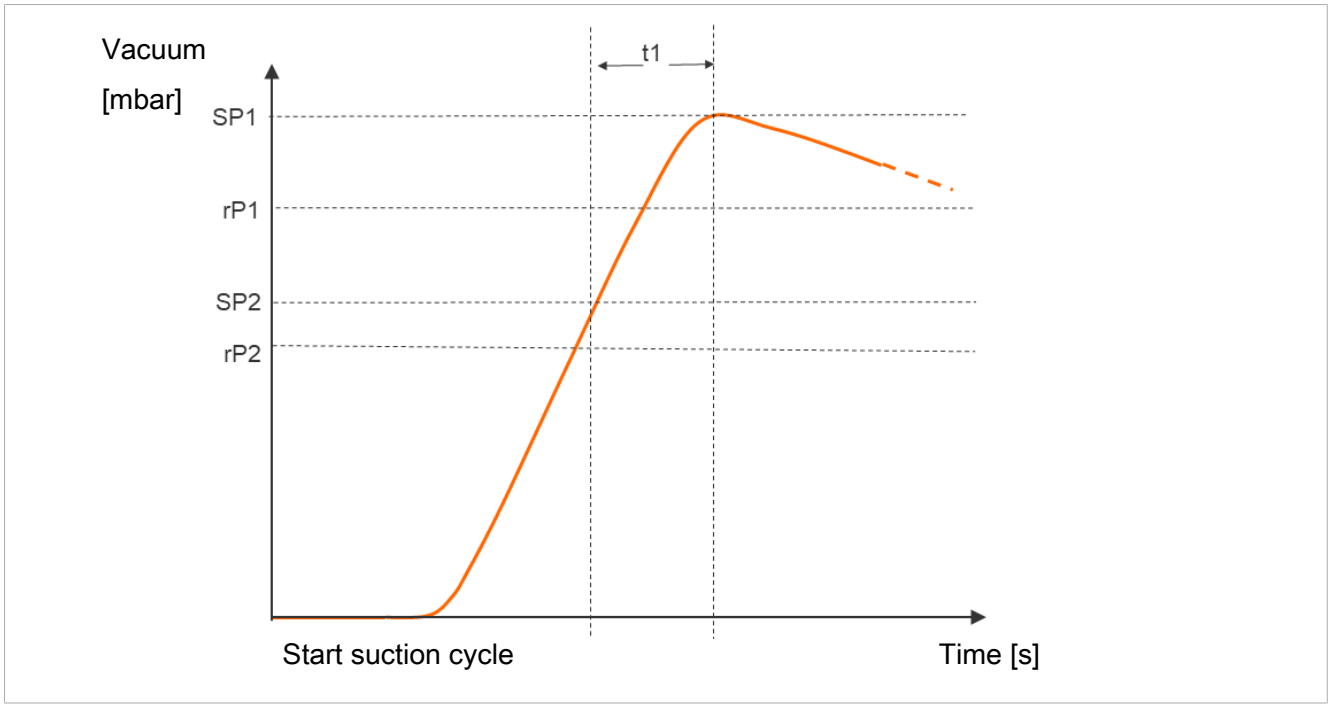
In IO-Link mode, the energy and process control (EPC) function is available. It is subdivided into three modules:

- Condition monitoring (CM): Condition monitoring to increase system availability
- Energy monitoring (EM): Energy monitoring to optimize the vacuum system's energy consumption
- Predictive maintenance (PM):
  - Predictive maintenance to increase the performance and quality of the gripping systems

6.24.1 Condition Monitoring (CM)

Monitor Evacuation Time

The functions listed here can be executed or read out for the GCPi itself, but also for external devices connected to X11 and X12 and prepared for the GCPi (vacuum switch VSi V or compact valve LQEi).



Measuring the evacuation time t0:

The time is measured (in ms) from the beginning of the suction cycle to the time when the limit value SP2 is reached (Parameter "Evacuation time t0 of last suction-cycle XXX" 0x0094).

Measuring the evacuation time t1:

The interval between reaching the switching points SP2 and SP1 is measured (in ms) (Parameter "Evacuation time t1 of last suction-cycle XXX" 0x0095).

If the measured evacuation time t1 (from SP2 to SP1) exceeds the specified value, the "Evacuation time above limit" condition monitoring warning is triggered and the system status light switches to yellow.

Setting the value to zero (= off) deactivates monitoring. The maximum permitted evacuation time setting is 9999 milliseconds [ms].

The maximum permitted evacuation time t1 is set via IO-Link using the parameter “Permissible evacuation time” for each production setup profile (for P0 using 0x006B).

The touchscreen defines the default value for the maximum permissible evacuation time t1 for the Production Profile P0 in the menu item **Process parameters**.

Leakage Monitoring and Evaluation

The leakage of the GCPi is measured and monitored in control mode. The measurement is performed using a calculation based on the pump control values (speed and duration) when readjusting to the setpoint SP1. The calculated value L can be read as a volume flow rate using the parameter “Leakage rate” 0x00A0 or alternatively using the process data (EPC select) in ml/min.

The evaluation of the leakage level differentiates between two statuses:

Leakage L < permitted value -L-

If the leakage L is less than the set value “Permissible leakage rate”

- The condition monitoring warning is not activated
- There is no effect on the system status light and the display on the touchscreen

Leakage L > permitted value -L-

If the leakage L is greater than the set value “Permissible leakage rate”

- The condition monitoring warning is activated
- The system status light switches to yellow and a warning (orange) is displayed on the touchscreen.

The permissible leakage value “Permissible leakage rate” can be set from 1 to 9999 milliseconds [ms]. The value zero does not display a warning.

Via IO-Link, the permissible leakage value is set using the parameter “Permissible leakage rate” 0x006C for Production setup P0. The addresses defined in the Data Dictionary are used for profiles P1 to P3.

The permissible leakage value “Permissible leakage rate” for production profile P0 is set using the touchscreen in the menu item **Menus and information > Process settings > Permitted leakage**.

Control Threshold Monitoring

If the switching point SP1 is never reached during the suction cycle, the “SP1 not reached in suction cycle” condition monitoring warning is triggered and the system status light switches to orange.

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

Monitor Dynamic Pressure

If possible, a dynamic pressure measurement is taken at the start of every suction cycle (vacuum during unobstructed suction). The result of this measurement is compared to the limit values set for SP1 and SP2.

If the dynamic pressure is greater than SP2 but less than SP1, the corresponding condition monitoring warning is triggered and the status light switches to yellow.

(> See ch. 6.24.3.2 Measuring Dynamic Pressure, p. 55)

Condition Monitoring Autoset

The “CM Autoset” process data function allows the condition monitoring parameters for the maximum permitted leakage “Permissible leakage rate” and the evacuation time (t-1) “Permissible evacuation time” to be determined automatically.

The actual values from the last suction cycle are combined with an additional tolerance and stored in the parameter data of production setup P0.

Feedback about the completed "CM Autoset" function is displayed via input process data byte 0 "CM Autoset acknowledged."

Monitoring of the Supply Voltages

The device has an internal voltage monitor. It requires a power supply of 24 V. If the voltage deviates outside a certain tolerance range, the device enters an error state.

The device measures the sensor supply voltage U_S ("Primary supply voltage" 0x0042) and the actuator supply voltage U_A ("Auxiliary supply voltage" 0x0043).

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

- Device status
- Condition monitoring parameter
- IO-Link event is generated
- Error is displayed

For more detailed information, see the data dictionary attached.

6.24.2 Energy Monitoring (EM)

In order to permit optimization of vacuum gripping systems' energy efficiency, the device provides a function for measuring and displaying the energy consumption. The electrical energy consumed by the device and by the valve coil(s) during a suction cycle is measured and given in watt-seconds (Ws).

The parameter "Energy consumption of last suction cycle" 0x009D stores the energy consumption of the last cycle of the GCPi and the externally connected devices.

The measured value is reset at the beginning of the suction cycle and constantly updated during the running cycle. Thus no further changes can occur after venting has finished. For determining the electrical energy consumption, the neutral phase of the suction cycle must also be considered. Therefore the measured values can be updated only when the next suction cycle begins. During the entire cycle, they represent the results from the previous cycle.

The product is not a calibrated measuring device. However, the values may be used as a reference and for comparison measurements.

6.24.3 Predictive Maintenance (PM)

Overview of Predictive Maintenance (PM)

To allow early detection of wear and other impairments to the vacuum gripping system, the product provides functions for recognizing trends in the quality and performance of the system. This is accomplished using the measured values for leakage and dynamic pressure.

The measurement value for the leakage rate and the related quality assessment in percent are reset at the start of every suction cycle and constantly updated during the cycle as moving averages. The values therefore only remain stable after the end of suction and can be read from the "Quality" parameter 0x00A2.

Measuring Dynamic Pressure

The system vacuum achieved during unobstructed suction is measured using parameter "Free-flow vacuum" 0x00A1. The duration of the measurement is approx. 1 second. Thus evaluation of a valid dynamic pressure value requires at least one second of unobstructed suction after the suction cycle has commenced. The suction point must not be occupied by a component at this time.

Measured values below 5 mbar or above the vacuum limit value SP1 are not regarded as valid dynamic pressure measurements and are discarded. The result of the last valid measurement is retained.

Measured values that are below the vacuum limit value SP1 but simultaneously above the vacuum limit value SP2 result in a condition monitoring event.

The dynamic pressure and the percentage performance value based on it are initially unknown when the product is switched on. As soon as a dynamic pressure measurement can be performed, the dynamic pressure and the performance evaluation are updated and retain their values until the next dynamic pressure measurement. The value can be read from the parameter “Free-flow vacuum” 0x00A1.

Maximum Vacuum Reached in the Last Cycle

The parameter “Max reached vacuum” 0x00A4 can be used to obtain the highest vacuum measured in the last cycle.

Quality Assessment

To evaluate the entire gripping system, the device calculates a quality rating based on the measured system leakage.

The greater the leakage in the system, the worse the quality rating of the gripping system. Conversely, low leakage results in a high quality rating.

The quality assessment can be read out using the parameter “Quality” 0x00A2. The value indicates the quality relative to a leakage-free system in %.

Performance Calculation

The performance calculation helps in evaluating the system status. The performance of the gripping system can be assessed based on the measurement of the dynamic pressure.

Optimal configuration of gripping systems leads to low dynamic pressure and thus to high performance. Conversely, poorly configured systems achieve low performance.

Dynamic pressure events that exceed the vacuum limit value SP2 always result in a performance rating of 0%. A dynamic pressure value of 0 mbar (which indicates that no valid measurement value could be obtained) also results in a performance rating of 0%.

The value can be read from the parameter “Performance” 0x00A3.

7 Checking the Delivery

The scope of delivery can be found in the order confirmation. The weights and dimensions are listed in the delivery notes.

1. Compare the entire delivery with the supplied delivery notes to make sure nothing is missing.
2. Damage caused by defective packaging or occurring in transit must be reported immediately to the carrier and J. Schmalz GmbH.

8 Installation

8.1 Installation Instructions

⚠ CAUTION

Improper installation or maintenance

Personal injury or damage to property

- Prior to installation and before maintenance work, the vacuum generator must be disconnected from the power supply and secured against unauthorized restart!

For safe installation, the following instructions must be observed:

Use only the connectors, mounting holes and attachment materials that have been provided.

Firmly connect and secure pneumatic and electrical line connections to the vacuum generator.

8.2 Mounting

NOTE

Use of other mounting elements

Damage to the screw-on points or the housing

- Only use the mounting variants and mounting elements described here.

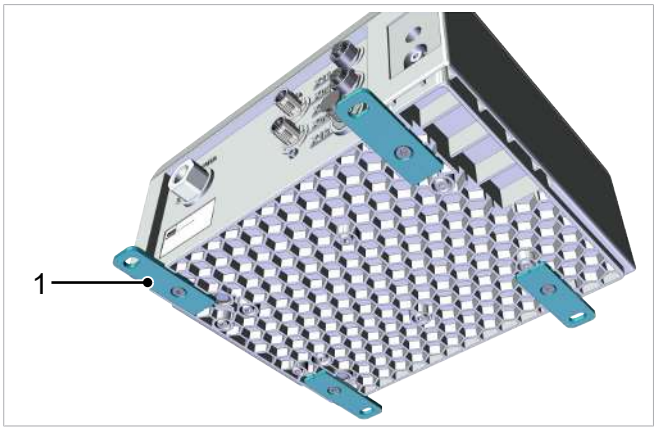
NOTE

The heated exhaust air cannot be dissipated from the device, because the exhaust air output / silencer is too close to an adjacent device or wall.

The device is overheating and getting damaged.

- Make sure that in the area of the exhaust air output / silencer the distance from adjacent devices / walls is at least 15 cm of open space so that the cooling air flow is not impaired and the heated air can flow out unhindered.

To mount the GCPi in a control cabinet, for example, four mounting plates with a slot are mounted on the underside.



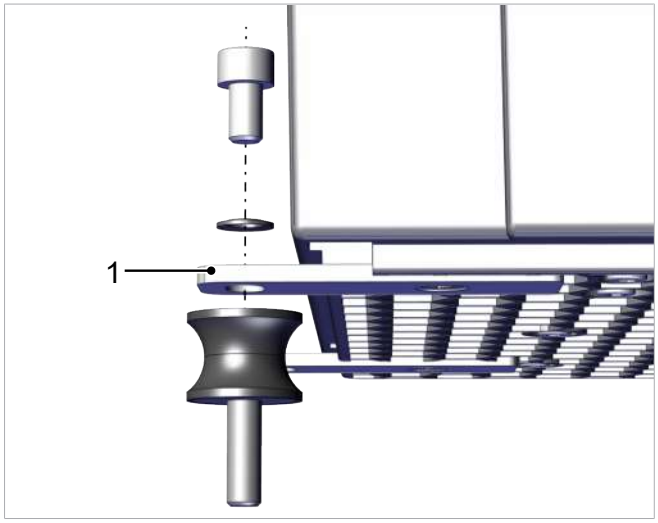
- Attach the GCPi to a suitable holder using the four mounting plates (1).

Optional: Mounting using rubber buffers

In order to prevent the transmission of structural vibrations from the GCPi to the surrounding area, rubber buffers are available in the accessories section.

✓ The mounting set with part no. 10.03.01.00810 is available as an accessory.

1. Mount the four rubber buffers with M6 external threads on the mounting plates (1) in the correct position as shown in the illustration.



2. Attach the GCPi to the holder provided.

Optional: Mounting with rubber feet

Alternatively, rubber feet are available in the accessories section, which are used to position the GCPi on a workbench (e.g. laboratory application).

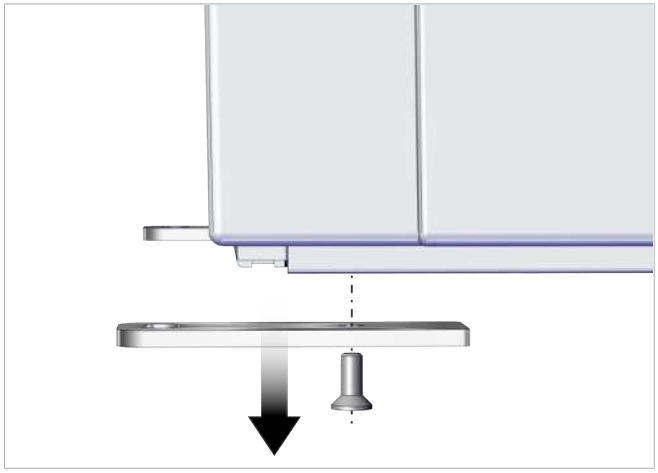
If the GCPi is operated on a workbench with the rubber feet fitted, it is not attached to a holder, i.e. there is a possibility that the GCPi will move due to vibrations generated during operation.

▸ Make sure that the product does not fall off the workbench.

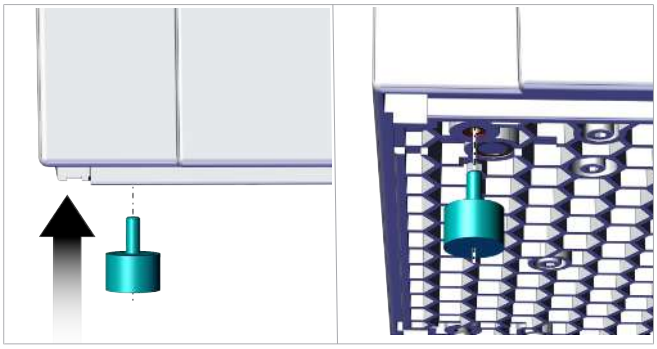
✓ The installation surface must be level and horizontal.

✓ The mounting set with part no. 10.03.01.00809 is available as an accessory.

1. Remove the four mounting plates.



2. Manually screw the four rubber feet into the threads of the previously removed screws.



⇨ The four rubber feet are mounted on the GCPi. For example, the GCPi can be operated on a workbench.

8.3 Description of the Electrical Connection

⚠ WARNING

Electric shock

Risk of injury

- Operate the product using a power supply unit with protected extra-low voltage (PELV).

⚠ CAUTION

Changing output signals when the product is switched on or plug is connected

Personal injury or damage to property!

- The electrical connection must be performed only by specialists who can evaluate the effects of signal changes on the overall system.

The electrical connection of the GCPi is established using the connections X01 (plug), X02 (plug) and X13 (plug) shown in the illustration.

Additional external devices, such as valves or vacuum switches, are connected using the sockets X11 and X12.

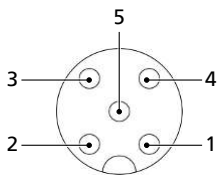
Carry out assembly or disassembly work only when the device is disconnected from the power supply. Electrical connections must be firmly connected to the device and secured.

When connecting to the electrical supply, take note of the following:

- Different applications require different power supplies
- Observe the voltage range for connection cables in L-coded design
- The maximum length of the connection cable is 20 m.
- Due to the power requirement, special cables with a larger cross section (0.75 mm²) must be used, depending on the version of the device ((> See ch. 14 Accessories, p. 97), 5 m cable length)

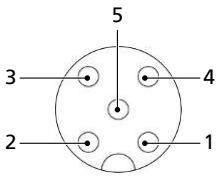
8.3.1 PIN Assignment

Connection X01: PIN Assignment for Class A IO-Link 5-pin M12 Connector

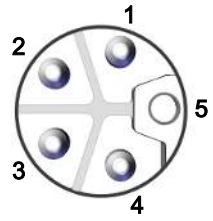
M12 plug	PIN	Wire color [1]	Symbol	Function
	1	Brown	U_S	Supply voltage
	2	White	OUT3 (CM/Error)	Only in SIO mode: CM or error (signal must be related to GND_S)
	3	Blue	GND_S	Ground
	4	Black	IO-Link / OUT2 (SP2)	IO-Link communication / part present. (Signal must be related to GND_S)

M12 plug	PIN	Wire color [1]	Symbol	Function
	5	Gray	NC	Not connected

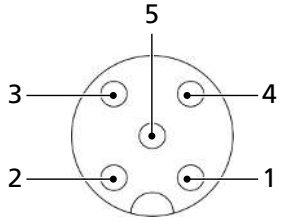
Connection X02: PIN Assignment for 5-pin M12 Connector

M12 plug	PIN	Wire color [1]	Symbol	Function
	1	Brown	U_A	Actuator voltage
	2	White	IN2 / DROP-OFF	Activate drop-off. Signal must be related to GND_A
	3	Blue	GND_A	Ground for actuator supply
	4	Black	IN1 / SUCTION	Activate suction. Signal must be related to GND_A
	5	Gray	NC	Not connected

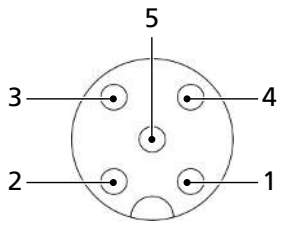
Connection X13: PIN Assignment for 5-pin M12 Plug in L-coded Design

M12 plug	PIN	Wire color [1]	Symbol	Function
	1	Brown	NC	Not connected
	2	White	GND_A	Ground for actuator supply
	3	Blue	NC	Not connected
	4	Black	U_A	Supply voltage
	5	Gray	NC	Not connected

Connection X11: PIN Assignment for 5-pin M12 Socket

M12 socket	PIN	Litz wire color	Symbol	Function
	1	Brown	OUT4 / U_S	Switchable sensor supply voltage
	2	White	OUT5 / U_A	Switchable sensor actuator supply
	3	Blue	GND_S	Ground for sensor supply voltage
	4	Black	IO-Link	IO-Link only for prepared Schmalz devices such as VSi V or LQEi
	5	Gray	GND_A	Ground for actuator supply

Connection X12: PIN Assignment for 5-pin M12 Socket

M12 socket	PIN	Litz wire color	Symbol	Function
	1	Brown	OUT6 / U_S	Switchable sensor supply voltage
	2	White	OUT7 / U_A	Switchable sensor actuator supply
	3	Blue	GND_S	Ground for sensor supply voltage
	4	Black	IO-Link	IO-Link only for prepared Schmalz devices such as VSi V or LQEi
	5	Gray	GND_A	Ground for actuator supply

8.3.2 Connecting External Devices Electrically

The electrical connection of external devices is established using the sockets at positions X11 and X12.

If external devices such as valves require an actuator supply, a corresponding voltage must be supplied via X13.

Carry out assembly or disassembly work only when the device is disconnected from the power supply. Electrical connections must be firmly connected to the device and secured.

8.3.3 Connection Recommendations for Applications – without the Use of External Devices

The electrical connection (power supply and transmission of the input and output signals) can be established using the following cables via connections X01 and X02:

		Supply + signals	
Operating mode	**Design of connection line**	**Connection to X01**	**Connection to X02**
IO-Link	Plug or socket – open cable end	**21.04.05.00080** (M12-5 A-coded, 0.34 mm², 5 m) IN: Supply US/GND-S IN/OUT: IO-Link	**21.04.05.00994** (M12-5 A-coded, 0.75 mm², 5 m) IN: Supply UA/GND-A
	1:1 plug/socket With I/O box	**21.04.05.00266** (M12-5 A-coded, 0.34 mm², 5 m) IN: Supply US/GND-S IN/OUT: IO-Link	**21.04.05.00931** (M12-5 A-coded, 0.75 mm², 5 m) IN: Supply UA/GND-A
SIO	Plug or socket – open cable end	**21.04.05.00080** (M12-5 A-coded, 0.34 mm², 5 m) IN: Supply US/GND-S OUT: SP2+CM/ERROR	**21.04.05.00994** (M12-5 A-coded, 0.75 mm², 5 m) IN: Supply UA/GND-A IN: Suction + drop-off
	1:1 plug/socket With I/O box	**21.04.05.00266** (M12-5 A-coded, 0.34 mm², 5 m) IN: Supply US/GND-S OUT: SP2+CM/ERROR	**21.04.05.00931** (M12-5 A-coded, 0.75 mm², 5 m) IN: Supply UA/GND-A IN: Suction + drop-off

8.3.4 Connection Recommendations for Applications – with the Use of External Devices

An electrical connection using external devices requires an increased power consumption, therefore a cable with a larger cross section is used.

The following table shows the connection combinations of the cables used:

		Supply + signals			Ext. devices
Operating mode	**Design of connection line**	**Connection to X01**	**Connection to X02**	**Connection to X13**	**Connection to X11/X12**
IO-Link	Plug or socket – open cable end	**21.04.05.00080** (M12-5 A-coded, 0.34 mm², 5 m) IN: Supply US/ GND-S IN/OUT: IO-Link	**21.04.05.00994** (M12-5 A-coded, 0.75 mm², 5 m) IN: Supply UA/ GND-A	**Alternatively to X02: 21.04.05.00352** (M12-5 L-coded, 2.5 mm², 5 m) IN: Supply U/ GND-A	**21.04.05.00434** (M12-5 A-coded, 0.34 mm², 3 m) IN: Supply US/ GND-S IN/OUT: IO-Link
	1:1 plug/socket With I/O box	**21.04.05.00434** (M12-5 A-coded, 0.34 mm², 3 m) IN: Supply US/ GND-S IN/OUT: IO-Link	**21.04.05.00931** (M12-5 A-coded, 0.75 mm², 5 m) IN: Supply UA / GND-A	**Alternatively to X02: 21.04.05.00607** (M12-5 L-coded, 2.5 mm², 3 m) IN: Supply UA/ GND-A	
SIO	Plug or socket – open cable end	**21.04.05.00080** (M12-5 A-coded, 0.34 mm², 5 m) IN: Supply US/ GND-S OUT: SP2+CM/ ERROR	**21.04.05.00994** (M12-5 A-coded, 0.75 mm², 5 m) IN: Suction + drop-off / Supply UA/GND-A	**Alternatively, in addition to X02: 21.04.05.00352** (M12-5 L-coded, 2.5 mm², 5 m) IN: Supply UA/ GND-A	
	1:1 plug/socket With I/O box	**21.04.05.00434** (M12-5 A-coded, 0.34 mm², 3 m) IN: Supply US/ GND-S OUT: SP2+CM/ ERROR	**21.04.05.00931** (M12-5 A-coded, 0.75 mm², 5 m) IN: Suction + drop-off / Supply UA/GND-A	**Alternatively, in addition to X02: 21.04.05.00607** (M12-5 L-coded, 2.5 mm², 3 m) IN: Supply UA/ GND-A	

8.4 Vacuum Connection and Exhaust Duct

The device has a vacuum connection.

The vacuum connection (1) is marked on the device with the number 2 and is designed with an internal thread measuring 1/4". The vacuum connection incorporates a filter screen for particles ≧ 100 µm. For applications with particles <100 µm, an additional filter (> See ch. 14 Accessories, p. 97) must be used.

The exhaust air flows out of the silencer (2) and is marked with the number 3.

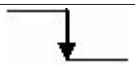
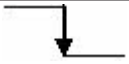
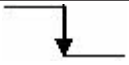
Alternatively, the exhaust air can be discharged via a hose. The installation is explained further in the Silencer Maintenance chapter.

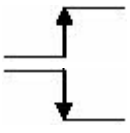
8.5 Start of Operations

As soon as the supply voltage is applied to the GCPi, it is ready for operation.

A typical handling cycle is divided into the following three phases: suction, drop-off and idle.

To check whether sufficient vacuum has built up, the limit value SP2 is monitored by an integrated vacuum sensor during suction and output to the higher-level control unit via OUT2.

Phase	Switching step	GCPi		
		Signal		Status
1	1		IN1	Suction ON
	2		OUT2	Vacuum > SP2
2	3		IN1	Suction OFF
	4		IN2	Drop-off ON
3	5		OUT2	SP3
	6		IN2	Drop-off OFF



Signal state change from inactive to active

Signal state change from active to inactive

8.6 Start of Operations: GCPi and LQEi

These instructions provide a checklist of all the necessary settings and connections for the operation of the GCPi with the LQE. When operating an LQE via the GCPi, an LQEi is always to be preferred. Even without an IO-Link connection for the GCPi, the interfaces of the two devices are designed so that they can communicate with each other and, for example, exchange the vacuum value SP2.
Although an LQEc would also be possible in principle via a normal SIO control (see the section on the activation of the 3/2-way valve), the feedback to the SP2 at the LQEc would be missing in this case, so the benefit of the integrated vacuum switch in the valve (2 devices in one) would be wasted.

The chapter applies only to the following applications:

- IO-Link Application: GCPi Controls **One** LQEi (> See ch. 8.6.1 IO-Link Application: GCPi Controls One LQEi, p. 66):
  Advantages:
  – Vacuum values are available at the suction point
  – Extended diagnostics data
  – Profiles can be used when handling different workpieces
- IO-Link Application: GCPi Controls **Two** LQEi Units (> See ch. 8.6.2 IO-Link Application: GCPi Controls Two LQEi Units, p. 72):
  Advantages:
  – Two separate suction points, separate control of the LQEi
  – Application e.g.: one suction point applies suction, the second suction point drops off
  – Vacuum values and separate vacuum monitoring for the two separate suction points available
  – Extended diagnostics data
  – Profiles can be used when handling different workpieces
- SIO Application: GCPi Controls **One** LQEi (24V Digital In/Out) (> See ch. 8.6.3 SIO Application: GCPi Controls One LQEi (24V Digital In/Out), p. 79)

8.6.1 IO-Link Application: GCPi Controls One LQEi

Connecting Components

In this application, the LQEi is connected to connection X11 on the GCPi (e.g. with connection cable 21.04.05.00434).

In addition, the GCPi is connected to the higher-level controller via IO-Link (e.g. with the connection cable 21.04.05.00080). The maximum length of the cables is 20 meters.

GCPi + LQEi provides the option to supply the devices with galvanic separation with US (sensor supply) + UA (actuator supply), with 24 V each. As a result, for example, UA can be switched off separately if there is an interruption on a safety section. If this is not required in the application, US can be supplied through X01 and UA can be supplied through X13 together via a power supply unit. The specified individual power levels required must be added up in this case.

Recommended power supply unit power:

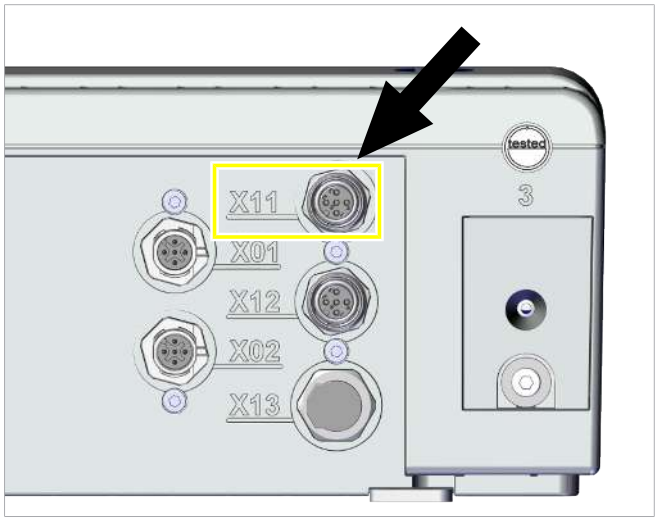
The current consumption of the GCPi depends on the vacuum generated by the GCPi. The maximum is up to 3.2 A. (The maximum GCPi power consumption to be expected can be found in (> See ch. 4.3 the table, p. 26). For the value of the current, the power is to be divided by 24 V.)
In addition, the LQEi requires up to 0.25 A (with a handling cycle of 1 Hz) on average or 1.2 A of peak current for 90 ms in each case.

If you can ensure that the GCPi and LQEi are not active at the same time, you can reduce the power values accordingly (> See ch. 4.3 Performance Data, p. 26).

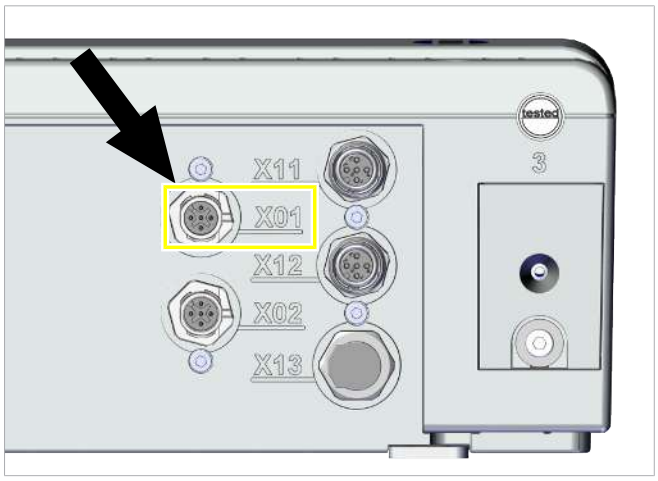
For the connection to X01, a **required recommended rated power of 3 watts** applies (that is, min. 125 mA at 24 V).

For the connection to X13, a **required recommended rated power of max. 84 watts** applies (that is, 3.5 A at 24 V) and a
recommended peak load capacity of 3.2 A + 1.2 A (105 W) for 90 ms in each case must be ensured.

1. Attach the connection cable (e.g. 21.04.05.00434) to the electrical connection (X11) and secure it (maximum tightening torque = hand-tight).

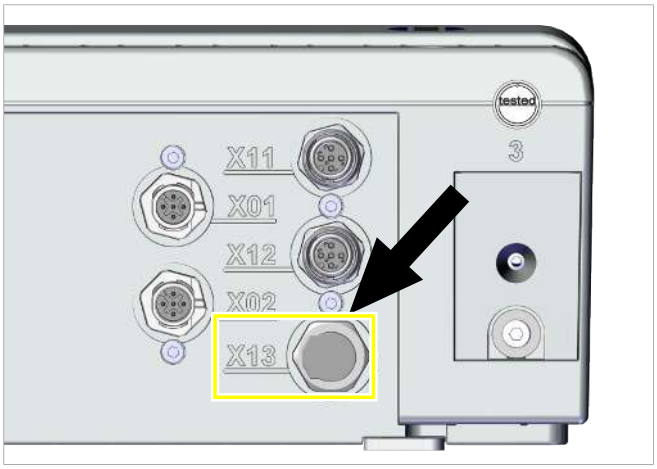


2. Connect the GCPi to the higher-level control via IO-Link, connection (X01) (e.g. with ASK 21.04.05.00080).



   ⇨ There is an explanation of the PIN assignment for connection X01 (> See ch. 8.3.1 PIN Assignment, p. 61).

3. To fulfil the function, connect the following PINs to the controller:
   — US (24 V) to pin 1
   — GND_S to pin 3
   — IO-Link to pin 4
   Do not connect anything to pin 2 or pin 5.
   Required recommended rated power:
   3 watts (i.e. at least 125 mA at 24 V)



4. Attach the connection cable for the GCPi supply voltage (e.g. ASK 21.04.05.00352) to the electrical connection (X13) and secure it (maximum tightening torque = hand-tight).

   ⇨ There is an explanation of the PIN assignment for connection X13 (> See ch. 8.3.1 PIN Assignment, p. 61).

5. To fulfil the function, connect the following PINs:
   — UA (24 V) to pin 4
   — GND_A to pin 2
   Do not connect anything to pin 1, pin 3 or pin 5.
   Required recommended rated power: max. **84 watts** (i.e. 3.5 A at 24 V)
   Recommended peak load capacity of 3.2 A + 1.2 A (**105 W**) for 90 ms in each case must be ensured

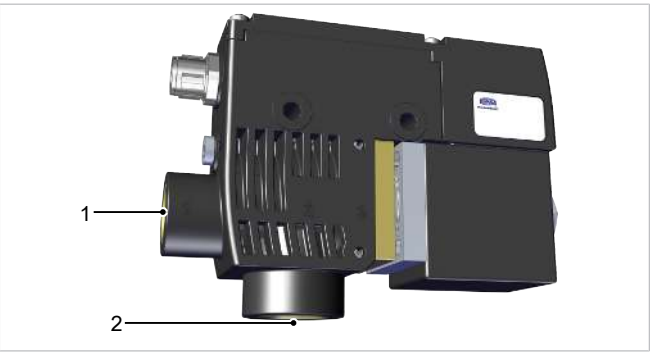
Pneumatic Connection

Connect the pneumatic connection according to the operating instructions for the GCPi (> See ch. 8.4 Vacuum Connection and Exhaust Duct, p. 65) and LQEi.

The vacuum connection is marked on the GCPi with the number 2 and is designed with a 1/4" internal thread.

✓ The customer has attached the components for connecting the hoses to the vacuum connections.

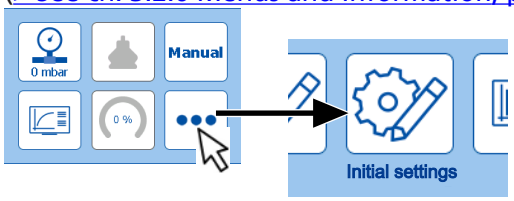
- Connect the vacuum hose for the GCPi at the connection (1) (marked on the housing with the number 1). The maximum tightening torque for 1/4" threads is: 2.0 Nm
  and connect the vacuum hose for the gripper or gripping system at the connection (2) (marked on the housing with the number 2). The maximum tightening torque for 3/8" threads is: 2.5 Nm



Basic Settings on the GCPi

The following options are available for configuring the basic settings:

- Via the touch screen of the GCPi
  (> See ch. 3.2.6 Menus and Information, p. 18)



- Via the NFC function of the GCPi using the Control Room App
- Via IO-Link

Parameter	ISDU parameters	Description	Adjustment
Drop-off-mode	69	Drop-off mode	Not relevant
Output functions	71	Function output 2	Not relevant
Signal type: SIO outputs of the device Signal type: SIO inputs of the device	73	Input and output logic of the higher-level controller	Not relevant
Drop-Off valve (SIO-Mode & manual mode)	86	Selection of the delivery valve(s) in SIO or manual mode	Not relevant; (1 = X11 if the LQEi units are to be controlled via manual mode)
Output filter	75	Output delay	Recommendation: 10 (ms)
US X11 US X12	87	Sensor supply for LQEi (to X11 & X12)	1 = on
UA X11 UA X12	88	Actuator supply for LQEi (to X11 & X12)	Info: no settings required; is always 1 = on if an LQEi is connected.
SP2 selection/displayed vacuum value	89	The vacuum level to be shown on the display	7 = automatic (The value of X11 is displayed automatically)

Setting the Vacuum Switching Points, Control Threshold SP1 and “Part Present” Check SP2 on the GCPi

Note:

Control threshold SP1: Control value SP1 at which the GCPi regulates the vacuum (if this value is reached, the pump switches off. If the value falls below this limit, the pump is automatically switched on)
=> vacuum value of the GCPi is relevant

“Part present” check SP2 and corresponding reset point rP2: vacuum values for a valid part present check (part securely picked up).
=> vacuum values of the LQEi are relevant

A “part present” check SP2 can also be set in the LQEi (e.g. via NFC). However, this is irrelevant and is not evaluated via the GCPi. It only compares the vacuum value on the LQEi with switching point SP2 in the GCPi. If SP2 is exceeded, the corresponding SP2 (Part Present) signal is activated.

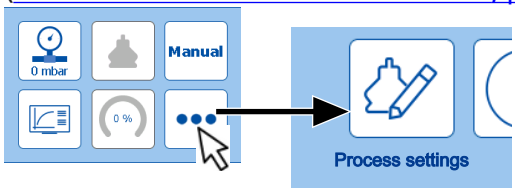
Creating Profiles for Handling Different Workpieces

If you are handling different workpieces, you can store different threshold values in up to four profiles. This can only be set via IO-Link parameters (not via the display or NFC). The setting parameters required for this purpose can be found in the GCPi DataDictionary.

Configuring settings

You can configure the settings in the following ways:

- Via the touch screen of the GCPi
  (> See ch. 3.2.6 Menus and Information, p. 18)



  (Important: Only the switching points of the profile that is currently active can be set via the display)
- Via the NFC function of the GCPi using the Control Room App in the menu item “Proc. settings”
  (Important: only the switching points of profile 0 can be set via the NFC app)
- Via IO-Link and using the settings for the ISDU parameters specified in the table below:

Parameter	ISDU parameters (for profile 0)	Description	Adjustment
Switchpoint 1 (SP1) / Schaltpunkt SP1	100	Vacuum control value SP1 at which the GCPi regulates the vacuum	Recommendation: **700 (mbar)**. With this setting: • With airtight workpieces, the pump normally switches to regulation mode • When handling workpieces with leakage, the max. possible vacuum is applied on the workpiece • The pump switches to regulation mode during DROP-OFF

Parameter	ISDU parameters (for profile 0)	Description	Adjustment
Switchpoint 2 (SP2) / Schaltpunkt SP2	102	Parts present check SP2 (Part Present)	A recommendation cannot be made here: The setting value depends on the application. (For non-airtight workpieces, for example, this value can be set 10% below the maximum vacuum that can be achieved.) • Value must be lower than SP1 • Value must be higher than rP2
Resetpoint (rP2) / Rückschaltpunkt rP2	103	Reset point rP2: If the value falls below this limit, the SP2 signal (Part Present) is deactivated again	The setting value must be lower than the selected SP2.

Settings on the Compact Valve LQEi

Note:
In principle, no settings are required on the LQEi itself (for the start of operations). LQEi status information is not forwarded to the GCPi or evaluated.

However, the following examples show the benefit of a separate configuration of the LQEi parameters:

- In an error-free cycle, the LQEi status LED should not display any warnings or the status > SP2 (for the LQEi).
- Data is to be read out from the LQEi cyclically or at specific times.

Configuring settings

You can configure the settings in the following ways:

- Via the NFC function of the LQEi using the Control Room App
- Via IO-Link (GCPi interface) and using “function modules”.
  (Function modules for the GCPi are available for various control unit manufacturers. With the appropriate integration into the control unit, this provides a convenient option for ISDU data exchange (ISDU read and write access) for the connected IO-Link device.

Control and Feedback

Note:

The handling process (picking up the part, dropping off the part) is NOT controlled using the “Suction” or “Vacuum on” signal on the GCPi. This is permanently on.

The process is controlled using the following signals:

- Drop-off offDrop-off off (also called Apply vacuum) => the part is picked up
- Drop-off onDrop-off off (also called Apply Atmosphere) => the part is picked up

	Description	Adjustment
Suction (GCPi)	When operating the GCPi with the LQEi, "Suction" should remain on permanently. This ensures that a vacuum is permanently maintained in the vacuum supply to the LQEi and that the section from the LQEi to the workpiece is evacuated immediately when parts are picked up.	Recommendation: Permanently ON via - IO-Link output process data:PD out byte 0, Bit 0 = HIGH (Vacuum on)
Pick up part (deactivate drop-off on LQEi)	While picking up the part, the LQEi valve connects the vacuum connection for the GCPi (connection 1) to the connection for the gripper (connection 2)	IO-Link output process data: PD out byte 0, Bit 4 = LOW (Deactivate X11 control) PD out byte 0, Bit 5 = HIGH (Activate X11 control)
Drop off part (drop-off activated at LQEi)	While dropping off the part, the LQEi valve connects the ventilation opening (connection 3) to the connection for the gripper (connection 2) The vacuum connection (connection 1) for the GCPi is closed.	IO-Link output process data: PD out byte 0, Bit 4 = HIGH (Deactivate X11 control) PD out byte 0, Bit 5 = LOW (Activate X11 control)

The table below shows the feedback (input to controller; output to GCPi):

	Description	Feedback
Feedback SP2 (Part Present activated)	Vacuum value on LQEi exceeds SP2 threshold (defined in GCPi)	IO-Link input process data: PD in byte 0, Bit 4 (Signal SP2 X11)
Vacuum value on LQEi	Vacuum value at the suction point	IO-Link input process data: PD in byte 8 + byte 8 (Current vacuum LQEi an X11 Low Byte + High Byte)

See also

Menus and Information [▶ 18]

8.6.2 IO-Link Application: GCPi Controls Two LQEi Units

Connecting Components

In this application, the LQEi units are connected to connections X11 and X12 on the GCPi (e.g. with connection cable 21.04.05.00434).

In addition, the GCPi is connected to the higher-level controller via IO-Link (e.g. with the connection cable 21.04.05.00080). The maximum length of the cables is 20 meters.

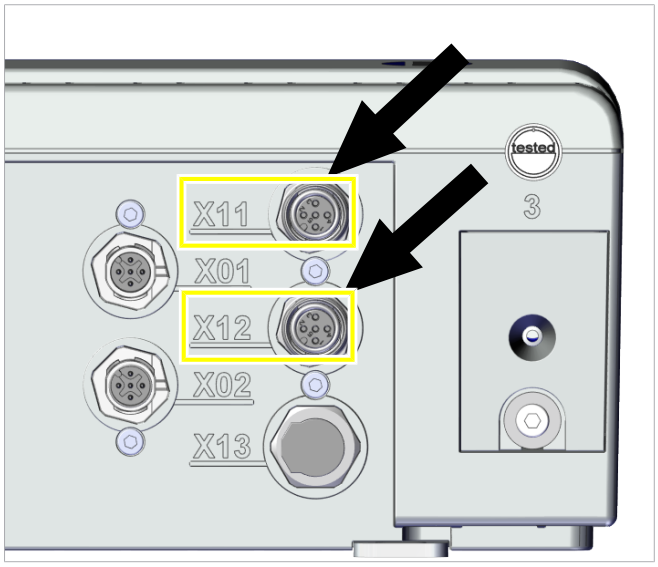
GCPi + LQEi provides the option to supply the devices with galvanic separation with US (sensor supply) + UA (actuator supply), with 24 V each. As a result, for example, UA can be switched off separately if there is an interruption on a safety section. If this is not required in the application, US can be supplied through X01 and UA can be supplied through X13 together via a power supply unit. The specified individual power levels required must be added up in this case.

Recommended power supply unit power:

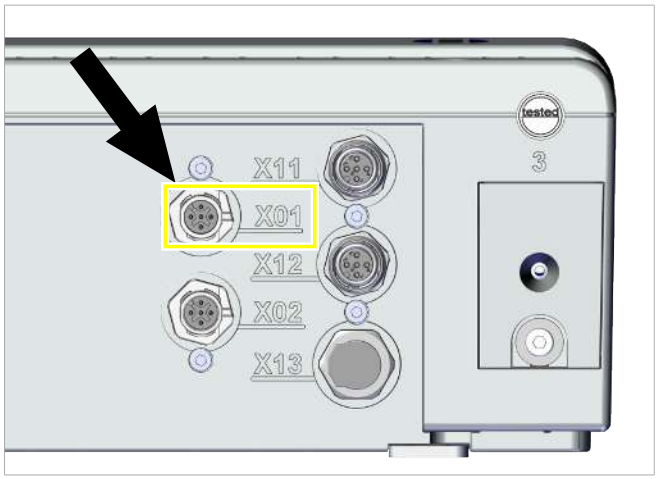
The current consumption of the GCPi depends on the vacuum generated by the GCPi. The maximum is up to 3.2 A. (The maximum GCPi power consumption to be expected can be found in (> See ch. 4.3 the table, p. 26). For the value of the current, the power is to be divided by 24 V.)
In addition, the LQEi units require up to 0.5 A (with a handling cycle of 1 Hz) on average or 2.4 A of peak current for 90 ms in each case.

If you can ensure that the GCPi and LQEi are not active at the same time, you can reduce the power values accordingly (> See ch. 4.3 Performance Data, p. 26).

1. Attach the connection cable (e.g. 21.04.05.00434) to the electrical connections X11 and X12 and secure it (maximum tightening torque = hand-tight).

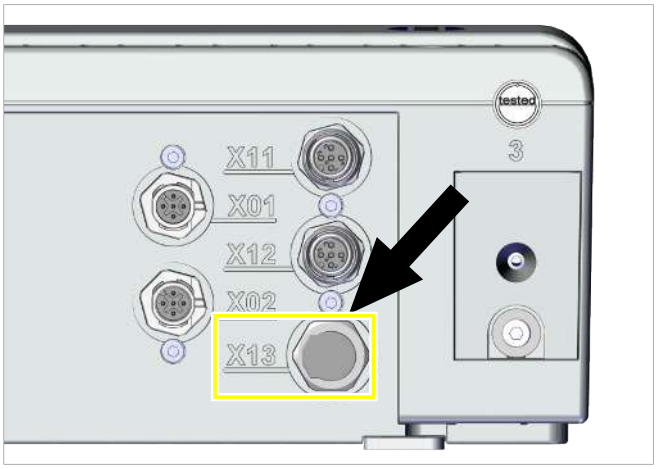


2. Connect the GCPi to the higher-level control via IO-Link, connection (X01) (e.g. with ASK 21.04.05.00080).



   ⇨ There is an explanation of the PIN assignment for connection X01 (> See ch. 8.3.1 PIN Assignment, p. 61).

3. To fulfil the function, connect the following PINs to the controller:
   — US (24 V) to pin 1
   — GND_S to pin 3
   — IO-Link to pin 4
   Do not connect anything to pin 2 or pin 5.
   Required recommended rated power: 3.5 watts (i.e. at least 150 mA at 24 V)



4. Attach the connection cable for the GCPi supply voltage (e.g. ASK 21.04.05.00352) to the electrical connection (X13) and secure it (maximum tightening torque = hand-tight).

   ⇨ There is an explanation of the PIN assignment for connection X13 (> See ch. 8.3.1 PIN Assignment, p. 61).

5. To fulfil the function, connect the following PINs at the power supply unit ???:
   — UA (24 V) to pin 4
   — GND_A to pin 2
   Do not connect anything to pin 1, pin 3 or pin 5.
   Required recommended rated power: max. **90 watts** (i.e. 3.7 A at 24 V)
   Recommended peak load capacity of 3.2 A + 2.4 A (**134 W**) for 90 ms in each case must be ensured

Pneumatic Connection

The vacuum connection is marked on the GCPi with the number 2 and is designed with a 1/4" internal thread.

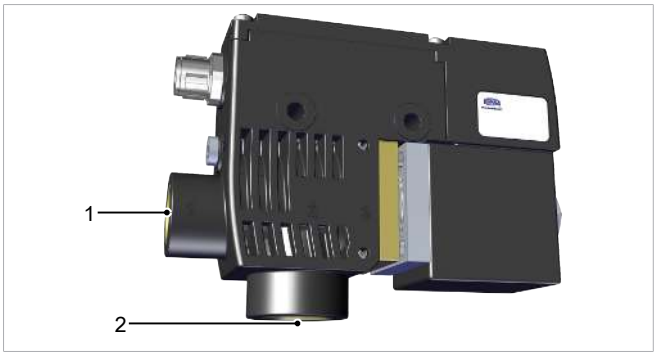
✓ The customer-supplied component for the hose connection is mounted on the vacuum connection.

▸ Connect the pneumatic connection according to the operating instructions for the GCPi (> See ch. 8.4 Vacuum Connection and Exhaust Duct, p. 65) and LQEi.

✓ The customer has attached the components for connecting the hoses to the vacuum connections of the LQEi.

1. Divide the vacuum hose using a T-piece so that both LQEi units can be connected with a vacuum hose each.

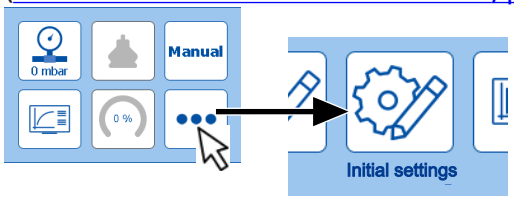
2. Connect the vacuum hose for the GCPi at the connection (1) (marked on the housing with the number 1). The maximum tightening torque for 1/4" threads is: 2.0 Nm
and connect the vacuum hose for the gripper or gripping system at the connection (2) (marked on the housing with the number 2). The maximum tightening torque for 3/8" threads is: 2.5 Nm



Basic Settings on the GCPi

The following options are available for configuring the basic settings:

- Via the touch screen of the GCPi
(> See ch. 3.2.6 Menus and Information, p. 18)



- Via the NFC function of the GCPi using the Control Room App
- Via IO-Link

Parameter	ISDU parameters	Description	Adjustment
Drop-off-mode	69	Drop-off mode	Not relevant
Output functions	71	Function output 2	Not relevant
Signal type: SIO outputs of the device Signal type: SIO inputs of the device	73	Input and output logic of the higher-level controller	Not relevant
Drop-Off valve (SIO-Mode & manual mode)	86	Selection of the delivery valve(s) in SIO or manual mode	Not relevant; (5 = X11+X12 if the LQEi units are to be controlled via manual mode)
Output filter	75	Output delay	Recommendation: 10 (ms)
US X11 US X12	87	Sensor supply for LQEi (to X11 & X12)	1 = on
UA X11 UA X12	88	Actuator supply for LQEi (to X11 & X12)	Info: no settings required; is always 1 = on if an LQEi is connected.
SP2 selection/displayed vacuum value	89	The vacuum level to be shown on the display	7 = automatic (The value of X11 is displayed automatically)

Setting the Vacuum Switching Points, Control Threshold SP1 and “Part Present” Check SP2 on the GCPi

Note:

Control threshold SP1: Control value SP1 at which the GCPi regulates the vacuum (if this value is reached, the pump switches off. If the value falls below this limit, the pump is automatically switched on)
=> vacuum value of the GCPi is relevant

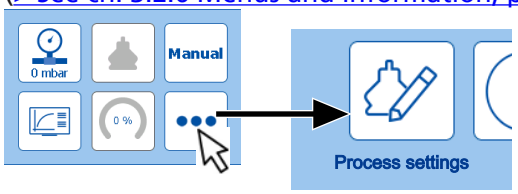
“Part present” check SP2 and corresponding reset point rP2: vacuum values for a valid part present check (part securely picked up).
=> vacuum values of the LQEi are relevant

A “part present” check SP2 can also be set in the LQEi (e.g. via NFC). However, this is irrelevant and is not evaluated via the GCPi. It only compares the vacuum value on the LQEi with switching point SP2 in the GCPi. If SP2 is exceeded, the corresponding SP2 (Part Present) signal is activated.

Configuring settings

You can configure the settings in the following ways:

- Via the touch screen of the GCPi
  (> See ch. 3.2.6 Menus and Information, p. 18)

  (Important: Only the switching points of the profile that is currently active can be set via the display)
- Via the NFC function of the GCPi using the Control Room App in the menu item “Proc. settings”
  (Important: only the switching points of profile 0 can be set via the NFC app)
- Via IO-Link and using the settings for the ISDU parameters specified in the table below:

Parameter	ISDU parameters (for profile 0)	Description	Adjustment
Switchpoint 1 (SP1) / Schaltpunkt SP1	100	Vacuum control value SP1 at which the GCPi regulates the vacuum	Recommendation: **700 (mbar)**. With this setting: • With airtight workpieces, the pump normally switches to regulation mode • When handling workpieces with leakage, the max. possible vacuum is applied on the workpiece • The pump switches to regulation mode during DROP-OFF
Switchpoint 2 (SP2) / Schaltpunkt SP2	102	Parts present check SP2 (Part Present)	A recommendation cannot be made here: The setting value depends on the application. (For non-airtight workpieces, for

Parameter	ISDU parameters (for profile 0)	Description	Adjustment
			example, this value can be set 10% below the maximum vacuum that can be achieved.) • Value must be lower than SP1 • Value must be higher than rP2
Resetpoint (rP2) / Rückschaltpunkt rP2	103	Reset point rP2: If the value falls below this limit, the SP2 signal (Part Present) is deactivated again	The setting value must be lower than the selected SP2.

Creating Profiles for Handling Different Workpieces

If you are handling different workpieces, you can store different threshold values in up to four profiles. This can only be set via IO-Link parameters (not via the display or NFC). The setting parameters required for this purpose can be found in the GCPi DataDictionary.

Settings on the Compact Valve LQEi

Note:
In principle, no settings are required on the LQEi itself (for the start of operations). LQEi status information is not forwarded to the GCPi or evaluated.

However, the following examples show the benefit of a separate configuration of the LQEi parameters:

- In an error-free cycle, the LQEi status LED should not display any warnings or the status > SP2 (for the LQEi).
- Data is to be read out from the LQEi cyclically or at specific times.

Configuring settings

You can configure the settings in the following ways:

- Via the NFC function of the LQEi using the Control Room App
- Via IO-Link (GCPi interface) and using “function modules”.
  (Function modules for the GCPi are available for various control unit manufacturers. With the appropriate integration into the control unit, this provides a convenient option for ISDU data exchange (ISDU read and write access) for the connected IO-Link device.

Control and Feedback

Note:

The handling process (picking up the part, dropping off the part) is NOT controlled using the “Suction” or “Vacuum on” signal on the GCPi. This is permanently on.

The process is controlled using the following signals:

- Drop-off offDrop-off off (also called Apply vacuum) => the part is picked up
- Drop-off onDrop-off off (also called Apply Atmosphere) => the part is picked up

	Description	Adjustment
Suction (GCPi)	When operating the GCPi with the LQEi, "Suction" should remain on permanently. This ensures that a vacuum is permanently maintained in the vacuum supply to the LQEi and that the section from the LQEi to the workpiece is evacuated immediately when parts are picked up.	Recommendation: Permanently ON via - IO-Link output process data: PD out byte 0, Bit 0 = HIGH (Vacuum on)
Pick up part (deactivate drop-off on LQEi)	While picking up the part, the LQEi valve connects the vacuum connection for the GCPi (connection 1) to the connection for the gripper (connection 2)	IO-Link output process data: (if both LQEi units pick up simultaneously) PD out byte 0, Bit 4 = LOW (Deactivate X11 control) PD out byte 0, Bit 5 = HIGH (Activate X11 control) plus PD out byte 0, Bit 6 = LOW (Deactivate X11 control) PD out byte 0, Bit 7 = HIGH (Activate X11 control)
Drop off part (drop-off activated at LQEi)	While dropping off the part, the LQEi valve connects the ventilation opening (connection 3) to the connection for the gripper (connection 2) The vacuum connection (connection 1) for the GCPi is closed.	IO-Link output process data: (if both LQEi units drop off simultaneously) PD out byte 0, Bit 4 = HIGH (Deactivate X11 control) PD out byte 0, Bit 5 = LOW (Activate X11 control) plus PD out byte 0, Bit 6 = HIGH (Deactivate X11 control) PD out byte 0, Bit 7 = LOW (Activate X11 control)

The table below shows the feedback (input to controller; output to GCPi):

	Description	Feedback
Feedback SP2 (Part Present activated)	Vacuum value on LQEi exceeds SP2 threshold (defined in GCPi)	IO-Link input process data: PD in byte 0, Bit 4 (Signal SP2 X11)
Vacuum value on LQEi	Vacuum value at the suction point	IO-Link input process data: PD in byte 8 + byte 9 (Current vacuum LQEi an X11 Low Byte + High Byte) plus PD in byte 10 + byte 11 (Current vacuum LQEi an X12 Low Byte + High Byte)

8.6.3 SIO Application: GCPi Controls One LQEi (24V Digital In/Out)

Connecting Components

In this application, the LQEi is connected to connection X11 on the GCPi (e.g. with connection cable 21.04.05.00434).

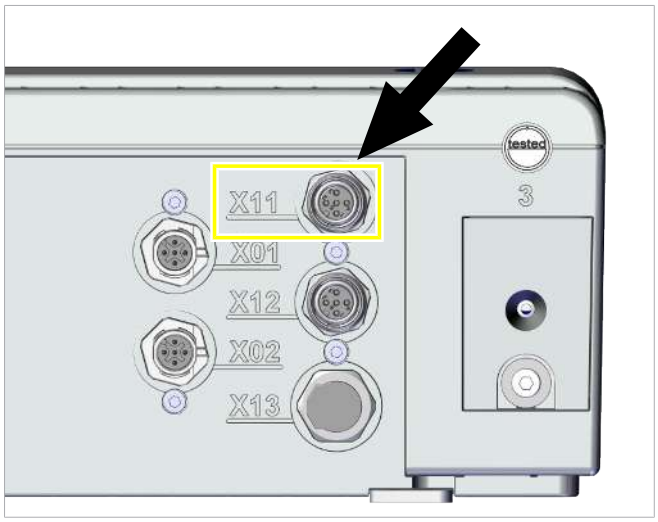
GCPi + LQEi provides the option to supply the devices with galvanic separation with US (sensor supply) + UA (actuator supply), with 24 V each. As a result, for example, UA can be switched off separately if there is an interruption on a safety section. If this is not required in the application, US can be supplied through X01 and UA can be supplied through X13 together via a power supply unit. The specified individual power levels required must be added up in this case.

Recommended power supply unit power:

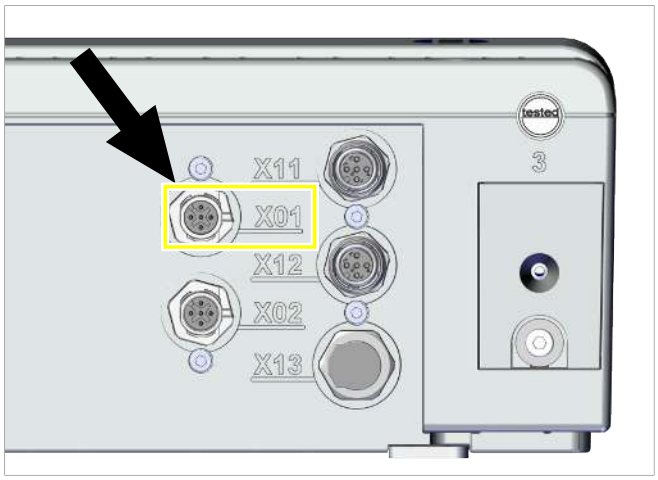
The current consumption of the GCPi depends on the vacuum generated by the GCPi. The maximum is up to 3.2 A. (The maximum GCPi power consumption to be expected can be found in (> See ch. 4.3 the table, p. 26). For the value of the current, the power is to be divided by 24 V.)
In addition, the LQEi requires up to 0.25 A (with a handling cycle of 1 Hz) on average or 1.2 A of peak current for 90 ms in each case.

If you can ensure that the GCPi and LQEi are not active at the same time, you can reduce the power values accordingly (> See ch. 4.3 Performance Data, p. 26).

1. Attach the connection cable (e.g. 21.04.05.00434) to the electrical connection X11 and secure it (maximum tightening torque = hand-tight).



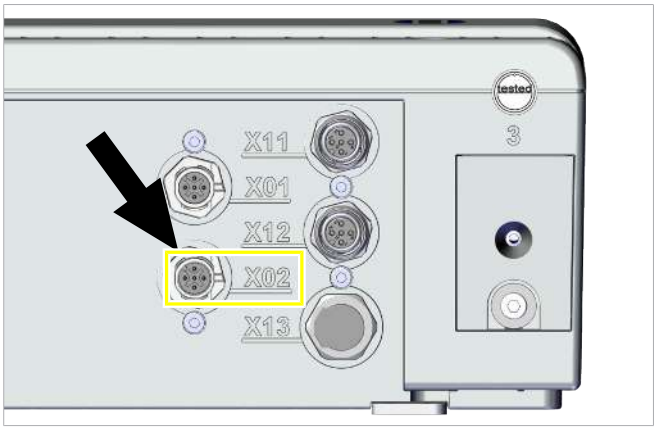
2. Connect the GCPi to the higher-level control, connection (X01) (e.g. with ASK 21.04.05.00080).



⇨ There is an explanation of the PIN assignment for connection X01 (> See ch. 8.3.1 PIN Assignment, p. 61).

3. To fulfil the function, connect the following PINs to the controller:
— US (24 V) to pin 1
— GND_S to pin 3
Optional:
— OUT2 to pin 4 (Part Presentpart present check) --> to digital controller input
— OUT3 on pin 2 (active in the event of warning/error) —> to digital controller input
Do not connect anything to pin 5.
Required recommended power: 3.5 watts (i.e. at least 150 mA at 24 V)

4. Connect connection cable to X02 (e.g. with ASK 21.04.05.00080).
(**Info**: due to its power consumption, the actuator supply UA should be connected via X13, not X02. X02 is used only for standard IO connections).
- IN2 / drop-off – pin 2: --> to digital controller output (PNP or NPN)
- IN1 / suction – pin 4: --> to digital controller output (PNP or NPN)
- GND_A: IMPORTANT: Corresponds to the actuator supply ground to X13. Controller outputs must be connected to GND_A.
Do not connect anything to pin 1.



5. Attach the connection cable for the GCPi supply voltage (e.g. ASK 21.04.05.00352) to the electrical connection (X13) and secure it (maximum tightening torque = hand-tight).

⇨ There is an explanation of the PIN assignment for connection X13 (> See ch. 8.3.1 PIN Assignment, p. 61).

6. To fulfil the function, connect the following PINs:
   — UA (24 V) to pin 4
   — GND_A to pin 2
   Do not connect anything to pin 1, pin 3 or pin 5.
   Required recommended power: max. **84 watts** (i.e. 3.5 A at 24 V)
   Recommended peak load capacity of 3.2A + 1.2A (**105 W**) for 90 ms in each case must be ensured

Pneumatic Connection

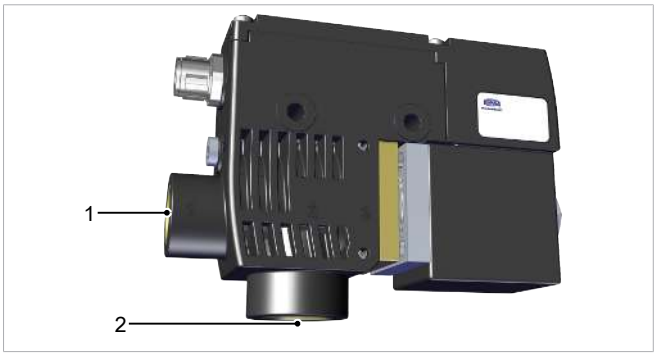
The vacuum connection is marked on the GCPi with the number 2 and is designed with a 1/4" internal thread.

✓ The customer-supplied component for the hose connection is mounted on the device vacuum connection.

▸ Connect the pneumatic connection according to the operating instructions for the GCPi (> See ch. 8.4 Vacuum Connection and Exhaust Duct, p. 65) and LQEi.

✓ The customer-supplied component for the hose connection is mounted on the device vacuum connection.

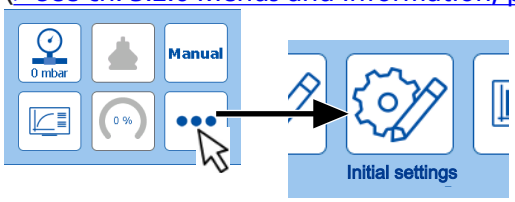
▸ Connect the vacuum hose for the GCPi at the connection (1) (marked on the housing with the number 1). The maximum tightening torque for 1/4" threads is: 2.0 Nm
and connect the vacuum hose for the gripper or gripping system at the connection (2) (marked on the housing with the number 2). The maximum tightening torque for 3/8" threads is: 2.5 Nm



Basic Settings on the GCPi

The following options are available for configuring the basic settings:

- Via the touch screen of the GCPi
  (> See ch. 3.2.6 Menus and Information, p. 18)



- Via the NFC function of the GCPi using the Control Room App

Parameter	ISDU parameters	Description	Adjustment
Drop-off-mode	69	Drop-off mode	externally controlled drop-off externally controlled drop-off (i.e. drop-off is activated or deactivated via external signals from a controller)
Output functions	71	Function output 2	Not relevant
Signal type: SIO outputs of the device Signal type: SIO inputs of the device	73	Input and output logic of the higher-level controller	0 = PNP or 1 = NPN depending on which input and output logic on the higher-level controller is required
Drop-Off valve (SIO-Mode & manual mode)	86	Selection of the delivery valve(s) in SIO or manual mode	1 = X11
Output filter	75	Output delay	Recommendation: 10 (ms)
US X11 US X12	87	Sensor supply for LQEi (to X11 & X12)	1 = on
UA X11 UA X12	88	Actuator supply for LQEi (to X11 & X12)	Info: no settings required; is always 1 = on if an LQEi is connected.
SP2 selection/displayed vacuum value	89	The vacuum level to be shown on the display	7 = automatic (The value of X11 is displayed automatically)

Setting the Vacuum Switching Points, Control Threshold SP1 and "Part Present" Check SP2 on the GCPi

Note:

Control threshold SP1: Control value SP1 at which the GCPi regulates the vacuum (if this value is reached, the pump switches off. If the value falls below this limit, the pump is automatically switched on)
=> vacuum value of the GCPi is relevant

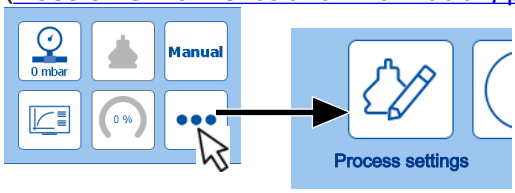
"Part present" check SP2 and corresponding reset point rP2: vacuum values for a valid part present check (part securely picked up).
=> vacuum values of the LQEi are relevant

A "part present" check SP2 can also be set in the LQEi (e.g. via NFC). However, this is irrelevant and is not evaluated via the GCPi. It only compares the vacuum value on the LQEi with switching point SP2 in the GCPi. If SP2 is exceeded, the corresponding SP2 (Part Present) signal is activated.

Configuring settings

You can configure the settings in the following ways:

- Via the touch screen of the GCPi
  (> See ch. 3.2.6 Menus and Information, p. 18)



  (Important: Only the switching points of the profile that is currently active can be set via the display)
- Via the NFC function of the GCPi, using the Control Room app in the "Proc. settings" menu item

  (Important: only the switching points of profile 0 can be set via the NFC app)

Parameter	ISDU parameters (for profile 0)	Description	Adjustment
Switchpoint 1 (SP1) / Schaltpunkt SP1	100	Vacuum control value SP1 at which the GCPi regulates the vacuum	Recommendation: **700 (mbar)**. With this setting: • With airtight workpieces, the pump normally switches to regulation mode • When handling workpieces with leakage, the max. possible vacuum is applied on the workpiece • The pump switches to regulation mode during DROP-OFF
Switchpoint 2 (SP2) / Schaltpunkt SP2	102	Parts present check SP2 (Part Present)	A recommendation cannot be made here: The setting value depends on the application. (For non-airtight workpieces, for example, this value can be set 10% below the maximum vacuum that can be achieved.) • Value must be lower than SP1 • Value must be higher than rP2
Resetpoint (rP2) / Rückschaltpunkt rP2	103	Reset point rP2: If the value falls below this limit, the SP2 signal (Part Present) is deactivated again	The setting value must be lower than the selected SP2.

Settings on the Compact Valve LQEi

Note:
In principle, no settings are required on the LQEi itself (for the start of operations). LQEi status information is not forwarded to the GCPi or evaluated.

However, the following examples show the benefit of a separate configuration of the LQEi parameters:

- In an error-free cycle, the LQEi status LED should not display any warnings or the status > SP2 (for the LQEi).
- Data is to be read out from the LQEi cyclically or at specific times.

Configuring settings

- The settings via the NFC function of the LQEi using the Control Room App

Control and Feedback

Note:

The handling process (picking up the part, dropping off the part) is NOT controlled using the “Suction” or “Vacuum on” signal on the GCPi. This is permanently on.

The process is controlled using the following signals:

- Drop-off offDrop-off off (also called Apply vacuum) => the part is picked up
- Drop-off onDrop-off off (also called Apply Atmosphere) => the part is picked up

	Description	**Adjustment**
Suction (GCPi)	When operating the GCPi with the LQEi, “Suction” should remain on permanently. This ensures that a vacuum is permanently maintained in the vacuum supply to the LQEi and that the section from the LQEi to the workpiece is evacuated immediately when parts are picked up.	Recommendation: Permanently ON via Standard I/O – “Suction” signal = HIGH (with PNP) or LOW (with NPN), connection X02: IN 1 / suction – pin 4
Pick up part (deactivate drop-off on LQEi)	While picking up the part, the LQEi valve connects the vacuum connection for the GCPi (connection 1) to the connection for the gripper (connection 2)	Standard I/O – “Drop-off” signal = HIGH (with PNP) or LOW (with NPN), connection X02: IN2 / drop-off – pin 2
Drop off part (drop-off activated at LQEi)	While dropping off the part, the LQEi valve connects the ventilation opening (connection 3) to the connection for the gripper (connection 2) The vacuum connection (connection 1) for the GCPi is closed.	Standard I/O – “Drop-off” signal = HIGH (with PNP) or LOW (with NPN), connection X02: IN2 / drop-off – pin 2

The table below shows the feedback (input to controller; output to GCPi):

	Description	**Feedback**
Feedback SP2 ((Part Present activated)	Vacuum value on LQEi exceeds SP2 threshold (defined in GCPi)	Standard I/O – “OUT2” signal connection X02: OUT2 – pin 4 = 24V (for PNP) or GND_S (for NPN)
Vacuum value on LQEi	Vacuum value at the suction point	—

8.7 Information about Connecting External Devices to the GCPi

Connection of one device

Device	VSi	LQEi	3/2-valve
Information available	- Vacuum value - Status message (diagnostics) - Evacuation time - Leakage measurement - Switching point monitoring - Counter evaluation		—
Control connection for GCPi	1x IO-Link		1–2x SIO output
Parameters for the display	- Vacuum value on VSi - SP monitoring (SP2)	- Vacuum value on LQEi - SP monitoring (SP2) on LQEi	—
Type of display	- GCPi vacuum value | Switching through active selection in display mode - SP indicator | Display of all SPs in the diagram		—
Parameters that can be adjusted via the display	SP setting		—

Connection of two devices

First device	VSi	VSi	VSi
Second device	**VSi**	**LQEi**	**3/2-valve**
Information available	- 2x vacuum value - 2x status message (diagnostics) - 2x evacuation time - 2x leakage measurement - 2x SP monitoring - 2x counter evaluation	- 2x vacuum value - 2x status message (diagnostics) - 2x evacuation time - 2x leakage measurement - 2x SP monitoring - 2x counter evaluation	- Vacuum value - Status message (diagnostics) - Evacuation time - Leakage measurement - SP monitoring - Counter evaluation
Control connection for GCPi	2x IO-Link	2x IO-Link	1x IO-Link 1–2x SIO output
Parameters for the display	- Vacuum value on 1st VSi - Vacuum value on 2nd VSi - SP monitoring (SP2) on 1st VSi - SP monitoring (SP2) on 2nd VSi	- Vacuum value on VSi - Vacuum value on LQEi - SP monitoring (SP2) on VSi - SP monitoring (SP2) on LQEi	- Vacuum value on VSi - SP monitoring (SP1) on VSi
Type of display	- GCPi vacuum value | Switching through active selection in display mode - SP indicator | Display of all SPs in the diagram		
Parameters that can be adjusted via the display	SP setting		

First device	**LQEi**	**LQEi**	**3/2-valve**
Second device	**LQEi**	**3/2-valve**	**3/2-valve**
Information available	- 2x vacuum value - 2x status message (diagnostics) - 2x evacuation time - 2x leakage measurement - 2x SP monitoring - 2x counter evaluation	- Vacuum value - Status message (diagnostics) - Evacuation time - Leakage measurement - SP monitoring - Counter evaluation	—
Control connection for GCPi	2x IO-Link	1x IO-Link 1–2x SIO output	2-4x SIO output
Parameters for the display	- Vacuum value on 1st LQEi - Vacuum value on 2nd LQEi - SP monitoring (SP2) on 1st LQEi - SP monitoring (SP2) on 2nd LQEi	- Vacuum value on LQEi - SP monitoring (SP1) on LQEi	—
Type of display	- GCPi vacuum value | Switching through active selection in display mode - SP indicator | Display of all SPs in the diagram		—
Parameters that can be adjusted via the display	SP setting		—

9 Operation

9.1 Hazard during Operation

⚠ CAUTION

Falling objects due to a sudden drop in vacuum (e.g. a power failure)

Risk of injury from falling parts!

- Wear protective work shoes (S1).

⚠ CAUTION

A strong vacuum is produced on the suction cup and suction lines.

Hair, skin, body parts and items of clothing can be sucked in.

- Wear protective glasses and tight-fitting clothing.
- Use a hairnet if necessary.
- Do not look or reach into the suction cup openings.

9.2 Preparations

⚠ WARNING

Extraction of hazardous media, liquids or bulk material

Personal injury or damage to property!

- Do not extract harmful media such as dust, oil mists, vapors, aerosols etc.
- Do not extract aggressive gases or media such as acids, acid fumes, bases, biocides, disinfectants or detergents.
- Do not extract liquids or bulk materials, e.g. granulates.

The following measures must be taken each time the device is activated:

1. Check the device for visible damage. Correct any faults or report them to the supervising personnel.
2. Ensure that only authorized persons are present in the working area of the machine or system in order to prevent any hazard from switching on the machine.
3. Ensure that the danger zone of the machine or system is free of persons during automatic operation in non-HRC applications.

10 Maintenance

10.1 Safety

Maintenance work may only be carried out by qualified personnel.

⚠ WARNING

Risk of injury due to incorrect maintenance or troubleshooting

- Check the proper functioning of the product, especially the safety features, after every maintenance or troubleshooting operation.

Opening the device will damage the “tested” label. This voids the warranty.

10.2 Cleaning the Device

Touchscreen surface

- Breathe on the surface and gently wipe it with a soft, dry cloth.
  For heavy soiling, dampen the cloth with one of the following solvents:
  — Isopropyl alcohol
  — Ethyl alcohol
  Do not scrub vigorously as this could damage the touchscreen surface.

Housing

1. Remove exterior dirt with a soft, damp cloth and soap suds (max. 60° C).
2. Ensure that the housing and control unit are not soaked with soap suds.

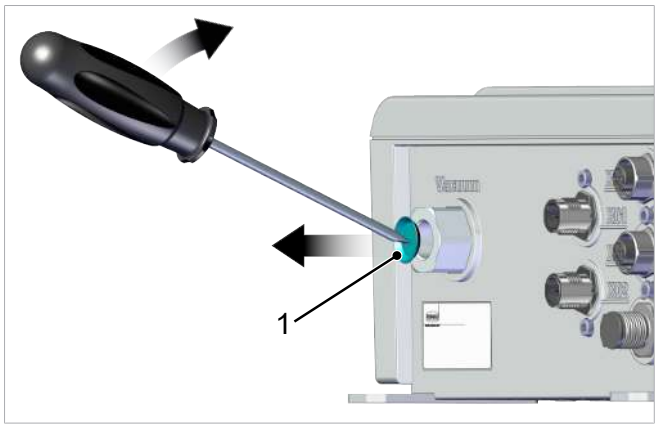
10.3 Replacing the Press-In Screens in the Vacuum Connection

A press-in screen is installed in the **vacuum connection** of the GCPi. Dust, chippings and other solid materials may be deposited in the screen over time.

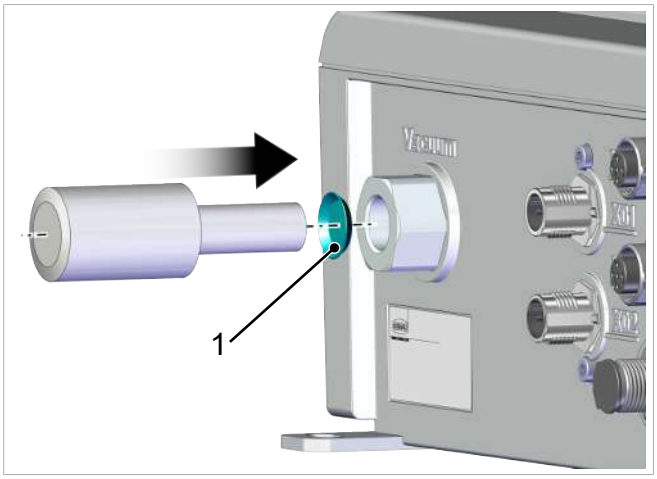
If there is a noticeable reduction in the performance of the GCPi, replace the filter screen (part no. 10.02.02.03377):

✓ Deactivate the device and depressurize the pneumatic systems.

1. **NOTE! When removing the filter screen, do not damage the internal thread of the connector.**
   Disassemble the filter screen (1) in the vacuum connection using a screwdriver.
   Pierce the filter screen to make it unusable.



2. Press in the new filter screen (1) as far as it will go using a suitable tool or mandrel.

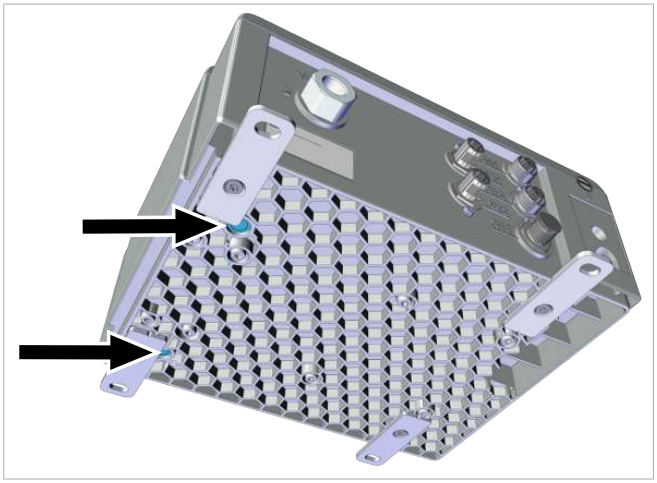


10.4 Cleaning the Underside of the Press-In Screens

The GCPi is designed with two air openings on the underside. These openings vent the vacuum circuit to the outer atmosphere during drop-off.

Press-in screens are integrated in the air openings. Dust, chippings and other solid materials may be deposited in the screens over time. Contaminated screens can extend the drop-off time.

✓ Deactivate the device and depressurize the pneumatic systems.



- Visually inspect the screens regularly and clean with a brush if necessary.

If the screens are heavily soiled, you can send the GCPi to Schmalz for repair (subject to a fee, the contaminated screen is replaced).

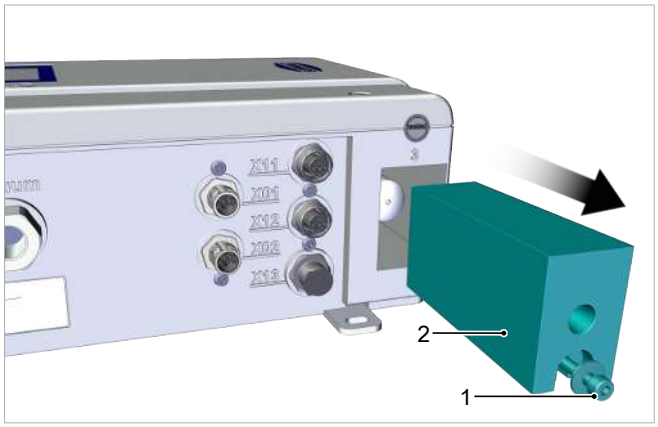
10.5 Replacing the Silencer

Heavy infiltration of dust, oil, etc. may contaminate the silencer and reduce the suction capacity. Cleaning the silencer is not recommended due to the capillary effect of the porous material.

If the suction capacity decreases, replace the silencer:

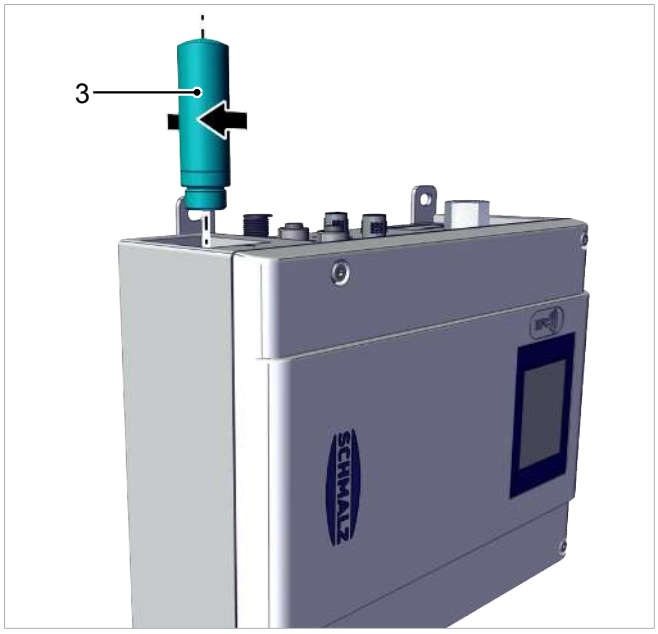
- ✓ Deactivate the device and depressurize the pneumatic systems.
- ✓ New silencer is available.

1. Release the screw (1) and remove the component (2).

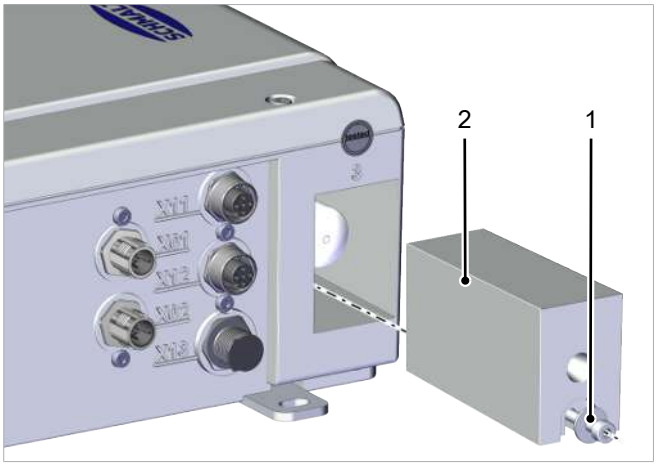


2. Disassemble the silencer (3) with needle-nosed pliers.

3. To mount the new silencer (3), position the GCPi as shown, so that the silencer (3) can be mounted from above. Grip the silencer (3) with your thumb and index finger and carefully screw into the thread as far as it will go.



4. Mount the component (2). Tighten the screw (1) with a torque of 1 Nm ± 0.5 Nm.



10.6 Replacement of the Device with a Parameterization Server

The IO-Link protocol provides 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.

✓ The device is operated on a master with IO-Link version 1.1 or higher.

✓ The Data storage feature in the configuration of the IO-Link port is activated.

▸ Ensure that the new device is restored to the factory settings **before** it is connected to the IO-Link master. If necessary, reset the device to the factory settings.

⇨ 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 mirrored in the master.

Changes to the parameters made by a PLC program using a function module are **not** automatically mirrored in the master.

▸ Manually mirroring data: After changing all the required parameters, execute ISDU write access to the parameter “System command” 0x0002 using the command “Force upload of parameter data into the master” (numerical value 0x05) (see Data Dictionary).

Use the Parameterization server function of the IO-Link master to ensure that no data is lost when switching the device.

11 Troubleshooting

General errors

Fault	Possible cause	Solution
Product does not respond	No power supply	▸ Check electrical connection and PIN assignment. ▸ Check whether both sensor supply and actuator supply voltage are present
	Signal input type does not match the signal type of the higher-level control unit	▸ Set the correct signal type PNP or NPN using the appropriate function or parameter
Vacuum level is not reached or vacuum is built up too slowly	Press-in screen is contaminated	▸ Replace screen
	Leakage in vacuum system	▸ Check vacuum system and replace if necessary.
	Max. power too low	▸ Increase max. power
	Silencer is dirty	▸ Replace the silencer
	Drop-off is activated at the same time for externally connected devices	▸ Make sure that drop-off is not simultaneously activated for externally connected valves
Load cannot be held	Vacuum level too low	▸ Check system for leakage and correct if necessary.
	Vacuum gripper too small	▸ Choose a larger vacuum gripper.
Warning displayed	During the suction process, the vacuum fell below the limit value SP2	▸ Check the system for leakage. ▸ Check whether vacuum limit value SP2 can be lowered.
	Leakage rate exceeds max. preset value	1. Check the system for leakage 2. Adjust maximum permissible leakage rate
	SP1 not reached during suction cycle	▸ For airtight workpieces, check whether the SP1 value can be reduced. ▸ Check that SP1 is > 800 mbar (max. vacuum of GCPi) ▸ For non-airtight materials, reduce the SP1 value if required. If continuous suction (without regulation) of the pump is required, this warning can be ignored. It cannot be deactivated.
	Dynamic pressure (free-flow vacuum) too high	▸ Check the vacuum system ▸ Replace screen
	Power supply outside the permitted range	▸ Set the power supply correctly ▸ Adjust the cross section or cable length if required to reduce the voltage drop across the line

Fault	Possible cause	Solution
	Temperature outside the permitted range	▸ Check that the maximum permissible temperatures are maintained ▸ Decrease max. power if necessary ▸ Check whether the exhaust air is discharged unhindered or the minimum distance is maintained ▸ If this error occurs repeatedly, contact the Schmalz service team
Error is displayed	Internal electronic fault	▸ If this error occurs repeatedly, contact the Schmalz service team
	Sensor calibration failed	▸ Vent vacuum system fully to the atmosphere
	Pump not working properly	▸ If this error occurs repeatedly, contact the Schmalz service team.
	IO-Link communication interrupted	▸ Check communication with the IO-Link master
SIO signals from the device cannot be evaluated	Signal output type does not match higher-level control unit	▸ Set the correct signal type, PNP or NPN
	Signal function does not match the higher-level control unit	▸ Set the correct signal function (NO or NC)
Touchscreen does not switch to the manual operation display after pressing the “Manual” button.	Actuator voltage too low.	▸ Apply or adjust the actuator voltage so that it is within the nominal range
When dropping off with an externally connected drop-off valve (standard valve), the suction function of the GCPi is switched off during venting as a result of the SIO drop-off signal.	Incorrect configuration	▸ Set the parameter value 0x0056 so that the internal drop-off valves of the GCPi are not activated by the drop-off signal.

12 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.

The exclusive use of original spare parts is a prerequisite for the proper functioning of the system and for the validity of the warranty.

Wearing parts are not covered by the warranty.

Opening the assemblies will damage the “tested” labels. This voids the warranty.

13 Spare and Wearing Parts

Maintenance work may only be carried out by qualified personnel.

⚠ WARNING

Risk of injury due to incorrect maintenance or troubleshooting

- Check the proper functioning of the product, especially the safety features, after every maintenance or troubleshooting operation.

Designation	Part no.	Type
Screen (in vacuum connection)	10.02.02.03377	Spare part
Silencer	10.03.01.00888	Spare part
Silencer 3/8	10.02.01.00905	Wearing part

14 Accessories

The function of the product cannot be guaranteed if you use accessories that are not sold or authorized **by Schmalz**.

Designation	Part no.	Note
Power supply unit NETZ 96VA 24V-DC 100-240-AC	21.07.01.00205	GCPi power supply unit
Vacuum cup filter VFT G1/4-IG 80	10.07.01.00119	-
Accessories ZUB GCPi GUMMI-PUFF	10.03.01.00809	4x gray rubber feet for operation on a workbench (laboratory application)(> See ch. 8.2 Mounting, p. 58)
Accessories ZUB GCPi GUMMI-PUFF	10.03.01.00810	4x fitted rubber buffer + 4x Schnorr safety washer and 4x M6x10 machine screw, for decoupling vibrations(> See ch. 8.2 Mounting, p. 58)
Connection cable ASK B-M12-5 5000 K-5P	21.04.05.00080	Connection 1: 5-pin M12 socket; cable length: 5000 mm; connection 2: Cable, 5-pin; Material: PUR cable; shape: Straight
Power cable P-LEIT-LK B-M12-5 5m OK	21.04.05.00352	Rated current: 16 A; Voltage: 63V DC; Degree of protection: IP 68; Connection 1: 5-pin M12 socket; cable length: 5 m; connection 2: Open cable end; Encoding: L; Cross section: 2.5 mm²; Shape: Straight; Material: PUR cable
Connection cable AK-SB-M12-G 5m A 5P	21.04.05.00931	Rated current: 4 A; connection 1: 5-pin M12 socket; cable length: 5 m; connection 2: 5-pin M12 plug; Encoding: A; Cross section: 0.75 mm²; shape: Straight; Material: PU
Connection cable ASK B-M12-5 5000 S-M12-5	21.04.05.00266	Connector 1: 5-pin M12 socket; cable length: 5000 mm; connection 2: 5-pin M12 plug; Material: PUR cable
Connection cable ASK B-M12-5 3000 S-M12-5	21.04.05.00434	Connector 1: 5-pin M12 socket; cable length: 3000 mm; connection 2: 5-pin M12 plug; Material: PUR cable
Power cable P-LEIT-LK S-M12-5 3m B-M12-5	21.04.05.00607	Rated current: 16 A; Voltage: 63V DC; Degree of protection: IP68; Connection 1: 5-pin M12 plug; Cable length: 3 m; connection 2: 5-pin M12 socket; Encoding: L; Cross section: 2.5 mm²; Shape: Straight; Material: PUR cable
Connection cable AK-BOK-M8/M12-G 5m A 5P	21.04.05.00994	Connector 1: Open cable end; Cable length: 5 m; connection 2: 5-pin M12 socket; Encoding: A; Number of pins: 5; Cross section: 0.75 mm²; shape: Straight
Connection distributor ASV SXP/SXMP B-M12-5 2xS-M12-4	10.02.02.02824	Connector 1: 5-pin M12 socket; Cable length L: 1050 mm; connection 2: 2x M12, 4-pin plug Optional for supplying and controlling the GCPi via a standard output box

15 Taking the Product Out of Operation and Disposal

If the product reaches the end of the utilization phase, it may be fully disassembled and disposed of. Only qualified specialist staff may prepare the product for disposal.

1. Fully disconnect the product from the power supply.
2. Dispose of the components properly based on their material groups.

For proper disposal, contact a company specializing in the disposal of technical goods and instruct the company to observe the applicable disposal and environmental regulations.

16 EU Declaration of Conformity

EU Declaration of Conformity

The manufacturer Schmalz confirms that the product described in these operating instructions fulfills the following applicable EC directives:

2006/42/EC	Machinery Directive
2014/53/EU	Harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC
2011/65/EU	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment

The following harmonized standards were applied:

EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction
EN 61000-6-2+AC	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-3+A1+AC	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
EN IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
EN 300 330	Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz
EN 301 489-1	Electromagnetic compatibility for radio equipment and services; Part 1: Common technical requirements
EN 301 489-3	Electromagnetic compatibility for radio equipment and services; Part 3: Specific conditions for short-range devices (SRD)

The EU Declaration of Conformity valid at the time of product delivery is delivered with product or made available online. The standards and directives cited here reflect the status at the time of publication of the operating and assembly instructions.

17 Attachment

See also

GCPi_10.03.01.00648_Data Dictionary.PDF [▶ 101]

IO-Link Data Dictionary

GCP

10.03.01.00648

09.12.2022

IO-Link

J. Schmalz GmbH
Johannes-Schmalz-Str. 1, D 72293 Glatten
Tel.: +49(0)7443/2403-0
www.schmalz.com
info@schmalz.de

SCHMALZ

IO-Link Implementation

Vendor ID	234 (0xEA)
Device ID	100336 (0x187F0)
SIO-Mode	yes
IO-Link Revision	1.1
IO-Link Bitrate	38.4 kBit/sec (COM2)
Minimum Cycle Time	6 ms
Process Data Input	12 bytes
Process Data Output	2 bytes

Process Data

Process data In		Bits	Access	Remark
PD in byte 0	Signal SP2	0	ro	Vacuum is over SP2 and not yet under rP2
	Signal SP1	1	ro	Vacuum value within setpoint area
	Signal SP3	2	ro	The part has been detached after a suction cycle
	CM-Autoset acknowledged	3	ro	Acknowledge that the autoset function has been completed
	Signal SP2 X11	4	ro	Vacuum is over SP2 and not yet under rP2 for X11
	Signal SP2 X12	5	ro	Vacuum is over SP2 and not yet under rP2 for X12
	Device status	6…7	ro	00 - [green] Device is working optimally 01 - [yellow] Device is working but there are warnings 10 - [orange] Device is working but there are severe warnings 11 - [red] Device is not working properly
PD in byte 1	Profile select acknowledge	0…7	ro	Active Profile
PD in byte 2	Errors, High-Byte	0…7	ro	Bit 0 = Internal error: data corruption Bit 1 = Temperature overrun Bit 2 = Primary voltage too low Bit 3 = Primary voltage too high Bit 4 = Auxiliary voltage too low Bit 5 = Auxiliary voltage too high Bit 6 = Short circuit at OUT2 Bit 7 = Short circuit at OUT3 Bit 8...9 = reserved Bit 10 = Sensor calibration failed Bit 11 = Pump not working properly Bit 12...14= reserved Bit 15 = IO-Link communication interruption
PD in byte 3	Errors, Low-Byte	0…7	ro	
PD in byte 4	Warnings, High-Byte	0…7	ro	Bit 0 = reserved Bit 1 = Evacuation time above limit Bit 2 = Leakage rate above limit Bit 3 = SP1 not reached in suction cycle Bit 4 = Free Flow Vacuum over SP2 Bit 5 = Primary Voltage US out of operating range Bit 6 = Auxiliary voltage UA out of operating range Bit 7 =Temperature out of operating range Bit 8 = Vacuum sank under rP2 during suction Bit 9...15 = reserved
PD in byte 5	Warnings, Low-Byte	0…7	ro	

PD in byte 6	Current vacuum GCP, High-Byte	0…7	ro	Unit: 1mbar
PD in byte 7	Current vacuum GCP, Low-Byte	0…7	ro	
PD in byte 8	Current vacuum X11, High-Byte	0…7	ro	Unit:1mbar
PD in byte 9	Current vacuum X11, Low-Byte	0…7	ro	
PD in byte 10	Current vacuum X12, High-Byte	0…7	ro	Unit:1mbar
PD in byte 11	Current vacuum X12, Low-Byte	0…7	ro	

Process data Out		Bits	Access	Remark
PD out byte 0	Vacuum	0	wo	Vacuum on/off
	Drop-off	1	wo	Activate drop-off
	reserved	2	wo	reserved
	CM-Autoset	3	wo	Perform CM-Autoset function (Info: Values for permissible evacuation time and permissible leakage are beeing safed in selected profile)
	X11 control	4	wo	Activate X11 Processdata out Byte 0 Bit 0 (LQE: Drop-off on)
	X11 control	5	wo	Activate X11 Processdata out Byte 0 Bit 1/Drop-off for external valve 1 (LQE: Drop-off off)
	X12 control	6	wo	Activate X12 Processdata out Byte 0 Bit 0 (LQE: Drop-off on)
	X12 control	7	wo	Activate X12 Processdata out Byte 0 Bit 1/Drop-off for external valve 2 (LQE: Drop-off off)
PD out byte 1	Profile select	0…7	wo	Select active profile (0-3)

ISDU Parameters

ISDU Index dec	ISDU Index hex	Subindex dec	Parameter	Size		Value Range	Access	Default Value	Remark
Identification									
Device Management									
16	0x0010	0	Vendor name	0…32	bytes	-	ro	J. Schmalz GmbH	Manufacturer designation
17	0x0011	0	Vendor text	0…32	bytes	-	ro	Innovative Vacuum Solutions	Vendor text
18	0x0012	0	Product name	0…32	bytes	-	ro	-	Product name
19	0x0013	0	Product ID	0…32	bytes	-	ro	-	Product variant name, z.B.: GCPi
20	0x0014	0	Product text	0…32	bytes	-	ro	-	Order-code, z.B.: GCPi
21	0x0015	0	Serial number	7	bytes	-	ro	-	Serial number, z.B.: 9900101
22	0x0016	0	Hardware revision	2	bytes	-	ro	-	Hardware revision, z.B.: 00
23	0x0017	0	Firmware revision	4	bytes	-	ro	-	Firmware revision, z.B.: 1.12

240	0x00F0	0	Unique device identification	9	bytes	-	ro	-	Unique ID, z.B.: B.:0x00EA 0187F0 3B8B8825
250	0x00FA	0	Article number	14	bytes	-	ro	-	Order-number, z.B.: 10.03.01.00648
252	0x00FC	0	Production date	3	bytes	-	ro	-	Date code of production (month and year, month is letter coded, z.B.: I19
254	0x00FE	0	Detailed product text	1…64	bytes	-	ro	-	Detailed type description of the device, z.B.: GCP
Device Localization									
24	0x0018	0	Application specific tag	1…32	bytes	-	rw	***	User string to store location or tooling information
25	0x0019	0	Function tag	1…32	bytes	-	rw	***	User string to store location or tooling information
26	0x001A	0	Location tag	1…32	bytes	-	rw	***	User string to store location or tooling information
242	0x00F2	0	Equipment identification	1…64	bytes	-	rw	***	User string to store identification name from schematic
246	0x00F6	0	Geolocation	1…64	bytes	-	rw	***	User string to store geolocation from handheld device
248	0x00F8	0	NFC web link	1…64	bytes	http://… https://…	rw	https://myproduct.schmalz.com/#/	Web link to NFC app (base URL for NFC tag)
249	0x00F9	0	Storage location	1…32	bytes	-	rw	***	User string to store storage location
253	0x00FD	0	Installation date	1…16	bytes	-	rw	***	User string to store date of installation
Parameter									
Device Settings									
Commands									
2	0x0002	0	System command	1	byte	5, 129, 131, 165, 167, 168, 169	wo	-	0x05 (dec 5): Force upload of parameter data into the master 0x81 (dec 129): Reset application 0x83 (dec 131): Back to box 0xA5 (dec 165): Calibrate vacuum sensor 0xA7 (dec 167): Reset erasable counters 0xA8 (dec 168): Reset voltages min/max 0xA9 (dec 169): Reset vacuum min/max 0xAF (dec 175): Setup external valves (Reset and Calibration are executed and SP2/rP2 and SP1/rP1 Values of GCP written in VSi/LQE)
Access Control									
12	0x000C	0	Device access locks	2	bytes	0, 4	rw	0	Bit 0-1: reserved Bit 2: Local parameterization lock (lock menu editing) Bit 3-15: reserved
90	0x005A	0	Extended device access locks	1	byte	0-255	rw	0	Bit 0: NFC write lock Bit 1: NFC disable Bit 2: Not used Bit 3: Local user interface locked (manual mode locked) Bit 4: IO-Link event lock (suppress sending IO-Link events) Bit 5-7: Not used
91	0x005B	0	Pin-Code NFC	2	bytes	0-999	ro	0	Pin-Code for NFC write
77	0x004D	0	Pin-Code display	2	bytes	0-999	rw	0	Pin-Code for display
Initial Settings									
69	0x0045	0	Drop-Off mode	1	byte	0-2	rw	0	0 = Externally controlled drop-off 1 = Internally controlled drop-off – time-dependent 2 = Externally controlled drop-off – time-dependent
71	0x0047	1 2 3	Outputs function X11 function Pin 2 and Pin 5 (auxiliary voltage) X12 function Pin 2 and Pin 5 (auxiliary voltage)	1 1 1	byte byte byte	0-1 0-1 0-1	rw rw rw	0 0 0	0 = NO, 1 = NC (only applies if ISDU 88 set to 2)
73	0x0049	1 2	Signal type: SIO outputs of the device Signal type: SIO inputs of the device	1 1	byte byte	0-1 0-1	rw rw	0 0	0 = PNP, 1 = NPN

74	0x004A	0	Display unit	1	byte	0-3	rw	0	0 = mbar, 1 = kPa, 2 = inHg, 3 = psi
75	0x004B	0	Output filter	2	bytes	0-999	rw	10	Unit: 1ms
76	0x004C	0	Display-Mode	1	byte	0-2	rw	0	0 = vacuum, 1 = menu, 2 = eco (Change after 60s without display-touch)
78	0x004E	0	Display-brightness	1	byte	0-100	rw	100	Unit: 1%
79	0x004F	0	Display rotation	1	byte	0-1	rw	0	0 = standard, 1 = 180° rotated
81	0x0051	0	Language selection	1	byte	0-4	rw	0	0 = english, 1 = german, 2 = french, 3 = spanish, 4 = italian
86	0x0056	0	Drop-Off valve (SIO-Mode & manual mode)	1	byte	0-7	rw	7	0 = GCP, 1 = X11, 2 = X12, 3 = GCP & X11, 4 = GCP & X12, 5 = X11 & X12, 6 = GCP & X11 & X12 7 = Automatic
87	0x0057	1	Us X11 (Pin 1 and Pin 2)	1	byte	0-1	rw	1	0 = off, 1 = on
		2	Us X12 (Pin 1 and Pin 2)	1	byte	0-1	rw	1	
88	0x0058	1	Ua X11 (Pin 3 and Pin 5)	1	byte	0-2	rw	2	0 = off, 1 = on, 2 = linked to SIO-Signal "drop-off"/controlled by process data (IO-Link) (Ua always on if LQE connected, and always off if VSi connected)
		2	Ua X12 (Pin 3 and Pin 5)	1	byte	0-2	rw	2	
89	0x0059	0	SP2 selection/displayed vacuum value	1	byte	0-7	rw	7	0 = GCP, 1 = X11, 2 = X12, 3 = GCP & X11, 4 = GCP & X12, 5 = X11 & X12, 6 = GCP & X11 & X12 7 = Automatic
ISDU X11 X12 (IOL-Devices external connectors)									
10200	0x27D8	0	ISDU: Index	2	bytes	0-16353	rw	0	ISDU-Index
10201	0x27D9	0	ISDU: Subindex	1	byte	0-255	rw	0	ISDU-Subindex
10202	0x27DA	0	ISDU: RW	1	byte	0-1	rw	0	0 = read, 1 = write
10203	0x27DB	0	ISDU: Length	1	byte	0-64	rw	0	Length of ISDU
10204	0x27DC	0	ISDU: Data	64	bytes	je 0-255	rw	0	64-Byte Data
10205	0x27DD	0	ISDU: Trigger	1	byte	0-1	rw	0	1 = Start ISDU process
10206	0x27DE	0	ISDU: Status	1	byte	-	ro	-	0 = No ISDU process started, 1 = ISDU process ongoing, 2 = ISDU process finished successfully, 3 = ISDU process terminated with errors (see extended error code)
10207	0x27DF	0	ISDU: Extended error code	1	byte	-	ro	-	Extended error code IO-Link specification
10208	0x27E0	0	ISDU: Valve select	1	byte	1-2	rw	1	0 = X11, 1 = X12

Process Settings									
275	0x0113	0	Active profile	1	byte	0-3	rw	0	Number of active profile
Production Setup P0/Setup For SIO-Mode									
100	0x0064	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 >= SP2+ 50	rw	800	Unit: 1mbar
102	0x0066	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
103	0x0067	0	Resetpoint 2 (rP2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
106	0x006A	0	Duration automatic drop-off	2	bytes	10-9999	rw	200	Unit: 1ms
107	0x006B	0	Permissible evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms, no evacuation time warning if set to 0
108	0x006C	0	Permissible leakage rate	2	bytes	0-9999	rw	2000	Unit: 1mL/min, no leakage rate warning if set to 0
111	0x006F	0	Max. allowed power	1	byte	10-100	rw	100	Unit: %
119	0x0077	0	Profile name	0…16	bytes	-	rw	***	Name of profile
Production Setup P1									
182	0x00B6	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 >= SP2+ 50	rw	800	Unit: 1mbar
184	0x00B8	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
185	0x00B9	0	Resetpoint 2 (rP2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
186	0x00BA	0	Duration automatic drop-off	2	bytes	10-9999	rw	200	Unit: 1ms
187	0x00BB	0	Permissable evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms, no evacuation time warning if set to 0
188	0x00BC	0	Permissable leakage rate	2	bytes	0-9999	rw	2000	Unit: 1mL/min, no leakage rate warning if set to 0
191	0x00BF	0	Max. allowed power	1	byte	10-100	rw	100	Unit: %
199	0x00C7	0	Profile name	0…16	bytes	-	rw	***	Name of profile
Production Setup P2									
202	0x00CA	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 >= SP2+ 50	rw	800	Unit: 1mbar
204	0x00CC	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
205	0x00CD	0	Resetpoint 2 (rP2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
206	0x00CE	0	Duration automatic drop-off	2	bytes	10-9999	rw	200	Unit: 1ms
207	0x00CF	0	Permissible evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms, no evacuation time warning if set to 0
208	0x00D0	0	Permissible leakage rate	2	bytes	0-9999	rw	2000	Unit: 1mL/min, no leakage rate warning if set to 0
211	0x00D3	0	Max. allowed power	1	byte	10-100	rw	100	Unit: %
219	0x00DB	0	Profile name	0…16	bytes	-	rw	***	Name of profile

Production Setup P3									
222	0x00DE	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 >= SP2+ 50	rw	800	Unit: 1mbar
224	0x00E0	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
225	0x00E1	0	Resetpoint 2 (rP2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
226	0x00E2	0	Duration automatic drop-off	2	bytes	10-9999	rw	200	Unit: 1ms
227	0x00E3	0	Permissible evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms, no evacuation time warning if set to 0
228	0x00E4	0	Permissible leakage rate	2	bytes	0-9999	rw	2000	Unit: 1mL/min, no leakage rate warning if set to 0
231	0x00E7	0	Max. allowed power	1	byte	10-100	rw	100	Unit: %
239	0x00EF	0	Profile name	0…16	bytes	-	rw	***	Name of profile
Observation									
Monitoring									
64	0x0040	1 2 3	System vacuum live System vacuum min System vacuum max	2 2 2	bytes bytes bytes	-	ro ro ro	-	Unit: 1mbar Unit: 1mbar Unit: 1mbar
66	0x0042	1 2 3	Primary supply voltage live Primary supply voltage min Primary supply voltage max	2 2 2	bytes bytes bytes	-	ro ro ro	-	Unit: 0.1V Unit: 0.1V Unit: 0.1V
67	0x0043	1 2 3	Auxiliary supply voltage live Auxiliary supply voltage min Auxiliary supply voltage max	2 2 2	bytes bytes bytes	-	ro ro ro	-	Unit: 0.1V Unit: 0.1V Unit: 0.1V
68	0x0044	1 2 3	Temperature live Temperature min Temperature max	2 2 2	bytes bytes bytes	-	ro ro ro	-	Unit: 0.1°C Unit: 0.1°C Unit: 0.1°C
564	0x0234	0	Communication mode	1	byte	-	ro	-	0x00 = SIO mode 0x11 = IO-Link
Diagnosis									
Device Status									
36	0x0024	0	Device status	1	byte	-	ro	-	0 = Device is operating properly 1 = Maintenance required 2 = Out of Spec 3 = unused 4 = Failure
37	0x0025	0	Detailed device status	96	bytes	-	ro	-	Information about currently pending events (Event-List) Byte 0 = Type of Event 1 Byte 1…2 = ID of Event 1 Byte 3 = Type of Event 2 Byte 4…5 = ID of Event 2 etc.
130	0x0082	0	Active errors	2	bytes	-	ro	-	Bit 0 = Internal error: data corruption Bit 1 = Temperature overrun Bit 2 = Primary voltage too low Bit 3 = Primary voltage too high Bit 4 = Auxiliary voltage too low Bit 5 = Auxiliary voltage too high Bit 6 = Short circuit at OUT2 Bit 7 = Short circuit at OUT3 Bit 8...9 = reserved Bit 10 = Sensor calibration failed Bit 11 = Pump not working properly Bit 12...14= reserved Bit 15 = IO-Link communication interruption

		Condition Monitoring [CM]							
146	0x0092	0	Condition monitoring	2	bytes	-	ro	-	Bit 0 = reserved Bit 1 = Evacuation time above limit Bit 2 = Leakage rate above limit Bit 3 = SP1 not reached in suction cycle Bit 4 = Free Flow Vacuum over SP2 Bit 5 = Primary Voltage US out of operating range Bit 6 = Auxiliary voltage UA out of operating range Bit 7 =Temperature out of operating range Bit 8 = Vacuum sank under rP2 during suction Bit 9...15 = reserved
		Counters							
140	0x008C	0	Vacuum on counter	4	bytes	-	ro	-	Counter for Vacuum on (non-erasable, saved every 20 mins)
142	0x008E	0	Condition monitoring counter	4	bytes	-	ro	-	Counter for condition monitorings (non-erasable, every all 20 mins)
143	0x008F	0	Vacuum on counter	4	bytes	-	ro	-	Counter for Vacuum on (erasable, saved every 20 mins)
145	0x0091	0	Condition monitoring counter	4	bytes	-	ro	-	Counter for condition monitorings (erasable, saved every 20 mins)
		Timing							
166	0x00A6	1	Total cycle time of last cycle GCP	4	bytes	-	ro	-	Unit: 1ms
		2	Total cycle time of last cycle X11	4	bytes	-	ro	-	Unit: 1ms
		3	Total cycle time of last cycle X12	4	bytes	-	ro	-	Unit: 1ms
148	0x0094	1	Evacuation time t0 of last suction-cycle GCP	2	bytes	-	ro	-	Unit: 1ms
		2	Evacuation time t0 of last suction-cycle X11	2	bytes	-	ro	-	Unit: 1ms
		3	Evacuation time t0 of last suction-cycle X12	2	bytes	-	ro	-	Unit: 1ms
149	0x0095	1	Evacuation time t1 of last suction-cycle GCP	2	bytes	-	ro	-	Unit: 1ms
		2	Evacuation time t1 of last suction-cycle X11	2	bytes	-	ro	-	Unit: 1ms
		3	Evacuation time t1 of last suction-cycle X12	2	bytes	-	ro	-	Unit: 1ms
170	0x00AA	1	Holding time t2 of last suction-cycle GCP	2	bytes	-	ro	-	Unit: 1ms
		2	Holding time t2 of last suction-cycle X11	2	bytes	-	ro	-	Unit: 1ms
		3	Holding time t2 of last suction-cycle X12	2	bytes	-	ro	-	Unit: 1ms
171	0x00AB	1	Drop-off time t3 of last suction-cycle GCP	2	bytes	-	ro	-	Unit: 1ms
		2	Drop-off time t3 of last suction-cycle X11	2	bytes	-	ro	-	Unit: 1ms
		3	Drop-off time t3 of last suction-cycle X12	2	bytes	-	ro	-	Unit: 1ms
167	0x00A7	0	Pump-on total time	4	bytes	-	ro	-	Unit: 1min (saved every 20 mins)
168	0x00A8	0	Power-on total time	4	bytes	-	ro	-	Unit: 1min (saved every 20 mins)
		Energy Monitoring [EM]							
157	0x009D	1	Energy consumption of last suction-cycle GCP	2	bytes	-	ro	-	Unit: 1Ws
		2	Energy consumption of last suction-cycle X11	2	bytes	-	ro	-	Unit: 1Ws
		3	Energy consumption of last suction-cycle X12	2	bytes	-	ro	-	Unit: 1Ws
		Predictive Maintenance [PM]							
160	0x00A0	0	Leakage rate	2	bytes	-	ro	-	Unit: 1mL/min
161	0x00A1	0	Free-Flow vacuum	2	bytes	-	ro	-	Unit: 1mbar
164	0x00A4	0	Max reached vacuum	2	bytes	-	ro	-	Unit: 1mbar
162	0x00A2	0	Quality	1	byte	-	ro	-	Unit: 1%
163	0x00A3	0	Performance	1	byte	-	ro	-	Unit: 1%

Coding of IO-Link Events

Extended Device Status ID (= IO-Link Event Code)		Extended Device Status Type		IO-Link	Event name	Remark
dec	hex	hex	Meaning	Event Type		
0	0x0000	0x10	Everything OK	(no IOL event)	Everything OK	Device is working optimally
6144	0x1800	-	(IOL event only)	Notification	Vacuum calibration OK	Calibration offset 0 set successfully
6145	0x1801	0x22	Warning	Notification	Vacuum calibration failed	Sensor value too high or too low, offset not changed
35841	0x8C01	0x22	Warning	Warning	Simulation active	Manual mode is active
20736	0x5100	0x42	Critical condition	Error	General power supply fault	Primary supply voltage (US) too low
20752	0x5110	0x42	Critical condition	Warning	Primary supply voltage over-run	Primary supply voltage (US) too high
20754	0x5112	0x42	Critical condition	Warning	General power supply fault	Auxiliary supply voltage (UA) too low
6162	0x1812	0x42	Critical condition	Warning	General power supply fault	Auxiliary supply voltage (UA) too high
6156	0x180C	0x22	Warning	Warning	CM: Primary supply voltage out of optimal range	Condition Monitoring: primary supply voltage US outside of operating range
6157	0x180D	0x22	Warning	Warning	CM: Secondary supply voltage out of optimal range	Condition Monitoring: secondary supply voltage out of optimal range
16384	0x4000	0x22	Warning	Warning	Temperature out of optimal range	Temperature overrun
6152	0x1808	0x22	Warning	Warning	CM: Evacuation time above limit	Condition monitoring: evacuation time t1 is above limit [t-1]
6153	0x1809	0x22	Warning	Warning	CM: leakage rate above limit	Condition Monitoring: leakage rate is above limit [-L-]
6154	0x180A	0x22	Warning	Warning	CM: SP1 not reached	Condition monitoring: vacuum level SP1 was never reached during suction cycle
6155	0x180B	0x22	Warning	Warning	CM: Free flow vacuum too high	Condition monitoring: free flow vacuum above SP2
6161	0x1811	0x82	Defect/fault	Error	Data corruption	Internal error, user data corrupted

At Your Service Worldwide

Vacuum automation

WWW.SCHMALZ.COM/AUTOMATION

Handling systems

WWW.SCHMALZ.COM/EN-US/VACUUM-LIFTERS-AND-CRANE-SYSTEMS

J. Schmalz GmbH
Johannes-Schmalz-Str. 1
72293 Glatten, Germany
T: +49 (0) 7443 2403-0
schmalz@schmalz.de
WWW.SCHMALZ.COM