Compact Vision System
Contents and general instructions

Original ................................. de
Version ................................. en 1201NH
Designation ............................. GDCS-SBOC-EN
Order no. ................................. 8001260

© (Festo AG & Co. KG, D-73726 Esslingen, 2012)
Internet: http://www.festo.com
E-Mail: service_international@festo.com

Reproduction, distribution or sale of this document or communication of its contents to others without express authorization is prohibited. Offenders will be liable for damages. All rights reserved in the event that a patent, utility model or design patent is registered.
Contents and general instructions

Trademarks

Harax ® is a registered trade mark of HARTING Electronics GmbH & Co. KG

Harting RJ Industrial ® is a registered trade mark of HARTING Electronics GmbH & Co. KG
### Contents and general instructions

<table>
<thead>
<tr>
<th>Intended use</th>
<th>Range of application and certifications</th>
<th>Safety instructions</th>
<th>Service</th>
<th>Target group</th>
<th>Important user instructions</th>
<th>Instructions on this description</th>
<th>Product-specific terms and abbreviations</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>VI</td>
<td>VII</td>
<td>VIII</td>
<td>VIII</td>
<td>IX</td>
<td>XI</td>
<td>XII</td>
</tr>
</tbody>
</table>

1. **System overview** .................................................. 1-1  
   1.1 Structure of the Compact Vision System type SBOC-M-R1B-H  .......... 1-3  
   1.2 Characteristics .................................................. 1-5  
   1.2.1 Mode of operation ............................................ 1-6  
   1.2.2 Display and connecting elements .................................. 1-7  
   1.3 FCT software (functional overview) .................................. 1-9  
   1.4 Lens selection ...................................................... 1-10  

2. **Mounting** ............................................................ 2-1  
   2.1 Mounting ............................................................. 2-3  
   2.1.1 Dimensions of the Compact Vision System SBOC-M-R1B-H ............. 2-4  
   2.1.2 Mounting the Compact Vision System ............................. 2-4  
   2.1.3 Attachment with adapter kit type SBOA-HMSV-39 ................... 2-5  
   2.1.4 Mounting/dismantling of lens and protective tubing .............. 2-6  

3. **Installation** .......................................................... 3-1  
   3.1 General installation instructions ................................... 3-3  
   3.1.1 Selection of the power supply unit ................................ 3-5  
   3.2 Electrical connections .............................................. 3-6  
   3.2.1 Connection of the operating voltage supply and the I/Os ........... 3-6  
   3.2.2 Connecting the Ethernet interface .................................. 3-10  

4. **Commissioning** ....................................................... 4-1  
   4.1 Notes on commissioning .............................................. 4-3  
   4.1.1 Installing and starting the FCT .................................. 4-3
Contents and general instructions

4.1.2 Steps for commissioning .......................................................... 4-4
4.2 Addressing in the Ethernet (basic principles) ............................... 4-6
4.3 Instructions for use of a firewall .................................................. 4-9
4.4 Making network settings with the Compact Vision System ............... 4-10
4.5 Instructions on operation ............................................................ 4-13
  4.5.1 Setting the optics ............................................................... 4-14
  4.5.2 Trigger signal ................................................................. 4-16

5. Diagnostics and error handling ..................................................... 5-1
  5.1 General diagnostics options ..................................................... 5-3
    5.1.1 Status display .............................................................. 5-3
    5.1.2 Error elimination .......................................................... 5-6

A. Technical appendix ................................................................. A-1
  A.1 Cleaning and maintenance ...................................................... A-3
  A.2 Accessories (at press time) .................................................... A-4
  A.3 Siemens star .................................................................... A-5
  A.4 Technical data ................................................................. A-6

B. Index .......................................................... B-1
  B.1 Index ................................................................. B-3
Contents and general instructions

**Intended use**

The Compact Vision System SBOC-M-R1B-H has been designed for installation in a machine or an automated system. It serves to visualize and diagnose fast motion sequences.

The device is intended for use in an industrial environment. Measures may need to be implemented in residential areas for interference suppression.

The Compact Vision System SBOC-M-R1B-H may only be used as follows:

- only in an industrial environment
- as intended
- in original status without unauthorised modifications. Only the conversions or modifications described in the documentation supplied with the product are permitted.
- in excellent technical condition.

If conventional accessory components such as sensors and actuators are connected, the specified limits for pressures, temperatures, electrical data, torques, etc. must not be exceeded.

Take into consideration the regulations applicable for the destination, as well as:

- regulations and standards
- regulations of the testing organizations and insurers
- national regulations.
Range of application and certifications

The product fulfils the requirements of EU directives and is marked with the CE marking.

Standards and test values, which the product complies with and fulfils, can be found in the Technical data section. The product-relevant EU directive can be found in the declaration of conformity.
Contents and general instructions

Safety instructions

**Caution**
During commissioning and programming, the safety regulations listed in this manual and in the documentation for the controller and the other components used must always be observed.
The user must ensure that nobody has access to the sphere of influence of the connected actuators. Access to the possible danger zone must be prevented by suitable measures, such as protective screens and warning signs.

**Caution**
Electrostatically sensitive devices! Electrostatic discharges can damage the internal electronics.
- Do not open the housing. Observe the handling specifications for electrostatically sensitive devices.

**Caution**
If the permissible temperature range is exceeded, e.g. due to powerful external sources of light, this can lead to system errors and cause damage.
- Mount the Compact Vision System in a well ventilated location, especially screened from the heat emitted by other devices and from sources of light.
Contents and general instructions

Note
A dirty and scratched lens or a dirty and scratched protective disc can lead to optical errors. Make sure that the lens and the protective disc are not scratched. Do not use any abrasive cleaning agents.

Clean the lens and protective disc if they are dirty or there are deposits on them:
– with an air gun or with clean non-lubricated compressed air
– with a soft moist cloth and non-abrasive cleaning agents.

Service

Please consult your local Festo repair service if you have any technical problems.

Target group

This description is intended exclusively for technicians trained in control and automation technology who have experience in installing and commissioning electronic systems.
Important user instructions

Danger categories

This description includes instructions on the possible dangers which can occur if the product is used incorrectly. These instructions are marked with a signal word (Warning, Caution, etc.), printed on a shaded background and marked additionally with a pictogram. A distinction is made between the following danger warnings:

**Warning**
... means that failure to observe this instruction may result in serious personal injury or material damage.

**Caution**
... means that failure to observe this instruction may result in personal injury or material damage.

**Note**
... means that failure to observe this instruction may result in material damage.

In addition, the following pictogram marks passages in the text which describe activities with electrostatically sensitive devices:

Electrostatically sensitive devices: Incorrect handling may cause damage to devices.
Identification of special information

The following pictograms mark passages in the text which contain special information.

**Pictograms**

Information:
Recommendations, tips and references to other information sources.

Accessories:
Specifications on necessary or useful accessories for the Festo product.

Environment:
Information on the environmentally friendly use of Festo products.

**Text designations**

- Bullet points indicate activities which may be carried out in any sequence.

1. Numerals identify activities which must be carried out in the sequence specified.
   - Arrowheads indicate general lists.
Instructions on this description

This description refers to the following versions:

<table>
<thead>
<tr>
<th>Hardware/software</th>
<th>Software version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Vision System</td>
<td>From firmware version 2.0</td>
</tr>
<tr>
<td>SBOC-M-R1B-H</td>
<td></td>
</tr>
<tr>
<td>Festo Configuration Tool FCT</td>
<td>From version 1.2.1</td>
</tr>
<tr>
<td>PlugIn “SBO..-M Network”</td>
<td>From version 1.2.0</td>
</tr>
</tbody>
</table>

Tab. 0/1: Hardware and software versions

This description contains general basic information on mounting, installation and operation of the Compact Vision System. Additional information on commissioning, parametrisation and diagnostics with the software package “Festo Configuration Tool” can be found in the help system for the software.

<table>
<thead>
<tr>
<th>Type</th>
<th>Title</th>
<th>Table of Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics description (this description)</td>
<td>Compact Vision System SBOC-M-R1B-H</td>
<td>Mounting, installation and operation of the Compact Vision System</td>
</tr>
<tr>
<td>Help system for the FCT software</td>
<td>Help for the FCT (included in FCT software)</td>
<td>Functional description of the Festo Configuration Tool</td>
</tr>
<tr>
<td>Help system for the Plugin “SBO..-M Network”</td>
<td>Help on the “SBO..-M Network”</td>
<td>Functional description for the PlugIn “SBO..-M Network”</td>
</tr>
</tbody>
</table>

Tab. 0/2: Documentation on the Compact Vision System SBOC-M-R1B-H
Product-specific terms and abbreviations

The following product-specific abbreviations are used in this description:

<table>
<thead>
<tr>
<th>Term/abbreviation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-signal</td>
<td>Input or output supplies 0 V</td>
</tr>
<tr>
<td>1-signal</td>
<td>Input or output supplies 24 V</td>
</tr>
<tr>
<td>Amplification</td>
<td>See sensor amplification</td>
</tr>
<tr>
<td>Aperture</td>
<td>Opening through which light passes through the lens onto the image converter surface. The larger the opening or aperture, the more light will reach the sensor. When the aperture opens, the depth of focus is reduced. The depth of focus increases the more the aperture is closed (larger f-number). Small aperture openings make longer exposure times necessary. Short exposure times require larger aperture openings.</td>
</tr>
<tr>
<td>Auto MDI-X</td>
<td>Recognizes the configuration of the other station and adapts the send and receive cables of a network connection automatically.</td>
</tr>
<tr>
<td>CMOS sensor</td>
<td>Optoelectronic sensor which converts light signals into electric signals. In addition to the purely sensor function, functions for image conversion are integrated directly into the chip, e.g. exposure control and contrast correction.</td>
</tr>
<tr>
<td>Depth of focus</td>
<td>The spatial area in front of and behind the focused object which is still sharp (also known as sharpness). The depth of focus depends on the focal length of the lens and the set aperture. Short focal lengths with small aperture openings result in greater sharpness.</td>
</tr>
<tr>
<td>Ethernet</td>
<td>Physical protocol and network for connecting various devices.</td>
</tr>
<tr>
<td>Exposure time</td>
<td>The time during which the CMOS sensor is subjected to light during recording. The longer the exposure time, the more light will penetrate. The choice of exposure time depends, for example, on the movement speed, the available light and the light sensitivity of the sensor (see also sensor amplification). With moving objects, excessive exposure times result in blurred pictures.</td>
</tr>
<tr>
<td>FCT</td>
<td>Festo Configuration Tool is the software package for configuring and commissioning various components and devices from Festo</td>
</tr>
</tbody>
</table>
### Term/abbreviation

<table>
<thead>
<tr>
<th>Term/abbreviation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal length</td>
<td>Long focal lengths create a large image, short focal lengths create a wide-angle image. Lenses with variable focal lengths are known as zoom lenses. Lenses with longer focal lengths usually have less sharpness and less luminous intensity.</td>
</tr>
<tr>
<td>I</td>
<td>Digital input</td>
</tr>
<tr>
<td>O</td>
<td>Digital output</td>
</tr>
<tr>
<td>PLC/IPC</td>
<td>Programmable logic controller/industrial PC</td>
</tr>
<tr>
<td>Plug-in</td>
<td>Additional module which extends the functionality of a program. Plug-ins for the FCT software package extend the functionality of the FCT with regard to the use of special devices.</td>
</tr>
<tr>
<td>Sensor amplification</td>
<td>Influences the light sensitivity of the sensor. If the amplification is increased, the light sensitivity is also increased. Excessive amplification can lead to grained pictures.</td>
</tr>
<tr>
<td>Sharpness</td>
<td>See depth of focus</td>
</tr>
<tr>
<td>TCP/IP</td>
<td>Combination of the protocols TCP and IP, the most widely used protocol for communication via Ethernet.</td>
</tr>
</tbody>
</table>

Tab. 0/3: Product-specific terms and abbreviations
Contents and general instructions
System overview

Chapter 1
1. System overview

Contents

1. System overview ................................................. 1-1
   1.1 Structure of the Compact Vision System type SBOC-M-R1B-H ......... 1-3
   1.2 Characteristics ............................................. 1-5
      1.2.1 Mode of operation ..................................... 1-6
      1.2.2 Display and connecting elements ........................ 1-7
   1.3 FCT software (functional overview) .......................... 1-9
   1.4 Lens selection .............................................. 1-10
1. System overview

1.1 Structure of the Compact Vision System type SBOC-M-R1B-H

Components

The Compact Vision System type SBOC-M-R1B-H is an intelligent high-speed camera with integrated electronics for image processing and communication. It is contained in a compact and robust housing and offers:

- an image-reproducing CMOS sensor (resolution 640 x 480 pixels; ½ inch; monochrome) with high frame rate (max. 241 pictures per second with full resolution; reduced resolutions enable higher frame rates)

- interfaces for communication and for connecting external equipment

- a standardized C-mount lens socket (suitable lenses as well as optical accessories such as filters and other lenses are obtainable on request).

Function

The Compact Vision System lets you achieve low-cost integration of optical test devices for visualizing and analysing fast motion sequences, e.g. for ascertaining errors, into your machines and systems.

Configuration, commissioning and operation are carried out with the software package “Festo Configuration Tool”.

User-specific firmware designs can be loaded into the device for special applications.
1. System overview

Network and control

The Compact Vision System can be linked directly to the PC via the Ethernet interface. Several Compact Vision Systems can be networked with each other in combination with a hub or switch, in order to record a motion sequence from several sides at the same time. Recordings can be controlled via digital I/Os or by a PC.

Fig. 1/1: Direct networking with the PC

Fig. 1/1: Camera network
1. System overview

1.2 Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Type codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>SBO</td>
<td>Sensor vision system</td>
</tr>
<tr>
<td>Design</td>
<td>C–</td>
<td>C-mount thread for lens mounting</td>
</tr>
<tr>
<td>Function</td>
<td>M–</td>
<td>High-speed camera (motion)</td>
</tr>
<tr>
<td>Sensor resolution</td>
<td>R1</td>
<td>640x480 Pixel (VGA resolution)</td>
</tr>
<tr>
<td>Image sensor</td>
<td>B–</td>
<td>Monochrome sensor (black-white)</td>
</tr>
<tr>
<td>Frame rate</td>
<td>H</td>
<td>Increased frame rate</td>
</tr>
</tbody>
</table>

Tab. 1/1: Type codes

<table>
<thead>
<tr>
<th>Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBOC-M-R1B-H</td>
<td>- CMOS sensor (resolution 640 x 480 pixels; ½ inch; monochrome)</td>
</tr>
<tr>
<td></td>
<td>- Interface: Ethernet and digital I/Os</td>
</tr>
<tr>
<td></td>
<td>- Standardized C-mount thread for lens mounting (external lens)</td>
</tr>
<tr>
<td></td>
<td>- Protection classes IP65 and IP67</td>
</tr>
<tr>
<td></td>
<td>- Any lens with C-mount thread can be used 2) 3) (focal length selectable)</td>
</tr>
<tr>
<td></td>
<td>- Especially fast and high quality lenses can be used</td>
</tr>
<tr>
<td></td>
<td>- Filters and lenses depending on the lens</td>
</tr>
</tbody>
</table>

1) Only in combination with protective tubing supplied
2) Without protective tubing, lenses with CS-mount thread can also be used (see section 1.4).
3) Entocentric, telecentric or hypercentric lenses can also be used

Tab. 1/2: Compact Vision System SBOC-M-R1B-H
1. System overview

1.2.1 Mode of operation

The Compact Vision System type SBOC-M-R1B-H has a monochrome CMOS sensor. The camera pictures are processed in 256 grey tones. The available processing functions are integrated in the operating system (firmware) of the device. Even motion sequences at high speed can therefore also be registered and analysed with high accuracy.

Resolution

The Compact Vision System offers a max. resolution of 640 x 480 pixels and a frame rate of max. 2100 pictures per second.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Frame rate (max) 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>640 (H) x 480 (V) pixels</td>
<td>241 images per second</td>
</tr>
<tr>
<td>432 (H) x 328 (V) pixels 2)</td>
<td>500 images per second</td>
</tr>
<tr>
<td>304 (H) x 224 (V) pixels 2)</td>
<td>1000 images per second</td>
</tr>
<tr>
<td>200 (H) x 152 (V) pixels 2)</td>
<td>2100 images per second</td>
</tr>
</tbody>
</table>

1) With the FCT and the plug-in “SBO..-M Network”, you can set the frame rate infinitely variably. The values for the number of columns and the number of lines must be divisible by 8. The resolution is adapted here automatically. High frame rates reduce the exposure time of the sensor and therefore require more light.

2) Corresponds to a height-to-width ratio of approx. 4:3. The same frame rates can also be achieved with other height-to-width ratios.

Communication

By means of the Ethernet interface, the Compact Vision System can communicate via the network with the PC or with other Compact Vision Systems.
1. System overview

Commissioning

The Festo Configuration Tool (FCT) is used for commissioning and operation in combination with the plug-in “SBO..-M Network” (see also section 1.3).

1.2.2 Display and connecting elements

1. Support ring of the protective tubing
2. Shield tube
3. Accessories: lens
4. Status LEDs
5. Ethernet interface
6. Operating voltage supply and digital I/Os

Fig. 1/2: Display and connecting elements SBOC-M-R1B-H
1. System overview

<table>
<thead>
<tr>
<th>Connection</th>
<th>Description</th>
</tr>
</thead>
</table>
| 24 V DC | Operating voltage supply and digital I/Os  
- Operating and load voltage supply  
- I/O circuitry (2 digital inputs and 3 digital outputs) |
| Ethernet | Ethernet interface  
- Synchronisation with other Compact Vision Systems of type SBO...M...  
- Communication with higher-order equipment, e.g. the PC  
- Output of data (e.g. film sequences, data analyses, etc.) |

Tab. 1/4: Connections of the Compact Vision System
1. System overview

1.3 FCT software (functional overview)

The Festo Configuration Tool (or briefly FCT) is used for commissioning and operation. FCT is the software interface for configuring and commissioning various components and equipment from Festo. It can run under the operating systems Windows® 2000, Windows XP, Windows Vista und Windows 7 and offers a comfortable user interface. The FCT consists of the following components:

- A framework as program start and entry point with uniform project and data management for all supported device types.

- A plug-in for the special requirements of each device type with the necessary descriptions and dialogues. The plug-ins are managed and started from the framework.

The minimum requirements which your PC must fulfil in combination with the plug-in “SBO..-M Network” can be found in the help for the plug-in.

The plug-in “SBO..-M Network” provides the following functions:

<table>
<thead>
<tr>
<th>Theme</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration and commissioning</td>
<td>- Configuration of the network</td>
</tr>
<tr>
<td></td>
<td>- Defining the signal reaction</td>
</tr>
<tr>
<td></td>
<td>- Defining the frame rate, sensor amplification and recording duration</td>
</tr>
<tr>
<td></td>
<td>- Defining the recording functions</td>
</tr>
<tr>
<td>Analysis</td>
<td>- Playing back of the saved video sequences with representation of recorded signal statuses</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>- Display of the device characteristics</td>
</tr>
<tr>
<td></td>
<td>- Display of errors</td>
</tr>
<tr>
<td>Service</td>
<td>- Loading of an updated operating system</td>
</tr>
</tbody>
</table>

Tab. 1/5: Function of the plug-in “SBO..-M Network”
1. System overview

1.4  Lens selection

Protection classes IP65 and IP67 can be fulfilled only in combination with the protective tubing (see section A.4 Technical data).

Lens dimensions when the protective tubing is used
Please observe the following if you wish to use the protective tubing:

- The maximum possible lens diameter is 38 mm
- The maximum possible length of the lens from the front edge of the lens to the flange surface of the thread side is 42 mm.

Observe that with most lenses the lens length changes when the focal position is reset. The setting “infinite” usually leads to the shortest lens dimension.

Operation without protective tubing
If you do not wish to use the protective tubing, you can use lenses in accordance with the CS-mount standard.

If you use C-mount lenses without protective tubing, you must screw in a 5 mm spacer ring in place of the protective tubing, in order to guarantee correct support dimensions (accessories see A.2).
1. System overview

Ascertaining the suitable focal length

The somewhat more expensive lenses with adjustable opening angle (zoom) enable you to adapt the field of vision to your requirements. Lenses with fixed focal length are less expensive. Whether a lens is suitable depends on:

- The smallest possible distance which can still be represented sharply (minimum object distance - MOD)
- Focal length
- Light intensity
- Permissible distortion.

The object distance, i.e. the distance between the camera and the object to be photographed, can be calculated according to the laws of optics. Please observe that the following calculation formula describes the distance between the so-called main level and the object to be represented. With a thin lens element, the main level is the centre of the lens. With an objective lens, the position of the main level cannot be ascertained so easily. As an estimate you can assume the centre of the objective lens to be the main level.

<table>
<thead>
<tr>
<th>Formula</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>( d = f \times (G : B + 1) )</td>
<td>( d ) : object distance (working distance)</td>
</tr>
<tr>
<td></td>
<td>( G ) : object size (size of field of vision)</td>
</tr>
<tr>
<td></td>
<td>( f ) : focal length</td>
</tr>
<tr>
<td></td>
<td>( B ) : image or sensor size 1)</td>
</tr>
</tbody>
</table>

1) The horizontal dimension of the sensor is 6.3 mm.

Tab. 1/6: Calculation formula
1. System overview

The following diagram offers help for other fixed focal lengths and the necessary distances for certain horizontal fields of vision. The vertical field of vision can be obtained by multiplying the horizontal field of vision by 0.75 (=480/640).

The diagram serves as a rough estimate.

Fig. 1/3: Focal length as a function of working distance \( d \) and object size \( G \)

Examples:

- A lens with a focal length of 12 generates a field of vision approx. 100 mm wide at a working distance of 200 mm.

- A lens with a focal length of 25 generates a field of vision approx. 100 mm wide at a working distance of 400 mm.
Mounting

Chapter 2
2. Mounting

Contents

2. Mounting .......................................................... 2-1
2.1 Mounting .......................................................... 2-3
  2.1.1 Dimensions of the Compact Vision System SBOC-M-R1B-H ...... 2-4
  2.1.2 Mounting the Compact Vision System ............................ 2-4
  2.1.3 Attachment with adapter kit type SBOA-HMSV-39 ............... 2-5
  2.1.4 Mounting/dismantling of lens and protective tubing ........... 2-6
2. Mounting

2.1 Mounting

**Warning**
- Before carrying out mounting, installation and maintenance work, always switch off the power supply for the electronic components.

**Caution**
If the permissible temperature range is exceeded, e.g. due to powerful external sources of light, this can lead to system errors and cause damage.
- Mount the Compact Vision System in a well ventilated location, especially screened from the heat emitted by other devices and from sources of light.

**Note**
The Compact Vision System may be damaged if it is handled incorrectly.
- Make sure that glass surfaces, lens elements and lenses are not scratched or contaminated.
- Mount the Compact Vision System so that items passing by do not touch the device.
2. Mounting

2.1.1 Dimensions of the Compact Vision System SBOC-M-R1B-H

Fig. 2/1: Dimensions SBOC-M-R1B-H with protective tubing

2.1.2 Mounting the Compact Vision System

On the bottom of the device, there is a mounting profile with dovetail guide. The following adapter kits can be used for mounting:

<table>
<thead>
<tr>
<th>Type</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBOA-HMSV-39</td>
<td>Adapter kit</td>
<td>Adapter kit for mounting with screw-on adapter plate (included in the adapter kit)</td>
</tr>
<tr>
<td>SBOA-HMSV-40</td>
<td>Adapter kit</td>
<td>Adapter kit for mounting with screw-on adapter plate, e.g. adapter plate type HMSV-11 (not included in the adapter kit)</td>
</tr>
<tr>
<td>SBOA-HMSV-41</td>
<td>Adapter kit</td>
<td>Adapter kit The adapter has an internal thread G 1/4&quot; for for attachment to commercially-available photo/video tripods.</td>
</tr>
</tbody>
</table>

Tab. 2/1: Adapter kits for mounting
2. Mounting

2.1.3 Attachment with adapter kit type SBOA-HMSV-39

The following figure shows mounting with the adapter kit type SBOA-HMSV-39:

![Diagram of attachment with adapter kit](image)

Fig. 2/2: Attachment with adapter kit SBOA-HMSV-39

1. Dovetail of the Compact Vision System
2. Clamping components
3. Hole for socket head screw M5x16 with centring sleeve
4. Adapter plate

Tab. 2/2: Dimensions for Fig. 2/2

<table>
<thead>
<tr>
<th>Type</th>
<th>B1</th>
<th>D1</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBOC-M-R1B-H</td>
<td>50</td>
<td>9</td>
<td>110</td>
<td>85</td>
<td>25</td>
<td>60</td>
</tr>
</tbody>
</table>

Proceed with mounting as follows:

- Place the Compact Vision System so that the field of vision is unhindered and the LEDs on the rear of the housing can be seen.
- Tighten the screws evenly.
2. Mounting

2.1.4 Mounting/dismantling of lens and protective tubing

**Note**
Handle the protective tubing and lens with care.

- Avoid contamination. Work in a clean environment.
- Do not touch the inside of the camera, the lens element of the lens or the glass surface of the protective tubing.

Mounting the lens without protective tubing
1. If applicable, remove the protective cover on the lens and on the camera housing.
2. Carefully guide the lens into the fixture of the camera housing and screw it in clockwise by hand.

Mounting the lens with protective tubing
1. Before mounting: Check the seals for proper seating on the support ring (see Fig. 1/2, [1]).
2. Carefully screw the support ring of the protective tubing clockwise by hand into the fixture of the camera housing.
3. Now carefully guide the lens into the fixture of the support ring and screw it in clockwise by hand as well.
4. Carefully guide the shield tube (see Fig. 1/2, [2]) over the lens and screw it clockwise by hand into the support ring.
2. Mounting

Dismounting the shield tube

On the support ring of the protective tubing (see Fig. 1/2, [1]), there is a hole with a diameter of 2.5 mm. There you can insert a pin for counter pressure, as required, if you wish to disconnect the shield tube (see Fig. 1/2, [2]) from the support ring.

- Insert a pin for counter pressure into the hole of the support ring, as required.
- Turn the shield tube anti-clockwise out of the fixture and pull it forwards.

Dimantling the lens

- Turn the lens anti-clockwise and pull it forwards out of the fixture.
- Attach the protective cover to the lens and the camera housing.
2. Mounting
Installation

Chapter 3
## 3. Installation

### Contents

3. Installation ................................................................. 3-1

3.1 General installation instructions .................................. 3-3
  3.1.1 Selection of the power supply unit ......................... 3-5

3.2 Electrical connections ................................................. 3-6
  3.2.1 Connection of the operating voltage supply and the I/Os ...... 3-6
  3.2.2 Connecting the Ethernet interface ............................ 3-10
3. Installation

3.1 General installation instructions

**Warning**
Accidental movements of the connected actuators can cause injury to people and material damage.

Before carrying out installation and maintenance work, switch off the following:

– Operating and load voltage supply
– If applicable, other sources of energy, e.g. the compressed air supply.

**Caution**
Electrostatic discharge on the lens or protective tube can cause operative malfunctions.

- Discharge yourself of static electricity before touching the device.
- Do not touch the protective tube and/or lens with the recording mode activated.
- Touch the protective tube and/or lens only with the recording mode inactive, when necessary (e.g. to set the aperture or focus).

**Caution**
Cables with high noise levels can cause electromagnetic interference.

- Do not place the control cables in the vicinity of such cables. If necessary, use separate wiring channels, separate cable bundles or separate cables.
3. Installation

**Note**
If you mount the Compact Vision System type SBO..-M-... flexibly in a machine, equip all connecting cables on the movable part of the machine with strain relief.

**Note**
Long signal lines reduce the resistance to interference.
- Make sure that the cable lengths specified in the following table are always complied with:

<table>
<thead>
<tr>
<th>Cable type</th>
<th>Permissible cable lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal lines</td>
<td>max. 30 m</td>
</tr>
<tr>
<td>Power supply cables</td>
<td>max. 10 m</td>
</tr>
</tbody>
</table>

Tab. 3/1: Maximum permissible cable lengths

**Note**
- Check within your EMERGENCY STOP concept to ascertain what measures are required for putting your machine/system into a safe status in the event of an EMERGENCY STOP (e.g. switching off the operating voltage for the valves and output modules, switching off the compressed air).
3. Installation

3.1.1 Selection of the power supply unit

**Warning**
- Use for the electrical power supply only PELV circuits in accordance with EN 60204-1 (Protective Extra-Low Voltage, PELV).
- Also consider the general requirements for PELV circuits in accordance with EN 60204-1.
- Use only power sources which guarantee reliable electrical isolation of the operating voltage as per EN 60204-1.

Through the use of PELV circuits, protection against electric shock (protection against direct and indirect contact) is guaranteed in accordance with EN 60204-1.

Recommendation: Use a regulated, separate power supply unit which does not have to supply any other devices. You will then achieve the greatest possible resistance to interference.

Simple 24 V transformers with rectifier and electrolytic capacitors achieve output voltages of 28 V and more with low loads. Correct operation can only be guaranteed if the permitted operating voltage range is not exceeded (see Technical data in appendix A.4).
3. Installation

3.2 Electrical connections

The following connection and display elements can be found on the reverse side of the Compact Vision System:

1. Ethernet interface (plug M12x1, 10/100 BaseT)
2. Operating voltage supply and digital I/Os (plug M12x1)

Fig. 3/1: Electrical connections of the Compact Vision System SBOC-M-R1B-H

3.2.1 Connection of the operating voltage supply and the I/Os

**Caution**

Damage to components!
- Make sure that the permissible operating voltage range is complied with (see Technical data).
- Protect the operating voltage supply for the Compact Vision System externally with a fast-acting 2 A micro fuse.
3. Installation

Note
Electromagnetic interference can cause malfunctions. To ensure electromagnetic compatibility in accordance with the EMC directives:

- Use only one of the following cables with sockets from Festo for connecting the operating voltage supply and the inputs/outputs (see Tab. 3/2).
- Connect the screening of the cable with socket on the side opposite the vision system to the earth potential with low impedance.

The following table shows the original cables which should be used for connecting the operating voltage supply and the I/Os:

<table>
<thead>
<tr>
<th>Type</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIM-M12-8GD-2-PU</td>
<td>Plug socket with cable</td>
<td>Cable for operating voltage supply</td>
</tr>
<tr>
<td>SIM-M12-8GD-5-PU</td>
<td>Plug socket with cable</td>
<td>– Straight socket, M12x1, 8-pin, core ends tin-plated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Length 2 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Length 5 m</td>
</tr>
</tbody>
</table>

Tab. 3/2: Cables for operating voltage supply and digital I/Os

Note
The cables with socket must not be lengthened!

The operating voltage is supplied together with the input/output circuit via the 8-pin M12 plug marked “24 V DC” (see also Tab. 3/3). The following components are supplied with +24 V DC via this connection:

- the internal electronics of the Compact Vision System
- the load current of activated outputs.

The maximum permissible current at the supply is 2 A.
3. Installation

**Caution**

Correct earthing is important for trouble-free operation.

- Connect the screening of the cable with socket (SIM-M12-8GD-...) on the side opposite the vision system to the earth potential with low impedance.

<table>
<thead>
<tr>
<th>M12 plug</th>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
<th>Core colour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>E0: Trigger 0</td>
<td>Trigger input E0</td>
<td>White (WH)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>24 V DC</td>
<td>+ 24 V DC (tolerance: ±10%)</td>
<td>Brown (BN)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Reserved</td>
<td>Do not connect</td>
<td>Green (GN)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>A1: Record ready</td>
<td>– 1-signal: Device is waiting for trigger signal</td>
<td>Yellow (YE)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>E1: Trigger 1</td>
<td>Trigger input E1</td>
<td>Grey (GY)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>A0: Ready</td>
<td>– 1-signal: Device ready for operation</td>
<td>Pink (PK)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– 0-signal: Device not yet ready for operation (e.g. initialization running, system error)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>0 V</td>
<td>0 V</td>
<td>Blue (BU)</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>A2: Recording available</td>
<td>Supplies a 1-signal when recording data is present for retrieval in the memory of the Compact Vision System.</td>
<td>Red (RD)</td>
</tr>
</tbody>
</table>

1) Tighten union nut by hand
2) Wire colours of the original cable type SIM-M12-8GD-...-PU
3) Connect cable screening with low impedance to earth potential (see Fig. 3/2)

Tab. 3/3: Operating voltage connection and I/Os on the 8-pin M12 plug “24 V DC”

You can establish the trigger input and trigger condition with the FCT and the plug-in “SBO..-M Network”. Additional information on this can be found in the help for the plug-in “SBO..-M Network”.

Festo GDCS-SBOC-EN en 1201NH
3. Installation

Connection example

The following diagram shows as an example the connection when the input E1 is used as a trigger input. Observe that:

- The tolerance of 24 V DC ±10% must be complied with.
- The power supply for the Compact Vision System must be fused externally with a fast-acting micro fuse, 2 A.
- The residual current of all outputs must not exceed 1.5 A.
- The cable screening must be connected to earth potential with low impedance.

With the configuration software Festo Configuration Tool (FCT), you determine whether a positive or negative edge should be used as a trigger signal.

Fig. 3/2: Example with use of a positive trigger signal at E1
3. Installation

3.2.2 Connecting the Ethernet interface

**Note**
Unauthorised access to your Compact Vision Systems can cause damage or malfunctioning.

- Ask your system administrator how you should protect your camera network against unauthorized access, e.g. with a firewall.

**Note**
With an active connection to the cameras in the camera network, live pictures from all cameras will be transmitted permanently to the plug-in “SBO...-M Network”. In this way, the network between the PC and cameras will be under correspondingly strong load. A direct connection is therefore to be preferred.

- If in doubt, ask your network administrator whether corresponding band widths are available for you or what an optimum network structure for you should look like.
- Comply with the necessary system requirements.
3. Installation

To commission Compact Vision Systems, you must create a connection between your PC and the Compact Vision Systems via Ethernet. For the connection to a network or a PC you will require the following cables:

<table>
<thead>
<tr>
<th>Connection</th>
<th>Type</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection via hub or switch</td>
<td>SBOA-K30E-M12S</td>
<td>Cable</td>
<td>Ethernet cable for simple stress 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Straight socket, M12, 4-pin, d-coded</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- RJ45 Ethernet plug</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Length 3 m</td>
</tr>
<tr>
<td>Direct connection with the PC</td>
<td>SBOA-K30E-M12S</td>
<td>Cable</td>
<td>Cable coupling for RJ45 plug connector</td>
</tr>
<tr>
<td>2)</td>
<td></td>
<td></td>
<td>Crossover cable</td>
</tr>
</tbody>
</table>

1) The Ethernet cable type SBOA-K30E-M12S has been designed for short-term use as a diagnostic cable or for continuous use as a fixed cable with simple stress.
2) Only required if the network connection of the PC does not support automatic adaptation of the transmit and receive cable (AUTO MDI-X). This accessory is commercially available.

Tab. 3/4: Cable for the Compact Vision System type SBO...-M...

For special requirements in an industrial environment, use a screened flexible Ethernet round cable of category 5, which will fulfill your requirements as regards resistance to oil, bending radius, permitted bending cycles, etc. Connections: M12 socket, 4-pin d-coded and RJ45 plug.

Cables and plug connectors for special requirements are commercially available - e.g. from Franz Binder GmbH & Co. (product program series 825) or from HARTING Electronics GmbH & Co. KG (product program Harax® M12 or Harting RJ Industrial®).
3. Installation

Ethernet connection

A network consisting of several Compact Vision Systems can be built up and the connection to the PC can be created via the Ethernet interface. For connection to the Ethernet, there is a d-coded M12 plug on the reverse side of the Compact Vision System.

<table>
<thead>
<tr>
<th>M12 plug</th>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
<th>Core colour 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>TD+</td>
<td>Transmitted data+</td>
<td>White/orange (WH OG)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>RD+</td>
<td>Received data+</td>
<td>White/green (WH GN)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>TD-</td>
<td>Transmitted data–</td>
<td>Orange (OG)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>RD-</td>
<td>Received data–</td>
<td>Green (GN)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metal covering</td>
<td>Screening (shield)</td>
<td></td>
</tr>
</tbody>
</table>

1) Core colours of the original cable type SBOA-K30E-M12S; the following cores of the original cable remain unused: white/blue, blue, white/brown, brown

Tab. 3/5: Pin allocation of the Ethernet interface

The Ethernet interface of the Compact Vision System complies with the standards 10BaseT/100BaseTX for 100 Mbit networks.

**Note**
- Use a screened plug connector which will guarantee continuous contact between the screening and the Compact Vision System.
- Connect the screening of the Ethernet cable on the side opposite the vision system to the earth potential with low impedance.

If the Ethernet cable is used with a fixed Ethernet building installation, correct earthing of the Ethernet cable will normally exist. In combination with mobile equipment, additional earthing measures at the Ethernet cable may be necessary to comply with electromagnetic compatibility (EMC) requirements.
3. Installation

Connection via hub or switch

Recommendation: Use network components which support data rates of at least 100 Mbits/s.

The number of Compact Vision Systems which can be networked together is dependent on the type and number of hubs or switches used (star connector).

If using a hub, make sure that this is set so that the multicasts of address 239.255.2.3. are passed on. If in doubt ask your network administrator.

Direct connection with the PC

If the network connection of the PC does not support automatic adaptation of the send and receive cable (AUTO MDI-X), you will also require with the original cable a crossover cable and a cable coupling (see also Tab. 3/4).

1 Original cable type SBOA-K30E-M12S
2 Cable coupling
3 Crossover cable

Fig. 3/3: Direct connection with the PC
3. Installation
Commissioning

Chapter 4
4. Commissioning

## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Notes on commissioning</td>
<td>4-3</td>
</tr>
<tr>
<td>4.1.1</td>
<td>Installing and starting the FCT</td>
<td>4-3</td>
</tr>
<tr>
<td>4.1.2</td>
<td>Steps for commissioning</td>
<td>4-4</td>
</tr>
<tr>
<td>4.2</td>
<td>Addressing in the Ethernet (basic principles)</td>
<td>4-6</td>
</tr>
<tr>
<td>4.3</td>
<td>Instructions for use of a firewall</td>
<td>4-9</td>
</tr>
<tr>
<td>4.4</td>
<td>Making network settings with the Compact Vision System</td>
<td>4-10</td>
</tr>
<tr>
<td>4.5</td>
<td>Instructions on operation</td>
<td>4-13</td>
</tr>
<tr>
<td>4.5.1</td>
<td>Setting the optics</td>
<td>4-14</td>
</tr>
<tr>
<td>4.5.2</td>
<td>Trigger signal</td>
<td>4-16</td>
</tr>
</tbody>
</table>
4. Commissioning

4.1 Notes on commissioning

Carry out commissioning with the FCT (Festo Configuration Tool) software package (see also FCT help system).

4.1.1 Installing and starting the FCT

The FCT is installed on your PC with an installation program. The plug-in for the Compact Vision System is installed on your PC together with the installation program of the FCT.

For the Compact Vision System SBOC-M-R1B-H with the firmware version 2.0 or higher, you will need the following software versions:

- Festo Configuration Tool from version 1.2.1
- Plug-in “SBO..-M Network” from version 1.2.0

Administrator rights are required for installing the FCT.

**Note**
The plug-in “SBO..-M Network” version V1.2.0 supports the following Compact Vision Systems:
- SBOC-M-R1B-H: Firmware version from 2.0
- SBO..-M-R1B: Firmware version from 1.1

- Check with later firmware designs whether an updated plug-in is available. If necessary, consult Festo.
4. Commissioning

The FCT is installed from the CD ROM as follows:

1. Close all programs.

2. Insert the Festo Configuration Tool CD in your CD-ROM drive. If Auto-Run is activated on your system, the installation starts automatically and you can skip steps 3 and 4.

3. Select [Run] in the Start menu.

4. Enter D:\setup (if necessary replace D by the letter of your CD ROM drive).

5. Follow the instructions on the screen.

4.1.2 Steps for commissioning

Carry out the following steps in order to commission the Compact Vision System with the FCT:

1. Connect the Compact Vision System via the Ethernet interface to your PC or hub/switch. Follow the instructions in chapter 3.

2. Start the FCT: double click on the Festo Configuration Tool icon on the Desktop
   – or –
   In the Windows menu [Start], select the entry [Festo Software] [Festo Configuration Tool].

3. Create a project in the FCT or open an existing project.

4. Add the component “SBO..-M Network” with version 1.2.0 or higher to the project.

Pay attention to the correct plug-in version (1.2.0 or higher) when selecting the component. The plug-in versions 1.1.0 does not yet support Compact Vision Systems “SBOC-M-R1B-H Network” with firmware version 2.0 or higher.
4. Commissioning

Additional information on the functions of the plug-in SBO..-M Network can be found in the plug-in help: command [Help] [Contents of installed plug-ins] [Festo (manufacturer name)] [SBO...-M Network (plug-in name)] e.g.:

– on the description of the dialogues of “Device SBO..-M-...”
– on the description of the work steps for commissioning
– on the basic functions: device connection, device names, device control and password protection.
4. Commissioning

4.2 Addressing in the Ethernet (basic principles)

Due to the separation into logical and physical protocol layers (Ethernet and TCP/IP), there are two types of addresses in a network:

– a fixed Ethernet address (MAC-ID) for each device and
– an IP address which is assigned to every device in the network.

Before the application, data are always sent to or received from an IP address. In order that the data reach the receiver, a correlation must be created between the logical IP address and the physical Ethernet address. The address resolution protocol ARP does this: An ARP table is saved in each network PC. This table lists the relevant physical Ethernet address for each IP address in the network. If an Ethernet address is not listed in the ARP table, the IP driver can ascertain it with the aid of an ARP request.

Ethernet address (MAC-ID) The unalterable worldwide unique Ethernet address (MAC-ID) of the Compact Vision System can be found on the name plate. Through this, you can uniquely distinguish the different Compact Vision Systems.

IP address An IP address as per standard IPv4 is usually specified with 4 decimal numbers separated by points (per 1 byte).  
**Example for an IP address:** 192.168.2.10

An IP address is used to address a network as well as an individual station in the network. The IP address therefore contains:

– the net ID (specifies the address of a network) and
– the host ID (specifies the address of an individual station in this network).
4. Commissioning

**Netmask**

Which numbers in an IP address now represent the net ID and the host ID are defined by the specification of a so-called “net mask”.

The telephone number of Festo Germany can be used as an example to explain the IP address and the net mask: 00497113470.

Which part of this telephone number is the dialling code and which represents the subscriber number only becomes clear when you also know: “The first 7 positions specify the dialling code, the last 4 the subscriber number”. That is the “net mask” for the above telephone number.

**Net classes**

The net mask for IP addresses defines, with “0” as a position marker, the bytes which are used for addressing the station (host ID). Networks belong to different net classes, depending on the number of these bytes:

<table>
<thead>
<tr>
<th>Net class</th>
<th>Netmask</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>255.0.0.0</td>
<td>Large network</td>
</tr>
<tr>
<td>B</td>
<td>255.255.0.0</td>
<td>Medium network</td>
</tr>
<tr>
<td>C</td>
<td>255.255.255.0</td>
<td>Small network with max. 254 stations</td>
</tr>
</tbody>
</table>

Tab. 4/1: The most important net classes with the net masks that belong to them (example)

**Gateway**

Networks with different net-IDs are connected to each other via a router or gateway. If a station in a network is to send data to stations in other networks, the IP address of the gateway must be specified.
4. Commissioning

Three specifications are therefore required for addressing in the Internet Protocol IP:

- IP address
- IP net mask
- IP address of the gateway

**Note**
The following is preset at the factory:
- IP address: 192.168.2.10
- IP net mask: 255.255.0.0
- IP address of the gateway:
4. Commissioning

4.3 Instructions for use of a firewall

As a rule, the network connections of a PC are protected by a firewall. Dependent on the firewall settings, incoming or outgoing data are blocked or permitted.

**Note**

To avoid malfunctions in the device search or in data exchange between the camera network and the Festo Configuration Tool:

- If the network connections of your PC are protected by a firewall, configure the firewall so that the Festo Configuration Tool always has free access to the network connections.

After installation of the Festo Configuration Tool, if you have an active firewall, you automatically receive a safety warning from Windows when you try to build up a connection to the camera network for the first time.

- For all network connections of the Festo Configuration Tool, select the setting [Permit access].

If you have any questions on configuration of the firewall used, consult your system administrator.
4. Commissioning

4.4 Making network settings with the Compact Vision System

You can make the settings for IP-addressing of your Compact Vision System with the FCT (device manager of the plug-in “SBO..-M Network”). Proceed as follows:

1. Create a connection to the device with the Device Manager. Before doing this, disconnect any active connection to the camera network with the button [Disconnect network].

2. Set the network parameters of your Compact Vision System with the Device Manager (IP address, network mask and if applicable the IP address of the gateway).

Creating a connection to the device

Search function for devices

The Device Manager offers a search function. This search function enables a connection to be created to devices for which the network address is not known. The search function uses a special Ethernet procedure (multicast). With this procedure, messages can be transmitted simultaneously to several stations or to a closed group of stations. The Multicast address 239.255.2.3. is used for this procedure.

If the search takes place within a network node, no special configuration of the network node (router, server etc.) is necessary. However, if devices which lie behind further network nodes need to be found, the network nodes must be enabled for multicast. You must also adapt the characteristics of the device search (search range and search duration) correspondingly. If you have any questions, consult your system administrator.
4. Commissioning

If you cannot create a connection to the device with the search function of the Device Manager:

- Check whether the network nodes are enabled for multicast.
- Check the set search range and search duration in the Device Manager of the plug-in “SBO..-M Network”.
- If the network connections of your PC are protected through a firewall: Check the configuration of the firewall of your PC. Configure the firewall so that the Festo Configuration Tool always has free access to the network connections.
- If this is not successful, connect the device as directly as possible to your PC. In doing this, you will exclude incorrect network configurations. Also, the search function will find the device even if the setting “Visibility in search requests” is set to “Local (1 router)”. Or, if you use a new device on which the IP address set at the factory is still valid, specify the IP address in the Device Manager manually.

Manual address specification for equipment

The Device Manager also offers the possibility of specifying the current IP address manually in order to create a connection (factory setting see section 4.2). Make use of this possibility if you know the current IP address of the device and if your network nodes are not enabled for Multicast. When specifying manually, leave the presets under “Message port” and “Data port” unchanged.
4. Commissioning

Undertaking network settings

If you have created a connection with the Device Manager, you can also modify the network settings of the devices with the Device Manager. You can:

- assign the IP address automatically (requires a DHCP server in the network).
- assign a fixed IP address.

Assign IP address automatically

Select this setting if you are using a DHCP server in your network and if the IP address is to be assigned automatically via DHCP (DHCP stands for Dynamic Host Configuration Protocol). The DHCP server manages a range of IP addresses and assigns them to the DHCP-capable terminals.

Specify fixed IP address

If you are not using a DHCP server, you must specify a fixed IP address. Make sure here that the IP address and the net mask of the devices are suited to the network settings of your PC. If you have any questions, consult your system administrator.

Note

Additional information on IP addressing can be found in the help for the plug-in “SBO..-M Network” of the software package Festo Configuration Tool (FCT).
4. Commissioning

4.5 Instructions on operation

**Caution**
- Make sure that no danger can emanate from the systems connected to the Compact Vision System.

**Note**
- Before important recordings, carry out a test in order to make sure that the Compact Vision Systems have been correctly commissioned with the FCT software package and that your network is functioning faultlessly.

If the permissible temperature range is exceeded, this will be recognized by the internal electronics and will lead to a defined error status. The following consuming devices will be switched off in order to reduce the energy consumption of the device as much as possible:

- digital outputs
- image sensor

Data processing is limited. The error status is indicated.

**Caution**
Further heating beyond this point can lead to uncontrolled malfunctions.
- Make sure that the permissible temperature range is complied with (see Technical data).
4. Commissioning

4.5.1 Setting the optics

In order to achieve good recordings, you must make the following settings dependent on the object/motif and the respective recording conditions:

- Focus the object
- Set the aperture
- Set the exposure time, amplification and image quality with the FCT software package.

A test image, e.g. a so-called Siemens star, is often used for setting and checking the sharpness. For this purpose the camera is aimed at the test picture and the test picture is then focused.

Appendix A.3 shows a Siemens star which you can use as a test picture.

The Siemens star is a circle with alternate white and black segments. The segments run to the centre but do not overlap. Cameras cannot reproduce optimally the centre of such a test picture.

An unsharp range will be visible, the so-called grey ring. The smaller the grey ring, the better the lens is focused.
4. Commissioning

**Focusing object – with standard lens from Festo**
- Loosen the clamping screw on the lens.
- In order to focus the object, turn the focusing ring.
- Tighten the clamping screw again slightly.

**Setting aperture – with standard lens from Festo**
- Loosen the clamping screw on the lens.
- To set the aperture, turn the aperture ring.
- Tighten the clamping screw again slightly.

Information on configuring the Compact Vision System can be found in the help for the plug-in “SBO.-M Network” of the software package Festo Configuration Tool (FCT).
4. Commissioning

4.5.2 Trigger signal

The trigger signal is applied through one of the two inputs (I0 or I1). Trigger input and trigger condition are adjustable via the configuration software Festo Configuration Tool (FCT). The trigger condition is either a positive or a negative edge on the selected trigger input.

When the system is ready for recording and is waiting for the trigger signal, the recording status LED (D) flashes yellow. If the trigger signal is present, the recording LED (C) will light up yellow for 250 ms (see also section 5.1.1).
Diagnostics and error handling

Chapter 5
5. Diagnostics and error handling

Contents

5. Diagnostics and error handling ........................................... 5-1
5.1 General diagnostics options ............................................. 5-3
  5.1.1 Status display ..................................................... 5-3
  5.1.2 Error elimination .................................................. 5-6
5. Diagnostics and error handling

5.1 General diagnostics options

The following options for diagnostics are available:

- the FCT shows operating statuses and error messages of the Compact Vision Systems used in plain text (further information on this, see help system of the FCT).

- the four LEDs on the rear of the Compact Vision System supply the status information listed in the following section.

5.1.1 Status display

The visual indicator of the operating statuses is via LEDs.

<table>
<thead>
<tr>
<th>Operating status LED (A)</th>
<th>Status</th>
<th>Meaning / error handling</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED illuminated green</td>
<td>Device ready for operation</td>
<td>–</td>
</tr>
<tr>
<td>LED illuminated red</td>
<td>Initialization is running</td>
<td>Wait until initialization is completed</td>
</tr>
<tr>
<td>LED is flashing red</td>
<td>Error</td>
<td>Look at error message with the FCT software package</td>
</tr>
<tr>
<td>LED is off</td>
<td>Undefined status, e.g. operating voltage not applied</td>
<td>Check the operating voltage connection of the electronics</td>
</tr>
</tbody>
</table>

Tab. 5/1: Operating status LED (A)
5. Diagnostics and error handling

### Ethernet traffic LED (B)

<table>
<thead>
<tr>
<th>LED</th>
<th>Process</th>
<th>Status</th>
<th>Meaning / error handling</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED is flashing green</td>
<td>ON</td>
<td>Ethernet data traffic</td>
<td>–</td>
</tr>
<tr>
<td>LED is off</td>
<td>OFF</td>
<td>No Ethernet data traffic</td>
<td>–</td>
</tr>
</tbody>
</table>

Tab. 5/2: Ethernet traffic LED (B)

### Recording LED (C)

<table>
<thead>
<tr>
<th>LED</th>
<th>Process</th>
<th>Status</th>
<th>Meaning / error handling</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED illuminated red</td>
<td>ON</td>
<td>Illuminated at each recording for at least 250 ms</td>
<td>–</td>
</tr>
<tr>
<td>LED illuminated yellow</td>
<td>ON</td>
<td>Illuminated for 250 ms when trigger signal is applied</td>
<td>–</td>
</tr>
</tbody>
</table>

Tab. 5/3: Recording LED (C)
## 5. Diagnostics and error handling

### Recording status LED (D)

<table>
<thead>
<tr>
<th>LED</th>
<th>Process</th>
<th>Status</th>
<th>Meaning / error handling</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="LED is flashing red" /></td>
<td>ON/OF</td>
<td>Recording data can be found saved in the memory of the Compact Vision System</td>
<td>Transfer recordings to the PC with the FCT. This takes place automatically if there is a connection to the FCT.</td>
</tr>
<tr>
<td><img src="image" alt="LED is flashing yellow" /></td>
<td>ON/OF</td>
<td>Device is waiting for trigger signal (ready for recording)</td>
<td>–</td>
</tr>
</tbody>
</table>

Tab. 5/4: Recording status LED (D)
## 5. Diagnostics and error handling

### 5.1.2 Error elimination

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>The device does not record</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Operating voltage not applied or is below the permissible tolerance  
- Record mode inactive  
- Trigger signal missing or has incorrect polarity  
- Hardware error |  
• Switch on operating voltage supply or comply with tolerances  
• Activate the desired recording mode with the FCT software package  
• Check trigger signal  
• Servicing required |
| The firmware of the device remains hanging |  
- Electromagnetic interference in the environment caused by non-CE-conforming devices |  
• Eliminate interference source  
• Check that the screening of the connecting cables of the vision system is placed technically correctly with low impedance  
• Check the functional earth connections  
• Use a separate power unit only for the Compact Vision System |
| Digital outputs and image sensor were switched off unexpectedly. |  
- Permissible temperature range exceeded |  
• Observe permissible temperature range (see Technical data) |
| Recording is blurred or not sharp |  
- The device was moved (e.g., by vibration on the machine/system).  
- The object moves too quickly.  
- The motif lies outside the focal range.  
- Lens not focused |  
• Check mounting, reduce vibrations  
• Reduce exposure time  
• Comply with the minimum distance (see specifications on the lens)  
• Focus the lens |
5. Diagnostics and error handling

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>The recording appears too dark or too bright</td>
<td>– Insufficient light for the recording</td>
<td>• Provide sufficient light</td>
</tr>
<tr>
<td></td>
<td>– Parameters (e.g. picture quality, exposure time, amplification) not set optimally</td>
<td>• Adapt parameters to the current recording situation with the FCT</td>
</tr>
<tr>
<td>Visual errors in recording</td>
<td>– Lens or protective disc dirty</td>
<td>• Carefully clean lens or protective disc</td>
</tr>
<tr>
<td>The plug-in SBO..-M cannot make a connection to the Compact Vision System</td>
<td>– Incorrect cable</td>
<td>• For a direct connection to the PC, you might require a connector and a so-called crossover cable in addition to the original cable. This is not required for a connection via a hub or a switch (see also section 3.2.2.).</td>
</tr>
<tr>
<td></td>
<td>– Your network blocks data exchange.</td>
<td>• Make sure that your hub passes on the multicast address 239.255.2.3. If in doubt consult your system administrator.</td>
</tr>
<tr>
<td>Windows error message</td>
<td>– Insufficient free virtual memory</td>
<td>• Comply with the system requirements (see help for the plug-in “SBO..-M network”)</td>
</tr>
</tbody>
</table>

Tab. 5/5: Error elimination
5. Diagnostics and error handling
Technical appendix

Appendix A
A. Technical appendix

Contents

A. Technical appendix ................................................. A-1
A.1 Cleaning and maintenance ........................................ A-3
A.2 Accessories (at press time) ...................................... A-4
A.3 Siemens star .................................................... A-5
A.4 Technical data .................................................. A-6
A.1 Cleaning and maintenance

Note
A dirty and scratched lens or a dirty and scratched protective disc can lead to optical errors.

- Make sure that the lens and the protective disc are not scratched.
- Do not use any abrasive cleaning agents.

- Switch off the power supply before cleaning.
- Clean the lens and protective disc if they are dirty or there are deposits on them:
  - with an air gun or with clean non-lubricated compressed air.
  - with a soft moist cloth and non-abrasive cleaning agents.
- Clean the device if it is dirty.

Permissible cleaning agents are soap suds (max. +60 °C) and all non-abrasive agents.
### A.2 Accessories (at press time)

Please select the corresponding accessories from our catalogue (www.festo.com/catalogue).

<table>
<thead>
<tr>
<th>Type</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIM-M12-8GD-2-PU</td>
<td>Plug socket with cable</td>
<td><strong>Cable for operating voltage supply</strong>&lt;br&gt;– Straight socket, M12x1, 8-pin, core ends tin-plated&lt;br&gt;– Length 2 m&lt;br&gt;– Length 5 m</td>
</tr>
<tr>
<td>SIM-M12-8GD-5-PU</td>
<td>Plug socket with cable</td>
<td></td>
</tr>
<tr>
<td>SBOA-K30E-M12S</td>
<td>Cable</td>
<td><strong>Ethernet cable for brief use as a diagnostic cable</strong>&lt;br&gt;– Straight socket, M12, 4-pin, d-coded&lt;br&gt;– RJ-45 Ethernet plug&lt;br&gt;– Length 3 m</td>
</tr>
<tr>
<td>SASF-C-L-F…</td>
<td>Lens</td>
<td><strong>Focal length</strong>&lt;br&gt;www.festo.com/catalogue</td>
</tr>
<tr>
<td>2)</td>
<td></td>
<td><strong>Cable coupling for RJ45 plug connector</strong></td>
</tr>
<tr>
<td>2)</td>
<td></td>
<td><strong>Crossover cable</strong></td>
</tr>
<tr>
<td>SBOA-HMSV-39</td>
<td>Adapter kit</td>
<td><strong>Adapter kit for mounting with screw-on adapter plate</strong>&lt;br&gt;(included in the adapter kit)</td>
</tr>
<tr>
<td>SBOA-HMSV-40</td>
<td>Adapter kit</td>
<td><strong>Adapter kit for mounting with screw-on adapter plate,</strong>&lt;br&gt;e.g. adapter plate type HMSV-11 (not included in the adapter kit)</td>
</tr>
<tr>
<td>SBOA-HMSV-41</td>
<td>Adapter kit</td>
<td><strong>Adapter kit The adapter has an internal thread G 1/4&quot;</strong>&lt;br&gt;for attachment to commercially available tripods.</td>
</tr>
<tr>
<td>SBOL-C-5</td>
<td>Adapter</td>
<td><strong>5 mm spacer ring (CS mount to C mount)</strong></td>
</tr>
</tbody>
</table>

1) Cables and plug connectors for continuous use in an industrial environment are commercially available, e.g. from HARTING Electronics GmbH & Co. KG (product program Harax® M12 or from Harting RJ Industrial®) or from Franz Binder GmbH + Co. elektrische Bauelemente KG (series 825).<br>
2) Only required if the network connection of the PC does not support automatic adaptation of the send and receive cables (AUTO MDI-X). These accessories are commercially available.

Tab. A/1: Accessories at press time
A.3 Siemens star

Fig. A/1: Siemens star
### A.4 Technical data

<table>
<thead>
<tr>
<th>Compact Vision System</th>
<th>SBOC-M-R1B-H</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></td>
<td></td>
</tr>
<tr>
<td>- Lens mounting</td>
<td>Without protective tube: CS mount</td>
</tr>
<tr>
<td></td>
<td>With protective tube: C mount</td>
</tr>
<tr>
<td><strong>Image sensors</strong></td>
<td></td>
</tr>
<tr>
<td>- Frame rate (full image)</td>
<td>[fps] 241</td>
</tr>
<tr>
<td>- Exposure time</td>
<td>[ms] 0.001 ... 1000</td>
</tr>
<tr>
<td>- Sensor resolution</td>
<td>[pixels] 640 x 480 (VGA)</td>
</tr>
<tr>
<td>- Sensor size</td>
<td>[inch] ½</td>
</tr>
<tr>
<td>- Sensor type</td>
<td>CMOS Global Shutter Monochrome</td>
</tr>
<tr>
<td><strong>Optics</strong></td>
<td></td>
</tr>
<tr>
<td>- Working distance</td>
<td>[mm] Dependent on the lens chosen</td>
</tr>
<tr>
<td>- Field of vision</td>
<td>[mm] Dependent on the lens chosen</td>
</tr>
<tr>
<td><strong>Electrical data</strong></td>
<td></td>
</tr>
<tr>
<td>- Current consumption with load-free outputs</td>
<td>[mA] 120</td>
</tr>
<tr>
<td>- Maximum residual current at the 24 V outputs</td>
<td>[A] 1.5</td>
</tr>
<tr>
<td>- Nominal operating voltage</td>
<td>[V DC] 24</td>
</tr>
<tr>
<td>- External fuse protection</td>
<td>[A] 2 (fast acting fuse)</td>
</tr>
<tr>
<td>- Permissible voltage fluctuations</td>
<td>[%] ±10</td>
</tr>
<tr>
<td><strong>Geometry</strong></td>
<td></td>
</tr>
<tr>
<td>- Width</td>
<td>[mm] 45</td>
</tr>
<tr>
<td>- Height</td>
<td>[mm] 45</td>
</tr>
<tr>
<td>- Length</td>
<td>[mm] With protective tubing: 139.4</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td></td>
</tr>
<tr>
<td>- Product weight</td>
<td>[g] Approx. 182</td>
</tr>
<tr>
<td><strong>Ethernet interface</strong></td>
<td></td>
</tr>
<tr>
<td>- Bus interface</td>
<td>IEEE802.3U (100BaseT)</td>
</tr>
<tr>
<td>- Connector plug</td>
<td>Plug, M12</td>
</tr>
<tr>
<td>- Transmission speed</td>
<td>[Mbps] 100</td>
</tr>
<tr>
<td>- Supported protocols</td>
<td>TCP/IP</td>
</tr>
</tbody>
</table>

Tab. A/2: Technical data (part 1)
### Compact Vision System

<table>
<thead>
<tr>
<th>Ambient characteristics</th>
<th>SBOC-M-R1B-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>–10 °C ... +50 °C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>–10 °C ... +60 °C</td>
</tr>
<tr>
<td>Protection class; with protective tubing, plug connector or inserted or provided with protective cap</td>
<td>IP65, IP67</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td>Screening against extreme external light influences; ambient atmosphere as clean as possible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection against electric shock</th>
<th>Through the use of PELV current circuits (protection against direct and indirect contact as per EN 60204-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certification</td>
<td>c UL us – Recognized (OL); C-Tick</td>
</tr>
<tr>
<td>CE mark (declaration of conformity)</td>
<td>In accordance with EU EMC Directive 1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials</th>
<th>Anodised aluminium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Acrylic butadiene styrene, glass-fibre reinforced</td>
</tr>
<tr>
<td>End cap</td>
<td>Free of copper and PTFE</td>
</tr>
</tbody>
</table>

1) The device is intended for use in industrial environments. Measures may need to be implemented in residential areas for interference suppression.

Tab. A/3: Technical data (part 2)
A. Technical appendix
B. Index

Contents

B. Index ................................................................. B-1
B.1 Index ............................................................... B-3
B. Index

B.1 Index

0
0-signal ........................................ XII

1
1-signal ........................................ XII

A
Abbreviations .................................. XII
Accessories .................................. A-4
Adapter kit .................................. 2-5
Amplification ................................ XII
Aperture ................................... XII
Approvals .................................. VI
Assign IP address automatically ........... 4-12

C
CE marking .................................. VI
CMOS sensor ................................ XII

D
Depth of focus ................................ XII
Diagnostics ................................ 5-3

E
Error elimination ............................... 5-7
B. Index

Ethernet .......................................................... XII
Ethernet address (MAC-ID) .......................... 4-6
Ethernet connection ................................. 3-12
Ethernet interface .................................. 3-12
Ethernet traffic LED (B) ......................... 5-4
Example of connection ......................... 3-9
Exposure time ........................................... XII

F
FCT ......................................................... 1-9, 4-3
Focal length ........................................... XIII, 1-11
Frame rate .............................................. 1-6

G
Gateway ...................................................... 4-7

I
Intended use .............................................. V
IP address .............................................. 4-6

L
Lens .......................................................... 1-11

M
MAC ID ...................................................... 4-6
Manual address specification for devices ...... 4-11

N
Net classes ............................................... 4-7
B. Index

Netmask ........................................ 4-7
Network and control .......................... 1-4

O
Operating status LED (A) ................. 5-3
Operating voltage supply and I/Os ......... 3-8

P
Pictograms ..................................... X
PLC/IPC ......................................... XIII
Plug-in .......................................... XIII

R
Recording LED (C) ............................. 5-4
Recording status LED (D) ................... 5-5
Resolution ...................................... 1-6

S
Safety instructions ............................ VII
Search function for devices ................. 4-10
Sensor amplification ......................... XIII
Sensor size ..................................... 1-11
Service ......................................... VIII
Sharpness ...................................... XIII
Siemens star ................................. 4-14, A-5
Size of field of vision ....................... 1-11
Specifying IP address ....................... 4-12

T
Target group ................................. VIII
B. Index

TCP/IP ........................................ XIII
Technical data ................................. A-6
Text designations ............................. X
Trigger signal ............................... 4-16

U
User instructions ............................. IX

V
Variants of the Compact Vision System ..... 1-5
Versions ..................................... XI

W
Working distance ............................ 1-11