



# Operating instructions Compact Valve LQEi,c

WWW.SCHMALZ.COM

 $\label{eq:EN-US} EN-US\cdot 30.30.01.03650\cdot 02\cdot 09/24$  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.

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## Contents

1	Impo	rtant Information	. 5
	1.1	Note on Using this Document	5
	1.2	The technical documentation is part of the product	5
	1.3	Type Plate	5
	1.4	Symbols	6
2	Funda	amental Safety Instructions	. 7
	2.1	Intended Use	. 7
	2.2	Non-Intended Use	. 7
	2.3	Personnel Qualifications	. 7
	2.4	Warnings in This Document	. 8
	2.5	Residual Risks	. 8
	2.6	Modifications to the Product	9
3	Produ	ict Description	10
	3.1	Applying Suction to the Workpiece/Part	10
	3.2	Dropping off the Workpiece/Part	10
	3.3	Operating Modes	10
	3.4	Product Name	11
	3.5	Product Design	12
	3.6	Description of Indicator Elements	13
	3.7	Interface NFC	14
4	Techr	nical Data	15
	4.1	Parameters	15
	4.2	Electrical Parameters	16
	4.3	Flow Capacity	17
	4.4	Dimensions	18
	4.5	Pneumatic Circuit Plans	19
	4.6	Factory Setting	20
5	Funct	ional Description	21
	5.1	Signal Type	21
	5.2	System Commands	21
	5.3	User-Specific Localization	23
	5.4	Device Data	24
	5.5	Process Data Monitoring	24
	5.6	Device Status	24
	5.7	Displaying Errors	25
	5.8	Access Control	25
	5.9	Switch-on and Switch-off Delay	26
	5.10	Set Permissible Evacuation Time t1 (0x006B)	26
	5.11	Setting the Function of Input PD1.0	26
	5.12	Counters	27
	5.13	Timing	27
	5.14	IO-Link Events	28

	5.15 5.16	Condition Monitoring Events and Status Indicator Switching Points	28 29
6	Checl	king the Delivery	31
7	Insta	llation	32
	7.1	Installation Instructions	32
	7.2	Mechanical Attachment	32
	7.3	Pneumatic Connection	34
	7.4	Electrical Connection	36
8	Opera	ation	38
	8.1	General Preparations	38
9	Warra	anty	39
10	Main	tenance and Cleaning	40
			דע
	10.1	Safety Instructions for Maintenance	40
	10.1 10.2	Safety Instructions for Maintenance Cleaning the Device	40 40 40
	10.1 10.2 10.3	Safety Instructions for Maintenance Cleaning the Device Cleaning the Screen	40 40 40 41
	10.1 10.2 10.3 10.4	Safety Instructions for Maintenance Cleaning the Device Cleaning the Screen Replacing the Press-In Screen in the Vacuum Connection for the Gripper	40 40 41 42
11	10.1 10.2 10.3 10.4 Takin	Safety Instructions for Maintenance Cleaning the Device Cleaning the Screen Replacing the Press-In Screen in the Vacuum Connection for the Gripper g the Product Out of Operation and Disposal	40 40 41 42 43
11	10.1 10.2 10.3 10.4 Takin	Safety Instructions for Maintenance Cleaning the Device Cleaning the Screen Replacing the Press-In Screen in the Vacuum Connection for the Gripper g the Product Out of Operation and Disposal	40 40 41 42 43 43
11 12 13	10.1 10.2 10.3 10.4 Takin Spare	Safety Instructions for Maintenance Cleaning the Device Cleaning the Screen Replacing the Press-In Screen in the Vacuum Connection for the Gripper g the Product Out of Operation and Disposal Parts	40 40 41 42 42 43 44
11 12 13 14	10.1 10.2 10.3 10.4 Takin Spare Acces	Safety Instructions for Maintenance Cleaning the Device Cleaning the Screen Replacing the Press-In Screen in the Vacuum Connection for the Gripper g the Product Out of Operation and Disposal Parts sories	40 40 41 42 43 43 45 46
11 12 13 14	10.1 10.2 10.3 10.4 <b>Takin</b> Spare Acces Attac 14.1	Safety Instructions for Maintenance Cleaning the Device Cleaning the Screen Replacing the Press-In Screen in the Vacuum Connection for the Gripper g the Product Out of Operation and Disposal Parts soories	40 40 41 42 43 43 43 45 45 46 47

## 1 Important Information

## 1.1 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 aimed at:

- 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

### **1.2** 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

## 1.3 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.
- $\Rightarrow$  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 compact valve is designed to monitor and control the externally supplied vacuum for gripping and transporting objects when used in conjunction with suction cups. Depending on the design, the control signals are transmitted directly or via appropriate communication lines.

Compressed air for cleaning the integrated screens can be supplied via a separate connection (1A).

Neutral gases in accordance with EN 983 are approved as evacuation media. Neutral gases include air, nitrogen and inert gases (e.g. argon, xenon 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 use.

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).
- 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 Qualifications

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

- 1. Task only qualified personnel to perform the tasks described in these Operating instructions.
- 2. The product must be operated only by persons who have undergone appropriate training.

These Operating instructions are intended for fitters who are trained in handling the product and who can operate and install it.

## 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
	Indicates a medium-risk hazard that could result in death or serious injury if not avoided
	Indicates a low-risk bazard that could result in minor or moderate injury if
	not avoided.
NOTE	Indicates a danger that leads to property damage.

## 2.5 Residual Risks



## 

Uncontrolled movements of system components or falling objects caused by incorrect activation and switching of the device while persons are in the plant (safety door opened and actuator circuit switched off)

Serious injury

- Ensure that the components are enabled via the actuator voltage by installing a potential separation between the sensor and actuator voltage.
- Wear the required personal protective equipment (PPE) when working in the danger zone.



## 

#### **Suspended load**

Risk of serious injury

> Do not walk, stand or work under suspended loads.



## 

### The product contains a permanent magnet that generates a continuous magnetic field.

Danger for persons with pacemakers. Devices and data carriers can be damaged.

- Keep persons with pacemakers away from the product.
- Keep sensitive electrical devices and data carriers away from the product.



## 

Damage to the electrical components in the product may cause the product and surfaces to heat up significantly.

Touching hot surfaces may cause injury from burns.

- Wear work gloves.
- Disconnect the product from the power supply and let it cool down.



## 

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).

### 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 Applying Suction to the Workpiece/Part

The compact valve is designed to switch the vacuum on and off in combination with suction systems. The vacuum is supplied externally and the air is sucked in through the vacuum connection for the gripper.

The valve is opened via the "Apply vacuum" signal input. The vacuum is guided from the vacuum generator to the vacuum connection for the gripper.

In this operating mode, LED position 1 lights up (> See ch. 3.6 Description of Indicator Elements, p. 13).

In the event of a supply voltage failure, the product maintains its current operating mode (bistable). This prevents an object that is picked up from falling off the suction cup if the supply voltage fails in "Apply vacuum" operating mode.

An integrated sensor measures the present vacuum. In the IO-Link variant, the exact vacuum value is made available in the process data.

If the vacuum drops rapidly on the vacuum generator side, the integrated non-return valve prevents the vacuum from dropping rapidly while objects with an airtight surface are picked up.

The OUT2 output is set once a part is picked up securely, based on the vacuum value. This enables the further handling process.

### 3.2 Dropping off the Workpiece/Part

In the "Apply atmosphere counter" operating mode, atmospheric pressure is applied to the vacuum circuit at the vacuum connection for the grippers. The vacuum circuit between the vacuum generator and the compact valve is closed. There is no atmospheric ventilation here. This ensures that the vacuum drops quickly, allowing the workpiece/part to be deposited quickly.

In this operating mode, LED position 2 lights up (> See ch. 3.6 Description of Indicator Elements, p. 13).

If the product is in the "Apply atmosphere counter" operating mode when the supply voltage fails, this mode is maintained. When the power supply returns, the product remains in "Apply atmosphere counter" mode.

### 3.3 Operating Modes

Depending on the variant, the device communicates with the higher-level controller in different ways:

- Via direct connection to inputs and outputs (standard I/O = SIO) or
- Via a connection through an IO-Link communication line

The options for parameterizing the device vary greatly depending on the variant.

#### Variant with SIO operation

All input and output signals are connected to a controller, either directly or using intelligent terminal boxes.

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

This enables the use of the basic functions "Apply vacuum" and "Apply atmosphere counter" as well as providing "Parts Present" feedback.

Depending on the product variant, the signal type (PNP or NPN) of the inputs/output is predefined based on the factory settings but can be configured via NFC (> See ch. 3.7 Interface NFC, p. 14). If the "Apply atmosphere counter" and "Apply vacuum" signals are applied simultaneously, the "Apply atmosphere counter" function is given priority and a part being held that was previously picked up is deposited. The individual basic functions are:

Inputs	Output
Apply vacuum ON/OFF (IN1)	SP2 (part present) feedback (OUT2)
Apply atmosphere counter ON/OFF (IN2)	

#### Variant with IO-Link operation

When using IO-Link (digital communication, class B), the power supply voltages and the communication line are connected to a control unit, either directly or via an IO-Link master. The device can be finely parameterized via IO-Link.

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

- Error messages and warnings
- System status indicator
- Access to all parameters

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

The device supports IO-Link version 1.1 with 2 bytes of input data and 1 byte 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).

### 3.4 Product Name

The item designation (e.g. LQEc 8 24V-DC 3/2 IMP PNP) is broken down as follows:

Property	Variants
Туре	LQE
Version	Controlled: c Intelligent: i
Nominal diameter	8
Power supply	24V-DC
Valve function	3/2-way valve
Switching logic or control	IMP
Signal type (only for LQEc)	PNP NPN

## 3.5 Product Design

1	Vacuum connection for external vacuum generator, 1/4" internal thread (labeled with 1)	5	Mounting holes, 2x
2 ( r	Compressed air connection for mainte- nance of the integrated filter screens, M5 (labeled with 1A)	6	Ventilation opening (labeled with 3)
3 I	Electrical connection, M12, 5-pin	7	Vacuum connection for vacuum grippers, 3/8" internal thread (marked with 2)
4 [	Display element	—	—

## 3.6 Description of Indicator Elements

The device has three light-emitting diodes (LEDs) for visually indicating the status.



- 2 Deposit/Apply atmosphere counter LED
  3 LED power supply and status
- Variant LQEi: IO-Link symbol
   NFC symbol

Posi- tion	Display	Status
1	Lights up	Suction at the vacuum connection for grippers (connection to the vacuum connection for vacuum generators)
2	Lights up	Deposit at the vacuum connection for grippers (connection to the ventila- tion opening), vacuum connection for vacuum generators is shut off.
3 ()	Lights up green	Sensor supply voltage is present, no device warning or error, vacuum > SP2
	Lights up blue	Sensor supply voltage is present, no device warning or error, vacuum < SP2
	Lights up yel- low	Sensor supply voltage present, device warning issued
	Lights up red	Sensor supply voltage present, device error issued

## 3.7 Interface NFC



The illustrations shown below may deviate from the customer's version because they serve as examples of different versions of the product.

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 parameters 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 optimum data connection, place the reader on the attached NFC symbol.



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.

## 4 Technical Data

## 4.1 Parameters

Temperature range	0 to +50 °C
Permissible humidity	10 to 85% r.h. (free from condensation)
Degree of evacuation (external)	0 to 900 mbar
Recommended hose diameter for vacuum generator <sup>1)</sup>	9 mm
Recommended vacuum hose diameter for the gripper <sup>1)</sup>	9 mm
Recommended hose diameter for the compressed air for maintaining the screens	2 mm
IP protection	IP40
Max. short-term cycle frequency (valve switching fre- quency; cycle = two changes of valve switching positions)	2 Hz for max. 20 s (Note: The max. cycle frequency of 1 Hz on average must be maintained; that is, if the average value is exceeded briefly up to a maximum of 20 seconds, an identical break period must be maintained)
Max. cycle frequency on average> 1Hz	1 Hz
Weight	400 g

 $^{\mbox{\tiny 1)}}$  For a max. length of 2 m

## 4.2 Electrical Parameters

The outputs are protected against overload and short circuit.

Parameter	Sym- bol	1	Limit value	S	Comment	Vers.
		min.	typ.	max.		
Actuator/sensor supply voltage	U <sub>A/S</sub>	20.4 V <sub>DC</sub>	24 V <sub>DC</sub>	28.8 V <sub>DC</sub>	PELV <sup>1)</sup>	
Current consumption	I	_	20 mA (perma- nent)	1.22 A (for 90 ms)		LQEc
Voltage of signal output OUT2 (PNP)	U <sub>OH</sub>	15 V		U <sub>A</sub>	I <sub>он</sub> < 140 mA	
Voltage of signal output OUT2 (NPN)	U <sub>OL</sub>	0 V		9 V	I <sub>oL</sub> < 140 mA	
Current of signal output OUT2 (PNP)	I <sub>он</sub>			140 mA	Short-circuit- proof <sup>2)</sup>	
Current of signal output OUT2 (NPN)	I <sub>OL</sub>			140 mA	Short-circuit- proof <sup>2)</sup>	
Voltage of signal input IN1 (Apply vacuum, suction)/IN2 (Apply atmosphere counter, drop-off) (PNP)	U <sub>IH</sub>	18 V		U <sub>A</sub>	_	
Voltage of signal input IN1 (Apply vacuum, suction)/IN2 (Apply atmosphere counter) (NPN)	U <sub>IL</sub>	0 V		6 V		
Current of signal input IN1 (Ap- ply vacuum, suction)/IN2 (Apply atmosphere counter) (PNP)	I <sub>IH</sub>		2.5 mA	_	U <sub>IH</sub> = 24 V	
Current of signal input IN1 (Ap- ply vacuum, suction)/IN2 (Apply atmosphere counter) (NPN)	I		-2.5 mA	_	U <sub>IL</sub> = 0 V	
Response time of signal inputs	t		3 ms		_	
Response time of signal output	to		2 ms	10 ms	_	
NFC	NFC Fo f = 13.	orum Tag ty 56 MHz	pe 4			LQEc / LQEi
Current consumption	I <sub>A</sub>	—		1.2 A (for 90 ms)	—	LQEi
Current consumption	I <sub>s</sub>			20 mA		
IO-Link	ink 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 output OUT2 is protected against short circuits. However, it is not protected against overloading. Constant load currents of > 0.15 A can lead to impermissible heating and subsequent functional failure.

## 4.3 Flow Capacity

The flow volume of the valve depends on the rated power of the externally connected vacuum generator.



Operating mode	Differential pressure	Flow volume
Apply vacuum (suction)	-70 mbar	109 l/min



## 4.4 Dimensions



G1	G2	G3	H5	SW3	L3	X1	d	SW1	L1
G1/4-IG	G3/8-IG	M12x1- AG	25.5	14	17	32	4.4	19	110.1
L	L2	В	B1	G4	Н	H1	H2	H3	H4
107.3	13.25	32	32.6	M5-IG	65.55	77	51	33.2	13.5

All length dimensions are in millimeters [mm].

## 4.5 Pneumatic Circuit Plans

Key:	
Р	Vacuum sensor
1	Vacuum connection (external vacuum generator)
2	Vacuum connection (gripper)
3	Exhaust outlet
1A	"Separate blow off" compressed air connection

## Variant LQEc



### Variants LQEi



## 4.6 Factory Setting

Parameter Value of		actory setting
ТҮРЕ	LQEc	LQEi
Function of input PD1.0	—	0 = SP1
Output filter	10	ms
Vacuum limit value SP1/FH1	750 r	nbar
Reset point rP1/FL1	600 r	mbar
Switching point 1 logic	0 =	NO
Switching point 1 mode	3 = two-point mode	
Switching point 1 hysteresis window	140 mbar	
Permitted evacuation time	(	)
Vacuum limit value SP2/FH2	550 mbar	
Reset point rP2/FL2	530 mbar	
Switching point 2 logic	0 = NO	
Switching point 2 mode	3 = two-point mode	
Switching point 2 hysteresis window	10 mbar	
Extended device access locks	0 = NFC write lock	
PIN code NFC	(	)

## 5 Functional Description

## 5.1 Signal Type

The signal type or switching behavior of the device, PNP or NPN, the electrical signal inputs and the signal output is predefined according to the factory setting depending on the product variant but can be adapted via NFC (control room app) (> See ch. 3.7 Interface NFC, p. 14).

## 5.2 System Commands

The following chapters describe the functions of the IO-Link variant.

System commands are predefined processes for triggering specific functions and are described below. They are controlled by writing parameter "System command" 0x0002 with a predefined value.

Offset param- eter	2 (0x0002)
Description	System command – triggers special features of the device
Index	-
Data type	uint8
Length	1 byte
Access	Write only
Value range	0x05: Force upload of parameter data into the master 0x81: Reset application 0x83: Back to box 0xA5: Calibrate vacuum sensor 0xA7: Reset erasable counters 0xA8: Reset voltage min./max. 0xA9: Reset vacuum min./max.
Default value	-
Unit	-
EEPROM	No

#### 5.2.1 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 revision 1.1 or higher.
- $\checkmark$  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 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 are automatically mirrored in the master.

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

 Manually mirroring data: After changing all the required parameters, execute ISDU write access to the "System Command" 0x0002 parameter with the "Force upload of parameter data into the master" (0x05) command (see Data Dictionary).



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

#### 5.2.2 Resetting the Application

Only the technology-specific application parameters are reset by this function.

System command "Reset application" 0x81 is used to reset all the parameters except the device localization parameters (see "Data Dictionary") to their factory settings.

Except for:

- "Device Localization Parameter"
- Counter readings
- The maximum and minimum values of the measurements
- "Device access locks" and "Extended device access locks"
- The zero-point adjustment of the sensor

Any IO-Link communication is not stopped in doing so.

The device must be restarted by interrupting the supply voltage.

#### 5.2.3 Reset to Factory Settings

The "Back to box" system command 0x83 resets all the setting parameters (such as SP1, SP2, and so on) to their delivered condition, but not the valve type or the nozzle size.

Any IO-Link communication is stopped in doing so.

The device must be restarted by interrupting the supply voltage.

Counter statuses, the zero-point adjustment of the sensor and the maximum and minimum values of the measurements are not affected by this function.

#### 5.2.4 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 vacuum circuit for the gripper must be open to the atmosphere.

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



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

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

#### 5.2.5 Resetting Counters

Via IO-Link, the system command to delete the two counters is executed using the value 0xA7 "Reset erasable counters".

#### 5.2.6 Resetting Maximum and Minimum Values for the Supply Voltage

System command 0xA8 "Reset voltages min/max" is used to delete the minimum and maximum values for the sensor supply voltage.

#### 5.2.7 Resetting Maximum and Minimum Values for the Vacuum

System command 0xA9 "Reset vacuum min/max" is used to delete the minimum and maximum values for the vacuum.

### 5.3 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.

## 5.4 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:

- 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)

## 5.5 Process Data Monitoring

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

- For the system vacuum, "System vacuum live / System vacuum min / System vacuum max" 0x0040
- For the supply voltage, "Primary supply voltage, live / Primary supply voltage, min / Primary supply voltage, max" 0x0042

The maximum and minimum values can be reset using the appropriate system command (0x0002).



The device is not a voltage meter! However, the measured values and the system responses derived from them provide a helpful diagnostics tool for condition monitoring.

The communication mode (SIO or IO-Link) is displayed in the parameter "Communication mode" 0x0234. The current communication mode can also be read out via NFC.

## 5.6 Device Status

In SIO mode, device status information is returned only via the status LED (<u>> See ch. 3.6 Description of In-</u> <u>dicator Elements</u>, p. 13).

In IO-Link mode, the following status information is also available:

- Device status (0x0024) (parameter data) in the form of a status traffic light
- Detailed device status (0x0025), event list
- Active errors (0x0082)
- Condition monitoring (0x0092)
- IO-Link Events

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
	Green (0)	Device is operating without any errors (Device is operating properly)
Device Status	Yellow (1)	Maintenance or adaptation of settings required (Maintenance required)
	Orange (2)	Device is operating outside the permissible specification (Out of Spec)
	Red (4)	Error – safe operation within the operating limits is no longer ensured (Error)

Any condition monitoring 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 IO-Link parameter "Condition monitoring" 0x0092.

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

## 5.7 Displaying Errors

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

- IO setup communication error (IO-Link startup check: data corruption)
- Valve switching frequency too high (Switch cycles too fast)
- Supply voltage sensor too low (Primary voltage too low)
- Supply voltage sensor too high (Primary voltage too high)
- Short circuit at OUT2 (Short circuit at OUT2)
- Measurement range of vacuum sensor exceeded (Measurement range overrun)
- IO-Link communication interruption (IO-Link communication interruption)

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

### 5.8 Access Control

#### 5.8.1 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.)
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.

For more detailed information, see the data dictionary attached.

### 5.8.2 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.

### 5.9 Switch-on and Switch-off Delay

You can use this function to set a switch-on and switch-off delay for the signals SP1 and SP2. This can be used to mask short-term fluctuations in the vacuum level of the vacuum system. The duration of the switch-on and switch-off delay is set via IO-Link using the parameter "Output filter" 0x004B. Values from 1 to 999 milliseconds can be set. To deactivate this function, enter the value "off" (0 = off).

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

### 5.10 Set Permissible Evacuation Time t1 (0x006B)

The permissible evacuation time t1 is set using the parameter "Permissible evacuation time". The measurement starts when the switching threshold SP2 (parts present check) is reached and ends when the switching threshold SP1 is exceeded.

Parameter	Description
Permissible evacuation time	Time from SP2 to SP1 [ms]

The maximum permitted evacuation time setting is 9999 milliseconds [ms].

If it is set to 0 milliseconds, monitoring is disabled and no warning is displayed.

### 5.11 Setting the Function of Input PD1.0

The function of process output byte 1, bit 0 can be set using "Input PD1.0".

The function of input PD1.0 can be set using the "Function of input PD1.0" command in parameter 0x0048.

The following settings are possible:

• O (zero) for SP1, which means that process data byte 1, bit 0 is activated if the vacuum level is > SP1 or is between FL1 and FH1, depending on the configured switch point mode. The bit is deactivated if rP1 is fallen below or is above or below FL1 or FH1.

SP1 and FH1/FL1 can be specified using parameter 0x003C. This function can be used, for example, to control a vacuum generator or to monitor an additional vacuum level independently of SP2.

 1 (one) for SP3, which means that process data byte 1, bit 0 is activated if the part has been deposited (Part detached). This is the case if the vacuum level is < 20 mbar, if SP2 was exceeded beforehand. This function can be used to detect the safe deposit of a part.

The bit remains activated until a new valve changeover is requested.



Regardless of which function is selected, internal evaluations of SP1 or SP3 are performed, which in turn are used for further evaluations (e.g. condition monitoring, etc.).

## 5.12 Counters

Parameter ad- dress	Description
0x008C	Vent/deposit counter ("Apply atmosphere counter" signal)
0x008D	Counter for SP2 switching frequency (Switch-on counter for switch point 2)
0x008E	Counter for SP1 switching frequency (Switch-on counter for switch point 1)
0x008F	Vent/deposit counter ("Apply atmosphere counter) – erasable
0x0090	Counter for SP2 switching frequency (Switch-on counter for switch point 2) – erasable
0x0091	Counter for SP1 switching frequency (Switch-on counter for switch point 1) – erasable

The device has three internal, non-erasable counters and three erasable counters.

The erasable counters can be reset to zero using the appropriate system command 0x0002.

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

## 5.13 Timing



Measure the evacuation time t1 (parameter "Evacuation time t1 of last suction cycle" 0x0095):

The evacuation time t1 is defined as the time (in ms) from when switching point SP2 is reached until switching point SP1 is reached.

If the measured evacuation time t1 (from SP2 to SP1) exceeds the specified value, the "Evacuation time above limit [t-1]" 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 using the parameter "Permissible evacuation time" 0x006B.



Measure the evacuation time t0 (parameter "Evacuation time t0 of last suction cycle" 0x0094):

The evacuation time t0 is defined as the time (in ms) from the start of a suction cycle, which is started by the "Apply vacuum" command, until switching point SP2 is reached.

The drop-off time t3 of the last drop-off is measured in milliseconds and is output in the parameter "Drop-off time t3 of last drop-off" 0x00AB.

The drop-off time t3 is defined as the period from the time of the "drop-off" signal (Apply atmosphere counter) to the activation of SP3 (part detached) when the vacuum is < 20 mbar. Prerequisite: SP2 must have been exceeded beforehand.

## 5.14 IO-Link Events

The device signals "IO-Link events" when certain events occur. As a result, these events do not have to be queried using a parameter. These are error messages and warnings.

For more information, see the Data Dictionary.

### 5.15 Condition Monitoring Events and Status Indicator

Any condition monitoring 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 IO-Link parameter "Condition monitoring" 0x0092.

The table below explains the coding of the condition monitoring warnings:

Bit	Event	Update
1	Evacuation time above the limit	Constant
3	Switching point SP1 not reached	Constant
5	Supply voltage $U_s$ outside the operating range	Constant

#### Evacuation time above the limit

If the measured evacuation time t1 (from SP2 to SP1) exceeds the specified value, the "Evacuation time above limit" condition monitoring warning 0x0092 is triggered, the system status light switches to yellow and an event is triggered.

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 using the parameter "Permissible evacuation time" 0x006B.

#### Switching point SP1 not reached

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 yellow. SP1 can be set using parameters 0x003C + 0x003D.

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

#### Supply voltage U outside the operating range

The device has an internal voltage monitor. It requires a power supply of 24 V. If the voltage deviates from the tolerance limit, the device enters a warning state.

The device measures the sensor supply voltage U<sub>s</sub> ("primary supply voltage" 0x0042).



The device is not a voltage meter! However, the measured values and the system responses derived from them provide a helpful diagnostics tool for condition monitoring.

If 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.

#### 5.16 Switching Points



In the following, the switching point number is always denoted by an "x" when information applies equally to both switching points. SPx therefore stands for both SP1 and SP2.

#### 5.16.1 Switching Point Mode and Switching Point Logic

Both switching points are identical in terms of function and can be parameterized independently of one another.

There are 4 different switching point modes to choose from:

- Two-point mode SP.no/SP.nc
- Window mode F.no / F.nc
- Condition monitoring mode C.no / C.nc
- Diagnostics mode D.no / D.nc

In this case, there is a differentiation between the switching point logic NO (normally open) and NC (normally closed). A change in the switching point logic from NO to NC causes a logical inversion of the electrical switching outputs, the switching point bits in the IO-Link process data and the orange LED display(s) on the switch.

The condition monitoring and diagnostics modes cannot be activated simultaneously for both switching points. That means that when a switching point is already parameterized to C.no, C.nc, D.no or D.nc, the other can only adopt the modes SP.no, SP.nc, F.no or F.nc.

#### 5.16.2 Two-Point Mode

The two-point mode is a threshold switch with hysteresis.

When the measurement value increases, the switching point will be active when the switch-on threshold SPx is reached and remains on until it falls below the reset threshold rPx. The following must always apply for switching thresholds and reset thresholds: |SPx| > |rPx|. The hysteresis is therefore defined by the difference |SPx - rPx|.



#### 5.16.3 Window Mode

In window mode, the switching point is active when the measurement value is between the upper window point FHx and the lower window point FLx. Outside this window, the switching point is inactive. If necessary, a common switching hysteresis Hyx can be set, which symmetrically applies to both window points. For the parameters of the upper window point FHx, lower window point FLx and hysteresis Hyx, the following must always apply: |FHx| > |FLx| + Hyx



When switching from two-point mode to window mode, the current switching points SPx and rPx are interpreted as window points FHx and FLx. They are the same internal parameters (also see the data dictionary). If the resulting set of parameters are not valid in the new mode (e.g. hysteresis too big in window mode), it is not possible to switch the mode because the difference must be at least 30 mbar.

(i)

## 6 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.

## 7 Installation

## 7.1 Installation Instructions



## 

#### Improper installation or maintenance

Injury to persons or damage to property

• During installation and maintenance, make sure that the product is disconnected and depressurized and that it cannot be switched on again without authorization.

To ensure safe installation, the following instructions must be observed:

- Use only the connectors, mounting holes and attachment materials that have been provided.
- Mounting and removal must be performed only when the device is unpressurized and disconnected from the mains.
- Pneumatic and electrical line connections must be securely connected and attached to the product.

### 7.2 Mechanical Attachment

The product can be mounted in any position.

The valve is mounted using the holes on the side (1).

- ✓ During mounting, ensure that the product is resting fully on the mounting surface and is fastened without distortion and tension.
- ✓ Suitable screws and washers are at hand (provided by the customer).



 There are two 4.4 mm through-holes for mounting the compact valve (1). Use screws at least 40 mm in length. Secure the compact valve to the mounting surface using 2 fastening screws (2) (M4, tightening torque = 1.5 Nm) and washers.

### 7.2.1 Mounting with a Mounting Bracket

The mounting bracket included in the accessories can be mounted in various positions on the device. The figure shown here is just one possibility.

- ✓ The mounting kit is on hand.
- ✓ The device has been disconnected from all supply lines.



 Secure the mounting bracket (1) (> See ch. 13 Accessories, p. 45) to the device using two screws. The maximum tightening torque is 1.5 Nm.

### 7.2.2 Mounting on a DIN Rail (Optional)

The device can also be mounted on a TS 35-type DIN rail using the mounting kit.

 Attach the mounting bracket to the device with a torque of 1.5 Nm (<u>> See ch. 7.2.1</u> <u>Mounting with a Mounting Bracket, p. 33</u>).

Loosely screw the clamps (2) onto the bracket
 (1) in the correct position.



3. Attach the assembly with the bracket onto the DIN rail 1 and press it onto it 2.





4. Tighten the screw to tighten the clamp so that the assembly is fastened to the DIN rail.

### 7.3 Pneumatic Connection



## 

#### Vacuum close to the eye

Severe eye injury!

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



## **A** CAUTION

#### Noise pollution from leakage

Hearing damage

- Correct position.
- Wear ear protectors.

### 7.3.1 Connecting the Vacuum



- $\checkmark$  The customer has attached the components for connecting the hoses to the vacuum connections.
- Connect the vacuum hose for the vacuum generator to the connection (1) marked with the number
   The maximum tightening torque for 1/4" threads is: 6.0 Nm.
- 2. Connect the vacuum hose for the gripper or gripping system at the connection (2) marked with the number 2. The maximum tightening torque for 3/8" threads is: 6 Nm.

#### 7.3.2 Notes for Pneumatic Connections

To ensure problem-free operation and a long service life for the product, always take the following requirements into account:

- Use only the connections and attachment materials that have been provided.
- Dirt particles or foreign bodies in the valve connections, hoses or pipelines can lead to partial or complete malfunction.
- 1. Shorten the hoses and pipelines as much as possible.
- 2. Keep hose lines free of bends and crimps.
- 3. Use only pipes or hoses with the recommended inner diameter to connect the valve:

Use hoses with sufficient internal diameter.	Internal ø
on the vacuum generator side to avoid high flow resistance. If the selected internal diameter is too small, the flow resistance increases and the evac- uation times are extended.	9 mm
on the vacuum gripper side to avoid high flow resistance. If the selected internal diameter is too small, the flow resistance increases and the evac- uation times and drop-off times are extended.	9 mm
Compressed air connection for maintenance	2 mm

Internal diameters are based on a maximum hose length of 2 m.

## 7.4 Electrical Connection



## **▲ 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.



## \land WARNING

#### **Electric shock**

Risk of injury

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

#### **Connection notes:**

The electrical connection is established using a 5-pin, A-coded M12 connector.

#### Note on connecting the LQEi:

When connecting the LQEi, the supply voltage  $U_s$  for the sensors and the C/Q communication line must be directly connected to the connections of an IO-Link master. A separate port on the master must be used for each LQEi. It is not possible to connect multiple C/Q lines to a single IO-Link master port. The supply voltage for the actuators can also be supplied separately.

Using an IO-Link class B master enables the one-to-one connection of the master port and LQEi with a single 5-pin connection cable. The IO-Link master must be connected in the configuration of the automation system in the same way as other fieldbus components. The required device description file (IO-Link data dictionary; abbreviated "IODD") of the LQEi can be downloaded at www.schmalz.com.

The maximum cable length is: 20 m for the variant LQEi

#### Notes on connecting the LQEc:

The variant LQEc must only be supplied with a single supply voltage. Control and feedback takes place via configurable standard IO signals (SIO).

The maximum cable length is 30 m for the variant LQEc

#### Establishing the electrical connection for the product

✓ Prepare an M12 5-pin connection cable with a socket (supplied by the customer).



 Attach the connection cable to the plug (1) (maximum tightening torque = hand-tight).

#### 7.4.1 Pin Assignment for M12-5 Plug, SIO

The table below shows the pin assignment of the electrical connection options in the SIO operating mode:

M12 plug	PIN	Symbol	Litz wire color	Function
	1	U	Brown	Supply voltage
	2	IN1	White	"Apply vacuum (suction)" signal input
(4 3)	3	GND	Blue	Ground
	4	OUT2	Black	"Parts Present" check signal output (SP2)
	5	IN2	Gray	"Apply atmosphere (drop-off)" signal in- put

#### 7.4.2 Pin Assignment of M12 Connector for IO-Link Class B

Electrical interface 1x M12 – A-coded pin assignment according to IO-Link class B.

M12 plug	PIN	Symbol	Wire color <sup>1)</sup>	Function
	1	Us	Brown	Supply voltage for sensor
	2	U <sub>A</sub>	White	Supply voltage for actuator
(4 3)	3	GND <sub>s</sub>	Blue	Sensor ground
	4	C/Q	Black	IO-Link
	5	GND <sub>A</sub>	Gray	Actuator ground

<sup>1)</sup> When using a Schmalz connection cable (see "Accessories")

## 8 **Operation**

## 8.1 General Preparations



## 

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.

Always carry out the following tasks before activating the device:

- 1. Check the product for visible damage and deal with any problems immediately (or notify the supervisor).
- 2. Ensure that the safety features of the machine or system are in perfect condition and check that they are functioning correctly.
- 3. Make sure all pneumatic connections are occupied and all screws are tight.
- 4. 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.

## 9 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.

## **10** Maintenance and Cleaning

## 10.1 Safety Instructions for Maintenance

The product must be maintained only by qualified specialist electricians and mechanics. Personnel must have read and understood the operating instructions.

## **10.2** Cleaning the Device



## \land CAUTION

#### **Use of Cleaners Containing Solvents**

Damage to the product (seals, insulation, coatings and other surfaces may be damaged by cleaners that contain solvents) and potentially damage to health

- Use a chemically and biologically neutral cleaning agent.
- Use cleaning agent that is rated as non-harmful to health.
- The use of the following cleaning agents is strictly prohibited:
  - Acetone
  - white spirit
  - cellulose thinner/turpentine oil (solvents)
- 1. For cleaning, do not use aggressive cleaning agents such as industrial alcohol, white spirit or thinners. Only use cleaning agents with pH 7–12.
- 2. Remove dirt on the exterior of the device with a soft cloth and soap suds at a maximum temperature of 60° C. Make sure that the product is not soaked in soapy water.
- 3. Ensure that no moisture gets into the electrical connection.

#### **Cleaning the filter elements**

- ✓ Position the device so that the blow-off air is guided into the open and ensure that there are no people in the air stream of the contaminated blow-off air.
- Remove coarse dirt on the filter elements of the suction points with one or more blow-off pulses.

## **10.3** Cleaning the Screen



## \land WARNING

Noise pollution due to the escape of compressed air Hearing damage!

- Wear ear protectors.
- ✓ The compact valve must be in the "Apply atmosphere counter" position here.
- ✓ The components for connecting the compressed air (e.g. plug-in screw union and a suitable compressed air hose) have been provided by the customer.
- ✓ The compact value is disconnected from the power supply and the pneumatic connections are free (no hoses connected).
- 1. Remove the sealing plug from the connection 1A.



- 2. Fit the plug-in screw union with the M5 connector (1) or the alternative hose connection. The max. tightening torque is 1.0 Nm.
- 3. Connect the compressed air hose.

4. WARNING! Eye injuries due to dirt particles. Do not look into the vacuum connections or ventilation opening when the compressed air is activated. Wear eye protection.

Activate compressed air with a maximum of 6 bar and blow out the screens from the inside; if necessary, release the dirt from the outside with a brush.



### 10.4 Replacing the Press-In Screen in the Vacuum Connection for the Gripper

A press-in screen is installed in the **vacuum connection** for the gripper (marked with the number 2). Dust, chippings and other solid materials may be deposited in the filter screen over time.

If there is a noticeable reduction in performance, replace the filter screen (part no. 10.02.02.03378):

- ✓ Deactivate the device and depressurize the pneumatic systems.
- ✓ Remove the vacuum hose and the hose mounting attachment.
- 1. NOTE! When removing the filter screen, do not damage the internal thread of the connector.

Disassemble the filter screen (1) using a screw-driver.

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.



## **11** 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.

## 12 Spare Parts

Maintenance work may only be carried out by qualified personnel.

The following list contains the most important spare parts.

Designation	Part no.
Round screen	10.02.02.03378
SIEB 17.5x2 A2 0.415/0.22	
for 3/8" thread	

## **13** Accessories

Designation	Part no.
Mounting bracket (assembled) BEF-WIN 45x20x87.35 LQE	10.05.11.00028
Mounting set SET LQE MOUNT1	10.05.11.00030
Vacuum cup filter VFT 1/4" int. thread 80	10.07.01.00119
Vacuum cup filter VFT 1/4" int. thread 100	10.07.01.00120
Vacuum cup filter VFT 3/8" int. thread 80	10.07.01.00122
Vacuum cup filter VFT 3/8" int. thread 100	10.07.01.00123
Straight plug-in screw union STV-GE 1/4" ext. thread 8	10.08.02.00207
Straight plug-in screw union STV-GE 1/4" ext. thread 10	10.08.02.00251
Straight plug-in screw union STV-GE 1/4" ext. thread 12	10.08.02.00208
Straight plug-in screw union STV-GE 3/8" ext. thread 8	10.08.02.00237
Straight plug-in screw union STV-GE 3/8" ext. thread 10	10.08.02.00252
Straight plug-in screw union STV-GE 3/8" ext. thread 12	10.08.02.00209
Angled plug-in screw union STV-W 1/4" ext. thread 8	10.08.02.00161
Angled plug-in screw union STV-W 1/4" ext. thread 10	10.08.02.00254
Angled plug-in screw union STV-W 1/4" ext. thread 12	10.08.02.00162
Angled plug-in screw union STV-W 3/8" ext. thread 8	10.08.02.00236
Angled plug-in screw union STV-W 3/8" ext. thread 10	10.08.02.00255
Angled plug-in screw union STV-W 3/8" ext. thread 12	10.08.02.00163
Hose for vacuum and compressed air systems VSL 8-6 PU MI-TR	10.07.09.00003
Hose for vacuum and compressed air systems VSL 10-7 PU MI-TR	10.07.09.00084
Hose for vacuum and compressed air systems VSL 12-9 PU MI-TR	10.07.09.00037
Connection cable ASK B-M12-5 5000 K-5P	21.04.05.00080
Connection cable ASK B-M12-5 2000 S-M12-5	21.04.05.00211

## 14 Attachment

#### See also

LQEi\_DataDictionary.pdf [> 47]

#### IO-Link Data Dictionary

10.05.11.00014

IO-Link

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	Process data In			Bits		Access		Remark				
PD in	byte 0	Vacuum High-Byte		07		ro		System vacuum (mbar)				
Vacuum Low-Byte			27		ro		System vacuum [mbar]					
PD in byte 1		Switching Point 1 / Switching Point 3		0		ro		Vacuum is above SP1 & not yet below r function with ISDU 72)	P1, vacuum is between FH1 & FL1 in Window Mode respectively part detached SP3 (switch			
		Switch	ning Point 2	1			ro		Vacuum is above SP2 & not yet below r	P2 respectively vacuum is between FH2 & FL2 in Window Mode		
Process data Out Bits							Access		Remark			
		Apply a	atmosphere	0		wo		Apply atmosphere				
PD ou	t byte U	Appi	y vacuum ot used	1		wo		Apply vacuum not used				
ISDU Pa	arameters	;										
ISDU dec	Index hex	Subindex dec	Parar	meter	Siz	e	Value Range	Access	Default Value	Remark		
<b>+</b>	Identifica	fication										
	\$	Device Management										
16	0x0010	0	Vendor name		032 b	ytes	-	ro	J. Schmalz GmbH	Manufacturer designation		
17	0x0011	0	Vendor text		032 b	ytes	-	ro	Innovative Vacuum Solutions	Vendor text		
18	0x0012	0	Product name		032 b	ytes	-	ro	LQEi	Product name		
19	0x0013	0	Product ID		032 b	ytes		ro	LQEi	Product variant name		
20	0x0014	0	Product text		032 b	ytes	-	ro	LQEi 8 24V-DC 3/2 IMP	Order-code		
21	0x0015	0	Serial number		9 b	ytes	-	ro	00000001	Serial number		
22	0x0016	0	Hardware revision		2 b	ytes	-	ro	00	Hardware revision		
23	0x0017	0	Firmware revision		4 b	ytes		ro	1.00	Firmware revision		
240	0x00F0	0	Unique device iden	tification	20 b	ytes	-	ro	-	Unique ID		
250	0x00FA	0	Article number		14 b	ytes	-	ro	10.05.11.00014	Order-number		
252	0x00FC	0	Production date		3 b	ytes	•	ro	N22	Date code of production (month and year, month is letter coded		
	\$	Device Lo	calization									
24	0x0018	0	Application specific	tag	132 b	ytes	-	rw	***	User string to store location or tooling information		
25	0x0019	0	Function tag		132 b	ytes	-	rw	***	User string to store location or tooling information		
26	0x001A	0	Location tag		132 b	ytes	-	rw	***	User string to store location or tooling information		
242	0x00F2	0	Equipment identific	ation	164 b	ytes	-	rw	***	User string to store identification name from schematic		
246	0x00F6	0	Geolocation		164 b	ytes	-	rw	***	User string to store geolocation from handheld device		
248	0x00F8	0	NFC web link		164 b	vtes	http://	rw	https://mvproduct.schmalz.com/#/	Web link to NFC app (base URL for NFC tag)		
249	0x00F9	0	Storage location		132 b	, ytes	- https://	rw	***	User string to store storage location		
253	0x00FD	0	Installation date		116 b	ytes		rw	***	User string to store date of installation		
<b>+</b>	Paramet	er				-						
+	- diamon	Device Se	ttinas									
	Ψ		Commondo									
	1	Ψ	Commands					1	1	0v05 (dec 5): Force unload of parameter data into the master		
2	0x0002	0	System command		1 bị	yte	5, 129, 131, 165, 167, 168, 169	wo		0x81 (dec 12): Reset application 0x83 (dec 131): Back to box 0x85 (dec 131): Calibrate vacuum sensor 0x87 (dec 167): Reset reasable counters 0x84 (dec 168): Reset voltages min/max 0x88 (dec 169): Reset vacuum min/max		
Access Control												
90	0x005A	0	Extended device a	ccess locks	1 bị	yte	0-255	rw	0	Bit 0: NFC write lock Bit 1: NFC disable Bit 2: Not used Bit 3: Not used Bit 4: IO-Link event lock (suppress sending IO-Link events) Bit 5-7: Not used		
91	0x005B	0	Pin-Code NFC		2 b	ytes	0-999	rw	0	PIN for writing data from NFC app		
	<b>+</b>	Process Settings										
72	0x0048	0	Function of input P	D1.0	1 b	yte	0-1	rw	0	u = 581 1 = 593		
75	0x004B	0	Output filter		2 b	ytes	0-999	rw	10	Unit: 1ms		
107	0x006B	0	Permissable evacu	lation time	2 b	ytes	0-9999	rw	0	no evacuation time warning if set to 0		
		#	Switchpoint 1	pper threshold				1				
60	0x003C	1	SP1 / FH1		2 b	ytes	999 >= SP1 > rP1 SP1 > SP2	rw	750	Unit: 1mbar		
		2	Switch Point 1 - Lo rP1 / FL1	wer threshold	2 b	ytes	999 >= FH1 > FL1+Hy1 FH1 > FH2	rw	600	Unit: 1mbar		
		1	Switch Point 1 - Lo	gic	1 b	yte	0.1	rw	0	0 = NO 1 = NC		
61	0x003D	2	Switch Point 1 - Mo	ode	1 b	ytes	2.2		3	2 = Window Mode		
01	0x003D						2, 3 0 <= Hv1 < FH1-FL1	rw	140	3 = Two-Point Mode		
1		3	Switch Point 1 - Wi	indow hysteresis	2 b	ytes	S - Hyr StillerEl	rw		Unit: 1mbar		

LQEi 03.08.202

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Switchpoint 2										
		1	Switch Point 2- Upper threshold SP2 / FH2	2	bytes	999 >= SP2 > rP2	rw	550	Unit: 1mbar	
62	0x003E	2	Switch Point 2 - I ower threshold	2	hvtes	SP2 < SP1 999 >= FH2 > FL2+Hy2	nw	530	Linit: 1mbar	
			rP2 / FL2	-	bytea	FH2 < FH1	IW	330		
			Switch Point 2 - Logic	1	byte	0-1	rw	0	0 = NO 1 = NC	
62	0×002E	2	Switch Point 2 - Mode	1	bytes	2, 3	rw	3	2 = Window Modo	
03	0x003F								3 = Two-Point Mode	
		2	Switch Point 2 - Window hysteresis	2	bytes	0 <= Hy2 < FH2-FL2	rw	10	Unit: 1mbar	
<b>+</b>	Observation									
	+ Monitoring									
		1	System vacuum live	2	bytes		ro		Unit: 1mbar	
64	0x0040	2	System vacuum min	2	bytes	-	ro	-	Unit: 1mbar	
		3	System vacuum max	2	bytes		ro		Unit: 1mbar	
		1	Primary supply voltage live	2	bytes		ro		Unit: 0.1V	
66	0x0042	2	Primary supply voltage min	2	bytes	-	ro	-	Unit: 0.1V	
		3	Primary supply voltage max	2	bytes		ro		Unit: 0.1V	
564	0x0234	0	Communication mode	1	byte	-	ro	-	0x00 = SIO mode 0x11 = IO-Link	
ф	Diagnos	is								
	ф.	Device St	atus							
	4	Device eta		1			1		0 = Device is operating properly (= Green)	
36	0×0024	0	Device status	1	bute		10	0	1 = Maintenance required (= Yellow) 2 = Out of Spac. (= Crappe)	
30	0X0024	0	Device status		Dyte	-	10	0	3 = unused	
37	0x0025	0	Detailed device status	32 x	3 bytes	-	ro	0	4 = Failure (= Red) Information about currently pending events (Event-List	
									Bit 0 = IO-Link startup check: data corruption Bit 1 = Switch cycles too fast	
									Bit 2 = Primary voltage too low	
									Bit 4 = reserved	
									Bit 5 = reserved Bit 6 = reserved	
130	0x0082	0	Active errors	2	bytes	-	ro	0	Bit 7 = reserved	
									Bit 9 = reserved	
									Bit 10 = reserved Bit 11 = Measurement range overrun	
									Bit 12 = reserved	
									Bit 15 = reserved Bit 14 = reserved	
	Bit 15 = IO-Link communication interruption									
	+			1			1		Bit 0 reserved	
									Bit 1 = Evacuation time above limit [t-1] Bit 2 reserved	
146	0x0092	0	Condition monitoring	2	bytes	-	ro	0	Bit 3 = SP1 not reached	
									Bit 5 = Primary Voltage US out of operating range	
		Counters							Bit 6 15 reserved	
140		- 0	Apply atmosphere counter	4	butes		r0	0	Apply strasphere (pop-erscable)	
141	0x008D	0	Switch-on counter for switch point 2	4	bytes		ro	0	Counter for switch-on switch point 2 (non-erasable)	
142	0x008E	0	Switch-on counter for switch point 1	4	bytes		ro	0	Switch-on counter for switch point 1 (non-erasable)	
143	0x008F	0	Apply atmosphere counter	4	bytes	-	ro	0	Apply atmosphere (erasable)	
144	0x0090	0	Counter for switch-on switch point 2	4	, bytes	-	ro	0	Counter for switch-on switch point 2 (erasable)	
145	0x0091	0	Switch-on counter for switch point 1	4	, bytes	-	ro	0	Switch-on counter for switch point 1 (erasable)	
	⊕	Timing	· · · · ·	·			1	I		
148	0x0094	0	Evacuation time t0 of last suction-	2	bytes	-	го	0	Unit: 1ms	
140	0x0005	0	cycle Evacuation time t1 of last suction-	-	,.00				I ime from suction start to reaching SP2 Unit: 1ms	
149	0x0095	U	cycle	2	bytes	-	ro	U	Time from reaching SP2 to reaching SP1 Unit: 1ms	
171	0x00AB	0	Drop-off time t3 of last Drop-off	2	bytes	-	ro	0	Time from apply vacuum on to vacuum < 20 mbar	

-							
Coding of	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	
20736	0x5100	0x42	Critical condition	Error	General power supply fault	Primary supply voltage (US) too low	
6152	0x1808	0x22	Warning	Warning	CM: Evacuation time above limit	Condition monitoring: evacuation time t1 is above limit [t-1]	
20752	0x5110	0x42	Critical condition	Warning	Primary supply voltage over-run	Primary supply voltage (US) too high	
6154	0x180A	0x22	Warning	Warning	CM: SP1 not reached	Condition monitoring: vacuum level SP1 was never reached during suction cycle	
6156	0x180C	0x22	Warning	Warning	CM: Primary supply voltage out of optimal range	Condition Monitoring: primary supply voltage US outside of operating range	
6161	0x1811	0x82	Defect/fault	Error	Data corruption	Internal error, user data corrupted	
36096	0x8D00	0x82	Critical condition	(no IOL event)	Short circuit at OUT2	Output is connect with counterpotential	
36097	0x8D01	0x42	Critical condition	Error	Switch cycles too fast	Switch cycles too fast	
35872	0x8C20	0x82	Defect/fault	Error	Measurement range overrun	Measured vacuum value too high, sensor fault	

## 14.2 EU Declaration of Conformity

The manufacturer Schmalz confirms that the product Compact valve LQEc / LQEi described in these operating instructions fulfills the following applicable EU directives:

2014/30/EU	Electromagnetic Compatibility
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



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.



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