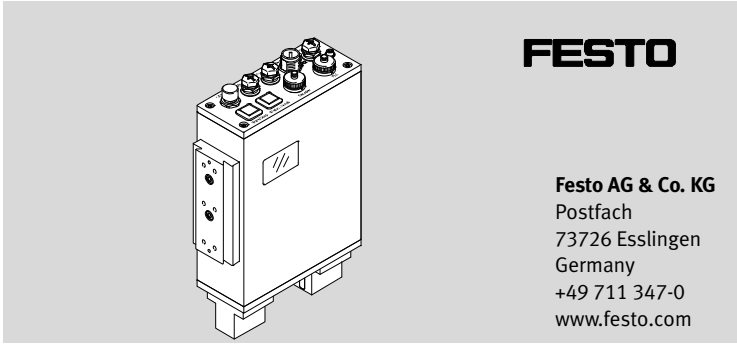


CHB-C-N



(en) Brief description

8046205
1508NH
[8046201]

Original: de

Checkbox CHB-C-N English

The description for the Checkbox CHB-C-N can be found in PDF format on the CD-ROM supplied with the Checkbox or via the support portal → www.festo.com/sp

User documentation for Checkbox CHB-C-N	
Description for checkbox CHB-C-N – GDCA-CHB-C-N-EN	Description of the function, commissioning, operation and maintenance of the Checkbox.
Help for software packages – Software CheckKon P.SW-KON – Software CheckOpti P.SW-OPTI	– Operation of the CheckKon software – Operation of the CheckOpti software

1 Safety and requirements for product use

1.1 Safety

Caution
Glare and eye irritation

With regard to the blue light hazard, the Checkbox Compact exceeds the limit values of the free group in accordance with DIN EN 62471:2009-03. Therefore, an assignment to risk group 1 applies for the blue light hazard. Looking at the light source for a long or prolonged period can dazzle your eyes and cause irritation. Take measures to prevent eye exposure:

- Do not remove any housing parts.
- Only mount/remove the prism support when the power supply is switched off.
- Mount the Checkbox only in its original state with closed, intact housing.
- Mount or remove the Checkbox only when the power supply is switched off.
- Mount the Checkbox in such a way that it is not possible to look directly into the light beam.
- Also take measures to ensure that if the light beam is reflected off mirrored or reflective objects, it does not pose a hazard (for example, by providing screening).
- Do not look directly into the light beam and do not direct the beam into the eyes of other people.

Ordinary light sources are divergent, i.e. the illuminated area becomes larger as the distance from the light source increases. As a result, the risk of eye injury decreases as the distance from the light source increases. However, as the Checkbox Compact uses parallel light, the risk of eye injury is not reduced as the distance increases; this applies to both looking directly at the beam and looking into the beam via a reflective surface.

Intended use

The Festo Checkbox Compact® has been designed for use under normal operating conditions in closed rooms in industrial installations. The Checkbox documented in this description is intended exclusively for use as follows: Contactless checking of the position and quality of small parts e.g. screws, springs, bolts, which pass through on a conveyor belt. Use the Checkbox only as follows:

- As intended in an industrial environment
- In perfect technical condition
- In its original state without unauthorised modifications. Only the conversions or modifications described in the documentation supplied with the product are permitted. The guarantee will become invalid if the Checkbox is opened.

The maximum values specified for pressures, temperatures, electrical connections etc. must not be exceeded.
Please observe the standards specified in the relevant chapters and comply with the regulations of the trade association and the German Technical Control Board (TÜV), the VDE conditions as well as the relevant national regulations.

1.2 Requirements for product use

For correct and safe use of the product:

- Comply with the connection and ambient conditions of the product and all connected components specified in the technical data. Compliance with the limit values and load limits permits operation of the product in compliance with the relevant safety regulations.
- Observe the instructions and warnings in the documentation.
- The features of the conveyed part which determine the orientation and quality must be recognizable and distinguishable for the Checkbox.
- It must be possible to integrate the Checkbox in the material flow.

Qualification of specialists (personnel requirements)

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

2 Product overview

The Festo Checkbox® enables the optical (contactless) positioning and quality inspection of conveyed parts and it precisely controls the actuators for sorting the inspected parts and parts assigned to the result groups (tracking, ejection of parts, etc.).

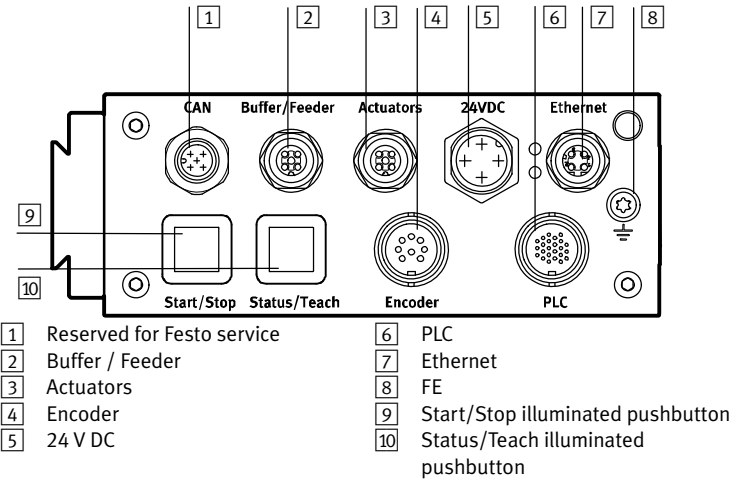


Fig. 1 Connections, display and control elements

Function of the illuminated pushbuttons	
9	– Start and stop the Checkbox – Display of the switching function Start (green)/Stop (red) – Set the tolerance – Acknowledge errors – Save the Teach data
10	– Switch between RUN and Teach modes – Select the orientation in the Teach mode – Display the scan procedure – Call up system information (e.g. belt speed during operation with encoder)

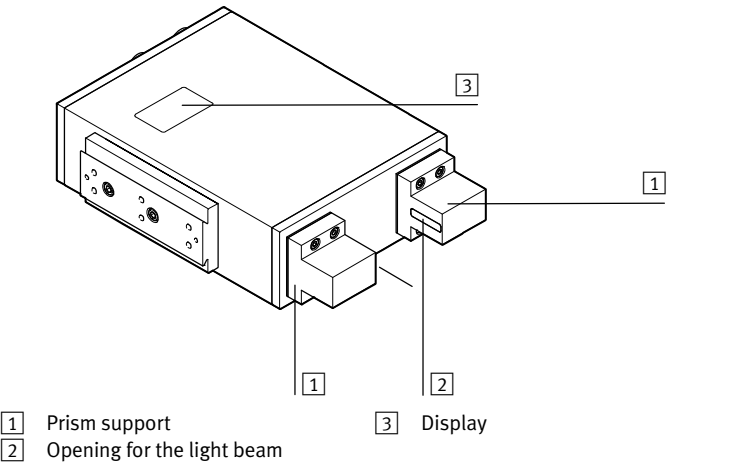


Fig. 2 Display and visual elements

3 Mounting



Warning Risk of injury

- During operation, make sure that no danger is caused by the controlled peripheral equipment



Caution Damage to components

- Before carrying out mounting, installation and maintenance work, always switch off the power supplies

Installation site

Please note the following ambient conditions in particular:

- The mounting location must be free of vibration
- There must be stable mechanical fastening
- Clean ambient atmosphere: Free of oil, no paint spray, no grinding dust
- Screening of external light influences and extreme magnetic fields (e.g. due to induction furnaces)
- The mounting position should be as cool and vertical as possible

In this way you will achieve optimum test results and ensure a long service life of the device.

Transport device

In order to ensure a reliable and reproducible test result, the transporting device used should fulfill the following requirements:

- Use a high-grade transporting system which conveys the parts at a constant speed.
- Ensure the stable position of the parts, e.g. by means of mechanical devices.
- Ensure a good transfer of parts from the small parts conveyor to the transporting device and that the transporting device is mechanically decoupled from the small parts conveyor.
- Also use mechanical devices to secure the transfer of parts from the transporting device to the buffer zone (e.g. drop pipe, slide, chute) of the subsequent machine so that the orientation of parts cannot be subsequently changed.

Mounting

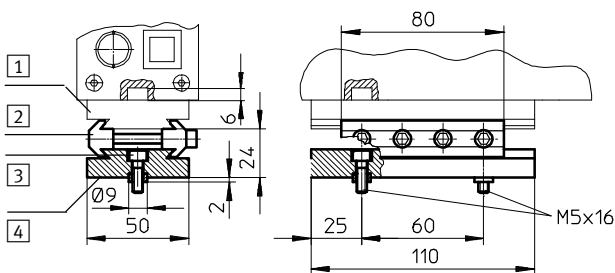
A mounting profile with dovetail guide is attached to the side of the Checkbox. If you want to mount the Checkbox from the other side, remove the profile and attach it to the opposite side of the Checkbox.



Caution Damage to components.

- Only modify the Checkbox in a clean environment
- Only use suitable screws. The screw-in depth in the device is limited to a maximum of 6 mm

A connecting kit (type HMSV-12) is available as an accessory from Festo



- 1 Mounting profile of the Checkbox
- 2 Clamping elements with 4 M5x45 socket head screws
- 3 2 M5x16 socket head screws with centring sleeves
- 4 Adapter plate

Fig. 3 Mounting the Checkbox with connecting kit HMSV-12



Note

In order to ensure a reliable test result can be achieved, the glass surfaces on the prism supports must not be scratched or dirty

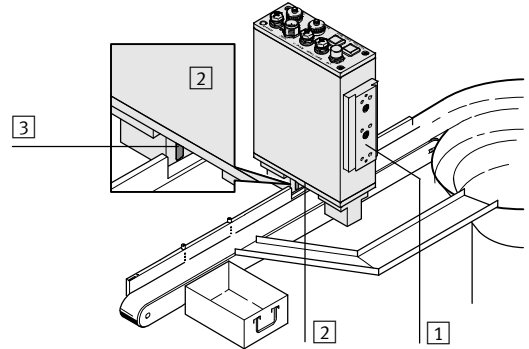
- Mount the Checkbox so that passing parts do not touch the glass surfaces.
- Ensure the stable position of the parts, e.g. by means of mechanical devices.
- Clean the glass surfaces if necessary

Mount the Checkbox over the transporting device so that:

- The Checkbox and transporting device are mounted securely to each other
- The field of view of the camera is not impeded
- The optical channel is not covered by the transporting device

The Checkbox Compact has excellent imaging properties over the entire working space. The contrast of the image is optimised for very fine details on the sensor side.

- To achieve maximum contrast for small details, mount the device in such a way that the objects are passed as close as possible to the prism support on the sensor side. This is on the side with the Start/Stop button.



- 1 Mounting profile
- 2 Optical channel of the camera
- 3 Glass surface on the prism support (opening for light beam)

Fig. 4 Arrangement of the Checkbox over the transporting device (example)

4 Electrical installation



Caution Danger from unexpected movement

- Check within the framework of your EMERGENCY STOP concept to ascertain the measures necessary for putting your machine/system into a safe state in the event of an EMERGENCY STOP (e.g. switching off the operating voltage, switching off pressure).



Caution Malfunctions due to excessively long cables

Long I/O signal lines reduce the resistance to interference.

- Therefore comply with the maximum permissible I/O signal line length of 30 m.

■ ■ ■ Preparing plugs and cables

Use plugs and sockets from the Festo supply programme which match the outer diameter of the cables used (www.festo.com/catalogue).



Note

Angled connectors can transfer large forces into the device. This can lead to mechanical destruction of the electronics.

- When using angled connectors pay particular attention to ensure that no excessive force is exerted on the connections. Attach cables in such a way that only minor forces are exerted on the connections of the Checkbox.



Note

In this way, you will avoid interference from electromagnetic influences:

- You can use unscreened cables up to 30 m in length for actuators and buffers.
- Only use screened cables and plug connectors for all other connections.
- Provide potential equalisation when connecting components via screened cables. The cable screening and screen connections of the Checkbox are not intended to carry compensating current caused by potential differences.
- Use large-cross-section cable that is as short as possible.
- Connect both the FE earth terminal and the cable screening with low impedance to the earth potential.
- At the FE connection on the front panel, use an earthing strap with a suitable cross section.

→

Note

To avoid damaging the device as a result of a voltage overshoot when switching on, please observe the following:

- Power supply is only permitted with round cables; do not use single wires.
- To avoid voltage overshoots when connecting to low impedance supplies, please pay attention to the lower inductance of the supply cable.
- To ensure optimum attenuation of the voltage overshoot, the supply cable should not be of too low an impedance. Festo therefore recommends a cross section of 1.0 or 1.5 mm²
- Observe the maximum load capacity of the cable.
- Safeguard the supply cable appropriately. Do not exceed values in data sheets. Only use regulated power supply units. First establish the secondary-side connection, then switch on the power supply unit on the primary side. Do not connect to sources when powered.

→

Note

For general protection of the device, and to avoid overloading the GND pins of the interfaces in particular, please observe the following:

- Do not connect any outputs in parallel.
- Do not feed any voltage into the outputs; this will annul the internal current monitoring function; if polarity reversal occurs, there is a risk that the device will be destroyed.
- Only use the GND connection of the respective plug connector or the GND of the power supply unit as the GND.
- Do not return any of the output signals at the PLC, actuator or buffer plug connector to the GND of one of the other output connectors.
- If an overload occurs, the outputs will be switched off. This also applies to the warning or error output where applicable. These are only intended for diagnostic purposes. To identify the operating status use the “Ready for operation” signal that operates with reverse logic. If an error occurs, this is switched off. As a result, an external control system could identify the error.
- When connecting inductive loads (solenoid coils, valves, contactors, relays, etc.), an appropriate RC element (free-wheeling diode, RC snubber, varistor, etc.) must be provided directly on the load.
- Select appropriate plug connectors and cables as well as suitable cross sections. Do not overload the cables.

Cable outside diameter	Plugs/sockets
4.0 ... 6.0 mm	PG 7
6.0 ... 8.0 mm	PG 9
10.0 ... 12.0 mm	PG 13.5

Connection	Plugs/sockets
Power supply socket	PG 9 or PG 13.5
Sensors, actuators	PG 7

In order to guarantee observance of the IP protection class for the completely fitted Checkbox:

- Tighten the union nuts of the plug connectors by hand.
- Seal unused sockets with the protective caps supplied

4.1 Selection of the power supply unit

⚠

Warning
Electric shock

Injury to people, damage to the machine and system

- Only use PELV circuits in accordance with IEC 60204-1 (protective extra-low voltage, PELV) for the electrical power supply.
- Observe the general requirements of IEC 60204-1 for PELV circuits.
- Use only voltage sources that guarantee a reliable electric separation of operating and load voltage in accordance with IEC 60204-1.

- Make sure the power supply unit fulfils the requirements specified in the Checkbox data sheet with regard to voltage, current and power.
- Allow for a sufficient power reserve.
- Observe the power consumption of connected consumers as well as system expansions.

4.2 Connection of the operating voltage

⚠

Warning
Risk of fire

- Protect the supply cable with a 4 A fast-acting fuse.

- Use an operating voltage cable with a suitable cable cross section
- Avoid long distances between the power supply unit and the Checkbox. Long operating voltage cables reduce the voltage supplied by the power supply unit. Connect the Checkbox to the operating voltage as follows:

Pin	24 V DC plug connection	
1	Do not connect	
2	+24 V DC, -15 % +20 %; protect with 4 A fast-acting fuse	
3	GND	
4	FE	

4.3 Power supply for external components

When connecting the Checkbox to other devices (e.g. PLC, conveyor device) via the connections PLC, ACTUATORS or BUFFER/FEEDER, do not connect the potential at the “24 V DC” connection of the Checkbox with other plug connectors of the Checkbox.

i

Consuming devices can also be supplied with voltage via the PLC plug. Also observe the information in the → CHB-C-N description, chapter 3.6.

4.4 Actuators

Actuators connection socket		
A/1	Actuator 3	
A/2	Actuator 2	
3	GND	
A/4	Actuator 1	
5	Do not connect	

4.5 Buffer/Feeder

Buffer/Feeder connection socket		
A/1	24 V DC / Box ready – Reference voltage for sensors (switched off in Stop status) – Operating status – Control for transporting device (e.g. conveyor belt)	
A/2	Feeder, control of the small parts conveyor (e.g. upstream feeder bowl)	
3	GND, reference voltage for sensors	
E/4	Buffer, buffer zone sensor 1	
5	Do not connect	

4.6 Ethernet

Pin	Signal	M12 Ethernet connection socket ¹⁾	
1	TD+	Transmitted data +	
2	RD+	Received data +	
3	TD-	Transmitted data -	
4	RD-	Received data -	
Metal covering		Screening (shield)	
¹⁾ d-coded			

4.7 Encoder:

Encoder connection socket		
Interface for rotary pulse generator as per RS 485 specification		
1	A+	
2	n.c.	
3	B+	
4	A-	
5	B-	
6	5 V supply ¹⁾	
7	GND	
8	n.c.	
¹⁾ Maximum loading 180 mA		

5 Commissioning

Warning

Check to see which measures are necessary for putting your machine/system in a safe state when it is switched on and off. Sudden, unexpected movements of the connected actuators can cause personal injury and damage to property if e.g.

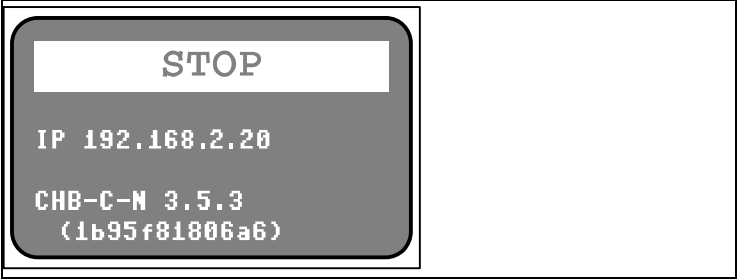
- the transporting device is moved to its initial position when the power supply is switched off,
- the transporting device starts automatically if controlled by the Checkbox when the Checkbox starts.

In order to prevent the transporting device from starting automatically when the operating voltage is switched on, observe the following.

- Select in CheckKon [View][System parameter] ◇ System ◇ Operating modes ... ◆ Automatic start after supply voltage on = **no** (factory setting).

Switching on

- Switch on the operating voltage for the Checkbox via the power supply unit
- Start CheckKon in order to display and set the system parameters.
- Start the transporting device manually if necessary.

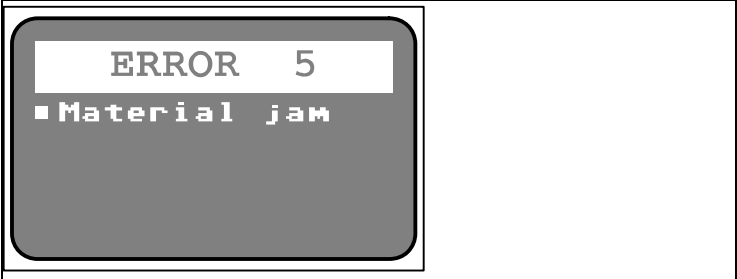


- Readiness to operate is signaled by the STOP status
- The IP address (factory setting 192.168.2.20) indicates the current IP address of the device
- CHB-C-N firmware version number (3.5.3)
 - (Hash value of the firmware version 1b95f81806a6)

Additional steps regarding preparation for commissioning can be found in the → CHB-C-N description

6 Diagnostics and troubleshooting

- The Checkbox indicates operating errors as follows:
- The Checkbox switches automatically to the STOP status.
 - The illuminated pushbuttons on the Checkbox flash.
 - The display shows the error code “Error” including an explanation in English (for an overview of the types of error refer to the CHB-CN description, appendix A1).



- Example:
- ERROR error number (5)
 - The error description (Material jam) provides a brief textual description for the corresponding error number and information concerning remedial measures

Pushbutton	Status		Significance
Start/Stop		Flashes red	Error message / warning
Status/Teach		Flashes yellow	

- The Checkbox cannot be started again until the fault has been eliminated:
- Eliminate cause of malfunction
 - Acknowledge error message: Press the Start/Stop button
 - Start Checkbox: Press the Start/Stop button

- Additional information:
- Details regarding the error codes and instructions on eliminating the errors can be found in the → CHB-C-N description, appendix A.1
 - The CHB-C-N also signals faults at the PLC connection via A/17 (error) and A/23 (warning) if applicable.

7 Repair and disposal

- The prism module can be replaced if it is damaged. Additional information about this can be found in the → CHB-C-N description, chapter 6.1
- Observe the local regulations for environmentally friendly disposal of electronic components.

8 Technical data

CHB-C-N		
Temperature ranges		
Ambient temperature	[°C]	5 ... +50 with 1 A load 5 ... +45 with 3 A load
Storage temperature	[°C]	-20 °C ... +70 °C
Ambient conditions		Dry Screened from extreme external light sources Cleanest possible ambient air
Protection against electric shock		PELV (Protective Extra-Low Voltage)
CE marking (see declaration of conformity)		In accordance with EU EMC Directive
Max. permissible I/O signal line length	[m]	30
Max. permissible Ethernet signal line length	[m]	70
Vibration resistance		Severity level 2 in acc. with EN-60068 Part 2-6 / FN 942017-4
Shock resistance		Severity level 2 in acc. with EN-60068 Part 2-27 / FN 942017-5
Protection class (plug connector inserted or provided with protective cap)		IP64
Electrical data		
Nominal DC operating voltage	[V DC]	24
Permissible voltage fluctuations	[%]	-15 / +20
Current consumption with load-free outputs	[mA]	400
Internal fuse protection	[A]	4 (fuse)
Interfaces		
Connection for encoder		according to RS 485 specification
Ethernet connection		Ethernet interface 100 MBit/s
Dimensions		
Length/width/height (without plug connector)	[mm]	164 / 60 / 241
Inside passage of the optical channel	[mm]	59.2
Inside height of the optical channel	[mm]	40
Electrical properties of the I/O signals		
Outputs		All outputs electronically limited to max. 700 mA
Max. resultant current at “PLC” connection	[A]	0.9
Max. resultant current at the Actuator, Buffer connections	[A]	1.9
Max. resultant current of all outputs	[A]	3
Camera and lighting		
Resolution	[Pixels] / [µm]	2048 / 14 * 14
Line rate	[Hz]	1000 ... 8500
Properties of conveyed parts		
Component range		Rotationally symmetrical parts and pre-oriented parts of any shape
Min. part length	[mm]	1
Max. part length		Dependent on belt speed and required resolution
Part diameter	[mm]	0.5 ... 25