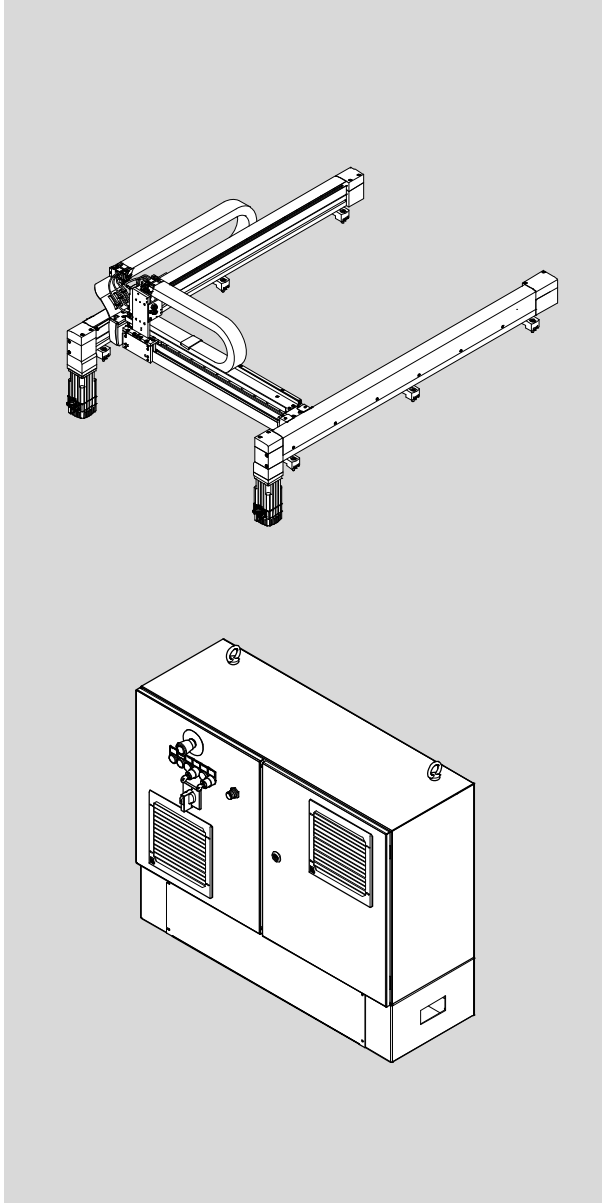


Planar surface gantry with control system

EXCH-...-C...



FESTO

Description

Commissioning

8046380

1506a

[8046374]

Translation of the original instructions

GDCP-EXCH-...-C... – INB-EN

CODESYS® is a registered trademark of its respective trademark holder in certain countries.

Identification of hazards and instructions on how to prevent them:



Danger

Immediate dangers which can lead to death or serious injuries.



Warning

Hazards that can cause death or serious injuries.



Caution

Hazards that can cause minor injuries or serious material damage.

Other symbols:



Note

Material damage or loss of function.



Recommendations, tips, references to other documentation.



Essential or useful accessories.



Information on environmentally sound usage.

Text designations:

- Activities that may be carried out in any order.
- 1. Activities that should be carried out in the order stated.
- General lists.
- ➔ Result of an action/References to more detailed information.

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1 Safety and requirements for product use

1.1 Safety

1.1.1 General safety information

- Observe the safety instructions in the corresponding chapters.



Special safety regulations are placed immediately before the task instruction.



Danger

Serious injuries due to uncontrolled movements of the planar surface gantry.

- Perform risk assessment on operation of the planar surface gantry.
- Place planar surface gantry in operation only if the dangers to people identified in the risk assessment can be excluded through appropriate measures.



Warning

Danger of electric shock even if power switch is shut off.

The control system is only completely voltage-free if all supply lines have been switched voltage-free.

- Switch off all supply lines (also external voltage) prior to assembly, installation and/or maintenance work and secure them from being restarted accidentally.
- Switch the voltages back on only after completion of work.



Warning

Severe injuries if installation and commissioning are not performed correctly.

- Commissioning only by specially trained personnel.

The following qualifications are required:

- knowledge of the Festo Configuration Tool (FCT) software
- experience with installation and operation of electrical control systems

For support in commissioning:

- Contact your regional Festo contact person (→ www.festo.com/sp).



Warning

If the planar surface gantry is mounted vertically

Mortal danger and material damage due to falling traverse (Y-axis).

In the following cases, the traverse can drop in an uncontrolled manner:

- through release of the motor brakes.
- if the toothed belt breaks during operation or at rest.
- during operation without the required components.
- Make sure that all components required for vertical operation are mounted and ready for operation:
 - Drive with high-performance motors with brake:
EXCH-40-...-AB2-... : motors EMMS-...-100-S-...-RMB
EXCH-60-...-AB3-... : motors EMMS-...-140-S-...-RMB
 - Control system with integrated safety switching device and power failure detection (order characteristic: EXCH-...-AB...-C...-S2-...)
 - Motor controller CMMP-AS-C5-11A-P3-M0 (order characteristic: B6, B7 or B8)
 - Additional braking resistors CACR-KL2-40-W2000 (part no. 2882343).
Accessories (→ www.festo.com/catalogue)
- Ensure through appropriate protection devices that no persons are located in and below the operating area of the planar surface gantry.
- Before releasing the motor brakes or switching off the power supply, ensure the following:
 - motors inactive (no rotation)
 - traverse in the lower end position at the end caps



Note

Damage to the product from incorrect handling.

- Never pull or plug in the plug connectors and interfaces when powered.
- Observe the handling specifications for electrostatically sensitive devices.



Note

Unauthorised access to the device can cause damage or malfunctions.

When connecting the device to a network:

- Protect the network from unauthorised access.

Measures for protecting the network include:

- Firewall
- Intrusion Prevention System (IPS)
- Network segmentation
- Virtual LAN (VLAN)
- Virtual private network (VPN)
- Security at physical access level (port security)

Additional information: standards/guidelines for security in information technology.

1.1.2 Intended use

The planar surface gantry EXCH and the control system CMCA-...-B... are intended for installation in machines or automation technology systems for moving payloads in combination with attachment components.

Employ the planar surface gantry and the control system as follows:

- In perfect technical condition
- in original condition, without unauthorised modifications
- within the limits of the product defined through the technical data
(→ Accompanying documentation)
- in an industrial environment

The safety circuit of the control system CMCA-...-B... is only one part of the safety concept for a machine, whereby the safety concept must be based on a risk assessment of the entire machine to be performed by the machine manufacturer.



Note

The removal of mechanical components (e.g. motor) causes referencing to be lost. At the subsequent commissioning, a new referencing and adaptation of the feed constants are required (→ 5 Repair).



Note

In the event of damage caused by unauthorised manipulation or other than intended use, the guarantee is invalidated and the manufacturer is not liable for damages.

1.1.3 Foreseeable misuse

- The safety circuit of the control system CMCA-...-B... is changed in its function.
- With the control system CMCA-...-B..., safety functions are implemented that are not described in this documentation.
- The safety circuit is not appropriate for the application.
- No verification and no validation of the switch in the machine have been performed.
- Operation without sufficient risk evaluation of the complete system.
- Operation without safety concept for the machine.

1.1.4 Specified standards/directives

Issue status
EN ISO 13849-1:2008-12

Tab. 1.1

1.2 Requirements for product use

- Provide this documentation to the following persons:
 - design engineer
 - installer
 - commissioner of the machine or system
- Comply with the specifications of the documentation.
Follow all accompanying documentation and the documentation of any associated accessories.
- Take the following into consideration for the destination:
 - Applicable legal regulations
 - Regulations and standards
 - Regulations of the testing organisations and insurers
 - National specifications

For correct and safe use:

- Observe all warnings and notes.
- Comply with all load limits of the product and the connected components
(➔ Technical data of the corresponding documentation).

1.2.1 Qualified specialists

- The product should only be installed by specialized personnel with corresponding qualifications.

The following knowledge is required:

- installation and operation of electrical control systems
- applicable regulations for operating safety-engineering systems
- applicable regulations for accident prevention and operational reliability
- documentation and mode of operation of the product

1.2.2 Range of applications and certifications

Standards and test data of the products (➔ Technical data of the corresponding documentation).

Certificates and declaration of conformity (➔ www.festo.com/sp).

2 Overview

2.1 System overview

The system EXCH-...-C... consists of the planar surface gantry and the control system CMCA-...-B... .

Planar surface gantry EXCH

The planar surface gantry has two servo motors that drive a toothed belt arrayed in an H-shape.

The rotating toothed belt moves the traverse (Y-axis) and the slide unit on the Y-axis in the 2-dimensional space. The position of the slide is calculated by a controller.

The slide movement in the direction of an axis is reached through the controlled interplay of the two motors.

Additional tasks can be taken over through attachment components (Z-axes).

Control system CMCA-...-B...

The control system CMCA-...-B..., subsequently called control system, includes the components necessary for activation of the planar surface gantry

- multi-axis controller CMXR, subsequently called multi-axis controller, and
- motor controller CMMP, subsequently called motor controller.

A safety circuit is also integrated, which represents the basic functionality with

- the operator unit CDSA, subsequently called operator unit, or
- an enabling button in combination with the CDSA emulation.

2.2 Accessories

Needed for commissioning of the planar surface gantry together with the control system are:

- PC (laptop) with installed Festo Configuration Tool (FCT), including the plug-ins for the multi-axis controller and the motor controller
- USB memory card with software and data (→ 3.1.3 USB memory card)
- accompanying documentation
- 2 zero point setting pieces (length 30 mm; included in scope of delivery)
- gauge for setting the feed constants (not included in the scope of delivery); dimension recommendation: → 3.6.4 Determining and adapting feed constants (step 5.)
- operator unit or enabling button



Commissioning can be carried in two ways:

- with the operator unit
 - or
 - with the enabling button in combination with the CDSA emulation.
- The CDSA emulation is a component of the CMXR plug-in.
The enabling button is not included in the scope of delivery.

3 Commissioning

This chapter describes commissioning of the system comprising the planar surface gantry and controller system in the delivery status (→ 3.1.2 Delivery status).



Note

Commissioning requires knowledge of how to work with the following systems:

- control system and the components contained therein
- operator unit or enabling button with CDSA emulation

Specific instructions on the individual products and components required for commissioning are in the corresponding descriptions.

- Prior to commissioning of the system, make sure you have read and understood the descriptions of these components.



The control system is available in various designs.

as a completely configured control cabinet or as a mounting plate for installation in a control cabinet by the system manufacturer or operator. In this description, the control elements are designated corresponding to the control cabinet version.

- In case of a user-specific or user-produced control cabinet:
Note the possibly deviating designations of the control elements.

3.1 General information

3.1.1 Prior to commissioning

Carry out the following steps to prepare for commissioning:

1. Mount kinematic system (→ Description of the planar surface gantry: EXCH “Mechanical Installation”).
2. Connect control system
(→ Description of control system CMCA-...-B... “Electrical Installation”).

3.1.2 Delivery status

FCT basic projects for all available kinematics variants can be found on the USB memory card.



Note

At the factory, the control system is not yet configured for the planar surface gantry.

The following steps must also be performed during commissioning:

- Create a kinematic-specific FCT project from the FCT basic project that fits the kinematics (→ 3.4).
- Transfer control data of the kinematics-specific FCT project into the components of the control system (→ 3.5).



In the case of user-specific or user-produced control systems:

- Adapt the corresponding FCT basic project or create a new one.

3.1.3 USB memory card

The accompanying USB memory card includes software and data for commissioning (→ Tab. 3.1):

- documentation on planar surface gantry and control system
- FCT software and plug-ins
- FCT basic projects for various kinematics variants (→ Tab. 3.2)

Fold out interface

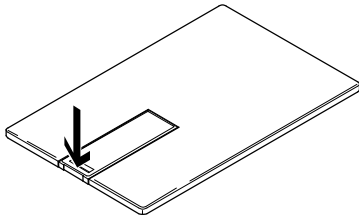


Fig. 3.1

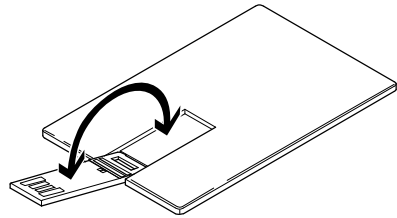


Fig. 3.2

Content structure

Directories	Contents
└─ Documentation	
├─ Declaration of Incorporation	- Declaration of incorporation in accordance with EC Machinery Directive 2006/42/EC
├─ Description Mechanical Installation	- Description EXCH “Mechanical installation”
├─ Description Electrical Installation	- Description CMCA-...-B... “Electrical Installation”
├─ Description Commissioning	- Description EXCH-...-C...“Commissioning”
├─ Description Accessories	- Mounting instructions of the accessories
└─ Software	
├─ CMMP	- Installation file for FCT framework and CMMP plug-in - Firmware file for motor controller (to install on it when a motor controller is replaced)
├─ CMXR-C2	- Installation file for FCT framework and CMXR-C2 plug-in
├─ Base_projects	- FCT basic projects for various kinematics variants with multi-axis controller CMXR-C2
├─ Target	- Installation files for Codesys
├─ CoDeSys	- Installation files for Codesys
├─ FCT-Plugin	

Tab. 3.1

FCT basic projects

The basic projects have been prepared for various kinematics variants and differ in content regarding the following characteristics and variants.

In the file name of the basic projects, the included characteristics and their variants are designated with the following codes.

Characteristics	Code in the basic project name EXCH-...-...-...	Variants	
Size of planar surface gantry	40		
	60		
Motor type and size	AB1	With brake	
	AB2		Size 70
	AB3		Size 100
	AS1	Without brake	Size 140
	AS2		Size 70
	AS3		Size 100
Motor attachment position	B	Bottom	
	T	Top	

Tab. 3.2 Code for file names of the basic projects

**Note**

The FCT basic projects do not yet include all kinematics-specific specifications. For commissioning, the basic project that fits the kinematics must be selected and expanded to a kinematics-specific FCT project (→ 3.4 Creating kinematics-specific FCT project).

3.1.4 Axes and motors



The attachment position of the motors is determined when the planar surface gantry is ordered.

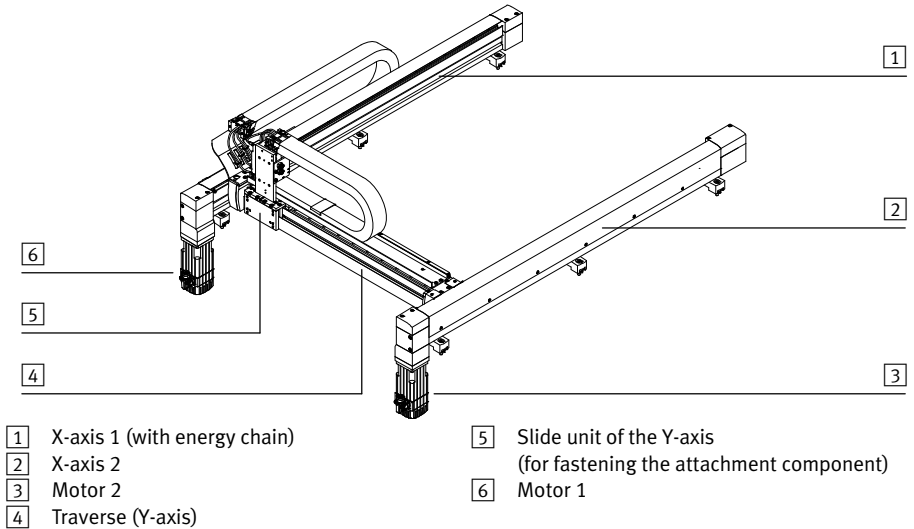
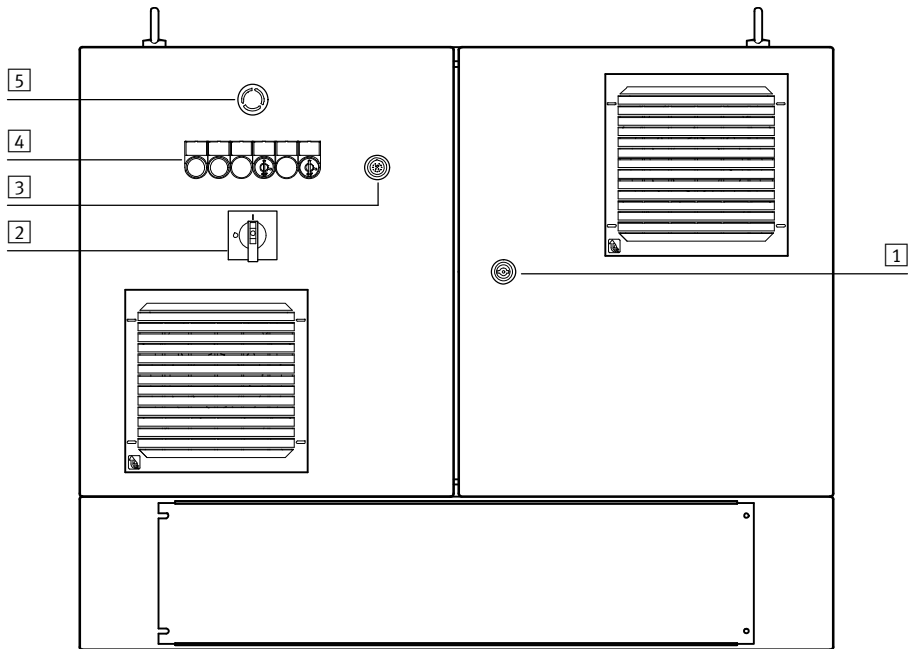


Fig. 3.3 Depicted as an example, planar surface gantry with motor attachment position underneath (EXCH-...-B-...).



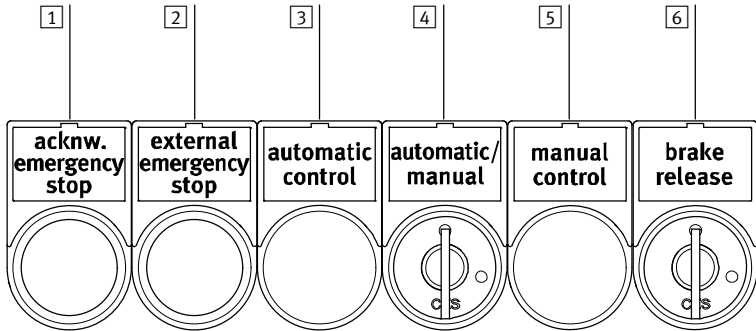
The motors are not assigned directly to an axis.
The directions of movement of the traverse and the slide unit of the Y-axis are achieved through the interaction of both motors.

3.1.5 Control elements



- 1** Interlock for control cabinet doors
- 2** Power switch
- 3** Connection for operator unit or enabling button
- 4** Control and signal elements (→ Fig. 3.5)
- 5** Emergency stop switches

Fig. 3.4 Control cabinet



- 1 Illuminated push-button “acknowledge emergency stop”: confirms that the emergency stop circuit is unlocked
- 2 Indicator light “external emergency stop”: external emergency stop triggered
- 3 Indicator light “automatic control”: automatic operation active
- 4 Key switch “automatic/manual”: switches between automatic and manual operation. The switch is only active when the “local” operating mode has been selected by means of link plugs
(→ Description of control system CMCA-...-B... “Electrical installation”).
With “external” operating mode, the switch is without effect.
- 5 Indicator light “manual control”: manual override active
- 6 Key switch “brake release”: release motor brakes (→ 3.1.9 Release brakes).
Only possible in manual override and in combination with one of the enabling buttons on the operator unit or a separate enabling button.

Fig. 3.5 Operating and signal elements



The labels for marking the control elements in German are also included with the control cabinet.

3.1.6 Operator unit/enabling button



Warning

Risk of injury/damage due to ineffective emergency stop.

A not-connected operator unit in reach of the user can result in ineffective use of the emergency stop switch.

- Keep the not-connected operator unit outside the reach of the user.



Unplugging the connection cover or a connected device triggers an emergency stop.

- Put the system at rest before the connection cover or a connected device is plugged in or unplugged.

Either a device must be connected or the connection cover mounted. Otherwise, the emergency stop circuit is opened (emergency stop active).

Connect operator unit/enabling button

1. Switch off control system at the power switch.
2. Connect operator unit or enabling button at the connection on the left control cabinet door or, for orders without control cabinet, on the mounting plate.



Warning

Risk of injury due to uncontrolled movements of the traverse or of the slide unit of the Y-axis.

The enabling keys of the operator unit and the enabling button are operational immediately after being connected.

- Note: Login is not required for the enabling keys to work.

3. Switch on control system at the power switch.
4. Switch control system to manual override (→ 3.1.8 Manual override/automatic operation).

Function of the enabling key

The operator unit has two enabling keys, which can be actuated alternatively.

The separate enabling button has an enabling key.

On both devices, the enabling key has the following three possible switch positions:

Switch position (step)	Enabling key	Function	Switch contact
1	Not actuated	Off (neutral position)	Off (opened)
2	Actuated (up to pressure point)	Permission	On (closed)
3	Pressed (end stop)	Off (panic setting)	Off (opened)

Tab. 3.3



The enabling function (switch position 2) of the enabling key is cancelled by

- releasing the enabling key (switch position 1) or
- pressing beyond the pressure point (switch position 3).

When the switch position is returned from 3 to 1, the enabling function is not effective.

3.1.7 Emergency stop circuits

The control system differentiates between two emergency stop circuits:

- internal emergency stop: triggered at the control system.
- external emergency stop: triggered, for example, by a higher-order controller.

The connection contacts for external emergency stop and safety door switch are open and not bridged in the delivery status.

- Acknowledge the external emergency stop at the higher-order controller, in order to close the contacts (→ Description of control system CMCA-...-B... “Electrical installation”; → Circuit diagram).

3.1.8 Manual override/automatic operation

The operating modes manual override and automatic operation differ primarily in the handling of safety doors and the reduced speed of the kinematics in manual override.



Warning

Risk of injury/damage risk at high travel speed of the traverse (Y-axis).

Setting up and checking may only be performed in manual override.

- To perform set up and checking work: Change the control system to manual override.

Automatic operation

Automatic operation corresponds to the configuration in production operation.

The following conditions must be met for the function (motor current enable):

- Contacts of the safety door switch closed.
- All emergency stop switches unlocked.
- All emergency stop circuits acknowledged.
- For local mode selection: key actuator “automatic/manual” set to “automatic”.
- For external mode selection: corresponding specification through the higher-order controller.
- Key switch “brake release” in position “0”.

Manual override

In manual override, the kinematics system can be moved manually via the operator unit or an enabling button, even with open safety doors. This operating mode of the multi-axis controller is used to check the installed system, made up of the planar surface gantry and the control system, as well as for setting up and commissioning the programs. The speed is limited during this mode.



Note

The speed limitation of the manual override is not reliable as defined by EN ISO 13849-1. Additionally, external protective measures must be adopted for safety-relevant control tasks or for the safety of persons.

The following conditions must be met to enable motor current with the enabling buttons on the operator unit or the separate enabling button:

- All emergency stop switches unlocked.
- All emergency stop circuits acknowledged.
- For local mode selection: key actuator “automatic/manual” set to “manual”.
- For external mode selection: corresponding specification through the higher-order controller.
- Key switch “brake release” in position “0”.

Switching from manual override/automatic operation

Switching of the operating modes depends on the setting for the operating mode selection.

- Mode selector local: with the key switch “automatic/manual”.
- Operating mode selection, external: with the higher-order controller.

In this case, the “automatic/manual” key actuator has no function.



Information on setting the mode selection:

➔ Description of control system CMCA-...-B... “Electrical installation”

3.1.9 Release brakes



This section is relevant if the motors of the planar surface gantry are equipped with a brake (EXCH-...-AB...).

Releasing the motor brakes permits manual moving of the traverse and the slide unit of the Y-axis. Releasing the brakes is possible only in manual override and only with the help of the operator unit or a separate enabling button.



Danger

If the planar surface gantry is mounted vertically
Mortal danger and material damage due to falling traverse (Y-axis).

The traverse falls down in an uncontrolled manner due to release of the motor brakes.

- Before releasing the brakes, make sure that the traverse is located in the lower end position at the end caps.

1. End all active programs.
2. Switch control system to manual override (→ 3.1.8 Manual override/automatic operation).
3. Connect operator unit or enabling button to the control system
(→ 3.1.6 Operator unit/enabling button).



Warning

Risk of injury due to uncontrolled movements of the traverse or of the slide unit of the Y-axis.

The enabling keys of the operator unit and the enabling button are operational immediately after being connected.

- Note: Login is not required for the enabling keys to work.

4. Rotate key switch “brake release” clockwise to the “2 o'clock position”.
5. Unlock brakes via an enabling key on the operator unit or the separate enabling button.
The brakes of the drives must unlock audibly.
The traverse and the slide unit of the Y-axis can now be shifted manually.



Connecting the operator unit or enabling button triggers an emergency stop
(→ Description of control system CMCA-...-B... “Electrical installation”).

- Before the start of commissioning: acknowledge emergency stop.


3.1.10 System inputs

The system inputs of the multi-axis control system are configured for control of the following operating statuses and user interventions.

Input	Function
DI0	Emergency stop (active at status “0”)
DI1	Enabling keys on the operator unit or separate enabling button
DI2	Automatic operation selected
DI3	Manual override selected
DI4	–
DI5	Safety doors closed
DI6	Release brake active
DI7	External emergency stop active

Tab. 3.4

The status of the inputs can be observed over the I/O monitor of the operator unit or in the CDSA emulation.

- Call up I/O monitor: Select key/button  and then “IO-Monitor”.

3.2 Festo Configuration Tool (FCT)

The Festo Configuration Tool (FCT) is the software platform for configuring and commissioning different components from Festo.



Information on installation and operation of the FCT can be found in the FCT description. The description is on the USB memory card or, after installation of the program, in the folder <FCT installation directory>\Help\FCT_<language>.pdf.

The following descriptions for the Festo Configuration Tool (FCT) refer to “English” as the language setting.

The FCT language setting can be changed in the menu [Extra][Language].

3.2.1 Required software

The files needed for installation of the FCT are on the accompanying USB memory card.

Required for commissioning are:

- FCT plug-in CMXR-C2, including FCT base program (Framework)
- FCT plug-in CMMP-AS
- Codesys



The component-specific FCT plug-ins each have their own help files.

Three options for opening Help:

- Command [Help][Content of installed PlugIns][Festo][Plug-in name]
- “Help” button in the window area or dialogue of the plug-in
- Function key F1 when a window or dialogue of the plug-in is activated

3.2.2 Installing the FCT

Admin rights are required for installation on the PC (laptop).

- Install software in the following sequence:
 1. FCT plug-in CMXR-C2 (includes FCT base program)
 2. Codesys
 3. FCT plug-in CMMP with all subordinate elements
 4. Target support package Codesys



For installation of target:

1. Unpack the ZIP file included on the USB memory card in any temporary directory.
2. Install via the Windows start menu:
[Programme][Festo Software][Codesys V... by Festo][Install Target].
3. In the “Install Target” dialogue window: With the “Open” button in the temporary directory, search for, select and “open” the file “CMXR-C2.tnf”.
4. For the possible target systems, select and “install” “CMXR-C2...”.
The Target program is installed.

3.2.3 Starting the FCT

1. Start the FCT via the symbol on the Desktop or via the Windows start menu:
[Programme][Festo Software][Festo Configuration Tool].
2. Close dialogue window “New project - Project properties”.

3.2.4 De-archiving an FCT project

1. Open the De-archive dialogue: [Project][Extract].
2. Select button “Search”.
3. In the dialogue window: Select in the directory of the USB memory card the FCT base project (ZIP file) that fits the kinematics (→ 3.1.3 USB memory card).
The project is de-archived and opened in the FCT.

3.3 Network configuration

3.3.1 IP addresses

The control system has an integrated Ethernet network, to which the following components are connected:

- multi-axis controller
- operator unit (via integrated CAMI-C interface housing)
- motor controller

Communication is via the TCP/IPv4 protocol.

At the time of commissioning with the control system, the components have the following settings:

Component	TCP/IP parameters	Settings	Adapt IP address ¹⁾
Multi-axis controller CMXR-C2	IP address	192.168.100.100	→ 3.3.3
	Subnet mask	255.255.255.0	
	Gateway address	192.168.100.1	
Operator unit ³⁾	IP address	192.168.100.101	→ 3.3.5
	Subnet mask	255.255.255.0	
	Gateway address	192.168.100.1	
	Host-IP address	192.168.100.100	
Motor controller CMMP-AS-...			→ 3.3.4
...C5-...-M0 for A1 Motor 1 ²⁾	IP address	192.168.100.102	
	Subnet mask	255.255.255.0	
	Gateway address	192.168.100.1	
...C5-...-M0 for A2 Motor 2 ²⁾	IP address	192.168.100.103	
	Subnet mask	255.255.255.0	
	Gateway address	192.168.100.1	
...C2-...-M0 for A3 Electrical attachment component ³⁾	IP address	192.168.100.104	
	Subnet mask	255.255.255.0	
	Gateway address	192.168.100.1	
...C2-...-M0 for A4 Electrical attachment component ³⁾	IP address	192.168.100.105	
	Subnet mask	255.255.255.0	
	Gateway address	192.168.100.1	

1) For orders without a control system, the IP addresses deviate from these and must be adapted.

2) Explanation of the motors (→ 3.1.4 Axes and motors)

3) Optional

Tab. 3.5



To create the connection between the control system and FCT-PC:

- Adapt network settings of the FCT-PC to the network settings of the control system (→ 3.3.2 Adapt IP address of the FCT-PC).



The multi-axis controller, the motor controller and the operator unit do not support automatic assignment of IP addresses (DHCP).

To integrate the control system into an existing network:

- Adapt IP addresses (→ 3.3.3, → 3.3.4, → 3.3.5).

3.3.2 Adapt IP address of the FCT-PC



Administrator rights are required to adapt the network settings.

To create a connection to the network of the control system, the TCP/IPv4 settings of the used Ethernet interface of the FCT-PC must be adapted.

- Assign an unassigned IP address from the address range 192.168.100.1 ... 254.

Component	TCP/IP parameters	Setting (example)
PC with installed FCT	IP address	192.168.100.110
	Subnet mask	255.255.255.0
	Gateway address	192.168.100.1

Tab. 3.6

After installation of the FCT (→ 3.2 Festo Configuration Tool (FCT)), the connection can be made to the multi-axis controller via the address 192.168.100.100.



If the network settings of the FCT-PC cannot be used:

- Adapt network settings of the control system (→ 3.3.3 Adapting the IP address of the multi-axis controller).

3.3.3 Adapting the IP address of the multi-axis controller



Only for orders without a control system:

- Change IP addresses according to the following procedure.

1. Connect FCT-PC to the control system.
2. Start FCT (→ 3.2.3 Starting the FCT).
3. Open the FCT base project that fits the kinematics.
4. In the FCT window “Workspace”, open the CPU parameters of the multi-axis control system: [CMXR-C2...][Configuration][CPU Parameter].
5. Adapt the settings in the range “Network Configuration (X7)”.
6. Establish a connection with the multi-axis controller and transfer the changed configuration with the button “Download”.
7. To accept the changed configuration:
Switch control system off and on at the power switch.

3.3.4 Changing IP addresses of the motor controllers



Only for orders without a control system:

The IP addresses of the motor controllers are from the range 169.254.1.0 ... 169.254.254.255 and can be adapted as needed.

- Change IP addresses according to the following procedure.

1. Connect FCT-PC to the control system.
2. Start FCT (→ 3.2.3 Starting the FCT).
3. Open the FCT base project that fits the kinematics.
4. In the FCT window “Workspace”, select a motor controller: [CMMP-AS...].
5. Select menu [Component] [FCT Interface].
The dialogue window “FCT Interface” is opened.
6. Select “Ethernet” tab.
7. Select “Scan...” button: The window “Festo Field Device Tool” opens.
8. In the device list, select the motor controller of the selected axis.
9. Identification with the right mouse key and start [Identification on].
On the motor controller, the letter sequence “H E L L O” appears in the 7-segments display.
10. Open dialogue window to the motor controller: right mouse key and [Network].
11. Change network settings of the motor controller in accordance with the table specifications (→ Tab. 3.5) and confirm with “OK”.
12. If the message “The command ReBoot is not supported” appears:
Press “Reset” key on the motor controller.
The changed network setting is accepted.
13. Repeat steps 4. to 12. for the other motor controllers.




The supplied FCT basic projects include the configured FCT components for the motor controllers of the drive motors on the X-axes (motor 1 and motor 2).

If additional motor controllers and attachment components are included in the system:

- First create the FCT components for the additional motor controllers CMMP-AS (→ 3.4.5 Adding FCT component).

3.3.5 Adapting IP address of the operator unit

The IP address can be adapted in the Setup menu of the operator unit.

1. Make sure that the operator unit is connected correctly to the control system (→ 3.1.6 Operator unit/enabling button).
2. Switch on control system.
3. If the message “Enter SetUp-Mask?” appears: Actuate  key on the operator unit.
4. Process TCP/IP settings:
 - Set the desired IP address of the operator unit.
 - Specify the IP address and host ID of the control system to which the operator unit is connected.
5. Save the changed settings with the “Save/Exit” button.

3.4 Creating kinematics-specific FCT project

3.4.1 Definition

Different FCT basic projects for the various kinematics variants can be found on the USB memory card (→ 3.1.3 USB memory card).



Note

The FCT basic projects do not yet include all kinematics-specific specifications. For commissioning, the basic project that fits the kinematics must be selected and expanded to a kinematics-specific FCT project with the following supplements:

- Adapt stroke lengths of the X- and Y-axis.

Creation of the kinematics-specific FCT projects and further procedures for commissioning are described subsequently.



Further information on the parameters as well as their transfer to the components (→ Description of FCT or Help files of the corresponding plug-ins).

3.4.2 Requirements

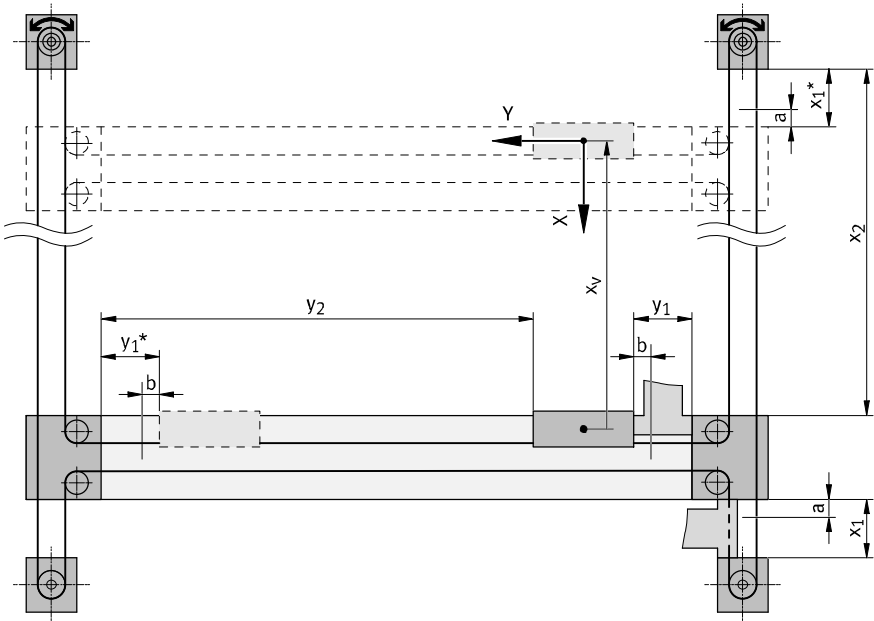
- FCT started (→ 3.2.3 Starting the FCT).
- The FCT base project that fits the kinematics is selected (→ 3.4.1 Definition)
The specifications on the rating plate have been observed.
- The FCT base project that fits the kinematics is opened (→ 3.2.4 De-archiving an FCT project).

3.4.3 Adapting stroke lengths

Note

In the FCT basic project, only temporary values are entered for the X- and Y-axis; these normally do **not** equal the actual stroke lengths.

- The entered values must be replaced by the actual mechanical stroke lengths of the planar surface gantry.



- x_1/y_1 Distance of the reference point from the mechanical stop:
In the FCT basic project, 30 mm is entered (aid: zero point setting piece).
- x_1^*/y_1^* Distance from the opposite mechanical stop:
(Value of 30 mm is automatically determined by the FCT.)
- a/b “Limits of the workspace” of the multi-axis controller (software end position).
In the FCT basic project, 3 mm is preset as additional travel distance.
The available travel distance on the X- and Y-axis can be extended by increasing this value: FCT window “Workspace” [CMXR-C2...][Kinematics Type].
Maximum value of the “Limits of the workspace a/b”:
 - EXCH-40: 26 mm
 - EXCH-60: 24 mm
- x_v Null shift

Fig. 3.6

3 Commissioning

1. Dimensions x_1 and y_1 :

Set distance by placing the zero point setting piece (30 mm) or determine distance dimensions on the planar surface gantry through measurement.

2. Do not move traverse and slide unit of the Y-axis.

Determine values x_2 and y_2 through measurement.

3. Calculate the mechanical stroke lengths of the X- and Y-axis:

$$X_{\max} = x_1 + x_2$$

$$Y_{\max} = y_1 + y_2$$

4. In the FCT window "Workspace": open [CMXR-C2...] [Kinematics Type].

5. Enter the determined stroke lengths in the FCT:

- X_{\max} at Xmax: maximum mechanical stroke X
- Y_{\max} at Ymax: maximum mechanical stroke Y

Do not change the following values:

- X1: mechanical distance 0-position X-axis: 30 mm
- Y1: mechanical distance 0-position Y-axis: 30 mm



With the determined mechanical stroke lengths, the travel distances that are actually available on the axes can be calculated:

- Travel distance on the X-axis = $X_{\max} - 2x_1 + 2a$
- Travel distance on the Y-axis = $Y_{\max} - 2y_1 + 2b$

Example:

$$Y_{\max} = 500 \text{ mm}; y_1 = 30 \text{ mm}; b = 3 \text{ mm}$$

On the Y-axis, a travel distance of 446 mm is available.

Null shift x_v



To ensure that the position values within the working space are always positive, the zero point of the basic coordinate system for the X-axis is shifted.

The null shift is automatically calculated in the FCT: $X_v = X_{\max} - 2x_1$

The value of the null shift is displayed in the FCT window "Workspace" [CMXR-C2...] [Kinematics Type] as "x-Displacement".

3.4.4 Check direction of motor rotation

1. In the FCT window “Workspace”, select a motor controller: [CMMP-AS...].
2. Open application data of the motor controller: [Application Data].
3. Change into the tab “Environment”.
4. In the “Parameters” area: Check the specification for the “Inverse Rotation Polarity” corresponding to the attachment position of the motors in accordance with the following table:

Attachment position of the motors (→ 3.1.4)	Specification of direction of rotation reversing
Top (EXCH-...-T-...)	Option field activated: ✓
Bottom (EXCH-...-B-...)	–

Tab. 3.7

5. If the specification of direction of rotation reversing does not fit the attachment position of the motors:
 - Adjust specification of direction of rotation reversing
or
 - Close FCT basic project.
Restart processing with the FCT basic project that fits the kinematics
(→ 3.4 Creating kinematics-specific FCT project).
6. Repeat steps 1. to 5. for the other motor controller.
7. Save the FCT project under a new name: [Project] [Save As].

3.4.5 Adding FCT component



The supplied FCT basic projects include the configured FCT components for the motor controllers of the drive motors on the X-axes (motor 1 and motor 2)
(→ 3.1.4 Axes and motors).

If additional motor controllers and attachment components are included in the system:

- Add the FCT components for the additional included motor controllers CMMP-AS and configure for the attachment component used.

Information on adding and configuring the FCT components can be found in the FCT description and the Help files of the FCT plug-ins.

The FCT description is on the USB memory card or, after installation of the program, in the folder <FCT installation directory>\Help\FCT_<language>.pdf.

3.5 Configuring the control system

For commissioning, the control parameters of the kinematics-specific FCT project are transferred into the components of the control system and a boot project is set up on the multi-axis controller.



Further information on the parameters as well as their transfer to the components (→ Description of FCT or Help files of the corresponding plug-ins).

3.5.1 Requirements

The following conditions must be met to transfer (download) the parameters onto the multi-axis control system and the motor controllers:

- Kinematics-specific FCT project created (→ 3.4 Creating kinematics-specific FCT project).
- Function-ready connection of the control system components to the FCT-PC:
 - Ethernet connection to the multi-axis controller
 - Ethernet or USB connection to the motor controllers
- Agreement of the plug-in versions of the components of the control system with the plug-in versions of the FCT project. (Additional information → 3.3 Network configuration).

3.5.2 Preparation

1. Start FCT (→ 3.2.3 Starting the FCT).
2. Open the kinematics-specific FCT project.

3.5.3 Multi-axis controller with Codesys

3. In the FCT window “Workspace” select the multi-axis controller: [CMXR-C2...].
4. Check the set interface: [Component][FCT Interface]



For configuration of the multi-axis controller, download of the CoDeSys project is required.

5. In the FCT window “Workspace”, select: [CMXR-C2...][CoDeSys].
6. In the “CoDeSys Project Status” window, select the “Start CoDeSys” button.
7. In the Codesys dialogue window, select: [Online][Login].
8. [Online][Create boot project].
9. [File][Exit].
10. In the Save dialog window, select “Yes”.
11. In the “CoDeSys Project Status” window, select: “Update PLC configuration”.
12. Create the connection between FCT and the multi-axis controller: [Component][Online][OK].

13. With “Download”, on the right side of the function bar, call up the dialogue window for transferring the settings.

- Option field “Transmit configuration” is already preset as activated: ✓.
- Activate option field “Transmit FTL projects”: ✓.
- Activate option field “Transmit CoDeSys sources”: ✓.

14. Start data transmission with “Confirm”.

The parameters of the FCT project are transferred to the multi-axis controller.

15. Select “Restart CMXR” on the right side of the function bar.

16. In the dialogue window, confirm the restart with “OK”.

The multi-axis controller starts with the updated parameters.

3.5.4 Motor controller

17. In the FCT window “Workspace”, select a motor controller: [CMMP-AS...].

18. Establish a connection between FCT and the motor controller: [Component][Online][Login].

19. Select “Download” on the right side of the function bar.

20. In the “Synchronize project and device data” dialogue window: Select “Download”.

21. In the “FCT Device Control...” dialogue window, select “OK”.

The parameters of the FCT project are transferred to the motor controller.

22. Repeat steps 17. to 21. for the other motor controllers.

Transfer of the control parameters to the components of the control system is completed.

Next step: ➔ 3.6 Homing and checking

3.6 Homing and checking



Homing and checking can be carried out in two ways:

- with the operator unit
- or
- with an enabling button in combination with the CDSA emulation

3.6.1 Requirements


- operator unit or enabling button connected (→ 3.1.6 Operator unit/enabling button).



To execute various steps, you must log on as administrator to the operator unit or the CDSA emulation.

Logging on as administrator

1. After completion of the boot procedure on the operator unit or in the CDSA emulation:

With the  and “Setup” key/button, change into the Setup mask.

2. Select “User” button on the lower edge of the screen.
3. In the “User” list field, select the user “Administrator”.
4. Enter password: factory setting “admin”.
5. Activate write permissions: Set ✓ at “Write Access”.
6. Confirm with “OK”.

3.6.2 Drives: direction of movement, assignment and homing



Note

Homing of the drives is required in the following cases:

- during initial commissioning.
- at initial start-up at operating temperature (after approximately 30 strokes), if the toothed belt pretensioning has been changed.
- after changing the toothed belt.
- For the above cases, make sure that the toothed belt pretensioning is checked and set beforehand (→ Description of planar surface gantry EXCH “Mechanical installation”).
- For homing, use the two zero point setting pieces.

If the planar surface gantry is in a vertical mounting position, two or three people are required to perform this.

Preparation

1. Start FCT (➔ 3.2.3 Starting the FCT).
2. Open the kinematics-specific FCT project.
3. Switch control system to manual override (➔ 3.1.8 Manual override/automatic operation).
4. Rotate key switch “brake release” clockwise to the “2 o’clock position”.



Danger

If the planar surface gantry is mounted vertically


Mortal danger and material damage due to falling traverse (Y-axis).

The traverse falls down in an uncontrolled manner due to release of the motor brakes.

- Before releasing the brakes, make sure that the traverse is located in the lower end position at the end caps.

5. Unlock brakes via an enabling key on the operator unit or with the separate enabling button. The brakes of the drive motors must unlock audibly.
The traverse and the slide unit of the Y-axis can now be shifted manually.

Checking direction of movement and assignment of the drives

6. On the operator unit or in the CDSA emulation:
With the  key/button, change into the position mask (coordinate view).
7. In the menu bar, select [Joints].
8. At the planar surface gantry, move traverse and the slide unit of the Y-axis in succession.
If the planar surface gantry is mounted vertically: Lift and move the traverse with two persons.
While moving the slide units, check at the operator unit or in the CDSA emulation
 - whether the value of the corresponding axis changes and
 - whether the change in value agrees with the direction of movement.
The value must become smaller:
 - if the traverse is moved in the direction of the drive cover (motor side).
 - if the slide unit of the Y-axis is moved in the direction of the X-axis 1 (with energy chain).

Preparation for homing

9. If the planar surface gantry is mounted vertically:

Lift traverse with two persons approx. 20 cm and hold it.

10. Place zero point setting piece (30 mm) between the end cap and carriage of the X-axis (if mounting position is vertical, with help of a third person) (→ Fig. 3.7).



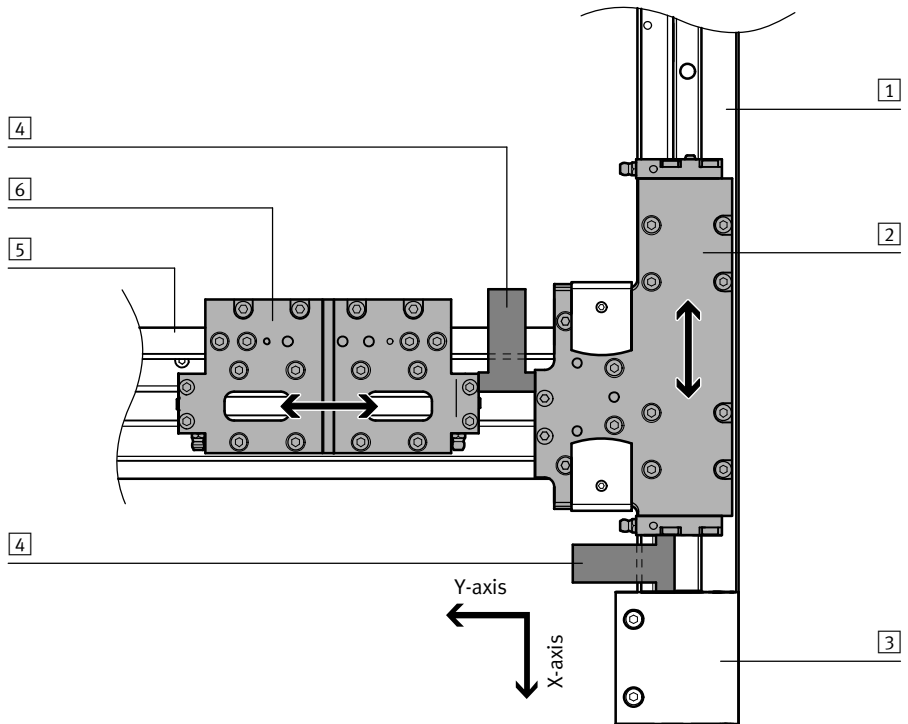
The slot in the zero point setting pieces is intended for hanging and locking onto the profile of the axis.



Warning

If the planar surface gantry is mounted vertically
If the zero point setting piece falls out, the traverse (Y-axis) falls downward.
Danger of crushing.

- Make sure that no one is located underneath the traverse.



1 X-axis 1 (with energy chain)

2 Carriage of the X-axis 1

3 End cap

4 Zero point setting piece (length 30 mm)


5 Traverse (Y-axis)

6 Slide units of the Y-axis

Fig. 3.7

11. With horizontal mounting position: Push traverse with the carriage of the X-axis 1 against the zero point setting piece and clamp it.
With vertical mounting position: Place traverse with the carriage of the X-axis 1 on the zero point setting piece.
12. Place the second zero point setting piece on the traverse between the carriage of the X-axis 1 and the slide unit of the Y-axis (→ Fig. 3.7).
13. Push the slide unit of the Y-axis against the zero point setting piece and clamp it.
14. With vertical mounting position: Activate motor brake.
 - Move key switch “brake release” to position “0”.
The brakes must lock audibly.

Homing

15. Make sure that both zero point setting pieces are placed at the specified positions (→ Steps 9. to 13.).
16. Switch control system to automatic operation (→ 3.1.8 Manual override/automatic operation).
17. In the FCT window “Workspace”, select the motor controller of the X-axis 1: [CMMP-AS: A1].
18. Establish a connection between FCT and the motor controller: [Component][Online][Login].
19. Call up Homing settings:
[CMMP-AS: A1][Axis][Homing].
20. Make sure that “Current Position” is selected in the destination of the homing method.
21. In the FCT area “Project Output”, open the tab “Homing”.
22. In the “Device Control” area:
 - Activate options fields “FCT” and “Enable” with ✓.
Device control is activated and released via FCT.
23. Start homing: In the FCT window “Homing”, select the “ Start Homing” button.
Homing is carried out.
24. After homing is completed, the “Homing successful” dialogue window is displayed:
Confirm with “OK”.
25. Lock device control: In the FCT window “Homing”, deactivate the option field “Enable”.
26. Transfer reference values to the motor controller:
Select “Save Offset To Encoder” button.
27. Dialogue window “Warning!” appears with reference to the homing position: Confirm with “OK”.
Homing position is transferred to the motor controller of the X-axis 1.
28. Deactivate device control via FCT: Deactivate the option field “FCT” in the FCT window “Homing”.
29. End connection to the motor controller: [Component][Online][Logout].
30. Home motor controller of the X-axis 2:
Repeat steps 17. to 29. for [CMMP-AS: A2].

31. With horizontal mounting position:

- Remove zero point setting piece from the X-axis 1.

With vertical mounting position:

- Switch control system to manual override (→ 3.1.8 Manual override/automatic operation).
- Rotate key switch “brake release” clockwise to the “2 o'clock position”.
- Unlock brakes via an enabling key on the operator unit or with the separate enabling button.
The brakes of the drive motors must unlock audibly.
The traverse and the slide unit of the Y-axis can now be shifted manually.
- Lift traverse with two people and pull out the zero point setting piece from the X-axis 1.
- Place traverse on the end caps.

32. Remove the other zero point setting piece from the traverse.

33. If the toothed belt pretensioning has not yet been checked at operating temperature:

- Check the toothed belt pretensioning
(→ 3.6.3 Checking the toothed belt pretension at operating temperature).

If the toothed belt pretensioning has already been checked at operating temperature:

- Determine feed constant (→ 3.6.4 Determining and adapting feed constants).

3.6.3 Checking the toothed belt pretension at operating temperature



Note

Temperature changes influence the toothed belt pretensioning.

One time after initial start-up at operating temperature (after approximately 30 strokes):

- Check toothed belt pretensioning again and correct it, if necessary.

1. Travel traverse (Y-axis) approximately 30 strokes.
2. Check toothed belt pretensioning again and correct it, if necessary.

In doing so, note the different procedures depending on the mounting position of the planar surface gantry:

- horizontal mounting position (→ Description of the planar surface gantry: EXCH “Mechanical installation”: 5.3)
- vertical mounting position (→ Description of the planar surface gantry: EXCH “Mechanical installation”: 6.3)

3. If the toothed belt pretensioning was changed in step 2.:

- Perform homing again (→ 3.6.2 Drives: direction of movement, assignment and homing).

If the toothed belt pretensioning was not changed in step 2.:

- Determine feed constant (→ 3.6.4 Determining and adapting feed constants).

3.6.4 Determining and adapting feed constants

The feed constant describes the ratio between motor speed and distance travelled by the toothed belt. Since a changed toothed belt pretensioning changes precisely this ratio, the feed constant must be newly determined. Setting of the feed constants is done in the FCT with the operator unit or CDSA emulation.



Note

The feed constants must be determined and adapted in the following cases:


- after setting of the toothed belt pretensioning at initial set-up
- after a toothed belt change and setting of the toothed belt pretensioning
- after replacement of the reversing sprockets
- if system precision is no longer sufficient

If the planar surface gantry is in a vertical mounting position, two or three people are required to perform this.

Requirements

- Homing successfully completed (➔ 3.6.2 Drives: direction of movement, assignment and homing).
- For motors with brakes: brakes released (➔ 3.1.9 Release brakes).
- operator unit or enabling button connected (➔ 3.1.6 Operator unit/enabling button).

Procedure

1. Start operator unit or CDSA emulation.
2. Actuate key (button) .
3. Actuate button “Drives”.
4. If the planar surface gantry is mounted vertically: Lift the traverse (Y-axis) with two persons.
5. On the X-axis 1 between guide rail and profile cover of the X-axis:
Place gauge between the end cap and the carriage of the X-axis (for vertical mounting position, with the help of a third person) (➔ Fig. 3.8).



The gauge is not included in the scope of delivery.

Length (recommendation): The longer the gauge, the more exact the setting of the system.

The exact dimension must be known.

Thickness: max. 12 mm (open distance between guide rail and profile cover).



Danger

If the planar surface gantry is mounted vertically

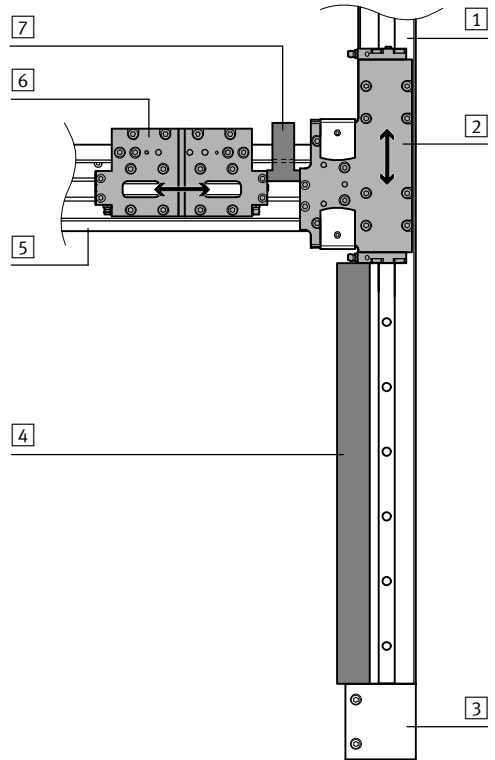
If the gauge falls out, the traverse (Y-axis) falls downward.

Danger of severe crushing, amputation of limbs and material damage.

- Make sure that no one is located underneath the traverse.

3 Commissioning

6. Horizontal mounting position:
 - Push traverse with the carriage of the X-axis 1 against the gauge and clamp it.Vertical mounting position:
 - Place traverse with the carriage of the X-axis 1 on the gauge.
7. Place the zero point setting piece between the carriage of the X-axis 1 and the slide unit of the Y-axis and clamp it. The slot in the zero point setting piece is intended for hanging and locking onto the profile of the axis.



- 1** X-axis 1 (with energy chain)
- 2** Carriage of the X-axis 1
- 3** End cap
- 4** Gauge¹⁾
- 5** Traverse (Y-axis)
- 6** Slide units of the Y-axis
- 7** Zero point setting piece (30 mm)

1) Not included in the scope of delivery

Fig. 3.8 Presented as an example EXCH-40.

The profile covers of the X-axis and traverse (Y-axis) are not depicted.

8. If both gauge and zero point setting piece are clamped simultaneously:
Read the values for Axis_1 and Axis_2 in the operator unit or CDSA emulation.
9. In the FCT window “Workspace”: open [CMXR-C2...] [Kinematics Type].

10. In the FCT, enter the values of the following parameters: length of the gauge, axis_1, axis_2.

Parameter designations	
Operator unit or CDSA emulation	Enter the values in the FCT for:
Length of the gauge	L: length of gauge
Axis_1	Drive 1 actual position
Axis_2	Drive 2 actual position

Tab. 3.8

In the FCT, the new feed constants are automatically calculated and displayed:

- fc1new: feed constant (new value)
- fc2new: feed constant (new value)



The following calculation formula is stored in the FCT:

$$fc1_{new} = \frac{(L - x_1)}{Axis_1} fc1_{old} \qquad fc2_{new} = \frac{(L - x_1)}{Axis_2} fc2_{old}$$

fc1new	fc1new: feed constant (new value)
fc2new	fc2new: feed constant (new value)
x1	x1: reference position
L	L: length of gauge
Axis_1	Drive 1 actual position
Axis_2	Drive 2 actual position
fc1old	fc1old: feed constant (old value)
fc2old	fc2old: feed constant (old value)

11. Create the connection between FCT and the multi-axis controller: [Component][Online][OK].

12. With “Download”, on the right side of the function bar, call up the dialogue window for transferring the settings:

- Option field “Transmit configuration” is already preset as activated: ✓.

Not required:

- “Transmit FTL projects”
- “Transmit CoDeSys sources”

13. Start data transmission with “Confirm”.

The updated project parameters are transferred to the multi-axis controller.

14. To accept the changed configuration:

On the right side of the function bar, select “Restart CMXR”.

15. In the dialogue window, confirm the restart with “OK”.

The multi-axis controller starts with the updated parameters.

A dialogue window appears with a note of communication interruption.

16. Log in again to the operator unit or CDSA emulation.

17. Check the set feed constants.

- In the operator unit or in the CDSA emulation in the position mask, change to the coordinate system “Joints”.
- Read values for A1 and A2 and compare with the setpoint values.
Setpoint values:
 - A1: length of gauge minus reference position
 - A2: “0”

In case of deviation: Repeat steps 4. to 17.

18. Horizontal mounting position:

- Remove gauge.
- Vertical mounting position:
- Lift traverse with two people and pull out the gauge.
 - Place traverse on the end caps.

19. Remove the zero point setting piece from the traverse.

3.6.5 Safety circuits

Checking safety circuits in manual override




1. Establish the following initial situation:
 - Control system in manual override (→ 3.1.8 Manual override/automatic operation)
 - Brake active (not released)
 - Emergency stop switch unlocked and emergency stop circuits acknowledged
2. Check safety circuits of the system with the following test steps:

Test step	Expected result	End test step
At the operator unit or enabling button		
<ul style="list-style-type: none"> • Actuate the enabling key and release it again. 	Motors of the kinematic system are enabled / brakes are released while the enabling key is actuated.	–
<ul style="list-style-type: none"> • Actuate enabling key and release internal emergency stop. 	Illuminated push-button “acknowledge emergency stop” lights up / Motors are no longer active. For external emergency stop circuit: Emergency stop is reported at an external emergency stop circuit.	<ul style="list-style-type: none"> • Acknowledge internal emergency stop circuit with illuminated push-button. • If present, acknowledge external emergency stop circuit.
<ul style="list-style-type: none"> • Press enabling key and trigger external emergency stop (if present). 	Indicator light “external emergency stop” lights up / Motors are no longer active.	<ul style="list-style-type: none"> • Acknowledge external emergency stop circuit.

Tab. 3.9

Checking safety circuits in automatic operation

1. Establish the following initial situation:
 - Control system in automatic operation
 - Brake active (not released)
 - Emergency stop switch unlocked and emergency stop circuits acknowledged
 - Contacts of the safety door switch closed
2. Check safety circuits of the system with the following test steps:

Test step	Expected result	End test step
<ul style="list-style-type: none"> • Open safety doors. 	 <p>Emergency stop symbol appears on the operator unit or in the CDSA emulation. Motor enable via operator unit or CDSA emulation not possible. Emergency stop is reported at an external emergency stop circuit.</p>	–
<ul style="list-style-type: none"> • Close safety doors and acknowledge external emergency stop (if present). 	 <p>Emergency stop symbol becomes grey.</p>	–
<ul style="list-style-type: none"> • Actuate “Mot” button on the operator unit or in the CDSA emulation.¹⁾ 	 <p>Motors of the kinematics system are enabled. Robot symbol on the operator unit or in the CDSA emulation turns grey.</p>	<ul style="list-style-type: none"> • Actuate “Mot” button on the operator unit or in the CDSA emulation again to terminate the enable.
<ul style="list-style-type: none"> • Actuate enabling key. 	Motors of the kinematics system must not be enabled.	–
<ul style="list-style-type: none"> • Trigger internal emergency stop. 	Illuminated push-button “acknowledge emergency stop” lights up and emergency stop is reported at an external emergency stop circuit.	<ol style="list-style-type: none"> 1. Unlock emergency stop switch. 2. Acknowledge emergency stop circuit with illuminated push-button.
<ol style="list-style-type: none"> 1. Actuate “Mot” button on the operator unit or in the CDSA emulation.¹⁾ 2. Trigger external emergency stop (if present). 	Indicator light “external emergency stop” lights up.	<ol style="list-style-type: none"> 1. Unlock external emergency stop switch. 2. Acknowledge emergency stop circuit.

1) Administrator and write access required

Tab. 3.10

3. When tests are completed:
Switch control system to manual override (➔ 3.1.8 Manual override/automatic operation).

3.7 Conclusion of commissioning



Warning

Faulty commissioning can result in severe injuries and material damage due to uncontrolled movements of the system.

- After completion of commissioning, check all safety equipment connected to the system and make sure that these work as intended.

The system is now checked and ready for application programming.

Installation and configuration of extensions to the multi-axis controller are now possible.

3.8 Fault clearance

Malfunction	Possible cause	Remedy
Accuracy does not correspond to the technical data	Feed constants are not entered	<ul style="list-style-type: none"> Determine and adapt feed constants (→ 3.6.4).
	Zero point of an axis displaced	<ul style="list-style-type: none"> Home drives (→ 3.6.2).
Motors of the kinematics system cannot be enabled	Emergency stop circuits not acknowledged	<ul style="list-style-type: none"> Unlock emergency stop switch and acknowledge emergency stop circuits.
	Supply voltage of the motors is not connected	<ul style="list-style-type: none"> Check plug connectors of the motor controllers. Check circuit breaker.
	Plug connector or cover at the connection of the operator unit or enabling button is not plugged in completely (rotatable connector)	<ul style="list-style-type: none"> Screw plug connector or cover in completely.
No connection between operator unit or enabling button and the multi-axis controller	Plug connector at the connection of the operator unit or enabling button is not plugged in completely (rotatable connector)	<ul style="list-style-type: none"> Screw plug in completely.
	Incorrect TCP/IP port used on the multi-axis connector	<ul style="list-style-type: none"> Use TCP/IP port X7 (standard configuration).
	IP address of the operator unit not correct	<ul style="list-style-type: none"> Adapt IP address (→ 3.3.5).
Coordinate system does not correspond to the “right-hand rule”	Axes incorrectly assigned, axis labelling does not correspond to the assignment of the multi-axis controller	<ul style="list-style-type: none"> Check assignment of the axes (→ 3.6.2).
Multi-axis control system reports error 401 at the start	Expansion card with an incorrect KBUS address was attached to the multi-axis controller (KBUS address does not agree with the specification of the FCT configuration)	<ul style="list-style-type: none"> Check expansion card and addressing at the rotary switch (→ Description of the multi-axis controller CMXR-C2).
Start of the multi-axis controller CMXR-C2 not successful (display not “0”)	Compact flash card on the multi-axis controller CMXR-C2 is not plugged in correctly	<ul style="list-style-type: none"> Plug compact flash card in correctly.
The main axes do not move or report an “!2t error”	Brakes at the motor controller are connected incorrectly	<ul style="list-style-type: none"> Check wiring of the brakes at the motor controller.
		<ul style="list-style-type: none"> Check low friction by manually releasing the brakes.

Malfunction	Possible cause	Remedy
Motor controller reports error E11-5 (I ² t / following error in reference travel)	Unsuitable acceleration ramp parameters	<ul style="list-style-type: none"> Check parameterisation of the acceleration ramps and adapt, if necessary.
Motor controller reports error E31-0 (I ² t motor)	Motor is blocked	<ul style="list-style-type: none"> Check mobility of the motors and kinematics.
	Application outside the permissible limits	<ul style="list-style-type: none"> Check application.
Connection between multi-axis controller and PC cannot be constructed	IP address of the PC incorrect	<ul style="list-style-type: none"> Check IP address of the PC.
Motor controller has an overvoltage error	Installation of the bridge for internal braking resistor faulty	<ul style="list-style-type: none"> Check installation of the bridge for internal braking resistor.
Safety circuit cannot be acknowledged; red lamp at the safety switching device flashing	Emergency stop switch connected incorrectly	<ul style="list-style-type: none"> Check connection and channel assignment of the emergency stop switches.
	The two channels were not simultaneous	<ul style="list-style-type: none"> Actuate emergency stop switch again. Check emergency stop switch and replace it, if necessary.

Tab. 3.11



Additional information on fault clearance is in the Help of the FCT and in the descriptions of the multi-axis controller and motor controller.

If the malfunction cannot be remedied:

- Contact your regional Festo contact person.
Additional information → www.festo.com/sp.

4 Operation

4.1 FCT projects

4.1.1 Transfer control parameters in FCT project

For diagnostics/servicing, or if a valid FCT project is not available:

The parameters of all components of the control system can be transferred to the FCT-PC (upload).

Requirements

The following conditions must be met to transfer the parameters of the multi-axis control system and the motor controllers into the FCT project (upload):

- Control system configured during commissioning (→ 3.5 Configuring the control system)
- Function-ready connections of the control system components to the FCT-PC:
 - Ethernet connection to the multi-axis controller
 - Ethernet or USB connection to the motor controllers.

Additional information: → 3.3 Network configuration

- Agreement of the plug-in versions of the components of the control system with the FCT plug-in versions of the FCT project.

Procedure

1. Start FCT (→ 3.2.3 Starting the FCT).
2. Open the kinematics-specific FCT project.
3. In the FCT window “Workspace” select the multi-axis controller: [CMXR-C2...].
4. Check the set interface: [Component][FCT Interface].
5. Create the connection between FCT and the multi-axis controller: [Component][Online].
6. With “Upload”, on the right side of the function bar, call up the dialogue window for uploading the settings.
 - Options field “Transmit configuration” is already preset as activated: ✓.
 - Activate option field “Transmit FTL projects”: ✓.
 - Activate option field “Transmit CoDeSys sources”: ✓.
7. Start upload with “Confirm”.

The configuration of the multi-axis controller is transferred to the FCT project.
8. In the FCT window “Workspace”, select a motor controller: [CMMP-AS...].
9. Establish a connection between FCT and the motor controller: [Component][Online][Login].
10. Select “Upload” on the right side of the function bar.
11. In the dialogue window, confirm transfer of the device data with “Yes”.

The configuration of the motor controller is transferred to the FCT project.
12. Repeat steps 8. to 11. for the other motor controllers.
13. Save and archive FCT project: → 4.1.2.

4.1.2 Saving and archiving FCT project



After the control parameters are transferred to the FCT project, the FCT project should be saved on the PC.

The FCT project can then be used for data backup and diagnostics.

1. Save FCT project with [Project][Save As ...] with a unique name (e.g. the serial number of the kinematics system).
2. Archive project as backup (Zip file): [Project][Archive].
3. In the dialogue window, select the options and start the archiving process with “OK”.

5 Repair

Repair instructions are available for download from the Festo Support Portal for repairs to the planar surface gantry (→ www.festo.com/sp). The components of the control system cannot be repaired and have to be replaced in case of a defect.

Removal and installation of control system components



Warning

Danger of electric shock even if power switch is shut off.

The control system is only completely voltage-free if all supply lines have been switched voltage-free.

- Switch off all supply lines (also external voltage) prior to assembly, installation and/or maintenance work and secure them from being restarted accidentally.
- Switch the voltages back on only after completion of work.



Note

Damage to the product from incorrect handling.

- Never pull or plug in the plug connectors and interfaces when powered.
- Observe the handling specifications for electrostatically sensitive devices.



Note

The removal of mechanical components (e.g. motor) causes referencing to be lost. At the subsequent commissioning, a new referencing (→ 3.6.2) and adaptation of the feed constants are required (→ 3.6.4).



Note

When the motor controller is replaced, another firmware version might have to be installed:

- Contact your regional Festo contact person.
Additional information: → www.festo.com/sp

6 De-commissioning and disposal

- Observe the notes for dismantling in the descriptions for the planar surface gantry EXCH “Mechanical installation” and the control system CMCA-...-B... “Electrical installation”.

Disposal



- Observe regulations for environmentally friendly disposal.

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