

Checkbox Compact, CHB-C-N



Checkbox Compact, CHB-C-N

Key features

The new Checkbox Compact

Camera-based sorting, inspecting and counting of assembly components

The Checkbox Compact is an automation component with optical workpiece identification for sorting small parts by type, by position orientation and quality, and, if appropriate, also by quantity (quantity selection).

It is particularly suitable for fault-free feeding of small parts to assembly and production machines, especially where there is a high parts rate and a large number of different types.

The Checkbox Compact enables reliable rejection of faulty parts, prevents assembly of incorrect types and reduces setup times to a minimum.

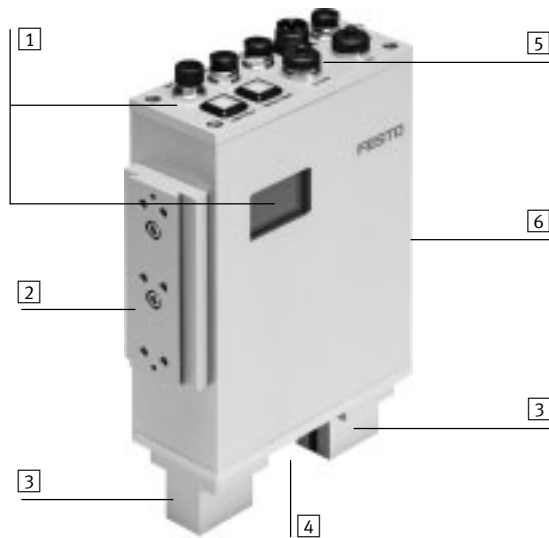
Compact versatility

Camera technology and control of parts flow integrated into field-tested unit

The Checkbox Compact consists of a sturdy aluminium housing which accommodates all the necessary components.

- User interface (keys, LEDs, display)
- Plugs for the electrical connection of actuators, buffer zone sensors, diagnostics PC, power supply, encoder
- Line scan technology (light, fibre-optic cable, image sensor)

The optical channel in which the parts are scanned is on the underside of the Checkbox Compact. It is open at the bottom, allowing the Checkbox to be mounted above a range transportation devices (e.g. conveyor belt).



The Checkbox Compact provides 24 V DC high-power signals at its outputs, which can be used to directly actuate quick-switching pneumatic valves, for example, in order to reliably filter faulty or incorrectly oriented parts out of the parts flow using an air jet. However, other actuators such as pneumatic or electrical ejectors, deflectors or turning stations can also be controlled. By integrating additional sensors (inductive, capacitive, optical, colour sensors) additional quality characteristics can be checked, or vision sensors or vision systems can be connected to integrate further complex workpiece inspections into the process. The function range is completed by inputs for encoders for belt speed monitoring and buffer zone sensors and an output for controlling the conveying device.

1 User interface front panel:

- Keys
 - LEDs
- Housing side:
- Display

2 Mounting component

- Mounting profile matches connecting kit HMSV-12 (accessories)
 - 6 threaded holes M5, screw-in depth 12 mm
 - Holes for dowel pins 3 mm (ISO 2338, 3m6)
- Mounting profile can also be mounted on the opposite side

3 Prisms

4 Optical channel

5 Electrical connections

- Power supply
- Ethernet interface
- Actuators
- Buffer sensor/small parts conveyor
- Higher-order PLC
- Encoder

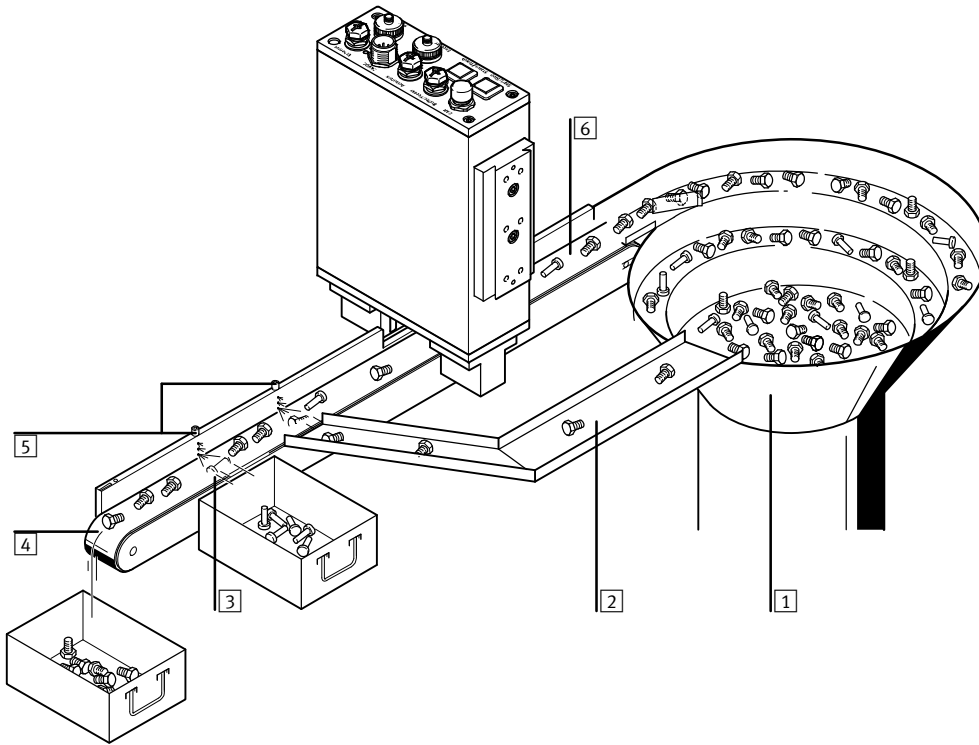
6 Mounting thread for

- Mounting profile with dovetail guide
 - Direct mounting with thread M5, max. screw-in depth 6 mm, drill holes for dowel pins 3 mm (ISO 2338, 3m6)
- Identical mounting pattern on the opposite side

Checkbox Compact, CHB-C-N

Key features

Operational principle



Integration of the Checkbox in a transportation device:

Example with conveyor belt and two actuators

| | |
|---|---|
| 1 | Small parts conveyor e.g.: vibratory bowl feeder, centrifuge, step feeder |
| 2 | Return of incorrectly orientated parts to the small parts conveyor |
| 3 | Ejecting bad parts (faulty parts, wrong part type) |
| 4 | Onward transfer of good parts to a buffer zone or the next machine |
| 5 | Actuators e.g.: blow-off valves, pushers or turning stations |
| 6 | Transportation device e.g. conveyor belt, linear axis |

The parts to be checked are passed through the optical channel of the Checkbox by a transportation device.

The part contour is scanned using the transmitted-light method as it passes through the "optical channel".

The Checkbox sorts the parts on the basis of the contour data into:

- Good part, correctly oriented: the checked part is conveyed to the end of the transportation device and passed to the next station
- Good part, incorrectly oriented: the checked part is filtered out, e.g. at the first actuator position, and returned to the conveying system or rotated to the correct orientation at a turning a rollover station. Filtering out can be carried out by a pulse of air, for example
- Bad part or incorrect type: the checked part is filtered out, e.g. at the second actuator position

Compared to detection using an area scan camera, image detection with the scanning method used by the Checkbox (line-scan system) has significant advantages. For example, any combination of parts can be detected and processed without the need to maintain minimum distances, and considerably longer objects (up to > 1000 mm) can also be detected and processed

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Key features

Which parts are suitable?

In principle, all workpieces that can be transported in a stable position and the quality and position orientation of which can be detected in a camera image using contour features.

Colour or material properties can also be included in the inspection by using additional sensors.

Selection from the variety of parts from A to Z:

- | | | | |
|-----------------------|-----------------------|--------------------------|-------------------------------|
| • Axes | • Filter elements | • Bearings | • Writing utensils |
| • Applicators | • Threaded pins | • Fibre-optic cables | • Sensor housing |
| • Batteries | • Threaded sleeves | • Lipstick casings | • Fuses |
| • Fittings | • Glass ampoules | • Insulating terminals | • Game pieces |
| • Mounting components | • Glass vials | • Motor parts | • Spikes |
| • Drills | • Buckles | • Nuts | • Syringes and their parts |
| • Pins | • Wooden dowel | • Needles | • Spray heads |
| • Brushes | • Sleeves | • Nails | • Stamping parts |
| • Clips | • Hygiene products | • Nail magazines | • Plug connectors |
| • Dental drills | • Hydraulic elements | • Rivets | • Pins |
| • Sealing rings | • Installation parts | • Camshaft components | • Pen tops |
| • Swivel parts | • Cannulae | • O-rings | • Tablets |
| • Dowel pins | • Ceramic seals | • Plastic housings | • Washers |
| • Inserts | • Chain links | • Piercing parts | • Valve springs |
| • Bicycle parts | • Buttons | • Wheel bolts | • Valve guides and seat rings |
| • Fixtures | • Cosmetic items | • Zipper components | • Shafts |
| • Springs | • Ballpoint pen parts | • Switch contacts | • Corrugated tubes |
| • Spring washers | • Plastic vials | • Windscreen wiper parts | • Toothbrush components |
| • Bottle tops | • Haberdashery items | • Screws | • Ignition parts |

What parts rates and speeds can be achieved?

Depending on the length of the parts, parts rates of over 1500 per minute can be achieved, with transportation speeds for the parts of more than 60 metres per minute.

In which sectors is the Checkbox CHB-C-N used?

- | | |
|--|---------------------------|
| • Automotive | • Furniture industry |
| • Clothing | • Pharmaceutical industry |
| • Dental technology | • Optical industry |
| • Electrical engineering and electronics | • Polymers |
| • Precision mechanics | • Toys and games |
| • Electroplating | • Grinding technology |
| • Woodworking industry | • Tools |
| • Cosmetics | • Packaging technology |
| • Metal working | |

Checkbox Compact, CHB-C-N

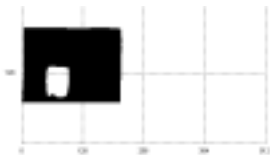
Key features

What does the camera see?

Inspection part
Insulating terminal insert



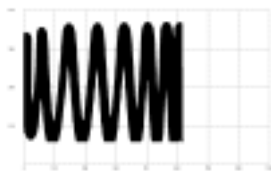
Camera image
Insulating terminal insert



Inspection part
Valve spring



Camera image
Valve spring



Inspection part
Glass ampoule



Camera image
Glass ampoule



Inspection part
Glow plug



Camera image
Glow plug



Inspection part
Check valve



Camera image
Check valve



Inspection part
Refill tip

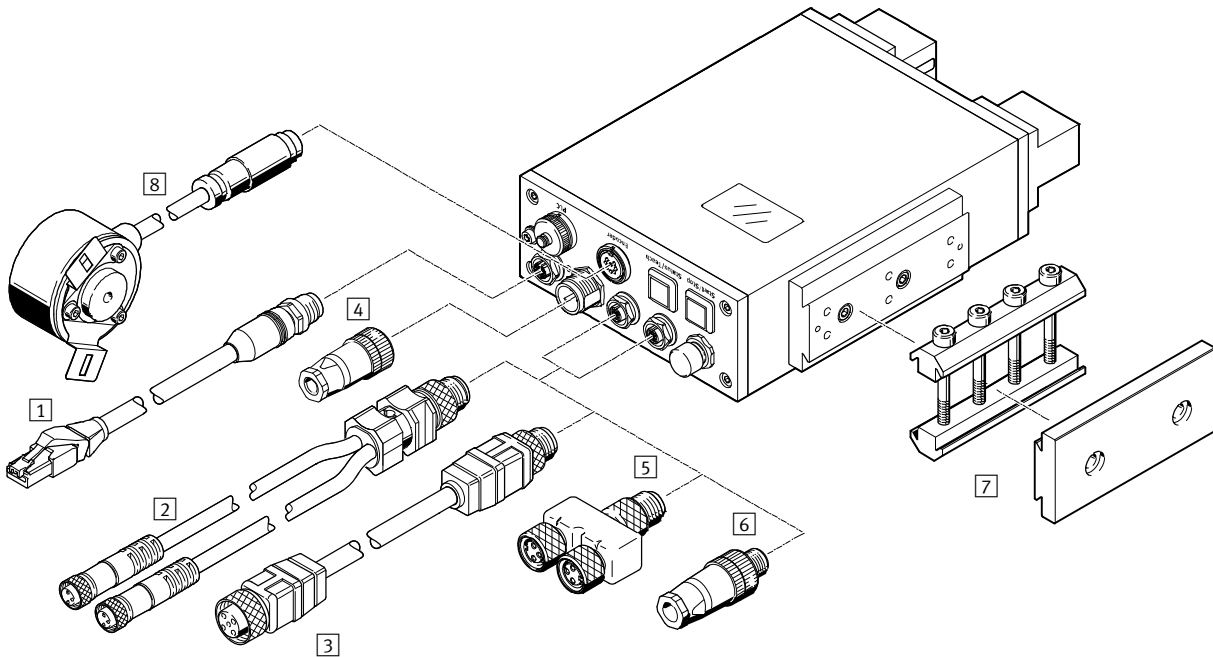


Camera image
Refill tip



Checkbox Compact, CHB-C-N

Peripherals overview



| Mounting components and accessories | | → Page/Internet |
|-------------------------------------|-----------------------------------|-----------------|
| 1 | Connecting cable NEBC-D12G4-KS | 12 |
| 2 | Duo cable KM12-DUO | 12 |
| 3 | Connecting cable KM12-M12-GSGD | 12 |
| 4 | Plug socket NTSD-GD | 12 |
| 5 | T-plug connector NEDU-M8D3 | 12 |
| 6 | Plug connector NECU-S-M12G4 | 12 |
| 7 | Adapter kit HMSV-12 | 11 |
| 8 | Encoder TU-30/80-EC-L/R | 11 |
| - | Software | 11 |

Checkbox Compact, CHB-C-N

Technical data



| General technical data | | |
|-------------------------------------|------|-------------------|
| Type of mounting | | Via dovetail slot |
| | | Via female thread |
| | | Via accessories |
| Dimensions W x L x H | [mm] | 60 x 164 x 256.9 |
| Dimensions of optical channel W x H | [mm] | 59.2 x 40 |
| Product weight | [g] | 2325 |

| Immissions/emissions | | |
|--|------|--|
| Ambient temperature | [°C] | -5 ... +45 |
| Storage temperature | [°C] | -20 ... +70 |
| Degree of protection | | IP64 |
| Certification | | RCM mark |
| CE marking (see declaration of conformity) | | To EU EMC Directive |
| Ambient conditions | | Screened from extreme external light sources |
| | | Cleanest possible ambient air |
| | | Dry |
| Photobiological safety | | Risk group 1 (low risk) to DIN EN 62471:2009-03 |
| Vibration resistance | | Transport application test with severity level 2 to FN 942017-4 and EN 60068-2-6 |
| Shock resistance | | Shock test with severity level 2 to FN 942017-5 and EN 60068-2-27 |
| Protection against direct and indirect contact | | PELV |
| Corrosion resistance class CRC ¹⁾ | | 2 |

1) Corrosion resistance class CRC 2 to Festo standard 940070
 Moderate corrosion stress. Internal applications in which condensation may occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.

Checkbox Compact, CHB-C-N

Technical data

| Electronics | | |
|---|------|---|
| Sensor resolution | | 2048 pixels/line |
| Pixel size | [mm] | 0.014 |
| Sensor type | | CMOS line scan |
| Max. line frequency, sensor | [Hz] | 8500 |
| Max. no. of inspection programs | | 256 |
| Max. no. of types per inspection program | | 1 |
| Max. no. of different orientations per memorised type | | 8 |
| Quantity preselection | | Using CheckOpti software |
| Counting function | | Yes |
| Counting range | | 1 ... 9999999 |
| Min. part length | [mm] | 1 |
| Max. part length | | Depends on belt speed and resolution required |
| Min. part diameter | [mm] | 0.5 |
| Max. part diameter | [mm] | 25 |
| Nominal DC operating voltage | [V] | 24 |
| Permissible voltage fluctuations | [%] | -15 ... +20 |
| Current consumption with load-free outputs | [mA] | 400 |
| Internal fuse protection | | 4 A fuse |
| Max. no. of memorised types | | 1 |
| Max. starting current per output channel | [A] | 1.3 |
| Electronic limitation of outputs | [mA] | 700 |

| Power supply interface | | |
|------------------------|-----|--------|
| Connection type | | Plug |
| Connection technology | | M 18x1 |
| Number of pins, wires | | 4 |
| Max. residual current | [A] | 3.0 |

| Actuator interface | | |
|-----------------------|-----|----------------------------------|
| Connection type | | Socket |
| Connection technology | | M12x1, A-coded to EN 61076-2-101 |
| Number of pins, wires | | 5 |
| Max. residual current | [A] | 1.9 |

| Buffer/feeder interface | | |
|-------------------------|-----|----------------------------------|
| Connection type | | Socket |
| Connection technology | | M12x1, A-coded to EN 61076-2-101 |
| Number of pins/wires | | 5 |
| Max. residual current | [A] | 1.9 |

Checkbox Compact, CHB-C-N

Technical data

| PLC interface | |
|----------------------------|--|
| Connection type | Socket |
| Connection technology | M16x0.75 |
| Number of pins, wires | 24 |
| Max. residual current [A] | 0.9 |
| Outputs | Good part and correctly oriented |
| | Good part but incorrectly oriented |
| | Faulty part |
| | Conveyor control |
| | Status signal "Warning" |
| | Error output |
| | Counter reading reached |
| | PLC power supply |
| Inputs | Buffer sensor 1 |
| | Buffer sensor 2/Inspection program bit 2 |
| | External error |
| | Counter reset |
| | External start |
| | Ext. sensor/inspection program bit 3 |
| | Key lock |
| | Check program bit 0 |
| | Check program bit 1 |
| Input characteristic curve | To IEC 61131-2, type 1 |

| Ethernet interface | |
|----------------------------|----------------------------------|
| Connection type | Socket |
| Connection technology | M12x1, D-coded to EN 61076-2-101 |
| Number of pins, wires | 4 |
| Transmission rate [Mbit/s] | 10/100 |
| Function | Diagnostics |
| | Programming |

| Encoder interface | |
|-----------------------|----------|
| Connection type | Socket |
| Connection technology | M16x0.75 |
| Number of pins, wires | 8 |

| Fieldbus interface | |
|--------------------|--------------------|
| Note | Not connected |
| Protocol | CAN, not supported |

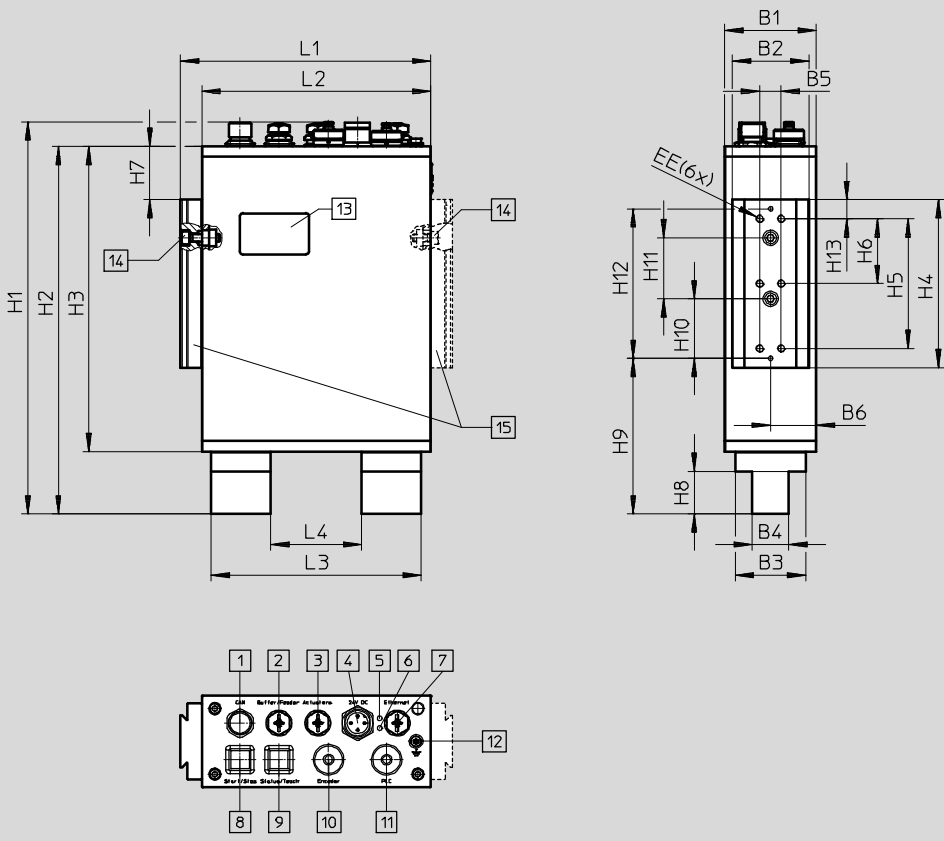
| Materials | |
|-------------------|-------------------------|
| Housing | Wrought aluminium alloy |
| End cap | Wrought aluminium alloy |
| Note on materials | RoHS-compliant |

Checkbox Compact, CHB-C-N

Technical data

Dimensions

Download CAD data → www.festo.com



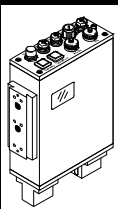
Technical drawing showing front and side views of the Checkbox Compact, CHB-C-N. Dimensions are labeled as L1, L2, L3, L4, H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, H12, H13, B1, B2, B3, B4, B5, B6. Callouts 1-15 identify specific features.

- 1 Fieldbus, not active
- 2 Buffer/feeder connection
- 3 Actuator connection
- 4 24 V DC connection
- 5 LED Ethernet speed
- 6 LED Ethernet link/traffic
- 7 Ethernet port
- 8 Start/stop button
- 9 Status/teach-in button
- 10 Encoder connection
- 11 PLC connection
- 12 PE
- 13 LCD display
- 14 M5. Screw-in depth max. 12 mm. For mounting without dovetail adapter plate, max. screw-in depth 6 mm.
- 15 Dovetail adapter plate

| Type | L1 | L2 | L3 | L4 | H1 | H2 | H3 | H4 | H5 | H6 | H7 | H8 |
|---------|-----|-----|-------|------|-------|-----|-----|-----|----|------|----|----|
| CHB-C-N | 164 | 150 | 137.4 | 59.4 | 256.9 | 241 | 200 | 110 | 85 | 42.5 | 35 | 28 |

| Type | H9 | H10 | H11 | H12 | H13 | EE | B1 | B2 | B3 | B4 | B5 | B6 |
|---------|-----|-----|-----|-----|------|----|----|----|----|----|----|----|
| CHB-C-N | 102 | 39 | 40 | 98 | 12.5 | M5 | 60 | 50 | 46 | 24 | 14 | 30 |

Ordering data

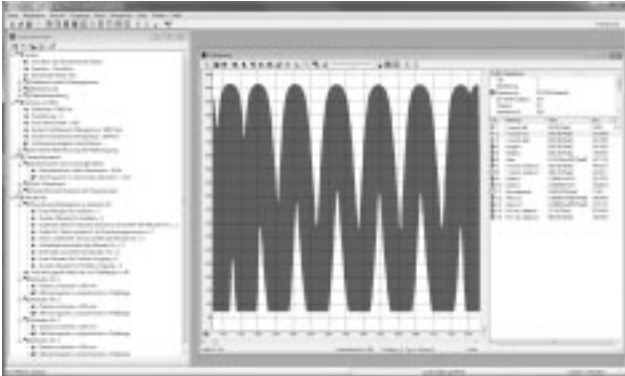
| Description | Part No. | Type |
|--|----------------|----------------|
|  Checkbox CHB-C-N | 3501040 | CHB-C-N |

Checkbox Compact, CHB-C-N

Features and accessories

Software to meet individual requirements

CheckKon



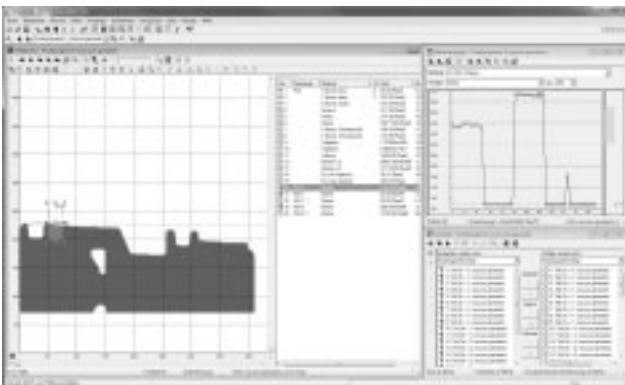
Performance characteristics

This software allows you to display, record and adjust the processes within the Checkbox CHB-C-N, from evaluation of the camera images through to the I/O parameters.

This includes:

- System configuration with display and modification of parameters and operating modes
- System diagnostics and error analysis
- Display and recording of inspection part images and inspection results
- Filing and documentation of system settings
- Inspection program management
- Statistical evaluation of inspection results

CheckOpti



Software program

“CheckOpti” is used if the standard learning process of the Checkbox CHB-C-N reaches its limits due to the differences in contours being too small, i.e. if the orientation and quality detection for an inspection part is not reliably guaranteed.

If necessary, additional, effective inspection characteristics can be defined so that the system is optimised for the particular application.

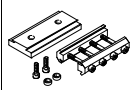
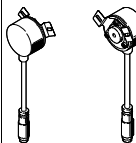
CheckOpti is also used for:

- Setting the default values for the counter function
- Filing and documentation of the inspection programs

Further product information → www.festo.com







| Engineering software | Technical data → Internet: www.festo.com/sp |
|----------------------|---|
| Description | Language |
| Software CheckKon | German, English |
| Software CheckOpti | German, English |

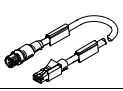
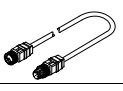

| Operating instructions | | Part No. | Type |
|------------------------|--|----------------|------------------------|
| German | | 8046181 | GDCA-CHB-C-N-DE |
| English | | 8046182 | GDCA-CHB-C-N-EN |

| Ordering data – Accessories | | | |
|---|-----------------------------|---------------|------------------------|
| | Description | Part No. | Type |
| Adapter kit | | | |
| Technical data → Internet: hmsv-12 | | | |
|  | With screw-on adapter plate | 177658 | HMSV-12 |
| Encoder | | | |
|  | Encoder, cable length 2 m | 540140 | TU-30/80-EC-L/R |

Checkbox Compact, CHB-C-N

Accessories

| Ordering data | | | | | |
|---|---|---|---------------|------------------------------|--|
| | Description | Connection cross section [mm ²] | Part No. | Type | |
| Plug socket Technical data → Internet: ntsd | | | | | |
|  | Straight socket, 4-pin, screw terminal | 1.5 | 18493 | NTSD-GD-9 | |
| | | 2.5 | 18526 | NTSD-GD-13,5 | |
| Plug connectors Technical data → Internet: sea, necu | | | | | |
|  | Straight plug, M12x1, 4-pin, type A, screw terminal | 0.14 ... 0.5 | 19208 | SEA-4-GS-7-2,5 | |
| | | 0.75 | 18666 | SEA-GS-7 | |
| | | 0.75 | 18779 | SEA-GS-11-DUO | |
|  | Straight plug, M12x1, 4-pin, type A, screw terminal | 0.14 ... 0.5 | 570955 | NECU-S-M12G4-P1-Q6-IS | |
| | | 0.75 | 570953 | NECU-S-M12G4-P1-IS | |
|  | Straight plug, M12x1, 4-pin, type A, screw terminal for intrinsically safe circuits | 0.75 | 570956 | NECU-S-M12G4-D-IS | |
| | | | | | |
| T-plug connector Technical data → Internet: nedu | | | | | |
|  | 4-pin, M12x1 plugs / 3-pin, M8x1 sockets | - | 541597 | NEDU-M8D3-M12T4 | |
| | | | | | |
|  | 4-pin A-coded M12x1 plugs/sockets | - | 541596 | NEDU-M12D5-M12T4 | |
| | | | | | |

| Ordering data | | | | | | |
|---|--|-------------------------------|------------|------------------|----------------|------------------------------|
| | Electrical connection 1 | Electrical connection 2 | Weight [g] | Cable length [m] | Part No. | Type |
| Connecting cable Technical data → Internet: nebc | | | | | | |
|  | Straight plug, M12x1, 4-pin, D-coded, screenable | Straight plug, RJ45, 4-pin | 157 | 3 | 8031121 | NEBC-D12G4-KS-3-R3G4 |
| | | | 455 | 10 | 8031122 | NEBC-D12G4-KS-10-R3G4 |
| Connecting cable Technical data → Internet: km12 | | | | | | |
|  | M12x1, 4-pin plug, straight | M12x1, 4-pin socket, straight | - | 2.5 | 18684 | KM12-M12-GSGD-2,5 |
| | | | - | 5 | 18686 | KM12-M12-GSGD-5 |
| Duo cable Technical data → Internet: km12-duo | | | | | | |
|  | M12x1, 4-pin plug, straight | M12x1, 4-pin socket, straight | - | 5 | 18685 | KM12-DUO-M8-GDGD |
| | | | | | | |

Checkbox Compact, CHB-C-N

Application examples

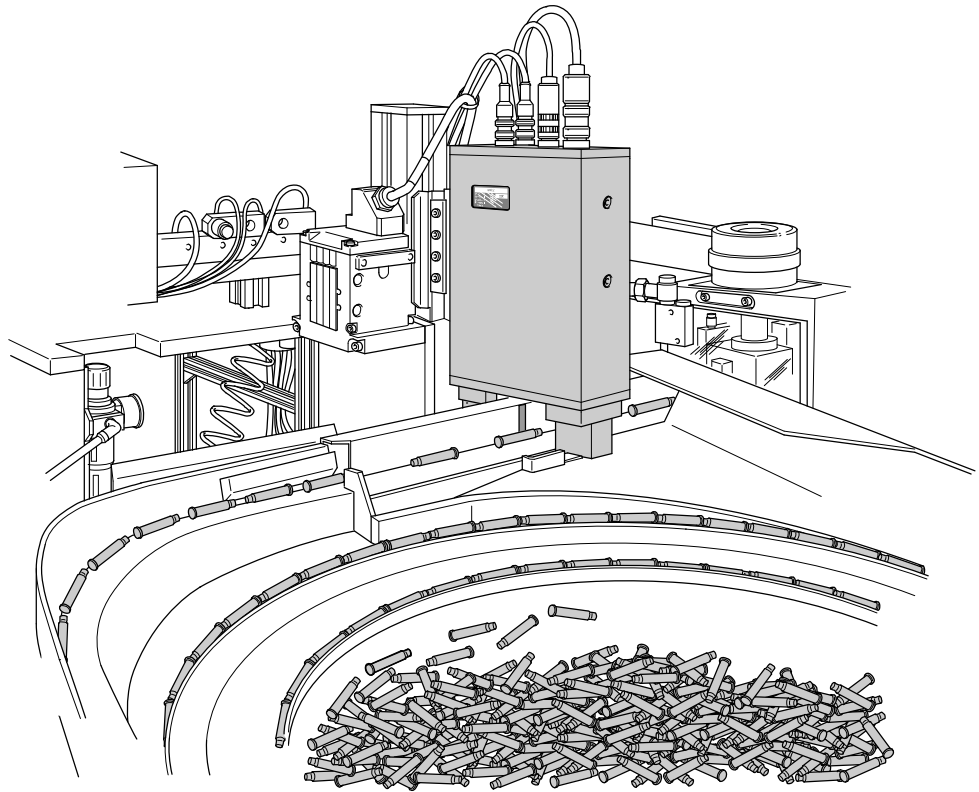
Application examples

Position and quality inspection of inner pins

The Checkbox CHB-C-N inspects the inner pins and controls the entire feed process, e.g. a subsequent turning station for rotating incorrectly oriented good parts and a blow-off nozzle for filtering out bad parts.

The following features are checked:

- Orientation
- Diameter
- Length
- Shape



Position and quality inspection of fibre-optic cables

The Checkbox CHB-C-N inspects the transparent display components, controls the parts flow and removes incorrectly oriented or faulty parts reliably with the use of blow-off nozzles.

The following features are checked:

- Orientation
- Shape
- Diameter
- Trapped air

