Application Note

FESTO

Assembly YXMx Compact handling system

Describes the assembly, adjustment and cabling of the compact handling system

YXMx

100095

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Version 1.10
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Author ..... Festo

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1 Components/Software used

Components	
Controller	CECC-X-M1 CECC-X-M1-MV CECC-X-M1-MV-S1
H-gantry	EXCM-30-...
Z-axis	EHMZ-EGSK-20-BS-KF-6P-75- EHMZ-EGSK-20-BS-KF-6P-125-
Motor	EMCX-ST-42-L-7-C1-S-CO EMCX-ST-42-L-S-7-C1-S-CO
Adjustment kit	EADC-E11-30
Mounting kit	EAHT-E9-FB-3D-30
Camera	SBPA-R1-B-U2-2E2A-CS SBPA-R1-C-U2-2E2A-CS SBPA-R2-B-U3-2E2A-CS SBPA-R2-C-U3-2E2A-CS SBPA-R5-B-U2-2E2A-C SBPA-R5-C-U2-2E2A-C SBPA-R8-B-U3-2E2A-C SBPA-R8-C-U3-2E2A-C
Motor cable	NEBM-L2G16-EH-1.5-Q6N-LE8 NEBM-L2G16-EH-3-Q6N-LE8
Connection cable camera head USB	NEBC-U3G5-ES-1.5-N-S-U1G4 NEBC-U3G5-ES-3-N-S-U1G4 NEBC-U7G10-ES-1.5-N-S-U5G9 NEBC-U7G10-ES-3-N-S-U5G9
Connection cable camera head I/O	NEBC-PPG6-E-1.5-N-LE3-V NEBC-PPG6-E-3-N-LE3-V

Table 1.1: 1 Components/Software used

2 Instruction

Information

The system may be used only for the designated use! Use the product only within the specifications!

The system has not been designed for application where a high level of safety is required.

The H-gantry system was planned as a part of an industrial machine. The developer of the machine has to design a safety concept. The compatibility with machines and equipment must be decided by the developer.

Warning

Danger for personal damage

The consequences of abuse and incorrect operation may cause severe injuries.
Only suitably qualified persons are permitted to operate the application.

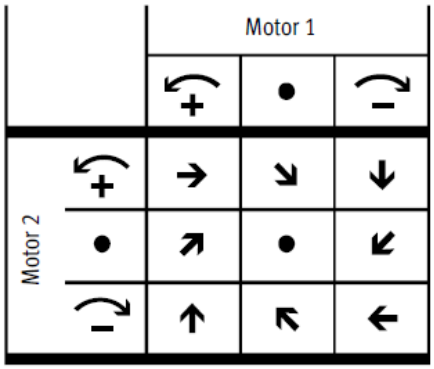
Operate the H-gantry system only under a closed cover or use a safeguard! A safety device must be available (e.g. emergency stop circuit)!
Keep away from any moving parts while the gantry is running!
Before turning on it must be excluded that persons are endangered!

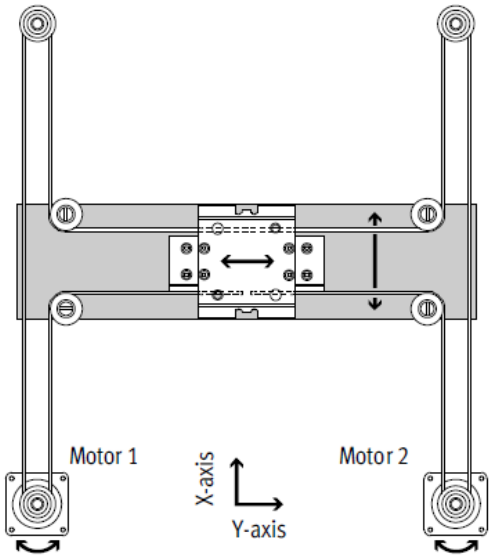
Information

Please observe the Application Notes on the subject of safety!

2.1 Functional principle of the H-gantry

A slide is moved in a two-dimensional space (X-axis/Y-axis) via a toothed belt. The system is powered via 2 fixed motors. The motors are coupled to the toothed belt. The belt is guided via pulleys in such a way that the slide can approach any position in a working space when the motors are actuated accordingly.





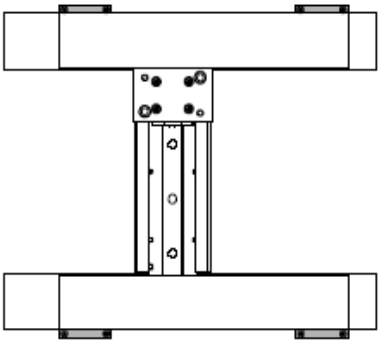
Mechanical/dynamical properties:

- Payload up to 3kg
- Repetition accuracy 0.05mm in XY, 0.005mm in Z
- Max. acceleration 10m/s²
- Max. speed 0.5m/s
- Scalable mechanism: x=90-700mm, Y=110-510mm
- Motor attachments: top or bottom (with various cable outlet directions)
- Flexible mounting MUE (incl.)
- Adjustment kit (opt. available)
- Necessary evenness ≤0,1 mm/m²
- Feed constant 38mm/rev

3 Assembly

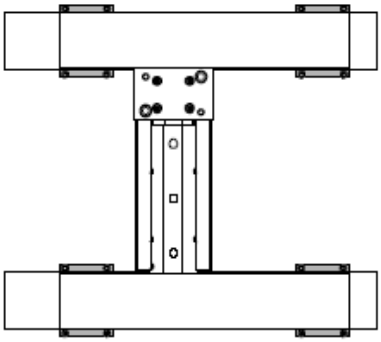
3.1 Adjustment of H-gantry

Horizontal mounting position (< 500 mm)



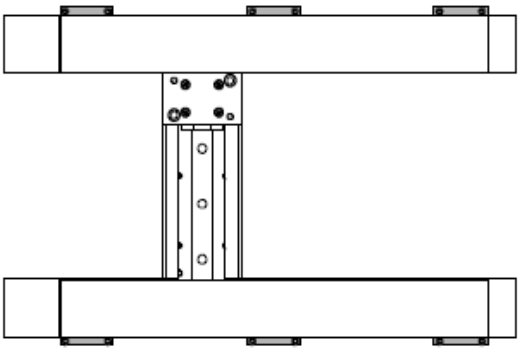
2 profile mountings per profile at the profile ends, optionally inside or outside.

Mounting position not horizontal (< 500 mm)



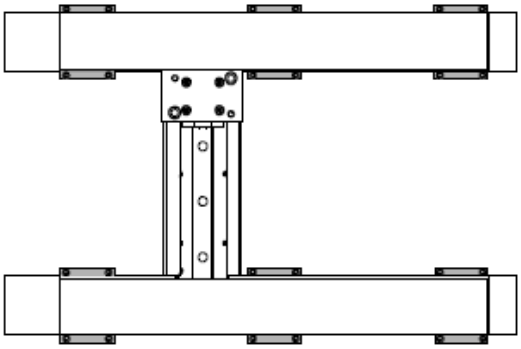
4 profile mountings per profile at the profile ends, in each case inside and outside.

Horizontal mounting position (≥ 500 mm)



2 profile mountings per profile at the profile ends, 1 additional profile mounting per profile in the middle, optionally inside or outside.

Mounting position not horizontal (≥ 500 mm)



4 profile mountings per profile at the profile ends, 2 additional profile mountings per profile in the middle, in each case inside and outside.

Information

See also Festo support portal -› technical documentation

3.1.1 Aligning and mounting the product

1. Make sure that the product and mounting surface have the same temperature.
2. Prepare the mounting surface (➔ 4.2.2 Mounting surface).
3. Select type of mounting according to the intended mounting position.

The following graphics represent as an example the design EXCM-30-...-B1-... with horizontal mounting position.

4. Attach lower part of profile mountings with 2 socket head screws each to the mounting surface (➔ 4.2.3 Types of mounting).

[1] X-axis 1
[2] Transport lock
[3] X-axis 2
[4] Y-axis (traverse)

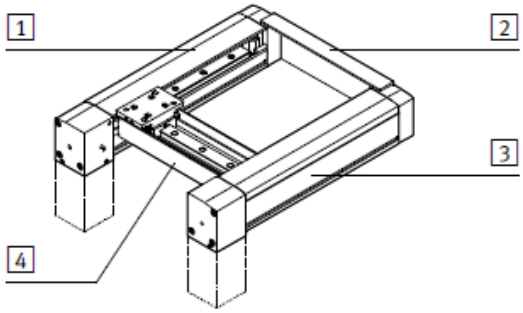


Fig. 4.4

5. Place product on mounting surface and align with the lower part of the profile mountings.
6. Remove transport lock.

Keep reusable transport locks and the corresponding screws for future use (maintenance, dismantling).

7. Shift the Y-axis (traverse) in the direction of the drive the stop position.

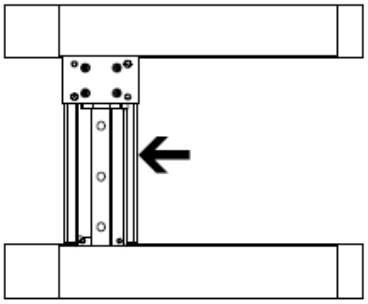


Fig. 4.5

Secure X-axis 1

8. Slide upper parts of profile mounting in mounting slot and position above lower parts.
9. Tighten the screws (tightening torque 1 Nm).

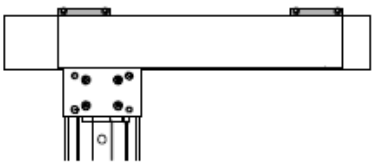


Fig. 4.6

10. Ensure that the Y-axis (traverse) is in direction of the drive in both stop positions.

Secure X-axis 2

11. Slide upper part of profile mounting in mounting slot and position above lower part.
12. Tighten the screws lightly.

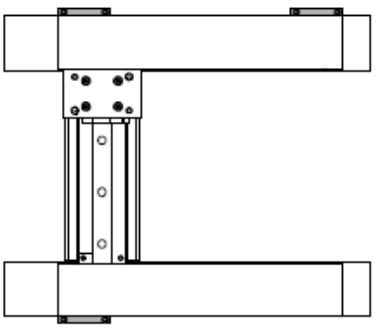


Fig. 4.7

13. Shift the Y-axis (traverse) in the direction of the end cap to the stop position.

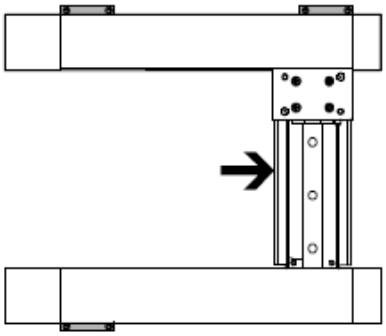


Fig. 4.8

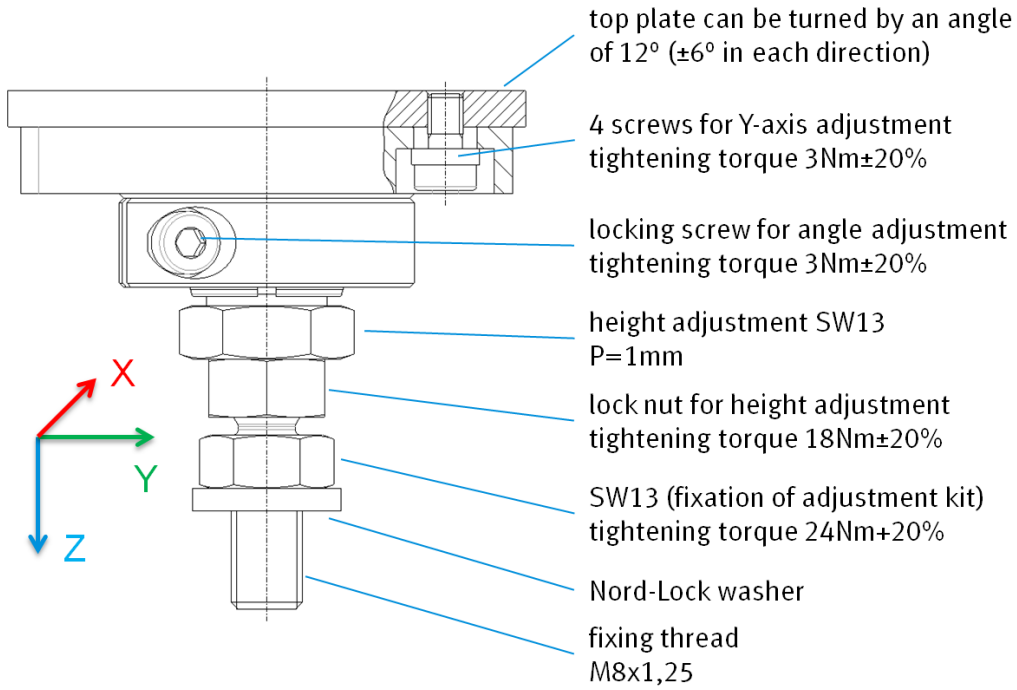
14. Slide upper part of profile mounting on the cover side in the mounting slot and position above lower part.
15. Tighten the screws lightly.
16. Tighten all screws of the profile mounting attachments (tightening torque: 1 Nm).

Fig. 4.9

Information
See also Festo support portal -> technical documentation

3.1.2 General assembly information for adjustment kit

For adjustment of the H-gantry, a specially adjustment kit is optionally available.

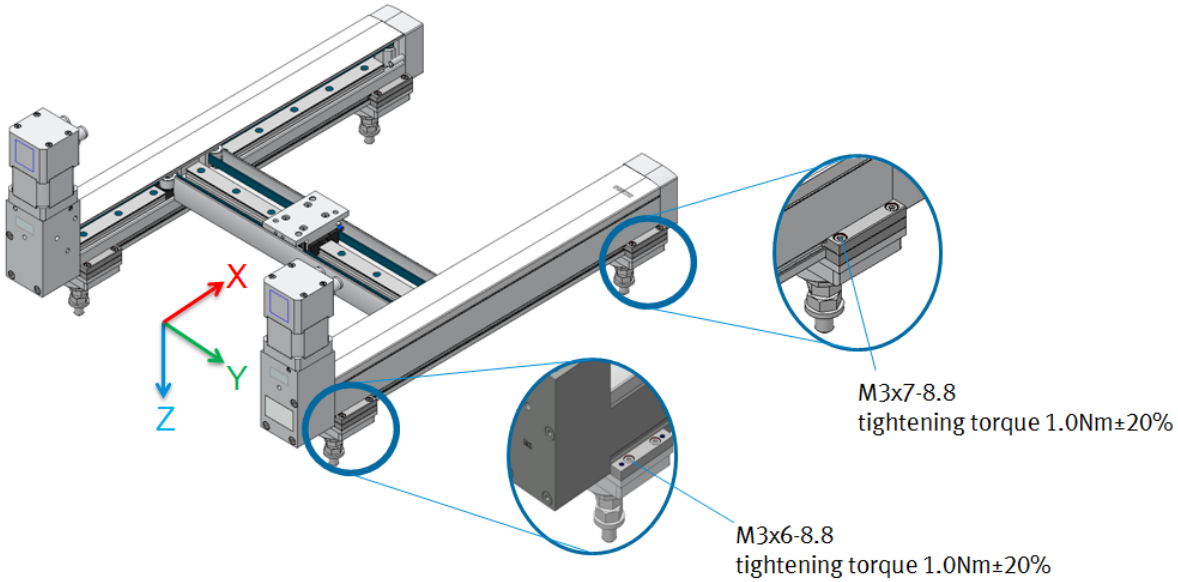


3.1.3 Assembly steps for H-gantry adjustment

Necessary tools for adjustment:

- Machinist's level (accuracy 0,05mm/m
- Gauge block (height › 24mm, accuracy 0,05mm/m)

1. Assemble the adjustment kits, 4 pieces for X-strokes ‹ 500 mm, 6 pieces for X-strokes › 500 mm
2. Pre adjust the height of the adjustment kits with an accuracy of ± 1 mm
3. Assemble the H-gantry to the adjustment kits



4. Align the evenness of the first X-axis with an accuracy of ‹= 0,1 mm. Measure the value several times over the X-axis. Disassemble the plastic covers of the X-axis for measuring.
5. Use the Y-axis to align the both X-axis in Y and X direction. X direction is correct aligned when both mechanical end-stops have contact with the Y-axis. Do the alignment of the X direction on the reference side of the h-gantry. Drive the Y-axis over the whole X-stroke to align both X-axis parallel.
6. Align the evenness of the second X-axis and the evenness of the Y-axis in an parallel way. Both axis have to be aligned with an accuracy of ‹= 0,1 mm. Measure the values several times over both axis.

Caution

Motor position

Use the motor only at the delivered kinematic and position! The engine is specially configured.

Do not exchange the motor to another position!

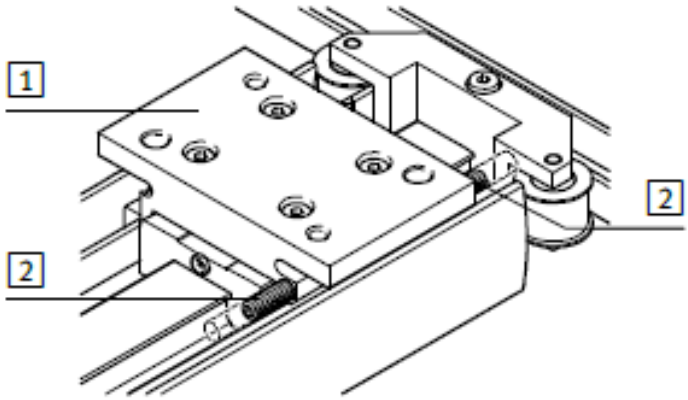
Information

See also Festo support portal -› technical documentation

3.1.4 Setting end stops of the Y-axis

To reduce the danger of collisions between attachment elements and planar surface gantry, the stroke of the Y-axis can be reduced by adjustable end stops (threaded pins).
Different pairs of threaded pins are included in delivery.

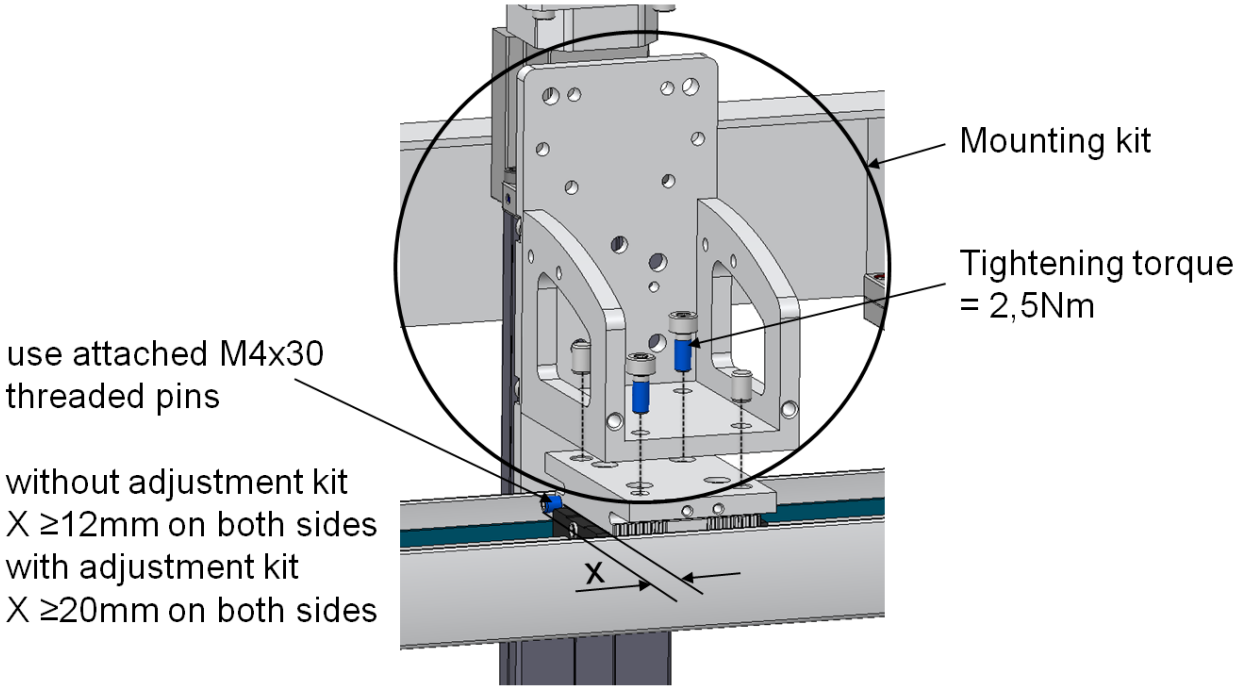
[1] carriage
[2] threaded pins

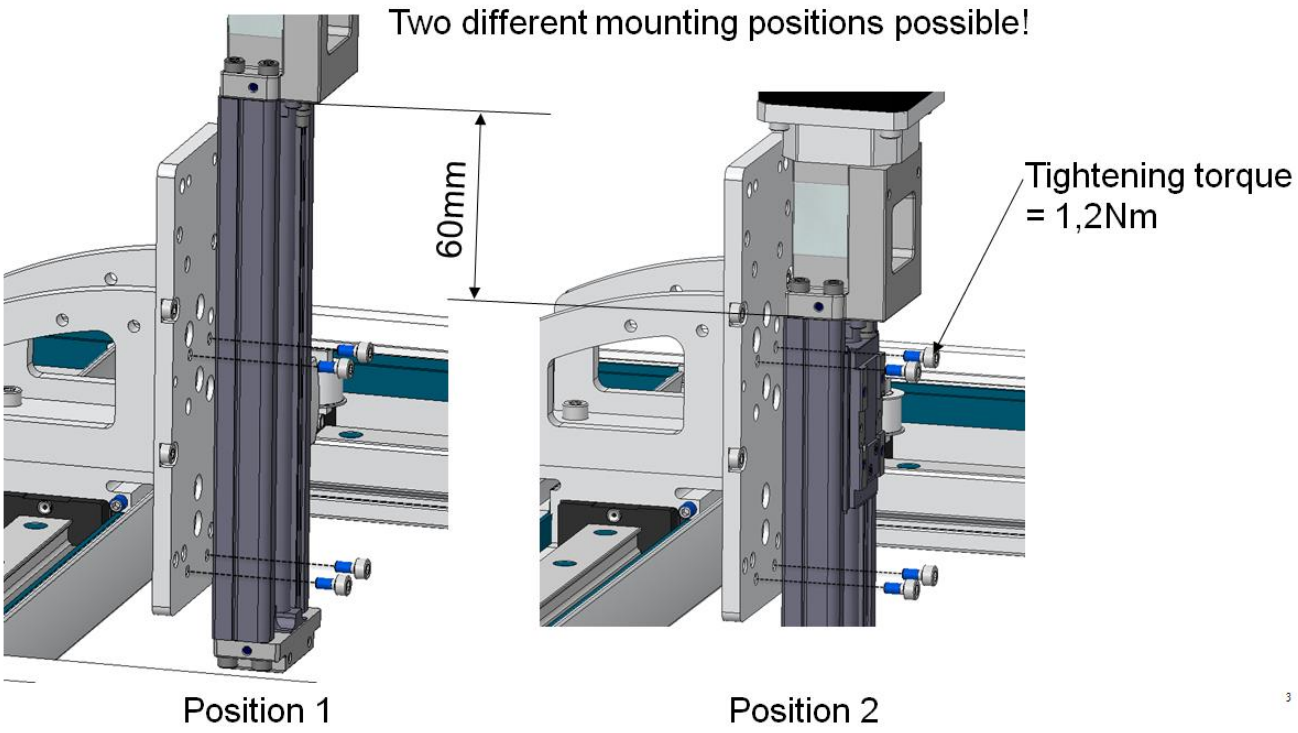


Information
Stroke reduction in Y-direction with standard z-axis is 16mm, with adjustment kit 32mm.
Need to be considered when order the h-gantry.

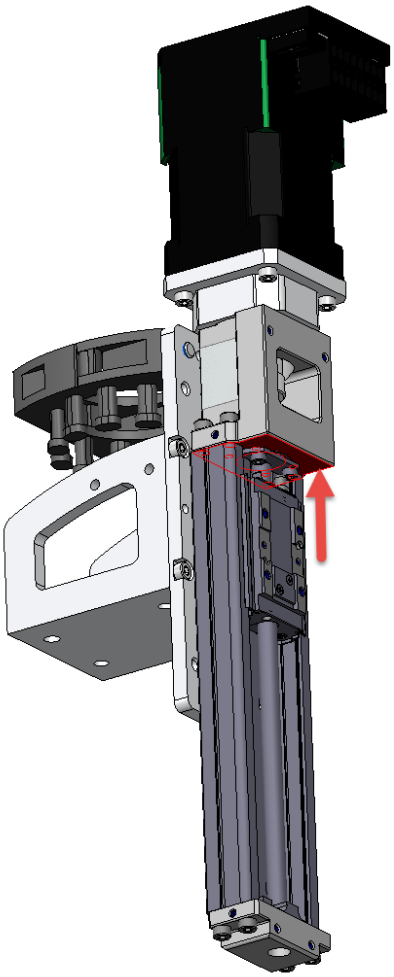
See also Festo support portal -› technical documentation

3.2 Assembly of the Z-axis and the mounting kit





3.2.1 Setting end stop of the Z-axis

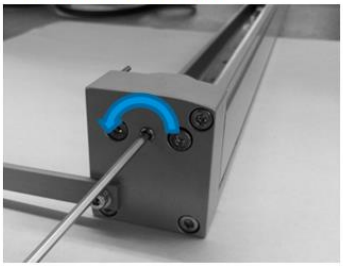


The referencing of the z-axis is done by the customer on a fixed stop (e.g.red surface).

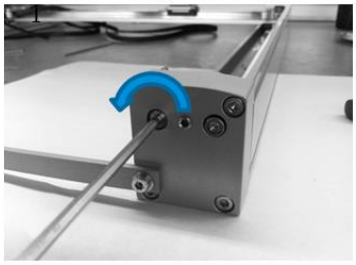
3.3 Belt change

Remove old belt – Standard version

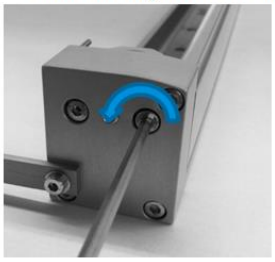
1. loosen allen pin



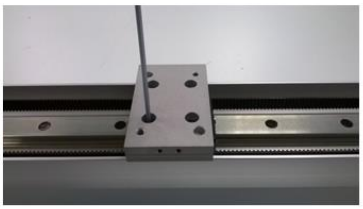
2. loosen adjustment screw



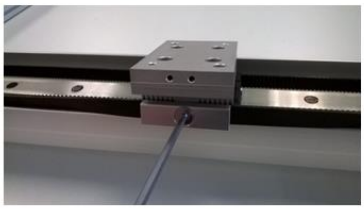
3. loosen adjustment screw 2



4. Loosen 4 carriage screws



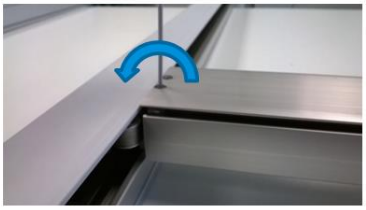
5. Remove belt clamping bracket



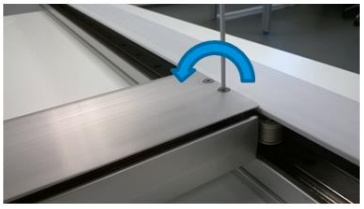
Remove old belt – particle protection version

1., 2., 3. same to standard

4. Loosen 2 screws left side

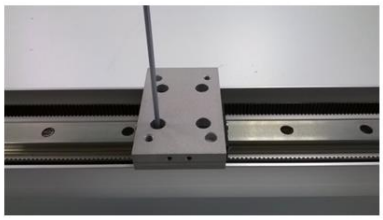


5. Loosen 2 screws right side

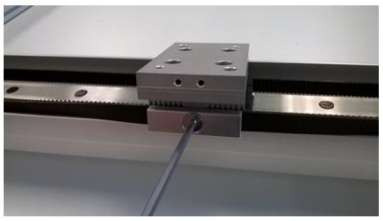


6. Remove cover

7. Loosen 4 carriage screws

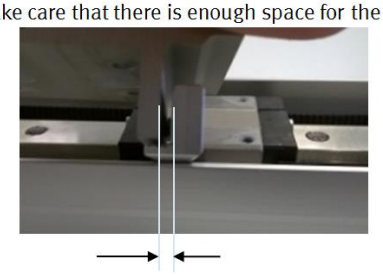


8. Remove belt clamping bracket

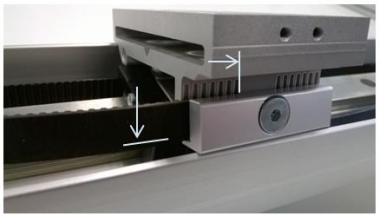


Add new belt 1/3

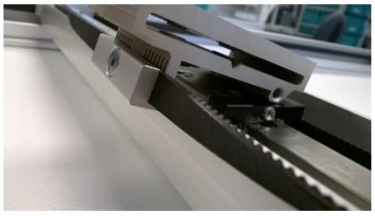
1. Pre-mount the clamping unit
Take care that there is enough space for the belt



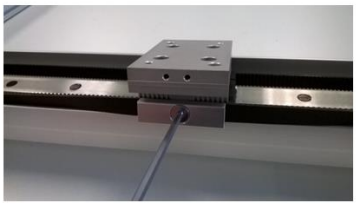
2. Assemble first end of the belt to the holder. Check alignment of the belt to the clamping unit.



3. Assemble second end of the belt to the holder. Check alignment of the belt to the clamping unit.



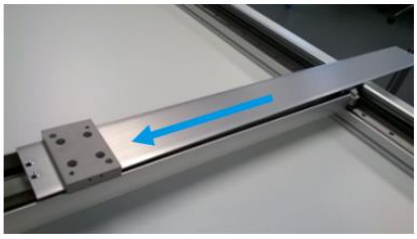
4. Tight clamping bracket



5. Tight carriage screws

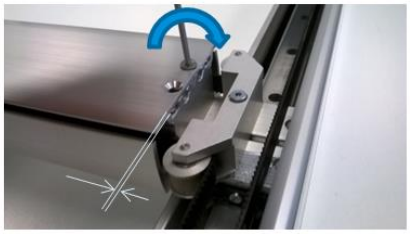
Add new belt 2/3 – particle protection version

6. Insert cover



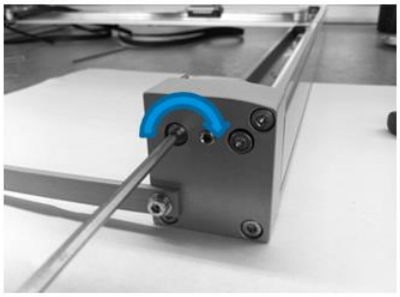
7. tight 2 screws on the left side, Cover and clamping plate need to be aligned

8. tight 2 screws on right side, gap between cover and clamping unit is tolerable

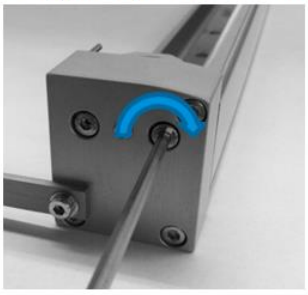


Add new belt 3/3

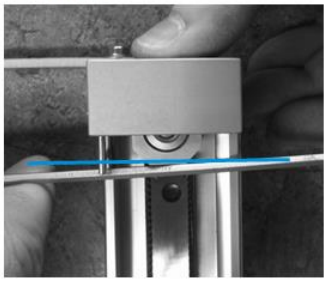
1. tight adjustment screw 1



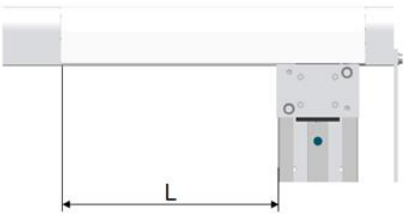
2. tight adjustment screw 2



Ensure straightness tension element



3. Measure the frequency of the belt

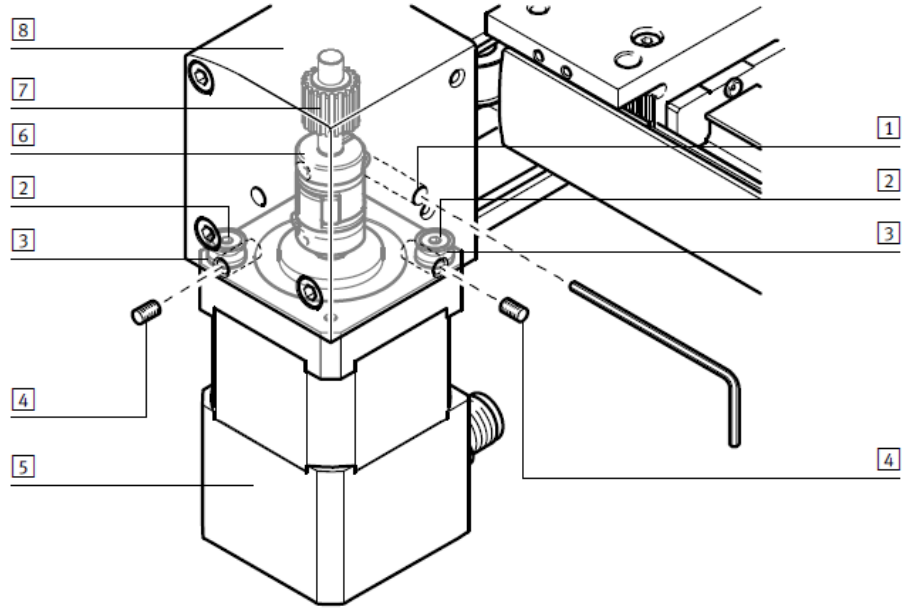


4. Counter screw allen pin

Belt Type	L [mm]	$l_{schwing}$ [mm]	m [kg/m]	F_v [N]	f [Hz]
PGGT 8LL-2MR-45M-610	90	114	0,012	46 - 49	271+9

3.3.1 Dismantling motor

Fastening principle



1 Drill hole – clamping screw coupling access
2 Countersunk screw
3 Sleeve
4 Threaded pin
5 Motor
6 Coupling
7 Drive pinion
8 Drive cover

Fig. 4.10

Dismantling the motor

1. Disconnect the cables 3 from the motor 2.
2. Unscrew and remove the headed pins 1.
   For motor attachment underneath:
   Secure motor from falling.
3. Disassemble motor 2.

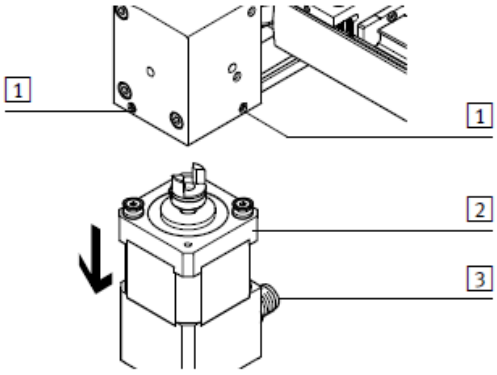


Fig. 4.11

Mount motor

4. Install motor 2.
5. Tighten the threaded pins 1 (tightening torque 3 Nm).
6. Connect the cables 3 to the motor 2.

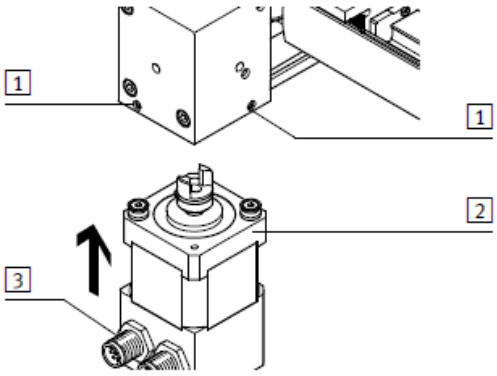


Fig. 4.12

Information

See also Festo support portal -› technical documentation

3.3.2 Lubrication

The product is lubricated initially upon delivery. Subsequent lubrication is only required if the guide elements have been degreased.
Use appropriate accessories from Festo (➔ www.festo.com/spareparts).

Lubrication points

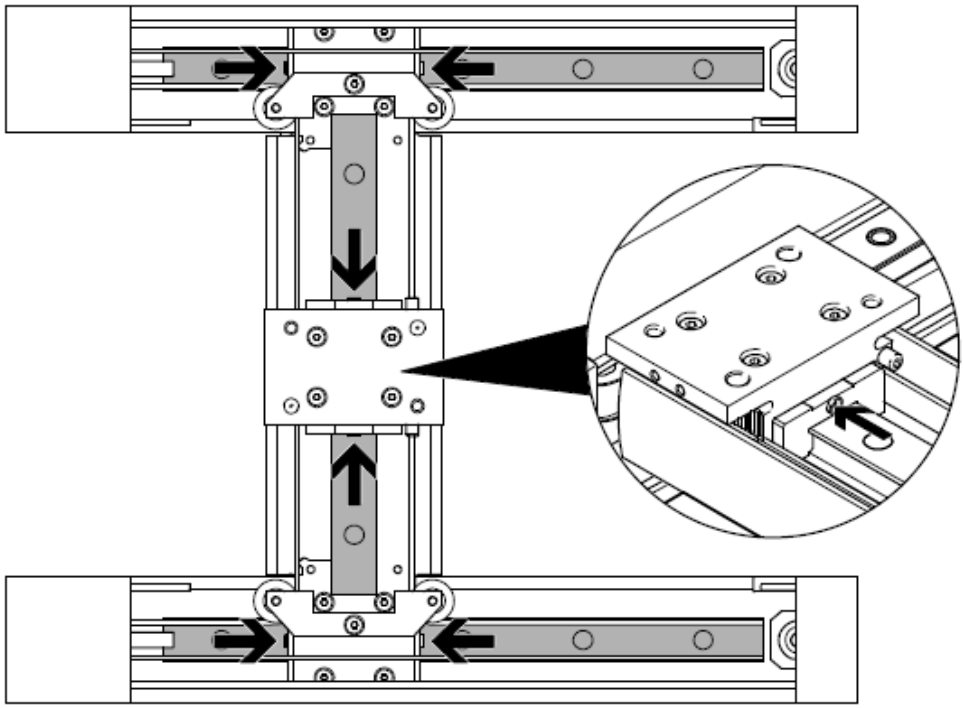


Fig. 7.1

	Bearing guide	Guide rail
Lubricating point	Lubrication hole	Surface
Lubricant	LUB-KC1	

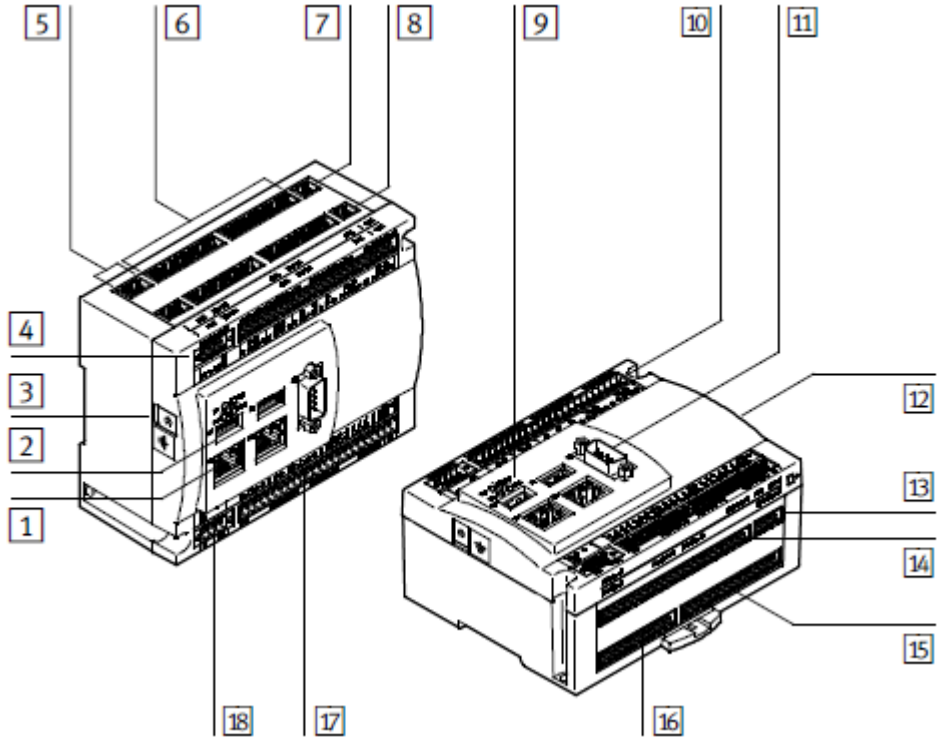
Tab. 7.1

Caution
Crushing due to axis movements of the product.
- Slowly move or travel the Y-axis (traverse) and the slide of the Y-axis.
- Make sure that no one is located in the movement area during the axis movements.

Information
See also Festo support portal -› technical documentation

4 Pin assignment / Electrical connections:

4.1.1 Overview



1: Ethernet-Interface
2: USB-Interface
3: Functional earth
4: Power-Supply for IO-Link and Encoder
5: Multipurpose inputs
6: Direct connection for motor controller
7: Safe-Torque-off Input
8: Load-Power-Supply for motor controller
9: Status-LED´s
10: Communication Interface: ENC, RS232, RS422, RS485 and IO-Link
11. CAN-open Interface CAN 1
12: MicroSD card slot
13: CANopen-Drivebus CAN 2
14: Digital Input
15: Digital Output
16: Analog Input
17: I/O Interface
18: Power-Supply I/0

4.1.2 Power-Supply [X1] for devices, motor controller (logic) and digital Inputs.

clamp	connection	comment
X1.3	24	U+ Power-Supply
X1.2	0	U- Ground
X1.3	FE	Function earth
X1.4	n.c.	Not connected

Table 1 Pin assignment X1

4.1.3 Power-Supply [X5] for digital Outputs.

clamp	connection	comment
X5.1	24	U+ Power-Supply
X5.2	0	U- Ground

Table 2 Pin assignment X5

4.1.4 Load-Power-Supply [X21] for motor controller

clamp	connection	comment
X21.1	left	24 V/48V Load-Power-Supply
X21.2	right	U- Ground

Table 3 Pin assignment X21

4.1.5 Motor controller A, B, C, D [X22, X23, X26, X27] with CANopen Drivebus CAN2

clamp	connection	comment	Int. connection
X2x.1	24/48 V DC	Load-Power-Supply Motor controller	X21.1
X2x.2	GND		X21.2
X2x.3	24 V DC	Power-Supply (logic) Motor controller	X1.1
X2x.4	GND		X1.2
X2x.5	CAN2_H[1)]	CAN-BUS-signal 2 (dominant high)	X18.1
X2x.6	CAN2_L[1)]	CAN-BUS-signal 2 (dominant low)	X18.2
X2x.7	CAN_GND	CAN GND	X18.3
X2x.8	CAN_SHILD	Connection function earth	X18.4
X2x.9	GPIO	Home-signal	X17.1.2 / X17.2.2[2)]
X2x.9	GPIO	Purpose-signal	X24.2 / X28.2[3)]
X2x.10	GND	Load-Power-Supply electronics	X1.2

Table 4 Pin assignment X2x

1) Max. cable length 3m
   If the CECC-X-M1-MV-CSXX is the end of the line, connect the terminals 18.1 and 18.2 by means of a termination resistor (120 Ω/0,25W).
2) Home-signal X22.9 (drive A) to X17.1.2; X26.9 (drive C) to X17.2.2
3) Purpose-signal X23.9 (drive B) to X24.2; X27.9 (drive D) to X28.2

4.1.6 Torque-off Input [X25]

clamp	connection	comment
X25.1	24 VDC	Power-Supply
X25.2	signal	Torque-off Input
X25.3	GND	Ground

Table 5 Pin assignment X25

4.1.7 USB-Interface [X7; X9]

The interface is compatible with the standards USB 3.0. They are suitable for USB type A connector.
The following applications are supported:

- Transmission of boot projects
- Storage of trace data
- Connecting a camera
- Connecting hardware extensions (e.g. WLAN-adapter)

Information

Use only memory with a power consumption ‹ 0,7 A!

4.1.8 Digital Input [X17]

The digital inputs, running in 3-wire connection technology, are not electrically isolated.

The ground potential of all inputs refer to GND of the power supplied [X1].
Use each 3 adjacent terminals to connect a sensor with a 3-wire technology.

clamp	connection	comment	Int. connection
X17.1.1	24 VDC	Connecting digital sensor 1 (IEC type 1 –200 Hz)	X1.1
X17.1.2	Signal 1		X2.0
X17.1.3	GND-logic		X1.2
X17.2.1	24 VDC	Connecting digital sensor 2 (IEC type 1 –200 Hz)	X1.1
X17.2.2	Signal 2		X2.1
X17.2.3	GND-logic		X1.2
X17.3.1	24 VDC	Connecting digital sensor 3 (IEC type 1)	X1.1
X17.3.2	Signal 3		X2.2
X17.3.3	GND-logic		X1.2
X17.4.1	24 VDC	Connecting digital sensor 4 (IEC type 1)	X1.1
X17.4.2	Signal 4		X2.3
X17.4.3	GND-logic		X1.2
X17.5.1	24 VDC	Connecting digital sensor 5 (IEC type 1)	X1.1
X17.5.2	Signal 5		X2.4
X17.5.3	GND-logic		X1.2
X17.6.1	24 VDC	Connecting digital sensor 6 (IEC type 1)	X1.1
X17.6.2	Signal 6		X2.5
X17.6.3	GND-logic		X1.2
X17.7.1	24 VDC	Connecting digital sensor 7 (IEC type 1)	X1.1
X17.7.2	Signal 7		X2.6

clamp	connection	comment	Int. connection
X17.7.3	GND-logic		X1.2
X17.8.1	24 VDC	Connecting digital sensor 8 (IEC type 1)	X1.1
X17.8.2	Signal 8		X2.7
X17.8.3	GND-logic		X1.2

Table 6 Pin assignment X17

Information

The inputs can be set for PNP or NPN sensors.
Selectable by Codesys to maturity for all inputs simultaneously.

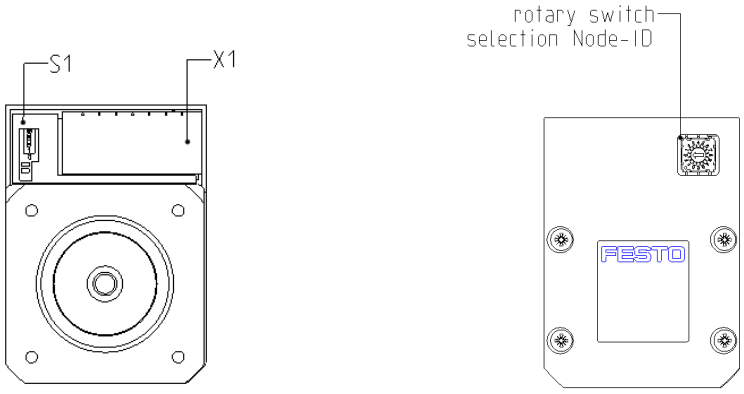
4.2 Motor

Following motors are supportive of the controller.

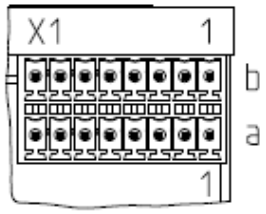
TN	type
4734580	EMCX-ST-42-L-S-7-C1-S-CO
4734581	EMCX-ST-42-L-7-C1-S-CO

Table 7 Components / motors

4.2.1 Pin assignment / Electrical connections:



X1: Parameterisation



Pin	connection
a1	+UB (12-48V)
a2	GND
a3	+UB_LOGIC (24V)
a4	GND
a5	INPUT 4 (5V/24V)
a6	CAN_H
a7	CAN_L
a8	CAN_GND
b1	INPUT 3 (5V/24V)
b2	GND
b3	OUTPUT 1 (open drain)
b4	Output +UB (12-48V)
b5	OUTPUT 2 (open drain)
b6	CAN_H
b7	CAN_L
b8	CAN_GND

Table 8 Pin assignment motor

S1: Switch position for bus termination

In position "on": Bus termination 120 ohms

4.3 Camera head

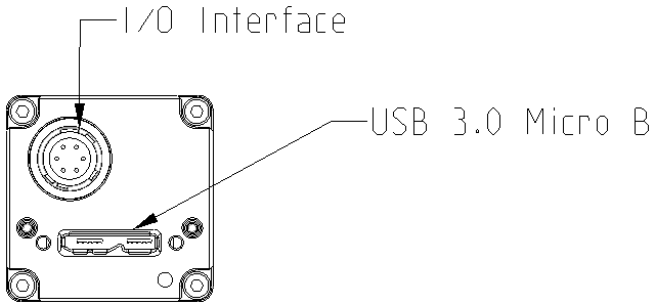
The following camera heads are supportive of the control.

TN	type
8060009	SBPA-R1-B-U2-2E2A-CS
8060010	SBPA-R1-C-U2-2E2A-CS
8060011	SBPA-R2-B-U3-2E2A-CS
8060012	SBPA-R2-C-U3-2E2A-CS
8060013	SBPA-R5-B-U2-2E2A-C
8060014	SBPA-R5-C-U2-2E2A-C
8060015	SBPA-R8-B-U3-2E2A-C
8060016	SBPA-R8-C-U3-2E2A-C

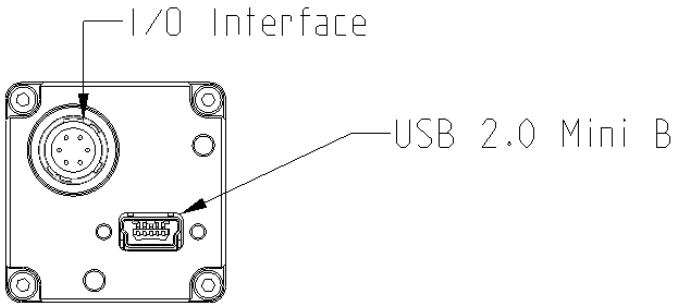
Table 9 Components / camera heads

4.3.1 Pin assignment / Electrical connections:

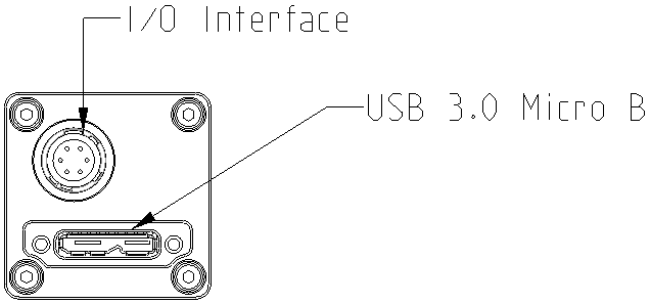
TN 8060011; TN 8060012



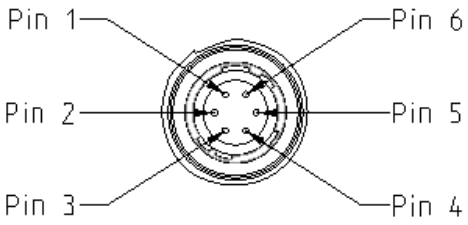
TN 8060009; TN 8060010; TN 8060013; TN 8060014



TN 8060015; TN 8060016



I/O Interface



Pin-Nr.	Name
1	IO GND
2	OUT 2
3	OUT 1
4	In 2
5	IN 1
6	IO VCC IN

HR10A-7R-6PB (Hirose)
or comparable

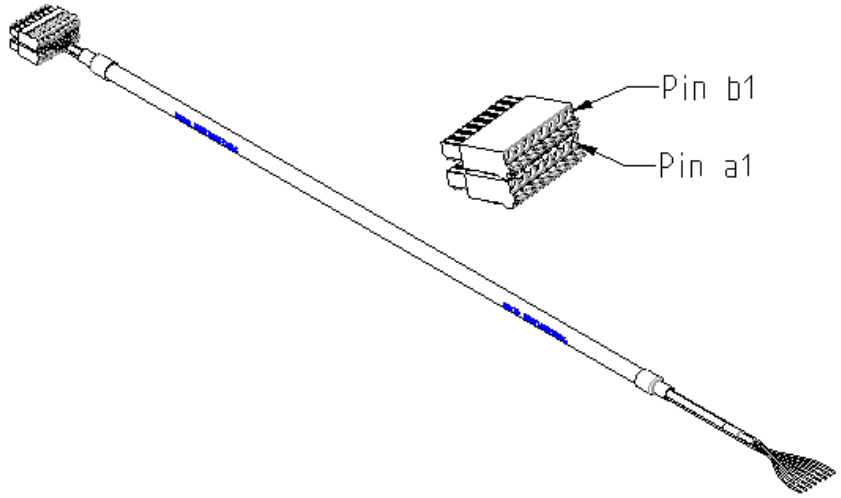
4.4 Motor cable

The following motor lines connect the motors to the controller.

TN	type
4668264	NEBM-L2G16-EH-1.5-Q6N-LE8
4668265	NEBM-L2G16-EH-3-Q6N-LE8

Table 10 Components / motor cables

4.4.1 Pin assignment / Electrical connections:



Field device side:

PIN	color	function
a1	WH	+UB (12-48V)
a2	BN	GND
a3	GN	+UB_LOGIC (24V)
a4	YE	GND
a5	PK	INPUT 4 (5V/24V)
a6	WH	CAN_H
a7	BN	CAN_L
a8	SH	CAN_GND
b1		n.c.
b2		n.c.
b3		n.c
b4		n.c
b5		n.c
b6		n.c
b7		n.c
b8		n.c

Table 11 Pin assignment

Control side:

color	function
WH	+UB (12-48V)
BN	GND
GN	+UB_LOGIC (24V)
YE	GND
PK	INPUT 4 (5V/24V)
WH	CAN_H
BN	CAN_L
SH	CAN_GND

Table 12 Pin assignment

4.5 Connection cable camera head USB

The following connecting lines connect the USB interface of cameras to the controller.

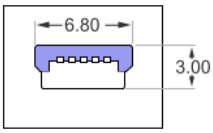
TN	type
8059994	NEBC-U3G5-ES-1.5-N-S-U1G4
8059995	NEBC-U3G5-ES-3-N-S-U1G4
8059996	NEBC-U7G10-ES-1.5-N-S-U5G9
8059997	NEBC-U7G10-ES-3-N-S-U5G9

Table 13 Components / cable connector

4.5.1 Pin assignment / Electrical connections:

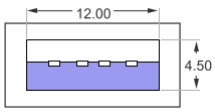
TN 805994; TN 805995

Field device side:



USB 2.0 type B mini

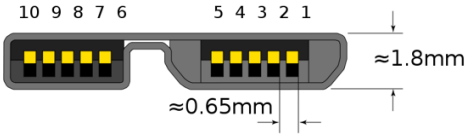
Control side:



USB 2.0 type A

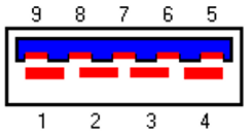
TN 805996; TN 805997

Field device side:



USB 3.0 type B micro

Control side:



USB 3.0 type A

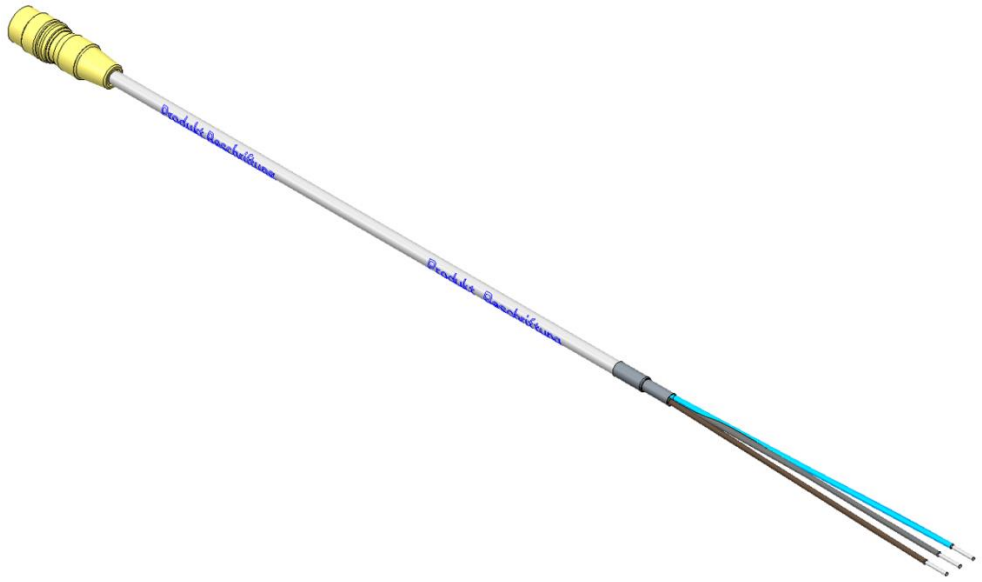
4.6 Connection cable camera head I/O

The following connecting lines connecting the interface of the digital inputs / outputs of the cameras to the controller

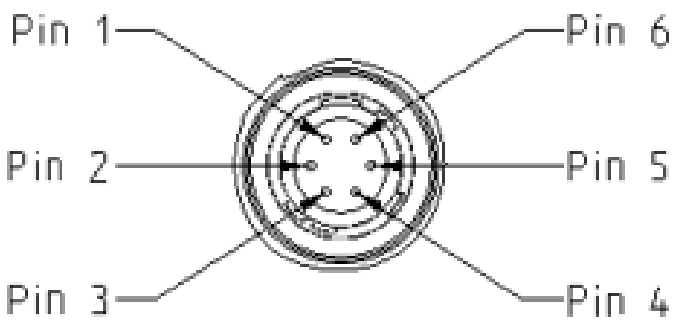
TN	type
4670529	NEBC-PPG6-E-1.5-N-LE3-V
4670530	NEBC-PPG6-E-3-N-LE3-V

Table 14 Components / cable connector

4.6.1 Pin assignment / Electrical connections:



Field device side:



PIN	Color	Function
1	BU	GND
2		n.c.
3	BK	SINGAL
4		n.c.
5		n.c.
6	BN	+UB +24V DC

Warning: Pin3 and Pin 6 is internally connected to a resistance of 2k2 Ω.

Control side:

color	function
BU	GND
BK	SINGAL
BN	+UB +24V DC

A Documents

Following documents have to be observed:

Document	Content
Documentation EXCM	Detailed description of planar surface gantry EXCM
Documentation EGSK	Detailed description of electric slide EGSK (Z-axis)
Documentation CECC-X	Detailed description of the controller CECC-X

Table 4.1: Documents

The documents can be downloaded at http://www.festo.com/sp.