Compact Performance
CP fieldbus node 5
Programming and diagnosis

Fieldbus protocols:
Festo fieldbus
ABB CS 31
Klöckner-Moeller SUConet K

Only valid in agreement with the printed documentation accompanying the product! Compare this edition code.
Contents and general safety instructions

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Contents and general safety instructions

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Designated use

The CP field bus node CP-FB5-E documented in this manual is designated for use as a slave on the following field bus systems:

– Festo Fieldbus
– ABB CS31
– Klöckner-Moeller SUCONET K

Festo CP modules can be connected to the field bus node CP-FB5-E. The specified limit values for pressures, temperatures, electrical data, moments, etc. must be observed when additional commercially-available components such as sensors and actuators are connected.

Please comply also with national and local safety laws and regulations.

Target group

This manual is directed exclusively at technicians who are trained in control and automation technology and who have experience in installing, commissioning, programming and diagnosing the slaves for the field bus systems above.

Information on this manual

This manual contains specific information on the installation, commissioning, programming and diagnosis of the CP field bus node 5.

Information on further CP modules can be found in the relevant manual. This is summarized in a table further in this chapter.
Contents and general safety instructions

Important user instructions

This manual contains instructions on the dangers which may occur if the CP system is not used correctly. These instructions are always printed in italics, are framed and also signalled by a pictogram.

A distinction is made between the following:

- **WARNING**
  This means that personal injury or damage to property may occur if these instructions are not observed.

- **CAUTION**
  This means that damage to property may occur if these instructions are not observed.

- **PLEASE NOTE**
  This means that this instruction must also be observed.
Pictograms and symbols complement the danger warnings and draw attention to the nature and consequences of dangers.

The following pictograms are used:

- Uncontrolled movements of loose tubing.

- Unintentional movements of the connected actuators.

- Electrostatically vulnerable components. These will be damaged if you touch the contact surfaces.

Text markings

- This mark indicates activities which can be carried out in any order.

1. Figures indicate activities which must be carried out in the numerical order of the figures.
   - Hyphens indicate general activities.
Fig. 0/1: Manuals on the CP system
The following product-specific terms and abbreviations are used in this manual:

<table>
<thead>
<tr>
<th>Term/abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Digital output</td>
</tr>
<tr>
<td>CP system</td>
<td>Complete system consisting of CP field bus node and CP modules</td>
</tr>
<tr>
<td>CP modules</td>
<td>Common term for the various modules which can be incorporated in a CP system</td>
</tr>
<tr>
<td>CP connection</td>
<td>Socket or plug on the CP modules, through which the modules are connected to the node by means of the CP connection</td>
</tr>
<tr>
<td>CP cable</td>
<td>Special cable for connecting the various CP modules</td>
</tr>
<tr>
<td>E</td>
<td>Digital input</td>
</tr>
<tr>
<td>I/O module</td>
<td>Common term for the CP modules which provide digital inputs outputs</td>
</tr>
<tr>
<td>I/Os</td>
<td>Digital inputs and outputs</td>
</tr>
<tr>
<td>Node</td>
<td>CP field bus node with/without field bus connection to which the I/O modules are connected</td>
</tr>
<tr>
<td>Save (SAVE buttons)</td>
<td>Save the current string assignment (connected I/Os): when the CP system is started the saved string assignment is compared with the current string assignment. If these differ the LEDs will blink.</td>
</tr>
<tr>
<td>PLC/IPC</td>
<td>Programmable logic controller/industrial PC</td>
</tr>
<tr>
<td>String</td>
<td>Total number of I/O modules that are connected to one common CP connection on the field bus node</td>
</tr>
<tr>
<td>String assignment</td>
<td>Total of all I/O modules that are connected to a CP field bus node via strings</td>
</tr>
<tr>
<td>Word length</td>
<td>Number of address words reserved by the CP system</td>
</tr>
</tbody>
</table>
Chapter 1

Installation
## Contents

### 1. Installation

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</tr>
<tr>
<td>1.5.3 Connecting the bus</td>
<td>1-18</td>
</tr>
</tbody>
</table>

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1.2 CP FB5-E 9706 NH
1. Installation

1.1 General instructions

**WARNING**

Before undertaking installation and maintenance work, switch off the following:
- the compressed air supply
- the operating voltage at the field bus node (pins 1 and 2)
- the operating voltage at the CP output modules

You thereby avoid:
- uncontrolled movements of loose tubing
- undesired movements of the connected actuators
- undefined switching states of the electronic components

**CAUTION**

The node of the CP system contains electrostatically vulnerable components.
- Do not therefore touch any components.
- Observe the regulations for handling electrostatically vulnerable components.

You thereby avoid damage to the electronic components of the node.

General information on installing CP modules can be found in the manual “CP system.”
1.2 Setting the DIL switches

The DIL switches are situated under the cover of the field bus node.

**WARNING**
- Before commissioning: make sure that the protocol and, if necessary, the baud rate are correctly set on DIL switch elements 1 .. 6.
- During operation: do not change the DIL switch settings.

You thereby avoid undesired reactions of the connected actuators.

![DIL switch](image)

*Fig. 1/1: Position of the DIL switch*
Dual inline switch

Set the following functions on the DIL switch:

- the field bus protocol
- the field bus baud rate (only required with Festo protocol)

<table>
<thead>
<tr>
<th>DIL switch (factory setting)</th>
<th>Switch element</th>
<th>Description of function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Festo protocol:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Field bus baud rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>see &quot;Setting the field</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bus baud rate&quot;</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>ABB CS31 or SUCOnet K:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Switch setting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>without meaning;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>any desired position</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Field bus protocol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>see &quot;Setting the field</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bus protocol&quot;</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
1.2.1 Setting the field bus address

PLEASE NOTE
The field bus addresses of the CP system cannot be modified by the master. The CP system can only be addressed by the field bus address set on the address selector switch.

Fig. 1/2: Setting the field bus address on the address selector switches

Set the field bus address of the CP system with the two round address selector switches. The switches are numbered from 0..9. The arrow indicates the units or tens figure of the field bus address which is set.
Summary of the possible field bus addresses

**PLEASE NOTE**
Field bus addresses may only be assigned once per master. Observe any possible limitations regarding the assignment of field bus addresses by the master.

## Recommendation
Assign the field bus addresses in ascending order. Where necessary, assign the field bus addresses to suit the machine structure of your system.

### Possible field bus addresses

<table>
<thead>
<tr>
<th>PLC</th>
<th>Address designation</th>
<th>Addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Festo</td>
<td>Field bus address</td>
<td>1; 2; ...; 98</td>
</tr>
<tr>
<td>ABB Procontic</td>
<td>CS31 module address</td>
<td>0; 1; ...; 60*)</td>
</tr>
<tr>
<td>Klöckner-Moeller</td>
<td></td>
<td>2; ...; 96</td>
</tr>
</tbody>
</table>

*) depends on controller and on equipment fitted on the CP system (see chapter 2.3)
Proceed as follows:
1. Switch off the operating voltage.
2. Assign an unused field bus address to the CP system.
3. Use a screwdriver to set the arrow on the relevant address selector switch to the units and tens figures of the desired field bus address.

Examples

![Diagram showing field bus address settings](image)

*Fig. 1/3: Example of set field bus addresses*
1.2.2 Setting the field bus baud rate

**PLEASE NOTE**
The desired baud rate need only be set with the Festo protocol.
With the protocols SUConet K and CS31, baud rate identification is made automatically.

If you are using the Festo protocol, set the desired field bus baud rate on switch elements 1 and 2.

<table>
<thead>
<tr>
<th>DIL switch</th>
<th>31.25</th>
<th>62.5</th>
<th>187.5</th>
<th>375</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 1/4: Setting the field bus baud rate with Festo protocol**
1.2.3 Setting the field bus protocol

Set the desired field bus protocol on DIL switch elements 3...6. First check to see which hardware status you are using (see type plate).

Settings with hardware status 06/97 or later

<table>
<thead>
<tr>
<th>DIL switch</th>
<th>Festo field bus</th>
<th>ABB CS31</th>
<th>Klöckner-Moeller SUCOnet K</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1/5: Settings with hardware status 06/97 or later

Settings with hardware status 05/97 or earlier

<table>
<thead>
<tr>
<th>DIL switch</th>
<th>Festo field bus</th>
<th>ABB CS31</th>
<th>Klöckner-Moeller SUCOnet K</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1/6: Settings with hardware status 05/97 or earlier
1.3 Connecting the CP modules

**WARNING**

- Use the special CP cables from Festo (type KVI-CP-1-...) for connecting the CP modules to a string.
- Note that the total length of the cable on a string must not exceed 10 m.

You thereby avoid:

- faults in the exchange of data between the node and the connected CP modules.

Information on the procedure can be found in the manual "CP system, installation and commissioning."

1.4 Connecting the operating voltage

**WARNING**

An isolating transformer as per EN 60742 (IEC 742, DIN/VDE 0551) with at least 4 kV isolation resistance is required for reliable electrical isolation of the operating voltage.

Information on the procedure as well as on the connecting cables and power requirements can be found in the manual "CP system, installation and commissioning."
1.5 Connecting the field bus interface

1.5.1 Selecting the cable

PLEASE NOTE
Observe the cable specifications. Signal reflections and signal attenuations can occur during data transmission, particularly with high baud rates. Both can lead to faults in transmission. Reflections are caused by:
– missing or incorrect terminating resistor
– branches
Signal attenuations are caused by:
– transmission over long distances
– unsuitable cables

If you are using the Festo IP65 plug, the cable must have a diameter of 6 - 9 mm.

Festo
The cables listed can be used for data transmission over the distances mentioned.

The following cable can be universally used for distances up to 1000 m (note voltage resistance).

BELDEN 9841: twisted pair, double-screened cable (strand 24AWG; 30 V)
1. Installation

Recommended cable types depending on baud rate and distance (see also table below):

A Coaxial cable pair
(Twinax; strand 20AWG, 600 V):
BICC H8106 Belden 8227 or 1162A
Helektra HE-TW-K 105 order no. 1107304
  cable as per EN 50170 (cable A)

B Coaxial, screened cable pair
(strand 25AWG; 300 V)
Belden 9271

C Twisted pair cable with screening
(strand 20 AWG; 250 V)
Kabelmetal DUE4001 order no. 444101
Helektra HE-DUE 4CY AWG20
  order no. 1109401

<table>
<thead>
<tr>
<th>Baud rate (in KBAud)</th>
<th>Cable type for distances (in metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>500</td>
</tr>
<tr>
<td>375</td>
<td>AB</td>
</tr>
<tr>
<td>187.5</td>
<td>AB</td>
</tr>
<tr>
<td>62.5</td>
<td>ABC</td>
</tr>
<tr>
<td>31.25</td>
<td>ABC</td>
</tr>
</tbody>
</table>

Sources of supply

BICC Deutschland GmbH, Düsseldorfer Str. 186, 41460 Neuss.
Belden Electronics GmbH Fuggerstr. 2, 41468 Neuss.
Helektra GmbH, Boschweg 12-16, 12057 Berlin 44.
kabelmetal electro GmbH, Schafhofstr. 35, 90411 Nürnberg.
Siemens AG, UB NK, Kistlerhofstr. 170, 81379 München 70.
ABB (CS31) / Klöckner-Moeller SUConet K

A twisted, screened two-core cable must be used as the field bus cable. Please refer to your PLC manual for the correct cable type. Take into account here the distance and the set field bus baud rate.

1.5.2 Connecting the field bus interface

**PLEASE NOTE**

*Only the Festo plug will comply with standard IP 65.*

There is a sub-D socket on the node for connecting the CP system to your field bus system. This socket is for the supply cable, as well as for the continuing field bus cable. You can connect the node by means of the sub-D plug (IP 65) from Festo (part no. 18529). The outer diameter of the cable for the Festo sub-D plug must be 6.9 mm.
1. Installation

PLEASE NOTE
Connect pins 3 and 8 for the field buses described here.

<table>
<thead>
<tr>
<th>Pin assignment (view of front)</th>
<th>Pin</th>
<th>Signal</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>n.c.</td>
<td>not connected</td>
<td>n.c.</td>
</tr>
<tr>
<td>2</td>
<td>n.c.</td>
<td>not connected</td>
<td>n.c.</td>
</tr>
<tr>
<td>3</td>
<td>RxD/TxD-P</td>
<td>Receive/send data-P</td>
<td>reserved</td>
</tr>
<tr>
<td>4</td>
<td>reserved</td>
<td>Receive/send data-N</td>
<td>(data reference potential (M5V))</td>
</tr>
<tr>
<td>5</td>
<td>reserved</td>
<td>(supply voltage positive / P 5V)</td>
<td>reserved</td>
</tr>
<tr>
<td>6</td>
<td>n.c.</td>
<td>not connected</td>
<td>n.c.</td>
</tr>
<tr>
<td>7</td>
<td>RxD/TxD-N</td>
<td>Receive/send data-N</td>
<td>reserved</td>
</tr>
<tr>
<td>8</td>
<td>reserved</td>
<td>direct connection to housing</td>
<td>reserved</td>
</tr>
<tr>
<td>9</td>
<td>screening</td>
<td></td>
<td>direct connection to housing</td>
</tr>
<tr>
<td>Housing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1/7: Pin assignment of the field bus interface

PLEASE NOTE
Before connecting the sub-D plugs of other manufacturers, replace the two flat screws with bolts (part no. 340960).
Festo plug

A floating screening connection can be achieved with the Festo plug.

- Clamp the screening of the field bus cable under the cable clip of the Festo plug (see diagram).

**PLEASE NOTE**
The cable clip in the Festo plug is internally connected capacitively with the metallic housing of the sub-D plug. This is to prevent equalizing currents from flowing via the screening of the field bus cable (see diagram).

![Diagram of screening connection](image)

**Fig. 1/8: Screening connection**
Manufacturer-specific instructions

**PLEASE NOTE**
Please check the assignment of the field bus module in your PLC manual.

### Manufacturer-specific connection of field bus signals

<table>
<thead>
<tr>
<th>Pin</th>
<th>Festo sub-D plug (IP65)</th>
<th>Manufacturer-specific signal designation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Festo field bus module</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-D 9-pin</td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>S+</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>S-</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Housing</td>
<td>Screening</td>
</tr>
<tr>
<td>9</td>
<td>Cable clip</td>
<td></td>
</tr>
</tbody>
</table>
1.5.3 Connecting the bus

**PLEASE NOTE**
Connect a bus terminator to both ends of the bus cable. This also applies if the master or the module is at the beginning of the bus cable.

If the CP system is at the end of the field bus system, a bus terminator is necessary.

Recommendation.
Use the sub-D plug from Festo (part no. 18529) for this purpose. A suitable resistor network is incorporated in the housing of the Festo sub-D plug. The bus terminator must be switched manually: (on/off).

![Bus Terminator Diagram]

Pin 6 Supply voltage
Pin 3 RxD/TxD-P
Pin 8 RxD/TxD-N
Pin 5 DGND

*Fig. 1/9: Bus terminator*
Chapter 2

Commissioning
2. Commissioning

Contents

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2.2 Festo

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2.2.2 Addressing

2.3 ABB

2.3.1 CS 31 central processing unit as bus master

2.3.2 T200 / 07CS61 as bus master

2.4 Klöckner-Moeller

2.4.1 Addressing inputs/outputs
2. Commissioning

2.1 Preparing the CP system for operation on the field bus

2.1.1 Operating voltage

PLEASE NOTE
• The CP field bus node must have a separate operating voltage supply.

2.1.2 Saving the string assignment

PLEASE NOTE
Before commissioning the CP system, you must first prepare the CP system for commissioning (see manual "CP system").

Before commissioning the CP system on the field bus, proceed as follows:
1. Connect the operating voltage of the node (see manual "CP system").
2. Connect the CP modules.
3. Switch on the operating voltage.
4. Save the string assignment by pressing the SAVE key.
5. Switch off the operating voltage of the node.
2.2 Festo

2.2.1 Configuration

The field bus configurator in the FST software supports you in creating the NOMINAL configuration. Menu control and operation of the FST software is described in the appropriate FST manual.

Procedure

1. Enter the field bus address of the field bus slave (CP system).

2. Select the type of field bus slave ("Valve terminal 10" for CP system).

3. Enter the number of assigned inputs/outputs in bytes under IW/OW. The number of IW and OW must be the same.

PLEASE NOTE
The entry mask for the field bus configurator shows IW and OW on the screen. This means input and output words with 8 bits each. Enter 2 IW and 2 OW per string (16 inputs and 16 outputs).
2. Commissioning

![Figure 2/1: Example – Configuring with FST 203; select CP system from type file](image)

![Figure 2/2: Example – Configuring with FST 203; enter the number of IW and OW](image)
2.2.2 Addressing

PLEASE NOTE
The CP system can be addressed byte-by-byte via the Festo field bus.
Note the differences from the word-by-word addressing of other field bus slaves.

Addressing inputs/outputs
The following example shows the addressing of the inputs/outputs with 3 assigned strings (field bus address of CP system: 3).

Example
Master: Festo SF3
Configuration with FST200: 6 IW and 6 OW
Field bus address of CP system: 3
Further details on addressing and programming can be found in the PLC manual for your controller (e.g. Festo manual FST200).
2. Commissioning

2.3 ABB

General information

A CP system can be fitted with a varying number of inputs/outputs. The addressing of the CP system is based on the stipulations of the CS31 system bus. The following applies to the CP system: every 16 bits require a CS31 bus address. Even a non-complete group of 16 requires a full CS31 bus address.

The following applies when a CS31 system bus is connected to an ABB Protonic T200:

– The address designation of the inputs and outputs is different from that of the CS31 central processing unit.

– The appropriate module identifiers must be entered in the configuration table of the T200.

PLEASE NOTE

If possible, select the range \( n = 0\ldots58 \) for the address to be set in the CP node. \( n+3 < 61 \) can then also be addressed.
2. Commissioning

2.3.1 CS 31 central processing unit as bus master

A CP system offers:

– max. 64 outputs
  (valves or digital outputs) and

– max. 64 inputs

The following example shows the configuration or addressing possibilities of a CP system on the CS 31 system bus.

<table>
<thead>
<tr>
<th>CP system</th>
<th>Signal designations when used with a CS 31 central processing unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assigned string</td>
<td>Inputs/outputs</td>
</tr>
<tr>
<td>0</td>
<td>16/16</td>
</tr>
<tr>
<td>1</td>
<td>32/32</td>
</tr>
<tr>
<td>2</td>
<td>48/48</td>
</tr>
<tr>
<td>3</td>
<td>64/64</td>
</tr>
</tbody>
</table>

\(n\) = station number; E = input; A = output

Fig. 2/4: Configuration possibilities and addresses for a CS 31 central processing unit
The 07KR91 central processing unit ascertains the configuration of the CS 31 system bus when it is switched on and does not require any settings.

PLEASE NOTE
With system flag KW 00,09, program processing can be blocked until the specified number of I/O modules (incl. CP systems) is available on the CS 31 system bus.

Example of addressing with the 07KR91 central processing unit

Address 12 is set in the CP node. The CP system occupies 3 CS 31 bus addresses (48 O/48 I).

Fig. 2/5: Example – addressing with a 07KR91 central processing unit
2. Commissioning

2.3.2 T200 / 07CS61 as bus master

The T200 station offers the possibility of connecting four CS31 system buses. The T200 central processing unit placed nearest coupler 07CS61 has line no. 1. The subsequent buses have line numbers 2, 3 and 4.

Signal designation e.g.: E 1.20,05:
Line 1, address in CP node 20, input 05

The maximum amount of data for each line is 1024 bits. Unused bits are also counted.

In the following example a total of 64 bits are assigned.

Within the framework of program creation, the central processing unit must be informed which configuration is on the lines. With the aid of programming system 07 PC 332, enter here the appropriate module identifiers in the configuration table (per string IO16; see examples).
2. Commissioning

Examples: module identifiers

The configuration list shown applies to line 1.

CP systems entered:

- Address in CP node: 20
  32 inputs, 32 outputs

- Address in field bus node: 33
  64 inputs, 64 outputs

Fig. 2/6: Examples – module identifiers
The following example shows the configuration or addressing possibilities of a CP system with T200/07CS61 as bus master.

<table>
<thead>
<tr>
<th>CP system</th>
<th>Signal designations when a T200 / 07CS61 central processing unit is used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assigned string</td>
<td>T200 module identifier</td>
</tr>
<tr>
<td>0</td>
<td>EA16</td>
</tr>
<tr>
<td>1</td>
<td>EA16</td>
</tr>
<tr>
<td></td>
<td>EA16</td>
</tr>
<tr>
<td>2</td>
<td>EA16</td>
</tr>
<tr>
<td></td>
<td>EA16</td>
</tr>
<tr>
<td></td>
<td>EA16</td>
</tr>
<tr>
<td>3</td>
<td>EA16</td>
</tr>
<tr>
<td></td>
<td>EA16</td>
</tr>
<tr>
<td></td>
<td>EA16</td>
</tr>
<tr>
<td></td>
<td>EA16</td>
</tr>
</tbody>
</table>

I = line; n = set address; E = input; A = output

Fig. 2/7: Possibilities of configuration or addressing with T200 as bus master
Example

Addressing with T200/07C61 as central processing unit
(line 1):
– CP node: address 20
– CP system occupies 3 CS31 bus addresses
  (48 output signals and 48 input signals)

Fig. 2/8: Example – addressing with T200/07CS61 as central processing unit

String unused, but address range assigned (reserved)
E = input; A = output
2. Commissioning

2.4 Klöckner-Moeller

Configuration

Use the following module types if you are using a CP system in the SUCOnet K:

- CP system
  - up to 32 O / 32 I (= 2 strings): SIS-K-06/07
  - CP system
    - up to 64 O / 64 I (= 4 strings): SIS-K-10/10

The following diagram shows the configuration entries for a CP system using the example of a PS4-201 as master.

![Configuration diagram](image)

- 1: 3 or 4 CP strings occupied
- 2: 1 or 2 CP strings occupied

Fig. 2/9: Configuration on the SUCOnet K
The topology configurator from Klöckner-Moeller can be used for configuring bus slaves.

**Configuration entries in Windows**

- SIS-K-10/10 assigned for 3 or 4 strings
- SIS-K-06/07 assigned for 1 or 2 strings

![Diagram of configuration entries in Windows]

**PLEASE NOTE**
The necessary CFG files can be loaded from the Klöckner-Moeller mailbox (Tel. xx49-(0)228-602-1414).
2.4.1 Addressing inputs/outputs

Observe the following when addressing the inputs/outputs of a CP system:
The slave number or the number of the unit differs from the set station number by -1.

Example:

<table>
<thead>
<tr>
<th>Set field bus address of the CP system</th>
<th>Number of unit or slave number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

Fig. 2/11: Example of assignment of units
Example  Addressing the inputs and outputs
Configuration  Master: PS4-201
                Set field bus address 2 (= unit 1)

Fig. 2/12: Example – addressing the inputs/outputs with PS 4-201

1 String unused, but address range assigned (reserved)
Chapter 3

Diagnosis
## 3. Diagnosis

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<th>Description</th>
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</tr>
<tr>
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<td>Error treatment</td>
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</tr>
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<td>Reaction of the CP valve terminal to faults</td>
<td>3-17</td>
</tr>
<tr>
<td>3.4.2</td>
<td>Short circuit/overload at an output module</td>
<td>3-18</td>
</tr>
<tr>
<td>3.4.3</td>
<td>Short circuit in sensor supply at an input module</td>
<td>3-19</td>
</tr>
</tbody>
</table>
3. Diagnosis

3.1 LED displays on the bus node

The LEDs on the node enable you to make a quick on-the-spot diagnosis of the operating status of the CP system.

Fig. 3/1: LEDs of CP node FB5
3. Diagnosis

<table>
<thead>
<tr>
<th>LED designation</th>
<th>Function</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS ERROR</td>
<td>Bus communication</td>
<td>Flashes if there is a fault in connection with field bus or address fault (*)</td>
</tr>
<tr>
<td>POWER</td>
<td>Operating voltage display of internal electronics</td>
<td>Lights up when operating voltage is applied to pin 1; node ready to operate</td>
</tr>
<tr>
<td>POWER V</td>
<td>Operating voltage display of valves</td>
<td>Lights up when operating voltage of valves is OK (pin 2); flashes if supply voltage &lt; 20.4 V</td>
</tr>
<tr>
<td>0..3</td>
<td>CP string LED</td>
<td>Flashes during starting phase if string assignment has been modified since last operation; Lights up during operation if a CP connection is interrupted; Flashes during operation if string assignment is not permitted</td>
</tr>
</tbody>
</table>

3.1.2 Normal operating status

In the normal operating status the following LEDs on the CP node light up:

( ● = lights up; ○ = flashes; ○ = off)

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Operating status</th>
<th>Error treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ BUS ERROR</td>
<td>normal *)</td>
<td>none</td>
</tr>
<tr>
<td>POWER</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>POWER V</td>
<td>●</td>
<td></td>
</tr>
</tbody>
</table>

*) Klöckner-Moeller: LED flashes until input/output of CP system is addressed first time by the master
### 3. Diagnosis

#### 3.1.3 Diagnostic operating voltage POWER or POWER V

(● = lights up; ○ = flashes; ◯ = off)

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Operating status</th>
<th>Error treatment</th>
</tr>
</thead>
</table>
| ● POWER  
● POWER V | Operating status normal or operating status normal, but valves do not switch.  
- Compressed air supply not correct  
- Pilot exhaust blocked  
or operating status normal, but error message of LED BUS ERROR | None  
Check the ...  
- compressed air supply  
- pilot exhaust channels  
See error message of LED BUS ERROR |
| ○ POWER  
○ POWER V | Operating voltage of valves (pin 2) not applied. CP valve terminal defective. | Replace CP module |
| ● POWER  
○ POWER V | Operating voltage of valves (pin 2) not within tolerance range. | Check operating voltage of valves (pin 2) |
| ○ POWER | Operating voltage of electronic components (pin 1) not applied  
Hardware error | Check operating voltage connection  
Servicing required |
3. Diagnosis

3.1.4 Diagnosis LED BUS ERROR

The following table shows the possible field bus specific LED displays on the operating status of the CP node.

Error displays BUS ERROR;

(● = lights up; ○ = flashes; ◯ = off)

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Operating status</th>
<th>Error treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>◯: BUS ERROR (quickly)</td>
<td>Field bus address not permitted or with Festo: S1, S2 incorrectly set</td>
<td>Correct field bus address Festo: 1;...; 98 ABB: 0;...; 60 K-M: 2;...; 98</td>
</tr>
<tr>
<td>◯: BUS ERROR (1 second intervals)</td>
<td>Field bus connection not OK. Possible causes: - Field bus address not correct (e.g. address assigned twice) - Switched off or defective field bus module - Interrupted, short-circuited or faulty field bus connection - Configuration faulty nominal &lt;&gt; actual status</td>
<td>Check the ... • setting of the address selector switch • field bus module • field bus connection • configuration</td>
</tr>
<tr>
<td>●: BUS ERROR</td>
<td>Only with ABB CS31: no diagnostic message which can be interrogated via the field bus</td>
<td>See diagnosis of field bus</td>
</tr>
</tbody>
</table>

*) Klöckner-Moeller: LED flashes until the input/output of the CP system is addressed the first time by the master
3.2 Testing the valves

**WARNING**
Before starting the test:
- switch off the compressed air supply to the valves
- save the string assignment if this has not already been done.

You thereby avoid:
- undesired or dangerous movements of the actuators
- the need to press the SAVE key again.

**CAUTION**
- This test function runs automatically in the CP terminals. All the valves will be switched on/off cyclically.
- None of the programmed locking or further switching conditions will taken into account.

**Test routine**
During the test routine of the CP terminal all the valves will be switched on and off at 1 second intervals.
3.2.1 Starting the test routine

1. Switch off the operating voltage supply (pins 1 and 2) on the node.
2. Switch off the operating voltage supply on the output modules.
3. Remove the cover over the DIL switches.
4. Note the setting of the address selector switch and of the DIL switches.
5. Set field bus address 99.
   Set DIL switch element 1 to ON.
6. Switch on the operating voltage supply (pins 1 and 2).
7. Start the test routine:
   set DIL switch element 1 to OFF.
   If faults occur when the test routine is started, the red LED on the node will flash fast.
   The procedure must then be repeated.

3.2.3 Concluding the test routine

1. Switch off the operating voltage supplies (pins 1 and 2) on the node.
2. Reset the address selector switch and the DIL switch elements to their original positions again.
Switch on the operating voltage supply again when the test routine is concluded:
   • on the node
   • on the output modules
3. Diagnosis

3.3 Diagnosis of the field bus

The following faults are recognized by the CP system:

<table>
<thead>
<tr>
<th>Diagnostic bit</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| KCP            | – CP system not yet ready (during starting phase)  
|                | – configuration fault;  
|                | String LEDs flash / have flashed;  
|                | SAVE key has been pressed: new saved configuration larger or smaller than the current address assignment in the field bus master |
| Vval           | – Failure of operating voltage (pin 2) at CP connection; at least 10 V are required in the CP node |
| Vtol           | – Lower limit of voltage tolerance (< 20.4 V) for supplying the CP valves (pin 2) exceeded |
| Vsen           | – Common message:  
|                | short circuit in sensor voltage supply |
| Voff           | – Common message:  
|                | failure of operating voltage at output modules |
| SC / O         | – Common message:  
|                | short circuit / overload at output modules |
| ACP            | – Common message:  
|                | connection to CP module(s) interrupted  
|                | (valve terminal, input / output module) |

Fig. 3/2: Summary of diagnostic bits
3.3.1 Festo

All diagnostic information can be evaluated directly with a Festo PLC. An error list is created in the master for this purpose. All diagnostic bits are included in this error list and are continually updated.

Structure of the diagnostic byte

<table>
<thead>
<tr>
<th>Bit-Nr.</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic information</td>
<td>KCP</td>
<td>Vval</td>
<td>Vtol</td>
<td>Vsen</td>
<td>Voff</td>
<td>SC/O</td>
<td>ACP</td>
<td>--</td>
</tr>
<tr>
<td>Signal status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Meaning</td>
<td>Signal status &quot;0&quot;: no fault</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Signal status &quot;1&quot;: fault</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Fig. 3/3: Festo diagnostic byte*

The diagnostic byte is interrogated via function module 44 or in the command interpreter (CI). Further information can be found in the PLC manual for your controller.
3.3.2 ABB

The CP system reacts on the ABB CS31 system bus like a binary input/output module. All central processing units and couplers perform the general monitoring of the CS31 system bus, e.g. in the event of total failure of local modules.

On the CP system the central processing units and couplers also interrogate the diagnostic messages which are provided (see section "Diagnostic byte" in this chapter). Depending on the output ability, the diagnostic messages are available in detail for further processing and for interrogation with test units. The displays on the central processing units and couplers provide a summary of the status of the ABB CS31 system bus and local modules.

The relevant ABB manuals apply to all central processing units and couplers. The following table shows as an example the diagnostic possibilities in conjunction with:

- central processing unit 07KR91
- coupler 07CS61
Table: Diagnostic information – example 07KR91

<table>
<thead>
<tr>
<th>Diagnostic bit</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| CP             | – CP system not yet ready (during starting phase)  
|                | – Configuration fault:  
|                | string LEDs flash / have flashed;  
|                | SAVE key has been pressed; new saved configuration larger or smaller than the current address assignment in the field bus master  
|                | – Common message:  
|                | connection to a CP module is interrupted |
| V<sub>val</sub> | – Load voltage drop (pin 2) at CP connection;  
|                | at least 10 V are required in the CP node |
| V<sub>tol</sub> | – Lower limit of voltage tolerance (<= 20.4 V) for CP valves (pin 2) exceeded |
| V<sub>sen</sub> | – Common message: short circuit in sensor voltage supply |
| V<sub>off</sub> | – Common message:  
|                | failure of load voltage supply at output modules |
| SC / O         | – Common message:  
|                | short circuit / overload at output modules |

Fig. 3/5: Diagnostic information – example 07KR91
### Structure of ABB fault flag:

<table>
<thead>
<tr>
<th>FK3 = Simple fault</th>
<th>FK4 = Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>M255,10</td>
<td></td>
</tr>
<tr>
<td>M 255,13</td>
<td>M 255,14</td>
</tr>
<tr>
<td>MW 255,00</td>
<td>MW 255,08</td>
</tr>
<tr>
<td>MW 255,01</td>
<td>MW 255,09</td>
</tr>
<tr>
<td>MW 255,02</td>
<td>MW 255,10</td>
</tr>
<tr>
<td>MW 255,03</td>
<td>MW 255,11</td>
</tr>
<tr>
<td>MW 255,04</td>
<td>MW 255,12</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>MW 255,05</td>
<td>MW 255,13</td>
</tr>
<tr>
<td>MW 255,06</td>
<td>MW 255,14</td>
</tr>
<tr>
<td>MW 255,07</td>
<td>MW 255,15</td>
</tr>
</tbody>
</table>

### Fault recognition / Meaning on Festo CP systems

<table>
<thead>
<tr>
<th></th>
<th>15D = CP system not connected</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Unit type: 4 = Binary inputs / outputs</td>
</tr>
<tr>
<td>3</td>
<td>Group no. (set field bus address, decimal)</td>
</tr>
</tbody>
</table>
| 4 | 1D = internal module fault (CP system diagnostic bit: VVal, Vsen, Voff, Vtol)  
   2D = cable fracture (CP system diagnostic bit: CP)  
   4D = overload / short circuit (CP system diagnostic bit: SC / O) |
| 5 | Channel no.: (0..3) number of first string in which faults 1; 2; 4 from MW 255,08 occurred |

*Fig. 3/6: Structure of ABB fault flag 07KR91*
Example 2: coupler 07CS61

The diagnostic information of the CP system is entered in the following system flags:

- Line 1: FW 4104.02...10
- Line 1: FW 4104.02...10
- Line 1: FW 4104.02...10
- Line 1: FW 4104.02...10
- Line 1: FW 4104.02...10

Example for line 1:

| FW 4104,02 | = Configuration fault |
| FW 4104,03 | = Status word |
| FW 4104,04 | = Error word 1 |
| FW 4104,05 | = Error word 2 |
| FW 4104,06 | = Error word 3 |
| FW 4104,07 | = Error word 4 |
| FW 4104,08 | = Error word 5 |
| FW 4104,09 | = Error word 6 |
| FW 4104,10 | = Error word 7 |

1. Faulty configuration

2. Common message; error code:
   - 1111 no fault
   - 1011 remote unit error *)
   - 1101 bus fault
   - 1110 serial unit error

Fig. 3/7: Example line 1: Entering diagnostic information (continued next page)
### 3. Diagnosis

<table>
<thead>
<tr>
<th>Fault code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>No fault</td>
</tr>
<tr>
<td>1111</td>
<td>CP system separated from bus; no longer responds</td>
</tr>
<tr>
<td>1000</td>
<td>Short circuit</td>
</tr>
<tr>
<td>0100</td>
<td>Overload (SC / O) *)</td>
</tr>
<tr>
<td>0010</td>
<td>Cable fracture (string connection interrupted)</td>
</tr>
<tr>
<td>0001</td>
<td>Internal fault on CP system (Vval, Voff, Vsen, Vtol) *)</td>
</tr>
</tbody>
</table>

String no.: 0...3

0 = Input module
1 = Input/output module
1 = with CP system always 0

CS31 Module address (= set field bus address)

0 = Binary module (= CP system)
1 = Analogue module

* is modified by CP system

---

Fig. 3/8: Continuation of example for line 1: entering diagnostic information
3. Diagnosis

3.3.3 Klöckner-Moeller

Depending on the equipment fitted on the CP system, the master receives the diagnostic byte from the SUC-Onet K via the 5th. or 9th. input byte (up to 2 strings, 3 or 4 strings). Further information can be found in the following example and in the PLC manual for your controller.

Example:
Load diagnostic byte
Master: PS4-201
Field bus address of CP system: 2 (= unit 1)

Program extract

```
L RDB1.1.0.8   Diagnostic byte of CP system no. 2
             = MB 11
```

Fig. 3/9: Program example from Klöckner-Moeller

<table>
<thead>
<tr>
<th>Bit-Nr.</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic information</td>
<td>KCP*</td>
<td>Vval*</td>
<td>Vtol*</td>
<td>Vsen*</td>
<td>Voff*</td>
<td>SC/O*</td>
<td>ACP*</td>
<td>--</td>
</tr>
<tr>
<td>Signal status</td>
<td>L or H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Meaning</td>
<td>Signal status L: no fault</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Signal status H: fault</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Explanation see chapter 3.3

Fig. 3/10: Structure of diagnostic byte of Klöckner-Moeller
3.4 Error treatment

3.4.1 Reaction of the CP valve terminal to faults

PLEASE NOTE
Unilaterally-actuated valves move to the basic position. Double solenoid valves remain in the current position. If mid-position functions are implemented by CP valves, these move to defined positions (pressurized, exhausted, blocked).
3.4.2 Short circuit/overload at an output module

If there is a short circuit or overload:
- all digital outputs of the module will be switched off,
- the green LED "Diag" on the output module will flash quickly,
- the bit short circuit/overload of the diagnostic byte will be set to "logic 1" (SC/O).

**PLEASE NOTE**
The outputs cannot be used again until the short circuit or overload is eliminated and the fault is deleted.

Deleting faults
You can delete a fault by resetting all eight outputs. You can do this as follows:

<table>
<thead>
<tr>
<th>Deleting procedure</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Set all outputs of the output module to logic &quot;0&quot; (RESET) or</td>
<td>• Manually or automatically in the program</td>
</tr>
<tr>
<td>• briefly interrupt the CP connection at the CP output module or</td>
<td>• Outputs on the output module are reset automatically</td>
</tr>
<tr>
<td>• briefly interrupt the operating voltage of the CP system at the field bus node</td>
<td>• All outputs of the CP system are reset automatically</td>
</tr>
</tbody>
</table>

The outputs can then be set at "logic 1" again.
If the short circuit still exists, the outputs will be switched off again.
3. Diagnosis

3.4.3 Short circuit in sensor supply at an input module

If there is a short circuit or overload:

– the sensor supply to all the inputs of a module will be switched off,
– the green LED "Diag" on the input module will flash quickly,
– the error bit in the diagnostic byte will be set to logic "1" (SC/O).

**PLEASE NOTE**
The inputs cannot be used again until the short circuit or overload is eliminated and the fault is deleted.

Deleting faults

You can delete the fault in one of the following ways:

• briefly interrupt the CP connection at the CP input module

or

• briefly interrupt the operating voltage of the CP system at the field bus node

The inputs can then be interrogated again. If the short circuit/overload still exists, the error will be displayed again.
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Technical appendix
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<th>Technical specifications of the field bus node CP FB5-E</th>
<th>A-3</th>
</tr>
</thead>
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<td>Index</td>
<td>A-5</td>
</tr>
</tbody>
</table>

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<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range:</td>
</tr>
<tr>
<td>- operation</td>
</tr>
<tr>
<td>- storage/transport</td>
</tr>
<tr>
<td>Relative humidity</td>
</tr>
<tr>
<td>Protection class as per EN 60 529</td>
</tr>
<tr>
<td>Plug connector plugged in or fitted with protective cap</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic components and input modules</td>
</tr>
<tr>
<td>Pin 1</td>
</tr>
<tr>
<td>Operating voltage connection</td>
</tr>
<tr>
<td>- rated value</td>
</tr>
<tr>
<td>- tolerance</td>
</tr>
<tr>
<td>Current consumption</td>
</tr>
<tr>
<td>- Pin 1 node FB5-E</td>
</tr>
<tr>
<td>- Complete electronics of the CP system</td>
</tr>
<tr>
<td>Residual ripple</td>
</tr>
<tr>
<td>Power failure bridging time</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electromagnetic compatibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>- interference emission tested</td>
</tr>
<tr>
<td>as per EN 55011</td>
</tr>
<tr>
<td>- resistance to interference tested</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
### Operating voltage

**Solenoid valves of CP terminal**

<table>
<thead>
<tr>
<th>Pin 2 Operating voltage connection</th>
<th>DC 24 V</th>
<th>20.4 .. 26.4 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Operating voltage connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- rated value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- tolerance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Current consumption**

- Pin 2 node FB6-E

<table>
<thead>
<tr>
<th>Current consumption</th>
<th>Sum of all connected CP solenoid valves; see &quot;CP pneumatics&quot; manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual ripple</td>
<td>4 Vpp (within tolerance)</td>
</tr>
<tr>
<td>Power failure bridging time</td>
<td>20 ms</td>
</tr>
</tbody>
</table>

### Field bus

<table>
<thead>
<tr>
<th>Field bus</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>RS 485, floating</td>
</tr>
<tr>
<td>Transmission type</td>
<td>serial asynchronous, half-duplex</td>
</tr>
<tr>
<td>Protocols</td>
<td>Festo field bus, ABB Procontic CS31, SUConet K</td>
</tr>
<tr>
<td>- can be set by switch</td>
<td>Festo field bus, ABB Procontic CS31, SUConet K</td>
</tr>
<tr>
<td>Baud rate</td>
<td>31.25 kBaud, 62.5 kBaud, 187.5 kBaud, 375 kBaud</td>
</tr>
<tr>
<td>Cable length</td>
<td>up to 4000 m</td>
</tr>
<tr>
<td>Cable type</td>
<td>see manual for your controller</td>
</tr>
<tr>
<td>Maximum loading supply voltage positive (P5V) pin 6</td>
<td>max. 40 mA</td>
</tr>
</tbody>
</table>
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