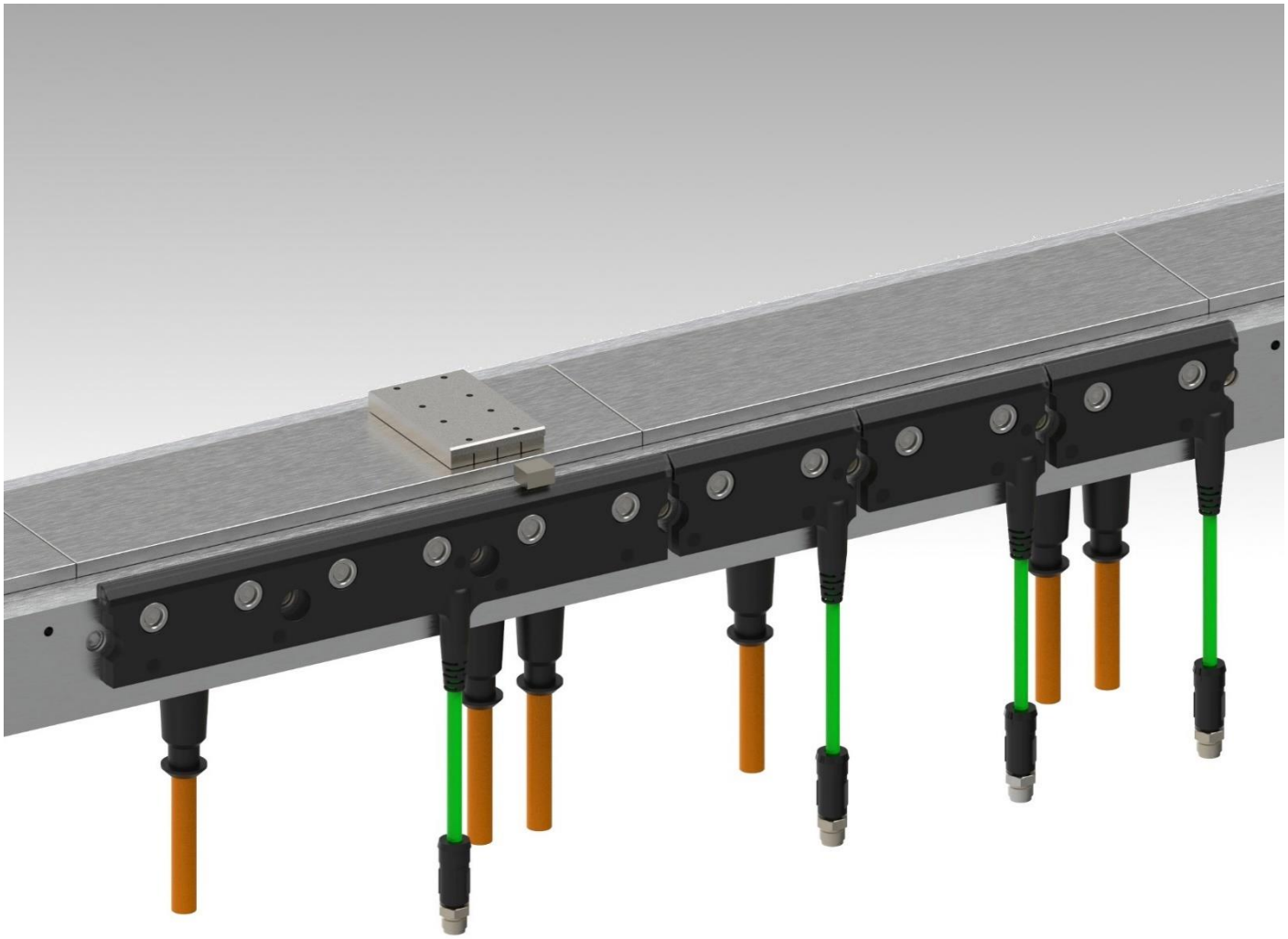
Multi-Carrier-System MCS®

FESTO



Contents

Overview

The Multi-Carrier System MCS® is a transport system on a linear motor basis, enabling high flexibility and dynamism of the workpiece carriers. The basic modular mechanical system can be easily adapted to your machine concepts and application requirements and integrated into existing transport and logistics solutions. The comparatively low magnetic forces of attraction between the moving and fixed motor components enable the workpiece carriers to leave the linear motor track in order to interact with conventional transport systems.

Advantages

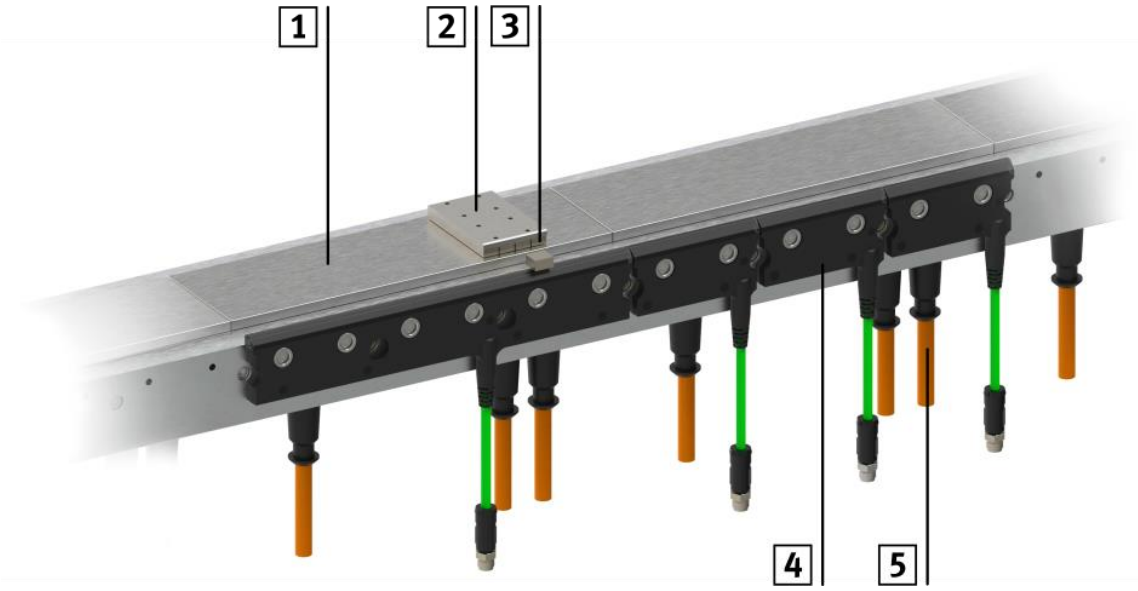
- Flexibility: Position, speed, and acceleration can be freely and individually programmed for each carrier
- Dynamic: Speed up to 4 m/s and acceleration up to 50 m/s²
- Control: Siemens SIMOTION / SIMATIC for MCS and peripheral modules

Functional principle

The MCS consists of a permanently excited, electro-dynamic, three-phase linear motor. The components consist of a slotless stator and a permanent magnet arrangement built into the carrier.

Functions

- Position control through absolute measuring system
- Movement and positioning of the carrier with high dynamics and precision
- One carrier can be controlled per motor segment
- Segmentation within one physical motor possible



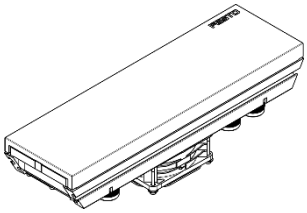
1 Linear motor
2 Magnet plate
3 Position magnet
4 Measuring system
5 Motor cable

Features

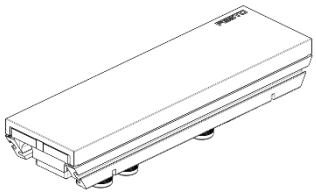
Linear motors Page 6

- 3-phase permanent-magnet linear-synchronous servo motors
- Uniform mounting interfaces
- Various motor versions in different overall lengths for a flexible machine layout
- IP65 protection thanks to fully potted motor elements
- Easy cleaning due to stainless steel surface
- Motor 306-1 contains 1 motor segments, each 306 mm long
- Motor 306-3 contains 3 motor segments, each 102 mm long
- Motor 306-1B contains 1 motor segments, each 306 mm long without star point for interlinking with another motor segment
- Motor 408-4 contains 4 motor segments, each 102 mm long

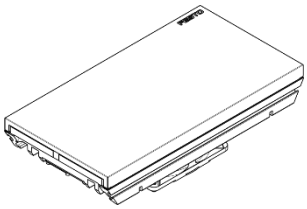
Linear motors EMLX-AS-90-...-CS (overall length 306 / 408 mm) Page 7



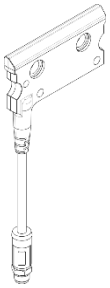
Linear motors EMLX-AS-90-...-W-...-CS (overall length 306 mm) Page 8



Linear motors EMLX-AS-160-...-CS (overall length 306 mm) Page 9

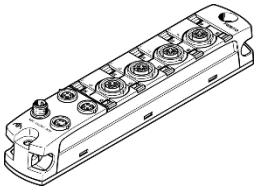


Position transmitter SDAT-MCS-HS-...-...-DQ-M12-CS Page 20



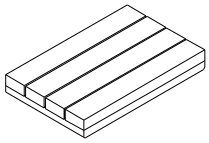
- Absolute displacement measuring system on Hall sensor basis
- Contactless and contamination resistant
- Enables Closed-Loop mode for high dynamic and precision
- Appropriate sensors for individual motor versions
- DRIVE-CLiQ interface

Bus interface NEFF-T7-M12G8-M12G4-CS Page 23



- Bus interface for integration of optical measuring systems
- Enables improved precision for special applications
- DRIVE-CLiQ interface

Magnet plate MCS-120-CA-NDFEB-N50-...-CS Page 29

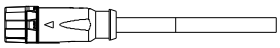


- Magnet plate for integration into individual carriers
- 4 high-energy NdFeBr magnets on a steel plate for easy installation into carriers
- Using several magnet plates in one carrier, the feed force can be increased

Position magnet MCS-120-NDFEB-N40-...-CS Page 34

- Position magnet for integration into individual carriers
- Position magnet with mounting interface
- Position magnet for the displacement encoder system
- Position magnet calibrated with respect to the mounting interface

Motor cable NEBM-M23G6-E-...-CS Page 37

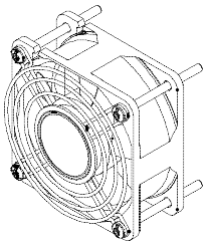


- Pre-assembled on one end with M23-Twilock plug
- Not assembled on the other end
- Available lengths: 5 m / 10 m / 15 m / other lengths on request
- Assembled on both ends for the interlinking of motor 306-1B

Connecting cable NEBC-M12G8-E-...-NS-R3G8-DQ-CS Page 39

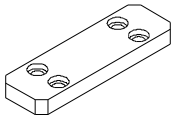
- DRIVE-CliQ connecting cable for connecting the position transmitter
- Available lengths: 5 m / 10 m / 15 m / other lengths on request

Fan EMLX-MCS-...-FAN-CS Page 40



- Fan for active heat dissipation in the heat sink
- For mounting onto the side of the heat sink LKK-L

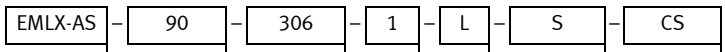
Connector MCS-120-RC-BG-CS Page 41



- Magnetic return coupling for jerk-free motor transition points
- Tolerance-free screw connection between the linear motors

Linear motor EMLX-AS

Type code



Type	
EMLX	Motor

Motor technology	
AS	AC-Synchronous

System width	
90	90 mm
160	160 mm

Length	
102	102 mm
306	306 mm
408	408 mm

Motor segments for each motor	
1	1 motor segment
2	2 motor segments
3	3 motor segments
4	4 motor segments
6	6 motor segments

Electrical interconnection	
–	Motor with star point

Cooling	
–	Convection
L	Axial fan
W	Water cooling

Electrical connection	
A	Angled plug
S	Straight plug

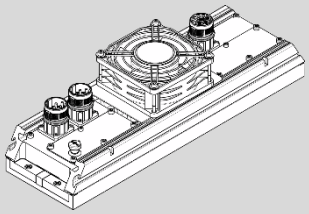
Version	
CS	Customer-specific

Linear motor EMLX-AS

Data sheet

-H- **Note**

Dynamic data
➔ Magnet plate

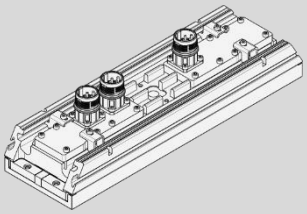


Technical data 90-L						
EMLX-AS-90-		306-1-...-CS	306-1B-...-CS	306-3-...-CS	408-4-...-CS	408-2-...-CS
Length	[mm]	306	306	306	408	408
Number of motor segments		1	1	3	4	2
Length of the motor segments	[mm]	306	306	102	102	204
Nominal voltage	[V DC]	600				
Nominal current[1]	[A]	1,7				
Peak current	[A]	7,0 (max. 1 s)				
Electrical nominal power loss P_{V0}	[W]	1 x 172	1 x 172	3 x 57	4 x 57	2 x 114
Electrical nominal power P_0[2)3)]	[W]	1 x 254	1 x 254	3 x 85	4 x 85	2 x 170
Resistance R_{UV}	[Ω]	40,2	19,8 per line	13,2	13,2	26,4
Inductance L_{UV}	[mH]	17,1	8,6 per line	5,8	5,8	11,6
Motor constant nominal / effective k_F[3)]						
Magnet plate 78 mm	[N/A]	15,8 / 13,0				
Magnet plate 55 mm	[N/A]	11,2 / 9,1				
Back EMF constant nominal / effective k_E[3)]						
Magnet plate 78 mm	[Vs/m]	9,1 / 7,5				
Magnet plate 55 mm	[Vs/m]	6,5 / 5,4				
Nominal air gap between motor and magnet plate	[mm]	0,5				
Mounting position		Any				
Weight	[g]	4000	4000	4100	5800	5400
Weight including air baffle and fan	[g]	4200	4200	4300	6000	5600
Static attraction force between motor and magnet plate[3)4)]						
Magnet plate 78 mm	[N]	max. 130				
Magnet plate 55 mm	[N]	max. 92				
Maximum constant surface temperature	[°C]	+75				
Maximum permissible internal motor temperature	[°C]	+95				

1) For active cooling with fan
2) For one carrier per motor segment
3) Valid for one magnet plate
4) With nominal air gap

Data sheet

-H- **Note**
Dynamic data
➔ Magnet plate



Technical data 90-W				
EMLX-AS-90-		306-1-W-S-CS	306-3-W-S-CS	306-6-W-S-CS
Length	[mm]	306	306	306
Number of motor segments		1	3	6
Length of the motor segments	[mm]	306	102	51
Nominal voltage	[V DC]	600		
Nominal current[1]	[A]	1,7		
Peak current	[A]	7,0 (max. 1 s)		
Electrical nominal power loss P_{V0}	[W]	1 x 172	3 x 57	6 x 29
Electrical nominal power P_0[2)3)]	[W]	1 x 254	3 x 85	6 x 42
Resistance R_{UV}	[Ω]	40,2	13,2	6,6
Inductance L_{UV}	[mH]	17,1	5,8	2,9
Motor constant nominal / effective k_F[3)]				
Magnet plate 78 mm	[N/A]	15,8 / 13,0		
Magnet plate 55 mm	[N/A]	11,2 / 9,1		
Back EMF constant nominal / effective k_E[3)]				
Magnet plate 78 mm	[Vs/m]	9,1 / 7,5		
Magnet plate 55 mm	[Vs/m]	6,5 / 5,4		
Nominal air gap between motor and magnet plate	[mm]	0,5		
Mounting position		Any		
Weight	[g]	3870	4000	4200
Static attraction force between motor and magnet plate[3)4)]				
Magnet plate 78 mm	[N]	max. 130		
Magnet plate 55 mm	[N]	max. 92		
Maximum constant surface temperature	[°C]	+85		
Maximum permissible internal motor temperature	[°C]	+95		

1) Depending on the type of cooling
2) For one carrier per motor segment
3) Valid for one magnet plate
4) With nominal air gap

Note

The linear motor EMLX-AS-90-306-6-W-S-CS is only intended for use with the NEFF bus interface and optical measuring systems.

MCS water cooled motors may only be operated via an externally connected cooling system. The motor power loss P_{v0}, which is converted into heat, is dissipated via the cooling liquid. The motors may therefore only be operated if the coolant supply is guaranteed. The cooling system must be designed by the machine manufacturer in such a way that all requirements for flow, pressure, purity, temperature gradient, etc. are met in every operating condition.

No general statement or investigation can be made regarding the suitability of system-specific cooling media, additives or operating conditions. The suitability test for the cooling media used and the design of the liquid cooling system are the responsibility of the machine builder.

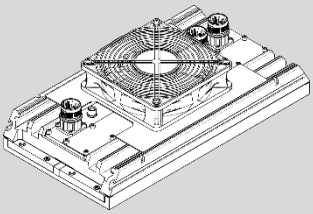
MCS water cooled motors are designed in accordance with DIN EN 60034-1 for operation from +10 ... +40 °C coolant temperature. This temperature range must be adhered to. Higher coolant temperatures result in a greater reduction in feed force. Lower coolant temperatures can lead to destruction of the motor due to high temperature gradients.

The coolant inlet temperature must be set within the range +10 ... +40 °C and may only be max. 5 °C below the existing room temperature to avoid condensation.

Coolant temperature	+10 ... +40 °C
Coolant minimum flow rate	2,0 l/min
Max. coolant inlet pressure	6 bar
Power loss per 1 m MCS-Track	app. 850 W (with 100 % duty cycle)

Data sheet

-H- **Note**
Dynamic data
➔ Magnet plate



Technical data 160-L				
EMLX-AS-160-		306-1-...-CS	306-1B-...-CS	306-3-...-CS
Length	[mm]	306	306	306
Number of motor segments		1	1	3
Length of the motor segments	[mm]	306	306	102
Nominal voltage	[V DC]	600		
Nominal current[1]	[A]	1,7		
Peak current	[A]	7,0 (max. 1 s)		
Electrical nominal power loss P_{V0}	[W]	1 x 200	1 x 200	3 x 67
Electrical nominal power P_0[2)3)]	[W]	1 x 402	1 x 402	3 x 281
Resistance R_{UV}	[Ω]	46,2	23,1 je Strang	15,4
Inductance L_{UV}	[mH]	18,3	9,2 je Strang	6,1
Motor constant nominal / effektiv k_F[3)]	[N/A]	28,0 / 23,0		
Back EMF constant nominal / effektiv k_E[3)]	[Vs/m]	16,2 / 13,9		
Nominal air gap between motor and magnet plate	[mm]	0,5		
Mounting position		Any		
Weight	[g]	7340	7350	7370
Weight including air baffle and fan	[g]	7800	7820	7840
Static attraction force between motor and magnet plate[3)4)]	[N]	max. 260		
Maximum constant surface temperature	[°C]	+75		
Maximum permissible internal motor temperature	[°C]	+95		

1) For active cooling with fan
2) For one carrier per motor segment
3) Valid for one magnet plate 78 mm
4) With nominal air gap

Operating and environmental conditions		
Ambient temperature	[°C]	–10 ... +30 (derating at temperatures > 30°C)
Storage temperature	[°C]	–10 ... +70
Relative humidity	[%]	0 ... +95 (non-condensing)
Temperature monitoring		none
Insulation class according to EN 60034-1		A
Corrosion resistance class CRC[1)]		1
Degree of protection according to EN 60529		IP65 / IP55 with fan
Material		
Housing		Anodised aluminium
Surface		Stainless steel 1.4301
Note on materials		RoHS-compliant
CE marking ➔ www.festo.com/sp ➔ Declaration of Conformity		In accordance with EU Low Voltage Directive
Certification		c UL us - Recognized (OL) E 344214 RCM compliance mark

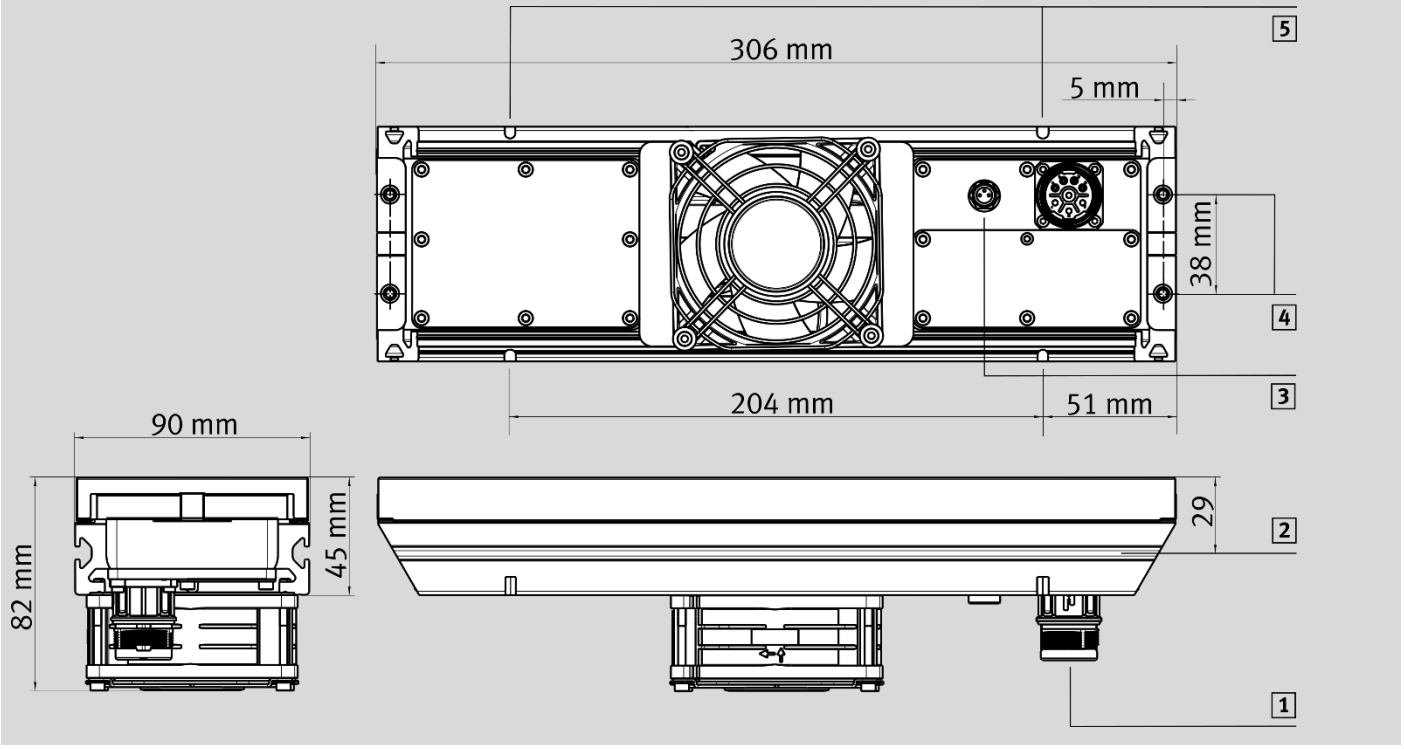
1) Corrosion resistance class CRC 2 according to Festo standard FN 940070
Moderate corrosion loading. Indoor application in which condensation can occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.

Accessories		
	Type	Part number
Mounting	Slot nut IPM-VN-05-15 / M4	1 Piece 191587 100 Piece 191588
	Slot nut IPM-VN-05-15 / M5	1 Piece 191589 100 Piece 191590

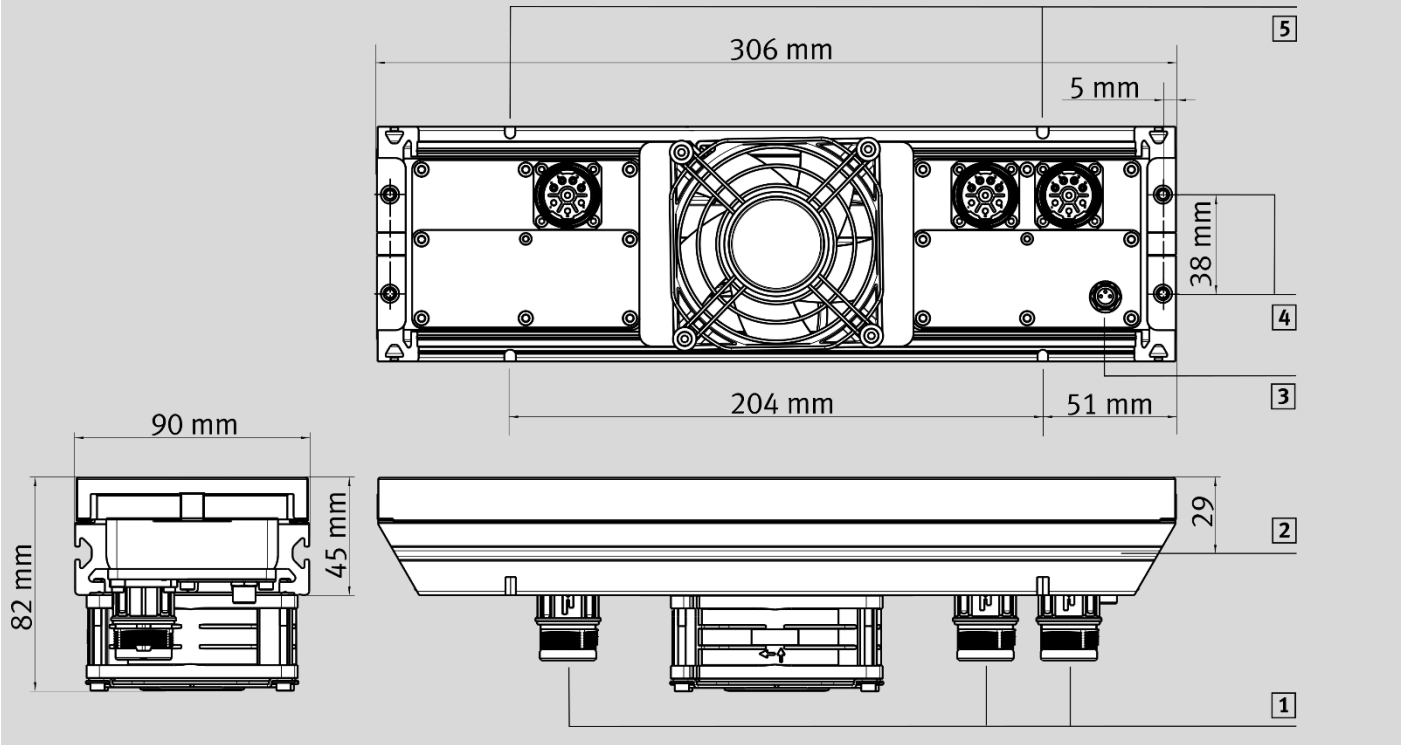
Linear motor EMLX-AS-90-306-...-S-CS

Dimensions

EMLX-AS-90-306-1-L-S-CS



EMLX-AS-90-306-3-L-S-CS

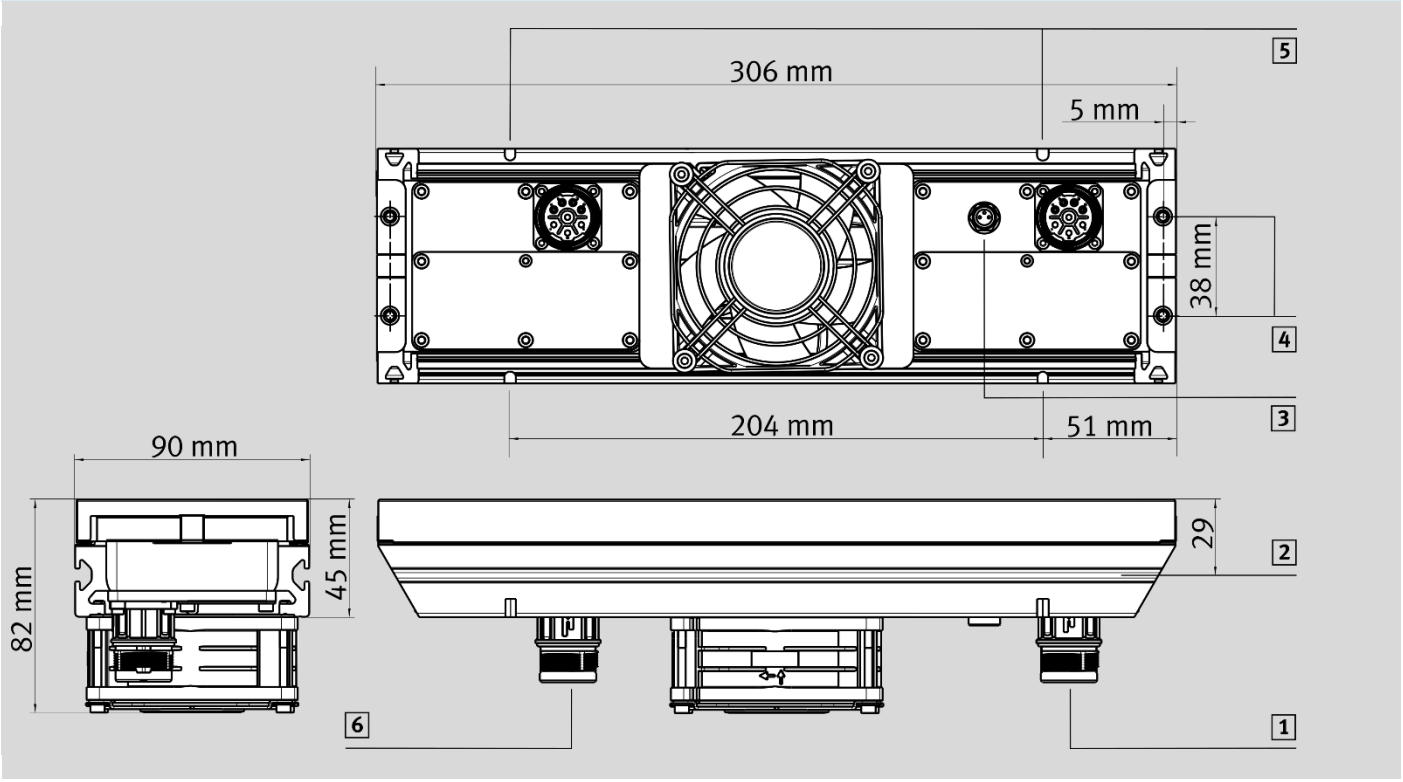


1 Connection plug for motor cable
2 Slot nut profile for lateral guide
3 Connection plug for fan
4 Mounting thread for the mechanical connection with an additional motor
5 Reference groove for longitudinal alignment of the motor as well as connection plate for position transmitter

Linear motor EMLX-AS-90-306-...-S-CS

Dimensions

EMLX-AS-90-306-1B-L-S-CS

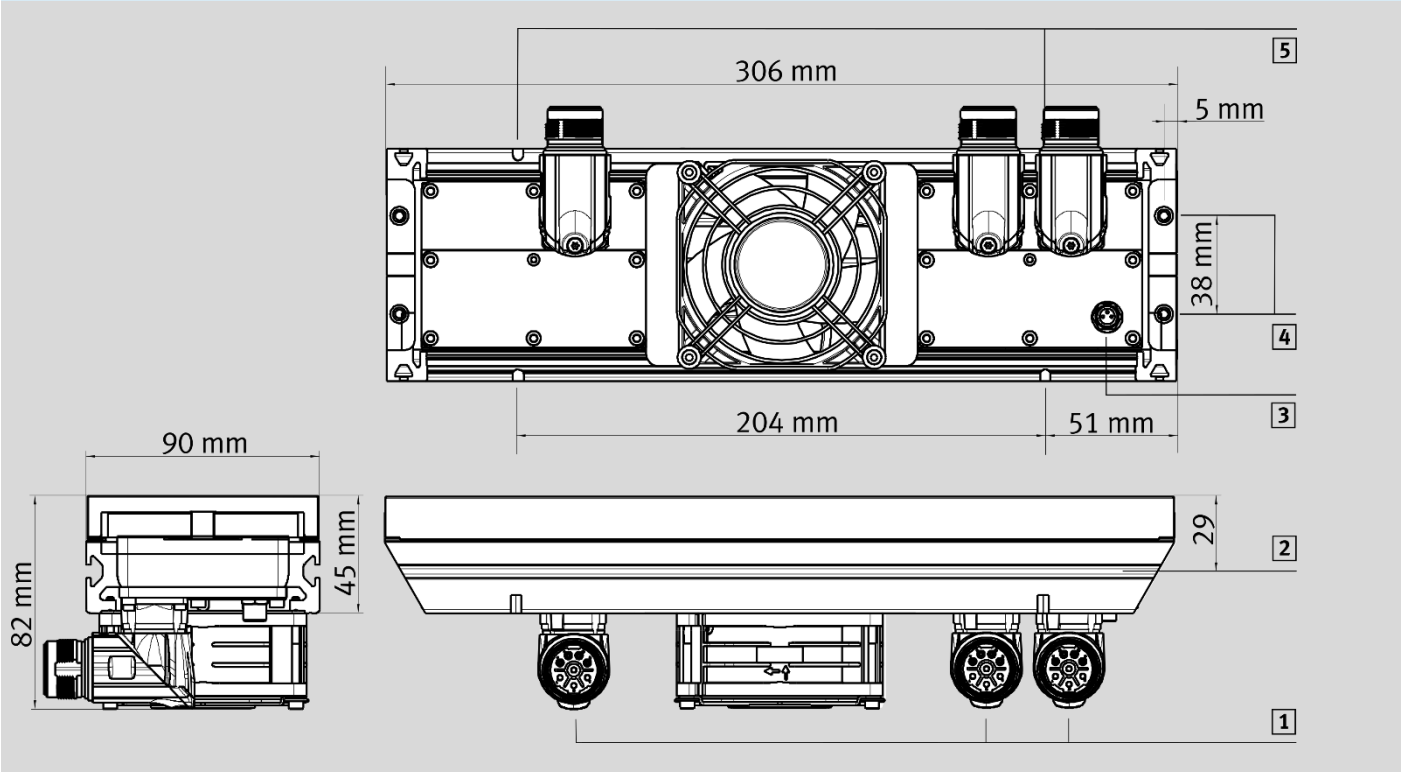


1 Connection plug for motor cable
2 Slot nut profile for lateral guide
3 Connection plug for fan
4 Mounting thread for the mechanical connection with an additional motor
5 Reference groove for longitudinal alignment of the motor as well as connection plate for position transmitter
6 Connection socket for interlinking with an additional motor segment

Linear motor EMLX-AS-90-306-...-A-CS

Dimensions

EMLX-AS-90-306-3-L-A-CS



1 Connection plug for motor cable
2 Slot nut profile for lateral guide
3 Connection plug for fan
4 Mounting thread for the mechanical connection with an additional motor
5 Reference groove for longitudinal alignment of the motor as well as connection plate for position transmitter

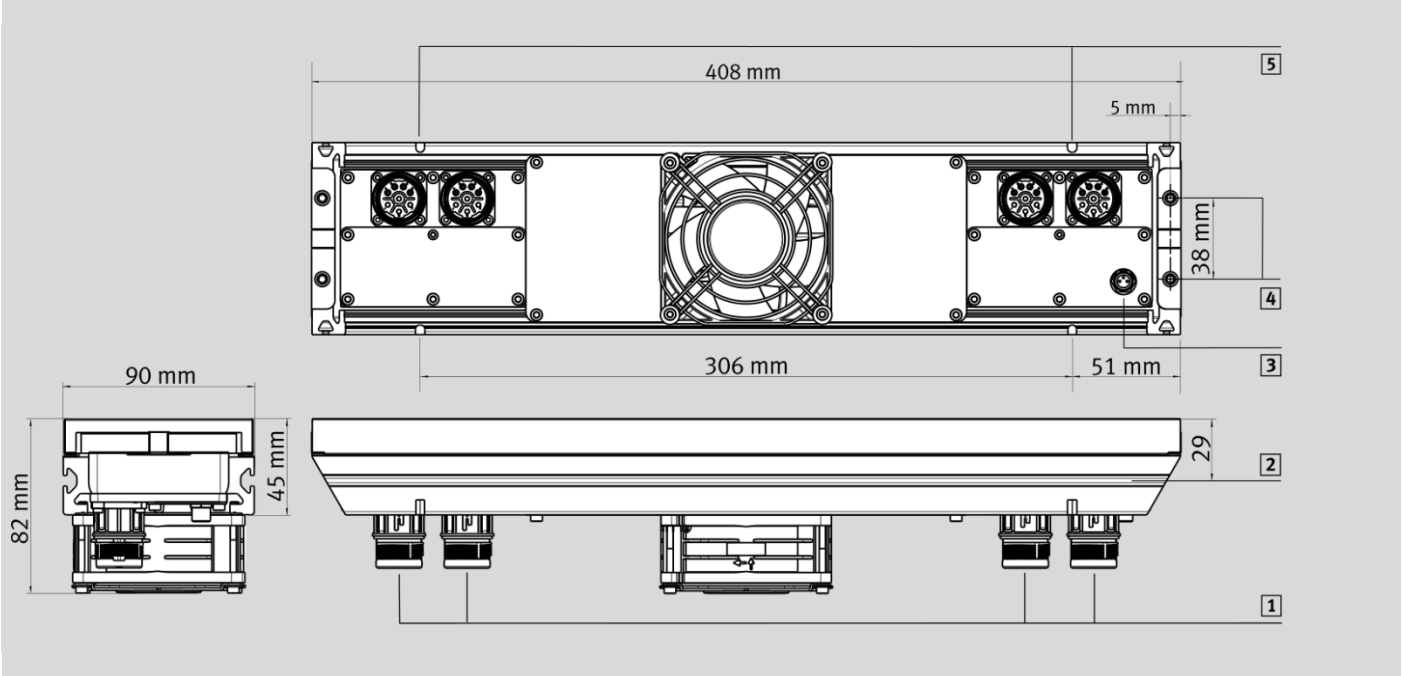
Note

The angled connector plugs for the motor cables cannot be rotated. They are only to be used in the orientation shown.

Linear motor EMLX-AS-90-408-...-S-CS

Dimensions

EMLX-AS-90-408-4-L-S-CS

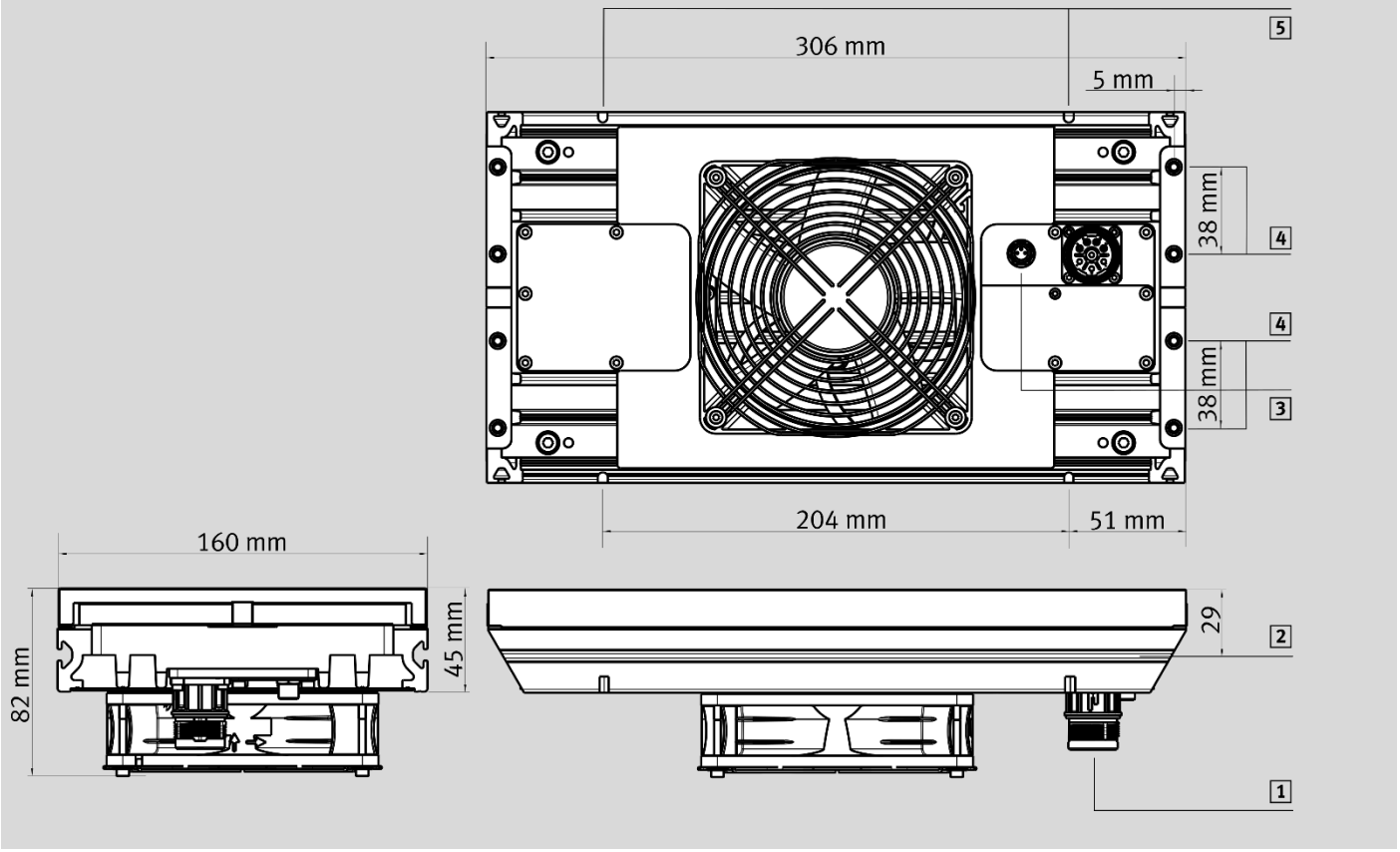


1 Connection plug for motor cable
2 Slot nut profile for lateral guide
3 Connection plug for fan
4 Mounting thread for the mechanical connection with an additional motor
5 Reference groove for longitudinal alignment of the motor as well as connection plate for position transmitter

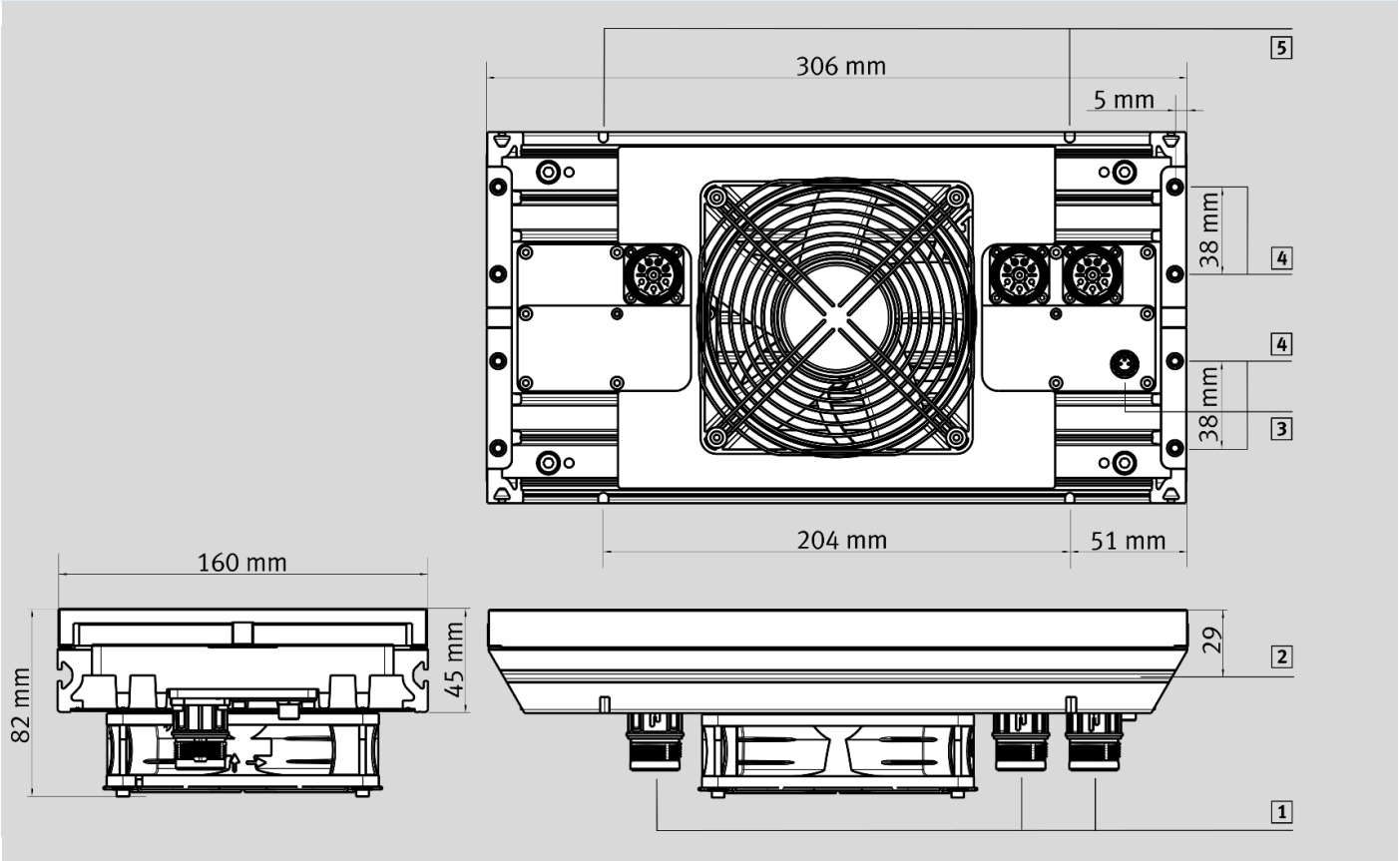
Linear motor EMLX-AS-160-306-...-S-CS

Dimensions

EMLX-AS-160-306-1-L-S-CS



EMLX-AS-160-306-3-L-S-CS

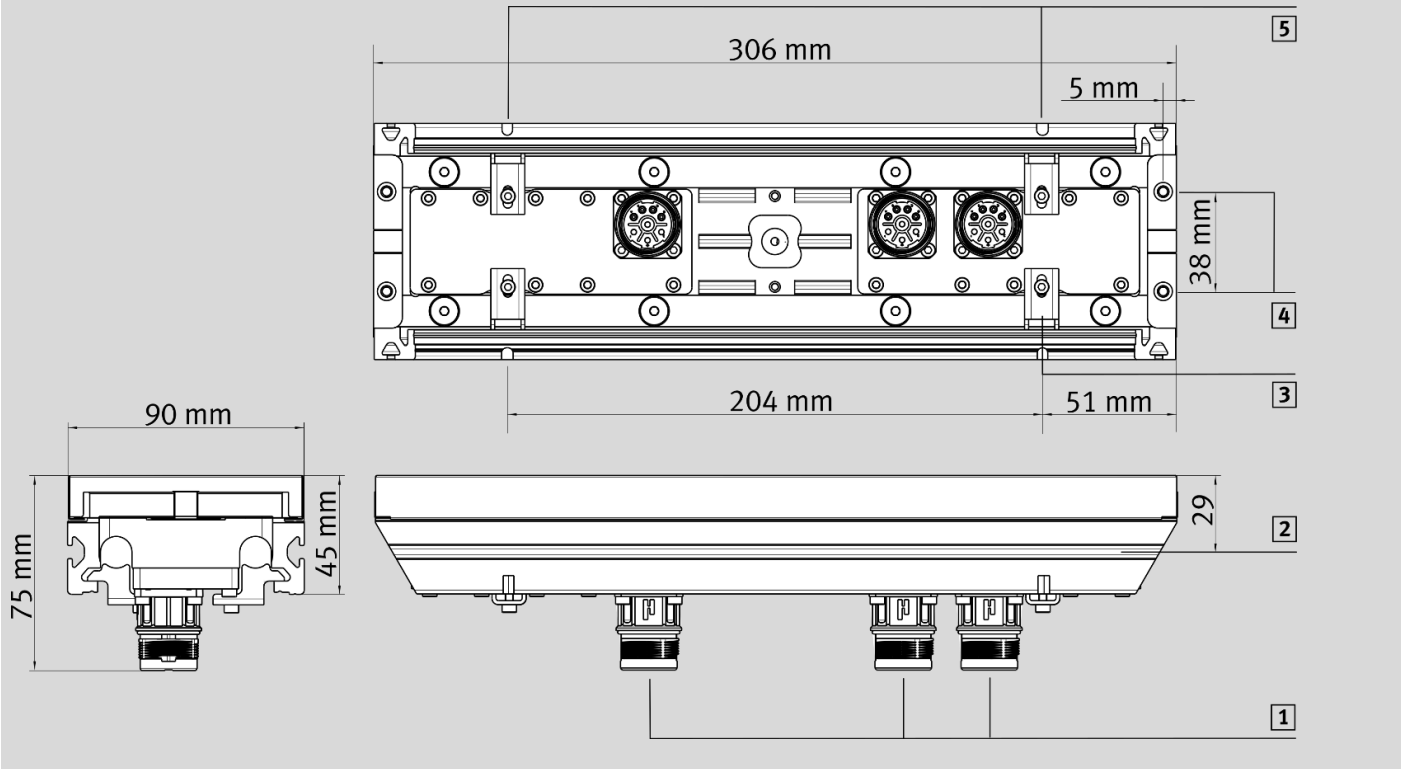


1 Connection plug for motor cable
2 Slot nut profile for lateral guide
3 Connection plug for fan
4 Mounting thread (2 x 2 pieces) for the mechanical connection with an additional motor
5 Reference groove for longitudinal alignment of the motor as well as connection plate for position transmitter

Linear motor EMLX-AS-90-306-...-W...-CS

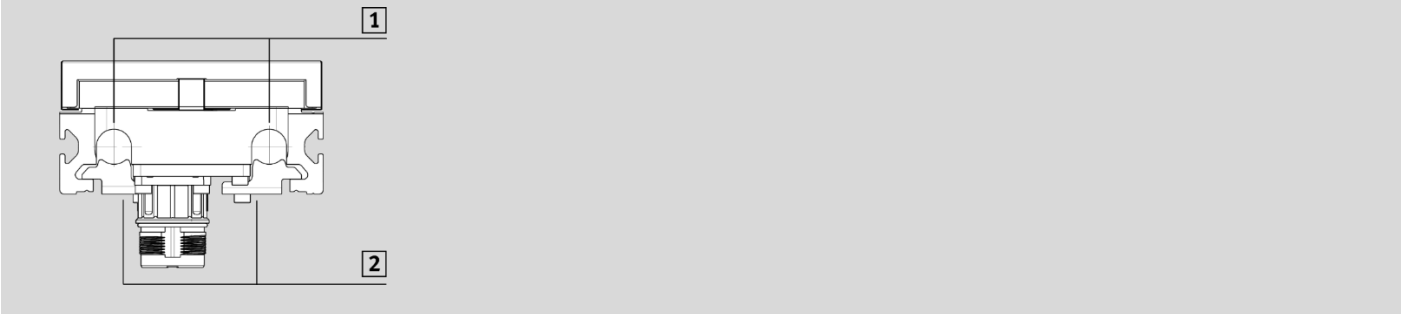
Dimensions

EMLX-AS-90-306-3-W-S-CS



1 Connection plug for motor cable
2 Slot nut profile for lateral guide
3 Pipe clamp (4 pieces)
4 Mounting thread for the mechanical connection with an additional motor
5 Reference groove for longitudinal alignment of the motor as well as connection plate for position transmitter

Cooling system interface



1 Channels for cooling water pipe - diameter 12 mm (tolerance +0,05 mm)
2 Pipe clamp with cylinder screw M3x20 (4x)

Note

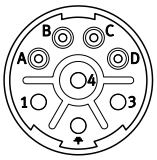
The pipe clamps are included in the delivery of the linear motor. The cooling water pipe must be installed when integrating it into the machine. A metal pipe (CU, or stainless steel) with an outer diameter of 12 mm must be provided for the water pipe.

Linear motor EMLX-AS-90-306-...-CS

Pin allocation

Motor, temperature sensor, fan

Motor plug, (M23, pins)



Pin	Connection	Function
1	U	Phase
4	V	
3	W	
⏚	PE	Protective earth
A	MT+	Temperature sensor
B	MT–	
C	24 V, 1 A	Power supply of fan
D	0 V	

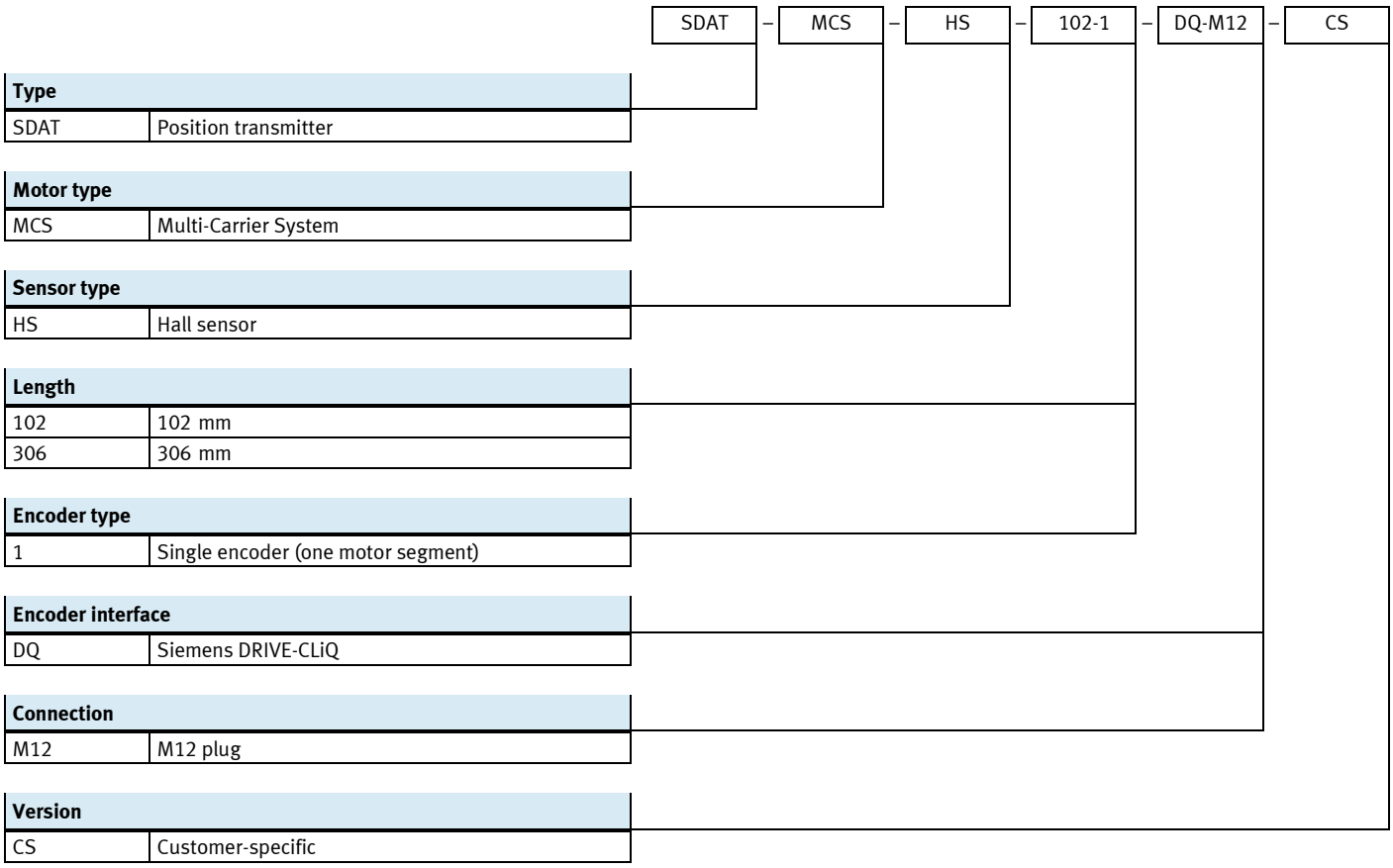
Connecting plug (M8, socket)

Connecting plug for fan for cooling of the linear motors, power supply through motor cable

Pin	Connection	Function
1	24 V, 1 A	Connection of fan
3	0 V	
4	n.c.	–
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–

Position transmitter SDAT-MCS-HS

Type code



Type	
SDAT	Position transmitter

Motor type	
MCS	Multi-Carrier System

Sensor type	
HS	Hall sensor

Length	
102	102 mm
306	306 mm

Encoder type	
1	Single encoder (one motor segment)

Encoder interface	
DQ	Siemens DRIVE-CLiQ

Connection	
M12	M12 plug

Version	
CS	Customer-specific

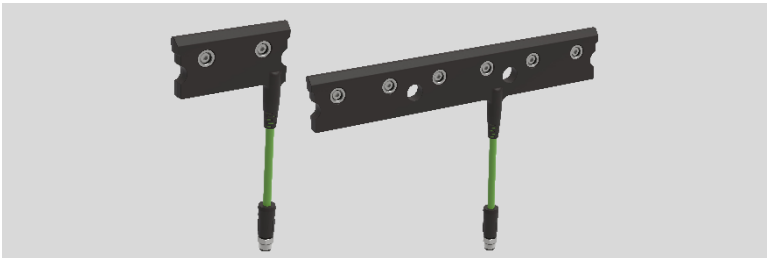
Position transmitter SDAT-MCS-HS

Data sheet

DRIVE-CLiQ

-H- Note

The position transmitter is used to record the carrier position and provides current measured values through the DRIVE-CLiQ interface.



Technical data			
SDAT-MCS-HS-		306-1-DQ-M12-CS	102-1-DQ-M12-CS
Measuring range	[mm]	306	102
Design		Design for MCS profile	
Measured variable		Absolute position	
Measuring principle		Magnetic, Hall effect	
Display components		Status LED according to DRIVE-CLiQ specification LED strip for position display	
Sensing range, effective	[mm]	0 ... 326	0 ... 122
Path resolution	[µm]	1	
Repetition accuracy[1)]	[mm]	±0,05	
Temperature coefficient[1)]	[µm/m/K]	4	
Field strength, nominal	[mT]	50	
Travel speed	[m/s]	≤ 5	
Travel acceleration	[m/s²]	≤ 50	
Interface		DRIVE-CLiQ	
Electrical connection		Cable with plug, M12, A-coded, 8-pin	
Cable length	[m]	0,3	
Cable diameter	[mm]	7	
Bending radius, fixed cable installation	[mm]	≥ 50	
Bending radius, flexible cable installation	[mm]	≥ 105	
Mounting position		Any	
Weight	[g]	280	115
Type of mounting		Through flanged bushes	
Scope of delivery		Position transmitter Flanged bushings O-rings Screws	

1) Repetition accuracy refers to the nominal measurement range of the position transmitter and cannot be transferred to the overall system.
1) Depending on the coefficient of expansion of the mounting surface

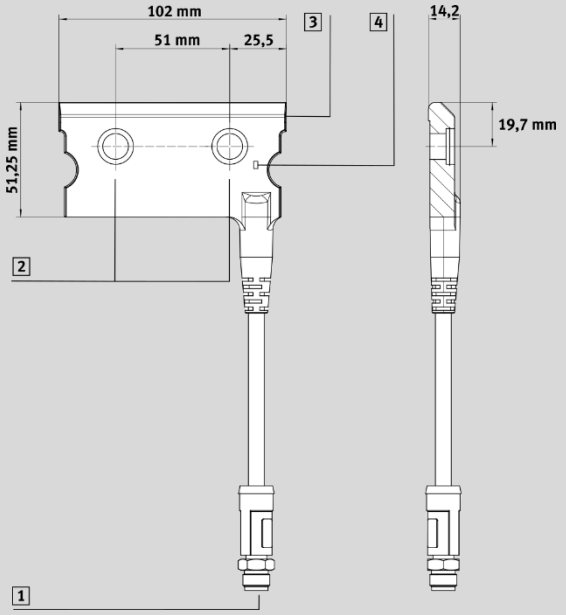
Operating and environmental conditions			
SDAT-MCS-HS-		306-1-DQ-M12-CS	102-1-DQ-M12-CS
Ambient temperature	[°C]	-10 ... +80	
Relative humidity	[%]	0 ... +95 (non-condensing)	
Corrosion resistance class CRC[0]		2	
Material			
Housing		Polyamid 12	
Cable sheathing		TPE-PUR	
Note on materials		RoHS-compliant	
Special characteristics		Oil-resistant	
Vibration/shock resistance		Class 2	
Degree of protection according to EN 60529		IP65	
Service-life values[2)]			
MTTF (Ta = 40°C)	[a]	> 61,6	> 98,8
MTTF (Ta = 60°C)	[a]	> 23,1	> 36,4
CE marking ➔ www.festo.com/sp ➔ Declaration of Conformity		To EU EMC Directive	
Certification		Siemens DRIVE-CLIQ certificate C00048 RCM compliance mark	

1) Corrosion resistance class CRC 2 according to Festo standard FN 940070
Moderate corrosion loading. Indoor application in which condensation can occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.
2) Calculated for an ambient temperature of Ta = 40°C/60°C according to the parts-count method pursuant to Siemens standard 29500 under reference conditions based on EN 61709 for the phase of constant failure rates.

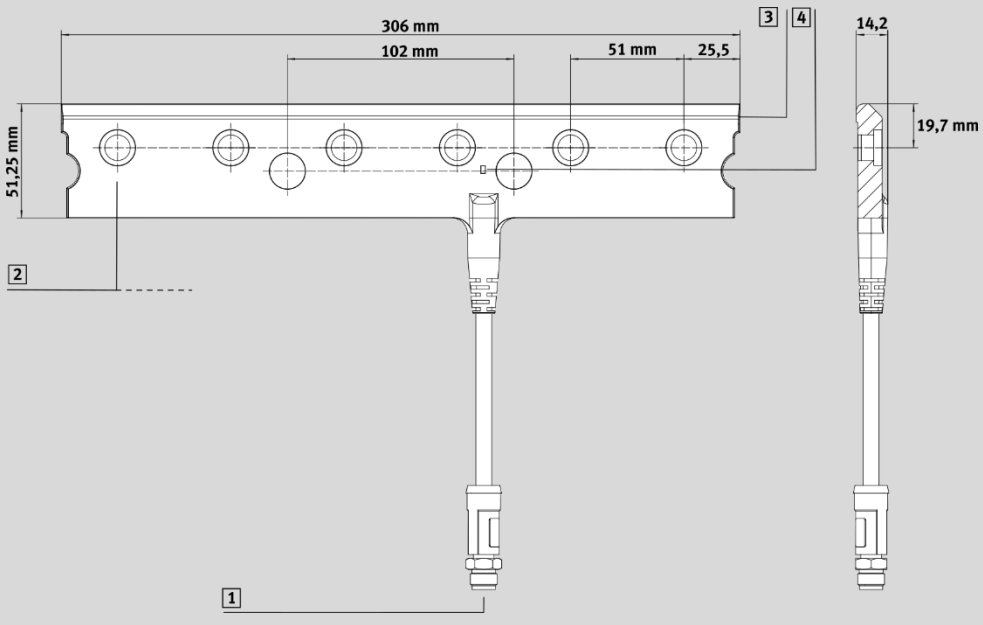
Position transmitter SDAT-MCS-HS

Dimensions

SDAT-MCS-HS-102-1-DQ-M12-CS



SDAT-MCS-HS-306-1-DQ-M12-CS

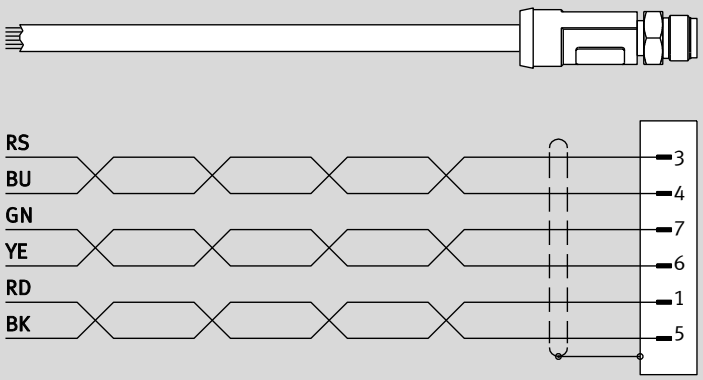


1 Connector plug for connecting cable to converter
2 Holes (6x) for mounting with flanged bushes
3 LED strip for displaying the current position of a carrier
4 DRIVE-CLiQ LED

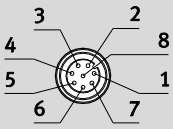
Position transmitter SDAT-MCS-HS

Data sheet

Pinning



Plug (M12, Pin)



Wire marking

Pin	Colour	Connection
3	RS	RX-P
4	BU	RX-N
7	GN	TX-P
6	YE	TX-N
1	RD	+24 V
5	BK	0 V

Allocation of position transmitter to linear motor

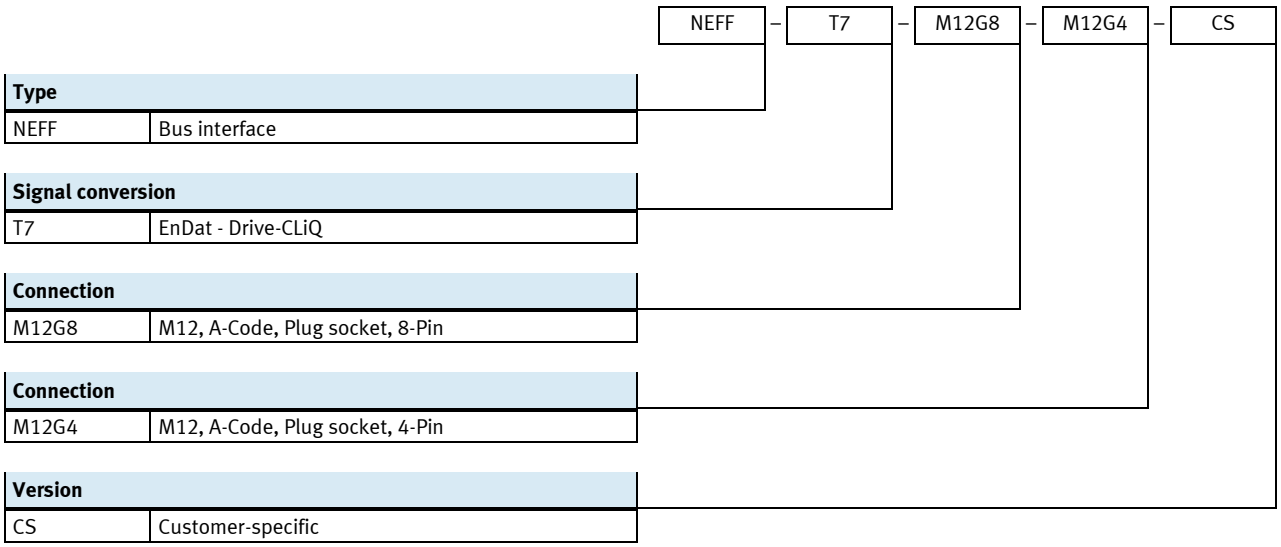
Linear motor	Position transmitter	Number
EMLX-AS-90-306-3-...-CS	SDAT-MCS-HS-102-1-DQ-M12-CS	3
EMLX-AS-90-306-1-...-CS	SDAT-MCS-HS-306-1-DQ-M12-CS	1
EMLX-AS-90-408-4-...-CS	SDAT-MCS-HS-102-1-DQ-M12-CS	4

Note

When installing the position transmitter, pay attention to the maximum bending radius of 50 mm of the connection cable.

Bus interface NEFF-T7-M12G8-M12G4-CS

Type code



Type	
NEFF	Bus interface

Signal conversion	
T7	EnDat - Drive-CLiQ

Connection	
M12G8	M12, A-Code, Plug socket, 8-Pin

Connection	
M12G4	M12, A-Code, Plug socket, 4-Pin

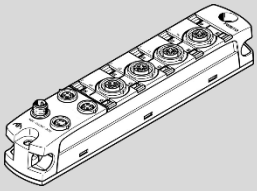
Version	
CS	Customer-specific

Bus interface NEFF-T7-M12G8-M12G4-CS

Data sheet

Note

The bus interface is used to detect the carrier position by use of an optical measuring system.



Technical data		
		NEFF-T7-M12G8-M12G4-CS
Functional principle		Position conversion absolute
Interfaces		EnDat 2.2 (2x) DRIVE-CLiQ TCP/IP
Interface X1 / X2		Plug socket, M12, A-Code, 8-Pin
Interface X3		Plug socket, M12, A-Code, 4-Pin
Interface X4		Plug socket, M12, A-Code, 4-Pin
Display elements		Status-LED according to DRIVE-CLiQ-Specification Status-LED EnDat Interface Status-LED TCP/IP Interface
Electrical connection	[V]	24
Electrical connection - Input		Plug pin, M8, A-Code, 4-Pin
Electrical connection - Output		Plug socket, M8, A-Code, 4-Pin
Mounting position		Any
Weight	[g]	156

Operating and environmental conditions		
		NEFF-T7-M12G8-M12G4-CS
Ambient temperature	[°C]	–20 ... +50
Relative humidity	[%]	0 ... +95 (non-condensing)
Material		
Housing		Polyamide Polycarbonate Zinc die casting
Special characteristics		RoHS-compliant
Vibration/shock resistance		Class 1
Degree of protection according to EN 60529		IP40
CE marking → www.festo.com/sp → Declaration of Conformity		To EU EMC Directive
Certification		RCM Mark

Accessories NEFF		
	Type	Part number
Read head, optical	RSF Elektronik GmbH AK MC15	1269654-02
Scale, optical	RSF Elektronik GmbH MB MC15MK	1337166-01
Connection cable - 24 VDC	NEBU-M8G4-K-2.5-LE4	541342
	NEBU-M8G4-K-5-LE4	541343
	NEBL-M8G4-E-5-N-LE4	8065110
	NEBL-M8G4-E-10-N-LE4	8065117
Connection cable - 24 VDC	NEBL-M8G4-E-0.3-N-M8G4	8082904
Connection cable - DQ	NEBC-D12G4-ES-3-S-D12G4-ET	8040448
	NEFU-D12G4-R3DW4	8040457
Connection cable - Ethernet	NEBC-D12G4-ES-3-S-R3G4-ET	8040452

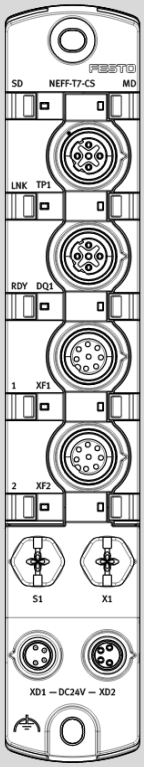
Note

All scales must start at an absolute measurement value of 0 mm and must be mechanically identical mounted on the carrier. The scales length depends on the motor configuration as well as the overlap area and must be considered when ordering.

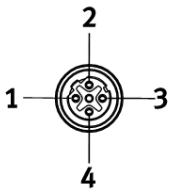
Bus interface NEFF-T7-M12G8-M12G4-CS

Data sheet

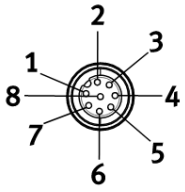
Pinning



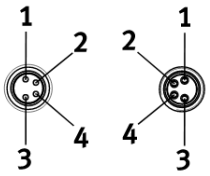
Ethernet / Drive-CLiQ TP1 / DQ1	
Pin	Connection
1	Tx+
2	Rx+
3	Tx-
4	Rx-



Encoder XF1 / XF2	
Pin	Connection
1	GND
2	+5V
3	Data+
4	Data-
5	GND
6	Clock-
7	Clock+
8	+5V



DC 24 V XD1 / XD2	
Pin	Connection
1	24V PS
2	0V PL
3	0V PS
4	24V PL

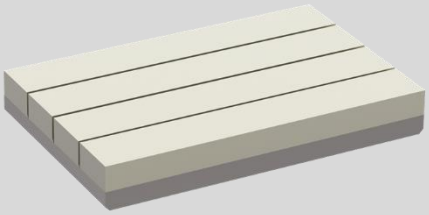


Magnet plate MCS-120-CA-NDFEB

Data sheet

-H- Note

Magnet plate for integration into an individual carrier



Technical data			
Type		78	55
Constant feed force per magnet plate[1)]	[N]	22	16
Peak feed force per magnet plate	[N]	91	64
Max. speed	[m/s]	4	4
Max. acceleration	[m/s²]	50	50
Weight	[g]	310	220

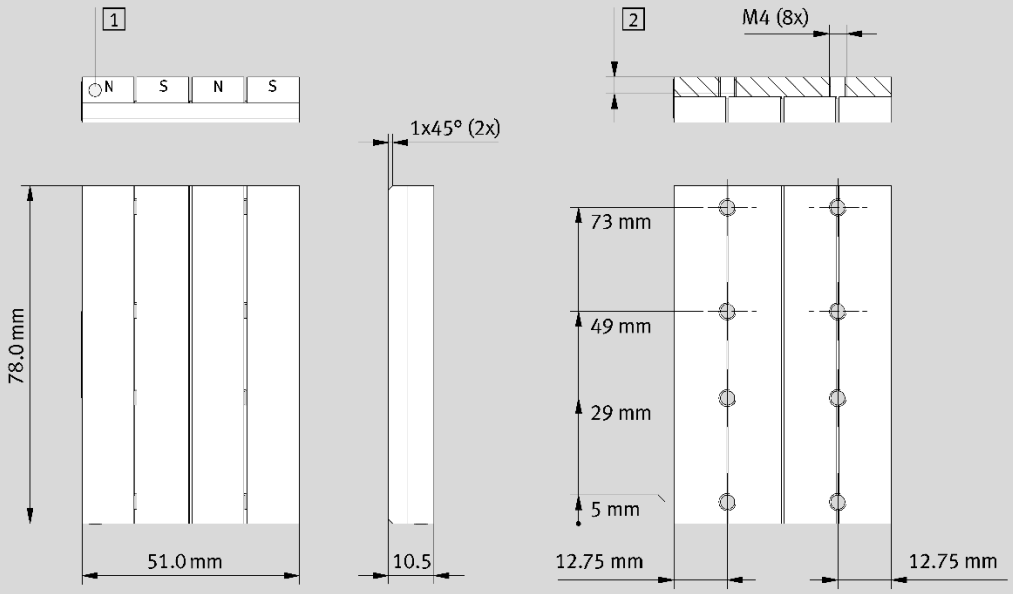
1) With a nominal current of 1,7 A

Operating and environmental conditions		
Ambient temperature	[°C]	–10 ... +80
Storage temperature	[°C]	–10 ... +80
Relative humidity	[%]	0 ... +95 (non-condensing)
Corrosion resistance class (CRC)[2)]		2
Material		
Base plate		Steel, nickel-plated
Magnetic material		NdFeBr N50, nickel-plated
Note on materials		RoHS-compliant

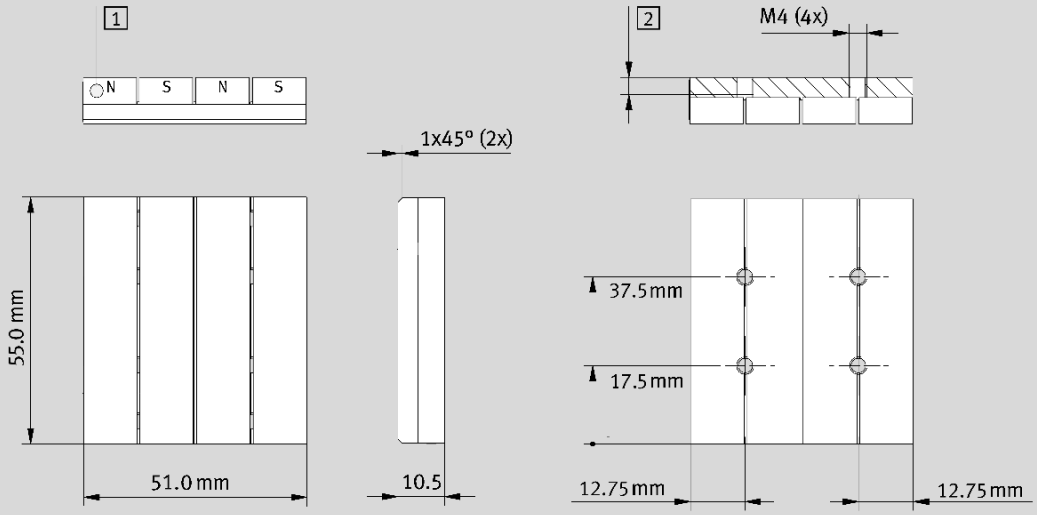
2) Corrosion resistance class CRC 2 according to Festo standard FN 940070
Moderate corrosion loading. Indoor application in which condensation can occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.

Dimensions

- 78



-55



1 Marking for magnetic north
2 Maximum screw-in depth: 4 mm

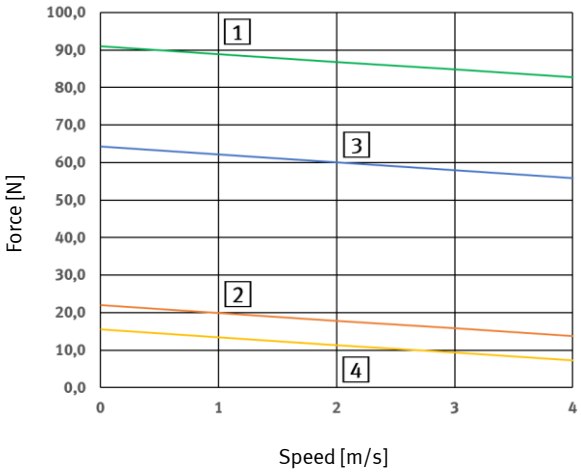
Note

When mounting the magnet plate, observe the maximum screw-in depth of 4 mm. Fastening screws that are too long will damage the magnet plate.

Magnet plate MCS-120-CA-NDFEB-N50-...-CS

Motor characteristic curves

Motor characteristic[1] - EMLX-AS-90



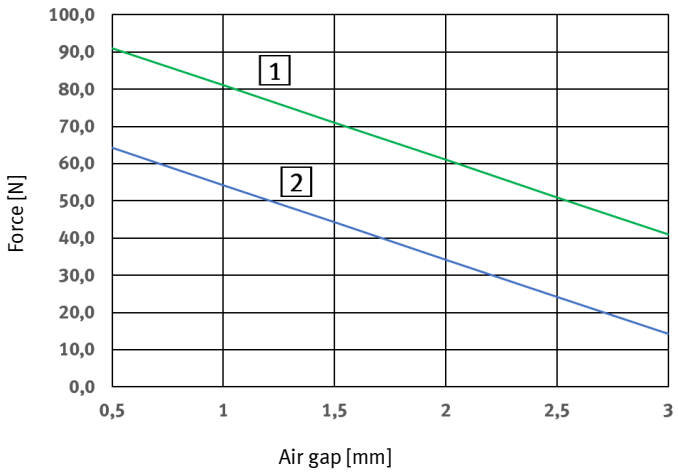
Magnet plate 78 mm

1 Design characteristic curve incl. friction, damping
2 Motor characteristic curve nominal force

Magnet plate 55 mm

3 Design characteristic curve incl. friction, damping
4 Motor characteristic curve nominal force

Force curve depending on the air gap



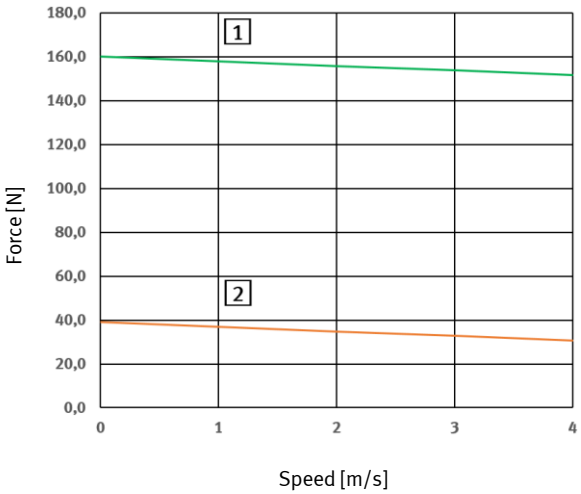
Magnet plate 78 mm

1 Design characteristic curve

Magnet plate 55 mm

2 Design characteristic curve

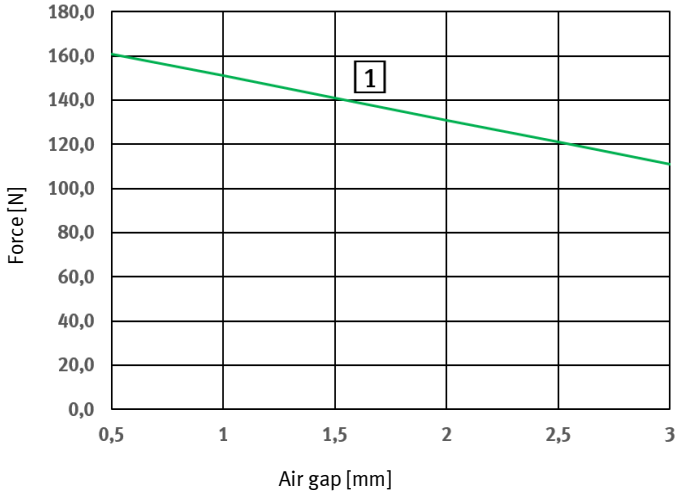
Motor characteristic[1] - EMLX-AS-160



Magnet plate 2 x 78 mm

1 Design characteristic curve incl. friction, damping
2 Motor characteristic curve nominal force

Force curve depending on the air gap



Magnet plate 2 x 78 mm

1 Design characteristic curve

1) With nominal air gap

Magnetic field

Magnets create a strong, extensive magnetic field. Amongst other things, they can damage televisions and laptops, computer hard disks, credit and debit cards, data carriers, mechanical clocks, hearing aids and loudspeakers.

- Keep magnets away from all devices and objects that can be damaged by strong magnetic fields.

Pacemakers

Magnets can influence the function of pacemakers and implanted defibrillators.

– A pacemaker can be switched to test mode and cause discomfort.
– A defibrillator may stop working.

- If you have any medical devices of this type, keep a sufficient distance from magnets.
- Warn people with such medical devices away from magnets.

Crushing and pinching injuries

Large magnets have a very strong attractive force.

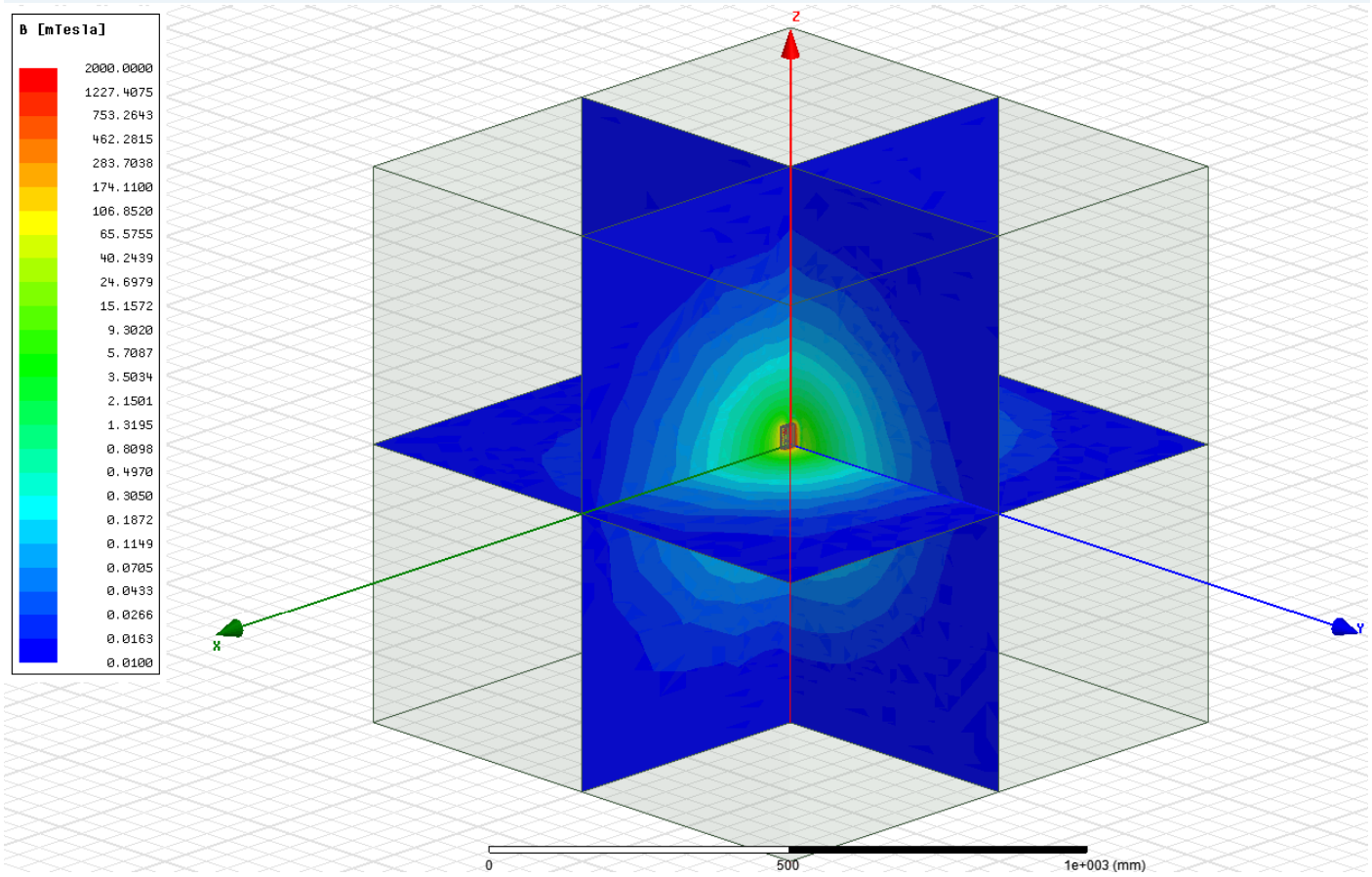
In case of careless handling, you can get your fingers or skin between two magnets. This can lead to crushing and pinching injuries and bruises at the pertinent points.

- When handling larger magnets, wear thick protective gloves.

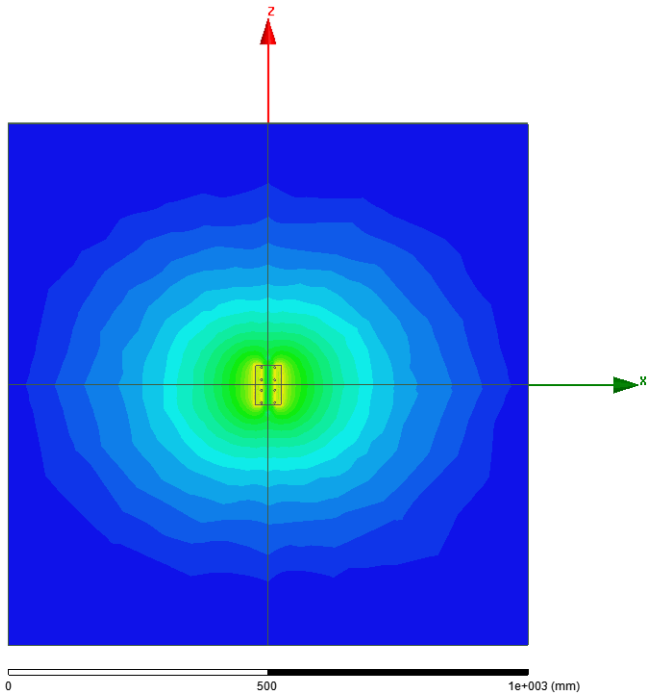
Magnet plate MCS-120-CA-NDFEB-N50-78-CS

Magnet field pattern

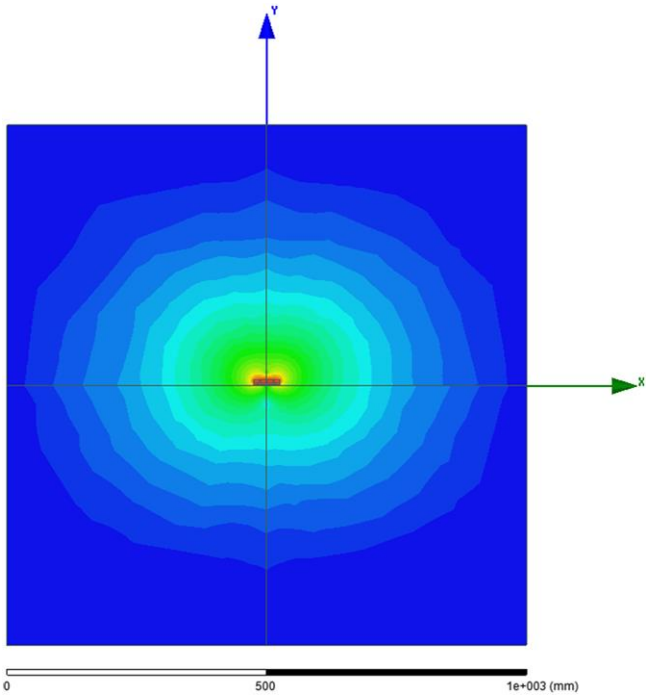
Example of a carrier with a built-in magnet plate.



View of main axis (from above)



View along longitudinal axis (from the front)

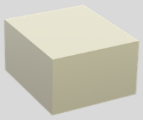


Position magnet MCS-120-NDFEB-N40-CS

Data sheet

-H- Note

Position magnet for integration into an individual carrier

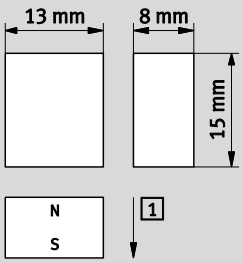


Technical data		
Type		MCS-120-NDFEB-N40-CS
Material		
Magnetic material		NdFeBr N40, nickel-plated
Note on materials		RoHS-compliant
Weight	[g]	12

Operating and environmental conditions		
Ambient temperature	[°C]	–10 ... +80
Storage temperature	[°C]	–10 ... +80
Relative humidity	[%]	0 ... +95 (non-condensing)
Corrosion resistance class CRC[1)]		2

1) Corrosion resistance class CRC 2 according to Festo standard FN 940070
Moderate corrosion loading. Indoor application in which condensation can occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.

Dimensions



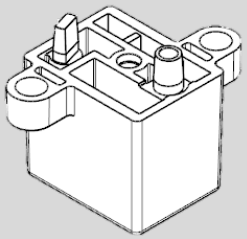
1 Direction of magnetization

Position magnet MCS-120-NDFEB-N40-V2-CS

Data sheet

-H- Note

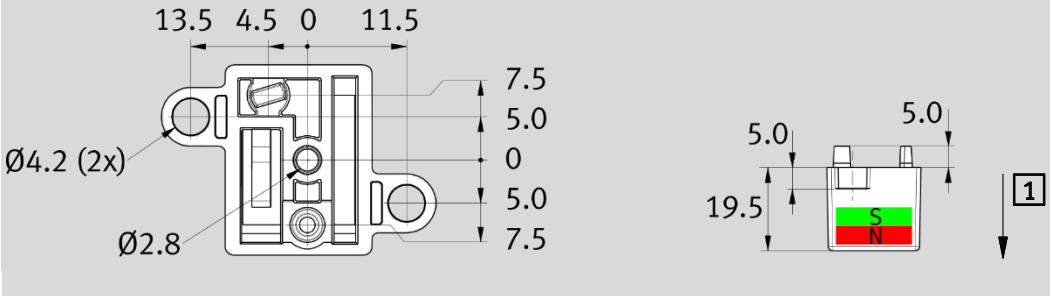
Position magnet with mounting interface



Technical data		
Type		MCS-120-NDFEB-N40-V2-CS
Material		
Magnetic material		NdFeBr, nickel-plated
Housing		PPS, reinforced
Potting		PUR
Note on materials		RoHS-compliant
PWIS conformity		VDMA24364-Zone III
Weight	[g]	20
Scope of delivery		Position magnet (10x) Screw 3x10 (10x)

Operating and environmental conditions		
Ambient temperature	[°C]	–10 ... +60
Storage temperature	[°C]	–10 ... +80
Relative humidity	[%]	0 ... +95 (non-condensing)

Dimensions



1 Direction of magnetization

Note

The 2.8 mm hole is intended for mounting the position magnet with the 3x10 screw supplied. The maximum screw-in depth is 6.0 mm. The maximum tightening torque is 1.0 Nm.

If the hole is used for fastening, the fastening eyelets on the side can be cut off.

System accuracy MCS

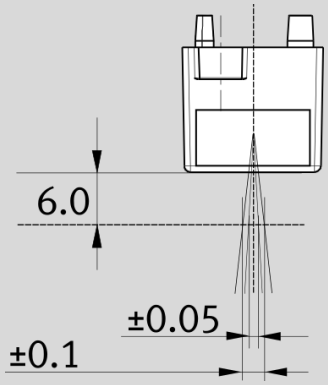
Position magnet MCS-120-NDFEB-N40

The following repeat accuracies apply to the MCS without the mechanical guide:

Position magnet without mounting interface: Repeatability with respect to the outer dimensions of the position magnet.
This results in a system accuracy of ±0,1 mm across all carriers.

Position magnet with mounting interface: Improved repeatability through calibration. The position magnet is delivered in a mechanically precisely defined holder and mounting interface. The repeatability is defined on the mounting interface.
This results in a system accuracy of ±0,05 mm across all carriers.

Comparison of position magnet without mechanics / with mounting interface



(Enlarged image)

Bus interface with optical sensor NEFF-T7-M12G8-M12G4-CS

Repeat accuracy depending on the mechanical guidance corresponding to a possible tilting of the carrier. The measuring head itself remains within its specified values if the installation situation is fulfilled. Specified values apply to accessories listed under accessories bus connection NEFF.

Measuring head and measuring tape:

- Measuring step: 0.1 µm
- Accuracy class: ±15 µm/m
- Coefficient of expansion: α = 10 x 10-6 K-1

To evaluate the optical sensor, the temperature drift as well as the tolerance of the mechanical guide must be considered.
This results in a system accuracy of ±0.002 mm over all carriers.

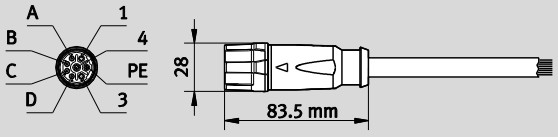
Accessories

Motor cable NEBM

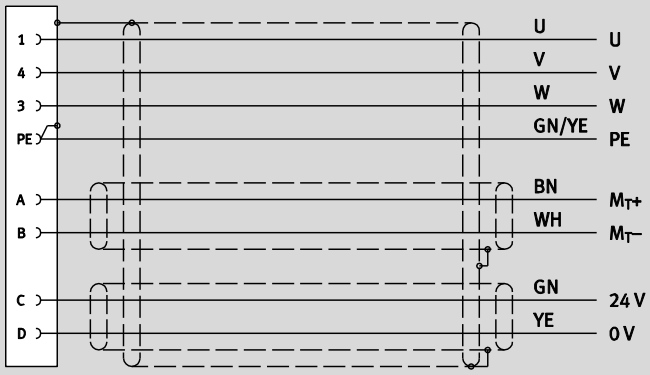
Technical data				
Type		NEBM-M23FG8-E-5-CS	NEBM-M23FG8-E-10-CS	NEBM-M23G8-E-15-CS
Cable composition		2x (2x 0,25 mm²) – colour-coded		
		4x 0,75 mm² – numbered		
		Shielded		
Cable length	[m]	5	10	15
Weight	[g]	900	1220	2510
Cable diameter	[mm]	11		
Bending radius, fixed cable installation	[mm]	≥ 55		
Bending radius, flexible cable installation	[mm]	≥ 110		
Ambient temperature	[°C]	–40 ... +90		
Electrical connection		M23x1, plug socket, TWILOCK		
Cable characteristics		Suitable for use with energy chains		
Degree of protection		IP65 (M12 in assembled state)		
Contamination level		3		
Cable sheath		PUR; TMPU according to DIN VDE 0282		
Sheath colour		Orange (RAL 2003)		
CE marking ➔ www.festo.com/sp ➔ Declaration of Conformity		In accordance with EU Low Voltage Directive		

Dimensions, pinning

Connection of motor (plug socket)



Connection of converter, non-assembled

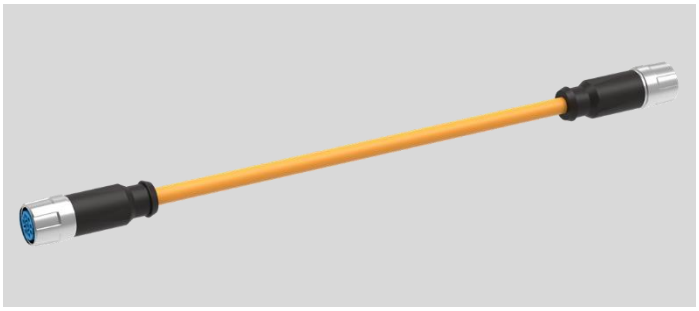


Pin	Wire marking	Connection	Function
1	U1	U	Phases for the power supply of the linear motor
4	V2	V	
3	W3	W	
PE	GN/YE	PE	Protective earth
A	BN	M_{T+}	Temperature sensor
B	WH	M_{T-}	
C	GN	24 V	Fan
D	YE	0 V	

Motor cable NEBM for motor 306-1B

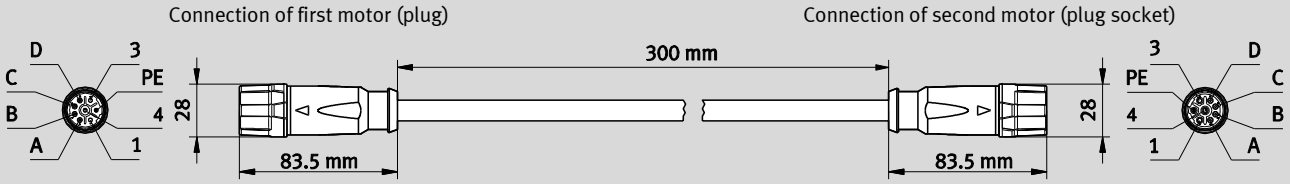
-H- **Note**

Motor cable assembled on both sides for interlinking of motor 306-1B



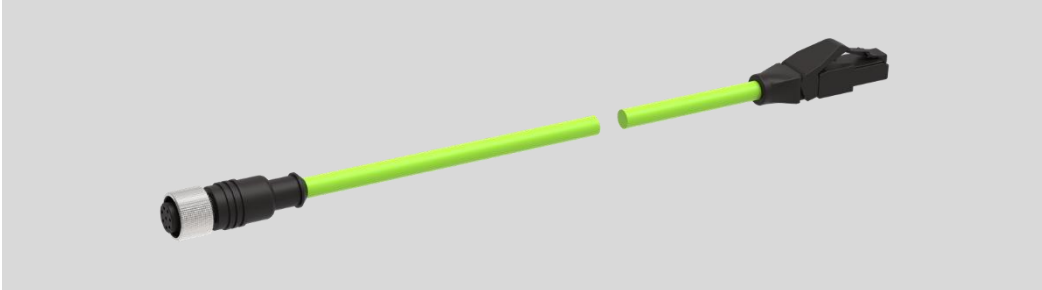
Technical data		
Type		NEBM-M23FG8-E-0,3-M23FS8-CS
Cable composition		2x (2x 0,25 mm²) – colour-coded
		4 x 0,75 mm² – numbered
		Shielded
Cable length	[mm]	300
Weight	[g]	230
Cable diameter	[mm]	11
Bending radius, fixed cable installation	[mm]	≥ 55
Bending radius, flexible cable installation	[mm]	≥ 110
Ambient temperature	[°C]	–40 ... +90
Electrical connection		M23x1, plug, TWILOCK
		M23x1, plug socket, TWILOCK
Cable characteristics		Suitable for use with energy chains
Degree of protection		IP65 (in assembled state)
Contamination level-...-		3
Cable sheath		PUR; TMPU according to DIN VDE 0282
Sheath colour		Orange (RAL 2003)
CE marking ➔ www.festo.com/sp ➔ Declaration of Conformity		In accordance with EU Low Voltage Directive

Dimensions, pinning



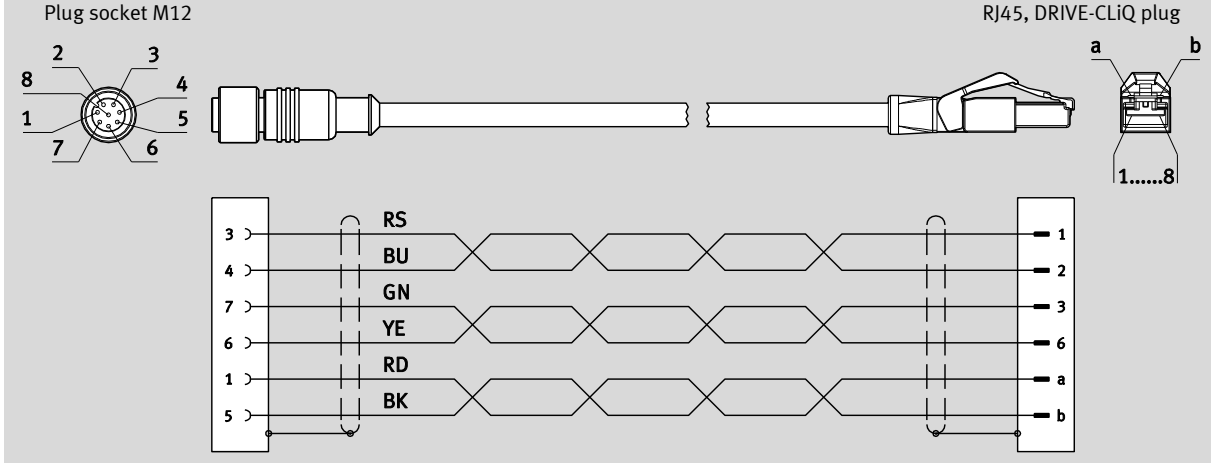
Pin	Connection	Function
1	U	Phases for the power supply of the linear motor
4	V	
3	W	
PE	PE	Protective earth
A	M_{T+}	Temperature sensor
B	M_{T-}	
C	24 V	Fan
D	0 V	

Connecting cable NEBC



Technical data				
Type NEBC-M12G8-E-...		5-NS-R3G8-DQ-CS	10-NS-R3G8-DQ-CS	15-NS-R3G8-DQ-CS
Cable composition		2x (2x 0,20 mm²) + (2x 0,38 mm²)		
		According to DRIVE-CLiQ specification		
		Shielded		
Cable length	[m]	5	10	15
Weight	[g]	320	680	910
Cable diameter	[mm]	6...8		
Bending radius, fixed cable installation	[mm]	≥ 35		
Bending radius, flexible cable installation	[mm]	≥ 105		
Ambient temperature	[°C]	–40 ... +90		
Electrical connection		Plug socket, M12, A-coded, 8-pin		
		Plug, RJ45, DRIVE-CLiQ plug		
Cable characteristics		Suitable for use with energy chains		
Degree of protection		IP65 (M12 in assembled state)		
Contamination level		3		
Cable sheath		PUR		
Sheath colour		Green (DESINA)		

Dimensions, pinning



Plug socket M12		Wire marking	RJ45 DRIVE-CLiQ-plug	
Connection	Pin	Colour	Pin	Connection
RX-P	3	RS	1	TX-P
RX-N	4	BU	2	TX-N
TX-P	7	GN	3	RX-P
TX-N	6	YE	6	RX-N
+24 V	1	RD	a	+24 V
0 V	5	BK	b	0 V

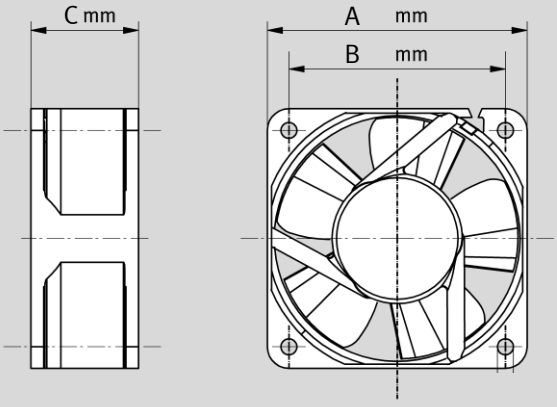
Fan EMLX-MCS-...-FAN-CS

-H- Note

Fan for active heat dissipation in the Heat sink

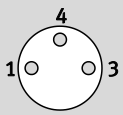
Technical data			
Type		EMLX-MCS-90-FAN-CS	EMLX-MCS-160-FAN-CS
Electrical data			
Supply voltage	[V DC]	24	24
Performance	[W]	12	12
Fan efficiency	[m³/h]	70	138
Temperature range	[°C]	-20 ... +70	-20 ... +70
Noise	[dB(A)]	30.000	30.000
Service life L10 (Tmax = 70°C)	[h]	80	119
Weight	[g]	71,5	104,8
Dimension A	[mm]	32	32
Dimension B	[mm]	70	24
Dimension C	[mm]	-20 ... +70	12
PWIS criterion		VDMA24364-Zone III	
Note on materials		RoHS-compliant	
Degree of protection		IP55	
CE marking ➔ www.festo.com/sp ➔ Declaration of Conformity		To EU EMC Directive	

Dimensions



(For dimensions see table above)

Pinning

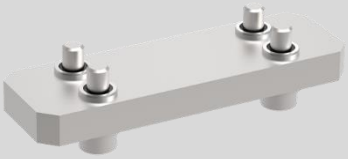


M8 plug	
Pin	Connection
1	+24 V
3	0 V
4	n.c.

Connector MCS-120-RC-BG-CS

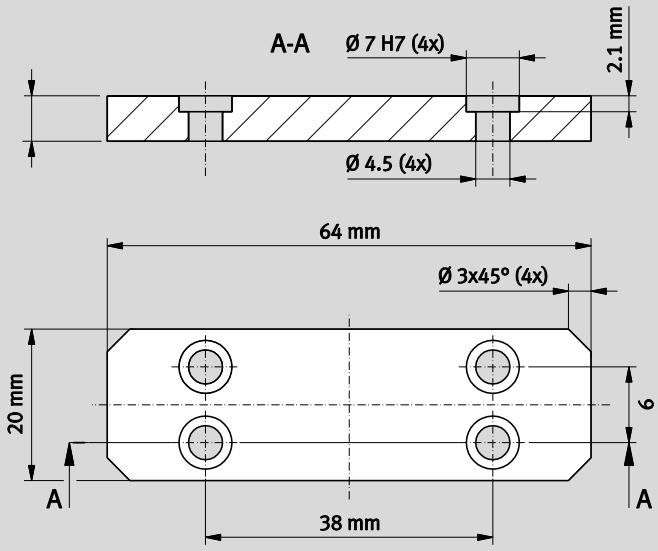
-H- Note

Connector for the magnetic return coupling of the linear motors.



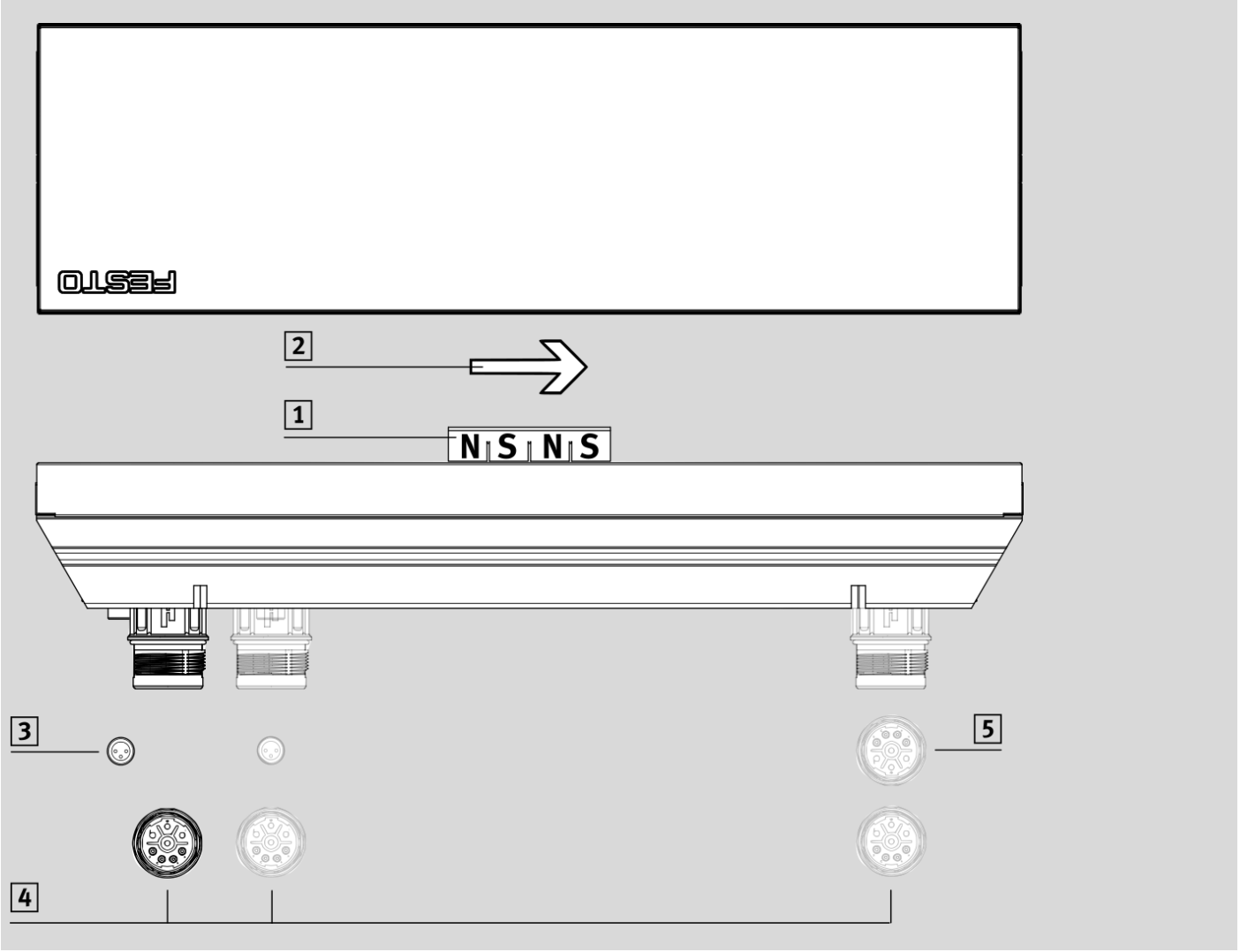
Technical data	
Type	MCS-120-RC-BG-CS
Material	Steel C45
Surface	Nickel-plated
Scope of delivery	Connector Centring sleeve ZBH-7 (4x) Screws (4x) Washers (4x)

Dimensions



Installation instructions

Placement of the linear motor



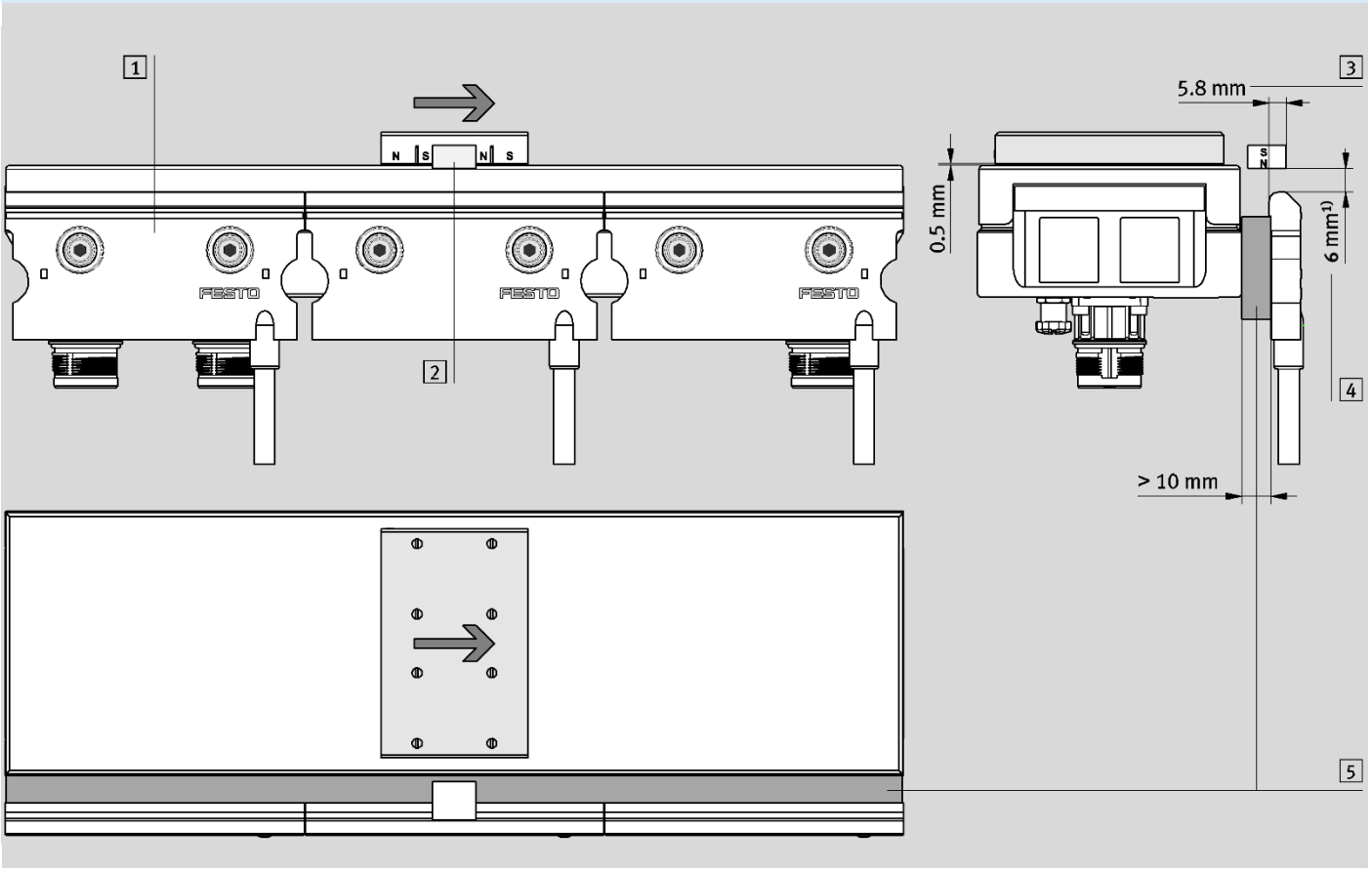
1 North pole
2 Standard direction of movement of a magnet plate (installed into the carrier)
3 Connection plug (M8, socket) for van
4 Standard Plug (M23, pin) for phases U, V and W
5 Standard Plug (M23, socket) for phases U, V and W[1)]

1) For EMLX-AS-xx-306-1B-x-CS: Plug socket for interlinking with an additional motor segment

To show the direction of movement (from left to right) 2 the view of the linear motor in the sketch above is suitable. The magnet plate must be aligned in such a way that the north pole lies in the rear in the direction of movement. The electrical polarity of phases U, V and W at the motor connection 4 determines the direction of rotation of the magnetic fields in the linear motor. The resulting magnetic force affects the magnet plate and moves it together with the converted carrier. The direction of movement shown in this sketch only results if the wiring of the motor connection shown on the page Motor cable NEBM is used.

Installation instructions

Placement of the position magnet and position transmitter



1 Position transmitter
2 Position magnet 13 x 15 x 8 mm
3 Horizontal alignment of the position magnet regarding the position transmitter (Tolerance ± 0,2 mm)
4 Vertical distance between the position magnet and position transmitter (Tolerance ± 0,2 mm)
5 Distance block for the minimum distance between the position transmitter and the linear motor

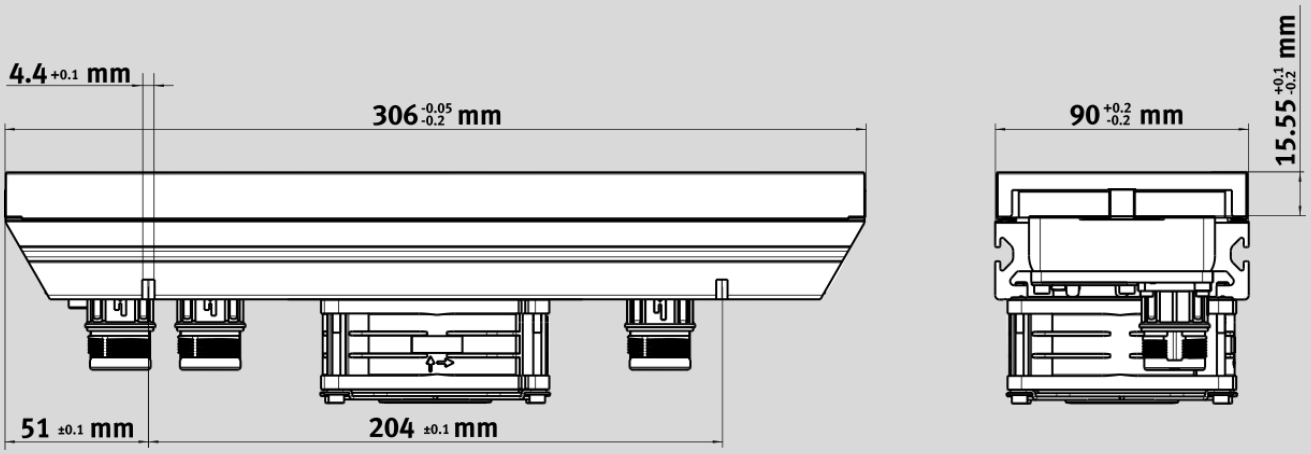
1) Nominal gap 6 mm

The position magnet 2 carried by the carrier can be found on the side of the carrier (not shown here) in this example. The position of the position transmitter 1 in relation to the position magnet is important for its reliable detection. Here, the position transmitter must be attached below the position magnets whilst observing the set distances 3 and 4.

If the position magnet in the carrier is designed to be at a greater distance from the magnetic plate, the position transmitter must be moved in the same way with the aid of a suitable distance block 5. In the distance block for fixing the position transmitter, cylinder recesses with a depth of 4 mm (tolerance +0,1) and a diameter of 10H7 must be provided.

All mounting components must be made of a non-magnetic material, such as aluminium, stainless steel or electrically conductive plastic.

Tolerances EMLX



General information

-H- Notes on mechanical construction

– There must be no magnetic steel parts in the direct area of influence of the motor and the position transmitter. If magnetic materials are to be used in this area, please contact Festo.

– All parts must be made of the following materials: aluminum, stainless steel or electrically conductive plastic.

– The connection of two motors must be realized with a magnetic steel material, e.g. steel C45. The dimensions can be taken from the connector (➔ drawing page 27).

– The air gap between motor surface and magnet plate should be 0,5 mm. Any deviation from the nominal air gap results in a reduction of the feed force (➔ diagram page 18).

Ordering data

Width		Length		Plug		Cooling		Type	Part number
90	160	306	408	straight	angled	Fan (active)	Water		
■		■		■		■		EMLX-AS-90-306-1-L-S-CS	8147432
■		■		■		■		EMLX-AS-90-306-3-L-S-CS	8147434
■		■			■	■		EMLX-AS-90-306-1-L-A-CS	8147438
■		■			■	■		EMLX-AS-90-306-3-L-A-CS	8147440
■			■	■		■		EMLX-AS-90-408-4-L-S-CS	8149463
■			■	■		■		EMLX-AS-90-408-2-L-S-CS	8149468
■			■		■	■		EMLX-AS-90-408-4-L-A-CS	8149469
■			■		■	■		EMLX-AS-90-408-2-L-A-CS	8149470
■		■		■			■	EMLX-AS-90-306-6-W-S-CS	8153463
■		■		■			■	EMLX-AS-90-306-3-W-S-CS	8153462
■		■		■			■	EMLX-AS-90-306-1-W-S-CS	8199193
	■	■		■		■		EMLX-AS-160-306-1-L-S-CS	8136495
	■	■		■		■		EMLX-AS-160-306-3-L-S-CS	8136497
	■	■			■	■		EMLX-AS-160-306-1-L-A-CS	8137332
	■	■			■	■		EMLX-AS-160-306-3-L-A-CS	8137334

Designation	Type	Part number
Position transmitter	SDAT-MCS-HS-102-1-DQ-M12-CS	8107067
	SDAT-MCS-HS-306-1-DQ-M12-CS	8106157
Bus interface	NEFF-T7-M12G8-M12G4-CS	8165847
Magnet plate	MCS-120-CA-NDFEB-N50-78-CS	8022552
	MCS-120-CA-NDFEB-N50-55-CS	8163443
Position magnet	MCS-120-NDFEB-N40-CS	4188197
	MCS-120-NDFEB-N40-V2-CS	8166096
Motor cable	NEBM-M23FG8-E-5-CS	8067792
	NEBM-M23FG8-E-10-CS	8067793
	NEBM-M23FG8-E-15-CS	8067794
	NEBM-M23FG8-E-0,3-M23FS8-CS	5399561
Connecting cable	NEBC-M12G8-E-5-NS-R3G8-DQ-CS	5216232
	NEBC-M12G8-E-10-NS-R3G8-DQ-CS	5217602
	NEBC-M12G8-E-15-NS-R3G8-DQ-CS	5217607
Fan (Spare part)	EMLX-MCS-90-FAN-CS	8131159
	EMLX-MCS-160-FAN-CS	8110931
Connector	MCS-120-RC-BG-CS	4188116