

Compact performance

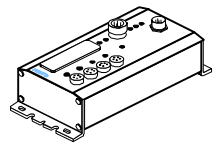


FESTO

Programming and diagnostics manual

CP field bus node 11
Type CP-FB11-E

Field bus protocol:
- DeviceNet



Manual

165 211
en 0802d
[730 616]

Contents and general instructions

Original de
Edition en 0802d
Designation P.BE-CP-FB11-E-EN
Order no. 165 211

© (Festo AG & Co. KG, D-73726 Esslingen, Federal Republic of Germany, 2008)

Internet: <http://www.festo.com>

e-mail: service_international@festo.com

The copying, distribution and utilization of this document as well as the communication of its contents to others without expressed authorization is prohibited. Offenders will be held liable for the payment of damages. All rights are reserved, in particular the right to carry out patent, utility model or ornamental design registration.

Contents and general instructions

Contents

Designated use	V
Target group	V
Service	VI
Notes on the use of this manual	VI
Important user instructions	VII
1. Installation	1-1
1.1 General instructions	1-3
1.2 Configuring the CP system	1-4
1.2.1 Setting the station number	1-5
1.2.2 Setting the field bus baud rate	1-7
1.2.3 Setting compatibility (DeviceNet configuration)	1-8
1.3 Connecting CP modules	1-10
1.4 Operating voltage	1-10
1.5 Connecting the CP node to the field bus	1-12
2. Commissioning	2-1
2.1 Preparing the CP system for commissioning	2-3
2.1.1 Saving the string assignment	2-3
2.1.2 Compiling the configuration list	2-4
2.1.3 Switching on the operating voltage	2-6
2.2 Commissioning and addressing on the DeviceNet	2-7
2.2.1 General information	2-7
2.2.2 Configuring DeviceNet slaves (EDS)	2-8
2.2.3 Valid instructions for parametrizing on the DeviceNet	2-10
2.2.4 Instructions on parametrizing with RSNetWorx for DeviceNet	2-11
3. Diagnosis	3-1
3.1 LED displays on the bus node	3-3
3.1.1 Normal operating status	3-5
3.1.2 Diagnostic operating voltage POWER or POWER V	3-6
3.1.3 Diagnostic bus LEDs	3-7

Contents and general instructions

3.2	Testing the valves	3-9
3.3	Reaction to errors in the control system	3-11
3.4	Diagnosis on the DeviceNet	3-12
3.4.1	Diagnosis via the Software Configurator	3-12
3.4.2	Diagnosis via user program	3-14
3.5	Short circuit/overload at an output module	3-15
3.6	Short circuit in the sensor supply at an input module	3-16
A.	Technical appendix	A-1
A.1	Technical specifications field bus node CP FB11-E	A-3
A.2	DeviceNet objects	A-5
A.2.1	Festo Output Object: Class Code 100d	A-5
A.2.2	Festo Input Object: Class Code 100d	A-5
A.2.3	Festo Diagnostic Object: Class Code 100d	A-6
A.3	Accessories	A-7
B.	Index	B-1

Designated use

The CP field bus node type CP-FB11-E described in this manual has been designed exclusively for use as a slave on the DeviceNet. CP modules from Festo can be connected to CP field bus node CP-FB11-E. The CP node may only be used as follows:

- in accordance with designated use
- in its original state
- without any modifications by the user
- in faultless technical condition.

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

Please observe the standards specified in the relevant chapters and comply with technical regulations, as well as with national and local regulations.

Target group

This manual is intended exclusively for technicians trained in control and automation technology, who have experience in installing, commissioning, programming and diagnosing network modules on the DeviceNet.

Service

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

Notes on the use of this manual

This manual contains specific information on installing, commissioning, programming and diagnosing CP field bus nodes FB11 for DeviceNet.

Information on further CP modules can be found in the manual for the relevant module. A summary is shown in fig. 0/1.

The CP field bus node FB11 has been certified by the ODVA.



Important user instructions

Danger categories

This manual contains instructions on the possible dangers which may occur if the product is not used correctly. These instructions are marked (Warning, Caution, etc.), printed on a shaded background and marked additionally with a pictogram. A distinction is made between the following danger warnings:



Warning

This means that failure to observe this instruction may result in serious personal injury or damage to property.



Caution

This means that failure to observe this instruction may result in personal injury or damage to property.



Please note

This means that failure to observe this instruction may result in damage to property.

The following pictogram marks passages in the text which describe activities with electrostatically sensitive components.



Electrostatically sensitive components may be damaged if they are not handled correctly.

Marking special information

The following pictograms mark passages in the text containing special information.

Pictograms



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



Accessories:
Information on necessary or sensible accessories for the Festo product.



Environment:
Information on environment-friendly use of Festo products.

Text markings

- The bullet indicates activities which may be carried out in any order.
- 1. Figures denote activities which must be carried out in the numerical order specified.
- Hyphens indicate general activities.





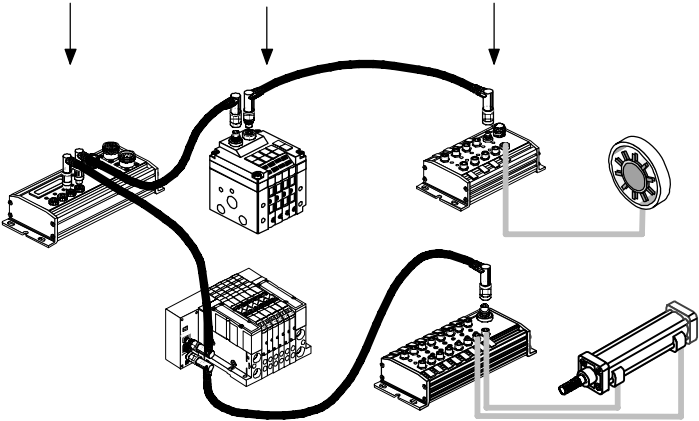
Manuals on the CP system			Peripherals
Description	“CP system, installation and commissioning” type P.BE-CPSYS-... 		
Contents	General basic information on the method of operation, fitting, installation and commissioning of CP systems		
Description	“CP field bus node, programming and diagnosis” type P.BE-CP-FB... or P.BE-VIFB...-10... 	“CPV valve terminal, pneumatics” or “CPA valve terminal, pneumatics” type P.BE-CPV-... or P.BE-CPA-... 	“CP modules, electronics” type P.BE-CPEA-... 
Contents	Special information on commissioning, programming and diagnosing related to the node used	Information on fitting, installing and commissioning CPA or CPV valve terminals	Information on fitting, installing and commissioning CPI/O modules
			

Fig. 0/1: Manuals on the CP system

The following product-specific terms and abbreviations are used in this manual:

Term/abbreviation	Meaning
Busy bit	Enable bit, for analysing data exchange with the CP system
CP cable	Special cable for coupling the various CP modules
CP connection	Plug or socket on the CP modules which enables the modules to be connected with the CP cable
CP modules	Common term for various modules which can be incorporated in a CP system
CP system	Complete system consisting of CP field bus node and P modules
I	Digital input
I/Os	Digital inputs and outputs
I/O modules	Common term for the CP modules which provide digital inputs and outputs (CP input modules and CP output modules)
Node	CP field bus node with/without field bus connection to which the I/O modules are connected
Octet	Number of address bytes assigned by the CP system
O	Digital output
PLC/IPC	Programmable logic controller/industrial PC
String	Total number of I/O modules connected together on one CP connection of the field bus node
String assignment	Total number of all the I/O modules connected via strings to a CP field bus node (0...3)

Installation

Chapter 1

1. Installation

Contents

1.	Installation	1-1
1.1	General instructions	1-3
1.2	Configuring the CP system	1-4
1.2.1	Setting the station number	1-5
1.2.2	Setting the field bus baud rate	1-7
1.2.3	Setting compatibility (DeviceNet configuration)	1-8
1.3	Connecting CP modules	1-10
1.4	Operating voltage	1-10
1.5	Connecting the CP node to the field bus	1-12

1. Installation

1.1 General instructions



Warning

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

- the compressed air supply
- the operating voltage on the field bus node (pins 1 and 2)
- the load voltage supply on the CP output modules.

You can thereby avoid:

- uncontrolled movements of loose tubing
- unexpected movements of the connected actuators
- non-defined switching states of the electronic components.



Caution

The node of the CP system contains electrostatically sensitive components.

- Do not therefore touch any contacts.
- Observe the regulations for handling electrostatically sensitive components.



You will then prevent the electronics in the node from being damaged.

Instructions on connecting the power supply as well as general information on installing CP modules can be found in the manual “CP system”.

1. Installation

1.2 Configuring the CP system

Switches for setting the configuration can be found under the cover on the field bus node.



Warning

- Before commissioning: Make sure that DIL switch elements 3 and 4 are set to the desired setting for the DeviceNet configuration (see chapter 1.2.3).
- During operation: Do not modify the settings of the DIL switches during operation.

You will thereby avoid undesired movements of the connected actuators.

- 1 Address selector switches for setting the station number
- 2 DIL switch for setting the baud rate and compatibility with V1.4

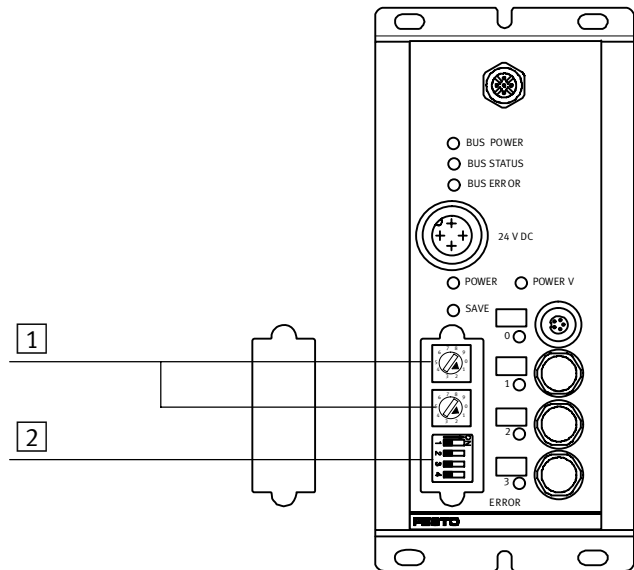


Fig. 1/1: Position of switch

1. Installation

1.2.1 Setting the station number

You can set the station number of the CP system with both address selector switches. The switch positions are numbered from 0 to 9. The arrow on the address selector switches indicates the units or tens figure of the station number set.

- 1 Address selector switch for the UNITS-figure
- 2 Address selector switch for the TENS-figure

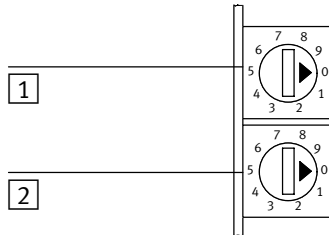


Fig. 1/2: Address selector switch



Please note

Station numbers may only be assigned once per module/ scanner.



Recommendation:

Assign the station numbers in ascending order. If necessary, assign the field bus addresses to suit the machine structure of your system.

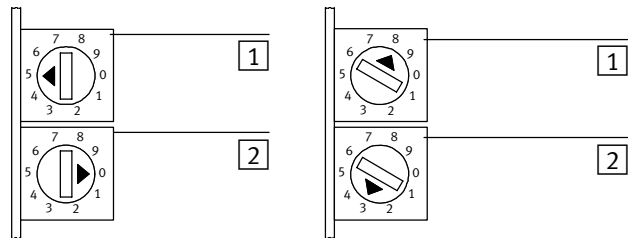
1. Installation

Possible station numbers

PLC	Address identification	Station numbers
DeviceNet	Node/network module	0...63

Proceed as follows:

1. Switch off the operating voltage.
2. Assign an unused station number to the CP system.
3. Use a screwdriver to set the arrow of the relevant address selector switch to the units or tens figure of the desired station number (example see Fig. 1/3).



Setting for:
field bus address 05

1 UNITS

2 TENS

Setting for:
field bus address 38

1 UNITS

2 TENS

Fig. 1/3: Example of address settings

1. Installation

1.2.2 Setting the field bus baud rate



Please note

Set the field bus baud rate of the CP system so that it corresponds to the setting of the field bus module/ interface of the master.

There is a DIL switch with four switch elements under the cover on the node.

Set the field bus baud rate on switch elements 1 and 2 as follows:

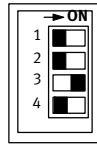



Setting the field bus baud rate			
DIL switch	125 kBaud	250 kBaud	500 kBaud
			

Fig. 1/4: Setting the field bus baud rate with switch elements 1 and 2 of the DIL switch

1. Installation

1.2.3 Setting compatibility (DeviceNet configuration)

Field bus node FB11 is available since February 2001 in an updated and improved software version for the DeviceNet. This current software version offers some simplifications in configuring and commissioning a CP system on the Device Net.

The current software version is no longer compatible with field bus nodes with the earlier software version (V1.4). You can, however, switch the field bus node to the earlier software version and thereby restore compatibility with the earlier DeviceNet configuration.

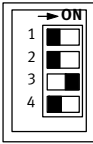


Setting compatibility		
DIL switch	Compatible to earlier versions Version 1.4 (until 01.02.2001)	Current software version Version 2.1 (as from 01.02.2001) (as supplied)
		
Switch element 3 must always be set to ON.		

Fig. 1/5: Setting compatibility (DeviceNet configuration) with switch element 4 of the DIL switch

1. Installation



Please note

If you wish to replace a field bus node with an earlier software version by a node with the current software version V2.1 (01.02.01) and maintain your current DeviceNet configuration:

- Set switch element 4 of the DIL switch to ON. The field bus node then supports the earlier software version V1.4 and you will avoid configuration errors on the existing DeviceNet.

When compatibility with software version 1.4 is set, the node reacts like “Device type 25”. Diagnostic bytes are not then available.

If you wish to use a node with the current software version (as supplied):

- configure the CP system in your DeviceNet in accordance with chapter 2.2.

1. Installation

1.3 Connecting CP modules



Warning

- For connecting the CP modules to a string, use the special CP cable from Festo (type KVI-CP-1-...).
- Please note that the total length of cable on a string must not exceed 10 m.

You can thereby avoid:

- faults in data exchange 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 Operating voltage



Warning

- Use only PELV **circuits** as per IEC/DIN EN 60204-1 (Protective Extra-Low Voltage, PELV) for the electrical supply. Consider also the general requirements for PELV circuits in accordance with IEC/DIN EN 60204-1.
- Use power **supplies** which guarantee reliable electrical isolation of the operating voltage as per IEC/DIN EN 60204-1.

By the use of PELV circuits, protection against electric shock (protection against direct and indirect contact) is guaranteed in accordance with IEC/EN 60204-1 (Electrical equipment for machines, General requirements).

1. Installation



Please note

Check within the framework of your EMERGENCY STOP circuit, 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 for the valves and output modules, switching off the compressed air).

Information on the procedure as well as on connecting cables and current requirements can be found in the manual “CP system, installation and commissioning”.

1. Installation

1.5 Connecting the CP node to the field bus

Cable selection

Use a twisted, screened 4-wire cable for the field bus.



Please note

Refer to the PLC manual for your controller for the type of cable to be used. Take into account the distance and the field bus baud rate selected.

The following table contains reference values for the maximum distances depending on the baud rate selected. Detailed information can be found in the manuals for your control system.

Baud rate	Maximum distance	Maximum branch line length
500 kBaud	50...100 m	0.75...3 m
250 kBaud	200 m	3 m
125 kBaud	500 m	3 m

Not all the baud rates mentioned are supported by all controllers, PLC/IPC. Note also any limitations in the maximum branch line length.

1. Installation

Field bus plug

There is a field bus plug on the node for connecting the node to the field bus. The two bus cables, the power supply (+ 24 V and 0 V) for the bus interface as well as the cable screening are connected to this plug.

The hardware basis of the bus interface is the CAN-bus. It is typical for this bus that the bus interface is supplied with power via the field bus plug.

Connection to the bus is made with a 5-pin M12 socket with PG9 screw connector. You can order these from Festo (type FBSD-GD-9-5POL, part no. 18324). Alternatively, you can use the bus cables of other manufacturers (see Appendix A).



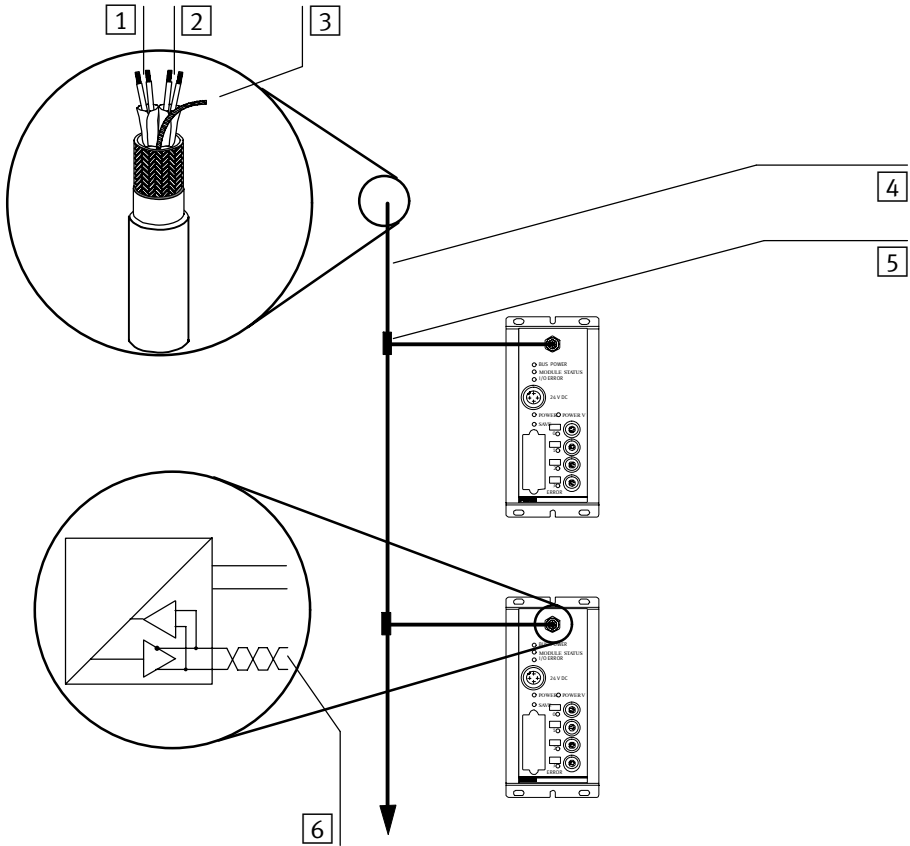
Please note

Use only T-adapters and branch line lengths which are permitted for your control system.

Information on this can be found in the manual for your PLC. Appendix A gives a summary of matching installation accessories.

The following summary shows the bus connection.

1. Installation



1 Operating voltage for the bus interface

2 Field bus cables

3 Screening/shield

4 Branch line

5 T-adapter

6 Bus cables

Fig. 1/6: Structure of bus cables

1. Installation

Current consumption of all bus interfaces	
Number of connected CP field bus nodes _____ * 50 mA	Σ A
Current consumption of the remaining field bus interfaces	+ Σ A
Current consumption of sensor inputs/sensor supply which is supplied via the bus	+ Σ A
Total current consumption of the bus interface	= Σ A

Avoid long distances between the bus power supply and the bus slaves.



Please note

Bus slaves of different manufacturers show different tolerances in respect of interface power supply. Take this into consideration when planning the bus length.

The following applies to valve terminal type 10:

$$V_{\max} = 25 \text{ V}$$

$$V_{\min} = 11.5 \text{ V}$$



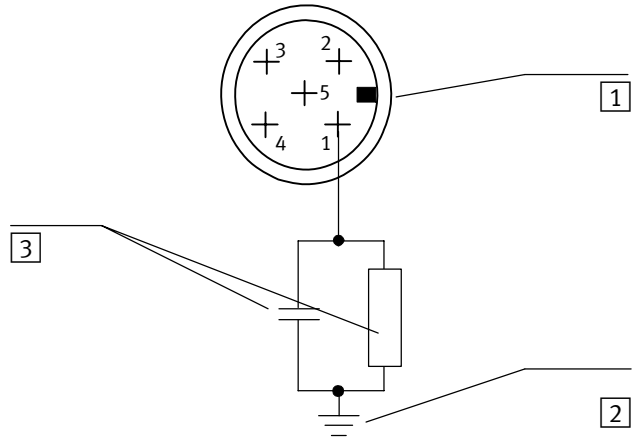
Caution

- Make sure of the correct polarity when you connect the field bus interface.
- Connect the screening/shield.



The following diagram shows the pin assignment of the field bus interface. Connect the field bus cables to the appropriate pins of the bus cable socket. Note also the connecting instructions in further diagrams, as well the instructions in the PLC manual for your controller.

1. Installation



- 1 Pin assignment
 - 1: Screening/shield
 - 2: + 24 V Bus
 - 3: GND Bus
 - 4: Data +
 - 5: Data -
- 2 Node housing, functional earth
- 3 Internal RC network

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

1. Installation

Connection instructions for DeviceNet



Please note

Always check the pin assignment of the module in the PLC manual for your controller.

Connect the field bus cable of your control system to the field bus interface of the node as follows:

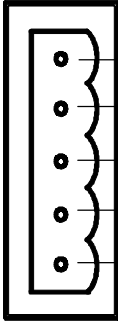
PLC pin/plug assignment		Pin assignment of the field bus interface on the node	
View	Signal designations		
	RED	+ 24 V Bus	Pin 2
	WHITE	Data +	4
	BARE	Screening/shield	1
	BLUE	Data -	5
	BLACK	GND Bus	3

Fig. 1/8: Connection instructions for the DeviceNet

1. Installation

Terminating resistor

If the CP system to be connected is at the end of the field bus, a terminating resistor (1220 Ohm, 0.25 W) must be fitted in the socket of the field bus cable (adaption required).

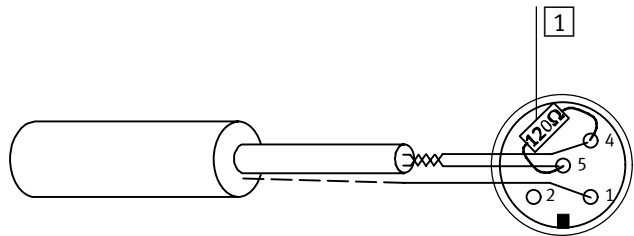
Fitting a terminating resistor

1. Crimp the wires of the resistor together with those of the field bus cable between the cores Data + (pin 4) and Data - (pin 5) of the bus cable socket.



Please note

In order to ensure reliable contact, we recommend that you clamp the wires of the resistor and those of the field bus cable in a common cable end sleeve.



- 1 Terminating resistor

Fig. 1/9: Terminating resistor in the socket of the field bus cable

2. Fit the bus cable socket onto the field bus plug.

Commissioning

Chapter 2

Contents

2.	Commissioning	2-1
2.1	Preparing the CP system for commissioning	2-3
2.1.1	Saving the string assignment	2-3
2.1.2	Compiling the configuration list	2-4
2.1.3	Switching on the operating voltage	2-6
2.2	Commissioning and addressing on the DeviceNet	2-7
2.2.1	General information	2-7
2.2.2	Configuring DeviceNet slaves (EDS)	2-8
2.2.3	Valid instructions for parametrizing on the DeviceNet	2-10
2.2.4	Instructions on parametrizing with RSNetWorx for DeviceNet	2-11

2. Commissioning

2.1 Preparing the CP system for commissioning



Please note

Supply the CP field bus node separately with operating voltage (see the manual “CP system”). The field bus interface of the CP node is supplied with power via the field bus cable.

2.1.1 Saving the string assignment



Please note

Before commissioning the CP system
Prepare the CP system for commissioning on the field bus (see also manual “CP system, installation and commissioning”).

Before commissioning the CP system on the field bus, proceed as follows:

1. Connect the operating voltage for the node (see manual “CP system”).
2. Connect the CP modules (see manual “CP system”).
3. Switch on the operating voltage.
4. Save the string assignment by pressing the **SAVE** button.
5. Switch off the operating voltage for the node.

2. Commissioning

2.1.2 Compiling the configuration list

Configuration list

Before commissioning or programming, compile a configuration list of all connected field bus slaves. On the basis of this list, you can:

- carry out a comparison between the NOMINAL and the ACTUAL configurations in order to ascertain if there are any connection faults
- access these specifications during the syntax check of a program, in order to avoid addressing errors.

Configuration of the CP system requires a very accurate procedure, as different configuration specifications are sometimes required for each system, due to the modular structure. Please observe here the instructions in the following sections.

Ascertaining the configuration

The configuration data must be known or ascertained for each bus slave. Ascertain here the address range occupied by the CP system.

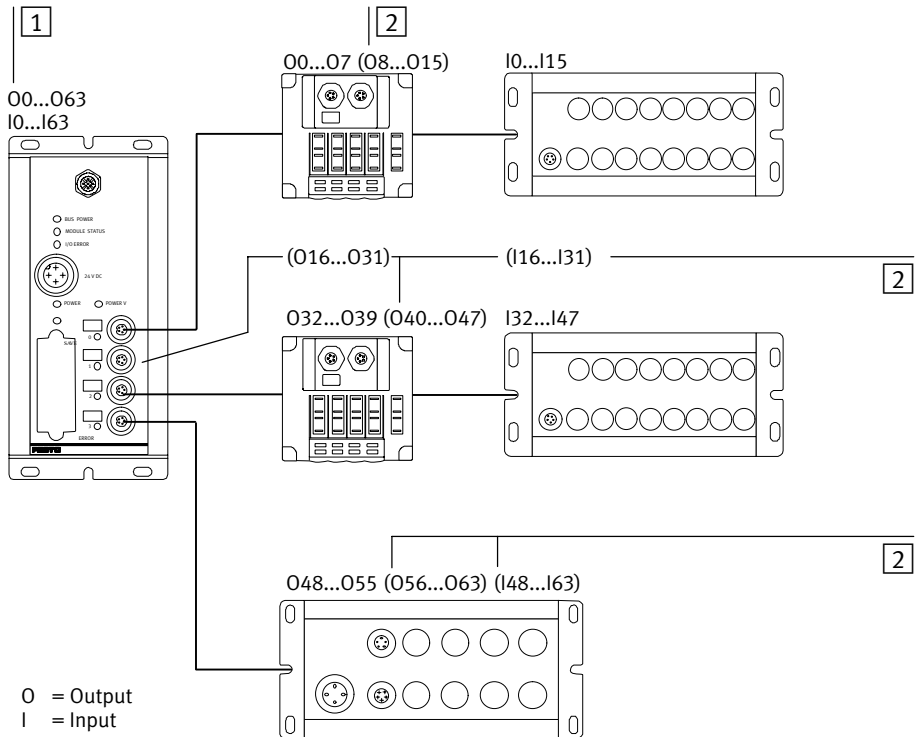
Address assignment of the CP system

The size of the address range occupied by the CP system depends on the number of the last used string (see also manual “CP system”). The last used string as well as all numerically lower strings each occupy 16 input addresses and 16 output addresses.

If no string is occupied, the node will respond to the field bus as standard with 2 occupied inputs and outputs (e.g. for test purposes).

2. Commissioning

The number of occupied input addresses is therefore always identical to the number of occupied output addresses, irrespective of the equipment fitted on the CP system. Unused addresses in the occupied address range remain reserved for later extensions of the CP system. The diagram below shows an example:



1 Address range occupied by the CP system (last used string is string 3)

2 () = reserved address range (occupied or unused)

Fig. 2/1: Address assignment of a CP system, example

2. Commissioning

2.1.3 Switching on the operating voltage



Please note

Please observe also the switching-on instructions in the PLC manual for your controller.

When you switch on your controller, it automatically carries out a comparison between the NOMINAL and the ACTUAL configurations. For this configuration run it is important that:

- the configuration specifications are complete and correct.
- the power supply for the programmable logic controller and that for the field bus slaves are switched on either simultaneously or in the sequence indicated above.

Please observe the following points when switching on the power supply:

Common supply

If there is a common supply for the control system and for the field bus slaves, the power should be switched on via a central power unit or central switch.

Separate supply

If there is a separate supply for the control system and for the field bus slaves, the power should be switched on in the following sequence:

1. the power supply for all the field bus slaves
2. the power supply for the control system.

2.2 Commissioning and addressing on the DeviceNet



Please note

- Field bus node type CP FB11-E can be used on all DeviceNet masters.
- This chapter describes configuration and commissioning using as an example the controllers from Allen-Bradley.

2.2.1 General information

Please note the following special features when using the node on the DeviceNet:

- The addresses of all recognized DeviceNet slaves can be freely assigned as M-file addresses or as discrete I/Os in the Scan list.
- The addresses of network slaves are assigned in ascending order.
- The input and output addresses can be assigned independently of each other.



Please note

Order the addresses of the network slaves so that there is sufficient reserve for later extensions.

The following sections contain generally valid instructions on the configuration of the node on the DeviceNet.



Detailed information can be found in the documentation or in the help for the configuration program you are using.

2. Commissioning

2.2.2 Configuring DeviceNet slaves (EDS)

When you commission a new DeviceNet slave the first time, you must inform your configuration program of certain features of the slave. The features of the various slaves are usually administered by the configuration program in a list or library e. g. “EDS library” (EDS for electronic data sheets).

The following possibilities are available for extending an “EDS library”:

- Installing an EDS library
- Entering the slave features by hand

Installing an EDS library

Current GSD files can be found on the Festo Internet pages under:

- www.festo.com/fieldbus

You can obtain the GSD files and further configuration aids with the CD ROM “Utilities” from Festo:

type P.CD-VI-UTILITIES-2, part no. 533500

The most up-to-date GSD files are always available via the Internet.

EDS file

The EDS file contains all the necessary features of node type CP FB11-E. You can install this file with the aid of your configuration program.

ICO/BMP file

Depending on the configuration program used, you can assign the Bitmap file or Icon file to the node. The node will then be appropriately represented in the configuration program.

2. Commissioning



Instructions on installing an EDS file and an ICO or BMP file can be found in the manual or in the help for your configuration program.

Entering the slave features by hand

When an EDS file is installed, the following information about the DeviceNet slave is added to the EDS library. This information can also be entered manually.

Information	Manual
Vendor name	Festo Corporation (26)
Device type	Communication adapter (12)
Product code	192
Major revision / minor revision	2.1
Input size / output size	8 bytes / 8 bytes
Product name	CP-FB11-E
Catalogue number	18227

When the EDS library has been extended, the node is entered in the slave list as a possible DeviceNet slave. It can now be added to a network.

2. Commissioning

2.2.3 Valid instructions for parametrizing on the DeviceNet

When the slave features have been configured (e.g. by installing the EDS file), the following steps are required for parametrizing, depending on the configuration program.

1. Insert the slave in the project/network (online or offline). If the slave is inserted e.g. offline, it will be selected from the slave list and added to the network.
2. Assigning a slave to a scanner. A network can contain several scanners. The slave must be assigned to a scanner.
3. Determine the I/O parameters of the slave. The following specifications are required here:
 - the number of I/O bytes to be transmitted. The following applies to node CP FB11-E:
 - 2, 4, 6 or 8 input bytes occupied
 - 2, 4, 6 or 8 output bytes occupiedThe number of occupied I/O bytes depends on the highest occupied string number (2 inputs and 2 outputs on each occupied string).
 - Specification of communication type. The following applies to node CP FB11-E:
 - Polled communication
 - or
 - Change of state / cyclic

In addition to these communication connections a Strobed I/O connection must be used in each case for the diagnosis.

2. Commissioning



Please note

The following applies to an SLC 500 with an Allen-Bradley scanner type 1747-SDN:

- Change of state / Cyclic can only be used in combination with the diagnosis via Strobed I/O as from software version V4.015 of the scanner.
- Polled I/O with Strobed I/O is also supported by earlier versions.

- Assign the I/O addresses of the slave to the PLC operands.
- Assign 4 diagnostic bytes to the PLC operands.

4. Load the configuration into the scanner.

2.2.4 Instructions on parametrizing with RSNetWorx for DeviceNet

This section gives instructions on parametrizing with RSNetWorx for DeviceNet version 2.11.51 from Rockwell.



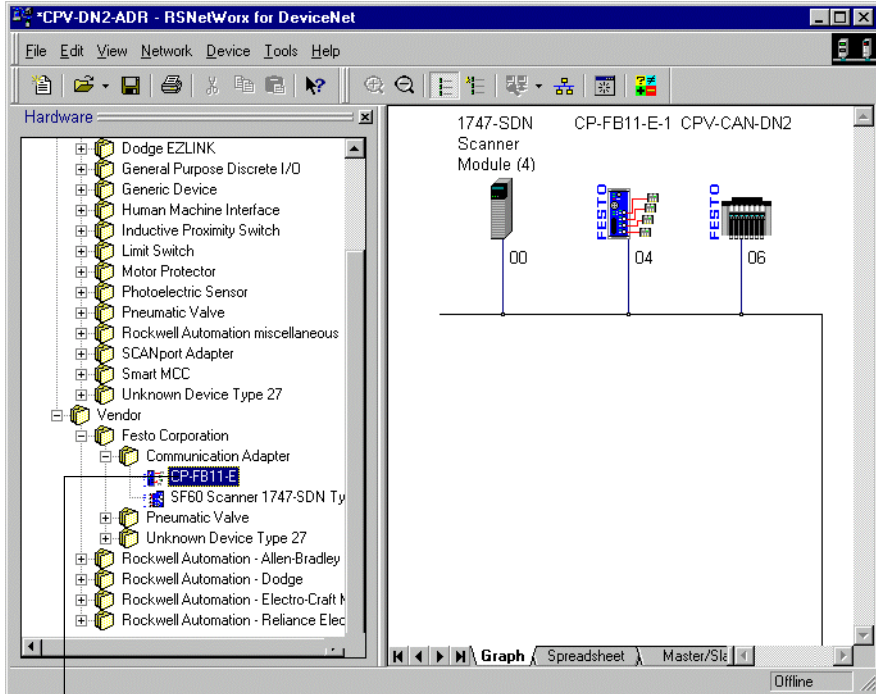
Please note

All the steps explained refer as an example to the Allen-Bradley scanner 1747-SDN. They also apply to other masters.

Inserting the slave into the project/network

RSNetWorx for DeviceNet contains an EDS assistant which will support you in installing the EDS file. When the EDS file has been installed, the node is included in the list “Hardware”. By pulling the cursor across, you can insert slaves in the network on the right-hand side.

2. Commissioning



1

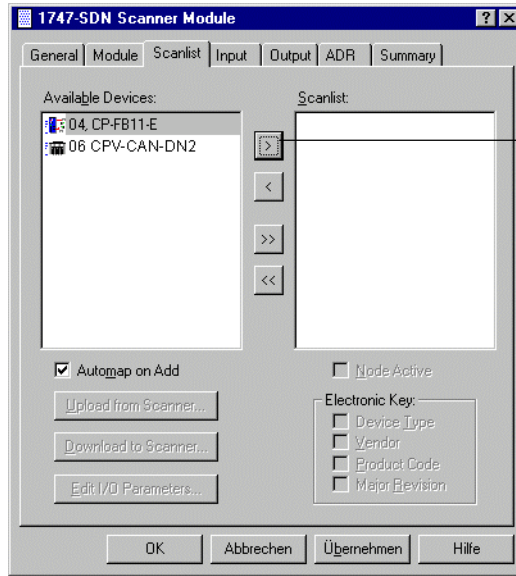
1 Node type CP FB11-E in the list "Hardware"

Fig. 2/2: Hardware list and network in RSNetWorx for DeviceNet

2. Commissioning

Assigning a slave to a scanner

A double click on the desired scanner in the network opens a dialogue field in which you can assign the available slaves to the scanner.



1 Button for assigning the slave

Fig. 2/3: Register card "Scanlist" (example)

Parametrizing slaves

A double click on the slave opens a dialogue field in which you can determine the I/O parameters of the slave.

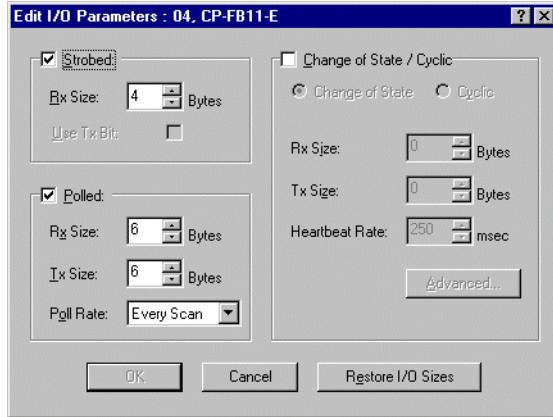


Fig. 2/4: Dialogue field “Edit I/O parameters”

The following applies to node CP FB11-E:

- The number of I/O bytes to be transmitted is fixed at 2 input bytes and 2 output bytes per CP string.

2. Commissioning

Assigning the I/O addresses of the slave

With the register cards “Output” and “Input” you can assign the I/O addresses of the node to the PLC operands.

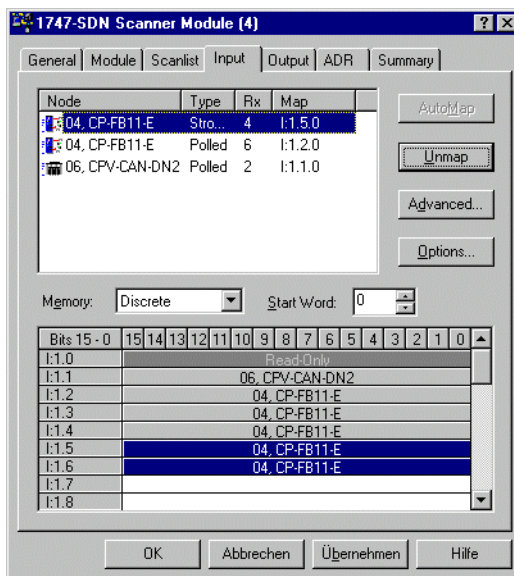


Fig. 2/5: Address assignment of the input of the 4-byte diagnostic information (Strobed)

2. Commissioning

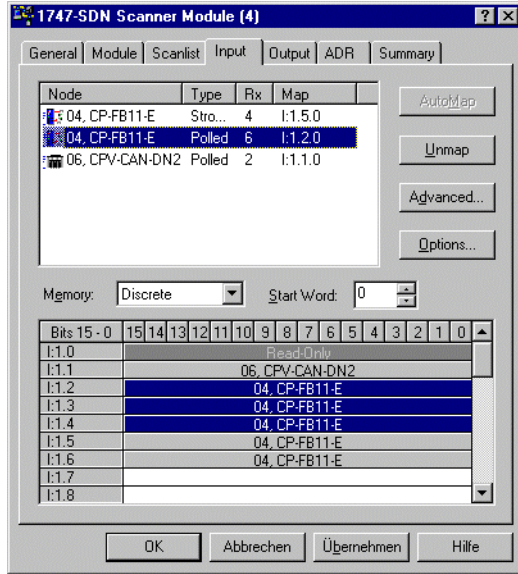


Fig. 2/6: Address assignment of the input of the physical sensor signals (Polled)

2. Commissioning

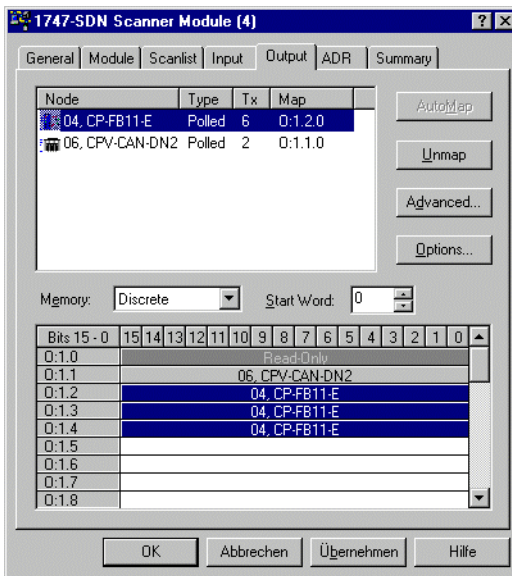


Fig. 2/7: Address assignment of the output (example)

Load the configuration into the scanner

To conclude, load the configuration into the scanner. Further information on this can be found in the documentation for your scanner.

Example: Scanner 1747-SDN (SLC 500 series)

Valve terminal #12 with:

- 4 occupied strings: strings number 0, 1, 2 and 3
- 8 input bytes, input address as from I:004//00
- 8 output bytes, output address as from O:004//00

2. Commissioning

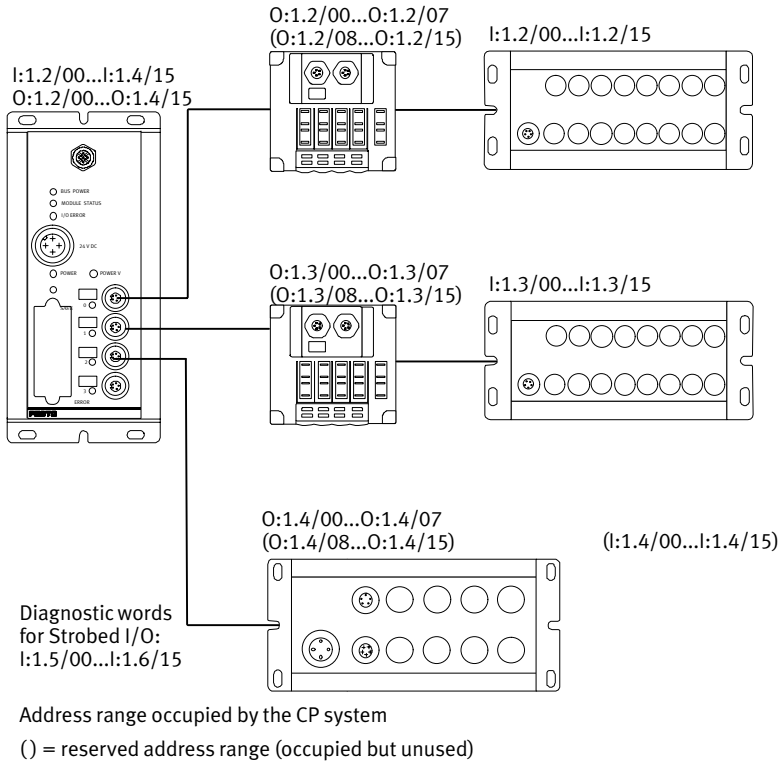


Fig. 2/8: Addressing example for scanner 1747-SDN (last used string is 3)



Please note

For access via the communication type “explicit messaging” the objects are described in Appendix A.2.

Diagnosis

Chapter 3

Contents

3.	Diagnosis	3-1
3.1	LED displays on the bus node	3-3
3.1.1	Normal operating status	3-5
3.1.2	Diagnostic operating voltage POWER or POWER V	3-6
3.1.3	Diagnostic bus LEDs	3-7
3.2	Testing the valves	3-9
3.3	Reaction to errors in the control system	3-11
3.4	Diagnosis on the DeviceNet	3-12
3.4.1	Diagnosis via the Software Configurator	3-12
3.4.2	Diagnosis via user program	3-14
3.5	Short circuit/overload at an output module	3-15
3.6	Short circuit in the sensor supply at an input module	3-16

3. Diagnosis

3.1 LED displays on the bus node

The LEDs on the node permit fast on-the-spot diagnosis.

- 1 Bus LEDs
- 2 Operating voltage LEDs
- 3 String LEDs

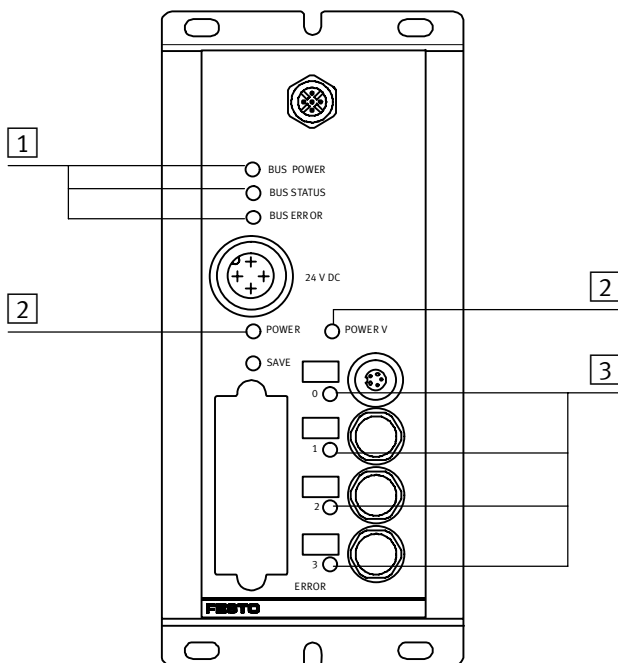


Fig. 3/1: LEDs of the CP node FB11

3. Diagnosis






LEDs	LED designation	Meaning
BUS POWER	Operating voltage display for the bus interface	lights up when operating voltage is applied to the bus interface
BUS STATUS	Module status display	lights up when the operating status is faultless and when data exchange takes place
BUS ERROR	Transmission error display	lights up when data transfer on the bus is faulty
POWER	Operating voltage display of internal electronics	lights up when the operating voltage is applied to pin 1 and when the node is ready to operate
POWER V	Operating voltage display of the valves	lights up when the operating voltage is applied to pin 2 (valves)
0...3 ERROR	String error LEDs	During the starting phase: – flashes if the string assignment has been modified since the previous operation. During operation: – lights up if a CP connection is interrupted

3. Diagnosis

3.1.1 Normal operating status

In normal operating status the following LEDs on CP node 11 will light up:









 lights up;  flashes;  out)

LED	Operating status	Error treatment
 BUS POWER	Normal	None
 MODULE STATUS		
 BUS ERROR		
 POWER POWER V		
 0...3 ERROR		

3. Diagnosis

3.1.2 Diagnostic operating voltage POWER or POWER V

 lights up;  flashes;  out)





LED	Operating status	Error treatment
 POWER  POWER V	<ul style="list-style-type: none"> – Operating status normal or – Operating status normal but valves do not switch. <ul style="list-style-type: none"> – Compressed air supply not OK – Pilot exhaust blocked or – Operating status normal, but error message on bus LEDs 	None Check the ... <ul style="list-style-type: none"> • compressed air supply • pilot exhaust channels See error message of bus LEDs
 POWER  POWER V	Operating voltage of the outputs (pin 2) not in the tolerance range	<ul style="list-style-type: none"> • Check operating voltage of the outputs (pin 2)
 POWER  POWER V	<ul style="list-style-type: none"> – Operating voltage of the outputs (pin 2) not applied or – CP valve terminal or output module defective 	<ul style="list-style-type: none"> • Check operating voltage of the outputs (pin 2) or • Replace the CP module
 POWER  POWER V	<ul style="list-style-type: none"> – Operating voltage of the electronics (pin 1) not applied. or – Hardware error 	<ul style="list-style-type: none"> • Check the operating voltage connection or • Servicing required

3. Diagnosis




3.1.3 Diagnostic bus LEDs

Possible DeviceNet-specific LED displays of the operating status of the CP node are shown in the following diagram:

 lights up;  flashes;  out)

LED	Operating status	Error treatment
BUS POWER		
 BUS POWER	Operating voltage of bus interface is applied	None
 BUS POWER	Operating voltage of bus interface is not applied	Check bus operating voltage connection (bus plugs pins 2 and 3)
BUS STATUS		
 BUS STATUS	<ul style="list-style-type: none"> – Operating status normal, data exchange runs or – Operating status normal, but valves do not switch. Possible causes <ul style="list-style-type: none"> – Compressed air supply not OK. – Pilot exhaust blocked 	None Check the ... <ul style="list-style-type: none"> • compressed air supply • pilot exhaust channels
 BUS STATUS	<ul style="list-style-type: none"> – Lights up once after switching on (LED test) – Node is ready for data exchange, but has not yet been initialized by the master after having been switched on 	None <ul style="list-style-type: none"> • Start communication

3. Diagnosis

LED	Operating status	Error treatment
BUS ERROR		
 BUS ERROR	No internal error	None
 BUS ERROR	<ul style="list-style-type: none"> – Non-permitted station number set, station address assigned twice or maximum value exceeded – Too many transmission errors (error counter overrun) 	<ul style="list-style-type: none"> • Correct station address • Check cables/plug connectors, switch on operating voltage again
 BUS ERROR	<ul style="list-style-type: none"> – Lights up once after switching on (LED test) – Timeout expired, no valid telegrams received within the timeout time, bus error, communication error or loss of communication 	<ul style="list-style-type: none"> • None • Check connection to PLC

3.2 Testing the valves



Warning

Before the test:

- Switch off the compressed air supply for the valves.
- In the case of a non-saved string assignment:
Save the existing string assignment.

You can thereby avoid:

- undesired or dangerous movements of the actuators
- repeated actuation of the SAVE button.



Caution

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

Test routine

During the test routine of the CP valve terminal, all the valves will be switched on and off at 1-second intervals.

3. Diagnosis



Starting the test routine

1. Switch off the power supplies (pins 1 and 2) on the node.
2. Switch off the power supply to the output modules.
3. Remove the DIL switch cover.
4. Note the setting of the address selector switch and the DIL switch elements.
5. Set DIL switch elements 1 and 2 to ON.
6. Set station number 99.
7. Switch on the power supplies (pins 1 and 2).
8. Starting the test routine.
Set DIL switch elements 1 and 2 to OFF.

Stopping the test routine

1. Switch off the power supplies (pins 1 and 2) on the node.
2. Set the address selector switch and the DIL switch elements to their original positions again.

When the test routine is finished, switch on the power supplies again.

- On the node
- On the output modules

3.3 Reaction to errors in the control system

PLC/protocol	Reaction of the CP system		
	after PLC stop	to field bus faults	to field bus interruption
DeviceNet	Valves and electric outputs are reset.	Valves and electric outputs are reset when timeout has expired.	Valves and electric outputs are reset immediately.



Please note

If all the outputs are reset in the event of a PLC stop, field bus interruption or field bus fault, the following “pneumatic rules” must be observed.

- Unilaterally-actuated valves move to the basic position.
- Double-solenoid valves remain in the current position.
- Mid-position valves move to the mid-position and (depending on valve type) are pressurized, exhausted or blocked.

3. Diagnosis

3.4 Diagnosis on the DeviceNet

The following bus diagnoses are available:

- Diagnosis via DeviceNet Scanner
- Diagnosis via the Software Configurator (e.g. RSNetworkx, see chapter 3.4.1)
- Diagnosis via the user program (see chapter 3.4.2)

3.4.1 Diagnosis via the Software Configurator

1. Make sure that the node is online on the DeviceNet.
2. Double-click the icon of the valve terminal in the Software Configurator (e.g. RSNetworkx).
3. Click the rider “Device Parameters”.
4. Double-click the parameter line “Status word”.
Detailed information will be shown (see Fig. 3/2)

Further information can be found in table Fig. 3/3.

3. Diagnosis

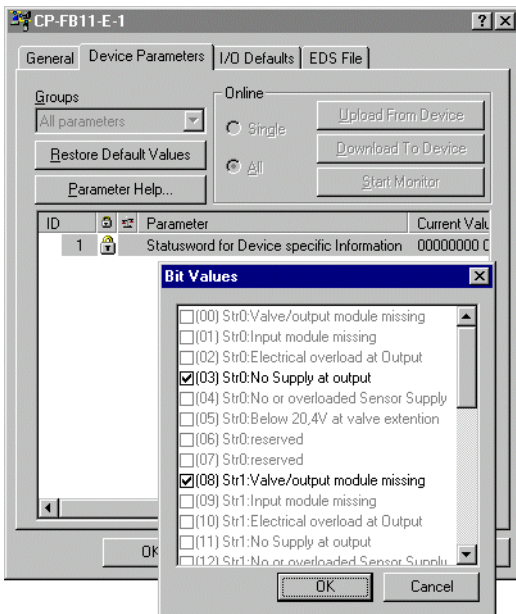


Fig. 3/2: Display of detailed information on diagnosis (explanations see text)

3. Diagnosis

The following table shows the composition of the diagnostic information of the strings:

Bit (string 0)	Bit (string 1)	Bit (string 2)	Bit (string 3)	Comment in EDS file	Explanation
0	8	16	24	Valve/output module missing	CP connection interrupted at output module
1	9	17	25	Input module missing	CP connection interrupted at input module
2	10	18	26	Electric overload at output	Short circuit/overload at output module (see chapter 3.5)
3	11	19	27	No supply at output	Load voltage failure at output module
4	12	20	28	No or overloaded sensor supply	Operating voltage failure at input module or sensors, short circuit/overload of sensor supply (see chapter 3.6)
5	13	21	29	Below 20.4 V at valve extension	Load voltage of valve coils < 20.4 V
6	14	22	30	Reserved	not used
7	15	23	31	Reserved	not used

Fig. 3/3: Table with explanation of the diagnostic information

3.4.2 Diagnosis via user program

If the separate communication connection “Strobed I/O” is configured for the CP system (see Fig. 2/5), the diagnostic information from the above table (Fig. 3/3) is then available for the user program. The data from the Strobed I/O connection can be placed in the input file or in the M1 file of the controller.

3.5 Short circuit/overload at an output module

In the event of a short circuit or overload:

- all the digital outputs of a string will be switched off,
- the green LED “Diag” on the output module will flash quickly.



Please note

The outputs cannot be used again until the short circuit or overload has been eliminated and the error deleted.

Deleting the error

You can delete the error by resetting all eight outputs. You can do this in one of the following ways:

Possibilities	Explanation
<ul style="list-style-type: none">• Set all the outputs of the output module to logical “0” (RESET) or• Briefly interrupt the CP connection at the CP output module or• Briefly interrupt the operating voltage for the CP system at the field bus node	<ul style="list-style-type: none">– Manually or automatically in the program– Outputs on the output module will be reset automatically.– All outputs of the CP system will be reset automatically.

The outputs can then be used again. If the short circuit/overload still exists, the outputs will be switched off again.

3.6 Short circuit in the sensor supply at an input module

In the event of a short circuit or overload:

- the sensor supply for all inputs of the module will be switched off
- the green LED “Diag” on the input module will flash quickly.



Please note

The outputs cannot be used again until the short circuit or overload has been eliminated and the error deleted.

Deleting the error

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

- briefly interrupt the CP connection at the CP input module

or

- briefly interrupt the operating voltage for the CP system at the field bus node.

The inputs can then be used again. If the short circuit/overload still exists, the error will be shown again.

Technical appendix

Appendix A

Contents

A.	Technical appendix	A-1
A.1	Technical specifications field bus node CP FB11-E	A-3
A.2	DeviceNet objects	A-5
A.2.1	Festo Output Object: Class Code 100d	A-5
A.2.2	Festo Input Object: Class Code 100d	A-5
A.2.3	Festo Diagnostic Object: Class Code 100d	A-6
A.3	Accessories	A-7

A.1 Technical specifications field bus node CP FB11-E

General	
Temperature range – Operation – Storage/transport	- 5 °C ... + 50 °C - 20 °C ... + 70 °C
Relative humidity	95 %, non-condensing
Protection class as per EN 60529 plug connector inserted or provided with protective cap	IP65
Protection against electric shock (protection against direct and indirect contact as per IEC/DIN EN 60204-1)	by means of PELV circuits (Protective Extra-Low Voltage)

Operating voltage for the bus interface	
Pin 2, 3; bus interface – Rated value not protected against incorrect polarity – Tolerance	External fuse required 24 V DC + 4 % - 52 % (V_{\max} 25 V, V_{\min} 11.5 V)
Current consumption (at 24 V)	50 mA

A. Technical appendix

Operating voltage for the electronics and the input modules	
Pin 1 Power supply connection – Rated value – Tolerance	24 V DC 20.4...26.4 V
Current consumption – Pin 1 node FB11-E – Complete electronics of the CP system	250 mA See manual “CP system”, table of current consumption
Residual ripple	4 Vpp (within tolerance)
Bridging time during drop in logic voltage	20 ms

Load voltage for solenoid valves on CP valve terminal	
Pin 2 Power supply connection – Rated value – Tolerance	24 V DC 20.4...26.4 V
Current consumption – Pin 2 node FB11-E	Sum of all switched-on CP solenoid valves; see manual “CP pneumatics”
Residual ripple	4 Vpp (within tolerance)
Bridging time during drop in logic voltage	20 ms

Electromagnetic compatibility	
– Interference emitted – Immunity against interference	Tested as per DIN EN 61000-6-4 (industry) ¹⁾ Tested as per DIN EN 61000-6-2 (industry)
¹⁾ The component is intended for industrial use.	

A.2 DeviceNet objects

A.2.1 Festo Output Object: Class Code 100d

Vendor-specific object which contains the output information.

Festo Output Object Class Attributes

Attributes	Access	Name	Type	Value
3	Get/set	Output bytes	Byte (2 bytes per string)	

A.2.2 Festo Input Object: Class Code 100d

Vendor-specific object which contains the input information.

Festo Input Object Class Attributes

Attributes	Access	Name	Type	Value
3	Get	Input bytes	Byte (2 bytes per string)	

A.2.3 Festo Diagnostic Object: Class Code 100d

By means of this vendor-specific object (class code 102d) you can receive the device-related diagnostic information for the CP system. The information is grouped together in a diagnostic byte for each string:

Festo Diagnostic Object Class Attributes

Attributes	Access	Name	Type	Value
3	Get	Diagnostic bytes	Byte (4 bytes)	1. Byte for string 0 2. Byte for string 1 3. Byte for string 2 4. Byte for string 3

A. Technical appendix

A.3 Accessories

→ www.festo.com/catalogue

A. Technical appendix

Index

Appendix B

B. Index

Contents

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

A

Abbreviations	
Product-specific	XII
Accessories	A-7
Addressing	
Address assignment of the CP system	2-4
Example for scanner 1747-SDN	2-18
On the DeviceNet	2-7

B

Bus LEDs	
Diagnosis	3-7

C

Cables	
Field bus	1-12
Operating voltage	1-12
Compatibility	1-8
Configuration list	2-4
Compiling	2-4
Connecting	
CP modules	1-10
Operating voltage	1-10
Connection instructions	1-17
CP system	
Operating voltage	2-3
Preparations for commissioning	2-3

D

Data transmission	
Interface	1-12, 1-15
Designated use	VII
DeviceNet	
Addressing	2-4
Diagnosis	
Bus LEDs	3-7
On the DeviceNet	3-12
Operating voltage LEDs	3-6

E

EDS library	2-8
-------------------	-----

F

Field bus	
Connecting the CP node	1-12
Interface	1-12
Station number	1-5
Field bus interface	
Pin assignment	1-15
Fitting	
Terminating resistor	1-18

I

Important user instructions	IX
-----------------------------------	----

L

LEDs	3-3
Diagnosis	3-6, 3-7

N

Node address	
Address selector switch	1-5
Nominal/actual configuration	2-4
Notes on this manual	VIII

O

Operating status	3-5
Operating voltage	
Bus interface	2-3
CP system	2-3

P

Pictograms	X
POWER LEDs	
Diagnosis	3-6

S

Save	
String assignment	2-3
Screening/shield	
Field bus	1-15
Service	IV
Setting	
Compatibility	1-8
Field bus baud rate	1-7
Station number	
Address selector switch	1-5
String assignment	
Save	2-3
Switching on	
Voltage	2-6
Switching status	
Valves	3-9

T

Target group	VII
Technical specifications	A-3
Test routine for valves	3-9
Text markings	X