

Compact Vision Systems SBOC-Q/SBOI-Q



Compact Vision Systems SBOC-Q/SBOI-Q

Key features

Mode of operation

The camera not only contains the sensor system for image data acquisition, but also the complete electronic evaluation unit for image processing, an integrated PLC and the interfaces for communication with higher-level controllers. The CheckKon and CheckOpti software tools make configuring the image processing task very straightforward. The user creates reference images with

the camera by presenting different sample parts and then defines the desired inspection criteria. These can include, for example, brightness, distance, angle and circularity, but also the reading of text and/or 1D or 2D codes. The sample parts define the tolerance range, within which parts are identified as good, for each inspection characteristic. Up to 256 characteristics can be combined

in a single program and up to 256 inspection programs can be stored on the camera. The camera can also be used to carry out sorting functions, as it is capable of storing and distinguishing between up to 16 different part types per inspection program. The characteristics calculated by the camera are not dependent on the rotary orientation and position of the

inspection part, as they are determined relative to the position of the inspection part – any tilting and/or movement of the inspection part in the field of vision is therefore irrelevant for the inspection process. The behaviour of the camera during inspection is determined by the evaluation mode. There are four different modes.

Evaluation modes

Mode	Function		Application
Triggered	Frame capture and inspection with each valid triggering signal. The triggering signal is generated by a master controller or a sensor as soon as the inspection part is in front of the	camera. The inspection results are output following the inspection, and the camera then waits for the next valid triggering signal.	Inspection of single parts when there is a triggering signal for image capture.
Idle run with image trigger with Compact Vision System SBO...-Q-R...B	Image capture is performed continuously, but image evaluation only if there is an inspection part in front of the camera, i.e. if the trigger condition has been satisfied in a freely defined image area (e.g. a specific	brightness is exceeded/fallen below). The inspection results are output following the inspection. The camera then waits for the next image-based trigger.	Inspection of single parts at a medium to fast rate without an external sensor.
Idle run without image trigger	Image capture and inspection (without fixed frame rate) are performed continuously. The triggering signal is permanently present, irrespective of whether or not there is an inspection part in front of the camera. The	camera acts like a basic sensor. The inspection results are output following the inspection, and the camera then starts the next inspection immediately.	Inspection of single or continuous parts at a medium to fast (continuous) rate.
Fixed frame rate with Compact Vision Systems SBO...-Q-R1 and SBO...-Q-R2	Image capture and inspection are performed continuously at a defined frame rate. The triggering signal is permanently present. The inspection	results are output following the inspection. The camera starts the next inspection in accordance with the defined frame rate.	Inspection of continuous parts at a constant speed.

Programming

Integrated PLC



The integrated PLC can be programmed in all programming languages covered by IEC 61131-3 (e.g. LDR, ST, sequential function chart, etc.) using the software tool CoDeSys provided by Festo. The predefined function blocks enable

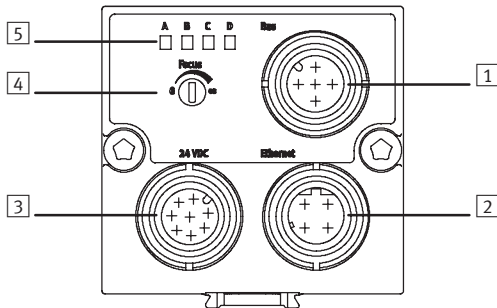
straightforward data exchange between the image processing task and the integrated PLC. This provides an easy means of implementing extensive inspection tasks or even communication between different cameras.

Compact Vision Systems SBOC-Q/SBOI-Q

Key features

Interfaces

Connection and display components



1 Fieldbus connection for Compact Vision Systems SBO...-Q-R1 and SBO...-Q-R2

2 Ethernet connection

3 Operating voltage supply and inputs/outputs

4 Adjusting screw for focus

5 Status LEDs:

- A Ready status
- B Ethernet traffic
- C Activity
- D Output

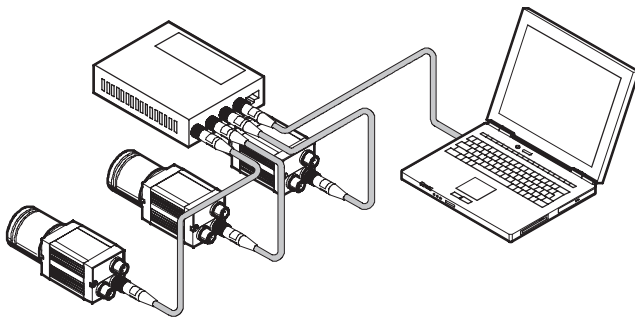
Inputs:

- Camera trigger
- Error acknowledgment

Outputs (can be parameterised):

- Ready status
- Good part correctly oriented
- Good part incorrectly oriented
- Reject part
- Error
- Warning
- External lighting

Ethernet – TCP/IP

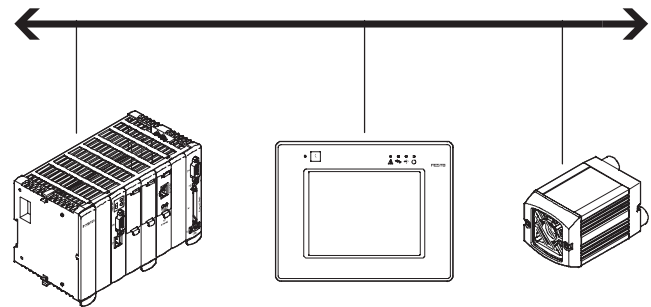


Commissioning and diagnostics:

- PC for configuration and for diagnostics with TCP/IP
- Integration of the camera in a corporate network (integrated web server)

– Visualisation of the camera images and inspection results via SBO...-Q WebViewer

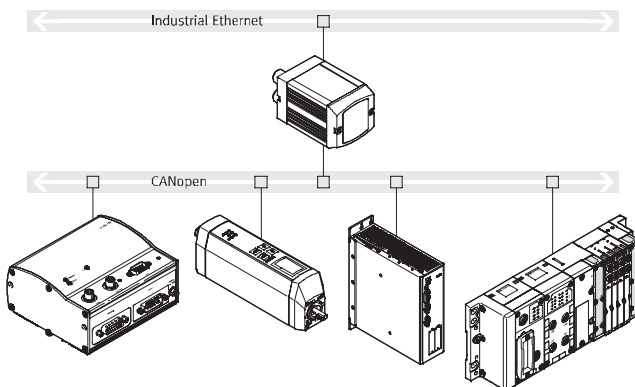
Ethernet – TCP/IP, EasyIP, Telnet, Modbus TCP



All parameters can be modified and all inspection results and characteristic values can be read via the Ethernet interface with EasyIP, Telnet and Modbus TCP.

- Front End Display FED, e.g. for teach-in, status signals, type selection or parameter modification
- Robot controllers and programmable logic controllers, e.g. CECX for reading characteristic values (e.g. coordinates and rotation angle)

CANopen master functionality



Servo controllers and remote I/O can be addressed directly via the CANopen master functionality.

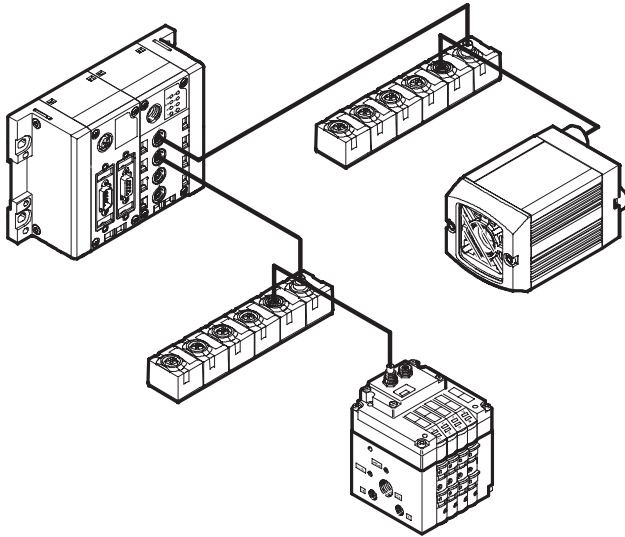
Compact Vision Systems SBOC-Q/SBOI-Q

Key features

Interfaces (continued)

CAN – Vision system as CPI module

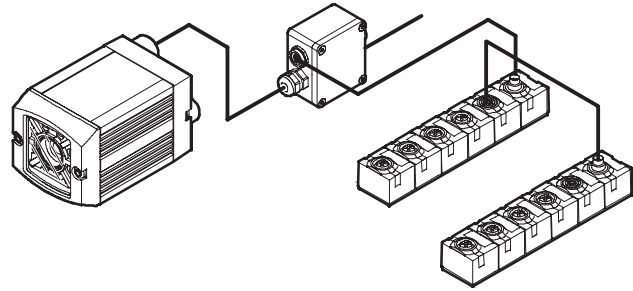
For Compact Vision Systems SBO...-Q-R1 and SBO...-Q-R2



- The Compact Vision System SBO...-Q can be integrated into a Festo CPI network. In this case it functions like a binary module with 16 inputs and outputs.
- In combination with a CPX-CPI module and a CPX fieldbus node, for example, the camera can be accessed via Profibus DP, Interbus, DeviceNet, CANopen and CC-Link.

CAN – I/O expansion

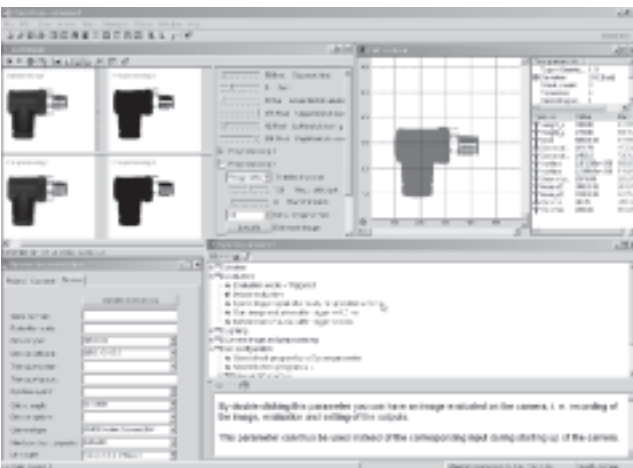
For Compact Vision Systems SBO...-Q-R1 and SBO...-Q-R2



- An input and output module can be connected to the camera via the camera's CAN interface.
- Input module CP-E08-M12-CL for binary preselection of the inspection program
- Output module CP-A04-M12-CL for binary signalling of part types

Software

CheckKon



Using the CheckKon software, all processes within the camera – from image capture to the input and output parameters – can be displayed, logged and modified.

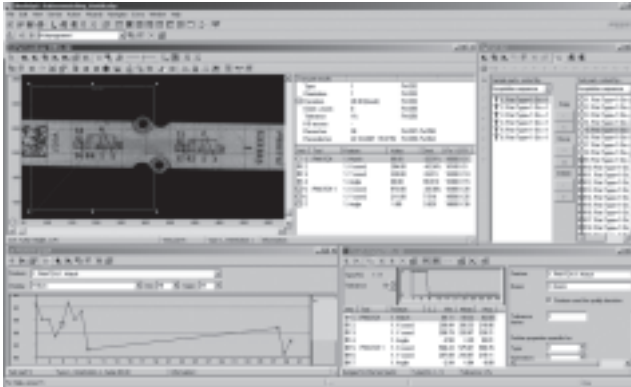
This includes:

- Selecting the evaluation mode
- Displaying and editing system parameters
- Displaying analysis of most recently inspected parts
- Displaying and logging inspection part images and the characteristics derived from them
- Loading new inspection programs
- System documentation

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Key features

CheckOpti



CheckOpti is used to configure inspection programs. Following the presentation of sample parts, the user defines the characteristics to be inspected with the aid of the software. This is done by selecting the characteristics from a list and then dragging and dropping them to the area of the sample part to be inspected. A total of 256 performance characteristics can thus be defined and optimised within the framework of an inspection program. The inspection program can then be uploaded to one of the camera's 256 memory locations.

Examples of inspection characteristics:

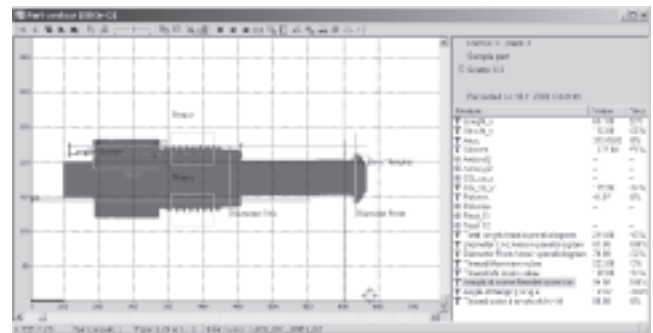
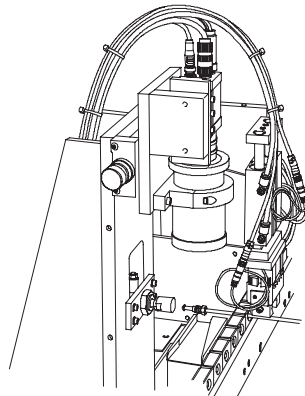
- Vertical length measurement
- Horizontal length measurement
- Angle measurement
- Counting of events
- Measurements on the inspection part contour
- Area definition
- Calculation of grey tone or colour differences

Application examples

Quality inspection of tube with union nut

The inspection takes place with backlighting; calculated characteristics:

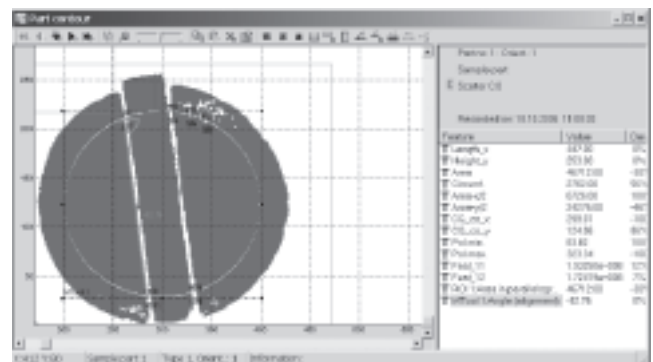
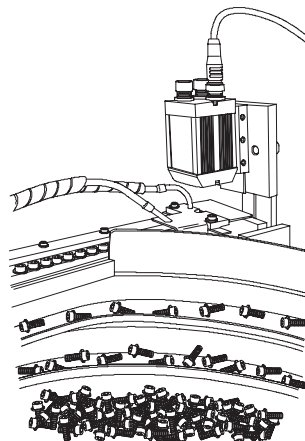
- Length of nut
- Threaded coupling distances
- Diameter of tube
- Thread outside diameter
- Angle measurement on the flange
- Circumference of the screw
- Area of the screw



Screw type differentiation

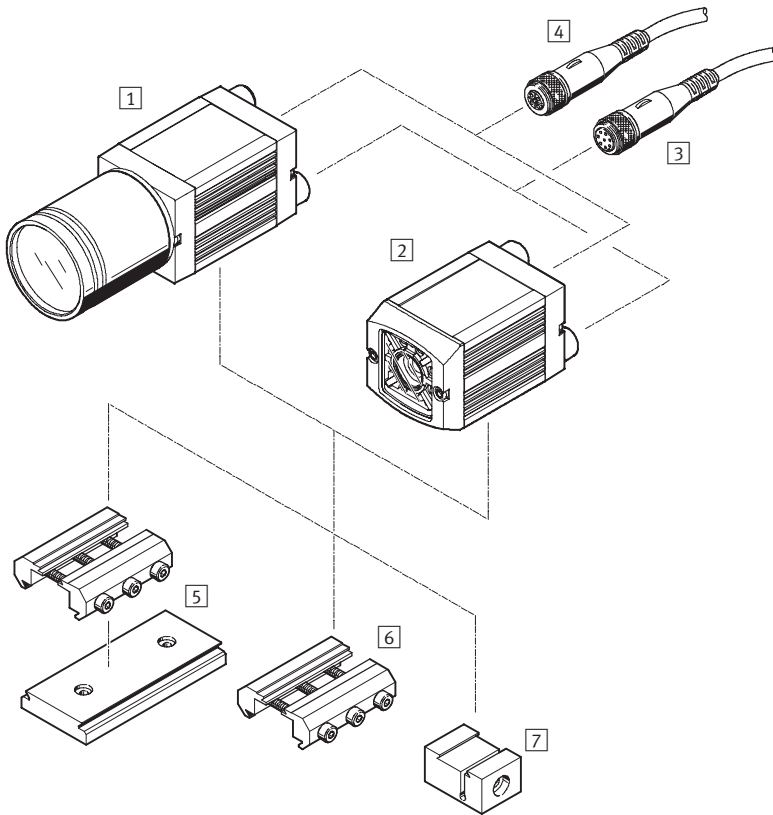
The inspection takes place with reflected light; calculated characteristics:

- Centre of gravity coordinates x, y
- Average grey tone of area
- Angle of screw drive to horizontal



Compact Vision Systems SBOC-Q/SBOI-Q

Peripherals overview



Accessories	Brief description	→ Page/Internet	
Compact Vision System			
1	SBOC-Q-...	8	
2	SBOI-Q-...		For standard lenses with C mount or CS mount ¹⁾ connection
With integrated lens and light			
Plug socket with cable			
3	SIM-M12-8GD-...-PU	14	
For supplying the operating voltage			
Cable			
4	SBOA-K30E-M12S	14	
-	SBOA-K20CP-WS		Ethernet diagnostic cable
-	SBOA-K20CP-SUP		For integration in a CPI system
-	SBOA-K20CP-SUP	For I/O expansion	
Lens			
-	SBOL-12	14	
-	SBOL-25		Focal length 12 mm
-	SBOL-25	Focal length 25 mm	
Mounting attachments			
5	Adapter kit SBOA-HMSV-39	13	
6	Adapter kit SBOA-HMSV-40		With screw-on adapter plate
7	Adapter kit SBOA-HMSV-41		Without screw-on adapter plate
-	Adapter SBOL-C-5	With female thread G1/4 for mounting on commercially available tripods	
-	Adapter SBOL-C-5	5 mm spacer ring (CS mount to C mount)	13

1) CS mount without protective tube.

Compact Vision Systems SBOC-Q/SBOI-Q

Type codes

FESTO

		SBO	C	-	Q	-	R3	B	-		-	S1
Function												
SBO	Compact Vision System											
Design												
C	For standard lenses with C mount or CS mount ¹⁾ connection											
I	Integrated lens											
Equipment												
Q	Field-based camera for quality inspection											
Sensor resolution												
R1	640 x 480 pixels, VGA resolution											
R3	752 x 480 pixels, Wide VGA resolution											
R2	1,280 x 1,024 pixels, SXGA resolution											
Sensor type												
B	Monochrome											
C	Colour											
Fieldbus interface												
	CAN interface											
WB	Without fieldbus interface											
Application												
S1	Tools add-in											

1) CS mount without protective tube.

Compact Vision Systems SBOC-Q/SBOI-Q

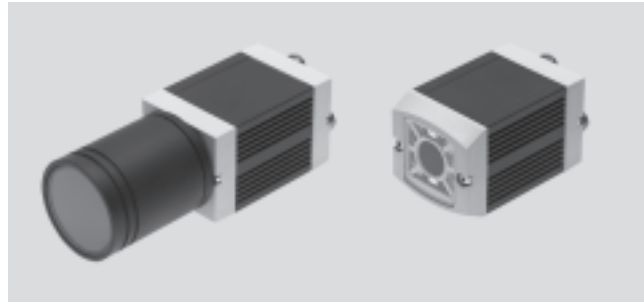
Technical data

Voltage

24 V DC

Temperature range

-10 ... +50 °C



General technical data					
Type	SBOC-Q-R1	SBOI-Q-R1	SBOC-Q-R3	SBOI-Q-R3	SBOC-Q-R2
Sensor resolution [pixels]	640 x 480		752 x 480		1,280 x 1,024
Exposure time [ms]	0.039 ... 1,000		0.018 ... 200		0.008 ... 1,000
Frame rate (full image) [fps]	150		60		27
Sensor type	Monochrome		Monochrome		Monochrome
	Colour		Colour		Colour
Lens mounting	C mount	Integrated lens	C mount	Integrated lens	C mount
	CS mount ¹⁾		CS mount ¹⁾		CS mount ¹⁾
Operating distance [mm]	Dependent on the lens selected	22 ... 1,000	Dependent on the lens selected	20 ... 550	Dependent on the lens selected
Field of vision [mm]	Dependent on the lens selected	14x10 ... 520x390	Dependent on the lens selected	7.9x5.5 ... 195x125	Dependent on the lens selected
Max. no. of inspection programs	256		256		256
Max. no. of orientations	8 per part type		8 per part type		8 per part type
Sorting function	Up to 16 types per inspection program		-		Up to 16 types per inspection program

1) Without protective tube.

Electrical data		
Type	SBOC-Q	SBOI-Q
Nominal operating voltage [V DC]	24	
Permissible voltage fluctuations [%]	±10	
Current consumption with load-free outputs [mA]	120	
Max. residual current [A]	1.5 at the 24 V outputs	
Input 1	Trigger signal	
	Used by CoDeSys	
Input 2	Applying inputs	
	Acknowledging errors	
	Used by CoDeSys	
Outputs	Good part	
	Reject part	
	Warning	
	Error	
	External lighting	
	Used by CoDeSys	
Protection class	IP65, IP67 ¹⁾	IP65, IP67

1) Only in combination with protective tube (included in the scope of delivery).

Compact Vision Systems SBOC-Q/SBOI-Q

Technical data

Electrical data			
Type	SBO...-Q-R1	SBO...-Q-R3	SBO...-Q-R2
Sensor resolution [pixels]	640 x 480	752 x 480	1,280 x 1,024
Ethernet interface			
Bus interface	IEEE802.3U (100BaseT)		
Connection technology	Plug M12		
Data transmission speed [Mbps]	100		
Supported protocols	TCP/IP		
	EasyIP		
	Telnet		
	ModbusTCP		
Fieldbus interface			
Type	CAN	-	CAN
Connector plug	Plug M12		Plug M12
Supported protocols	CP fieldbus		CP fieldbus

Operating and environmental conditions	
Ambient temperature [°C]	-10 ... +50
Storage temperature [°C]	-10 ... +60
Ambient conditions	Screened from extreme external light sources
	Cleanest possible ambient air
CE mark (see declaration of conformity) ¹⁾	In accordance with EU EMC Directive
Certification	c UL us Recognized (OL)
	C-Tick

- 1) For information about the applicability of the component see the manufacturer's EC declaration of conformity at: www.festo.com → Support → User documentation.
If the component is subject to restrictions on usage in residential, office or commercial environments or small businesses, further measures to reduce the emitted interference may be necessary.

Materials	
Housing	Anodised aluminium
Cap	ABS, fibre glass reinforced
Note on materials	Free of copper and PTFE
	RoHS-compliant

Weight [g]					
Lens mounting	C mount/CS mount ¹⁾			Integrated lens	
Type	SBOC-Q-R1	SBOC-Q-R3	SBOC-Q-R2	SBOI-Q-R1	SBOI-Q-R3
Compact Vision System	182	172	182	184	174

- 1) CS mount without protective tube.

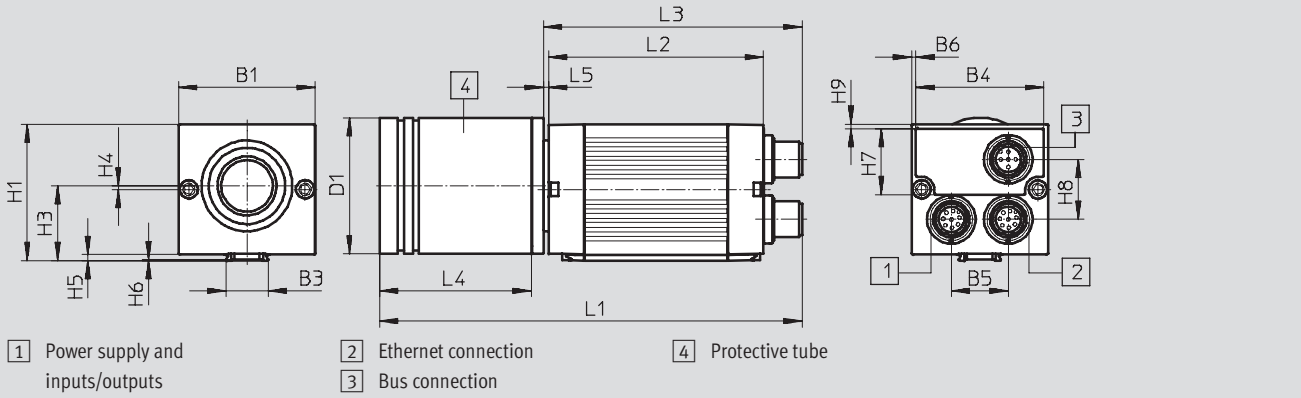
Compact Vision Systems SBOC-Q/SBOI-Q

Technical data

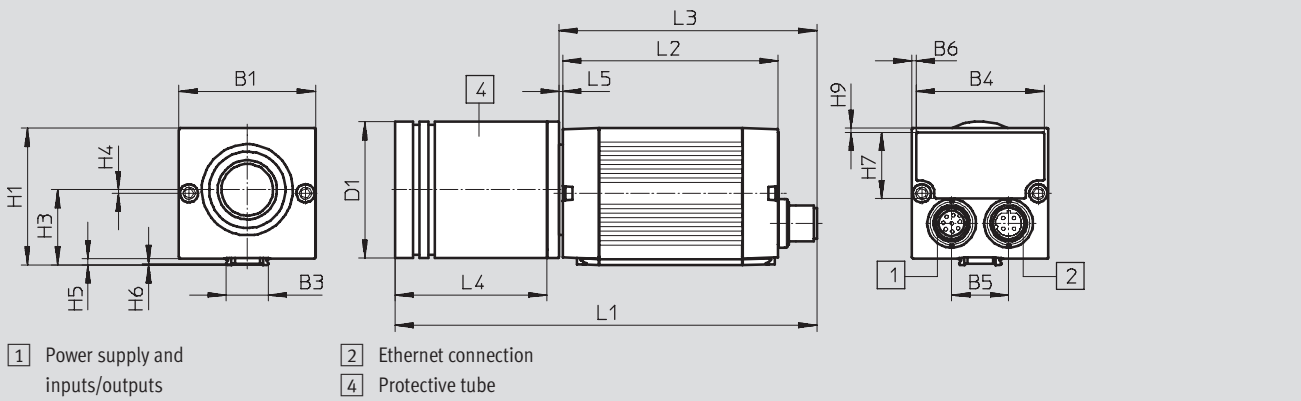
Dimensions

Download CAD Data → www.festo.com/us/cad

C mount/CS mount¹⁾ SBOC-Q-R1/-R2



C mount/CS mount¹⁾ SBOC-Q-R3



1) CS mount without protective tube.

Type	B1	B3	B4	B5	B6	D1 ∅	H1	H3	H4	H5	H6	H7	H8	H9	L1	L2	L3	L4	L5
SBOC-Q-R1/-R2	45	13.91	42.2	18.8	1.4	45	45	24.65	1.15	2	0.3	21.8	19.8	1.4	139.4	71	85.4	50	1.7
SBOC-Q-R3													-		139		85		1.3

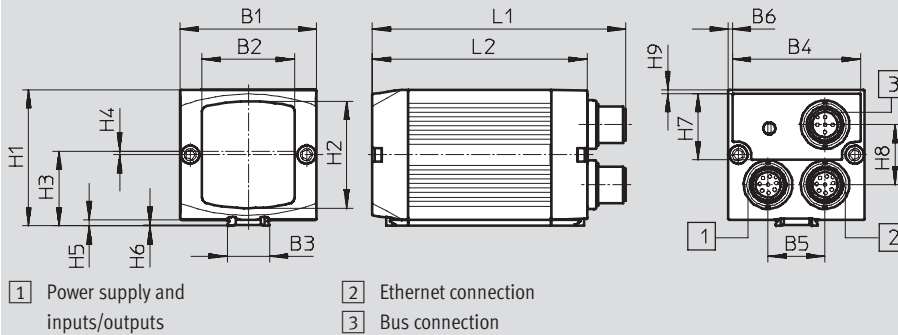
Compact Vision Systems SB0C-Q/SB0I-Q

Technical data

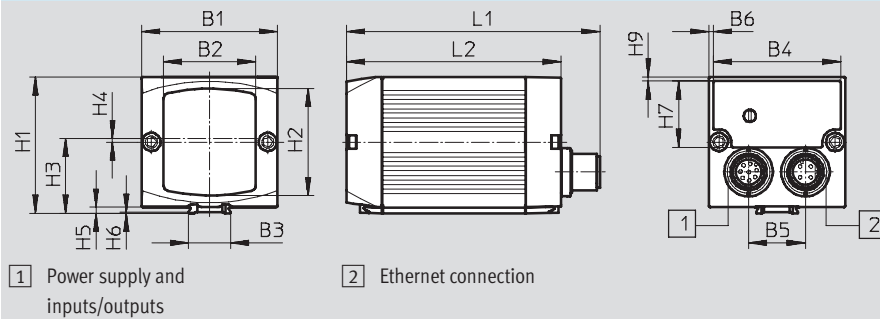
Dimensions

Download CAD Data → www.festo.com/us/cad

Integrated lens SB0I-Q-R1












Integrated lens SB0I-Q-R3



Type	B1	B2	B3	B4	B5	B6	H1	H2	H3	H4	H5	H6	H7	H8	H9	L1	L2
SB0I-Q-R1	45	30.2	13.91	42.2	18.8	1.4	45	35	24.65	1.15	2	0.3	21.8	19.8	1.4	83.7	71
SB0I-Q-R3														-			

Compact Vision Systems SBOC-Q/SBOI-Q

Technical data

Ordering data			
	Sensor type	Part No.	Type
640 x 480 pixels, VGA resolution			
For standard lenses with C mount or CS mount ¹⁾ connection	Monochrome	541399	SBOC-Q-R1B
		569771	SBOC-Q-R1B-S1 
	Colour	548317	SBOC-Q-R1C
		569774	SBOC-Q-R1C-S1 
Integrated lens	Monochrome	541396	SBOI-Q-R1B
		569773	SBOI-Q-R1B-S1 
	Colour	548316	SBOI-Q-R1C
		569776	SBOI-Q-R1C-S1 
752 x 480 pixels, Wide VGA resolution			
For standard lenses with C mount or CS mount ¹⁾ connection	Monochrome	555841	SBOC-Q-R3B-WB
		569777	SBOC-Q-R3B-WB-S1 
	Colour	555842	SBOC-Q-R3C-WB
		569778	SBOC-Q-R3C-WB-S1 
Integrated lens	Monochrome	555839	SBOI-Q-R3B-WB
		569779	SBOI-Q-R3B-WB-S1 
	Colour	555840	SBOI-Q-R3C-WB
		569780	SBOI-Q-R3C-WB-S1 
1,280 x 1,024 pixels, SXGA resolution			
For standard lenses with C mount or CS mount ¹⁾ connection	Monochrome	551021	SBOC-Q-R2B
		569772	SBOC-Q-R2B-S1 
For standard lenses with C mount or CS mount ¹⁾ connection	Colour	551022	SBOC-Q-R2C

1) CS mount without protective tube.

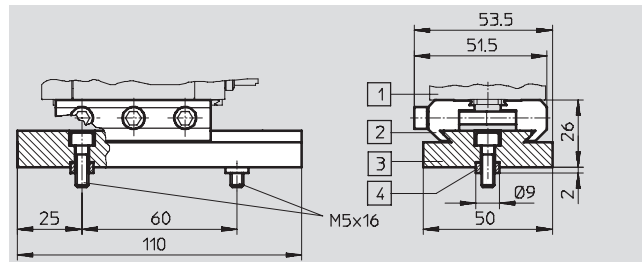
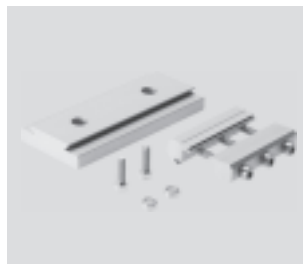
Compact Vision Systems SBOC-Q/SBOI-Q

Accessories

FESTO

**Adapter kit
SBOA-HMSV-39**
with screw-on adapter plate

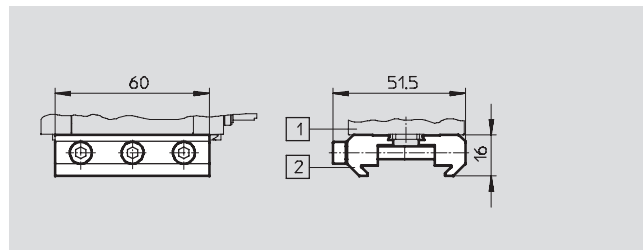
Material:
Anodised wrought aluminium alloy



Ordering data		
	Part No.	Type
Adapter kit	541599	SBOA-HMSV-39

**Adapter kit
SBOA-HMSV-40**
without screw-on adapter plate

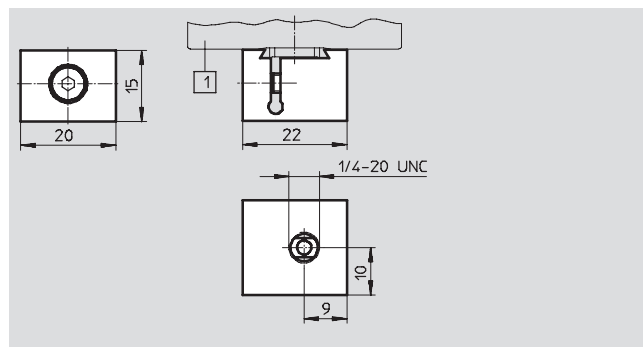
Material:
Anodised wrought aluminium alloy



Ordering data		
	Part No.	Type
Adapter kit	541600	SBOA-HMSV-40

**Adapter kit
SBOA-HMSV-41**
with female thread G $\frac{1}{4}$ for mounting
on commercially available tripods

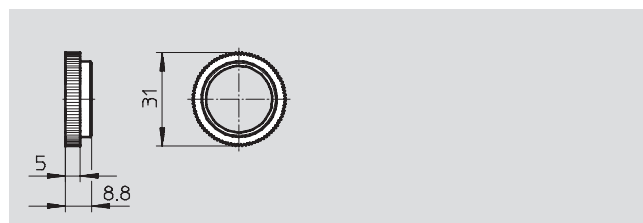
Material:
Anodised wrought aluminium alloy



Ordering data		
	Part No.	Type
Adapter kit	542140	SBOA-HMSV-41

Adapter SBOL-C-5
5 mm spacer ring
(CS mount to C mount)

Material:
Anodised wrought aluminium alloy







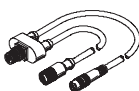
Ordering data		
	Part No.	Type
Adapter	541601	SBOL-C-5



Compact Vision Systems SBOC-Q/SBOI-Q


Accessories

FESTO

Ordering data – Lenses				
	Description	Focal length [mm]	Part No.	Type
	C mount with fixed focal length	12	549132	SBOL-12
		25	549133	SBOL-25

Ordering data				
	Use	Connection	Cable length [m]	Part No. Type
Plug socket with cable				Technical data → Internet: sim-m12
	For supplying the operating voltage	Straight socket, M12x1, 8-pin Open end, 8-pin	2	525616 SIM-M12-8GD-2-PU
			5	525618 SIM-M12-8GD-5-PU
Cable				Technical data → Internet: sboa
	Ethernet diagnostic cable	Straight socket, M12x1, 4-pin, D-coded RJ45 plug	3	542139 SBOA-K30E-M12S
	For integration in a CPI system	Straight socket, M12x1, 5-pin Angled plug, M9x0.5, 5-pin	2	548823 SBOA-K20CP-WS
	For I/O expansion	Straight socket, M12x1, 5-pin Straight socket, M9x0.5, 5-pin Straight plug, M12x1, 4-pin	2	548824 SBOA-K20CP-SUP

Ordering data – Documentation				
	Description	Language	Part No.	Type
	Manual User manual in paper form is not included in the scope of delivery for the Compact Vision System.	German	548318	P.BE-SBO-Q-DE
		English	548319	P.BE-SBO-Q-EN
	Documentation package User manual on CD-ROM is included in the scope of delivery for the Compact Vision System.	German, English	549036	P.BE-SBO-Q-UDOK

Ordering data – Software				
	Brief description	Language	Part No.	Type
	CheckKon software	German, English	194496	P.SW-KON
	CheckOpti software		568339	P.SW-OPTI
	SBO...-Q Tools add-in software licence for unlocking tools on the Compact Vision System		570045	GSLO

Product Range and Company Overview

A Complete Suite of Automation Services

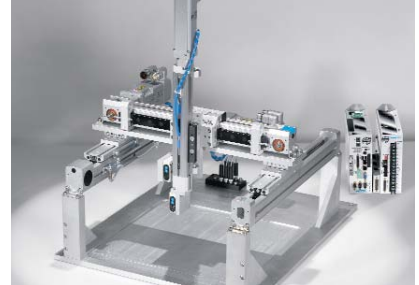
Our experienced engineers provide complete support at every stage of your development process, including: conceptualization, analysis, engineering, design, assembly, documentation, validation, and production.



Custom Automation Components
Complete custom engineered solutions



Custom Control Cabinets
Comprehensive engineering support and on-site services



Complete Systems
Shipment, stocking and storage services

The Broadest Range of Automation Components

With a comprehensive line of more than 30,000 automation components, Festo is capable of solving the most complex automation requirements.



Electromechanical
Electromechanical actuators, motors, controllers & drives



Pneumatics
Pneumatic linear and rotary actuators, valves, and air supply



PLCs and I/O Devices
PLC's, operator interfaces, sensors and I/O devices

Supporting Advanced Automation... As No One Else Can!

Festo is a leading global manufacturer of pneumatic and electromechanical systems, components and controls for industrial automation, with more than 12,000 employees in 56 national headquarters serving more than 180 countries. For more than 80 years, Festo has continuously elevated the state of manufacturing with innovations and optimized motion control solutions that deliver higher performing, more profitable automated manufacturing and processing equipment. Our dedication to the advancement of automation extends beyond technology to the education and development of current and future automation and robotics designers with simulation tools, teaching programs, and on-site services.

Quality Assurance, ISO 9001 and ISO 14001 Certifications

Festo Corporation is committed to supply all Festo products and services that will meet or exceed our customers' requirements in product quality, delivery, customer service and satisfaction.

To meet this commitment, we strive to ensure a consistent, integrated, and systematic approach to management that will meet or exceed the requirements of the ISO 9001 standard for Quality Management and the ISO 14001 standard for Environmental Management.



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